# Appendix

# Appendix A: A Backgrounder on Forest Certification

Forest certification is a way for the manufacturers of wood and paper products to provide assurances that the wood or wood fiber used in their product comes from a forest that has been properly managed.

The assurances provided are generally that the forest is managed and wood is harvested in a way that protects and enhances soil, water, cultural, and natural resources. Under the required management regime, consideration is given to providing wildlife habitat and enhancing biological diversity. Wood is produced under a system that yields a long-term sustained volume. Reforestation is accomplished in a timely manner. Harvested wood is not wasted. Forests are adequately protected from fire, insect, and disease damage. The aesthetic impacts from harvesting trees are mitigated, and landowners, operators, and manufacturers are held accountable for compliance with all applicable state, local, national, and international laws.

Verification that these assurances have been met is accomplished through independent evaluations conducted by third-party auditors who are trained and qualified according to national standards for audit professionals.

Once verification has been completed, manufacturers can place a label on their products signifying that the wood contained in each labeled product comes from a properly managed forest.

This background paper provides information on who is responsible for overseeing certification systems and where certification currently stands as an industry practice.

## Primary Certification Systems

There are five organizations that are most relevant to current and any future certification activity in Missouri. Each has a somewhat different emphasis and lexicon, and they all have their core supporters. They are not necessarily exclusive of one another, and in some instances one system is designed to be supportive or complementary of a second system. There are some landowners and producers who subscribe to multiple systems.

## The Forest Stewardship Council

The Forest Stewardship Council (FSC) came into existence in 1993. Its overall governing body, the general assembly, is international and consists of all members, who must designate themselves as part of the economic chamber, the social chamber, or the environmental chamber. Each chamber is allotted equal weight in decision making, and voting is further weighted to give the developing countries of the southern hemisphere equal say to the developed countries of the northern hemisphere. A board of directors that is similarly balanced is elected by the general assembly.

Their international headquarters are located in Bonn, Germany. At that level, FSC establishes principles and criteria that apply across all countries. There are ten principles, each with multiple criteria. As an example of the level of specifics applied internationally, Principle 5, "Benefits from the Forests," states: "Forest Management Operations shall encourage the efficient use of the forest's multiple benefits and services to ensure economic viability and a wide range of environmental and social benefits."

There are five criteria intended to support this particular principle. An example is Criterion 5.1, which states: "Forest Management should strive toward economic viability, while taking into account the full environmental, social and operational costs of production, and ensuring the investments necessary to maintain the ecological productivity of the forest."

In each country where FSC is utilized, a national-level body is formed. FSC–US is headquartered in Minneapolis, Minnesota. The national body is structured similarly to the international organization and has the responsibility for establishing indicators under each criterion. These indicators are the measurable requirements involved in becoming certified. An example is Indicator 5.1.a under Criterion 5.1, which states: "The forest owner or manager is financially able to implement core management activities, including all those environmental, social and operating costs, required to meet this Standard, and investment and reinvestment in forest management." Indicators are applicable all across all U.S. forests.

In addition, there are limited instances where the national body has adopted more specific standards at the regional level. For example, Indicator 6.3.g includes further guidelines for the Ozark-Ouachita Region, which, among other things, state: "Even-aged opening sizes are limited to a maximum of 20 acres."

Qualified auditors must be accredited by FSC.

Manufacturers who want to use the FSC label on their product must achieve a "Chain-of-Custody Certification," which ensures there is a system in place to track what wood comes from certified forests. There are several label options available depending upon the percentage and type of acceptable content in the product.

For smaller landowners and manufacturers, FSC provides a process for "Group Certification" where several enterprises can join together in order to lower costs.

Complete, more detailed information can be found at ***fsc.org***.

# The Sustainable Forestry Initiative, Inc.

The Sustainable Forestry Initiative, Inc. (SFI) began as a reporting requirement for members of the American Forests and Paper Association (AFPA) in 1994. By 1998 it had evolved into a system for third-party certification of forest lands to the SFI Standard. By 2002 it had officially separated from AFPA to become an independently governed, nonprofit organization that manages a certification system applicable to operations in the United States and Canada.

It is governed by an 18-member board of directors comprised of six members from each of three chambers — economic, environmental, and social. Replacements to the board are nominated and selected by existing members. They approve revisions to the SFI Standard, requirements for on-product labeling, and all other elements of governance.

Auditors must be accredited by the Standards Council of Canada (SCC) or the American National Standards Institute–American Society for Quality (ANSI–ASQ) National Accreditation Board, otherwise known as ANAB. Audits must be conducted according to processes consistent with the requirements of the International Organization for Standardization (ISO) 17021:2006 conformity assessment and in accordance with principles contained in ISO 19011:2002 Guidelines for Quality and/or Environmental Management Systems Auditing.

Participants must have a written policy to achieve 14 overall principles that cover such topics as forest productivity and health, protection of water resources, protection of biological diversity, and responsible fiber sourcing. Supporting these principles are seven objectives that apply to land management operations, six objectives that apply to operations involved in fiber procurement, and seven objectives that apply to either of those operations. Under each objective there are one or more performance measures, and under each performance measure there are several indicators.

An example of this structure is:

- Objective 3. Protection and Maintenance of Water Resources. To protect water quality in rivers, streams, lakes and other water bodies.

- Performance Measure 3.1. Program participants shall meet or exceed all applicable federal, provincial, state and local laws and meet or exceed best management practices developed under Canadian or U.S. Environmental Protection Agency-approved water quality programs. Indicators:
  - Program to implement state or provincial best management practices during all phases of management activities.
  - Contract provisions that specify conformance to best management practices.

In order to use the on-product label, primary manufacturers must be certified in compliance with those portions of the SFI Standard that are required for fiber procurement operations, namely, Objectives 8–20 and their accompanying performance measures and indicators. Secondary manufacturers who want to label their products must pass a Chain-of-Custody audit, verifying that the wood they are using is from an SFI-certified primary producer.

There are no specific group certification systems under SFI, but this would not prohibit a group of entities from seeking certification together, as long as the audit process met ISO standards as outlined above.

More information is available at ***sfiprogram.org***.

# The American Forest Foundation

The American Forest Foundation (AFF) has been in existence since the 1940s and has had as one of its primary programs the American Tree Farm System (ATFS) since inception. In 2006 the AFF board of directors established procedures for developing "Standards of Sustainability for Forest Certification." Subsequently, all members of ATFS were group certified by independent auditors working with each state as a separate group and with audit costs paid by AFF. The program is currently in transition to a system whereby members of ATFS will have the option to become group certified by paying a separate fee.

ATFS determines who is qualified to verify conformance and establishes the acceptable procedures for doing so. By direction of the AFF board of directors, members of the panel who draft standards must represent a "cross-section of forestry community leaders with a stake in AFF's Tree Farm Program, or a sincere interest in forest sustainability on small private forest ownerships in the US."

The system is available to anyone in the United States owning 10 or more acres of woodland and is comprised of eight standards, under which are performance measures and accompanying indicators. An example of their structure is:

- Standard 4: Air, Water and Soil Protection — Forest management practices maintain or enhance the environment and ecosystems, including air, water, soil and site quality.

- Performance Measure 4.1 — Forest owner must meet or exceed practices prescribed by State Forestry Best Management Practices (BMPs) that are applicable to the property.

- Indicator 4.1.1 — Forest owner must implement specific BMPs that are applicable to the property.

For purposes of compliance with SFI's objectives for fiber procurement operations, AFTS-certified lands are recognized as a certified source of wood.

Additional information is available at ***forestfoundation.org***.

# Programme for the Endorsement of Forest Certification

Originally established as the Pan-European Forest Certification System in the mid-1990s and primarily focused on private forest landowners in Europe, this organization eventually evolved into the Programme for the Endorsement of Forest Certification (PEFC). As such PEFC establishes criteria as to what constitutes a credible forest certification system, and certification organizations from across the globe can petition to become part of the PEFC Mutual Recognition umbrella.

This allows systems to be tailored to a national level, recognizing the unique circumstances and culture of each country, at the same time allowing those systems to be judged at the international level as credible. Once endorsed by PEFC, wood certified under that national-level system can move more freely across international boundaries under reciprocal understandings of recognition.

Headquartered in Geneva, Switzerland, PEFC has endorsed more than 30 systems worldwide, including SFI and ATFS. It is governed by a general assembly composed of both representatives of endorsed certification systems and international stakeholders such as the International Laborers' Organization, which oversees global standards for the rights of workers. The general assembly selects a board of directors who support the work of the general assembly and the organization as a whole.

Criteria for endorsement cover such topics as governance structure, decision-making processes, chain-of-custody requirements, labeling procedures, and topics that must be addressed by a certification standard. In total there are more than 300 criteria that must be met. An example of their structure is:

- 5 Specific requirements for SFM standards

- 5.1 Criterion 1: Maintenance and appropriate enhancement of forest resources and their contribution to the global carbon cycle.

- 5.1.1 Forest management planning shall aim to maintain or increase forests and other wooded areas and enhance the quality of the economic, ecological, cultural and social values of forest resources, including soil and water. This shall be done by making full use of related services and tools that support land-use planning and nature conservation.

Petitions for endorsement are evaluated by independent expert contractors who are hired and overseen by the board of directors, and the petitions are ultimately voted on by the general assembly.

More information is available at ***pefc.org***.

# The International Organization for Standardization

The International Organization for Standardization (ISO) was established in 1947 and sets voluntary standards that cover just about any aspect of technology and business. As with PEFC, this organization is also headquartered in Geneva, Switzerland. Members comprise a network of national-level standard-setting bodies, such as the American National Standards Institute in the United States.

ISO is governed by the member institutes.

SFI draws on ISO standards to define what constitutes an acceptable audit process and scope.

In addition, many organizations use the ISO Standard 14001:2004 to structure their certification program. ISO 14001 defines a system that can be used to manage an entity's risk for impacting the environment. It defines the elements of the environmental management system that must be in place and how those elements should be utilized.

For example, ISO 14001 requires that there be a documented environmental policy and method in place to ensure that the policy is implemented, maintained, and communicated to all employees. Using ISO 14001 as the basic

structure, organizations can build a system of compliance for a forest certification standard knowing that their system has a high likelihood of being successfully implemented and maintained.

Auditors that are qualified to conduct ISO verifications meet the same requirements as those qualified to do SFI verifications. Some organizations have both their ISO system and their SFI compliance audited together.

# The Current State of Forest Certification

Worldwide more than one-fourth of the world's industrial round wood production comes from a certified operation. As of 2012, approximately 500 million acres of forest were certified in the United States and Canada.

In Missouri, forest certification has been more slowly adopted than perhaps in any other state in the country with a significant acreage of forest land. The L-A-D Foundation's approximate 180,000 acres is certified to the FSC standard. With transition currently underway, it is not known how many Missouri ATFS members will remain certified. There are no acres certified to the SFI standard in the state. There are also no in-state primary producers certified to SFI's set of fiber procurement objectives, though a couple of paper mills located out of state procure chips in Missouri and are SFI certified. There are a small number of primary producers who have an FSC Chain-of-Custody Certificate.

When certification first began, there was a presumption that it would be adopted based on the marketplace paying more for certified wood and paper products. This "market premium" has been realized in some limited instances but not in a widespread fashion. Instead, major customers have driven the movement toward certification more as a requirement for doing business with their organization. This need to maintain market access has made its presence felt in the paper industry and the commodity lumber market. There has also been applicability in the growing "green building" market. By and large, products manufactured in Missouri (barrel staves, pallets, railroad ties, and grade hardwood lumber) have not experienced the market pressure that would drive the state's primary producers into a certification program.

