BUFFALO NATIONAL RIVER

TERRESTRIAL HABITAT MANAGEMENT PLAN

ENVIRONMENTAL ASSESSMENT

2005

TABLE of CONTENTS

I. INTRODUCTION

Terrestrial habitat management at Buffalo National River (BNR) represents a unique opportunity to mesh the objectives of cultural resource management, natural resource management, and public use in a single plan. The enabling legislation for BNR requires the protection of these three seemingly competing resources. Public Law 92-237 of March 1, 1972 (86 Stat. 44) established BNR:

> "for the purpose of conserving and interpreting an area containing unique scenic and scientific features and preserving as a free-flowing stream an important segment of the Buffalo National River in Arkansas for the benefit and enjoyment of present and future generations…".

The U.S. House of Representatives Committee Report (1972) describes the justification for the establishment of BNR:

> "…It is not one single quality, but the combination of its size, its completeness, its wild qualities, and its associated natural, scenic, and historic resources that makes the Buffalo worthy of national recognition".

Interpretation of the enabling legislation was made in the Final Master Plan (NPS, 1977) in part by addressing the provision of open fields:

> "Open fields will be maintained where scenic and wildlife habitat will be enhanced".

The Concept for Land Classification within the Master Plan outlines land use zones within BNR and includes; pastoral, recreational, natural, and primitive zones that further support the coexistence of the various resource objectives.

Background

Approximately 10.5 percent (10,005 acres) of the authorized 95,730 acres of BNR was cropland or pasture when Public Law 92-237 was signed into effect (Final Environmental Statement, Proposed Master Plan, NPS, September 1975). Well over half of those acres lie along the bottom lands of the river and its tributaries. Many fields, especially those

that were marginally productive and those with difficult access, were withdrawn from agricultural use as they were acquired by the National Park Service (NPS). Agricultural use is currently approximately 3,700 acres divided into: Private Use Zones (1,690 acres), Agricultural Use and Occupancy (400 acres), Historic Leasing (260 acres) or Special Use Permits (SUP) (1,350 acres). As Use and Occupancy terms have expired, they have been evaluated for inclusion in terrestrial habitat management actions.

In the past, the determination of an open field's best utilization was on a case by case basis. Park planning and zoning concepts provide a general framework but are subject to broad interpretation. Selection of fields and open areas was based on landscape conditions present when BNR was established in 1972.

In 1987, an Open Fields Management Plan was developed. In the mid 1980s and early 1990s small scale efforts were made to improve the forage on SUP fields using native warm season grass mixes. These efforts met with limited success.

In the mid 1990s, a cooperative effort with a challenge cost share agreement between BNR and the Arkansas Game and Fish Commission (AGFC) was initiated to establish native warm season grasses in SUP fields. Thirty (30) acres of warm season grasses were successfully established in SUP fields. At the same time, a list of candidate areas to be managed as early succession communities was made by an analysis of remote sensing data.

The candidate areas were physically surveyed in 1998 to determine species composition, vegetation state, and feasibility of managing as early succession areas. Field operations were begun to meet the goals of the 1982 plan and to improve the available habitat on public land. These operations were funded by various sources including the National Park Service, AGFC, Rocky Mountain Elk Foundation (RMEF), and the National Wild Turkey Federation (NWTF).

By the mid 1990s the Arkansas elk herd had increased its range to areas well outside of BNR. As the herd’s range expanded, nuisance elk complaints on adjacent private lands increased. This provided impetus to develop management strategies to improve the available habitat on public land. Buffalo National River, AGFC, and the University of

Arkansas (UA) undertook a study of habitat utilization and elk population dynamics within the Arkansas elk range.

AGFC developed an Elk Management Plan in 2001 (AGFC, 2001). The strategic management of the herd was coupled with a limited managed hunt initiated in 1998. These actions led to the need to develop a more comprehensive management document covering many aspects of wildlife habitat management, both game and non-game species.

A more specific terrestrial habitat management program is necessary to address the management of forested land as well as early successional and open areas including cane communities, glades, and savannahs.

II. NEED AND JUSTIFICATION

Early planning documents and the legislative history of BNR envisioned agricultural activities and open fields as part of the "array of qualities" to be perpetuated along the Buffalo River. According to the Master Plan for the Proposed Buffalo National River (NPS, 1967):

> "Bottomland pastures along the river add a pleasing note of variety to the Buffalo River countryside."

The Master Plan for Proposed Buffalo Nation River (NPS, 1967) envisioned areas that are not visible from the river to continue in crop cultivation, grazing and haying where terrain and soil are suitable. This is in addition to the Boxley and Richland Valleys which are managed under private ownership and scenic easements. The Proposed Buffalo National River booklet (NPS, 1968), which was used during Congressional hearings (NPS, 1971), states that the National Park Service would buy most of the land in the Conservation Zone (78,133 acres) in fee and then "lease back the better agricultural land to individuals who could maintain the pastoral scene by farming."

According to the Park's Final Master Plan (NPS, 1977), the concept for dividing BNR into various broad land classes is to assure the visitor a variety of experiences as they pass through the different environments: pastoral, primitive, recreational, and natural. This concept envisions a further breakdown of the usual land classifications, dividing the natural environment zone into natural and pastoral. The plan states that "the natural is to revert to a normal succession of growth, while the pastoral is to be

perpetuated." The plan goes on to say that the pastoral can then be acquired on an easement basis or leased to maintain this scene.

The Master Plan (NPS, 1977) refers again to open areas less specifically. The introductory description of the "essence" of Buffalo River refers to the "valley bottoms dotted with open grassy meadows." The section titled "Managing the Resource" states that once the lands become subject to NPS management, "Its pastoral/natural character will be reasonably assured of preservation."

Among the several management objectives stated in the Plan are two that deal directly with open area management; 1) issue SUPs and make periodic evaluations to determine the validity of continuing their use for grazing and agriculture, 2) open fields will be maintained where scenic and wildlife habitat will be enhanced.

Buffalo National River must maintain the open qualities associated with historic agricultural use, provide high quality wildlife habitat and address protection of special plant and animal communities. The Terrestrial Habitat Management Plan will be based on the previously mentioned legislation, planning documents, and current scientific knowledge of the resources. Additionally, this plan must comply with the Organic Act of 1916, National Environmental Policy Act of 1969 as amended, the Wilderness Act of 1964, and the National Historic Preservation Act of 1966.

In some areas of Buffalo National River, management concerns and concepts other than those discussed in this plan will govern decisions pertaining to terrestrial habitat management. For example, cultural landscapes, historic landscapes, and development zones may have overriding goals that transcend the scope of this plan. These areas are discussed in the Final Master Plan (NPS, 1977) and other specific Buffalo National River management documents.

III. GOALS AND OBJECTIVES

The goal of this plan is to establish a strategy for management of upland forests, bottomland forests, canebrakes, open fields, glades, savannahs, and early succession habitat at Buffalo National River to support a diverse mosaic of plant and animal communities, and

pastoral settings reflective of historic cultural landscapes. This plan will provide guidelines to achieve the following primary objectives:

- Provide and maintain aesthetic visual diversity with a mosaic pattern of plant communities and successional stages.
- Restore and manage old field plant communities, and early successional stages using native flora or non-invasive, non-native grasses and forbs when necessary, to provide multi-season habitat for a diversity of wildlife.
- Maintain historic land use patterns and pastoral settings through agricultural SUP's and Historic Leasing.
- Manage and restore forests, canebrakes, thickets, savannas, and glades for floristic and habitat diversity.
- Conserve natural animal and plant communities and processes within the Park.
- Implement measures to eliminate or control invasive exotic species within BNR.

The purpose for managing terrestrial habitat at BNR is to perpetuate visual diversity, and to provide for the preservation and enhancement of plant and animal habitat. Title 36 Code of Federal Regulations 2.60 provides for such activities within National Park Service areas when they are "conducted as a necessary and integral part of a recreational activity or required in order to maintain a historic scene." Visitors will enjoy viewing these agricultural scenes, along with the forested environment. Wildlife viewing will be enhanced and hunting opportunities will be maintained as a result of this management program. These are integral parts of BNR's recreational activities and opportunities.

Wildlife habitat as used in this plan refers to those habitats intrinsic to the well being of mammals, birds, and herpetofauna. Aquatic fauna, such as fish and aquatic invertebrates, is beyond the scope of this plan and is dealt within BNR's Water Resources Management Plan (BNR, 2004). The impacts of the various management alternatives to achieve BNR's terrestrial habitat goals and objectives have been analyzed in the accompanying environmental assessment. **(Appendix A)**

IV. VEGETATION MANAGEMENT UNITS

Buffalo National River is an important refuge for native plant communities. Scattered fragments of these communities provide a glimpse of what was once a rich and diverse natural landscape. Native plant community types at Buffalo National River include savannas, glades, cane communities, upland forest and bottomland forest. Many of these communities have been invaded and ecologically degraded by non-native plants. In addition to these native plant communities there are scattered open lands in early successional stages as a result of cultural practices. The three Buffalo National River wilderness areas contain components of each of these native and cultural communities.

This plan considers six vegetation management units for Buffalo National River and develops management strategies for each. These management units are:

A. **Forest Upland** refers to forested land with greater than 50 percent canopy cover on non-alluvial soils which are generally not inundated by water. This forest type is typified by a variety of oaks and hickories, black gum, short leaf pine overstory with a mid and understory of dogwood, mulberry, redbud, and a generally sparse herbaceous ground cover.

B. Bottomland Forest refers to forested land with greater than 50 percent canopy cover on periodically flooded alluvial soils. This forest type is typified by sycamore, box elder, sweet gum, silver maple overstory species with a mid and understory of pawpaw, witch hazel, inland sea oats, cane, and Canada wild rye.

C. Fields

- *Early Succession Old Fields*
  The old field systems are open lands that have been relatively un-maintained since the federal government acquired the property. They are in various stages of plant succession and typically are dominated by eastern red cedar, locust, fescue, and sericea lespedeza (a vigorous invasive non-native). Bull thistle and spotted knapweed have the potential for providing

problems in the future. The most productive wildlife habitats occur along an edge where two or more plant communities intersect.

- *SUP Fields*
  The SUP fields are existing field systems that preserve the "pastoral" setting. They are primarily cut for hay. Tall Fescue is the dominant grass found in SUP fields. Widespread use of fescue as a forage grass for livestock is common in the Ozarks due to its ability to withstand extreme conditions and abuse. It does not produce quality forage for livestock and is detrimental to wildlife populations.

D. **Glades** are treeless or sparsely wooded openings in forests with bedrock at or near the surface and thin, well-drained soils.

Collared Lizard in Glade

E. **Savannas** are characterized by widely spaced trees and diverse ground cover vegetation which combines the floristic characteristics of both grasslands and woodlands.

F. **Cane Communities** are areas, usually alongside larger rivers and streams where river cane is the dominant understory vegetation. These areas provide a unique

habitat that is important for the survival of certain species.

The desired future condition to be achieved through this plan is the development of sustainable and enduring vegetation that can be managed with less maintenance effort, provide more sensitivity to natural and cultural resources and increase use of natural processes, while preserving the riparian corridor. Given our proposed actions, a variety of native habitats will be enhanced and the overall acreage of native plant communities significantly enlarged. The habitats for rare or endangered plant species still present on Buffalo National River, and re-introduced rare and uncommon plants once found in the Park, will be protected, restored and monitored.

Re-established Native Grass Field

Buffalo National River supports a number of rare plant and animal communities with its humid temperate climate and rugged topographic conditions. Populations of these rare species and community types are scattered throughout the Park. **(Appendix B)**

V. TERRESTRIAL HABITAT MANAGEMENT ACTIONS

> The management of terrestrial habitat is allowable and desirable at Buffalo National River as outlined in Chapter IV of National Park Service Management Policies and Buffalo National River's Master Plan (NPS, 1977) and Resource Management Plan (NPS, 1998). The Final Master Plan states that, "Improvement of game habitat for hunting will be undertaken where it can be coordinated with other programs such as improvement of scenic or general wildlife habitat and maintaining open fields." (NPS, 1977). This document outlines one resource management objective as: "Open fields will be maintained where scenic and wildlife habitat will be enhanced." (NPS, 1977).

The Arkansas Game and Fish Commission recommends a component of at least 10 percent in early successional vegetation stages for wildlife habitat management as recommended in Open Field Management Plan (NPS, 1987).

METHODS

Several environmental concerns must be considered prior to the inclusion of an area into a terrestrial management program. Buffer areas must be established to mitigate potential impacts. Continuity of a natural riparian zone has a significant beneficial effect on many fish and wildlife populations. The area necessary to reestablish this zone will undoubtedly convert some of the bottomland currently in open fields to bottomland hardwood and shrub communities. Buffer zones must also be established to offset potential erosion and pollution problems associated with agricultural use. Wildlife habitat concerns will generally limit maximum size of unbroken fields to about forty acres so that adequate wildlife travel lanes and edge habitat may be maintained. Sociological concerns may preclude certain areas from consideration where visitor uses may be in conflict with agricultural activities. Fields near backcountry camping areas or within visual or audible distance of a wilderness unit are examples.

The following actions and associated guidelines are based on the previous discussion of terrestrial habitat management:

1. Provided that specific ecological and sociological impacts are mitigated and the necessary resources are available, areas outside of wilderness that were open in 1972 will be considered for restoration and maintenance. These areas will be maintained through the use of an agricultural lease or permit. The remaining areas, where such lease or permit options are not available, will be maintained through the use of fire and approved mechanical methods. Agricultural activities will in most cases be limited to haying and grazing. This will maintain an appropriate scene, maximize benefits for wildlife, and minimize potential for resource damage.

2. The objectives used in management of those areas maintained through burning will be primarily aimed toward maintenance of a mosaic vegetation pattern for visual variety and the improvement of wildlife habitat through successional diversity.

3. A riparian corridor will be maintained or re-established to reduce stream bank erosion and enhance riparian habitat.

4. Vegetative buffer strips may be used along field edges to reduce or prevent activities such as illegal hunting and vehicular access.

