Ohio CTE: Agricultural and Environmental Systems

Environmental Science

Soils: Apply knowledge of soil characteristics and soil information resources to overcome any existing soil use limitations while maintaining or improving soil quality. 6.1

1. **Identify soil forming factors and explain how they produce variability in soils.** 6.1.1
2. **Describe the relationship among physical properties of soils.** 6.1.2
3. **Collect, test, and analyze soil samples for physical and chemical properties.** 6.1.3
4. **Identify and describe factors (e.g., climate, soil texture, mineralogy, soil organisms, drainage co-efficient, land use, vegetation types, management practices) affecting organic matter and its function in soil quality.** 6.1.4
5. **Determine land use and identify land capabilities classes.** 6.1.5
6. **Identify and describe soil conservation practices to reduce soil erosion and compaction.** 6.1.6
7. **Compare and contrast the causes and effects of soil erosion.** 6.1.7
8. **Describe soil limitations in agronomic, urban, and natural resource practices.** 6.1.8
9. **Evaluate soil survey data and implement management decisions.** 6.1.9
10. **Assess basic processes (e.g., slope stability, water control, earth material control, vegetative treatment, soil amendments) of soil reclamation.** 6.1.10

Water Quality: Analyze, interpret, and manage the biological, chemical, and physical properties of water quality. 6.2

1. **Assess and explain the interactions between human activities and the Earth's hydrosphere (e.g., septic systems, desalinization, point and non-point source pollution).** 6.2.1
2. **Measure pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), nitrogen, and phosphorus in lentic and lotic waters to determine water quality.** 6.2.2
3. **Measure vegetation, temperature, turbidity, macroinvertebrate populations, and bacterial quality in lentic and lotic waters to determine water quality.** 6.2.3
4. **Explain the hydrological cycle and how human and animal activity impacts the cycle.** 6.2.4
5. **Explain the biotic and abiotic factors affecting water quality.** 6.2.5

	6 Monitor and analyze water quality and quantity. 6.2.6
	7 Identify and describe best management and industry (e.g., agriculture, timber production, construction) production practices that maintain or improve water quality. 6.2.7
Air Quality: Analyze, interpret, and manage the biological, chemical, and physical properties of air quality. 6.3	1 Determine the chemical and physical properties of air (e.g., composition, density, pressure). 6.3.1
	2 Explain biogeochemical cycles (e.g., nitrogen, oxygen, sulfur) and how they relate to the biosphere, geosphere, and atmosphere. 6.3.2
	3 Explain the effects of carbon dioxide sequestration on air quality. 6.3.3
	4 Analyze the importance of air quality to humans and other living organisms. 6.3.4
	5 Explain human and natural factors (e.g., transportation, farming practices, greenhouse gases, forest fires, volcanic eruptions) affecting air quality. 6.3.5
	6 Monitor and evaluate air composition, quality, and quantity with direct reading instruments (e.g., combustible gases, oxygen, ammonia). 6.3.6
	7 Assess the potential for air contamination at a specific site. 6.3.7
	8 Identify and describe best management and industry (e.g., agriculture, timber production, construction) production practices that maintain or improve air quality. 6.3.8
Water Use and Management: Collect, analyze, and interpret data for a localized water use and management plan. 6.4	1 Explain the domains of hydrology. 6.4.1
	2 Describe the geological and meteorological principles affecting water supplies. 6.4.2
	3 Identify and describe types of tests (e.g., Well Yield Test, Pumping Test) used to determine groundwater potential and discharge rates. 6.4.3
	4 Identify and describe uses of surface water flow measurements (e.g., stage, stage-discharge curve, peak stage, instantaneous flow, estimation of annual discharge). 6.4.4
	5 Interpret surface water flow measurements (e.g., stage, stage-discharge curve, peak stage, instantaneous flow, estimation of annual discharge). 6.4.5
	6 Evaluate water collection, storage, and distribution systems (e.g., wells, ponds, runoff, waterways, irrigation). 6.4.6
	7 Identify and describe watersheds and their structures (e.g., flowing waters, still water, and upland areas.) 6.4.7

