Colchester Urban Tree Inventory

Prepared for the Town of Colchester
by the Vermont Urban and Community Forestry Program

November 2013

PLANT LIVE GROW
VERMONT URBAN & COMMUNITY FORESTRY PROGRAM

TOWN OF Colchester ESTABLISHED • 1763

FORESTS, PARKS & RECREATION VERMONT
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CULTIVATING HEALTHY COMMUNITIES

Acknowledgements

This report was created by the Vermont Urban and Community Forestry (UCF) Program based on an urban forest inventory conducted for the Town of Colchester from August 2012 to March 2013. The field work was conducted by volunteers Tim Moran, Darlene Sabourin, Theresa Carroll, and Pam Loranger with the assistance of UCF staff Caitlin Cusack and Elise Schadler. Particular thanks to Tim Moran, a Stewardship of the Urban Landscape (SOUL) Tree Steward, who faced snow, the bitter cold, and mosquitos to steadfastly inventory his community's trees over the course of four seasons. Thank you to Brian Osborne, Director of Public Works, for his guidance and direction.

About the Urban and Community Forestry Program

Vermont has a long history of managing its forests for multiple uses, including timber, fuelwood, wildlife, and recreation. In addition to the 4.5 million acres of land that we traditionally view as forestland, another forest touches our lives every day: our urban and community forest. Trees along streets, in parks and town greens, and on municipal forest lands are our community forests. These trees provide numerous environmental, social and economic benefits; however, they are not always managed as a community resource. In Vermont, assistance in the urban and community forestry is provided by the Urban and Community Forestry (UCF) Program. The UCF program is a partnership between Vermont Department of Forests Parks and Recreation and the University of Vermont Extension. **The Program's vision is "Vermont's forests and trees are integral to the health and well-being of our communities and are valued as critical community infrastructure. Citizens, government and businesses collaborate in planning for, investing in and maintaining these resources and the ecosystem services they provide, for this and future generations." This vision recognizes that urban forests are an essential feature of the urban ecosystem providing valuable services; and in order to maintain the system and services, responsibility lies with us all.**

Funded in part by a grant from the USDA Forest Service, Vermont's Urban & Community Forestry Program is designed to help communities plan, plant, and care for their community trees. Since its' inception in 1991, the Program has provided technical and financial assistance to over 150 Vermont communities and more than $1,000,000 in competitive grants have been awarded to municipalities and volunteer organizations across Vermont to support healthy urban and community forests.

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Executive Summary

The goal of the inventory was to document the location, size, species composition, and condition of trees planted within new residential developments in Colchester, Vermont. This information provides residents and decision makers with a better understanding of the health and benefits of Colchester's urban forest and will allow the Department of Public Works to incorporate Colchester's green infrastructure (street trees) into the town's GIS-based asset management tool for public infrastructure.

The inventory was commissioned by the Colchester Department of Public Works and the Colchester Conservation Commission. Volunteers completed an inventory of 663 trees located in the Colchester public right-of-way (ROW) that had been planted within the last 20 years. Staff from the Vermont Urban and Community Forestry (UCF) Program provided technical assistance.

Local government, conservation agencies, and private landowners all play an important role in monitoring and maintaining urban forests. Urban trees provide a number of benefits to a community, including reducing stormwater runoff, reducing air pollution, providing shade, sequestering carbon dioxide, enhancing property values, and improving the aesthetics of the community. The 663 trees planted within residential developments built in the last 20 years provide an estimated **$62,170** in benefits annually to the residents of Colchester.

Summary of findings

Forest diversity

- Of the 663 trees recently planted within the public ROW, there are 35 different species in 22 different genera.
- The top five most common tree genera: maple (*Acer*), ash (*Fraxinus*), elm (*Ulmus*), oak (*Quercus*) and apple (*Malus*), comprise 80% of the urban forest.
- Forty-six percent (46%) of the newly planted trees are either ash or maple; both of these genera are currently threatened by invasive tree pests: the emerald ash borer (EAB) and Asian longhorned beetle (ALB).
- The top five most common species: green ash (19%), American elm (11%), red maple (11%), Northern red oak (9%) and Norway maple (9%) comprise 59% of the stocking.

Forest structure

- The majority of these trees (338 trees or 51%) have diameter measurements falling within the 0-3 inch class.
- 174 trees fall within the 3-6 inch class.
- 128 trees are in the 6-12" class.
- The remaining 23 are greater than 12" in diameter.

Forest health

- An overwhelming majority (87%) of trees inventoried was assessed as being in "Good" condition; of the remaining trees 85 were either considered to be in "Fair" or "Poor" condition and only 2 were dead.

Summary of recommendations

Diversify—Plant new species and increase the number of the lesser represented species using best management practices to ensure the long-term health of individual trees and Colchester's complete urban forest. Plan now for losing trees in fair to poor condition. Plant a mix of species versus high-density stands of the same species whose close proximity may be conducive to the spreading of disease and pests.

Monitor trees for signs and symptoms of the emerald ash borer, Asian longhorned beetle and other forest pests and diseases.

Maintain tree health by preventing mechanical damage to trees during mowing, removing stakes, pruning to promote long-term structural integrity, and correcting root problems.

Plan for the arrival of the emerald ash borer by developing an EAB preparedness and response plan.

Inventory the remaining public trees to develop a comprehensive management and urban forestry master plan.

Establish a routine systematic trimming cycle for all public trees to reduce future tree failures due to poor structure, minimize conflicts with people and infrastructure, improve lines of sight, reduce storm damage, and protect public safety.

Develop a public tree policy or ordinance to establish authority for conducting forestry programs, define municipal responsibility and regulations for public and private trees, and set minimum standards for urban forestry management.

Introduction

Project Description

Volunteers with the Colchester Conservation Commission and Stewardship of the Urban Landscape (SOUL) Tree Stewards Program, with assistance from the Urban and Community Program, inventoried nearly all public street trees planted within the public right-of-way in the last 20 years in Colchester. The goal of the inventory was to document the location, size, species composition, and condition of trees planted within new residential developments to better understand the health and benefits of Colchester's urban forest and incorporate Colchester's green infrastructure (street trees) in the GIS-based asset management tool for public infrastructure. This inventory establishes a baseline for future inventories, management decisions, and improvements to Colchester's urban forest.

