

COMPATIBILITY DETERMINATION

USE:

Forest Management for Wildlife Habitat Enhancement and Improvement

REFUGE NAME:

Clarks River National Wildlife Refuge, hereafter referred to as the Refuge, located in Marshall, Graves, and McCracken Counties in Kentucky.

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

- (1) Migratory Bird Conservation Act {16 U.S.C. 715}
- (2) National Wildlife Refuge System Administration Act {16 U.S.C. 668(a)(2)}
- (3) Fish and Wildlife Act of 1956 {16 U.S.C. 742 (b)(1)}
- (4) Refuge Recreation Act {16 U.S.C. 460 K-1}
- (5) Executive Order 9670

REFUGE PURPOSE(S):

- (1) "...for use as a refuge and wildlife management area for migratory birds and other wildlife..." {Executive Order 9670, dated December 28, 1945}
- (2) "...for us as an inviolate sanctuary, or for any other management purpose, for migratory birds" {16 U.S.C. 715 (d), Migratory Bird Conservation Act}
- (3) "...for the development, advancement, management, conservation, and protection of fish and wildlife resources..." {16 U.S.C. 742 (b)(1)}
- (4) "...incidental fish and wildlife-oriented recreational development" {16 U.S.C. 460k-1; Refuge Recreation Act}
- (5) "the protection of natural resources" {16 U.S.C. 460k-1; Refuge Recreation Act}
- (6) "the conservation of endangered or threatened species..." {16 U.S.C. 460k-1; Refuge Recreation Act}

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

- (a) *What is the use?*

Forest Management for wildlife habitat enhancements and improvements included timber thinning, regeneration of timber stands, treatment of disease outbreaks, and other silvicultural practices used to improve forest habitat conditions. Forest management for wildlife habitat enhancements and improvements are conducted solely to enhance habitats just like other resource management actions, it may involve the use of commercial vendors hence constituting an economic use that requires a compatibility determination. Commercial activities are permitted activities and are directed under the guidance of a Special Use Permit, which is issued by the refuge.

Forest management for wildlife habitat enhancements and improvements, including when necessary, the use of commercial silvicultural contractors and techniques, including the use of pesticides to control exotic and nuisance plant species, will contribute to the purposes, for which the Clarks River National Wildlife Refuge (NWR, refuge) was established, the mission of the Refuge System, the enhancement of biological integrity, diversity, and environmental health and to facilitate the ability of the refuge to meet its habitat and wildlife management objectives. Forest management for wildlife habitat enhancement and improvement is necessary for Clarks River NWR to meet the objectives in the Comprehensive Conservation Plan (CCP; U.S. Fish and Wildlife Service [USFWS] 2012) and Habitat Management Plan (HMP; USFWS 2013) that maintain and enhance necessary habitat for priority species by promoting plant communities beneficial to these species, habitats for trust resources, and multiple forest stands to provide diverse plant successional stages ranging from regeneration to mature trees, which will support a variety of wildlife species (Lower Mississippi Valley Joint Venture [LMVJV] 2007). Forest management for wildlife habitat enhancement and improvements will be based upon resources of concern and their habitat requirements for the promotion of hard mast species and ensure adequate number of den and stages remain in the forest. Den trees provide cavities used by birds, reptiles and mammals for roosting and nesting. Different wildlife requires various stages of forest growth to meet the life requirements for food, cover, water and space.

The approved Comprehensive Conservation Plan details the concepts and specifics of desire future conditions of the forest to provide enhanced wildlife habitat for federally listed species and priority trust species. To achieve **CCP Goal B [Conserve, restore, and enhance diverse bottomland hardwood forests, open lands, and associated habitats essential to support sustainable populations of migratory and resident wildlife species]**, manipulation of the forest is essential. Long-term and short-term planning is conducted prior to any manipulation of the forest. Commercial and non-commercial silvicultural practices may be necessary to meet these objectives. Creating gaps in the overstory and midstory canopies provides sunlight penetration to the forest floor to promote regeneration of mast producing species, and stimulates the growth of vegetation vital as food, nesting substrate, and cover for wildlife. Thinning can increase canopy gaps, thereby increasing understory and midstory growth (Robinson and Robinson 1999). Also, crowded trees can be thinned to encourage development of habitat characteristics such as large full crowns for perching, nesting, and mast production as well as cavities for denning and nesting sites. Thinning and canopy gaps are made by removing selected trees that are surplus to the needs of the wildlife. Trees to be removed may be injected or girdled (killed) or cut so that their shade is eliminated. Harvests of non-native species or plantations of one single tree species can be removed more efficiently through commercial silvicultural operations. Also commercial operations can be used to regenerate stands if it is senescing due to age, insect die-off, weather damage, or to ensure the desired reproduction. Wildlife habitat objectives are often times best achieved with wildlife habitat enhancements or improvements of the forest. The 2013 HMP is a 15 year plan outlining wildlife habitat management on Clarks River NWR. Goals, objectives, and strategies outlined for wildlife habitat enhancement and improvement includes:

The overarching objective (Objective 4.1.1) in bottomland hardwood forests at Clarks River NWR is the implementation of Desired Forest Conditions (LMVJV 2007). Desired Forest Conditions, according to the LMVJV, are described as, at any given time, having 35-50% of the forested acres, and on newly

acquired lands as appropriate, with a basal area of 60-90 ft²/acre, for a canopy cover between 60-80 percent, 30-60 percent midstory cover, 30-40 percent understory cover, and 20-50 percent ground cover, with regeneration of hard mast-producing species (e.g., oaks and hickories) (Objective 4.1.2), maintain < 60 percent canopy cover on 5-10 percent of the bottomland hardwood forest at any point in time to allow regeneration of shade-intolerant trees (e.g., hickories, red oak species, and willow oak) (Objective 4.1.3), maintain 2 to 4 logs/acre to provide coarse woody debris, 4 to 6 cavity trees >4" in dbh per acre, and 1 to 4 large den trees or "unsound cull" trees per 10 acres in bottomland hardwood forest to increase habitat for resident wildlife, such as amphibians, reptiles, bats, squirrels and cavity-nesting birds (Objective 4.1.4). In addition to natural bottomland hardwood forests, the refuge acquired lands from a private timber organization which were managed for single species plantations of sweetgum, sycamore, alder, and loblolly pine. The plantations will also be administered to advance toward Desired Forest Conditions, however, supplementary silvicultural treatments may be required to accomplish these goals (Objective 4.1.5). Loblolly pine and alder are not native to Kentucky and therefore those stands should be regenerated to native hardwoods in accordance with the Desired Forest Conditions. Additionally, the refuge may need to implement wildlife habitat enhancements and improvements to treat invasive species, insect die-off, weather damage, or to promote desired regeneration. The HMP includes a great deal of information that is not mentioned in this compatibility determination and should be regarded as a contextual part of this compatibility determination. Other than identifying the silvicultural methods that could be used, due to stand diversity, silvicultural treatments will be selected for site specific habitat conditions and developed in the habitat management prescriptions. The refuge staff will implement a wide variety of silvicultural treatments (mechanical, chemical, and prescribed burning) to accomplish wildlife habitat enhancement and improvements. The details on specific management strategy prescriptions are limited within the scope of this HMP and compatibility determination. Management prescriptions for wildlife habitat enhancement and improvement will be prepared at the Refuge and undergo a review and approval process through the Regional Office. Examples of management strategies (CCP pages 71-75, 78-81) for wildlife habitat enhancements and improvements are listed in the HMP under Section V. Habitat Management Strategies. As part of the planning process the CCP, HMP, and compatibility determinations are monitored and reviewed annually.

To achieve goals over the next 15 years, manipulation through wildlife habitat enhancements and improvements is essential. The refuge does not have the required staffing, equipment and expertise to harvest timber on a large scale. Commercial silvicultural contractors can assist refuge managers in providing habitat for endangered species, forest breeding birds (Twedt and Somershoe 2009, Rosenberg et al. 2016) and other forest-dependent species (LMVJV 2007).

(b) Where would the use be conducted?

Clarks River NWR has primarily forested habitat, being approximately 9,000 acres of forest on about 9,500 acres of land owned by the Fish & Wildlife Service. Areas that are not currently forested, but have the potential to be reforested would also fall under this use at some future point in time. Additionally, future ownership of forested land and potentially reforested areas will be included in the use.

(c) When would this use be conducted?

Different aspects of wildlife stand enhancements and improvements will take place at various times throughout the year including but not limited to inventory, planting, tree marking, harvesting, injecting, monitoring, and various other tasks involved with habitat administration. The harvesting portion of this process would be conducted during the dry periods of the year. This period is normally between July and December, but could occur during other times of the year if conditions were acceptable.

(d) How would this use be conducted?

