

The Garmin eTrex 10/20/30: An Introductory Handbook for Natural Resource Managers

Prepared by: The Virginia Geospatial Extension Program

GPS: An Introduction and the Basics

This handbook is intended to provide you with a basic understanding of how your Garmin eTrex GPS receiver (version 10, 20, or 30) can help to support your day to day business needs. For detailed information about this receiver, refer to the owner's manual that is included with you GPS receiver (a digital version of your owner's manual can also be downloaded from the Garmin website: (http://www8.garmin.com/manuals/eTrexLegendHCx_OwnersManual.pdf).

The ETrex GPS receivers are fairly rugged. However, these receivers are small computers, and they should therefore be treated with care. For example, never store the GPS receiver in direct sunlight or in hot areas (car trunks). When you are not using your GPS receiver for long periods of time (over 2 months), it is recommended that you remove the batteries. The eTrex GPS is fully water resistant and dust proof, however, it does not float! You should clean the outside of your GPS receiver by simply running cool water over it, or by wiping it off with a moist rag.

In addition, it should be noted that the GPS has an internal antennae. The antennae is located at the top of the GPS receiver (above "eTrex"). Do not obstruct the antennae when you are operating your GPS! Most GPS receivers do not work inside, underground, or underwater. In order to get the best reception, your GPS receiver will require an unobstructed view of the sky. However with new high sensitivity GPS chip, the eTrex can receive consistently strong signals under dense tree canopy.

Marketing material suggests that this GPS receiver will require new batteries (#2 AA) after approximately 22 hours of use. You may want to keep spare batteries handy.

When purchasing your GPS, it comes with a detailed owner's manual, and a quick start user's guide. In addition, your GPS receiver also comes with a USB cable. This cable can be attached to your computer. This will enable you to download or upload coordinates, and can facilitate field data collection.

A digital version of this manual is accessible from the VCCS Geospatial Portal, or via the Virginia Geospatial Extension Program website: <http://www.gep.frec.vt.edu/cooltools.html>

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Some Tricks of the Trade and things to remember...

- ◆ You know enough to be dangerous! Please note that this handout is intended to give you a working knowledge of GPS to the degree that you can collect data for use in forestry and natural resources management and planning. This handout does not give you the skills or authority of a licensed land surveyor. Applications of GPS for recording property boundaries, zoning boundaries and other legal boundaries such as setbacks requires the involvement of a licensed land surveyor. Likewise, legally binding calculations of property area must also be performed by licensed surveyors. Measurements taken with this GPS do contain errors. These measurements should be considered to be estimates!
- ◆ Update your software. The Garmin website (<http://www8.garmin.com/support/collection.jsp?product=010-00190-00>) provides free software updates for the eTrex (and other models). Garmin has created a downloadable program that automatically checks for software updates and will download them to your unit. The software is called Web Updater and can be found at the above link. To maximize its area measurement capabilities, be sure that the software is up to date. To check this, go to: Menu > Setup > About > this will display the current software version at the top of the information listed. If needed, download the latest software version using Web Updater, then upload it to your unit using the supplied USB cable.
- ◆ Enabling WAAS (Wide Area Augmentation System) will usually improve accuracy of your unit's area calculations. However, if you have difficulty in maintaining contact with the WAAS satellite (#35 in our area) because of tree cover or other terrain obstacles, you may be better off to disable WAAS. To enable/disable WAAS, go to: Menu > Setup > System > WAAS/EGNOS.
- ◆ Wait for accuracy after you turn on your unit. Before marking waypoints or laying tracks, give your receiver time (usually just a minute or two) to "settle down" and make full contact with the available satellites. When the accuracy reading on the satellite page becomes relatively steady - usually at 10-15 ft. (3-5 m) or so - then you are ready to put it to work. If WAAS is enabled, wait until satellite #35 is providing differential correction - small D's will show up on several satellite strength bars. You should then get accuracy readings of about 10 ft (3 m).
- ◆ The eTrex allows measurements to be displayed in your choice of units. Go to: Menu > Setup > Units > Distance/Speed to initially select from Nautical (nm, kt, ft), Nautical (nm, kt, m), Statute, Metric, and Yards. If you wish to change from one measurement system to another, the unit automatically and instantly handles the conversions.
- ◆ You can connect your Garmin eTrex to a tablet computer or other hand-held device using the download cable. The port is located on the back of the GPS unit, at the top. You may also require an adaptor, depending on the type of port that is supported by your device.

