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Appendix B

Glossaries

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Appendix B - Glossary of Terms Used

A

Activity	Actions, measures, or treatments that are undertaken which directly or indirectly produce, enhance, or maintain forest and rangeland outputs or achieve administrative or environmental quality objectives, such as recreation.
affected environment	The natural and physical environment and the relationship of people to that environment that will or may be changed by actions proposed.
air quality related values (AQRV's)	A feature or property of an area that is (or has the potential to be) affected in some way by air pollution. General categories are: flora, fauna, soil, water cultural/historical resources, odor and visibility.
alternative	In Forest Planning, a mix of practices applied in specific amounts, locations, and periods to achieve future forest conditions through the application of management prescriptions.
ambient air	The air of the surrounding outdoor environment. The air encompassing a specific geographic area.
animal unit (AU).	Defines forage consumption on the basis of one standard mature 1,000-pound cow, either dry or with calf up to 6 months old; all other classes and kinds of animals can be related to this standard, e.g. a bull equals 1.25 AU, a yearling steer equals 0.6 AU.
animal unit month (AUM).	The amount (780 pounds) of air-dry forage calculated to meet one animal unit's requirement for one animal unit for one month.
aquatic	Aquatic pertains to standing and running water in streams, rivers, lakes, and reservoirs.
aspect	The compass direction that the slope of a land surface faces toward.
attainment area	A geographic area in which levels of a criteria air pollutant meets the health-based primary standard (national ambient air quality standard, or NAAQS) for the pollutant. An area may have on acceptable level for one criteria air pollutant, but may have unacceptable levels for others. Thus, an area could be both attainment and non-attainment at the same time. Attainment areas are defined using federal pollutant limits set by EPA. There are six Criteria Pollutants; Lead (Pb), Sulfur Dioxide (SO _x), Nitrogen Oxides (NO _x), Ozone (O ₃), Particulate Matter (PM-10 and PM-2.5) and Carbon Monoxide (CO) which are regulated by EPA. A seventh pollutant, Volatile Organic Carbons (VOC's) is on the list but is not regulated by EPA at this time.
available water holding capacity	The maximum amount of water a soil profile can hold, which can be used by plants.

B

biodiversity	The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.
Biological Assessment (ESA species)	Biological Assessment (ESA species) A "biological evaluation" conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under section 7 of the Endangered Species Act (16 U.S.C. 1536(c)). The purpose of the assessment and the resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species.
Biological Control	The use of animals, fungi, or other microbes to feed upon, parasitize or otherwise interfere with a targeted pest species.
Biological Evaluation (Forest Service Sensitive Species)	A documented Forest Service review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, proposed, or sensitive species.
Biological Opinion (BO)	An official report by the Fish and Wildlife Service (FWS) issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modification of its critical habitat.
buffer zone	A zone of fixed width in which activities are modified to meet specific objectives of an adjoining site.
bunch grass	Grasses of many genera which grow primarily in tufts of clumps rather than forming a sod or

Appendix B - Glossary of Terms Used	
	mat. Native warm season grasses are often referred to as “bunch grasses”.
C	
canopy	The vegetative cover formed collectively by the crowns of adjacent trees and other woody growth.
capability	The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity.
carrying capacity	The average number of livestock and wildlife that may be sustained on a management unit compatibly with management objectives. It is a function of site characteristics, and management goals and intensity.
cavity trees	Trees exhibiting hollows large enough to provide shelter for wildlife usage.
Class I Area	A geographic area designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as mandatory Class I areas each National Park over 6,000 acres and each Wilderness over 5,000 acres in existence as of August 7, 1977. Subsequent additions of land to those Class I areas are also considered Class I.
Class II Area	A geographic area designated for a moderate degree of protection from future degradation of air quality. Moderate increases in new pollution may be permitted in Class II areas. All wildernesses designated after August 7, 1977 or were less than 5,000 acres are automatically Class II areas, as are all other National Forest System lands.
compaction	In soil, the process by which soil particles are rearranged to decrease void space and bring them in closer contact with each other, thereby reducing available water capacity, aeration, and porosity and increasing bulk density.
cool-season plant	A plant that generally makes the major portion of its growth during the late fall, winter, and spring.
cumulative effect (NEPA)	The impact on the environment which results from the incremental impact of the action when added to other past present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
cumulative effect (ESA)	Those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. <i>NOTE: This definition applies only to section 7 analyses and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws.</i>
D	
dbh	Diameter breast height of a tree measured 4-1/2 feet above ground level.
deferred rotation	A grazing system that provides for a systematic rotation of the deferment among pastures.
direct effects	Effects that are caused by the action and occur at the same time and place.
displacement	In soils, often used interchangeably with erosion. Detachment and movement of soil particles by water, wind, ice, or gravity and can be natural, human caused or both.
dolomite	A limestone or marble rich in magnesium carbonate.
duff	The more or less firm organic layer on top of mineral soil, consisting of fallen vegetative matter in the process of decomposition, including everything from pure humus below to the litter on the surface.
E	
ecological classification system (ECS)	A systematic procedure for delineating, naming, and describing units of land with management significance and ecological integrity. It includes a terrestrial and an aquatic subsystem.
ecological landtype (ELT)	An area of land with a distinct combination of natural, physical, chemical, and biological properties that cause it to respond in a predictable and relatively uniform manner to the

Appendix B - Glossary of Terms Used	
	application of given management practices. In a relatively undisturbed state and/or at a given stage (sere) of plant succession, an ELT is usually occupied by a predictable and relatively uniform plant community. Typical size generally ranges from about ten to a few hundred acres.
endangered species (E)	Any species which is in danger of extinction throughout all or a significant portion of its range and which has been designated as endangered in the FEDERAL REGISTER under the Endangered Species Act (ESA).
environmental analysis	An analysis of alternative actions and their predictable short and long-term environmental effects which include physical, biological, economic, and social factors. The process associated with the preparation of an environmental assessment or environmental impact statement, environmental assessment (EA) A public document that serves to (1) briefly provide sufficient analysis and evidence for determining whether to prepare an environmental impact statement or a finding of no significant impact and (2) aid in agency's compliance with the NEPA when no environmental impact statement is necessary (40 CFR 1598.9a).
environmental effect	Net change (good or bad) in the physical, biological, social, or economic components of the environment resulting from human actions.
environment impact statement (EIS)	A statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act of 1969 (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality guidelines, and directives of the agency.
even-aged silvicultural system (EAM)	See silvicultural system, even-aged.
F	
fen	A distinctive bog-like wetland in which ground water seepage and small springs saturate soils or substrates and which is dominated by a wide variety of sedges and herbs.
fire ecology	The study of the effects of natural and anthropogenic fire on ecosystems, plants and animals, and its application/role in carrying out resource management objectives.
floodplain	Lowland and relatively flat areas adjoining inland and coastal water including flood-prone areas of off-shore islands, including as a minimum, that area subject to a one percent or greater chance of flooding in any given year. The base floodplain shall be used to designate the 100-year floodplain (one percent chance floodplain). The critical action floodplain is defined as the 500-year floodplain (0.2 percent chance floodplain).
forage	Browse and herbage that are available for food for grazing animals or be harvested for feeding. Forage production. The weight of forage that is produced within a designated period of time on a given area (e.g. pounds per acre).
forbs	Any herbaceous plant other than a grass.
Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA)	An act of Congress requiring the preparation every five years of a program for the management of the National Forests, renewable resources and every 10 years an inventory of all National forest and rangeland resources.
forest	A natural community in which 90 to 100 percent of the landscape is covered in trees, and often contains multiple subcanopy layers, shrubs, ferns, and ephemeral herbs. Forests are found in protected valleys, ravines, bluff bases, lower north-facing slopes, and fire shadow areas.
Forest Plan	A shortened name for Land and Resource Management Plan.
Forest Service Handbook (FSH)	Handbooks are directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity. Handbooks are usually based on a part of the manual or incorporate external directives.
Forest Service Manual (FSM)	The manual contains legal authorities, objectives, policies, responsibilities, delegations, and instructions needed on a continuing basis by Forest Service line officers and primary staff in more than one unit to plan and execute assigned programs and activities.
forest type	A descriptive term used to group stands of similar character or development and species

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	composition by which they may be differentiated from other groups of stands.
fragipan	Loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt and fine sand. A fragipan appears cemented and restricts roots. When dry, it is very hard and has a higher bulk density than the horizons above. When wet, it tends to rupture suddenly under pressure rather than to deform slowly.
fuels	Wildland vegetative materials that can burn. While usually referring to above ground living and dead wildland surface vegetation, roots and organic soils such as peat are often included.
G	
game species	Any species of wildlife or fish for which seasons and bag limits have been prescribed under state or federal laws, codes, and regulations.
glade:	A predominantly rocky, shallow-soil barren area dominated by an herbaceous layer of grasses, sedges, and herbs and with sparse woody vegetation. Eastern red cedar often invades many glades as a result of past or current overgrazing and fire suppression.
grass	A plant with long, narrow leaves having parallel veins and nondescript flowers. Stems are hollow or pithy in cross-section.
Grazing management	The control of grazing and browsing animals to accomplish a desired result.
Grazing system	Grazing management that defines the periods of grazing and non-grazing.
H	
habitat	The place where animals live. It can be water for beaver, fish, and aquatic insects; caves for bats; or forested areas for many mammals, birds, and reptiles.
hardwood	A broad-leaved flowering tree that drops its leaves annually, as distinguished from a conifer.
herbicide	A chemical from a group of chemicals known as pesticides, which prevent, destroy, repel or mitigate any pest. A herbicide is a chemical substance used to specifically kill undesirable plants.
Heritage Resource	The physical remains (artifacts, ruins, burial mounds, petroglyphs, etc.) or conceptual context (as a setting for historic, or prehistoric events, etc.) of an area that gives insight into the lives of earlier man.
I	
implementation	Forest Plan implementation is the action necessary to ensure uniform accomplishment of the Forest and Regional management direction. 36 CFR 219.10(e).
indirect effects	Those effects that are caused by or will result from the proposed action and later in time, but are still reasonably certain to occur.
Interdisciplinary Team (IDT)	A group representing several disciplines used for regional and forest planning to insure coordinated planning of the various resources. Through interactions among its members, knowledge of the physical, biological, economic and social sciences, and the environmental design arts shall be integrated in the planning process.
Intermittent stream	A stream or portion of a stream, which in general, flows during wet seasons and are dry during dry seasons. The groundwater table lies above the bed of the stream during the wet season but drops below the streambed during dry seasons. Hence, the flow is derived principally from surface runoff, but during wet seasons receives a contribution from groundwater.
Invasive plant	Plants that have been introduced into an environment in which they did not evolve and usually do not have natural enemies to limit their reproduction or spread. Invasive plants have characteristics that permit them to rapidly invade and dominate new areas, out-competing other vegetation for light, moisture and nutrients.
K	
karst	Terrain with distinctive characteristics of relief and drainage arising primarily from a higher degree of rock solubility in natural waters than is found elsewhere. Some of these characteristics are dry streams, underground drainage, eaves, and sinks.
L	
Land and Resource Management Plan (Forest)	A plan of management for a National Forest developed in accord with the principles set out in 36 CFR 219.1 and the planning process set out in 36 CFR 219.12 and which will provide for

