San Mateo Union High School District
Course of Study

Environmental Science 1-2

I. Course Overview

A. UC/CSU "d" Subject Area: Life Science/ Physical Science

B. Grade Level: 11th & 12th

C. Credits: 10

D. Pre-Requisites:

Approved by the
BOARD OF TRUSTEES
March 10, 2011

One year successful completion of a level D Life Science course.
One year successful completion of a level D Physical Science.
Concurrent enrollment in or completion of Algebra 3-4
It is strongly recommended that this be taken as a 4th year science course, as a thorough background in the life and physical sciences will provide students with the breadth necessary to explore the integral nature of environmental science. This course is designed as a parallel to AP Environmental Science. Students would not take this class prior to or after successful completion of AP Environmental Science.

E. Course Description

Environmental science is a course dedicated to understanding the interactions between earth's natural systems and the demands placed on them by the human population. This course examines the scientific principles behind natural phenomena and resource cycles, explores how we utilize these systems and our impact, and potential solutions for the resulting consequences of resource mismanagement and exploitation. The course includes elements of life science, physical science, and social science and focuses on breadth and interrelatedness of relevant current events. Concepts can be explored through inquiry based laboratory exercises, environmental health assessment techniques, student presentations and projects.

II. Course Purpose: Goals and Student Outcomes

The purpose of this course can be broken down into three main themes. The first theme is understanding how our planet works and how natural systems work together. The second theme is understanding how our use of resources has impacted environmental quality, resource availability and human health. The third theme is evaluating solutions to our existing environmental problems through sustainable practice, and identifying challenges faced in implementing solutions.

Earth Systems

- Students will identify and explore how natural resources cycle through earth's systems, the differences between renewable and non-renewable resources, how non-renewable resources are formed, and types of renewable resources.
- Students will identify and explore the structure of the atmosphere, climate patterns and weather.
- Students will identify and explore the cause and types of ecosystem and biological diversity, and their importance in resources cycles.

Human Impact and Resource Use

- Students will investigate how human activity has impacted the quality and availability of our renewable and non renewable resources.
- Students will investigate how environmental quality problems harm ecosystems and human health.

Sustainability

- Students will research and evaluate potential solutions to environmental quality problems.
- Students will research, identify and propose legislation and laws that protect natural resources.
- Students will analyze proposed solutions and identify challenges to creating sustainable practice.

The goals and course outline are consistent with the state of California's Education and Environment Curriculum Initiative framework. Listed below are the California State Science Content Standards for grades 9-12 that are addressed in this course.

Investigation & Experimentation - Grades 9 To 12

Science Content Standards.

1. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:
    a. Select and use appropriate tools and technology (such as computer-linked probes, spreadsheets, and graphing calculators) to perform tests, collect data, analyze relationships, and display data.
    b. Identify and communicate sources of unavoidable experimental error.
    c. Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.
    d. Formulate explanations by using logic and evidence.
    e. Distinguish between hypothesis and theory as scientific terms.
    f. Recognize the usefulness and limitations of models and theories as scientific representations of reality.
    g. NA
    h. Analyze the locations, sequences, or time intervals that are characteristic of natural phenomena (e.g., relative ages of rocks, locations of planets over time, and succession of species in an ecosystem).
    i. Recognize the issues of statistical variability and the need for controlled tests.
    j. Recognize the cumulative nature of scientific evidence.
    k. Analyze situations and solve problems that require combining and applying concepts from more than one area of science.
    l. Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Earth Sciences - Grades Nine Through Twelve

Processes

3. Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface. As the basis for understanding this concept:
    a. Students know features of the ocean floor (magnetic patterns, age, and sea-floor topography) provide evidence of plate tectonics.
    b. Students know the principal structures that form at the three different kinds of plate boundaries.
    c. Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.
    d. Students know why and how earthquakes occur and the scales used to measure their intensity and magnitude.
    e. Students know there are two kinds of volcanoes: one kind with violent eruptions producing steep slopes and the other kind with voluminous lava flows producing gentle slopes.
    f. * Students know the explanation for the location and properties of volcanoes that are due to hot spots and the explanation for those that are due to subduction.

Energy in the Earth System

4. Energy enters the Earth system primarily as solar radiation and eventually escapes as heat. As a basis for understanding this concept:
    a. NA
    b. Students know the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.
    c. Students know the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.
5. Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents. As a basis for understanding this concept:
    a. Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.
    b. NA
    c. Students know the origin and effects of temperature inversions.
    d. Students know rain forests and deserts on Earth are distributed in bands at specific latitudes.

e. * Students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.

f. * Students know features of the ENSO (El Niño southern oscillation) cycle in terms of sea-surface and air temperature variations across the Pacific and some climatic results of this cycle.

