TIPS FOR USING GPS IN ENVIRONMENTAL FIELD WORK

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The Global Positioning System has become a powerful and affordable tool for a variety of scientific investigations in the field. Prices of "recreational" GPS models have been dropping, even as accuracy and unit capabilities have been increasing. For about $120 or less, you can purchase a receiver that not only locates your position anywhere on earth, but can also display road and topographic maps on its color screen, track and direct your movements, perform area calculation in the field, follow cruise lines and transects, find the nearest restaurant or hospital, display the current sun & moon phase, and perform a hundred other useful tasks. Spend a little more and you can get an altimeter/barometer, electronic compass, weather radio, and even a FRS/GMRS radio that can send and receive positions among co-workers in the field.

The latest GPS receiver models are user-friendly and intuitive. Basic operations are explained in the owner manuals. But, because they have become so feature-rich, many of the advanced capabilities are glossed over. The following tips may help you to see some new ways to use GPS in the field and to avoid some of the pitfalls in dealing with this technology.

Map Datum. A map datum is a mathematical model used to manage the inherent distortion created when producing a flat map of the round earth. Be sure to set your GPS unit's map datum to correspond to that of the paper or electronic maps you are using. The default GPS datum is WGS 84. However, the datum for most USGS topographic maps is NAD 27 CONUS. Failure to match the datum can lead to considerable error, although the GPS receiver can handle the conversion after-the-fact if necessary.

Coordinate/Grid systems. Most folks are familiar with Latitude-Longitude, but there are many other position formats that your GPS receiver can display. One of the most useful is UTM (Universal Transverse Mercator), especially when working with paper maps and with sampling. Connecting the blue tick marks along the margins of USGS 7.5' topographic maps will produce a grid of squares, 1000-meters on a side. When set to UTM, your GPS receiver displays coordinate precision to one meter within these squares, allowing you to easily pinpoint herp locations on the map. Note that precision exceeds accuracy in this case.

Accuracy. Standard civilian GPS horizontal accuracy is often listed as 15 meters (49.2'). In reality, with the new high-sensitivity antennas, it is usually much better (10'-20'). Most new GPS models also are capable of differential correction using WAAS (the FAA's Wide Area Augmentation System), which can improve accuracy even more. Most GPS receivers will display an accuracy or position error estimate. Several factors affect accuracy - satellite geometry, ionospheric interference, multipath (reflected) signals, and blocked signals. The latter two are of particular concern for environmental fieldwork in Virginia when using the older GPS models with standard antennas. Both

heavy tree cover and steep terrain can cause problems. Use your receiver's satellite page to locate blockages. Sometimes patience will solve the problem, since the satellite positions are constantly changing. Moving a few feet or elevating the receiver (your body can block signals) may help. If none of these suggestions work, you may just have to move uphill or to a more open area to get a position reading.

Batteries. Multi-featured GPS receivers can put a real drain on the batteries (usually two to four AA size). Fortunately many of the newer color-screen GPS models also have a much improved battery-conservation technology. Rechargeable NIMH (Nickel Metal Hydride) batteries are the economical and environmental choice.

Marking & Saving Coordinates. All hand-held GPS receivers allow you to mark and save precise coordinates. These could locations of vernal pools, mark & release sites, rare bird sightings, cover boards, unusual plant colonies, notable trees, unique geological features, or any number of other places of environmental interest. Coordinates are often matched with up with photographs for a variety of purposes. GPS coordinates are used in surveys and reports (e.g. the VDGIF Scientific Collection Report) and are important in many Geographic Information System projects.

Area Calculation. Environmental studies often require acreage data on areas to be sampled or surveyed. Many low-cost GPS models are now capable of area calculation in the field. Using the track log generated while traversing the perimeter of a tract, the receiver measures both circumference and enclosed area. The results can be displayed in (and instantly converted among) units of your choice - metric, statute, nautical. Some models also can produce an area estimate by linking major corner/turn waypoints in sequence, using the "route" creation function. This is useful in difficult terrain where it is not possible to traverse the tract's perimeter.

Sampling. As mentioned earlier, UTM is a grid system that can be reduced to one meter squares, each with its own unique geographic-numerical address (the UTM coordinate). This lends itself to random sampling selection techniques. Selected coordinates are entered into the GPS receiver, which is then used to locate the scattered plots in the field. GPS can also be used in linear sampling (such as foresters' cruise lines & plots). From any given waypoint in the GPS receiver, a series of new waypoints can be "projected" at selected distances in a desired direction. These waypoints are then linked together as a "route" in the receiver, which when activated, will lead the user along the cruise line to each plot.

Conclusion. GPS can be a very useful tool for environmental fieldwork. This article has only scratched the surface. Small-group GPS workshops can be arranged to explore and practice ways to use this technology. If you are interested in participating in such a session, contact Mike Clifford by email at ***mjc4h@vt.edu*** or call 804.561.5411.