Understanding Your GPS Receiver

There are six buttons on your eTrex 10, 20, or 30 that you need to be familiar with (Figure 1). These buttons include:

1. The Power/ Backlight Button
2. The Click-Stick Button
3. The Back Button
4. The Zoom-out Button
5. The Zoom-in Button
6. The Menu Button



Figure 1. The Garmin eTrex10

1. The **Power button** is the button that turns your GPS receiver on and off. This button will also turn on the backlight (so that you can use your receiver at night). Note that using the backlight will consume your batteries faster!!!

2. The **Click-Stick (mouse)**: The Click-Stick (Figure 2) is very similar to a computer mouse. The Click-stick will enable you to navigate to different menu options by pushing the click-stick in a direction (left or right; up or down). Furthermore, you can use the Click-Stick as a button (by pressing it straight down or “in”) to activate highlighted selections. Pushing the Click-Stick “in” is similar to clicking your mouse, or hitting the “enter” key on a computer keyboard.

3. The **Back button** is used to quit a menu or page.

4. The **Zoom-out button**: From the Map Page pressing this button will enable you to zoom out on the map. From any other page, press to scroll or move a highlighted slider up.

5. The **Zoom-in button**: From the Map Page pressing this button will enable you to zoom in on the map. From any other page, press to scroll or move a highlighted slider down.

6. The **Menu button**: Press and release once to view the Options Menu for a page or press and release a second time to display the Main Menu from any page (Figure 3). If you press and release once to see an Options menu for a specific page, and you want to get out of it, be sure to press the **Back** button (*not* the Menu button a second time, which will give you the Main Menu!).



Figure 2.
The Click-Stick works like a computer mouse



Figure 3. The Main Menu.

Clearing Data From Your GPS

Before you get started, you may need to clear all existing data from your GPS receiver, so that you can start working with a “clean slate”. If you are interested in saving the data that is currently on your GPS receiver, then please reference: “DNR Garmin: A Handbook for Educators”.

1. Use the **Menu button** and navigate to the **Main Menu** (click and release twice) (Figure 4). Use the “click stick” to select (highlight) the **Setup** option., click the click stick straight down, and then select the **Reset** item.

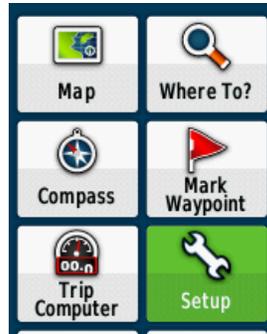


Figure 4 **

2. Once the Setup menu is visible (Figure 5), select **Reset** from the menu options by highlighting it and pressing straight down with the click stick. This will take you to the **Reset Options** page (Figure 6).

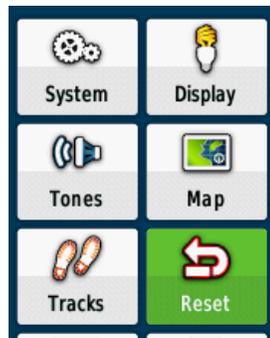


Figure 5

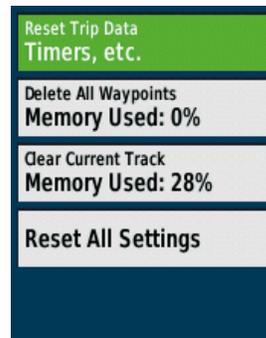


Figure 6

Note: You can also reach the Reset Options Page by going to the **Main Menu**, then **Trip Odometer**, then clicking the **Menu** button one time.

** All Screenshots in this manual were taken from a Garmin eTrex30. The Garmin eTrex10 has a black and white, rather than a color, screen. There may also be some menu items that appear only on the Garmin eTrex30 Main Menu that are not available on the eTrex 10. This manual only covers features available on all eTrex models.

