



**Forest Invasives Regulatory Review:
Existing Regulations, Enforcement Strategies, Gathering
Codes and Response Plans in the 1836, 1837, and 1842
Ojibwe Ceded Territories**

By

Steve Garske
Forest Pest Project Coordinator

and

Philomena Kebec
Policy Analyst

Great Lakes Indian Fish & Wildlife Commission

PO Box 9
72682 Maple Street
Odanah, WI 54861

Project Report 15-01
August 2015

This publication was funded in part by Environmental Regulatory
Grant #90NR0280, US Department of Health and Human Services,
Administration for Children and Families, Administration for Native Americans.

FOREST INVASIVES REGULATORY REVIEW

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ACKNOWLEDGEMENTS

Thanks to GLIFWC Language Specialist Wesley Ballinger for advice on Ojibwemowin. His expertise and patience are greatly appreciated. Thanks also to GLIFWC staff who took time to review parts or all of this report, including Jonathan Gilbert, Miles Falck, Neil Kmiecik, McCammon-Soltis and Jim Thannum. And finally thanks to all the tribal elders, gatherers and natural resource department staff who (often braving snowstorms and icy roads) came to our focus groups in the spring of 2014 to share their knowledge about the these trees, and the stories and traditions that teach us how to interact with them in a respectful and sustainable way.

INTRODUCTION

History and Tradition

“Kitche Manitou (the Great Spirit) had a vision of the earth, and decided to bring it into being. As part of this earth he made four kinds of plant beings: trees, flowers, grasses, and fruits. To each he gave a spirit of life, growth, healing, and beauty. He placed each where it would be most beneficial, and lend the earth the greatest harmony and order.”

- Paraphrased from Ojibwe Heritage, by Basil Johnston (1990)

According to *Anishinaabe* (Ojibwe)¹ elders, Kitche Manitou created the world according to his vision. First he created the physical world of sun, moon, earth and stars. Next he created the plants. Then he created the animals. These included the two-leggeds, the four-leggeds, the winged and the swimmers. Finally, he created humans. Plants were created prior to the animals and the humans and could exist without them, while these other beings need the plants to survive (Johnston 1990).

The *Anishinaabe* (or *Anishinabe*) people (as they called themselves) arrived in the Lake Superior region over 500 years ago, having made their way from the Atlantic Coast (Benton-Banai 1988, Treuer 2010). Traditional stories relate that the Ojibwe once lived along the “saltwater sea”. Over several centuries they moved west until they came to “the land where food grows on water”, a clear reference to the abundant wild rice in the region. Along the way, they and their neighbors developed unique a way of life, well-adapted to the woodland environment of the western Great Lakes region.

The Ojibwe have always depended on plants. Hundreds of plants are used for ceremonies and medicine, food, and a wide variety of utilitarian purposes (Meeker et al. 1993). Wood from a variety of trees provides fuel for cooking and heat for the long harsh winters. Plants are acknowledged as gifts from Gitchi-Manitou (the Great Spirit). Before harvesting part or all of a plant, the gatherer asks the plant’s permission to harvest it, tells the plant what it will be used for, and offers *asemaa* (tobacco) in thanks (Keewaydinoquay 1989, in Geniusz 2009). Often part of the harvest is returned to the earth in thanksgiving.

The purpose of this report is to identify current regulations dealing with forest pests which may apply to activities within the ceded territory of the Lake Superior Ojibwe Bands, identify new regulations or best management practices that could protect the band’s resources, and describe how the bands can adopt new laws that apply to off-reservation activities.

This report will discuss how the Ojibwe have used, and continue to use, several species of trees. Depending on the tree, the traditional use continues by a small or large segment of Lake Superior Ojibwe communities.

¹ According to James H. Schlender (Preface to Meeker et al. 1993), *Anishinabe* is the term they use to describe themselves, Ojibwe is what other tribes called the *Anishinabe*, and Chippewa is what non-Indians called the Ojibwe. Treuer (2010) gives a similar view, though he states that *Anishinaabe* was also used to refer to all Indians. Treuer also writes that the word Chippewa, which was until recently the term mostly used by historians and the US Government, was a corruption of Ojibwe. Schlender refers readers to *The Migration of the Anishinabe* (Benton-Banai 1988, Chapter 14) for the history of how the *Anishinaabe* migration also played a role in *Anishinaabe* identity.

These trees are considered valued resources for their utilitarian and spiritual value, as they represent Ojibwe sovereignty from modern material culture. In a time of globalization, resource depletion and climate change, traditional Ojibwe technologies become ever more valuable as our future ability to obtain necessary goods from the international markets is uncertain. The trees primarily discussed in this report include *ininaatig* (sugar maple, *Acer saccharum*), *aagimaak* (black ash, *Fraxinus nigra*), *emikwaansaak* (green ash, *F. pennsylvanica*), *baapaagimaak* (white ash, *F. americana*), *wiigwaasaatig* (paper birch, *Betula papyrifera*), red oaks including *mashkode-mitigomizh* (northern red oak, *Quercus rubra*) and *mitigomizhiig-mitigomizh* (northern pin oak, *Q. ellipsoidalis*), white oaks (generically *mitigomizh*) including bur oak (*Q. macrocarpa*) and white oak (*Q. alba*), and *aninaandag* or more generally *zhiingob* (balsam fir, *Abies balsamea*). Others such as *gaagaagimizh* (eastern hemlock, *Tsuga canadensis*) and *giizhikaandag* (northern white cedar, *Thuja occidentalis*) are included as well. These trees are used in a multitude of ways for housing, medicine, transportation, ceremony and other purposes.

This report will also discuss threats to the health and survival of these trees by forest pests, and the human behavior that facilitates their spread. The forest pests which currently pose the most imminent and serious threats to Ojibwe resource trees include the emerald ash borer (*Agrilus planipennis* Fairmaire), the Asian longhorn beetle (*Anoplophora glabripennis* Motschulsky), the balsam woolly adelgid (*Adelges piceae* Ratz.), the hemlock woolly adelgid (*Adelges tsugae* Annand), the oak wilt fungus [*Ceratocystis fagacearum* (Bretz) J. Hunt], along with beech bark disease (caused by the European beech scale *Cryptococcus fagisuga* Lind. and *Neonectria* spp. fungi). Beech bark disease has already decimated *Azhaawemizhiig* (American beech, *Fagus grandifolia*) throughout most of its range, including the ceded territories of Lower Michigan, eastern Upper Michigan, and eastern Wisconsin. Emerging threats include walnut twig disease (carried by the walnut twig beetle, *Pityophthorus juglandis* Blackman and the pathogenic fungus *Geosmithia morbida* sp. Nov) and the mountain pine beetle (*Dendroctonus ponderosae* Hopkins). While these insects and diseases spread on their own, they are often assisted by humans, who carry them long distances in firewood and horticultural products. The question then becomes, how do we design regulations, education initiatives and response programs to encourage good behavior, slows the spread of these invasives and protect our precious trees from harm?

Finally, this report will review existing regulations on forest invasives that apply within the Lake Superior Ojibwe reservations and to the Ojibwe ceded territories (Figure 1), and describe how the tribes can develop strategies to address these organisms. For the most part, regulations enacted and enforced by tribes are the only rules that apply to Ojibwe tribal members harvesting plants on public lands within the ceded territories. In order to maintain exclusive jurisdiction in this area, the tribes must ensure that their regulations and enforcement is sufficiently protective of conservation and public safety values. Accordingly, as rules to limit the spread of forest pests are adopted to regulate non-tribal forest users and protect various tree populations, it will be important for tribes to consider adopting rules which are designed to protect forests in a manner consistent with Ojibwe cultural values.

Ojibwemowin

Ojibwe names generally follow Meeker et al. (1993). Other references consulted included the online Ojibwe People's Dictionary of the University of Minnesota (Ojibwe People's Dictionary 2015) and the Freelang Ojibwe-English dictionary (Weshki-ayaad et al. 2014).

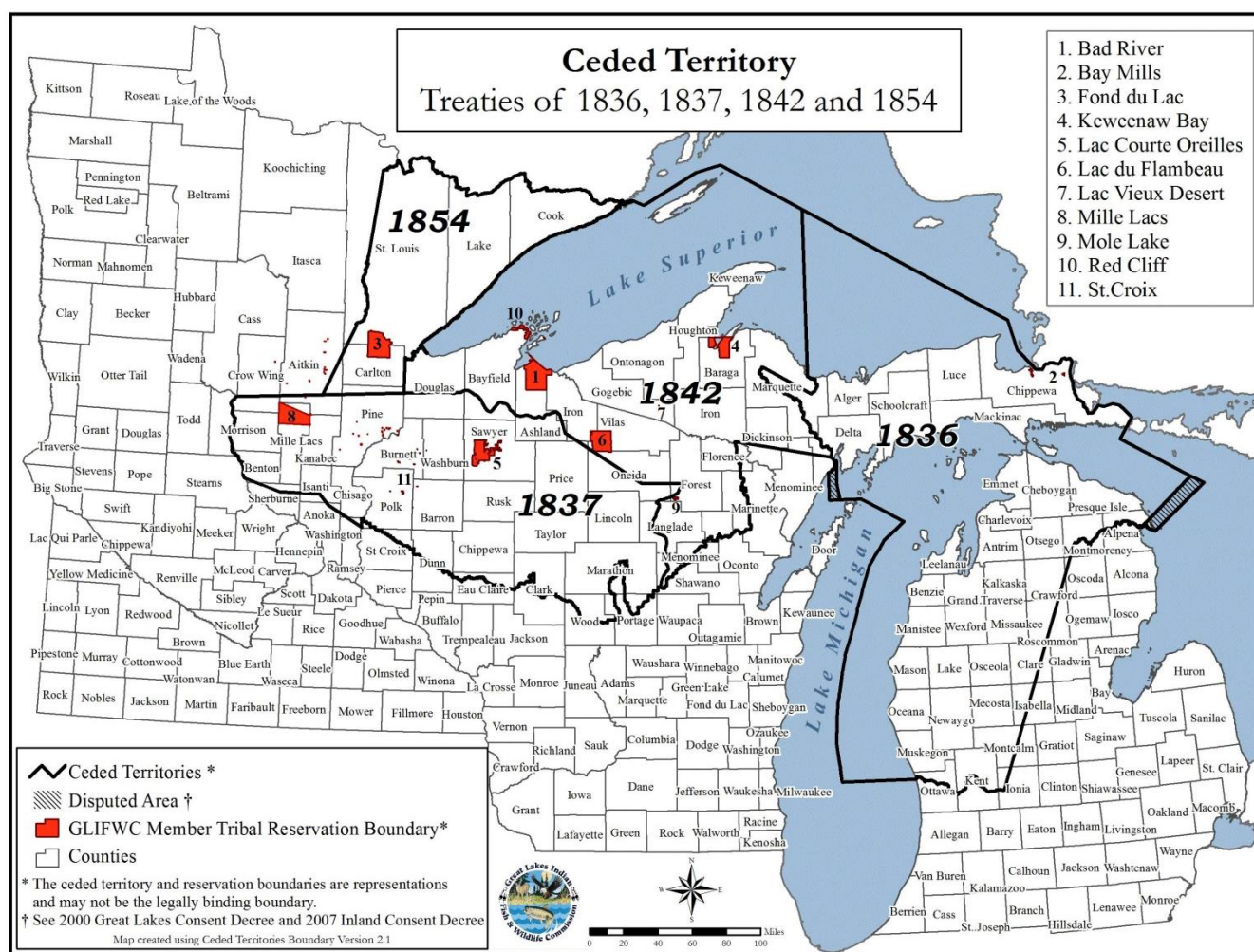


Figure 1. Lands included in the 1836, 1837, 1842, and 1854 treaties and the locations of the eleven Ojibwe tribes which are members of GLIFWC.

Biological Nomenclature

Unless otherwise indicated, plant nomenclature follows Voss and Reznicek (2012). Insect and fungal nomenclature was gleaned from the numerous publications reviewed, and authorities were included with the scientific names for this report.

OVERVIEW

In addition to the specific uses described below, the Ojibwe have used trees as firewood to heat their homes, process various harvested foods (including maple sap), and carry out other important activities (i.e. torches made of wood and birchbark used to hunt deer or spear fish at night). GLIFWC member tribes continue to harvest various types of trees for firewood on-reservation and within properties of the US Forest Service (USFS), pursuant to an agreement between the tribes and the USFS [MOU 1998 (amended 1999, 2012)].

In spring of 2014, GLIFWC staff visited the reservations of each of the 11 GLIFWC member tribes, and conducted focus groups with tribal elders, gatherers and natural resource department staff. During these focus groups tribal members and staff talked about traditional uses of these trees, the stories and traditions surrounding their use, and the challenges of protecting these trees and traditions for future generations. Comments by participants at these focus groups are cited below, with the acronym for the band or tribe they are associated with (but not necessarily a member of), followed by “TEK” for “Traditional Ecological Knowledge” and the date of the focus group session.

The Trees

Maple and the iskigamizigan

To the Ojibwe people, the movement of the *ziinzibaakwadwaaboo* (maple sap) marked the arrival of *ziigwan* (spring). With snow still on the ground, it was time to head to the *iskigamizigan* (sugarbush). The *ininaatigoog* (sugar maple trees) provided one of the most important foods to the Ojibwe people (Densmore 1974), and the sugar camp was a place for families to gather and celebrate the coming of spring (Figure 2).

Each family or small group of families had their own sugarbush, and the camp and structures were repaired and used from year to year. If the lodge needed heavy repairs the men would break camp, but otherwise the women would go first. Typically the women would make their way on snowshoes, carrying long rolls of birch bark to cover the frame of the lodge. They then set about repairing utensils and retrieving blankets and furs to make the lodge comfortable. Lots of firewood needed to be gathered to boil down the sap.

Originally, the sap was boiled in lodges that were open on both ends. These lodges were originally framed with stout poles, and covered with *giizhikanagek* (cedar bark) or *wiigwaas* (paper birch bark). Wooden benches ran along each side for sleeping and for sitting and working on the sap. A double shelf was often fastened to a wall of the lodge for storing utensils and containers. A smaller, closed storage shed was also constructed for storing utensils in the off-season. One or more kettles with sap were hung over the fire on long poles. These poles were suspended over perpendicular cross-frames on each side of the lodge, so that the kettles could be placed over any part of the fire. Originally the kettles and other containers for the sap were made from bark and wood, but metal kettles were quickly adopted. Stirring paddles and other large utensils were made from solid maple wood (Densmore 1974). Buckets of sap were poured into *wiigobimizh* (American basswood, *Tilia americana*) troughs and covered with *wiigwaas*, to store it until it could be boiled. To control boiling and frothing, *giizhikaandagoog* (cedar branches) or *zhingobaandagoog* (balsam fir branches) would be dipped into the boiling sap.

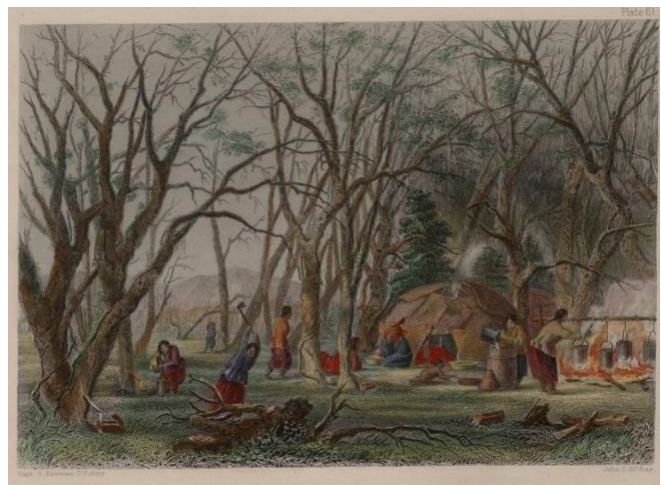


Figure 2. Ojibwe sugarbush, c. 1850. Seth Eastman, US Army. (Minnesota Historical Society)

The size of the sugarbush was measured in number of taps (Densmore 1974), with very large trees often receiving two or three taps. An average-sized camp might have 900 taps, with some having as many as 2000 (Densmore 1974). At Lac du Flambeau, taps were traditionally made from *giishkaandag* (cedar) or *baakwaanaatig* (sumac) (Greg Johnson, LDF TEK, 2014 May 14), with Densmore (1974) mentioning *zhiishiigimewanzh* (slippery elm, *Ulmus rubra*) taps being used in Minnesota. The sap was eventually processed into solid sugar, granulated sugar, sugar gum, a sugar drink (by dissolving the sugar in water), and other foods (Densmore 1974).

Ziinzibaakwid (maple sugar) was one of the most important plant foods of the Ojibwe (Densmore 1974). It was an important source of calories and could be stored almost indefinitely. It was used for seasoning all foods (Densmore 1974). While other maple species can also be tapped for *ziinzibaakwid*, *ininaatig* is generally preferred because the *ziinzibaakwid* is more concentrated (Joe Rose Sr., BR TEK, 2014 February 13).

Iskigamizigan time is still widely cherished today (Figure 3). Some family sugar camps have been handed down for generations (Giiwe Martin, LVD TEK, 2014 May 19).



Figure 3. Spring has arrived in the Penokee Hills. This yellow birch was the first tree tapped in 2014. (SCG, GLIFWC)

Ash

As spring gave way to *niibin* (summer), various other trees are commonly harvested. May and June is the best time to harvest *aagimaak* (black ash). *Aagimaak* has unique properties that make it well-suited for making woven *makuks* (baskets). After choosing and harvesting a tree the bark is removed from the logs. The logs are then pounded with a blunt, heavy object, causing the annual growth rings to separate. The outer strips can then be easily pulled from the log, and split into narrower strips if necessary. Pounding and peeling is repeated until all the usable strips are removed. Often the strips are woven into baskets entirely of ash, but for larger baskets the bark is often used, with wood strips used as the frame. Paper birch or cedar bark is often used with *aagimaak* in making baskets as well.

Aagimaak baskets are durable and sturdy. Some are put to use for berry-picking and storing cooking utensils, while others become beautiful works of art (Figure 4).

Because of strength and durability, the Ojibwe traditionally also used *baapaagimaak* (white ash) and



Figure 4. Black ash basketmaker and Bad River member April Stone-Dahl and her husband Jarrod derive much of their income from black ash basketry and other traditional arts. (COR, GLIFWC)

emikwaansaak (green ash) for a variety of purposes (Densmore 1974, Greg Johnson, LDF TEK, 2014 May 14). According to Johnson, *baapaagimaak* is still used to make lacrosse sticks, snowshoe frames, traditional *dikinaagan* (cradle boards), spoons, knife handles, drumsticks, and other items at Lac du Flambeau. White ash is also used for spiles (taps for sap) and sometimes for the cross braces on the *wiigwaasi-jiimaan* (birch bark canoe). The outer sapwood is used for lacrosse sticks, drumsticks and cradleboards. Johnson said that the grain of *emikwaansaak* wood is pretty much the same as white ash wood, and can be used in much the same way. Bows are also made from *baapaagimaak* (Jason Peterson, LDF TEK, 2014 May 14). Johnson mentioned that ash trees that are straight and about 10-12 inches in diameter are preferred.

Oak

Mitigominan (acorns) are an important food source for mice, squirrels, deer, bear, turkeys, some insects, and many other animals (Auchmoody et al. 1993, Lovett et al. 2006). Blue jays love *mitigominan*, and some credit them with “planting” the oak forests of the Great Lakes region after the last glacial retreat some 12,000 years ago (Johnson and Webb 1989). *Mashkode-mitigomizhiig* (northern red oak trees) start producing *mitigominan* at about 25 years, but usually don't produce large crops until about age 50. Seed predation is so great that even in good years only about 1 percent of the *mitigominan* become available for regenerating *mashkode-mitigomizh*. As many as 500 or more *mitigominan* may be required to produce a single 1-year-old seedling. Seed-eaters can eat or damage more than 80 percent of the crop in most years, and virtually the entire crop in very poor seed years (sources in Sander 1990). Several TEK focus group participants mentioned that *mitigomizhiig* stands were good places to hunt deer (Gerald Jondreau, KBIC TEK, 2014 April 8, Larry Balber and Mark Duffy, RC TEK, 2014 April 30) (Figure 5).

Mitigominan or acorns were historically an important food for indigenous people in North America, Central America, Europe, and Asia. Acorn consumption is still important in some areas, but because of the intense preparation necessary to remove tannins and strong flavor of red and black oak acorns in particular, they have fallen out of use as human food in developed areas (Nixon 1997).

At Lac du Flambeau *mitigomizh* is still used for crossbeams to carry buckets of maple sap (Greg Johnson, LDF TEK, 2014 May 14).



Figure 5. Oak stands often make excellent hunting spots. Unless the deer are hiding in a sedge meadow. (COR, GLIFWC)

Paper birch

The importance of *wiigwaasitig* (paper birch trees) to Ojibwe culture cannot be overstated. *Wiigwaas* (paper birch bark) is durable and easy to work with. With a few simple folds and some *wiigobimizh* (basswood) fiber or split *gaawaandag* (spruce, *Picea* spp.) roots for stitching, *wiigwaas* was fashioned into quick containers of all sorts (Densmore 1974). If the container needed to hold water, *zhingob* or *gaawaandag* pitch was applied to

the seams. Food stored in *wiigwaas* will last as long as a year or more without rotting, so *wiigwaas makuks* were commonly used to store *miinan* (berries), *ginoozheg* (fish), *ziinzibaakwid*, and other foods for the winter (Densmore 1974). *Wiigwaas* contains quantities of an antifungal compound called betulin, which may explain its food-preserving qualities (Zasada 2002).

Along with baskets and trays, *wiigwaas* is used for a variety of utilitarian purposes, from baby bathtubs to fire starters. Rolls of *wiigwaas* are used for covering wigwams (Densmore 1974) and newly harvested rice is spread on sheets of birch bark for preliminary drying (Densmore 1974). Birch bark makes great winnowing baskets for rice (Evelyn Ravindran, KBIC TEK, 2014 April 8). Figures of birds, people, animals, trees, flowers and other beings and objects were often cut from birch bark, to represent clans or simply as art (Densmore 1974). Patterns for beadwork were also often cut from birch bark. And of course birch bark forms the outer shell of traditional *wiigwaasi-jiimaan*, known around the world for their durability, craftsmanship and beauty (Figure 6). According to Ravindran (KBIC TEK, 2014 April 8), birch bark is still frequently used for many of these purposes.

Birch bark is primarily harvested in June and early July, as this is the time when it easily separates from the trunk. *Wiigwaasitig* is traditionally referred to as “grandfather birch” (Keewaydinoquay 1988, in Geniusz 2009). To honor the gift of the *wiigwaasitig*, a simple pipe ceremony is conducted before harvesting its bark (Geniusz 2009).

Some Ojibwe bands tap *wiigwaasaatig* for sap, particularly in the northern and western parts of the Ojibwe territory (Canada) which has little or no *ininaatig* (Densmore 1974, Joe Rose Sr., BR TEK, 2014 Feb 13). Rose explained that while *wiigwaasitig* produces tasty sap, the sap is thinner than *ininaatig* sap and must be boiled significantly longer to refine it. Roughly 100 gallons of *wiigwaasitig* sap are needed for one gallon of birch syrup, whereas 40 to 50 gallons of *ziinzibaakwadwaaboo* are required for one gallon of maple syrup (Zasada 2002).

Wiigwaasitig has a number of medicinal properties (Meeker et al. 1993, Richard LaFernier, RC TEK 2014 April 30). The sap and boiled-down syrup from *wiigwaasitig* is drunk as a medicine (Charlotte Loonsfoot, KBIC TEK focus group, 2014 April 8, Richard LaFernier, RC TEK 2014 April 30).

During the course of writing this paper several tribal gatherers and natural resource staff (e.g., Steve Olson and Chris Nelsen, FDL TEK, 2014 April 2, Pam Nankervis, KBIC TEK, 2014 April 8, Greg Johnson, LDF TEK, 2014 May 14) expressed concern about the decline of paper birch over the years. They said there was less paper birch on the land, and that it was becoming very hard to find large trees for canoe bark. These observations are backed up by a recent study using USFS Forest Inventory and Analysis (FIA) data to examine the status of paper birch in the ceded territories (Moser et al. 2015).



Figure 6. Traditional *wiigwaasi-jiimaan*. July 2013, Big Sandy Lake, MN. (SCG, GLIFWC)

Johnson (LDF TEK, 2014 May 14) said that when land managers do a select cut and leave the *wiigwaasitig*, they die after a few years. Jason (LDF TEK, 2014 May 14) mentioned that when managers do select cuts they believe they are doing the timber stands a favor, but “there are stories that all these trees are related.” He added that when the trees stand together, that’s when you get those big ones. But if you take the *gaagaagimizh* (hemlock) or some of the *ininaatigoog* out they won’t last long.

Paper birch stands frequently experience dieback after 50-75 years (Jones et al. 1993). Birch decline is caused by multiple factors including drought, excessive heat and soil compaction, and is aggravated by the bronze birch borer, *Agrilus anxius* Gory, a native relative of the EAB (Marquis et al. 1969).

