Lesson: Population Management Math Walk

Time Needed: 80-90 minutes

Lesson Summary	Students will participate in a Math Walk outdoors. Along their walk, students will encounter three math challenges that represent changes to Prairie Dog populations. Students will use models and calculations to show changes in Prairie Dog populations from human/wildlife conflict, disease, and conservation efforts. After the Math Walk, students will return to the classroom to discuss and compare Prairie Dog population management strategies and propose solutions.
Lesson Driving Question:	How do we estimate Prairie Dog populations?
Materials Needed	Slides (1-2) Other Materials: ● Math Walk Worksheet ● Surveying Measuring Tape ● Science Notebooks ● Clipboards ● Pencils
Teacher Preparation	1. Choose the route for the Math Walk. Be sure your route includes: a. An area with many loose parts like sticks, seeds, or stones. b. A Prairie Dog Burrow that can be measured by students. c. A place to sit and watch Prairie Dogs at a distance. 2. Print enough copies of the Math Walk Worksheet to give one to each student. 3. Pre-group students if you prefer to conduct any of this lesson in groups.

Standards & Vocabulary

Aligned Science Standards:

- **SC.3.2.5.b:** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Aligned SS Standards:

- **SS.3.4.1.a:** Identify and apply the elements of civil discourse. For example: listening with respect, speaking in a disrespectful manner, and restating an opposing viewpoint or opinion.

Aligned Math Standards:

- **CCSS: 3.NF.A.1**: Describe a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b
- **CCSS: 3.OA.C.7:** Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
- **CCSS: 3.MD.D.8:** Solve real-world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

Aligned Physical Education Standards:

- **Standard 3. Social Emotional Wellness:** Demonstrate positive social behaviors during physical activity.
    - **a:** Identify the positive behaviors of self and others
    - **b:** Congratulate teammates and opponents upon conclusion of a game or activity.
    - **c:** Follow directions, activity-specific rules, procedures, and etiquette with few reminders.
    - **d:** Encourage others regularly, and refrain from put-down statements
    - **e:** Ask a partner to participate in a physical activity.
- **Standard 4. Prevention and Risk Management:** Identify ways to prevent injuries during physical activity.
    - **a:** Recognize how injuries can occur during physical activity.
    - **b:** Understand how activities can affect safety of self and others.

Formative Assessment/Check for Understanding

Assessment Options:

- Observe knowledge through participation and discussions.
- Completed Math Walk worksheets.
- Group Discussion: Can students explain the strategies they used to complete each challenge?
- Head-Hands-Heart-Feet Exit Ticket.

Scaffolds & Supports

Scaffolds & Supports:

- Heterogeneous assigned groups for peer-to-peer support.
- Use visual and/or tactile supports in classroom discussions or one-on-one.
- Use peer support and peer explanations.
- Group roles.
- Sentence starters on exit ticket

For enrichment:

- Challenge students to write and draw in their science notebooks:
    - What other ways could we use math to understand our local Prairie Dog populations? Write or draw ideas about your questions and proposed solutions.

Extension/Side Hike Ideas

Math:

- Repeat Challenge #3 using a known burrow size. Have students imagine that conservationists have mapped out the underground tunnels of a Prairie Dog town. The town is made up of 4 connected burrows, each with one coterie living inside. If we assume one coterie has 1 male, 3 females, and 4 pups per female, how many Prairie Dogs live in this Prairie Dog Town?

Videos:

- Prairie Dog Restoration
    - American Prairie Reserve conservation methods to protect Prairie Dogs

Art:

- Students can illustrate what they think the burrow looks like underground using a new medium (ex: paint, collage, etc.)

Lesson Plan: Steps

Engage	1. Have a brief discussion about the Science Fact of the Day. 2. Explain that today, we're going to be looking closely at Prairie Dog populations. 3. Revisit our Notecatcher and review what we've learned so far

