

Southeast Coast Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 1.1.02

Uploading Points to GPS Units—Version 2.0

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Summary

This standard operating procedure (SOP) describes the procedure for uploading coordinates of sampling locations (waypoints) to a Garmin GPSMAP 66i unit. Software used includes ArcGIS 10.x, Microsoft Excel, and NotePad++.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
–	B. Smrekar	Minor edits	Publication of anuran protocol.	1.1
05/25/2023	M. Parrish	Complete revision	New GPS hardware and software now in use.	2.0

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Required Equipment, Software, and Data

- Garmin GPSMAP 66i or similar.
 - USB cable and batteries
- Personal computer running Microsoft Windows 10.
 - Esri ArcGIS ver. 10.x.
 - Microsoft Excel.
 - NotePad++ (available at: www.notepad-plus-plus.org).
- ArcGIS shapefile containing sampling location coordinate data.

Procedural Overview

Permanent sampling location coordinates for the SECN Landbird and Vocal Anuran community monitoring protocols are maintained on the SECN GIS server as an Esri shapefile (*S:\GIS\projects\Wildlife\SL_coords\SL_COORDS_2023.shp*). The coordinates must be transferred to a GPS handheld unit to allow for navigation to each sampling location in the field. The general procedure to accomplish this is:

1. Add the coordinates shapefile to ArcMap and open the shapefile attributes table.
2. Select the sample locations of interest and export their attributes to a CSV file.
3. Open the exported CSV file in Microsoft Excel and parse the latitude/longitude (“lat/lon”) coordinates into a series of XML code lines.
4. Copy the XML code into an XML document created in NotePad++ and save it to the GPSMAP 66i.

This SOP assumes the user has general familiarity with the above software packages.

Export Sample Location Coordinates from ArcGIS

1. Open ArcMap. Add the coordinates shapefile to either an existing or new map. Right click the shapefile and select Open Attributes Table.
2. Select rows containing the coordinates of sample locations of interest. Export the selected records, formatted as a text file with a .CSV extension (comma-separated values).
3. Close ArcMap.

Use Excel to Generate XML Tags from Coordinates

1. Open the CSV file in Microsoft Excel.
2. Delete all columns except for park sample location identifier (*ParkSL*, column A) and sample location coordinates in decimal degree format (*LatDD*, column B; *LonDD*, column C).
3. Create new columns *LAT* (column D) and *LON* (column E) to receive rounded coordinate values.
 - a. Round *LAT* and *LON* to 5 digits based on the value of *LatDD* and *LonDD*.
 - i. D2: =round(B2, 5)
 - ii. E2: =round(C2, 5)
 - iii. Apply formulae to remainder of columns D and E.

	A	B	C	D	E	F	G	H	I	J
1	ParkSL	LatDD	LonDD	LAT	LON					
2	PARK001	10.12345111	-50.12345111	10.12345	-50.12345					
3	PARK002	11.12345111	-51.12345111	11.12345	-51.12345					
4	PARK003	12.12345111	-52.12345111	12.12345	-52.12345					
5										
6										
7										

Figure 1. Sample location (ParkSL) latitude (LatDD) and longitude (LonDD) coordinates imported from ArcMap are rounded to 5 decimal places (as LAT and LON respectively) for use with handheld GPS (precision approximately ± 1.1 m).

4. Copy the contents of columns D and E, then paste the contents back into the same columns “as values.”

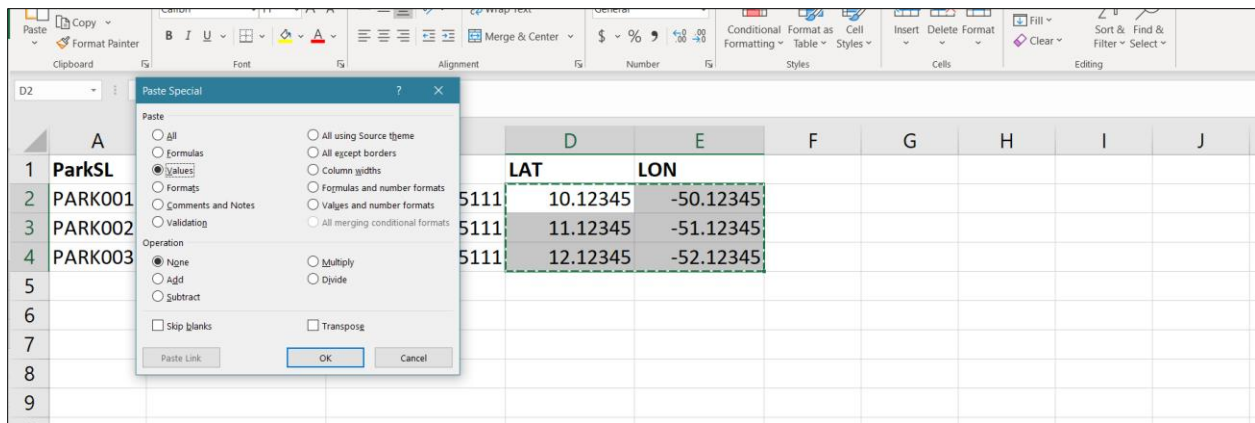


Figure 2. Rounded latitude and longitude (LAT and LON, respectively) are copy-pasted “as values” to remove the cell references to columns B and C.