Methodology

Brian Osborne with the Colchester Department of Public Works identified 33 streets where trees were intentionally planted as part of residential developments within the past 20 years. Teams of two conducted the inventory during the period from July 2012 to March 2013 and inventoried a total of 663 trees within the public right-of-way (ROW), which in most cases was the green planting strip along the street or between the sidewalk and the street. The list of streets and number of trees inventoried by street is found in Table 1 and shown in the map in Appendix I.

Each public tree identified was recorded using a Trimble Juno unit, a handheld device provided by the Vermont Urban & Community Forestry Program. Data recorded included the unique tree identification number, tree species, diameter at breast height (DBH), condition, and

Importance of the Inventory and Urban Forestry in Vermont

An inventory of urban trees provides a record of the trees present in a community. An inventory can provide information about the species, size, health, and location of each tree and future management needs. This detailed information allows town planners to estimate the monetary contributions of their communities green infrastructure. In the event of a disease outbreak or insect infestation, data from an inventory may assist in monitoring and preventing the spread of a forest health epidemic. An inventory can also help build public support for expanding community forests and to guide future urban planning**.**

Urban trees improve the quality of life for Vermont communities in a variety of ways. The most readily apparent benefit is the unparalleled aesthetic value that trees provide a street, home, or public space. Along with this beauty is the functional benefit of providing shade along the streets in the summertime and helping reduce heating costs in the wintertime. Furthermore, the presence of trees has also been shown to positively affect property values (Morales 1973; 1983). Many types of urban wildlife such as birds and squirrels depend on trees as sources of food and shelter. Unseen environmental benefits of urban trees include improvements in air quality and temperature regulation through reduction of the heat island effect. Trees can mitigate noise pollution common in an urban environment and can clean and conserve water by controlling run-off. Additionally, urban forests create opportunities for environmental education, community engagement and in some instances can be related to crime reduction.

For more information on urban forest benefits go to:

Benefits of Urban Greening
http://fuf.net/benefits-of-urban-greening/

Trees: A Prospectus, A Solid Green Investment
http://www.arborday.org/takeaction/investment.cfm

Sustaining America's Urban Trees and Forests
http://www.fs.fed.us/openspace/fote/sustaining.html

geospatial location. Each of these data parameters are described in Table 2.

The data was compiled and uploaded to the Vermont Urban and Community Forestry Inventory Microsoft Access database and analyzed and summarized using Microsoft Excel. Data was also uploaded to i-Tree, software developed by the USDA Forest Service (USDA Forest Service 2013), in order to determine the monetary and ecological benefits of Colchester's trees.

Community Profile of Colchester

Colchester is Vermont's fourth largest community, with a population of over 17,000. It was incorporated on June 7, 1763 and is located in Chittenden County, just north of Burlington and Winooski. The Town of Essex borders Colchester to the east and Milton to its' north. Twenty-seven miles of shoreline border Lake Champlain to the west, including "Vermont's Hidden Treasure", Mallets Bay. Colchester has a land area of 58.6 square miles which contains agricultural fields, 15 different public recreational parks or natural areas and two bike paths, residential developments, restaurants, shopping, and St. Michael's College (Town of Colchester, 2013).

Table 1. List of Colchester streets and number of trees inventoried July 2012-March 2013

Road Code	Road Name	Number of Trees
08030	AIKEY LN	16
10400	MOREHOUSE DR	66
13270	MARINER HTS	52
16020	LILY LN	17
31769	GRANITE CREEK RD	No new tree plantings in public ROW.
31770	STONE DR	5
32741	NOTTINGHAM CT	13
51270	WILLIAMS RD	15
51300	EDGEWOOD DR	75
51320	MIDNIGHT PASS	1
51400	ORCHARD CIR	1
52150	S PARK DR	24
52290	CARRIAGE WY	9
52310	ABIGAIL DR	25
52320	MAZZA CT	1
52530	MARBLE ISLAND RD	51
52650	FERN CT	32
52930	OVERLAKE DR	1
52940	BARBARA TERR	3
53060	LAKEWOOD CT	10
53160	PRETTY RD	20
53390	DUNLOP WY	4
53720	KYLIES WY	1
54680	CAMPUS RD	Covered by Hegeman Ave.
54820	TOWER RDG	3
54980	RYAN PL	2
55000	HOLY CROSS RD	56
55060	FORMAN DR	1
67590	WILD FLOWER LN	15
99990	KATHLEEN LN	24
99991	COLDEN RD	27
99992	NATIONAL GUARD RD	Covered by Hegeman Ave.
52040	HEGEMAN AVE	75

Table 2. Description of data parameters collected for Colchester inventory

Parameter	Description	
Tree number	The Trimble Juno Unit auto populates this field with a number unique to each tree.	
Tree species	Trees were identified by genus and species and reported with the common name. There were a number of autumn blaze maples, a hybrid of red and silver maple. These trees were entered as red maples.	
Diameter at Breast Height (DBH)	Measured using a DBH tape at a height 4.5' above ground level on the uphill side of the tree. It there was a bulge at DBH, then the measurement was made just above the bulge, where the stem returns to normal. If the tree forks into multiple stems below 4.5', then each stem was entered as a different tree and then noted in the comments field. The data was entered as diameter class: 0-3", 3-6", 6-12", 12-18", 18-24".	
Condition	The condition of the tree reflects the health of the tree as inventoried the day the tree data was collected. This does not forecast any potential health issued that could create maintenance issues or concerns in the future. The following definitions are provided so that condition assessment will be consistent among data collection teams:	
	Good	Full canopy: 75-100% live foliage. No dieback of branches over 2" diameter. No significant structural defects (cankers, seams, decay, etc.). Minimal to no mechanical damage to trunk. No suckering (root or water). Form is characteristic of species. Foliage color and leaf size is characteristic of the species.
	Fair	Thinning canopy: 50-75% live foliage. New growth medium to low amount, or stunted. Significant mechanical damage to trunk, new or old. Insect/disease that is affecting tree. Foliage may be off-color, or exhibit early fall color; leaves may be smaller or sparser than normal. Form not representative of species. Good Premature fall coloring on foliage.
	Poor	Tree is declining: 25-50% live foliage. Visible dead branches over 2" diameter in canopy. Significant dieback of other branches. Severe mechanical damage to trunk, usually including decay resulting from damage. New foliage small, stunted, or minimal amount. Foliage may be off-color, or exhibit early fall color; leaves may be smaller and sparser than normal.
	Dead	No signs of life with new foliage. Bark may be beginning to peel.

