

ECOS Inquiry Template

1. CONTRIBUTOR'S NAME: **Hannah Elliott**

2. NAME OF INQUIRY: **Hopscotch Migration**

Adapted from:

Marks, Marie. 1999. Hopscotch Migration. Texas Lutheran University

http://www.tceq.state.tx.us/comm_exec/forms_pubs/pubs/gi/gi-268_183364.pdf

(Quotes from Marks 1999 lesson in blue)

3. GOALS AND OBJECTIVES:

- a. Inquiry Questions: **How and where do birds migrate?
What other factors influence bird migration?**
- b. Ecological Theme(s): **Winter Ecology/ Migration/ Birds/ Adaptations**
- c. General Goal: **Learn about migratory birds as part of winter ecology adaptations unit.**
- d. Specific Objectives: **The students will be able to:**
 - 1. Understand the use of the wetlands by migrating birds.**
 - 2. Identify causes for disappearance of the wetlands. (Marks 1999)**
- e. Grade Level: **2-5**
- f. Duration/Time Required: **50-70 minutes total (about 1 class period)**
 - Prep time **10 minutes**
 - Implementing Exercise During Class **30-40 minutes**
 - Assessment **10-20 minutes**

4. ECOLOGICAL AND SCIENCE CONTEXT: **Model of Migratory Bird Behavior**

- a. Background (for Teachers): **Common migratory birds in Montana include the American Robin, American Crow, Mallard, Bald Eagle... Some of these birds may be seen overwintering in Montana as well. Migration behavior depends greatly on weather:**

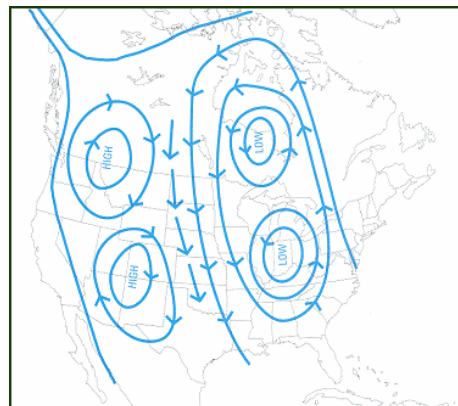


Figure 12. A hypothetical weather system that could be ideal for mass migrations of waterfowl in the fall. The strong southerly flow of air created by counter-clockwise winds about the lows and the clockwise rotation of air about the highs, aids the rapid movement of waterfowl from their breeding grounds in the Canadian prairies to wintering areas in southern United States.

Above Figure from Migration of Birds from USGS: [Northern Prairie Wildlife Research Center](http://www.npwrc.usgs.gov/resource/othrdata/migratio/migratio.htm)

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- b. Background (to present to Students): **Migratory birds use different areas of North America to stop along their path of migration from north to south. Many birds travel the same paths each year and use landmarks to identify areas they stopped in previously. As the human population expands and more natural habitats are replaced by developed areas, the migratory birds have a difficult time finding safe, inhabitable areas. (Marks 1999)**

5. MOTIVATION AND INCENTIVE FOR LEARNING: **Hopscotch game is fun and played outdoors. Understanding a little about migration and which birds migrate helps students know which birds to look for and when.**

6. VOCABULARY:

Wetlands:

Government agencies have adopted a consistent wetland definition developed jointly by the Army Corps of Engineers (ACOE) and Environmental Protection Agency (EPA), in “The Wetlands Delineation Manual of 1987”:

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands generally include swamps, marshes, bogs, and similar areas.

This wetland definition is based on hydrology, hydric soils and hydrophytic vegetation. Only areas that meet all three criteria are considered wetlands subject to federal regulation.