From a resource health and sustainability standpoint, credible research has shown that where certification is widely adopted there have been measurable improvements in the benefits produced by forest management.

# Appendix B: Best Management Practices for Common Cultural Resources

## Criteria of Cultural Resources

Criteria for National Register Evaluation of Cultural Resources can be found at ***achp.gov/nrcriteria.html***.

The following are best management practices for different types of cultural resources that may be encountered in Missouri. The BMPs are derived and modified from BMP guidance used for public land management by the Missouri Department of Conservation on public lands.

## BMPs for Prehistoric Burial Mounds and Rock Cairns

In Missouri, prehistoric mounds are earthen structures that may have a variety of shapes and were likely constructed primarily for burial purposes. Cairns, on the other hand, may be one of two construction types depending on function. Burial cairns are constructed of rock or rock and earth and are usually low in height and wide in diameter. Cairns used as boundary or trail markers, however, are constructed of rock and are narrow and more conical or columnar in shape.

Prehistoric burial mounds and cairns are a very sensitive and endangered cultural resource. They are considered sacred by Native American peoples. For this reason, burial sites are afforded some protection under the Missouri Revised Statutes 194.400–410. Because grave goods are sometimes associated with burial mounds and cairns, they are sought-after targets for looters who will dig to steal artifacts and human remains for display and profit.

Key features identifying a prehistoric burial mound or rock cairn include:

- Circular, conical, oblong, or other earthen features that do not resemble the natural surroundings.
- Mounds are generally no smaller than 15 feet in diameter and may have a diameter up to 150 feet, or larger.
- Burial mounds and cairns are often located on terraces or bluffs overlooking major rivers or permanent streams.
- Prehistoric materials such as chipped chert flakes, prehistoric tools (projectile points, blades, etc.), or pottery may be located in the vicinity of the mound or cairn.
- Cairns can be U-shaped, square, rectangular, or conical.
- Cairns can vary from a small, loose pile of stones to more elaborate construction.

### Management Recommendations for Prehistoric Burial Mounds and Rock Cairns

- Prior to construction or any land-disturbing activities in the vicinity, the established buffer should be marked off with flagging tape. Flagging should be removed at the conclusion of the project so it does not draw attention to the site.
- Identify potentially destructive threats to the burial mound or cairn and address these threats on a case-by-case basis. To deter erosion and to aid in camouflage, the growth of naturally occurring, minimally invasive plants (i.e., tall grasses, scrub brush, poison ivy, etc.) on and around the mound is encouraged. Avoid planting trees on or around the mound as the roots may have an unwanted, destructive effect on the mound and/or the

associated burial(s). If the mound lies on a stream bank in an area of high erosion, take appropriate measures to slow or stop the erosion process, if possible.

- If small saplings are growing on the mound or cairn, they may be removed if their roots are growing no greater than 4–6 inches below the surface. Larger saplings should be cut off at the ground and the stump treated to prevent regrowth.

- Generally prehistoric burials occurred within the central portion of a mound or cairn. Erosion, farming, flooding, or other disturbance may soften the profile or scatter mound construction material. A buffer around the identified mound area should be maintained to prevent disturbance of artifacts that may be scattered. Excavation or other forms of disturbance should be avoided within the buffer area established for protection. Do not drive or park heavy equipment in the buffer area. Refrain from removing vegetation.

- If a timber harvest is planned in the area around the burial site, the mound and buffer should be flagged and clearly marked prior to the start of operations. Remove temporary markers upon harvest completion to protect the anonymity of the site.

- If a burial site is found during normal operation, STOP all ground-disturbing activities and establish a buffer zone with a minimum circumference of 150 feet. Avoid driving vehicles and unnecessary walking on the site. At no point should vehicles of any sort be driven onto or across mounds or other burial sites. Constructed trails, roads, or other paths should not be located adjacent to burial mounds or cairns to prevent disturbance.

# BMPs for Caves and Rock Shelters

A cave is a natural underground void. Prehistoric peoples made use of caves for shelter, burial, and religious sites. Since items placed in caves are protected from the climate and thus somewhat preserved, caves are an archaeological treasure for learning about these people. Missouri has some 6,300 recorded caves, more than any other state in the union.

A rock shelter is a shallow cave-like opening at the base of a bluff or cliff. Rock shelters are natural rock overhangs that form natural shelters, which prehistoric and historic humans often used as living places, storage spaces, and burial sites. As a result of these activities, trash, tools, and other artifacts were often left behind.

Previously occupied caves or rock shelters often have the following indicators:

- Historic materials located in the vicinity (i.e., glass, metal, ceramics).

- Prehistoric materials located in the vicinity or located downslope (i.e., chipped chert flakes, prehistoric tools, or ceramics).

- Prehistoric drawings, etchings, petroglyphs (images pecked or scratched into the rock surface), or pictographs (painting done with pigment on rock) in or around the mouth or walls of the cave or shelter.

- Other historic or prehistoric sites or features found in the vicinity such as rock cairns or burial mounds.

## Management Recommendations for Caves and Rock Shelters

Caves are a vital cultural resource. Along with projectile points and ceramics, caves oftentimes yield artifacts made of organic material (leather, cloth, etc.) because of their natural protection from the elements. These artifacts can offer important information about prehistoric people and their way of life.

- Since artifacts are often outside the cave, around the perimeter, and inside (vertical or horizontal entrances), prior to any silvicultural (including road construction) activities in the vicinity of the cave, a buffer up to 100 feet around the outer diameter of the mouth should be protected. The buffer can be marked off with flagging tape at 50-foot intervals or by marking larger tree trunks along the buffer perimeter with spray paint that will be noticeable by logging crews. This buffer should be put in place to ensure that possible artifacts and features around the mouth are not disturbed. Take appropriate measures to further secure the location.

- No ground-disturbing activities should be conducted within the established buffer or on the land in the overhang of the mouth of a horizontal entrance (no hand or machine excavation, no driving or parking heavy equipment, no large-scale vegetation removal).

- Avoid planting trees at or around the opening as the roots may have an unwanted destructive effect on the features or associated artifacts. If small saplings are growing inside the mouth of the cave, they may be removed if their roots are growing no greater than 4–6 inches below the surface. Larger saplings should be cut off at the ground and the stump treated to prevent regrowth.

The key recommendation for management of a cave is protection.

# BMPs for Cemeteries

A cemetery is an area set apart for or containing graves, tombs, or funeral urns. Cemeteries are also referred to as graveyards or burial grounds. Cemeteries can include many large, modern tombstones and graves, or they can be small family plots with historic headstones.

Cemeteries, including small family plots whose boundaries may not be defined, are addressed by Missouri Revised Statutes Chapter 214, which allows public access.

Some key identifiers of undefined cemeteries:

- Mounds or indentations in the ground fitting the size of a grave.
- Evidence of carved headstones, footstones, or limestone slabs.
- Indications of fencing: fallen wooden or metal posts and wire.

## Management Recommendations for Cemeteries with Undefined Boundaries

- Graves may be present without headstones and may lie outside of the easily identified gravesites. A buffer of up to 100 feet should be established around the identifiable outer diameter of the cemetery. No ground-disturbing activities should be conducted within this buffer (no hand or machine excavation, no driving or parking heavy equipment, no large-scale vegetation removal).
- Prior to any construction or ground-disturbing activities in the cemetery area and the 100-foot buffer, mark the boundary with flagging tape or by marking larger tree trunks along the buffer perimeter with spray paint that will be noticeable by construction or maintenance crews.
- When a cemetery is encountered, STOP all construction or ground-disturbing activities within a 100-foot buffer. This buffer ensures that possible burials around the perimeter of the cemetery are not disturbed. Take appropriate measures to further secure the location if needed. Although not as common as prehistoric burial looting, looters will also plunder historic cemeteries in search of buttons, jewelry, etc. Civil War burials are particularly vulnerable to looting.

## Maintenance Recommendations for Cemeteries

- Do not disturb headstones in any way, including resetting, scrubbing, rubbing, or enhancing in any manner.
- Identify destructive threats to the cemetery and address these threats on a case-by-case basis. Avoid planting trees on or around the graves as the roots may have an unwanted destructive effect on the plot.
- The general spraying of caustic chemicals such as commercial herbicides or weed killers should not be used around historic cemetery stones, as this may severely erode or rapidly deteriorate the stones. However, direct treatment of a stump, such as with a paintbrush or other controlled application, is acceptable to prevent regrowth.
- Vegetation may be mechanically removed if the roots have not grown deeply into the grave, grave depression, or through fallen, cracked head- or footstones. Vegetation growing in graves or grave depressions should be manually cut off at the ground, and the stump should be treated to prevent regrowth. Likewise, vegetation growing through fallen head- or footstones should be manually cut off just above the headstone and the stump should be treated, using a paintbrush or other controlled application, to prevent regrowth.

# BMPs for Charcoal Production Sites

Charcoal pits are the remnants of charcoal production sites generally related to charcoal production in Missouri's iron industry. Although charcoal was not actually made in pits, the term "charcoal pit" is the common term used in Missouri and elsewhere. The term "pit" denotes the remains of a temporary charcoal production facility and is sometimes interchanged with the term "kiln," which usually indicates a larger-scale operation. Later charcoal kilns supplied briquettes for home use.

Charcoal production was one of the most important, costly, and dangerous parts of iron production at Missouri iron furnaces. Early furnaces using charcoal as a fuel were often established in remote, isolated locations because they required extensive woodlands from which to produce charcoal, as was the case with the Missouri iron industry (Wettstaed 2003).

Some key indicators often used to identify a charcoal pit:

- An area of soil darker than the surrounding soil, usually in a circle, with an average diameter of 30–35 feet and 6 inches deep. Larger, or multiple, charcoal pits may have been a more permanent operation and may have the remains of an associated house place and/or outbuildings.
- Many charcoal pits have been located on creek terraces adjacent to the base of the slope.

- Charcoal kilns are actual structures where charcoal was made and generally indicate later, larger-scale production of charcoal. Charcoal kilns are generally rectangular structures with a domed or gabled roof constructed of brick or reinforced concrete.

### Management Recommendations for Charcoal Pits and Kilns

Charcoal pits and kilns are important because they offer valuable insight into the history of the Missouri iron and briquette industries.

- When a charcoal pit or kiln is encountered, STOP all construction or ground-disturbing activities within a minimum 25-foot buffer zone. This buffer should be put in place to ensure that the site and its perimeter, which could contain buried materials, are not disturbed. Take appropriate measures to further secure the location if needed.

- Identify potentially destructive threats to the site, and address these threats on a case-by-case basis.

- Brush hogging, mowing, and routine maintenance is allowed in the area of the charcoal pit or kiln as long as no subsurface damage occurs to the feature.

- Caustic chemicals such as commercial herbicides or weed killers should not be used adjacent to charcoal kilns, as this may severely erode or rapidly deteriorate the stone, concrete, or brick construction.

The key recommendation for management of a charcoal pit is avoidance, while kilns may be preserved or removed with proper documentation.

### References

Wettstaed, James R., *Cutting It Back and Burning It Black: Archaeological Investigations of Charcoal Production in the Missouri Ozarks. IA, The Journal of the Society for Industrial Archeology* 29.2 (2003): 40 pars. 9 Jan. 2009.

Massengale, Robert, *"Black Gold: A History of Charcoal in Missouri,"* 2006.

