Green Girls Curriculum
Lesson 5: Caring for the Urban Forest: Street Trees

Lesson Duration: Up to 6 hours or 3 sessions

Standards:
Next Generation Science Standards: MS-LS: 1-4 ,1-5, 2-1, 2-2, 2-4,2-5; MS-ESS: 3-3, 3-4, 3-5

New York State Science Learning Standards:
MS-LS: 1-4, 1-5, 2-1, 2-2,, 2-4, 2-5; MS-ESS: 3-3, 3-4, 3-5

Keywords: urban forest, passive cooling/heating, ecosystem services, stewardship, advocacy

Purpose of Lesson:
- In urban ecosystem knowledge, students will:
    - Understand the role of street trees in providing a number of ecosystem services
    - How to identify common street trees

- In advocacy skills building, students will:
    - Increase confidence in engaging in conservationism
    - Increase confidence in engaging in political action

- In socio-emotional skills building, students will:
    - Increase in self awareness by understanding and articulating their own ability to address environmental issues
    - Increase social awareness and connectedness by working collaboratively and creatively in small groups
    - Increase their environmental awareness and interest through gaining knowledge of trees, their biological functions and unique beauty

Essential Questions:
1. What does ecosystem service mean and what are some ecosystem services provided by trees?
2. What role do trees play specifically in the regulation of air temperature?
3. What are some things that impact street trees?
4. What are some basic methods for ensuring the health of street trees?
5. Are the street trees plentiful and healthy in my neighborhood? Why or why not?

Session Routine:

Activity	Time	Description
Opening Circle	30 min.	Introduce the day + Journal Prompt
Activity 1	1 hour	The role of street trees in air temperature regulation
Activity 2	1.5 - 2 hours	Street Tree Care
Activity. 3	1.5 - 2 hours	Street Tree Advocacy
SEL Activity + Wrap Up	20 - 30 min.	Group Activity including assessment
Closing Circle	5 min.	Connecting to Final Project

Materials:
Journal booklets, Smart board or projector, computer with internet access OR printed sheets of local street trees; air temperature thermometers, data sheets, pencils; hand cultivators or trowels (at least one or two per group), shredded bark mulch or wood chips, flowers or bulbs; art materials such as pens, pencils, markers, paint, brushes, poster paper

Some things to know/do before you start this lesson:

- Identify a block with street trees and pitts that can be beautified or improved
- Choose and identify the species of trees that your students will work with
- If necessary, research and obtain a permit for this work. In New York City a permit is not required to help maintain street trees but NY Parks, the agency responsible for the city's urban forest, provides many resources to citizens to help them provide effective and safe tree care.
- Find out if there is a city agency, non-profit or community group that focuses on urban tree care and education and request that one of their staff or volunteers assist in your service day as well as contribute materials and tools (Ex. Trees NY in NYC)
- Utilize video or website for basics in street tree care

Background:
Most urban dwellers walk by street trees many times a day without ever looking at or thinking about them. Sadly, these trees are often like the overlooked furniture in a waiting room. However, once introduced to the powerful role of trees within our

environment and especially how the role of the street tree in particular relates to the higher quality of life in our city, students adopt a different attitude.

Street trees perform a number of ecosystem services for both humans and wildlife. They filter our air, provide passive cooling and heating, capture carbon, take up storm water (a vital aspect in cities prone to flooding due to climate change - see the lesson Urban Water Health), and help reduce noise. For wildlife they provide food and shelter and for humans, they provide beauty. None of this should be taken lightly. Beyond the benefits to environmental and human health, studies have shown that street trees are an economic driver in that they raise property values in cities and residential areas.

Assessment:
Formative:
Active participation in discussions (can be logged at each session)
Exit ticket (see last activity)
Temperature data sheet
Tree care log
Final Reflection Unity Tree

Summative:
Project Rubric
Pre- and Post-Survey
Final Reflection Unity Tree

Opening Circle (5 minutes)

Students greet and check in with each other and the class educator/leaders. Students volunteer to briefly remind the group about what was done/learned in the previous session OR some students can briefly describe what they have done in practice of their Green Girls training (i.e. participated in a volunteer environmental service or justice action through their school, local park or community).

Journal (5 - 10 minutes)

ASK students to record and answer the following in their journals:
Describe any experience you've ever had with a tree. This can be anything but describe the beginning, middle and end to your experience and include how you felt about that experience.

