

## 2.1 Overview

This chapter provides an overview of lands and activities for which take authorization is requested under the Lake States HCP. A primary driver for this HCP is the need to conduct forest management activities, especially timber harvest, on nonfederal lands in Michigan, Minnesota, and Wisconsin. The Departments of Natural Resources for these states (State DNRs) will be the recipients of the incidental take permit for each state. They will be able to extend this incidental take coverage to counties, municipalities, and private landholders within their state through a Certificate of Inclusion (COI) or similar process. Forested land in all three states is managed to benefit a variety of organisms, provide economic benefits to citizens, maintain ecosystem services, and provide recreational opportunities for residents. All forested lands not owned or managed by the federal government and falling within the states of Michigan, Minnesota, and Wisconsin are eligible to receive coverage under the Lake States HCP and will be referred to as the *covered lands*.

The covered lands comprise approximately 9.2 million acres of land owned or managed by the DNRs in the states of Michigan, Minnesota, and Wisconsin as well as 38.1 million acres of forestlands owned and managed by other nonfederal entities. Descriptions of covered activities are based on current operations and available projections. As a programmatic plan covering multiple entities, the amount and exact location of these activities may shift over time. The nature of each activity is described below and the extent (acres) of each activity is provided for context. Chapter 4, *Potential Effects of Covered Activities*, quantifies the potential effects of these activities on covered species and anticipated take under this HCP for each covered species.

### 2.1.1 Covered Lands Summary

This section describes three categories of covered lands in each state: DNR-managed lands, county and municipal lands, and private lands. Table 2-1 provides ownership across the three states and includes a summary of federal lands, which, while not covered in this HCP, provides important context. Ownership data were obtained from the Forest Inventory and Analysis National Program (FIA), a national forest dataset that provides a consistent, replicable record of forestland ownership, as well as forest type, timber harvest, and other variables relevant to subsequent analyses. The U. S. Forest Service developed and maintains this system, which is one of the most comprehensive forest monitoring programs in the world. It is a multi-tiered inventory and data processing effort in which foresters use a combination of both field data collected by biologists and remote sensing data. The result is a publicly available data set that is collected using a consistent approach across the Lake States (Smith 2002, Oswalt et al. 2014). The data are available as decadal summaries of forest resources by state and annual reports.<sup>1</sup> The FIA database was used to quantify ownership patterns across the Lake States. The FIA defines forestland as land that has at least 10 percent crown cover by live, countable trees now, or in the past (as evidenced by stumps, snags, etc.) Individual patches of

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<sup>1</sup> Available at <https://www.fia.fs.fed.us>.

forestland must be at least 1 acre and 120 feet wide. Tree-covered agricultural production areas, such as orchards, and tree clusters in urban settings, such as city parks, are excluded.

The 54.78 million acres of forestland in the Lake States are distributed unevenly across ownerships. Federal forestland accounts for 13.7%, state ownership is 16.9%, county and municipal ownership is 9.8%, 10.3% is private corporations, 45.4% noncorporate entities (private individuals), and 3.8% other private entities, such as nonprofit conservation groups, private clubs, and Native American tribes.

Among the State DNRs, Michigan holds the largest amount of forestland as defined by FIA, 4.20 million acres, followed by Minnesota with 3.85 million, and Wisconsin with 1.19 million. (Elsewhere in this document state-owned lands exceed the acres of FIA-reported forestland due to inclusion of non-forestlands, and in Minnesota, the inclusion of state-owned forestland managed by counties.) County land represents a small fraction of Michigan's forestland (435,000 acres), but Minnesota and Wisconsin counties and municipalities manage 2.57 million and 2.36 million acres, respectively. Nearly all Minnesota land reported as county land in the FIA data is actually held in trust by the state and managed as forestland by counties.

Private forestland owners hold significant amounts of land in Michigan and Wisconsin (12.60 million and 11.89 million acres, respectively). Minnesota private forestland ownership is about 30% less, at 8.15 million acres. Individuals own the majority of private forestland in all states. Corporate holdings in Michigan, Minnesota, and Wisconsin are 2.9 million (23.0% of all private forestlands), 1.24 million (15.2%), and 1.5 million acres (12.6%), respectively.

**Table 2-1. Distribution of Forestlands and Ownership across the Lake States**

FIA Ownership Class	Acres of Forestland			Total
	Michigan	Minnesota	Wisconsin	
<b>State</b>				
State	4,208,398	3,848,587	1,192,783	9,249,768
<b>County and Municipal</b>				
County and municipal	426,537	2,569,083	2,354,532	5,350,152
Other local government	8,212	5,279	4,434	17,925
Total county & municipal	434,749	2,574,362	2,358,966	5,368,077
<b>Private Corporate</b>				
Corporate-forest industry	468,716	615,878	196,098	1,280,692
Corporate-other (e.g., universities, other incorporated entities)	2,432,879	622,836	1,299,873	4,355,588
<b>Private Noncorporate</b>				
Individual and family, incl. Trusts, estates, and family partnerships	9,036,292	6,147,247	9,699,733	24,883,272
Nongovernmental conservation/ natural resources organization	165,319	31,725	79,893	276,937
Unincorporated local partnership/ association/club	485,589	70,002	198,396	753,987

FIA Ownership Class	Acres of Forestland			
	Michigan	Minnesota	Wisconsin	Total
Native American Indian	29,278	662,693	411,069	1,103,040
Total private	12,618,073	8,150,381	11,885,062	32,653,516
Total covered lands	17,261,220	14,573,330	15,436,811	47,271,361
<b>Federal</b>				
National forest	2,756,444	2,594,167	1,424,254	6,774,865
Bureau of Land Management		5,686		5,686
U.S. Fish and Wildlife Service	54,736	84,479	99,479	238,694
U.S. Department of Defense	6,156	12,013	40,233	58,402
Other federal	232,320	142,854	56,193	431,367
Total federal	3,049,656	2,839,199	1,620,159	7,509,014
Grand total (all ownerships)	20,310,876	17,412,529	17,056,970	54,780,375

Source: Miles, P.D. Thu Feb 09 08:05:46 CST 2017. Forest Inventory EVALIDator web-application Version 1.6.1.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station.

## 2.1.2 Covered Activities Summary

The Lake States HCP was primarily developed to provide the State DNRs with incidental take coverage associated with forest practices that might affect listed or at-risk bat species. Timber harvest and related forest practices are the primary covered activities in the Lake States HCP. This HCP and the associated incidental take permit can offer incidental take coverage to eligible applicants engaged in forest management through COIs or through 50 C.F.R. 13.25(e). Associated activities such as road and trail construction for forestry, prescribed fire, and monitoring which may result in incidental take will also be covered (Table 2-2).

**Table 2-2. Categories of Covered Activities**

Covered Activity	Ownership Category		
	State DNR	County or Municipal Government	Private
<b>Timber harvest and related forest practices<sup>a</sup></b>			
Regeneration harvest	X	X	X
Intermediate harvest	X	X	X
Salvage/sanitation	X	X	X
<b>Road and trail construction, maintenance and use<sup>a</sup></b>			
DNR and county road and trail construction <sup>a</sup>	X	X	
DNR and county road maintenance and use	X	X	
<b>Prescribed fire</b>			
Fire breaks	X	X	X
Burning	X	X	X

Covered Activity	Ownership Category		
	State DNR	County or Municipal Government	Private
Lake States HCP implementation			
Lake States HCP monitoring	X	X	X
Habitat restoration	X	X	X

<sup>a</sup> Temporary forest roads associated with specific timber sales are covered as part of forestry in all ownership types.

### 2.1.3 Timber Harvest and Related Forest Practices

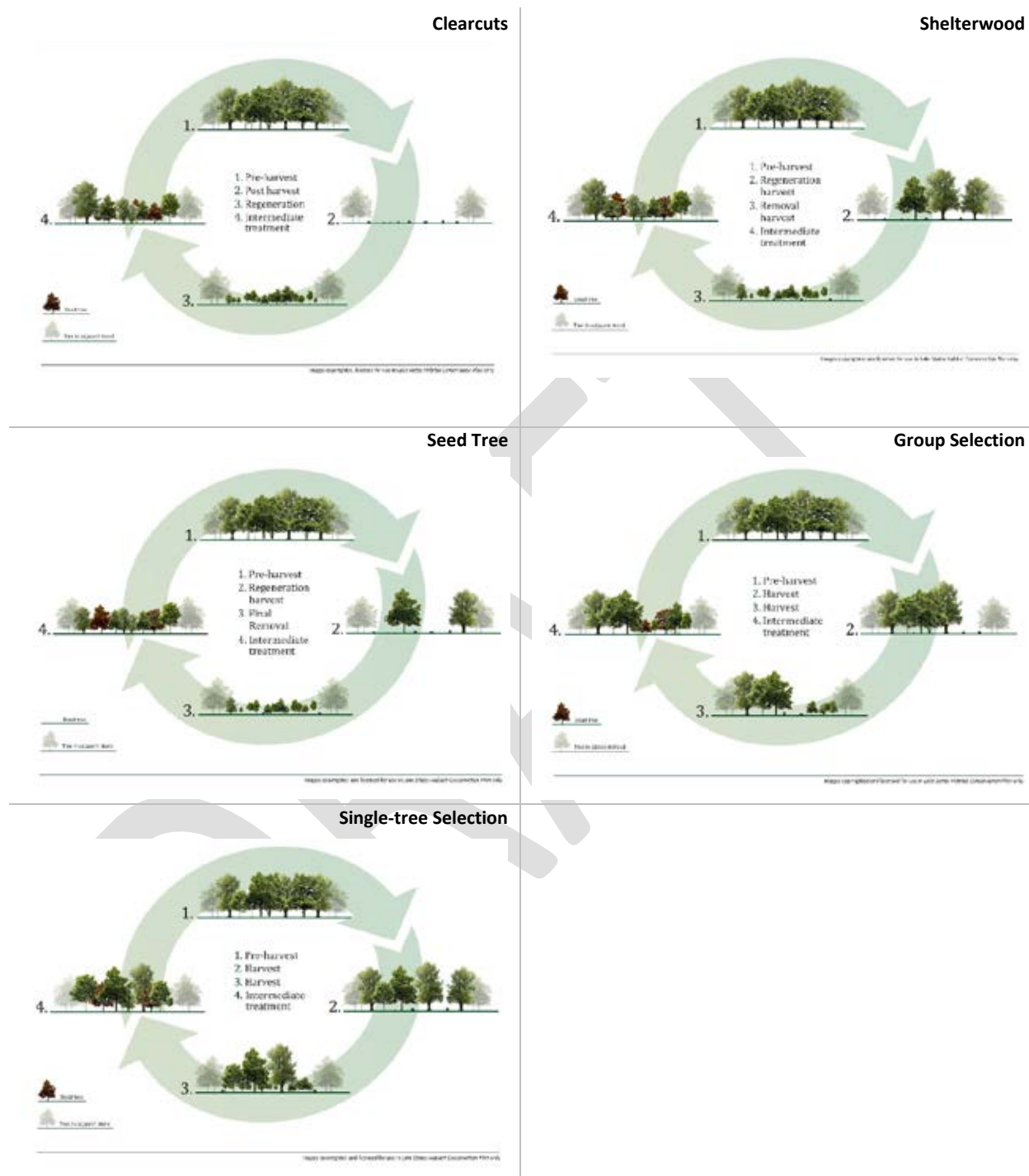
Timber harvest provides an economic benefit to the landowner and supports the forest products industry. It is also an important and often-used tool in natural resources management. Timber harvests are used in forestry to help regenerate and direct the growth of forest stands toward specific management objectives. Timber harvests can be aimed at controlling the growth, development, health, structure, composition, and quality of forest stands to meet a set of needs including timber production, wildlife habitat, preservation of rare species, and recreational opportunities. The rate and extent of timber harvest ranges widely depending upon forest cover type, the age and development stage of timber resources, and the goals of the harvest. Most timber harvested on the covered lands is sold to private purchasers.

Silvicultural techniques used by the State DNRs are generally similar, but each state uses its own variation on forest management terminology. Timber harvesting follows a spectrum of duration, disturbance, intensity, and frequency. For example, a single tree selection harvest is relatively low in intensity and includes multiple entries once every 10 to 15 years (depending upon the tree species and site conditions) over multiple decades. Conversely, a clearcut is a relatively high-intensity management action that occurs at a single point in time and, depending on the tree species and site conditions, may only occur once every 50 to 100 years. Timber harvesting, as practiced by the permittees, falls into the following categories (see Section 2.1.3.1 for definitions).

- **Regeneration harvest**
- **Intermediate harvest**
- **Salvage/sanitation harvest**

In keeping with their various missions, divisions in each of the State DNRs use a different mix of practices, and not all activities occur on all lands. Further, management practices vary because of differing site conditions and state-level regulations and directives. Terminology used to refer to timber harvest practices also varies across states. Appendix C provides a crosswalk to standardized terms.

Regeneration methods (Fig. 2-1) have different ecological effects on bats, and they are grouped into two effect categories described in Section 2.1.3.3. *Ecological Categories of Harvest*.



