Water Ways: North America

Age(s): Upper Elementary & Middle School (7-12)

Description: The Water Ways curriculum was designed to reinforce student knowledge of the main river systems both as a focus on geographical components & use of the longitudinal & latitudinal coordinate system to locate points of interest on a map. Students will be introduced to important concepts such as source, mouth, tributary, watershed basin, longitude, latitude, minute, second, etc…

Materials Included:

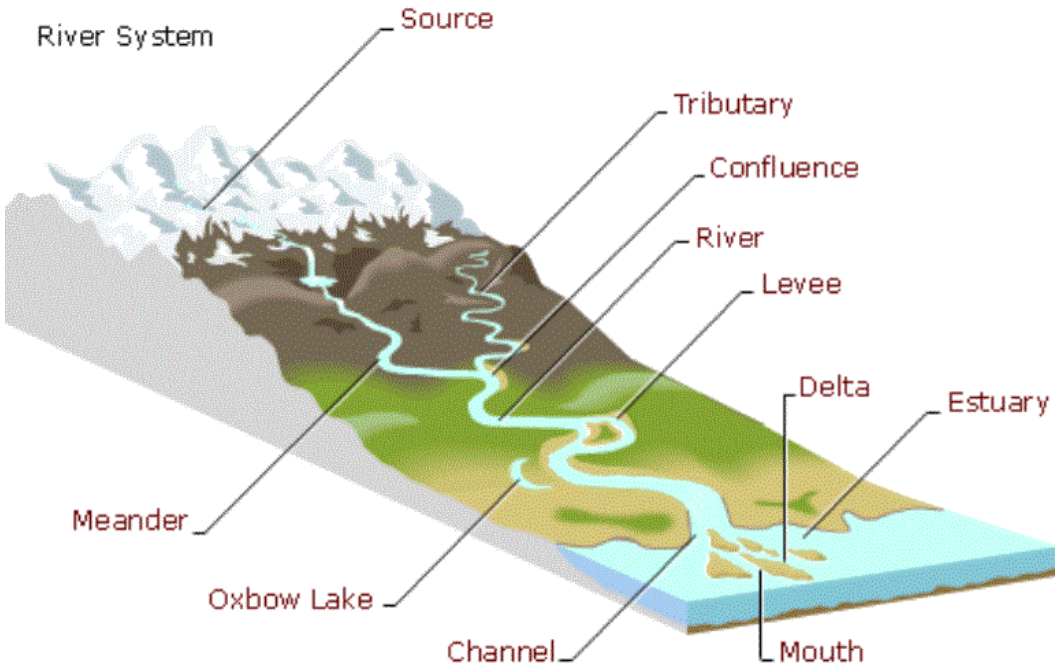
- Waterways: North America "Who Am I" card set
- Waterways: North America Map It card set
- North America River Map with Coordinates
- Magnetic Map Board (sold separately)
- Magnetic Map Pins (included with purchase of Magnetic Map Board)

Prerequisite: It is suggested that student is familiar with geographical features, maps, & basic coordinate graph knowledge.

Suggested Presentation(s):

(1) River Systems in North America

Important Concepts:



Every river is part of a larger system—a watershed, which is the land drained by a river and its tributaries. Rivers are large natural streams of water flowing in channels and emptying into larger bodies of water.

The river **source**, also called the headwaters, is the beginning of a river. Often located in mountains, the source may be fed by an underground spring, or by runoff from rain, snowmelt, or glacial melt.

A **tributary** is a smaller stream or river that joins a larger or main river.

The **main river** is the primary channel and course of a river.

A fully-developed **floodplain** is relatively flat land stretching from either side of a river, which may flood during heavy rain or snowmelt. Built of materials deposited by a river, floodplain soil is often rich in nutrients and ideal for growing food.

A **meander** is a loop in a river channel. A meandering river winds back and forth, rather than following a straight course.

Upstream is in the direction of or nearer to the source of a river.

