

# MICHIGAN TEST FOR TEACHER CERTIFICATION (MTTC)

## TEST OBJECTIVES FIELD 049: ENVIRONMENTAL STUDIES

| Subarea                                 | Approximate Percentage<br>of Questions on Test |
|---|--|
| Foundations and Skills                  | 20%  |
| Physical Geography                      | 20%  |
| Ecological Concepts                     | 20%  |
| Energy and Natural Resources            | 16%  |
| Human Interactions with the Environment | 24%  |

### FOUNDATIONS AND SKILLS

#### **Understand the history of environmental studies.**

Includes important individuals and events in the history of environmental studies.

#### **Apply research skills in environmental studies.**

Includes interpretation of information from reference sources, maps, charts, and tables; identifying sources of information appropriate for various purposes; and appropriate methods and procedures for conducting research.

#### **Apply the scientific processes of hypothesis formation and testing to solve problems and interpret the natural world.**

Includes the application of scientific processes to solve problems; the construction of operational definitions; the prediction of outcomes of situations and experiments using cause-and-effect relationships, inference, and extrapolation; and the use of experimental results and data to confirm predictions.

#### **Apply the scientific processes of observation, organization, and classification.**

Includes the recognition of patterns, cycles, and relationships in the natural world; the classification of objects, events, and phenomena using various criteria; the organization of data; and the categorization of observations and groups.

#### **Understand procedures and principles of experimental research.**

Includes principles and techniques of scientific experimentation and investigation; differences among variables, constants, experimental groups, and control groups; and the effectiveness of experimental designs and techniques in various situations.

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**TEST OBJECTIVES**  
**FIELD 049: ENVIRONMENTAL STUDIES**

**Understand methods and equipment used in measurement, computation, and quantification.**

Includes units and systems of measurement; equipment and methods used in measurement and computation; problem solving using units of measure; and problem solving involving the metric system.

**Understand methods used in collecting, analyzing, and reporting data.**

Includes techniques used in collecting data; the interpretation of data; statistical concepts and their application to data; and methods of reporting data.

**Apply critical thinking skills in environmental studies.**

Includes the development of hypotheses for various problems; analysis of the validity of information in relation to a problem; and the construction of valid arguments and conclusions.

**PHYSICAL GEOGRAPHY**

**Understand the global energy budget.**

Includes the methods of heat transfer to, from, and within the atmosphere; and the relationships among insolation, latitudes, and seasons.

**Understand characteristics and properties of the earth's atmosphere.**

Includes the structure and composition of the atmosphere; the processes of radiation and convection in the atmosphere; and air pressure and the movement of air in the atmosphere.

**Analyze the earth's weather and climate.**

Includes cloud formation and precipitation; storms and fronts and their characteristics; characteristics and locations of climatic zones; and factors that affect weather and climate.

**Understand the hydrologic cycle.**

Includes the movement of water in the hydrologic cycle between the atmosphere, surface water systems, and ground water systems.

**Understand characteristics of oceans.**

Includes the components and properties of ocean water; characteristics of ocean currents; and the role of oceans in heat transfer around the globe.

**TEST OBJECTIVES**  
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**Understand types and characteristics of freshwater systems.**

Includes types and characteristics of ground water, moving water systems, and bodies of fresh water; and the processes by which they are formed and changed.

**Analyze the earth's dynamic geologic processes.**

Includes processes of structural change in the earth's crust; the theory of plate tectonics; and the effects of catastrophic phenomena (e.g., volcanoes, earthquakes) on the earth and its inhabitants.

**Understand types of land formations.**

Includes types and characteristics of various land formations; and the ways in which they were formed and altered over time.

**Identify types of soil and their composition.**

Includes characteristics, classification, and components of soil; biological, chemical, physical, and other factors affecting soil; and soil maps.

**ECOLOGICAL CONCEPTS**

**Understand the role of energy in living systems.**

Includes forms of energy; and ways in which energy is stored, changed from one form to another, and transferred from one level of a food chain to another.