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Plan)	multiple use and sustained yield of goods and services in a way that maximizes long-term net public benefits in an environmentally sound manner.
landtype association (LTA)	These are recurring areas of land approximately 5,000 to 100,000 acres, fairly uniform in land surface form, subsurface geological materials, patterns of soils, and potential natural vegetation. Each LTA exhibits a unique pattern of ecological landtypes (ELTs). It is a subdivision of a physiographic subsection.
legume	An herb, shrub, or tree of the family Leguminous bearing nodules on the roots that contains nitrogen-fixing bacteria.
Loess	Material transported and deposited by wind and consisting of predominantly silt sized particles.
M	
management area (MA)	An area that has direction to achieve a common goal throughout. The entire Forest is divided into management areas; each is given a description, and the policies and management prescriptions relating to their use are listed with them.
management indicator species (MIS)	A species whose presence in a certain location or situation at a given population indicates a particular environmental condition. Their 'population changes are believed to indicate effects of management practices on a number of other species or water quality.
management prescription (MP)	Management practices and intensities selected and scheduled for application on a specific area to attain multiple use and other goals and objectives. 36 CFR 219.3.
mesic:	A soil moisture class (moisture modifier) used to describe relative soil moisture availability. Soil that is moderately well drained; water is removed from the soil somewhat slowly, so that the soil profile is wet for a small but significant part of the time. Mesic soils are productive with high site productivity indices, but often rare in the Ozarks in being restricted to north and east-facing slopes and large floodplains.
monitoring and evaluation	The periodic evaluation, on a sample basis, of management practices to determine how well Forest Plan objectives have been met and how closely management standards have been applied.
multiple use	The management of all the various natural resources of the National Forest so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration given to the relative values of the various resources, and not necessarily the combination of the uses that will give the greatest dollar return or the greatest unit output.
N	
National Ambient Air Quality Standards (NAAQS)	Legal limits of atmospheric pollution established by the Environmental Protection Agency (EPA), as the concentration limits needed to protect all of the public against adverse effects on public health and welfare, with an adequate safety margin. Primary standards are those related to health effects; secondary standards are designed to protect the public welfare from effects such as visibility reduction, soiling, material damage and nuisances. There are six criteria pollutants; Lead (Pb), Sulfur Dioxide (SO _x), Nitrogen Oxides (NO _x), Ozone (O ₃), Particulate Matter (PM-10 and PM-2.5) and Carbon Monoxide (CO). A seventh pollutant, Volatile Organic Carbons (VOC's) is on the list but is not regulated by EPA at this time.
National Environmental Policy Act of 1969 (NEPA)	An act to declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality.
National Forest	

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Management Act of 1976 (NFMA)	A law passed as an amendment to the Forest and Rangeland Renewable Resources Planning Act and which requires the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.
National Forest System land (NFS)	National Forests, National Grasslands, and other related lands for which the Forest Service is assigned administrative responsibility.
National Register of Historic Places	A listing maintained by the U.S.D.I. National Park Service of areas which have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation as a whole.
native grasses	Grasses that originated in the area in which they are found, i.e., were not introduced and naturally occur in that area.
natural regeneration	The reestablishment of a tree cover by natural seed fall, sprouting, or suckering of vegetation on or adjacent to the area.
non-attainment area	A geographic area in which the level of a criteria air pollutant is higher than the level allowed by the federal standards. A single geographic area may have acceptable levels of one criteria air pollutant but unacceptable levels of one or more other criteria air pollutants; thus, an area can be both attainment and non-attainment at the same time. It has been estimated that 60% of Americans live in non-attainment areas. The six Criteria Pollutants are; Lead (Pb), Sulfur Dioxide (SO _x), Nitrogen Oxides (NO _x), Ozone (O ₃), Particulate Matter (PM-10 and PM-2.5) and Carbon Monoxide (CO). A seventh pollutant, Volatile Organic Carbons (VOC's) is on the list but is not regulated by EPA at this time.
Noxious weed	Plants that interfere with agriculture, cause human health problems or invade and degrade the environment.
O	
off-road vehicle (ORV-OHV-ATV)	Any motorized vehicle designed for or capable of cross-country travel on or over land, water, sand, snow, ice, marsh, swampland, or other natural terrain; except that such term excludes (a) any registered motorboat, (b) any fire, military, emergency, or law enforcement vehicle when used for emergency purposes, and any combat or combat support vehicle when used for national defense purposes, and (c) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.
open land management	Application of management activities with the intent of maintaining or converting grass and/or herbaceous vegetation regardless of the historic natural vegetation occurring on the site. For example: using prescribed fire or mechanical methods to prevent exotic species or honey locust from invading a fescue pasture with the intent to plant native warm season grasses for wildlife purposes.
over-story	That portion of the trees in a forest forming the uppermost canopy.
overuse	Using an excessive amount of the current years growth.
P	
Partial Retention (PR)	A visual quality objective that in general means man's activities may be evident but must remain subordinate to the characteristic landscape.
pasture	A grazing area enclosed and separated from other areas by fencing or other barriers.
PM-10	Particles with an aerodynamic diameter smaller than ten micrometers. Particles this size and smaller have been shown to cause problems with human health and visibility.
PM-2.5	Particles with an aerodynamic diameter of 2.5 micrometers. Particles this size and smaller have been shown to cause problems with human health and visibility.
prescribed burning	Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions, which allows the fire to be confined to a predetermined area, and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.
prescribed fire	A management ignited wildland fire that burns under specified conditions, where the fire is confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives

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project	A project is a combination of one or more management practices and associated support activities to meet the intent of the Forest Plan.
Project Area	Similar features in combination that reflects the basic land characteristics and existing conditions. These features are combined for the purpose of analysis in formulating alternatives and monitoring results.
Proposed species	Any species of fish, wildlife, or plant that is proposed in the FEDERAL REGISTER to be listed under section 4 of the Endangered Species Act.
puddling	Act of destroying soil structure, reducing porosity and permeability. Often results from handling soil when it is in a wet, plastic condition so that when it dries it becomes hard and cloddy.
R	
range improvement	Any practice designed to improve range condition or allow more efficient use.
range management	A distinct discipline founded on ecological principles with the objective of sustainable use of rangelands and related resources for various purposes.
Range Management Unit (RMU) (Allotment).	Any management area with range management objectives such as grazing allotments.
Ranger District	Administrative subdivision of a National Forest supervised by a District Ranger who reports to a Forest Supervisor.
reforestation	All treatments and activities aiding the re-establishment of a tree crop or tree cover on forested land. It includes the preparation of the ground surface prior to natural seed fall, natural sprouting, artificial seeding, or planting. It also includes the setting out of seedlings, cuttings, or transplants, and scattering or placement of seed over a designated area for the re-establishment of a forest stand.
riparian area	A term used by the Forest Service that includes stream channels, lakes, adjacent riparian ecosystem, floodplain, and wetlands.
Risk assessment	Assessment of risk to human health and ecosystem from herbicide use.
road density	The measure of the degree to which a length of road occupies a given land area: e.g., one mile of road within a square mile.
rutting	Soil disturbance where the soil is puddled and and the topsoil and/or a portion of the subsoil removed.
S	
salvage	The utilization of trees that are dead, dying, or deteriorating before they become worthless.
SASEM	Simple Approach Smoke Emissions Model. According to the Huntana Web site, SASEM is a screening 1 planning level, Gaussian dispersion model designed to predict ground level particulate matter and visibility impacts from single sources in relative flat terrain in the western United States. SASEM utilizes internally calculated plume rise and emission rates based on specified fuel types and configurations. The model is limited to particulate matter and visibility impact assessments; simplicity requires several physical assumptions. According to Miller, the Simple Approach Smoke Estimation Model (SASEM) is a tool for the analysis of smoke dispersion from prescribed fires (Sestak and Riebau 1988). It is a screening model, in that it uses simplified assumptions and tends to over predict impacts, yielding conservative results. If violations of air quality standards are not predicted by SASEM, it is unlikely that they will occur. Inputs to the model include basic descriptions of the fuels, such as type and loading, expected fire line intensity, and expected burn duration. Wind speed and direction, dispersion conditions, and average mixing height are considered, as well as distance and direction of the fire from sensitive receptors. The model calculates fuel consumption and particulate emission factors from fuel loading and expected fire line intensity. Model outputs include maximum particulate concentration and the distance from the fire at which it will occur, ranges of distances from the fire at which any primary or secondary particulate standards would be violated, and the reduction in visual range at selected receptors. Outputs are given in tabular fashion for a range of dispersion and wind speed conditions.
savanna	A prairie-like natural community in which 10 to 30% is covered in trees characterized by wide

