

Lesson Plan: Biodiversity and Species Extinction due to Climate Change

Teacher-submitted lesson plan, contributed by Dr. Robin Suyesh, Assistant Professor, Sri Venkateswara College (University of Delhi), India

As an **undergraduate Biological Sciences** or **Environmental Sciences** teacher, you can use this set of computer-based tools to teach about **biodiversity** and the **vulnerability of species** due to climate change.

The biodiversity of plant and animal species on planet Earth is threatened by several factors such as habitat loss, poaching, disease, overexploitation of natural resources, and introduction of invasive species. Climate change is expected to be one of the leading causes of species decline or extinction. This lesson plan discusses the extinction of one mammal species, the Bramble Cay melomys. It is believed to be the first mammalian extinction due to climate change.

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

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

- What is biodiversity?
- What is the importance of biodiversity for the health of an ecosystem?
- What are the historical records of biodistribution of the mammal, Bramble Cay melomys?
- How has climate change lead to the extinction of the Bramble Cay melomys?
- How can climate related factors endanger the biodiversity of a region?

About the Lesson Plan

1. **Grade Level:** Undergraduate
2. **Discipline:** Biological Sciences, Environmental Sciences

3. **Topic(s) in Discipline:** Biodiversity, Conservation, Biogeography, Endemic Species, Vulnerability of Species, Susceptibility of Species, Species Extinction, Habitat Loss, Endangered Species, Threatened Species, Mammalian Extinction, Bramble Cay melomys

4. **Climate Topic:** Climate and the Biosphere

5. **Location:** Australia

6. **Access:** Online

7. **Language(s):** English

8. **Approximate Time Required:** 55-65 min

1 Contents

1. Video (~8 min)

A video that highlights the importance of biodiversity and briefly discusses the challenges of preventing its degradation due to human activities.

This can be accessed at:

<https://www.csiro.au/en/Research/Environment/Biodiversity/Biodiversity-book/Chapter-1>

2. Reading (20 min)

A review article that describes how climate change may alter the biodiversity of a region and potentially cause species extinction.

This can be accessed at:

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2012.1890>

3. Reading (7 min)

An editorial, '[The Bramble Cay melomys: the first mammalian extinction due to human-induced climate change](#)', by Graham R. Fulton, *Pacific Conservation Biology*, 2017, 23, 1-3, that explains the case of the extinction of a mammalian species, Bramble Cay melomys, due to climate change.

This can be accessed at:

http://www.publish.csiro.au/PC/pdf/PCv23n1_ED

4. Classroom/Laboratory Activity (20-30 min)

A classroom activity to explore the existential status of local and global species of organisms using the International Union for Conservation of Nature (IUCN) Red List for Threatened Species, including the Bramble Cay melomys. The activity also includes a factsheet by the (IUCN) that highlights the susceptibility of certain species to climate change impacts.

This tool can be accessed at:

<https://www.iucnredlist.org/species/13132/97448475>

The factsheet can be accessed at:

https://www.iucn.org/sites/dev/files/import/downloads/climate_change_and_species.pdf

5. Suggested questions/assignments for learning evaluation

- What is biodiversity?
- What is the importance of biodiversity for the health of an ecosystem?
- What are the historical records of biodistribution of the mammal, Bramble Cay melomys?
- How has climate change lead to the extinction of the Bramble Cay melomys?
- How can climate related factors endanger the biodiversity of a region?

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. Topic introduction and discussion

Play the video, '[What is biodiversity and why is it important](#)', by Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia, to introduce the topic of biodiversity. Use this video interview of Dr Steve Morton to understand the importance of biodiversity and its benefits. Stress on how anthropogenic climate change may affect biodiversity. Also emphasize how certain species may possibly go extinct due to climate change.

