

Topic: Environmental Impact Project

Summary: Students thoroughly research a local ecosystem and learn how humans affect that ecosystem. Students form groups and submit competing bids for a development of their choice.

Goals & Objectives: Students will be able to use ecology to understand their local environment. Students will be able to write a large report, create drawings and maps, and to present the report to an audience. Students will be able to collaborate in groups, to innovate, and to use their problem-solving skills collectively and as individuals.

Standards: CA Biology *6a. 6b. 6c. 6d. 6e. 6f. Investigation-h. Investigation-l. Investigation-m.*

Time Length: 2 weeks of class time for students to work on the project.

Materials:

- Library – computers with internet access for research
- Large posters for presentation
- Color pens or pencils and white paper for drawing
- Photocopy attendance sheet for each period

Teacher Setup:

1. Decide on an area close to the school that will be developed. It should be at least the size of the school property. It can be a place that is already developed but in bad shape, a large parking lot, or undeveloped land.
2. Reserve a day at the library for the first day of the project. The library might have books on your local environment. If the library does not have internet access, reserve a day for students to use the computer lab. Make sure account username and passwords are taken care of before hand. All students need to research using the computers. If login will be a problem, reserve the lab for two days and add an extra day on to the project. You can use the websites given or choose to find your own resources. The environmental survey websites are based upon eastern SF bay area.
3. Research websites that have the same ecosystem types as your local environment. Try to find websites that have names of plants, herbivores, carnivores, decomposers, and endangered species. An example would be if you live in a western conifer forest or grasslands.
4. Select a day for the presentation and when the written report will be due. You may need to determine if the students need an extra day or two to finish the report.

Procedures:

1st day: Explain the project and give out handouts. Assign students to groups of four. Try not to use groups of three. Students decide what kind of project to develop from the list provided. Students will discuss and agree on responsibilities of the project. The groups then submit the rubrics with their names, development title and assigned parts. All students must participate in the presentation of the project. Have students exchange phone numbers or emails so that they can keep in touch during the project. Being absent does not excuse the student for their portion of their work. All students who know they will be gone for an extended period of time must work on an alternative assignment.

2nd day: Library or computer lab. Have students write out their research on paper. It is faster if they print but they must pay for the paper. Many groups will come up with the same information, books and websites. It is important that students learn research skills on their own. Groups are to sit together and record where they locate the information: website URL, publisher, and date published. Students should leave all research with you in the classroom so that if a student is sick they will not delay the rest of the group.

3rd day to 9th day: Each day all students should work on their portion of the project. At the end of the period mark a plus, check, minus, or absent on your attendance sheet to indicate the student's participation level. Most student work will be writing paragraphs, outlining research, or drawing. Mark on your attendance sheet if another student in the group covered the part of an absent or non-working student. Use two pluses for students who go beyond their assigned work. Students can work on their part of the project at home but must be on task during class time. Additional presentation posters are optional and recommended.

10th day: Presentations. All students in a group present their project to the class. Use the presentation rubric to grade each group presentation. After all presentations are finished, have students fill out the peer evaluation form. The form must be completed individually (no collaboration) and turned over when completed. Teacher collects the forms so that the other students do not get to see the evaluation.

Accommodations:

Students who will not be in class or are unable to work in a group should have an alternative assignment. Students with an IEP can join a group of four students to make a total of five students in that group. Students who are dyslexic can write a smaller portion of the report and concentrate on the drawings instead. Students with an IEP can take their section home if they need extra time.

Evaluation:

The project is worth a total of 250 points: 50 for participation, 150 for the written report, and 50 for the presentation. There are rubrics for the 3 sections of the project.

Ecosystem Development Project

Students are going to work in a group to develop a large parcel of land. The development project will incorporate real world economic, social, and environmental issues. The loan for your team to build this project has already been approved. The teacher will become both an advisor and the judge who decides who will win the development project. The project will include a minimum of *three posters* for the class presentation. A large written report will be produced to detail the proposal.