Inventory Results

Urban Forest Diversity

Of the 663 trees recently planted within the public ROW, there are 35 different species in 22 different genera. The top five most common tree genera: maple (*Acer*), ash (*Fraxinus*), elm (*Ulmus*), oak (*Quercus*) and apple (*Malus*), comprise 80% of the urban forest (Figure 1). The top five most common species: green ash (*Fraxinus pennsylvanica*) (19%), American elm (*Ulmus americana*) (11%), red maple (*Acer rubrum*) (11%), Northern red oak (*Quercus rubra*) (9%) and Norway maple (*Acer platanoides*) (9%) comprise 59% of the stocking (Figure 2). The "Other" category is made up of all the species that consisted of less than 5% of the total percentage of trees inventoried; 27 species in 16 genera were included in this category (see Appendix III for full species list).

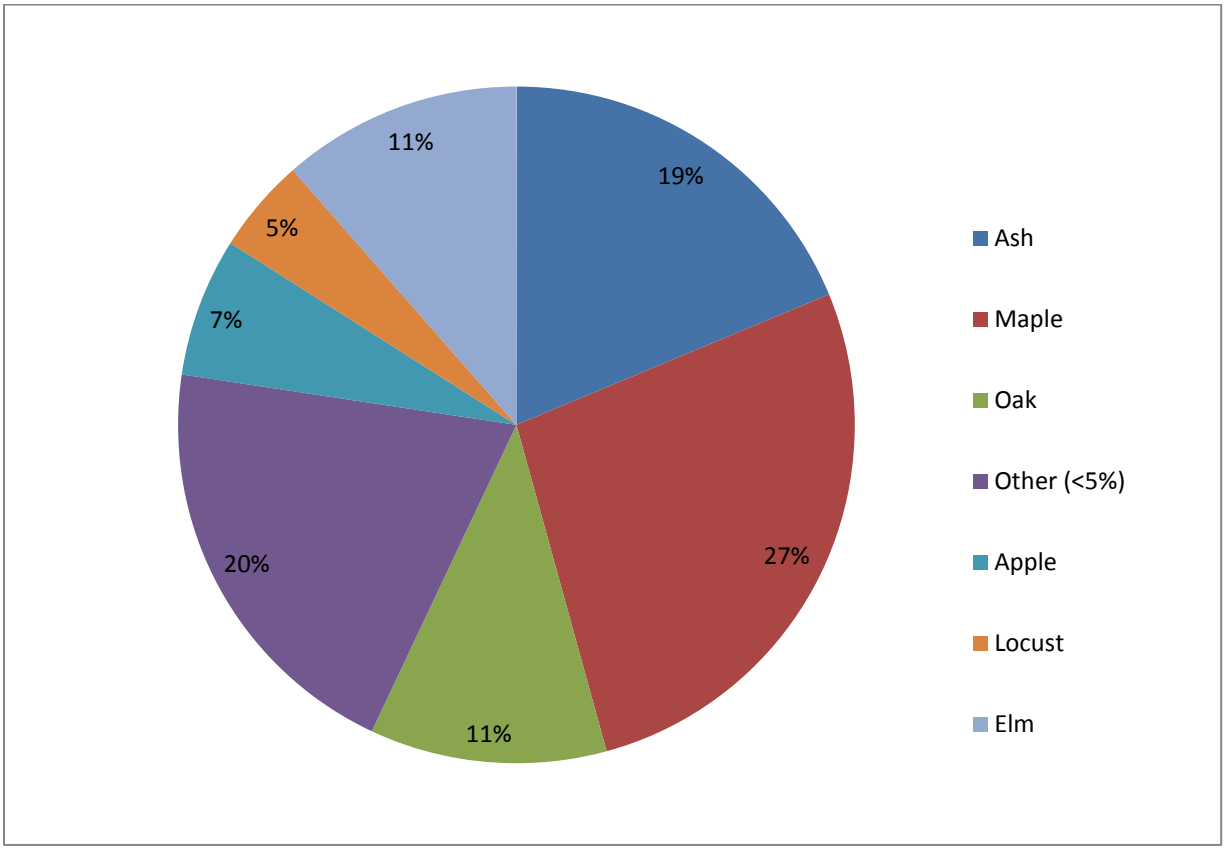

Figure 1. Graph showing tree genus by percent composition. "Other" represents tree species with a less than 5% distribution.

