

# Tree Health Tool Kit

A lending backpack  
for grades 6<sup>th</sup> through 8<sup>th</sup>

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This backpack contains materials and activities for you to do with your class to identify and monitor the trees in your schoolyard/neighborhood.

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    - 9<sup>th</sup>-12<sup>th</sup> grades



This backpack contains materials and activities for you to do with your class to identify and monitor the trees in your schoolyard/neighborhood.

### NGSS Connections:

Middle School	High School
MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

### Activity Overview

#### Part I: Tree identification and monitoring

1. In this lesson, students will measure the trees in their schoolyard and collect data about the trees they sample. As part of their data collection, students will identify the trees in their schoolyard and measure the Diameter at Breast Height (DBH) for each tree. It is recommended that students complete this task in groups. Depending on your schoolyard, it is also recommended to divide the schoolyard into plots so that each student group is responsible for a different set of trees to measure.
2. Activity Materials: Tree Identification/Monitoring Data Sheets (per group/pair), clipboard (optional), measuring tape, writing utensil, *Forest Trees of Illinois* book (information on common Illinois trees and how to identify them), map of your schoolyard or printed Google map of the area to be sampled, & calculator
3. Activity Procedure:
  - a. Divide the class into data collection groups and distribute materials. Each group needs a data sheet, clipboard (optional), tape measure, *Forest Trees of Illinois* book or other tree identification resource (see materials for linked resources).
  - b. Go outside to measure the trees in your community (schoolyard).
  - c. Recommended tips for management:
    - i. Before letting the class measure trees on their own, model how the class will complete their data sheet by compiling data on a tree together.
    - ii. Model how to use the tree identification resources (see attached supplement as well). Encourage the class to draw the leaf shape and make other observations of the tree's features: bark texture, leaf texture, leaf arrangement, etc.
    - iii. Model how to measure the DBH (Diameter at Breast Height) - Using the tape measure, have the students stand next to the tree and measure at the height of their armpit. Students should wrap the tape measure around the tree to get the tree's circumference in inches. Next, students will need to calculate the diameter by dividing their measured circumference by pi (3.14).
    - iv. Model to the class how you want them to describe their location or mark their location on the map of your schoolyard. (Since schoolyards vary by location, a map or chart on how you will want students to describe the location of the tree, will need to be given to the students as well. As part of the analysis, the location of their plotted trees will become important information for them to collect.)
    - v. Since the overall goal is to monitor the health of these trees over time, you will want to make an initial assessment of whether or not the tree is healthy. Use the following key to help you determine the overall health of each tree. (Chart is also located in the supplemental resources.)
      1. Excellent (1) - Tree appears to be in reasonably good health. Less than 10% cumulative fine twig dieback, defoliation, and/or discoloration present.
      2. Good (2) - Major branch losses, fine twig dieback, and/or foliage discoloration present in 10-25% of the crown.



## Curriculum Overview

3. Fair (3) - Major branch losses, fine twig dieback, and/or foliage discoloration present in 26-50% of the crown.
4. Poor (4) - Major branch losses, fine twig dieback, and/or foliage discoloration present in more than 50% of the crown.
5. Dead (5) - Tree is standing dead with no green leaves or buds (greater than 4.5 ft. tall).
- vi. Note: More information on these categories for tree health can be found within the “Healthy Trees Healthy Cities” app. The rating is modeled on the U.S Forest Service’s Tree Health Scales.
- vii. Divide the schoolyard and give each group of students an area to measure. (Note: Consider using Google Maps to create a grid of your schoolyard and assign each student group to a specific grid.)

### Part 2: Tree risk assessment

1. Now that you have identified the trees in your schoolyard, you will assess the potential risks that these trees may face against disease and non-native pests.
2. Review the Threat Identification pages. (Also available: <http://bit.ly/2x5Tcry>) Have students work in groups to review, research, and identify information about each of these potential tree threats. Students can use the attached data sheet to compile this information or summarize the information on their own in another format.
3. Next, have students cross reference the trees on your site with the information they researched on threats that apply. You are looking for overlap with the host species for the pests or diseases with the trees on your site. You will use this information to develop a threat analysis for the trees on your site. For example, if you do not have any ash trees on your school site, then the emerald ash borer (*Agrilus planipennis*) insect would not be a potential threat that you would include or monitor for in the coming years.
4. Have the class work through the case studies (see below) to help them understand the impact these pests can have on the trees in a given area.
5. For each of the trees on your site, complete a Tree Monitoring Threat Analysis page.

### Part 3: Tree stress scenarios (pest and disease case studies)

1. The goal of this activity is for the class to identify a common stress for a group of trees, determine what additional information may be needed to properly identify the stress, and suggest a plan to protect the future of the tree or trees impacted.
2. Activity Materials: scenario cards, scenario notes sheet (1 per group or individual), appendices and clue sets for each scenario, and additional resources page for next steps.
3. Activity Procedure:
  - a. Divide the class into four groups.
  - b. Give each group a different Tree Stress Scenario page.
  - c. Allow the class time to review their scenario, assess their needs for additional information, and discuss as a group the discussion prompts for each scenario.
  - d. Provide the class with the next piece of information or the requested appendices.
  - e. Allow the class time to review the additional information, make a prediction or claim, and provide supporting evidence.
  - f. Provide the class with the second piece of information, and allow them to verify or change their claim and add or remove their supporting evidence.
  - g. Provide students with the final solution.
  - h. Allow the class time to formulate the next steps needed to protect their tree(s). This may require access to the provided resource list so that students can come up with feasible solutions for improving tree health in each of the given scenarios’ community.
  - i. Discuss results as a group or as a whole class. Each group could present their scenario, results, and next steps for improving tree health.



### Part 4: Data sharing and on-going monitoring

1. Once you have completed the Tree Monitoring Threat Analysis page for each tree in your plot, have the students share the information with the “Healthy Trees Healthy Cities” application.
2. The Nature Conservancy’s “Healthy Trees Healthy Cities” (HTHC) tree health initiative seeks to protect the health of our nation’s trees, forests, and communities by creating a culture of stewardship that engages people in long-term stewardship and the monitoring of trees in their respective communities.
3. For more information about this resource, visit: <https://healthytreeshealthycitiesapp.org/index.cfm>.
4. Download the “Healthy Trees Healthy Cities” app on a smart phone or tablet.
5. Allow the app to use your current location. (You may need to turn location services on.)
6. Create an account.
7. Choose “Add A Tree.”
8. Record the information from your data sheet.
9. Click “Save.”
10. Add a photo of the tree, if you are able to utilize the mobile device outside the classroom.
11. Share this information with your community or local forester. Look into how your municipality evaluates the trees in your city/town.
12. In subsequent years, compare the Tree Monitoring Threat Analysis pages for each tree, year after year.
13. Check for the arrival or evidence of pests or diseases. Use the “Healthy Trees Healthy Cities” app to report evidence of pests or diseases.

### Part 5: Building awareness

1. Although (possibly) none of the trees on your site have evidence of a pest or disease—building awareness about these pests is a critical component of mitigating the impact that these pests/diseases can have on the environment.
2. Engage your class in the problem by creating awareness about these pests/diseases, in order to encourage early detection in your community.
3. Use the resources listed below to have the class research information on the potential pests that could impact their community and create awareness tools. These awareness tools could be: videos, posters, identification brochures (for early detection), etc.
  - a. Junior Invasive Inspector
    - Program: <http://bit.ly/2x3XMqn>
    - Curriculum: <http://bit.ly/2lsGSZ5>
  - b. Hungry Pests: <http://bit.ly/2WUub9sz>
    - Hungry Pests Videos
      - <http://bit.ly/2ISKBxW>
    - Middle School Curriculum/Activities
      - <http://bit.ly/2XlJfoj>
    - Invasive Species Article (6-8)
      - <http://bit.ly/2x6vs6Q>
    - Invasive Species Article (9-12)
      - <http://bit.ly/2lrsXCA>



- Pest Identification Sheets:
  - Asian longhorned beetle (*Anoplophora glabripennis*): <http://bit.ly/2KZVDnP>
  - Emerald ash borer (*Agrilus planipennis*): <http://bit.ly/31ldPIr>
  - Asian gypsy moth (*Lymantria dispar asiatica*): <http://bit.ly/2ZDJBoj>
  - Spotted lanternfly (*Lycorma delicatula*): <http://bit.ly/2KtbLyw>
  - Sudden Oak Death: <http://bit.ly/2XqEydh>
- Pest Cards:
  - Asian longhorned beetle (*Anoplophora glabripennis*): <http://bit.ly/2WRpukL>
  - Emerald ash borer (*Agrilus planipennis*): <http://bit.ly/2L2fvqv>
  - Asian gypsy moth (*Lymantria dispar asiatica*): <http://bit.ly/2ZyJESc>
  - Sudden Oak Death: <http://bit.ly/2MVGnkP>

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## Why Monitor Tree Health? Benefits of Trees Anticipation Guide

### Anticipation Guide - The Benefits of Trees

Read each statement and decide if the statement is true or false.

