

Introduction

This sequence of benchmarks leads to the goal in *Science for All Americans (SFAA)* that water evaporates from the surface of the earth, rises and cools, condenses into clouds and then into rain or snow, and falls again to the surface, where it collects in rivers, lakes, soil, and porous layers of rock (*SFAA*, Chapter 4: The Physical Setting). This goal appears in grades 6–8 and is extended in grades 9–12 to include an explanation for why evaporated water rises. Before students can understand that "when liquid water disappears, it turns into a gas (vapor) in the air," they need to move beyond viewing air as something only produced by wind to accepting it as a permanent substance. Before they can understand rainfall in terms of gravity, they need to know that "things on or near the earth are pulled toward it by the earth's gravity." The Water Cycle strand contributes to, and is supported by, literacy goals related to the Conservation of Matter strand.

Project 2061: hwater



Strand Map: Water Cycle

9-12 (4B) Weather (in the short run) and climate (in the long run) involve the transfer of energy in and out of the atmosphere. Solar radiation heats the land masses, oceans and air. Transfer of heat energy at the boundaries between the atmosphere, the land masses, and the ocean results in layers of different temperatures and densities in both the ocean and atmosphere. The action of gravitational force on regions of different densities causes them to rise or fall—and such circulation, influenced by the rotation of the earth, produces winds and ocean currents.

6-8 (4B) The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean.

6-8 (4E) Heat can be transferred through materials by the collisions of atoms or across space by radiation. If the material is fluid, currents will be set up in it that aid the transfer of heat.

3-5 (4B) Things on or near the earth are pulled toward it by the earth's gravity.

3-5 (**4B**) When liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. Clouds and fog are made of tiny droplets of water.

3-5 (4B) Air is a substance that surrounds us, takes up space, and whose movement we feel as wind.

K-2 (4B) Water left in an open container disappears, but water in a closed container does not disappear.

K-2 (4B) Water can be a liquid or a solid and can go back and forth from one form to the other. If water is turned into ice and then the ice is allowed to melt, the amount of water is the same as it was before freezing.