# Environmental Systems: Year at a Glance

## First Semester

### Ecology - 63 instructional days in S1 / 45 + 5 days performance assessment = 50 instructional days in Ecology Unit

| **Unit** | **Introduction/SEL (7 days)** | **Movement within Ecosystems (12 days)** | **Community Interactions (13 days)** | **Population Dynamics (13 days)** |
| --- | --- | --- | --- | --- |
| **TEKS** | 1A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K | 4C, 4D, 6A, 6C, 6D, 6E | New: 4A, 4B, 4F, 4D, 4G, 4H, 5E | 4G, 7A, 7B, 7D, 9E, 9K |
| **Stage One Snapshot** | **Enduring Understandings:**   * Science is important for everyday decision making. * Humans heavily impact the world around them. | **Enduring Understandings:**   * Nutrients move through ecosystems in cycles. * Energy is released from the sun and transferred between organisms. | **Enduring Understandings:**   * Relationships between species play a pivotal role in the functioning of an ecosystem. * Climate and latitude determine biomes. | **Enduring Understandings:**   * Populations are constantly in flux. * All species play important roles in the ecosystem. |

## First and Second Semester

### Human Impacts - 15 instructional days, 72 days in S2/30 + 4 days performance assessment = 34 instructional days in Human Impacts Unit

| **Unit** | **Human Populations (13 days)** | **Land Use and Food (15 days)** | **Energy (15 days)** |
| --- | --- | --- | --- |
| **TEKS** | 7A, 7B, 7C, 7D, 8A, 9E, 9F, 9I | 5A, 8C, 9B, 9E, 9F, 9G, 9J, 9K | 5A, 6B, 8C, 9B, 9E, 9F, 9G, 9J, 9K |
| **Stage One Snapshot** | **Enduring Understandings:**   * The human population is exponentially growing and heavily impacting resource availability. * Education drives human population sizes. | **Enduring Understandings:**   * Land resources are renewable if managed properly. * Food production impacts the environment. | **Enduring Understandings:**   * Sun is the source of almost all energy. * All energy sources have both advantages and disadvantages; balance is needed to justify their use. |

## Second Semester

### Pollution - 34 + 4 days performance assessment = 38 instructional days in Pollution Unit

| **Unit** | **Wastes (11 days)** | **Water Pollution (11 days)** | **Air Pollution (12 days)** |
| --- | --- | --- | --- |
| **TEKS** | 5E, 5F, 9A, 9B, 9F, 9I, 9K | 4E, 5B, 5C, 5D, 5E, 8A, 9A, 9B, 9C, 9D, 9K | 8B, 8D, 8E, 9A, 9B, 9C, 9D, 9E, 9H, 9I, 9J,9K, 9L |
| **Stage One Snapshot** | **Enduring Understandings:**  ✔ All human activities create waste; the reduction and management of waste is critical for survival. | **Enduring Understandings:**  ✔ Fresh water is a finite resource; clean water is critical | **Enduring Understandings:**   * Air quality is critical to life. * You are causing climate change. |

# ENVIRONMENTAL SYSTEMS TEKS

1. **Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices**

\*1A demonstrate safe practices during laboratory and field investigations, including the appropriate first aid responses to accidents that could occur in the field such as insect stings, animal bites, overheating, sprains, and breaks

1B demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials

1. **Scientific processes. The student uses scientific methods to solve investigative questions.**

2A know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section

2B know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories

2C know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well‐established and highly reliable explanations, but may be subject to change as new areas of science and new technologies are developed

2D distinguish between scientific hypotheses and scientific theories

\*2E follow or plan and implements investigative procedures, including making observations, asking questions, formulating testable hypotheses, and selecting equipment and technology

2F collect data individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range

\*2G demonstrate the use of course apparatuses, equipment, techniques, and procedures, including meter sticks, rulers, pipettes, graduated cylinders, triple beam balances, timing devices, pH meters or probes, thermometers, calculators, computers, Internet access, turbidity testing devices, hand magnifiers, work and disposable gloves, compasses, first aid kits, binoculars, field guides, water quality test kits or probes, soil test kits or probes, 100ft appraiser’s tapes, tarps, shovels, trowels, screens buckets, and rock and mineral samples

2H use a wide variety of additional course apparatuses, equipment, techniques, materials, and procedures as appropriate such as air quality testing devices, cameras, flow meters, Global Positioning System (GPS) units, Geographic Information System (GIS) software, computer models, densiometers, clinometers, and field journals

\*2I organize, analyze, evaluate, build models, make inferences, and predict trends from data

