Environmental Science Syllabus

Mrs. Clark

**Course Description:**

The purpose of this course is to help students develop an understanding of the interactions of organisms with each other and the environment, improve scientific literacy skills, and gain an appreciation for the natural world and local community. Environmental Science is explored from a single species through the ecosystem level and the year concludes with applications to conservation and preservation of our ecosystems. Students improve field and laboratory research skills from field sketching and data collection to experimental design and problem solving skills. Students learn how to identify and classify organisms, use scientific tools and techniques, and work as a team to investigate their own scientific questions.

**Objectives:**

As a student you will be exposed to new scientific language and concepts, technology, and research. You will actively participate in laboratory investigations using the scientific methods to help you develop or strengthen scientific attitudes and interests. You will be encouraged and guided towards taking an independent responsibility in your own learning, which will prepare you for college, technical school, and/or the workplace

**Learning Sequence:**

| **Week** | **Unit** | **Major Topic** | **Standard** |
| --- | --- | --- | --- |
| 1-3 | 1 | The Earth as a System | **EVSC.ESS2.1** Research the development of the theory of plate tectonics. Use the theory to construct an explanation for how changes in Earth’s crust cause mountain formation, volcanoes, earthquakes, and tsunamis. Provide evidence to support the explanation using information pertaining to plate boundary types (divergent, convergent, transform). |
|  |  |  | **EVSC.ESS2.2** Considering Earth’s position within our solar system, use a model to demonstrate the causes of day length, seasons, and climate. |
|  |  |  | **EVSC.ESS2.3** Analyze the composition of the Earth’s atmosphere. Obtain information and use graphs to observe patterns regarding stability and change within the Earth’s atmospheric composition (O2, N2, CO2, etc.) over geologic time. |
|  |  |  | **EVSC.ESS2.4** Differentiate weather and climate and analyze and interpret data examining naturally occurring patterns pertaining to each. |
|  |  |  | **EVSC.ESS2.6** Develop a model to explain soil formation and the flow of matter in the rock cycle. |
| 4-5 | 2 | Ecosystems, Energy Flow in Ecosystems, Cycling of Materials, Change in Ecosystems | **EVSC.LS2.4** Compare and contrast production (photosynthesis, chemosynthesis) and respiratory (aerobic respiration, anaerobic respiration, consumption, decomposition) processes responsible for the cycling of matter and flow of energy through an ecosystem. Using evidence, construct an argument regarding the importance of homeostasis in maintaining these processes in ecosystems. |
|  |  |  | **EVSC.LS2.5** Use a mathematical model to explain energy flow through an ecosystem. Using the first and second laws of thermodynamics, construct an explanation for: A) necessity for constant energy input; B) limitations on energy transfer from one trophic level to the next; and, C) limitations on number of trophic levels that can be supported. |
|  |  |  | **EVSC.LS2.6** Evaluate the interdependence among major biogeochemical cycles (water, carbon, nitrogen, phosphorus) in an ecosystem and recognize the importance each cycle has in maintaining ecosystem stability. |
|  |  |  | **EVSC.LS2.7** Examine stability and change within an ecosystem by using a model of succession (primary or secondary) to predict impacts of disruption on an ecosystem. |
| 6-7 | 2 | Biomes | **EVSC.LS2.1** Using a variety of data sources, construct an explanation for the impact of climate, latitude, altitude, geology, and hydrology patterns on plant and animal life in various terrestrial biomes. |
| 8 | 2 | Aquatic Ecosystems | **EVSC.LS2.2** Develop an explanation of behavioral and physical adaptations organisms have for life in aquatic habitats with varying chemical and physical features. |
|  |  |  | **EVSC.LS2.5** Use a mathematical model to explain energy flow through an ecosystem. Using the first and second laws of thermodynamics, construct an explanation for: A) necessity for constant energy input; B) limitations on energy transfer from one trophic level to the next; and, C) limitations on number of trophic levels that can be supported. |
| 9 | 3 | Understanding Populations  Studying Human Populations | **EVSC.LS2.3** Using mathematical models, support arguments regarding the effects of biotic and abiotic factors on carrying capacity for populations within an ecosystem. |
|  |  |  | **EVSC.LS4.1** Construct an explanation based on scientific evidence for mechanisms of natural selection that result in behavioral, anatomical, and physiological adaptations in populations. |
|  |  |  | **EVSC.ESS3.2** Interpret graphical data representing global human population growth over time. Look for patterns within this data and construct possible explanations for the patterns. Revise the explanations as needed based on research. |
|  |  |  | **EVSC.ESS3.3** Obtain and evaluate information regarding demographics for a variety of countries. Construct an explanation for varying fertility rates and life expectancies between countries and throughout human history. Taking into account demographic transition, predict what trends are likely to occur in various countries over time. |
|  |  |  | **EVSC.ESS3.4** Gather, organize, analyze, and present data on current land use trends by humans. Based on analysis, predict future trends. |
|  |  |  | **EVSC.ESS3.5** Plan and carry out an investigation examining best management practices in water usage, agriculture, forestry, urban/suburban development, mining, or fishing and communicate findings. |
| 10 | 3 | Biodiversity | **EVSC.ESS3.9** Evaluate ecosystem services provided by forests ecosystems. Construct an explanation for human impact on these services. |
|  |  |  | **EVSC.LS4.2** Justify claims with scientific evidence that changes in environmental conditions lead to speciation and extinction. |
|  |  |  | **EVSC.LS4.3** Evaluate the impact of habitat fragmentation and destruction, invasive species, overharvesting, pollution, and climate change on biodiversity (genetic, species, and ecosystem). |
|  |  |  | **EVSC.LS4.4** Engage in argument from scientific evidence critiquing effectiveness of the Endangered Species Act. Give specific examples to support your argument. |
| 11 | 4 | Water Resources  Water Use and Management  Water Pollution | **EVSC.ESS3.13** Analyze and interpret data on the effects of land, water, and air pollution on the environment and on human health. Propose solutions for minimizing pollution from specific sources. |
|  |  |  | **EVSC.ESS3.14** Obtain and communicate information on environmental laws pertaining to the regulation of pollution and on regulatory agencies. Provide a specific example of how a given business/industry would comply with such regulations. |
| 12 | 4 | Air Pollution  Climate and Climate Change | **EVSC.ESS3.13** Analyze and interpret data on the effects of land, water, and air pollution on the environment and on human health. Propose solutions for minimizing pollution from specific sources. |
|  |  |  | **EVSC.ESS3.14** Obtain and communicate information on environmental laws pertaining to the regulation of pollution and on regulatory agencies. Provide a specific example of how a given business/industry would comply with such regulations. |
|  |  |  | **EVSC.ESS3.16** Obtain, evaluate, and communicate scientific information tracing the breakdown of ozone caused by chlorofluorocarbons and the effectiveness of efforts to address this environmental problem. |
| 13 | 4 | Land Use  Land Management/Conservation | **EVSC.ESS3.9** Evaluate ecosystem services provided by forests ecosystems. Construct an explanation for human impact on these services. |
|  |  |  | **EVSC.ESS3.10** Using scientific data, analyze effectiveness of conservation versus preservation efforts. Obtain and communicate information on organizations involved in protecting natural resources. |
|  |  |  | **EVSC.ESS3.13** Analyze and interpret data on the effects of land, water, and air pollution on the environment and on human health. Propose solutions for minimizing pollution from specific sources. |
| 14 | 4 | Food and Agriculture  Green Revolution  Crops and Soil  Animals and Agriculture | **EVSC.ESS3.6** Use a model to make predictions regarding the impact of topsoil loss due to erosion resulting from human activity. Design, evaluate, and revise a solution to preserve topsoil. |
|  |  |  | **EVSC.ESS3.7** Construct an argument including claim, evidence, and scientific reasoning regarding the impact of the Green Revolution on agricultural practices, food availability, and the environment. |
|  |  |  | **EVSC.ESS3.8** Research information on the environmental impacts of genetically modified organisms and engage in debate regarding pros and cons of this agricultural technology. |
| 14 | 5 | Minerals and Resources  Exploration and Mining  Regulations and Reclamation | **EVSC.ESS3.11** Define problems and suggest solutions associated with using, conserving, and recycling energy and mineral resources taking into account economic, social, and environmental costs and benefits. |
| 15-16 | 5 | Nonrenewable Energy  Renewable Energy  Alternative Energy and Conservation | **EVSC.ESS3.1** Research Earth’s natural resources (renewable and nonrenewable resources). Construct an argument from evidence supporting the claim that a particular type of resource is important for humans. |
|  |  |  | **EVSC.ESS3.12** Ask questions about technology needed to develop alternative energy sources and obtain information from various sources to answer those questions. |
|  |  |  | **EVSC.ETS2.1** Engage in an argument from evidence on the role engineering and technology play in a sustainable human society. |
| 17 | 5 | Solid Waste  Reducing Solid Waste  Hazardous Waste | **EVSC.ESS3.15** Evaluate current methods of waste management and reduction and design possible improvements. |
|  |  |  | **EVSC.ESS3.18** Use mathematics to calculate ecological footprints. Develop a personal plan for reducing your impact on the environment. |
| 18 | 6 | Environment and Human Health  Economics, Policy, and the Future | **EVSC.ESS3.17** Using mathematics and computational thinking, analyze data linking human activity to climate  change. Design solutions to address human impacts on climate change. |
|  |  |  | **EVSC.ETS2.2** Research and communicate information on an environmental science career. Analyze the role of society, engineering, technology, and science in that career. |
|  |  |  | **EVSC.ETS3.1** Plan and carry out an investigation of a local ecosystem to assess human impacts. Based on your findings, design and evaluate a solution to minimize impacts. |

