

Earth Science Prerequisites to High School Content Expectations

STANDARD E3: THE SOLID EARTH

E3.p1 Landforms and Soils (*prerequisite*)

Landforms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruptions, and deposition of sediments transported in rivers, streams, and lakes through watersheds. Destructive forces include weathering and erosion. The weathering of rocks and decomposed organic matter result in the formation of soils.

E3.p1A Explain the origin of Michigan landforms. Describe and identify surface features using maps and satellite images.

E3.p1B Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments.

E3.p1C Describe how coastal features are formed by wave erosion and deposition.

E3.p2 Rocks and Minerals (*prerequisite*)

Igneous, metamorphic, and sedimentary rocks are constantly forming and changing through various processes. As they do so, elements move through the geosphere. In addition to other geologic features, rocks and minerals are indicators of geologic and environmental conditions that existed in the past.

E3.p2A Identify common rock-forming minerals (quartz, feldspar, biotite, calcite, hornblende).

E3.p2B Identify common igneous (granite, basalt, andesite, obsidian, pumice), metamorphic (schist, gneiss, marble, slate, quartzite), and sedimentary (sandstone, limestone, shale, conglomerate) rocks and describe the processes that change one kind of rock to another.

E3.p3 Basic Plate Tectonics (*prerequisite*)

Early evidence for the movement of continents was based on the similarities of coastlines, geology, faunal distributions, and paleoclimatological data across the Atlantic and Indian Oceans. In the 1960s, additional evidence from marine geophysical surveys, seismology, volcanology, and paleomagnetism resulted in the development of the theory of plate tectonics.

E3.p3A Describe geologic, paleontologic, and paleoclimatologic evidence that indicates Africa and South America were once part of a single continent.

E3.p3B Describe the three types of plate boundaries (divergent, convergent, and transform) and geographic features associated with them (e.g., continental rifts and mid-ocean ridges, volcanic and island arcs, deep-sea trenches, transform faults).

E3.p3C Describe the three major types of volcanoes (shield volcano, stratovolcano, and cinder cones) and their relationship to the Ring of Fire.

STANDARD E4: THE FLUID EARTH

E4.p1 Water Cycle (*prerequisite*)

Water circulates through the crust and atmosphere and in oceans, rivers, glaciers, and ice caps and connects all of the Earth systems. Groundwater is a significant reservoir and source of freshwater on Earth. The recharge and movement of groundwater depends on porosity, permeability, and the shape of the water table. The movement of groundwater occurs over a long period time. Groundwater and surface water are often interconnected.

E4.p1A Describe that the water cycle includes evaporation, transpiration, condensation, precipitation, infiltration, surface runoff, groundwater, and absorption.

E4.p1B Analyze the flow of water between the elements of a watershed, including surface features (lakes, streams, rivers, wetlands) and groundwater.

E4.p1C Describe the river and stream types, features, and process including cycles of flooding, erosion, and deposition as they occur naturally and as they are impacted by land use decisions.

E4.p1D Explain the types, process, and beneficial functions of wetlands.

E4.p2 Weather and the Atmosphere (*prerequisite*)

The atmosphere is divided into layers defined by temperature. Clouds are indicators of weather.

E4.p2A Describe the composition and layers of the atmosphere.

E4.p2B Describe the difference between weather and climate.

E4.p2C Explain the differences between fog and dew formation and cloud formation.

E4.p2D Describe relative humidity in terms of the moisture content of the air and the moisture capacity of the air and how these depend on the temperature.

E4.p2E Describe conditions associated with frontal boundaries (cold, warm, stationary, and occluded).

E4.p2F Describe the characteristics and movement across North America of the major air masses and the jet stream.

E4.p2G Interpret a weather map and describe present weather conditions and predict changes in weather over 24 hours.

E4.p2H Explain the primary causes of seasons.

E4.p2I Identify major global wind belts (trade winds, prevailing westerlies, and polar easterlies) and that their vertical components control the global distribution of rainforests and deserts.

E4.p3 Glaciers (*prerequisite*)

Glaciers are large bodies of ice that move under the influence of gravity. They form part of both the rock and water cycles. Glaciers and ice sheets have shaped the landscape of the Great Lakes region. Areas that have been occupied by ice sheets are depressed. When the ice sheet is removed, the region rebounds (see also climate change).

E4.p3A Describe how glaciers have affected the Michigan landscape and how the resulting landforms impact our state economy.

E4.p3B Explain what happens to the lithosphere when an ice sheet is removed.

E4.p3C Explain the formation of the Great Lakes.

STANDARD E5: THE EARTH IN SPACE AND TIME

E5.p1 Sky Observations (*prerequisite*)

Common sky observations (such as lunar phases) can be explained by the motion of solar system objects in regular and predictable patterns. Our galaxy, observable as the Milky Way, is composed of billions of stars, some of which have planetary systems. Seasons are a result of the tilt of the rotation axis of the Earth. The motions of the moon and sun affect the phases of the moon and ocean tides.

E5.p1A Describe the motions of various celestial bodies and some effects of those motions.

E5.p1B Explain the primary cause of seasons.

E5.p1C Explain how a light year can be used as a distance unit.

E5.p1D Describe the position and motion of our solar system in our galaxy and the overall scale, structure, and age of the universe.