SONGBIRDS AT THE CROSSROADS OF MIGRATION

SECTION TWO – LESSONS

CHAPTER TWO – MIGRATION PRIMER

Lesson 1 - SEASONAL SURVEY: COMPARE AND CONTRAST BIRD POPULATIONS

Lesson 2 - WHY MIGRATE?: ASSESS RESOURCE AVAILABILITY

Lesson 3 - NAVIGATING THE SKY: PLOT A COURSE

SEASONAL SURVEY:
COMPARE AND CONTRAST BIRD POPULATIONS

BACKGROUND
Local bird populations are in flux throughout the year. Some of this is due to birds’ migratory movements while other reasons include seasonal distribution and post-breeding season dispersal. The change over in bird species can be noticed through careful observation and careful record keeping.

Population trends can be noted when records spanning multiple years are kept. For instance, John Serrao, former naturalist at Greenbrook Sanctuary in Bergen County, analyzed annual spring breeding bird data that was kept for the Sanctuary on the Hudson River since 1946. His analysis revealed that there was a definite and significant decline in breeding species and individual birds at the Sanctuary over a period of 50 years. This type of analysis enables ornithologists and other scientists to be alerted to potential problems in the environment because birds are indicators of environmental health.

TIME
(2) 40-minute indoor discussion and work period
(1) 30-minute outdoor observation period per week over a 3-month period (September to November or March to May)

SKILLS
Observing, communicating, gathering data, comparing/contrasting, formulating hypotheses, analyzing, synthesizing, evaluating
CORE CURRICULUM CONTENT STANDARDS
Language Arts – 3.2B  3.3A,B,D  3.4A,B
Mathematics – 4.4A  4.5A-D,F
Science – 5.1A,B  5.3D, 5.5D  5.10A
Social Studies – 6.8B,C,E
Technology – 8.1A,CD  8.2

KEY WORDS
Research protocols

PRIOR KNOWLEDGE / SKILLS
An understanding of how to use binoculars and bird identification guides

OBJECTIVES
Students will:
• Identify the bird species that frequent a particular habitat or site.
• Understand that there is a difference between residential birds and migratory species.
• Explain reasons why migratory species leave the area.

INSTRUCTIONAL METHODS
Field investigation
Research
Classroom activity and discussion

MATERIALS
• Habitat survey form (Worksheet #5)
• Bird survey form (created by the students, depending on their research questions)
• Binoculars
• Bird identification guides

PREPARATION
1. Decide if this activity is going to be done on school grounds or as an independent activity for students to do in their own backyards or local parks.
2. Copy the Habitat Survey form (Worksheet #5) for each student or group of students.

SETTING THE STAGE
Discuss with the students the definitions of research, data collection, and scientific research protocols.

THE ACTION
Part 1 – Setting Up the Survey
1. Identify the research site (whether on school grounds, student backyards, or local neighborhood park).
2. Distribute the Habitat Survey form to each student or group of students. They are to complete the sheet as part of the data collection procedure.
3. Tell the students that they will be observing the bird life in their research site over a period of three months. Have the students generate some research questions that they could answer. Examples: What types of birds do we see in the research site? Why are these birds here? Why do we see some birds only once or twice while we see other birds a lot of times?

4. Discuss with the students what specific things one would need to study in order to gather data on the suggested research questions. (Note: examples are progressive from a simple monthly census to more complex observations concerning bird behavior which can lead to a discussion on bird needs and migration) Examples: Q – What types of birds do we see in the research site during different months? Data needed – Data sheet that has space for bird name, identification marks, and date(s) seen. Q – Why are these birds here? Data needed – Data sheet that identifies the bird, what the bird is doing (behavior), and date(s) seen. Q – Why do we see some birds only one or twice while we see other birds a lot of times? Data needed – Data sheet that identifies the bird, date(s) seen, how many of the birds were seen, and what the bird(s) were doing.

5. Have the students decide what data they will collect and design the data collection form.

6. Ask the students formulate a hypothesis about what they might discover over the course of project.

Part 2 – Comparing Results
1. Have the students analyze their data and briefly share their findings.

2. Discuss the following:
   a. What were the most common birds? The least common birds?
   b. What is your theory as to why some birds are common while others are not?
   c. What habitat changes did you notice during the study?
   d. Explain how habitat changes may have affected the presence or absence of particular bird species.
   e. Based on your data, which birds do you think are resident species and which birds are migratory species?
   f. How did your findings support or disprove your hypothesis?