Above definition from Montana Watercourse: *Wetland Laws, Permits, and Regulations.*

<http://nris.state.mt.us/wis/wetlands/Brochures/wetland3.pdf>

Migration: “Many species of land [birds](#) migrate very long distances, the most common pattern being for birds to breed in the temperate or arctic [northern hemisphere](#) and winter in warmer regions, often in the tropics or the southern hemisphere.” (Wikipedia: Bird Migration http://en.wikipedia.org/wiki/Bird_migration)

7. SAFETY INFORMATION: **Winter sidewalks can be icy, so hopscotch should be played on dry, flat sidewalk or in gym or other indoor open space (use tape to make squares).**

8. MATERIALS LIST (including any handouts or transparency masters): **Sidewalk chalk or tape, maps of migration routes for expansion, pictures of different migratory and non-migratory birds.**

9. METHODS/PROCEDURE FOR STUDENTS:

- a. Pre-investigation work: **1. The teacher will draw a large sized hopscotch course. The course can be drawn on the pavement with chalk or on the sand/dirt with a stick. The squares should be approximately 3' X 3'. The hopscotch course should contain 10 squares. (Marks 1999)**

b. Investigation work:

1) What evidence (data, samples) do students collect?

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 [Texas 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).*

3. Students are then challenged to migrate northward on the course one at a time. They do not have to step on every square, however, they must not go outside the course. All students should be successful in the first migration.

4. Now, tell the students you are a developer. You will destroy two wetland areas in order to build houses. Put an "X" on two of the squares.

5. Tell students to make the migration once again. The students may not set foot on the destroyed wetlands. If they do, they die and may not participate in any further migrations.

6. 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. (Marks 1999)

***I would tell students that the migration is between Alaska/ Northern Canada and the west coast of Mexico, and whether it is going south or north would depend on the season (Fall/Winter=South, Spring=North)**

K-3: Students play game without recording data.

4-6: Students play game while teacher or volunteer student records data: number of "birds" who start each migration and number who finish and the number of "wetlands" destroyed each migration, by migration number.

7-8: Students play game and record data.

2) How do students present the evidence (data)?

K-3: Students discuss game without necessarily graphing results.

4-6: Teacher graphs data on board for students, possibly compare with real maps and data.

7-8: Students are required to graph data (by hand or using Excel); extensions can include looking up real data for Montana migratory birds.

3) What conclusions are drawn from the evidence students collect?

K-3: Teacher discusses importance of wetlands to migratory birds.

4-8: Students will probably say that wetlands are important and without them birds die; Teacher may want to discuss what really happens (birds have a more difficult time finding food along their journey without wetlands, may be forced to stop in more populated areas where they are more likely to be hit by

cars or otherwise hurt). Discuss the differences and similarities between this model data and what really happens to birds.

4) Include examples of data sheets. (grades 4-8)

| Migration Number | # Birds Starting Migration | # Birds Finishing Migration | # Destroyed Wetlands of 10 |
|------------------|----------------------------|-----------------------------|----------------------------|
| 1 | 20 | 20 | 0 |
| 2 | 20 | 18 | 2 |
| 3 | 18 | 14 | 4 |
| 4 | 14 | 2 | 6 |
| 5 | 2 | 0 | 8 |

10. ASSESSMENT:

K-8:

Discussion:

Ask students these questions:

1. Why did some birds die earlier than others?
2. Why did the rest of the birds die?
3. How does this game represent 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? (Marks 1999)

7-8: Students should put graph in lab notebook, along with a paragraph or so written answer to the discussion questions.

11. EXTENSION IDEAS:

Have students research migration patterns of certain birds.
Visit a wetland area nearby. (Marks 1999)

K-3: Show students pictures of migratory birds and the discuss the seasons they are likely to find them.*

Younger students can also check out the Enchanted Learning website on birds to find out more <http://www.enchantedlearning.com/subjects/birds/>.

4-8: Students research a migratory bird that either lives part of the year in Montana or flies through Montana, its migration patterns, adaptations for migration, and what kind of wetland or other space it needs for survival. Examples could include American Robins, Mallards, Bald and Golden Eagles, Snowy Owls, and one especially interesting research idea might be Bohemian vs. Cedar Waxwings.*

Students could also research bird migration in another part of the world, a good example of this is *Migrating Birds Know no Boundaries*, a project in Israel, at:

http://www.birds.org.il/show_item.asp?levelid=457

*See pictures and maps at end of inquiry description!

