



Bird Migration in New Mexico

by Karen Herzenberg

The theme of migration can cover many topics in New Mexico, but the focus of this unit is on the species of migratory birds that make the Middle Rio Grande Valley of New Mexico their home for at least part of the year, and the importance of habitat here in the valley as well as in the places these birds call home during the rest of the year.

Suitable habitat may not be available in one location for all the stages of an animal's life and migration is an adaptation that addresses this issue. **Migration** is the seasonal, cyclic movement of a population of animals, which includes a return to their original location. Food abundance, nest site availability and the ability to tolerate seasonal variations in moisture and temperature are all factors that contribute to whether a particular animal species is migratory. The ability to fly, in some cases long distances, has made this strategy especially useful for birds because they can access a much larger variety of habitats over the course of a year than non-flying animals. The bird species with the longest annual migration is the Arctic tern with an almost pole-to-pole trip twice per year. Most migrations, however, are much shorter. Movements that are daily or a very short distance are not considered to be migration.



The riparian cottonwood forest, or bosque, of New Mexico's Middle Rio Grande Valley is part of a major route of travel for migratory birds. Most avian migration follows natural land forms such as coasts, mountain ranges and rivers. In North America, this occurs primarily in a north-south direction and the various species follow many different routes. Scientists and regulatory agencies in North America have divided up these routes into four flyways through which most migratory birds tend to confine their travels: Pacific, Central, Mississippi and Atlantic. These four flyways converge in Panama and then diverge again in South America.

Most of New Mexico lies in the Central flyway, though the western-most part of the state is considered to be part of the Pacific flyway. In our state, birds tend to travel along the Rio Grande and other rivers and the main mountain chains. Humans, too, have tended to travel along and settle in these locations. If you look at a map of New Mexico's rivers, you can see that many of the original human settlements and current large cities are located in riparian areas.

Avian migrants also converge at other bodies of water and forested areas in flat, open country along the way. These so-called "islands" include Rattlesnake Springs, a spring with riparian vegetation in the middle of the desert near Carlsbad, and the "Melrose Trap," a small patch of trees in the otherwise flat, open plains near Melrose.



Birders (people who observe birds as a recreational activity) travel to these locations during migration and are able to see many species of birds at once in a small area and often have the opportunity to see a rarity or a species that has wandered off its typical migratory route and is not expected in New Mexico. These areas near bodies of water and other habitat corridors or islands tend to have a higher number of avian species, or species richness, because of the habitat resources available. See Activity 22 “Mapping Species Richness” for a Grade 6-12 level classroom activity on this topic.

About 500 of the world’s approximately 10,000 bird species have been reported over the last 100 years in New Mexico. About 100 of these are year-round **residents**. These birds have adapted to the climate and geography of New Mexico and are able to find the water, food, shelter and territory (**habitat**) they need to both nest and over-winter. Just because a species is found in New Mexico year-round, does not mean that its range is limited to New Mexico. For example, New Mexico’s state bird, the Greater Roadrunner, is a year-round resident but can be found living throughout the Southwestern US.

Most other birds observed in the Middle Rio Grande Valley of New Mexico are migratory: they spend only part of the year here and the rest of the year in other locations. Some are here only in summer, some only in winter and others make a brief stopover on their way between their wintering and nesting grounds. New Mexico’s Bosque del Apache National Wildlife Refuge is world-famous for the large numbers of waterfowl and Sandhill Cranes that spend the winter there. The sights and sounds of the Sandhill Cranes’ arrival in New Mexico go hand-in-hand with the smell of roasting green chile to announce the beginning of autumn. The following section will highlight several species that follow these migratory patterns.

Hummingbirds

There are more than 300 species of hummingbirds in the world (all in the Americas) and they are adapted to many different habitats including deserts and rainforests and locations at sea-level up to mountain environments above 4,000 meters (13,000 feet). They are primarily nectar-feeders but they eat insects too, and must have insect-protein in order to raise healthy young.



Black-chinned Hummingbird nestlings

photo by Laurel Ladwig

Hummingbirds are astonishing for many reasons. They can fly backwards, upside-down and hover. They are avian record-holders for the most wingbeats per minute and for their extraordinary metabolisms. They are among the smallest birds in the world (adults of most species compare in weight to a penny and the eggs of most species are about the size of a dry pinto bean) and yet some of them migrate huge distances, non-stop, over water.



Four species of hummingbird are typically observed in New Mexico and all are migratory. Broad-tailed and Black-chinned Hummingbirds spend their nesting season here (mid-April through mid-October). Broad-tailed prefer higher elevation habitats and Black-chinned lower, such as the bosque. Black-chinned hummers are the primary patrons of New Mexico's backyard hummingbird feeders. Two other species, Rufous and Calliope Hummingbirds, are observed moving through New Mexico during late summer and early fall. Rufous hummers fight with the Black-chinned over backyard feeders; Calliope are only infrequently observed in urban and rural locations.

North American hummingbirds, along with about 75% of migrants that fly south of the border, go to Mexico and Central America. Only 25% of North America's migratory birds go further into South America.

Human impact on habitat and threats to birds

Humans have had a huge impact on migratory birds. Because of increased human population size and specific human behaviors, migratory birds are facing many threats including decreased habitat, predation by cats, collisions with windows and wind turbines, disorientation due to light pollution and, of course, climate change. Thankfully, humans are now engaged in efforts to decrease these threats around the world and in New Mexico.

The United States is made up of many different biomes and ecosystems which provide suitable habitat for a great diversity of wildlife. There are coastlines, mountains, deserts, prairies, tundra, wetlands and swamps amongst many others. A diversity of birds (and other living things) requires a diversity of habitats. All of these areas include people and have been affected by our activities.



Hairy Woodpecker nestling in cottonwood cavity

photo by Laurel Ladwig

Habitat has been lost at a great rate over the last 150 years due to increases in human population and population density. In urban areas, "empty" lots have been paved, wetlands have been filled in and much of the landscape is "hardscape:" pavement, concrete, stone and metal. Rural areas have seen many thousands of acres of rangeland overgrazed, forest cleared for timber. Various types of habitat have been converted into huge agricultural fields that are chemically treated to prevent other types of plants (or insects) from growing there. Due to habitat loss, birds find fewer stopover points along migration routes. All of these factors have contributed to a decline in bird numbers and diversity in both rural and urban areas. See Activity 23 for a grade 2-6 activity related to avian habitat loss, "Crane Migration."



Climate change only worsens these effects. Some species of birds have begun to migrate or nest earlier, corresponding with earlier warm temperatures. This is problematic because the plants or prey needed to survive migration or to raise young may not yet be available earlier in the year. Conversely, some populations of insects now hatch out or end dormancy earlier, becoming available before birds have begun breeding and effectively making them unusable as a food source for nesting birds. Birds' ranges are changing as well. For example, some birds that formerly were only seen in the southern part of New Mexico have begun to appear with some regularity in the Albuquerque area. Increases in severe weather events due to climate change such as drought and heavy rainstorms have an impact on avian life as well. Growing numbers of wildfires and escalating fire severity are destroying vast swaths of forest habitat with effects made worse by years of fire suppression. Coastal wetlands and deltas have been altered by tropical storms and by rising sea levels. All of these shifts affect not only birds, but humans as well.

Research and monitoring of birds

People are beginning to make the changes necessary to address threats to birds, including climate change. Many projects are underway to increase, improve and restore bird habitat in urban and rural areas. Long-term monitoring by professional researchers and citizen scientists has paved the way for us to address the effects of climate change (including loss of habitat). Bird banding is one of many such efforts. Research collected by banders can contribute to habitat conservation efforts, to education about threats to birds and to advances in the science of climate change.

Bird banding is a method of monitoring in which birds are captured, tiny metal or plastic bands engraved with unique identification numbers are placed on one or both of their legs, data about the birds are collected and, finally, the birds are released. All of this occurs over a span of minutes. If and when the birds are recaptured by other scientists or rescuers of injured birds, or found dead, the person encountering that bird can report the band number to the U.S. Geological Survey at the web site <https://www.pwrc.usgs.gov/bbl/bblretrv/index.cfm>. If nothing else, the original banding data together with recapture data can give insights as to the bird's age and the distance it traveled. Most birds are not recaptured repeatedly but for those that have been, information about a particular bird's life can contribute to the big picture of the natural history of that species. All of the data together from banders throughout the world and over the course of scores of years begins to show patterns in timing and movement, and this information, when compared with other knowledge and data about natural history and climate, can help us to understand and inform our past, present and future actions.

Rio Grande Bird Research (RGBR) is a team of biologists and volunteers who have been monitoring songbirds at the Rio Grande Nature Center State Park since 1979. Like similar data collected around the world, their work shows some dramatic changes in bird populations and habits over this period in time. The lessons in this section are based on data collected by RGBR.