# BMPs for Foundations

Historic foundations are important because they mark an area of cultural activity and associated artifacts that can provide clues about the people who occupied the area. Foundations used for only a short period of time often look unremarkable but can be accurately dated and provide information on when and how the structure was used and often by whom. Building foundations offer information about architectural design, exact locations of historic buildings, and human use of the structure. Foundations tend to be one component of larger sites.

Some key markers to look for when attempting to identify a historic foundation:

- Large concrete blocks, sometimes laid out in the shape of a square or rectangle

- Brick rubble or large, cut stones, and stone or brick piers

- Historic materials located in the vicinity (i.e., glass, metal, ceramics)

- Large depressions in the ground, remains of a cellar or basement area

### Management Recommendations for Foundations

- Often there are additional features left behind besides the foundation. Other historic features like privies, trash dumps, wells, cisterns, etc., may not be visible.

- Historic artifacts and features are usually found around the foundation, sometimes near the ground surface. A minimum 100-foot buffer around the perimeter of the foundation should be adhered to or adjusted to include other features as noted above. No ground-disturbing activities should be conducted within this 100-foot buffer zone (no hand or machine excavation, no driving or parking heavy equipment, no large-scale vegetation removal).

- Prior to any construction or ground-disturbing activities in the vicinity, the buffer can be marked off with flagging tape or by marking larger tree trunks along the buffer perimeter with spray paint that will be noticeable by logging crews.

- When a foundation is encountered during a logging operation or ground-disturbing activities, STOP all activities. Contact the State Historic Preservation Office for information on the importance of the site. Take appropriate measures to secure the location if needed.

- For previously unrecorded foundations or structures, avoid all disturbance until the status of the site can be determined.

- Avoid planting vegetation near foundations as the roots may have an unwanted destructive effect. Vegetation may be mechanically removed if the roots have not grown through the foundation. Vegetation growing in the foundations should be cut off at the ground and the stump treated to prevent regrowth.

- Caustic chemicals such as commercial herbicides or weed killers should not be used around historic foundations, as this may severely erode or rapidly deteriorate the stone or brick.

- Identify potentially destructive threats to the foundation and address them on a case-by-case basis.

The key recommendation for management of a historic foundation is protection. Regular visits are recommended to ensure that unauthorized disturbance or looting is not occurring.

Not all foundations are historically significant and may not need to be maintained and protected, but this should be determined by the cultural resources coordinator in consultation with the State Historic Preservation Office.

# BMPs for Timber Industry Sites

Historic logging took place from roughly the 1800s to the early 1900s to supply charcoal fuel for iron ore smelting, to produce railroad ties, and to supply raw materials for the wood products industry, including logs for sawmills and pulpwood for the pulp and paper industry.

Some key markers to look for when attempting to identify historic timber industry sites:

- Tram or railroad remnants — spikes and timbers, graded beds or plateaus indicating old track locations, or culverts and bridges associated with tram remnants

- Metal artifacts — machinery, harnesses, and tools, all of which may be complete or fragmented

- Collapsed structures — dilapidated buildings that may indicate sawmills or other timber-related structures

- Historic materials — located in the vicinity such as glass, metal, or ceramics, which could indicate the location of temporary timber camps, for example

## Management Recommendations for Timber Industry Sites

- When a timber industry cultural site is encountered during construction, STOP all construction or ground-disturbing activities.

- Identify potentially destructive threats to the site and address them on a case-by-case basis.

The key recommendation for management of a historic timber-related site is protection. Not all sites are historically significant and may not need to be maintained and protected, but this will need to be determined in consultation with the State Historic Preservation Office.

# Appendix C: Management Pre-Activity and Post-Activity Check Sheets

# Missouri Forest Pre-Harvest Checklist

1. **Landowner's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____

2. **Logger's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____
   **Certified Master Logger?** ❑ Yes ❑ No **PTH Certificate #**_____

3. **Today's Date:** _____ **Contract Length:** _____ **Expiration Date:** _____

4. **Forest Property Location:** County _____ Section _____ Township _____ Range _____

5. **List how the property lines are identified:** _____
   _____

6. **Acreage to be harvested:**_____

   **Harvest type:** _____ Thinning _____ Clear-cut _____ Shelterwood cut _____ Selection cut (single tree or group)
   _____ Salvage _____ Other *(Please specify)*: _____

   a. Does harvesting meet recommendations in forest management plan? ❑ Yes ❑ No

   b. Were wildlife habitat needs (snags, dens, coarse woody debris, etc.) considered in this harvest? ❑ Yes ❑ No
   What actions will be taken during the harvest to address wildlife habitat needs? _____
   _____

   c. Are cultural resources located on the property? ❑ Yes ❑ No
   Are they being avoided by the harvest operation? ❑ Yes ❑ No
   What actions will be taken to mitigate impacts to cultural resources? _____
   _____
   _____

   d. Are there natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? List and describe management needs. _____
   _____

   e. Are there any known invasive species or other forest pest threats located in the sale area? ❑ Yes ❑ No
   What actions will be taken during the harvest to avoid spreading these pests? _____
   _____
   _____

   f. Does the harvest area contain any stands in visually sensitive locations as identified by the forest management plan?
   ❑ Yes ❑ No
   What actions will be taken during the harvest to mitigate these impacts *(indicate on attached map)*? _____
   _____
   _____

7. **Sale Layout: Where are the access roads, landings, and main skid trails?** *(Show on attached map.)*

   a. Attach a map. *(This can be a hand drawing on a topographical map.)*
   b. Are the log landings and main skid trails flagged? ❑ Yes ❑ No
   c. Will existing roads (ER), new roads (NR), or reworked roads (RR) be used? *(check all that apply)*: ❑ ER ❑ NR ❑ RR

**8. Best Management Practices: Circle *Yes* or *No*. If No, explain the proposed alternative to be used or why the BMP is not applicable.**

Yes No a. Construct all roads, landings, and skid trails outside SMZs. **Explain alternative:** _____

_____

_____

Yes No b. SMZs have been identified and will be a minimum of 50 feet wide, will have minimal or no exposed mineral soil, and have been determined based on *Missouri Watershed Protection Practice*. **Explain alternative:** _____

_____

_____

Yes No c. Haul road entrances will be graveled up to the public highway when necessary to reduce mud on the road. **Explain alternative:** _____

_____

_____

Yes No d. Log landings will be constructed as small as is practical, adequately drained, and constructed outside of any SMZs. **Explain alternative:** _____

_____

_____

Yes No e. A minimum of one-third of the overstory trees will be left in the SMZs. **Explain alternative:** _____

_____

_____

Yes No f. Drainage structures such as out sloped roads, ditches, wing ditches, broad-based dips, waterbars or properly sized culverts at intervals specified in the *Missouri Watershed Protection Practice* will be used whenever possible. **Explain alternative:** _____

_____

_____

Yes No g. Temporary waterbars or turnouts will be placed on skid trails to control potential erosion during any temporary shut-down periods. **Explain alternative:** _____

_____

_____

Yes No h. Permanent waterbars will be installed at 30–45 degrees to the road or skid-trail surface and at intervals specified in the *Missouri Watershed Protection Practice*. **Explain alternative:** _____

_____

_____

Yes No i. Stream crossings for haul and skid roads shall be avoided when possible.

- Streams should be crossed at right angles (90°). Divert water from road prior to the crossing with a water diversion device or break in grade.
- Portable bridges will be used when practical and culverts used when necessary.
- Streams to be forded shall have banks and stream bottom armored with oversized, clean rock.
- All stream crossings shall be restored.

**Explain alternative:** _____

_____

Yes No j. Does the harvest ensure that all clear-cuts are less than 40 acres and meet green-up requirements? **Explain alternative:** _____

_____

Yes No k. Logging slash shall be removed from the channel of streams. **Explain alternative:** _____

Yes No l. Harvest (sale) closeout procedures shall be completed. The following areas will be seeded and mulched according to seeding guidelines found in the *Missouri Forest Management Guidelines*: landings, roads within filter strips, stream crossings, haul roads, and skid trails.
**Indicate the seed mixture that will be used:** _____
**Explain alternative:** _____

Yes No m. All trash, such as used oil filters, hydraulic buckets, oil jugs, equipment, parts, and other items will be removed from the harvest site. **Explain alternative:** _____

Yes No n. If woody biomass is being harvested, list BMPs being used from *BMPs for Woody Biomass Harvesting*. **List all that apply and explain what actions will be taken:** _____

Yes No o. All spring poles shall be cut and slash height will not exceed 5 feet within 100 feet of roads with high public use.
**Explain alternative:** _____

Yes No p. Are residual damage BMPs found in the *Missouri Forest Management Guidelines* being followed? **Explain alternative:** _____

Yes No q. In regeneration area, are leave trees being retained to meet management objectives? **Explain alternative:** _____

Yes No r. Will the required amount of snags and dens be left in the harvest area? **Explain alternative:** _____

**9. What logging system will be used? List the type of equipment:** _____

Additional Notes/Comments _____

# Missouri Forest Post-Harvest Checklist

1. **Landowner's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____

2. **Logger's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____
   **Certified Master Logger?** ❑ Yes ❑ No **PTH Certificate #**_____

3. **Today's Date:** _____ **Date contract finished:** _____

4. **Forest Property Location:** County _____ Section _____ Township _____ Range _____

5. **List how the property lines are identified:** _____
   _____

6. **Acreage to be harvested:**_____

   **Harvest type:** _____ Thinning _____ Clear-cut _____ Shelterwood cut _____ Selection cut (single tree or group)
   _____ Salvage _____ Other *(Please specify)*: _____

   a. Does harvesting meet recommendations in forest management plan? ❑ Yes ❑ No

   b. Were wildlife habitat needs (snags, dens, coarse woody debris, etc.) considered in this harvest? ❑ Yes ❑ No
   What is the corrective action for future harvests? _____
   _____

   c. Are cultural resources located on the property and were they avoided by the harvest operation? ❑ Yes ❑ No
   What is the corrective action for future harvests? _____
   _____
   _____

   d. Were there natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? ❑ Yes ❑ No
   Were they properly protected during the timber harvest? ❑ Yes ❑ No
   What is the corrective action for future harvests? _____
   _____
   _____

   e. Were there any known invasive species or other forest pest threats located in the sale area? ❑ Yes ❑ No

   f. Are they expanding or present in areas other than known locations before the harvest? ❑ Yes ❑ No

   g. What is the corrective action for future harvests? _____
   _____
   _____

   h. Does the harvest area contain any stands in visually sensitive locations as identified by the forest management plan?
   ❑ Yes ❑ No

   i. Were proper actions taken during the harvest to minimize these impacts *(indicate on attached map)*? ❑ Yes ❑ No

   j. What is the corrective action for future harvests? _____
   _____
   _____

**7. Sale Layout: Where are the access roads, landings, and main skid trails?** *(Show on attached map.)*

a. Attach a map. *(This can be a hand drawing on a topographical map.)*
b. Were log landings and main skid trails flagged and located as defined on map? ❑ Yes ❑ No
c. Were the roads identified on the pre-harvest plan used and maintained? ❑ Yes ❑ No

What is the corrective action for future harvests? _____

_____

_____

**8. Best Management Practices: Circle *Yes* or *No*. If No, explain the proposed alternative or the corrective action for future harvests.**

Yes No a. Were all roads, landings, and skid trails constructed outside SMZs? **Explain alternative:** _____

_____

_____

Yes No b. Were SMZs identified and were they a minimum of 50 feet wide, with minimal or no exposed mineral soil, and determined based on *Missouri Watershed Protection Practice*? **Explain alternative:** _____