**Figure 2-1. Overview of Regeneration Methods**

A timber operation involves several activities, all of which are part of the broader category of timber harvest practices. For the purposes of the HCP, these activities are described in this section rather than individually in the subsections of 2.1.3.2, *Harvest Types*, below. These component activities include tree felling, skidding/forwarding, delimiting, bucking/chipping, loading, and hauling. Felling is done using either chain saws or mechanized fellers. Larger trees are usually processed into logs

for transport by skidders or forwarders to roadside landings, where they are loaded onto trucks. Skidders drag logs or entire trees along skid trails, which confines the area on which logs are moved. Motorized equipment is used to cut, move, chip, and haul trees during harvesting operations. Equipment operators acting as agents of the State DNRs occasionally remove individual trees to ensure operator safety. In some cases, multiple acres may be cleared where undesirable species have become established, especially if spot treatments (mechanical and/or chemical) are impractical, or to clear brush for planting seedlings of desired species. Planting trees after harvest may require wildlife repellants or fencing to prevent seedling damage. For mechanical treatments (those that use machines as opposed to manual labor), mowers designed to handle brush and small trees, and disking (a form of plowing) may be needed. This type of activity is part of forest management, but may also be used to create and maintain roads and trails (Section 2.1.4, *Roads and Trails Construction, Maintenance, and Use*). Collectively, these activities are subsumed by the larger categories of activities (i.e., regeneration harvest, intermediate harvest and salvage) described in Section 2.1.3.2, *Harvest Types*.

### 2.1.3.1 Background and Definitions

Forest managers use a wide variety of techniques to influence the current and future conditions of trees within a management unit termed a *stand*. One of the most important tools available to forest managers is timber harvest. The Lake States HCP recognizes three major categories of timber harvest based on the function and purpose of the harvest – regeneration harvest; intermediate harvest; and, salvage/sanitation harvest. Those harvest types are described above.

The general forestry definitions provided below are modified from the Society of American Foresters definitions (Helms et al. 1998), unless otherwise cited. Note that many techniques in forestry are adapted or modified to suit desired outcomes, and the defined prescriptions may be used or modified in ways that are not specified here.

#### General Terms

- **Clutter.** Clutter describes the structural complexity of the overall forest (O’Keefe et al. 2014). The higher the clutter, the more complex the forest. Clutter can be measured by comparing the volume of trees and vegetation to the volume of open space in a stand.
- **Cohort.** A cohort is a group of trees developing after a single disturbance, commonly consisting of stems of similar age, although it can include a considerable range of tree ages from seedling or sprout origin as well as trees that predate the disturbance.
- **Coppice.** A coppice is the production of new stems from the stump or roots, which can be used in combination with any other silvicultural technique to regenerate a stand.
- **Cord.** A cord is a measure of volume by which firewood and pulpwood are measured.
- **Firebreak.** A firebreak is an area empty of combustible material that prevents fire from spreading beyond it.
- **Intermediate harvest.** An intermediate harvest is a forest harvest method used to manipulate the growth, quality, vigor, and composition of a stand after establishment of regeneration and prior to final harvest.
- **Management approach.** The management approach describes the practices used in forestry to achieve management objectives (Duncker et al. 2014).

- **Overstory removal.** Overstory removal refers to the harvesting of many to all of the trees within the upper layer of the canopy in a stand. This is usually done to facilitate the forest regeneration process, e.g., to release seedlings and saplings in the understory. Overstory removal is employed in multiple even-aged management approaches.
- **Regeneration harvest.** A regeneration harvest is a forest harvest that uses various methods to remove trees from a mature stand to allow establishment of a new age class.
- **Release.** Release refers to the increased growth rate caused when a tree gains access to a previously limiting factor (usually sunlight, water, or nutrients). Most silvicultural techniques are aimed at releasing a targeted group of trees within a stand.
- **Salvage harvest.** Salvage harvest refers to a forest harvest completed to remove dead, dying, or damaged trees to avoid economic loss.
- **Seral stage.** The seral stage is the series of biotic communities formed by the process of ecosystem development called succession. In forested landscapes, the various vegetation communities that occupy disturbed sites are called seral stages. Seral-stage communities consist of vegetation types that are adapted to the site's particular set of physical and biotic conditions. A seral stage indicates the point of succession a forest is currently in (early seral, midseral, late seral).
- **Silviculture.** Silviculture is 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” (U.S. Forest Service 2014).
- **Slash.** Slash refers to the limbs, tops, branches, and/or bolewood left on the ground after logging.
- **Stand.** A stand is a contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable and manageable unit.

### Types of Stand Management

- **Even-aged.** An even-aged stand is a management approach where trees in the stand consist of one to two cohorts at any given time. Even-aged stands are regenerated through the use of clearcuts, shelterwoods, or seed tree management approaches.
- **Uneven-aged.** An uneven-aged stand is a management approach where trees in the stand consist of three or more cohorts at any given time. Uneven-aged stands are regenerated through the creation of gaps within an existing stand through either natural means or by harvest. Harvest approaches used to create uneven age management can consist of removing one tree at a time (single tree selection) throughout the stand, or by removing small clusters of trees (group tree selection).

### Management Systems that Produce Even-Aged Stands

- **Clearcut.** A clearcut management system uses an even-aged stand harvesting method in which all trees in a stand are removed to allow regeneration of a new age class.
- **Seed tree.** A seed tree management system uses an even-aged stand harvesting method in which most trees in a stand are removed with exception of a few trees that are retained to spread seeds for regeneration. Seed trees are often removed after regeneration occurs.

- **Shelterwood.** A shelterwood management system uses an even-aged stand harvesting method that involves the cutting of mature overstory trees in successive harvests. This is often conducted in three cuts: preparatory, regeneration or seeding, and removal.

### Management Systems that Produce Uneven-Aged Stands

- **Group selection.** A group selection management system uses an uneven-aged stand harvest method that removes small clusters of trees and establishes new age classes within a stand.
- **Single tree (individual) selection.** A single tree selection system uses an uneven-aged stand harvest method where regeneration is managed in small gaps by the harvesting of individual trees.

### Subtypes of Intermediate Harvests

- **Cleaning.** A cleaning removes select tree species to better support favored tree species.
- **Commercial thinning.** Commercial thinning removes trees of an appropriate size and type to be sold.
- **Precommercial thinning.** Precommercial thinning removes trees that are not marketable due to size and/or type.
- **Thinning.** Thinning removes trees to reduce competition and stem density, with the aim of improving growth, enhancing forest health, and recovering potential mortality.
- **Salvage cut.** A salvage cut removes dead or dying trees affected by adverse events (i.e., disease, insects, fire, etc.) to improve stand health, capture economic value that would be lost in the near future, and prevent additional mortality within or beyond a stand's boundary.
- **Sanitation cut.** A sanitation cut removes either infected or healthy trees of a species prone to infection to limit the spread of a biotic pest (e.g., disease, insects).

## 2.1.3.2 Harvest Types

### Regeneration Harvest

Regeneration harvest is timber harvest conducted to promote tree regeneration, balance forest age classes, and extract usable or merchantable timber. Regeneration cuts occur in forest stands that are either even-aged (consisting of one or two age classes) or uneven-aged (consisting of three or more age classes). Trees growing in even-aged stands have small differences in ages (typically less than 20% of the intended rotation age), while uneven-aged stands comprise trees having markedly different ages. In addition, uneven-aged stands tend to be more structurally complex than even-aged stands.

### Even-Aged Stand Harvests

Techniques that regenerate even-aged stands typically include clearcutting, shelterwood harvests, and seed tree harvests. Even-aged management can promote early- to midseral stage species such as black cherry, oaks, and hickories, which are often particularly valuable for wildlife. For the purposes of this HCP, two-aged stand systems are included with the closely related even-age techniques. These typically have both young and old trees, often in woodland or savannah habitats with relatively low canopy cover, which are also often highly valuable for wildlife. All types of even-aged



stand harvests employ some kind of overstory removal, or the removal of the highest layer of canopy in a stand to release advance regeneration in the understory.

### **Clearcuts**

Michigan, Minnesota, and Wisconsin all define clearcuts as one of their timber harvest techniques. Historically clearcuts removed all or nearly all trees from the stand in a single harvest. The DNRs practice clearcuts with reserves, which retain a minimum of 5% of the trees. These remaining trees are called a residual, standard, or reserve. These trees are left either in clumps or as scattered individuals for maintaining a structural legacy or for wildlife habitat (i.e., retention of cavity, mast, and legacy trees) or other benefits such as erosion control and aesthetics. In some cases a more extensive reserve can be used to produce the same type of regeneration produced by a shelterwood (see below) without requiring re-entry to the stand. Clearcuts are usually regenerated by a combination of advance regeneration (seedlings already established), seed produced by trees adjacent to the harvest area or from trees cut in the harvest operation, sprouting from stumps or roots of cut trees, and the planting of seedlings. Regeneration of clearcuts might require site preparation and subsequent control of competing vegetation. A variation of a *two-aged* clearcut produces a stand with two age cohorts.

Each state conducts a variety of subtypes of clearcutting (even and two-aged). These subtypes include coppicing or clearcutting with sprouting, uniform, alternate, and progressive cuts. These activities are effective for managing different species of trees, but they all produce the same result of a cleared stand, most often with residuals. Species that are commonly managed with clearcuts include pine, oak and oak/hickory, aspen, birch, and spruce-fir forest types.

Outside of state and federal lands, property owners have significant leeway in terms of how they apply the various silvicultural practices. Clearcuts on private land can range from leaving no residual trees in the stand to retaining a significant number of residual trees.

### **Shelterwood**

The shelterwood system is an even-aged management system that involves the removal (cutting) of the mature overstory in two or more successive harvests. Residual, older trees in the overstory are kept for a specified time to serve as a source of seed and to protect seedlings or regeneration. The shelterwood method can be used to temper visual characteristics in a regenerating stand, and to maintain important habitat elements for specific wildlife and plant communities. These types of cuts are used in the Lake States for birch, oak, ash, black cherry, basswood, white pine, red maple, hemlock, spruce, balsam fir, cedar, and other intolerant or intermediately shade tolerant species. Shelterwoods systems in the Lake States may be characterized by up to three types of cuts: preparatory, regeneration or seeding, and removal. In many cases, the preparatory and regeneration harvests are combined in a single event.

**Shelterwood is a system of partial harvesting that allows new trees to grow under an overstory of maturing trees.**

- **Preparatory cut.** A preparatory cut is an intermediate harvest that removes trees from which seeds are not desired. This cut may or may not occur, depending on the quality of the stand. The lower the quality, the greater the need for a preparatory cut.
- **Regeneration or seeding cut.** A regeneration or seeding cut is then conducted which removes some of the larger trees and allows light into the subcanopy. This maintains spacing such that the large trees provide seeds that become the regenerating forest.

- Removal harvest.** The final cut in a shelterwood system is a removal cut which eliminates most or all of the remaining overstory trees. Preparatory and regeneration cuts have a different effect on bats than the removal harvest. Therefore, these cuts are tracked separately (Section 2.1.3.3. *Ecological Categories of Harvest*). The result of a shelterwood system is an even-aged stand of trees that was initiated between the seeding and removal harvests. Once the overstory is removed, the seedlings and saplings that were already established in the understory are then “released” to grow, because the overstory was previously shading and inhibiting the growth of these smaller trees. Another term for the removal harvest is overstory removal.

### Seed Tree

The seed tree system is an even-aged management approach similar to a shelterwood that involves the removal (cutting) of the mature overstory in up to two successive harvests. Scattered trees (fewer than in a shelterwood system) are retained in the overstory and are kept for a specified time to serve as a source of seed. Seed trees may be harvested later or retained indefinitely in the stand. Seed tree techniques are used to produce white, jack, and red pine, white birch, red maple, white spruce, balsam fir, black spruce, tamarack, and cedar. Seed trees systems in the Lake States may require up to two cuts: regeneration or seeding, and removal, as described previously under *Shelterwood*.

The seed tree system is similar to shelterwood but removes more trees in the regeneration cut.

### Uneven-Aged Stand Harvests

Techniques that can regenerate stands with at least three age classes are termed uneven-aged management and include group selection and single tree selection.

Uneven-aged stand management is implemented by selectively removing individual trees or small groups of trees from a stand to match a target stand condition. In some cover types, this mimics a natural disturbance regime. Forest management often coincides with wildlife management, and some preferred wildlife species require older forest conditions rarely found in even-aged stands.

With either technique, the removal must be large enough to allow regeneration of new trees, because promotion of trees from just the sub-canopy can result in an even-aged stand. In a group selection, the greatest width of the group of trees that is felled is approximately twice the height of the most mature trees in that group. Individual tree selection creates new age classes in uneven-aged stands by removing individual or small clusters of trees throughout the stand to achieve the desired end stand structure. In some cases, a selective harvest is followed by non-commercial cutting or herbicide application to remove undesirable species, especially within regeneration gaps.

### Group Selection

In group tree selection, gaps are made that may vary in size from just a few adjacent trees up to half an acre. The species that benefit from group selection are trees that are tolerant of an intermediate amount of shade. Herbicide or brushing may be used to control competition from shrubs and other nontree species like blackberry. Group selection is becoming more common in the Great Lakes Region.