Forest management for wildlife habitat enhancements and improvements would be conducted to achieve the Desired Forest Conditions described in the 2013 HMP developed by the LMVJV (LMVJV 2007) for bottomland hardwoods. [4.1 **Habitat Management Goal** (CCP Goal B).Conserve, restore, and enhance diverse bottomland hardwood forests, open lands, and associated habitats essential to support sustainable populations of migratory and resident wildlife species. - HMP Objectives 4.1.1;4.1.2; 4.1.3; 4.1.5] These goals and objectives may be updated if more endangered species and trust resources are identified:

4.1 Habitat Management Goal (CCP Goal B).Conserve, restore, and enhance diverse bottomland hardwood forests, open lands, and associated habitats essential to support sustainable populations of migratory and resident wildlife species.

- **4.1.1 Objective: Bottomland Hardwood Forest Restoration and Protection (CCP Objectives B-1, B-7).** In Management Units 1B, 2B, and 3B, strategically restore and protect bottomland hardwood forest habitat according to the Lower Mississippi Valley Joint Venture's (LMVJV's) Desired Forest Conditions (LMVJV 2007) in the Clarks River Basin, where opportunities exist and as appropriate.
- **4.1.2 Objective: Bottomland Hardwood Forest Management (CCP Objectives B-1, B-2).** Implement adaptive management in Management Units 1B, 2B and 3B to maintain and work towards 35-50% of 8,000 acres and on newly acquired lands as appropriate of bottomland hardwood forest at any given time with a basal area of 60-90 ft²/acre, for a canopy cover between 60-80 percent, 30-60 percent midstory cover, 30-40 percent understory cover, and 20-50 percent ground cover, with regeneration of hard mast-producing species (e.g., oaks and hickories) (LMVJV 2007).
- **4.1.3 Objective: Bottomland Hardwood Forest (CCP Objectives B-1, B-2).** In Management Units 1B, 2B and 3B and on newly acquired lands where regeneration is assessed as highly likely, maintain < 60 percent canopy cover on 5-10 percent of the bottomland hardwood forest at any point in time to allow regeneration of shade-intolerant trees (e.g., hickories, red oak species, and willow oak).
- **4.1.4 Objective: Bottomland Hardwood Forest (CCP Objectives B-1, B-2).** In Management Units 1B, 2B and 3B and on newly acquired lands where appropriate, maintain and work towards 2 to 4 logs/acre to provide coarse woody debris, 4 to 6 cavity trees >4" in dbh per acre, and 1 to 4 large den trees or "unsound cull" trees per 10 acres in bottomland hardwood forest to increase habitat for resident wildlife, such as amphibians, reptiles, bats, squirrels and cavity-nesting birds (LMVJV 2007).
- **4.1.5 Objective: Bottomland Hardwood Forest (CCP Objective B-1, B-2).** In Management Units 1B, 2B, and 3B, and on newly acquired lands where appropriate, initiate immediate action on approximately 833 acres to improve plantations including but not limited to: reducing row numbers; thinning; and chemical treatments to encourage sufficient oak and other desirable regeneration.

(e) Why is this use being proposed?

Clarks River NWR was established for use as a refuge and wildlife management area for migratory birds and other wildlife and the conservation of threatened and endangered species. Forest management for wildlife habitat enhancement and improvement were designed to emulate natural disturbances, create forest with multiple ages and structure, promote regeneration, and provide habitat needed by a wide variety of wildlife. The LMVJV Desired Forest Conditions are a quantified set of landscape and local level conditions deemed desirable for wildlife habitat. Some species of migratory birds which have significant regional or continental population declines are shown to increase occupancy of treated stands

(Twedt and Wilson, 2017). These conditions appear to benefit multiple bat species by promoting dead wood, large diameter trees, high tree species diversity, and by increasing insect prey abundances (USFWS Final Report, 2016). Desired Forest Conditions, through wildlife enhancement and improvement treatments, are designed to create a diverse landscape with a mosaic of forest having varied structures to appeal to a wide variety of migratory birds and other wildlife.

AVAILABILITY OF RESOURCES:

Resources involved in the administration and management of the use includes personnel time associated with administration and law enforcement. Existing staffing and funding are adequate to support these activities.

Minimal special equipment is needed to facilitate this use with a cost less than \$5,000. No additional facilities, or improvements are necessary to support the uses. Maintenance costs are not directly attributable to these incidental uses on the refuge.

Refuge staff will conduct monitoring protocols according to the individual prescription, Habitat Management Plan and Inventory and Monitoring Plan to determine when habitat conditions warrant treatment and to monitor achievement of habitat condition objectives post treatment.

