Managing Ash in Farm Woodlots; some suggested prescriptions

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This document provides several examples that forestry specialists can use to develop alternatives for managing ash in southern Ontario woodlots. In their communications material, the Canadian Food Inspection Agency (CFIA) suggests that Emerald Ash Borer (EAB) kills an estimated 97% of the ash trees as the "killing front" moves through an area. Other agencies have found nearly 100% mortality of ash over 1" dbh.(Knight *et al*., 2010, Herms *et al*. 2009) It is important to retain some ash in the forest as EAB moves through to provide for diversity, wildlife habitat and a future seed source. However, the high mortality rate and the loss in wood value when trees die, suggest that a prudent land manager would carefully consider management to optimize the value of their ash resource and encourage the forest to become more resilient to EAB and other pests. It is important that forest managers begin considering their alternatives well in advance of actual infestation, especially in stands with over 30% ash.

A stand management strategy should include plans for one or more stand entries that consider the owners objectives, the likely time frame of infestation, ecological and economic effects of ash harvesting/mortality (current and future stand dynamics), strategies to buffer the effects of impending ash mortality on the stand, the size classes and density of ash present, and existing regeneration. In lowland ash-dominant stands (monocultures), encouraging the establishment and development of other desirable species is critical.

Several assumptions and estimates are made;

- estimate of the number of years before the ash in the stand will be threatened or killed by EAB infestation. For example, if EAB has been found 50 km distant, it may be 10 years before that woodlot is affected; if a dense population front was 50 km distant it may be only 5 years.
- the landowner wishes to harvest in their woodlot to optimize the economic value of ash in the woodland and mitigate the impact of the loss of ash on their forest, stand integrity and productivity.
- that ash is an early- to mid-successional genus and that in ash-dominated stands, a harvest prescription can be implemented which can advance the succession process to develop a woodlot with a greater diversity of mid to shade tolerant tree species.

An ash component made up of vigorous trees should be maintained going into the infestation to provide for diversity, habitat and potential seed sources. Regeneration of desirable non-ash species must be encouraged where it is lacking. If a natural seed source is not available, consider underplanting with appropriate mid-tolerant or shade tolerant species. The short term economic benefits of harvesting mature, seed-producing ash trees ahead of EAB ash mortality should be weighed against the negative long term effect on the local gene pool.

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This note is meant to compliment other guidelines and should be read in conjunction with MNR Forest Health Guides *'A Landowner's Guide for Woodlots Threatened by Emerald Ash Borer'* and *'When Invasive Species Threaten Your Woodlot'* and Regional Forest Health Network '*Pest Alert - Emerald Ash Borer (EAB) Information for Woodlot Owners'*

This document is not comprehensive and generally applies to the types of stands described. The situations presented here were applied in Wellington County but could also apply in locales with similar forest types. **Ash management is complicated by several health problems including "ash yellows" a poorly understood disease that affects ash health and can cause dieback leading to the death of the tree.**

Three general scenarios are provided;

- Scenario 1: EAB is found in the woodlot
- Scenario 2: EAB is in the County (a quarantine area) or nearby. (expected infestation in 5 to 10 years)
- Scenario 3: EAB may affect the woodlot in more than 10 years.

Four site-specific prescriptions are provided for actual stands in southwestern Ontario which are in a scenario 2 situation (EAB is in the County/Region, a quarantine area or nearby).

- a prescription for an upland tolerant hardwood forest with a higher sugar maple component
- three prescriptions for ash-dominant lowland forests of different age/size classes with soft maple as the other major stand component. These are even-aged stands with heavier soils on poorly drained (often seasonally inundated) agricultural sites.

Scenario 1. General prescription where EAB is found in woodlot.

Where the ash component is greater than 30% stand density, it is generally recommended to salvage most sawlog trees and as much fuelwood as possible, encouraging the development of other species and maintaining stand integrity as much as possible. Recommendations will also depend on the ability to harvest smaller fuelwood trees by the owner or contractors. While it is clear that for the foreseeable future, EAB will kill most ash as it moves through; the long-term future is not clear.

Wood movement to less infested areas should be discouraged.

A reasonable assumption is that most or all ash that remain in a woodlot through EAB infestation will be killed. That being said, it is important to retain a proportion of healthy small to medium sawlog and polewood ash that will provide growing stock, seed sources, wildlife habitat and ease the transition of a stand to one without a significant ash component. These choices depend somewhat on the owner's objectives, stand characteristics and the ability of the owner or contractors to harvest/salvage trees. If the owner uses fuelwood, sells it, or has other ways to salvage, the options are much greater, particularly with stands dominated by smaller ash.

