Ecosystem Development Project **50 points** **Due Date _____**

Students are going to work in a group to develop a large parcel of land with the theme of either enriching biodiversity or increasing sustainability. 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 class presentation and a large written report to detail the proposal.

Groups:

Each member of the group is expected to be involved in **all** aspects 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 as leader for that section, but all group members must work together to complete the project. If a student does not fully participate, 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
- Environmental impact and sustainability assessment
- Economic / social benefits and a blueprint
- Ecosystem management plan

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 / canal*, *wetlands*, and old *farmland*. The city wants to meet the needs of future generations through enriching biodiversity of the area and or through increasing the city's sustainability in the resources used for the development. 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, enriching biodiversity or increasing sustainability.

Potential projects could include:

- **Power Plant -** A power plant large enough to provide 50% of the electricity for surrounding area.
- **Amusement Park -** A family-oriented theme park that provides revenue for the city and entertainment.
- **Zoo** – A large zoo for animals and plants that provides revenue for the city, entertainment and education.
- **Mall** - A cooperation of locally owned stores in one location that provides revenue for the city and entertainment.
- **Amphitheater -** A large outdoor arena for music concerts that provides revenue for the city and entertainment.
- **Office Park** - A large office park for multinational companies that provides employment and some city revenue.
- **Factory / Oil Refinery** - A factory where something is manufactured or fossil fuel refining factory focusing on high quality gas for cars that provides high levels of employment at the cost of the environment.
- **Farm** – A locally owned agricultural company that provides organic local food, with low economic benefits.
- **University** – The state university wants to open a campus extension here that provides revenue and education.
- **Sports Stadium** – A large sports field for sports of your choice with high city revenue, but with ecological impacts.
- **Park / Open Space** – Used for both wildlife and recreational activities at the cost of the city.
- **Other** – ???

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 see 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, using sustainable materials. 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 Ecosystem management plan
Environmental impact assessment
Biodiversity or sustainability assessment
Economic and social benefits
Final blueprint

4th Presentation

Written Report:

The written report will include four sections: environmental survey, environmental impact and sustainability 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. Design a data table of plants, mammals, birds, insects, and endangered species present in this type of ecosystem. Columns must include the common name, species name, habitat, food source, and autotroph / heterotroph. Provide 20 different species total.
2. Explain the main abiotic and biotic features of your site.

Environmental Impact and Sustainability Assessment: Before 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 and Sustainability Assessment goes hand in hand with the drawing of the blueprint for your planned development.

Include the following items in the assessment:

1. A list of the main things you will be building on the parcel.
2. Assess the types of materials, the cost and your Green Score (see attached) you will be using in the main structure of your development. The funding for your development will be limited to 1.5 million dollars. Do not to go over budget!
3. Outline how your development specifically affects the biodiversity of the surrounding ecosystems and what steps you will take to decrease the development's negative impact on biodiversity.
4. Estimate much electricity and water will your development need, and outline how will you supply this demand.
5. Describe how the development will affect the traffic on neighboring highways, freeways and roads.
6. Outline 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. List the types of garbage and waste materials produced by your development and explain how you will dispose of them. Outline how you will use the 3 R's concept (reduce, reuse and recycle) to reduce your impact.

Ecosystem Management Plan: Open space on your land while 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 trials, a sports park, or parking?

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 **three** economic benefits and outline 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: List five different jobs available through your development, how much will each pay (CA minimum wage: $11.00/hour), what kind of benefits will you offer?
    - Increased land value – Does the development attract people to move here or to leave? Explain.
    - Lower the impact on city resources (water, sewage, energy).
- Social benefits must include **three** of the following:
    - Fine art installation
    - Entertainment and relaxation
    - Education facilities
    - Health care facilities
    - Provide shelter, day care, clothing, or food for families
    - Improve the quality of life for youths or elderly residents

Visual Aids:

There are two required visual aids: The visual aids must be large/clear enough so that the students in the back of the room can see and read it during the presentation. You can create additional visual aids or use presentation software to outline your impact and sustainability 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 and neat (i.e. use a straight edge or computer program).
- An infographic outlining how your development will positively address either biodiversity or sustainability in the area. The infographic should:
    - Describe how biodiversity or sustainable developments are vital to future generations of humans.
    - Outline how your development will positively enrich biodiversity or increase sustainability.

