



Migration Matters

In a Nutshell

Students will learn how and why scientists collect data about individual bird species and bird migration patterns by participating in a bird banding simulation and a binocular bird hike.

Grade 4 - 5
Season Spring and Fall
Location Visitor Center

Learning Objectives

After participating in this activity, students will be able to:

- define the term migration.
- name two refuge birds that migrate.
- name two refuge birds that do not migrate.
- identify the ability to access food all year long as the main reason for migration.
- explain why so many National Wildlife Refuges are located along bird migration routes.
- give at least two examples of information biologists can get from banding birds.

Literature Connections

Welcome, Brown Bird by Mary Lyn Ray (610L)

Luck by Jean Craighead George

The Peregrine's Journey by Madeleine Dunphy

Who's That Navigator? by Tom Anderson, MN Conservation Volunteer Magazine

Minnesota Valley National Wildlife Refuge

3815 American Blvd. East
Bloomington, MN 55425



15865 Carver Highlands Drive
Carver, MN 55315

Minnesota Valley National Wildlife Refuge

How Do Birds Find Their Way? by Roma Gans

She's Wearing a Dead Bird On Her Head! By Kathryn Lasky (870L)

Pre-Activities

Students will be introduced to songbird and waterfowl banding, a scientific management tool. A slide show, discussion, and demonstration of equipment will help students understand how biologists collect information on the flight patterns, stopover sites, and general health of a variety of migratory birds.

On-site Activities

Students will participate in a mock bird banding session by rotating through a series of banding stations using the equipment and techniques of real biologists. The field trip will conclude with a binocular bird hike, encouraging students to collect their own scientific bird observation data.

Classroom Connection

Engage students in any of the following Flying WILD activities:

Hidden Hazards - students will act as migratory birds attempting to avoid the risks they face when running into various obstacles.

Migratory Mapping - compiling and mapping data from hypothetical band records, students will learn about the migration patterns of two neotropical migratory birds, Swainson's Thrush and Wood Thrush.

Teacher Resources

Birds of Minnesota by Stan Tekiela



Migration Matters Pre Activities

Materials

- Bird Banding power point and script
- Portable projector (if needed)
- Tool box with one sample of banding equipment including: pliers, wing/tail ruler, visor loupes, slide scale, bands
- Laminated Migratory Birds poster (leave for their Classroom)

Introduction

Ask students to consider all the challenges migratory birds face during their travels between nesting grounds and over-wintering areas. Make a list of their responses, for example: inclement weather, physical obstacles, and loss or degradation of habitat.

Ask students why, considering all the hazards birds face during migration, many birds still make the annual trip south? Explain that if a bird is unable to find the type of food it is designed to eat during Minnesota's cold winter months it must migrate. The birds able to find a constant food supply, despite weather conditions, will not migrate. Even ducks, geese and eagles will continue to stay as long as open water is available. Lead students in listing a variety of both migratory and non-migratory Minnesota bird species and the types of food they consume.

Examples:

<u>Migratory Birds</u>	<u>Food Source</u>
Ruby-throated Hummingbirds	nectar
Dabbling ducks, geese	water plants, snails, water insects
American Robin	insects, worms, grubs, fruits
Eastern Bluebird	insects, fruits

<u>Non-Migratory Birds</u>	<u>Food Source</u>
Woodpecker (many species)	hibernating insects
Black-capped Chickadees	seeds
Northern Cardinals	seeds, fruits like grapes, Crabapples
White-breasted Nuthatches	hibernating insects

Minnesota Valley National Wildlife Refuge

Ask students why it might be important for scientists to gather information about bird migration. What questions do they have about bird migration?

Activity

Use the Bird Banding power point and script to explain why biologists band birds and to show the songbird banding process. Show students examples of the equipment biologists use to collect scientific data. Explain that they will have an opportunity to work as a bird biologist during their fieldtrip on the refuge by participating in a bird banding simulation.

Explain to students that in order not to overly stress the birds, banding is usually done very early in the morning, when the birds are most active and the weather is the coolest, from about sunrise to 10:00am. This is before most field trip groups can come to the refuge.

