City of Madison Emerald Ash Borer Plan Update

September 2013

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2013 EAB Taskforce Report Executive Update

Introduction

Since 2008, the City of Madison has been working on how to mitigate the impact of the Emerald Ash Borer (EAB). With an estimated 21,700 terrace ash trees, an unknown number of ash trees in parks and the many thousands more found on private property, the EAB could have a devastating effect on our urban forest. A taskforce was created to coordinate assessing the EAB threat, planning various response strategies, reviewing the latest research and acting to mitigate impacts on our tree canopy, ensuring public safety, protecting our environment and containing costs.

In late 2011, the EAB Taskforce presented background information on EAB and an overview of their report to the Common Council. The Taskforce was asked to continue meeting on the EAB threat and to report back to the Council in June 2012 with a list of final recommendations and estimated costs. After continued discussion and review, the Taskforce returned to the Council on July 3rd, 2012.

The Council referred the revised June 2012 EAB Plan to seven City boards, commissions or committees for review and final approval. The EAB Plan was approved in September 2012 and the Taskforce was asked to provide an annual update on the Plan and the mitigation of EAB. Below is an update of the Plan recommendations based on the latest scientific and operational findings of the Taskforce. Appendices are also provided at the end of this report highlighting supporting material and details from the Plan. See Appendix B for the Financial Section Update for treatment costs.

Recommendations

1. Implement a chemical treatment program for terrace trees 10 inches Diameter at Breast Height (DBH) and above, excluding trees in poor condition or under power transmission lines. The Taskforce strongly recommends injection treatments versus soil drench treatments to ensure protection of ground and surface water quality. Chemical treatments would begin when EAB was detected within 15 miles of

Madison which includes all of Dane County and be consistent with currently accepted Integrated Pest Management (IPM) plans, adopted, adapted or developed by the Forestry Section of Madison Parks Division.

2. Preemptively remove ash street trees in poor condition. Two hundred Ash trees were removed in 2013. In 2014, the Taskforce recommends that this number be increased to four hundred street trees. The first two hundred trees would be similar to the 2013 poor condition street trees that were removed, but the additional two hundred street trees would target trees that measure less than 10" DBH in two pilot canopy restoration projects in recently planted newly developed neighborhoods. These trees would be replaced by Madison Parks Forestry Section designated species within one year (or next appropriate planting season) to hasten renewal of urban tree canopy and ensure biodiversity. Forestry would work with homeowners on the pilot projects for volunteer removal of fair to good condition small ash street trees. Forestry maintains the decision about the replacement tree species and planting location.

3. Remove ash street trees designated in poor condition or that are under power transmission lines during infrastructure maintenance projects. Offer property owners the option of removing fair or good condition ash street trees during infrastructure maintenance projects. Replace these trees with Madison Parks Forestry Section designated species within one year (or next appropriate planting season) to hasten renewal of urban tree canopy. No ash trees under power lines or in poor condition will receive chemical treatments.

4. Provide property owners with the option of chemically treating publically owned trees located in Madison parks, at their own expense, through an Adopt-a-Tree program, that preserves legacy or high value trees and preserves tree canopy for environmental, economic or social reasons. The Adopt-a-Tree program would be facilitated by the Madison Parks Forestry Section and would be performed by licensed contractors through a Forestry Section permit. The decision to treat a publically owned tree would be made by the Madison Parks Forestry Section. If the

City hires a licensed private contractor to treat city owned trees, the city would provide private property owners the same access to licensed contractors, at their own expense, for the treatment of ash located on private property. The Adopt-a-Tree program would only be offered once EAB has been detected within 15 miles of Madison and be consistent with currently accepted Integrated Pest Management (IPM) plans. No ash trees under power lines or in poor condition will receive chemical treatments.

The Taskforce will continue to provide a yearly update of the EAB Plan to highlight actions taken to mitigate the EAB threat, latest research findings and other key issues impacting the urban tree canopy.

Consistent with the adopted EAB Plan, if an EAB infestation is discovered in Madison or Dane County, State of Wisconsin response guidelines and regulations would have to be followed and all options for mitigating its impact would be reexamined and the best options that help us ensure public safety, preserve the tree canopy and mitigate environmental impacts would be pursued. (See Diagram 1 and 2)

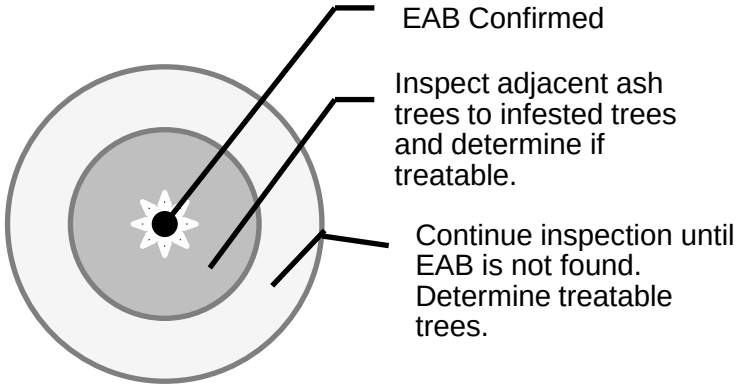


Diagram 1. Process of Inspecting Ash Street trees when EAB is found within City of Madison or in neighboring community (i.e. Middleton, Fitchburg, Town of Madison, etc.)

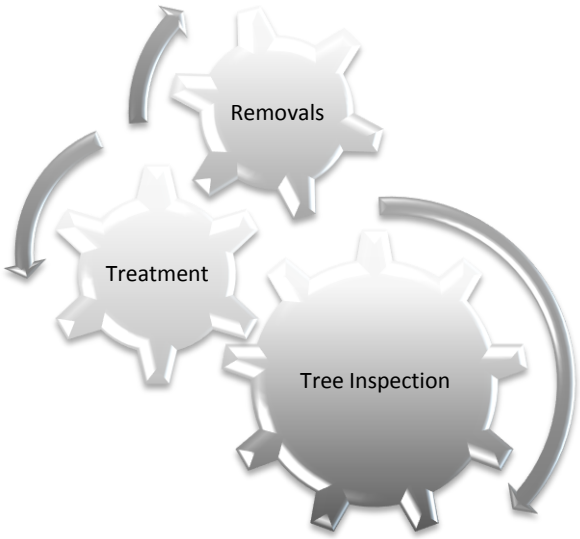
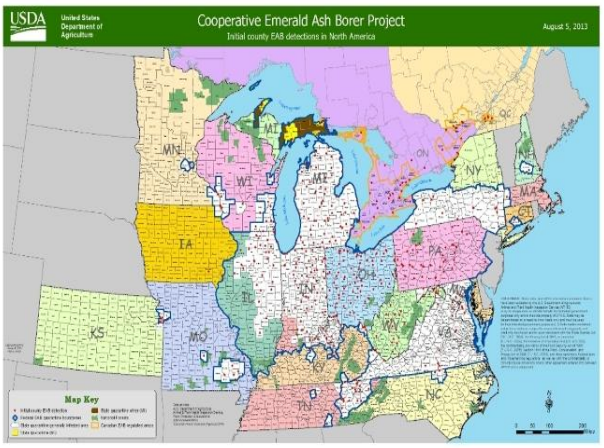


Diagram 2. The Inspection phase is a major component in the Chemical Treatment Process, the Removal Process and the Replacement Process. At time of this update 2013, there are 2 Forestry Specialists on staff.

The City of Madison Parks Forestry Section will utilize the EAB process: problem analysis, collaboration with researchers on latest findings and development of cost effective and environmentally friendly solutions, as a frame work for dealing with other potential insect and urban forest threats.

The Emerald Ash Borer (EAB) is an exotic pest from Asia that has already been responsible for the death of over 50 million ash trees in the United States and Canada (See Map 1). EAB has been found in several Wisconsin counties (See Map 2).

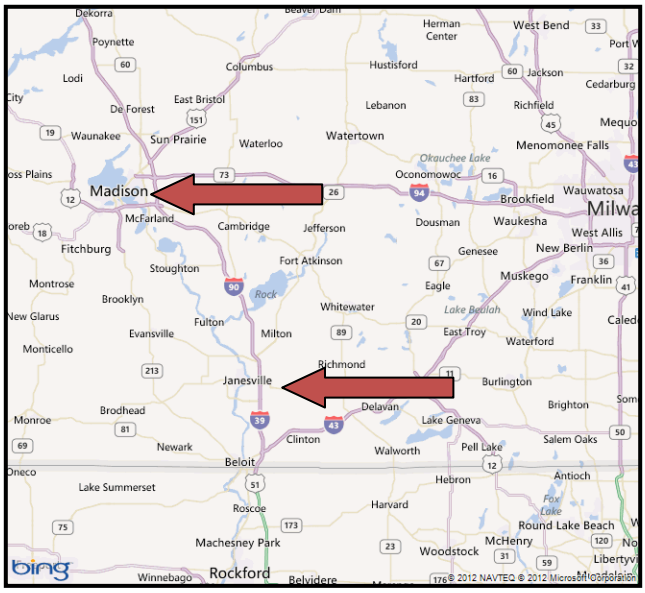
As of the date of this report, no EAB has been detected in Dane County. The nearest known EAB infestation is in Janesville, Wisconsin which is approximately 28 air miles from Madison, Wisconsin (See Map 3).



Map 1. Emerald Ash Borer locations in North America as of August 2013 (Source US Department of Agriculture).

Emerald Ash Borer Quarantined Counties
August 2013

Map 2. Emerald Ash Borer locations in Wisconsin as of August 2013 (source DATCP



Map 3. Nearest EAB infestation to Madison is approximately 28 miles in Janesville, Wisconsin

Appendix A: Cost Analysis For EAB Taskforce Recommendations

2013 Additional Forestry Specialist overtime to continue EAB prep and other tasks

2013-2018 Equipment and personnel in Madison Parks Forestry and Streets for EAB mitigation and infestation efforts.

Below is a chart highlighting costs associated with removing ash trees and replanting trees in increments of 200, 400, 800 and 1,000 trees. The chart outlines costs associated with either Forestry staff doing the work, contractors doing the work or a combination of Forestry staff and contractors doing various activities.

Cost Estimates for Pre-emptive Ash Street Tree Removals

Operational Year 1*

200 Trees		**400 Trees*** **		**800 Trees**		**1000 Trees**	
Staff/Equip	*Cost*	*Staff/Equip*	*Cost*	*Staff/Equip*	*Cost*	*Staff/Equip*	*Cost*
Forestry Specialist OT	$4,238	Forestry Specialist OT	$8,500	Forestry Specialist**	$65,824	Forestry Specialist**	$65,824
				For Spec Equipment	$500	For Spec Equipment	$500
						Arborist 2**	$60,917
						Eq. Operator 3**	$60,917
						Arborist 1**	$57,401
						Arborist 1**	$57,401
						Arb.Equipment	$6,000
				Depreciation for Pickup	$2,500	Depreciation for Pickup	$2,500
				Pickup annual repair and Fuel	$2,420	Depreciation for 45 ft tower	$9,500
						Depreciation for clam	$15,400
						Clam annual repair and Fuel	$13,380
						Tower annual repair and Fuel	$8,599
						Pickup annual repair and Fuel	$2,420
Totals	$4,238		$8,500		$71,244		$360,759

Year #2 and beyond, or until EAB is discovered

200 Trees		400 Trees***		800 Trees		1000 Trees	
Staff/Equip	*Cost*	*Staff/Equip*	*Cost*	*Staff/Equip*	*Cost*	*Staff/Equip*	*Cost*
Forestry Specialist OT	$4,238	Forestry Specialist OT	$8,500	Forestry Specialist	$65,824	Forestry Specialist	$65,824
						Arborist 2	$60,917
						Eq. Operator 3	$60,917
						Arborist 1	$57,401
						Arborist 1	$57,401
				Depreciation for Pickup	$2,500	Depreciation for Pickup	$2,500
				Pickup annual repair and Fuel	$2,420	Depreciation for 45 ft tower	$9,500
						Depreciation for clam	$15,400
						Clam annual repair and Fuel	$13,380
						Tower annual repair and Fuel	$8,599
						Pickup annual repair and Fuel	$2,420
Totals	$4,238	$8,500		$70,744		$354,259	

* Street stump grubbing would include some of the work to be contracted and capitalized. The cost of stump grubbing is related to the size of the stump (measured in inches).
** Salary for additional staff does include benefit of 36.3%
******* 200 preemptive removal of poor condition ash street trees plus 200 ash street trees that are less than 10-inches in diameter breast height. The ability to perform these removals is due to the fact that new plat developments at a decrease therefore there aren't many assessable street tree plantings scheduled. When new plat development increases this would need to be reevaluated.
The Streets Division would be able to absorb these smaller sized stumps with their current staff.

Capital Expenditures Year 1*

200 Trees		400 Trees***		800 Trees		1000 Trees	
Equip./Trees	*Cost*	*Equip./Trees*	*Cost*	*Equip./Trees*	*Cost*	*Equip./Trees*	*Cost*
Ash Replacements	$15,000	Ash Replacements	$30,000	Pickup truck	$25,000	Pickup truck	$25,000
				Replacement Planting	$284,000	45 ft Tower	$95,000
				Ash Replacements	$200,000	Clam	$154,000
				Contract Stump Removal	$90,000	Ash Replacements	$250,000
						Contract Stump Removal	$200,000
Totals	$15,000	$30,000		$599,000		$724,000	

Note: **Cost of contractual replacement tree (2.5" to 3.5") can range from $250 to $350.**

Year #2 and beyond, or until EAB is discovered*							
200 Trees		**400 Trees *****		**800 Trees**		**1000 Trees**	
Trees	*Cost*	*Trees*	*Cost*	*Trees*	*Cost*	*Trees*	*Cost*
Ash Replacement	$15,000	Ash Replacements	$30,000	Replacement Plantings Ash Replacements Contract Stump Removal	$284,000 $200,000 $90,000	Ash Replacements Contract Stump Removal	$250,000 $200,000
Totals	$15,000	$30,000		$574,000		$450,000	

The following applies to both operational and capital budgets for preemptive ash removals until a confirmed EAB infestation is found in Dane County:

200 - 400 Trees: estimated number of trees Forestry could remove without adding field staff or vehicles to our East or West crews. Planting site and species is determined by the Forestry Section.

800 Trees - estimated number of trees Forestry could remove if all tree planting would be contracted out. Costs for labor to plant trees in new subdivisions would be assessed directly to property owners instead of using city labor (reimbursed to Operation Budget). Costs would also increase for Engineering to plant trees along non-assessable street reconstruction projects. Planting site
and species is determined by the Forestry Section.

1,000 Trees - estimated number of removals if additional forestry staff added to specifically remove ash street trees. Replacement of ash removals would need to be contracted out – Forestry crews could continue to plant normal street tree replacements, new street trees on assessable plats, and street trees for street reconstruction projects. Planting site and species is determined by the Forestry Section.

Appendix B: EAB Cost Calculator for All Ash Street Trees

This assessment of Emerald Ash Borer management options is for all ash street trees that are 1-inch in DBH to over 30 –inches DBH. Consistent with direction from the Common Council to save as many trees as is reasonably possible, the Taskforce has recommended biannual trunk injection with emamectin benzoate. Three categories of trees would be excluded from treatment, as follows:

1. Trees under power transmission lines. These 2,921 ash trees have reduced canopies due to repeated pruning by the power utilities.

2. Trees in poor condition. These 1,891 trees are currently declining in health or have structural defects to the extent that they are beyond treatment.

3. Good condition trees under 10 inches DBH. These 4,297 trees could be expected to suffer significant damage from biannual trunk injection. Trees of 6 inches DBH and above are theoretically treatable. However, four injection sites would have to be drilled every two years. The vascular tissue of these smaller trees does not have enough time to heal from the first set of treatments by the time the third treatment is due four years later. The small diameter trunks do not offer enough space to safely offset the holes drilled during the first and second treatments. Chemical treatments by trunk injection has the potential to damage smaller diameter trees and, therefore are impractical.

Removing these three classes from the total estimated ash street tree population of 21,828 trees leaves a remaining population of 12,719 economically treatable trees, or 58.27% of the total terrace ash population, to this number each year would be added those of the 4,297 healthy smaller trees (noted above) growing into the treatable 10 inch DBH size class. And from this number each year would be subtracted trees expiring from natural causes or declining into the poor condition category.

Costs to treat the street tree forest one time are estimated at $900,977 using in-house staff. However, the chemical treatments are effective for at least two years. The ash

street trees would therefore be divided in half and treated in two-increments. The cost to treat half of the ash street tree population each year is estimated at $450,489 (half of the number above), and this funding would be the minimum required in each year's capital budget. This cost number would increase for a number of years, as treatable trees continue to grow in diameter and are also joined by graduates from the small tree classes. At some point, however, the costs would begin a slow decline to zero as more trees expire naturally or are removed preemptively.

Marginal costs to treat the trees are considerably lower if the work is performed in-house and these numbers are assumed in the analysis above. During the late spring and summer, approximately 3 of the current 23 Arborists would be detached from normal duties to lead 3 treatment crews consisting of one Arborist and two seasonal employees.

In addition to the capital expenses noted above, approximately $62,000 of overtime and benefits expense would need to be added to the capital budget to backfill the workload of the 3 Arborists diverted during the treatment season.

Appendix B:
Marginal Costs of Chemically Treating Ash Trees in Terraces: In House
Trees above 10" dbh
Excludes trees in parks, golf courses, and on private property
From Inventory of August 27, 2013

Revised September 27, 2013

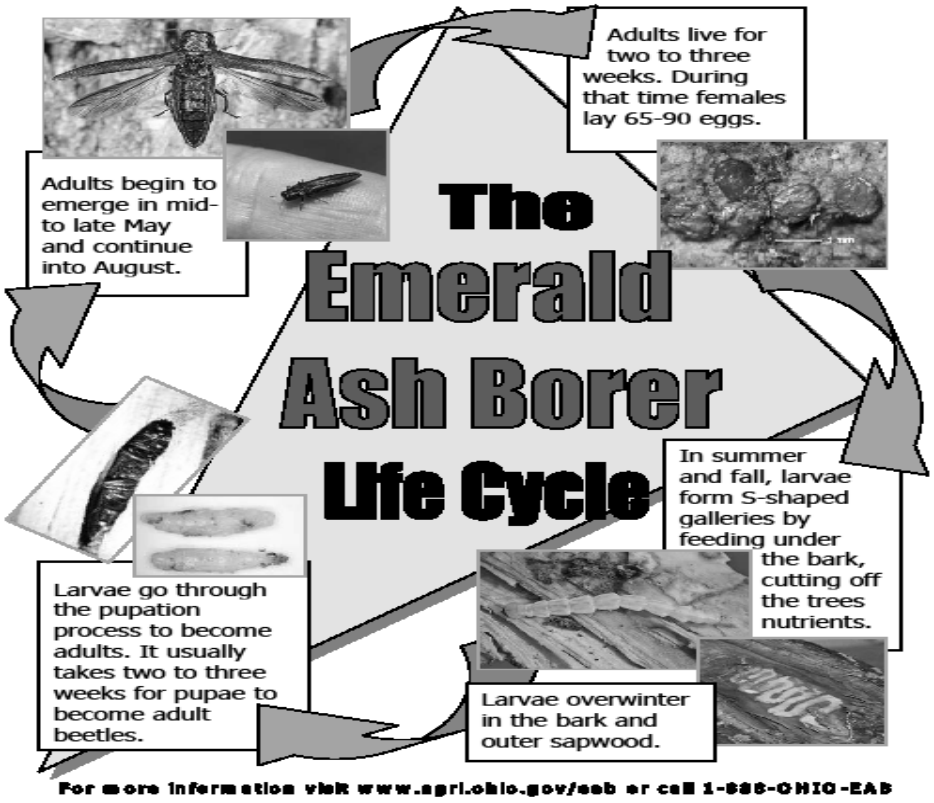
A	B	C	D	E	F	G	H	I	J	K	L	M	Marginal Costs N	O	P	Q	R	S	
Diameter (in.)	Total Ash	Under High Voltage	Estimated Poor Condition	Good Location & Condition	Cumulative Good Trees	Good & Economic Sized Trees	Ave number of injection sites per tree	Volume (m injected per site	Injected volume (ml) per tree	Total volume (L) required	Total Arborplugs required	If dbh / hour = 28 seasonal hrs needed	Chemical/L $475	Arborplug $0.65	Labor/hour $16.36	Equipment & Training $40,000	Total Marginal Costs	Marginal Costs Per Tree	Marginal Costs/ In. dbh
1	0	0	0	0	-	-	-		-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	-
2	0	0	0	0	-	-	-		-	-	-	-	-	-	-	-	-	-	-
3	85	3	8	74	74	-	-		-	-	-	-	-	-	-	-	-	-	-
4	439	0	44	395	469	-	-		-	-	-	-	-	-	-	-	-	-	-
5	951	4	95	852	1,321	-	-		-	-	-	-	-	-	-	-	-	-	-
6	989	14	98	877	2,198	-	4	5	20	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	920	19	90	811	3,009	-	4	5	20	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	795	20	78	697	3,706	-	4	8	32	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	717	60	66	591	4,297	-	4	8	32	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	823	77	75	671	4,968	671	6	8	48	32.2	4,026	159.8	$ 15,299	$ 2,617	$ 2,614	$ 1,370	$ 21,900	$ 32.64	$ 3.26
11	839	88	75	676	5,644	676	6	8	48	32.4	4,056	177.0	$ 15,413	$ 2,636	$ 2,897	$ 1,381	$ 22,327	$ 33.03	$ 3.00
12	916	108	81	727	6,371	727	6	8	48	34.9	4,362	207.7	$ 16,576	$ 2,835	$ 3,399	$ 1,485	$ 24,295	$ 33.42	$ 2.78
13	964	120	84	760	7,131	760	7	8	56	42.6	5,320	235.2	$ 20,216	$ 3,458	$ 3,850	$ 1,811	$ 29,334	$ 38.60	$ 2.97
14	1024	114	91	819	7,950	819	7	8	56	45.9	5,733	273.0	$ 21,785	$ 3,726	$ 4,468	$ 1,951	$ 31,931	$ 38.99	$ 2.78
15	970	142	83	745	8,695	745	7	8	56	41.7	5,215	266.1	$ 19,817	$ 3,390	$ 4,354	$ 1,775	$ 29,336	$ 39.38	$ 2.63
16	1051	156	90	805	9,500	805	8	8	64	51.5	6,440	306.7	$ 24,472	$ 4,186	$ 5,018	$ 2,192	$ 35,868	$ 44.56	$ 2.78
17	1009	132	88	789	10,289	789	8	8	64	50.5	6,312	319.4	$ 23,986	$ 4,103	$ 5,226	$ 2,148	$ 35,463	$ 44.95	$ 2.64
18	1107	210	90	807	11,096	807	8	8	64	51.6	6,456	345.9	$ 24,533	$ 4,196	$ 5,660	$ 2,197	$ 36,586	$ 45.34	$ 2.52
19	1079	222	86	771	11,867	771	10	10	100	77.1	7,710	348.8	$ 36,623	$ 5,012	$ 5,708	$ 2,624	$ 49,966	$ 64.81	$ 3.41
20	1162	251	87	824	12,691	824	10	10	100	82.4	8,240	392.4	$ 39,140	$ 5,356	$ 6,421	$ 2,805	$ 53,722	$ 65.20	$ 3.26
21	1035	183	85	767	13,458	767	10	10	100	76.7	7,670	383.5	$ 36,433	$ 4,986	$ 6,276	$ 2,611	$ 50,304	$ 65.59	$ 3.12
22	1007	208	80	719	14,177	719	12	10	120	86.3	8,628	376.6	$ 40,983	$ 5,608	$ 6,163	$ 2,937	$ 55,691	$ 77.46	$ 3.52
23	844	158	69	617	14,794	617	12	10	120	74.0	7,404	337.9	$ 35,169	$ 4,813	$ 5,529	$ 2,520	$ 48,031	$ 77.85	$ 3.38
24	761	140	62	559	15,353	559	12	10	120	67.1	6,708	319.4	$ 31,863	$ 4,360	$ 5,227	$ 2,283	$ 43,734	$ 78.24	$ 3.26
25	578	128	45	405	15,758	405	13	10	130	52.7	5,265	241.1	$ 25,009	$ 3,422	$ 3,945	$ 1,792	$ 34,168	$ 84.37	$ 3.37
26	528	108	42	378	16,136	378	13	10	130	49.1	4,914	234.0	$ 23,342	$ 3,194	$ 3,829	$ 1,673	$ 32,038	$ 84.76	$ 3.26
27	362	76	29	257	16,393	257	13	10	130	33.4	3,341	165.2	$ 15,870	$ 2,172	$ 2,704	$ 1,137	$ 21,882	$ 85.14	$ 3.15
28	282	81	20	181	16,574	181	15	10	150	27.2	2,715	120.7	$ 12,896	$ 1,765	$ 1,975	$ 924	$ 17,560	$ 97.02	$ 3.46
29	165	27	14	124	16,698	124	15	10	150	18.6	1,860	85.6	$ 8,835	$ 1,209	$ 1,401	$ 633	$ 12,078	$ 97.40	$ 3.36
30	137	13	12	112	16,810	112	15	10	150	16.8	1,680	80.0	$ 7,980	$ 1,092	$ 1,309	$ 572	$ 10,953	$ 97.79	$ 3.26
31	87	14	7	66	16,876	66	16	10	160	10.6	1,056	48.7	$ 5,016	$ 686	$ 797	$ 359	$ 6,859	$ 103.92	$ 3.35
32	74	17	6	51	16,927	51	16	10	160	8.2	816	38.9	$ 3,876	$ 530	$ 636	$ 278	$ 5,320	$ 104.31	$ 3.26
33	37	9	3	25	16,952	25	16	10	160	4.0	400	19.6	$ 1,900	$ 260	$ 321	$ 138	$ 2,618	$ 104.70	$ 3.17
34	29	5	2	22	16,974	22	18	10	180	4.0	396	17.8	$ 1,881	$ 257	$ 291	$ 135	$ 2,565	$ 116.57	$ 3.43
35	18	2	2	14	16,988	14	18	10	180	2.5	252	11.7	$ 1,197	$ 164	$ 191	$ 86	$ 1,637	$ 116.96	$ 3.34
36	5	0	1	4	16,992	4	18	10	180	0.7	72	3.4	$ 342	$ 47	$ 56	$ 25	$ 469	$ 117.35	$ 3.26
37	12	5	1	6	16,998	6	19	10	190	1.1	114	5.3	$ 542	$ 74	$ 86	$ 39	$ 741	$ 123.48	$ 3.34
38	7	2	1	4	17,002	4	19	10	190	0.8	76	3.6	$ 361	$ 49	$ 59	$ 26	$ 495	$ 123.87	$ 3.26
39	9	1	1	7	17,009	7	19	10	190	1.3	133	6.5	$ 632	$ 86	$ 106	$ 45	$ 870	$ 124.26	$ 3.19
40	5	2	0	3	17,012	3	21	10	210	0.6	63	2.9	$ 299	$ 41	$ 47	$ 21	$ 408	$ 136.13	$ 3.40
41	0	0	0	0	17,012	-	21	10	210	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -
42	3	1	0	2	17,014	2	21	10	210	0.4	42	2.0	$ 200	$ 27	$ 33	$ 14	$ 274	$ -	$ -
43	1	0	0	1	17,015	1	22	10	220	0.2	22	1.0	$ 105	$ 14	$ 17	$ 7	$ 143	$ 143.04	$ 3.33
44	2	1	0	1	17,016	1	22	10	220	0.2	22	1.0	$ 105	$ 14	$ 17	$ 7	$ 143	$ -	$ -
	21,828	2,921	1,891	17,016		12,719				1,079.4	117,519	5,538.3	$ 512,691	$ 76,387	$ 90,633	$ 40,000	$719,712		
check	21,828	2,921	1,891	17,016	trees	trees				Liters	plugs	hours	chemicals	plugs	labor	misc	total	Per Tree	

Years treatments last: 2
Average annual marginal treatment cost: $359,856
Average annual number of trees treated: 6,360

Costs Summary:	Trees	One Time Remove and Replace	Annual Chemical Treatment
0 - 5" dbh	1,321	$ 451,490	$ -
6 - 9" dbh	2,976	1,180,680	-
10 - 25" dbh	11,461	6,805,170	301,329
26" and above	1,258	1,382,920	58,527
Total Treatment	17,016	$ 9,820,260	$359,856

Add: Overtime for workload backfill $ 62,000
Total Program Marginal Costs $421,856

Appendix C: EAB Life Cycle



Appendix D: Ash Condition Criteria

GOOD

- Healthy, full canopy
- No structural defects
- Adequate grow space

FAIR

- 10%- 30% decline
- Structural defects
- Growing under high voltage power lines

POOR

- 30%-50% decline
- Multiple structural defects
- Heavily pruned for power line clearance – probably would be removed during next City Forestry or MGE pruning cycle (5 yrs)
- Poor crown structure – e.g. storm damage, heading cuts. Prior pruning that results in poor branch taper, poor wind load distribution, and a higher risk of branch failure.
- Poor grow space – narrow terraces, vision obstructions at corners, stop signs
- Tree will be removed.

REMOVE NOW – trees that Forestry will schedule removal and replacement during inspection

- >50% decline
- Structural defects that warrant removal

Appendix E: EAB Detection Methods

One of the many requirements for effective management of EAB is early detection of infestations, when densities are still low and before signs and symptoms are obvious. Visual surveys rely on external signs and symptoms (e.g., exit holes, larval tunnels seen through cracks in the bark, feeding by woodpeckers or squirrels) that may not be noticeable for 2 to 3 or more years after the arrival of the population, particularly if the infestation begins in the upper part of the tree (Ryall, K. L., et al. 2010).

Currently the Emerald Ash Borer can be detected by two methodologies. They are by purple traps or by branch sampling. In 2003, researchers began investigating EAB to develop an effective detection tool. For many insects, color frequently plays an important role, and EAB is no exception. Scientists found that buprestids (the insect family to which EAB belongs) in general are more attracted to red and purple hues compared to other colors. Therefore, researchers initiated a study using a variety of red and purple traps to determine which trap attracted the most beetles; the purple trap achieved the best results. To improve the purple traps' attractiveness to EAB adults, they are baited with oil from the Manuka tree. Researchers found that there are four active compounds in Manuka oil that are also produced when an ash tree is stressed.

The purple trapping process was implemented in 2009 by the U.S. Department of Agriculture. Wisconsin was one 47 States that participated in the purple trap program. There is a 44% success rate that EAB will be discovered by the purple trapping program. The trap is a three-dimensional triangle or prism. It's made out of thin, corrugated, purple plastic that has been coated with non-toxic glue on all three sides. The purple prisms are about 24 inches long and hang vertically in an ash tree or are secured to the trunk of a tree or on a pole. The purple traps are placed in spring before EAB adults emerge. The trap is monitored and remains in place throughout the summer during the beetle’s flight season and is removed in the fall. The purple trap process may not be wholly funded in 2012. Also, there is a question if purple traps will be available for purchase by local governments.

The branch sampling method was developed by the Canadian Forest Service in 2009. This technique was developed using open-grown ash trees in an urban setting. In this method, a maximum of five ash trees (measuring at least 10 inches in diameter at breast height) are sampled on plot grid basis. Two live branches (measuring two inches minimum diameter at the base to six inches at the top) from the south side of tree at mid-crown are removed and labeled. The branches are then stored in a cool dry place until the can be whittled (peeled) to find the EAB larvae life stage and gallery. If the objective is only to detect EAB, then sampling can stop when the first gallery is found. If the objective is to assess densities, then it is important to count all EAB galleries and living larvae on the sample branch.

Branch sampling has an 88% success rate as a highly effective tool for detection of low level EAB populations, before outwardly signs or symptoms become apparent. The optimum time for branch sampling is January through May because the larvae galleries are easiest to see.

The City of Madison EAB Taskforce recommends branch sampling be the primary EAB detection tool used by city staff. It is further recommended that branch sampling should continue in 2014 if funding is secured.

Appendix F: Before and After Effects of EAB

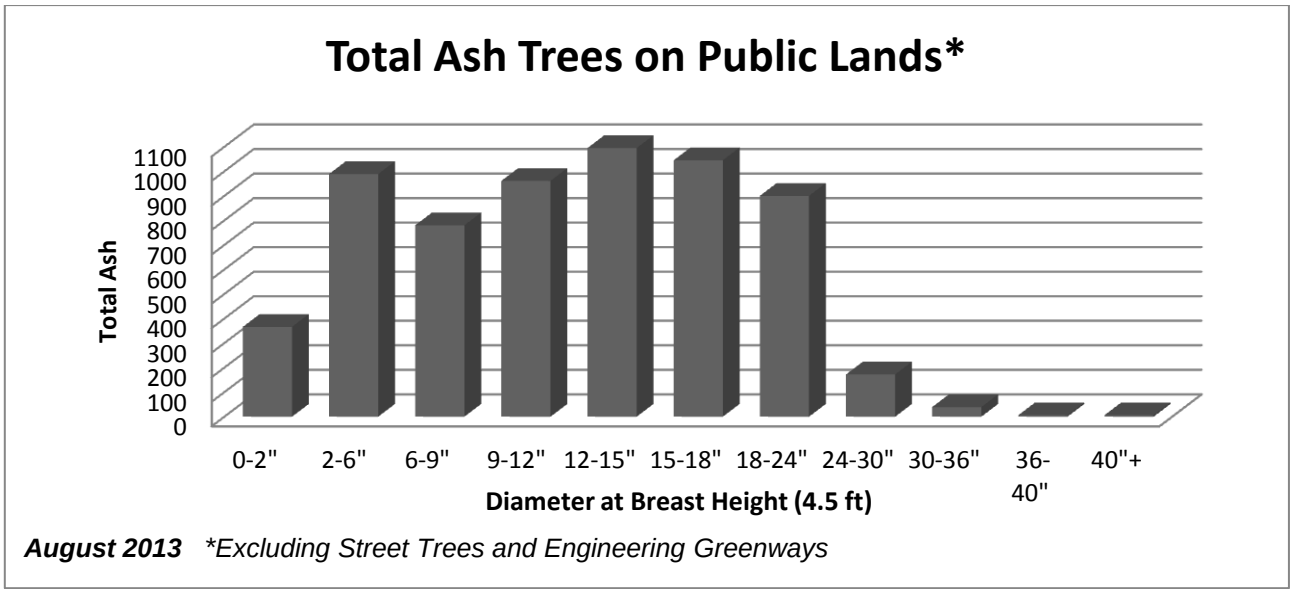
Dead ash trees in St. Paul, MN before and after removal.
CREDIT: Minnesota Public Radio

Appendix G: Summary of City Committees regarding June 2012 EAB Plan

DATE	COMMITTEE	
7/11/2012	**Park Commission**	A motion was made by **Barker, seconded by Scarbrough, t**o Return to Lead with the Following Recommendation(s) to the BOARD OF ESTIMATES. The motion passed by voice vote/other. The Commission recommended that the report include a strong statement of the importance of biodiversity in the urban environment. The Commission recommended that the approved species list for trees in the terraces be appended to the report. The Commission recommended that Integrated Pest Management be a part of the report due to concerns about broad based use of chemical treatments.
7/16/2012	**Committee on the Environment**	A motion was made **by Weier, seconded by Lasky,** to Return to Lead with the Following Recommendation(s) to the BOARD OF ESTIMATES: Approve the report with the additional recommendation that there should not be soil-applied treatment (for EAB) within a wellhead protection zone or within 100 feet of surface water. The motion passed by voice vote/other.
7/24/2012	**Water Utility Board**	A motion was made by **Nelson, seconded by Cnare,** to Return to Lead with the Recommendation for Approval to the BOARD OF ESTIMATES, and to refer the use of pesticides on both public and private property to the Water Quality Manager and Water Quality Technical Advisory Committee. The motion passed by voice vote.
7/25/2012	**Board of Public Works**	A motion was made by **Anthony, Jr., seconded by Fix,** to Return to Lead with the Recommendation for Approval, amended so that chemicals cannot be sprayed within 100 feet of water and/or wildlife protection zones to the BOARD OF ESTIMATES. The motion passed by voice vote/other.
8/9/2012	**Board of Health for Madison & Dane Co**	A motion was made by **Wilcox, seconded by Phair,** to Return to Lead with the Recommendation for Approval to the BOARD OF ESTIMATES. The motion passed by voice vote/other.
9/6/2012	**Solid Waste Advisory Committee**	A motion was made by **King**, **seconded by Lawton**, to RECOMMEND TO COUNCIL TO ADOPT . The motion passed by voice vote/other.
9/10/2012	**Board of Estimates**	A motion was made by **Rhodes-Conway, seconded by Verveer**, to RECOMMEND TO COUNCIL WITH THE FOLLOWING RECOMMENDATIONS - Include the recommendations from the Board of Park Commissioners and the Committee on the Environment and include stronger language regarding chemical treatment in the report. - REPORT OF OFFICER. The motion passed by voice vote/other.

Appendix H: City of Madison Park Ash Tree Count Summary

	0-2"	2-6"	6-9"	9-12"	12-15"	15-18"	18-24"	24-30"	30-36"	36-40"	40"+	Totals
City Owned Public Land Ash Tree Inventory	**366**	**858**	**626**	**787**	**900**	**765**	**752**	**143**	**34**	**5**	**6**	**5242**
Golf	**0**	**115**	**151**	**156**	**195**	**250**	**102**	**11**	**4**	**0**	**0**	**984**
Glenway	0	1	3	9	9	13	15	0	0	0	0	50
Monona	0	27	35	47	41	32	25	6	4	0	0	217
Odana	0	10	0	2	18	107	26	1	0	0	0	164
Yahara	0	77	113	98	127	98	36	4	0	0	0	553
Water	**0**	**12**	**1**	**5**	**4**	**0**	**7**	**6**	**0**	**1**	**0**	**36**
Housing	**0**	**4**	**2**	**13**	**12**	**30**	**39**	**12**	**1**	**0**	**0**	**113**
Totals:	**366**	**989**	**780**	**961**	**1111**	**1045**	**900**	**172**	**39**	**6**	**6**	**6375**



Note: Ash tree count only includes trees growing in and along maintained areas and right – of –way frontages. It does NOT include ash trees growing in wooded areas within parks or conservation parks.

Appendix I: Approach to Other Threats to the Urban Forest

There are many native insects and diseases that affect our city trees. However, native trees are most vulnerable to exotic invasive insects and diseases because there are no known natural defenses. In the past our city has battled Dutch Elm Disease and Gypsy Moth. We have prepared strategies to respond to EAB. A future threat includes the Asian Longhorned Beetle (ALB) which is currently found in Ohio, New York, New Jersey and Massachusetts.

The threat from non-native invasive insect species is very costly to U.S. tax payers. In fact, according to a new study by a U.S. Forest Service, Northern Research Station science team, non-native, wood-boring insects such as the Emerald Ash Borer (EAB) and the Asian Longhorned Beetle are costing an estimated $1.7 billion in local government expenditures. In addition to those billions of dollars add approximately $830 million annually in lost residential property values due to tree loss and one gets the idea that these invaders are costing us a lot. Given observations of new species, there is a 32% chance that another highly destructive borer species will invade the U.S. in the next 10 years. (Aukema JE, Leung B, Kovacs K, Chivers C, Britton KO, et al. 2011)

Prevention, Early Detection and Rapid Response, Control and Management

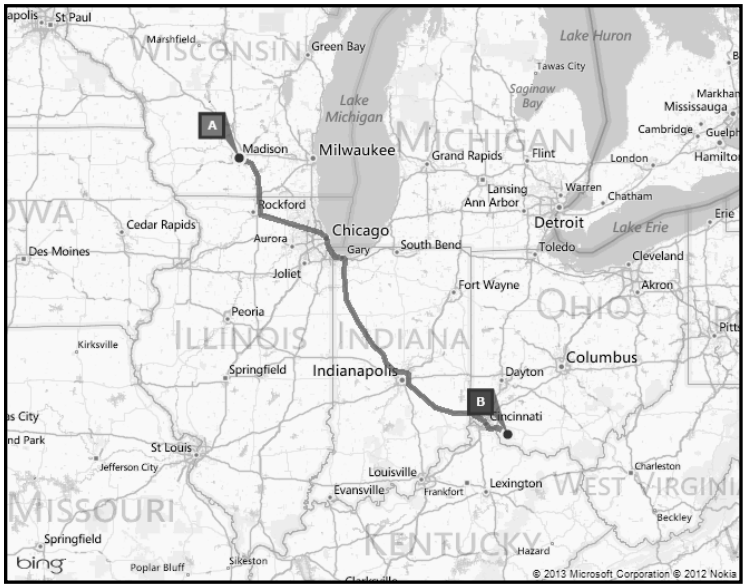
The City of Madison EAB Taskforce recognizes that the same methods used for Gypsy Moth and EAB can be applied to other potential threats: early detection, prevention, control and management, rehabilitation and restoration. The strategy includes a whole range of programs involving various treatment regimes such as: (1) mechanical removal, (2) cultural methods aka tree diversity selection, (3) biological control, and (4) chemical treatments.

Asian Longhorned beetle

The Asian Longhorned Beetle (*Anoplophora glabripennis*) has been devastating urban forests in the Northeast since it was first detected in Brooklyn, New York in 1996. Asian Longhorned Beetle (ALB) is native to eastern Asia. The insects are very destructive to any eco-system they inhabit. In China, 40% of the poplar plantations have been damaged, leaving the wood only useful for packing material. They enter the country in packing crates, mostly from China, and have been spotted in warehouses in the states of California, Florida, Illinois, Indiana, Massachusetts, Michigan, North Carolina, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Texas, Washington, and Wisconsin, as well as several eastern areas of Canada.

Since ALB's discovery in 1996 it has also been found elsewhere in New York City and nearby in New Jersey and Long Island. ALB was also discovered in Chicago, IL in 1998, Toronto, ON in 2003, Worcester, MA in 2008, Boston, MA in 2010 and Bethel, OH in 2011. In all locations where ALB has been discovered, an eradication strategy has been undertaken. In Chicago the strategy has been effective, and ALB was declared eradicated there in 2008. Efforts to eradicate this pest have resulted in the removal of tens of thousands of trees in several northeastern communities in the United States and Canada.

While the eradication battle continues on several other urban fronts, there are growing concerns that this invasive pest could enter natural and managed forests of Eastern North America. The nearest known ALB infestation to Madison, Wisconsin is Bethel, Ohio (approximately 490 miles) (see Map 4). Adults are capable of flying several hundred yards in a single flight. Because they can live for up to 66 days, they have the potential to fly up to 400 yards to locate suitable host trees. However, most adults fly only about 50-75 yards to find a host. Local human assisted spread is typically via transport of infested firewood.



Map 4. Nearest ALB infestation is Bethel, Ohio (near Cincinnati)

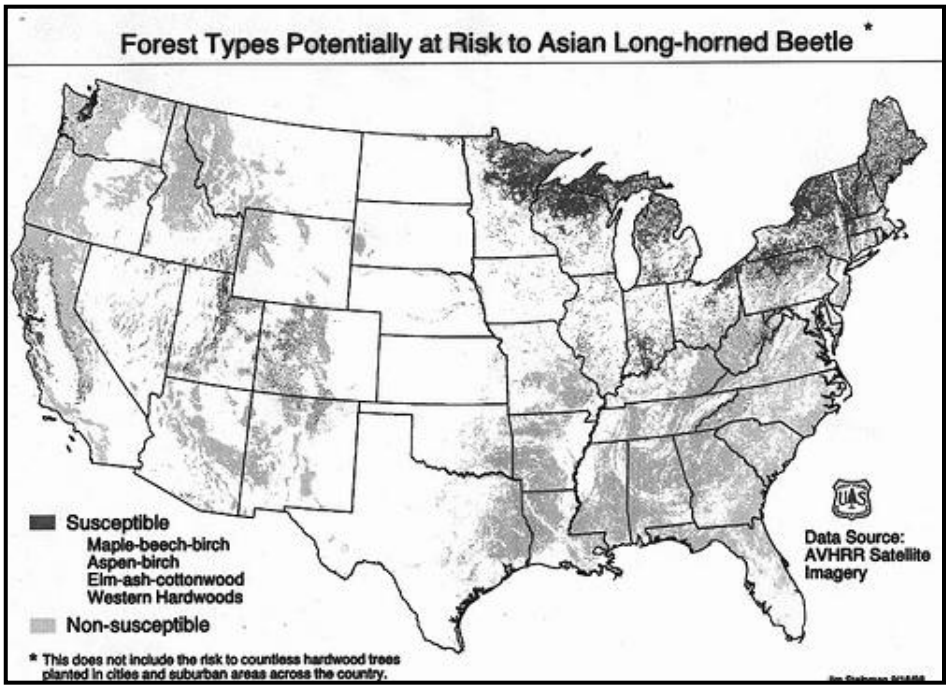
The adult ALB is a large, “showy” insect that is 1 inch to 1 ½ inches in length and has a shiny, jet black body with distinctive white spots (see Photo 1). Detection of the beetle often depends on the ability to identify the signs of injury left by each stage of the insect’s development in or on trees, some of which can be seen throughout the year.

Photo 1 Adult Asian Longhorned Beetle. Their antennae are banded with black and white stripes and are longer than the insect’s body.

Asian Longhorned Beetle larvae are the most dangerous as they can bore into trees, greatly weakening the tree’s structural system and eventually causing the tree’s death which is similar to EAB. In the United States, the Asian Longhorned Beetle prefers to feed on maple trees, especially the sugar maples (see Map 5). There are no effective trapping methods and pesticides do not have any effect on them. And there are no natural predators. Once the tree becomes a host for these beetles, it must be destroyed. If a host tree is merely cut and not destroyed, the beetles will move to other trees and infect other areas. ALB will also infest other trees:

- Ash
- Birch
- Elm
- Hackberry

- Horsechestnut
- Katsura
- London Planetree
- Mountain ash
- Poplar
- Willow



Map 5. US Forest types potentially at risk to ALB.

Appendix J: Sawmill Project

The Streets Division has received a grant from the Wisconsin Department of Natural Resources to lease a portable sawmill. During the two year grant period, the City of Madison will work with Dane County, and other interested municipalities in the area on testing the market for lumber made from urban trees, including those that are removed due to the Emerald Ash Borer.

The portable sawmill will be used to cut lumber from trees removed by the Forestry Section and by participating communities. The lumber will be used in several demonstration projects that illustrate the beauty and usefulness of lumber from urban trees. It is hoped that by showing potential end uses of this material how useful urban lumber is, new markets can be developed for urban wood. These new markets have the potential of increasing the value of the urban forest.

The City of Madison will explore partnerships with the Madison Metropolitan School District and Madison College which will add an educational component to the program. The City will supply some lumber from the sawmill project to these institutions in exchange for display items made from the lumber and possibly a small structure which will be converted into a kiln.

The sawmill will also be used in cooperation with Dane County to test the viability of wood marshalling yards. These yards will be used to store trees removed due to EAB or from storms. It is hoped that we can develop intergovernmental protocols for working together on wood processing as a result of the grant.

Appendix K: Deferred Street Tree Maintenance

The Forestry Section tree maintenance operations by city arborists are scheduled utilizing one of three priorities: request work, emergency, and programmed maintenance. Request work is scheduled based on citizen requests for pruning or removal of trees adjacent to their property with a completion goal within four weeks. Request work can also come from city agencies. For example, Streets Division may request pruning for clearance along the curb for snow plowing or street sweeping; engineering may need pruning of street trees for street clearance for reconstruction or resurfacing projects or tree removal for the sidewalk repair program. Emergency work is the removal to a clear hazard (i.e. tree branches blocking the view of a stop sign or partially broken branches, downed trees blocking a roadway or storm damage) that must be addressed immediately for public safety. Programmed maintenance (aka District Cycle pruning) city tree crews are assigned to a given area (aka Tree Maintenance District) of the city and perform all services upon the street trees in that location on a rotational basis. This is also referred to as grid pruning, area pruning, or scheduled pruning. There is a total of 35 Tree Maintenance Districts. The service includes the following:

1. Removal of all dead branches; crossed limbs; diseased limbs; split, or hollow limbs, storm damage; and suckers.
2. Provide adequate clearance for pedestrians and vehicles; rooftops; buildings; stop signs; school/parking signs; traffic signals; street lights; bus stop signs; and intersections.
3. Provide crown structure to address double central leaders and the ability to withstand high wind and snow loads from storms.
4. Remove trees that have significant trunk decay; diseased; dying; and dead.
5. Address illegally planted street trees.

Request work and emergency work cannot be ignored entirely, but programmed maintenance scheduled with reasonable frequency will greatly reduce the need to schedule request and emergency work for these reasons.

The District Pruning Cycle is the number of years it takes to service all street trees in the city on a programmed basis. For example, a city on a seven-year pruning cycle will prune one-seventh of the street trees each year with each street tree receiving maintenance once every seven years. Currently, the City of Madison is on a 17-year District Pruning Cycle. The length of a pruning cycle is dependent upon on the number of street trees and funds available for maintenance.

The City of Madison does have a Small Tree Pruning Cycle whereby young street trees that are about ten inches or less in diameter in a Tree Maintenance District are pruned for the following objectives:

1. Remove dead branches; crossed limbs; and suckers
2. Remove lower scaffold branches for eventually obtaining sidewalk and street clearance.
3. Address co-dominant limbs.
4. Provide for good branch arrangement

The Small Tree Pruning Cycle is currently on a four year schedule. Again, this means that small street trees are pruned every four years or less. Frequent pruning of small trees will demand less corrective pruning at tree maturity. Generally, young trees need more frequent pruning because of rapid growth rates. Small Tree Pruning Cycle allows for more frequent inspections, smaller pruning cuts, better public relations, a dramatic reduction in request tree work and fewer tree failures.

Avg Monthly hours (June, July, & Aug)
2008-2012

Task	# Hrs per month	Keep	Defer %	Eliminate	Hrs Available for EAB treatment
District Hours	73.6			x	73.6
Request Hours	576.7		90%		519.0
Sm. Tree Hours	47.3			x	47.3
Removal Hours	881.3	x			
Clean up	1031.5		25%		257.9
CDL & Tower Checks	208.6	x			
Maintenance	176.4	x			
Meetings	10.7	x			
Training/Classes	5.3	x			
Posting	10.4			x	10.4
Storm Work/Hangers	275.7	x			
Acting Foreperson	47.2	x			
Vehicle Transport	15.0	x			
Light Duty	5.5	x			
Sign Clearance	18.2	x			
Digout Hours	45.0	x			
Tree Watering	179.1	x			
Planting Maintenance	59.5		100%		59.5
Vehicle Damage	4.0	x			
Survey/Inspection	90.6			x	90.6
Other	80.3	x			
TOTALS	3845.6				**1058**
Unfilled Vacancy	396.3		Will be at full staff in 2014		396.3
Workmen's Comp.	29.3	x			
FMLA/AWOP	73.1	x			
Sick	118.8	x			
CU/VAC/FLH	516.7	x			
TOTALS	1134.2			**Available Hrs Per Month:**	**1455**

Deferred maintenance due to full time staff involved in EAB treatments:

> Estimated 1550 staff hours that would be required for EAB treatments would equal 1,223 trees that would not be pruned (Request pruning) June/July/Aug.

> $62,000 (estimate) of overtime would be required to maintain current services June/July/Aug.