Appendix A
Consultation History
Mark Twain National Forest Revised Forest Plan

In August 1985, formal consultation was completed for the newly developed Mark Twain National Forest Land and Resource Management Plan (Forest Plan). Seven species were covered during that consultation. No incidental take statement was issued with the 1985 opinion.
The biological opinion stated:

"if standards and guidelines as modified were followed, the proposed action is likely to promote the conservation of TE species" and is "not likely to jeopardize the continued existence of the species listed or result in destruction or adverse modification of their critical habitat".

Continuing research and inventory of TE species populations, as well as a refinement of our knowledge of species' habitat requirements led to the development of a new Biological Assessment and formal consultation on four species in 1998. The Biological Opinion issued in June 1999 stated:

"it is the Service's biological opinion that forest management and other activities authorized, funded, or carried out by the MTNF through implementation of the LRMP, are not likely to jeopardize the continued existence of"…the gray bat, bald eagle, Indiana bat, or Mead's milkweed.

"the Service concluded that activities outlined in the LRMP were not likely to adversely affect running buffalo clover or the Tumbling Creek cavesnail and stated that a "no effect" determination was appropriate for Topeka shiner, Curtis' pearly mussel, pink mucket pearly mussel, and Hall's bulrush."

and

"Because critical habitat has not been designated for this species (gray bat, bald eagle, Mead's milkweed), none will be adversely affected by the continued implementation of the LRMP." "Of the six caves in Missouri designated as critical habitat, none are owned by the MTNF and none will be adversely affected by the continued implementation of the LRMP."

Forest Plan Amendment #25, dated March 2000, incorporated the RPM/TC into the Forest Plan. Forest Plan Amendment #26, dated August 2002, added Management Prescription 3.5 as areas of influence (AOI) for Indiana bat habitat. On August 13, 2004, the Forest Supervisor made the decision to amend the Forest Plan to incorporate the Brown's Hollow Area of Influence for a newly discovered maternity colony on MTNF.

Since the issuance of the 1999 programmatic BO, hundreds of individual consultations have occurred for site-specific projects to implement the Plan. In addition, MTNF has monitored the level of incidental take for bald eagle, gray bat and Indiana bat. There has been no documented take for bald eagle or gray bat from 1999-2004.

Incidental take for Indiana bats has been measured in acres of forest cover affected by various management activities (USFWS 1999).

Indiana Bat Take Acres Baseline (1999-2004)

Activity	Forested Acres Annual Maximum	1999	2000	2001	2002**	2003	2004	TOTAL	Total 6 Year Maximum Acres	% Maximum Annual Acres	% MTNF
Timber harvest	20,000	12,011	2,648	5,259	8,845	8,506	9,276	46,545	120,000	39%	4%
Prescribed fire	12,000	9,429	5,878	8,656	10,478	6,581	6,195	47,217	72,000	66%	4%
Wildlife habitat improvement	2,000	95	1,716	223	112	266	470	2,882	12,000	24%	0.33%
Timber stand improvement	4,000	1,107	2,570	2,689	1,896	3,660	3,146	15,068	24,000	63%	1%
Soil & water improvement	150	52	2	55	50	74	62	295	900	33%	0.03%
Range management	50	38	10	15	0	0	0	63	300	21%	0.01%
Mineral exploration & development	50	6	4	7	5	10	12	44	300	15%	0.01%
Wildfire fire lines	50	47	10	31	22	35	21	166	300	55%	0.01%
Special uses	50	2	2	6	5	43	0	58	300	19%	0.01%
Road construction*	25	8	7	19	8	0	0	42	150	28%	0.004%
TOTAL	38,375	22,795	12,847	16,960	21,421	19,175	19,182	150,755	230,250	65%	10%

*All acres are road reconstruction - No acres of new road construction.

**Numbers may not match Annual Report - chart in 2002 Annual Report was copied from 2001 and never updated - numbers in this chart are more accurate…. Jae 1/14/05

The acres in this chart do not match total acres accomplished in a year for some activities because a) activities for which there was a No Effect or Not likely to Adversely Affect determinations by definition do not have incidental take, and therefore do not count toward the incidental take acres tracked here; and b) only acres in forest cover are included in the estimation of incidental take; i.e. activities which take place on acres of open pasture, open glade or other openlands are not included in the incidental take estimate.

Appendix B
Species List
Mark Twain National Forest Revised Forest Plan

Plants

Asclepias meadii	Mead's milkweed
Helenium virginicum	*Virginia sneezeweed*
Trifolium stoloniferum	Running buffalo clover

Insects

Somatochlora hineana	Hine's emerald dragonfly

Naiades

Antrobia culveri	Tumbling Creek cavesnail
Lampsilis orbiculata	Pink mucket pearlymussel
Leptodea leptodon	Scaleshell mussel

Fish

Notropis topeka	Topeka shiner

Birds

Haliaeetus leucocephalus	Bald eagle

Mammals

Myotis grisescens	Gray bat
Myotis sodalis	Indiana bat

Submitted by USFS 11/29/04
Approved by USFWS 12/1/04

Revised submission by USFS 4/20/05
Approved by USFWS 4/20/05

Appendix C
Overview of Forest Plan Revision Process and Project Level Decision-making
Mark Twain National Forest Revised Forest Plan

Forest Plans set out management area prescriptions with standards and guidelines for future decision-making and are adjustable through amendment and revision. The Forest Plan management area prescriptions and forest-wide direction are the "zoning ordinances" under which future decisions are made. Forest Plan approval establishes multiple-use goals and objectives for the planning unit. Project decisions are not authorized, carried out, or funded by Forest Plan approval, amendment, or revision except as specifically authorized in the Record of Decision or Decision Notice.

The Forest Service Planning Handbook provides for systematic stepping down from the overall direction provided in the Forest Plan when making project or activity level decisions:

"Planning for units of the National Forest System involves two levels of decisions. The first is the development of a Forest Plan that provides direction for all resource management programs, practices, uses, and protection measures… The second level planning involves the analysis and implementation of management practices designed to achieve the goals and objectives of the Forest Plan. This level involves site-specific analysis to meet NEPA requirements for decisionmaking" (FSM 1922). Site-specific projects and activities are proposed, analyzed, and carried out within the framework of the Forest Plan.

In addition to consistency with the Forest Plan, each project must be in compliance with NEPA, CWA, CAA and other laws. Simply being consistent with the Forest Plan does not fulfill the site-specific requirements of Federal law. Project level analysis is to "determine findings for NFMA, to ensure compliance with NEPA, and to meet other appropriate laws and regulations." (Forest Service Land and Resource Management Planning, FSM 1920 and Forest Service Handbook 1909.12, 5.31).

One of the laws with which site-specific projects must comply is the Endangered Species Act of 1973, as amended. Potential effects on TES will be analyzed in a Biological Evaluation for each site-specific project proposed to implement the Revised Forest Plan. Informal consultation will be conducted with USDI Fish and Wildlife Service for all proposed projects. Consultation for projects with a "No Effect" determination will be considered complete when the "no effect" determination is made. Concurrence from USDI Fish and Wildlife Service will be requested for all projects with determinations of "May Affect – Not Likely to Adversely Affect" determinations, except those which are completed under the Alternative Consultation Agreement. Formal consultation will be requested for all projects with "May Affect – Likely to Adversely Affect" determinations.

Appendix D
Standards and Guidelines Applicable to Federal Species
Mark Twain National Forest Revised Forest Plan

Standards and guidelines written in blue are those that were added or modified during informal consultation with USDI Fish and Wildlife Service.

General

- Carry out Forest Service responsibilities for the conservation of endangered and threatened species and habitat identified through interagency consultation with the U.S. Fish and Wildlife Service.
- Manage federally listed species in accordance with approved species recovery plans (FSM 2672.21).
- Issue permits for the collection of federally listed TES plant and animal species only if collector has a current U.S. Fish and Wildlife Service collecting permit.
- Mimic ecosystem dynamics, patterns, and disturbance processes to achieve desired conditions except where ecological recovery is unlikely or unfeasible.
- Do not allow surface disturbing mineral operations on administrative sites, on known endangered and threatened species sites, or over known caves or sinkholes**.**

Mead's milkweed (prairies, glades) (One known site on MTNF)

Wilderness standards and guidelines state that:

- No man-caused vegetative manipulation will be permitted beyond the minimum needed for trails and signs.
- When approved by the Chief of the Forest Service thru a change in, or exception to, National Wilderness Policy, prescribed fire will be used where it can be determined that a certain frequency of fire is essential to aid, maintain, or restore natural plant communities or threatened and endangered plant species.
- Projects involving manipulation of vegetative cover shall be approved by the Chief of the Forest Service on a project-by-project basis. All projects must have, as their objective, enhancement of the Wilderness resource. To qualify for approval habitat manipulation projects must satisfy:

    1. The project can be accomplished with complete assurance that damage to watershed of Wilderness values of serious or lasting nature will not develop.

2. There is reasonable assurance that the project will accomplish the desired objectives.
3. The condition to be remedied is a result of man's influence.
4. The project will promote the perpetuation of a threatened or endangered species.