Many refuges, state agencies, and organizations have permits to band birds to gather data that can help answer other questions about waterfowl, songbirds and raptors. In order to band, an agency or organization must obtain a special permit that is issued through the USGS Bird Banding Laboratory located at Patuxent (pa – tux – ent) Wildlife Research Center in Maryland. These special permits allow only trained individuals to band birds for a specific purpose or study.

Migration Matters

On-site Activities

Simulated Bird Banding Demonstration Stations

Materials

- Student Data Sheet (1 per student team)
- Clipboards (1 per student team)
- Pencils (1 per student team)
- Bird banding demonstration kit, set-up in the following manner:

Station 1: Songbird Capture - Mist Netting

- mist “poles” (actually dowel rods)
- 10-gallon buckets/sand and bungee cords to hold the poles in place
- demonstration mist net
- 4 toy birds: Northern cardinal, mourning dove, blue jay, American goldfinch
- toothpicks
- stop watches

Station 2: Songbird Data Collection - Banding

- Songbird transport bags (4)
- Bag rope and clothes pins to hold bags
- Wing/tail rules (4)
- Spring scales (3)
- Digital Scale (1)
- toy birds (blue jay, Northern cardinal, mourning dove, American goldfinch) or 4 species of birds/ducks “on a stick” wearing simulated bands
- Visor loupes (magnifying glasses worn on the head, 1)

Station 3: Duck Data Collection and Banding

- Bird photos (Canada goose, Mallard,)
- Band size reference sheets
- Pliers
- Laminated photo of actual birding pliers
- Bird band gauges (2)

Minnesota Valley National Wildlife Refuge

- Demonstration duck bands
- Paper clips
- Short sections of dowel rod to simulate a duck leg or dead fowl trainers with legs
- Sample banded bird certificate

Station 4: Migration Math

- *A Bird's Solution* math word problems
- Calculators
- Bird field guides

Bird Hike

Materials

- Binoculars
- Bird behavior scavenger hunt sheet (1 per student)
- Birds of North America- Peterson First Field Guides (1 per adult)
- Clipboards (1 per student)
- Pencils (1 per student)

Introduction

Inside Visitor Center (10 minutes)

Review with students what they learned in the power point pre-activity about how scientists gather information about bird migration.

Explain to students that during their refuge field trip they will participate in two activities. Both activities involve the collection of scientific bird data. Divide the class into 2 groups. Send one group to participate in the simulated bird banding stations while the second group leaves for a bird hike. After 50 minutes the groups will meet back in the Visitor Center to switch activities.

Bird Banding Demonstration Stations

Inside Visitor Center (50 minutes)

Explain to students that for this activity, they will rotate through 4 learning stations. Three stations provide students with an opportunity to use real bird banding equipment in a simulated banding operation. At the

Minnesota Valley National Wildlife Refuge

fourth station, students calculate the food required for survival of migration for a variety of Minnesota bird species. Explain to students at each station they will complete one section of their data sheet.

Walk the students through each station, briefly describing the work they will perform, the information they will collect, and where to record it on their data sheet. Divide the group into 4 smaller teams. Assign one adult to each station to assist student teams with the tasks they are required to complete. Break the group into four teams. Provide each team with a data sheet, clipboard and pencil. Rotate student teams through the stations every 7-10 minutes.

Equipment provided, set-up, and student tasks are described here for each station. Background information is provided for the adult leaders to share with the student teams as they begin their work at the station.

Station 1: Songbird Capture

Mist “poles” (actually dowel rods), 10-gallon buckets/sand and bungee cords to stabilize the poles, demonstration mist net, 4 toy birds (blue jay, Northern cardinal, mourning dove, American goldfinch), stop watches, toothpicks.

