

Bio/Diversity Project
Lesson Title: Introduction to Pollinators

Teacher: Jessika Mesa and Abbie Gheju

Grade Level: *K-2nd*

Time: *50-60 minutes*

Sources and Resources:

<https://modernfarmer.com/2017/06/non-bee-pollinators-how-to-attract-them/>

<https://www.abfnet.org/page/PollinatorFacts>

<https://wise.arizona.edu/sbip-educator-resources> (Kindergarten - 2nd grade Section)

AZ State Science Standard:	<p><i>1.L2U2.7</i></p> <ul style="list-style-type: none">· Develop and use models about how living things use resources to grow and survive; design and evaluate habitats for organisms using earth materials. <p><i>1.L2U1.8</i></p> <ul style="list-style-type: none">· Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.
Content Objective:	<ul style="list-style-type: none">● <i>Students will be able to explain how pollination works</i>● <i>Students will be able to name simple pollinators (ex: bees, butterflies, etc.)</i>● <i>Students will be able to describe the relationship between pollinators and pollination</i>
Language Objective: (Optional)	N/A

Scientist of the Week:

- Linda Black Elk
 - From North Dakota
 - Native American woman from the Catawba nation.
- Linda studies plants and what they are used for. She also studies how to protect plants and how to grow them back when they are ruined.
- Linda wants to protect land that means a lot to her. She is opening a clinic that uses local plants to make medicine.

Vocabulary		Materials		
Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding: <ul style="list-style-type: none"> ● Pollination ● Pollinator ● Plant ● Flower 		Provide a bulleted list of relevant materials for the lesson. <ul style="list-style-type: none"> ● Brown paper lunch bags ● Cheetos ● White pictures of flowers (depending on class size) ● Glue sticks 		
<p>Seasonality: (If more specificity is required, please note date/time range under the season)</p> <p>Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.</p>				
<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	Spring Mar.-Apr.	<i>Dry Summer</i> May-June
<p>Guiding Questions:</p> <ul style="list-style-type: none"> ● Why does pollination happen? ● Name any examples of pollinators. ● Why are only certain insects or animals pollinators? 				

- What also helps pollination, other than animals?

Introduction/ Scientist of the Week

Introduce yourself, what institution you are with, and your purpose at the school. Then lead into the scientist of the week.

Engagement/Introductory Activity:

1. Begin the class by passing around slides of pollinators
2. After a few minutes, ask the students if they can identify any of the insects that are on the slides
3. Then ask them if they know what all these insects have in common
4. Let the classroom know that these are all types of pollinators
5. Ask a follow up question to see if they know what pollinators are
6. This should lay a foundation for us to gauge what information the students know, then we can go into the lesson plan

Exploratory Activity:

1. Explain the activity to the students and make it clear that the bag of Cheetos is the flower and their hand is the bee
2. Explain that the Cheeto crumbs on the students fingers is "pollen"
3. Have the students touch the picture of the flower on the outside of the bag
4. Have the students observe where the Cheeto crumbs are: on their hands, on the bag, etc.

<https://static1.squarespace.com/static/569ec99b841abaccb7c7e74c/t/5c420d7f0e2e72f2a34e0c59/1547832723435/Bee+and+Pollinator+Activities+for+Kids.pdf>

Explain:

- Where did the pollen (Cheeto crumbs) end up?
 - Notice that the Cheeto crumbs are all over other flowers. This means that your hand was able to move the crumbs from other bags. This is how bees move pollen from other flowers. Pollen is sticky and ends up everywhere.
- What does the spreading of pollen (Cheeto crumbs) mean?
 - When pollen is spread, it means that plants are able to make more plants with the pollen they are given.
- Why does pollination need to happen?
 - Like the last question, pollination needs to happen for plants to keep being made. Pollen is the reason why some flowers and plants exist.

Extension Activity/Questions:

- How do other pollinators pollinate?
 - Bats use their tongues
 - Hummingbirds use their long beaks
- What happens if there are no pollinators around? How does pollination happen?

- Wind, other natural resources, etc.
- The concept being learned is that plants need pollinators in order to keep making plants. We can then introduce how plants produce types of food like vegetables and fruits.
 - What types of food do you eat that are made by pollination?
 - Then, we will present a brief PowerPoint that connects what they learned (the concept that plants need pollination to keep making plants) to the products of pollination. Plants reproduce to make plants which results in the production of food products. The PowerPoint will feature the video of the lesser long-nosed bat pollinating a flower.

What do plants need to grow?



This slide will reemphasize that plants need pollinators to keep making plants.





Can you guess which foods are made by pollinators?

Evaluation Activity:

How will you evaluate whether or not the students have achieved the learning objective(s) of the lesson?

- Get the students joined together in a large circle. Using popsicle sticks to call, students will share one thing with the classroom that they learned during the lesson that they will take home with them.

Bio/Diversity Project

Lesson Title: Plant Anatomy and Classification

Teacher: Jessika Mesa and Abbie Gheju

Grade Level: *K-2nd*

Time: *50-60 minutes*

FLOWER DISSECTION

Parts of a Plant Cut and Paste

The Parts of a Plant (song for kids about flower/stem/leaves/roots)

AZ State Science Standard:	<i>K.L1U1.7</i> <i>Observe, ask questions, and explain how specialized structures found on a variety of plants and animals (including humans) help them sense and respond to their environment.</i> <i>1.L2U2.7</i> <i>Develop and use models about how living things use resources to grow and survive; design and evaluate habitats for organisms using earth materials.</i>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● <i>Students will be able to label the three parts of a flower.</i>● <i>Students will be able to differentiate between the female and male components of a flower.</i>● <i>Students will be able to identify the four main parts of a plant: root, stem, leaf, and flower.</i>
Language Objective: (Optional)	<i>N/A</i>

Scientist of the Week:	<p>George Washington Carver</p> <ul style="list-style-type: none"> • Studied plants, especially plants that make food like peanut crops and sweet potatoes • Aside from being a scientist, he also was an artist and loved to draw paintings of plants • First African American to have a national park named after him • Came up with over 300 uses of the peanut, he made dyes and soap from peanuts!

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none"> • Stem • Root • Pistil • Stamen 	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none"> • Scissors • Glue sticks • Magnifying glasses • All About Flowers Diagram • Parts of Flower Worksheet • Parts of Plant Worksheet • Easily dissectable flowers (preferably spotted lilies) • Powerpoint

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	Spring Mar.-Apr.	<i>Dry Summer</i> May-June
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Guiding Questions:

Write down bulleted, guiding questions that you will ask students in order to promote a deeper understanding of the subject matter. These are questions you will ask many students, and maybe even more than once per student.

- What are the four main parts of a plant?

- What are the three parts of a flower?
- What parts of the flower help pollination happen?

Engagement/Introductory Activity:

Scientist of the Week portion

1. Talk about George Washington Carver

Dance like a Plant Portion

1. Ask the students to all stand up
2. Explain that we're going to dance like plants
3. Tell the students their head is the flower and when instructed to dance like a plant they should shake their head like a flower
4. Tell the students their arms are the leaves and when instructed to dance like a plant they should point their arms up to the sky
5. Tell the students their bodies are the stem and when instructed to dance they should stand still with their bodies
6. Tell the students their feet are the roots and when instructed to dance they should use their feet to stay in the same place
7. Demonstrate how the dance should look at each step
8. Then, have the students all dance like plants and the instructor should follow along with them

Exploratory Activity:

Lecture Portion

1. After the engagement activity, have the students sit down at their respective tables.
2. Show them a brief Google Slide on the structure and function of plants and flowers which has a visual component to it as well.

https://docs.google.com/presentation/d/1jXZiNak7-wPA58Bnm-vWCIf8IWUmt9TpHfuBhukp8Yc/edit#slide=id.g35ed75ccf_015

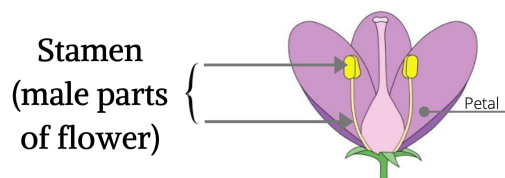
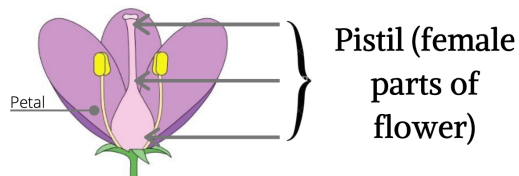
Dissection Activity

1. Begin by passing out the flower, magnifying glasses, and Parts of a Flower Diagram and then instruct students to not touch their flower just yet
2. Using either a projector or a PowerPoint show the steps 1 by 1 and do the activity alongside them
3. Begin by taking off *one* of the petals and explain to the classroom that this is the petal
4. Using the projector or slide, show the students what their flower should now look like
5. Pause the activity and check the class is following along and has removed only one petal by going around the classroom
6. Then remove the rest of the petals
7. Using the projector or slide, show the students what their flower should now look like

8. Ask the students to place the petals in the respective box on the Parts of a Flower diagram
9. Pause again to see if the class has removed all of the petals and placed them in the appropriate box
10. Then have the students remove only *one* of the stamens
11. Explain to them that this is the stamen, the male part of the flower, and that they can use their magnifying glasses to get a better view
12. Using the projector or slide, show the students what their flower should now look like
13. Pause again to see if the students are correctly following the task and that only one stamen has been removed
14. Then, continue to remove the rest of the stamens and ask the students to place the stamens in the respective box on the Parts of a Flower Diagram
15. Using the projector or slide, show the students what their flower should now look like
16. Pause again to see if the students have removed all of the stamens
17. Then begin to examine the pistil and explain this is the female part of the flower
18. Now have the students tear the pistil off the flower
19. Ask the students to place the pistil in the appropriate box
20. Using the projector or slide, show the students what their flower should now look like
21. Then check if the students have placed the pistil in the appropriate box

Diagram of a Flower

All About Flowers



Parts of a Flower

Instructions: Glue the parts of the dissected flower to the matching box .



Petal	
Pistil	
Stamen	

Explain:

1. What do you notice on the top of the stamen? Why is it sticky?
 - a. This is pollen, which pollinators like bees and birds, get on them when they land on the flower. Think about the activity from last week with the Cheetos. When you put your hand in the bag you were collecting pollen and taking it to other plants. The male part of the flower, the stamen, makes pollen.
2. What do pollinators carry from one flower to the next?
 - a. Pollen
3. On your Parts of a Flower worksheet, point to the male parts of the flower
4. On your parts of a flower worksheet, point to the female parts of the flower
5. How many petals does your flower have?
6. How many stamens does your flower have?
7. How many pistils does your flower have ?
 - a. They should only have one pistil.
8. What do you notice about the stamen? Where are their location on the flower?
 - a. The stamens surround the pistil.

Extension Activity/Questions:

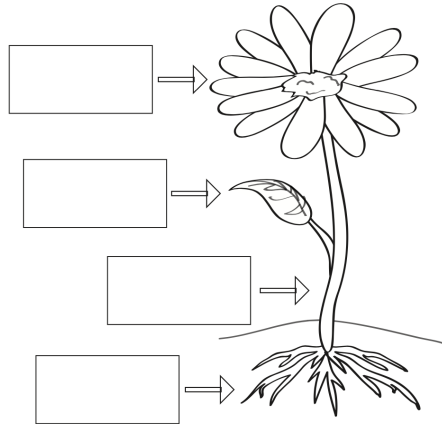
1. Have the students do the flower dance again and listen to the music video
2. Pass out the Parts of a Plant Worksheet and the cut-out labels

3. Have the students glue the corresponding pieces of their plant (leaf, root, stem, flower) to the cut and paste worksheet about the parts of a plant.

Name _____

Parts of a Plant

Color in the flower. Then cut and paste the correct word to each part of the plant.



ScienceWorksheet

www.allkidsnetwork.com
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leaf

root

stem

flower

Evaluation Activity:

1. Have the students sit down in a large circle
2. Then call on the students to share one thing they learned in today's lesson

Bio/Diversity Project
Lesson Title: Specific Pollinators: Butterflies and Moths

Teacher: Abbie Gheju and Jessika Mesa
Grade Level: *Kindergarten and 2nd Grade*
Time: *60 minutes*
[Monarch Butterfly Pollination](#)
[Butterflies](#)
[Moths](#)
[Monarch Watch](#)

AZ State Science Standard:	1.L1U1.6 <i>Observe, describe, and predict life cycles of animals and plants.</i>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● Students will be able to differentiate between butterflies and moths.● Students will be able to identify the four stages of a moths and butterflies life cycle.● Students will be able to explain the function of butterflies and moths in the pollination process.● Students will be able to explain the migration process of butterflies.
Language Objective: (Optional)	N/A

Scientist of the Week:

- Noland Johnson
- Tohono O’Odham farmer
- Sells, Arizona
- Runs a non-profit to help youth get involved with farming and plants traditional O’Odham foods like squash, tepary beans, and cholla cactus using *ak chin*, a traditional O’Odham farming method

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none">● Life Cycle● Egg● Caterpillar● Chrysalis● Cocoon	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none">● <i>The Very Hungry Caterpillar</i> Animated Video● Multiple colors of PlayDoh● White PlayDoh● Butterfly and Moth Powerpoint● Life Cycle of a Butterfly Diagram<ul style="list-style-type: none">○ https://www.superteacherworksheets.com/animals/life-cycle-butterfly_WMRMZ.pdf?up=1524721043● Butterfly Plastic Toys● Caterpillar Plastic Toys● Artificial Green Leaves● Artificial Flowers With Branches● Laminated Butterfly Life Cycle Poster<ul style="list-style-type: none">○ https://content.twinkl.co.uk/resource/dd/37/t-t-983-life-cycle-of-a-butterfly-display-posters-ver_1.pdf?token=exp=1581709609~acl=%2Fresource%2Fdd%2F37%2Ft-t-983-life-cycle-of-a-butterfly-display-posters-ver_1.pdf%2A~hmac=74d0535d6de91f8c88a00044c6441f709150cfce06c398ee31e30aebb8407b85<ul style="list-style-type: none">■ Only need pages 3,4,5, and 7 for the posters● Pictures of Tohono O’Odham Nation

Seasonality: (If more specificity is required, please note date/time range under the season)

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Guiding Questions:

- What is the life cycle of a butterfly and moth?
- Are butterflies and moths pollinators?
- What are some of the big differences between butterflies and moths?