	8 Identify and describe risk factors for potential surface water and groundwater contamination. 6.4.8
	9 Identify and describe best management practices that conserve and sustain water. 6.4.9
Potable Water Treatment: Monitor the water treatment processes for potable water at a specific site. 6.5	1 Identify and assess the characteristics of potable water treatment and the sources of water. 6.5.1
	2 Collect and analyze water samples to determine potability. 6.5.2
	3 Describe components of a water treatment facility. 6.5.3
	4 Monitor the water treatment process (e.g., aeration, flocculation, sedimentation, filtration, disinfection). 6.5.4
	5 Monitor the control and treatment of chemical and biological contaminants (e.g., trihalomethanes, lead, bacteria, nitrates) in water. 6.5.5
	6 Describe taste and odor control in water treatment. 6.5.6
	7 Identify methods for backflow prevention. 6.5.7
Wastewater Operations: Monitor the wastewater collection and treatment methods for a specific site. 6.6	1 Identify the components of a wastewater treatment system. 6.6.1
	2 Collect wastewater samples using industry approved standard operating procedures. 6.6.2
	3 Identify, analyze, and reconcile the components of wastewater samples using industry-approved standard operating procedures. 6.6.3
	4 Identify normal and abnormal conditions in wastewater collection and treatment systems. 6.6.4
	5 Describe the processes of wastewater treatment (e.g., mixing, coagulation, flocculation, disinfection, treatment system, effluent disposal, solids management). 6.6.5
	6 Identify and describe methods for cross-connection and backflow prevention. 6.6.6
	7 Locate, identify, and inventory wastewater assets. 6.6.7
Solid Waste and Renewable Resource Management: Control and process solid waste using current and	1 Collect, analyze, and treat solid waste materials (e.g., livestock mortalities, manure, garbage, food waste). 6.7.1
	2 Distinguish the risks associated with solid waste accumulation, utilization, and disposal. 6.7.2

alternative technologies. 6.7	**3** Determine an acceptable site for solid waste disposal. 6.7.3
	4 Compare the processes of aerobic and anaerobic waste decomposition. 6.7.4
	5 Describe and monitor solid waste disposal procedures (e.g., landfill, compost). 6.7.5
	6 Describe and monitor solid waste disposal procedures and management procedures (e.g., composting, incineration, recycling, burial, bio-digester). 6.7.6
	7 Explain the control processes and potential uses for solid waste byproducts (e.g., leachate, ash, landfill gas, biosolids, methane, manure). 6.7.7
	8 Describe standard operating procedures and identify design requirements for specific purposes (e.g., landfill, lagoon, leachate treatment). 6.7.8
	9 Evaluate site closure methods and post-closure monitoring. 6.7.9
	10 Determine type and volume of solid waste generated by an operation or facility. 6.7.10
Contaminants and Pollution Control: Assess an affected area, determine the source and type of contaminant, and respond. 6.8	**1** Collect, record, and analyze environmental samples and interpret the results. 6.8.1
	2 Determine the types, sources, and impact of natural, human-made contaminants, and high-risk contaminants. 6.8.2
	3 Monitor, analyze, and quantify levels of contaminants from point and non-point sources. 6.8.3
	4 Monitor noise and light pollution and recommend abatement measures. 6.8.4
	5 Describe the environmental impact from both industrial and nonindustrial processes. 6.8.5
	6 Identify, comply with, and implement best management practices for contaminant control, remediation, and prevention (e.g., biological, sanitation, buffer strips). 6.8.6
	7 Identify, describe, and recommend remediation strategies for the release of contaminant to soil, surface water, or groundwater. 6.8.7
	8 Monitor and conduct remediation activities. 6.8.8
	9 Identify and describe requirements to develop and implement various emergency response plans. 6.8.9
	10 Identify and contact local emergency response teams. 6.8.10

