U.S. Fish and Wildlife Service
New Jersey Field Office
Forest Management Recommendations for Indiana Bats Near Hibernacula

The following general recommendations were developed by the U.S. Fish and Wildlife Service, New Jersey Field Office (NJFO) to assist land managers and land owners in managing forests to protect the federally-listed endangered Indiana bat (*Myotis sodalis*) as required under the Endangered Species Act (ESA). The recommendations consider the Indiana bat's needs for suitable foraging and roosting habitat for survival and successful reproduction. Adherence to these recommendations will result in habitat that is suitable for Indiana bat use, but may not represent optimal habitat. Creating optimal habitat typically would require more intensive management practices than described herein. This document will be periodically revised as new information becomes available.

Section 9 of the ESA prohibits unauthorized 'take" of federally listed wildlife by killing, wounding, harming, or harassing a species. Harm includes significant habitat modification or degradation; harass includes an intentional or negligent act or omission that significantly disrupts normal behavioral patterns such as breeding, feeding, or sheltering. The risk of incidental take of Indiana bats in forest stands managed in accordance with these recommendations is likely discountable or insignificant and, therefore, not likely to adversely affect (cause take) of the species. If these management recommendations cannot be followed or conflict with other management goals or directives, forest managers or land owners should contact the NJFO for site specific guidance to avoid adverse effects to Indiana bats.

FOREST MANAGEMENT RECOMMENDATIONS

1. Maintain at least 60% canopy closure after timber harvest within forested stands.

2. Retain standing snags, except where they pose a serious human safety hazard due to their location near a building, yard, road or powerline. A live tree with less than 10% canopy should be considered a snag. Snags with no remaining bark and no visible cracks, splits, or hollows may be felled, as well as any snags leaning more than 45^{o} from vertical. When possible, delay removal of hazard trees until bats are hibernating (between November 15 and March 31).

3. Do not harvest or manipulate shagbark hickory trees (*Carya ovata*) unless the density of shagbark hickory exceeds 16 trees per acre. If present, maintain at least 16 live shagbark hickory greater than 11" dbh (diameter at breast height) per acre. If there are no shagbark hickory trees greater than 11" dbh, then the live shagbark hickory trees retained per acre must include the largest specimens in the stand.

4. Maintain at least 16 live high value roost trees per acre on average with at least 3 live trees > 20" dbh and 6 live trees > 11" dbh. The remaining trees retained per acre should be among the largest or highest roost value trees present within the stand.

The following tree species have been identified as having relatively high value as potential Indiana bat roost trees:

red maple (*Acer rubrum*)
silver maple* (*Acer saccharinum*)
sugar maple* (*Acer saccharum*)
yellow birch (*Betula alleghaniensis*)
gray birch (*Betula populifolia*)
bitternut hickory (*Carya cordiformis*)
sweet pignut hickory *(Carya ovalis*)
shagbark hickory* (*Carya ovata*)
other hickories (*Carya* spp.)
white ash (*Fraxinus americana*)
green ash* (*Fraxinus pennsylvanica*)
white pine (*Pinus strobus*)
eastern cottonwood8 (*Populus deltoides*)
white oak* (*Quercus alba*)
pin oak (*Quercus palustris*)
northern red oak (*Quercus rubra*)
post oak (*Quercus stellata*)
American elm* (*Ulmus americana*)
slippery elm (*Ulmus rubra*)

*preferred roost tree species

The above list is based on review of literature and data on Indiana bat roosting requirements. Other species may be added as they are identified. Trees with characteristics such as loose or shaggy bark, crevices, or hollows are more important than tree species.

5. Do not harvest trees or conduct timber stand improvement within 300 feet of a stream bank or wetland or within 500 feet of a known bat hibernaculum.

6. Do not fell trees > 3" dbh while Indiana bats may be present, generally April 1 through November 15. Trees may be felled from November 16 to March 31.

7. Avoid prescribed burns from April 1 to November 15 in forest stands containing potential Indiana bat live roost trees and / or snags.

8. Avoid prescribed burns year round within 1,000 feet of a known bat hibernaculum.

U.S. Fish and Wildlife Service
New Jersey Field Office
Forest Management Recommendations for Indiana Bats
Summer Breeding Range

The following general recommendations were developed by the U.S. Fish and Wildlife Service, New Jersey Field Office (NJFO) to assist land managers and land owners in managing forests to protect the federally-listed endangered Indiana bat (*Myotis sodalis*) as required under the Endangered Species Act (ESA). The recommendations consider the Indiana bat's needs for suitable foraging and roosting habitat for survival and successful reproduction. Adherence to these recommendations will result in habitat that is suitable for Indiana bat use, but may not represent optimal habitat. Creating optimal habitat typically would require more intensive management practices than described herein. This document will be periodically revised as new information becomes available.