At the current time, there is no proposal to use prescribed fire in Bell Mountain Wilderness. The Chief of the Forest Service has delegated responsibility for approval of wilderness fire to the Regional Foresters (FSM 2324.04b(2)).

Other glade and grassland habitats outside Wilderness are subject to Forest-wide standards and guidelines, as well as standards and guidelines of their respective Management Prescriptions. In general, glades and natural grasslands would be managed to enhance their unique qualities and move toward desired conditions. There are several protective standards and guidelines for glades that limit or prohibit certain types of activities.

- Prohibit mechanical disturbance to rare plant sites.

- Minimize surface disturbing activities within 100 feet of the border of glades.

- For fire suppression, use manually constructed firelines on and within 100 feet of glades unless mechanically constructed firelines are needed to protect life, private property, structures, public health, or firefighter safety.

- Mechanically constructed firelines for prescribed fires are prohibited in the following areas:
  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps, rock bluffs, outcrops, cliffs, and glades,

- Unless necessary to protect life, structures, private property, or to maintain public and firefighter safety mechanically constructed firelines for suppression are prohibited:
  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps, rock bluffs, outcrops, cliffs, and glades;

- For fire suppression, use manually constructed firelines on and within 100 feet of glades unless mechanically constructed firelines are needed to protect life, private property, structures, public health, or firefighter safety.

- Manage natural grasslands (including glades) to enhance ground flora species diversity and abundance, and minimize woody encroachment (see Desired Condition Chart in Appendix Restoration).

- Modify or terminate permitted use when necessary to ensure native open woodlands and glades reach desired conditions as described in Appendix A.

- Fertilization shall not be allowed within RMZ, WPZ, on glades or other natural communities.

- Minimize surface disturbing activities within 100 feet of the border of glades.

- Whenever possible, avoid road construction:
  - Within 100 feet of glades;

- Whenever possible, avoid temporary road construction:
  - Within 100 feet of glades;

Virginia sneezeweed (sinkhole ponds, sunny, seasonally wet open areas)
(No known sites on MTNF – habitat available)

- Prohibit mechanical disturbance to rare plant sites.

- Emphasize the maintenance and improvement of natural grasslands as the preferred means of providing openland habitat.

- Manage natural grasslands to enhance ground flora species diversity and abundance and minimize woody encroachment (see Desired Condition Chart in Appendix A).

- Designate springs, seeps, fens, sinkholes, and shrub swamps as 8.1 Management Prescription areas when the feature is listed or qualifies for listing in the Missouri natural heritage database as a significant, exceptional, or notable natural feature site.

- Evaluate newly discovered fens and seeps and consider them for inclusion in the natural heritage database.

- Prohibit all mechanical disturbances on springs, seeps, fens, sinkholes, and shrub swamps, regardless of size.

- Establish a buffer zone of 100 feet in radius from the outside edge of:
  - Small, isolated fens less than 400-square feet in size;
  - Seeps greater than 200-square feet in size or which support associated natural communities;
  - Springs;
  - Sinkholes; and
  - Shrub swamps.

- For fens greater than 400-square feet in area, and not designated as 8.1, establish a buffer zone of 300 feet on the lateral and downstream sides and 500 feet on the upstream side.

- Within these buffer zones, the following activities are prohibited unless needed to meet specific restoration objectives:
  - Rangeland management, including grazing;
  - Significant soil disturbance;
  - Use of chemicals;

  - Construction of new facilities or roads;
  - Timber management activities;
  - Storage of construction waste, material, debris or excess materials;
  - Refueling of equipment; and
  - Fertilizer application.

- Locate new trails within these buffer zones at least 100 feet from the feature's edge, unless the trail leads to an overlook or other interpretive opportunity regarding the wetland. When reconstructing or maintaining existing trails near these habitats, consider relocating the trail away from the wetland.

- When a feature within these buffer zones has high public use, consider adding or improving trails to concentrate foot traffic or closing the area to public use.

- Design roads so the runoff does not change natural hydrologic functioning of springs, seeps, fens, sinkholes, and shrub swamps.

- If existing roads interfere with the natural flow of groundwater seepage and springs associated with adjacent fens and seeps, where feasible restore the natural hydrologic flow if such activities would not result in a loss of habitat.

- Manage wetland natural communities that are fire-dependent (see Appendix A) with a fire regime (timing and intensity) similar to that with which the communities evolved.

- Manage and rehabilitate existing waterholes as a priority over constructing new ones.

- When rehabilitating waterholes they should be irregular in shape and natural in appearance.

- Mechanically constructed firelines for prescribed fires are prohibited in the following areas:
  - Within 100 feet from the upslope break or crest of the sinkhole;
  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps, rock bluffs, outcrops, cliffs, and glades,

- Unless necessary to protect life, structures, private property, or to maintain public and firefighter safety mechanically constructed firelines for suppression are prohibited:
  - Within 100 feet from the upslope break or crest of the sinkhole;
  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps,

- Water withdrawals are not permitted from natural sinkhole ponds.

- Wash and rinse equipment used in the mixing and application of pesticides and fertilizers in areas where runoff will not reach surface waters, wetlands, fens, sinks, or special other habitats.

- When using pesticides within the RMZ, WPZ, and within 100 feet of sinkholes, springs, wetlands, and cave openings adhere to the following:
  - Minimize the use of pesticides, herbicides, fertilizers, or hazardous materials;
  - Use only pesticides labeled for use in or near aquatic systems; and
  - Use only hand application and single plant application of herbicides and pesticides, unless other methods are approved by the forest supervisor based on environmental analysis that has shown they are environmentally sound and the most biologically effective method practicable.

- Grazing is not allowed within 100 feet of springs, significant seeps, fens, other wetland features or the break of a sinkhole basin.

- Prohibit timber harvest activities within 100 feet of the edge of a sinkhole

- Skid trails should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, or watercourses.

- Prohibit skid trails within 100 feet of the edge of a sinkhole, cave entrance, or other karst feature, or within the buffer zone for wetland features.

- Prohibit surface-disturbing mineral activities within 100 feet of the edge of a cave entrance, spring, seep, fen, sinkhole, or shrub swamp

- Do not allow surface disturbing mineral operations on administrative sites, within developed recreation sites, on known endangered and threatened species sites, on National Trails Systems or over known caves or sinkholes.

- Do not use caves, sinkholes, and other karst features when locating new common variety disposal locations or pits

- Design roads so the runoff does not change natural hydrologic functioning of karst or wetland features.

- Whenever possible, avoid road construction:
  - Within 100 feet from the upslope break or crest of the sinkhole,
  - Within the buffer zone for wetland features, (Reference Forestwide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.);

- If existing roads interfere with the natural flow of groundwater seepage and springs associated with adjacent fens and seeps, restore the natural hydrologic flow where feasible if such activities would not result in a loss of habitat.

- Whenever possible, avoid temporary road construction:
  - Within 100 feet from the upslope break or crest of sinkholes,
  - Within the buffer zone for wetland features (reference: Forest-wide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management);

- Temporary roads should be designed and located so they do not change natural hydrologic functioning of karst or wetland features.

- Temporary roads should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, other small wetlands, or watercourses. Install drainage features at appropriate intervals to prevent erosion.

Running buffalo clover (streamside open woodlands) (No known sites on MTNF – habitat available)

- Prohibit mechanical disturbance to rare plant sites.

- Design prescribed burns to include streamsides with open woodland natural communities that may be suitable running buffalo clover habitat.

The revised Forest Plan addresses potential habitat for RBC through this standard, as well as through emphasis on managing natural communities on appropriate sites to provide the diversity of conditions needed by all native Missouri species (Forest Plan Appendix B; MP 1.1 and 1.2; Vegetation Goals and Objectives).

Hine's emerald dragonfly (open, calcareous fens) (9 known sites on MTNF)

- Control non-native invasive and/or undesirable plant species in fen habitats through the most effective means while protecting water quality.

- Restore local hydrology by eliminating old drainage ditches or other water diversionary structures when possible if such activities would not result in a loss of habitat.

- Fens that harbor known populations of Hine's emerald dragonfly should be prescribe burned to control invasion of woody species or as part of larger landscape restoration and enhancement projects.

- Prescribed burns on fens that harbor known or suspected populations of Hine's emerald dragonfly must be scheduled to occur from November through April.

- Designate springs, seeps, fens, sinkholes, and shrub swamps as 8.1 Management Prescription areas when the feature is listed or qualifies for listing in the Missouri natural heritage database as a significant, exceptional, or notable natural feature site.

- Evaluate newly discovered fens and seeps and consider them for inclusion in the natural heritage database.

- Prohibit all mechanical disturbances on springs, seeps, fens, sinkholes, and shrub swamps, regardless of size.

- Prohibit vehicle and heavy equipment use in fens, unless needed to improve HED habitat.

- Control unauthorized vehicle access to fens.

- Establish a buffer zone of 100 feet in radius from the outside edge of:
  - Small, isolated fens less than 400-square feet in size;
  - Seeps greater than 200-square feet in size or which support associated natural communities;
  - Springs;
  - Sinkholes; and
  - Shrub swamps.