White cedar

The presence of grandfather *wiigwaasitig* and grandmother *giizhikaandag* (northern white cedar) means that you are safe among family. Because everything needed to survive can be obtained from these two trees, they are considered the “trees of life”. Several fascinating and delightful *aadizookaanan* (songs that tell stories, each with a particular spirit that knows it’s being sung) connect these two trees to the trickster of Ojibwe legend, Nenabozho (or Waynaboozhoo) (see Geniusz 2009).

Giizhikaandag (Figure 7) is considered one of the four sacred medicines. *Niibiish* (tea) is drunk as a cough syrup and to aid in the healing of respiratory illnesses. *Giizhikaandagoog* (cedar boughs) placed in water often aid in breaking up congestion. The smoke of *giizhikaandag* is also considered healing. Cedar tea made from the leaves or inner bark can be applied to skin to treat skin problems (Melvin Gasper and Gary Zentz, LCO TEK, 2014 April 24). The tea is high in vitamin C and good for colds and stomach problems (Melvin Gasper and Gary Zentz, LCO TEK, 2014 April 24, Geniusz 2009)

Giizhikaandagoog are often used in ceremonies to bring healing and protection to participants.

Giizhikaandagoog are hung above the doors when someone passes on (Melvin Gasper, LCO TEK, 2014 April 24). *Giizhikaandag* and *asemaa* are used during funerals, naming ceremonies, feasts, and other important events (Geniusz 2009). *Giizhikaandag* is also used in the *madoodiswan* (sweatlodge) for purification, as it is poured on the hot rocks to breath in the steam. *Giizhikaandag* is traditionally placed in shoes or moccasins to protect one’s spirit during social or traditional events. *Giizhikaandag* is also used in cradleboards, and for ribs and other parts of the *wiigwaasi-jiimaan* frame (Greg Johnson, LDF TEK, 2014 May 14).



Figure 7. *Giizhikaandag*, one of the “trees of life”. (SCG, GLIFWC)

Balsam fir

Aninaandag has a variety of uses. *Aninaandag* sap (pitch) is used for sealing *wiigwaas makuks*, trays, and canoes (Densmore 1974, Greg Johnson, LDF TEK, 2014 May 14). *Zhingobaandagoon* (balsam boughs) and *giizhikaandagoog* (cedar boughs) are used in spring for dipping into boiling maple sap, to keep it from bubbling over (Evelyn Ravindran, KBIC TEK, 2014 April 8). At KBIC the needles and the tips of the boughs are used for stuffing pillows (Evelyn Ravindran, KBIC TEK, 2014 April 8). If you're in the woods overnight *zhingobaandagoon* makes a quick bed (Gerald Jondreau, KBIC TEK, 2014 April 8). Balsam helps with breathing, which gives added benefit to pillows and other items made with it (Evelyn Ravindran and Wausaumoutouikwe Sandman-Shelifoe, KBIC TEK, 2014 April 8).

Aninaandag was used to treat headaches, rheumatism, colds, coughs, sores, and sore eyes (Densmore 1974, Meeker et al. 1993). The resin was used to treat convulsions (Densmore 1974 p. 338). *Aninaandag* was also used as a hair ointment, a wash, and in the sweat lodge ceremony (Meeker et al. 1993). During the 2014 TEK focus group sessions, several elders mentioned boiling fresh twigs with the leaves for *niibiish* (Melvin Gasper, LCO TEK, 2014 April 24, Joyce LaPorte, FDL TEK, 2014 May 14).

At Lac du Flambeau *aninaandag* branches are sometimes used for winter spearing. Jason Peterson and Scott Smith (LDF TEK, 2014 May 14) said that the branches are used to make "this little spearing thing" that's laid on the ice to block the light from above, so it's easier to see the fish below. Or a traditional darkhouse can be made with *aninaandag* (Alexandra Wrobel, GLIFWC Forest Ecologist, pers. comm., 2015 April 29).

The balsam fir has a very special spiritual role in Ojibwe culture. Makawa and Keewaydinoquay (1995) relate how the Great Lakes Ojibwe honor the spirit of the balsam fir. The tree is called "Nimissé" or "elder sister". The spirit of balsam fir is a maiden who represents illumination and enlightenment. Like an elder sister, the balsam fir has the highest concern for her family. Balsam fir's beautiful fragrance is understood to represent the tree praying for the People, particularly those who for one reason or another may not be able to pray for themselves. If one were walking by a balsam fir when she released her fragrance, they would know that someone somewhere needed prayers and blessings, and would add theirs to those of Nimissé. Other traditional names associated with balsam fir are *jingo'b pikewa'ndag*, which also refers to the tree, and *zhingobaandag*, which refers to the balsam fir bough.

The most common reason tribal members and other northwoods residents harvest balsam boughs today is to sell them to commercial wreath makers (Greg Johnson, LDF TEK, 2014 May 14, Chris Nelson, FDL TEK, 2014 May 14, Terry Carrick, BM TEK, 2014 May 20) (Figure 8). Generally only the ends of the branches (with cut ends less than the thickness of a pencil) are used (MN DNR 2014). Harvesting in this way causes less damage to the trees, allowing the clipped branches to grow new tips. It also increases the value of the harvester's load, since almost all of the material will be useable. The fall bough harvest provides



Figure 8. Balsam fir boughs are an important source of income for many northwoods residents. (COR, GLIFWC)

welcome income, and a chance to get out in the woods with family and friends. If the BWA ever becomes established in the ceded territories, it could devastate balsam fir stands and seriously affect the viability of this fall tradition.

Eastern hemlock

Gaagaagimizh (eastern hemlock) is an ecologically important tree across much of the ceded territory (Figure 9). Sap from *gaagaagimizh* (and from red pine, *Pinus resinosa* and white pine, *P. strobus* as well) is “really good stuff” for sealing canoes, baskets and other objects, making them watertight (Greg Johnson, LDF TEK, 2014 May 14). Johnson noted that *gaagaagimizh* probably wouldn’t be used for this anymore though, unless “someone cut a tree down near a road or something.” Where *gaagaagimizhiin* (hemlock trees) are growing with *ininaatigoog*, the sap runs longer because the ground doesn’t thaw as fast (Jason Peterson, LDF TEK, 2014 May 14). At KBIC, *gaagaagimizh* boughs are sometimes included with *zhingobaandagoon* (balsam boughs) in wreaths and other holiday decorations (Evelyn Ravindran, KBIC TEK, 2014 April 8).



Figure 9. Even small *gaagaagimizh* groves have an enchanted feel. (SCG, GLIFWC)

Medicinally, an infusion of twigs of *gaagaagimizh* was used to treat dysentery (Meeker et al. 1993). The pulverized inner bark was used as a styptic, for stopping heavy bleeding. The leaves were used to flavor medicinal *niibiish*, and the bark was used on cuts and wounds to stop bleeding.

Even today some people enjoy “northwoods tea”. This pleasant-tasting *niibiish* (specifically *gaagaagiwan-zhiwaaboo*) is easily made by boiling the twigs and needles of *gaagaagimizh* in water for a few minutes.

The Onslaught of Invasive Insects and Diseases

In the past dozen years, 28 new tree-killing pests have been detected in the US (Campbell and Schlarbaum 2014). Beginning in 1635 with the Eurasian codling moth (which feeds on apples, pears and crabapples, producing “wormy apples”) (Aukema et al. 2010), invasive tree-feeding insects and pathogens have arrived in North America on a regular basis. From 1860 through 2006, an average of 2.4 tree-eating insect pests were detected in the US each year (Aukema et al. 2010). More than 30 new tree-killing pests have been detected in the US since 2000 (Campbell and Schlarbaum 2014). Today more than 450 tree-feeding insects and pathogens have become established in the US (Aukema et al. 2010). High-impact invasives have included the chestnut blight fungus, *Cryphonectria parasitica* (Murrill) Barr, which effectively wiped out the American chestnut (*Castanea dentata*), and Dutch elm disease (caused by the fungi *Ophiostoma ulmi* (Buisman) Nannf. and

O. novo-ulmi Braiser), which has notoriously eliminated the country's elm street trees and decimated wild populations as well.

With increased global trade, the rate of pest introduction continues to accelerate, despite regulatory measures designed to prevent this (Aukema et al. 2010). Introductions from China and Russia are of particular concern, because they have similar climates, and their forests include many plant species that are close relatives of North American species.

Regulations for the forest invasives discussed in this report are currently in effect for the ceded territories. Additional information on these forest invasives and the trees they attack is provided in Tables 1, 2, and 3. For detailed information on these species please refer to Garske (2015).

Table 1. Distribution of forest invasives in the Ojibwe ceded territories.  = present,  = formerly present,  = not known to be present.

CEDED TERRITORY	FOREST INVASIVE								
	Emerald ash borer	Asian longhorned beetle	Mountain pine beetle	Balsam woolly adelgid	Hemlock woolly adelgid	European gypsy moth	Thousand canker disease (walnut twig beetle and fungus)	Beech bark disease (European beech scale and fungi)	Oak wilt fungus
	<i>Agrilus planipennis</i>	<i>Anoplophora glabripennis</i>	<i>Dendroctonus ponderosae</i>	<i>Adelges piceae</i>	<i>Adelges tsugae</i>	<i>Lymantria dispar dispar</i>	<i>Pityophthorus juglandis</i> , <i>Geosmithia morbida</i>	<i>Cryptococcus fagisuga</i> , <i>Neonectria</i> spp.	<i>Ceratocystis fagacearum</i>
1836 Lower Michigan	Generally infested				Declared eradicated	Generally infested		Generally infested	Widespread
1836 Upper Michigan	Local in eastern and western portions					Generally infested		Generally infested	Local - Delta County
1842 Upper Michigan	Houghton-Handcock area					Generally infested		Southeastern side - Menominee, Delta, and Dickinson Counties	Local - Iron, Dickinson, Menominee, and Delta Counties
1842 Wisconsin	Rhineland (Oneida County), Superior (Douglas County)					Generally infested except Douglas County		Southeastern edge, corresponding with western edge of beech range	Local north, local to common south
1837 Wisconsin						Generally infested - eastern half (roughly)		(West of beech range)	
1837 Minnesota								(West of beech range)	
1854 Minnesota								(West of beech range)	

Table 2. Ceded territory trees at risk, and the forest invasives that attack them. X=preferred host, (X)=less preferred/affected host.

TREE		FOREST INVASIVE								
COMMON NAME		Emerald ash borer	Asian longhorned beetle	Mountain pine beetle	Balsam woolly adelgid	Hemlock woolly adelgid	European gypsy moth	Thousand canker disease	Beech bark disease	Oak wilt
SCIENTIFIC NAME		<i>Agrilus planipennis</i>	<i>Anoplophora glabripennis</i>	<i>Dendroctonus ponderosae</i>	<i>Adelges piceae</i>	<i>Adelges tsugae</i>	<i>Lymantria dispar dispar</i>	<i>Pityophthorus juglandis</i> (walnut twig beetle), <i>Geosmithia morbida</i> (fungus)	<i>Cryptococcus fagisuga</i> (European beech scale), <i>Neonectria</i> spp. (fungi)	<i>Ceratocystis fagacearum</i> (fungus)
Ash	<i>Fraxinus</i> spp.	X	(X)							
American beech	<i>Fagus grandifolia</i>						(X)		X	
Aspen (Poplar)	<i>Populus</i> spp.		(X)				X			
Balsam fir	<i>Abies balsamea</i>				X					
Eastern hemlock	<i>Tsuga canadensis</i>					X	(X)			
Elm	<i>Ulmus</i> spp.		(X)				(X)			
Maple	<i>Acer</i> spp.		X				(X)			
Paper birch	<i>Betula papyrifera</i>		(X)				X			
Pines	<i>Pinus</i> spp.			X			(X)*			
Red and black oaks	<i>Quercus</i> subsp. <i>Erythrobalanus</i>						X			X
White oaks	<i>Quercus</i> subsp. <i>Quercus</i>						X			(X)
Walnut, butternut	<i>Juglans</i> spp.							X		

* Scotch pine (*Pinus sylvestris*) is generally avoided by the gypsy moth (WI DNR 1997).

Table 3. Major forest invasives posing a current or potential threat to trees in the ceded territory.

FOREST INVASIVE		NATIVE RANGE/ ESTABLISHMENT	DISPERSAL	IMPACT	REFERENCES
Emerald ash borer	<i>Agrilus planipennis</i>	East Asia, including the Russian Far East, China, Korea, and Japan. First discovered in Detroit, MI in 2002. Probably arrived in solid wood packing material in the early 1990s.	A strong flyer, capable of flying as far as 12 miles (20 km). Most adults fly less than 328 ft (100 m) when ash trees are nearby. Easily transported in ash logs, firewood and nursery trees. Usually established for several years before detection.	Attacks and kills ash (<i>Fraxinus</i> spp.) All three ceded territory ash species are at risk of functional extinction in the wild.	Seigert et al. 2007, Baranchikov et al. 2008, Taylor et al. 2010.
Asian longhorned beetle	<i>Anoplophora glabripennis</i>	China and Korea. Transported in solid wood packing material. First established in 1996 in Brooklyn, NY.	Capable of flying several hundred meters at a time, and more than 1.2 miles (2000 m) in a season. Typically fly only a few hundred feet if suitable hosts are nearby. Easily moved in ash logs, firewood and nursery trees.	Attacks a number of host genera. In North America maple (<i>Acer</i> spp.) are strongly preferred, with birch (<i>Betula</i> spp.), willows (<i>Salix</i> spp.), and elm (<i>Ulmus</i> spp.) also attacked. Larvae riddle trees with tunnels until the tree is severely damaged, sometimes to the point of collapse.	Haack et al. 1997, 2010, Hu et al. 2009, Dodds and Orwig 2011, USDA-FS and UVT 2012
Citrus longhorned beetle	<i>Anoplophora chinensis</i>	China, Korea and Japan. Closely related to ALB. Nursery trees and possibly solid wood packing material.	Similar to ALB. Has been intercepted in ports, including in Wisconsin. Most interceptions have been in live plants. Can reproduce in small-diameter trees including bonsai trees. Easily moved in ash logs, firewood and nursery trees.	Similar to ALB, but with an even wider range of hosts. Not known to be currently established in North America.	Haack et al. 2010
Mountain pine beetle	<i>Dendroctonus ponderosae</i>	Western North America, from central British Columbia to northern Mexico. The Minnesota Dept. of Agriculture has recently documented dead MPBs in western pine log shipments to the state.	Rather weak flyers, but during massive outbreaks can ride updrafts for several hundred miles. Historically the Great Plains and severe cold of the northern Rockies have prevented the MPB from colonizing eastern North America. Recent warm winters have allowed the MPB to expand its range northward to the western edge of the boreal jack pine (<i>Pinus banksiana</i>) forest. Another	Attacks pines (<i>Pinus</i> spp.). May attack spruce (<i>Picea</i> spp.) during outbreaks. Primary hosts in native range are ponderosa and lodgepole pine. Adults excavate tunnels under the bark, where the females lay their eggs. Beetles carry blue-staining fungi which further damages trees. Heavily attacked trees slowly turn rusty brown, dying within weeks or months. During periodic	Amman et al. 1990, Nikiforuk 2011, de la Giroday et al. 2012

			potential pathway to the east is through pine log shipments.	outbreaks, nearly all host trees may be killed over hundreds of square miles. Recent warm winters and long summers, combined with widespread fire suppression, have set the table for this boom-and-bust insect.	
Balsam woolly adelgid	<i>Adelges piceae</i>	Europe. Arrived on the east coast on imported fir nursery trees in the late 1800s.	The first instar or “crawler” is the only mobile stage in North America, walking up to 100 ft or more before settling down. Eggs and crawlers are frequently blown several hundred feet and rarely much farther (miles). Both are sticky and are also dispersed by birds, squirrels, deer and other animals. Readily transported on fir firewood, logs, boughs, nursery stock and Christmas trees. While fir seedlings have some natural resistance to BWA, seedlings shipped from infested areas can still carry BWA.	Attacks balsam fir and other true fir (<i>Abies</i>) species. Foliage attacks cause crown distortion and dieback, gouting (swelling) of the branches, and branch death. Stem (trunk) attacks cause the tree to produce dense, brittle wood, resulting in dehydration and death. In the ceded territories the BWA would likely result in reduced abundance and weakened trees of little value for boughs. Colder winters in the western ceded territories (USDA hardiness zone 4a or below) may limit damage, but global warming may counteract that effect.	Balch 1952, Amman 1966, Ragenovich and Mitchell 2006, Quiring et al. 2008, Guillet et al. 2010, Deb McCullough, pers. comm., 2013 Forest Health Update, Escanaba, MI, 2013 March 28.
Hemlock woolly adelgid	<i>Adelges tsugae</i>	China and Japan. Eastern North American populations genetically match a southern Japanese lineage. Western North American populations are native.	As with the BWA, the first instar larvae (“crawlers”) only walk short distances before permanently attaching to the tree. Eggs and crawlers can be blown for hundreds of feet (rarely much farther) in the wind though. Both are sticky and are also dispersed by birds, deer and other animals. Temporary colonization of several Lower Michigan sites (subsequently eradicated) was due to illegal importation of infested nursery trees.	Attacks hemlock (<i>Tsuga</i> spp.). Adelgids feed on starch, depleting the tree’s winter food supply. The needles drop and most buds are killed, so little if any new growth is produced. Dieback of major limbs can occur within two years. Trees may die within four years, but some survive for a decade or more. A small percentage of trees may have some resistance. The HWA has caused severe hemlock mortality in eastern North America, but colder winters in the ceded territories may limit damage.	McClure 1990, McClure et al. 2001, Ward et al. 2004, Havill et al. 2014, Bob Heyd, Michigan DNR, pers. comm., Roscommon, MI, 2014 June 4.
Oak wilt	<i>Ceratocystis fagacearum</i>	Unknown, but suspected of being	The oak wilt (OW) fungus reproduces via spores and through root grafts	Oaks (<i>Quercus</i> spp.) of the red/black oak group are highly susceptible to OW.	Juzwik et al. 2008, O'Brien et al. 2011

		native to Central or South America.	between trees. Red and white oaks often form root grafts with trees in their own group. In red oaks the fungus spreads rapidly through these root grafts, killing whole stands. Spread though white oak roots is much slower, and may stall out. After red oaks die, the fungus may form thickened “pressure pads” under the bark, splitting it open. Bark beetles are attracted to the pads, feeding on spores and infecting other oak trees. Long-distance spread typically occurs via movement of red oak firewood with pressure pads.	Leaves of infected trees quickly develop bronzy patches and begin to fall. Red oaks can be killed in as little as 3 weeks, depending on species and environmental factors. Oaks of the white oak group are much more resistant to OW, often surviving for a decade or more. Occasionally white oaks will persist indefinitely or recover.	
Beech bark disease	<i>Cryptococcus fagisuga</i> (European beech scale) and <i>Neonectria</i> spp. (fungi)	The beech scale insect is native to Europe, and the associated fungi are native and perhaps introduced as well. The scale insect arrived in Nova Scotia on European beech nursery stock around 1890.	The immature, wingless “crawlers” are the only mobile stage in North America. They can only walk short distances, but can be carried by the wind and by birds and other animals. Long-distance dispersal is primarily due to moving infested beech firewood between midsummer and early winter when the crawlers are present. The beech scale has now spread throughout most of the range of beech in the Great Lakes region, including eastern Wisconsin and eastern Upper Michigan.	Attacks American beech (<i>Fagus grandifolia</i>). The scale insect pierces the outer bark, allowing <i>Neonectria</i> fungi to enter the tree. As the fungi spreads through the tree, patches of bark develop “tarry” spots, and cankers form on the trunk and large branches. The leaves turn yellowish later in the summer. Branches die and large areas of bark crack and eventually fall away. Tunneling by ambrosia beetles weakens limbs, making them susceptible to snapping off in high winds. “Beech snap” presents a human hazard in populated areas.	Ehrlich 1934, Wainhouse 1980, Houston 1994, Heyd 2005, McCullough et al. 2005, Papaik et al. 2005
European Gypsy moth	<i>Lymantria dispar dispar</i>	Native to Europe. Imported to Massachusetts for silk production, escaping around 1869.	Spread has been relatively slow, mainly because female European gypsy moths are flightless. Tend to lay their eggs on anything from trees to outdoor furniture and even parked vehicles,	Caterpillars prefer oak and aspen leaves, but eat almost anything green during outbreaks. Healthy trees can usually survive several years of defoliation, but stressed trees are more susceptible to	Liebholt et al. 1995, Lovett et al. 2006, UWEx 2011.

			making inadvertent human transport likely. First instar larva often “balloon” from the treetops for 150 yards or more. Control along the advancing front and the widespread establishment of an effective, highly host-specific fungal pathogen have greatly reduced this insect’s impact.	other pests and diseases.	
Thousand canker disease	<i>Geosmithia morbida</i> fungus and <i>Pityophthorus juglandis</i> (walnut twig beetle)	Southwestern US and northern Mexico. Established in 9 western states and several eastern states, including Ohio, Pennsylvania and Indiana.	The fungus is carried from tree to tree by the beetle. Rapid expansion of range in the west is not well understood, but may be tied to widespread planting of black walnut across the west. Introduction to the east was through transport of infested logs.	As beetles tunnel repeatedly into the inner bark, the fungus produces numerous cankers that eventually coalesce and girdle the tree. Leaves turn yellow and the tree dies.	National Response Framework 2011, Seybold et al. 2013, IDNR 2015.
Pine shoot beetle	<i>Tomicus piniperda</i> L.	Eurasia and North Africa. First detected in North America in Ohio in July 1992, but widely established years before.	Likely arrived on infested crating or ship dunnage off-loaded in a Great Lakes port. Now widely established through the Midwest.	Adults primarily feed on the buds and damages the branch tips of pine. Fir, larch, tamarack and spruce may also be affected. Damage has not been as severe as first feared.	Langstrom 1983, Morgan et al. 2004, Haack 2006.

PATHWAYS OF DISPERSAL

Overview

Nearly all non-native forest pests have arrived in North America as a result of international trade (US OTA 1993, Lodge et al. 2006, Colunga-Garcia et al. 2009, Aukema et al. 2010). More than 450 insects and at least 16 pathogens are known to have invaded North America from overseas since European settlement (Aukema et al. 2010). Of these, at least 14% of the insects and all 16 pathogens have caused significant damage to trees.

Like most non-native species, introduced forest pests spread relatively short distances through natural dispersal, but are carried much longer distances when humans move infested material such as nursery stock, logs or firewood (Herms and McCullough 2014). Human-facilitated spread results in the establishment of satellite populations outside the main invasion front, which grow and eventually coalesce with each other and the primary invasion front, greatly increasing the overall rate of spread (Cappaert et al. 2005, Mercader et al. 2011). Common vectors for human spread of forest invasives are listed in Table 4.

Nursery Trees

The transport of nursery trees is a major pathway for forest pests (Cappaert et al. 2005, Campbell and Schlarbaum 2014). Movement of nursery stock was an important vector for spread of the EAB from Detroit early on (Cappaert et al. 2005). As mentioned above, infestations of hemlock woolly adelgid at six locations (residential areas) in 5 Lower Michigan counties originated when hemlock nursery stock was shipped from quarantined areas in the eastern US, in violation of Michigan's external quarantine (John Bedford, pers. comm by phone, October 3, 2014). While prompt, aggressive action by the Michigan Department of Natural Resources (MI DNR) combined with the very cold winter of 2013-2014 appears to have eliminated these infestations, precautionary follow-up surveys and chemical treatments continue (John Bedford, pers. comm. by email, October 3, 2014).

Firewood

Firewood movement patterns

Transporting firewood for long distances is an inherently high-risk activity due to the likelihood of spreading EAB and other forest pests (USDA-APHIS-PPQ 2011). Firewood is often obtained from disease-ridden, dying or dead trees which often harbor various insects and diseases. Unlike most lumber and other products, the bark is not intentionally removed from firewood, retarding drying and allowing insect larvae and other pests which normally live just under the bark to survive and continue to mature. Under favorable conditions of shade and relatively high ambient moisture (firewood stacked in a woodlot, for example), EAB larvae can survive and emerge as adults up to two years after the wood is cut (Petrice and Haack 2006).

Campers and other outdoor recreationalists comprise a highly mobile group for moving firewood. The US National Recreation Reservation Service (NRRS) handles reservations for campgrounds and other

Table 4. Common vectors for spread of forest invasives by humans. Parentheses indicate secondary pathways. Logs and firewood refer to untreated materials, with some or all bark still attached. X = high risk, (X) = lower risk.