_____

_____

Yes No c. Were haul road entrances graveled up to the public highway when necessary to reduce mud on the road? **Explain alternative:** _____

_____

Yes No d. Were log landings constructed as small as practical and adequately drained and constructed outside of any SMZs? **Explain alternative:** _____

_____

Yes No e. Was a minimum of one-third of overstory trees left in the SMZs? **Explain alternative:** _____

_____

_____

Yes No f. Were drainage structures such as out sloped roads, ditches, wing ditches, broad-based dips, waterbars or properly sized culverts used at intervals specified in the *Missouri Watershed Protection Practice*? **Explain alternative:** _____

_____

_____

Yes No g. Were stream crossings for haul and skid roads avoided when possible?
Were streams crossed at right angles (90°)?
Was water diverted from road prior to the crossing with a water diversion device or break in grade?
Were portable bridges used when practical and culverts used when necessary?
Did streams to be forded have banks and stream bottom armored with oversized, clean rock?
Were all stream crossings restored?
**Explain alternative:** _____

_____

Yes No h. Were all clear-cuts less than 40 acres and did they meet green-up requirements? **Explain alternative:** _____

_____

_____

Yes No i. Was logging slash removed from the stream channels? **Explain alternative:** _____

_____

_____

Yes No j. Were harvest (sale) closeout procedures completed?
Were waterbars built on skid trails and haul that did not have vehicular traffic?
Were the following areas seeded and mulched according to seeding guidelines found in the *Missouri Watershed Protection Practice*: landings, roads within filter strips, stream crossings, haul roads, and skid trails?
**Indicate the seed mixture used:** _____
**Explain alternative:** _____

_____

Yes No k. Was all trash, such as used oil filters, hydraulic buckets, oil jugs, equipment, parts, and other items, removed from the harvest site? **Explain alternative:** _____

_____

Yes No l. If woody biomass was harvested, list the BMPs used from *BMPs for Woody Biomass Harvesting*. **List all that apply and explain what actions were taken:** _____

_____

_____

Yes No m. Were all spring poles cut, and did slash height not exceed 5 feet with 100 feet of roads with high public use?
**Explain alternative:** _____

_____

Yes No n. Were residual damage found in the *Missouri Forest Management Guidelines* BMPs followed? **Explain alternative:**

_____

_____

Yes No o. In regeneration area, were leave trees retained to meet management objectives? **Explain alternative:** _____

_____

_____

Yes No p. Were the required amount of snags and dens left in the harvest area? **Explain alternative:** _____

_____

_____

**9. What logging system was used? List the type of equipment:** _____

_____

_____

_____

Additional Notes/Comments _____

_____

_____

_____

_____

# Pre-Treatment Checklist: Tree Planting

Landowner's Name: _____ Phone Number: _____
Address/City/State/Zip: _____

Contractor's Name: _____ Phone Number: _____
Address/City/State/Zip: _____
Pesticide Applicator License #_____

Today's Date: _____ Contract Length: _____ Expiration Date: _____

Forest Property Location: County _____ Section _____ Township _____ Range _____

List how the property lines are identified: _____
_____

Acreage to be treated: _____ Spacing _____ Trees per acre _____

Planting type: _____ Hand plant _____ Tree planter

Does practice meet recommendations in forest management plan? ❑ Yes ❑ No

Will wildlife habitat needs (snags, dens, coarse woody debris, mast, super canopy trees) be considered in this treatment? ❑ Yes ❑ No
What actions will be taken during the treatment to address wildlife habitat needs? _____
_____
_____

Are cultural resources located on the property and are they being avoided by the planting operation? ❑ Yes ❑ No
What actions will be taken during the treatment to address cultural resources needs? _____
_____
_____

Are there natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? List and describe management needs. _____
_____

Are there any know invasive species or other forest pest threats located in the treatment area? ❑ Yes ❑ No
What actions will be taken to avoid spreading these pests _____
_____

Does the treatment area contain any stands in visually sensitive locations as identified by the forest management plan? ❑ Yes ❑ No
What actions will be taken during the treatment to minimize these impacts? *(Indicate on attached map.)* _____
_____
_____

Planting Area Layout: Attach a map. *(This can be a hand drawing on a topographical map.)*

ADDITIONAL NOTES/COMMENTS: _____
_____
_____

# Post-Treatment Checklist: Tree Planting

Landowner's Name: _____ Phone Number: _____
Address/City/State/Zip: _____

Contractor's Name: _____ Phone Number: _____
Address/City/State/Zip: _____
Pesticide Applicator License #_____

Today's Date: _____ Contract Length: _____ Expiration Date: _____

Forest Property Location: County _____ Section _____ Township _____ Range _____

List how the property lines are identified: _____
_____

Acreage treated: _____ Spacing _____ Trees per acre _____

Planting type: _____ Hand plant _____ Tree planter

Did practice meet recommendations in forest management plan? ❑ Yes ❑ No

Were wildlife habitat needs (snags, dens, coarse woody debris, mast, super canopy trees) considered in this treatment? ❑ Yes ❑ No
What actions were taken during the treatment to address wildlife habitat needs? _____
_____
_____

Were cultural resources located on the property and were they being avoided by the planting operation? ❑ Yes ❑ No
What actions were taken during the treatment to address cultural resources needs? _____
_____
_____

Were there natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? List and describe management needs. _____
_____

Were there any know invasive species or other forest pest threats located in the treatment area? ❑ Yes ❑ No
What actions were taken to avoid spreading these pests _____
_____

Does the treatment area contain any stands in visually sensitive locations as identified by the forest management plan? ❑ Yes ❑ No
What actions were taken during the treatment to minimize these impacts? *(Indicate on attached map.)* _____
_____
_____

Planting Area Layout: Attach a map. *(This can be a hand drawing on a topographical map.)*

ADDITIONAL NOTES/COMMENTS: _____
_____
_____

# Pre-Tending Treatment Checklist

1. **Landowner's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____

2. **Contractor's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____
   **Pesticide Applicator License #**_____

3. **Today's Date:** _____ **Contract Length:** _____ **Expiration Date:** _____

4. **Forest Property Location:** County _____ Section _____ Township _____ Range _____

5. **List how the property lines are identified:** _____
   _____

6. **Acreage to be treated:**_____

   **Tending type:** _____ Timber Stand Improvement (TSI) _____ Woodland thinning _____ Salvage
   _____ Other *(please specify)*: _____

   a. Does treatment meet recommendations in forest management plan? ❑ Yes ❑ No

   b. Were wildlife habitat needs (snags, dens, coarse woody debris, mast, super canopy trees) considered in this treatment? ❑ Yes ❑ No
   What actions will be taken during the treatment to address wildlife habitat needs? _____
   _____

   c. Are cultural resource located on the property and are they being avoided by the treatment operation? ❑ Yes ❑ No
   What actions will be taken mitigate impacts to cultural resources? _____
   _____

   d. Are there natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? ❑ Yes ❑ No
   List and describe management needs. _____
   _____

   e. Are there any known invasive species or other forest pest threats located in the sale area? ❑ Yes ❑ No
   What actions will be taken during the treatment to avoid spreading these pests? _____
   _____
   _____

   f. Does the treatment area contain any stands in visually sensitive locations as identified by the forest management plan? ❑ Yes ❑ No
   What actions will be taken during the treatment to mitigate these impacts? *(Indicate on attached map.)* _____
   _____
   _____

7. **Treatment Area Layout: Where are the access roads, landings, and main skid trails (if applicable)?**
   *(Show on attached map.)*

   a. Attach a map. *(This can be a hand drawing on a topographical map.)*
   b. Are the log landings and main skid trails flagged? ❑ Yes ❑ No ❑ NA
   c. Are existing roads (ER), new roads (NR), or reworked roads (RR), Used or Not Applicable (NA)?
   Check all that apply: ❑ ER ❑ NR ❑ RR ❑ NA

**8. Best Management Practices: Circle *Yes* or *No*; If No, explain the proposed alternative to be used or why the BMP is not applicable.**

Yes No a. Construct all roads, landings, and skid trails outside SMZs. **Explain alternative:** _____

Yes No b. SMZ's have been identified and will be a minimum of 50' wide, will have minimal or no exposed mineral soil and have been determined based on *Missouri Watershed Protection Practice*. **Explain alternative:** _____

Yes No c. Haul road entrances will be graveled up to the public highway when necessary to reduce mud on the road. **Explain alternative:** _____

Yes No d. Log landings will be constructed as small as practical, and will be adequately drained and constructed outside of any SMZs. **Explain alternative:** _____

Yes No e. A minimum of ⅓ of the overstory trees will be left in the SMZs. **Explain alternative:** _____

Yes No f. Drainage structures such as out sloped roads, ditches, wing ditches, broad-based dips, waterbars or properly sized culverts at intervals specified in the *Missouri Watershed Protection Practice* will be used whenever possible. **Explain alternative:** _____

Yes No g. Temporary waterbars or turn-outs will be placed on skid trails to control potential erosion during any temporary shut-down periods. **Explain alternative:** _____

Yes No h. Permanent waterbars will be installed at 30–45 degrees to the road/ skid trail surface and at intervals specified in the *Missouri Watershed Protection Practice*. **Explain alternative:** _____

Yes No i. Stream crossings for haul and skid roads shall be avoided when possible.

- Streams should be crossed at right angles (90°). Divert water from road prior to the crossing with a water diversion device or break in grade.
- Portable bridges will be used when practical and culverts used when necessary.
- Streams to be forded shall have banks and stream bottom armored with oversized, clean rock.
- All stream crossings shall be restored.

**Explain alternative:** _____

Yes No j. Logging slash shall be removed from the channel of streams. **Explain alternative:** _____

Yes No k. Harvest (sale) closeout procedures shall be completed.

- Waterbars will be built on skid trails and haul roads that will not have vehicular traffic.
- The following areas will be seeded and mulched according to seeding guidelines found in the *Missouri Forest Management Guidelines*: landings, roads within filter strips, stream crossings, haul roads, and skid trails.
- Indicate the seed mixture that will be used: _____

**Explain alternative:** _____

_____

Yes No l. All trash, such as used oil filters, hydraulic buckets, oil jugs, equipment, parts, and other items, will be removed from the treatment site. **Explain alternative:** _____

_____

_____

Yes No m. If woody biomass is being harvested, list BMPs used from *BMPs for Woody Biomass Harvesting*. **List all that apply and explain what actions will be taken:** _____

_____

_____

Yes No n. All spring poles shall be cut and slash height will not exceed 5 feet within 100 feet of roads with high public use. **Explain alternative:** _____

_____

_____

Yes No o. Are residual damage BMPs found in the *Missouri Forest Management Guidelines* being followed? **Explain alternative:** _____

_____

_____

Yes No p. Were the required amount of snags and dens left in the harvest area? **Explain alternative:** _____

_____

_____

**9. What management practice, chemical, mechanical, or other, will be used? List the type of equipment:** _____

_____

_____

Additional Notes/Comments: _____

_____

_____

_____

_____

_____

# Post-Tending Treatment Checklist

1. **Landowner's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____

2. **Contractor's Name:** _____ **Phone Number:** _____
   **Address/City/State/Zip:** _____
   **Pesticide Applicator License #**_____

3. **Today's Date:** _____ **Date contract completed:** _____

4. **Forest Property Location:** County _____ Section _____ Township _____ Range _____