In general, it is recommended to harvest/salvage larger ash (>48 cm dbh) if they can be harvested without excess site disturbance or damage to non-ash species. Total basal area reduction should generally not

exceed 40%. This can usually be achieved by harvesting the larger ash trees while thinning those of poorest health across the diameter classes and leaving a reasonable percentage of small to medium-sized ash (30 to 48 cm dbh).

In ash-dominant stands, this will still leave many ash that will likely be killed by EAB. These can be salvaged for several years after mortality and used as fuel or low-grade lumber. In the meantime, their presence will provide a shelterwood effect to foster the development of residual trees and regeneration.

If the stand is a quality mixed stand, retain smaller but vigorous ash that are inconvenient to access to minimize damage to residual trees. The retained ash will likely die as EAB moves through, self-thinning and providing wildlife habitat without damaging residuals. If they survive, they may help replenish the stand.

Scenario 2. General prescription where EAB is in the County/Region (a quarantine area) or nearby with expected infestation in 5 to 10 years.

The variety of stand types, species composition, stocking and past management only allow for general guidelines. See following prescriptions for examples of specific situations. As the stand will likely be affected by EAB within the next 10 years, mark as much ash as feasible while maintaining stand integrity using two stand entries. In the first entry ash should be marked to encourage the development of non-ash stand components and capture the value before the trees die; retaining vigorous good-quality medium-sized trees to optimize their volume and value growth prior to infestation. This also provides the opportunity to have healthy trees going into the infestation and a choice whether to salvage them or leave them as a seed source for regeneration. A general reduction in the density of larger ash will capture their value and may help to reduce the EAB population in the stand. .

Where ash makes up less than 30% of stand density, a single entry using normal procedures could be used. . In ash-dominant stands, this will still leave many ash that will likely be killed by EAB. These can be salvaged for several years after mortality and used as fuel or low-grade lumber. In the meantime, their presence will provide a shelterwood effect to foster the development of residual trees and regeneration. Where regeneration of non-ash species is lacking and there is limited local seed source, consider underplanting with appropriate species.

Where ash is dominates or is greater than 30% BA, the number of years before EAB infests the stand is an important consideration as it relates to the number of entries possible before mortality. It is important to consider that smaller trees can be salvaged for fuelwood up to four or five years after mortality. This provides for an additional stand entry to salvage ash that have died after or during the infestation.

Scenario 3: General prescription where EAB may affect the woodlot in more than 10 years.

If it is anticipated that the stand will not be infested for ten years or more in ash-dominant stands, there may be time for three or four stand entries spaced 5 to 10 years apart. This will help optimize the value and growth of ash before infestation and moderate the impact of EAB on the forest. The sooner efforts begin the more you will encourage the development of species other than ash while retaining healthy ash, should genetics or new control methods prevail over the EAB.

The first entry would tend to reduce UGS ash and other species by harvesting with an improvement thinning in all diameter classes. Retained ash trees should be vigorous trees with good, straight stems that will either accumulate significant volume before EAB affects the stand or will move up a product/grade class to optimize the value of volume growth. For example, a 14 inch tree could grow to 16 inches in ten years, moving from a fuelwood or pallet tree to a Grade 1 butt log. When comparing trees of similar quality, ash should be marked to release non-ash species.

With two entries before infestation, a generalized prescription for an ash-dominant stand would be to reduce basal area by an average of 30% at the first entry. Consistent with the marking target, diseased trees, trees that are high risk to fail, trees with height and grade limitations, and dense patches should be marked for harvest and to release better quality trees of all species.

Some vigorous dominant or co-dominant ash should be retained and released to encourage their value/volume growth before the next stand entry. Ash should be thinned heavily where soft maple or other non-ash advanced regeneration is in the understory.

In ash-dominant stands, this will still leave many ash that will likely be killed by EAB. These can be salvaged for several years after mortality and used as fuel or low-grade lumber. In the meantime, their presence will provide a shelterwood effect to foster the development of residual trees and regeneration. Where regeneration of non-ash species is lacking and there is limited local seed source, consider underplanting with appropriate species.