5. Wildlife lanes will be established where practical to reduce the size of large unbroken fields, these lanes should be developed with wildlife friendly native species.

6. The National Park Service Management Policies (NPS, 2001) provide guidance for dealing with non-native species. Control of populations of exotic plant and animal species, including eradication, will be undertaken wherever such species threaten Park resources or public health and when control is prudent and feasible.

   Priority will be given to the control of exotic species that have a substantial impact on Park resources and that can reasonably be expected to be successfully controlled; lower priority will be given to exotic species that have almost no

> impact on Park resources or that probably cannot be successfully controlled. The decision to initiate a control program will be based on existing, and where necessary newly acquired, scientific information that identifies the exotic status of the species, demonstrates its impact on Park resources, and indicates alternative control methods and their probabilities of success (NPS Management Policies, 2001).

Currently, NPS exotic species management guidelines are being met by replacing fescue with perennial wildlife-friendly cool season grasses, warm season grasses, and legumes. The treatment methods are chosen for each field based on the least invasive application for maximum results and include a variety of treatments (herbicide treatment, no-till drilling, and fertilizer application).

Agriculture

The leasing of fields, whether under SUP or historic leasing, to private individuals for agricultural use is a generally effective method to maintain open areas. This system's general advantages are numerous:

- Little or no equipment need be maintained by the agency.
- No manpower is required from the agency for actual maintenance activities.
- Fields are usually maintained in a pastoral state.
- There are economic benefits to local communities from agricultural activities.
- Some wildlife species benefit depending on the type of agricultural activity.

Following is a specific discussion of the basic types of agricultural activities. Agricultural use will be authorized through SUP or other documents as appropriate and will generally-be granted for five years. Special conditions will be outlined in the permit to guide the permittee's activities and to protect Park resources and other National Park Service interests. These activities will be in conformance with Directors Orders 53 and specific park management plans. All fields suitable for

agricultural use which have not previously been offered for bid, will be considered for leasing to maintain their open character. Those fields for which no bid is received will be maintained following the guidelines of this management plan. If at a later date an interest is expressed in agricultural use of the field, it will again be offered for lease.

Hay Production

Hay production has been the dominant type of open field maintenance used in the past at Buffalo National River under terms of an SUP. It requires no National Park Service equipment or manpower; however, a significant amount of time is required to administer the program. Benefits are gained by certain species of wildlife from hay production alone.

Fertilized forage is often used as food by deer, elk, turkey, rabbits, woodchucks, and other herbivores; however, the primary forages used for hay in this area, fescue and Bermuda grass, are very low in palatability and are much less valuable as wildlife food than are higher quality forages such as alfalfa, orchard grass, clover and native grasses which require more careful and intensive management. Cool season grasses provide small game habitat and nesting sites. Haying operations lend themselves well to soil conservation because of the consistent, usually dense, ground cover. Maintenance of this cover and soil fertility is possible only through the application of some form of plant food or fertilizer to replace those nutrients removed from the soil by the hay crop. This creates a potential for some degree of water quality degradation, primarily from nitrogen and phosphorus. This risk, however, is minimized through use of good management practices such as applying fertilizer according to soil test recommendations, maintaining proper forage heights and utilization of buffer strips.

A great deal of flexibility is available to the National Park Service through this type of arrangement. Conditional provisions may easily be attached to any lease or permit to improve the programs value toward wildlife habitat and erosion/pollution control. Even though this type of program requires a considerable amount of staff supervision, management of this type of agreement is usually much simpler than other types of agricultural

programs since most permittee activities are very visible and take place usually only once per year (hay cutting, fertilizing, liming, etc.), thereby making it much easier to monitor. Some visitor conflicts arise in relation to camping or driving on or across hayfields but to a much lesser extent as compared to other agricultural operations.

SUP Hay Field

Grazing

Properly managed grazing is roughly equivalent to haying operations in its relation to wildlife habitat and food production. Scenic appearance is not as uniform as other practices but is in keeping with a pastoral scene, and grazing animals provide desirable additional scenic diversity.

Difficulty is encountered in attempting to supervise a program to assure that good husbandry practices such as proper stocking rates, rotational grazing, and minimum grazing heights are followed. Water Sources other than the river and adequate fencing are lacking in most fields. Ground cover may be seriously damaged, runoff volume increased, percolation decreased, animal wastes washed directly into the river and streams, and competitive wildlife food and habitat destroyed during grazing activities. Grazing animals congregate in river and stream access areas depositing wastes directly in the water and causing excessive erosion and pollution without the development of alternate water sources and construction of fencing.

The lack of cattle handling facilities is also a hindrance to grazing operations at Buffalo National River. Visitor access and/or use of those areas has high potential for conflict as a result of fences being damaged or gates left open or livestock disturbed by hunters or hikers. Grazing leases should be limited to upland areas outside of the riparian corridor to minimize impacts to water resources. Exceptions to that would be historic and private use zones in Boxley and Richland valleys. Grazing is not considered a viable management method for most Buffalo National River open lands within the foreseeable future.

Fire

Fire can set back the growth of invading woody perennials and encourage the re-growth of annual weeds and forbs in abandoned fields, glades, and savannas. Prescribed fire in forested areas reduces mid story canopy cover promoting herbaceous ground vegetation. Diversity is perhaps the most important of the factors in wildlife habitat management, and prescribed burning provides more diversity than most modern agricultural practices can offer. Application of fire within Buffalo National River is fully addressed in the Buffalo National River Fire Management Plan 2003 (NPS, 2003).

Mechanical

Open areas, glades, and savannas may be managed through the use of mechanical methods such as mowers, chainsaws, and hydraulic tree cutters where desired objectives will not be met with prescribed
fire. Open areas maintained in such a manner are usually uniform (pastoral) and wildlife habitat is enhanced if a proper schedule is followed. The use of discing and drilling in early successional old fields and SUP fields allows the establishment of improved forage by replacing low nutritive exotic species with high quality grasses and forbs including native species.

Grass No-Till Operation Being Used to Re-establish Native Grasses

Riparian areas will be managed by agricultural set-backs, planting of native riparian plant species and removal of exotic species by chainsaw, hydraulic tree cutter, mowing and pulling.

Forested areas will generally not be managed with mechanical methods except for removal of exotic species with chainsaws and hydraulic tree cutters.

Herbicide

NPS Integrated Pest Management Guidelines (www.nature.nps.gov/biology/ipm) are used to determine if herbicide is necessary for management of terrestrial habitat. Herbicide use will not be authorized if pest species can be controlled with methods such as cutting, pulling, mowing, or burning. The herbicide label, toxicity data, and Material Safety Data Sheets will be evaluated to determine if the herbicide can be used to control the pest species in the physical environment where it occurs. Herbicides will only be applied in accordance with label directions and the guidelines set forth in NPS-77, Natural Resource Management Reference Manual.

VI. APPLICATIONS

Each year, an annual work plan will be developed in consultation with appropriate Park staff to guide specific management actions. Sensitive resources will be protected by coordination and consultation with natural and cultural resource specialists, U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), and the Arkansas Department of Natural Heritage. At the end of each year, an accomplishment report will be developed and furnished to all cooperating agencies and organizations.

VII. SUMMARY

The goal of this plan is to establish a strategy for management of various vegetation management units to support a diverse mosaic of plant and animal communities reflective of historic cultural landscapes and balanced and productive wildlife habitat.

The purpose for managing terrestrial habitat is to perpetuate visual diversity and to provide for the preservation and enhancement of plant and animal habitat as required by Congressional guidance and Park planning documents.

Visitors to the Park will enjoy viewing the agricultural scenes, with wildlife viewing and hunting opportunities enhanced as a result of this management program as related in the Master Plan (NPS, 1977), “The openings cut by the river, man, or fire, in many cases provide the “edge” habitat of variety and animal activity so appealing to man for wildlife observation.”

Various methods will be utilized to accomplish the overall goals of managing terrestrial habitat. These methods will consider several environmental, cultural, historical and sociological impacts before areas are considered for inclusion in the Terrestrial Management Program.

As these proposed actions are undertaken, a variety of native habitats will be enhanced and native plant communities enlarged. The habitats for rare or endangered plant species will be protected, restored and monitored.

VIII. ORGANIZATION AND RESPONSIBILITIES

The **Superintendent** is responsible for the overall management and direction of Buffalo National River.

The **Resource Management Chief** is responsible for the overall management of the natural resource program.

The **Lead Biologist** is responsible for the development and implementation of terrestrial habitat management actions in coordination with other agencies and organizations.

The **Habitat Crew Leader** is responsible for oversight of daily field operations and provides input and feedback on operational aspects of the program.

The **Habitat Crew** implements the management actions outlined in the annual work plan.

The **Arkansas Game & Fish Commission Biologist** acts as the liaison between AGFC and BNR and other cooperators. The AGFC Biologist also provides input in the development of annual work plans and accomplishment reports.

The **University of Arkansas** system provides scientific support for management activities.

The **U.S. Forest Service** cooperates in development of regional terrestrial habitat management actions where common interests and boundaries exist.

Private Cooperators include the Rocky Mountain Elk Foundation, National Wild Turkey Federation, and other organizations and individuals. They provide technical and financial assistance to the terrestrial habitat management program.

IX. CRITIQUES AND PLAN REVIEW

The plan will be reviewed every five years and adjustments made to reflect the current status of affected tracts and to reassess priorities, strategic techniques and goals.

X. CONSULTATION AND COORDINATION

The planning team:

Sammy Lail, Lead Biologist, Buffalo National River
Mark Baron, Biologist, Arkansas Game and Fish Commission
Raymond Wiggs, Habitat Crew Leader, Buffalo National River
A.J. Riggs, Region 8 Assistant Regional Supervisor, Arkansas Game and Fish Commission
Diana Angelo, Biological Science Technician, Buffalo National River
Shawna Miller, Biological Science Technician, Buffalo National River
Chuck Bitting, Geologist, Buffalo National River
Regan Plumb, Biological Science Technician, Buffalo National River
David Mott, Chief of Resource Management, Buffalo National River
C.D. Scott, Biological Science Technician, Buffalo National River

Reviewers

During development of this plan, the following individuals reviewed the plan and made substantive comments:

Doug Wilson, Chief of Interpretation and Cultural Resource Management, Buffalo National River
Suzanne Rogers, Historian, Buffalo National River
Caven Clark, Archeologist and Curator, Buffalo National River
John Sunderland, Assistant Chief Wildlife Management, Arkansas Game and Fish Commission
John Logan, Plant Ecologist, Missouri Department of Conservation
Eddie Linebarger, Regional Wildlife Supervisor, AGFC
Michael Cartwright, Elk Program Coordinator, AGFC

XI. REFERENCES

Arkansas Game and Fish Commission (AGFC), 2001. Strategic Elk Management Plan.

Bitting, Charles J. and Slay, Michael E., 2004. An inventory of endangered bats of the Lower Buffalo Wilderness, Buffalo National River.

Cannon, B.J., et al., 2001. Distribution and Habitat Use of Swainson's Warblers in Southeastern and Northern Arkansas

2000 Annual Report: Department of Biological Sciences, Arkansas State University, Jonesboro, Arkansas.

Culpepper, R.B., and Bayard, A., 1998. A Comparison of the Arkansas GAP Vegetation map to the 1995 LULC Map of the Buffalo National River Watershed: University of Arkansas, Fayetteville, Arkansas.

Dechant, J.A., 1996. Effects of Hay and Fire Management on Breeding Bird Communities and Artificial Nest Success Along The Buffalo National River, Arkansas: University of Arkansas, Fayetteville, Arkansas.

Foti, Tom, 1991. Site Report and Community Abstract, Turkey Mountain Savanna, Lower Buffalo Wilderness, Buffalo National River, Marion County, Arkansas. Arkansas Natural Heritage Commission, Little Rock, Arkansas.

Fulcher, Bob, 1999. Discussion of draft article on canebrake management and ecology. Pers. Commun. State of Tennessee Dept. of Environment and Conservation. Bureau of State Parks.

Guyette, R.P. and D.C. Dey, 1997. Historic pine (Pinus echinata) abundance and fire frequency. In B.Brookshire and S. Shiefly, eds. Proceedings of the Missouri Ozark Forest Ecosystem Project. USDA Forest Service GTR NC-193.

Grabner, Keith and Struckoff, Matthew. 2002. Fire history, vegetation composition and structure, and fire response of post oak barrens within the Lower Buffalo Wilderness, Buffalo National River, Arkansas: Preliminary report. USGS Missouri Field Station, University of Missouri-Columbia, Columbia, MO.

Hardwick, A., and Powell, A., 2000. Preliminary Survey for Swainson's Warblers at Buffalo National River, Arkansas, 2000: University of Arkansas, Fayetteville, Arkansas.

Herner-Throgmartin, J.H. et al., 1997. Perceived Damage by Elk in the Arkansas Ozarks, Journal of the Arkansas Academy of Science, Vol. 55, 2001.

Howe, H.F., 1994. Managing Species Diversity in Tallgrass Prairie: Assumptions and Implications: Conservation Biology, Volume 8, No. 3.

Jenkins, S.E., Guyette, R.P. and A.J. Rebertus, 1997. Vegetation-site relationships and fire history of a savanna-glade-woodland mosaic in the Ozark Highlands. Pages 184-199 in S.G. Pallardy, Cecich, R.A.

Jenkins, S.E., and Jenkins, M.A., 1996. Savanna and Glade Vegetation of Turkey Mountain, Arkansas: Effects of a Single Prescribed Burn: University of Missouri-Columbia, Columbia, Missouri.

Johnson, F.L and G.D. Schnell, 1988. Effects of Prescribed Burning on Plant Communities at Buffalo National River, Arkansas. National Park Service Report #CX 7029-3-0033. Santa Fe, NM.

Logan, J.M., 1992, The Glades of the Buffalo National River, Arkansas: M.S. Thesis, Iowa State University, Ames, Iowa, 103 pp.