5. **List how the property lines are identified:** _____
   _____

6. **Acreage treated:**_____

   **Tending type:** _____ Timber Stand Improvement (TSI) _____ Woodland thinning _____ Salvage
   _____ Other *(please specify)*: _____

   a. Did practice meet the recommendations in the forest management plan? ❑ Yes ❑ No

   b. Were wildlife habitat needs (snags, dens, coarse woody debris, mast, super canopy trees) considered in this treatment? ❑ Yes ❑ No
   What is the corrective action for future treatments? _____
   _____

   c. Were cultural resources located on the property, and were they avoided by the tending treatment operation?
   ❑ Yes ❑ No
   What is the corrective action for future treatments? _____
   _____

   d. Were natural features (springs, seeps, fens, caves, glades, etc.) or species of concern present? ❑ Yes ❑ No
   Were management needs addressed? ❑ Yes ❑ No
   What is the corrective action for future treatments? _____
   _____

   e. Were there any known invasive species or other forest pest threats located in the treatment area? ❑ Yes ❑ No
   Were actions were taken to avoid spreading these pests? ❑ Yes ❑ No
   What is the corrective action for future treatments? _____
   _____

   f. Does the treatment area contain any stands in visually sensitive locations as identified by the forest management plan?
   ❑ Yes ❑ No
   Were actions taken during the treatment to minimize these impacts? *(Indicate on attached map.)* ❑ Yes ❑ No
   What is the corrective action for future treatments? _____
   _____

**7. Treatment Area Layout: (Where are the access roads, landings, and main skid trails (if applicable)?** *(Show on attached map.)*

a. Attach a map. *(This can be a hand drawing on a topographical map.)*
b. Were the log landings and main skid trails flagged? ❑ Yes ❑ No ❑ NA
c. Were existing roads (ER), new roads (NR), or reworked roads (RR) used, or Not Applicable (NA)?
Check all that apply: ❑ ER ❑ NR ❑ RR ❑ NA

**8. Best Management Practices: Circle *Yes* or *No*. If No, explain the proposed alternative or the corrective action needed for future treatments.**

Yes No a. All roads, landings, and skid trails were constructed outside SMZs. **Explain alternative:** _____

Yes No b. SMZs were identified and made a minimum of 50 feet wide, and had minimal or no exposed mineral soil, and have been determined based on *Missouri Watershed Protection Practice*. **Explain alternative:** _____

Yes No c. Haul road entrances were graveled up to the public highway when necessary to reduce mud on the road. **Explain alternative:** _____

Yes No d. Log landings were constructed as small as practical, adequately drained, and constructed outside of any SMZs. **Explain alternative:** _____

Yes No e. A minimum of ⅓ of the overstory trees were left in the SMZs. **Explain alternative:** _____

Yes No f. Were drainage structures such as out sloped roads, ditches, wing ditches, broad-based dips, waterbars or properly-sized culverts used at intervals specified in the *Missouri Watershed Protection Practice*? **Explain alternative:** _____

Yes No g. Permanent waterbars were installed at 30–45 degrees to the road/ skid trail surface and at intervals specified in the *Missouri Watershed Protection Practice*. **Explain alternative:** _____

Yes No h. Stream crossings for haul and skid roads were avoided when possible.
- Streams were crossed at right angles (90°). Water was diverted from road prior to the crossing with a water diversion device or break in grade.
- Portable bridges were used when practical and culverts used when necessary.
- Streams forded had banks and stream bottom armored with oversized, clean rock.
- All stream crossings were restored.

**Explain alternative:** _____

Yes No i. Logging slash was removed from the channel of streams. **Explain alternative:** _____

_____

_____

Yes No j. Treatment area closeout procedures were completed.

- Waterbars were built on skid trails and haul roads that will not have vehicular traffic.
- The following areas were seeded and mulched according to seeding guidelines found in the *Missouri Forest Management Guidelines*: landings, roads within filter strips, stream crossings, haul roads, and skid trails.

**Indicate the seed mixture that was used:** _____

_____

**Explain alternative:** _____

_____

_____

Yes No k. All trash, such as used oil filters, hydraulic buckets, oil jugs, equipment, parts, and other items, were removed from the treatment site. **Explain alternative:** _____

_____

_____

Yes No l. If woody biomass was harvested, list BMPs used from *BMPs for Woody Biomass Harvesting*. **List all that apply and explain what actions were taken:** _____

_____

_____

Yes No m. All spring poles were cut, and slash height did not to exceed 5 feet within 100 feet of roads with high public use. **Explain alternative:** _____

_____

_____

Yes No n. Were residual damage BMPs found in the *Missouri Forest Management Guidelines* being followed? **Explain alternative:** _____

_____

Yes No o. Were the required amount of snags and dens left in the harvest area? **Explain alternative:** _____

_____

_____

**9. What management practices, chemical, mechanical, or other, were used? List the type of equipment:** _____

_____

_____

Additional Notes/Comments: _____

_____

_____

_____

_____

# Chemical Application Record

| | | |
|---|---|---|
| **Applicator:** | **Tract Name:** | **Date:** |
| **Pesticide:** | **County:** | **Acres:** |
| **Purpose:** | | |
| **Method of Application:** | | |
| **Chemical Rate:** | **Water Rate:** | |
| **Additive Rate:** | **Sprayer Pressure:** | |
| **Speed:** | **Boom Spray Width:** | |
| **Nozzle Size:** | **Number of Tips:** | |

| | |
|---|---|
| **Chemical Name:** | **Brand Name:** |
| **Chemical Name:** | **Brand Name:** |
| **Chemical Name:** | **Brand Name:** |
| **Chemical Name:** | **Brand Name:** |

| | Time | Temperature | Wind Speed | Wind Direction | Acres Treated |
|---|---|---|---|---|---|
| **Starting** | | | | | |
| **Stopping** | | | | | |
| **Starting** | | | | | |
| **Stopping** | | | | | |

| |
|---|
| **Comments:** |
| **Mixing Instructions:** |
| **Spraying Instructions:** |
| **Date Completed:** |

# Missouri Department of Conservation Prescribed Burn Plan

## Project Description

| | |
|---|---|
| **Area/Field, Stand, or Unit No.** | |
| **Prepared by:** | **Date:** |
| **RX Burn Boss approval:** | **Date:** |
| **Location description:** ***(attach map)*** | **Acreage:** |
| **Site description:** | |
| **Sensitive areas:** | |
| **Risk Assessment Value:** ***(attach Risk Assessment Worksheet)*** | |

## Prescription

| | |
|---|---|
| **Burn objectives:** | |
| **Preferred timing:** | |
| **Desired fire behavior:** | |

| **Conditions needed:** | | **Range** | **Ideal** |
|---|---|---|---|
| | **Temperature** | | |
| | **Relative humidity** | | |
| | **1 hr. fuel moisture** | | |
| | **10 hr. fuel moisture** | | |
| | **Midflame windspeed** | | |
| | **Wind direction** | | |

| **BEHAVE run results** | | | |
|---|---|---|---|
| **Burn area fuel model(s)** | | | **Adjacent area fuel model(s)** |
| | **Head** | **Back** | **Head** |
| **Rate of spread (ch/hr or ft/min)** | | | |
| **Heat/unit area (BTU/ft$^2$)** | | | |
| **Fireline intensity (BTU/ft/sec)** | | | |
| **Flame length (ft)** | | | |

| |
|---|
| **Smoke management:**<br>Desired atmospheric conditions:<br>Mixing height):<br>Ventilation rate:<br>Air quality restrictions that apply: |
| **Firelines:** |
| **Adjacent fuels:** |

## Project Resources

| | |
|---|---|
| **Prescribed Fire Burn Boss:** | **Crew size:** |
| **Ignition/holding crew(s):** | |
| **Suppression crew(s):** | |
| **Other crew members:** | |

| HAND EQUIPMENT | Number | Assignment |
|---|---|---|
| **Drip torches** | | |
| **Backpack pumps** | | |
| **Swatters** | | |
| **Broom rakes** | | |
| **Chain saws** | | |
| **Backpack blowers** | | |
| **Belt weather kit or Kestral** | | |
| **Other** | | |
| **MECHANIZED EQUIPMENT** | **Number** | **Assignment** |
| **ATVs** | | |
| **Tractors** | | |
| **Pickups with water unit** | | |
| **Dozers** | | |
| **ATV water units** | | |
| **Pulled water units** | | |
| **Other** | | |

| OTHER EQUIPMENT | Number | Assignment |
|---|---|---|
| **Matches** | | |
| **Portable radios** | | |
| **Blower fuel** | | |
| **Drip torch fuel** | | |
| **Bolt cutters** | | |
| **Pliers** | | |
| **Drinking water** | | |
| **Food** | | |
| **Compass** | | |
| **Aerial photos, maps, topos** | | |
| **First aid kits** | | |
| **Cell phone** | | |
| **Other** | | |
| **Other** | | |

## Logistics

**Weather monitoring:**

**Public notifications:**

**Ignition plan *(attach map)*:**

**Contingency plans:**

Fire out of prescription:

Moderate escapes:

Major escape:

## Burn Plan Review and Approval

**Low risk assessment (value 8–13)** — Forestry, Wildlife, or Private Land Services Regional Supervisor*

**Signature:** **Date:**

**Moderate risk assessment (value 14–22)** — Forestry and Wildlife or Private Land Services Regional Supervisor

**Signature:** **Date:**

**Signature:** **Date:**

**High risk assessment (value 23+)** — Fire Management Coordination Team

**Signature:** **Date:**

**Fisheries Regional Supervisor approval if riparian zones (RMZs) involved**

**Signature:** **Date:**

**Natural History Biologist approval if Natural Area involved**

**Signature:** **Date:**

## Re-Approval**

**I certify that this burn plan is still valid and the risk criteria (new construction, fuels, etc.) have not changed.**

**RXBB Signature:** **Date:**

**I certify that this burn plan is still valid and the risk criteria (new construction, fuels, etc.) have not changed.**

**RXBB Signature:** **Date:**

**I certify that this burn plan is still valid and the risk criteria (new construction, fuels, etc.) have not changed.**

**RXBB Signature:** **Date:**

**I certify that this burn plan is still valid and the risk criteria (new construction, fuels, etc.) have not changed.**

**RXBB Signature:** **Date:**

* Regional Supervisors must be Incident Commander (IC) or Prescribed Fire Burn Boss (RXBB) qualified to sign. If a Regional Supervisor lacks this experience, they will select a member of their staff who is qualified as an IC or RXBB to sign on their behalf.
** A burn plan may be used for repeat burns of an area without rewrite if the Prescribed Fire Burn Boss certifies that the plan is still valid and none of the risk assessment criteria (such as new construction or developments, fuel type, smoke impacts, etc.) have changed.

# Day of Burn Checklist

**Area/Field, Stand, or Unit No.:**

**Date:**

**Burn Day Checklist (Go/No Go):** *Refer to contents of Burn Plan*

_____ Notifications made

_____ All equipment present and in working order

_____ Personnel on site with proper personal protective equipment

_____ Personnel briefed on procedures and contingencies

_____ Personnel briefed on communications and safety zones

_____ Backup resources available

_____ Weather within prescription Time: _____

Wind speed: _____ Direction: _____

Temperature: _____ RH: _____

_____ First aid kits fully stocked

**Emergency Medical Services:** _____

Name Phone

I certify that all items on the checklist are "go" for the burn:

_____

Prescribed Fire Burn Boss

# Post-Burn Evaluation

## Weather

**Pre-Burn**

Time: _____

Temperature: _____ Relative humidity: _____

Windspeed: _____ Direction: _____

**Post-burn**

Time: _____

Temperature: _____ Relative humidity: _____

Windspeed: _____ Direction: _____

## Fire behavior

Rate-of-spread: _____ Flame lengths: _____

Circumstances of any erratic fire behavior:

Smoke dispersal during burn:

Percent of area burned:

Amount of fuel consumed:

Any public interest during burn — pro or con:

# Appendix D: Timber Sale Contract

## Timber Sale Contract

_____of _____, Missouri, herein after called the Buyer, agrees to purchase from _____ of _____, Missouri, herein after called the Seller, the designated timber specified below:

**Witnesseth:**

**Article I.** The Seller hereby agrees to sell to the Buyer, subject to the terms listed below, all of the timber specified below, on a certain tract owned by the Seller, located in _____, Section _____, Township _____, Range _____, County of _____, State of Missouri, located on _____ acres, more or less.

