



***Town of Bethlehem, New York
Street Tree Inventory Analysis and Management Plan***

Completed by Davey Resource Group



VISION STATEMENT

The Town of Bethlehem maintains a healthy street tree canopy using best arboricultural practices. The street tree canopy is equitably distributed and provides a wide range of physical and mental health benefits. It has positive impacts on property values, pedestrian travel, and calms vehicular traffic. Street trees are carefully selected and planted in appropriate places and there are few to no conflicts with utilities and roadway intersections. Street trees mitigate some of the impacts of the changing climate as they improve stormwater management, reduce the urban heat island effect, increase carbon dioxide storage, and minimize the risk posed by invasive plant and insect species and diseases. This vision will ensure canopy continuity, which will reduce stormwater runoff and improve aesthetic value, air quality, and public health.



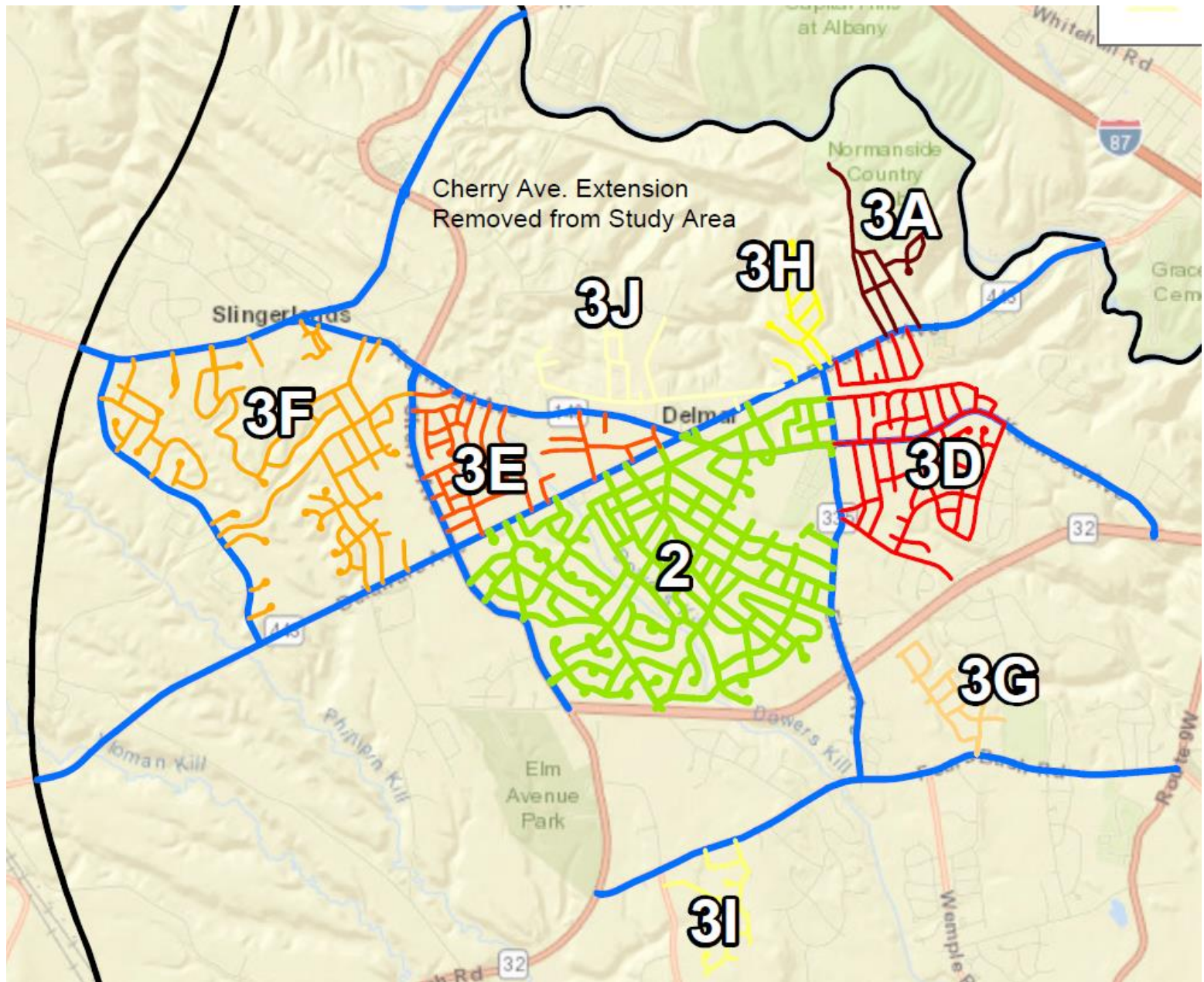
Sites Included in the Inventory:

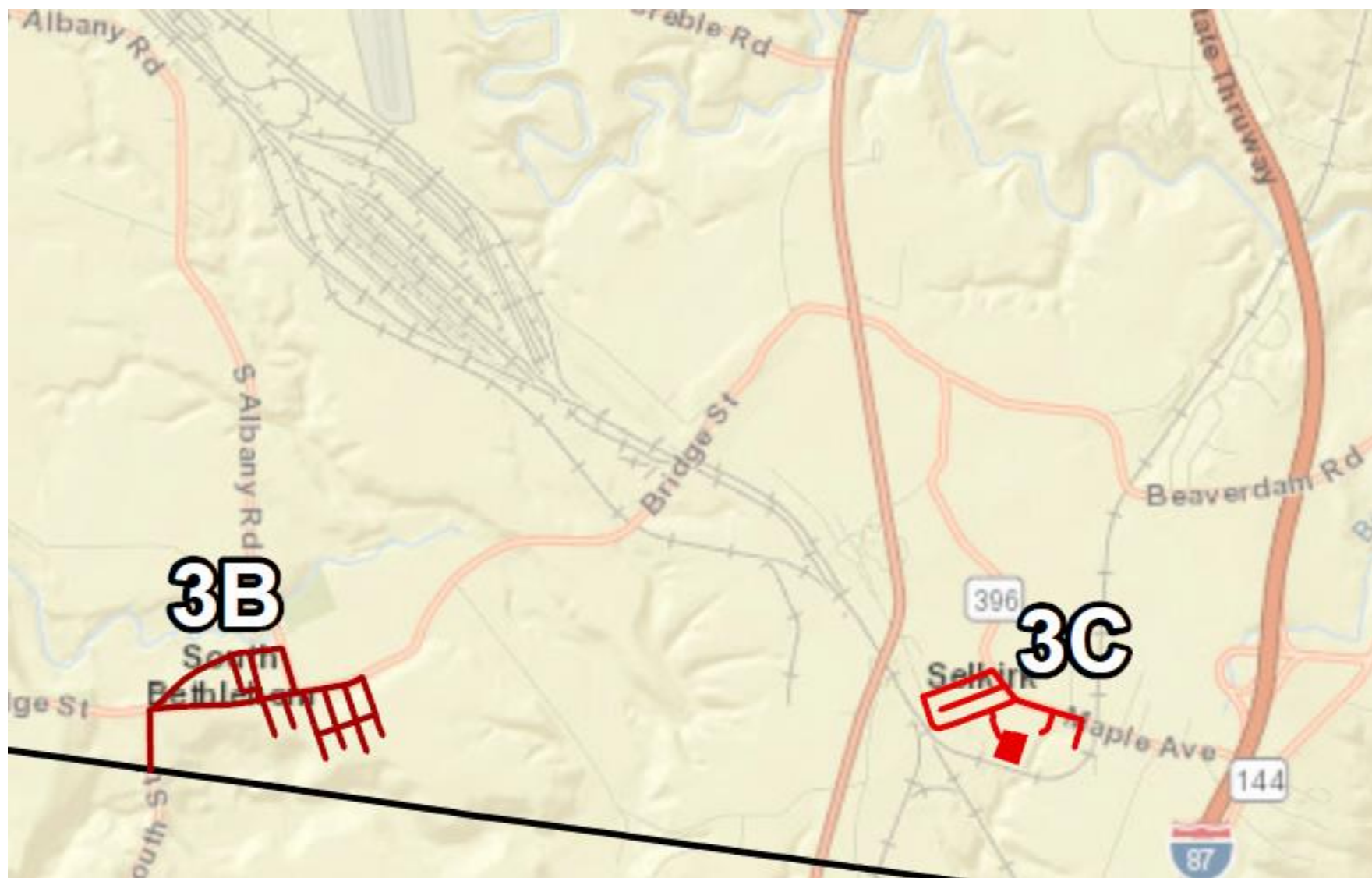
- Trees, Stumps, & Planting Sites
- Located within town and state-maintained street rights-of-way, specified public spaces, and public facilities
- These locations were selected by The Town for the likelihood of existing street trees

Data Fields

Location (Address, On Street, Side)	Defects
GPS X and Y	Risk Assessment
Species	Residual Risk
Size (DBH & multistem)	Further Inspection
Tree Condition	Overhead Utilities
Primary Maintenance Need	

Data Collection: September 2019 to October 2019





Inventory Results



Photo courtesy of Picket Fence Properties

Davey Resource Group inventoried a total of 6,649 Sites:

- 4,843 Trees
- 149 Stumps
- 1,657 Available Planting Sites

110 Species representing 53 Genera



Inventory Results

- On the street ROW, maple (*Acer* spp.) were found in abundance (31%), which is a concern for the town's biodiversity.
- One species, Norway maple (*Acer platanoides*), comprises a large percentage of the street ROW (11%), also a concern for biodiversity.

Goals

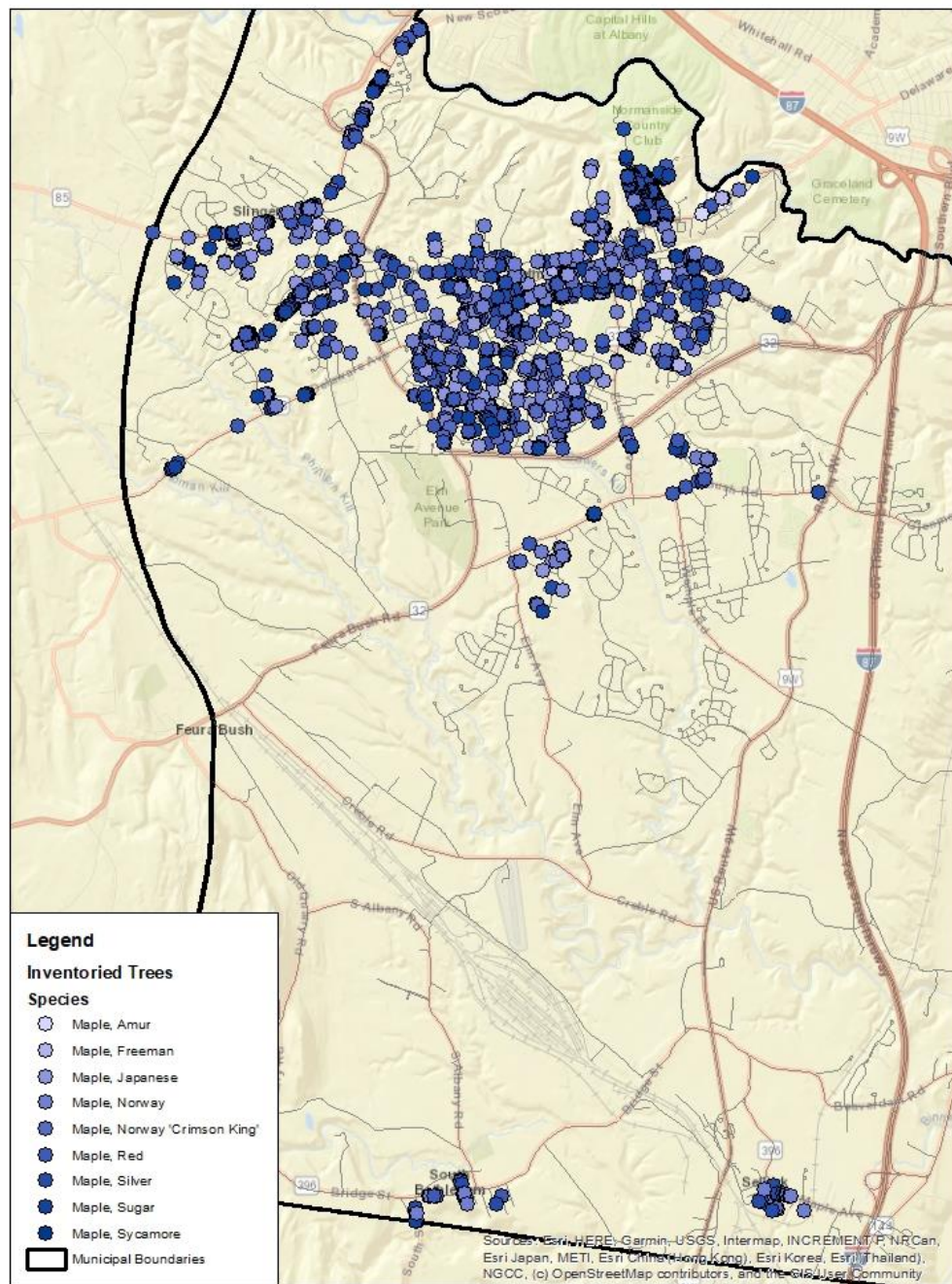
Based on the 10-20-30 Rule for Species Diversity