Group selection harvests groups of trees to create opportunities for natural regeneration.

If very large groups in a stand are removed at one time, the harvest technique is termed a patch cut. These harvests create large openings in the overstory, which, when deployed across an entire stand, creates even-aged patches that constitute an uneven-aged stand. These patches are termed *cohorts*.

Cohorts should be created at different times so that each represents a distinct age class. A wider variety of trees can be grown using this method because openings are relatively large and sun exposure across the cohort varies from full shade to full sun. Trees that can be regenerated using group selection include red maple, central hardwoods, swamp hardwoods, bottomland hardwoods, white pine, white birch, oak, black walnut, white spruce, balsam fir, black spruce, tamarack, and white cedar.

### **Single-Tree Selection**

Single tree selections are very much like heavy thinnings, wherein trees are independently selected and felled to create an environment similar to small-scale natural disturbances. This type of selection is prescribed every 10 to 20 years for a stand, and is often used when managing for a wildlife species that requires low levels of disturbance. Tree species that benefit from this type of management are shade-tolerant species, such as sugar maple, American beech, basswood, hop-hornbeam, hemlock, red maple, balsam fir, black spruce, and cedar.

**Single tree selection** harvests individual trees to encourage regeneration of the remaining stand.

### **Intermediate Harvest**

An intermediate treatment or harvest involves the removal of trees at the point in stand development between stand initiation and the final harvest or regeneration cutting method that ends a rotation. Intermediate harvest cuts are done to enhance the long-term value of commodities such as saw timber, or ecosystem services such as wildlife habitat, or both. These cuts are called intermediate cuts because they occur between regeneration events.

### **All Stands**

For the purposes of this HCP, intermediate harvest types are separated into two categories: commercial thinning and precommercial thinning/release. Thinning occurs in even- and uneven-aged stands. All of the State DNRs practice thinning, although different practices may include complete release, partial release, weeding, cleaning, liberation, crown or high thinning, low thinning, and others. Thinning reduces the number of trees in a given area, leaving the remaining trees with more light and other resources. Thinning (both commercial and noncommercial) improves the health and value of any stand by creating openings in the stand that allow smaller trees to get larger and grow faster, or that allow larger trees to grow even larger. Thinning prevents stress and overcrowding and can alter the species composition of a stand, improve growing conditions, improve tree quality, and increase the economic value of the stand. Commercial and precommercial thinning/release have different ecological effects on bats.

**Thinning** (commercial, and precommercial) reduces number of trees per acre to improve forest quality for timber or wildlife

### **Commercial Thinning**

This type of thinning removes trees that have low timber value. Commercial thinning typically occurs in stands dominated by trees that are at least 5 inches diameter at breast height (dbh), but more typically 10 inches dbh in the Lake States.

The Lake States engage in a variety of types of commercial thinning. Different types of thinning may be carried out to achieve different forestry objectives. Row, strip, selective, and mechanical variations all describe how the thinning is performed (rows, strips, or by mechanical means). Crown, high, low, and free variations describe where the thinning is performed (crown or high is in the upper canopy, low is in the subcanopy, and free describes thinning both heights at once). Variable density thinning creates uneven density structure throughout a stand, and an improvement cutting is thinning primarily to improve composition and quality. For the purposes of this HCP, all commercial thinning has the same ecological effect on bats and is grouped accordingly.

### **Precommercial Thinning and Release**

Precommercial thinning comprises a variety of activities that improve the stand, but provides no economic value in terms of harvested wood (relative to commercial thinning described above). This category includes release thinning done for saplings soon after a regeneration harvest, liberation thinning that prevents overtopping by older trees of the same species that would not sell commercially, and cleaning and weeding. Cleanings or brushing removes trees and plants that are of undesirable species or are of the same age as the surrounding trees but are unmerchantable. A common type of brushing removes raspberry or blackberry bushes, or invasive species like bush honeysuckle. Cleaning is used in any sapling stand to release desirable stems, and it is not confined to any particular regeneration method. Precommercial thinning allows for release (freeing younger trees from competing vegetation) of preferred merchantable species.

## **Salvage**

### **All Stands**

A harvest (regardless of technique) whose primary purpose is to remove damaged, dead, or diseased trees from a stand is termed a salvage harvest. Salvage harvests are conducted in response to an unplanned event when trees are killed by wildfire, flooding, disease, insect outbreak, or another event. Salvage harvests can range from the sale of a single decadent tree to removal of all trees in the stand. Standard silvicultural terms used to describe regeneration or intermediate harvests are often used to describe salvage harvests. Salvage harvests can also be identified based on their purpose; for example, a sanitation cut is used to prevent spread of disease by removing healthy individuals.

### **Salvage Cuts**

Salvage cuts remove dead, dying, or damaged trees after a widespread wind or fire event while the tree is still merchantable. Salvage cutting is done in response to outbreaks of forest pests and weather-related damage that impair forest health. Salvage cuts can range in scale from clearcuts to a type of thinning to the removal of individual stems by landowners for firewood. Salvage thinning removes individual trees either dead or actively dying from a disease or insect infestation.

All states practice salvage as a continuum between whole-stand removal and thinning. Most salvage operations in the Lake States are categorized by the silvicultural method used to complete the salvage. As such, a salvage where all trees are removed is termed a clearcut salvage, and a salvage harvests where only select trees are removed is termed a thinning salvage (Appendix C).

- **Firewood.** All three states have programs that allow the public to remove firewood from state lands. These can be considered small-scale salvage harvests. In Michigan, the salvaged material

is primarily down and dead woody debris. In Minnesota, area managers can issue permits that allow for removal of up to 12 cords of fuelwood per year from dead, down and damaged trees, or live trees that are of negative value under good forestry management practices (Statute 90.195). In Wisconsin, DNR property managers issue permits that allow the removal of up to 10 cords of firewood per individual.<sup>2</sup> Firewood harvesting may consist of both dead and downed trees as well as live trees, and the type and location of firewood removed is at the discretion of the property manager. People interested in harvesting firewood from Wisconsin state lands need to complete a state Forest Products Permit (Form 2460-008). Because the Minnesota and Wisconsin permits allow removal of standing trees that may be used by bats, there is potential for take. The permitted removal of firewood is considered a sub-category of salvage and is covered by this HCP.

- **Hazard tree removal.** Hazard trees are those trees that threaten people or their property. The removal of such trees is covered by this HCP. It is treated as a subcategory of salvage harvest although many such trees are not sold for timber.

### Sanitation Cuts

Sanitation cuts are used by all Lake States and serve as an early response to a pending insect and/or disease outbreak. Actions involve the removal of trees to prevent the buildup or spread of a pest outbreak to susceptible or host trees. Depending upon the severity of a pending problem, the value of forest resources, and potential off-site impacts, sanitation cuts range from the removal of select individuals to clearcutting large areas. As such, sanitation cuts may remove both merchantable and non merchantable timber.

### 2.1.3.3 Ecological Categories of Harvest

Timber harvest activities are the primary focus of the Lake States HCP. These activities can be complex, representing a wide array of actions with different effects on bats. Harvest activities are defined based on these different ecological effects.

- **Final harvest** activities have the greatest potential effect on bat habitat because they remove most canopy trees (i.e., potential roost trees) from the stand. Harvests will comply with current silvicultural guidelines (described in more detail in Chapter 5, Conservation Program) that ensure a proportion of canopy trees remain after final harvest. In Michigan, this equates to maintaining patches of trees that cover 3 to 10% of the stand. In Minnesota, at least 5% of the area is left standing in either reserve areas or 6-12 scattered trees per acre, and in Wisconsin 5-15% crown cover (a measure of how much space is occupied by the top of the tree) or basal area (a measure of how much space is occupied by the stem of the tree) is left standing. All three states also recommend that the retention be representative of the trees that were harvested and contain some trees that are especially valuable for wildlife including snags and cavity trees, mast trees, and legacy trees (which are meant to survive multiple timber rotations).
- **Partial harvest** activities have a lower potential effect on bats because they remove only some of the potential roost trees from a stand while retaining other bat habitat features.

The timber harvest and forest management practices are identified according to their harvest type in Table 2-3.

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<sup>2</sup> See <http://dnr.wi.gov/topic/TimberSales/nonCommercial.html>.

**Table 2-3. Timber Harvest Systems**

Forest Practice	Harvest Type	
	Final Harvest	Partial Harvest
<b>Regeneration Harvest</b>		
<b>Even-Aged Stand Harvest</b>		
Clearcut	X	
Clearcut with reserves	X	
Shelterwood preparatory cuts		X
Shelterwood regeneration/seeding cut		X
Shelterwood removal harvest	X	
Seed tree removal harvest	X	
Seed tree regeneration/seeding cut		X
<b>Uneven-Aged Stand Harvest</b>		
Group selection		X
Single-tree selection		X
<b>Intermediate Treatment</b>		
Commercial thinning		X
Precommercial thinning/release		X
<b>Salvage Cutting</b>		
Salvage cut (prorated)	X	X
Sanitation cut (prorated)	X	X

Note: Salvage cutting can be both partial and complete. It will be distributed proportional to the amount of harvest occurring in the landscape.

## 2.1.4 Roads and Trails Construction, Maintenance, and Use

Management of forested areas requires the construction, maintenance, and use of roads and trails. Incidental take resulting from road and trail construction, maintenance, and use is covered on DNR and county lands, which are primarily used to support forestry operations and for public recreational use. This Plan specifically excludes coverage for roads and trails that are built by third parties on state lands for purposes outside the DNR's mission statement. Any such roads must seek separate permitting and incidental take authority, if desired. Roads associated specifically with timber sales on private lands will not be addressed in this category but will be included in the take estimate for timber harvest practices on private lands (see Section 2.1.3, *Timber Harvest Practices*).

### 2.1.4.1 Background and Definitions

The three categories of roads and trails are not exclusive. For example, a drivable road may be used to connect multiple backcountry roads, which may, in turn, connect to a hiking trail that is also used by bicyclists and horseback riders.

Maintenance and creation of roads in a forest requires some tree removal. In these cases, heavy timber harvest equipment such as delimeter machines, feller-bunchers, forwarders, harvesters, skidders, stump grinders, and forestry mowers are also used to remove trees along the roadway. The Lake States HCP covers all activities that use heavy machinery that are affiliated with covered activities on DNR lands.

### 2.1.4.2 DNR and County Road and Trail Construction

The construction of new roads provides access for forest management and for public use.<sup>3</sup> All three states will construct, maintain, and use roads to access areas for timber harvest and to reroute existing roads around sensitive areas.

Some road construction and reconstruction entails the use of bulldozers and other heavy equipment to remove timber and stumps from the new roadbed. Heavy equipment is confined to designated alignments selected to minimize soil, water, and tree damage. Once woody material is removed, construction machinery such as graders, bulldozers, backhoes, and dump trucks are used to shape the road. Culverts or bridges are placed at stream crossings. Finally, gravel (or pavement) is added to the roadway and compacted with a roller.

Trail construction is much less intense. It may require removal of woody vegetation and is often accomplished with the use of hand tools.

### 2.1.4.3 DNR and County Road and Trail Maintenance and Use

For all roads and trails, routine maintenance such as removing hazard trees, removing trees to maintain or widen the road corridor, and removing trees to install or maintain culverts and bridges at any time during the summer roosting season (15 May to 15 August) may cause incidental take of bats using those trees as roosts. The Lake States HCP addresses all forms of incidental take associated with road maintenance.

Roads and trails are maintained to repair breakdowns and washouts, prevent sedimentation from eroding into nearby streams or wetlands, and protect public safety.

Road maintenance typically consists of patching potholes, cleaning or repairing culverts and ditches, installing rock, repaving, repairing, or replacing V-shaped ditches, resculpting, sealing cracks, and minor grading. Road maintenance can be performed with a grader, a dump truck to distribute road base rock, and a roller to compact it. When needed, a bulldozer is used to clear roads where a grader cannot access or work. Road work at stream crossings is commonly accomplished with a backhoe or excavator to install or modify culverts or other drains. In general, roadside-maintenance activities can involve parking and/or soil disturbance in a strip with an average width of 4 feet on either side of the road.

Culvert upgrades, cleaning (manually and mechanically), and replacement are required to reduce the risk of problems related to structural, hydrologic, and durability failure. Culvert maintenance, repairs, and replacement are performed as needed. Hand labor and backhoes are used to maintain culverts. Culvert upgrading, repair, and maintenance may affect areas up to 25 feet from the edge of the road.

Some sections of road or trail may need more maintenance than other sections. Therefore, some parts of the road system might not undergo maintenance during the permit term, while other parts might undergo frequent maintenance. Trail maintenance and repair includes vegetation maintenance and minimal grading to maintain the designed trail width.

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<sup>3</sup> Construction of roads for other purposes (e.g., mineral extraction) is not included as these are not covered activities under the Lake States HCP.

The Lake States HCP covers normal road use, including driving on roads and trails by State DNR staff, timber operators, and permittee contractors working on DNR lands. This activity includes use by parties on all motorized vehicles (commercial trucks, passenger cars and trucks, motorcycles, snowmobiles, utility vehicles, and ATVs). Legal recreational road use is included under the permit.