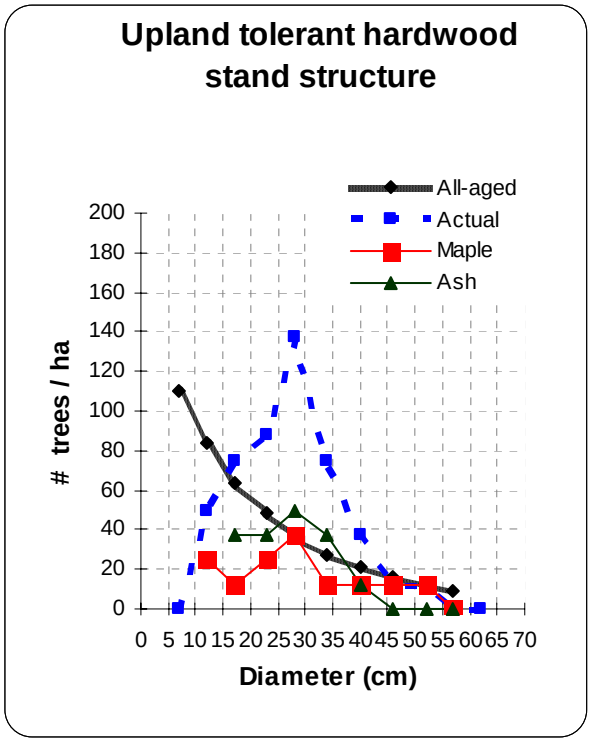
Where there is soft maple or non-ash regeneration and no larger trees to be marked, smaller ash should be thinned/marked to improve the vigour and development of the other species.

Smaller ash which are below marketable size should be marked where operationally convenient (i.e., near trees marked for other reasons, to provide access to other trees or to encourage the development of other species.

Most of the remaining ash should be healthy trees with potential to grow into sawlog sizes by the next stand entry (5 to 10 years), just before or when the stand becomes infested.

Trees with significant wildlife value (e.g., cavity trees) should be retained.

Four prescriptions where EAB is found in the County/Region (quarantine) or nearby area (Scenario 2).



Upland Tolerant Hardwood Forest
November , 2010

County: Wellington

Township: Guelph/Eramosa

Area (acres): 6.8

Mh_3 Aw_3 Hi_1 O_3 Other = Cb, Id, Bd, Po, Bb, Pw, By

Age ~ 95 years

Initial BA 31 m^2/ha

Note: in the entire stand there was less ash. We put plots in the ash area for demonstration purposes.

Basal Area Distribution (m^2/ha)									
Tree Size Classes (cm)	**10-24**		**26-36**		**38-48**		**50-59**		**Total**
Actual BA	**6.05**		**15.8**		**6.95**		**2.71**		**31**
Recommended BA for single tree selection	**4**		**5**		**6**		**5**		**20**

UGS is 1 m^2/ha

Stand Description: This upland forest sits is located on a drainage sideslope between a field to the north and a wetland to the south. It is made up of two even-aged patches; the main part of the stand became established after clearcutting in the early 1900's and subsequent pasturing, a strip along the field edge was likely pastured open until the 1950's likely when grazing was discontinued. The stand had an improvement cut during the 1980's.

The stand is mostly made up of very good quality, healthy trees, particularly sugar maple. However, the stand is overstocked and trees are dying because of high density. To maintain tree vigour and reduce the impact of EAB

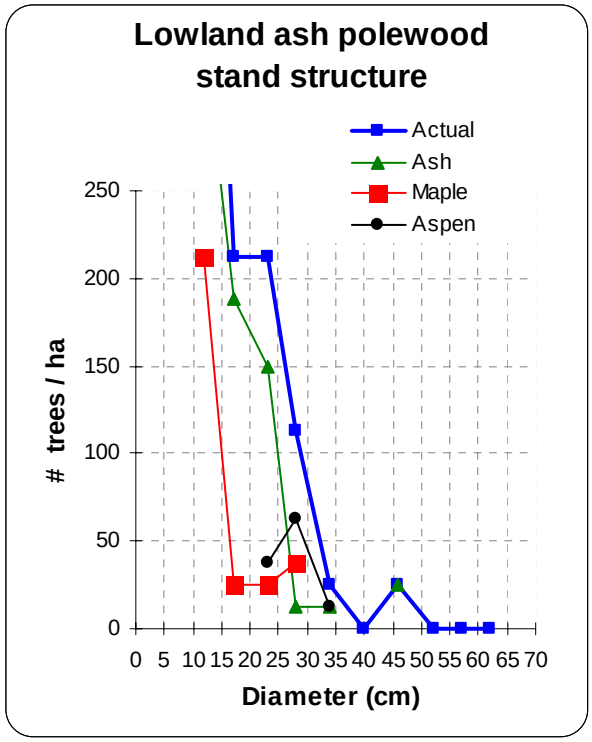
(likely to affect the stand within 10 years), it is recommended to conduct a crown thinning, primarily removing ash with a lighter improvement cut in the other species.

