

United States Department of Agriculture



Using the Garmin GPSMap 76 for Field Data Collection

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Introduction

The intent of this document is to provide instructions for utilizing a Garmin GPSmap 76 for field data collection. The instructions include:

- An overview of the Garmin GPSmap 76.
- Setting up the Garmin so that data collected in the field matches current NRCS GIS layers.
- Setting up the Garmin for use with the differential GPS (DGPS) Beacon Receiver.
- Loading background maps into the Garmin.
- Collecting data with the Garmin.
- Required accuracy levels.
- Using the MN DNR Garmin software to download data from the Garmin into ArcView and to upload ArcView data into the Garmin for use in the field.
- Navigating with the Garmin GPSmap 76.

Required Software

In order to use the procedures contained in this document, the following software is needed:

- MapSource
- ArcView 3.2a or 3.3
- MN DNR Garmin GPS interface software.

NOTE: The mention and/or use of any software contained in this document should not in any way be considered as an endorsement by USDA-NRCS.

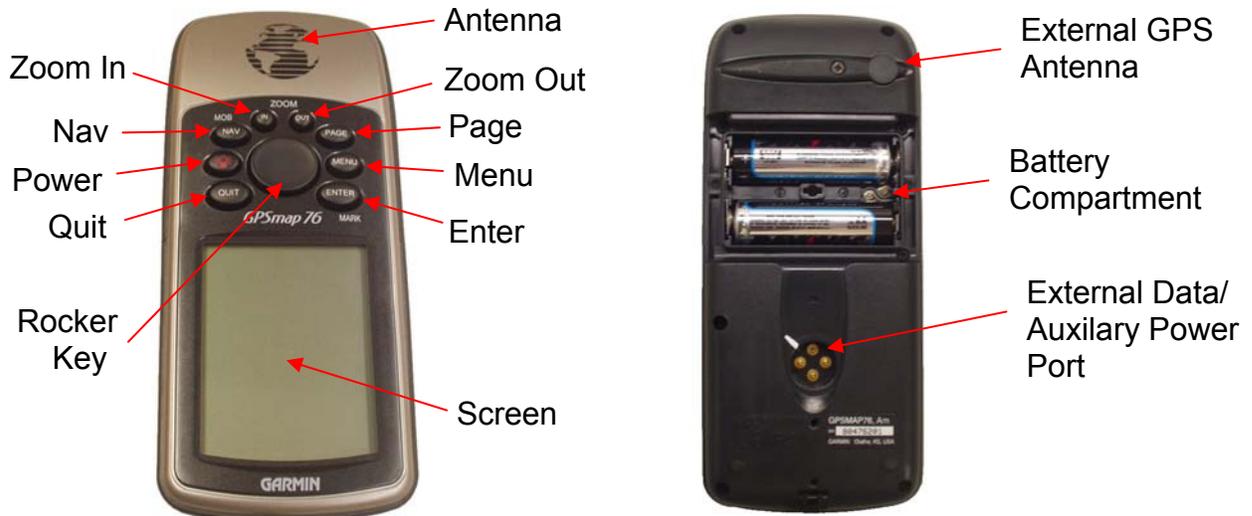
Equipment

This document assumes the equipment being used is that found in the USDA Configuration I GPS system. This includes a Garmin GPSmap 76 receiver, a radio beacon receiver, a dual GPS/beacon antenna, a rechargeable external battery, backpack, and all the necessary cables. This equipment provides real-time differential GPS capability. This simply means that a correction from an external source at a known location (e.g., US Coast Guard radio beacon site) can be received and applied to the satellite information your GPS unit is receiving to obtain a more accurate location.

Overview of the Garmin GPSmap 76

This section gives a brief overview of the unit and how to use the basic features. For more details, users should read the **Garmin GPSmap 76 Owner's Manual and Reference Guide**.

Layout of the Garmin GPSmap 76



Button descriptions

Power Key: The **POWER** key is used to turn the unit on and off. Press and hold the Power key to turn on or off the GPS

Rocker Key: The **ROCKER** key is used to control the movement of the cursor on menus and map displays.

Page Key: The **PAGE** key is used to navigate forward through the 5 main display pages. The Page key will also end an operation in progress and return to one of the main pages.

Quit Key: The **QUIT** key is used to navigate backward through the 5 main display pages. The Quit key will also end an operation in progress and return to one of the main pages.

Menu Key: The **MENU** key will display the page options menu for the current page. Pressing the Menu key twice will display the main options menu.

Enter Key: The **ENTER** key is used to activate a data field or make a menu selection. Pressing and holding the Enter key will allow the user to capture the current position as a waypoint.

Nav Key: The **NAV** key is used to start or end navigation functions. Holding down the **NAV** key will store the current position and gives you the opportunity to begin navigating back to that marked point.

Zoom In and Zoom Out Keys: These keys allow you to view a smaller area of the displayed map in greater detail (**ZOOM IN**) or a larger area in less detail (**ZOOM OUT**).

Tips on using Garmin keypad

The following tips should be helpful in selecting and entering items on the screens using the keys on the Garmin keypad.

Use the **ROCKER** key to highlight (i.e., move to) the desired field by pressing on the side of the key in the direction you wish to move.

For a list field (e.g., Symbol field on the “Mark Waypoint” screen),

- a) Press **ENTER** to change to selection mode.
- b) Use **ROCKER** key to highlight the desired item from the list.
- c) Press **ENTER** to select item.

For a data entry field (e.g., Waypoint number field on the “Mark Waypoint” screen),

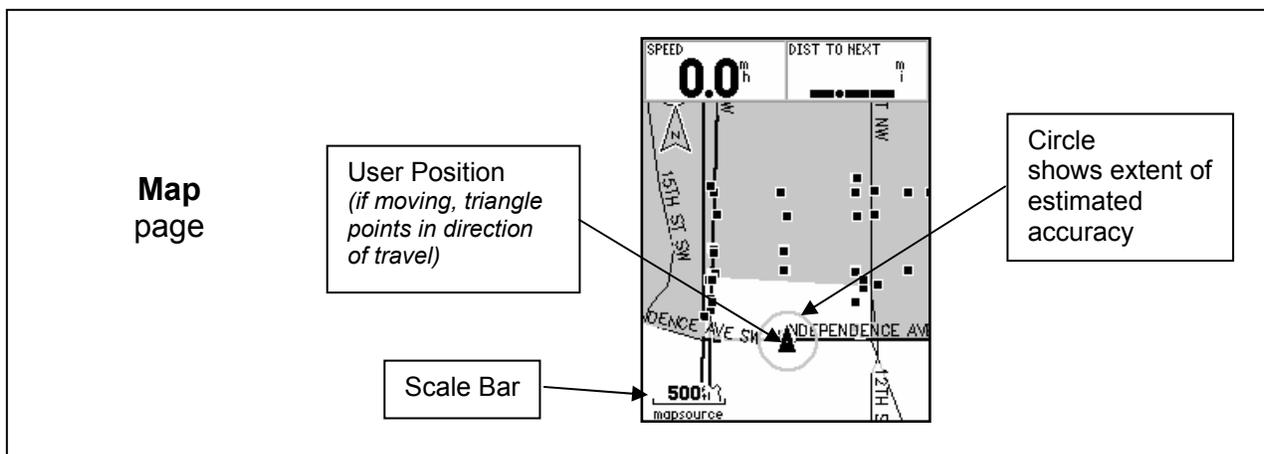
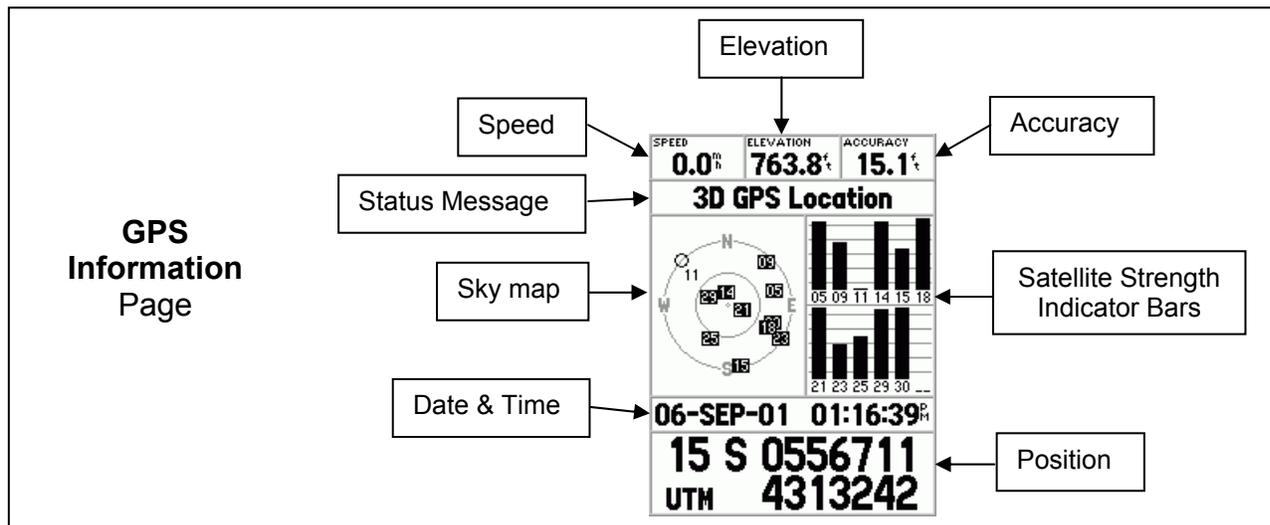
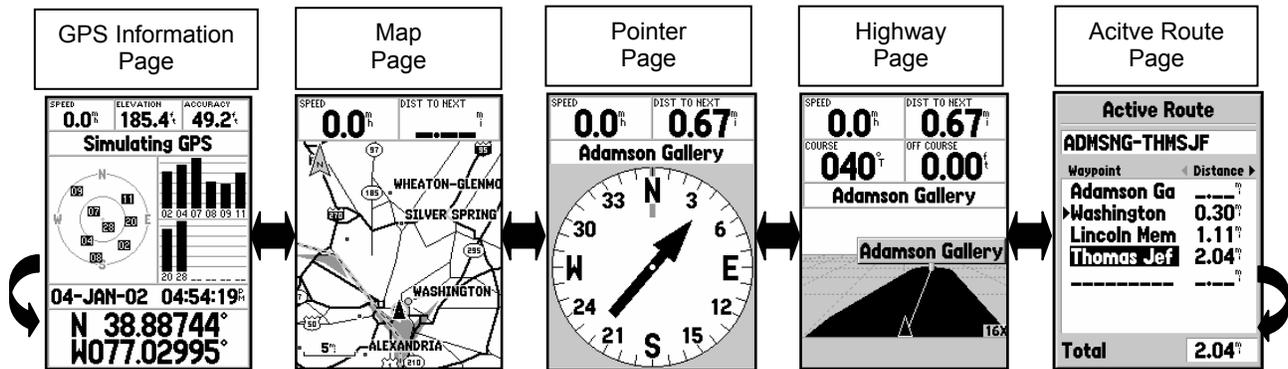
- a) Press **ENTER** to change to edit mode. The first character will be highlighted.
- b) Use top/bottom of **ROCKER** key to scroll up/down through available numbers and/or letters.
- c) Use right side of **ROCKER** key to move to next character.
- d) Repeat steps b and c as needed.
- e) Press **ENTER** to accept changes or **QUIT** to cancel changes.

