

Draft Compatibility Determination

Title

Draft Compatibility Determination for Non-Commercial and Commercial Tree Harvest, Tamarac National Wildlife Refuge

Refuge Use Category

Agriculture, Aquaculture, and Silviculture

Refuge Use Type(s)

Tree harvesting (non-commercial) and tree harvesting (commercial)

Refuge

Tamarac National Wildlife Refuge

Refuge Purpose(s) and Establishing and Acquisition Authority(ies)

Tamarac National Wildlife Refuge was established in 1938 under the following establishing and acquisition authorities:

"... as a refuge and breeding ground for migratory birds and other wildlife: ..." Executive Order 7902, dated May 31, 1938.

"... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." 16 U.S.C. § 715d (Migratory Bird Conservation Act).

"... conservation, management, and restoration of the fish, wildlife and plant resources and their habitats for the benefit of present and future generations of Americans..." 16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act).

"... to secure for the American people of present and future generations the benefits of an enduring resource of wilderness...wilderness areas... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character and for the gathering and dissemination of information regarding their use and enjoyment as wilderness..." 16 U.S.C. § 1131 (Wilderness Act).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System, otherwise known as 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 (Pub. L. 105-57; 111 Stat. 1252).

Description of Use

Is this an existing use?

Yes. This compatibility determination reviews and replaces the 2010 compatibility determination for non-commercial and commercial tree harvesting. The use is consistent with the Tamarac National Wildlife Refuge Habitat Management Plan (USFWS, 2022), associated Comprehensive Conservation Plan (USFWS, 2010b) and Finding of No Significant Impact (USFWS, 2010a).

What is the use?

Non-commercial tree harvesting is defined as the cutting and removing of trees by various techniques, such as selective cutting, for personal use as wood or firewood.

Commercial tree harvest is defined as the cutting and removing of trees by various techniques, such as selective cutting or clearcutting, for sale or commercial use as wood, paper, chips, other fiber products or firewood.

Commercial tree harvesting is considered a refuge management economic activity.

Is the use a priority public use?

No. This is not considered one of the legislated priority wildlife-dependent public uses of the National Wildlife Refuge System (i.e., hunting, fishing, wildlife observation and photography or environmental education and interpretation).

Where would the use be conducted?

The areas open to tree harvest and management strategies are specified in the habitat management plan (USFWS, 2022). The scope of activity would be determined by the management objective for the area and by the quantity and quality of available wood.

Non-Commercial Tree Harvest

Non-commercial tree harvesting for wood or firewood would generally occur along trails, roads and firebreaks and wherever there is a need to remove downed trees. No tree harvest would be allowed in the Wilderness Area or Research Natural Areas.

Although the Wilderness Area is open to the public from September 1 to March 1 annually, no camping is allowed anywhere on the refuge.

Commercial Tree Harvest

Commercial tree harvest would be conducted on any portion of the refuge other than the Wilderness Area. Tree harvest in Research Natural Areas would only occur if the actions are necessary to maintain the process for which the research natural area was established or to prevent the spread of insects and disease. These habitat types include upland deciduous forest, mixed upland forest, upland conifer forest and in specific circumstances (i.e., insect infestation or disease) lowland deciduous forest, mixed lowland forest and lowland conifer forest. Harvest sites would vary in size from a portion of an acre up to several hundred acres depending on the site and management objectives. These sites are identified as areas where habitat management objectives can be best accomplished using tree harvest as a management tool.

Upland deciduous forest: This habitat type includes aspen, paper birch, oak, red and sugar maple, basswood, northern hardwoods and broadleaf mix cover types. This habitat type comprises approximately 37% (16,021 acres) of refuge land and is dominated by aspen, particularly in the young to middle age classes. Much of this habitat type is a high priority for forest management, and tree harvest would be used to increase early successional aspen habitat and improve structural diversity and diversify species composition.

Mixed upland forest: This habitat type contains various hardwoods and softwoods and includes an aspen/birch/spruce/fir mix, aspen/pine mix, upland broadleaf/coniferous mix and coniferous mix cover types. This habitat type comprises approximately 10% (4,379 acres) of refuge land. Red and white pines are prevalent in the overstory along with a mix of hardwood, such as aspen and birch. Jack pines are often mixed with northern pin oak and bur oak on drier, sandy soils. This habitat type is a moderate forest management priority, and selective tree harvest would be used to increase upland conifer species and structural diversity and diversify species composition.

Lowland deciduous forest: This habitat type consists of black ash and lowland forest broadleaf mix cover types, totaling 755 acres. These communities are often referred to as black ash swamps. Species composition includes green ash, black ash and occasionally American elm. The lowland hardwoods are located mostly on medium quality sites, which are found along sluggish streams, swamp edges and in depressions within the upland hardwoods. This habitat type is a low forest management priority and is generally not identified for forest management through tree harvest. Some limited harvest could occur in areas negatively affected by disease or insect infestations (e.g., emerald ash borer).

Mixed lowland forest: This habitat type includes a lowland conifer/hardwood mix consisting primarily of black ash, lowland conifer/broadleaf mix and lowland conifer mix, totaling 584 acres. The mixed lowland conifer/broadleaf forest is heavily

dominated by hardwoods in the overstory compared to the lowland conifer mix forest, which is dominated by tamarack, black spruce and balsam fir. This habitat type is a low forest management priority and is generally not identified for forest management through tree harvest. Some limited harvest could occur in areas negatively affected by disease or insect infestations (e.g., emerald ash borer, sawfly).

Upland conifer forest: This habitat type consists of jack pine, red pine, white pine, red cedar (non-native) and white spruce/balsam fir mix dominated cover types, totaling 681 acres. Red and white pines once dominated the landscape as pure stands but now comprise only 1% (482 acres) of the refuge, including plantations. Jack pine barrens, which were prevalent prior to European settlement, only make up about one-quarter of 1% of the refuge. Jack pine are found in pure stands on dry, sandy soils, and in heavier soils are mixed with oak, red pine and aspen. This habitat type is a high forest management priority, and selective harvest of deciduous trees, such as oak and aspen, would be used to restore jack pine barrens and woodland habitat.

