

## **USDA APHIS PPQ**

### ***2009 Emerald Ash Borer Survey Guidelines***

#### **Introduction**

Survey for emerald ash borer (EAB) since its discovery in 2002 has undergone an evolution of tactics, scope, and application. Survey was originally based on visually detectable symptoms (exit holes, bark cracks, epicormic branching, woodpecker feeding sites, etc.) to determine presence or absence of EAB. Visual survey was applied at various levels of intensity and with various techniques (ground surveys vs. ladders, climbing devices, bucket trucks, etc.) Overall results were poor and newly infested areas were often left undiscovered. It soon became apparent that destructive sampling of suspect trees was necessary.

Artificially stressed (girdled) trap trees offered an alternative to visual survey and were adopted program-wide in 2005. This technique was an improvement for defining or delimiting the extent of an EAB infestation and was used to evaluate areas treated for EAB (eradication cuts). Trap trees, however, are expensive to establish and evaluate, and offer liability problems for workers and the public. Uniformity of survey is also an issue because of difference in size, species, and locations of trees as well as methodology and timing of stressing prior to flight.

Continued developments in trap and lure design enabled the program to implement a survey based on attractant-baited traps in 2008. Traps offer several advantages over trap trees including lower expense, uniformity of sampling unit, greater safety, fewer logistical problems, and more precision in sampling. Based on the positive results and feedback from the 2008 survey, APHIS is implementing the 2009 survey with similar yet improved methodology.

#### **Scope**

In 2009, the EAB National Management Program seeks to accomplish *three* goals through survey activities:

- 1) Conduct a **National Survey** to determine whether additional pockets of infestation may exist undetected outside the known infested areas. This segment of survey will target high risk sites and establishments in states where potentially infested articles such as nursery stock, ash logs, or firewood may have moved a long distance from the generally infested area either prior to regulation or in violation of current regulations. In addition, the survey supports a public outreach component to raise awareness and facilitate reporting of the pest. Any new detections resulting from national survey efforts will be delimited using the delimiting survey guidelines detailed later in this document.
- 2) Conduct a **Grid-Based Survey in counties located within a 50 mile band approximately 50 miles from the periphery of the generally infested area** to better define the leading edge and identify areas to provide support for mitigation activities to reduce the impact and spread. A strong public awareness component and a targeted high risk site survey are also components of this survey. If it is deemed necessary, a new detection resulting from grid-based survey efforts will be delimited using the delimiting survey guidelines detailed later in this document.

3) Conduct a **High Risk Survey** at sites inside the inner boundary of the 50 mile band and *within the 2008 grid-based survey band in uninfested counties* to determine whether additional pockets of infestation may exist undetected inside the known infested areas.

**All survey and public outreach activities will be coordinated with tribes and federal, state, and local agencies and organizations to ensure efficient use of resources.**

### **National Survey**

**Criteria for Participation:** Prioritization of sites selected for survey may be required due to limited funding. Criteria to consider, from most important to least, include: proximity to the generally infested area (areas available to both long and short range pathways), states with native ash species and states with non-native ash species prevalent in the urban environment (primarily through movement of nursery stock).

**Participating States:** Parts of states outside the 50 mile band and states outside the regulated area are encouraged to participate in the National Survey. Alaska, Arizona, Arkansas, California, Colorado, Idaho, Iowa, Kansas, Louisiana, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming in the Western Region, and, Alabama, Connecticut, Delaware, Florida, Georgia, Illinois, Kentucky, Massachusetts, Maine, Maryland, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, North Carolina, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin in the Eastern Region are participating in the 2009 EAB National Survey. The US Forest Service, National Park Service, and Army Corps of Engineers are also expected to participate.

**Site Selection:** Outside the generally-infested area and the adjacent 50 mile band, survey personnel will need to identify up to **fifty** “high risk sites” in each state listed above using all available information sources including, but not limited to, aerial photographs, road maps, plat maps, and ash density maps.

Site selection should be coordinated with State Plant Regulatory Officials (SPRO) and tribal governments where tribal lands are involved. Coordination also should occur with other federal, state, local government and non-government organizations involved in the program. Examples of high risk sites suggested for this trapping activity are listed below in order of priority:

1. Declining ash: Ash trees exhibiting two or more of the symptoms listed below should also be examined using destructive sampling techniques (i.e., the removal of bark to inspect for EAB):

- Canopy stress/dieback
- Epicormic shoots/suckering
- Bark splits
- Woodpecker damage
- D-shaped exit holes (3-4 mm diameter)
- Serpentine larval galleries

2. Campgrounds, recreation areas, cottage communities, summer camps, hunting camps

3. Nurseries, sawmills, arborist/landscape firms and firewood dealers

4. Recently landscaped residential and commercial properties

5. Sites of high attendance/ high profile cultural events: Pow-wow grounds, hunting lodges, NASCAR tracks, horse trail ride sites, motor cross sites, rafting and fishing camps, etc.

6. Major transportation arteries, rest areas
7. Waterways and fencerows
8. Rural residences

**Conducting survey and inspections:** Activities include:

- Identification of high risk sites
- Contacting and visiting high risk sites and establishments
- Distributing educational material where appropriate
- Selection of trees and placement and maintenance of traps
- Visual survey of the environment in proximity of the traps for symptoms of EAB.

**Trap Density:** The target density in the National Survey for a selected site is **up to four traps per site** and **at least one trap per one and one half mi<sup>2</sup>**. However, sites associated with known pathways from the generally infested area may be surveyed using **up to 16 traps per site** and **up to four traps per one and one half mi<sup>2</sup>**. Local knowledge of high risk sites should be used to determine distribution and density of trap placement.

**Grid-Based Survey in a 50 Mile Band on the Periphery of the Generally Infested Area**

**Criteria for Participation:** States with counties' majority land area intersected by the 50 mile band as identified below. Individual states will be contacted to refine and finalize the area to be surveyed. (See Fig. 1 - counties in red.)