True	Statement	False
	Trees collect rain on their leaves and channel heavy rainfall to the soil.	
	You can reduce the surrounding temperature by 50 to 100 degrees by planting a big shade tree.	
	People tend to spend more money in tree-lined business districts.	
	100 mature trees intercept about 250,000 gallons of rainfall per year.	
	Every tree provides benefits to the entire community.	
	Big trees are worth less.	
	A community's trees reduce the water that flows into storm sewers.	
	Chicago region trees provided \$51.2 billion worth of services to our environment and communities.	
	The "heat island affect" is caused by heat stored in paving and masonry buildings and trees can actually reduce this affect.	
	Urban trees save the U.S. \$7 billion a year by capturing fine particles from the air as well as carbon dioxide, sulfur dioxide, nitrous oxides, and other pollutants.	

More information on the benefits of trees, visit <https://www.mortonarb.org/trees-plants/benefits-trees>



### DATA SHEET

As you explore your schoolyard, collect data on 4-5 trees on your plot. When choosing your trees, try to choose trees with a Diameter Breast Height (DBH) greater than 3 inches. This would mean the tree's circumference would be about or greater than 9 inches. Therefore, you will want to take the DBH measurement first. Consider collecting the optional observations in order to get a "whole picture" of the trees in your schoolyard. You never know how your observations will help to answer questions or lead to interesting observations concerning the trees in your community.

Notes to reference when conducting your observations:

Plot # and description	Tree species	DBH	Tree health rating descriptions
<ul style="list-style-type: none"> <li>Mark on your schoolyard map or describe the location.</li> <li>For this section, be sure to observe the sunlight and exposure of this plot.</li> <li>Describe the location (or use a map) with the intended goal that someone could find the exact tree you are observing. (Example: Use site descriptions to reference the tree: "SW corner of school near parking lot (gym).")</li> </ul>	<ul style="list-style-type: none"> <li>Use the <i>Forest Trees of Illinois</i> book in this backpack to help identify common Illinois street trees.</li> <li>Use other tree finding resources.</li> <li>Make observations on the leaves, bark, and shape (leaf bud/fruit/flower, based on time of the year).</li> </ul>	<ul style="list-style-type: none"> <li>Diameter at Breast Height - (taken at approximately 4.5 feet above ground). Use the tape measure to measure the circumference and then calculate the DBH.</li> </ul>	<p>Excellent (1) - Tree appears to be in reasonably good health. Less than 10% cumulative fine twig dieback, defoliation, and/or discoloration present.</p> <p>Good (2) - Major branch losses, fine twig dieback, and/or foliage discoloration present in 10-25% of the crown.</p> <p>Fair (3) - Major branch losses, fine twig dieback, and/or foliage discoloration present in 26-50% of the crown.</p> <p>Poor (4) - Major branch losses, fine twig dieback, and/or foliage discoloration present in more than 50% of the crown.</p> <p>Dead (5) - Tree is standing dead with no green leaves or buds (greater than 4.5 feet tall).</p>



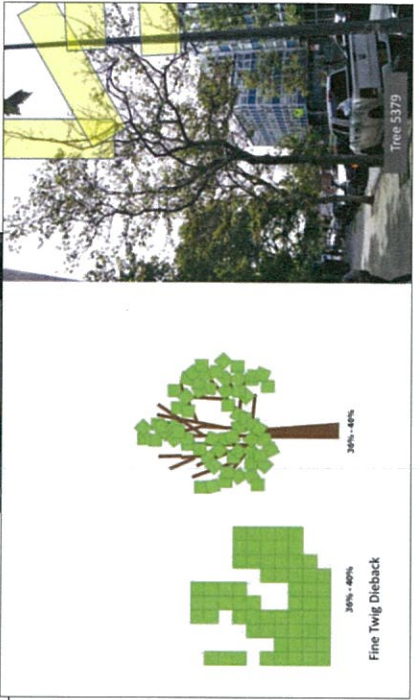
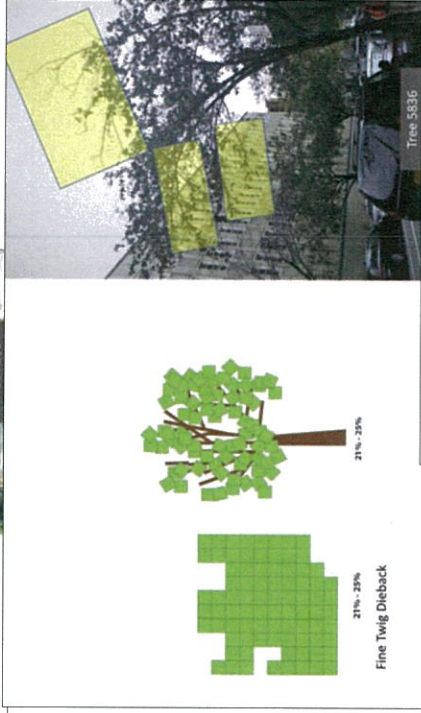
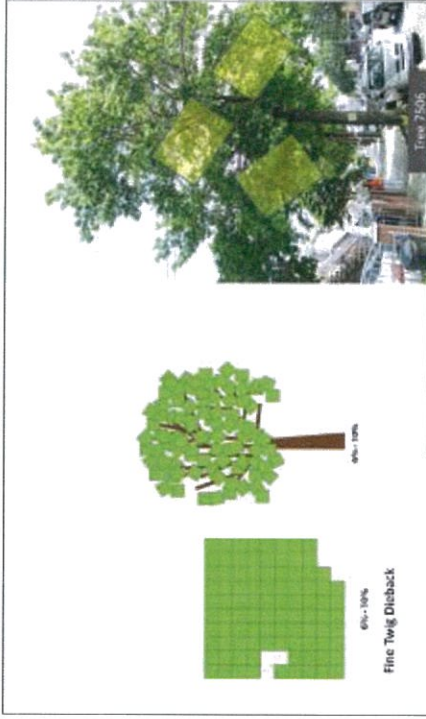
Tree Health Visuals and Details for Tree Health Ratings Examples

HEALTHY TREES HEALTHY CITIES

Vigor Class	Description
1	Tree appears to be in reasonably good health; no major branch losses; <b>less than 10% cumulative</b> fine twig dieback, defoliation, and/or discoloration present
2	Major branch losses, fine twig dieback, and/or foliage discoloration present in <b>10-25% cumulative</b> of the crown
3	Major branch losses, fine twig dieback, and/or foliage discoloration present in <b>26-50% cumulative</b> of the crown
4	Major branch losses, fine twig dieback, and/or foliage discoloration present in <b>more than 50% cumulative</b> of the crown
5	Tree is <b>standing dead</b> with no green leaves or live buds; greater than 4.5 ft. tall

Photo by Julia Pike

**Photo Example:**  
Vigor Class 2  
(Due to some discoloration and fine twig dieback)





Group Member Names:

Plot # and description	Tree species	Calculate the DBH	Tree health observations :
<p><b>Plot Number:</b></p> <p>Is the plot...</p> <p>Sunny?</p> <p>Shady?</p> <p>Partial sun and shade? (Circle one.)</p>	<p>Species:</p> <p>Leaf Drawing:</p> <p>Bark Description:</p>	<p><b>Calculate the DBH</b></p> <p>Circumference at Breast Height : _____ inches</p> <p><i>Formula for Diameter is</i> Circumference / <math>\pi</math> (3.14)</p> <p><b>Diameter at Breast Height (DBH):</b> _____ inches</p>	<p>Estimated distance to closest man-made structure (building, road, sidewalk, etc.): _____ feet</p> <p>Tree Health: Does the tree look healthy to you? Why or why not? Use the rating scale to help your analysis. Give a one sentence explanation for your rating.</p>

Plot # and description	Tree species	Calculate the DBH	Tree health observations :
<p><b>Plot Number:</b></p> <p>Is the plot...</p> <p>Sunny?</p> <p>Shady?</p> <p>Partial sun and shade? (Circle one.)</p>	<p>Species:</p> <p>Leaf Drawing:</p> <p>Bark Description:</p>	<p><b>Calculate the DBH</b></p> <p>Circumference at Breast Height : _____ inches</p> <p><i>Formula for Diameter is:</i> Circumference / <math>\pi</math> (3.14)</p> <p><b>Diameter at Breast Height (DBH):</b> _____ inches</p>	<p>Estimated distance to closest man-made structure (building, road, sidewalk, etc.): _____ feet</p> <p>Tree Health: Does the tree look healthy to you? Why or why not? Use the rating scale to help your analysis. Give a one sentence explanation for your rating.</p>

