

**LITTLE MISSOURI RIVER
MANAGEMENT ACTION PLAN**



**CADDO RANGER DISTRICT
OUACHITA NATIONAL FOREST
SOUTHERN REGION
USDA - FOREST SERVICE**



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OUACHITA NATIONAL FOREST

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I. Introduction

A. Background

The Little Missouri River begins approximately three miles southwest of Big Fork, Arkansas in Polk County and flows south for 29 miles to Lake Greeson east of Newhope, Arkansas. There are approximately 17.7 miles within the Forest Proclamation Boundary as follows:

	<u>Miles</u>
Forest Service / Both sides -----	12.21
Forest Service / One side -----	0.55
Private / Both sides -----	4.93
Private / One side -----	0.55
Total Miles (Within National Forest Boundary) ---	17.69

In 1982, the U. S. Department of Interior, with the cooperation of state and local agencies, produced a listing of rivers that had potential for inclusion into the National Wild and Scenic Rivers System. This listing was called the Nationwide Rivers Inventory (NRI). The Little Missouri River from its headwaters to the backwaters of Lake Greeson was identified as one of these rivers.

In accordance with the National Wild and Scenic Rivers Act and the Final Revised Guidelines for Eligibility, Classification and Management of River Areas, the Ouachita National Forest initiated the eligibility study process in the summer of 1987. The Study was completed on February 4, 1988.

The following is a description of the three segments that were studied for eligibility.

Segment 1. From the headwaters downstream approximately 11.3 miles to the Albert Pike Recreation Area. This segment was recommended for designation as "SCENIC" due to roads, several access points, and a small federal recreation area.

Segment 2. From the north boundary of the Albert Pike Recreation Area downstream approximately 2.0 miles to the property line between James Lowery and National Forest land. This segment was recommended for designation as "RECREATIONAL" due to the presence of conspicuous roads, developments in a major federal recreation area, developoments in a large private campground, numerous access points, and a large amount of human activity.

Segment 3. From the property line between James Lowery and National Forest land downstream approximately 4.4 miles to the National Forest Boundary. This segment was recommended for designation as "WILD" due to limited access and the natural condition (lack of evidence of man).

The Arkansas Wild and Scenic Rivers Act of 1992 (Public Law 90-542) designated the portion of the Little Missouri River on the Ouachita National Forest as "Wild and Scenic River". The river was designated in two segments totaling 15.7 miles as follows:

Segment 1 - the 11.3-mile segment from its origin in the northwest 1/4 of Section 32, Township 3 South, Range 28 West, to the west section line of Section 22, Township 4 South, Range 27 West, as a SCENIC river.

Segment 2 - the 2.0 mile segment including the Albert Pike Recreation Area and the James Lowery property known as "Camp Albert Pike" was not designated.

Segment 3 - the 4.4-mile segment from the north line of the southeast 1/4 of the southeast 1/4 of Section 28, Township 4 South, Range 27 West, to the north line of the northwest 1/4 of the southwest 1/4 of Section 5, Township 5 South, Range 27 West, as a WILD river.

In 1990 the Amended Land and Resource Management Plan (Forest Plan) for the Ouachita National Forest was completed. The Forest Plan allocated the Little Missouri River and the surrounding area to Management Area 20. For this management area, the plan established a desired future condition, management area prescription goals, objectives, and standards and guidelines.

See Exhibit A in the Appendix for a map of Management Area 20.

On February 2, 1994, Congress established the final boundaries for the Little Missouri Wild and Scenic River corridor.

See Exhibit B in the Appendix for a map of the river corridor boundaries.

B. Purpose of the Plan

The purposes of this plan are:

1. Describe the existing ecological conditions of the Little Missouri River as identified through field examinations, inventory, and public issues.
2. Compare the desired condition from the Forest Plan with the existing condition and define opportunities for action.
3. Identify and prioritize possible projects and activities to be carried out to implement the direction for management of the Little Missouri River as provided in the Forest Plan. As decisions are made on individual projects through the NEPA (National Environmental Policy Act) process, further data specific analysis and public involvement will be conducted.

II. Existing Condition

A. Watershed

The Little Missouri watershed is the second largest on the Caddo Ranger District. It includes the subwatersheds of Crooked Creek, Straight Creek, Long Creek, Brier Creek, Blaylock Creek, Greasy Branch, Raven Branch, and Viles Branch within the Forest proclamation boundary. The total watershed area of the river basin within the proclaimed Forest boundary is approximately 39,650 acres, of which more than 90 percent is on National Forest System land.

The river is free-flowing with no man-made dams, river channel diversions, or other flow regulation structures between the headwaters and Lake Greason. Flow data above the Forest proclamation boundary is not available. The U. S. Geological Survey has a gauging station at the State Highway 84 bridge near Langley, Arkansas. Only periodic instantaneous readings are taken.

Water quality of the Little Missouri River is considered to be excellent. However, because of heavy increases in recreation use in recent years, dispersed camping, ORV's, roads, and equestrian use could have an increasing detrimental effect on water quality. These impacts must be monitored. Water samples are taken weekly at the Albert Pike Recreation Area and below the mouth of Blaylock Creek through the summer months. The U. S. Geological Survey also takes periodic samples at the Highway 84 bridge. All of these samples consistently meet state water quality standards (Regulation No. 2, as amended, of Section 3 of the Arkansas Water and Air Pollution Control Act, as amended, establishes water quality standards for all surface waters of the State of Arkansas).

The Little Missouri River is within the Ouachita Mountain ecoregion, as defined by the Department of Pollution Control and Ecology. It is classified by the State of Arkansas as an extraordinary water resource; Natural and Scenic Waterway; ecologically significant waterbody; primary contact recreation area; domestic, industrial and agricultural water supply; and fisheries. The following are the standards listed in the State of Arkansas Water Quality Standards (1988), for water bodies with the above classification and representative sample data from 1993:

<u>CRITERIA</u>	<u>STANDARD</u>	<u>DATE COLLECTED FEB.-SEPT. 1993</u>
pH	6.0-9.0	7.15
Temperature (oC)	30oC max.	14.12
Turbidity (NTU)	10 max.	2.5
Fecal Coliform	200/100 ml max.	36.0
Dissolved Oxygen (mg/l)	6.0 min.	10.5

B. Wildlife and Fisheries

All of the area along the Little Missouri River within the Forest Proclamation Boundary is managed under cooperative agreement with the Arkansas Game and Fish Commission (AGFC) as part of the Caney Creek Wildlife Management Area. Black bear scent stations, white-tailed deer spotlighting surveys and wild turkey brood surveys are conducted in cooperation with the AGFC. The rugged terrain provides habitat for these and other game species, including gray and fox squirrel, and furbearers such as raccoon, otter, and beaver, as well as an amazing variety of non-game species.

The Cerulean Warbler, a species of special concern and possibly a candidate for federal listing, has been observed in this area of the Ouachita National Forest. The Rufous-Crowned Sparrow, another species of special concern, is known from glade sites on Paul and Pryor Mountains. These sites and Magazine Mountain on the Ozark National Forest are the only known sites in Arkansas.

Amphibians and reptiles are abundant in numbers as well as species. The Caddo Mountain salamander, ringed mole salamander, southern redback salamander, Ouachita dusky salamander and western diamondback rattlesnake are just a few that are of special concern.

Common game fish occurring within the river include channel catfish, several species of sunfish, smallmouth bass, and rainbow trout. The trout are stocked annually by the AGFC. Migratory species, such as spotted sucker and striped bass (introduced), move upstream during spawning runs from Lake Greeson to as far as Albert Pike Recreation Area during high water. The State also stocks channel catfish to supplement the native population. The greenside and orangebelly darters, central stoneroller, bigeye shiner, redbfin shiner, creek chub, and striped shiner minnows, northern studfish, northern hog sucker, and blackspotted topminnow are the most common non-game fish species occurring in the Little Missouri River and its tributaries. Another sensitive species that may be found in the river corridor is the Ozark clubtail dragonfly.

