SkyTruthing for Students: Prescribed Fires Teacher's Guide

SkyTruthing for Students demonstrates how satellite imagery can be utilized to examine the impact humans have on the environment, as well as how it can be used to track landscape recovery after significant environmental events. The Prescribed Fires module explores the role that fire plays in shaping habitats, the different species of plants and animals found in longleaf pine ecosystems that are adapted to it, and the changing nature of fire policy in the U.S.

Step 1: Understanding the Issues

Step 1 provides background information for students about historic fire policy in the United States, and how changes in this policy have shifted the way that land managers view and utilize fire. It details the important role fire has played in shaping the Longleaf pine ecosystem of the Southeastern US, as well as the species which have adapted to frequent fires. It also discusses how fire is one form of energy, provides background on satellite technology, and describes how satellites are used to monitor environmental events such as fires. A Lesson Questions Worksheet contains questions to gauge student's knowledge before reading the narrative, as well as questions for them to answer as they read through the narrative. The Lesson Questions are available on the SkyTruthing for Schools website and are also provided on **Page 3** of this Guide.

Go to the SkyTruthing for Students website http://skytruth.org/schools and click on the Prescribed Burn link on the left hand column to read the background information.

Step 2: Using satellite imagery to track forest recovery after a fire event

Step 2 gives students access to satellite imagery and allows them to analyze an area of Florida's Blackwater River State Forest, which underwent a prescribed burn in 2014, and to measure the forest's recovery in the months following the fire. The exercise requires students to analyze satellite images in Google Earth, calculate area, and draw conclusions about forest recovery. To complete the exercises, the students will need to use:

- KMZ file that stores the satellite images of the oil spill on 4 separate dates (available on the left hand column of the SkyTruthing for Schools website)

- Google Earth Pro to trace the outline of the spill on the satellite images

- The Guide to using Google Earth Pro and worksheet to calculate the volume of oil spilled and flow rate of leaking oil on each of the dates.
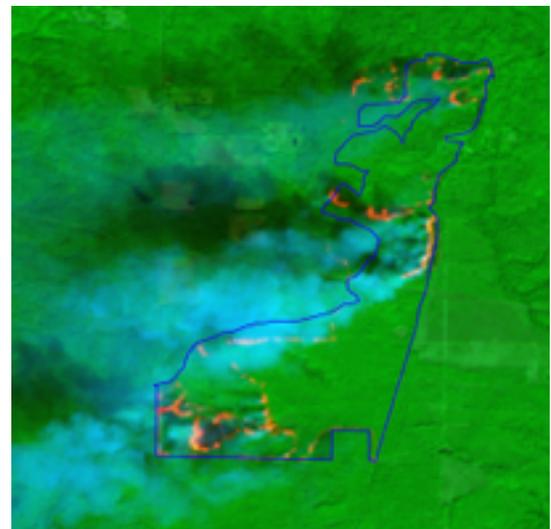
As a first step, go to the SkyTruthing for Students website and download the Guide to Using Google Earth Pro provided in the left-hand column. Following the steps in the guide, have the students select a satellite image provided in the KMZ to practice using Google Earth by outlining the area of the burned land in the forest on that date. Once students have mastered maneuvering in Google Earth Pro, they can outline and measure the area of visibly burned land in Blackwater River State Forest for each of the four months presented, record their measurements on the Calculations Worksheet, and identify trends (quantitatively) in landscape recovery over time. The Calculations Worksheet is available on the SkyTruthing for Schools Website and is also attached to this Teacher's Guide.

Step 3: Exploring the Impact of Fire

Once students have completed the workshop, step 3 allows them to explore the environmental and social aspects of prescribed burns. Students are divided into groups and tasked with answering the following discussion questions, using the knowledge they have gained throughout the lesson and the supplemental information provided by links in the narrative:

- Before this lesson, what was your opinion of forest fires? Has your opinion changed? If so, how?

- What role does fire play in Longleaf pine ecosystems?

- What are the benefits of conducting prescribed burns? What are the potential downsides?

- Would you expect land that was burned by a wildfire to recover in the same amount of time as land affected by a prescribed burn? Why or why not?

- What other environmental issues do you think Landsat satellite observations could help illuminate? Can you think of issues for which it would not be helpful?

- Based on the knowledge you have gained throughout this lesson, would you recommend the continued use of prescribed burns as a land management technique? Why or why not?

Lesson Questions:

Discuss students ideas on these questions before beginning the lesson.

1. What do you think the term "fire ecology" means?

2. In what ways do you think fire affects wildlife, plants, or ecosystems?

3. How do you think animals escape fires?

4. Do you think fires good or bad? Explain.

5. Why do you think it's important for people living in this county to understand fire ecology?

Answer these questions while reading through the lesson.

1. What is the difference between a wildfire and a prescribed burn?

2. On what day did the prescribed burn in Blackwater River State Forest take place?

3. Give 2 examples of species that take shelter in Gopher tortoise burrows during forest fires.

4. How did the policy on fire and its use change between the 1800's and late 1900's?

5. List 3 reasons State and Federal Agencies prescribe fires.

6. How much property damage was caused by wildfires in Oakland, California in 1991?

7. What percent of Yellowstone National Park was burned in 1988?

8. What is the difference between natural and artificial satellites?

9. True/False: Satellites are able to observe infrared and ultraviolet light.

10. What is the pixel size in a Landsat image in square meters?

11. How long has the Landsat program provided imagery of Earth?

12. True/False: Bare ground reflects more Near-Infrared light than healthy vegetation.

13. What percentage of sunlight that hits the Earth reaches the planet's surface?

14. During fires, what forms of energy is the chemical energy of plants transformed to?

15. True/False: Some satellites are able to detect the location of fires through smoke.

Science and Math Standards Addressed (grades 6-8), developed for a grant in Okaloosa County, FL.

8th grade Florida Science Benchmarks:

SC.8.N.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

SC.8.N.4.2: Explain how political, social, and economic concerns can affect science, and vice versa.

SC.6.P.11.1: Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

SC.7.P.11.1: Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.

SC.7.P.11.2: Investigate and describe the transformation of energy from one form to another.

SC.7.P.11.3: Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.

Potential to reinforce 6th and 7th Grade standards:

7th grade:

SC.7.N.2.1: Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

6th grade Science:

SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

MS Common Core Connections: Reading – Writing – Speaking/Listening – Mathematics

Reading: RST - Reading Science and Technical Subject

LACC.68.RST.1.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

LACC.68.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Writing: WHST-Writing History, Science and Technical Subjects

LACC.68.WHST.1.1: Write arguments focused on discipline-specific content.

- a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

- b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

LACC.68.WHST.3.9: Draw evidence from informational texts to support analysis reflection, and research.

Speaking: SL-Speaking and Listening

LACC.6.SL.1.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

- b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.

- c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.

- d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

LACC.6.SL.1.2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.