**Major Assignments:**

Investigating the pros and cons of renewable vs nonrenewable

Final research project on improvement of a local environmental issue

Comprehensive final exam

**Important Links:**

For grades and assignments: [www.fcstn.net](http://www.fcstn.net) (click Skyward at bottom of page)

To access teacher webpage: <http://fchs.fcstn.net> (select “School Staff” in left column and select teacher’s name)

**Class Attendance:**

It is imperative that you attend class on a regular basis. If you are absent, you can check Google classroom for any missing assignments. Upon your return to school, it is YOUR responsibility to come to me about your missing work. If you are out for more than one day, I would suggest having a classmate gather your work for you or you can email me and I will send what I can to you via email. You will have as many days as you are absent to turn in your missed assignments. If you are absent on a test day and you had prior knowledge of the test, you are expected to make the test up when you return to school. Class time is not the best time for make-up work since we will be continuing in our learning experience so it is preferred that you stay after school for make-up tests. If you are aware of an upcoming absence, you should see me for the assignments you will miss.

**Laboratory Information:**

Many of the concepts discussed in this course are best explained through hands-on activities; therefore, we will spend at least 20% of our time in a lab environment. You will be given a lab safety contract to read and sign along with your parent/guardian acknowledging you understand the lab safety rules. A copy can also be found on my webpage under the link “Syllabus and Handouts”. You are expected to read over all lab procedures and listen carefully to any added instructions before beginning ANY experiment. If you neglect to observe the lab safety rules, you will be removed from the lab and receive a zero for the lab that day. A lab final will be given at the end of the semester; therefore it is suggested you be in attendance for each lab. There is a lab fee of **$10** for this course.