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	crowns and spreading limbs, generally associated with level to gently rolling topography. Dominant trees include bur, chinquapin, post, and white oaks.
sensitive species (RFSS)	<p>Species designated by the Regional Forester and included on the Eastern Region Sensitive Species list. The list will include those species identified by criteria below that are known, reported, or suspected to occur on or in the immediate vicinity of the planning area in the Eastern Region. The criteria are:</p> <ul style="list-style-type: none"> A. Species is in officially proposed status by Federal Register Proposed Rule making. B. Species is on a Notice of Review List in the Federal Register (e.g., CFR 45: 242; 12/15/80). C. Species placed on the Region 9 Sensitive Plant or Animal lists at the discretion of the Regional Forester if he deems that they require special management attention. <p>Examples of situations that may cause such listing include:</p> <ul style="list-style-type: none"> 1. Species common elsewhere, but a disjunct population of unique, popular, or scientific interest occurs on National Forest System land. 2. Locally endemic population in unique habitats that warrant continued monitoring or special management to assure jeopardy is not occurring and will not occur in the future.
Serecia lespedeza	An introduced perennial legume with erect, somewhat woody stems that is a native of eastern Asia. Invasive weed species.
silviculture	The science and art of cultivating forest tree crops. The theory and practice of controlling the establishment, composition, constitution, and growth of forests.
Silvicultural System	<p>A planned process whereby a stand is tended, harvested, and re-established. The system name is based on the number of age classes and/or the regeneration method used.</p> <p>Even-Aged Methods: Methods to regenerate a stand with a single age class.</p> <p>clearcutting: A method of regenerating an even-aged stand in which a new age class develops in a fully-exposed microclimate after removal, in a single cutting, of all trees in the previous stand. Regeneration is from natural seeding, direct seeding, planted seedlings, and/or advance reproduction.</p> <p>seed tree: An even-aged regeneration method in which a new age class develops from seeds that germinate in fully-exposed micro-environments after removal of all the previous stand except a small number of trees left to provide seed. Seed trees are removed after regeneration is established.</p> <p>shelterwood: A method of regenerating an even-aged stand in which a new age class develops beneath the moderated micro-environment provided by the residual trees. The sequence of treatments can include three distinct types of cuttings: 1) an optional preparatory cut to enhance conditions for seed production; 2) an establishment cut to prepare the seed bed and to create a new age class; and 3) a removal cut to release established regeneration from competition with the overwood.</p> <p>Uneven-Aged (Selection) Methods: Methods of regenerating a forest stand, and maintaining an uneven-aged structure, by removing some trees in all size classes either singly, in small groups, or in strips.</p> <p>group selection : A method of regenerating uneven-aged stands in which trees are removed, and new age classes are established, in small groups. The maximum width of groups is approximately twice the height of the mature trees, with small openings providing micro-environments suitable for tolerant regeneration and the larger openings providing conditions suitable for more intolerant regeneration</p> <p>single tree selection: A method of creating new age classes in uneven-aged stands in which individual trees of all size classes are removed more-or-less uniformly throughout the stand to achieve desired stand structural characteristics.</p>
sinkhole	A depression on the land surface of various depths, sizes, and shapes resulting from the

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	collapse of surface or near-surface material into underlying cavities. Surface water or precipitation drainage is funneled toward the basin of the sinkhole where it either enters a subsurface cavity or is trapped and forms a pond or wetland.
skid trail	A path traversed by a tractor or skidder one or more times in which mineral soil is not intentionally exposed. Machines operate on the litter surface and not on a graded surface.
slash	The vegetative residue left on the ground after felling and other silvicultural operations or accumulating there as a result of storm, fire, girdling, or poisoning.
snags	Dead trees with or without cavities, at least 6 inches in diameter and at least 10 feet in height.
Soil displacement	The movement of soil particles from one place to another by erosion or management activities and/or those influences which result in the soil structure.
Soil horizons	<p>A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil forming processes and differing in characteristics and properties from the adjacent layers above and below it.</p> <p style="text-align: center;">O horizon – Organic layer of fresh and decaying plant residue</p> <p style="text-align: center;">A horizon – The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with mineral material. This horizon has the most organic matter accumulation, the most biological activity, and/or loss of soil materials containing iron, aluminum, and clay.</p> <p style="text-align: center;">B horizon – Horizon, usually below the O, A, or E horizon, and is, in part, a transition layer from the overlying horizon to the underlying C horizon. It is characterized by (1) accumulation of clay material, humus, and other material, (2) granular, prismatic, or blocky structure, and/ or (3) redder or browner colors than those in the overlying horizon.</p> <p style="text-align: center;">C horizon – Mineral horizon, excluding bedrock, that is little affected by soil forming processes and does not have properties found in the overlying horizon.</p> <p style="text-align: center;">E horizon – Mineral horizon in which the main feature is loss of clay particles, iron, aluminum, or combination of these.</p> <p style="text-align: center;">R horizon – Bedrock underlying the C horizon.</p>
special use permit	Permits, memorandums of understanding, and easements (excluding road permits and highway easements) authorizing the occupancy and use of National Forest land for a specific period of time by individuals, organizations, or businesses generally for a fee.
stand	A community of trees or other vegetation possessing sufficient uniformity as regards composition, constitution, age, spatial arrangement, or condition, to be distinguishable from adjacent communities, so forming a silvicultural or management entity.
standards and guidelines (S&Gs)	Criterion indicating acceptable norms, specifications, or quality that management actions must meet.
subsoil	Technically, the B horizon.
subsurface layer	Any surface soil horizon below the surface layer
surface soil	The A, E, or combinations of those horizons.
T	
temporary road	Temporary roads are roads without formal design and survey used to provide access to the Forest for resource management purposes and are subsequently closed after these resource objectives have been met. The land occupied by the road is reclaimed for natural resource purposes.
terrestrial	Land related.
Terrestrial Natural	An interrelated assemblage of plants and animals found in a given area delineated by soil

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Community:	moisture modifier, substrate type, and vegetation structure. Example: Dry chert woodland (Nelson, 1987).
threatened species (T)	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register under the Endangered Species Act.
timber production	The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use.
U	
understory	The trees and other woody species growing under a cover of foliage formed collectively by the upper portion of adjacent trees and other woody growth.
V	
viable population	A population, which has adequate numbers and dispersion of reproductive individuals to ensure the continued existence of the species population on the planning area.
visual quality objective (VQO)	A desired level of excellence based on physical and sociological characteristics of an area. It refers to degree of acceptable alteration of the characteristic landscape.
W	
warm-season plant	A plant that makes most or all its growth during late spring, summer or early fall and is usually dormant in winter.
weed	(1) A plant growing where unwanted. (2) A plant having a negative value within a given management system.
wildfire	A fire occurring on wildland that is not meeting management objectives and thus requires a suppression response.
woodland:	A natural community in which 30 to 90 percent of the landscape is covered in trees and often containing a dense woodland grass/sedge/and herb ground layer resulting from frequent fires. The understory is sparse to dense depending on fire frequency. This natural community is often found on steep upper slopes with southerly aspects, narrow ridges, broad ridges, and fire prone landscapes.
X	
Xeric:	Describing sites without significant moisture, very dry sites.

Glossary of Abbreviations and Acronyms	
ATV	All terrain vehicle
AUM	Animal Unit Month
BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practice
BO	Biological Opinion
CDS	Combined Data System
CEQ	Council on Environmental Quality
DFC	Desired Future Condition
EIS	Environmental Impact Statement
ELT	Ecological Landtype
ESA	The Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement

Glossary of Abbreviations and Acronyms	
FR	Forest Service Road
FWS	United States Fish and Wildlife Service. See also USFWS.
GIS	Geographic Information System
ID	Interdisciplinary Team
Kg	Kilogram (1000 grams)
LC₅₀	Median Lethal Concentration
LD₅₀	Median Lethal Dose
LRMP	The Mark Twain National Forest's Land and Resource Management Plan
LTA	Landtype Association
Mg	Milligram (1/1000 of a gram)
MA	Management Area
MBF	Thousand Board Feet
MDC	Missouri Department of Conservation
MIS	Management Indicator Species
MOS	Margin of Safety
NOEL	No Observed Effect Level
MOFWS	Missouri Fish and Wildlife Information System
MP	Management Prescription
MSDS	Material Safety Data Sheet
MTNF	Mark Twain National Forest
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act of 1976
NFS or NFSL	National Forest System Land
NRCS	Natural Resource Conservation Service
NTMB	Neotropical Migrant Bird
NWI	National Wetlands Inventory
OOHA	Ozark-Ouachita Highlands Assessment
PIF	Partners in Flight
PPE	Personal Protective Equipment
ppm	Parts per million
RfD	Reference Dose
RFSS	Regional Forester's Sensitive Species
ROS	Recreation Opportunity Spectrum
RPA	Forest and Rangeland Renewable Resources Planning Act of 1974
SCS	Soil Conservation Service
SOPA	Schedule of Proposed Actions
T&E	Federally listed as threatened or endangered
TES	Includes Threatened, Endangered, Proposed and Sensitive Species
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	United States Fish and Wildlife Service
WFRP	Wildlife, Fish, Rare Plants Monitoring Report
WRD	The United States Geological Survey's Water Resources Division

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APPENDIX C

Biological Diversity

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Appendix C - Biodiversity

The Council on Environmental Quality in January 1993 published "Incorporating Biodiversity Considerations Into Environmental Impact Project Under the National Environmental Policy Act". This report outlined several General Principles that are intended to help managers and planners identify biodiversity concerns and seek solutions in specific situations as agencies pursue their diverse mandates (CEQ General Principles Pages 6-8). The principles and how they relate to the Middle River Project Area are:

1. Take a "big picture" or ecosystem view.

The Middle River project area is located at the very Northern edge of the Oak Hickory-Hills Land Type Association (LTA) in the Outer Ozark Border Subsection, Ozark Highlands Section, Eastern Broadleaf Forest (Continental) Province, Hot Continental Division, and Humid Temperate Domain. It is located near the southern boundary of the Oak-Bluestem Plains LTA. The LTA information is from the Mark Twain Forest Plan and the section, province, division and domain come from the (Ecoregions & Sub regions of the United States, USDA, 1994)

The Cedar Creek Unit is the only portion of the Mark Twain National Forest that is located North of the Missouri River. The remainder of the Mark Twain National Forest is scattered throughout the Southern part of Missouri in the Ozark Highlands.