VECTOR	FOREST INVASIVE								
	Emerald ash borer	Asian longhorned beetle	Mountain pine beetle	Balsam woolly adelgid	Hemlock woolly adelgid	European gypsy moth	Thousand canker disease	Beech bark disease	Oak wilt
	<i>Agrilus planipennis</i>	<i>Anoplophora glabripennis</i>	<i>Dendroctonus ponderosae</i>	<i>Adelges piceae</i>	<i>Adelges tsugae</i>	<i>Lymantria dispar dispar</i>	Walnut twig beetle (<i>Pityophthorus juglandis</i>) and <i>Geosmithia morbida</i> fungus	European beech scale (<i>Cryptococcus fagisuga</i>) and <i>Neonectria</i> spp. fungi	<i>Ceratocystis fagacearum</i>
Hardwood firewood (mixed)	X	X				X	X (walnut and butternut)	X	X (esp. red oak group)
Hardwood logs (mixed)	X	X				X	X (walnut and butternut)	X	X (esp. red oak group)
Balsam logs				X		(X)			
Hemlock logs					X	(X)			
Pine logs			X			(X)			
Solid wood packing material	X	X							
Nursery stock (hardwoods)	X (Ash)	X (Maple, birch, elm, ornamental poplar, and others)				X	X (walnut and butternut)	X (beech)	X (oaks)
Pine nursery stock			X			(X)			
Fir nursery stock (incl. Christmas tree seedlings)				X		(X)			
Hemlock nursery stock					X	(X)			
Asian spruce spp. nursery stock					X		(X)		

recreational facilities operated by the US Army Corps of Engineers, the Bureau of Land Management, the Bureau of Reclamation, the US Forest Service, and the National Park Service. Using data from the NRRS, Koch et al. (2012) found that most campers (about 53%) traveled less than 100 km to reach a public campground, but that about 10% traveled more than 500 km, and one traveled 5,500 km. Surveys from the western and northeastern US indicate that 8-57% of campers may bring firewood from home, often traveling 100-200 miles and frequently crossing state lines (USDA-APHIS-PPQ 2011).

Because the firewood industry consists of multiple small to large suppliers selling to many dispersed buyers, the distance firewood is shipped is difficult to calculate (USDA-APHIS-PPQ 2011). Nonetheless estimates for how far firewood for residential heating in 2002 is shipped (see USDA-APHIS-PPQ 2011, Figure 4) are quite surprising. Based on data for firewood and other raw wood shipments, the average distance firewood was shipped to homeowners in Minnesota was about 100 miles, while the averages for Wisconsin and Michigan were about 130 and 240 miles, respectively. The greatest average distance from source to homeowner was about 950 miles, for Indiana. These estimates did not include the numerous homeowners who cut and transport their own wood.

Firewood sold by retailers such as big box stores, grocery stores, gas stations and convenience stores is a potentially major vector for spread of forest pests. In a study of four western states (Colorado, New Mexico, Utah, and Wyoming), Jacobi et al. (2012) found that over an 18 month period, insects emerged from 47% of the firewood bundles purchased from these outlets. Fungi (especially blue stain fungi) were present in many of the bundles as well. The bundles (often shrink-wrapped) came from as far away as Pennsylvania and British Columbia.

Infested firewood double-bagged entirely (but loosely) in contractor grade 4 mil plastic bags is an inexpensive and effective method for preventing the spread of emerald ash borer (Poland et al. 2008) and most likely other forest pests as well (USDA-APHIS-PPQ 2011). At Minnesota and Wisconsin state parks, confiscated firewood is routinely bagged (Poland et al. 2008). At the Mackinac Bridge in Michigan, large metal containers are used to hold confiscated firewood.

Prepackaged firewood shipped to the ceded territory and the upper Midwest comes from a variety of suppliers and sources. Given the fact that firewood is being shipped to western states from far reaches of the continent, an attempt to determine the origin of bundled firewood sold in the ceded territories would be highly recommended.

While most of the firewood used in the US originates in the US, a significant amount is imported (USDA-APHIS-PPQ 2011). Between 2005 and 2009, the United States received imports of firewood ("fuelwood") with monetary values exceeding \$39 million. As of 2011 about 64.4% of imported firewood came from Canada, 33.9% from Central and South America, Europe, or Asia; and a little less than 2% from Mexico (USDA-APHIS-PPQ 2011).

Firewood is generally sold as "green", "seasoned," or "kiln dried", with green wood posing high risk of carrying pests (USDA-APHIS-PPQ 2011). Though lower-risk on average, seasoned or air-dried wood can still carry pests including EAB larvae, which can overwinter as a prepupa or pupa and emerge in their second spring. Kiln-dried wood is generally dried at over 212°F (100°C) for a day or more, and poses little to no risk of harboring pests. Most firewood imported into the United States is packaged in single bundles shrink-wrapped for personal use.

Harvesting by GLIFWC member tribes

In late 2013 GLIFWC staff conducted a phone survey of tribal members from GLIFWC tribes who had National Forest gathering permits for the 2012-2013 harvest season (unpublished data). These permits are required by 10 of the 11 GLIFWC member tribes for harvesting on National Forest lands in the ceded territory. (Keweenaw Bay allows members to harvest on National Forest lands with a tribal ID.) Permittees were asked whether they harvested any of the five “non-timber forest products”: conifer boughs (primarily *zhingob* or balsam fir), *wiigwaas* (birch bark), *abanzh* (lodgepoles), *misan* (firewood) and *jisens* (ginseng). They were asked how many cords of firewood they harvested (0-3, 4-6, 7-10, or greater than 10 cords) during the season, assuming that 1 pick-up truck load equaled one cord.

The surveyor (Diane Ketring) attempted to contact all 203 tribal members having firewood permits. Of the 63 people with firewood permits who were contacted, 54 (86%) harvested firewood during the 2012-2013 season. Using the midpoints of the above categories for cords harvested (1.5, 5.0, and 8.5 cords) and 10.0 for >10 cords, 53 of the 54 firewood harvesters reporting cords harvested, harvested a total of about 217 cords, or 4.1 cords on average. Of the 41 harvesters reporting their use(s) of firewood (6 reported more than one use), the most frequent uses by far were home heating (56%) and camping (46%), with two people listing “heat garage” (5%). “Ceremonies”, “fishing shack”, “recreation”, “smoke fish”, and “heat sauna” were each reported once.

Of the firewood permit holders surveyed, 39 harvested only off-reservation, 2 harvested only on-reservation, and 16 harvested both on and off-reservation, though it is not possible from the data to determine whether permit-holders with multiple permits harvested firewood versus other products on- and off-reservation. Of the 38 firewood harvesters reporting distance traveled for firewood, 23 (61%) transported it less than 10 miles, 9 (24%) transported it 10-25 miles, and 6 (16%) transported it more than 25 miles. When asked whether they transported firewood more than 25 miles, 32 of 40 (80%) of harvesters responding to this question answered “no” with the rest answering “sometimes” or “yes”. Asked whether they were aware of the emerald ash borer, 34 (97%) of the 35 respondents said they were at least somewhat aware of it, with only one person answering “no”.

Of the 38 respondents who had balsam bough gathering permits, 22 (58%) harvested 45 tons of boughs, for an average of 2.0 tons per gatherer. Most of the 14 gatherers specifying end use reported gathering boughs to sell for wreaths and other Christmas decorations, but 3 reported making wreaths, 2 reported using them for “crafts”, and one reported ceremonial use.

Of 31 respondents who had birch bark permits, 19 (61%) harvested birch bark from a total of 130.5 trees, or around 6.9 trees per harvester. Eleven people held lodgepole permits, of which 6 harvested a total of about 140.5 lodgepoles, for an average of 23.4 lodgepoles each.

EXISTING REGULATIONS

Import Regulations

International Plant Protection Convention regulations

The International Plant Protection Convention (IPPC) of the United Nations has formulated phytosanitary treatments aimed at eliminating the transport of plant pests in wood packing material (Haack et al. 2014). These IPPC International Standards for Phytosanitary Measures No. 15 (ISPM15), *Regulation of wood packaging material in international trade*, was first adopted by IPPC member countries in 2002. The latest version of ISPM15 (approved in 2013) has the stated goal to “reduce significantly the risk of introduction and spread of most quarantine pests” associated with wood packing material (WPM) (IPPC 2013). Approved treatments include heat treatment using kilns, steam or dielectric heating (e.g. microwaves) and methyl bromide treatments. Regardless of treatment used, WPM must be made of debarked wood, with any remaining visually separate and clearly distinct small pieces of bark less than 1.18 in (3 cm) in width (regardless of the length) or greater than 3 cm in width, if the total surface area of each individual piece is less than 7.75 in² (50 cm²). Imported wood materials are required to undergo heat treatments of at least 132.8°F (56°C) for 30 minutes at the core of the wood (as measured by a temperature probe). As of 2014 more than 78 countries (27 of which are European Union members) had approved ISPM15, including the US and Canada.

To meet the requirements of ISPM15, WPM used in international trade must be marked (stamped) to show that the WPM was subjected to an approved phytosanitary treatment [IPPC 2013]. The official mark includes the IPPC logo, the International Organization for Standards (ISO) 2-letter country code indicating in which country the wood was treated, a producer code indicating the treatment provider, and the 2-letter treatment code to specify the treatment used, such as HT for heat treatment or MB for methyl bromide fumigation. Codes are usually separated by hyphens, but other specified formats are allowed. Marks must be legible, durable, not hand-drawn, not transferable, and placed where they are visible when the wood packaging unit is in use, preferably on at least two opposite sides of the unit. Wood packaging material that is not properly treated must be returned to the country of origin, or if that is not feasible, chipped, treated, burned or buried.

There is some evidence that the ISPM15 standards have led to a moderate reduction in pest interceptions at international ports and at US ports (Haack et al. 2014). Though sampling protocols vary from port to port, Haack et al. were able to estimate that compliance at US ports (as judged by the WPM having the official ISPM15 mark) went from 72.4% in 2005 to 97.7% in 2009. Commodities most associated borer-infested WPM were tiles (26.5% of recorded interceptions) and quarry products (20.4%), followed by fabricated metal products (3–22%), machinery and equipment (2–21%), primary metals (2–16%), and vegetables and fruit (0–33%). They estimated that after ISPM15 was implemented, infestation rates of WPM entering the United States declined by 36–52% to about 0.11%. Others have concluded that the success of ISPM15 standards cannot be verified due to faulty data collection (Campbell and Schlarbaum 2014). Furthermore, the continuing detection of live pests within WPM suggests that the standards, or enforcement of those standards, is insufficient.

Although the IPPC heat treatment standard appears to greatly reduce the survival of insects and pathogens in solid wood, it is not always effective at treating all life stages (particularly prepupae) of the emerald ash borer (Haack et al. 2014, Goebel et al. 2010, McCullough et al. 2007, Myers et al., 2009). Research has shown that

while EAB larvae and prepupae can survive heat treatments comparable to the ISPM15 standard, slightly more intense treatments appear to be effective (McCullough et al. 2007, Myers et al. 2009). Myers et al. recommend a minimum exposure of 140°F (60°C) for 120 minutes to reliably eliminate the emerald ash borer from wood products.

The fact live wood pests are still found in ISPM15-marked WPM can be attributed to several causes (Haack et al. 2014). The ability of certain pests to survive the prescribed treatments is one possibility, while unintentional failure to implement the treatment properly is another. A third cause is intentional noncompliance or fraud, where the ISPM15 mark is knowingly applied to WPM that has not been properly treated or not treated at all. The frequency of fraud is unknown, but clearly occurs both domestically and abroad.

Because there is a small but significant possibility that international shipments of WPM still carry forest pests, these shipments still pose a significant threat to the ceded territories and beyond. International ports on the Great Lakes are relatively high-risk sites for the introduction of Asian longhorned beetle, citrus longhorned beetle, and other destructive forest pests from overseas.

Federal import regulations

Required treatments for various imported articles are described in the *USDA Treatment Manual* (USDA-APHIS-PPQ 2014). Treatment Schedule T314-c requires heat treatment for logs, firewood and other regulated wood materials. Regulated materials include unprocessed logs, lumber, any whole tree, bark, cork, laths, hog fuel, sawdust, painted raw wood products, wood mulch, wood shavings, pickets, stakes, shingles, solid wood packing materials, humus, compost, and litter (7 CFR §319.40-1²). Treated materials must be heated to at least 160°F (71.1°C) for 75 minutes prior to entrance into the United States (USDA-APHIS-PPQ 2014, p. 5-4-39). Articles may be treated using steam, hot water, kilns, or any other method that raises the temperature of the center of the largest piece of material to the minimum required temperature for the specified time. Treatment must be performed at an approved facility that maintains a current compliance agreement with the USDA (USDA-APHIS-PPQ 2014). Any portion of a tree consisting solely of leaves, flowers, fruits, buds, or seeds is exempt from heat treatment. As of October 17, 2008 a Federal Order requires the same treatment for commercial and noncommercial shipments of all hardwood firewood from Canada (USDA-APHIS 2008). Pine (*Pinus* spp.) firewood from areas of Canada infested with the European pine shoot beetle (*Tomicus piniperda* L.) must also be treated (USDA-APHIS-PPQ 2011).

The federal treatment manual also provides treatments permitted for export of oak logs to destroy oak wilt disease (T312-a and T312-a-Alternative) (USDA-APHIS-PPQ 2014, p. 5-4-29 to 5-4-36).

² http://www.ecfr.gov/cgi-bin/text-idx?SID=d1787f3e82588b6e2f28ad6f25e6cf6e&mc=true&node=se7.5.319_140_61&rgn=div8 (2015 June 4).

Firewood from Canada is not regulated, with the exception of ash logs and wood which are regulated under 7 CFR §319-40-2(a)³ (Campbell and Schlarbaum 2014). Firewood from Mexican states adjacent to the United States is not required to undergo treatment. The rationale is that nearly all of the wood-borne pests native to these areas are also native to adjacent areas of the US. However, introduced pests could still be imported. Cut conifer Christmas trees that originate from European gypsy moth quarantine areas must undergo T313-a, which requires treatment with methyl bromide (MB) in an enclosure (under a tarpaulin or in a chamber) (USDA-APHIS-PPQ 2014, p. 5-4-37). The trees must be exposed to MB for 30 minutes to 4.5 hours, depending on the MB concentration used and the temperature, which ranges from 40°C (104°F) to 75°C (167°F) or more. A similar but somewhat more potent MB treatment (T313-b) is required to treat cut pine Christmas trees and pine logs from pine shoot beetle quarantine areas. If conifer material is being treated for both pests, schedule T313-b must be used.

Domestic Regulations

Federal authority

Federal quarantines for agricultural and forest pests are administered by the USDA Animal and Plant Health Inspection Service (Domestic Quarantine Notices, 7 CFR §301⁴). Subparts apply to specific forest pests, including gypsy moth, Asian longhorned beetle, pine shoot beetle, and emerald ash borer.

State authority

States can also implement quarantines within their boundaries. Federal quarantines are primarily focused on interstate movement of invasive pests, whereas state quarantines (where they exist) focus mainly in within-state movement of these pests (WI DATCP 2008).

Michigan

Having been “ground zero” in the invasion of the EAB in North America, and the site of the first appearance of the European beech scale in the western Great Lakes region (and the ceded territory), Michigan has perhaps the most comprehensive set of forest pest regulations of the three Lake Superior states.

Michigan's pest regulation and quarantine authority is based on Act 72 of 1945 (Insect Pests and Plant Diseases) as amended in 2005⁵, of the Michigan Compiled Laws. Michigan's EAB quarantine laws are in some

³ http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=d1787f3e82588b6e2f28ad6f25e6cf6e&mc=true&n=pt7.5.319&r=PART&ty=HTML#se7.5.319_140_62 (2015 June 4).

⁴ <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9318863f478d4130f0f5f0d9fb749ae3&n=pt7.5.301&r=PART&ty=HTML> (2015 June 4).

⁵ <http://www.legislature.mi.gov/%28S%28zt4p2tesag3szbuduc4wewgt%29%29/mileg.aspx?page=MclPASearch> (2015 January 19).

ways more stringent than federal law. Act 451 of 1994, §324.41301.amended⁶ prohibits knowingly possessing certain living organisms, including the ALB and EAB. This provision does not apply if the organism is present on land or in waters owned by that person unless the person has knowingly introduced it. It is presumed that the possession is unintended if the following conditions apply: the organism was obtained from the environment at the specific location where the person possesses it; the possession is for the purpose of presenting the organism to a government, university or private “expert” for identification purposes; a person has been presented the organism for identification purposes; or the possession is for the purpose of promptly destroying the organism. The law requires individuals who are presented an organism for identification, or who possess the organism in conjunction with lawful control efforts, to notify the MI DNR, MI DARD, or Michigan Department of Environmental Quality (MI DEQ) if the organism was found in a previously unknown location.

A wide range of penalties exist under Part 413 for possession of “prohibited” species. Civil fines range up to \$100 for not reporting new infestations, and up to \$10,000 for knowing, illegal possession of a prohibited species. The penalty for willfully releasing prohibited species with the intent of damaging natural, agricultural, or silvicultural resources or human health is felony prosecution and (if convicted) fines ranging from \$2,000 to \$500,000 and imprisonment for up to 4 years.

Wisconsin

Wisconsin law has been written to control the spread of invasive forest pests, and gives the Wisconsin Department of Natural Resources (WI DNR) broad powers to control those pests.

The WI DNR’s rule, “Invasive species identification, classification and control” (Chapter NR 40) lists

QUARANTINES

*A **quarantine** of an area means that it is illegal to move certain materials into or out of that area. Quarantined materials can include items such as nursery trees, boughs, and logs and firewood of specified trees which can harbor forest pests.*

***Internal quarantines** prohibit or restrict the movement of regulated materials out of the quarantined area.*

***External quarantines** prohibit or restrict the movement of regulated materials into the quarantined area. (Typically these are state-implemented quarantines that include the entire state).*

***State quarantines** are primarily focused on movement of materials within that state.*

***Federal quarantines** are primarily focused on movement of materials across state lines.*

QUARANTINES IN THE CEDED TERRITORIES:

Federal:

- ❖ Gypsy moth
- ❖ Emerald ash borer
- ❖ Asian longhorned beetle
- ❖ European pine shoot beetle

Michigan:

- ❖ Emerald ash borer
- ❖ Hemlock woolly adelgid
- ❖ Balsam woolly adelgid
- ❖ Thousand canker disease

Wisconsin:

- ❖ Gypsy moth
- ❖ Emerald ash borer
- ❖ Hemlock woolly adelgid
- ❖ Thousand canker disease

Minnesota:

- ❖ Gypsy moth
- ❖ Emerald ash borer
- ❖ Thousand canker disease
- ❖ Mountain pine beetle

⁶<http://legislature.mi.gov/doc.aspx?mcl-324-41301> (2015 April 22)

certain non-native, invasive species as “prohibited” or “restricted”, depending on how abundant and widespread they are in the state, and the damage they are likely to cause to the environment, economy, or to human health (WI DNR 2015). In general, “prohibited” species are either not found in the state or not yet widely established in the state, and pose great economic, environmental or human health threat. “Restricted” species also pose a significant economic, environmental or human health threat, but are already widely established in the state. No one may knowingly “transport, possess, transfer or introduce species listed as “prohibited” anywhere in the state.” “Restricted” species may be possessed, but may not be transported, transferred or introduced without a permit. Control measures are required for prohibited species but not for restricted species. Sensible exceptions to NR 40 exist for people possessing a written compliance agreement from the Wisconsin Department of Agriculture, Trade and Consumer Protection (WI DATCP) or the USDA APHIS, for people who have collected a pest in order to report it to the WI DNR or other authorities (as long as no pest propagules are allowed to escape), for people who catch a prohibited fish while fishing, and for several other special situations.

The latest version of NR 40 (published April 2015) lists several forest invasives as prohibited in Wisconsin, including the hemlock woolly adelgid, Asian longhorned beetle, the sudden oak death pathogen, *Phytophthora ramorum* (Werres, DeCock & Man in't Veld), the Asian gypsy moth, *Lymantria dispar asiatica* Vnukovskij, the mountain pine beetle, and the walnut twig beetle and thousand cankers fungus *Geosmithia morbida* sp. Nov, with the last three organisms new to the list (WI DNR 2015). It downlists the EAB from prohibited to restricted, and removes the European beech scale from the list entirely. The rationale for moving the EAB to “restricted” is that this insect is notoriously difficult to detect during the first few years of infestation, and once established has proven all but impossible to eradicate. The beech scale has also proven nearly impossible to control, and has already spread nearly throughout the range of beech in eastern Wisconsin.

The WI DATCP maintains a website on current EAB regulations, quarantine areas and other information at <http://datcpservices.wisconsin.gov/eab/article.jsp?topicid=20>.

Wisconsin law [Protection of forest lands and forest productivity, §26.30 (7)]⁷ provides that the WI DNR may designate a “zone of infestation” in any area of the state. Before designating a “zone of infestation” a public hearing must be held, unless the delay leading up to a hearing “would result in an epidemic or infestation”. The WI DNR is required to enter into agreement(s) with any private landowners concerning the control work on their lands and cost-sharing arrangements whenever possible, but is authorized to enter private forest lands and conduct control work if the private landowner is uncooperative. Cost-sharing agreements with private landowners do not include salaries of seasonal WI DNR personnel, and costs are reduced to reflect the value of any equipment, funds, supplies or services contributed by the private landowner pursuant to agreement. Owners of infested forest lands of 160 acres or less are exempt from control costs.

Wisconsin has strict rules governing transport of firewood to state DNR lands (Use of department properties, Chapter NR 45.045)⁸. Firewood (defined to include all forms of raw woody material including unprocessed logs, roots, and wood chips) may not be brought to state campgrounds from more than 10 miles away, unless the firewood is from a state-certified vendor. Wisconsin firewood dealers can be certified so their wood can be

⁷ <https://docs.legis.wisconsin.gov/statutes/statutes/26/30/7> (2015 June 4).

⁸ http://docs.legis.wisconsin.gov/code/admin_code/nr/001/45/045

used in state parks and state-managed lands. Wisconsin also prohibits firewood being brought into state campgrounds from tribal lands quarantined by the tribe and from out-of-state. Processed lumber is exempt.

Minnesota

Quarantines are declared by the Commissioner of the Minnesota Department of Agriculture (MND), under the authority of Section 18G.06 (2014) of Minnesota Statutes⁹.

Regulated Forest Invasives

Gypsy moth

Federal regulations

The USDA-APHIS continues to maintain a federal quarantine for the European gypsy moth¹⁰, 7 CFR §301.45 (Subpart - gypsy moth) (2015)¹¹. The quarantine restricts the interstate movement of regulated articles and outdoor household articles from quarantined to unquarantined areas. Within the ceded territories the quarantined counties include Bayfield, Ashland, Price, Lincoln, Marathon and Clark Counties, Wisconsin, and all ceded territory counties east of those counties, splitting the ceded territory into two (Figure 10). It is illegal to move or transport any wood products or outdoor household articles (OHAs) that have been exposed to gypsy moth from a “generally-infested” (quarantined) area to a non-quarantined area without inspection or certification. Regulated articles requiring inspection and certification include nursery stock, logs, posts, pulpwood, bark and bark products, firewood, “outdoor household articles” and mobile homes.

The movement of regulated articles from a quarantined area into or through a non-quarantined area requires one of the following: a completed self-inspection checklist from APHIS Program Aid 2147 (USDA-APHIS 2013), APHIS Plant Protection and Quarantine (PPQ) Form 540, PPQ Form 527 (Sticky Back Certificate) or Rubber Stamp Certificate for nursery stock, or several other forms of documentation. The completed self-inspection checklist would typically be the one used by the general public. Establishments that regularly ship large quantities of regulated articles outside the generally infested area must operate under a written Compliance Agreement. If establishments infrequently ship regulated articles from a generally infested area, PPQ and/or State personnel will inspect and certify each shipment.

The USDA-APHIS maintains a website (<http://www.hungrypests.com/YourMoveGypsyMothFree/>) and provides a two-page flyer with a checklist that individuals and shippers can use to check their belongings and as a certificate of compliance (USDA-APHIS 2013).

⁹ <https://www.revisor.mn.gov/statutes/?id=18G.06> (2015 March 2).

¹⁰ Since 1991, the Asian gypsy moth (*L. dispar* subsp. *asiatica* Vnukouskij) has been discovered on at least 20 occasions across North America, but due to quick eradication efforts, is not currently known to be established in North America (USDA-APHIS 2014).

¹¹ <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9318863f478d4130f0f5f0d9fb749ae3&n=pt7.5.301&r=PART&ty=HTML#sp7.5.301.xx4> (2015 June 5).

Wisconsin

Wisconsin lists the Asian gypsy moth as “prohibited” and the European gypsy moth as “restricted” under NR 40. A state quarantine for gypsy moth (*Lymantria dispar*) is in effect (WI DATCP 2014). This state quarantine roughly bisects the state from north to south, mirroring the USDA-APHIS quarantine for the gypsy moth. As with the federal quarantine, it is illegal for a common carrier or other person to move any regulated article or outdoor household article out of the quarantine area without a compliance agreement. People moving regulated items out of a quarantine area are required to inspect their outdoor items for all gypsy moth life stages, and remove them before moving the items. In the process they must completed a self-inspection checklist and have it in their possession during the move. Christmas trees, logs, and nursery stock must also be inspected before transporting them out of the quarantine area. The state’s hardwood firewood restrictions may also serve to limit the spread of the gypsy moth within the state.