## 2.1.5 Prescribed Fire

Prescribed fires are used by foresters and ecologists to accomplish a variety of goals including removal of slash (discarded parts of felled trees), control of fire intolerant species, creation, or maintenance of wildlife habitat, and as an aid in regeneration.<sup>4</sup> Proper training in the purpose, use, and application of prescribed burning is provided to personnel carrying out the burns so that each burn safely accomplishes its management objectives. The amount of prescribed fire and the conditions under which fires are used varies between the states.

Fire on state, county, and municipal lands is governed by a prescribed burn plan, and land managers in all three states must submit a plan to their DNR's Division of Forestry that contains the following elements.

- **Location.** The location includes the township, county, management unit, and ownership.
- **Description.** The description outlines how, when, and why the fire is being set, including the type of vegetation, detailed plan information and a map.
- **Justification.** The justification explains why fire was chosen for the specific management goals of the site, and how the effectiveness of the fire will be measured.
- **Acceptable conditions.** The conditions for a prescribed fire must be met prior to the burn because of the unpredictability of fire in less than ideal conditions. Fires can escape control if variables such as wind and air temperature do not meet the acceptable conditions.
- **Fire behavior.** Behavior of the fire is defined to ensure safety and the achievement of desired fire effects. These behaviors include how tall the flames are and how fast the fire spreads.
- **Smoke management plan.** The purpose of a smoke management plan is directly related to the mitigation of public health, nuisance, and safety hazards posed by smoke intrusions into populated areas and roadways. It generally includes the actions to minimize emissions, an evaluation of smoke dispersion, air quality monitoring, and public notification and exposure reduction procedures.

Firebreaks are also used to prevent the spread of wildfire. Their creation and maintenance are covered by this HCP.

## 2.1.6 Conservation Strategy Implementation

As described in Chapter 5, *Conservation Strategy*, the effects of the conservation program are largely beneficial for the covered species. However, some activities associated with the conservation strategy are likely to result in some incidental take of the covered species. Therefore, the conservation activities, which are summarized below, must also be covered activities. A detailed description of the conservation program is found in Chapter 5.

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<sup>4</sup> See <https://efotg.sc.egov.usda.gov/references/public/MN/338mn.pdf>, accessed February 9, 2016.



### 2.1.6.1 Habitat Restoration

Habitat management practices such as plantings, forest management, and prescribed fire are covered activities (Section 2.1.3, *Timber Harvest*), but they also have benefits for covered species as described and will be implemented as part of the conservation strategy. These practices will create stands that support dead trees that receive significant solar exposure, as well as living trees with hollows. A variety of forest ages will provide a mix of both high suitability foraging and roosting habitat for all four covered species. Tree planting and early seral improvements may be used to increase roosting and foraging habitat for covered bat species. Some have suggested that the return of fire to the landscape is among the most important ecological issues of the 21st century (Nowacki and Abrams 2008). These activities, when carried out specifically to benefit bats, will be part of the conservation strategy, and any incidental take associated with these activities will be covered under the HCP's incidental take permit.

### 2.1.6.2 Monitoring

State DNRs or their contractors will survey covered bats in the plan area as part of monitoring, and adaptive management. These surveys may require physical capture and inspection of specimens to determine identity, mark individuals, or measure physical features; such activities constitute incidental take under the ESA. Biologists participating in these monitoring efforts will be qualified surveyors as identified in the appropriate U.S. Fish and Wildlife Service (USFWS) and DNR regulations pertaining to the covered species. These may include individuals designated as Agents of the State as outlined in the cooperative agreement between each DNR and USFWS as outlined in Section 6 of ESA. Research on the covered lands by outside individuals (e.g., academic scientists) and others not acting under the control of the Master Permittee is not covered by the Lake States HCP because the nature and impacts of these future research projects cannot be predicted, and these researchers are not bound by the terms of the permit.

### 2.1.7 Activities Not Covered by the Lake States HCP

Some projects and activities that may occur on covered lands over the permit term are not appropriate for coverage under this Plan for reasons such as the lack of information, the speculative nature of the project, existing permits, permits obtained under a separate program, or the risk that the project or activity is incompatible with the conservation strategy of this Plan. The projects and activities listed in Table 2-4 were considered, but rejected for coverage under this Plan.

**Table 2-4. Activities Not Covered by the Lake States HCP**

Activities	Description	Reason for Exclusion
Invasive plant control	Application of herbicides and pesticides and implementation of biological controls. The objective of this activity is to increase the regeneration and survival of native or merchantable trees through the eradication of invasive plants.	USFWS is unable to provide take authorization for herbicide or pesticide use. <sup>a</sup>
Broadcast spray of herbicide	Technique is used to prepare the forest understory for the establishment of desirable regeneration. Spraying large areas, greater than 1 acre, is done with mechanized equipment and smaller areas are sprayed using a backpack sprayer (Brose et al. 2008).	USFWS is unable to provide take authorization for herbicide or pesticide use. <sup>a</sup>

<b>Activities</b>	<b>Description</b>	<b>Reason for Exclusion</b>
Basal application of herbicide	Individual-stem technique used to control woody interference, especially stems less than 2 inches dbh. This technique involves the application of herbicide on the lower 12 to 15 inches of each undesirable stem (Brose et al. 2008).	USFWS is unable to provide take authorization for herbicide or pesticide use. <sup>a</sup>
Cut stump application of herbicide	Another individual-stem technique used to eradicate individual trees. The technique involves felling the undesirable tree, followed by the application of the herbicide (Brose et al. 2008).	USFWS is unable to provide take authorization for herbicide or pesticide use. <sup>a</sup>
Lessee activities	Activities can include, but are not limited to farming and to energy exploration, extraction, and distribution across State Lands (see below for specific examples).	State will incorporate lease terms consistent with their incidental take permit for activities covered by the Lake States HCP only.
Gas and power line access	Use of rights-of-way and other routes to access gas and power lines on State Lands	Right-of-way owner is responsible for ESA compliance for their activities.
Recreational activities	Activities include hunting, hiking, biking, use of motorized vehicles (i.e., snowmobiles, ATVs), and camping. Recreational activities occur on State lands throughout the year.	Recreational activities such as walking, swimming, horseback riding, biking, and using ATVs are unlikely to take bats. The states do not assume responsibility for any individual's take (incidental or otherwise) of covered species.
Development and exploration of energy and other mineral resources	Mineral resources occur below some State Lands. Exploration and development of these resources have the potential to affect the covered species. Similarly, changing technology may make other energy production methods (e.g., wind, solar, smaller-scale hydroelectric) economically viable on State Lands. All such exploration or development activities are excluded from coverage by the Lake States HCP, whether proposed by the state or by a private entity.	ESA compliance is the responsibility of the party seeking to develop the resource in question.
Collection of down and dead firewood	All three states allow the removal of down and dead trees for firewood in some capacity, or on some lands. This activity is distinct from the removal of standing live or dead trees which is a covered activity.	Although bats may occasionally use down and dead material as a temporary roost, removal of such material is unlikely to result in take of bats.
Research by external parties	Research on covered lands by individuals or organizations not affiliated with or working for the permittees (e.g., academic studies).	The nature and impacts of future research projects cannot be predicted. Researchers would obtain a separate ESA section 10(a)(1)(A) permit.

**Notes:**

<sup>a</sup> Most herbicides and pesticides cannot be covered in an HCP because of an ongoing dispute between USFWS and EPA over the ESA compliance of herbicide and pesticide certification by EPA.

USFWS = U.S. Fish and Wildlife Service; dbh = diameter at breast height; ESA = Endangered Species Act; ATV = all-terrain vehicle; EPA = U.S. Environmental Protection Agency

## 2.2 Methods for Quantifying Covered Activities

The State DNRs are public agencies that must comply with public records requirements under separate state statutes and thus maintain records of departmental activities. Such records are centrally located and have been subject to internal quality assurance/quality control measures. These data represent the best commercially and scientifically available data for properties owned or managed by the DNRs. Conversely, record keeping on private lands varies from detailed records kept by some entities to conditions where a property owner has recently acquired a parcel with little to no knowledge of previous harvests and no definitive plan for future management. Acquiring, evaluating, and using such disparate data is challenging. Section 2.2.2, *County, Municipal, and Private Lands*, describes how publicly available data sources were used to estimate such activities. Note that not all covered activities are quantified. Timber harvest is the driver for this HCP, accounting for almost all of the incidental take covered by the incidental take permit. Other activities are assessed qualitatively because accurate measures of the amount of the activity are not available and are not measurable over the course of plan implementation. All timber harvest practices are quantified. Prescribed fire is quantified. Activities associated with roads and trails as well as conservation strategy implementation are described qualitatively.

### 2.2.1 State Lands

#### 2.2.1.1 Primary Data Source

Information about all covered activities was provided by the State DNRs. These data typically consist of forest treatment types and acreages, salvage acreages, and prescribed fire acreages, and, in Wisconsin and Minnesota, the cords of firewood produced each year. Other forestry and prescribed burn acreages were obtained through publicly available databases and scientific literature.

#### 2.2.1.2 Timber Harvest

##### Data Sources

Both Michigan and Wisconsin publish a formal silvicultural guide for their foresters. Definitions and methods of application are defined in those guides (Michigan Department of Natural Resources 2015, Wisconsin Department of Natural Resources 2012). Guidance in Minnesota follows the *Site-level Forest Management Guidelines* (MFRC 2005) and describes their forestry practices through the DNR's website.<sup>5</sup> These and other written resources provided the information on how each state conducts its forestry practices.

- **Michigan.** Information on acres of timber harvest from Michigan was acquired primarily through their Open Data Portal<sup>6</sup> website. The website provides acreages of forest treatments as well as miles of roads and trails throughout state-owned lands. While this Open Data Portal is an extremely useful resource, information prior to its implementation is still being actively transferred from the Michigan Geographic Data Library, and therefore legacy data acquired through the portal may be incomplete. Years 2011 through 2016 have been presented in the Lake States HCP because they represent the most complete dataset for forestry treatments.

<sup>5</sup> Available at [http://www.dnr.state.mn.us/forestry/harvesting/prescription\\_defs.htm](http://www.dnr.state.mn.us/forestry/harvesting/prescription_defs.htm)

<sup>6</sup> Available at <http://gis.michigan.opendata.arcgis.com/>

- **Minnesota.** Annual forest harvest data for Minnesota was based on a query of the Minnesota DNR's forest harvest database (FORIST), completed on March 11, 2016. These data are presented as annual harvest data, which are then grouped into ecological categories.
- **Wisconsin.** Wisconsin provided an estimate of the number of acres of timber harvest as a series of spreadsheets that covered the years 2012 to 2014.

Timber harvest results, grouped by partial and complete harvest, are found for each state in their respective *Timber Harvest* section below. Detailed tables with each harvest type crosswalked to partial and complete harvest can be found in Appendix B, *Detailed Forestry Tables*.

### Seasonality of Harvest

Because bat densities in forests vary seasonally, information about when trees are harvested can greatly influence the potential risk faced by bats. However, data on the exact timing of harvest are not available. In general, harvest occurs year-round in the Lake States. The most frequent time-of-year restriction relates to harvests within lowland forest types. Sales within these stands typically require timber to be removed while the ground is frozen to prevent damage to wet soils and to limited-maintenance roads. It is important to note that harvested trees may be removed from the stand to an intermediate location prior to being sold. This can occur in different years, with storage in one year and shipment to the mill in the next. This is especially likely to occur when harvesters are working right before the thaw.

The winter season was designated as December through March and the growing season as April through November. Based on a review of mill receipts and opinions of DNR foresters, the following general patterns are anticipated. Timber harvest in Michigan and Wisconsin occurs in roughly equal amounts per quarter. Timber harvest in Minnesota is heavily biased toward frozen ground conditions due to the large amount of lowland forest. These general guidelines were used to frame seasonality of harvest on all lands. Working with DNR foresters and stand-specific estimates from FIA, rough estimates of the seasonality of harvest were generated for all forest types for each state. For some forest types, for example, harvest is regularly conducted only during the winter period, as is the case for elm, ash, and cottonwood. In this case, 100% of the harvest was assigned to winter. Given the annual and geographic climatic variation across the Lake States, at any location and in any year, actual harvest dates may occur later than the beginning and earlier than the end of the winter season. The variation at the edges of the harvest season, however, does not significantly affect the analysis because the emergence of the covered species occurs well outside the winter season. Winter harvest away from the hibernacula avoids the potential for direct take of individuals, but may impact habitat such as roost trees.

#### 2.2.1.3 Roads and Trails

Roads and trails are not quantified in the Lake States HCP as there are no reliable sources of data that can both be quantified in the take assessment and monitored through HCP implementation. At present, there is no reliable database of forest roads on DNR lands. In addition, unmapped roads and trails exist on many properties owned and managed by the DNRs. However, relative to the effects of other covered activities, such as timber harvest and prescribed fire, the amount of take associated with roads and trails is expected to be very small. As the methods used to estimate take from timber harvest and prescribed fire are very conservative, it is expected that acreages associated with timber harvest will also represent any small amount of take associated with forest roads and trails.

