



Standard Operating Procedure (SOP) 5:

Using GPS V2.0

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Revision History Log

Prev. Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.0	Dec 2018	M. Dettling and D. Humple	Removed references to antiquated technology and focused document on key reminders relevant to any GPS unit	Text referred to software and units no longer used	2.0

This Standard Operating Procedure is available in digital format from [San Francisco Bay Area Network website](#) and the [NPS Data Store](#).

This Standard Operating Procedure outlines reminders for use of GPS units.

Checklist for GPS users

- Know what coordinate system (e.g., UTM, zone 10) and datum (e.g., NAD83) your project uses. The Landbirds project and California Avian Data Center (CADC) default is Latitude-Longitude, WGS84 (equivalent to NAD83). Using a consistent datum and recording the datum with coordinates is imperative for accuracy. In some areas, points within different datums may vary by 400m or more.
- Download new or updated GPS coordinates taken in the field daily, and/or record your coordinates by hand in the field on your datasheet or printed narrative. It is not uncommon for handheld units to die in the field, which could result in a loss of coordinate data.
- Upload necessary point count GPS coordinates at the beginning of each season so that the most up-to-date coordinates are used. Check the day before to see that all of the points are uploaded for the transect you plan on surveying.
- Always carry a fully charged GPS unit (and extra batteries depending on unit type), and turn off your GPS unit when not in regular use to avoid draining the internal lithium battery.
- Upload any new or modified GPS coordinates to CADC, and add to the site narrative and Point Blue's metadata files, at the end of the field season for archiving and general mapping purposes. Include datum used to record coordinates, date coordinates gathered, and unit type (brand at a minimum) used to generate coordinates. On CADC, the original or previous coordinates should be archived in the notes field associated with the geospatial data for that point.

GPS Unit Setup

Get to know your GPS unit in advance of the field day that you plan to generate coordinates or navigate to established locations. Please refer to your user manuals for specific instructions.

Before taking waypoints in the field, the **GPS navigation display** should be set up to match the **coordinate system, horizontal datum, and units** used at a particular field project's location. The coordinate system used for the Point Blue landbirds project is decimal degree coordinates (latitude/longitude). Use the **WGS84** (World Geodetic System of 1984) datum. These should also match between the GPS computer program (e.g., GPS Utility) and your GPS unit when uploading from a file containing coordinates (e.g., those downloaded from CADC in WGS84) to your unit via a computer interface.

Coordinate Systems, Map Projections, and Datums

Latitude and longitude coordinates (degrees-minutes-seconds or decimal degrees) are referred to as **geographic** coordinates, meaning that they refer to an exact location on the earth's three-dimensional surface. Other coordinate systems are "projected," meaning they reference a map projection

(Transverse Mercator). A **map projection** is a method for **converting the Earth's three-dimensional round surface to the two-dimensional planar surface** of a map.

In any mapping project, whether you are using projected (e.g., UTM) or geographic (e.g., lat/long) coordinates, you will need to reference a **horizontal datum**, which can be described as a **base reference** for a coordinate system. It includes the position of a point of origin, a network of surveyed control points, and a model for the shape of the earth. For more information on horizontal datums, see this ESRI website: <http://www.esri.com/news/arcuser/0401/datum.html> (Accessed: June 9, 2009).

True vs. Magnetic North

It is said that a compass points north. That isn't exactly true. The magnet in a compass aligns itself with the magnetic field of the planet. This field flows between the earth's two magnetic poles, the northern of which is the magnetic north pole. True north is the axial pole centered at the top of the planet where the meridians of longitude converge and around which the planet rotates. **Magnetic declination**--the amount and direction of difference between true and magnetic north--changes with location. At Palomarin, for example, magnetic north is to the east of true north and the difference in 2018 is approximately 13.5°. The variation is therefore 13.5°E, though this changes by as much as 0.1° West per year. In other words, at Palomarin, if your compass is not preset to adjust for this declination, when it reads 0° or 360° magnetic (magnetic north), it is actually pointing to 13.5° true (determined by adding 13.5° to your compass reading; 0°+13.5°); and when you want to use a compass to go towards true North (0° or 360°), you would point it to 346.5° (determined by subtracting 13.5° from your desired direction; 360° - 13.5°). The variation in St. Paul, Minnesota is close to 0°. From there true north is in line with magnetic north. Figure 1 shows 2004 magnetic declination contours for the continental U.S. To calculate the declination at a specific study site, go to the following NOAA website: <http://www.ngdc.noaa.gov/geomagmodels/Declination.jsp> (Accessed: June 9, 2009).

