Lesson one

http://www.fws.gov/northeast/bombayhook/Bird_Migration_lessonplan.htm

U.S. Fish and Wildlife Service
Environmental Education Materials
Bird Migration
Bombay Hook
National Wildlife Refuge
2591 Whitehall Neck Road
Smyrna, DE 19977
302/653 6872
FAX 302/653 0684
Website: bombayhook.fws.gov

Bird Migration

Lesson Plan Objectives:

1. Students will know what bird migration is.
2. Students will know why birds migrate.
3. Students will know how birds find their way on migrations.
4. Students will be able to name some of the hazards birds find on their migrations.
5. Students will know why many birds migrate at night.
6. Students will know what a "flyway" is, name the four flyways in North America, and know what a "route" is.
7. Students will be able to describe the migration patterns of some common birds (examples: greater snow goose, common [Atlantic] Canada goose, red knot).

Lesson Plan Overview:

The primary purpose cited for the establishment of Bombay Hook National Wildlife Refuge in 1937 was to provide habitat for migratory waterfowl. In fact, the first name of the refuge was "Bombay Hook Migratory Waterfowl Refuge."

Many bird populations migrate, and the most common pattern involves flying north in the spring to breed in the temperate or Arctic summer, then returning in the fall to wintering grounds in warmer regions to the south. The longer days of the northern summer provide greater opportunities for breeding birds to feed their young. Many northern-breeding ducks, geese, and swans also are migrants, but need only to move from their northern breeding grounds far enough south to escape frozen waters.

Lesson Plan

What Is Bird Migration?

Bird migration is described as the regular, recurrent, seasonal movement of bird populations from one geographic location to another and back again. Birds require specific environmental resources for reproduction, and adequate food for the young is a primary determinant to where and when a species will breed. The most common pattern involves flying north in the spring to breed and returning in the fall to wintering grounds in warmer regions in the south.

The body structure and physiology of birds, unlike other animals, makes it possible for them to seek environments most favorable to their needs at different times of the year. Their ability to fly, their lungs and air sacks, and their metabolic abilities all contribute to this facility.

Questions:

1. What is bird migration?
2. Why are birds able to migrate better than other animals?

Why Do Birds Migrate?

The longer days and abundant food of the northern summer provide greater opportunities for breeding birds to feed their young. The extended daylight hours and food resources allow birds to produce larger clutches than those of related non-migratory species remaining in the tropics year round. As the days shorten in autumn and the breeding period is over, the birds return to warmer regions where the available food supply varies little with the season. Many northern-breeding ducks, geese, and swans are also migrants, but need to move from their northern breeding grounds only far enough south to escape frozen waters. The advantages of migration offset the high stress, physical exertion, and other risks of the migration.

Day length is the primary environmental factor that prompts birds to prepare for migration. They have hormonal changes that increase their appetite and result in substantial weight gain, giving them the fat reserves that provide energy for their migratory flight. They also show increased activity at night, which is when most birds migrate. While length of day is the primary stimulus for migration, birds also respond to temperature changes. For example, if a spring is late and temperatures are colder than normal, birds delay migration; if spring is early, birds also begin migration early.

The timing of the migratory cycle must allow birds to arrive on the breeding site so that there is time to establish a breeding territory, mate, incubate the eggs, and hatch the young before the optimum abundance of food is available to feed the young in the nest. Similarly, if birds waited until the climate in their northern breeding grounds became intolerable, there would be no time to gain the necessary weight that provides the energy surplus needed for their southbound migration.

Questions for students:

1. Why do birds migrate?
2. How do birds know when to migrate?

3. How do birds time their migratory cycle?

How Do Birds Find Their Way on Migration?

Canada geese migrate as family units with several generations making up the migratory flight, including many of those who have traveled the route before. Therefore, landmarks learned in previous migrations by these birds probably are important contributors to their navigation.

Migration with family groups, however, is not the typical pattern. Typically, parents and their young don't migrate together. Parents often leave before or after the young. The red knots and a number of other shorebirds are good examples. Shortly after the young have hatched, females red knots form flocks and head south, leaving the males behind to feed the young. About time the young have fledged (begun to fly), the males also take off and head south. Then several weeks after they have gained enough fat reserves for the migratory flight, the young begin their 9,300-mile journey alone from their breeding grounds in Arctic Canada to Terra del Fuego at the southern tip of South America. How do they know where to go?

To make migration even more complex, many bird species follow one route on their late summer or early fall southbound trip and another in the spring on their northbound migration. Again, red knots are an example. In the spring they take three long non-stop flights, first from Terra del Fuego to the northeast coast of South America where they feed on clams and marine worms, then to the Delaware Bay to feast on horseshoe crab eggs, and then on to their high Arctic breeding ground. They return from the Arctic to beaches on the New England coast, followed by a non-stop crossing over the ocean to the northern tip of South America, and then work their way south until finally reaching Terra del Fuego.

To navigate, birds need to know three things: (a) where they are now, their current location; (b) where they are going, their destination; (c) the direction to travel to get there. We don't know how they do this, but it is believed that they use a combination of factors and that in their brain they have some kind of internal map.

Geographic features are an obvious navigational tool. In some cases specific landmarks may be used (as some speculate is the case with Canada geese); in others simply following a coastline or a mountain range may assist them. Young birds learn the environmental conditions and geographic features of the area where they were born and tend to return to that same place year after year.

