

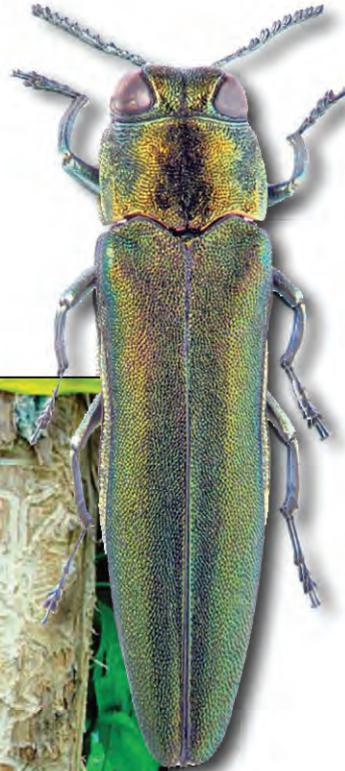


United States
Department of
Agriculture



Forest Service

National Response Framework for Emerald Ash Borer October 2011



US Forest Service, Animal Plant Health Inspection Service,
National Association of State Foresters, and the National Plant Board

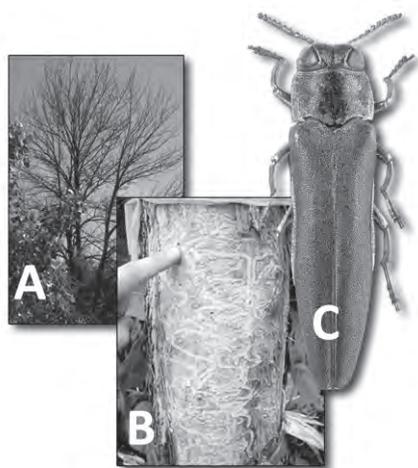




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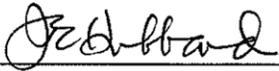
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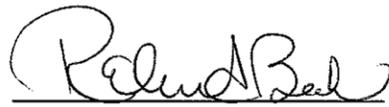
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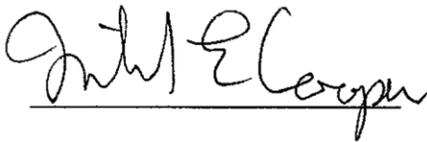
The intent of this framework is to coordinate the US Forest Service (USFS), Animal Plant Health Inspection Service (APHIS), National Association of State Foresters (NASF), and National Plant Board (NPB) and their missions, level of expertise, and available resources to effectively respond to the emerald ash borer. We, the undersigned, approve this document and its intent toward better management of this damaging insect problem



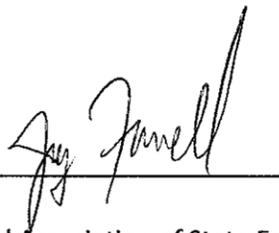
USDA Forest Service



USDA Animal Plant Health Inspection Service



National Plant Board



National Association of State Foresters

National Response Framework for Emerald Ash Borer

October 2011

**US Forest Service, Animal Plant Health Inspection Service,
National Association of State Foresters, and the National Plant Board**

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EXECUTIVE SUMMARY

The emerald ash borer (EAB), a beetle native to Asia, was first found in North America in 2002 in southeastern Michigan. Surveys in 2003 detected EAB in 12 counties in Michigan and three counties in northern Ohio. Although first found in 2002, EAB was likely introduced into the area in the early 1990's. By 2010, EAB was found in 15 states from Minnesota across the upper Midwest to New York and south to Missouri, Tennessee and Virginia, as well as across southern Ontario and Quebec in Canada. Across the area, EAB has killed tens of millions of ash trees and poses a serious threat to the ash resource of North America. The broad distribution of EAB is largely due to the inadvertent movement of infested ash commodities, especially before its original detection.

In its native range EAB does not cause serious damage to ash trees, however, due to lack of host resistance by North American ash trees as well as lack of predators and parasitoids, EAB has had a significant impact on the ecology and economy of infested areas (Figs. 2, page 2).

The management of EAB across the US is a complex task that involves many levels of Tribal, Federal, state, and local governments, non-governmental groups and private stakeholders. EAB-related activities within USDA are coordinated among the Animal and Plant Health Inspection Service (APHIS) and Forest Service. APHIS works with states to survey, establish and implement the regulatory framework and outreach activities. The FS provides technical and financial support for biological investigations, monitoring, management and outreach. Both agencies conduct research and develop methods needed to conduct these activities.

The USDA Forest Service and APHIS convened a group of subject matter experts from state, and federal agencies to develop this framework. The National EAB Framework is not a policy document, nor does it make any resource commitment. The document identifies and aligns key roles and responsibilities of the signatories: USDA's Forest Service and Animal and Plant Health Inspection Service, National Association of State Foresters, and the National Plant Board. It is designed to link these agencies and serve as a reference for dealing with the ecological and economic impacts of EAB. These roles and responsibilities may be changed in the future as needed. The Framework identifies four strategic goals of prevention, preparedness, response and recovery for areas with established EAB infestations and areas where EAB has not been detected.

