Standard Operating Procedure 5: Using the Global Positioning System, version 1.0

Overview

This Standard Operating Procedure explains the methods that all observers should follow to learn to use Global Positioning Systems (GPS) with the Garmin GPSMAP 76CSx unit and DNR Garmin software. GPS is used to help navigate to and locate pre-existing sites, and to document the location of new sites. All points reside on the "Aquatic" labled GPS or you may enter new ones if needed. If more help is needed, see the data manager or find further directions in O:\WORKING\AQUATIC\GPS_Incoming\GPS Directions. Required equipment in the field includes the GPS unit, external antenna, site directions, and data cover form. In the office you will need a networked computer.

Using the Garmin Unit in the Field

GPS is used to navigate to the predetermined location of new sites and to aid in the relocation of existing sites. The location of lower and upper tag trees, parking areas, and other significant features are marked and recorded as waypoints. Always be sure to carry at least one full replacement of spare batteries for the GPS receiver (i.e. 2 "AA" batteries). An external antenna is recommended when using the GPS under forest canopy. The external antenna increases the reception of satellite signals and is best mounted to the top of the GPS operator's backpack.

Turning on the unit

Turn the unit on and wait several minutes for it to acquire satellite reception. The GPS is most accurate when it has four satellites and a 3D position. This information is displayed on the GPS information page. The location of satellites in the sky changes from day to day and thus sometimes satellite reception is more difficult to achieve. Forest canopy openings can increase the strength of satellite signals reaching the GPS unit.

Make sure the GPS is set to UTM NAD83. Under the main menu, select 'Setup', then toggle over to 'Units' and set the 'Position Format' to **UTM UPS**, the 'Map Datum' to **NAD83.** Hit the 'Quit' button, toggle over to 'Heading' and set the 'North Reference' to **True**. These settings will be saved on the GPS and should not have to be re-entered each time the unit is turned on.

The current estimated accuracy of the receiver is displayed on the GPS Information Page and Map Page. The accuracy fluctuates as satellite signals are gained and lost. An accuracy of + or – 10 m or less is desirable to precisely document location.

Navigating to a site

After the receiver is turned on and has adequate reception, press the 'FIND' button, highlight 'Waypoints' and press 'Enter'.

Press 'Menu' then 'Find by Name' or 'Find by Nearest' to find the appropriate waypoint name and press 'Enter'.

1. On the ‘Waypoint’ screen select ‘Go to’. Type in the name of the desired point, or press ‘Page’ to scroll through all the options.

2. The Map Page or Compass Page can be used to navigate to the waypoint. The distance and bearing to the waypoint will be displayed at the top of the page. (If not, change the settings so that distance and bearing are displayed.) As the distance to the waypoint decreases, the bearing and distance numbers will begin to fluctuate as the accuracy varies. Using a hand compass in conjunction with the bearing from the GPS unit is often the easiest way to navigate, and the task can be shared by two people. An alternative to this is to have direction of travel displayed on the screen instead of “north” and track your location to the tag tree area.

Marking a Waypoint

1. The locations of the lower and upper tag trees, parking, and at times travel routes may need to be recorded with GPS waypoints. This is accomplished by holding the receiver at the edge of the stream closest to the tag tree, at the vehicle or at designated intervals on a route and holding the Enter button until the ‘Mark Waypoint’ Screen appears. Note: If the Enter button or toggle button are held down too long, a MOB (man overboard) point will be collected. If this happens, just ignore it and start again.

2. The GPS automatically assigns the waypoint a number. Toggle over to the name field and once it is highlighted, press enter to change the waypoint name. Toggle up and down through the numbers and letters and left and right between characters. For the lower tag tree add an “A” to the site number. For the upper tag tree, add a “B” to the site number. Once the last letter or digit has been selected, press enter to save the name and highlight the whole name field.

3. The most accurate way to document a location is to collect a waypoint position that averages at least 100 points. To do this select ‘Menu’ and then choose ‘Average Location’. The ‘Average Location’ screen appears and measurement counts automatically begin. After the ‘Measurement Count’ reaches 100, press enter to save. Press ‘OK’ on the Mark Waypoint screen to return to the Map Page.

3.6 Downloading Waypoints into ArcMap GIS

Waypoints for newly established sites as well as updated waypoints for sites with inaccurate GPS locations need to be downloaded onto the office computer upon return from the field. If there is only time for a quick download to secure data off the GPS unit, don’t open ArcMap. Simply download the text file as directed below. Shapefiles can be downloaded at a later time by reloading the text file into the DNR-Garmin program.

1. Turn on the computer, open an ArcMap project and load the most current fisheries monitoring sites shapefile from O:\WORKING\ AQUATIC\gis\data\<year>.