**Understand biogeochemical cycles.**

Includes the water, carbon dioxide-oxygen, and nitrogen cycles; the role of cycles in the maintenance of ecosystems; and the effects of human activity on the cycles.

**Understand populations and population dynamics.**

Includes characteristics of populations and factors that affect population structure and size.

**Understand ecological communities.**

Includes relationships among organisms in a community; the concept of niche; and the role of producers, consumers, and decomposers in food chains and food webs.

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**Understand ecosystems.**

Includes abiotic factors that affect ecosystems; biotic factors that affect ecosystems; and the interaction of abiotic and biotic factors in ecosystems.

**Understand the process of ecological succession.**

Includes factors that determine and influence successional patterns in various types of ecosystems.

**Analyze species extinctions and their effects.**

Includes the causes of extinctions of organisms; and the effects of extinctions upon genetic diversity, food chains and food webs, and the ecological balance within a community or ecosystem.

**Understand world biomes.**

Includes types, characteristics, and locations of world biomes; and the organisms typically found in the various biomes.

**ENERGY AND NATURAL RESOURCES**

**Understand nonrenewable energy resources.**

Includes types and characteristics of nonrenewable energy resources (e.g., fossil fuels, nuclear fuels); how they were formed; where they are found; how they are used; and their advantages and disadvantages.

**Understand perpetual and renewable energy resources.**

Includes types and characteristics of perpetual energy resources (e.g., solar, wind, and geothermal energy) and renewable energy resources (e.g., hydropower, biomass); how they are used; and their advantages and disadvantages.

**Understand nonrenewable mineral resources.**

Includes types, characteristics, and uses of mineral resources and where they are found; mining methods; and the economic importance of various minerals.

**Understand the characteristics and importance of land resources.**

Includes the classification and characteristics of various land resources (e.g., forests, rangeland); how they are used; and the importance of land resources to plants, animals, and humans.

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**Understand water resources and their importance.**

Includes characteristics of water resources (e.g., surface water, ground water); how they are used; processes by which water resources are renewed; and the consequences of insufficient or depleted water resources.

**Understand the types and characteristics of food resources.**

Includes the classification and characteristics of food resources (e.g., grain, livestock); the comparative energy yield from various food resources; and methods used to increase the overall yield of food resources.

**HUMAN INTERACTIONS WITH THE ENVIRONMENT**

**Analyze the interrelationship between humans and the environment.**

Includes land use patterns; how environmental factors affect human activities; and the effects of various types of human activities on biotic and abiotic environments.

**Understand human population growth and distribution patterns.**

Includes factors that influence population growth and distribution patterns; issues related to population growth control; and the effects of human population growth and distribution on the local and global environments.

**Understand air pollution and methods of controlling air pollution.**

Includes types, sources, and effects of air pollution; chemical reactions involving air pollutants; factors affecting air pollution levels; and methods and technologies used to control air pollution.

**Understand land and water pollution and methods of controlling them.**

Includes types, sources, and effects of land and water pollution (e.g., sewage, hazardous waste, pesticides); factors affecting pollution levels; and methods and technologies used to control land and water pollution.

**Understand the principles of conservation.**

Includes issues related to and methods of conserving and managing the earth's natural resources and living organisms.

**TEST OBJECTIVES**  
**FIELD 049: ENVIRONMENTAL STUDIES**

**Identify U.S. federal laws, regulations, and policies related to environmental protection and management.**

Includes U.S. laws and acts related to pollution control, land use, and endangered species.

**Identify Michigan laws, regulations, and policies related to environmental protection and management.**

Includes Michigan laws and acts related to pollution control, land use, and endangered species.

**Identify government agencies responsible for the protection and management of the environment and wildlife.**

Includes agencies responsible for promoting environmental conservation and enforcing environmental laws and policies (e.g., National Park Service, EPA, Department of Agriculture); and their duties and responsibilities.

**Understand the principles of sustainable societies.**

Includes the characteristics of sustainable societies; reasons and goals for developing them; and the relationship between humans and the environment in sustainable societies.