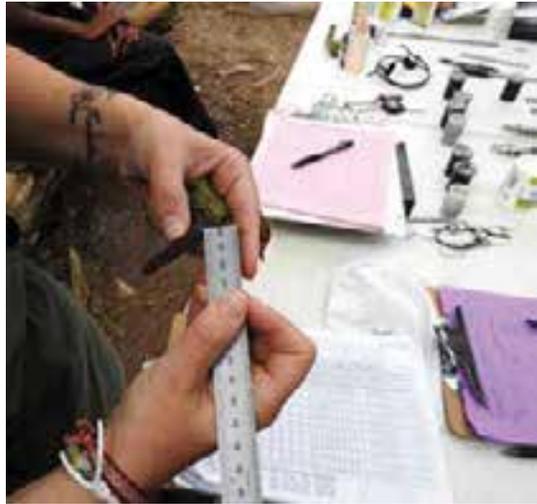
The Rio Grande Bird Research banders conduct monitoring either once or twice a week for ten week periods in fall and winter. They do not band birds at the Park



during breeding season. The duration of each daily monitoring session is six hours.

Twenty 2 x 6 meter (6 x 20 foot) mist nets are set up between poles at different locations around the premises of the Park just before dawn. Mist nets are lightweight mesh with holes for the capture of songbirds (see photo at right). Occasionally an insect or hummingbird is caught or, at the other end of the spectrum, a raptor or a roadrunner. The banders go on a round checking for captured birds every 25 minutes. Any birds that are caught are gently removed from the net, placed in a small cloth bag for their protection and brought to the banding station.

Each bird's species and its time & place of capture are logged in and the following data are collected for each bird: band number (new or recapture), wing and tail length; weight; condition of wing, tail and body feathers; and amount of muscle and fat present. Using these data and other observations of plumage, the species (and sometimes subspecies) is identified and the age and sex of some birds can be determined. Information about weather conditions and other birds and animals observed during the course of the monitoring session is also recorded. All of these data are then logged into the bird banding database where they become accessible to scientists all over the world.



Photographs by Laurel Ladwig

"But to the old timer the banding of new birds becomes merely pleasantly routine; the real thrill lies in the recapture of some bird banded long ago, some bird whose age, adventures, and previous condition of appetite are perhaps better known to you than to the bird himself."

- Aldo Leopold, *A Sand County Almanac*



A note about names

Birds and other animals and plants have many common names (see the box below about Greater Roadrunners) and because of this, there can sometimes be confusion about which thing is being discussed. Sometimes it doesn't matter (you say toe-may-toe, I say toe-mah-toe) but in other contexts it can be important: it can mean life or death if we're discussing which mushrooms are or are not edible! For more information about scientific names, see the background section of Activity 10, "A Rose by Any Other Name."

In addition to names, scientists use four-letter "alpha codes" to save time when collecting data or writing notes. If the name is one word, the code will be that word's first four letters (MALL for Mallard). If the name is two words, the code will usually be the first two letters of each name (COHA for Cooper's Hawk). If the name includes a hyphenated first name, the code uses the first letter of the first hyphenated word, the first letter of the second hyphenated word and the first two letters of the second word (WCSP for White-crowned Sparrow). There are a few exceptions like LAZB for Lazuli Bunting which differentiates it from LARB for Lark Bunting...otherwise they'd both be LABU. There are also six-letter codes in use, but, for the purpose of this curriculum we will stick with the four-letter codes.

The Migratory Bird Treaty Act

The Migratory Bird Treaty Act regulates the acquisition, possession and disposal of migratory birds in the U.S. and is administered and enforced by the U.S. Fish and Wildlife Service. Living or dead birds, and their feathers, bones, nests and eggs may only be handled according to special regulations — and law-breakers may face time in prison and up to \$10,000 in fines. Scientists, bird rehabbers, bird banders and other professionals receive special training so that they may work with these protected species, and are then issued a permit which must be renewed annually. For more information on the act, contact the U.S. Fish and Wildlife Service's Migratory Bird Program or visit <https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php>.





Interesting Facts About Bird Migration

- 1) About 40% of the world's 10,000 birds migrate regularly. Even birds that don't fly may migrate, including some species of penguins (they swim) and Australia's emus (they walk).
- 2) The Bar-headed Goose is the highest-flying migrant. It reaches altitudes of up to 8.8 kilometers (5.5 miles) above sea level - more than twice as far above sea level as the highest mountains in New Mexico!
- 3) The Great Snipe maintains speeds of up to 96 kph (60 mph) over the course of its 6,800 kilometer (4,200 mile) migratory path. No other bird (or other animal of any kind) travels at such high speeds for such long distances.
- 4) The Arctic Tern, is the world's leader in miles logged per year. These birds fly twice annually between the Arctic and Antarctica!
- 5) The Swainson's Hawk has the one of the longest migrations of any raptor found in North America. It spends the breeding season in open lands from Alaska to northern Mexico and winters in Argentina. Swainson's Hawks can be found nesting in grasslands and agricultural lands throughout New Mexico.
- 6) Some Lesser Sandhill Cranes (a subspecies of the Sandhill crane) breed in Siberia but winter in New Mexico!
- 7) The Bar-tailed Godwit flies the longest distance non-stop of any bird: 11,000 kilometers (7,000 miles) from Alaska to New Zealand in just 8 days!
- 8) **Hyperphagia** is a state in which birds bulk up on food prior to migration in order to store fat that they'll use during long and often non-stop journeys. Some birds almost double their body weight during hyperphagia! For example, a Prothonotary Warbler was captured during migration by Rio Grande Bird Research at the Rio Grande Nature Center State Park. This is an Eastern species and so it was way off course, maybe blown in by a storm system. It was captured twice. When first measured it scored a low number for the amount of fat present on its body. It was recaptured a week later and scored the highest number possible.

Adapted from National Audubon's *Nine Awesome Facts about Bird Migration* (<https://www.audubon.org/news/9-awesome-facts-about-bird-migration>)

MIGRATION - by Linda Rockwell

*While you were sleeping last night
I flew 300 miles without stopping or eating.
An ounce of bright feathers, heart, muscle,
And bones as light as air.
Danger everywhere:
Predators, exhaustion, windows that look like sky.
Today I eat seeds in your garden.
You do not notice a miracle.*



Selected Bosque Bird Information Cards

Some bird species can be found all year at one location and are considered “year-round residents” of that location. Other species are present at a location only during certain times of year and are considered “migrants.” They may be present during breeding season, wintering season or during spring or fall (or both) migrations.

Each of the following cards represents one of these categories of migratory status and presents photos and information about a New Mexico bird that fits the category. Teachers could use the cards as background reading for themselves or students or as part of an activity of some kind with students. For example, individual students or groups could be in charge of presenting information from the cards to the rest of the class; the cards could be used as a springboard for further research on birds of New Mexico or students could prepare some kind of graphic comparing the migratory status of the different birds in order to teach others in the school community.

In addition to the seven cards below, use the list “Migratory Birds Frequently Found in New Mexico” in this chapter for extension activities in conjunction with these cards or independently.



Newly banded Lazuli Bunting

Photograph by Laurel Ladwig



Year-round Resident

Greater Roadrunner (*Geococcyx californianus*)

The Greater Roadrunner is a member of the family of birds called Cuckoos. Birds in the cuckoo family can be found throughout the world and are adapted to many different environments. The Greater Roadrunner favors arid lands like New Mexico and is year-round resident here. Not surprisingly, roadrunners are often found on or along roadways and edges of agricultural fields in rural as well as more urban areas like Albuquerque. They are adapted to living around humans and consequently are known by many different regional names (roadrunner, paisano, chaparral and correcaminos are just a few used in New Mexico).



Photograph by Laurel Ladwig

Summer Resident

Black-chinned Hummingbirds (*Archilochus alexanderi*)

Black-chinned Hummingbirds are among the most adaptable of all hummingbirds and are found in urban areas and recently disturbed natural areas as well as pristine natural areas. They winter along the Pacific coast of Mexico and Central America and migrate north to breeding grounds that extend from northern Mexico up into southern Canada. In the southwestern US, they are most common in canyons and along rivers. They are in New Mexico from about mid-April through mid-October and are the most common nesting bird in the bosque.



Photograph by Laurel Ladwig



Winter Resident

Sandhill Crane (*Grus canadensis*)

Sandhill Cranes nest in wetlands near the Rocky Mountains in Colorado and north into Canada. Some individuals of a subspecies called the Lesser Sandhill Crane actually travel all the way to Siberia to nest. These birds begin to arrive in New Mexico in September in pairs, trios and fours: family units with young of the year. Later in September and on into October, huge, high-flying flocks arrive or stop-in on their way to parts further south. Over the winter, thousands of Sandhill Cranes reside throughout New Mexico. They migrate back to northern nesting grounds in February and March.



Photograph by Laurel Ladwig

Spring and Fall Migration

Wilson's Warbler (*Cardellina pusilla*)

Wilson's Warblers pass through our area during migration. They can be found in Albuquerque in April through June when traveling north to their breeding grounds and August through October when heading back south for the winter. They migrate at night either singly or in small groups of other Wilson's Warblers or other warbler species. Wilson's Warblers eat mostly insects and occasionally berries and look for suitable habitat during migration. They are most often found near the bosque but can be seen throughout the city, gleaning trees for insects. They breed throughout Alaska and Canada and there are small pockets of birds that breed more southerly in the American west. They build a cup-shaped nest on the ground under bunches of grass or at the base of shrubs.



