Module
Introduction to GPS

FIRST-A little History

Mariners and explorers throughout history struggled to come up with a way to predictably chart the progress of their explorations.

Because if you can’t find:
1. your way home at the end of the day and
2. the way back to your new discovery
   (i.e. buried treasure, a new world or invasive plants)
then much of the value of your journey is lost.

A reliable method for charting your way across large bodies of water or a vast wilderness is vital.

Latitude and Longitude

Vertical and horizontal imaginary lines form a grid which allows us to find a single point anywhere on the earth

Based on degrees of a circle, 360° total, with the maximum value of +180° and minimum value of -180°
Longitude lines are called meridians and begin at the Prime Meridian which starts at the Royal Observatory in Greenwich, England.

Longitude lines meet at the poles.

One half of the world is measured in degrees of east longitude up to 180°, and the other half in degrees of west longitude up to 180°.
Datum

Since the earth is not a perfectly shaped ellipsoid GPS uses WGS84 (World Geodetic System 1984) or NAD83 (North American Datum of 1983) which are ground based mapping systems to match coordinates and help ensure accuracy.

Both of these systems use a set of surveyed points as a reference for making maps. Most USGS topographic maps used the survey points from 1927 (NAD27). Those points were re-surveyed and corrected in 1983 (NAD83). NAD83 is the accepted setting for GPS receivers when collecting data in North America. Most GPS units have the ability to choose the coordinate system.

The GPS can give latitude and longitude in different formats. The traditional being the degrees, minutes, seconds. Today decimal degrees is the accepted format and the one used in EDDMapS.
Latitude-Longitude data formats

DD/MM/SS (Degrees, minutes, seconds)

DD/MM.MMM (Degrees, decimal minutes)

DD.DDDDD (Decimal degrees)

Same coordinate system, different ways of expressing it

32º 45’ 12” x -84º 35’ 57” DD/MM/SS

32º 45.2000’ x -84º 95.00’ DD/MM.MMM

32.75333º x -84.59917º DD.DDDDD
Now to GPS

What is GPS?

GPS stands for Global Positioning System. It is a satellite-based navigation and positioning system. It was originally developed for US military applications and, in recent years has been made available for civilian use world-wide. GPS works night and day, 24 hours a day, anywhere in the world.

How does GPS work?

GPS measures the time difference between signals sent from a satellite with a known position to a ground receiver. Four such signals will very accurately determine the position of the receiver. Twenty-four satellites, each circling the earth twice every day (with three more extras) constitute the heart of the system. They are in very stable orbits at about 12,000 miles altitude.

Hand-held receivers search for the signal from each of these satellites and in some cases, the signal from a satellite in geosynchronous orbit at about 23,000 miles altitude. It will read signals from any satellite within direct line of sight above the horizon. Signals from satellites 15 degrees above the horizon or higher will typically yield signals usable for accurate positioning.

GPS Accuracy

Most GPS receivers will generate a reasonably accurate position within a minute or two – often much faster. While GPS “fixes” are quite good, positional inaccuracy is great enough in most cases (averaging about 15 meters) that you will want describe in your site notes which side of the road you’re on (N,S,E,W) if you’re collecting data on a roadside.
Setting Up Your Receiver

You will need to set up your receiver to display geographic coordinates in **decimal degrees**. GPS receiver menus often have this setting in the *Units* tab. On Garmin Etrex receivers decimal degrees appear as the menu choice, `hddd.ddddd`. Other GPS receiver models will feature slightly different set-ups, but all are similar. See Module—Choosing a GPS Receiver for more detailed information on GPS receivers.

GPS receivers generally now have 12 or more channels, which indicates how many satellites it can monitor at one time. On many receivers each satellite is represented by a bar and shows which channel is receiving a signal.
Choosing the point to GPS

You can choose a single point to denote entire infestation. If this is the best choice try to collect that point in the center of the infestation.

When you have one large mostly continuous infestation.

When you have several separate infestations which are relatively close together. Say patches of johnsongrass scattered over an acre.
All values for longitude in the United States will be a **negative** number.

33.75333, -86.59917

So add a (-) before longitude unless you are collecting in China.
Collect coordinate data:

- Write-down the coordinates (record at least 5 decimal places)
- Create a waypoint (so that you can write it down later)

Title the point something that can associate it with:

- By the area “Doug’s farm”
- By the invasive species “Garlic Mustard #1”


EDDMapS Data Collection Form

Observation Date - ______________

Species - ____________________________________________________________

State - ____________ County - ______________

Latitude - ___________________________ Longitude - ___________________________

<table>
<thead>
<tr>
<th>Infested Area - __________</th>
<th>□ Acres □ Hectares □ Sq Feet □ Sq Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Area - ____________</td>
<td>□ Acres □ Hectares □ Sq Feet □ Sq Meters</td>
</tr>
</tbody>
</table>

Canopy Closure – canopy area invasive plant covers

□ Trace (Less than 1%) □ Low (1.0 – 5.0%) □ Moderate (5.1 – 25%) □ High (25.1 – 100%)

Habitat

□ Edge: Upland/wetland □ Forests: Pine □ Wetlands: Marsh
□ Edge: Field/forest □ Forests: Hardwood □ Wetlands: Swamp
□ Edge: Lake edge □ Forests: Mixed □ Wetlands: Bog
□ Edge: Roadside □ Dune □ Stream bank
□ Open Field □ Beach □ Yard/Garden
□ Old Field □ Park □ Ag Field
□ Right-of-way □ Rocky outcrops □ Abandoned lot/old home site
□ Other

Abundance

□ Single Plant □ Scattered Plants
□ Dense Monoculture □ Scattered Dense Patches

Ownership______________________________________________

Location Description/Comments:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Voucher Specimen Made □ Yes □ No
Herbarium holding specimen - ____________________________________________