A. PURPOSE

A National Response Framework will help align key roles and responsibilities in response to an incident. The general model of the Framework contains the four strategic goals of prevention, preparedness, response, and recovery. This Framework identifies two areas for dealing with Emerald Ash Borer EAB: areas with established EAB infestations and areas where EAB has not been detected yet. For each of these areas, this document sets Framework goals and identifies the lead agencies responsible for interagency coordination and management of EAB.

This Framework is meant to be a living document and informs USDA programs that reach across US Forest Service, Animal Plant Health Inspection Service, individual state departments of agriculture and state forestry agencies. The National Framework for Emerald Ash Borer has been developed to link various levels of government to address the impacts of EAB across the US. It is intended to serve as a reference for land managers and government agencies currently dealing with EAB, and those not yet affected by the insect. The Framework is not intended to be a policy, budget or investment strategy document. The document identifies and aligns key roles and responsibilities of the signatories: USDA's Forest Service and Animal and Plant Health Inspection Service, National Association of State Foresters, and the National Plant Board. These roles and responsibilities may be changed in the future as needed.

B. INTRODUCTION

The emerald ash borer (EAB) (Fig. 1), *Agrilus planipennis* Fairmaire (Coleoptera:Buprestidae), is a devastating, wood boring beetle native to Asia. It was first found infesting trees in North America in southeastern Michigan and adjacent areas of Ontario, Canada, in 2002 (USDA Forest Service, 2008). Within the core infested area of Michigan, Indiana and Ohio, more than 50 million ash trees are estimated to be dead, dying or infested by EAB (Smith et al. 2009). Elsewhere, EAB already has killed tens of millions of ash trees, and continues to pose a serious threat to the ash resource of North America (Fig. 2).

Although EAB was first found in the US in 2002, it was likely introduced into the area around Detroit in the early 1990s (Kovacs et al. 2009). It is not known how EAB arrived in the US, but a likely pathway is solid wood packing material associated with cargo from Asia. Soon after EAB was recognized as a serious pest, five counties in Michigan were placed under quarantine; however, in the years prior to its detection, EAB-infested material, such as nursery stock, ash logs, and firewood, were most likely moved from Michigan to many areas around the US. Surveys in 2003 found EAB in 12 counties in Michigan, and three counties in northern Ohio. As of September, 2010, EAB infestations were found in 15 states: Illinois, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin (Fig. 3). In Canada, infestations are known to occur in several areas of Ontario and Quebec.



Figure 1. Adult stage of the emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera:Buprestidae). Howard Russell, Michigan State University, Bugwood.org, 1241011.



Figure 2. (A) Galleries caused by emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera:Buprestidae), Bugwood.org 5147090. (B) Larvae, the destructive stage, of emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae). Houping Liu, Michigan State University, Bugwood.org 5449382.