Background Information: Songbirds are captured using fine mesh nets called mist nets. Biologists and assistants usually band songbirds in the early morning hours (a few hours past sunrise in the spring and summer) while the temperature is cool, as this reduces stress to the birds. Songbirds (unable to see the thin mesh) are caught in the net as they fly back and forth between netted areas. As soon as a songbird flies into the net, biologists and their assistants work quickly to remove the bird, to minimize the amount of time each bird tosses and turns in the net. Sometimes biologists and their assistants use toothpicks to help remove the fine mesh from between a bird's toes, beak, or fragile feathers. The greater the amount of time a bird is in the net, the more difficult it will be to remove the bird. When the songbird has been removed, it is then placed in a solid canvas bag (to minimize stress) and quickly brought to the data collection area for banding.

Minnesota Valley National Wildlife Refuge

Instruct students to gently toss each bird species into the mist net at least 3 times and record the following information for each bird:

- Number of times the bird escaped (did not get tangled in the mist net)
- Number of times the bird was captured.
- Amount of time it took to remove the captured bird from the net.

Students should work together, taking turns at tossing and freeing birds, and using the stopwatch to time bird removal.

Station 2: Songbird Data Collection

Songbird transport bags, rope and clothes pins to hold bags, wing/tail rulers, spring scales, digital scale, visor loupes (magnifying glasses), 4 toy birds (blue jay, cardinal, dove, goldfinch) or 4 specimens from the “on a stick” collection wearing simulated bands

Background Information: Banders begin by recording the date, time, and location of capture as well as current weather conditions. Captured birds are weighed while still in the bag. The weight of the bag is subtracted from the total.

In the event the bird escapes before all data is collected, biologists always record the new band number (or the existing band number if the bird has already been captured) and the species. The small band numbers can be extremely hard to read with the naked eye. Banders typically use magnifying glass worn on the head, called visor loupes, to keep their hands free to hold and work on the birds. Additional information including age, sex, size (weight & tail length) is gathered and recorded in the data log. This information is eventually entered into a national database at the USGS Bird Banding Laboratory.

Instruct students to complete the following for as many bird species as time will allow:

- Weight with digital and spring scale (do not open bags)
- Tail length (if using toy birds), wing cord length if using specimens from the “on a stick” collection
- Band number

Students should work together, taking turns at weighing, reading bands using the visor loupes, and taking tail or wing cord measurements.

Minnesota Valley National Wildlife Refuge

Station 3: Banding

Bird photos (Canada goose, Mallard, Blue Jay, Ruby-throated hummingbird), band size reference sheets, pliers, demonstration duck bands, paper clips, laminated photo of actual birding pliers, band gauges, short pieces of dowel rod to simulate a duck leg or dead fowl trainers with legs.

Background Information: Once captured, each bird is given a bracelet, called a band, made of lightweight aluminum. Each band is imprinted with a unique number. Bands that are properly fitted rotate freely around the bird's leg and add very little weight (compare the weight of the paperclip (1 paperclip = 1g) to the weight of the bands). The size and thickness of bands vary by bird species. Larger birds get a larger, thicker band.

Bands found on a dead or sick bird should be reported to the USGS Bird Banding Laboratory. A certificate and information collected on that bird is mailed to the individual who reports the band. Show students the example provided.

Station 4: A Bird's Solution

A Bird's Solution word problems, calculators, bird field guides
Students work together to calculate the answers to the 7 word problems on *A Bird's Solution* and record answers on the team data sheet.

Bird Hike

Refuge Trail (50 minutes)

In addition to bird banding, biologists use observation to collect valuable information about birds. Help students develop their observation skills using the **FLYING WILD** activity, *Bird Behavior Scavenger Hunt*, as part of the refuge hike, or use the simple observation data sheet included. During the hike, make sure to travel through various habitats to give students the opportunity to observe different bird behaviors and record

Observing Birds in the Wild

(Examples of Bird Behaviors)

Singing or calling

Preening

Bathing in water

Taking a dust bath

Soaring

Flying

Perched on a limb or branch

Hovering in mid air

Feeding

Minnesota Valley National Wildlife Refuge

their findings on the data sheet. Encourage students to use a field guide as a resource to identify as many bird species as possible, but remind them that it is OKAY if they don't know what kind of bird it is.