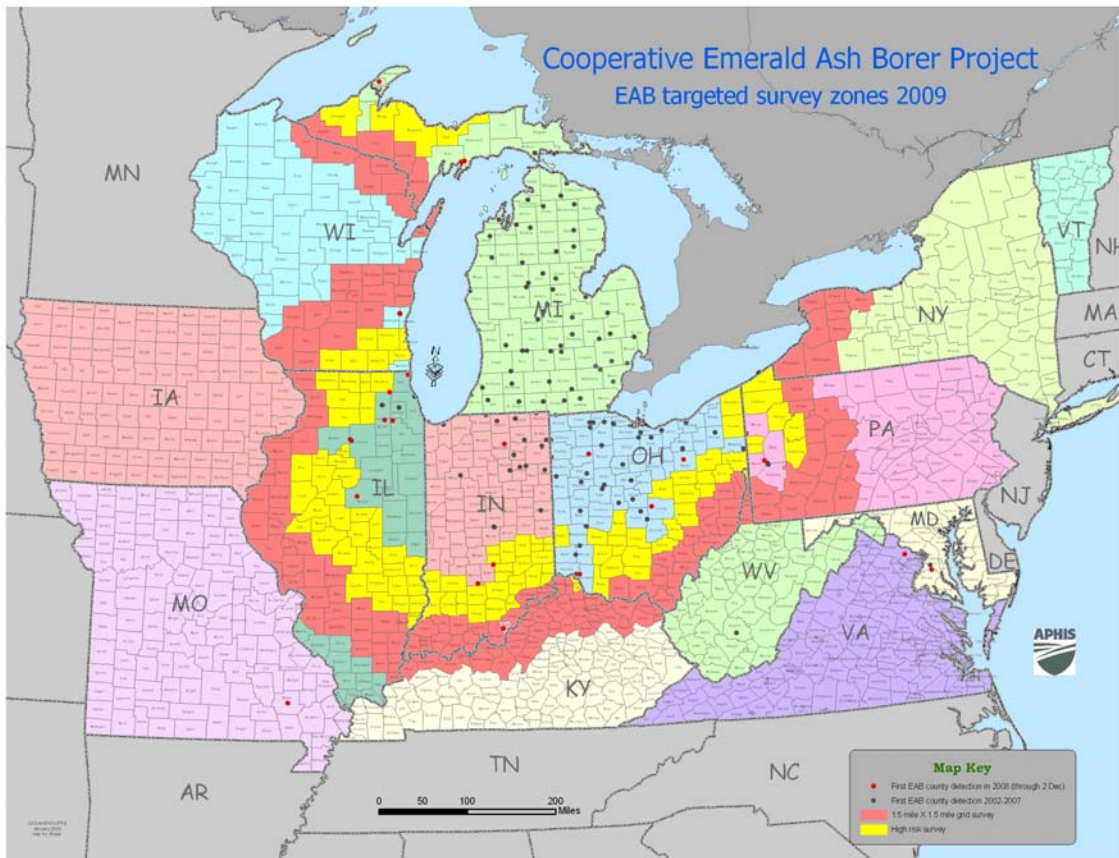


FIGURE 1. 2009 Emerald ash borer survey map.

**List of States:** Illinois, Indiana, Kentucky, Michigan, Missouri, New York, Ohio, Pennsylvania, West Virginia, Wisconsin.

**Conducting survey and inspections:** Activities include:

- Development of a trapping grid and identification of high risk sites
- Selection of trees and placement and maintenance of traps
- Visual survey of the environment in proximity of the traps for symptoms of EAB
- Contacting and visiting high risk sites and establishments
- Distributing educational material where appropriate

**Trap Density:** A trap should be placed within each grid square of a **1.5 x 1.5 mile grid** where ash is found. Traps should be spaced as evenly as possible within the grid taking into consideration accessibility and the presence and condition of ash trees. (High risk sites within the Grid-based Survey Zone should be targeted and prioritized as a trap location).

### **High Risk Survey at sites in the Inner Boundary of Band Survey**

Conduct a **high risk site survey inside the inner boundary** of the 50 mile band and *within the 2008 grid-based survey band* in uninfested counties to determine whether additional pockets of infestation may exist undetected inside the known infested areas. (See Fig. 1 - counties in yellow.)

**Criteria for Participation:**

**Participating States:** Parts of states with high risk sites located inside the inner boundary of the 50 mile band and *within the 2008 grid-based survey band* in uninfested counties to determine whether additional pockets of infestation may exist undetected inside the known infested areas.

**List of States:** Illinois, Indiana, Ohio, Pennsylvania, and Wisconsin.

**Site Selection:** In the area located inside the inner boundary of the 50 mile band and *within the 2008 grid-based survey band* in uninfested counties, “high risk sites” in each state listed above using all available information sources including, but not limited to, aerial photographs, road maps, plat maps, and ash density maps.

Site selection should be coordinated with State Plant Regulatory Officials (SPRO) and tribal governments where tribal lands are involved. Coordination also should occur with other federal, state, local government and non-government organizations involved in the program. Examples of high risk sites suggested for this trapping activity are listed below in order of priority:

1. Declining ash: Ash trees exhibiting two or more of the symptoms listed below should also be examined using destructive sampling techniques (i.e., the removal of bark to inspect for EAB):

- Canopy stress/dieback
- Epicormic shoots/suckering
- Bark splits
- Woodpecker damage
- D-shaped exit holes (3-4 mm diameter)
- Serpentine larval galleries

2. Campgrounds, recreation areas, cottage communities, summer camps, hunting camps

3. Nurseries, sawmills, arborist/landscape firms and firewood dealers
4. Recently landscaped residential and commercial properties
5. Sites of high attendance/ high profile cultural events: Pow-wow grounds, hunting lodges, NASCAR tracks, horse trail ride sites, motor cross sites, rafting and fishing camps, etc.
6. Major transportation arteries, rest areas
7. Waterways and fencerows
8. Rural residences

***Conducting survey and inspections:*** Activities include:

- Identification of high risk sites
- Contacting and visiting high risk sites and establishments
- Distributing educational material where appropriate
- Selection of trees and placement and maintenance of traps
- Visual survey of the environment in proximity of the traps for symptoms of EAB.