3. On the Reset Options Page, use the click stick to navigate to the **Delete All Waypoints** menu item. Click straight down, then select **Yes** and click straight down again to delete all waypoints (Figure 7).

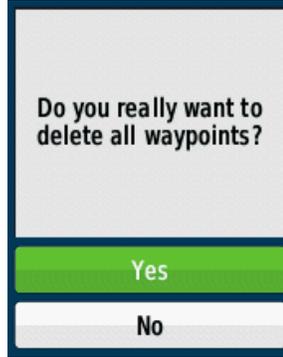


Figure 7

4. Once you have deleted all waypoints, you will go back to the Reset Options page. Now you can select **Clear Current Track**, select **Yes** to clear any tracks stored on the device.

Note: From the Reset Options page, you can also Reset Trip Data in the same way, and you can Reset All Settings to factory defaults. If you Reset All Settings, you will have to go back and set all your preferences again—units of measurement, etc.—so we do not recommend doing this.

Getting Started: Using Your GPS Receiver

Your GPS receiver has many capabilities and functionalities. This section of the handbook is intended to show you how to get started using the GPS and to introduce you to some of the major GPS capabilities that can directly support your day to day extension needs. After you become comfortable with the basic GPS capabilities that are listed in this handbook, you may want to refer to your owner's manual to learn even more about your GPS receiver!

Getting started...

Turn on your GPS receiver by pushing the power button. Use the **Menu** button to go to the **Main Menu**, then select the **Satellite** option to view current satellites.

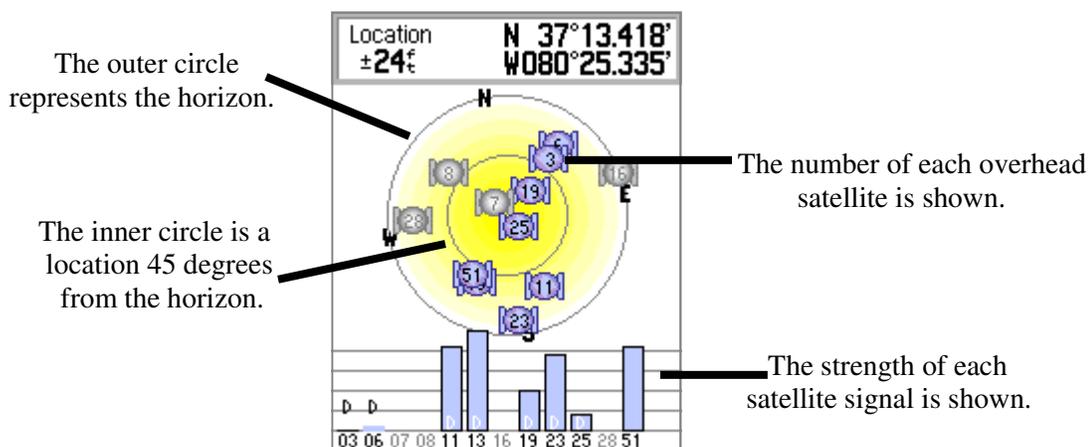


Figure 8

It normally takes a couple of minutes for the GPS receiver to “home-in” on the satellites, and to determine a location. Initially, the status window may read: *Wait...tracking satellites*. The GPS receiver will be ready to use when the satellite page disappears and the map page is showing .

The satellite page can be seen at any time by going to the Menu Page and selecting *Satellite Page*. After the GPS receiver is ready to navigate, a location (x, y coordinates) and error (± 24 ft) for the location will appear in the upper section of the satellite page (Figure 8).

