



TREES ARE COOL - ISSAQUAH

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State the problem in one very clear sentence:

We need to plant trees at home, in our neighborhoods, and on school campuses to meet the City of Issaquah's goal of 50% tree canopy for suburban residential areas by 2050 (or sooner!).

Impact statement:

If I plant trees in my yard, neighborhood, or on my school campus, I will help increase tree infrastructure and provide multiple opportunities for environmental education to students. Adding trees will aid carbon sequestration efforts, provide shade, lower asphalt temperatures, and improve the campus' visual aesthetic. If we do this, neighborhoods and school campuses will look and feel more inviting and help fight climate change. In addition, planting trees and learning about their many [benefits](#) will teach students how to be environmental stewards and participate more actively in city planning and policymaking.

Provide brief background knowledge:

Issaquah has been proud to be a Tree City USA since 1992. The forests in our parks help keep our waters healthy and provide homes for wildlife. The trees in our streets and parks, though, are what make Issaquah truly special. The city of Issaquah has been honoring trees through maintaining a tree board department, a tree-care ordinance, an annual community forestry budget of at least \$2 per capita, and an Arbor Day observance and proclamation. The care and dedication to trees has and continues to provide health and economic benefits, increase property values and traffic safety, reduce crime, filter out air pollution, limit stormwater runoff, and improve water quality. Trees are also essential to the protection of salmon habitat because they provide shade along streams and preserve water quality by preventing erosion. Source: [Issaquah's Tree Canopy](#)

Sammamish High School Mini Forest Establishes a Model

In the fall of 2021, 300 Trees will help Sammamish High School students plant 200-300 trees on their campus. This ground-breaking collaboration brings together the students, 300 Trees, the Washington Department of Natural Resources, US Forest Service, Bellevue School District, YMCA Earth Service Corps, and the City of Bellevue. Source: [300 Trees](#)

Green Issaquah Partnership Establishes a Model

On October 23rd, the Green Issaquah Partnership will be hosting an event to plant the future forest of Bernsten Park. This ground-breaking collaboration brings together the City of Issaquah,

Forterra, community groups, nonprofits, schools, businesses, and hundreds of volunteers to restore and maintain our forested parks and open spaces. Source: [Green Issaquah](#), [Berntsen Park Event](#)

Global challenge

We are deforesting trees at an alarmingly high rate, and many areas need more trees to preserve the well-being of humans and the natural environment. An important benefit of a tree is carbon sequestration. Carbon sequestration fights the climate crisis by absorbing carbon during photosynthesis and storing it in its wood for its lifetime. It is also vital to choose the right type of tree, as some trees store more carbon than others. According to [Eartheasy](#), the trunk of an ancient oak or redwood tree represents tons of sequestered carbon. Other functions of trees are providing shade to reduce UV ray exposure, giving cool spaces to rest, and lowering asphalt temperatures to limit burns and toxic fumes. Project Learning Tree states that [environmental education](#) is becoming increasingly important, as it empowers students to engage deeply in real-world challenges and to become skilled problem solvers. Tree planting on school campuses and in neighborhoods provides ongoing science and civics learning opportunities as part of an emerging problem-based, place-based approach to curriculum design.

Show how the project supports community goals

(Local policies, plans, or performance measures of your school district or city government):

- [Issaquah Land Use Ordinance](#): The City of Issaquah is committed to stewarding the 1680 acres of forest, playfields, and community gardens that make up our park system, along with the tree canopy in the city. A 2020 assessment found that 48.1% of Issaquah is covered by tree canopy. In the Comprehensive Plan, the City set a target of at least **50% tree canopy cover** to offset the urban heat island effects, sequester carbon dioxide emission, and create an inviting pedestrian environment. By achieving this goal, we can expand on the health and economic benefits that trees provide.
- [Trees 101](#): a guide on how to plant trees in the King County area
- [Issaquah's Tree Guide](#): a list of documents on how to identify, plan, choose, prune, and remove trees
- [City of Issaquah's Comprehensive Plan](#)
 - **Climate Change Goal**: Care for the natural environment by protecting and restoring natural systems, conserving habitat, improving water quality, reducing greenhouse gas emission and air pollutants, and addressing potential climate change impacts (page 8 from the [Intro and Vision 2040 Document](#))
 - Reduce greenhouse gas emissions by 80% by 2050, below a 2008 baseline
 - **Tree Canopy Target and Goal**: The city of Issaquah measures tree canopy coverage through aerial surveys, and aims for tree coverage to be 51% of total land with no net loss of overall coverage. (page 14 from the [Sustainability Indicators Appendix](#)).