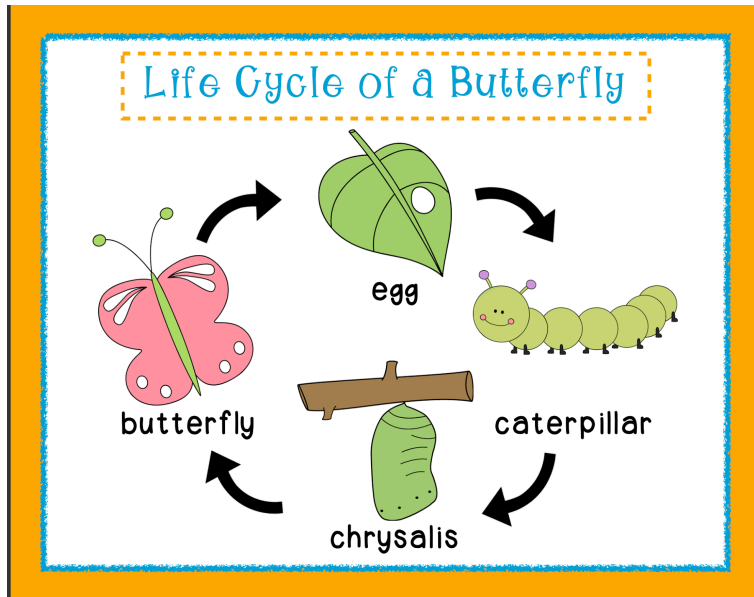
Engagement/Introductory Activity:

1. Introduce scientist of the week and show a short video of the Tohono O’Odham farmers, Sterling and Noland Johnson. (This relates back to the scientist of the week)
[Noland Johnson, Sterling Johnson - Tohono O'odham Nation Farmers | Chapter 3](#)
2. After introducing the scientist of the week, show a short video of *The Very Hungry Caterpillar*:
<https://www.youtube.com/watch?v=75NQQ-Sm1YY>
 - a. At 0:33, do you have any guesses what the white thing on the leaf is?
 - i. This is an egg!
 - b. At 1:16, ask the students what they think the very hungry, hungry caterpillar is going to eat?
 - i. The caterpillar is going to eat a lot! They will see what the caterpillar ate every day of the week.
 - c. At 2:06, regarding the caterpillar eating the apple, we can ask the students if apples are a food pollinated by pollinators
 - d. What did the caterpillar eat on Thursday?
 - i. He ate strawberries!
 - e. At 5:15, can you guess what the caterpillar is going to do after he’s eaten for a whole week?
 - i. He is going to make something called a chrysalis. Repeat this word after me chrys-a-lis! We will learn about what a chrysalis is today!
 - f. After 5:45, ask the students how long the caterpillar stayed in the chrysalis for
 - i. A: for more than 2 weeks
 - g. At 5:45, ask the students what they think the caterpillar will be after he comes out of the chrysalis.
 - i. The caterpillar will emerge as a butterfly.

Exploratory Activity:

[ButterflyandMothLessonPlan](#)

1. Begin with a brief powerpoint teaching them about the life cycle
2. At the end of the powerpoint, there is a video that can be started around the 0:43 time mark
3. The video can be paused multiple times throughout and specific questions can be asked to the students. For example, at the 1:48 mark, ask the students what the caterpillar turned into and what part of the life cycle is this
4. Begin the “butterfly world” activity by passing out a diagram of the life cycle of butterflies to use as a guide
5. Have students take a look at the diagram



[Butterfly World Play Dough Kit](#) (Probably my favorite idea)

6. Pass out the all necessary materials for the Butterfly Life Cycle activity, white and various colored Play-Doh, caterpillar and butterfly figures, and artificial leaves and flowers to each table.
7. Ask the students to first take some of the colored PlayDoh and roll out into a large enough circle so that there is enough space for the whole Butterfly life cycle.
8. Go around the classroom to check if the students have rolled out the circle properly. The circle doesn't have to be perfect, it just has to be large enough.
9. Ask the students to lay down leaves at the bottom of their circle. Since there are plenty of leaves, the students can place multiple.
10. After they have placed the leaves, ask the students to place 1 branch with flowers on their butterfly world.
11. Instruct them to roll out an egg using a very small amount of the white Play-Doh.
12. Tell the students to place the egg on or near the flower on the butterfly world
13. Ask the students to pick up only one caterpillar and place this caterpillar on the leaves
14. Ask the students the 3rd Explain question and follow it up with the 4th explain question.
15. Instruct the students to pick up some white Play-Doh, this time a larger amount for the chrysalis. Show the class how to roll the Play-Doh into the shape of the chrysalis and then instruct the students to roll the white Play-Doh into this same shape.
16. Check around the classroom to see if students need any assistance molding the chrysalis.
17. Then instruct the students to place the chrysalis under one of the branches.
18. Ask the students the 5th explain question.

19. Instruct the students to then pick up only one butterfly and have them place on their butterfly world.

Explain:

1. What is the first stage of the life cycle that you put on your butterfly world?
 - a. The first stage is an egg.
2. After the egg, what life cycle will come next?
 - a. The caterpillar.
3. What do caterpillars need to eat to grow?
 - a. Caterpillars eat a lot of leaves!
4. After the caterpillar has eaten a lot of leaves, the caterpillar is going to grow very big. After the caterpillar grows, the caterpillar is going to enter what life cycle?
 - a. The caterpillar will enter the chrysalis cycle.
5. After the caterpillar has stayed in its chrysalis for many days, it will come out of its chrysalis as what?
 - a. A butterfly.
6. How do butterflies and moths look different?
 - a. Butterflies have bright colors, moths are darker
7. What do butterflies do in the winter and summer? Where do they go?
 - a. Spend winter in Mexico
 - b. Spend summer in warmer places

Extension Activity/Questions:



1. Show students a photo of a traditional Tohono O'odham butterfly basket
2. Then tell the students about the Tohono O'odham nation, a brief background of their location in Arizona and history
 - Native American people of the Sonoran Desert
 - Used to have a lot of land but not anymore
 - Has been taken over by governments
 - These baskets are made from coil of bear grass and wire
 - They use the same materials as their ancestors
3. Then ask the students to gather around in a large circle for a traditional Tohono O'odham story about the origin of butterflies
4. Share with them the legend [How The Butterflies Came To Be - A Papago Legend](#). A story about children
5. While sharing the legend with the classroom, **act out** parts of the story.
 - Part of the legend describes that Elder Brother took various elements and mixed them in a bag to create butterflies and out of this bag “flew hundreds of butterflies.” In this case,

find any blue material like a cloth, a cut out of a sun, red "flower", purple "flower," and orange "flower," yellow "leaves" etc. and add them to what will be the Creation bag. Then mix it around and have butterflies already in the bag for the portion of the legend ("out flew hundreds of beautiful butterflies") and proceed to take out cutouts of butterflies.

Along with the life cycle of a butterfly, they migrate depending on weather

1. The Monarch butterfly spends the winters in Mexico (it is warmer)
2. They make this annual round-trip every winter
3. The North is too cold for them to survive in winter
4. Every species has their own life stage hibernation
 - a. Purplish Copper hibernates their eggs on leaves
 - b. Checkerspot hibernates as caterpillars
 - c. Mourning Cloaks as adults, they tuck themselves into cracks and holes in trees
5. Monarch Butterfly Biosphere Reserve in Mexico
8. Butterflies fly to Mexico and forests turn orange
9. They stay close together (sleep in clusters, close their wings)
10. When it is warmer, they fly around and it looks magical
11. The forest is protected due to cultural connection

Evaluation Activity:

1. Using the laminated posters of the butterfly life cycle poster ask the classroom to help you out before putting the posters on the classroom wall
2. Show the classroom the first four posters and ask them to wait before any questions
3. Then ask the students to shout out which of the four posters is the first stage of the butterfly life cycle
4. If the majority answer correctly, put the first poster up
5. Repeat this with the next 3 stages and put the following posters on the wall
6. This activity should both act as a learning check for the students and be a useful guide and way to preserve the knowledge learned as the year progresses.

Bio/Diversity Project

Lesson Title: Bats and Cacti in the Sonoran Desert

Teacher: Jessika Mesa and Abbie Gheju

Grade Level: K-2nd

Time: 50-60 minutes

AZ State Science Standard:	<p>1.L1U1.6 <i>Observe, describe, and predict life cycles of animals and plants.</i></p> <p>1.L2U2.8 <i>Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.</i></p>
Content Objective:	<ul style="list-style-type: none">• <i>Students will be able to explain how bats pollinate in the Sonoran desert.</i>• <i>Students will be able to explain what a saguaro cacti is, the purpose, and their inhabitants.</i>
Language Objective: (Optional)	N/A

Scientist of the Week:	<ul style="list-style-type: none"> ● Michelle McMahon ● Has a lab at the UofA ● Her lab studies biological diversity ● Studies the evolution of plants and flowers ● McMahon tests species and their relation (biodiversity)
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Vocabulary		Materials		
Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding: <ul style="list-style-type: none"> ● Bats ● Saguaro ● Nocturnal ● Migration 		Provide a bulleted list of relevant materials for the lesson. <ul style="list-style-type: none"> ● Stلالuna by Jannell Cannon (Stلالuna: Jannell Cannon: 9780152062873) ● Word Web Worksheet <ul style="list-style-type: none"> ○ Word Web ● Life Cycle of the Saguaro Worksheet <ul style="list-style-type: none"> ○ 1 2 3 6 5 4 STUDENT HANDOUT - LIFE CYCLE OF THE SAGUARO ● Bat Activity sheet <ul style="list-style-type: none"> ○ Bat Activity Sheets -Itsy Bitsy Bat Book 		
Seasonality: (If more specificity is required, please note date/time range under the season) <p>Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.</p>				
<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	Spring Mar.-Apr.	Dry Summer May-June

Guiding Questions:

- How do bats pollinate?
- What plant do bats mostly pollinate?
- What is the importance of saguaro cacti to the desert?
- What is the relationship between saguaro cacti and the lesser long-nosed bat?

Engagement/Introductory Activity:

1. Ask students if they know anything about bats.
 2. Pass out the Word Web worksheet. Explain to them that they will write in the bubbles what they think about bats. The word **BATS** will be in the center of the circles
 - a. On the board, draw the Word Web
 - b. Fill in the word Bats in the center of the circle and then label the remaining circles 1, 2, 3, 4
 - c. For circle 1, ask the students: What do they think bats look like?
 - d. For circle 2: How do they feel about bats?
 - e. For circle 3: What do you think bats eat?
 - f. For circle 4: When are bats more active in the day or night?
- a. Have this worksheet be double-sided so they can complete the back later

Name _____

Word Web

3. After completing the worksheet: share a few facts about bats
 - a. 70 species of bats live in Sonoran Desert
 - b. Bats pollinate flowers and help keep control of insect populations (mosquitoes!)
 - c. 1 out of every 4 mammals on our planet is a bat
 - i. For this portion, explain to the students that they will play a game where the whole classroom is a mammal.
 - ii. In order to find out which students are bats go around the classroom and tap the shoulders of every student who will be a bat (so every 4th student)
 - iii. Ask the students who were tapped to stand up and explain to the class that this is the number of bats in the whole classroom.
 - d. Bats are the only mammals that can fly
4. Explain how bats are beneficial to the environment
 - a. Pest control - they eat a lot of flying-insects
 - b. Pollinators - allow the plants to grow
 - c. Seed dispersers - seeds are dropped/moved around

Exploratory Activity:

1. Have students sit on the carpet or area where they gather
2. Share the cover of *Stellaluna* with the students and ask them if this is how they think bats looked like
3. Read *Stellaluna* by Jannell Cannon to the students
4. After reading:
 - a. Ask students if they learned anything new about bats
 - b. If they would add/change anything to their word web about bats
5. Have students go back to their seats
6. Have the students draw a picture of a bat and give them a piece of paper to draw a story of how they would make others think of bats positively (how would you make them not seem scary?)
Example is below:



Bat lesson plans (Modified Lesson Plan Based)

1. Ask the students to get their clipboard and then sit down in a large circle
2. First show the students this video [All About Bats for Kids: Animal Videos for Children - FreeSchool](#)
3. Pass out the [Bat Activity Sheets -Itsy Bitsy Bat Book](#) which includes some of the information from the video

- a. Example: bats sleep in caves, bats are furry, bats fly all night
 - b. On the page with bats fly all night ask the students to write the word nocturnal on the page
 - c. Have the word nocturnal written on the board so the students can use that as a reference
2. Have the students color the bat in the Itsy Bitsy Bat Book