***Trap Density:*** The target density for a selected site is at least **one trap per one and one half mi<sup>2</sup>, and up to four traps per site**. However, sites associated with known pathways from the generally infested area may be surveyed using up to **four traps per one and one half mi<sup>2</sup> and up to 16 traps per site**. Local knowledge of high risk sites should be used to determine distribution and density of trap placement.

### ***Delimiting Survey of New Detections***

1) After detecting adult EAB(s) in traps or finding an infested tree, conduct a visual survey until infested trees are no longer found. Continue visual survey for a distance of two miles beyond the initial trap catch or infested tree detection. (Note: Visual survey is not recommended as a general survey tool but may be helpful in delimiting a new infestation.)

2) Determine the age of the infestation by examining the most heavily infested trees in the area (protocol to be provided by APHIS CPHST).

3) Establish a systematic grid of traps starting at the last known infested trees and extending for one mile in radius for every year that the infestation was determined to have existed and then add one additional mile.

Example: Aging of the infestation indicates that it is three years old. From the last infested tree determined from visual survey, draw a band four miles wide (3 years + 1 mile) around the infestation and survey the area with program traps.

4) It is recommended trap deployment should be conducted with eight traps placed per square mile where ash trees are accessible.

5) If a candidate area is devoid of ash, the area should be omitted. Exceptions to setting traps in only ash trees include areas where volumes of potentially infested logs and/or firewood were introduced to the site.

### General Trapping Protocols:

**Trap:** A prism trap consisting of three 14" x 24" panels will be used, with several holes for trap and lure attachment (Fig. 2). The trap is constructed from a sheet of pre-glued purple corrugated plastic. An instructional video detailing trap assembly and use can be found at:

[http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/emerald\\_ash\\_b/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/index.shtml)

After the trap is assembled into its prism shape, spreaders are attached to the trap at holes labeled (3) in Fig. 2. Lures are attached to a loop on the spreader using a cable tie (Fig. 3).

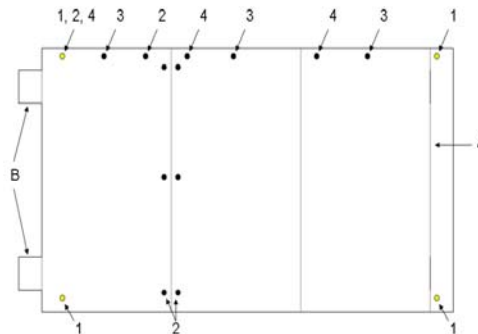


FIGURE 2: Prism trap diagram

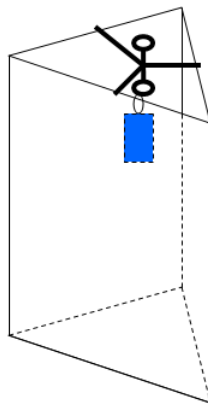


FIGURE 3: Lure hung from loop on spreader using a cable tie

**Lure:** A blended lure consisting of 80% Manuka oil and 20% Phoebe (pronounced: FEE-bee) oil with a **50 mg/day** release rate is recommended. The blended lure provided by commercial firms is produced as a pouch that is designed to last in the field for 60 days. Lure attachment to the trap should be reinforced with duct tape placed at the very top to ensure continued attachment during heavy weather. Do not cover the lure with duct tape as that will inhibit the release of the lure. If possible, any unused lure remaining at the end of the trapping season should be stored frozen for future use in EAB surveys.

**Trap Placement:** Traps must be placed in ash trees (*Fraxinus* spp.). The only instance where traps may be placed in non-ash trees is at high risk sites where no ash is present (e.g., campground, rest area). If possible, ash trees should be 8" or greater in diameter with *larger or largest ash tree in a stand of trees preferred*. Also, trees should be located along edges, in open areas, or in open stands such as in parks. Traps should be placed in the lower to mid canopy, but

no lower than five feet above the ground. They should be placed on the sunny side of the tree, most typically, the south or southwest side.

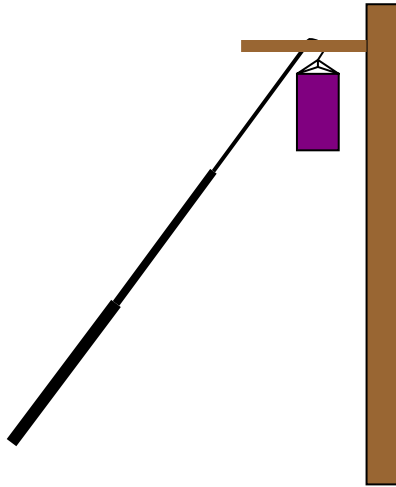


FIGURE 4: Trap hung using a telescoping pole

Traps should be hung in the canopy as high as possible from a branch or limb. A wire hanger will be used to hang traps (Fig. 4). An 8' telescoping pole that extends to 23'+ (several sources including "Mr. Long Arm", are available at Home Depot, or <http://www.excelsails.com/telescopingextensionpoles.htm>, or <http://www.briarwoodproducts.com/newtools.htm>, or <http://www.woosterbrush.com/products.asp?200>), and can be fitted with a hook to place the trap in one of the lower limbs is recommended. The full extension of the pole may be necessary. Alternately, if all limbs are too high to reach with a pole, a throw line may be tossed over a limb, and a rope and trap may be hoisted up into the canopy (Fig. 5).

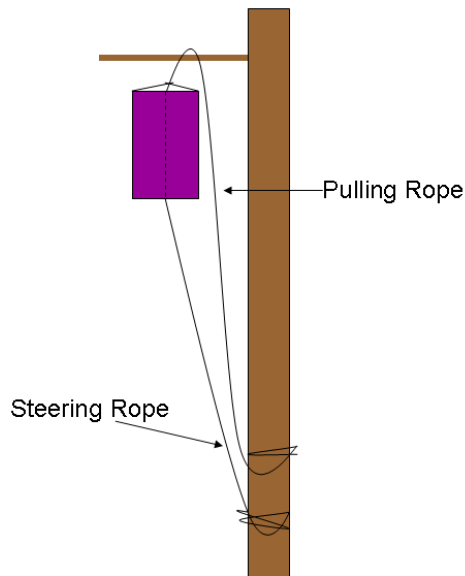


FIGURE 5: Trap hung using a rope

All trap placements will be accompanied by an APHIS- or state-provided sign affixed to the tree.