- [King County 30 Year Forest Plan](#): a plan that outlines goals and actions for improving forest cover and forest health
- [King County 2020 Strategic Climate Action Plan](#): a comprehensive outline explaining how King County will take action against climate change
- [King County Blueprint for Addressing Climate Change and Health](#): a resource to put people at the center of the conversation on climate change
 - The blueprint provides data, goals, and strategies for incorporating health and equity into actions to combat climate change.
 - See **page 6** for guiding principles, six core functions, and 15 key strategies.

Identify your stakeholders. Who cares about this issue? Who needs to care?

- Issaquah High School, my high school
- Myself, my family, and my friends
- People living in my neighborhood and community
- Issaquah School District
 - Superintendent for the Issaquah School District
 - School Board member who is a champion of this issue
 - Operations and grounds
- Teachers, particularly environmental science, human geography, and civics teachers
- [Forterra](#): an organization to drive land-based solutions in Washington to support a healthy environment and resilient communities for all
- City of Bellevue officials, particularly those involved with the Green Issaquah Partnership
 - Matt Mechler, Parks Operations Supervisor (mattm@issaquahwa.gov)
 - Councilmembers who are champions of this issue
- People who plan or attend city-wide tree planting events
- Community service groups and clubs centered on climate action
 - Key Clubs
 - Eco Club
 - National Honor Society
- School/city leadership groups and their members
 - ASBs
 - Student councils

Describe the actual steps you will take to implement the solution you propose:

1. Conduct research on how to properly plant trees in the PNW (including which species of trees grow best, provide the most shade, and sequester the most carbon).
2. Connect with staff at the City of Issaquah to learn more about its programs, goals, and performance measures related to its tree canopy.
3. Connect with [Forterra](#) to collaborate on a model for tree planting events with Sustainability Ambassadors.
 - a. Develop a plan with Forterra regarding:
 - i. Location
 - ii. Resources

- iii. Funding
 - iv. Capacity
4. Start planting trees at local parks with help from volunteers
5. Look up tree-planting events near me and make plans to attend them.
 - a. Invite family, friends and schools to attend as well. Use this [Trees Are Cool Invitation Template](#) to email science teachers or advisors/students a part of service hour clubs (Key Club, National Honors Society, etc.)
 - b. Create a google form by referencing the [Sample Event Sign Up form](#) to keep track of everyone registered from your campaigning efforts and to send a follow up survey of their efforts at the event.
 - c. Use this [sign in/out sheet](#) OR reference this [Post Event Impact Tracking survey](#) to keep track of people attended, # of trees planted, and people educated on the day of the event.
 - i. Send the google form to participants after the event.
 - ii. Fill out the [Trees Are Cool Sample Impact Tracking Sheet](#) to store your data!
6. Head over to the [evidence and data section](#) of this project to practice impact tracking and CO2 sequestration calculations!
7. Design a social media campaign to encourage others to participate in planting trees.
 - a. Post pictures/vlogs on my personal story of the trees I've planted in my backyard and at events.
 - b. Post information about the benefits of planting trees on my story and encourage my followers to repost.
 - c. Post our tree planting efforts on www.mywater.world.
 - d. Reach out to Instagram pages on sustainability, climate change, and community service.
 - i. Ask them to share our posts and encourage their followers to engage in tree-planting efforts.
 - ii. Reach out to Green Teams, Key Clubs, and similar school organizations to encourage them to plan their own tree-planting projects.
 - e. Take photos of the trees over time and post them to document their progress.
8. Identify other communities that could benefit from similar tree-planting efforts.

This is it! Document the impact your project had with evidence and data. Be sure to describe how your impact directly supports one or more community needs or goals (local policies, plans, or performance measures).

- How many trees the project initiatives helped plant?
- How many pounds of carbon trees help omit?
- How many volunteers and volunteer hours the project helped organize?
 - Include demographics (age, race, gender, etc.)
 - Include schools
- School or community groups the project has worked with?
- What were the sites where trees were planted?

After planting trees, it's important to gather data regarding the amount of carbon those trees can sequester - **the process of removal and long-term storage of carbon dioxide (CO₂) from our atmosphere.**

Our newly planted trees will not be able to absorb as much CO₂ in their early stages of life... so how can we measure and present data that will support the POTENTIAL these trees have of absorbing carbon? Together, we'll create a hypothesis supported by calculations!