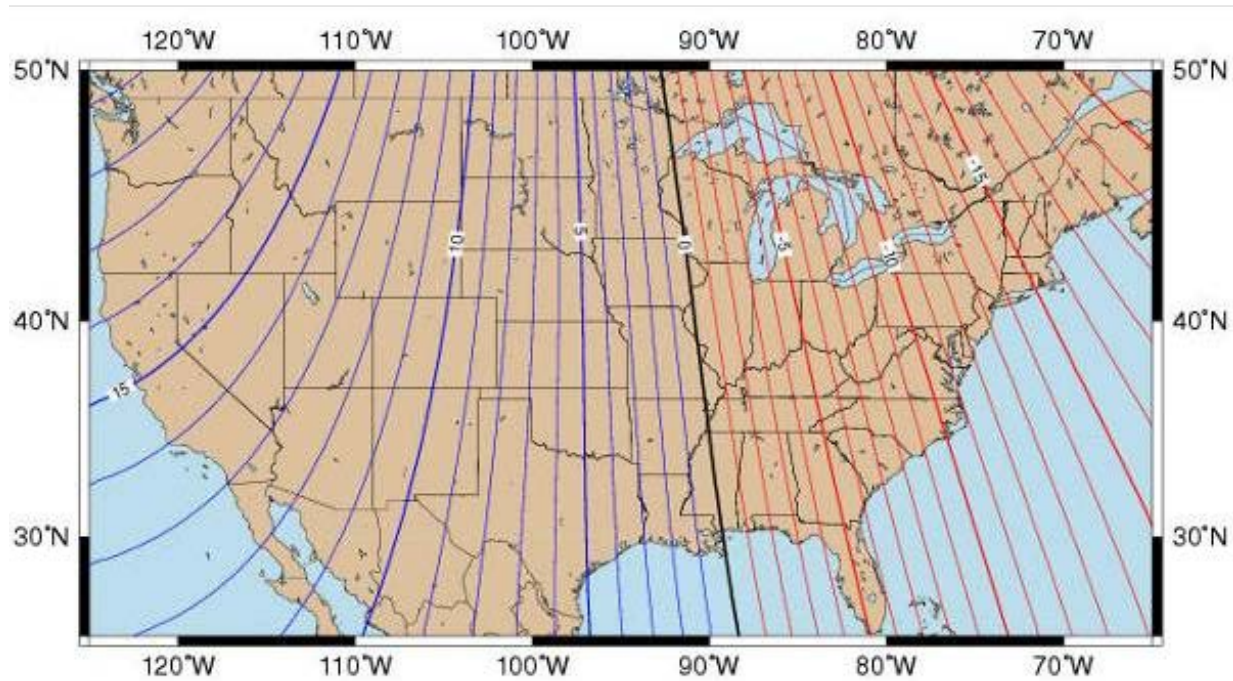


Figure 1. 2004 magnetic declination contours.

Downloading GPS Waypoints

An important part of collecting GPS data is retrieving it quickly and efficiently, so that it may be used for analysis purposes later. **Daily data downloads are STRONGLY encouraged** in order to prevent loss of data. Every field office should have at least one data / **PC interface cable** (make sure that your cables match your GPS units). Once you are set up, this should take less than five minutes per day, and will save you frustration later if your GPS unit falls off a cliff containing the only copy of your data (although recording it on a datasheet in the field is always recommended as well). Follow instructions per whatever compatible software program or system is currently in use at your office for this activity (e.g., GPS Utility).