It also is believed that birds have the ability to detect magnetic fields. Apparently they detect the north and south magnetic poles and, therefore, know to head south in the fall and north in the spring. The magnetic field varies in strength, stronger at the poles, weaker in the mid-latitudes, and birds may also be able to detect these variations to know where they are along the north/south axis.

The sun is thought to be an important compass that also allows birds find direction, but it requires them to know how to compensate for the passage of time and the sun's changing position. Therefore, they need some internal clock to know where the sun is at a given time.

Many birds, including many of the smaller birds (passerines), migrate at night. Star patterns and particularly the North Star may be another navigation tool used maintaining their direction.

But night migration has other advantages: it is cooler; there is less turbulence in air currents; they can better avoid predators; and they can refuel, eating and resting by day while flying by night.

Eagles, vultures, hawks and other soaring birds, on the other hand, migrate during the day using thermals created by differential heating of the earth's surface. They soar on the updraft of one thermal, and then glide down to the next one, then rising again, using very little energy. Other birds also use the prevailing winds and frontal systems to assist their flights and to avoid headwinds.

The V-shaped flight pattern, similar to those used by geese and swans, uses less energy, and it has been shown that many birds migrate in flocks rather than as individuals for the same reason.

Storms are the most dangerous hazard facing birds during migration. For example, many birds die by being blown off course or meeting contrary headwinds when crossing large bodies of water. Predation is a second natural danger that takes many lives. Man-made hazards including tall buildings, communication towers, and other aerial obstructions take a heavy toll on migrating birds. Lights on tall structures and lighted windows in tall buildings kill many night migrants.

Questions for Students:

1. What three things do the birds need to know in order to find their way?
2. What are the things we believe birds use to find their way?
3. How do Canada geese and red knots differ after they hatch their young and start their migratory journey?
4. During migratory flights, why do birds fly in flocks or V formations?
5. Why do most birds migrate at night?
6. Name one group of birds that migrate during the day and tell why.
7. Name some of the hazards birds face on their migratory flights.

What Are Flyways and Routes?

There are four major North American flyways: the Atlantic, the Mississippi, the Central and the Pacific. Flyway boundaries are not sharply defined, and in the breeding areas in the north and in the wintering areas in the south there is overlapping of the four flyways.

The terms "migration route" and "flyway" are theoretical concepts. Flyways are wide arterial highways, broad areas in which migration routes are found. Migration routes, on the other hand, are the lanes of travel from a particular breeding ground to the winter quarters used by specific bird populations.

The **Atlantic Flyway** extends from the offshore waters of the Atlantic Coast west to the Allegheny Mountains, then curving northwestward across northern West Virginia and northeastern Ohio, it continues across the prairie provinces of Canada and the Northwest Territories to the Arctic Coast of Alaska. Many migratory waterfowl use a primary migration route from the northwest to the Atlantic coast. The coastal route, which follows the shoreline, has its northern origin in the eastern Arctic islands and the coast of Greenland. This is a regular avenue of travel for shorebirds and greater snow geese. Another migratory route passes directly over the Atlantic Ocean from Labrador and Nova Scotia to the Lesser Antilles and then across a group of small islands to the mainland of South America. It also is used by several species of

shore birds.

The eastern boundary of the **Mississippi Flyway** runs through southern Ontario to western Lake Erie, then southwest across Ohio and Indiana to the Mississippi where it closely follows the river to its mouth. This route is uninterrupted by mountains and there are no hills or ridges to interfere with migrating birds. The longest migration route in the Western Hemisphere lies in this flyway. Its northern terminus is on the Arctic coast of Alaska and its southern end is in Patagonia.

The western boundary of the **Central Flyway** follows closely along the eastern base of the Rocky Mountains, but after crossing the continental divide the flyway goes south across the Great Plains. It encompasses the entire region between the valley of the Mississippi River and the Rocky Mountains.

The **Pacific Flyway** follows the coast from Alaska and the Aleutian Islands to the Rocky Mountain and Pacific coast regions of Canada, the United States, and Mexico. The most important waterfowl route in the Pacific Flyway originates in northeastern Alaska and passes through the interior to winter quarters in California from the Sacramento Valley south to the Salton Sea and the tidal marshes near San Francisco Bay. The route of migratory land birds goes from the interior of California to the mouth of the Colorado River and then on south to the winter quarters in western Mexico.

Questions for Students:

1. What is a flyway?
2. What is the difference between a flyway and a route?
3. How many flyways are there in North America?
4. Name or describe one of the routes in the Atlantic Flyway.
5. Under the guidance of a teacher or an environmental education naturalist, use the eBird Trail Tracker to identify a migratory bird that is found on the refuge and see where its breeding grounds are and where its winter grounds are.
6. Explain the migratory patterns of a common bird that uses the Atlantic Flyway.
7. Compare the migratory routes of purple martins with those above. Which of the flyways

Lesson Plan Relates to Delaware Science Content Standards: (6-8; 1.1.D); (4-5;3,1,A); (6-8;3,1,A); (4-5:4.1,A); (K-3;5,2,A); (6-8;5,2,H); (4-5;6,3,A); (6-8;7,1,E)

Lesson two

Academy Curricular Exchange

Columbia Education Center

TITLE: WETLANDS/MIGRATION HOPSCOTCH

AUTHOR: Stephen T. Ferguson; Williams/Cone, Topsham ME

GRADE LEVEL/SUBJECT: 2-6

OVERVIEW:

Coastal wetlands are an important factor to insure the success of bird migration. Ponds, lakes and marshes provide food and shelter for traveling birds. Without the wetlands birds would not have the energy to make the trek from areas as far south as Panama in the case of the Belted Kingfisher. At the time of the European settlement of the United States there were 215 million acres of wetlands. Today there are less than 100 million. Besides providing habitats for waterfowl, wetlands help relieve flooding, filter pollutants and are an integral part of the biosphere.

