Can Plants and Animals Deal With Climate Change?

Appropriate for 4-12 grades. As written, it is appropriate for middle school level. With modifications, it would work for the other levels also.
Prep time - 30-40 minutes
Activity time – 45-55 minutes

NGSS Disciplinary Core Ideas
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems

MS-LS2-3 Evaluate competing design solutions for maintaining biodiversity and ecosystem services

CCSS
Reading
Anchor Standard 1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

8.RST.1 Cite specific textual evidence to support analysis of science and technical texts.

Anchor Standard 8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

8.RST.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Writing
Anchor Standard 1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

8.WHST.1 Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

Speaking
Anchor Standard 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

8.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Objectives:

Students will:
1. demonstrate, in writing and in discussion, their knowledge of the effects of climate change on particular plants and animals
2. develop hypotheses, based on their reading, of ways humans can mitigate the problems climate change causes plants and animals

Scientific terms for students:

- invertebrates – animals without a backbone
- stabilize – to make firm, steady
- ecosystem – a biological community of interacting organisms and their physical environment
- tributary – a river or stream flowing into a larger river
- spawn – release or deposit eggs (fish, frog, mollusk, crustacean, etc)
- prairie – grassland
- species – a group of living organisms capable of interbreeding
- invasive species – a plant, fungus, or animal species that is not native to a specific location
- butterfly life cycle – egg, caterpillar, pupa, adult
- drought – a prolonged period of abnormally low precipitation
- marine – something found in or produced by the sea
- predatory – an animal that kills and eats other animals

Materials:

1. Story cards, one for each student. See the **stories** and **pictures** at the end of this lesson plan. Copy one story onto cardstock and the picture of the plant or animal onto the other side.
2. Vocabulary written on posterboard, white board, or power point, displayed in room.
3. A way to write while kids are walking around, perhaps small whiteboards or clipboards.
4. A question sheet for each child or one for each group.

Introduction

1. Place everyone in groups of 4 or 5 people.

2. Discuss some of the mechanics of climate change that the students have already learned.

3. Introduce the idea that climate change affects whole networks of plants and animals that interact with each other and with the physical environment.

a. What do you imagine is happening to plants and animals while the world is going through these changes?

b. What is an ecosystem?

c. Does it make sense that climate change (different temperatures, different precipitation amounts, etc) would affect an ecosystem?

d. Do all the plants and animals in the ecosystem react to the same degree and at the same time, or are there variations?

4. Describe the mixer.

Mixer:

1. Place everyone in groups of 4 or 5 people.
2. Give each person a card with a picture of a plant or animal on one side and the plant or animal's words on the other side, telling how they are affected by climate change.
3. Each person familiarizes himself with who they are, their characteristics, and the climate change problem they have. As a class, use one card to practice learning a plant or animal using **visualization,** so they get a picture in their mind. They need to try to put their mind into the plant or animal and really *be* it. This may be easiest if they close their eyes.
4. a. All the students will find another person to tell their story to. The other person will, in turn, tell his/her story. They may refer to their card if need be, but try to as little as possible.

b. Each person will write down key words to help them remember the other person's animal/plant name and story. **This is NOT extensive notetaking**.

c. When the two have told their story to each other, they should look for a new partner. It would be ideal to have three or more switches.

Group Work:

1. Give everyone a copy of the Questions, which are at the end of this lesson plan.
2. Students should brainstorm the answers to all or some of the questions, as you feel appropriate, but each person should write the answers themselves. Alternatively, they could take turns writing, but each person should have a chance to write.

Wrap-Up:

1. Lead a group discussion, using students' answers to questions. Have students from different groups compare their answer to the same question. Encourage them to talk with each other in the group discussion, not just to you, the teacher, i.e. ask questions of each other, question each others' conclusions, etc.

2. After establishing the relationships between plants, animals, physical environment, and climate change, brainstorm patterns that take place across multiple ecosystems, e.g. patterns of migration, human disturbance, etc.

3. End by brainstorming and evaluating ways humans can mitigate the effects of climate change on ecosystems. One clear-cut example is given in the Brewer's spruce story, that seedlings would have to be planted much further north. Besides this, we might try to correct the damage to land that we have already done, and we might fight in the public sector for policies that will reduce our carbon footprint to zero. Ask the kids to be creative, encouraging out-of-the box thinking.

Learning Extensions

1. Draw a picture of one plant or animal, showing all the connections between it and other parts of its environment, including the factor of climate. (This could be a continuing education

Background for Educators:

Brewer's spruce

https://en.wikipedia.org/wiki/Picea_breweriana
http://www.amjbot.org/content/99/7/1217.full

Snowy plover

http://www.pointblue.org/about-pointblue/news-resources/press-releases/releasing-snowy-plovers
http://www.oregonwild.org/wildlife/western-snowy-plover

Sockeye salmon

http://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ThreatsForestHealth/Climate/CI-Endangered%20Species%20Coalition%20Top%20Ten.pdf p. 10

American pika

http://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ThreatsForestHealth/Climate/CI-Endangered%20Species%20Coalition%20Top%20Ten.pdf p. 9

Fender's Blue butterfly

http://occri.net/wp-content/uploads/2011/04/chapter7ocar.pdf p. 3
http://www.naba.org/pubs/ab201/ab201butterflies_and_climate_change.pdf
http://www.xerces.org/wp-content/uploads/2008/06/Conserv-of-Prairie-Oak-Butterflies-in-OR-WA-and-BC_Schultz-C.B.-et-al.pdf

Fisherman

http://www.fishermensnews.com/story/2015/09/01/features/climate-changes-could-affect-pacific-fisheries/347.html

Allen's hummingbird

http://climate.audubon.org/birds/allhum/allens-hummingbird
http://audubonportland.org/issues/hazards/climate
http://occri.net/wp-content/uploads/2011/04/chapter7ocar.pdf p.5

Jeffrey pine

http://www.fs.fed.us/psw/publications/documents/psw_gtr237/psw_gtr237_013.pdf