Explain:

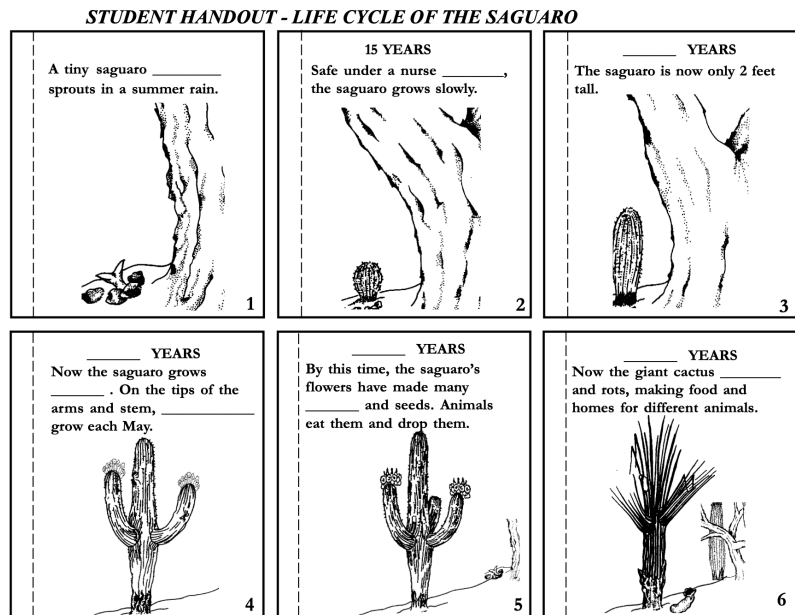
1. Bats are nocturnal pollinators. What does nocturnal mean?
 - a. Nocturnal means active at night
2. What is the word that explains how bats find their way around at night?
 - a. Echolocation
3. What makes bats different from other pollinators?
 - a. They can carry more pollen in their fur than other pollinators
 - b. Bats have longer noses which helps them get deep into a flower to look for food
 - c. They also travel for a longer distance than other pollinators like bees
4. Name one type of bat you can find in the Sonoran Desert
 - a. The lesser long-nosed bat
5. What flower does the lesser long-nosed bat pollinate?
 - a. The saguaro cactus flower
6. Thinking about the features of a saguaro cactus flower, what kind of plants help attract bats?
 - a. Flowers that bloom at night, are large, white, and smell very strongly

Extension Activity/Questions:

[LIFE CYCLE OF THE SAGUARO](#)

1. Begin with a brief slide on the Life Cycle of a Saguaro [SaguaroCactusSlide](#)
2. Included in the slide is a video on saguaro cactus flower blooming
 - a. Questions to ask with video [Saguaro bloom time lapse](#)
 - i. When do the saguaro cactus flowers bloom
 - At night
 - ii. What pollinator pollinates the saguaro cactus flower?
 - Lesser long-nosed bat
 - iii. Then show the second video which shows the lesser long-nosed bat pollinating the saguaro cactus flower (Begin the video at 4:00)

- Before class, print out the Life Cycle of the Saguaro worksheet and form it into a booklet.



- Pass out the Life cycle of the Saguaro booklet to the class.
- Write the words and numbers that go in the blanks on the board so that the students can have a reference on how to spell the words and numbers.

ANSWERS: Page 1: seed, Page 2: tree, Page 3: 30, Page 4: 50, arms, flowers, Page 5: 100, fruits, Page 6: 150, dies

- Then, alongside the students fill in the booklet together.
- Ask questions to guide them with the answers, but do not give out answers directly.
 - How does a saguaro begin it's life?
 - As a seed
 - Where does the seed come from?
 - From an adult saguaro
 - How does the seed get onto the desert floor?
 - From animals, like birds and bats, that eat the fruit and spread the saguaro seed
 - Under what plant does the small saguaro stay under to protect it?
 - Nurse tree
- Once the booklet is filled out, have the students color it in.

**** [Saguaro Story](#)**

If possible, is there anyway we could get in touch with the Cooper Center to get the materials for the Saguaro Story? I prefer the Saguaro Story activity to the Powerpoint as it's more hands on!

Evaluation Activity:

How will you evaluate whether or not the students have achieved the learning objective(s) of the lesson?

- Have students flip to the back blank page of the word web that they created at the beginning of the class
 - Ask students if they would change or add anything new to their word web

- b. Have students sit in a circle and share one new fact or something they added to their word web (what was not there at the beginning of class)

Bio/Diversity Project
Lesson Title: Specific Pollinators: Birds

Teacher: Abigail Gheju and Jessika Mesa

Grade Level: *Kinder and 2nd*

Time: *60 minutes*

AZ State Science Standard:	<p><i>K.L1U1.7</i></p> <p><i>Observe, ask questions, and explain how specialized structures found on a variety of plants and animals (including humans) help them sense and respond to their environment.</i></p> <p><i>1.L2U1.8</i></p> <p><i>Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.</i></p>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● <i>Students will be able to name similarities amongst a species of birds.</i>● <i>Students will be able to identify different species of birds.</i>● <i>Students will be able to explain why hummingbirds are some of the most effective bird pollinators.</i>
Language Objective: (Optional)	N/A

Scientist of the Week:

- *Salim Ali*
- *Ornithologist - the name for a scientist who studies birds*
- *Mumbai, India*
- *Referred to as the "Birdman of India," Salim Ali was the first Indian scientist to survey birds in India and helped conserve bird populations so that birds could be protected*

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none">● Species● Hummingbird● Nectar● Bill/Beak	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none">● Hummingbird Specimen kit<ul style="list-style-type: none">○ https://d2l.arizona.edu/content/enforced/863195-616-2020Non-term-250106-TheBioDiversi/Tucson%20Audubon%20Society%20Kits.pdf?&d2lSessionVal=qtpl8vS6Pnb0CnJ5IN96e5Piv● Pollinator Friends: Hummingbirds Powerpoint● Hummingbird Outline● Rose Outline● White construction paper● Watercolors● Brushes● Water Cups● Black marker● Red solo cups● Straws

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	Spring Mar.-Apr.	Dry Summer May-June
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Guiding Questions:

- What do all birds have in common?
- What are some of the characteristics that separate birds from other creatures? (wings/flight, feathers, hollow bones)
- What makes hummingbirds good pollinators? (their adapted beaks)
- What kind of flowers do hummingbirds like? (bright flowers)
- What is so unusual about the flight of a hummingbird? (figure 8)

Engagement/Introductory Activity:

1. Introduce the Scientist of the Week
2. Hold up one of the photos from the Hummingbird specimen kit
3. Ask students if they know what type of animal this is
 - a. They should know these are birds
4. Then ask the students if they can guess what species of birds these are
 - a. Provide the definition for species
 - b. Species: A group of similar animals, the most specific form of identifying animals
 - c. Give them an example: Hold up the photo of the hummingbird and another photo of a hawk. Explain to them that these are both birds, but they are two different species of birds
 - d. Ask them if they can identify any similarities and differences between the hummingbird and the hawk and call on some students
5. Then pass out all the photos of the hummingbirds
6. Let the students look at the photos
7. Ask them to identify the similarities between hummingbirds
8. Share with them that hummingbirds are the only species of bird able to move backwards while flying and that hummingbirds fly really fast
9. Ask the students to stand up to show them how hummingbirds fly in the air

-
- We can somewhat simulate hummingbird wings with our arms. We will
 - cheat a bit, however, by rotating our lower arm bones as we demonstrate
 - wing beats. Hummingbirds do it all from the shoulder.
1. First we will flap our arms as a typical bird. Hold your arms out to the sides and bend them at the elbows as you flap.
 2. Now we will flap our arms as a hummingbird, moving our arms at the shoulders only. This is how a hummingbird moves forward.
 3. Hummingbirds can fly backwards. They do this to back away from a flower after feeding and for other maneuvers. Hold your arms out to your sides, palms forward, and make backward circles with your arms (remember—move them only at the shoulders) pushing against the air. You can almost feel yourself wanting to move backwards.
 4. Hummingbirds can hover—remain in one spot in midair—for minutes at a time as they feed from flowers or shower under a water spray. Hold your arms straight out to your sides. Again move only at the shoulder. With palms out, push the air forward. As your arms move forward a ways, turn your palms downward, then backward, this time pushing back. Now forward again. You will notice your hands are making figure eights in the air—eights that are lying on their sides. By pushing against the air forward, then backward, hummingbirds are able to stay in one place in midair. Any students who are swimmers may have used this technique while treading water— pushing the palms forward then backward against the water (making those figure eights), thus staying afloat and in one place.
10. _____
 11. After the activity is done ask the students to sit down
 12. Lastly, walk around the classroom to show the hummingbird nest from the Hummingbird Specimen kit and explain to them the nest is where hummingbirds live

Exploratory Activity:

1. Brief Powerpoint and video on hummingbirds: [friendly pollinators:hummingbirds](#)
[Hummingbird activity: happier than a hummingbird](#)
 1. Give students a straw and explain that it represents a hummingbird's beak
 2. Place cups on each students desk with fruit punch (or water) and explain that these are the “flowers”
 3. Give each student 2 different straws with different lengths (we can easily cut them ourselves)
 4. Have students try one straw at a time to try and drink the “nectar”
 5. Have students look around and observe their classmates experiences
 6. Ask the students reflective questions:
 - What worked and what didn't?
 - What did each material involved represent? The cup, straws, and the student

Explain:

- What happened with those of you who had short bills?
 - a. unable to reach the flower's nectar
- What might happen to hummingbirds with shorter beaks?
 - a. they might die if they could not get enough food
- Did you notice any pollination occurring in this activity? No? How could this be represented?
 - a. perhaps some collected baby powder as they went from flower to flower
- Review how hummingbirds collect nectar with their tongues and bills and compare it with sucking the nectar through a straw in the activity
- Why is the nectar sweet? Why are hummingbirds attracted? (think about how you like candy)
 - a. The nectar is sweet in order to attract pollinators

- What types of flowers do you think are most attractive to hummingbirds?
 - a. Red colors, circle shape, little place for insects to land on, etc.
- What else might also be attracted to this flower that might benefit the hummingbird?
 - a. Small insects to eat
- Could other pollinators (like bees) easily get nectar from this flower? Why or why not?
 - a. Some flower opening are too small to let in pollinating insects, and some flower structures are reinforced to discourage insects from boring into the flower to get the nectar

Extension Activity/Questions:

Silhouettes Against an Arizona Sunrise (or Sunset)
 This art lesson reinforces bird silhouettes as students have fun playing with wet paint on wet paper.

Part One


1. Discuss the colors that appear in the sky at sunrise and sunset and, if available, look at photographs in magazines such as *Arizona Highways*.
2. Add water to the sunny colors (reds, yellows, oranges) in the water color tray.
3. Wet the paper with a wide brush.
4. Dip a brush into a color and draw it across the wet paper. The color should feather out.
5. Draw another color across the paper and allow it to run as well. It may blend with the previous color. Tilting the paper will produce interesting effects as the colors intertwine.
6. Do this a few times until there is a pleasing pattern that resembles the sky at sunrise or sunset.
7. Allow students to experiment with a number of sky paintings. Set them aside to dry.

Materials:
 white construction paper
 water color paints
 brushes
 water cup
 black felt pen (optional)
 photographs of sunsets (optional)
 bird books

Note: Students tend to overdo the colors and scrub with the brush, which results in a muddy brown. Take care not to overdo the colors or the brushwork.

Part Two

1. On the sky painting, paint or sketch a few desert plants with colored pencils.
2. Students examine pictures of desert birds they wish to include in their pictures.
3. On separate sheets of paper they draw the outlines of these birds and color them black to resemble silhouettes.
4. They may then add these to the sky picture. They can redraw them on the painting, then paint the silhouette with black paint or black felt marker. Or they may cut out the silhouettes and glue them on the painting. The birds can be perched on the plants, or flying against the colorful sky background.
5. Take care to make the bird the appropriate size in reference to other birds, the background, and the distance.