Wetlands are low-lying areas saturated with water for long enough periods to support vegetation adapted to wet conditions. Wetlands help maintain river quality by filtering out pollutants and sediments, and regulating nutrient flow.

The river **mouth** is the place where a river flows into a larger body of water, such as another river, a lake, or an ocean.

A **watershed boundary**, also called a drainage divide, marks the outer-most limit of a watershed. A watershed is a tract of land drained by a river and its tributaries. Anything that affects a watershed may eventually impact its tributaries and river as well as the water body at the mouth of the river. People's actions within a watershed can affect the overall quality of its rivers.

Downstream is in the direction of or nearer to the mouth of a river.

1. Review Parts of a River with students using a diagram of a River System.
2. Have students create a list of known rivers in North America. Do they know the source of the rivers listed? Do they know the mouth of the rivers listed?
3. Using the Mississippi River as a model of river system, discuss the importance of the drainage system.
4. Have students use the Who Am I cards to reinforce knowledge of the Main North America Rivers, locations, & features.

20 Longest Rivers in North America:

Missouri River	2,341	Hell Roaring Creek near Brower‘s Spring, Montana	Mississippi River, Spanish Lake near St. Louis, Missouri
Mississippi River	2,320	Lake Itasca, Clear Water County, Minnesota	Gulf of Mexico at Pilottown, Plaquemines Parish, Louisiana
Yukon River	1,981	Llewellyn Glacier, Juneau Icefield near Atlin Lake, British Columbia, CAN	Bering Sea at Kusilvak Census Area, Alaska, USA
Red River	1,360	Confluence of Prairie Dog Town Fork & Buck Creek at Harmon County, Oklahoma	Atchafalaya River and Mississippi near West Feliciana Parish, Louisiana
Columbia River	1,243	Columbia Lake, British Columbia (CAN)	Pacific Ocean near Clatsop County, Oregon
Mackenzie River Canada	1,080	Great Slave Lake near Fort Providence, Northwest Territories, CAN	Arctic Ocean, Beaufort Sea near Inuvik, CAN
Snake River	1,078	Rocky Mountains, Yellowstone NP, Wyoming	Columbia River near Franklin County, Washington
Ohio River	980	Allegheny River, Pennsylvania, Ohio	Mississippi near Cairo, Illinois
Canadian River	906	Rocky Mountains, Las Animas County, Colorado	Arkansas River at Haskell County, Oklahoma
Colorado River of Texas	862	Dawson County, Texas	Gulf of Mexico at Matagorda County, Texas
Brazos River	840	Llano Estacado, New Mexico	Gulf of Mexico near Brazoria County, Texas
Saint Lawrence River Canada	744	Lake Ontario near Kingston, Ontario, CAN	Atlantic Ocean at Gulf
Green River	730	Wind River Mountains, Rocky Mountains, Wyoming	Colorado River near San Juan County, Utah
Pecos River	730	Pecos Falls near Pecos, New Mexico	Rio Grande near Del Rio, Texas
Milk River	729	Confluence of South & Middle Forks at Glacier County, Montana	Missouri River at Valley County, Montana
White River of Arkansas	722	Boston Mountains, Madison County, Arkansas	Mississippi, Desha County, Arkansas
North Platte River	716	Confluence of Grizzly & Little Grizzly Creeks in Jackson County, Colorado	Platte River in Lincoln County, Nebraska
James River aka Jim River or Dakota River	710	Wells County, North Dakota	Missouri River at Yankton County near Yankton, South Dakota
Kuskokwim River	702	Confluence of East, North & South Forks near Medfra, Alaska	Bering Sea, Kuskokwim Bay near Eak, Alsaka
Cimarron River	698	Confluence of Dry Cimarron River & Carrizozo Creek near Kenton, Oklahoma	Arkansas River, Keystone Lake near Tulsa, Oklahoma

(2) Mapping

Types of Maps:

In geography, maps are one of the most important tools researchers, cartographers, students and others can use to examine the entire Earth or a specific part of it.

