Grade Level: 3rd
Time: 1-2 class periods (75 minutes total)
Topic: How changes such as wildfires affect an ecosystem and organisms within that ecosystem

Background

Earlier this year, students learned about rapid changes such as floods, landslides, hurricanes, earthquakes and wildfires. These changes were examined through the lens of how they affected towns and people around them, and on protecting the towns from these changes in the future. Building on this knowledge, they will now apply new learning to discover how changes such as these can affect animals in the environment, specifically animals whose structures and functions allow them to survive in that environment.

In the previous lesson, students focused on the Golden Cheeked Warbler and Houston Toad, both endangered species found in a specific area in Central Texas, and the structures that allow them to survive in the environment. They also discussed how those structures allow them to function specifically in their environment, and would not help them to survive in other environments such as grasslands or deserts.

This lesson is intended to connect previous learning to new concepts of how changes to the environment such as flood, drought, or wildfires affect populations, forcing organisms to either perish, survive, or move to a new location.

Standards

NGSS
3-LS4-4. 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.

Disciplinary Core Ideas
Ecosystem Dynamics, Functioning, & Resilience

- When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Science and Engineering Practices
Analyzing and Interpreting Data
- Analyze and interpret data to make sense of phenomena using logical reasoning

Engaging in Argument from Evidence
- Construct an argument with evidence, data, and/or a model
- Construct an argument with evidence

Crosscutting Concepts
Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change.

Scale, Proportion and Quantity
- Observable phenomena exist from very short to very long time periods

Connection to Nature of Science
Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Science assumes consistent patterns in natural systems.
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Connection to Engineering, Technology, and Applications of Science
Interdependence of Engineering, Technology, and Science on Society and the Natural World
- Knowledge of relevant scientific concepts and research findings is important in engineering

Texas Essential Knowledge & Skills (TEKS) Addressed
Science
- 3.3A analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing
- 3.4 The student knows how to use a variety of tools and methods to conduct science inquiry
- 3.9A observe and describe the physical characteristics of environments and how they support populations and communities of plants and animals within an ecosystem

- 3.9 C describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations

Social Studies

- 3.5C identify and use the compass rose, grid system, and symbols to locate places on maps and globes
- 3.17A research information, including historical and current events, and geographic data, about the community and world, using a variety of valid print, oral, visual, and Internet resources
- 3.17E interpret and create visuals, including graphs, charts, tables, timelines, illustrations, and maps
- 3.17F use appropriate mathematical skills to interpret social studies information such as maps and graphs
- 3.18 The student communicates in oral, written & visual forms
    - A. express ideas orally based on knowledge and experience
    - C. Use standard grammar, spelling, sentence structure, and punctuation

Math

- 3.1A apply mathematics to problems arising in everyday life, society, and the workplace
- 3.7B determine the perimeter of a polygon or a missing length when given perimeter and remaining side lengths in problems
- 3.8A summarize a data set with multiple categories using a frequency table, dot plot, pictograph, or bar graph with scaled intervals

ELA

- 3.1A listen actively, ask relevant questions to clarify information, and make pertinent comments
- 3.1D work collaboratively with others by following agreed-upon rules, norms, and protocols
- 3.6G evaluate details read to determine key ideas
- 3.6H synthesize information to create new understanding
- 3.11E publish written work for appropriate audiences
- 3.13C identify and gather relevant information from a variety of sources
- 3.13H use an appropriate mode of delivery, whether written, oral, or multimodal, to present results

Justification

In the previous unit, students learned how to read maps and how to interpret map features. Map reading skills are historically low performing standards, so through the use of integration with this investigation the students are able to apply their skills to a high-interest topic, giving them more buy-in into applying this harder skill. This will also allow for refreshing those skills and an opportunity for reteaching for those students who continue to struggle with it. The use of maps in this lesson is a natural connection as

we examine the area affected by the wildfires and build on the knowledge that the species we learned about in the last lesson live only in certain areas, as reflected on the maps.

Through studying maps, graphs, and tables to gather information about the impacts of the wildfires, the students will be obtaining the information needed to draw conclusions about the effects of changes to an environment while simultaneously practicing skills learned in mathematics with these graphic organizers. Analyzing charts, tables, and graphs is a math skill the students have previous experience with insofar as reading and using the charts examining population numbers before and after the wildfires is a seamless connection. In order to strengthen their graph reading skills, students need to see a variety of graphs in meaningful context, and using them to reflect on a high-interest topic such as wildfires increases student engagement.