Through increased education of their importance and beauty children will become responsible stewards of the remaining 100 million acres of wetlands.

PURPOSE: To increase awareness for the need to protect our nation's wetlands.

OBJECTIVES:

1. Students will be able to operationally define migration.

2. Students will be able to visualize the dependence of wetlands for Migrating birds.

RESOURCES/MATERIALS: chalk or a stick.

ACTIVITIES AND PROCEDURES:

1. This activity will be best accomplished on a sandy section of the playground or a parking lot. The teacher will draw a large sized hopscotch course. The course can be drawn on the pavement with chalk or drawn on the sand/dirt with a stick. The squares should be approximately 3'x3'. The hopscotch course should contain 10 squares.

2. Have the students line up at the beginning of the course. Tell the students that they are birds starting their journey northward. Tell the students that each of the squares represents a wetland between Florida and Maine (it will be more dramatic using a migration path which includes your state. Specific migration patterns and bird species can be obtained from a bird field guide.). Students are then challenged to migrate northward on the course. They do not have to step on every square, however they must not go outside the course.

3. All students should be successful in the first migration. Now, tell the students you are a developer. You will destroy 2 wetland areas in order to build condos. Put an "X" on two of the squares. Tell students to make the migration once again. The students may not set foot on the destroyed wetlands. If they do, they die and thus may not participate in any further migrations. After all students have run through destroy two more and repeat the procedure. Repeat this until all students fail to make the migration. Try to "X" off the squares in such a way that not all are destroyed but are so far apart students cannot make the jump. This will help with the debriefing.

TYING IT ALL TOGETHER:

At the end of the activity ask students the following questions:

1. Explain why some birds died earlier than others?

2. Why did the rest of the birds die?

3. Explain how this game represents migration.

4. Why did the birds die even though some wetlands remained at the end of the game?

5. Why is it important to save wetlands in all states?

6. How do migrating birds depend on wetlands during migration?

EXTENSION:

Have students investigate any developments in their community that threaten wetlands.

Have students use field guides to investigate birds which migrate to and from their community.

Footnote:

1. William A. Niering, Wetlands, (New York, 1988), p. 19. S

Lesson three

Original URL: http://www.teachervision.fen.com/skill-builder/lesson-plan/48892.html

Migration Analogy

TeacherVision®

Grade Levels: **4 - 7**

Objective

This lesson introduces the concept of migration to intermediate students. Students compare the analogy of bird migration being like a tropical vacation. Students will use an analogy to gain understanding of a new concept.

Key Understandings

Analogies and metaphors can make new and unfamiliar concepts more meaningful to students by connecting what they know to what they are learning.