Simply defined, maps are pictures of the Earth's surface. They can be general reference and show landforms, political boundaries, water, the locations of cities, or in the case of thematic maps, show different but very specific topics such as the average rainfall distribution for an area or the distribution of a certain disease throughout a county. Today with the increased use of GIS, also known as Geographic Information Systems, thematic maps are growing in importance and becoming more readily available.

A **political map** does not show any topographic features. It instead focuses solely on the state and national boundaries of a place. They also include the locations of cities - both large and small, depending on the detail of the map.

A **physical map** is one that shows the physical landscape features of a place. They generally show things like mountains, rivers and lakes and water is always shown with blue. Mountains and elevation changes are usually shown with different colors and shades to show relief. Normally on physical maps green shows lower elevations while browns show high elevations.

A **topographic map** is similar to a physical map in that it shows different physical landscape features. They are different however because they use contour lines instead of colors to show changes in the landscape. Contour lines on topographic maps are normally spaced at regular intervals to show elevation changes (e.g. each line represents a 100 foot (30 m) elevation change) and when lines are close together the terrain is steep.

A **climate map** shows information about the climate of an area. They can show things like the specific climatic zones of an area based on the temperature, the amount of snow an area receives or average number of cloudy days. These maps normally use colors to show different climatic areas.

An **economic** or **resource map** shows the specific type of economic activity or natural resources present in an area through the use of different symbols or colors depending on what is being shown on the map.

A **road map** is one of the most widely used map types. These maps show major and minor highways and roads (depending on detail) as well as things like airports, city locations and points of interest like parks, campgrounds and monuments. Major

highways on a road map are generally red and larger than other roads, while minor roads are a lighter color and a narrower line.

A **thematic map** is a map that focuses on a particular theme or special topic and they are different from the six aforementioned general reference maps because they do not just show natural features like rivers, cities, political subdivisions, elevation and highways. If these items are on a thematic map, they are background information and are used as reference points to enhance the map's theme.

1. Review different types of maps with students. Show examples of each style and discuss how each are utilized.
2. Show the student the North America River Map (with Magnetic Map Board). What type of map is this?

Latitude & Longitude:

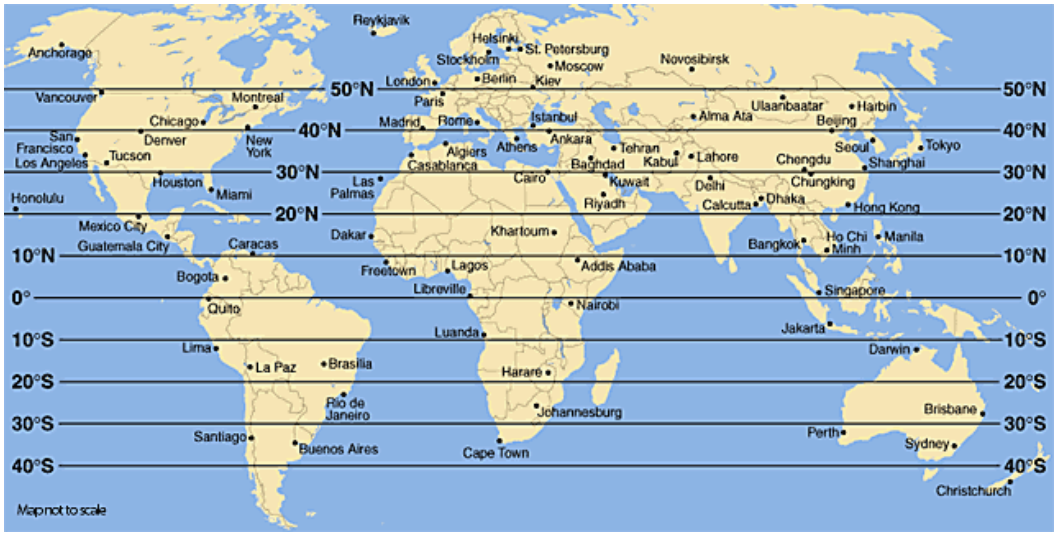
A **geographic coordinate system** is a coordinate system used in geography that enables every location on Earth to be specified by a set of numbers, letters or symbols. The coordinates are often chosen such that one of the numbers represents a vertical position, and two or three of the numbers represent a horizontal position. A common choice of coordinates is latitude, longitude and elevation.

