

**Tree Inventory and Assessment**  
for  
**Holland Township**

Completed in collaboration with

Holland Township Environmental Commission

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**Completed by**

**Holland Township Environmental Commission  
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## **Introduction**

Holland Township applied for and received a grant from the New Jersey Forest Service to complete a street tree survey to evaluate problematic trees along township roadways and within existing rights-of-way. The Township Environmental Commission prioritized the roadways to be surveyed first. This was completed by breaking the township into sections and members of the Environmental Commission evaluating the condition of trees along each township roadway. The high priority roads included the roadways with the highest number of trees and most potentially hazardous trees located within the right-of-way (ROW). Only township-maintained roads were surveyed. Private roads were not included and county road assessments are being completed by Hunterdon County.

A Community Stewardship Incentive Grant (CSIP grant) was received in 2018 by Holland Township. Field work began in May 2019 and was completed in October 2020, with work postponed by COVID restrictions March through June 2020. Field work was conducted one day per week, leaf on, weather permitting.

## **Background**

Not all tree failures can be predicted but risk can be reduced or managed to the extent possible within the realities of funding for tree maintenance and removal. Trees, particularly older and larger trees, should be inspected annually or after severe storms. Many of the trees located along roadways and in these rights-of-way are 80-100 years old or older in many instances. Very few trees were planted within the township right-of-way; rather, the large majority of the trees within this area had grown naturally. There are hazardous defects that can cause a tree to lose limbs or cause the entire tree to fail depending upon the extent of the defects. In order for a tree to be deemed a hazard two conditions must exist:

1. There must be a significant defect that may result in a tree, limb or part of the tree to fall.
2. There must be a target which will be struck and damaged by this failing tree. This would include but is not limited to a home or other structure, power or other utility lines, fences, vehicles, park benches or tables or people. During this survey power lines and roadways were the primary targets along these rural and suburban roadways. If there is no target, the tree need not be removed.

Regular preventive care of healthy trees is the best solution to avoid hazard trees. Unfortunately, municipal budgets rarely allow for this work to be completed by employees or contractors or for the township to have the proper equipment or training to complete the work required. Holland Township is a small population municipality with limited township staff; the entire public works department has 6 employees.

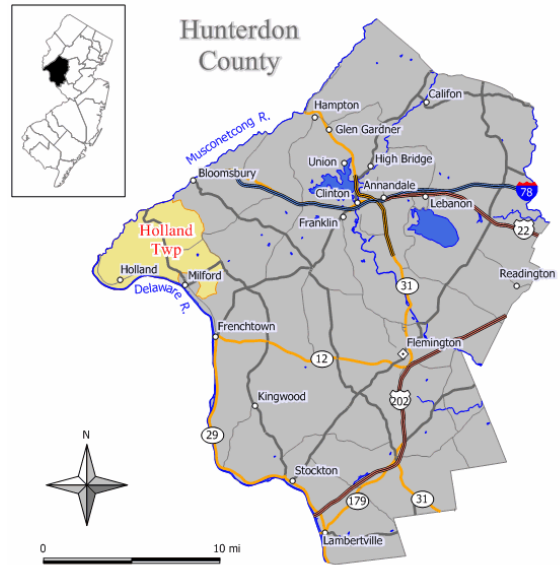
A hazard tree is a tree that has a structural defect that makes it likely to fail in whole or in part. Signs of a hazard tree include: dead wood, cracked trunk, codominant stems with poor crotch development,

hollow, decayed or damaged trunks, decay on large limbs, insect damage, sawdust or fungi near the base of the tree, decline in vigor, man-caused damage, improper pruning, tree lean or uplifted roots.

### Holland Township Background

Holland Township is located in the northwestern part of the County. The Delaware River forms its boundary with Pennsylvania and the Musconetcong River, its boundary with Warren County. It was created from Alexandria Township in 1874. In 1876, it was re-merged with Alexandria Township and separated as a municipality of its own again in 1879. The approximate square mileage of Holland Township is 23.97 and the estimated population is 5,291 based upon 2010 Census data. The population density is 220.7 residents per square mile.

There are 62.58 miles of roads within Holland Township, including 16.85 miles of County Roads, 9.71 miles of private roads and the remaining 45.73 miles were township roads.



### Objectives

The objectives of the project included:

1. An evaluation of all the trees within the Township right-of-way.
2. Ratings to prioritize the remediation of hazards or removal of hazard trees.
3. Collection of data associated with the trees located within the ROW including but not limited to species, diameter at breast height (dbh), location, hazard rating and recommended action to eliminate the hazard situation.

### Methods

Information concerning Hunterdon County Roadways was received from the Hunterdon County GIS Department and a list of private roads was confirmed by the Township. All township roads were mapped on GIS software and printed for use in the field.

All the Tier 1 roadways (Tier 1 roadways had the highest density of trees and potential hazards) as determined by the Environmental Commission were sampled. All roadways were walked and individual trees within the right of way were evaluated and measured. Data was collected on a paper spreadsheet

by volunteers who walked the roads with the Forester. Data was then entered by members of the Environmental Commission into Excel and i-Tree. Below is a map of the Township Roads that were evaluated under the grant. Where the roadway also serves as the Township Boundary only the Holland Township side of the roadway was surveyed.