Groups:

Each member of the group is expected to complete his or her fair share of the project. All group members are expected to compromise, collaborate and share information and ideas. All students must present at the end of the project. The project can be broken down into sections and each member can be assigned to a section. If a student does not complete their section, other team members will need to pick up the slack. These students will earn extra credit and the underperforming student will be docked points. The sections are:

- Environmental survey and drawing the food web & energy pyramid poster
- Environmental impact assessment
- Economic / social benefits and drawing the blueprint poster
- Ecosystem management plan and drawing the carbon, nitrogen, water cycle poster

Background Info:

In your city, there will be a vote at the next city council meeting on the proposed sale of a large area of land that has a *creek or canal, wetlands, and a farm*. Your project must first go through the planning commission (all requirements below) and then to the city council (presentation to your teacher).

Each group represents a development company with different ideas on how to best develop the land. All bidding interests will be required to present an environmental impact assessment, a blueprint of land development, and a statement of the social and economic benefit for the community. Additionally, each project bidder must establish an ecosystem management plan to improve and maintain the land not developed in the project. The city council will determine which bidding party will develop the land based on the best interest of the community.

Your city is interested in a monetary gain that would be realized with the development of the property. Pollution from external sources is a concern for the city residents and some open space is desired regardless of which plan is accepted.

Your choice of projects includes:

- **Power Plant** - A power plant large enough to provide 50% of the electricity for surrounding area.
- **Amusement Park** - A family-oriented theme park.
- **Residential District** - A mix density residential community.
- **Zoo** - A large zoo.
- **Mall** - A cooperation of locally owned stores in one location.

- **Amphitheater** - A large outdoor arena for music concerts.
- **Office Park** - A large office park for multinational companies.
- **Oil Refinery** - A fossil fuel refining factory focusing on high quality fuel for cars.
- **Farm** – A locally owned agricultural company.
- **University** – The state university wants to open a campus extension here.
- **Factory** – A large factory where something is manufactured.
- **Sports Stadium** – Build a large sports field for sport or sports of your choice.
- **Park / Open Space** – Used for both wildlife and recreational activities.

Order of Progression:

- 1st Research animals and plants for the environmental survey and your type of development. Example – if you are going to build an amusement park, research Six Flags resorts to get an idea of what you are going to need to build.
- 2nd Discuss and draw a rough copy of the blueprint to generate ideas of everything that you are going to build. Make estimates of proportions of what you are going to build in relation to the entire plot of land. Create a data table for the environmental survey.
- 3rd Finish the environmental survey
Ecosystem management plan
Environmental impact assessment
Economic and social benefits
Posters: food web, food pyramid, 3 cycles
Final blueprint
- 4th Presentation

Written Report:

The written report will include four sections: environmental survey, environmental impact assessment, ecosystem management plan, and economic and social benefits.

Environmental Survey: Before you develop the land

The object of this survey is to show the people that you have carefully examined what currently exists at and around the development site. The items that are part of your survey are:

1. Make a data table of plants, mammals, birds, insects, and endangered species present in this type of ecosystem. Columns include the common name, species name, habitat, food source, and autotroph / heterotroph. Provide 20 different species total.
2. Explain the features of the biome of your site. Explain about the climate of the area.
3. How does the fertilizer from the farm affect the creek/canal's water quality? How do the wetlands affect the creek/canal's water quality?

Ecosystem Management Plan: open space on your land after you develop.

Part of the parcel needs to be maintained as open space to help the environment. Your team gets to decide how much land to set aside from development. You also need to create a management plan for this open space. The management plan should incorporate:

1. Pest control – Are you going to use pesticides, herbicides, fungicides, or bat houses for insect control?
2. Native or non-native plants – Which will you plant? Are you going to try to control non-native plants?
3. Animal management – Is the land large enough for big animals? Will you allow hunting to control population size?
4. Water usage – Are you going to irrigate the trees and lawn, drill for wells or put the creek into a pipe and cover it?
5. Recreational use – Are you going to have hiking trails, a sports park, or parking?

