

# Types of Tides

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## Key Concepts

1. Tidal patterns vary from place to place around the world.
2. Tidal patterns have characteristics by which they may be classified.
3. Tides may be represented graphically as well as in chart form.



## Background

Real tides change with geographic location. Tides are generally classified as one of three types:

**SEMIDIURNAL** has two high waters and two low waters each day with little or no difference between consecutive high or low water heights. Tides along the east coast of the United States, for example, are of the semidiurnal type.

**DIURNAL** type, which has only one high water and one low water each day. The tides along the Vietnam-China coast are diurnal.

**MIXED** type, which has both diurnal and semidiurnal characteristics. That is, there are two high waters and two low waters each day but with considerable difference between heights of successive high waters or successive low waters; these differences are called **DIURNAL (daily) INEQUALITIES**. The tides along the Pacific Coast of the United States are mixed.

For additional information about the patterns and causes of tides, please see the Teacher Background and Student pages for the subsequent activity "Oceans in Motion: The Tides".

## Materials

For each student:

- copy of "Types of Tides" student pages
- ruler or straight edge

## Teaching Hints

“Types of Tides” introduces your students to three types of tides and to their similarities and differences.

Duplicate the activity pages. One set is recommended per student. The figures in the text can be used as samples from which your students can prepare a marigram from the given tide predictions. In addition, the first day’s data is plotted on the graph provided. This activity may be performed individually or in small groups. Plan to spend some time in a discussion of the results.

You will definitely want to use overhead transparencies to help students get started on this activity. Have students label the time and tide height for each point they graph as was done for Day 1. This same process is used in “The Year of the Tides”.

“Understanding Tides,” the Oregon State University Extension Marine Advisory Program publication, provides additional background information on the types of tides.

## Key Words

**diurnal inequalities** - the vertical difference between one high tide and the next high tide, this quantity will be large in mixed tides and small in semidiurnal tides

**diurnal tide** - tides which display only one high and one low tide each tidal cycle, such as those that occur in the Gulf of Mexico

**kinetic** - having to do with motion, kinetic energy is the energy of a moving body

**marigram** - a graphic depiction of the tides

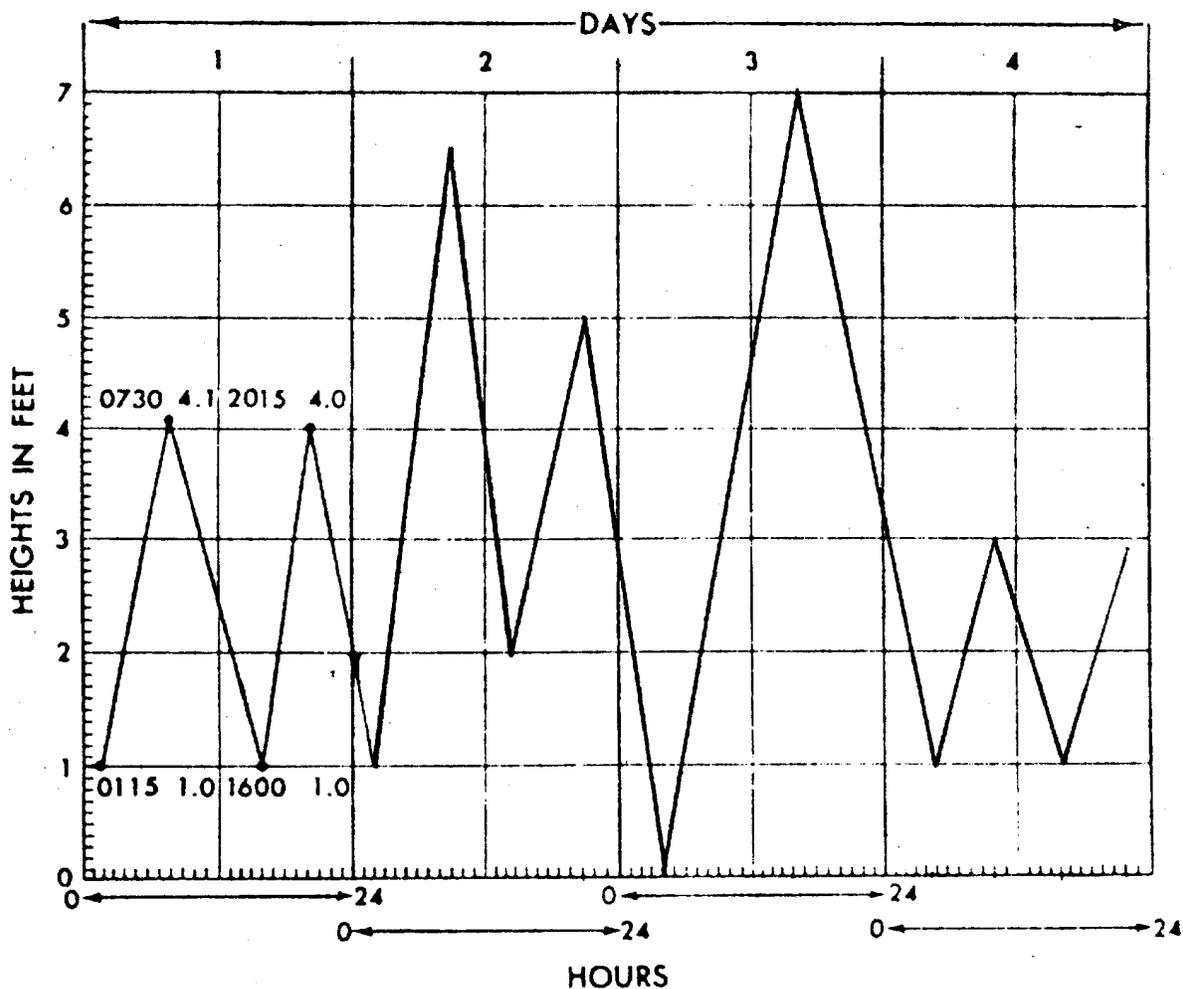
**mixed tide** - a tide cycle which has some diurnal and some semidiurnal qualities, i.e., two highs and two lows each tide cycle (24 hrs 52 min) with highs that are markedly different