5. Delete columns B and C (LatDD and LonDD). Enter “XML” as the header for the new column D.
6. Enter the following formula in cell D2. Include the equals sign and place the entire expression on a single line with no spaces between the expressions.

```
= "<wpt lat=""&B2&"" lon=""&C2&""><name>"&A2&"</name><sym>City (Large)</sym></wpt>"
```

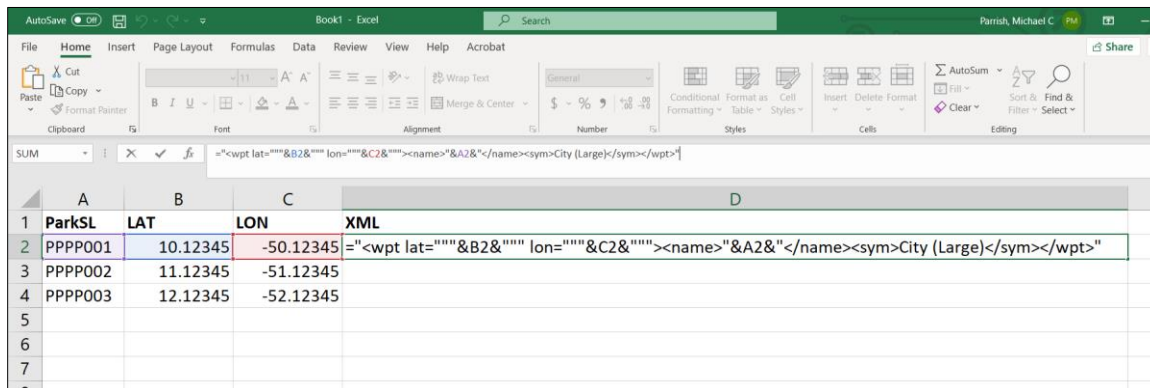


Figure 3. An XML expression is created by referencing sample location (ParkSL), latitude (LAT) and longitude (LON) records.

- a. Press enter to complete the formula. Then copy the formula in cell D2 down column D to the remaining rows and press enter. The result should be a series of cells containing XML tags, as illustrated below.

	A	B	C	D
1	ParkSL	LAT	LON	XML
2	PPPP001	10.12345	-50.12345	<wpt lat="10.12345" lon="-50.12345"><name>PPPP001</name><sym>City (Large)</sym></wpt>
3	PPPP002	11.12345	-51.12345	<wpt lat="11.12345" lon="-51.12345"><name>PPPP002</name><sym>City (Large)</sym></wpt>
4	PPPP003	12.12345	-52.12345	<wpt lat="12.12345" lon="-52.12345"><name>PPPP003</name><sym>City (Large)</sym></wpt>
5				
6				
7				

Figure 4. The XML expression in cell D2 is copied down the remainder of column D, producing all waypoint expressions that will be uploaded to the GPS handheld unit in a later step.

Produce a GPS-readable Waypoints File

1. Open a new tab in NotePad++. Select the Language menu and change the language to XML.
2. Enter the header information (lines 01–03) from Table 1 in the NotePad++ window.

Note: Required trailing white spaces are indicated in Table 1 using a dot symbol (“•”) and must be preserved in a GPX waypoints file. (Input them as a space, not as a dot, in the actual file.)

3. Copy the XML code lines from the Excel document (do not include the Excel headers from row 1). Paste the code into the XML document in NotePad++ on a row following the </metadata> tag, beginning on Row 12 in the Table 1 example.
4. Add </gpx> as the final line of the XML document, as shown in Table 1.
5. Connect the GPSMAP 66i to the PC using the supplied USB cable. Save the XML file with a short file name with a .GPX file extension (e.g., Park2021.GPX). Transfer the GPX file to the ..\Garmin\GPX folder within the GPSMAP 66i file structure.
6. Disconnect the GPSMAP 66i from the PC and restart it. Navigate to the waypoints menu and ensure the desired waypoints were successfully uploaded to the device before departing for the field.

Table 1. XML code used to create a GPX waypoints file compatible with the Garmin GPSMAP 66i handheld device. Waypoints tags (“<wpt>”) are generated in Microsoft Excel from data exported from ArcMap as described above. Three waypoints are depicted below (lines 04-06) as an example, but an unlimited number of waypoints may be included in a GPX file. Required trailing whitespaces are indicated with a dot symbol (●).

Line	XML Code
01	<?xml version="1.0" encoding="UTF-8" standalone="no"?>
02	<gpx xmlns="http://www.topografix.com/GPX/1/1"● xmlns:gpxx="http://www.garmin.com/xmlschemas/GpxExtensions/v3"● xmlns:wptx1="http://www.garmin.com/xmlschemas/WaypointExtension/v1"● xmlns:gpxtpx="http://www.garmin.com/xmlschemas/TrackPointExtension/v1" creator="GPSMAP 66i" version="1.1"● xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"● xsi:schemaLocation="http://www.topografix.com/GPX/1/1● http://www.topografix.com/GPX/1/1/gpx.xsd● http://www.garmin.com/xmlschemas/GpxExtensions/v3● http://www8.garmin.com/xmlschemas/GpxExtensionsv3.xsd● http://www.garmin.com/xmlschemas/TrackStatsExtension/v1● http://www8.garmin.com/xmlschemas/TrackStatsExtension.xsd● http://www.garmin.com/xmlschemas/WaypointExtension/v1● http://www8.garmin.com/xmlschemas/WaypointExtensionv1.xsd● http://www.garmin.com/xmlschemas/TrackPointExtension/v1● http://www.garmin.com/xmlschemas/TrackPointExtensionv1.xsd">
03	<metadata><link href="http://www.garmin.com"><text>Garmin International</text></link><time>2023-01-01T00:00:00Z</time></metadata>
04	<wpt lat="10.12345" lon="-50.12345"><name>PARK001</name><sym>City (Large)</sym></wpt>
05	<wpt lat="11.12345" lon="-51.12345"><name>PARK002</name><sym>City (Large)</sym></wpt>
06	<wpt lat="12.12345" lon="-52.12345"><name>PARK003</name><sym>City (Large)</sym></wpt>
07	</gpx>