- For fens greater than 400-square feet in area, and not designated as 8.1, establish a buffer zone of 300 feet on the lateral and downstream sides and 500 feet on the upstream side.

- Within these buffer zones, the following activities are prohibited unless needed to meet specific restoration objectives:
  - Rangeland management, including grazing;
  - Significant soil disturbance;
  - Use of chemicals;
  - Construction of new facilities or roads;
  - Timber management activities;
  - Storage of construction waste, material, debris or excess materials;
  - Refueling of equipment; and
  - Fertilizer application.

- Locate new trails within these buffer zones at least 100 feet from the feature's edge, unless the trail leads to an overlook or other interpretive opportunity regarding the wetland. When reconstructing or maintaining existing trails near these habitats, consider relocating the trail away from the wetland.

- When a feature within these buffer zones has high public use, consider adding or improving trails to concentrate foot traffic or closing the area to public use.

- Design roads so the runoff does not change natural hydrologic functioning of springs, seeps, fens, sinkholes, and shrub swamps.

- If existing roads interfere with the natural flow of groundwater seepage and springs associated with adjacent fens and seeps, where feasible restore the natural hydrologic flow if such activities would not result in a loss of habitat.

- Manage wetland natural communities that are fire-dependent (see Appendix A) with a fire regime (timing and intensity) similar to that with which the communities evolved.

- Mechanically constructed firelines for prescribed fires are prohibited in the following areas:
  - Within 100 feet from the upslope break or crest of the sinkhole;

  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps, rock bluffs, outcrops, cliffs, and glades,

- Unless necessary to protect life, structures, private property, or to maintain public and firefighter safety mechanically constructed firelines for suppression are prohibited:
  - Within 100 feet from the upslope break or crest of the sinkhole;
  - Within 100 feet of sinkhole ponds, springs, seeps, fens, shrub swamps

- Wash and rinse equipment used in the mixing and application of pesticides and fertilizers in areas where runoff will not reach surface waters, wetlands, fens, sinks, or special other habitats.

- When using pesticides within the RMZ, WPZ, and within 100 feet of sinkholes, springs, wetlands, and cave openings adhere to the following:
  - Minimize the use of pesticides, herbicides, fertilizers, or hazardous materials;
  - Use only pesticides labeled for use in or near aquatic systems; and
  - Use only hand application and single plant application of herbicides and pesticides, unless other methods are approved by the forest supervisor based on environmental analysis that has shown they are environmentally sound and the most biologically effective method practicable.

- Grazing is not allowed within 100 feet of springs, significant seeps, fens, other wetland features or the break of a sinkhole basin.

- Skid trails should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, or watercourses.

- Prohibit skid trails within 100 feet of the edge of a sinkhole, cave entrance, or other karst feature, or within the buffer zone for wetland features.

- Prohibit surface-disturbing mineral activities within 100 feet of the edge of a cave entrance, spring, seep, fen, sinkhole, or shrub swamp.

- Do not allow surface disturbing mineral operations on administrative sites, within developed recreation sites, on known endangered and threatened species sites, on National Trails Systems or over known caves or sinkholes.

- Design roads so the runoff does not change natural hydrologic functioning of karst or wetland features.

- Whenever possible, avoid road construction:
  - Within the buffer zone for wetland features, (Reference Forestwide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.);

- If existing roads interfere with the natural flow of groundwater seepage and springs associated with adjacent fens and seeps, restore the natural hydrologic flow where feasible if such activities would not result in a loss of habitat.

- Whenever possible, avoid temporary road construction:
  - Within the buffer zone for wetland features (reference: Forest-wide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management);

- Temporary roads should be designed and located so they do not change natural hydrologic functioning of karst or wetland features.

- Temporary roads should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, other small wetlands, or watercourses. Install drainage features at appropriate intervals to prevent erosion.

- Determine location of new roads near fens containing known or suspected habitat for Hine's emerald dragonfly during consultation with U.S. Fish and Wildlife Service.

Tumbling Creek cavesnail (Tumbling Creek cave) (One known site off MTNF – MTNF has 24% of cave recharge area)

- Firelines and water diversion structures must not drain directly into stream channels, sinkholes, or other specialized habitats.

- Contracts, leases, and permits for occupancy of National Forest System lands shall contain clauses that prohibit or regulate the production, use, disposal, or storage of hazardous materials.

- Modify allotment plans to accomplish Management Area goals.

- Control the timing, duration, and intensity of livestock grazing to achieve desired structure and species composition objectives.

- Modify or terminate permitted use when necessary to ensure native open woodlands and glades reach desired conditions as described in (Forest Plan) Appendix A.

- Grazing permits should be adjusted to allow fuel buildup prior to prescribed burning.

- Reduce livestock impacts and achieve desired structure and species composition objectives within the WPZ and RMZ by using tools such as hardened crossings, fencing, and controlled timing, duration, and intensity of grazing.

- Place livestock distribution tools to minimize use within the WPZ, unless needed to meet specific restoration objectives or desired conditions.

- Remove tops from drainages within the RMZ and WPZ, and avoid concentrations of tops and slash in drainages outside the RMZ and WPZ.

Pink mucket pearly, and Scaleshell mussels (clear, flowing Ozark streams)
(0 and 3 sites respectively)

- Prioritize areas of NNIS for treatment based on threats to resources, species status, relationship to boundaries, size of the infestation, potential for further spread and effectiveness of available control measures,

- Include NNIS control and prevention clauses in contracts and permits as needed.

- Prohibit permanent stream channelization on National Forest System lands.

- Prohibit new man-made impoundments, mine tailing ponds, and water diversions within the RMZ.

- Whenever possible, avoid new manmade impoundments, mine tailing ponds and water diversions within the WPZ.

- Limit in-stream use of heavy equipment to the minimal amount of time necessary for completion of the project.

- Design aquatic habitat enhancement structures using natural appearing materials and placement to mimic the appearance and function of natural habitat features.

- Use of heavy equipment to facilitate in-stream aquatic habitat improvement should be limited to the minimal amount of time essential for project completion.

- Fish or other aquatic organism passage in streams shall not be blocked or prevented unless done in conjunction with prescribed fish-management objectives.

- For projects where in-stream work, low-water crossings, or fords are proposed:
  a) Determine if suitable habitat for threatened, endangered or rare mussel species is present before any in-stream work is initiated.
  b) If suitable habitat is present, conduct specific biological surveys to determine the presence or absence of threatened, endangered or rare mussel species.
  c) If threatened, endangered or rare mussel species are discovered during pre-work surveys, modify or re-locate the project to avoid or minimize impacts to mussels.
  d) Design fish management plans to minimize impacts to fish host species of threatened, endangered or rare mussels.

- Remove large woody material from streams or streamsides only if it poses an immediate risk to water quality, degrades habitat for aquatic and riparian-associated wildlife species, or poses a public safety risk or a threat to private property or Forest Service infrastructures (i.e., bridges).

- Manage for naturalized trout species, including stocked trout, only in the cold-water streams listed in Table 2-2 (where management existed as of August 2002).

Table 2-2. Naturalized trout species managed in cold-water streams (where management existed as of August 2002).

Stream	Segment	Management
Little Piney River	Phelps-Dent county line to Milldam Hollow Access	Wild Trout
Little Piney River	Milldam Hollow Access to CR 7400	Trout, stocked
Spring Creek	Relfe Spring to Big Piney River	Wild Trout
Mill Creek	Yelton Spring to Little Piney River	Wild Trout
Stone Mill Spring	Entire length of spring	Trout, stocked

DO ANY OF THESE HAVE THE MUSSELS??? IF SO, KEEP IN… IF NOT, DELETE

- Manage only for native fish species in those cold-water streams not listed above (where trout did not exist as of August, 2002). Trout must not be introduced into these streams.
- Timber harvest is prohibited in RMZs along self-sustaining trout streams.
- Maintain, where possible, a canopy closure of 75-100% on all trout streams less than 25 feet wide.
- Prohibit in-stream activities that could adversely affect trout spawning between November 15 and February 15 within self-sustaining trout streams.
- Manage cool-water streams to achieve self-sustaining small-mouth bass, goggle eye, and other naturally reproducing aquatic populations or other populations maintained by releases of hatchery-reared fish.
- Manage warm-water streams to achieve a self-sustaining largemouth bass, bluegill, and other naturally reproducing aquatic populations.
- Maintain a canopy closure of 50-100% on all permanent streams less than 25 feet wide, where possible.
- Minimize in-stream management activities between March 15 to June 15 that could increase sedimentation and adversely affect spawning.

Topeka shiner (prairie streams) (Historic locations only on Cedar Creek District – no known current sites)

- Prohibit permanent stream channelization on National Forest System lands.
- Limit in-stream use of heavy equipment to the minimal amount of time necessary for completion of the project.
- Design aquatic habitat enhancement structures using natural appearing materials and placement to mimic the appearance and function of natural habitat features.

- Use of heavy equipment to facilitate in-stream aquatic habitat improvement should be limited to the minimal amount of time essential for project completion.