The continued planting of maple should be minimized to help achieve better species diversity

Genus Diversity

Top 5 Genera

Common Name	Percent Trees Inventoried
Maple	31%
Spruce	11%
Ash	9%
Pine	9%
Apple	4%





Goal:

Protecting species diversity and maximizing environmental and economic benefits

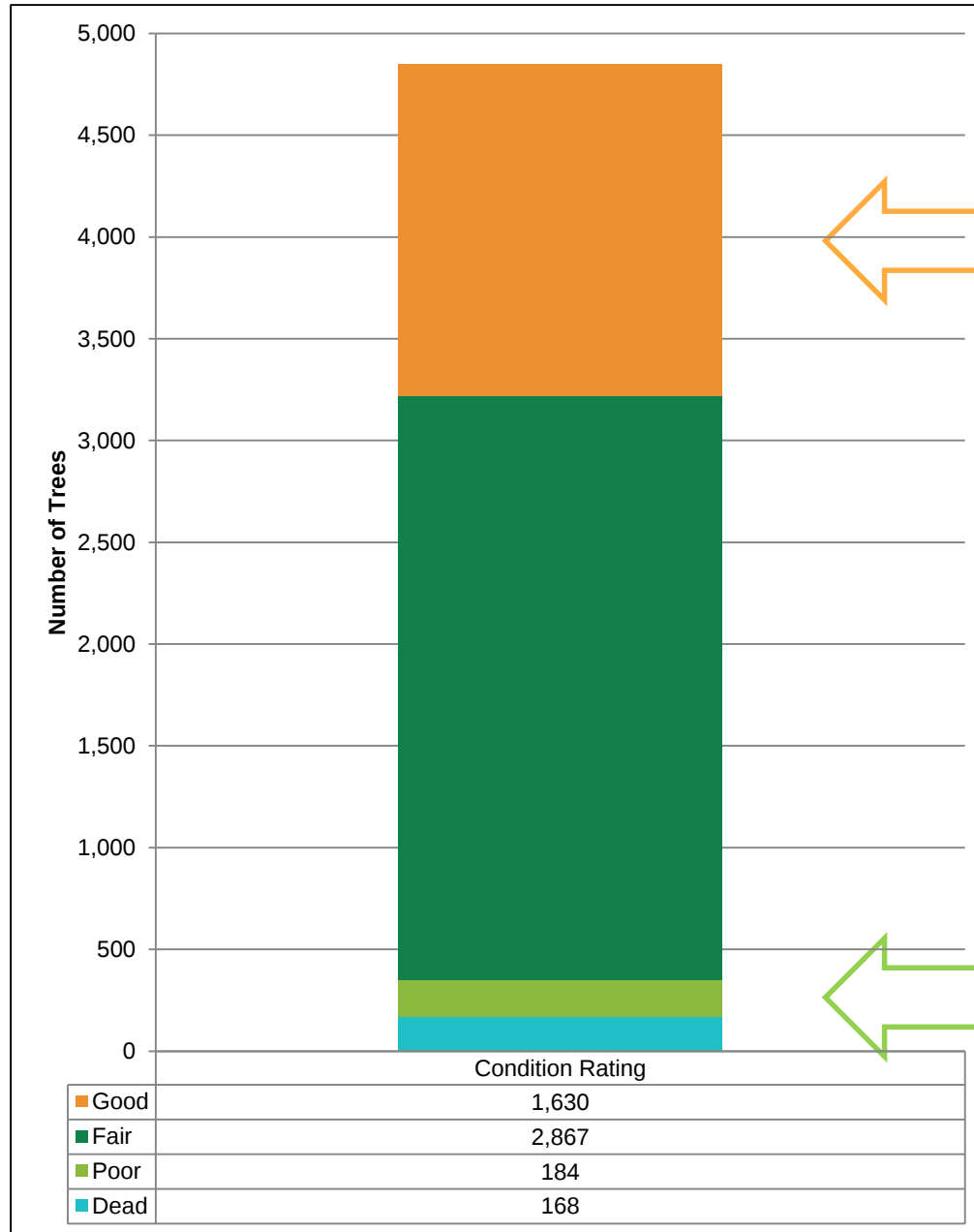
Recommendation:

To increase the benefits the inventoried trees provides, the town should plant large-statured tree species that are low emitters of BVOCs. (large broadleaf trees, can be found on recommended species list)



