

Title:

Team Tree Tender: Ecosystem Service Group Project

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Abstract:

In the film Tree Tender, CAaLVIN discusses the ecosystem service coral reefs provide to us. There are many other services that are naturally provided to us that are crucial to our survival, and without them life would be extremely expensive or impossible for us and other species. You will split your class into groups of 3-4 students. Each group will choose an ecosystem service to research and create an eye-catching presentation. Once all students have presented their ecosystem service, the class will come together and discuss changes we can make to our daily lives to help slow biodiversity loss and the loss of these ecosystem services. This project may cover ecology, ecosystem services, food webs, sustainability, and effects of ecotourism and uses many different pedagogy, mainly Open-Ended Instruction, Integrated Learning, Experiential Learning, Co-operative Learning, and Peer Teaching through the presentations.

Learning objectives:

- Define Ecosystem Services and identify examples
- Perform research using credible internet sources
- Collaborate with peers to identify a problem and find a solution
- Critically think about how our actions affect the planet
- Critically think about solutions to real problems on our planet
- Create an eye-catching representation and report on an ecosystem service
- Gain skills in public speaking

Timeframe:

Watching Tree Tender takes about 15 minutes. Project should take about a week (most work outside of class) for in-depth research and a well-made project. If time constraint occurs, project and depth of research and presentation can be altered so work takes less time.

List of materials:

- Computer, Tablet, or Smart Phone with internet access
- Access to online sources or books in the library
- Presentation materials, such as posters, dioramas, art supplies, or a computer for multimedia presentations (slideshow or video)

Procedure and general instructions (for instructor). REQUIRED.

- Divide students into groups of 3-4
- Have students choose the Ecosystem Service from the list provided.
 - Concrete examples are provided here in the teacher materials. Have students try and come up with their own examples before aiding students.
 - Make sure you approve of the students' choice before they begin researching.
 - If the students need to make a change after their research has begun, they need to seek approval from the instructor before continuing.
- Give students the week to research:
 - The Ecosystem Service in detail (what it is, how we benefit, how other species benefit, etc.)
 - A specific example of their ecosystem service
 - Things we've done to disrupt the ecosystem service (our impact, cost to replace service, etc.)
 - A current event or research based on their ecosystem service or example chosen
 - How we can help (individually, in our school, in our community, etc.)
- Have the students make a presentation (PowerPoint, or creative visual aid such as a video, or physical art project) to spread the knowledge of their ecosystem service to their classmates.
 - Presentation or display must be professional, clean, and understandable enough for Gaia to check out during her busy day.
 - Presentation must be approved by the instructor to make sure it is allowed by the school and the room is prepared.
- If there is a time constraint, project can be altered to involve brief research within a day with a short presentation following.

Procedure and general instructions (for students).

After seeing some loss of biodiversity, Gaia needs your help taking inventory on ecosystem services! These services are important for our survival and the survival of other organisms we share this planet with. In a small committee of 3-4 Tree Tenders, choose an Ecosystem Service from the list below to monitor and help Gaia. The more we understand about services and other organisms, the better we can protect them for their survival! To provide Gaia with enough information, we need to find out what the ecosystem service is, how we benefit from it (physically, economically, emotionally, etc.), and how we've disrupted the ecosystem service. Finally, come up with a few solutions to help preserve this ecosystem service. Make sure you create a professional, eye-catching presentation to show Gaia!

List of Ecosystem Services to Choose From (For Teachers)

This is the list provided to your students with the addition of specific examples. Please try and have your students discover their own examples for their project, as it allows them an opportunity to think critically and research something they find interesting. If they need guidance, you may talk more with groups individually to help them focus in on a research topic.

Supporting Services:

Habitats for Other Species - necessities provided for migratory/residents

(Ex: Wetlands and prairies provide ample habitat for migratory birds, but are often lost to human development)

Genetic Diversity - diverse gene pool within a species/high numbers of species

(Ex: Levels of higher biodiversity show fewer diseases in ecosystems and in agriculture.

Questions your students may ask are what does a more diverse population provide?