# Part I: Tree Identification & Monitoring

## Tree Identification/Monitoring Data Sheets



Plot # and description	Tree species	Calculate the DBH	Tree health observations:
<p><b>Plot Number:</b></p> <p>Is the plot... Sunny? Shady?</p> <p>Partial sun and shade? (Circle one.)</p>	<p>Species:</p> <p>Leaf Drawing:</p> <p>Bark Description:</p>	<p>Circumference at Breast Height : _____ inches</p> <p><i>Formula for Diameter is:</i> <math>Circumference / \pi (3.14)</math></p> <p><b>Diameter at Breast Height (DBH):</b> _____ inches</p>	<p>Estimated distance to closest man-made structure (building, road, sidewalk, etc.): _____ feet</p> <p>Tree Health: Does the tree look healthy to you? Why or why not? Use the rating scale to help your analysis. Give a one sentence explanation for your rating.</p>

Plot # and description	Tree species	Calculate the DBH	Tree health observations:
<p><b>Plot Number:</b></p> <p>Is the plot... Sunny? Shady?</p> <p>Partial sun and shade? (Circle one.)</p>	<p>Species:</p> <p>Leaf Drawing:</p> <p>Bark Description:</p>	<p>Circumference at Breast Height : _____ inches</p> <p><i>Formula for Diameter is:</i> <math>Circumference / \pi (3.14)</math></p> <p><b>Diameter at Breast Height (DBH):</b> _____ inches</p>	<p>Estimated distance to closest man-made structure (building, road, sidewalk, etc.): _____ feet</p> <p>Tree Health: Does the tree look healthy to you? Why or why not? Use the rating scale to help your analysis. Give a one sentence explanation for your rating.</p>



## Tree Monitoring Threat Analysis

\*Use the data sheet from your Tree Identification/Monitoring Activity (pages 10-11).

\*Complete a Threat Analysis for each of the trees in your plot. If you numbered your trees to help identify them, include a map to ensure that future monitors can track the data over time.

Name of person(s) completing the analysis: \_\_\_\_\_

Date of observations: (month/year): \_\_\_\_\_

Tree # (if information on multiple trees is collected)	Tree location (description or GPS location)
Tree species:	Tree observations:
Diameter at Breast Height (DBH):	Tree health rating: (ranging between 1-5 where 1=good, 5=dead)
Potential pest or disease threats to monitor for (based on species):	Potential future signs or symptoms, based on future potential threats:

Please visit <http://bit.ly/2x5Tcry> for "Top Invasive Pest Threats" on

- Asian longhorned beetle (*Anoplophora glabripennis*)
- Emerald ash borer (*Agrilus planipennis*)
- European gypsy moth (*Lymantria dispar*)
- Asian gypsy moth (*Lymantria dispar asiatica*)
- Spotted lanternfly (*Lycorma delicatula*)
- Sudden Oak Death

## Activity Overview

**Background:** A number of stresses impact the growth and health of trees. However, trees are also resilient and have adapted throughout history to a number of environmental stressors, diseases, changes in climate, and pests. As humans and trees live together, and trees serve as a vital part of our urban and rural landscapes, it is important to identify and monitor the stresses and impacts imposed on trees, especially since many of these stresses that threaten tree health have been introduced by humans.

**Materials:** scenario cards, scenario notes sheet (1 per group or individual), appendices and clue sets for each scenario, additional resources page for next steps

**Goal:** Students will be able to identify a common stress for a group of trees, determine what additional information may be needed to properly identify the stress, and suggest a plan to protect the future of the tree or trees impacted.

### Procedure:

1. Divide the class into four groups.
2. Give each group a different tree stress scenario page.
3. Allow students time to review their scenario, assess their needs for additional information, and discuss as a group the discussion prompts for each scenario.
4. Provide students with the next piece of information, or the requested appendices.
5. Allow students time to review the additional information, make a prediction or claim, and provide supporting evidence.
6. Provide students with the second piece of information and allow them to verify or change their claim, and add or remove their supporting evidence.
7. Provide students with the final solution.
8. Allow students time to formulate the next steps in protecting their tree(s). This may require access to the provided resource list so that students can come up with feasible solutions for improving tree health in each of the given scenario's community.
9. Discuss results as a group or whole class. Each group could present their scenario, results, and next steps for improving tree health.



## Tree Stress Scenario #1 SOLUTION:

Asian longhorned beetle (*Anoplophora glabripennis*)

## Tree Stress Scenario #2 SOLUTION:

Tar Spot

## Tree Stress Scenario #3 SOLUTION:

Emerald ash borer (*Agrilus planipennis*)

## Tree Stress Scenario #4 SOLUTION:

Oak wilt

### Additional Web Resources for Pest and Disease Packets/Research

#### **Pests (insects) fact sheet(s) and resources:**

- Emerald ash borer (*Agrilus planipennis*)
  - <http://bit.ly/31leJoj>
  - <http://bit.ly/2Rxyw5r>
- European gypsy moth (*Lymantria dispar*)
  - <http://bit.ly/2Ks7MCB>
  - <http://bit.ly/2IYaV9S>
- Asian longhorned beetle (*Anoplophora glabripennis*)
  - <http://bit.ly/2IYbUXC>
  - <http://bit.ly/2Rxyw5r>
- Gold-spotted oak borer (*Agrilus coxalis*)
  - <http://bit.ly/2x2qVCe>
  - <http://bit.ly/2ITZxfb>
  - <http://bit.ly/2XXxTV7>

#### **Diseases fact sheet(s) and resources:**

- Bur oak blight
  - <http://bit.ly/2WUMLC6>
- Tar spot
  - <http://bit.ly/2RxyMkV>
- Oak wilt
  - <http://bit.ly/2Fla0iV>
- Cedar-rust
  - <http://bit.ly/2Krm7IV>
- Apple scab
  - <http://bit.ly/2ZlcXC3>
- Anthracnose
  - <http://bit.ly/2Zz0j84>
- Verticillium wilt
  - <http://bit.ly/2WQKWLn>

#### **Other resources (by species or governing agency)**

- Hungry Pests
  - <http://www.hungrypests.com>
- Oak Problems
  - <http://bit.ly/2FmbOYT>
- Don't Move Firewood
  - <http://bit.ly/2FIRveh>



### Scenario #1 Card

#### Part 1: Review the scenario

- Read through the scenario.
- Review and decide on what additional information is needed to help solve the problem.

Scenario: Spotted on the Schoolyard

The 5th grade class at Lincoln Elementary notices some changes to the trees on their playground. The playground contains 16 trees total: 4 different species with 4 trees of each species. When they were in 4th grade, they had to adopt different trees as part of a science project, and so they remember making observations on different trees throughout the course of the year. They remember that two of the trees that were adopted had more leaves on the top half of the tree than others.

- Look at the list of appendices, which do you think would be useful to consult?
- What observations do you think the 5th grade class should record during recess?
- What information do they need to collect on all of the trees?
- What information do they need to collect on some of the trees?

Appendices:

- List of trees planted and their location (from the school's landscape design)
- List of vendors and landscape garden centers in which the trees were purchased
- The "Adopt A Tree Observations" from the last 2 years

#### Part 2: Additional clues

- Review the additional appendices you requested. How does this information help?
- Look at the leaf photo, bark, and other observations made this year from the 5th graders. Based on these observations, what do you think could be impacting these trees?

#### Part 3: First prediction

- Make a prediction: What do you think is causing a change to the foliage of the tree?
- Record the evidence you have to support this claim.

#### Part 4: Additional information

- Review the final set of information and make a claim about what is impacting the trees on the schoolyard.
- Record the evidence you have to support this claim.

#### Part 5: Review the solution

- Review the additional evidence that definitely solves this scenario.
- Was your prediction correct? If your prediction was incorrect, what evidence did you miss?

#### Part 6: Wrap up - Next steps

- What can be done to improve the health of these trees?
- What next steps should the school or students consider?
- How can the community help to support the health of these trees moving forward?

**Scenario #1 Worksheet****Part 1: Review the scenario**

- Think About: What additional information do you need?

**Part 2: Additional clues**

- What does this additional information tell you? What do you observe?

**Part 3: Make your first prediction**

- Do you think it is likely that a pest, disease, or other environmental factor could be impacting the tree?
  
- Prediction/Claim:
  
- Evidence that supports your claim:

**Part 4: Additional information**

- Does any of this additional information add more support/evidence for your claim? Does it change your prediction?

**Part 5: The solution**

- Was your prediction/claim correct? If your prediction/claim was incorrect, what evidence did you miss?

**Part 6: Next steps**

- Research solutions to this pest/disease. What can be done to improve the health of the tree?
  
- What advice would you give to the school in regards to this tree(s)?



**Additional information (Part 4):** The principal at Lincoln Elementary heard about the 5<sup>th</sup> grade class' concerns and looks outside to examine the affected trees. He notices the "holes" as well. Additionally, he finds some sawdust-like material in the branch joints. Since he is almost six feet tall, he is able to measure some of the holes on the branches that the class first observed. He placed a dime next to the hole for reference.



