

Chapter 9: Introduction to GPS

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What is GPS?

The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all.

The GPS is made up of three parts: satellites orbiting the Earth; control and monitoring stations on Earth; and the GPS receivers owned by users. GPS satellites broadcast signals from space that are picked up and identified by GPS receivers. Each GPS receiver then provides three-dimensional location (latitude, longitude, and altitude) plus the time.

Using the Garmin 60 GPS Receiver

1. Review the Garmin GPS 60 manual
2. Turn the GPS on – it will try to acquire satellites. Push the **menu** button and “use with GPS off “ will be highlighted, push the **enter** button.
3. There are 5 main pages, move among them using **page** key. When on any particular page, pushing the **menu** button will display a relevant set of options and settings for that page. Pushing the **quit** button allows you to back up a step at any time.
 - a. **Satellite Page** - shows locations of satellites above you, signal strength, and whether receiver is "locked on" (if so, satellite icon and bar will be solid black). Once receiver is locked on to 3 satellites, your location will be indicated at the top of this page.
 - b. **Trip Computer** - various bits of information relevant to most recent use of unit (you can change what information is displayed here).

- c. **Map** - if your receiver does not have any data saved on it this will be pretty blank. Eventually you will see your waypoints and tracks depicted here, use the **in** and **out** buttons to zoom in and out.
- d. **Compass** - this is somewhat misleading since these units do not actually have built-in compasses. **They can only indicate direction when you are moving!** This page will point up or towards (depending on your settings) a point you are navigating toward once you are navigating.
- e. **Main Menu** - lots of options here. Let's set our units to decimal degrees so we are all speaking the same language.
 - i. **Page** to the "main menu"
 - ii. Highlight "setup" and press **enter**
 - iii. Highlight "units" and press **enter**
 - iv. Highlight "position format" and press **enter**
 - v. Choose "position format" hddd.ddddd (decimal degrees) and press **enter**
 - vi. Highlight map datum and press **enter**
 - vii. Choose NAD 83 and press **enter**
 - viii. Press the **quit** button

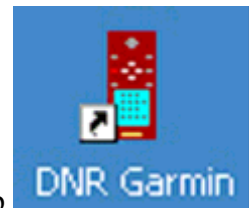
Collecting Waypoints

1. Page to the Satellites page - push the **menu** button and choose "use with satellites on" by pushing the **enter** button.
2. Wait while the receiver locks on to at least 4 satellites and notice the locations of the satellites as well as the signal strength.
3. Once the receiver has locked on to 4 satellites you can collect a point by simply pushing the **mark** button (you can be on any page when you do this).
4. Once you have pushed the mark button you will see the attribute data that has been created for that point, as well as the coordinate location. You can edit this information by highlighting information, pushing **enter**, and then editing (it is tedious). Change the name of the point you collected to reflect your initials followed by 1. Highlight "OK" and press **enter** to save the point.
5. Collect several more points and changed the name of each point to reflect your initials followed by sequential numbers (e.g. llp1, llp2, llp3, etc.). ***Place the object given to you at one of your waypoints and give it a different name so that you know which point represents that location.***
6. Now let's make sure our "Tracks" option is turned on and cleared out.
 - a. Highlight "Tracks" and press **enter**.
 - b. highlight "on" and press **enter**.
 - c. If the % is not zero highlight "clear" and press **enter**.
 - d. If there are any named tracks highlight them, press **enter** and choose delete.

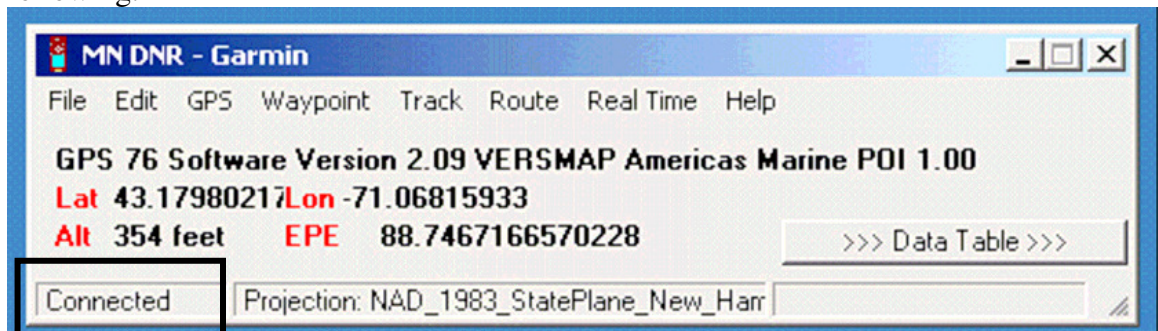
- e. Highlight and choose "settings" to set the method of collecting your track, then push the enter and quit buttons a few times to get back out to the main pages.
7. Walk around a bit to make a track
8. Then go back into the Tracks menu to shut off the track collection and save and name the track you have created.