2J perform calculations using dimensional analysis, significant digits, and scientific notation

\*2K communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology‐based reports

1. **Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom**

3A in all fields for science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student

\*3B communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles and marketing materials

3C draw inferences based on data related to promotional materials for products and services

3D evaluate the impact of research on scientific thought, society, and the environment

3E describe the connection between environmental science and future careers

3F research and describe the history of environmental science and contributions of scientists

1. **Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:**

4A identify native plants and animals using a dichotomous key

4B assess the role of native plants and animals within a local ecosystem and compare them to plants and animals in ecosystems within four other biomes

4C diagram abiotic cycles including the rock, hydrologic, carbon, and nitrogen cycles

4D make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes

4E measure the concentration of solute, solvent, and solubility of dissolved substances such as dissolved oxygen, chlorides, and nitrates and describe their impact on an ecosystem

4F predict how the introduction or removal of an invasive species may alter the food chain and affect existing populations in an ecosystem

4G predict how species extinction may alter the food chain and affect existing populations in an ecosystem

\*4H research and explain the causes of species diversity and predict changes that may occur in an ecosystem if species and genetic diversity is increased or reduced

1. **Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:**

5A summarize methods of land use and management and describe its effects on land fertility

5B identify source, use, quality, management, and conservation of water

\*5C document the use and conservation of both renewable and no‐renewable resources as they pertain to sustainability

5D identify renewable and non‐renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy

5E analyze and evaluate the economic significance and interdependence of resources within the environmental system

\*5F evaluate the impact of waste management methods such as reduction, reuse, recycling, and composting on resource availability

1. **Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:**

6A define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

\*6B describe and compare renewable and non‐renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind

6C explain the flow of energy in an ecosystem, including conduction, convection and radiation

6D investigate and explain the effects of energy transformations in terms of the laws of thermodynamics within and ecosystem

\*6E investigate and identify energy interactions in an ecosystem

1. **Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:**

\*7A relate carrying capacity to population dynamics

7B calculate birth rates and exponential growth of populations

7C analyze and predict the effects of non‐renewable resource depletion

\*7D analyze and make predictions about the impact on populations of geographic locales due to diseases, birth and death rates, urbanization, and natural events such as migration and seasonal changes

1. **Science concepts. The student knows that environments change naturally. The student is expected to:**

\*8A analyze and describe the effects on areas impacted by natural events such as tectonic movement, volcanic events, fires, tornadoes, hurricanes, flooding, tsunamis, and population growth

8B explain how regional changes in the environment may have a global effect

8C examine how natural processes such as succession and feedback loops restore habitats and ecosystems

8D describe how temperature inversions impact weather conditions, including El Nino and La Nina

8E analyze the impact of temperature inversions on global warming, ice cap and glacial melting, and changes in ocean currents and surface temperatures

1. **Science concepts. The student knows the impact of human activities on the environment. The student is expected to:**

\*9A identify causes of air, soil, and water pollution, including point and nonpoint sources

9B investigate the types of air, soil, and water pollution such as chlorofluorocarbons, carbon dioxide, pH, pesticide runoff, thermal variations, metallic ions, heavy metals, and nuclear waste

9C examine the concentrations of air, soil, and water pollutants using appropriate units

\*9D describe the effect of pollution on global warming, glacial and ice cap melting, greenhouse effect, ozone layer, and aquatic viability

\*9E evaluate the effect of human activities, including habitat restoration projects, species preservation efforts, nature conservancy groups, hunting, fishing, ecotourism, all‐terrain vehicles, and small personal watercraft, on the environment

9F evaluate cost‐benefit trade‐offs of commercial activities such as municipal development, farming, deforestation, over‐harvesting, and mining

9G analyze how ethical beliefs can be used to influence scientific practices such as methods for increasing food production

\*9H analyze and evaluate different views on the existence of global warming

9I discuss the impact of research and technology on social ethics and legal practices in situations such as the design of new buildings, recycling, or emission standards

9J research the advantages and disadvantages of “going green” such as organic gardening and farming, natural methods of pest control, hydroponics, xeriscaping, energy‐efficient homes and appliances, and hybrid cars

9K analyze past and present local, state, and national legislation including Texas automobile emissions regulations, the National Park Service Act, the Clean Air Act, the Soil and Water Resources Conservation Act, and the Endangered Species Act

9L analyze past and present international treaties and protocols such as the environmental Antarctic Treaty System, Montreal Protocol, and Kyoto Protocol

Source: The provisions of this §112.37 adopted to be effective August 4, 2009, 34 TexReg 5063.