Growing degree days can predict different life stages of organisms, such as when a flower may bloom, or in this specific case, when an emerald ash borer may emerge. (A growing degree day is the number of degrees that the average temperature is above a baseline value.) Research suggests that an accumulation of 450 growing degree days (base 50°F) results in initial emergence of EAB adults. Traps should be placed prior to 450 growing degree days and lure replacement is recommended to occur just prior the 60 day expiration date. In order to assist states with trap placement, maps of the Continental U.S. depicting predictive bands of initial emergence are attached to this document. Appendices A and B, also attached, define which counties are to be surveyed in the grid-based survey and the inner-band survey, respectively. Appendix C defines by state when initial emergence is predicted to occur.

***Trap Maintenance:*** Traps should be checked at least once during the season. Lures will last approximately 60 days and should be replaced prior to expiration. A cursory inspection of traps during lure replacement may be conducted.

If trap surfaces are loaded with debris, they should be renewed by removing the debris and scraping the glue. Scraping can be accomplished with a trowel or putty knife. If necessary, glue can be added using a paint roller or trowel. The glued surface should remain intact throughout the season unless a trap is allowed to come in repeated contact with an adjacent branch or tree bole. It is not necessary to inspect for EAB specimens until trap removal as an investigation of specimen retention indicates almost no loss of trapped adults over the course of a trapping season.

***Trap Disposition:*** Traps should not be removed prior to 1500 growing degree days and not before Aug 1st south of 36 degrees North latitude. While the polypropylene material of the traps is recyclable, the glue that is adhered to the panels renders the traps undesirable to most recyclers. Alternatively, one may seek a user of waste fuel material for trap disposition. Hangers and spreaders are reusable and should be retained for future use. Hangers and spreaders that cannot be reused should be recycled.



### **Screening for Suspect Buprestidae and Specimen Submission**

Any suspect Buprestidae adult or suspect EAB specimen collected from a trap in a **non-quarantined** state should be placed in a vial with 70% ethanol and delivered to the State Plant Health Director or APHIS representative to be packaged and shipped to Dr. James Zablotny along with a completed "Specimens for Determination" PPQ form 391. Be sure to include any survey record number and/or GPS coordinates on the PPQ form 391 so identified specimens can be linked to survey records. Additional data should also include:

1. EAB detected by: Program related personnel or non-Program related personnel
2. EAB detected in: Purple trap - Detection tree - Destructive Sampling- Non-targeted ash tree
3. Is this a single occurrence or are other symptoms and life stages present?  
Please specify \_\_\_\_\_.

Dr. James Zablotny  
USDA, APHIS, PPQ  
11200 Metro Airport Center Drive, Suite 140  
Romulus, MI 48174

Phone: 734-942-9005  
E-mail: james.e.zablotny@aphis.usda.gov

Dr. Zablotny will make a determination and send specimens to the Systematic Entomology Laboratory (SEL) if necessary for initial state detection confirmation.

Any suspect Buprestidae adult or suspect EAB specimen collected from a trap in a **quarantined** state should be placed in a vial with 70% ethanol and delivered to the State Plant Health Director or APHIS representative to be packaged and shipped to Dr. Bobby Brown along with a completed "Specimens for Determination" PPQ form 391. Be sure to include any survey record number and/or GPS coordinates on the PPQ form 391 so identified specimens can be linked to survey records. Additional data should also include:

1. EAB detected by: Program related personnel or non-Program related personnel
2. EAB detected in: Purple trap - Detection tree - Destructive Sampling- Non-targeted ash tree
3. Is this a single occurrence or are other symptoms and life stages present?  
Please specify \_\_\_\_\_.

Dr. Bobby Brown  
USDA, APHIS, PPQ  
901 W. State Street  
Smith Hall, Purdue University  
West Lafayette, IN 47907-2089

Phone: 765-496-9673  
E-mail: robert.c.brown@aphis.usda.gov

**Data Management Structure For:**

**Emerald Ash Borer (EAB) – Agrilus planipennis**

**Introduction:**

PPQ wants to make it clear that the utilization of the National “Integrated Survey Information System” (ISIS) as a field data collection tool is not required. We do believe however that operationally specific data is of great importance and therefore have designated the ISIS application to be utilized as the final holding tank (centralized database) for this data.

The ISIS database is housed inside the APHIS network and is accessible to employees who have direct access to the APHIS network and to co-operators with APHIS VPN accounts. After receiving network access and a username and password for ISIS, users can log into the systems and utilize any (or all) of the three (3) data entry tools. These tools include; a web interface, a web upload tool, and a PDA (Hand Held Computer) software application. The Excel spreadsheet that is to be used for submission to ISIS is available at:

[http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/emerald\\_ash\\_b/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/emerald_ash_b/index.shtml)

We encourage users to use the PDA portion of ISIS, but understand organizations have existing tools and/or applications used to collect data in the field. Organizations utilizing methods other than the PDA (paper, spread sheets, or third party software platforms) can enter data directly into the web interface or “bulk” upload data from flat file spread sheets using the web upload tool. **It is important for cooperators to upload data as soon as possible when traps are set and again when traps are removed.**

**Note:** This survey is NAPIS compliant. NAPIS "required" fields are marked in yellow.

While most issues surrounding connectivity have little to do with ISIS, (but more to do with government security requirements) the ISIS team understands unique connection situations still exist. In these cases, we will make every accommodation and, if needed, upload the data into the system. The ISIS team is always available to discuss end user needs and/or other solutions available regarding data collection and data management issues. Assistance and support is available from the ISIS help desk at the following:

**National Support**

Email: [ISIS.Support@aphis.usda.gov](mailto:ISIS.Support@aphis.usda.gov)  
1-866-910-9091

**ER ISIS Support**

Deron Medley  
[Deron.M.Medley@aphis.usda.gov](mailto:Deron.M.Medley@aphis.usda.gov)  
919-855-7754

**WR ISIS Support**

Ryan J. Reynolds  
[ryan.j.reynolds@aphis.usda.gov](mailto:ryan.j.reynolds@aphis.usda.gov)  
970-494-7557

For those who do not have direct access to the APHIS network or do not have an APHIS VPN account, please submit your data directly to Brad P. Jones, ER ISIS Data Manager, [Brad.P.Jones@aphis.usda.gov](mailto:Brad.P.Jones@aphis.usda.gov), 919-855-7396, preferably in an Excel spreadsheet format.