**semidiurnal tide** - a tide cycle with two highs and two lows each tidal cycle with the two highs being nearly identical

## Answer Key

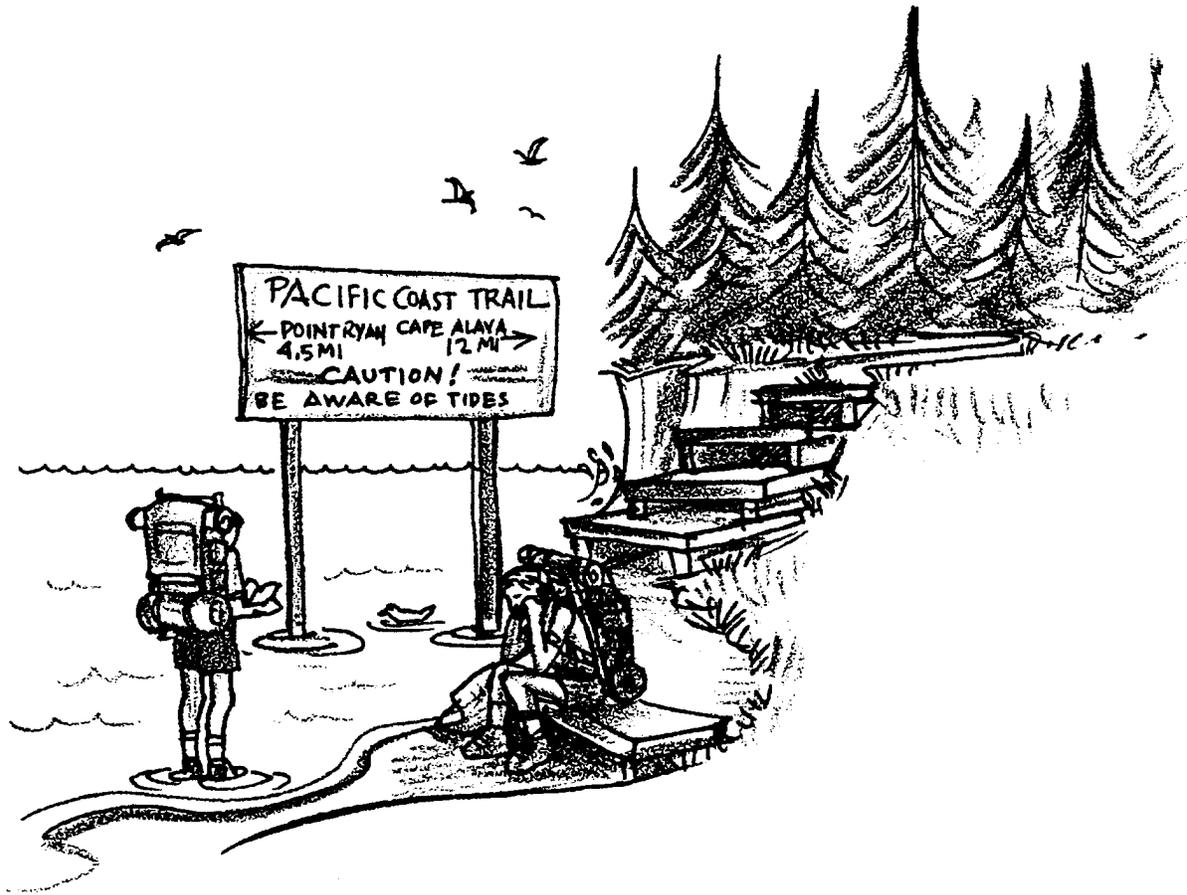
1. The tide is diurnal on Day 3. There is one high water and one low water.
2. The tide is mixed on Day 2. There are two high waters and two low waters each day but with considerable difference between heights of successive high waters or successive low waters.
3. The tide is semidiurnal on Day 1 and Day 4. There are two high waters and two low waters each day with little or no difference between consecutive high or low water heights.
4. The range is the largest on Day 3.
- 5a. The smallest range is 1.9 feet.