The project area contains gently rolling landscape that has potential natural vegetation of oak-hickory forest interfaced with bluestem prairie. The oak-hickory forest is generally older and intermixed with cool season and native grasses. Historic and natural disturbance factors include infrequent low intensity fires, windstorms and tornadoes, insect/disease mortality, occasional summer drought or late spring frost, ice storms, and cattle grazing.

Prehistoric and Historic Ecological Changes

Wildfire is among the oldest of natural phenomena. Wildfires, whether lightning caused or set by humans, trace their ancestry to the early development of terrestrial vegetation. Hardly any plant community in the temperate zone has escaped fire's selective action. Many biota have consequently so adapted themselves to fire that such adaptations have become symbiotic (Pyne, 1982). Missouri is no exception. Natural and man-made fires were and are clearly evident across the landscape. Trees bear fire scars dating back hundreds of years. Early explorers wrote about the numerous fires set by Indians. Even today's remaining natural vegetation and wildlife alludes to the importance of fire. From an ecological and natural resource management perspective fire is treated as one of many factors in the environment comparing with rainfall, tornados, and drought. The effects can be both beneficial and destructive.

There is evidence that Paleo Indians, nomadic hunters and gatherers people used the general area prior to 8000 BC. The Mississippian people used the land for agricultural purposes between A.D. 900 and 1700. These were the predecessors of the Osage, Iowa, Kickapoo, Pottawatomie, Sioux, Sac, and Fox Indians, whom the European Explorers contacted after 1700. Native Americans have constantly influenced plant communities and ecosystems throughout North America and the Ozark Highlands for thousands of years

especially through widespread broadcasting of fire that burned across the land. American Indians regularly set fires that burned across huge areas and stopped only at rivers or when rain intervened. Lightning fires were added ignition sources, such fires have resulted in the occurrences of fire dependent prairies, savannas, and woodlands.

European settlers began making dramatic changes to the land commencing in the 1830's through land clearing and the suppression of fire. Prior to European settlers it is estimated that the fire frequency on lands comprising the Cedar Creek Unit was once every 3 – 25 years (Rich Guyette Personnel communication 2003). The fire frequency was reduced after settlement and it was reduced even more when modern fire suppression tactics were implemented during the mid 20 th century. The settlers also had an impact on plants and animals by reducing certain habitats by farming (which converted some prairie into fields) and fencing areas. The over-hunting of some species was also a concern. The loss of large free roaming ungulates such as Bison also had an effect.

Status and Trends of Vegetation

The original land survey of Callaway County was conducted in 1816-1817. Following this, the U.S. Government offered the land for sale and thus initiated the major immigration into the county. Areas settled first included the bottomland and the wooded areas near the major rivers and streams. The grassland in the northern part of the county was foreign and appeared barren to the settlers, who had been raised in wooded New England or the South. Therefore the prairie was often the last area settled. Traditional uses include small farming or cattle raising; hunting, fishing and trapping; and removal of various kinds of wood products. More recently uses include recreational hiking and camping. Most of the original forest cover was cut over by the early 1900's. Extensive overgrazing, intensive cultivation and annual burning caused severe depletion and erosion of the fragile soils of the Middle River and other areas. Most of the forested bottomlands were cleared for production of row crops.

Land acquisition records indicate that many of the rough upland areas were settled between the 1880's and the 1930's.

Starting in the early 1940's, the U. S. Soil Conservation Service (now know as the Natural Resource Conservation Service) purchased the land and began rebuilding it by filling and stabilizing gulleys, reseeding grasses and planting trees. In 1953, these public lands were transferred to the Forest Service for administration and management. Protection from annual burning, open range grazing, and indiscriminate logging resulted in re-growth (in non permanent openings) of the oak-hickory forest communities.

Silvicultural Practices

The hardwood forests in the Middle River project area consist primarily of relatively shade-intolerant oaks and hickories. The Cedar Creek Unit has employed both singletree selection and a combination of singletree with group selection (also known as uneven age management) to release shade-intolerant oak regeneration with group openings wherever possible. It has been utilizing uneven age management exclusively since the mid 1980's.

The Cedar Creek Unit has used prescribed burning as a tool for managing areas, burning a yearly average of nearly 500 acres over the last decade. This includes openings and of Forested areas. Overall the the

Mark Twain National Forest has recently been utilizing prescribed fire on approximately 10,000+ acres annually to restore and maintain oak-hickory woodlands, maintain prairies and other open lands, savannas, glades; to sustain wildlife habitat diversity; encourage natural regeneration; and to reduce fuels.

Biological Threats to Forest Resources

Knapweeds, invasive non-native plants, have been present for several decades on some roadsides in southern Missouri. There are health concerns for humans and livestock related to this plant.

Sericea lespedeza, Multiflora Rose and Eastern Red Cedar are the major invasive species to woodlands and openings in Missouri and appear to be rapidly spreading on certain areas of the Cedar Creek Unit and the Mark Twain National Forest. Sericea lespedeza is present along roadsides and old pastures in the Project Area. Multi-flora rose is another non-native invasive noxious weed common in the Middle River area. Red Cedar is usually found in openings and/or old fields.

The Project Area is composed of oak-hickory forest in various successional stages. Historic and natural disturbance factors include fairly frequent low intensity fires, with infrequent high intensity (or stand replacement) fires; windstorms and tornadoes; insect/disease mortality; occasional summer drought or late spring frost; ice storms; and flash flooding in intermittent drainages and permanent streams.

Summary:

In Alternative 1, several things would remain the same: The highways, county roads and Forest Service roads would continue to exist. Grazing would continue on private and federal lands. Natural disturbances, such as windstorm, ice storms, frosts, and insects/disease outbreaks would continue to affect the Project Area. Fire protection would continue because it is a policy of the Forest Service to protect resources from wildland fire, and the proximity of private lands & dwellings makes it imperative. The local economy would continue to rely cattle grazing on federal lands as well as a limited amount of wood products. Both of these would come from private lands as well as other public lands. Hunting, fishing, trapping and other recreational pursuits would continue.

Alternative 2 and 3 would utilize practices such as mowing and/or grazing during the appropriate time of the year to help minimize the spread of the existing Non-native and Noxious weeds in the area. Both of these alternatives include limited, site specific herbicide use to control non-native and noxious weeds in the area.

Alternative 2 is intended to use traditional kinds of disturbances such as fire. Logging in an environmentally sensitive way would be used to manage areas and to create and maintain natural communities in all their successional stages. Out of this would come sustainable plant and animal communities as well as sustainable supplies of goods and services.

Alternative 3 would continue to use traditional types of disturbance such as fire, that could result in sustainable plant and animal communities. However, if the fire is not intense, it may not create early successional habitat in permanently forested areas.

2. Protect communities and ecosystems.

The Upper and Lower Ozarks sections of the Ozarks Natural Division have been continuously available for habitation by and evolution of plants, animals and communities since the end of the Paleozoic era (200 million years ago). The great geologic age and hypsographic diversity make the Ozarks by far the most biologically diverse area in the state of Missouri and one of the most significant centers of biodiversity in North America. A large percent of biodiversity is found in smaller/rarer communities such as caves, springs, sinkholes, glades, etc. This diversity of habitats, species endemism, and occurrence of relic plant and animal populations are inextricably linked to Missouri's past climatic changes, prehistoric vegetation history, and geology.

The oak-hickory forest with all its successional stages is a major community in the Project Area. There are subtle differences in vegetation depending on Ecological Land Type (slope & aspect). For instance, broad ridges & southwest slopes are warmer & drier and support more white oak. North slopes are moister and are suitable for a slightly different assemblage of herbaceous plants along with a higher component of hardwood trees. However there are a large amount of openings in the Middle River area. In the non prairie areas, Oak can be considered a species, which has a central role on which the integrity of the whole ecosystem relies. The oak species provides important food, habitat and other ecological values which encompass a wide variety of plants, insects, animals and even small, inconspicuous species such as mycorrhiza-forming fungi (such as honey mushrooms, chanterelles, and boletes).

Oak forests are changing ecologically because of widespread successional replacement of oaks by more shade tolerant species, such as sugar maple, the absence of fire, and oak dieback and decline.

White oak species predominate, with red oak intermixed but already dying out in many stands. Cedar is a prevalent component, particularly in old field settings. The shade tolerant sugar maple has been accumulating in the under story in many stands. In drainages adjacent to permanent water, bottomland hardwood species such as sycamore, river birch, cottonwood and ash are present.

The 3.4 management prescription "emphasizes wildlife habitat diversity to maintain and enhance populations of native and naturalized vertebrates." (FP IV-115). Ecological Land Types present in the project area include: upland forest, side slopes (ELT 51,52,53,55), Upland mesic forest (ELT 56), loess-derived upland forests (ELT 54), and dry rocky upland forest (ELT 57).

Summary:

Alternative 1 would mean that only natural disturbances (with the exception of fire suppression and livestock grazing) would occur. All communities present would continue to exist, although the amount of each community type might fluctuate over time. Fire protection would attempt to keep wildland fires to a minimum. The oak-hickory communities would continue to grow and mature (however, no old growth would be designated) with many small openings created by natural mortality of individual trees and some larger openings created by windstorm, ice damage, insect/disease, or other disturbance. A percent of the area would eventually be in mature and old growth successional stages with a small amount of early successional stages present. The grazed areas would continue to remain open. Open areas that are not grazed would become vegetated as a result of succession. This would involve the encroachment of cedars in many areas.