Photograph by Laurel Ladwig



Summer Resident

Yellow-billed Cuckoo (*Coccyzus americanus*)

Yellow-billed Cuckoos nest in the Rio Grande bosque. The timing of their breeding is tied to the local food supply. They begin breeding when food is abundant and their entire breeding cycle takes only 17 days, from egg-laying to fledging. Within minutes after they are born, baby cuckoos can climb and perch using their feet and bills. The nestlings have bursting feather sheaths which allow them to transform into fully feathered young cuckoos in only two hours. The western sub-species was classified as threatened in October 2014 and much of the Middle Rio Grande bosque is designated as critical habitat for the species. It is usually heard rather than seen.



Photograph by Laurel Ladwig

Listen to the sounds made by Yellow-billed Cuckoos:

https://www.allaboutbirds.org/guide/Yellow-billed_Cuckoo/sounds

Winter Resident

White-crowned Sparrow (*Zonotrichia leucophrys*)

White-crowned Sparrows winter here and can be found in flocks along roadsides and in grain fields, and close to thickets and shrubs. White-crowned Sparrows have magnetite in the fascia of their heads and necks that may make them capable of magnetic navigation. Because male White-crowned Sparrows learn the songs they grow up with and typically breed close to where they were raised, song dialects frequently form. Males on the edge of two dialects may be bilingual and able to sing both dialects. A migrating White-crowned Sparrow was once tracked moving 480 kilometers (300 miles) in a single night. Alaskan White-crowned Sparrows migrate about 4000 kilometers (2,600 miles) to winter in Southern California. The oldest recorded White-crowned Sparrow was 13 years 4 months old.



Photograph by Laurel Ladwig



Variable. Present year-round.

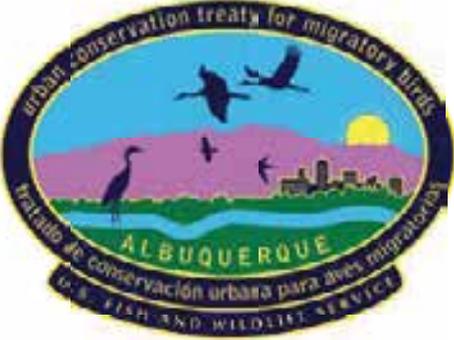
Chipping Sparrow (*Spizella passerina*)

Chipping Sparrows are present in the Albuquerque area throughout the year. They are most often observed in town during migration and are also found in low numbers in the winter. During breeding season they are most easily observed in the mountains and foothills. Chipping Sparrows can be seen in trees, but also forage on the ground. They eat seeds from a variety of grasses and add extra protein to their diet during breeding season by eating insects.



Photograph by Ashli Maruster Gorbet

Written and edited by Letitia Morris, Karen Herzenberg and Laurel Ladwig.



**More information:*****Bosque Education Guide***

<http://www.nmnaturalhistory.org/bosque-education-guide.html>
Some curriculum materials and activities are available in Spanish.

Rio Grande Bird Research

http://www.rgbr.org/RGBR_site/Rio_Grande_Bird_Research.html

About bird banding

<https://www.pwrc.usgs.gov/BBL/homepage/aboutbanding.cfm>

Reporting banded birds

<http://www.fws.gov/birds/surveys-and-data/bird-banding/reporting-banded-birds.php>

Bird threats

<http://abcbirds.org/threats/>

US Fish and Wildlife Service Migratory Bird Division

<http://www.fws.gov/birds/about-us.php>

Spanish version available: <https://www.fws.gov/birds/grants/neotropical-migratory-bird-conservation-act/nmbca-espanol.php>

Audubon article on the Migratory Bird Treaty Act

<https://www.audubon.org/news/the-migratory-bird-treaty-act-explained>

Bird banding codes chart

<https://www.pwrc.usgs.gov/BBL/manual/speclist.cfm>

All About Birds is an online guide to birds of North America which includes images, sounds, identifying features, range maps and life history of hundreds of birds.
<https://www.allaboutbirds.org>

Audubon's guide to birds of North America is available in Spanish here:
<http://www.audubon.org/es/guia-de-aves>

Migratory Birds Frequently Found in New Mexico

Migratory species mentioned / described within this introduction and associated lessons are marked with an asterisk(*).

Students could research any of these species to expand their knowledge of New Mexico migrants.



Snowy Egret (<i>Egretta thula</i>)	Calliope Hummingbird* (<i>Selasphorus calliope</i>)
Green Heron (<i>Butorides virescens</i>)	Broad-tailed Hummingbird* (<i>Selasphorus platycercus</i>)
Snow (<i>Anser caerulescens</i>) and/or Ross' Goose (<i>Anser rossii</i>)	Rufous Hummingbird* (<i>Selasphorus rufus</i>)
American Wigeon (<i>Mareca americana</i>)	Western Kingbird (<i>Tyrannus verticalis</i>)
Northern Shoveler (<i>Spatula clypeata</i>)	Barn Swallow (<i>Hirundo rustica</i>)
Green-winged Teal (<i>Anas crecca</i>)	Yellow Warbler (<i>Setophaga petechia</i>)
Canvasback (<i>Aythya valisineria</i>)	Wilson's Warbler* (<i>Cardellina pusilla</i>)
Ring-necked Duck (<i>Aythya collaris</i>)	Common Yellowthroat (<i>Geothlypis trichas</i>)
Hooded Merganser (<i>Lophodytes cucullatus</i>)	Yellow-breasted Chat (<i>Icteria virens</i>)
Turkey Vulture (<i>Cathartes aura</i>)	Summer Tanager (<i>Piranga rubra</i>)
Swainson's Hawk*(<i>Buteo swainsoni</i>)	Western Tanager (<i>Piranga ludoviciana</i>)
Ferruginous Hawk*(<i>Buteo regalis</i>)	Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	Blue Grosbeak (<i>Passerina caerulea</i>)
Osprey (<i>Pandion haliaetus</i>)	Lazuli Bunting* (<i>Passerina amoena</i>)
Sandhill Crane* (<i>Antigone canadensis</i>)	Chipping Sparrow* (<i>Spizella passerina</i>)
Ring-billed Gull (<i>Larus delawarensis</i>)	White-crowned Sparrow* (<i>Zonotrichia leucophrys</i>)
Yellow-billed Cuckoo* (<i>Coccyzus americanus</i>)	Dark-eyed Junco (<i>Junco hyemalis</i>)
Spotted Sandpiper (<i>Actitis macularius</i>)	Bullock's Oriole (<i>Icterus bullockii</i>)
Common Nighthawk (<i>Chordeiles minor</i>)	Pine Siskin* (<i>Spinus pinus</i>)
Black-chinned Hummingbird* (<i>Archilochus alexandri</i>)	American Goldfinch* (<i>Spinus tristis</i>)



47.

Who Flew Where?

Description: Students explore bird migration using actual banded bird recovery data; students measure a scaled distance of where 20 different birds were found from where they were originally banded. A second part has students locating those places on a map of western North America.

Objective: Students will see and understand the distances some birds fly in their migration. Students will be able to identify that appropriate habitat is critical to birds' survival in breeding, migrating and wintering locations.

Materials: **Part A**

- Bird Recapture Data cards showing 20 different individual birds on the Rio Grande Bird Research recapture list (there are 11 species included)
- Measuring tape (25 - 50 meter is best)
- Master copy of data page for teacher
- Space that is at least 43 meters / 130 feet long; could be hallway, gym, school yard.

Part B

- Copies of map for each student or small group
- Copies of "Who Flew Where" Banded Bird Recaptures data sheets for each student or group
- Maps, atlases, computer for map search-- for student use
- Bird Recapture Data cards used in Part A
- Scissors
- Tape and/or glue

47. Who Flew Where?

Grades: 4-8

Time: at least 2 class periods

Subjects: science, social studies / geography, math

Standards: see end of migration activities

Terms: *migration, bird banding, habitat, ornithologist, range*



Background: Through bird banding, biologists are documenting the health, size, age, and travels of birds. The Bird Banding Laboratory makes this statement about what has been learned through banding birds:

“In this way we have learned that some species go south in one pathway and return north by another pathway. Nesting and wintering grounds have been located for some species, and specific nesting grounds have been connected to specific wintering areas. The Arctic Tern makes the longest migration flight of any living species, making an annual round trip flight of 40,234 km (25,000 miles). The migration routes used by this species have been determined by band recoveries in part.”

This activity uses data from Rio Grande Bird Research and their long-term banding project at the Rio Grande Nature Center State Park, in Albuquerque’s bosque. They do band a few other places such as Bosque del Apache National Wildlife Refuge, Capilla Peak in the Manzano Mountains, and beginning in 2014, Valle de Oro National Wildlife Refuge.

NOTE: Rio Grande Bird Research primarily bands birds during the fall and early spring. The majority of birds they band are migrating or wintering and that is shown in the map the students create. *Birds that breed in the Albuquerque area and fly south for the winter are typically not banded*, because the group does not band during the nesting season and they are already headed south when banding starts in the fall.

