The Emerald Ash Borer

In the

State of Ohio

!A White Paper !

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THE GENERAL PROBLEM

Invasive species continue to be a growing problem in forested ecosystems in the United States. An invasive species (sometimes referred to as non-indigenous or non-native) is defined as specie that is non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the primary means of invasive species introductions.

Through history, it has been estimated that approximately 50,000 non-indigenous (non-native) species have been introduced into the United States. Introduced species, such as corn, wheat, rice, and other food crops, and cattle, poultry, and other livestock, now provide more than 98% of the U.S. food system at a value of approximately $800 billion per year (USBC 1998). Other non-indigenous species have been introduced for landscape use, biological pest control, sport, pets, and food processing. Some non-indigenous species, however, have caused major economic losses in agriculture, forestry, and several other segments of the U.S. economy. One recent study reported approximately $97 billion in damages from 79 non-indigenous species from 1906 to 1991 (OTA 1993). Current studies suggest that invasive species in the United States cause losses adding up to more than $138 billion per year.

Invasive species can be very harmful to the environment and indigenous ecosystems as well. Invasive species typically have high reproductive rates, disperse easily, and can tolerate a wide range of environmental conditions. Often, they lack predators in their new environments. As a result, invasive species may out-compete native species for prey or other resource needs (e.g., breeding sites). They may also prey upon native species, spread pathogens and parasites, or alter the genetic make up of closely related species The extent that invasive species have impacted ecosystems in the United States is difficult to know. Little is known or understood about the estimated 750,000 potentially threatened plants within these ecosystems (Raven and Johnson 1992.*)* What is known is that nearly 42% of the species on federal and state threatened or endangered species lists are at risk due to non-indigenous species. Approximately 400 of the 958 species that are listed as threatened or endangered are at risk as the result of competition with or predation by invasive species (Nature Conservancy 1996; Wilcove et al. 1998). There is no doubt that invasive species can have tremendous impacts upon our ecosystems.

The Ohio Chapter of the Society of American Foresters (OSAF) recognizes that nearly all of our crop and livestock species are non-indigenous and have proven essential to the viability the United States' agriculture, economy, and quality of life. However, the fact that certain non-indigenous species (e.g., corn, wheat, cattle, carrots, and Great Lakes salmon) are vital to agriculture and the U.S. food system does not diminish the enormous negative impacts that non-indigenous invasive species may have upon our economy, ecosystems, and communities. Therefore OSAF recognizes the importance of eradicating when possible and aggressively managing non-native invasive species in Ohio's ecosystems in order to maintain ecological integrity, processes, and sustainability, as well as to prevent substantial social and economic harm to Ohio citizens.

THE SPECIFIC PROBLEM—EMERALD ASH BORER (EAB)

Emerald Ash Borer

Emerald ash borer (EAB), *Agrilus planipennis* Fairmaire, is an introduced beetle that was discovered in southeastern Michigan near Detroit during the summer of 2002. Speculation is that this invasive species arrived in the US on solid wood packaging material carried on ships or aircraft from its native Asia. While the adult stage of this species causes little damage (chewing on ash foliage), the larvae, or immature stage, cause significant damage by feeding on the inner bark of ash trees (*Fraxinus* species). This causes significant disruption of the tree's ability to transport water and nutrients resulting in the tree's three-year death spiral.

EAB reproduces in large numbers, often resulting in total infestation of large ash trees within three (3) years. The adults are hardy flyers. Currently no predators that yield any population control of this insect have been identified in the United States. Unlike native ash borers that only infest stressed, dying, or dead ash trees, EAB will infest healthy North American ash trees as well as unhealthy trees of any size. Accordingly, this species has the ability and potential to spread rather quickly from a point of introduction to epidemic levels. This species has been responsible for killing 8 to 10 million ash trees in Michigan, Ohio, and Indiana, with the majority of this mortality occurring in southeastern Michigan. In addition to the large numbers of killed ash trees, these devastations have cost municipalities, property owners, nursery operators, and forest products industries tens of millions of dollars in tree removal and landscape mitigation costs, as well as wood product losses.

Detection Strategies

One of the most challenging efforts is finding existing EAB populations. The Ohio Department of Agriculture (ODA) has utilized a combination of visual surveys, trap trees, and physical surveys to detect EAB infestations in Ohio. Because EAB begins to infest trees from the top of the tree, it is extremely difficult to see damage without samples from the crown of the tree. As a result, ODA identified thousands of "trap trees" in 2004 as a means to attract and capture flying adults and to extract the bark to find the presence of larval galleries. ODA plans to continue the trap tree program in 2005 targeting high-risk areas within a 50-mile radius of the Lucas County quarantine.

Other state and local agencies, private foresters, green industry, woodland owners, and government officials are taking action to reduce ash populations. Current plans are to inspect all ash wood prior to its movement off site.

