Mapping Migration

Investigative Question: What species of bird migrate? How far and through what geographic areas and features do bird migrate?

Goal: Understand that a wide variety of birds migrate and migration routes differ among species. Determine the differences between and among bird species route distances.

Objectives

Knowledge: Students learn that many types of birds migrate to a variety of places depending on adaptations and needs. Students will examine migratory routes of a specific species on a map of North and South America.

Skills: Students use non-standard and standard forms of measurement to calculate a migration route on the map to the nearest foot, yard, and meter. Students will use math skills to find equivalent periods of time for migration. (Hours into days; days into months).

Values: Students develop an appreciation for the bird migration and the difficulty of migrating.

Virginia SOL: Math (2016) 3.1, 3.4, 3.7, 4.1, 4.4, 4.8, 5.4, 5.8, 5.17, 6.2, 6.8, 6.11

Science (2018)- 3.4, 3.5, 3.8, 4.2, 4.3, 4.8, 4.5, 6.7, 6.8, 6.9

Social Studies- USI.1g, WG.1a, US1,2a, VS.2a, VS.2c, USI. 2c, USII.2c, US1.2b, WG.4

Materials:

- Migration game (Signs, dice, cups, arm bands, tape, clip boards, pencils, migratory bird information sheet, & Mapping Migration bird data sheets)
- Wet erase markers and wet wipes
- Colored string (5 different colors, one for each bird route in varying sizes)
- Measuring devices (meter tape, meter stick and rulers)
- Large Maps (shower curtain world maps)
- Conversion sheet

Instructional Strategy:

1. Students will participate in the migration game (Flying Wild activity) as 5 different migratory birds. Once they have done this, each group completed data sheet .
2. After all students have experienced one round of a bird migration and discussed their migration journey, students examine the large world maps. Ask students: What is this a map of? What do you see on the map? Is this map missing anything? (Title, Legend, Equator, Compass Rose)
3. Instruct students to find their bird's migratory path on the large map. Each bird has a corresponding color. These colors are found on their bird species information sheets.

4. Students estimate the distance of their bird's migratory route using context clues.(This can be done by using the map scale option 2: estimating the distance from east coast to west coast in miles --- hint- the conversion sheet helps with estimation.)
5. Ask students: how can you determine the distance of the migration route? Ask: If you did not have any measurement devices (ruler) available, what are other ways you can measure? (Instruct students to consider various was to solve this problem and to explain their reasoning. This is an investigation: there is no one correct way).
6. Once the migration distances are determined, provide each group with a datasheet to explore the landscape and geographic areas the birds flew over. Ask: Carefully examine your bird's path of migration. What terrain did the bird either pass over or stop in? Encourage students to extrapolate the potential hazards the birds faced related to the landscape. Such as mountains, rain, pollution from a water body (near a city), lack of food. Etc.
7. Conclusion: Once the groups have completed their data sheet, ask each group to share their bird species and one interesting fact they learned about the migration of their bird species.

Possible Extensions-

1. Place the string over their bird's migratory path on the large laminated map. **Students or teachers may have to select one path to examine due to some birds having multiple paths**Have them look at the scale provided on the map (1 in: 205 miles) and determine the approximate distance of their migratory route.

   (1 inch on the map = 205 miles (1:205). If the measurement of the route is 4 inches then the distance of migratory route is 820 miles)

   - 4 multiplied by 205, or four groups of 205. You can also ask students to estimate (ex. Round 205 to 200.)
2. Students use rulers to calculate the distance (to the nearest inch, inch, foot, yard, centimeter, and meter) traveled using the scale on the map.
   a. As time allows, students can convert the final measurement from U.S Customary to metric system.
3. Ask students which form of measurement was easier (the string estimate or ruler measurement)? Which form of measurement was more accurate?
   - With the information given on each of the bird information sheets, students can convert their bird's total length of migration into equivalent time periods: days, months, hours if possible (ex. 15 days= ½ month, 2 months = 60 days). This may be total migration or a portion of their bird's migratory route
4. Overlay the longitude and latitude lines on your larger map. Students can identify coordinates along the bird's route.
5. Students analyze and compare the migratory patterns and distances of each species of bird
   a. What is the sum of all of the distances combined? Estimate the sum of all migratory distances of the same species.