The Caddo madtom (Noturus taylori), a diminutive catfish that prefers clear, shallow, moderate flowing water over small rocks or gravel riffles and pools, has historically occurred in the Little Missouri River. It is a candidate species for federal listing (Category 3C-U.S. Fish and Wildlife Service). This species was discovered in 1970.

The Forest Service is continuing to monitor or research:

1. Continued exceptional water quality to support aquatic and terrestrial animals.
2. The effect of stocking exotic rainbow trout on the native fish community.
3. The effect of adding large woody debris for fish and aquatic insect habitat.

C. Vegetation

DESCRIPTION --- The Little Missouri River corridor is composed of a rich mixture of forest communities. Topography, aspect, seeps, and springs of the mountains and floodplains of the river and its tributaries have all contributed to the diversity of the corridor. Vegetation communities present include oak-hickory (dry and mesic), pine, pine hardwood, hardwood pine, beech-oak-umbrella magnolia, stunted oak woodlands, and glades. Current data on the vegetation shows 47% of the area is hardwood, 9% is hardwood/pine, 6% is pine hardwood and 38% is pine.

Pine communities are normally found on drier south-facing slopes with hardwood communities on north slopes. Pine stands may also be found on lower portions of north slopes as well as intermittent ridges off north slopes. Hardwood communities on the north slope vary depending on moisture and slope position. Mixtures of white oak, northern red oak, hickory, and black oak are the dominant species present. Stunted oak hickory communities are usually found at the tops of ridges interspersed occasionally with pine and eastern red cedar. Open grassy areas called glades are also interspersed along the ridges. On north facing sides of ridge tops, almost pure stands of northern red oak can be found. Where springs or seeps occur high along slopes and ridges, mesic communities normally found along creeks can be found.

Pine communities are usually shortleaf pine dominated with loblolly interspersed on the more moist areas. In the pine communities, understory vegetation includes flowering dogwood, vacciniums (high and low), sweetgum, blackgum, oaks, and hickories. Where fire has occurred in the past, understory and midstory species are sparse. Ground level species, grasses and forbs, are more abundant.

Hardwood communities found in the corridor can be divided into five groups; white oak/northern red oak/hickory (83%), northern red oak (4%), post oak/blackjack oak (12%), beech/umbrella magnolia (1%), and river birch/sycamore (<1%). Post oak and blackjack oak are found on xeric sites along the ridges, northern red oak is found along a narrow band on upper north slopes, the white oak, northern red oak, and hickory community on the submesic to mesic north slopes, beech/umbrella magnolia along drains, and river birch/sycamore is on floodplains on the Little Missouri River. Where seepage occurs, mesic plant communities can be high on slopes that would typically support xeric communities.

Species associated with the white oak/northern red oak/hickory forest community include black oak, black gum, red maple, winged elm, sweet gum, and black cherry. Black gum, red maple, and black cherry are usually found on more mesic sites. Mid- and understory species are also influenced by slope and moisture gradients. Serviceberry, wild plum, and gum bumelia may be found on the upper drier slopes. Flowering dogwood, sassafras (infrequent) and blackhaw occur on midslopes. Hophornbeam is found on lower mesic sites with witch hazel, redbud, and ash. American hornbeam occurs along drain floodplains where soils remain moist almost year round. Shrub layer

species include vacciniums and azaleas near drains or seeps. Umbrella magnolia and pawpaw may also occur in moist soils, usually near well drained springs. High on north slopes where there is a thick layer of humus kept moist by seeps, communities of red buckeye are found.

Northern red oak communities occur in a strip from the top edge of north facing slopes. Midstory species can be clumps of northern red oaks, wild plum, and serviceberry. Generally no shrub layer exists.

Xeric communities are generally found along south facing ridges. Overstory species include shortleaf pine, post oak, and blackjack oak, and eastern red cedar. As elevation increases pine is replaced by stunted oaks. Along the ridge tops, occasional shortleaf pine and eastern red cedar exist but the dominant species are the oaks. These can be interspersed with grassy glades and large boulders. Many of the tree species are stunted, most less than 11 inches in diameter. Associated understory species include fragrant sumac, blueberry, and huckleberry. Grassy openings include bluestems, sedges, and wiregrass. On areas that are slightly moist, dense thickets of greenbrier are present. Two sensitive species have been identified along the ridge tops in xeric communities. These include the Cossatot leafcup and maple leaf oak.

Beech/magnolia communities occur along floodplains of the Little Missouri river, perennial creeks, and some of the drainages leading to them (usually where areas have not been disturbed to a great extent). These communities grade quickly into the mesic oak communities. Associated species include American hornbeam, witch hazel, and hophornbeam.

River birch/sycamore communities are found in narrow bands on frequently flooded moist alluvial soils along the Little Missouri river. Moving away from the river, other flood tolerant species begin to dominate, such as sweet gum, red maple, box elder, hackberry, elms, and eventually the oaks and loblolly pine. There is the potential for early succession habitat to be created here from beavers which are located along Brier creek which is in the area between the wild and scenic portions of the river. Currently, the beavers populations are being kept low by trapping so that vegetation in the Albert Pike recreation area is not damaged.

Novaculite glades are typically found on steep, boulder dominated south facing slopes of exposed novaculite where soils are thin and fluctuation in temperature and moisture are extreme. Mosses and lichens are abundant on large expanses of bare rock interspersed with small patches of stunted trees (ALRMP I:IV 45). Grasses, forbs, prickly pear cactus, and ferns can be found in them. The trees that are present include post oak, blackjack oak, hickory, shortleaf pine, and eastern red cedar. One glade has been identified on Paul's Mountain. It is actively managed through prescribe burning on a three to five year cycle to stop tree and shrub encroachment. This is the only glade that has been identified that needs active management within the river corridor at this time.

HISTORIC LAND USE --- A review aerial photographs of management area 20 from the 1950's onward showed that most of the area was wooded. The only cleared area identified consisted of a house and two pastures which were located on a floodplain of the river at the south tip of the scenic portion of the river corridor. These totalled about 30 acres. The only other visible openings in the management area were openings along the ridges (glades).

The wild section of the river corridor along the Little Missouri River was privately owned until the 1980's when it came under U.S. Forest Service jurisdiction. The area had not been cut until the 1970's when the older pines were attacked by southern pine beetles. Many of the pine trees on the floodplains of the river were removed as a result of the beetle infestation.

Forest Service timber harvesting on public lands occurred throughout the scenic and wild sections although exact locations and the amount of timber removed is unknown. In the 1950's and 1960's, pine forests across the Forest were selectively harvested on a rotation basis. In the 1950's, most of the better pine trees were removed. In the 1960's, policy changed and the poorer formed and suppressed trees were culled. Trees were cut out of areas so steep that today they would be considered inaccessible. In the 1970's and 1980's, clearcutting became the preferred harvest method. Cutting units were originally 200 acres in size and were reduced to 80 acres in the 1980's. Many of the areas that were selection harvested in the 1950's and 1960's were too steep for clearcutting. Based on current stand ages, clearcutting occurred on 437 acres or five percent of the river corridor. Since the 1990's the only tree removal that has occurred in the corridor has been to stop the spread of southern pine beetle infestations.

USE OF PRESCRIBE FIRE --- Many plant communities of the Ouachita mountains are fire dependent. Glade communities are an example of these which are found in the river corridor. Historically, lightning strikes would burn the mountains. The cooler north slopes would not receive the intensity of the fires that the ridge tops and the south slopes received. Southern pine on the south slopes tolerated the fire while the hardwoods and cedar on the south slopes and ridge tops succumbed to it. Grassy glades developed on the ridge tops. These glades are in part due to fire and to the low productivity of the soils typical of the ridges. Low soil quality resulted in slow growing stunted trees that even if fires were infrequent, kept the hardwoods from invading glades. Suppression of fire in the last decades has allowed some hardwood encroachment in the ridgetop glades. As a consequence, a glade on Pauls mountain is currently being managed by fire to reduce the hardwood component.