- Fish or other aquatic organism passage in streams shall not be blocked or prevented unless done in conjunction with prescribed fish-management objectives.

- Remove large woody material from streams or streamsides only if it poses an immediate risk to water quality, degrades habitat for aquatic and riparian-associated wildlife species, or poses a public safety risk or a threat to private property or Forest Service infrastructures (i.e., bridges).

- Manage warm-water streams to achieve a self-sustaining largemouth bass, bluegill, and other naturally reproducing aquatic populations.

- Maintain a canopy closure of 50-100% on all permanent streams less than 25 feet wide, where possible.

- Minimize in-stream management activities between March 15 to June 15 that could increase sedimentation and adversely affect spawning.

- Control the timing, duration, and intensity of livestock grazing to achieve desired structure and species composition objectives.

- Grazing is allowed within the RMZ only under the following conditions:
  - Grazing may continue on existing improved pastures that are under an active permit as of September 2005;
  - Livestock are fenced at least 100 feet away from stream banks; and
  - Grazing on these allotments must be foreclosed at the earliest opportunity.

- Grazing shall not be allowed to degrade the RMZ or WPZ, or their functionality.

- Reduce livestock impacts and achieve desired structure and species composition objectives within the WPZ and RMZ by using tools such as hardened crossings, fencing, and controlled timing, duration, and intensity of grazing.

- Place livestock distribution tools such as feeding troughs, water troughs, salt and mineral blocks outside the RMZ, unless there is no other feasible alternative. Where there is no other feasible alternative, place livestock distribution tools so as to minimize use with the RMZ, unless needed to meet specific restoration objectives or desired conditions.

- Place livestock distribution tools to minimize use within the WPZ, unless needed to meet specific restoration objectives or desired conditions.

- Fertilization shall not be allowed within RMZ, WPZ, on glades or other natural communities.

- Provide for sufficient shade and large woody material recruitment to meet WPZ objectives when developing silvicultural prescriptions.

- Gold panning may involve the pan only. Picks, shovels, mechanical and motorized equipment is prohibited. Disturbance of stream banks is prohibited.

- Removal of mineral materials, such as sand and gravel, from stream channels or RMZ's is prohibited, unless needed for protection of infrastructure or for public health and safety.

Bald eagle (large trees near open water) (Several winter locations; limited summer locations)

- Maintain suitable habitat for nesting, roosting, and foraging bald eagles. Protect all occupied nest sites from disturbance from January through July (or during active breeding, incubation, and brood rearing periods).

- Conduct management activities planned near known nesting sites in a manner that protects the existing nest site, maintains suitable alternate nesting habitat, and occurs outside of the breeding, incubation, and brood rearing periods (approximately January through July).

- In cooperation with U.S. Fish and Wildlife Service and Missouri Department of Conservation, develop educational signs regarding appropriate behavior near occupied bald eagle nests or near roosting eagles. Post signs at accesses on rivers or lakes where eagles may be present.

- Designate a ¼ mile old growth corridor along the waters' edge of Table Rock Lake and Lake Wappapello (traditional bald eagle wintering areas).

Gray bat (specific caves & riparian corridors) (18known occupied caves)

- Mechanically constructed firelines for prescribed burns shall be located at least 100 feet from known cave and abandoned mine entrances. Hand constructed firelines shall be located at least 50 feet from cave and abandoned mine entrances.

- All structures placed at cave entrances must permit bats to pass with minimal danger and must not alter airflow into or out of the cave, regardless if federally listed bats currently occupy the cave.

- Maintain existing gates at occupied Indiana or gray bat caves.

- Abandoned mines must be evaluated for use by bats prior to permanent closure

- Prohibit the following within 100 feet of caves and abandoned mine openings:
  - Storing construction waste, debris, and excess materials;
  - Refueling equipment; and
  - Appling fertilizers.

- Prohibit timber harvest activities within 100 feet of the edge of a cave entrance.

- Except for regularly scheduled population monitoring or other legitimate scientific purposes do not allow human entrance to gray bat hibernacula or summer caves during the periods of use by bats.

- Locate new trails at least 100 feet from a cave entrance unless the trail leads to an overlook or other interpretive opportunity regarding the cave. When reconstructing or maintaining existing trails near caves, consider relocating the trail away from the cave.

- Do not allow camping within caves or within 100 feet of a cave entrance.

- Designate an area of at least 20 acres completely surrounding an Indiana or gray bat cave entrance(s)—including the area above known or suspected cave or mine passages, foraging corridor(s), ridge tops, and side slopes around the cave for permanent old growth management. Within this area, only vegetation management activities needed to reach the desired condition are allowed.

- Maintain an additional 130 acres of mature forest or mature woodland around each occupied Indiana or gray bat cave.

- The area around occupied Indiana or gray bat caves is a smoke-sensitive area. Develop prescribed burn plans to avoid or minimize smoke influences at or near these caves. Give the U.S. Fish and Wildlife Service an opportunity to review and comment on prescribed burn plans within these areas.

- Maintain or restore a mature forested corridor at least 100 feet wide and with at least 70% canopy closure between a cave used by gray bats and their foraging areas (streams and rivers). Within the corridor, allow only vegetation management activities needed to restore, enhance, or maintain mature forest or woodland natural communities.

- Minimize the impact of smoke for each prescribed fire by identifying smoke-sensitive areas, using best available control measures, monitoring smoke impacts, and following applicable guidance.

- Prohibit timber harvest activities within 100 feet of the edge of a sinkhole, cave entrance, or within the buffer zone for wetland features. (Reference: Forestwide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.)

- Prohibit skid trails within 100 feet of the edge of a sinkhole, cave entrance, or other karst feature, or within the buffer zone for wetland features. (Reference Forest-wide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.)

- Prohibit surface-disturbing mineral activities within 100 feet of the edge of a cave entrance, spring, seep, fen, sinkhole, or shrub swamp.

- Prohibit core drilling or other surface disturbing mineral operations over known caves and in the 20 acres designated around Indiana bat or gray bat caves and the additional 130 acres designated around Indiana bat caves.

- Do not use caves, sinkholes, and other karst features when locating new common variety disposal locations or pits.

- Whenever possible, avoid road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;

- Where feasible, relocate roads away from known cave entrances during road reconstruction or maintenance activities.

- Whenever possible, avoid temporary road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;

- Bridges proposed for construction or reconstruction across streams that are 40 or more feet wide should be designed of concrete with girders or chambers to provide suitable bat roosting space underneath whenever possible.

Indiana bat (specific caves, roost trees, foraging habitat) (4 known hibernacula – six known summer locations)

Winter and fall swarming habitat (caves and abandoned mines)

- All structures placed at cave entrances must permit bats to pass with minimal danger and must not alter airflow into or out of the cave, regardless if federally listed bats currently occupy the cave.

- Maintain existing gates at occupied Indiana or gray bat caves.

- All occupied Indiana and gray bat caves should be periodically assessed to determine needs for physical protection of the cave entrance.

- All cave gates and protective structures should be periodically monitored to detect trespass, vandalism, or other situations which render those structures ineffective.

- Abandoned mines must be evaluated for use by bats prior to permanent closure.

- Except for regularly scheduled population monitoring, or other legitimate scientific purposes, do not allow human entrance to Indiana bat hibernacula during the fall swarming, hibernation, and spring emergence period.

- Designate an area of at least 20 acres completely surrounding an Indiana or gray bat cave entrance(s)—including the area above known or suspected cave or mine passages, foraging corridor(s), ridge tops, and side slopes around the cave for permanent old growth management. Within this area, only vegetation management activities needed to reach the desired condition are allowed.

- Maintain an additional 130 acres of mature forest or mature woodland around each occupied Indiana or gray bat cave.

- The area around occupied Indiana or gray bat caves is a smoke-sensitive area. Develop prescribed burn plans to avoid or minimize smoke influences at or near these caves. Give the U.S. Fish and Wildlife Service an opportunity to review and comment on prescribed burn plans within these areas.

- Minimize the impact of smoke for each prescribed fire by identifying smoke-sensitive areas, using best available control measures, monitoring smoke impacts, and following applicable guidance.

- Within the 20 acres of old growth and 130 acres of forest or mature woodland surrounding an Indiana bat hibernacula, avoid prescribed burning and removal of suitable roost trees in the swarming and staging periods – dates to be determined individually for each cave (normally between September 1 and November 1 and between March 15 and April 31 respectively).

- Prohibit timber harvest activities within 100 feet of the edge of a sinkhole, cave entrance, or within the buffer zone for wetland features. (Reference: Forestwide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.)

- Prohibit skid trails within 100 feet of the edge of a sinkhole, cave entrance, or other karst feature, or within the buffer zone for wetland features. (Reference Forest-wide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.)

- Prohibit surface-disturbing mineral activities within 100 feet of the edge of a cave entrance, spring, seep, fen, sinkhole, or shrub swamp.

- Prohibit core drilling or other surface disturbing mineral operations over known caves and in the 20 acres designated around Indiana bat or gray bat caves and the additional 130 acres designated around Indiana bat caves.

- Do not use caves, sinkholes, and other karst features when locating new common variety disposal locations or pits.