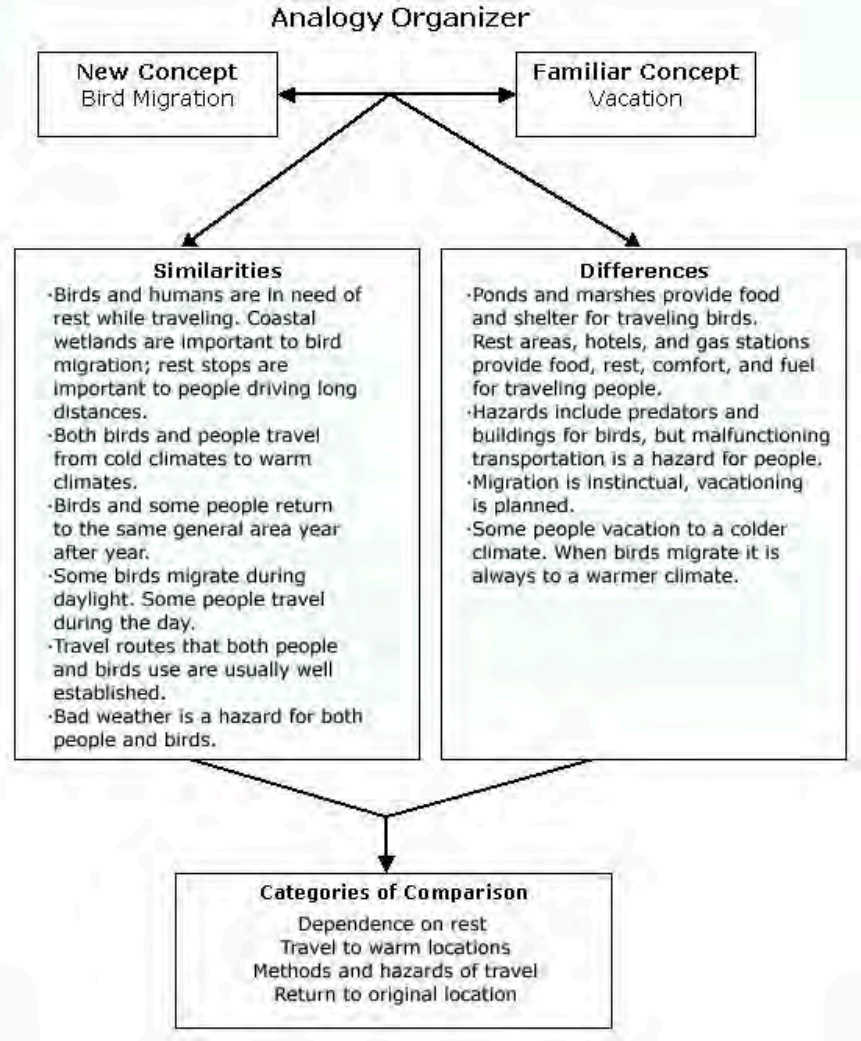
Procedure

In introducing the concept of migration, use an analogy that likens it to a vacation to a warm climate. Note and discuss some interesting facts about migration: More than one-third of the world's birds migrate; migration allows birds to adapt to changes in the environment, because they go to habitats with more food and better weather for survival; migrating is instinctual and most birds migrate in groups; and because traveling is so strenuous, only the fittest birds survive, allowing the strongest birds to reproduce. Review vocabulary that you would like students to be familiar with and use in the discussion, such as: predation, nocturnal, hazards, diurnal, flyway, migration, raptors, traits, and habitat.

Review the familiar concept of vacationing. Have students discuss trips they have taken to warm climates. Encourage them to discuss the details of travel, such as method of transportation, rest stops, eating habits, and energy levels, including the return trip.

Use the graphic organizer to identify the similar features or characteristics of migration and traveling on vacation. Identify the dissimilar features or where the analogy does not apply. Record these in the graphic organizer. Some questions to ask students: What is the connection between migration and vacationing? What is important to know about a vacation? What is important to know about migration? What are some of the differences between migration and vacationing?

1. **Demonstration** Use the Analogies graphic organizer to organize thinking about the familiar concept and new concept. Start the discussion and complete at least half of the chart with students as a class. Here is an example of what a completed chart might look like.



2. **Sharing Ideas** When students have completed the organizer, come together as a class to draw conclusions about the analogy and the overall similarities between the two concepts of migration and vacationing.

3. **Independent Practice** Have students write journal entries imagining that they are preparing for and traveling to a warm climate. Have them next write a parallel journal entry imagining that they are a bird preparing for and migrating to a warm climate. Then ask students to write a summary paragraph comparing and contrasting the two entries.

4. **Assessment** Review the new concept, migration, by either having the students write a paragraph of their understanding of the new concept or having them draw general conclusions that refer to the analogy. You may want to use a rubric to assess student writing.

LESSON FOUR

Google Earth Integration Lesson Plan
ECOMP 7010 Sheila Samuel
Theme Focus: Migration (**Modifications to sections of Ken Rose lesson (in red) by Sheila Samuel are highlighted in yellow)**

Original Lesson Plan and Credits to: Thanks to Ken Rose for writing this activity!

http://www.caosclub.org/totalcaos/members/caosho12.html
Ask students to do more research on the highlighted birds on the data sheets to determine if the photos are of male or female birds?

Migration

http://www.gelessons.com/lessons/songbirds/index.html

Lesson Introduction

My modifications: Read this as a part of the set. Check and see if SCETV Streamline has a video on the migration of birds, or more specifically the "Neo-tropical songbird" from South America

- Neo-tropical songbird's journey each spring from their winter homes in South America to their summer, or breeding, homes in North America. Beginning in late February, this natural phenomenon can be witnessed and tracked as the birds head north across Latin America or over the Gulf of Mexico.
- The flood of returning birds into the United States occurs in late April or May and is usually complete sometime in early June. Often, the songbirds stop off in sheltered areas along the route home. These birds are declining in population each year as more and more of the land they depend on is taken away for human development.

Age Appropriateness:

In order to make **Total CAoS**** relevant to as many grades (K-8) as possible, activities have been written at a middle grade level. Teachers in very early elementary or middle school classrooms may need to adapt portions of the "Total CAoS!" lesson to meet the needs of their grade level.

**Total CAoS is not a typographical error. It refers to the Chicago Academy of Sciences. It deals with science standards relating to the science of matter.

Look for the M symbol for the math connection in this lesson.

This activity meets many of the National Science Standards for Grades 5-8. Click below to find this activity according to the standards it addresses:

National Science Content Standards

Links to State Learning Standard Pages

My Standard Modification: The inclusion of the relevant science standards for grade 5 in South Carolina

South Carolina Grade 5 Science Standards:

Science in grade five focuses on scientific and technological problem solving, and decision making as well as the skills of scientific inquiry: formulating usable questions and hypotheses, planning experiments and product design, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating the findings to others.

Standard 5-1: The student will demonstrate an understanding of scientific inquiry, including the foundations of technological design and the processes, skills, and mathematical thinking necessary to conduct a controlled scientific investigation.