This can be accessed at:

<https://www.csiro.au/en/Research/Environment/Biodiversity/Biodiversity-book/Chapter-1>

2. Explore the topic further

Use the review article, '[How does climate change cause extinction?](#)', by Cahill et al. (2013), from the Proceedings of the Royal Society B (Biological Sciences), to explain to your students the proximate causes of climate change related species extinction. Discuss the various case studies presented in the reading and assess the possible climatic factors responsible for the extinction of these species. Use the findings in this review to explain to the students that there may be both direct and indirect effects of climatic variations on the survival of a species. Also, discuss how the inference of the proximate causes of species extinction may require scrutiny in several cases.

This can be accessed at:

<https://royalsocietypublishing.org/doi/full/10.1098/rspb.2012.1890>

3. Reading

Use this editorial, '[The Bramble Cay melomys: the first mammalian extinction due to human-induced climate change](#)', by Graham R. Fulton, Pacific Conservation Biology, 2017, 23, 1-3, to explain the case of the extinction of a mammalian species, Bramble Cay melomys due to climate change.

This can be accessed at:

http://www.publish.csiro.au/PC/pdf/PCv23n1_ED

4. Explore local and global species for threat of extinction

Use the [IUCN's Red List](#) to carry out a hands on activity that shows the relationship between the extinction of the Bramble Cay melomys and climate change:

- Introduce your students to the information on the extinct mammal, Bramble Cay melomys, using the IUCN tool available at <https://www.iucnredlist.org/species/13132/97448475>
- Click on the relevant tabs to learn about its taxonomy, population, habitat and ecology, geographic range, threats, conservations actions and research undertaken.
- Point out to its extinct status because of habitat inundation due to climate change related sea level rise, storm surges and a lack of timely efforts for species conservation.

- Then, allow students to explore the status of several local and global species of animals, plants and fungi by entering the common or species-specific name in the search box and refreshing the page.
- Encourage your students to use the factsheet '[Species Susceptibilities to Climate Change](#)', by IUCN Red List, to explain why certain animal species are more at risk of extinction due to climate change, than others.
- Direct the students to compile information for chosen species of organisms and explain how such species are designated as 'climate-susceptible-species' by the IUCN and are 'flagged' for conservation efforts.
- Finally, use this information to encourage students to apply their understanding of species susceptibilities and comment on the present and future biodiversity scenarios.

This tool can be obtained at:

<https://www.iucnredlist.org/species/13132/97448475>

The factsheet can be accessed at:

https://www.iucn.org/sites/dev/files/import/downloads/climate_change_and_species.pdf

5. Questions/Assignments

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

- What is biodiversity?
- What is the importance of biodiversity for the health of an ecosystem?
- What are the historical records of biodistribution of the mammal, Bramble Cay melomys?
- How has climate change lead to the extinction of the Bramble Cay melomys?
- How can climate related factors endanger the biodiversity of a region?

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- understand the importance of biodiversity
- explain the role of climate change in impacting biodiversity

- discuss the causes for extinction of a species due to climate change
- explain the susceptibilities of certain species to climatic variations

4 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; “What is biodiversity and why is it important?”

Developed by [Commonwealth Scientific and Industrial Research Organisation \(CSIRO\)](#), Australia.

2. Reading; “How does climate change cause extinction?”

Review article: Cahill AE, Aiello-Lammens ME, Fisher-Reid MC, Hua X, Karanewsky CJ, Yeong Ryu H, Sbeglia GC, Spagnolo F, Waldron JB, Warsi O, Wiens JJ. 201 How does climate change cause extinction? Proc R Soc B 280: 20121890. <http://dx.doi.org/10.1098/rspb.2012.1890>.

Published by the [Proceedings of the Royal Society B](#)

3. Reading; “The Bramble Cay melomys: the first mammalian extinction due to human-induced climate change”

Editorial by Graham R. Fulton, [Pacific Conservation Biology](#), 2017, 23, 1-3.

4. Classroom/Laboratory Activity; “IUCN Red List”

Developed by the [International Union for Conservation of Nature \(IUCN\)](#).