6. Climate is the long-term average of a region's weather and depends on many factors. As a basis for understanding this concept:
    a. Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere.
    b. Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents.
    c. Students know how Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.
    d. * Students know how computer models are used to predict the effects of the increase in greenhouse gases on climate for the planet as a whole and for specific regions.

Biogeochemical Cycles

7. Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles. As a basis for understanding this concept
    a. Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle.
    b. Students know the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.
    c. Students know the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.
    d. * Students know the relative residence times and flow characteristics of carbon in and out of its different reservoirs.

Structure and Composition of the Atmosphere

8. Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life. As a basis for understanding this concept:
    a. Students know the thermal structure and chemical composition of the atmosphere.
    b. NA

c. Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities.

California Geology

9. The geology of California underlies the state's wealth of natural resources as well as its natural hazards. As a basis for understanding this concept:
    a. NA
    b. Students know the principal natural hazards in different California regions and the geologic basis of those hazards.
    c. Students know the importance of water to society, the origins of California 's fresh water, and the relationship between supply and need.

Biology / Life Sciences - Grades Nine Through Twelve

Science Content Standards.

Ecology

6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
    a. Students know bio diversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
    b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
    c. Students kno*w* how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
    d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
    e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.
    f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.

Evolution

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
    a. Students kno*w* new mutations are constantly being generated in a gene pool.

b. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
    a. Students know how natural selection determines the differential survival of groups of organisms.
    b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
    c. NA
    d. NA

NOTE: Relevant California Content Standards are indicated below each major topic by discipline and content number. Shaded/ highlighted areas represent suggested core standards for the course

III. Course Outline

The following is a suggested sequence of course units. Some units may be more appropriately placed in the spring or fall semester depending on the seasonality and availability of laboratory and field activities that take place outside of the classroom, thus replacing or supplementing in-class investigations.

Populations

Botikin & Keller Ch3 "Systems of Change," Ch4 "Human Population and the Environment"

- Human population growth, population characteristics/ statistics
    - history of human population growth, distribution and change
    - fertility, mortality and growth rates, and understanding their impact on population growth
    - interpreting population age structure diagrams
    - *(California Content Standard- CCS Biology 6c)*
- Consequences of exponential population growth.
    - examining the relationship between poverty, education, overpopulation, hunger and disease;
    - understanding how overpopulation and poverty lead to environmental degradation through habitat destruction and overuse of natural resources
    - *(CCS Biology 6b)*
- Solutions for and challenges facing exponential human population growth
    - comparing the population growth policies of different nations in terms of need, effectiveness, and sustainability.

Ecology & Ecosystem Diversity
Botkin & Keller Ch5 "Biogeochemical Cycles," Ch6 "Ecosystems and Ecosystem Management", Ch 9 "Biological Productivity & Energy Flow," Ch 13 "Forests, Parks and Landscape"

- Biogeochemical Cycles
  - Hydrologic, carbon, phosphorus, nitrogen, and sulfur cycles.
  - (CCS Biology 6d, Earth Science 7a, 7b, 7c, 7d)
- Biomes & terrestrial diversity
  - Definitions, descriptions and locations of major biomes.
  - (CCS Biology 6b, Earth Science 5d, 5e)
- Animal populations growth, population characteristics/ statistics
  - defining and identifying biological populations;
  - inter and intraspecific competition effects on population dynamics,
  - limiting factors, carrying capacity, life history and reproductive strategies
  - (CCS Biology 6a, 6c, 6e, 6f)
- Consequences of habitat destruction & fragmentation
  - Impacts on biogeochemical cycles and ecosystem services, species diversity and migration.
  - (CCS Biology 6a, 6b)
- Solutions for protecting ecosystem diversity and challenges we face.
  - Different approaches to preserving land and resources, remediation, mitigating and restoring environmental impacts.
- Forestry management & Land Reserves Forestry
  - Timber harvesting techniques and their economic and environmental impacts; old growth forests, secondary and primary forests; tree plantations.
  - Public and Federal Lands: differing types of forests, parks, refuges, and wilderness management in the US.