Section Three - Fun With Birds
- 110 -

<https://ecdn.teacherspayteachers.com/thumbitem/Hummingbird-and-Flower-Pollinator-Coloring-Page-4640144-1560967984/original-4640144-1.jpg>

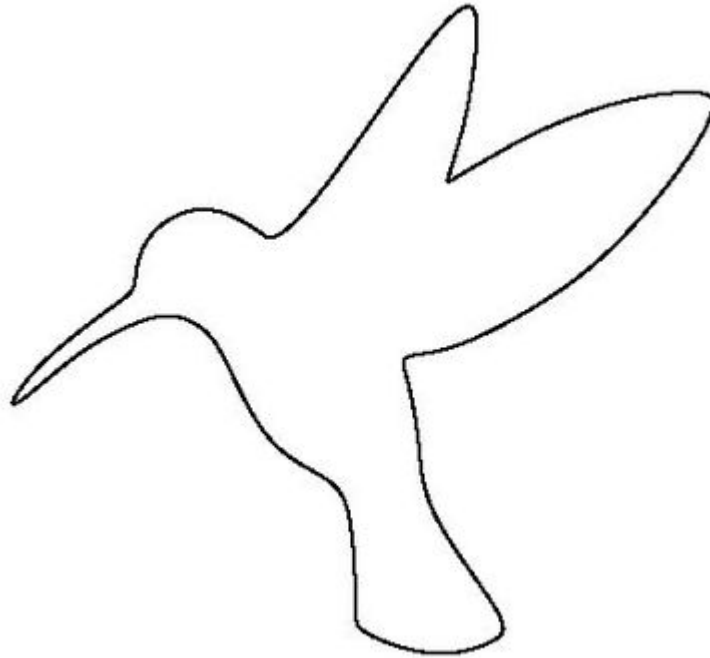
Pg. 110 from Tucson Audubon Society, Desert Birding in Arizona

For Abbie's class:

Pass out all the materials for the Silhouettes Against An Arizona Sunset (watercolors, brushes, construction paper)

1. Add water to some of the colors like purple, red, yellow, and orange
2. Instruct the students to first wet their white piece of paper with a small amount of water
3. Instruct them to dip their brush into a color that has previously been wetted and to draw it across the paper
4. Then instruct them to repeat this with other colors so that they can create a beautiful sunset
5. After the sunset has been created, ask the students to put their papers to the side while they wait for them to dry
6. Hand out sketches of a hummingbird so the students can paste the body of the hummingbird

7. Mention to them to pay special attention to some of the characteristic features of hummingbirds like their long beak and small body

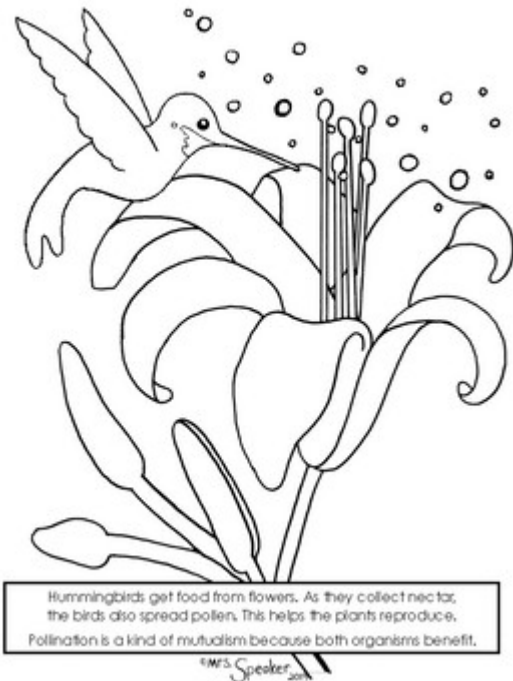


8. Ask the students to fill in the bird with all black marker
9. Then pass out cut out flowers and ask the students to brightly color these with colors that would attract a hummingbird, reiterate how flowers contain nectar that hummingbirds eat



10. Then instruct the students to glue their hummingbird on their sunset and to paste their flower next to their hummingbird to show the process of pollination

For Jess' class:



<https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.teacherspayteachers.com%2FProduct%2FHummingbird-and-Flower-Pollinator-Coloring-Page-4640144&psig=AOvVaw1EOa0EE4SubijgLEOIHKqw&ust=1583031984925000&source=images&cd=vfe&ved=0CAIQiRxqFwoTCIDsjuvj9ecCFQAAAAAdAAAAABAD>

1. Hand this coloring page out to students
2. Ask: what is the hummingbird doing in the photo?
3. Ask: can I have someone explain pollination?
4. Ask: what colors would be needed to make this coloring page complete? To make it realistic?
5. Have the students take out a red, purple, green, blue, and yellow markers/crayons
6. Go through each color with the students in the following order (do not let students get ahead):
7. Have the students color the hummingbird blue and green, maybe teal if possible (hummingbirds can be numerous different colors)
8. Ask: does the color of the hummingbird mean anything?
9. Instruct students to blend the numerous colors on the bird as much as possible
10. Have students take the red marker and color the flower petals
11. Ask: why are the petals red?
12. Have students recall the parts of a flower (this is in their science notebook!)
13. Have students color the stamen yellow
14. Ask: why is the stamen yellow?
15. Have students color the stem green
16. Have the students name their pollinator
17. Have students buddy up and think pair share about the colors of their page and what the humming bird is doing in the photo

Evaluation Activity:

How will you evaluate whether or not the students have achieved the learning objective(s) of the lesson?

1. Have the students sit down in a large circle

-
2. Using popsicle sticks, ask the students to share their favorite activity during the lesson and what they learned from this activity

Bio/Diversity Project
Lesson Title 6: Pollinators in Urban Areas/Migratory Pollinators

Teacher(s): Abbie Gheju and Jessika Mesa

Grade Level: *Kinder and 2nd*

Time: *60 minutes*

AZ State Science Standard:	K.L2U1.8 <i>Observe, ask questions, and explain the differences between the characteristics of living and non-living things.</i> 1.L1U1.6 <i>Observe, describe, and predict life cycles of animals and plants.</i>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● Students will be able to explain how urban areas impact pollinators.● Students will be able to explain how migration contributes to pollination.● Students will be able to explain the advantages and disadvantages of pollinator migrations.
Language Objective: (Optional)	N/A

Scientist of the Week:

- *Dr. Kathleen Prudic*
- *Dr. Prudic is an entomologist, a type of scientist that studies bugs like bees, butterflies, and beetles*
- *Tucson, Arizona*
- *Dr. Prudic works to conserve butterflies and she created eButterfly, a website for citizen scientists who want to also help conserve the number of butterflies.*

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none">● Migration● Citizen scientist● Urban● Ecosystem diversity● Species diversity	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none">● eButterfly website/eButterfly Slide● Migration Powerpoint<ul style="list-style-type: none">○ PollinatorMigration● Caprisun● Follow the Butterflies Map<ul style="list-style-type: none">○ http://www.scholastic.com/content/collateral_resources/pdf/t/TeachNow_FollowButterflies.pdf● Comic strip printables https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.timvandevall.com%2Ftemplates%2Fprintable-comic-strip-template%2F&psig=AOvVaw0rd7XbrlYiRHrI3iGAALOr&ust=1584844322024000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCJjTngrDqugCFQAAAAAdAAAAABAJ

Seasonality: (If more specificity is required, please note date/time range under the season)

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	<i>Spring</i> Mar.-Apr.	<i>Dry Summer</i> May-June
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Guiding Questions:

- What is migration?
- Why do pollinators migrate?
 - Why do monarch butterflies migrate to Tucson?
- Why are the advantages and disadvantages of pollinator migration?
- How has urbanization (explain what this is) impacted pollinators?
- How do pollinators contribute to ecosystem diversity?

Engagement/Introductory Activity:

1. Introduce the scientist of the week
2. Talk about how Dr. Kathleen Prudic has a website called eButterfly
3. Go to the eButterfly website : [eButterfly](#)
4. If the website is not working, then this powerpoint functions as a backup showing the students the map and how each dot represents a species sighting [e-ButterflyWebsiteScreenshots](#)
5. Under the Explore Data tab, click on the Species Map
6. Under English name write: Monarch
7. The map should pop up dotted with sightings
8. Click on a few of the dots in the north region closer to Canada, then click on dots in the Tucson/Mexico region and explain to them that monarchs move from Canada to Mexico
 - a. Geography might confuse the students so try to stick to basic north and south movement and from Canada to Mexico
9. Explain to them that the dots on the map come from people who see monarchs in their neighborhoods, like Tucson, and record them down
10. Explain to them that these are “citizen scientists”
11. Define what a citizen scientist is and how they are citizen scientists
12. Tell them that if they see a monarch butterfly near them, they can use this website or have their parents help them record their sighting
13. In order to fortify the migration route, explain to them the directions for a Follow the Monarch Butterfly activity
14. Write the words Canada and Mexico on the board to serve as a reference
15. Reiterate that butterflies begin their journey in Canada and ends in Mexico
16. Tell them that for this activity, they have to draw a line connecting the dots and they must start their line at the first letter of their ABC's so A, then B, then C etc all the way until they have drawn a line showing the Monarch's movement from Canada to Mexico
17. Pass out the worksheet
 - a. For Abbie's kinder class, the questions are too complicated so the students will only be connecting the dots and coloring the map in!

18. Go around the classroom to ensure that students understand the directions and are doing the activity correctly
19. After the students have connected the lines, have them color in the map and the monarch

Photo 1

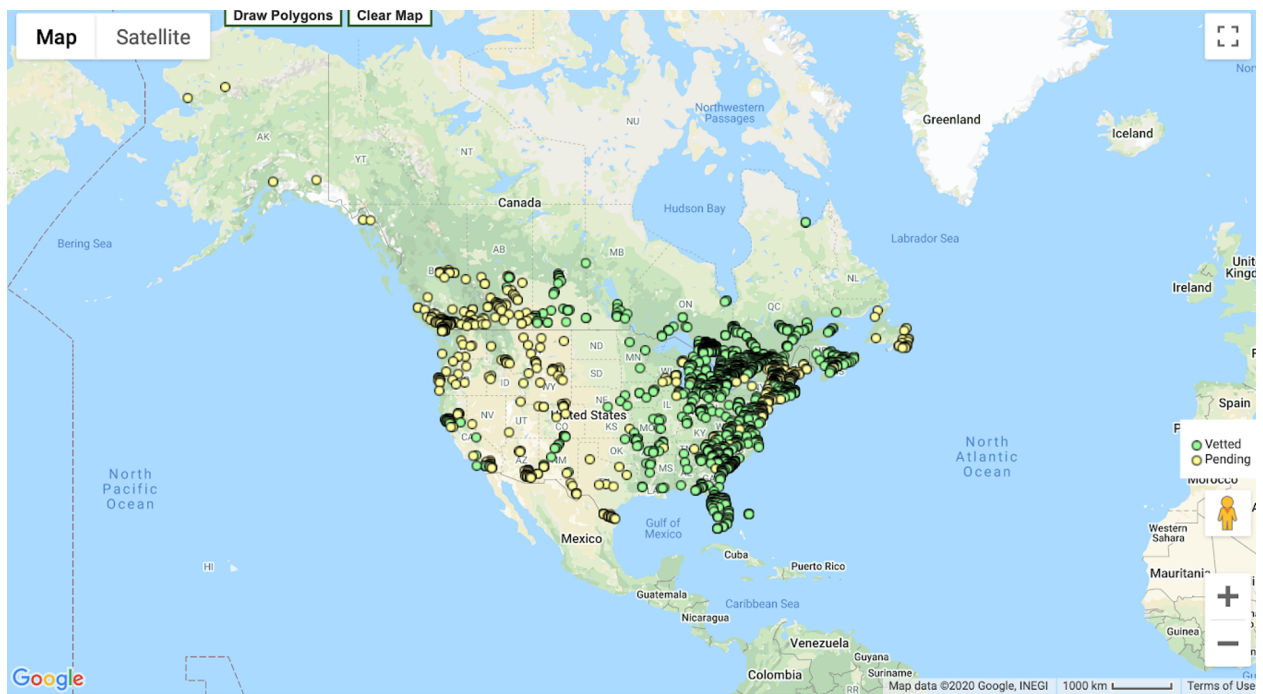


Photo 2

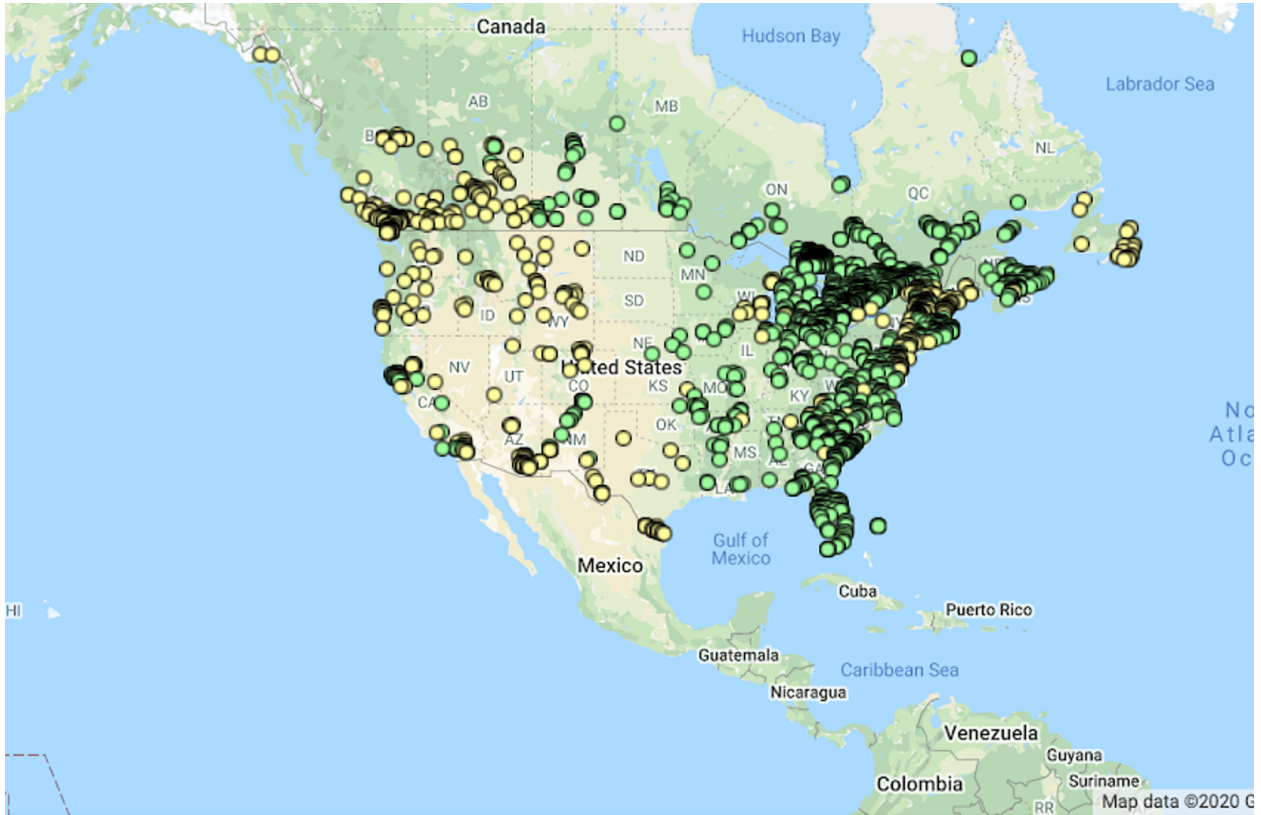


Photo 3

Checklists on this location

Arizona

	Date	Observer	Species Count
Checklist-93063	2019-07-23	Dave Czaplak	
Checklist-93063	2019-07-23	Dave Czaplak	
Checklist-93063	2019-07-23	Dave Czaplak	
Checklist-93063	2019-07-23	Dave Czaplak	
Checklist-93063	2019-07-23	Dave Czaplak	

Page 1 of 1, showing 5 sightings of 5

First 1 Last

Close

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About eButterfly
eButterfly is an international, data driven project dedicated to butterfly biodiversity, conservation, and education

Follow eButterfly

Exploratory Activity:

1. Begin with a brief powerpoint on 1) what migration means 2) why pollinators migrate 3) the Monarch migration [PollinatorMigration](#)

Monarch Migration through Tucson - Monarch Hopscotch Modified

[MONARCH MIGRATION GAME](#)

Migration Hopscotch

Objectives: Students will experience the need for habitat connectivity and make connections between this experience and that of animals that migrate or occupy large ranges.

