LESSON 2
SOLUTIONS!
Green Stormwater Infrastructure Photo Galleries

Problem Statement: How can I apply the practices of engineering design to recommend the best green stormwater infrastructure (GSI) applications for a high priority site in my neighborhood?

Subject: Human Geography, Science, Engineering, Math, Civics, Common Core
Grade Level: Middle School or High School

DESCRIPTION

Explore 14 engineering strategies to understand how Green Stormwater Infrastructure can help your neighborhood handle stormwater like the original forest that once stood here.

BACKGROUND

Runoff from stormwater continues to be a **major cause of water pollution** in urban areas. It carries trash, microplastics, bacteria, heavy metals, and other pollutants through storm sewers into local waterways. Heavy rainstorms can cause flooding that damages property and infrastructure.

Historically, communities have used **"gray infrastructure,"** a carefully engineered system of gutters, pipes, and tunnels, to move stormwater away from where we live to treatment plants or straight to local water bodies. Many communities are installing **green infrastructure** systems to bolster their **capacity to manage stormwater.**

Basically, green infrastructure filters and absorbs stormwater where it falls, **just like how a forest functions.** There are a wide range of engineering strategies for achieving this outcome such as:

1. Downspout Disconnection
2. Rainwater Harvesting
3. Rain Gardens
4. Grattix Boxes

5. [Planter Boxes](#)

6. [Bioswales](#)

7. [Modular Wetlands](#)

8. [Permeable Pavement](#)

9. [Permeable Pavers](#)

10. [Green Walls](#)

11. [Green Roofs](#)

12. [Urban Tree Canopy](#)

13. [High-Rise GSI 2050](#)

14. [Beautiful GSI](#)

Add to your understanding by visiting…

- [What is Green Stormwater Infrastructure?](#)
- [Rain gardens could make stormwater safe for salmon](#)
- [Separating the facts and fears around permeable pavement](#)
- [What does a green roof cost, and will it last?](#)

Green stormwater infrastructure elements can be implemented into community planning at several scales.

- Examples at the **building scale** could include a rain harvesting cistern next to house, a row of trees along your street, or adding pervious pavers to a driveway.

- **Neighborhood scale** green infrastructure could include acres of open park space integrated into urban planning, bioswales along roads, highways, and transit centers, or preserving a wetland near a residential housing complex or school campus.

- At the **watershed scale**, examples could include protecting large open natural spaces, riparian areas, wetlands, greening steep hillsides, and improving the health of riparian buffers along streams and rivers. .

When green infrastructure systems are installed throughout a community, city or across a regional watershed, they can provide cleaner air and water as well as significant value for the community with flood protection, diverse habitat, and beautiful green spaces. Adapted from: [EPA What is GSI?](#)

Green Infrastructure for Climate Resiliency
As different parts of the country become drier, wetter or hotter, green infrastructure can help improve community resiliency today and into the future through these functions.

- Manage flooding
- Prepare for drought
- Reduce urban heat island
- Lower building energy demands
- Spend less energy managing water
- Protect coastal areas

Learn more about how green infrastructure practices can help communities prepare for and manage these effects of climate change here: EPA Green Infrastructure for Climate Resiliency

YOUR TASK

1. **Gain Knowledge:** Form a team and become micro-experts on some or all of the GSI strategies linked above. Many of these links lead to useful fact sheets as well as case studies from different cities around the US.

2. **School Campus Field Investigation:** Talk a walk around the school campus and map out any places where one or more of these GSI strategies have been applied. Produce some rough calculations of how much surface area is being treated by each GIS strategy. **For example:**

   a. The bioswale running down the middle of the school parking lot is 200 feet long and receives stormwater runoff from asphalt lots on both sides, each of which is 250 feet long by 40 feet wide or 10,000 feet x two lots = 20,000 square feet of surface runoff being treated by the bioswale.

   b. The rain garden beside the south classroom wing is treating stormwater from one downspout from a roof area estimated to be 100 x 60 feet = 6,000 square feet.

   c. The row of coniferous trees along the edge of the playfield is 300 feet by 30 feet and is managing stormwater over an estimated 9,000 square feet.

3. **But My School is Really Old:** If you attend an older school and see no evidence of GSI, then conduct the same field observations but make some notes on a campus map of where you think specific GSI strategies could be added.

4. **Neighborhood GSI Inventory:** Over the next couple days, as you commute to and from school, around your neighborhood, and to your local shopping center, make specific observations of where you see GSI strategies being applied or where it's needed. .

5. **Map Study:** Go to mywater.world and take some time to explore the map layers for your school / neighborhood. Zoom into your neighborhood and try different combinations of base maps and map layers such as some of the suggestions in the table below. How does this geographic survey from a bird's eye view support your understanding of where GSI is already in place and where it might be needed?

Explore all the possibilities at mywater.world	
BASE MAPS	**MAP LAYERS**
Topography	Sub-Basin Boundaries Contour Lines Impervious Surface Area Salmon Spawning Habitat Schools and Colleges
Hillshade	
Satellite	
Historical	

6. **Final Presentation:** Gather with your team to create a presentation of your choice that meets the criteria below. You could do a standard PowerPoint, a mock podcast, a panel of experts, or some other form.

1. Demonstrate your knowledge of GSI.
2. Provide map-based evidence of where you have noticed GSI around school and in the neighborhood.
3. Make specific recommendations for where GSI strategies could significantly reduce polluted stormwater runoff around school and in the neighborhood.

WHAT CAN WE DO?

1. Help plant 3 Million Trees
2. Switch to these strategies for Natural Yard Care (in 15 different languages!)
3. Take personal action at Puget Sound Starts Here
4. Don't Feed the Tox-Ick Monster - 7 Simple Actions
5. See playlist of 20 King County informational videos on Yard Talk
6. Build a Rain Garden at 12,000 Rain Gardens
7. Advocate for Green Stormwater Infrastructure around your school neighborhood
8. Follow the indicators that scientists track on the dashboard Puget Sound Vital Signs

HELP IMPROVE THIS LESSON

1. What advice do you have for making this lesson better?
2. How would you teach parts of this lesson to younger students?
3. Are there broken links that we need to know about?
4. Did you find even better links in your research?
5. Would you like to share examples of your work so that other classrooms can learn by your example?

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