Trees with multiple stems were listed as one tree, and the diameters of all stems were recorded on the field data sheet. Risk rating was rated from 1 to 5, with 1 being the lowest risk to 5 being the highest risk. This rating scale will be utilized to prioritize tree removal considering limitations within the Township Budget, the small number of Public Works Department staff (6 employees) and the large number of hazard trees and White Ash found within the Township ROW. In an ideal world, all hazards would be remediated as they are found via removal or pruning and the township would have the equipment and manpower necessary to maintain the health and vitality of the community trees. Trees located along roadways in high volume traffic areas pose more of a risk (or potential to cause injury) than those on lightly travelled streets.

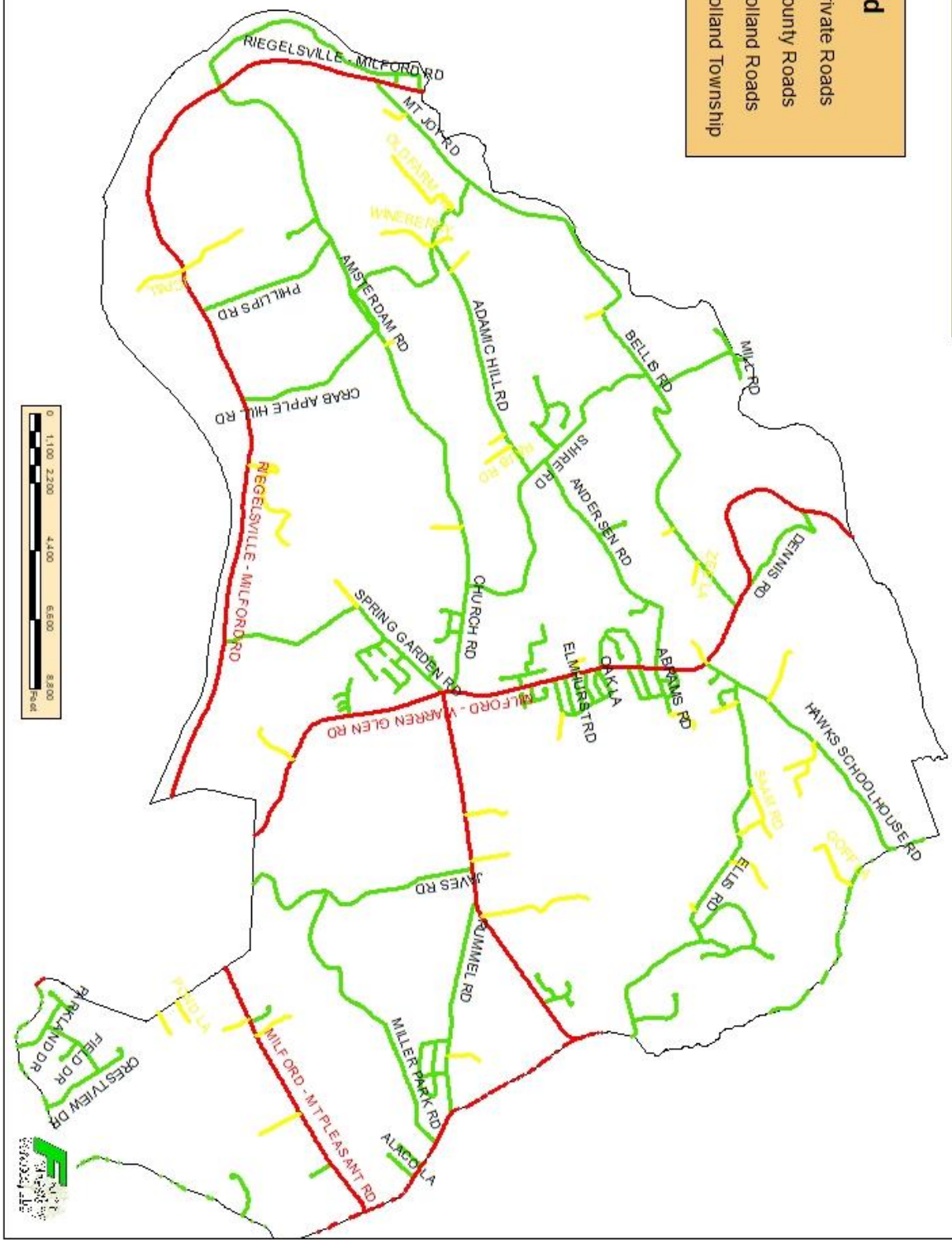
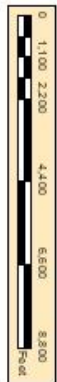
Other data collected included tree species, tree crown health, street address (where available), nearest utility pole number, utility line conflicts, management recommendations and gps locations. Maintenance options proposed on the field data sheets were remove the tree, monitor the tree or no maintenance required.

All tier 1 streets were walked and evaluated, representing a total of 26.83 miles of roads, or about 58.7% of the total miles of township roads within Holland Township but including all of those with the highest number of trees or largest trees within the right-of-way.