Materials: Carpet squares, sidewalk chalk, or some way of marking/creating pathways for students to walk/jump on.

Procedure:

1. Begin by reviewing the components a habitat must include to meet an animal's basic needs (food, water, shelter). What happens if an animal accidentally travels to an unsuitable habitat?
2. Use carpet squares or sidewalk chalk to create a long path or hopscotch setup. Explain to the students that they are Monarchs traveling between Maine and Mexico, and that the path represents suitable Monarch habitat. To make the journey successfully, they must stay on the path.
3. After one or several successful journeys, begin to take away or cross out sections of the path. You can explain that the milkweed in that area was converted to crops, the area was paved, pesticides were used, etc. Let students attempt to make it through by jumping over the disconnects as you continue to make the path more difficult.
4. When the route becomes impassable, pause the game to debrief. What happened when a gap became too large to jump? How did that affect the Monarch populations on either side? You may need to point out that Monarchs that get stuck in suitable habitat in Maine/Mexico will only find the habitat suitable until the weather gets colder/hotter—which is why they migrate in the first place!
5. Finish by brainstorming some ways to restore the habitat that was lost. Maybe a town can plant milkweed in its parks, or a school can create a butterfly garden. Return the squares and allow the butterflies to make one last successful trip.

Extension: Once the students realize how important it is to restore/steward Monarch habitat at all points along their migration route, they may wish to spread the word! Create letters and/or posters to send to friends or family — this is what Leo's grandfather does in *A Monarch Butterfly Story*.

[MONARCH MIGRATION GAME](#) (Daily Situation Examples)

1. Have the students go outside in a large enclosed field for the Monarch Migration activity
2. Line the students up side by side, giving them decent space on each side
3. Place a "sign" that says Canada at the beginning of the hopscotch path
4. Remind the students that as monarchs, they will begin their migration in Canada
5. Place a "sign" that says Mexico at the end of the hopscotch patch
6. Tell the students it is getting too cold for the monarchs up in Canada and they must migrate
7. Have all the students do one round of hopscotch with no interruptions
8. Begin by removing one of the hopscotch single squares in the middle so students have to jump over the gap
9. Ask the students to travel their path again
10. Place that student (the car) in one of the spaces where a hopscotch square was
11. Tell the students it's very common when butterflies migrate that they have to travel through busy cities
12. For the next scenario, tell students that a car will obstruct the path, meaning the monarchs will have to go off the path to avoid the car
13. Explain to the students how the car changed their path and that it took longer for the monarch to migrate

14. Tell the students today is a very windy day so for every hop they take forward they have to take two hops back
15. Explain to them again how this has lengthened their path
16. Tell them it is nightfall
 - a. Ask: can butterflies migrate during nightfall?
 - i. No! So students will not “migrate” for that day
17. For the next “day,” tell students that they must first find nectar (juice box) before migrating for the day
18. The weather is sunny, but it starts to rain so students must hop side to side to avoid any raindrops touching their wings
19. For the last round, tell the students it is very hot today. Before hopping to the next square they must wait 2 seconds!
20. Have them finish up their last round of hopscotch then go back in the classroom for questions.

Explain:

- When we were playing hopscotch, what were we doing as butterflies?
 - We were migrating
- What is migration?
 - The movement of animals from one place to another
- Where did we start our migration?
 - Canada
- Why did we have to migrate/move from Canada?
 - Because it was getting too cold
- Why do pollinators migrate?
 - Pollinators migrate for food, for better weather, to reproduce
- When you stopped for food at the flower, what food were you eating?
 - Nectar
- When a pollinator like a monarch stops for food at a flower, what does it collect on its body and wings?
 - Pollen
- When the butterfly has to stop at other flowers to get more nectar, what does it take from one flower to another?
 - Pollen
- So, what happens when the butterfly spreads pollen from one flower to another? What is this called?
 - Pollination
- This would mean that when pollinators, like monarchs, migrate they are helping what occurs/happens?
 - They are helping pollination happen
- During the game, how did being in Tucson, the city, affect the movement of monarchs?
 - In the city, the car was getting in the way of the monarchs moving/migrating, so cities can get in the way and be dangerous for pollinators like monarchs

Extension Activity/Questions:

1. Hand out the blank comic strips and crayons - have comic strips of both 3 and 6 boxes for the students who can be challenged with more boxes



2. Ask students if they have ever read a comic strip or have created their own before
3. Prompt the students with: Trevor the monarch butterfly was traveling with his mother and sister when he saw a massive thunderstorm approaching!
 - Ask the students: what is a name for the massive thunderstorms that happen in Tucson? With all the dust, wind, and rain? (A monsoon)
 - What time of year do monsoons usually happen?
 - What do we, as citizens, usually do during the time of monsoons?
4. Ask the students as a group: (write these on the white board)
 - What will Trevor and his family do next?
 - How will they find nectar along the way?
 - What will their final destination be?
5. With the given prompt above, ask students to create a comic strip by finishing the story with the guided questions above
6. Walk around and hand out printed butterflies for those who are struggling
7. Guide the students every 1-2 minutes that they should be starting the next box
8. Allow the students to share their story with a partner

Evaluation Activity:

1. Have the students sit down in a large circle
2. Vocab Review
3. Put on the board the word MIGRATION with the letter A and G missing
4. Ask the class to sit quietly and think what word from today's lesson is on the board
5. Then, using popsicle sticks call on a student to answer what vocab word is on the board
6. If guessed correctly, use another popsicle stick to call on a student who can explain what the word migration means
7. Repeat this again with the word URBAN removing the letter A

Bio/Diversity Project
Lesson Title: Protecting Pollinators

Teacher: Abbie Gheju and Jessika Mesa

Grade Level: *Kinder and 2nd*

Time: *60 minutes*

AZ State Science Standard:	2.L2U1.9 <i>Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive.</i>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● <i>Students will be able to explain how conservation helps protect pollinators.</i>● <i>Students will be able to explain why bees are so important.</i>● <i>Students will be able to identify several ways they can take action to help the bees.</i>
Language Objective: (Optional)	N/A

Scientist of the Week:

This is basic information about your diverse scientist of the week. This should be in kid-friendly language. Here you should list:

- *Dr. Gillian Bowser*
- *Wildlife ecologist, activist, and conservationist*
 - *A wildlife ecologist is the name of a scientist who looks for ways to protect wild animals like bears, wolves, etc and how wildlife and humans interact*
 - *A conservationist is someone who protects environments for animals and insects and makes sure we have clean air and water*
- *Colorado, United States*
- *Dr. Boswer created the Rocky Mountain Sustainability and Science Network which brings together diverse college students to national U.S parks to learn more about conservation*

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none"> ● Conservation ● Population ● Habitat ● Native 	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none"> ● 5 bowls (various sizes) ● Different size pebbles ● Food coloring ● Save the bees worksheet ● KWL worksheet (https://cdn2.hubspot.net/hubfs/3409662/Offers/Long_Live_The_Bees_Lesson_Plan.pdf) last two pages ● Plant a Flower Garden worksheet <ul style="list-style-type: none"> ○ Download Worksheet ○ Plant a Flower Garden Worksheet ● Crayons ● Colored photos of native Tucson plants (Spider Milkweed, Autumn Sage, Desert Honeysuckle, Adonis Blazingstar) with names written below plants ● What If There Were No Bees?: A Book About the Grassland Ecosystem <ul style="list-style-type: none"> ○ https://www.amazon.com/What-There-Were-Bees-Grassland/dp/140486394X/ref=sr_1_2?crd=3DKJVOPBA2R8&keywords=what+if+there+we+re+no+bees&qid=1584919956&

[srefix=what+if+there+%2Caps%2C197&sr=8-2](#)

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	<i>Spring</i> Mar.-Apr.	<i>Dry Summer</i> May-June
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Guiding Questions:

- Why is it important to protect and help pollinators?
- How can we protect pollinators?
- How can we conserve and restore pollinator habitats?

Engagement/Introductory Activity:

1. Have the students recall what they remember about bees
2. Ask the students a few questions to refresh their memory:
 - Are there different types of bees?
 - How do bees pitch in to help life around them?
 - How do bees spread pollen?
 - What color flowers are bees attracted to?
 - How can we help bees day-to-day?
3. Pass out the 3 column KWL chart and have students fill in at least one comment in each column: what they already know, what they want to know, and what they want to learn

NATURE NATE'S
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K

WHAT DO YOU KNOW?

W

WHAT DO YOU WANT TO KNOW?

L

WHAT DID YOU LEARN?

4. Now, read the book: "What If There Were No Bees?: A Book About the Grassland Ecosystem"
5. Have students add something new to each KWL column

Exploratory Activity:

1. Pass out the Save The Bees worksheet

SAVE THE BEES

HOW CAN WE HELP THE BEES?

WHAT ARE THINGS BEES NEED TO SURVIVE?

HOW WOULD THE WORLD BE DIFFERENT WITH NO BEES?

NAME: _____

2. Discuss each of the 3 hexagons with the students
3. Ask the students a few questions:
 - Why are bees important to us?
 - What do both us and bees need in order to survive? (water, food, shelter, air)
 - What are examples of things hurting the bees? (weed killer, weather, some people)
 - What are some ways we can help the bees? (make sure there are plants that bees can gather pollen from, create a safe zone, pick up litter, share how important bees are to us!)
4. Explain to the students that offering a bee pond is another way to help bees
5. Explain that a bee pond is where bees can drink water when they are taking a break between pollinating
 - Why are bee ponds important? FRESH WATER! It is important to keep the bee pond clean and keep cleaning it.
 - What should we not put in them? Sugar and honey! Bee's can get this somewhere else, however, fresh water is not always readily available.
6. Number students off into groups of 4
7. Pass out the bee pond materials to each group
8. Fill each bowl with clean water $\frac{1}{4}$ of the way

9. Have the students arrange the pebbles in different positions so that there a few rocks sticking out above the water
10. Explain that bees land on pebbles and stones to take a break and drink some water
11. Explain that the water must be replaced and the stones must be cleaned frequently in order for the bees to stay clean and healthy
12. (Optional): put food coloring in the water for the water to become “dirty” and have the students clean it
13. (Optional if time is given): go outside and find a place outside the classroom where a bee pond could be placed

Explain:

1. Ask the students: what was the purpose of sharing the idea of bee ponds with you?
2. Revisit these main points:
 - Why are bee ponds important? FRESH WATER! It is important to keep the bee pond clean and keep cleaning it.
 - What should we not put in them? Sugar and honey! Bee’s can get this somewhere else, however, fresh water is not always readily available.
3. Mention these points:
 - They consume the water and also take it back to their hive to help cool it.
 - Also, just as humans do, **bees** like the natural, peaceful element associated with a **pond**.
4. Have students brainstorm ways to share the importance of bees to others (posters, sharing with friends and family, etc.)
5. Ask students if they can create a bee pond at home (discuss with parents)
6. Have students complete drawings in the Save the Bees Worksheet with these scenarios:
 - First hexagon: draw what a park would look like without bees
 - 2nd hexagon: draw flowers, water, the sun (we are just like bees)
 - 3rd hexagon: your own idea!
7. Have students create a one page poster to give to their parents or friend on why bees are important

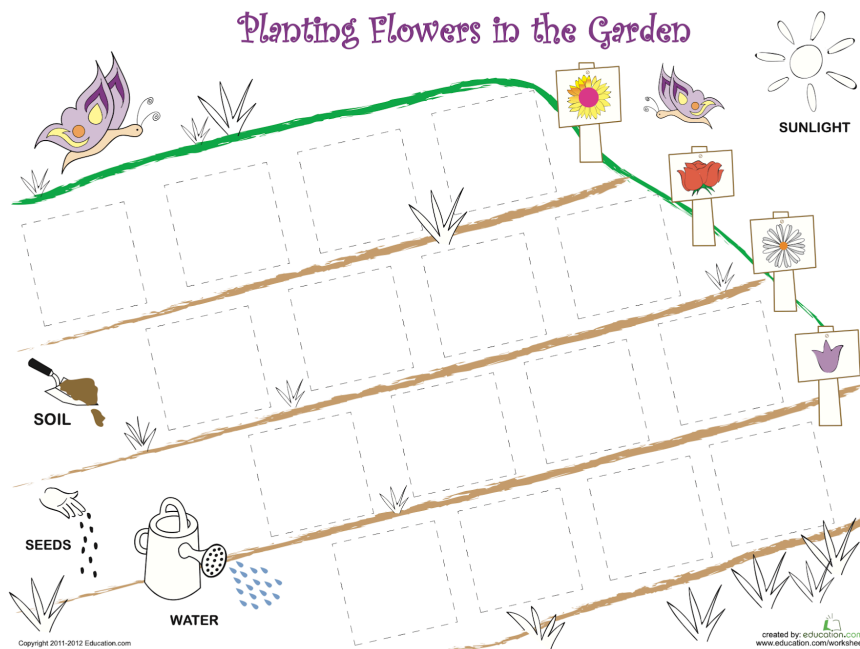
Extension Activity/Questions:

[Protecting Pollinators Classroom Activity: Teacher's Guide](#)

Imaginary Pollinator Garden

1. Ask the students to recall what bees need to survive.
2. Elaborate on the previous point to explain how all pollinators, like bees, need :
 - a. Food
 - b. Shelter
 - c. Clean air and water
 - d. Space
3. Explain to the students that these 4 things make up a **habitat**.
4. Tell the students that a pollinators habitat is like a home where pollinators live.
5. Ask the students to remember what food pollinators need (nectar) and where they get nectar from (flowers).
6. Explain that if there are no flowers in their home/habitat, pollinators won’t have any food.
7. Ask the students if they recall what flowers hummingbirds, bees, and Monarch butterflies are attracted to.

