

## Photo Description



This image shows a large group of snow geese resting in a plowed farm field during their migration. You can see hundreds of white birds scattered across the brown soil, with a few birds flying overhead. Power lines and distant trees line the horizon, showing this is an agricultural area where migrating birds stop to rest and find food.

## Scientific Phenomena

Anchoring Phenomenon: Long-distance bird migration and stopover site selection

This image captures an important part of the annual migration cycle of snow geese. Snow geese travel thousands of miles between their Arctic breeding grounds and wintering grounds in the southern United States and Mexico. They stop at places like farm fields to rest and refuel with food (seeds and plants) before continuing their journey. This behavior is triggered by seasonal changes in daylight length and temperature, which signal to the birds that it's time to move to a location with better food and weather conditions. The geese instinctively know which routes to take and where to stop—knowledge passed down through generations.

## Core Science Concepts

1. Migration as an Adaptation: Snow geese have evolved the ability to migrate long distances to survive harsh winters and find abundant food sources. This is a behavioral adaptation that helps the species survive.
2. Seasonal Environmental Changes: Birds respond to seasonal patterns—shorter days and colder temperatures in fall trigger southward migration, while longer days and warming temperatures in spring trigger northward migration.
3. Habitat Selection and Resource Needs: Geese choose stopover sites strategically based on the availability of food, water, and safe resting areas. Farm fields provide seeds and vegetation, making them ideal rest stops.
4. Population Dynamics and Interdependence: Large flocks of geese depend on each other for safety (more eyes watching for danger) and information-sharing about good feeding and resting locations.

### Pedagogical Tip:

Use this image as a "hook" at the beginning of the unit. Ask students to notice details first (descriptive observations) before explaining the "why" (scientific explanations). This scaffolds comprehension and maintains student engagement. Consider using a document camera to zoom in on different parts of the photo during whole-group discussion.

### UDL Suggestions:

Provide Multiple Means of Representation: Some students may benefit from a simplified diagram showing the migration route (north! south) with seasonal labels. Others might benefit from a video showing geese in motion. Offer both visual and kinesthetic options (e.g., have students act out migration movements).

Provide Multiple Means of Engagement: Connect migration to students' own experiences (Have you ever traveled far from home? How did you prepare?). This personal relevance increases motivation and deepens understanding.

## Zoom In / Zoom Out

### Zoom In: Cellular & Physiological Level

When snow geese fly long distances, their muscles work extremely hard and burn lots of energy. At the cellular level, special structures called mitochondria (the "powerhouses" of cells) convert the food the geese eat into energy that their muscle cells can use. Before migration, geese eat extra food to build up fat reserves. This fat is stored in their bodies and broken down by mitochondria during flight to provide the energy needed for thousands of miles of flying. Without this cellular energy conversion system, the geese wouldn't have the fuel to complete their journey.

### Zoom Out: Continental Ecosystem & Climate Systems

Snow geese migration is part of a continental-scale ecosystem that spans the entire North American continent. The geese connect Arctic breeding grounds, prairie and farm stopover sites, and southern wetlands into one interconnected system. When geese arrive at farm fields (like in this photo), they impact the ecosystem by eating seeds and vegetation, which affects plant populations and other animals that depend on those plants. Simultaneously, larger climate patterns—Earth's axial tilt, which creates seasons, and ocean currents that influence temperature—drive the seasonal changes that trigger migration. The geese are both responding to and participating in these vast, interconnected planetary systems.

## Discussion Questions

1. Why do you think the snow geese stopped in this farm field instead of flying all the way south without stopping? (Bloom's: Analyze | DOK: 2)
2. What would happen to the geese if they didn't migrate during winter? (Bloom's: Evaluate | DOK: 3)
3. How do you think the geese know when it's time to fly south and which direction to go? (Bloom's: Infer | DOK: 2)
4. Compare and contrast how snow geese prepare for migration with how you prepare for a long car trip. (Bloom's: Compare | DOK: 3)

## Potential Student Misconceptions

Misconception 1: "The geese are just taking a vacation or resting lazily."

Scientific Clarification: Migration is not a leisure activity—it's a survival strategy driven by necessity. Geese stop at farm fields because they must refuel their bodies with food and rest before their muscles and hearts become too exhausted to continue flying. These stops are essential, not optional. The birds are working hard to survive, not relaxing.

Misconception 2: "Each goose knows the migration route all by itself, like it has a built-in GPS."

Scientific Clarification: While geese do have some innate instincts to migrate, they also learn the migration route by following experienced geese in their flock—especially their parents or older birds. Young geese learn the stopover locations and routes by traveling with the group. It's a combination of instinct (the urge to migrate) and learning (the specific route and places).

Misconception 3: "All birds migrate, and they all fly south for winter."

Scientific Clarification: Not all birds migrate. Some birds, like chickadees and cardinals, stay in cold areas year-round.

Additionally, some birds migrate in different directions or seasons. Migration is an adaptation that works for some species but not others, depending on their food sources, body size, and survival needs.