Your GPS receiver has now been initialized, and is ready for use to support your extension application needs. The GPS receiver can be used, for example, to:

- ◆ identify and mark areas within tree stands for future reference (research plots, areas of infestation, etc.).
- ◆ estimate area measurements of a field/ tree stand (estimate fertilizer application needs)
- ◆ estimate the perimeter of a field/ tree stand (estimating fence line lengths)

Application #1: Marking and Saving Waypoints

Waypoints enable you to mark and record your current location. A waypoint is a “virtual” location marker. Once a waypoint is established and saved, you can easily navigate back to the waypoint using the GPS. This can be helpful to locate research plots in a large stand, identify and relocate potential pollution sources, or to identify and mark specific areas within an area that have been impacted by blight or disease (that you may want to return to at a later date). It is also possible to upload Waypoints to a desktop computer (using DNR Garmin or GPS Utility or similar software program).

To mark and save your current location as a waypoint:

1. Walk to the point where you want to obtain a waypoint (a location on a stand experiencing drainage problems, an area within an orchard that may require additional attention, etc.).
2. Press down and hold the Click-Stick until the **Waypoint Page** appears (See Figure 9). You can also go to **Main Menu** and select **Mark Waypoint**.
3. This GPS automatically assigns 3 digit numbers to waypoints (in this example, it assigned 001 as the waypoint name). You can customize the name of the waypoint. To change the name of the Waypoint, use the Click-Stick to highlight the waypoint name field (in Figure 5, the name field is *001*) and click straight down.
4. Type the new name for the waypoint, using the Click-Stick to select and enter the characters from the on-screen keyboard and select Done (in small print, at the bottom of the screen) (Figure 10).
5. You can also change the marker symbol associated with the waypoint by selecting the marker (with the Click-Stick) and scrolling through the different options (Figure 7). You can access even more marker options by selecting Points of Interest or Outdoors at the bottom of the Markers menu.
6. Use the Click-Stick to scroll down to the **Done** button (Figure 11), when you select this it will save the Waypoint and take you back to the **Main Menu**.

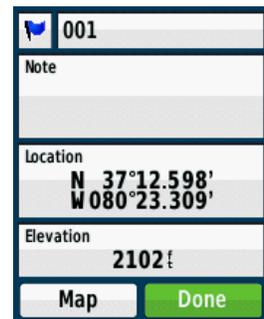


Figure 9



Figure 10



Figure 11

Application #2: Finding (navigating to) a Waypoint

Your GPS can serve as an “automatic pilot” to navigate you back to a previously defined Waypoint! To navigate back to a previously defined waypoint, follow these steps...

1. Go to the **Main Menu** (click Menu two times) and select **Where to?** (Figure 12).
2. On the **Where to?** menu, select **Waypoints** using the Click-Stick.
3. Use the Click-Stick to select the desired waypoint from the list (Waypoints are typically listed alphabetically) (Figure 13).
4. Select **Go** to create a direct line of travel to the Waypoint (Figure 14).



Figure 12

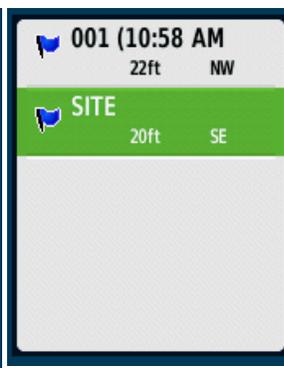


Figure 13

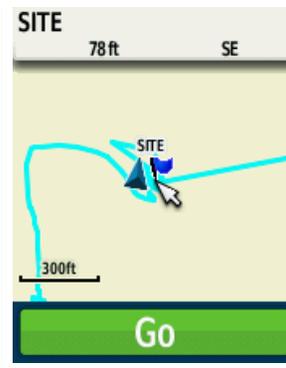


Figure 14

The map page is the default navigation page (Figure 14). At the top of the page there will be navigational directions. These directions will indicate a cardinal direction that will take you to your destination (Waypoint).

To use the Compass Page for navigation (Figure 15), go to the **Main Menu** again (click **Menu** button twice) and go to the **Compass** page. The arrow in the center of the compass serves as the bearing pointer, which directs you to the destination waypoint. The navigation page also informs you how close you are (in Figure 10, 70 feet) to the waypoint. It also gives current speed (0 miles/hour), as well as an estimated time of arrival (ETA).

To stop navigating press the **Menu** button twice, go to **Where To?** and select **Stop navigation**.

