



GPS Pathfinders Post-visit

Classroom Activity

Brief Synopsis

At Eagle Bluff students had the opportunity to experience the recreational uses of GPS technology first hand. In this activity, students will begin to realize the wide scope of practical uses of GPS technology and the impact it is having on their lives.

Ages: Designed for 4th–High School

Activity Length: 1-2 hours for research

Materials:

- Pencil
- Paper
- GPS career and field list
- Questions to explore
- Access to internet or library

Outcomes:

1. Students will gain an understanding of how many different areas GPS technology is being used.
2. Students will see how technology is constantly changing the way in which we do things.

Vocabulary:

GPS, Technology, Limitations

Minnesota Academic Standards:

Science: 5.I.C.1; 6.I.C.1; 7.I.C.1; 8.I.D.2; 9-12.I.C.1-5

Language Arts: 5.I.C.3; 5.II.C; 5.II.D; 6.I.C.3; 6.II.C; 6.II.D; 7.I.C.3; 7.II.C; 7.II.D; 8.I.C.3; 8.II.C; 8.II.D; 9-12.II.C; 9-12.II.D

Activity 1: *GPS Careers*

Background:

The uses of GPS technology reach far beyond recreational hand held units and in-car navigation assistance. This technology has revolutionized many careers and is becoming a valuable skill when looking for a job.

Procedures:

1. Have students brainstorm the many uses of GPS technology, including careers.
2. Brainstorm questions the class would like to have answered in regards to using the technology. Examples could include:
 - When did GPS start being used in this way?
 - How has GPS technology improved the career or use?
 - Does the technology have any limitations for this career or field?
 - Is there any information about upcoming uses of GPS technology in regards to this field?
 - Do you have any other ideas how GPS technology could be used in this career or field?
3. Assign students, either as individuals or small groups, to a research a specific GPS use or career. If you are in need of ideas a reference sheet of GPS uses is included.
4. Final projects options may include:
 - Written essay
 - Report
 - Poster
 - Presentation to class

Extension Activities:

- Place a geocache on your school campus.
- Follow a travel bug online. Create maps and graphs to see where it has been! You can even create your own bug to follow. Helpful websites include:

<http://www.geocaching.com>

<http://www.earthcache.org>

<http://www.confluence.org/index.php>



All information was found online at: www.mapwatch.com/gps/gps-use.shtml

GPS Use in Agriculture:

- **Tractor Guidance:** Farmers can not put their tractors on auto-pilot. If they plow their fields with a recording GPS system the tractor can then be programmed to follow the same route - for cultivating, fertilizing, pest control and harvesting. The programming of tractor routes has the potential to save a lot of money.
- **Cropduster Targeting:** Insects don't attack a field with a uniform distribution. Instead outbreaks of insect activity are concentrated in certain areas. Workers strolling the crops can use a GPS to record the locations of insect problems. The data can then be used by cropduster pilots to selectively target the problem areas instead of treating an entire field. This method results in a savings of time, fuel, insecticide and crop exposure to chemicals.
- **Tracking Livestock:** The location of valuable animals on a large farm can be monitored by GPS transmitters attached to the animals collar. When the animals are sent to market GPS transmitters can also be used to track their location.
- **Yield Monitoring:** Estimates of yield variations across a property can be made using GPS. To do this the property is divided into zones and the yield of each zone is estimated and plotted on a map. The map can then be used to better understand the property and for decision-making in regard to the next planting.
- **Soil Sampling:** Collecting soil samples across a large property can be organized using GPS and mapping software. The sample locations can be waypointed in the field and those waypoints marked on the mapping software. Then, when the laboratory results are returned the data can be plotted on the maps and decisions for soil treatment can be made for various parts of the property. The locational information can save money and time by allowing variable rate applications and treating only those areas with a documented need.

GPS Use in Auto Sales and Rentals:

- **Tracking Rental Cars:** Some car rental companies have installed GPS tracking on their rental cars to monitor mileage, speed and location of their cars. These companies have levied heavy surcharges on customers who were found to be speeding or going outside of the area covered by the lease agreement. This type of monitoring has been challenged because the vehicle monitoring practices were not clearly explained to customers.
- **Monitoring High Risk Auto Loans:** Cars sold to some buyers with a poor credit history could be equipped with transmitting GPS units to monitor the whereabouts of the car and disable it in the event of a loan default.

GPS Use in Public Transportation:

- **School Bus Tracking:** GPS tracking can be used to monitor school buses. This will enable school officials to continuously know the location of all buses, route them more efficiently, monitor speeding and cut costs.
- **Snow Plow Tracking:** GPS tracking units placed on snow plows can keep track of the location of all plows at any time and record the areas which have been serviced. They can also be used for more effective routing and to confirm the services of contractors.
- **GPS-Equipped Bus Routes:** The city of Edinburgh, Scotland has a "Bustracker" system that tracks the location of city buses. When an emergency or crime occurs the bus location is immediately available. In addition the bus transmits its location and speed and this information is used to display estimated time of arrivals at street-side bus stops.
- **GPS-Equipped Taxi Cabs:** Tracking taxi cabs with GPS can yield significant cost savings and customer satisfaction. When a call for a cab comes in the dispatcher can use a GPS tracking system to locate the cab nearest to the pick-up. This saves not only vehicle miles but the customer also gets picked up faster and to his destination happier.

GPS Uses - Camera & Photography:

- **Geocoding Photos :** Some cameras will annotate your digital and traditional images with the date and time, however, new GPS-enabled cameras can also annotate them with precision coordinates which mark the location



of your photos. These annotations can be very useful in science field work, real estate, law enforcement and many other areas.

