Forest Management Guidelines for the Provision of Pileated Woodpecker Habitat

VERSION 1.0

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Attention: Guidelines

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Summary of Forest Management Guidelines for the Provision of Pileated Woodpecker Habitat

The guidelines were developed to help forest managers address the habitat needs of pileated woodpeckers *(Dryocopus pileatus)* during the planning and implementation of forest management activities. The guidelines address the habitat needs at two scales. At the stand level (tens of hectares), the guidelines identify practices that provide specific habitat features (e.g., cavity trees, downed woody debris) needed for feeding, nesting and roosting. At the landscape or forest management unit (MU) level (thousands of hectares), the guidelines help to establish broad habitat objectives and the means for their achievement.

The remainder of this document describes the rationale and objectives for the guidelines, and provides an overview of the habitat needs of pileated woodpeckers. The implications of forest management activities and recommended forest management practices for the provision of habitat are also discussed.

Recommended Guidelines

To meet current and future habitat needs of pileated woodpeckers throughout the Great Lakes - St. Lawrence forest of central Ontario, the following practices are recommended.

<u>Stand Level</u>

Cavity Trees

1. Retain a minimum of six cavity trees per hectare on all selection, shelterwood, seed tree, and clearcut harvest blocks. (A cavity tree is defined as a tree with existing cavities or the potential to develop cavities.)

2. To minimize the risk of injury to forest workers, all cavity trees retained should be living (with one exception noted below) and should not constitute a safety risk as defined by the Occupational Health and Safety Act (RSO 1990).

3. All cavity trees retained should be at least 25 cm diameter at breast height (dbh). At least one cavity tree per hectare should be 40+ cm dbh.

4. In selection cuts or shelterwood preparatory and seeding cuts, retain trees to meet the needs of pileated woodpeckers and other cavity users for the next 20 years. In order of priority retain: (i) (i) (i) pileated woodpecker roost trees, (ii) (ii) pileated woodpecker nest trees, (iii) (iii) trees with other woodpecker nest cavities or natural nest or den cavities, (iv) trees with escape cavities, (v) trees with feeding excavations, and (vi) (vi) (vi) potential cavity trees.
   Because pileated woodpecker roost trees are rare, retain these trees even if dead. If retaining a dead roost tree, establish a reserve with a radius equal to the height of the surrounding stand to comply with the Occupational Health and Safety Act (RSO 1990).

5. In clearcuts, seedtree cuts, and shelterwood removal cuts, retain: (i) (i) (i) trees with existing cavities to meet immediate habitat needs of cavity users of early successional forest; and (ii) (ii) (ii) trees with the potential to develop cavities to meet the future needs of pileated woodpeckers as the regenerating stand matures.

6. Standing dead trees (with or without cavities) are an important component of wildlife habitat. When they represent potential safety risks, forest workers should be required to comply with the Occupational Health and Safety Act (RSO 1990) and safely lower to the ground any standing dead trees that may pose a safety risk and are in the vicinity of living trees to be felled. However, when standing dead trees do not pose a potential safety risk, their retention should be encouraged during harvest and site preparation activities.

Downed Woody Debris

1. Whenever possible, use tree length instead of full tree harvesting methods to retain small diameter downed woody debris on sites.

2. Where possible, encourage operators to leave unmerchantable portions of tree boles at harvest sites to provide large diameter downed woody debris.

3. Where silvicultural objectives and worker safety concerns will not be compromised, consider girdling or felling and leaving unmerchantable trees.

4. Where feasible, use site preparation equipment and techniques that do not windrow or crush downed woody debris.

5. Where feasible, modify the use of prescribed fire to minimize the impact on downed woody debris.

Landscape Level

At the landscape or MU level, the guidelines are intended to minimize adverse effects of planned forest management activities on the overall supply of preferred feeding, nesting and roosting habitat. The forest management planning team will identify specific habitat supply objectives based on a variety of factors including:
(i) the current supply of habitat on the MU relative to a broader landscape level (e.g., ecoregion); (ii) long-term projected trends in habitat supply for the MU and the broader landscape level; and (iii) other biologically relevant information such as historic abundance and distribution of pileated woodpeckers on the MU.

Application of the Guidelines

The guidelines are to be used on Crown land throughout the Great Lakes - St. Lawrence (GLSL) forest of central Ontario. In the transition zone between the GLSL and boreal forests, either the pileated woodpecker or the marten guidelines **must** be applied, although both **may** be applied. The choice of guidelines should be based on an assessment of habitat capability and suitability for the MU.

The guidelines are intended to provide a consistent approach to managing habitat for pileated woodpeckers across the GLSL and transition forest. Since pileated woodpecker populations and their habitat vary across this large geographic area, the guidelines may be used with some flexibility. However, any deviations from the guidelines must be recorded and rationalized on the basis of compelling biological or socioeconomic concerns.

Forest Management Guidelines for the Provision of Pileated Woodpecker Habitat

Preface

These guidelines comply with the Crown Forest Sustainability Act (CFSA)(RSO 1994) and the Environmental Assessment Board's ruling on timber management on Crown lands (April 1994). The Forest Operations and Silvicultural Manual (CFSA. Section 68) requires that these guidelines be considered during the preparation and implementation of forest management plans (FMP).

These guidelines have been prepared to help forest management planning teams develop and implement sound practices that contribute to securing the long-term health of Ontario's forests. More specifically, the guidelines are intended to help ensure that populations of the pileated woodpecker (*Dryocopus pileatus)* are maintained throughout the Great Lakes-St. Lawrence forest of central Ontario. By providing habitat for pileated woodpeckers, it is expected that some of the habitat requirements of other species associated with similar forest conditions will also be met. For example, about 50 species of birds and mammals may benefit from the retention of cavity trees recommended by these guidelines.

These guidelines have been developed by combining current scientific evidence and expert opinion. A summary of existing scientific information is available in a companion document (Kirk and Naylor 1996). These guidelines are intended to be used in conjunction with habitat supply models currently available.

Revisions to these guidelines will occur as understanding improves and new tools are developed. At a minimum, the guidelines will be revisited every five years.

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Forest Management Guidelines for the Provision of Pileated Woodpecker Habitat

1.0 Introduction

The pileated woodpecker (*Dryocopus pileatus)* was elevated to the status of a provincially featured species by the 1994 decision of the Environmental Assessment Board. The Board directed that guidelines be prepared to manage for the habitat of the marten (*Martes americana*) in the boreal forest and the pileated woodpecker in the Great Lakes-St. Lawrence (GLSL) forest of central Ontario.

