



## 23.

## Crane Migration

**Description:** Students act out the trip Sandhill Cranes make between their nesting habitats in Idaho and their winter home in New Mexico. They experience the hazards cranes face at either end of the migration path as well as along the way, seeing the importance of habitat to survival of cranes throughout the year.

**Objectives:** Students will:

- list the factors adversely affecting the population of Sandhill Cranes wintering in New Mexico;
- predict the effects of these restricting factors; and
- describe the effects of habitat loss and degradation on Sandhill Cranes and the importance of preserving wetland habitats for the cranes and other migrating water birds.

**Materials:**

- Large playing field or gymnasium
- Two bases for every three students; half at each end of playing area-

*Indoors:* paper plates clearly marked to differentiate top from bottom [i.e., paint one side blue to represent a wetland habitat and paint the other side brown to represent the loss of wetland habitat or write “habitat” on one side to represent wetland habitat and a large “X” for lost habitat]. Alternative materials are 12” x 12” carpet samples from carpet retail stores).

*Outdoors:* cones or other objects as bases; e.g., use upright as “good wetland” and tip over for loss of wetland habitat.

**Phenomenon:** Cranes live in New Mexico in the winter, migrating in spring and fall.

**Lesson Questions:**

- *What do cranes need to survive through a year?*

### 23. Crane Migration



**Grades:** K-6

**Time:** two 30-minute sessions

**Subjects:** science, social studies

**Terms:** *behavioral adaptation, degradation, migration, staging area*



## New Mexico STEM Ready! / Next Generation Science Standards NGSS DCIs and New Mexico State Performance Expectations

K.LS1.C Organization for Matter & Energy Flow in Organisms

K.ESS3.A Natural Resources

K.ESS3.C Human Impacts on Earth Systems

1.LS1.A Structure & Function

1.LS1.B Growth & Development of Organisms

1.LS1.D Information Processing

3.LS1.B Growth & Development of Organisms

3.LS2.C Ecosystem Dynamics, Functioning & Resilience

3.LS2.D Social Interactions & Group Behavior

3.LS4.C Adaptation

3.LS4.D Biodiversity & Humans

4.LS1.A Structure & Function

4.LS1.D Information Processing

5.LS1.C Organization for Matter & Energy Flow in Organisms

5.ESS3.C Human Impacts on Earth Systems

5.ETS2.A (5-SS-1 NM) Interdependence of Science, Engineering & Technology\*

MS.LS1.B Growth & Development of Organisms

MS.LS2.A Interdependent Relationships in Ecosystems

MS.LS2.C Ecosystem Dynamics, Functioning & Resilience

MS.ESS3.C Human Impacts on Earth Systems

MS.ESS3.D Global Climate Change \*

### NGSS CCCs

Patterns; Cause & Effect: Mechanism & Explanation; Systems & System Models; Structure & Function; Stability & Change

### NGSS SEPs

Asking Questions & Defining Problems; Developing & Using Models; Analyzing & Interpreting Data\*; Constructing Explanations & Designing Solutions; Engaging in Argument from Evidence

(\* indicates extension activity)

### Background:

Every fall, the characteristic bugling call of the Sandhill Cranes can be heard along the Rio Grande, signaling the return of these magnificent creatures from their northern breeding grounds to their winter homes along the Middle Rio Grande Valley. Students living along the Valley will be familiar with the call and with the sight of cranes flying overhead. With their large size, loud calls, and tendency to hang out with large groups of peers, Sandhill Cranes are easy to observe and provide a captivating subject for student inquiry.

There are 15 species of cranes worldwide, 11 of which are considered threatened or endangered. Only two species, the Sandhill Crane (*Antigone canadensis*) and the Whooping Crane (*Grus americana*), live in North America. The Whooping Crane is the rarest of all crane species and is listed on the federal list of threatened and endangered species. More than 10,000 individuals may have been present prior to European settlement, but this number declined rapidly until they reached a low of 19 in 1945. Successful recovery efforts increased the U.S. population to over 600 by 2015; although they previously wintered in New Mexico there is no longer a local population.



