

Memorandum to All AP Biology Students:

We at the Natural Resources Defense Council (NRDC) have been working as environmental activists since 1970. NRDC uses law, science and the support of 1.3 million members and online activists to protect our health and natural environment. Our mission is “To safeguard the Earth: its people, its plants and animals and the natural systems on which all life depends.” (<http://www.nrdc.org/about/>)

A basic tenet of the science of the environment is that all living and nonliving things in the biosphere interact and affect each other. Scientists tell us that humans have had a disproportionate effect on the health of various compartments within the biosphere, primarily through upsetting the balance of these interactions. Many people have a hard time understanding how and why that is. The NRDC wants you to participate in a campaign to educate future voters on these issues. As the best and brightest of our high school students, we feel that you can learn and understand the complex scientific principles that help to define a “healthy” ecosystem, and help us to know that there are enormous environmental problems that we face. Further, we believe that you, as teenagers, know the best way to communicate information about these problems to other teenagers. We are therefore asking you to learn all that you can about the interactions between living and nonliving parts of the environment, and then to choose a specific environmental issue of interest to you. We then would like you to research that issue, and develop a public service advertising campaign to educate other teenagers. There are several issues that are our priorities; you are welcome to select one of these issues to research. They include:

* [Curbing Global Warming](http://www.nrdc.org/globalwarming/) and [Creating the Clean Energy Future](http://www.nrdc.org/energy/)
* [Reviving the World's Oceans](http://www.nrdc.org/oceans/)
* [Defending Endangered Wildlife](http://www.nrdc.org/wildlife/)and [Wild Places](http://www.nrdc.org/land/)
* [Protecting Our Health by Preventing Pollution](http://www.nrdc.org/health/)
* [Ensuring Safe and Sufficient Water](http://www.nrdc.org/water/)
* [Fostering Sustainable Communities](http://www.nrdc.org/sustainable-communities/)

You will see in your study of environmental interactions that there are also many other issues that you could research. For example, introduced and invasive species are a huge problem in many areas, and research into the causes and possible solutions to this problem would be an additional area that would be of great use to us. In any case, we’d like you to use your interests and your imagination to guide your selection. Make sure that you look carefully at all scientific evidence related to your topic; do not fall into the trap of only using one or two sources to inform your advertising campaign. We want all information to be accurate and of the highest quality.

We will expect you to use whatever media you believe will most effectively communicate with your fellow teenagers for your advertising campaign. This may include, but is not restricted to, audio recordings, collages, comics, eBooks, narrated slideshows, videos, or animations. We are very excited to see your finished products, and we hope that they are the key to educating the voters of tomorrow about why they should be concerned about the health of Planet Earth, and vote to protect the natural environments upon which all life depends.

Sincerely,

**Jennifer Powers**

**NRDC National Media Director, Communications Department**

**AP Biology Project Based Learning Ecology Unit Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Enduring Understanding:** AP Biology Big Idea #4 - Biological systems interact, and these systems and their interactions possess complex properties.

**Driving Question - How have the interactions of humans with their environment upset the balance of nature on Planet Earth? What are the possible consequences?**

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| **Project Context:** All living and nonliving things in the biosphere interact and affect each other. Scientists tell us that humans have had a disproportionate effect on the health of various compartments within the biosphere. Many people have a hard time understanding how and why that is. NRDC wants us to participate in a campaign to educate future voters on these issues. | **Performance Product:** Working in groups, you will develop a public service advertising campaign on one environmental problem to communicate to teenagers the importance of that problem to the health of Planet Earth. You will be able to use your media of choice, and you must use at least two different media to get your message across. Examples of possible media include audio recordings, collages, comics, eBooks, narrated slideshows, videos, animations, etc. The culminating event will be a presentation of your advertising campaign to the class and a panel of judges. |

**Content Standards:**

* **Enduring understanding 4.A**: Interactions within biological systems lead to complex properties.
* **Enduring understanding 4.B**: Competition and cooperation are important aspects of biological systems.
* **Enduring understanding 4.C**: Naturally occurring diversity among and between components within biological systems affects interactions with the environment.

**Science Practice:**

1.3 The student can *refine representations and models* of natural or manmade phenomena and systems in the domain.

1.4 The student can *use representations and models* to analyze situations or solve problems qualitatively and quantitatively.