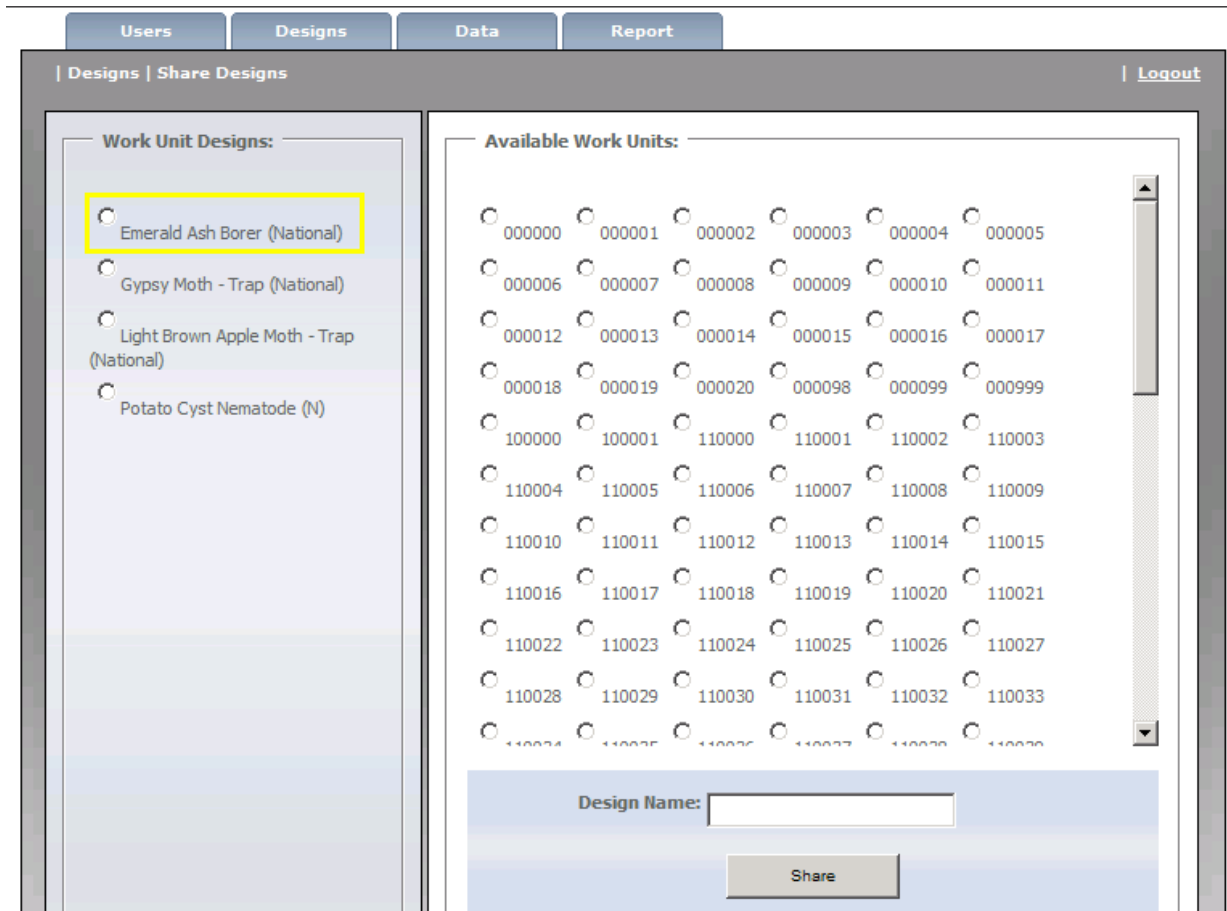
### **Survey Data Elements and Templates**

Data Elements were determined from: National, Eastern, and Western Regional Program Managers, as well as, the 2008 EAB Survey Guidelines Document.

The “Emerald Ash Borer (National)” Template is available at the following work unit:

Username: ISISDesigns  
Password: password

This work unit was created as a “Sand Box” work unit, for all users to have access to pre-designed ISIS templates. Users can access the work unit using the above username and password and “share” the template they want to their home work unit(s). If users have any questions regarding this procedure, please contact the ISIS help desk.



ISIS Section	Data Element	Data	Format / Definition	Status	NAPIS
RECORD NAME					
	Record Name	Text or #	Recommend State + Grid + Trap (Delimitated Survey) Recommend State + Trap (Detection Survey)	Required	
MAIN					
	Survey Date	Date	00/00/0000 (Record Date)	Required	
	Survey Time	Time	Automatically displayed	Recommended	
	Target Pest	Emerald Ash Borer	Drop Down, Default	Required	
SITE / LOCATION					
	Trap Number	Text or #	Open Text, Identifier	Required	
	Ash Material	Ash Firewood Ash Saw Logs Unplanted Nursery Stock Nursery Stock Planted<5 Years Natural/Planted>5 Years No Ash	Drop Down	Recommended	
	Dmtr Breast Hgt	Number (size)	Drop Down, User can define	Recommended	
	Method of Survey	Artificial Trap - High Artificial Trap - Low Destructive Sample Detection Tree Visual	Drop Down, User can define	Recommended	
	Location Type	Agricultural Forest etc. Rural residential Urban Commercial Urban Residential	Drop Down, User can define	Recommended	
	Land Ownership	State Federal Municipal Private	Drop Down, User can define	Recommended	
	EPA Site (Host)	Ash	Drop Down, Default	Required	NAPIS
	Crop Situation	Detection Delimitation	Drop Down, Default	Required	NAPIS