8. Discuss three types of Sonoran Desert pollinators and what types of flowers they are attracted to. In order to make this easier to memorize, students can remember that bumblebees are yellow, so they're attracted to yellow flowers. The Rufous hummingbird is orange and red, so it's attracted to red and orange flowers. Lastly, Monarch and Milkweed both start with the letter M which should help the students remember what plant Monarch butterflies are attracted to.
 - a. Rufous hummingbird: Red and orange flowers that are large and look like tubes (Desert Honeysuckle, Autumn Sage)
 - b. Monarch butterfly: Milkweed, a plant that grows in Tucson (Spider Milkweed)
 - c. Bumblebee: Yellow flowers (Adonis Blazingstar)
9. Go into more detail about how native plants are good for pollinators, because native plants are habitats for pollinators. Also explain how pesticides are bad for pollinators because they kill pollinators.
10. Ask some of the students who their favorite superhero is and why. Then explain to the students that they are Pollinator Superheroes and it is their job to save the pollinators! Tell them to think of their superhero name which they can share later. Their first task as Pollinator Superheroes is to create a "garden" and plant native plants, without using pesticides to help save the pollinators.
11. To each table: Pass out the Plant a Flower Garden worksheet, crayons, and printed colored photos of native Tucson plants that are beneficial for pollinators. [Plants for Enhancing Pollinator Habitat in Arizona](#)
12. Instruct the students to "grow" these plants inside their garden by drawing them using the photos as references.



Evaluation Activity:

1. When the students are done, have them first share their Pollinator Superhero name and what flowers/plants they grew in their garden.
2. After the activity is done, emphasize that by helping make habitats for pollinators we are conserving their population.

3. Call on one of the students in the class with popsicle sticks to share what the definition of a habitat is

Bio/Diversity Project
Lesson Title: Protecting Pollinators/Action Project Week 1

Teacher: Jessika Mesa and Abigail Gheju

Grade Level: *Kinder and 2nd*

Time: *60 minutes*

Parts of Lesson Plan Adapted from the Arizona Audubon

[Hummingbird Migration Game](#)

[Untitled](#)

AZ State Science Standard:	<i>1.L2U2.7</i> <i>Develop and use models about how living things use resources to grow and survive; design and evaluate habitats for organisms using earth materials.</i>
Content Objective: Math, Reading, Science, Writing, Other:	<ul style="list-style-type: none">● <i>Students will be able to explain how creating hummingbird feeders and seed balls will protect Sonoran Desert pollinators.</i>● <i>Students will be able to connect how the seed balls and hummingbird feeders help pollinators while they migrate.</i>● <i>Students will be able to identify why hummingbirds migrate.</i>
Language Objective: (Optional)	N/A

Scientist of the Week:

- *Dr. Kathleen Walker*
- *A professor at the University of Arizona*
- *Studies entomology: the study of insects*
- *She goes to schools (just like yours!) to teach students about insects and why they are important*
- *Dr. Kathleen Walker specifically studies mosquitoes and why they are found in certain communities and not others*
- *She specifically studies mosquitoes in different Africa communities*

Vocabulary		Materials		
<ul style="list-style-type: none"> ● Migration ● Conservation ● Nectar ● Biodiversity 		<ul style="list-style-type: none"> ● Color the Hummingbirds at the Feeder worksheet ● Crayons ● Photos of Rufous and Anna hummingbird ● Mini paper cups ● Lemonade ● If You Plant a Seed book (https://www.amazon.com/gp/product/0062298895/ref=as_li_qf_sp_asin_il_tl?ie=UTF8&camp=1789&creative=9325&creativeASIN=0062298895&linkCode=as2&tag=thameamom0e-20&linkId=522YYPGIPMB5LKW3) ● Blank sheets of paper 		
<p>Seasonality: (If more specificity is required, please note date/time range under the season)</p> <p>Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.</p>				
<p><i>Monsoons</i> July-Sept.</p>	<p><i>Autumn</i> Oct.-Nov.</p>	<p><i>Winter</i> Dec.- Feb.</p>	<p>Spring Mar.-Apr.</p>	<p>Dry Summer May-June</p>

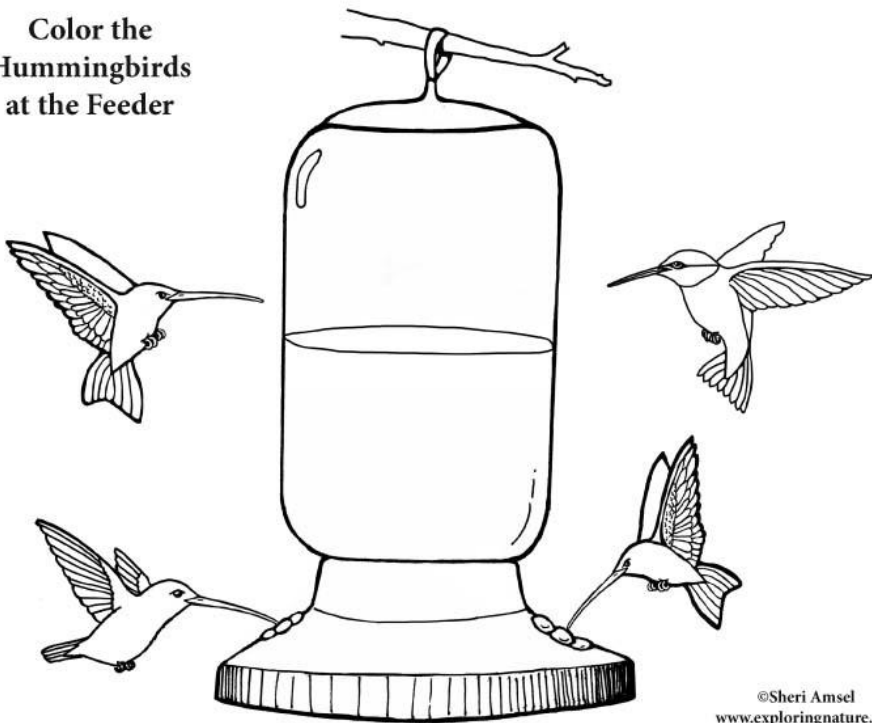
Guiding Questions:

- What do pollinators need to live?
- Where do pollinators get their nectar from?
- What do hummingbirds and monarch butterflies begin to do when it gets warmer outside?
- How can we help pollinators that migrate?

Engagement/Introductory Activity:

1. Ask the students what they remember from the hummingbird lesson plan.
2. Remind the students that hummingbirds are pollinators who also help the environment by acting as insect control.
3. Pass out the hummingbirds at the feeder worksheet.

Color the Hummingbirds at the Feeder



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4. Ask the students if they know what the hummingbirds are drinking from the feeder.
5. Explain that the birds are drinking a mixture of sugar and water.
6. Ask the students why they think the hummingbirds are drinking the sugar and water mixture.
7. Tell the students that the sugar water mixture is like nectar for the birds and gives them energy while they migrate.
8. Tell the students that in the next two weeks, the students are going to be doing something called an action project. Explain to the students that for a long time, they have been learning about pollinators and what pollination is. Tell them that this action project is also going to be about pollinators and that they will be making “mystery items” for the action project. These items will be revealed throughout the lesson plan (hummingbird feeders and seed balls).

9. Then, reintroduce the idea of pollinator superheroes. Ask the students to recall their pollinator superhero name from the previous week. Explain that their next goal as pollinator superheroes is to build feeders for hummingbirds as part of the action project. Explain that these feeders have water mixed with sugar in them and will provide a drink similar to nectar for the hummingbirds. Explain that they need the nectar for energy while they migrate.
10. Then instruct the students to first color in the hummingbirds. To make it more Sonoran Desert specific, photos of the Anna and Rufous hummingbirds will be provided so the students can use this as a guide to color the hummingbirds purple and orange/red respectively.
11. After they have colored in the hummingbirds, instruct the students to color the liquid inside the feeder a yellow color to represent nectar.

Exploratory Activity:

Part 1: Introduction to Hummingbird Migration

1. Ask the students to recall the migration game they played as monarch butterflies.
2. Explain that today the students will be learning about hummingbird migration and that there are some similarities and differences between monarch and hummingbird migration.
3. Begin with the similarities between monarchs and hummingbirds. Ask the students if they can think of any similarities.
 - a. They are both pollinators.
 - b. They both eat nectar.
 - c. They both begin to migrate towards Mexico when it gets colder up north.
 - d. They both start their migration in Canada.
4. Then touch on the differences between monarchs and hummingbirds.
 - a. Explain that hummingbirds begin their migration when the weather gets colder, but for different reasons than monarchs. When the weather gets colder, there are less insects outside. Hummingbirds eat insects for food, so they have to migrate to where it's warmer like Mexico to find more insects to eat.
 - b. Hummingbirds also face different challenges when they migrate compared to monarchs. They are bigger than butterflies and hummingbirds also need more sources of food while they migrate. Hummingbirds almost never stop flying, so they have to eat a lot of food to have energy to fly.
5. Then reintroduce hummingbird feeders. Ask the students to recall what the feeders are filled with. Then explain that like monarchs, hummingbirds often can't find flowers while they migrate. Reiterate that flowers is where hummingbirds get nectar from. So, hummingbirds need hummingbird feeders, because they provide a source of food.
6. Lastly, ask the class : why are we learning about hummingbird migration if we already learned about monarch migration?
 - a. Because hummingbirds have different migrations than butterflies. Remember that they have different challenges along the way. So, it's important as pollinator superheroes to know about all pollinators so we can help them along the way. Because we're learning about hummingbird migration, we now know about hummingbird feeders. This information will help us be able to help hummingbirds.

Part 2: Hummingbird Migration Game - Musical Chairs

[Hummingbird Migration Game](#)

[Untitled](#)

1. Line up two rows of chairs facing back to back.
2. For the first round have the number of chairs equal to the number of students.

3. Place 6 mini paper cups around the room with lemonade in them to represent a sugar water mixture. These will be used later in the game.
4. Tell the students that they're going to be playing musical chairs, but as Rufous hummingbirds. Explain to them that the game is going to get harder as they go and they will face more challenges along the way.
5. Explain to the students that the game is going to represent the migration route of the Rufous hummingbird. When the game starts, they will begin their migration in Canada and the student who wins musical chairs will be the Rufous hummingbird who made it to Mexico.
6. Before the game starts, explain the rules of musical chairs.
 - a. Before you start the game, remind the students to be friendly to other classmates. This means no pushing, yelling, hitting, etc.
 - b. When the music plays, the students will walk around the perimeter of the chairs.
 - c. When the music stops, the students must find a chair to sit down in.
 - d. The student who does not find a chair is taken out of the game.
7. Have the students do the first round with no challenges. For the first round the scenario will be: "You are a Rufous hummingbird living in Canada. The weather is getting colder and you need to start migrating to find more insects."
8. For the second round, tell the students that "As hummingbirds, you have to fly a long way before you can get to your food." Take the first chair out of the game.
9. Perform multiple rounds of the game using the scenarios provided in the Migration Mishap Game Card game. (See document attached at the bottom titled *Untitled*. This pdf provides multiple scenarios.) Every round the teacher should announce to the class the upcoming challenge and take out a chair or multiple chairs which will represent that the migration journey becomes progressively more difficult.
10. For one of the rounds, give the students the scenario that "You are the first hummingbird to find a hummingbird feeder that a student just put up at their school." In this round, all the students play musical chairs **without** a chair being removed.
11. When there are only 10 chairs and 11 students left, instruct the students that for this round they have to first find a "feeder" before they can continue their migration route. The scenario should be: "You have found hummingbird feeders along the way to Mexico, but there is only a small amount. You are running low on energy and you will have to compete with other hummingbirds to get food." Instruct the students they must find a cup of lemonade and drink from it when the music stops before they can sit down on a chair. The 6 mini cups of lemonade will represent the feeders. Make sure that before the students play this round, there should only be 6 chairs available. (The 6 chairs being equivalent to the number of bird feeders.) In this round, 5 students will be eliminated.
 - a. Preface to the students that because there is a small amount of feeders, a lot of hummingbirds won't get to finish their migration. Explain that this will be the most challenging round and that 5 students will be eliminated.
12. Continue the game using the scenarios provided above until only one student remains and has completed their "migration."
13. Once the game is over, have the students help put back the chairs and have the students sit down for question time.