1.1 Evolving Management Philosophy

Historically, the Ministry of Natural Resources (MNR) attempted to provide habitat for some game species and those species whose long-term survival was of concern (i.e., vulnerable, threatened and endangered species). In recent years, recognition of the connections among the components of natural systems and appreciation of the intrinsic value of all species has grown. At the same time, it has become increasingly unwieldy to manage for the specific habitat needs of an ever-growing list of species of concern. Thus, MNR's approach to resource management has been shifting to the maintenance of entire ecological systems and their associated biological diversity. This approach does not preclude the management of habitat for individual species such as the pileated woodpecker, marten, red-shouldered hawk (*Buteo lineatus*), moose (*Alces alces*) or white-tailed deer (*Odocoileus virginianus*). However, management of individual species must not threaten the long-term well-being of other species, or the functioning of the overall biological system.

This evolution in thinking about resource management has been reflected in, and encouraged by, a number of government policy initiatives. For example, Ontario's Policy Framework for Sustainable Forests and the Crown Forest Sustainability Act (RSO 1994) promote the long-term health of forest ecosystems. At the national level, Ontario has indicated its support for the provisions of the 1995 Canadian Biodiversity Strategy.

These guidelines have been developed with the expectation that they will be applied in a way that contributes to the maintenance of ecological systems and biodiversity.

1.2 Evolving Management Methods and Technology

A key consideration in the maintenance of ecological systems is the need to manage at a number of spatial scales. Not only is it necessary to manage for certain habitat features at the forest stand level (tens of hectares), but certain properties of the landscape (thousands of hectares) must also be considered. Maintenance of a variety of landscape characteristics (e.g., different types and ages of forest) will increase the likelihood that the biological diversity associated with that landscape will be perpetuated.

These guidelines deal with the desired properties of both forest stands and landscapes that, together, are considered necessary to ensure the perpetuation of pileated woodpecker populations. Key habitat components are protected through stand level prescriptions. Requirements at the landscape level are addressed by modifying forest management practices to meet habitat supply objectives.

These guidelines consist of 6 parts: (i) a brief overview of pileated woodpecker status and habitat requirements, and the implications of forest management activities; (ii) stand level guidelines that describe how to retain the cavity trees and downed woody debris needed by pileated woodpeckers; (iii) landscape level guidelines to be used in conjunction with non-spatial habitat models to plan for the supply of habitat through time; (iv) suggestions for application of the guidelines; (v) a brief discussion of the anticipated future direction of forest habitat management and improvements to the guidelines; and (vi) appendices providing information on habitat affinities, cavity tree selection, and an example of how habitat supply modelling can be used to meet objectives for pileated woodpecker habitat.

2.0 Status and Habitat Requirements

2.1 Distribution, Abundance and Territory Size

The pileated woodpecker is the largest of the nine species of woodpeckers native to Ontario. It is found throughout the forested parts of the province south of the Hudson Bay Lowlands. It is less abundant south of the Canadian Shield and is relatively scarce in the most heavily settled parts of the province, such as extreme southwestern and southeastern Ontario (Dance 1987). Population density has been estimated at about 2 to 10 breeding pairs per 10 km^2 in both northern and southern Ontario (Dance 1987). Population density in Ontario appears to be higher than in all other provinces except British Columbia (Kirk and Naylor 1996). Despite its broad distribution in Ontario, this species is still uncommon compared to the other species of woodpeckers with which it shares habitat (e.g., yellow-bellied sapsuckers *Sphrapicus varius*, hairy woodpeckers *Picoides villosus*, and northern flickers *Colaptes auratus).*These other species are thought to have breeding densities of 11 to 100 pairs per 10 km^2 (Dance 1987).

Numbers of pileated woodpeckers are probably higher today than in the recent past, at least in southern Ontario. Extensive forest clearing, large man-caused fires and market harvesting (for food) during the 1800s caused notable declines in pileated woodpecker populations in southern Ontario by 1900 (Dance 1994). However, populations began to increase in the 1940s in response to maturation of second growth forests, greater fire protection and protection from hunting (Dance 1994). Today, numbers are thought to be relatively stable (see Table 5 in Kirk and Naylor 1996).

Pileated woodpeckers are territorial and pairs defend their territories throughout the year (Hoyt 1957). Territory (or home range) size has been reported to range from about 40 to 260 ha in eastern North America and 120 to 1,000+ ha in western North America (see Table 6 in Kirk and Naylor 1996).

2.2 Stand Level Requirements

Feeding, nesting and roosting requirements of pileated woodpeckers must be considered during habitat management (Kirk and Naylor 1996). Pileated woodpeckers feed on a variety of insects (primarily carpenter ants and larvae of wood boring beetles) throughout the year and on fruits and nuts in the autumn (Bent 1939, Martin et al. 1951). Insect food is obtained from dead or declining trees or downed woody debris using three foraging techniques: 1) gleaning, 2) bark pecking, and 3) excavations into the sapwood or heartwood (Bull et al. 1990). Pileated woodpeckers will feed on a wide variety of tree species (see Table 9 in Kirk and Naylor 1996).

Dead trees used for feeding are generally in intermediate stages of decay (e.g., Bull and Holthausen 1993) and living trees typically have advanced heart rot or large dead limbs. Well decomposed downed woody debris appears to be a preferred feeding substrate (Bull and Holthausen 1993). Pileated woodpeckers will forage on trees and logs varying in size but appear to prefer large diameter material (at least 25 cm dbh and preferably 40+ cm dbh; see Kirk and Naylor 1996).

Pileated woodpeckers excavate a cavity each year for nesting. Nest cavities, excavated in the decayed heartwood of standing trees, are generally about 20 cm in diameter, are up to 75 cm deep, and are accessed by an entrance hole that is about 10 cm in diameter (Hoyt 1957, Peck and James 1983).

Nests are excavated in dead trees or living trees with advanced heart rot, especially that caused by the false tinder fungus (*Phellinus igniarius*)(e.g., Conner et al. 1976). In Ontario and elsewhere in eastern North America, most nests are in hardwood trees, with poplars (*Populus* spp.) appearing to be the preferred choice (Peck and James 1983). Tree size is important. Nests have been located in trees as small as 25 cm dbh but are generally found in trees 40+ cm dbh (see Table 7 in Kirk and Naylor 1996).