	Address	Address	Open text	Recommended	
	City	City	Open text	Recommended	
	State	State	Drop Down, User Can Define	Recommended	
	FIPS (County)	County Code	Drop Down, User Can Define	Required	NAPIS
	Zip	Zip Code	Open text	Recommended	
	Section (Grid)	Grid Number	Open Text	Required	
	Latitude	Number	Number	Required	NAPIS
	Longitude	Number	Number	Required	NAPIS
SERVICE					
	Service Date	Date	00/00/0000 (Activity Date)	Required	NAPIS
	ServiceTime	Time	Automatically displayed	Optional	
	Primary Surveyor	Name or Initials	Open text	Recommended	
	Service Action	Placement Monitor Destructive Sample Tree peel and/or remove Removal	Drop Down, User Can Define	Required	
	Bark Splits	Yes/No	Checkbox	Recommended	
	D-Shaped Exit Hole	Yes/No	Checkbox	Recommended	
	Serpentine Galleries	Yes/No	Checkbox	Recommended	
	Woodpecker Damage	Yes/No	Checkbox	Recommended	
	Epicormic Sprouting	Yes/No	Checkbox	Recommended	
	Crown Dieback	Yes/No	Checkbox	Recommended	
	Sample Taken (Y/N)	Yes/No	Checkbox	Required	
PEST					
	Sample ID	Text or #	Open text	Required (If Applicable)	
	Survey Method	Trap, EAB	Drop Down, Default	Required	NAPIS
	Pest Status	Positive Negative	Check Box, Multiple select	Required	NAPIS

		Known to be established			
		Not Known to be established			
		Eradication in progress			
	EPA Pest (Pest)	EAB	Drop Down, Default	Required (If applicable)	NAPIS
	Count	Number	Open Text	Required (If applicable)	NAPIS
	Descriptor Units	Specimens Submitted	Drop Down	Required (if Applicable)	NAPIS
	Pest Comments	Text	Open Text	Optional	
	Pest Life Stage	Pupa	Drop Down	Required (If Applicable)	NAPIS
		Larva			
		Adult			

## **Public Outreach:**

**Introduction:** The active participation of target audiences in preventing the spread of emerald ash borer (EAB) throughout the United States is critical. Outreach is an integral element of the EAB Program supporting regulatory, survey, and control components of the program.

Public relations campaigns targeting industries that move regulated articles should be undertaken, together with, public awareness campaigns designed to provide education to citizens about the dangers of moving infested host materials such as firewood. Since the beetle is difficult to detect, the more people trained to identify EAB symptoms/damage and report suspects, the greater the opportunity for successful outcomes. Outreach activities should encourage public support in recognizing and reporting possible beetle damage in their area as well as suspected incidents of quarantine violations.

**Cooperative Emerald Ash Borer Communication Initiative:** The initiative focuses on the development of public awareness campaigns in areas outside the generally infested area. Awareness regarding artificial movement of EAB, best management practices and program delivery will be the primary focus of outreach messages.

**Message:** Detection of EAB, movement of regulated articles, quarantine awareness and specifically 'Don't Move Firewood'.

**Goal:** As a component of the national and grid-based surveys for EAB, the Cooperative EAB Communication Initiative garners the active participation of target audiences (see below) in the early detection of emerald ash borer. In the development of public awareness campaigns to achieve this goal, each state should consider incorporating a variety of initiatives including:

- . Needs assessment/survey of target audience
- . Stakeholder and cooperator meetings, industry seminars
- . Advertising in professional journals, newsletters and networking opportunities
- . Distribution of USDA & Cooperator program materials
- . Web-based networking, *e.g.*, e-newsletters, advertising
- . Cooperative advertising or packaging initiatives

**Target Audience:** The list below reflects target audiences, who by employment or through associations, have knowledge and/or experience in forestry, wood-processing, plant pathology or pest detection. These individuals are likely to have the greatest opportunity to discover EAB and are more easily engaged.

- . U.S. Forest Service, National Parks Personnel, APHIS-PPQ personnel
- . State cooperators; Departments of Agriculture, Natural Resources, Parks & Recreation, Fish & Wildlife
- . State Cooperative Extension, specifically Master Gardner Program personnel
- . Urban foresters, Municipal Departments of Public Works, Public park managers & grounds keepers, commercial facilities managers, school districts, hospitals, etc.
- . Tree care professionals, arborists, nursery owners, landscapers, landscape architects, retail garden centers, etc.
- . Foresters, sawmill owners, wood packing material producers, lumber mills
- . Firewood dealers
- . Alumni of university programs in forestry, urban planning, turf grass, entomology
- . Hunters, fishermen, hikers, campers, horse trail riders, nature-loving outdoors people or youth groups, such as scouts and 4H organizations.

Appendix A. States and counties in 50 mile grid-based survey zone (Fig. 1 counties in red).

