CAPS 2012 Emerald Ash Borer Visual Survey Summary

In 2012, the State of New Hampshire received funding from the CAPS program to identify sites with land use change indicating new developments and to survey those sites for *Fraxinus* plantings and potential detection of EAB in nursery stock. Using remote-sensing technology at the US Forest Service field station in Durham, NH detected 2,476 sites in the state which had undergone land use change in the prior 10 years (2002-2012). All of these sites were then examined in Google Earth. Many of them were eliminated from the survey because of their low-probability of being landscaped (i.e. they were timber sales, road expansions, manufacturing/trucking locations, grave sites in cemeteries, and additions of swimming pools to backyards). Preliminary surveys were conducted to confirm that removal from the survey was justified. After this initial examination of sites to determine the highest-risk survey sites, 362 commercial and residential sites remained. Sites were distributed in eight of New Hampshire's ten counties (no sites in Coös or Sullivan Counties). Of these, a total of 213 sites were surveyed in forty-seven towns in 2012. These sites were clustered along the I-93 and I-89 corridors.

Landscaped trees were categorized as to species, estimated size class by dbh (<2", 3-5", 5-7", >8"), numbers, and condition. A visual survey for symptoms of EAB infestation was conducted in the identified ash trees. Digital photography and GPS coordinates were used to reference developments and identified individual trees.

A database was created categorizing plantings in new developments, via a robust dataset with community data, tree density and diversity data, and EAB detection data that can be used to direct future early detection and rapid response efforts.

1. **Survey methodology (trapping protocol):**

	Common Name	Scientific Name
Pest:	Emerald Ash Borer	*Agrilus plannipennis*

Number of Counties:	8
Counties:	Belknap, Carroll, Cheshire, Grafton, Hillsborough, Merrimack, Rockingham, Strafford

2. **Survey dates:**

	Proposed	Actual
Survey Dates:	May through August, 2012	April 20 through September 17, 2012

3. **Benefits and results of survey:**

In addition to surveying for *Fraxinus* and EAB, several other tree genera were included as both a reference as to popularity of *Fraxinus* as a landscape tree in the state and to maximize surveyor effort by targeting ALB host trees as well. Genera surveyed in addition to *Fraxinus*

included the ALB hosts *Acer*, *Salix*, *Betula*, *Aesculus*, and *Sorbus*, as well as the hemlock woolly adelgid host, *Tsuga*. Hemlock nursery stock is under quarantine in NH, but sales of *Tsuga* have risen dramatically in the last few years. For comparison to tree landscaping, boxwoods, azaleas, and rhododendrons were also counted.

Fraxinus was the third most common landscape tree included in the survey (following *Acer* and *Betula*) (Table 1). Analysis of number of *Fraxinus* by county as compared to *Betula* and *Acer* (Fig. 1 and Table 2) shows high numbers of *Fraxinus* planted in Cheshire County. There were only five identified sites with land use change in this county, and *Fraxinus* was highly planted at a commercial development and urban housing development in the Keene area. This number was higher than might be expected based on plantings of *Acer* and *Betula* in the same area. Keene, "The Elm City" is renowned for its tree-lined Main Street, which is predominantly planted in *Fraxinus*. It may be that new developments in the greater Keene area have tried to emulate the feel of Main Street with high–density *Fraxinus* plantings. This finding in Cheshire County is consistent with overall trends regarding utilization of *Fraxinus* nursery stock in this survey.

Table 1: Numbers of plants per genera counted in the survey

Genus	**# individuals in surveyed developments**
Acer	3,644
Aesculus	3
Betula	914
Fraxinus	601
Salix	37
Sorbus	4
Tsuga	137
Total trees included:	**5,340**
Buxus	638
Rhododendron	6,070
Total shrubs	**6,708**

