



Benefit of Trees: An Interdisciplinary Project-Based Unit

Content Area	Math, English, Science, Social Studies, and Computer Science/Design Thinking	Grade Level	Between 8th-9th
Topic/Concept/Skill	The Benefit of Trees	Time Frame	15-20 hours
Overview/Rationale			
<p>In this unit, students explore the multifaceted impact of trees on the environment and human life, focusing on the urban heat island effect, carbon storage, ecosystem health, and social equity. Through videos, data collection, and discussions, students investigate significant temperature differences in local school areas first and generate hypotheses about these variations. They conduct local investigations to analyze surface temperatures, research the role of trees in cooling environments, and use various resources to deepen their understanding. The lessons emphasize active learning, where students collect and analyze data, engage in discussions, and reflect on their findings to foster a comprehensive understanding of the environmental benefits of trees. This unit was designed for a summer enrichment program for incoming freshmen but can be used in multiple grade levels.</p> <p>Additionally, students delve into the practical applications of tree biomass and carbon storage, learning how forests mitigate climate change. They engage in hands-on activities such as measuring tree circumferences and using allometric equations to calculate biomass. The lessons highlight the significance of tree diversity and forestry management on carbon storage capacity. Students also explore the importance of forests moving from a local to more global perspective. They investigate the impact of urban heat islands, equitable access to green spaces, and how increasing tree canopy coverage can benefit their local community. The culminating activities include creating proposals for tree planting initiatives and presenting findings to promote sustainable practices and community engagement.</p>			

Desired Results

Interdisciplinary Content Standards

Math:

6th-8th

- 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

9th-12th

- S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models
- S.IC.B.6 Evaluate reports based on data.
- G.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

English:

6th-8th

- RI.CR.8.1. Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text.
- W.AW.8.1.A-E: Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence.
- W.IW.8.2.A-F: Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

9th-12th

- RI.CR.9–10.1. cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.
- RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem.
- W.AW.9–10.1.A-E: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence.

- W.IW.9–10.2.A-E: Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

Science:

6th-8th

- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ESS3-4: Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

9th-12th

- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards and changes in climate have influenced human activity.
- HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Social Studies:

- 6.2.12.EconGE.6.a: Evaluate efforts of governmental, non-governmental, and international organizations to address economic imbalances, social inequalities, climate change, health and/or illiteracy.

Computer Science/Design Thinking:

9th-12th

- 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation and propose an innovative, sustainable solution.

Enduring Understandings	Essential Questions
Trees benefit humans and the planet by providing cooling, reducing the effects of climate change, saving energy, benefiting wildlife, cleaning air and water, providing oxygen, and improving human health.	How do trees benefit humans and the planet? How can trees support local schools and communities to fight the impacts of climate change?

Student Objectives

- Explore how trees impact the environment and human life, and mitigate urban heat island effects.
- Conduct and analyze an investigation measuring surface temperature variations in different environments.
- Construct a Claim, Evidence, Reasoning (CER) statement, explaining how tree planting can reduce surface temperatures and mitigate the urban heat island effect.
- Propose locations for tree planting in their school area, supported by their investigation data and research on heat reduction strategies.
- Analyze how trees reduce the Heat Island Effect and create a presentation to effectively communicate the benefits of tree planting for public and environmental health.
- Research, analyze, and compare environmental health data across different locations, using tools such as the NatureScore.
- Critically evaluate the connection between systemic racism, such as redlining, and environmental inequities, and recognize the role of tree planting in addressing these disparities.
- Justify selection of location for tree planting based on research into environmental and public health benefits, particularly in economically disadvantaged or redlined areas.
- Analyze how trees store carbon and how forests mitigate climate change by constructing models to evaluate CO₂'s impact on global temperatures.
- Apply data collection techniques to identify tree species, utilize allometric equations to calculate tree biomass, and analyze collected data to estimate and evaluate the carbon storage capacity of various trees.
- Apply and justify through research to select tree species for their tree planting project proposal, providing justifications based on carbon storage capacity and environmental impact.
- Identify the additional environmental and economic benefits of trees.
- Analyze and assess the environmental and economic benefits of different tree species, linking this data to their Tree Planting Project Proposal.
- Create a diagram illustrating how trees benefit water, land and air, incorporating new insights from the lesson, and revising it as their understanding deepens.
- Identify appropriate tree species for their selected location and justify their choices based on the environmental benefits, using data and research from the lesson activities.
- Analyze the role of trees in supporting biodiversity by researching different forest ecosystems and summarizing findings in an infographic.
- Evaluate the impact of logging on biodiversity through group readings and discussions focused on the Boreal Forest and related ecosystems.

- Collaborate to create a visual representation of a forest ecosystem's food web, demonstrating the effects of deforestation on species interactions and habitats.
- Justify the selection of tree species and planting locations in the Tree Planting Project Proposal by integrating research on environmental benefits and economic value.
- Conduct research and apply data effectively to design and develop a comprehensive Tree Planting Project Proposal.
- Demonstrate understanding of tree benefits and climate considerations by explaining their impact and relevance in environmental planning.
- Create a detailed written proposal and presentation, including a planting plan, tree selection justification, and the projected environmental benefits, to submit for the Trees for Schools Grant.
- Present their Tree Planting Proposal to their peers and engage in reflective self-assessment, identifying strengths and areas for improvement in both their own work and the ideas presented by others.

Project Based Learning

The Project: The Trees for Schools program will provide \$5.0 million in grants to New Jersey public school districts, colleges, and universities to support planting trees on school grounds and campuses across the state. You have been tasked by your school board to create a proposal to submit for the Trees for Schools Grant. The proposal will need to include your selected location on or around your school campus and the types of trees, justification of the chosen location and tree types selected, detailed planting landscape design, the potential benefits of planting these selected trees, and a presentation that summarizes the key points and persuades school administrators and school board members to approve the submission of the grant application to Sustainable Jersey. The presentation format can be a slideshow, poster, video, or another type of media. It should highlight the benefits of the tree planting project to the school and community, supported by research, data, and other resources. Keep in mind planting for today will provide solutions for a future changing climate.

**Disclaimer - Grants change all the time so feel free to replace the Project Launch Description to fit a grant you would like your students to focus on with the theme of Tree Planting. We decided to use the Sustainable Jersey Trees for Schools grant offered in 2023 as a model for students. It may be offered again in 2025 for more information about this grant email mcdermom@tcnj.edu.*

Additional area that could be added to the project proposal:

- *Aesthetics - how they will look to improve the school environment*
- *Educational value - how they will be used to support learning on school site*

Assessment Evidence	
Formative Assessment(s)	Summative Assessment(s)
<ul style="list-style-type: none"> ● Progress Tracker ● Notice/Wonder ● Surface Temperature Investigation ● Research on how trees benefit surface temperatures ● Allometry in Trees and Carbon Sequestration Lab ● Modeling Climate Change ● Tree Diagram ● Tree Benefits Research & Infographic ● Annotation of Readings & Food Web ● Tree Planting Project Proposal 	<ul style="list-style-type: none"> ● Tree Planting Project Proposal

Lesson Plan Overview

[Lesson 1: Addressing Rising Temperatures Through the Lens of Trees and Forests](#)

In this lesson on Surface Temperature Investigation, students will explore how surface temperatures vary based on environmental conditions such as direct sunlight, shade, and different surface materials (e.g., asphalt, grass, or concrete). Divided into small groups, students will design and conduct experiments by measuring temperatures at various outdoor locations around their school. They will collect data at different times of the day, analyze it using graphs, and share their findings with the class. This investigation will help students understand how tree placement can mitigate temperature variations and prepare them for further study of the Urban Heat Island Effect.

The lesson also introduces the Urban Heat Island Effect, encouraging students to analyze data from local sources, such as the Rutgers NJ Public Health Adapt, to examine temperature disparities in their communities. Through observation and research activities, including exploring maps, articles, and videos, students will gain insights into the impact of urban surfaces and tree cover on temperature. These findings will support the development of their Tree Planting Project by raising awareness of how trees can be strategically placed to address potential heat islands.

[Lesson 2: Impact of Trees on Public Health and Environmental Justice](#)

In Lesson 2, students continue their exploration of the benefit of trees focusing on public health and environmental justice, building on the progress made in Lesson 1. They are asked to review their Progress Trackers and share their thoughts with the class. The lesson delves into the Urban Heat Island Effect and how trees can mitigate it, with a focus on redlining and environmental justice. Students discuss inequities faced by redlined neighborhoods, particularly how a lack of tree cover contributes to higher temperatures and poorer air quality. By engaging in group discussions, watching a video, and reviewing resources, students explore the health impacts of extreme heat and the systemic issues contributing to environmental disparities.

As part of the Tree Planting Project, students are tasked with justifying the locations they chose for tree planting, based on the benefits and needs identified in their research. They use the NatureScore tool to assess the health impact of trees in various New Jersey locations that received grants to combat urban heat islands. By comparing health scores and analyzing data, students identify patterns and make connections between tree cover, urban heat, and public health. The lesson culminates with students reflecting on how trees can improve environmental justice and working on the third part of their Tree Planting Project Proposal, integrating their findings to support their location choices.

[Lesson 3: What is the Role of Forests in Carbon Sequestration](#)

In this lesson, students dive deeper into the relationship between trees, forests, and climate change, focusing on the concept of carbon sequestration. They begin by reviewing their Progress Trackers from Lesson 2, reflecting on the impact of trees on public health and

environmental justice. The class is introduced to tree biomass and carbon storage through guided note-taking and a model of the carbon cycle. Using a climate change simulation, students explore how varying levels of carbon dioxide affect global temperatures, predicting and testing their ideas. They watch a video on forest protection to further connect their learning to the real-world benefits of trees in mitigating climate change. Students then document their justifications for tree planting as part of their ongoing project proposal.

The hands-on portion of the lesson involves students identifying tree species, measuring tree diameters, and applying allometric equations to estimate biomass and carbon storage. They conduct fieldwork in a designated area, recording data on various tree species to understand which trees store the most carbon and produce oxygen. Back in the classroom, students analyze their data, discussing the implications of tree diversity on carbon sequestration and how forestry management impacts the carbon cycle. The lesson introduces the concept of micro forests, showing their potential to address urban heat islands. Students conclude by updating their Progress Trackers with insights on how carbon sequestration in forests mitigates climate change, preparing them to identify and justify tree choices for their final project proposal.

[Lesson 4: Other Environmental and Economic Benefits of Trees](#)

In Lesson 4, students will continue building on their knowledge of how trees contribute to environmental health by focusing on the benefits trees provide to water, air, and land. They will revisit their Progress Trackers from Lesson 3, where they explored carbon sequestration, and share their findings. As they work through Lesson 4, students will dive into Part 1, #4 of their Tree Planting Project Proposal, identifying specific tree species and justifying their selection based on environmental benefits. The lesson introduces a range of activities, including a turn-and-talk on tree benefits, reading articles, watching videos, and creating diagrams that highlight the positive impact of trees.

Additionally, students will use tools such as the Arbor Day Foundation - Tree Benefit Calculator and i-Tree Planting to explore the tangible benefits trees provide. They will analyze trees from their Lesson 3 lab and apply this knowledge to their proposals. The lesson also includes class discussions, a gallery walk for peer review, and a math extension on calculating tree cover and uncertainty using statistical methods. Ultimately, students will refine their tree planting proposals and update their diagrams with the new information they have gathered.

[Lesson 5: The Role of Trees in Supporting Biodiversity](#)

In Lesson 5, students will deepen their understanding of how trees contribute to environmental quality and biodiversity. They will begin by reviewing their Progress Trackers from the previous lesson. The lesson then shifts to an exploration of the Boreal Forest (*was introduced in Lesson 3 with carbon sequestration*) and the impacts of logging, using a video and group reading activity to analyze biodiversity changes.

Through annotation and collaborative discussions, students will synthesize key ideas and create food webs illustrating ecosystem changes caused by deforestation.