Utilizing contract loggers to achieve forest habitat management goals is the only way to achieve improvement given inadequate staff to implement force account harvest activities. Receipts generated from the sale of forest products removed from the refuge are deposited into the Refuge Revenue Sharing Account. The funds collected annually from all refuges are distributed to the counties on a prorated basis (acreage of refuge land within each county and appraised value of this land) as an “in-lieu-taxes payment” as directed by the Refuge Revenue Sharing Act.

ANTICIPATED IMPACTS OF THE USE:

The operation of heavy equipment for wildlife habitat enhancements and improvements over refuge roads and through natural habitats has the potential to impact soils, cause severe rutting, result in increased site erosion, or degrade near-by wetlands or water resources. Therefore, all wildlife habitat enhancements and improvements actions will be mitigated by following forestry management procedures described in Kentucky’s Forestry Best Management Practices Manual.

Heavy equipment use required for timber harvesting operations also has the potential to result in localized impacts to vegetation and wildlife. Damage or destruction of understory vegetation, including rare plants and unique botanical communities are of concern. Short-term impacts are anticipated during tree removal and could include disturbance and displacement of wildlife that is typical of any noisy heavy equipment operation. Operation of heavy equipment and removal of some vegetation could possibly result in a short-term increase in soil erosion. These impacts can be prevented through careful management of stream-side management zones and use of exclusion zones.

Whole tree harvesting can result in a reduction of downed wood and snags in a forest ecosystem. Skidding operations can cause residual damage to trees remaining in the stand that can result in the introduction of disease and insects into an otherwise healthy forest. Harvesting trees may also leave the remaining trees more susceptible to wind throw, altering plant and animal communities, facilitating the spread of invasive plants, disturbing wildlife temporarily, or displacing it over the long term. Forest prescriptions are designed to minimize these impacts.

During the next growing season after tree removal, any impacts would diminish as the effects of increased sunshine quickly results in enhanced diversity and productivity of the habitat. Since a wide diversity of wildlife species are dependent upon habitat found in managed forests, the overall cumulative effects of these disturbances is positive. Harvesting of trees could negatively impact some species of wildlife at given points in time; however, these impacts are considered minor and short-term on a landscape level and would not result in cumulative impacts to the species or adversely affect the purpose of the refuge or the mission of the National Wildlife Refuge System.

DETERMINATION (CHECK ONE BELOW):

_____ Use is not compatible

 X Use is compatible, with the following stipulations

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Close inspection and supervision of all wildlife habitat enhancements and improvements is necessary to ensure that harvesting operations meet the special conditions of the Special Use Permit and produce the outcome needed to meet refuge goals and objectives. The refuge's assistant manager will inspect the treatment site and assess effectiveness of the treatment.

The following example Special Conditions are included in the bid invitation and permits for all wildlife habitat enhancements and improvement activities to further protect the resources of the refuge. These conditions may be modified at any time to provide better guidance to operators and protection of refuge resources.

1. A pre-entry conference with permittee and loggers will be held prior to any work being done on the sale area or haul roads associated with the sale area. A pre-entry meeting will be held before initiation of activity within each Compartment and Stand prior to start of any work. The Refuge Manager or their representative retains authority to stop logging operations at any time if road, weather, water, or other unsatisfactory conditions exist.
2. The permittee will maintain any Refuge road, right-of-way, or easements. The permittee will repair any damages to the haul roads, primary gravel roads or paved roads resulting from logging operations to standards existing prior to timber harvest activities. Repair and maintenance work may include, but is not limited to, grading, graveling, or rocking. Cost to repairs or replacements of damaged culverts or other infrastructure caused by logging equipment will be the sole responsibility of the permittee. When applicable, reasonable actual costs for work on Refuge gravel roads will be refunded from performance deposits. The expense of work on dirt roads within the sale area is the sole responsibility of the permittee. No new roads will be created and all access will be limited to existing roads and infrastructure.
3. The location of loading decks and logging roads will be mutually agreed to by permittee (or representative) and Refuge Manager or designee prior to their placement. All primary haul roads used

by permittee will be left in good condition or blocked after operations are completed by placing logging slash and/or dirt mounds across all entrance points as directed by Refuge Manager or designee. Those roads to be left open will be built up enough so that the road will not hold standing water any more than the adjacent area. This will require the use of equipment such as a bulldozer and/or road grader. If required as determined by the Refuge Manager or designee, blocked roads will be reseeded with refuge approved grasses to prevent erosion.