Logan, J.M., 1999. A Qualitative Vegetational Assessment of Selected Open Fields of the Buffalo National River, Arkansas: National Park Service, Order No. 1443PX715099021, Buffalo National River, Harrison, Arkansas.

Meiners, S.C., et al., 2002. Exotic plant invasions over 40 years of old field successions: community patterns and associations.

Missouri Department of Conservation, 1985. Managing Missouri's Hay Prairies: Conservation Commission of the State of Missouri, Missouri.

National Park Service, 1967. Master Plan Proposed Buffalo National River Arkansas: U.S. Department of the Interior, National Park Service, Washington, D.C.

National Park Service, 1968. Proposed Buffalo National River Arkansas, U.S. Department of the Interior, Washington, D.C.

National Park Service, 1976. Memo – Field Trip to Buffalo National River.

National Park Service, 1975. Final Environmental Statement, Proposed Master Plan, Buffalo National River.

National Park Service (NPS, 1977a), 1977. Memo - Meeting with AGFC Biologist concerning hay field management.

National Park Service (NPS, 1977b), 1977. Final Master Plan, Buffalo National River.

National Park Service, 1985, Land Use Plan, Cultural Landscape Report, Buffalo, Boxley Valley: Buffalo National River, Harrison, Arkansas, 72 pp.

National Park Service (NPS), 1987. Open Field Management Plan, Buffalo National River.

National Park Service, 1995, Environmental Assessment, Turkey Mountain Savanna Prescribed Fire, Buffalo National River, Arkansas: Buffalo National River, Harrison, Arkansas, 19 pp.

National Park Service (NPS), 1998. Resource Management Plan, Buffalo National River.

National Park Service (NPS), 2001. Management Policies, Department of the Interior, Nation Park Service, Washington, D.C.

National Park Service, 2003, Fire Management Plan, Environmental Assessment, Buffalo National River, Arkansas: Prepared by C. Gale and L. Kolankiewicz, Mangi Environmental Group, Mclean, Virginia, 70 pp plus EA.

Nelson, P.W., 1985. The Terrestrial Natural Communities of Missouri, Missouri Department of Natural Resources and Missouri Department of Conservation.

Rebertus, A.J. and Jenkins, S., 1994. Savanna and Glade Vegetation of Turkey Mountain, Arkansas, University of Missouri.

Russell, K.R., et al., 1999. Prescribed Fire Effects on Herpetofauna: Review and Management Implications: Wildlife Society Bulletin, Volume 27, Number 2, Summer 1999.

Smith, K., and Dechant, J., 1994. Effects of Hayfields and Prescribed Burning on Birds Along the Buffalo National River: University of Arkansas, Fayetteville, Arkansas.

Thomas, B.G., 1994. Habitat Selection and Breeding Status of Swainson's Warblers: Masters Thesis, University of Missouri, Columbia, Missouri.

U.S. Congress, Congressional Hearing for Proposed Buffalo National River, 1971.

USDI, 2001, United States Department of the Interior, National Park Service, Conservation Planning, Environmental Impact Analysis, and Decision Making, Director's Order #12 and Handbook.

U.S.G.S., 2000. Invasive Species Science Strategy for Department of the Interior Lands in the USGS Central Region: USGS-National Wetlands Research Center Technology & Information Branch, Little Rock, Arkansas.

U.S. House of Representatives Committee Report, 1972. Hearings before the Subcommittee on National Parks and Recreation of the Committee on Interior and Insular Affairs, House of Representatives, Ninety-second Congress, First Session, on H.R. 9119, H.R. 8382, S. 7, Bills to provide for the Establishment of the Buffalo National River in the State of Arkansas, and for Other Purposes. Hearings Held October 28 and 29, 1971. Serial No. 92-28: U.S. Government Printing Office, Washington, 204pp.

Vermeire, L.T., et al., Ecology and Management of Sericea Lespedeza: Oklahoma Cooperative Extension Service, Oklahoma State University, Still Water, Oklahoma.

Wiggs, R.L., 1994. Herpetofauna of Cecil Creek Area, Buffalo National River.

Wiggs, R.L., 2004. An Inventory of Herpetofauna of Buffalo National River.

All above references can be found in the Resource Management Division library at 402 N. Walnut, Harrison, Arkansas.

XII. GLOSSARY

Buffer: A strip of land where disturbances are not allowed, or are closely monitored, to preserve aesthetic and other qualities adjacent to roads, trails, waterways, and recreation sites.

Canopy: The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees.

Cultural Landscape: A geographic area, including both cultural and natural resources and the wildlife and domestic animals therein, associated with an historic event, activity or person or exhibiting other cultural or aesthetic values.

Edge habitat: A loosely defined type of habitat that occurs at the boundary between two different habitat types. Typically, edge habitats share characteristics with both adjacent habitat types and have particular transitional characteristics that are important to wildlife.

Endangered species: Species that are threatened with imminent extinction; includes species whose numbers or habitats have been reduced to critical levels.

Environmental assessment: A process designed to contribute pertinent environmental information to the decision-making process of forest management and other resource projects and programs.

Fauna: A general term for all forms of animal life characteristic of a region, period or special environment.

Flora: A general term for all forms of plant life characteristic of a region, period or special environment.

Historic Lease: Written contract under CFR regulations granted for a specific time for buildings or lands eligible for the National Register.

Habitat: The environment in which a population or individual lives; includes not only the place where a species is found, but also the particular characteristics of the place (e.g., climate or the availability of suitable food and shelter) that make it especially well suited to

meet the life cycle needs of that species.

Integrated resource management: A holistic approach to resource management that entails the management of 2 or more resources (e.g., water, soil, timber, pasture, wildlife, and recreation) and that integrates the values of the community into the design of policies or projects to use and sustain these resources in perpetuity.

Landscape: Areas of land that are distinguished by differences in landforms, vegetation, historic land use, or aesthetic characteristics.

Native Warm Season Grasses: A mix of grasses that are native to the Ozarks and that grow primarily during the warm season. The mix includes wildlife friendly grasses such as big blue stem, little blue stem, Indian grass, as well as native herbs beneficial to multiple wildlife species.

Old Field: Open land areas that were maintained as fields prior to being acquired by the National Park.

Old-growth forest: A forest dominated by mature trees that has not been significantly influenced by human activity. The stand may contain trees of different ages and various species of vegetation.

Overstory: The upper canopy of a forest, typically formed by the branches and leaves of trees.

Protected area: An area protected by legislation, regulation, or land-use policy to control the level of human occupancy or activities. Categories of protected areas include protected landscapes, national parks, designated wilderness areas, and nature (wildlife) reserves.

Riparian forest: The band of forest at the immediate water's edge, where some specialized plants and animals form a distinct community. Riparian forest has a significant influence on a stream ecosystem or is significantly affected by the stream.

Riparian zone: A strip of land maintained along a stream, lake, road, recreation site or different vegetative zone to mitigate the impacts of actions on adjacent lands, to

enhance aesthetic values, or as a best management practice.

Special Use Permit (SUP): Park land for special use including leases for hay production.

Succession: Changes in the species composition of an ecosystem over time, often in a predictable order. In forests, it refers to the sequence of one community of plants gradually replacing another.

Threatened species: A species that is likely to become endangered if certain pressures are not reversed.

Understory: The lower level of vegetation in a forest. Usually formed by ground vegetation (mosses, herbs and lichens), herbs and shrubs, but may also include subdominant trees.

Use and Occupancy: Lands reserved by landowner for time period, usually 25 years, for private use with easements after which land becomes U.S. government property.

Watershed: An area of land that is drained by underground or surface streams into another stream or waterway.

Appendix A
Environmental Assessment
for
Buffalo National River
Terrestrial Habitat Management Plan

Table of Contents

CHAPTER 1 PURPOSE AND NEED

1.1 INTRODUCTION

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts of an action proposed by the National Park Service (NPS) to amend the Buffalo National River (BNR) Open Fields Management Plan to be more comprehensive and holistic in nature. The new plan is to be called the Buffalo National River Terrestrial Habitat Management Plan (THMP)

The Purpose of an Environmental Assessment (EA)

There are three primary purposes of an EA:

- To help determine whether the impact of a proposed action or alternative could be significant, thus an environmental impact statement (EIS) is needed;
- To aid in compliance with NEPA when no EIS is necessary by evaluating a proposal that will have no significant impacts, but that may have measurable adverse impacts; and
- To facilitate preparation of an EIS if one is necessary.

This EA has been prepared in compliance with:

- The National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), which requires an environmental analysis for major Federal Actions having the potential to impact the quality of the environment;
- Council of Environmental Quality Regulations at 40 Code of Federal Regulations (CFR) 1500-1508, which implement the requirements of NEPA;
- National Park Service Conservation Planning, Environmental Impact Analysis, and Decision Making: Director's Order #12 (DO-12) and Handbook.

Key goals of NEPA are to help Federal agency officials make well-informed decisions about agency actions and to provide a role for the general public in the decision-making process. The study and documentation mechanisms associated with NEPA seek to provide decision-makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them. NEPA studies, and the documents recording their results, such as this EA, focus on providing input to the particular decisions faced by the relevant officials. In this case,

the Superintendent of Buffalo National River (BNR) is faced with a decision to amend and update the park's Open Fields Management Plan to better reflect the wide array of actions necessary to manage the terrestrial habitat of the park. This decision will be made within the overall management framework already established in the BNR Final Master Plan (NPS, 1977) and BNR Resource Management Plan (NPS, 1998). The alternative courses of action to be considered at this time are, unless otherwise noted, crafted to be consistent with the concepts established in the BNR Resource Management Plan.

In making decisions about NPS-administered resources, the National Park Service is guided by the requirements of the 1916 Organic Act and other laws, such as the Clean Air Act, Clean Water Act, Wilderness Act, National Historic Preservation Act, and Endangered Species Act (summarized in Appendix G). The authority for the conservation and management of the National Park Service is clearly articulated in the Organic Act, which states the agency's purpose: *"…to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."* This authority was further clarified in the National Parks and Recreation Act of 1978: *"Congress declares that…these areas, though distinct in character, are united…into one national park system…. The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."*

The Buffalo National River was established by Congress in 1972 "*…for the purposes of conserving and interpreting an area containing unique scenic and scientific features, and preserving as a free-flowing stream an important segment of the Buffalo River in Arkansas for the benefit and enjoyment of present and future generations…*" (Public Law 92-237). The enabling legislation additionally stated that fishing and hunting opportunities were to be provided, and that within three years the land area within the boundaries of

BNR was to be evaluated for possible wilderness designation.

The requirements placed on the National Park Service by these statutes, especially the Organic Act, mandate that resources are passed on to future generations "unimpaired" (USDI, 2001). This EA addresses whether the actions of the various THMP alternatives proposed by BNR impair resources or values that are

1. necessary to fulfill specific purposes identified in the enabling legislation of the park,
2. key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and
3. identified as a goal in the park's Master Plan or other National Park Service planning documents (see *Chapter 3 – Environmental Analysis*).

1.2 Purpose and Need

The purpose of this project is to maintain a diversity of high quality terrestrial habitat throughout Buffalo National River which will sustain healthy populations of native plant and animal species. This environmental assessment is used to evaluate the potential environmental impacts associated with each of the alternatives for the terrestrial habitat management program at Buffalo National River. The resulting plan will guide terrestrial habitat management at Buffalo National River for the next ten to fifteen years.

1.3 Background

Nestled in the Arkansas Ozarks (Figure 1), Buffalo National River is noted for its recreational, scenic, cultural, and wilderness values. The park's Master Plan (NPS, 1977) characterized the river as follows:

> *"The Buffalo River is recognized as the central element of the whole array of natural and historical features in its setting. It has clean, clear water uniting all elements in philosophical coherence. Difficult to grasp, but important, it is a symbol of the Nation – a free river preserved to flow through open space for all time as a remnant of our original homeland."*

Formal recognition of the Buffalo River's outstanding scenic and recreational qualities began with the establishment of Buffalo River State Park in 1935, continued in 1963 with the

NPS determining that the river was nationally significant, and culminated in 1972 with the creation of Buffalo National River, 37 years after its initial designation as a state park. The U.S. House of Representatives Committee Report (USGPO, 1972) explained the basis for establishing the Buffalo National River.

Early planning documents and the legislative history of Buffalo National River envisioned agricultural activities and open fields as part of the "array of qualities" to be perpetuated along the Buffalo River. According to the Master Plan for the Proposed Buffalo National River (NPS, 1967) p. 70:

> ***"Bottomland pastures along the river add a pleasing note of variety to the Buffalo River countryside".***

The plan provides for areas in addition to Boxley and Richland Valleys that are not visible from the river could continue in crop cultivation, grazing and haying where terrain and soil are suitable. As stated in the Proposed Buffalo National River booklet (NPS, 1968), which was used during Congressional hearings (USGPO, 1972), the National Park Service would buy most of the land in the Conservation Zone (78,133 acres) in fee and then "lease back the better agricultural land to individuals who could maintain the pastoral scene by farming". According to the Park's Final Master Plan (NPS, 1977) p. 24, the concept for dividing the national river into various broad land classes is to assure the visitor a variety of experiences as he passes through the different environments: pastoral, primitive, recreational, and natural. This concept envisions a further breakdown of the usual land classification, dividing the natural environment zone into natural and pastoral. The plan states that "the natural is to revert to a normal succession of growth, while the pastoral is to be perpetuated". The plan goes on to say that the pastoral can then be acquired on an easement basis or leased to maintain this scene.

The Master Plan refers again to open fields less specifically in several other areas. The introductory description of the "essence" of Buffalo River refers to the "valley bottoms dotted with open grassy meadows." The section titled "Managing the Resource" states that once the lands become subject to National Park Service management, "Its pastoral/natural character will be reasonably assured of preservation". Among the several management objectives stated in the Plan are two that deal directly with open field management; 1) issue special use permits and make periodic evaluations to determine the validity of continuing their use for grazing and agriculture, 2) open fields will be maintained where scenic and wildlife habitat will be enhanced.