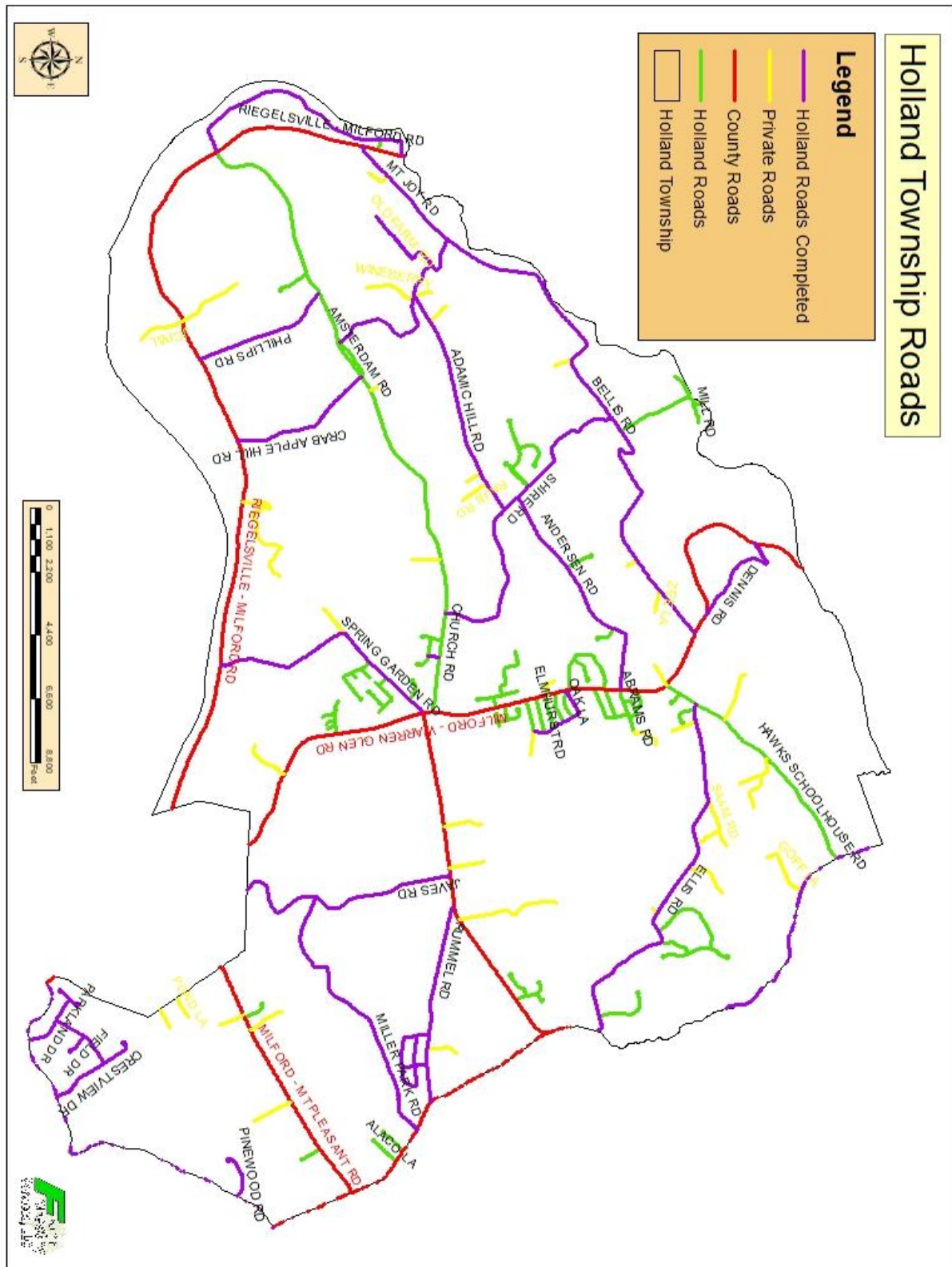
# Holland Township Roads

**Legend**

- Private Roads
- County Roads
- Holland Roads
- Holland Township



Municipal Roads completed are highlighted in purple.