Pileated woodpeckers roost in cavities in trees to conserve energy (especially during winter) and to avoid predation (Bull et al. 1992). While they will use abandoned nest cavities as roost sites, they appear to prefer to use special roost trees. These are large diameter (40+ cm dbh) hollow trees (compared to solid but decayed trees used for nesting) with multiple (2-10+) entrances. Entrances are either natural (access provided by seams or broken tops) or excavated by the woodpeckers (similar in size and shape to entrance holes to nest cavities). In Oregon, the hollow chamber inside roost trees averaged 28 cm in diameter and 4.3 m in length (Bull et al. 1992). In western North America, pileated woodpecker roosts are slightly more likely to be found in dead trees than living trees (e.g., 59% dead trees in Washington [Aubry and Raley 1994] and 51% in Oregon [Bull et al. 1992]). A higher proportion of roost cavities appears to be in dead trees in Ontario (pers. obs.). In Oregon, pileated woodpeckers had an average of 8 - 12 roost trees per home range (Bull et al. 1992).

Dead and declining trees and downed woody debris appear to be critical components of pileated woodpecker habitat at a stand level. A number of studies have suggested a direct relationship between the size of pileated woodpecker home ranges or their density and the supply of these habitat components (e.g., Renken and Wiggers 1989, Bull and Holthausen 1993, Kirk and Naylor in prep.).

2.3 <u>Landscape Level Requirements</u>

While stand level features are clearly important, habitat requirements of pileated woodpeckers must also be considered at a landscape level (Kirk and Naylor 1996). At this broad scale, the overall supply of habitat suitable for feeding, nesting and roosting will influence the abundance of pileated woodpeckers.

Across their range in North America, pileated woodpeckers will use a wide range of forest types for feeding, nesting and roosting, but studies suggest a strong preference for mature, dense and productive forest (see Table 11 in Kirk and Naylor 1996). Recent work in the GLSL forest of Ontario (Bush and Naylor in prep.) describes preference in relation to ecosite types (ES) developed through the Central Ontario Forest Ecosystem Classification (FEC) program (see Appendix 1).

In the study by Bush and Naylor (in prep.) pileated woodpeckers showed a strong preference for mature stands, but very old stands tended to receive lower use, possibly because intolerant hardwoods (preferred nest sites) gradually become replaced by more shade tolerant trees. Stand density (as measured by canopy closure) was also an important factor affecting habitat suitability. Highest use of ecosites appeared to occur at intermediate levels of canopy closure (about 60%).

D'Eon and Watt (1994) summarized the habitat preferences of pileated woodpeckers in the boreal forest of northeastern Ontario. They suggest that preferred habitat of pileated woodpeckers is represented by old growth stages of the following northeastern Ontario FEC site types (ST): aspen (*Populus tremuloides*)(ST 7), aspen-balsam poplar (*Populus balsamifera*)(ST 10), red maple (*Acer rubrum*)(ST 15), and sugar maple-yellow birch (*Betula lutea*)(ST 16).

In addition to overall supply, the dispersion of suitable habitat at the home range scale may influence the abundance and distribution of pileated woodpeckers. For example, in Oregon, Bull and Holthausen (1993) suggest that a typical 364 ha home range should have (i) all forest cover in mature or old growth stages with at least 25% in old growth, (ii) at least 50% of the forest cover composed of stands with 60%+ canopy closure; and (iii) at least 40% of the forest cover in an uncut condition. In Manitoba, Millar (1994) suggests that a typical 250 ha home range should have (i) at least 40% of the habitat suitable for nesting, (ii) the remaining habitat suitable for foraging, and (iii) no more than 10% of the area in clearcuts.

A number of researchers have further suggested that the pileated woodpecker may be an area-sensitive or forest-interior species, i.e., one that requires relatively large contiguous blocks of suitable habitat (e.g., Whitcomb et al. 1981, Robbins et al. 1989, Freemark and Collins 1992). If true, the size and connectedness of patches of suitable habitat within home range-sized areas may be as important as the total amount of suitable habitat available. Unfortunately, the research that supports this contention has generally been conducted in highly fragmented landscapes (i.e., islands of forest surrounded by unsuitable nonforested land). In areas of relatively continuous forest cover the results are equivocal. For example, in Alberta, Bonar (pers. comm. to Millar 1994) found pileated woodpeckers using islands of uncut forest (fragmented by clearcuts) that ranged in size from less than 1 ha to 34 ha. In California, Rosenberg and Raphael (1986) found a weak positive relationship between the size of uncut blocks of nesting habitat (fragmented by clearcuts) and use by pileated woodpeckers, and considered this species to be only moderately intolerant of small forest islands.

3.0 Implications of Forest Management Activities

Because pileated woodpeckers require relatively old forest and large trees for nesting, roosting and feeding, forest management activities are generally considered to have a negative impact (Kirk and Naylor 1996). Typically, pileated woodpeckers respond to the loss or fragmentation of suitable habitat by changing their pattern of habitat use and increasing home range size (Ruggiero et al. 1991, Bull et al. 1992, Bull and Holthausen 1993).

3.1 Stand Level

There is anecdotal evidence of pileated woodpeckers feeding and nesting in recent clearcuts (Kirk and Naylor 1996). However, clearcutting generally creates habitat that is unsuitable for feeding, nesting or roosting. Clearcutting removes security cover and most standing trees that provide nest, roost and feeding sites. Mechanical site preparation may exacerbate this problem by knocking down residual trees (especially standing dead trees), and windrowing or crushing downed woody debris (Bellhouse and Naylor 1996). Moreover, since stands regenerating after clearcutting have relatively few standing dead trees compared to naturally disturbed stands of similar age, they may begin to support pileated woodpeckers at a later age than stands of fire origin. In fact, if rotation ages are short, regenerating stands may not reach an age at which they begin to produce trees of sufficient size and condition to provide nest and roost sites for pileated woodpeckers (Bull 1987).

In contrast to clearcutting, selection cuts and shelterwood preparatory or seeding cuts probably maintain adequate security cover for pileated woodpeckers as cut sites continue to be used after harvest (Kirk and Naylor in prep.). However, many dead and declining trees (potential sites for feeding, nesting and roosting) may be harvested or knocked down to meet silvicultural objectives or to eliminate potential safety hazards and this may result in lower use by pileated woodpeckers, at least during the first 10 years following harvest (Kirk and Naylor in prep.). Mechanical site preparation in shelterwood cuts may further knock down standing dead trees and windrow or crush downed woody debris.

Shelterwood removal cuts and seed tree cuts are likely similar to clearcuts in their impact on pileated woodpecker habitat.

3.2 Landscape Level

At a landscape level, any factors that affect the amount and pattern of forest in mature age classes (including forest management activities) will influence the supply of suitable feeding, nesting and roosting habitat. Thus, when considering forest management practices, the supply of suitable habitat will be influenced by harvest levels, rotation ages, harvest allocation rules, the amount of area left in parks, reserves and bypass, and possibly by the pattern of cut block layout. Ultimately, the supply of habitat for pileated woodpeckers is determined by the interaction of these factors and the current state of the landscape, which represents the legacy of past practices and forest disturbances (harvest, fire suppression, insect outbreaks).