- b. The smallest range occurs on Day 4.
- 6a. The largest diurnal inequality shown is 4.0 feet.
  - b. The largest diurnal inequality occurs overnight between Days 3 and 4.
- 7. No, one would not expect to find a location in real life where the types of tides changed daily. The data is used as an example to show the different types of tides and does not represent tides at a particular location.



Tide Predictions Marigram Key

# Types of Tides

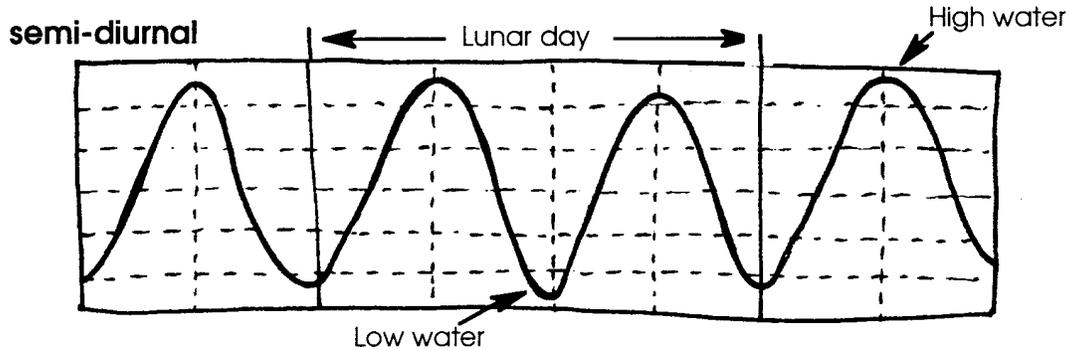


Knowledge of tidal movements is important to all areas of marine science. Accurate predictions of tidal times and heights are as important to an ecologist studying blue herons as they are to a river pilot who wants to move a ship full of cars safely into the Columbia River. Even the tidepool animals living along the coast have definite tidal behavior patterns. Any field trip taken to the coast must be planned with the tides in mind.