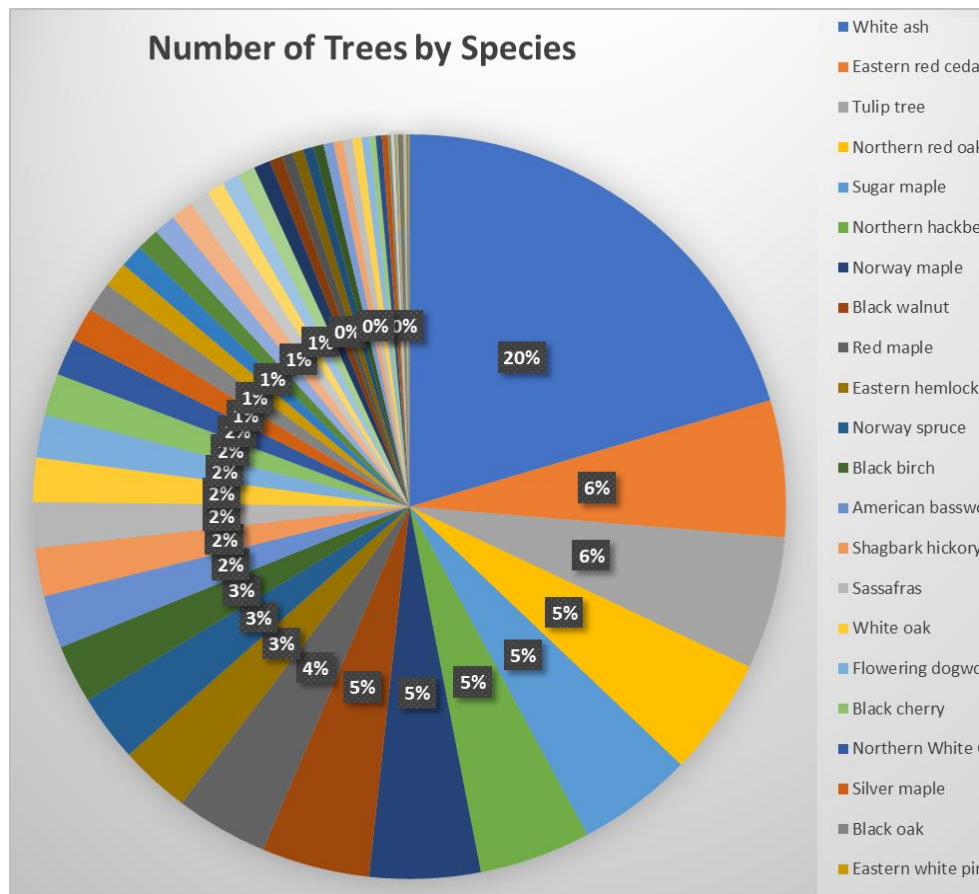




## Findings

The Township is heavily infested with Spotted Lanternfly as well as Emerald Ash Borer. With the Spotted Lanternfly issue, the Township has been cooperating with USDA, who has been creating trap trees within the Township and educating residents on how to control the spread of the species as well as Ailanthus trees. Emerald Ash Borer and its damaged was noted throughout the Township. The Ash trees decline was caused by a combination of Ash Yellows as well as Emerald Ash Borer.

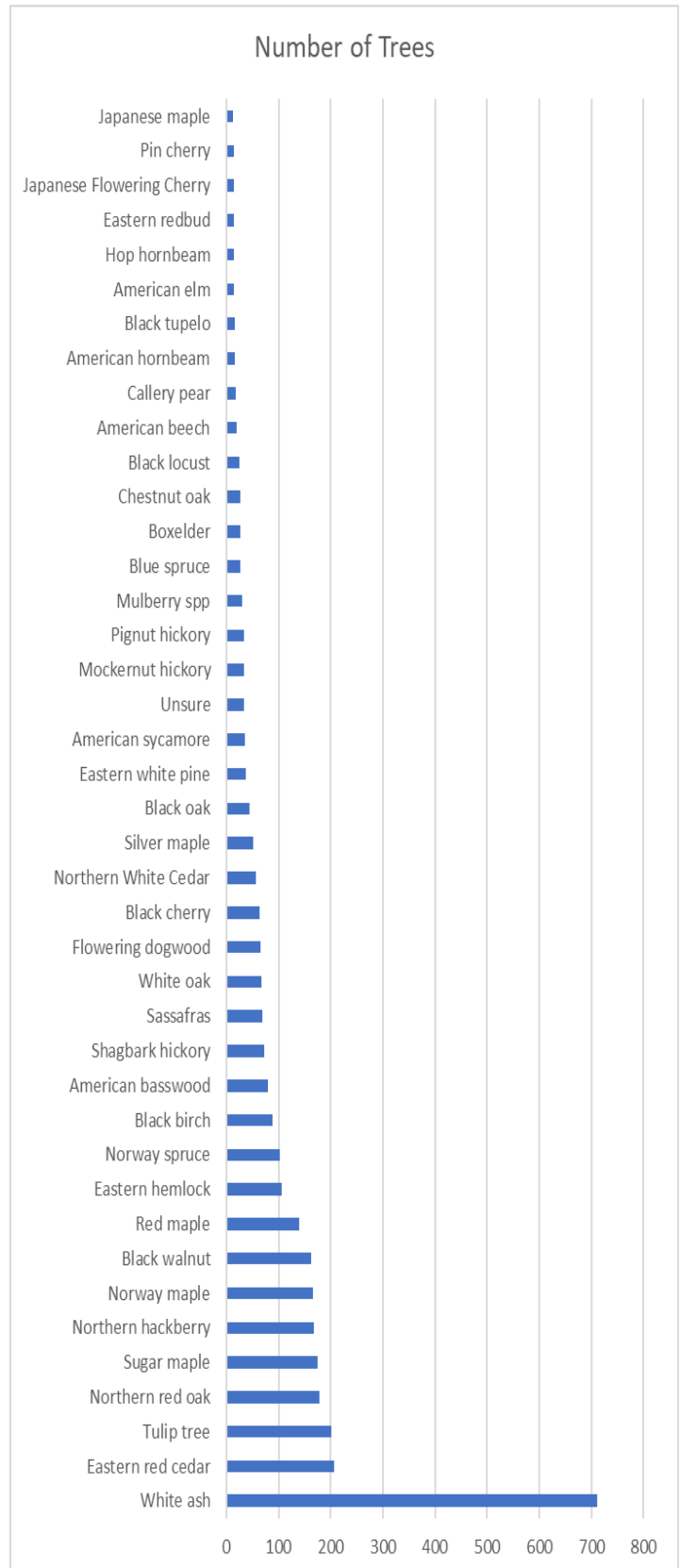
Overall, 3,007 trees were evaluated and data recorded during the inventory. Many of the trees had multiple stems. Raw data can be found in the appendices. Seventy-seven different tree species were noted during the inventory within the township right of way. Trees ranged from 1” to 67” in diameter at breast height (dbh). The average dbh for all trees was 14.64 inches. The following data was developed using the number of total stems not the number of trees. So where one tree had three stems these tables are utilizing the three stems. Overall the township has very good tree diversity, only one tree species



made up more than 6% of the total number of trees measured. Unfortunately, that species was white ash which made up 20% of the trees measured and most are in decline due to the pathogens above. Eastern Red Cedar and Tulip Poplar each made up 6% of the trees measured. The following species made up 5% of the trees measured: Northern Red Oak, Sugar Maple, Hackberry, Norway Maple and Black Walnut. It should be noted that many Spotted Lanternfly instars were often found on Black Walnut within the township.