Lowland conifer forest: This habitat type consists of pure stands of tamarack and a mixture of black spruce/balsam fir stands, totaling 1,741 acres. This habitat type is a low forest management priority and is generally not identified for forest management through tree harvest. Some limited harvest could occur in areas negatively affected by disease or insect infestations (e.g., emerald ash borer).

Wilderness Areas: No active habitat management or maintenance is conducted within the Tamarac Wilderness Area (2,138 acres), however, removal of trees along the Egg Lake Trail and Highway 35 right of ways (south and east boundaries of the wilderness area) is authorized or permissible to maintain the right of way.

Research Natural Areas: Manipulative practices, such as tree cutting, are not conducted in the Tamarac National Wildlife Refuge Research Natural Areas (249 acres) unless the actions are necessary to maintain the process for which the research natural area was established or to prevent the spread of insects and disease. Tree removal along the right of ways adjacent to the research natural areas is permissible to maintain right of ways.

When would the use be conducted?

Non-commercial tree harvest for personal firewood would be allowed by special use permit along refuge roads, trails and other designated areas as necessary that are open to the public from September through February. This coincides with the dates the sanctuary area in the north part of the refuge is open to the public and disturbance to breeding wildlife is minimized.

Depending on the goals and objectives of the commercial tree harvest, activities may be authorized to occur during any season, although large scale commercial tree harvest operations would typically be conducted during the winter months (i.e., frozen ground conditions). Where the objective is to promote red and white pine

regeneration, scarification of the soil is required, and is most effectively done during the growing season. Lowland forest sites have soils that are prone to rutting, and management activities in this forest type should only occur during the winter when the ground is frozen. Management activities would occur when they meet habitat management objectives, not adversely impact other ecosystem processes (e.g., water and soil quality), facilitate access and prevent damage to cultural resources, soils, vegetation and infrastructure (e.g., roads).

For both non-commercial and commercial tree harvest, activities would occur during daylight hours (sunrise to sunset).

How would the use be conducted?

Special use permits would be issued to individuals for non-commercial tree harvest of firewood after completing an application. The number of permittees for non-commercial tree harvest typically varies from zero to ten annually.

Commercial tree harvest would be awarded through a competitive bidding process based on a bid prospectus. Once awarded a bid, the contractor would be required to sign a contract for the tree harvest based on the bid prospectus and then issued a special use permit. Commercial contractors must meet requirements related to equipment type, capacity and insurance to be eligible to work on the refuge.

Both uses are overseen by the refuge manager and their designee, usually the refuge biologist or assistant refuge manager. The number of people participating in either activity varies from year to year depending on the need and local conditions.

Commercial tree harvest can also be influenced by market interests. The number of contractors for commercial tree harvest generally varies between one and three per year.

The specific details that determine tree harvest would be outlined in a special use permit and/or contract (i.e., commercial harvest) to ensure the activity is consistent with the goals and objectives of the habitat management plan as well as appropriate and compatible with the refuge's mission and purpose.

Equipment used for non-commercial tree harvest of firewood would be limited to chainsaws, handsaws, axes and the vehicles needed to transport the wood after cutting.

Equipment used for commercially harvested trees would be completed using traditional logging equipment such as chainsaws, feller-bunchers, forwarders and log skidders. Access may be by truck, trailers and larger traditional logging equipment, including semi-tractor trailer combinations. Differences in required equipment would occur depending on the amount and type of wood being removed.

All contractors must follow permit requirements and best practices to ensure equipment is clean and free of plant material and soil before starting work.

Why is this use being proposed or reevaluated?

This use is being reevaluated because the 10-year renewal period ended in 2020 (USFWS, 2000 (603 FW2.11 H)). No administrative changes would occur regarding how this use has previously been conducted on the refuge.

The purposes of forest management as outlined in the habitat management plan (USFWS, 2022) are to:

- Conserve and restore nationally, regionally or locally imperiled ecosystems and diverse habitat types (i.e., native plant communities and cover types) while providing ecosystems, habitats or seral stages important for wildlife species of national, regional, state or local conservation concern.
- Conserve and restore the ecological integrity, particularly the structure, composition and natural processes, of native biotic communities and physical environments within the historic range of natural variability; and
- Conserve the diversity of cover types and seral stages, while striving to increase patch size and connectivity between similar ecosystems, thereby reducing fragmentation.

Forest management on the refuge using non-commercial and commercial tree harvest would be administered in accordance with wildlife and ecosystem management principles as well as ongoing research and land management demonstrations. This activity would only occur where the agency has determined that a management need exists to remove trees. In addition to using tree harvest to accomplish habitat management goals, tree removal may also be done following storm events, where trees are encroaching on hiking and administrative trails, fire breaks and roads, grassland areas or earthen water impoundment structures.

Firewood cutting is not a priority public use, as defined by the National Wildlife Refuge System Improvement Act of 1997, but rather serves as a management instrument for ensuring refuge goals are being addressed.

Availability of Resources

Administration of non-commercial and commercial tree harvest programs would require a commitment of staff hours and other resources. By permitting tree harvest, the manager has identified a management need and would have secured and prioritized the necessary station resources.

For non-commercial tree harvest, refuge staff would be responsible for reviewing applications related to this use and preparing special use permits. The refuge typically issues zero to ten permits annually for non-commercial tree harvest, charging a \$10 permit fee. For example, in a year where ten non-commercial tree harvest permits are issued, the refuge would take in \$100 in permit fees and expend approximately \$500 in staff time and office resources. The permit fees would not off-

set costs since they would be lower than the cost of staff time and office resources used to administer the program.

