Lesson #5: “Services that Stick”
Teacher Guide

Explain, Lesson #5: “Services that Stick”

These materials are all part of EPA Report #: EPA/600/R-18/231.

Time Consideration

**Prep time:** 10-15 minutes, **Activity time:** 30+ minutes

Materials

Printed handouts: (a) Ecosystem Blank Templates, (b) Ecosystem Services Puzzle Pieces, (c) Connections to Human Health Sheets, scissors, crayons, and glue for each group

Teacher Preparation

1. Print all of the following:
   - **Ecosystem Blank Templates** (there are 7 unique ecosystem templates). Having the students work in groups of three is recommended, so if you have 21 students, you’ll need only one complete set of Ecosystem Blank Templates per class.
   - **Ecosystem Services Puzzle Pieces**. Again, there are 7 unique sets of ecosystem services puzzle pieces. Each group should receive one Ecosystem Blank Template and one matching set of Ecosystem Services Puzzle Pieces (i.e., the group that receives the “Coast” Ecosystem Blank Template should also receive the “Coast” set of Ecosystem Services Puzzle Pieces).
   - **Connections to Human Health Sheets**. You can adapt this as you see fit; it is recommended that you give each group of students all of the Connections to Human Health pieces and make the students select which human health outcome is the best fit for their ecosystem. Therefore, you would need one Connections to Human Health Sheet per group.

2. Distribute all necessary materials for each group: glue, scissors, crayons, and three total sheets of paper per group (Figure 1).

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Procedure

1. Deliver background information on ecosystem services: providing the benefits that humans receive from nature. Have students provide examples of ecosystem services and related human benefits.

   Examples of ecosystem services: trees provide oxygen which we breathe; trees provide shade on the playground (US EPA 2008); wetlands filter water (Vellidis et al., 2003); forests provide places for people to recreate (Kline et al., 2011). Examples of human benefits: reductions in stress and anxiety from spending time at the beach (MacKerron & Mourato 2013); reduced symptoms of post-traumatic stress disorder after spending a weekend fly-fishing by the river (Vella et al., 2013).

2. Explain the directions to the students:
   - Cut out the Ecosystem Services Puzzle Pieces.
   - As a group, discuss where in their Ecosystem Blank Template the Ecosystem Services Puzzle Pieces should go. Note: have the students check with you before gluing anything to the page. There are some pieces that could go in multiple spots.
   - Lay puzzle pieces where they should go.
   - Glue the puzzle pieces to their pages.
   - Look at the Connections to Human Health Sheet. Decide which human health connection works best with your specific ecosystem. Cut it out, lay it on the sheet, check it with your teacher, and then glue it to the page.
   - Color their Ecosystem Blank Templates.
   - Tell the students to take a few minutes to prepare a mini-presentation on their Ecosystem and the ecosystem services and health benefits that their ecosystem provides.
   - Have students explain their Ecosystems. As groups finish, tape the papers to the board at the front of the room. Note: paste them together where the letters meet (A matches with A, etc.). At the end, it should look like the example on the next page, and students should notice that there are multiple ecosystem services that repeat across different ecosystems. Discuss this with the students.
3. **Evaluate:** During the group discussions, informally assess student understanding of ecosystem services. Then, have the groups share and **explain** their examples with the whole class. Finally, formally assess student understanding with the collection and reading of the student handouts.
Services That Stick: Coast

- Provides opportunities for recreation and tourism
- Supports local jobs and economy
- Absorbs CO₂ from the atmosphere
- Provides food and income; supports local economy
- Source of research in biotechnology and pharmaceuticals
- Views and sounds of water provide beauty and inspiration
- Prevents erosion
- Buffers against extreme weather

Connection to Human Health: Happiness. In a study using a phone app to record happiness levels in different environments, participants reported being significantly happier outdoors in all green or natural habitat types than in urban settings. Marine and coastal shorelines were the happiest locations (this and more information available from www.epa.gov/enviroatlas).
Services That Stick: Coastal Wetlands

- Buffers against extreme weather
- Provides food and income; supports local economy
- Supplies groundwater
- Provides opportunities for recreation and tourism
- Filters and purifies water
- Serves as a "nursery" for many aquatic species
- Absorbs CO₂ from the atmosphere

Connection to Human Health: Water Quality. Studies show that wetlands can remove up to 99% of nutrients (Xiong et al., 2011), 89% of metals (Khan et al., 2009), and 100% of pesticides (Budd et al., 2009). This and more information available from [www.epa.gov/enviroatlas](http://www.epa.gov/enviroatlas).
Services That Stick: **Forest**

- Absorbs CO₂ from the atmosphere
- Provides oxygen
- Can be used for fuel
- Provides opportunities for recreation and tourism
- Produces game species (deer, turkey, elk, etc.)
- Can be used for raw materials
- Reduces impacts of erosion and flooding

**Connection to Human Health: Air Quality.** Forests are important to the process of natural air filtration. Given that air pollutants negatively affect health by making some respiratory symptoms worse, the removal of these pollutants from the air by trees can decrease cases of such respiratory illness (this and more information available from www.epa.gov/enviroatlas).
Services That Stick: **Rivers**