Tracking information can be found at The Center for Conservation Biology https://ccbbirds.org/what-we-do/research/bird-migration/bird-migration-projects/

6. Have students research what birds need in a migration flyway (flight used in bird migration) (what type of habitat)?
7. Students examine the migration route and make a predictions as to why they stopped at specific locations. Research different areas of the migration route. Students can then make a prediction as to where the bird may fly next.

8. Students create a large number line/migration line down a hallway at school. Online resources are available to track a current bird's migration by The Center for Conservation of Biology and Wildlife tracking. https://ccbbirds.org/what-we-do/research/bird-migration/bird-migration-projects/
   a. Options include: How far does a bird travel in a day and move a bird along a migration line. Compare the findings to how far you would travel on a family vacation. Remember to factor in mileage, hours of driving, cost of gas, etc.
9. Determine the scales of various maps and/or globes when the scale is not provided.
   a. This can be done by determining a distance from one place to another, then dividing by the length on the map
      i. Example: length of east coast to west coast in miles approximately 2514 miles. Divide by measuring east to west coast with a ruler -- 12 inches. 2514/12 = 210.
         1. 1 inch on our map is equal to 205 miles. This is written as 1:210
   b. How long would your bird take to fly halfway around the world?
   c. What is the perimeter and area of the Globe?
10. Overlay the longitude and latitude lines on your larger map. Have students identify coordinates along the bird's route.
11. Researching weather data (fronts, maps) and correlate this data to a specific bird migration route.
   a. Analyzing multiple years of migration data. How do temperature, fronts, systems and humidity affect a birds flight? https://www.weather.gov/help-past-weather
12. Compare historical data of wetlands, estuaries and river systems to current stopover sites.

Engineering and Technology

- Have students use technology to research satellite transmitters and their specific use of tracking. Use engineering design principles to build/design a transmitter model. In what ways can the original transmitters be improved?

Higher Level Thinking Extension/ Abstract thinking

- Have students compare their bird migratory path with a globe. How does the path change based off of the Earth's structure? Does a bird fly in a straight line? How do birds compare to airplanes?

Teacher Background Information

Northern Pintail

"Pintails were caught with both rocket nets and swim-in traps and then fitted with transmitters. The satellite transmitters weigh 20g. The weight of the transmitter is critical as the overall weight of the transmitter/harness package should not exceed approximately 3-4% of the weight of the bird. Because we are primarily interested in large-scale movements over the course of 1 year, our transmitters are programmed to send a signal every 65 seconds for eight hours every six days. This routine conserves battery power and should allow researchers to track the pintails through spring migration, breeding, and the following fall migration (North Carolina Wildlife Resource Commission)."

North Carolina Wildlife Resource Commission
http://www.ncwildlife.org/Hunting/waterfowl/SatelliteTrackingofNorthernPintails.aspx#2375787-capture--tracking-techniques

Whimbrel

"Beginning in 2008, the Center for Conservation Biology collaborated with The Nature Conservancy to investigate the stopover ecology of whimbrels along the Delmarva Peninsula. The study includes aerial surveys to estimate seasonal numbers, traditional transmitters to examine stopover periods, and satellite transmitters to document migration pathways and breeding destinations for birds leaving the site (wildlifetracking.org)."

http://www.seaturtle.org/tracking/?project_id=369

Eagles

"Wildlife tracking.org banded and satellite tagged Bald and Golden Eagles in the upper Chesapeake Bay, USA as part of a program funded in part by the US Army. The Chesapeake Bay is a unique convergence zone for eagles along the Atlantic Coast of North America. It hosts over 1,000 breeding pairs of Bald Eagles year-round, plus thousands of migrant eagles from the southeastern US and northeastern US and Canada. Using the satellite tracking data, we can study the eagles' migration path, roosting patterns, foraging sites, and nesting sites. In addition, we can determine common causes of mortality and provide management recommendations to reduce future eagle mortalities. Eagles were tagged as nestlings or captured as free flying birds. We fitted eagles with backpack harness to hold the solar-powered transmitter in the middle of the eagle's back. Eagles were named after rivers and creeks in the Chesapeake Bay watershed, Canada, and Florida (wildlifetracking.org)."