Prescribe burning during cooler winter months has been occurring on a three to five year cycle on six percent of the river corridor. Prescribe burning is occurring on approximately 2500 acres between the scenic and wild sections on the west side of the river. Prescribe burning will begin between the two sections on the east side of the river corridor. The river corridor is adjacent to one of the pine grass old growth units of management area 21.

NATURAL DISTURBANCES --- In addition to wildfire, heavy winds and insect and disease infestations have continuously impacted the vegetation in the Ouachita mountains. Southern pine beetle (SPB) is a major damage causing insect to southern pine trees. Infestations are usually cyclic, peaking every six to seven years. SPB typically attack older less vigorous stands; usually older suppressed trees, wind damaged trees, or lightening struck trees. Attacked trees range from spots of four to five trees to acres of trees.

Eight outbreaks were recorded and controlled in the river corridor in 1987. These were generally 1/4 to one acre in size. The next recorded outbreaks occurred in 1993; 20 spots were controlled from 1/4 to two acres in size. Two outbreaks were not controlled immediately after detection. These grew in size to 10 and 15 acres of infected trees before they were suppressed. In the 1990's, the cut and leave method of beetle suppression was used to stop the spread in the wild section, while the cut and remove method was used in the scenic section. The cut and remove method was used in the 1980's.

Heavy winds periodically blow through the mountains and result in sections of blown over trees, either singly or in large swatches. Typically the larger hardwoods which are either hollow or shallow rooted go over. Heavy winds in the late 1980's blew over seed trees in a pine seed tree regeneration stand. These strong winds also blew over many large hardwoods across all northern slopes on high mountains as well as in drains up and down the slopes.

D. Minerals and Geology

The Little Missouri Wild and Scenic River is comprised primarily of shale, sandstone, chert, and novaculite formations that crop out in an impressive display through the River corridor. Cherts in the Stanley Shale formation and novaculites of the Arkansas Novaculite Formation form the dominant ridges of jagged outcrops along the River. The formations, originally deposited in relatively flat lying layers, have been severely folded and buckled as part of the mountain building period for the Ouachita Mountains. Beds and bedding pans now stand at odd angles as a reminder of the power exhibited in the folding processes for mountains. The Little Missouri Wild and Scenic River will lend itself to excellent geologic interpretations.

A descriptions of the rock formations along the Little Missouri River can be found in the Appendix (Exhibit D).

E. Cultural Resources

Little Missouri Wild and Scenic River Corridor is a high-probability area for the presence of archeological sites. Today as in prehistory, elevated landforms in proximity to potable water make excellent campsites. Consequently, there is great potential for uncontrolled recreational camping to impact significant archeological remains.

The Little Missouri River Valley contains a lengthy record of human occupation and use stretching back in time for ten millenia. From the first Paleoindian hunters of 10,500 years ago-to-early twentieth century American homesteaders, humans have adapted to a dynamic environment and in turn, cultural intervention over generations has shaped regional ecology. At the end of the Pleistocene, boreal forests receded northward and were gradually replaced by the mixed deciduous forest of today. The mastodon, great sloth, and other Pleistocene megafauna became extinct, possibly a result of overexploitation by Paleoindian hunters in combination with habitat changes. These changes caused a dramatic shift in human subsistence--from nomadic big game hunters to semisedentary hunter-gatherers emphasizing a diverse resource base with nuts, fish, and small game animals being the new dietary staples. The following climatic episode, known as the hypsithermal, prevailed from about 7,000 to 4,500 B.C. and was a time of drier climatic conditions when human populations clustered along the river corridors. So efficient had indigenous peoples become in their new subsistence adaptation, that by 5,000 years ago populations became much more sedentary and presumably, exerted more influence in the surrounding environment.

Indigenous peoples significantly altered the environment. Novaculite, available only in the southern Ouachita Mountains, was intensively exploited. This stone material, highly desired for production of sharp edged stone tools, was transported through prehistoric trade networks across the southeastern United States. Tons of this material were mined from ridgetops and outcrops overlooking Little Missouri River, leaving these landforms pitted and covered with lithic debris stretching for hundreds of meters. Denuded ridgetops favored colonization by pioneer xeric plant and animal species, gradually changing the character of the landscape from forest to grassland in these localities. Prehistoric use of fire to enhance game species habitat is widely acknowledged in other regions and fire may have been employed in the Ouachitas as well. Repeated seasonal burning would have created an open forest habitat interspersed with meadows--precisely the landscape encountered by later Anglo-American settlers. The new subsistence strategy focused on foraging for edible plants and gradually, cultural selection led to domestication of native annuals such as goosefoot, may grass, and others. Before A.D. 800, corn had been added to this repertoire of cultigens. Native populations farmed the rich alluvial floodplains along major Ouachita Mountain streams and significantly altered the character of the riparian habitat by replacing forest with field.

In the nineteenth century when Anglo-Americans arrived to settle the area, the Ouachita Mountains were not inhabited. Caddo Indians, who once occupied the region had moved south to Texas and later relocated to present-day Oklahoma. Nonetheless, the landscape encountered there had been the product of generations of cultural selection--barren ridgetops supporting upland prairies, expansive open forests, and meadows interspersed on alluvial floodplains--possibly old fields of the Caddo.

Historic settlement in the Little Missouri River Valley occurred comparatively late after the introduction of railroads in the Ouachita Mountains. The last 150 years, however, have been the most dynamic in terms of wholesale environmental change. New access to interstate markets touched off an era of agricultural development and widespread speculation in lumber and minerals. By making a few improvements--rustic buildings with fields and pastures placed under-fence, citizens acquired parcels of land under the Homestead Act. Much of this upland acreage, submarginal for agricultural purposes and incapable of supporting a family for an extended period, was ultimately sold to timber companies. Timber was high-graded or systematically stripped from large tracts, leaving a devastated landscape of barren mountains and silt-choked streams. In 1907, President Theodore Roosevelt set aside remaining Public Domain lands as the Arkansas National Forest--renamed the Ouachita National Forest in 1926 for the mountain range it encompasses. This initiated a period of intensive forest management in Arkansas. The Forest Service acquired cutover timber land and abandoned farms under the Weeks Act, greatly expanding the size of the Forest. In the early years of the Agency, selective planting and fire suppression were employed to reclaim this acreage and create the present forest landscape.

The Little Missouri River corridor of today is a cultural landscape as much as a natural environment. Evidence of former cultures abound there. Isolated stone tools mark the paths of the first Indian hunters. Small temporary camps of prehistoric family groups that stopped to harvest riverine resources or to process meat from an opportunistic kill are abundant on the river banks. Large quarry pits for extraction of novaculite line the ridge tops and most rock outcrops bear unmistakable signs of ancient mining. Choice camping locations, the bluff-shelters and elevated terraces near potable water and critical resources, were inhabited frequently or continuously. Generations of sustained occupation in such locations resulted in deeply stratified archeological sites with artifact laden soils or midden deposits. Euro-American exploitation in the nineteenth and twentieth centuries have also altered the environment. Stone chimney stacks, cellar depressions, and collapsed rock fences with stones laboriously collected from adjacent fields, mark failed homestead patents. Mines and slag piles, tree stumps, logging roads, and abandoned sawmill sets all bear testimony to intensive exploitation and provide a record of recent environmental change. The forest environment today, especially composition of plant and animal species, is a result of former cultural intervention from 10,500 years ago to the present. The Forest is dynamic and at any point in the past has been significantly different than the forest of today. Many archeological sites contain a time sensitive record of environmental change and are essential to understanding the human role in formation and composition of the Ouachita National Forest. It is therefore critical that significant archeological resources be identified and protected for future research.

