# ENVIRONMENAL ENGINEERING

The State Parks and Recreation District has decided to develop some of its lands at various state parks as an environmental educational fun park. Your engineering and ecology teams have been asked to submit a proposal for the development of this land. Consider the following criteria when developing your plan.

**The Problem:**

The area of your allotted park is 300 feet long and 200 feet wide (the approximate the length of a football field and 1 ½ times as wide). The size of the paper that you will use for your design is approximately 30 inches by 20 inches. **The scale for the model is 1 inch = 10 feet.** The area has the following natural features which must be included:
- At least 15 trees native to the park region
- 1 hill
- An outcropping of rocks (you may decide how large this feature is),
- 1 stream (you may decide how large this feature is and depending on what state park this educational park is built in).

**Ecology Educational Fun Park Locations:**

- Calaveras Big Tree State Park
- Anza - Borrego Desert State Park
- Pfeiffer Big Sur State Park
- Great Valley Grasslands State Park
- Big Basin Redwoods State Park
- Auburn State Recreation Area

**Group Members Jobs for the Project:**

| Draft Person | Engineer | Finance Officer | Public Relations Person |
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Your team will choose a draft person, a finance officer, an engineer, and a public relations officer. The major responsibilities will be:
- **Draft Person**: Draws the design to scale and displays the finished design.
- **Engineer**: Responsible for design and safety
- **Finance Officer**: Keeps track of and presents the budget
- **Public Relations Person**: Keeps track of special features of the design and presents the team proposal. Prepares a 3 minute presentation of the proposal for the class, points out why this plan should be chosen over the others.

When designing your park, take the following questions into consideration for planning an environmentally safe and useful park for the community.

| **Versatility:** | **Environment Considerations:** |
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| • Is the park suitable for people of all ages? <br> • Can the park be used at night as well as during the day? <br> • Is the park useful in all seasons? <br> • Is there a wide range of activities available within the park? <br> • How safe is the design for young as well as old users? <br> • Are there any possible hazards? | • Will there be enough trash cans, recycling cans in the park to keep it clean? <br> • Will there be trees, hills, and rivers in the park to create habitats for animals? <br> • How will you create an environmentally safe place for animals and visitors at the park? |
| **Aesthetics/Beauty/Innovation:** | **Cost Effectiveness:** |
| • Is the design pleasing? <br> • Would people of all ages enjoy the park? | • Was the entire allotted budget spent? <br> • Is energy used efficiently in the park? |

Your team decides where to put the natural features in your design. Below are some possible materials and costs for the development of the land. You are free to use as much or as little of these as you wish. If you wish to use something that is not on the material list, check with your teacher whether the item is appropriate for an environmental park, and what the approximate cost is. You will have a budget of $5000 and it is your goal to use as much of the budget as possible without going over budget.

| COST OF MATERIALS AND EQUIPMENT | | | | |
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| **Material** | **Cost** | **Unit** | **Quantity/Amount of Units Needed** | **Total Cost** |
| Rope | $1 | Per 10 feet | | |
| Bricks | $1 | Each | | |
| Sand | $1 | Cubic foot | | |
| Stepping Stones | $5 | Each | | |
| Ecology Education Signs | $10 | Each | | |
| Plants/Shrubs | $10 | Each | | |
| Trash Barrels | $10 | Each | | |
| Recycling Barrels | $10 | Each | | |
| Benches (6' long) | $15 | Each | | |
| Old Telephone Poles 10' long | $25 | Each | | |
| Wire Fencing (6' tall) | $30 | Per 10 running feet | | |
| Asphalt pavement | $40 | Per 10 running feet | | |
| Picnic Tables | $50 | Each | | |
| Drinking Fountains | $75 | Each | | |
| Pond | $100 | Each | | |
| Playground equipment | $100 | Per item | | |
| Bike Racks | $150 | Each | | |
| Barbecues | $150 | Each | | |
| Street Lights | $250 | Each | | |
| Public Telescope | $300 | Each | | |
| Stage (20' square) | $300 | Each | | |
| Bathrooms (men and women together) | $350 | Pair | | |
| Bridge | $1000 | Each | | |
| Wind Turbines | +$50 | Each (up to 10) | | |
| Solar Panels (10 ft x 10 ft) | +$100 | Each (up to 5) | | |
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**Park Ecology:**

Your park is an educational ecology fun park, and in order to build such a park, you have to understand the ecosystem and community of organisms that live in it. You will be research about the type of ecosystem your park is located in, the organisms that could live in your park, and create a food chain and food web of organisms that live in your park. Also, you and your group members have to take in consideration on how to protect your educational park from being destroyed and harmfully impacted by humans visiting it.

Your ecology team members will choose to be: an ecosystem researcher, a producer and consumer researcher, a food chain constructor, and a food web constructor. The major responsibilities will be:

- **Ecosystem Researcher**: Research what type of ecosystem your park is located in and research about key components of the ecosystem.
- **Producer and Consumer Researcher**: Research different organisms that could live in or be seen in your park.
- **Food Chain Constructor**: Construct a food chain to show the transfer of energy in your park.
- **Food Web Constructor**: Construct a food web to show how organisms consume one another in your park.

When researching about the ecological components of your park, think about answering these questions.

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| **Ecosystem** | <ul><li>What is the ecosystem your park is located in?</li><li>What are the major abiotic factors of your park?</li><li>Describe the climate of your park's location?</li><li>What dangers does your park face (fires, pollution, construction, agriculture practices, earthquakes, volcanic eruptions, etc.)</li></ul> |
| **Producers and Consumers** | <ul><li>What type of producers/plants/algae could be found in the park and ecosystem?</li><li>Include pictures of what the producers look like.</li><li>What type of consumers could be found in the park and its ecosystem?</li><li>Chose herbivores, omnivores, and carnivores.</li><li>Include pictures of what they look like.</li></ul> |
| **Food Chain** | <ul><li>Construct a food chain with one producer and three consumers.</li><li>State what tropic level they and what type of consumer they are for the three consumers?</li></ul> |
| **Food Web** | <ul><li>Construct a food web with at least two producers, four consumers, and 2 decomposers.</li><li>Use arrows to connect how the organisms consume one another in the parks ecosystem.</li><li>Use pictures to make the food web</li></ul> |

**Final Product:** There will be two pieces made and turned in for this project. First, you and your group members will construct a 2D drawing of the layout of your educational ecology park. You must include all materials needed and bought for the park. Everything must be done to scale of **1inch on the drawing is equal to 10 feet in real life**. The drawing must be colored, organized, neatly made, and done on the provided paper.

The other product of this project is a Google Slideshow presentation. There is a provided template for the slide show at hamiltonlifephysscience.weebly.com under the ecology tab. The slideshow must be shared with your group members and with your teacher. Include all information asked on each slide and from the project directions. Make sure to delete the speech bubbles, include pictures, use proper grammar and spelling, and make the presentation presentable.

**Grading:** The project will be a major portion of your grade. It is worth 100 points per student. It can serve to raise your grade greatly, or it can lower your grade tremendously. There will be a group collaboration portion of the grade for each student. If you do not work with your group, you will lose points for this portion of the project grade. Work carefully and with the proper amount of effort for a project of this magnitude.

**Due Date:** _____