Standard 5-2: The student will demonstrate an understanding of relationships among biotic and abiotic factors within terrestrial and aquatic ecosystems. (Life Science)

Standard 5-3: The student will demonstrate an understanding of features, processes, and changes in Earth's land and oceans. (Earth Science)

Time Allotment

Original lesson - One 50-minute session, plus a field trip to a nature center, if desired

Lesson with Modifications Time Allotment:
We use the 5 day rotation block schedule with 40 minutes per class visit. If we were to find all of the flight places of the songbirds, it might take us 5 days or 5 40-minute class periods to complete this project. We are a k-5 school, but I would gear this more toward my 5th grade students.

Materials

Original lesson materials

- Copies of student data sheet *Map of Western Hemisphere*, (one per student)
- One copy of student data sheet *Bird Band Sighting Report*, (cut into sections)
- Access to reference materials, like atlases or other world maps
- Colored pencils or markers
- Pencils or pens

My Material Modification:

GOOGLE EARTH PROGRAM (ONLINE THROUGH INTERNET EXPLORER)

Color pencils

Markers

Pencils

World Map

Atlas Book

Use Smart Technologies Smartboard with internet access to visit sites of maps showing the Western Hemisphere. Smartboard is "touch interactive" and allows for students to come up and interact with the site we are visiting.

1 copy of the student data sheet for each student or 1 per group if students work in their usual "table" groups, in which there are 4 students per table.

Note:
The Bird Band Sighting student data sheet is broken up into 6 groups. That's just about perfect! In my art class, I have 7 tables of 4 students. I can very easily move a student or two from the extra table, or divide some of the data and give it to group 7 to research.

Advanced Preparation

Make copies of the students data sheet *Map of Western Hemisphere*, one for each student, to plot the migration patterns.
My Modification: Save the links of all related websites to the migration lesson plan in "my content" within the files of my Smartboard area on my laptop.
Secure the link of the map showing the Western hemisphere
Make a copy of the *Bird Band Sighting Reports*, and cut into sections so there is a different section for each group.
~~Prepare a large wall map of the *Map of the Western Hemisphere*.~~
~~Arrange students in cooperative groups of four.~~
Students are already in cooperative groups of four. I only need to take some of the data and give it to my remaining group seven.

Lesson Assessment

~~Collect student's maps of the migration flyways and the ranges. Check for accuracy and completion. Ask each group to tell you which flyway they have plotted, based upon the information you have given them during the lesson.~~

My modification for assessment:
Create a checklist to use as our rubric for this cooperative project.
The checklist would have the following data:
1.Bird Location Date Student would have to write the name of the bird, its location of the migration, and the date it was seen.

2. Students would then use the graph to show plotting of bird's flight based on information on data sheet.
3. Students will use the color pencils for plotting the graph and use a separate color for each bird plotted.

Neo-Tropical Songbird Migration Checklist

Bird	Location	Date	MISCELLANEOUS
1			
2			
3			
4			
5			

Procedure

Tap Prior Knowledge

1. Modification: Explain the term "banded" to students in referring to animals. Ask students if they have ever seen a banded bird. Why do scientists band birds? What could be some of the uses for reporting sightings of banded birds? Allow students to think about these questions without giving any reasons to the class.

The excerpt below was moved from the procedure section. I feel it is better suited in the introductory set. It is information about banding and birds. Here is the excerpt:

The collective data should indicate that birds often migrate in flyways, general paths or routes for migration. Band recoveries give scientists information about these flyways so they can promote their habitat restoration projects

Share with Neighbor

2. ~~Encourage students to discuss their ideas about bird banding within their small groups.~~ After a few minutes, let each group share at least two reasons why bird banding is done. Assign each student the role of ornithologist to compile bird band sighting reports. These reports contain data from locations all along a Neo-tropical songbird's migratory route. After each group receives data on a different migrating species, it will plot the sighting reports on maps, and share the data with the rest of the class. (or display on the Smartboard)

Engage Students in a Hands-On Activity

3. Distribute copies of the student data sheet, *Map of the Western Hemisphere*, and the student data sheet for the bird band sighting reports one to each student. Have students work in their groups to label the major features on their maps: North America, South America, Gulf of Mexico, etc. Provide access to reference materials as necessary. **At this point, the website that contains the image of the Western Hemisphere should be on the screen to ensure that students correctly label each area of the data sheet.**
4. ~~Next, distribute copies of the student data sheet, *Bird Band Sighting Reports*, which lists the sightings of banded songbirds~~. Review the use of a key in making maps. Ask students for prior classroom knowledge about using or reading a "key" in a map. Students should use different colors to signify migration dates: sightings between February and June are one color; those between July and January are a different color.

5. After groups review their plotted data points, invite one member of each group to trace its results on the ~~large classroom wall map~~ Smartboard, using one of the electronic pens for writing on the Smartboard. ~~Use pieces of masking tape or little Post-it notes so that the map does not get damaged~~.

Introduce Scientific Principle

Read and point out locations to students as we view the map together:

There are four flyways in North America. Review them with the class by pointing out the routes on the map.

A. The Atlantic Flyway goes from Florida up the Atlantic coastline, then stretches from the Northeast over to the Great Lakes.
B. The Mississippi Flyway goes from Louisiana up the Mississippi River then stretches from the Great Lakes west to the Dakotas (Chicago is in the Mississippi Flyway).
C. The Central Flyway goes from Texas and New Mexico up to Montana.
D. The Pacific Flyway goes from California up the Pacific coastline to Washington. Encourage students to list these flyways in the space provided below their own maps.