Minnesota

Minnesota implemented a gypsy moth quarantine for Lake and Cook Counties in northeastern Minnesota on July 1, 2014 (MNDA 2014). Nurseries or dealers shipping nursery stock out of a quarantine area must visually

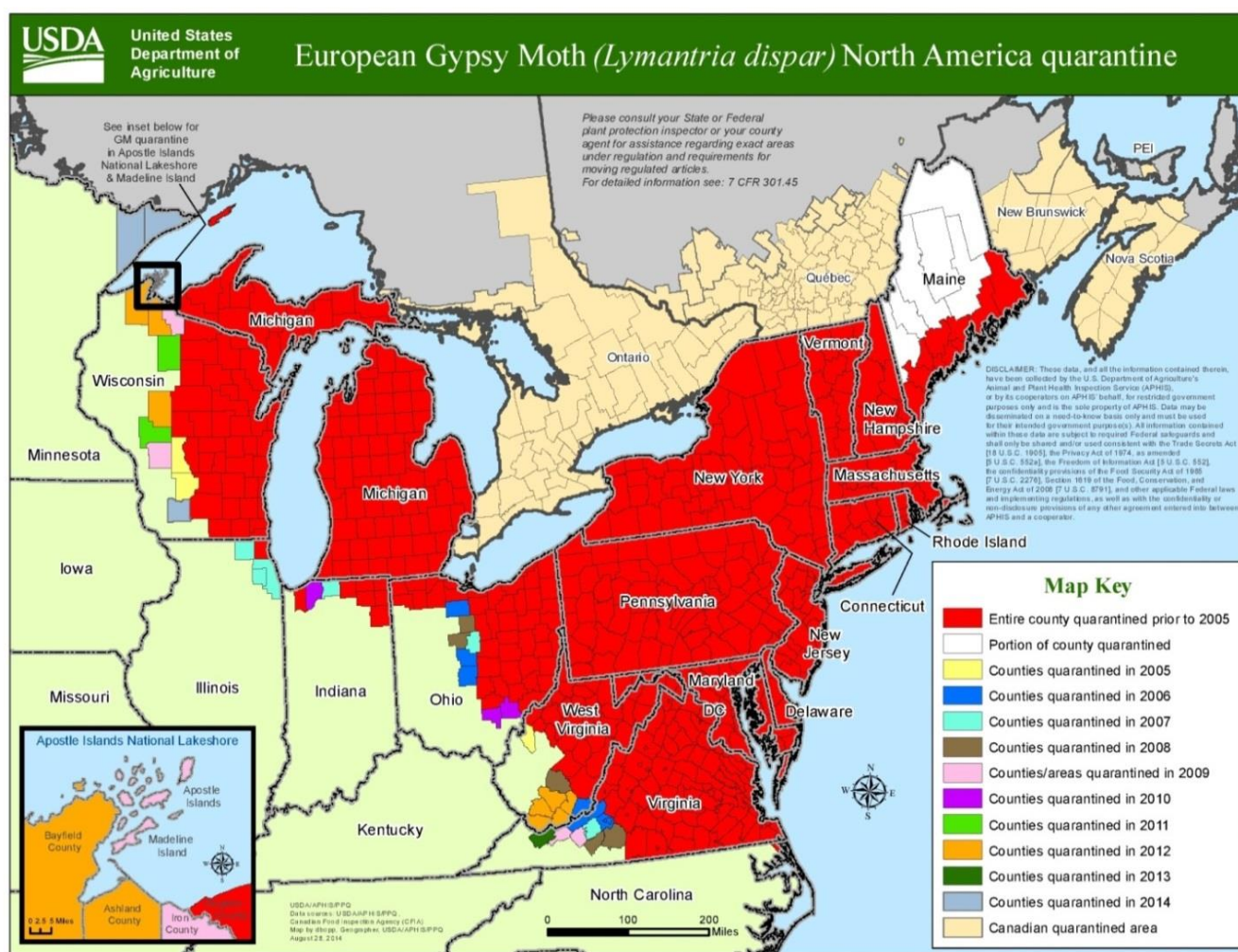


Figure 10. The most recent (August 2014) gypsy moth federal quarantine area (Bopp 2014).

inspect or treat their stock, and certify it to be pest-free. Shippers must operate under a compliance agreement with USDA-APHIS or MNDA prior to moving the stock. Christmas trees cut in a gypsy moth quarantined area must be treated during the growing season prior to shipping, and growers must operate under a compliance agreement to certify, document, and ship loads.

Shippers of logs, posts, pulpwood, bark and bark products must have a compliance agreement and document all loads leaving the quarantine and specify the destination. Any life stages of gypsy moth found upon inspection must be removed. Receivers of quarantined products must operate under a compliance agreement and follow the specified guidelines for processing procedures.

Tourists and homeowners must inspect outdoor household articles and complete the self-inspection checklist (USDA-APHIS 2013) before moving household goods out of the quarantine area. Those using a moving company or portable storage must include the completed checklist with the shipment. Mobile homes must also be inspected. Any gypsy moth life stages must be removed. Inspection and documentation are required prior to moving outside of the quarantine. Qualified certified applicators or state/federal agriculture agencies may provide inspection assistance.

Emerald ash borer

Federal regulations

The USDA-APHIS has maintained a federal quarantine for the EAB since 2003 (Federal Register 2003). Regulated articles are:

(a) the emerald ash borer; firewood of all hardwood (non-coniferous) species; nursery stock, green lumber, and other material living, dead, cut, or fallen, including logs, stumps, roots, branches, and composted and uncomposted chips of the genus Fraxinus.”

(b) Any other article, product, or means of conveyance not listed in paragraph (a) of this section may be designated as a regulated article if an inspector determines that it presents a risk of spreading emerald ash borer and notifies the person in possession of the article, product, or means of conveyance that it is subject to the restrictions of the regulations.

The law directs an authorized official of the USDA-APHIS (referred to as the “Administrator”) to list each state or portion of a state where the emerald ash borer has been verified, where the emerald ash borer is likely to be present, or where “inseparability for quarantine enforcement purposes from localities where emerald ash borer has been found” makes leaving an area unquarantined unworkable, as a quarantined area. If the state in question is actively enforcing restrictions on the intrastate movement of regulated articles and the designation of a portion of a state as a quarantined area will (hypothetically) prevent the artificial interstate spread of the emerald ash borer, then a portion (generally one or more counties) will be quarantined. If not, the entire state is usually quarantined.

Provisions in the law (under 7 CFR §301.53-5, Issuance and cancellation of certificates and limited permits) allow for written agreement(s) between APHIS and individuals engaged in growing, handling, or moving

regulated articles across state boundaries, allowing the movement of regulated articles from quarantined areas if the shipment meets certain conditions. Articles are generally issued certificates for interstate movement if they are inspected and found to be apparently free of EAB, or are grown, produced, manufactured, stored, or handled in a manner that, in the judgment of the inspector, prevents the regulated article from presenting a risk of spreading EAB, or are to be moved interstate to a specified destination for specific processing, handling, or utilization, and this interstate movement will not result in the spread of emerald ash borer because emerald ash borer will be destroyed by this processing, handling, or utilization.

North American quarantine areas for the EAB are shown in Figure 11.

Michigan

The current Michigan EAB quarantine (MI DARD 2014a, also see map at MI DARD 2014b) prohibits movement of regulated articles from areas of any state that is state- or federally-quarantined for EAB to uninfested counties in Michigan. Regulated articles include the emerald ash borer, ash (*Fraxinus spp.*) trees, limbs branches, stumps, and bark, ash logs and lumber with bark, all non-coniferous (hardwood) wood and bark chips larger than 1 inch in two dimensions, all hardwood firewood, and any other articles determined by the MI DARD Director to present a risk for spread of the EAB (MI DARD 2014a). Movement of ash nursery stock into or out of the state of Michigan is unconditionally prohibited.

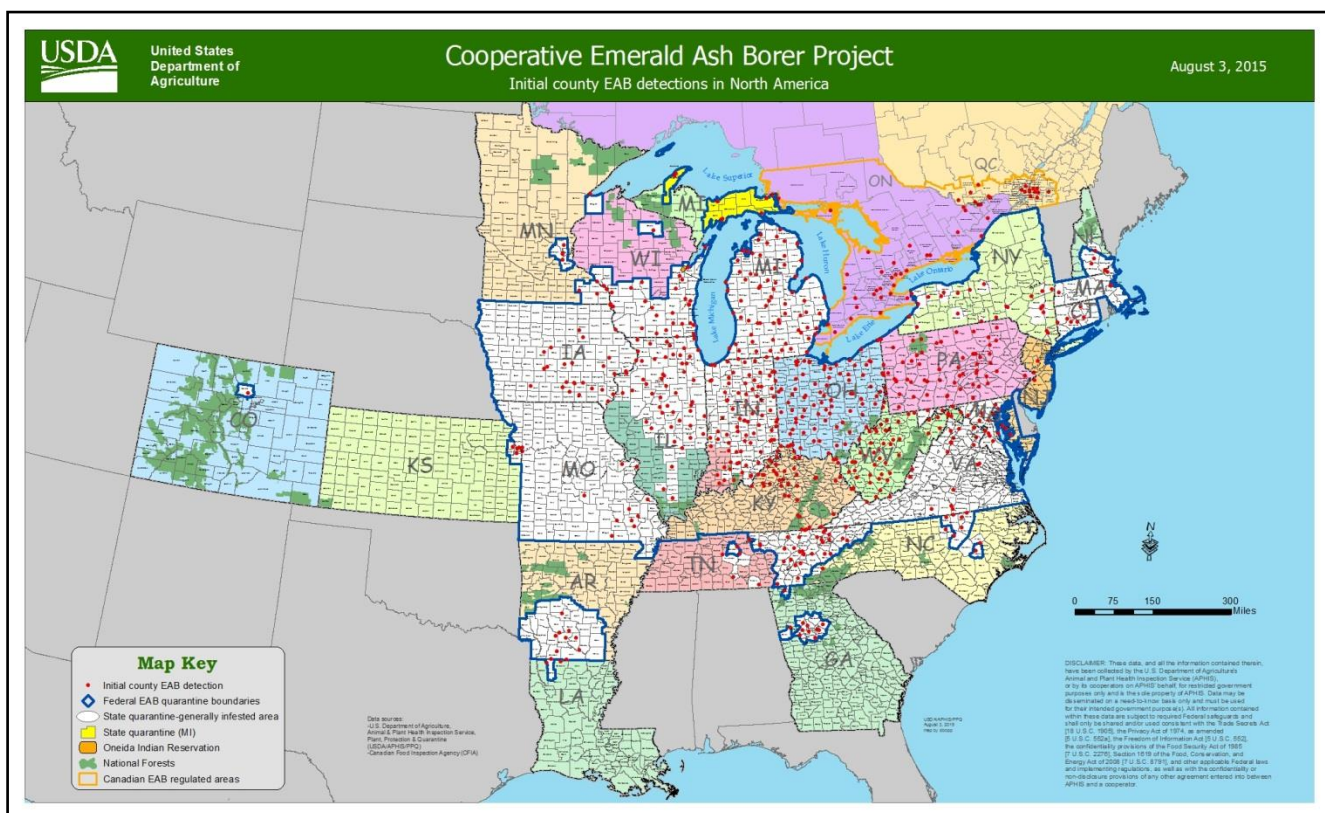


Figure 11. North American emerald ash borer quarantine areas, as of August 3, 2015 (Bopp 2015). Current monthly maps can be downloaded from http://www.emeraldashborer.info/files/multistate_eabpos.pdf.

Two state quarantine categories (levels) exist in Michigan (MI DARD 2014a). The Lower Peninsula is considered “generally infested” with the EAB, and all 68 Lower Peninsula counties are designated as “Quarantine Level I” counties. The six easternmost UP counties, plus Houghton and Keweenaw are considered “Quarantine Level II” counties. (So far the EAB has only been found in the Houghton-Hancock area, but both counties are quarantined, including Isle Royal, which is considered part of Keweenaw County.) Regulated materials may be freely moved within the Quarantine Level I area (the entire Lower Peninsula), but may not be moved out of the Level I area without a written compliance agreement (MI DARD 2014a). Regulated materials may not be moved out of Quarantine Level II (quarantined UP counties) without a written compliance agreement, unless they are being moved from the eastern UP counties (UP counties other than Keweenaw and Houghton counties) to Quarantine Level I (the Lower Peninsula, generally across the Mackinac Bridge). Moving firewood from Quarantine Level I to Quarantine Level II without a compliance agreement is prohibited, and any hardwood firewood that is detected is confiscated. Knowingly moving firewood north across the bridge without a compliance agreement can result in hefty fines ranging from \$1,000 to \$250,000, and jail time of up to five years. Act 72 of 1945, §286.260 §10 (2015)¹².

Even though these Great Lakes islands are federally quarantined, state law prohibits the movement of regulated materials to the Beaver Island Archipelago in Lake Michigan, North and South Manitou Islands in Lake Michigan, Big Charity and Little Charity Islands in Lake Huron, and Isle Royal in Lake Superior without a compliance agreement. It is illegal to bring ash firewood onto any MI DNR-managed lands, including state parks, campgrounds, recreation areas, water access sites and forests (Ron Murray, MI DNR, pers. comm. by phone, 2015 May 4).

Michigan's EAB quarantine law (MI DARD 2014a) states that, “Michigan's emerald ash borer internal quarantine encompasses tribal lands. Each tribe may have in effect a similar quarantine that regulates the movement of ash trees ash wood, hardwood firewood, wood chips, and bark chips. The violation of quarantine regulations on tribal lands could be punishable by criminal prosecution.” State law, however, does not apply to Indian reservation lands in Michigan, and the application of federal law is limited.

As of this writing the MI DARD has not issued a press release on any changes in the emerald ash borer quarantine for 2015. There were no positive detections for emerald ash borer as a result of the 2014 USDA-APHIS trapping survey, conducted in the un-quarantined counties of the Upper Peninsula (John Bedford, MI DARD, pers. comm. by email, 11 December 2014). So unless evidence of EAB in these counties is found (and barring a push by economic interests to quarantine the rest of the UP), it is likely that no additional Michigan counties will be quarantined before spring 2015.

The EAB is listed as a “prohibited” species under Act 451 of 1994 §324.41301.amended¹³, meaning that it is illegal to knowingly possess live EAB at any life stage (eggs, larvae, pupae, or adult beetles).

The entire Lower Peninsula of Michigan is federally quarantined for the EAB, along with all the state-quarantined UP counties. Federally-quarantined counties for the EAB in Michigan are listed in 7 CFR §301.53

¹² <http://www.legislature.mi.gov/%28S%282awfzk0vj3ped4t1jadid2wz%29%29/mileg.aspx?page=getObject&objectName=mcl-286-260> (2015 June 6).

¹³ <http://legislature.mi.gov/doc.aspx?mcl-324-41301> (2015 March 2)

§§1-9 (Subpart - Emerald Ash Borer) (2015)¹⁴. The MI DARD maintains a website on current EAB regulations, quarantine areas and other information at http://www.michigan.gov/mdard/0,4610,7-125-2390_18298---.00.html.

Wisconsin

Wisconsin prohibits movement of firewood from counties or areas of any state that are state- or federally quarantined for EAB to uninfested counties in Wisconsin. As with Michigan, EAB quarantined areas are defined by 7 CFR 301.53 §1-9 (Subpart - Emerald Ash Borer) (2015). In addition, a Wisconsin emergency rule (Administrative Rule ATPC 21¹⁵) allows the WI DATCP to temporarily quarantine an infested county until the USDA puts a federal quarantine in place. Regulated items include emerald ash borer organisms, cut hardwood (non-coniferous) firewood, unprocessed (though heat treatment, chipping, etc.) ash logs, limbs, branches, roots, and wood chips, ash mulch or bark fragments larger than one inch in diameter, and ash nursery stock. It is illegal to move or transport regulated materials out of EAB quarantined areas without a written compliance agreement with WI DATCP or USDA-APHIS.

Producers (including loggers, commercial arborists or municipal crews), truckers and transporters who move ash logs and other materials out of a quarantine area must sign a compliance agreement stating that they will deliver these materials only to approved mills or processors that have a compliance agreement, and ship the material only between October 1 and March 31 (WI DATCP 2013). The mill or processor must be visited by a WI DATCP or USDA-APHIS official, and a compliance agreement must be completed and signed, stating that their operations will prevent the spread of EAB.

Minnesota

Minnesota has quarantined several counties that are known to have EAB infestations (MNDA 2015b, 2015c). Regulated articles include the EAB in any stage of development and all plants and plant parts of the genus *Fraxinus*, including but not limited to nursery stock, logs and green lumber, composted or uncomposted chips and mulch, stumps, roots, and branches, and firewood of any non-coniferous (hardwood) species. Articles exempt from regulation include ash seeds and leaves that contain no ash twigs, branches, and wood, processed lumber that is generally bark free, kiln dried, and with squared edges, and finished wood products without bark, including furniture, baskets, and baseball bats. Regulated articles may not be moved out of a quarantined area without a written compliance agreement.

Transit of regulated articles is as follows. Articles may be freely moved within a quarantined area. They may also be moved from a non-quarantined area into a quarantined area. Once an article has entered a quarantined area, it is subject to the same restrictions as an article originating in the quarantined area. Transporting articles originating in a non-quarantined area through a quarantined area and back into a non-quarantined area is prohibited, with these exceptions:

¹⁴ <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9318863f478d4130f0f5f0d9fb749ae3&n=pt7.5.301&r=PART&ty=HTML#sp7.5.301.xx9> (2015 June 5).

¹⁵ https://docs.legis.wisconsin.gov/code/admin_code/atcp/020/21 (2015 April 22)

- From May 2 through September 30, regulated articles may be shipped in an enclosed vehicle or completely enclosed by a covering adequate to prevent infestation by emerald ash borer,
- From April 1 through September 30, uncovered regulated articles may be transported without stopping except for refueling or traffic conditions, and
- Transit is not regulated from October 1 through May 1.

All regulated articles originating from a quarantined area and moved within Minnesota must be accompanied by certifications and/or shipping documents showing the movement was in accordance with this quarantine. Regulated articles violating the quarantine must be removed to a permitted area within 24 hours of discovery, or be subject to destruction under the direction of the Commissioner and at owner's expense.

Compliance agreements are available from the Minnesota Department of Agriculture that may allow the movement of hardwood firewood within and into Minnesota. Individuals violating quarantine regulations are subject to the civil penalties up to \$7,500.00 per day of violation, misdemeanor penalties set forth in Minnesota Statutes §18J.10 (2014)¹⁶, or criminal penalties set forth in Minnesota Statutes §18J.11 (2014)¹⁷.

Asian longhorned beetle

Federal regulations

Federal quarantine authority for the Asian longhorned beetle falls under 7 CFR 301.51 §§1-9 (Subpart - Asian Longhorned Beetle) (2015)¹⁸. Regulated articles include all hardwood firewood, green lumber, and all other living or dead material including "nursery stock, logs, stumps, roots, branches, and debris of half an inch or more in diameter of the following genera: *Acer* (maple), *Aesculus* (horse chestnut), *Albizia* (mimosa), *Betula* (birch), *Celtis* (hackberry), *Cercidiphyllum* (katsura), *Fraxinus* (ash), *Koelreuteria* (golden rain tree), *Platanus* (sycamore), *Populus* (poplar), *Salix* (willow), *Sorbus* (mountain ash), and *Ulmus* (elm)." It also includes any other article that an inspector determines presents a risk of spreading Asian longhorned beetle, upon notifying the person in possession of the article that it is subject to the restrictions of this subpart.

As with the EAB quarantine, if a state is actively enforcing restrictions on the intrastate movement of regulated articles, and if the designation of a portion of the state as a quarantined area will prevent the artificial interstate spread of the emerald ash borer, then a portion of that state will be quarantined. If not, the entire state will be quarantined (7 CFR §301.51-3, Subpart - Asian Longhorned Beetle). In practice, relatively small, targeted areas have been quarantined, based on careful surveys to determine the extent of the infestations.

¹⁶ <https://www.revisor.mn.gov/statutes/?id=18J.10> (2015 June 5).

¹⁷ <https://www.revisor.mn.gov/statutes/?id=18J.11> (2015 June 5).

¹⁸ <http://www.ecfr.gov/cgi-bin/text-idx?SID=77b02eee1c3189fb79954252b446149b&node=pt7.5.301&rgn=div5#sp7.5.301.xx7> (2015 June 5).

Michigan

Along with the EAB, the ALB is listed as “prohibited” under Act 451 of 1994 §324.41301.amended. It is illegal to knowingly possess live AB at any life stage (eggs, larvae, pupae, or adult beetles).

Wisconsin

As with the EAB, Wisconsin emergency rule ATCP 21 allows the WI DATCP to temporarily quarantine a county or area infested with an ALB, until the USDA can put a federal quarantine in place (WI DATCP 2014). Regulated items include the Asian longhorned beetle in any living stage, cut non-coniferous (hardwood) firewood, and trees, wood, roots, stumps, debris or other tree parts more than ½ inch in diameter, from any of the following genera: *Acer* (maple), *Aesculus* (buckeye), *Albizia* (mimosa), *Betula* (birch), *Celtis* (hackberry), *Fraxinus* (ash), *Platanus* (sycamore), *Populus* (poplar), *Salix* (willow), *Sorbus* (mountain ash), and *Ulmus* (elm). This includes nursery stock, logs, green lumber, stumps, roots, and branches, whether living, dead, cut, or fallen, along with any other item designated as a regulated item by a pest control official, as long as the person in possession of the item is notified.

Exceptions exist if a pest control official in the state or province of origin (1) inspects the regulated item and (2) certifies that it originates from non-infested premises and has not been exposed to the ALB, is free of ALB, has been effectively treated to destroy ALB, or was produced, processed, stored, handled, or used under conditions that effectively preclude the transmission of ALB. A completed certificate of inspection must accompany the shipment.

All life stages of the ALB are listed as “prohibited” under Wisconsin NR 40 (WI DNR 2015). No one may knowingly “transport, possess, transfer or introduce” the ALB anywhere in the state.

Minnesota

Minnesota apparently has no laws prohibiting the possession of the ALB. The state’s restrictions on firewood movement would presumably help to limit the movement of the ALB.

Pine shoot beetle

Federal regulations

Anticipating severe losses from the European pine shoot beetle (PSB), a US federal quarantine was initiated soon after its discovery in Ohio in 1992. Damage from this insect has so far been low though (Morgan et al. 2004, Haack 2006). The current quarantine area includes the entire ceded territory (Figure 12).

The federal quarantine, 7 CFR 301.50, Subpart - Pine Shoot Beetle (2015)¹⁹ prohibits the movement of pine (*Pinus* spp.) materials out of the quarantine area without a compliance agreement. Regulated materials include cut Christmas trees, nursery stock, logs, firewood and lumber with the bark attached, raw pine materials for pine wreaths and garlands, stumps, and any other article, product, or means of conveyance that presents a risk of spreading the pine shoot beetle, upon notification of the person in possession of the product or material by an official inspector. A rather complicated set of rules exist under which producers, shippers and others may obtain compliance agreements.

In recent years federal and state regulatory agencies including USDA-APHIS have gone from a "zero-risk" philosophy to a "minimal-risk" philosophy in regulating pine Christmas trees for the PSB (MI DARD 2015). They now accept trees from regulated areas without a PSB inspection and certification process, if those trees were grown under the PSB Compliance Management Program such as the one in Michigan (see below).