Explain:

1. Does the Rufous hummingbird live all year in Tucson or do they migrate to Tucson when the weather gets colder in Canada?
 - a. Hummingbirds migrate to Tucson.

2. What were some of the challenges that the Rufous hummingbird went through while it was migrating?
 - a. This answer varies, but it should include the scenarios listed. For example, one of the scenarios describes how “The flowers you drank from last year have been cut down, you must find a new way to get nectar.”
 - b. Should include habitat destruction, chemicals like pesticides, weather getting colder/raining
 - c. Emphasize to the students that all of these prevent hummingbirds from getting food, like nectar
 - d. Explain how this makes migration more difficult for hummingbirds and ask them to recall how musical chairs became harder as they continued to play
3. What happened in the round where the student put up the hummingbird feeder at the school?
 - a. The “hummingbirds” were able to find nectar/food. This meant that in the game all the students were able to find a chair and not leave the game.
4. If every round in the game made it harder for the students to find the chair, then did the round where the student put up the hummingbird feeder make musical chairs easier or harder?
 - a. Easier
5. So, if musical chairs was the migration route for hummingbirds, was migration easier or harder for hummingbirds when the student put up the feeder?
 - a. Easier
6. Ask the students to recall the round where they had to get lemonade before sitting down. In this round, there were a lot of students who had to leave the game because there weren't enough feeders. Ask them a series of questions.
 - a. In that round, what did the lemonade in the cup represent?
 - i. Nectar.
 - b. What happened to the students who were able to “find” a hummingbird feeder?
 - i. They got to continue the game.
 - c. What happened to the students who weren't able to “find” a hummingbird feeder?
 - i. They weren't able to play the next round.
 - d. Why did the students need to find a feeder in that round?
 - i. Because the hummingbirds had low energy and they needed to find nectar to give them energy.
 - e. Imagine if there were more feeders in the game for all the students to get a cup of lemonade. Would this make the game easier?
 - i. Yes.
7. So, would having a lot of hummingbird feeders make migration easier for hummingbirds?
 - a. Yes.
8. Why would a hummingbird feeder make migration easier for hummingbirds?
 - a. Because hummingbirds need food/nectar while they migrate. Unfortunately, there are less flowers or insects for hummingbirds because of pesticides or people cutting down flowers.
9. If there are less flowers or insects, what does this mean for hummingbirds?
 - a. This makes it harder for hummingbirds to get food. So, putting up a hummingbird feeder will help hummingbirds by giving them food so they can make it all the way to Mexico.

Extension Activity/Questions: (This is messy but I am not too sure how to clean it up. Feedback is going to be extremely helpful)

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B5LKW3

1. Read the book If You Plant a Seed
2. Ask students if they have ever planted a seed before
 - If they have:
 - how did that work out?
 - What seed did you plant?
 - If they have not: why not? Did you not have the materials?
3. Hand out blank pieces of paper to each student
 - Instruct the students to fold their paper in half (hamburger style)
 - Ask the students to draw a seed on the left side
 - Ask the students what comes from a seed? Have them draw a flower on the right
 - Ask the students why we drew a seed then a flower
 - Share that seeds become flowers and hummingbirds need flowers to get nectar
 - Share that hummingbirds need nectar to survive
 1. Ask the students why they need something sweet like nectar (tell them to think about what soda/sweet drinks do their energy levels)
 2. Nectar is sweet for hummingbirds energy
4. Introduce the topic of seed balls to the students
 - Seed balls are balls that are made from seeds covered in natural earth material (soil, clay, water, etc)
 - These are super easy to make
 - They can be used to help pollinators and biodiversity
 - The seeds can be food to pollinators
 - Depending on how early the seed balls are placed, flowers can grow and bloom to attract pollinators
5. Explain to the students that certain seeds attract Hummingbirds
 - Revisit the main idea of If You Plant a Seed book
6. Ask students what kind of seed they think would attract different pollinators
 - a. For example, if the seed grows into a flower that is red this would attract a red pollinator. Ask the students if they can remember any red pollinators. (Hint: Hummingbird)
 - b. If the seed grows into a yellow flower, what type of pollinators would this attract?
 - c. If the seed grows into milkweed, what type of pollinator would this attract?
7. Have students expand on the idea of seed balls by drawing a picture of what throwing a seed ball in their backyard would do
 - Ask students to include a seed ball and a hummingbird in their picture
8. Have students share their pictures with a partner
 - Guide the students to talk about how hummingbirds need to get nectar from flowers which grow from the seeds
9. Explain to the students that these seed balls can help migrating butterflies by allowing them to:
 - See milkweed (a plant that monarch butterflies migrate for) and know they are on the right path
 - Seeds that bloom into flowers let butterflies to get nectar and to pollinate
 - Lead the monarchs to other necessities: nearby clear water, flowers, other monarchs

Evaluation Activity:

1. Revisit the guiding questions with the students:

- What do pollinators need to live?
 - Where do pollinators get their nectar from?
 - What do hummingbirds and monarch butterflies begin to do when it gets warmer outside?
 - How can we help pollinators that migrate?
2. Ask each question and have two students respond each time
 3. Write this question on the board: How can we help pollinators that migrate?
 4. Have the students write two sentences responding to the question to the board

Extended Resources

[Hummingbird Migration Game](#)

[Untitled](#)

Bio/Diversity Project

Lesson Title: Week 2 Action Project

Teacher: Jessika Mesa and Abbie Gheju

Grade Level: *K-2nd*

Time: *50-60 minutes*

AZ State Science Standard:	<p><i>K.L1U1.6</i> <i>Observe, ask questions, and explain how specialized structures found on a variety of plants and animals (including humans) help them sense and respond to their environment.</i></p> <p><i>1.L2U2.7</i> <i>Develop and use models about how living things use resources to grow and survive</i></p>
Content Objective:	<ul style="list-style-type: none">● Students will be able to explain why seed balls are beneficial to local pollinators.● Students will be able to identify what flowers attract hummingbirds.● Students will be able to understand why protecting pollinators, especially while they migrate, is important for the environment.
Language Objective: (Optional)	N/A

Scientist of the Week:

- *Valerie Madera-Garcia*
- *From Puerto Rico*
- *Studied chemistry and biology*
- *Valerie works for the College of Public Health at UofA*
- *She uses her knowledge to protect others and create a positive impact*
- *She specifically studies climate change and what to do in emergencies (like earthquakes)*

Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none">● Seed ball● Local pollinator● Native● Biodiversity	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none">● Local pollinator mix● Soil● Waterproof red paint<ul style="list-style-type: none">○ https://www.michaels.com/deco-art-patio-paint-outdoor/10216521.html?cm_mmc=PLASearch--google--MICH_Shopping_US_N_Crafts%26Hobbies_CraftPaint_N_N_N--&Kenshoo_ida=&KPID=go_cmp-6723840959_adg-79549661175_ad-388067335429_pla-342310405190_dev-c_ext-prd-10216521&gclid=CjwKCAjwssD0BRBIEiwA-JP5rPBkEh1qqPOPjh8Nw86Zs9awPXXrBz-L0rbkek6v8fq2Rvj7_xSxoCL0sQAvD_BwE● Aluminum can pieces cut into flower shapes● Paint brushes

Seasonality: (If more specificity is required, please note date/time range under the season)
 Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	<i>Spring</i> Mar.-Apr.	<i>Dry Summer</i> May-June
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Guiding Questions:

- How can humans help pollinators when there are no living things around?
- How do seed balls help pollinators?
- What do you need to make seed balls?
- What do we need to put on your hummingbird feeders to help attract hummingbirds?
- Why do hummingbirds like the color red?

Engagement/Introductory Activity:

1. Introduce the Scientist of the Week.
2. Reintroduce the action project. Explain to them that last week, we talked about action projects.
3. Ask them to recall what action projects are.
 - a. Remind them of their pollinator superhero name.
 - b. Remind them that their tasks as pollinator superheroes is to protect pollinators in all the ways they can.
 - c. Remind them that the action project is a project that will take 3 weeks where they will be making seed balls and hummingbird feeders to protect pollinators.
4. Once the action project has been reintroduced, explain to them that this is week 2 of the action project. Elaborate that in week 2, they will be doing hands-on activities that will help pollinators, like making seed balls and painting flowers for the feeder.
5. Ask the students to brainstorm about the connection between seed balls and hummingbirds.
6. If seeds grow into flowers, how can they help hummingbirds?
 - a. Flowers provide nectar for hummingbirds.
7. Give the students a scenario. Ask them to imagine there are hummingbirds in Tucson with no flowers around, but they need nectar. The hummingbirds will have to find a hummingbird feeder. You put a feeder in your backyard, but before you do, you need to know what will attract hummingbirds
8. Put or draw a picture of a hummingbird feeder on the board WITHOUT ANY FLOWERS.
9. Pass out a piece of paper.
10. Ask students to draw what they think will need to add to their feeder to attract a hummingbird.
 - a. Give them a hint: If hummingbirds are attracted to real flowers, do you think they'll also be attracted to fake flowers?
11. Ask students to pair and share both of their pictures.
12. Walk around and find 1-2 students who drew flowers on their paper.
13. Ask them to recall that hummingbirds are pollinators, so they're drawn to things that look like flowers.
14. Explain that even though the flowers on the feeders are fake, feeders have holes in them where the flowers are that hummingbirds can drink from.

15. Emphasize the connection between seed balls and hummingbird feeders - that both of these help provide food for pollinators.

Exploratory Activity:

(This activity can be done inside or outside, depending on how messy it might get)

1. Explain the concept of seed balls to the students
 - Seed balls are a mixture of local pollinator mix and water formed into a ball
 - Seed balls are used to feed local pollinators and can lead to flowers growing
2. Explain that it is important to choose the right pollinator mix for your area
 - This is why we are using local pollinator mix
3. Make sure to damp the soil so it will not be too complicated for students to add water on their own
4. Pass out supplies to students
 - Give each student a bowl of local pollinator mix and a bowl of soil
 - Give the students small amounts of each for now, as we can always distribute more
 - Have bowls of water on hand to give to students
 - Give each student a few paper towels
5. Ask students to look up front for a demonstration of how to make a seed ball
 - Walk students through the process as you create the ball
 - Tell the students the mixture should be damp, but not dripping wet.
6. Instruct students to take a small amount of local pollinator mix, a handful of soil to form a ball
7. Ask students to ask for water if the ball is not staying together (give students very small amounts)
8. For the students that need to add water, ask them to add small amounts of water so it does not get "muddy"
9. Make sure to walk around and help students that need it
10. Ask students to raise their hands when they are done with a seed ball
11. Look at the completed seedballs to see if any water is needed (do not fix this, walk the student through what needs to be done)
12. Allow students to make more than one seed ball if there is enough time

Explain:

(This will be an all class discussion)

- How can humans help pollinators when there is not food in the area?
 - Seed balls, planting gardens, do not use harmful sprays
- How do seed balls help pollinators?
 - Provide food for pollinators
 - Flowers can grow from the seeds which can help other pollinators
 - Spread biodiversity
- What do you need to make seed balls?
 - Local pollinator mix - choosing the right seeds
 - Water
- What do you do with seed balls when they are done drying?
 - A couple things: plant them or throw them in open fields
- Why are native and local plants/seeds needed?
 - This is what hummingbirds are attracted to
 - This helps the environment and it helps grow more flowers, bringing more pollinators to an environment. This makes the environment more biodiverse.

Extension Activity/Questions:

1. After the students have been introduced to seed balls, remind them again that seeds grow into all types of flowers.
2. Ask them to guess what color of flowers will be the most attractive to a hummingbird.
3. Explain to the students that hummingbirds are very attracted to the color red for two reasons:
 - a. Hummingbirds don't have a strong sense of smell, so they have to use their eyes to find flowers instead. This means that very bright flowers, like red, can be seen by hummingbirds.
 - b. Most insects can't see the color red, but hummingbirds can. This helps hummingbirds get as much nectar as they can since they don't have to compete with other insects.
 - i. To explain this portion, ask the students to recall the musical chairs game that was played to explain hummingbird migration.
 - ii. In the scenario with the limited amount of hummingbird feeders, the students will remember that they had to compete with other students ("hummingbirds" for hummingbird feeders.
 - iii. Explain that the same happens with insects. Because other pollinating insects eat nectar, hummingbirds compete with them for nectar. Red flowers are perfect for hummingbirds, since only hummingbirds can see them.
4. Ask the students, so if we were to make our hummingbird feeders, what color flowers would we put on them to attract hummingbirds?
 - a. Red
5. Then pass out the flowers from aluminum cans, some red paint, and brushes to each table.
6. Instruct the students to paint these flowers red and lay them on a designated drying area.
7. Using a photo of a hummingbird feeder, explain where the flowers will go on the hummingbird feeder.