Procedure:

- ♣ Class discussion about migration and bird banding:

What is the connection between people and birds? What is important about birds?

Think, pair share: Give a few minutes for students to individually think about this. Then have them discuss in small groups, finally ask the whole class to share their ideas.

Why do scientists study birds? What can we learn by studying birds?

Bird scientists or **ornithologists** use different techniques to study birds. Field ornithologists may observe birds in the wild using binoculars. **Bird banding** is one way field ornithologists monitor wild birds. We can determine the **range** of that species, where that type of bird can be found through its lifetime.



How can we define migration?

♣ Warm-up activity.

Some of the birds are wintering in this area, some are nesting, some are migrating through, and some are here year-round.

Can you think of birds you have seen only in the summer here?

Can you think of birds you have seen only in the winter in New Mexico?

Can you think of birds that you can see all year round in your neighborhood?

Put the following bird names on the board, ask the students to match the bird with its migratory status.

Greater Roadrunner -- (year-round resident in New Mexico)

Black-chinned Hummingbirds -- (nest in New Mexico, migrates south for the winter)

Sandhill Crane -- (nests far to the north, migrates to New Mexico and stays the winter)

You can share information from the Introduction section about each of these three species and additional species from the selected bosque bird information cards.

What is bird banding?

Bird banders catch birds in large nets called mist nets. They then observe the birds closely and record data about them. Banders put a ring around the bird's leg that is imprinted with a unique number. If someone finds a banded bird they should report it to the US Fish and Wildlife Service; the information is then relayed back to the original banders.

What are scientists learning by catching the birds and banding them that they wouldn't know just by looking at them? (Also, see Introduction).

Bird Banders find out the age, sex of the bird, measure their wing & tail length, weight, amount of fat & muscle, and the amount of feather wear. This provides information about the health of each bird.

If a banded bird is recaptured, what can we find out from that?

This is the activity we will be doing now--focusing on bird banding recapture data from the Rio Grande Bird Research team.

This activity focuses on the scaled distances between where birds were banded and later recaptured. The second section has students locate those places on a map. Students can see that birds do not stay in a narrow corridor--they have wings and can fly in many directions.



Part A

- Hand each student a Bird Recapture Data card. There are 20 different cards, make additional copies to duplicate a few species, if needed for your class size.

Have the students look at the distance between the location banded and location recaptured.

- Have everyone line up by distance.

Spread out according to the scaled distance for the activity.

Determine a starting point at one end of your large space--that will be Albuquerque.

Tip: if the area has standard floor tiles that are one-foot square, use the "feet" measurement for this activity--with students counting the tiles for the distance. Otherwise, students will need to use meter sticks or measuring tape; the longest / farthest is 43 meters / 130 feet.

- Pull the group back and have each student tell:

Kind of bird?

Where banded?

Where recaptured?

How many kilometers between location banded and location recaptured?

There are several birds of the same species that have been recaptured. Have students with the same species gather together and compare similarities and differences of each one--Where were they banded and recaptured? It lived at least how long, etc?

What do birds need to survive?

- All animals need appropriate **habitat**. Review what habitat is:

Food, water, shelter, space in the appropriate arrangement

Finding these birds where they were first banded shows that there was appropriate habitat for them at that time.

Identify elements of appropriate habitat for some of the species of banded birds.

How can we as citizens and land managers ensure that appropriate habitat is here when birds migrate through? Answers will vary.

What is the furthest distance for any band recovery related to Rio Grande Bird Research? Note: it was banded elsewhere and recovered in Albuquerque.

Originally banded in Fairbanks, Alaska, recaptured by RGBR in Albuquerque: 4319 kilometers, 2684 miles away.



Which bird banded by Rio Grande Bird Research in Albuquerque was recovered the greatest distance away? How far was this? Where was it recovered?

Leduc, Alberta, Canada: 2110 kilometers, 1311 miles

Two birds were banded elsewhere in New Mexico—Where? Where were they later found?

White-crowned Sparrow: Banded at Bosque del Apache, New Mexico on 11-21-1999, found in Quincy, California on 11-6-2002

Ferruginous Hawk: Banded in Catron County, New Mexico on June 18, 1997, found in San Carlos, Arizona on August 8, 1997

Part B

- ♣ Hand out the map page to each student or small group. Printing the map on 11 x 17 paper makes it large enough for the activity.
- ♣ Hand out the one page “Who Flew Where” Banded Bird Recaptures data sheet.

There are circles with bird silhouettes and a four-letter name on each circle along the right and left margins of the paper. Students will be cutting out those circles and placing them on the map in the proper location where they were found.

The locations are noted with the name of the nearest town, as well as longitude and latitude. There are two versions of the map of Western North America: one with stars showing the locations where birds were found, and one without the stars--students will need to use the latitude / longitude lines to correctly place them.

- ♣ Students should glue or tape the icon of the bird to the location where they were found on the map. Draw arrows from the banding location to the recapture location.

You may want students to use maps, atlases or the internet to find the communities where some of the birds were found.

Have students add the names of the states (and Canadian Provinces) to their map.

Have students color-code the bird species icon and the appropriate star, and place the icon near the star. There are 11 species, pick colors for each.

Is this a map of birds that typically nest in Albuquerque? Reside year-round in Albuquerque? Winter in Albuquerque?

- ♣ Using the Bird Recapture Data cards from Part A section above, look at the dates when the birds were banded and the dates when recaptured.

Rio Grande Bird Research primarily bands birds during the fall and early spring. The majority of birds they band are migrating or wintering and that is shown in the map. Birds that breed in the Albuquerque area and fly south for the winter are typically not banded because they are not present at this time of the year.



What patterns can you see by looking at your finished map?

Answers will vary, but most go north to south. Most birds nest in the north and fly south for the winter.

What areas need appropriate habitat for birds that are residents or migrants?

Answers will vary--but good habitat at stopover spots during migration are extremely important. They must be able to feed and build up their fat stores for continued flight. So there must be proper habitat throughout their migration path.

Assessment:

- Have students describe the seasonal pattern of bird migration.
- Have students draw their own bird migration map.
- Are students able to find locations by longitude and latitude?
- Have students write an argument about the human impacts on migrating birds. [Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.]
- Have students write an argument about the behaviors of birds to allow them to survive different seasons. [Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors affect the probability of successful reproduction.]

Extensions:

- **Phenology Challenge:**
Have students record when they see the first migrating Sandhill Cranes arriving in the fall, and heading north in the spring.
When do the first hummingbirds arrive in the spring?
- Students can research a variety of New Mexico migrants using the list in the Introduction.
- Visit the eBird website. Students can click on “Explore Data” and there are options to look for information in various ways. Probably the most “student-friendly” would be “Species Maps” and “Bar Charts.” By clicking on “Species Maps” students can explore where in the world a particular species of bird is found and then can narrow the search to certain times of the year or certain locations in the world. By clicking on “Bar Charts,” students can explore shifts in numbers of birds seen at a particular location throughout the year.
- Compare the map the students made with maps of other bird migration flyway maps. How does theirs compare? There are 20 data points on the map they made, many, many more records are assembled to make the national maps. But it takes years of research to be able to make such a map.
- Compare the age of the birds--find the longest to shortest time between banding and recapture. Recapture does not necessarily indicate death, but does give a hard number to researchers to know that an individual bird lived at least that long.



- Calculate the number of months between banding and recapture, and list the birds in the order of how long we know they lived. Here are some of the answers:

What is the longest time between banding and recapture?

American Kestrel: 57 months, May 29, 1996 to March 21, 2001

White-crowned Sparrow: 35 months, November 21, 1999 to November 6, 2002

Song Sparrow: 29 months, October 1, 1996 to March 10, 1999

White-crowned Sparrow: 27 months, October 7, 1996 to January 28, 1999

House Finch: 26 months November 6, 1988 to January 21, 1991

- Students can research each species to identify where each one breeds--which were banded on likely breeding locations?
- Students can research bird migration records--some birds fly from the far north to the far south two times a year--an astounding feat for a small animal.
- Research bird banding--look for images of the nets, pliers, bands etc., used to band birds. Who bands birds?
- Research the type of habitat the birds needed where they travelled to or from--for example, an AMGO (American Goldfinch) was banded in Albuquerque in the bosque, but found in Heber, Utah. What habitat is in the area of Heber, Utah?
- Students can research threats to birds: habitat reduction, predation by pets, collisions with windows and wind turbines, disorientation due to light pollution and climate change.

Resources/References:

eBird is a searchable online database of bird sightings throughout the world. Many of the sightings were entered by citizen scientists. Teachers and students may be familiar with eBird because of the annual Great Backyard Bird Count. <http://ebird.org/content/ebird/>

National Geographic publishes a map, Migration Flyways of North America, that can be purchased here (in the past it was a supplement to the magazine)

<http://shop.nationalgeographic.com/ngs/product/maps/wall-maps/specialty-maps/bird-migration-in-the-americas-thematic-map?npd&npd&code=SR50002&code=>

Interactive map documenting migratory movements of bird populations spanning the entire year for 118 species throughout the Western Hemisphere prepared by

Cornell Lab of Ornithology

<https://www.allaboutbirds.org/mesmerizing-migration-watch-118-bird-species-migrate-across-a-map-of-the-western-hemisphere/>

Partners in Flight / Compañeros en Vuelo / Partenaires d'Envol was launched in 1990 in response to growing concerns about declines in the populations of many land bird species at their wintering grounds. <http://www.partnersinflight.org>

Who Flew Where?