4.0 Recommended Habitat Guidelines

Since forest management activities may affect pileated woodpecker habitat at both the stand and landscape level, recommendations are provided at both scales.

4.1 Stand Level Guidelines

Large dead and declining trees needed for feeding, nesting and roosting, and downed woody debris used for feeding appear to be key components determining habitat suitability at the stand level.

4.1.1 Cavity Trees

The most detailed work on the habitat needs of pileated woodpeckers has occurred in Oregon. There, current research on pileated woodpeckers recommends retention of 8 standing dead trees/ha for feeding, nesting and roosting (Bull and Holthausen 1993). However, pileated woodpeckers do exhibit some major differences in habitat use in eastern and western North America (Kirk and Naylor 1996). Thus, until data from Ontario can be analyzed, it is recommended that the general cavity tree guidelines described in Anderson and Rice (1993) and Naylor (1994a) be used, with some additions to specifically address habitat needs of pileated woodpeckers.

Anderson and Rice (1993) and Naylor (1994a) recommend the retention of 6 cavity trees per hectare in all selection, shelterwood and seed tree cuts. Although pileated woodpeckers do not typically use early successional forest, this guideline should be extended to clearcuts as well; a recent study in Pembroke showed that retention of 6 cavity trees per ha in clearcuts increased both the abundance and diversity of birds (Naylor et al. in prep.).
To minimize the risk of injury to forest workers, all cavity trees retained should be living and not constitute a safety hazard as defined by the Occupational Health

and Safety Act (RSO 1990)(see exceptions noted below for pileated roost and nest cavity trees). If a forest worker believes a cavity tree poses a safety risk, it must be felled or operations in the vicinity must be avoided.

In selection cuts and shelterwood preparatory or seeding cuts, retain cavity trees that will provide habitat during the next 20 years (i.e., until the next entry into the stand) for both pileated woodpeckers and other cavity-using wildlife (e.g., barred owl *Strix varia*, wood duck *Aix sponsa*, marten, flying squirrels *Glaucomys* spp.). Retain trees in the following order of priority: (i) pileated woodpecker roost trees, (ii) pileated woodpecker nest trees, (iii) trees with other woodpecker nest cavities or natural nest or den cavities, (iv) trees with escape cavities, (v) trees with feeding excavations made by woodpeckers, and (vi) potential cavity trees. See Appendix 2 for a detailed discussion of criteria for cavity tree selection.

Pileated woodpecker roost trees are given highest priority because they receive repeated use and, because of their very specific nature (see Section 2.2), are relatively rare. Since roost trees are rare and most may be dead trees, it is recommended that dead standing trees with pileated woodpecker roost cavities be retained. When dead roost trees are retained, a reserve with a radius equal to the height of the surrounding living trees should be left to comply with the Occupational Health and Safety Act (RSO 1990). The impact of this reserve on timber supply should be negligible as it is anticipated that tree markers will encounter about 1 roost tree per 40 ha.

It is recommended that any living trees encountered with pileated woodpecker roost or nest cavities should be retained. If these trees have characteristics that might pose a potential safety hazard (e.g., a large dead limb), a reserve with a radius equal to the height of the surrounding stand should be placed around them. If otherwise, no reserve is required.

In seed tree cuts and shelterwood removal cuts retain a variety of cavity trees that will provide both immediate habitat for cavity-using wildlife of early successional forest (e.g., northern flicker, eastern bluebird *Sialia sialis*, American kestrel *Falco sparverius*) and future habitat for pileated woodpeckers. Retain some trees with good quality existing cavities that will stand for the next 20 years and some trees that will stand for 40 to 60 years and will gradually develop cavities. For trees with cavities, retain in the following order of priority:
(i) trees with woodpecker or natural nest or den cavities; (ii) trees with escape cavities; and (iii) trees with woodpecker feeding excavations.

In clearcuts, the objectives are similar to those for seedtree cuts and shelterwood removal cuts. However, cavity trees should be identified and retained by forest operators. It is recommended that operators in clearcuts use the same criteria as markers in seedtree or removal cuts when possible. If not feasible (e.g., mechanical harvest operations), operators should retain 6 living cavity trees per ha that may provide potential habitat for cavity-users. These should be relatively large living trees (25+ cm dbh when available), preferably hardwoods (poplars, maples or oaks) that will not pose a potential safety hazard. To facilitate mechanical harvest or site preparation activities, cavity trees can be left in clumps of 3 to 6 trees.

4.1.2 Standing Dead Trees

In all types of cuts, standing dead trees are an important resource for pileated woodpeckers and many other species of cavity and non-cavity using wildlife. Standing dead trees may, however, represent potential safety hazards. Standing dead trees will therefore not be identified for retention, except for pileated woodpecker roost trees. Moreover, forest workers are required to comply with the Occupational Health and Safety Act (RSO 1990) and safely lower to the ground any standing dead trees that may pose a safety risk and are in the vicinity of a living tree being felled. However, where standing dead trees do not pose a safety risk, their retention (during harvest and subsequent site preparation activities) should be encouraged. In all cases, retention of standing dead trees will be at the discretion of the forest worker.

4.1.3 Downed Woody Debris

In all types of cuts, downed woody debris is an important habitat component for pileated woodpeckers and over one-third of all vertebrate wildlife in the GLSL forest (Bellhouse and Naylor 1996, Kirk and Naylor 1996). The following recommendations for the retention of downed woody debris are from Bellhouse and Naylor (1996).

1. Whenever possible, use tree length instead of full tree harvesting methods. Retention of tops on site will provide small diameter downed woody debris

2. Where possible, encourage operators to leave unmerchantable portions of tree boles at harvest sites. Retention of unmerchantable material such as cull butts will provide larger diameter downed woody debris.

3. Where silvicultural objectives and health and safety concerns will not be compromised, consider girdling or felling and leaving unmerchantable trees. Felling and transporting trees that cannot be utilized to the landing reduces the amount of downed woody debris on sites and increases damage to residual stems and advanced regeneration.

4. Where feasible, use site preparation equipment and techniques that do not windrow or crush downed woody debris.

5. Where feasible, modify the use of prescribed fire to minimize the impact on downed woody debris. For example, use preharvest or postharvest prescribed burns when the water content of downed woody debris is high.