Alternative 2 and 3 would designate additional old growth, ensuring late successional communities would be available into the future. They would utilize practices such as mowing during the appropriate time of

the year to help minimize the spread of the existing Non-native and Noxious weeds in the area. Both of these alternatives include limited, site-specific herbicide. This is to control, Non-native and Noxious weeds in the area and to enhance hardwood seedling survival.

Alternative 2 is intended to use traditional kinds of disturbances such as fire. Logging in an environmentally sensitive way would be used to manage areas and to create and maintain natural communities in all their successional stages. Out of this would come sustainable plant and animal communities. Uneven age harvest would create small openings similar to those caused by natural tree mortality. These acres would have some value for early successional species, while at the same time maintaining a largely unbroken canopy of forest preferred by mid-successional species. Early successional openings of 0.5 - 2 acres would be created through group selection.

Alternative 3 would continue to use traditional types of disturbance such as fire. Out of this would come sustainable plant and animal communities.

3. Minimize fragmentation. Promote the natural pattern and connectivity of habitats.

The existing canopy closure probably varied from moderate to heavy depending on the soil type, weather conditions, and other disturbance factors. There were probably open woods on most ridge tops and south and west-facing slopes, more dense woods on north and east-facing slopes, and bottomland hardwoods in the riparian corridors. The forest probably had a naturally occurring variety of age classes, sizes and species distribution.

The pattern created by natural disturbances (such as tornadoes, fires, insects and disease etc.) is probably a combination of a large number of small openings created by death of individual trees or small groups of trees, scattered natural openings where soil is poor, and a few large openings in the canopy created by windstorm or wildland fire.

The Middle River and the surrounding area has already been greatly influenced by man and was already heavily fragmented before being added to the National Forest Service system. The majority of the private land in the area is in permanent openings (fescue pastures) with intermingled small woodlands, farms and housing. See Section 1, 2 and 5 for additional information.

The Cedar Creek Unit consists of 16, 310 acres of Forest Service system lands in Boone and Calloway counties Missouri. The total acres in these two counties is 978,600. According to the 2000 Census Calloway County has a total population of 41, 590 people (a 24% increase from 1990) and Boone County has a population of 136, 774 people (a 20% increase since 1990). The average population density in these counties is 117 people per square mile. Some of the larger population centers nearby include Fulton, Missouri (8 miles and 12,128 people); Columbia Missouri (30 miles and 84,531 people); Jefferson City Missouri (15 miles and 39,611 people) and St. Louis County with over 1 million people is approximately 100 miles away. US Highway 54, a 4 lane divided Highway lies within 2 miles of the Middle River project area.

Summary:

Items common to all alternatives: Private land uses are likely to remain much the same as in the past 10

years (homes, outbuildings, pastures, hayfields, small woodlots). It is also possible that additional woodland would be cut and/or bulldozed to create permanent pasture. Woodlands may continue to be cleared or open areas may be converted into homesites and/or lawns. There would be no fragmentation of forestland in all Alternatives by non-forest land uses; only natural fragmentation of forest types or communities. The differing age-classes and successional stages would leave the forest matrix intact and would continue to provide the mosaic of age-classes and successional stages common in the area for the past 20-30 years.

Alternative 1 - See discussion in #2 above.

The existing permanent openings consist of old open fields. No new permanent openings would be created with this alternative. Alternative 1 designates no old growth.

In Alternatives 2 and 3, a total of 75 existing acres of open lands would be allowed to slowly revert to forested areas by not allowing any management activities such as grazing, mowing and/or burning to occur. Some of these acres would be planted with native hardwoods.

The old growth designations in Alternatives 2 and 3 were selected, as much as possible, to create blocks of continuous old growth habitat, and provide travel ways along drainages.

In alternative 2 temporary openings of several sizes would be created through commercial timber harvest. Many small openings (0-.5 – 2.0 acres) would be created through single tree and group selections (uneven aged management). All these openings would consist of regenerating oak, hickory, and associated trees; small fruiting trees such as dogwood; shrubs and vines such as blackberry and greenbrier; and annual & perennial forbs and grasses. As the regenerating trees grow, the lower vegetation would slowly be shaded out and eventually the opening would cease to exist. These temporary openings reduce the amount of continuous forest canopy (but are still part of the forest community) and provide early successional habitat for a short period (up to 10 years).

Temporary edges would be created where uneven-aged harvest adjoins mature forest. These temporary edges would be young forest against immature or mature forest and would last for about 10-20 years (or until the new regenerating stand grows tall enough to function as immature forest). There would be no new permanent edges created.

Prescribed fire proposed in Alternatives 2 and 3 would help to maintain semi-open areas (increasing the amount of grasses and forbs on the forest floor) and reduce fuel loading.

4. Promote native species. Avoid introducing non-native species.

Natural vegetative communities are described on pages IV - 14 through IV - 17 of the Forest Plan. Communities and management areas, which exist within the Project Area, are described in #1 and #2 above. Perpetuation of a healthy and diverse oak-hickory forest community is one of the primary goals for this Project Area.

Summary:

Items common to all alternatives:

There would be no intentional introduction of non-native species in any Alternative. In addition, there would be no management of native species on inappropriate sites in any of the Alternatives. All Alternative would utilize practices such as mowing and/or grazing during the appropriate time of the year to help minimize the spread of the existing Non-native and Noxious weeds in the area.

Alternative 1 would not utilize any herbicides to control any existing Non-native and Noxious weeds in the area.

The oak-hickory communities and their successional stages would be maintained in Alternative 2. However, native annual and perennial plants would also be found in those areas

Alternative 2 and 3 include limited, site specific herbicide application to control the existing Non-native and Noxious weeds in the area.

5. Protect rare & ecologically important species.

A Biological Assessment (BA) was prepared for the Federally Listed Threatened, Endangered and Proposed Species. A Biological Evaluation (BE) was prepared for the Regional Forester Sensitive Species. The BA and BE for the Middle River project are located in Appendix C. The BA concluded that there was unlikely to be any adverse effects on any listed species as a result implementing Alternative 2. The BE concluded that there was unlikely to be any adverse effects on any sensitive species as a result of any of the alternatives. The BA also determined that Alternative 2, complies with the Reasonable and Prudent Measures and Terms and Conditions of the June 23, 1999 US Fish & Wildlife Service's Biological Opinion.

In March 2001, the MTNF completed a Supplemental Information Report (SIR) regarding information on plethodontid (lungless salamanders). The report was revised in May 2001. The report was made in response to public concern about recent articles describing the decline of these species and effects of silvicultural treatments on salamander populations. The SIR concludes that the 1986 Forest Plan addressed habitat needs for these species and acknowledged the importance of mature/over-mature forest with dead, downed, and rotten woody debris. The Forest Plan requires a certain percent of the Forest be maintained in mature and old growth forest, and protects special habitats such as springs, seeps, fens, fishless ponds, caves, and glades that may harbor salamander species.

In 2001 the Mark Twain National Forest completed an analysis of the new Regional Forester Sensitive Species (RFSS) on the February 29, 2000 species list. This SIR along with its background information report contained information on all 127 RFSS, their unique needs and the habitats they utilize. The Forest Plan goals and objectives, management prescriptions, standards and guidelines are appropriate to meet the needs of all the 127 RFSS. The above conclusions from this analysis are documented in a Supplemental Information Report (SIR) dated June 27, 2001.

Partners in Flight (PIF) completed the Bird Conservation Plan for the Prairie Peninsula (Physiographic Region 31) in February 2000. This region includes parts of Missouri, Illinois, Indiana and Ohio. According the plan, "Historically tallgrass prairie, savanna and forest habitats were interspersed across the

Prairie Peninsula physiographic region. During and following settlement, both prairie and woodlands were converted to pasture, hayfields and cropland. Today, almost 70% of the planning unit is in corn and soybeans.” “As with native prairie, less than 1% of the original savanna/woodland acreage is estimated to be present in the Prairie Peninsula today”. Large areas have been converted to cities, suburbs and small acreage farms or ranches. *Note: large openings of monocultures (such as lawns and/or alfalfa fields) that are mowed regularly do not provide any suitable grassland habitat for birds.* The increased amount of feral cats is also a concern. The increased use of some pesticides and herbicides on farm or near homes may also be a concern. Nest parasitism by Brown-headed Cowbirds is also a problem in the Prairie Peninsula Physiographic Region. (PIF 2000)

The priority species from the Bird Conservation Plan for the Prairie Peninsula include the Greater Prairie Chicken (grasslands), Henslow’s sparrow (grasslands), Dickcissel (grasslands), Bells’ Vireo (shrubland), Cerulean Warbler (deciduous forest), Red-headed Woodpecker (deciduous forest), and the Eastern Wood Pewee (deciduous forest).

Missouri has established a Neo-tropical Bird Working Group composed of experts from the Missouri Department of Conservation, Mark Twain National Forest, North Central Forest Experiment Station, and the University of Missouri. The Missouri Working Group is a part of the national Partners in Flight (PIF) effort and was created to evaluate threats to these species in Missouri and develop a list of species of concern for Missouri.

The above group has drafted a list, which are ranked according to the threats to the species in Missouri. The work of this group highlights the fact that breeding habitat for neo-tropical migratory birds includes all successional stages and all types of habitat and is not only large areas of unbroken woodland. The loss of wintering habitat (including area’s outside of the United States) is also a concern. Results of this preliminary list show the top three birds of concern and their habitats in Missouri are: Swainson's warbler (riparian/cane), Bachman's sparrow (glades/savannas/open pine woods), and dickcissel (open land).

The most recent research by North Central Forest Experiment Station suggests that the type of landscape that surrounds an area has much to do with what effects occur on Neo-tropical migrant songbirds. This research has shown that landscapes which are fragmented by large blocks of agriculture (pastures & crops) or human development (subdivisions, shopping malls, towns, businesses, etc) and have only a small proportion of forest, such as southern Illinois, show the greatest negative impacts on neo-tropical songbirds from cowbirds and possibly other nest predators. There is no one single habitat that meets the needs of all the different species.

Bats surveys by the North Central Forest Experiment Station involving the use of Mist Nets and/or Anabats are being conducted in the Middle River Project area during 2003.

