

The shore zone or beach along barrier islands — where water meets the land — is a zone of extremely high physical energy. This energy occurs in the form of waves, currents, astronomical tides, and storm tides and is derived from two important sources.

The first and most extensive influence on the coastal system is solar energy, which differentially heats the earth's atmosphere, ocean, and land surfaces. Differential heating drives the great heat pump operating between the air-sea-land interfaces and produces storms and winds that result in wind tides, waves, and currents.

The second influence is the force of gravity. Gravity causes rivers to flow downhill, delivering both water and sediments to the coastal system. Also, the gravitational forces acting between the moon, sun, and earth — as they move on their endless journeys through space — produce the astronomical tides and associated tidal currents that are important within coastal systems. These great and continuous inputs of energy into the earth system must either directly do work, be converted to some other form of energy that can do work, or be released back into space. Energy does not just disappear (Law of Conservation of Matter and Energy).

The water cycle (figure 1-8) is a product of this energy and depends on both the energy of the sun and the force of gravity. Solar energy heats the water's surface and then converts liquid water into water vapor that enters the atmosphere. As the vapor cools, heat is released into the atmosphere, and the vapor forms droplets that gravity then pulls back to the earth as rain; it can then repeat the process. The process of heat absorption by water in one area and heat release by vapor miles away regulates the temperature of our atmosphere. Water falls as precipitation to the earth's surface under the influence of gravity. What happens to it next?

Energy transfers occur throughout the water cycle. Shorelines are affected when the work of wind and waves moves sediment from one place to another — eroding some, building others, but always moving sediment about like chess pieces on a game board.

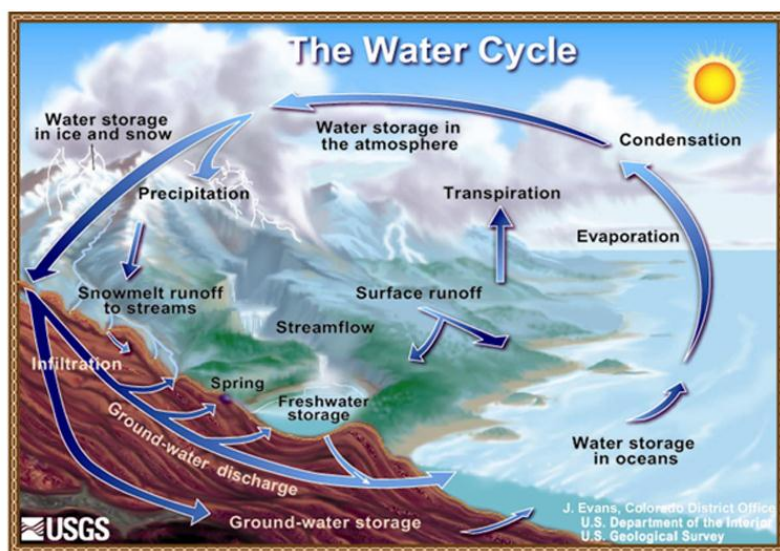


Figure 1-8. The water cycle is fueled by energy from the sun and aided by the force of gravity. Figure is by J. Evans and is from the U.S. Geological Survey (<http://ga.water.usgs.gov/edu/watercycle.html>)