3. Combine all of the students’ data to compare and contrast species and their seasonal distribution.

4. Have the students learn more about the least common species to determine if they are migratory or not. Discuss those implications.

PULLING IT TOGETHER
1. Have the students graph their results to create visual products that illustrate their research – share the research using PowerPoint, at a science fair, on the school website or post their findings and bird sightings on www.ebird.com, a cooperative venture between Cornell Laboratory of Ornithology and National Audubon Society.

2. Have each student keep a journal that includes the following:
   - Habitat survey of the site
   - Research question and a sample survey form
   - Written hypothesis that tells what they might find
• Data collected (raw forms)
• Graphs and analysis of data
• Discussion/conclusion based on their research question, their prediction, and their findings
HABITAT SURVEY FORM (Worksheet #5)

Name: ________________________________ Date: __________

SECTION ONE:
Date survey begins ________________

Describe the habitat:

Note any human-provided food or water sources:

SECTION TWO:
Date survey ends ________________

Describe the habitat:

If the habitat changes, describe what climatic or human-induced forces caused the change:
WHY MIGRATE?: ASSESS RESOURCE AVAILABILITY

BACKGROUND

One of the major reasons why birds migrate is tied to food availability. Like all living things, birds require food in order to survive and ease of finding food is key to a bird’s survival. The more time it needs to spend finding food, the less time the bird has to be successful breeding and avoiding predators. Just like people, birds require a consistent supply of food, although their food preference and intake may change with daily or seasonal needs.

During the breeding season, an adult bird feeds not only itself, but also a number of nestlings (usually four). The nestlings are only in the nest for a period of two weeks or less before they fledge (leave the nest). During this time, young songbirds go from featherless, sightless and helpless to being sighted, feathered and much more autonomous. They more than double their size and weight during this time. In order to accomplish this, their parents feed them almost continuously, and their diet consists of high protein meals. They are fed insects, spiders, snails, and all forms of small creatures that are abundant during the breeding season.

At the end of the breeding season, some birds migrate out of the region while others will stay in the area throughout the winter season. The birds that migrate are those that can’t adapt their diets to be able to survive our temperate winters or their feeding strategy is such that it is not conducive to cold temperatures or snow cover. For example, a Purple Martin eats flying insects. Not only are there few insects available for consumption in most of New Jersey during the winter season, but out of all the insects that may be available flying insects are the least numerous. Purple Martins would die if they tried to stay in New Jersey.

Some birds can undertake long migrations because they adjust their diet to enable them to do so. Think of migrant birds like long distance runners. Prior to the marathon, runners will eat foods high in carbohydrates such as pasta and breads. If they only ate protein, they would not have enough reserves to complete the run. Birds are similar; even those birds that rely heavily on insect protein during the summer need to bulk up before undertaking the arduous migratory journey. During migration they switch their diet to include almost entirely food items that are high in carbohydrates like berries and fruit. This switch occurs because these migrants need to put on fat that provides a food resource in their bodies that metabolizes slowly.

Other birds may be able to switch their diet so that they can find enough food items to survive the winter. Robins are a perfect example of this. During the warmer months, Robins primarily eat worms – every five-year old knows this. When the ground freezes and worms are unavailable, Robins switch over to berries. Although many Robins migrate from New Jersey to warmer climates, a large number of them redistribute themselves throughout the wooded habitats of the state in search of holly, cedar and muliflora rose berries, along with crab apples and any other fruit that is still available.

TIME
(1) 40-minute period
SKILLS
Communicating, comparing/contrasting, analyzing, evaluating, inferring, synthesizing, justifying

CORE CURRICULUM CONTENT STANDARDS
Language Arts – 3.1G, I 3.3A, B, D 3.4A, B
Science – 5.1A, B 5.3D 5.5B 5.10A, B
Social Studies – 6.1C, E
Technology – 8.1C

KEY WORDS
None

PRIOR KNOWLEDGE / SKILLS
None

OBJECTIVES
Students will:
• Explain why bird diets may change throughout the seasons
• Understand that migrant bird species have different needs than resident bird species in regards to diet.
• Explain the relationship between bird diets and bird movement.

INSTRUCTIONAL METHODS
Classroom activity and discussion

MATERIALS
Avian Food Preferences (Figure 4)
Bird identification guides

PREPARATION
1. Make enough copies of the Avian Food Preference chart (Figure 4) for each pair of students.
2. Gather some bird reference guides for the students.