The invention of a geographic coordinate system is generally credited to Eratosthenes of Cyrene, who composed his now-lost *Geography* at the Library of Alexandria in the 3rd century BCE. A century later, Hipparchus of Nicaea improved on this system by determining latitude from stellar measurements rather than solar altitude and determining longitude by using simultaneous timings of lunar eclipses, rather than dead reckoning. In the 1st or 2nd century, Marinus of Tyre compiled an extensive gazetteer and mathematically-plotted world map using coordinates measured east from a prime meridian at the westernmost known land, designated the Fortunate Isles, off the coast of western Africa, and measured north or south of the island of Rhodes off Asia Minor. Ptolemy credited him with the full adoption of longitude and latitude, rather than measuring latitude in terms of the length of the mid-summer day. Ptolemy's 2nd-century *Geography* used the same prime meridian but measured latitude from the equator instead.

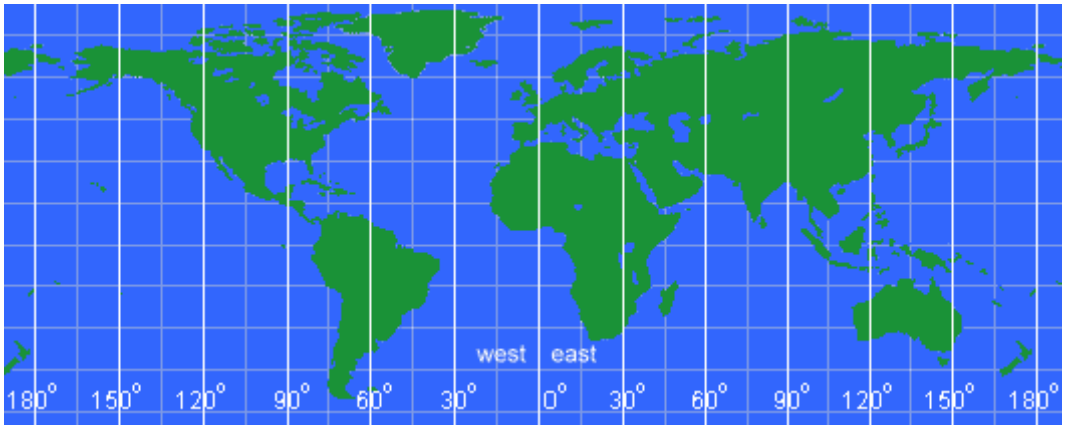
The "**latitude**" (abbreviation: Lat., φ, or phi) of a point on Earth's surface is the angle between the equatorial plane and the straight line that passes through that point and through (or close to) the center of the Earth. Lines joining points of the same latitude trace circles on the surface of Earth called **parallels**, as they are parallel to the equator and to each other.

The north pole is 90° N; the south pole is 90° S.

The 0° parallel of latitude is designated the **equator**, the fundamental plane of all geographic coordinate systems. The equator divides the globe into Northern and Southern Hemispheres.