Buffalo National River must maintain the open qualities associated with historic agricultural use, provide high quality wildlife habitat and address protection of special vegetative communities. The Terrestrial Habitat Management Plan will be based on the previously mentioned legislation, planning documents, and current scientific knowledge of the resources. Additionally, this plan must comply with the Organic Act of 1916, National Environmental Policy Act of 1969 as amended, the Wilderness Act (1964), and the National Historic Preservation Act (1966).

Terrestrial habitat management at Buffalo National River represents a unique opportunity to mesh the objectives of cultural resource management, natural resource management, and public use in a single plan. The enabling legislation for BNR requires the protection of these three seemingly competing resources. Public Law 92-237 of March 1, 1972 (86 Stat. 44) established BNR

> *"for the purpose of conserving and interpreting an area containing unique scenic and scientific features and preserving as a free-flowing stream an important segment of the Buffalo National River in Arkansas for the benefit and enjoyment of present and future generations…".*

The US House of Representatives Committee Report (USGPO, 1972) describes the justification for the establishment of BNR:

> *"…It is not one single quality, but the combination of its size, its completeness, its wild qualities, and its associated natural, scenic, and historic resources that makes the Buffalo worthy of national recognition".*

Interpretation of the enabling legislation was made in the final Master Plan (NPS, 1977) in part by addressing the provision of open fields:

> *"Open fields will be maintained where scenic and wildlife habitat will be enhanced".*

The Concept for Land Classification within the Master Plan outlines land use zones within BNR and includes; pastoral, recreational, natural, and primitive zones that further support the coexistence of the various resource objectives.

Approximately 10.5 percent (10,005 acres) of the authorized 95,730 acres of BNR was cropland or pasture when Public Law 92-237 was signed into effect (NPS, 1975). Well over half of those lie along the bottom lands of the river and its tributaries. Many of these fields, especially those that were marginally productive and those with difficult access, were withdrawn from agricultural use as they were acquired by the National Park Service. Agricultural use is currently approximately 3700 acres. These acres are divided into private use zones (1690 acres), agricultural use and occupancy (400 acres), Historic Leasing (260 acres) or Special Use Permits (SUP) (1,350 acres). As Use and Occupancy terms have expired, they have been evaluated for inclusion in terrestrial habitat management actions.

In the past, the determination of an open field's best utilization was on a case by case basis. Park planning and zoning concepts provide a general framework but are subject to broad individual interpretation. A more specific terrestrial habitat management program is necessary to address the management of forested land as well as early successional and open areas including cane communities, glades, savannahs, and cultural landscapes.

In 1987 an Open Fields Management Plan was developed. In the mid 1980s and early 1990s small scale efforts were made to improve the forage on SUP fields using native warm season grass mixes. These efforts met with limited success.

In the mid 1990s a cooperative effort with a challenge cost share agreement between BNR and the Arkansas Game and Fish Commission (AGFC) was initiated to establish native warm season grasses in SUP fields. Thirty (30) acres of warm season grasses were successfully established in SUP fields. At the same time, a list of candidate areas to be managed as early succession communities was made by an analysis of remote sensing data.

The candidate areas were physically surveyed in 1998 to determine species composition, vegetation state, and feasibility of managing as early succession areas. Field operations were begun to meet the goals of the 1987 plan and to improve the available habitat on public land. These operations were funded by various sources including the National Park Service, AGFC, Rocky Mountain Elk Foundation (RMEF), and the National Wild Turkey Federation (NWTF).

By the mid 1990s the Arkansas elk herd had increased its range to areas well outside of BNR. As the herd's range expanded nuisance elk complaints on adjacent private lands increased. This provided impetus to develop management strategies to improve the available habitat on public land. Buffalo National River, AGFC, and the University of Arkansas (UA) undertook a study of habitat utilization and elk population dynamics within the Arkansas elk range.

AGFC developed an Elk Management Plan in 2001 The strategic management of the herd was coupled with a limited managed hunt that was initiated in 1998. These actions led to the need to develop a more comprehensive management document covering many aspects wildlife habitat management, both game and non-game species.

A more specific terrestrial habitat management program is necessary to address the management of forested land as well as early successional and open areas including cane communities, glades, and savannas.

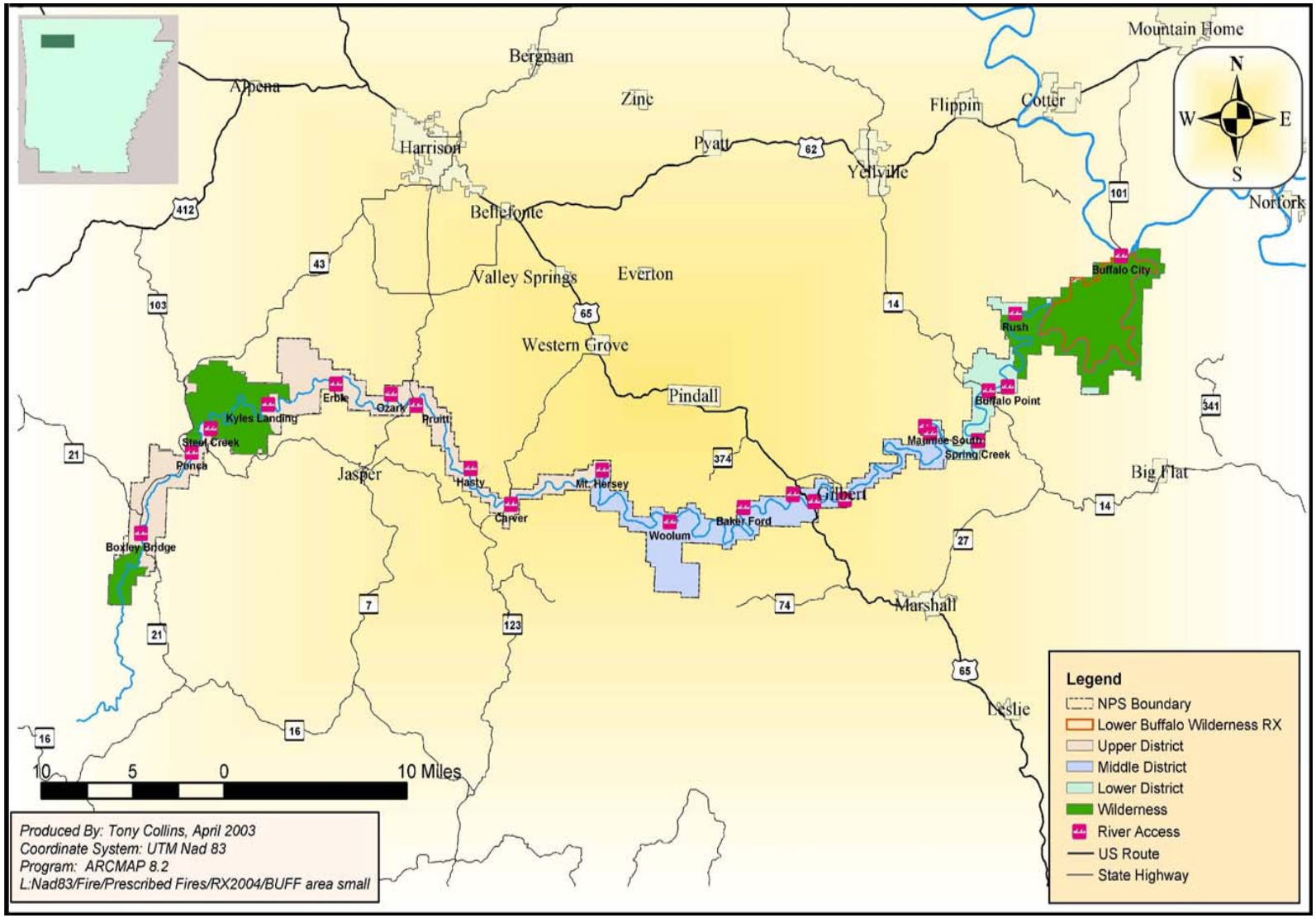

Figure 1: Buffalo National River area map

1.4 Terrestrial Habitat Management Objectives

The goal of this plan is to establish a strategy for management of upland forests, bottomland forests, canebrakes, open fields, glades, savannahs, and early succession habitat at Buffalo National River to support a diverse mosaic of plant and animal communities and pastoral settings reflective of historic cultural landscapes. This plan will provide guidelines and a plan of action to:

- Provide and maintain aesthetic visual diversity with a mosaic pattern of plant communities.
- Restore and manage old field plant communities, and early successional stages using native flora or non-invasive, non-native grasses and forbs when necessary, to provide multi-season habitat for a diversity of wildlife.
- Maintain historic land use patterns and pastoral settings through agricultural SUP's and Historic Leasing.
- Manage and restore forests, canebrakes, thickets, savannas, and glades for floristic and habitat diversity.
- Conserve natural animal and plant communities and processes within the park.
- Implement measures to eliminate or control invasive exotic species within BNR.

1.5 Scoping Issues and Impact Topics

Preliminary scoping for the Terrestrial Habitat Management Program began in June 2001. At this meeting, a list of seven potential alternatives for management of open fields was developed. These initial alternatives were:

A. No Action, continue use of 1987 Open Fields Management Plan.
B. Maintain 10% of vegetated land in open fields. Base extent and location on 1970 aerial photos.
C. Maintain 7-8% of vegetated land in open fields, no new fields added, improve management of current old fields, retain current level of Special Use Permits.
D. Maintain 7-8% of vegetated lands in open fields. Use prescribed fire only for management of current open

fields. Maintain current level of agricultural Special Use Permits.

E. Maintain 5% of vegetated land in open fields. Discontinue active management, but retain agricultural Special Use Permits.
F. Discontinue Open Fields Management Plan and Special Use Permits, allow fields to undergo succession to forest.
G. Discontinue Special Use Permits, restore 5% of open fields to native "old field" vegetation.

The initial scoping discussed using prescribed fire, herbicides, chain saws, no-till planting of native vegetation, disking, and brush hogging to achieve desired results.

There was a long hiatus between this meeting and the next scoping meeting which was held April 28, 2004. At this meeting the plan was changed to Terrestrial Habitat Management Plan because of the recognition that this was more comprehensive than an Open Fields Management Program. A new set of alternatives was developed and discussed:

1. No Action, allow all open areas to go through un-managed succession to climax forest.
2. Maintain current level of terrestrial habitat management.
3. Maintain clearings, cane communities, glades, and savannas as they are at present and review additional candidate open spaces for feasibility.
4. Fully restore to pre-European settlement vegetation.
5. Fully restore all fields to 1972 levels and uses.

On September 27, 2004, a third scoping meeting was held to flesh out and refine the basic outlines of the terrestrial habitat management plan.

At a scoping meeting held on January 12 and 13, 2005 the alternatives from 2004 were reviewed. It was determined that Alternatives 4 and 5 would not be prudent or feasible to attempt, and would result in significant impact to the natural and cultural resources and values of Buffalo National River. Therefore, these alternatives were dropped from further consideration. Alternative 3 was revised to: Increase terrestrial habitat management to further natural and cultural resource management goals.

Scoping issues identified at the meetings in 2004 and 2005 were:

- Maintenance of plant diversity and variety
- Non-native plant populations
- Availability of habitat for early succession dependent wildlife species
- Maintenance of wildlife species richness and diversity.
- Impacts on archeological resources
- Impacts on historic cultural properties
- Economic impacts to the local community
- Maintenance of pastoral settings
- Riparian corridor maintenance and streambank stability
- Use of fire
- Native species re-introductions
- Non-native faunal populations
- Threatened and Endangered species populations
- Sensitive species, species at risk, and species of concern
- Water quality of the Buffalo National River and tributaries
- Karst groundwater quality

Impact Topics

Not every conceivable impact of a proposed action is substantive enough to warrant analysis. For example, air quality, transportation, and waste management were dismissed from consideration as they will not be substantively affected by any of the proposed alternatives. The topics that were determined to merit consideration in this EA are listed below, followed by the methods used to predict impacts on each topic.

Geology and Soils

Buffalo National River contains valuable geologic resources and landforms including bluffs, caves, and natural arches. These features are the result of eons of climatic, digenetic, and tectonic events that impacted the sedimentary rock deposits. The soils range from thin and rocky on hillsides and ridge tops to thick sandy loam alluvial deposits in the major stream valleys. Natural and human caused erosion and depositional processes are inextricably linked with the properties of local soils and

geology. As a result, impacts of proposed actions to geology and soils warrant careful consideration.

Water Resources

National Park Service policies require protection of water resources according to the Federal Clean Water Act. This is particularly important at BNR, where water has been mandated as the "number one natural resource". Impacts to water resources can have far-ranging and long-lasting effects. These possible impacts need to be carefully considered. Water quality in the Buffalo River and its tributaries is generally very good. Most of the impacts to water quality are the result of non-point source pollution originating from agricultural/silvacultural practices and road construction and maintenance. Water quality is linked to land based activities which can result in point source and non-point source pollution.

Floodplains

Presidential Executive Orders mandate protection of floodplain function. The floodplain of the Buffalo River runs the entire length of the river, and is generally in good condition. Existing impacts to floodplain integrity include earthen dikes used for past road construction, agricultural activity which extends to the streambank, and development of physical facilities within the floodplains of the river and major tributary streams. Developments incompatible with floodplain function are restricted under this Executive Order. Generally this is limited to construction of physical facilities, but may include changes to vegetation that changes the ability of the floodplain to store excess flood energy.

Vegetation

The park is largely forested but also contains a number of clearings. Various terrestrial habitat management strategies proposed under this management plan would impact vegetation directly by cutting, planting, burning, mowing, or disking plants within BNR. All of the alternatives will have impacts on vegetation.

Wildlife

Resident populations of wildlife species, including reptiles, amphibians, birds, and mammals are directly impacted by the terrestrial habitat present at BNR. These populations may be impacted by any action to manage terrestrial habitat within the National River.