For a search list field (e.g., Waypoint name field on the “Waypoint by Names” screen),

- a) Use top/bottom of **ROCKER** key to scroll up/down through available numbers and/or letters in highlighted character position.
- b) Use right side of **ROCKER** key to move to next character.
- c) Repeat steps a and b as needed.
- d) Press **ENTER** to drop into list.
- e) Use top/bottom of **ROCKER** key to scroll up/down through list.
- f) Press **ENTER** to select the highlighted item.

Screens

There are 5 main screens or pages on the Map76 as shown below. Use the Page and Quit keys to switch between these pages.



Screens (cont.)

Pointer Page

Vertical line shows direction of travel

Pointer direction to point to which you are navigating

Compass Ring (not a true compass, must be moving to get a true reading)

Highway Page

(This page is best used for straight line navigation)

Position icon – black arrowhead (keep this on the white line of the road)

Numbers to aid in navigation

Active Route Page

Waypoint	Distance
Adamson Ga	0.30 ^m
Washington	1.11 ^m
Lincoln Mem	2.04 ^m
Thomas Jef	2.04 ^m
Total	2.04^m

Route name

Distances for each leg of the route

Total distance

Garmin GPSmap 76 Setup

The following procedure should be used to set up a Garmin GPSmap 76 receiver to insure that data collected in the field is consistent with GIS data and imagery currently available to USDA Service Centers.

1. To use the GPS unit with the backpack, do the following:

- a. Connect the thin gray antenna cable from the “GPS Out” port on the beacon receiver to the external antenna port on the top of the Garmin. This improves satellite reception over using the internal antenna of the Garmin unit.
- b. Connect the gray cable with the 4-pin Garmin connector from the “quadcomm” cable to the data/power port on the back of the Garmin. This powers the unit as well as relays the DGPS signal.
- c. Connect the red cable with the male cigarette lighter adapter end from the “quadcomm” cable to the female cigarette lighter adapter end of the battery. This will power up the beacon receiver as well as provide power to the GPS unit.

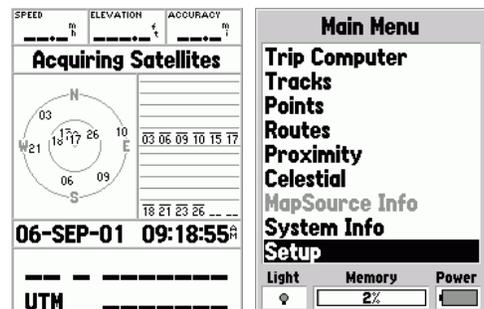


2. Turn on GPS unit by holding down **POWER** key until unit comes on.

3. Press the **ENTER** key until the GPS Information screen appears.

4. Press the **MENU** key twice to bring up the Main Menu.

5. Highlight “Setup” using the **ROCKER** key. Press the **ENTER** key to select.



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6. The Setup page has a number of tabs

(*General, Time, Units, Location, Alarms, and Interface*)

Use the following procedure to change the setup values to those specified below for each tab.

- a. Use **ROCKER** key to move left or right to the desired tab.
- b. Use **ROCKER** key to move to desired field. Press **ENTER**.
- c. Use **ROCKER** key to select the correct setting. Press **ENTER**.

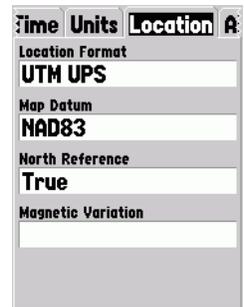
7. *General* tab.

- a. WAAS should be "**Enabled**" as shown at right. This will allow for greater accuracy if used without the DGPS beacon receiver. WAAS is used only when the interface is set to "Garmin" (i.e., not when it is set to "RCTM In/NMEA Out").



8. *Location* tab.

- a. Set *Location Format* to "**UTM UPS**".
Note: "Location format" simply determines the coordinate display on this unit. Data is still downloaded as latitude/longitude values into the MN DNR Garmin software.
- b. Set *Map Datum* to "**NAD83**".
- c. Set *North Reference* to "**True**".



9. *Interface* tab.

NOTE: The preferred method of collecting data with the Garmin is to use it with the DGPS Beacon Receiver in the backpack.

a. Use Without the DGPS Beacon Receiver

The Garmin GPSmap 76 can be used without attaching the GPS to the DGPS beacon receiver in instances where maximum accuracy is not a requirement. Such instances might include conducting resource inventories, conservation planning, navigation, etc.

To operate without the beacon receiver, set

Serial Data Format to **GARMIN**

Note: This setting is also used when downloading data to a computer.

b. Use With the DGPS Beacon Receiver

The Garmin GPSmap 76 must be used with the DGPS beacon receiver in instances where maximum accuracy is required. Such instances include certifying conservation practices for payment, precise layout of conservation practices in the field, precise navigation, etc.

When using the beacon receiver, set

Serial Data Format to **RTCM In/NMEA Out**

Baud to **4800**

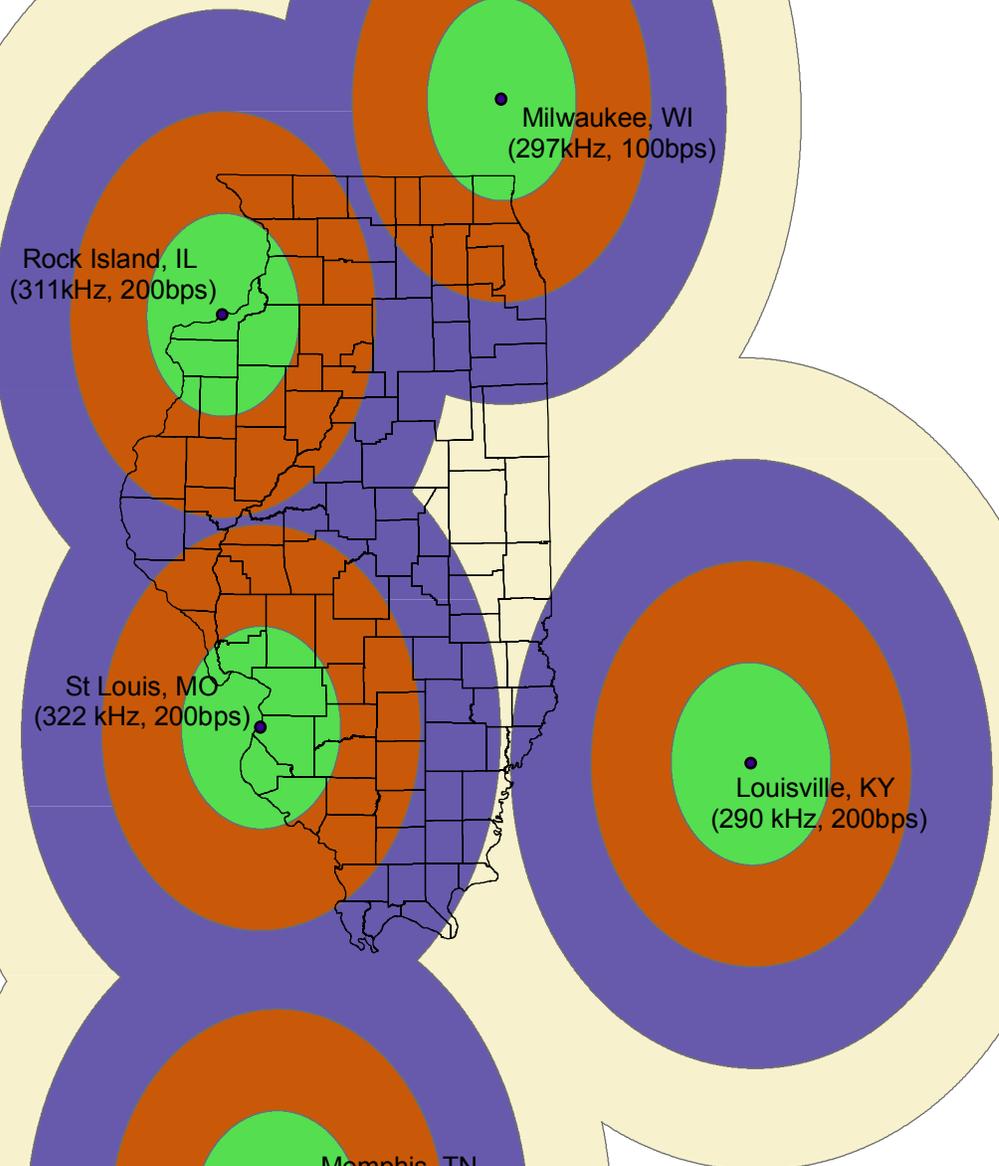
Beacon to **User** and then enter a known frequency and bit rate from the table below for one of the beacons available in Missouri:

Location	Freq.	Bit Rate
St. Louis, MO	322.0	200
Memphis, TN	310.0	200
Rock Island, IL	311.0	200
Louisville, KY	290.0	200
Milwaukee, WI	297.0	100

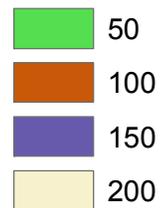
Refer to the map on the next page to find the DGPS Beacon closest to your location. When a beacon signal is detected, *Status* should indicate *Receiving* and a value for *SNR* (signal to noise ratio) should appear. A *Distance* value may or may not appear. The GPS Info screen should indicate *3D Differential Location* in the status line. Also a *D* in or above a satellite strength indicator bar will indicate that differential corrections are being applied to that satellite.