https://ccbbirds.org/what-we-do/research/species-of-concern/virginia-eagles/eagletrak/

Peregrine Falcon

"Center for Conservation Biology began a research program called FalconTrak as a cooperative project designed to answer questions about the movements and survival of Peregrine Falcons (*Falco* *peregrinus*) within the mid-Atlantic region of North America. Sixty-one falcons were tracked between 2001 and 2012 with solar-powered, satellite transmitters to investigate the spatial dynamics of their annual cycle and to identify causes of mortality (The Center for Conservation Biology)."

https://ccbbirds.org/what-we-do/research/species-of-concern/species-of-concern-projects/falcontrak/

Northern Harrier

Avian Research and Conservation Institute

"During the fall of 2010 and again in 2012, we deployed satellite transmitters on a total of five Northern Harriers (Circus cyaneus) migrating through the westernmost reaches of the Florida Keys. This study was a first attempt at identifying pathways, stopover sites, and wintering destinations for this long-distance migrant (Avian Research and Conservation Institute)."

http://www.seaturtle.org/tracking/?project_id=556

5th Grade Extensions

Students analyze and compare the migratory patterns and distances of each species of bird.
What is the sum of all of the distances combined? Estimate the sum of all migratory distances.
(Math SOL 5.16 c) Find the mean, median, mode and range for other individuals of the same species. Tracking information can be found at The Center for Conservation Biology https://ccbbirds.org/what-we-do/research/bird-migration/bird-migration-projects/

Have students look at different locations of their bird's migration and make a prediction as to why they stopped at that specific location. Research different areas of the migration route. Students can then make a prediction as to where the bird may fly next.

What is the perimeter and area of the Globe?
Does a 2-D Map when folded, a similar geometric shape as a globe? Does the newly formed (the cylinder) have the same perimeter?

