# Standard Operating Procedure (SOP) 3: Using Global Positioning System (GPS) Units

# Protocol for Monitoring American Peregrine Falcons

*Central Alaska (CAKN) Inventory and Monitoring Network*

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The main Narrative for the Protocol for Monitoring Peregrine Falcon in Central Alaska (CAKN) Inventory and Monitoring Network is available from the NPS Inventory and Monitoring Central Alaska Network website (http://science.nature.nps.gov/im/units/CAKN/) and the Natural Resource Publications Management website (http://www.nature.nps.gov/publications/nrpm/

# SOP 3 – Training Observers

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**Revision History Log:**

| Previous Version # | Revision Date | Author | Changes Made | Reason for Change | New Version # |
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| Add rows as needed for each change or set of changes associated with each version. | | | | | |

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## SOP 3.0 – Introduction

This Standard Operating Procedure explains the procedures and considerations that all observers should follow when collecting geospatial data or navigating to locations. This SOP is written for use with recreational-grade GPS units such as those manufactured by Garmin or Magellan. These units are far less expensive than mapping-grade units (e.g., Trimble GeoExplorer), yet they are effective for obtaining point information at a level of spatial accuracy that is required for this project. Recreational-grade GPS units do not have the capability of a data dictionary for storing attribute information with point locations.

This SOP assumes that each observer is familiar with the operation and function of the GPS unit to be used for this project. This SOP is intended to complement, not replace, the operations manual accompanying the GPS unit. Each observer should be familiar with the use of their particular GPS unit before entering the field to collect data or navigate to points.

This SOP does not require the use of a specific type or brand of GPS unit; however, the unit is required to meet the minimum standards listed below. The procedures below provide project-specific guidelines that are applicable to any recreation-grade unit. Attachment A contains detailed instructions relating to the operation of the Garmin 76 model. Though this is not the only GPS that may be used, instructions are easily transferable to other Garmin GPS models. GPS functions other than those associated with this protocol are not explained in this document.

## SOP 3.1 – Minimum GPS receiver standards for navigating and mapping:

**1. The minimum GPS receiver standards for navigating and mapping are:**

- Capable of storing date, time, and coordinates of features collected.
- Capable of exporting features collected to a format that can be used by a GIS
- Capable of maintaining an EHE (Estimate of Horizontal Error) of less than or equal to 12 meters. Maintaining an EHE (or EPE – Estimate of Positional Error) of 12 meters or less meets the National Map Accuracy Standard.
- Capable of tracking a minimum of 4 satellites
- Capable of collecting real-time differentially-corrected positions (DGPS)

## SOP 3.2 – Required Equipment

- GPS unit
- One set of extra batteries
- Operation manual
- Compass
- Rangefinder
- USGS 1:63,360-scale topographic map
- Personal computer for downloading data from the GPS unit. DNR Garmin (freeware, available at http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions.html) should be installed on the computer to facilitate the data download.

## SOP 3.3 – GPS Unit Setup

Do this before leaving the office (see Attachment A)

- Set GPS unit standards

**Minimum GPS Receiver Settings Standards**

| Name | Standard |
|---|---|
| Projection (displayed coordinates) | Decimal Degrees |
| Datum | WGS 84 |
| WAAS | Enabled (on) |

- Upload background data (MapSource) (if necessary)
- Upload existing waypoints to the GPS unit (if necessary)

## SOP 3.4 – Navigation to an existing location

If an existing peregrine falcon observation point is to be revisited, the observer can relocate that point using the GPS unit. Navigation to the point is best accomplished by using background maps that have been loaded onto the GPS unit, in addition to using hard-copy USGS 1:63,360-scale topographic maps.

- Select the waypoint you wish to navigate towards. Navigation to a point can be done by following the pointer, or by obtaining distance and bearing to the point and navigating by compass.
- In order to navigate, the GPS unit must be moving

## SOP 3.5 – Collection of new location data

Once the operator has determined the location from which the peregrine nest will be observed, a waypoint will be taken that represents that location. Associated information on bearing and distance to the nest site is also be collected at that time.