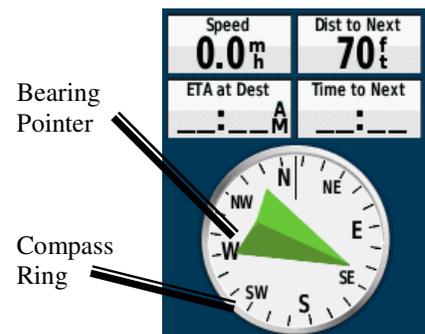


Figure 15

Application #3: Finding (navigating to) a Waypoint that was defined by someone else

You may need to navigate to a Waypoint that was defined by someone else (i.e.. a landowner or other constituent, a county official, a fellow extension agent or fellow extension specialist). This person may have used a different GPS receiver (or even model) and may therefore provide you with coordinate information (or, you can also obtaining coordinate information off of a Geographic Information System or other map).

Obviously, your GPS receiver can not navigate you to a coordinate pair (i.e. lat./ long, UTM, etc.) if the coordinates are not stored on your GPS receiver as a waypoint. However, you can create a waypoint by **manually entering coordinate information** (i.e. lat/long., UTM, etc.) into the GPS receiver.

To create a waypoint by manually by entering its coordinates, follow these steps:

1. Press in and hold the Click-stick to access the **Mark Waypoint Page**
2. Using the Click-stick, highlight the **Location Field** on the **Mark Waypoint Page** (Figure 16). Press straight down to select.
3. Enter the new coordinates using the numerical keyboard on the screen and the arrows to select different parts of the coordinate number (Figure 17). Highlight and press **Done** when finished.
4. Once the Waypoint coordinates have been manually entered and saved, you can then use the **Where to?** function (see previous page) to navigate to that waypoint!

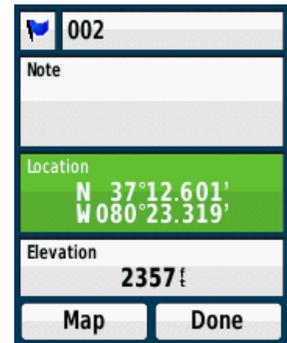


Figure 16



Figure 17

Important Tip: In the United States, the first (latitudinal) coordinate will always have a “N” as a prefix (as we are north of the equator). The second (longitudinal) coordinate will always have a “W” as a prefix (as we are west of the prime meridian). In addition, the first digit after the “W” should be entered as a “zero” (see illustration above). It is very important to identify and select these prefixes when manually entering waypoints on your GPS!

Application #4: Estimating Area Measurements

Estimating area measurements in the field is a necessary task for many application areas of extension including business planning, forestry, and natural resource management. This GPS receiver has the capability to estimate area measurements, even of curved and irregularly shaped polygons!

There are two methods for calculating an area estimate:

1. Area Calculation tool on the GPS unit (uses Tracks)
2. The Route method

The Garmin eTrex models make area calculations quite simple. It is important to note that area estimates taken with these GPS units are just estimates. Many variables can change the area calculation when using the first method, including the number of satellites available and the speed of the person walking the boundary.

Estimating Area Measurements: Area Calculation Tool (Option #1)

Overview and Setup

As you travel the perimeter of an area, the eTrex unit records track points and uses the resulting GPS track log to internally calculate the size of the enclosed tract. This method works well when you can reasonably transport the receiver directly along the boundary of the tract. [If swamps, lakes, cliffs, gorges, or grizzly bears get in your way, you may need to use the route technique as an alternative!]. The active track log can hold up to 10,000 points.

On small and irregularly shaped tracts of land, you might want to increase the track log interval - the frequency at which tracks points are recorded. Otherwise, you will lose accuracy when the receiver occasionally “cuts corners” as you travel the boundary. Go to: **Main Menu > Setup > Tracks**. (Note: Make sure you are in the Setup menu, then Tracks, not Track Manager!) The Track Log Setup page (Figure 18) will open, you have choices here. The default setting is Record Method: *Auto* (a combination of distance and time) and Interval: *Normal*. If you choose to keep the *Auto* setting, you can set the Interval to *More Often* or *Most Often* to increase the frequency of track points. Instead of *Auto*, you can choose to record by *Distance* or *Time*, each with its own Interval choices.

