



RACING
EXTINCTION

Modern
Extinction
The Sixth Mass
Extinction

Essential Questions

- What is extinction?
- Which species have become extinct in modern times?
- What are the characteristics of past mass extinctions?
- How do modern extinction rates compare with natural (background) rates?
- How do human activities result in species extinctions, and what species have become extinct due to human activities?

Objectives

- Define extinction.
- Cite examples of past mass extinctions and recent species extinctions.
- Compare current extinction rates with background extinction rates.
- Analyze the connection between recent extinctions and human activities.
- Cite examples of how human activities have caused species extinctions.

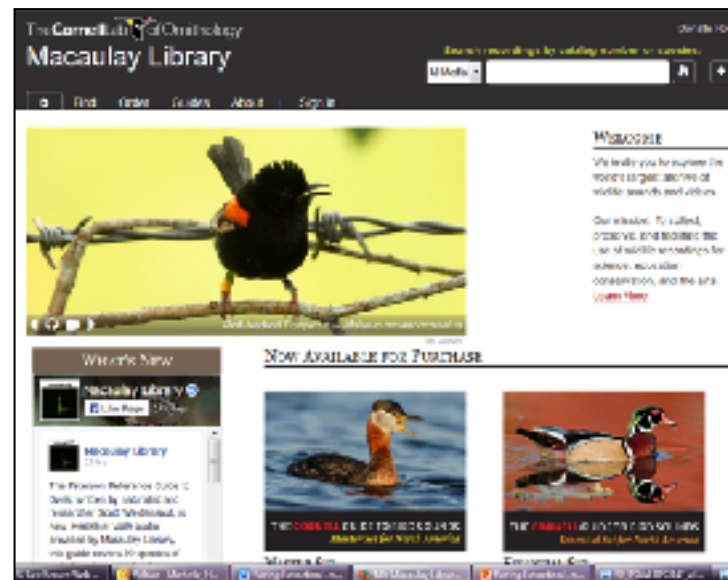
The World is Singing Video



Click image above to view video

The World is Singing

What animal sounds have you heard in real life or in movies?



What is **extinction**?

What are some extinct
species you know of?

 *Tip Try to remember some movies and books about animals that no longer exist on Earth.*