Ninety six recreational campsites exist within the river corridor that could potentially affect significant archeological sites. To assess their potential effects, campsites have been grouped into five

condition classes ranging from loss of vegetation cover and organic litter-to-soil erosion and ravine formation. These condition classes also represent a continuum of effects to archeological sites from gradual loss of diagnostic artifacts through casual collecting behavior to complete destruction of cultural features and midden deposits. Only condition class 1 "slight loss of vegetation cover and/or minimal disturbance of organic litter" has no potential to impact archeological sites. Class 1 campsites, however, represent only eight percent of the total campsite inventory.

Numerous archeological sites are already documented in the Little Missouri Wild and Scenic River Corridor. At least 18 recreational campsites (almost 19 percent of the total inventory) are affecting a previously recorded archeological site. The river corridor, however, has not been the subject of a formal archeological survey. It is not possible, therefore, to state that the remaining campsites are not affecting archeological remains.

To assess the potential effects of uncontrolled recreational camping on archeological resources, it will be necessary to identify and to document all affected archeological sites and to determine their significance or National Register eligibility. If a recreational campsite (condition classes 2-5) is found to be impacting a significant archeological site, then the impact should be mitigated by campsite closure or relocation.

F. Recreation

DEVELOPED FACILITIES --- Two Recreation Areas are located on the Little Missouri River. The Little Missouri Falls Picnicground is located within the upper (scenic) segment of the designated Wild and Scenic River corridor. The site includes five picnic units, toilets, water handpump and an overlook for viewing the Little Missouri Falls. On weekends, this area is usually filled to capacity with picnickers, hikers, waders and sightseers. The Albert Pike Campground is located between the upper (scenic) segment and the lower (wild) segment of the designated Wild and Scenic River corridor. The area includes 46 campsites, three toilets, eight water fountains, amphitheater and a swimming area. The toilets were constructed in 1978 and are in need of rehabilitation and to meet accessibility standards. The sewage system is planned for rehab this year. Rehab is also needed for 24 of the campsites. Some sheet erosion is occurring in these campsites, especially the ones located along the river in Area "C". Albert Pike Campground is usually filled to capacity (230 Campers at one time) every weekend from May 1 until Labor Day in September.

Adjacent to the federal campground is a private facility with approximately 200 cabins, 30 RV units w/electricity, water and sewer hookups, and a grocery store.

TRAIL SYSTEM --- Within the Little Missouri watershed, there are approximately 26.5 miles of developed trails for hikers. In addition, approximately 10 miles of the system (Viles Branch) is available for equestrian use. The Little Missouri Trail parallels the river from

the headwaters to the National Forest boundary (15.4 miles). There is also a one-mile hiking trail (Bluff Mountain) within the Albert Pike Recreation Area.

A trail counter installed on the Little Missouri Trail indicates some 3,000 visitors have hiked from the trailhead on Road 106 to the "Winding Stairs" area on the lower (wild) segment of the Little Missouri River during the last six months. This 2.5-mile section of the Little Missouri Trail has been identified as the "most heavily used trail on the entire Ouachita National Forest". The heavy amount of use has made it difficult to keep the trail drained and the threadway has worn down several inches in some of the level segments. Maintenance costs are very high for this segment of the Little Missouri Trail. Although hikers and horseback rider share the same trail through the "Winding Stairs" area, there have been no reported conflicts.

DISPERSED CAMPSITES --- The existing dispersed campsites along the Little Missouri River were inventoried from October 12, 1993 through January 7, 1994. Attached (Exhibit C) is a summary of the inventory showing the number of campsites by drainage, average size of campsites, number and percent of campsites with swimholes, method of access to campsite by foot or vehicle, existing condition class of campsites by number and percent, and number of campsites recommended to be left open, temporarily closed, and permanently closed.

There were 96 campsites inventoried with the average size being approximately 0.08 acre. 92% of the campsites are located next to swimholes. Access is primarily by vehicle (67%) with 32% by foot. Existing conditions of the campsites vary from barely distinguishable to soil erosion obvious. The inventory showed that 33 of the 96 campsites probably should be closed permanently to prevent further resource damage.

OFF-ROAD VEHICLES (ORV'S) --- ORV's continue to be a concern due to occasional violations in closed areas within the river corridor. ORV's are prohibited from use within the boundaries of Albert Pike Recreation Area, Little Missouri Trail or on temporary roads that have been revegetated. Some resource damage does occur especially during the heavy use period of late May through late August. Although all of the system roads are available for use, some riders leave the developed roads for the challenges of the old primitive logging roads and sometimes road banks. Law Enforcement Officers routinely patrol both the Brier Creek and Long Creek Roads since these appear to be the popular riding routes. Since the closure to ORV's at Albert Pike, the amount of use and violations have decreased since they cannot ride the ORV's out of camp. Continued monitoring of ORV use is essential and if resource damage becomes significant, a closure within the entire corridor may be necessary.

PRIVATE LAND --- There are two areas of private ownership between the headwaters of the Little Missouri River and the National Forest proclamation boundary. Within the upper (scenic) segment of the river in Sections 3 & 4, T4S, R28W, there are approximately 165 acres in

private ownership (Clouse - 56, Buffinton - 39, Liles - 10, Crowson - 10 and Page - 10). There are three cabins on this private tract and it is completely natural forest. At the present time, all uses of this private land are consistent with protection of the outstanding remarkable values of the river.

Within the middle (undesignated) segment of the river adjacent to Albert Pike Recreation Area, there are 200 acres in private ownership (Lowery). This tract is made up of about 20 acres of improvements such as cabins, parking, roads and garden, 20 acres of pastureland and the remaining acreage is in natural forest. The forested area has not been developed due to the steepness of the mountains around the private tract. There are approximately 150 cabins leased along both sides of the river. In addition, Mr. Lowery also operates a small grocery store and RV Park on the east side of the river next to his private residence. Access to the cabins on the west side of the river is through Loop "A" of the Albert Pike Recreation Area. Some of the leasees deposit their trash at the federal garbage bins when leaving the area even though signs are posted. At the present time, all uses of the private land are consistent with protection of the outstanding remarkable values of the river.

RECREATION USE --- Recreation use continues to increase both on and adjacent to the Little Missouri River. Primary uses are camping, picnicking, swimming, hiking, fishing, hunting, canoeing and viewing scenery. On most weekends and especially holidays, the recreation areas are at capacity with most of the dispersed campsites occupied. Day use adds even more visitors to the river from the other Federal Areas within a 20-mile radius from Shady Lake Recreation Area and the Corps of Engineers Areas on Lake Greeson. Primary access to the river is from Langley on State Highway 369. County Road 73 through Albert Pike Recreation creates even more congestion.

INTERPRETIVE OPPORTUNITIES --- There are many opportunities to inform the public about the "outstanding remarkable" features that made this river eligible for the "Wild and Scenic" designation. Currently, the main effort is through Saturday evening amphitheater programs at Albert Pike Recreation Area. Various topics are presented to the campers throughout the summer. Videos, movies, slide programs, along with special guest speakers on cultural resources, wildlife, fisheries, snakes, bats, hiking opportunities, etc. are presented weekly from Memorial Day through Labor Day.

III. Desired Condition

The goals and objectives and standards and guidelines of the Forest Plan, taken together, define the desired condition of the Forest as a whole and within each management area.

The Forest Management Goals and Objectives which guide this proposal are (Forest Plan, Pages IV - 1, 2, 3, 4):

Provide a safe transportation system that meets the minimum needs of the various resources and their users.

Inventory, evaluate and protect significant cultural resources as a integral part of the public's interest in the Forest.

Protect, maintain and improve soil productivity, water and air quality.