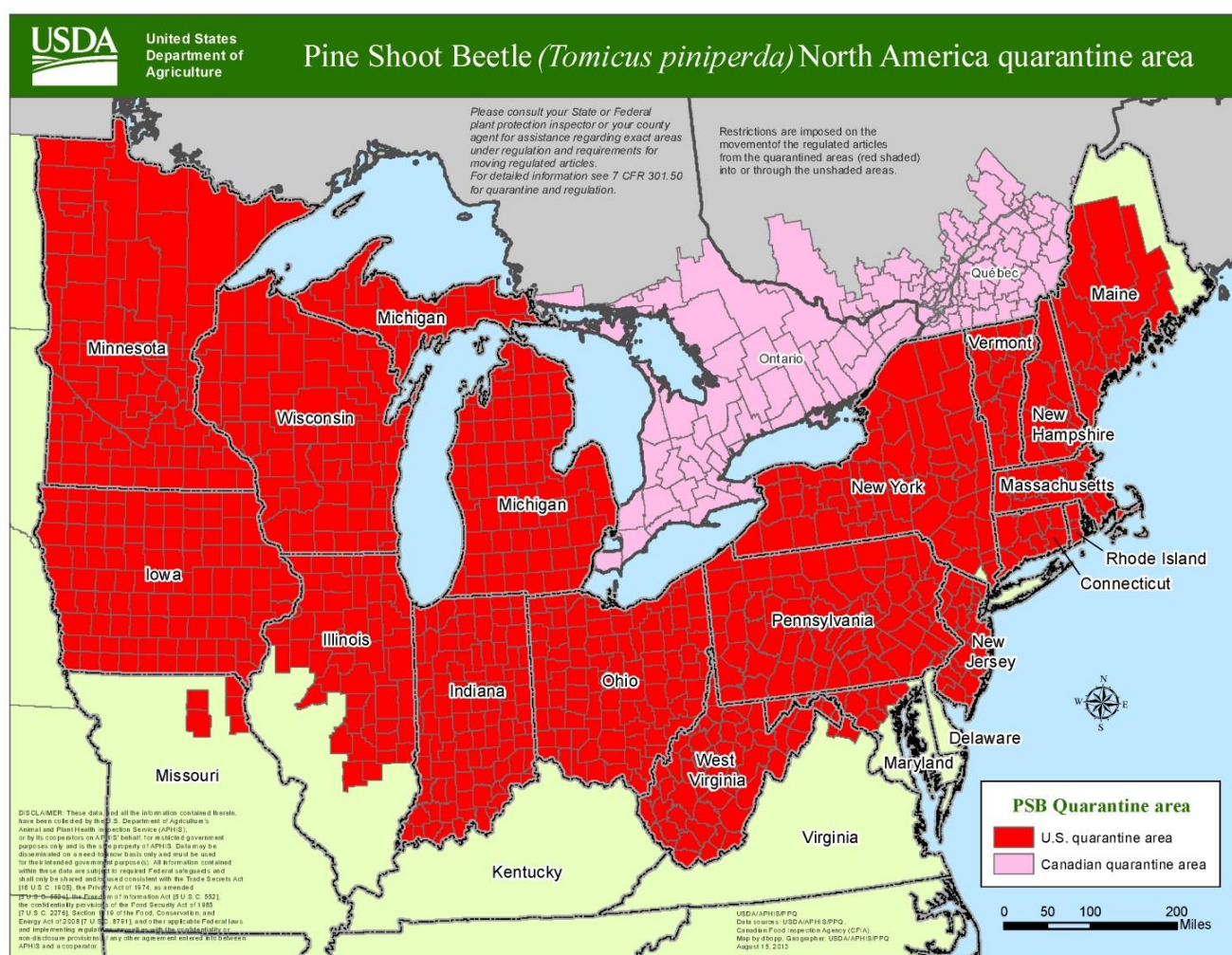


Figure 12. The most recent (August 2013) pine shoot beetle federal quarantine map (Bopp 2013).

¹⁹ <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=9318863f478d4130f0f5f0d9fb749ae3&n=pt7.5.301&r=PART&ty=HTML#sp7.5.301.xx6> (2015 June 5).

State programs

Because the states of Michigan, Wisconsin and Minnesota all fall entirely within the federal quarantine area for PSB, these states do not have state quarantines in place for the PSB.

Michigan maintains a voluntary program for Christmas tree growers wishing to ship cut pine trees out of the federal quarantine area. Growers must follow best management practices, whereupon they can qualify for MI DARD certification. See MI DARD (2015a) for more information.

Mountain pine beetle

Federal regulations

The federal government has not promulgated regulations relative to the MPB.

Michigan: Michigan currently does not have regulations in place pertaining to the MPB.

Wisconsin: The most recent revision to NR 40 lists the MPB as “prohibited” throughout the state (WI DNR 2015). No one may knowingly “transport, possess, transfer or introduce” the MPB anywhere in the state.

Minnesota: On January 1, 2015 the State of Minnesota implemented an exterior state quarantine for the mountain pine beetle, or MPB (MNDA 2015a). This quarantine was initiated in response to the recent discovery of these beetles and their larva by the MNDA in logs shipped into Minnesota. (Fortunately the insects were dead.) It is intended to reduce the risk of human transport of this insect into pine forests of Minnesota and eastern North America.

The MPB quarantine limits importation of pine wood with bark from western states that support populations of the MPB. Regulated articles include any living stage of the mountain pine beetle, pine wood with bark, or any article, product or means of conveyance determined by the State Plant Regulatory Official to present the risk of spread of the MPB. Regulated articles originating in states not known to have MPB populations that are shipped through states with the MPB are also prohibited from entering Minnesota. Pine wood without bark (100% debarked), pine mulch or chips, pine Christmas trees and pine nursery stock are exempt. Under certain circumstances regulated articles may be allowed into the state if the individual(s) have a signed, written compliance agreement with the MNDA, and if the regulated article is accompanied by a phytosanitary certificate from the originating state verifying that the material complies with the conditions of the compliance agreement.

Quarantine violations can result in destruction of the regulated materials at the expense of the owner, and violators may be subject to civil penalties of up to \$7,500.00 per day of violation or misdemeanor penalties set forth in Minnesota Statutes Section 18J.10 (2010), and criminal penalties set forth in Minnesota Statutes Section 18J.11 (2010).

Thousand cankers disease

Federal regulations

The federal government has not promulgated regulations relative to the balsam woolly adelgid.

Michigan

On May 17, 2010 the MI DARD implemented an exterior quarantine for thousand canker disease of walnut. The quarantine prohibits the movement of regulated materials into the state from states known to have the disease (MI DARD 2010). It prohibits the import of disease agents (the walnut twig beetle, *P. juglandis*, and the fungus *G. morbida*). Hardwood firewood is prohibited, as well as all *Juglans* spp. plant parts including “nursery stock, budwood, scionwood, green lumber, and other material living, dead, cut, or fallen, including stumps, roots, branches, and composted and uncomposted chips.” Regulated articles originating in an area not known to have the disease but transported through an area known to have it are also prohibited. Nuts and hulls, processed, kiln-dried bark-free dimensional lumber with squared edges, and finished wood products without bark (such as furniture) are exempt from the quarantine. Regulated articles originating from unregulated states must be accompanied by documents indicating the state of origin, and persons receiving regulated articles from interstate and international sources are required to retain “shipping records, invoices, waybills, bills of lading certificates of quarantine compliance and/or phytosanitary certificates for a period of 36 months.” Violators are guilty of a misdemeanor and subject to fines under the provisions of Act 189 of 1931, §286.228.amended (2009). For more information see MI DARD (2010).

Wisconsin

The most recent revision to NR 40 lists the walnut twig beetle and the thousand cankers fungus as “prohibited” throughout the state (WI DNR 2015). The state also implemented an external quarantine for TCD in May 2014 (WI DATCP 2014). Knowingly importing the walnut twig beetle and the fungal pathogen is illegal. It is also illegal to import any regulated articles into this state, if they “originated in or have been exposed to the environment in any infested area”. Regulated articles include firewood from any species of tree along with living or dead plants or plant parts of the genus *Juglans*, including nursery stock, budwood, scionwood, green lumber, logs, stumps, roots, branches, composted and uncomposted chips. Exempt materials include nuts, nut meats, or nut hulls, lumber with square edges which is 100% bark-free and kiln-dried, and finished walnut wood products without bark, including furniture, musical instruments, and gun stocks.

Exceptions exist for materials accompanied by a written phytosanitary certificate, signed by a pest control official in the infested area. Like the phytosanitary certificate required for importation of regulated hemlock materials, the certificate must describe the materials certify that they are produced, processed, stored, handled, or used under conditions that effectively preclude the transmission of TCD. Articles may be imported into the state under a written agreement between the importer and the department, which specifies the name and address of the importer and recipient, source and destination of each import, details about the nature of the imported articles, and specifies the conditions that will, in DATCP’s opinion, effectively prevent the spread of TCD. DATCP reserves the right to cancel the agreement for any reason at any time. The compliance agreement must include the importer’s commitment to keep complete records of each import shipment, and to submit those records to the department for inspection and copying upon request.

Minnesota

On August 8, 2011 the MNDA implemented an exterior quarantine for thousand canker disease of walnut and other *Juglans* spp. (MNDA 2011). This external prohibits the import of the walnut twig beetle and disease-causing fungus, as well as untreated hardwood logs, firewood, nursery stock and other plant parts able to transmit the disease agents, from any states or other areas known to have this insect/disease complex. For more information see MNDA (2011).

Balsam woolly adelgid

Federal regulations

The federal government does not have regulations in place pertaining to the BWA.

Michigan

On June 24, 2014, Michigan implemented a statewide quarantine for the BWA (MI DARD 2014d). Like the HWA quarantine, it prohibits the BWA, along with nursery stock and forest products from all provinces and regulated counties of states where the BWA is known to occur²⁰. Regulated forest products include logs, branches, boughs, lumber and firewood with the bark attached, and uncomposted or unshredded bark of all true fir (*Abies*) species. Exemptions include “holiday greenery” (including cut Christmas trees, wreaths and boughs) if moved between October 15 and January 1. *Abies* lumber, logs, firewood and other forest products are exempt if the bark is completely removed, as are ISPM15-compliant lumber, pallets and other products. Finally, *Abies* seedlings no more than 3 years old can be certified for import if grown under an active pest management program as stipulated in the regulations. Information on Christmas tree certification is available from MI DARD (2015b).

Wisconsin

Wisconsin does not have regulations in place pertaining to the balsam woolly adelgid.

Minnesota

Minnesota does not have regulations in place pertaining to the balsam woolly adelgid.

Hemlock woolly adelgid

Federal regulations

The federal government has not promulgated regulations relative to the balsam woolly adelgid.

²⁰ Currently includes the states and provinces of: California, Idaho, Maine, New Hampshire, New York, North Carolina, Oregon, Tennessee, Vermont, Virginia, Washington, West Virginia, British Columbia, New Brunswick, Newfoundland, Nova Scotia, Ontario and Prince Edward Island.

Michigan

Michigan has restricted the importation of items likely to transmit the HWA since at least 2008. It was most recently revised on June 24, 2014 (MI DARD 2014c). This quarantine regulates the importation into Michigan of regulated items from all states and Canadian provinces where the HWA is known to occur²¹. Counties within the regulated states that do not have known populations of HWA based on official surveys done at least once every three years, and that are adjacent to counties also surveyed once every three years and not have known populations of HWA, may be allowed entry with a permit issued by MI DARD. Regulated articles include the HWA, as well as nursery stock and forest products of hemlock (*Tsuga spp.*) and two Asian spruce species: Yeddo spruce, *Picea jezoensis* (Siebold & Zuccarini) Carrière, and tiger-tail spruce, *Picea torano* (Siebold ex K. Koch) Koehne (referred to as *P. polita* in the quarantine law), which are the HWA's natural alternate hosts. Regulated forest products of the above trees include uncomposted or unshredded bark, and products with the bark attached, including logs, branches, boughs, lumber and firewood. Composed or shredded bark and mulch, lumber, logs and other forest products with the bark completely removed, wood products treated to comply with ISPM15 standards, lumber and posts treated with wood preservatives, and certified firewood are exempt from the quarantine. Regulations dealing with transport through infested areas also apply.

Wisconsin

Wisconsin lists the HWA as a “prohibited” species under NR 40. In August 2003 the state also implemented an external quarantine for the HWA (WI DATCP 2014). Chapter ATCP 21.16²² bans the import of regulated articles from any infested areas identified in “Appendix A”, including hemlock seedlings and nursery stock, hemlock logs and lumber with bark, and uncomposted hemlock bark and chips with bark.

Exemptions exist in cases when a pest control official in the state of origin inspects the imported items and certifies in a phytosanitary certificate that the articles have not been exposed to HWA, have been treated to destroy the HWA, or are free of HWA. If treated, the phytosanitary certificate must specify the pesticide or other treatment used. Alternatively the pest control official must certify that the items are produced, processed, stored, handled, or used under conditions, described in the phytosanitary certificate, that effectively preclude the transmission of HWA. A third option is to import the articles into the state under a written agreement between the importer and the department, which specifies the name and address of the importer and recipient, source and destination of each import, details about the nature of the imported articles, and specifies the conditions that will, in DATCP’s opinion, effectively prevent the spread of the HWA. DATCP reserves the right to cancel the agreement for any reason at any time.

Minnesota

Minnesota doesn’t regulate for the HWA, largely because the western extent of eastern hemlock’s range barely makes it into eastern Minnesota, where it is state-listed as “endangered” (MN DNR 2013).

²¹ Currently includes the states and provinces of: California, Connecticut, Delaware, Georgia, Kentucky, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Washington, West Virginia, and British Columbia.

²² https://docs.legis.wisconsin.gov/code/admin_code/atcp/020/21/16 (2015 June 5).

Oak wilt

Federal regulations

The federal government has not promulgated regulations relative to oak wilt. Restrictions on the movement of hardwood logs, firewood and other regulated materials (aimed at slowing the spread of the EAB) might help slow the spread of OW as well.

State regulations

Michigan, Wisconsin and Minnesota have not implemented regulations aimed specifically at oak wilt. All three states have internal quarantines for the EAB and external quarantines for TCD though. These quarantines prohibit the import of hardwood firewood and the movement of hardwood firewood out of EAB quarantine areas within these states, without a written compliance agreement. One route where the EAB quarantine might also help prevent OW is with the movement of firewood from heavily OW-infested southern Wisconsin to northern Wisconsin and Upper Michigan, where OW is still rare and localized. Unfortunately OW is also found in some unquarantined counties, where movement of firewood (including oak infested with OW) is legal.

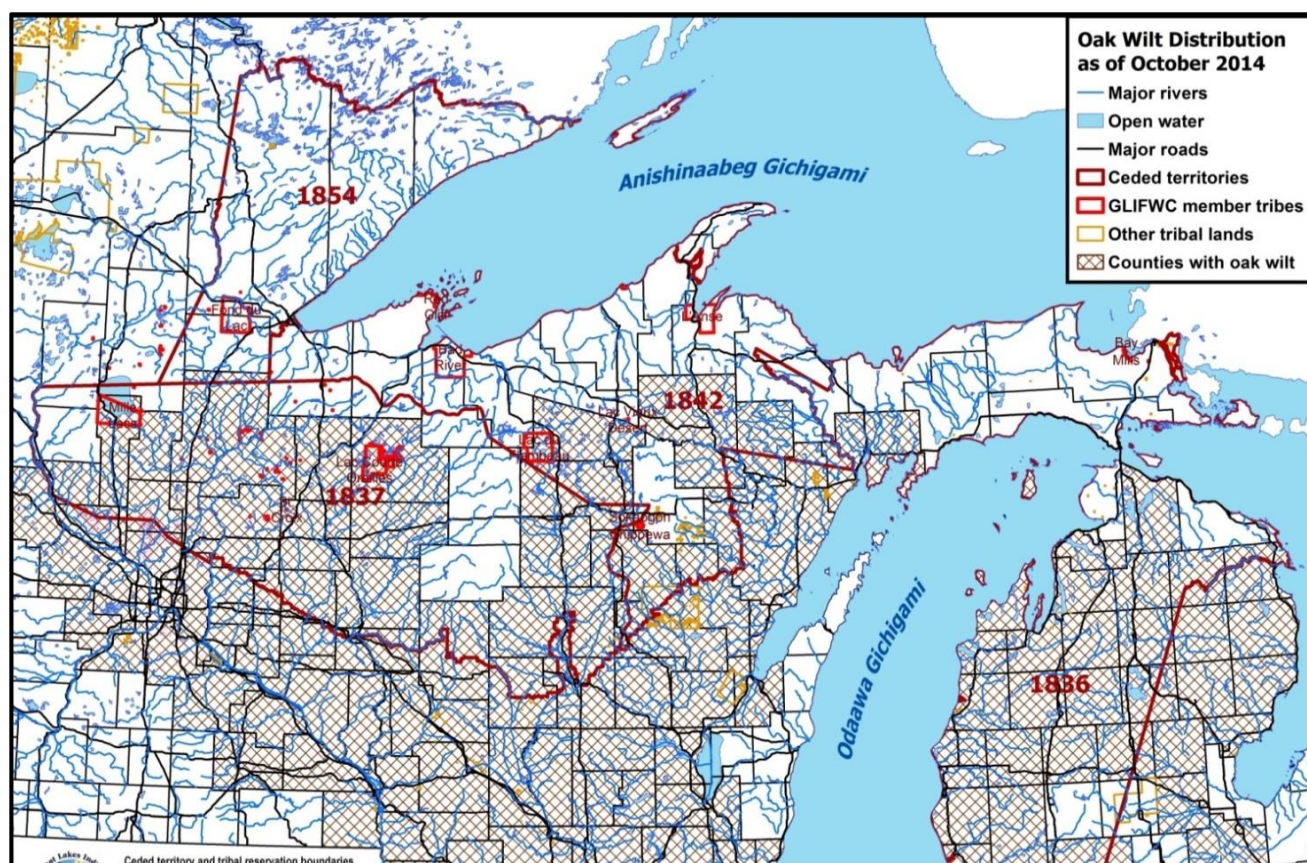


Figure 13. Oak wilt distribution by county in the three ceded territory states. Shaded counties have at least one OW infestation. While OW is now widespread and fairly common in Lower Michigan, southern Wisconsin and the Twin Cities region of Minnesota, it is still local and relatively rare in Upper Michigan and northern Wisconsin. (Compiled from 2014 Michigan, Wisconsin, and Minnesota Departments of Natural Resources data.)

Counties outside the EAB quarantine areas that have (widely scattered) OW infestations are located across western Upper Michigan, northern Wisconsin, and northeast Minnesota (Figure 13).

Certified Firewood

Federal regulations

Federal regulations are in place for movement of regulated materials from EAB and gypsy moth quarantine areas. They require that all hardwood firewood and all ash logs, green lumber, nursery trees, chips, and all other untreated, living or dead wood from EAB quarantine areas undergo heat treatments before being transported out of the quarantine areas (USDA-APHIS-PPQ 2014, p. 5-4-38). This treatment (Treatment Schedule T314-a) requires the core temperature to reach a minimum of 140°F (60°C) for 60 minutes (USDA-APHIS-PPQ 2014, p. 5-4-38), a temperature-time combination shown to eliminate all EAB larvae within infested ash firewood (Myers et al. 2009). All logs and firewood from gypsy moth quarantine areas must undergo schedule T314-b, heat treatment at 132.8°F (56°C) for 30 minutes, to eliminate all life stages including egg masses (USDA-APHIS-PPQ 2014, p. 5-4-38). If the logs and firewood originate from a location quarantined for both pests, schedule T314-a must be used.

Firewood harvested in Minnesota

Firewood vendors in Minnesota can apply for one or both of two state-sponsored programs. “Option A” allows vendors to sell any NON-ASH firewood within 50 miles of the MN DNR facility where it will be used (MN DNR 2014). MN DNR-approved firewood may not be moved out of quarantined areas. “Option B” requires dealers to heat-treat their wood, whereupon the vendor may use the MNDA “certification shield” on their firewood label. MNDA-certified firewood may move unrestricted throughout the state, and may be used on any MN DNR-administered lands regardless of how far away (within Minnesota) it was harvested. Firewood harvested outside Minnesota is not eligible for MNDA certification and is not allowed on MN DNR-administered lands, even if it is USDA certified (MN DNR 2015). Wood harvested within a quarantined county can only be moved out of that county if it is MNDA- or USDA-certified (MN DNR 2014).

Minnesota is unique among the three states in requiring that all firewood sold in the state be labeled with the county or counties and state where it was harvested, along with the quantity, unit price, and name and address of the manufacturer, packer, or distributor (Minn. Stat. §239.093)²³. This information must be included on the label or wrapper of each unit sold. For bulk sales, it must be included on each invoice or receipt. For more on labeling and selling firewood in Minnesota, see the MNDA’s pamphlet (MNDA 2013a).

The MNDA maintains a website on EAB regulations, quarantine areas and other information at MNDA 2015c. Firewood vendor information and an application to become a Minnesota approved firewood vendor are available online (see MN DNR 2015).

²³ <https://www.revisor.mn.gov/statutes/?id=239.093> (2015 March 3).

US Forest Service policy

In August 2009 the Chequamegon-Nicolet National Forest (CNNF) issued a firewood restriction order (Order #R913-09-02) banning the possession, storage, or transport of any firewood originating outside Wisconsin or more than 25 miles from the destination point within the Forest, unless it is USDA or Wisconsin Department of Agriculture, Trade and Consumer Protection (WI DATCP) certified (USDA-FS 2009, 2015). Firewood that has been gathered from within the Forest with a valid permit is exempt. This rule mirrors the state of Wisconsin's rule for bringing firewood onto state land, before the state reduced its limit to 10 miles.

The Ottawa National Forest (ONF) follows Michigan DNR recommendations regarding movement of firewood onto the forest (Melissa Simpson, pers. comm. by phone, April 21, 2015). ONF literature and ONF staff tell visitors not to bring firewood from more than 25 miles away. Most ONF campgrounds are run by one of three concessionaires. Two of these concessionaires are operated by local people who cut their own firewood locally and sell it to campers. The third is apparently still deciding whether and where to obtain firewood.

The other two national forests within the project area (the Hiawatha and the Huron-Manistee) are both within areas federally quarantined for the EAB, except for a small portion of the Hiawatha National Forest (HNF) in Marquette County. The HNF strongly discourages people from bringing firewood from outside the forest. According to HNF Forester Bill Gimler (pers. comm. by phone, 20 April 2015) HNF contractors do provide free firewood at some "administrative sites" such as bunk houses, cabins, campgrounds, and research buildings. The Munising District has probably been most active in doing this. This is more of a continuation of a long-held practice than a response to the EAB though. The HNF is participating in the state's planning process for more restrictive firewood regulations. The Huron-Manistee National Forest (HMNF) also strongly discourages people from bringing firewood to the Forest, but currently has no restrictions prohibiting people from doing so (Carol Young, Silviculturalist, pers. comm. by phone, 2015 April 10). Both the HNF and the HMNF follow state and federal quarantine rules.

GLIFWC tribes and the USFS have developed a cooperative agreement, allowing the tribes to regulate the harvesting activities of their members on USFS properties within the ceded territories in Michigan and Wisconsin. The current version of the agreement, and the codes enforced by the tribes, do not regulate for invasive forest pests.

Table 5 summarizes existing international, federal and state regulations pertaining to major forest invasives in the US.

Table 5. Summary of international, federal and state regulations pertaining to major forest invasives.