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DGPS Beacons for Illinois



Distance in miles

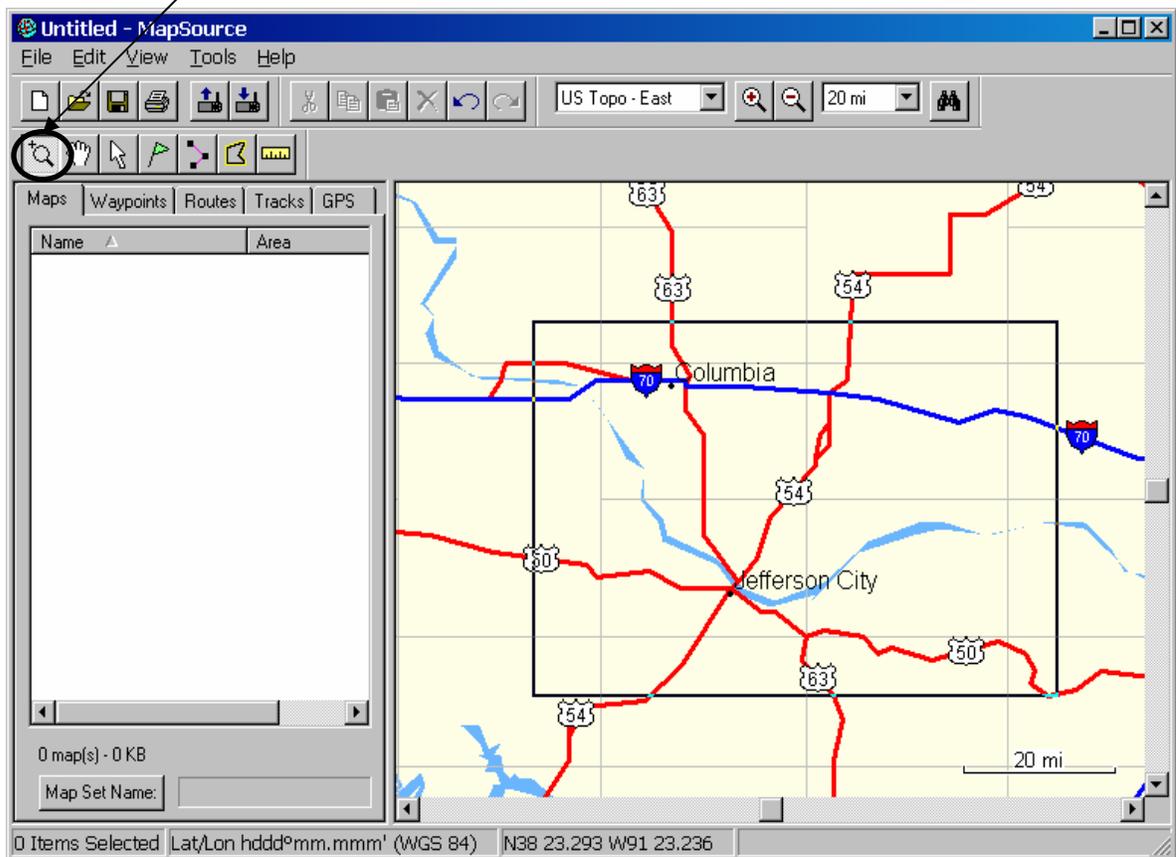


Loading Background Maps into Garmin

The Garmin MapSource TOPO software was included in the Configuration I GPS system. This software provides the capability to load maps into the Garmin receiver that contain contour lines as well as more detailed roads than the receiver's built-in maps. This would be very similar to adding a topo map (i.e., DRG) to a view in an ArcView project. MapSource divides a map into blocks or regions. These blocks do not correspond to the USGS quad map boundaries. In fact, a block might cover an area equivalent to that of 8-16 quad maps.

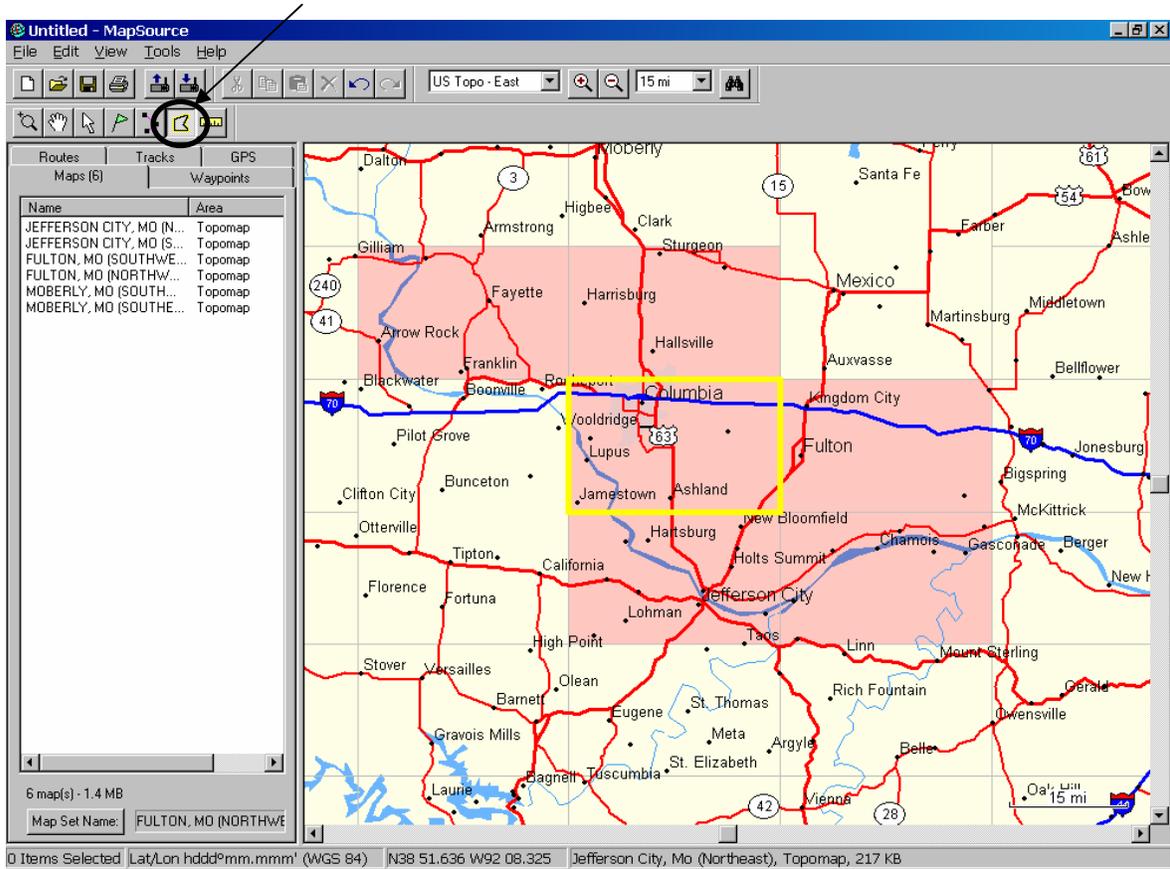
This procedure assumes that the MapSource TOPO software is installed on your computer. If not, you will need to install it before proceeding. These instructions guide you through loading background maps into the Garmin.

1. **Insert the Eastern US CD** (Disk 2 of 3) of MapSource TOPO into the computer.
2. **Start MapSource** program .
3. Use the **Zoom Tool** to draw a box around the area that you want to load the detailed maps from.



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- Use the **Map Tool** to click on sections of the map to load into the GPSmap 76. When you click on a “block” of maps the area is outlined in yellow and the area that will be loaded becomes shaded. The names of selected blocks are listed under the Maps tab. To remove a block, simply click on it again.

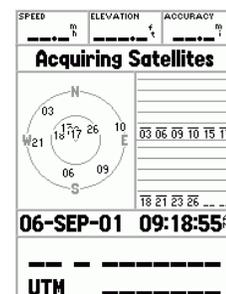


The GPSmap 76 can hold 8mb of map data, which is approximately 30-35 map blocks.

- Connect the GPSmap 76 to the computer.



- Turn on the GPSmap 76 (hold down red **POWER** key).
- Press the **ENTER** key (2 to 3 times) until you see the GPS Information Page.