The chart to the right lists tree species of which there were 10 or more stems within the right of way while the list below lists all species found.

Tree Species	Number of Trees	% of trees
White ash	711	19.97
Eastern red cedar	207	5.81
Tulip tree	201	5.64
Northern red oak	178	5.00
Sugar maple	174	4.89
Northern hackberry	167	4.69
Norway maple	166	4.66
Black walnut	162	4.55
Red maple	139	3.90
Eastern hemlock	106	2.98
Norway spruce	102	2.86
Black birch	88	2.47
American basswood	80	2.25
Shagbark hickory	73	2.05
Sassafras	69	1.94
White oak	67	1.88
Flowering dogwood	65	1.83
Black cherry	63	1.77
Northern White Cedar	57	1.60
Silver maple	51	1.43
Black oak	45	1.26
Eastern white pine	38	1.07
American sycamore	35	0.98
Unsure	34	0.95
Mockernut hickory	33	0.93
Pignut hickory	33	0.93
Mulberry spp	30	0.84
Blue spruce	26	0.73
Boxelder	26	0.73
Chestnut oak	26	0.73
Black locust	25	0.70
American beech	19	0.53
Callery pear	17	0.48
American hornbeam	16	0.45
Black tupelo	16	0.45
American elm	15	0.42
Hop hornbeam	15	0.42





Eastern redbud	14	0.39
Japanese Flowering Cherry	14	0.39
Pin cherry	14	0.39
Japanese maple	12	0.34
fir spp	9	0.25
Honeylocust	9	0.25
Tree of heaven	9	0.25
Scarlet oak	1	0.03
Cherry spp	1	0.03
Common Apple	1	0.03
Kentucky coffeetree	1	0.03
oak spp	1	0.03
spruce spp	1	0.03
Staghorn sumac	1	0.03
willow spp	1	0.03
European white birch	1	0.03
Pin oak	1	0.03
Pitch pine	1	0.03
Persian silk tree	1	0.03
European yew	1	0.03
Gray birch	1	0.03
Osage orange	1	0.03
Witch hazel	1	0.03
Ginkgo	1	0.03
Hawthorn spp	1	0.03
Horse chestnut	1	0.03
Magnolia spp	1	0.03
Peach	1	0.03
Scots pine	1	0.03
American chestnut	1	0.03
Ash spp	1	0.03
Bear oak	1	0.03
Common bamboo	1	0.03
Douglas fir	1	0.03
Eastern service berry	1	0.03
Green ash	1	0.03
Northern catalpa	1	0.03
Quaking aspen	1	0.03
Sweet Chestnut	1	0.03
Weeping willow	1	0.03
<b>Grand Total</b>	<b>3561</b>	<b>100%</b>

The most common non-native species noted were Norway Maple, Norway Spruce and Callery Pear. Norway Maple and Callery Pear are invasive species that will readily spread into forest and old field ecosystems. Norway Spruce can reproduce but are not likely to spread. Ailanthus, Japanese Maple and Bamboo were the other non-native invasive species noted are highly invasive.