8. Ask the students to brainstorm or predict how the hummingbird feeder will work.
9. Explain that the red flowers will attract the hummingbirds to the feeder. The flowers surround a hole in the feeder that hummingbirds can poke their bill into, just like a real flower, and drink up nectar from the feeder.
10. Ask the students if they can recall why bird feeders are important.
 - a. When hummingbirds migrate, they need a lot of energy to fly from Canada to Mexico and back. Hummingbirds get energy from nectar which comes from flowers. Sometimes they can't find all the flowers they need to make it. So, hummingbird feeders provide the hummers with a drink made of sugar and water that acts like nectar. This gives them the energy they need to migrate.

- b. Tell them to think about a road trip they took. When they migrate, hummingbirds stop as rest stops like gas stations to get food and shelter. Sometimes there aren't enough gas stations, so we can help hummingbirds by making more rest stops for them.
 - c. Ask: so what kind of rest stops are we making for our action project for hummingbirds?
 - i. A: Hummingbird feeders.
11. How does helping hummingbirds help us?
- a. Hummingbirds are pollinators. If we didn't have pollinators, would we have fruits and vegetables?
 - i. No
 - b. So, it's important to care for hummingbirds, because their survival means human survival.

Evaluation Activity:

1. Draw a seed bomb on the board.
2. Ask the students what grows from seed bombs.
 - a. Flowers
3. Draw three flowers on the board: one colored in yellow, one colored in red, and another colored white.
4. Ask the students, out of these three flowers, which flower is the most attractive to hummingbirds?
 - a. Red
5. So, what color did you paint on your flowers today?
 - a. Red
6. And why do we put these red flowers on the feeder?
 - a. To attract hummingbirds to the feeder, so they can then drink "nectar" from it.

Bio/Diversity Project
Lesson Title: Action Project Week 3

Teacher: Jessika Mesa and Abbie Gheju

Grade Level: *K-2nd*

Time: *50-60 minutes*

AZ State Science Standard:	<p><i>K.L1U1.6</i> <i>Observe, ask questions, and explain how specialized structures found on a variety of plants and animals (including humans) help them sense and respond to their environment.</i></p> <p><i>1.L2U2.7</i> <i>Develop and use models about how living things use resources to grow and survive</i></p>
Content Objective:	<ul style="list-style-type: none">● Students will be able to identify the parts of a hummingbird feeder and what hummingbirds drink from a feeder.● Students will be able to understand how the features of a hummingbird, like their high level of physical movement, affect a hummingbird's daily needs.● Student's will ultimately be able to understand how hummingbird feeders help hummingbirds.● Students will be able to explain why seedballs are important.
Language Objective: (Optional)	N/A

Scientist of the Week:	<ul style="list-style-type: none"> ● <i>Ynes Mexia</i> ● <i>Mexican-American</i> ● <i>Worked in Mexico</i> ● <i>Studies plants</i> ● <i>Mexia discovered a new plant category</i> ● <i>She was the most accomplished plant collector of her time (she collected 145,000 different types of plants!)</i>
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Vocabulary	Materials
<p>Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:</p> <ul style="list-style-type: none"> ● Nectar ● Native ● Seed ball 	<p>Provide a bulleted list of relevant materials for the lesson.</p> <ul style="list-style-type: none"> ● Sugar ● Water ● Measuring Cups ● Home-made mini hummingbird feeders <ul style="list-style-type: none"> ○ https://www.nature-watch.com/hummingbird-feeder-activity-kit-p-1070.html ● Seed balls ● Glue ● Capri Sun drink

Seasonality: (If more specificity is required, please note date/time range under the season)

Highlight which season(s) your lesson would be most suited to. When working with the natural world, it is important to keep this in mind for your planning! Some activities are possible for a brief window of time while others may be appropriate during any time of year.

<i>Monsoons</i> July-Sept.	<i>Autumn</i> Oct.-Nov.	<i>Winter</i> Dec.- Feb.	Spring Mar.-Apr.	<i>Dry Summer</i> May-June
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Guiding Questions:

- What are the parts of a hummingbird feeder?
- Why are hummingbird feeders filled with a nectar-like drink?
- Why are seed balls important?

Engagement/Introductory Activity:

1. Reintroduce the action project to the students.
2. Ask the students if they can recall what hummingbirds need to live.
 - a. Shelter
 - b. Food
 - c. Water
3. Explain that hummingbird feeders provide food and oftentimes shelter to hummingbirds.
4. Ask the students if they can recall what hummingbird feeders are filled with.
5. Have them brainstorm a few ideas and give hints if needed.
 - a. What do hummingbirds eat?
 - i. Nectar
 - ii. Insects
6. Would we fill up the feeder with a bunch of insects for hummingbirds?
 - a. No!
7. So, would we fill up the feeder with nectar?
 - a. Yes!
8. We can't go get nectar from flowers, because other pollinators need that nectar too. However, we can make a drink that is similar to nectar and has the same effect on hummingbirds.
9. Explain that because hummingbirds have very fast heart rates and move all the time, they need to eat a lot to have energy. Ask the students to think of a time when they played for a long time outside and we're really tired after. That's how hummingbirds feel all the time, because they are almost always flying they need all the energy they can get.
10. Explain that the nectar-like drink is like a Caprisun - it's got sugar in it to give the hummingbirds energy. Using the example of Halloween, ask the students to recall that when it's Halloween, they aren't able to sleep at night, because all of the energy they have from eating a bunch of candy.
11. Explain that this is similar to what the drink in the hummingbird feeder does for hummingbirds.
12. Ask the students why might hummingbirds need all this energy?
 - a. For migration!
13. Pass out to each table a vial from the homemade hummingbird feeder kit. Each table should have around 3-4 students.
14. Then pass out a cup filled with sugar, a cup filled with water, and a teaspoon measuring utensil to each table.
15. Explain that the students will be making the nectar like drink for the hummingbird feeder.
16. During the activity, have the students rotate roles. Instruct one student from a table to put in only 1 teaspoon of water! At the end of step 16, only one teaspoon of water should be in the vial.
17. Then have the first student pass the vial onto the other student and instruct this student to put only one teaspoon of water into the vial. Keep rotating students while repeating the task, until **4 teaspoons total** of water have been added to the vial. This should allow each student a turn. At the end of step 17, *there should be 4 tablespoons total in the vial.*
18. Then have the next student in rotation add **ONLY** one teaspoon of sugar to the vial! This same student should tightly place the cap back onto the vial. Go around and ensure the cap is tightly closed. At the end of step 18, *there should be 5 teaspoons total*, one of those teaspoons being a tsp of sugar.
19. Have the other students take turns shaking the vial to fully dissolve the sugar until the nectar-like solution is made.
20. Have the students set aside the vial.

Exploratory Activity:

1. Explain to the students that they've just made one part of the hummingbird feeder, but they have to put the rest of the feeder together.
2. Pass out the rest of the materials from the homemade hummingbird kit. This should include the two pipe cleaners, the flowers, and the stem.
3. The students will work together as a table to construct the hummingbird feeders.
4. Explain carefully step by step the instructions to assemble the feeders. Construct the feeder with the students alongside them, so they get a better understanding of how it needs to be done. This video can also be shown to demonstrate how the feeder is put together. Like the nectar portion, have the students *rotate roles* so they all get a chance at building the feeder.
https://www.youtube.com/watch?time_continue=1&v=NrqyeR8vbwu&feature=emb_title
 - a. The vial should already be capped and filled with nectar before assembling.
 - b. Take one of the red pipe cleaners and bend it in half.
 - c. Wrap the pipe cleaner around the vial and twist the two pieces together to create a "knot" around the vial. Then, wrap the pipe cleaner around the other side and twist to secure this side again. Bend the ends of the pipe cleaner up to resemble the stamen.
 - d. Have the student rotate roles.
 - e. Using the second pipe cleaner, repeat part C. Make sure that the students start wrapping the second piece of pipe cleaner on the same side of the "anthers" so that when the pipe cleaner has been wrapped around the other side, the second pair of stamen will be on the opposite side of the vial. "Have the direction start in the direction of the loose ends."
 - f. Rotate roles again.
 - g. Have the student slide the smaller yellow flower from the end of the vial all the way up until it reaches the pipe cleaners. Then slide the larger red flower from the end of the vial all the way up until it reaches the pipe cleaner.
 - h. Have the students rotate roles.
 - i. Have the last student take the stem portion and tuck it under both of the flowers. Then, at the bottom of the stem have them make a bend to resemble a hook.
5. Go around the classroom during assembly time to make sure the students are assembling the feeder correctly.
6. Have the students finish construction of their feeders and go outside to find an appropriate place to hang them.

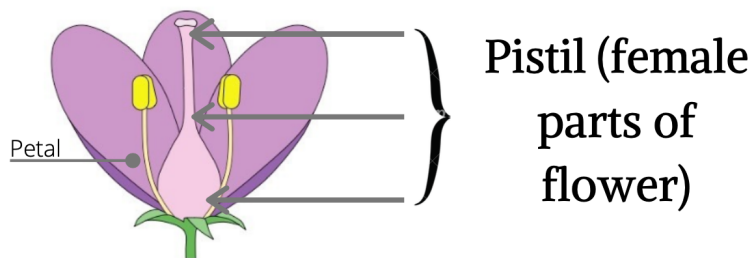
Explain:

(This is a class discussion)

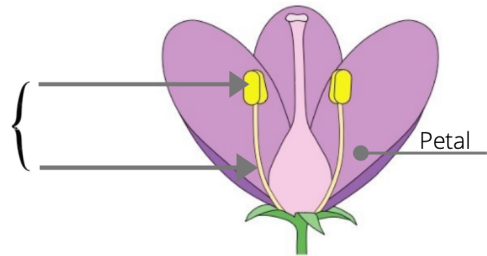
- What did we just build?
 - Hummingbird feeders.
- Explain how the hummingbird feeder works, hummingbirds come to the feeder and use their bills to get inside the small hole in the vial. They then use their very long tongues to drink up the nectar, similar to a straw.
- Use a Capri Sun to compare the pack of juice to the vial containing the sugar drink. Take the straw and poke a hole into the top. This is how the small bills of hummingbird's are able to get into the hole in the vial.
- Why was the vial part of the feeder? What was in the vial?
 - The vial is part of the feeder because it holds a sugar drink similar to nectar.
- What does the drink give hummingbirds?
 - Energy
- Why do hummingbirds need more food to get more energy than other birds?
 - Because their hearts beat faster and because they fly a lot more than other birds. This means they need more food, to keep up with how much they fly.

- Ask the students to recall last week's lesson plan on flowers and hummingbird feeders. Why did we put flowers on the hummingbird feeder?
 - Because these flowers help attract hummingbirds to the feeder. Remember that hummingbirds don't have a strong sense of smell, so they use their eyes to find bright flowers. If we put flowers on our feeders, we help hummingbirds find their way to the feeder.
- This might be a more challenging one for the students to remember, but what do the pipe cleaners on the flower represent?
 - They represent stamens!
- Show them a photo of pistils and stamens to refresh their memory.

All About Flowers



Stamen
(male parts
of flower)



- Do any of you remember when we dissected flowers? We learned about stamen and pistils. Does anyone want to explain what these are?
 - They are the male and female parts of a flower. The stamen is the male part and the pistil is the female part.
- Explain that the stamen has pollen on it. When a hummingbird goes to a real flower, they get stamen all over their bodies. Then they fly to another flower.
- Can anybody guess what happens when a hummingbird flies to another flower with pollen on its body?

- The pollen spreads from the hummingbird's body to the pistil of another flower. When this happens, pollination happens.
- Remember that hummingbirds are pollinators. Why are pollinators important?
 - Because if we didn't have pollinators, we wouldn't have many of our favorite fruits or vegetables.
- What are some of the reasons why we built the hummingbird feeders?
 - To help hummingbirds while they migrate! Like we learned, hummingbird's need a lot of energy and even more energy when they migrate! So, we put out feeders so they can find food and keep flying to where they need to go.
 - Also, there are hummingbird's who stay in Tucson all year round. These native hummingbirds are always here and need feeders just as much as hummingbird's who migrate.

Extension Activity/Questions:

(Bring out the seed balls made from last week)

1. Recall information from last week about the seed balls by asking questions (pair students up)
 - What are seed balls?
 - Why did we make them?
 - Why are they important?
2. Ask the students to think where putting their seed balls would be more beneficial to pollinators
3. Split the class in half for a mini quiz game - let them name their groups, if not pick a name
4. Have the students stand in 2 lines (by team) - once they answer a question, hand them a seed ball
5. Ask these questions
 - What are seed balls?
 - A. Seed balls are a mixture of local pollinator mix and water formed into a ball
 - Why did we make them?
 - A. To help pollinators during migration
 - B. Attract pollinators to our school
 - What did we use to make them?
 - A. Local pollinator mix - choosing the right seeds
 - B. Water
 - Why are they important?
 - A. Provide food for pollinators
 - B. Flowers can grow from the seeds which can help other pollinators
 - C. Spread biodiversity
6. Once everyone has answered and received a seed ball, take them outside to throw them
7. If students make more than 1 seed ball, they can take it home if they want to put it near their house

Evaluation Activity:

1. Have the students sit down together for a class discussion.
2. Using popsicle sticks, ask the students to share 1) what their favorite part about the action project was and 2) how the favorite part of their action project helps out pollinators.
 - a. For example if their favorite part was making nectar, ask them to explain how making nectar helps hummingbirds.