SETTING THE STAGE
Talk with the students about food preference. Discuss how food preferences change over time – babies need milk and soft foods; as they grow they are more variety from which to choose. Ask the students if there are some times of the year where they are more apt to eat some foods than others. Why?

THE ACTION
1. Provide each pair of students with their sample charts of bird stomach contents. Explain that these data were derived from scientific analysis taken from dead birds and from observations made by ornithologists in the field.
2. Have the students analyze the data to determine which of the species are migratory and which are non-migratory (resident). Note that these are all species that breed or pass through New Jersey and are reliant upon New Jersey’s temperate climate.

3. Discuss their analysis. Have students follow-up on their bird species by doing further research to verify whether they are correct in their assumptions. Follow-up research should include using bird identification field guides, Internet information, or bird life histories.

PULLING IT TOGETHER
Based on what they have learned, how could people help migratory bird species? (Maintain habitat that provides/encourages the types of food the migrants require either generally or for specific species.) Discuss species management programs such as those for endangered / threatened species.

RESOURCES
AVIAN FOOD PREFERENCES (Figure 4)

Primary food eaten during each season is in **bold**.

<table>
<thead>
<tr>
<th>BIRD SPECIES</th>
<th>BREEDING SEASON</th>
<th>WINTER</th>
<th>FEEDING STRATEGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indigo Bunting</td>
<td><strong>Spiders</strong>; insects including caterpillars, grasshoppers, and beetles; seeds; berries</td>
<td><strong>Grass seeds</strong>, buds, some insects</td>
<td>Picks insects from leaves and individual seeds off plants</td>
</tr>
<tr>
<td>Bobolink</td>
<td><strong>Insects</strong></td>
<td><strong>Grass seeds</strong>, rice</td>
<td>Picks insects seeds off plants</td>
</tr>
<tr>
<td>Orchard Oriole</td>
<td><strong>Insects</strong>, spiders, nectar, small fruits</td>
<td><strong>Fruit</strong>, nectar, and some insects</td>
<td>Pierces fruit to get juice and pulp, drinks nectar from flowering plants</td>
</tr>
<tr>
<td>Eastern Bluebird</td>
<td><strong>Insects</strong> including beetles, grasshoppers, crickets, moths, caterpillars, bees</td>
<td><strong>Insects</strong>, small fruits</td>
<td>Picks insects from leaves, swoops down on grasshoppers, etc. from a perch.</td>
</tr>
<tr>
<td>Blackpoll Warbler</td>
<td><strong>Insects</strong></td>
<td><strong>Insects</strong>, berries</td>
<td>Picks insects from leaves.</td>
</tr>
<tr>
<td>House Finch</td>
<td><strong>Seeds</strong>, insects</td>
<td><strong>Seeds</strong></td>
<td>Cracks open seeds to get to the meat inside.</td>
</tr>
<tr>
<td>Northern Cardinal</td>
<td><strong>Insects</strong>, snails, slugs, spiders, fruit, seeds</td>
<td><strong>Seeds</strong>, some fruit, some insects</td>
<td>Cracks open seeds to get to the meat inside.</td>
</tr>
<tr>
<td>Wood Thrush</td>
<td><strong>Insects</strong> including beetles, caterpillars, ants, crickets; spiders; earthworms; some small berries</td>
<td><strong>Insects</strong>, some berries and fruit</td>
<td>Picks insects off the ground or from leaves.</td>
</tr>
<tr>
<td>American Robin</td>
<td><strong>Worms</strong>; insects, berries, fruit</td>
<td><strong>Berries</strong> and fruit</td>
<td>Picks whole berries off bushes and trees</td>
</tr>
<tr>
<td>Tufted Titmouse</td>
<td><strong>Insects</strong>, spiders, seeds</td>
<td><strong>Seeds</strong></td>
<td>Cracks open seeds to get the meat inside.</td>
</tr>
<tr>
<td>Purple Martin</td>
<td><strong>Flying insects</strong></td>
<td><strong>Flying insects</strong></td>
<td>Picks flying insects out of the air.</td>
</tr>
<tr>
<td>Carolina Wren</td>
<td><strong>Spiders</strong>, insects, berries</td>
<td><strong>Insect egg cases</strong>, hibernating spiders, berries</td>
<td>Gleans insects cases and hibernating spiders from tree bark</td>
</tr>
<tr>
<td>Bird Type</td>
<td>Diet/Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigo Bunting</td>
<td>Migrant – although there are seeds available in the winter, these birds rely on grass seeds, which are only last through the fall season and often are buried with snow and unavailable as food.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bobolink</td>
<td>Migrant – same as above, feed extensively in rice fields in Argentina in the winter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orchard Oriole</td>
<td>Migrant – although there are some dried fruits that persist through the winter, Orchard Orioles subsist mostly on fresh fruits and nectar.</td>
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</tr>
<tr>
<td>Eastern Bluebird</td>
<td>Migrant – diet consists primarily on insects, although small fruits will be consumed if the birds are under stress. Some bluebirds will stay through the winter, but most migrate slightly south.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blackpoll Warbler</td>
<td>Migrant – primarily eats insects and does not change over in its diet substantially except prior to its fall migration when it feeds on berries to bulk up for its migration to South America.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>House Finch</td>
<td>Resident – feeds its young insects, but relies primarily on seeds, especially those found at feeding stations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Cardinal</td>
<td>Resident – feeds its young insects, but relies primarily on seeds, especially those found at feeding stations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood Thrush</td>
<td>Migrant – feeds on invertebrates found in woodland habitats – especially on the forest floor, these creatures die, go into hibernation, or are covered with snow during winter months and are unavailable as a food source.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Robin</td>
<td>Migrant/resident – Majority migrate, but some winter over if there are enough berries for the birds to eat.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tufted Titmouse</td>
<td>Resident – feeds its young insects, but relies primarily on seeds, especially those found at feeding stations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purple Martin</td>
<td>Migrant – needs flying insects; cannot survive in New Jersey in the winter.</td>
<td></td>
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</tr>
<tr>
<td>Carolina Wren</td>
<td>Resident – expanded its range into New Jersey, especially southern Jersey; does well as long as there is not a persistent cold snap or snow cover for the entire season.</td>
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</tbody>
</table>
NAVIGATING THE SKY: PLOT A COURSE