- Do not allow camping within caves and 100 feet of a cave entrance.

- Locate new trails at least 100 feet from a cave entrance or wetland, unless the trail leads to an overlook or other interpretive opportunity regarding the natural feature. When reconstructing or maintaining existing trails near karst or wetland features, consider relocating the trail away from the feature.

- Whenever possible, avoid road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;

- Where feasible, relocate roads away from known cave entrances during road reconstruction or maintenance activities.

- Whenever possible, avoid temporary road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;

Summer roosting habitat

- Maintain trees with characteristics of suitable roosts (i.e., dead or dying with exfoliating bark or large living trees with flaking bark) wherever possible with regard for public safety and accomplishment of overall resource goals and objectives.

- If occupied Indiana bat maternity roost trees are discovered, protect them from physical disturbance until they naturally fall to the ground. Designate an area of use based on site conditions, radio-tracking or other survey information, and best available information regarding maternity habitat needs. Minimize human disturbance in the foraging and roosting areas of the maternity colony until the colony has left the maternity area for hibernation. The character of the site should be maintained or enhanced year-round by (1) maintaining an adequate number of snags, including known roost trees; (2) maintaining large live trees to provide future roosting opportunities; and (3) maintaining small canopy gaps (and/or opening the mid-story) to provide a continual source of foraging habitat.

- Within the area of use (foraging and roosting) determined for each maternity colony, conduct prescribed burning only during the hibernation season.

- Using the current, accepted technology, determine the location of summer roost trees and foraging areas for female Indiana bats.

- If occupied Indiana bat male roost trees are discovered during the summer season (not migration), protect them from physical disturbance by designating a 75-foot radius buffer zone around the tree(s). Within the buffer zone, no ground-disturbing activity or timber harvest shall occur. Prescribed burning may be done within the buffer zone if a fireline is manually constructed no less than 25 feet from, and completely around, the tree to prevent it from catching fire. The buffer zone shall remain in place until hibernation season begins (around November 1.)

- Protect known male roost trees from physical disturbance until they naturally fall to the ground.

- Remove hazard trees between November 1 and April 1 whenever possible.

- Whenever vegetation management is undertaken, leave standing dead trees, cavity or den trees, and downed woody material whenever possible, while providing for public safety and the achievement of resource management goals and objectives.

- All even-aged regeneration harvests shall retain at least 7%-10% of the harvest unit in reserve trees and/or reserve tree groups.

- Reserve trees and reserve tree groups should include a combination of the following:
  - The largest, long-lived species occurring on the site (pine, white oak, post oak, hickory, black gum);
  - Standing dead trees; and
  - Cavity or den trees.
- Space reserve trees and reserve tree groups to mimic natural community structure and composition.

- Include a combination of at least five trees in reserve tree groups. Where opportunities permit, locate some reserve tree groups within drainages.

- Plan salvage activities to leave at least 10%-15% of the affected area, unless the area presents an unacceptable risk to public health or safety, or threatens forest health. These areas should be in a variety of patch sizes and distributions on the landscape.

- Conduct an evaluation for the presence of Indiana bats prior to any decision to remove a building or bridge.

- Bridges proposed for construction or reconstruction across streams that are 40 or more feet wide should be designed of concrete with girders or chambers to provide suitable bat roosting space underneath whenever possible.

Summer foraging habitat

- Mimic ecosystem dynamics, patterns, and disturbance processes to achieve desired conditions except where ecological recovery is unlikely or unfeasible.

- Distribute activities across the landscape to emulate the historical vegetation patterns and quantities of natural communities based on available information. (1.1, 1.2, 2.1)

- Construct waterholes only where natural or man-made water sources are limited or lacking.

- *For the 1.1 and 1.2 Management Prescriptions only*: New wildlife waterholes shall only be constructed if site-specific analysis demonstrates a long-term, landscape-level viability concern for TES, RFSS, species groups (such as herptofauna), and such concerns cannot be addressed through waterhole construction in other areas of the Forest (i.e. 2.1 Management Prescription).

- Manage and rehabilitate existing waterholes as a priority over constructing new ones.

- Construct temporary pools at the end of outlet ditches whenever possible.

Spring and fall migrating habitat

See summer foraging and roosting habitat

Standards and Guidelines to Minimize Soil Movement, Sedimentation into Waterways, and Protect Water Quality and Quantity (Tumbling Creek cavesnail, , Pink mucket, , Scaleshell, Topeka shiner, Bald eagle, Gray bat)

- Do not exceed the soil's nutrient retention capacity when applying fertilizer.

- Revegetate soils disturbed by National Forest management activities by allowing growth of existing on-site vegetation where possible and desirable.

- Where on-site revegetation is not desirable, or not likely to quickly revegetate the site, use one or more of the following methods:
  - Fertilize to encourage growth of desirable on-site vegetation;
  - Apply local surrounding organic mulch (i.e., leaf litter and pine needles) or covering with sterile weed-free straw to promote reestablishment of native vegetation;
  - Reseed or replant with native species appropriate to the site or sterile annuals (wheat, rye, etc.) and fertilizing if necessary; or
  - Scarify to establish seed bed.

- Allow vegetation management within the RMZ only to move toward the desired condition.

- Within the RMZ the following activities are prohibited:
  - Pond fertilization;
  - Mechanical constructed firelines for prescribed burns;
  - Grazing within 100 feet of streambanks;
  - Fertilization;
  - Construction of sanitation facilities;
  - New motorized trails (except at designated crossings);
  - Timber management (unless needed to move toward desired condition, or for some salvage);
  - Drilling and associated structures;
  - Servicing of equipment;
  - New man-made impoundments, mine tailing ponds, and water diversion structures;
  - Maintenance of existing wildlife food plots;
  - Construction of new wildlife food plots;
  - Maintenance of existing wildlife openings (unless naturally occurring);
  - Construction of new wildlife openings;
  - Wildlife pond construction;
  - Log landings and;
  - Use of chemicals (unless needed to move towards desired condition).

- Within the RMZ the following activities should be avoided whenever possible:

- Placement of livestock distribution tools (water tanks, salt blocks, etc.);
- New recreational facilities and opportunities;
- Equipment operation;
- Mechanically constructed firelines for suppression;
- New roads (unless no feasible alternative);
- Temporary roads;
- Stream channel crossings;
- Removal of mineral material from stream channels; and
- Modification of beaver-created impoundments.

- Within the WPZ the following activities are prohibited:
  - Fertilization;
  - Timber management within 25 feet of stream
  - Servicing of equipment
  - Log landings;
  - New roads, unless no feasible alternative;
  - Temporary roads except at designated locations;
  - Maintenance of existing wildlife food plots;
  - Maintenance of wildlife openings, unless naturally occurring;
  - Wildlife pond construction; and
  - Use of chemicals (unless needed to move towards the desired condition).

- Within the WPZ the following activities should be avoided whenever possible:
  - Mechanically constructed firelines for prescribed burns;
  - Placement of livestock distribution tools (water tanks, salt blocks, etc.);
  - New recreational facilities and opportunities limited to low cost or flood resistant, minimize impacts to streams and ecosystems;
  - Construction of sanitation facilities;
  - Drilling and associated structures;
  - New man-made impoundments, mine tailings ponds and water diversions structures;
  - Equipment operation;
  - Mechanically constructed firelines for suppression;
  - Stream channel crossings;
  - Use of chemicals (unless needed to move towards the desired condition), and
  - Modification of beaver-created impoundments.

- Design all ground disturbing activities to prevent or minimize rutting, erosion, compaction, rapid runoff, disruption of water movement, and distribution or loss of water and soil quality.

- Prevent or minimize sedimentation by employing adequate erosion control measures where earth-moving activities unavoidably expose areas of soil for extended periods of time.

- Minimize ground-disturbing activities on soils highly subject to compaction during wet periods.

- Prohibit permanent stream channelization on National Forest System lands.

- Prohibit new man-made impoundments, mine tailing ponds, and water diversions within the RMZ.

- Whenever possible, avoid new manmade impoundments, mine tailing ponds and water diversions within the WPZ.

- Beaver-created impoundments should not be modified, except where human health and safety; private property; threatened, endangered, and sensitive species and their habitat; other riparian resources, or improvements such as roads, regulated dam spillways, bridges, or campgrounds are threatened.

- Limit in-stream use of heavy equipment to the minimal amount of time necessary for completion of the project.

- Design hydrologic control structures to mimic as much as possible the appearance and function of natural habitat features in the RMZ and WPZ.

- Design aquatic habitat enhancement structures using natural appearing materials and placement to mimic the appearance and function of natural habitat features.

- Use of heavy equipment to facilitate in-stream aquatic habitat improvement should be limited to the minimal amount of time essential for project completion.

- Fish or other aquatic organism passage in streams shall not be blocked or prevented unless done in conjunction with prescribed fish-management objectives.

- Remove large woody material from streams or streamsides only if it poses an immediate risk to water quality, degrades habitat for aquatic and riparian-associated wildlife species, or poses a public safety risk or a threat to private property or Forest Service infrastructures (i.e., bridges).