Periodic small-scale commercial tree harvest operations would be adequately administered with existing staff resources. Based on past activity, administering a small-scale tree harvest program would require approximately \$2,000-\$5,000, per event, in staff salary and equipment costs., which includes developing a plan, surveying the area, monitoring progress and issuing the permit. Revenue would generally be determined by market value per cord and the funds would be managed by the agency. A portion of these funds would be returned to the refuge and may or may not cover the cost associated with administering the activity, depending on the sale, markets and volume harvested. Generally, zero to three events per year may occur over the ten-year duration of this compatibility determination.

Large-scale commercial tree harvest operations affecting many acres would require additional staff time and resources. Refuge staff would be responsible for developing a harvest plan and bid prospectus, surveying and marking the harvest area, monitoring harvest operations, reviewing permit applications and issuing permits. Based on past activity, administering a large-scale tree harvest program would require \$6,000-\$8,000, per event, in staff salary and equipment costs. Like small-scale commercial tree harvest operations, revenue from large-scale operations would be determined by market value per cord and the funds would be managed by the agency. A portion of these funds would be returned to the refuge and usually meet or exceed the costs associated with administering the activity. Generally, zero to three events per year may occur over the ten-year duration of this compatibility determination.

The comprehensive conservation plan identifies the long-term need for one full time forest ecologist on staff to conduct the day-to-day operations of the forest management program on the refuge (USFWS, 2010b).

Anticipated Impacts of the Use

The effects and impacts of the proposed use on refuge resources, whether adverse or beneficial, would be those that are reasonably foreseeable and have a close causal relationship to the proposed use. This compatibility determination includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an “affected resource.” Refuge management and operations would not be more than negligibly impacted by the action and have been dismissed from further analyses.

Tree harvest would maintain healthy forest habitat on the landscape, and the impacts from management activities would be beneficial or mitigated through careful planning and implementation. Tree harvest would be conducted in a manner that avoids or mitigates short- or long-term impacts that adversely affect the purpose or

mission of the refuge or the National Wildlife Refuge System. Restrictions imposed by the refuge manager and special use permits would reduce any anticipated negative impacts to refuge resources.

Potential impacts of a proposed use on the refuge's purpose(s) and the Refuge System mission

Non-commercial and commercial tree harvest would further the mission of the National Wildlife Refuge System and the U.S. Fish and Wildlife Service by providing important tools for forest management and conservation, which benefit wildlife and their habitats. Tamarac National Wildlife Refuge is located within a diverse ecological transition zone where northern hardwood forests, coniferous forests and tallgrass prairies converge. Although dominant cover types within the refuge have been altered since pre-European settlement, most of the refuge is still comprised of native cover types with a high degree of ecological integrity. Management that restores or mimics natural ecosystem processes and functions would be used when possible but may be modified occasionally to best fulfill refuge purpose(s) or contribute to biological integrity at larger landscape scales (USFWS, 2022).

Habitat management in Tamarac National Wildlife Refuge would focus on increasing forest habitat quality by improving structural and stand age diversity, while encouraging both early and late successional stands through active and passive forest management, conifer restoration and invasive species control. Through tree harvest, forests would be managed or restored to provide breeding, roosting, foraging or other habitat requirements for priority resources of concern (USFWS, 2022).

Short-term impacts

Wildlife Species

Tamarac National Wildlife Refuge is important for migratory birds, both during the migrating and nesting seasons. Duck nesting densities were historically among the highest reported for the woodland transition zone in Minnesota, and the wetland ecosystems provide ideal nesting sites for other waterbird species (USFWS, 2010b). The diverse forests are well suited for migrating and nesting passerines, and the abundant young forest habitats are home to a significant number of breeding golden-winged warblers, American woodcock and resident ruffed grouse.

The refuge supports 53 species of resident mammals and seven species of bats that migrate off-refuge to overwinter. White-tailed deer, beaver, striped skunk, raccoon, muskrat, mink and red squirrels are abundant. Cottontail rabbits and snowshoe hare populations follow a cyclical pattern. Other furbearers, including red fox, coyote, bobcat, fisher, otter and short- and long-tailed weasels, are locally common and seen in the area on a regular basis.

Forests provide habitat for many wildlife species, and the quantity, quality and

distribution of those habitats changes when trees are harvested. The response of wildlife to forest management activities, including tree harvest, varies depending on forest type and harvest intensity (Fredericksen and Mostacedo, 2000). Even within groups of wildlife species (e.g., amphibians, reptiles, birds, mammals, etc.) the effects are variable and often species-specific. Management activities can have a positive impact on some species and a negative effect on others. Managing refuge habitat for priority resources of concern, yields the greatest benefit to trust resources and maintains and enhances the biological integrity, diversity and environmental health of the refuge (USFWS, 2022). Guidelines provided in the Minnesota voluntary site-level forest management handbook for wildlife habitat would be implemented where appropriate and feasible to mitigate wildlife impacts (MFRC, 2013; MFRC, 2014).

Tree harvest may temporarily disturb or displace wildlife due to an increase in motion (e.g., people, equipment, vehicles, etc.) and/or noise (Campbell et al., 2007; deMaynadier and Hunter Jr., 1995; Holmes and Pitt, 2007). Although tree harvest may disrupt wildlife, most of the effects would be short-term and mitigation measures would be taken to minimize their impact. The measures used to reduce wildlife disturbance related to tree harvest activities would be defined in a special use permit.

Wildlife-related components of forests can be altered during management activities including damage to understory vegetation (Scheller and Mladenoff, 2004), modifications to microhabitat environments (deMaynadier and Hunter Jr., 1995), changes in the abundance and type of coarse woody debris (deMaynadier and Hunter Jr., 1995; Siitonen, 2001) and removal of snags. Management considerations for dead wood retention should consider both structural as well as compositional legacies that address not only variable size classes but also decay classes and species diversity (Adams et al., 2021).