This activity focuses on Sandhill Cranes. There are several subspecies of Sandhill Crane, with the Greater Sandhill Crane most abundant in the Middle Rio Grande Valley. Greater Sandhill Cranes stand 4.5 to 5 feet (1.4-1.5 meters) tall with a wingspan of six to seven feet (2–2.1 meters). They spend winters in New Mexico (as well as Texas, Arizona, California, and Mexico), but return to breeding grounds in the northern Rocky Mountains each spring. Lesser Sandhill Cranes are common in eastern New Mexico. Sandhill Cranes can fly from 15 to 50 miles per hour (24–80 kilometers per hour), often migrating 1,000 miles (1,600 km) or more each way.

Migration is a **behavioral adaptation** (actions organisms take to survive) that allows the cranes to find appropriate habitat at all times of the year. Whether in their winter home in New Mexico, in their breeding grounds in the north, or along their route in between, Sandhill Cranes spend much of their time in freshwater wetlands, including marshes, wet meadows, irrigated croplands, and river basins. These habitats are increasingly rare.

Most Sandhill Cranes that winter in the Middle Rio Grande Valley begin their migration in September from wetlands like those at Gray's Lake National Wildlife Refuge in Idaho. By the end of November, the majority of cranes that will winter in New Mexico have arrived; they start to leave again in mid-February. Many migrating cranes stop in the San Luis Valley of Colorado, at what is termed a **staging area**, to spend several weeks in the spring preparing for further migration. There they feed and socialize, and single birds choose partners before flying on to their northern nesting areas. The birds perform elaborate mating dances, which intensify during the breeding season but may be seen all year. Sandhill Cranes mate for life, so unless one partner dies, the pair stays together year-round. They typically build nests in small isolated wetlands, such as marshes, bogs, wet meadows and other areas with standing water. They use whatever vegetation is dominant, including cattails, sedges, bulrushes or grasses. While both sexes gather the vegetation, the female usually arranges the material. She usually lays two eggs, but typically only one nestling survives to fledge. Incubation takes about a month and the parents take turns sitting on the nest. Chicks are precocial, meaning they are born fully feathered, their eyes open shortly after hatching and they are able to walk within hours. The young chicks still require warmth, protection and feeding from their parents. By their second month, chicks become colts and begin pre-flight training. They begin foraging on their own in their third month, and are ready to migrate by the end of the summer. Family groups, including young of the year, migrate together, typically with other cranes. Unlike many smaller birds, cranes fly only during the day, usually at an altitude of about 2,500 feet (750 meters). They follow the same flyway they have used for centuries. Along the way they need wetlands where they can rest and eat before continuing their migration.

During migration and at their wintering grounds, cranes stay together in these



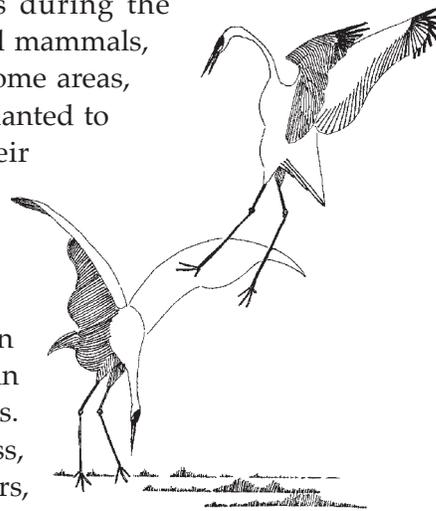


large groups, which may number in the thousands of individuals. Group living provides many benefits, including increased flight efficiency, increased detection of predators and the decreased likelihood of any one individual being captured when among a large group. For example, when foraging in a group, individuals can share time watching for predators, so those not watching have more time to eat. Juveniles also benefit from staying with their parents by learning the migration route and the location of wintering sites.

**Did you know?**

- a juvenile crane is called a colt, adult male is roan, adult female is mare
- a group of cranes may be called a dance, a flock, a herd, a sedge, a siege, or a swoop

While in New Mexico, from late October through mid-February, cranes typically feed in open fields or along sandbars in or along the river during the days and roost in shallow water wetland areas at night. They are omnivorous, opportunistic feeders, eating primarily plants and grains during the winter but also feeding on invertebrates, small mammals, amphibians, and reptiles when available. In some areas, fields of grains, such as corn or triticale, are planted to support cranes, geese, and ducks during their winter stay in New Mexico, but recently there has been an effort to maintain and restore wetland areas as a way to provide natural foods for these birds, in addition to planting crops. Cranes use their stout bills to dig and probe in the ground for food and their long legs to wade in shallow water or walk through grassy meadows. When threatened, cranes spread their wings, hiss, and kick with their feet to deter their predators, which include raccoons, bobcats, coyotes, foxes, wolves, crows, ravens, eagles, and owls. Eggs, nestlings, and injured or sick adult cranes are most vulnerable to predation.