- Where practical and safe for firefighters and the public, utilize existing natural or manmade barriers, such as drainages, cliffs, streams, roads, and trails instead of constructed firelines.

- Encourage hand-constructed firelines where feasible and practical.

- Implement adequate erosion control measures (water bars, rolling dips, etc.) as shown in Table 2.3 on all constructed firelines where necessary to reduce the amount of sediment leaving a given area.

Table 2-3. Recommended spacing between drainage features.

Fire-line grade (%)	Distance between features (feet)
5 to 10	125
10 to 20	60
20 to 30	40
30 to 35	30

- Firelines and water diversion structures must not drain directly into stream channels, sinkholes, or other specialized habitats.

- Mechanically constructed firelines for prescribed fires are prohibited in the following areas:
  - On slopes greater than 35%, except for short runs with low erosion potential (for example, coming off of a road grade);
  - Within 100 feet from the upslope break or crest of the sinkhole;
  - Within the RMZ;

- Mechanically constructed firelines for prescribed burns should avoid the WPZ whenever possible. When there is no feasible alternative, lines crossing these areas should not disturb the ground (i.e., lift the blade) for 50 feet on each side of the channel.

- Mechanically constructed firelines for prescribed burns should avoid fragipan soils where feasible. For a list of fragipan soils See Appendix B.

- When the value-at-risk is low, and the Fire Intensity Level (FIL) is two or less, suppression activities should be the least impacting that still achieve the objective, such as allowing the fire to burn to a natural or manmade fuel break. When the value-at-risk is medium to high, a variety of suppression activities may be used including, but not limited to construction of fire lines.

- Use existing natural or manmade barriers—such as drainages, cliffs, streams, roads, and trails—instead of constructed firelines for suppression activities when the value-at-risk is low and where practical and safe for firefighters and the public.

- Unless necessary to protect life, structures, private property, or to maintain public and firefighter safety mechanically constructed firelines for suppression are prohibited:

- On slopes over 35% except for short runs with low erosion potential, (for example, coming off a road grade);
  - Within 100 feet from the upslope break or crest of the sinkhole;

- Mechanically constructed firelines for suppression should avoid WPZ and RMZ, unless there is no feasible alternative. Firelines crossing these zones should not disturb the ground (i.e., lift the blade) for 50 feet on each side of the channel, unless necessary to protect life, structures, private property, or to maintain public and firefighter safety.
- When using heavy equipment for suppression activities, cross stream channels at right angles. Stabilize and revegetate the crossing as soon as possible after the fire is controlled.

- Do not apply fire retardants directly over water bodies unless needed for firefighter or public safety.

- Wash and rinse equipment used in the mixing and application of pesticides and fertilizers in areas where runoff will not reach surface waters, wetlands, fens, sinks, or special other habitats.

- When using pesticides within the RMZ, WPZ, and within 100 feet of sinkholes, springs, wetlands, and cave openings adhere to the following:
  - Minimize the use of pesticides, herbicides, fertilizers, or hazardous materials;
  - Use only pesticides labeled for use in or near aquatic systems; and
  - Use only hand application and single plant application of herbicides and pesticides, unless other methods are approved by the forest supervisor based on environmental analysis that has shown they are environmentally sound and the most biologically effective method practicable.

- Grazing is allowed within the RMZ only under the following conditions:
  - Grazing may continue on existing improved pastures that are under an active permit as of September 2005;
  - Livestock are fenced at least 100 feet away from stream banks; and
  - Grazing on these allotments must be foreclosed at the earliest opportunity.

- Grazing shall not be allowed to degrade the RMZ or WPZ, or their functionality.

- Reduce livestock impacts and achieve desired structure and species composition objectives within the WPZ and RMZ by using tools such as hardened crossings, fencing, and controlled timing, duration, and intensity of grazing.

- Place livestock distribution tools such as feeding troughs, water troughs, salt and mineral blocks outside the RMZ, unless there is no other feasible alternative. Where there is no other feasible alternative, place livestock distribution tools so as to minimize use within the RMZ, unless needed to meet specific restoration objectives or desired conditions.

- Place livestock distribution tools to minimize use within the WPZ, unless needed to meet specific restoration objectives or desired conditions.

- Fertilization shall not be allowed within RMZ, WPZ, on glades or other natural communities.

- Within the WPZ, avoid development of new recreation facilities and opportunities whenever possible.

- Where development cannot be avoided:
  - Locate, construct, and maintain recreation facilities to minimize impacts on streams and riparian values and functions;

  - Design new recreation development and improvements to existing facilities (including all types of trails) to minimize impacts on ecosystems;
  - Plan recreation facilities improvements to be low-cost or flood-resistant in order to endure occasional flooding; and
  - Avoid locating new sanitation facilities within the WPZ. If toilets are installed in the WPZ, the vaults must resist flooding and prevent leakage of waste water.

- Within the RMZ:
  - Restrict facilities to low cost or flood resistant developments (i.e., boat ramps and trail and road crossings);
  - As existing facilities are being replaced, evaluate them and relocate when possible;
  - Prohibit construction of sanitation facilities;
  - Prohibit new motorized trails except at designated crossings; and
  - Locate stream crossings in areas that have a well-defined stream channel, minimal channel width, a low stream gradient, stable approaches, and stable banks on both sides of the proposed crossing.

- Provide for sufficient shade and large woody material recruitment to meet WPZ objectives when developing silvicultural prescriptions.

- Leave downed woody material on site whenever possible.

- Mechanical site preparation that exposes bare soil on more than 25% of the treated area is not allowed.

- Salvage of dead or dying timber and other sanitation removals may occur in the RMZ, when the riparian values are protected and the activities are needed to protect public safety, resource values, and maintain the health of the forest.

- Design and implement all ground-disturbing activities to prevent or minimize soil dislocation, compaction, rapid runoff, disruption of water movement, and distribution or loss of water and soil quality.

- Allow timber management activities within the RMZ only to move the area towards the desired condition.

- Restrict equipment operation within the WPZ and RMZ to designated crossings or other approved locations.

- Mechanized equipment may make one to two passes off designated skid trails within the WPZ when needed to facilitate management activities, but not within the 25-foot buffer zone.

- Ensure all equipment used for harvesting and hauling operations is serviced outside of the RMZ and WPZ.

- Within 25 feet of a WPZ stream channel:

  - Do not cut trees, unless necessary to move the area towards the desired condition or to facilitate designated crossings; and
  - Do not operate mechanized equipment, except at designated skid trail locations.
  - When possible, avoid cutting trees that are anchoring the banks of all drainages, including those that are not within the RMZ or WPZ. If these trees must be cut, the stump and root system should be left in place and intact whenever possible.

- Remove tops from drainages within the RMZ and WPZ, and avoid concentrations of tops and slash in drainages outside the RMZ and WPZ.

- Suspend operations during wet periods when excessive rutting and soil displacement are anticipated.

- When removing felled trees from areas of soils with high rutting or compaction potential, methods must be used which minimize rutting or displacing soil (i.e., use of low ground pressure skidders, operate when the ground is dry or frozen). Soils with a high compaction potential are listed in Appendix B.

- Skidder operation is prohibited on slopes over 35%.

- Do not use stream channels or drainages as skid trails or temporary logging roads.

- Skid trails should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, or watercourses.

- Implement adequate erosion control measures on skid trails to reduce the amount of sediment leaving a given area (see table 2-8).

Table 2-8. Recommended spacing between drainage features.

Skid-trail grade (%)	Distance between features (feet)
5 to 10	125
10 to 20	60
20 to 30	40
30 to 35	30

- Keep erosion control work as up to date as practical.

- Locate log landings outside of the WPZ and RMZ.

- All surface-disturbing mineral activities must have a Forest Service approved Plan of Operation or Surface Use Plan that includes a reclamation plan.

- Reclamation on any mineral operation site should commence as soon as impacts on any part of the site are completed. Consequently, reclamation should keep pace with ongoing mineral activity.

- After mineral operations have been completed, all facilities shall be removed from the site. The disturbed area shall be reclaimed to prevent erosion and sedimentation. The site shall be re-contoured when necessary. The site shall be revegetated to meet management area objectives.

- Avoid drilling, drill pad construction, and structures within the WPZ when possible.
- Drilling, drill pad construction, and structures are prohibited within the RMZ.
- Restrict equipment operation within the WPZ and RMZ to designated crossings or other approved locations.
- Removal of mineral materials, such as sand and gravel, from stream channels or RMZ's is prohibited, unless needed for protection of infrastructure or for public health and safety.
- Use minimum road construction, reconstruction, and maintenance standards necessary to meet management area objectives, protect area resources, accommodate design vehicles, and provide safe and efficient travel.
- Schedule road construction, reconstruction, and maintenance to take advantage of favorable weather and ground conditions, and to avoid high stream flows.
- Existing roads should be used in preference to the construction of new ones.
- Locate new roads outside the RMZ and WPZ, unless there is no feasible alternative.
- Whenever possible, avoid road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;
  - Within 100 feet from the upslope break or crest of the sinkhole, other karst feature, rock bluffs, outcrops, or cliffs;
  - Within 100 feet of glades;
  - Within the buffer zone for wetland features, (Reference Forestwide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management.); and
  - Within, or near, collapsed features or losing streams.
- Construct road grades at less than 10%, although steeper grades may be suitable for short sections of road.
- Design and construct drainage features so that run-off water is spread, retained, or infiltrated below or beyond drainage features. Install drainage features at appropriate intervals to prevent erosion.
- Consider fords only where permanent roads receive low or intermittent use, and use is restricted to low-flow periods.
- Fords should only be used where stream bottom conditions can support this use.
- Where stream crossings are necessary, roads should cross at right angles, perpendicular to the flow of water, with minimal disturbance of the stream banks and bed.