BACKGROUND

Knowing that the geography of some areas trap migrants, that some habitats are suitable for migrants while others are not, and that migrants choose suitable habitat if available during migration, it is apparent that some places will become significant stopping sites for migrants. These important areas are known as stopover or staging areas.

The importance of a stopover site is simple, it is a place for the migrant to refuel and rest before continuing its journey. The primary goal of stopping for a migrant is to replenish fat reserves as fast as possible, while avoiding predation and expending as little energy as possible. If a migrant is unable to put on enough weight during a stopover, it has a smaller chance of surviving any problems encountered during the remainder of their flight or at their final destination. Conversely, if it takes too much time to reach an optimum weight, they will arrive too late on the breeding grounds and lose chances at the prime nesting sites, or perhaps not be able to breed at all.

Stopover locations are extensive throughout the world. These areas may not always be apparent to the casual observer, as they may not concentrate extraordinary numbers of larger, highly visible migrants. Throughout New Jersey is a plethora of varied stopover locations. Each is critical to the continued survival of migrant species. When most people think of migration in the state, the Cape May Peninsula comes to mind, but stopover locations are much more extensive. The many migratory bird corridors in the state include the ridge systems of the Kittatinny Ridge, the Central Highlands, the Hunterdon Plateau and the Sourland Mountains. These ridges are parts of an ancient system that have been used by migrants as a visual map for thousands of years. The forests along the slopes of these ridges are rich in food resources like insects and fruit. Other stopover locations include the major river corridors including the Delaware, the Hudson, the Passaic, and Hackensack Rivers. Riverside or riparian vegetation is a place of concentrated food sources and can also provide uninterrupted woodland resting areas.

Attending these river systems are huge wetlands. Major wetland systems like the Great Swamp near Basking Ridge, the Hackensack Meadowlands with its distant views of New York City, Trenton Marsh in the backyard of the state capitol, or Mannington Marsh in Salem County are rich feeding areas for migratory waterfowl and wading birds. Barrier islands that still have significant natural vegetation like Island Beach State Park, coastal marshes and nearby wooded areas also become prime stopping sites for migrants. Almost any forested or vegetated area is likely to meet the needs of migrants for a brief time, even the local neighborhood park, or an overgrown tangle in your backyard.