Banded Bird Recaptures, Rio Grande Bird Research, Inc.



(1) **Sharp-shinned Hawk** Williamsburg, NM (33°N 107°W)
Banded: October 12 1995 · Recaptured: October 27, 1997



Fairbanks, Alaska (64°N 147°W) **White-crowned Sparrow (11)**
Banded: August 26, 1991 · Recaptured: October 30, 1993



(2) **Cooper's Hawk** Salt Lake City, UT (40°N 111°W)
Banded: August, 28, 1995 · Recaptured: April 12, 1996



Quincy, California (40°N 121°W) **White-crowned Sparrow (12)**
Banded November 21, 1999 · Recaptured November 6, 2002



(3) **Ferruginous Hawk** San Carlos, Arizona (33°N 110°W)
Banded: June 18, 1997 · Recaptured: August 8, 1997



Ogden, UT (41°N 111°W) **Lazuli Bunting (13)**
Banded: August 20, 1989 · Recaptured: May 4, 1991



(4) **American Kestrel** Albuquerque, NM (35°N 106°W)
Banded: May 29, 1996 · Recaptured: March 21, 2001



Albuquerque, NM (35°N 106°W) **House Finch (14)**
Banded: November 6, 1988 · Recaptured: January 21, 1991



(5) **Song Sparrow** Lander, WY (42°N 108°W)
Banded: October 26, 1997 · Recaptured: April 8, 1998



Tijeras, NM (35.08°N 106.37°W) **Pine Siskin (15)**
Banded: November 6, 1996 · Recaptured: December 30, 1996



(6) **Song Sparrow** Durango, CO (37°N 107°W)
Banded: October 1, 1996 · Recaptured: March 10, 1999



Tijeras, NM (35°N 106°W) **Pine Siskin (16)**
Banded: October 13, 1995 · Recaptured: February 1, 1996



(7) **White-crowned Sparrow** Bosque del Apache, NM (33°N 106°W)
Banded: November 17, 1990 · Recaptured: April 7, 1991



Pojoaque, NM (35.89°N 106.00°W) **Lesser Goldfinch (17)**
Banded: September 30, 1996 · Recaptured: August 19, 1998



(8) **White-crowned Sparrow** Leduc, Alberta, Canada (53°N 113°W)
Banded: January 10, 1978 · Recaptured: May 12, 1978



Raton, NM (36.89°N 104.44°W) **Lesser Goldfinch (18)**
Banded: September 6, 1996 · Recaptured: August 9, 1998



(9) **White-crowned Sparrow** Prescott, AZ (34°N 112°W)
Banded: October 7, 1996 · Recaptured: January 28, 1999



West Jordan, UT (40°N 111°W) **American Goldfinch (19)**
Banded: January 25, 2003 · Recaptured: August 16, 2004



(10) **White-crowned Sparrow** Evans, CO (40°N 104°W)
Banded: April 15, 1994 · Recaptured: later in 1994



Heber, UT (40°N 111°W) **American Goldfinch (20)**
Banded: October 12, 1996 · Recaptured: June 15, 1997

Bird Banding Codes Demystified:

One word names: first four letters (MALL for Mallard).

Two word names: usually the first two letters of each name (COHA for Cooper's Hawk).

Hyphenated first name: the first letter of the first hyphenated word, the first letter of the second hyphenated word and the first two letters of the second word (WCSP for White-crowned Sparrow).

[Exceptions are: LAZB for Lazuli Bunting which differentiates it from LARB for Lark Bunting...otherwise they'd both be LABU.]





Bird Species:
Sharp-shinned Hawk

1

Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 12 1995**

Bird recaptured at this location:

Williamsburg, New Mexico (33°N 107°W)

Bird recaptured on this date: **October 27, 1997**

Distance between banding & recapture locations:

~225 km (140 miles)

Scaled distance for activity: **~2.25 meters (8 feet)**



Bird Species:
Cooper's Hawk

2

Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **August, 28, 1995**

Bird recaptured at this location:

Salt Lake City, Utah (40°N 111°W)

Bird recaptured on this date: **April 12, 1996**

Distance between banding & recapture locations:

~800 km (500 miles)

Scaled distance for activity: **~8 meters (26 feet)**



Bird Species:
Ferruginous Hawk

3

Bird banded at this location:

Catron County, New Mexico (33°N 108°W)

Bird banded on this date: **June 18, 1997**

Bird recaptured at this location:

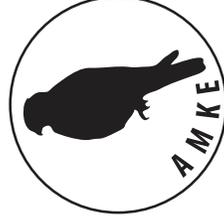
San Carlos, Arizona (33°N 110°W)

Bird recaptured on this date: **August 8, 1997**

Distance between banding & recapture locations:

~200 km (125 miles)

Scaled distance for activity: **~2 meters (7 feet)**



Bird Species:
American Kestrel

4

Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **May 29, 1996**

Bird recaptured at this location:

Albuquerque, New Mexico (35°N 106°W)

Bird recaptured on this date: **March 21, 2001**

Distance between banding & recapture locations:

~0 km (0 miles)

Scaled distance for activity: **~0 meters (0 feet)**

5

**Bird Species:
Song Sparrow**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 26, 1997**

Bird recaptured at this location:

Lander, Wyoming (42°N 108°W)

Bird recaptured: **April 8, 1998**

Distance between banding & recapture locations:

~925 km (575 miles)

Scaled distance for activity: **~9.25 meters (30 feet)**

6

**Bird Species:
Song Sparrow**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 1, 1996**

Bird recaptured at this location:

Durango, Colorado (37°N 107°W)

Bird recaptured on this date: **March 10, 1999**

Distance between banding & recapture locations:

~300 km (190 miles)

Scaled distance for activity: **~3 meters (9 feet)**

7

**Bird Species:
White-crowned Sparrow**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **November 17, 1990**

Bird recaptured at this location:

Bosque del Apache, New Mexico (33°N 106°W)

Bird recaptured on this date: **April 7, 1991**

Distance between banding & recapture locations:

~144 km (90 miles)

Scaled distance for activity: **~1.44 meters (5 feet)**

8

**Bird Species:
White-crowned Sparrow**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **January 10, 1978**

Bird recaptured at this location:

Leduc, Alberta, Canada (53°N 113°W)

Bird recaptured on this date: **May 12, 1978**

Distance between banding & recapture locations:

~2100 km (1300 miles)

Scaled distance for activity: **~21 meters (69 feet)**

9

Bird Species:

White-crowned Sparrow



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 7, 1996**

Bird recaptured at this location:

Prescott, Arizona (34°N 112°W)

Bird recaptured on this date: **January 28, 1999**

Distance between banding & recapture locations:

~540 km (335 miles)

Scaled distance for activity: **~5.4 meters (18 feet)**

10

Bird Species:

White-crowned Sparrow



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **April 15, 1994**

Bird recaptured at this location:

Evans, Colorado (40°N 104°W)

Bird recaptured: **1994**

Distance between banding & recapture locations:

~650 km (400 miles)

Scaled distance for activity: **~6.5 meters (21 feet)**

11

Bird Species:

White-crowned Sparrow



Bird banded at this location:

Fairbanks, Alaska (64°N 147°W)

Bird banded on this date: **August 26, 1991**

Bird recaptured at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird recaptured on this date: **October 30, 1993**

Distance between banding & recapture locations:

~4300 km (2677 miles)

Scaled distance for activity: **~43 meters (130 feet)**

12

Bird Species:

White-crowned Sparrow



Bird banded at this location:

Bosque del Apache, New Mexico (33°N 106°W)

Bird banded on this date: **November 21, 1999**

Bird recaptured at this location:

Quincy, California (40°N 121°W)

Bird recaptured on this date: **November 6, 2002**

Distance between banding & recapture locations:

~1425 km (885 miles)

Scaled distance for activity: **~14.25 meters (47 feet)**

13

**Bird Species:
Lazuli Bunting**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **August 20, 1989**

Bird recaptured at this location:

Ogden, Utah (41°N 111°W)

Bird recaptured: **May 4, 1991**

Distance between banding & recapture locations: ~

~825 km (512 miles)

Scaled distance for activity: **~8.25 meters (27 feet)**

14

**Bird Species:
House Finch**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **November 6, 1988**

Bird recaptured at this location:

Albuquerque, New Mexico (35°N 106°W)

Bird recaptured: **January 21, 1991**

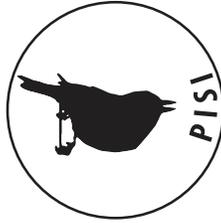
Distance between banding & recapture locations:

~0 km (0 miles)