**Article II.** The Buyer agrees:

1. To cut only those trees marked with a fresh orange paint spot. Trees marked with an "X" may be cut if desired.
2. Trees other than those specified above may be cut only for access on areas used for roads and landings.
3. To pay the Seller a lump price of $_____ when the contract is signed to pay for the trees designated for cutting.
4. To pay three times the stumpage value per tree, a penalty rate, for each tree that is cut which is not designated for cutting.
5. To keep fields, fences, roads, and streams free from treetops and other logging debris at all times.
6. To hold and save the Seller, his officers, agents, or employees harmless from any or all liability on account of any claim whatsoever, for wages, supplies, equipment, damage, and injury to persons or property arising in connection with any activity conducted or undertaken by the Buyer, his agents or employees under the terms of this contract.
7. That this contract cannot be transferred to another party without the written permission of the Seller.

**Article III.** The following conditions known as Best Management Practices and referenced in the Missouri Conservation Department publication *Missouri Watershed Protection Practices* apply to the sale of said forest products and will be adhered to by the Buyer:

1. All roads constructed and used during the cutting and transportation of forest products shall follow the contour with slope grades of 8 percent or less maintained, except where terrain or the use of existing roads requires short, steep grades necessitating the construction of water diversion measures (waterbars, broad-based dips, turnouts, culverts) installed at the proper intervals.
2. New roads will be constructed to allow for proper drainage.

3. Except at stream crossings, roads will not be constructed within _____ feet (the corresponding Streamside Management Zone (SMZ)) of any stream, pond or lake on the property.

4. All exposed soil at stream crossings will be stabilized with gravel, grass and mulch, or silt fences to prevent erosion and sedimentation.

5. Under no circumstances will temporary stream crossings made of logs and brush piled in the stream and covered with soil be permitted.

6. Wheeled and tracked equipment are not allowed within _____ feet (the SMZ) of any stream, pond, or lake on the property. Trees marked for cutting within the SMZ should be chain saw felled and cable winched out.

7. Log decks, portable sawmills, or chippers are not allowed within _____ feet (the SMZ) of any stream, pond, or lake on the property.

8. All roads on and adjacent to the sale area used by the Buyer shall be reshaped, seeded and mulched, and have water diversion structures installed upon completion of the sale as prescribed in Missouri Watershed Protection Practices.

9. All human garbage, tires, cables, used lubricants, fuels, fluids, and containers used by the Buyer shall be removed from the sale area and disposed of properly by the Buyer.

10. The Seller or Forester in charge may temporary terminate hauling and/or skidding during periods of wet soil conditions should these operations be causing or likely to cause damage beyond normal wear and tear to the roads and trails. The number of working days that the Buyer's operations are terminated for this reason shall be added to the term of this contract upon request of the Buyer.

**Article IV.** The Buyer further agrees to cut and remove said timber in strict accordance with the following conditions:

1. To waive all claims to the above described trees unless they are cut and removed on or before _____, 20_____.

2. To cut all spring poles and pull all lodged trees to the ground.

3. To do all in his power to prevent and suppress forest fires on or threatening the sale area.

4. To protect from unnecessary injury young growth and other trees not designated for cutting.

5. To repair damage caused by logging to fences, bridges, roads, trails, or other improvements damaged beyond ordinary wear and tear.

6. To allow the owner to cut and remove any portion of a tree left on the ground by the Buyer after he has removed his products.

**Article V.** The Seller agrees to the following conditions:

1. To guarantee title to the forest products covered by this agreement and to defend it against all claims at his expense.

2. To grant or secure necessary entry and right of way to the Buyer and his employees on and across the area covered by this agreement, and also other privileges usually extended to Buyers.

**Article VI.** It is mutually understood and agreed by and between the parties hereto as follows:

1. All timber included in this agreement shall remain the property of the Seller, and shall not be removed until paid for in full.

Signed in duplicate this _____ day of _____, 20_____.

_____ _____
(Witness) (Buyer)

_____ _____
(Witness) (Seller)

_____ _____
(Witness) (Seller)

## Acknowledgment

State of _____

County of _____

On this _____ day of _____, 20_____ before me personally appeared

_____ to be known to be the person(s) described in and who executed the foregoing instrument and acknowledged that _____ executed same as _____ free act and deed.

In Testimony Whereof, I have hereunto set my hand and affixed my official seal, at my office in _____, the day and year first above written.

My commission expires _____

_____

Notary Public

# Resource Directory

In Missouri, several organizations, associations, and individuals can provide publications, technical advice, educational programs, and financial assistance to help you manage your forests and woodlands. Start with your local Conservation Department or University Outreach and Extension office. The staff will assist you or help you find the appropriate agency or individual for your land management decisions. Below are other available resources.

## The Center for Agroforestry at the University of Missouri

203 Anheuser-Busch Natural Resources Building
Columbia, MO 65211
573–884–2874 or 573–882–1977
E-mail: ***musnragroforestry@missouri.edu***

The Center for Agroforestry at the University of Missouri, established in 1998, is one the world's leading centers contributing to the science underlying agroforestry, the science and practice of intensive land-use management combining trees and/or shrubs with crops and/or livestock.

Agroforestry practices help landowners to diversify products, markets, and farm income; improve soil and water quality; sequester carbon and reduce erosion, nonpoint source pollution, and damage due to flooding; and mitigate climate change.

## Conservation Federation of Missouri

728 W Main, Jefferson City, MO 65101–1559
573–634–2322
***confedmo.org***

In 1935, sportsmen from throughout Missouri came together to form the Conservation Federation of Missouri (CFM). They organized with the purpose of taking conservation out of the realm of politics. Their initiative petition campaign resulted in the creation of the Missouri Department of Conservation, a nonpolitical conservation agency that has been a model for other states. Since then, the Federation has undertaken many successful battles to ensure that Missouri continues to be the leading state in conservation policies and funding. In 1976, CFM spearheaded successful passage of the conservation sales tax to create stable broad-based funding for Missouri's forests, fauna, and fish. Today CFM is the largest and most representative conservation group in Missouri. It is a citizens' organization with 80 clubs and more than 85,000 members. CFM is the Missouri affiliate of the National Wildlife Federation.

## Forest and Woodland Association of Missouri

520 West 103rd Street, #347, Kansas City, MO 64114
***forestandwoodland.org***

The Forest and Woodland Association of Missouri (FWAM) is a citizen advocacy group for forestry issues. They work in conjunction with other forestry organizations like The Missouri Tree Farm Program and University of Missouri Forestry Extension to provide field days on woodland management for wildlife and timber production. They are also the only forest landowner advocate for forestry-related legislation.

## Missouri Consulting Foresters Association

***missouriforesters.com***

Private foresters furnish a variety of forest management activities on a fee basis. Services include all types of appraisal work: timber land, timber sales, ornamental shade tree damage or value, timber theft, damage to trees due to chemicals, construction, storms, etc. Consultants also perform all phases of timber sale: mark trees to be harvested, summary tally the marked trees by species and board-foot volume, determine estimated value, solicit bids, assist in the sale, provide timber sale contracts, and supervise harvesting operations. They also handle a broad spectrum of work, including forest, wildlife, recreation, and water management; insect and disease identification and control recommendations; tax information; tree planting; timber stand improvement; pruning; thinning; and boundary marking. Often consultants can provide these services at a more intensive level, provide a quicker response, offer unlimited repeat services, and spend more time with a client than public foresters can. A directory of consulting foresters in Missouri can be obtained from the state forester, the extension forester, or the Missouri Consulting Foresters Association.

## Missouri Department of Agriculture

PO Box 630, Jefferson City, MO 65102
573–751–2462
***mda.mo.gov***

The Missouri Department of Agriculture licenses and regulates applicators of pesticides. With the assistance of other state and federal agencies, it also conducts surveys to locate and control the spread of serious insect pests and plant diseases. The DOA establishes preservative retention standards for treated timber products. It also helps pecan and other nut growers, fish farmers, and produce growers market their products.

## Missouri Department of Conservation

PO Box 180, Jefferson City, MO 65102
573–522–4115
***mdc.mo.gov***

The Missouri Department of Conservation, through its Forestry Division, offers free technical advice and services to landowners. Professional foresters can give on-the-ground advice and assistance on tree planting, woodland management, fuel wood cutting, timber stand improvement, harvesting and marketing, wildfire protection, insect and disease detection, and woodland wildlife management. Foresters will prepare management plans and give advice on available financial assistance programs. If you are a landowner, you can receive cost-share payments for specific forestry practices, such as timber stand improvement and tree planting. (Also see Farm Service Agency and Natural Resources Conservation Service.)

The Forestry Division operates the George O. White State Forest Nursery at Licking, MO. You can purchase tree and shrub seedlings at minimal cost for conservation plantings on private lands. Obtain order forms at your local Conservation Department, University Outreach and Extension, Soil and Water Conservation District office, or on the web at mdc.mo.gov. You can order from November through mid-February on a first-come-first-served basis.

## Missouri Department of Natural Resources

PO Box 176, Jefferson City, MO 65102
800–334–6946
***dnr.mo.gov***

The Department of Natural Resources (DNR) regulates standards for air, water, minerals, and energy. It also administers the extensive system of state parks and historic sites in Missouri. Staff members in the Division of Geology and Land Survey restore original public land survey corners to ensure accurate location of property boundaries. DNR's soil and water conservation program promotes good farming practices to prevent erosion and runoff. The staff helps counties form soil and water conservation districts to encourage watershed protection and proper land management.

The Missouri Soil and Water Districts' Commission develops statewide resource conservation programs. These programs are administered locally by county Soil and Water Conservation Districts (SWCDs) in affiliation with the USDA Natural Resources Conservation Service (see USDA section on the following pages). Currently, a state-funded soil and water conservation cost-share program offers financial incentives to agricultural landowners if they install erosion-control projects and practices. A soil and water conservation loan interest-share program offers rebates to landowners for authorized conservation projects. Eligible projects for either program include establishment or protection of woodlands. For more information, contact your local SWCD office.

## Missouri Forest Products Association

505 East State Street, Jefferson City, MO 65101
573–634–3252
***moforest.org***

The Missouri Forest Products Association is dedicated to serving and promoting the forest products industry of Missouri. Founded in 1970, MFPA has more than 300 members representing the primary and secondary wood industry, supplier and service industries, loggers, and landowners. MFPA advocates sustainable management and sound stewardship of Missouri's forests in order to benefit current and future generations.

## Missouri Nut Growers Association

***missourinutgrowers.org***

The Missouri Nut Growers Association is a nonprofit organization of growers of pecan, walnut, hickory, and other nut species. The common interest of all these individuals is growing and promoting Missouri-grown nuts. Members can exchange ideas, tour nut groves and plantations, obtain information about planting and growing nut trees, and keep informed about current research. Meetings are held four times a year, usually at a grower's farm.