### 2.2.1.4 Prescribed Fire

Each Lake State DNR provided data on the time of year and acres of prescribed fire.

- **Michigan.** The Michigan DNR provided information on prescribed fire in Michigan by email (November 11, 2016, and February 16, 2017).
- **Minnesota.** Data on prescribed fires were obtained for the years 2000 through 2011 from the Minnesota DNR's website.<sup>7</sup>
- **Wisconsin.** Wisconsin is in the process of placing prescribed fire under the control of the Wisconsin DNR Division of Forestry. While preliminary data were provided by email (March 13, 2017), additional detail about prescribed fire will likely be available as the Lake States HCP is implemented.

### 2.2.1.5 Lake States HCP Implementation

Chapter 5, *Conservation Strategy*, describes implementation methods for this Plan. Some of these methods could result in short-term impacts, such as disturbance during monitoring. Because these activities are expected to have a net benefit to bats and the activities are the focus of another chapter, they are not described in detail here.

## 2.2.2 County, Municipal, and Private Lands

### 2.2.2.1 Primary Data Source

Information on acres of timber harvest is not collected and maintained by county, municipal, or private ownerships. FIA data were used to obtain comparable information on forest type acreage and harvest levels across these ownerships.

The publicly available FIA data provide a breakdown of forestland ownership into federal, state, county and municipal, and private categories. With the assistance of a FIA research forester in the Northern Research Station (P. D. Miles, with assistance from E. Burrill, U.S. Forest Service), detailed data were extracted and reaggregated for the purposes of this analysis.

### 2.2.2.2 Timber Harvest

#### Data Sources

Among the metrics measured by the FIA is the amount of timber harvested, which is obtained by a combination of mill receipts and stump counts within inventory plots. These data are reported by volume, as cubic feet. FIA data from 2015 represented the most recently available data at the time. It is similar to the previous several years and is considered representative of recent timber harvest levels in the plan area (Perry 2015, Pugh 2015, Minnesota Department of Natural Resources 2016). Subcategories were established for private lands and for forest type groups that are not publicly documented (Miles pers. comm.). In particular, aspen-birch was subdivided into two size classes at 9 inches dbh, and pines were subdivided into the jack and red pine types versus the white pine and eastern hemlock types.

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<sup>7</sup> Available at <http://www.dnr.state.mn.us/rxfire/index.html>.

FIA data were used to develop a dataset that allowed quantification of non-DNR ownership types, including county, municipal, and private forestland for which harvest levels were not available. Use of the FIA dataset for county, municipal, and private lands presented two main challenges: data were presented in cubic feet and not acres, and seasonality of harvest was not recorded.

### **Volume-to-Acres Conversions**

The FIA uses cubic feet as a measure of harvest. Therefore, for the purposes of the HCP it was necessary to convert the volume of harvested timber into acres for consistency across datasets. FIA data includes the per acre volume (in cubic feet) of all “sound” trees of 5 inches dbh and greater (VOLCFSND). Sound volume is a measure of the harvestable trees within a stand (i.e., those that can be sold), but volume increases over time as trees in the stand grow. In order to convert this volume to acres, for each forest type a stand age-volume table was generated from the FIA plot data. Plots were grouped by age (STDAGE) and the average sound volume per acre at each age was calculated (adjusted for FIA plot size). This produced a table of average stand volume per acre by age—an approach similar to that used by USFWS when developing the 4(d) rule for northern long-eared bat, 81 Fed. Reg. 1900 (Jan. 14, 2016) (USFWS 2016).

In order to select the average age of harvest to make the volume-to-acre conversion, DNR foresters provided input on the typical age at which a stand was harvested. The volumes from the tables were averaged over a 20-year period to capture a range of stand harvest ages (i.e., volumes for the typical age of harvest and 10 years on either side). For example, aspen-birch is usually harvested at 50 years. The sound volume at 50 years was averaged for stands aged 40 to 59 years. The resulting average volume at harvest was then used to convert the harvest level for each forest type to acres. When a range of ages was given, we used the younger age. Overall, the three State DNRs harvested forest types at a similar age.

#### **2.2.2.3 Roads and Trails**

Roads and trails are not quantified in the Lake States HCP as there are no reliable sources of data that can both be quantified in the take assessment and monitored through HCP implementation. At present, there is no public database of forest roads on private, county, and municipal properties. However, relative to the effects of other covered activities, such as timber harvest and prescribed fire, the amount of take associated with roads and trails is expected to be very small. As the methods used to estimate take from timber harvest and prescribed fire are very conservative, it is expected that acreages associated with timber harvest will also represent any small amount of take associated with forest roads and trails.

#### **2.2.2.4 Prescribed Fires**

The State DNRs work closely with private conservation organizations to provide technical support for prescribed fires, especially where fires are used to manage rare habitat types or the habitat types of rare species. Total acres of prescribed fires on county, municipal, and private lands includes fires where the State DNRs provided support, but were not present for the burn. However, prescribed burns on forestland performed by non-DNR entities are few compared to prescribed fires performed within open habitat types. Estimates of the scope and intensity of prescribed fires on non-DNR lands were made based on publicly available data for each state and with input from prescribed fire managers within each DNR.

### 2.2.2.5 Lake States HCP Implementation

Chapter 5, *Conservation Strategy*, describes methods that will be used to implement the Lake States HCP on all covered lands. Some of these methods have the potential to result in short-term impacts, such as disturbance during monitoring. Because these activities are expected to have a net benefit to bats and the activities are the focus of another chapter, they are not described in detail here.

## 2.3 Covered Activities Results Michigan

Below are results of the covered activities quantification for Michigan. Note that not all covered activities were quantified as described in Section 2.2, *Methods for Quantifying Covered Activities*.

### 2.3.1 State Lands

#### 2.3.1.1 Covered Lands

Michigan DNR manages approximately 4.7 million acres of state lands (Table 2-5). Although all state lands are managed for a variety of purposes, the three divisions within the DNR have different roles and use different land management regimes. State Wildlife Areas are primarily used for wildlife conservation and providing the public with hunting, fishing and trapping opportunities. State Forests provide a wide range of ecological, social, and economic values, including timber production, mineral resources production, watershed protection, rare-species protection, and public recreation. The Parks and Recreation Division owns more than 98 parks ranging in size from a few acres on a single lake or historic site to almost 55,000 acres (Michigan Department of Natural Resources 2007). The goals of the park system are to provide opportunities for outdoor recreation and to serve as an outdoor classroom for environmental education.

**Table 2-5. Michigan State Lands Managed by DNR Division**

Program	Michigan DNR-Managed Lands	
	Thousand Acres	Percent
State Forests	3,821	82%
State Wildlife & Fisheries	552	12%
State Parks	299	6%
<b>Total</b>	<b>4,672</b>	<b>100%</b>

Note: Includes forestland and nonforestland

The Michigan DNR Forest Management Division manages state forestlands for timber and mineral production, fish and wildlife habitat, environmental quality and recreation. Michigan currently manages 3.8 million acres as state forestlands, in 43 of 83 counties, accounting for more than 82% of the land administered by the Michigan DNR. Michigan's state-owned forest system is the largest of its kind in the United States (Garmon and Holste 2013). The DNR Forest Resources Division consists of four districts, all located in the northern two-thirds of the state. These four districts are divided into 16 forest units that administer all of the state forestlands. These lands, which are mostly forested, account for 20% of the 20.3 million-acre statewide forest resource (Michigan Department

of Natural Resources 2014). Geographically, 50% of Michigan's state forestland is in the Upper Peninsula.

- State forests.** Michigan DNR's mission for state forestland is to "sustain fundamental ecological processes and functions that, in turn support representative, diverse, and productive biological assemblages; provide for a variety of ecosystem services that help sustain human civilization; provide for a variety of sustainable human values that are derived from ecosystems, including economic, recreational, and intrinsic values; and provide for a variety of forest-based products" (Michigan Department of Natural Resources 2008). Timber harvest on state forests supports a forest products industry comprised of more than 270 mills, over 1,200 manufacturing companies and nearly 600 logging companies. This forest products industry generates \$14 billion annually and sustains 154,000 jobs. From 2008 to 2012, the Michigan DNR generated \$30 million to \$40 million a year in revenue from timber sales (Michigan Department of Natural Resources 2008).
- State wildlife and fisheries.** The Michigan DNR Wildlife Division manages about 552,000 acres on 70 state wildlife areas, mostly in southern Michigan, where 85% of the population resides. The mission of the Michigan DNR Wildlife Division is to manage populations and habitat of wildlife species that live in or pass through Michigan. The division is separated into four regions: Upper Peninsula, Northern Lower Peninsula, Southwestern Lower Peninsula, and Southeastern Lower Peninsula. The Michigan DNR Wildlife Division uses the sale of hunting and fishing licenses to fund conservation throughout Michigan. More than 1.5 million people fish and there are 750,000 licensed hunters in Michigan, bringing in \$1 billion and \$2 billion annually to the state's economy, respectively. Much of this activity occurs on state-administered wildlife areas. The DNR manages more than 400 species of animals, including game and nongame species and administers the state's threatened and endangered species program.
- State parks.** The Michigan DNR Parks and Recreation Division manages the state's 96 park and recreation areas. These areas account for approximately 300,000 acres of recreation land, 142 miles of Great Lake shoreline, and 462 miles of inland lakes, rivers and streams. The Parks and Recreation Division's mission is to "acquire, protect, and preserve the natural and cultural features of Michigan's unique resources, and to provide access to land and water based public recreation and educational opportunities" (Michigan Department of Natural Resources 2009). Boating and snowmobiling are popular activities in Michigan State Parks: Michigan has 931,000 registered watercraft (3rd in the United States) and 390,000 registered snowmobiles (1st in the United States). The Parks and Recreation Division manages 1,300 public boating access sites, 145 state forest campgrounds, more than 3,000 rustic campsites, and 6,200 miles of snowmobile trails.

The Michigan DNR is empowered to lease state-owned mineral rights for oil, gas, and other mineral exploration and development purposes. However, the Lake States HCP does not cover the lease or development of mineral rights because it focuses on forestry and forestry-related activities.

### 2.3.1.2 Covered Activities

#### Timber Harvest

Table 2-6 provides a summary of timber harvest on Michigan DNR lands from 2011 through 2016, from which a projected level of activity was developed for this Plan. In Michigan, timber harvest is spread evenly over the year, although the type of forest harvested varies depending on season.



**Table 2-6. Estimated Annual Timber Harvest Activities on Michigan State Lands (Acres, 2011–2016)**

	2012	2013	2014	2015	2016	5-Year Average	Projected
Final harvest	26,216	35,435	37,256	45,319	36,078	33,041	40,000/year
Partial harvest	22,432	22,689	24,721	26,232	20,731	21,582	24,000/year
Total	48,648	58,124	61,977	71,551	56,809	54,623	64,000/year

Source: Michigan DNR 2016

## Prescribed Fire

In Michigan, prescribed fire activities are coordinated and prioritized by the Michigan Prescribed Fire Council. The council is responsible for defining the objectives of a prescribed burn, as well as establishing best management practices for prescribed burning throughout the state. Michigan does not have a defined prescribed fire burn window, but burns typically occur in the snow-free season during spring, late summer and fall: effectively March through October.

The amount of prescribed burns conducted by the Michigan DNR from 2010 through 2016 is presented in Table 2-8. Annual totals vary substantially depending on staffing, and recent increases are the result of grant funding that allowed extensive use of prescribed fire in the southern portions of the Lower Peninsula for management of herbaceous wetlands, prairies, savannas, and oak woodlands. Michigan DNR plans more burns than are actually completed. For example, 27,000 acres of burns were planned for 2016, but funding, planning, weather, and limited staff reduced this amount by more than 70%.

The Michigan DNR expects to complete approximately 8,400 acres of prescribed burns each year over the duration of the permit, with only 25% of those fires occurring in forested habitat. As indicated above, the amount burned each year will vary with changing weather, funding, and staffing. To address this pattern of “rolling-over” fire prescriptions, a cap of 45,000 acres of prescribed fire in Michigan will be applied to each 5-year increment of this Plan.

**Table 2-7. Prescribed Fire on Michigan State Lands (Acres, 2010–2016)**

Michigan DNR Division	Prescribed Fire (Acres)					5-Year Average
	2012	2013	2014	2015	2016	
Forest resources	807	762	3801	3151	591	1822
Parks & recreation	1189	970	1312	1037	1095	1121
Wildlife	2416	914	4713	5320	6290	3931
<b>Total Acres</b>	<b>4412</b>	<b>2646</b>	<b>9826</b>	<b>9508</b>	<b>7976</b>	<b>6874</b>
Number of Fires	46	36	105	137	74	80

Source: Data provided on November 11, 2016 and supplemented on February 16, 2017.

## 2.3.2 County, Municipal, and Private Lands

### 2.3.2.1 Covered Lands

The Lake States HCP extends ESA compliance to all forestlands in Michigan that are not owned or managed by the federal government. As outlined in Table 2-1, the majority of these lands are owned by private individuals or families (52%). This is more than double the amount managed by the DNR (24%). Corporations own approximately 17% of all covered lands, with the rest owned by county and municipal governments, Native American tribes, and private organizations such as hunting clubs and natural resource organizations.