Scaled distance for activity: **~0 meters (0 feet)**

15

**Bird Species:
Pine Siskin**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **November 6, 1996**

Bird recaptured at this location:

Tijeras, New Mexico (35.08°N 106.37°W)

Bird recaptured: **December 30, 1996**

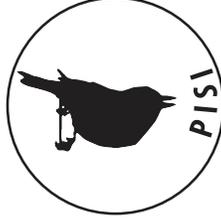
Distance between banding & recapture locations:

~25 km (17 miles)

Scaled distance for activity: **~0.25 meters (1 foot)**

16

**Bird Species:
Pine Siskin**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 13, 1995**

Bird recaptured at this location:

Tijeras, New Mexico (35°N 106°W)

Bird recaptured: **February 1, 1996**

Distance between banding & recapture locations:

~25 km (17 miles)

Scaled distance for activity: **~0.25 meters (1 foot)**

17

**Bird Species:
Lesser Goldfinch**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **September 30, 1996**

Bird recaptured at this location:

Pojoaque, New Mexico (35.89°N 106.00°W)

Bird recaptured: **August 19, 1998**

Distance between banding & recapture locations:

~100 km (64 miles)

Scaled distance for activity: **~1 meter (3 feet)**

18

**Bird Species:
Lesser Goldfinch**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **September 6, 1996**

Bird recaptured at this location:

Raton, New Mexico (36.89°N 104.44°W)

Bird recaptured: **August 9, 1998**

Distance between banding & recapture locations:

~275 km (175 miles)

Scaled distance for activity: **~2.75 meters (9 feet)**

19

**Bird Species:
American Goldfinch**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **January 25, 2003**

Bird recaptured at this location:

West Jordan, Utah (40°N 111°W)

Bird recaptured: **August 16, 2004**

Distance between banding & recapture locations:

~775 km (480 miles)

Scaled distance for activity: **~7.75 meters (25 feet)**

20

**Bird Species:
American Goldfinch**



Bird banded at this location:

Albuquerque, New Mexico (35.13°N 110.67°W)

Bird banded on this date: **October 12, 1996**

Bird recaptured at this location:

Heber, Utah (40°N 111°W)

Bird recaptured: **June 15, 1997**

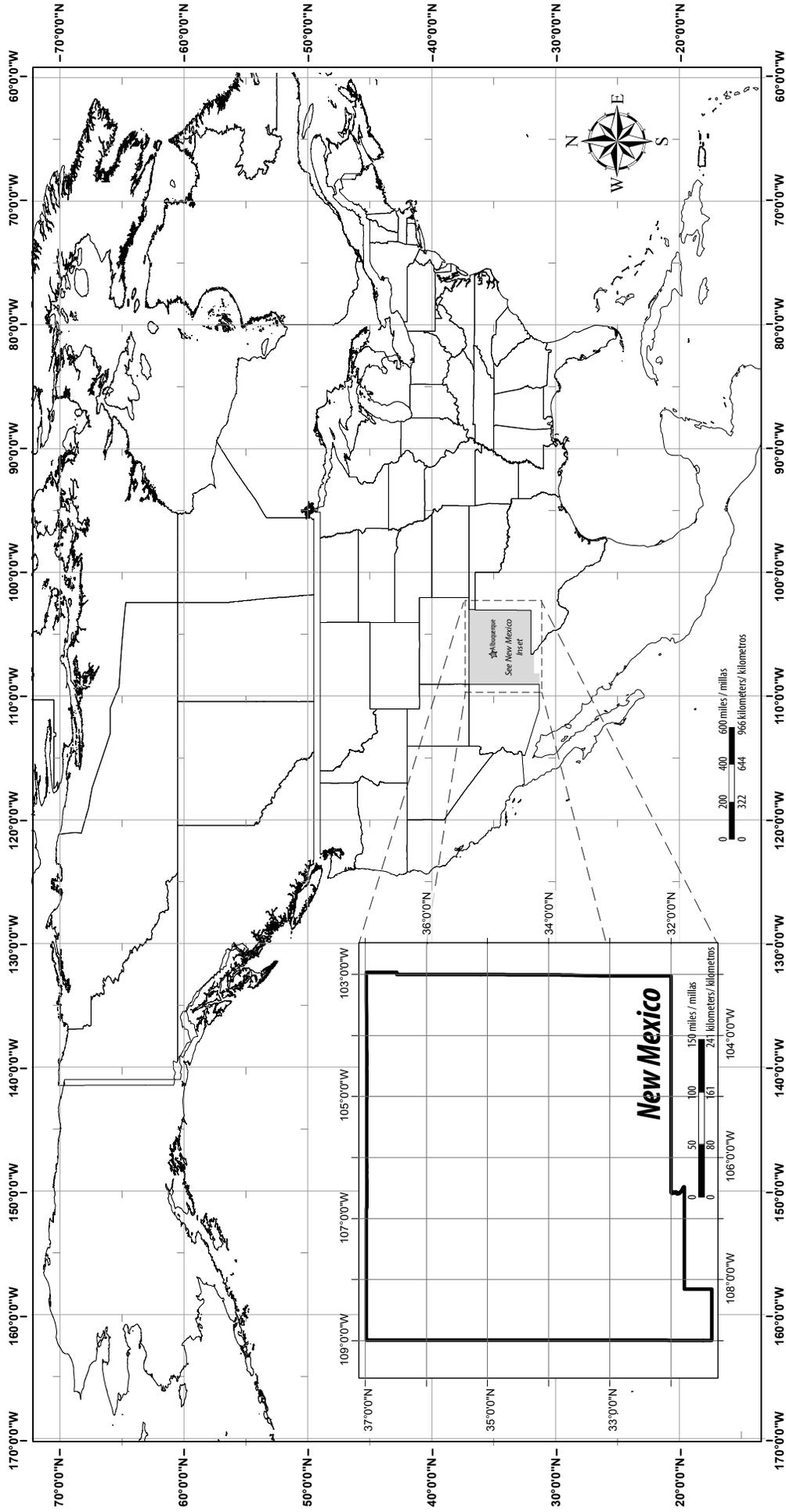
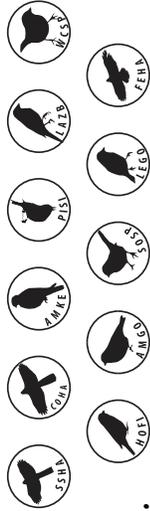
Distance between banding & recapture locations:

~725 km (450 miles)

Scaled distance for activity: **~7.25 meters (24 feet)**

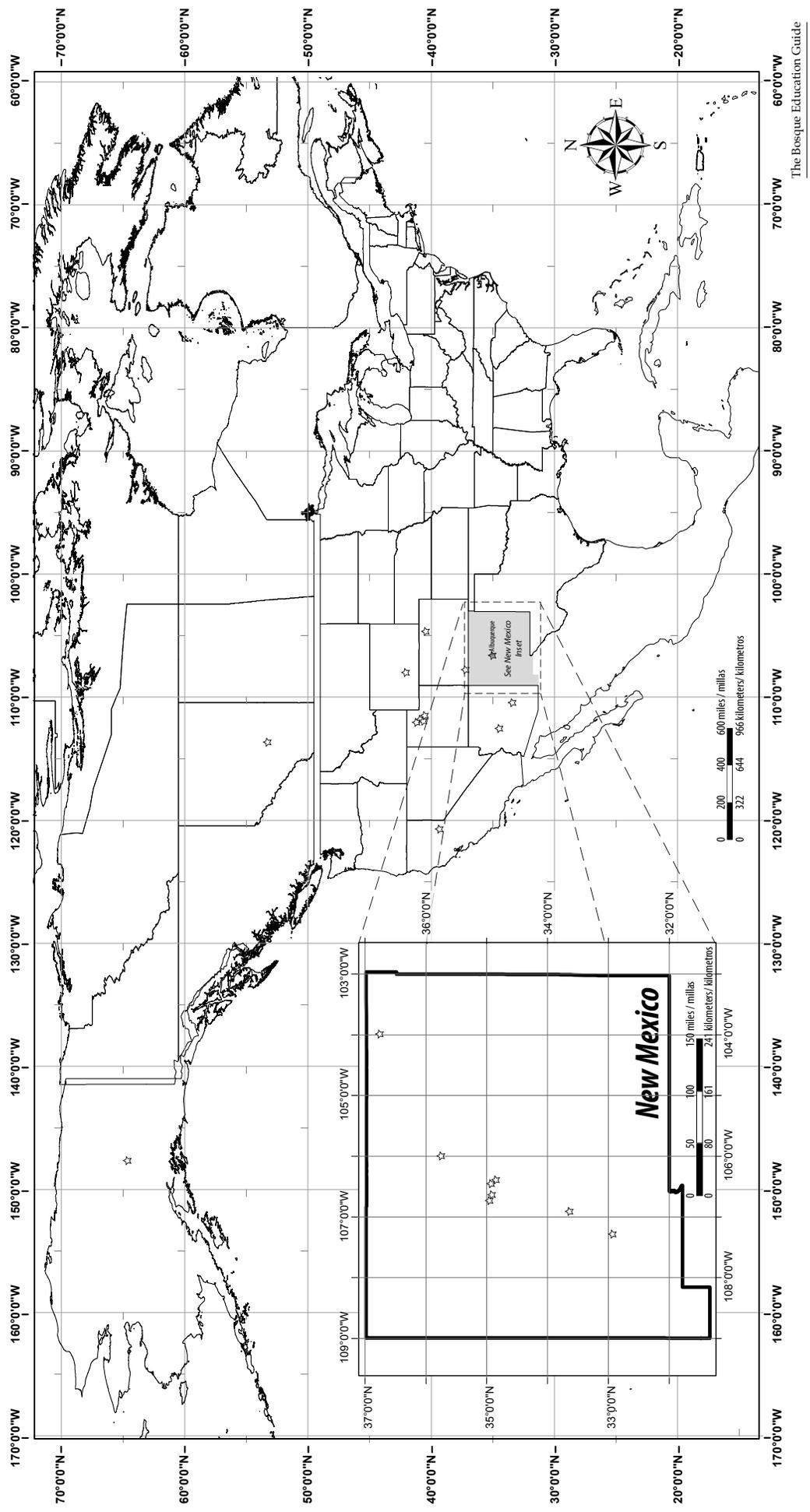
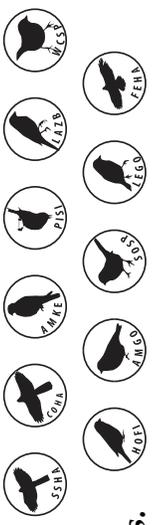
Who Flew Where? ¿Quién voló a dónde?

Add icons of banded recaptured birds to the locations where they were found.
Añadir iconos de aves anilladas recapturadas a los lugares donde fueron encontrados.



Who Flew Where? ¿Quién voló a dónde?

Add icons of banded recaptured birds to the locations where they were found.
 Añadir iconos de aves anilladas recapturadas a los lugares donde fueron encontrados.





Description: Students graph long-term data of birds banded by Rio Grande Bird Research to see if there have been changes in birds encountered.

Objective: Students look at data, and decide how to present it in graphic form, then write an analysis of the data.

Materials: Graph paper, pencils, worksheets

Background: Look at the main migration background information for Wilson's Warblers, Chipping Sparrows and White-crowned Sparrows.

Procedure: This activity provides total numbers of individuals for three species of birds banded during fall migration by Rio Grande Bird Research at the Rio Grande Nature Center; these are divided into three decades for students to graph.

There is one template that you could use for drawing the graph, or students can start with graph paper and decide on the scale themselves. The vertical axis should be the average number of birds per decade, and both the species of birds and the years (decades) represented should be along the horizontal axis.

◆ Hand out the raw data and have students calculate averages for three 10 year periods: 1985-1994, 1996-2005, 2006-2015. Note that data for 1995 are missing. Students then make bar graphs for these averages.

◆ Students should then write a claim-evidence-reasoning statement.

Claim: Answers a question

Evidence: Data that supports the claim. This can be quantitative--numbers you can count; or qualitative--something descriptive such as color.

Reasoning: Explains and justifies why the evidence supports the claim. These should be written in complete sentences.

48. Changes in Bird Populations

Grades: 4-8

Time: one class period

Subjects: area science, math

Standards: see end of activity

Terms: *data, average, bar graph, claim, evidence, reasoning, population*





Rio Grande Bird Research observed that Chipping Sparrows (*Spizella passerina*) were the most commonly banded bird during their first few years of banding. Now, RGBR catches them only rarely. Why? Well, we know that Chipping Sparrows prefer a forest with a closed canopy and we know that many forests have become fragmented. One hypothesis, or possible explanation based on these two statements, is that the Chipping Sparrows numbers have declined because they don't have enough closed canopy any more due to habitat loss. Even though we know that both the earlier statements are true, we don't actually have data to support that one causes the other. Other elements can come into play, such as: drought, fire, flooding, nest success, predation by cats, window strikes, etc.



Chipping Sparrow gathering nesting material in the Sandias

Photograph by Laurel Ladwig

Similarly, it has been observed that Wilson's Warbler (*Cardellinapusilla*) numbers are increasing. They are birds that like "edges" such as the line between where a fire burned and where it didn't, a riverbank, and a fence line. Due to habitat loss, there has been fragmentation and so more edges. Again, it is tempting to say that the increase in Wilson's Warblers numbers is due to the increase in edges. And, again, we don't have enough data to fully support that claim because there are other factors that could be partially or completely responsible.

In the lessons using RGBR data, we have listed possible claims and noted the evidence or data that supports the claims. These claims note what is happening, but do not explain why, because we cannot say "why" based on the data we have so far.

For this activity, here is a possible claim-evidence-reasoning statement.

Claim: Wintering bird populations vary over years

Evidence: From 1985 to 1994 there were an average of 422 Chipping Sparrows banded each year, but an average of 81 were banded each year in 1996 to 2005, and 38 per year from 2006 to 2015. Wilson's Warblers numbers for the same years are, 95, 132 and 145. White-crowned Sparrow numbers were 106, 124, 98.

Reasoning: The Chipping Sparrow numbers dropped dramatically over the decades. The Wilson's Warblers were lower initially, and then almost doubled the following decade, and then dropped somewhat recently. The White-crowned Sparrows (*Zonotrichia leucophrys*) were relatively stable over those years, but still the numbers vary from year to year.



Alternate Claim

Claim: Chipping Sparrow numbers have declined since the 1980s.

Evidence: An average of 422 birds were banded from 1985 to 1994, declined to 81 birds in 1996 to 2005, and 38 birds banded between 2006 and 2015.

Reasoning: Clearly, there are fewer birds being banded in recent years compared to the 1985 to 1994 decade. In fact, the highest number of Chipping Sparrows banded during any year was 1159 birds in 1990, much higher than the average.

Teacher Key:

The average number of birds banded in the years 1985 to 1994:

Chipping Sparrow	422
Wilson's Warbler	95
White-crowned Sparrow	106

The average number of birds banded in the years 1996 to 2005:

Chipping Sparrow	81
Wilson's Warbler	132
White-crowned Sparrow	124

The average number of birds banded in the years 2006 to 2015:

Chipping Sparrow	38
Wilson's Warbler	145
White-crowned Sparrow	98

Assessment:

- Are graphs complete and labeled?
- Does the claim, evidence, reasoning statement make sense, and is written in full sentences that build from one section to the next.

Extensions:

- Students can also graph the following; they should then describe what the graph shows.

The highest number of Chipping Sparrows banded was 1159 birds in 1990.

The highest number of White-crowned Sparrows banded was 255 in 1992.

The highest number of Wilson's Warblers banded was 262 in 2009.

- For more advanced math exercises, calculate error estimates for averages in each of the three decades. How accurately do averages represent actual numbers each year? How much annual variation is present?

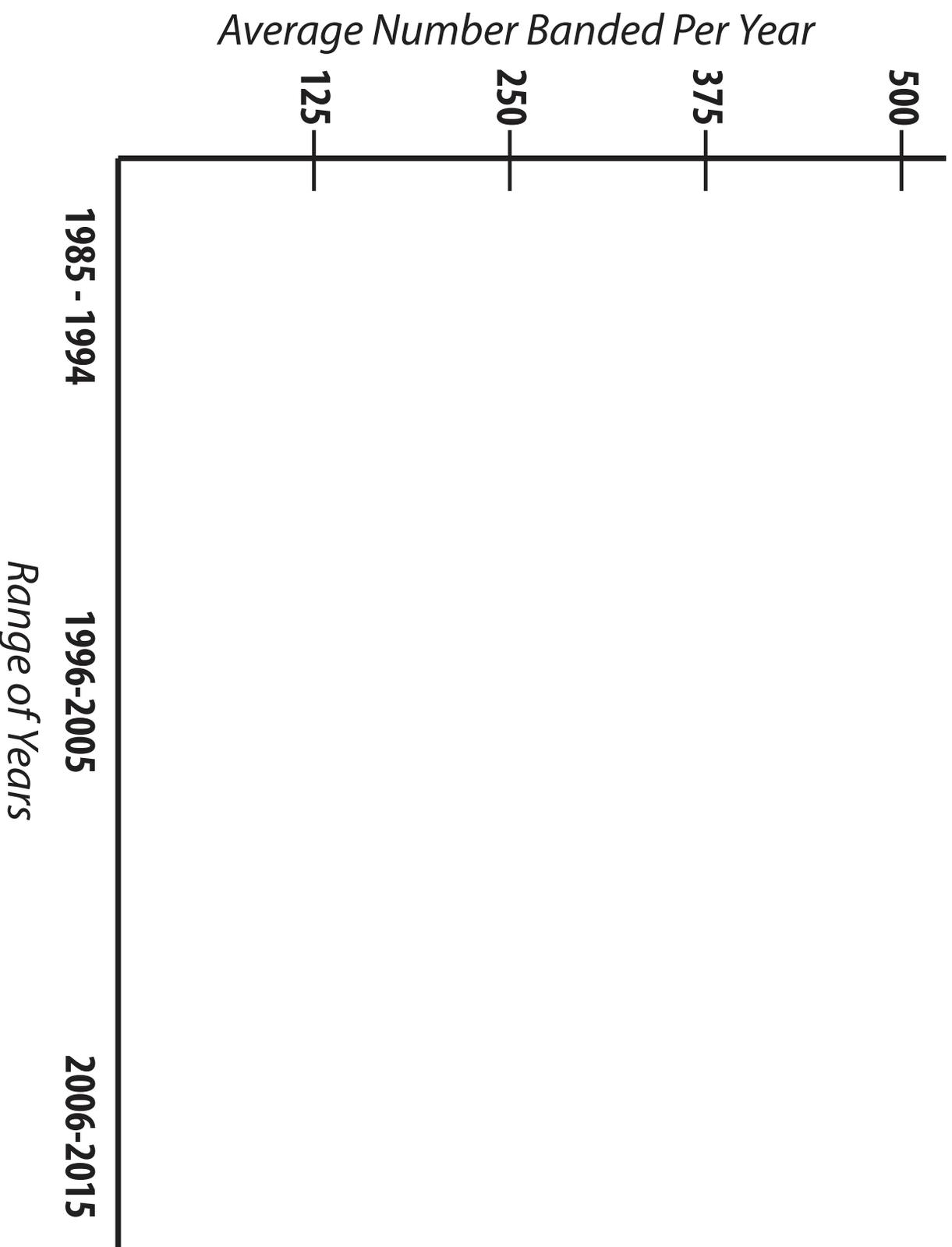


Birds Banded at Rio Grande Nature Center 1984-2015

Total numbers of birds captured (banded) during fall migration at Rio Grande Nature Center between 1985 and 2015. Data are included for Chipping Sparrows (CHSP), Wilson's Warblers (WIWA) and White-crowned Sparrows (WCSP).

	CHSP	WIWA	WCSP
1985	304	57	61
1986	159	59	19
1987	114	51	49
1988	88	59	60
1989	244	148	131
1990	1159	139	191
1991	235	124	83
1992	1134	79	255
1993	386	111	114
1994	394	123	101
1995	data unavailable		
1996	272	208	174
1997	78	65	92
1998	21	54	168
1999	46	40	92
2000	12	88	76
2001	185	135	231
2002	27	217	155
2003	118	185	108
2004	2	115	93
2005	47	208	51
2006	61	117	89
2007	168	130	164
2008	17	63	45
2009	73	262	96
2010	8	215	60
2011	14	144	122
2012	8	190	166
2013	12	92	78
2014	13	95	66
2015	6	141	95

Changes in Bird Populations Over Time





A Glossary of Migration Terms

Items with a * are in the glossary for the whole guide, other items are specific to this section.

Adaptation* - a genetically controlled characteristic (anatomical, physiological or behavioral) of an organism that increases its chances of survival and reproduction; also refers to the evolutionary process that creates such a trait

Bosque* (BOH-skay) - Spanish for “woods” or “forest”; in the Southwest it has been used to describe the cottonwood area adjacent to a river (note on pronunciation: use long “o” as in “bow and arrow,” otherwise you are actually saying the word “bosky” from old English, an adjective meaning wooded; the English poet Robert Burns once wrote a poem titled “The Bosky Bourne” [the wooded creek])

Climate Change - current patterns in climate data show that our planet’s global surface temperature is rising. This change is linked to the dramatic increase in greenhouse gases in the atmosphere that has occurred over the past two centuries. [From the National Oceanic and Atmospheric Administration: <http://www.education.noaa.gov/Climate/>]

Flyway* - the path taken by birds during their annual migrations; many birds will take the same route following a river or mountain ridge as landmarks for their journey

Game bird - a bird hunted for sport or food, or, a member of a large group of birds that includes pheasants, grouse, quails, guineafowl, guans, etc.

Habitat* - the kind of place where an organism usually lives; it includes the arrangement of food, water, shelter and space that is suitable to meet an organism’s needs; think of it as the “address” where an organism lives

Migration* - any cyclical movements (usually annual) during the life of an animal at regular intervals and that always include a return trip to where they began

Omnivore* - an animal that eats both plants and animals

Phenology - the study of cyclic and seasonal natural phenomena (such as birds migrating, plants flowering and insects emerging), especially in relation to climate and plant and animal life

Range - the range or distribution of a species is the geographical area within which that species can be found

Riparian* - relating to or living or located on the bank of a natural fresh watercourse such as a river, stream, pond or lake

Sexual dimorphism - the difference in appearance between males and females of the same species, such as in color, shape, size, and structure, that are caused by the inheritance of one or the other sexual pattern in the genetic material



Species* - a unit of classification that refers to a population or series of populations whose members are able to interbreed under natural conditions and do not breed with any other species; for young audiences, an acceptable definition is that a species is a unit of classification that refers to a population (or a group) or a series of populations (or groups) of closely related and similar organisms

Species richness* - the number of species in a community or location

Torpor - a state of decreased physiological activity in an animal which allows the animal to survive cold temperatures or reduced food availability. Animals enter torpor by reducing their metabolisms

Trachea - a large membranous tube reinforced by rings of cartilage, extending from the larynx to the bronchial tubes and conveying air to and from the lungs; the windpipe

Wetland* - a transitional zone between dry land and aquatic (water) areas, which stays wet at least part of the year because the water table is at the surface; includes wet meadows, marshes, sloughs, ponds and small lakes

Zygodactyl - a bird with feet with two toes facing front and two toes facing back



NGSS Connections to Migration Activities – Disciplinary Core Ideas

47 - Who Flew Where?

2.LS4.D Biodiversity and Humans

There are many different kinds of living things in any area, and they exist in different places on land and in water.

PE: 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

3. LS2.C Ecosystem Dynamics, Functioning, and Resilience

When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

PE: 3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

3.LS4.C Adaptation

For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. Particular organisms can survive only in particular environments.

PE: 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

4.LS1.A: Structure and Function

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

PE: 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

MS.LS1.B Growth and Development of Organisms

Animals engage in characteristic behaviors that increase the odds of reproduction

- *How do organisms grow and develop?*

PE: MS-LS1-4 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors affect the probability of successful reproduction.

MS.LS2.A Interdependent Relationships in Ecosystems

-Organisms and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

-Growth of organisms and population increases are limited by access to resources.

- *How do organisms interact with the living and nonliving environments to obtain matter and energy?*

PE: MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS.LS2.C Ecosystem Dynamics, Functioning and Resilience

Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

- *What happens to ecosystems when the environment changes?*

PE: MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Crosscutting Concepts

Patterns

Cause and Effect: Mechanism and Explanation

Systems and System Models

Science and Engineering Practices

Analyzing and Interpreting Data

Students look at bird banding data, analyze it and make sense of the data.

Developing and Using Models

Students model the migration routes of birds.

Engaging in Argument from Evidence Construct an argument with evidence, data, and/or a model.

New Mexico Social Studies Standards

STRAND : Geography

Content Standard II: Students understand how physical, natural, and cultural processes influence

where people live, the ways in which people live, and how societies interact with one another and their environments.

K-4 Benchmark II-A: Understand the concept of location by using and constructing maps,

globes, and other geographic tools to identify and derive information about people, places, and environments.

**Grade 4**

1. apply geographic tools of title, grid system, legends, symbols, scale and compass rose to construct and interpret maps;
2. translate geographic information into a variety of formats such as graphs, maps, diagrams and charts;
3. draw conclusions and make generalizations from geographic information and inquiry;

5-8 Benchmark 2-A: analyze and evaluate the characteristics and purposes of geographic tools, knowledge, skills and perspectives and apply them to explain the past, present and future in terms of patterns, events and issues;

Grade 5:

1. make and use different kinds of maps, globes, charts and databases;
5. employ fundamental geographic vocabulary (e.g., latitude, longitude, interdependence, accessibility, connections);
7. use spatial organization to communicate information; and
8. identify and locate natural and man-made features of local, regional, state, national and international locales.

Grade 6:

1. identify the location of places using latitude and longitude
- 5-8 Benchmark 2-C: understand how human behavior impacts man-made and natural environments, recognize past and present results and predict potential changes:

Grade 5

2. identify and define geographic issues and problems from accounts of current events.

Grade 7

2. interpret and analyze geographic information obtained from a variety of sources (e.g., maps, directly witnessed and surveillanced photographic and digital data, personal documents and interviews, symbolic representations - graphs, charts, diagrams, tables, etc.);
4. explain a contemporary issue using geographic knowledge, tools and perspectives.

48 - Changes in Bird Populations Science and Engineering Practices

Analyzing and Interpreting Data

Engaging in Argument from Evidence Students write claim, evidence and reasoning statements

Common Core State Standards Connections

WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence.

Mathematics

6.SP.B.4 Summarize numerical data sets in relation to their context.

References:

Next Generation Science Standards: For States, By States. NGSS Lead States. The National Academies Press. 2013

The NSTA Quick Reference Guide to the NGS: K-12. Ted Willard, editor. NSTA Press. 2015