- Provides opportunities for recreation and tourism
- Provides food and income; supports local economy
- Can go to a reservoir for human water resources
- Prevents erosion and controls floods
- Filters and purifies water
- Absorbs CO₂ from the atmosphere
- Can provide food

**Connection to Human Health: PTSD (Post-Traumatic Stress Disorder).** A study conducted to evaluate the effectiveness of a 3-day fly-fishing trip in reducing measures related to PTSD found better significant acute effects for increases in self-assuredness, joviality, and serenity, as well as significant effects on better sleep and fewer feelings of guilt and sadness (this and more information available from www.epa.gov/environatlas).
Services That Stick: Field/Meadow

Pollinators are essential for about 1/3 of all food

Provides opportunities for physical activity

Rainwater collects underground as groundwater

Provides species management (food chain)

Provides aesthetic engagement

Can provide opportunities for wildlife viewing (recreation)

Soil organisms increase soil health

Connection to Human Health: Anxiety. Studies suggest that viewing natural landscapes, even in photos, can decrease feelings of anxiety. Additionally, spending time in green space and exercising outdoors can significantly reduce anxiety (this and more information available from www.epa.gov/enviroatlas).

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Services That Stick: Urban

- Absorbs CO₂ and ozone along roadways
- Provides shade and reduces heat
- Can promote healing: Studies show that hospital patients with a view of a park had 10% faster recoveries and needed 50% less strong pain relieving medication compared with patients whose rooms faced a wall.
- Window views of greenery provide beauty and inspiration
- Can help with noise reduction
- Provides opportunities for recreation and tourism
- Supports local jobs and economy
- Connection to Human Health: Social and Community Ties. In urban areas, including public housing developments, access to common green spaces and the greenness of those areas are positively linked to neighborly activities, social and community ties, and more cooperative behavior across age groups (this and more information available from www.epa.gov/enviroatlas).
Services That Stick: Mountains

- Provides vistas for aesthetic engagement
- Absorbs CO₂ from the atmosphere
- Produces oxygen
- Can provide opportunities for physical activity
- Provides opportunities for recreation and tourism
- Can provide freshwater

Supports local jobs and economy

Connection to Human Health: Aggression. Taking a walk outdoors can reduce feelings of anger by nearly 8%. Running outdoors can reduce feelings of hostility by 80% (this and more information available from www.epa.gov/enviroatlas).
Services That Stick: Coast
Services That Stick: Coastal Wetlands
Services That Stick: Forest
Services That Stick: **Rivers**

[Diagram of a river ecosystem with various elements like fish, plants, and a person fishing.]

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APPENDIX, Lesson #5: “Services that Stick”
Student Handouts, Ecosystem Blank Templates

Services That Stick: **Field/Meadow**

[Diagram of a field/meadow ecosystem with various elements such as plants, animals, and human figures.]

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Services That Stick: **Urban**

Diagram of an urban area with buildings such as a school, a hospital, and a city park. The diagram includes a road with a bus, a bicycle, and some trees and plants in the area.
Services that Stick: Coast

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- Buffers against extreme weather
- Absorbs CO₂ from the atmosphere
- Prevents erosion
- Source of research in biotechnology and pharmaceuticals
- Views and sounds of water provide beauty and inspiration
- Provides opportunities for recreation and tourism
- Supports local jobs and economy
- Provides food and income; supports local economy

Services that Stick: Coastal Wetlands

- Buffers against extreme weather
- Provides opportunities for recreation and tourism
- Provides food and income; supports local economy
- Supplies groundwater
- Filters and purifies water
- Absorbs CO₂ from the atmosphere
- Serves as a “nursery” for many aquatic species
Services that Stick: Forest

- Can be used for raw materials
- Absorbs CO₂ from the atmosphere
- Produces game species (deer, turkey, elk, etc.)
- Reduces impacts of erosion and flooding
- Provides oxygen
- Provides opportunities for recreation and tourism
- Can be used for raw materials
- These “goods” support jobs and local economy

Services that Stick: Rivers

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- Can provide food
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- Filters and purifies water
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- Can provide opportunities for wildlife viewing (recreation)
- Soil organisms increase soil health
- Provides species management (food chain)
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APPENDIX, Lesson #5: “Services that Stick”
Student Handouts, Ecosystem Services Puzzle Pieces
Instructions: Choose the best example below that best matches your Ecosystem Blank Template.

Connection to Human Health: Aggression. Taking a walk outdoors can reduce feelings of anger by nearly 8%. Running outdoors can reduce feelings of hostility by 80% (this and more information available from www.epa.gov/enviroatlas).

Connection to Human Health: Anxiety. Studies suggest that viewing natural landscapes, even in photos, can decrease feelings of anxiety. Additionally, spending time in green space and exercising outdoors can significantly reduce anxiety (this and more information available from www.epa.gov/enviroatlas).

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