Images provided by the staff at The Morton Arboretum

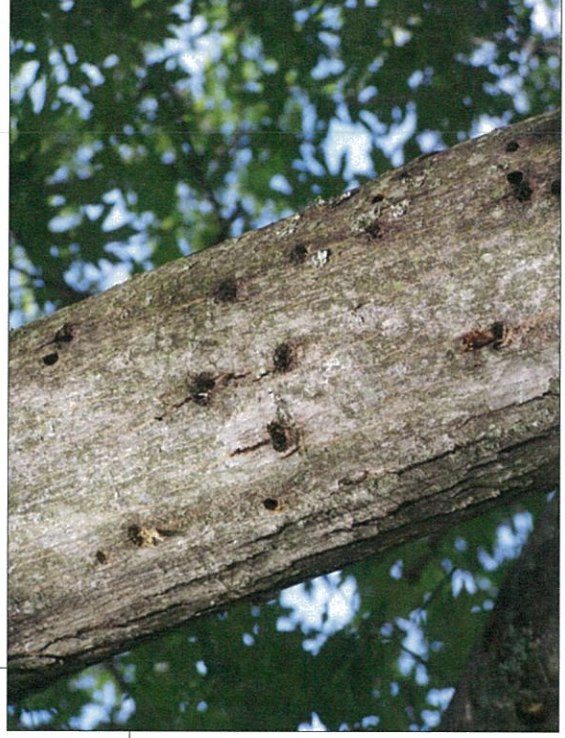


## Part 3: Tree Stress Scenarios

### Scenario #1: Spotted on the Schoolyard



**Additional Information (Part 2):** Pictured are leaf and bark images from the trees on the Lincoln Elementary playground/schoolyard that are losing leaves at the top of the tree. Upon closer examination, the class also noticed some “holes” in the branches of the tree.



Images provided by the staff at The Morton Arboretum



## Part 3: Tree Stress Scenarios

### Scenario #1: Spotted on the Schoolyard



#### Appendices: 2 Years Ago "Adopt a Tree" Observations

	Tree Journal		Tree Journal
	Tree #1		Tree #3
<input type="radio"/>	<u>Tree Location:</u> Large tree in the northwest corner of the school	<input type="radio"/>	<u>Tree Location:</u> West side of the school closest to the front of the building
	<u>Date of Observation:</u> October 1st		<u>Date of Observation:</u> October 1st
	<u>Diameter of Tree:</u> .48M DBH		<u>Diameter of Tree:</u> .9M DBH
	<u>Tree Species:</u> American Elm		<u>Tree Species:</u> White oak
	<u>Other Tree Observations:</u> Lots of leaves; they have started to change color, there is a large bump on the trunk.		<u>Other Tree Observations:</u> Lots of leaves and acorns. Some leaves have started to change color.
<input type="radio"/>	Tree #2	<input type="radio"/>	Tree #4
	<u>Tree Location:</u> Large tree in the northwest corner, closest to the basketball court		<u>Tree Location:</u> East side of school, closest to the building and the playground.
	<u>Date of Observation:</u> October 1st		<u>Date of Observation:</u> October 1st
	<u>Diameter of Tree:</u> .39M DBH		<u>Diameter of Tree:</u> .4M DBH
	<u>Tree Species:</u> Sugar maple		<u>Tree Species:</u> Sugar Maple
	<u>Other Tree Observations:</u> Tree looks healthy; has lots of leaves; no bare spots. Leaves have started to change color.	<input type="radio"/>	<u>Other Tree Observations:</u> Leaves on all the branches. Trunk is rough, not smooth. Leaves have started to change color.

### Appendices: Last Year's "Adopt a Tree" Observations

Tree #1	Tree #2	Tree #3	Tree #4
<p><u>Tree Location:</u> Large tree in the northwest corner of the school.</p> <p><u>Date of Observation:</u> September 30th</p> <p><u>Diameter of Tree:</u> .5M DBH</p> <p><u>Tree Species:</u> American elm</p> <p><u>Other Tree Observations:</u> Lots of leaves; they have not started to change color; there is a large knot on the trunk.</p>	<p><u>Tree Location:</u> Large tree in the northwest corner, closest to the basketball court.</p> <p><u>Date of Observation:</u> September 30th</p> <p><u>Diameter of Tree:</u> .4M DBH</p> <p><u>Tree Species:</u> Sugar maple</p> <p><u>Other Tree Observations:</u> Has lots of leaves and does not have any bare branches. Leaves do not have spots. Some branches have holes.</p>	<p><u>Tree Location:</u> West side of the school closest to the front of the building</p> <p><u>Date of Observation:</u> September 30th</p> <p><u>Diameter of Tree:</u> 1M DBH</p> <p><u>Tree Species:</u> White oak</p> <p><u>Other Tree Observations:</u> Lots of leaves and visible acorns. Some leaves have brown spots, but most are all green.</p>	<p><u>Tree Location:</u> East side of school, closest to the building and the playground.</p> <p><u>Date of Observation:</u> September 30th</p> <p><u>Diameter of Tree:</u> .5M DBH</p> <p><u>Tree Species:</u> Sugar maple</p> <p><u>Other Tree Observations:</u> Some of the leaves on the branches near the top of the tree are missing. Some branches have holes.</p>



## Part 3: Tree Stress Scenarios

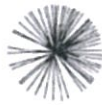
### Scenario #1: Spotted on the Schoolyard



Appendices: List of trees planted and their location



American elm (*Ulmus americana*)



Arborvitae (*Thuja occidentalis*)



White oak (*Quercus alba*)



Sugar maple (*Acer saccharum*)

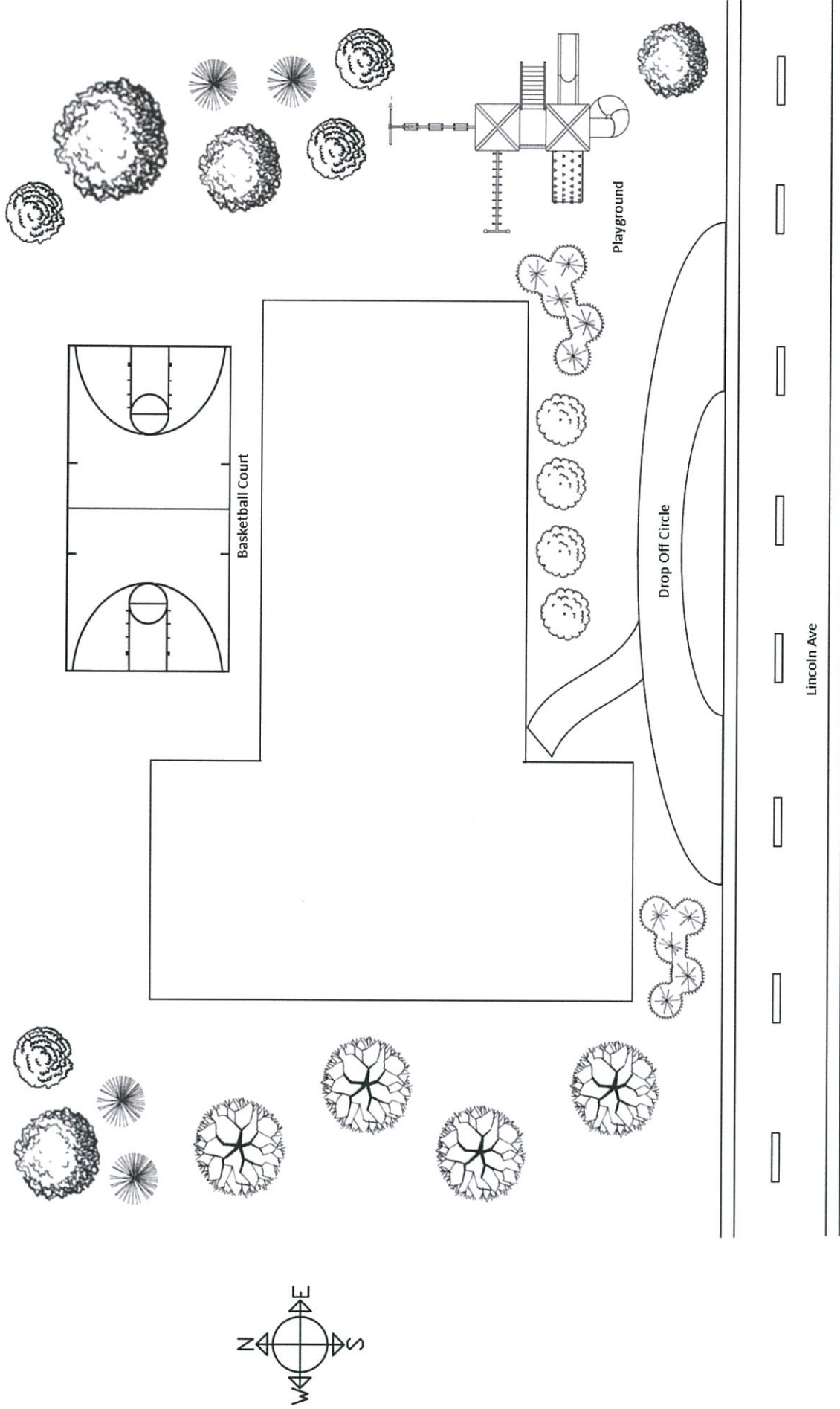


Juniper shrub (*Juniperus horizontalis* 'hegedus')



Boxwood shrub (*Buxus* 'green velvet')

Appendices: List of trees planted and their location





### Part 1: Review the scenario

- Read through the scenario.
- Review and decide on what additional information is needed to help solve the problem.

