GPS 4-H: USING THE GLOBAL POSITIONING SYSTEM IN 4-H PROGRAMMING

GPS FIELD EXERCISES & CHALLENGE GAMES

Instructor Guide

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The following are a series of hands-on learning exercises that can be used with GPS/land navigation classes. Generally, they are designed to be used after a period of instruction and demonstration on the particular topic. The exercises can be used with small groups that must share GPS units and other equipment. The terms and features relate to using Garmin receivers, but can be easily adapted to other brands. Actual receiver operations are indicated as ***bold italicized*** instructions.

Be sure that all of the GPS receivers are set to the same coordinate system (usually either UTM/UPS or Lat-Long) and to the correct map datum to match your topographic maps (usually NAD27-CONUS).

Unless you are fortunate enough to have a GPS receiver for each student, divide the participants into teams according to the number of receivers available. Hopefully, you would have enough so that the each team is no larger than 4 or 5 students. If some students already have a basic familiarity with GPS, try to spread them among the teams as helpers. Even if you have enough receivers for everyone, some of the exercises are best done in the team format.

GETTING TO KNOW YOUR GPS RECEIVER

This basic field exercise is designed to teach students the fundamentals of operating a GPS receiver. It is similar to the "getting started" section found in most GPS owner manuals. Each team needs a GPS receiver and a magnetic compass.

1. Each team should ***mark*** *(and name)* the starting location and then freely roam the designated site as a group with their GPS receiver.
2. Each participant should operate the GPS unit on at least one leg of the trip:
   - scroll through the pages to observe their functions (speed, track, distance, etc.).
   - practice marking ***waypoints***
   - use compass to check GPS directional accuracy when stopped and at walking speeds.
   - demonstrate ***tracback*** at least once during the trip
   - use the ***go to*** function to return to the starting location.
3. All teams gather back together. Review any problems or questions that arose during the field exercise.

TREASURE HUNT

This is another basic field exercise that can be used in the early stages of your GPS class since it is simply a series of ***go to*** operations. Depending on the terrain you select, a Treasure Hunt can be as easy or as challenging as you wish to make it.

1. Prior to your class, stash small "treasure chests" (containers of popcorn, granola bars, etc.) in scattered locations. Make the same number of treasure stashes as your number of teams. ***Mark*** the waypoint of *each* treasure chest on *each* of the GPS receivers. (Variation: for an advanced class, you may prefer to provide the set of waypoint coordinates for the students to enter into their GPS receivers).

2. Form the class into teams of "treasure hunters". Explain that _xxx_ number of treasure chests await them, the location of each one marked as a waypoint in their GPS receivers. Their challenge is to race against the other teams to find the hidden treasure ... or the teams may choose to collaborate instead, assigning a different treasure to each team, since there is enough to go around.

3. Give them a specific time to return (with or without their treasure), then turn 'em loose.

4. When completed, gather all teams back together. Review any problems or questions that arose during the field exercise. Eat any remaining treasure.

GPS AND TOPOGRAPHIC MAPS

This field exercise develops basic skills in using GPS receivers in combination with topographic maps. Each team will need a topographic map of the area with UTM or Lat/Long gridlines (which they can draw prior to the field exercise), a GPS receiver set to the matching coordinate system and map datum, grid cards or ruler, and a magnetic compass.

1. Each team should roam to several sites with distinct topographical features that would show up on the map (junction of 2 creeks, hilltop, road fork, etc.). ***Mark*** each of these locations in the GPS receiver. Then plot each of the marked GPS waypoints on the map, using the grid card or ruler. If everything was done correctly, the plotted locations should closely match the on-the-ground landmarks.

2. To practice the reverse procedure, team members should view the map and measure the coordinates of selected distinct landmarks (using grid card or ruler). Enter the coordinates as waypoints in the GPS receiver. The team should then use the GPS unit to ***go to*** these waypoints to see if they end up at the expected locations.

3. Gather teams back together. Review any problems or questions that arose during the field exercise. If you have access to a digital mapping program and a PC connector, transfer the waypoints from the GPS receiver to the computer. Have the team members observe the process and check the results for accuracy according to their field observations.

NAVIGATION TRAIL

This exercise tests skills in GPS operation, topo mapping, compass, and pacing. The route is a circular, multiple-leg trail. Each team will need a topographic map covering the field exercise area, a magnetic compass, and a GPS receiver. Prior to your class, set up a series of waypoint stations, each with posted instructions for navigating to the next station. The following is a sample of the type of navigation instructions you might post. Depending on terrain you select, number of stations, and complexity of the navigation instructions, a Navigation Trail can be as easy or as challenging as you wish to make it.

Station 1 (start): "Using your GPS receiver, ***mark*** and name your starting location and then ***go to*** *(provide Station 2 coordinates)* to locate Station # 2."