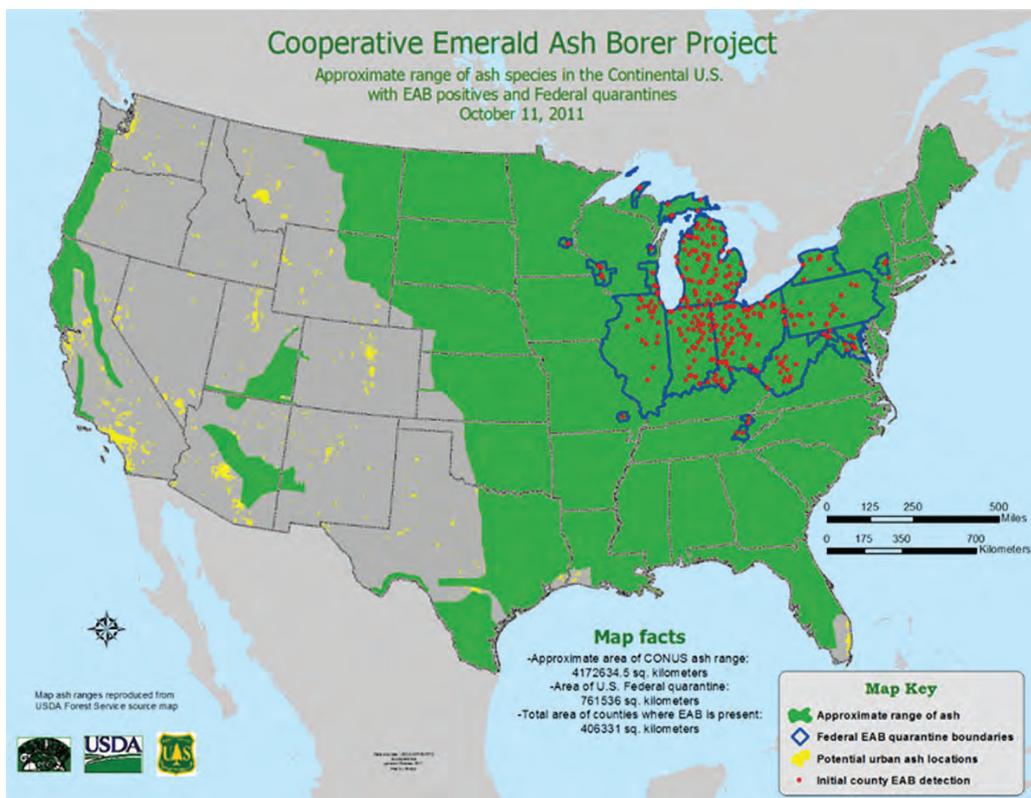


Figure 3. Emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera:Buprestidae), in the U.S.

The broad distribution of EAB in the US and Canada is largely due to the inadvertent movement of infested ash nursery stock, unprocessed logs, firewood and other ash commodities. Once EAB is detected in a county, Federal and state quarantines restrict the movement of these materials (for details see Appendix A. Agency Authorities and Roles).

In its native range in Asia, EAB does not cause serious damage to ash trees. As a consequence, very little was known about the biology or control of EAB in Asia prior to its identification in North America. Basic information on its life cycle, flight capabilities, host preferences and natural enemies was necessary. Studies were also needed on methods to detect EAB and EAB-infested trees. One of the greatest challenges in managing EAB continues to be a limited ability to detect EAB infestations early enough to effectively manage them and prevent their spread.

Since its introduction, EAB has had a significant negative impact on the ecology and economy of infested areas. All 16 species of North American ash appear to be susceptible to EAB attack. Ash trees are an important part of the rural and urban forests of the US, valued at more than \$282 billion (Federal Register, 2003). White, green and black ash make up more than 7 percent of the hardwood forests in the northeastern US; however, in certain areas, such as western New York, northern Pennsylvania and the upper Midwest, ash may make up 20 to 40 percent of the forest. Ash wood is used for a number of applications including tool handles, baseball bats, furniture, cabinetry and paper. In the nation's urban forests, ash is often the tree of choice for landscaping in new residential areas and commercial plantings, and is one of the most common species along streets, and in parks and yards. Annually, the nursery industry produced an estimated 2 million ash trees, valued at approximately \$140 million. Ecologically, the 16 species of ash fill a number of niches, from riparian areas to upland forests.

C. AGENCY AUTHORITIES AND ROLES

EAB-related activities within USDA are coordinated among the Animal and Plant Health Inspection Service (APHIS), and Forest Service (FS). The lead federal agency responsible for responding to EAB is APHIS, Plant Protection and Quarantine (PPQ). The corresponding entity at the state level is generally within the state Department of Agriculture. APHIS works with states to survey, establish and implement the regulatory framework, and provides funds to states to support regulatory, response and outreach activities. APHIS' EAB Program Manual outlines the action plan to limit the spread of EAB through survey, regulatory actions, and containment procedures. The FS provides technical and financial assistance to support ongoing activities in ash utilization, biological investigations, communication and outreach, monitoring, and management actions in affected areas. In addition, FS Research and Development and APHIS' Center for Plant Health Science and Technology conduct science-based research and develop the technology needed to conduct these activities.

The management of EAB across North America is a complex task involving many levels of Federal, state and local governments, as well as non-governmental groups and private stakeholders. This National Response Framework for Emerald Ash Borer has been devel-

oped to assist states and communities prepare for and respond to EAB by providing an overview of the resources available from USDA agencies and to guide them in obtaining additional information. By better equipping state and city planners for their efforts to prepare for and/or respond to EAB impacts, those impacts and costs can be better managed and minimized.

Outreach and public education activities are conducted by a wide range of parties, including APHIS, FS, state departments of agriculture, state foresters, local governments, and private sector parties like The Nature Conservancy. These efforts have focused on five core messages (detection, control, regulatory, personal responsibility, and compliance) that are simple and easily understood by target audiences, in order to raise public awareness and support for the effort to manage EAB in the United States and encouraging helpful behaviors such as not moving untreated firewood. The core messages address the critical mission of the program, and allow for agency autonomy and the evolution of the program. Outreach and public education efforts have been a critical component of the campaign against EAB and are regarded as a successful and worthwhile use of resources.

D. MANAGEMENT AREAS

How a community or land manager prepares for or responds to EAB depends on the proximity of an infestation of EAB to the management area. This plan is organized into two sections. The first section addresses areas and communities that have already been impacted by EAB and are attempting to minimize these impacts. The second section is focused on areas that are not yet directly impacted; therefore have time to plan for its arrival. The structure for this document was chosen in order to reflect the different activities and timeframes that are appropriate in each of these two scenarios.