Engineering and Technology

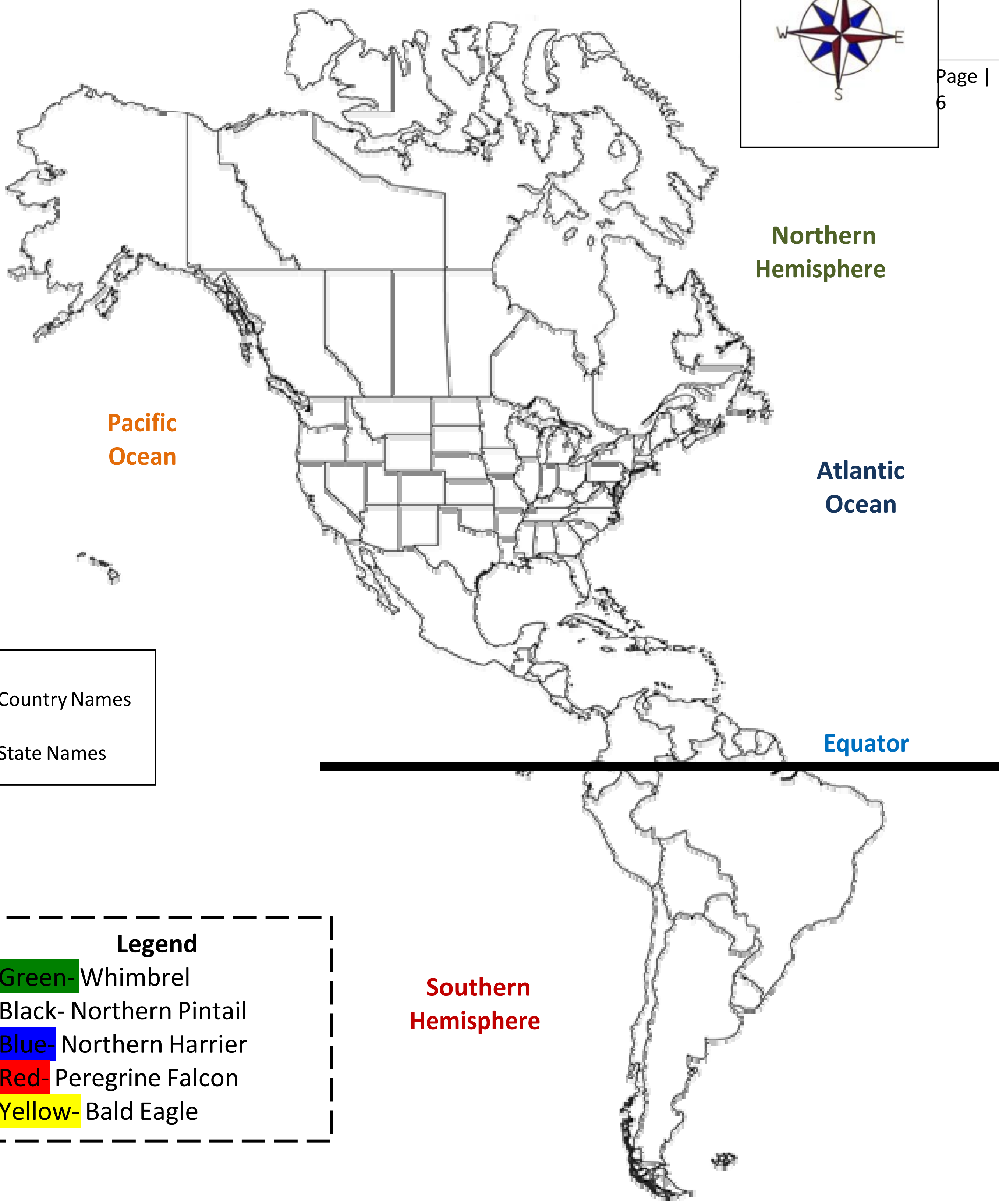
- Students can research the technology used to track birds. Use engineering design principles to build/design a transmitter model. In what ways can the original transmitters be improved?

Higher Level Thinking Extension/ Abstract thinking

- Students compare the bird's migration pathway on a globe. How does the Earth's structure affect their bird's path? Does a bird fly in a straight line?
- How do birds compare to airplanes?

North and South America

Compass Rose



Extra

- Country Names
- State Names

Legend

Green- Whimbrel
Black- Northern Pintail
Blue- Northern Harrier
Red- Peregrine Falcon
Yellow- Bald Eagle

Blandy Experimental Farm Education Programs
Boyce Va 540-837-1758
www.virginia.edu/blandy

Encourage Inspire Empower

Clarke County Education Foundation, Inc.
Supporting Our Public Schools

Bird Species _

Did you successfully complete your migration?

YES!

What was one significant event in your migration?

Was this significant event caused by living or non living things?

LIVING

How did humans have an impact upon your species survival?

NON-LIVING

Did humans play a role with your significant event? Why or why not?

NO

Cause of death

Living thing or Non-living thing?