In order to share their learning, the students will be writing a scientific conclusion which will allow them to write from their collected data to make a claim but also practice writing longer pieces. The students will be expected to follow all writing guidelines, including grammar and mechanics, while organizing their ideas in writing to convey information. This piece will then be shared with their peers for review, revised as needed, then shared with the class to provide an authentic audience.

Objectives

Students will know:

- When changes to environments occur, and organism may perish, thrive, or move away
- Changes to environments affect the populations and communities within the environment

Students will be able to:

- Formulate scientific questions
- Analyze and interpret a variety of graphs, charts and tables
- Read and interpret maps
- Communicate learning to peers
- Justify a conclusion and provide evidence
- Write using correct grammar and punctuation
- Present findings to an audience
- Work collaboratively to find answers to scientific questions
- Collect and organize information from a variety of sources

Engaging Context

Students will be shown this video from TXPWD about the wildfires that burned over 90% of the area where the Houston Toad and Gold Cheeked Warbler live, and asked to discuss the question ‘what is the impact of wildfires on organisms in the affected area?’

Lesson Plan

Engage
Discuss previous learning about structures and functions of organisms and how it helps survive in the environment. If needed, watch the video postcard again to discuss the Golden Cheeked Warbler. Tell students today we are going to examine wildfires that occurred in its environment.

Show the clips from the Texas Parks & Wildlife department of the wildfire, first with no sound. Have students turn and talk to a partner about what they notice. Next, play the video a second time with sound and have students begin to generate questions about the effect of the fires on the animals living in the affected area.

Explore
Tell students they will be exploring the effects of wildfires on the local environment today. Explain the resources at each station and talk students through the directions and expectations for each one, then release them to explore each station. Students may work in partners or groups of 3, depending on class size/ability level. Remind students to bring their science notebooks and a pencil to record their learning and wonderings as they move through the stations. While students work, the teacher will circulate and engage students with questions listed below and facilitate their learning at each station. Station descriptions and examples of guiding questions are included below:

Station 1- Photos
Students will work to compare before, during, and after photos of the area affected by the wildfires. They will explore satellite images as well as photos from the ground to examine the effects of the fires. After discussing together, students will record findings and further wonderings in their science notebooks.

Guiding question examples:
-What differences do you notice about the before and after pictures?
-How would the fires burning the trees impact the birds such as the Golden Cheeked Warbler?

-Explain how the fires would affect the water and animals relying on it to survive
-How do you think this impacts the animals living in water, such as the Houston Toad

Station 2- Reading
Students read the passages and/or the book at this station, either independently or with a buddy. When they finish reading, they can discuss their learning and record it in science notebooks.

Guiding question examples:
-How do wildfires change the landscape and habitat?
-What ways can wildfires be prevented from spreading?
-What happens if animals no longer have trees to build their nests in?
-What effect does losing trees in the park have on the Warbler and its mating season?

Station 3- QR codes
Students will use the ipads and QR page to explore and learn more about the two endangered species living in the area affected by the fires. Next, students will watch videos showing footage of the area both before and after the fire and record their findings in their science notebook.

Guiding question examples:
-How does the environment support the Warbler? The toad?
-What structures does the warbler have that help it survive in a forest?
-What structures does the toad have that help it survive in a forest?
-Would either species be able to survive in an environment other than a forest? (Justify)
-What problems do you see with the area after the fires?
-What happens to the animals when they no longer have trees for shelter?

Station 4- Graphs & Tables
Students will use the maps of the area as well as tables showing populations and amount of area affected by wildfires to do basic calculations and examine the severity of the fires.

Students will use lines drawn by the teacher previously on the satellite images showing burn scars to calculate the perimeter of the affected area. They will also compare the perimeter of the range the Warbler was found in both before and after the fire.

Guiding question examples:
-How did the fires affect the area populated by the Warbler? (Use your perimeter findings to justify your answer)
-What do you notice about the amount of fires in 2011 compared to other years?
-Describe factors that led to a higher rate of fires in 2011.
-What do you notice about the change in the area before and after the fires?
-What do you notice about the numbers of animals found in the area before and after the fires?