Station 2 "Using magnetic compass and pacing, go *(xxx yards)* on a bearing of *(xxx degrees)* to locate and ***mark*** Station # 3."

Station 3 "Using your topographic map, go to intersection of *xxx* creek and *xxx* road to locate and ***mark*** Station # 4."

Station 4 "To find and ***mark*** Station #5, walk upstream from the bridge along *xxx* creek to a point located on a bearing of *(xxx degrees)* from Station 2."

Station 5 "Using your GPS receiver, ***go to*** Station # 1 to complete the navigation trail.

Follow-up Exercises

1. Plot the path of Navigation Trail on the topographic map.
2. Measure the distance walked for each leg and the total trail.
3. Compare to the distances measured by the GPS receiver.
4. Estimate the acreage enclosed by the Navigation Trail.
5. If you have a digital topographic mapping program, transfer the marked waypoint stations and tracks from the GPS receiver to the computer's map. Then use the mapping program to estimate the distances and acreage. Compare the results to your earlier measurements.

Variation: For an advanced class, have each team design a Navigation Trail themselves. Then have another team try out the newly created trail.

GPS NATURE TRAIL

The trouble with most nature trails is that you actually need a trail. Often, existing trails are not located near the most notable biological and geological features in a given area. With a "GPS Nature Trail" however, this is not a concern (as long as the terrain is not too rugged). Each nature trail station is a marked *waypoint* along a cross-country *GPS route* that links all the stations/waypoints. To enable people to follow your trail, you provide a list of the coordinates for each station along with a description of the natural feature(s) at that location. (Or you could provide them with a GPS receiver in which you have already entered the nature trail route). You may also wish to provide a topographic map with the station locations marked.

Creating a GPS Nature Trail is a great 4-H club or class project. The young people search the designated area for notable geological, botanical, or zoological features. They ***mark*** the coordinates and flag each station, and then plot the stations on a topo map. The group researches information about the natural features and decides which ones should be included on their nature trail. Then they create written descriptions of the selected sites. The final product is a "GPS Nature Trail Guide" booklet with coordinates and natural history information for each station.

GPS SEARCH AND RESCUE

GPS Search and Rescue is an exciting field exercise in which teams of "Wilderness Rescue Rangers" (or whatever you want to call your students!) race to the rescue of "Bubba", an injured hunter /hiker/etc. Each team will need a topographic map of the area, a magnetic compass, and a GPS receiver. Portable two-way radios are also highly recommended. Site selection is very important. Match the size and scale of field terrain to the age and experience level of your students. You want to challenge the rescue teams ... but keep it safe! For adults and older teens, you might want to set up a scenario over several square miles in which the teams might select from a variety of transportation modes (cars, canoes, horseback, hiking) to complete the rescue.

1. First you will need a somewhat life-sized rescue dummy (our "Bubba" is a scare-crow with a blaze orange hat). Choose a lightweight model, since you'll need to haul it to the rescue location.
(Or you could use a real live person to serve as "Bubba").

2. Select a good location to place "Bubba", secluded but not hidden, then ***mark*** and record his coordinates.

3. Back at headquarters, gather your teams of "Wilderness Rescue Rangers". Explain the scenario and provide the coordinates. Here's an example:

> *"Our dispatcher just received a radio distress call from an injured hunter in the State Forest. Said his name was Bubba. He fell out of a tree and broke his leg. Fortunately, he didn't break his GPS receiver or his two-way radio. He reported his coordinates as _xxx_ before he passed out. First team to save him gets a free summer vacation week at Holiday Lake 4-H Center. Go get him!"*

4. After entering the coordinates in their GPS receiver(s), each team *should* take time to plot Bubba's location on the topo map and then devise a rescue plan ... what route, transportation mode(s), equipment needed, etc. Time spent in planning usually results in time and energy savings on the trail.

5. The first team on the scene brings Bubba back to headquarters, dead or alive. Before leaving the rescue site however, they should either wait for the other teams to arrive or leave a message that have retrieved Bubba ... you wouldn't want rescue teams wandering around for hours searching for him.
If two-way radios are available, they would valuable for communication among the teams and for contacting headquarters.

Variations: *GPS Search and Rescue* lends itself to all sorts of challenging variations. One suggestion, taking an idea from hunter education training, is to have Bubba crawl away from his reported location, leaving a blood trail (red food color and glycerin in squeeze bottle) for rescuers to follow. Another idea is expand on the *rescue* part of *GPS Search and Rescue*. Using a real human Bubba, have the team simulate the first aid treatment for the designated injury and then figure how to actually transport Bubba back to headquarters (the simulated "emergency room"). Other variations are limited only by our imaginations ... and risk management guidelines.