12. SCALABILITY This lesson has already been adapted for grades K-8, for grades 9-12, I would have students do research on specific birds, and perhaps play the game as different

bird species (some can fly further, so on the game that person can do a double jump, whereas some birds only fly short distances at a time, so that person can only take steps).

13. REFERENCES:

Lesson adapted from:

Marks, Marie. 1999. *Hopscotch Migration*. Texas Lutheran University.
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Other References:

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Montana Watercourse: *Wetland Laws, Permits, and Regulations*.

<http://nris.state.mt.us/wis/wetlands/Brochures/wetland3.pdf>

Wikipedia Online Encyclopedia: *Bird Migration*.

http://en.wikipedia.org/wiki/Bird_migration

Hoffman, SW, and Smith, JP. 2003. *Population Trends of Migratory Raptors in Western North America 1977-2001*. The Condor. Vol. 105, No. 3 pp. 397-419.
Retrieved from BioOne on December 10, 2005 (<http://bioone.org>)

Col, Jeananda. 2003-2005. Enchanted Learning. *All About Birds*.

<http://www.enchantedlearning.com/subjects/birds/> or

<http://www.zoomschool.com/subjects/birds/>

International Center for the Study of Bird Migration, in Latrun. Israel
Ornithological Center. *Migrating Birds Know no Boundaries*.

http://www.birds.org.il/show_item.asp?levelid=457

14. LIST OF EXPERTS AND CONSULTANTS

Cornell Lab of Ornithology. 2005. *The Birds of North America Online*.

<http://bna.birds.cornell.edu/BNA/>

Alison Perkins, ECOS PhD Fellow

Avian Science Center at the University of Montana.

<http://avianscience.dbs.umt.edu/>

15. EVALUATION/REFLECTION BY FELLOWS AND TEACHERS OF HOW IT WENT:

I have not tried this lesson with a real class yet! (updates on how it works soon to come)