- Take (or mark) a waypoint, and identify it with a unique ID that matches the location identifier recorded on the field sheet: 3 digit nest territory number and one letter site number – Ex. 002B identifies the observation location as in territory 002, nest site observation point B. Space permitting, the CAKN recommends adding a GPS unit ID number to the end of the waypoint ID (002B3 would indicate GPS unit "3" was used to mark the location).
- Record waypoint coordinates that are displayed on the GPS unit on field sheet
- Use compass to determine bearing to nest site and record on field sheet
- Record approximate distance from observation point to nest site. Use rangefinder, or, if out of range, determine distance using topographic map

## SOP 3.6 – Downloading Data from GPS Unit

(see Attachment A)

The data from the GPS unit are downloaded to a personal computer daily, or after each field stint. Frequent, regular downloads will safeguard against any loss of data.

Text files are required as part of the download. GIS shapefiles can be created at the same time. See Attachment A for additional information on shapefile creation. CAKN recommends that during the field season downloads be limited to text files, with a single set of GIS shapefiles created at the conclusion of the field season.

Downloaded GPS text files will be appended to the Peregrine Falcon database at the time of data entry (see SOP 7).

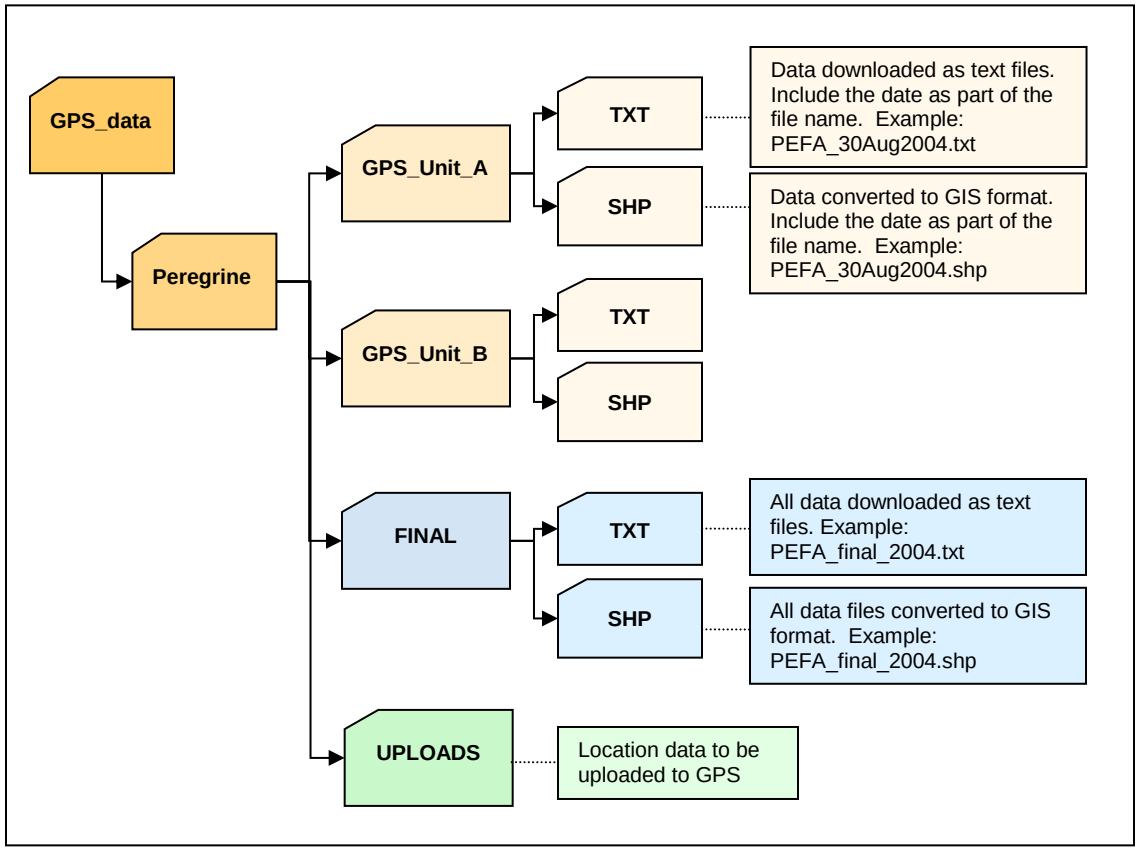


Figure 3-1. Recommended directory structure for data downloaded from GPS unit.