4. In wildlife habitat enhancements and improvements operations, no trees planned to be left (leave trees) following the operation will be cut or excessively damaged. Excessive is defined more specifically as, 1) bole damage that exposes cambium more than 6 inches (in any dimension) and 2) crown damage of 1/3 or more of the crown. As determined by the Refuge Manager or designee, penalties may be assessed for cutting or damaging leave trees at a rate of three (3) times the stumpage paid for the harvested merchantable timber.

5. Trees shall be cut so as to leave a stump not less than 4 inches high and no more than 12 inches high on the side adjacent to the highest ground. Ground level paint spot must be visible after the tree has been cut.

6. Skid trails with turn trees should be planned to prevent the damage to leave trees. Turn trees shall consist of trees being harvested and should be removed only after use of skid trails ends. Additional trees removed to prepare loading sites will be paid for at bid prices. Loading sites should be determined cooperatively between Refuge staff and permittee prior to clearing. Unmarked trees, which are cut or injured through carelessness, shall be paid for at double the bid price.

7. All wildlife habitat enhancement and improvement operations shall be conducted during daylight hours.

8. Trees and tops cut shall not be left hanging or supported by any other living or dead tree or brush and shall be pulled down immediately after falling.

9. Tops and logging debris shall be kept pulled back 50 feet from highways, county roads, refuge roads and trees with basal cavities. All roads, rights-of-way, streams, openings and fields must be kept clear of tops and debris. When a timber sale is adjacent to private land, all logging debris will be pulled back onto the refuge to avoid damage to private property. The permittee and his employees will do all in their power to prevent and suppress fires; shall pay the United State for any unnecessary damage to roads, rights-of-way, streams, fields, openings, and ditches resulting from operations.

10. Wildlife habitat enhancements and improvements operations will be allowed only when site conditions allow. Wildlife habitat enhancements and improvements will not be allowed when ground is wet and subject to rutting or severe soil compaction. At no time will rutting deeper than 6" be allowed.

11. The Refuge Manager or designee shall have the authority to temporarily close down all or any part of the operation during a period of high fire danger, inclement weather, refuge hunts, safety reasons or any other reason deemed necessary. Extensions to the Special Use Permit time period equal to the closed period will be granted to the permittee. Extensions will not be granted due to inactivity during favorable harvesting conditions.

12. The permittee (or his representative) will not litter. Disposal of petroleum products onsite is prohibited. Equipment must be maintained and not leak more than a few drops of petroleum product per day. Performance bond monies may be used to pay for litter clean-up.

13. Tree-length logging and skidders will be allowed. Unnecessary damage to the residual stand will not be tolerated (see Special Condition No 3). As determined by the Refuge Manager or his designee, penalties may be assessed for damage to unmarked trees at a rate of three (3) times the stumpage paid for the harvested merchantable timber.
14. If spacing between trees does not allow cutter head grapples to be used without damage to leave trees, alternative harvest methods should be used.
15. Sufficient cut trees, trees that are to be removed as part of the operation, should be left along the skid trails and deck to prevent skidder damage to leave trees and these cut trees should be the last trees removed as part of the operation.
16. Each portion of the sale area must be completed before moving to other portions of the area unless authorized by the Refuge Manager.
17. The permittee will be responsible for job safety while operating on the Refuge.
18. The possession and/or use of firearms and alcohol on the refuge are prohibited.
19. All of the Best Management Practices for forestry in Kentucky will be followed as mandatory practices. Failure to follow BMPs is grounds for termination of the Special Use Permit.
20. If requested, satisfactory scale tickets for timber products shall be submitted to the Refuge Assistant Manager.
21. The permittee will remove temporary plugs, dams, and bridges, constructed by the permittee, upon completion of the contract. There are areas on the refuge where temporary plugs or dams in an intermittent stream would not be allowed.
22. Ownership of all products remaining on a sale area will revert to the U.S. Government upon termination of the permit.
23. The U.S. Government accepts no responsibility to provide right-of-way over private lands for materials sold under this contract.
24. The decision of the Refuge Manager shall be final in the interpretation of regulations and provisions governing the sale, cutting, and removal of the timber covered by the permit. Additional site-specific stipulations may be cover in the Habitat Management Plan and attached to the Special Use Permit.

JUSTIFICATION:

The Forest Management for Wildlife Habitat Enhancement and Improvement use supports the fulfillment of the goals and objectives in the Comprehensive Conservation Plan (CCP; U.S. Fish and Wildlife Service [USFWS] 2012) and Habitat Management Plan (HMP; USFWS 2013) for Clarks River NWR.