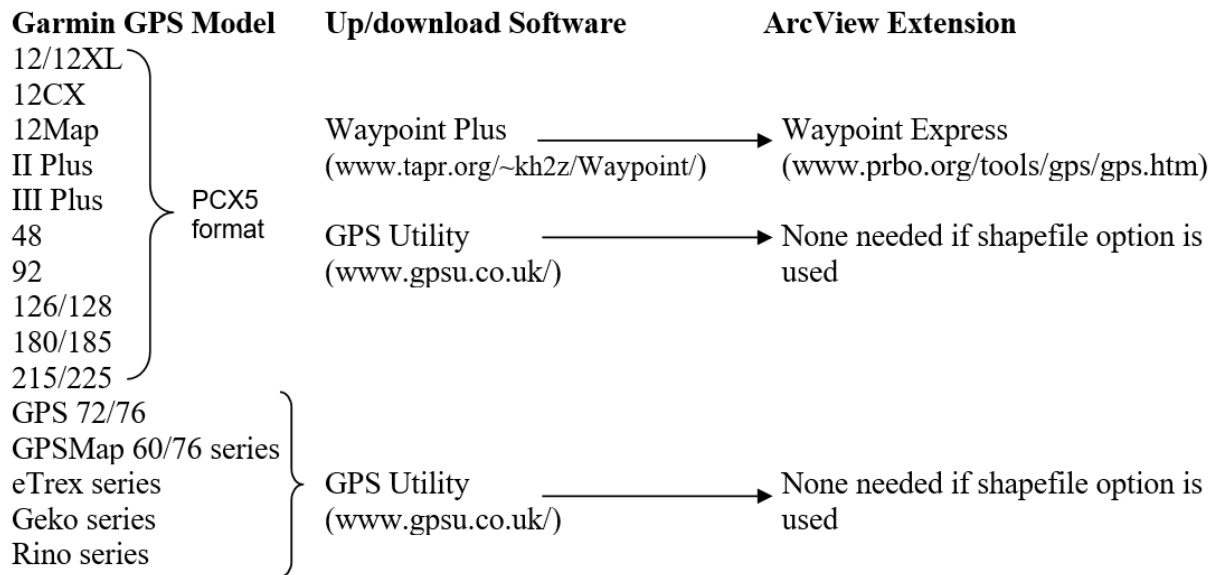


Figure 2. Summary of GPS models and software needed for downloading data and importing to Shapefiles.

Uploading GPS Waypoints

Uploading GPS coordinates is necessary to re-find point locations, nests, mist-net locations, or other features that will help you navigate in the field. Become familiar with how to upload coordinates by referring to the GPS user's manual or by training from an experienced staff person. The source file format might be different than the one required by the GPS unit and might require a program (e.g. GPS Utility, www.gpsu.co.uk) to convert the format. It is recommended that all the coordinates for locations needed in a season be uploaded at the beginning of the season. Since the system used changes with some regularity, it is not documented in detail herein.

GPS Data Management / GIS Lab Coordination

Before going out to a given site for which GPS coordinates are required, biologists or project leaders should download the current copy of the relevant GPS coordinates from CADC (under Locate Your Study Site > Get Maps and Coordinates). Download according to whatever interface system and compatible GPS unit you are using (e.g., GPS Utility). With newer units, you may need to save the file post-download in your interface program as a gpx (interchangeable gps file) and then use Windows to drag and drop it into your connected unit. Since the interface system used changes with some regularity, the process for uploading or downloading coordinates is not documented with much detail herein.

At the end of each field season, biologists should update corrected coordinates into CADC, add to the site narrative and Point Blue's metadata files, and type the historic/changed coordinates into the CADC notes field associated with the geospatial data for that site. Each year that coordinates are updated, a new version of the SOP should be published to IRMA.