Living

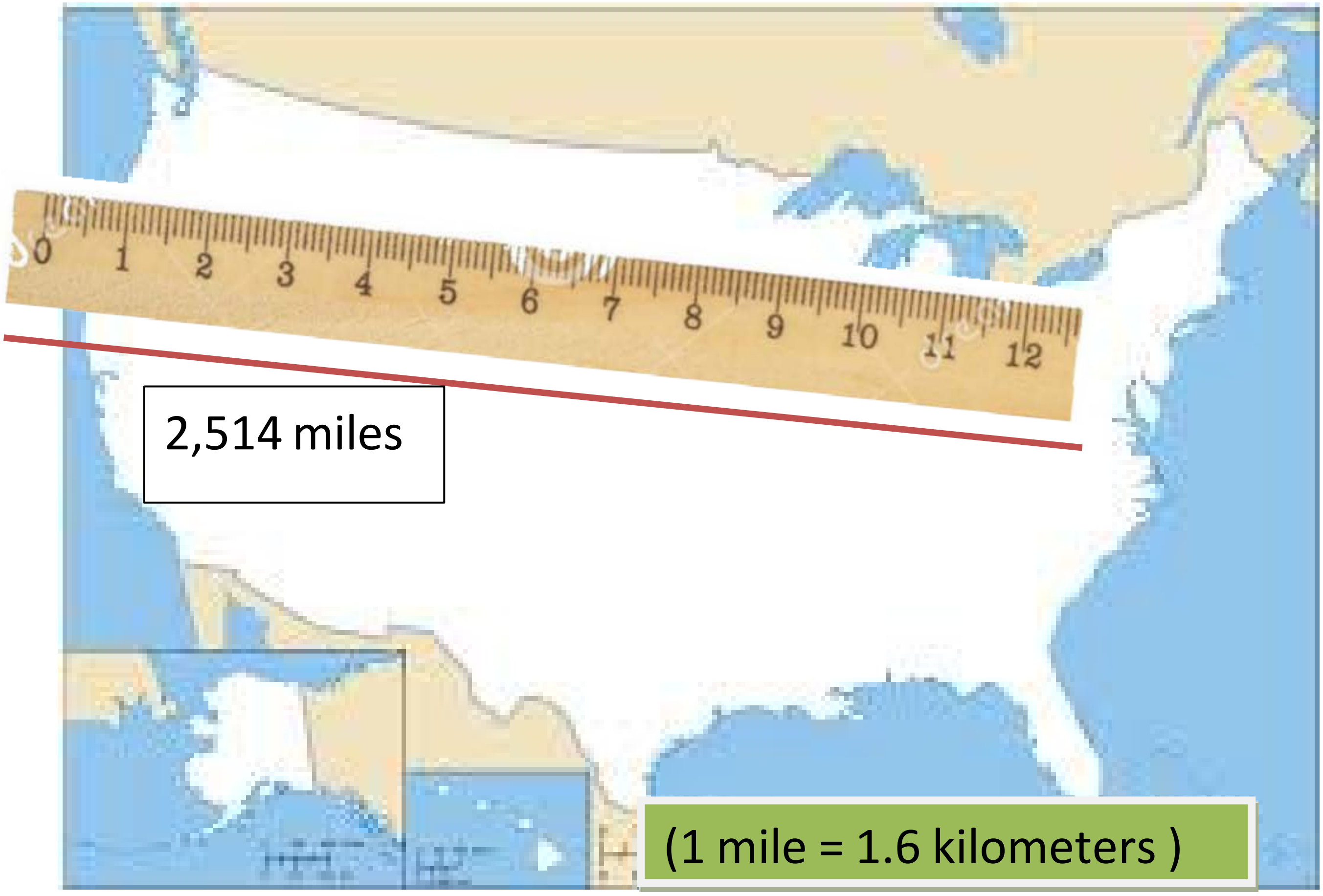
How did humans have an impact upon your species survival?

Non Living

Did humans play a role with your significant event? Why or why not?

Conversion Sheet

The United States



*This map is not to scale

Inches	Miles	Kilometers
1in	205	1 mile = 1.6km
East Coast to West Coast inches		E. Coast to W. Coast Kilometers
12 1/4'"	2,514	330 km