Building on this research, students will work in small groups to create infographics detailing how trees improve and support biodiversity. These infographics will focus on various New Jersey forests, utilizing both provided resources and independent research. The lesson culminates in a gallery walk, where students will review and discuss each group's findings, followed by a reflection on how trees offer additional benefits. Throughout the lesson, students will continue to update their Progress Trackers as they work towards completing their Tree Planting Project Proposal.

[Lesson 6: Written Project Proposal - Promoting Tree Stewardship](#)

In Lesson 6, students will use their Progress Trackers to compile research and data gathered throughout the unit for their Tree Planting Project Proposal. The lesson reviews the project objectives and guidelines, including selecting a tree planting location, choosing tree types, and creating a landscape design with environmental benefits. Students will also utilize tools like the National Tree Benefit Calculator and i-Tree to aid in their proposals. They will present their final proposals to the class, followed by a reflection on their own work and ideas shared by others.

****Note for Teachers:** Teachers can also enhance the project by connecting with local organizations like the Shade Tree Commission, Environmental Commission, Green Team, or nonprofits such as Rutgers Cooperative Extension or the Native Plant Society. These groups can offer guest speakers to share insights on tree planting, community initiatives, and the value of trees, as well as participate in student presentations to provide feedback and support.*

Vocabulary

- | | |
|---|---|
| <ul style="list-style-type: none"> ● Urban Heat Island ● Carbon Sequestration ● Biodiversity | <ul style="list-style-type: none"> ● Allometric Equations ● Redlining ● Forestry Practices ● Mitigation |
|---|---|

Resources



All resources have been linked within each lesson.

Differentiation

Enrichment

- Increased examination of red lining and equity:
 - [Why shade trees are hard to find in redlined neighborhoods \(nationalgeographic.com\)](http://nationalgeographic.com)

	<ul style="list-style-type: none"> o 50 years after being outlawed, redlining still drives neighborhood health inequities (berkeley.edu) o Redlining—and Greening—of Cities. What’s the Connection? - American Forests o Studies Find Redlining Linked To More Heat, Fewer Trees In Cities Nationwide : NPR o Housing Segregation and Redlining in America: A Short History Code Switch NPR o What is Redlining? o How Systemic Racism Linked to Fewer Trees in Your City One Small Step ● Rutgers Climate Snapshots: https://climatesnapshots.rutgers.edu/ <ul style="list-style-type: none"> o Students will first pick their county and municipality. Then scroll to the bottom of the page and select Forest Data Report. The Forest Data Snapshot provides a quick look at how forests play an important role in providing wildlife habitat, wood products, recreation, carbon sequestration, clean air and water. o Students will go back to the climate snapshots page again picking their county and municipality. Then they will scroll to the bottom and select the Forest Climate Risk Report. The Forest Climate Risk Snapshot provides a summary of how changes in temperature may impact the forest resources and tree species in New Jersey. ● NJ Data: Using the NJ Adapt - NJ Forest Adapt - https://njforestadapt.rutgers.edu/#/splash students will pull data to determine how many trees and the type of trees that can be found in their city and county within NJ. ● Art Connection- Review how paint can be used to capture carbon. https://engineering.rice.edu/2024-magazine/paint-positive ● In Absecon, Atlantic City Electric is providing trees to areas that are historically redlined areas. To combat urban heat islands, Atlantic City Electric is giving out trees to residents as part of their 2023 grants. Specifically, the trees provided are either a Red Maple, River Birch or Eastern Redbud. <ul style="list-style-type: none"> o Source- City of Absecon - Atlantic City Electric and the Arbor Day Foundation Provide Free Trees for Energy-Efficient Living
Optional Modifications	<ul style="list-style-type: none"> ● Students will read and annotate readings during the unit. Teachers can use Diffit to adjust the reading levels as needed for students. Here are step-by-step directions on how to use Diffit: Directions for Diffit. ● These images and videos can support students visually with the carbon cycle <ul style="list-style-type: none"> o https://www.britannica.com/science/carbon-cycle/images-videos ● If students are struggling with understanding the scope and scale of carbon emissions, a suggestion is to use Tuva to support students in understanding the graphical relationships between carbon emissions over time to show the need for carbon sequestration over time. https://climate.tuvalabs.com/dataset/142/ <ul style="list-style-type: none"> o Click on year and Filter Range 1900 min, max 2014

- o Add year to the x-axis central drop and drag box
- o Drop and drag Cumulative Emissions to the y-axis.
- Give students the opportunity to explore more about Redlining in NJ by having them work with the [Mapping Inequality: Redlining in New Deal America](#) website. Have students partner up and give them one of the 3 following cities in NJ to learn more about Redlining in these locations. Then have them record what they  Notice/Wonder (*Optional Modification Students can click on the links on the map to learn more about the various areas.*)
- Modification- if there are no trees on campus tree cuts can be used for measuring diameter and bark analysis (Example- <https://a.co/d/24NU5Hw>). Paper models of bark, diameter, and leaves can also be used if there are no trees on campus. Additionally, students can use data collected from trees at Rutgers to use for their allometric equations. Students can choose from one of the following three trees that can be found on Rutgers New Brunswick campus.
 - o Tree #1: White Oak-Circumference 141cm
 - o Tree #2 Sugar Maple-Circumference 132cm
 - o Tree #3: Red Oak-Circumference 112cm
- Another option instead of the annotation and jigsaw is to have students do the viral video mini activity using the readings provided. In this activity, students will create a script for a viral video ad based on a reading passage. This exercise helps students practice summarizing key points, identifying interesting elements, and crafting engaging content. It also encourages creativity and critical thinking as they decide how to present the information in a way that will capture viewers' attention. Here are step-by-step directions on how to do this activity.
 - o  Viral Video Mini Lesson : A System for a Healthy Planet

The development of this unit was funded by a grant from the New Jersey Department of Education. This material and any opinions, results, conclusions, or recommendations expressed within are those of the author(s) and do not necessarily represent the views of the New Jersey Department of Education nor constitute an endorsement thereof.

Lesson 1: Addressing Rising Temperatures through the Lens of Trees and Forests

Duration	3 hours
Objective(s)	<ul style="list-style-type: none"> ● Explore how trees impact the environment and human life, and mitigate urban heat island effects. ● Conduct and analyze an investigation measuring surface temperature variations in different environments. ● Construct a Claim, Evidence, Reasoning (CER) statement, explaining how tree planting can reduce surface temperatures and mitigate the urban heat island effect. ● Propose locations for tree planting in their school area, supported by their investigation data and research on heat reduction strategies.
Standards	<p>English</p> <p>6th-8th</p> <ul style="list-style-type: none"> ● RI.CR.8.1. Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text. ● W.AW.8.1.A-E: Write arguments on discipline-specific content (e.g., social studies, science, technical subjects, English/Language Arts) to support claims with clear reasons and relevant evidence. <p>9th-12th</p> <ul style="list-style-type: none"> ● RI.CR.9–10.1. cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. ● RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem. ● SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

Science

6th-8th

- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

9th-12th

- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards and changes in climate have influenced human activity.
- HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Math

6th-8th

- 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

9th-12th

- S.ID.A.1 Represent data with plots on the real number line
- S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models
- S.IC.B.6 Evaluate reports based on data.



Computer Science/Design Thinking

9th-12th


- 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation and propose an innovative sustainable solution.


<p>Synopsis/Overview</p>	<p>In this lesson on Surface Temperature Investigation, students will explore how surface temperatures vary based on environmental conditions such as direct sunlight, shade, and different surface materials (e.g., asphalt, grass, or concrete). Divided into small groups, students will design and conduct experiments by measuring temperatures at various outdoor locations around their school. They will collect data at different times of the day, analyze it using graphs, and share their findings with the class. This investigation will help students understand how tree placement can mitigate temperature variations and prepare them for further study of the Urban Heat Island effect.</p> <p>The lesson also introduces the urban heat island effect, encouraging students to analyze data from local sources, such as the Rutgers NJ Public Health Adapt, to examine temperature disparities in their communities. Through observation and research activities, including exploring maps, articles, and videos, students will gain insights into the impact of urban surfaces and tree cover on temperature. These findings will support the development of their Tree Planting Project by raising awareness of how trees can be strategically placed to address potential heat islands.</p>
<p>Activity(ies)</p>	<p>1. Project Based Learning Launch: At the start of the unit, please review with students the Benefits of Trees Project Based Learning Unit - ☰ The Benefit of Trees Teacher Instructions . Students will work on the project throughout the unit and complete a proposal at the end of the unit. This will also provide students with background knowledge on why they are doing these specific lessons and what research they should be gathering to help them write their proposal.</p> <p>a. ☰ The Benefit of Trees Teacher Instructions : The Trees for Schools program will provide \$5.0 million in grants to New Jersey public school districts, colleges, and universities to support planting trees on school grounds and campuses across the state. You have been tasked by your school board to create a proposal to submit for the Trees for Schools Grant. The proposal will need to include your selected location on or around your school campus and types of trees, justification of the chosen location and types of trees selected, detailed planting landscape design, the potential benefits of planting these selected trees, and a presentation of your proposal to the school board. Keep in mind planting for today will provide solutions for a future changing climate.</p> <p>b. The following slideshow has been created for Lesson 1:</p> <p>☑ Lesson 1: Addressing Rising Temperatures Through the Lens of Trees and Forests</p> <p><i>*Disclaimer - Grants change all the time so feel free to replace the Project Launch Description to fit a grant you would like your students to focus on with the theme of Tree Planting. We decided to use the Sustainable Jersey Trees for Schools grant offered in 2023 as a model for students. It may be offered again in 2025 for more information about this grant email</i></p>

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- c. **Proposal Directions:** Walk through the proposal with students so they are aware of each of the components of the project and what they will want to focus on as they go through each lesson to help them prepare their proposal.
 - i.  The Benefit of Trees Student Proposal Plan
 - ii. All documents for the project can be found in  Lesson 6
- d. **Final Goal of Lesson 1:** As students work through Lesson 1, they will need to work on Part 1, #2 and #4a. Identification of planting areas and c. site plan of The Benefit of Trees Student Project Overview and Student Instructions. They will want to select 3 locations where they might want to plant the trees. Students should also start to provide justification for why they selected these locations.

2. Surface Temperature Investigation: Students will design an investigation to analyze different surface temperatures. Before students can determine the location of where they will want to propose planting trees for their Tree Planting Project students will need to have an understanding of surface temperatures and how surface temperature can vary depending on if the area is in the shade or in direct sunlight. The following investigation will give students the chance to explore different surface areas outside to collect temperature data. Giving students this opportunity will help them to determine which locations would benefit from having trees added. It will also help them to start to understand Urban Heat Islands, which will be explained in part 2 of this lesson. The data collected in this investigation will help them in writing a claim, evidence, reasoning (CER).




- a. Students are going to develop an investigation on analyzing the temperature at different surface areas in the spaces that surround the school.
 - i. First - you will want to break students up into groups of 3 or 4. Each group will be provided with a designing investigation worksheet.
 - 1.  Surface Temperature Investigation
 - a. On the 3rd page of the worksheet is the Claim, Evidence, and Reasoning. Depending on how you complete a CER, you can introduce the claim to the students prior to the investigation, or can wait till have the lab. It would be helpful to let the students know they will be writing a CER based on the investigation and research they will be conducting in Lesson 1.