Landowner Objectives:. Maintain a healthy woodlot and provide income within good forestry practices.

Silvicultural Prescription: The single tree selection system is used here. The stand should be thinned to harvest/salvage larger ash, to release high quality residuals of non-ash species, to provide income and to improve growing conditions for the remaining residuals and younger trees. Large sawlog ash over 48 cm, diseased trees, trees that are high risk to fail, trees with height and grade limitations, and dense patches should be marked for harvest and to release better quality trees. Smaller ash, particularly those less than 30 cm should be marked where operationally convenient (i.e., near trees marked for other reasons, to provide access to other trees or to encourage the development of other species. Individual/clumps of important trees (e.g., high quality maple, hemlock, yellow birch) should be released using crop-tree strategy on at least one side. Basal area should be reduced an average of 25%, leaving a average residual basal area in the neighbourhood of 22 m^2/ha. Mark to reduce potential felling damage and remove UGS to improve the health, value and growth of the residual stand. Structurally unsound and dying/dead that may fall on the trail should be marked for cutting. Trees with wildlife values such as stick nest, cavity trees, and hemlock should be retained.

This harvest is not likely to result in new seedling establishment because of the high residual stand density. It is recommended that the woodlot be assessed after it stabilizes in five years or when affected by EAB to assess stand response and develop supplementary recommendations. Otherwise, the next stand entry could be within 8 to 12 years.

Cautions: Avoid harvesting from late March through June to minimize damage to valuable regeneration and disturbing wildlife. The felling of all marked trees within 30 feet of the trail and others that may fall on the trail should be required.



Lowland Ash Polewood Stand Woodlot
November, 2010

County: Wellington
Township: Centre Wellington

Area (acres): 20

Ag_6Ms_2 At_2 Other = Ew

~40 years old

Initial BA 34 m^2/ha

Recommended Residual BA - 23 m^2/ha +/-

Basal Area Distribution (m^2/ha)									
Tree Size Classes (cm)	**10-24**		**26-36**		**38-48**		**50-59**		**Total**
Actual BA	**20.7**		**9.5**		**4.3**				**34**
Recommended BA for single tree selection (Guidance only)	**4**		**5**		**6**		**5**		**20**

Stand Description: The stand is an even-aged swamp, seasonally inundated and traversed by an open drain. The western parts of the stand were likely open pasture in the 1950's and the rest was heavily pastured and likely diameter-limit cut in the late 1990's. It is a single-aged stand dominated by green ash that are rapidly becoming suppressed. The poplar is declining. There is reasonable amount of soft maple in the overstory and sapling/seedling regeneration. The soft maple is generally good-quality and should be encouraged.

Landowner Objectives: Maintain a healthy woodlot, improve quality and diversity of the stand, salvage value prior to Emerald Ash Borer infestation while encouraging development of other species.

Silvicultural Prescription: Using a shelterwood approach, the stand should be thinned heavily (30%+), reducing the ash component and encouraging soft maple and other species, and regeneration. As the stand will likely be affected by EAB within the next 10 years, as much ash as feasible should be marked to reduce the future impact of this invasive pest. The ash component should be reduced by retaining the most vigorous individuals, while removing UGS, and intermediate/suppressed ash. Vigorous dominant or co-dominant trees between 30 and 48 cm should be retained and released to encourage their growth before the next stand entry. Larger soft maple should be released on at least one side by marking adjoining ash. Ash should be thinned heavily where soft maple regeneration is in the understory. Between 30 and 40% basal area should be marked leaving a residual of approximately 23 m^2/ha. Most of the remaining ash should be healthy trees with potential to grow into sawlog sizes by the next stand entry (10 years).

Diseased trees, trees that are high risk to fail, trees with height and grade limitations, and dense patches should be marked. Trees with wildlife values such as stick nest and cavity trees should be retained.

Assuming that this harvest is completed expeditiously, the stand should be assessed for a follow-up thinning in 2017 or sooner if the stand is being attacked by EAB. . Regeneration is expected to be soft maple, ash, and aspen. The landowner should consider underplanting with appropriate species (e.g., bur oak, soft maple, yellow birch.)