Binocular Tips

If the group has not used binoculars before, here are some tips to increase success before heading out on the hike:

- Instruct students to always keep the binocular strap around their neck! This reduces the chance students will swing, drag or drop the binoculars. It also improves their chances of being ready when an interesting bird lands on the trail in front of them!
- Show students how to adjust the binoculars to fit the space between their eyes. Ask them to practice widening and closing the barrels until they see a single image. Students who report seeing only "black" often do not have the binocular barrels adjusted properly for their eyes. This can also be caused by not having the eye cups adjusted properly –up for glasses, down for no glasses.
- Ask students to practice bringing a figure into and out of focus. This will help them determine when something is truly clear and sharp.
- Have students practice finding a stationary object. One way to explain this is to use the "keep your eye on the ball" analogy. Students should find the bird with their naked eyes, **KEEP** their eyes on the bird, and bring the binoculars up to their eyes. This keeps them from having to "hunt" for the bird in a much smaller field of view.



When the group returns, summarize the results of the hike with questions about their observations.

Minnesota Valley National Wildlife Refuge

- How might a particular behavior benefit a bird?
- Would any of the behaviors observed be dangerous for a bird? What (if any) behaviors were not observed? Why?
- Did any single species seem to be exhibiting a particularly distinctive behavior? Why?
- Do these behaviors happen year round or only during certain seasons? Which behaviors might be specific to the breeding season, migration season, etc.?

Wrap-up Management Connection

Inside the Visitor Center (10 minutes)

Ask students what species and behaviors they observed on their bird observation hike. What unique behaviors did they observe? What part of the bird banding process did students find the most challenging and why? What kinds of information can we learn from banding birds? What new information did they learn about bird banding from the simulation? Ask which students would be interested in taking part in an actual banding program. Provide information on upcoming opportunities to observe and/or participate in refuge bird banding.

Bird Banding at Minnesota Valley National Wildlife Refuge

Birds have been scientifically banded in North America since 1902, starting with the work of Dr. Paul Bartsch of the Smithsonian Institution. Dr. Bartsch banded 23 black-crowned night herons in Washington D.C. His first band recovery happened in September 1902.*

To monitor wood duck populations, MN Valley NWR is required to band at least 100 wood ducks each year prior to the opening of the waterfowl hunting season. The quota includes 25 adult females, 25 adult males, 25 immature females & 25 immature males. Although the Refuge is only required to band wood ducks, the refuge is able to monitor all bird species through banding. As a result, the refuge has a songbird banding program in place. Through the banding program, the refuge staff can contribute to scientific data collection, providing biologists with valuable information about a variety of bird species that use the refuge.

Minnesota Valley National Wildlife Refuge

Naturalist: _____ Date: _____ Location: _____

Weather: _____

Songbird Banding Simulation

Station: Mist Net

Toss each species into the net three times. Fill in the data for the number of escapes and captures. Time the length of each capture and release.

Blue Jay

of Escapes = _____

of Captures = _____

Length of time to release
a capture:

1. _____
2. _____
3. _____

Northern Cardinal

of Escapes = _____

of Captures = _____

Length of time to release
a capture:

1. _____
2. _____
3. _____

American Goldfinch

of Escapes = _____

of Captures = _____

Length of time to release
a capture:

1. _____
2. _____
3. _____

Mourning Dove

of Escapes = _____

of Captures = _____

Length of time to release
a capture:

1. _____
2. _____
3. _____

Station: Data Collection

For each species, fill in the data for species name, species weight, measured tail length and band number.

Bird Species: _____

Weight: _____

Tail length: _____

Band Number: _____

Bird Species: _____

Weight: _____

Tail length: _____

Band Number: _____

Bird Species: _____

Weight: _____

Tail length: _____

Band Number: _____

Bird Species: _____

Weight: _____

Tail length: _____

Band Number: _____

Station: Duck Banding

For each picture determine the species, then determine the correct band size for the species.