Summary:

No prescribed fire would occur in alternative 1. No additional old growth would be designated in Alternative 1.

Alternative 2 and 3 would slightly reduce the amount of open areas in order to meet Forest Plan objectives by not allowing prescribed burning, grazing and/or mowing to occur in some areas. In addition hardwoods would be planted in some of the above areas. A diversity of forest management practices

would meet the habitat needs of songbirds better than any one practice. Both alternative 2 and 3 would use prescribed fire that would maintain some areas in a semi-open brushy environment,

Alternative 2 does include some uneven age timber harvest. This would help to create some savanna like areas. Temporary brushy openings of varying sizes would be created through uneven-aged harvest.

In summation all alternatives would help to meet the habitat requirements of all species. There would be no conversion of forest to permanent non-forest uses in any alternative of the Middle River Project.

6. Maintain unique or sensitive environments.

See items 2, 3 and 5 above for additional information and for items that address the unique and sensitive environments. The activities in the Middle River project would help to maintain the unique or sensitive environments in the area.

7. Maintain or mimic natural ecosystem processes.

See items 2, 3 and 5 above for additional information and for items that maintain or mimic natural ecosystem processes. The activities in the Middle River project would help to maintain or mimic natural ecosystem processes.

8. Maintain or mimic naturally occurring structural diversity.

Also see items 2, 3 and 5 above for additional information and for items that maintain or mimic naturally occurring structural diversity. The activities in the Middle River project would help to maintain or mimic naturally occurring structural diversity.

Historic and natural disturbance factors include fairly frequent low intensity fires, with infrequent high intensity (or stand replacement) fires; windstorms & tornadoes; occasional summer drought and/or late spring frosts; insect/disease mortality; and flash flooding in intermittent drainages and permanent streams. These disturbances formed a mosaic of successional stages of the oak-hickory forest. Small openings resulting from wind throw, insect/disease, or natural mortality were probably frequent, with larger openings caused by stand-replacement fires, drought, frost and tornadoes probably infrequent across the landscape. In addition, soil fertility helped determine the species composition and density of vegetation. Poorer soils had less density of tree species and more herbaceous under stories, while richer soils had a higher density of tree species along with a varied mid-story of shrubs and small trees and less herbaceous ground cover.

Summary:

Normally alternative 1 may come the closest to allowing natural processes to operate. However, fire suppression activity would continue, therefore contributing to a denser forest. This would result in the loss of open and semi-open areas such as savannas and prairies. Therefore Alternative 1 has the greatest potential off all alternatives to move the Middle River area away from historic conditions. No additional old growth would be designated in Alternative 1.

The Uneven-aged management in Alternative 2 (either single tree or group selection) would create the smaller and more numerous openings typical of most natural disturbances. This would help to maintain the diversity in the Middle River area

Designation of old growth in Alternative 2 and 3 allows for the formation of the older, late successional stages that have been lacking since the late 1800's/early 1900's.

Prescribed burning that would encourage growth of herbaceous ground cover would occur in Alternatives 2 and 3. This would also help portions of the area maintain the more open characteristic it historically had.

9. Protect genetic diversity.

See items 2 - 5 above for additional information and the items that address the genetic diversity.

"To preserve genetic adaptations, species should be maintained in natural habitats across their natural ranges, and plants and animals for reintroduction should be selected from ecologically similar areas as close to the restoration site as feasible." (CEQ General Principles- Page 7).

Summary:

There would be no attempt to physically move any plant or animal species from somewhere else into the Project Area in any alternative.

Natural vegetative disturbances or human-caused wild land fires (and the associated fire suppression activities) would affect the Project Area in Alternative 1. The area would move toward a higher percent in mature or older successional stages. However, larger numbers of dead and dying trees would occur. Cavity dependent species and species dependent on dead and downed woody material would increase in the short term.

Alternatives 2 and 3 would attempt to maintain the type and amount of disturbance which create a mix of "natural habitats" within the oak-hickory ecosystem as well as minimize adverse impacts from insects and disease on forest vegetation. A range of successional stages would be provided and non-native species would be discouraged (see discussion under #4). By maintaining the range of successional stages of communities on appropriate sites, genetic variations and the ability to adapt are also maintained.

10. Restore ecosystems, communities, and species.

Species extirpated from Missouri within historic times include: red & gray wolf, cougar, red-cockaded woodpecker, elk, and bison. The Missouri Department of Conservation is responsible for wildlife populations. Species successfully recovered or reintroduced in the Lower Ozarks from the 1930's until the present include: deer, turkey, beaver, ruffed grouse, and river otter.

Some species that are relatively uncommon in Missouri are naturally moving back into the state. In the past several years, black bear and armadillo sightings have been more frequent in the Lower Ozarks south of the Project Area. It appears that both these species are expanding their ranges by moving into southern Missouri from adjoining states. The Missouri Department of Conservation has a Black Bear Management Plan, but has no immediate plans to actively reintroduce bears to the state. They are monitoring bear

sightings and responding to situations where bears and people come in conflict. Armadillos make recurring attempts to move north and are usually decimated during extended periods of extremely cold weather. The last several winters in south Missouri have been relatively mild, allowing the expansion of armadillo populations.

Natural communities that have been altered or reduced within historic times include: prairies, savannas, large fens, open woods and old growth. Forests with more woody understory plants have gradually replaced open woods typical of poor soils and/or ridge tops as fire protection kept out frequent low-intensity fires. Old growth forests were almost completely wiped out during the logging boom of the late 1800's and early 1900's.

Summary:

See #2 – 5 above, and fire history for discussions of how natural communities would be affected by each alternative.

11. Monitor for biodiversity impacts. Acknowledge uncertainty. Be flexible.

Ecosystems are complex and the interrelationships often difficult to understand. There is much research being done on various aspects of ecosystem composition, structure and function. In Missouri, efforts are underway by the Missouri Department of Conservation, Missouri Department of Natural Resources, United States Geological Survey, USDI National Park Service, USDA Forest Service, the Missouri Universities, and other organizations or private businesses to study many of these subjects. These agencies along with other state, federal, and private Midwestern organizations are applying promising methodologies in restoring and maintaining ecosystems in the Midwest. The Missouri Resource Assessment Project (MoRAP) is measuring the effects of forest management on many species of animals and plants. This work is ongoing.

At the present time, there are no studies being done specifically within the Project Area. This area would be available for future research/studies under all Alternatives.

Summary:

Alternatives 2 - 3 all contain various mitigation measures and provisions for monitoring. See Chapter 2 of this EA for additional information. In addition, normal contract administration monitors actions carried out under contract. District persons visit different areas to informally monitor compliance with specifications and the results of various activities. Formal monitoring also occurs at the District and Forest level.

12. Incorporate human needs.

The objectives of the Forest Plan incorporate human needs as a part of management of the ecosystem (LRMP IV – 1, 2, 13, 27 – 36, 115, 117, 185, 188).

These objectives can be met by maintaining traditional uses while providing for changing societal needs within the limits of ecosystem capability.

Also see items 1 and 3 above, which contain information on the human needs and use in the area.

Summary:

Traditional uses such as hunting, fishing, hiking, berry-picking and horseback riding would still be possible under any alternative. Driving for pleasure would still be possible in all alternatives. Nature enthusiasts seek out special habitats to observe, photograph, and study rare and unusual non-game plant and animal species. The existing road system would still exist in all alternatives.

Game species such as doves, rabbits, quail and deer that prefer early successional habitats would be less abundant in Alternative 1, therefore, hunting success might be lower for these species. Game species such as turkey, raccoon, and squirrel, which prefer mid to late successional habitats would be more abundant in Alternative 1; thus leading to the possibility of higher hunter satisfaction.

Conversely, in Alternative 2 - 3, early successional species (and hunting success) would be relatively higher and late successional species relatively lower than Alternative 1.

There would be no commercial wood products removed from the Middle River Project Area under Alternatives 1 and 3. Wood products removed in Alternative 2 would help to supply wood to local sawmills. Firewood would be available with a permit in Alternatives 2. All alternatives maintain the opportunity to provide goods & services in the future.

Cumulative Effects on Biological Diversity

Protect Communities and Ecosystems: Natural communities are protected/managed on appropriate sites according to Forest Plan standards and guides in all management activities, including all alternatives in the Middle River Project Area. Unique or sensitive communities are protected and managed to enhance and perpetuate their special characteristics. The effect of past and current management has been to perpetuate an oak-hickory forest ecosystem composed of all successional stages well distributed throughout the landscape. In addition, unique communities are recognized, restored and managed if necessary to retain their uniqueness. Future management is expected to result in a similar composition and distribution of natural communities. However, if management practices were not implemented open and semi-open habitat (such as savanna') would continue to be lost due to forest succession. In addition there would be a decrease in the diversity of the forests in the Middle River area.

Minimize Fragmentation: The oak-hickory forest ecosystem is naturally fragmented due to natural processes (windstorm, natural mortality, frost, flood, fire, etc.) in terms of age classes, forest types, and interspersions of natural openings (glades, river corridors, areas of tree mortality). Management activities in the Oak Hickory Hills LTA's within the past decades have tended to perpetuate this diversity, particularly in age class distribution. Wildlife openings created in the past on inappropriate sites have been allowed to succeed back to their natural structural composition; while recent work has concentrated on restoring oak savannah conditions which have been lost due to effective fire suppression over the past 50 years.

Continued management of the forest with commercial timber harvest and restoration of natural communities should continue to provide a forest ecosystem that is varied in species composition and structure. Distribution of various age-classes and types should be approximately the same as it is now. There would continue to be permanent edges between forest and non-forest land uses (roads, private land

pastures, other developments), as well as temporary edges between forest age classes and types. Temporary edges would not be static, but would be varied in distribution over time. However, they should continue to be approximately the same amount as currently exists. Potential effects to vegetation on private lands are discussed above under cumulative effects on vegetation.

Due to the increasing population in the area, land use conversions to home-sites would continue on private lands.