- ii. Second - review with students the materials they will have to work with during the investigation. Having these on display for the students to see will be helpful and showing them how they work.
 - iii. Third - go over the locations they will have access to create and conduct their investigation. *(Depending on students' understanding of different surfaces this would be a good opportunity to review impervious surfaces.)*
 - 1. Give students the opportunity to check out each location prior to them filling in the locations they will use for the investigation on their Surface Temperature Investigation sheet. *(If you feel you need to preselect the locations then have that part filled out on the Surface Temperature Investigation sheet prior to giving students the sheet to use for the lab.)*
 - iv. An exemplar of the Surface Temperature Investigation sheet has been provided to help better understand how the lab will work. Also if you feel you need to give your students more guidance or directions.
 - 1.  Exemplar Surface Temperature Investigation.pdf
- b. Once students have developed their investigation, they will be brought outside to conduct their tests and collect their data. Students will want to take note of the time of day they are doing this investigation and if possible, allow them the opportunity to test in the morning and in the afternoon. *Another idea is to share all of the data collected from all classes indicating what time of day they collected their data.* After all the data has been collected students will head back inside to analyze their data.
 - c. Analyze Data: In the student groups, they will want to analyze and draw a conclusion based on the data they collected and how the temperatures differed from surface to surface. They should create graphs showing the data and be able to explain what they are seeing through the graphs. Come back as a whole class to share out.
 - d. Class discussion and analysis: As a whole class, each group will share their data, giving students the chance to look for patterns, ask questions, and draw conclusions. *Another idea is to share all of the data collected from all classes indicating what time of day they collected their data and give students the opportunity to have a class discussion. Students can identify patterns and conduct a notice/wonder.*

Alternate investigation if weather or location is not doable for your classes: Allow students to create an

investigation where they are measuring the difference surface temperature using heat lamps. Students can create different surfaces by using different colors for surfaces and placing a heat lamp on the surface for a specific amount of time. Then collect data on the temperature from each set up. Make sure to still take students outside to scout out potential locations for where they will be planting their trees. They should take into consideration the data they collected during their investigation and what they found out.

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the whole class discussion to draw conclusions from the investigation. Then wait for the next class to go into The Heat Island Effect.

- 3. The Heat Island Effect:** Students will gain an understanding of heat islands and analyze data on surface temperatures in their local communities.
 - a. Students observe the video and images of urban heat islands
 - i. CBS news *The "heat island effect" traps cities in domes of extreme temperatures. Experts only expect it to get worse.*
<https://www.cbsnews.com/news/heat-island-effect-dome-extreme-temperatures-experts/>
 - ii. Pause Video at 1:50 to show students the 17 degree difference map.
 1.  Notice/Wonder : Have students make observations of what they are noticing and wondering. Ask students “What do you notice” and “What do you wonder”? They can start by jotting down their observations then turn and talk with a neighbor (this can be done in their notebook or on a sheet of paper, or using the sheet provide -  Notice/Wonder).
 2. Come back as a whole class to record observations and any questions they have from the clip of the video and image. *Depending on time, you can finish watching the video with students, the video does go further into the impact heat islands have on human health.*
 - b. NJ specific surface temperature data: *Step by step directions have been provided in the  Lesson 1: Addressing Rising Temperatures Through the Lens of Trees and Forests* slideshow.
 - i. Students will now have the chance to work with Surface Temperature data collected from Summer 2022 throughout NJ using the Rutgers NJ Public Health Adapt. They will pull the data for their specific area of where their school is located in NJ.

- ii. [NJ Public Health Adapt](#) - have students use the NJ Public Health Adapt to pull data for their county and municipality.
 - 1. An example has been provided in the lesson 1 slideshow. The data is from Middlesex County, New Brunswick City. *You could use this location as a comparison with your school location if you would like to go a step further.*
- iii. Step-by-step directions of using NJ Public Health Adapt:
 - 1. Students will use the drop-down menu to select the county first then the municipality.
 - 2. Then students will click on the report Climate Conditions that Impact Health. Once in that document they will review: (students are able to click directly in the maps to further explore depending on time and grade appropriateness)
 - a. Land Surface Temperature Map
 - b. Heat Island Map
 - 3. Students will use the [☰ Notice/Wonder](#) sheet to fill out what they notice and wonder about both maps. Possible points to have students look at:
 - a. What are the maps showcasing?
 - b. What kind of data is being highlighted?
 - c. How does this data relate to the surface temperature lab and heat island exploration?
 - d. What other data can be examined from the maps and data?
- c. Rising Temperatures **Claim, Evidence, Reasoning**
 - i. Students will complete a Claim, Evidence, Reasoning (*found on page 3 of the [☰ Surface Temperature Investigation](#)*) on the investigation and data they have gathered to answer the following questions:
 - 1. How do varying environmental conditions, such as full sun, partial sun/shade, and full shade, influence surface temperature variations?
 - 2. How do various surfaces including texture and color (i.e. black asphalt, green grass, white concert) affect temperature?
 - 3. What implications might these findings have for urban planning and mitigating the heat island effect?

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the whole class discussion to draw conclusions and ask questions using the CER. Then wait for the next class to go into part 3 How Trees Impact Surface Temperatures.










4. How Trees Impact Surface Temperatures: Students then will draw conclusions from their data on how trees impact temperatures.

- a. Based on the questions and conclusions drawn from the investigation, students are going to do some research on how trees can support decreasing surface temperatures and address urban heat islands. Students will work through some different sources to help them gather their research.
 - i. NJ Data: Using . [NJ Forest Adapt](#) - students will pull data to determine how many trees and the type of trees that can be found in their city and county within NJ. *Step-by-step directions on using NJ Forest Adapt are provided in the lesson slide presentation. .*
 - ▢ Lesson 1: Addressing Rising Temperatures Through the Lens of Trees and Forests
 1. ☰ Notice/Wonder protocol to record what students found out about their city and county. *You may also want to have students select a nearby city if they live in a more suburban or rural area so that they can compare the two locations while filling out their notice and wonder.* Specifically looking at:
 - a. How many trees vs impervious surfaces
 - b. Type of trees
- b. **Research:** To provide students with further understanding of urban heat islands and benefits of planting trees students will dig deeper into several identified sources of research. *To help meet the needs of different learning styles and levels we have provided several different sources that are presented in different ways.* The following are the list of sources students can use for their research. After are the directions on how to run the research activity with the students.
 - i. Sources:
 1. Read Article: [Successful Reforestation Is Keeping the Eastern U.S. Cooler](#)
 2. Review Website: [Using Trees and Vegetation to Reduce Heat Islands](#)
 - a. Article from EPA Website (would recommend reading pages 1-6) - [Reducing Urban Heat Islands: Compendium of Strategies Trees and Vegetation](#)
 3. Watch Youtube: [The Heat Island Effect Explained | Eco Facts | One Tree Planted](#)
 4. Listen to Podcast:

- a. Option a: [Sprouting a Forest in the City](#)
- b. Option b: [Growing Impact: Cities cooled by trees](#)
- c. Option c: [Trees Are Key To Fighting Urban Heat — But Cities Keep Losing Them](#)

- ii. **Jigsaw Research Activity:** The research can be done several different ways. We have provided a jigsaw activity but you could select one or two sources from the list below and do this whole class or individual. You could also have students work on annotating the source they are assigned.
 1. Have students break into groups of 8. Then assign one of the sources to two of the members in the group. (*You may want to select the groups and sources based on your student levels and which type of source would they be able to work with best*).
 2. As a pair, students will work with their sources by reading over the article, listening to the podcast, watching the Youtube video, or exploring the website. As they are doing this they will want to take notes on anything they find important. They can use their **Notice/Wonder** sheet or have them do this on a new paper.
 3. Once everyone has collected their notes they will come back to their group to share out what they have found out. Then each group will be given a piece of chart paper and markers (*or can have them do this digitally on a slide*) to record/illustrate what they have found out. The group will want to come to a consensus of what was found out from their research and record their findings to share with the whole class.
 4. Lastly students will conduct a gallery walk to showcase their group findings. Allow all the students the chance to walk around and review each of the posters, letting them add anything to their notes. We also suggest getting the students engaged with the gallery walk to give them another chance to walk around with 3 dot stickers that they can place next to something that stood out to them, they agree with, or were surprised about on the posters.
 5. Come back as a whole class to talk about what students found out allowing several students to share where they placed a dot sticker and why they did. Explain to them they will use all the research they gather from Lesson 1 to help them with Part 1 of the Tree Planting Project. Go back to the

	<p style="text-align: center;">☰ The Benefit of Trees Student Proposal Plan and review with students Part 1 selecting their location. In the next activity students will have time to use their research to start working on Part 1 of the project.</p> <p>5. Progress Tracker: Give each student a Progress Tracker that will be used throughout the unit.</p> <ol style="list-style-type: none"> a. The Progress Tracker is a thinking tool that helps students keep track of important discoveries. Students can use the tracker as a way to think with others about what is important in their models, explanations and/or designs. <ol style="list-style-type: none"> i. ☰ Progress Trackers ii. Lesson 1 Question: How can trees reduce the Urban Heat Island Effect? b. Give students the chance to share what they have written and/or drawn in each column: <ol style="list-style-type: none"> i. What I figured out ii. Questions I still have/Any surprising or interesting findings iii. Research for Tree Proposal Project: <ol style="list-style-type: none"> 1. Final Goal of Lesson 1: As students work through lesson 1, they will need to work on Part 1, #2 & #4a & c of the Tree Planting Project Proposal. They will want to select 3 locations where they might want to plant the trees. Students should also start to provide justification for why they selected these locations.
<p>Assessment(s)</p>	<ul style="list-style-type: none"> ● Surface Temperature Investigation ● Notice & Wonder ● Research on how trees benefit surface temperatures ● Progress Tracker
<p>Student Learning Goals</p>	<ul style="list-style-type: none"> ● I can design and carry out an investigation to collect data on surface temperatures around my school. ● I can analyze the temperature data I collect, create graphs, and explain the patterns I observe. ● I can understand what an Urban Heat Island is and explain how different surfaces contribute to higher temperatures. ● I can write a claim based on evidence from my investigation and explain my reasoning using the data I collected.


	<ul style="list-style-type: none"> ● I can use what I learned to identify places where planting trees could reduce heat and improve the environment.
Materials	<ul style="list-style-type: none"> ● Lesson Folder <ul style="list-style-type: none"> ○  Lesson 1 ○  Lesson 6 (in case you want access to all the documents for the final project) ● Teacher slideshow <ul style="list-style-type: none"> ○  Lesson 1: Addressing Rising Temperatures Through the Lens of Trees and Forests ● Materials for student activities <ul style="list-style-type: none"> ○ Sensors or infrared thermometer Chart paper ○ Clip boards Stop watch/Timer ○ Tree site that students want to use: different outside locations within that area ● Student worksheets, documents, readings, etc. <ul style="list-style-type: none"> ○  Surface Temperature Investigation & CER ○  Exemplar Surface Temperature Investigation.pdf ○  Progress Trackers ○  Notice/Wonder or can be done on a sheet of paper or in student notebook ○  The Benefit of Trees Student Proposal Plan ○  The Benefit of Trees Teacher Instructions

Lesson 2: Impact of Trees on Public Health and Environmental Justice

Duration	2 hrs
Objective(s)	<ul style="list-style-type: none"> ● Analyze how trees reduce the Heat Island Effect and create a presentation to effectively communicate the benefits of tree planting for public and environmental health. ● Research, analyze, and compare environmental health data across different locations, using tools such as the NatureScore. ● Critically evaluate the connection between systemic racism, such as redlining, and environmental inequities, and recognize the role of tree planting in addressing these disparities. ● Justify selection of location for tree planting based on research into environmental and public health benefits, particularly in economically disadvantaged or redlined areas.
Standards	<p>English</p> <ul style="list-style-type: none"> ● RI.CR.8.1. Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text. ● RI.CR.9–10.1. cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. ● RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem. ● SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. <p>Science</p> <ul style="list-style-type: none"> ● MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on