A wide array of vertebrate and invertebrate taxa relies on different classes and species of coarse woody debris to fulfil life history requirements. Invertebrates play a key role in the decomposition and nutrient cycling of woody material, and in turn provide forage for higher taxa. Studies of insect richness in forested wetlands have demonstrated a diverse community of aquatic, wetland and terrestrial invertebrates directly associated with coarse woody debris (Braccia and Batzer, 2001).

Short-rotation harvest (less than 50 years), whole-tree harvest and selective cuts can alter soil moisture regimes by reducing the abundance of downed wood and large-diameter logs necessary for forest floor amphibians and small mammals (Gore and Patterson III, 1986; deMaynadier and Hunter Jr., 1995). Ectotherm species are susceptible to changes in microclimates, which can result in exposure to temperature extremes (Currylow et al., 2012). Harvest strategies would consider retention or creation of coarse woody debris and slash to provide habitat for reptiles and amphibians, as well as food and cover for invertebrates, soil organisms, plants, small mammals and birds.

Where safety permits, all snags, dens and some leave trees, leave tree clumps or legacy patches, which are undisturbed sites, would be preserved during tree harvest and thinning, especially those being used by cavity nesting wildlife. Trees and snags that provide nesting cavities have a diameter at breast height greater than 16 inches and would be maintained for wood ducks where feasible (USFWS, 2022). A mix of poor and good quality trees is desirable to provide diverse habitat, however, diseased trees are typically removed. Retention of leave trees and snags during tree harvest provide perches, cavities and foraging sites during forest regeneration and mimic natural disturbance (MFRC, 2013). Providing and maintaining old tree forest structure and trees, living or dead, with nesting habitat would be considered when planning tree harvest activities (USFWS, 2022).

Removal of mast producing trees and shrubs may impact the availability of food resources to wood ducks, forest passerines and a variety of mammals. Mast retention would be considered during tree harvest planning and prioritized based on the surrounding habitat types and abundance of other mast producing trees and shrubs.

Aquatic Species and Water Quality

Lakes, streams, ditches and other wetland basins on the refuge provide aquatic habitat required for a variety of turtles, frogs, toads and salamanders. Reptiles and amphibians are important food sources for many mammals, birds and fish. Their numbers and diversity are often indicators of the health of an ecosystem.

Forest management operations may have significant impacts on both water quantity and quality. Data from forested experimental watersheds in the eastern United States indicate that leaching of nutrients tends to increase after tree harvest (Bormann et al., 1968; 1974) and increases in stream water temperature are highest where revegetation of cutover areas is delayed (deMaynadier and Hunter Jr., 1995). These factors may have negative impacts on stream organisms, including fish, invertebrates and amphibians (Campbell and Doeg, 1989). Conditions identified in special use permits and harvest plans along with following guidance from the Minnesota Forestry Resources Council would minimize disturbance to aquatic species and habitats (MFRC, 2013; 2014; USFWS, 2022).

Riparian management zones adjacent to lakes, streams and wetlands provide protection for aquatic wildlife and habitat. Standard operating procedures include maintaining relatively continuous forests, between 50 and 120 feet, within the riparian management zone, depending on the size of the water body and slope. These guidelines do not typically apply to non-open water wetlands, seasonal ponds, seeps or springs, but those areas are protected or avoided when feasible. Leave tree clumps and legacy patches can be located to protect sensitive areas (i.e., seasonal ponds, vernal pools and steep slopes). Priority mitigation measures include preserving

vegetation in these areas to retain nutrients, sediment and organic matter lost to erosion, which stabilizes banks, channels and shorelines and maintains water quality. The shading effect from riparian management zones also maintains water temperatures in adjacent lakes, streams and wetlands (MFRC, 2013; 2014; USFWS, 2022).

Filter strips (i.e., buffers) are used in conjunction with riparian management zones to trap sediment before it reaches surface water. Filter strips are applied to all perennial and intermittent streams, lakes and open and non-open water wetlands. Harvest within filter strips is permissible if the integrity of the buffer is maintained. Roads, skid trails and landings are generally avoided in filter strips (MFRC, 2013; 2014; USFWS, 2022).

Additional measures may be implemented to preserve water quality. A portion of slash from any limited harvest is retained within riparian management zones to prevent soil erosion, and all slash is kept out of streams, lakes, seasonal ponds and wetlands. Additional erosion controls such as water bars, broad based dips in roads or trails, cross drain culverts, straw bales, excelsior rolls, brush and slash barriers may be used on landings, roads and skid trails with steep slopes where sedimentation is possible (MFRC, 2013; 2014; USFWS, 2022). All contractors would be required to maintain and clean equipment to prevent or minimize the movement of pesticides, fuel, lubricants and other chemicals to surface water. Generally, wetlands and stream crossings are avoided when creating roads, skid trails and landings. Where stream crossings or wetlands cannot be avoided, additional best management practices would be incorporated into harvest plans (MN DNR, 1995; Phillips, 1997).

Threatened and Endangered Species and Other Special Status Species

Northern long-eared bat is federally listed as threatened and may occur within the refuge. Based on the notice in the federal register as of November 20, 2022, the agency anticipates this species will be listed as endangered on approximately January 30, 2023. Overall impacts to Northern long-eared bats from forest management would be expected to range from positive (e.g., maintaining or increasing suitable roosting and foraging habitat within Northern long-eared bat home ranges) to neutral (e.g., minor amounts of forest removal, forest management in areas outside Northern long-eared bat summer home ranges, forest management away from hibernacula) to negative (e.g., death of adult females or pups or both resulting from the removal of maternity roost trees; Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat, 2016).