2. Turn on the GPS unit and insert the computer plug into the external data port located on the back of the GPS receiver.

3. Open DNR-Garmin software on the desktop (if only downloading the text file) or within an ArcMap document (if downloading text files and shapefiles).

4. At the top of the DNR-Garmin window, select 'Waypoint' then 'Download'. The saved waypoints from the Garmin will now appear in the table.

5. These waypoints need to be saved twice, once as a text file and once to an existing shape file.

6. To save as a text file, under File select 'Save To' then select 'File…' The files are saved at O:WORKING/AQUATIC/GPS_incoming. The file names created are based on the letter of the GPS used and the date of download, GPSx_year-month-day_wp. Thus, a file downloaded on 06/24/2005 from GPS unit O would be named GPSO_2005-06-24_wp. Make sure the file is save as a text file, .txt.

7. To save the data in a shape file, select 'File', Save To', 'ArcMap', 'Shapefile Layer'.

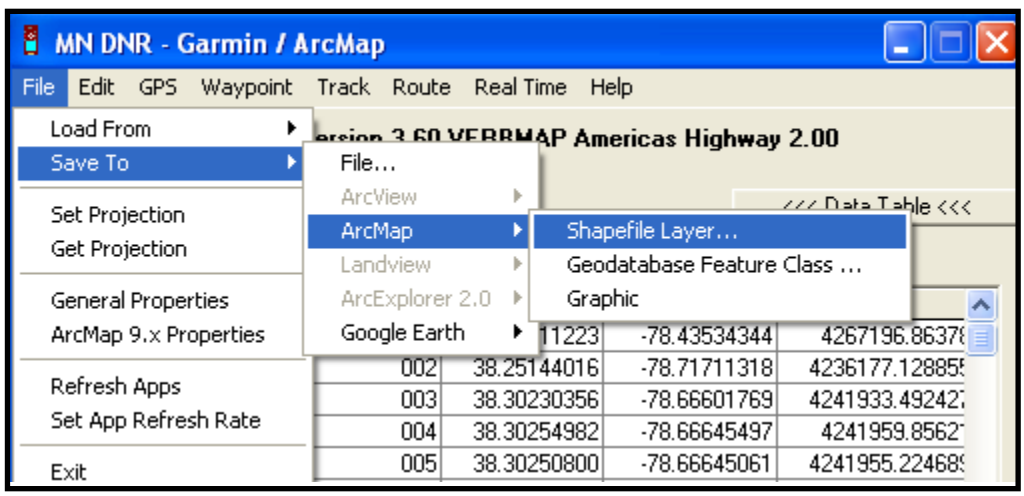

Figure 1. MN DNR – Garmin with ArcView window showing how to save data as a Shapefile.

8. To append to an existing shapefile, browse to the shapefile and select 'OK'. Say 'Yes' to append to the shapefile (Caution: 'No' will overwrite the existing shapefile!) To save to a new shapefile, browse to the location to be saved, name the file and select 'OK'.

9. The data should now be saved. Load the data into ArcMap and check the attributes table to ensure that your data were properly transferred. Points should not be deleted from the GPS unit the next day to allow time for daily server backups.

3.7 Deleting Waypoints from the GPS Unit

The GPS receiver can hold up to 500 waypoints, but it is advisable to delete the downloaded waypoints from the GPS periodically to keep it from becoming full while in the field.

1. With the GPS turned on, press Menu twice to pull up the 'Main Menu' screen. Press the 'Find' button. Select 'Waypoints' then press the 'Page' button to open the table of all current, saved waypoints.

2. Waypoints can either be deleted individually or the entire table can be deleted at once.

3. To delete a single waypoint, toggle to the point, highlight the name and then press 'Enter'. Select 'Delete' and then 'Yes' to delete the waypoint.

4. **Be sure that all of the waypoints have been downloaded and backed up before doing this!** To delete the entire table, Press the 'Find' button. Select 'Waypoints' then press the 'Menu' button. Select 'Delete All' to clear all of the saved waypoints from the GPS Unit.

Suggested Reading

For more information, reference the Garmin GPSMAP 76CSx Owner's Manual and Quick Reference Guide.

References

Garmin GPSMAP 276CSx Owner's Manual and Quick Reference Guide (http://support.garmin.com/support/manuals/).

SOP Revision History

All protocols, regardless of how sound they are originally, require modification as new and different information becomes available. SOP version numbers increase incrementally by tenths (e.g. version 1.1, version 1.2…etc.) for minor changes. Major revisions should be designated with the next whole number (e.g., version 2.0, 3.0, 4.0 …). Small changes or additions to existing methods will be reviewed in-house by Shenandoah or Mid-Atlantic Network staff. However, if a complete change in methods is sought, an outside review is required.

Revision History Log:

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #