

ECO-SCHOOLS USA PATHWAYS TO SUSTAINABILITY ALIGNMENT TO THE GLOBE PROGRAM

GLOBE INVESTIGATION & DESCRIPTION	ECO-SCHOOLS USA PATHWAY COMBATIBILITY	GUIDING QUESTIONS TO SUPPORT GLOBE/ ECO-SCHOOLS USA INTEGRATION
ATMOSPHERE GLOBE student data within the Atmosphere investigation aids scientific understanding of spatial gaps in air temperature and precipitation coverage by weather monitoring stations, important data on aerosols and surface ozone. In addition, atmospheric data play a critical role in the calibration of satellite instruments collecting data on, for example, clouds and aerosols.	 Biodiversity -investigating and increasing biodiversity at school and beyond  Climate Change -finding meaningful lasting ways to reduce the school's carbon footprint  Consumption and Waste -analyzing and addressing the full life cycle of a school's products including what teachers, staff, and students use  Energy -energy conservation  Healthy Living -promoting outdoor time, physical activity and other aspects of a healthy lifestyle  Schoolyard Habitats™ -developing sustainable learning laboratories for plants and animals  Transportation -sustainable solutions to reduce our travel footprint  Water -water conservation and stewardship	1) How is biodiversity in our schoolyard and neighboring community impacted by changes in temperatures in our soil, air and water? 2) What does data collected about aerosols, surface ozone, temperature, and precipitation coverage convey about how the climate is changing in our community? What anecdotal evidence is available to support or refute a changing climate in our community? 3) What is the connection between our consumption and waste habits and atmospheric changes over time? 4) What is the link between atmospheric changes over time and energy use? 5) How has time spent outdoors changed over time and what is the link to changes in our atmosphere? 6) What role does understanding atmospheric conditions in your schoolyard play when creating an action plan and designs for your outdoor learning laboratories? 7) Does traffic in and around my school impact various atmospheric data? 8) What is the relationship between water in and around my community and the atmosphere? What can these data sets tell me about our water?

Atmospheric conditions can have an important impact on the types of plants and animals that can live in a particular area as well as soil formation. The atmospheric measurements collected by GLOBE students are important to scientists studying weather, climate, land cover, phenology, ecology, biology, hydrology and soil.

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HYDROSPHERE Water covers approximately 70 percent of earth's surface, continually circulating between Earth's surface and atmosphere as part of the hydrologic, or water cycle and is one of the basic processes in nature. Water evaporates into the atmosphere to become water vapor where it cools and condenses into liquid water or ice crystals to become clouds. It then falls back to the surface as rain or snow, where it can filter into the soil, be absorbed by plants, percolate to groundwater reservoirs, run off into water bodies, or evaporate.	 Biodiversity -investigating and increasing biodiversity at school and beyond  Climate Change -finding meaningful lasting ways to reduce the school's carbon footprint  Consumption and Waste -analyzing and addressing the full life cycle of a school's products including what teachers, staff, and students use  Energy -energy conservation  Healthy Living -promoting outdoor time, physical activity and other aspects of a healthy lifestyle  Healthy Schools -eliminating toxic and hazardous materials improve school health inside and out  Schoolyard Habitats™ -developing sustainable learning laboratories for plants and animals  Sustainable Food -improving nutrition and sustainability at school  Transportation -sustainable solutions to reduce our travel footprint  Water -water conservation and stewardship	1) How does healthy soil impact schoolyard biodiversity? 2) What impacts to local plant and animal species does change in climate have? 3) What litter impacts does our school have on our watershed? How can we raise awareness and reduce litter? 4) What is the connection between energy production and water use in our community? 5) What can we accomplish if our community better understands how their watershed impacts everyday life? 6) What impact does improper disposal of toxic or hazardous waste have on our community's watershed? 7) What species rely on healthy waters on our school grounds? 8) Why is water conservation and quality important in a sustainable food system? 9) How does traffic in and around our school impact our watershed? 10) What's the best way to engage our school and family's in water conservation practices?

Water participates in many important natural chemical reactions and is a good solvent. Changing any part of the Earth system, such as the amount or type of vegetation in a region or from natural land cover to an impervious one, can affect the rest of the system. Rain and snow capture aerosols from the air. Acidic water slowly dissolves rocks, placing dissolved solids in water. Dissolved or suspended impurities determine water's chemical composition.