### 2.3.2.2 Covered Activities

#### Timber Harvest

Table 2-9 provides data on the harvest rates by ownership type. Notably, while individuals and families own the majority of covered lands in Michigan, these forestland owners conduct the lowest level of forest harvest. County and municipal forests in Michigan are often received as the result of tax forfeiture of previously private lands. A specific goal for these properties is to allow revenues from timber harvest to offset revenues that otherwise would be raised from taxes. Similarly, corporate lands are also managed specifically for economic benefits associated with timber harvest. These two land classes are harvested at a much greater rate than lands held by individuals and families. State harvest levels derived here using FIA data are provided for comparison with total forest harvest levels above, and in order to present harvest levels by forest types.

Table 2-10 shows the forestland harvest by season and ownership in Michigan.

**Table 2-8. Estimated Annual Forestland Harvest by Ownership in Michigan**

Forest Type	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age (±10 yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category		
						Partial	Complete	
<b>County &amp; Municipal</b>								
Nonstocked	3,853	-	20	N.A.	0	N.A.	N.A.	
Red/jack pine	33,988	3,793,133	50	1,798	2,110	25%	75%	
White pine/hemlock	-	-	80	2,670	0	90%	10%	
Spruce/fir	33,610	-	50	929	0	25%	75%	
Other eastern softwoods	6,172	-	50	217	0	25%	75%	
Exotic softwoods group	-	-	50	1,520	0	10%	90%	
Oak/pine	6,897	2,892,056	80	2,574	1,124	50%	50%	
Oak/hickory	88,313	884,783	80	2,032	435	25%	75%	
Elm/ash/cottonwood <sup>a</sup>	59,049	388,361	80	2,035	191	90%	10%	
Maple/beech/birch	127,212	1,103,130	80	2,298	480	100%	0%	
Aspen/birch <9 inches dbh	66,670	203,942	20	775	263	10%	90%	
Aspen/birch >9 inches dbh		165,126	50	1,633	101	10%	90%	
Other hardwoods	7,439	-	50	781	0	50%	50%	
Exotic hardwoods group	1,546	-	20	860	0	10%	90%	
<b>Total Harvest Acres</b>					<b>4,704</b>			
<b>Private Corporation</b>								
Nonstocked	10,069	-	20	N.A.	0	N.A.	N.A.	
Red/jack pine	93,658	2,786,069	50	1,798	1,550	25%	75%	
White pine/hemlock	82,992	871,815	80	2,670	327	90%	10%	
Spruce/fir	449,187	8,391,609	50	929	9,035	25%	75%	
Other eastern softwoods	-	-	50	217	0	25%	75%	
Exotic softwoods group	32,331	-	50	1,520	0	10%	90%	
Oak/pine	29,575	-	80	2,574	0	50%	50%	
Oak/hickory	211,092	4,427,924	80	2,032	2,179	25%	75%	

Forest Type	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Elm/ash/cottonwood <sup>b</sup>	211,454	4,694,782	80	2,035	2,307	90%	10%
Maple/beech/birch	1,533,616	55,402,341	80	2,298	24,107	100%	0%
Aspen/birch <9 inches dbh	236,454	2,277,530	25	775	2,940	10%	90%
Aspen/birch >9 inches dbh		1,463,092	50	1,633	896	10%	90%
Other hardwoods	11,166	-	50	781	0	50%	50%
Exotic hardwoods	-	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>43,340</b>		
<b>Private Noncorporate</b>							
Nonstocked	84,079	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	279,837	7,149,643	50	1,798	3,977	25%	75%
White pine/hemlock	191,068	3,725,384	80	2,670	1,395	90%	10%
Spruce/fir	865,152	6,449,926	50	929	6,945	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group <sup>c</sup>	182,847	3,219,625	50	1,520	2,118	10%	90%
Oak/pine	271,308	1,488,942	80	2,574	579	50%	50%
Oak/hickory	2,032,572	42,923,919	80	2,032	21,121	25%	75%
Elm/ash/cottonwood <sup>d</sup>	1,387,963	13,854,321	80	2,035	6,807	90%	10%
Maple/beech/birch	2,548,744	60,933,459	80	2,298	26,514	100%	0%
Aspen/birch <9 inches dbh	1,132,537	6,691,343	20	775	8,638	10%	90%
Aspen/birch >9 inches dbh		17,776,758	50	1,633	10,883	10%	90%
Other hardwoods	40,539	129,662	50	781	166	50%	50%
Exotic hardwoods	19,646	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>89,142</b>		
<b>Private Other</b>							
Nonstocked	1,957	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	64,683	3,009,489	50	1,798	1,674	25%	75%
White pine/hemlock	34,100	-	80	2,670	0	90%	10%

Forest Type	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Spruce/fir	66,242	341,566	50	929	368	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	-	-	50	1,520	0	10%	90%
Oak/pine	39,340	-	80	2,574	0	50%	50%
Oak/hickory	132,854	68,549	80	2,032	34	25%	75%
Elm/ash/cottonwood	86,271	-	80	2,035	0	90%	10%
Maple/beech/birch	124,603	75,399	80	2,298	33	100%	0%
Aspen/birch <9 inches dbh		0	20	775	0	10%	90%
Aspen/birch >9 inches dbh	130,138	0	50	1,633	0	10%	90%
Other hardwoods	-	-	50	781	0	50%	50%
Exotic hardwoods	-	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>2,108</b>		

## Notes:

- a Includes 1,641 acres of oak/gum/cypress
  - b Includes 7,330 acres of oak/gum/cypress
  - c Includes 7,600 acres of fir/spruce/mountain hemlock
  - d Includes 8,212 acres of oak/gum/cypress
- dbh = diameter at breast height

**Table 2-9. Estimated Annual Forestland Harvest by Season and Ownership in Michigan**

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
<b>County &amp; Municipal</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	703	1,407
White pine/hemlock	33%	67%	-	-
Spruce/fir	67%	33%	-	-
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	749	375
Oak/hickory	67%	33%	290	145
Elm/ash/cottonwood <sup>a</sup>	100%	0%	191	-
Maple/beech/birch	50%	50%	240	240
Aspen/birch <9 inches dbh	33%	67%	88	175
Aspen/birch >9 inches dbh	33%	67%	34	67
Other hardwoods	33%	67%	-	-
Exotic hardwoods group	33%	67%	-	-
<b>Private Corporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	517	1,033
White pine/hemlock	33%	67%	109	218
Spruce/fir	67%	33%	6,023	3,012
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	-	-
Oak/hickory	67%	33%	1,453	726
Elm/ash/cottonwood <sup>b</sup>	100%	0%	2,307	-
Maple/beech/birch	50%	50%	12,054	12,054
Aspen/birch <9 inches dbh	33%	67%	980	1,960
Aspen/birch >9 inches dbh	33%	67%	299	597
Other hardwoods	33%	67%	-	-
Exotic hardwoods	33%	67%	-	-
<b>Private Noncorporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	1,326	2,651
White pine/hemlock	33%	67%	465	930
Spruce/fir	67%	33%	4,630	2,315
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group <sup>c</sup>	33%	67%	706	1,412
Oak/pine	67%	33%	386	193

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
Oak/hickory	67%	33%	14,081	7,040
Elm/ash/cottonwood <sup>d</sup>	100%	0%	6,807	-
Maple/beech/birch	50%	50%	13,257	13,257
Aspen/birch <9 inches dbh	33%	67%	2,879	5,759
Aspen/birch >9 inches dbh	33%	67%	3,628	7,255
Other hardwoods	33%	67%	55	111
Exotic hardwoods	33%	67%	-	-
<b>Private Other</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	558	1,116
White pine/hemlock	33%	67%	-	-
Spruce/fir	67%	33%	245	123
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	-	-
Oak/hickory	67%	33%	23	11
Elm/ash/cottonwood	100%	0%	-	-
Maple/beech/birch	50%	50%	17	17
Aspen/birch <9 inches dbh	33%	67%	-	-
Aspen/birch >9 inches dbh	33%	67%	-	-
Other hardwoods	33%	67%	-	-
Exotic hardwoods	33%	67%	-	-
Notes:				
a Includes 1,641 acres of oak/gum/cypress				
b Includes 7,330 acres of oak/gum/cypress				
c Includes 7,600 acres of fir/spruce/mountain hemlock				
d Includes 8,212 acres of oak/gum/cypress				
dbh = diameter at breast height				

## Prescribed Fire

In Michigan, prescribed fire is rare outside of lands managed by the Michigan DNR. A limited amount of burning occurs on lands managed by conservation organizations and on industrial lands. Most such burning occurs within prairie and savanna habitats managed by private conservation organizations such as The Nature Conservancy and Michigan Nature Association. Prescribed burning on nonforested habitat is covered on State Lands but not on other ownership types. Only prescribed burning on forestlands is eligible for coverage under the incidental take permit on county, municipal, and private lands. Prescribed fire activities and techniques on private lands are coordinated through the Consortium for Prescribed Burning and the Michigan Prescribed Fire

Council.<sup>8</sup> Prescribed fires on forestlands in Michigan are expected to total less than 1,000 acres per year.

## 2.4 Covered Activities Results Minnesota

Below are results of the covered activities quantification for Minnesota. Note that not all covered activities were quantified as described in Section 2.2, *Methods for Quantifying Covered Activities*.

### 2.4.1 State Lands

#### 2.4.1.1 Covered Lands

The State of Minnesota is approximately 51.0 million acres (U.S. Census Bureau 2010), 3.4 million acres of which are public water lakes (excluding Lake Superior) (Minnesota Department of Natural Resources 2016). The Minnesota DNR is responsible for the management of more than 90% of all state-owned land, or approximately 5.6 million acres (Table 2-11). About 80% of Minnesota DNR land is forestland, primarily in state forest units, with other land in wildlife management areas, state parks, scientific and natural areas, fisheries management areas, water access sites, and state trails and recreation areas. In addition, the state holds title to 2.82 million acres of tax-forfeited lands and holds them in trust for local taxing authorities. The surface interest on most tax-forfeited land is managed by the counties, while the mineral interest is managed by the DNR. Land use and management planning for all these lands is done in accordance with Minnesota's Outdoor Recreation Act.

**Table 2-10. Minnesota State Lands Administered by DNR Division**

Program	Minnesota DNR-Administered Lands <sup>a</sup>	
	Thousand Acres	Percent
State Forests	4,232	70%
State Wildlife & Fisheries	1,300	22%
State Parks	256	4%
Other <sup>b</sup>	214	4%
<b>Total</b>	<b>6,002<sup>c</sup></b>	<b>100%</b>

Source: Minnesota Department of Natural Resources 2017

<sup>a</sup> There are approximately 383,000 acres of overlapping management units where the DNR manages for multiple objectives and land management is coordinated among divisions.

<sup>b</sup> Includes water access sites, state trails, and recreation areas.

<sup>c</sup> In addition, the DNR holds title to 2.8 million acres of tax-forfeited lands held in trust for and generally managed by the counties.

- State forests.** The Minnesota Division of Forestry manages 59 state forests with a mission to “protect and manage the trees, woodlands, and forests entrusted to them for the benefit of the people of Minnesota” (Minnesota Department of Natural Resources 2016). Their mission also includes providing a sustainable supply of forest resources, protecting lives and property from wildfires, and providing expertise to understand, sustain, and manage Minnesota's trees,

<sup>8</sup> Available at <http://firecouncil.org>.



woodlands, and forests. The Minnesota Division of Forestry provides services such as tree nurseries, timber harvest and sales, land reforestation, wildfire fighting, and management of state forest roads. The forest products from Minnesota have a \$16.2 billion economic impact with an employment impact of 60,900 jobs.

- State wildlife and fisheries.** Lands managed by the Minnesota DNR Division of Fish and Wildlife include designated wildlife management areas and aquatic and fish management areas. There are about 1,523 wildlife management areas in Minnesota in 86 of 87 counties. These sites support wildlife habitats, which range from prairies and wetlands to forests and swamps. They provide important opportunities for recreation for hunters, trappers, hikers, and wildlife enthusiasts. In Minnesota, 52% of residents are wildlife watchers and 15% are hunters. Together, these activities support a \$1 billion annual industry related to the state's wildlife resources (Minnesota Department of Natural Resources 2016). (Some of these recreational opportunities are also allowed in all or only specific Scientific & Natural Areas, which are administered by the Division of Ecological and Water Resources.)
- State parks.** The Minnesota Division of Parks and Trails is responsible for 232,000 acres in 66 state parks and recreation areas, nine waysides, more than 5,000 campsites, more than 1,500 public water access sites, and more than 1,400 miles of state trails. In addition, it manages most state forest campgrounds and trails on State Forest Land. Minnesota has more than 9.4 million state park visitors, more than 810,000 registered watercraft, more than 216,000 registered snowmobiles, and 1.5 million licensed anglers. State park visitors spend \$656 million in state park trip-related activities (Minnesota Department of Natural Resources 2016).