Team Name _____ Period _____

Ecosystem Development Project					
	Beginning	**Novice**	**Proficient**	**Excellent**	**Score**
Environmental Impact and Sustainability Assessment	4 or more items are incomplete, incorrect or lacking details. Green score is 30 or below. 0-5 Points	2-3 items are incomplete, incorrect or lacking details. Green score is 31-50 points. 6-7 Points	1 item is incomplete, incorrect or lacking details. Green score is 51-70 points. 8-9 Points	All 7 items are complete with detail. Green score is 71-+100 points. 10 Points	
Environmental Survey	Less than 15 organisms are in the survey. Little to no description of the site is included, with either abiotic or biotic factors missing. 0-5 Points	Less than 20 organisms are in the survey. A general description of the site is made, with limited abiotic and/or biotic factors. 6-7 Points	At least 20 organisms are in the survey. A description of the site is given with some specific abiotic and biotic factors. 8-9 Points	More than 20 organisms are in the survey. The site is well described in detail with specific abiotic and biotic factors. 10 Points	
Ecosystem Management Plan	Plan won't help the local ecosystem. 0-1 Points	Plan is unrealistic or too simple. 2-3 Points	Plan is detailed but little to no explanation is given or explanation is unrealistic 4 Points	Plan is detailed with realistic explanations why the plan will help the ecosystem. 5 Points	
Economic and Social Issues	Benefits are unrealistic or confusing or lacking in detail. 0-5 Points	Only Economic or Social benefits are defined with little detail given. 6-7 points	Economic and Social benefits are defined but don't explain why they benefit the community. 8-9 points	Economic and Social benefits are well defined and explained with connections to community well being. 10 points	
Blueprint of Development	Drawings are sloppy and confusing. No key or title is shown. Drawings lacking scale. 0-2 Points	Drawing does not show that area around your parcel. The drawing is lacking details and/or a key. 3 points	Drawing is labeled and shows most aspects of your development. Drawing is to scale with a key. 4 points	Drawing is clear, precise, labeled, and shows all aspects of your development. Drawing is to scale with a well designed key. 5 points	
Infographic	Infographic does not present information in an organized way, information is contradicting, lacking in color/design, or does not specifically address biodiversity / sustainability. 0-5 Points	Infographic is organized, but does not clearly communicate the importance of biodiversity / sustainability. The infographic states how the issue(s) will be positively addressed. 6-7 Points	Infographic is well designed that clearly communicates the importance of biodiversity / sustainability. The infographic outlines how the issue(s) will be positively addressed. 8-9 Points	Infographic is well designed, clearly communicates the importance of biodiversity / sustainability. The infographic explains in detail how the issue(s) will be positively addressed in a realistic manner. 10 Points	
				Total	

NOTES:

Green Score Sheet

Leadership in Energy and Environmental Design (LEED) uses different categories of building elements and assigns points for using "green" building codes are better for the environment, energy efficient, and sometimes more cost efficient.