4.2 Landscape Level Guidelines

The abundance and distribution of pileated woodpeckers across a landscape appears to be influenced by both the total amount of suitable habitat and its dispersion (see Section 2.3). However, since little is known about how habitat should be dispersed, these guidelines focus only on the provision of habitat supply at the MU level (but see Section 6.0).

The general habitat objective for each MU will be to minimize adverse effects of planned forest management activities on the overall supply of preferred feeding, nesting and roosting habitat. How this general objective is translated into specific objectives and actions by the forest management planning (FMP) team will depend on a variety of factors including: (i) the current supply of habitat on the MU relative to a broader landscape level (e.g., ecoregion); (ii) long-term projected trends in habitat supply for the MU and the broader landscape level; and (iii) other biologically relevant information such as historic abundance and distribution of pileated woodpeckers on the MU.

5.0 Application of the Guidelines

The guidelines are to be used on Crown land throughout the GLSL forest of central Ontario. In the transition zone between the GLSL and boreal forests, either the pileated woodpecker or the marten guidelines **must** be applied, although both **may** be applied. The choice of guidelines should be based on an assessment of habitat capability and suitability for the MU.

The guidelines are intended to provide a consistent approach to providing habitat for pileated woodpeckers across this geographic area. Since habitat and pileated woodpecker populations vary across this large area, the guidelines may be used with some flexibility. However, any deviations from the guidelines must be recorded and rationalized on the basis of compelling biological or socio-economic concerns.

5.1 Stand Level Guidelines

Cavity tree guidelines will be incorporated into all tree marking prescriptions for selection, shelterwood and seed tree cuts and will be implemented by qualified tree markers. Cavity tree guidelines will also be applied on all clearcuts and implemented by forest operators.

Guidelines for downed woody debris will be incorporated into silvicultural ground rules and forest operations prescriptions.

5.2 Landscape Level Guidelines

Landscape level guidelines will be incorporated into FMPs using a habitat supply analysis (HSA) approach (see Naylor 1994b). The specific steps recommended follow those outlined in the Forest Management Planning Manual:

Step 1 . Identify the ecoregional context . Review ecoregional analyses of pileated woodpecker habitat supply and any broad ecoregional objectives or direction.

Step 2 . Based on information from step 1 and a consideration of other forest objectives, set specific MU objectives for the supply of pileated woodpecker habitat. For example, if the ecoregional analysis suggests a long-term decline in habitat and the MU contains a large proportion of the ecoregion's preferred habitat, an objective of no net loss of preferred habitat might be proposed.

Step 3 . Identify management alternatives. One alternative might be to provide a sustainable supply of timber products while ensuring the area of habitat does not fluctuate through time by more than a specified amount.

Step 4 . Use SFMM to forecast the effect of each management alternative on the long-term supply of pileated woodpecker habitat and other plan objectives.

Step 5 . Identify the preliminary preferred management alternative considering, among other objectives, those set for pileated woodpecker habitat in step 2.

Step 6 . Use the PWPHSM to identify eligible stands that represent preferred habitat for pileated woodpeckers. Use this information when making the initial allocation of stands for harvest (e.g., see Appendix 3).

Step 7 . Input planned depletions into the PWPHSM and forecast impact of the preliminary preferred management alternative on habitat supply.

Step 8 . Based on results from step 7, modify stand allocations as necessary. Appendix 3 provides a simple example of how HSA can be used to manage the supply of pileated woodpecker habitat during development of a FMP.

6.0 Future Directions

These guidelines are based on a body of scientific literature reviewed in Kirk and Naylor (1996), and preliminary unpublished results from field studies conducted in Ontario (Bush and Naylor in prep., Kirk and Naylor in prep., Naylor et al. in prep.).

The stand level guidelines are based primarily on literature review and expert opinion. While the cavity tree guidelines are quantitative, the downed woody debris guidelines are not. Research is currently being conducted to describe the relationship between the supply of cavity trees and downed woody debris and the abundance of pileated woodpeckers (and other cavity-users). Results from this work will be used to refine the current guidelines.

6.1 Habitat Supply Modelling

Existing models (SFMM, PWPHSM) allow managers to examine habitat supply at the landscape level. However, neither model examines spatial pattern when assessing habitat suitability. Spatial models are needed to provide more accurate estimates of habitat supply.

Before spatial models can be developed, research is needed in Ontario to determine the influence of landscape pattern at the scales of individual home ranges and multiple home ranges on the abundance of pileated woodpeckers.

Current models predict the supply of habitat, not the abundance or dynamics of pileated woodpecker populations. Integrated habitat and population models are needed to assess the effects of forest management on the viability of woodpecker populations. These future models will allow managers to set management objectives for habitat based on the desired population response.

6.2 Ecological Land Use Planning

MNR's new planning system will consist of ecological land use planning for large, ecologically-based planning areas, and operational planning for smaller areas and MUs.

Ecological land use planning will; (i) integrate direction from relevant provincial policies, (ii) establish broad objectives and management standards for the key natural resources within the planning area, and (iii) allocate land and natural resources among competing uses. These plans will establish objectives for biodiversity conservation, sustainable resource use and desired future forest condition. These objectives will provide important context for operational planning, and will assist managers in setting landscape and MU-level objectives for habitat supply.

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APPENDIX 1

Ecosite Suitability for Feeding and Nesting

Suitability of ecosites (from the Central Ontario Forest Ecosystem Classification) as feeding and nesting habitat for pileated woodpeckers in the Great Lakes - St. Lawrence forest region of Ontario (● = preferred, O = used, – = not used). Sites suitable for nesting are assumed to be suitable for roosting. Suitability ratings are derived from the habitat suitability index model developed by Bush and Naylor (in prep.) and assume optimal canopy closure (60%).

