Where in the World are We?

(Adapted in part from **Journey North**)

Objectives

Students learn what latitude and longitude are and how to use them to plot and find locations on maps.

Method

Students play a grid-based game and devise clues to help classmates locate spots on the globe. In doing so, they come to recognize the value of using latitude and longitude for identifying locations.

Materials

- Where in the World? Swan Grid (2 copies for each pair or group)
- Map or maps with latitude/longitude lines on it. This could be a map of Montana, the United States, North America, or the world.
- Access to Google Earth or Google Maps

Background Information

Students participating in Adopt-A-Swan must understand geographic location. Using a mathematical grid system (in this case, latitude and longitude), any spot on earth can be identified with just two numbers. In order to track migrating species or even short-distance animal movements, students should know how to use latitude and longitude.

Latitude is the angular distance measured in degrees, minutes, and seconds North or South of the equator. Longitude is the angular distance measured in degrees, minutes, and seconds East and West of the Prime Meridian (an imaginary line that runs North/South through Greenwich, England). Positive latitudes are north of the equator, negative latitudes are south of the equator. Positive longitudes are east of Prime Meridian, negative longitudes are west of the Prime Meridian. Latitude and longitude are usually expressed in that sequence, latitude before longitude.

Grade level: 5-8

Subject Areas: Biology, math, geography

Duration: 1-2 hours

Topics: Latitude and longitude, mapping, animal migration, wildlife ecology

National/Montana Science Standards: C, E, G / 3, 6

The radius of the earth at the equator is 6,378,160.0 meters resulting in a circumference of 40,075,161.2 meters. The equator is divided into 360 degrees of longitude, so each degree represents 111,319.9 meters or approximately 111 km. As you can

see, latitude lines are equidistant but longitude lines are not. The distance between longitude lines is much greater at the equator and much less at the poles. Here are rough distances for degrees latitude:

Degrees (latitude) and distance (miles)

- 1 degree = 69 miles
- .1 degrees = 6.9 miles
- .01 degrees = .69 miles (3,642 feet)
- .001 degrees - .069 miles (364 feet)

Decimal degrees (DD) express latitude and longitude geographic coordinates as decimal fractions and are used in many Geographic Information Systems (GIS), web mapping applications such as Google Maps, and GPS devices. Decimal degrees are an alternative to using degrees, minutes, and seconds (DMS). A DMS value is converted to decimal degrees using the formula (D + M/60 + S/3600). For an online converter go to: http://www.calculatorcat.com/latitude_longitude.phtml.

This lesson begins by helping students recognize the value of using a grid system for finding locations. They then explore latitude and longitude on paper maps and use them to find a location selected by their classmate. After practicing using latilongs on paper, they use them to navigate on Google Earth. (See the Journey North website at http://www.learner.org/jnorth/ for lots more on animal migration.)

Procedure

Write these or similar sentences on the board:

- *My house is close to the firehall.*
- *Becky's house is on the corner of Pine Street and Larch Avenue.*
- *My cousin's house is in a small Montana town named Swan Lake.*

Ask your students which of these statements would be the most useful in helping them find the house that's described. Have them explain their thinking. Accept their responses and encourage discussion about how different kinds of information may help us in different ways. Finally, invite the class to explore different ways of describing locations. See the Journey North website at http://www.learner.org/jnorth/ for lots more on animal migration.

Hidden Animals

1. Invite the class to play an animal variation of the "Battleship" game. Divide the class into pairs and give each student a copy of the Where in the World? Swan Grid.
2. Ask one partner to hide the four migratory animals somewhere on the grid, but not to show the grid to his or her partner. The other partner must then guess coordinates (e.g., C,8) to locate the animals. Partner #1 should respond "yes" or "no" to each guess to indicate whether any part of an animal touches those coordinates. Partner #2 should use a blank grid to mark responses and narrow down the possible locations for each animal. Partners should switch roles when one has uncovered all the animals.
3. Discuss whether the grid/coodinate system was helpful in finding the animals. Why or why not?
4. If students are unfamiliar with latitude/longitude lines on maps, explore a map together. Ask them to describe things they notice about it. If they don't point out the lines running across the page (latitude) and lines running up and down (longitude), ask them if they see any type of grid. Ask why might these lines are drawn on many maps. Discuss the way the lines are numbered and share as much detail as is appropriate for your grade range.
5. Now ask student pairs to use a map to identify a beach on a lake or river that they would like to visit. It should be somewhere in the Western Hemisphere. Have them record the latitude or longitude coordinates, remembering to identify appropriate compass directions (north, south, east, and west).
6. Ask each pair to write down five to ten clues that would help others locate their beach on a map. Each new clue should help someone narrow down the location; the last clue should give the latitude/longitude coordinates. See the following example:

   - My beach is in North America
   - It is on the Pacific Ocean
   - It is north of Seattle, Washington
   - It is on an island in Puget Sound
   - It is on the east side of Lopez Island
   - It is at 48 32′ 15.08″N and 122 51′ 26.09″ W (Spencer Spit)

7. Each pair should join another pair and take turns challenging one another to guess the location of the secret beach. When they are finished, discuss the following:

- How is the grid you used in the animal hiding game similar to latitude and longitude lines?
- What was challenging about finding the mystery beaches? Which clues were most useful?

8. Now introduce your students to using Latitude and Longitude on Google Earth. Have them open Google Earth and enter a latitude/longitude into the Search box. They will need to calculate the decimal degrees, since this is the only way latlongs can be entered in Google, or they can enter just the degrees (not minutes and seconds), since degrees are the same either way, and then move around on the map to find the exact location. To use Google they will need to put their values in this format: **19, -100. <u>Notice these things</u>:**

    a) There's comma between the latitude and longitude values,

    b) You don't use "North" or "West", and

    c) The longitude value is a negative number because it's the western hemisphere.

9. You can move the map north/south by editing the latitude; you can move the map east/west by editing the longitude. (Let students discover that the map moves north when you make the latitude higher, south when lower; west when you make the longitude higher and east when you make it lower.)

Extensions

- After students have learned how to use latitude and longitude on Google, they can challenge one another to navigate to a familiar place using latitude and longitude coordinates.
- Change the battleship grid to be a mathematical grid (1,1; 1,-1; -1, 1; -1,-1) or latitude and longitude to reinforce math ideas. Have it printed on the card already and the students must use the coordinates to guess the location of the swan.
- Laminate these grid cards and provide dry erase markers so the students could keep re-using the same game cards, or have them make and cut out the swan shapes on separate paper to place on top of the grid.

Where in the World? Swan Grid

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A																						
B																						
C																						
D																						
E																						
F																						
G																						
H																						
I																						
J																						
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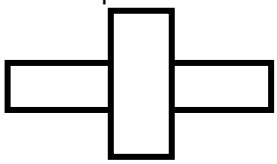
Trumpeter Swan



INSTRUCTIONS: Place four swans in different locations on the grid by drawing them as one is shown here. Use the same number of squares and layout shown. Do not show the grid to your partner!