LEED LEVELS

Bronze: 70 green points
Silver: 80 green points
Gold: 90 green points
Platinum: 100 green points

LEED Category		Option	Green Points	Cost (10 K)
Sustainable Sites	1	VEGETATION TYPE: Shrubs-nonnative (invasive)	- 1	**$3**
	2	VEGETATION TYPE: Shrubs-native (drought resistant)	+ 3	**$1**
	3	VEGETATION TYPE: Grass only	- 3	**$5**
	4	VEGETATION TYPE: Mixed-shrubs and grass (nonnative)	- 2	**$5**
	5	VEGETATION TYPE: Mixed-shrubs and grass (native)	0	**$3**
	6	VEGETATION TYPE: Shade trees only	+ 4	**$3**
	7	PAVING TYPE: Standard concrete slab for walkways, parking spaces, sports courts, patios, etc.	- 4	**$4**
	8	PAVING TYPE: Open Paving for walkways, parking (paving stones, brick, or gravel, allows for water draining and plant growth between stones of path)	+ 4	**$3**
	9	PAVING TYPE: No Paving for walkways or parking (dirt/gravel paths only. Warning! Sustainable but MUDDY...)	+ 5	**$1**
	10	IRRIGATION TYPE: Hand watering plants	+ 1	**$5**
	11	IRRIGATION TYPE: Drip system	+ 3	**$1**
	12	IRRIGATION TYPE: Sprinkler system. **REQUIRED if you have grass or mixed vegetation**	- 3	**$4**
	13	IRRIGATION TYPE: None. **NATIVE PLANTS ONLY**	+ 6	**$0**
	14	BUILDING SIZE (floor area): 500 sqft per floor	+ 14	**$5**
	15	BUILDING SIZE (floor area): 1000 sqft per floor	+ 8	**$10**
	16	BUILDING SIZE (floor area): 2000 sqft per floor	+4	**$15**
	17	BUILDING SIZE (floor area): +2000 sqft per floor	+ 2	**$20**
	18	NUMBER OF LEVELS OF BUILDING: 1 story	+ 2	**$5**
	19	NUMBER OF LEVELS OF BUILDING: 2-3 stories	+ 4	**$10**
	20	NUMBER OF LEVELS OF BUILDING: 4-5 stories	+ 8	**$15**
	21	NUMBER OF LEVELS OF BUILDING: +6 stories	+ 14	**$20**
Water Efficiency	22	FIXTURES: All normal throughout the building (sinks, toilets, dishwasher, shower, washing machine)	0	**$7**
	23	FIXTURES: Low flow/water saver throughout the building (sinks, toilets, dishwasher, shower, washing machine)	+ 4	**$10**

LEED Category		Option	Green Points	Cost (10 K)
Energy and Atmosphere		****NOTE: NON-RENEWABLE ENERGY SOURCES COME FROM OFF SITE. RENEWABLE ENERGY SOURCES MUST BE PRESENT ON YOUR SITE!!**		
	24	ACTIVE ENERGY: Electric Heating/cooking (electricity from **non-renewable coa**l fire power plants)	- 5	**$3**
	25	ACTIVE ENERGY: Heating/cooking (using **non-renewable natural gas**)	- 3	**$4**
	26	ACTIVE ENERGY: Heating/cooking (using **active solar heating system**)	+ 6	**$5**
	27	ACTIVE ENERGY: Electric Heating/cooking (electricity from **renewable solar panels**)	+ 5	**$7**
	28	ACTIVE ENERGY: Electric Heating/cooking (electricity from **renewable geothermal energy**)	+ 4	**$6**
	29	ACTIVE ENERGY: Electric Heating/cooking (electricity from **renewable wind energy**)	+ 6	**$8**
	30	ACTIVE ENERGY: Electric Heating/cooking (electricity from **renewable hydroelectric energy**)	+ 3	**$5**
	31	ACTIVE ENERGY: Natural gas Heating/cooking (using **renewable biomass energy--methane**)	+ 3	**$4**
	32	ACTIVE ENERGY: Electricity to run Standard appliances (fridge, microwave, toaster, etc.--(electricity from **non-renewable coa**l fire power plants)	-5	**$3**
	33	ACTIVE ENERGY: Electricity to run Standard appliances (fridge, microwave, toaster, etc. (electricity from **renewable solar panels**)	+ 5	**$7**
	34	ACTIVE ENERGY: Electricity to run Standard appliances (fridge, microwave, toaster, etc. (electricity from **renewable geothermal energy**)	+ 4	**$6**
	35	ACTIVE ENERGY: Electricity to run Standard appliances (fridge, microwave, toaster, etc. (electricity from **renewable wind energy**)	+ 6	**$8**
	36	ACTIVE ENERGY: Electricity to run Standard appliances (fridge, microwave, toaster, etc. (electricity from **renewable hydroelectric energy**)	+ 3	**$6**
	37	ACTIVE ENERGY: Electricity for standard lighting (electricity from **non-renewable coa**l fire power plants)	- 5	**$3**
	38	ACTIVE ENERGY: Electricity for standard lighting (electricity from **renewable solar panels**)	+ 4	**$8**
	39	ACTIVE ENERGY: Electricity for standard lighting (electricity from **renewable geothermal energy**)	+ 4	**$7**
	40	ACTIVE ENERGY: Electricity for standard lighting (electricity from **renewable wind energy**)	+ 5	**$8**
	41	ACTIVE ENERGY: Electricity for standard lighting (electricity from **renewable hydroelectric energy**)	+ 3	**$6**
	42	ACTIVE ENERGY: Energy source Tax--1 energy type for the building	+ 5	**$5 Credit**
	43	ACTIVE ENERGY: Energy source Tax--2 energy types for the building	+ 2	**$3 Credit**
	44	ACTIVE ENERGY: Energy source Tax--3 energy types for the building	0	**0**
	45	ACTIVE ENERGY: Energy source Tax--4 energy types for the building (using too many energy sources is more expensive and bad for the environment because of the resources/technology/equipment needed to have those energies on your site)	- 2	**$3**