	11 Analyze environmental conditions that influence environmental response. 6.8.11
Hazardous Materials and Waste Management: Follow and apply handling, storage, and recording procedures for hazardous materials and waste. 6.9	1 Identify and differentiate solid waste, hazardous waste, toxic waste, and radioactive waste streams. 6.9.1
	2 Describe health and safety practices for reducing risks from hazardous materials (e.g., safety data sheet [SDS], employer notification forms, personal protective equipment [PPE]). 6.9.2
	3 Demonstrate appropriate responses for major types of hazardous materials disasters. 6.9.3
	4 Locate and use information addressing hazardous substance discharge. 6.9.4
	5 Demonstrate safe management, handling, disposal, and recycling procedures for hazardous materials and waste. 6.9.5
	6 Perform site assessments to detect and identify the presence and storage of hazardous materials. 6.9.6
	7 Identify and describe collection procedures for hazardous materials and waste and interpret results. 6.9.7
	8 Identify and describe procedures to transport and store hazardous materials in accordance with regulations. 6.9.8
	9 Prepare and maintain hazardous material handling documentation. 6.9.9
	10 Identify hazardous materials that can be recycled. 6.9.10
Ecosystems: Evaluate biotic and abiotic components and relationships in ecosystems to apply restoration and conservation practices that maintain functionality. 6.10	1 Describe ecological levels, including population, community, ecosystem, biome, and biosphere. 6.10.1
	2 Distinguish the flow of energy through ecosystems. 6.10.2
	3 Identify and classify interactions among organisms, including predation, symbiosis, and competition, to determine species interdependent relationships. 6.10.3
	4 Describe the process of succession and its impact on ecosystems. 6.10.4
	5 Connect biotic interactions with the abiotic environment. 6.10.5
	6 Describe biogeochemical cycles (e.g., carbon, nitrogen, phosphorous, hydrological) and their roles in maintaining equilibrium in an ecosystem. 6.10.6
	7 Identify interactions of ecosystems to differentiate biomes. 6.10.7

	8 Select and implement restoration ecology practices to repair damaged ecosystems. 6.10.8
	9 Identify and describe impacts of native, non-native, and invasive species on an ecosystem. 6.10.9
	10 Describe the relationship between evolution and ecosystems. 6.10.10
Habitat Management and Restoration: Develop a plan for the management and restoration of a specific habitat. 6.11	1 Differentiate the properties and characteristics of habitats. 6.11.1
	2 Examine sites and place them into ecological classifications. 6.11.2
	3 Evaluate the current and historical (e.g., industrialism, agriculture, climate change) impacts of human interactions on ecosystems and habitats. 6.11.3
	4 Identify and differentiate extinct, endangered, extirpated, threatened, and species of concern. 6.11.4
	5 Survey and monitor species within a habitat. 6.11.5
	6 Explain the role of various stakeholders, including individuals, non-governmental organizations (NGOs), corporations, and governments in habitat restoration and conservation. 6.11.6
	7 Implement techniques used in habitat management, mitigation, enhancement, and restoration. 6.11.7
	8 Develop a management plan for the restoration and sustainability of a specific habitat using environmental practices that enhance biological diversity. 6.11.8
	9 Implement habitat restoration and sustainability management plan environmental practices. 6.11.9
Parks and Recreational Management: Demonstrate a basic understanding of the foundation of the park and recreation profession and their associated industries in history, theory, science, and philosophy. 6.12	1 Identify and describe the principal concept of leisure (Time, Activity, and State of Mind). 6.12.1
	2 Identify and describe theories (e.g. flow theory, Csikszentmihalyi, etc.) and how they may be applied to leisure, play, and recreation. 6.12.2
	3 Identify and describe legislative and historical events that have significantly impacted leisure, play, and recreation in the United States. 6.12.3
	4 Identify and describe the nature and scope of park, recreation, tourism, or related professions and their associated industries. 6.12.4
	5 Identify the relationship between a variety of cultural identities (e.g. age, ability, economic class, gender, race, ethnicity) and recreation participation. 6.12.5

6 **Identify and describe the leisure needs and opportunities of community that can be facilitated through parks and recreation management.** 6.12.6

7 **Identify and describe individual, organizational, and community barriers that can impede engagement in leisure, play, and recreation.** 6.12.7

8 **Describe the ways parks, recreation, and associated professions promote economic development in their communities.** 6.12.8

9 **Identify ways parks, recreation, and associated professions promote inclusivity across abilities, cultures, and life stages.** 6.12.9