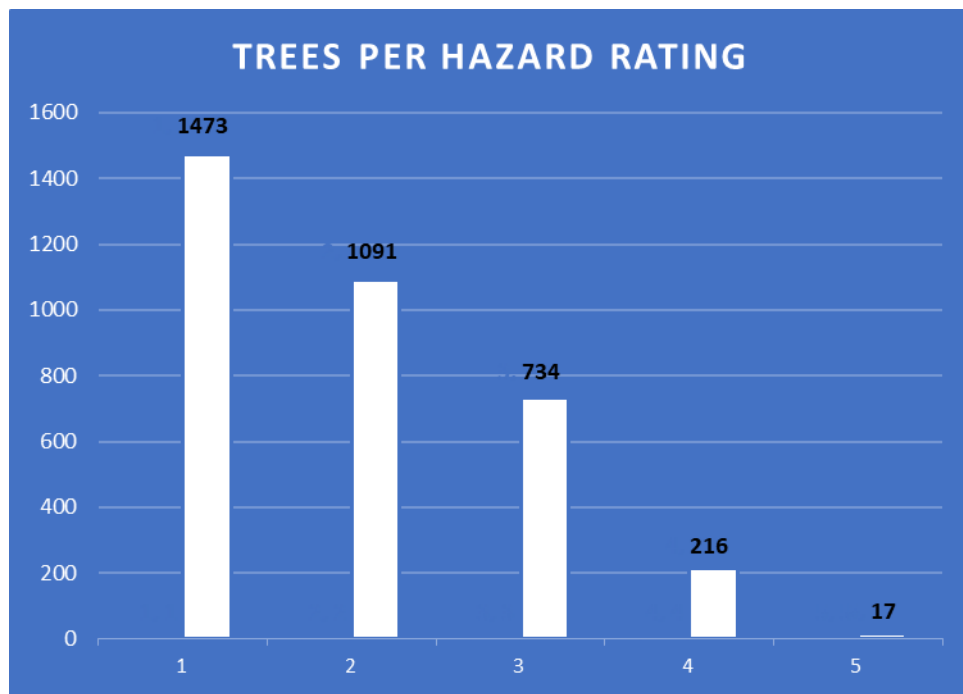
## Hazard Tree Discussion

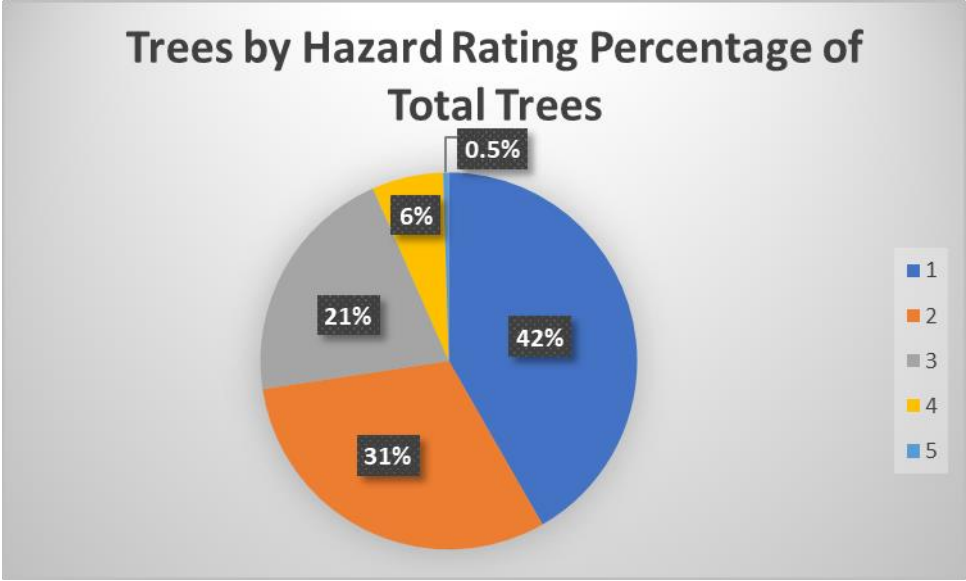
Hazards cannot be predicted 100% of the time or be removed immediately upon finding them. A key purpose of this report is to prioritize the removal of trees.

Each tree was given a risk/hazard rating. Risk rating 1 would be considered a non-hazard non-risk tree. A tree listed as risk rating 1 would include healthy trees with no dead limbs or branches or trees that were small diameter and would not cause damage if they did fall. Risk rating 2 trees are in good health, have few if any defects or any signs of decline or damage to the roots or trunk of the tree.

Trees with a risk rating of 3 have defects or are showing signs of decline and should be monitored to gauge decline. They will likely have to be removed within the next 5-7 years. Trees with a risk rating of 4 will require intervention or removal in 1-3 years to eliminate the risk. Defects would be major with large dead or dying limbs, insect or fungal growth, major rot noted on the trunk or severely damaged roots. These trees should be monitored and removed if tree health declines further. Trees with a risk rating of 5 are at risk of imminent failure and should be removed as soon as practical based upon available finances.

Below is a chart showing the number of hazard trees by rating.





Overall, 967 trees, or 27.4% of the total number assessed, were assigned a risk rating of 3-5 and should have some sort of intervention to reduce hazards. This is not a realistic goal for a small town with 6 employees. The highest risk trees are listed below by species and street location. These are the highest priority trees for removal. These trees should be removed as soon as practicable with either municipal staff or hired contractors.

White Ash was the most common tree found during the inventory as well as the most common hazard tree with 476 trees noted. Seven of the 17 highest risk trees, or 41%, were White Ash trees impacted by Emerald Ash Borer. Tulip Poplar made up 48 of the hazard trees noted while Northern Red Oak made up 43 of the hazard trees. Tulip Poplar was the third most common tree within the right of way while Northern Red Oak was the fourth most common tree species noted.

Risk Rating 5 by Species	
Species	Number
White Ash	7
Tulip Poplar	2
Red Oak	2
Red Maple	2
Norway Maple	1
Mulberry	1
Black Birch	1
Black Oak	1

Risk Rating 5 by Street	
Street	Number
Javes Road	4
Shire Road	4
Dennis Road	2
Alphalfa Hill Road	2
Bellis Road	2
Ellis Road	1
Sweet Hollow Road	1
Miller Park Road	1

The trees in these tables should be removed within 1-3 years depending on their continued rate of decline.

<b>Risk Rating 4 by Species</b>	
<b>Species</b>	<b>Number</b>
White Ash	121
Tulip Poplar	12
American Basswood	10
Black Birch	9
Eastern Hemlock	9
Hackberry	7
Black Walnut	6
White Oak	6
Silver Maple	5
Red Oak	4
Black Oak	4
Black Cherry	4
Dead	3
Red Maple	3
Oak spp	2
Shagbark Hickory	2
Sugar Maple	1
Pin Cherry	1
Sassafras	1
Norway Maple	1
Green Ash	1
Flowering Dogwood	1
Allegheny Serviceberry	1
Chestnut Oak	1
Black Walnut	1
American Sycamore	1

<b>Risk Rating 4 by Street</b>	
<b>Street</b>	<b>Number</b>
Ellis Road	36
Bellis Road	33
Miller Park Road	26
Shire Road	22
Alphalfa Hill Road	12
Crab Apple Hill Road	12
Mt. Joy Road	12
Sweet Hollow Road	12
Anderson Road	11
Dennis Road	11
Adamic Hill Road	11
Stamets Road	7
Javes Road	6
Myler Road	5
Old River Road	3