### Scenario 2: Disc Golf Frustration

The Park District has noticed that several trees at one of the town's disc golf courses have spots on their leaves. The spots are black and vary in size and frequency on the leaves. The spots on the leaves became present during the early part of the summer. The park has over 10 different species of trees, some planted within the landscape, others in parts of the park's natural areas. They have noticed the spots on a total of 15 trees.

- Look at the list of appendices below. Which do you think would be useful to consult?
- What observations do you think the park manager should record?
- What information do they need to collect on all of the trees?
- What information do they need to collect on some of the trees?

Appendices:

- List of trees planted and their location (from the park's landscape design)
- List of vendors and landscape garden centers in which the trees were purchased

### Part 2: Additional clues

- Review the additional appendices requested. How does this information help?
- Look at the leaf photo, bark, and other observations made by the park manager. Based on these observations, what do you think could be impacting these trees?

### Part 3: First prediction

- Make a prediction: What do you think is causing a change to the foliage of the tree?
- Record the evidence you have to support this claim.

### Part 4: Additional information

- Review the final set of information and make a claim about what is impacting the trees at the disc golf course/park.
- Record the evidence you have to support this claim.

### Part 5: Review the solution

- Review the additional evidence that definitely solves this scenario.
- Was your prediction correct? If your prediction was incorrect, what evidence did you miss?

### Part 6: Wrap up - Next steps

- What can be done to improve the health of these trees?
- What next steps should the park manager consider?
- How can the community help to support the health of these trees moving forward?

#### Scenario #2 Worksheet

##### Part 1: Review the scenario

- Think about: What additional information do you need?

##### Part 2: Additional clues

- What does this additional information tell you? What do you observe?

##### Part 3: Make your first prediction

- Do you think it is likely that a pest, disease, or other environmental factor could be impacting the tree?
- Prediction/Claim:
- Evidence that supports your claim:

##### Part 4: Additional information

- Does any of this additional information add more support/evidence for your claim? Does it change your prediction?

##### Part 5: The solution

- Was your prediction/claim correct? If your prediction/claim was incorrect, what evidence did you miss?

##### Part 6: Next steps

- Research solutions to this pest/disease. What can be done to improve the health of the tree?
- What advice would you give to the park manager in regards to this tree(s)?



Appendices: List of trees planted and their location













Appendices: List of trees planted and their location

# Bogey Disc Golf Course

Landscape Design and Tree Selection/Survey

\*This outlines the existing and added trees that have been incorporated into the new disc golf course.

Landscape Drawing	Tree Species	Landscape Drawing	Tree Species
	White oak ( <i>Quercus alba</i> )		Norway maple ( <i>Acer platanoides</i> )
	Green ash ( <i>Fraxinus pennsylvanica</i> )		Staghorn sumac ( <i>Rhus typhina</i> )
	European larch ( <i>Larix decidua</i> )		Arborvitae ( <i>Thuja occidentalis</i> )
	Sugar maple ( <i>Acer saccharum</i> )		Sweet gum ( <i>Liquidambar styraciflua</i> )
	Ironwood ( <i>Ostrya virginiana</i> )		American elm ( <i>Ulmus americana</i> )



**Appendices: 2017 List of Vendors**  
**(Golf Course Maintenance and Design)**  
**Bogey Disc Golf Course**

Vendor	Item	Cost
ABC Landscape	Arborvitae ( <i>Thuja occidentalis</i> ) (2), European larch ( <i>Larix decidua</i> ) (2), Sweet gum ( <i>Liquidambar styraciflua</i> ) (2)	6 @ \$ 89.99
Dynamic Discs	Disc Basket (replacement)	5 @ \$149.99
Tree-scape	Norway maple ( <i>Acer plantanoides</i> ) (2), Sugar maple ( <i>Acer saccharum</i> ) (2), Staghorn sumac ( <i>Rhus typhina</i> ) (2)	6 @ \$179.99
Sand Gravel Incorporated	8 cubic yards of sand	\$44.99/per cubic yard
Golf Supply Unlimited	Tee markers (36)	\$39.99 (per unit)
Signs-4-You	Custom signs to mark off new portions of the course (4 total)	\$249.99
Green-N-Healthy Lawns	Lawn Treatments (3 times per year)	\$599.95
For-Evergreen Tree Supply	American elm ( <i>Ulmus americana</i> ) (4), Green ash ( <i>Fraxinus pennsylvanica</i> ) (2), Ironwood ( <i>Ostrya virginiana</i> ) (2), White oak ( <i>Quercus alba</i> ) (3)	4 @ \$199.95, 4 @ \$219.99, 3 @ \$179.99





## Part 3: Tree Stress Scenarios

### Scenario #2: Disc Golf Frustration



THE  
CHAMPION  
of TREES

**Additional information (Part 4):** Pictured are leaf images from several of the Norway maples (*Acer platanoides*) and sugar maple trees (*Acer saccharum*). Additionally, the park manager noticed that over the last year, they have had more rainfall in early spring than in the previous years.





## Part 3: Tree Stress Scenarios

### Scenario #2: Disc Golf Frustration

**Additional information (Part 2):** Pictured are leaf and bark images from the types of trees on the Bogey Disc Golf Course that have spots.



Images provided by the staff at The Morton Arboretum



### Part 1: Review the scenario

- Read through the scenario.
- Review and decide on what additional information is needed to help solve the problem.

### Scenario 3: Fire Station Sprouts

The firemen in Centerville have noticed that some of the trees surrounding the fire station have less leaves within the top half of the tree, and have branches or outgrowths visible from the trunk of the tree. The fire station has over 10 trees planted in the parkway and five small trees planted near the building. The trees affected are located in the parkway that runs adjacent to the sidewalk and road.

- Look at the list of appendices, which do you think would be useful to consult?
- What observations do you think the fire men should record?
- What information do they need to collect on all of the trees?
- What information do they need to collect on some of the trees?

#### Appendices:

- List of trees planted and their location (from the city's landscape design of the fire station)
- List of vendors and landscape garden centers in which the trees were purchased

### Part 2: Additional clues

- Review the additional appendices below. How does this information help?
- Look at the leaf photo, bark, and other observations made by the firemen. Based on these observations, what do you think could be impacting these trees?

### Part 3: First prediction

- Make a prediction: What do you think is causing a change to the foliage of the trees?
- Record the evidence you have to support this claim.

### Part 4: Additional information

- Review the final set of information and make a claim about what is impacting the trees at the fire station.
- Record the evidence you have to support this claim.

### Part 5: Review the solution

- Review the additional evidence that definitely solves this scenario.
- Was your prediction correct? If your prediction was incorrect, what evidence did you miss?

### Part 6: Wrap up - Next steps

- What can be done to improve the health of these trees?
- What next steps should the park manager consider?
- How can the community help to support the health of these trees moving forward?



### Scenario #3 Worksheet

#### Part 1: Review the scenario

- Think about: What additional information do you need?

#### Part 2: Additional clues

- What does this additional information tell you? What do you observe?

#### Part 3: Make your first prediction

- Do you think it is likely that a pest, disease, or other environmental factors could be impacting the tree(s)?
- Prediction/Claim:
- Evidence that supports your claim:

#### Part 4: Additional information

- Does any of this additional information add more support/evidence for your claim? Does it change your prediction?