Cranes face numerous hazards throughout their annual cycle, but habitat loss remains the most significant as their preferred wetland habitats have been greatly reduced across their range. Prior to development during the 20th century, the natural flooding regime of the Rio Grande and the high water table in the Valley created rich wetland habitats along the floodplain. Humans began to use the river widely for irrigation and began adding flood control measures to protect their crops and homes; these changed the natural flooding regime of the Rio Grande. The installation of riverside drains lowered the water table and caused many wetlands to dry up. Today, the Rio Grande is confined to a small area within the floodplain, and many wetland areas where cranes and other birds used to live or



stop during their migration have been converted to cities, towns, and farmland. Introduction of non-native plants, such as saltcedar and Russian olive, has also reduced the extent of wetlands. In addition to habitat loss, cranes are affected directly or indirectly by the use of pesticides and herbicides, predators, weather, fire, hazards during flight such as powerlines, and disease.

Like Whooping Cranes, populations of Sandhill Cranes declined dramatically after European settlement. In 1939, the Bosque del Apache National Wildlife Refuge was created as a safe place for birds (especially Sandhill Cranes) and other wildlife that migrate to the wetlands of the Middle Rio Grande for the winter. The refuge includes 13,000 acres (5,200 hectares) of bottomlands where the water of the Rio Grande has been diverted to create extensive wetlands. There are several other refuges in New Mexico, both state and local, that provide wintering wetland habitat as well. There are also international treaties and national laws protecting migratory species. State wildlife agencies share some responsibilities with the U.S. Fish and Wildlife Service, which is the regulating authority for managing and protecting migratory birds.

Through conservation efforts, including those at wildlife refuges like Bosque del Apache, the Sandhill Crane has made a comeback. In 1941, there were only 1,000 Greater Sandhill Cranes in the Rocky Mountain population, and 17 wintered at the Bosque del Apache. In 2016, the Rocky Mountain population of Sandhill Cranes was between 17,000 and 21,000. Sandhill Cranes are no longer considered endangered but their habitat is; if their habitat disappears, the cranes will disappear.

In this activity, students, acting as cranes, will “migrate” between their winter habitat in the wetlands of the Middle Rio Grande Valley to their nesting habitat at Gray’s Lake in Idaho, while facing potential hazards along the way. Each student (assuming a class size of 25 to 30) represents 1,000 Sandhill Cranes. Thus, occasional losses due to predation and other minor events are not emphasized in the role play. The emphasis of the activity is on **habitat loss**. The main purpose of this activity is for students to dynamically experience some of the major destructive factors affecting Sandhill Crane habitats and the survival of the Sandhill Crane as a species.

### **Procedure:**

#### **Introduction:**

- ♣ Have students make a KWL chart.

Ask the question: *What do we **Know** about Sandhill Cranes and about habitat use by cranes? What do we **Want** to know about Sandhill Cranes?*

After the lesson, revisit the chart and ask, *What have we **Learned** about cranes?* Remember to come back to the KWL chart frequently to show what students have learned and to encourage new questions as variables change during the activity! (**Asking Questions & Defining Problems**)

- ♣ You can also use the lens of **Systems** to learn about cranes in the bosque. For example, you can look at an individual crane as a system itself or the wintering flock of cranes in their habitat as part of a larger ecosystem. Brainstorm with students: boundaries, components, interactions, inputs and outputs, properties.



Here are more tips for using a Systems lens:

1. Look for the bigger picture.
2. Study systems from multiple perspectives.
3. Consider the role of short and long time frames.
4. Search for complex cause and effect relationships.
5. Explore places where systems connect with other systems.