State	County	Indiana	Ohio	Michigan	Gogebic
Illinois	Adams	Indiana	Perry	Michigan	Iron
Illinois	Bond	Indiana	Pike	Michigan	Menominee
Illinois	Brown	Indiana	Posey	New York	Cattaraugus
Illinois	Calhoun	Indiana	Scott	New York	Chautauqua
Illinois	Carroll	Indiana	Spencer	New York	Erie
Illinois	Cass	Indiana	Switzerland	New York	Erie
Illinois	Clay	Indiana	Vanderburgh	New York	Genesee
Illinois	Clinton	Indiana	Warrick	New York	Monroe
Illinois	Edwards	Kentucky	Boone	New York	Niagara
Illinois	Fayette	Kentucky	Bourbon	New York	Orleans
Illinois	Franklin	Kentucky	Boyd	New York	Wyoming
Illinois	Gallatin	Kentucky	Bracken	Ohio	Adams
Illinois	Greene	Kentucky	Breckinridge	Ohio	Athens
Illinois	Hamilton	Kentucky	Bullitt	Ohio	Belmont
Illinois	Hancock	Kentucky	Campbell	Ohio	Brown
Illinois	Hardin	Kentucky	Carroll	Ohio	Gallia
Illinois	Henderson	Kentucky	Carter	Ohio	Guernsey
Illinois	Henry	Kentucky	Daviess	Ohio	Harrison
Illinois	Jefferson	Kentucky	Fleming	Ohio	Jackson
Illinois	Jersey	Kentucky	Franklin	Ohio	Jefferson
Illinois	Jo Daviess	Kentucky	Gallatin	Ohio	Lawrence
Illinois	Macoupin	Kentucky	Grant	Ohio	Meigs
Illinois	Madison	Kentucky	Greenup	Ohio	Monroe
Illinois	Marion	Kentucky	Hancock	Ohio	Morgan
Illinois	McDonough	Kentucky	Hardin	Ohio	Noble
Illinois	Mercer	Kentucky	Harrison	Ohio	Scioto
Illinois	Montgomery	Kentucky	Henderson	Ohio	Vinton
Illinois	Morgan	Kentucky	Henry	Ohio	Washington
Illinois	Pike	Kentucky	Jefferson	Pennsylvania	Bedford
Illinois	Rock Island	Kentucky	Kenton	Pennsylvania	Blair
Illinois	Saline	Kentucky	Lewis	Pennsylvania	Cambria
Illinois	Schuyler	Kentucky	Mason	Pennsylvania	Clearfield
Illinois	Scott	Kentucky	Meade	Pennsylvania	Elk
Illinois	St. Clair	Kentucky	Nelson	Pennsylvania	Erie
Illinois	Wabash	Kentucky	Nicholas	Pennsylvania	Fayette
Illinois	Warren	Kentucky	Oldham	Pennsylvania	Forest
Illinois	Washington	Kentucky	Owen	Pennsylvania	Greene
Illinois	Wayne	Kentucky	Pendleton	Pennsylvania	Indiana
Illinois	White	Kentucky	Robertson	Pennsylvania	Jefferson
Illinois	Whiteside	Kentucky	Rowan	Pennsylvania	Somerset
Indiana	Clark	Kentucky	Scott	Pennsylvania	Warren
Indiana	Crawford	Kentucky	Shelby	Pennsylvania	Washington
Indiana	Dubois	Kentucky	Spencer	Pennsylvania	Westmoreland
Indiana	Gibson	Kentucky	Trimble	West Virginia	Brooke
Indiana	Harrison	Kentucky	Union	West Virginia	Hancock
Indiana	Jefferson	Michigan	Dickinson	West Virginia	Marshall



West Virginia	Ohio	Wisconsin	Green Lake	Wisconsin	Vilas
Wisconsin	Calumet	Wisconsin	Iowa	Wisconsin	Waushara
Wisconsin	Columbia	Wisconsin	Iron	Wisconsin	Winnebago
Wisconsin	Dane	Wisconsin	Lafayette		
Wisconsin	Dodge	Wisconsin	Manitowoc		
Wisconsin	Door	Wisconsin	Marinette		
Wisconsin	Florence	Wisconsin	Marquette		
Wisconsin	Fond Du Lac	Wisconsin	Richland		
Wisconsin	Forest	Wisconsin	Sauk		
Wisconsin	Grant	Wisconsin	Sheboygan		

Appendix B. States and counties in inner boundary of 50 mile grid-based survey zone (Fig. 1 counties in yellow).

<b>State</b>	<b>County</b>				
Illinois	Boone	Illinois	Tazewell	Ohio	Columbiana
Illinois	Cass	Illinois	Wabash	Ohio	Coshocton
Illinois	Christian	Illinois	Winnebago	Ohio	Fayette
Illinois	Clark	Illinois	Woodford	Ohio	Greene
Illinois	Clay	Indiana	Bartholomew	Ohio	Highland
Illinois	Coles	Indiana	Daviess	Ohio	Hocking
Illinois	Crawford	Indiana	Dearborn	Ohio	Holmes
Illinois	Cumberland	Indiana	Decatur	Ohio	Knox
Illinois	De Kalb	Indiana	Fayette	Ohio	Madison
Illinois	De Witt	Indiana	Franklin	Ohio	Muskingum
Illinois	Effingham	Indiana	Greene	Ohio	Perry
Illinois	Fayette	Indiana	Jackson	Ohio	Pickaway
Illinois	Fulton	Indiana	Jennings	Ohio	Pike
Illinois	Jasper	Indiana	Johnson	Ohio	Preble
Illinois	Knox	Indiana	Knox	Ohio	Ross
Illinois	Lawrence	Indiana	Lawrence	Ohio	Stark
Illinois	Lee	Indiana	Martin	Ohio	Trumbull
Illinois	Logan	Indiana	Orange	Ohio	Tuscarawas
Illinois	Macon	Indiana	Ripley	Pennsylvania	Armstrong
Illinois	Marshall	Indiana	Rush	Pennsylvania	Clarion
Illinois	Mason	Indiana	Scott	Pennsylvania	Crawford
Illinois	McHenry	Indiana	Shelby	Pennsylvania	Erie
Illinois	Menard	Indiana	Sullivan	Pennsylvania	Lawrence
Illinois	Moultrie	Indiana	Union	Pennsylvania	Venango
Illinois	Ogle	Indiana	Washington	West Virginia	Hancock
Illinois	Peoria	Kentucky	Campbell	Wisconsin	Green
Illinois	Piatt	Michigan	Alger	Wisconsin	Jefferson
Illinois	Putnam	Michigan	Baraga	Wisconsin	Milwaukee
Illinois	Richland	Michigan	Marquette	Wisconsin	Racine
Illinois	Sangamon	Michigan	Ontonagon	Wisconsin	Rock
Illinois	Shelby	Ohio	Ashtabula	Wisconsin	Walworth
Illinois	Stark	Ohio	Brown	Wisconsin	Waukesha
Illinois	Stephenson	Ohio	Carroll		
			Clinton		

Appendix C. Growing Degree Day Zones for EAB Initial Emergence.