Each group should determine which flyway was used by the migrant they have plotted, and record it at the bottom of the data sheet.

Teacher Key:
Atlantic Flyway: prothonotary warbler
Mississippi Flyway: green heron
Central Flyway rose-breasted grosbeak and black-whiskered vireo
Pacific Flyway: tree swallow and black-billed cuckoo

My Modification:

This would be information about data collected, which can be shared with students by placing these on the table as "reference" sheets and students can review these at the end of the section above where we would identify the four flyways.

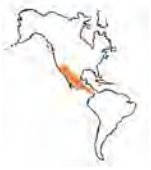
MA closer look at the data shows that some species of birds do not migrate as far as others. Allow students a chance to describe the patterns they see. Looking at the colors of the data points, what can we tell about the birds based on the band sightings collected? If all of the colors are mixed together, then the birds did not migrate during the year. If all the red dots are in one area and the blue dots are in another, we can tell that the birds were in different places at different times of the year. ornithologists have made similar conclusions about bird migration, and have described three basic patterns:

- **Complete**
  there are complete migration patterns, when all members of a species leave the breeding range. In this pattern, there is no overlap between where they spend the winter and where they spend the summer. The migration pattern of the black-whiskered vireo, the rose-breasted grosbeak, and the prothonotary warbler, for example, is complete in this lesson.

- **Partial**
  There are partial migration patterns, when some, but not all, of the

member of a species travel from the breeding range. This is the most common pattern. Robins migrate from regions with harsh winters, but in milder parts of their range like the Puget Sound, they stay all winter long. In this lesson, the migration patterns of the green heron and the tree swallow are partial.

- **Irruptive**
  There are irruptive migration patterns, when migrations are not as predictable. These flexible migrants are more like food specialists that travel where they need to depending upon the conditions of that particular year. In some years, red crossbills migrate south, but they do not do so every year. This lesson shows the black-billed cuckoo's migration pattern as irruptive.



Relate Activity and Concept

My Modification:

S.C. Visual Arts Standard: Making Connections Between Visual Arts and Other Disciplines.

In this instance, there would be connections between Visual Arts and math, science and social studies

~~If you live near Chicago, take a field trip. The North Park Village Nature Center on the northwest side of Chicago provides a summer breeding ground for swans, egrets, herons, sand hill cranes, and yellow-headed blackbirds. The nature center is the city's first wetlands restoration effort~~.

My Modification: Self-directed research about Migration

- If you don't live near Chicago, find a nature center in local directories and see what they have available. Discuss how important these restored wetlands are to the birds that migrate along the flyways.
- If you live in another part of the state or country, do some research on other types of birds and migration patterns. Find out where you could go in your own area to observe migratory birds. They may be closer than you think!

Connect to Other Everyday Examples

- Ask the students if anyone in their family makes an "annual migration." Some examples of human migrations include "snowbirds" or people who travel south in the winter to escape the cold (in a motor home or they have a second home) and return to their northern home in the summer. Also, some families go to the same vacation spot (on a lake perhaps) every year for a week or so. Where do the members of their families go? Where are they coming from? How long do they stay? How often to they "migrate" in a year?

Language Arts Connection

- Have the students pretend that they are going to make an annual migration and write in their journals where they would go and why. What would they bring? What would they leave behind? What kinds of things would they need to make sure they had along the way (i.e. food, lodging, etc.) and what ways could they meet those needs? What skills would they need to complete their migration? They should illustrate their migration plans, and label their starting point and their destination on a map.

My Modification: For The Teacher...before you begin

Background Information

All of the information necessary to teach this lesson is included in the steps above. However, often a lesson such as this will get students asking many more questions. For your own information, then here are some more details about bird migration, which- we must warn you- is still an uncertain science!

Long ago, no one knew that birds migrated during the winter months. Many naturalists believed that they went underground or under the mud at the bottom of a pond to escape the cold. Aristotle, the Greek philosopher, thought that some birds changed into a different species for the winter! We now know that is not the case, but there is still a lot we don't know about bird migration. By banding some of the birds and tracking their routes, scientists have been amazed by what birds are capable of doing. As seen in the video, On a Wing and a Prayer, songbirds travel great distances, often thousands of miles. Arctic terns, for example, fly 10,000 miles from Maine to the South Pole!

Some questions remain. How do they find their way? Why do some travel at night and others during the day? How do birds instinctively know that it is time to go? More than that, how do they know where to go? There are several theories on each of these questions. Migration research has been conducted by hundreds of people throughout the years, and all of them have contributed to what we know today. Phrenologists still do not know all there is to know about migration, but their studies are great examples of scientific inquiry and solving mysteries in science. In this lesson, students join the researchers to see what they can find out about the mysteries of bird migration.

Do birds fly with the sun as a cue?

Key ideas:
Birds may use the sun as a cue while they are flying. For example, if flying north, they may know that the sun should be kept on their right in the morning and on their left in the afternoon. Birds may also calibrate their own direction senses to other cues like stars or magnetic compasses by noting where the sun is setting. The plane of polarized light caused by the setting sun could be a very reliable cue. This idea would account for both diurnal and nocturnal birds.