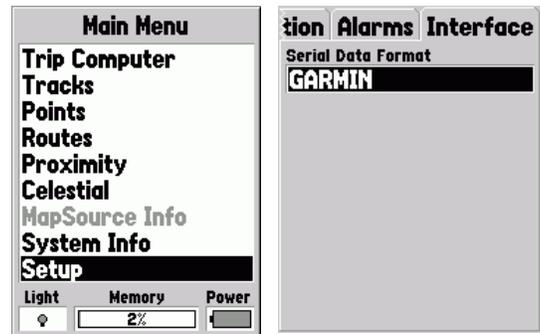


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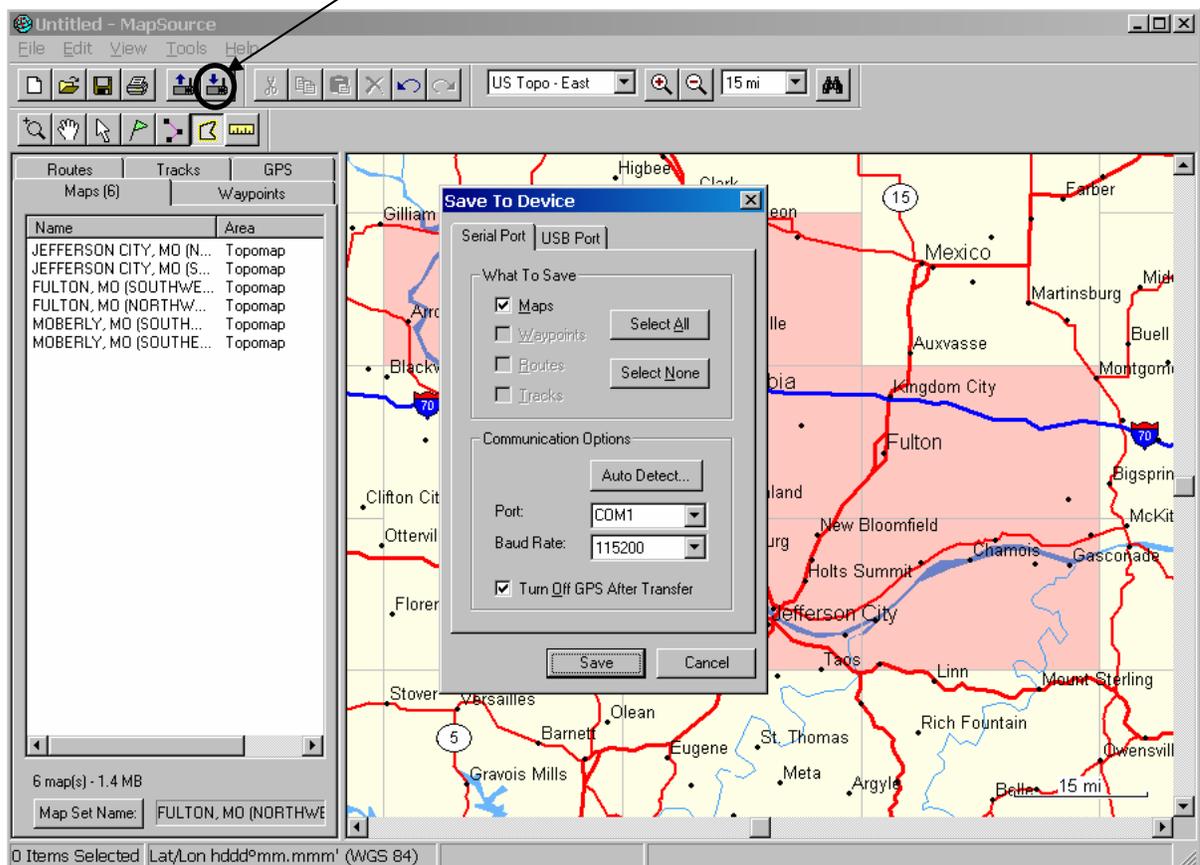
8. Press the **MENU** key. Select “Start Simulator”. Press the **ENTER** key.

9. Verify the “GARMIN” interface is selected:

- Press the **MENU** key two times.
- Use **ROCKER** key to select “Setup”; then press the **ENTER** key.
- Use **ROCKER** key to move left or right to select the *Interface* tab. Verify **Serial Data Format** is set to “**GARMIN**”. If not, toggle down and change the setting.



10. In MapSource, click the **Save to GPS** button.



- A pop-up window will appear with *Maps* checked. If you know which serial port you connected to the Garmin, set the port accordingly. If not known, click [Auto Detect..] and it should find the correct port. Baud rate can be set to 115200. If you encounter communication problems, you might try lowering the baud rate. Click the [**Save**] button.

11. After transfer is complete, exit MapSource.

Collecting GPS Data in the Field

Waypoints vs. Tracks

Once set-up, the Garmin GPS offers two distinct methods of data collection – waypoints and tracks. Waypoints are individual locations stored in the GPS buffer. Each point must be consciously marked and stored by the user. The points are independent until the user, with ArcView or similar tool, relates them as nodes along a line or polygon, for example, based on their sequence. Tracks, on the other hand, are a continuous series of points collected automatically at a regular time or distance interval. The only user intervention is to start and finish a track log. Track points are treated by the GPS as points along a line or polygon boundary. Therefore, the GPS can estimate area bounded by tracks without downloading the points to GIS software (see page 18 for precautions about track area calculations).

The pros and cons of waypoints versus tracks are often debated. Features which consist of well-defined points (i.e. field boundaries, fences, pipelines, etc) can, in most cases, be captured more efficiently and accurately as individual waypoints. Points that are not well defined or that are non-linear (curved) (i.e. treatment areas, wetland boundaries, etc) are generally more accurately and efficiently captured using the track function. However, tracks with short collection intervals can quickly exceed the GPS storage buffer. Also, tracks collect data for wherever the GPS travels (including, e.g., diversions around wet areas) unless the user is careful to pause the track data collection when off-course. Finally, if using a vehicle to collect tracks, it is possible to traverse a critical bend in a boundary between capture of points and misrepresent the shape.

The user must ultimately choose a method best for each unique circumstance. Using the MN DNR Garmin ArcView extension, waypoints and tracks can be edited and processed into point, line or polygon themes for similar results.

Required Accuracy Levels

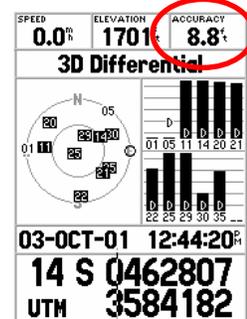
When collecting data with GPS in the field, certain accuracy levels need to be maintained in order to collect data as precisely as possible. This level of accuracy will depend on the type of data being collected:

Using GPS to Certify Conservation Practices

When collecting data with GPS for use in certifying conservation practices, every attempt should be made to maximize accuracy. In order to make this possible, it is **required** that the Garmin GPSmap 76 be connected to the DGPS Beacon Receiver where beacon coverage is available. Data collected using DGPS is inherently more accurate and consistent than data collected with autonomous GPS.

The user should only collect data when the following parameters have been met in the field:

The Accuracy which is found on the GPS Information Page should always be **less than or equal to 10 ft.**



Using GPS for Conservation Planning

In instances where absolute accuracy is not a requirement (i.e. Basic Conservation Planning, Resource Inventories, Navigation, etc.) the Garmin GPSmap 76 can be used without being connected to the DGPS Beacon Receiver. However, the following accuracy levels should be maintained for best results:

The Accuracy which is found on the GPS Information Page should always be **less than or equal to 20 ft.**

Collecting GPS Data as Waypoints

Points that are well defined (i.e. wells, pipelines, fences, field boundaries, etc) can, in most cases, be more accurately and easily obtained by collecting GPS data as waypoints. Use the following procedure to collect waypoint data:

1. Make sure GPS unit is setup correctly (see **Garmin GPSmap 76 Setup** section on page 6).
2. Place the GPS antenna (either the external antenna mounted on the backpack pole or the internal antenna of the Garmin receiver) directly over the point desired.
3. Wait until accuracy is below required value (see **Required Accuracy Levels** on page 14).
4. Press and hold down the **ENTER** key until the *Mark Waypoint* screen appears with the coordinates of your current location displayed. A default 3 digit number for the new waypoint will display. The user can either change this number or accept the default. If averaging is desired do the following, otherwise skip to step 5 below.



Mark Waypoint	
054	
Location	
15 S 0556701	
UTM 4313304	
Elevation	Depth
758'	-----'
<input checked="" type="checkbox"/> Show Name on Maps	
Delete	Map
Goto	OK

Averaging

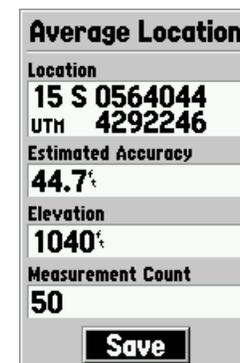
To improve the accuracy of a point, averaging can be used.

- a) Press the **MENU** key.
- b) Select "Average Location" and press the **ENTER** key.
- c) The *Average Location* screen should then appear.
NOTE: Do not move GPS antenna while in this mode.



Average Location
Project Location
Append To Route
(MENU) for Main Menu

The *Measurement Count* field should start counting number of measurements used in the average. The *Estimated Accuracy* value should start decreasing. When you feel that enough measurements have been recorded to get a good average of your position, press the **ENTER** key to save the average.



Average Location	
Location	
15 S 0564044	
UTM 4292246	
Estimated Accuracy	
44.7'	
Elevation	
1040'	
Measurement Count	
50	
Save	

5. While on the *Mark Waypoint* screen, highlight [OK] and press the **ENTER** key to store the point

Important note: Keep good notes in the field! Keeping notes of which waypoints go where will make data handling much easier when you get back to the office.

Deleting Points

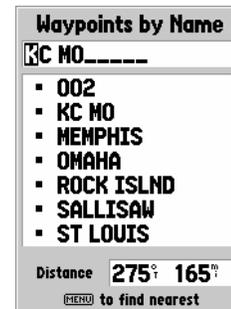
1. Press the **MENU** key twice.
2. Select "Points". Press the **ENTER** key.
3. Select "Waypoints". Press the **ENTER** key.



4. If you want to delete a single waypoint,
 - a. Highlight the desired point in lower window (you might want to refer to the tips on using the keypad earlier in this document).
 - b. Press the **MENU** key.
 - c. Select "Delete Waypoint".
 - d. Highlight [Yes] and press the **ENTER** key to confirm the deletion.



5. If you want to delete all of the waypoints,
 - a. Press the **MENU** key.
 - b. Select "Delete All".
 - c. Highlight [Yes] and press the **ENTER** key to confirm the deletion.



Collecting GPS Data as Tracks

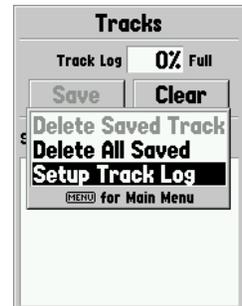
The “Track” feature can be used to more easily collect data for boundaries, treatment areas, etc. that might be difficult to define by manually marking waypoints (e.g., not well defined and non-linear or curved). It is also useful if you would like to determine an acreage estimate for an area while in the field. Before using tracks, however, the user should be fully aware of the issues related to using this feature in the Garmin (see the discussion under **Waypoints vs. Tracks** on page 13 as well as warnings given in this section). When collecting data as Tracks, setup the Garmin as follows:

1. Press the **MENU** key twice to bring up the *Main Menu*.
2. Select “Tracks”. Press the **ENTER** key.

Note: Before beginning a new track, you might consider clearing the stored track log (see instructions below).