Ensure that riparian areas are protected, maintained and managed to protect water quality; enhance aquatic biota; provide wildlife and waterfowl habitat; and preserve or enhance the natural values and diversity of the areas.

Protect, manage and enhance all aquatic habitats for native vertebrate and invertebrate populations.

Protect and improve habitat for threatened, endangered and sensitive species of plants and animals.

Maintain viable populations of all existing native plants and animals in the planning area.

Provide for a diversity of plant and animal communities throughout the planning area.

This river corridor is located within Management Area 20. The Desired Future Condition for this area is described as follows:

The visitor would find the appearance of an unmodified natural landscape away from existing roads and trails. Little evidence of timber harvesting would be seen by the visitor. Vegetation would move toward a mixture of old-growth conditions with some level of loss of shrub and other forage species (Forest Plan IV - Page 176).

Vehicles and motorized travel would be restricted to only a few system roads. From the river the visitor would find a natural appearing landscape and experience a full range for water-related recreation activities. Developed recreational facilities would be evident within the area and at river access points (Forest Plan IV - Page 176).

Management activities and practices will protect the inherent quality of the river and its outstanding remarkable features (Forest Plan IV - Page 176).

Management will provide for river related recreational opportunities that are compatible with the designation and protection of the outstanding remarkable features of the river and its corridor (Forest Plan IV - Page 176).

Old growth is further clarified here as the maximum age of a species, not a climax forest. Characteristics of these communities will include individual large old trees, large dead standing trees, large down trees, and large down tress in streams (Leopold et al. 1988).

Mesic Forests

Mesic forest on north-facing slopes will feature various mixtures of northern red and white oak, cucumber magnolia, hickory, black gum, American beech, sugar maple, and occasionally basswood. Large old grape vines will be evident. The canopy will be more or less continuous with gaps created by mortality, insects, disease, and blowdown. Tree reproduction and sapling growth will be evident in the gaps. Overstory trees will typically range from 18 to 30 inches in diameter with ages over 200 years. Clumps of umbrella magnolia and sweetbay may appear around seeps and drainages. Although old growth mesic forests have recognizable layers, including mid- and understories, they appear generally open and easy to walk through. Large down woody material will be abundant. Associated with the rotting wood and moisture will be forbs, ferns, and mosses.

Dry and Dry Mesic Forests

Rates of natural disturbance are higher on dry slopes, and there are probably more varieties of disturbance here than under mesic conditions. Conditions that typify old growth dry and dry mesic forest are therefore less predictable and more variable than classic models of old growth would suggest. Mixtures of shortleaf pine and a variety of oaks, hickories, and black gum make up most of the overstory, with canopy tree diameters averaging 20-25 inches at 4.5 feet from the ground. Standing dead and down logs appear scattered throughout and occasionally in conspicuous groups within the old growth stands. Smaller trees and shrubs include service berry, wild plum, farkleberry, and lowbush huckleberry on the upper dryer slopes with rusty blackhaw, dogwood, and others on the lower slopes. Azealeas will be found around springs and drains. Dense carpets of lowbush huckleberry can be common. Where fire is frequent, these and small diameter trees will be replaced by grasses. Tree regeneration on the upper slopes will be slow and dependent on the appropriate seed year, soil, and moisture conditions occurring simultaneously. As pine trees age, they will become more susceptible to southern pine beetle attack. This will create gaps in which regeneration will occur.

IV. Desired and Existing Conditions, Opportunities, and Possible Management Practices

The following table compares key facets of the Desired Condition of this area with existing on-the-ground conditions to define opportunities and possible management practices:

<u>Desired Condition</u>	<u>Existing Condition</u>	<u>Opportunity</u>	<u>Possible Management Practices</u>
Protect the inherent quality of the river and its outstanding remarkable features (Forest Plan - Page IV-176)	<p>A. 33 of 96 dispersed recreation campsites causing soil erosion</p> <p>B. Horseback riders and hikers use the same trail system on the lower segment of the river in the "Winding Stairs" area</p> <p>C. Heavy use (swimming, wading, canoeing, fishing, etc. on river on weekends during the summer (especially holidays) in the "Winding Stairs" area</p> <p>D. 24 of 46 camping units at the Albert Pike Recreation Area are substandard with some soil erosion</p> <p>E. Pedestrians and vehicles use same bridge (Road 106) across river resulting in a serious safety hazard in Albert Pike Recreation Area</p> <p>F. Disabled and elderly visitors to the Little Missouri Falls Recreation Area are unable to view the falls due to the dangerous walkway across river and steep trail to the overlook</p> <p>G. 18 known sites currently affected by camping within the river corridor. Because a complete heritage resources survey has not been undertaken, the effects of the remaining 78 campsites are unknown.</p>	<p>A. Decrease the number of dispersed campsites causing soil erosion</p> <p>B. Determine use on trails</p> <p>C. Determine use on river</p> <p>D. Decrease the number of developed campsites causing soil erosion</p> <p>E. Eliminate safety hazard on Road 106 bridge in Albert Pike Recreation Area with a pedestrian walkway</p> <p>F. Eliminate barriers for disabled and elderly so they may view Little Missouri Falls</p> <p>G. Eliminate campsites which are impacting significant heritage resources</p>	<p>- close or relocate 33 dispersed campsites</p> <p>- continue monitoring trail users and evaluate impacts and potential conflicts among users</p> <p>- establish monitoring process to determine amount and kind of use</p> <p>- Rehab 24 campsites at Albert Pike</p> <p>- Construct accessible trails from the parking lot to the falls at Little Missouri Falls Recreation Area</p> <p>- Survey all campsites for the presence of heritage resources</p> <p>- Evaluate heritage resources for National Register eligibility</p> <p>- Selectively close campsites with significant heritage resources</p> <p>- Monitor campsites to ensure that closure is effective</p>
Provide a safe transportation system that meets the minimum needs of the various resources (Forest Plan - Page IV-4)			
Protect significant cultural resources (Forest Plan - Page IV-2)			

Maintaining the exceptional water quality classification (Forest Plan - Page IV-3)

Maintain the health of the riparian ecosystem within the wild and scenic river corridor while maintaining some recreational uses (Forest Plan - Page IV-4)

Maintain native aquatic communities (Forest Plan - Page IV-2)

H. While recognized by the State as an exceptional water no current inventory exists characterizing it's condition. Without baseline information changes or trends are not identifiable.

I. The riparian area within the wild and scenic corridor is undergoing change from natural process such as decline of old growth stands and social process such as dispersed camping

J. From a 1987 BASS Survey, it was determined that the Little Missouri River aquatic fauna exhibits a typical Quachita Mountain Ecoregion stream, and receives heavy fishing pressure.

K. However, it also has a history of introduction of non-native fauna on the native aquatic biota, such as rainbow trout, channel catfish, and migratory striped bass.

L. In addition, challenges to the integrity of the aquatic system include potential habitat fragmentation due to fish barriers as in culverts, etc., and from ORV's as they are driven in streams.

H. Establish a baseline inventory of the aquatic ecosystem

- Conduct Baseline Area Stream surveys in 1996 and reinventory every 3 years

I. Determine trends and conditions for riparian condition

- Using stand mapping techniques establish a projected history of riparian stands with respect to campground disturbance

J. Monitoring of aquatic biota (BASS) and Creel Surveys to determine impacts.

- If necessary, install habitat structures
- Recommend appropriate regulations (catch n release, slot length limits).

K. Evaluate the impacts of non-native fauna on the native aquatic biota. Launch a PR program to encourage the harvest of migrating striped bass due to the food habits of these large predators.

- According to study results cease or persist in stockings.
- Promote harvesting of all stocked species.

L. Determine and prioritize replaceable culverts. Encourage law enforcement measures to protect stream biota from ORV damage.

- Modify existing man-made barriers in coordination with engineers.
- ORV regulations and enforcement.

