Case Study: Florida Scrub Jays

By Archbold Biological Station Education Department
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At a Glance

Using the relationship between Florida Scrub Jays and fire, students learn introductory experimental design and data analysis—with real data from Archbold Biological Station. Students complete worksheet on a Florida Scrub Jay study. Then, the class reviews and discusses answers with a guided slideshow.

Directions

1. Print worksheets for students. Students work in pairs or small groups to complete worksheet.
2. As a class, review the guided slideshow. Students should be encouraged to discuss their answers and revise their worksheets.

Optional: Have students look up their own research question to see if their hypothesis was supported.

Learning Objectives

- Discuss the unique relationship between fire and the inhabitants of the Florida Scrub—specifically the threatened Florida Scrub Jay.
- Interpret graphs to answer a posed scientific question.
- Develop additional research questions and hypotheses

Optional Materials

At Home in the Florida Scrub (2015)

- https://www.youtube.com/watch?v=Km3RpDYlyaI

Cornell Bird Guide

- https://www.allaboutbirds.org/guide/Florida_Scrub-Jay

Grade Level

9th-12th

Length

40 minute worksheet
20 minute review

Materials

Case Study Worksheet
Case Study Slideshow

Vocabulary

Xeric
Endemic
Cooperative breeding
Demographic
Bird Banding
Biotic
Abiotic

Standards

SC.912.N.1.1
SC.912.L.17.1
SC.912.L.17.7
MA.912.DP.5.11
MA.K12.MTR.7

Name: _____

Archbold Biological Station

Case Study: Florida Scrub Jays

Research Background:

Archbold Biological Station is a biological field station located in Highlands County, Florida, on the southern tip of the Lake Wales Ridge—the highest and oldest of Florida's sand ridges. Slightly higher than the rest of peninsular Florida, these sand dune ridges were the only part of Florida above sea level at points in history —making them islands. On these sand ridges, one of Florida's most distinctive ecosystems formed—the Florida scrub. The Florida scrub is an upland ecosystem with **xeric** (dry, or well-drained), low-nutrient sandy soil and a distinctive plant community. This community includes a variety of shrubs, dwarf oaks, pines, palmettos, hickory and Florida rosemary. Open sandy patches often have small herbaceous plants and reindeer lichen. The Florida scrub has a high number of **endemic** species. This means that many of the scrub species only live there—they aren't found anywhere else geographically. This is likely due to the periods of isolation during sea level rises and the unique conditions of the scrub.


Fire in the Scrub

One important characteristic of the Florida scrub is fire. Historically, the scrub would face lightning-ignited wildfires. Because of this, many scrub species have adapted to fire. Animals will fly away or find refuge underground in burrows. Many scrub-adapted plants can resprout or reseed after the fires have cleared space. Many plants and animals have adapted to the low and open habitat after a fire. When the scrub doesn't burn for a while, it will become tall and dense.

Scientists have been studying the scrub and its inhabitants for a long time. One species, the Florida Scrub-Jay (FSJ), has been studied at Archbold since 1969.

Florida Scrub Jay Life History Stages

FSJs (*Aphelocoma coerulescens*) are endemic to the Florida scrub. They are unable to survive in suburban or urban areas. With the loss and fragmentation of the Florida scrub, FSJ populations have declined throughout their range.

FSJs form family groups with offspring staying to help raise their siblings. This is a social system known as **cooperative breeding**. This behavioral adaptation helps all family members be more successful. The younger offspring have more caregivers. The parents benefit by having more help around the nest. The older offspring learn how to better care for their own young someday. Each family group has their own territory that they maintain and defend. A sentinel jay will sit at the top of a taller tree to watch for predators and to defend territory.

FSJs will typically build their nest about 3 feet off the ground in shrubs or short oaks. The baby birds eat soft caterpillars and other insects in the spring. Adults have a varied diet with acorns as a staple. In the fall, a single jay will bury up to 8,000 acorns in the open, sandy patches in preparation for spring.

Part I – Study Design

Today, you are a scientist at Archbold examining the FSJ populations on plot MU50, which is a designated study area. You'll be looking at **demographic** data, which is data about a population. Archbold scientists keep track of births, deaths, family structure, and distribution of territories. You will be answering the research question:

What long term impact does fire have on the number of FSJ territories in MU50?