Examples could include natural populations, such as cheetah genetic diversity or how habitat fragmentation affects woody or herbaceous plants, or in monoculture, such as with potato or corn leaf blight)

Provisioning Services:

Food - for human consumption from wild sources

(Ex: Fish populations and the issue with overfishing; aquatic and marine invertebrates, discovering new plant or animal food sources, benefits of regulated hunting; while pollination affects our food sources, keep this group from straying into that category)

Raw Materials - for construction and fuel (energy)

(Ex: wood for building or fuel, fuel from switchgrass (*Panicum virgatum*) or corn, mining for materials in construction, fossil fuels and how further extraction may become more difficult)

Medical Resources - medicinal plants and raw materials for manufacturing

(Ex: Humans have been using plants, such as ginger, ginkgo, and lavender, for hundreds of years; Black Willow, *Salix nigra*, used for pain; new research around traditional medicinal plants in Africa has begun in 2017 to look at secondary metabolites in these plants and how they might affect people)

Water Availability - vegetation provide purified water; hydrological cycle

(Ex: In destroying ecosystems, such as the Blackland Prairie or rainforests in South America, Asia, and Africa, we see a loss of fresh water replenishment in clouds, leading to drought conditions and a vicious cycle of drying. Grasslands lead to the purification of water above and below ground in aquifers in North America)

Regulating Services:

Air Quality – plants remove pollutants from atmosphere

(Ex: Plants store pollutants from air, sometimes with the help of fungi; NASA study on carcinogenic contaminants filtered by plants; trees improving contaminant levels, such as NO₂ in urban areas.

Carbon Sequestration - ecosystems store greenhouse gasses and can remove CO₂

(Ex: Deforestation of large wooded areas have not only released CO₂, but plants are no longer living to convert carbon dioxide to oxygen; students may want to research how

much carbon dioxide scientists believe is being converted this year compared to previous years)

Erosion Control - plant cover prevents land degradation and improves soil fertility

(Ex: Madagascar has lost 90% of its plant cover, and erosion of red soils into ocean can be seen by satellites; erosion and increased run-off of soils and pollutants from cities due to loss of plant cover worldwide, leading to flooding events and pollutants in natural bodies of water)

Pollination - insect, Bird, and Bat Pollination, especially

(Ex: Recent studies on loss of bees and the cost it would take to pollinate by hand; some plants are adapted to have very specific pollinators; how would wind pollination work with fragmented habitats?)

Biological Control - regulate pests and diseases that affect all organisms by predation and increasing biodiversity

(Ex: Sharks feed on diseased or dying fish, and with the increased loss of sharks we could see our fish supply becoming more diseased; Zika outbreak due to Aedes mosquitoes, which increase with temperature and with loss of natural predators; Mountain Pine Beetle decimating the Rocky Mountain Pines; Invasive species with no natural predators, like the fungus *Cryphonectria parasitica* causing the chestnut blight in the 1900s)

Weather Extremes Control - natural hazards like landslides, hurricanes, flooding

(Ex: Mangrove forests protecting the coast from hurricanes/tsunamis, landslide increase from the loss of plant cover/roots and increased soil erosion, urban areas with increased flooding due to loss of plants)

Waste Decomposition - decompose and filter human and animal waste

(Ex: Wetlands filter animal waste, including our own waste, through plants, microorganisms, invertebrates, and fish; decomposers of human waste, such as insects and invertebrates as well as microorganisms in soil)

Culture Services:

Mental Health - role green spaces play in mental health, issue of city living on mental health

(Ex: Past studies on the importance of green spaces and green belts in city living, such as Central Park or the Green Belt in Austin, TX; Recent Studies on the benefits of plants inside apartments; Singapore Green Spaces and their benefits to humans as well as other organisms)

Eco-Tourism - biodiversity and ecosystems attract visitors, boosting local economy

(Ex: Poachers have been known to take jobs as tour guides or artisans for a higher salary How does ecotourism affect local people? What pros and cons may exist for having people travel to an area? How might snorkeling traffic affect a reef? What places or species have been protected due to ecotourism?)

Spiritual/Religious Purpose - natural features with sacred meaning

(Ex: Natural Heritage Sites like Uluru-Kata Tjuta in Australia, Sacred Groves or forests in Estonia, Kashima Wildlife Preservation Area in Japan, Osun-Osogbo Sacred Grove in Nigeria, Mount Sinai in Egypt)

Assessment Questions

- After all the students have presented, have them come together as a class and list some of the ecosystem services on our planet.
- How have we affected these services?
- Does it only affect us? What other organisms are affected by the loss of biodiversity?
- What do you think might happen if we lose too many species and too many services?
- What is one thing you can do to help?
- What is one thing your community can do to help?

Reference list

The Economics of Ecosystems & Biodiversity-TEEB. Retrieved May 9, 2018, from

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TreeTender. (2017). Retrieved May 9, 2018, from <https://www.treetender.org>