Threatened, Endangered, and State Listed Species
Populations of threatened, endangered, and state listed species are directly impacted by the terrestrial habitat present at BNR. These populations may be impacted by any action to manage terrestrial habitat within the National River. The Federal Endangered Species Act of 1973 prohibits harm to any species that is listed as threatened or endangered, including disruption of habitat. Special consideration should be taken regarding proposed actions that may impact environments harboring species that are listed on the Endangered Species Act, or on lists maintained by Arkansas Natural Heritage Commission.

Visitor Use and Experience
The 1916 National Park Service Organic Act directs the Park Service to provide for public enjoyment of the scenery, wildlife, and natural and historic resources of national parks *"in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations."* All of the proposed actions to manage the terrestrial habitat have the potential to impact the visitor experience. The visitor experience includes canoeing, fishing, hunting, wildlife observation, scenery viewing, hiking, horseback riding, and camping.

Human Health and Safety
Because staff and visitor health and safety are a critical priority, the potential impact of any proposed action at Buffalo National River should be considered with respect to health and safety.

Cultural Resources
Section 106 of the National Historic Preservation Act of 1966 provides the framework for federal review and protection of cultural resources and ensures that they are considered during federal project planning and execution. Buffalo National River contains nearly 500 identified archeological sites, over 250 historic structures, four National Register historic districts, and a fifth district that is eligible as such. Some of these cultural resources may be subject to impacts of proposed terrestrial habitat management actions.

Wilderness
The Buffalo National River Wilderness consists of three disjunct units totaling 36,000 acres. Terrestrial habitat

management actions may have direct and indirect impacts upon wilderness values. These wilderness values include opportunity for solitude, natural soundscapes, vistas overlooking primitive lands, and the physical and mental challenges posed by wilderness travel.

CHAPTER 2 ALTERNATIVES

2.1 ALTERNATIVES CONSIDERED BUT REJECTED

The proposed alternative to fully restore BNR to pre-European settlement vegetation was rejected for a number of reasons. Early records of non-native visitors and settlers are not accurate enough to ascertain the specific conditions the landscape was in at that time. Vegetation patterns are dynamic and reflect long term changes in climate and man's imprint on these changes. Much of the National River is now in Wilderness. This legal status limits the kind and amount of habitat manipulation that can be accomplished.

The proposed alternative to fully restore all fields to 1972 levels and uses was rejected for several reasons. Much of the 1972 land use was causing severe impacts upon the riparian zone of the bottomlands. These impacts could be expected to compromise the quality of the Buffalo River over time. Grazing was a widespread activity, with livestock having ready access to the river for drinking water. These activities have been shown in several studies to increase the fecal coliform levels in the river. This would have a negative impact on the water quality of Buffalo National River. Much of the area is now in Wilderness. It would not be feasible, or legal, to return these old fields to their previous uses.

2.2 ALTERNATIVES CONSIDERED AND ANALYZED

Alternative 1, No Action
Under this alternative, all current habitat management actions would be suspended other than the use of fire as outlined in the BNR Fire Management Plan (NPS, 2003). Over time, the current open areas, glades, savannas, and agricultural lease fields not being managed with fire would be allowed to undergo succession to a mature forest state.

Alternative 2, Continue following 1987 Open Fields Management Plan.
Under this alternative, habitat management actions would continue as guided by the 1987 Open Fields Management Plan. These actions would include leasing hayfields under the Special Use Permit system, and maintaining a number of old

fields and glades in an early successional stage using fire as outlined in the 2003 Fire Management Plan.

Alternative 3, Increase terrestrial habitat management activities to further natural and cultural resource management goals.

Under this alternative, BNR would continue to offer hayfields for lease under the Special User Permit system. Old fields outside of Wilderness would be maintained as early successional plant communities using fire and mechanical methods. Exotic species in Special Use Permit hayfields would be replaced with native grasses, or non-invasive, non-native species where site conditions and wildlife habitat needs would not be conducive for native forage. Old fields would be managed in an early successional state using fire and mechanical methods. Exotic species in old fields would be replaced, where practical, with native species using Integrated Pest Management strategies. Glades and savanna areas would be managed with mechanical methods and fire to maintain their species diversity. Canebrakes, riparian forest, and upland forest would be managed with a variety of methods to ensure a mosaic of habitat types for all wildlife species.

Environmentally Preferred Alternative

The environmentally preferred alternative is that which causes the least damage to the biological and physical environment and best protects, preserves, and enhances historic, cultural, and natural resources. Economic, recreational, and technical issues are not considered when identifying the environmentally preferred alternative. This alternative is the one that best meets the mandates of NEPA to:

- fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

- ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

- attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

· preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;

· achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

· enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In all cases, Alternative Three best achieves the mandates. This alternative fulfills Buffalo National River's responsibilities as an environmental trustee by maintaining the widest possible array of wildlife habitat and visual diversity of any of the alternatives.

The No Action Alternative allows the continued succession of plant communities to a mature forest throughout the National River. It does nothing to meet the goals in the Final Master Plan to maintain the open qualities associated with historic agricultural use, provide high quality diverse wildlife habitat and address protection of special vegetative communities.

Alternative Two minimally meets the same goals. Over time, the existing old fields not in Special Use Permit or Private Use Zones will revert to mature forest, thus eliminating this valuable wildlife habitat and edge.

2.3 Comparison of Alternatives

The three alternatives approach terrestrial habitat management with three levels of intensity. The differences in intensity will affect both the short and long term condition of the wildlife and plant habitats at BNR.

Alternative one, no action, is the least intense, but could result in the most striking changes over time. This alternative will allow for glades, savannas, and old fields which are not in private ownership to revert to mature forest. This will eliminate much of the scenic and floristic diversity of BNR. The changes in the floristic

structure and diversity will, in turn, cause changes in faunal composition.

Alternative two is of low intensity. It will allow many old fields to revert to forest over time. Special Use Permit fields will continue to be managed with hay cutting operations. The old fields managed with fire will undergo compositional changes to more fire tolerant species. Because they are managed with fire, they will generally be less uniform in nature, and have less of a pastoral scene than if they were managed with a combination of mowing and fire. Fire tolerant invasive exotic species will continue to expand un-checked in these open areas. Early succession trees over 4" diameter will be difficult to manage with fire. Glades and savannas will be maintained with fire. They will probably not expand back to their 1972 size, but succession will be held in check. Cane communities will be encouraged to flourish by applying fire on a cyclic basis to ensure resprout.

Alternative three is of medium intensity. It will continue the SUP hay lease program. It allows for the removal of populations of exotic species in open fields, glades, and savannas. It will allow for the use of mechanical tools to remove woody encroachment in old fields, glades, and savannas outside of wilderness. It will continue to utilize fire to manage glades, savannas, and canebrakes. It allows for the planting of native species in suitable areas to improve wildlife habitat and forage quality, reduce soil erosion and improve invasive exotic species control. It allows for planting non-invasive, non-native forbs where there are no suitable native species to improve wildlife habitat and forage quality, reduce soil erosion, and improve invasive exotic species control.

CHAPTER 3 ENVIRONMENTAL ANALYSIS

3.1 IMPACT DEFINITIONS

Each impact topic has been evaluated by the Interdisciplinary Team to determine the threshold where the impact reaches significance. This evaluation relied upon public laws, regulations, policies, and guidelines. Table 2.1 illustrates the documentation related to each impact topic. Table 2.2 defines impact in terms of significance.

Table 3-1: Impact Topics and their Governing Laws, Regulations, Policies, and Guidelines

Impact Topic	Governing Laws, Regulations, Policies, and Guidelines
Geology & Soils	Federal Cave Resources Protection Act, 1988; NPS Management Policies, 2001; NPS-77
Water Resources	Clean Water Act, 1977; Executive Order 12088; NPS Management Policies, 2001; NPS-77
Floodplains	Rivers and Harbors Act, 1899; Executive Orders 11988 & 11990; NPS Management Policies, 2001; NPS-77; Regulation #2, ADEQ
Vegetation	NPS Management Policies, 2001; NPS-77
Wildlife	NPS Management Policies, 2001; NPS-77
Threatened, Endangered, and State Listed Species	NPS Management Policies, 2001; Endangered Species Act, 1973; NPS-77
Visitor Use & Experience	NPS Management Policies, 2001
Human Health & Safety	NPS Management Policies, 2001; Directors Order's #50
Cultural Resources	National Historic Preservation Act, 1966; Native American Graves Protection and Repatriation Act, 1990; National Environmental Policy Act, 1969; Executive Order 13007; NPS Management Policies, 2001; Director's Order #28
Wilderness	Wilderness Act, 1964; NPS Management Policies, 2001; Director's Order #41

In addition, the National Park Service Organic Act as amended and the Buffalo National River enabling legislation (Public Law 92-237) mandate the prevention of impairment of natural and cultural resources, features and values while providing for the enjoyment of the public. This over-arching mandate is used to determine when impacts result in impairment.

All of the alternatives will have impacts on the human environment. The impacts can be either positive or negative. In some cases, an alternative can have both positive and negative impacts on a single resource or value. When this occurs, the duration and magnitude of the differing impacts are weighed against one another to come up with the final impact.

The cumulative effects analysis for this Environmental Assessment considers past, present, and future actions that could intensify or offset impacts due to the proposed alternatives. Cumulative effects vary by resource. In general, the geographic areas considered include Buffalo National River and adjacent areas. In some instances, activities may result in both immediate and long-term, and negative and positive impacts. Actions that may have cumulative effects include managing early succession fields, upland forest, bottomland forest, canebrakes, glades, and savannas.

Table 3-2: Impact Thresholds

Impact Topic	Negligible Impact	Minor Impact	Moderate Impact	Major Impact	Impairment
Geology	Non-measurable changes to internal drainage features in karst terrain.	Small, short-term, or localized disruption of internal drainage features in karst terrain. These type of disruptions require little or no mitigation.	Disruption of internal drainage features in karst terrain that is measurable and of moderate consequence. These disruptions require mitigation.	Substantial disruption of internal drainage features or processes in karst terrain. Mitigation is required and may not be successful.	Disruption of internal drainage features or process in karst terrain which results in non-reversible changes in hydraulic function.
Soils	Localized changes in soil erosion or deposition rates that are below detection limits and require no mitigation. Localized changes in soil fertility that are below detection limits and require no mitigation.	Localized changes in soil erosion or deposition rates that are measurable and of short duration that requires little or no mitigation. Localized changes in soil fertility detectible through soil testing for less than five years that requires little or no mitigation.	Widespread changes in soil erosion or deposition rates which are measurable and of moderate duration. These impacts require mitigation. Widespread changes of in soil fertility for more than five years detectible through soil testing. These changes can be easily mitigated.	Substantial, wide-spread, and long-term changes in soil erosion or deposition rates that can be mitigated with difficulty. Substantial, widespread changes in soil fertility for more than ten years detectible through soil testing These changes can be mitigated with difficulty	Extreme changes to natural erosion and deposition rates that cannot be mitigated. Extreme changes in soil fertility that cannot be compensated for with mitigation.
Water Resources	Non-measurable impacts to riparian areas that does not increase stream temperatures, turbidity, or nutrient levels above detection limits. No detectable traces of pesticides or other agricultural chemicals in streams. Buffalo River continues to meet Federal and State guidelines for water quality.	Localized and indirect riparian impact that does not substantively increase stream temperatures, turbidity, or nutrient levels or affect stream habitats. No detectable traces of pesticides or other agricultural chemicals in streams Buffalo River continues to meet Federal and State guidelines for water quality.	Localized and indirect riparian impact that results in moderate increases in stream temperatures, turbidity, or nutrient levels, or affects stream habitat. No detectable traces of pesticides or other agricultural chemicals in streams Buffalo River continues to meet Federal and State guidelines for water quality.	Widespread indirect riparian impact that substantively increases stream temperatures, turbidity, or nutrient levels, or affects stream habitats. Detectable traces of pesticides or other agricultural chemicals in streams. Buffalo River continues to meet Federal and State guidelines for water quality.	Widespread riparian impact that significantly increases stream temperatures, turbidity, or nutrient levels, and affects stream habitats. Detectable traces of pesticides or other agricultural chemicals in streams. Buffalo River no longer meets Federal and State guidelines for water quality.

Impact Topic	Negligible Impact	Minor Impact	Moderate Impact	Major Impact	Impairment
Floodplains	No change to floodplain function	Altered erosion/deposition regime on less than 0.1% of a sub-watershed.	Altered erosion/deposition regime on 0.1% to 0.5% of a sub-watershed	Altered erosion/deposition regime on more than 0.5% to 5% of a sub-watershed	Altered erosion/deposition regime on more than 5% of a sub-watershed
Vegetation	No noticeable change in exotic species numbers and extent. No change in the extent and location of old fields, glades and savannas.	Little change in exotic species numbers and extent. Slight change in location and extent of old fields, glades, and savannas.	Exotic species numbers and extent change by a factor of two (double or half) of current estimates. Location and extent of old fields, glades, and savannas is doubled or cut in half.	Exotic species numbers and extent change by a factor of four (quadruple or quarter) of current estimates. Location and extent of old fields, glades, and savannas quadruples or is reduced by 75%.	Exotic species become uncontrollable. Their numbers and extent increase to point of eliminating native species. Location and extent of old fields, glades, and savannas is reduced or increased by a factor of ten.
Wildlife	No noticeable displacement of individuals or groups. Direct mortality of less than 0.1% of any native species population.	Temporary displacement of a few localized individuals or groups. Direct mortality of 0.1% to 0.5% of any native species population.	Long term or widespread displacement of groups. Direct mortality to 0.5% to 1% of any native species population.	Long term or widespread displacement of groups. Direct mortality of 1% to 5% of any native species population.	Long term or widespread displacement of groups. Direct mortality greater than 5% of any native species population.
Threatened, Endangered, and State Listed Species	No noticeable displacement of individuals or groups.	Temporary displacement of a few localized individuals or groups. No direct mortality of Federal or State listed species.	Long term or widespread displacement of groups. No direct mortality of Federal or State listed species.	Long term or widespread displacement of groups. Direct mortality of Federal or State listed species.	Loss of entire groups of Federal or State listed species.
Human Health & Safety	No noticeable change to injury rates of staff or public.	Insignificant injuries, such as minor cuts or bruises, to any staff.	Modest injuries to any member of staff or public.	Serious injury to any staff person or member of the public.	Direct or indirect mortality of any staff person or member of the public.