### 2.4.1.2 Covered Activities

#### Timber Harvest

Table 2-12 provides a summary of timber harvests on Minnesota DNR lands from 2011 through 2015, from which a projected level of activity was developed for this Plan. Approximately 75% of harvest on DNR lands in Minnesota occurs from December 1 to March 31, with the rest occurring in approximately equal portions during the remaining months.

**Table 2-11. Estimated Annual Timber Harvest Activities on Minnesota State Lands (Acres, 2011–2015)**

	2011	2012	2013	2014	2015	5-Year Average	Projected
Final harvest	22,811	25,386	28,522	32,869	30,940	27,398	30,000/year
Partial harvest	9,558	12,789	11,875	11,338	10,148	8,403	12,000/year
Total	32,369	38,175	40,397	44,207.6	41,088	35,801	39,500/year

#### Prescribed Fire

Minnesota has four administrative regions: the northwestern, northeastern, central, and southern regions. Prescribed fire activities are coordinated and prioritized by the prescribed burn committees for each region. These committees act to ensure the following oversight.

- Burn activities are properly coordinated and priority for burning is given to more-complex burns.
- Fire resources are recorded and staff throughout the state are retained.
- The science of prescribed fire is advanced and coordinated.
- Contacts for the regional fire team leaders can provide the availability of personnel, equipment, and resources.
- Interdivisional burns are coordinated.
- Communication and coordination between the state's regions, divisions, and agencies is actively enhanced.
- Reviews of escaped burns are initiated, coordinated, and implemented.
- Regional burns are reviewed annually.

Table 2-14 provides an overview of prescribed fires conducted by the Minnesota DNR staff from 1999 through 2011.<sup>9</sup> Covered bats may be found in isolated trees in any landscape, but the greatest risk to these bats occurs during burns of woodlands and brushlands. Approximately 10% of Minnesota's prescribed fires are in forestland, and most of these burns are conducted between April 1 and September 30. Brushland fires account for 22% of the burning program. In future years, Minnesota expects to continue a similar amount (6,800 acres per year) of activity in forested and brushland systems.

**Table 2-12. Prescribed Fire on Minnesota State Lands (1999–2011)**

Land Type	Prescribed Fire (Acres )					5-year Average
	2007	2008	2009	2010	2011	
Forested	4,064.9	4,069	2,271	5,614.5	4,143	4,032
Brushland	1,664	6,265	2,231	2,447	936	2,709
Grass/wetland	18,985	42,836	23,005	29,662	22,682	27,434
Slash	36	84	245	60	101	105
<b>Total</b>	<b>24,744</b>	<b>53,254</b>	<b>27,752</b>	<b>37,783</b>	<b>27,862</b>	<b>34,280</b>
Number of fires	393	550	452	471	496	472

## 2.4.2 County, Municipal, and Private Lands

### 2.4.2.1 Covered Lands

The Lake States HCP extends incidental take authority to all forestlands in the state that are not owned or managed by the federal government. As outlined in Table 2-1, slightly less than half (42%) of the covered lands in Minnesota are owned by private individuals or families, and approximately 24% and 18%, respectively, are associated with county and municipal governments. (County governments manage lands held in trust by the state and these lands are not included in the state

<sup>9</sup> Available at <http://www.dnr.state.mn.us/rxfire/index.html>. Accessed January 29, 2016.

ownership total.) Corporations, Native American tribes, and organizations such as hunting clubs and natural resource organizations own and manage the remaining portions.

## 2.4.2.2 Covered Activities

### Timber Harvest

Table 2-15 provides data on the harvest rates by ownership type. Notably, while individuals and families own the majority of covered lands in Minnesota, these owners conduct the lowest level of timber harvest. County and municipal forests in Minnesota are often the result of tax forfeiture of previously private lands. A specific goal of these properties is to allow revenues from timber harvest to offset revenues that otherwise would be raised via taxes. Similarly, corporate lands are also managed specifically for economic benefits associated with timber harvest. These two land classes are harvested at a much greater rate than lands held by individuals and families. Forests managed by other types of owners are harvested at an intermediate level.

Table 2-16 shows the forestland harvest by season and ownership in Minnesota.

**Table 2-13. Forestland Estimated Annual Harvest by Ownership in Minnesota**

FIA Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
<b>County &amp; Municipal</b>							
Nonstocked	32,778	21,283	20	N.A.	0	N.A.	N.A.
Red/jack pine	92,642	1,144,004	50	1,566	730	25%	75%
White pine/hemlock	10,038	-	80	2,340	0	90%	10%
Spruce/fir	633,089	8,210,184	50	765	10,734	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	-	-	50	1,527	0	10%	90%
Oak/pine	40,871	1,409,059	80	1,780	792	50%	50%
Oak/hickory	155,243	3,883,247	80	1,486	2,614	25%	75%
Elm/ash/cottonwood	224,868	744,502	80	1,263	589	90%	10%
Maple/beech/birch	219,112	1,595,636	80	1,775	899	100%	0%
Aspen/birch <9 inches dbh		7,960,814	20	601	13,245	10%	90%
Aspen/birch >9 inches dbh	1,124,425	40,549,809	50	1,172	34,608	10%	90%
Other hardwoods	41,296	-	50	333	0	50%	50%
Exotic hardwoods group	-	-	20	484	0	10%	90%
<b>Total Harvest Acres</b>					<b>64,211</b>		
<b>Private Corporate</b>							
Nonstocked	16,827	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	97,521	5,460,210	50	1,566	3,487	25%	75%
White pine/hemlock	9,562	-	80	2,340	0	90%	10%
Spruce/fir	252,914	2,190,850	50	765	2,864	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	-	-	50	1,527	0	10%	90%
Oak/pine	23,444	697,031	80	1,780	392	50%	50%
Oak/hickory	49,867	104,400	80	1,486	70	25%	75%
Elm/ash/cottonwood	84,357	198,659	80	1,263	157	90%	10%

FIA Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Maple/beech/birch	59,577	236,063	80	1,775	133	100%	0%
Aspen/birch <9 inches dbh	615,139	5,558,260	25	601	9,248	10%	90%
Aspen/birch >9 inches dbh		10,855,968	50	1,172	9,265	10%	90%
Other hardwoods	27,177	377,830	50	333	1,135	50%	50%
Exotic hardwoods	2,329	-	20	484	0	10%	90%
<b>Total Harvest Acres</b>					<b>26,751</b>		
<b>Private Noncorporate</b>							
Nonstocked	68,076	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	174,217	4,783,220	50	1,566	3,054	25%	75%
White pine/hemlock	32,798	359,977	80	2,340	154	90%	10%
Spruce/fir	481,394	1,617,023	50	765	2,114	25%	75%
Other eastern softwoods	22,727	-	50	217	0	25%	75%
Exotic softwoods group	10,161	-	50	1,527	0	10%	90%
Oak/pine	122,225	594,527	80	1,780	334	50%	50%
Oak/hickory	1,674,145	7,614,267	80	1,486	6,406	25%	75%
Elm/ash/cottonwood	878,777	4,419,319	80	1,263	3,498	90%	10%
Maple/beech/birch	543,065	7,112,538	80	1,775	4,007	100%	0%
Aspen/birch <9 inches dbh	2,034,201	6,209,282	20	601	10,331	10%	90%
Aspen/birch >9 inches in dbh		17,825,795	50	1,172	15,214	10%	90%
Other hardwoods	92,748	342,197	50	333	1,028	50%	50%
Exotic hardwoods	12,714	66,448	20	484	137	10%	90%
<b>Total Harvest Acres</b>					<b>46,278</b>		
<b>Private Other</b>							
Nonstocked	3,466	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	27,276	765,427	50	1,566	489	25%	75%
White pine/hemlock	10,418	-	80	2,340	0	90%	10%
Spruce/fir	240,316	1,780,723	50	765	2,328	25%	75%

FIA Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	-	-	50	1,527	0	10%	90%
Oak/pine	16,480	235,326	80	1,780	132	50%	50%
Oak/hickory	82,092	268,353	80	1,486	181	25%	75%
Elm/ash/cottonwood	69,576	25,681	80	1,263	20	90	10%
Maple/beech/birch	55,875	652,511	80	1,775	368	100%	0%
Aspen/birch <9 inches dbh	245,826	428,774	20	601	713	10%	90%
Aspen/birch >9 inches dbh		4,850,981	50	1,172	4,140	10%	90%
Other hardwoods	13,095	-	50	333	0	50%	50%
Exotic hardwoods	-	-	20	484	0	10%	90%
<b>Total Harvest Acres</b>					<b>8,371</b>		

dbh = diameter at breast height

**Table 2-14. Forestland by Season and Ownership in Minnesota**

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
<b>County &amp; Municipal</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	75%	25%	548	183
White pine/hemlock	75%	25%	-	-
Spruce/fir	90%	10%	9,661	1,073
Other eastern softwoods	75%	25%	-	-
Exotic softwoods group	75%	25%	-	-
Oak/pine	75%	25%	594	198
Oak/hickory	75%	25%	1,961	654
Elm/ash/cottonwood	100%	0%	589	-
Maple/beech/birch	25%	75%	225	674
Aspen/birch <9 inches dbh	75%	25%	9,934	3,311
Aspen/birch >9 inches dbh	75%	25%	25,956	8,652
Other hardwoods	75%	25%	-	-
Exotic hardwoods group	75%	25%	-	-
<b>Private Corporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	70%	30%	2,441	1,046
White pine/hemlock	70%	30%	-	-
Spruce/fir	90%	10%	2,578	286
Other eastern softwoods	70%	30%	-	-
Exotic softwoods group	70%	30%	-	-
Oak/pine	70%	30%	274	118
Oak/hickory	70%	30%	49	21
Elm/ash/cottonwood	100%	0%	157	-
Maple/beech/birch	30%	70%	40	93
Aspen/birch <9 inches dbh	70%	30%	6,474	2,774
Aspen/birch >9 in dbh	70%	30%	6,486	2,780
Other hardwoods	70%	30%	795	341
Exotic hardwoods	70%	30%	-	-
<b>Private Noncorporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	67%	33%	2,036	1,018
White pine/hemlock	67%	33%	103	51
Spruce/fir	90%	10%	1,903	211
Other eastern softwoods	67%	33%	-	-
Exotic softwoods group	67%	33%	-	-
Oak/pine	67%	33%	223	111

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
Oak/hickory	67%	33%	4,271	2,135
Elm/ash/cottonwood	100%	0%	3,498	-
Maple/beech/birch	33%	67%	1,336	2,671
Aspen/birch <9 inches dbh	67%	33%	6,887	3,444
Aspen/birch >9 inches dbh	67%	33%	10,143	5,071
Other hardwoods	67%	33%	685	343
Exotic hardwoods	67%	33%	91	46
<b>Private Other</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	75%	25%	367	122
White pine/hemlock	75%	25%	-	-
Spruce/fir	90%	10%	2,095	233
Other eastern softwoods	75%	25%	-	-
Exotic softwoods group	75%	25%	-	-
Oak/pine	75%	25%	99	33
Oak/hickory	75%	25%	136	45
Elm/ash/cottonwood	100%	0%	20	-
Maple/beech/birch	25%	75%	92	276
Aspen/birch <9 inches dbh	75%	25%	535	178
Aspen/birch >9 inches dbh	75%	25%	3,105	1,035
Other hardwoods	75%	25%	-	-
Exotic hardwoods	75%	25%	-	-

dbh = diameter at breast height

## Prescribed Fire

In Minnesota, prescribed fire is rare on private, county, and municipal lands, and often is conducted by DNR staff. Hunting organizations, including Ducks Unlimited, Pheasants Forever, and local hunting groups complete burning on an irregular basis relative to habitat succession, weather, and staffing. The frequency of such fires is increasing as more individuals are trained to conduct prescribed fire and the practice becomes more widely accepted by the public. A limited amount of burning occurs on lands managed by conservation organizations and on industrial lands. The Minnesota DNR keeps records of the amount of acres burned on these non-DNR-administered lands. Based on these data, the level of this activity on forestland varies by more than an order of magnitude but is **expected to affect fewer than 1,000 acres per year**. Table 2-17 shows the acres of prescribed fire on county, municipal, and private lands.



**Table 2-15. Prescribed Fire on County, Municipal, and Private Lands (Acres, 2007–2011)**

	2007	2008	2009	2010	2011	Average
Forested	2.5	227	29	21	520	160
Brushland	0	204	70	233	293	160
Grass/wetland	672	4,129	4,138	4,190	4,782	3,582
Slash	0	6	186	0	0	38
<b>Total</b>	<b>674.5</b>	<b>4,566</b>	<b>4,423</b>	<b>4,444</b>	<b>5,595</b>	<b>3,941</b>
Number of fires	32	91	66	70	68	65

## 2.5 Covered Activities Results Wisconsin

### 2.5.1 State Lands

#### 2.5.1.1 Covered Lands

Wisconsin has 34.7 million acres (U.S. Census Bureau 2010) of land, 1.5 million acres of which is owned by the Wisconsin DNR (about 4.3% of the state). Wisconsin also leases approximately 250,000 acres and manages these lands as part of the DNR system. All lands owned or managed by the Wisconsin DNR are included under Wisconsin's incidental take permit. Wisconsin DNR-owned lands are partitioned into five areas as shown in Table 2-18.

