

Google Earth Integration Lesson Plan  
ECOMP 7010 Sheila Samuel  
Theme Focus: Migration (Modified by Sheila Samuel)

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

<http://www.caosclub.org/totalcaos/members/caosho12.html>



## Migration

### 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  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**

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)

South Carolina  
Grade 5  
Science  
Standards:

## Time Allotment

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

### My Modified 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 5<sup>th</sup> grade students.

## 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**

<b>Bird</b>	<b>Location</b>	<b>Date</b>	<b>MISCELLANEOUS</b>
<b>1</b>			
<b>2</b>			
<b>3</b>			
<b>4</b>			
<b>5</b>			

## 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.

- A 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 do 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

## Student Data Sheet

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Ornithologist's Name \_\_\_\_\_

### Copies of Bird Band Sighting Reports

#### **Group 1:**

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

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## Student Data Sheet

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Ornithologist's Name \_\_\_\_\_

Copies of Bird Band Sighting Reports

### **Group 2:**

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

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## Student Data Sheet

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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

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## Student Data Sheet

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Ornithologist's Name \_\_\_\_\_

Copies of Bird Band Sighting Reports

### **Group 4:**

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

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## Student Data Sheet

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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

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## Student Data Sheet

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Ornithologist's Name \_\_\_\_\_

Copies of Bird Band Sighting Reports

### **Group 6:**

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