To minimize negative impacts, the stipulations of the 4(d) Rule for the Northern long-eared bat would be followed (Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat, 2016). Tree harvest would not occur within a 0.25-mile radius of known hibernacula and would not cut or destroy known occupied

maternity roost trees or any other trees within a 150-foot radius from a known maternity tree during the pup season (June 1 through July 31). No harvest would occur in areas with suitable habitat for maternal roosting trees during the summer months, unless a thorough inventory and monitoring of bats has been conducted pre-harvest, during harvest and post-harvest and the presence of northern long-eared bats was not detected. Removal and management of hazardous trees would be allowed. Whenever possible, removal of these trees would be conducted in the winter when they would not be occupied by Northern long-eared bats. Necessary consultation, mitigation and timing of tree harvest would be used to minimize potential impacts to this species. Permit stipulations (i.e., timing) would be used to reduce potential effects unless reasons for human safety or maintenance requirements dictated otherwise.

In recent years two packs of gray wolves have successfully produced young on the refuge. The wolf density is considered viable and sustainable with an estimated 20 individuals on the refuge. Tamarac National Wildlife Refuge can only manage for wolves indirectly by fostering habitat conditions that are favorable to prey populations, such as white-tailed deer. The proportion of forested habitats in early succession would increase slightly, which would sustain the white-tailed deer population. Habitat management activities would typically be small-scale and localized in nature (i.e., limited to a small geographic area in any given year and not the entire refuge). Distribution and monitoring data show radio-marked and non-marked wolves use management units where tree harvest has occurred in recent years, indicating that silviculture practices would not negatively affect wolf populations within the refuge (USFWS, 2022).

The monarch butterfly is listed as a candidate species under the Endangered Species Act. Although monarch butterflies generally inhabit prairie environments, they can be found in forested areas and may be temporarily displaced by tree harvest activities. Despite the short-term disturbance, tree harvest can improve habitat conditions for monarch butterflies. Thinning dense forest stands creates canopy gaps, which allows more sunlight to reach the forest floor. This stimulates herbaceous vegetation growth and increases host and food sources for monarch butterflies. The creation of early successional habitat provides host and flowering plants for several years until the regenerating forest shades out the herbaceous understory (USFS, 2015).

Migrating and breeding raptors, including bald eagles, can also be found throughout the refuge. Although no longer threatened or endangered, Bald eagles are referenced here due to their protection under the Bald and Golden Eagle Protection Act. White pine has been mostly preserved to provide nesting habitat for bald eagles, and future restoration efforts within the Refuge intend to promote white pine regeneration and retention

Habitat and Vegetation

Non-commercial tree harvest would remove several trees per year along previously disturbed or high use areas such as trails, roads and firebreaks or wherever there is a need to remove downed trees. Removal of trees for personal firewood or use is considered to have a minimal impact on habitat and vegetation on the refuge.

Commercial tree harvest may substantially alter habitat and vegetation of forested areas throughout the refuge to achieve management objectives as outlined in the Tamarac National Wildlife Refuge Habitat Management Plan (USFWS, 2022). Forest management activities would range from passive management promoting preservation and late successional processes to active tree harvest promoting early successional stages.

Upland conifer communities have decreased substantially since the pre-settlement era. Most of the jack pine habitats on the refuge are dominated by competing deciduous species such as pin oak, aspen and paper birch due to historic fire suppression. Selective tree harvest or removal of non-coniferous tree species, particularly oak and aspen, is necessary to restore native jack pine communities. Over the lifetime of this compatibility determination, up to 276 acres of mixed upland deciduous forest would be converted to jack pine dominated cover types while also maintaining existing jack pine stands to meet habitat management objective 4.5.0 (USFWS, 2022). This would result in harvesting about 20 acres of deciduous species per year. Some of the mixed dry oak-pine sites would be converted to jack pine barrens by harvesting approximately 25 acres of northern pin oak or bur oak annually through commercial firewood harvest operations (USFWS, 2022). To promote and maintain jack pine woodlands (short-term) and barrens (long-term), trees may require thinning to reduce crowding (USFWS, 2022).

Habitat management objective 4.5.1 prioritizes red and white pine restoration. An estimated 215 acres of aspen and oak cover types would be converted to white and red pine cover types over the lifetime of this compatibility determination by selectively harvesting deciduous trees within these mixed stands as well as creating canopy gaps within existing hardwoods (USFWS, 2022).

Several studies have demonstrated the importance of early-successional forest habitat for breeding bird abundance, composition and diversity (Hanle et al., 2020). Approximately 25-30 percent of the aspen cover type would be managed as early successional habitat (less than 20 years age class) for the duration of this compatibility determination. Under habitat management objective 4.6.0, approximately 160 acres of aspen would be harvested annually to maintain a balanced age structure of aspen on a 40-55-year-old rotation (USFWS, 2022). Habitat management objective 4.6.1 prioritizes aspen dominated cover types by harvesting trees on an additional 25-50 acres of northern hardwood cover types annually, resulting in the conversion of 375 to 750 acres total (USFWS, 2022).

Northern hardwood cover types would be managed to promote structural and compositional diversity by emulating gap dynamics and increasing dominance of rare species. Under habitat management objective 4.6.2 approximately 40 acres of northern hardwood and/or upland forested broadleaf mix cover types would be harvested annually to benefit forest interior passerine priority resources of concern (USFWS, 2022). However, most northern hardwoods would be maintained as late successional communities with only 11% managed through active manipulation or treatment. Forestry practices would promote large, unbroken tracts (greater than 2,500 acres) of mature deciduous forest or mixed deciduous/coniferous forest, create the least amount of forest edge and selectively harvest trees to create canopy gaps (USFWS, 2022).

The refuge strives to protect forest health by preventing, where possible, the introduction of invasive species and diseases (USFWS, 2022). Damage to uncut trees from heavy equipment may create entry points for invasion by insects or disease (Nichols et al., 1994). Harvesting may also leave the remaining trees more susceptible to wind throw (Ruel, 1995) and facilitate the spread of invasive plants (Sakai et al., 2001). Equipment used for commercial tree harvest would be required to be free of vegetation from previous work sites before entering the refuge. Brush and sod control may be necessary following harvest of upland conifers to prevent establishment of invasive or cool-season, sod-forming grass species.