Biodiversity & Endangered Species
Botkin & Keller Ch 10 "Ecological Restoration," Ch 7 "Biological Diversity," Ch 8 "Biogeography," Ch 14 "Wildlife, Fisheries, and Endangered Species"

- Definition and determination of biodiversity
  - how natural selection and evolution lead to biodiversity
  - Species roles in ecosystems and keystone and foundation species
  - Hot spots, threatened and endangered species
  - (CCS Biology 7a, 7b, 8a, 8b, 6a, 6e)
- Biodiversity and it's importance
  - Biodiversity and ecosystem diversity provide economic, health, and aesthetic benefits to people.
- Consequences of endangered species, invasive species, loss of biodiversity.
  - Threatened through the loss and fragmentation of habitat, over use of resources, introduction of invasive/ non-native species, and results in species endangerment and extinction.
  - (CCS Biology 6b)
- Solutions for and challenges facing managing animal populations
- Solutions for maintaining diversity and challenges we face.

- conservation practices, protection by enforced laws and international agreements/ treaties.

Geology & Soils
Botkin & Keller Ch 26 "Minerals and the Environment," Ch 10 "Effects of Agriculture on the Enviornment," Ch 11 "Producing Enough Food for the World"

- Earth's structure & geologic processes
  - the theory of plate tectonics; plate tectonics relationship to earthquakes and volcanism.
  - Rock cycle, weathering and erosion
  - (CCS Earth Science 3a, 3b, 3c, 3d, 3e, 3f, 9b)
- Soil formation
  - soil composition, soil horizons, soil profiles
  - soil formation, erosion, and conservation measures
  - (CCS Earth Science 3c, 7c)
- Resource extraction
  - mineral formation, methods of extraction, extraction curves
  - (CCS Earth Science 3c)
- Consequences of exploitation and mismanagement of nonrenewable geologic resources.
  - environmental impact associated with different mining practices, loss of non-renewable resources.
- Solutions for resource use, and challenges we face with improving resource management.
  - Resource conservation, reclamation of mining sites, and mining legislation/ regulation.

Agriculture and Food Resources
Botkin & Keller Ch 11 "Producing Enough Food for the World," Ch 12 "Effects of Agriculture on the Environment," Ch 14 "Wildlife, Fisheries, and Endangered Species"

- Grazing and feedlots
  - different rangeland practices, federal management of rangelands, environmental impact of grazing practices such as desertification, deforestation, overgrazing
  - feedlot impacts and practices
- Fisheries & aquaculture
  - fish farming and aquaculture practices;
  - commercial fishing practices, techniques, regulation
- Green revolution, traditional farming, industrial agriculture
  - basic human nutritional requirements and major food crops
  - sustainable and non-sustainable agricultural practices
  - green revolution
  - effects and implications of genetic engineering on crop yields and insect resistance
  - relationship between agriculture, deforestation and irrigation
  - Pest management including conventional spraying, and genetic engineering
  - major types of pesticides and their associated benefits and costs

- Consequences of intensive agricultural model (water pollution, soil erosion, pesticides)
    - Inorganic fertilizers, pesticides, animal waste and water pollution.
    - Causes of soil erosion, soil salinization, and desertification.
    - Human and environmental health effects associated with pesticides, including bioaccumulation and biomagnification.
- Commercial fishing practices and techniques and their affects on the marine ecosystems
- Solutions toward sustainable agricultural, aquaculture, fishing and grazing practices, and challenges we face implementing these solutions.
    - Sustainable fishing practices, sustainable aquaculture, and relevant legislation to conserve aquatic resources.
    - Sustainable agricultural practices including integrated pest management, organic farming, soil conservation and water conservation.

Spring Semester
Water Resources, Water Pollution and Toxicology
Botkin & Keller Ch 15 "Environmental Health, Pollution and Toxicology," Ch 21 "Water Supply, Use and Management, " Ch 22 "Water Pollution and Treatment"

- Freshwater resources, management and use
    - freshwater and saltwater global distribution, abundance and circulation patterns; industrial, agricultural and domestic freshwater uses
    - freshwater availability and issues in surface and groundwater supplies
    - (CCS Earth Science 7c, 9c)
- Water pollution types, sources and consequences
    - understanding implications of bioaccumulation and biomagnification
    - determining and evaluating dose-response models and effects
    - water pollution types and sources, cultural eutrophication
- Solutions for and challenges facing freshwater resource management.
    - political and environmental issues associated with freshwater resources; conservation issues and practices. sources, cause and effects of major water pollutants; cause and effect of
    - maintaining and monitoring water quality
- Solutions for and challenges facing water pollution
    - Protecting water resources through watersheds, sustainable agriculture, soil conservation, urban planning, and managing industrial wastes.
    - water reclamation and treatment/purification systems; sewage reclamation and treatment