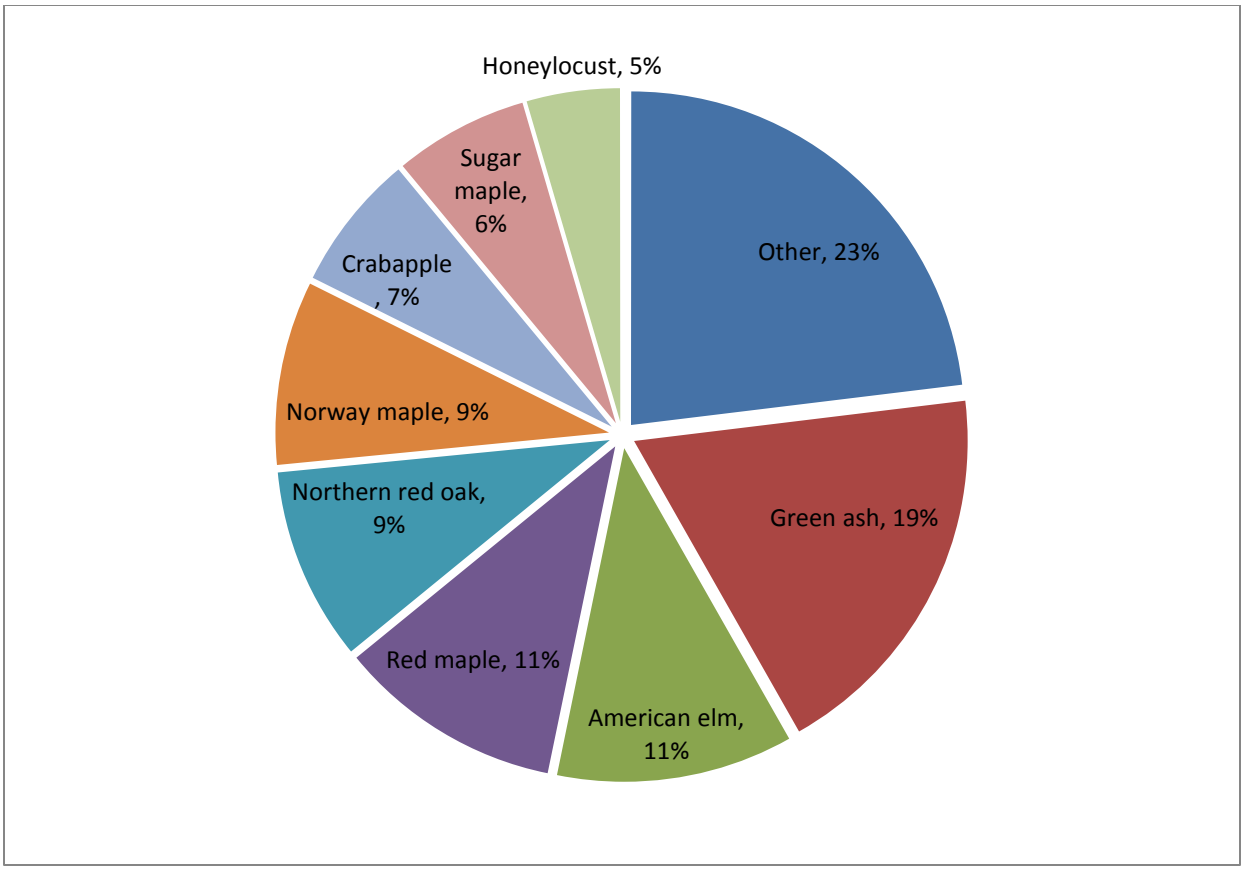

Figure 2. Graph showing tree species by percent composition. "Other" represents tree species with a less than 5% distribution.

Urban Forest Structure

Most of the trees inventoried were planted in the last 20 years in new residential developments. The majority of these trees (338 trees or 51%) had diameter measurements falling within the 0-3 inch class (see Figure 4 below). One hundred and seventy-four (174) fall within the 3-6 inch class. The composition of genera within each of these size classes is fairly evenly distributed with the exception of *Malus*, (Figure 5). Trees within the maple and ash genera, specifically green ash and Norway maple, were either favored in earlier plantings or have grown quickly into the 6-12 inch class during this time. Both of these species are characterized by fast growth and are salt tolerant. The two largest size classes represented, 12-18" and 18-24", only contain a total of 23 trees. These trees are growing within the public ROW and were probably not planted but instead left in the traffic islands at the end of cul-de-sacs or as individual trees along the street when the developments were built.

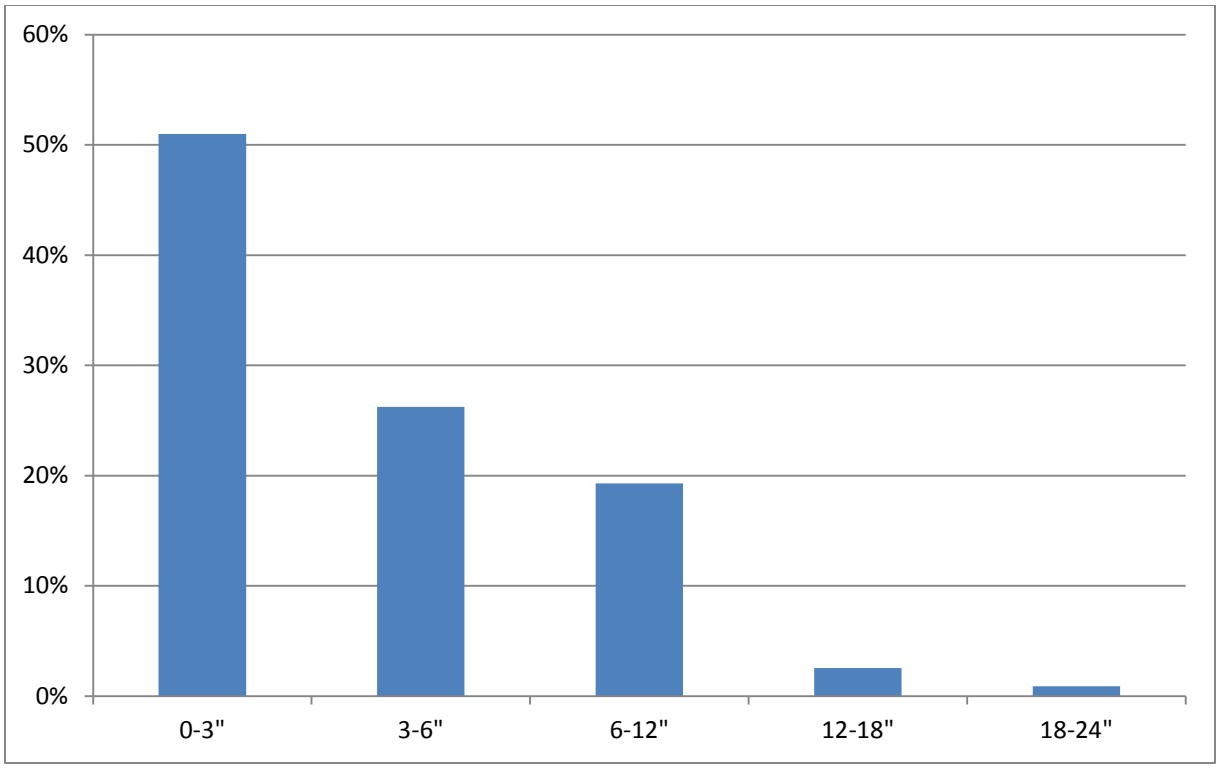

Figure 3. The percentage of trees in each diameter class (inches)