Currently lowland hardwood species, primarily green ash, black ash and American elm, are managed under a preservation approach with minimal to no tree harvest. However, with the potential threat of emerald ash-borer, removal of affected trees may be warranted if these stands become infested.

Geology and Soils

Forested habitats on Tamarac National Wildlife Refuge are supported by several soil types. Wet Alfisol soils support aspen, basswood, maple, red oak and black ash, whereas drier Alfisol soils support red and white pine. Entisol soils support jack pine, northern pin oak, bur oak and dry prairie communities (USFWS, 2022).

The establishment of temporary trails and landings and the operation of heavy equipment may impact soil causing rutting and erosion (Helfrich et al., 2009; NHDFL and UNH, 2016 Wiest, 1998). To mitigate potential impacts and minimize erosion, tree harvest would follow best management practices as recommended by the Minnesota Forest Resources Council (MFRC, 2013; 2014). Temporary trails may be created through silvicultural treatments but are not intended to be maintained in the future. Harvesting would use existing forest roads where possible, however, the construction of temporary trails may occasionally be necessary to provide access to some forest stands. These temporary trails would be decommissioned and restored to native vegetation upon harvest completion. Any damage to roads would be remediated once activities have stopped. New roads, temporary trails and landings would follow

Minnesota Forest Resource Council guidelines for size and placement (MFRC, 2013; 2014).

Soil disturbance following tree harvest may increase the export of particulate matter and soil nutrients (Bormann et al., 1968; 1974). To reduce potential soil impacts, tree harvesting is recommended during the fall and winter months (November through March), when conditions are driest and snow depths, frozen ground and cold temperatures reduce soil compaction, rutting and erosion. Some tree harvest is authorized throughout the year depending on the management objective, habitat or cover type, harvest technique (i.e., scarification needed for regeneration), equipment type (i.e., low-impact equipment that does not tear up the soil or cause rutting) or known presence/absence of wildlife or sensitive plants. Tree harvest would not be allowed when soils are saturated or prone to rutting and would generally be avoided in areas with hydric, steep, shallow or easily erodible soils unless deemed necessary for management purposes. Additional erosion controls may be incorporated such as water bars, broad based dips in roads or trails, cross drain culverts, excelsior rolls, brush and slash barriers and regeneration of native vegetation to minimize soil erosion where necessary. Soil and understory vegetation disturbance would be limited in filter strips and riparian areas to avoid soil compaction (MFRC, 2013; 2014; USFWS, 2022).

Air Quality

Equipment used for non-commercial tree harvest would be limited to small engines and personal vehicles. Emissions would be less than or comparable to those typically emitted by general visitor use and would minimally affect air quality.

Due to the infrequency, limited duration and localized area of commercial tree harvest activities on the refuge, negative effects to air quality through increases in atmospheric pollution are expected to be minimal. Emissions from equipment and vehicle exhaust used for commercial tree harvest could cause a negligible, temporary decrease in air quality, however, air quality would improve once the emission-emitting equipment stopped operating.

Visitor Use and Experience

Consistent with its authorizing legislation, Tamarac National Wildlife Refuge conducts a broad array of wildlife and habitat management activities while providing for a variety of visitor services. Efforts to balance competing demands for natural resources, wildlife and protection from environmental hazards is crucial. Removal of trees that are a hazard to property and human safety would be permitted in specific circumstances to create a safer environment for the visiting public.

Non-commercial tree harvest would be limited to established roads and trails from September 1 to the end of February and excludes the Blackbird Wildlife Drive. Some visitors could be temporarily disrupted by the sound of power saws, but the activity

would not have a detrimental effect on their overall experience.

Commercial tree harvest has the potential to disturb refuge visitors or temporarily detract from the aesthetics of an area. To ensure the safety and awareness of visitors, areas of the refuge undergoing active forest management would be signed if occurring in places normally open to the public. Trails would be shared by the public and logging equipment until harvest operations are complete. Depending on the silvicultural treatment being used, visual buffers (e.g., leave patches or strips) adjacent to roads or other access point would be retained to maintain visitors' aesthetic experience.

Commercial tree harvest activities may disrupt familiar recreational patterns of visitors by altering the seral stage of a habitat, but would ultimately provide new, unique opportunities for wildlife-related recreation after harvest has ceased.

Cultural Resources

Non-commercial tree harvest of fallen trees would occur along well-established roadways and trails without the use of heavy equipment. The potential to encounter or effect cultural resources for this use are negligible.

The National Historic Preservation Act requires Tamarac National Wildlife Refuge to consider potential affects to cultural resources when undertaking a management actions. Planning for all commercial tree harvests must include coordination and clearance from the Regional Historic Preservation Officer. Once a potential tree harvest site has been identified, a request for review would be provided to the officer to ensure compliance with the National Historic Preservation Act. The refuge has a rich history of human use by many cultures spanning thousands of years. Commercial tree harvest would only be conducted in areas where the potential to encounter cultural resources is minimal. Forest management would also primarily be conducted in the winter months when the soil is frozen, which further mitigates potential disturbance to cultural resources.

Socioeconomics

The variety of habitats found at Tamarac National Wildlife Refuge support a diversity of wildlife species. The refuge receives approximately 50,000 visits a year from the public. Many of these visitors come to pursue game species such as American woodcock, ruffed grouse and white-tailed deer that benefit from forest management, especially young-forest regeneration practices. Each year the forests also attract hikers, birdwatchers, photographers and other outdoor enthusiasts to the refuge. These visitors bring socioeconomic activity to the surrounding communities as people purchase fuel, outdoor gear and visit local establishments.

Indirect effects of non-commercial tree harvest removal could lead to personal gain by individuals that are permitted to remove trees. For example, firewood harvested from the refuge could be used to offset home heating costs, for recreational

campfires and/or for personal hobbies or crafts.

Commercial tree harvest would result in economic benefit to the operator. It also provides an economic return to the community through the operation of sawmills to process wood and fuel costs.