Large Inventoried Vacant Sites: 344

Tree Condition

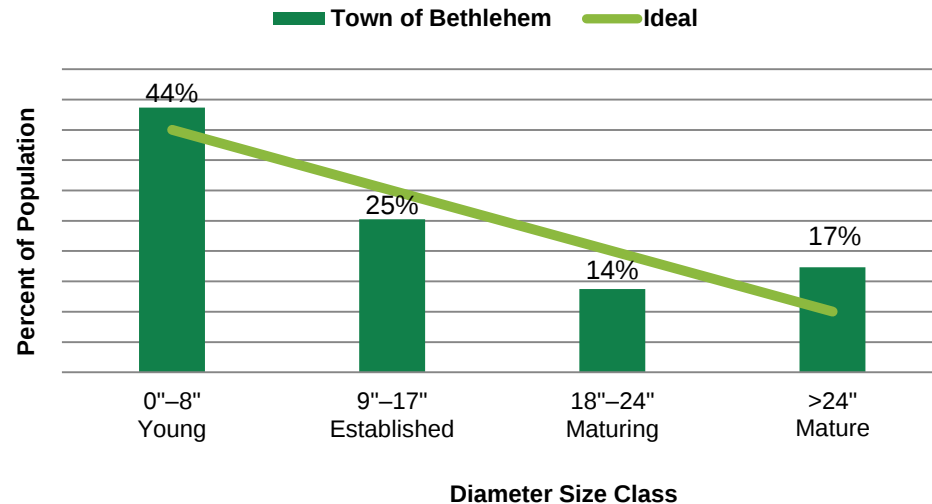


Good Condition trees make up 34% of total inventory

Poor to Dead Condition trees only account for 7%

Inventory Results

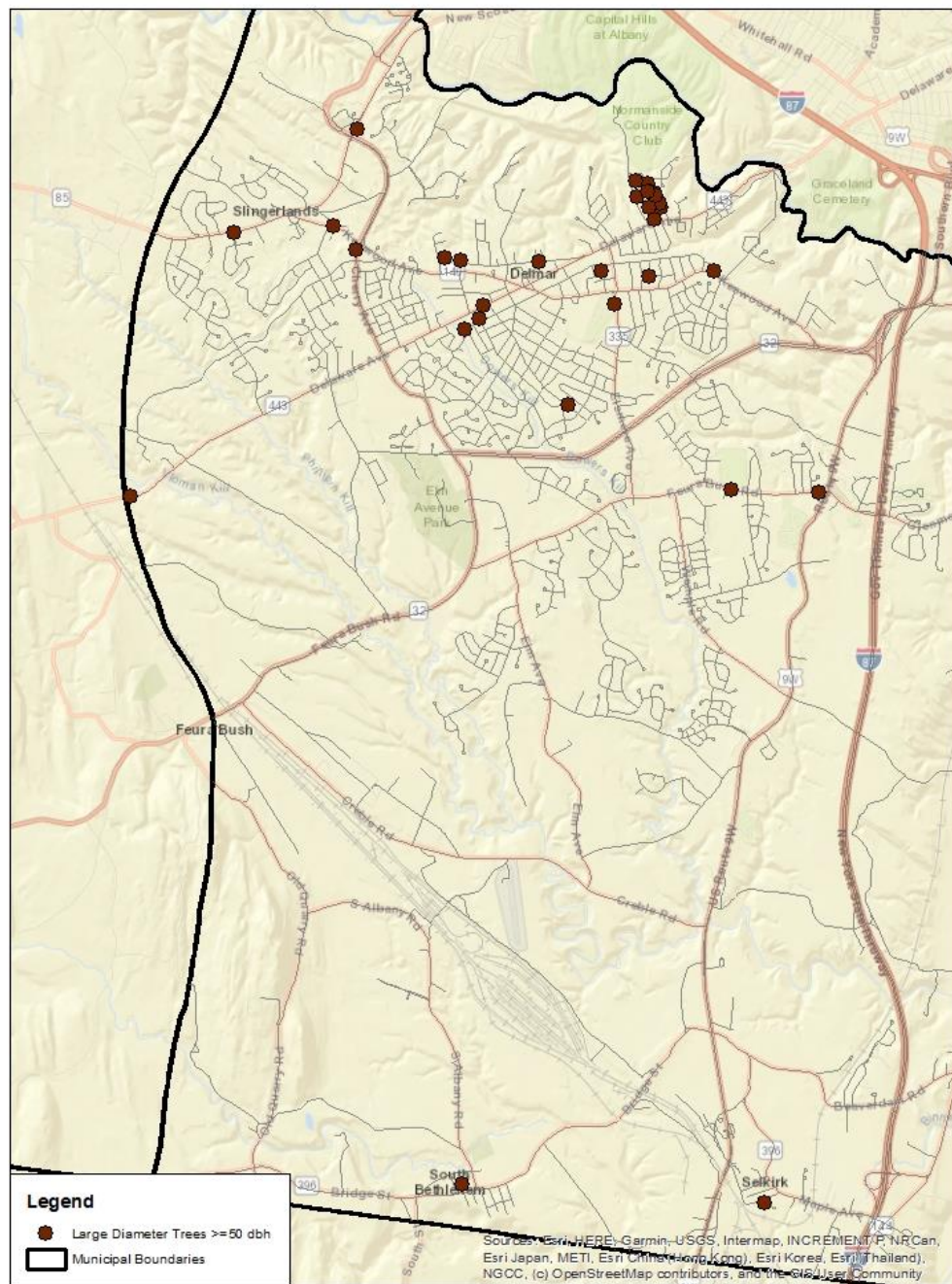
The size class distribution of the inventoried tree population trends toward the ideal, with a greater number of young trees than established, maturing, or mature trees.



Goals

Richards Size Class Distribution Ideal

Support a strong planting and maintenance program to ensure that young, healthy trees are in place to fill in gaps in tree canopy, replace older, declining trees, and maintain the ideal size class distribution.



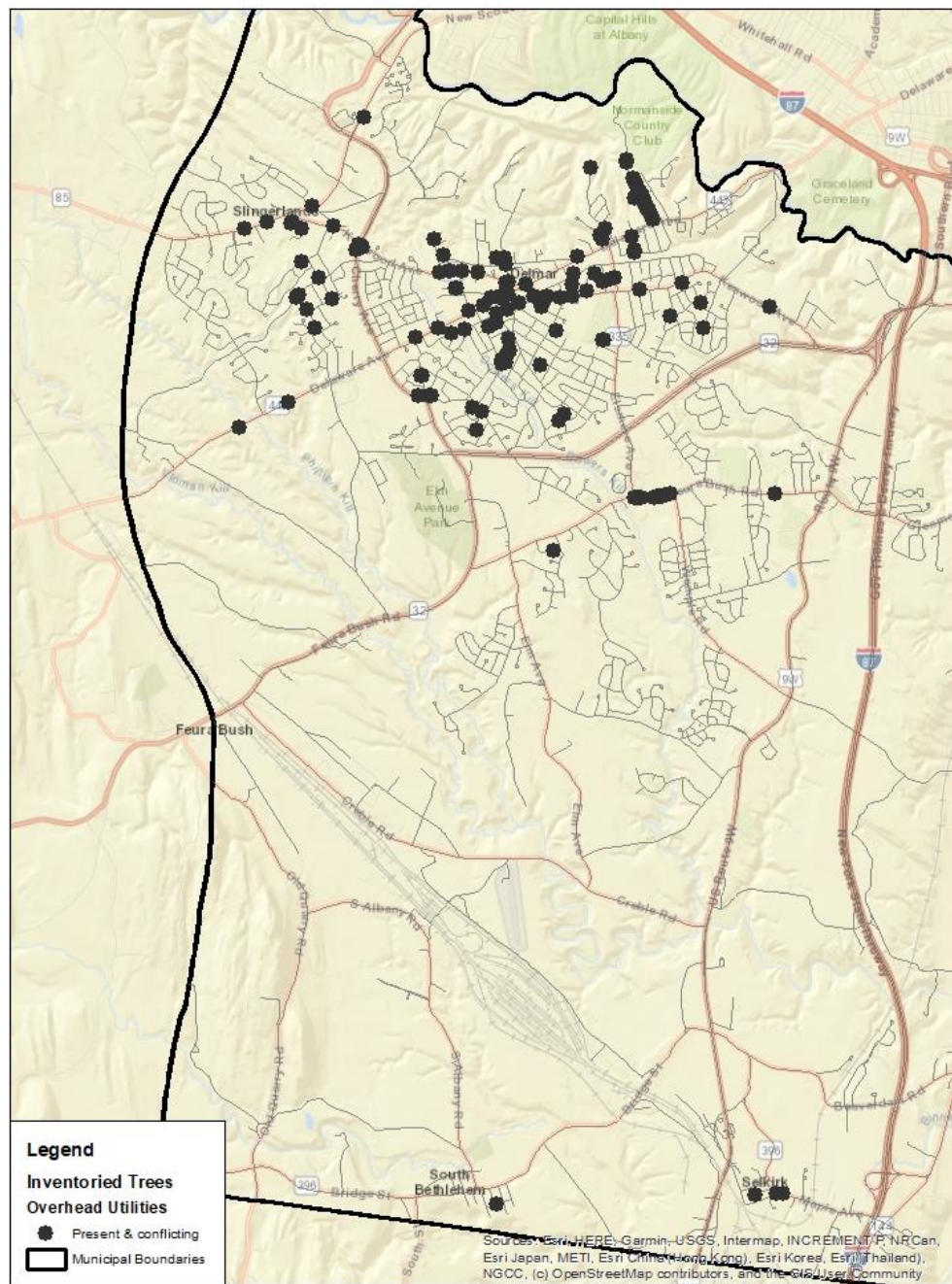
Inventory Result:

Overhead utilities interfering with street trees occur among 3% of the inventoried population.

Goal:

- Planting only small-growing trees within 20 feet of overhead utilities.
- This will help improve future tree conditions, minimize future utility line conflicts, and reduce the costs of maintaining trees under utility lines





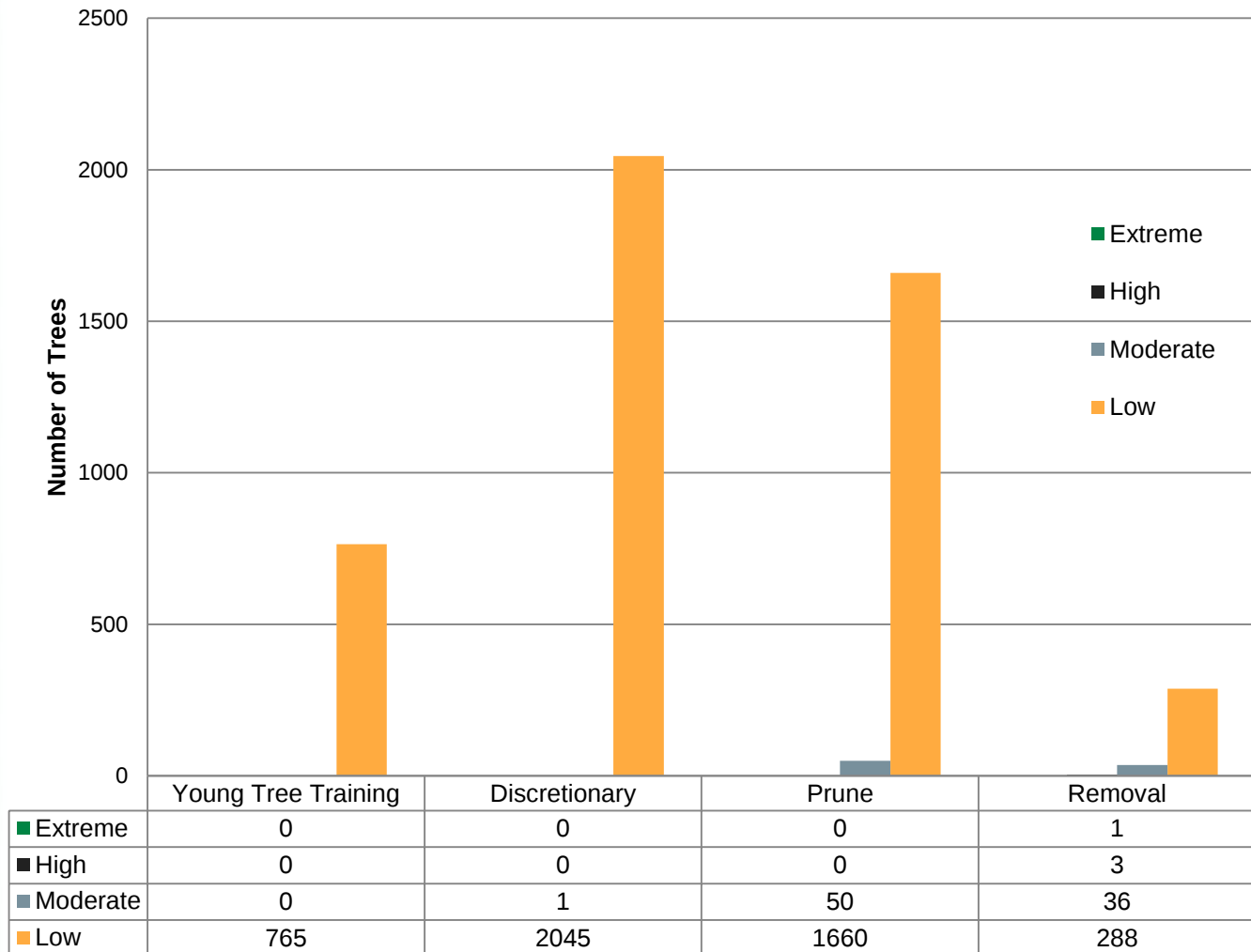


Tree Inventory Maintenance Needs: Priority Maintenance

- Tree removals and pruning of trees with an assessed risk rating of High or Extreme
- Likely to fail sooner than other assessed trees
- Removal of these trees or the defective parts can greatly reduce the risk to public safety

Bethlehem had very few High or Extreme Risk trees (under 4), One has already been removed by The Town, and one was found to be on private property via further inspection.

Maintenance by Risk Rating



Proactive Maintenance

Routine Inspections

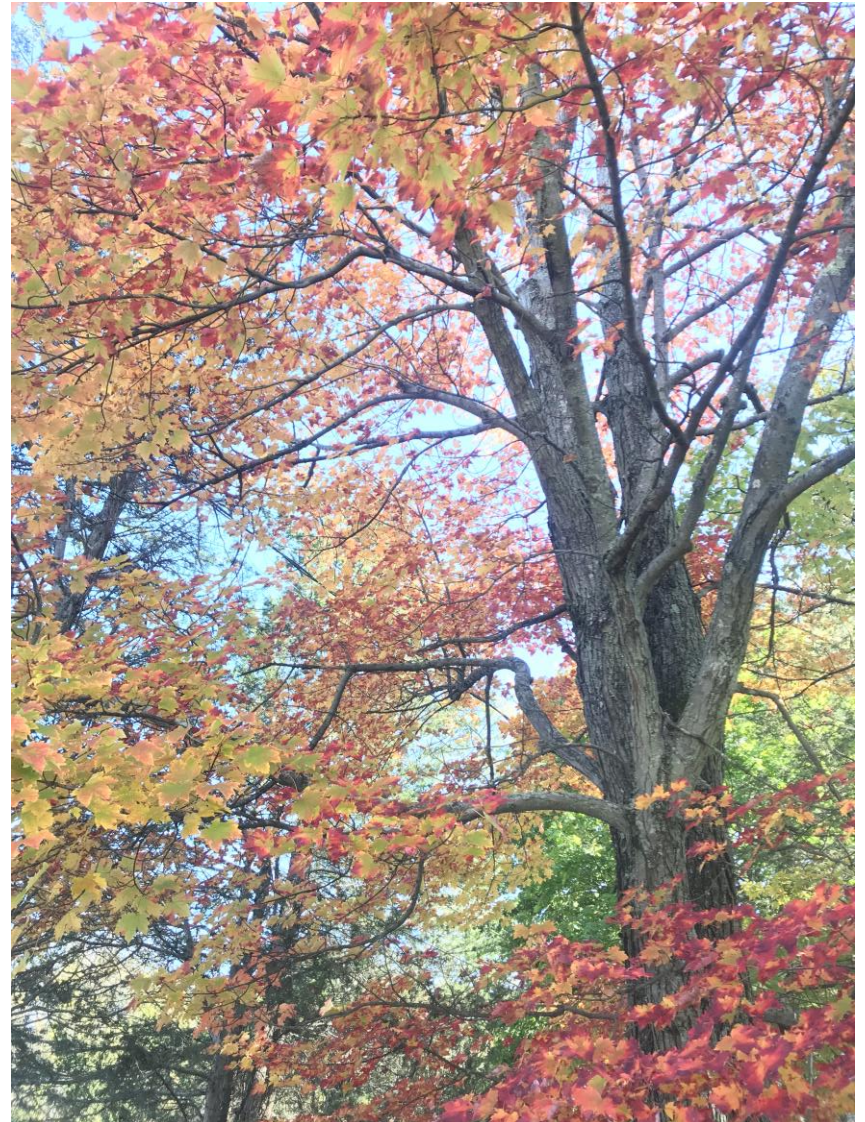
- Routine inspections are essential to identifying major and minor tree issues.
- Inspections should be performed by an ISA Certified Arborist
- Recommended that 1/5th of the Town be inspection yearly



Proactive Maintenance

Routine Pruning

- Like Routine Inspections, 1/5th of Town should be pruned yearly on a 5-year cycle
- This promotes a healthy structure and provides trees with a lower associated risk annually



Proactive Maintenance

Young Tree Training

- 1/3rd of the Town's young trees (DBH less than 8") should be tended to on a 3-year cycle.
- Used to correct or eliminate weak, interfering, or objectionable branches to improve structure
- Ensures canopy continuity and lowers the rate of priority maintenance in the future.





Invasive Species: Present and Potential

Emerald Ash Borer (EAB) is present in New York State and was found on a select few ash trees throughout the Town.