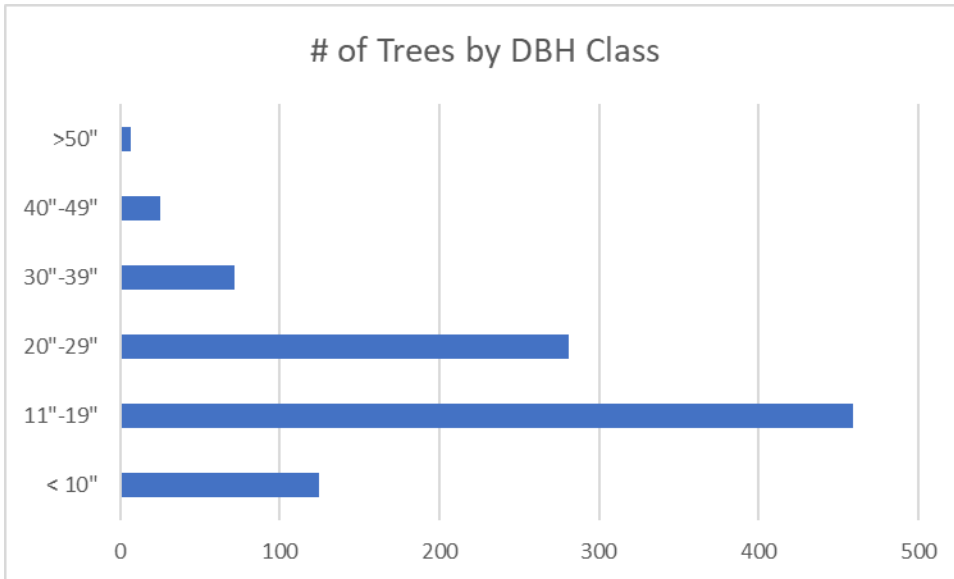
<b>Risk Rating 3 by Species</b>	
<b>Species</b>	<b>Number</b>
White Ash	349
Red Oak	37
Tulip Poplar	34
Silver Maple	33
Red Maple	30
Hackberry	28
American Basswood	27
Black Walnut	23
Eastern Hemlock	19
Norway Maple	18
Black Birch	16
Black Cherry	16
Sassafras	13
Boxelder	12
Black Oak	11
White Oak	8
American Sycamore	8
Dead	7
Sugar Maple	7
Mulberry	6
Eastern White Pine	5
American Beech	4
Norway Spruce	3
Eastern Red Cedar	3
Scarlet Oak	2
Tree of Heaven	2
Shagbark Hickory	2
Spruce spp.	1
Pin Cherry	1
Weeping Willow	1
Mockernut Hickory	1
Honey Locust	1
Chestnut Oak	1
Cherry spp.	1
Colorado Blue Spruce	1
Black Tupelo	1
Callery Pear	1

Trees noted on this page all showed signs of decline and will be monitored, reprioritized and remediated as funding allows.

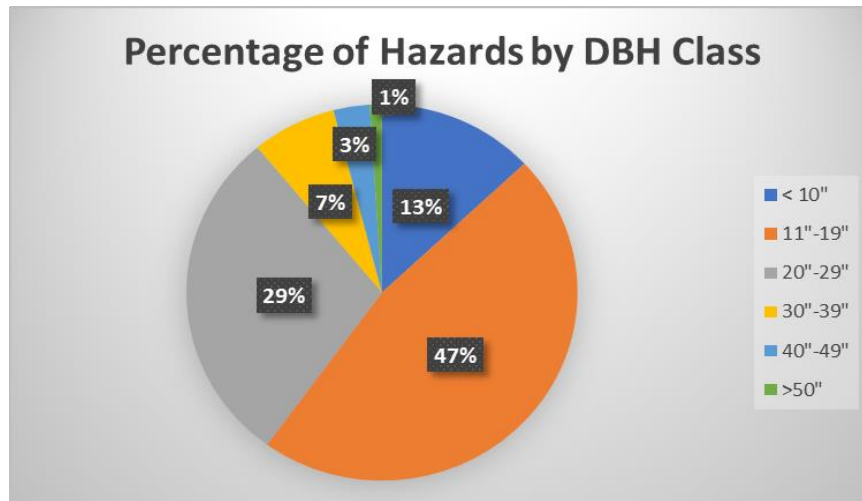
<b>Risk Rating 3 by Street</b>	
<b>Street</b>	<b>Number</b>
Bellis Road	139
Shire Road	96
Ellis Road	92
Miller Park Road	76
Dennis Road	76
Adamic Hill Road	41
Old River Road	39
Mt. Joy Road	36
Sweet Hollow Road	27
Crab Apple Hill Road	26
Alphalfa Hill Road	23
Stamets Road	22
Anderson Road	14
Javes Road	12
Myler Road	6
Fawn Ridge Drive	3
Crestview Drive	3
Deer Path	1
Stag Run	1

## Diameter Ranges of Hazard Trees

The diameters of hazard trees ranged from 1” to 67” at breast height (DBH). For the diameter distribution each stem was separated. Risk of damage increases as the diameter of the tree increase. Potential damage caused by a 4” DBH White Ash tree would be much less than an injury or damage from a 67” DBH Silver Maple tree. The average diameter of trees having a risk rating of 5 is 24.18 inches. The average diameter of risk rating 4 trees is 18.74 inches and average diameter of risk rating 3 is 19.06.



DBH Class	# of Trees
< 10"	125
11"-19"	459
20"-29"	281
30"-39"	72
40"-49"	25
>50"	7



The highest percentage of hazard trees were located within the 11-19” DBH range. There were 459 trees (47%) of the hazard trees were found within this DBH range. Given the age of the community forest in these urban areas this range was not unexpected. The second highest number was found in the



20-29” range where 281 hazard trees were within this DBH range 29% of the total hazard trees. Many of the stems noted below 10” are part of a multi-stemmed tree.