TIME
(2) 40-minute indoor sessions
Independent research and work time

SKILLS
Interpreting information, estimating, analyzing, formulating conclusions, synthesizing, justifying, communicating
CORE CURRICULUM CONTENT STANDARDS

Language Arts – 3.2B,C,D  3.3A,B,D  3.4A,B
Mathematics – 4.2D  4.5A,E
Science – 5.1A,B  5.3A,B,D  5.5D  5.8A
Social Studies – 6.1A,B,C,F  6.8A,B,C,E
Technology – 8.1C,D

KEY WORDS
Stopover site, latitude, longitude

PRIOR KNOWLEDGE / SKILLS
An understanding of how to read latitude and longitude

OBJECTIVES
Students will:
• Plot a bird’s migratory path using latitude and longitude.
• Explain about the bird’s life history including habitat and food preferences.
• Describe the bird’s journey based on the stops that it makes.

INSTRUCTIONAL METHODS
Classroom activity with creative writing

MATERIALS
• Navigating the Western Hemisphere (Figure 5)
• North and South America maps with latitude and longitude lines 
  (Worksheets #6 & #7)
• Reference materials

PREPARATION
1. Make enough copies of Figure 5 so that each student will be able to have one bird 
   species card (there will be overlap among species).
2. Make one copy of both the North America and South America continents 
   (Worksheets #6 and #7) for each student or pair of students.

SETTING THE STAGE
Ask students to estimate how many days it would take to drive from New Jersey to 
California (approximately 3,000 miles) if one drove about 500 miles a day. Discuss the 
types of things that you need to do in order to complete the journey (rest, refuel, eat).

THE ACTION
1. Distribute one bird species card to each student or pair of students. Tell the students 
   that each of the bird species migrants from one “rest area” to another in order to 
   complete their northerly journey in the spring.
2. Have students tape the South and North American maps together to make one map of 
   the Western Hemisphere.
3. Ask the students to plot the birds’ movements on a Western Hemisphere map using the latitude and longitude given on each card.
4. Have the students do research to determine the bird’s food and habitat preferences.
5. Ask students to write, and then share, a creative accounting of the bird’s journey using all the information that they have gathered.
6. Discuss with the students:
   a. In the context of this activity, how would you define a stopover site? *(an area where a bird will stop and rest during migration)*
   b. What do these sites provide for a migrating bird? *(resting area, food)*
   c. Do all birds require the same types of stopover sites? *(Some species will share the same types of habitats during migration because those habitats contain a plethora of food resources and rest areas; some birds prefer woodland habitats, while others prefer field or grasslands).*
   d. What do you think would happen to the bird if it were unable to find an appropriate stopover site? *(Without suitable stopover sites birds may not complete their migration, if birds do not get enough food to sustain them during migration they may not have enough energy to make it to the breeding grounds on time to get the best breeding sites)*

PULLING IT TOGETHER
Create a rubric for the students’ creative writing and presentations. Attributes to include: writing skills, creativity, factual information, and oral presentation skills.

RESOURCES
Latitude and longitude websites:
   United States – [http://www.nLogN.com](http://www.nLogN.com)
Map website:
   For maps of countries and continents – [http://www.lib.utexas.edu/maps](http://www.lib.utexas.edu/maps)
### NAVIGATING THE WESTERN HEMISPHERE