Impact Topic	Negligible Impact	Minor Impact	Moderate Impact	Major Impact	Impairment
Visitor Use & Experience	No change to visitor access. No change to vistas.	Short term displacement of visitors or closure of recreation areas during off-peak periods. Short-term presence of equipment in localized area.	Long term closure of trails and recreation areas. Conflicts with peak recreation use. Long term presence of equipment in localized area.	Permanent closure of trails and recreation areas. Conflict with peak recreation use. Long-term change in scenic integrity of vistas.	Long term closure of sections of river and backcountry areas.
Cultural Resources	No effect to properties listed on the National Register, or to ethnographic resources or objects.	No adverse effects to properties listed on the National Register, or to ethnographic resources or objects.	Short-term adverse impacts to properties listed on the National Register, or to ethnographic resources or objects.	Long-term adverse impacts to properties listed on the National Register, or to ethnographic resources or objects.	Permanent adverse impacts to properties listed on the National Register, or to ethnographic resources or objects.
Wilderness	No audible impacts from activities adjacent to wilderness boundary	Audible impacts of less than one week from activities adjacent to wilderness boundary	Audible impacts of one week to one month from activities adjacent to wilderness boundary.	Persistent audible impacts exceeding one month in duration from activities adjacent to wilderness boundary.	Loss of value of solitude from persistent audible impacts from activities adjacent to wilderness boundary.

3.2 GEOLOGY AND SOILS

Affected Environment

The potential affects of the proposed action on geologic resources is limited to changes in the internal drainage function and processes in karst areas of BNR. Karst areas are characterized by sinkholes, dry valleys, sinking streams, caves, and springs. Rocky soils can range from very thin to over 10m in depth. Much of the rainfall enters the groundwater by percolating through these soils until it reaches open fractures in the underlying bedrock. Water transport in these systems is relatively rapid and there is little effective filtration or adsorption of contaminants. As a consequence, contaminants can quickly enter the shallow aquifers and impact aquatic species.

The potential affects of the proposed action on soils is limited to changes in erosion and deposition. Activities which could increase erosion include soil disturbing activities such as disking. Soil deposition in floodplains could be reduced by lessening the coarse woody growth in the floodplain. The larger stems create eddies which slow current velocity, causing suspended sediments to drop from solution. This woody growth would include canebrakes, brush thickets, and riparian forest. Grasses typically have very limited impact on current velocity because of low surface roughness. Increasing the amount of grass in the floodplain in preference to brush, cane, and trees would tend to reduce the amount of sediment deposited, and reduce the ability of the floodplain to dissipate excess energy from the hydrologic system.

Environmental Consequences

Potential impacts to geology and soils were assessed through review of literature on the impacts of various methods used for habitat management, as well as a review of management actions on and adjacent to BNR that may impact these resources.

Alternative 1: Negligible impact. There would be no measurable changes to karst drainage functions or processes. There would be a minor reduction of soil erosion and a minor increase in floodplain deposition. There would be a minor widespread improvement in soil fertility on non-SUP fields within the floodplain as a result of deposition. SUP fields outside of the floodplain

would see reduced fertility.

Alternative 2: Negligible impact. There would be no measurable changes to karst drainage functions or processes. The amount of soil loss through erosion would continue at current levels. Floodplain deposition would remain at current levels. There would be no change in soil fertilities.

Alternative 3: Negligible impact. There would be no measurable changes to karst drainage functions or processes. Soil erosion could be temporarily increased in certain areas as a result of disking and other mechanized activities. Soil deposition in the floodplains would be improved by increasing forested buffers between the river and fields, improving cane stands, and planting brushy buffer strips in bottomland fields. Soil fertility would be increased or maintained in Special Use Permit hayfields by application of soil fertility amendments. Soil deposition in floodplains would increase soil fertility in these areas.

Cumulative Impacts

Buffalo National River's geology and soils are subject to cumulative impacts such as erosion and loss due to past and present timber practices, road building, agriculture, and mineral extraction both on the park and in adjacent areas. The proposed activities may have temporary and negligible effects on soils such as minor erosion and compaction. These will be compensated for by long-term beneficial effects. Future actions in adjacent areas, such as logging, road building, agriculture, mineral extraction, and residential development, will continue to impact geology and soils within the park. The implementation of the No Action Alternative will reduce the erosion potential of soils and improve floodplain sedimentation. Alternative two will do the least to improve floodplain sedimentation and erosion reduction. Overall, the Preferred Alternative will not have negative cumulative impacts on the park's geology and soils. Buffalo National River's soils will be improved over time through improved floodplain sedimentation if this alternative is implemented.

Impairment

None of the alternatives would result in impairment of the geology and soils of Buffalo National River.

3.3 WATER RESOURCES

Affected Environment

The potential affects of the proposed action upon water resources includes possible impacts upon the Buffalo River and its tributaries that are outside of wilderness. Possible impacts include sedimentation from soil erosion, changes in stream temperature, turbidity, and nutrient levels, and the leaching of herbicide residues into surface water.

Environmental Consequences

Potential impacts to water resources were qualitatively assessed using results of past terrestrial habitat management efforts on the Buffalo River and related literature reviews.

Alternative 1: Negligible impact. Potential stream impacts would be reduced as SUP fields would be removed from production. This would eliminate the risk of contamination of surface streams with agricultural runoff. Soil erosion would be reduced over time, resulting in less sediment being deposited in the tributaries and river.

Alternative 2: Minor impact. There would be a slight risk of contamination of surface streams from agricultural runoff. This risk is mitigated by the existing buffers between SUP fields and streams. Soil erosion would remain at its current level.

Alternative 3: Minor impact. There would be a slight risk of contamination of surface streams from agricultural runoff and herbicide drift. This risk is mitigated by following IPM guidelines and enlarging the buffer strip between fields and streams. Converting from grasses which require heavy fertilization to those which require little will reduce the risks of agricultural runoff more than under Alternative 2.

Cumulative Impacts

The Buffalo River's water quantity and quality have been impacted by past and present human activities such as logging, agriculture, and road-building within and adjacent to the park. Alternative one will help protect the water quality of Buffalo National River by reducing the impact of rain runoff on the river and tributaries. Alternative two will make no changes in the water quality. Alternative

three has potential to impact water quality in both a negative and positive way. Potential negative impacts include the possibility of herbicide residues reaching surface streams. This can be mitigated by using IPM guidelines to reduce herbicide use, and taking adequate precautions to ensure any herbicide used will not leach into the water. Potential positive impacts include improving the buffer strips between streams and agricultural fields, and catching exotic invasive species relatively early when they can be managed most effectively.

Impairment
None of the alternatives would result in impairment of the water resources of Buffalo National River.

3.4 FLOODPLAINS

Affected Environment

The potential affects of the proposed action upon floodplains include possible impacts to the over-bank sediment deposition and erosion rates. These deposition rates are generally related to surface roughness. Rougher surfaces, such as those covered with brush, canebrakes, and forests, tend to slow the velocity of flood waters more than smooth surfaces such as grasses. As the water slows, it deposits fine sediments such as silt and sand. This enriches the soils in the floodplain, and reduces the total hydraulic energy of the stream. Grassy floodplains, on the other hand, are susceptible to erosion as the surface is smooth, and the sod layer may not be intact enough to prevent erosion.

Environmental Consequences

Potential impacts to floodplains were assessed through consideration of the hydrologic features and processes of the Buffalo River.

Alternative 1: Minor impact. The floodplain would begin to function as it did before widespread agricultural practices occurred in the Buffalo River valley. This would be a very long term change that would change erosion and deposition regimes very slowly. There would be no development in the floodplain which would be detrimental to floodplain processes.

Alternative 2: Negligible impact. The floodplain would

function just as it has for the past twenty years. There would be no new development in the floodplain which would be detrimental to floodplain processes.

Alternative 3: Minor impact. Wider buffer strips adjacent to streams, increased canebrake size, and improvement of forage grasses would improve floodplain function and reduce streambank erosion.

Cumulative Impacts
The floodplain of the Buffalo River is potentially subject to greater flooding as a result of upstream human activities, past and present. This increase in flooding, combined with development within the floodplain, results in increased exposure of people and structures to risks associated with damaging floods. None of the proposed alternatives would add development to the floodplain, or reduce its ability to absorb excess flood energy.

Impairment
None of the alternatives would result in impairment of the floodplains of Buffalo National River.

3.5 VEGETATION

Affected Environment
Plant communities at Buffalo National River are rich and diverse. The ridges, bluffs, hillsides and valleys provide a variety of habitats, supporting over 1,500 species of plants. The major forest types are the Floodplain, Mixed-Hardwood, Oak-Hickory, Oak-Pine, Cedar Glade and Beech. Forests, cultivated fields, or abandoned fields at different stages of ecological succession are present throughout the area.

BNR is located within the Oak-Hickory Forest Association. Six oak and three hickory species predominate in the Buffalo watershed. White, black, blackjack, chinquapin, post, and northern red oaks are plentiful, as are mockernut, black, and shagbark hickories. Winged elm, red maple, sassafras, and persimmon are also present, in addition to walnut, hackberry, black gum, shortleaf pine, red cedar, sweet gum, and more than 40 other tree species.

Many of the tributary drainages represent unique botanical areas with relic plant communities surviving regional climate change due to micro-climatic conditions created along steep

north-facing slopes.

Spicebush, redbud, serviceberry, and dogwood are common in the understory and shrub layers, providing showy displays of flowers and blossoms in the spring and early summer. In autumn, the color changes of the deciduous, broad-leaf trees can be spectacular.

Dominant species define each of the dominant plant communities found at BNR. A primary source of species richness is found in the herbaceous layer, which contains components from both the tall grass species and deciduous forest biomes.

In the Forest Oak/ Dry Woodland community dominant species are white oak (*Quercus alba*), black oak (*Q. velutina*), black hickory (*Carya texana*), sweet gum (*Liquidambar styraciflua*), post oak (*Quercus stellata*), shortleaf pine (*Pinus echinata*), and hickory (*Carya* spp.). The sub canopy often *consists of* serviceberry (*Amelanchier arborea*) and fragrant sumac (*Cornus aromatica*). Herbaceous cover is sparse and dominated by bracken fern (*Pteridium aquilinum*) and bush clovers (*Desmodium* and *Lespedeza* spp.). Mosses and lichens are often conspicuous on rock or bare soil. Dense thickets of river cane (*Arundinaria gigantea*) are found in associated riparian areas.

Special Use Permit hayfield and early succession old field plant communities are co-dominated by fescue (*Festuca arundinacea*), sericea lespedeza (*Lespedeza cuneata*), bluegrass (*Poa pratense*), and wingstem (*Verbesina virginica*). Little bluestem (*Schizachyrium scoparium*) is a notable component of about 25% of surveyed field areas. Box elder (*Acer negrundo*), honey locust (*Gleditsia triacanthos*), and winged elm (*Ulmus alata*) also make a dominant presence in many sites. Dense thickets of rivercane are also found in association with many open field sites.

One of BNR's more unique vegetative communities is known as the savanna or "post oak barrens," characterized by open areas of widely scattered trees and a very diverse herbaceous ground cover. The herbaceous ground cover includes both dry-forest and dry-prairie grass and herbs while the woody overstory is composed of several species of scattered, stunted oaks and black hickory. Over the past 50 years, eastern red cedar (*Juniperus virginiana*) has increased

dramatically on the savannas. As the basal area of red cedar, blackjack oak and black hickory rises, overall species diversity declines as the herbaceous layer is shaded out. Frequent fire occurrence is believed to have been a primary factor in the maintenance of the savanna community (NPS, 1995).

Dominant species in the Glade Transition/Post oak barrens include post oak, eastern red cedar, winged elm, winged sumac (*Rhus copallina*), chinquapin oak (*Quercus muhlenbergii*), blackjack oak (*Quercus marilandica*), little bluestem, big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), black-eye Susan (*Rudbeckia* spp.), and blazing star (*Liatris* spp.). Mosses and lichens are often conspicuous over exposed rock in the Glade Transition/Post oak barrens.

A vegetation map, produced in 1978, utilized general vegetation classification systems. Recent ground truth attempts have confirmed the need to revise and update this existing map. A vegetation mapping project is scheduled to begin in 2005 to accomplish this task. Logan surveyed glades of BNR, documenting the location and status of 54 sites and providing voucher specimens of one hundred ninety-three species. A botanical survey of a unique post oak barrens community in the Lower Wilderness (Logan, 1992) documented 255 plant species. Permanent vegetation plots were established and a collection of voucher specimens were included as part of the survey. Grabner and Struckhoff (2002) found a total of 271 ground flora species in 18 plots in post oak barrens, and reported dramatic increases in richness values after the prescribed application of fire.

The top three invasive plant species and noxious weeds of primary concern at BNR are the following:

1. **Eastern red cedar** Eastern red cedar is a widely distributed, native conifer growing in all states east of the Great Plains. It is a prolific invader of thin-soiled glades, dry woodlands, abandoned fields, prairies, and disturbed forests. Eastern red cedar is especially effective in shading out the desirable native grasses that are to be managed for under BNR's Terrestrial Habitat Management Program.

2. **Sericea lespedeza**
   Sericea was first brought to the United States from Japan

in the 1890s. It is a legume, but furnishes very little nitrogen to surrounding plants. It is an aggressive colonizer of disturbed sites, and will often reduce or eliminate competing vegetation, including the native plant species for which BNR actively manages. Seed banks of sericea are very long lived, making it a difficult species to control. A combination of control strategies utilizing integrated pest management concepts is necessary to effectively control this species and reduce its spread.