- **Time Sequence Photos:** You can easily create a photographic time line of changing seasons, growing crops, construction sites or other landscape elements in areas where you can not leave a mounted camera. To do this simply use a GPS unit to get accurate geographic coordinates of where the photos are to be taken along with the bearing of the view. You will then be able to repeatedly return to a very close location to take all of your photos.

GPS Use in Emergency Response:

- **Pinpoint Location of Emergency Reports:** GPS equipped cell phones can transmit precise locations to 911 dispatchers. This allows the dispatcher to have an immediate and accurate location instead of relying upon descriptions of people who may be unfamiliar with the area or too distraught to explain their location. The same technology has also helped catch people who make crank 911 calls from their GPS-enabled cell phone.
- **Speedy Arrival Thanks To GPS:** GPS software can be used to quickly tell which emergency vehicle is closest to an accident or other emergency. With GPS coordinates associated with land-line telephone numbers, a 911 location can be quickly plotted on a map and the closest emergency response vehicle can be quickly identified, shaving precious minutes off of the response time.

GPS Use in Fishing:

- **Marking Hotspots:** When fishing in a large lake it can be difficult to return to the exact location where you have had success in the past. However, with GPS you can mark a waypoint at each of your productive areas and easily return to them the next time out.
- **Map Your Trolling Success:** Each time you catch a fish, mark a waypoint with your GPS. Then when you return home you can upload those waypoints to a computer database. Now you have a powerful tool that can be used to map the most productive areas in the lake, where you have caught certain species of fish and where you have found success at different times of day.
- **Mooching Hotspots from Fishing Guides:** A number of charter fishing fleets have banned the possession of GPS units on their boats. They are concerned that clients will waypoint the locations of their "secret" spots and then return on their own - thus eliminating the need for guide services.

GPS Use in Corporate Fleet Management:

- **Cell Phones enabled with GPS** can be used to monitor the location of all vehicles and/or employees in a corporate fleet. Dispatchers can pull up maps showing the location of all vehicles, the path covered by a specific vehicle on a specific date, log addresses visited and time spent. The devices can send an automatic warning or notification of speeding, off-course travel or schedule departures.

GPS for Tracking Your Kids and Pets:

- **Blind Walker Guidance:** GPS units and palm-size computers can help blind walkers find their way. The systems are programmed to give detailed travel instructions and provide information about businesses and landmarks passed en-route.
- **Tracking Your Kids:** GPS-enabled cell phones can be used to monitor your kids. When Johnny calls you for his after school check in you can confirm if his coordinates are at the public library or at the pool hall.
- **Tracking Your Pets:** After you get GPS tracking for your kids, don't forget to buy one for your dog. A GPS transmitter on Fido's collar can help you recover him if he fails to come home.



GPS Use in Law Enforcement:

- **Tracking Suspected Criminals:** GPS units have been used to record and monitor the movements of crime suspects. Use of such information to aid in a conviction or an investigation has been challenged by defendants as an infringement of their privacy.
- **Tracking Convicted Criminals:** GPS bracelets can be placed on selected felons on parole to monitor their movements. For example: the system could monitor if criminals are staying away from the homes of their victims, traveling to work each day or going near schools. Such systems can be used to verify that certain restraining orders are being obeyed.
- **Online Crime Maps:** The San Francisco police department is running an online GIS that allows the public to create maps of the locations of different categories of crimes which have occurred over the past 90 days. This is part of their philosophy of keeping the public well informed.
- **Appeal You Speeding Ticket With GPS Data:** A few individuals cited for speeding have produced GPS tracking information from their on-board GPS to appeal their ticket. Maybe the officer stopped the wrong car or his radar was malfunctioning?

Recreational Uses of GPS:

- **Geocaching** is a game played around the world. Players hide a "cache" (a waterproof container with a log book and trinkets inside) and other players try to find it using GPS coordinates and clues posted on one of several websites (Geocaching.com). Some players have hundreds of "hides" and "finds".
- **Bird Watching** is a recreational activity where GPS has significant value. Many bird watchers maintain a log of the date and location of where they have observed different bird species. Accurate locational data can be a significant enhancement to these logs because it will help the bird watcher return to the same location for future observations. In addition, the GPS coordinates can be shared with friends so that they can go to the same location without a personal guide. Perhaps they will be lucky and sight the same birds.
- **Hiking** has many uses for GPS. Trails can be viewed on topographic map software, traced on the screen and that route can be downloaded into the GPS. Then, in the field the route can be displayed in the map window of the GPS and easily followed. Another use is to leave the GPS on and in a mesh pocket of your backpack while hiking. This will allow the GPS to record a tracklog of your hike. The tracklog can be shared with others, plotted on maps, used for distance hiked estimates and even printed with mapping software and shared with friends.

GPS Use in Scientific Field Work:

- **Marking Sample Collection Sites:** Recording locations for water samples, mineral specimens, animal sightings and more. These can be quickly marked in the field and then archived in the office or plotted on maps. GPS is faster and more accurate than using a paper map.
- **Tracking Wildlife:** The movements of larger animals can easily be monitored with a transmitting GPS unit. Elephants, bears and more can be studied with GPS.

GPS Use in Sports:

- **Bicycle Racing:** Ten riders in the 2004 Tour de France were equipped with GPS transmitters. This provided their location and speed at all times. In future years all riders could be equipped with GPS and the progress of the race tracked on maps and topographic profiles.
- **Athletic Training:** Runners, cyclists, skiers and other athletes who race across the landscape can use tiny GPS units while training to monitor their speed, distance covered, course difficulty and more. Combined with a recording heart rate monitor they can provide valuable information about an athlete's condition and be used to develop racing strategies.
- **GPS Golf:** Many golf courses are installing GPS units on golf carts. These can be used to estimate how far a ball has been hit, distance to the green and even to keep location-challenged golfers from getting lost on the links.