#### Part 5: The solution

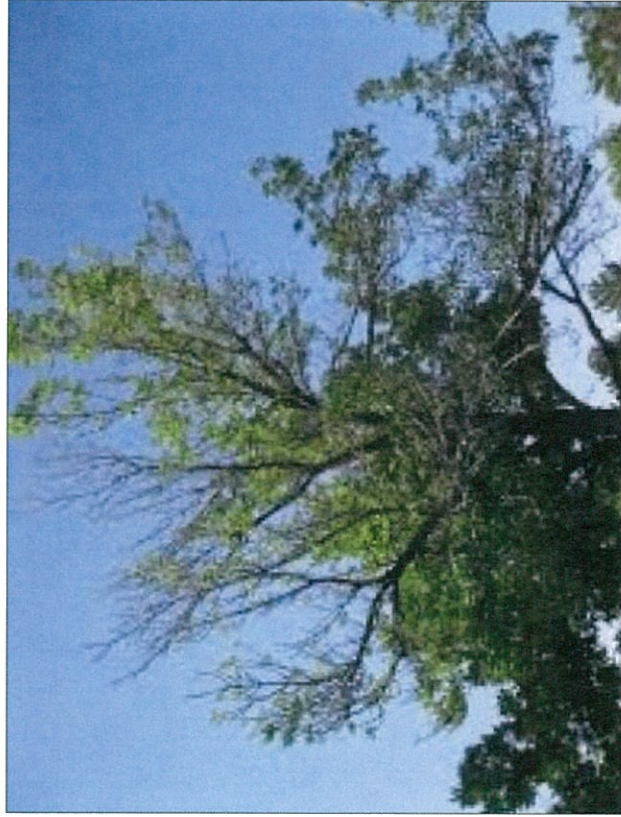
- Was your prediction/claim correct? If your prediction/claim was incorrect, what evidence did you miss?

#### Part 6: Next steps

1. Research solutions to this pest/disease. What can be done to improve the health of the tree(s)?
2. What advice would you give to the firemen in regards to this tree(s)?



**Additional information (Part 4):** The fire chief pulled out some photos from last year that they took during an annual inspection of the property, realizing that they may be helpful in determining how the trees have changed over the last year. Additionally, while they were outside cleaning some of their equipment on the fire station's front lawn, they found a twig beneath the affected trees and noticed the unique markings just below the branch bark.



Last year during the annual inspection



This year during the annual inspection



Twig found near infected trees



## Part 3: Tree Stress Scenarios

### Scenario #3: Fire Station Sprouts

Appendices: List of trees planted and their vendors

Map Key and Vendor List  
Centerville Fire Station



White ash (*Fraxinus americana*)  
(10) Purchased at ABC Landscape

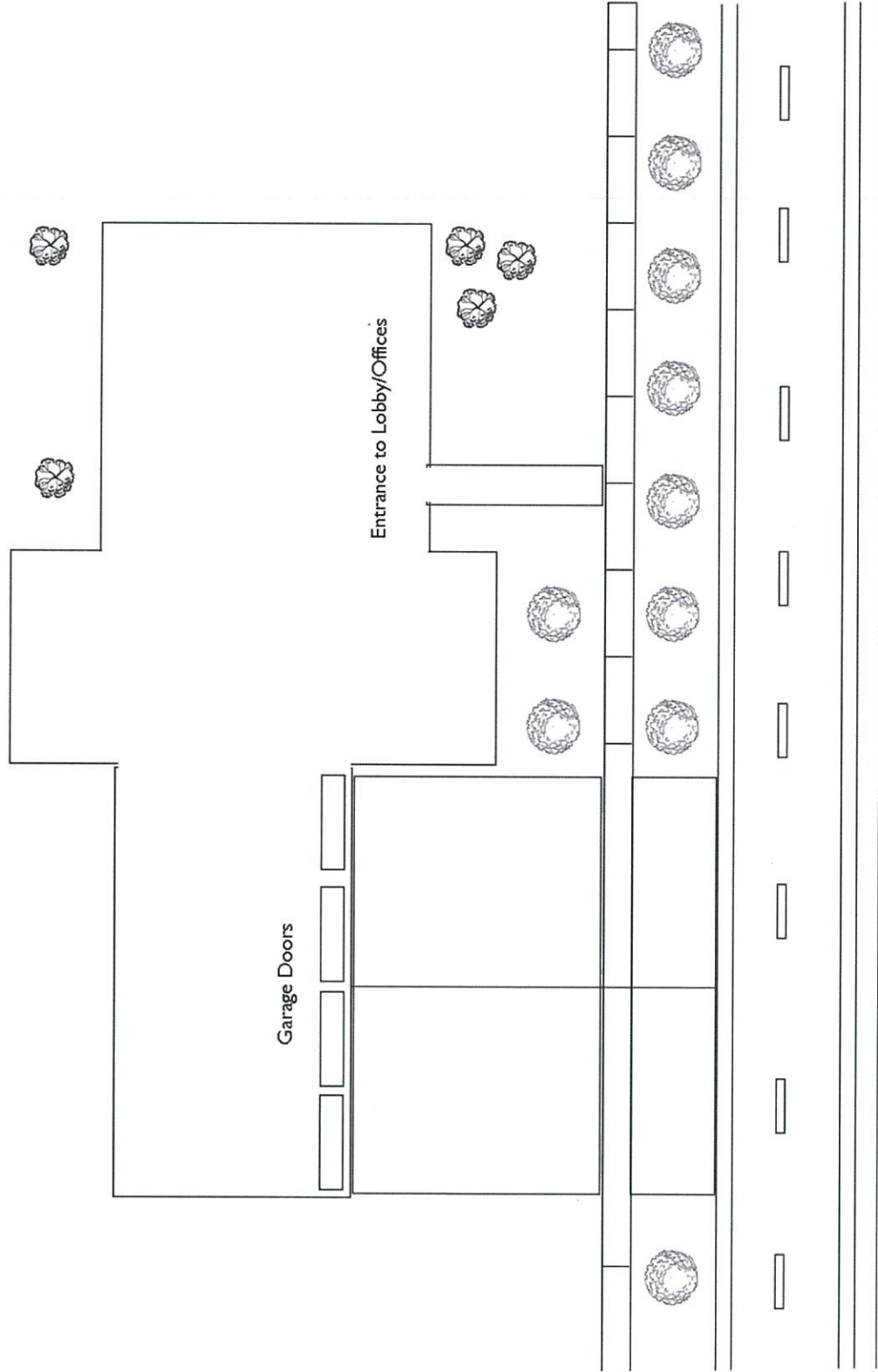


Flowering dogwood (*Cornus florida*)  
(5) Purchased at ABC Landscape

Appendices: List of trees planted and their location

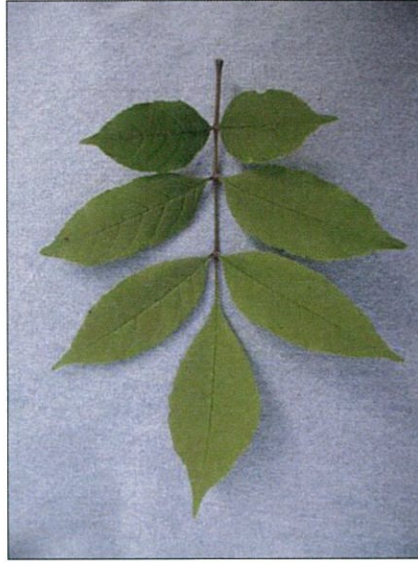
### Centerville Fire Station

6,000 square feet





**Additional information (Part 2):** Pictured are leaf and bark images from the trees surrounding the fire station.



Images provided by the staff at  
The Morton Arboretum



## Scenario #4: Soccer Field Fiasco

### Part 1: Review the scenario

- Read through the scenario.
- Review and decide on what additional information is needed to help solve the problem.

### Scenario 4: Soccer Field Fiasco

Several parents and coaches have noticed a change to the trees surrounding the community's soccer and softball fields. Each of the fields are separated by small patches of woodland and tree plantings. Several of the trees within these bordering plots have discoloration and browning on several of the leaves. Several of the leaves appear to be half brown or burnt looking.

- Look at the list of appendices below. Which do you think would be useful to consult?
- What observations do you think the parents and coaches should record?
- What information do they need to collect on all of the trees?
- What information do they need to collect on some of the trees?

#### Appendices:

- Map of the park with some trees identified (from the city's landscape design of the park and fields)
- List of teams and people who use the field

### Part 2: Additional clues

- Review the additional appendices requested. How does this information help?
- Look at the leaf photo, bark, and other observations made by the parents and coaches. Based on these observations, what do you think could be impacting these trees?

### Part 3: First prediction

- Make a prediction: What do you think is causing a change to the foliage of the tree(s)?
- Record the evidence you have to support this claim.

### Part 4: Additional information

- Review the final set of information and make a claim about what is impacting the trees at the fire station.
- Record the evidence you have to support this claim.

### Part 5: Review the solution

- Review the additional evidence that definitely solves this scenario.
- Was your prediction correct? If your prediction was incorrect, what evidence did you miss?

### Part 6: Wrap up - Next steps

- What can be done to improve the health of these trees?
- What next steps should the park manager consider?
- How can the community help to support the health of these trees moving forward?



#### Scenario #3 Worksheet

##### Part 1: Review the scenario

- Think about: What additional information do you need?

##### Part 2: Additional clues

- What does this additional information tell you? What do you observe?

##### Part 3: Make your first prediction

- Do you think it is likely that a pest, disease, or other environmental factors could be impacting the tree(s)?
- Prediction/Claim:
- Evidence that supports your claim:

##### Part 4: Additional information

- Does any of this additional information add more support/evidence for your claim? Does it change your prediction?