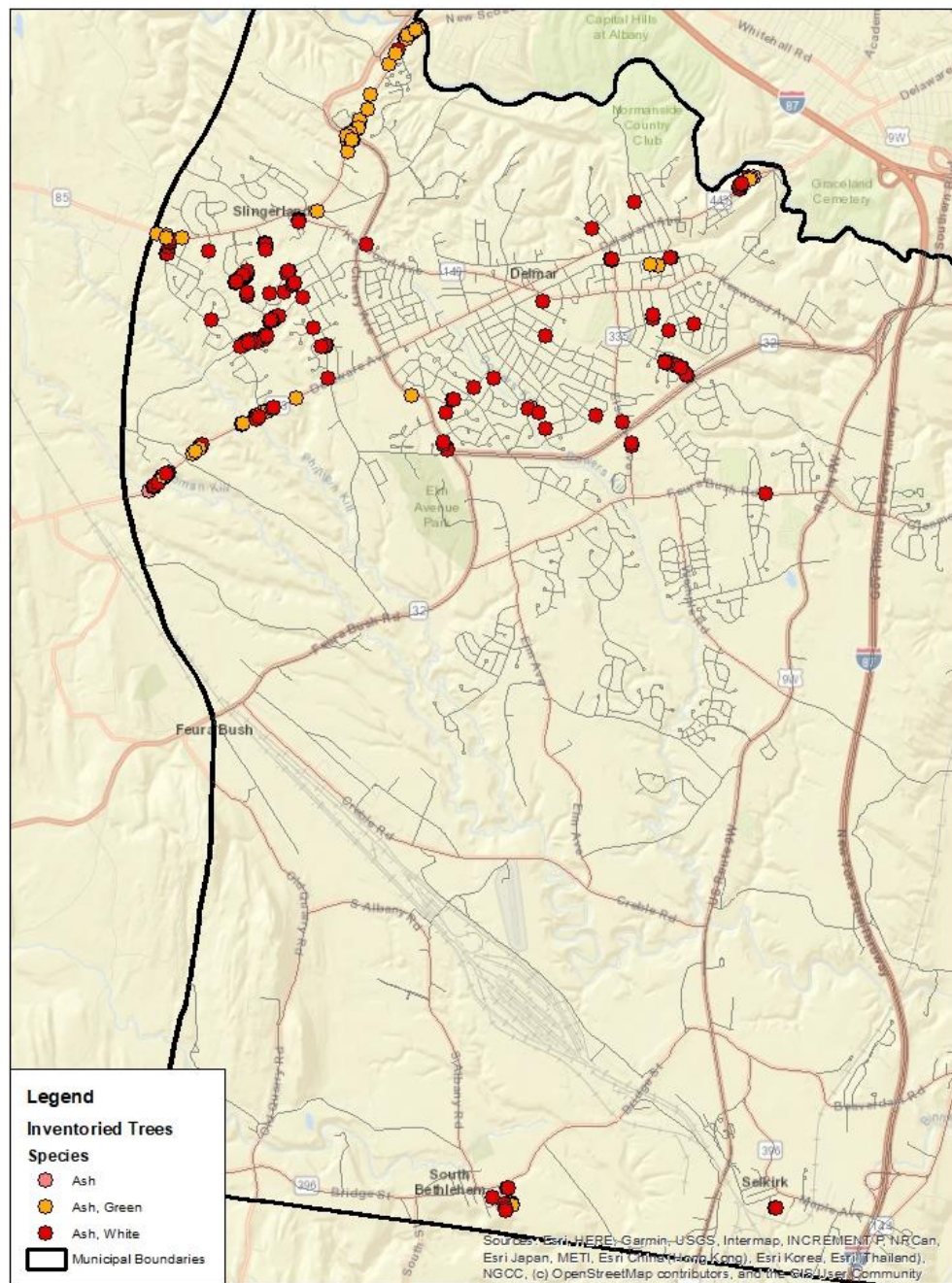
- The Town has 431 inventoried ash trees, 83 (19%) of which were found to have EAB damage
- The Town should strategically use a combination of treatment, removals, and replacement as management

Asian Longhorned Beetle (ALB) is not present in Bethlehem, but has populations in Long Island and Worcester, MA, among other locations throughout the US

- Of concern to the Town as it has the potential to impact 32% of the inventoried population
- Slow moving (considered a “lazy” insect)

Spotted Lanternfly (SLF) is not present in Bethlehem but has been found in New York State and is a fast-spreading invasive insect.

- Of concern to the Town as it has the potential to impact 28% of the inventoried population





Town Programs and Knowledge Resources

Street Tree Planting Program

- Step by step process the Town follows for the street tree planting program

Highway Dept. Pruning and Maintenance

- Current processes and procedures

Planting List by Context

- Recommended trees and their tolerances, pH, pest resistance, shape, growth rates, grow space, and suitability for planting under overhead wires

Guidance for Planting Trees in Residential and Commercial Development

- How developers should plant street trees relative to underground utilities, sight distance, signs, each other, snow storage areas. Also includes recommendations for use of structural soils.

Town Programs and Knowledge Resources

Planning Board Development Application Review Guidance

- Record of the guidance the Town Planning Board uses when reviewing development applications.

Town Code Review

- List of Town Code provisions that deal with, or could deal with, street trees and recommendations on changes to Town Code language.

Climate Crisis

- Considerations for the Town for how the changing climate will impact street tree management and the value of street tree management.

Estimated budget for five-year tree inventory management program in Bethlehem, NY

			Year 1		Year 2		Year 3		Year 4		Year 5		Five-Year Cost
Maintenance Type	Activity	Ave. Cost/ Tree	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	# of Trees	Total Cost	
PRIORITY MAINTENANCE	Extreme and High Risk Removals	\$726	3	\$4,785	0	\$0	0	\$0	0	\$0	0	\$0	\$6,380
	High Risk Pruning	\$213	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	\$0
	Total Cost		\$4,785		\$0		\$0		\$0		\$0		\$6,380
PROACTIVE MAINTENANCE	Moderate and Low Risk Removals	\$726	162	\$53,913	162	\$50,118	0	\$0	0	\$0	0	\$0	\$104,031
	Stump Removals	\$94	44	\$3,526	49	\$3,902	50	\$4,230	0	\$0	0	\$0	\$11,657
	Young Tree Training (3-year cycle)	\$25	331	\$7,910	331	\$7,910	332	\$7,940	331	\$7,910	331	\$7,910	\$39,580
	Routine Pruning (5-year cycle)	\$213	702	\$98,715	705	\$99,265	705	\$99,265	708	\$100,005	707	\$99,675	\$496,925
	Total Cost		\$164,064		\$161,195		\$111,435		\$107,915		\$107,585		\$652,193
PLANTING	Procurement	\$170	331	\$56,270	331	\$56,270	331	\$56,270	332	\$56,440	332	\$56,440	\$281,690
	Planting	\$110	331	\$36,410	331	\$36,410	331	\$36,410	332	\$36,520	332	\$36,520	\$182,270
	Mulching	\$100	331	\$33,100	331	\$33,100	331	\$33,100	332	\$33,200	332	\$33,200	\$165,700
	Watering	\$100	331	\$33,100	331	\$33,100	331	\$33,100	332	\$33,200	332	\$33,200	\$165,700
	Total Cost		\$259,872		\$260,352		\$183,072		\$159,072		\$159,072		\$1,021,440
Maintenance Cost Grand Total			\$428,721		\$421,547		\$294,507		\$266,987		\$266,657		\$1,680,013

