

# Env Sci Scope & Sequence

Timing	Unit & Topics Covered	Labs and Activities	Materials Needed
2.5 weeks	<p><b><u>Intro to Env Sci</u></b></p> <p><b>Intro to Environmental Science</b></p> <ul style="list-style-type: none"> <li>• Environmental science v. ecology v. environmental activism</li> <li>• Renewable and nonrenewable resources</li> <li>• Tragedy of the Commons</li> <li>• Ecological footprints</li> </ul> <p><b>Scientific Processes</b></p> <ul style="list-style-type: none"> <li>• Scientific methods</li> <li>• Quantitative v. qualitative data</li> <li>• Science v. pseudoscience</li> <li>• Peer review process</li> <li>• Scientific theory v. law</li> </ul> <p><b>Economics &amp; Policy</b></p> <ul style="list-style-type: none"> <li>• What are economics?</li> <li>• Ecosystem services</li> <li>• Cost-benefit analyses</li> <li>• Types of environmental policies (regulatory v. incentive)</li> </ul>	<ul style="list-style-type: none"> <li>• Tragedy of the Commons Digital Activity</li> <li>• Ecological Footprint Activity &amp; Bookmark</li> <li>• Environmental Scientist Research Project</li> <li>• Create Your Own Experiment Lab</li> <li>• Environmental Policy Timeline Activity</li> <li>• Environmental Careers Flyer</li> </ul>	<p><u>General Classroom Supplies:</u></p> <ul style="list-style-type: none"> <li>• Computers</li> <li>• Calculators</li> <li>• Rulers</li> <li>• Colored pencils</li> <li>• Paper</li> <li>• Scissors</li> </ul>
	<p><b><u>Biosphere Unit 1</u></b></p> <p><b>Spheres of the Earth</b></p> <ul style="list-style-type: none"> <li>• Hydrosphere, geosphere, atmosphere, biosphere, cryosphere</li> <li>• Interactions between spheres</li> </ul> <p><b>Basics of Ecology</b></p> <ul style="list-style-type: none"> <li>• Biotic v. abiotic factors</li> <li>• Organization of living things</li> <li>• Habitat v. niche</li> </ul> <p><b>Organism Relationships</b></p> <ul style="list-style-type: none"> <li>• Food chains v. food webs</li> <li>• Energy pyramid and trophic levels</li> <li>• Conservation of energy and First Law of Thermodynamics</li> <li>• Symbiotic relationships</li> <li>• Prey adaptations</li> </ul>		
1.5 weeks			

Timing	Unit & Topics Covered	Labs and Activities	Materials
2 weeks	<p><b><u>Biosphere Unit 2</u></b></p> <p><b>Species</b></p> <ul style="list-style-type: none"> <li>• Definition of species</li> <li>• Endangered v. threatened species</li> <li>• Endangered Species Act</li> <li>• Speciation Interspecific competition</li> </ul> <p><b>Populations and Population Growth</b></p> <ul style="list-style-type: none"> <li>• Linear v. exponential growth</li> <li>• Logistic growth</li> <li>• S curve v. J curve</li> <li>• Limiting factors</li> <li>• Carrying capacity</li> <li>• Natality, fecundity, fertility, mortality, life expectancy</li> <li>• Survivorship curves (Types 1, 2, &amp; 3)</li> <li>• R strategists v. K strategists</li> <li>• Age Structure Diagrams</li> </ul>	<ul style="list-style-type: none"> <li>• Endangered Species Research Project</li> <li>• R v. K Strategists Card Sort</li> <li>• Deer Ecology Population Analysis</li> </ul>	<ul style="list-style-type: none"> <li>• General classroom supplies</li> <li>• optional materials for presentations (poster paper, etc.)</li> </ul>
	3 weeks	<p><b><u>Biosphere Unit 3</u></b></p> <p><b>Biomes</b></p> <ul style="list-style-type: none"> <li>• 9 different world biomes</li> <li>• Climate v. weather</li> <li>• Climatograms</li> </ul> <p><b>Communities &amp; Ecological Succession</b></p> <ul style="list-style-type: none"> <li>• Keystone species</li> <li>• Indicator species</li> <li>• Primary v. Secondary succession, climax community, pioneer species</li> </ul> <p><b>Biodiversity</b></p> <ul style="list-style-type: none"> <li>• Types of biodiversity</li> <li>• Biodiversity index</li> <li>• Sampling methods</li> <li>• Invasive species</li> </ul>	<ul style="list-style-type: none"> <li>• Biome Travel Brochure Research Activity</li> <li>• Biome Food Web Group Poster Project</li> <li>• Geocaching Lab (outdoors)</li> <li>• Plant Transect Biodiversity Lab (outdoors)</li> <li>• Lionfish Invasive Species Panel Discussion</li> </ul>