	Stand age (yrs)										
Ecosite	0	20	40	60	80	100	120	140	160	180	200+
ES1[1]											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	O	O	O	O	O	O	O
ES2											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	O	O	O	O	O	O	O	O
ES3											
Feed	–	O	O	O	O	●	O	O	O	O	O
Nest	–	–	–	–	O	●	O	O	O	O	O
ES4											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	●	●	●	●	●	O	O	O
ES5											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	O	O	O	O	O	O	O
ES6											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	●	●	●	●	O	O	O

	Stand age (yrs)										
Ecosite	0	20	40	60	80	100	120	140	160	180	200+
ES7											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	O	O	O	O	O	O	O
ES8											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	●	●	●	●	O	O	O
ES9											
Feed	–	O	O	O	O	●	O	O	O	O	O
Nest	–	–	–	–	O	●	O	O	O	O	O
ES10											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	O	O	O	O	O	O	O
ES11											
Feed	–	O	●	●	●	●	●	●	●	O	O
Nest	–	–	–	–	●	●	●	●	●	O	O
ES12											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	●	●	●	●	O	O	O
ES13											
Feed	–	O	●	●	●	●	●	●	●	O	O
Nest	–	–	–	–	●	●	●	●	●	O	O
ES14											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	●	●	●	●	●	O	O	O
ES15											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	●	●	●	●	O	O	O

	Stand age (yrs)										
Ecosite	0	20	40	60	80	100	120	140	160	180	200+
ES16											
Feed	–	O	●	●	●	●	●	●	●	●	O
Nest	–	–	–	●	●	●	●	●	●	●	O
ES17											
Feed	–	O	●	●	●	●	●	●	●	●	O
Nest	–	–	–	–							
ES18											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	●	●	●	●	●	O	O	O
ES19											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	●	●	●	●	O	O	O
ES20											
Feed	–	–	O	O	O	●	O	O	O	O	O
Nest	–	–	–	–	–	–	O	O	O	O	O
ES21											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	–	●	●	●	O	O	O
ES22											
Feed	–	O	O	●	●	●	●	●	O	O	O
Nest	–	–	–	–	–	●	●	●	O	O	O
ES23											
Feed	–	O	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	–	O	O	O	O	O	O
ES24											
Feed	–	–	O	O	O	O	O	O	O	O	O
Nest	–	–	–	–	–	–	–	–	–	–	–

[1] Ecosite types are based on a combination of understory and overstory species composition. Dominant species comprising the overstory of each ecosite are described below:

ES1 - Sugar maple (*Acer saccharum*) - basswood (*Tilia americana*)
ES2 - Sugar maple - American beech (*Fagus grandi*folia) - red oak (*Quercus rubra*)
ES3 - Sugar maple - red oak - basswood
ES4 - Red oak - other hardwoods
ES5 - Lowland hardwoods (black ash [*Fraxinus nigra*] - poplar [*Populus* spp.])
ES6 - White cedar (*Thuja occidentalis*) - lowland hardwoods
ES7 - Sugar maple - yellow birch (*Betula lutea*)
ES8 - Sugar maple - white birch (*Betula papyrifera*) - poplar
ES9 - Sugar maple - eastern hemlock (*Tsuga can*adensis) - yellow birch
ES10 - Eastern hemlock - yellow birch
ES11 - Poplar - white birch
ES12 - Poplar - white birch - white spruce (*Picea glauca*) - balsam *fir (Abies balsamea*)
ES13 - Poplar - jack pine (*Pinus banksi*ana) - white spruce - black spruce (*Picea mariana*)
ES14- White pine (*Pinus strobus*) - red pine (*Pinus resinosa*) - white spruce - white birch
ES15 - White cedar - white birch - white spruce - white pine
ES16 - White pine - poplar - red oak
ES17 - White pine - red pine
ES18 - Red pine
ES19 - Jack pine - white pine - red pine
ES20 - White cedar - black spruce - tamarack (*Larix laricina*)
ES21 - White cedar - other conifers
ES22 - Black spruce - pine
ES23 - Jack pine
ES24 - Black spruce - tamarack

APPENDIX 2

Criteria for Selecting Cavity Trees for Retention

Condition

To minimize the risk of injury to all forest workers, retain only living cavity trees that do not represent potential safety hazards as defined by the Occupational Health and Safety Act (RSO 1990). Dead standing trees with pileated woodpecker roost cavities and living trees with pileated woodpecker roost or nest cavities that have potential safety concerns (e.g., a large dead limb) are the only exceptions to this rule. When these trees are being retained (see below), place a reserve with a radius equal to the height of the stand around the cavity tree.

In selection cuts and shelterwood preparatory or seeding cuts, retain trees that are likely to last as cavity trees until at least the next cut (20 years). In clearcuts, seed tree cuts, or shelterwood removal cuts, retain some trees (potential cavity trees) that will stand for at least 40 to 60 years.

Type of Cavity

In selection cuts and shelterwood preparatory and seeding cuts, the primary objective is to retain trees that will provide habitat for pileated woodpeckers for the next 20 years. The secondary objective is to retain trees to provide habitat for other cavity-users. Thus, in order of priority, retain trees with the following types of cavities:

<u>Pileated woodpecker roost cavities</u> First priority for retention are **living or standing dead trees** with cavities used by pileated woodpeckers for roosting. These are large diameter trees (usually 40+ cm dbh) that are **hollow** and have at least 2 excavated entrance holes (Fig. 1). Entrance holes excavated by pileated woodpeckers are somewhat oval and are about 7.5 to 10 cm wide and 10 to 12.5 cm high. Entrance holes to roost (or nest) cavities differ from excavations made while feeding. Feeding excavations are rectangular or irregular in shape (instead of a symmetrical oval shape), have very rough edges (instead of clean smooth edges), and extend 5 to 20 cm into the tree then stop (they do not lead into a large chamber suitable for roosting or nesting).

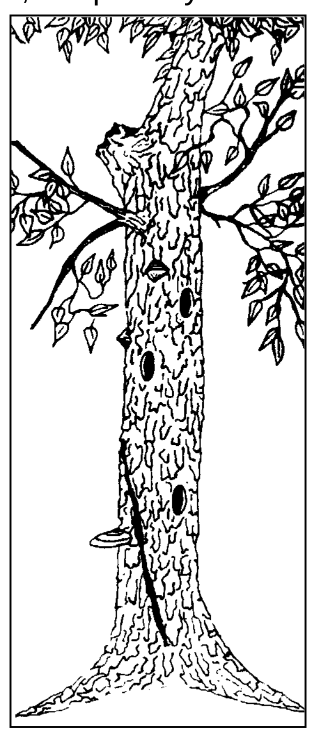

Fig. 1. Pileated woodpecker

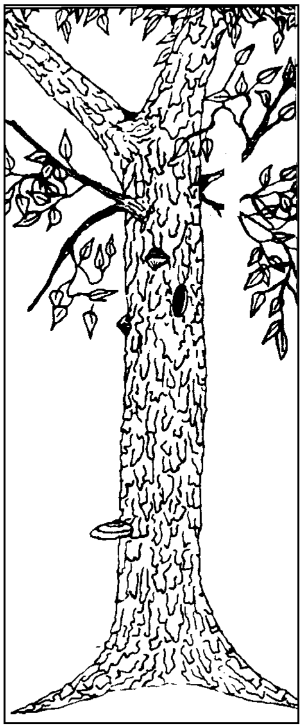

Fig. 2. Pileated woodpecker nest cavity tree.