Using the information from the Research Background, make a prediction—or hypothesis—about the impact of fire on FSJ territories in MU50.

_____

_____

What evidence from the Research Background supports your hypothesis?

_____

_____

_____

_____

Bird banding is a sampling technique that uses aluminum and/or colored plastic bands as identification. The bands signify each individual and the family they belong to. Researchers band every FSJ at Archbold. Nestlings are banded at 11 days old. Using the banded birds, scientists are able to track the birds throughout their lives and define their territories.


Banded FSJ

In addition to tracking birds and territories, Archbold's researchers keep detailed records of other potential variables, such as fires. Scientists also evaluate the vegetation composition, local weather, resource availability, and other factors.

To determine the relationship between FSJs and fire, scientists must evaluate their long-term data sets —dating back to when the study started more than fifty years ago. Long term studies are important to understand patterns that may not be noticeable short term. Using this long term data, the following graphs were created.

Part 2 – Data Analysis

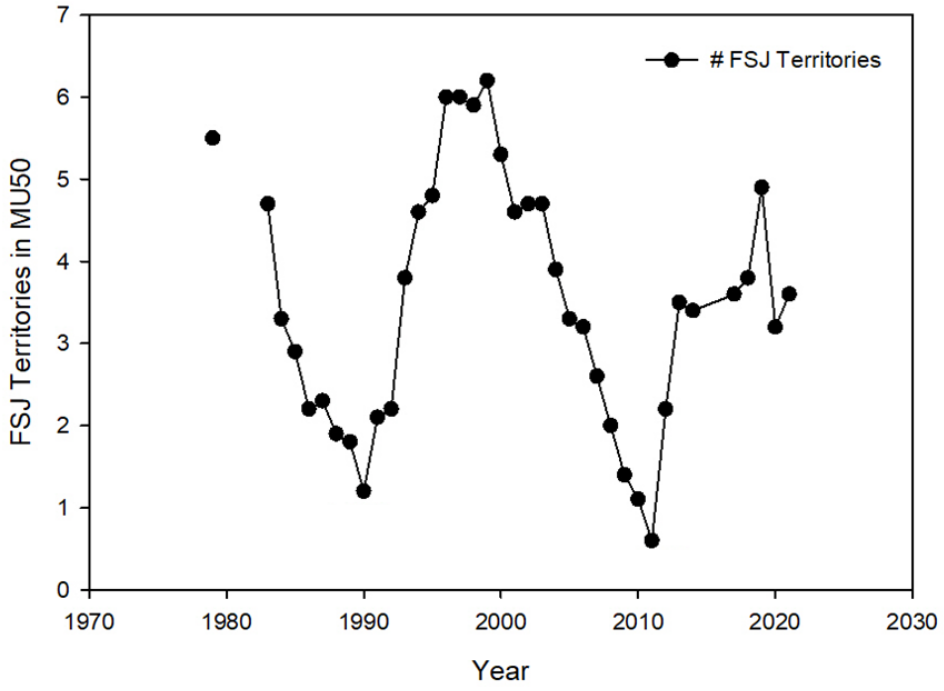


Figure 1.

This graph shows the number of FSJ territories in MU50 by year.

Explain a trend in this graph. Use specific data points as evidence.