3. On the *Tracks* page, press the **MENU** key.
4. Select “Setup Track Log”. Press the **ENTER** key.



5. On the *Track Log Setup* page, set *Recording* to “Off” to turn OFF tracking , or set *Recording* to either “**Stop When Full**” or “**Wrap When Full**” to turn ON tracking, The *Record Method* and *Interval* fields should be set appropriate to the need of the specific job. If “Auto” method is used, the interval “Most Often” should be used to give best results.
6. Highlight [OK] and press the **ENTER** key.



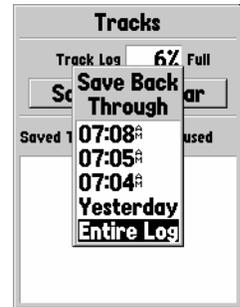
Keep in mind that the antenna needs to be kept as close as possible to the boundary being marked. If you need to divert from the boundary, you should turn off tracking. Upon returning to the boundary, turn on tracking to begin collecting data again. Two separate track segments will be created which can be joined in the DNR Garmin software (see instructions on page 27 in the Editing the Track Data section). This same technique can be used to define multiple features (i.e., turn off tracking to finish one feature and turn on tracking to begin marking the next feature).



Calculating Area

The Garmin GPSmap 76 has the ability to calculate the area of a single track or multiple tracks that make up the same feature. The GPSmap 76 does not have the ability to compute the area from individual waypoints. **NOTE: This area should only be considered as an estimate (see important note below concerning official area calculations).** Follow these steps to compute the area of a Track:

1. From the *Tracks* page, Highlight **[Save]** and press the **ENTER** key.
2. You will be given the choice to save the entire track log, or if you have multiple segments, you can choose how far back to save. Make your choice and press the **ENTER** key.



IMPORTANT: In the process of saving a track, the GPS filters the track data. Be aware that the area calculated may vary somewhat from the area calculation you will get in ArcView from the unfiltered (original) track data. This variation will depend on how complex the original track data is. **Remember that official NRCS policy is to calculate area/lengths measured with a GPS in ArcView/Customer Service Toolkit before certifying a conservation practice.**



3. After viewing the area calculation of the track, highlight **[Delete]** and press the **ENTER** key to remove this saved track. The original track will remain stored in the GPS internal memory.



Again, keep good notes in the field! Keeping notes of which track segments go where will make data handling much easier when you get back to the office.

Clearing the Track Log

If the track log memory becomes full or you wish to free up memory before beginning a new track, you will need to clear the entire existing track log as follows:

1. From the *Tracks* page, highlight **[Clear]** and press the **ENTER** key.
2. Highlight **[Yes]** and press the **ENTER** key.



Using GPS Data

DNR Garmin (© 2001 Minnesota Dept. of Natural Resources) is a combination Visual Basic program and ArcView extension that communicates with the GPS receiver and converts the information received into shapefiles or graphics for use in ArcView. These instructions are based on version 4.0. For more detailed information on the use of this program, refer to the DNR Garmin help file.

Garmin GPSmap76 Setup for Downloading

1. Using the download cable (round Garmin connector on one end, 9-pin serial connector on the other end), connect the GPS unit to an open serial port on the computer.



2. Turn on GPS unit. Press the **ENTER** key until the GPS Information screen appears.
3. Press the **MENU** key. Highlight "Start Simulator". Press the **ENTER** key. This will stop the unit from trying to acquire satellites and thus conserve battery power.



IMPORTANT: The Garmin GPSmap 76 interface setup **MUST** always be returned to the **Garmin** format before attempting to download to ArcView using DNR Garmin!!!

4. Verify the "GARMIN" interface is selected:
 - a. Press the **MENU** key two times.
 - b. Select "Setup"; then press the **ENTER** key.
 - c. Move left or right to select the *Interface* tab. Verify **Serial Data Format** is set to "**GARMIN**". If not, toggle down and change the setting.



MN DNR - Garmin / ArcMap

File Edit GPS Waypoint Track Route Real Time Help

Lat Alt

DNR Garmin Properties

Projection Waypoint Track Route RTime/Wpt

POSC Codes: EPSG ESRI

26916

Datums: NAD83

Projections:

- UTM zone 10N
- UTM zone 11N
- UTM zone 12N
- UTM zone 13N
- UTM zone 14N
- UTM zone 15N
- UTM zone 16N**

Description of Selected Projection:

<26916>
 +proj=utm
 +zone=16
 +ellps=GRS80

PRJ File: Load PRJ

OK Cancel Reset **NONE** **MNDNR**

	proj	x_proj
271	137229.62849317	306912.48
272	137220.06078266	306914.16
273	137210.49194269	306915.84
274	137203.43716472	306911.88
275	137203.61280456	306904.27
276	137203.78845133	306896.67
277	137204.00802464	306887.17
278	137204.13978610	306881.47
279	137204.18368699	306879.57
280	137206.65276273	306875.82
281	137213.88317373	306872.19
282	137221.07079270	306870.45
283	137228.16945497	306872.52
284	137237.60544721	306876.54
285	137249.37875150	306882.51
286	137258.85864823	306884.63
287	137268.38246616	306884.85
288	137277.86236345	306886.97
289	137284.96102928	306889.04
290	137292.10472512	306889.21
291	137296.86607944	306889.32
292	4137301.71638468	306885.62
293	4137304.27217440	306878.08
294	4137304.44784864	306870.48

DNR Garmin setup

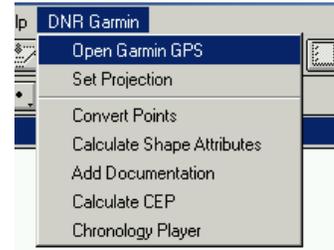
- 1) Set projection
- 2) Select **File-> Set Projection**
 All counties in Illinois will use UTM zone 16 N except:

- JoDaviess
- Rock Island
- Henry
- Mercer
- Henderson
- Warren
- Knox
- Hancock
- McDonough
- Fulton
- Adams
- Schuyler
- Brown
- Cass
- Pike
- Scott
- Morgan
- Calhoun
- Greene
- Jersey
- Monroe

which will use UTM zone 15 N

Downloading GPS Data

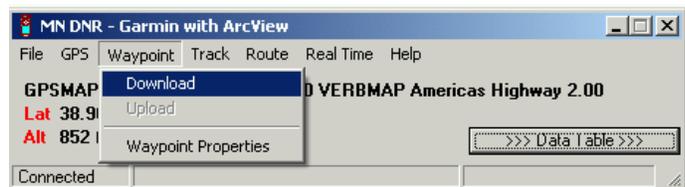
1. Select **DNR Garmin -> Open Garmin GPS** from the top menu. If there is no “DNR Garmin” menu, see DNR Garmin Setup above. The MN DNR – Garmin program should then load.



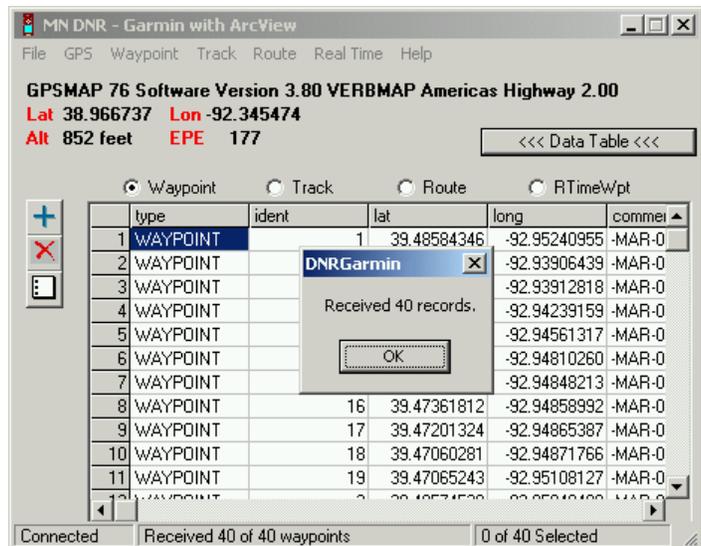
2. If the Garmin does not connect, select **GPS -> Assign Port** and check that correct port and baud rate (9600) are selected.