Extinct Species

*Tyrannosaurus
rex*



Extinct Species

Woolly mammoth
*Mammuthus
primigenius*



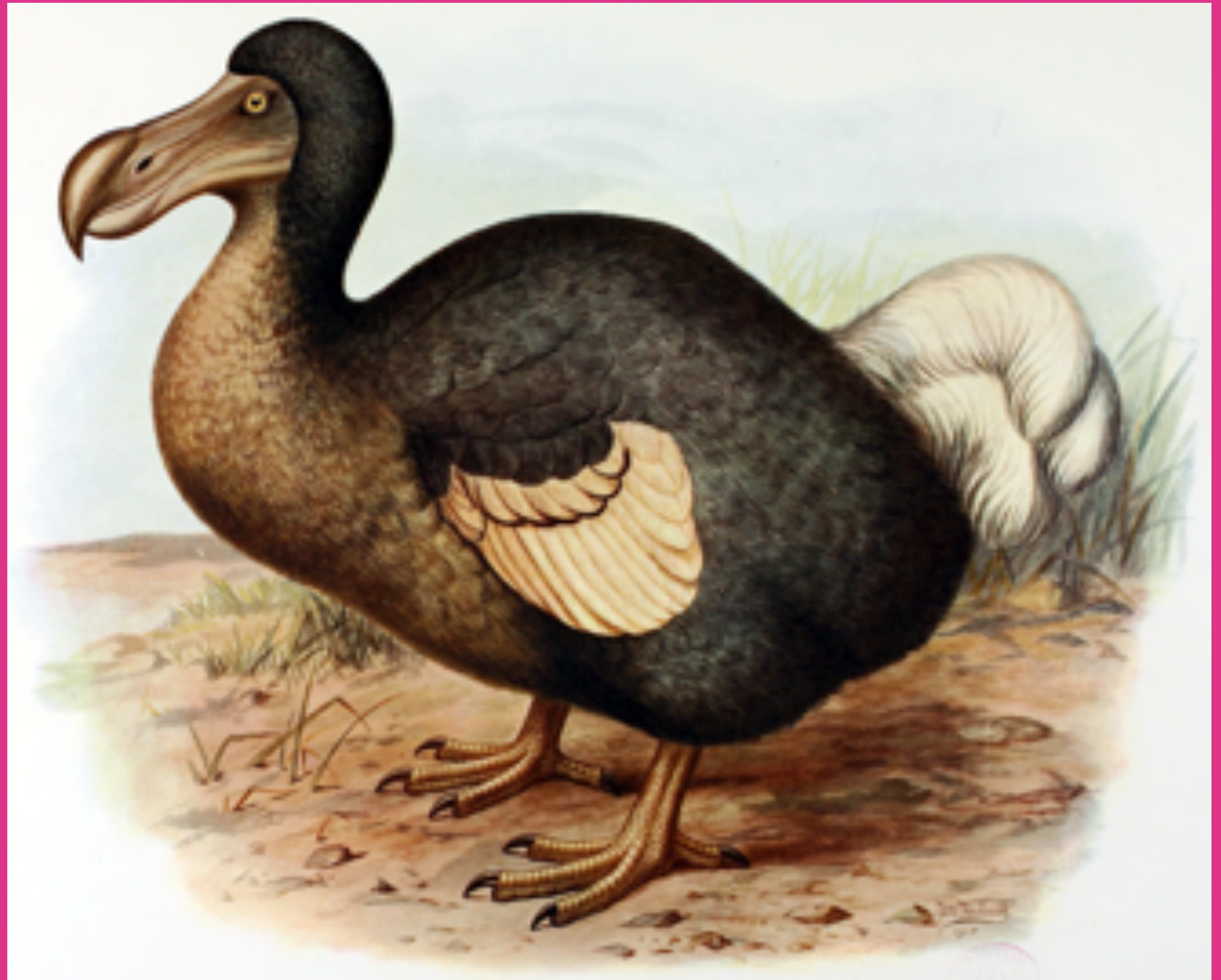
Extinct Species

Passenger pigeon
*Ectopistes
migratorius*



Extinct Species

Dodo
Raphus cucullatus



Defining **extinction**

Write your definition of the word “extinction.”

Use the word “extinction” in a sentence.

The Sound of Extinction

Describe the sounds you think the species you selected would have made. Briefly explain why you think the species would have made that sound.

Understanding Extinction

You will learn about the concept of extinction and obtain evidence for actual extinctions in Earth's history and in modern times.

Mass Extinction Events Video Clip



Click image above to view video

Mass Extinction Events

Research online and create a timeline of past mass extinctions.

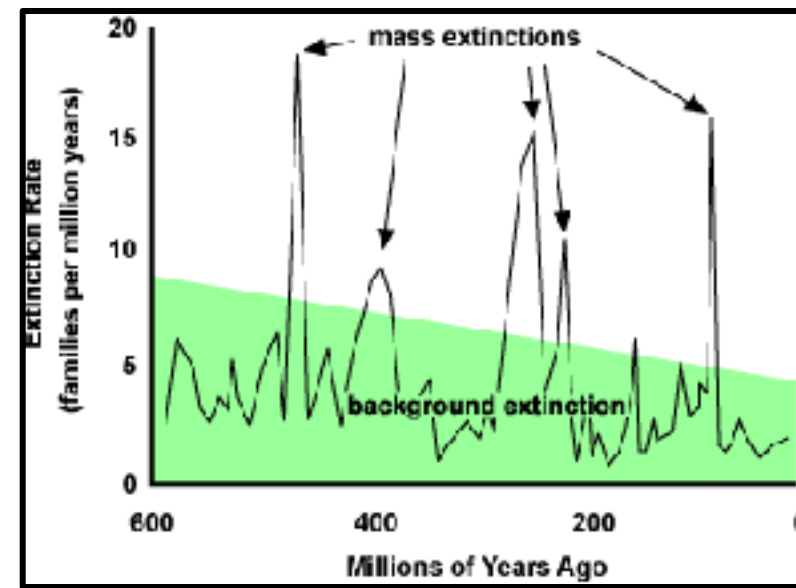
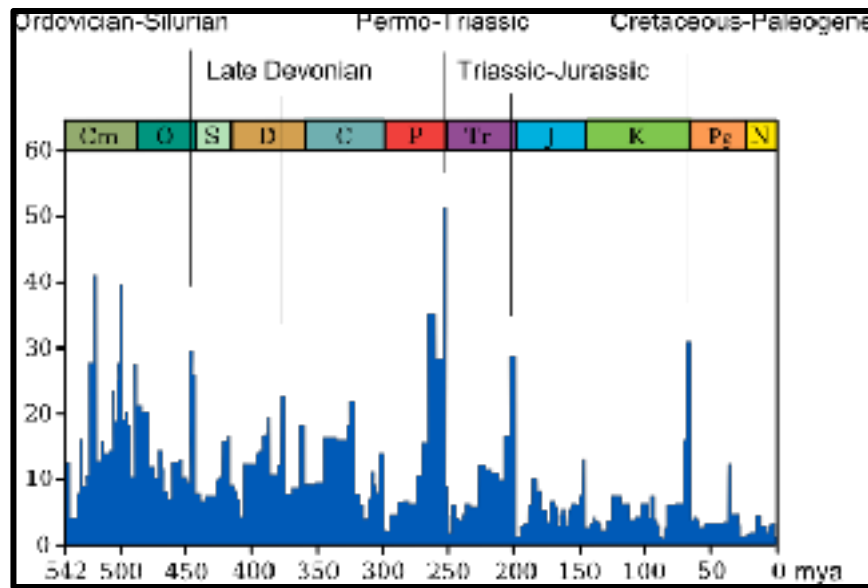


