

## Lesson Plan: Teaching Biodiversity through Climate-related Examples

As an **undergraduate Biological Sciences** teacher, you can use this set of computer-based tools to help you in teaching **evolution and behavior**, **biodiversity**, and **ecology**.

This lesson plan helps students to learn about the current and past habitats of an animal (specifically, squirrels), and how changing habitats can affect the distribution of a species. The activity will also allow learners to examine data and interpret whether climate change can cause changes in habitats and consequently, changes in species distribution.

Thus, the use of this toolkit allows you to integrate the teaching of a climate science topic with a core topic in the Biological Sciences.

Use this lesson plan to help your students find answers to:

- *What are the factors that influence the distribution of a species?*
- *How does climate impact biodiversity?*
- *What is range shift? Examine global databases to find out examples of climate-related range shifts.*

### About the Lesson Plan

<b>Grade Level</b>	Undergraduate
<b>Discipline</b>	Biological Sciences
<b>Topic(s) in Discipline</b>	Biodiversity, Animal Diversity (Chordates, Mammals), Evolution and Behavior (Species and Speciation), Ecology (Populations; Precipitation Patterns, Vegetation, Soil Types; Zoogeography)

<b>Climate Topic</b>	Climate and the Biosphere
<b>Location</b>	USA
<b>Access</b>	Online
<b>Language(s)</b>	English
<b>Approximate Time Required</b>	120 – 150 min

## 1 Contents

### 1. Video (~5 min)

A video that explains how the monitoring of a climate-sensitive species, the American Pika, can reveal the possible impact of climate change on the habitat and population of a species.

<https://www.youtube.com/watch?v=t31rFXQSUno>

### 2. Classroom/Laboratory Activity (90 – 120 min)

A classroom/laboratory activity to examine and analyze squirrel species distribution and habitat data (from the USA) over time, and to interpret the possible relationship between climate change and biodiversity.

[https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim\\_activity\\_ideas/squirrels.html](https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim_activity_ideas/squirrels.html)

### 3. Suggested questions/assignments for learning evaluation

- *What are the factors that influence the distribution of a species?*
- *How does climate impact biodiversity?*
- *What is range shift? Examine global databases to find out examples of climate-related range shifts.*

## 2 Step-by-step User Guide



Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

### 1. Introduce the topic

- Discuss one or more species of animals and their habitats.
- Introduce the topic of species distribution and biodiversity.
- Discuss how a species adapts to changes in habitat or climate.

### 2. Play a short video

Now, play the short video (approx. 5 min), "[The American Pika: A climate indicator species?](#)". In this video, Chris Ray from the University of Colorado Boulder talks about her research on the American Pika, a species that is sensitive to climate change. The monitoring of pikas could serve as an indicator of the effect of climate change on biodiversity and ecosystems.

The video "The American Pika: A climate indicator species?", produced by Earth Initiatives, is available at <https://www.youtube.com/watch?v=t31rFXQSUuo>.

### 3. Conduct a classroom/laboratory activity

Now, explore this topic in an interactive and engaging manner through a classroom/laboratory activity, "[What do Squirrels know about Climate Change?](#)", contributed by Beth Norman, Allan Ashworth, and Russell W. Graham, available on the SERC Carleton website.

This activity will help your students analyze data for past and modern squirrel populations and habitats. They will then determine how climate change may affect habitat changes and species distribution. Students will use actual data from some states in the USA to perform data analysis and interpretation.

- Go to [https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim\\_activity\\_ideas/squirrels.html](https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim_activity_ideas/squirrels.html)
- Conduct the activities described in Part 1 and Part 2.

#### 4. Questions/Assignments

Use the tools and the concepts learned so far to discuss and determine answers to the following questions:

- *What are the factors that influence the distribution of a species?*
- *How does climate impact biodiversity?*
- *What is range shift? Examine global databases to find out examples of climate-related range shifts.*

## 3 Learning Outcomes

The tools in this lesson plan will enable students to:

- categorize species by family and by habitat
- compare and analyze past and modern data on species distribution and habitat
- interpret the effect of climate change on changes in species distribution and habitat
- explain how the monitoring of some species can serve as an indicator of the effect of climate change on biodiversity and ecosystems

## 4 Additional Resources



If you or your students would like to explore the topic further, these additional resources will be useful.

### 1. Reading, Audio

A reading and audio podcast, “Bird populations shift north as climate changes”, from Samantha Harrington, Yale Climate Connections: <https://www.yaleclimateconnections.org/2017/07/bird-populations-shift-north-as-climate-changes/>

### 2. Video

A video, “American Pika Monitoring”, from the National Park Service (NPS), USA: <https://www.youtube.com/watch?v=OVgyloPU40U>, <https://www.youtube.com/watch?v=WZS5ayKm8yI>

### 3. Classroom/Laboratory Activity

A classroom/laboratory activity “Climate, Ecoregions, and the Mammals Who Live in Them”, contributed by Jonathan Hoffman, Beth Johnson, and Mark Merritt, from the SERC Carleton website: [https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim\\_activity\\_ideas/ecoregions.html](https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim_activity_ideas/ecoregions.html)

## 5 Credits/Copyrights

All the teaching tools in our collated list are owned by the corresponding creators/authors/organizations as listed on their websites. Please view the individual copyright and ownership details for each tool by following the individual links provided.

We have selected and analyzed the tools that align with the overall objective of our project and have provided the corresponding links. We do not claim ownership of or responsibility/liability for any of the listed tools.

1. **Video, “The American Pika: A climate indicator species?”**

[Chris Ray, University of Colorado Boulder](#); [Niwot Ridge LTER Program](#); [Earth Initiatives](#)

2. **Classroom/Laboratory Activity, “What do Squirrels know about Climate Change?”**

Beth Norman, Allan Ashworth and Russell Graham, available on the SERC Carleton website, [https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim\\_activity\\_ideas/squirrels.html](https://serc.carleton.edu/NAGTWorkshops/climatechange/paleoclim_activity_ideas/squirrels.html), [MIOMAP](#), [Smithsonian National Museum of Natural History](#)

3. **Additional Resources**

Samantha Harrington, Yale Climate Connections;

National Park Service (NPS), USA;

[SERC Carleton](#)