Promote Native Species: The forest and district would continue to manage native species on appropriate sites and avoid introducing non-native species. However, non-native plant species are used extensively on adjacent private lands and are ubiquitous on area roadsides. It would be very difficult, and in some cases undesirable, to attempt to eradicate all non-native plant/animal species. Although creation of areas of disturbed soil in this and other projects would provide areas for colonization of some non-native plant species, these are not necessarily undesirable and would not normally affect the viability of native species within the project area.

Protect rare and ecologically important species: Natural forces and past management activities have created a forested landscape with all successional stages of the oak-hickory forest represented. Small areas of special habitats or unique natural communities exist and are protected in all alternatives of the Middle River Project Area, as well as other proposed projects in these Land Type Associations. Future management would be done to implement the Forest Plan and try to move towards the desired future condition described in the Plan. What that means for listed species is that the types of habitats currently available would continue to be available in approximately the same amount and distribution. Special habitats and unique natural communities would continue to be protected and/or managed to retain their unique characteristics. Although it is possible that individual animals of some species would be affected by management activities, it is very unlikely that the viability of local or regional populations of any listed species would be adversely affected.

The 3.4 Management Area Prescription, over the next 10 years, would continue to provide a variety of well-distributed habitat types. Large blocks of forest canopy would still be available within the Middle River Project Area.

Maintain Unique or Sensitive Environments: Unique and special areas are protected in all management activities through application of Forest Plan standards and guides. Within the 3.4 Management Prescription Areas, in the next 10 years, all special areas would be protected and/or managed to retain/restore/enhance their unique characteristics.

Maintain or Mimic Natural Ecosystem Processes and Naturally Occurring Structural Diversity: The Middle River Project Area, within the 3.4 Management Area Prescriptions and the management activities in the Oak Hickory Hills (HP) LTAs would continue to provide a variety of forest ages, sizes, species composition, and structures due to normal forest management (according to Forest Plan standards and guides) and natural processes, including prescribed burning to mimic historic fires.

Protect Genetic Diversity: Genetic interactions could take place. Vegetation would continue to provide a variety of age classes, sizes and species distribution. No permanent changes in land use are planned (i.e. the forest areas would remain forested), and there would not be elimination of any species.

Restore ecosystems, communities, and species: All the above apply.

Incorporate human needs:

The human needs would continue to meet in the Middle River Project Area and on the surrounding private lands. The needs for grazing areas and limited wood products would be met. This includes opportunities for sightseeing, hunting, fishing, camping and other activities. However, the amount of non developed open areas would continue to decline due to the increased population in the area.

APPENDIX D

Economic Analysis Tables

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**Middle River Project Area Economic Analysis
Houston/Rolla/Cedar Creek District**

Table 26: Timber Sale Economics of Existing Stands Alternative 2	
COSTS:	
Sale Prep/Administration (645 MBF @ \$46/MBF)	\$29, 267
Site Prep (UEAM, 460 ac @ \$50/ac)	\$23,000
Stocking Survey (460 ac @ \$5/ac)	\$ 2,300
Total Costs	\$54,567
REVENUES:	
Oak Sawtimber (516 MBF @ \$100/MBF)	\$51,600
Cedar Sawtimber (129 MBF @ \$35/MBF)	\$ 4,515
Firewood (920 Cords @ \$5/Cd)	\$ 4,600
Total Revenue:	\$60,715
Net Sale Revenue:	\$ 6,148
Sale Revenue/Cost Ratio	1.1
OTHER COSTS:	
Road Reconstruction (FR1686, 0.9 mile @ \$10,000/mi)	\$ 9,000
Road Closure (0.4 mi @ \$1000/mi)	\$ 400
Prescribed Burning (650 ac @ \$30/ac)	\$19,500
Plant Native Hardwoods (45 ac @ \$100/ac)	\$ 4,500
Herbicide Use (59 ac spot treatment for a total of 5 ac @ \$100/ac)	\$ 500
Fencing (1 mile)	\$ 5,000
Pond Reconstruction	\$ 5,000
Improve Parking and Access	\$1,000
Erosion Control/Planting	\$ 500
TOTAL OTHER COSTS:	\$45,400

**Middle River Project Area Economic Analysis
Houston/Rolla/Cedar Creek District**

Table 27: Timber Sale Economics of Existing Stands Alternative 3	
COSTS:	
Sale Prep/Administration (645 MBF @ \$46/MBF)	\$29, 267
Site Prep (UEAM, 460 ac @ \$50/ac)	\$23,000
Stocking Survey (460 ac @ \$5/ac)	\$ 2,300
Total Costs	\$54,567
REVENUES:	
Oak Sawtimber (516 MBF @ \$100/MBF)	\$51,600
Cedar Sawtimber (129 MBF @ \$35/MBF)	\$ 4,515
Firewood (920 Cords @ \$5/Cd)	\$ 4,600
Total Revenue:	\$60,715
Net Sale Revenue:	\$ 6,148
Sale Revenue/Cost Ratio	1.1
OTHER COSTS:	
Road Reconstruction (FR1686, 0.9 mile @ \$10,000/mi)	\$ 9,000
Road Closure (0.4 mi @ \$1000/mi)	\$ 400
Prescribed Burning (688 ac @ \$30/ac)	\$20,640
Plant Native Hardwoods (8 ac @ \$100/ac)	\$ 800
Herbicide Use (59 ac spot treatment for a total of 5 ac @ \$100/ac)	\$ 500
Fencing (1 mile)	\$ 5,000
Pond Reconstruction	\$ 5,000
Improve Parking and Access	\$1,000
Erosion Control/Planting	\$ 500
TOTAL OTHER COSTS:	\$42,840

APPENDIX E

Soil Characteristics Tables

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Table 28: Soil Type: Armstrong loam	
	Characteristics
Landscape Location	The Armstrong series consists of very deep, moderately well drained or somewhat poorly drained, slowly permeable soils formed on uplands in 10 to 20 inches of sediments or loess and in the underlying paleosol weathered from glacial till. Slope ranges from 2 to 25 percent.
Stand Location	Compartment 9: 14, 19, 20, 23, 24, 28, 42;
Water-Holding Capacity	8.3 – 11.0 inches
Permeability	Moderate (surface soil), Slow (upper subsurface), moderately slow (lower subsurface)
Total Depth	48 – 80 inches solum
A Horizon Depth	6 – 10 inches thick
Rock content in surface horizon	0 – 5 percent
Erosion Hazard & Equipment Limitation	Moderate suited to harvesting equipment. Slight erosion hazard off roads and skid trails. Moderate to severe erosion hazard on roads and skid trails.
Potential for damage to soil by fire	Low potential
Suitability for pond development	Moderate to severe limitation due to slope.
Management Considerations	Perched water table at 1.0 – 3.0 feet thick typically from November to May.

Table 29: Soil Type: Bethesda silty clay loam	
	Characteristics
Landscape Location	The Bethesda series consists of deep, well drained soils with moderately slow permeability formed in acid regolith from surface mine operations. The regolith is a mixture of partially weathered fine earth and fragments of bedrock. Fragments of rock consist mainly of acid shale, siltstone, coal, and medium and fine-grained sandstone. Slopes range from 0 to 90 percent.
Stand Location	Compartment 9: Stand Nos. 37 & 53
Water-Holding Capacity	2 ½ - 6 ½ inches
Permeability	Moderately slow
Total Depth	60 inches
A Horizon Depth	0 – 7 inches
Rock content in the surface horizon	0 – 15 percent, Small shale fragments may comprise up to 30 percent.
Erosion Hazard & Equipment Suitability	Moderate to severe erosion hazard due to slope and erodability. Moderately suited to harvesting equipment.
Potential for damage by fire	High potential due to texture, slope, coarse fragments
Suitability for pond development	Severe limitations due to slope
Management Considerations	May require reclaiming for vegetative growth.

Table 30: Soil Type: Calwoods silt loam	
	Characteristics
Landscape Location	The Calwoods series consists of very deep, somewhat poorly drained, very slowly permeable soils formed in loess or loess and pedisegment or glacial till. These soils are on broad summits and have slopes of 1 to 5 percent.
Stand Location	Compartment 9: Stand Nos. 19 – 2, 23, 24, 52
Water-Holding Capacity	10 – 12 inches
Permeability	Moderate (upper surface), moderately slow (lower surface), very slow (subsurface)
Total depth	60 inches
A Horizon Depth	4 – 13 inches
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight erosion hazard off roads and skid trails, Moderate hazard on roads and skid trails due to slope and erodability. Moderately suited to harvesting equipment.
Potential for damage from fire	Low
Suitability for pond development	Moderate limitations due to slope.
Management Considerations	Perched water table at 1.0 – 2.5 feet typically from November to April.

Table 31: Soil Type: Cedargap gravelly silt loam	
	Characteristics
Landscape Location	The Cedargap series consists of very deep, well drained, moderately and moderately slowly permeable soils formed in cherty alluvium with a high content of chert fragments. These soils are on flood plains of small streams near active channels. Slopes range from 0 to 3 percent.
Stand Location	Compartment 9: Stand Nos. 2, 17, 25, 32, 34, 54, 55
Water-Holding Capacity	4 ½ - 8 ½ inches
Permeability	Moderate
Total depth	60 inches
A Horizon Depth	6 – 24 inches
Surface rock content	3 – 60 percent
Erosion Hazard & Equipment Limitation	Slight hazard for erosion. Moderately suited for harvesting equipment.
Potential for damage from fire	Low
Suitability for pond development	Moderate limitation due to seepage.
Management Considerations	Brief, frequent flooding from November to May.