2.2 The student can *apply mathematical routines* to quantities that describe natural phenomena.

4.1 The student can *justify the selection of the kind of data* needed to answer a particular scientific question.

6.4 The student can *make claims and predictions about natural phenomena* based on scientific theories and models.

**Targeted Content:**

**Essential knowledge 4.A.5**: Communities are composed of populations of organisms that interact in complex ways.

* Learning objective 4.10 The student is able to refine representations and models to illustrate biocomplexity due to interactions of the constituent parts.
* Learning objective 4.11 The student is able to justify the selection of the kind of data needed to answer scientific questions about the interaction of populations within communities.
* Learning objective 4.12 The student is able to apply mathematical routines to quantities that describe communities composed of populations of organisms that interact in complex ways.
* Learning objective 4.13 The student is able to predict the effects of a change in the community’s populations on the community.

**Essential knowledge 4.A.6**: Interactions among living systems and their environment result in movement of matter and energy.

* Learning objective 4.14 The student is able to apply mathematical routines to quantities that describe interactions among living systems and their environment, which result in the movement of matter and energy.
* Learning objective 4.15 The student is able to use visual representations to analyze situations or solve problems qualitatively to illustrate how interactions among living systems and with their environment result in the movement of matter and energy.
* Learning objective 4.16 The student is able to predict the effects of a change of matter or energy availability on communities.

**Essential knowledge 4.B.3**: Interactions between and within populations influence patterns of species distribution and abundance.

**Essential knowledge 4.B.4**: Distribution of local and global ecosystems changes over time.

**Essential knowledge 4.C.3**: The level of variation in a population affects population dynamics.

**Essential knowledge 4.C.4**: The diversity of species within an ecosystem may influence the stability of the ecosystem.

* Learning objective 4.27 The student is able to make scientific claims and predictions about how species diversity within an ecosystem influences ecosystem stability.

**Performance Product Public Service Ad Campaign Rubric**

Group grade, 100 points possible equal to a test score

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| CRITERIA | EMERGING(Below Performance Standards) 50-69% | DEVELOPING (Proficient Criteria)  70-89% | MASTERING (High Performance)  90-100% |
| **CONTENT LITERACY** | * Irrelevant topic * Less than 2 appropriate media developed for ad campaign * Does not cover appropriate ecological content. * Does not make appropriate connections between ecological concepts, environmental issues, and/or human activity. | * Selected relevant environmental issue to research. * Developed 2 appropriate/high quality media for ad campaign. * The following ecological vocabulary words are used correctly somewhere in the media developed:   + Homeostasis   + Population   + Community   + Ecosystem   + Biosphere   + Interactions   + Matter   + Energy   + Diversity   + Species   + Biodiversity * Connections between ecological concepts and environmental issue are made correctly. * Connections between human activity and environmental issue are highlighted. | **In addition to the “Proficient” criteria…**   * Complex and/or high stakes environmental issue selected for research. * More than 2 appropriate/high quality media are developed. * Ecological concepts are described clearly and correctly. * Logical, clear connections are made between ecological concepts, environmental issues, and human activity. |
| **COMMUNICATION** | * Communicates poorly with little or no awareness of audience or purpose * Disorganized content; difficult to follow * Provides little or irrelevant evidence to support claims * Demonstrates inadequate control of sentence structure * Uses inappropriate language, slang, or spelling * Shows numerous errors in spelling, capitalization, punctuation, grammar some of which may obscure meaning * Does not use specified format   If hand written, product is messy or illegible | * Communicates effectively with awareness of audience and purpose * Organization of content shows some logic and generally “flows” * Provides details to support claims * Demonstrates adequate control of sentence structure (grammatically correct writing) * Uses appropriate diction * Shows evidence of proofreading; the writing displays fundamental control of written English, some errors but none that obscure meaning * Uses format specified by assignment   If handwritten, product is neat and legible | **In addition to the “Proficient” criteria…**   * Communicates insightfully with consistent awareness of audience and purpose * Product consistently organized in a logical manner with effective use of transitions * Provides a variety of well-chosen details or examples to support claims * Demonstrates exceptional control of sentence structure * Uses precise language and sophisticated word choice * Is virtually free of errors   The product is neat and correctly formatted |
| **CRITICAL THINKING**  **&**  **PROBLEM SOLVING** | * Student selects tools, techniques, or structures that do not achieve the desired goal as defined in the project or course guidelines * Student demonstrates some understanding of the concepts, theories, relationships, and/or principles of topic or skill under study, but struggles to apply and/or modify * Student misinterprets evidence, statements, graphics, questions, etc. * Student may justify a few results or procedures, but justification is based on incomplete or irrelevant data | * Student **selects** an effective tool, technique, or structure to achieve the desired goal as defined in the project or course guidelines * Student demonstrates an ability to **apply** and/or modify theories, principles, and/or skills to new situations, settings, or problems * Student **analyzes** concepts, theories, relationships, and/or principles of topic or skill under study through a step-by-step, logical progression * Student accurately **interprets** evidence, statements, graphics, and questions   Student **synthesizes** ideas, images, and/or objects to form a cohesive whole | **In addition to the “Proficient” criteria, the student…**   * Objectively draws **conclusions** based on data and evidence * Generates an **evaluation** that is supportable based on the established criteria * Includes comparison and contrast to other ideas in his/her evaluation |

