Env Sci Scope & Sequence

Timing	Unit & Topics Covered	Labs and Activities	Materials Needed
3.5 weeks	**Intro to Env Sci** **Intro to Environmental Science** • Environmental science v. ecology v. environmental activism • Renewable and nonrenewable resources • Tragedy of the Commons • Ecological footprints **Scientific Processes** • Scientific methods • Quantitative v. qualitative data • Science v. pseudoscience • Peer review process • Scientific theory v. law **Economics & Policy** • What are economics? • Ecosystem services • Cost-benefit analyses • Types of environmental policies (regulatory v. incentive)	• Tragedy of the Commons Digital Activity • Ecological Footprint Activity & Bookmark • Environmental Scientist Research Project • Create Your Own Experiment Lab • Environmental Policy Timeline Activity • Environmental Careers Flyer	General Classroom Supplies: • Computers • Calculators • Rulers • Colored pencils • Paper • Scissors
1.5 weeks	**Biosphere Unit 1** **Spheres of the Earth** • Hydrosphere, geosphere, atmosphere, biosphere, cryosphere • Interactions between spheres **Basics of Ecology** • Biotic v. abiotic factors • Organization of living things • Habitat v. niche **Organism Relationships** • Food chains v. food webs • Energy pyramid and trophic levels • Conservation of energy and First Law of Thermodynamics • Symbiotic relationships • Prey adaptations	• Spheres of the Earth outdoor activity • Animal Habitat and Niche Survey • Biological Relationships Symbiosis Activity • Prey Adaptations Research Activity	• General classroom supplies • An outdoor space

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2 weeks	**Biosphere Unit 2** **Species** • Definition of species • Endangered v. threatened species • Endangered Species Act • Speciation Interspecific competition **Populations and Population Growth** • Linear v. exponential growth • Logistic growth • S curve v. J curve • Limiting factors • Carrying capacity • Natality, fecundity, fertility, mortality, life expectancy • Survivorship curves (Types 1, 2, & 3) • R strategists v. K strategists • Age Structure Diagrams	• Endangered Species Research Project • R v. K Strategists Card Sort • Deer Ecology Population Analysis	• General classroom supplies • optional materials for presentations (poster paper, etc.)
3 weeks	**Biosphere Unit 3** **Biomes** • 9 different world biomes Climate v. weather • Climatograms **Communities & Ecological Succession** • Keystone species • Indicator species • Primary v. Secondary succession, climax community, pioneer species **Biodiversity** • Types of biodiversity • Biodiversity index • Sampling methods • Invasive species	• Biome Travel Brochure Research Activity • Biome Food Web Group Poster Project • Geocaching Lab (outdoors) • Plant Transect Biodiversity Lab (outdoors) • Lionfish Invasive Species Panel Discussion	• General classroom supplies • Posterboard & glue sticks • Cell phones or GPS units • Outdoor space with geocaches • Plant ID guides or apps (ex: iNaturalist) • Outdoor space with a variety of plants • Tall garden stakes • Yarn or fishing line

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3.5 weeks	**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)	• 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	• 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
2 weeks	**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	• Plate Mapping Activity • Volcano Project-based Learning (PBL) Activity	• General classroom supplies

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4 weeks	**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 panty hose • Watering can • 12 Plastic cups • 2 Twist ties • 6 coffee filters • Fill materials for erosion barriers (see lab)

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2.5 weeks	**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 EI 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

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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