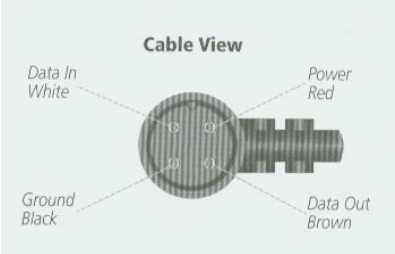
## Attachment A




*This graphic demonstrates the keys of a Garmin 76 GPS unit, and their functions. These keys are referred to in the following instructions.*

### SOP 3.7 – To Connect GPS to Computer

- Either a serial or USB port cable will accompany the GPS unit. This is the cable that connects the GPS receiver to your workstation computer, allowing the uploading and downloading of waypoints.
- The serial or USB end of the cable attaches to your workstation computer. The other cable end (below) inserts into the Garmin GPS unit (lift bottom of black flap on the back of the GPS unit)



## SOP 3.8 – To Change the Displayed Map Projection:

- Turn on the unit by depressing the POWER key
- Set Projection
    1. Access the Main Menu (press the MENU key twice)
    2. Using the rocker key, scroll down to Setup and press the ENTER key
    3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to Location Format and press the ENTER key.
    4. Scroll down the list of formats to UTM UPS, make sure this choice is highlighted, and press the ENTER key.
    5. Scroll down to Map Datum, press the ENTER key. Scroll down through the Map Datum choices, press the ENTER key when NAD 83 is highlighted.
    6. Press the PAGE key to get back to the "GPS Information" screen. (If the GPS Information screen is not showing, press the PAGE key; it will cycle through the screens). The bottom of the screen should now be displaying coordinates as UTM.

## SOP 3.9 – Set the GPS to Log Differentially Correct Data

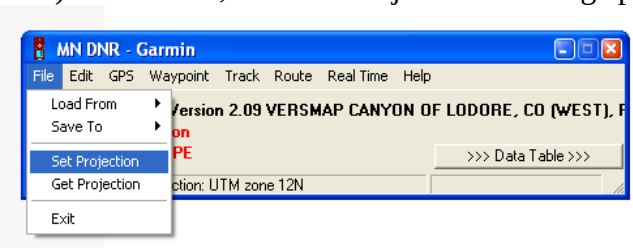
- If not already on, power up the GPS
- Enable WAAS
    1. Access the Main Menu (press the MENU key twice)
    2. Using the key, scroll down to Setup and press the ENTER key
    3. There are several tabs listed (General, Time, Units, Location, Alarms & Interface) – using the rocker key, scroll over to the Location tab. Scroll down with the rocker key to General and press the ENTER key.
    4. Scroll down to WAAS, press ENTER, highlight Enabled, and press ENTER
    5. Press the PAGE key to exit Setup

## SOP 3.10 –Data Waypoint in the Field

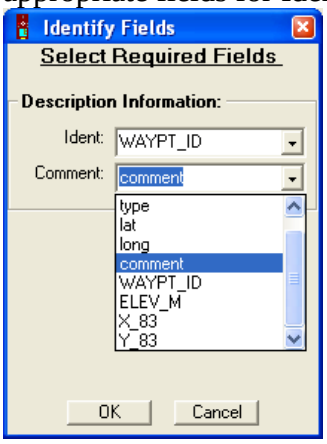
- Collect (or mark) a waypoint
    1. When at the observation location, check the GPS Information page for number of satellites (4 or more needed) and accuracy (12 meters or less)
    2. Press and hold the ENTER/MARK key until the Mark Waypoint Page is displayed.
    3. Using the Rocker key, change the waypoint ID to Nest Territory number plus site letter (GPS number optional).
    4. Using the Rocker key, highlight "OK" and press ENTER
- Navigation
    1. Press the NAV key
    2. Select 'Go To Point' then press the ENTER key
    3. Select 'Waypoints' then press the ENTER key
    4. Select 'your point' then press the ENTER key
    5. Highlight the 'GoTo' button, press ENTER
    6. As you start walking, the Pointer will point to your destination

## SOP 3.11 – To Upload Background Data

- Upload background maps from MapSource (proprietary software) if needed
- Upload waypoints using DNR Garmin
    1. Connect GPS to the computer
    2. Turn GPS on, then open DNR Garmin, it will connect to the computer
    3. When the MN DNR – Garmin window opens, make sure that the projection is set to UTM, NAD 83, zone 12N (unless at CURE or BLCA, which are zone 13N). Go to File, then Set Projection to change projection.