_____

_____

_____

_____

_____

Based on your hypothesis, which year(s) do you predict had fires? _____

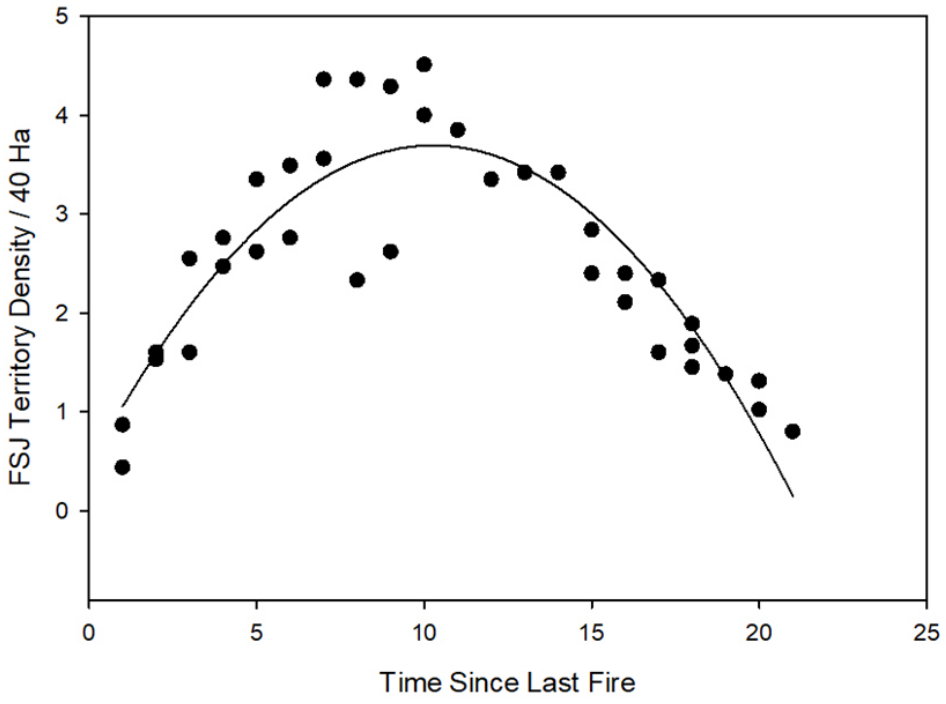


Figure 2.

This graph shows the number of FSJ territories per 40 hectares based on how many years it's been since the last fire.

Explain the general trend of this graph. Use specific data points

_____

_____

_____

_____

Does this graph support your hypothesis? Why or why not?

_____

_____

_____

_____

Part 3 – Application

The Burn Boss at Archbold plans and conducts prescribed burns, which are intentional fires set under specific conditions. Historically, wildfires would be dynamic multi-day events—leaving a mosaic of different growth. The Burn Boss keeps careful track of the fire history of the different plots in attempts to mimic the mosaic pattern of natural fires


Prescribed Burn

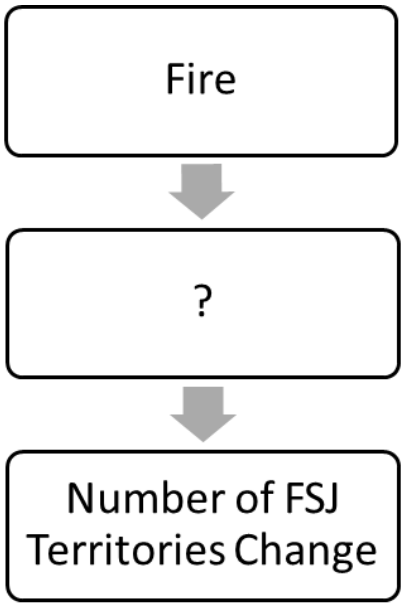
Based on your data analysis, how often would you suggest MU50 to be burned to maximize FSJ territories?

_____

Fire impacts the entire ecosystem—from the **biotic** (living) elements like plants and animals to the **abiotic** (non-living) elements like soil. Organisms form many relationships with each other—both within their own species and with other species. For example, FSJs are the prey for hawks and the predators of caterpillars. Additionally, species form relationships with non-living things. For example, FSJs may rely on a particular seasonal pond as their water source.

While the data analysis revealed a relationship between FSJ territories and fire, it is likely that fire has an indirect impact. Instead, fire likely changes the environment in many ways—impacting the FSJs and all the other biotic and abiotic factors.


Florida Scrub



Based off the Research Background and your knowledge of the requirements of living things, think of three biotic or abiotic factors could fill in for the "?" on the flow chart to the left.

1. _____
_____

2. _____
_____

3. _____
_____

Science is an ongoing process. Researchers continue to evaluate fire's effects on the Florida Scrub and its inhabitants. Choose one of the three factors you noted above. Write a research question that connects your factor to fire, FSJs or both. Then make a hypothesis.

Research Question:

_____
_____
_____

Hypothesis:

_____
_____
_____
_____