	<p>the environment.</p> <ul style="list-style-type: none"> ● HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. <p>Math</p> <ul style="list-style-type: none"> ● S.ID.A.1 Represent data with plots on the real number line ● 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. ● S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models ● S.IC.B.6 Evaluate reports based on data. <p>Social Studies</p> <ul style="list-style-type: none"> ● 6.2.12.EconGE.6.a: Evaluate efforts of governmental, non-governmental, and international organizations to address economic imbalances, social inequalities, climate change, health and/or illiteracy. <p>Computer Science/Design Thinking</p> <ul style="list-style-type: none"> ● 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation and propose an innovative sustainable solution
Synopsis/Overview	<p>In Lesson 2, students continue their exploration of the benefit of trees focusing on public health and environmental justice, building on the progress made in Lesson 1. They are asked to review their Progress Trackers and share their thoughts with the class. The lesson delves into the Urban Heat Island Effect and how trees can mitigate it, with a focus on redlining and environmental justice. Students discuss inequities faced by redlined neighborhoods, particularly how a lack of tree cover contributes to higher temperatures and poorer air quality. By engaging in group discussions, watching a video, and reviewing resources, students explore the health impacts of extreme heat and the systemic issues contributing to environmental disparities.</p>


	<p>As part of the Tree Planting Project, students are tasked with justifying the locations they chose for tree planting, based on the benefits and needs identified in their research. They use the NatureScore tool to assess the health impact of trees in various New Jersey locations that received grants to combat urban heat islands. By comparing health scores and analyzing data, students identify patterns and make connections between tree cover, urban heat, and public health. The lesson culminates with students reflecting on how trees can improve environmental justice and working on the third part of their Tree Planting Project Proposal, integrating their findings to support their location choices.</p>
<p>Activity(ies)</p>	<ol style="list-style-type: none"> 1. Progress Tracker: Have students pull their Progress Tracker from Lesson 1 <ol style="list-style-type: none"> a. Give students the chance to share what they have written and/or drawn from their Progress Tracker. <ol style="list-style-type: none"> i. Progress Trackers ii. Lesson 1 Question: How can trees reduce the Urban Heat Island Effect? b. Final Goal of Lesson 2: As students work through Lesson 2 they will need to work on the Part 1, #4b. of the The Benefit of Trees Student Proposal Plan . Based on the locations they selected from Lesson 1, they will now want to focus on gathering justification and benefits for why they selected these locations. c. The following slideshow has been created for Lesson 2: <ul style="list-style-type: none"> Lesson 2: Impact of Trees on Public Health and Environmental Justice 2. Environmental Justice/Inequalities: Students will discuss the impact of heat and air quality in areas with few or no trees, and explore how redlining has contributed to inequities in urban tree coverage. <ol style="list-style-type: none"> a. Turn & talk with a partner about the following questions. <i>To not overwhelm students, we suggest displaying one question at a time so they have the chance to fully develop their answers.</i> <ol style="list-style-type: none"> i. How does being hot affect you? ii. What do you do to deal with heat? iii. Think about your experience of a hot summer day when you have been in a parking lot with no shade. How is it different from being in a shady park on a hot summer day? What might this tell us about how life is different for people who live in urban areas and people who live in suburban or rural areas when it is very hot? iv. How might consistently poor air quality and higher temperatures affect people over time? How could their lives differ from those who do not experience these challenges?


- b. Then have students come back as a whole class to discuss the questions. As a whole class, make a list of health issues that people experience as a result of extreme heat on a piece of chart paper or in a presentation, so students can see it throughout the lesson.
- c. Show students the following video stopping at 5:53 mins into the video. [How Systemic Racism Linked to Fewer Trees in Your City | One Small Step](#)
 - i. Return to the list of health issues that could occur from extreme heat. Give students a few minutes to add any other health issues they uncovered while watching the video. Also give students a chance to reflect on other benefits that the trees can have on people.
 - ii. How does heat affect breathing - *having students tie into what they are seeing in the video about asthma.*
 - iii. Start to have students think about what environmental justice might be using the video as context for the students.
- d. **Taking Notes:** Using the  Lesson 2: Impact of Trees on Public Health and Environmental Justice
The presentation provides students with the definition of Environmental Justice and an overview of what Redlining is.
 - i. Define - EPA Environmental Justice (*definition comes from the <https://www.epa.gov/environmentaljustice>*): the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, tribal affiliation, or disability, in agency decision-making and other Federal activities that affect human health and the environment so that people:
 1. are fully protected from disproportionate and adverse human health and environmental effects (including risks and hazards), including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
 2. have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices

We have also provided the definition as a 5th grade reading level: Environmental justice means making sure everyone is treated fairly and gets a chance to be involved in decisions about their health and the environment, no matter their skin color, where they're from, how much money they have, or if they have a disability. It means:

- *Protecting people from things that could harm their health or the environment, like pollution, climate change,*


or unfair systems from the past.

- *Making sure everyone has an equal chance to live, play, work, learn, and grow in a healthy and safe environment.*
 - ii. Examples of Environmental Justice - show either of the following videos (if time permits you can show them both) then give them a chance to reflect on the video and what environmental justice means. Allow them time to update their definition in their notes.
 - 1. Option A: 4:35 from the [How Systemic Racism Linked to Fewer Trees in Your City | One Small Step](#)
 - 2. Option B: Young people shine light on Camden’s environmental racism in the following video.  THROUGH APRIL’S EYES *(If you want more information here is an article that goes with the video*
https://srhub.org/2022/07/13/camden-environmental-racism-play/?utm_source=chatgpt.com)
 - iii. Overview of what Redlining is - Play the 3 min NPR Recording [Racist Housing Practices From The 1930s Linked To Hotter Neighborhoods Today](#) for the students to listen to. Then if you have time or want to go further you can have them read over the article below the recording. *There is another video at the bottom of the page Housing Segregation and Redlining in America: A Short History but we would recommend pre-watching it if you decide to use this video because it starts out with a curse word.* Then have students take a few minutes to jot down answers to the following three questions.
 - 1. Explain how the redlining practices of the 1930s continue to impact neighborhoods (the ones presented in the video) today, focusing on the relationship between redlining and environmental factors. *See graph on the article linked above.*
 - 2. What is the connection between the historical practice of redlining and the current debate over environmental justice?
 - 3. The article highlights the link between redlining, tree canopy, and heat disparities. How does this information make you think about the relationship between environmental issues and social justice? Consider how these issues might intersect in your own life, and what actions you might take to address them.
 - iv. Come back together as a class to discuss the answers to the questions.
- e. **Notice/Wonder** - Give students the opportunity to explore more about redlining in NJ by having

them work with the [Mapping Inequality: Redlining in New Deal America](#) website. Have students partner up and give them one of the 3 following NJ cities to learn more about Redlining in these locations. To get to the locations students will click search to find New Jersey then the cities listed below. Then have them record what they  Notice/Wonder *(Optional Modification Students can click on the links on the map to learn more about the various areas.)*


- i. Locations:
 1. Atlantic City
 2. Camden
 3. Trenton
- f. Come back as a whole class to allow students to share what they noticed and wonder. Have students compare the 3 locations as well. Then provide students with the following information to help them further understanding redlining.
 - i. Those red mapped areas on the original maps almost 100 years ago are called redline areas. Those original areas still affect life today and often the tree cover in these areas is particularly low.
 1. Give students the chance to Google those 3 cities to pull up a Google Map. Then compare the Google Map to the redlining map to see if there is much or little change in the green spaces in those cities.
 - ii. One solution for reducing urban heat islands and making redline areas healthier for their inhabitants is to add more trees to a city.
 1. A targeted tree planting program is an example of a systematic approach to do this while also increasing biodiversity.
 2. Planting trees that will live well in an area will help address climate change and provide benefits to water, air and animals, which we will explore further in Lessons 4 & 5.

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the whole class discussion. Then wait for the next class to go into the Impact of Trees on Public Health.

3. **Impact of Trees on Public Health:** Students will research about a grant program providing trees to urban NJ areas and identify the health score of these locations.
 - a. **Present:** Using the  Lesson 2: Impact of Trees on Public Health and Environmental Justice review the NJ Natural Climate Solutions Grant Program. As a whole class or in small groups have students

look over [NJ Natural Climate Solutions Grant Program](#) . If reading in small groups, assign one location to each group to read over, otherwise if a whole group you may want to just summarize what is presented in the document. The document lists the NJ cities/towns that were awarded grants including a description of the projects and a map of locations. The document was created from the following press release.

- i. [Murphy Administration Awards \\$24.3 Million Through Its Natural Climate Solutions Grant Program](#)
 - ii. *Additional resources on the grant can be found at the NJDEP website [Natural Climate Solutions Grants](#) if you would want to extend the students research please use this site for further information.*
- b. **Turn and Talk:** Then provide students with the following questions to answer based on the grant.
- i. Which of the awarded projects would most likely help address urban heat islands and give economically disadvantaged communities relief from the effects of climate change and improve health?
 - ii. Come back as a whole class to share answers. Then explain that the students will be calculating the nature health scores of some of these locations and how adding trees may impact these locations.
- c. **Calculating Nature Health Scores:** Compare the Nature Health Score of awarded locations from the Natural Climate Solutions Grant
- i. NatureScore: [Discover your NatureScore](#)
 1. As a whole class, walk students through how to use the NatureScore by having them look at their school location. Within the [Lesson 2: Impact of Trees on Public Health and Environmental Justice](#) step-by-step instructions have been provided on how to use the Nature Score with using an example location.
 2. To tie back to the [The Benefit of Trees Student Proposal Plan](#) it would be beneficial to allow students to see an example of how to use the NatureScore with their school location. Using the school location will allow them to start gathering data and research for Part 1, #4a of the project which is working on justifications and locations. Students can record their findings in the [Progress Trackers](#) .
 3. Break students up into pairs and have them use the [NatureScore](#) to calculate the

score for different cities taking part in the Natural Climate Solution Grant. Each pair should be assigned one of the locations from Group A and one of the locations from Group B. Students will compare the health score to the 2 locations they have been assigned using the  Notice/Wonder to record their observations.

a. A list of locations and addresses have been provided.

i. Group A Locations:

1. Atlantic Avenue Street Tree Initiative

a. Address to use: 1301 Bacharach Boulevard, Atlantic City, NJ, 08401

2. Kearny Urban Forest Canopy & Stormwater Mitigation

a. Address to use: 402 Kearny Ave, Kearny, NJ 07032

3. Newark Canopy Initiative

a. Address to use: 60 Park Pl, Newark, NJ 07102, USA

4. Enhancing Camden's Canopy for Climate & Community

a. Address to use: 2250 S 8th St, Camden, NJ 08104

5. Throwin' Shade: Greening the Capital City

a. Address to use: 400 Chambers St, New York, NY 10282, USA

ii. Group B Locations:

1. Community Park North Forest Restoration

a. Address to use: 380 Witherspoon St, Princeton, NJ 08542

2. Readington Township Meadow Afforestation

a. Address to use: River Rd, Raritan Township, NJ 08822, USA

4. Come back as a whole class for each pair to share their findings of the health scores and anything they noticed/wondered. Fill out the class notice/wonder chart so students can see all of the scores for all the locations. Then ask the students the following questions:

i. What patterns are starting to come through from the data reviewed?