LEED Category		Option	Green Points	Cost (10 K)
Energy and Atmosphere	46	ACTIVE ENERGY: Energy source Tax--5 energy sources for the building (using too many energy sources is more expensive and bad for the environment because of the resources/technology/equipment needed to have those energies on your site)	- 5	**$4**
	47	PASSIVE ENERGY: Windows--single pane	- 2	**$4**
	48	PASSIVE ENERGY: Windows--double pane (better at trapping heat)	+ 2	**$6**
	49	PASSIVE ENERGY: Windows--traditional tinting (with harmful chemicals)	- 1	**$4**
	50	PASSIVE ENERGY: Windows--Low-E tinting (with out harmful chemicals)	+ 5	**$8**
	51	PASSIVE ENERGY: Windows direction--most facing South	+ 2	**$0**
	52	PASSIVE ENERGY: Windows direction--most facing East or West	0	**$0**
	53	PASSIVE ENERGY: Windows direction--most facing North (no sun = no heat getting in = loss of energy)	- 2	**$0**
	54	PASSIVE ENERGY: Wall Insulation--NONE	- 4	**$1**
	55	PASSIVE ENERGY: Wall Insulation--with standard insulation	0	**$2**
	56	PASSIVE ENERGY: Wall Insulation--with double insulation	+ 3	**$3**
	57	PASSIVE ENERGY: Wall Insulation--with triple insulation	+ 5	**$4**
Materials and Resources	58	BUILDING MATERIAL: Building frame is built from normal wood	+ 3	**$4**
	59	BUILDING MATERIAL: Building frame is built from wood from a Sustainable Forest	+ 5	**$6**
	60	BUILDING MATERIAL: Building frame is built from new steel	0	**$10**
	61	BUILDING MATERIAL: Building frame is built from post-consumer recycled steel	+ 7	**$10**
	62	BUILDING MATERIAL: Building frame is built from new brick	+ 3	**$6**
	63	BUILDING MATERIAL: Building frame is built from recycled brick	+ 7	**$7**
	64	BUILDING MATERIAL: Building frame is built from concrete	+ 3	**$10**
	65	BUILDING MATERIAL: Building frame is built from concrete containing FLY ASH (a waste byproduct of industrial processes). Good because it will last hundreds of years	+ 10	**$15**
Interior Environment Quality	66	FLOORING: Mostly wood floors	0	**$3**
	67	FLOORING: Mostly wood floors from sustainable forests	+ 4	**$5**
	68	FLOORING: Mostly carpet floors	- 3	**$2**
	69	FLOORING: Mostly carpet floors **without** toxic volatile organic compounds (V.O.C.)	+ 3	**$4**
	70	FLOORING: Mostly tile floors	0	**$4**