M. Various forest communities
at various age classes

M. Allow the area to
develop characteristics
of old growth communities,
ie dead and down woody material,
snags, rotting wood

- Prescribe Fire:
Eliminate the use of prescribe
burning except for glade main-
tenance

- Wildfires:
Natural:

Let run to pre-established
natural boundaries or man made
that have been set up in a
burning plan for the river
corridor.

Man Caused:

Control, contain, or confine
depending on conditions.

- Southern Pine Beetle:

In the wild section, monitor
outbreaks, cut and leave if
private property/public safety
is threatened (ALRMP I:IV 89,
180). In the scenic section,
monitor spots. If outbreaks
threaten scenic quality of the
corridor, cut and leave or cut
and remove using mules or
cables. Allow openings to
regenerate naturally.

N. Young pine plantations

N. Advance to healthy old growth
condition, improve scenic quality

- If young pine plantations
become overstocked (ALRMP I:IV
137), thin. Use only mules/
cables for logging.

O. Disease/insect damage/heavy winds
have flattened/killed large areas
of trees in the past

O. Reduce negative visual impact in
the scenic section and safety
hazard in the wild section while
advancing old growth conditions

- Scenic section: areas where
trees are killed will be left
to regenerate naturally
regardless of the size of the
opening. Where trees are killed
in visually sensitive locations
the Forest landscape architect
will determine what actions
need to be taken (ie timber
salvage, lop and scatter).
Wild section: no actions will
be taken unless public safety
is threatened.

Healthy PETS
(Forest Plan - Page IV-2)

P. Populations have been identified. Some are located near trails.

P. Identify, maintain, and enhance PETS populations

- Set up long term plan to measure pertinent features of known populations and if populations are decreasing, take corrective actions. Continue to inventory to identify new populations. Move trails/campsites where necessary.

Little evidence of human use
(Forest Plan - Page IV-176)

Q. Use of some campsites and trails has compacted soils, understory vegetation is non-existent, surrounding trees are damaged.

Q. Reduce impacts

- Monitor vegetation and soils along trails and campsites. Close campsites and portions of trails if "rest period" is needed, else relocate them.

Native plant communities
(Forest Plan - Page IV-2)

R. Some introduced species could become pests (common privet, Japanese honeysuckle, autumn olive, etc.).

R. Reduce or eliminate these species where practical

- Inventory and monitor exotic populations. Take action to eliminate if necessary.

Diversity of plant communities
(Forest Plan - Page IV-3)

S. One glade within the river corridor is actively managed. Many other glades have been identified.

S. Maintain glade communities

- Prescribe burn the glade on Paul's Mountain on a three to five year rotation as needed. Use handbuilt firelines around the glade. If other glades are identified in the future that require fire for maintenance, prescribe burn the glade with handbuilt firelines as needed.

Maintain scenic quality of the river
(Forest Plan - Page IV-176)

U. When road maintenance is finished, slash is usually left on the road side.

U. Remove slash

T. Presence of beavers in Brier Creek may impact vegetation along the Little Missouri River

T. Maintain/manage beaver community for diversity of habitat they create

- Monitor beaver population size and impact on the surrounding vegetation. Adjust population size if significant flora in the scenic portions of the river are negatively impacted. Set up a scientific experiment to measure impacts to vegetation and adjust management actions.

- Lop and scatter slash 100 feet off of the roadsides.

V. Schedule of Proposed Management Practices

From the extensive list of management practices shown in Section IV, the following list of annual management practices and proposed management projects are recommended:

<u>Annual Management Practices</u>	<u>Estimated Cost</u>
1. Monitoring of all existing and new campsites will be a continuing process with an annual field review scheduled every fall following the recreation season.	\$5,000
2. Monitoring of trail use on the Little Missouri Trail and the Viles Branch Trail	\$2,000
3. Monitoring of water use on the Little Missouri River	\$1,000
4. Continue monitoring of all campsites for effects on Cultural Resources. Annual target date for updating Cultural Resources Effects Inventory is December 31.	\$2,000
5. Monitor visitors on river to determine learning and educational benefits.	\$1,000
6. Prepare burning plan for the LMR corridor Update annually.	\$500
7. Monitor SPB activity (Aerial and ground detection).	\$2,000
8. Inventory vegetation by prescription in the LMR corridor.	\$27,000
9. Inventory known populations of PETS annually.	\$2,000
10. Inventory exotic species populations annually.	\$2,000
11. Inventory recreation impacts to vegetation annually.	\$2,000

<u>Special Management Projects</u>	<u>Estimated Cost</u>
1. Conduct basin area stream surveys initially in 1996 and reinventoried on a three year rotation.	\$2,000
2. Using stand mapping techniques, establish a projected history of riparian stands with respect to campground distrubance.	\$2,000
3. Close or relocate 33 dispersed campsites.	\$66,000
4. Conduct heritage resources survey of 96 campsites and identify significant sites impacted by camping.	\$30,000
5. Close dispersed campsites that are affecting significant heritage resources (10 are included above).	\$8,000
6. Reconstruct 26 campsites at Albert Pike Recreation Area.	\$52,000
7. Reconstruct trail from parking lot to Little Missouri Falls to accessibility standards.	\$80,000
8. Determine effects of trout and catfish stocking.	\$12,000
9. Conduct creel surveys to determine fisheries use management in Little Missouri River.	\$10,000
10. BASS Survey habitat needs for natural fish in river	\$15,000
11. ID fish passage barriers and modify appropriately	\$50,000
12. Replace Road 512 (Long Creek Road) slab.	\$10,000
13. Develop new campsites and rest stops in interesting geologic, botanical and scenic settings. Install interpretive signs where possible.	\$50,000
14. Develop new hiking trail segments to interesting geologic, botanical and scenic settings. Install interpretive signs where possible.	\$25,000
15. Develop an interpretive section on the Little Missouri Trail from Albert Pike Recreation Area to the "Winding Stairs" area. Special interest points and tree identification marked with numbered posts. Pamphlets describing the points and trees will be distributed by the Campground Hosts at Albert Pike.	\$5,000
16. Inventory to identify unknown PETS populations.	\$2,000
17. Measure beaver population size/relationship to vegetation use, movement, etc.	\$500