D.1 Areas with Established Infestations

Fifteen states now have one or more areas with established EAB populations. Within these areas the primary goal is to detect and contain EAB and mitigate its impacts. The management of EAB in these areas requires an integrated, multi-agency collaboration. Regulatory measures coupled with robust outreach and public education activities are the most effective tools currently available to prevent human assisted movement of EAB. Areas with established EAB populations are under regulatory control to prevent human-assisted movement of EAB-infested materials. APHIS works closely with the appropriate state agencies to determine quarantine boundaries on a county-by-county basis. If a state should choose not to establish and enforce county level quarantines, then APHIS is required to place the entire state under Federal quarantine.

Communities and land managers may want to aggressively suppress EAB populations, minimize EAB impacts, assist with utilization of EAB infested material or help restore infested lands. For each of these objectives, those managing EAB should work with local, state and Federal agencies for advice and assistance.

D.1.1 PREVENTION

D.1.1.1 OBJECTIVE: PREVENT THE SPREAD OF EAB OUT OF AN AREA THROUGH REGULATORY MEASURES

Lead Agencies: APHIS & state plant regulatory agencies

To minimize the artificial movement of EAB from infested areas to non-infested areas, communities and land managers will need to coordinate with state plant regulatory agencies (usually state departments of agriculture) and APHIS. Regulated articles such as ash logs, ash nursery stock or firewood may be prohibited from moving out of the infested county. Arborists, forest products businesses and others will need to follow quarantine regulations or phytosanitary measures. APHIS and the state agency or agencies with regulatory authorities are responsible for enforcing EAB regulations within quarantined areas.

D.1.1.2 OBJECTIVE: PREVENT THE SPREAD OF EAB OUT OF AN AREA THROUGH OUTREACH AND PUBLIC EDUCATION

Lead Agencies: APHIS, Forest Service, state plant regulatory and state forestry agencies

Outreach and public education activities are critical components of efforts to prevent the human-assisted spread of EAB. Regulated establishments and the public must be made aware of the regulatory requirements that apply to them, and the importance and benefits of engaging in helpful behaviors. Outreach and public education activities can be and are conducted by APHIS, Forest Service, state agencies and extension services, and private sector organizations. Care should be taken by all parties involved in outreach activities to make sure that messages presented reflect the five core messages of the EAB Program, and to ensure that those activities are coordinated with other parties also engaged in outreach efforts.

D.1.2 PREPAREDNESS

D.1.2.1 OBJECTIVE: PREPARE FOR EAB AND ITS IMPACTS

Lead Agencies: APHIS, Forest Service, state plant regulatory and forestry agencies

Preparing for EAB should take place years before any known infestation of EAB is found in an area; however, EAB often shows up in unexpected places. As part of preparedness, states and communities should develop response plans, and prepare the public and government officials for the impacts on the environment and local budgets.

D.1.2.1.1 ACTION: DEVELOP LOCAL RESPONSE PLANS TO AN EAB INFESTATION

For those communities dealing with a new EAB infestation, it is important to develop a response plan to quickly address the infestation. The objectives may range from enforcing regulatory measures to aggressively trying to manage the EAB population. Response plans should not only address the technical, and field aspect, but also, the administrative

and legislative aspect of community readiness. As part of response plans, communities or land managers should have an accurate, up-to-date inventory of their ash resource. This will facilitate surveying for EAB infestations and prioritizing tree removals or treatment. The response plan may also include contingencies for canopy replacement as EAB-infested or hazard trees are removed. Communities and land managers can seek advice on developing response plans from local APHIS and Forest Service staff.

D.1.2.1.2 ACTION: PREPARE THE PUBLIC TO DEAL WITH EAB MANAGEMENT AND IMPACTS

An EAB infestation can have a significant impact on the daily activities of a community. Making the public aware of these impacts is an essential part of preparations. Homeowners, local arborists, nursery managers, landscapers, firewood dealers and many others will need to be aware of any quarantine regulations that affect them. If tree removals are planned, public information meetings may be necessary. Managers of facilities, such as National Forests, state parks or campgrounds, should prepare visitors for potential closings or other impacts. If tree removal for EAB suppression is not part of the response plan, the public, visitors, and businesses should be made aware of potential hazards and expenses of increased tree damage and mortality on public and private lands.

D.1.3 RESPONSE

How a community or land manager responds to an EAB infestation will depend on a number of factors. The fiscal resources of a community, the size of the EAB infestation and how long EAB has been established will factor into the type of response chosen. Areas with newly detected EAB infestations may be more aggressive in their approach to management, whereas, communities and land managers with extensive EAB infestations may need to concentrate more on mitigating the impacts and aftermath of the infestation or only address special situations and locations.

To assist local governments manage insects and diseases under state or federal quarantines, the Forest Service is establishing a Pest and Disease Revolving Loan Fund. The Fund provides grants to qualified units of state governments to make and service loans to qualified local governments to purchase authorized equipment necessary to monitor, remove, dispose of, and replace infested trees that are within the borders of quarantine areas infested by plant pests. The Pest and Disease Revolving Loan Fund is authorized by Section 10205 of the Food, Conservation, and Energy Act of 2008 (2008 Farm Bill).