Wilderness

Staff does not carry out any active management in the Tamarac National Wildlife Refuge Wilderness Area. The management strategy for the wilderness area calls for passive management with natural succession allowed to take its course.

Long-term impacts

This compatibility determination includes written analyses of the environmental consequences only when long-term impacts on a resource could be more than negligible or have an overall positive effect. Although some resources were evaluated under short-term impacts, minimal long-term impacts are anticipated. Threatened and endangered species, air quality, wilderness, cultural resources, refuge management and operations and socioeconomics would not be more than negligibly impacted by the action, as there are mitigation measures in place to reduce long-term impacts and have been dismissed from further analyses.

Wildlife Species, Habitat and Vegetation

Although tree removal can alter forested landscapes, most wildlife species would not be negatively affected long-term by tree harvest activities on the refuge. Carefully managed harvest would provide lasting benefits to wildlife by restoring or enhancing habitats and increasing or maintaining habitat diversity (e.g., forest stand age, species and structure).

A preliminary assessment of the ecological condition class for the refuge indicates fire regimes, species composition and structure have been significantly altered from their historical range and the risk of losing key ecosystem components is high (USFWS 2022). Actions proposed in the habitat management plan, such as increasing forest compositional diversity, contribute to promoting resiliency and adaptive capacity of the existing forest ecosystems. Specifically, retention and regeneration of conifers, particularly in mixed deciduous/coniferous stands provide a critical structural component throughout the refuge by providing food, nesting habitat and cover for wildlife (USFWS, 2022).

The size and shape of tree harvest sites affects wildlife and vegetation composition in different ways. Mixed forest with diverse plant forms, vertical structures and ages provide habitat for a variety of wildlife. Harvest patterns that minimize edge and vary in size provide diverse landscapes and habitats. A shifting mosaic of early successional habitat (i.e., rotational tree harvest) would promote a diverse mix of forest age classes, habitat types and vegetative composition and structure (MFRC,

2013; 2014; USFWS, 2022). Young forest structure would initially benefit early successional species (Martin et. al., 2007, Swarthout et al., 2009) and eventually provide long-term benefits to late successional forest species. Large, unbroken tracts of mature deciduous forest or mixed deciduous and coniferous forest benefit forest-interior songbirds. Large-scale harvest patches mimic historic or natural disturbance regimes associated with even-aged, fire-dependent communities such as aspen, jack pine and other conifers. Smaller harvests and uneven-aged management are typically applied in deciduous stands to represent heterogeneous forest types (MFRC, 2013; 2014).

Climate change is a growing concern for land managers regarding long-term forest management. Although exact future climatic conditions are uncertain, some predictions can be made regarding how forested vegetation and habitats will respond to various climate change scenarios and their vulnerability to these changes (Handler et al., 2014). The Climate Change Field Guide for Northern Minnesota Forests provides insight on site-level considerations and adaptation for future forest management within Tamarac National Wildlife Refuge (Handler et al., 2017; Swanston et al. 2016).

Many of the strategies and techniques mentioned in this compatibility determination would favor conditions that decrease climate risk impacts to vegetation. These strategies include increasing species and structural diversity, managing for natural conditions and disturbance regimes and maintaining deer and pest populations or disease at levels that would not exacerbate the effects of climate change. Other strategies within the field guide provide additional measures to mitigate climate change risk and vulnerability on the refuge (Handler et al., 2017; Swanston et al. 2016).

Aquatic Species and Water Quality

Maintaining forested buffers near streams and other aquatic resources would minimize long-term impacts on water resources and water quality (MFRC, 2014). Carefully considered access points, skid trail planning and harvest operations would follow best management practices provided by the agency to minimize the alteration of hydrology and the impacts of siltation on water quality (USFWS, 2022).

Geology and Soils

Maintaining soil productivity is critical to sustainable forest management because of its capacity to support plant growth and habitat for wildlife. Careful planning minimizes the forested area occupied by roads, landings and skid trails, and their location is based on topography and soil types. Alternating between equipment and techniques (i.e., mechanical harvesters, forwarders or other low-impact or low-ground pressure equipment) would avoid soil compaction, rutting and erosion. Distributing slash across the site would reduce nutrient depletion and sedimentation (MFRC, 2013; 2014; USFWS, 2022).

Visitor Use and Experience

The long-term impacts associated with other refuge user groups are anticipated to be positive as forest management may increase presence and therefore observation of bird or other wildlife species, provide for enhanced opportunities for interpretation regarding the benefits of forest management for wildlife habitat and improve hunting opportunities and access.

Public Review and Comment

The draft compatibility determination will be available for public review and comment for 15 days from February 1 to February 16, 2023. The public will be made aware of this comment opportunity through newspapers, social media, postings at local libraries and letters to potentially interested stakeholders such as the Minnesota Department of Natural Resources and White Earth Nation. A hard copy of this document will be posted at the Refuge Headquarters or Visitor Center at 35704 County Highway 26 Rochert, Minnesota. It will be made available electronically on the refuge website (<https://www.fws.gov/refuge/tamarac>). Comments can be sent by email to: tamarac.fws.gov or by standard mail to the address above. Please let us know if you need the documents in an alternative format. Concerns expressed during the public comment period will be addressed in the final.

Determination

Is the use compatible?

Yes

Stipulations Necessary to Ensure Compatibility

To ensure compatibility with the National Wildlife Refuge System Improvement Act and refuge establishing purposes, goals and objectives, non-commercial and commercial tree harvest can only occur with the following stipulations:

1. All tree harvest requires compliance with a special use permit. The permit stipulates the applicable requirements based on the habitat management plan.
2. Each special use permit will be issued to minimize or eliminate site specific impacts, to meet specific habitat and related wildlife objectives and to contribute to the purposes of the refuge.
3. All tree harvesting is monitored by the refuge biologist or refuge manager for compliance with the special use permit.
4. For commercial tree harvest, no harvest of standing trees will occur from June 1 through July 31 to adhere to Northern long-eared bat guidelines (see

threatened and endangered species section above).