--WestEd/*Making Sense of Science* (Systems & System Models)

Think of cranes in terms of systems. *What interactions do cranes have with other living things and non-living factors? List them. What environmental factors affect growth and development of cranes? If cranes cannot find places to rest and eat, whether at their breeding grounds, at their wintering grounds, or during migration, what happens?* (MS.LS2.A)

### Steps:

- ♣ Begin by asking the students, *What do you know about Sandhill Cranes?* Students who live in the Valley will likely have seen cranes flying overhead in the spring and fall, but students living away from the river might not have this familiarity. There are many Sandhill Crane videos on YouTube or on the websites of National Wildlife Refuges that cranes visit that can give an idea about crane behavior (do an internet search for “Sandhill Crane,” “Sandhill Crane migration,” “Sandhill Crane wintering grounds,” etc. Share information from the **Background** section to supplement students’ knowledge.)
- ♣ Ask the students, *What factors affect the survival of Sandhill Cranes?* These include elimination of wintering, nesting, and migratory habitats due to development, such as building houses or industry, times of abundance or lack of food, drought, or floods. Students will learn of various limiting factors during the activity (see list below). (3.LS2.C; 5.ESS3.C; MS.LS2.C; MS.ESS3.C)
- ♣ Select a large playing area about 70 feet (21 meters) in length. Place one base for every three students at each end of the field. Designate one end as the “winter habitat” and the other as the “nesting habitat.”
- ♣ Explain to the students that they are modeling Sandhill Cranes during their annual migration. They will migrate between the two areas at your signal.
  - In this model, each student represents 1000 cranes assuming a class size of 25 to 30. Adjust values as needed for your class size.
  - To increase interest, teach them the dance of the cranes. They bow their heads, flap their wings and leap high in the air. The cranes’ dancing activity increases at the end of their stay at their winter habitats and then increases even more upon arrival at their nesting habitats in Idaho. Students can dance while waiting for the signal to migrate.
  - Tell them the bases represent wetlands. These wetlands provide a suitable habitat for the Sandhill Cranes. *Can you name any local wetlands?*



- Have them flap their wings. Cranes make a slow downbeat with a quick upbeat as they fly. They fly with their necks extended as they make their journey.
- At the end of each trip, the students will have to have one foot on a base in order to be allowed to continue. If they cannot get their foot on a plate, they have not found any suitable habitat, so they die and have to move, at least temporarily, to the sidelines and watch.
- Only three students (i.e., 3,000 Sandhill Cranes) can occupy a “habitat haven” (base) at any one time. (Adjust depending on number of students in the class.)
- Two students can be made permanent monitors to change the bases as per your instructions (see below).

♣ Throughout the activity, you can ask questions and provide information about crane natural history, such as while the “cranes” are resting between rounds. For example:

*What do cranes need in order to survive in each place they live during the year?  
What are cranes’ habitat (food, water, shelter, space) needs? (K.ESS3.A)*

Point out the seasonal pattern that the student “cranes” are portraying.

*Why do cranes migrate? What causes them to move to different areas?  
(Patterns; Cause & Effect: Mechanism & Explanation)*

*All animals need food. What food do cranes need and where do they find it?  
(K.LS1.C; 5.LS1.C)*

*What parts of the crane help it to get food? To find a warm place to spend the winter? To escape predators? (1.LS1.A; 4.LS1.A; Structure & Function)*

*What senses do cranes use to tell if a predator is near? Then what actions do they take? What senses do cranes use to find food and water? (1.LS1.D)*

*How do crane parents help their young survive? How do they help their young successfully migrate? (1.LS1.B)*

Crane parents lead juveniles along the migration route to the wintering grounds, and the young then follow the route back on their own.