Eradication of recently detected EAB infestations that are in or near other infested areas is generally not recommended. The APHIS Program Manual for EAB identifies three criteria for consideration of an eradication campaign:

1. The outlier must be a single, clearly identifiable regulatory incident. This may include nursery stock, firewood, or other regulated material transported beyond the current buffer.
2. The population, using dendrochronology and a delimiting survey, must be demonstrated to be less than two years old or to have no more than one population release from the original host material.

3. The population, using current technologies and methodologies, must be identified as eradicable by the EAB Management Team (i.e., the point of introduction clearly identified and age of infestation as delineated in item 2). In lieu of eradication, communities and land managers may decide on management actions to mitigate the impacts of EAB.

D.1.3.1 OBJECTIVE: DETERMINE THE LOCATION AND EXTENT OF THE INFESTATION

Lead Agencies: APHIS, Forest Service, state plant regulatory and forestry agencies

The extent of the infestation should be determined before management actions are taken. APHIS and FS are working with research scientists to develop more effective survey tools (see the Research Activities in Support of Management Actions section below). Once a community or land manager is aware of an EAB infestation, technical assistance from APHIS and FS can help to identify the size and severity of the infestation. Once this is determined, appropriate management options can be selected. Delimiting the infestation provides information used to determine appropriate quarantine boundaries. Identifying the high risk pathways of infested material into a community, areas in a community with high risk sites for EAB introduction and establishment, and identifying the ash resource in a community or forested area will help quickly direct efforts to detect and delimit an EAB infestation.

D.1.3.2 OBJECTIVE: IMPLEMENT PLANS TO REDUCE EAB POPULATIONS OR MINIMIZE IMPACTS TO ASH RESOURCES

Lead Agencies: APHIS, Forest Service, state plant regulatory and forestry agencies

One of the greatest challenges facing a community or land manager is how to manage the ash resource once an EAB infestation is identified. The management of an established EAB infestation will require a strategic approach that integrates EAB biology, management tools available and a clear definition of the management objectives. The response/management plan may focus on protecting high value ash trees that are at immediate risk to EAB infestation, ash that are in unique ecosystems, limiting the rate of expansion from the core infestation or reducing the chances for the development of satellite infestations. Tools currently exist to reduce EAB attacks on individual trees; however, managing EAB populations at the landscape level is still a challenge. APHIS, ARS, the Forest Service and their university partners are investigating new insecticides, application techniques, biological control options, and integrating these into a strategy to reduce ash mortality. Management decisions should take into account identification of the ash resource, assessment of the EAB infestation, evaluation of management tools, cost of the treatment selected and evaluation of chances the project will be successful. The Forest Service has the authority to provide technical advice to partners on the latest techniques for reducing EAB populations.

D.1.3.3 OBJECTIVE: UTILIZATION OF UN-INFESTED ASH TREES, AND THOSE RECENTLY INFESTED OR KILLED BY EAB

Lead Agencies: Forest Service and state forestry agencies

In areas where the response plan to a newly detected or contained EAB infestation involves the removal of ash trees, the utilization of the harvested trees may provide a usable wood resource that can be turned into wood products providing economic return for the community or land manager. In addition, EAB-infested wood and other waste wood may be utilized as part of a woody biomass energy market. The Forest Service can provide technical assistance for the utilization and marketing of ash through its Wood Education and Resource Center (WERC). EAB-infested or potentially infested forest products, including firewood, generated through utilization plans are likely to be regulated articles. Care should be taken to follow all applicable regulations and quarantine requirements during the implementation of utilization plans.

D.1.3.4 OBJECTIVE: COMMUNICATE INFORMATION ABOUT RESPONSE

Lead Agencies: APHIS, Forest Service and state plant regulatory and forestry agencies

During the implementation of any EAB-management response, local governments, residents, utilities and businesses may be affected. An important component of a response plan is communication. Providing accurate and timely information to these groups, either directly or through the media, will help cooperation or maximize project effectiveness. APHIS and state plant regulatory agencies should provide information concerning quarantines and movement of regulated articles from the infested area. If there will be management actions involving tree removals or insecticidal treatment of trees, state forestry or pesticide regulatory officials should inform affected groups.

D.1.4 RECOVERY

D.1.4.1 OBJECTIVE: REMOVAL AND UTILIZATION OF ASH TREES KILLED BY EAB

Lead Agencies: Forest Service and state forestry agencies

Some trees killed by EAB over time will become hazard trees, and communities as well as landowners will want to remove these trees. Technical advice from the Forest Service on the proper removal and utilization of these trees will help communities deal with the expense of tree removal. As with tree removal in the response phase, proper utilization of the harvested trees may provide a usable wood resource that can be turned into wood products providing economic return for the community or land manager. In addition, EAB-infested wood and other waste wood may be utilized as part of a woody biomass energy market. The Forest Service can provide technical assistance for the utilization and marketing of ash through its Wood Education and Resource Center (WERC). Forest products, woody biomass or firewood generated through utilization plans are likely to be regulated articles. Care should be taken to follow all applicable regulations and quarantine requirements during the implementation of utilization plans.