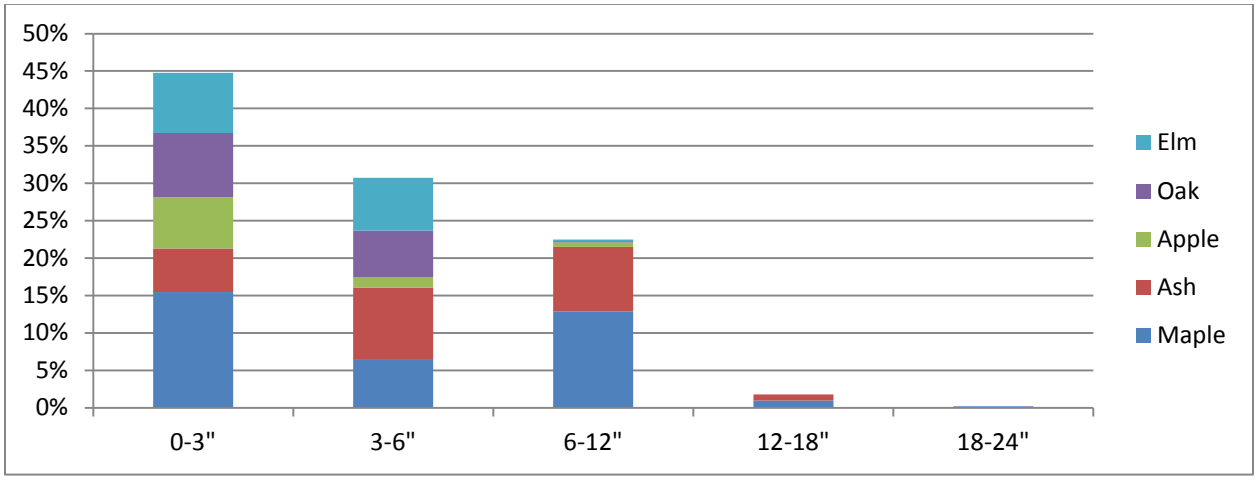

Figure 4. Diameter distribution for the 5 most common genera

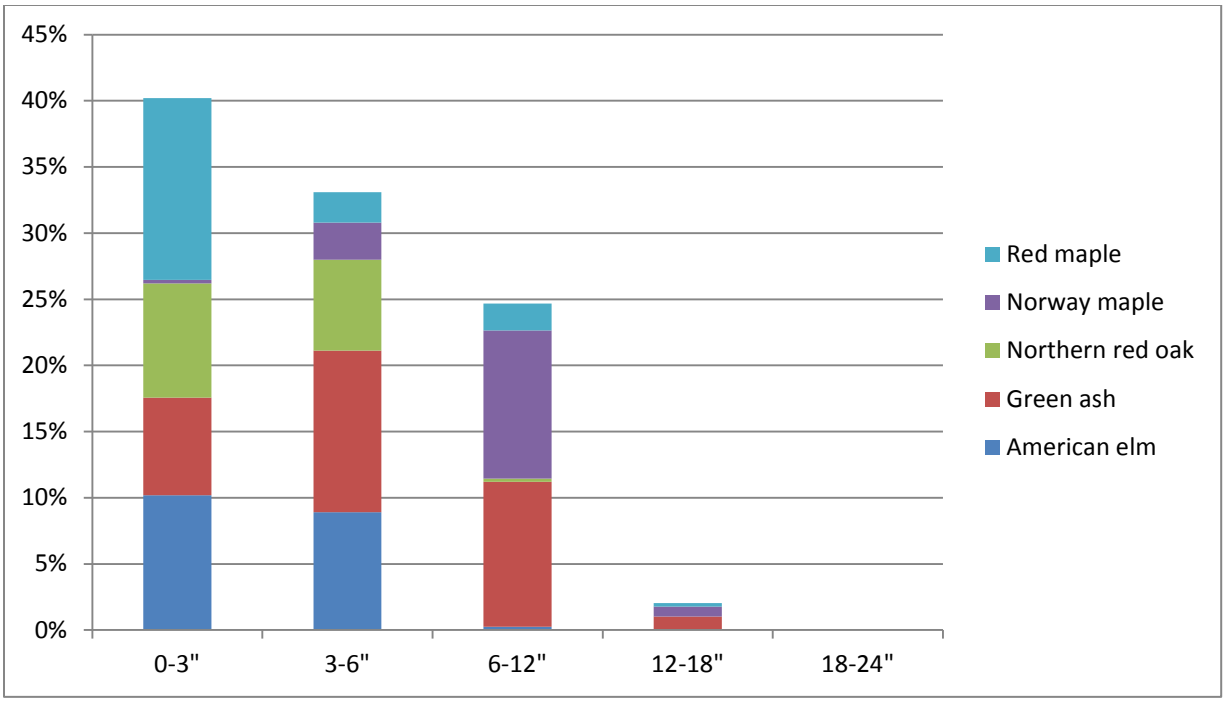

Figure 5. Diameter distribution for the 5 most common species

Urban Forest Health

An overwhelming majority (87%) of trees inventoried were assessed as being in "Good" condition; of the remaining trees 85 were either considered to be in "Fair" or "Poor" condition and 2 were "Dead" (see Figure 6). The trees in the genera *Acer* (maple), *Fraxinus* (ash) and *Ulmus* (elm) had the most trees in either fair or poor condition: 16, 18 and 16 trees respectively (see Figure 7). However, these genera also comprise the highest percentage of overall trees inventoried. The dead trees were a crabapple and a hackberry.