## Timing

## Unit & Topics Covered

## Labs and Activities

## Materials

### Atmosphere

#### Composition & Layers of the Atmosphere

- Atmospheric composition
- Composition of early atmosphere
- Layers of the atmosphere
- Temperature trends in each layer of the atmosphere
- Function and importance of ozone layer

#### Weather

- Tilt of the earth, seasons, and solar radiation
- Global circulation Coriolis Effect
- ENSO (El Nino, La Nina)
- Weather maps Effects of deforestation on local and global weather

#### Biogeochemical cycles

- Nutrient sources, sinks, and reservoirs
- Nitrogen cycle
- Phosphorous cycle
- Carbon cycle
- Human impacts on the nitrogen, phosphorous and carbon cycles
- Greenhouse gases and global warming (climate change)

### Geosphere Unit 1

#### Plate Tectonics

- Layers of the earth
- Evidence for plate tectonics & continental drift
- Types of plate boundaries
- Landforms at plate boundaries
- Environmental disturbances
- Ecosystem resistance and resilience
- Rain shadow effect

- Composition of the Atmosphere lab
- Layers of the Atmosphere graphing activity
- Exploring the Coriolis Effect partner activity
- Local Weather independent exploration
- Meteorology Video Report group activity
- What's Your Weather? independent exploration

- Plate Mapping Activity
- Volcano Project-based Learning (PBL) Activity

- General classroom supplies
- Birthday candles (at least 5 cm long)
- Shallow pans or culture dishes
- Metric rulers
- Test tubes
- Matches or lighters
- Food coloring (optional)
- Markers
- Paper plates
- Small, metal-backed thermometers with holes in the top ([like these](#))
- String
- Paper Towels
- Rubber bands
- Game playing pieces (coins, chips, etc)
- Dice

- General classroom supplies

3.5 weeks

2 weeks

## Timing

## Unit & Topics Covered

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## Materials

### Geosphere Unit 2

#### **Minerals, Rocks, & Mining**

- Characteristics and properties of minerals
- Use of minerals in everyday life
- Mining methods and impacts (surface v. subsurface, restoration v. reclamation)
- Preservation of mineral deposits
- Types of rocks (igneous, sedimentary, metamorphic) and their properties
- Rock cycle

#### **Soil Composition & Conservation**

- Formation of soil
- Soil horizons and profile
- Soil particles (sand, silt, clay)
- Porosity and permeability of soil
- Soil erosion by wind and water
- Soil conservation methods

- Mineral social media profile
- Mineral identification lab
- Edible mining simulation lab
- Types of rocks jigsaw activity
- Mining impact research project
- Soil analysis lab
- Global soils profiles research project
- Soil erosion STEM activity

- Mineral kit (including mineral samples, streak plate, magnet, & nail)
- Glass slide
- Brownie mix
- White chocolate chips
- Icing
- Food coloring
- Clear plates
- Wooden and plastic toothpicks
- Plastic spoons
- Empty disposable water bottles or jars with lid (must be clear and without label)
- Droppers or pipettes
- Samples of soil
- Newspapers
- Calculators
- 2 Disposable aluminum baking pans (9"x13")
- Kitchen or scientific scale
- One section of party hose
- Watering can
- 12 Plastic cups
- 2 Twist ties
- 6 coffee filters
- Fill materials for erosion barriers (see lab)

4  
weeks

## Timing

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### Geosphere Unit 3

#### Energy

What is Energy?