*How do young cranes learn to migrate, including what route to take? They follow their parents south the first year, then can find their way back north on their own. They follow the same path in future years on their own. They are using perception and memory to guide their actions.) (4.LS1.D)*

*What behaviors do cranes have that increase their odds of reproduction? What courtship and pair bonding behaviors do cranes have? (3.LS1.B; MS.LS1.B)*

*How does traveling in a group affect cranes’ survival? (3.LS2.D)*

*What dangers are there for Sandhill Cranes? What predators are looking for cranes, and where and how are predators typically successful?*



Eggs, nestlings, and injured or sick adult cranes are most vulnerable to predation. Predators include raccoons, bobcats, coyotes, foxes, wolves, crows, ravens, eagles, and owls. Cranes are particularly vulnerable at night while resting; they typically stand in water so they can hear predators approaching. Predators weed out sick animals, which can help keep diseases from spreading to other cranes. **(MS.LS2.A)**

Consider carrying capacity. *What resources might be limited as cranes migrate south and winter in New Mexico? What is the result to crane populations when resources are limited?* **(3.LS2.C; MS.LS2.A; MS.LS2.C)**

- ♣ Begin the activity at the wintering habitats in New Mexico. The students will be doing the dance of the cranes. Signal the start of the first migration. Have the students migrate in slow motion until they become familiar with the process. Then they can speed up. On the first try, all the birds will migrate successfully to the nesting habitat.
- ♣ Explain that there is sufficient nesting habitat for all the migrating cranes. Thus, the students can do the crane dance and begin a successful nesting season.
- ♣ Turn over one base in the wintering region. Explain that a large wetland area has been drained and used for agricultural purposes. Repeat the signal to migrate and send the cranes on their journey to southern and central New Mexico for the winter. Have the three displaced students stand on the sidelines. Remind the students that these three represent 3,000 cranes. Thus these 3,000 died as a result of habitat loss. Let the students playing dead birds know that they can get back in the activity as surviving hatchlings when conditions are favorable and habitat is available in the nesting ground. **(3.LS2.C; MS.LS2.C)**
- ♣ Before the next migration to the northern nesting area, turn over four plates in that area. Tell the students there was a catastrophic forest fire, which has severely polluted and damaged wetlands. **(3.LS2.C; MS.LS2.C)** Give the dancing cranes the signal to migrate. At least 12 students will not find nesting habitat. Note: this results in a large number of students waiting on the sidelines. Before many cycles are repeated, provide them with an opportunity for re-entry in the nesting habitat. Each time, give the students examples of changes in habitat conditions that make increases in population possible. For example, the Valle de Oro NWR has constructed new wetland habitat for wading and shore birds (see below). **(K.ESS3.C; 3.LS4.D; 5.ESS3.C; MS.ESS3.C)**
- ♣ Repeat the process for eight or 10 migration cycles to illustrate changes in habitat conditions that affect the cranes. See the lists below for suggestions of human-caused factors that might influence the Sandhill Cranes' survival.



Factors **limiting** the survival of Sandhill Cranes:

- wetland drainage
- drought, causing less available food and drying out of wetlands
- pollution and contamination of water
- pollution of food on which cranes feed
- urban expansion
- conversion of wetlands to non-crane-friendly farm lands
- conversion of natural waterways to canals
- diseases such as avian cholera
- conversion of wetlands to developments, industrial or residential
- not wanting wildlife to feed in agricultural fields
- illegal hunting (poaching)
- crane flies into power line and is killed or severely injured

Factors **favoring** the survival of Sandhill Cranes:

- human action aimed at preservation of wetlands
- wildlife forage crops, such as corn or alfalfa, left for wintering birds (such as at Los Poblanos farm and Los Poblanos Open Space in Albuquerque, farmers in Valencia County)
- civic action aimed at habitat conservation and restoration (e.g., building wetlands where they used to be)
- education programs to appreciate wetlands and wetland species
- regulation of hunting and reduced poaching

Although some limiting factors to the cranes' survival are a natural part of any environment, the largest threat to these big birds seems to be the loss or **degradation** of suitable habitat, most often as a result of human actions such as draining wetlands and pollution.

Be sure to create one or more "disaster" years to illustrate catastrophic loss of large areas of available habitat. Remember that wetland habitats are diminishing both locally and worldwide, so the activity should end with fewer areas of available habitat than can accommodate all the cranes. The result is a smaller population of cranes locally and worldwide. **(3.LS2.C; MS.LS2.C)**

Cranes need certain habitats to survive: in their nesting area, during migration, and at their wintering areas. *What habitats do cranes need to survive?* **(K.ESS3.A; 3.LS4.C)**

In this activity, we have seen some human-caused changes to the habitat that cranes need during their life cycle: in their nesting area, during migration, and at their wintering areas. *How do human-caused changes in any of those areas of habitat affect the cranes? What habitat changes, both good and bad, did we see? Humans can decide what changes they make to the environment, including avoiding those that may affect wildlife and habitat. Can you think of an example where humans thought about building, clearing, or somehow affecting habitat, but then decided not to? Have you heard of past pollution that has been reduced or eliminated?*



What are things that individual people and communities can do to help protect cranes and the places where they live and travel? Can you think of ways people can protect Earth's wildlife and environments? (K.ESS3.C; 3.LS4.D; 5.ESS3.C; MS.ESS3.C; **Stability & Change**)

Play several rounds of the game recording population changes for each round.

