



TREE TRAILS

2-3

★ SECONDARY ★

★ TREE AND FOREST HEALTH ★

History has shown us the risk of planting too many of the same species in the urban forest. Cities and forests have lost millions of trees to foreign or species-specific diseases and insect pests. Exotic tree species can sometimes invade our forest landscapes and crowd out native species.

Goal and Objectives

Goal: Students will demonstrate ways to keep trees and forests healthy.

Objectives: Students will

1. Specify the causes of the major disruptions to a healthy forest.
2. Conduct a research investigation on forest health; complete a report and present conclusions to the class.
3. Evaluate the health of the campus landscape and name ways to maintain its health.

Materials

General

- Tablet(s) or computer(s) with internet access
- Projector and screen
- White board or chart paper and markers
- Tree Trails Portfolio, Student Learning Log/Journal

Handouts

- Tree Cross Sections
- Signs of Unhealthy Trees Guide
- Investigative Report Outline
- Investigative Procedures
- Research Topics
- (Optional) Media Presentation Instructions

Activity Materials

- Cameras or camera phones

Time and Internet Links

Instructional Time: 3 sessions, 45 minutes each

- Trees of Texas, How Trees Grow
<http://texastreeid.tamu.edu/content/howTreesGrow/>
- Texas A&M Forest Service, Forest Health
<http://tfsweb.tamu.edu/foresthealth/>
- The Nature Conservancy, The Benefits of Prescribed Fire Video
<http://www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml>
- Good Fires, Fighting Fire with Fire
<http://goodfires.org/fire>
- Texas A&M Forest Service Forest, Forest Health
Thinning Pine Plantations: Why, When and How?
<http://bit.ly/2dVW00N>
- U.S. Forest Service, Forest Insect & Disease Leaflets
<http://bit.ly/2dw0ko1>
- Arbor Day Foundation, Tree Health Guide
<https://www.arborday.org/trees/health>
- Southern Group of State Foresters, Forest Health
<http://www.southernforests.org/rural/forest-health-1>
- Western Forestry Leadership Coalition, Forest Health
<http://wflcenter.org/priority-issues/forest-health>
- Northeastern Area Association of State Foresters, Issues
<http://www.northeasternforests.org/content/issues>



Instructional Procedures

I. Engage/Excite

1. Ask the students to imagine their life as a growing tree. Ask what they *Know* that may determine tree growth and its life; i.e., what affects the health of a tree, what makes it grow fast or slow. List their responses on a chart/whiteboard or in their journal.
2. Tell students that foresters use cross sections of a tree to help determine a tree's health, age and to find other important information related to a tree's health and the health of the forest where it is growing.
3. Provide students with Tree Cross Sections handout and actual Tree Cookies, if available. The handout contains signs about a tree's health and its life. Tree rings tell if the tree had sufficient food, water, if it was crowded, if there was an insect invasion, disease, or fire, etc. Ask students to notice the different tree rings sizes and markings on the handout.
4. Have students read the information about each tree cross section and the information to estimate the age of a tree.

II. Explore

1. Activate "Team Forest Investigators" to investigate Forest Health. Divide students into small groups of four or five to create an investigative documentary entitled "Who are the Real Culprits of a Sick Forest."
2. Provide all students with a Signs of Unhealthy Trees handout. Before they begin their online investigation, take the students outside with their handout to explore the health of the trees on school grounds. Students should take photos and/or make drawings of their findings.
Teacher Tip: Invite an arborist to visit the campus grounds with the class or take a field trip with an arborist to discuss and view community urban or rural forest health issues.
3. Have the students return to the classroom and lead a discussion of their findings. Tell students to keep their notes in their Portfolios to include in their scientific research investigation.

III. Explain

1. Provide each group with a topic to investigate. Each topic will be a Chapter in the Documentary. You or the class may choose a list of topics or use the Research Topics handout which includes corresponding internet resources.



III. Explain continued

2. Provide each group with a list of Investigative Procedures and Report Guidelines handout and explain each step.
3. Have the students go online to research their topic or chapter of the report. Provide each group with a Report Outline format to use as a guideline to compile their report.