## Missouri Forest Resources Advisory Council (MoFRAC)

***mofrac.org***

The Missouri Forest Resources Advisory Council facilitates communication among all who are interested in Missouri's forests in order to assure long-term forest health, productivity, and sustainability. With a membership of more than 30 organizations, the Council serves as a sounding board or in an advisory capacity for agencies and organizations regarding planning, operations, programs, policies, or legislation affecting forestry. Ensuring that timber harvest serves forest management has been a primary concern of the Council since its inception.

## Missouri State Tree Farm Committee

c/o Missouri Forest and Woodland Association
520 West 103rd Street, #347, Kansas City, MO 64114

The Tree Farm Program is a national program sponsored by wood-using industries and coordinated by the American Forest Foundation to promote sound forest management on privately owned woodlands. To qualify as a tree farm, your woodlands must be privately owned, 10 acres or more in size, managed for production of timber and forest products, and protected from fire, insects, disease, and grazing. You can have a forester inspect your woodlands to help you develop a management plan and to determine whether your woods qualify for the Tree Farm system. Owners of certified woodlands receive woodland management information and a green-and-white Tree Farm sign to post on their land. Every year, Missouri tree farmers are recognized for wise forest management through the Outstanding State Tree Farm awards sponsored by the State Tree Farm Committee. Contact the committee or your local forester for more information.

## Pioneer Forest

PO Box 497, Salem, MO 65560
573–729–4641
***www.PioneerForest.org***

At more than 142,000 acres, the L-A-D Foundation's Pioneer Forest is Missouri's largest private land ownership. Since the early 1950's, Pioneer Forest has employed a conservative, uneven-aged forest management method known as single-tree selection harvesting. Pioneer's decades-long research of this successful method strongly indicates it as a truly sustainable forest management practice.

## Walnut Council, International

Wright Forestry Center
1007 N 725 W, West Lafayette, IN 47906-9431
765–583–3501
Fax: 765–583–3512
***walnutcouncil.org***

The Walnut Council includes walnut growers, researchers, foresters, and walnut buyers and manufacturers. Their common interest is growing and using black walnut trees. Landowners exchange ideas and discuss problems at the annual meeting. They also can obtain information about planting, growing, and tending black walnut trees for nut, lumber, and veneer crops at the meeting or from the office. As a member of the Walnut Council International, you may join the Missouri chapter for closer-to-home information.

## University of Missouri—Columbia School of Natural Resources

203 Anheuser-Busch Natural Resources Building
Columbia, MO 65211
573–882–7242
***snr.missouri.edu***

As a land-grant institution, the University of Missouri has three functions: teaching, research, and extension. The School of Natural Resources (a part of the College of Agriculture, Food, and Natural Resources) offers undergraduate and graduate programs in forest resource management, forest recreation, urban forestry, and industrial forestry. The school also has degree programs in fisheries and wildlife; soils and atmospheric science; and parks, recreation, and tourism. Faculty research focuses on the natural resources of Missouri. The school also administers centers for agroforestry, tourism, and water quality.

## USDA Cooperative Extension Service, University Outreach and Extension

103 Anheuser-Busch Natural Resources Building
Columbia, MO 65211
573–882–6446
***extension.missouri.edu***

The Cooperative Extension Service provides technology transfer in cooperation with local and state extension services through land-grant universities such as the University of Missouri–Columbia and Lincoln University. University Outreach and Extension offices are located in each county of Missouri.

## USDA Farm Service Agency

601 Business Loop 70 West, Suite 225, Columbia, MO 65203
573–876–0932
***fsa.usda.gov/FSA/stateoffapp?mystate=mo&area=home&subject=landing&topic=landing***

The Farm Service Agency (FSA) administers the Conservation Reserve Program (CRP). This program is available in all counties in Missouri. The CRP offers cost-share incentives that provide landowners the opportunity to carry out conservation and environmental practices that result in long-term public benefits. Trees, as well as wildlife-cover practices are eligible for cost-share assistance. In addition to cost-share assistance, CRP provides10–15 year annual rental payments to those producers who participate in the program. The FSA also assists the USDA Forest Service in administering the Stewardship Incentives Program (SIP). Under this program, cost-share assistance is available for a wide range of forestry-related practices. You can discuss eligibility requirements and fill out applications for CRP or SIP at the county FSA office where your property is located.

## USDA Forest Service Mark Twain National Forest

401 Fairgrounds Road, Rolla, MO 65401
573–364–4621
*fs.usda.gov/mtnf*

The U.S. Forest Service manages the federal lands of the Mark Twain National Forest in Missouri, providing the multiple benefits of timber, recreation, watershed protection, grazing, and wildlife. The staff conducts research on oak silviculture and management. The Forest Service cooperates on programs designed to benefit private woodland owners.

## USDA Forest Service Northern Research Station

202 Anheuser-Busch Natural Resources Building
Columbia, MO 65211–7260
573–875–5341
*nrs.fs.fed.us*

Laboratory staff conduct forest and wildlife research on upland forests in Missouri and surrounding states. Research information is available on silviculture and ecology of hardwood forests, growth and yield, oak flowering and acorn production, forest wildlife, propagation, ground covers, old-growth forests, site productivity, and ecosystem management.

## USDA Natural Resources Conservation Service

601 Business Loop 70 West, Suite 250, Columbia, MO 65203
573–876–0900
*nrcs.usda.gov/wps/portal/nrcs/site/mo/home/*

The Natural Resources Conservation Service (formerly the Soil Conservation Service) provides technical assistance and guidance to land users, groups, and units of government to help protect, develop, and wisely use soil, plant, air, water, and animal resources. NRCS programs and initiatives include reducing erosion, improving water quality, preventing floods, enhancing fish and wildlife habitat, promoting good land use, and conserving soil, water, and other natural resources. NRCS administers cost-sharing programs with forestry-related uses. Producers can discuss eligibility requirements, fill out applications for these programs, or request technical assistance at any of the county field offices in Missouri. Check your telephone directory under U.S. Government for your local NRCS office.

## USFWS — Missouri Ecological Services Field Office

101 Park De Ville Drive, Suite A, Columbia, MO 65203
573–234–2132
*www.fws.gov/midwest/ColumbiaES*

The USFWS Missouri Ecological Services Field Office achieves conservation throughout the state of Missouri through partnerships and collaboration. Responsibilities under the Endangered Species Act include conserving declining species before listing is necessary, adding species to the list of threatened and endangered species, working to recover listed species, and working with other Federal agencies to ensure that their projects do not irreparably harm listed species.

## USFWS — Missouri Private Lands Office

101 Park De Ville Drive, Suite B, Columbia, MO 65203
573–234–2132
E-mail: ***missouriplo@fws.gov***
*www.fws.gov/midwest/partners/*

The USFWS Missouri Private Lands Office works strategically and in collaboration with voluntary private landowners, non-profit organizations, businesses, communities and county governments to implement stewardship based projects for fish and wildlife conservation in Missouri with a focus on restoring key habitats for migratory birds, federally-listed threatened and endangered species, species in decline and landscapes that enhance our National Wildlife Refuge System.

# Credits and Acknowledgments

## Development Process

In 2012–2013, the Missouri Department of Conservation and more than a dozen partner organizations and agencies created these guidelines.

To help shape and develop this document, five technical teams were assembled. These teams were comprised of subject matter experts from resource management agencies, forest researchers, and members of various organizations from the Missouri Forest Resources Advisory Council (MoFRAC). The teams were charged with developing best management practices related to forest management activities. The technical teams met over an 18-month period to structure and develop these guidelines.

An integration team was also formed, which included one elected member from each technical team. The integration team compiled the practices recommended by the technical teams into a comprehensive document that details voluntary guidelines for well-managed forests in Missouri. The document was peer reviewed, based on the best available scientific research, and was presented for a 60-day public comment period to ensure that it achieved the social, environmental, and economic objectives of forest sustainability.

## *Missouri Forest Management Guidelines* Technical Team Members

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# Glossary of Terms

Excerpts from: *The Dictionary of Forestry*, ed. John A. Helms; *The Terrestrial Natural Communities of Missouri*, by Nelson (Missouri DNR, 2010); *Forest Stand Dynamics*, by Oliver and Larson (Mcgraw–Hill, 1990); *Missouri Woody Biomass Harvesting Best Management Practices Manual*, 2009; *Wisconsin Forest Management Guidelines*, 2011; *Understanding Earth*, second edition by Siever (Freeman and Company, 1997)

***Note:*** Definitions from Helms are starred. Definitions from other sources are not. Definitions including information in brackets are localized to Missouri conditions.

*** Abiotic** — Pertaining to the nonliving parts of ecosystems, such as bedrock, soil particles, air, water.

**Acceptable Growing Stock** (AGS) — Merchantable trees that are not large enough to be mature but are desirable species, form, and quality, and would be satisfactory as crop trees in a final stand on the site or have potential to be grown for a future intermediate cut.

*** Advance Regeneration** — Seedlings or saplings that develop or are present in the understory.

**Aesthetics** — Pleasing in appearance or pleasing to the senses.

**Alfic Soils or Alfisol** — Soil order describing moderately weathered soils with a clay-rich B horizon and a base saturation of > 35 percent that have typically developed under tree-dominated vegetation — moderately fertile soils.

*** Artificial Regeneration** — A group or stand of young trees created by direct seeding or by planting seedlings or cuttings; synonym for artificial reproduction.

**B level** — Fully stocked stand where all growing space is being utilized. Theoretically, there would be no gaps or room to grow between tree crowns.

*** Basal Area** — (1) The cross-sectional area of a single stem, including the bark, measured at breast height (4.5 feet above the ground); (2) the cross-sectional area of all stems of a species or all stems in a stand measured at breast height and expressed per unit of land area.

**Broad-Based Dip** — A drainage structure designed to drain water off a dirt road while in use for vehicles maintaining normal haul speeds; also called a rolling dip.

**Buffer Strip** — A barrier of permanent vegetation established or left undisturbed downslope from disturbed forest areas to filter out sediment from runoff before it reaches a watercourse. Buffer strips help stabilize stream banks, protect floodplains from flood damage, and provide important fish and wildlife habitat.

**Bumper Trees** — Trees along skid trails that are used by the skidder driver to help guide a drag of logs up the hill toward the landing. These trees will be severely damaged. Trees used as bumper trees should be trees designated for harvest or inferior trees not intended or desired for future growth.

**C level** — Understocked stand where all of the growing space is not being utilized. There should be no gaps in the canopy. On a slower growing site, such as a post oak woodland, it should take approximately 12–15 years to reach B level stocking.

**Cavity tree** — A live tree with a cavity large enough to shelter wildlife. For wildlife purposes, these should be at least 6 inches DBH and 10 feet tall. Long-lived species such as oaks and hickories are preferred.

*** Cation Exchange Capacity** — The sum of exchangeable bases plus total soil acidity at a specific pH, usually 7.0 or 8.0 — *note 1*. when acidity is expressed as salt extractable acidity, the cation exchange capacity is called the effective cation exchange capacity (ECEC) because this is considered to be the CEC of the exchanger at the native pH value.

**Coarse Woody Debris** — Treetops, stumps, fallen trunks or limbs more than 6 inches in diameter at the large end.

*** Community** — An assemblage of plants and animals living together and occupying a given area. Note: (1) in a closed community, plants are so completely utilizing the site that they exclude (or give the appearance of excluding) further entrants; (2) classifying a community as closed is subjective and is based on one-time measurements or observations.

