

Chapter 14 Section 4 Tides

Bellringer

If the moon had the mass of a golf ball, the sun would have the mass of about 110 school buses! This analogy shows the difference in mass of the moon and the sun. Although the moon is much smaller than the sun is, the moon exerts more influence on Earth's tides than the sun does. Why do you think this happens?



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Objectives

- **Explain** tides and their relationship with the Earth, sun, and moon.
- **Describe** four different types of tides.
- **Analyze** the relationship between tides and coastal land.



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The Lure of the Moon

- The daily changes in the level of ocean water are called **tides**. Tides are influenced by the sun and the moon and occur in a variety of cycles.
- **High Tide and Low Tide** How often tides occur and the difference in tidal levels depend on the position of the moon as it revolves around the Earth.



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The Lure of the Moon, *continued*

- **Battle of the Bulge** When part of the ocean is directly facing the moon, the water there and the water on the opposite side of Earth bulges toward the moon. The bulges are called *high tides*.
- Water is drawn away from the areas between the high tides, which causes low tides to form.



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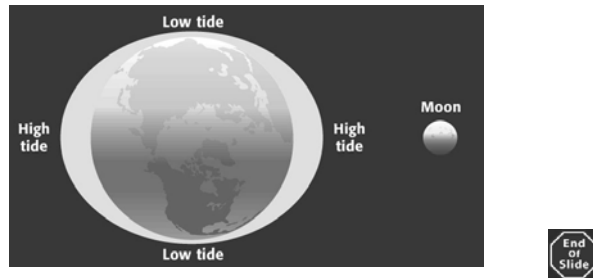
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The Lure of the Moon, *continued*

- The figure below shows how the position of the moon affects where high and low tides form.



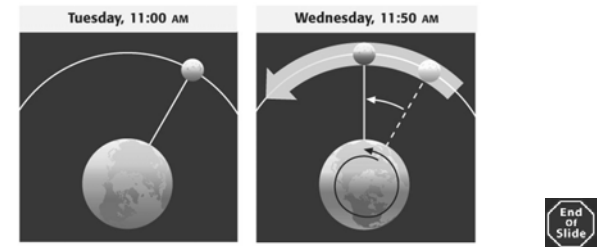
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The Lure of the Moon, *continued*

- **Timing the Tides** Tides occur at different times each day because the Earth rotates more quickly than the moon revolves around the Earth.



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Tidal Variations

- The sun also affects tides. The combined forces of the sun and the moon on Earth result in tidal ranges that vary based on the positions of the three bodies.
- A **tidal range** is the difference between levels of ocean water at high tide and low tide.

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Tidal Variations, *continued*

- **Spring Tides** are tides with the largest daily tidal range and occur during new and full moons. During these times, the sun, Earth, and moon are aligned.
- **Neap Tides** are tides with the smallest daily tidal range and occur during the first and third quarters of the moon. During these times, the sun, Earth and moon form a 90° angle.

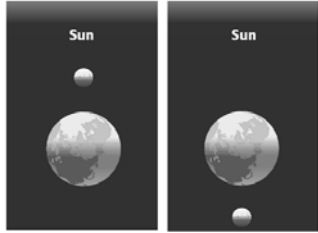
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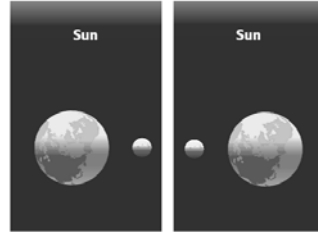
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Tidal Variations: Spring Tides; Neap Tides

Spring Tides During the full moon and the new moon, the sun, Earth, and the moon are aligned. The gravitational force of the sun reinforces the high tides created by the gravitational force of the moon.



Neap Tides The sun and the moon are at right angles to each other relative to Earth. In this arrangement, the gravitational forces of the sun and moon work against each other.



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Tides and Topography

- In some coastal areas that have narrow inlets, movements of water called *tidal bores* occur.
- A tidal bore is a body of water that rushes up through a narrow bay, estuary, or river channel during the rise of high tide and causes a very sudden tidal rise.

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