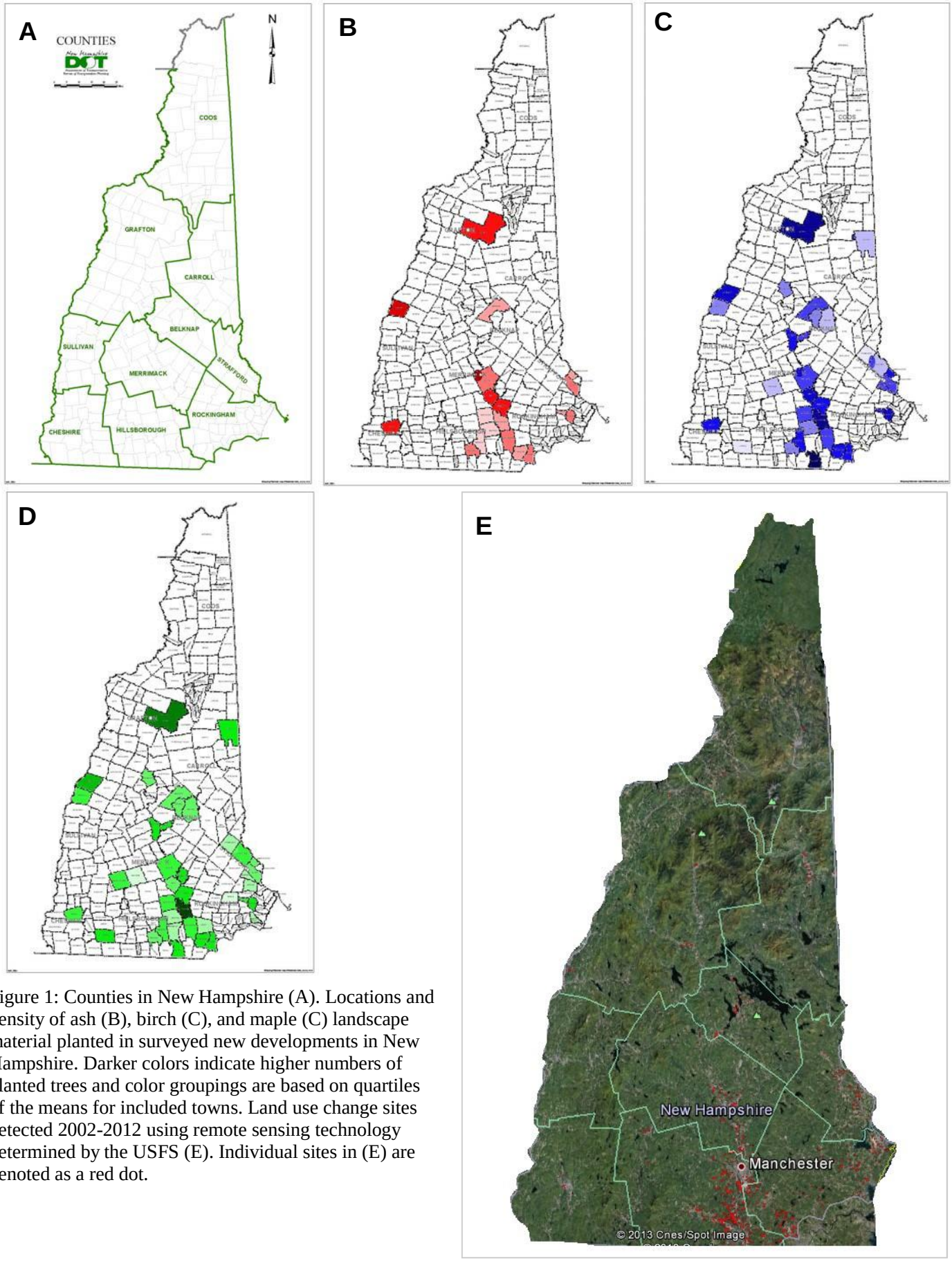

Figure 1: Counties in New Hampshire (A). Locations and density of ash (B), birch (C), and maple (C) landscape material planted in surveyed new developments in New Hampshire. Darker colors indicate higher numbers of planted trees and color groupings are based on quartiles of the means for included towns. Land use change sites detected 2002-2012 using remote sensing technology determined by the USFS (E). Individual sites in (E) are denoted as a red dot.