Environmental Impact Assessment: After you develop the land.

The local people will be very interested in what effect your planned development will have on their environment and quality of life. A careful, scientific presentation of the facts will help to make the best decision. Although you are doing research and presenting the impact of your fictional development, you must use real facts. The preparation of this Environmental Impact Assessment goes hand in hand with the drawing of the blueprint for your planned development. Include the following items:

1. A list of the main things you will be building on the parcel.
2. How will the development affect the traffic on neighboring highways, freeways and roads?
3. List the types of garbage and waste materials produced by your development and explain how you will dispose of them. How are you going to use the 3 Rs concept (reduce, reuse and recycle).
4. How will your development affect the surrounding ecosystems, the creek/canal, and the quality of air and water in the city?
5. How much electricity, heating, cooling and water will your development need and how are you going to supply this demand?
6. Explain how your development will affect city services like police, fire, schools, sewage, and health care. What you are going to do to lessen the impact?
7. Make-up a birth rate, death rate, immigration rate, emigration rate, and current population size of one animal species in the ecosystem before you develop. Explain how each rate is changed because of the development.
8. A review of the impact of this development on any endangered or threatened species found at the site. Use one species as an example.

Economic and Social Benefits: benefits the community receives after you develop.

The main reason why we develop is to provide either an economic or social benefit to society. In what way will your development provide a benefit? Listed below are some of possible benefits.

- Make estimates on each economic benefit and explain how you arrived at that amount. Economic benefits would be things that will bring:
 - Increased tax revenue for the city: Estimate how much your development will make in a year
 - Jobs: what kind of jobs, how much will each pay, what kind of benefits will you offer?
 - Increased land value – does this attract people to move here or to leave? Explain
 - Lower the impact on city resources (water, sewage, energy).
- Social benefits would include things like:
 - Entertainment and relaxation
 - Education
 - Health care
 - Provide shelter, day care, clothing, or food for families
 - Improve the quality of life for youths or elderly residents

Presentation Posters:

There are three required posters: The posters must be large so that the students in the back of the room can see and read it during the presentation. You can create additional posters outlining your impact assessment and management plan.

- The blueprint is a drawing of the entire site and the surrounding area. It should show the location of all buildings, parking lots, roads, landscaping and preserved open space, etc. Make sure to consider, especially with homes, what is next to your plot of land and plan accordingly. The blueprint should be drawn to scale using a ruler / meter stick.
- Create a food web of the plants, animals, insects, and decomposers from the environmental survey. Draw a food web that includes the interconnections of who eats who. Create an energy pyramid of the plants, animals, insects, and decomposers of the local ecosystem. Draw an energy pyramid with labels that show how 90% of energy is lost as heat at each level.
- Draw diagrams to show how your development will affect the Carbon cycle (CO₂), the Water cycle (water usage and water pollution) and the Nitrogen cycle (air or water pollution). All three cycles need to include arrows with labels going into your development and arrows with labels coming out of the development.

Name: _____ Row: _____

Project Title : _____ Period: _____

Ecology Project Rubric

	Beginning	Novice	Proficient	Excellent	Grade
Environmental Impact Statement	4 or more items are incomplete. 20 Points	2-3 items are incomplete. 26 Points	1 item is incomplete. 32 Points	All 8 items are complete with detail. 40 Points	
Environmental Survey	3 or more items are incomplete. 15 Points	1-2 items are incomplete. 20 Points	All 3 items are complete but lacking detail. 25 Points	All 3 items are complete with detail. 30 Points	
Ecosystem Management Plan	Plan won't help the ecosystem. 4 Points	Plan is unrealistic or too simple. 6 Points	Plan is detailed but no explanation. 8 Points	Plan is detailed with explanations why the plan will help the ecosystem. 10 Points	
Food Web and 3 Cycles Posters	Food web has no interconnections or missing cycle. 15 Points	4-6 plants and animals of the ecosystem or wrong interconnections or one of the cycles were wrong. 20 Points	7 - 11 plants, animals, insects of the ecosystem with correct interconnections and 1-3 parts of the cycles were excluded. 25 Points	12 + plants, animals, insects, decomposers of the ecosystem with correct interconnections and all parts of the cycles included. 30 Points	
Economic and Social Issues	Benefits are unrealistic or confusing. 10 Points	Only economic or social benefits are defined. 13 points	Economic and Social benefits are defined but don't explain why. 16 points	Economic and Social benefits are well defined and explained. 20 points	
Blueprint of Development	Drawings are sloppy and confusing. 10 Points	Drawing does not show that area around your parcel. 13 points	Drawing is labeled and shows most aspects of your development. 16 points	Drawing is clear, precise, labeled, and shows all aspects of your development. 20 points	
				Total =	