Cautions: The harvest should be in dryer or frozen conditions to avoid rutting

Lowland Ash Small Sawlog Woodlot
November 2010

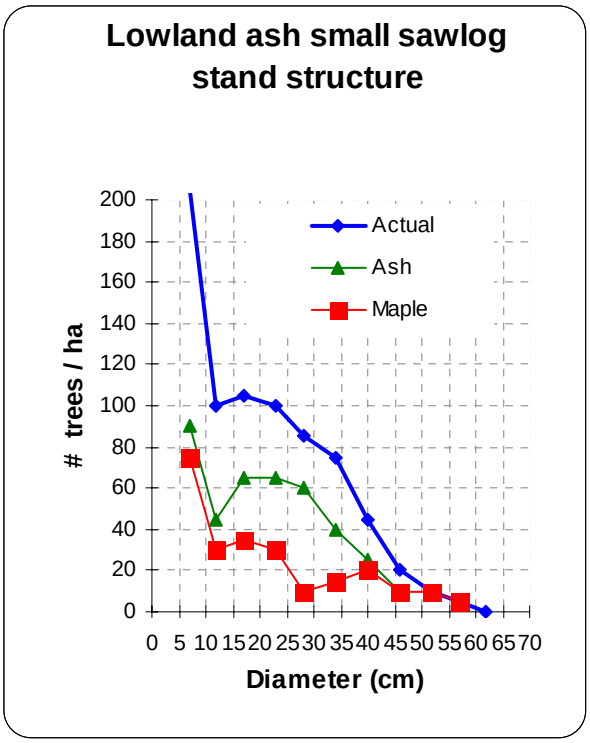
County: Wellington
Township: Guelph/Eramosa

Area (acres): 6

$Ag_5Ms_4\ O_1$ Other =At, Ew, Mh, Cb

~50 years old

Initial BA 30 m^2/ha
Recommended Residual BA - 20 m^2/ha +/-



Basal Area Distribution (m^2/ha)									
Tree Size Classes (cm)	**10-24**		**26-36**		**38-48**		**50-59**		**Total**
Actual BA	**7.9**		**12.4**		**9.2**		**3.5**		**33**
Recommended BA for single tree selection (Guidance only)	**4**		**5**		**6**		**5**		**20**
UGS			5		4				

Stand Description: The stand is an even-aged swamp, seasonally inundated, located in a swale between two fields, attached to a larger wetland to the north. The stand was likely pastured heavily until the 1960's and left to regenerate. It is a single-aged stand dominated by green ash. The stand was marked using good forestry practices in 2003, harvesting scattered poorly-formed sawlog trees. There are many poor quality ash (firewood-sized and borderline sawlogs) and patchy regeneration of ash and soft maple. There are many co-dominant trees around 40 cm, with some larger dominants and many saplings. There is more poplar on the east side that is not included in the current assessment. Many of the ash have significant defects and a number are falling over. The soft maple regeneration is generally good and should be encouraged. There is a dense buckthorn understory in places.

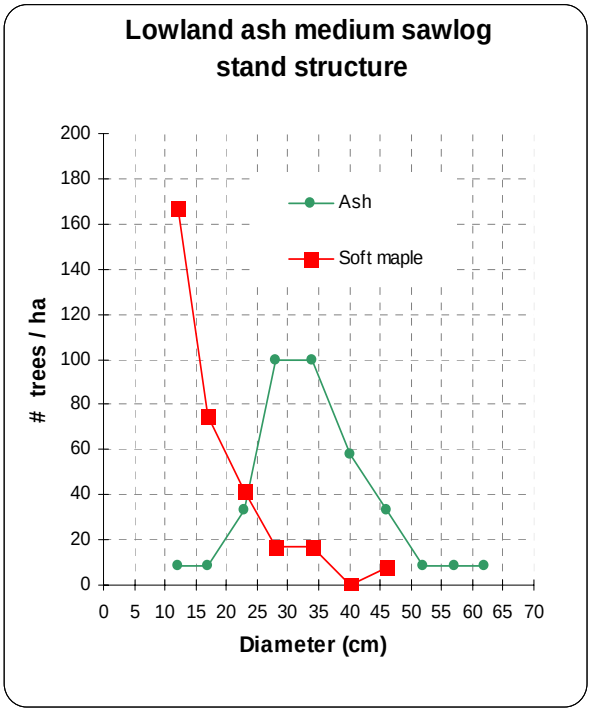
Landowner Objectives: Maintain a healthy woodlot, improve quality and diversity of the stand, and provide economic return within good forestry practices.