Table 2: Distribution of surveyed *Acer, Betula,* and *Fraxinus* landscape trees in surveyed new developments by county

	Acer			*Betula*			*Fraxinus*		
	Total	**Mean per site**	**Rank**	**Total**	**Mean per site**	**Rank**	**Total**	**Mean per site**	**Rank**
Belknap	185	10.9	8	28	1.6	8	31	1.8	5
Carroll	70	11.7	7	35	5.8	2	0	0	8
Cheshire	74	14.8	4	26	5.2	5	46	9.2	1
Grafton	249	24.9	1	53	5.3	3	91	9.1	2
Hillsborough	927	23.2	2	262	6.6	1	74	1.9	4
Merrimack	825	14.2	5	178	3.1	6	240	4.1	3
Rockingham	967	20.1	3	254	5.3	4	73	1.5	7
Strafford	347	12	6	78	2.7	7	46	1.6	6

The locations with the highest numbers of landscaped *Fraxinus* were all planned communities of commercial developments, or single-family homes, condos, or retirement communities where a single landscaper was responsible for planting and maintaining trees. Condo associations, apartment complexes, and retirement communities were classified as residential managed developments and neighborhoods with single-family homes and no common landscaping motif were classified as residential independent developments, unless informed otherwise by resident or development manager. When broken out by development type (commercial, residential managed communities, and residential independent homeowners), *Fraxinus* tended to be planted predominantly in residential managed communities and commercial developments as compared to the planting distribution of *Betula* and *Acer* (Fig. 2A.) Overall, more maples were planted at a site than ash regardless of development classification (Fig. 2B). Although a higher percentage (40%) of residential managed communities planted *Fraxinus* nursery stock, *Acer* nursery stock was planted in higher numbers where present.

Although it cannot be verified by this data set as host plants were not consistently recorded to species by surveyors, this preference for maples in residential managed neighborhoods may have been a reflection of the changing regulatory status of the popular Norway maple, *Acer platanoides,* in the state. Norway maple was added to the NH prohibited invasive plant species list in 2004, with a 3 year phase out, so that in 2007 it became a violation of the state's Invasive Species Rules (Agr3800) to: "collect, transport, import, export, move, buy, sell, distribute, propagate or transplant" Norway maples in NH. The timing of the phase-out period for Norway maple coincides with the development years encompassed by this survey. This may have resulted in a market with a high number of *Acer* plants at a potentially reduced price as nurseries and landscapers liquidated their stock. Although *Acer* was a preferred tree among residential independent neighborhoods, with about 70% of the developments in this classification with *Acer* plantings (Fig. 2A), where *Fraxinus* was planted, it was planted in equivalent numbers to *Acer* (Fig. 2B).