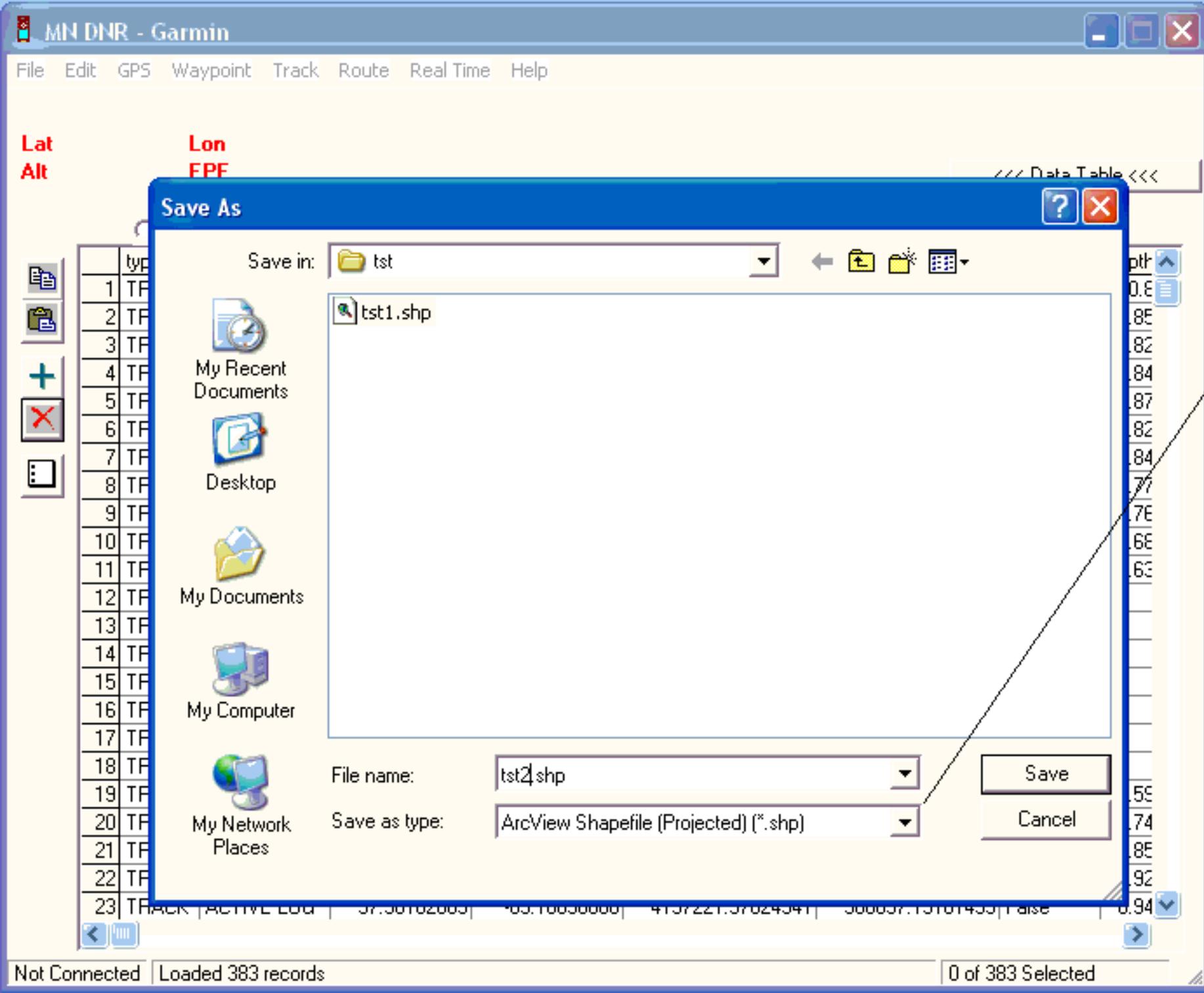
3. Select **Waypoint -> Download** to download waypoints or **Track -> Download** to download tracks from the GPS.



4. The program will begin retrieving all waypoints or tracks stored in the GPS memory. When all records have been retrieved, a dialog box will appear that tells how many records have been received. Click **[OK]** to close this dialog box.

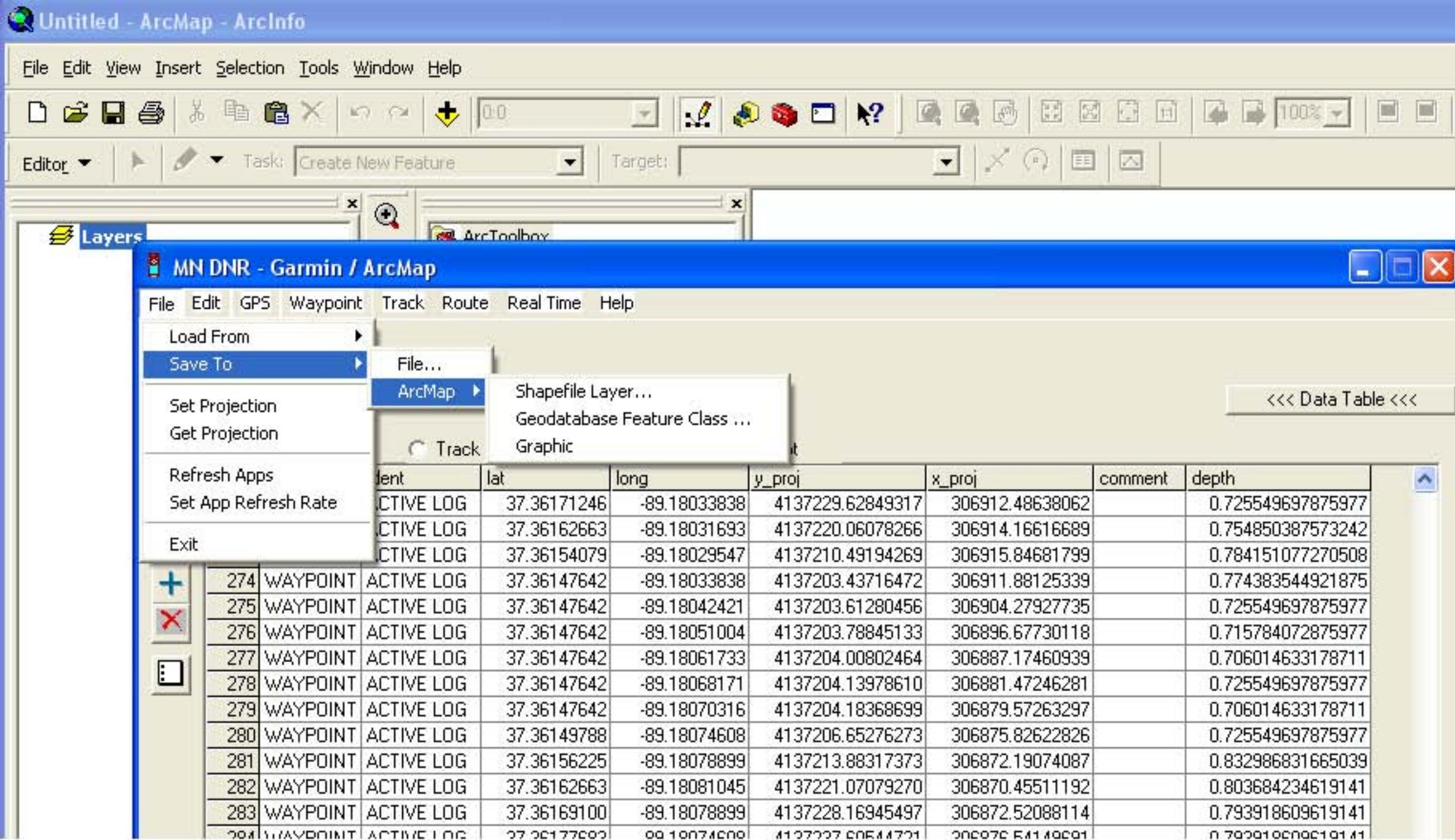


NOTE: If you are finished downloading, you can shut off the GPS unit to conserve battery life. Simply hold down the Power key until unit shuts off.



Saving Waypoints

- 1) Works as standalone, or with ArcMap if ArcMap is open
- 2) Select File-> Save To->
- 3) Select file format from dropdown.
- 4) You can create a unique shapefile, append to an existing shapefile, or create a text file. Saving as a text file, will serve as a back-up if the shapefile is corrupted.



Options for saving when ArcMap is open

Lat
Alt Lon
EPE

<<< Data Table >>>

Waypoint Track Route RTimeWpt

	type	ident	lat	long	y_proj	x_proj	new_seg	depth
1	TRACK	ACTIVE LOG	37.36169100	-89.18044567	4137227.46681798	306902.92869986	true	0.8
2	TRACK	ACTIVE LOG	37.36171246	-89.18044567	4137229.84804967	306902.98371893	False	0.85
3	TRACK	ACTIVE LOG	37.36173391	-89.18044567	4137232.22817176	306903.03871240	False	0.82
4	TRACK	ACTIVE LOG	37.36175537	-89.18051004	4137234.74113442	306897.39249196	False	0.84
5	TRACK	ACTIVE LOG	37.36177683	-89.18051004	4137237.16129705	306891.58034753	False	0.87
6	TRACK	ACTIVE LOG	37.36179829	-89.18051004	4137239.58145968	306891.47030291	False	0.82
7	TRACK	ACTIVE LOG	37.36181975	-89.18051004	4137242.00162231	306889.40543526	False	0.84
8	TRACK	ACTIVE LOG	37.36184121	-89.18051004	4137244.42178494	306885.43893936	False	0.77
9	TRACK	ACTIVE LOG	37.36186267	-89.18051004	4137246.84194757	306883.37317835	False	0.76
10	TRACK	ACTIVE LOG	37.36188413	-89.18051004	4137249.26211020	306881.30741432	False	0.68
11	TRACK	ACTIVE LOG	37.36190559	-89.18051004	4137251.68227283	306881.14236607	False	0.63
12	TRACK	ACTIVE LOG	37.36192705	-89.18051004	4137254.10243546	306882.82298888	False	
13	TRACK	ACTIVE LOG	37.36194851	-89.18066025	4137173.14318252	306882.65794283	False	
14	TRACK	ACTIVE LOG	37.36197000	-89.18066025	4137170.76195092	306882.60291899	False	
15	TRACK	ACTIVE LOG	37.36199146	-89.18070316	4137168.46965047	306878.74735918	False	
16	TRACK	ACTIVE LOG	37.36201292	-89.18076754	4137170.98153875	306873.10018900	False	
17	TRACK	ACTIVE LOG	37.36203438	-89.18081045	4137175.83182796	306869.40968368	False	
18	TRACK	ACTIVE LOG	37.36205584	-89.18085337	4137180.68102987	306865.71827143	False	
19	TRACK	ACTIVE LOG	37.36207730	-89.18087482	4137185.48739758	306863.92849489	False	0.59
20	TRACK	ACTIVE LOG	37.36209876	-89.18087482	4137195.01121495	306864.14858712	False	0.74
21	TRACK	ACTIVE LOG	37.36212022	-89.18089628	4137202.19772590	306862.41293402	False	0.85
22	TRACK	ACTIVE LOG	37.36214168	-89.18093920	4137211.80939537	306858.83160120	False	0.92
23	TRACK	ACTIVE LOG	37.36216314	-89.18096066	4137221.37824941	306857.15101495	False	0.94