Migration Distance

Type of Bird

____

Map Scale: 1 inch equals

X

205 miles

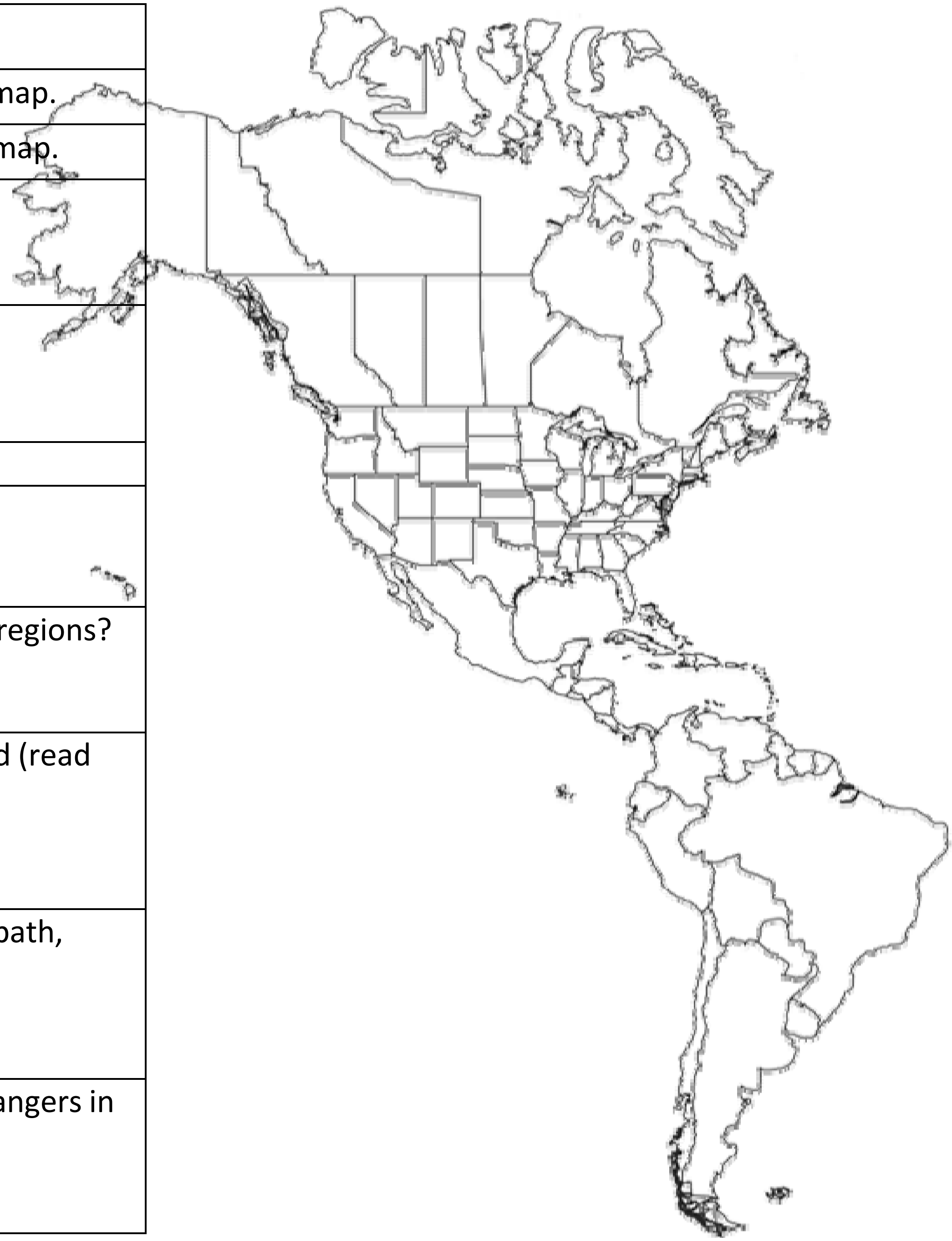
How long did it take for your bird to complete their journey?

How many inches on the map was your bird's journey?

____

Total number of miles during migration

Look at the migration map for your bird.
Mark the most northern point of the migration on your map.
Mark the most southern point of the migration on your map.
What is the geographic region at this point?
What are the characteristics of this region?
Trace the path of the bird.
What geographic region(s) did it move through?
What are some differences in the environment of these regions?
Think- What places could the bird stopover in to get food (read 'Diet and Habitat' on the bird sheet)?
Based on the migration game you played and the bird's path, What are any potential dangers along the way?
What are dangers in an urban place (cities)? What are dangers in rural places?



North America

Geographic Regions