Renewable v. nonrenewable energy

Mechanics of energy generation

#### Fossil Fuels and Renewable Energy

Pros and cons of each energy type

Distribution of energy resources

Impacts of energy sources

Energy conservation

- Electricity generation lab
- Energy speed dating activity
- Energy battle/debate
- Energy impacts Google mapping activity

- 4  
-1x2x5cm ceramic bar magnet from [E1 Ceramic Magnets](#)
- 1 - #30 Magnet wire 200ft from [Amazon TEMCo Magnet Wire](#)
- 1 -1.5V 25mA from [All Electronics 1.5V Lamp](#)
- Cardboard
- Large nails (8cm+)
- Sandpaper
- Voltmeter or multimeter
- Water source attached to long hose or tube
- Bucket
- Recycled materials
- Wooden or metal skewers
- Index cards or cardboard
- House fan
- X-acto knife or box cutter

2.5  
weeks

### Hydrosphere Unit 1

#### Introduction to Water & The

#### Hydrologic Cycle

- Unique properties of water
- Processes in the water cycle
- Human impacts on the water cycle

#### Surface Water & Watersheds

- Watersheds
- Eutrophication and acidification of aquatic ecosystems
- Structure and impact of dams
- Benefits of riparian buffers

#### Groundwater & Irrigation

- Water table
- Aquifers (confined v. unconfined)
- Types of irrigation
- Human impacts from groundwater usage

- Properties of Water Stations Lab
- Macroinvertebrate Stream Study
- Personal Water Audit
- Watershed Mapping Activity
- Building an Aquifer STEM Model
- Irrigation Jigsaw Group Research Activity
- Salination Investigation Lab

- General classroom supplies
- cups or beakers
- Water
- Food coloring
- Capillary tube
- Paper clip
- Eyedropper
- Penny
- Rubbing alcohol
- Ice cubes (optional)
- Kick net
- Waders/boots
- Trays
- Identification app or key
- Sediments
- Clear container
- Hand pump
- Food coloring

2.5  
weeks

## Timing

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2.5  
weeks

### Hydrosphere Unit 2

- **Marine Biomes**
- Types of aquatic biomes
- Adaptations for the intertidal zone
- Ocean productivity and nutrients in ocean food webs
- Ocean zones
- Oil spills and clean-up methods
- Aquaculture v. Fishing
- Coral bleaching
- **Wetlands & Water Pollution**
- Water Quality
- Point-source v. nonpoint-source pollution
- Microplastic pollution
- Oxygen sag curve and nutrient pollution
- Effects of pollution on aquatic ecosystems
- Persistent Organic Pollutants (POPs)
- Bioaccumulation v. biomagnification
- Bioassays and LD50
- Characteristics of wetlands
- Environmental benefits of wetlands

- Group Discussion: Commercial Fishing & Aquaculture
- Research a Fish Project
- Oil Spill Clean-up Simulation Lab
- Effects of Oil on Marine Life Research Activity
- Sources of Water Pollution Card Sorting Activity
- Water Quality Testing Lab (outdoors)
- Group Activity: Wetland Mitigation (outdoors)

- General classroom supplies
- Posterboard
- Cooking oil
- Dish pan or disposable metal baking pan
- Pipe cleaners or string
- Cotton balls
- Plastic spoons
- Dish soap

4.5  
weeks

### Land Use & Sustainability

#### **Urbanization & Land Use**

Development of villages & cities from hunting & gathering

Environmental impacts of cities

Human health impacts of cities

Heat islands

Urban sprawl

City planning and smart growth

#### **Sustainable Forestry**

3 E's of sustainability (economics, environment, equity)

Economic and environmental benefits of trees

Deforestation and reforestation

#### **Sustainable Agriculture**

The Green Revolution

Agricultural impacts on the environment

Sustainable practices in agriculture

Organic v. traditional farming

Vertical farming and other future agricultural techniques

Genetically modified organisms (GMOs)

- Heat Islands online research
- Impacts of Urbanization poster
- Urban Sprawl Drawing activity
- Urban Issues in Developing & Developed Countries research activity
- Be a City Planner group activity
- What's the Value of a Tree outdoor activity
- Forest Pest Management research activity
- GMO class debate
- Perplexed by Protein graph interpretation activity
- Informational flyer on protein sources
- General classroom supplies
- Outdoor stand of large trees
- Straws
- String
- Metal washers or other small, heavy object
- Flexible measuring tapes
- Tree identification guide or app