- A stream crossing must include mitigating measures, which protect the channel from disturbance and the road from storm-flow.

- Design crossings to:
  - Allow passage of LWM, bed load and floating debris, when possible;
  - Maintain stable channel configurations, native local substrates, and native vegetation;
  - Carry expected storm flows; and
  - Provide passage for aquatic and semi-aquatic organisms (i.e., fish, crayfish, shellfish, salamanders, and turtles).
- Whenever possible, conduct in-stream construction activities from August through October and avoid the period between March and June, to avoid disrupting aquatic species during spawning season.

- Allow equipment operation within the RMZ only at designated crossings or other approved locations.

- Stream channels and drainages shall not be used as travel ways for any mechanized equipment.

- Temporary roads are prohibited within the RMZ and WPZ except at designated locations.

- Minimize stream channel crossings by temporary roads within the RMZ or WPZ.

- Locate stream channel crossings within a stable reach and harden if needed.

- Remove hardening material and restore the original contours of the banks and approaches when practical and as needed.

- The Forest Service must approve layouts of any temporary access under permit, lease, or contract before construction.

- Whenever possible, avoid temporary road construction:
  - Above known cave passages;
  - Within 100 feet of known cave and abandoned mine entrances;
  - Within 100 feet from the upslope break or crest of sinkholes, other karst features, rock bluffs, outcrops, or cliffs;
  - Within 100 feet of glades;
  - Within the buffer zone for wetland features (reference: Forest-wide Standards and Guidelines for Geological Features under Terrestrial and Aquatic Wildlife management); and
  - Within or near collapsed features or losing streams.

- Temporary roads should not drain directly into roads, areas of disturbed mineral soil, sinkholes, fens, springs, other small wetlands, or watercourses. Install drainage features at appropriate intervals to prevent erosion.

- Erosion control work should be kept up to date to minimize soil movement.

- Decommission temporary accesses when no longer needed for the purpose for which it was developed.

- All unneeded roads under Forest Service jurisdiction should be decommissioned.

Appendix E
Indiana bat Survey Strategy
Mark Twain National Forest Revised Forest Plan

MTNF Indiana Bat Survey Strategy 1997-2004

1980 -2004 Periodic population surveys at Indiana bat hibernacula and at gray bat summer and winter caves in cooperation with MDC.

1997 & 1998 Started surveying MTNF lands near FLW (near where reproductively active females had been previously caught).
Also surveyed near Indiana bat hibernacula on MTNF (i.e. White's Creek Cave).
Set up mist nets over ponds, road ruts, intermittent streams, and road clearings near ponds.
Anabats or other acoustic devices set up with/near mist net locations to test comparison between the 2 methods.

Harp trapped at hibernacula entrances in fall to gain understanding of swarming activity and cave preferences.

Installed temperature and humidity monitors at both MTNF hibernacula. Data indicated both caves are warmer than ideal temperatures for Indiana bat during winter months.

1999 Added surveying of various areas around Forest to obtain information on summer roosting and foraging habitat for all forest bats, including Indiana bat to contribute to range-wide understanding of habitat use.

Programmatic Biological Opinion issued with RPM/TC related to Indiana bat hibernacula, maternity colonies, capture sites of reproductively active females, and foraging areas.

2000 Began targeting specific projects where bat habitat might be affected (i.e. oak mortality areas – oak health EIS)

2001 Began long-term study of forest bats in Pineknot Project Area (pine woodland restoration) to gather baseline bat data prior to activities (surveys continued in 2002).
Continued oak health surveys, and survey of areas of HRCC near hibernacula & reproductively active female capture locations.

2002 Added surveys of other project areas as a way to stratify the Forest and get information from all units on habitat use by other forest bats, as well as occurrence and habitat use of Indiana bat.

2003-2004 Continued survey of project areas to get information from across the Forest.

2003 Capture of pregnant female on Potosi/Fredericktown District triggered identification of AOI and implementation of RPM/TC related to capture site of reproductively active female. Radio not attached due to risk to small female in advanced state of pregnancy.

2004 Tracking of 2 pregnant females from COE land to roost tree on MTNF lands results in identification of maternity roost tree on Poplar Bluff District, and triggers implementation of RPM/TC related to identification of maternity colony site. Possible reevaluation of future MTNF survey strategy.

2005 Gather pre-treatment data on possible sites for management effects study in cooperation with North Central Research Station, MDC, and FWS. Increase use of acoustic surveys as a method of narrowing mist-net surveys. Attempt radio-tracking of bats from hibernacula in spring.

MTNF Survey Strategy Rationale

1980 -2004

The Mark Twain National Forest has cooperated with Missouri Department of Conservation since the early 1980's to survey hibernating populations of Indiana bats in MTNF caves. Despite consistently low numbers of Indiana bats at each of the four known hibernacula on National Forest lands, we will continue to survey these caves on a schedule determined jointly by MTNF and MDC bat specialists.

1997 & 1998

During preparation of the programmatic Biological Assessment for continued implementation of the Forest Plan, and evaluation of existing data on summer habitat use by Indiana bats, MTNF determined that additional survey information was needed to get a good picture of Indiana bat summer habitat use on MTNF lands. In cooperation with researchers at North Central Research Station, we decided to start survey efforts in areas where it seemed likely that Indiana bats would be caught (i.e. near known hibernacula and near other locations where reproductively active females had previously been caught). In addition, some work was done at cave entrances during the fall to understand their function as swarming habitat.

1999

After reviewing data gained by 1997-1998 surveys, MTNF, in cooperation with NCRS, decided to expand efforts to additional areas of the Forest and include other forest bats as part of the survey effort. While much has been done over the past decade to understand Indiana bat habitat use, little is known about most other forest bat species.

2000-2003

Starting in 2000, we increased survey efforts by targeting specific project areas across the Forest (a) where potential impacts to Indiana bat were occurring (i.e. oak mortality areas) and (b) as a useful way to stratify the Forest, schedule surveys, and ensure that the whole Forest would be surveyed in the long-term.

In addition, MTNF started a long-term study of forest bat habitat use in the Pineknot Project Area, gathering pre-treatment data.

2003 – 2004

Capture of a pregnant female at Silver Mines in 2003, the discovery of a maternity colony at Poplar Bluff, and capture of several males and an additional female at Salem/Potosi/Fredericktown caused us to reevaluate MTNF's short and long-term survey strategy. The following letter from Forest Supervisor Ronnie Raum to the USDI Fish and Wildlife Service, Missouri Department of Conservation, and North Central Research Station describes the rationale for this shift in strategy.

File Code: 2600/2610
Date: February 15, 2005

Mr. Charles Scott
U.S. Fish and Wildlife Service
101 Park DeVille Dr.
Suite A
Columbia, MO 65203-0007

Dear Mr. Scott:

At an interagency meeting on Wednesday, October 28, 2004, members of our staffs met to discuss the Mark Twain National Forest's role in Indiana bat conservation in Missouri. Specifically, the discussion centered around surveying for Indiana bats, and other forest bats. The group's objective was to determine a survey strategy that will result in information needed to conserve and protect the Indiana bat on the Mark Twain National Forest.

It was a very successful meeting; and three recommendations were brought back to me. These recommendations are for actions that the Mark Twain National Forest should implement, and would involve a partnership with all the agencies represented at the meeting (Mark Twain National Forest, North Central Research Station, US Fish and Wildlife Service, Missouri Department of Conservation).

The group determined that random surveys to determine the presence of Indiana bats were not sufficient to answer the two primary questions which we, as forest managers, need to answer. The actions which this group recommended to me are intended to answer these two questions.

1. What are the effects of forest management on Indiana bats and other forest bats in Missouri?
2. Is the Mark Twain National Forest providing quality habitat, well-distributed across the Forest for Indiana bats and other forest bats?

If we know the answers to these two questions, the Forest Service and other land management agencies can make better informed management decisions; regardless if we know that bats are present or absent in a specific area.

In order to answer these questions, we need to:

a) conduct a statistically valid study of effects of management actions on forest bats, including Indiana bat,
b) conduct a focused study of the 2004 maternity colony at Poplar Bluff to give us valuable information about the only known maternity colony located in a continuously forested landscape rather than fragmented landscapes, and
c) conduct "targeted" surveys for Indiana bats in habitats likely to result in capture; as well as surveys of general forest areas for information on other forest bat species.