<b>Hazard Tree Rating 3-5 by Species</b>		
<b>Tree Species</b>	<b>#</b>	<b>DBH Range</b>
White Ash	476	1 to 50
Tulip Poplar	48	52
Northern Red Oak	43	6 to 44
Silver Maple	38	4 to 67
American Basswood	37	2 to 33
Red Maple	36	2 to 35
Northern Hackberry	35	2 to 41
Black Walnut	29	13 to 39
Eastern Hemlock	29	7 to 29
Black Birch	26	6 to 22
Black Cherry	20	9 to 30
Norway Maple	20	2 to 36
Black Oak	16	13 to 32
Sassafras	14	12 to 27
White Oak	14	9 to 41
Boxelder	12	10 to 27
Dead	10	6 to 25
American Sycamore	9	19 to 55
Sugar Maple	8	6 to 37
Mulberry	7	7 to 48
Eastern White Pine	5	16 to 37
American Beech	4	17 to 22
Shagbark Hickory	4	8 to 19
Norway Spruce	3	7 to 15
Chestnut Oak	2	10 to 22
Mockernut Hickory	2	19 to 25
Pin Cherry	2	14 to 18
Scarlet Oak	2	29 to 34
Tree of Heaven	2	15 to 17
Black Locust	1	40
Black Tupelo	1	14
Blue Spruce	1	18
Callery Pear	1	18
Cherry spp.	1	8
Eastern Red Cedar	1	14 to 23
Eastern Serviceberry	1	11

Flowering Dogwood	1	4
Green Ash	1	1
Honey Locust	1	24
Pignut Hickory	1	20
Spruce spp.	1	28
Weeping Willow	1	31

## Hazard Ratings

In order to prioritize work with a limited budget, the risk ratings were ranked in order to better prioritize work moving forward. From this report, the Department of Public Works and Holland Township Environmental Commission can determine which of the work can be completed in house or if the work will be contracted out to a private contractor. The Township does not currently have a pruning program nor the staff or equipment to implement a pruning program.

Hazard ratings range from 1 to 5. The highest risk and trees that should be dealt with as soon as practical with limited financial resources. Trees receiving a 5 rating would include trees with major defects, hazards over a high-risk target, a high use area, a tree with major structural damaged, cracked trees/trunks, poor crotches on multi-stemmed trees, severely rotted trunks, major dead limbs, dead trees, etc. A hazard rating of 4 would be a tree with major defect(s) or in serious health decline, an example would be an Ash tree that are currently alive but have Emerald Ash Borer and was showing signs of decline in major limbs. Hazard rating 4 trees should be removed within 1-3 years to reduce the risk. Risk rating 3 trees would be trees that appear to be in declining health, healthy looking trees which are leaning, dying branches, has defects or insect or disease infestations that may result in further decline of the tree which should be monitored and reprioritized for removal if the tree continues to decline. Trees rated 1 or 2 would include trees in good health, with minimal or no defects, rot resistant trees such as Red Cedar or Black Locust, trees that are short in height, trees with good growing space, are leaning away from the road or a “small tree” less than 4” in diameter.

## Recommendations

Tree risk ratings were utilized to prioritize tree work moving forward. The Township will be/has been removing Ash trees/hazard trees as funding permits. Remediating risk can be reduced to a few actions:

1. Remove the tree.
2. Prune the dead limbs (not a realistic option for Holland Township).
3. Maintain the database, removing trees from the list as they are removed adding or upgrading trees as they decline or if the utility company removes hazard trees.

4. Monitor the trees to determine hazard progression to reprioritize remaining hazards ideally annually.

The Township should contact JCP&L regarding next steps with regard to item numbers 1 and 2 above. Those discussions should include the sharing of this report with the utility company, and follow up with them to determine what steps JCP&L plans to take to prune and/or remove trees that pose a risk to utility poles, wires and other assets.

All of the hazard trees identified in this are all within the roadway right-of-way.

All trees rated 5 should be removed as soon as possible but definitely within the year. All trees rated a 4 should be remediated within 1-3 years, pruned or removed. Again, all work would be budget dependent with a focus on removing the worst risks first as financing allows. Trees rated a 3 should be monitored annually and reprioritized should further decline be noted. These trees will likely have to be removed within 3-5 years.

An individual tree can have multiple recommendations, meaning remove, prune or monitor. Trees that can be pruned to reduce the risk (at least temporarily) would extend the useful life and benefits of the tree. Trees recommended for removal was 17 as soon as possible and 216 that will likely need to be removed within 3 years. There were 337 trees that should be monitored due to declining health. These trees may survive long term but will require remedial action to reduce potential hazards. This may include Ash trees that are currently healthy and relatively remote from other Ash trees. Trees showing loss of fine branches but not having large dead limbs.

The Forester will continue to work with the Holland Township moving forward to remediate the hazards and monitor the condition of list trees moving forward, if necessary. In many of the wooded areas tree replacement would not be necessary. Some of the more developed roads removal of a number of trees particularly numerous Ash trees may change the character of a neighborhood. Tree planting may be possible if CSIP funding was available although a CSIP grant to remove hazard trees should be a higher priority. The number of trees that should be removed would overwhelm the Township DPW budget.

## **Appendices**

### **Raw Data**