LEED Category		Option	Green Points	Cost (10 K)
Interior Environment Quality	71	FLOORING: Mostly tile floors made from composite (recycled) material	+ 2	**$3**
	72	PAINT: Lead-based	- 6	**$1**
	73	PAINT: Oil-based	- 3	**$2**
	74	PAINT: Water-based	0	**$2**
	75	PAINT: **Without** any toxic volatile organic compounds (V.O.C.)	+ 4	**$4**
EXTRAS: Below are extra options that you may choose to include in your design. **Remember, you are limited to spending $1.5 million !!!**				
Sustainable Sites	76	RAIN WATER COLLECTION for irrigation	+ 3	**$2**
	77	RAIN WATER COLLECTION for grey water (toilet use)	+ 5	**$4**
	78	RAIN WATER COLLECTION for potable uses (drinking, sinks, showers)	+ 6	**$6**
	79	SUBSISTENCE FARMING: Livestock raised for renewable personal use (eggs, milk, manure for fertilizer, wool) **NO KILLING OF ANIMALS**	+ 10	**$10**
	80	SUBSISTENCE FARMING: Fruits and vegetables for personal consumption (i.e. vegetable garden)	+ 4	**$4**
	81	GREEN ROOF: Installing a living roof on top of your building can increase the amount of vegetation on the site, reduce water usage and waste, and add insulation to your building.	+ 8	**$6**
	82	OUTDOOR LIGHTING: Solar powered lights	+ 3	**$4**
	83	OUTDOOR LIGHTING: Electric lights	- 3	**$2**
	84	TRANSPORTATION: Renewable energy shuttle service	+ 4	**$6**
	85	TRANSPORTATION: Bicycle parking	+ 2	**$1**
Water Efficiency	86	SPA/HOT TUB/SAUNA	- 3	**$3**
	87	POOL: Indoor (heated)	- 5	**$6**
	88	POOL: Outdoor (not heated)	- 1	**$4**
Energy and Atmosphere	89	ACTIVE ENERGY: Electric Car charging station	+ 3	**$2**
	90	ACTIVE ENERGY: Air Conditioning	- 5	**$4**
	91	ACTIVE ENERGY: Make all appliances Energy Star (energy efficient)	+ 5	**$2**
	92	ACTIVE ENERGY: Replace standard refrigerator with NON-OZONE depleting refrigerator (non CFCs)	+ 2	**$1**
	93	PASSIVE ENERGY: Add skylights (but no green roof allowed)	+ 4	**$2**
Materials and Resources	94	RECYCLING AREA: All recycling goes in one bin	+ 1	**$1**
	95	RECYCLING AREA: Recycling is sorted into bins for paper, cardboard, glass, plastic, and metal	+ 5	**$2**

Group Name _____ Period _____ Date _____

Green Score Sheet

LEED Category	Design Element	Write the name of your choice	Green Points	Cost (10 K)
Sustainable Sites	Vegetation			
	Paving			
	Irrigation			
	Building Size			
	Number of Levels			
Water Efficiency	Fixtures			
Energy and Atmosphere	Heating/Cooking			
	Electricity for appliances			
	Energy Source Tax			
	Window Type			
	Window Direction			
	Wall Insulation			
Interior Environment Quality	Building frame			
	Flooring			
	Paint			
Extras*				
		Total		

***Attach additional sheets if necessary.**