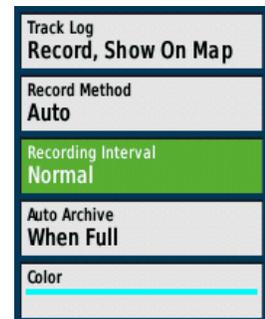


Figure 18*

* Some menu options displayed are only available in the eTrex 30. If you have model 10 or 20, your menu may look slightly different.

Using the Area Calculation Tool:

1. Generally you should clear the current active track log just before you begin laying tracks. Go to: **Main Menu > Track Manager > Current Track > Clear Current Track**. [If you wish to save the previous track log, first select SAVE, then clear the log].
2. Go to **Main Menu > Area Calculation** (Figure 19).
3. The Area Calculation page will have a **Start** option at the bottom (see Figure 20). Once you are at your starting point, click **Start** using the click-stick.
4. Begin walking around the perimeter of the area that you want to calculate. The screen displays your progress. Zoom in or out as appropriate to view your tracks. Don't despair if heavy tree cover causes you to occasionally lose contact with the satellites as you track. The GPS will "connect the dots" and link your recorded track points in an attempt to estimate the enclosed area. View the saved track screen to decide whether or not the integrity of the track was maintained.
5. Once you return to your starting point, click on **Calculate** (Figure 21). If you aren't at your starting point, your receiver will automatically complete the loop with a straight shot from your current position to your starting point. The enclosed area value will be displayed (Figure 22). To change units, highlight and click on the **Change Units** option to bring up a selectable list of choices (square feet, square yards, square meters, hectares, square miles, etc).
6. If this area calculation is something you'll need to refer to later, select **Save Track**. A page will open that will allow you to re-name the track if necessary.
7. To view all of your saved tracks, go to: **Main Menu > Track Manager > Archived Tracks**.



Figure 19*

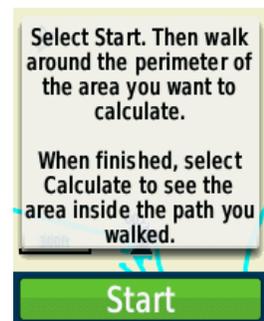


Figure 20



Figure 21

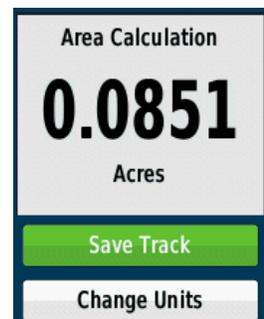


Figure 22

Estimating Area Measurements: The Route Method (Option #2)

Overview and Setup

For area calculation purposes, a route is a sequential set of perimeter waypoints linked together to describe the boundary of a tract of land. The route method of area calculation has some definite advantages. You don't need to travel along the entire border of the tract, as long as you can mark the major corners and turns of the boundary line. For very large tracts and for areas with severe terrain restrictions, this may be the only practical GPS technique. The route method also allows you to perform estimated acreage comparisons of several tracts after returning to the office.

Accuracy of the route method depends largely on your ability to locate and mark all the key twists and turns that enclose the tract. It works best on rectangular areas with straight-line boundaries. Irregularly bordered, oddly shaped tracts are more difficult to work with, requiring a much larger number of waypoints to accurately describe the tract. The maximum number of waypoints in a route is 250 with a maximum of 50 routes on the eTrex 10 (more storage on higher models).

You will need the program GPS Utility installed on your office computer to finish calculating area using this method.

Links to GPS Utility and a user manual are available at <http://www.gep.frec.vt.edu/cooltools.html>

By using the Route Method to calculate area, a series of Waypoints are identified (Figure 23) at corners, at turns, and other definition points along the area to be measured.



Figure 23

The Waypoints are then associated with a Route, and GPS Utility is later used to calculate the area measurement for that particular route, based on the associated Waypoints (Figure 24).