D.1.4.2 OBJECTIVE: REPLANTING URBAN AREAS FOLLOWING AN EAB INFESTATION

Lead Agencies: Forest Service and state forestry agencies

Restoration of EAB-affected landscapes is often desirable after infested or killed trees are removed. Communities replanting urban areas should coordinate activities with Forest Service and state forestry agencies to select proper trees for the location. Proper species selection and diversification is important to the health of these areas in the future. Maintaining the health and diversity of urban forests provides greater resilience to future insect and disease infestations.

In rural forests impacted by EAB, good forest management that maintains forest health and encourages species diversity will help these areas to recover and become productive and resilient systems. Land owners can contact state forestry agencies to get technical advice and assistance in developing a forest management plan to suit their objectives.

D.2 AREAS NOT KNOWN TO HAVE EAB INFESTATIONS

Emerald ash borer can spread to new areas either naturally or through human assistance. Early detection of new infestations is still a challenge. Often when EAB is first found in a community it quickly becomes evident that the infestation has been present for several years. Therefore, even though communities and landowners do not have EAB they should prepare for the possibility. While being near a known EAB infestation may increase the likelihood of an infestation, newly detected EAB infestations often are located one or more counties from previously known infestations due to human assisted movement of the pest.

Communities and landowners near known infestations should be proactive in prevention and preparedness activities. Areas that are more than a state away from known EAB infestations have the opportunity to prepare for EAB through public education and outreach, surveys, inspection of regulated articles and preparedness plans. The objectives of preparedness and prevention actions can be grouped into activities that reduce and define the risk of EAB infestations.

D.2.1 PREVENTION**D.2.1.1 OBJECTIVE: PREVENT THE SPREAD OF EAB FROM INFESTED AREA THROUGH INSPECTION OF REGULATED ARTICLES**

Lead Agencies: APHIS and state plant regulatory agencies

Regulation and prevention of the movement of high-risk articles from areas under State or Federal quarantine prevents human assisted spread of EAB. Routine or random inspections of these articles verify that proper mitigations have been applied prior to movement and ensure that regulated establishments are in full compliance with applicable standards and requirements. State and Federal regulatory officials from areas under quarantine should provide appropriate notices to regulatory officials in areas receiving regulated articles in order to facilitate these inspections.

D.2.1.2 OBJECTIVE: PREVENT THE SPREAD OF EAB FROM INFESTED AREA THROUGH PUBLIC AWARENESS

Lead Agencies: APHIS and state plant regulatory agencies

Increasing public awareness of the identification EAB and its impacts are important actions to help prevent the spread of EAB into uninfested areas. While the early detection of EAB remains a challenge, an informed public can help detect EAB infestations before they are widespread in an area. Public meetings with citizens and landowners can increase awareness of EAB and its impacts. Efforts that increase awareness of detection and reporting potential EAB-infested trees by professional tree care companies, landscapers and public agencies can also be effective in early detection of an infestation.

Outreach activities that influence citizen behaviors are also effective in preventing establishment of EAB into uninfested areas. Public information efforts can focus on the risk of moving potentially EAB-infested material, such as firewood, from infested areas. In addition, efforts by local agencies should focus on informing businesses of the risk of moving firewood, pallets, landscaping materials and wood products from EAB-infested areas.

D.2.2 PREPAREDNESS

Activities that help landowners and communities prepare for an EAB infestation may often center on defining the risk. Objectives for a community may be maintaining community tree inventories, modeling risk of introduction or identifying resources at risk.

D.2.2.1 OBJECTIVE: PROVIDE AN ACCURATE DEPICTION OF EAB'S FOOTPRINT IN THE UNITED STATES

Lead Agencies: APHIS and state plant regulatory agencies

Survey and detection activities conducted nationwide provide critical information about the distribution of EAB. This information supports planning and decision making in several areas, including determining appropriate timeframes within which preparedness activities like canopy replacement programs will occur.

D.2.2.2 OBJECTIVE: MODEL RISK POTENTIAL OF EAB IN AN AREA

Lead Agencies: APHIS and Forest Service

Risk modeling for EAB is based on several critical factors, including the known current distribution of EAB, the distribution and value of ash trees across the American landscape, and dispersal patterns of the pest, by both natural and human assisted means. APHIS conducts pathway analyses in order to better understand the avenues by which EAB is spread by people. In turn, this information is used to guide the development of regulatory protocols and actions designed to prevent human assisted movement. The FS uses information from inventories of forest resources to produce risk maps that depict areas and regions at elevated risk from EAB due to high densities and values of host material, coupled with other risk factors such as con-

centrations of sites such as campgrounds or sawmills at high risk for human introductions of the pest. These maps can then be used inform planning and decision making. Risk modeling conducted at the national level can and should be mirrored at state and local levels.