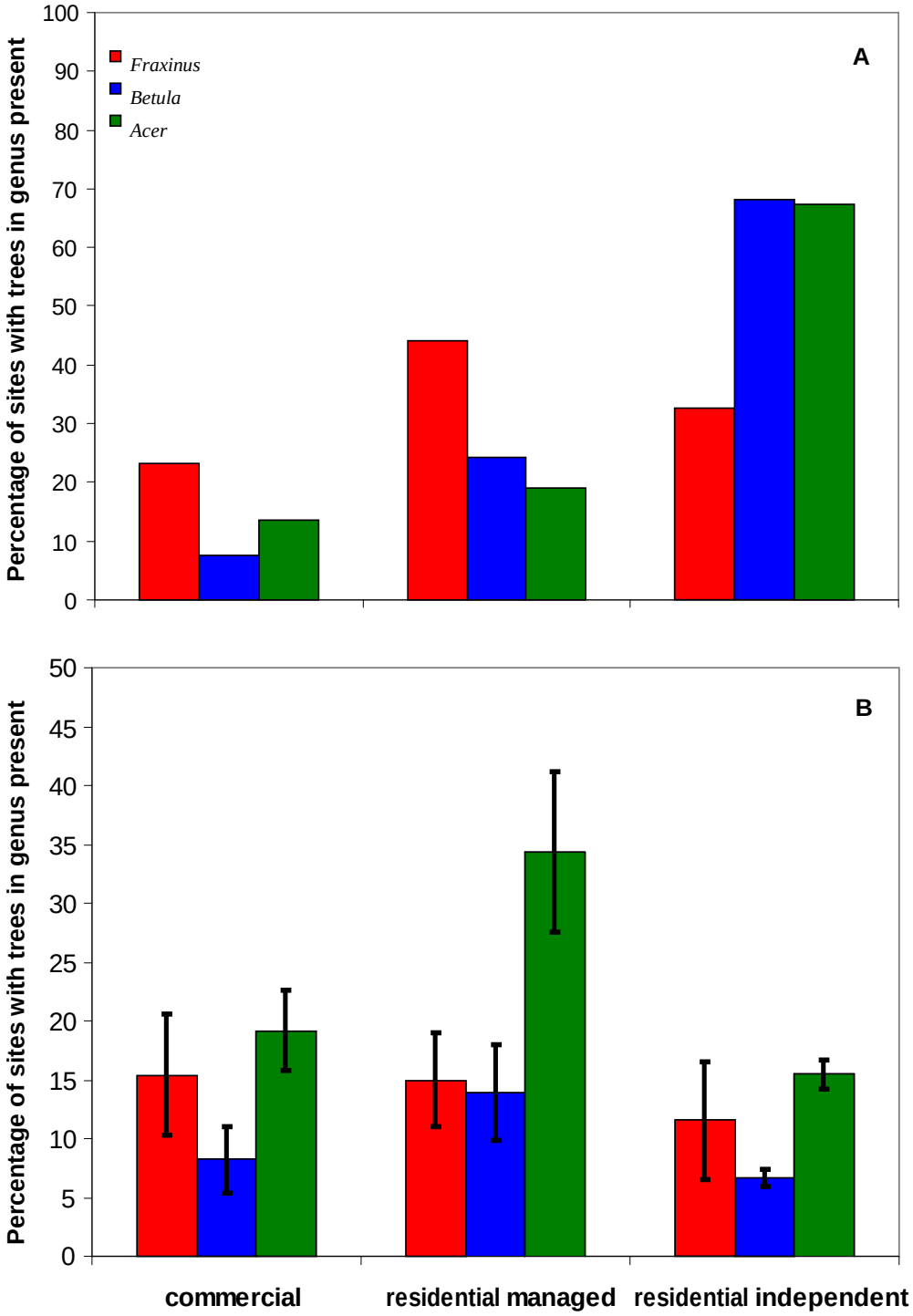

Figure 2: A) Percentage of surveyed developments with at least one *Fraxinus*, *Betula* or *Acer* planted by development classification. B) Mean (± SEM) numbers of trees planted per site where the host genus was present by development classification.

Outcomes of this survey:

- No EAB detected in surveyed *Fraxinus* as indicated by D-shaped exit holes, galleries, or bark splits with exposed galleries
- No ALB detected in surveyed *Acer, Betula, Salix, Aesculus* or *Sorbus* as indicated by exit holes, limb drop, etc.
- Illuminated trends for *Fraxinus* nursery stock use in the state 2002-2012
- Detection of neighborhoods at high risk from EAB (some locations had *Fraxinus* as 90%+ of their landscape trees)
- Targeting of regions with higher risk, esp. as many of NH's 244 cities and towns do not have up- to-date inventories of their urban forest resources
- Development of a similar survey to be conducted by middle-school children. This was part of an outreach effort to middle-school science teachers. This survey was felt to be optimal for use in schools because both negative and positive data are collected and students would gain experience with: GPS recording, tree identification to genus, data measurement, recording, management, analysis and reporting, assessment of risk, and hands-on interaction with a current hot topic. This survey was developed and presented at a Science Teachers Workshop in response to a request for a science-based activity that could be done with the students. Response to the proposed survey was mixed.

Generated data has been used to:

- Communicate with the state legislature, other decision makers, and the general public regarding potential impacts of EAB to the state
- Provide background information and some focus for future EAB survey efforts in the state
- Identify communities to target for outreach about EAB