Downloading and Projecting GPS Data

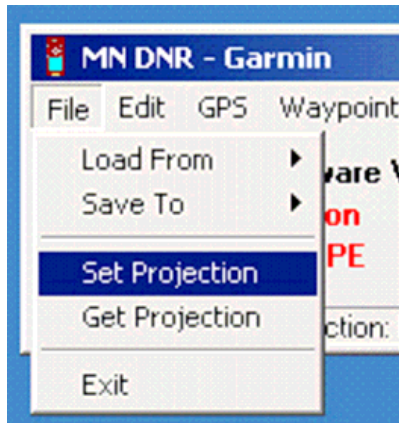
1. Page to the Satellites page - push the **menu** button and choose "use with satellites off" once again.
2. Connect the GPS receiver to your computer using the cable provided.



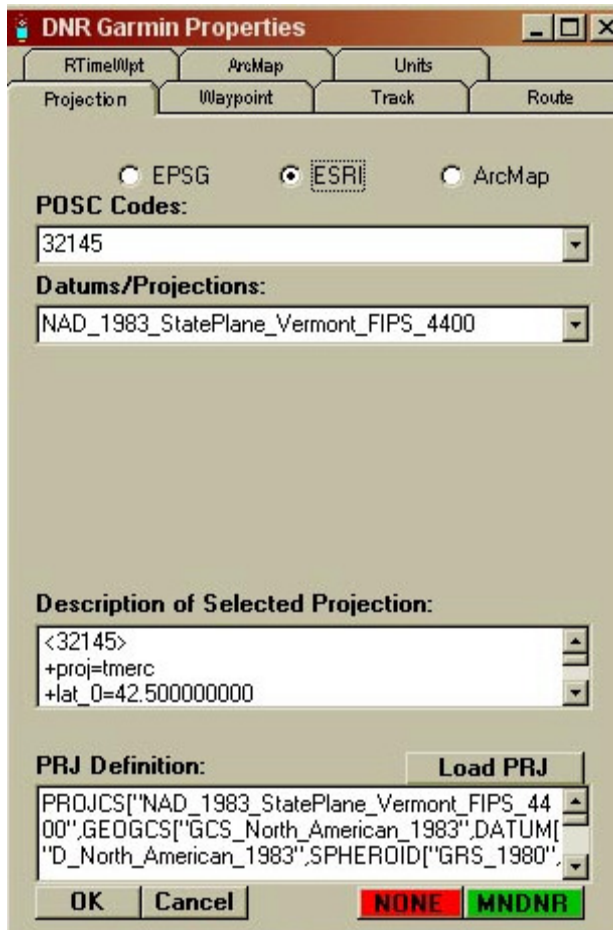
3. Open DNR Garmin by clicking the icon on your desktop
4. If DNR Garmin is able to find your GPS receiver you will see something like the following:



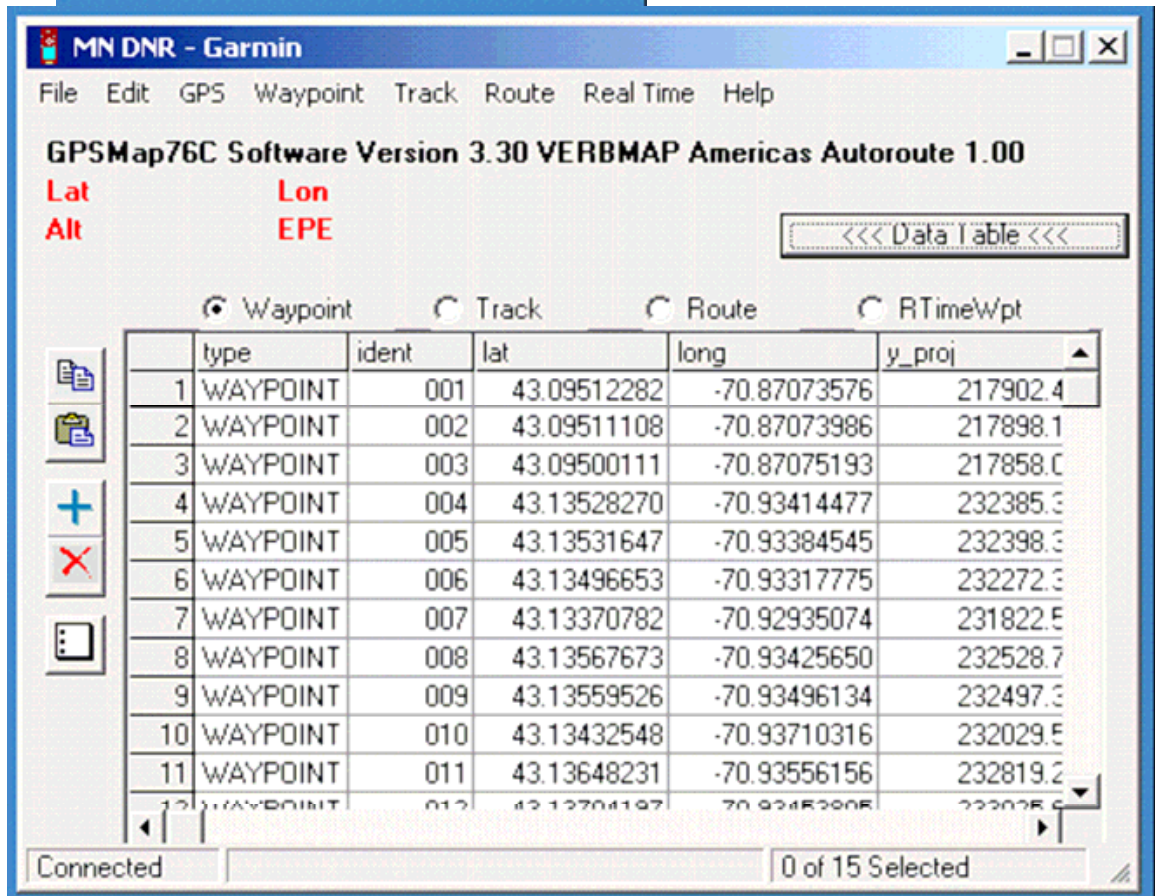
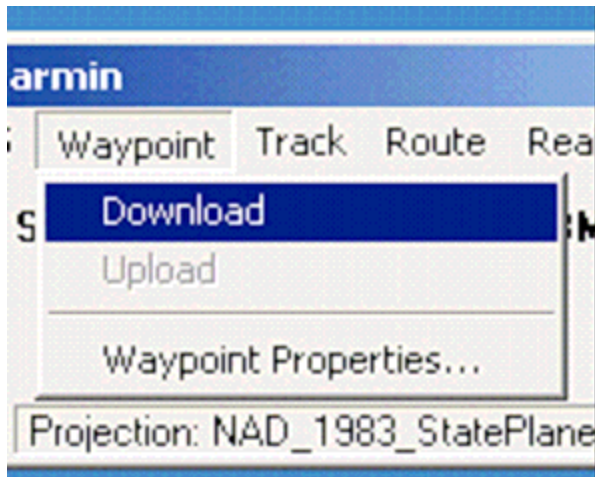
5. If it cannot connect, you may need to click on "GPS" and then choose "USB" as the port.
6. Once DNR Garmin has recognized your receiver, you will set the coordinate system so that it can calculate the appropriate coordinates when it reads the data. Since all GIS data used in VT is in the VT State Plane, NAD 83, Meters coordinate system, that is what we will set DNR Garmin to.
7. Click on the File menu and choose "Set Projection"