**Assessment:**

- Evaluate the accuracy of this activity as a model of annual crane migration. *In what ways does this model do a good job of describing crane migration? How is it inadequate or inaccurate? How could it be improved?*
- Have students choose among the following:
  - Write a story as if you were a crane. Explain what happened to you and your flock over your many migrations.
  - Draw a series of pictures about what happens to you and your flock.
  - Give a presentation to someone in your family about crane migrations.
  - Show your understanding of the life cycle of Sandhill Cranes through a drawing, writing, or other creative means. **(3.LS1.B)**
  - Draw or make maps of the migration routes. *How can models such as these maps be used to provide information on and explanations of crane activity? What are the limitations of such models?* **(Developing & Using Models)**
- Have the students write a summary of the ideas generated during the discussion. Be sure to have them distinguish between the human-caused factors and the environmental factors involved in the success or decline of the crane's population. Working from the students' summaries, generate a class list of factors causing population increases or declines. Compare the similarities and differences between these limiting factors. Finalize the discussion by having the students identify the factors that pose the most significant long-term threat to the survival of the Sandhill Crane. **(Patterns; Cause & Effect: Mechanism & Explanation; Constructing Explanations & Designing Solutions)**
- Discuss what kinds of things can and should be done to protect the wetland habitats necessary to the survival of the Sandhill Crane and all migratory birds. Discuss the compromises and trade-offs related to different recommendations. *Are there multiple solutions to the problem?* Gather facts and support the recommended solutions you put forward. **(Constructing Explanations & Designing Solutions; Engaging in Argument from Evidence)**

**Extensions:**

- Have the students think about a low population of cranes. How might they show that the Rocky Mountain flyway had a population of only 1000 Sandhill cranes in 1941 when Bosque del Apache National Wildlife Refuge was just created. *How does that refuge and others help increase the Sandhill Crane population?*



- Use a graph to chart the declines and increases in crane population size that were observed during the crane migration activity. After the activity the students can be asked to:
  - identify the apparent causes of any changes in population from year to year;
  - identify the major factors contributing to habitat loss and degradation;
  - make predictions about the effects of these factors;
  - distinguish between short-term and long-term effects;
  - distinguish between catastrophic and gradual changes; and
  - support their ideas with evidence, engaging in research if necessary. **(Analyzing & Interpreting Data; Engaging in Argument from Evidence)**
- Take a trip to see cranes during their winter stop in New Mexico. Possible locations include (directions and visiting information available online):
  - Bosque del Apache National Wildlife Refuge (south of Socorro)
  - Bernardo Wildlife Area (between Belen and Socorro)
  - Los Poblanos Open Space (North Valley, Albuquerque)
  - Bitter Lake National Wildlife Refuge (near Roswell)
  - Grulla National Wildlife Refuge (near Portales)
  - Whitfield Wildlife Conservation Area (Valencia County)
- Make videos of cranes at a refuge or other location.
- Have older students lead primary students in the Crane Migration activity
- Watch videos of cranes dancing and calling to their mates. *Why do cranes make loud calls? How can cranes make such loud calls?* Research crane vocalizations. Students should find that cranes have specially adapted tracheas to help them with their calls. **(3.LSI.B; 4.LS1.A; MS.LSI.B)**
- Research the possible effects of climate change on Sandhill Cranes and their migration or on other migrating species. Biologists must now consider climate change as they predict the impacts of human activities on wildlife species. **(MS.ESS3.D)**
- Research New Mexico biologists who study Sandhill Cranes, other wildlife or wetland ecology. This will address New Mexico Specific Standard/ Performance Expectation about Science and Society. **(5.ETS2.A; 5-SS-1.NM)** 