D.2.2.3 OBJECTIVE: DEVELOP AN EAB RESPONSE PLAN

Lead Agencies: APHIS, Forest Service and state plant regulatory and forestry agencies

Development of response plans is one of the most important activities that states, counties municipalities and land managers should do prior to the arrival of EAB. A comprehensive response plan should identify the lead agencies and organizations responsible for all aspects of a coordinated response to an EAB infestation. Clearly defining agency roles and responsibilities and leadership for planning and coordinating on-the-ground response, budgetary response and communication plans will expedite a response. Communities and agencies such as state, regional and national parks should coordinate with state plant regulatory officials and APHIS to understand the intricacies and impacts of EAB quarantines. These groups should also coordinate with state forestry agencies and the Forest Service to include in response plans technical assistance to assess and mitigate EAB, utilize trees from infested areas and restore landscapes.

D.2.2.4 OBJECTIVE: MAINTAIN URBAN CANOPY INVENTORIES

Lead Agencies: Forest Service, state forestry agencies and municipalities

Communities that have a significant ash component should initiate or maintain inventories of their ash trees. Knowing the location and condition of susceptible trees can help communities survey and respond to recently detected infestations. Municipalities often have unique or historically significant ash trees that should also be inventoried and inspected regularly.

D.2.2.5 OBJECTIVE: DIVERSIFY COMMUNITY FOREST CANOPIES

Lead Agencies: Forest Service and state plant regulatory and forestry agencies

As communities with a large ash component conduct routine maintenance and tree removals of ash they should consider alternative tree species to diversify tree canopies. This will lessen the impacts of EAB on the fiscal resources of the community when EAB arrives.

D.2.2.6 OBJECTIVE: DEVELOP AND MAINTAIN FOREST MANAGEMENT PLANS

Lead Agencies: Forest Service and state forestry agencies

Forest landowners and land managers with a significant ash component should develop or maintain management plans for their resource before EAB is found in the area. Based management objectives before EAB impacts the forest, land managers can be prepared to make decisions on tree removal and acceptable levels of mortality. Land managers with ecologically sensitive ash resources should pay particular attention to these areas and plan for appropriate mitigation when EAB is found in the area.

D.2.2.7 OBJECTIVE: PROVIDE OUTREACH AND PUBLIC EDUCATION

Lead Agencies: APHIS, Forest Service and state plant regulatory and forestry agencies

An interested and informed public is one of the most powerful resources available in the effort to mitigate the impacts of EAB. Outreach and public education activities should focus on educating the public about the signs and symptoms of EAB infestation, how to report suspect trees, high risk behaviors that should be avoided (e.g. moving firewood), and ways to proactively prepare for mitigating the impacts of EAB once it arrives. These outreach activities should be part of an ongoing campaign.

Infestations of EAB, and any subsequent regulatory, eradication or management actions, impact many different Federal, state, local, industry, environmental and natural resource partners as well as the public. Early and effective communications with these groups is essential to the success of EAB management. A communication plan should:

Inform all partners about the potential impacts of EAB on the rural and urban forests across the US.

Inform all partners about the eradication, regulatory and management strategies being developed and how they may be affected by these strategies.

Provide information to partners so they can recognize EAB infestations and report new infestations.

Implement a strategy to address questions and concerns from partners concerning impacts of EAB and implications of management actions.

D.2.3 Response & Recovery

When EAB is found in the area the response and recovery activities will be as discussed in the section above for areas with known infestations of EAB.

E. RESEARCH ACTIVITIES IN SUPPORT OF MANAGEMENT ACTIONS

Both APHIS and FS have active research and methods development programs in support of EAB management. As stated, above, before EAB was known to occur in North America, very little was known about its biology and control. Since 2002, research and methods development conducted by APHIS, FS and collaborators has led to a much better understanding of EAB. APHIS and FS scientists and their partners have made considerable progress in understanding the life history of EAB including its life cycle, fecundity, factors that affect its rate of development and its host and mate-finding behaviors. Progress has also been made on determining EAB's host range and host preferences. Improved survey and detection technologies are an important part of EAB management. Detecting populations soon after they invade an area is critical to a rapid response which will result in a more successful and cost effective management effort. Considerable progress has been made in identifying host attractants including

leaf and bark volatiles and evaluating different trapping tools; however, more effective traps and other detection tools are critically needed. Treatment and control technologies are also critical to any successful management action. Much research has been conducted to evaluate the efficacy of different chemical and microbial insecticides for control of EAB. Several products show promise for individual treatment of landscape trees; however, more research is needed to evaluate long-term and area-wide control products and strategies.