Output Shape

Please Define the Output Shape

Point

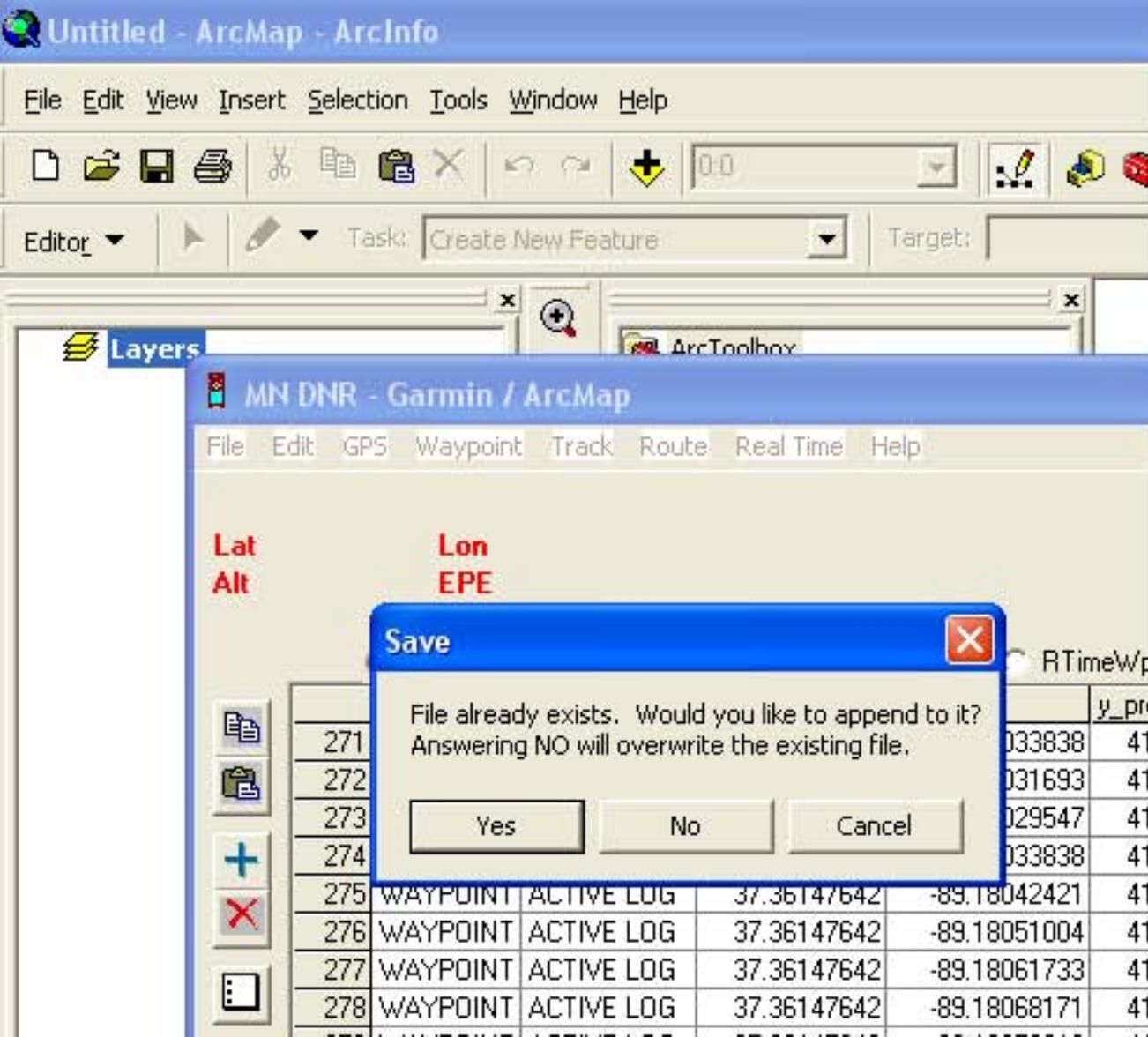
Line

Polygon

OK

Saving Tracks

- 1) Select File-> Save To->
- 2) If ArcMap is open, select ArcMap-> Shapefile
- 3) Select feature type to save as



Appending to an existing shapefile

- 1) Select an existing shapefile and Select Yes to append
- 2) Selecting No will create a new shapefile with new points

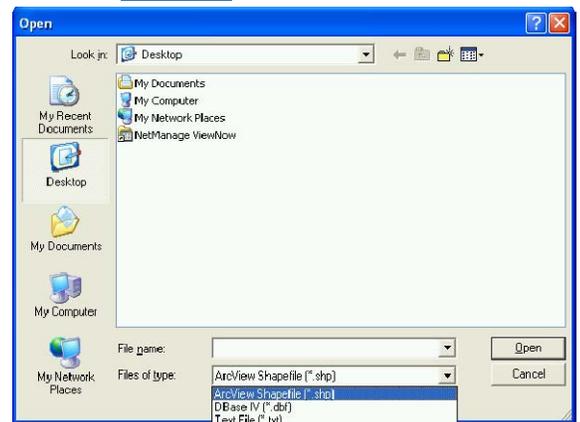
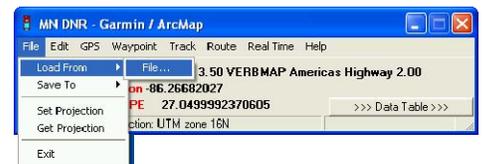
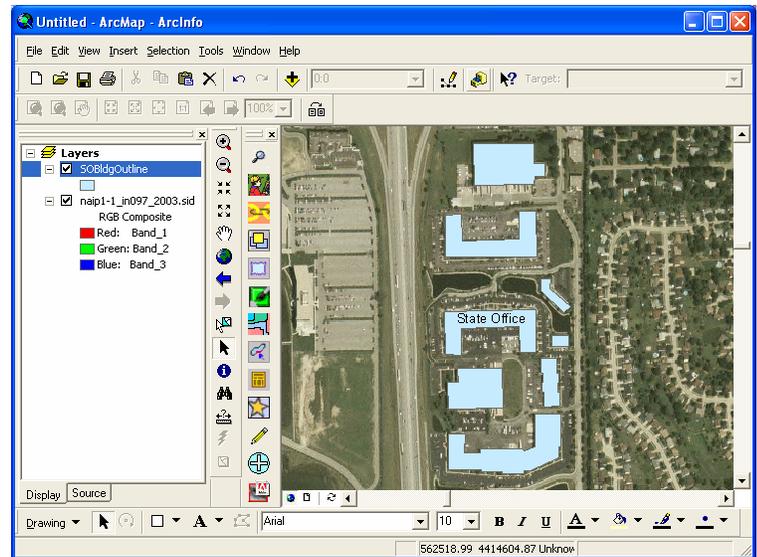
Uploading Polygon Information to Garmin GPSMAP76

These instructions make the following assumptions:

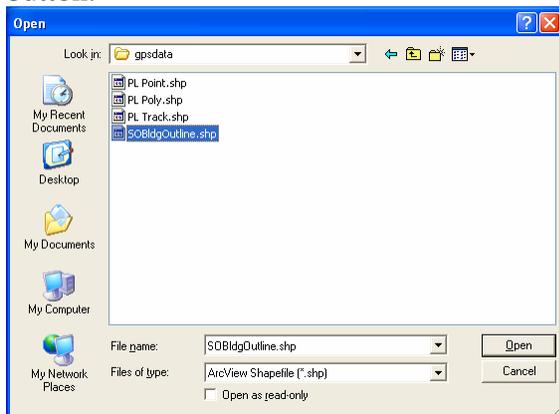
1. A polygon shapefile has already been created. The method used to create the shapefile is not relevant. The example data on the right is of building outlines near and including the State Office.
2. The GPS unit is on, attached to the computer you are using, and has the GARMIN serial data format selected in setup (interface tab).
3. There is no track or point data saved on the GPS unit.

Procedure:

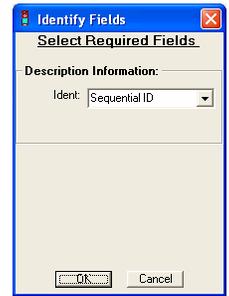
1. Open DNR-Garmin program
2. Load existing polygon data
 - 2.1. From the **File** menu, point to **Load From**, then click **File...**
 - 2.2. Select the correct data type to load (ArcView Shapefile).



- 2.3. Navigate to the folder containing the shapefile, select it by clicking on its name, then click the **Open** button.



2.4. If you have an attribute field that you want assigned to each vertex, select it from the drop-down menu and click the **OK** button. Otherwise, leave the default setting, and the program will assign a sequential numeric value to each vertex in the shapefile.

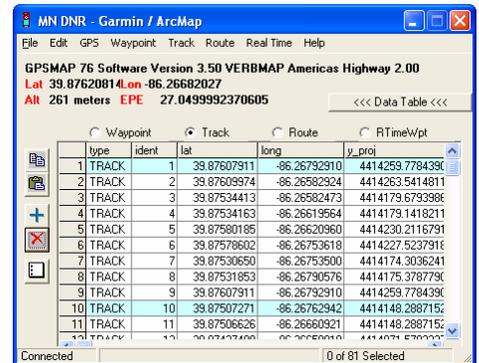


2.5. Once the program had completed reading the shapefile, a message similar to this will appear:



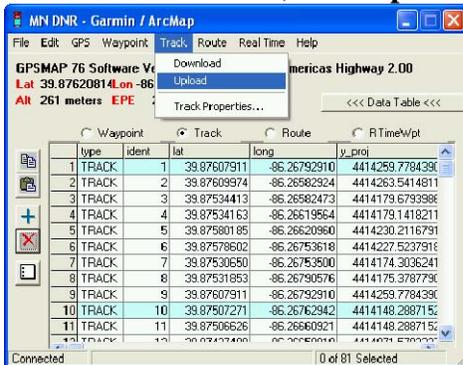
Click the **OK** button to confirm.

2.6. Each line in the DNR-Garmin's table represents a polygon vertex. The light blue lines indicate the start of a new polygon. The last vertex of a polygon is identical to the first. In this example, line 9 is identical to line 1.