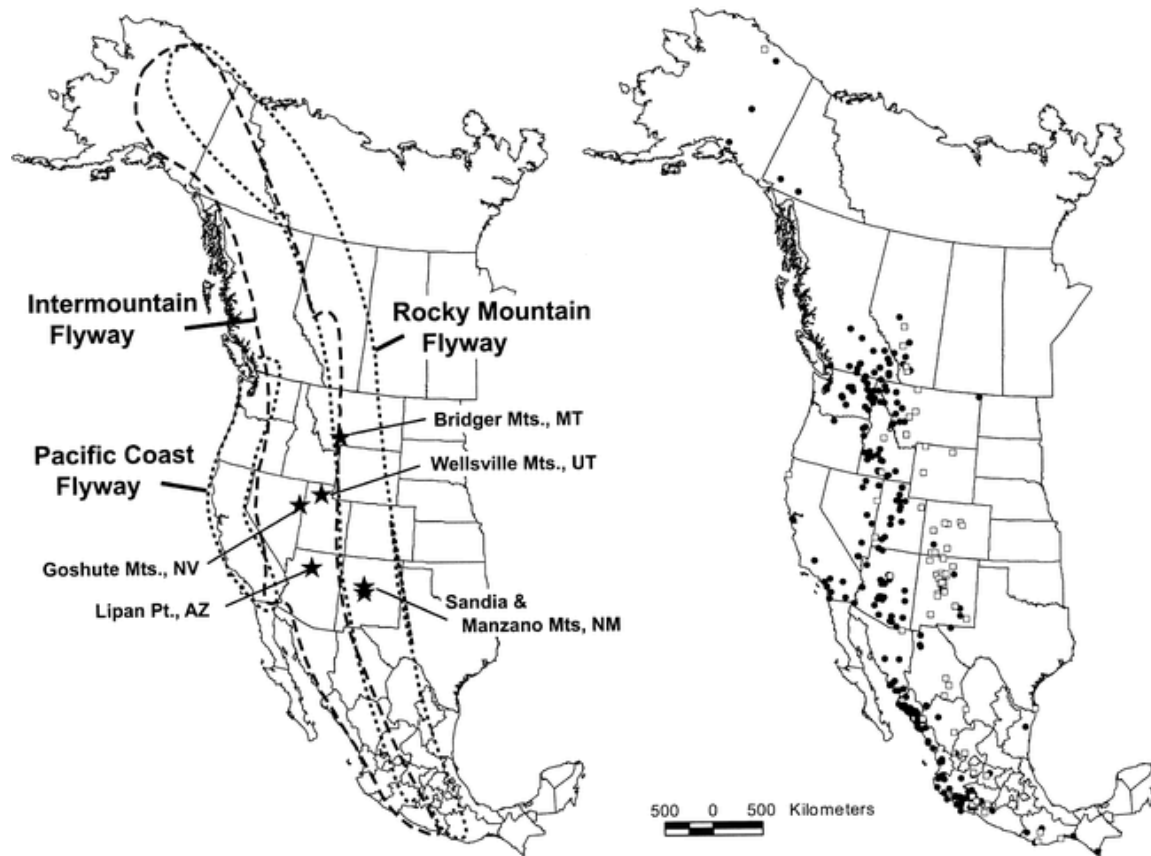
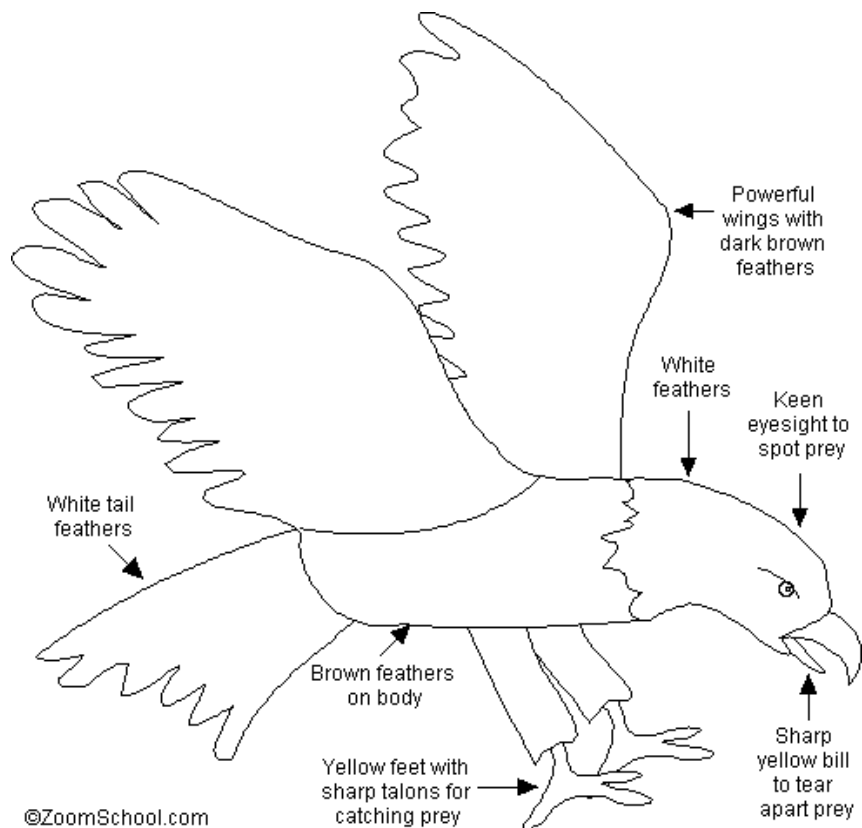
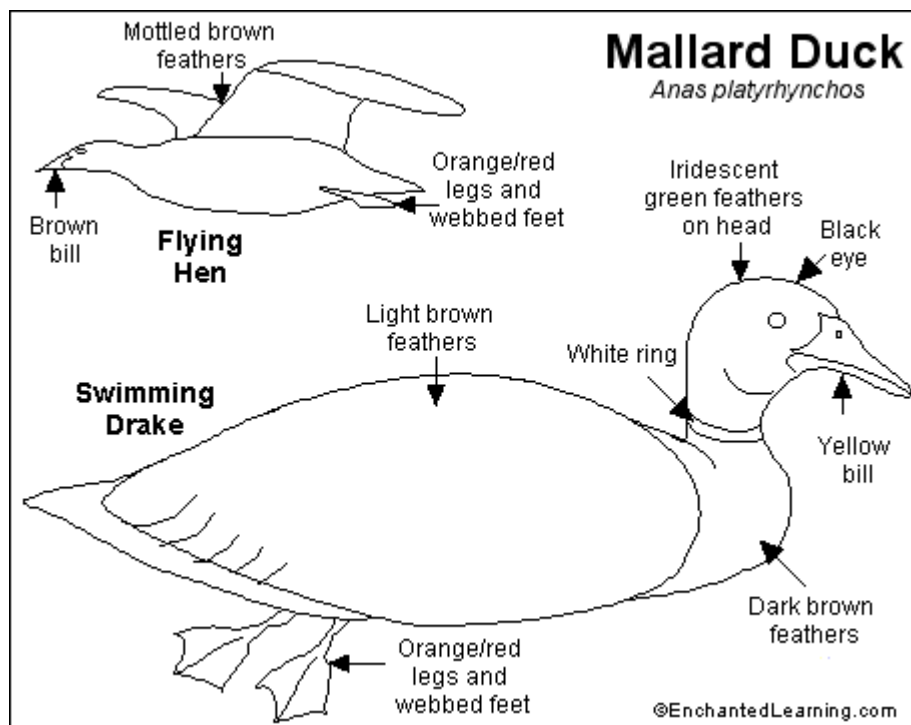
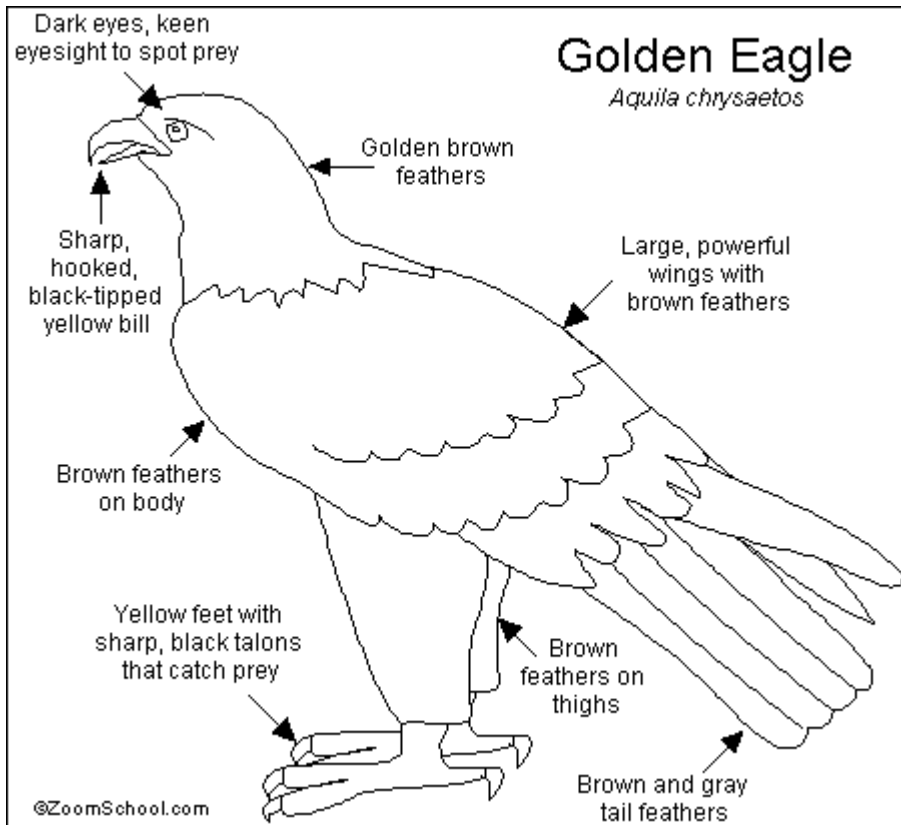
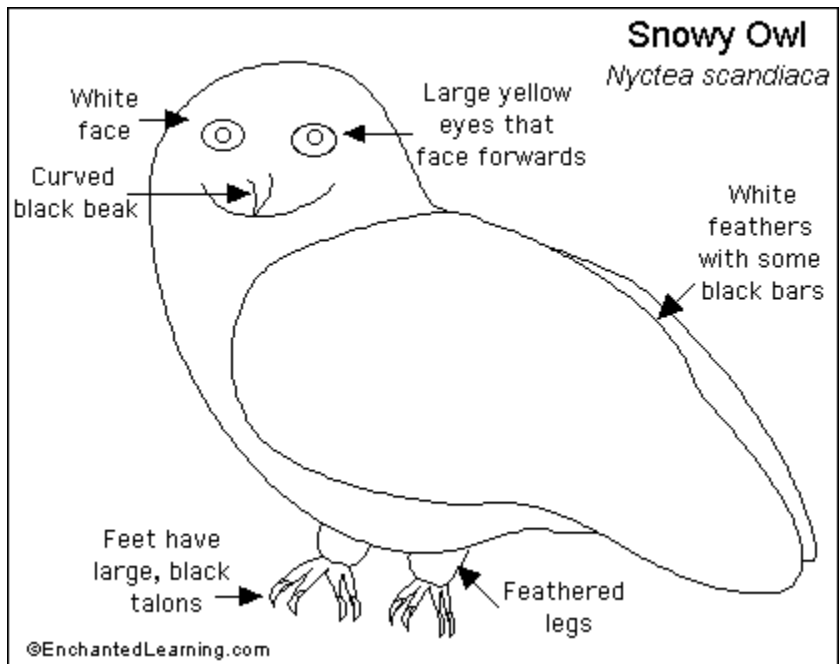
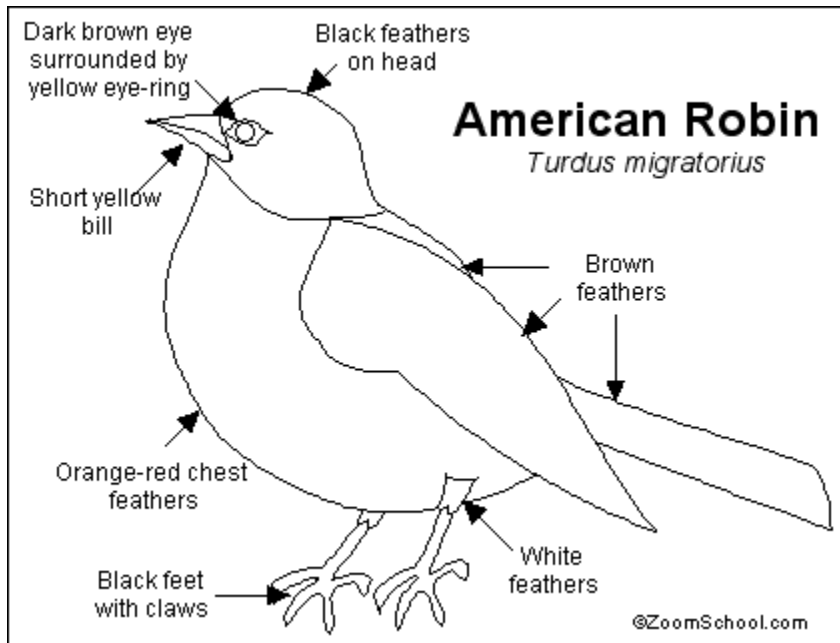


FIGURE 1. Locations of raptor counting sites in relation to major raptor migration flyways in western North America, and distributions of encounters with raptors (78% Sharp-shinned and Cooper's Hawks) banded on migration in the Goshute Mountains, Nevada, from 1980–2001 (filled circles) and in the Sandia and Manzano Mountains, New Mexico, from 1985–2001 (unfilled squares; after Hoffman et al. 2002) (Hoffman and Smith 2003)

Bald Eagle:







Above Coloring Pictures from Enchanted Learning at <http://www.zoomschool.com/subjects/birds/>