(above) Sandhill Cranes with "landing gear" down, settling in for the night in the Rio Grande in Albuquerque  
photos by Laurel Ladwig



## Resources and References:

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## NGSS Connections to Crane Migration—Disciplinary Core Ideas

**K.LS1.C Organization for Matter and Energy Flow in Organisms** *All animals need food in order to live and grow. They obtain their food from plants or from other animals.*

All animals need food. *What food do cranes need and where do they find it?*

**K.ESS3.A Natural Resources** *Living things need water, air and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.*

*What do cranes need in order to live in each place they live during the year? What are cranes' habitat (food, water, shelter, space) needs?*

**K.ESS3.C Human Impacts on Earth Systems** *Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things.*

Humans can decide what changes to make in the environment, including avoiding those that may affect wildlife and habitat. *Can you think of an example where humans thought about building, clearing, or somehow affecting habitat, but then decided not to? Have you heard of past pollution that has been reduced or eliminated?*

**1.LS1.A Structure and Function** *All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air.*

Use cranes as an example to address this standard. *What parts of the crane help it to get food? To find a warm place to spend the winter? To escape predators?*

**1.LS1.B Growth and Development of Organisms** *Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring survive.*

Crane parents take care of their young by feeding them, teaching them to find food themselves, and then leading them on their first migration south. Once they travel the route once, they make the return trip north on their own. *How do crane parents help their young survive? How do they help their young successfully migrate?*

**1.LS1.D Information Processing** *Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive.*

*What senses do cranes use to tell if a predator is near? Then what actions do they take? What senses do cranes use to find food and water?*

**3.LS1.B Growth and Development of Organisms** *Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.*

Using cranes as an example, look at the dances parent cranes do to reinforce their lifetime pair bond. Have students show their understanding of the life cycle of Sandhill Cranes through a drawing, writing, or other creative means. *What behaviors do cranes have that increase their odds of reproduction? What courtship and pair bonding behaviors do cranes have?*

**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.*

This activity focuses on the effect of habitat loss (i.e., changes to the environment) on the survival of Sandhill Cranes. Changes include elimination of wintering and nesting habitats because of development, such as houses or industry, times of abundance or lack of food, drought, or floods. *What changes to the environment limit the survival of Sandhill Cranes? What resources might be limited as cranes migrate south and winter in New Mexico? What is the result to crane populations when resources are limited?*

**3.LS2.D Social Interactions and Group Behavior** *Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.*

Sandhill Cranes live and travel in flocks. *How does traveling in a group affect cranes' survival? Do cranes take on different roles in a group? Does the same bird always lead in their "V" formation flights?*

**3.LS4.C Adaptation** *For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.*

Cranes need certain habitats to survive: in their nesting area, during migration, and at their wintering areas. *What habitats do cranes need?*

**3.LS4.D Biodiversity and Humans** *Populations live in a variety of habitats, and change in those habitats affects the organisms living there.*

In this activity, we have seen some human-caused changes in the habitats that cranes need during their life: in their nesting area, during migration, and at their wintering areas. *How do human-caused changes in any of those areas of habitat affect the cranes? What habitat changes, both good and bad, did we see?*



**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.*

Use cranes as an example to address this standard. *What parts of the crane help it to get food? To find a warm place to spend the winter? To escape predators?*

Extension: Watch videos of cranes dancing and calling to their mates. *Why do cranes make loud calls? How can cranes make such loud calls?* Research crane vocalizations. Students should find that cranes have specially adapted tracheas to help them with their calls.

**4.LS1.D Information Processing** *Different sense receptors are specialized for particular kinds of information, which may then be processed by an animals' brain. Animals are able to use their perceptions and memories to guide their actions.*

*How do young cranes learn to migrate, including what route to take?* They follow their parents south the first year, then can find their way back north on their own. They follow the same path in future years on their own. They are using perception and memory to guide their actions.