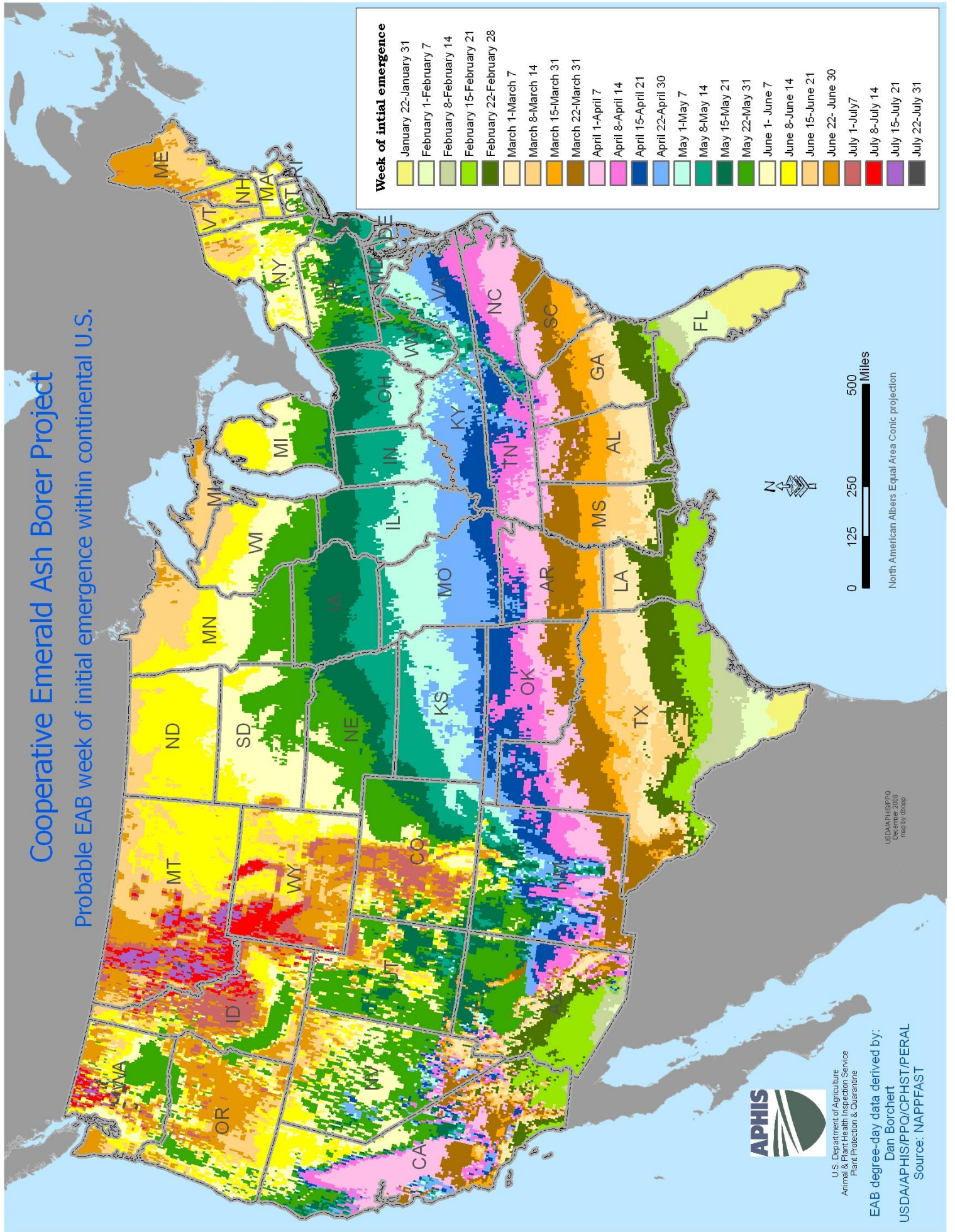
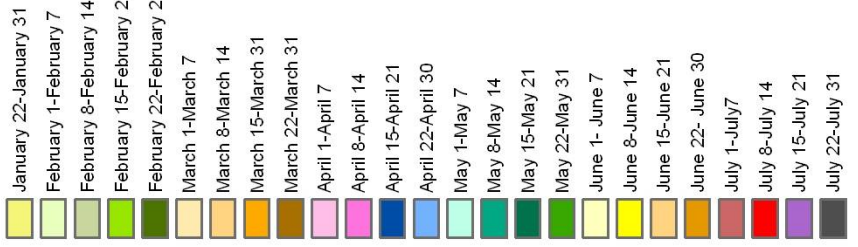
Alabama	02/22/09
Alaska	06/15/09
Arizona	02/01/09
Arkansas	03/15/09
California	01/22/09
Colorado	05/01/09
Connecticut	05/01/09
Delaware	04/22/09
Florida	01/22/09
Georgia	02/15/09
Hawaii	01/22/09
Idaho	05/22/09
Illinois	04/22/09
Indiana	04/22/09
Iowa	05/08/09
Kansas	04/15/09
Kentucky	04/15/09
Louisiana	02/15/09
Maine	06/01/09
Maryland	04/22/09
Massachusetts	06/01/09
Michigan	05/15/09
Minnesota	05/22/09
Mississippi	02/22/09
Missouri	04/15/09

Montana	06/08/09
Nebraska	05/08/09
Nevada	03/01/09
New Hampshire	06/01/09
New Jersey	06/08/09
New Mexico	03/22/09
New York	05/15/09
North Carolina	03/22/09
North Dakota	06/01/09
Ohio	05/01/09
Oklahoma	03/05/09
Oregon	05/22/09
Pennsylvania	05/08/09
Rhode Island	06/01/09
South Carolina	03/06/09
South Dakota	05/22/09
Tennessee	04/01/09
Texas	01/22/09
Utah	05/08/09
Vermont	06/01/09
Virginia	04/08/09
Washington	05/22/09
West Virginia	05/01/09
Wisconsin	05/15/09
Wyoming	06/01/09

# Cooperative Emerald Ash Borer Project

Probable EAB week of initial emergence within continental U.S.

## Week of initial emergence



North American Albers Equal Area Conic projection

USDA/APHIS/PPFO  
December 2008  
map by dtopp



U.S. Department of Agriculture  
Animal & Plant Health Inspection Service  
Plant Protection & Quarantine

EAB degree-day data derived by:  
Dan Borchert  
USDA/APHIS/PPQ/CPHST/PERAL  
Source: NAPPFAST