**Figure 5**

<table>
<thead>
<tr>
<th>MIGRANT SPECIES</th>
<th>LATITUDE / LONGITUDE OF STOPOVER SITE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WOOD THRUSH</strong></td>
<td>12° 46' 0&quot;N / 85° 37' 60&quot;W</td>
<td>3/28</td>
</tr>
<tr>
<td></td>
<td>15° 30' 0&quot;N / 88° 01' 60&quot;W</td>
<td>4/3</td>
</tr>
<tr>
<td></td>
<td>17° 23' 37&quot;N / 89° 38' 1&quot;W</td>
<td>4/10</td>
</tr>
<tr>
<td></td>
<td>18° 8' 60&quot;N / 90° 50' 60&quot;W</td>
<td>4/18</td>
</tr>
<tr>
<td></td>
<td>33° 39' 35&quot;N / 85° 49' 54&quot;W</td>
<td>4/23</td>
</tr>
<tr>
<td></td>
<td>39° 16' 50&quot;N / 80° 20' 41&quot;W</td>
<td>5/1</td>
</tr>
<tr>
<td></td>
<td>40° 26' 30&quot;N / 75° 20' 31&quot;W</td>
<td>5/13</td>
</tr>
<tr>
<td></td>
<td>41° 05' 19&quot;N / 74° 08' 39&quot;W</td>
<td>5/16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MIGRANT SPECIES</th>
<th>LATITUDE / LONGITUDE OF STOPOVER SITE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AMERICAN REDSTART</strong></td>
<td>04° 58' 60&quot;N / 74° 32' 60&quot;W</td>
<td>3/26</td>
</tr>
<tr>
<td></td>
<td>09° 10’ 0&quot;N / 78° 49’ 0&quot;W</td>
<td>4/10</td>
</tr>
<tr>
<td></td>
<td>18° 08’ 60&quot;N / 90° 50’ 60&quot;W</td>
<td>4/18</td>
</tr>
<tr>
<td></td>
<td>29° 34’ 0&quot;N / 94° 23’ 36&quot;W</td>
<td>4/20</td>
</tr>
<tr>
<td></td>
<td>34° 30’ 28&quot;N / 87° 43’ 43&quot;W</td>
<td>4/26</td>
</tr>
<tr>
<td></td>
<td>36° 07’ 19&quot;N / 79° 25’ 45&quot;W</td>
<td>5/1</td>
</tr>
<tr>
<td></td>
<td>39° 06’ 40&quot;N / 77° 50’ 03&quot;W</td>
<td>5/9</td>
</tr>
<tr>
<td></td>
<td>41° 06’ 48&quot;N / 74° 14’ 45&quot;W</td>
<td>5/13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MIGRANT SPECIES</th>
<th>LATITUDE / LONGITUDE OF STOPOVER SITE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INDIGO BUNTING</strong></td>
<td>10° 5’ 60&quot;N / 85° 58’ 0&quot;W</td>
<td>3/26</td>
</tr>
<tr>
<td></td>
<td>16° 45’ 0&quot;N / 89° 0’ 0&quot;W</td>
<td>4/8</td>
</tr>
<tr>
<td></td>
<td>18° 01’ 0&quot;N / 98° 19’ 0&quot;W</td>
<td>4/14</td>
</tr>
<tr>
<td></td>
<td>30° 16’ 30&quot;N / 89° 46’ 52&quot;W</td>
<td>4/16</td>
</tr>
<tr>
<td></td>
<td>35° 56’ 17&quot;N / 77° 47’ 27&quot;W</td>
<td>4/26</td>
</tr>
<tr>
<td></td>
<td>39° 25’ 39&quot;N / 75° 42’ 39&quot;W</td>
<td>5/11</td>
</tr>
<tr>
<td></td>
<td>40° 19’ 60&quot;N / 74° 36’ 03&quot;W</td>
<td>5/14</td>
</tr>
</tbody>
</table>
**NAVIGATING THE WESTERN HEMISPHERE**

Figure 5 continued

<table>
<thead>
<tr>
<th>MIGRANT SPECIES</th>
<th>LATITUDE / LONGITUDE OF STOPOVER SITE</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BOBOLINK</strong></td>
<td>31 37’ 60”S / 60 42’ 0”W</td>
<td>3/7</td>
</tr>
<tr>
<td></td>
<td>19 51’ 0”S / 43 43’ 60”W</td>
<td>3/15</td>
</tr>
<tr>
<td></td>
<td>10 11’ 60”S / 65 57’ 0”W</td>
<td>3/25</td>
</tr>
<tr>
<td></td>
<td>20 18’ 0”N / 76 02’ 60”W</td>
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<tr>
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<td>30 09’ 31”N / 85 39’ 37”W</td>
<td>4/8</td>
</tr>
<tr>
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<td>34 59’ 52”N / 78 19’ 25”W</td>
<td>4/18</td>
</tr>
<tr>
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<td>41 05’ 54”N / 74 41’ 20”W</td>
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<tr>
<th>MIGRANT SPECIES</th>
<th>LATITUDE / LONGITUDE OF STOPOVER SITE</th>
<th>DATE</th>
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<tr>
<td><strong>PURPLE MARTIN</strong></td>
<td>09 03’ 0”N / 69 45’ 0”W</td>
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<td>17 33’ 0”N / 88 07’ 0”W</td>
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<tr>
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<td>26 01’ 60”N / 97 58’ 0”W</td>
<td>3/9</td>
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<td>25 54’ 05”N / 97 29’ 50”W</td>
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<td>29 54’ 39”N / 90 06’ 39”W</td>
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<td>36 59’ 25”N / 86 26’ 37”W</td>
<td>4/1</td>
</tr>
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<td>39 0’ 11”N / 75 57’ 30”W</td>
<td>4/10</td>
</tr>
<tr>
<td></td>
<td>39 08’ 29”N / 74 51’ 12”W</td>
<td>4/15</td>
</tr>
</tbody>
</table>
WESTERN HEMISPHERE – South America
WORKSHEET #7