1. Make sure to note the health benefits from each score and






	<p style="text-align: center;">what health problems are identified.</p> <ul style="list-style-type: none"> ii. What connections can we bring back to the Health Issue chart we made at the start of Lesson 2? <i>(Bring up the slide from earlier in the lesson with the list they created and see what health issues are listed and if they come up in the Nature Score. Trying to help students make a connection between trees and the impact they have on human health)</i> iii. How does this relate back to what we learned in Lesson 1? <ul style="list-style-type: none"> 1. Urban heat islands, surface temperatures, and environments? iv. What information gathered could be used to help support your The Benefit of Trees Student Proposal Plan Unit. (Have students add this to their Progress Tracker, focusing on Part 1, #4 of the proposal) <p>4. Progress Tracker: Have students pull their Progress Trackers from Lesson 1 to now completed Lesson 2 on the Progress Tracker.</p> <ul style="list-style-type: none"> a. Give students the chance to answer the following question: <ul style="list-style-type: none"> i. Lesson 2 Question: What is the impact of trees and forests in public health and environmental justice? ii. Make sure students have the chance to write or draw what they have figured out and any questions they still have. iii. Final Goal of Lesson 2: As students work through Lesson 2, they will need to continue working on Part 1, #4b of the Tree Planting Project Proposal. Based on the locations they selected from Lesson 1, they will now want to focus on gathering justification and benefits for why they selected these locations.
Assessment(s)	<ul style="list-style-type: none"> ● Progress Tracker ● Notice/Wonder




Student Learning Goals	<ul style="list-style-type: none"> ● I can gain an understanding of how trees can reduce the Heat Island Effect and effectively communicate the benefits of tree planting to improve public and environmental health. ● I can explain how systemic racism, such as redlining, has contributed to environmental inequities as well as analyze the connection between access to green spaces and the health impacts of environmental injustice. ● I will gather research to justify the locations I selected for my tree planting project, focusing on how tree planting can improve public health and mitigate climate change impacts in my chosen location.
Materials	<ul style="list-style-type: none"> ● Lesson 2 Folder <ul style="list-style-type: none"> ○ Lesson 2 ● Teacher slide show <ul style="list-style-type: none"> ○ Lesson 2: Impact of Trees on Public Health and Environmental Justice ● Materials for student activities <ul style="list-style-type: none"> ○ All resources have been embedded in the teacher directions and slide show ● Student worksheets, documents, readings, etc. <ul style="list-style-type: none"> ○ Progress Trackers ○ Notice/Wonder ○ NJ Natural Climate Solutions Grant Program ○ The Benefit of Trees Student Proposal Plan ● Extra Resources: <ul style="list-style-type: none"> ○ EPA Heat Islands and Equity ○ Why shade trees are hard to find in redlined neighborhoods (nationalgeographic.com) ○ 50 years after being outlawed, redlining still drives neighborhood health inequities (berkeley.edu) ○ Redlining—and Greening—of Cities. What’s the Connection? - American Forests ○ Studies Find Redlining Linked To More Heat, Fewer Trees In Cities Nationwide : NPR ○ What is Redlining? ○ How Systemic Racism Linked to Fewer Trees in Your City One Small Step ○ The Arbor Day Foundation And Naturequant Join To Unlock The Power Of Trees In Neighborhoods ○ Using Tree Equity Score

Lesson 3: What is the Role of Forests in Carbon Sequestration?

Duration	3 hours
Objective(s)	<ul style="list-style-type: none"> ● Analyze how trees store carbon and how forests mitigate climate change by constructing models to evaluate CO₂'s impact on global temperatures. ● Apply data collection techniques to identify tree species, utilize allometric equations to calculate tree biomass, and analyze collected data to estimate and evaluate the carbon storage capacity of various trees. ● Apply and justify through research to select tree species for their tree planting project proposal, providing justifications based on carbon storage capacity and environmental impact.
Standards	<p>English</p> <ul style="list-style-type: none"> ● W.AW.9–10.1.A-E: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence. ● SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. ● SL.PE.9–10.1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. ● RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem. <p>Math</p> <ul style="list-style-type: none"> ● 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

	<ul style="list-style-type: none"> ● S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models. ● S.IC.B.6 Evaluate reports based on data. ● G.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). <p>Science</p> <ul style="list-style-type: none"> ● MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. ● HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. ● HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
Synopsis/Overview	<p>In this lesson, students dive deeper into the relationship between trees, forests, and climate change, focusing on the concept of carbon sequestration. They begin by reviewing their Progress Trackers from Lesson 2, reflecting on the impact of trees on public health and environmental justice. The class is introduced to tree biomass and carbon storage through guided note-taking and a model of the carbon cycle. Using a climate change simulation, students explore how varying levels of carbon dioxide affect global temperatures, predicting and testing their ideas. They watch a video on forest protection to further connect their learning to the real-world benefits of trees in mitigating climate change. Students then document their justifications for tree planting as part of their ongoing project proposal.</p> <p>The hands-on portion of the lesson involves students identifying tree species, measuring tree diameters, and applying allometric equations to estimate biomass and carbon storage. They conduct fieldwork in a designated area, recording data on various tree species to understand which trees store the most carbon and produce oxygen. Back in the classroom, students analyze their data, discussing the implications of tree diversity on carbon sequestration and how forestry management impacts the carbon cycle. The lesson introduces the concept of micro forests, showing their potential to address urban heat islands. Students conclude by updating their Progress</p>

	Trackers with insights on how carbon sequestration in forests mitigates climate change, preparing them to identify and justify tree choices for their final project proposal.
Activity(ies)	<ol style="list-style-type: none"> 1. Progress Tracker: Have students pull their Progress Tracker from Lesson 2 <ol style="list-style-type: none"> a. Give students the chance to share what they have written and/or drawn from their Progress Tracker. <ol style="list-style-type: none"> i.  Progress Trackers ii. Lesson 2 Question: What is the impact of trees and forest in public health and environmental justice? b. Final Goal of Lesson 3: As students work through Lesson 3 they will need to work on #4 of the  The Benefit of Trees Student Proposal Plan &  Planting Summary and Benefits Spreadsheet . Students are starting to identify which trees they want for their location, the justification for these trees, and building out parts of the planting spreadsheet. c. The following slideshow has been created for Lesson 3: <ol style="list-style-type: none">  Lesson 3: What is the Role of Forests in Carbon Sequestration? 2. Introduction to Tree Biomass and Carbon Storage: Students will be taking notes on tree biomass and carbon storage to prepare for the lab that follows. <ol style="list-style-type: none"> a. Note Taking/Researching: As a whole class, brief students on how trees store carbon and the significance of this in climate regulation. <ol style="list-style-type: none"> i. Provide students with a model of the carbon cycle which has been provided in the  Lesson 3: What is the Role of Forests in Carbon Sequestration? b. Modeling Climate Change Simulation: Give students the chance to work with the Climate Change Model from Concord Consortium to learn how an increase in carbon dioxide with all other factors staying consistent, increases the global temperature. <ol style="list-style-type: none"> i. They can do this individually, in pairs, or as a whole class. Once students have interacted with the model, have them draw a prediction showing the interaction of variables to make the world as hot or cold as possible. Do not let them do this yet on the simulation. Allow students the opportunity to share out to the class their predictions. ii. Next have students try the following using the Concord Consortium Simulation to determine if their predictions were correct: <ol style="list-style-type: none"> 1. Try to make the world as hot as possible, how much Co2 is used?



- 2. Try to make the world as cold as possible, what ppm is Co2?
 - iii. Once they have tried out the simulation, give them a chance to modify or update their models. Come back as a class to talk about what they found out.
- c. **Show Video: Protecting This Forest Can Help Stop Climate Change**
 - i. Turn & Talk: Have students talk about the following questions to connect from what they did with the simulation and how it ties into the benefits of trees.
 - 1. Based on your model, less carbon in the atmosphere keeps the world colder?
 - 2. What are some ways that we might be able to reduce carbon in our atmosphere?
 - ii.  Protecting This Forest Can Help Stop Climate Change
 - iii. Give students the chance to record in their  Progress Trackers any justifications for why they are planting trees. This activity will support Part 1, #4 of the  The Benefit of Trees Student Proposal Plan .

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the whole class discussion. Then wait for the next class to go into the Allometry in Trees and Carbon Sequestration Lab.

- 3. Allometry in Trees and Carbon Sequestration Lab:** Students will learn about how to identify trees and will conduct a lab to calculate how much carbon trees store.
- a. **How to Identify Trees:** First students will need to learn how to identify trees so that when they complete the lab they will know which trees they are working with.
 - i. You will want to decide on which tool you want students to use to identify trees and then walk them through that tool. Below are some suggested resources/tools to use for identifying trees.
 - 1. Trees of New Jersey & Mid-Atlantic States
 - a. <https://rucore.libraries.rutgers.edu/rutgers-lib/54233/PDF/1/play/>
 - 2. Apps
 - a. [iNaturalist](#)
 - b. Camera from iPhone and Photo will identify the tree
 - ii. Students can use the following sources to help with identifying the trees around their school. This will help them with working on the allometry in trees and Carbon Sequestration Lab in this lesson.

- iii. We suggest you take your students out and give them a chance to practice identifying some trees that you could use for the lab. While doing this they can also start to work on gathering research and data for # 4 of the [☰ The Benefit of Trees Student Proposal Plan](#) .
- b. **Carbon Sequestration Lab:** Introduce the concept of allometric equations and how they are used to estimate tree biomass from measurable parameters. Scientists use allometric equations to estimate the total weight of a tree, or its biomass, without having to chop it down and weigh it. These equations are like mathematical formulas that use easy-to-measure tree characteristics, like its diameter, height, and wood density, to predict the tree's total weight. They are especially important for understanding how much carbon forests store, which is crucial in the fight against climate change.
 - i. Use the [📄 Lesson 3: What is the Role of Forests in Carbon Sequestration?](#) to provide students background knowledge on allometric equations.
 - ii. Break students up into groups of 3 and provide each student with the following handout: [📄 Activity: The Carbon in Trees.pdf](#) (*worksheet comes from NOAA*) to use for how to collect and record their data. Each student will need the handout so that each group is able to collect data on 3 different types of trees.
- c. Take students to a designated area with a variety of tree species.
 - i. Demonstrate how to measure the circumference at chest height (approximately 4.5 feet off the ground) and convert this measurement to diameter. Make sure to keep the tape level! 3 team members could make independent measurements of each tree, so they see the variation (measurement error). They can then use the average in their calculations.
- d. Have students practice measuring several trees before having them record their data for the trees they are working with. Then give students time to record their data before going back into the classroom to learn how to work with the allometric questions. Each group should have data on 3 different trees before going back into the classroom)

Modification- if there are no trees on campus, tree cuts can be used for measuring diameter and bark analysis (Example- <https://a.co/d/24NU5Hw>). Paper models of bark, diameter, and leaves can also be used if there are no trees on campus. Additionally, students can use data collected from trees at Rutgers to use for their allometric equations. Students can choose from one of the following three trees that can be found on Rutgers New Brunswick campus.

- *Tree #1: White Oak-Circumference 141cm,*
 - *Tree #2 Sugar Maple Circumference 132cm,*
 - *Tree #3: Red Oak-Circumference 112cm*
- e. Back in the classroom, introduce the specific allometric equations for the species measured.
- i. Guide students through the calculations to estimate the biomass from their measurements.
 1. To calculate tree biomass, we use a standard allometric equation of the form $M=aDb$ where M is aboveground tree biomass (dry weight; kg), D is the diameter at 54 inches or 4.5 feet above the ground (cm), and “a” and “b” are species specific coefficients. Locate the coefficients for the species of tree that you have in the table and calculate tree biomass (M).
- f. Discuss the conversion from biomass to carbon storage, using general factors (e.g., assuming 50% of biomass is carbon).
- g. i-Tree Planting Calculator: Carbon Sequestration Calculator
Students will want to check their math from the carbon sequestration lab by using the i-Tree Planting Calculator. They should use the 3 trees they identified from the lab in the calculator.
- i. The following document will walk students through how to use this calculator.
 1.  Carbon Sequestration Calculation.pdf
 - a. Make students do not change the preselected units, as the program has already set them to the correct settings..
 - ii. Students should be directed to first look at carbon sequestration and then focus on avoidance of carbon dioxide. Refer back to lesson one about shade and how the deflection of solar energy hitting the air will create cooler air under the tree leaves. This will reduce the need for air conditioning.
 1. *Note for Teachers: In this report, students can also see data under the tabs of Energy, Hydro, and Air Pollution that they will use in Lesson 4.*
 - iii. If students plan to use any of the trees selected during the lab they will want to add this to the  Planting Summary and Benefits Spreadsheet *(This would be a good opportunity to show the students this document since it is part of the proposal and will need to be filled out. The i-Tree Planting Calculator will have most of the information needed for the spreadsheet)*

h. Data Analysis from Carbon in Trees

- i. Have students analyze the calculated carbon storage data for the 3 trees they selected to identify which species store the most carbon.
- ii. Students should create a bar graph representing each tree and the amount of carbon storage.
 1. Misconception - There is a known misconception that students value trees highly for their oxygen creation. However that is a low level benefit for trees and the economic Valuation i-Tree assigns the value of oxygen production at \$0/tonne. The reason the oxygen production value of trees is insignificant is due to the large amount of oxygen within the atmosphere (approximately 21 percent of the atmosphere's volume is oxygen) and because species of algae are estimated to replace about 90 percent of all oxygen used. Thus, though trees do produce significant amounts of oxygen, it is not a significant ecological benefit (see Nowak et al. 2007b).




i. Discussion

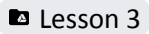


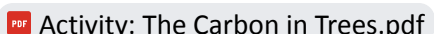
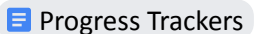
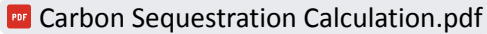
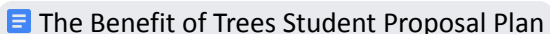
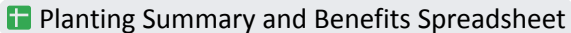
- i. Have students in their groups present their findings from the data they collected and analyzed during their fieldwork.
- ii. As a class, create a histogram of trees with carbon sequestration.
 1. A histogram is a visually represent the distribution of carbon sequestration rates across a group of trees, showing how many trees fall within different ranges of carbon capture capacity, typically with the x-axis displaying the carbon sequestration rate and the y-axis representing the number of trees in that range, resulting in a bar graph where taller bars indicate a higher concentration of trees sequestering a specific amount of carbon.
- iii. Discuss the implications of tree diversity on carbon storage capacity and how urban and rural forestry management can impact local and global carbon cycles.