**Table 2-16. Wisconsin State Lands Managed by DNR Program**

Program	Wisconsin DNR-Owned and Managed Lands	
	Thousand Acres	Percent
State Forest	541	36%
State Wildlife & Fisheries	645	43%
State Parks	112	7%
Other (including State Natural Areas)	216	14%
<b>Subtotal: DNR-Owned Lands</b>	<b>1,514</b>	<b>100%</b>
DNR Leased and Managed Lands	57	

Note: Includes forestland and nonforestland

- State forests.** Wisconsin has 13 state forests, which contain approximately 7% of the total state forestland (Wisconsin Department of Natural Resources 2011). These state forests provide valuable recreation opportunities and outdoor activities including, biking, backpacking, camping, fishing, hunting, and snowmobiling. Wisconsin state forests are also sustainably managed for forest products, and native biological diversity.
- State wildlife and fisheries.** The Wisconsin DNR manages 202 state wildlife areas that allow hunting, fishing, trapping, hiking, nature study, and berry picking. Some wildlife areas also allow camping, bicycling, horseback riding, dog training, competitive field trials for dogs, and snowmobiling. Wisconsin also has 683 state natural areas that are managed by Wisconsin DNR

for the preservation of biological diversity, but allow low-impact activities such as research and educational use.

- **State parks.** The Wisconsin DNR state park system has 110 parks and recreation areas, southern forests, and state trails that receive over 14 million visitors each year (Wisconsin Department of Natural Resources 2015). All state parks provide a variety of different recreational opportunities, and some offer hunting. In addition, DNR Foresters set up and administer commercial timber harvests in state parks in order to improve and promote the ecological integrity and diversity of forestland.

### 2.5.1.2 Covered Activities

#### Timber Harvest

Table 2-19 provides a summary of timber harvest on Wisconsin DNR lands from 2012 through 2014, from which a projected level of activity was developed for this Plan. In Wisconsin, timber harvest is spread evenly over the year, although the type of forest harvested varies depending on season.

**Table 2-17. Timber Estimated Annual Harvest Activities on Wisconsin State Lands (Acres, 2012–2014)**

	2012	2013	2014	3-Year Average	Projected
Final harvest	5,254	4,455	4,118	4,609	5,000/year
Partial harvest	8,461	6,003	6,271	6,912	8,000/year
Total	13,715	10,458	10,389	11,520	13,000/year

#### Prescribed Fire

Table 2-21 describes a range of prescribed fires reported to the Wisconsin DNR. Most prescribed fires occur in grasslands and herbaceous wetlands, although approximately 25% occur in forested habitats where bats are more likely to occur. Most burns occur in late winter/early spring when the opportunity for fires to escape control measures is least. However, fires can occur at any time of year so long as site-specific conditions are appropriate. These levels of burning are expected to continue throughout the permit term.

**Table 2-18. Prescribed Fire on Wisconsin State Lands for Years of High and Low Effort**

Region, Vegetation Type		Acres of Burns					
Dominant	Secondary	2012	2013	2014	2015	2016	Average
<b>Southern</b>							
Grassland	Wetland	17,512	10,782	19,916	20,995	22,408	18,323
<b>West Central</b>							
Oak Savanna	Grassland/hardwoods	1,175	548	3,045	3,335	3,717	2,364
<b>Northwest</b>							
Pine Barrens	Grassland/wetland	1,252	2,310	4,508	4,978	7,295	4,069
<b>Northeast</b>							
Pine Barrens	Grassland/wetland	1,290	525	852	914	1,205	957
Acres burned		21,229	14,165	28,321	30,222	34,625	25,712
Number of fires		420	367	523	631	687	526

## 2.5.2 County, Municipal, and Private Lands

### 2.5.2.1 Covered Lands

The Lake States HCP extends ESA compliance to all forestlands in the state that are not owned or managed by the federal government. As outlined in Table 2-1, the majority of the covered lands in Wisconsin (53%) are owned by private individuals or families. Approximately 12% of lands are associated with corporations and 11% are associated with county and municipal governments. The remaining lands are owned and managed by Native American tribes, and organizations such as hunting clubs and natural resource organizations.

### 2.5.2.2 Covered Activities

#### Timber Harvest

Table 2-22 provides data on the harvest rates by ownership type. As with the other states, timber is harvested at a lower rate per acre from lands managed by individuals and families. Other landowners conduct more timber harvest relative to individuals and families.

Table 2-23 shows the forestland harvest by season and ownership in Wisconsin.

**Table 2-19. Forestland Estimated Annual Harvest by Ownership in Wisconsin**

Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age (±10 yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
<b>County &amp; Municipal</b>							
Nonstocked	7,459	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	223,831	9,290,945	50	1,798	5,168	25%	75%
White pine/hemlock	103,286	1,380,227	80	2,670	517	90%	10%
Spruce/fir	221,162	254,566	50	929	274	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	1,388	-	50	1,520	0	10%	90%
Oak/pine	81,717	1,739,672	80	2,574	676	50%	50%
Oak/hickory	391,283	12,222,652	80	2,032	6,014	25%	75%
Elm/ash/cottonwood	202,779	454,801	80	2,035	223	90%	10%
Maple/beech/birch	496,601	17,975,734	80	2,298	7,822	100%	0%
Aspen/birch <9 inches dbh	608,217	7,264,010	25	775	9,377	10%	90%
Aspen/birch >9 inches dbh		10,318,432	50	1,633	6,317	10%	90%
Other hardwoods	18,922	-	50	781	0	50%	50%
Exotic hardwoods group	2,321	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>36,389</b>		
<b>Private Corporate</b>							
Nonstocked	11,980	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	139,031	6,602,283	50	1,798	3,672	25%	75%
White pine/hemlock	46,035	613,658	80	2,670	230	90%	10%
Spruce/fir	134,252	30,765	50	929	33	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%
Exotic softwoods group	-	-	50	1,520	0	10%	90%
Oak/pine	26,470	514,608	80	2,574	200	50%	50%
Oak/hickory	251,243	4,493,238	80	2,032	2,211	25%	75%
Elm/ash/cottonwood	118,101	1,507,728	80	2,035	741	90%	10%

Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age ( $\pm 10$ yrs)	Equivalent Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Maple/beech/birch	479,840	20,002,774	80	2,298	8,704	100%	0%
Aspen/birch <9 inches dbh	284,125	2,672,257	20	775	3,450	10%	90%
Aspen/birch >9 inches dbh		5,713,208	50	1,633	3,498	10%	90%
Other hardwoods	4,143	-	50	781	0	50%	50%
Exotic hardwoods	749	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>22,738</b>		
<b>Private Noncorporate</b>							
Nonstocked	115,537	40,753	20	N.A.	0	N.A.	N.A.
Red/jack pine	476,814	21,333,565	50	1,798	11,866	25%	75%
White pine/hemlock	328,999	9,252,286	80	2,670	3,466	90%	10%
Spruce/fir	642,953	2,949,472	50	929	3,176	25%	75%
Other eastern softwoods	17,740	-	50	217	0	25%	75%
Exotic softwoods group	25,578	437,738	50	1,520	288	10%	90%
Oak/pine	316,448	3,850,391	80	2,574	1,481	50%	50%
Oak/hickory	3,252,419	62,290,393	80	2,032	30,345	25%	75%
Elm/ash/cottonwood	1,166,074	7,319,883	80	2,035	3,596	90%	10%
Maple/beech/birch	1,912,555	38,210,280	80	2,298	16,626	100%	0%
Aspen/birch <9 inches dbh	1,390,220	9,220,631	20	775	11,903	10%	90%
Aspen/birch >9 inches dbh		27,389,054	50	1,633	16,768	10%	90%
Other hardwoods	52,117	-	50	781	0	50%	50%
Exotic hardwoods	2,278	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>99,515</b>		
<b>Private Other</b>							
Nonstocked	1,686	-	20	N.A.	0	N.A.	N.A.
Red/jack pine	29,351	2,560,323	50	1,798	1,424	25%	75%
White pine/hemlock	47,611	69,705	80	2,670	26	90%	10%
Spruce/fir	49,862	-	50	929	0	25%	75%
Other eastern softwoods	-	-	50	217	0	25%	75%

Forest Type Group	Forest Type Group (Acres)	Forest Type Group Annual Harvest (cubic feet 2015)	Typical Harvest Age	Cubic Feet/Acre at Harvest Age (±10 yrs)	Equivalen t Area of Harvest (Acres)	Estimated Proportion of Harvest By Ecological Category	
						Partial	Complete
Exotic softwoods group	-	-	50	1,520	0	10%	90%
Oak/pine	24,930	-	80	2,574	0	50%	50%
Oak/hickory	175,339	1,920,557	80	2,032	936	25%	75%
Elm/ash/cottonwood	40,375	609,333	80	2,035	299	90%	10%
Maple/beech/birch	204,614	4,153,917	80	2,298	1,807	100%	0%
Aspen/birch <9 inches dbh	109,100	877,938	20	775	1,133	10%	90%
Aspen/birch >9 inches dbh		4,490,861	50	1,633	2,749	10%	90%
Other hardwoods	6,490	-	50	781	0	50%	50%
Exotic hardwoods	-	-	20	860	0	10%	90%
<b>Total Harvest Acres</b>					<b>8,375</b>		

dbh = diameter at breast height

**Table 2-20. Forestland by Season and Ownership in Wisconsin**

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
<b>County &amp; Municipal</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	1,723	3,445
White pine/hemlock	33%	67%	172	345
Spruce/fir	90%	10%	247	27
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	451	225
Oak/hickory	67%	33%	4,009	2,005
Elm/ash/cottonwood	100%	0%	223	-
Maple/beech/birch	50%	50%	3,911	3,911
Aspen/birch <9 inches dbh	33%	67%	3,126	6,251
Aspen/birch >9 inches dbh	33%	67%	2,106	4,211
Other hardwoods	33%	67%	-	-
Exotic hardwoods group	33%	67%	-	-
<b>Private Corporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	1,224	2,448
White pine/hemlock	33%	67%	77	153
Spruce/fir	90%	10%	30	3
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	133	67
Oak/hickory	67%	33%	1,474	737
Elm/ash/cottonwood	100%	0%	741	-
Maple/beech/birch	50%	50%	4,352	4,352
Aspen/birch <9 inches dbh	33%	67%	1,150	2,300
Aspen/birch >9 inches dbh	33%	67%	1,166	2,332
Other hardwoods	33%	67%	-	-
Exotic hardwoods	33%	67%	-	-
<b>Private Noncorporate</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	3,955	7,911
White pine/hemlock	33%	67%	1,155	2,311
Spruce/fir	90%	10%	2,858	318
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	96	192
Oak/pine	67%	33%	987	494

Forest Type Group	Estimated Proportion of Harvest By Season		Estimated Harvest Removals By Season (Acres, 2015)	
	Dec. – Mar.	Apr. – Nov.	Dec. – Mar.	Apr. – Nov.
Oak/hickory	67%	33%	20,230	10,115
Elm/ash/cottonwood	100%	0%	3,596	-
Maple/beech/birch	50%	50%	8,313	8,313
Aspen/birch <9 inches dbh	33%	67%	3,968	7,935
Aspen/birch >9 inches dbh	33%	67%	5,589	11,179
Other hardwoods	33%	67%	-	-
Exotic hardwoods	33%	67%	-	-
<b>Private Other</b>				
Nonstocked	0%	100%	-	-
Red/jack pine	33%	67%	475	949
White pine/hemlock	33%	67%	9	17
Spruce/fir	90%	10%	-	-
Other eastern softwoods	33%	67%	-	-
Exotic softwoods group	33%	67%	-	-
Oak/pine	67%	33%	-	-
Oak/hickory	67%	33%	624	312
Elm/ash/cottonwood	100%	0%	299	-
Maple/beech/birch	50%	50%	904	904
Aspen/birch <9 inches dbh	33%	67%	378	755
Aspen/birch >9 inches dbh	33%	67%	916	1,833
Other hardwoods	33%	67%	-	-
Exotic hardwoods	33%	67%	-	-

dbh = diameter at breast height

## Prescribed Fire

In Wisconsin, prescribed fire is less common on private, county, and municipal lands and is often conducted in conjunction with DNR staff (and is thus included in Table 2-21). The Nature Conservancy owns approximately 12,000 acres of fire-maintained habitat and completes fires on an irregular basis depending on weather, funding, and successional dynamics. Prescribed fires also occur on the University of Wisconsin Arboretum, properties owned by the Leopold Foundation, and private nature centers, with most efforts restricted to prairies and savannas. The Wisconsin-based Tallgrass Prairie & Oak Savanna Fire Science Consortium<sup>10</sup> is working to train and support individuals interested in the use of prescribed fire throughout the region, an activity that may see the amount of prescribed fire increase over time in the Lake States. In Wisconsin, the level of prescribed fire is estimated at 5,000 acres per year throughout the permit. As with other covered activities, this estimate will function as a cap.

<sup>10</sup> Available at <http://www.tposfirescience.org>.



## 2.6 References

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## 2.6.2 Personal Communications

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