 *5 Minutes*	about Prairie Dogs: a. What did we learn about Prairie Dogs in our last lesson? b. Can you think of anything we've discussed that can change Prairie Dog populations? 4. Explain that today we will be taking a Math Walk through our backyard Prairie Dog habitat to solve real-world problems together!
Set Goals  *5 Minutes*	I can… ● I can propose solutions for problems caused by environmental changes affecting organisms. ● I can demonstrate respectful listening and speaking in discussions. I'll know I've got it when… ● I **suggest** solutions for problems caused by environmental changes affecting organisms. ● I **demonstrate** respectful listening and speaking in discussions.
Explore  *50-60 Minutes*	1. Begin outside in our Sit Spots. Explain that today's activity will be a Math Walk. Take a moment to look around our ecosystem. Ask: a. What do you notice? b. What do you wonder? c. How could math help to answer your questions? 2. Have students quietly think and write down ideas in their science notebooks for two minutes, share their ideas in small groups of 3-4 students. 3. Gather students in a Learners Circle and share out as a whole group. Validate student ideas and encourage students to show a silent agreement with ideas they have in common. 4. Explain that today, we will take a nature walk through our Prairie Dog habitat and use math to answer our questions along the way. 5. Challenge 1: Prairie Dog Population Decline in Fractions a. Visit an area that has plenty of loose parts (sticks, stones, seeds, etc.) that students may use to represent fractions as parts of a whole. Have students work together in small groups and remind students to only use items on the ground that plants are no longer using. b. Our first challenge is to represent the number of Prairie Dogs today out of the number of Prairie Dogs that lived here before colonization. Roughly a **billion** Prairie Dogs lived here before colonists arrived, and today we have 10-20 **million** Prairie Dogs remaining. c. The remaining population represents 2% of the historical population, or 2 out of every 100. Ask students: i. How would you represent 2 out of 100 using natural objects? d. Give students 5-10 minutes to create their representations and draw them on their Math Walk Worksheet. e. Come together in a Learners Circle and briefly share out before moving on to the next stop. Ask students: i. What do you think affected Prairie Dog populations

over the last few hundred years? Human-wildlife conflict, habitat loss, and disease are the biggest factors. There is a lot to be hopeful about, though, which we will explore at our next stop!

6. Challenge 2: Perimeter and Area of a Burrow
    a. Prairie Dog populations are rebounding thanks to the work of Wildlife Biologists, Conservationists, and local citizens. While it is challenging to count individuals because they live underground, we can use math to estimate the size of the burrow.
    b. Select four burrow mounds for this estimation activity. We will take turns using a measuring tape to measure the perimeter of the burrow. Then we will use those measurements to calculate the area.
        i. Option: Split students into groups if you prefer. Each group can measure one side of the shape (from one burrow on the perimeter to another).



    c. Students will sketch the shape of the burrow.
    d. Students will take turns measuring the length between each side of the burrow and label the length of each side of their sketch accordingly.
    e. Students will calculate the perimeter and write it on their Math Walk worksheets.
    f. They will then follow the instructions to calculate the area of the burrow and record that on their Math Walk worksheets.
    g. When students are finished with their measurements and calculations, gather together and reflect as a group:
        i. Did we measure one burrow? How do we know? Listen to student ideas and validate responses. We aren't sure we measured a whole burrow - and we might have even measured two different burrows! Without seeing the tunnels underground and the number of Prairie Dogs inside, it's hard to tell if we have one coterie or several. So, we can see that estimating Prairie Dog populations is challenging!
7. Challenge 3: Estimating the number of Prairie Dogs
    a. For this last challenge, find a comfortable place to sit and watch the Prairie Dogs as we estimate the population by counting individuals.
    b. Students will tally the number of Prairie Dogs spotted on their Math Walk worksheets to estimate our Prairie Dog population.
    c. As students are tallying, have them consider the following challenges:
        i. How do we know we're seeing all of the Prairie Dogs

	in the burrow? ii. Are we counting the same Prairie Dog over and over? iii. What is another way we could use math to estimate Prairie Dog populations in our ecosystem? 8. Return to the classroom and settle in with the Prairie Dog Restoration video.
Explain  *10 Minutes*	1. Gather as a class in a Learners Circle with students and their Math Walk Worksheet, using page 5 as an exit ticket for reflection. The reflection has Head-Hand-Heart-Feet Guiding Questions. Challenge students to add pictures and labels wherever possible. Sentence starters are also on slides and on the reflection itself as universal supports. a. Head: What do you wonder about Prairie Dogs or their burrows after today's math walk? b. Hands: What activity helped you understand the most? c. Heart: Why should people care about saving space for Prairie Dogs? d. Feet: What's one thing you learned today that you'd like to teach others about?