Section 9 of the ESA prohibits unauthorized "take" of federally listed wildlife by killing, wounding, harming, or harassing a species. Harm includes significant habitat modification or degradation; harass includes an intentional or negligent act or omission that significantly disrupts normal behavioral patterns such as breeding, feeding, or sheltering. The risk of incidental take of Indiana bats in forest stands managed in accordance with these recommendations is likely discountable or insignificant and, therefore, not likely to adversely affect (cause take) of the species. If these management recommendations cannot be followed or conflict with other management goals or directives, forest managers or land owners should contact the NJFO for site specific guidance to avoid adverse effects to Indiana bats.

FOREST MANAGEMENT RECOMMENDATIONS

1. Maintain at least 60% canopy closure after timber harvest within forested stands.

2. Retain standing snags, except where they pose a serious human safety hazard due to their location near a building, yard, road or powerline. A live tree with less than 10% canopy should be considered a snag. Snags with no remaining bark and no visible cracks, splits, or hollows may be felled, as well as any snags leaning more than 45^{o} from vertical. When possible, delay removal of hazard trees until bats are hibernating (between October 1 and March 31).

3. Do not harvest or manipulate shagbark hickory trees (*Carya ovata*) unless the density of shagbark hickory exceeds 16 trees per acre. If present, maintain at least 16 live shagbark hickory greater than 11" dbh (diameter at breast height) per acre. If there are no shagbark hickory trees greater than 11" dbh, then the live shagbark hickory trees retained per acre must include the largest specimens in the stand.

4. Maintain at least 16 live high value roost trees per acre on average with at least 3 live trees > 20" dbh and 6 live trees > 11" dbh. The remaining trees retained per acre should be among the largest or highest roost value trees present within the stand.

The following tree species have been identified as having relatively high value as potential Indiana bat roost trees:

red maple (*Acer rubrum*)
silver maple* (*Acer saccharinum*)
sugar maple* (*Acer saccharum*)
yellow birch (*Betula alleghaniensis*)
gray birch (*Betula populifolia*)
bitternut hickory (*Carya cordiformis*)
sweet pignut hickory *(Carya ovalis*)
shagbark hickory* (*Carya ovata*)
other hickories (*Carya* spp.)
white ash (*Fraxinus americana*)
green ash* (*Fraxinus pennsylvanica*)
white pine (*Pinus strobus*)
eastern cottonwood* (*Populus deltoides*)
white oak* (*Quercus alba*)
pin oak (*Quercus palustris*)
northern red oak (*Quercus rubra*)
post oak (*Quercus stellata*)
American elm* (*Ulmus americana*)
slippery elm (*Ulmus rubra*)

*preferred roost tree species

The above list is based on review of literature and data on Indiana bat roosting requirements. Other species may be added as they are identified. Trees with characteristics such as loose or shaggy bark, crevices, or hollows are more important than tree species.

5. Do not harvest trees or conduct timber stand improvement within 300 feet of a stream bank or wetland.

6. Do not fell trees > 3" dbh while Indiana bats may be present, generally April 1 through September 30. Trees may be felled from October 1 to March 31.

7. Avoid prescribed burns from April 1 to September 30 in forest stands containing potential Indiana bat live roost trees and / or snags.

Enclosure – Characteristics of Indiana Bat Summer Habitat

Potential summer habitat for Indiana bats features at least 16 suitable roost trees per acre. Tree characteristics such as loose or shaggy bark, crevices, and hollows are more important than tree species. Suitable roost trees include any of the following:

- live shagbark hickories (*Carya ovata*) over 9 inches in diameter at breast height (dbh);
- lightening-struck trees over 9 inches dbh;
- dead, dying, or damaged trees of any species over 9 inches dbh with at least 10 percent exfoliating bark;
- den trees, broken trees, or stumps over 9 inches dbh and over 9 feet in height; and
- live trees of any species over 26 inches dbh.

Trees as small as 5 inches dbh have been used as maternity roosts and trees as small as 3 inches dbh have been used by roosting males; therefore, smaller dbh trees with the aforementioned characteristics should be retained if larger dbh trees are not present.

The following are examples of native tree species that should be included in planting plans designed to provide suitable roosts for Indiana bats in New Jersey.

Red maple	*Acer rubrum*
Silver maple*	*Acer saccharinum*
Sugar maple *	*Acer saccharum*
Yellow birch	*Betula alleghaniensis*
Gray birch	*Betula populifolia*
Bitternut hickory	*Carya cordiformis*
Sweet pignut hickory	*Carya ovalis*
Shagbark hickory *	*Carya ovata*
White ash	*Fraxinus americana*
Green ash*	*Fraxinus pennsylvanica*
White pine	*Pinus strobus*
Eastern cottonwood*	*Populus deltoides*
White oak*	*Quercus alba*
Pin oak	*Quercus palustris*
Northern red oak	*Quercus rubra*
Post oak	*Quercus stellata*
American elm*	*Ulmus americana*
Slippery elm	*Ulmus rubra*

* preferred roost tree species