## Extension Activities

1. Migration Route Mapping: Provide students with a map of North America. Using string or yarn, have them trace the migration route of snow geese from the Arctic to Mexico. Mark stopover sites like the one in the photo. Students can label the seasons and explain why geese stop at each location.
2. Energy Demands Investigation: Discuss how much energy migration requires. Have students calculate (or estimate) how far the geese fly and how much food they need. Create a simple chart showing what geese eat (seeds, plants) and estimate how long food in one farm field would last for 100 geese.
3. Bird Behavior Observation: If possible, take students outside to observe local birds (crows, sparrows, robins, etc.). Ask: Do these birds migrate? How do they find food? How do they stay safe? Create a class comparison chart between local birds and snow geese.

## Cross-Curricular Ideas

### Math Connection: Distance & Scale

Have students use a map scale to calculate the total distance snow geese travel during migration (approximately 3,000+ miles round trip). Create a comparison chart: "If a goose flies 100 miles per day, how many days does migration take?" Students can then compare goose migration distances to familiar distances (how many times across your state, how far compared to a cross-country road trip, etc.).

### ELA Connection: Narrative & Perspective Writing

Have students write a first-person narrative from the perspective of a young snow goose on its first migration. Prompt: "Tell the story of your journey from the Arctic to a farm field stopover. What do you see, hear, and feel? What challenges do you face?" This builds empathy and deepens comprehension of the migration experience while practicing descriptive and narrative writing.

### Social Studies Connection: Human & Wildlife Interaction

Discuss how farmers and geese share the same land. Ask: "How do geese help or hurt farms? Why might farmers allow geese to rest in their fields?" Students can research and debate the relationship between agriculture and wildlife. Extend by discussing conservation efforts and how humans can protect migrating birds while supporting farming communities.

### Art Connection: Movement & Pattern

Have students create artwork showing the patterns and movement of the geese flock. They could use chalk pastels to show the V-formation flying pattern, or create a mixed-media collage showing geese at different stages of migration. Display artwork in a gallery walk where students observe and discuss how artists convey movement and scale.

## STEM Career Connection

### Ornithologist (Bird Scientist)

An ornithologist is a scientist who studies birds. These scientists observe birds like snow geese in the wild, track their migration routes using special tags and technology, study their behavior, and work to protect them from harm. Some ornithologists work for universities, wildlife organizations, or government agencies. They might spend time in the field watching birds with binoculars and cameras, or they might work in labs analyzing data about bird populations. This job helps us understand how to protect endangered bird species and their habitats.

Average Annual Salary: \$65,000–\$85,000 USD

### Wildlife Biologist / Conservation Specialist

A wildlife biologist studies how animals interact with their environments and works to protect animal populations and habitats. They might study why snow geese choose certain farm fields as stopover sites, or work with farmers to create safe resting areas for migrating birds. These professionals help design wildlife preserves, manage ecosystems, and create policies that protect animals while supporting human activities like farming. They often work for state or federal wildlife agencies, nonprofits, or research institutions.

Average Annual Salary: \$70,000–\$95,000 USD

### Environmental Data Analyst / GIS Specialist

This scientist uses computer technology and maps to track and analyze data about animal migration, habitat changes, and environmental patterns. They might use satellite imagery to monitor farm fields where geese rest, or create digital maps showing migration routes and stopover sites across the continent. This job combines biology with computer skills and helps scientists make big-picture decisions about conservation. These professionals work for research centers, government agencies, or environmental organizations.

Average Annual Salary: \$60,000–\$90,000 USD

## NGSS Connections

Performance Expectation: 4-LS1-1: Use evidence to construct an explanation for how the structures of animals help them function in their environment.

### Disciplinary Core Ideas:

- 4-LS1.A Structure and Function
- 4-LS1.D Information Processing (How animals sense their environment)

### Crosscutting Concepts:

- Patterns (Seasonal patterns trigger migration behavior)
- Cause and Effect (Environmental changes cause migration)
- Systems and System Models (Geese are part of agricultural and wetland ecosystems)

## Science Vocabulary

- \* Migration: The long journey that animals make seasonally from one place to another to find food, water, or better weather.
- \* Adaptation: A body part or behavior that helps an animal survive in its environment.
- \* Stopover: A place where traveling animals rest and refuel before continuing their journey.
- \* Instinct: A natural behavior that an animal is born knowing how to do, without having to learn it.
- \* Seasonal: Related to the four seasons (spring, summer, fall, winter) and the patterns that repeat each year.

## External Resources

### Children's Books:

- Stranger in the Woods by Carl R. Sams II and Jean Stoick (photo-illustrated story about geese migration)
- Swirl by Swirl: Spirals in Nature by Joyce Sidman (includes migration patterns and nature spirals)
- Are You a Butterfly? by Judy Allen (metamorphosis and seasonal change themes; good for understanding animal life cycles)

---

Teaching Tip: This lesson naturally connects to units on ecosystems, animal adaptations, and seasonal change. Consider pairing it with studies of wetlands or agricultural systems where geese are found.