Examples of past research:
Frank Moore of the University of Southern Mississippi studied whether birds use the sun as an orientation cue. Using Savannah sparrows he found that the accuracy of orientation was best when the setting sun was visible. When the setting sun was blocked by covers or clouds, this accuracy was reduced significantly. He placed mirrors around their cages to alter the position of sunset. When sunset was shifted 90 degrees to the true sunset position, the birds shifted

their orientation 90 degrees in the same direction. Without the sun, or the polarized light it produces, the birds lost their sense of direction.

Some things to think about:
Navigation by the sun is not as simple as it seems, however, because you must know the time of day fairly accurately. Also, what happens on cloudy days? Although some birds do migrate during the day, the majority do so at night. Sun navigation cannot account for over 90% of migration which takes place at night.

Do birds fly with the stars as a cue?

Key ideas:
When birds fly at night, they may use the stars to find their way. Caged birds that see the stars in a planetarium show migratory restlessness and often face the direction they should be flying. Many birds migrate at night, and may use the stars as their guide.

Examples of past research:
A German scientist used European warblers, some of which had never seen a real sky, to show that birds do pay attention to the stars. When the planetarium sky was matched to the real sky on a particular night, the birds inside was oriented in the same direction their wild relatives were flying outside. When the planetarium sky was changed to match a sky hundreds of miles to the east, the birds oriented in such a way as to get back on the right course.

Some things to think about:
This investigator used very few birds and other researchers have not been able to replicate his results. Also, what happens on overcast nights when the birds cannot see the sky?

Do birds fly with the earth's magnetic field to guide them?

Key ideas:
The magnetic field is a force surrounding the earth. Scientists think that magnetism is the most important directional cue used by migrating birds. Birds may use the built-in compasses in their bodies to find the poles. The magnetic force gets stronger as they get toward the poles. Even on cloudy days, birds could use this method.

Examples of past research:
Scientists have tied small magnets to the wings of pigeons and found that they homed just as well as control birds carrying an equal weight of non-magnetic metal. The earth's magnetic field did not seem to help them, but more research is needed.

Some things to think about:
Birds are capable of using several cues to orient during migration, including the moon, the sun, stars, wind, magnetism, topography, and olfactory cues. With so many possibilities, it is exceedingly difficult to study one cue in isolation from others.

How do the birds know that it is time to start migrating?

Key ideas:
Birds may be able to tell that it is time to go by using changes in amount of light, temperature, or food. As winter comes, for example, the daylight hours are reduced and the temperature goes down. These cause the amount of food to change, too.

Examples of past research:
Scientists once thought that birds knew to migrate in the spring because it got warmer in the spring, but that was not reliable enough because some springs were cooler than others. Finally they concluded that it was the increase in the length of day in as spring advanced. It has also been concluded that males leave the tropics earlier than females so they arrive about one to four days earlier. Competition for food and nesting sites would be in favor of males more than for females.

Some things to think about:
It is important to recognize which are direct causes and which are indirect. When food is needed the most, it becomes very scarce: insects die, water freezes, rodents hibernate, and birds leave. The lack of food may very well be the direct cause for the birds to migrate, but the light and temperature may be indirect causes.

How does weather affect bird migration?

Key ideas:
A migrating bird doesn't rely on sight alone. Their vision at night is not even as good as ours. Birds fly with the air mass. In truth, the fact that they migrate in summer and fall has less to do directly with temperature and more to do with the fact that air patterns are changing. They do not see well, so they have to trust that the north or south wind will take them the right course. Sometimes things go wrong.

Examples of past research:
Frontal movements are correlated with large numbers of migration birds. Whenever a south wind switches to west on nights when birds are migrating, a drift of dead birds on the beaches of the Atlantic coast is common. On April 16, 1960, this kind of tragedy happened on the shores of Lake Michigan. A migration flight was taking place on the south winds along the west shore when the wind abruptly changed direction and started blowing from the west. The birds were blown out over the lake on winds reaching 80 miles per hour. A squall with hail then beat them down into the water. On the next morning, dead birds were found along 35 miles of Indiana Shoreline. Counts covering 25% of the dunes indicate that a total number of birds who died may have been 12,000. There were at least 56 species involved. The wild migrants are what pilots call "pressure pattern" flyers. This simply means that they only fly if the air mass is going their way on south winds in spring and north winds in fall.

Some things to think about:
Not all birds fly with the wind. Swallows and swifts, day migrants who feed on insects in the air as they fly, migrate against the wind.

My Modification:

This excerpt was moved from the beginning of the lesson plan. I feel that it is information the teacher should be aware of before starting the activity, and that it should be here as well as in the beginning of the plan.

In this activity, student ornithologists study common patterns of bird migration. They compile bird data from bird band sighting reports and plot the annual journey of common Neo-tropical migrants. They illustrate the four most common migration flyways and the songbirds' typical winter and summer distribution ranges. To follow up, teachers, students, and parents can visit other web sites to discover more about the songbirds' winter habitats and summer breeding grounds. Thanks to Ken Rose for writing this activity!