**Performance Product Oral Presentation Rubric**

Individual grade, 100 points possible equal to a test score

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| CRITERIA | EMERGING(Below Performance Standards) | PROFI IENT (minimum Criteria) | MASTERING (High Performance) |
| **PHYSICAL CHARACTERISTICS** | - Attire was inappropriate for audience  - Little eye contact with audience  - Poor or slouchy posture  - Movements were stiff or unnatural  13-17 points | - Presented in appropriate attire for audience & purpose  - Made strong eye contact with audience  - Had good posture and presence, using natural gestures and physical movement when appropriate  18-22 points | **In addition to the “Proficient” criteria, the student…**  - Complex and/or high stake environmental issue selected for research.  - More than 2 appropriate/high quality media are developed.  - Ecological concepts are described clearly and correctly.  - Logical, clear connections are made between ecological concepts, environmental issues, and human activity.  23-25 points |
| **VOCAL EXPRESSION** | - Speaker was hard to hear or understand  - Voice or tone distracted from purpose of presentation  - Excessive use of verbal fillers  - Speaker did not seem confident or knowledgeable  13-17 points | - Tone, register, volume and energy are appropriate to the presentation  - Was easy to hear and understand  - Pronounced words clearly without verbal fillers  - Generally appeared to be confident and/or knowledgeable  18-22 points | **In addition to the “Proficient” criteria, the student…**  - Speaker was engaging; used expression and emphasis  - Speaker used voice to create an emotional response in audience  - Speaker was both confident and knowledgeable  23-25 points |
| **STRUCTURE & ORGANIZATION** | - Weak Introduction  - Overall presentation was not engaging, creative, and/or exciting  - Important ideas were not supported with references or data  - No conclusion or conclusion did not adequately summarize presentation  - Presentation did not use time allotted  - No visuals used, or visuals distracted from presentation  25-43 points | - Started the presentation with a strong introduction  - Overall presentation was engaging, creative, and/or exciting  - Thesis supported w/appropriate references and logical data  - Conclusion restates and reinforces thesis and is memorable  - Time requirement was met for specific assignment (neither too long or too short)  - Visuals used to enhance presentation when appropriate  35-44 points | **In addition to the “Proficient” criteria, the student…**  - Clever attention getting introduction or an imaginative thesis and preview  - Speaker used logical, ethical and emotional appeals that enhanced a specific tone and purpose  - Ideas connected by original transitions, logical throughout; creative pattern  - Conclusion tied speech together and left audience with memorable message  - Visuals used to enhance presentation when appropriate  45-50 points |

**Supporting Assignments, Labs, and Additional Assessments:**

* Textbook reading guides for chapters 40-43
* Bozeman Science videos 020, 046, 047, 050, 051, 054, 055
* HHMI Biointeractive *CSI Wildlife*
* Biotechnology Lab *Measure for Measure*
* Biotechnology Lab *Electrophoresis of DNA*
* Multiple choice and free responses quizzes

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| **Curbing Global Warming & Climate Change** | **Ocean Conservation** |
| **Sustainable Agriculture** | **Wildlife Conservation** |
| **Introduced & Invasive Species Awareness** | **Pollution Prevention & Remediation** |
| **Energy Conservation & Clean Energy Sources** | **Sustainable Architecture & Communities** |
| **Wildland Conservation** | **Population Solutions** |

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