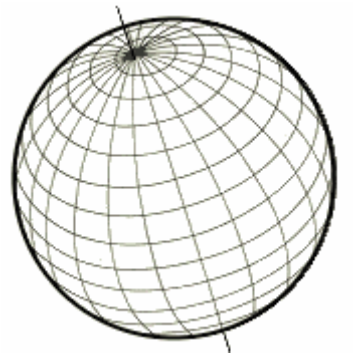


The "**longitude**" (abbreviation: Long., λ, or lambda) of a point on Earth's surface is the angle east or west of a reference meridian to another meridian that passes through that point. All meridians are halves of great ellipses (often called great circles), which converge at the north and south poles. The meridian of the British Royal Observatory in Greenwich, in London, England, is the international prime meridian. The **prime meridian** determines the proper Eastern and Western Hemispheres. The antipodal meridian of Greenwich is both 180°W and 180°E.



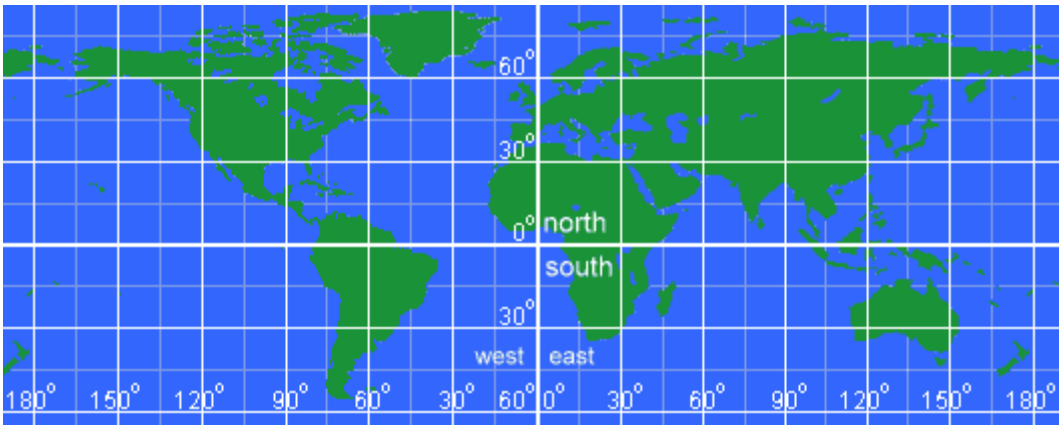
Latitude and Longitude Grid

Combining latitude and longitude results in a grid that covers the globe. Every point can be defined by a north/south degree and an east/west degree.



For example, Seattle, Washington, USA is at latitude 47.6° North and longitude 122.33° West. From the center of the earth, look up 47.6° from the equator and turn right (west) 122.33° from the Prime Meridian and you will be looking directly at Seattle.

And, the complete grid on a map looks like:



Degrees are helpful, but as the earth is almost 25000 miles around then dividing that into 360 pieces means each degree is about 69 miles wide around the equator. That isn't very precise. To help with that, each degree is divided into 60 minutes and each minute is divided into 60 seconds. These used to be used all the time, but now fractional degrees are more common.

For example, the location of the White House in Washington, DC is:

	Decimal Degrees	Deg:Min:Sec
Lat:	38.898648N	38° 53' 55.133" N
Lon:	77.037692W	77° 02' 15.691" W

- Latitude is always given before longitude (49° N 100° E)
- Latitudes are parallel, but longitudes are not
- Degrees West and South are sometimes referred to as negative degrees (-12° -23° is the same as 12 S 23 W)
- A place's latitude effects its climate, but its longitude does not
- Key longitude lines are the Prime Meridian (0°) and the International Date Line (180°)
- Key latitude lines include the equator (0°), tropic of cancer (23° 26' N), tropic of capricorn (23° 26' S), the arctic circle (66° 33' N), and the antarctic circle (66° 33' S)

1. Have students practice figuring out longitude and latitude on a map.
    a. Where is the equator on the map?
    b. Where is the prime meridian?
    c. Which parallels run through the continent on which you live?
    d. Which meridians run through the continent on which you live?
2. Give the students a few coordinates to practice locating on the map.
    a. Important Geographical Features
    b. Important cities
3. Have students use the Map It cards to map the 10 North American Rivers on the magnetic map board with magnetic markers.