Learn about Badlands National Park!

Lesson One: Intro to GPS

Objective: Students will understand how GPS technology works and practice recording waypoints and navigating to known waypoints.

Keywords: GPS, waypoint, track, UTM, navigate

Grade 5-8

National Science Content Standards A and D

National Geography Standards 1, 7, 17, and 18

Classroom Procedure

1) Ask for a volunteer.
    If he is 7 feet from back wall where could he be?
    If he is 7 feet from back wall and 3 feet from side wall where could he be?
    Where else? Imagine he can fly. 3 feet from ground. Just stay there.

This is similar to how GPS works. Play How GPS Works Videos (from howstuffworks.com) & Worksheets. Ranger describes GPS to fill in any gaps.

2) Discussion: Why is it important to know your location? Where you are?

3) Provide examples of scientific applications of GPS at Badlands National Park. Use Fire Program and Wildlife Program as examples, show project maps.

Today, we are going to use GPS units to mark and find waypoints. Explain difference between GeoCaching & EarthCaching and ethics related to National Parks. At National Parks we do not leave anything behind, so GeoCaching is prohibited; however, EarthCaching is encouraged.

4) Activity: Hand out GPS units & How to sheets. Go outside at school turn them on. Practice skills.

Field Trip (or Outdoor) Procedure

1) Hands-on activities with GPS unit. Students practice skills for next field trip to Badlands Earth Cache site.
    a) Group Orientation: Turn on GPS, page through screens, record a waypoint. Walk about 0.5 miles, record waypoint. Return to original waypoint
    b) Partner Games: one partner marks a waypoint, then the other partner tries to find the waypoint. Switch partners & repeat if time.

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GPS

Scientists at Badlands National Park use GPS technology to conduct surveys and learn about the park. Get ready to learn about GPS.

Listen to the Ranger. Use the outline below to follow along.

GPS stands for G_____ P_____ S_____. GPS is a satellite-based navigation system that sends and receives radio signals. A GPS receiver receives signals and gives you information about your location.

Why was GPS originally developed? _____

Who owns GPS technology? _____

GPS is made up of three **segments**.

1) Space Segment

How many GPS satellites orbit the earth? _____

These satellites send coded radio signals. The radio signals send information about the particular satellite location and if everything is working properly. These signals can pass through clouds, glass, and plastic. Signals can not pass through objects that contain metal or water.

2) Control Segment

The control segment constantly monitors the satellites, the signals, and the orbital configuration of the satellite. There are _____ unmanned GPS monitor stations around the world. The Master Control Station gathers information from each monitor station. The master control station is located near _____. The controllers at the master station can make precise corrections and send that information to the satellites by way of ground antennas.

3) User Segment

The user segment consists of the handheld GPS receivers we will be using. These receivers collect signals from four satellites to determine your location, speed, elevation, time, etc. The receivers must have a clear view of the sky to be accurate.

Lesson Two: EartheCaching with GPS

Objective: Students will understand how GPS technology works and practice recording waypoints and navigating to known waypoints.

Keywords: GPS, waypoint, track, UTM, navigate

Grade 5-8

National Science Content Standards A and D

National Geography Standards 1, 7, 17, and 18

Classroom Procedure

1) Review Erosion
   - What is erosion
   - What do we know about erosion in Badlands?

2) Introduce EarthCache Site
   - Show Earth Cache website.
   - The cache is some natural wonder – not anything placed there by people
   - Your GPS should get you within 20 feet of the cache—you will have to look around to find it from there.

Field Trip Procedure

1) Drive to Yellow Mounds Overlook. Students practice with GPS units on the way.

2) See worksheet. Have students follow procedures in pairs or small groups. Ranger and teacher available to help.

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EarthCache!

An EarthCache site is a special place that people visit to learn about a unique geoscience feature or aspect of our Earth. Visitors to EarthCache sites can see how our planet has been shaped by geological processes, how we manage the resources, and how scientists gather evidence to learn about the Earth.

You will be searching for the Dillon Pass Erosion EarthCache.

How fast are the badlands eroding? This EarthCache site will help answer that question!

Step One: Yellow Mounds Overlook

Turn on your GPS unit.

What is the UTM location of Yellow Mounds Overlook?

N_____ W_____

Step Two: Enter the following coordinates as a waypoint.

N43 50.733 W102 11.719 Navigate to this waypoint.

When you get to this waypoint, stop and enter the next waypoint:

N43 50.668 W102 11.726 Navigate to the last waypoint.

Step Three: The last waypoint marks the EarthCache site. You will see several geologic markers eroding out of the Badlands. Only one of these markers is the correct earth cache. Use the coordinates to find the right marker.

These markers were originally set in concrete. The top of the marker was level with the ground. Since then, the ground has eroded away and now the marker sticks up out of the ground.

Step Four: You can calculate the rate of erosion at this exact spot by collecting some data.

_____ current year

_____ year marker was set (look on the top of the marker)

_____ number of years the marker has been in place.

EarthCache Continued

Step Five: Measure

Measure the distance from the top of the marker to the ground from three different points around the marker.

1. _____ inches
2. _____ inches
3. _____ inches

What is the **average** distance from the top of the marker to the ground?

Step Six: Calculate

1. How many inches per year, on average did the badlands erode at this spot?

_____ inches (average distance from top of marker to ground)

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_____ year (number of years markers has been in ground)

2. Do you think the rate of erosion is the same everywhere in the park? Why or why not?

Step Seven:

Take a class picture at the YellowMounds Overlook sign.
Hold up your GPS units in the photo. Now you are an EartheCacher!

www.earthcache.org