Appendices

APPENDIX A: DATA COLLECTION AND SITE LOCATION METHODS

**APPENDIX B: RISK ASSESSMENT/ PRIORITY AND PROACTIVE
MAINTENANCE**

APPENDIX C: TREE PLANTING

APPENDIX D: RECOMMENDED SPECIES FOR FUTURE PLANTING

APPENDIX E: INVASIVE PESTS AND DISEASES

Recommended Large Tree Species

Scientific Name	Common Name	Cultivar
<i>Betula nigra</i>	river birch	Heritage®
<i>Carpinus betulus</i>	European hornbeam	'Franz Fontaine'
<i>Celtis laevigata</i>	sugar hackberry	
<i>Celtis occidentalis</i>	common hackberry	'Prairie Pride'
<i>Cercidiphyllum japonicum</i>	Katsura tree	'Aureum'
<i>Ginkgo biloba</i>	ginkgo	(Choose male trees only)
<i>Gleditsia triacanthos inermis</i>	thornless honeylocust	'Shademaster'
<i>Gymnocladus dioica</i>	Kentucky coffeetree	Prairie Titan®
<i>Liquidambar styraciflua</i>	American sweetgum	'Rotundiloba'
<i>Metasequoia glyptostroboides</i>	dawn redwood	'Emerald Feathers'
<i>Nyssa sylvatica</i>	black tupelo	
<i>Platanus × acerifolia</i>	London planetree	'Yarwood'
<i>Quercus alba</i>	white oak	
<i>Quercus bicolor</i>	swamp white oak	
<i>Quercus coccinea</i>	scarlet oak	
<i>Quercus lyrata</i>	overcup oak	
<i>Quercus macrocarpa</i>	bur oak	
<i>Quercus montana</i>	chestnut oak	
<i>Quercus muehlenbergii</i>	chinkapin oak	
<i>Quercus palustris</i>	pin oak	
<i>Quercus imbricaria</i>	shingle oak	
<i>Quercus phellos</i>	willow oak	
<i>Quercus robur</i>	English oak	Heritage®
<i>Quercus rubra</i>	northern red oak	'Splendens'

Continued...

Scientific Name	Common Name	Cultivar
<i>Quercus shumardii</i>	Shumard oak	
<i>Styphnolobium japonicum</i>	Japanese pagodatree	'Regent'
<i>Taxodium distichum</i>	common baldcypress	'Shawnee Brave'
<i>Tilia americana</i>	American linden	'Redmond'
<i>Tilia cordata</i>	littleleaf linden	'Greenspire'
<i>Tilia × euchlora</i>	Crimean linden	
<i>Tilia tomentosa</i>	silver linden	'Sterling'
<i>Ulmus parvifolia</i>	Chinese elm	Allée®
<i>Zelkova serrata</i>	Japanese zelkova	'Green Vase'

Recommended Medium Tree Species

Scientific Name	Common Name	Cultivar
<i>Aesculus × carnea</i>	red horsechestnut	
<i>Alnus cordata</i>	Italian alder	
<i>Cladrastis kentukea</i>	American yellowwood	‘Rosea’
<i>Corylus colurna</i>	Turkish filbert	
<i>Eucommia ulmoides</i>	hardy rubber tree	
<i>Koelreuteria paniculata</i>	goldenraintree	
<i>Ostrya virginiana</i>	American hophornbeam	
<i>Parrotia persica</i>	Persian parrotia	‘Vanessa’
<i>Pistacia chinensis</i>	Chinese pistache	
<i>Prunus maackii</i>	amur chokecherry	‘Amber Beauty’
<i>Prunus sargentii</i>	Sargent cherry	
<i>Quercus acutissima</i>	sawtooth oak	
<i>Quercus cerris</i>	European turkey oak	

Recommended Small Tree Species

Scientific Name	Common Name	Cultivar
<i>Amelanchier arborea</i>	downy serviceberry	(Numerous exist)
<i>Amelanchier laevis</i>	Allegheny serviceberry	
<i>Cercis canadensis</i>	eastern redbud	'Forest Pansy'
<i>Chionanthus virginicus</i>	white fringetree	
<i>Cornus alternifolia</i>	pagoda dogwood	
<i>Cornus kousa</i>	Kousa dogwood	(Numerous exist)
<i>Cornus mas</i>	corneliancherry dogwood	'Spring Sun'
<i>Corylus avellana</i>	European filbert	'Contorta'
<i>Crataegus viridis</i>	green hawthorn	'Winter King'
<i>Laburnum × watereri</i>	goldenchain tree	
<i>Maackia amurensis</i>	amur maackia	
<i>Malus species</i>	flowering crabapple	(Disease resistant only)
<i>Oxydendrum arboreum</i>	sourwood	'Mt. Charm'
<i>Prunus subhirtella</i>	Higan cherry	'Pendula'
<i>Prunus virginiana</i>	common chokecherry	'Schubert'
<i>Stewartia ovata</i>	mountain stewartia	
<i>Syringa reticulata</i>	Japanese tree lilac	'Ivory Silk'



Thank you for working with DRG!

QUESTIONS?

Sophia Rodbell, Project Manager

Sophia.Rodbell@davey.com

610-585-1714

Andy Hillman, Business Developer

Andrew.Hillman@davey.com

607-339-3968