##### Part 5: The solution

- Was your prediction/claim correct? If your prediction/claim was incorrect, what evidence did you miss?

##### Part 6: Next steps

1. Research solutions to this pest/disease. What can be done to improve the health of the tree?
2. What advice would you give to the community members in regards to this tree(s)?

**Additional information (Part 4):** By mid-summer, a few parents have observed that several of the affected trees have started to lose their leaves. Additionally, they notice some streaking on the interior of the branches when broken (see image below).



Images provided by the staff at The Morton Arboretum



**Additional information (Part 2):** Pictured are leaf and bark images from the trees affected at the community park.



Images provided by the staff at The Morton Arboretum



## Appendices: List of Teams using the Community Soccer and Softball Fields

### Current Soccer Teams

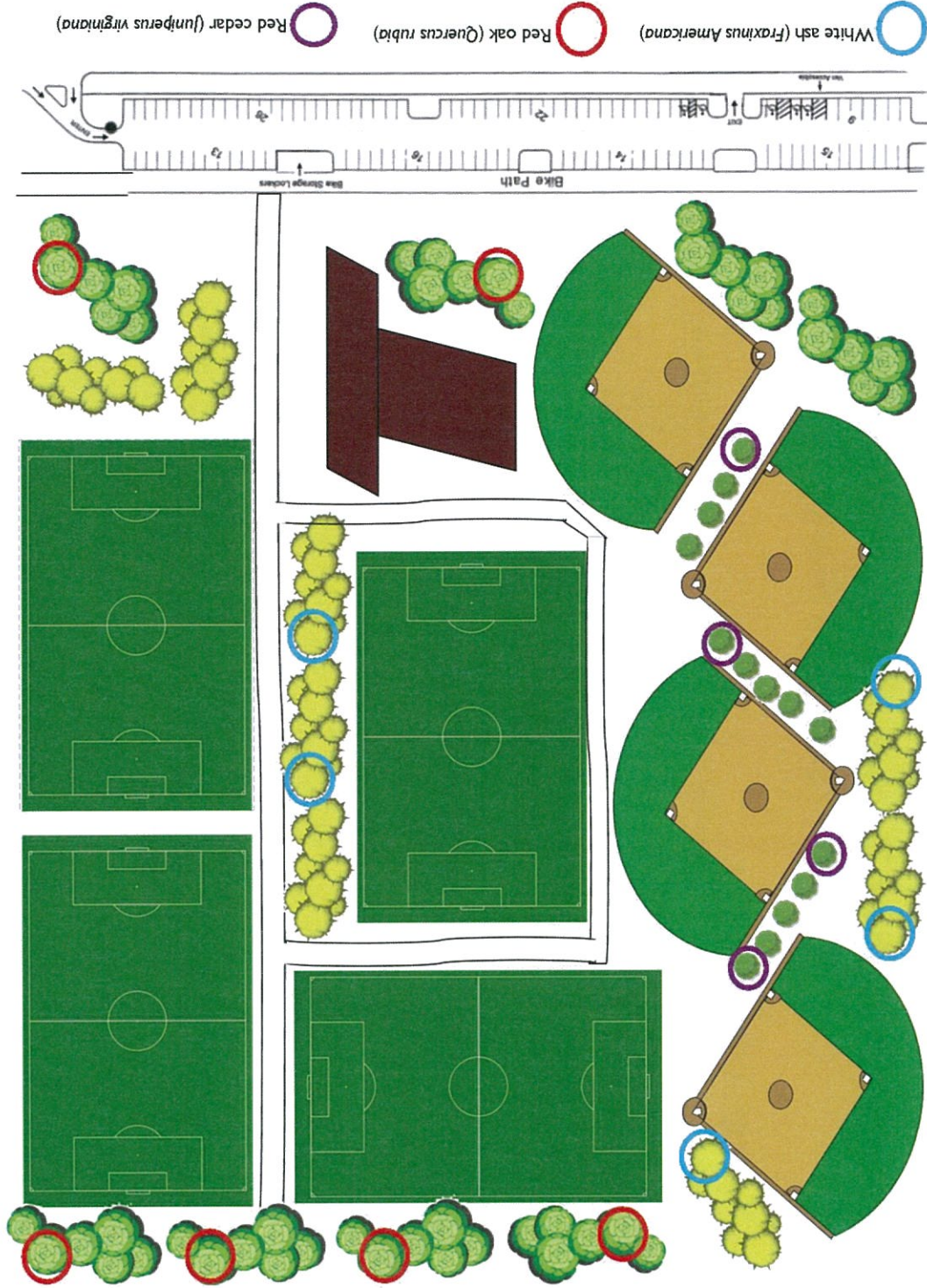
Team	Season	Day of Week/Time	Field Used
Jaguars	Fall, Spring	MWF 4:00-5:30 P.M.	Field 1
Trojans	Fall, Spring	TTH 4:00-5:30 P.M.	Field 1
Tigers	Fall, Spring	MWF 4:00-5:30 P.M.	Field 2
Strikers	FALL ONLY	TTH 4:00-5:30 P.M.	Field 1
Magic	Fall, Spring	TTH 4:00-5:30 P.M.	Field 2
Celtics	SPRING ONLY	MWF 4:00-5:30 P.M.	Field 3

### Current Softball Teams

Team	Season	Day of Week/Time	Field Used
Rangers	Spring, Summer	MWF 4:00-5:30 P.M.	Field 1
Dodgers	Spring, Summer	TTH 4:00-5:30 P.M.	Field 1
All-Stars	Spring, Summer	MWF 4:00-5:30 P.M.	Field 2
Bulls	Spring, Summer	TTH 4:00-5:30 P.M.	Field 2
Bears	SUMMER ONLY	TTH 4:00-5:30 P.M.	Field 3
Cubs	Spring, Summer	MWF 4:00-5:30 P.M.	Field 3



Appendices: Map of the Community Soccer and Softball Fields





### How to Use the “Healthy Trees Healthy Cities” Application

1. Download the “Healthy Trees Healthy Cities” application on internet enabled tablets or devices.
2. Open the “Healthy Trees Healthy Cities” application.
3. Create an account (with one email address, you can have multiple devices logged into an account).
4. Once you are ready to add your trees or record your data, begin by opening the application logged into your created account.
5. Use the screen shots below to walk you through the process of adding your trees and inputting health information.

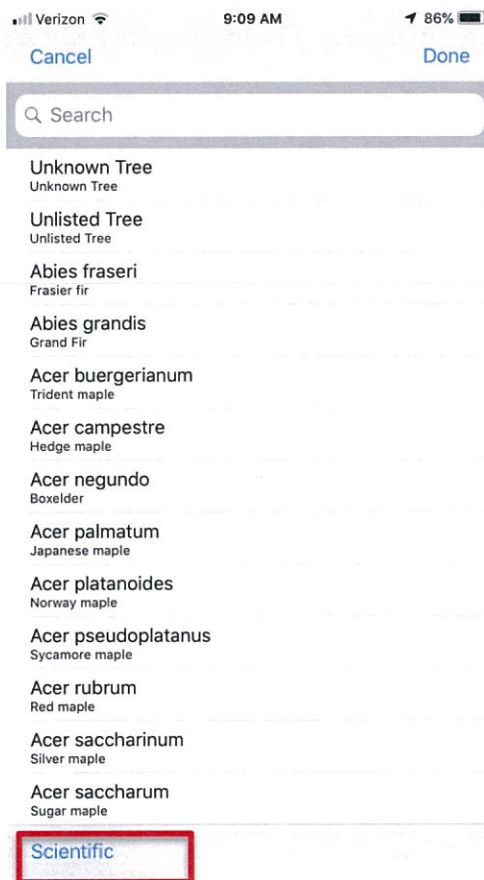
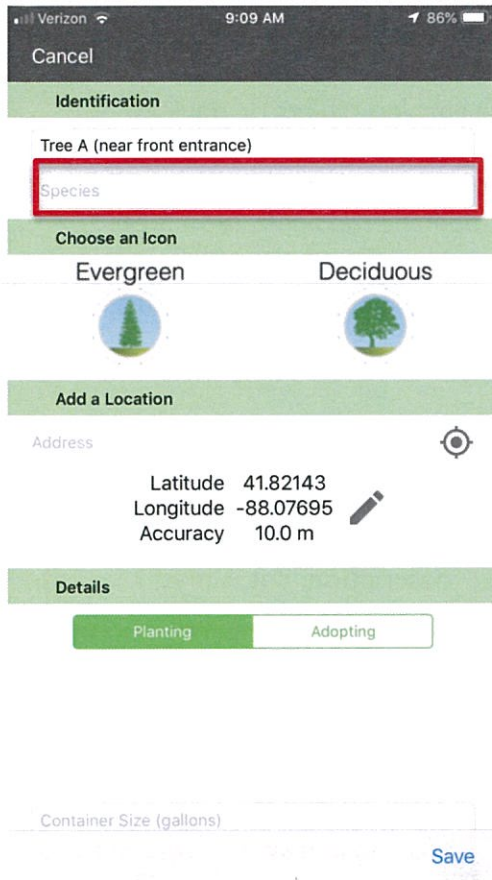
The image shows two screenshots from the Healthy Trees Healthy Cities app. The left screenshot is the home screen with a menu on the left containing options: Tree Care, Pruning, Health Check, Pest Detection, Add A Tree (circled in red), and Add A Photo. The right screenshot shows the 'Add A Tree' form with several fields highlighted by red boxes and callouts:

- Identification:** A text field containing "Tree A (near front entrance)". Callout: "Enter tree label (Consider including location description, if it is brief.)"
- Choose an Icon:** Two options: "Evergreen" (with a tree icon) and "Deciduous" (with a tree icon). Callout: "Look at the leaves, are they needle- or broad-shaped? If it is winter, are they bare or green? (Hint: Deciduous trees lose leaves in winter.)"
- Add a Location:** A field showing GPS coordinates: Latitude 41.82143, Longitude -88.07695, Accuracy 10.0 m. Callout: "This is the GPS location, as enabled by the device. If you are not next to the tree, you can log the same location for all of your trees."
- Details:** Two buttons: "Planting" and "Adopting".