4. **Micro Forests:** What are the benefits of micro forests? Now we are moving from individual trees to forests as a system including soil, trees, air and water. How can micro forests be used to address urban heat islands, especially in places that have been impacted by redlining?

a. Show student the video:

- i. [Empowering community-led green urban development](#)

	<p>b. Then ask students the following:</p> <ol style="list-style-type: none"> i. How could policies or community collaborations like this support an urban area to improve the health of its environment? ii. What aspects of these solutions do you think would be most persuasive for a grant proposal? <p>c. When we think of forests, we think of trees above land, but can soil sequester carbon?</p> <ol style="list-style-type: none"> i. Show students the slide on carbon sequestration in the soil. Give them time to notice and wonder about the diagram on Slide 20. ii. What else do you know about how the trees and soil sequester carbon? <p>5. Progress Tracker: Have students pull their  Progress Trackers from Lesson 2</p> <p>a. Give students the chance to answer the following question.</p> <ol style="list-style-type: none"> i. Lesson 3 Question: How does carbon sequestration in trees and forests help to mitigate climate change effects? ii. Make sure students have the chance to write or draw what they have figured out and any questions they still have. At the start of the next lesson, we will review what students have reflected on. iii. Final Goal of Lesson 3: As students work through Lesson 3 they will need to work on #4 of the  The Benefit of Trees Student Proposal Plan &  Planting Summary and Benefits Spreadsheet. Students are starting to identify which trees they want for their location, the justification for these trees, and building out parts of the planting spreadsheet. <p><i>Extension: Depending on time you can introduce students to iTree (https://www.itreetools.org/) giving them the opportunity to use the tool. Reference support for Itree landscape can be found here- https://www.itreetools.org/documents/637/I-Tree_Landscape_How_To_reduced.pdf</i></p>
Assessment(s)	<ul style="list-style-type: none"> ● Progress Tracker ● Allometry in Trees and Carbon Sequestration Lab ● Modeling Climate Change

Student Learning Goals	<ul style="list-style-type: none"> ● I can explain how trees store carbon and how forests help mitigate climate change, and I can use models to explore how CO₂ affects global temperatures. ● I can identify tree species and use measurements to calculate their carbon storage using allometric equations. ● I can select appropriate tree species for my tree planting project and justify my choices based on their carbon storage capacity and environmental benefits.
Materials	<ul style="list-style-type: none"> ● Lesson 3 Folder <ul style="list-style-type: none"> ○  Lesson 3 ● Teacher slideshow for Lesson 3 <ul style="list-style-type: none"> ○  Lesson 3: What is the Role of Forests in Carbon Sequestration? ● Materials for student activities <ul style="list-style-type: none"> ○ Calculator ○ Measuring tape ○ Ways to Identify trees <ul style="list-style-type: none"> ▪ Trees of New Jersey & Mid-Atlantic States <ul style="list-style-type: none"> ● https://rucore.libraries.rutgers.edu/rutgers-lib/54233/PDF/1/play/ ▪ Apps <ul style="list-style-type: none"> ● iNaturalist ● Camera from iPhone and Photo will identify the tree ● Student worksheets, documents, readings, etc. <ul style="list-style-type: none"> ○  Notice/Wonder ○  Activity: The Carbon in Trees.pdf ○  Progress Trackers ○ https://www.itreetools.org/documents/637/I-Tree_Landscape_How_To_reduced.pdf ○  Carbon Sequestration Calculation.pdf ○  The Benefit of Trees Student Proposal Plan ○  Planting Summary and Benefits Spreadsheet

Lesson 4: Other Environmental and Economic Benefits of Trees

Duration	3 hours
Objective(s)	<ul style="list-style-type: none"> ● Identify the additional environmental and economic benefits of trees. ● Analyze and assess the environmental and economic benefits of different tree species, linking this data to their Tree Planting Project Proposal. ● Create a diagram illustrating how trees benefit water, land and air, incorporating new insights from the lesson, and revising it as their understanding deepens. ● Identify appropriate tree species for their selected location and justify their choices based on the environmental benefits, using data and research from the lesson activities.
Standards	<p>English</p> <ul style="list-style-type: none"> ● SL.UM.9–10.5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance findings, reasoning, and evidence and to add interest. ● W.AW.9–10.1.A-E: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence. <p>Math</p> <ul style="list-style-type: none"> ● S.IC.B.6 Evaluate reports based on data. ● G.MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). <p>Science</p> <ul style="list-style-type: none"> ● MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. ● HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

	<ul style="list-style-type: none"> ● HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
<p>Synopsis/Overview</p>	<p>In Lesson 4, students will continue building on their knowledge of how trees contribute to environmental health by focusing on the benefits trees provide to water, air, and land. They will revisit their Progress Trackers from Lesson 3, where they explored carbon sequestration, and share their findings. As they work through Lesson 4, students will dive into Part 1, #4 of their Tree Planting Project Proposal, identifying specific tree species and justifying their selection based on environmental benefits. The lesson introduces a range of activities, including a turn-and-talk on tree benefits, reading articles, watching videos, and creating diagrams that highlight the positive impact of trees.</p> <p>Additionally, students will use tools such as the Arbor Day Foundation - Tree Benefit Calculator and i-Tree Planting to explore the tangible benefits trees provide. They will analyze trees from their Lesson 3 lab and apply this knowledge to their proposals. The lesson also includes class discussions, a gallery walk for peer review, and a math extension on calculating tree cover and uncertainty using statistical methods. Ultimately, students will refine their tree planting proposals and update their diagrams with the new information they have gathered.</p>
<p>Activity(ies)</p>	<ol style="list-style-type: none"> 1. Progress Tracker: Have students pull their Progress Tracker from Lesson 3 <ol style="list-style-type: none"> a. Give students the chance to share what they have written and/or drawn from their Progress Tracker. <ol style="list-style-type: none"> i. Progress Trackers ii. Lesson 3 Question: How does carbon sequestration in trees and forests help to mitigate climate change effects? b. Final Goal of Lesson 4: As students work through Lesson 4 they will need to work on Part 1, #4 of the The Benefit of Trees Student Proposal Plan and Planting Summary and Benefits Spreadsheet . Students are continuing to identify which trees they want for their location and the justification and benefits for these trees. c. The following slideshow has been created for Lesson 4: Lesson 4: Other Environmental and Economic Benefits of Tree 2. Overview of how Trees Benefit Water, Land and Air: This will be a brainstorming opportunity for students to help prepare them for the Tree Benefit Calculator activity and other parts of the lesson.

- a. **Turn & Talk:** Have students review the slideshow as an introduction to the benefit and trees <https://www.arborday.org/youth-education/benefits-trees> Then have students do a turn and talk about the following question:
 - i. How can trees benefit the environment i.e. water, land, and air?
 - b. Come back as a whole class to make a list of benefits they identified. You can create this list in the [Lesson 4: Other Environmental and Economic Benefits of Tree](#) .
 - c. Next give students the opportunity to read the following article from the Nature Conservancy
 - i. [6 Ways Trees Benefit All of Us](#)
 - ii. Come back as a whole class to add any other benefits to the class list.
 - d. Have students watch the video *Why Do We Need Trees?*
 - i. [Why Do We Need Trees? | Eco Facts | One Tree Planted](#)
 - e. **Tree Diagram:** Have students work in pairs to create a diagram of a Tree showcasing different benefits that support the environment. *(Please note they will be adding to this as they go through Lesson 4)*
 - i. Consider tying back to Lesson 2 and having students include how trees can improve health on their diagram.
 - ii. The diagram can be done on a sheet of blank paper, chart paper, or digital but the expectations for the diagram should include:
 1. Labels
 2. Symbols
 3. Color
 - f. Allow students time to fill in their [Progress Trackers](#) for research on justification and benefits of the trees they are selecting for the [The Benefit of Trees Student Proposal Plan](#) which goes with Part 1, #4b of the proposal.
3. **Tree Benefit Calculator:** Examine certain trees we observed in our Lesson 3 lab activity to learn more about their specific benefits.
- a. Walk students through using the Arbor Day Foundation - [National Tree Benefit Calculator](#) to calculate certain trees they observed during the lab to learn more about the specific benefits these trees can provide.
 - i. A step by step overview will be provided with an exemplar tree found in the

Lesson 4: Other Environmental and Economic Benefits of Tree . During the overview, make sure to point out the different tabs from each area. *(To customize lessons for your school, teachers can pick a local familiar tree to use in the benefit calculator and then ask questions like: "What is this tree worth? What is it doing for the community?")*

- ii. Students will pick a tree species, tree diameter, and what land-type use is the tree nearest.
 - 1. You may want to guide them to select a tree that they identified during Lesson 3 Allometry in Trees and Carbon Sequestration Lab. During this lab, they had worked with 3 different trees outside. Using one of those would be a great place to start.
 - iii. As you do the overview with an example tree make sure to point out the tabs and go over any areas that students may not have knowledge about. Each tab deals with how the tree benefits the following areas:
 - 1. Overall Benefits
 - 2. Stormwater
 - 3. Property Value
 - 4. Energy
 - 5. Air Quality
 - 6. CO₂
 - 7. About
- b. **Turn and Talk** - Looking at the overall benefits with students have them answer the following questions:
- i. We learned how trees can help with Co₂ by Carbon Sequestration, but how can they improve those other 5 factors?
 - ii. How can they be attached to a monetary value?
- c. **Notice/Wonder:** Have students pick three trees that they have identified as possible trees they want to include in their Tree Planting Project Proposal.
- i. Have students complete a Notice/Wonder about the various trees that they place into the calculator.
 - 1. What else do you know about how trees sequester carbon?
 - ii. Come back as a whole class to discuss their findings and share out anything they have noticed or wondered to at to the class chat in the

Lesson 4: Other Environmental and Economic Benefits of Tree .

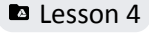
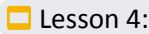
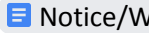
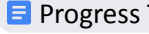
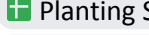
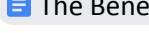
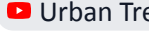
- iii. Give students the opportunity to go back to their tree diagram and update or add any new benefits.

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the students update their diagram. Then wait for the next class to go into the i-Tree Planting.

4. i-Tree Planting: Students will use [i-Tree planting](#) to evaluate the benefits they will achieve by planting trees in their selected location for the Tree Planting Project Proposal.