Figure 24

To Create a Route and Calculate Area

1. **FIRST**, mark and save waypoints of all important corners of the area you want to calculate (see page 7: Marking and Saving Waypoints). It works best to save these waypoints with sequential numbers.
2. From the GPS unit, go to **Main Menu > Route Planner**. (Figure 25).
3. Select **Create Route**, and on the next screen, click on **Select First Point**. This takes you to the category selection menu (Figure 26). Go to **Waypoints**.
4. Now you'll see a list of waypoints to choose from. Select the waypoint that marks the first corner of the area you want to calculate by clicking straight down (Figure 27). When you see the map of this waypoint, click on **Use**.
5. Now you'll be able to select more waypoints, in order, to complete the route by repeating steps 3 and 4.
6. Once you have added all the waypoints to your route, you can go back to **Main Menu > Route Planner**. From the Route Planner Menu, you should see the name of your route (usually Route 001 if it is the first route saved to your device). By selecting the Route name, you can edit the Route (add more points or delete points), rename, etc. (Figure 28).
7. Once you have returned to the office, download your route using the free software GPS Utility (see previous page). To view the resulting area calculation, view your routes and select the View menu and then Reports. This will bring up a report detailing each leg of your route, total distance and the area enclosed by the route.

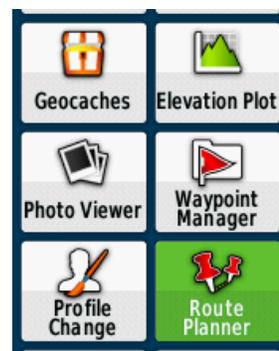


Figure 25



Figure 26

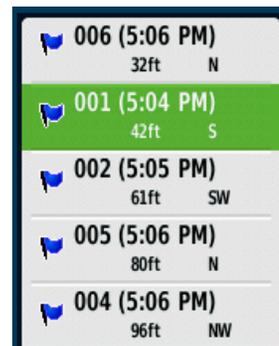


Figure 27



Figure 28

Application #5: The Trip Computer Page

The Trip Computer Page can also be used to estimate perimeter, or distance measurements. The Trip Computer Page is not as applicable to extension agents as the previous described options for estimating area and perimeter (see Application #4). However, the functions associated with the Trip Computer Page are something that you should be familiar with. To estimate perimeter or distance using the Trip Computer Page, follow these steps.

1. You may need to configure your GPS to ensure that perimeter measurements are calculated in yards (by default, the units of measure are in miles). To change the measurement units, navigate to the **Main Menu** (click the Menu button twice).

Note: If the default “statute” option is used, you will get Trip Odometer measurements in feet until the distance reaches 528' (0.1mi.), at which time the receiver automatically switches to hundredths of a mile (without yards ever being used).

If the “yards” option is selected, you will get Trip Odometer measurements in yards until the distance reaches 1000 yards, at which time the receiver automatically switches to hundredths of a mile (without feet ever being used). **For these reasons, it is suggested that you use the techniques outlined in Application #4 for estimating area and perimeter measurements.**

- a. While on the Main Menu Page, use the Click-stick to select **Setup**. On the Setup menu page, select **Units** (Figure 29), and the Units Setup Page will appear.
- b. On the Units Setup Page, use the Click-stick to scroll down and highlight Distance/Speed. Press the Click-stick, and a menu will appear. From the menu items, select **Statute** (Figure 30). This will enable you to view the perimeter measurements in feet. You are now ready to use the GPS receiver to calculate the perimeter of an area.

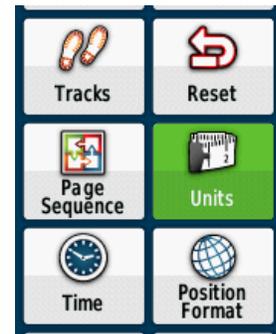


Figure 29

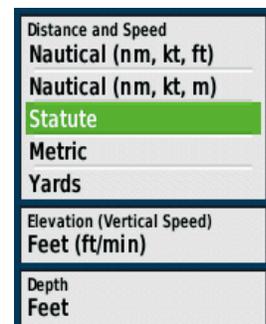


Figure 30

2. After you have configured the unit to measure the perimeter in statute units, go back to the **Main Menu** (push Menu button twice) and then select the **Trip Computer** page (Figure 31).