I intend to move forward with these actions on Mark Twain National Forest. However, I would like to get your concurrence that these actions are biologically appropriate and necessary to advance the conservation of forest bats in Missouri. And, since our forest bats do not recognize
political/agency boundaries, I would also like to gain your agency's commitment to explore further partnerships that will help us all understand more about forest bats in Missouri.

In addition, the Indiana Bat Agency Draft Recovery Plan states "research designed to identify the cause(s) of the current population decline must be the number one priority of the recovery plan." A study would help determine if specific forest management practices are, or are not, probable causes for continued decline.

The Agency Draft Recovery Plan also states "Further, definitive habitat management recommendations cannot be made until the importance of various habitat characteristics

is known. Research and monitoring projects need to be initiated immediately and simultaneously to answer these important questions." The study envisioned will help determine important habitat characteristics in Missouri.

Together, we have accomplished much in our understanding of Missouri's forest bats over the past two decades. I look forward to continuing the vital partnerships we have undertaken, and to continued success in bat conservation work.

If you have questions, please contact Rich Hall at (573) 341-7404, or Jody Eberly at (573) 341-7499.

Sincerely,

/s/ Ronnie Raum
RONNIE RAUM
Forest Supervisor

cc:
John Hoskins, MDC
Linda Donoghue
North Central Research Station

2005

As a result of this shift in thinking, the survey strategy for FY 2005 has been adjusted to begin the process of answering the questions posed at the October meeting. Early spring harp trapping was done at the newly discovered hibernaculum to attempt radio-tracking of females from the cave to their summer locations. Only males were captured, but some valuable information was gained from radio-tracking two males.

The project areas chosen for survey this year were based on (a) their potential as management study units (5 areas on the Poplar Bluff, Salem/Potosi and Houston/Rolla units), (b) their proximity to previously captured Indiana bats (4 areas on the Poplar Bluff and Salem/Potosi units), or (c) the lack of survey data in certain areas of the Forest (3 areas on Houston/Rolla, Eleven Point, and Ava units).

Ten Anabat acoustic units were purchased by the Forest to broaden the area of survey possible in a given year. Acoustic surveys in FY 2005 will be targeted to areas around hibernacula and the Silver Mines female capture site (early spring to test units); areas that are possible management study units; areas recommended for additional survey in the 2004 SIR, and to increase coverage of the west side of the Forest.

The following charts show the preliminary priorities for surveying on MTNF in FY 2005. If Indiana bats are captured and radio-tracked, the schedules may be adjusted. The

highest priority is to get the most information possible about both foraging and roosting habitat use, which means that radio-tracking individuals is given top priority.

Bat Survey Proposals For FY 05

1/13/2005

Priority*	District	Area	Remarks
1	PB	Pine Ridge	Possible study site
1	HRCC	Northwest	Possible study site
1	Sal	District (Targeted searches)	Possible study site
2	PB	Otter Creek	Possible study site
2	PF	Shirley	Possible study site
2	HRCC	Southard	
2	EP	Compton	
2	ACW	Brushy Creek/Clayton	
2	PF	East Fredericktown	FWS requested additional surveys
3	ACW	Rock Creek	Surveyed 02
3	ACW	Turnip Knob	Submit next year
3	ACW	Bluehole	Submit next year
3	EP	Pineknot	Monitoring - Wait till more work done
3	PF	Palmer West	Submit next year
3	ACW	Weeks Allotment	No funding this year - submit next year
4	PF	Clear Creek	Acoustic - District biologists complete
4	PF	Delbridge	Acoustic - District biologists complete
4	Sal	Crooked Creek	Acoustic - District biologists complete
4	PB	Blackwell OHV study area	Mist & Acoustic - No funding this year
4	PF	Cherokee OHV study area	Mist & Acoustic - No funding this year

NUMBER 1 & 2 PRIORITIES WILL BE FIRST ON NORTH CENTRAL'S SCHEDULE.

NUMBER 3 PRIORITIES WILL PROBABLY NOT BE MIST-NETTED IN FY 05, BUT CAN BE SURVEYED ACOUSTICALLY BY DISTRICT PERSONNEL. If there are no unforseen difficulties with surveys, AND IF no Indiana bats are captured, some Number 3 priorities may be surveyed in FY 05.

Number 4 priorities should be done by District biologists if time permits.

* Number 1 priorities are areas having pre-treatment data collected for Forest-wide study of effects of Forest management on Ibats and where Ibats are known or highly suspected to occur in summer.

* Number 2 priorities are areas near 2003/2004 capture sites of Indiana bats (PB, Sal, PF) or in areas with little survey info to date

* Number 3 priorities are areas which can wait another year before surveys.

* Number 4 priorities are areas recommended for additional survey in SIR and may be acoustically surveyed by District personnel

* Some of the Number 3 & 4 priorities are in areas of the state which are biologically the least likely to have summering Indiana bats

Bat Acoustic Survey Proposed Schedule For FY 05

3/23/2005

Priority	District	Area	Week scheduled	Remarks
Testing	HRCC	Knife Cave	April 4-22	Hibernacula
Testing	PF	Cave Hollow Cave	April 4-22	Hibernacula
Testing	EP	White's Creek Cave	April 4-22	Hibernacula
Testing	PF	Silver Mines & mine entrances	April 25 - May 13	Pregnant female capture site & possible gray bat use
1	PF	Delbridge	May 16-20	Possible mgmt study site
2	PF	Clear Creek	May 23-27	04 SIR recommendation
3	Sal	Crooked Creek	May 31-June 3	04 SIR recommendation
4	Sal	East Karkaghne	June 6-10	Possible mgmt study site
5	PF	Palmer West	June 13-17	Possible mgmt study site
6	ACW	Bluehole	June 20-24	West side MTNF coverage
7	ACW	Turnip Knob	June 27-July 1	West side MTNF coverage
8	ACW	Rock Creek	July 5-8	West side MTNF coverage
9	ACW	Weeks Allotment	July 11-15	West side MTNF coverage
10	PB	Blackwell OHV study area	July 18-22	04 SIR recommendation
11	PF	Cherokee OHV study area	July 25-29	04 SIR recommendation

The following areas are planned for mist-netting in FY 05. If Indiana bats are caught and radio-tracked, we may want to shift acoustic surveys to some of these areas since the mist-netting schedule may be interrupted for tracking.

1	PB	Pine Ridge		Possible mgmt study site
2	HRCC	Northwest		Possible mgmt study site
3	Sal	District (Targeted searches)		Possible mgmt study site
4	PB	Otter Creek		Possible mgmt study site
5	PF	Shirley		Possible mgmt study site
6	HRCC	Southard		Salvage near AOI
7	EP	Compton		Southcentral MTNF coverage
8	ACW	Brushy Creek/Clayton		West side MTNF coverage

Appendix F
Photo Album
Mark Twain National Forest Revised Forest Plan Biological Assessement

MEAD'S MILKWEED

Mead's milkweed on Bell Mountain
Photo by David Moore

Bell Mountain – Mead's milkweed site
USDA Forest Service photo

HINE'S EMERALD DRAGONFLY

ATV Damage
Blue Flag Fen – summer 2004
Photo by Keith Kelley

Blue Flag Fen – Beginning to Recover
October 2004
Photos by Keith Kelley

Welker Fen – possible Hine's emerald dragonfly site
Photo by Lynda Mills

Barton Fen road closure to prevent ATV access (summer 2004)
Before – access to fen on right After – fence closes illegal access
Photos by Lynda Mills

BALD EAGLE

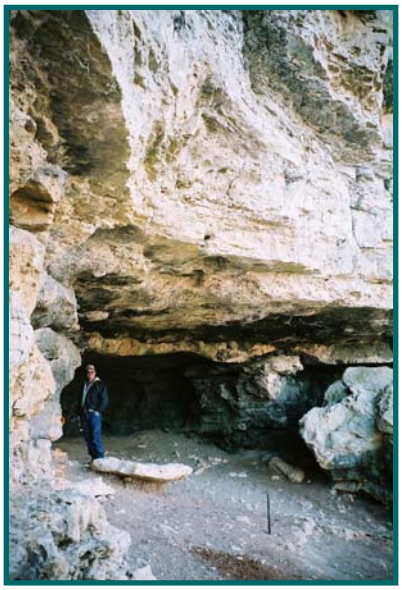
Bald eagle nest along Eleven Point River
(Photos by Keith Kelley)

2002

Inactive bald eagle nest on Eleven Point River
(Photos by Keith Kelley)

GRAY BAT

Turner Spring Cave
Gray bat maternity cave
Gated inside entrance
US Forest Service Photo



Bat Cave
Gray bat maternity cave
US Forest Service photo

Bat Cave – Ozark County- gate inspection

INDIANA BAT



Maternity roost tree and surrounding habitat
Poplar Bluff
(Photos by Megan York- Harris)


Salem male roost tree and roost tree location
(Photos by Sarah Bradley)






Male roost trees on Salem District
(Photos by Sarah Bradley)


Male roost trees East Fredericktown
(Photos by Lynda Mills)

Salem female foraging areas
(Photos by Sarah Bradley)

Male capture sites – Salem & East Fredericktown
(Photos by Sarah Bradley & Lynda Mills)