Look out for:

- Taxonomic levels used to analyze mass extinctions
- Different measures of extinction
 - Percent of taxa
 - Extinction rate (e.g., families per million years)

Mass Extinction Events

Compare these two graphs, which show mass extinctions over time.



Mass Extinction Events

Choose a mass extinction event.

Mass Extinction Events: Resource

The screenshot shows a BBC website page from October 2014. The main heading is 'NATURE PREHISTORIC LIFE'. The article title is 'Big Five mass extinction events'. The text explains that while the Cretaceous-Tertiary (K-T) extinction is the most famous, there are other significant events. It lists 'Extinction theories' including catastrophic methane release, flood basalt eruptions, climate change, and impact events. A specific section on the 'Ordovician-Silurian mass extinction' is highlighted, describing it as the third largest extinction in Earth's history, occurring in two waves separated by hundreds of thousands of years, primarily affecting sea life.

Big Five mass extinction events

Although the Cretaceous-Tertiary (or K-T) extinction event is the most well-known because it wiped out the dinosaurs, a series of other mass extinction events has occurred throughout the history of the Earth, some even more devastating than K-T. Mass extinctions are periods in Earth's history when abnormally large numbers of species die out simultaneously or within a limited time frame. The most severe occurred at the end of the Permian period when 98% of all species perished. This along with K-T are two of the Big Five mass extinctions, each of which wiped out at least half of all species. Many smaller scale mass extinctions have occurred, indeed the disappearance of many animals and plants at the hands of man in prehistoric, historic and modern times will eventually show up in the fossil record as mass extinctions. Discover more about Earth's major extinction events below.

Extinction theories

- Catastrophic methane release
- Flood basalt eruptions
- Climate change
- Impact events

Ordovician-Silurian mass extinction
The third largest extinction in Earth's history, the Ordovician-Silurian mass extinction had two peak dying times separated by hundreds of thousands of years. During the Ordovician, most life was in the sea, so it was sea creatures such as trilobites, brachiopods and graptolites that were drastically reduced in number.

Mass Extinction Today: Vanishing Species Video



[Click image above to view video](#)

Mass Extinction Events

Analyze the causes and consequences of one of the five mass extinctions.

- Compare background rates of extinction with the current rates of extinction.



Research evidence used to estimate extinction rates:

- The fossil record
- Speciation rates
- Diversification
- The Theory of Island Biogeography

Mass Extinction Events: Resources

The article discusses the current mass extinction event, comparing it to the Cretaceous-Paleogene extinction. It features a line graph showing extinction rates over time. The graph has a y-axis labeled 'Extinction rate' and an x-axis labeled 'Time'. A red line shows a sharp increase in the extinction rate starting around 1950, reaching a peak around 2000, and then declining. The text below the graph discusses the impact of human activities on biodiversity and the need for conservation efforts.

This article discusses the estimation of the normal background rate of species extinction. It includes a line graph showing extinction rates over time. The graph has a y-axis labeled 'Extinction rate' and an x-axis labeled 'Time'. A red line shows a sharp increase in the extinction rate starting around 1950, reaching a peak around 2000, and then declining. The text below the graph discusses the impact of human activities on biodiversity and the need for conservation efforts.



This is a screenshot of a Science journal article. The title is "The biodiversity of species and their rates of extinction, distribution, and protection". The authors listed are S. J. Hubbell, C. A. S. Jones, B. A. S. Jones, E. M. S. Jones, J. J. Silman, J. S. S. Jones, P. B. S. Jones, and J. S. S. Jones. The article discusses the biodiversity of species and their rates of extinction, distribution, and protection.

Explaining Extinction

Create a resource explaining your chosen mass extinction event.

- Web page
- Digital slide presentation
- E-brochure



Your resource should include:

- Fossil and radiometric evidence for dating the event
- Kinds of species that went extinct
- Severity of the event
- Scientific hypotheses that explain the event

Current Extinction Rates

With your group:

Prepare a short report comparing evidence and methods used to estimate background extinction rates and current extinction rates.



Your report should include:

- Methods and data on:
 - The fossil record
 - Speciation rates
 - Diversification across families
- Potential sources of error or inaccuracy in estimating extinction rates
- Units for measuring extinction rates

Theory behind Extinction Rates

Write a short passage explaining why and how scientists use the **theory of island biogeography** to estimate current extinction rates.