Source of Regulation	Scope	Regulated Activities	Requirements
International Plant Protection Convention (IPPC), United Nations	Import/Export	International transport of Wood Packing Material (WPM)	Standards for WPM (ISPM15): <ul style="list-style-type: none"> Heat: 132.8°F (56.0°F) for 30 minutes, or chemical treatments Debark wood Stamped after treatment with official ISPM mark.
Federal Law	Import/Export	Importation of logs, lumber, whole tree, bark, cork, laths, hog fuel, sawdust, painted wood products, wood mulch, wood shavings, pickets, shingles, solid WPM, hummus, compost and litter into the United States, but not from Mexico or Canada (except for pine firewood from pine-shoot beetle areas)	Standards for imported materials: <ul style="list-style-type: none"> Heat: 160°F (71.1°C) for 60 minutes Performed at an approved facility.
Federal Regulations	Interstate Commerce	Movement of ash logs, green lumber, nursery trees, chips and all other untreated living or dead wood or wood material from EAB quarantine areas	Ash cannot be moved out of EAB quarantine areas and across state lines without a written compliance agreement. If the articles are moved through quarantine areas from May 1 through August 31 or the air temperature is 40 F or more, they must be accompanied with a waybill giving origin and destination, be completely covered, and must move through the quarantine area without prolonged stops. Must undergo heat treatments of 140°F (60°C) for 60 minutes.
Federal Regulations	Interstate Commerce	Movement of logs and firewood from gypsy moth quarantine areas	All logs and firewood from gypsy moth quarantine areas must undergo Schedule T314-b heat treatment at 132.8°F (56°C) for 30 minutes.
Federal Regulations	Interstate Commerce	Movement of cut conifer Christmas trees originating from European gypsy moth quarantine areas	Schedule T313-a treatment (methyl bromide in an enclosure for 30 minutes to 4.5 hours, depending on the concentration used and the temperature.
Federal Regulations	Interstate Commerce	Movement of cut conifer Christmas trees and pine logs from pine shoot beetle quarantine areas	Schedule T313-b treatment.
Federal Regulations	Export	Export of oak logs	Oak logs and lumber must be fumigated with 15 lbs methyl bromide gas/1000 m ³ material, at 40°F (4.4°C) or above for specified periods of time.
Michigan	Intrastate Commerce	Movement of ash logs, branches, chips, or other wood products,	1) Illegal to transport the following items into uninfested Michigan counties: <ul style="list-style-type: none"> Live emerald ash borer (any life stage)

		hardwood firewood and other regulated items from areas of any state under state or federal EAB quarantine	<ul style="list-style-type: none"> Ash trees, limbs, branches, stumps, bark, logs, lumber with bark, all hardwood wood and bark chips, all hardwood firewood, any other items determined to present a risk for the spread of EAB <p>2) Movement of ash nursery stock into or out of the state is unconditionally prohibited.</p> <p>3) Regulated materials may not be moved to specified islands in Lakes Michigan, Huron and Superior, including Isle Royal.</p> <p>4) <i>Moving regulated items from Quarantine Level I area (Lower Peninsula) to Quarantine Level II area (Upper Peninsula) without a compliance agreement can result in large fines and jail time.</i></p>
Michigan	Intrastate Commerce	Movement of fir (<i>Abies</i> spp.) products into the state from infested counties in other states, and from counties in infested states that have not been inspected and/or are adjacent to counties that have not been inspected or are infested.	<p>External quarantine. Illegal to import untreated fir bark, branches, boughs, logs and nursery stock from BWA-infested counties, counties adjacent to BWA-infested counties, and counties that have not been officially surveyed for BWA within the last 3 years, or that border counties not officially surveyed in the last 3 years. Exemptions include “holiday greenery” if moved between October 15 and January 1, composted or shredded bark, debarked logs, lumber, firewood etc., preserved wood, seeds and cones, and (notably) fir seedlings 3 years old or less, if grown under an active pest management program.</p> <p>Lumber, pallets, firewood (with or without bark) are exempt if heat-treated at 132.8°F (56°C) for 30 minutes or otherwise treated to ISPM-15 standards.</p>
Michigan	Intrastate Commerce	Movement of hemlock and certain Asian spruce species and products into the state from infested counties in other states, and from counties in infested states that have not been inspected and/or are adjacent to counties that have not been inspected or are infested.	<p>External quarantine. Illegal to import untreated bark, branches, boughs, logs and nursery stock from HWA-infested counties, counties adjacent to HWA-infested counties, and counties that have not been officially surveyed for HWA within the last 3 years or that border counties not surveyed in the last 3 years.</p> <p>Exemptions include composted or shredded bark, completely debarked logs, lumber, firewood etc., preserved wood, seeds and cones, and (notably) fir seedlings 3 years old or less, if grown under an active pest management program.</p> <p>Lumber, pallets, firewood (with or without bark) are exempt if heat-treated at 132.8°F (56°C) for 30 minutes or otherwise treated to ISPM-15 standards.</p>
Wisconsin	Intrastate Commerce	Movement of the EAB, ash logs, hardwood firewood, and other	Illegal to move ash logs, trees of any size, limbs, branches, stumps, roots, chips and bark fragments larger than 1” in 2 dimensions, untreated lumber with bark

		regulated materials from a quarantined to a non-quarantined area within the state.	<p>attached, any hardwood firewood, and any other item determined by a DATCP official to presents a risk of spreading the emerald ash borer. No movement of any ash nursery stock out of a quarantine area.</p> <p>Compliance agreements can be obtained for logs and firewood that has undergone one or more of the approved treatments:</p> <ul style="list-style-type: none"> • Removal of all bark and additional ½ inch of wood (cambium) • USDA-APHIS compliant kiln sterilization • USDA-APHIS compliant heat treatment for firewood or logs • ISPM-15 compliant heat treatment for solid wood packing material • Chipping or mulching • Transport safeguards, if originating outside a quarantine area • Movement of ash logs to an approved receiving facility outside of the quarantine area between October 1 and March 31. The facility must have a compliance agreement and burn or otherwise dispose of the material by April 30.
Wisconsin	Intrastate Commerce	Possession, transport or introduction of listed invasive species including certain forest pests.	<p>Illegal to possess, transport or introduce “prohibited” invasive species including the ALB, HWA, the MPB, the walnut twig beetle and thousand cankers fungus <i>G. morbida</i>, the Asian gypsy moth and the sudden oak death pathogen anywhere in Wisconsin. Illegal to transport or introduce “restricted” species including the EAB in Wisconsin. Control measures are required for prohibited species. Certain exceptions to NR 40 exist (see Wisconsin regulations section above).</p>
Minnesota	Intrastate Commerce	Movement of the EAB, ash logs, hardwood firewood, and other regulated materials from a quarantined to a non-quarantined area within the state.	<p>Illegal to transport the following items into uninfested counties:</p> <ul style="list-style-type: none"> • The EAB in any life stage • All ash (<i>Fraxinus</i> spp.) nursery stock • All other plants and plant parts of the genus <i>Fraxinus</i>, including, ash logs, green lumber, composted or uncomposted chips and mulch, stumps, roots and branches • Any hardwood firewood <p>Ash seeds and leaves without twigs or branches, and processed lumber and finished wood products without bark are exempt.</p> <p>Regulated articles may be freely moved within or into a quarantined area. Once an article has entered a quarantined area though, it is subject to the same restrictions as an article originating in the quarantined area.</p>

			<p>Regulated articles from an unquarantined area may be shipped though a quarantine area if:</p> <ul style="list-style-type: none"> • They are shipped in an enclosed vehicle or completely covered and enclosed, if shipped from May 2 through September 30. • From April 1 through September 30, they may be transported uncovered if shipped without stopping, except for refueling or traffic conditions. • Transit is not regulated from October 1 through May 1. <p>All regulated articles originating from a quarantined area and moved within Minnesota must be accompanied by a signed, written compliance agreement and shipping documents showing quarantine compliance. Regulated articles violating the quarantine must be removed to a permitted area within 24 hours of discovery or be subject to destruction at owner's expense. Violations are subject to civil penalties of up to \$7,500.00 per day and may be subject to misdemeanor or criminal penalties.</p>
Minnesota	Intrastate Commerce	External quarantine. Movement of walnut and other <i>Juglans</i> spp. logs, hardwood firewood, and other regulated materials from infested states and areas into Minnesota.	<p>Regulated articles are as follows:</p> <ul style="list-style-type: none"> • All life stages of the walnut twig beetle • All life stages of the <i>Geosmithia</i> fungus • All <i>Juglans</i> spp. nursery stock • All <i>Juglans</i> spp. plants and plant parts, including logs, green lumber, chips and mulch, stumps, roots, branches, and packing material • All hardwood firewood <p>Exemptions are nuts, nutmeat, and hulls, processed lumber, and finished wood products without bark.</p> <p>Sale and/or movement of regulated articles from infested areas, or transiting through these areas, is prohibited without a signed, written compliance agreement with the MN Department of Agriculture and a phytosanitary certificate from the state of origin. Sale and/or movement of all regulated articles originating in uninfested states or areas must provide proof of harvest location of the wood by state.</p> <p>As with Minnesota's EAB quarantine, regulated articles moved in violation of the quarantine are subject to destruction at the owner's expense. Violations are</p>

			subject to civil penalties of up to \$7,500.00 per day, and may be subject to misdemeanor or criminal penalties.
Minnesota	Intrastate Commerce	External quarantine. Movement of the MPB, pine wood with bark, and other regulated materials from infested states and areas into Minnesota.	<p>Regulated articles from infested areas are prohibited from entering the state. These include:</p> <ul style="list-style-type: none"> • Any living stage of the mountain pine beetle • Pine wood with bark • Any other article, product or means of conveyance presenting the risk of spreading the MPB. <p>Regulated articles originating in states not having MPB populations but shipped through states with the MPB are also prohibited from entering Minnesota.</p> <p>Exemptions include completely debarked pine wood, pine mulch or chips, pine Christmas trees and pine nursery stock. Regulated articles may be allowed into the state with a signed, written compliance agreement with the MNDA a phytosanitary certificate from the originating state. As with the state's EAB and TCD quarantine laws, violations are subject to fines of up to \$7,500.00 per day and may be subject to misdemeanor or criminal penalties.</p>

Tribal Regulations

Self-determination and off-reservation rights

Forest pests do not respect the political boundaries between tribal and state lands, and jeopardize resources valued by indigenous and non-indigenous communities alike. In order to protect these valuable natural resources, tribal, federal and state agencies should develop and implement forest pest regulations comprehensively and cooperatively. An understanding of how each type of government operates within the ceded territory, and the reach of its regulatory authority, is critical for crafting comprehensive regulation. Furthermore, an understanding of community interests is important to developing strategies designed to reach consensus. Apart from regulation, other initiatives such as educational campaigns, promotion of local forest-based economies, and the implementation of Best Management Practices (BMPs) may also slow the spread of invasive tree pests, and could be undertaken cooperatively by various agencies.

This section will describe the extent of regulatory authority for tribal governments, federal agencies and state governments with respect to activities carried out within the ceded territories and within the Lake Superior Ojibwe Reservations located within the ceded territories. Within each subsection, we will identify the interests to which the government is likely to respond.

Indian tribal sovereignty and legal authority

Tribal Sovereignty has been characterized as...

“The spiritual, moral, and dynamic cultural force within a given tribal community empowering the group toward political, economic, and most important, cultural integrity, and toward maturity in the group’s relationships with its own members, with other peoples and their governments, and with the environment.”

- David E. Wilkins, McKnight Professor of American Indian Studies, University of Minnesota.

The Lake Superior Ojibwe retain law-making and enforcement authority on their respective reservations, and also regulate their members within the ceded territories. The ability of tribes to exercise self-government stems from their status as separate sovereigns that pre-existed the United States. As separate sovereigns, Indian nations still make and enforce laws to govern their lands, their interests and their citizens. State law does not automatically apply and the application of federal law is also limited.

It is not true that the United States obtained Indian lands by merely “discovering” America (taking title through discovery is only effective with respect to unoccupied lands). Indian nations owned and controlled vast territories at the inception of the United States. In order to expand its territorial reach, the US had to engage in negotiations for land cession (treaties) or win wars in order to acquire lands controlled by Indian nations. The US entered into several treaties with the Lake Superior Ojibwe to gain title to what are now northern Michigan, northern Wisconsin and northeastern Minnesota. While the Lake Superior Ojibwe gave up exclusive control over much of their original territory in the treaties of 1836, 1837 and 1842, they reserved a partial interest in those lands, including the right to hunt, fish and gather. The validity of these interests was confirmed in *Lac Courte Oreilles v. Voigt*, 700 F.2d 341 (7th Cir. 1983) cert. denied 464 U.S. 805 (1983). Within the context of the

Lac Courte Oreilles case, the courts determined that the state could not prevent tribal members from exercising their treaty-reserved harvesting rights as long as the bands developed regulatory mechanisms to protect conservation, public health and public safety interests. A similar case brought by the Mille Lacs Band of Ojibwe against the State of Minnesota was appealed to the US Supreme Court, culminating in a decision affirming the off-reservation harvesting rights reserved by the Lake Superior Ojibwe in the Treaty of 1837. *Minnesota v. Mille Lacs Band*, 526 U.S. 172 (1999). Accordingly, regulations adopted by the GLIFWC member tribes, for the most part, constitute the only law that applies to tribal members for harvesting on public lands within the ceded territory.²⁴

Following the treaties for land cessions, several tribes demanded that the United States set aside permanent homelands for their people within their ancestral lands. Six GLIFWC-member tribes signed the Treaty of 1854: Fond du Lac, Red Cliff, Lac Courte Oreilles, Bad River, Lac du Flambeau and Keweenaw Bay. The Mille Lacs Band signed the Treaty of 1855, which also granted the band a permanent reservation. These treaties were also significant because they provided for the division of tribally-owned reservation lands into individual tracts or allotments. Not long after the exterior reservation boundaries were marked and plotted, 40 or 80-acre plots were surveyed within the reservations, and Indian agents began assigning these allotments to individual band members. Following allotment, many tribal members lost title to their lands due to the imposition of state and local property taxes. Today, a significant portion of reservation lands from these treaty-created reservations are owned by non-Indians.

The legacy of allotment has created significant barriers for tribes instituting comprehensive regulations. On reservation, the application of tribal law to non-tribal members depends upon the ownership status of the land where the relevant activities are taking place. On tribally-owned land, tribal governments possess the power to exclude non-Indians, which includes the power to enforce civil regulations. For activities on lands owned by non-tribal members, even on-reservation, tribal laws and regulations have much less force. Instead, state or county law usually applies. On federally-owned lands held in trust for the tribe or tribal members, tribal law generally applies to non-Indian activities, though federal regulations may also apply. Today, many Indian reservations contain a “checkerboard” of land ownership, with parcels owned by the tribe or tribal members next to parcels owned by non-members and state and local governments, along with federal lands held in trust for the tribe or tribal members. On these reservations, tribes are not currently able to independently promulgate comprehensive regulations to protect their on-reservation resources.

The remaining GLIFWC-member bands (Bay Mills, Lac Vieux Desert, St. Croix and Mole Lake) acquired reservations after Congress passed the Indian Reorganization Act in 1934. By this time, the federal government had disavowed the allotment policy because of the significant amount of Indian lands that were lost. Due to the historical circumstances, these reservations are comparatively small and have a limited jurisdictional reach. Accordingly, these tribes face similar challenges in creating sufficiently comprehensive resource regulations as the bands that experienced allotment.

²⁴ But see (Bay Mills Consent Decree) which allows tribal members to exercise their treaty-protected rights on private property belonging to tribes and tribal members.

Intertribal natural resource management

Like other communities, the Ojibwe Bands are motivated to protect their forests from forest pests for a variety of different reasons. Trees indigenous to the northwoods are deeply significant to Ojibwe communities. As illustrated in previous sections of this report, these trees provide sustenance, medicine, building materials and heat, and have spiritual significance as well. Native trees provide tribal members with opportunities to carry on traditional activities, and to teach those activities to youth and other individuals interested in learning about Anishinabe culture. Additionally, tribal forestry programs provide tribes and tribal members with income and jobs. According to the Bureau of Indian Affairs - Great Lakes Agency, 14,786 million board feet (MBF) of timber with a monetary value of \$1,309,192 was harvested from tribal lands of five Ojibwe tribes in 2014 (Bad River, Lac Courte Oreilles, Lac du Flambeau, Sokaogon and Fond du Lac) (BIA- GLA 2014). Many Ojibwe families also earn a significant portion of their income from the harvesting and processing of tree products (April Stone-Dahl, pers. comm., 19 March 2015). In these ways, native trees support Indigenous sovereignty.

Off-reservation, GLIFWC member tribes reserved their rights to harvest resources through various treaties. *LCO* 700 F.2d 341 (7th Cir. 1983), *cert. denied* 464 U.S. 805 (1983). The practical implication of those reservations, as agreed amongst the tribes and the states, is that GLIFWC-member tribes maintain their law-making and enforcement authority over tribal member harvesting within the ceded territories, as long as they can show that their regulatory system is sufficiently protective in terms of conservation and public safety. *Lac Courte Oreilles v. Voigt*, (“LCO III”), 653 F.Supp. 1420 (W.D. Wis. 1987). As treaty rights are held collectively by tribes, tribes engage in coordination of harvesting activities: to adopt and enforce appropriate standards, stay within tribal allocation of resources, and engage in intertribal “co-management” to effectively manage and regulate tribal harvesting and prevent regulation by states.

Ojibwe tribes in Wisconsin developed intertribal protocols on the harvest of particular species and an intertribal agreement covering resource management (*Ojibwe Intertribal Agreement Governing Resource Management and Regulation of Off-Reservation Treaty Rights in the Ceded Territories*). That agreement sets forth the responsibilities of the Voigt Inter-tribal Task Force (VITF) to develop inter-tribal management plans, harvest goals and model regulations applicable to the resources subject to treaty harvesting. The tribes also formed GLIFWC, an intertribal agency functioning through governmental authority delegated by each of its member tribes. GLIFWC assists tribes with coordination of harvesting and provides governmental services related to conservation enforcement, biology, public information and inter-governmental affairs.

As part of the *Mille Lacs Band v. Minnesota* litigation, a protocol between that State and eight Tribes establishes a Minnesota 1837 Ceded Territory Wildlife and Plant Resources Committee. This committee is the forum in which the parties to the case discuss and coordinate wildlife and plant management within the 1837 treaty ceded territory. In particular, the committee is required to meet at least once a year, and is responsible for developing, reviewing and analyzing relevant survey and harvest data, considering harvestable surplus levels, reviewing proposed changes in Band and State hunting, trapping, and gathering regulations and codes, and addressing other wildlife and plant management issues in the 1837 ceded territory.

One of GLIFWC’s member tribes (the Bay Mills Indian Community) is a signatory to the Treaty of 1836, which includes the eastern Upper Peninsula and part of the Lower Peninsula of Michigan. That tribe (and four others that are not GLIFWC members) have entered into a Consent Decree with the State of Michigan that governs

how treaty rights in inland areas are to be exercised. As required under the Consent Decree, the Tribes and the State have entered into an Information Sharing and Consultation Protocol in which they meet at least annually to review the status of inland resources. Separate litigation (not relevant to forest pests) governs the exercise of treaty rights in the 1836 ceded territory within Lakes Huron, Michigan and Superior.

Inland portions of the western Upper Peninsula were ceded in the Treaty of 1842. Because there has been no court case related to treaty-reserved rights in this inland portion of Michigan, no formal intertribal or State/Tribal protocols exist with respect to coordination of resource management. However, National Forests in this area are part of the Tribal-USFS Memorandum of Understanding discussed later in this document. In addition, informal mechanisms for intertribal and tribal-State coordination are in place.

Since the tribes first resumed regulating their members' off-reservation harvesting activities and developed the first versions of their model codes, these model codes have been continually adjusted due to changes in the condition and abundance of the resources, greater biological understanding of those resources and changes within the broader political context. The introduction of non-native forest pests seriously threatens the health of various tree populations within the United States, triggering political responses in the form of new state, federal and international laws. Likewise, the threat posed by these pests may require the tribes to develop regulatory systems (or other methods of influencing tribal member behavior), especially if other governments have adopted regulations for non-tribal forest users within the ceded territories. If tribes fail to develop an effective method of influencing or controlling tribal member behavior in relation to forest products and it becomes clear that these measures are critical for conservation of certain valued species, then tribes must either take action or state law may apply to certain aspects of tribal harvesting. In developing regulatory responses, tribes retain self-governing authority and are generally not required to adopt the exact same regulations as states. The courts recognize that tribes should be free to govern their members in manners consistent with their cultural norms.

In developing regulations or other methods of influencing off-reservation harvesting behaviors that protect ash, maple or other vulnerable trees, tribes may choose to adopt regulations (or take other measures) individually or on an intertribal basis. Within the Ojibwe intertribal resource management framework, although individual tribes have delegated a portion of their self-governing authority to GLIFWC, they retain all law-making rights. Most GLIFWC member tribes have adopted some form of a "model code," which are minimum standards covering the full-range of harvesting activities. Tribes who have adopted model codes are free to enact stricter standards, but cannot adopt anything weaker. Accordingly, regulations governing the treatment of forest products could be incorporated into the model codes, or tribes could simply adopt them on their own as more restrictive regulations. In lieu of new regulations, the tribes could develop educational materials, trainings, and voluntary harvest guidelines on an intertribal basis or as individual tribal governments.

Tribal regulation of off-reservation harvesting on state and federal lands

GLIFWC member tribes have established formal relationships with state and federal agencies which own lands within the ceded territories for tribal harvest of forest products on those lands. These agreements have allowed for tribal members to harvest forest products under tribal law, in recognition that tribal law is sufficiently protective of the resources. One such relationship is with the US Department of Agriculture and its subordinate agency, the USFS. The USFS manages four national forests within the territories ceded by the

Treaties of 1836, 1837 and 1842: the Chequamegon-Nicolet National Forest located in Wisconsin, and the Ottawa, Hiawatha and Huron-Manistee located in Michigan. The Memorandum of Understanding (MOU) between the tribes and the USFS [MOU 1998 (amended 1999, 2012)] provides for the regulation of tribal member harvest of forest products from National Forest properties. Within the states of Michigan, Minnesota and Wisconsin, most GLIFWC tribes have also developed formal agreements on the harvest of forest products.

In 2007, the VITF adopted voluntary guidelines regarding the transport of firewood at campgrounds owned by the State of Wisconsin and the USFS. Adoption of these guidelines was required to prevent the imposition of USFS or Wisconsin regulations regarding firewood use at these campgrounds.

Tribal - USFS Memorandum of Understanding

The MOU was ratified by the tribes and the USFS in 1998 and updated in 1999 and 2012. It provides the framework for treaty harvesting activity on National Forest properties located within the ceded territories of 1836, 1837 and 1842. The parties agreed for tribal members to engage in hunting, trapping and wild rice harvesting, pursuant to their duly-enacted off-reservation codes. Harvesting of forest products is permitted by specific regulations set forth in the MOU. The forest products addressed in the MOU include: timber (including salvage of downed or damaged trees harvested for firewood), sap, lodgepoles (trees less than 5" dbh), bark, boughs, and non-timber products including branchlets, roots, berries, fruits, nuts, seeds, fungi, etc. Nothing in the current agreed-upon regulations specifically addresses invasive forest pests.

Within the tribes' National Forest model code, the harvest of certain forest products requires a permit issued by the tribal conservation department. This includes bark, boughs, firewood, ginseng and lodgepoles. Small-scale harvesting of these items does not require any specific authorization, only maximum amounts (bark from up to 20 birch trees, up to 20 tons of balsam boughs, up to 10 cords of firewood, and up to 75 lodgepoles). Harvesting larger amounts requires a large-scale harvest activity permit valid for a specific area, established by the tribal conservation department in consultation with the USFS. Additional terms and conditions may apply to large-scale harvesting permits. The parties have agreed that certain areas are off limits to harvesting, including designated wilderness areas, research natural areas and special use areas.

The tribes have developed specific harvest regulations on gathering conifer boughs, princess pine, sheet moss, lodgepoles, firewood, ginseng and sap – generally addressing concerns related to general sustainability (i.e. using harvesting techniques that allow for natural regrowth). The firewood regulations are designed to avoid conflict over timber sales and prevent tribal members from causing significant erosion or downing trees too close to highways and waterbodies.

The practical effect of the MOU is that tribal members can access National Forest lands and harvest various forest products, including firewood and other tree products. After harvesting, tribal members may bring harvested materials back to reservation communities for home-heating or other purposes. Because dead and downed trees are regularly used for firewood, this activity could contribute to the spread of forest invasives.

Section 3.05 (1) of the Model Off-Reservation National Forest Gathering Code authorizes "the closure of the harvest activity of any wild plant in a National Forest generally or with respect to a particular location, whenever the continuation of the harvest is likely to cause biological harm to the species involved." In 2001 representatives from the Chequamegon-Nicolet National Forest met with the VITF representatives to discuss

an outbreak of oak wilt on the forest. After the discussion the VITF voted to authorize the GLIFWC Biological Services Director to close areas of the forest in Oconto and Forest Counties to tribal oak firewood harvest for one year. The result was emergency closure order #2001-01, which closed the area to oak firewood harvest from October 5, 2001 through October 4, 2002. This was followed by emergency closure order #2002-01 (in effect from October 5, 2002 through October 4, 2003), closure order #2004-01 (November 4, 2004 through November 3, 2005), and closure order #2005-01 (November 4, 2005 through November 3, 2006).

The National Park System – Apostle Islands National Lakeshore

The Apostle Islands National Lakeshore (AINL) is administered by the National Park Service (NPS). The Apostle Islands have a long history of use by the Ojibwe people, and remain culturally significant today (NPS 2013). The AINL prohibits the public from bringing firewood into the National Lakeshore (NPS-AINL 2006).

The *General Agreement Comprising Tribal–National Park Service Relations Regarding the Apostle Islands National Lakeshore* (“General Agreement”) outlines the government-to-government relationship between the NPS, an agency of the US Government, and 10 of the 11 sovereign federally recognized tribes that are members of the VITF and GLIFWC. (The Bay Mills Band is not a party to the agreement.) It establishes the standards by which the NPS and the Tribes will “conduct their relationship and carry out their respective responsibilities regarding protection and use of the mainland and islands that comprise the Apostle Islands National Lakeshore.” Appendix A of the *General Agreement* states that, “No member shall bring firewood from the mainland onto the Islands or move firewood from any Island to another Island or to the mainland.”

1836 and 1842 ceded territories within the State of Michigan

The State of Michigan is encompassed by two separate land areas ceded by the Ojibwe. The eastern half of the Upper Peninsula and the northwestern quarter of the Lower Peninsula are within the areas ceded in the Treaty of 1836. Bay Mills Indian Community is the only GLIFWC member tribe signatory to the Treaty of 1836 (other signatories include the Grand Traverse Band of Ottawa and Ojibwe Indians, Little River Band of Ottawa Indians, Little Traverse Bands of Odawa Indians and the Sault Ste. Marie Tribe of Ojibwe Indians). The remaining western portion of the Upper Peninsula is within the areas ceded in the Treaty of 1842. After suing the state for recognition of their treaty-reserved rights, the tribes within the 1836 ceded territory entered into the Inland Consent Decree with the State of Michigan in 2007. Part of that agreement set forth standards regarding the tribal harvest of forest products. Within the Michigan portion of the territory ceded in the Treaty of 1842, there is no formal agreement or court order outlining the parameters of the treaty rights, however this has not prevented tribal members from exercising their rights. Several signatory bands of the Treaty of 1842 have enacted codes to regulate their members’ harvesting, which include the harvesting of forest products. (Tribal members of signatory tribes who have not enacted specific codes pertaining to the Michigan portion of the 1842 ceded territory may still engage in harvesting activities pursuant to the treaty, and certainly gather forest products within National Forest properties.)

