

# Pollinators

This issue of the North Dakota Ag Mag focuses on pollinators. The information and activities are geared primarily for the state's third, fourth and fifth graders.

North Dakota Ag Mag is distributed three times each school year. Subscriptions are free, but if you're not on the mailing list or know someone else who wants to be added, contact the North Dakota Department of Agriculture at 800-242-7535 or [ndda@nd.gov](mailto:ndda@nd.gov).

Ag Mags and many other teacher and student resources are online at [www.ndda.nd.gov/aitc](http://www.ndda.nd.gov/aitc).

This magazine is one of the ND Agriculture in the Classroom Council activities that helps K-12 teachers integrate information and activities about North Dakota agriculture across the curriculum in science, math, language arts, social studies and other classes. It's a supplemental resource rather than a separate program. See page 7 for other AITC programs.

## Teacher Guide

**Idea:** Introduce this Ag Mag by asking students if they can explain pollination and how it happens.

### Identify each pollinator:

1. honey bee
2. butterfly
3. beetle
4. hummingbird
5. moth
6. bird
7. bat

Source: Natural Resources Conservation Service



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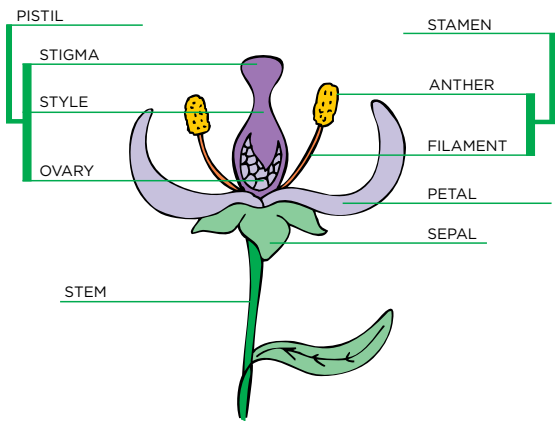
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# Flower Power

**Idea:** Have students complete the Flower Power lesson by Utah Agriculture in the Classroom where students observe physical characteristics of flowers and explore principles of pollination. Flower Power has two activities of 40 minutes each. <https://agclassroom.org> and search for “Flower Power” under Curriculum Matrix

**Idea:** This 2-minute “Introduction to Pollination” video by April Neander provides an animated illustration of the pollination of a flower. It also teaches flower anatomy to explain the role each part of the flower plays in pollination. [www.youtube.com/watch?v=26oq5tWrb2Q](http://www.youtube.com/watch?v=26oq5tWrb2Q).

## Monarch Butterflies

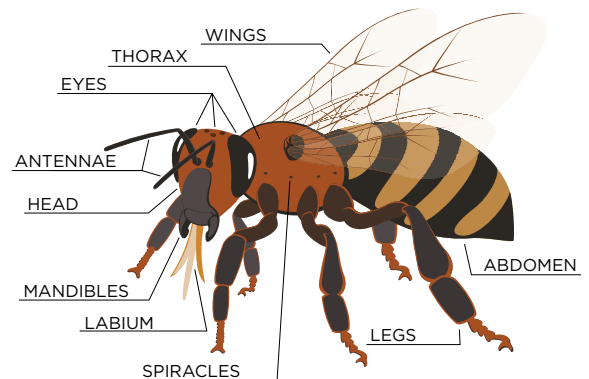
Some animals that migrate in winter include birds (hummingbirds, Canada geese, sandhill cranes, American robins); whales (humpback, blue); fish (Chinook salmon); deer (mule deer, pronghorn, moose, elk); and bats.

## Parts of the Honey Bee

**Idea:** Complete Honey Bees: A Pollination Simulation developed by Utah Agriculture in the Classroom at <https://agclassroom.org> and search for the title under the Curriculum Matrix tab. The Honey Bee PowerPoint illustrates the parts and life cycle.

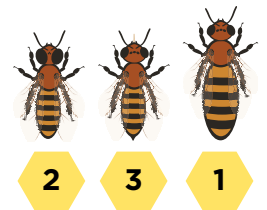
**Idea:** Show students the time-lapse video of bees hatching (1:08) from National Geographic at [www.youtube.com/watch?v=f6mJ7e5YmnE](http://www.youtube.com/watch?v=f6mJ7e5YmnE) or search YouTube for National Geographic Bees Hatch Before Your Eyes.