**Contour** — An imaginary line on the surface of the earth connecting points of the same elevation; a line drawn on a map connecting points of the same elevation.

**Crop Tree** — A tree having a dominant or co-dominant crown, and a stem having good form and with little to no defects that would prevent the tree from reaching biological maturity. Crop trees are selected for special treatment due to certain virtues, usually with a future product in mind. Virtues include species, form, growth rate, potential future products, match to site growing conditions, etc.

**Culvert** — A pipe of either metal or concrete or a constructed box-type conduit, through which water is carried under roads.

**DBH** — The diameter of the stem of a tree measured at breast height (4.5 feet; 1.37 meters) from the ground.

**Ephemeral Stream** — Water flow with runoff from rain or snowmelt; the water table never reaches the streambed.

**Erosion** — The process by which soil particles are detached and transported by water, wind, and gravity to some downslope or downstream point.

**Even-Age Management System** (EAM) — A forest management strategy that results in stands of trees all nearly the same age.

**Felling** — The act of cutting down standing trees.

**Fen** — A peat-accumulating wetland that has received some drainage from surrounding mineral soils and usually supports marsh-like vegetation including sedges, rushes, shrubs, and trees. Note: Fens are less acidic than bogs and derive most of their water from groundwater rich in calcium and magnesium.

**Fine Woody Debris** — Leaves, twigs, tops, limbs, and other woody debris less than 6 inches in diameter at the large end.

**Ford (Stream Crossing)** — A place in a stream or river that is shallow enough to be crossed by wading, on horseback, or in a wheeled vehicle.

**Forester** — (1) In Missouri, "any individual who holds a Bachelor of Science degree in Forestry from a regionally accredited college or university with a minimum of two years of professional forest management experience," as defined in Senate Bill 931, 2008. (2) In general, a professional engaged in practicing the science and art of forestry. Foresters may be credentialed by states or other certifying bodies and may be licensed, certified, or registered. An example is the Society of American Foresters Certified Forester credential. The requirements for each credentialing program differ but usually include at least a baccalaureate degree in forestry and success in passing a comprehensive examination.

**Forest Road** — An access route for vehicles into forest land.

*** Fragipan** — A natural subsurface horizon with very low organic matter, high bulk density, or high mechanical strength relative to overlying and underlying horizons, which typically has redoximorphic features, is slowly or very slowly permeable to water, is considered root restricting, and usually has few to many bleached, roughly vertical planes that are faces of coarse or very coarse polyhedrons or prisms. Note: A fragipan has hard or very hard consistency (seemingly cemented) when dry but shows a moderate to week brittleness when moist.

**Glacial Till** — A mixture of clay, silt, sand, mud, gravel, and boulders deposited by a glacier.

**Harvesting** — The felling, skidding, loading, and transporting of forest products such as saw logs, stave logs, veneer, pulpwood, pine poles, posts, etc.

**High Grading** — The removal of the most commercially valuable (high-grade) trees, often leaving a residual stand composed of trees of poor condition or species composition. Note: High grading may have both genetic implications and long-term economic or stand health implications.

**Intermittent Stream** — A watercourse with water flow only during wet seasons but still with well-defined banks and natural channels. It may contain seasonal pools during dry periods. The water table is above the streambed at certain times but not always.

**Invasive Exotic** — Any species, including its seeds, eggs, spores, or other biological material capable of propagating that species that is not native to the ecosystem and whose introduction does or is likely to cause economic or environmental harm or harm to human health (from ***invasive.org***). Examples of invasive exotics are kudzu, emerald ash borer, Japanese honeysuckle, euonymus, Asian longhorned beetle, tree-of-heaven, gypsy moth, Japanese beetle, garlic mustard, tall fescue, and zebra mussel.

**Karst** — Topography with sinkholes, caves, and underground drainage that is formed by dissolution of a layer or layers of soluble bedrock, usually limestone, dolomite, or gypsum.

**Landform** — Literally "the lay of the land" (i.e., terrain features such as hills, plains, bottomland).

**Log (Woody Biomass) Landing** — A place where logs or tree-length materials are assembled for loading and transport; also called log deck, log yard, or bunching area.

**Logging Debris** — The unused and generally unmarketable woody material such as large limbs, tops, cull logs, and stumps that remains after timber harvesting.

**Lopping** — Cutting large branches on treetops to reduce their visibility near roads and other areas where the public may find the view offensive.

**Mast** — Fruit, seeds, and nuts from trees that provide food for wildlife; further defined into soft mast, such as persimmon, and hard mast, such as acorns.

*** Mesic** — Of sites or habitats characterized by intermediate moisture conditions (i.e., neither decidedly wet nor dry); a soil moisture class used to describe soils that are moderately well drained.

**Mineral Soil** — The portion of soil originating from rock that has eroded and broken down into small particles.

**Mulch** — Any loose soil covering of organic residues such as grass, straw, or wood fibers that helps to check erosion and stabilize exposed soil.

*** Native Species** — (1) an indigenous species that is normally found as part of a particular ecosystem; (2) A species that was present in a defined area prior to European settlement.

**Natural Disturbance** — Disturbance regimes that shape a natural community's structure and composition, including windstorm, ice storms, tornadoes, drought, fire, flood, elk, bison grazing, herbivory, and insect and disease outbreaks. Management practices are often undertaken to emulate or mimic to some degree natural disturbance.

**Perennial Stream** — A watercourse that flows throughout the year in a well-defined channel; same as a live stream.

**Pesticides** — Chemicals that are used for the control of undesirable insects, disease, vegetation, animals, or other forms of life.

*** Prescribed Burn** — To deliberately burn wild-land fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives; includes maintenance type fire.

**Regeneration** — (1) The young tree crop replacing older trees removed by harvest or natural disaster; (2) The process of replacing old trees with young trees.

**Regeneration Cutting** — Any removal of trees intended to assist regeneration already present or to make regeneration possible.

**Riparian Management Zone** (RMZ)— See Streamside Management Zone

**Rotation** (Period) — The period of time required to establish a forest stand from seed or planted seedling, grow the trees to financial or biological maturity, harvest the crop, and prepare for the next stand.

**Sawtimber** (Tree) — Logs cut from trees with minimum diameter and length and with stem quality suitable for conversion to lumber. Hardwoods must be at least 11 inches DBH or larger to be considered sawtimber.

**Seep (Seepage)** — (1) Any wetland areas with soils fed by groundwater saturation or a local perched water table; (2) Water escaping through or emerging from the ground along an extensive line or surface, as contrasted with a spring where the water emerges from a localized spot; (3) Percolation, or the slow movement of gravitational water through the soil.

*** Shade-Tolerant** — Having the capacity to compete for survival under shaded conditions.

*** Silviculture** — The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.

**Sinkhole** — A small, steep depression caused by dissolution and collapse of subterranean caverns in carbonate formations.

**Site Preparation** — A forest activity to remove unwanted vegetation and other material and to cultivate or prepare the soil for reforestation; includes bulldozing, brush hogging, and use of herbicides.

**Skid** — Moving logs or felled trees along the surface of the ground from the stump to the log landing.

**Skidder** — A large tractor-like machine used to pull logs from the place where they were cut to the log landing/deck. Skidders have very large rubber tires with four-wheel drive. They have a blade in the front used to push dirt and small trees out of the way. There are cable skidders and grapple skidders. Cable skidders require the driver to stop, get off the skidder, and set the cable around each log. Grapple skidders allow the driver to back up to each log and grab it. Good work can be done by both types of skidder if the driver is skilled; grapple skidders generally do more damage.

**Skid Trail** — A temporary, heavily used pathway to drag felled trees or logs to a log landing.

*** Slash** — The residue, e.g., treetops and branches, left on the ground after logging or accumulating as a result of storm, fire, girdling, or delimbing.

**Slope Percent** — The grade of a hill expressed in terms of a percentage; a vertical rise of 10 feet and a horizontal distance of 100 feet equals a 10 percent slope.

*** Snag** — A standing, generally unmerchantable dead tree from which the leaves and most of the branches have fallen —note for wildlife habitat purposes, a snag is sometimes regarded as being at least 10 in (25.4 cm) in diameter at breast height and at least 6 ft (1.8 m) tall; a hard snag is composed primarily of sound wood, generally merchantable, and a soft snag is composed primarily of wood in advanced stages of decay and deterioration 2. A standing section of the stem of a tree, broken off usually below the crown 3. A sunken log or a submerged stump or tree 4. The projecting base of a broken or cut branch on a tree stem.

*** Stocking Percent** — The extent to which a given stand density meets a management objective, expressed as a percentage.

**Streamside Management Zone** (SMZ) — An area along the banks of streams and bodies of open water where extra precaution is necessary in carrying out forest practices in order to protect the stream bank and water quality.

*** Succession** — The gradual supplanting of one community of plants by another. Notes: (1) The sequence of communities is called a sere, or seral stage. (2) A sere whose first stage is open water is termed a hydrosere; and one whose first stage is dry ground is termed a xerosere. (3) Succession is primary (by pioneer species) on sites that have not previously borne vegetation, secondary after the whole or part of the original vegetation has been supplanted, allogenic when the causes of succession are external to and independent of the community (e.g., accretion of soil by wind or water, or a change of climate), and autogenic when the developing vegetation is itself the cause.

**Swallet** — A place where water disappears underground in a karst region; swallet is commonly used to describe the loss of water in a streambed.

**Timber Stand Improvement** (TSI) — A thinning made in immature stands to improve the composition, structure, condition, health, and growth of remaining trees.

**Ulitisol** — The dominant "red clay" soils in the southern United States, often having a pH less than 5. The high acidity and low amounts of major nutrients, such as calcium and potassium, make these soils poorly suited for agriculture without the aid of fertilizer and lime. They can be easily exhausted and require careful management but can support productive forests.

**Uneven-Age Management System** (UAM) — A planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

**Visual Quality** — A subjective measure of the impact that viewing an object, landscape or activity has on a person's perception of attractiveness

**Waterbar** — A hump or small dike-like drainage structure used to divert water in closing skid trails, retired roads, and firelines.

**Watershed** — An area of land that drains rain and snowmelt into a stream or river. Size is relative to the use of the information. Size may range from a single creek draining only a few acres to a large river where water comes from many states, like the Mississippi River.

**Water Turnout** — The extension of an access road's drainage ditch into a vegetated area to provide for the dispersion and filtration of storm water runoff; also called a wing ditch.

*** Wetland** — (1) A transitional area between aquatic and terrestrial ecosystems that is inundated or saturated for periods long enough to produce hydric soils and support hydrophytic vegetation; (2) A seasonally flooded basin or flat. Note: The period of inundation is such that the land can usually be used for agricultural purposes.

*** Wildlife** — (1) All non-domesticated animals; (2) Non-domesticated vertebrates, especially mammals, birds, and fish, and some of the higher invertebrates, for example, many anthropoids.

*** Woodland** — (1) A forest area; (2) A plant community in which, in contrast to a typical forest, the trees are often small, characteristically short-boled relative to their crown depth, and forming only an open canopy with the intervening area being occupied by lower vegetation, commonly grass.

**Woodland Structure** — A woodland is characterized by wide-spreading tree crowns and an open understory of grasses, forbs, and shrubs. Canopy closure is generally 30–70 percent.

**Woody Biomass** — "Small-diameter trees, branches, and the like (brush, treetops) — that is generated as a result of timber-related activities in forests" (U.S. Government Accountability Office).

*** Xeric** — Pertaining to sites or habitats characterized by decidedly dry conditions.

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