Bay Mills off-reservation code (1836 ceded territory)

The Bay Mills Indian Community has developed a State Land Utilization Code (State Land Utilization Code, no date) for implementing their Inland Consent Decree with the State of Michigan. The Utilization Code regulates activities related to the gathering of plant products, including firewood, by Bay Mills tribal members on state

lands in the 1836 ceded territory. The Utilization Code contains specific rules which apply to the collection of firewood and the gathering of conifer boughs and birch bark. (Gathering within National Forest properties is governed by a separate code, as explained above.) Permits are required for collecting firewood and gathering conifer boughs, black ash, basswood, ironwood and birch. Firewood collection is limited to dead or downed trees outside of an active state timber sale area, except with the permission of the timber sale contractor. A maximum of 5 standard (4 x 4 x 8 ft) cords can be gathered under each firewood collection permit. Regulations limit conifer bough gathering to within 20 ft of the edge of roads, designated trails and streams, and limit birch bark gathering to 33 ft from the edge of roads and trails. The regulations also prohibit establishing new trails or roads to access conifers and restrict how boughs may be harvested. Within this code, trees and tree parts may not be harvested for commercial purposes, but traditional handicrafts made from tree parts may be sold.

The 1836 ceded territory extends into the Lower Peninsula of Michigan, including lands infested by EAB. It is an open legal question whether the state-imposed quarantines would apply to tribal members harvesting ash or other hardwood products pursuant to the Forest Service MOU or State Land Utilization Code.

Keweenaw Bay, Lac Vieux Desert, Bad River, Red Cliff, Lac du Flambeau, Lac Courte Oreilles, St. Croix and Fond du Lac (1842 ceded territory)

The gathering of forest products under these tribes' Off-Reservation Conservation Codes on National Forest lands is governed by the MOU (explained above). Tribes may have enacted codes governing the gathering of forest products on other lands, but there is no litigation or agreement with the State with respect to treaty rights exercise on those lands.

Sokaogon Indian Community (1842 ceded territory)

The Sokaogon Indian Community, also known as Mole Lake, enacted an Off-Reservation Conservation Code in 2015, which provides for their tribal members to harvest forest products on National Forest lands, pursuant to the MOU (explained above), on privately held lands open to public gathering pursuant to Michigan law (and with consent of the land owner), and on public lands identified as open for tribal gathering by the VITF (no such lands have been identified to date). The regulations for non-National Forest properties are nearly identical to the regulations applicable to the National Forest.

1837 and 1854 ceded territories within the State of Minnesota

The State of Minnesota contains two separate areas of ceded territory, within which various GLIFWC member tribes retain the rights to hunt, fish and gather. In the Treaty of 1837, tribes ceded lands which now comprise the east-central area of Minnesota, while in the Treaty of 1854 tribes ceded lands directly north of that area. The 1854 Treaty Authority has been delegated the authority to enforce an agreement between the State and its two member tribes, the Grand Portage and Bois Forte Bands, that governs how treaty rights are exercised. The Fond du Lac Band also exercises treaty rights in the 1854 ceded territory pursuant to less formal agreements with the State of Minnesota.

Tribes signatory to the Treaty of 1837 include the Mille Lacs Band of Ojibwe, Fond du Lac Band of Lake Superior Chippewa, St. Croix Indian Community, Lac du Flambeau Band of Lake Superior Chippewa, Red Cliff Band of Lake Superior Chippewa, Bad River Band of Lake Superior Chippewa and the Lac Courte Oreilles Band of Lake

Superior Chippewa. Each of these bands has enacted a code covering off-reservation harvesting activities within the 1837 ceded territory within Minnesota. (There are no National Forest properties within the Minnesota portion of the 1837 ceded territory.)

According to the tribes' off-reservation conservation codes, the harvesting of forest products is limited to certain public and private lands open to the general public for gathering under state law. Specific permits are required for gathering any forest products. These permits may set forth specific conditions under which gathering can occur. Tribal natural resources departments issue these permits following consultation with the public land manager. Although there is nothing in the code specifically addressing forest invasives, tribal natural resources departments could add provisions in the permits issued for the harvest of firewood and other tree products requiring the use of phytosanitary measures.

1837 and 1842 ceded territories within the State of Wisconsin

Although the northern third of Wisconsin is bisected by two areas of land ceded in separate treaties, treaty-rights litigation within the state has collapsed any differences. There are differences in which Ojibwe tribes with reservations outside of Wisconsin are signatory to each treaty, but because the state has not recognized those tribes, the ceded territories are treated as one unit.

In addition to the harvesting of forest products within the Chequamegon-Nicolet National Forest pursuant to the MOU (as explained above), tribal members can harvest on certain properties owned by the State of Wisconsin. Gathering on state and non-public lands is regulated by each tribe's Off-Reservation Conservation Code specific to the Wisconsin portion of the 1837 and 1842 ceded territories. These regulations are nearly identical to the regulations from the MOU, and do not specifically address invasive forest pests. Like the code provisions applicable to gathering in the National Forests, tribal natural resource departments can add provisions for large scale harvesting of certain products. Tribal natural resource departments could certainly add conditions related to phytosanitary measures to the large scale permits they issue.

Voluntary tribal guidelines

In 2007, the USFS and the State of Wisconsin had implemented restrictions on firewood brought into their campgrounds and informed the tribes that these restrictions would apply to tribal members unless the tribes developed regulations or guidelines. This issue was brought to the VITF in September 2007, and in October 2007 the VITF approved the following voluntary guidelines regarding firewood transported into State of Wisconsin and USFS campgrounds:

- In general, tribal members should avoid bringing firewood which was gathered at a long distance from the campground.
- If camping between October and April, take home any unburned firewood. The rationale behind this guideline is that potentially unsafe firewood should be burned to destroy EAB larvae. Unburned firewood left at campsites could harbor larvae which would mature and emerge in the spring.

- If camping during the summer months, only firewood that has been seasoned for at least two years should be brought to campsites. The premise underlying this guideline is that EAB larvae are no longer present in trees cut two years ago.

These guidelines will likely be updated soon, as current research indicates that they may not be entirely effective at preventing the spread of forest invasives.

Existing tribal on-reservation regulations relating to forest pests

GLIFWC member tribes have developed regulations for gathering firewood and other “miscellaneous forest products”, and several have regulations on EAB which apply on their reservations. A summary of these regulatory schemes follows.

Bay Mills Indian Community

The Bay Mills community was the first GLIFWC member tribe to be impacted by the EAB. In 2005, EAB-infested ash trees were found in Brimley State Park, just outside the reservation boundary (St. Ignace News 2006, Storer et al. 2009). The Bay Mills Executive Council has passed several resolutions in response. In November 2005, they passed resolution 05-11-14 prohibiting transport of firewood to and from Bay Mills Indian Community lands in Superior Township, without a permit from a Bay Mills Conservation Department. In 2013, after the MI DARD had found new EAB infestations in Chippewa and Mackinac Counties, the Council passed 09-12-14-A, extending the quarantine to tribal lands in these counties. Tribal members transporting firewood without the required permit may be subject to a civil penalty of up to \$5000.

In 2009 the Executive Council passed Resolution 09-4-13C, reaffirming the establishment of a tribal black ash reserve of about 10.54 acres, which was established by the Executive Council in 2004. In 2013 Resolution 13-5-28B was passed to better define the boundaries of the black ash reserve, which after a detailed land survey was found to cover approximately 9.99 acres. Tribal members can harvest trees from the reserve with a permit from the Executive Council.

Keweenaw Bay Indian Community

The Keweenaw Bay Indian Community has not enacted any specific regulations concerning EAB or any other forest pests. The tribe does require its members to obtain permits from the Community and from the Bureau of Indian Affairs for harvesting trees, tree parts or sap located within the boundaries of the L’Anse and Ontonagon Reservations. These permits are issued in accordance with the requirements set forth in the Community’s Forest Management Plan.

Lac Vieux Desert Band of Lake Superior Chippewa Indians

The LVD reservation has only a handful of ash stands within and immediately outside of the reservation (pers. obs.). The band placed purple panel traps to monitor for EAB in these stands in 2013, and will probably do so again in 2015 (Roger LaBine, LVD Planning and Environment Department, pers. comm. by phone, 2015 April 13). According to LaBine, the tribe does not have a formal response plan.

Lac du Flambeau Band of Lake Superior Chippewa Indians

The Lac du Flambeau Forestry staff has developed a draft forest pest response plan (Scott McDougall, pers. comm. by phone, 2015 April 4). The plan is being reviewed. The Forestry Department plans on putting four purple panel traps up on the reservation this year to monitor for EAB.

Sokaogon Chippewa Community

Article IV.5 (“Insect and Disease Protection”) of the Sokaogon Chippewa Community’s 2011 Forest Management Plan mentions that response plans to slow the spread of the EAB being developed, and would be added as an amendment to the plan when completed (Sokaogon Chippewa Community 2011). A response plan has subsequently been developed (Quade, no date). Quade (no date) notes that the Sokaogon tribe has six stands totaling 310 acres classified as ash stands, the least amount of ash of all the tribes in the BIA-GLA management region. In summer 2010 the Forestry Department placed EAB detection traps on reservation lands, but has not placed traps since then (Quade, no date).

Once the EAB is detected in Forest County or neighboring counties, the Sokaogon Community’s Forestry and Recreation Department plans to remove all merchantable ash (ash > 4” dbh) from all six ash stands. Ash trees of less than 4” dbh will be left to grow. A tree removal service will be hired to remove ash in residential areas.

The Sokaogon Chippewa Community’s forest plan also includes a concise review of European gypsy moth biology and impacts, as well as federal regulations pertaining to the movement of regulated articles from quarantined areas to unquarantined areas. The Sokaogon community and surrounding Forest County, Wisconsin are within the “generally infested area” quarantined for the gypsy moth (Figure 10).

Red Cliff Band of Lake Superior Chippewa Indians

The Red Cliff Band of Lake Superior Chippewa has a comprehensive response plan (Norwood 2013) that includes strategies for prevention, detection, communication, regulation and management. The goal is to “minimize and delay the destructive effects of EAB on Red Cliff’s ash resources and forest.”

Red Cliff tribal regulations outline provisions for logging and firewood harvest on tribal lands. Red Cliff tribal members cutting for home use on the reservation require a tribal woodcutting permit from the Red Cliff Environmental Office. The Environmental Office can issue tribal woodcutting permits only to members for home use. Only one person per household can hold a permit.

Loggers must obtain a commercial logging permit from the tribe’s environmental office, after approval by the Tribal Council. All permits are subject to any timber cutting regulations promulgated by the tribe.

Mille Lacs Band of Ojibwe

The Mille Lacs Band’s environmental and natural resource statutes has provisions for enrolled members of the “Non-Removable Mille Lacs Bands of Chippewa Indians” to harvest any species of tree within the Mille Lacs Band Reservation, if they first obtain a valid wood-cutting permit from the Natural Resource Office or Clerk of

Court (Mille Lacs Band Statutes 2004). Wood-cutting permits designate the type of wood product to be cut, specify the area where cutting is allowed, and the number of cords authorized. Permits are good for 30 days, with a 15 day extension allowed for bad weather. The Mille Lacs Band Statutes do not include provisions pertaining to movement of firewood or forest invasives.

Remaining GLIFWC member bands

As of this writing, the following GLIFWC member bands have not yet adopted on reservation laws related to gathering firewood or miscellaneous forest products: Bad River Band of Lake Superior Chippewa, Fond du Lac Band of Lake Superior Chippewa, Lac Courte Oreilles Band of Lake Superior Chippewa and St. Croix Chippewa Indians of Wisconsin.

Regulations as a Tool

Motivations for compliance

While quarantines alone are usually effective with large organized industries such as paper mills and biomass plants, they are not effective in limiting movement of firewood (Diss-Torrance and Peterson 2014). The firewood industry includes numerous small commercial producers and members of the public, who move firewood in delivery trucks to retail outlets across the US, and in cars, pickup trucks, and vans to homes and campsites (Peterson and Diss-Torrance 2012). Educating the public on why they shouldn't move firewood long distances and convincing them to follow regulations prohibiting the movement of firewood is always a major challenge (Peterson and Diss-Torrance 2012).

As related by Peterson and Diss-Torrance (2012, 2014), the effectiveness of regulations depends on the willingness and ability of the regulated to comply. The social science literature on environmental regulation suggests three general motivations for compliance: calculated, normative, and social. Outdoor recreation is usually pursued sporadically on public lands, where costs of compliance and non-compliance are generally low.

As part of their research into the social aspects of firewood regulation compliance in Wisconsin, Peterson and Diss-Torrance mailed out 800 surveys to randomly-selected campers who used the state's parks and forests in 2006, 2008, 2010 and 2012, receiving a remarkably high 62% response rate overall (Diss-Torrance and Peterson 2014). The survey data showed that 94% of all campers had a campfire on their most recent trip, and that 87% replied that campfires are "extremely important" (Peterson and Diss-Torrance 2012). They found that the most important factors in the decision to move firewood long distances were the belief that firewood prices at or near the campground were too high, the availability of wood at home, and the type of camping people do - those with mobile homes and trailers were more likely to bring wood and were willing to pay less than those using tents (Diss-Torrance and Peterson 2014). The opinion that firewood at or near the campground was of lower quality than what they could bring, and the availability and price of firewood were also important factors. Social norms also played a role - those who felt that their friends and family were committed to not moving firewood were more likely to comply with the rules. A sense of moral duty increased with increased knowledge of the EAB and its impact (Peterson and Diss-Torrance 2012).

Wisconsin's strategy for compliance

The WI DNR has taken a proactive approach to educating citizens on the risks of moving firewood. At Wisconsin state campgrounds, regulations are used as a tool to impress upon visitors that moving firewood long distances can have serious consequences (Diss-Torrance and Peterson 2014). Firewood regulations are mentioned in reservation process and repeated in the message confirming reservation. Reminder postcards are sent to past visitors, and the “don’t move firewood” message is sent out with hunting, fishing, and recreational vehicle licenses.

Upon arrival at a state campground, visitors are asked whether they have firewood with them. If their firewood was obtained from more than 10 miles away and is not USDA or DATCP-certified, it is confiscated. This immediate enforcement grabs their attention, providing a “teachable moment” for park staff to explain why it’s important to not transport firewood. As a last resort regulations can be used to stop the handful of visitors intent on violating the law. To date the need for enforcement and prosecution has been almost nonexistent (Andrea Diss-Torrance, pers. comm., 2015 March 19).

To encourage visitors to leave their firewood at home, the WI DNR has contracted with local firewood producers to provide a reliable supply of high-quality, reasonably-priced firewood at state campgrounds. The firewood is now stored under shelters, providing a visual cue that it is good firewood worth taking care of. Marketing campaigns emphasize that it’s easier, cheaper and more convenient to get your firewood at your destination than to haul it from home. The messages also emphasize that most campers have stopped moving wood, appealing to the desire of most people to be “part of the group”.

The results of this campaign have been impressive. From 2006 to 2012, the number of respondents who brought firewood from farther than the allowed limit went from about 42% to about 8% (Diss-Torrance and Peterson 2014). The percentage of campers who got wood inside or near the state properties increased significantly, the percentage aware of firewood regulations on state lands increased from just over 65% to about 94%, and the percent aware of the link between firewood movement and pests went from about 68% to about 98%. The perception that invasive pests pose a significant threat and that it is important to stop moving firewood also increased. While their results technically apply only to their study area (Wisconsin), Peterson and Diss-Torrance (2014) conclude that providing cheap, good-quality firewood at or near campgrounds is generally a lower cost and more socially acceptable approach for discouraging firewood movement than increased enforcement and imposing fines.

RESPONSE PLANS

Michigan

Michigan’s Community Preparedness Plan (MI DNR and MI DARD 2008) is a detailed guidance to Michigan communities. As stated in the introduction, this plan is intended as a “tool to help establish a framework for local EAB preparedness and community action by outlining major issues and providing guidance on how to address them.”

Michigan's plan provides information on EAB identification and symptoms of EAB infestation. It goes into great detail on how a city, town or other municipality should go about conducting a tree inventory. It covers budgeting and how to identify essential personnel, resources, and procedures. It outlines the tough economic, environmental, legal and social issues that communities face when the EAB arrives in town.

Among other resources the Appendices of the plan give an extensive list of tree inventory programs, methods and sample calculations for estimating cost of ash removal and replacement, and a template for a tree removal contract. A major drawback of the plan would seem to be that it is simply guidance for communities, which are on their own to implement it.

Wisconsin

Wisconsin has developed a detailed strategic plan addressing the arrival and spread of the EAB in the state. The Wisconsin Emerald Ash Borer Strategic Plan (WI DATCP and WI DNR 2014) was developed by the WI DATCP and the WI DNR to "help guide prioritization, development and implementation of actions related to threats and harm caused by EAB in the state." Unlike Michigan's plan, the Wisconsin Strategic Plan outlines the active role that the state will take in assisting both urban and rural communities deal with the EAB.

Because eradication of the EAB has not been successful, the plan focuses on limiting the artificial (human-facilitated) and natural spread of the EAB to uninfested areas. It emphasizes cooperation between "state agencies, tribes, communities, businesses and landowners".

The plan's strategy to limit artificial spread relies on regulating movement of potentially EAB-infested material, combined with establishing and supporting firewood options that reduce the risk of spreading EAB. These include supporting a state certification program for firewood dealers, connecting the public with these dealers, and educating the public on how to avoid spreading the EAB. It outlines steps for early detection of EAB (always a difficult task) and for monitoring known infestations. It outlines strategies for working with forest landowners and communities to take proactive steps to mitigate impacts, dealing with large quantities of infested ash wood, and finding ways to put this wood to the best uses possible. It includes strategies to replace ash in cities and facilitate ecosystem recovery (especially of black ash swamps) in rural areas. The plan even outlines how to develop a public awareness campaign to alert arborists, community and private foresters, and state agency staff to the possibility of EAB-tolerant ash trees once the EAB has run its course, and how to report such trees so they can be used for propagation. An important part of the strategy is to inform the public of the impacts and costs of the EAB, and how the EAB program can benefit the state's landowners, communities and forests.

The emeraldashborer.info site provides links to EAB preparedness/response plans for about a dozen states and several municipalities (though several links are unfortunately broken or out-of-date), at <http://emeraldashborer.info/communityplan.cfm#sthash.HN0ZXlbd.dpbs>.

Minnesota

According to their "Pest Detection & Response Unit" website (MNDA 2013b), Minnesota follows the *National Strategy and Implementation Plan for Invasive Species Management* (USDA-FS 2004). (This document has been superseded by USDA-FS (2013). The state is working on a comprehensive response plan that will be structured as an Incident Command System (ICS). The structures and positions of the ICS are modular and will be filled only as needed. The Minnesota Department of Natural Resources (MN DNR) and the Minnesota Department of Agriculture (MNDA) are the two lead agencies developing the plan. Good informational sites for Minnesota communities include UMEEx (2013) and MNDA (2014).

The University of Minnesota Extension (UMEx 2009), MN DNR and MNDA have also put together a statewide First Detectors program, where volunteers are trained how to recognize EAB infestations, collect samples and alert the state. Program volunteers may be called to help others in their community examine suspicious ash trees, teach landowners how to recognize EAB infestations, deliver prevention education materials, and collect seeds for the genetic conservation program. See the Minnesota Forest Pest First Detector Program website (MN FDP 2015) for more information.

Local Governments

City of Ashland

The City of Ashland prohibits firewood that was harvested from more than a 25-mile radius of Ashland from entering its two parks with campgrounds (Prentice and Kreher Parks) (Ashland Area Chamber of Commerce 2015, Sarah Hudson, Ashland Parks and Recreation Department, pers. comm. by phone, 10 April 2015). Compliance is mostly on the "honor system", though Kreher Park has an attendant who would question visitors with wood who were not from the area (Sarah Hudson, pers. comm.).

City of Superior

The City of Superior began preparing for the arrival of the EAB several years before it was known to be present in northern Wisconsin (City of Superior 2013). Even so it was somewhat of a shock to city officials and residents when the EAB was discovered in a residential neighborhood in the "North End" of Superior in August 2013. The city had inventoried all of the ash trees in public right-of-ways, parks, and in the city's golf course (City of Superior 2014). The Superior Municipal Forest was not included in this inventory²⁵. At that time, city forestry crews identified 3,078 ash trees. In October 2013, the Superior Common Council approved a plan to remove all ash from city-managed properties (excluding the Superior Municipal Forest) by 2020. City crews began removing ash immediately, starting with the North End. Private residents are allowed to treat city-managed ash with insecticides at their own expense if they wish to. Residents must first obtain a free tree treatment permit, mainly so treated trees are not removed. The goal of the plan is to distribute the costs

²⁵ This 4,400 acres of mostly intact boreal forest and wetlands is the third largest municipal forest within a city in the nation. Black ash is abundant there. See City of Superior (2015) for more information.

associated with accelerating tree death over a manageable time period, and lessen the social and economic impact that extensive tree loss will have on their resident's quality of life (City of Superior 2014).

In preparation for the EAB's arrival the city had also purchased a new chipper that was supposed to chip the ash trees to one inch by one inch (the third dimension can be any length). This processing is assumed to destroy all EAB larvae, making the resulting chips compliant with state and federal regulations (City of Superior 2013). A small percentage of the chips exceeded this size standard though (Mary Morgan, City Forester, pers. comm., August 2013), so the chips had to be stored at an unused city-owned parking lot less than a mile north of the infestation. In December 2013 the city entered into an agreement to sell the ash wood chips to the Minnesota Power Hibbard SE Station in West Duluth (City of Superior 2014). Under their USDA compliance agreement, the ash chips may be transported outside the quarantined area between October 31 and March 31. Both the Hibbard Station and any of the city's contract haulers must enter into these agreements also. Minnesota Power pays the city a variable per ton fee for the chips, and the city pays the hauler to transport the chips to Duluth. Their agreement with Minnesota Power will continue until all the city-managed ash have been chipped, transported, and burned at their facility. Any resulting revenue is used for planting new trees.

The EAB Management Plan concludes with a brief overview of the WI DNR's program for releasing and monitoring survival of parasitoid wasps provided by the USDA (City of Superior 2014). At the time (January 2014) the city was considering working with the WI DNR to release two of the three USDA-approved EAB parasitoid wasps in the Superior Municipal Forest. (The third wasp has proven to have very low winter survival in Wisconsin.)

Douglas County

The City of Superior is located in the northwest corner of Douglas County, which in turn is the northwestern-most county in Wisconsin. Soon after the EAB was found in Superior, the Wisconsin DATCP quarantined Douglas County under Wisconsin's emergency rule, until the USDA could put a federal quarantine in place.

Douglas County lands are extensive, and include large areas of wetlands and swamps. The Douglas County Forestry Department manages over 23,000 acres of black ash swamps and almost 30,000 acres of mixed northern hardwoods that include substantial ash (DCFD, no date). The county has produced a management plan to reduce the risk of EAB (DCFD, no date). The stated primary goal of the plan is to not eliminate ash, but to "create a more diverse forest resource that is resistant to catastrophic changes affecting a single species or genera." A second goal is to "capture maximum economic value of ash wood products at high risk for EAB infestation through pre-infestation and post-infestation salvage harvests." The plan is to be implemented when the EAB is discovered within the county forest or within 5 miles of county forest holdings.

The plan relies primarily on timber operations to deal with the problem. It outlines how an attempt should be made to remove all ash from stand with less than 20% ash, and preferentially remove ash from stands with more than 20% ash. It concedes that in mucky lowland and wetland sites, riparian corridors and remote stands with no road access, infestations will be allowed to run their course. In some cases high-grading of ash would take place, to "capture the maximum economic value". It advocates discouraging ash regeneration as much as possible, including planting trees in canopy gaps and using herbicides to kill regenerating ash.

RECOMMENDED STRATEGIES FOR RESPONDING TO FOREST INVASIVES

GLIFWC member tribes maintain the right of self-government, with individual tribes developing and enforcing their own laws in areas related to resource protection and harvesting both on and off-reservation. The right of self-government is critical to tribal sovereignty, as it allows for the development of laws that are consistent with tribal cultures and meet the ever-changing needs of the community.

As part of this project, GLIFWC has been studying forest invasives for the past two and a half years. This work has shown that forest invasives constitute a substantial threat to Ojibwe resources. Human activities such as transporting wood products and importing landscaping plants have enabled these invasives to spread much more rapidly than they could on their own. Once they become established, adaptations in human activity can slow (but generally not stop) their spread.

The following recommendations are options for tribal governments to consider adopting in response to the threat of forest invasives. Some of these strategies encourage the tribes to modify their regulations related to off-reservation harvesting activities. Others are aimed at protecting on-reservation resources, as forest invasives do not respect political boundaries. Public education, ongoing monitoring and intergovernmental coordination are key components that relate to both on and off-reservation protection. All of these recommendations are meant to advance tribal sovereignty and protect tribal members from the imposition of federal and state jurisdiction, which could impede their ability to gather pursuant their reserved treaty rights.

The following regulatory strategies have been organized to show the range of options available to tribal governments. Less restrictive regulations may be appropriate now, but as the threats become more serious, tribal governments should consider more restrictive options. In general, regulations that limit the distance raw wood products travel are likely to afford more protection. A summary of the recommendations appears in Table 6 below.

Off-Reservation Regulatory Strategies

Harvest of live trees

Tribal members harvest live trees for various purposes. These activities may be affected by the introduction of forest pests into the ceded territories, and can also contribute to the spread of forest pests.

Recommendation 1(a): Develop a system for tribal compliance agreements for off-reservation tribal harvest of ash trees.

Tribal governments could approve a system allowing tribal natural resource departments to develop agreements with tribal ash harvesters, to ensure that the harvesters are aware of best management practices for ash harvesting and comply with those practices. GLIFWC can assist tribal natural resource departments in developing compliance agreements and providing up-to-date information on best management practices, including peeling portions of the bark of harvested ash trees to look for signs of EAB and other precautionary measures.

Rationale: Allowing tribal natural resources departments to enter into compliance agreements with ash harvesters supports tribal sovereignty by keeping the certification process at the level of the tribe, and likely pre-empting state or federal regulations.

Recommendation 1(b): Develop a permitting process specific to the small-scale harvest of ash trees within the model code for USFS properties.

Currently, the USFS model code provisions governing the harvest of live trees larger than lodge poles require tribal consultation with the Forest Service, an approval process that can be time-consuming and inefficient for tribal members who are looking for a limited number of trees. Tribal governments could consider requesting that the US Forest Service work with the tribes to develop a more streamlined process for small-scale harvesting of live ash trees while operating under tribal compliance agreements.

Rationale: Increasing the efficiency of the permitting process may allow tribal ash harvesters greater opportunity to access ash tree stands, which may become rare in the ceded territories due to increased commercial harvest of ash trees in advance of the EAB.

Recommendation 1(c): Amend the USFS model code provisions to prevent the harvest of living oak trees from March 15 through August 1, except for ceremonial harvest.

The tribes could consider adopting a regulation to prohibit the harvest of living oak trees from March 15 to August 1, except for ceremonial harvest. In the case of ceremonial harvest, other measures can be taken to protect trees. (Prompt application of water-soluble latex paint or tree paint to the damaged areas can prevent oak wilt in most cases.)

Rationale: Oak wilt is effectively spread overland by beetle vectors from spring bud swelling until two to three weeks after full leaf development (typically from April 15 to July 1 in the Great Lakes states) (see O'Brien et al. 2011). Wounding or cutting down oak trees during this period can encourage the spread of oak wilt.

Balsam and other true fir (Abies) species

The balsam wooly adelgid (BWA) is not yet known to occur within the ceded territories. Recommendation 2(a) is aimed at preventing the BWA from reaching the Upper Peninsula of Michigan. Should the BWA become established in portions of the ceded territories (and chances are that it will eventually), recommendation 2(b) could be enacted to slow the spread of this invasive insect, allowing more opportunity for infestations to be discovered early and/or eradication efforts to be implemented. Except for Michigan, state and federal governments have not taken measures to respond to the BWA as they have with other forest invasives, perhaps due to the political clout of the holiday greenery and nursery industries. If the tribes instituted serious measures to prevent the spread of the BWA, state and federal agencies may feel pressure to follow suit.

Recommendation 2(a): Amend the Forest Service Model Code to prohibit the movement of balsam and other true fir (*Abies* spp.) materials from Michigan's Lower Peninsula to the Upper Peninsula across the Mackinac Bridge.

Tribal governments could adopt a provision in the model code governing gathering activities within USFS lands, prohibiting tribal members from transporting balsam products from the Lower Peninsula of Michigan to the Upper Peninsula.

Rationale: The majority of tree-destroying forest invasives in North America have arrived on eastern ports, becoming established on the east coast. The BWA is established in the eastern US, as far west as West Virginia and central New York. Prohibiting the movement of *Abies* material into the Upper Peninsula may help delay or prevent nascent Lower Peninsula BWA infestations from reaching the Upper Peninsula, as the European beech scale recently did.

Note: This regulation is more restrictive than Michigan's balsam fir external quarantine law, which does not restrict transport of *Abies* materials across the Mackinac Bridge. If the tribes adopt such a regulation, it may encourage the states to take a proactive stance against the BWA. Currently, political pressure from the Christmas tree and nursery industry has prevented the states from enacting comprehensive measures to protect our region from this invasive insect.

Recommendation 2(b): Establish quarantine areas for BWA and amend various tribal laws to prohibit the movement of balsam fir materials from areas within the ceded territories infested with BWA to uninfested areas.

If the BWA became established within parts of the ceded territories, the tribes could consider establishing quarantine areas within the ceded territories to delineate BWA infestations and limit the human-assisted spread of the organism. Concurrently, the tribes could amend their off-reservation model codes to prevent tribal members from bringing *Abies* boughs and other products harvested within areas known to harbor BWA to areas still free of the organism. No restrictions would be needed to transport *Abies* products within contiguous quarantine areas or within non-quarantined areas. Exceptions could include completely debarked logs, lumber, and firewood, lumber treated with preservatives, lumber, pallets and other wood compliant with and bearing the markings indicating compliance with ISPM15 standards, seeds and cones, and composted or shredded bark.

As BWA has become established in several states in the eastern United States, tribal governments might also consider adopting an on-reservation regulation now to prohibit the importation of live balsam and other risky balsam products from counties (state and provincial) known to have BWA infestations.

Rationale: Balsam fir is a very common tree across the ceded territory, occurring in virtually all natural, forested habitats except droughty sand plains. Therefore there is normally little if any need to travel long distances to reach good stands of balsam fir. Even with the imposition of tribal quarantine areas, it is likely that boughs and other materials would still be readily accessible within the ceded territories.

Firewood

Firewood is a major vector for the transport of a number of destructive forest invasives, including the emerald ash borer (EAB). By adopting regulations to limit the spread of forest invasives through the transport of

firewood, tribes could protect valuable forest resources, advance tribal sovereignty and shield tribal members from the imposition of state and federal regulations.

Note: The mountain pine beetle (MPB) typically feeds only on pine trees while the Asian longhorned beetle (ALB) feeds on a variety of hardwood tree species, favoring maple (*Acer* spp.) trees. Neither organism is expected to reach the ceded territories anytime soon. If they do, however, the tribes may consider imposing regulations to slow their spread.

Recommendation 3(a): Amend the USFS Model Code to prohibit the movement of all untreated firewood and logs from Michigan's Lower Peninsula across the Mackinac Bridge to the Upper Peninsula.

Tribal governments could adopt a provision in the model code governing gathering activities within USFS lands, prohibiting tribal members from transporting logs and firewood from the Lower Peninsula of Michigan to the Upper Peninsula.

Rationale: The majority of tree-destroying forest invasives have arrived via eastern ports, becoming established on the east coast before moving west. Prohibiting the movement of firewood from the Lower Peninsula to the Upper Peninsula may help delay or prevent transport of presently-established or future forest invasives from eastern North America.

Note: By including untreated conifer as well as hardwood logs and firewood, this regulation would go beyond Michigan's emerald ash borer quarantine law, which prohibits the transport of untreated hardwood logs and firewood (but not conifer wood) across the Mackinac Bridge. It would also complement Bay Mills Indian Community resolution 05-11-14, which prohibits the movement of all firewood (conifer and hardwood) onto Bay Mills tribal lands.

Recommendation 3(b): Adopt tribal firewood quarantine areas for EAB, ALB and MPB.

As the EAB becomes established in new locations within the ceded territories, tribal governments could respond by establishing hardwood firewood quarantine areas, and prohibiting the transport of hardwood firewood from quarantine areas to non-quarantine areas. The tribes would need to decide the parameters of their quarantine areas. While state and federal agencies have generally used county and state lines to delineate quarantine areas, other methods of delineation might also be used (i.e. a 25-mile radius from the site of any known infestation.) If the tribes adopt a distinct methodology for delineating quarantine areas, additional resources will be needed for monitoring and publicizing tribal quarantine zones.

Rationale: When combined with public outreach and education, quarantines on firewood transport can slow the spread of forest invasives by limiting the human transport of these organisms.

Note: The EAB is currently established in the Lower Peninsula and the eastern half of the Upper Peninsula of Michigan (1836 Ceded Territory), the Keeweenaw Peninsula (1842 Ceded Territory), and within the City of Superior, northwest Douglas County, Wisconsin (1842 Ceded Territory). It was recently discovered within the City of Rhineland, Oneida County, Wisconsin (1842 and 1837 Ceded Territories). The ALB and MPB are not known to occur anywhere within the ceded territories, therefore no quarantine zones for these organisms are currently required.

Recommendation 3(c): Amend the model codes governing off-reservation harvesting to prohibit the transport of uncertified firewood into off-reservation public lands from more than 25 miles away.

As the EAB is established within the ceded territories, tribal governments should consider adopting regulations prohibiting the transportation of hardwood firewood to off-reservation public lands that was harvested more than 25 miles away. Exceptions could be made for certified firewood and firewood collected within the same national forest, state park or other property where it is used, as long as these properties remain non-quarantined.

Rationale: Many important and potentially vulnerable forest resources are available to tribal harvesters on public lands, including maple, black, green and white ash, and oak and other trees. Adopting distance limits on firewood transportation to off-reservation public lands may help delay or even prevent forest invasives from reaching these important resources. Furthermore, adoption of protective regulations advances tribal sovereignty by preempting the imposition of state or federal regulations.

Note: Currently, Michigan prohibits ash firewood from being brought onto DNR-managed lands, including state parks, campgrounds, recreation areas, water access sites and forests. Wisconsin prohibits the transport of uncertified firewood harvested more than 10 miles from state DNR-managed lands. Minnesota does not allow visitors to bring firewood into state parks or other MN DNR properties unless they obtain it from within the park, from state-registered vendors who sell non-ash wood harvested from within 50 miles (Option A), or bring MNDA-certified wood (Option B). The Chequamegon-Nicolet National Forest prohibits uncertified firewood collected more than 25 miles from the Forest boundaries.

Recommendation 3(d): Prohibit the movement of all uncertified firewood to some or all Great Lakes islands within the ceded territories.

Tribal governments could adopt regulations preventing the transport of uncertified firewood to all islands within the Great Lakes, or to certain islands. We note that Madeline Island contains both on-reservation lands (Bad River Reservation) and public lands accessible for harvesting by all tribes party to the Treaty of 1842.

Rationale: Forest invasives are unlikely to reach these islands on their own, but can be easily transported to them in firewood.

Note: This restriction would mirror Michigan's EAB quarantine, which bans firewood to Michigan Great Lakes islands regardless of whether the county they are part of is quarantined. It would be more restrictive than Michigan's EAB quarantine in that Michigan may allow movement of firewood to these islands under a compliance agreement (presumably this exception is rare). Appendix A, Chapter 3.05 of the 2013 Apostle Islands General Agreement (NPS 2013) already prohibits the transport of firewood from the mainland to the Apostle Islands, from the islands to the mainland, or between islands. The general public is prohibited from bringing firewood into any part of the National Lakeshore.

Educational Strategies

From our discussions with tribal harvesters on the topic of forest invasives, it appears that most members who gather forest products are highly motivated to “do the right thing” and engage in practices that prevent the spread of forest invasives. Members who gather generally appreciate the gifts that healthy forests provide in the form of maple sap, medicinal plants, birch bark and black ash for basket materials, and more. Providing members with good-quality information about how their harvesting practices can help protect the forest is likely to prove as effective, or more effective, than simply adopting new regulations.

Recommendation 4: Develop and disseminate educational materials on the current best practices for gathering off-reservation.

GLIFWC and the tribes should continue to devote resources to monitoring forest invasives and developing up-to-date responses. In the event that the tribes adopt quarantine areas, staff time should be devoted to keeping these quarantine areas updated as forest invasives spread into new areas or are successfully eradicated. Tribes and the VITF should receive periodic reports regarding the status of forest invasives within the ceded territories and modifications that may be needed to keep their regulations current.

Currently, GLIFWC is developing best management practices (BMPs) and other outreach materials to provide members with information on how they can help slow the spread of forest invasives. These materials will be provided to tribal natural resource departments and distributed at registration stations to members obtaining gathering and camping permits. In addition, GLIFWC could use residence and permit data from the NAGFA system to create targeted mailing lists of members who might benefit from information on particular forest invasives. For instance, because the EAB is already established in the Twin Cities, Superior and Rhinelander, members from those areas who obtain gathering or camping permits could also receive information on EAB and BMPs on firewood, reminding them not to bring firewood from home.

Recommendation 5: Use community events such as powwows to educate members and visitors about the threat posed by forest invasives.

Tribes should consider adopting on-reservation regulations aimed at keeping potentially infected firewood from being imported onto their reservations. Specifically, we would recommend prohibiting visitors or members from bringing uncertified firewood that was harvested far away to powwows and other community events. Instead, the tribes could consider providing campers good-quality, free or low-cost local firewood, while confiscating non-compliant firewood. Powwow literature and websites should advertise the fact that non-compliant firewood will not be allowed, and that firewood will be available on-site. Tribal staff or GLIFWC staff may be available to provide public information on forest invasives at these events to educate the public about risks these invasives pose to tribal independence and sovereignty.

Recommendation 6: Advise natural resources and conservation enforcement staff on forest invasives, and develop on-going strategies to manage for these invasives on and off-reservation.

Tribes should consider devoting tribal or GLIFWC resources to training their natural resource staff members on forest invasives. Staff should be provided with current information on identification, known distribution and

risks associated with these organisms. Training should also provide them with working knowledge of the various strategies to combat the spread, including the best management practices and model code provisions specific to forest invasives. Specialized training could be developed to assist conservation enforcement staff in identifying tree species of concern, practices that threaten tribal forest resources and protocols for educating and (if need be) citing tribal members violating the code.

Intergovernmental Coordination

Recommendation 7: Engage with local and regional partners in monitoring and managing forest invasives.

Some GLIFWC member tribes already participate in “Cooperative Weed Management Associations”, or CWMAs. These organizations include tribal, state and federal agencies, local governments and private landowners, and focus on addressing invasive, non-native plant species within a given area on a cooperative and coordinated basis. Their activities include regular meetings which are open to the public, data sharing, and the coordination of projects and events to eradicate invasive weeds. Similar coalitions could be formed to monitor and address forest invasives. Alternatively, the scope of existing CWMAs could be expanded to include forest invasives.

Recommendation 8: Engage with state and federal policy-makers and legislators to develop better enforcement strategies to combat forest invasives.

GLIFWC member tribes should also consider developing legislative and/or policy positions to encourage other governments to proactively address forest invasives. Currently the policy conversation on forest invasives emphasizes economic considerations, with state and federal agencies making a cost-benefit determination on regulations by comparing the costs associated with imposing a particular regulation to the potential (usually short-term) economic payoff. This type of analysis has encouraged risky behavior. For example, state and federal agencies currently allow tree farms in the ceded territories to import fir (*Abies* spp.) seedlings grown in areas infested by the BWA for economic reasons, an activity potentially threatening balsam fir populations. GLIFWC member tribes can assist other governments in expanding the conversation to include non-monetary values such as the potential impact of various forest invasives to tribal cultural resources, some of which are shared with non-Indians. GLIFWC member tribes may also choose to emphasize federal trust responsibility, and their right and responsibility for co-management of natural resources with federal and state agencies.

Table 6. Summary of recommended strategies for responding to forest invasives.

Recommendation	Type	Time Frame for Implementation	Forest Invasive(s) Addressed
Compliance agreement for black ash harvest	Regulatory/educational	Now	EAB
Small-scale harvest of ash permit	Regulatory	Now	EAB
Season for live oak harvest	Regulatory	Now	Oak Wilt
Import restrictions on balsam (Mackinac Bridge)	Regulatory	Now	BWA
Quarantine areas for BWA	Regulatory	When BWA becomes established somewhere in the ceded territories	BWA
Import restrictions on firewood (Mackinac Bridge)	Regulatory	Now	EAB, ALB, MPB and others
Tribal firewood quarantine for EAB	Regulatory	Now	EAB
Tribal firewood quarantine for ALB	Regulatory	When ALB becomes established somewhere in the ceded territories	ALB
Tribal quarantine for MPB	Regulatory	When MPB becomes established somewhere in the ceded territories	MPB
Prohibition on bringing firewood to off-reservation public lands	Regulatory	Now	EAB, ALB, MPB and others
Prohibition on bringing firewood to Great Lakes islands	Regulatory	Now	EAB, ALB, MPB and others
Monitor forest invasives and develop educational materials	Educational	Now	Forest invasives that threaten ceded territory resources
Powwow/community events	Educational	Now	Forest invasives that threaten ceded territory resources
Advise natural resource department staff	Educational	Now	Forest invasives that threaten ceded territory resources
Regional intergovernmental engagement and coordination	Intergovernmental coordination	Now	Forest invasives that threaten ceded territory resources
National and state-level intergovernmental engagement and coordination	Intergovernmental coordination	Now	Forest invasives that threaten ceded territory resources

ADDITIONAL RESOURCES

There are hundreds of websites by the USDA, state and federal agencies, universities and other organizations dealing with non-native forest insects and diseases. Nearly all provide accurate and useful information, often geared to a particular region or forest invasive. Some of the most comprehensive and valuable sites (along with one very good book) include:

Forest Invasives

Emerald ash borer (EAB)

emeraldashborer.info

<http://emeraldashborer.info/#sthash.1N1VSvXJ.dpbs>

This is the go-to site for accurate and up-to-date information on every aspect of emerald ash borer biology, impacts, distribution, management and control in North America. Don't miss the dozens of excellent EAB University (http://emeraldashborer.info/eab_university_ondemand.cfm#sthash.ojQ3CB2T.dpbs) webinars on cutting-edge EAB management and control by scientists, land managers and others.

The Akwesasne task force on the environment

The Akwesasne Task Force on the Environment (ATFE) works a number of environmental issues in upstate New York, including the EAB. They're transitioning to a new website (<https://sites.google.com/site/atfeonline/>), but the EAB stuff is on the old site (http://www.northnet.org/atfe/atfe_BlackAshProject.htm). See how the Mohawk Nation is dealing with the EAB!

Minnesota Department of Agriculture - Emerald ash borer early detection & rapid response

The starting point for learning about and dealing with EAB in Minnesota.

<http://www.mda.state.mn.us/en/plants/pestmanagement/eab.aspx>

Wisconsin's emerald ash borer information source

<http://datcpservices.wisconsin.gov/eab/index.jsp>

Information about emerald ash borer identification, locations, management, laws and much more.

Michigan's forest pest information site

The starting point for information on forest invasives in Michigan is the state's Department of Agriculture and Rural Development's Plant, Plant Pest and Pesticide Info website at <http://www.michigan.gov/mdard/0,4610,7-125-2390---,00.html>. Links from their home page include "Invasive and exotic species in Michigan" "What's hot with the EAB", "Michigan quarantines", and "Pine Shoot Beetle Compliance Management Program". Lots of useful resources and concise, eye-catching fact sheets.

Asian longhorned beetle (ALB)

ASIANLONGHORNEDBEETLE.COM (formerly Beetlebusters.info)

<http://asianlonghornedbeetle.com/>

Maintained by USDA-APHIS, this is the go-to site for information on Asian longhorned beetle identification and biology, how to recognize infested trees, where to report possible ALB sightings, and eradication efforts.

Mountain pine beetle (MPB)

Empire of the beetle: How human folly and a tiny bug are killing North America's great forests

by Andrew Nikiforuk (cited as Nikiforuk 2011)

(See <http://www.davidsuzuki.org/publications/books/empire-of-the-beetle/> for more information.)

This is the beetle that has been killing huge swaths of lodgepole and ponderosa pine forests from Alaska to New Mexico. Learn how fire suppression, mismanagement and human greed have set the table for the west's

oldest forest manager. Learn how human-caused climate change has allowed this insect to expand its range north and east of the Canadian Rockies to the western edge of the continent's great boreal jack pine forest, with frightening implications. If you're looking for a book on bark beetles that you can't set down, this is it. Winner of the Globe 100 Best Book of the Year award in 2011.

Thousand cankers disease (TCD)

Thousandcankers.com

<http://www.thousandcankers.com/>

The goal of this site is to "provide comprehensive, accurate, and timely information regarding issues related to the thousand cankers disease." It's a collaborative effort between the USFS Northern Research Station - Northeastern Area State and Private Forestry, Purdue University Department of Forestry and Natural Resources, the Hardwood Tree Improvement and Regeneration Center, the American Walnut Manufacturers Association, and the Walnut Council. Site created by the USFS and administered through Purdue University.

Balsam woolly adelgid (BWA)

Balsam woolly adelgid

<http://www.na.fs.fed.us/pubs/fidls/bwa.pdf>

Though a bit dated, this 11-page US Forest Service leaflet (Ragenovich and Mitchell 2006) gives a very good overview of the BWA and its impacts on fir trees in both eastern and western North America. Includes good photos of the symptoms of infestation and impacts of the BWA.

Hemlock woolly adelgid (HWA)

Biology and control of hemlock woolly adelgid

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20029649.pdf

This very nicely written 21-page report by the Forest Health Technology Enterprise Team of the USDA-Forest Service (Havill et al. 2014) summarizes the ecological importance of hemlock, the HWA's biology, status and impact, and the ongoing efforts to control the HWA (especially using biocontrol insects) and save eastern North America's great hemlock forests. Includes a fair amount of technical information yet is quite readable, with lots of great photos.

Oak wilt (OW)

How to identify, prevent, and control oak wilt

http://na.fs.fed.us/pubs/howtos/ht_oakwilt/identify_prevent_and_control_oak_wilt_print.pdf

This very nice 38-page booklet (O'Brien et al. 2011) has all the basics on how to recognize and deal with oak wilt, and how to avoid spreading it.

Lake States Woodlands: Oak wilt management-what are the options?

<http://learningstore.uwex.edu/Assets/pdfs/G3590.pdf>

This 6-page UW-Extension Publication (#G3590) (Carlson et al. 2010) also gives a very good overview of oak wilt symptom, prevention and management. Excellent photos.

General forest invasives sites

Don't move firewood

<http://www.dontmovefirewood.org/>

This informative and entertaining site has everything from downloadable posters and other outreach materials to detailed summaries on a wide variety of forest invasives. Watch dozens of entertaining, epic video clips including *Identify the Asian Longhorned Beetle* by The Nature Conservancy (TNC) and USDA-APHIS, *The Smith Family Goes Camping* by TNC, and *Ski Bro Talks Trees* by world famous extreme skier Glen Plake. Lots of good information and hours of entertainment. This site proves that learning about forest pests can be fun!

Continental dialogue on non-native forest insects and diseases

<http://www.continentalforestdialogue.org/>

This unique and valuable site (thanks to WI DNR Forest Health Specialist Andrea Diss-Torrance for letting us know about it) is a collaboration of “non-profit organizations, for-profit corporations, government agencies, landowners, and academic scholars.” Their mission statement is to cultivate and catalyze “collaborative action among diverse interests to abate the threat to North American forests from non-native insects and diseases.”

This site includes tons of information, including high-quality fact sheets and other documents on invasive forest organisms not found on other sites. The organization holds an annual meeting once a year, and posts the many presentations and cutting-edge updates from these meetings online.

Bugwood.org

<http://www.bugwood.org/>

Hosted by the Center for Invasive Species & Ecosystem Health at the University of Georgia. The Center's mission is to “...serve a lead role in development, consolidation and dissemination of information and programs focused on invasive species, forest health, natural resource and agricultural management through technology development, program implementation, training, applied research and public awareness at the state, regional, national and international levels.” It includes a wealth of accurate science-based information and thousands of photos of invasive species (including forest pests), submitted by the US Forest Service and other cooperating agencies and individuals. Photos are available for free download for nonprofit use (with proper credit).

Tribal websites

Michigan

Ginoozhekaaning (Bay Mills)

<http://www.baymills.org/>

Gakiwe 'onaning (Keweenaw Bay)

<http://www.ojibwa.com/>

Gete-gitigaaning (Lac Vieux Desert)

<http://www.lvdtribal.com/>

Wisconsin

Waaswaaganing (Lac du Flambeau)

<http://ldftribe.com/>

Zaka'aaganing (Mole Lake/Sokaogon)

<http://www.sokaogonchippewa.com/>

Odaawaa-zaaga'iganiing (Lac Courte Oreilles)

<http://www.lco-nsn.gov/>

Bikoganoogan St.Croix (Danbury)

<http://www.stcciw.com/>

Gaa-miskwaabikaang (Red Cliff)

<http://www.redcliff-nsn.gov/>

Mashkiigong-ziibiing (Bad River)

<http://www.badriver-nsn.gov/>

Minnesota

Misi-zaaga'iganiing (Mille Lacs)

<http://www.millelacsojibwe.org/>

Nagaajiwanaang (Fond du Lac)

<http://www.fdlrez.com/>

GLIFWC, Odanah, WI

Home page

<http://www.glifwc.org/>

Forest invasives website

http://www.glifwc.org/Forest_Pests/index.html

Cooperative Weed Management

National Network of Invasive Plant Centers

<http://www.invasiveplantcenters.org/cwmamap.cfm>

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