Mapping Seasonal Homes

Group 1 Green Heron Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Green heron shot by hunter in St. Louis, Missouri - July 10, 1996

Green heron found dead in Meridian, Mississippi along route 85 - June 17, 1996

Green heron seen in New Orleans, Louisiana - December 13, 1996

Green heron seen in Lafayette, Louisiana - June 2, 1996

Green heron seen in Council Bluffs, Iowa - July 20, 1996

Green heron found dead in Sioux, Minnesota - August 1, 1996

Green heron accidentally hit by truck in Mitchell, South Dakota - August 16, 1996

Green heron seen on route 75 in Lake City, Florida - August 12, 1996

Green heron seen taking a bird bath in Guatemala, Mexico - December 25, 1996

Green heron on window ledge in Honduras, Mexico - June 14, 1996

Mapping Seasonal Homes

Group 2 Rose-breasted Grosbeak Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Rose-breasted grosbeak caught in fishing gear Austin, Texas - June 3, 1996

Rose-breasted grosbeak hunted in Tulsa, Oklahoma - July 3, 1996

Rose-breasted grosbeak captured in Wichita, Kansas - July 15, 1996

Rose-breasted grosbeak seen in Cheyenne, Wyoming - August 2, 1996

Rose-breasted grosbeak accidentally runs over in Fort Worth, Texas - November 15, 1996

Rose-breasted grosbeak captured for research in Rapid City, South Dakota - August 19, 1996

Rose-breasted grosbeak found dead of starvation in Kingsville, Texas - May 25, 1996

Rose-breasted grosbeak seen taking bread crumbs in Brownsville, Texas - April 15, 1996

Rose-breasted grosbeak being fed seeds in Monterey, Mexico - March 27, 1996

Rose-breasted grosbeak seen by water fountain in Pueblo, Mexico - March 18, 1996

Mapping Seasonal Homes

Group 3 Tree Swallow Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Group 3:

Tree swallow released back into environment in Durango, Mexico - December 6, 1996

Tree swallow captured in Hermosillo, Mexico - January 12, 1996

Tree swallow injured by truck in McAllen, Texas - February 2, 1996

Tree swallows freshening up at water fountain in El Paso, Texas - February 2, 1996

Tree swallow hunted down in Tucson, Arizona - March 5, 1996

Tree swallows being fed by pedestrian in Moreno Valley, California - May 1, 1996

Tree swallow seen in bird house near a meadow in Chihuahua, Mexico - April 20, 1996

Tree swallow found hunted down in Bakersfield, California - April 16, 1996

Tree swallows seen gliding in circles in Red Bluff, California - May 19, 1996

Tree swallow captured for research in Yuba City, California - May 31, 1996

Mapping Seasonal Homes

Group 4 Prothonotary Warbler Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Prothonotary warbler hunted down in Andover, Maine - August 20, 1996

Prothonotary warbler seen in Augusta, Maine - July 19, 1996

Prothonotary warbler seen taking bread crumbs in Boston, Massachusetts - June 14, 1996

Prothonotary warbler accidentally hit by truck in New York City, New York - May 30, 1996

Prothonotary warbler injured by building structure in Harrisburg, Pennsylvania - May 18, 1996

Prothonotary warbler captured for research in Norfolk, Virginia - April 8, 1996

Prothonotary warbler released in Orlando, Florida - February 1, 1996

Prothonotary warbler hunted down in Charleston, South Carolina - March 26, 1996

Prothonotary warbler seen on ledge in Belize, Mexico - January 18, 1996

Prothonotary warbler seen humming ZWEET! ZWEET! in Honduras, Mexico - January 14, 1996

Mapping Seasonal Homes

Group 5 Black-billed Cuckoo Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Group 5:

Black-billed cuckoo hunted in Winnipeg, Canada - June 13, 1996

Black-billed cuckoo seen taking bread crumbs in Rochester, Minnesota - May 22, 1996

Black-billed cuckoo captured for research Dubuque, Iowa - February 15, 1996

Black-billed cuckoo released in Springfield, Missouri - March 11, 1996

Black-billed cuckoo seen on ledge in Jonesboro, Arkansas - March 29, 1996

Black-billed cuckoo hunted in Monroe, Louisiana - April 7, 1996

Black-billed cuckoo injured by building structure in Baton Rouge, Louisiana - April 19, 1996

Black-billed cuckoo flying around in Coatzacoalcos, Mexico - May 2, 1996

Black-billed cuckoo seen humming in Oaxaca, Mexico - May 26, 1996

Black-billed cuckoo hunted down in Chiapas, Mexico - June 25, 1996

Mapping Seasonal Homes

Group 6 Black-whiskered Vireo Student Data Sheet

Ornithologist's Name _____

Copies of Bird Band Sighting Reports

Black-whiskered vireo hunted in Helena, Montana - April 15, 1996

Black-whiskered vireo making bird nest in Gillette, Wyoming - May 17, 1996

Black-whiskered vireo injured by building structure in Lorraine, Wyoming - June 12, 1996

Black-whiskered vireo seen on statue in Raton, Nevada - June 15, 1996

Black-whiskered vireo released in San Antonio, Texas - August 5, 1996

Black-whiskered vireo captured in Nuevo, Mexico - September 2, 1996

Black-whiskered vireo seen humming in a tree in Veracruz, Mexico - September 23, 1996

Black-whiskered vireo taking a bird bath in Hidalgo, Mexico - September 28, 1996

Black-whiskered vireo seen in low woods in Guerrero, Mexico - October 27, 1996