Forest management for wildlife habitat enhancements and improvements, to include such actions as commercial timber thinning, salvage, and other silvicultural practices, is used to improve wildlife

habitat conditions. Forest management for wildlife habitat enhancements and improvements allow the refuge to maintain and enhance necessary habitat for wildlife including threatened and endangered species by promoting plant communities beneficial to these species. Additionally, use of commercial foresters can protect forest health during time requiring emergency forest actions to prevent unwanted spread of insect or disease outbreaks.

The primary goal of active wildlife habitat management on the refuge will be to enhance and maintain habitat for species identified as Resources of Concern and associated habitat communities identified in the refuge's CCP. Forest management for wildlife habitat enhancements and improvements forest management operations, including when necessary, the use of commercial silvicultural contractors and techniques, will contribute to the purposes, for which the Clarks River NWR was established, the mission of the Refuge System, the enhancement of biological integrity, diversity, and environmental health, and to facilitate the ability of the refuge to meet its habitat and wildlife management objectives.

The use will not pose significant adverse effects of the refuge natural resources, interfere with the public use of the refuge, or cause undue administrative burden. Forest management for wildlife habitat enhancements and improvements on the refuge will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established as evidenced by the environmental assessment that shows this use will improve and advance our ability to achieve the goals and objectives set forth under the CCP. This use would be administered in compliance with 50 CFR 29.1.

This compatibility determination can be categorically excluded from further NEPA analysis under 40 CFR §1508.4, 516 DM 8.5(A)(1), 516 DM 8.5(B)(7), 516 DM 8.5(B)(9), and 516 DM 8.5(C)(5). Further, the actions do not trigger an extraordinary circumstance as outlined under 43 CFR §46.215.

NEPA Compliance for Refuge Use Description:

- ☐ Categorical Exclusion without Environmental Action Statement
- ☒ Categorical Exclusion and Environmental Action Statement
- ☐ Environmental Assessment and Finding of No Significant Impact
- ☐ Environmental Impact Statement and Record of Decision

References

Lower Mississippi River Joint Venture Forest Resource Conservation Working Group. 2007. Restoration, Management and Monitoring of Forest Resources in the Mississippi Alluvial Valley: Recommendations for Enhancing Wildlife Habitat. Edited by R. Wilson, K. Ribbeck, S. King, and D. Twedt

Robinson, W.D. and S.K. Robinson. 1999. Effects of selective logging in forest bird populations in a fragmented landscape. *Conservation Biology* 13: 58-66.

Rosenberg, K.V., J.A. Kennedy, R. Dettmers, R.P. Ford, D. Reynolds, J.D. Alexander, C.J. Beardmore, P.J. Blancher, R.E. Bogart, G.S. Butcher, A.F. Camfield, A. Couturier, D.W. Demarest, W.E. Easton, J.J. Giocomo, R.H. Keller, A.E. Mini, A.O. Panjabi, D. N. Pashley, T.D. Rich, J.M. Ruth, H. Stabins,

J. Stanton, and T. Will. 2016. Partners in Flight Landbird Conservation Plan: 2016 Revision for Canada and Continental United States. Partners in flight Science Committee. 119 pp.

Twedt, D.J. and S.G. Somershoe. 2008. Bird response to prescribed silvicultural treatments in bottomland hardwood forests. *Journal of Wildlife Management* 73:1140-1150.

Twedt, D.J. and R.R. Wilson. 2017. Breeding birds in managed forests on public conservation lands in the Mississippi Alluvial Valley. *Forest Ecology and Management*. January 2017.

U. S. Fish and Wildlife Service. Final Report. 2016. Bat occurrence relative to silvicultural treatments intended to yield desired forest conditions for priority wildlife. Prepared by C. Comer and L Ketzler.

Approval of Compatibility Determination:

SIGNATURE: REFUGE

MANAGER: Michael W Johnson 5-24-17

(Signature and date)

**REVIEW: COMPATIBILITY
COORDINATOR:** _____

CHRISTOPHER
SWANSON

Digitally signed by CHRISTOPHER
SWANSON
Date: 2017.05.25 06:59:52 -04'00'

(Signature and date)

**REVIEW: REFUGE
SUPERVISOR:** _____

Daffy Pitchford 5-31-17

(Signature and date)

**CONCURRENCE: REGIONAL
CHIEF:** _____

[Signature] 5-31-17

(Signature and date)

MANDATORY 10-YEAR REEVALUATION DATE: _____