Reflection:
Have students group up in 2s or 3s and share their journal entries. Challenge them to step outside of their comfort zones to choose someone they've not yet paired up

with. Alternately, if the group is not too large, pick three people to describe one aspect of their description of an experience with a tree. This can be done by having students draw pieces of paper from a hat - those with a tree drawn on them get to describe their experiences. Experiences can also be drawn and students may choose to show their drawings instead.

Introduction (30 minutes): Benefits and Selection of Street Trees

Materials: Smart board or projector, computer with internet access OR printed sheets of local street trees
Location: Indoor meeting site OR safe area near street trees

DISCUSS with students what ecosystem services means and which are provided by street trees.

Implementation:
Students review examples of the trees outside of the meeting site, think about and state the ecosystem services of these trees. Students review several entries listed on the projected screen and discuss how trees provide these services (i.e. what attributes the tree has that make this possible such as the height of the tree or the leaf size). The teacher or a student intern may develop a slide presentation that includes not only the recommended or other websites but some representative photos of trees.

In pairs or small groups, students research and list in their journals why certain trees are selected by city managers as street trees.

Activity #1 (1 hour) Take it Outside! Air Temperature Surveys

Students take the air temperature directly under a tree in its shade and away from trees in the sunlight.
Note: This is a very informal activity aimed at getting students to begin thinking about the cooling service of trees. For those educators and students who want to take this further, consider participating in the GLOBE Program's Urban Heat Island Effect - Surface Temperature Field Campaign.
Materials: air temperature thermometers, data sheets, pencils
Location: Street lined with trees along the sidewalk, in a playground or parking lot outside of the meeting site.

DISCUSS with students that trees and other plants provide passive cooling and heating because their leaves shade surfaces in the summertime and cool those

surfaces as well as the air in the space directly above the surface (which humans and some wildlife occupy). In the winter, bare trees allow the sun's energy to reach more of the surface thereby warming it. The massive reduction of trees across the globe due to habitat destruction and development has contributed greatly to climate change. In cities, the lack of trees has greater impacts creating what is called Urban Heat Island Effect. In summertime, exposed or hardened surfaces can be heated by the sun's rays up to 50 degrees celsius hotter than the air temperature! This in turn may actually increase the air temperature close to the surface depending on the weather conditions.[1] A mature tree can shade and reduce the surface temperature of a paved street by as much as 27 degrees fahrenheit.[2]

Resources:
EPA - Reducing Urban Heat Islands -
https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_1.pdf

https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf

Implementation
In pairs, and using digital air thermometers (preferable but any types that are available), have pairs of students stand under a tree so as to be well inside its shade and other pairs of students stand in safe exposed areas that have hard surfaces such as on a sidewalk, playground or in a safe spot in a parking lot. One student holds the thermometer at waist height with the arm extended away from their body while the other records the temperature on the data sheet. The students repeat this three times in similar spots. Student groups can rotate through the same spots if needed.

Return to the meeting area and have students write their results on a white board or large sheet of paper. This can be done after the street tree care activity.

Activity #2 (2 hours) Street Tree Care - Service Learning

Materials/tools: hand cultivators or trowels, shredded bark mulch or wood chips, flowers or bulbs

Location: a street with trees with pits lining it in proximity to the meeting site or possibly near the homes of the students. Students must be able to maintain a safe distance from any traffic or motorized vehicles.

ASK students:

What are some examples of ways we improve environmental quality at home or on our streets?

Discuss with students that street Trees are an integral part of the urban landscape and they serve to absorb water, reduce street temperature, provide habitat and more! Just like we saw in the demonstration, healthy plants and proper ground cover can help to reduce runoff into our streets and prevent soil erosion.

Tree Pit Care
A city tree must battle many urban hazards daily — from air pollution and bicycles to dogs and people. In addition to above ground threats, tree roots also must contend with tough below–ground conditions. A tree pit or lawn strip provides limited space for these forest giants and this soil is a tree's only source of nutrients. Because of this, it is essential to create as nurturing a tree pit as possible.