Photo 1: Bird Species: _____

Band Size: _____

Photo 2: Bird Species: _____

Band Size: _____

Photo 3: Bird Species: _____

Band Size: _____

Photo 4: Bird Species: _____

Band Size: _____

Minnesota Valley National Wildlife Refuge

Naturalist: _____ Date: _____ Location: _____

Weather: _____

Migration Matters

What bird behaviors did you see?

List or describe some of the bird species you saw.

Sketch your favorite bird that you saw today.

What was your favorite thing you learned about birds today?

A Bird's Solution!

1. American Robins and earthworms

American Robins eat about 14 feet of earthworms per day. How many feet would this equal in one week's time?



2. Pileated Woodpecker Drums

A Pileated Woodpecker typically drums 15 times in a series. A series is repeated 5 times every 60 seconds. How many drumbeats would this be over a ten-minute period?



3. Yellow-headed Blackbird

Yellow-headed Blackbirds live in cattail marshes. A cattail head typically has 300,000 seeds. If there are 1,000 cattail heads in an acre, how many seeds would you expect in one acre?



4. Hummingbird Food

a. Hummingbirds eat 30% of their body weight daily. If you weighed 100 pounds and ate 30% of your weight, how many pounds of food would you need to eat daily?



b. How many Quarter-pounders would you need in a day?



5. Cooper's Hawk: To raise one Cooper's hawk to the age of six weeks, an average of 66 robin-size prey are needed for food.

- a. How much prey would a Cooper's hawk need to raise 3 chicks for six weeks?
- b. How many for 4 chicks?
- c. How many for 5 chicks?

6. Grow Red-winged Blackbird, Grow!

The male red-winged blackbird chick will increase in weight by a factor of ten in the first ten days.

- a. Multiply your own birth weight by ten.
- b. At this rate how much would you weigh in one month (30 days)?



7. A Great Gray Owl Invasion



Minnesota winters can be harsh, some years great gray owls must travel south in search of prey. Recent invasions in central Minnesota happened in 1989, 1993, 1997, 2001, and 2005.

- a. What pattern do you notice occurring between these invasion years?
- b. Based on this pattern what most likely will be the next two invasion years?

A Bird's Solution!

ANSWER KEY

1. Robins and earthworms

Robins eat about 14 feet of earthworms per day. How many feet would this equal in one week's time?



$$14 \times 7 = 98 \text{ feet}$$

2. Pileated Woodpecker Drums

A Pileated Woodpecker typically drums 15 times in a series. A series is repeated 5 times every 60 seconds. How many drumbeats would this be over a ten-minute period?



$$15 \times 5 = 75 \text{ per minute}$$

$$75 \times 10 = 750 \text{ drumbeats per 10 minute}$$



3. Yellow-headed Blackbird

Yellow-headed Blackbirds live in cattail marshes. A cattail head typically has 300,000 seeds. If there are 1,000 cattail heads in an acre, how many seeds would you expect in one acre?

$$300,000 \times 1,000 = 300,000,000 \text{ cattail seeds}$$

4. Hummingbird Food

a. Hummingbirds eat 30% of their body weight daily. If you weighed 100 pounds and ate 30% of your weight, how many pounds of food would you need to eat daily?

$$100 \times 0.30 = 30 \text{ pounds}$$



b. How many Quarter-pounders would you need in a day?

$$4 \text{ quarters pounders} = 1 \text{ pound}$$
$$30 \times 4 = 120 \text{ quarter}$$



5. Cooper's hawk: To raise one Cooper's hawk to the age of six weeks, an average of 66 robin-size prey are needed for food.

a. How much prey would a Cooper's hawk need to raise 3 chicks for six weeks?

$$66 \times 3 = 198 \text{ prey for 3 birds}$$

b. How many for 4 chicks?

$$66 \times 4 = 264 \text{ prey for 4 birds}$$

c. How many for 5 chicks?

$$66 \times 5 = 330 \text{ prey for 5 birds}$$

6. Grow Red-winged Grow!

The male red-winged blackbird chick will increase in weight by a factor of ten in the first ten days.



a. Multiply your own birth weight by ten.