By understanding a fully matured tree absorbs the greatest quantity of CO₂ - we can ask the following guiding question...

How much carbon would the newly planted trees sequester after reaching maturity?

Below are step-by-step instructions to calculate the yearly rates of carbon sequestration of varying tree species. Take note, the equations below can calculate a **roughly estimated** sequestration rate of all the tree species in southeast U.S. It is difficult to create an exact calculation because the rate can be dependent on lots of growth characteristics like environmental conditions and density of a tree's wood.

1. Part-Time Detectives

Before jumping into the calculations we must gather some background information! You will need to...

- a) Find your Tree Species
- b) Maturity Age
- c) Average Diameter (in.) of Trunk at Maturity
- d) Average height (ft.) of Tree at Maturity

Find the above information from a reliable source, check out [these dimensions](#) for a head start. Remember to do the following calculations for 1 tree from each of your planted tree species.

2. Determine the Total Weight of the Tree (Green Weight)

Key - Symbols and Definitions	
W	Above-ground weight of tree (lbs)
W_{tot}	Total weight of tree (lbs)
W_{dry}	Dry weight of tree (lbs)
W_{carbon}	Weight of Carbon in tree (lbs)

W_{CO2}	Weight of Carbon Dioxide in tree (lbs)
D	Diameter of the trunk (in.)
H	Height of the tree (ft.)

How do we find W?

For trees with $D < 11$ (in): $W = 0.25D^2H$

For trees with $D \geq 11$ (in): $W = 0.15D^2H$

Depending on the species, the coefficient (e.g. 0.25) could change, and the variables D^2 and H could be raised to exponents just above or below 1. However, these two equations could be seen as an “average” of all the species’ equations.

The root system weighs about 20% as much as the above-ground weight of the tree. Therefore, to determine the total green weight of the tree, multiply the above-ground weight of the tree by 120%.

$$W * \left(\frac{120}{100}\right) = \text{Total Weight of Tree } (W_{tot})$$

$$* \frac{120}{100} = 120\%$$

3. Determine the Dry Weight of the Tree

On average, a tree is 72.5% dry matter and 27.5% moisture.

Therefore, to determine the dry weight of the tree, multiply the total green weight of the tree by 72.5%.

$$W_{tot} * \frac{72.5}{100} = W_{dry}$$

4. Determine Weight of Carbon in the Tree

The average carbon content is generally 50% of the tree’s total volume. Therefore, to determine the weight of carbon in the tree, multiply the dry weight of the tree by 50%.

$$W_{dry} * \frac{50}{100} = W_{carbon}$$

5. Determine Weight of Carbon Dioxide Sequestered in the Tree

We know the weight of carbon in our tree, but CO₂ is composed of one molecule of Carbon and 2 molecules of Oxygen, so, how can we find the weight of CO₂?

The atomic weight of Carbon is 12.001115.

The atomic weight of Oxygen is 15.9994.

Then, the weight of CO₂ is $C+2*O=43.999915$ (substitute weight of C and O).

The ratio of CO₂ to C is $43.999915/12.001115=3.6663$.

Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.6663.

$$W_{carbon} * 3.6663 = W_{CO2}$$

6. Tell your story!

You have found the weight of CO₂ sequestered by **1** of the planted trees of the respective tree species after it has reached **maturity**! Be sure to run through the calculation for each tree species planted AND multiply the weight of CO₂ sequestered by the amount of trees from the species planted.

Organize your calculations in [this](#) event tracking data sheet.

All done! Once again, we have proved trees really are cool!

How will you communicate your impact to all of the stakeholders you identified? Some ideas:

- Create graphics to put on social media about the benefits of planting trees
- Create a catalog of all of the trees planted on my campus that monitors their growth
- Film and edit short vlogs of my tree planting experience to share on social media and at school
- Give PowerPoint presentations to community-oriented and environmental groups and clubs to encourage them to do similar projects
- Ask school ASBs and PTSAs to share information about tree planting events
- Create a report detailing the number of trees planted and their specific benefits to report to city council members

Reflect on your experience: What skills did you gain? How did your understanding expand? How do you feel about the process and the impact you made? What's next?

References

1. <https://www.pacificforest.org/ee-old-trees-store-more-carbon-more-quickly-than-younger-trees/>
2. https://www.unm.edu/~jbrink/365/Documents/Calculating_tree_carbon.pdf
3. http://biorefinery.utk.edu/technical_reviews/Tree%20Size.pdf
4. <https://www.psp.wa.gov/salmon-recovery-overview.php>