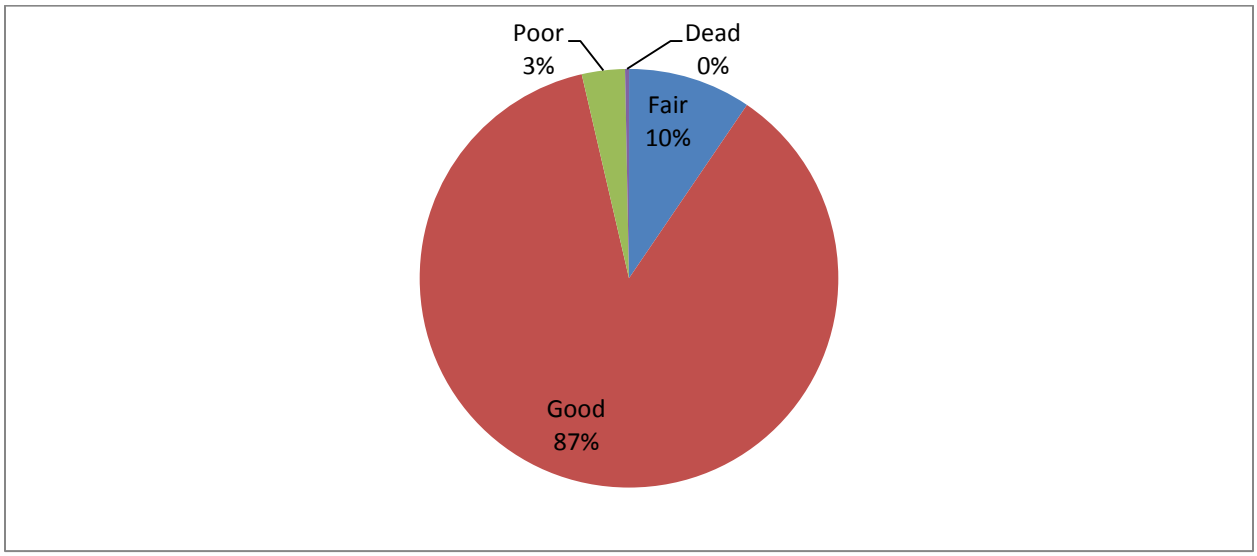

Figure 6. The percentage of trees in each condition class.

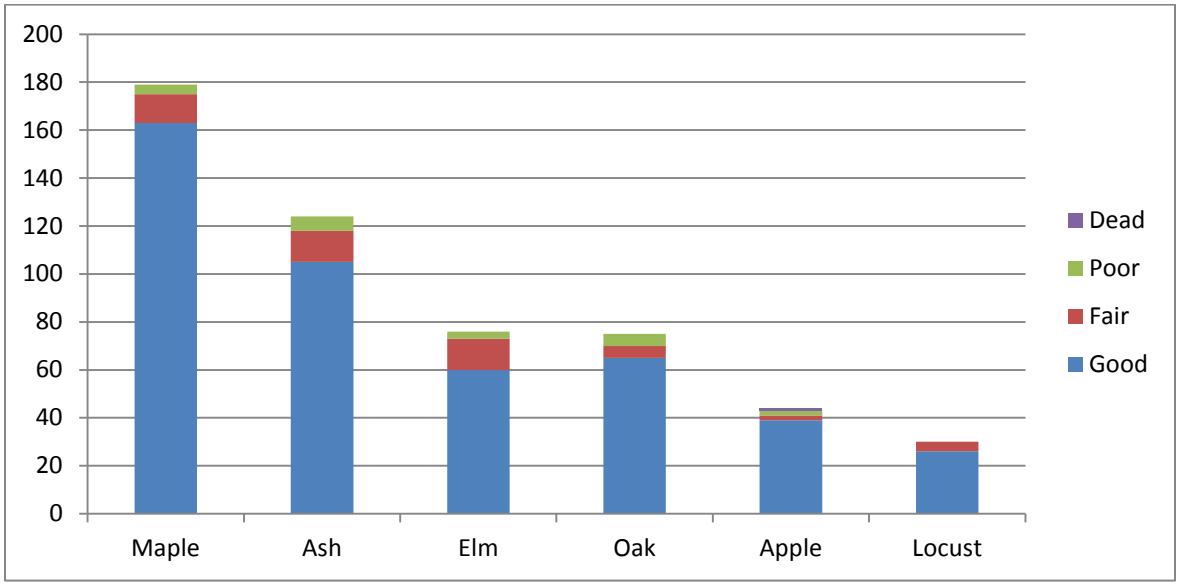

Figure 7. The number of trees within the five most common genera displayed according to condition. Tree genera with less than 5% representation are not included in this graph.

Monetary Value and Ecosystem Services

The data was analyzed using i-Tree Streets software to determine the monetary value of the ecosystem services provided by Colchester's public trees. The 663 trees provide a total of **$62,170** in annual benefits by filtering air pollutants, mitigating stormwater runoff, sequestering carbon, conserving energy and increasing property values. At the scale of an individual tree, a 6" sugar maple provides an estimated $57 annually in benefits. If this tree were able to grow to 11" then the estimated annual benefits would increase to $103. Regular maintenance and care are needed to provide for urban tree health and longevity.

Table 3 provides an overview of the value of each ecosystem service provided by Colchester's trees. (The reports produced by the i-Tree Streets program for Colchester are presented in the tables in Appendix II.) Energy conservation and increases to property values are the most significant services provided by these trees in terms of their monetary value.

Table 3. Summary of annual environmental and monetary benefits provided by Colchester's street trees.