**Idea:** Watch PBS Nature’s “Silence of the Bee: Inside the Hive” (2:41) by searching [www.dailymotion.com](http://www.dailymotion.com) for the title.



### Types of Honey Bees

Identify the  
1. queen, 2. drone  
and 3. worker bees.



## Wind Pollination

### Answers to Wind Pollination

- They are not **scented** because there is no need to attract insects.
- They have small, **faint** flowers because there is no need for **bright** colors to attract insects.
- They have no **nectar**.
- They produce **pollen** that is very light in texture, so it is easily **blown** in the wind to increase the chance of pollination.
- Many of the world’s most important crop plants are wind-pollinated. These include **wheat**, rice, corn, rye, barley and oats.
- Most **conifer** trees also are pollinated by the wind.
- Many people are **allergic** to ragweed when its pollen is blowing in the wind.

# Honey Bees by the Numbers

1. If a worker bee lives 42 days, how many weeks does it live?  $42 \text{ days} / 7 \text{ days per week} = \mathbf{6 \text{ weeks}}$
2. If a queen bee lays an egg on April 4 and a worker bee develops in 21 days, when will the adult bee come out of its cell? **April 25**
3. During part of the year, queen bees lay about 1,500 eggs each day. How many eggs is that in a week?  $1,500 \text{ eggs per day} \times 7 \text{ days per week} = \mathbf{10,500 \text{ eggs}}$
4. A worker bee flies 15 miles per hour. How far could it fly in 20 minutes?  $60 \text{ minutes per hour} / 20 \text{ minutes} = 3$ ;  $15 \text{ miles per hour} / 3 = \mathbf{5 \text{ miles}}$
5. A worker bee makes  $1/12$  teaspoon of honey in its life. How much honey will 12 bees make in their lifetimes?  $1/12 \text{ teaspoon per bee} \times 12 \text{ bees} = \mathbf{1 \text{ teaspoon honey}}$
6. A hive of bees must fly 55,000 miles to produce a pound of honey. How far must they fly to produce 5 pounds of honey?  $55,000 \text{ miles} / \text{pound} \times 5 \text{ pounds} = \mathbf{275,000 \text{ miles}}$
7. If one bee colony produces 75 pounds of honey per year, how much honey will it produce in five years?  $75 \text{ pounds per year} \times 5 \text{ years} = \mathbf{375 \text{ pounds}}$
8. If a hive has 50,000 bees, but 10% of them die, how many bees are left?  $50,000 \times .10 = 5,000$ ;  $50,000 - 5,000 = \mathbf{45,000}$
9. A 12-ounce container of honey costs \$4.50 at your grocery store. How much does it cost per ounce?  $\$4.50 / 12 \text{ ounces} = \mathbf{\$0.375 \text{ per ounce}}$
10. The 16-ounce (1 pound) container costs \$5.60. How much does it cost per ounce?  $\$5.60 / 16 \text{ ounces} = \mathbf{\$0.35 \text{ per ounce}}$
11. Using your answers from 9 and 10, which container costs less per ounce? **The 16-ounce container at \$0.35 per ounce costs less than the 12-ounce at \$0.375 per ounce.**
12. Your recipe calls for 2 tablespoons of honey, and you want to double the recipe. How much honey do you need? What portion of a cup is that? (Hint: 1 cup = 16 tablespoons) **2 tablespoons  $\times$  2 = 4 tablespoons; 4 tablespoons / 16 tablespoons = 0.25 cup or  $\frac{1}{4}$  cup**

## Career Corner

**Idea:** If a beekeeper lives in your area, invite him or her to speak to your class. See the North Dakota bee map at <https://beemap.ndda.nd.gov/map>.

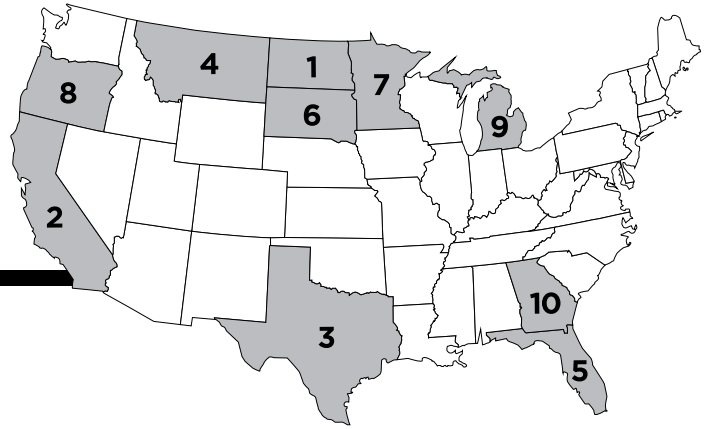
**Idea:** Have students read the story of Mikaila Ulmer, 13, who started her own business of selling lemonade with honey and a nonprofit for supporting bee research at [www.beeeculture.com/all-the-buzz-in-bee-kids-corner/](http://www.beeeculture.com/all-the-buzz-in-bee-kids-corner/)

## Beekeepers

1. **Put on Proper Protection** – Wear a bee suit that covers your body, including your head and hands.
  2. **Smoke the Bees** – Smoking helps keep the bees calm during harvest. Using a smoker that burns grass, twigs or paper allows you to open the hive and does not harm the bees.
  3. **Pull Frames Out of Hive** – Using a hive tool, lift the frames out of the hives.
  4. **Brush Bees Off the Frames** – Using a soft-bristled brush, brush off any bees that may still be on the frames.
  5. **Remove the Wax Caps** – When the bees fill a comb with honey in a frame, they place wax from their bodies over the hexagonal openings to keep the honey from spilling out. You need a sharp, warm knife to cut off the wax caps.
  6. **Extract the Honey** – Place the frames in an extractor that spins the honey from the frames. When the honey is removed from the outer portion of the frames, flip the frame and repeat the process.
  7. **Filter the Honey** – Pour the honey through a mesh filter to remove wax or other debris.
- Idea:** “How It’s Made: Honey” is Ian Collier’s 4:45-minute video that illustrates the steps in making honey from field to factory — [www.youtube.com/watch?v=iT6lQx26eHk](http://www.youtube.com/watch?v=iT6lQx26eHk)
- Idea:** “The Honey Files: A Bee’s Life” is a 16:22-minute video produced by the National Honey Board that explores all aspects of honey production and includes fun facts, such as how much honey a single worker bee makes in its lifetime — [www.youtube.com/watch?v=VZV8Jq3ka4s](http://www.youtube.com/watch?v=VZV8Jq3ka4s)

# Top 10 Honey-Producing States

Source: USDA - NASS 2017



## Fun Facts about Honey

Bees must visit about **2 million flowers** to gather enough nectar to make one pound of honey

Ancient **Greek** civilizations regarded honey as a symbol of blessings and happiness.

To share information about the best food sources, bees perform a **waggle dance**. When the worker returns to the hive, it moves in a figure eight and waggles its body to indicate the direction of the food source.

Bees collect nectar from flowers within a radius of around **4 miles** and take this nectar to their hive.

If the queen bee dies, workers will create a new queen by selecting a young larva (a newly hatched young insect) and feeding it a special food called **royal jelly**. This enables the larva to develop into a fertile queen.

Honey keeps indefinitely in a jar. However, it can react to cool temperatures by **crystallizing**.

Rameses III, an ancient Egyptian pharaoh, offered a river god a honey sacrifice by dumping **30,000 pounds** of honey into the Nile River.

Honey is the only food made by an **insect** and eaten by both the insect and humans.

In 1791, when the **French** government demanded a record of all hives for collecting taxes, their owners destroyed many hives.

A typical beehive houses about **60,000 bees**, most of them workers, busily making honey and the honeycombs in which it is stored.

Bees have glands that secrete an **enzyme** that is mixed with nectar the bee collects in the bee's mouth.

Source: [www.buzzaboutbees.net](http://www.buzzaboutbees.net) and [www.natgeokids.com/au/discover/animals/insects/honey-bees](http://www.natgeokids.com/au/discover/animals/insects/honey-bees)

### Books:

"Animals Help Plants" by Mary Lindeen (ages 8-12; Norwood House Press, 2018)

"Bees: A Honeyed History" by Piotr Socha (ages 7-11; Abrams Books for Young Readers, 2017)

"The Best Beekeeper of Lalibela: A Tale from Africa" by Cristina Kessler (ages 6-8; Holiday House, 2006)

"The Buzz on Bees: Why Are They Disappearing" by Shelley Rotner (ages 5-8; Holiday House, 2010)

"Honeybee: The Busy Life of Apis Mellifera" by Candace Fleming (ages 4-9, Neal Porter Books, 2023)

"Make Way for Butterfly" by Ross Burach (ages 4-8, Scholastic Press, 2023)

"Monarch and Milkweed" by Helen Frost (ages 3-8; Atheneum Books for Young Readers, 2008)

"Pollen: Darwin's 130-Year Prediction" by Darcy Pattison (ages 6-9, Mims House, 2019)

"The Reason for a Flower: A Book About Flowers, Pollen, and Seeds" by Ruth Heller (ages 5-8, Puffin Books, 1999)

"What If There Were No Bees?: A Book About the Grassland Ecosystem" by Suzanne Slade (ages 7-9, Picture Window Books, 2010)

**Idea:** Tour the Northern Prairie Wildlife Research Center near Jamestown. <https://www.usgs.gov/centers/northern-prairie-wildlife-research-center>

## Videos

**Flight of the Pollinators** (23:06 video) – Wild Kratts, <https://www.dailymotion.com/video/x7232tg>

**What Do Honeybees Do in Winter?** (2:39 video) – Scientific American, <https://www.youtube.com/watch?v=aPjOW2eT9PM>

**The First 21 Days of a Bee's Life** (6:06 video) – TED Talk by photographer Anand Varma, specifically 1:47-3:00, <https://www.youtube.com/watch?v=6-tqiaPoS2U>

**Pollinator Research and Monitoring** (5:02 video) – by Northern Prairie Wildlife Research Center at Jamestown, ND; <https://www.usgs.gov/media/videos/usgs-pollinator-research-and-monitoring>

## Resources

- The Urban Pollinator Program Curriculum Guide K-12 from North Dakota Game and Fish includes background information, hands-on activities, worksheets and more <https://gf.nd.gov/gnf/education/docs/instructor-resources/upp-curriculum.pdf>
- NDSU Extension Master Gardeners – Check out [www.ndsu.edu/agriculture/extension/programs/master-gardener/visit-our-pollinator-teaching-gardens](http://www.ndsu.edu/agriculture/extension/programs/master-gardener/visit-our-pollinator-teaching-gardens) to see if there's a pollinator teaching garden near you to visit.
- The Great Sunflower Project is a citizen science activity that asks students and others to count and record pollinators [www.greatsunflower.org/](http://www.greatsunflower.org/)
- Butterflies, Moths, Dragonflies, and Damselflies - North Dakota Game and Fish Department – <https://gf.nd.gov/publications/506>
- Pollinators - North Dakota Game and Fish Department – <https://gf.nd.gov/pollinators>
- Xerces Society for Invertebrate Conservation education resources – <https://xerces.org/education>
- Pollinator Partnership education resources – <https://pollinator.org/learning-center/education>
- NDSU Extension publications and information – search by title at [www.ndsu.edu/agriculture/extension](http://www.ndsu.edu/agriculture/extension)
  - “Bee-utiful Landscapes: Building a Pollinator Garden “
  - “Butterfly Gardening in North Dakota”
  - “Insects That Look Like Bees”
  - “Meet the Threatened Rare and Endangered Insect Pollinators of North Dakota”
  - “Pollination in Vegetable Gardens and Backyard Fruits”
  - “The Monarch Butterfly: Migration and Life Cycle”
  - “Encouraging Bees To Visit Your Yard and Garden”

# Pollinator Ag Mag Standards and Benchmarks

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## English Language Arts: Reading Informational/ Nonfiction Text

- 3.RI.1 Ask and answer questions to demonstrate understanding of a text (textual evidence), referring explicitly to the text as the basis for the answers.
- 3.RI.2 Determine the main idea of a text and recount the key details to explain how they support the main idea.
- 3.R.5 Determine the meanings of unknown and multi-meaning words within a text.
- 5.RI.3 Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
- 3.F.10 Determine the meaning of multiple-meaning words and phrases, choosing from a range of strategies with varying texts (homophones).
- 3.F.11 Use new academic, content-specific, grade-level vocabulary to make connections to previously learned words and relate new words to background knowledge.
- 3.RI.4 Determine the meaning of general academic and domain specific words and phrases in a text relevant to a grade 3 topic or subject area.
- 4.RI.4 Determine the meaning of general academic and domain specific words or phrases in a text relevant to a grade 4 topic or subject area.
- 5.RI.4 Determine the meaning of general academic and domain specific words and phrases in a text relevant to a grade 5 topic or subject area.

## Math Content Standards

### Operations and Algebraic Thinking

- 4.OA.2 Use drawings and equations with a symbol for the unknown number (variable) to represent the problem. Multiply or divide to solve word problems involving multiplicative comparison, distinguishing multiplicative comparisons from additive comparisons.
- 3.OA.8 Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies.

### Number and Operations-Fractions

- 3.NF.1 Understand a fraction  $\frac{1}{b}$  as the quantity formed by 1 part when a whole is partitioned into  $b$  equal parts.
- 4.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. Understand a multiple of  $\frac{a}{b}$  as a multiple of  $\frac{1}{b}$ , and use this understanding to multiply a fraction by a whole number.

### Measurement and Data

- 3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

## Social Studies Standards 2007

- Standard 1: Skills and Resources: Resources Benchmark 3.1.3 Use a variety of resources (e.g., maps, charts, bar graphs, Internet, books) to gather information about people, places, and events.
- Benchmark 3.1.3 Use a variety of resources (e.g., maps, charts, bar graphs, Internet, books) to gather information about people, places, and events.

## Science Content Standards

### From Molecules to Organisms: Structures and Processes

- Performance Standard 3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all experience birth, growth, reproduction, and death.
- Performance Standard 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

# North Dakota Agriculture in the Classroom Activities

This **Ag Mag** is just one of the North Dakota Agriculture in the Classroom Council projects. Each issue of the Ag Mag focuses on an agricultural commodity or topic and includes fun activities, bold graphics, interesting information and challenging problems. Send feedback and suggestions for future Ag Mag issues to:

Becky Koch  
NDSU Agriculture Communication  
701-866-6162  
becky.koch@ndsu.edu

Another council teacher resource is **Project Food, Land & People (FLP)**. Using the national FLP curriculum, ND Ag in the Classroom provides 600-level credit workshops for teachers to instruct them in integrating hands-on lessons that promote the development of critical thinking skills so students can better understand the interrelationships among the environment, agriculture and people of the world. Teachers are encouraged to adapt their lessons to include North Dakota products and resources.

Project Food, Land & People's 55 lessons include:

- Amazing Grazing
- Cows or Condos?
- By the Way
- Seed Surprises
- Schoolground Caretakers
- Could It Be Something They Ate?
- What Piece of the Pie?
- and many more.

For information, contact:

Jill Vigesaa  
N.D. Farm Bureau Foundation  
701-799-5488  
jill.vigesaa@gmail.com

The ND Geographic Alliance conducts a two-day **Agricultural Tour for Teachers**. The tour includes farm and field visits, tours of agricultural processing plants to see what happens to products following the farm production cycle, and discussions with people involved in the global marketing of North Dakota farm products.

For information, contact:

Jeffrey Beck  
North Dakota Geographic Alliance  
701-240-9231  
jeff.beck@minot.k12.nd.us

Educators may apply for **mini-grants for up to \$500** for use in programs that promote agricultural literacy. The Agriculture in the Classroom Council, working with the ND FFA Foundation, offers these funds for agriculture-related projects, units and lessons used for school-age children. The mini-grants fund hands-on activities that develop and enrich understanding of agriculture as the source of food and/or fiber in our society. Individuals or groups such as teachers, 4-H leaders, commodity groups and others interested in teaching young people about the importance of North Dakota agriculture are welcome to apply.

Examples of programs that may be funded: farm safety programs, agricultural festivals, an elementary classroom visiting a nearby farm and ag career awareness day. Grant funds can be used for printing, curriculum, guest speakers, materials, food, supplies, etc. More ideas and an application are at [www.ndffaoundation.com/applications](http://www.ndffaoundation.com/applications).

For information, contact:

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701-224-8390  
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**Nikki Fideldy-Doll** – ND Dept. of Career and Technical Education  
**Jackie Buckley** – Member at Large  
**Lucas Lang** – North Dakota Farm Bureau  
**Suzanne Wolf** – North Dakota Soybean Council

Statutory Member: Superintendent of Public Instruction  
**Kirsten Baesler** (represented by Steve Snow)

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[www.facebook.com/ndaginclassroom](https://www.facebook.com/ndaginclassroom)



Agriculture Commissioner  
Doug Goehring

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