3. **Tall fescue**
   Tall fescue is an exotic, cool-season forage grass introduced to North America from its native northern Europe. The palatability and nutritional value for wildlife varies. Tall fescue makes very dense root mats. It generally carries endophytes which allow it to out-compete most other grasses. The endophyte carrying strains of this grass have negative impacts on grazing herbivores such as cattle. This species is not desirable on sites where management intent is for high quality hay production, wildlife forage or plant diversity.

Environmental Consequences

The proposed action will have a variety of affects on the vegetation of BNR. Floristic diversity and structure will be managed differently by each of the alternatives. Impacts to vegetation from the alternatives were qualitatively assessed by means of a literature review, consultation with, botanists, plant ecologists, wildlife biologists, and fire specialists.

Alternative 1: Moderate impact. There will be a loss of pastoral setting as the result of reduction in early succession old fields and hayfields. Hayfields will be lost as the SUP program is suspended. Old fields will be lost as they undergo uninterrupted succession to mature forest. There may be a net loss of glades and savannas as woody encroachment continues to close the canopies as mechanical methods are not used. Canebrakes will be expand into fields along the river as they are abandoned. Sericea lespedeza and tall fescue will also expand into abandoned fields.

Alternative 2: Moderate impact. There will be a loss of the pastoral setting of early succession old fields. Glades and savannas may also shrink or be lost. The loss

of the early succession old fields will be the result of lack of mechanical management to keep them open. The loss of the glades and savannas will occur as mechanical methods are not used to keep woody encroachment from closing the canopy. Canebrakes will continue to exist in areas on the margins of the SUP fields, and areas along the river corridor where sunlight can penetrate the overstory. Canebrakes will expand into old field areas alongside of the river. Sericea lespedeza and tall fescue will also expand into abandoned fields.

Alternative 3: Moderate impact, the pastoral setting will be preserved. Early succession old fields will be managed with a variety of methods to ensure a diverse grass and forb component. SUP fields will continue to be leased. Glades and savannas will be managed with mechanical methods and fire to allow for the greatest floristic diversity. Canebrakes will expand into the larger riparian buffer in the early succession old fields and SUP hay fields. Fire will be used on a recurring basis to rejuvenate the canebrakes. Sericea lespedeza and tall fescue will continue to be reduced by following IPM strategies.

Cumulative Impacts

As a result of past and present human use, vegetative communities have been altered, native plant diversity and habitats have declined, and noxious weed infestations have increased. In the future, these effects are likely to continue because humans will continue to use adjacent areas. The Preferred Alternative will help to counter these cumulative impacts to vegetation by promoting the development of native plant communities throughout BNR. Alternatives One and Two will do nothing to enhance remnants of the diverse native plant communities which once flourished in this area.

Impairment

None of the alternatives would result in impairment of the vegetation of Buffalo National River.

3.6 WILDLIFE

Affected Environment

The proposed action will have affects on the wildlife within BNR and outside of the boundaries. Wildlife, as this document refers to it, includes terrestrial forms of

mammals, birds, reptiles, and amphibians. Wildlife within the boundary will be affected directly. Wildlife living outside the boundary will be affected indirectly by changes in the movements and habits of those individuals that move back and forth across the boundary as a result of this action.

Whitetail deer, raccoon, opossum, bobcat, mink, and bear are common at BNR. Elk populations have slowly increased since their introduction to this area in 1981, and sightings are common on the middle and upper river.

Hunting is permitted within BNR in accord with regulations set by the Arkansas Game and Fish Commission. Popular game species include white-tail deer, gray squirrel, cotton-tail rabbit, wild turkey, and black bear. Several species have been re-introduced within or adjacent to the park since its establishment including ruffed grouse, turkey and elk. The NPS and the State have agreed to cooperatively manage BNR as a separate state wildlife management area.

Environmental Consequences

Impacts to wildlife from the three alternatives were qualitatively assessed by means of a literature review, consultation with biologists, mitigation measures, and professional judgment.

Alternative 1: Moderate impact. Wildlife diversity will be reduced in response to a reduction in habitat diversity. Grazing herbivores, such as elk, will be displaced in preference to browsing herbivores such as white-tailed deer. Bobwhite quail, roadrunner, and many other open land birds will be pushed to areas outside the boundary where openings exist, or forced into the remaining openings within BNR. Woodland predators will increase in preference to open land predators. The structure of the forest will change to be dominated by species found in mature forests. Populations of glade wildlife such as collared lizards will be reduced as the areas they depend upon for survival shrink. As canebrakes encroach into abandoned fields along the rivers edge, populations of species like the Swainson's warbler, which depend upon them for nesting, may increase.

Alternative 2: Minor Impact. This alternative will maintain limited species diversity. The pastoral conditions of hayfields are not necessarily conducive to species which rely upon open lands to survive. Hayfields

benefit large grazing herbivores like elk, but can be detrimental to bobwhite quail and other small species that require cover during the haying season. As the glade and savanna areas continue to shrink, the wildlife species populations which are specialized for these areas will begin to shrink as well. The nesting habitat for Swainson's warbler will be maintained, but not increased.

Alternative 3: Minor impact. This alternative will improve species richness by increasing the acreage of early succession old fields from their current level. The grasses in these fields will be improved, both in nutrition and structure. They will be maintained with fire and mechanical methods. This will improve the habitat in these fields for small species which require these openings for survival. The glades and savannas will be managed to maintain their open structure and improve those which have been encroached upon by woody vegetation. Both mechanical methods and fire will be used for this effort. This will improve the habitat quality and availability for the collared lizard and other glade dependent wildlife. Nesting habitat for Swainson's Warbler will be increased as canebrakes are enlarged. Upland forests will be managed with fire to improve the floristic diversity. This will open the understory in some areas which will improve the foraging of forest bat species. Fire tends to reduce the stem density in mature forests which allows sunlight to reach the forest floor. This sunlight increases the herbaceous ground cover, providing forage for a greater number of species.

Cumulative Impacts

Timbering activities and agricultural practices on adjacent lands have generally degraded wildlife habitat and diversity at Buffalo National River, with some exceptions. These impacts are likely to continue into the future, particularly under Alternatives One and Two. The Preferred Alternative will partially offset these impacts by improving wildlife habitat quality and diversity throughout BNR.

Impairment

None of the alternatives would result in impairment of the vegetation of Buffalo National River.

3.7 THREATENED, ENDANGERED, AND STATE LISTED SPECIES

Affected Environment

There are no federally listed vascular plants known to occur at Buffalo National River. Inventory Elements are those for which the Arkansas Natural Heritage Commission is currently conducting active inventory work, and for which there is conservation concern. Proactive management may keep such species off the Federal Endangered Species list. Appendix B shows state-listed plant species and communities found on Buffalo National River:

The bald eagle occurs as a migrant and winter resident within BNR. Three species of threatened and endangered bats (gray bat, Indiana bat, and Ozark big-eared bat) are found at Buffalo National River. A fourth bat species, Eastern small-footed bat, is a state Inventory Element. Hibernating, bachelor and maternity colonies are known to exist and are monitored during the winter and summer season. Fourteen caves and three mines have been identified as habitat used by these bats. A system for cave closure and permitting is utilized for resource protection and recreational activities. Appendix B summarizes the terrestrial fauna that is either State or Federally listed.

Environmental Consequences

Impacts to threatened, endangered, and State listed species from the three alternatives were qualitatively assessed by means of a literature review, consultation with biologists, and professional judgment.

Alternative 1: Moderate impact. This alternative will cause changes in animal and plant community patterns and structure within BNR. Populations of rare plants which require open areas such as glades and savannas will decrease as a mature overstory forms in these areas.

The Gray and Indiana bats forage primarily in riparian areas. They will be un-affected by the closing of old fields, glades, and savannas. The Ozark big-ear bat appears to forage in forests and along forested edges. Their favored foraging area may be reduced as the amount of edge is reduced.

Swainson's warbler tends to nest in thickets, primarily rivercane, in riparian areas. Increase in the size of canebrakes as old fields are abandoned may have positive impacts on this species.

Bewick's wren uses brushy areas, thickets and scrub in open country, open and riparian woodland. Insects comprise about 97% of its diet. This bird forages on the ground, among foliage and limbs of trees and bushes, on log piles, or around old buildings. Most of its foraging occurs within ten feet of the ground. As the open areas close in, the preferred habitat for this species will be reduced.

The Great Blue Heron will be un-affected by any of the proposed alternatives as riparian forest will be available for nesting and foraging.

The wood frog requires riparian forest, deep shade, fish free ponds, large woody debris, and loose leaf litter. This alternative would provide all of these properties.

Alternative 2: Moderate impact. Alternative two would have similar impacts to glade and savanna species as Alternative 1. This alternative would maintain the habitat currently used by the Gray and Indiana Bats. Some of the foraging habitat for the Ozark Big-ear bat could be lost, but it would probably be insignificant. Swainson's warbler and Bewick's wren habitat would be maintained at current levels. Wood frog habitat would be maintained at current levels.

Alternative 3: Negligible impact. This alternative would improve the habitat for glade and savanna species of plants and animals. It would not alter the habitat availability for the Gray and Indiana bats. It would increase foraging habitat for the Ozark Big-ear bat. It would increase available nesting habitat for the Swainson's warbler and Bewick's wren. It has the potential to reduce the available habitat for the wood frog, but this reduction would probably be insignificant.

Cumulative Impacts

Conversion of forest into pastures is expected to continue on lands outside of BNR. Rural home development is also expected to continue. These activities will reduce the total available habitat for the three endangered bat species found in the area. While these habitat losses may

not be offset, all of the alternatives would increase or maintain the current habitat for these bats within BNR.

Many of the state listed species on lands outside of BNR may be impacted by agricultural practices and homebuilding. Since these activities are expected to continue at current levels or even increase these species can be expected to face increased threats. Alternatives one and two would generally do little to offset these threats. Alternative three would offset some of the threats to these state listed species.

Impairment

None of the alternatives would result in impairment of the Threatened, Endangered, or State Listed species at Buffalo National River.

3.8 VISITOR USE AND EXPERIENCE

Affected Environment

The clean, free-flowing waters of the Buffalo National River, set off by the surrounding bluffs, cliffs, woods and pastoral lands, constitutes a visual resource enjoyed by visitors. BNR receives about 800,000 visitors a year. BNR has two major highway crossings, a number of smaller ones, and 47 access points, providing for dispersed entry to this linear park.

Popular outdoor recreational and educational activities at BNR include hunting, wildlife viewing, fishing, camping, hiking, horseback riding, interpretive programs, and of course, floating the Buffalo by raft, canoe, or kayak:

- Non-developed sections of BNR are open to hunting under Arkansas Game and Fish Commission regulations with a state hunting license.

- Wildlife viewing is a popular activity, especially in the Ponca and Carver areas where resident herds of elk are routinely sighted

- Fishing is a popular pastime in the park. Long pools and shallow riffle complexes provide opportunities for game fish like the smallmouth, largemouth, spotted and

Ozark bass, catfish, and a variety of pan fish. Anglers utilize both bank fishing and float fishing in canoes and johnboats. Fishing is governed by state regulations.

- BNR contains 14 designated, auto-accessible. Campgrounds typically provide water and restrooms. Stays are limited to two weeks. Most campgrounds offer excellent river access.

- Short, day-use trails are located at Lost Valley, Pruitt, Tyler Bend and Buffalo Point. Longer trails with opportunities for backpackers are found in the Ponca, Erbie, Pruitt, Woolum, and Tyler Bend areas. Traces of former roads also lure hikers. Hiking is best in winter when foliage has disappeared, and snakes, ticks and chiggers are dormant.

- Horseback riding is a common recreational pursuit throughout most of BNR. Designated horse trails exist in all districts of the park.

- BNR provides interpretive programs at Buffalo Point, Tyler Bend, Pruitt, Ozark and other locations in the spring, summer and fall. Campfire programs, guided nature walks and hikes, guided canoe tours and Ozark craft and folk music programs are all offered.

- Floating on the river is one of the primary recreational uses of the Buffalo National River. Slow-moving reaches of the river are particularly inviting to beginning canoeists. Concessionaires rent canoes, and provide all equipment needed except personal gear and food. Motorized craft restricted to 9.9 horsepower are allowed on the river but are seldom used above the lowest stretches due to the abundance of shallow shoals found in the middle and upper river stretches.

- A visitor center/ranger station is at Tyler Bend. There are visitor contact/ranger stations at Buffalo Point and Pruitt.

Environmental Consequences

Recreation impacts were qualitatively assessed in light of the intensity and duration of habitat management activities

as they related to visitor use and experience. Visual resource impacts in this environmental assessment were assessed in terms of scenic integrity, visual wholeness, and unity of the landscape.

Alternative 1 : Moderate impact. There would be a long term change in the scenery of BNR. Much of the pastoral scene will be lost over time. Sightings of elk and many bird species will be reduced as their habitat shrinks. The scenic diversity of the BNR will be reduced as mature forests fill in the fields that dot the river valley and benches. Canoeists and anglers may not notice the changes to the landscape, as their pursuits are limited to the riparian areas. Hikers, horseback riders, hunters, and motorists will notice significant changes. There are no anticipated changes to visitor programs.

Alternative 2 : Minor impact. Some of the pastoral scene will be lost by continuing to follow this alternative. Sightings of elk and many bird species will be reduced as their habitat continues to shrink. Scenic diversity will be reduced as old fields continue to undergo succession to mature forest. Canoeists and anglers may not notice the changes to the landscape, as their pursuits are limited to the riparian areas. Hikers, horseback riders, hunters, and motorists will notice significant changes over time. There are no anticipated changes to visitor programs.