Table 32: Soil Type: Gasconade flaggy clay loam	
	Characteristics
Landscape Location	The Gasconade series consists of shallow and very shallow, somewhat excessively drained, moderately slowly permeable soils formed in thin clayey layers with a considerable amount of coarse fragments from residuum of the underlying limestone bedrock. These soils are on steep dissected upland landscapes and generally are isolated glade areas. Slope gradients range from 2 to 50 percent.
Stand Location	Compartment 9: Stand Nos. 1 – 27, 30, 32, 34 – 37, 40, 41, 44 – 47, 49, 53 – 56; Compartments 10: 1 – 16, 18 – 21, 31, 33 – 36
Water-Holding Capacity	1.3 – 1.7 inches
Permeability	Moderate (surface), moderately slow (subsurface)
Total depth	4 – 20 inches
A Horizon Depth	4 – 10 inches
Surface rock content	0 – 70
Erosion Hazard & Equipment Limitation	Moderate erosion hazard due to slope and erodability. Moderate suitability for harvesting equipment.
Potential for damage from fire	Low
Suitability for pond development	Severe limitation due to depth of rock, seepage, and slope.
Management Considerations	Low soil depth and water holding capacity. Occurs on landscapes generally isolated as glades.

Table 33: Soil Type: Gorin silt loam	
	Characteristics
Landscape Location	The Gorin series consists of very deep, somewhat poorly drained, slowly permeable soils formed in loess and loamy sediments or loess, loamy sediments and a paleosol from glacial till. These soils are on ridgetops and have slopes ranging from 2 to 14 percent.
Stand Location	Compartment 9: Stand Nos. 10, 11, 13 – 15, 18, 35 – 37, 40 – 42, 44, 46, 47, 49, 53, 56; Compartment 10: Stands Nos. 1, 2, 5, 8, 16 – 19, 22, 25, 30 – 35, 37.
Water-Holding Capacity	10 – 12 inches
Permeability	Moderate (surface), slow to moderately slow (upper subsurface), moderately slow (lower subsurface)
Total depth	48 – 60
A Horizon	2 – 5 inches
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight erosion hazard off roads and trails. Moderate hazard due to slope and erodability on roads and skid trails. Moderately suited to harvesting equipment.
Potential for damage from fire	Low
Suitability for pond development	Moderate limitation due to slope.
Management Considerations	Perched water table at 2.0 – 4.0 feet from November to April.

Table 34: Soil Type: Goss gravelly silt loam	
	Characteristics
Landscape Location	The Goss series consists of very deep, well drained, moderately permeable soils formed in colluvium and the underlying residuum weathered from cherty limestone or cherty dolomite and some interbedded shale. These soils are on uplands. Slopes range from 1 to 70 percent.
Stand Location	Same as for Gasconade
Water-Holding Capacity	2 ½ - 6 inches
Permeability	Moderately fast (surface and upper subsurface), moderate (lower subsurface)
Total depth	80 inches
A Horizon	2 – 8 inches
Surface rock content	5 – 75 percent
Erosion Hazard & Equipment Limitation	Moderate hazard off roads and trails due to slope and erodability. Severe hazard on roads and skid trails due to slope and erodability. Moderately suited to harvesting equipment, limited by soil strength and slope.
Potential of damage from fire	Low
Suitability to pond development	Severe limitations due to slope.
Management Considerations	Low to very low available water holding capacity.

Table 35: Soil Type: Haymond silt loam	
	Characteristics
Landscape Location	The Haymond series consists of very deep, well drained, moderately permeable soils that formed in silty alluvium. These soils are on flood plains and flood-plain steps. Slope ranges from 0 to 3 percent.
Stand Location	Compartment 9: Stand Nos. 2, 3, 7, 8, 10, 54
Water-Holding Capacity	12 – 13 ½ inches
Permeability	Moderate
Total depth	60 inches
A Horizon Depth	7 – 12 inches
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight erosion hazard. Moderately suited to harvesting equipment, limited due to soil strength.
Potential of damage from fire	Low
Suitability for pond development	Moderate limitation due to seepage
Management Considerations	Occasional, brief flooding from November thru May.

Table 36: Soil Type: Keswick loam	
	Characteristics
Landscape Location	These soils are on convex summits of interfluves and convex side slopes and on narrow, lower-stepped interfluves or on the shoulders of side slopes where geologic erosion has exhumed the Late Sangamon paleosol. Slope gradients commonly are 5 to 20 percent, but range up to 25 percent. Keswick soils formed mostly in reddish-colored Late Sangamon paleosols, but the horizons above the pebble band formed partly in loess or loess and pedisements.
Stand Location	Compartment 9: Stand Nos. 5, 10 – 15, 18 – 30, 37, 40 – 54, 56; Compartment 10: Stand Nos. 1 – 3, 9, 13 – 15, 17, 20 – 34, 36, 37, 39
Water-Holding Capacity	7 – 9 ½ inches
Permeability	Moderate (surface); Slow (upper subsurface); Moderately slow (lower subsurface)
Total depth	48 – 75 inches
A Horizon Depth	2 – 5 inches
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight to moderate hazard off roads and skid trails (due to slope and erodability). Moderate to severe hazard on roads and skid trails (due to slope and erodability). Moderately suited to harvesting equipment (limitation due to soil strength).
Potential for damage from fire	Moderate potential (texture, coarse fragments)
Suitability for pond development	Moderate to severe limitation due to slope
Management Considerations	Perched water table at 1.0 – 3.0 feet (November to May)

Table 37: Soil Type: Landes fine sandy loam	
	Characteristics
Landscape Location	Landes soils are on natural levees, low terraces, and bars on flood plains. Slopes commonly are 0 to 3 percent, but range to as steep as 7 percent. These soils formed in loamy and sandy alluvium of recent origin that is stratified with subtle differences in texture or organic carbon content.
Stand Location	Compartment 9: Stand Nos. 2, 8
Water-Holding Capacity	7 – 10 inches
Permeability	Surface (Moderate to moderately rapid); Subsurface (Moderately rapid)
Total depth	60 inches
A Horizon	10 – 20 inches
Surface rock content	0 – 20 percent
Erosion Hazard & Equipment Limitation	Slight erosion hazard. Moderately suited to harvesting equipment (limitation due to soil strength).
Potential for damage from fire	Moderate due to texture and coarse fragments.
Suitability for pond development	Severe limitation due to seepage
Management Considerations	Frequent, brief flooding from November thru May.

Table 38: Soil Type: Lindley loam	
	Characteristics
Landscape Location	Lindley soils are on valley side slopes and narrowly dissected interfluves. The slope gradients range from 5 to 60 percent. The soils are thought to have formed in pre-Illinoian glacial till and they may have a thin mantle of loess.
Stand Location	Compartment 9: Stand Nos. 3, 4, 28, 30, 34 – 37, 40 – 42, 44, 51, 53; Compartment 10: 5 – 8, 16, 17, 22 m- 25, 31, 38
Water-Holding Capacity	8 – 10 inches
Permeability	Moderate (surface); moderately slow (subsurface)
Total depth	40 – 60+
A Horizon depth	1 – 4 inches thick
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight to moderate hazard off road and skid trail (due to slope and erodability). Severe erosion hazard on roads and skid trails (due to slope and erodability). Moderately suited to harvesting equipment (limitations due to strength and, in some cases, slope).
Potential of damage from fire	Low
Suitability to pond development	Severe limitation due to slope
Management Considerations	

Table 39: Soil Type: Mexico silt loam	
	Characteristics
Landscape Location	Mexico soils are on slopes of the main divides. These soils formed in 30 to 60 inches of loess or loess and pedisegment. Slopes range from 1 to 5 percent.
Stand Location	Compartment 9: Stand 42
Water-Holding Capacity	9 – 12 inches
Permeability	Moderate (surface); upper subsurface (moderately slow); very slow (mid subsurface); moderately slow (lower mid subsurface), very slow (lower subsurface)
Total depth	Up to 60
A Horizon Depth	6 – 10 inches thick
Surface rock content	0 - 5
Erosion Hazard & Equipment Limitation	Slight erosion hazard off roads and skid trails. Moderate erosion hazard on roads and skid trails due to slope and erodability. Moderately suited for harvesting equipment (limitation due to level of soil strength).
Potential of damage from fire	Low potential (limitation due to texture and coarse fragments)
Suitability for pond development	Moderate limitation due to slope
Management Considerations	Perched water table at 1.0 – 2.5 feet (November to May).

Table 40: Soil Type: Weller silt loam	
	Characteristics
Landscape Location	Most of the Weller soils are on convex ridgecrests and side-valley slopes surrounding the nearly level, stable, upland divides in the loess-covered Kansan till plain. Some are on benches. Slope gradients are from about 0 to 14 percent. These soils formed in loess (Wisconsin) low in sand (less than 5 percent).
Stand Location	Compartment 9: Stand Nos. 1 – 3, 8, 9, 46, 56; Compartment 10: Stand No. 4
Water-Holding Capacity	9 – 12 inches
Permeability	Moderate (surface); slow (upper subsurface); moderately slow (lower subsurface)
Total depth	48 – 75 inches
A Horizon Depth	3 – 9 inches
Surface rock content	0 – 5 percent
Erosion Hazard & Equipment Limitation	Slight erosion hazard off roads and skid trails. Moderate erosion hazard on roads and skid trails (slope and erodability). Moderately suited to harvesting equipment (limitation based on level of soil strength)
Potential of damage from fire	Low to moderate (texture and coarse fragments)
Suitability for pond development	Moderate to severe limitation based on slope.
Management Considerations	Perched water table at 2.0 – 4.0 feet. (November thru May).

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APPENDIX F

Middle River Project Maps

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APPENDIX G

Biological Assessment / Biological Evaluation/US Fish and Wildlife Service Consultation

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APPENDIX H

Photographs of Invasive Plants in Project Area, Herbicide Labels, Material Safety Data Sheets,

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Photographs of Invasive Plants Sites in Middle River Project Area



Figure 1: Multiflora Rose plant



Figure 2: Serecia Lespedeza plants in Stand 56, Compartment 9



Figure 3: Hardwood Tree Planting Site, Stand 8, Compartment 9

Herbicide Labels and MSDS for glyphosate products Roundup and Rodeo are available online at:
<http://www.fs.fed.us/foresthealth/pesticide/material.htm>

Herbicide Labels and MSDS for triclopyr products Garlon 3A and Garlon 4 are available at
<http://www.dowagro.com>