Benefit Type	Benefit Description	Total value of trees inventoried	Average value /tree
Energy conservation	Reduced natural gas use in winter and reduced electricity use for air conditioning in summer.	$20,439	$31.94
Carbon dioxide	Annual reductions in atmospheric CO^2 due to sequestration by trees and reduced emissions from power plants due to reduced energy use. The model accounts for CO^2 released as trees die and decompose and CO^2 released during the care and maintenance of trees.	$505	$0.79
Air quality	Quantifies the air pollutants (O^3, NO^2, SO^2, PM10) deposited on tree surfaces and reduced emissions from power plants (NO^2, PM10, VOCs, SO^2) due to reduced electricity use. Also reported are the potential negative effects of trees on air quality due to BVOC emissions.	$3,668	$5.73
Stormwater	Reductions in annual stormwater runoff due to rainfall interception by trees.	$4,835	$7.56
Aesthetic/other	Tangible and intangible benefits of trees reflected in increases in property values.	$27,507	$42.98
Stored carbon dioxide	Tallies all of the carbon dioxide stored in the urban forest over the life of the trees as a result of sequestration.	$5,216	$8.15

Discussion and Recommendations

Urban Forest Diversity and Structure

An important best management practice in urban forestry is to maintain a diverse range of species. It is recommended that communities work towards a goal of no more than 20% representation of a single genus (for example: maples) in a tree population and no more than 10% in one species (example: sugar maple). Resistance to disease and insect infestation is one of the many reasons that diversity within the urban forest is of paramount concern. A more diverse forest will be more resistant to environmental stressors, and therefore remain healthy and resilient in the face of change. Furthermore, by maintaining higher diversity a community can prevent a rapid loss of canopy due to insect and disease issues, as seen with Dutch elm disease.

In Colchester, 27% of trees inventoried are in the maple genus and 19% are in the ash genus. Specifically, green ash, red maple and American elm comprise 19%, 11% and 11% of the species diversity respectively. Not only are these percentages too large for any single species, it is especially troubling because 46% of the newly planted trees are either ash or maple; both of these genera are currently threatened by invasive tree pests: the emerald ash borer (EAB) threatens the former and Asian longhorned beetle (ALB) is a threat to the latter. While neither of these pests have been discovered to-date in Vermont, the largest ALB infestation in North America is a little over 50 miles to our south in Worcester, MA and with the discovery of EAB in New Hampshire in the summer of 2013, Vermont is now surrounded on all sides by states or provinces with isolated infestations of EAB.

For future plantings we suggest planting tree species that have been grown successfully in

Components for Managing a Vibrant and Resilient Urban Forest

A successful urban forestry program is not born but made and requires a combination of organized leadership, comprehensive information about the tree population, dedicated personnel, and effective public relations.

Public Policies: A tree ordinance or policy provides authority for conducting forestry programs, defining municipal responsibility for public and private trees, passing regulations, and setting minimum standards for urban forestry management.

Leadership: Define who is responsible for the oversight of the community forest, including formulating policies, advising, administration, management, representation, and/or advocacy.

Partnerships: A well-managed urban forest takes the work of many. Seek strategic partnership to meet a shared vision. At a minimum the Tree Warden, a local advisory committee like a tree board or conservation commission, and municipal staff (parks, roads, planning) should collaborate.

Responsibility: A clear understanding of what trees and areas will be managed is an important first step. Street trees, parks and village greens, cemeteries and schools are typical areas of municipal responsibility.

Assessment: A complete tree inventory, including tree locations, species, condition, and management needs provide the necessary information to manage the resource. An inventory is the foundation to developing a strategic management plan.

Management Plan: A management plan provides a vision for the long-term management of the community forest. It should include strategies, budgets, and responsibilities for meeting that vision.

Staffing: The care of urban forest requires a certain skill set that can found in-house with professional staff or through consultants. Whether creating a staff position for a certified arborist or urban forester, or contracting with them on an *as needed* basis, professional assistance will have some of the greatest and most immediate impacts on your community forestry program.

Tree Canopy Goals: Consider your community's entire tree canopy to reduce loss and maximize gains over time by protecting undeveloped forest and impacts of land development, enhance the health condition, and function of forests, and reforest through active replanting or allowing regeneration.

the area, that do not show any signs of diseases and deformity, and that are not exotic invasive species. Norway maple has been a favored street because it is hearty and aesthetically pleasing (the species represents 9% of the trees inventoried in Colchester). Yet, it has the potential to propagate beyond the desired urban setting and has escaped into the wild and creates a monoculture by out-competing our native hardwoods. In fact, Vermont's Plant Quarantine Rule prohibits the movement, distribution, and sale of several established invasive plant species, including Norway maple.

Recommendation:
Develop species, structural, and age diversity by planting new species and increasing the number of the lesser represented species using best management practices in order to promote long-term health and resilience of individual trees and Colchester's forest.

Recommended action practices:

- In order to increase species diversity, consider species for future plantings that are appropriate to Colchester's hardiness zone 5a: -20 to -15 (F). Table 4 summarizes the characteristics of ash and provides suggestions for similar species to consider for future plantings.
- We also advise against planting high-density stands of the same species whose close proximity may be conducive to the spreading of disease. For example, many ash trees lining a street may create a greater susceptibility of the trees to the emerald ash borer.
- Since this inventory focused on newly planted trees, the vast majority of the trees were young. Another consideration to build forest resilience and to spread out costs is to strive for tree age diversity as well. If all the trees are of a similar age, they will all reach maturity at the same time which will increase maintenance and removal costs in the future.
- Consider obstructions above ground (power lines) and below ground, minimize grey infrastructure conflicts (sidewalks, streets, buildings etc.), available soil volume, species mature size (height and spread), branching patters, environmental tolerances (exposure, salt, and drought), and desired function when choosing replacement species.

Resource: For more information on site assessment and species selection, please refer to VT Tree Selection Guide http://www.vtfpr.org/urban/documents/VTTree%20Guide.pdf, or contact the VT UCF for a hard copy.

Table 4. Ash tree characteristics and similar tree species for potential replacement.[1]

CHARACTERISTICS of WHITE/ GREEN ASH	Hackberry (*Celtis occidentalis*)	Gingko (*Gingko biloba*)	American elm (*Ulmus americana*) "Jefferson" (resistant cultivar)	Honeylocust (*Gleditsia triacanthos*)	London Planetree (*Platanus x acerifolia*)	Eastern Red Cedar (*Juniperus virginiana*)
Adaptable		x	x	x	x	
Good for alkaline soils	x	x	x	x	x	x
Salt tolerant	x	moderate	moderate	x	moderate	x
Tolerant of air pollution	x	x	x		x	x
Good fall foliage		x	x	x		
Native to VT	x		x			x
Medium height: 50-60	x	x	x	40	60-85	x
Hardiness zones 3-4	x	x	x	x	5 (looking forward: advantage)	x
Poor drainage (green ash)		moderate		moderate		
Other pros					Fruit bearing, winter interest	Fruit bearing, wildlife host, winter interest
Other cons			Host of Asian longhorn beetle			

[1]Table created by Middlebury College class INTD1127, Winter 2013.