Example: birth weight = 8 pounds

$$8 \times 10 = 80 \text{ pounds}$$

b. At this rate how much would you weigh in one month (30 days)?

$$30 \text{ days} / 10 = 3 \quad 3 \times 80 = 240 \text{ pounds in one month}$$



7. A Great Gray Owl Invasion

Minnesota winters can be harsh, some years great gray owls must travel south in search of prey. Recent invasions in central Minnesota happened in 1989, 1993, 1997, 2001, and 2005.

a. What pattern do you notice occurring between these invasion years?

Common factor = Each invasion year is 4 years apart

b. Based on this pattern what most likely will be the next two invasion years?

2009 and 2013

Migration

Rainy Day Hike Alternatives

In place of the bird observation hike, lead students in one of the following inside activity options after the simulated bird banding demonstration.

Option 1

Flying WILD Migratory Mapping

In the Flying WILD activity *Migratory Mapping*, students learn about migration patterns of two Neotropical migratory birds, the Swainson's Thrush and the Wood Thrush, by compiling and mapping data from hypothetical band records.

Materials

- North America Map Data Sheet (4)
- South America Map Data Sheet (4)
- Western Hemisphere Data Sheet- blown up to hang on the wall
- 4 different colored markers (4 sets = 1 per group)
- Pictures of Swainson's & Wood Thrush

Ask students to select a partner for this activity. Pass out a set of data sheets, colored markers, and thrush pictures to each team. Follow the Flying WILD activity, *Migratory Mapping*, using the simulated band records and instruct students how to compile and map data for the Swainson's and Wood Thrushes.

Option 2

Bird Feeder Observation

Students observe birds that visit the refuge feeder and record the behaviors they observe.

Materials

- Binoculars (1 per student)
- Data sheets (1 per student)
- Clipboard/pencil (1 per student)
- Bird field guide (1 per student)
- Blank paper
- Assortment of color pencils

Pass out the binoculars, data sheets, clipboards, and pencils to each student. Using the field guides, ask students to identify the birds that

Minnesota Valley National Wildlife Refuge

visit the refuge feeders and record the behaviors they observe on their data sheets. Provide blank paper and color pencils. Encourage students to draw at least one of the birds they watch.

Option 3 (Rapids Lake Only)

Migration Matters Worksheet

Students use the migration matters exhibit and National Wildlife Refuges Wall Map to answer questions about three migratory species: Bobolink, American White Pelican, and Woodcock.

Materials

- Calculators
- Migration Matters worksheet (one per student or student team)
- Clipboard and pencil (one per student or student team)

Divide students into teams of 4. Provide each team with a calculator, Migration Matters Worksheet, clipboard and pencil. Point out the location of the migration matters exhibit and wall map to the student teams.

Option 4

Project WILD, Migration Headache

Follow the Project WILD Minnesota Activity, *Migration Headache*, using the scenario cards for ducks, not sandhill crane, as ducks are more common to Minnesota Valley National Wildlife refuge.

Materials

- Large playing field or gymnasium
- Hula-hoops or carpet squares (8)
- Duck scenario cards
- Posters: The National Wildlife Refuge System and
- North American Migration Flyways

Discuss with the class the importance of stopover habitat to migrating ducks, which were represented by the hula hoops in this game. Ask students how an increase or decrease in the number of stopover habitats affected duck survival. Ask students to carefully look at the map of *The National Wildlife Refuge System*. What do they notice about the numbers and locations of National Wildlife Refuges? Make students aware, if they do not notice, the greater concentration of National Wildlife Refuges located in the Midwest, east, and west coasts. Ask

Minnesota Valley National Wildlife Refuge

students to hypothesize why the U.S. Fish and Wildlife Service would concentrate National Wildlife Refuges in these areas. Use the poster *North American Migration Flyways*, to show students where National Wildlife Refuges are situated along the three major North American flyways, or “Highways in the Sky”. Explain to students the locations of these refuges provide a variety of habitat types necessary for resting and feeding migratory birds of all types.