**5.LS1.C Organization for Matter and Energy Flow in Organisms** *Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.*

*All cranes need food. What food do cranes need and where do they find it?*

**5.ESS3.C Human Impacts on Earth Systems** *Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.*

Human impacts on crane survival include elimination of wintering and nesting habitats because of development, such as houses or industry, times of abundance or lack of food, drought, or floods. *What factors limit the survival of Sandhill Cranes? What are things that individual people and communities can do to help protect cranes and the places where cranes live and travel? Can you think of ways people can protect Earth's wildlife and environments?*

### New Mexico Specific Standards

Because these performance expectations are unique to New Mexico, we present the PEs as well as the supporting DCIs, CCCs and SEPs that can be addressed by the Crane Migration activity.

#### Performance Expectation

**5-SS-1 NM.** *Communicate information gathered from books, reliable media, or outside sources, that describes how a variety of scientists and engineers across New Mexico have improved existing technologies, developed new ones, or improved society through applications of science.*

#### DCI: 5.ETS2.A Interdependence of Science, Engineering, and Technology

*-Advances in science offer new capabilities, new materials or new understanding of processes that can be applied through engineering to produce advances in technology.*

*-Advances in technology, in turn provide scientists with new capabilities to probe the natural world at larger or smaller scales; to record, manage and analyze data; and to model ever more complex systems with greater precision.*

*-In addition, engineers' efforts to develop or improve technologies often raise new questions for scientists' investigation.*

Each year biologists make important contributions to our understanding of New Mexico's wildlife. This activity can inspire students to learn more about these wild species as well as about the people who study their ecology and what the animals need to survive here. Challenge your students to learn about some of these dedicated scientists.

#### CCC: Science is a Human Endeavor

*Men and women from all cultures and backgrounds choose careers as scientists and engineers. Most scientists and engineers work in teams. Science affects everyday life. Creativity and imagination are important to science.*

#### CCC: Science is a Way of Knowing

*Science is both a body of knowledge and process that add new knowledge. Science is a way of knowing that is used by many people.*

#### SEP: Obtaining, Evaluating & Communicating Information

**MS.LS1.B Growth and Development of Organisms** *Animals engage in characteristic behaviors that increase the odds of reproduction.*

Using cranes as an example, look at the dances parent cranes do to reinforce their lifetime pair bond. *What behaviors do cranes have that increase the odds of reproduction? What courtship and pair bonding behaviors do cranes have? Why do cranes make loud calls? How can cranes make such loud calls?*

**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 non-living factors.*

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

*-Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival.*

*Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared*

*.Think of cranes in terms of systems. What interactions do cranes have with other living things and non-living factors? List them. What environmental factors affect growth and development of cranes? If cranes cannot find places to rest and eat on their migration, what happens? Consider carrying capacity. What resources might be limited as cranes migrate south and winter in New Mexico? What is the impact on crane populations when resources are limited?*

Cranes are particularly vulnerable at night while resting; they typically stand in water so they can hear predators' approach. Bobcats will try to catch cranes. If they are sick or injured, coyotes will chase them and will catch vulnerable cranes. If predators catch sick animals, this can help keep diseases from spreading to other cranes. *What dangers are there for Sandhill Cranes? What predators are looking for cranes, and where and how are predators typically successful?*



**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.*

This activity looks at disruptions to physical and biological components of the crane's habitat throughout its annual life cycle. Disruptions include elimination of wintering and nesting habitats because of development, such as houses or industry, times of abundance or lack of food, drought, or floods. *What factors limit the survival of Sandhill Cranes? What resources might be limited as cranes migrate south and winter in New Mexico?*

**MS.ESS3.C Human Impacts on Earth Systems** *Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.*

*--Typically, as human populations and per capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.*

Human impacts on crane survival include elimination of wintering and nesting habitats because of development, such as houses or industry, times of abundance or lack of food, drought, or floods. *What factors limit the survival of Sandhill Cranes? What are things that individual people and communities can do to help protect cranes and where they live and travel? Can you think of ways people can protect Earth's wildlife and environments?*

**MS.ESS3.D Global Climate Change** *Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and the other kinds of knowledge, such as understanding of human behavior, and on applying that knowledge wisely in decisions and activities.*

Extension: Research the possible effects of climate change on Sandhill Cranes and their migration or other migrating species. Biologists must now consider climate change as they predict the impact of human activities on wildlife species.



*(right) Sandhill Cranes dancing at Valle de Oro National Wildlife Refuge*

photos by Laurel Ladwig