Atmosphere, Air Pollution and Ozone Depletion
Botkin & Keller Ch 23 "The Atmosphere, Climate and Global Warming"
Ch 24 "Air Pollution," Ch 25 "Indoor Air Pollution"

- Atmospheric structure and composition
    - (CCS Earth Science 8a)
- Outdoor Air Pollutants & Acid Deposition/ Acid Rain

  - major air pollutants and source, smog formation, acid deposition
  - (CCS Earth Science 5c)
- Indoor Air Pollutants
  - Sources and human health effects.
- Ozone layer and depletion
  - Function of the ozone layer in blocking ultraviolet radiation, effects and sources of CFCs and other ozone depleting chemicals on ozone in the stratosphere
  - (CCS Earth Science 8c)
- Consequences of air pollution and ozone depletion on human health and the environment.
  - environmental and health effects of ozone depletion; legislation and strategies aimed at reducing ozone depletion.
  - environmental and health effects associated with indoor air pollutants, outdoor air pollutants and acid deposition.
- Solutions for and challenges we face reducing air pollutants, acid rain, and protecting the ozone layer.
  - remediation, reduction, legislation, international agreements and treaties.

Climate, Weather & Global Climate Change
Botkin & Keller Ch 23 "The Atmosphere, Climate and Global Warming"

- Global climate patterns
  - Global precipitation, air circulation patterns, seasons, effects of latitude and altitude.
  - (CCS Earth Science 5a, 5e, 6a, 6b, 6c, 6d)
- Weather
  - Movement of air masses and moisture, high pressure and low pressure systems, cloud formation and precipitation.
  - (CCS Earth Science 6a, 5f)
- Green house effect
  - Natural green house effect, major green house gases and emission sources
  - Consequences of increasing green house gas emissions
  - Climate change models and predicted global changes
  - (CCS Earth Science 4b, 4c)
- Solutions for and challenges we face with global climate change
  - International agreements and treaties
  - Political changes/ regulations, personal measures to reduce climate change.

Energy
Botkin & Keller Ch 17 "Energy, Some Basics." Ch 18 "Fossil Fuels and the Environment," Ch19 "Alternative Energy and the Environment," Ch 20 "Nuclear Energy and the Environment"

- Energy
  - Energy definitions, power units, conversions
  - Changing and growing needs for energy from the onset of the industrial revolution

  - Current global energy usage, planning for future energy needs.
- Non-renewable energy resources
  - Fossil Fuel Resources and Use
    - geologic formation of fossil fuels
    - processing for extracting fossil fuels
    - understanding the benefits and disadvantages (both economically and environmentally) of using the different fossil fuels
    - location and control of world reserves and global demand.
    - (CSS Earth Science 7b)
  - Nuclear Power
    - basic process of nuclear fission in a nuclear reactor
    - environmental and safety issues associated with nuclear power and radioactive wastes
    - disposal and treatment of radioactive wastes
- Renewable & Sustainable Energy resources
  - Solar power, active and passive designs
  - Hydroelectric power basic design and function of a hydroelectric dam, environmental impacts of dams.
  - Wind power basic design and function.
  - Biofuel definitions, uses and sources
- Consequences of using non-renewable resources
- Solutions for and challenges we face with sustainable energy
  - investigate the environmental and economic advantages, disadvantages and geographic limitations of alternative energy sources such as wind power, solar power (passive and active), hydrogen fuel cells, biomass and biofuels, small-scale hydroelectric, geothermal plants, and ocean/ tidal energy.

  - methods for improving energy efficiency and conservation, understanding importance of mass transit and various vehicle designs that improve efficiency and energy consumption.

Sustainable Planning
Botkin & Keller Ch 28 "Urban Environments," Ch 29 "Waste Management"

- Urban sprawl and urban planning
  - Phenomena of suburban sprawl and its environmental implications; noise pollution
  - urban planning with respect to public transportation systems and highways, impact of roads and road-less areas on habitat and development; overall environmental impact of transportation planning and choices.
- Green building design & improving urban living
  - Advantages and disadvantages of urbanization; planning developments, greening urban areas
  - Sustainable building design,
- Solid Waste creation and management
  - Source and types of waste, major contributors to solid waste, disposal methods, reasons for and methods to reduce solid waste.

- Solutions for and challenges facing sustainable living.
  - reducing waste, removing recyclable materials, effectively sorting and storing hazardous wastes.
  - Hazardous Chemicals in the Environment- different categories of hazardous waste, their source and disposal or treatment; classification, complications, and clean up of hazardous waste contaminated sites, important laws and legislation.