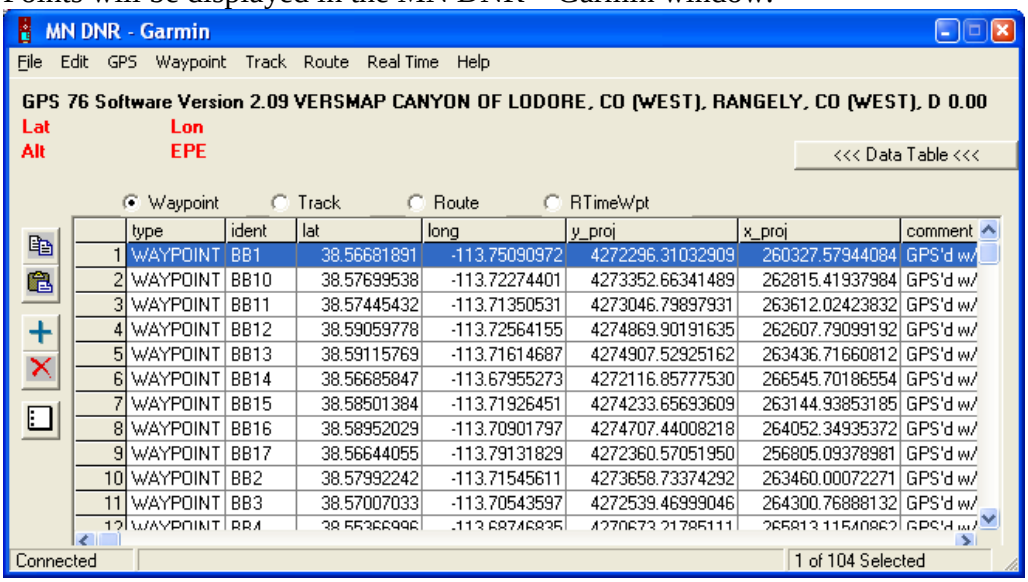



    4. Click on File, then Load From. You can upload a .txt file, .dbf file or a shapefile. Navigate to the file you wish to upload and click Open.
    5. A window will open prompting you select description information. Choose appropriate fields for Ident (ID) and Comment and click OK.




    6. A window will open stating "File was loaded successfully from….", click OK

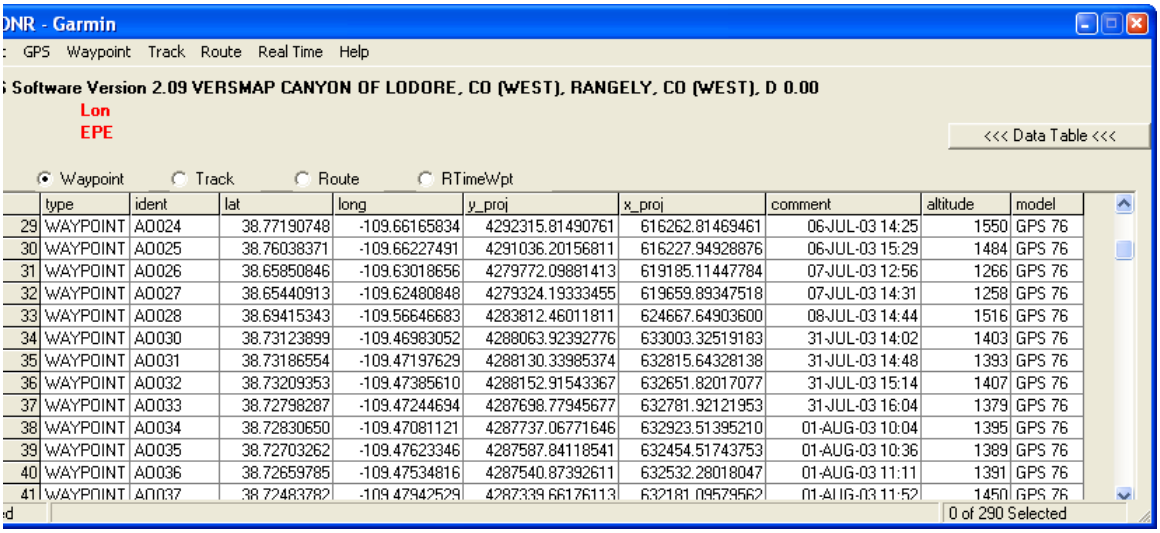
7. Points will be displayed in the MN DNR – Garmin window.