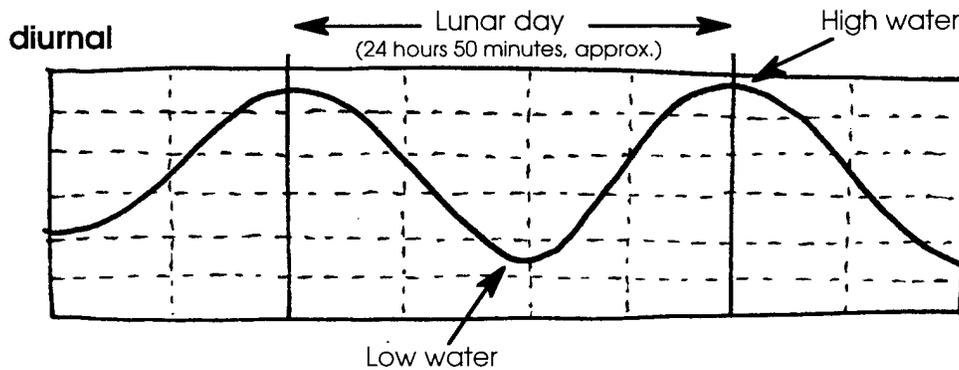
As a result, humans have long wanted to predict the tides. By taking observations of the time and amount of rise and fall each day over a long period of time, basic characteristics of the local tide were discovered. These characteristics allow predictions to be made regarding future tides. A marigram is a graphic record of the rise and fall of the tide at a given location.

The recording of marigrams at many locations has shown us that there are general characteristics of the tides throughout the world that allow us to classify them as three types. The three general types of tides are:

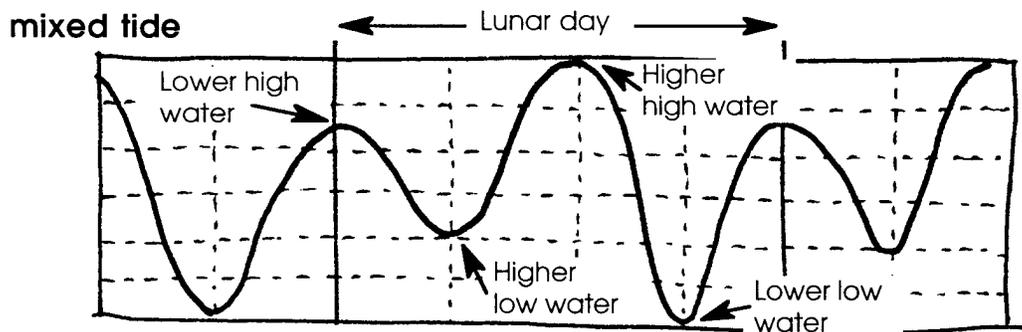
(1) **SEMIDIURNAL** type, which has two high waters and two low waters each day with little or no difference between consecutive high or low water heights. Tides along the east coast of the United States, for example, are of the semidiurnal type.



(2) **DIURNAL** type, which has only one high water and one low water each day. The tides along the Vietnam-China coast are diurnal.



(3) **MIXED** type, which has both diurnal and semidiurnal characteristics. That is, there are two high waters and two low waters each day but with considerable difference between heights of successive high waters or successive low waters; these differences are called **DIURNAL (daily) INEQUALITIES**. The tides along the Pacific Coast of the United States are mixed.



## Procedure:

1. The table below shows examples of different tide types. Plot a marigram or tide curve from the tide predictions given below. The first day has been plotted on the accompanying graph. Complete the tide curves for Days 2, 3, and 4 by plotting the times and heights. Connect all the points.

2. Answer the questions based upon your graph.

Tide Predictions			
DAYS	Time*		Heights*
	Hours	Minutes	Feet
1	01	15	1.0
	07	30	4.1
	16	00	1.0
	20	15	4.0
2	02	00	1.0
	08	30	6.5
	14	15	2.0
	21	00	5.0
3	04	15	0.0
	16	00	7.0
4	04	30	1.0
	10	00	3.0
	16	00	1.0
	22	00	2.9

\* The days are divided into 24 hours (0 to 24), midnight to midnight. Heights are measured from the zero reference line.

## Questions:

1. During what day is the tide diurnal?
2. During what day is the tide mixed?
3. During what days is the tide semidiurnal?
4. During what day is the range largest? (The range is the difference (subtract) between the highest and lowest tides.)

- 5 a. What is the smallest range? \_\_\_\_\_ ft.
- b. On what day does the smallest range occur?
- 6 a. What is the largest diurnal inequality shown?
- b. When does it occur?
7. Would you expect to find a single, real geographic location with tides like those shown in the table? Explain.