IV. Extend/Elaborate

1. Instruct student groups to develop a "stage" for each group to present their Chapter of "Who are the Real Culprits of the Forest." Have each group present their Chapter. Have students display their visuals, audios and their completed report. They may conduct a question and answer session after the presentation.
2. (Optional) During their presentations, the students may role play a healthy tree becoming unhealthy due to their specific type of disruption. One or two student(s) play(s) the tree, one or two student(s) play(s) the culprit or disrupter and one student narrates the event. Students may make and use props for their roles. For example, tree with brown paper trunk and green hair, disrupter with paper plate face of bug/disease/invasive species and narrator with microphone.
3. After the presentations, have students respond by generating conclusions about healthy and unhealthy trees and the disruptions. List their conclusions on a chart/whiteboard.
4. (Optional) Explain to students how to make a media production out of the investigative documentary report. Let students know you will help facilitate the production but they will be the directors, producers, writers and performers. Have each group assign roles for their members. Provide the Media Presentation Instructions and discuss the directions. Have students record the presentation.

V. Evaluate

1. Discuss how the class can use their ideas to develop a class plan or list of ways to maintain and/or improve the forest health around their school or neighborhood. Have the students make a poster or bulletin of their plan to improve the forest health around their school or community and display it in the room, hall or on the school's website.
2. Ask students what they *Learned* about tree health and list on a whiteboard/chart or their journal.



VI. Extra Mileage/Attention

Extra Mileage: Have students pose a hypothesis to investigate a question of interest. Have them conduct their research and present it at a convenient time for extra credit, a prize, a privilege, etc.

Extra Attention: Have students brainstorm ideas about their part of the report that they liked the most and why and the part they did not like, why and what they may do to change their dislikes.

Tree Trails curriculum was developed by Texas A&M Forest Service in cooperation with Texas Urban Forestry Council and was supported by grants from the USDA Forest Service and Keep America Beautiful.



Tree Cross Sections

1.
The study of tree rings is called dendrochronology. Each year, a tree adds a spring and summer ring, a light colored ring in the spring and a dark colored ring in the summer.

The rings can tell dendrochronologists about the growth of that tree. Narrow rings could mean slower growth, possibly from not enough water, sunlight, space or nutrients.



2.
This tree shows scars where branches have died or fallen off and the tree has grown around and over them.



Tree Cross Sections

3.
Wide rings could mean the available water, sunlight, space or nutrients allowed the tree to grow vigorously.

Narrower rings toward the outer edge could mean that the younger trees are starting to crowd each other.



4.
This tree shows the difference in color of the heartwood and sapwood.

Blue stain fungus is also evident in the sapwood. The fungus is carried by bark beetles and quickens the tree's death after attack by the beetles.

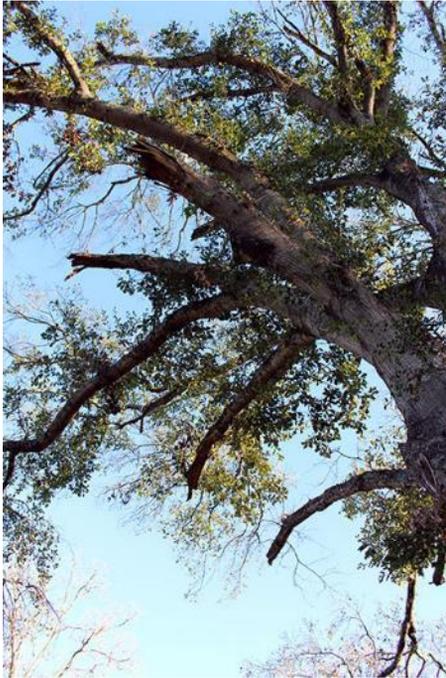


Signs of Unhealthy Trees

Cavities in trunks or branches



Many broken branches or severe topping



Signs of Unhealthy Trees

Unusual leaf shapes or colors

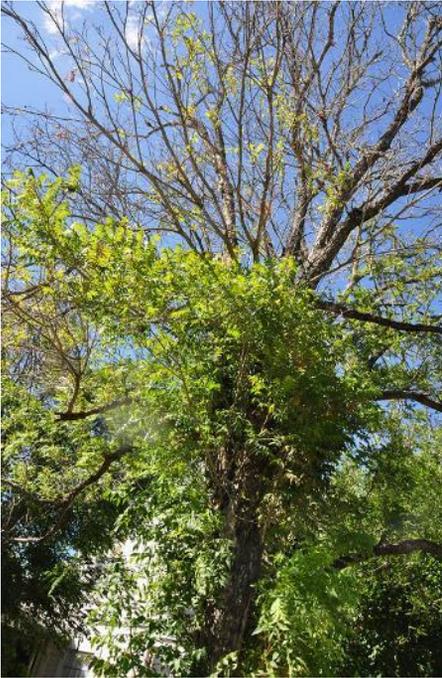


Pine attacked by engraver beetles



Squirrel damage

Numerous branches without leaves



Signs of Unhealthy Trees

Damage from carvings or lawn equipment



Insect presence or evidence such as leaf chewing and rolling, holes in the bark, sawdust, etc.



Soapberry borer infestation



Engraver beetle galleries in loblolly pine bark



Caterpillars feeding



Boring dust in cedar elm

Signs of Unhealthy Trees

Slime oozing from trunk or branches



Mushrooms or other fungi growing from trunk, branches or roots



Mushrooms on trunk

Brown fungus is Hypoxylon canker

Hypoxylon canker

Investigative Report Outline

Title: Investigative Documentary on the Real Culprit of Sick Forests

Chapter: Name of Investigation

Section I. Purpose of investigation

Section II. Hypothesis predicting the results

Section III. Research procedures

Section IV. Findings to include possible causes for the disruption (drought, etc.)

Section V. Conclusions

Investigators: Names of students



Investigative Procedures

- a. You will be responsible for a chapter of the investigative documentary and present it to the class. You will use your laptops/tablets and go online to generate your report.
- b. You should read the narrative provided by Texas A&M Forest Service Forest Health sections, which reports factors contributing to forest health such as heat, drought, flooding, lightning, animal damage, construction damage, soil compaction, wildfire, etc.
- c. You will be given a list of online resources to use for your specific chapter.
- d. You will write a synopsis of your findings to develop your chapter. You may incorporate any resources into your report. You may include photos, graphs or other graphics as supporting evidence for your conclusions. The chapter should include evidence found on your investigative campus trip.

Report Guidelines

Title: Investigative Documentary on the Real Culprit of Sick Forests

Chapter: Name of Investigation

Section I. Purpose of investigation

Section II. Hypothesis predicting the results

Section III. Research procedures

Section IV. Findings to include possible causes for the disruption (drought, etc.)

Section V. Conclusions

Investigators: Names of students

(find a fillable worksheet for the Report in the Tree Trails Resources section online)



Research Topics

1. Overcrowded, Make Room

Read and report on management techniques beneficial to forested ecosystems such as thinning or fire.

2. Insects: the Good and the Ugly

Compare and report on “Useful and Ugly Insects” such as Barklice and “Ugly Insects” that are not harmful such as the Hickory Horned Devil and Giant Walkingsticks.

3. Insects: the Bad and the Ugly

Read and report on “Harmful and Ugly Insects” to certain trees such as Pine Regeneration Weevils.

4. Difficult Diseases

Carefully read and report the information about how diseases occur and how to prevent them and keep the forest healthy. Examples of the conditions contributing to these diseases are found in particular disease sections: Oak Wilt, Root Rot, etc.

5. Invasive Awfuls

Report why invasive species are harmful to our forests. Select a pest and a plant to highlight.

Internet Resources

- Texas A&M Forest Service, Forest Health
<http://tfsweb.tamu.edu/foresthealth/>
- Texas A&M Forest Service Forest, Forest Health, Thinning Pine Plantations: Why, When and How?
<http://bit.ly/2dWW00N>
- Good Fires, Fighting Fire with Fire
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- The Nature Conservancy, The Benefits of Prescribed Fire video
<http://www.nature.org/ourinitiatives/habitats/forests/howwework/maintaining-fires-natural-role.xml>
- U.S. Forest Service, Forest Insect & Disease Leaflets
<http://bit.ly/2dw0ko1>
- Arbor Day Foundation, Tree Health Guide
<https://www.arborday.org/trees/health>
- Southern Group of State Foresters, Forest Health
<http://www.southernforests.org/rural/forest-health-1>
- Western Forestry Leadership Coalition, Forest Health
<http://wflcenter.org/priority-issues/forest-health>
- Northeastern Area Association of State Foresters, Issues
<http://www.northeasternforests.org/content/issues>



Media Presentation Instructions

Each group will appoint a:

1. **Director** to introduce the Chapter Question, coordinate the performers and close the presentation.

Group Member _____

2. **Producer** to coordinate the research, produce the order/sequence of the presentation and present the first section of the chapter.

Group Member _____

3. **Writer** to gather and compile the information, record the script and present the second section of the chapter.

Group Member _____

4. **Assistant Producer and Writer** to help with the script, the production and conclude the presentation.

Group Member _____

5. **Performers:** This is a suggestion for the performers but the group may decide a different order. All students in the group should have an individual role.

Group Members _____