At the bottom of the form, there is a "Container Size (gallons)" field and a "Save" button.

Images provided by the Healthy Trees Healthy Cities app

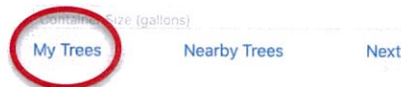
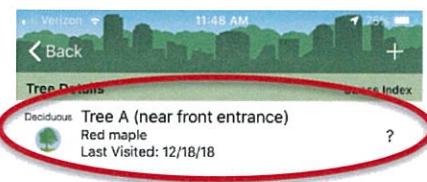
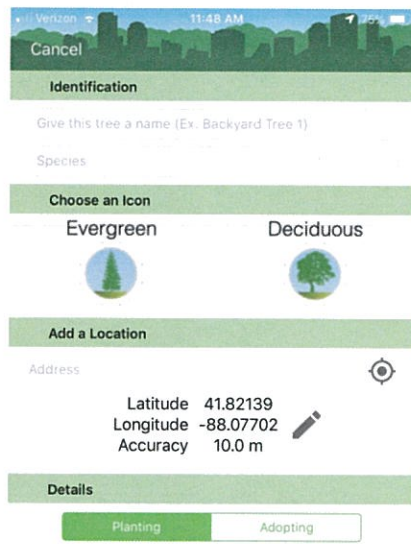
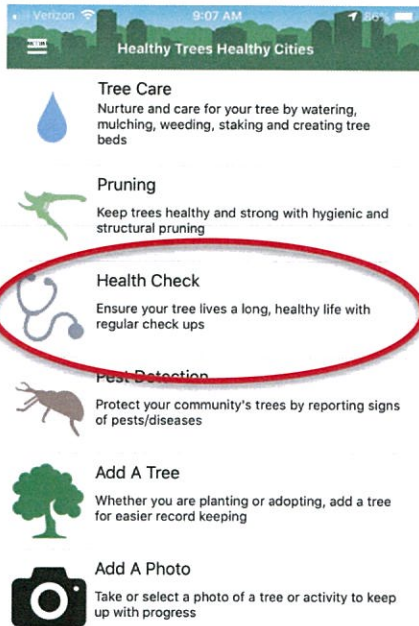




Use the “Tree Identification Resource” to help you identify the trees on your site. You can search by either scientific (Latin name) or common name. The example included in these screen shots is for *Acer Rubrum* (red maple).

Identifying the tree correctly is important. However, please note: pests and diseases usually impact the entire “family” of trees, so exact species or variety is less important, as long as the family is identified correctly. (For example: “Acer” is the family name for maples.)

Images provided by the Healthy Trees Healthy Cities app



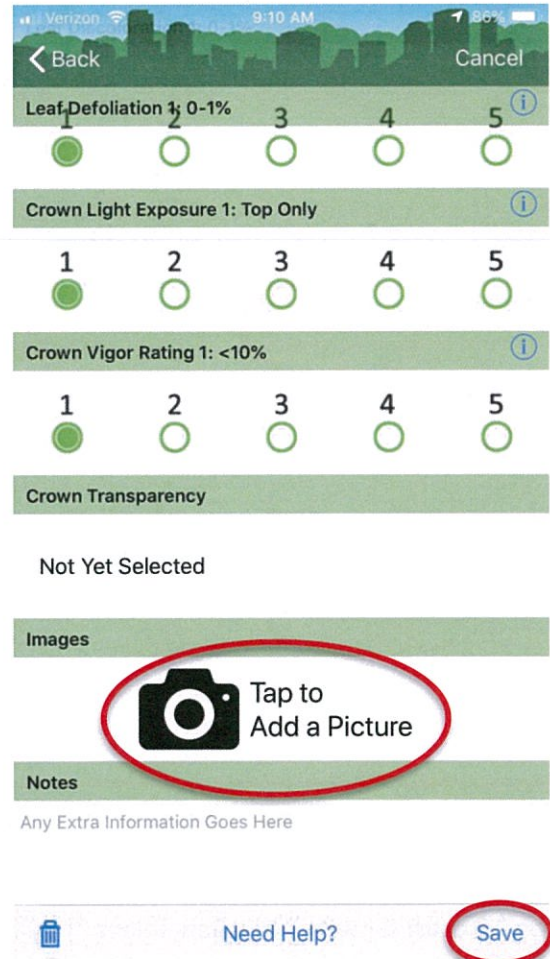
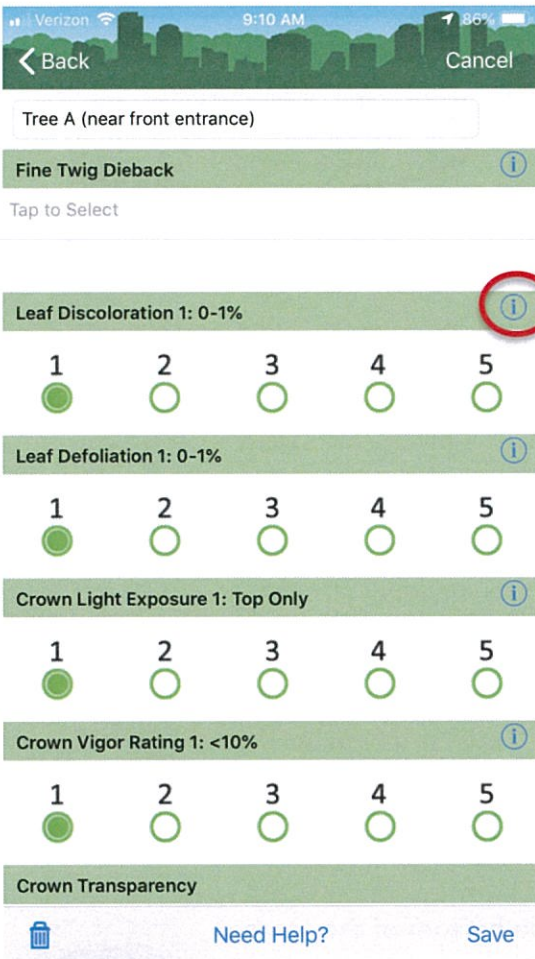
Once all of the trees in your inventory have been added, and you are ready to monitor or add tree health data, go back to the Main Menu.

Choose “Health Check” and then select “My Trees” from the bottom of the screen.

Choose a tree in which you recorded a health score.

Images provided by the Healthy Trees Healthy Cities app





Enter any health information you have recorded about the tree. Any information you can provide is helpful, even if you are not completing a rating for every category. Remember the scale is 1 (Healthy) to 5 (dead).

For additional information, images, and definitions of each of the categories; click the blue info circle in the upper right of each section/category.

Once you have recorded the rating, add a picture if you are able.

Click “Save” when you are done.

Thank you for recording information about the trees in your community!

Images provided by the Healthy Trees Healthy Cities app

To access the Hungry Pests Curriculum, visit the following web addresses:

- Hungry Pests 6<sup>th</sup>-12<sup>th</sup> grade
  - <http://bit.ly/2XlJfoJ>
- Kindergarten – 5<sup>th</sup> grade informational article for Hungry Pests
  - <http://bit.ly/2WUFzG1>
- 6<sup>th</sup> – 8<sup>th</sup> grade informational article for Hungry Pests
  - <http://bit.ly/2x6vs6Q>
- 9<sup>th</sup> – 12<sup>th</sup> grade informational article for Hungry Pests
  - <http://bit.ly/2lrsXCA>
- Vin Vasive Mask
  - <http://bit.ly/2Xn5CtY>
- Jr. Invasive Program Powerpoint
  - <http://bit.ly/2lsGSZ5>