Maintenance

Proper tree maintenance, especially pruning, can extend the life and health of trees, as well as reduce public safety issues. There are four main maintenance issues to be addressed: routine pruning, crown cleaning, crown raising, and crown reduction. Crown cleaning removes dead, diseased, and damaged limbs. Crown raising is the removal of lower branches that are 2 inches in diameter or larger in the case of providing clearance for pedestrians or vehicles. Crown reduction is removing individual limbs from structures or utility wires. It is recommended that all trees be pruned on a routine schedule every five to seven years.

Recommendation:
Establish a routine systematic pruning cycle for all public trees to reduce future tree failures due to poor structure, minimize conflicts with people and infrastructure, improve line of sight, reduce storm damage, and protect public safety. When trees are located near electrical lines, it is important to work directly with the local utility company.

Inventory remaining public trees to develop comprehensive management plan.

Resources:
Arboriculture training is available from the VT UCF upon request.

Financial and technical assistance is available from the VT UCF to assist with tree inventories and plan development.

Urban Forest Health

Thirteen (13) percent of Colchester's recently planted trees (85 total) were either considered to be in "Fair" or "Poor" condition. There were only five streets (Morehouse Dr., Hedgeman Ave, Holy Cross Rd, Kathleen Ln and Wildflower Ln) with over 10% of the trees in Fair or Poor condition.

The low soil volume and fertility in a street setting, exposure to salt spray, root damage, mechanical damage to the stem, and poor pruning are some of the contributing factors to poor tree health. Poor pruning (cuts made into the Branch Bark Ridge and cuts leaving 2" stubs) were observed throughout town. Mechanical damage from weed whackers or other mowing equipment was significant along some streets, especially Holy Cross Rd, Edgewood, South Park Dr., and Colden. Mulch volcanoes (where the mulch is piled too high around the trunk) were also observed on Edgewood, Nottingham Court, and Stone Drive. Mulching too high around the stem traps moisture and can lead to stem decay. In addition to the potential of being structural hazards, stressed trees are more vulnerable to attack by diseases and insects.

Exotic Invasive Forest Pests
EAB was introduced to the U.S. from Asia in 2002 and attacks all species of ash native to North America, including green ash. It has led to the death of millions of ash trees from Michigan to New York. Currently, most ash trees in Colchester (see the map in Appendix I) are clustered along Edgewood Dr., Mariner Heights, Abigail Dr., Wildflower Lane, and Carriage Way. Unfortunately, it's not *if* but *when* EAB will arrive in Vermont. Eventually, Colchester will have to deal with a large number of dead or dying ash trees within a short time frame.

Overall, the town appears to have a relatively young and healthy population of public trees, and fortunately there are no signs of EAB or ALB. However, even though most trees are in good condition, the majority of Colchester's planted trees represent two of the most vulnerable types of genera: ash and maple. In particular because of the high density of ash within new residential developments alone, in combination with those in private yards, woods and natural areas, it's the opinion of the Vermont Urban & Community Forestry Program that it is in the best interest of Vermont municipalities to begin planning now. A proactive response plan will be invaluable in addressing the threat by allowing Colchester to:

- Modify budgets to accommodate increased tree-related costs/losses over a longer period of time. With an average replacement cost of $250/tree, **it would cost Colchester an estimated $31,000 to replace the 124 ash trees**. Ash is also common along many back roads. When these trees die they may become a hazard to public safety and may need to be removed.

- Identify, arrange or develop strategies for debris disposal space.
- Start outreach and education to your residents NOW! Inform citizens about forest pests, how to deal with their private trees, and to help looking for them.
- Develop a public tree policy or ordinance for designating trees to be preserved and replacing trees that are lost. While we don't have any way to eradicate EAB, trees can be saved if they are treated with an insecticide. If you start planning now, you will be able to diversify your urban forest to soften the impact of EAB arrival.
- Ease costs by forming partnerships, brokering group or volume prices for removal, disposal and replacement, prearranging contracts, and seeking grants.
- Mitigate the spread of the EAB—If we find EAB early, then we can utilize management options to slow the spread. This buys time for research to develop biocontrols so we are able to live with EAB.

Recommendations:
Plan now for losing trees in fair to poor condition and focus future plantings on increasing the diversity of tree species.

Monitor signs and symptoms of emerald ash borer, Asian longhorned beetle and other pests and diseases.

Maintain tree health by preventing mechanical damage to trees during mowing, removing stakes and mulch volcanoes, pruning to promote long-term structural integrity, and correcting root problems.

Develop an EAB preparedness and response plan.

Resources:

There are resources available to help Colchester develop an EAB preparedness plan. These resources include planning tools and templates, educational materials, an online toolbox, technical assistance provided by VT Forestry Division staff as well as potential funding in the form of a $500 incentive to assist you with the planning effort.

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Appendix I: Data Tables from iTree Showing Environmental and Monetary Benefits of Colchester's Street Trees

Appendix II: Maps

Appendix III: Complete list of tree species inventoried during 2012-2013

Tree Species	Number of Trees
Green ash	124
American elm	76
Red maple	72
Northern red oak	62
Norway maple	59
Crabapple	44
Sugar maple	43
Honeylocust	30
Pear	23
Serviceberry	20
Littleleaf linden	16
Northern hackberry	13
Japanese tree lilac	12
Oak	10
European hornbeam	8
Horsechestnut	7
Kentucky coffeetree	6
Eastern white pine	5
Scotch pine	4
Tatar maple	4
Black cherry	3
Blue spruce	3
Swamp white oak	2
Eastern hemlock	2
Red mulberry	2
Norway spruce	2
White spruce	2
River birch	2
Austrian pine	1
Eastern red cedar	1
Beech	1
Basswood	1
Silver maple	1
Pin oak	1
Birch	1