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BIOSPHERE Land cover is a term used to describe what is on the ground or cover the land. Different terms are used to describe the differences seen when looking at the land and can be split into natural and developed areas.	 Biodiversity-investigating and increasing biodiversity at school and beyond  Climate Change-finding meaningful lasting ways to reduce the school's carbon footprint  Healthy Living-promoting outdoor time, physical activity and other aspects of a healthy lifestyle  Schoolyard Habitats™-developing sustainable learning laboratories for plants and animals  Transportation-sustainable solutions to reduce our travel footprint  Water-water conservation and stewardship	1) How does remote sensing help our action (green) team design our schoolyard habitat for wildlife? 2) How have MUC classes changed at our school site over X number of decades? What are potential relationships between MUC classes and a changing climate? 3) How many different MUC levels and classes are represented in our schoolyard? Is this beneficial or not? Why? 4) How does land cover in the schoolyard change over the course of a school year, and how can this information help us in the design or redesign of our Schoolyard Habitat™? 5) What impact does a new development, such as a school, in our community have on MUC level's and classes? 6) What role does water play in MUC levels and how can it increase our schoolyard's biodiversity?

Land cover is divided into natural and developed areas. Developed areas include urban and commercial areas, agricultural areas and transportation. Natural areas include many different natural habitats: deserts, forests, water bodies and the like. All living things—including humans—depend on their habitat or land cover-- for survival. Land cover provides shelter, food and protection. Land cover also has a direct effect on the kinds of animals that will likely inhabit an area.

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PEDOSPHERE (SOIL) Soil makes up a thin layer known as the pedosphere and an important, yet very limited, natural resources which affects every part of the ecosystem. Soils hold nutrients and water for plants and animals. Soils also filter and clean water and can change the chemistry of water. Soils store and transfer heat and affect temperature of the atmosphere.	 Biodiversity-investigating and increasing biodiversity at school and beyond  Healthy Living-promoting outdoor time, physical activity and other aspects of a healthy lifestyle  Schoolyard Habitats™-developing sustainable learning laboratories for plants and animals  Sustainable Food-improving nutrition and sustainability at school	1) How can healthy soil increase our plant and animal biodiversity? 2) What role does “the understanding of our schoolyard soil” play in the design and planting or our schoolyard habitat™? 3) How can we (action/green team) increase the use of our composter as a tool for learning? 4) What role does soil type and health play in our sustainable food gardens? Does it even matter?

Data collection of soil temperature, moisture and chemical properties is invaluable to scientists in many fields: **soil scientists** use the data to better understand their potential for plant growth; **hydrologists** use the data to determine potential sedimentation in water bodies; **climatologists** use soil data in climate prediction models as soils can affect humidity and temperature; **biologists** use soil data to understand its potential for supporting plant and animal life; and **anthropologists** study the soil in order to reconstruct the human history of an area.

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EARTH AS A SYSTEM Understanding Earth as a system – Earth system science – requires a quantitative exploration of the connections between and among the critical parts of the system: Atmosphere, Cryosphere, Hydrosphere, Lithosphere/pedosphere, and Biosphere	 Biodiversity-investigating and increasing biodiversity at school and beyond  Climate Change-finding meaningful lasting ways to reduce the school's carbon footprint  Consumption and Waste-analyzing and addressing the full life cycle of a school's products including what teachers, staff, and students use  Energy-energy conservation  Healthy Living-promoting outdoor time, physical activity and other aspects of a healthy lifestyle  Healthy Schools-eliminating toxic and hazardous materials improve school health inside and out  Schoolyard Habitats™-developing sustainable learning laboratories for plants and animals  Sustainable Food-improving nutrition and sustainability at school  Transportation-sustainable solutions to reduce our travel footprint  Water-water conservation and stewardship	1) Do all trees, shrubs, plants, etc. have the same first bloom dates? Why? 2) How is climate change impacting animals in relation to phenology? 3) How do our consumption and waste habits impact phenology? Does this impact animal species in my community? 4) How do our energy choices impact phenology? 5) Does studying outside increase our appreciation of the natural world? 6) How do the materials used in school to clean impact the phenology of the schoolyard and surrounding community? 7) How have our planting and harvesting schedules changed over time in our community? 8) How is our food system impacted by changes in the phonological record? What impact does this have on wildlife? 9) Does the traffic in and around our school impact plant life cycles? 10) What impacts would occur with more water restrictions in your community? What are possible solutions?

GLOBE students aid in the understanding of how Earth functions as a system through data collection and student research.

Phenology, the study of living organisms' response to seasonal changes in their environment, is a key component of the Earth as a System investigation. Changes in the length of the growing season, the period between green-up and senescence, may be an indication of global climate change.