Silvicultural Prescription: The prescription is for the second entry in a three-entry shelterwood approach. The stand should be thinned heavily (30%), reducing the ash component and encouraging soft maple, other species, and regeneration. As the stand will likely be affected by EAB within the next 10 years, as much ash as feasible should be marked to reduce the future impact of EAB. The ash component should be reduced by harvesting larger trees (48

cm+), UGS, and intermediate/suppressed ash. Most of the remaining ash should be healthy trees with potential to grow into sawlog sizes by the next stand entry (10 years). Intermediate crown class and larger soft maple should be released on at least one side by marking adjoining ash. An average of 30% basal area should be marked leaving a residual of approximately 20 m^2/ha. Diseased trees, trees that are high risk to fail, trees with height and grade limitations, and dense patches should be marked. Trees with wildlife values such as stick nest and cavity trees should be retained.

Assuming that this harvest is completed expeditiously, the stand should be assessed for a follow-up harvest in 2017 or sooner if the stand is being attacked by EAB. Regeneration is expected to be soft maple, ash, aspen and perhaps cherry. The landowner should consider buckthorn control to aid in the establishment of more desirable vegetation.

Cautions: Care should be taken to avoid damaging high quality residual stems and the harvest should be in dryer or frozen conditions to avoid rutting



Lowland Ash Medium Sawlog Stand
November, 2010

County: Wellington
Township: Centre Wellington

Area (acres): 10

Ag_8Ms_2 Other Ew

~70 year old

Initial BA: 47 m^2/ha

Recommended Residual BA - 32 m^2/ha +/-

Basal Area Distribution (m^2/ha)									
Tree Size Classes (cm)	**10-24**		**26-36**		**38-48**		**50-59**	**Total**
Actual BA	**8.0**		**18.4**		**14.6**		**4.0**	**47**
Recommended BA for single tree selection (Guidance only)	**4**		**5**		**6**		**5**	**20**
UGS			8				2	

Stand Description: The stand is an even-aged swamp, seasonally inundated located in a swale between a field and a road, connected by culverts to a larger swamp to the south. The stand was likely clearcut in the early 1900's and likely pastured heavily through the 1950s. It is an excellent single-aged stand dominated by green ash. The site quality is exceptional for green ash and soft maple, with an estimated 30 to 35-m canopy height. It does not appear that there has been any historic harvesting and the last stand disturbance was likely in the 1970's when the elm died.

Many of the trees have stagnated because of the high stand density. Because of the high proportion of ash, the excessive stocking and resulting lack of stem taper, it is clear that this stand will be devastated when emerald ash borer affects the area in an estimated 10 years. There are scattered soft maple in dominant to intermediate crown positions and scattered soft maple saplings and seedlings.

Landowner Objectives: Maintain a healthy woodlot, optimize economic returns prior to ash borer infestation and encourage the development of other species.

Silvicultural Prescription: This is the first entry in a three-entry shelterwood approach. It is recommended that two more stand entries be made within the next 10 years. The first should reduce the stand density by about 30% with a second in approximately 7 years. Details of the second entry would be developed based on stand conditions and regeneration development at the time, and proximity of EAB infestations. The first entry should harvest a significant sawlog volume/acre, encourage the development of species other than ash and retain individual ash that are increasing in volume and value.

To achieve the basal area reduction, UGS ash over 48cm should be marked, any ash should be marked to release soft maple or other non-ash species of any size. Where there is soft maple or non-ash regeneration and no larger trees to be marked, smaller ash should be thinned/marked to improve the vigour and development of the other species.

To help maintain stand integrity, dominant ash with bigger crowns can be retained and low-vigour trees marked (the healthy dominants will continue to increase in volume and help hold the stand together until the next entry). Unmerchantable UGS, or UGS with large crowns may also be left to help maintain stand integrity and allow for other trees to be salvaged this entry. Trees with significant wildlife value (e.g., cavity trees) should be retained.

Soft maple advanced regeneration is expected to become the main regenerating species. To improve stand diversity bur oak, yellow birch and hemlock could be planted where larger openings are made and there is no advanced regeneration. . The landowner should consider underplanting with appropriate species (e.g., bur oak, soft maple, yellow birch.)

Cautions: The stand should be cut in dryer or frozen conditions to avoid rutting. The stand is not as wet as other swamps in the area and has a larger operating window.

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