5. Standing cavity trees and snags actively being used by wildlife will be marked and protected.
6. Vehicle and equipment access will be limited to existing trails or restricted to time frames identified in the special use permit to protect soils and vegetation (see geology and soils section above).
7. No motorized vehicles can be used beyond existing roads or trails for non-commercial tree harvest.
8. Permittees will be required to follow all state and federal quarantine measures regarding movement of firewood.
9. Commercial equipment must be cleaned prior to entering the refuge to prevent the spread of invasive plant species and is subject to inspection.
10. Commercial tree harvest will use management techniques that emulate natural disturbance regimes.
11. Each tree harvest sale must have a detailed plan that outlines the specific goals and objectives of the management action, existing stand conditions, silvicultural treatment to be used, logger guidelines that consider equipment limitations, projected outcomes and any other relevant concerns.

Justification

The stipulations outlined above would help ensure that the use is compatible at Tamarac National Wildlife Refuge. Non-commercial and commercial tree harvest as outlined in this compatibility determination, would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge. Based on available science and best professional judgement, the agency has determined that non-commercial and commercial tree harvest at Tamarac National Wildlife Refuge, in accordance with the stipulations provided here, would not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose of the Tamarac National Wildlife Refuge. Rather, appropriate and compatible non-commercial and commercial tree harvest would be a use of Tamarac National Wildlife Refuge that maintains healthy, productive habitats and provides the public with an opportunity to enjoy wildlife and wild lands.

Signature of Determination

Refuge Manager Signature and Date

Signature of Concurrence

Assistant Regional Director Signature and Date

Mandatory Reevaluation Date

2032

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Figure(s)



Tamarac

National Wildlife Refuge

Areas CLOSED to Tree Harvest

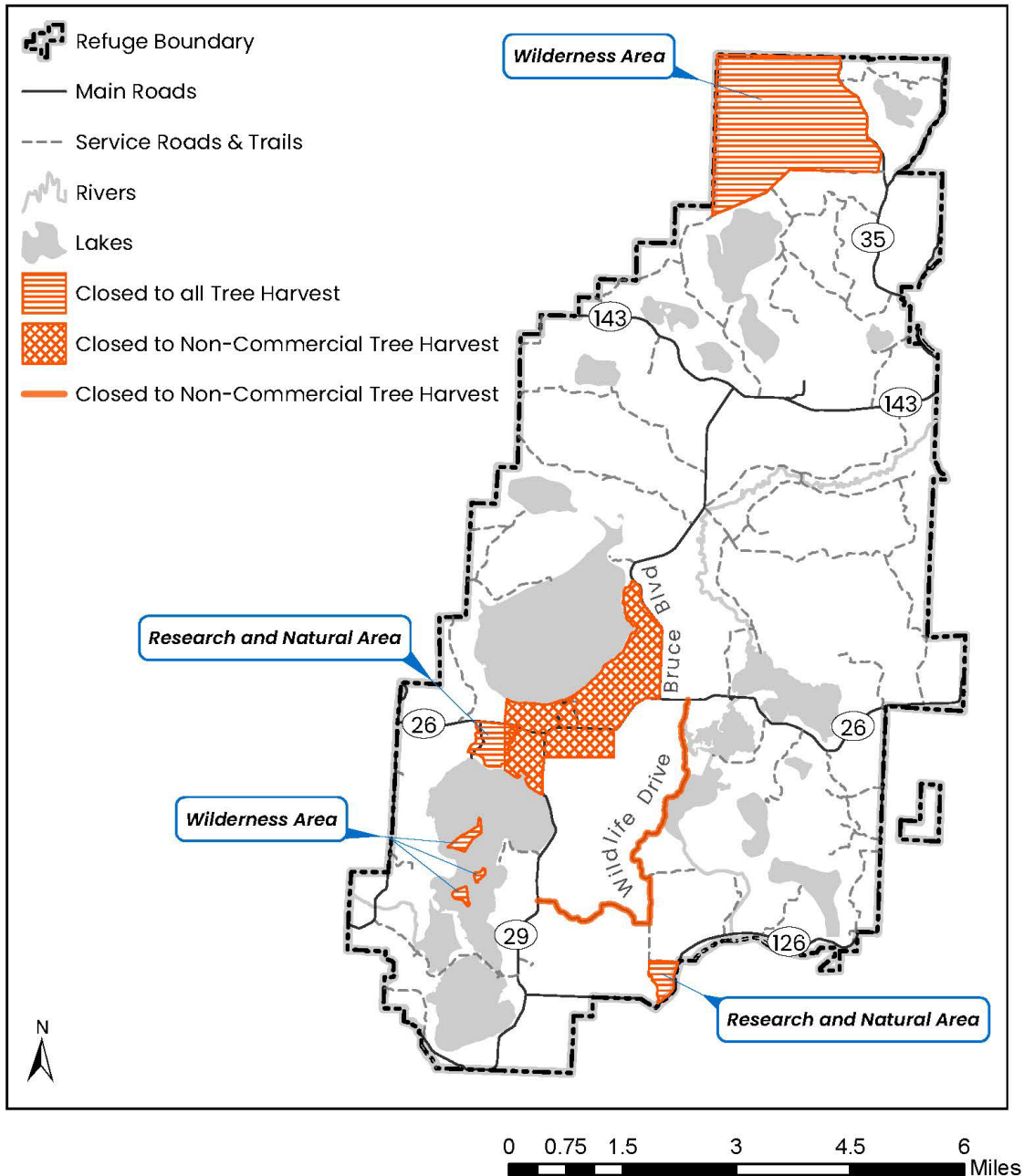


Figure 1. Areas closed to non-commercial and commercial tree harvest within Tamarac National Wildlife Refuge.