Name: _____ Row: _____

Project Title : _____ Period: _____

Your Assigned Section: _____

Partner Name: _____ Assigned Section: _____

Partner Name: _____ Assigned Section: _____

Partner Name: _____ Assigned Section: _____

Presentation Rubric

	Large Negative Impact	Small Impact	Large Positive Impact
Economic Benefits			
Job Creation	0	5	10
Tax Revenue			
Assist Other Businesses			
Social Benefits			
Recreation	0	5	10
Family Facility			
Youth / Elderly Facility			
Environmental Benefits			
Pollution / Waste (Air, Water, Soil, Garbage)	10	15	20
Open Space Benefits			
Management Plan	0	5	10
Presentation Total 50 points total			_____
Student Participation 50 points total			_____
Written Report 150 points total			_____
Total Project Points out of 250 points			_____

Collaboration Rubric

You are to rate each of your partners on a scale of 1 to 5.
1 is very poor or little and 5 is very good or large.

Partner Name _____	<u>1 to 5</u>
How much did they work on their own part of the project?	_____
How much did they help you / partners during class time?	_____
How useful was their help in the decision making of the project?	_____
How easy was it to work with the partner?	_____
How often was he/she <i>on task</i> during class time?	_____
Total	_____

Partner Name _____	<u>1 to 5</u>
How much did they work on their own part of the project?	_____
How much did they help you / partners during class time?	_____
How useful was their help in the decision making of the project?	_____
How easy was it to work with the partner?	_____
How often was he/she <i>on task</i> during class time?	_____
Total	_____

Partner Name _____	<u>1 to 5</u>
How much did they work on their own part of the project?	_____
How much did they help you / partners during class time?	_____
How useful was their help in the decision making of the project?	_____
How easy was it to work with the partner?	_____
How often was he/she <i>on task</i> during class time?	_____
Total	_____

Useful Links

Example Environmental Impact Assessment

<http://www.concordreuseproject.org/news/nop.htm>

Environmental Survey – East SF Bay Area

<http://www.mdia.org/wildlife.htm>

<http://www.mdia.org/plants.htm>

<http://www.nativeplants.org/>

<http://www.baynature.com/home.html>

http://en.wikipedia.org/wiki/Mount_Diablo_State_Park

<http://www.mbgnet.net/index.html>

<http://www.bringingbackthenatives.net/>

Management Plan

<http://www.whatisipm.org/>

<http://www.doityourself.com/stry/pestmanagefarm>

<http://anrcatalog.ucdavis.edu/pdf/7251.pdf>

<http://ianrpubs.unl.edu/range/ec148.htm>

http://www.weedcenter.org/management/mgmt_overview.html

<http://www.nixalite.com/animalcontrolproducts.aspx>

<http://www.afrc.uamont.edu/whited/Opposing%20Views%20of%20Deer%20Pop%20Control.pdf>

Blueprint Planning

<http://www.planning.org/>

Environmental Assessment

<http://www.epa.gov/msw/reduce.htm>

http://en.wikipedia.org/wiki/Urban_planning#Transport

<http://ntl.bts.gov/DOCS/UTP.html>

<http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookpopecol.html>