IV. Key Assignments
The following are a list of suggested key assignments for each unit. The goal is to have at least one hands on laboratory or group simulation activity every week. These should encompass at least 20% of the course time in order to meet a level D science course requirement.

Unit: Populations
Major Assignments and/or Assessments:
Activity: Population Statistics and calculations from a local cemetery
Human Population Age Structure Diagrams
Country Demographic Case Studies

Unit Name: Ecology & Ecosystem Diversity
Major Assignments and/or Assessments:
Laboratory Investigation: Constructing and Monitoring Ecocolumns
Laboratory Investigation: Measuring Primary Productivity
Student Biome Research Projects

Unit Name: Biodiversity & Endangered Species
Major Assignments and/or Assessments:
Laboratory Investigation: Allelopathy in Soils
Laboratory Investigation: Calculating Biodiversity in Soils using Berlese Funnel Extractions
Laboratory Investigation: Growth of Lemna minor under different limiting environmental factors.
Endangered Species/ Invasive Species Case Studies

Unit: Geology & Soils
Major Assignments and/or Assessments:
Laboratory Investigation: Examining Local Soil Properties
Activity: Creating a resource extraction curve based on a mining simulation
Activity: Mapping Tectonic Plates &
Path of a mineral resource posters

Unit: Agriculture and Food Resources
Major Assignments and/or Assessments:
Laboratory Investigation: Effects of Soil Salinization on seed germination
Tragedy of the Commons Simulation
Student research on major pesticides.

Unit: Water Resources, Water Pollution and Toxicology
Major Assignments and/or Assessments:
Laboratory Investigation: Effects of Toxins on Ascaris
Laboratory Investigation: Designing a Primary Sewage Treatment Facility
Student Presentations on Freshwater Use and Conflict Case Studies
Personal Water Use Audit
Activity: tracing bioaccumulation and biomagnification of mercury

Unit: Atmosphere, Air Pollution and Ozone Depletion
Major Assignments and/or Assessments:
Laboratory Investigation: Airborne Particulates
Student research projects on indoor air pollutants
Laboratory Investigation: Effects of Acid Deposition on Seed Germination

Unit Climate, Weather & Global Climate Change
Major Assignments and/or Assessments:
Mapping Changes in Ozone Concentration
Student Debate on Effects of Global Warming
Laboratory Activity: Carbon Dioxide Effects on Temperature Increase

Unit Name Energy
Major Assignments and/or Assessments:
Student research and presentations on alternative energy
Laboratory Investigation: Design and create a wind power machine (or solar powered machine)
Laboratory Investigation: Comparing fuel efficiency
Personal Energy Use Audit

Unit: Sustainable Planning
Major Assignments and/or Assessments:
Student Project: Research, plan and design a sustainable community.
Laboratory Activity: Waste Burial and Decomposition
Personal Trash Audit
Student presentations on hazardous waste case studies.

V. Instructional Methods and/or Strategies
See Key Assignments for specific methods and strategies

- Direct Instruction including but not limited to lecture notes, example problems, and case studies.
- Guided Practice including but not limited to worksheets, reading guides, graphic organizers, individual and group work.
- Internet and multimedia including but not limited to webquests, simulations, research projects, animations and tutorials.
- Hands on Laboratories with emphases on skills, inquiry and investigation, data analysis and calculations.

- Hands on simulations & group activities to review, model/ simulate phenomena, reinforce major concepts and principles from direct instruction.
- Student research & presentations, individual and group, on concepts, principles and real-life case studies.

VI. Assessment Methods and/or Tools

The student will be assessed using a variety of assessment tools. Their final grade will be divided between work on laboratory write ups, activity questions, reading assignments, projects, unit exams, quizzes, and the final exam.

- Laboratory Reports and Write Ups
- Quizzes- multiple choice, fill in the blank, matching, short answer questions
- Unit Exams- multiple choice, fill in the blank, matching, and short answer questions
- Student group and individual research projects
- Cumulative semester final exams
- Embedded content review questions
- Informal and formal pre-assessment strategies through warm ups, quizzes, and teacher questioning.

VII. Textbook(s) and Supplemental Instructional Materials

Primary Textbook for student readings and course content:

Environmental Science: Earth as a Living Planet, 8th Edition
by Daniel B. Botkin, Edward A. Keller
ISBN 978-0-470-52033-8
December 2010, ©2011

Supplemental Websites include but are not limited to….

NOAA: http://www.noaa.gov/
EPA: http://www.epa.gov/
CDIAC: http://cdiac.esd.ornl.gov/
Population Reference Bureau: http://prb.org/
USGS: http://www.usgs.gov/