Current Control Strategies

Two strategies are currently employed simultaneously by the Ohio Department of Agriculture (ODA) and USDA Animal Plant Health Inspection Service (APHIS) to eliminate EAB from Ohio. These two strategies involve eradication and quarantine processes.

Eradication Strategy

The current approach to eliminating this invasive species is by the eradication of host trees (*Fraxinus* sp.). Currently, there is no insecticide treatment for trees that has proven to be 100% effective and practical for either prevention or eradication of the insect. Research suggests that the female lays eggs within a ½ mile of where she emerges as an adult. Accordingly, the best approach at this time to effectively destroy the insect is to cut infested and potential host trees from properties within a ½ mile radius of an infested tree. The trees are then chipped into small pieces (1-inch diameter or less) before the chips are transported and burned. This eradication process is timed to eliminate the pest before the adult beetle emerges in mid-May and spreads to surrounding properties. The ODA has developed protocols for this eradication process in order to provide greater assurance that this insect would be eliminated within and around the infested areas that are identified.

Quarantine Strategy

Since adult beetles will continue to emerge from ash firewood or logs with intact bark for a year after the tree is cut, the movement of infested wood as well as live trees must be prohibited in order to stop the artificial movement of EAB. Therefore, the ODA has placed the state of Ohio under a quarantine program in regard to EAB. The quarantine regulates the movement of ash materials and non-coniferous firewood from, within, and through quarantined areas. Quarantine restrictions are limited to specific areas of Ohio where EAB infestations have been confirmed. Currently, ash materials may enter any of these regulated areas, from Ohio's non-regulated areas, but once taken in, they may not leave without compliance agreements with APHIS and ODA.Quarantine restrictions in Ohio also prohibit the movement of ash materials and non-coniferous firewood from Michigan into Ohio.

EAB AND FOREST IMPACT

Forest ecosystems have long been shaped by a variety of natural disturbance processes and events. Some of these processes and events include fire, hurricanes, droughts, ice storms and insect and disease outbreaks. Outside of these natural disturbance regimes, anthropogenic sources of disturbance have also had impacts on our forests throughout history, including Native Americans. Some of these anthropogenic influences include fire suppression, land clearing for agriculture and development, and forest harvesting. These forest disturbances have both positive and negative outcomes, depending on the source, type, and method. Nevertheless, the Ohio Society of American Foresters recognizes that forests are shaped by a multitude of forces, and that management is often necessary to assure that outcomes benefit both society and ecosystems.

However, invasive species such as EAB present ~~a~~ unique disturbance to an ecosystem that can prove to be detrimental in many ways. Because EAB infests healthy as well as unhealthy native ash trees of all sizes, EAB has the potential of eliminating the presence of mature ash trees from Ohio. This, in turn, is sure to have an impact on ecosystem function, forest production, and local economies. Accordingly, management strategies must be developed to eliminate, reduce, or slow the movement of EAB in Ohio. To this end, OSAF recognizes that coordinated multi-agency planning and cooperation is necessary to develop these strategies and programs. OSAF has divided management strategies into three distinct categories: rural forests (small wooded areas,

found primarily in agricultural areas in northern, western, and central Ohio); contiguous forests (large tracts of forestland, found primarily in southern and eastern Ohio); and urban forests (trees within municipalities and developed areas of the state. Although they have overlapping qualities, each has its own special considerations as they relate to forest management considerations and strategies.

Forest Management (General)

Ash comprises approximately 5.6% of both the total and growing stock volume in the state of Ohio (Northeastern Forest Inventory and Analysis, 2002). On privately owned forests, ash constitutes 6% of the total volume, but only 2.8% of the total volume on public forests. These figures represent the statewide composition and say nothing of its statewide distribution, which is higher in some regions than in others. While these figures may be relatively low when compared to other important forest species, the presence of ash still represents risks and the potential to support the continued spread of EAB.

Forest management can be implemented that reduces the EAB risk within the forest and its spread to other forest systems. Various activities that reduce or eliminate the ash component from a forest are options available to the forestland owner. These activities include stronger consideration of removals during improvement activities, thinning, or harvests, and in planting plans as well as the reduced planting of ash in currently unaffected areas. Reducing the inadvertent movement of EAB to other areas can be avoided with diligent inspection of ash wood and nursery stock prior to its movement off-site. What the landowner ultimately decides to do will be determined by the risks involved, and the short-term and long-term economic considerations. Foresters and other green industry professionals can play an important role in helping landowners to reach informed conclusions and to make responsible decisions regarding the management of their forests.

While a decision by the landowner to eliminate ash from his/her forest may in effect produce the same alteration in the forest community as that produced by an EAB infestation, the economic outcome may have better results than if a landowner waited until an infestation occurs. Landowners will have the opportunity to market their ash product and the timber industry will have an opportunity to buy and sell an ash product. Proper management will also give landowners time to plan with professional foresters for the long-term management of their forest resource in light of EAB rather than incurring the expense of trying to restore EAB damaged woodlands.