The FS and APHIS are involved in multi-agency projects to evaluate an integrated management program to slow the impacts of EAB in an area or SLOW ASH MORTALITY (SLAM). This integrated program involves implementing all of the known tools for detecting and controlling EAB and for monitoring the ash resource and EAB impacts and rate of spread.

Scientists in APHIS, ARS and FS are looking at various potential biological control agents for EAB. Natural enemies have been discovered and described from EAB's native range and from North America. They have been evaluated in the laboratory against EAB and non-target species and methods for mass-rearing have been developed. Natural enemies may be an important management tool for EAB in the future. Another challenge in managing EAB is predicting its spread across the landscape. Both APHIS and FS have conducted studies to determine the dispersal capability of EAB and are working on models to predict the local and large scale movement of EAB and dynamics of EAB populations. The ecological and economic impacts of EAB are significant. Research is being conducted into the disturbances caused by loss of ash trees in a forest. Long term studies into host resistance and ash tree genetics, as well as collection and preservation of ash seed are critical aspects of maintaining ash as a viable part of North American forests

APPENDIX A

AGENCY AUTHORITIES AND ROLES

There has been a significant Federal and State response to EAB. By Executive Order 13112 (February 1999), all Federal agencies dealing with invasive pests are required to work in consultation with the National Invasive Species Council (NISC), coordinate and collaborate with one another, and cooperate and share information with stakeholders, international organizations, and foreign countries.

Four agencies within the US Department of Agriculture (USDA) deal with EAB: the US Forest Service (FS), the Animal Plant Health Inspection Service (APHIS), Agricultural Research Service (ARS) and the Natural Resources and Conservation Service (NRCS). According to the Plant Protection Act (June 2002) and other public laws, APHIS is the primary agency responsible for regulating against non-native invasive plant pests, such as EAB, as well as any biological control organisms that may be used against invasive pests. In its broader mission, to protect the health and value of American agriculture and natural resources, APHIS works closely with other federal agencies, state departments of agriculture and tribes to restrict or prohibit the movement of plants, plant products and pests, and implement emergency procedures and actions to contain, control or eradicate destructive plant pests. Such close cooperation has resulted in the discovery of numerous areas where EAB is present and the designation of multiple quarantine areas.

The Plant Protection and Quarantine (PPQ) program of APHIS also aims to insure a strong domestic agricultural-pest detection system. PPQ has implemented a national survey effort for EAB, some of which is accomplished through agreements with state departments of agriculture and universities. As well, PPQ conducts EAB-related research to identify, develop, refine, and transfer technology for pest survey, exclusion, control, and risk assessment.

In accordance with the Food, Conservation and Energy Act of 2008, the 2002 Farm Bill, and other public laws, NRCS has helped America's private landowners and managers to conserve their natural resources and combat EAB. NRCS has provided conservation programs and activities in the areas of: technical assistance, environmental improvement, stewardship, easements (e.g., Healthy Forest Reserve Program), and community assistance.

Many of these NRCS programs provide technical and/or financial assistance to rural landowners and farmers to establish, protect, enhance, and manage trees and forests. NRCS's Plant Materials Program has partnered with the FS and the National Center for Genetic Preservation and created the Ash Tree Seed Collection Initiative, the ultimate goal of which is to preserve ash trees in all the ash regions of the U.S.

Through the Organic Act of 1862, which established what is now USDA, ARS is the principal research agency within the Department. Scientists with ARS work closely with APHIS and FS scientists to address EAB biological control, ash genetic conservation and tools to identify EAB and related species.

Under the authority of the Cooperative Forestry Assistance Act of 1978, Forest and Rangeland Renewable Resources Research Act of 1978, the Multiple-Use and Sustained-Yield Act of 1960, American Recovery and Reinvestment Act of 2009, and other laws, the FS has provided technical and financial assistance for a myriad of EAB-related activities. All three Deputy Areas of the FS—State & Private Forestry (S&PF), Research & Development (R&D), and the National Forest System (NFS)—are addressing the EAB problem.

S&PF assists state forestry and agriculture agencies and other partners to provide resource-protection and management assistance to state and private land managers, local communities, organizations, and citizens of urban and rural areas. In addition, through its Forest Health Protection (FHP) section, S&PF provides technical and financial assistance to the National Forests, other Federal lands, and Tribal lands to monitor and control insect and disease pests.

R&D works closely with universities and other scientific institutions to share knowledge with, and transfer technologies to, private land owners and managers in the U.S and abroad. Also, R&D provides expertise in detecting, controlling, and managing invasive plant pests, such as EAB.

NFS is responsible for managing the public's National Forests across 44 States, Puerto Rico, and the Virgin Islands. The lands comprise 193 million acres, or 8.5 percent of the total land area in the US. The natural resources on these lands have major economic, environmental, and social significance for all Americans. To help protect against the inadvertent spread of EAB onto the National Forests, NFS has restricted or prohibited the movement of firewood.

APPENDIX B

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