Implementation: Guidelines provided by NY Parks-
● Using a hand cultivator, loosen the top 2-3 inches of soil to alleviate compaction and help water and air reach the roots.
● Apply a three-inch layer of mulch, preferably shredded bark to the tree pit. Mulch keeps the water from evaporating quickly, reduces soil compaction, and improves the soil as it breaks down. Do not pile the mulch against the trunk of the tree; water will accumulate and rot the trunk.
● The soil level around a tree should not be changed from the soil level at which it was planted. Adding soil (even 6 inches) can smother roots and rot a tree's trunk. Digging soil out can damage shallow roots.
● Keep dogs and dog waste (both liquid and solid) out of the tree pit. The waste will overwhelm a tree, burning its trunk, and throwing the soil nutrients out of balance.
● Remove unwanted competing plants, i.e. weeds.
● Keep garbage and de-icing salt out of the tree pit. Try alternatives to rock salt (sodium chloride) such as calcium chloride or granular urea. In the spring, flush the tree pit with water to dilute winter salt buildup.
● Consider creating signage: Don't lock bikes to trees or leave decorative lighting on past February.
● Remove supporting wires if they are left on more than one year after planting.

Suggestions
● If done carefully, you can plant flowers or bulbs in the tree pit. Flowers that have shallow roots and die back each year (annuals) will not seriously compete for limited resources. However, be sure to provide enough water for the tree,

not just enough to perk up the flowers. Do not plant flowers within one foot of the tree trunk.

- Consider installing tree guards. Strong metal or wooden structures around the edge of the pit protect the soil by discouraging pedestrians and dogs from walking through or urinating in the pit. Most cities have guidelines in place for tree guards so check with your local municipal agency first. In New York City, this is NY Parks. Most importantly, do not place tree guards close to the tree and don't build solid walls as these encourage people to add soil to the tree pit (see above guideline). Tree grates or the metal grating that sits flush with the sidewalk are not recommended. Trash accumulates beneath the grates and trees that outgrow a grate can be fatally girdled or strangled.

Students will work to care for as many trees as they can during the alloted time in the lesson. Students should be tracking care on the maintenance log provided. Use tree identification guides and iNaturalist or the LeafSnap Apps to help with identification.

Students in New York City can also track the care of their street trees on the NYC Street Tree Map by becoming NYC Super Stewards.

Activity #3 (1 -3 hours) Street Tree Advocacy

Materials:Access to computers and a digital device for taking photos or recording songs; art materials such as pens, pencils, markers, paint, brushes, poster paper

Location: indoor meeting space

This lesson can include a number of extensions: students can write formal requests to the City, a local council member, the local parks department, etc to plant trees where they are needed or provide materials for the care of trees. They may also request trees from the Arbor Day Foundation or identify a funding opportunity and co-write a grant to purchase trees. *Confidence is built through practice and positive feedback, not only within the group but also from members of the students' social spheres so any advocacy effort should be coupled with an opportunity to promote their work.* For example, students may launch a campaign to educate their local community about their street tree stewardship or advocacy projects.

Implementation

Students work together in pairs or small groups to complete a mini-research project on trees and their ecosystem services. Their project can be prompted at the beginning and will be completed by the end of the Street Trees session(s) and can include artwork, photos, poetry, songs or videos (their own or that of others

although copyright should be taken into consideration if the projects are to be published in any public forum as well as factual information. Aspects of this project can be integrated into their final projects.

All or a group of the students can work to identify a physical or web-based exhibition space for the final projects such as a school, library or other local visible community location.

Presentation: The program leader or student interns assist by communicating with administrators or local community leaders to have projects displayed or uploaded to a website.

Closing Circle: Wrap Up and Summary (A peer mentor or intern leads):

Using the tree as a symbol of unity is a great way to help students to see their own contributions and importance within the group.

Implementation
Tape together four sheets of large presentation paper into a large square or rectangle and draw a tree on it with as many branches as there are students. Leave room between the branches for students to write on them. Provide the students with markers and ask them to think about and write what they contributed to the group's efforts to conserve and protect trees. Remind them that this can be from any part of the lesson but that they should be specific, i.e. "I shoveled mulch into the tree pit I was working in." They can write their names or not.

Next ask individuals to choose a statement that is not their own, read it out loud and describe why that was important for the trees (science), the projects (advocacy) or the group in general (social-emotional). These affirmations offered to each other should serve to strengthen the bonds between the students and group leaders. Some may be repeated and that's ok. The tree itself can serve as an exit ticket and parts of the conversation can also be recorded as informal assessment.

Assessment Reminder
Formative assessment:
Temperature data sheet
Tree care log
Exit ticket/Final Reflection Unity Tree

Summative Assessment:
Project Rubric
Pre- and Post Survey