Property owners will also have the means to utilize “Best Management Practices” (BMP) in their tree removal efforts in order to protect remaining trees and the land itself. Identifying entry and exit points and work areas plus dictating the timing of operations and debris clean up procedures will help to protect forest properties and forest owners (e.g. burning debris, ruts, and state/local laws.)
Finally, these forest community alterations may be relatively short-lived if proper management and programs are developed that eliminate EAB from North America and ash is reintroduced to our forests.

Rural Forest Management Considerations

Nearly half of Ohio is comprised of small tracts (less than 50 contiguous acres) of forested or wooded areas. Most of these woodlands are remnants of once large forests that were cleared for agricultural use in the 1800's. Many, although small in size, are important components of the landscape; providing harvestable timber for woodland owners, filtering agricultural runoff for waterways that drain into Lake Erie or the Ohio River, reducing soil erosion as windbreaks, and growing some of the finest hardwoods in the United States. The space between these rural forests may work to slow the natural spread of EAB.

Because of the character of these small forests, ash, a pioneer species, is often a dominant species in regenerating woodlands. The sudden loss of any dominant species can be extremely detrimental to such small woodlands and the woodland owners. Therefore, management strategies for rural forests should be implemented keeping the health and, in many cases, the mere existence of these small forests in the forefront of management decisions.

Contiguous Forest Management Considerations

Ohio's forest resources in the south and southeastern part of the state have components quite different from the small woodland tracts of the north. Ash is a more common species in the southwest part of the state than in the east and southeast region. The potential for natural movement, however, is estimated to be greater simply because woodlands containing at least some ash are very close together – making it very difficult to contain EAB populations in contiguous forests.

The hilly terrain in the Southeastern part of Ohio creates challenges in managing for EAB because of accessibility. Although thousands of contiguous acres may be forested, the properties themselves may have many different owners, have various levels of forest management history, and be dotted with homes, small farms, businesses, and communities which create socio-economical challenges in trying to control EAB.

Urban Forest Management Considerations

An informal survey in the nursery industry suggested that as much as seventy percent of the larger shade trees being produced in 2003 were EAB sensitive white and green ashes. These trees were being planted in both municipal and private landscape plantings. Even though planting guidelines suggested the need for biodiversity, it had been more than seventy years since the last major loss of a commonly planted urban species, American elm. Urban foresters were surveyed in 2000 and indicated that only 8% of trees being planted in municipal plantings were ash and that they were concerned about biodiversity (D'Amato, Sydnor, and Struve 2002). Popularity of ash was due to its salt and urban tolerance as well as ease of transplanting. Without question, the ash population in Ohio communities is more than high enough to support epidemic levels of EAB.

Concerns expressed earlier over accessibility in rural and continuous forests will be magnified in urban areas. Tree removals complicated by proximity to buildings and people often cost thousands of dollars per tree even if equipment can access the site. Informal reports out of

Michigan indicate that municipal budgets have been devastated and that individual citizens have had to take out second mortgages in order to cover tree removal costs. Ohio is spending in excess of $10,000,000 dollars for EAB eradication and control in 2005. Costs could well increase ten fold if the affected areas increase especially in urban areas.

Another concern for communities is that dead or declining ash loses strength more rapidly than other trees such as maple and oak. Ash has the desirable characteristic in the wood products industry of being a self-pruning tree as dead branches shear close to the main stem. Self-pruning is undesirable in proximity to people as branches fail without warning placing residents and property at risk. This means that trees will need to be removed relatively quickly after they are seriously compromised. Budgeting will have less flexibility, as we have to deal with a safety issue in a timely fashion.

Political activity will be much more intense in urban areas than in less intensely populated areas. As an example, Ohio citizens appear to be less willing to give up property rights than in some other areas. Dutch elm disease (DED) has been held in check in Minneapolis by a rigorous elm inspection and removal program, which allows the city to remove infested trees on private property at homeowner expense although this would be less likely to be successful against EAB. Tens of thousands of Ohio's homeowners are at risk in the currently infested areas. Urban areas will require close attention to public needs and requests.

Pesticides are unlikely to be a viable option for municipalities although some citizens may well employ pesticides on private property if the eradication effort, currently in effect, were to fail. Municipalities will likely find that removal and replacement is less costly for municipal trees than an annual application of pesticides. The previous statement does not consider the difficulty in obtaining permission for using pesticides in urban areas. Biological controls are being researched but have not shown economic potential to date.

Reducing the impact of this pest in Ohio communities appears to rest on long established management tools. Municipalities can reduce their current stocking levels of ash, allowing ash to remain in sites to which ash is best adapted and removing any stressed ash trees prior to infestation by EAB. Infested trees should be removed as soon as possible in accordance with existing eradication or control efforts. Planting programs should reduce or eliminate ash in future plantings until more is known about the impact of the current eradication effort. Long-term projects such as an ash breeding effort and biological control should be considered for public funding.

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