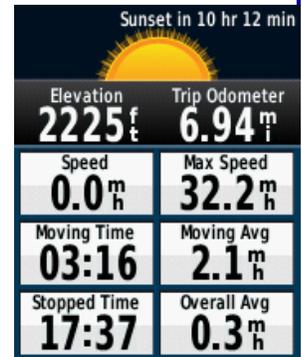


Figure 31

3. To estimate the perimeter of an area, you will be working with the *Trip Odometer* function on the TRIP COMPUTER PAGE. Make sure that before you begin, that the *Trip Odometer* is set to “zero”. If the odometer is not set to zero, then follow these steps:

- a. Click the **Menu** button **once** to bring up the Trip Computer Menu options.
- b. Press straight down on the Click-stick to open the Reset page (Figure 32)
- c. Use the Click-stick to select the **Reset Trip Data** option (Figure 33).
- d. Use the click-stick to select **Yes** (Figure 34).
- e. Your Trip Odometer is now set to zero and is ready for use! Press the **Back** button and navigate to the **Trip Computer** Page.

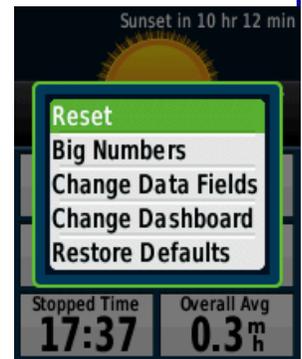


Figure 32

4. Now that your Trip Odometer is set to zero, begin walking around the field (parking lot, or any feature...). Notice that the odometer changes as you walk. When you complete walking around the field, you will need to make note of the Trip Odometer reading in a notebook. There is not a way to save the trip odometer numbers within the GPS.

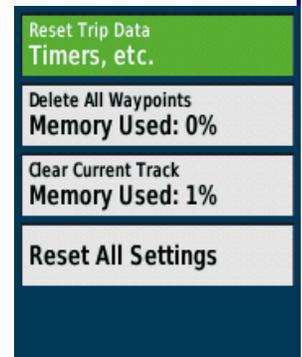


Figure 33

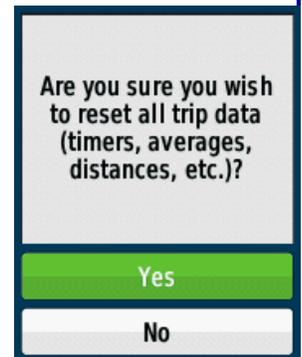


Figure 34

The MAP Page

So far, you have seen how the different pages on the GPS receiver can support some of your day to day business application needs. The Map Page, however, is a page that has not been summarized yet. The Map Page enables you to visualize your Waypoints and Tracks as maps that are located on screen. You can access it from **Main Menu > Maps**. You have the ability to zoom in and out of these maps to obtain more or less detail (Figure 35).

Your GPS receiver has some minimal reference data (eTrex 10—towns, boundaries; eTrex 20 and 30—major streets and interstates, relief shading) built into the GPS receiver (Figure 36). *If* you have the eTrex model 20 or 30, you can also obtain (i.e. purchase) digital topographic maps and other imagery that can be downloaded to your GPS unit for reference purposes (from GARMIN at <http://buy.garmin.com>). However, be aware that the maps are only available in sections of the United States, and any maps you download will take up space e on your unit's memory (1.7 GB on eTrex 30).

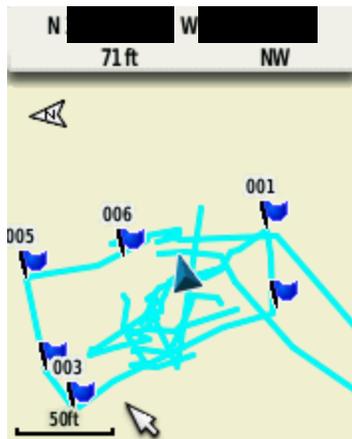


Figure 35



Figure 36

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