Explain
First, students will return to their table groups and share out their learning to generate ideas for their writing. Students will then take their learning and data from their station exploration and use it to write their scientific conclusion. The students will answer the question, how do wildfires impact the environment and organisms that live in it?

Sentence stems can be used to scaffold the writing for students who need it, such as:

Wildfires changed the Bastrop forest by _____.

I used to think _____ but now I know _____.

The data shows _____.

I believe _____.

The wildfires caused animals to _____.

Transition words to post: In addition/also/however/furthermore

*If needed, students may also record themselves talking through their explanation instead of writing it.

Elaborate
Students may watch the video 7 Years after the Fires using the QR code included on the QR resource page. They may also use technology to explore how the wildfires affected other organisms in the environment, or conservation efforts being made to restore the area and habitat.

Coming together as a class, read the book Forest Fire by Mary Ann Fraser to discuss further what happens to animals when their habitat burns.

(During this time, students may also be asking questions about the benefits of fires or how it affects organisms around the burned area, leading into the next investigation.)

Evaluate

The students will turn in their writing to be scored using the following rubric to address their understanding of the target as well as their written composition. For students with writing difficulty, provide sentence stems to help scaffold their writing, or allow students to record their explanation instead of writing it, or use a speech-to-text feature and have them edit for mechanics.

Students will have a writing conference with the teacher after scoring, at a later time, to discuss the written piece.

If students finish quickly or need an extension, they can choose to make a slideshow, comic, brochure, etc to show their learning after completing the written piece.

4	• Describes 3 ways animals were affected by the fires • Describes 3 ways the fires changed the environment • Writing is free of spelling errors • Writing uses correct punctuation
3* (Mastery)	• Writing uses correct punctuation • Few/minor spelling errors • Describes 2 ways animals were affected by the fires • Describes 2 ways the fires changed the environment
2	• Describes 1 way animals were affected by the fires • Describes 1 way the fires changed the environment • Writing has many spelling errors • Writing uses some correct punctuation
1	• Writing uses no correct punctuation • Writing has many spelling errors

	• Does not describe how animals were affected by the fires • Does not describe how the fire changed the environment

Materials
Materials for stations:

Station 1- Photos
-2 copies of satellite photo and summary from Earth Observatory website
-2 copies of satellite photo from Wikipedia of burn scar
-2 copies of before and after Google Earth imagery

Station 2- Reading
-2 copies of Golden Cheeked Warbler passage from Balcones Canyonlands
-2 copies of Explore Wildfires passage and organizer
- Wildfire by Julie Fox & Julie Pratten

Station 3- QR codes
-5 copies of QR code page
-ipads or other device (1 per 2 students)

Station 4- Graphs & Tables
-print 2 copies of each map and table from NOAA site

Other:
Sentence stems for any writing accommodations during evaluate stage

Resources

Texas Parks and Wildlife Department. (2014, April 3). *Postcard: Golden-cheeked Warblers-Texas Parks and Wildlife*. [Video file]. Retrieved from https://www.youtube.com/watch?v=or3p7Ty7y_Y.

Texas Parks and Wildlife Department. (2011, September 6). *Bastrop State Park Wildfires 2011- Texas Parks and Wildlife*. [Video file]. Retrieved from https://www.youtube.com/watch?v=9kFw2mQcZaQ.

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U.S. Fish and Wildlife Department (2019, February 15). Golden-cheeked Warbler - Balcones Canyonlands. Retrieved from https://www.fws.gov/refuge/Balcones_Canyonlands/GCW.html

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(2012). Explore Wildfires. Retrieved from https://www.education.com/download/worksheet/104191/wildfires.pdf

NOAA. (2011, October 6). Wildfires - September 2011 Retrieved from https://www.ncdc.noaa.gov/sotc/fire/201109

https://en.wikipedia.org/wiki/Bastrop_County_Complex_Fire#/media/File:Bastrop_Fire_Scar_12_Sep_2011.png

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Fox, J. & Pratten, J. (2018) **Wildfire**. CreateSpace Independent Publishing Platform

Fraser, M. A. (1999) **Forest Fire**. Troll Communications