VI. Appendix

Exhibit A - Map of Management Area 20

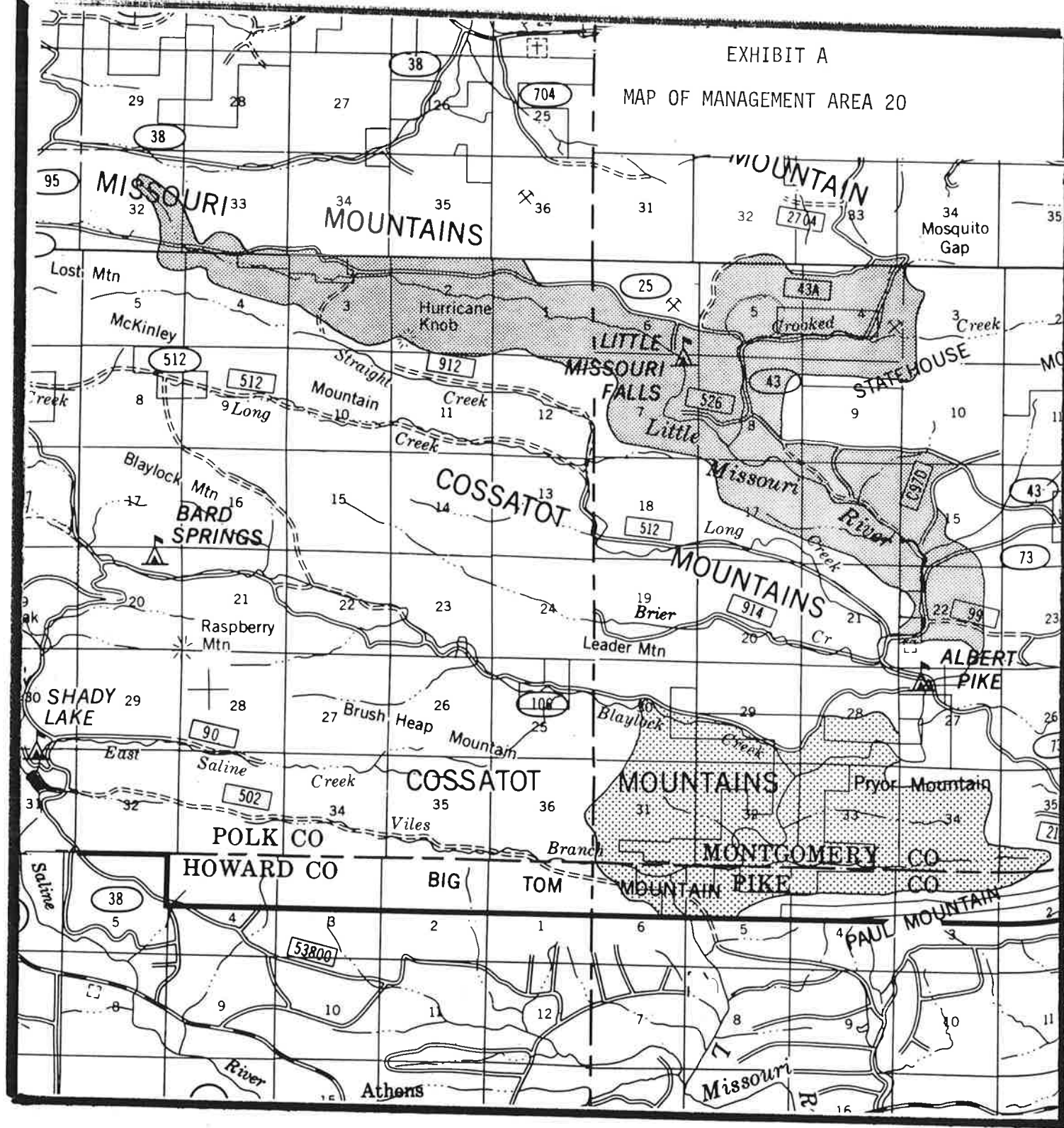
Exhibit B - Map of River Corridor

Exhibit C - Summary of Campsite Inventory





Exhibit D - Description of Rock Formations

EXHIBIT A

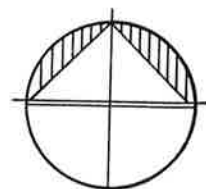
MAP OF MANAGEMENT AREA 20



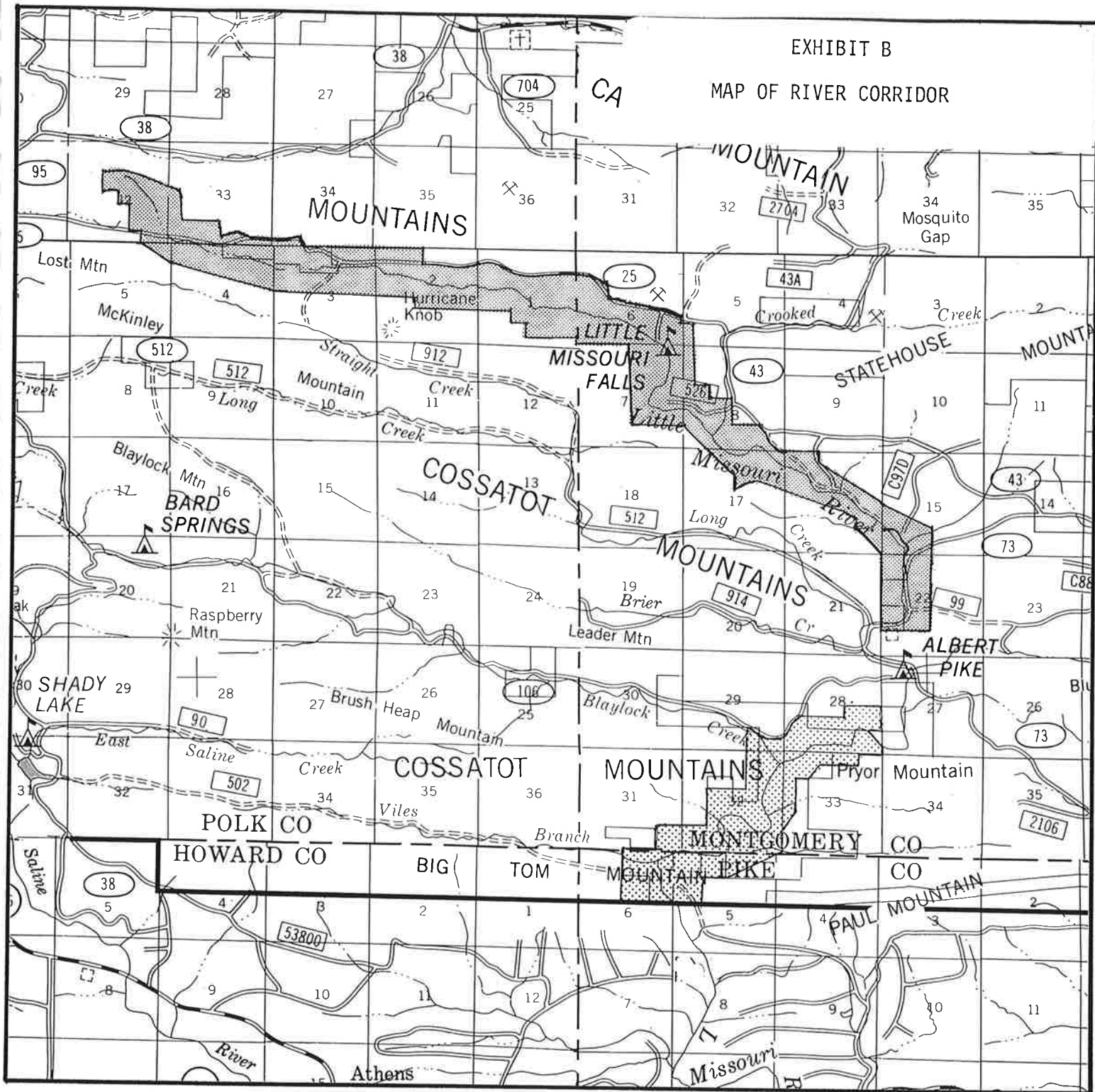
LEGEND

-  SEGMENT 1 SCENIC
-  SEGMENT 2 NON-DESIGNATION
-  SEGMENT 3 WILD
-  FOREST BOUNDARY

SCALE 1 1/2 0 1 MILE



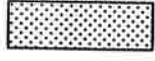



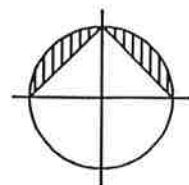
NORTH



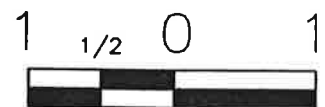
CORRIDOR MAP

LEGEND

-  SEGMENT 1 SCENIC
-  SEGMENT 2 NON DESIGNATED
-  SEGMENT 3 WILD
-  FOREST BOUNDARY



NORTH



SCALE IN MILES

EXHIBIT C --- SUMMARY OF CAMPSITE INVENTORY

LITTLE MISSOURI WILD & SCENIC RIVER

Caddo RD - Ouachita NF

DRAINAGE LOCATION	CAMPSITE NUMBERS	AVG. SIZE	NO. WITH SWIMHOLES	TYPE ACCESS		*CONDITION CL.					RECOMMENDATION ON CLOSURES
				FOOT	VEHICLE	1	2	3	4	5	
LITTLE MISSOURI RIVER	A1-A54	0.08	47	22	32	6	16	14	13	5	LEAVE OPEN - 33 CLOSE TEMP - 3 CLOSE PERM - 18
CROOKED CREEK	B1-B19	0.05	18	4	15	2	1	3	7	6	LEAVE OPEN - 7 CLOSE TEMP - 4 CLOSE PERM - 8
BLUFF BRANCH	C1	0.03	1	0	1	0	0	1	0	0	LEAVE OPEN - 1 CLOSE TEMP - 0 CLOSE PERM - 0
LONG CREEK	D1-D17	0.14	17	0	17	0	1	3	4	9	LEAVE OPEN - 10 CLOSE TEMP - 2 CLOSE PERM - 5
BRIER CREEK	E1	0.02	1	0	1	0	0	1	0	0	LEAVE OPEN - 1 CLOSE TEMP - 0 CLOSE PERM - 0
BLAYLOCK CREEK	F1-F4	0.06	4	3	1	0	1	1	2	0	LEAVE OPEN - 2 CLOSE TEMP - 0 CLOSE PERM - 2
TOTALS AND/OR AVERAGES	96 CAMP SITES	0.08 ACRE	88 (92%)	29 (32%)	67 (67%)	8	19	23	26	20	LEAVE OPEN - 54 CLOSE TEMP - 9 CLOSE PERM - 33

*CONDITION CLASS DEFINITIONS

- Class 1: Campsite barely distinguishable; slight loss of vegetation cover and/or minimal disturbance of organic litter.
- Class 2: Campsite obvious; vegetation cover lost and/or organic litter pulverized in primary use areas.
- Class 3: Vegetation cover lost and/or litter pulverized on much of the site, some bare soil exposed in primary use areas.
- Class 4: Nearly complete or total loss of vegetation cover and organic litter, bare soil widespread.
- Class 5: Soil erosion obvious, as indicated by exposed tree roots and rocks and/or gullyng.

- I
- Individual Inventory Forms also include the following data for each campsite:
- County and legal description (1/4 Section).
 - Description of how to access the campsite (distance & direction to nearest system road).
 - Inventory Parameters (distance to nearest maintained trail, number of other campsites visible from site, distance to water, and percent canopy cover).
 - Impact Parameters (vegetative ground cover on-site, vegetative ground cover off-site, percent of soil exposure, no. of stumps, no. of fire rings, percent of tree damage, percent with root exposure, and if site is polluted by litter/trash, human waste or stock waste).
 - Name of person doing inventory, date of inventory and additional comments.

EXHIBIT D --- DESCRIPTION OF ROCK FORMATIONS

LITTLE MISSOURI WILD & SCENIC RIVER

Caddo RD - Ouachita NF

The following formations are part of the Little Missouri Wild and Scenic River:

A. (MDa Devonian/Lower Mississippian)

Arkansas Novaculite - consists predominatly of white to light gray novaculite with lesser amounts of gray chert and olive green to black shale. The Formation ranges in thickness from about 350 feet to 900 feet. Novaculite is defined as a hard dense rock comprised essentially of silica, usually white and resembling unglazed porcelain in general appearance and texture. The Formation is divisible into three distinct divisions in the Central and Southern Ouachita Mountains:
"lower division" -- massive white novaculite;
"middle division" -- dark novaculite and chert layers inter-bedded with olive green to black shale;
"upper division" -- white, often tripolitic and calcareous, thin-bedded novaculite.

The Arkansas Novaculite is extremely resistant and forms tall, sharp crested ridges along east-west belts. Novaculite is best known as a raw material for making whetstones and specialty tools for sharpening knives and surgical instruments. It is mined both on and off the Forest for this purpose. Tripoli, the weathered form of novaculite, has been prospected for in the upper division at several places. Tripoli is actively mined on private lands near the Forest primarily for use in industrial applications as a filler and as an abrasive agent.