Alternative 3 : Minor impact. The scenic diversity of the BNR will be maintained. Visitors will have improved wildlife viewing and hunting opportunities. Canoeists and anglers may not notice the changes to the landscape. Hikers, horseback riders, hunters, and motorists will continue to appreciate the diversity of habitat and scenery. There are no anticipated changes to visitor programs.

Cumulative Impacts

The establishment of Buffalo National River has greatly increased opportunities for recreational use by the visiting public. Improved roads and trails provide better access to the river and its resources. In addition, increasing population growth and heightened national interest in outdoor recreation has led to increased visitation of national parks such as Buffalo National River. Increased visitation may lead to the development of further tourist destination resources in the future.

The No Action Alternative may reduce the availability of hunting and wildlife viewing opportunities within BNR as early successional fields revert to forest. Alternative Two would make no changes in visitor use and experience. The Preferred Alternative would contribute in a positive way to the enjoyment of visitors as it would improve wildlife viewing and hunting opportunities as well as maintaining a relatively pastoral setting along much of the river.

3.9 HUMAN HEALTH AND SAFETY

Affected Environment

The proposed action has the potential to cause illness and/or injury to park staff, contractors, permittees, and visitors. Using industry standard risk management guidelines, every effort will be made to eliminate these potential hazards.

Environmental Consequences

Impacts on human health and safety were qualitatively assessed through determination of activities, equipment, and conditions that could result in injury, and in light of mitigation measures and best management practices.

Alternative 1: Negligible impact. In many ways, this alternative poses the least risk to human health and safety. Since there would be a cessation of hay leasing activity, there will be no need to run tractors and associated equipment through the fields and down the roads. This will eliminate this source of potential hazards.

Alternative 2: Minor impact. This alternative would not change the risk possibility from its current level. There is a limited risk for injury or illness from the hay field management activities ongoing. This risk is mitigated by following risk management guidelines.

Alternative 3: Moderate impact. This alternative has the highest potential to expose park employees, contractors, permittees, and visitors to the risks associated with farm equipment, herbicide application, and prescribed fire. These risks can be satisfactorily mitigated by following industry standard risk management guidelines.

Cumulative Impacts:
None of the alternatives has the potential to make a change

in the cumulative impacts to human health and safety.

3.10 CULTURAL RESOURCES

Affected Environment

The potential affects of the proposed action upon cultural resources includes a variety of surface and subsurface archeological sites and historic properties. Bluff shelters, caves, and open sites constitute the prehistoric site types found in BNR. Historic properties include National Register Historic Districts and Classified Structures which have as their component parts houses, outbuildings, cisterns, cemeteries, roads, agricultural fields, mining features (mills, shafts, adits, etc.), railroad grades, ferry landings, bridges, and walls. Periods of significance run from the prehistoric (ca. 10,000B.C.) to A.D. 1955.

A unique area within BNR is the Boxley Valley Historic District which is managed by the Boxley Valley Land Use Plan/Cultural Landscape Report, 1985. The Boxley Plan was develop to implement the private use zone exclusion of the park's Land Protection Plan and turn around what was rapidly becoming a valley of abandoned farms with resulting loss of community. The Boxley Plan inventoried occupied or recently occupied farms and proposed a "community development district" of non contiguous community pockets along the main highway corridor and on the river tributaries. Areas currently in agricultural use, including those with old home sites, were designated as the "agricultural district."

Richland Valley is another unique area within BNR. Most of the valley bottom is under private ownership. NPS retained a scenic easement over this property. The landowner's utilizes this area for livestock production.

Environmental Consequences

Impacts to cultural resources were assessed qualitatively by discussions with archeologists and cultural resource specialists.

Alternative 1: Moderate impact. Archeological sites and standing structures and ruins would be increasingly obscured by encroaching vegetation. This would likely increase the level of bioturbation of subsurface archeological deposits, and would foster the deterioration

of above ground features.

Alternative 2: Minor impact. Cultural properties would be enhanced by the open fields in the SUP program. The SUP program restores and maintains historic cultural landscapes while stabilizing and protecting subsurface archeological deposits. Special management consideration of historic properties will result in enhanced conditions of historic districts, farmsteads, and mining communities.

Alternative 3: Minor impact. Cultural properties would be enhanced by terrestrial habitat management use of fire, mechanical tools, and no till planting. The SUP program restores and maintains historic cultural landscapes while stabilizing and protecting subsurface archeological deposits. Special management consideration of historic properties will result in enhanced conditions of historic districts, farmsteads, and mining communities.

Cumulative Impacts:
Although past human disturbance impacted numerous cultural sites along the Buffalo River, establishment of the park helped to protect these resources. All of the alternatives have the potential to have some impacts upon cultural resources. Taken in balance, the Preferred Alternative has the potential to have the most positive impact to the cultural resources of BNR.

Impairment:
None of the alternatives would result in impairment of the cultural resources of Buffalo National River.

3.11 WILDERNESS

Affected Environment

The potential impacts of the proposed actions include noise entering wilderness land from activities lying outside of the wilderness boundaries. These impacts will be of short duration and of a limited extent. NPS Management Policies (2001) require minimum requirement/minimum tool analysis for all work anticipated to occur in a wilderness setting.

Environmental Consequences

Impacts to wilderness were assessed by evaluating probable locations of work in relation to wilderness boundaries, and resource specialist professional judgment.

Alternative 1: Negligible impact. There will be no direct impacts to wilderness from management in this alternative.

Alternative 2: Minor impact. Direct impacts are limited to noise impacts from agricultural activities occurring on SUP hayfields outside of the wilderness.

Alternative 3: Minor impact. Direct impact is noise from agricultural activities occurring on hay fields and early successional fields outside of wilderness lands.

Cumulative Impacts:
The Buffalo National River Wilderness has been impacted by past human activity prior to designation, and current activity outside of the boundary. Human use both inside and outside of wilderness is expected to increase as the human population increases in the region. Cumulative impacts to wilderness include development along the wilderness boundary where it is shared with the park boundary, noise impacts from outside, changes in character from vegetative succession, and wildlife moving into wilderness from outside areas. Activities outside BNR will continue to affect wilderness increasingly. Residential development which brings in the ubiquitous "security light" will continue to impact the wilderness values of quiet, natural darkness, and large undeveloped vistas. Aircraft over flights and satellite deployment are expected to continue to increase, impacting natural quiet and darkness. Fire suppression has impacted wilderness by allowing succession, in the absence of fire to shade out glade and savanna plant communities and increase the under and mid-story within the forest.

Alternatives One and Two will not improve habitat diversity outside of wilderness. Alternative Three will improve habitat diversity outside of wilderness. This will allow for a more diverse native fauna, which may be seen more often within wilderness as a result. Alternatives One and Two will have no impact on the soundscapes of wilderness. Alternative Three may impact these soundscapes. These impacts will be additive to the impacts from outside of BNR lands. They will be of short duration and will not constitute a significant impact.

Impairment:
None of the alternatives would result in impairment of the cultural resources of Buffalo National River.

Appendix B
State Listed Species and Communities

Terrestrial Plant Inventory Elements, Buffalo National River

Scientific Name	Common Name
Abutilon incanum	Pelotazo Abutilon
Allium stellatum	Glade Onion
Arabis shortii var. *shortii*	Short's Rock-cress
Brickellia grandiflora	Tassel Flower
Carex careyana	Carey's Sedge
Carex mesochorea	Midland Sedge
Carex pellita	Wooly Sedge
Carex radiata	Stellate Sedge
Castanea pumila var. *ozarkensis*	Ozark Chinquapin
Caulophyllum thalictroides	Blue Cohosh
Collinsia verna	Spring Blue-eyed Mary
Delphinium newtonianum	Moore's Larkspur
Delphinium treleasei	Trelease's Larkspur
Desmodium illinoense	Illinois Tick-Trefoil
Heuchera parviflora var. *puberula*	Little-leaved Alumroot
Hieracium scabrum	Rough Hawkweed
Juniperus ashei	Ashe's Juniper
Leavenworthia uniflora	a Leavenworthia
Lithospermum incisum	Narrow-leaved puccoon
Mimulus floribundus	Floriferous Monkeyflower
Muhlenbergia bushii	Bush's Muhly
Neviusia alabamensis	Alabama Snow Wreath
Penstemon cobaea	Purple Beardtongue
Phacelia gilioides	Brand Phacelia
Philidelphus hirsutus	a Mock Orange
Phlox bifida	Sand Phlox
Pseudactium ursum	Ozark Pseudactium
Rhynchospora capillacea	Capillary Beak Rush
Ribes cynosbati	Prickly Gooseberry
Sedum ternatum	Wood Stonecrop
Smilax ecirrata	Carrion-Flower
Spiranthes lucida	Shining Ladies'-tresses
Stylophorum diphyllum	Celandine Poppy
Symphotrichum sericeum	Silky Aster
Thelypteris noveboracensis	New York Fern
Toxolasma lividus	Purple Liliput
Tradescantia ozarkana	Ozark Spiderwort
Trillium pusillum var. ozarkanum	Ozark Least Trillium
Valerianella ozarkana	a Corn-salad

Terrestrial Fauna Inventory Elements, Buffalo National River

Scientific Name	Common Name
Ardea herodias	Great Blue Heron
Arrhopalites clarus	a springtail
Corynorhinus townsendii ingens	Ozark Big-eared Bat
Crosbyella distincta	a cave obligate harvestman
Derops divalis	beetle
Limnothlypis swainsonii	Swainson's Warbler
Myotis grisescens	Gray Myotis
Myotis leibii	Eastern Small-footed Bat
Myotis sodalis	Indiana Bat
Rana sylvatica	Wood Frog
Scaphinotus inflectus	a ground beetle
Thryomanes bewickii	Bewick's Wren
Trigenotyla parca	a cave obligate millipede

Appendix C
Environmental Laws and Regulations

Relevant Laws and Regulations	Summary
National Environmental Policy Act (NEPA) (42 USC 4321-4370)	Requires Federal agencies to evaluate the environmental impacts of their actions and to integrate such evaluations into their decision-making processes.
Council on Environmental Quality (CEQ) Regulations	These regulations (40 CFR 1500-1508) implement NEPA and establish two different levels of environmental analysis: the environmental assessment (EA) and the environmental impact statement (EIS). An EA determines whether significant impacts may result from a proposed action. If significant impacts are identified, an EIS is required to provide the public with a detailed analysis of alternative actions, their impacts, and mitigation measures, if necessary.
Antiquities Act (AA) (16 USC 431 et seq.)	Authorizes the President to designate as national monuments any historic landmarks and historic and prehistoric sites, structures, and objects situated on Federal land. Establishes the requirement of a permit for the examination or excavation of such nationally important sites and establishes penalties for their destruction.
Archaeological Resources Protection Act (ARPA) (16 USC 470a et seq.)	Ensures the protection and preservation of archeological resources on Federal lands.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.)	Provided broad Federal authority to respond directly to releases of hazardous materials that may endanger public health or the environment. Established prohibitions and requirements pertaining to closed and abandoned hazardous waste sites, provided for liability of persons responsible for releases of hazardous waste at these sites, and established a trust fund to provide for cleanup when a responsible party cannot be identified.
Endangered Species Act (ESA) (16 USC 1531-1544)	Prohibits the harming of any species listed by the U. S. Fish and Wildlife Service (USFWS) as being either Threatened or Endangered. Harming such species includes not only directly injuring or killing them, but also disrupting the habitat on which they depend.
Federal Land Policy and Management Act (43 USC et seq.)	Declares that all public lands will be retained in federal ownership unless it is determined that a use other than public will better serve the interests of the nation. Requires that all public land be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, and environmental aspects of the land. Requires that all public lands and their resources be inventoried periodically and

	systematically.
Historic Sites Act (HSA) (16 USC 461 et seq.)	Authorizes the establishment of national historic sites, the preservation of areas of national interest, and the designation and the preservation of National Historic Landmarks (NHLs). Provides procedures for designation, acquisition, administration, and protection of such sites.
Migratory Bird Treaty Act (16 USC 703 et seq.)	Restricts the taking, possession, transportation, sale, purchase, importation, and exportation of migratory birds through permits issued by the USFWS.
National Historic Preservation Act (NHPA) (16 USC 470 et seq.)	Provides for a national policy on historic preservation. Section 106 (36 CFR Part 800) requires federal agencies to consider the effects of their undertakings on National Register properties as eligible properties. The Secretary of the Interior maintains a National Register of Historic Places (NRHP) and sets forth significance criteria for inclusion in the Register. Cultural resources included in the NRHP, or determined eligible for inclusion, are considered "historic properties".
National Park Service Organic Act of 1916 (16 USC et seq.)	Established the National Park Service to manage national parks for the purposes of conserving the scenery, natural resources, historic objects, and wildlife within the parks, and providing for the enjoyment these resources in such manner that will leave them unimpaired for the enjoyment of future generations.
Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.)	Protects Native American human remains, burials, and associated burial goods.
Wilderness Act of 1964 (16 USC 1121 (note), 1131-1136)	Establishes the National Wilderness Preservation System. Wilderness defined as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain…which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable."
Executive Order 11514: Protection and Enhancement of Environmental Quality	Provides leadership for protecting and enhancing the quality of the Nation's environment to sustain and enrich human life.
Executive Order 12372: Intergovernmental Review of Federal Programs	Directs Federal agencies to consult with and solicit comments from state and local government officials whose jurisdictions would be affected by Federal actions.
Executive Order 13007: Protection and Accommodation of Access To "Indian Sacred Sites"	Directs Federal agencies to consider Indian sacred sites in planning agency activities.
Executive Order 11990:	An overall wetlands policy for all agencies managing Federal lands, sponsoring Federal

Protection of Wetlands	projects, or providing Federal funds to State or local projects. It requires Federal agencies to follow avoidance/mitigation/ preservation procedures with public input before proposing new construction projects.
Executive Order 11988: Floodplain Management	Requires all Federal agencies to take action to reduce the risk of flood loss, to restore and preserve the natural and beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. Because many wetlands are located in floodplains, Executive Order 11988 has the secondary effect of protecting wetlands.