8. If the points are correct, click on WAYPOINT, then Upload
9. A window will pop up stating "Transfer Complete. # points uploaded"

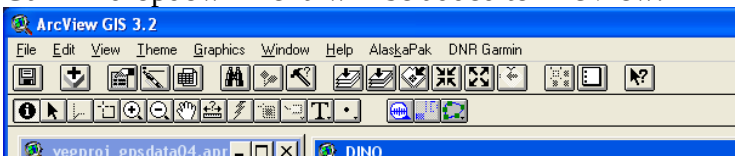
## SOP 3.12 – To Download Waypoints

- Download waypoints using MN DNR Garmin freeware
  1. Connect the GPS to the computer and turn on the GPS unit, then open the program DNR Garmin on the computer
  2. From the DNR Garmin main menu, click on Waypoint, then Download. Your data will appear in the MN DNR Garmin window (see below). Elements to be included in the downloading process are: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. These fields can be chosen by choosing Waypoint from the main menu, then Waypoint Properties and checking only those fields.

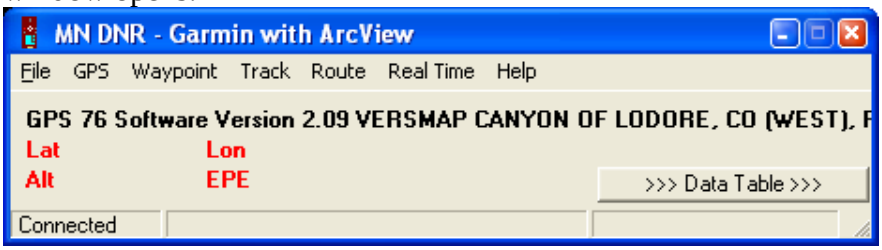


3. Click on File, then Save To. Navigate to the proper folder on the computer (see possible directory structure, Figure 3-1)
   There are several file types which you can save the file as. The NCPN recommends saving the data as a Text File (Comma delimited)(*.txt) file. This is the default choice.
4. Name the file with the date of download in the file name (example: Peregrine_June10_05.txt) and click the Save button. A window will display "File successfully written to …"

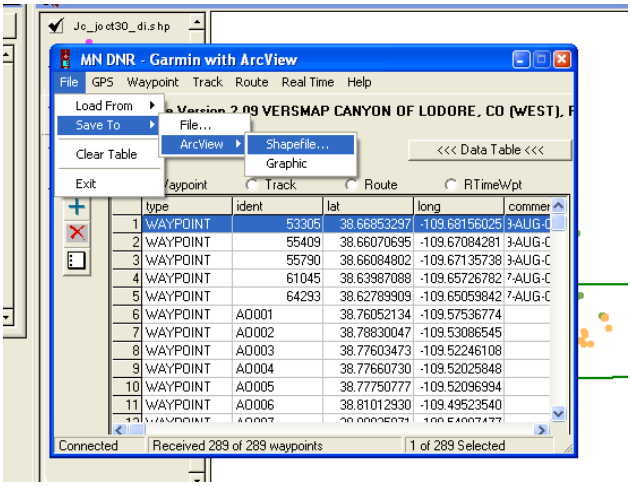
- Download waypoints using MN DNR Garmin and ArcView 3.x
  1. Connect GPS unit to workstation
  2. Open and activate the DNR Garmin-ArcView extension in ArcView. A DNR Garmin dropdown menu will be added to ArcView.




  3. From the DNR Garmin menu, choose "Set Projection". Choose UTM NAD83, and the appropriate zone (12 for all NCPN parks except CURE and BLCA which are 13)
  4. From the DNR Garmin menu, choose "Open Garmin GPS". The following window opens:




  5. From this window, click on Waypoint, then Properties. Choose (check) the following fields: type, ident, lat, long, y_proj, x_proj, comment, altitude & model. Click OK to dismiss the Properties window
  6. Click on Waypoint, then Download. All points collected will be downloaded.
  7. Click on File, then Save To, then ArcView, then Shapefile.




8. Navigate to the appropriate folder, and click Save. The newly created shapefile will appear in the active ArcView view window. Notice that X & Y coordinates have been added to the shapefile.