

# **Evolutionary Advantage of The Eastern Gray Squirrel**



AP Bio Case Study

**Engage:** Ask students to come up with 3 questions they have when looking at these 2 squirrels?



Discuss how scientists collect data to determine abundance of the different colored morphs.

Mark and recapture, sampling, point count, trail cam photos.



Introduce students to iNaturalist. Take students around schoolyard and practice using app.

The screenshot displays the iNaturalist website interface for the Eastern Gray Squirrel (*Sciurus carolinensis*). The page features a search bar at the top, navigation links (Explore, Community, More), and a breadcrumb trail: Life > Animals > ... > Subgenus Neosciurus > Eastern Gray Squirrel. A search bar for species and a 'Filter by Place' option are also visible.

The main content area includes a large photograph of a squirrel, a smaller gallery of images, and a 'View More' link. To the right, there are statistics for the species, including the top observer (dallonw with 3,295 observations) and the top identifier (maxallen with 32,244 observations). The last observation date is March 14, 2023, and the total number of observations is 168,425.

A seasonal observation chart is displayed, showing the number of observations per month. The chart has two peaks: one in April (around 22k) and another in September/October (around 20k). The x-axis represents months from JAN to DEC, and the y-axis represents the number of observations from 0 to 22k.

Navigation tabs at the bottom include Map, About (which is selected), Taxonomy, Status, and Similar Species. A 'More Info' link is also present at the bottom right.

Source: [Wikipedia](#)

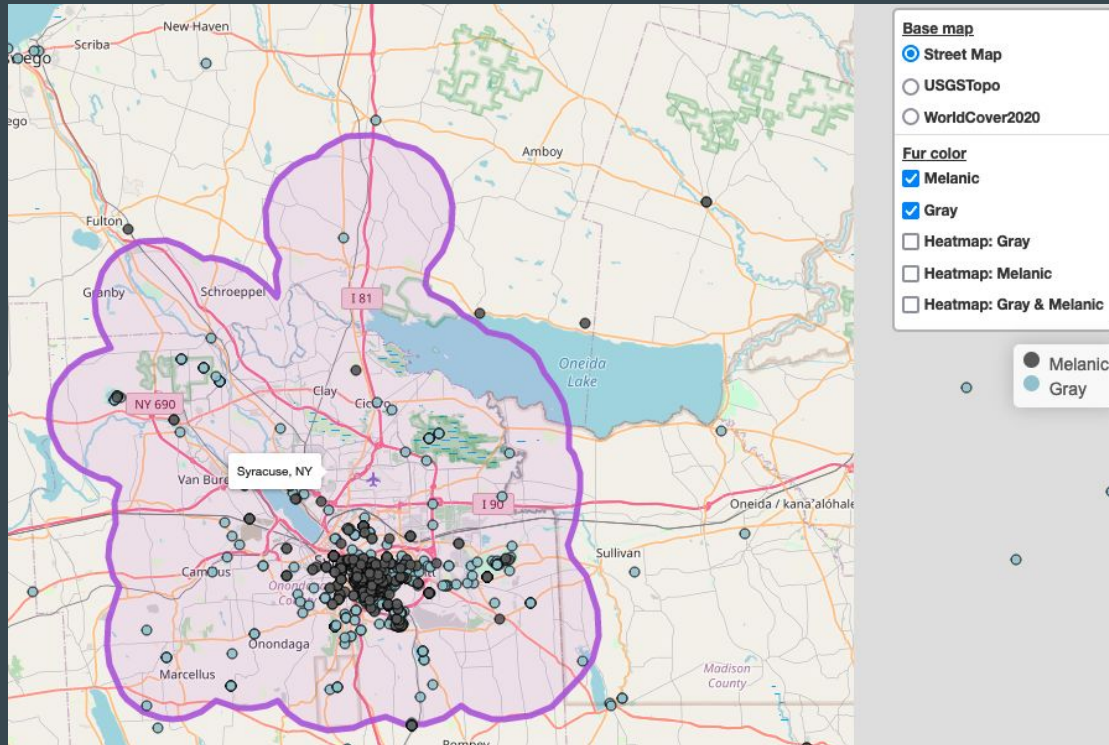
**Explore:** Is there an evolutionary selective/adaptive advantage for one squirrel color morph in a particular environment?