Copper has been prospected from one site on the Forest in this Formation. Often associated together, copper and manganese prospects occur in both the lower and upper divisions. Some turquoise has been removed from a site on the Forest near Caney Creek Wilderness on the Mena Ranger District.

B. (Ms Mississippian)

Stanley Shale Formation - has a maximum thickness of about 11000 feet and is composed mostly of brownish green to black shale with lesser quantities of thin to massive, fine-grained, silty sandstone and some chert layers. A known barite deposit is present in the southern part of the Caddo Ranger District. In the 1970's barite had been produced from deposits in the lower Stanley. A large barite mill and mine on National Forest and adjacent private lands near Caddo Gap, was closed and reclaimed before production was underway due to significant changes in the barite market conditions in the mid 1980's. Barite's primary use is as an important weighting agent in drilling fluids necessary in drilling oil and gas wells and other deep drilling applications. Consequently the demand for barite is generally connected with the amount of exploration in the oil and gas industry. The Fork Mountain Slate unit is within the lower Stanley Shale Formation. This slate unit is described by Purdue (1909) as a hard gray slate, weathered surfaces of green or chocolate, with thin frequent sandy or quartzitic

layers, well developed cleavage, but highly jointed thereby affecting the usefulness of the slate. The Fork Mountain Slate is specifically identified in: T3S R28W Sec. 19&20 (Herring Slate mining claims: a low grade slate deposit that had been evaluated and rejected in the 1970's for potential billiard quality tabletop application); South slopes of Missouri and Caddo Mountains; outcrop thickness on the mountain slope exceeds 100 feet in T4S R27W Sec.5 (Caddo RD); along the creek in T4S R28W Secs. 25, 26&27 (Caddo RD); in T2S R21W Sec.24 (Womble RD), among other locations. Slate for roofing granules is mined in one operation on private lands adjacent to the Forest near Norman, AR on the Caddo Ranger District. Some quartz crystal is also produced from veins in the Stanley Shale Formation. Prospects in the Stanley Shale Formation were reported in the early 1900's for lead, zinc, copper, and manganese in the northern portion of McCurtain County, Oklahoma. However, there is no record or evidence of production.

C. (Smb Silurian)

Missouri Mountain Shale and Blaylock Sandstone - The Missouri Mountain Shale lies between the Arkansas Novaculite Formation and the Blaylock Sandstone or, in places along the central and northern border, between the Arkansas Novaculite Formation and the Polk Creek Shale. It is typically a red, green or buff shale or slate, and is poorly exposed. The unit ranges in thickness from 50 feet to a maximum of 300 feet. In some areas it has been mined for ornamental slates.

The Blaylock Sandstone lies between the Missouri Mountain Shale and the Polk Creek Shale. It has a maximum thickness of 1000 feet, but is totally absent in most places in the Northern Ouachita Mountains. Typically, it is comprised of alternating thin brownish gray, very fine grained, silty sandstone and gray shale layers.

D. (Obp/Obpf Upper Ordovician)

Polk Creek Shale and Big Fork Chert - The Polk Creek Shale (Opc) is a black sooty shale, with some very thin gray chert intervals. Graptolite fossils are very common in the Formation. The unit varies in thickness from 110 to 175 feet. The Bigfork Chert is composed primarily of thin-bedded, highly fractured, gray chert, with some thin, interbedded black shale, dense gray limestone and calcareous siltstone layers. Graptolite fossils are also found. The unit varies in thickness from about 500 feet to possibly over 750 feet. Intense fracturing creates good aquifer conditions in the Formation throughout most of the Ouachita Mountains, and allows for use as a non-processed rock aggregate. Quartz crystal is produced from several mines on the Forest within the Bigfork Chert Formation. Some occurrences of the aluminum phosphate mineral "wavellite" have been found in small veins in the Formation. Wavellite is intermittently mined in T1S R22W on the Jessieville Ranger District primarily for specimen collections. Occurrences of turquoise have been reported near Caddo Gap. Some prospects for copper and for vanadium have also occurred in this formation.