8. In the section for POSC Codes, click on the radio button for **ESRI**, In the section for **DATUMS/ PROJECTIONS**, select the following:
 NAD_1983_StatePlane_Vermont_FIPS_4400 then Click on the **OK** button on lower left.
 NOTE: The POSC Code at the top of the page should read "32145" when you have chosen the correct Datum/Projection. To skip the step of scrolling down the list, click on the box under **POSC Codes**, type "32145", then push **Enter** on your keyboard.



9. From the WAYPOINT menu, select DOWNLOAD When the download is complete, you will see a box confirming the number of waypoints which you have successfully downloaded.
10. Click on the OK BUTTON.
11. You will have a list of the points you have downloaded, including a unique number for each point, latitude and longitude, x- and y-coordinates for the chosen projection, a comment field in which you will find the date and time the point was collected, as well as other information.



12. You can now output the data in a variety of different formats: Shapefile, KML (for use in Google Earth and Google Maps) being two of the most useful.
13. Go to the **FILE menu**, select **SAVE TO**, and select **FILE....**
14. Click on the **SAVE AS TYPE:** dialogue to select **ARCVIEW SHAPEFILE (PROJECTED)(*.SHP)**.
15. Navigate to the **Your Directory** then into the **GPSDATA** directory.
16. Name the file and Click on the **SAVE BUTTON**.
17. Click on the **OK BUTTON** when the dialogue appears that informs you the file was successfully written.
18. In order to save the file in KML format go through the same steps but choose KML rather than Shapefile.

Using GPS Data With Online Applications and GIS

1. You can now use your Shapefile data by adding it to any new or existing project that is in the VT State Plan Coordinate system.
2. You can also add it to the VT Interactive Viewer. Refer to Section 6 of Chapter 2 for directions.
3. You can double click on your KML data to open Google Earth
4. You can also import that KML data into a Google Maps "My Places" map.

Navigating to a Location

1. Exchange the coordinates of the object you hid with someone else in the class.
2. Once you are outside, turn the satellites back on.
3. Push the find button, "waypoints" will be highlighted, push the **enter** button to choose waypoints.
4. Highlight one of the waypoints listed and push the **enter** button.
5. Highlight the location, press **enter**.
6. Edit the coordinates to reflect those given to you by your classmate.

7. Highlight "OK" and press **enter**.
8. Highlight "GOTO" and press **enter**.
9. You can use the compass page or the map page to direct you towards the location. When you are very close your GPS will beep. Look around!

Online Resources

<http://www.gps.gov/>

UNH Cooperative Extension Training and Manuals:

<http://extension.unh.edu/gisgps/GISGPS.htm>

GIS/GPS for Educators

<http://www.gis2gps.com/>

This site was developed by educators for educators and students. It provides a site where educators can find useful links, lesson plans and find classroom resources and ideas they can use with their projects.