Pileated woodpecker nest cavities Second priority for retention are living trees with cavities used by pileated woodpeckers for nesting. These are large diameter trees (usually 40+ cm dbh) in which pileated woodpeckers have excavated one or more nest chambers and associated entrance holes (Fig. 2). Nest and roost trees can be distinguished by the number of entrance holes and tree condition. Roost trees may have 2 to 10+ entrance holes and entrance holes may be less than 1 m apart. Although pileateds will nest in the same tree more than once, it is rare to find a tree with more than 2 nest holes and when multiple nest holes are encountered, they are generally more than 1 m apart (because nest chambers may be 75 cm deep). Condition is probably the best clue to separate nest and roost trees. Pileated woodpeckers excavate nest cavities in trees with white spongy heart rot (not trees with existing hollows). Roost cavities are in hollow trees (look for seams, barrelling etc. to indicate hollowness).

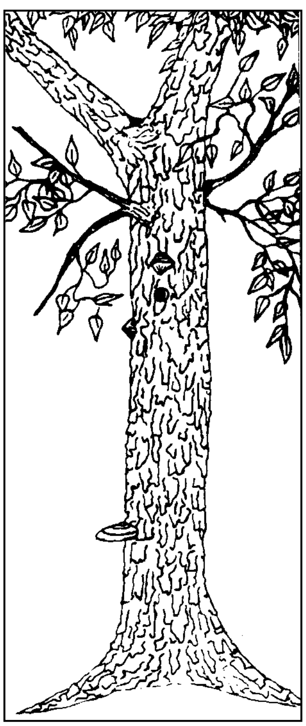

Fig. 3. Other woodpecker nest cavity tree.

Other woodpecker nest cavities or natural nest or aternal den cavities The third priority for retention are living trees with cavities excavated by other woodpeckers (e.g., yellow-bellied sapsucker, hairy woodpecker, northern flicker) for nesting (Fig. 3) or cavities suitable for nesting or denning (by secondary cavity users) that formed from natural decay processes (Fig. 4). Nests created by pileated woodpeckers can be distinguished from those created by other woodpeckers by the size and shape of the entrance hole. Entrance holes created by other woodpeckers are generally circular (instead of oval) and are smaller (less than 10 cm in diameter). Entrance holes to woodpecker nest cavities differ woodpecker feeding excavations because they are generally symmetrical and circular, have smooth clean edges, and lead into a chamber and thus look dark. Feeding excavations are typically rectangular or irregular in shape, have rough edges, and do not lead into a cavity and appear relatively light.

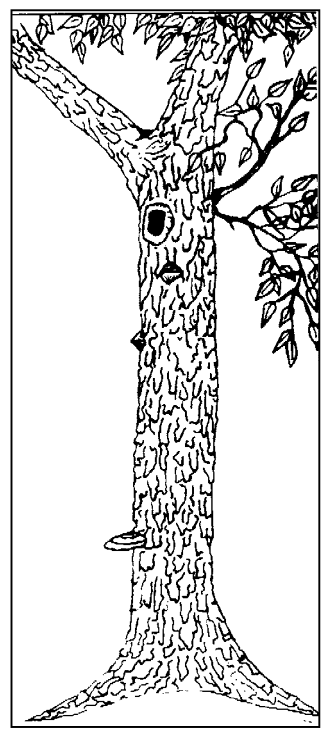

Fig. 4. Natural nest or den cavity tree.

Natural nest or maternal den cavities are hollow chambers associated with an entrance hole formed by branch mortality or wounding. In contrast to woodpecker nests, entrance holes to natural nest cavities are rarely perfectly symmetrical and are often rimmed with callus tissue. Active cavities may show gnawing on the callus.

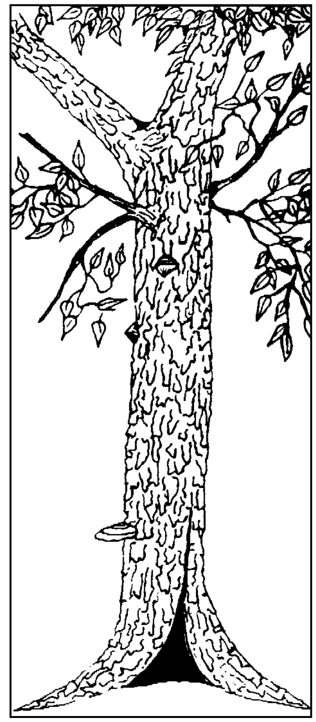

Fig. 5. Escape cavity tree.

Escape cavities The fourth priority for retention are **living trees** with natural cavities that are not ideal nest or den sites but could be used by wildlife as temporary shelter or escape from predators (Fig. 5). Cavities in these trees are usually not ideal for nesting or denning because of the location, size, or orientation of the cavity. Examples include: (i) trees with a cavity at ground level (little protection from predators); (ii) hollow trees with a large open seam (little protection from predators or weather); (iii) trees with a cavity whose entrance hole faces up and collects rain and snow (little protection from the weather); and (iv) trees that are hollow fromtop to bottom and thus have no platform to support eggs or young.

Woodpecker feeding excavations The fifth priority for retention are **living trees** with feeding excavations created by pileated or other woodpeckers (Fig. 6). Trees that are riddled with feeding excavations are likely past their most useful stage and are thus not the best candidates for retention.

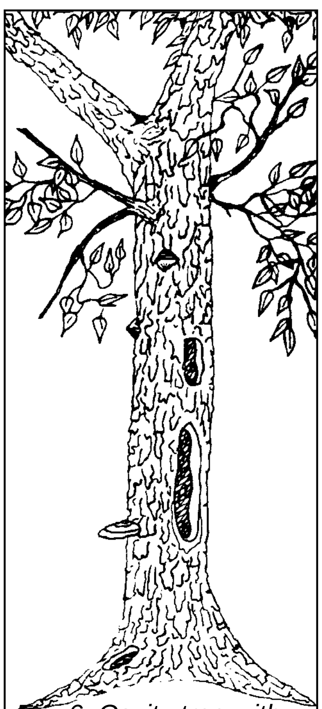

Fig. 6. Cavity tree with feeding excavations.

Potential cavities When an average of 6 trees with existing cavities cannot be left per ha, retain living trees with the potential to develop into cavity trees in the future. This includes any tree with evidence of initial or advanced development of heart rot in the upper portion of the bole.

When selecting cavity trees in clearcuts, seed tree cuts, or shelterwood removal cuts, immediate habitat for pileated woodpeckers is not the primary consideration. Leave trees that will provide immediate habitat for cavity-users that live in early successional habitats and trees that will provide habitat for pileated woodpeckers in the future stand. Thus, leave a mix of trees with existing cavities and the potential to develop into cavity trees. Retain trees with existing cavities in the following order or priority: 1) living trees with woodpecker nest cavities or natural nest or den cavities; 2) living trees with escape cavities; and 3) living trees with woodpecker feeding excavations.

Size of Tree

Bigger is better. Pileated woodpeckers generally nest and roost in trees at least 40 cm dbh and feed in trees at least 25 cm dbh. Moreover, small cavity-users can usually find holes in large trees but the reverse is not true. Thus, at least 1 of the 6 cavity trees per ha should be 40+ cm dbh. The other five cavity trees should be at least 25 cm dbh.

Species of Tree

The majority of nest cavities in living trees (pileated, other woodpecker, or natural) will be found in hardwood trees. Retention of some living conifers with escape or feeding cavities is recommended since conifer cavity trees provide other wildlife values (see below) and when dead will provide long-lasting standing dead trees. When selecting among species of hardwoods for retention, consider rate/ease of cavity formation and cavity longevity. For example, poplars rot at an earlier age than maples and their wood is generally more conducive to excavation by woodpeckers. However, once formed, cavities in maples will have a longer life expectancy. Moreover, dead limbs on tolerant hardwood trees such as red oaks are generally a lower potential safety hazard than similar-sized dead limbs on intolerant hardwoods, especially white birch.

Dispersion

Since most cavity users are territorial, retain a relatively uniform distribution of cavity trees throughout each cut block. Some variation from 6 per ha is expected since existing trees with cavities are rarely evenly distributed across the landscape. Thus, some parts of a cut block may have as few as 3 cavity trees per ha while other parts may have as many as 9 cavity trees per ha. The primary concern is that all cavity trees do not end up concentrated on one small portion of the cut block with the result that they are defended and exclusively used by relatively few cavity-users.

At the scale of the individual hectare, cavity trees do not need to be evenly spaced. Some clumping is acceptable and may even be advantageous. This is especially true for cavity trees retained on cuts that will receive subsequent mechanical site preparation treatments. On these sites, 2 clumps of 3 cavity trees or 1 clump of 6 cavity trees could be retained per ha. This may reduce windthrow as well as facilitate site preparation activities.

Multiple Wildlife Benefits

All things being equal, retain cavity trees that provide multiple wildlife benefits. For example, oaks, American beech, black cherry (Prunus serotina), basswood, and ironwood (Ostrya virginiana) cavity trees will also provide mast for a wide range of wildlife. Conifer cavity trees will provide thermal and security cover and will eventually form long-lasting standing dead trees when they die.

Other Characteristics of Cavity Trees to Consider

Trees with multiple cavities (especially if varying in size) will provide habitat for a variety of cavity-using wildlife. Cavities that provide protection from predators and the weather are preferred. Cavities in the upper portion of the bole are preferred.

APPENDIX 3

Example Use of Habitat Supply Analysis to Meet Habitat Objectives for Pileated Woodpeckers during Forest Management Planning

In this example, a hypothetical Management Unit (MU) in the Great Lakes - St. Lawrence forest of central Ontario is preparing a Forest Management Plan (FMP) for the period 2000 - 2020. An ecoregional analysis has identified a declining trend in the supply of habitat for pileated woodpeckers. This MU has one of the largest supplies of pileated woodpecker habitat in the ecoregion. Based on this information, the planning team has decided that one of the objectives of the plan is to ensure no short term (20 year) net loss of preferred feeding and nesting (includes roosting) habitat for pileated woodpeckers. Analysis of management alternatives indicates that this objective is achievable while meeting the other objectives of the plan.

The FMP team must now use the pileated woodpecker habitat supply model (PWPHSM) to help allocate stands for harvest (steps 6 to 8 in Section 5.2). The steps involved in this analysis are described below. For simplicity, we assume that preferred feeding and nesting habitat is provided by the same polygons and that all preferred habitat is eligible for harvest during 2000 - 2020.

Step 1 Conduct a habitat supply analysis (HSA)

The PWPHSM for pileated woodpeckers is run on the Forest Resources Inventory (FRI) database updated to April 1 2000. The FRI is then grown to 2020 assuming no depletions and the PWPHSM is rerun. The area of preferred, used, and not used habitat is summarized below:

Habitat suitability	**Apr 1 2000**	**Mar 31 2020**
Preferred	60,000	75,000
Used	120,000	125,000
Not used	220,000	200,000
Total	400,000 ha	400,000 ha

Based on the results of the HSA, the net increment in supply of preferred habitat from 2000 - 2020 is 15,000 ha.

Step 2 Calculate the allowable harvest of preferred habitat

Using output from the HSA, all polygons that are preferred in 2020 and eligible for harvest during 2000 - 2020 are identified. The area is then summarized by silvicultural system as follows:

Silvicultural System Prescribed	Area of Preferred Habitat
Selection	5,000
Shelterwood	
Preparatory	5,000
Seeding	20,000
Removal	5,000
Seed tree	5,000
Clearcut	35,000
Total	75,000 ha

The suitability of polygons receiving selection cuts or shelterwood preparatory or seeding cuts will not change after harvest. Thus, up to 30,000 ha of preferred habitat could receive selection cuts or shelterwood preparatory or seeding cuts without causing a net loss of preferred habitat. In contrast, polygons receiving shelterwood removal cuts, seed tree cuts, or clearcuts will no longer be preferred habitat after harvest. Thus, up to 15,000 ha (the 20 year increment calculated in step 1) of the 45,000 ha of polygons eligible for shelterwood removal cuts, seed tree cuts, or clearcuts could be harvested without causing a net loss of preferred habitat during 2000 - 2020. This 20 year allowable harvest translates to roughly 7,500 ha of selection cuts or shelterwood preparatory or seeding cuts and 3,750 ha of shelterwood removal cuts, seed tree cuts, or clearcuts of preferred habitat each 5 year operating period.

Step 3 Allocate stands for harvest, 2000 - 2005

The listing of the polygons providing preferred habitat in 2020 from Step 1 and the calculation of allowable harvest of preferred habitat from Step 2 are used during the stand allocation process to help identify which stands can be allocated without compromising the objective for pileated woodpecker habitat.

Step 4 Validate set of allocations

Planned depletions for 2000 - 2005 are entered into the PWPHSM and the supply of preferred habitat is projected to March 31 2005. If the analysis predicts a net loss of preferred habitat, steps 3 and 4 should be repeated until a satisfactory set of allocations is identified.