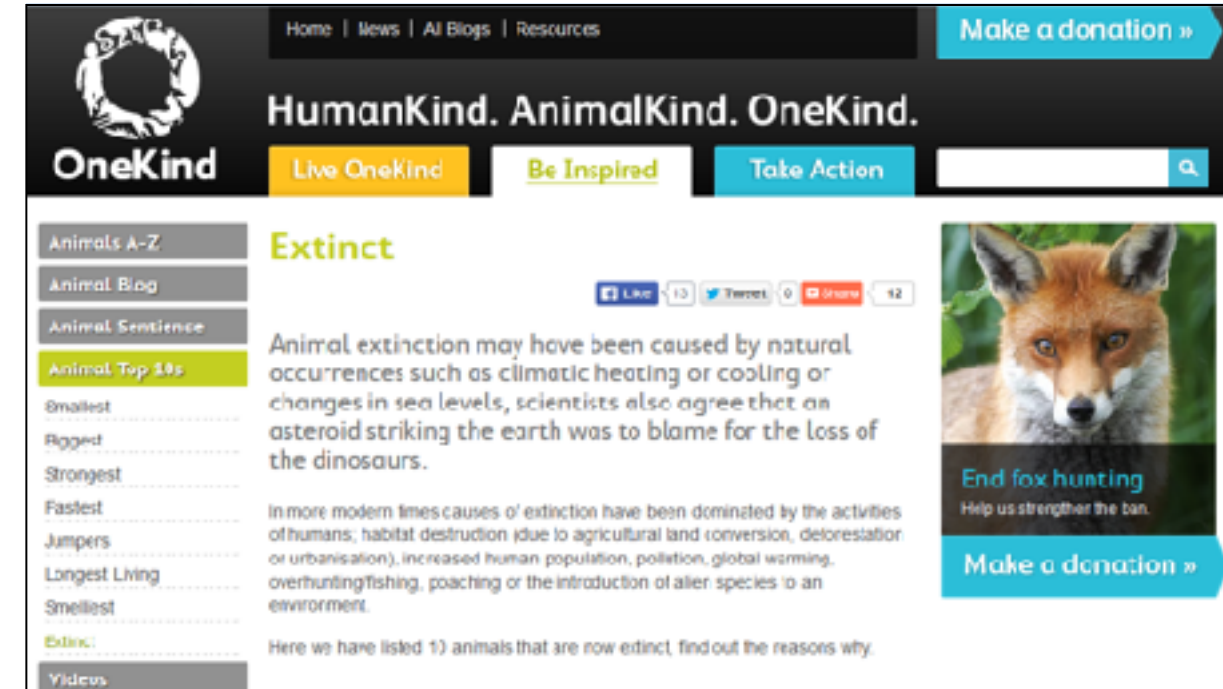
Case Study Concept Map

With your group:

Select a species that has gone extinct in modern times.

- Create a concept map to describe the causes and consequences of the extinction

Case Study Concept Map: Resources



Case Study Concept Map

Tip

Include key data in your concept map:

- Species scientific name
- Illustrations or photos if available
- Dates of discovery and extinction
- Biogeographical data
 - Location
 - Initial population size
 - Ecology and behavior
- Causes of extinction
- Ecological effects of the extinction
- Possible actions that may have prevented the extinction

Brainstorm!

Your mission (should you choose to accept it)!

Create a list of activities that publicize and educate about the Sixth Mass Extinction.



Ensure that your activities:

- Are feasible and realistic
- Do not require funding
- Ideally could be conducted in a class setting

Evaluation

1. Write a short passage describing characteristics of past mass extinctions.
2. Describe how modern extinction rates compare with natural (background) rates.
3. Describe five kinds of human activities that result in species extinctions.
4. List three species that have become extinct due to human activities and the causes of those extinctions.

Resources

Data

- http://evolution.berkeley.edu/evolibrary/images/evo/extinction_graph2.gif
- https://www.e-education.psu.edu/earth103/sites/www.e-education.psu.edu.earth103/files/module11/mass_extinctions.png

Websites

- <https://www.e-education.psu.edu/earth103/node/713>
- <http://science.nationalgeographic.com/science/prehistoric-world/mass-extinction/>
- http://www.bbc.co.uk/nature/extinction_events
- http://www.pbs.org/wgbh/evolution/library/03/2/l_032_04.html
- <http://www.ncbi.nlm.nih.gov/pubmed/25159086>
- <http://www.sciencemag.org/content/344/6187/1246752>
- <http://rainforests.mongabay.com/0908.htm>
- <http://facstaff.uwa.edu/jmccall/Evolutionary%20Biology/Extinction.ppt>