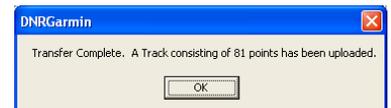
3. Upload polygon data to GPS

3.1. From the Track menu, click **Upload**

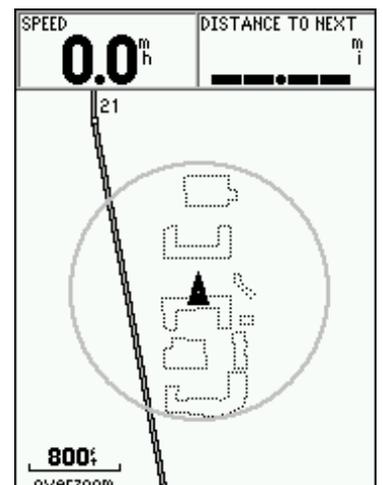


3.2. When uploading is complete, a message similar to this will appear:

Click the **OK** button to confirm.



3.3. By moving the Garmin's display to the intended area and setting the appropriate zoom level, you should see the features appear, similar to this:

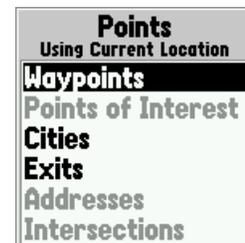


Navigating with the Garmin GPSmap 76

The Garmin GPSmap 76 can be used to navigate to (i.e., locate) any of its stored points (e.g., those uploaded in the previous section). This can be very useful for locating features such as well heads, wetland boundaries, etc, or for laying out conservation practices such as fences, brush management, or grass plantings.

Navigating to a Point

1. To navigate to a point, press the **NAV** key.
2. Highlight “Go To Point” and press the **ENTER** key.
3. Highlight “Waypoints” and press the **ENTER** key.



4. One of 2 screens will appear, *Waypoints by Name* or *Nearest Waypoints* . Use the **MENU** key to switch between the two. (Note: The bottom of each screen shows direction and distance to highlighted point).

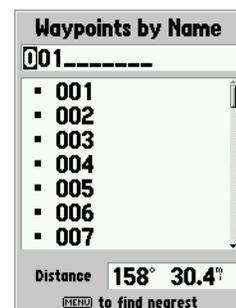
Waypoints by Name

Points are sorted by name.

Select desired point

(see *Tips on using Garmin keypad* on page 3).

Press the **ENTER** key.

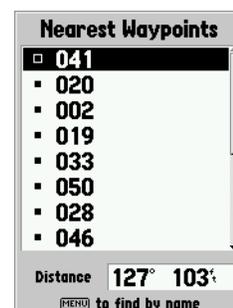


Nearest Waypoints

Points are sorted by distance from your current position (nearest being listed first).

Highlight desired point using up/down of **ROCKER** key.

Press the **ENTER** key.



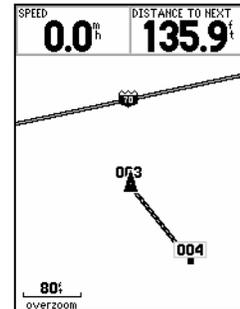
5. The *Waypoint* screen will appear.
Highlight [Goto] and press the **ENTER** key.



6. Use the **PAGE** key to switch to the *Map Page*.

This shows your current location as a triangle near the center of the screen and a line to the point you are navigating to. The line indicates the direction you need to go (North is toward top of screen). Zoom In and Out keys can be used to change scale of map.

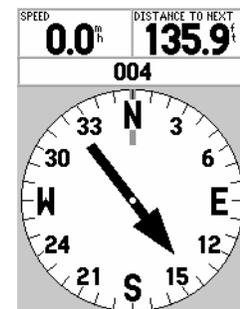
Example at right instructs you to move southeast 135.9 feet.



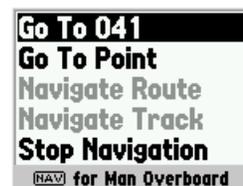
7. An alternative to the *Map Page* is the *Pointer Page*.
Use the **PAGE** key to switch to the *Pointer Page*.

This shows a compass ring. The vertical line near the top of the ring indicates your direction of travel. The large pointer indicates the direction you need to travel to reach the navigation point.

Example at right shows that you are moving north and that you actually need to be moving southeast 135.9 feet.



8. Once point is found, press the **NAV** key and select
 - a. "Go To Point" to find another point, or
 - b. "Stop Navigation" to end.
9. Press the **ENTER** key.



Appendix - Field Guides

The Field Guides are quick "instruction" cards that can be printed, cut to size and laminated to carry with the Garmin in the field.

Garmin GPSmap76 SETUP

Press MENU twice, select "SETUP", use ROCKER key to select Tabs below

General	Time	Location	Interface																		
Mode Normal WAAS Disabled Backlight Timeout <i>user preference</i> Beeper <i>user preference</i> Language English	Time Format <i>user preference</i> Time Zone Central Daylight Savings Time Auto	Location Format UTM UPS Map Datum NAD83 North Reference TRUE	Serial Data Format RCTM In/NMEA Out Baud 4800 Beacon Scan or User <table border="1"> <thead> <tr> <th><u>Location</u></th> <th><u>Freq.</u></th> <th><u>Bit Rate</u></th> </tr> </thead> <tbody> <tr> <td>Milwaukee</td> <td>297</td> <td>100</td> </tr> <tr> <td>Rock Is.</td> <td>311</td> <td>200</td> </tr> <tr> <td>St. Louis</td> <td>322</td> <td>200</td> </tr> <tr> <td>Louisville</td> <td>290</td> <td>200</td> </tr> <tr> <td>Memphis</td> <td>310</td> <td>200</td> </tr> </tbody> </table>	<u>Location</u>	<u>Freq.</u>	<u>Bit Rate</u>	Milwaukee	297	100	Rock Is.	311	200	St. Louis	322	200	Louisville	290	200	Memphis	310	200
<u>Location</u>	<u>Freq.</u>	<u>Bit Rate</u>																			
Milwaukee	297	100																			
Rock Is.	311	200																			
St. Louis	322	200																			
Louisville	290	200																			
Memphis	310	200																			
			(<i>for downloading</i>) Interface Serial Data Format GARMIN																		

Garmin GPSmap76 - Interface SETUP for Backpack Use

Press **MENU** button twice
Select **SETUP** and press the **ENTER** key
Scroll left once using the **ROCKER** key to the Interface tab
Move down to *Serial Data Format* field using the **ROCKER** key. Press the **ENTER** key.
Select **RTCM In/NMEA Out** and press the **ENTER** key
Move down to Beacon field using the **ROCKER** key. Press the **ENTER** key.
Select **SCAN**

if having problems getting Differential corrections, select **User** and press the **ENTER** key

Move right to *Freq* field using the **ROCKER** key
Press the **ENTER** key
Select number using up or down of **ROCKER** key for the appropriate station at right
Move to the next digit by pressing right on the **ROCKER** key
and repeat number selection
Press the **ENTER** key to accept number
Repeat same procedure for *Bit Rate* if needed

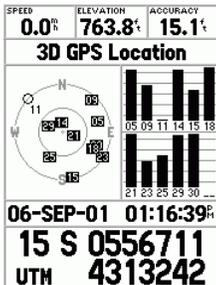
<u>Location</u>	<u>Freq.</u>	<u>Bit Rate</u>
Milwaukee	297	100
Rock Is.	311	200
St. Louis	322	200
Louisville	290	200
Memphis	310	200

Press the QUIT key to return to the main menu.

Remember to change *Serial Data Format* to **Garmin** before downloading data

“Marking Points” Field Guide

**Marking (and entering) Points
w/Garmin GPSmap76**

	<p>< Accuracy should be <= 10 ft for certifying</p> <p> <= 20 ft for planning</p> <p>< should be UTM coordinates</p>
<p>☞ Press and hold ENTER key ☞</p>	
	<p>< change point name as desired</p> <p>< should be UTM coordinates (you can manually enter a point by entering coordinates here)</p> <p> Highlight [OK] and < press ENTER</p>
<p><u>To improve accuracy, averaging can be used:</u> Press MENU; select Average Location; do not move GPS unit while measurements are collected; press ENTER to save the point when desired count has been reached.</p>	
<p>4/15/2004</p>	

“Deleting/Navigating to Points” Field Guide

Deleting Points	GARMIN GPSmap76	Navigating to Points
Press MENU twice. Select “Points” Select “Waypoints”		Press NAV key. Select “Go To Point” Select “Waypoints”
Highlight point using <i>Nearest Waypoint</i> , or <i>Waypoints by Name</i> page		Select point using <i>Nearest Waypoint</i> , or <i>Waypoints by Name</i> page
Press MENU . Select “Delete Waypoint” or “Delete All”		Select [GoTo] on waypoint page
Confirm the deletion by selecting [Yes].		Use <i>Map</i> or <i>Pointer</i> page to guide you to the point.
		10/1/2003

“Starting/Stopping Track Logs” Field Guide

Starting Track Log	GARMIN GPSmap 76	Stopping Track Log
Press MENU twice Select “Tracks” Press MENU . Select “Set Up Track Log”	→ Press MENU twice Select “Tracks” Press MENU . Select “Set Up Track Log”	Press MENU twice Select “Tracks” Press MENU . Select “Set Up Track Log”
<u>To turn ON tracking, set Recording:</u> Stop when full or Wrap when full Record Method & Interval As needed for specific job. If Auto method is used, select “Most Often”. Highlight [OK] and press ENTER .	<u>To turn OFF tracking, set Recording:</u> Off Highlight [OK] and press ENTER .	
Press PAGE until <i>Map</i> page is displayed to view “bread crumbs”.		
Travel around desired area. TRY NOT TO STRAY OFF TRACK WHILE LOGGING IS ON! When finished, turn track log off as follows: >>>>>>		
		10/1/2003

“Calculate Area/Clear Track Log” Field Guide

Calculate Area	GARMIN	Clear Track Log
Press MENU twice		Press MENU twice
Select “Tracks” Highlight [Save] and press ENTER key.		Select “Tracks” Highlight [Clear] and press ENTER key.
Select desired track segment. A page appears with the calculated <i>Area</i> . REMEMBER: This area is just an <i>estimate</i> and should be used as such.		Highlight [Yes] and press ENTER key. This will clear the entire track log memory.
===== NOTE ===== Because saving a track filters the data, the track SHOULD NOT BE SAVED . Make sure to delete it!.		
Highlight [Delete] and press ENTER key. Highlight [Yes] and press ENTER key.		
		10/1/2003