- a. Students should open their [+](#) Planting Summary and Benefits Spreadsheet from Lesson 3. They will use the spreadsheet to add in information on the benefits of their selected trees for energy, storm water, and air pollution.
- b. Start by having students watch an introduction in i-Tree
 - i. [▶ Intro to i-Tree: Value of a tree?](#)
 - 1. Key Vocabulary from the video
 - a. Revenue Generator: Something that makes money. Example: A lemonade stand makes money by selling lemonade.
 - b. Carbon Compensation: A way to balance out pollution by doing something good for the environment, like planting trees to absorb carbon dioxide.
 - c. Asset Management: Taking care of things you own, like making sure your bike is clean and working so it lasts longer.
- c. Next walk students through the i-Tree Planting. Step-by-step directions have been created in the [📄 Lesson 4: Other Environmental and Economic Benefits of Tree](#) .
 - i. [Welcome to i-Tree Planting](#)
Welcome to the i-Tree Planting Calculator!
Easily estimate the long-term environmental benefits from a tree planting project in terms of carbon dioxide, air pollution, stormwater impacts, energy savings, and canopy cover.
- d. **Selected Project Location Review:** Allow students time to work with the selected location that they will use for their proposal.
 - i. To tie back to the [☰ The Benefit of Trees Student Proposal Plan](#) it would be beneficial to gather data and maps about their location to help with building their proposal.
 - ii. Students should write a summary of the benefits that the trees provide in their location based on the current existing grass, trees, structures, impervious surfaces (*was explained in*


	<p><i>Lesson 1, but does not hurt to review here), hydrology (you will want to explain this term to students - the distribution, movement, and management of water), and roads.</i></p> <p>iii. Students should use this data to make suggestions for which trees should be planted where at their chosen location. For example, an addition of shade trees along a vacant area by metal bleachers could provide shade for spectators.</p> <p>e. Class Discussion and Update Tree Diagram:</p> <p>i. Come back as a whole class to discuss their findings.</p> <p>ii. Then allow them time to update their Tree Diagram one last time.</p> <p>5. Gallery Walk: Give students the chance to conduct a gallery walk of the tree diagrams they created on benefits of trees.</p> <p>a. Display their diagrams and allow them to walk around to review the diagrams.</p> <p>b. Then give each student 3 sticker dots to go back and place them on parts of the diagrams that stood out to them, they agree with, or were surprised about.</p> <p>c. Come back as a whole class to look at where the dots were placed and give students an opportunity to share and ask any follow up questions.</p> <p>6. Progress Tracker: Have students pull their Progress Trackers from Lesson 3</p> <p>a. Lesson 4 Question: What are some other environmental and economic benefits of trees? How do they benefit trees?</p> <p>b. Make sure students have the chance to write or draw what they have figured out and any questions they still have. At the start of the next lesson, we will review what students have reflected on.</p> <p>c. Final Goal of Lesson 4: As students work through Lesson 4 they will need to work on Part 1, #4 of the The Benefit of Trees Student Proposal Plan & Planting Summary and Benefits Spreadsheet. Students are continuing to identify which trees they want for their location and the justification and benefits for these trees.</p>
Assessment(s)	<ul style="list-style-type: none"> ● Progress Tracker ● Tree Diagram ● Notice/Wonder
Students Learning Goals	<ul style="list-style-type: none"> ● I will be able to clearly articulate the various ways trees benefit people and the environment by improving water and air quality, absorbing stormwater, reducing energy use, and increasing property values.

	<ul style="list-style-type: none"> ● I will effectively use tools such as the Arbor Day Foundation National Tree Benefit Calculator and i-Tree planting to gather data on tree species, and interpret this data to inform my or our? Tree Planting Project Proposal. ● I will be able to create and update a detailed diagram that visually represents the environmental benefits of trees, incorporating feedback and new information throughout the lesson. ● I will be able to justify their tree species selections for their Tree Planting Project Proposal with research-backed explanations and data on the ecological and community benefits those trees provide.
<p>Materials</p>	<ul style="list-style-type: none"> ● Lesson 4 Folder <ul style="list-style-type: none"> ○  Lesson 4 ● Teacher slideshow for Lesson 4 <ul style="list-style-type: none"> ○  Lesson 4: Other Environmental and Economic Benefits of Tree ● Materials for student activities <ul style="list-style-type: none"> ○ All resources have been embedded in the teacher directions and slide show ● Student worksheets, documents, readings, etc. <ul style="list-style-type: none"> ○  Notice/Wonder ○  Progress Trackers ○  Planting Summary and Benefits Spreadsheet ○  The Benefit of Trees Student Proposal Plan ● Extra Resources: <ul style="list-style-type: none"> ○  Urban Trees, Better Air Quality ○ Planting Healthy Air (arcgis.com)

Lesson 5: The Role of Trees in Supporting Biodiversity

Duration	2 hours
Objective(s)	<ul style="list-style-type: none"> ● Analyze the role of trees in supporting biodiversity by researching different forest ecosystems and summarizing findings in an infographic. ● Evaluate the impact of logging on biodiversity through group readings and discussions focused on the Boreal Forest and related ecosystems. ● Collaborate to create a visual representation of a forest ecosystem's food web, demonstrating the effects of deforestation on species interactions and habitats. ● Justify the selection of tree species and planting locations in the Tree Planting Project Proposal by integrating research on environmental benefits and economic value.
Standards	<p>English</p> <ul style="list-style-type: none"> ● RI.CR.8.1. Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text. ● RI.CR.9–10.1. cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. ● RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem. <p>Science</p> <ul style="list-style-type: none"> ● MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. ● HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. <p>Math</p> <ul style="list-style-type: none"> ● S.ID.A.1 Represent data with plots on the real number line


	<ul style="list-style-type: none"> ● 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. ● S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models ● S.IC.B.6 Evaluate reports based on data. <p>Computer Science/Design Thinking</p> <ul style="list-style-type: none"> ● 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation and propose an innovative sustainable solution.
<p>Synopsis/Overview</p>	<p>In Lesson 5, students will deepen their understanding of how trees contribute to environmental quality and biodiversity. They will begin by reviewing their Progress Trackers from the previous lesson. The lesson then shifts to an exploration of the Boreal Forest (<i>was introduced in Lesson 3 with carbon sequestration</i>) and the impacts of logging, using a video and group reading activity to analyze biodiversity changes. Through annotation and collaborative discussions, students will synthesize key ideas and create food webs illustrating ecosystem changes caused by deforestation.</p> <p>Building on this research, students will work in small groups to create infographics detailing how trees improve and support biodiversity. These infographics will focus on various New Jersey forests, utilizing both provided resources and independent research. The lesson culminates in a gallery walk, where students will review and discuss each group's findings, followed by a reflection on how trees offer additional benefits. Throughout the lesson, students will continue to update their Progress Trackers as they work towards completing their Tree Planting Project Proposal.</p>
<p>Activity(ies)</p>	<ol style="list-style-type: none"> 1. Progress Tracker: Have students pull their Progress Tracker from Lesson 4 <ol style="list-style-type: none"> a. Give students the chance to share what they have written and/or drawn in column 2, What I figured out, from their Progress Tracker. <ol style="list-style-type: none"> i.  Progress Trackers ii. Lesson 4 Question: How can trees benefit the environment i.e. water, air, and land? iii. Final Goal of Lesson 5: As students work through Lesson 5 they will need to work on #2, #3, & #4 of the  The Benefit of Trees Student Proposal Plan &

 [Planting Summary and Benefits Spreadsheet](#) . Students are continuing to research justifications and benefits for the location and trees they are selecting.

iv. The following slideshow has been created for Lesson 5:

 [Lesson 5: The Role of Trees in Supporting Biodiversity](#)

2. The Role Forests have in Biodiversity: Students will examine an example forest not in NJ, the Boreal forest. Students previously learned about the Boreal forest in Lesson 3 while watching the YouTube

( [Protecting This Forest Can Help Stop Climate Change](#)) on carbon sequestration. Take a moment to

allow students to look over their Progress Tracker from Lesson 3 and have a class discussion on what they remember. You could also take the time to reshew the video. Students will learn about how the changes from logging have affected biodiversity. They will use this information as an example for their infographic project.

a. Turn & Talk: Based off of the Boreal forest video from Lesson 3 and what they have learned so far, ask students to **define Biodiversity**. Have students turn & talk about what biodiversity means and how it may be impacted by logging in the Boreal forest. Come back as a call to create a class definition of Biodiversity (*short for biological diversity — is the variety of all living things and their interactions*).

i. Next, have students draw on what they learned in Lesson 4, the benefits of trees on land, air, and water, and how those areas can impact biodiversity as well.

1. Have students take out their tree diagram from the previous lesson. Share their tree diagram with another group. Place sticky notes on the diagrams for ways that animals and plants can benefit from those improvements to water, air, and land. Share your thoughts with the original owner of the tree diagram.

b. Show students the following YouTube video *Climbing Big Lonely Doug: Round 2* about Canada's boreal forest to see how logging removes large ecosystems


i.  [Climbing Big Lonely Doug: Round 2 \(Drone\)](#)

ii. Ask students to write down how they felt after watching the video.

iii. Come back as a whole class to discuss what they wrote.

iv. Have students work in pairs to research if their town has an ordinance related to cutting down trees. Once students have had time to do the research, have them come back as a whole class to discuss what they found out. *Please search prior to make sure your town has an ordinance, if they do not have one, talk to your students about this and give them time*



to brainstorm what ordinance they would create for their town. You can also look at towns next to yours and have them look at their ordinances if they have them. Most municipalities have a link on their website to an online Code Book. It contains all the municipal ordinances and is searchable. Sample ordinances can also be found [here](#). It may be interesting for students to compare the different ordinances to assess the range of commitments to protecting their tree canopy.

- c. **Annotation Reading/Jigsaw:** Students will read and annotate the reading and website about the Boreal Forest. *Suggested Reading Modifications - Use Diffit to adjust the reading levels as needed for your students. Here are step-by-step directions on how to use Diffit: [Directions of Diffit](#).*
- d. Break students up into groups of 4 and assign each of them one of the following readings:
 - i. [Why Boreal Forests Matter The Role of Boreal Forests in Sustainable Development](#) (pgs. 2-6 students need to read)
 - ii. [Canada's Boreal Forest: Why It's So Important](#)
 - iii. [Habitat, Food Web Changes From Logging Threatening Endangered Caribou, Study Reveals](#)
 - iv. [How a Change in the Forest Can Affect the Dynamics of its Animal Community](#)
- e. Have students use the provided annotation template ( Annotation Template -Lesson 5) to complete their notes. (*To learn more about how to annotate in science check out [New Visions for Public School: Annotation](#)*)
 - i. Once students annotate their reading they will come back as a group to share their annotations. They can use the prompting questions at the bottom of the template to ask their group questions if they need help sharing their annotations. Once they have done this, give students a few minutes to go back and add anything helpful or useful to their annotations.
- f. **Creating a Food Web:** In their group they will take their annotated notes to create a food web showing how the food web will look after cutting down trees.
 - i. Come back as a whole class and have each group share out their food web. Also allow them time to share a couple of their best annotations from the readings.

Modification - Another option instead of the annotation and jigsaw is to have students do the viral video mini activity using the readings provided. Here are step-by-step directions on how to do this activity.

 **Viral Video Mini Lesson : A System for a Healthy Planet**

If you need a stopping point from one class period to another this would be a perfect time to stop. Have the whole class discussion. Then wait for the next class to go into the Tree Benefits Research & Infographic.



3. **Tree Benefits Research & Infographic:** Students will research and create an infographic on the benefits of trees. They will take into consideration what they have learned in Lesson 4 and Lesson 5 to help with creating the infographic.
 - a. Students will move into researching a specific forest in NJ to better understand the benefits trees have on improving environmental qualities that could include land, air, water, and biodiversity. Students can decide on which benefits they want to highlight and showcase on their infographic, but should include at least 3 benefits and one must be on biodiversity. Students will work in groups of 2-3 to create an infographic of the benefits of trees. *An infographic is a visual image such as a chart or diagram used to represent information or data. Students can create infographics in any program you think students will do best on but if you need a program suggestion then [canva](#) is a good program to use.*
 - i. Have students use the following document to complete the research and infographic. It includes resources they can use to gather information to help create the infographic and the expectations for the infographic.
 1.  Tree Benefits Research & Infographic
 - a. Websites that student can create their infographic:
 - i. [Canva](#)
 - ii. [Piktochart](#)
 - iii. [Adobe Express](#)
 2. Examples of Tree Benefits Infographics can be found on the slides  Lesson 5: The Role of Trees in Supporting Biodiversity *(These examples can be used to show students what an infographic looks like and the expectations of what should be on them. You do not have to show them to students if you feel they will just copy the ones you are showing them.)*
 - ii. Then assign each group one of the 5 forests identified in the My Healthy Woods handbook published by the New Jersey State Forestry Services.
 1. <https://www.nj.gov/dep/parksandforests/forest/docs/MYHEALTHLYWOODS.pdf>

	<ul style="list-style-type: none"> 2. The five types of forests are as follow and can be found starting on page 12: <ul style="list-style-type: none"> a. Northern Hardwoods b. Oak-Hickory c. Pitch-Shortleaf Pine d. Oak Pine e. Mixed Lowland Forest iii. Students will use the provided resources (including information from the previous lesson, National Tree Benefit Calculator or i-Tree Planting) as well as find at least 2 other resources about their forest type to create their infographic. iv. Gallery Walk of infographics and class discussion: <ul style="list-style-type: none"> 1. Each group should display their infographic on a computer or have them print them out. Space them out throughout the classroom and give students time to complete a gallery walk to review each type of forest in NJ and the benefits. 2. Come back as a whole class to have a class discussion on the findings, takeaways, and new questions that have come up. 4. Progress Tracker: Have students pull their Progress Trackers from Lesson 4 <ul style="list-style-type: none"> a. Lesson 5 Question: How do trees support biodiversity and why is that important? d. Make sure students have the chance to write or draw what they have figured out and any questions they still have. At the start of the next lesson, we will review what students have reflected on. e. Final Goal of Lesson 5: As students work through Lesson 5 they will need to work on #2, #3, & #4 of the The Benefit of Trees Student Proposal Plan & Planting Summary and Benefits Spreadsheet . Students are researching justifications and benefits for the location and trees they are selecting. f. Since this is the last time students will pull their Progress Tracker before they get time to work on just the project it would be helpful to have a class discussion about the research they have been collecting for the project in the Progress Tracker.
Assessment(s)	Formative: <ul style="list-style-type: none"> ● Tree Benefits Research & Infographic ● Annotation of Readings & Food Web

	<ul style="list-style-type: none"> ● Progress Tracker
Student Learning Goals	<ul style="list-style-type: none"> ● I can research and identify the benefits of trees to create an infographic. ● I can explain the effects of logging on biodiversity by examining and discussing the example of the Boreal Forest. ● I can collaborate with my group to create a food web that shows how deforestation impacts an ecosystem's species and relationships. ● I can justify my choice of tree species and location for the Tree Planting Project by researching their environmental and economic benefits.
Materials	<ul style="list-style-type: none"> ● Lesson 5 Folder <ul style="list-style-type: none"> ○ Lesson 5 ● Teacher slide show <ul style="list-style-type: none"> ○ Lesson 5: The Role of Trees in Supporting Biodiversity ● Materials for student activities <ul style="list-style-type: none"> ○ Computer/I-pad/Device ○ Infographic program: Google Slides, Canva ● Student worksheets, documents, readings, etc. <ul style="list-style-type: none"> ○ Annotation Template -Lesson 5 ○ Progress Trackers ○ Tree Benefits Research & Infographic ○ The Benefit of Trees Student Proposal Plan ○ Planting Summary and Benefits Spreadsheet ● Extra Resources <ul style="list-style-type: none"> ○ Which Trees Absorb the Most Carbon and Why? ○ Climate change: Trees 'most effective solution' for warming ○ https://www.sciencedirect.com/science/article/abs/pii/S0006320716310308

Lesson 6: Written Project Proposal - Promoting Tree Stewardship

Duration	3 hours
Objective(s)	<ul style="list-style-type: none"> ● Conduct research and apply data effectively to design and develop a comprehensive Tree Planting Project Proposal. ● Demonstrate understanding of tree benefits and climate considerations by explaining their impact and relevance in environmental planning. ● Create a detailed written proposal and presentation, including a planting plan, tree selection justification, and the projected environmental benefits, to submit for the Trees for Schools Grant. ● Present their Tree Planting Proposal to their peers and engage in reflective self-assessment, identifying strengths and areas for improvement in both their own work and the ideas presented by others.
Standards	<p>English</p> <ul style="list-style-type: none"> ● RI.CR.8.1. Cite a range of textual evidence and make clear and relevant connections (including informational text features such as charts, graphs, and diagrams) that strongly support an analysis of multiple aspects of what an informational text says explicitly, as well as inferences drawn from the text. ● RI.CR.9–10.1. cite a range and thorough textual evidence and make clear and relevant connections, to strongly support an analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. ● RI.MF.9–10.6. Analyze, integrate, and evaluate multiple interpretations (e.g., charts, graphs, diagrams, videos) of a single text or text/s presented in different formats (visually, quantitatively) as well as in words in order to address a question or solve a problem. ● W.AW.9–10.1.A-E: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient textual and non-textual evidence. <p>Science</p>

	<ul style="list-style-type: none"> ● MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. ● HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. <p>Math</p> <ul style="list-style-type: none"> ● S.ID.A.1 Represent data with plots on the real number line ● 6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. ● S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models ● S.IC.B.6 Evaluate reports based on data. <p>Computer Science/Design Thinking</p> <ul style="list-style-type: none"> ● 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systematic plan of investigation and propose an innovative sustainable solution
Synopsis/Overview	<p>In Lesson 6, students will use their Progress Trackers to compile research and data gathered throughout the unit for their Tree Planting Project Proposal. The lesson reviews the project objectives and guidelines, including selecting a tree planting location, choosing tree types, and creating a landscape design with environmental benefits. Students will also utilize tools like the National Tree Benefit Calculator and i-Tree to aid in their proposals. They will present their final proposals to the class, followed by a reflection on their own work and ideas shared by others.</p>
Activity(ies)	<ol style="list-style-type: none"> 1. Progress Tracker: Have students pull their Progress Tracker that they have been using throughout the lesson to collect research and data for different parts of the  Progress Trackers . <ol style="list-style-type: none"> a. The following slideshow has been created for Lesson 6: <ul style="list-style-type: none">  Lesson 6: Written Project Proposal - Promoting Tree Stewardship

2. **Why we are Planting Trees:** To reinforce why we are having students develop a tree planting proposal start out by watching the following video on a school in California that is planting native trees at their schools.
 - a. Show - [Video: Berkeley School Forest](#)
 - b. Discussion - Have students reflect on why they are trying to create a tree planting plan for their school.
3. **Review The Tree Planting Project Directions:** Review project again with the students.
 - a. Project-Based Learning Review: At the start of the unit, we reviewed the Benefits of Trees Project Based Learning Unit Tree Planting Project. Throughout the unit, students gathered background information during each of the lessons. This should have given them the opportunity to gather enough research and data to help them write their proposal.
 - i. **The Project:** The Trees for Schools program will provide \$5.0 million in grants to New Jersey public school districts, colleges, and universities to support planting trees on school grounds and campuses across the state. You have been tasked by your school board to create a proposal to submit for the Trees for Schools Grant. The proposal will need to include your selected location on or around your school campus and the types of trees, justification of the chosen location and tree types selected, detailed planting landscape design, the potential benefits of planting these selected trees, and a presentation that summarizes the key points and persuades school administrators and school board members to approve the submission of the grant application to Sustainable Jersey. The presentation format can be a slideshow, poster, video, or another type of media. It should highlight the benefits of the tree planting project to the school and community, supported by research, data, and other resources. Keep in mind planting for today will provide solutions for a future changing climate.
 - b. Go over with students the project goals and rubric before giving them time to put together their written proposal and presentation. All details can be found here:
 - Teacher Instructions: [The Benefit of Trees Teacher Instructions](#)
 - Student Instructions (document they can fill out):
[The Benefit of Trees Student Proposal Plan](#)

You will want to decide on how you want to distribute all parts of the student proposal plan and directions. If you use Google Classroom you can attach all components in the classroom as an assignment.

Student groups should submit the following:

- i. Written Proposal Form (starts on page 2 or should we make a separate form?)
- ii. Completed [Planting Summary and Benefits Spreadsheet](#)
- iii. Site Plan
- iv. Completed [Trees for Schools Budget Spreadsheet](#)
- v. Presentation: The presentation format can be a slideshow, poster, video, or another type of media. It should highlight the benefits of the tree planting project to the school and community, supported by research, data, and other resources.

4. Resources for Building Proposal:

a. **Grant Plan & Documents:** The following documents will help students to develop a tree planting proposal.

- i. [Tree Planting Resources](#)
- ii. [New Jersey Invasive Species Strike Team](#) - 2024 Do Not Plant List
- iii. [Carbon Sequestration Calculation Instructions](#)
- iv. [Site Plan Examples](#)




b. **Tools & Sources Used in the Unit:** Review with students the different tools and sources they used throughout the Unit that can help them with preparing their proposal

- i. [NJ Public Health Adapt](#)
- ii. [NJ Forest Adapt](#)
- iii. NatureScore: [Discover your NatureScore](#)
- iv. [National Tree Benefit Calculator](#)
- v. [i-Tree](#)

5. Presentation of Project: Students will present their proposal to the class.

- a. Allow each group the opportunity to present their finished Tree Planting Proposal.

	<p>b. Once all students have presented, give them time to self-reflect on their proposal (<i>students can write out or share out their reflections</i>). Ask them to think about the following:</p> <ol style="list-style-type: none"> i. What stood out from the presentations? ii. Were there any ideas presented that you did not think of? iii. Would you change any parts of your proposal? If so, which part and why? <p><i>*Note for Teachers: Teachers can also enhance the project by connecting with local organizations like the Shade Tree Commission, Environmental Commission, Green Team, or nonprofits such as Rutgers Cooperative Extension or the Native Plant Society. These groups can offer guest speakers to share insights on tree planting, community initiatives, and the value of trees, as well as participate in student presentations to provide feedback and support.</i></p>
Assessment(s)	<ul style="list-style-type: none"> ● Tree Planting Project Proposal
Student Learning Goals	<ul style="list-style-type: none"> ● I can conduct research, analyze , and apply data to effectively design a comprehensive Tree Planting Project Proposal. ● I can create a detailed written proposal that includes a planting plan, tree selection, and projected environmental benefits. ● I can justify my tree selection by explaining how it aligns with environmental goals. ● I can explain how trees benefit the environment and their role in addressing climate challenges. ● I can present my proposal clearly to an audience, reflect on feedback, and identify areas where I can improve my project.
Materials	<ul style="list-style-type: none"> ● Lesson 6 Folder <ul style="list-style-type: none"> ○ Lesson 6 ● Teacher slide show <ul style="list-style-type: none"> ○ Lesson 6: Written Project Proposal - Promoting Tree Stewardship ● Materials for student activities

- o All resources have been embedded in the teacher directions and slide show
- Student worksheets, documents, readings, etc.
 - o  Progress Trackers
 - o  The Benefit of Trees Teacher Instructions
 - o  The Benefit of Trees Student Proposal Plan
- Extra Resources
 - o [TED-Ed: How to grow your own tiny forest. Includes two great videos!](#)
 - o SUGI Project:
 - [Where Can You Plant a Miyawki Forest](#)
 - o [Ecological Landscape Alliance](#)
 - o [Handbook, Tiny Forest Planting Method](#)
 - o [Garden for Wildlife Guides \(nwf.org\)](#)