Students came up with an environment to investigate such as differences in urban vs rural, differences between cities, different sized cities, differences in cold vs warm climates, etc.

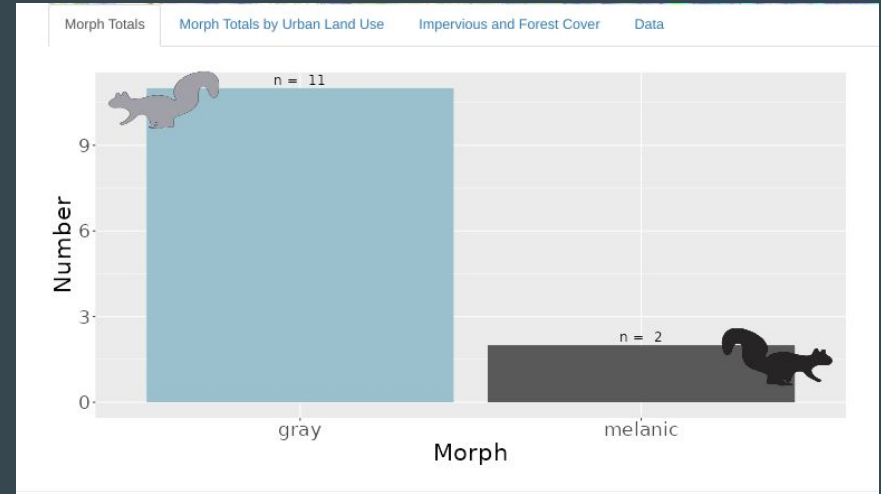
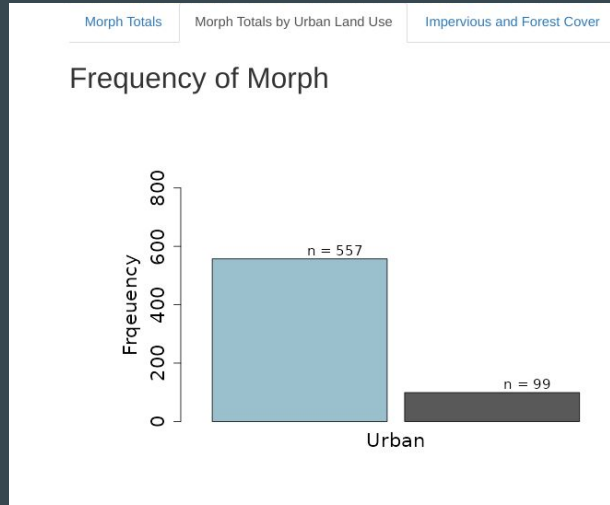
Students were then tasked with generating a claim as to the evolutionary adaptive advantage of coat color in the Eastern Gray Squirrel in a particular environment.



Using SquirrelMapper they were able to explore the data and apply statistical analysis (Chi-Square)



# Student Data



	Urban (Manhattan)	Non Urban - (Catskills)
Melanic	99	2
Gray	557	11

Melanic and Gray Coated Squirrels in Urban and Non-Urban Areas

The Chi-Square value was  $< 0$ , therefore the Null Hypothesis is accepted.

## **Explain:** Argumentation Session

After gathering and analyzing the data the groups prepared a white board/poster where they shared their initial argument with other groups.

This was done using a round robin format.

Groups gave constructive feedback which allowed students to revise their initial argument.



# Evaluate: Using CER

Students developed a final CER using the template and then graded using a rubric.

Argument Presentation Template	
The Guiding Question:	
Our Claim:	
Our Evidence:	Our Justification of the Evidence:

# Elaborate

## Colored Variation Over Time in Rock Pocket Mice Populations

<https://www.biointeractive.org/classroom-resources/color-variation-over-time-rock-pocket-mouse-populations>

## Peppered moths of Industrial Revolution

<https://askabiologist.asu.edu/activities/peppered-moth>

Have students read article “The Biological System—Urban Wildlife, Adaptation, and Evolution: Urbanization as a Driver of Contemporary Evolution in Gray Squirrels (*Sciurus carolinensis*)” by James P. Gibbs, Matthew F. Buff, and Bradley J. Cosentino. Discuss their work and our experiences from Squirrel Boot Camp.

