Alaska Exotic Plant Management Team (AK-EPMT) Protocol 2009

Last Modified
Whitney Rapp 4/09

Welcome to the Alaska Exotic Plant Management Team! This document will guide you through this summer's field season, including collecting data using Trimble GPS units and a customized Data Dictionary, data management, collecting specimens, taking photographs, and more. Since the same protocol is used throughout the Alaska Region of the NPS, it is intended to maintain high standards of quality in data and consistency among observers. If you have any questions about what is written here, contact data manager Whitney Rapp (907-697-2603, Whitney_Rapp@nps.gov).

The protocol itself is a GPS-based method to map exotic plant infestations and uninfested areas and collect relevant information about them. The data will become part of a database that spans multiple years from across the Alaska Region of the NPS. It will also be incorporated into a statewide database that has been developed to track exotic plant distributions across jurisdictional boundaries.

Most Importantly

From a national performance standpoint, our work is assessed by 1) the number of acres treated and 2) the number of acres controlled (infestation documented eradicated after previous year(s) efforts). We need to ensure that all work gets documented so the year end values reflect our excellent work.

- Number of acres treated – any control effort of EPMT team, volunteers, other park employees, etc. needs to be mapped. If mapping is not feasible, we can work on digitizing areas from sketches, descriptions, etc, but you need to relay all the relevant information to Whitney Rapp
- Number of acres controlled – it is critical that previous infestations are revisited and remapped. If the infestation is gone (yeah!), map the location where it once was and indicate what taxon was there and phenology "not_detected." At the end of season, Whitney will inquire whether you perceive these infestations to be eradicated.

Additionally, some other key points for this year are:

- Future use of herbicides will be determined by past mapping efforts. The plan needs to show that alternative control methods have not been viable over a 3-5 year period. This means we need data over 3-5 consecutive. Treatments to priority infestations and subsequent mapping annually is essential.
- At least two "money" shot photos are needed from every park this year. These shots should include people (arrowheads, uniforms, etc are always good), action, invasive plants, and great backgrounds. Staging the photo is acceptable (glacier background, wildlife, mountains, etc). We want cover photos!

There are many other integral components to our program that will be discussed throughout the protocol.

Starting the Season

Establish Park Priorities for Season

- What are you going to do this summer?
- Where are you going to go?
- What areas need to be revisited?
- What new areas need to be inventoried?
- What are the control priorities?

First, read all the annual field reports for your park whether you are returning or new to the program. The insights from previous years will be invaluable to establishing priorities for this season. Consult with Whitney Rapp for a regional perspective and your park supervisor and/or resource division for a local perspective. Remember that plant phenology will dictate some of your work. In other cases, travel logistics may limit access to areas of the park. Undoubtedly, there will always be more that could have been done, but with a solid set of priorities, you will accomplish a significant amount this summer.

To aid in developing priorities, all previous data was merged to delineate the maximum mapped area of different infestations over the course of the EPMT program. This data is available for GIS, as well as in summary tables sorted by different criteria (park, location, species, ranking, etc). This information will help develop real goals. For instance, if there are 250 infestations of species A (ranking 52) covering 13 acres and 3 infestations of species B (ranking 71) covering 0.009 acres, it should become evident that the priority is species B since it is higher ranked, less abundant, and covers a much smaller area.

As a regionwide priority, map all species with a ranking greater than 50 (Table 1) at a higher precision than you might otherwise since we need to have more precise information on distribution and extent of infestations for planning alternative, non-manual treatments.

Table 1 – Species of greatest threat to Alaska. Species in bold are already known to occur in or near Alaskan National Park Units. All of the following species should be mapped and treated with the highest level of precision. Ranking from *Invasiveness Ranking System for Non-Native Plants of Alaska*.

Scientific Name(s)	Common Name(s)	Rank
Myriophyllum spicatum	Eurasian watermilfoil	90
***Polygonym sachalinense, Fallopia sachalinensis,* P.× bohemicum [cuspidatum x sachalinense], F. x bohemica, P. cuspidatum, F. japonica**	**giant knotweed, Bohemian knotweed, Japanese knotweed**	**87**
Centaurea biebersteinii	spotted knapweed	86
Spartina alterniflora, S. anglica, S. densiflora, S. Patens	cordgrass complex	86
Euphorbia esula	leafy spurge	84
Lythrum salicaria, L. virgatum	purple loosestrife, spike loostrife	84
Phalaris arundinacea	**reed canarygrass, canarygrass**	**83**
Impatiens glandulifera	ornamental jewelweed	82

Scientific Name(s)	Common Name(s)	Rank
Heracleum mantegazzianum	giant hogweed	81
Melilotus alba	**white sweetclover**	**81**
Hydrilla verticillata	waterthyme	80
Nymphaea odorata ssp. *odorata*	white waterlilly	80
Hieracium aurantiacum and Hieracium caespitosum	**orange hawksweed, devil's paintbrush & meadow hawkweed**	**79**
Bromus tectorum	cheatgrass	78
Rubus discolor	Himalyan blackberry	77
Cirsium arvense	**Canada thistle**	**76**
Prunus padus	European bird cherry	74
Sonchus arvensis	**perennial sowthistle**	**74**
Vicia cracca	**bird vetch, cow vetch, tufted vetch**	**73**
Lepidium latifolium	broadleaved pepperweed	71
Alliara petiolata	garlic mustard	70
Brachypodium sylvaticum	false slender brome	70
Cytisus scoparius	English broom, Scotch broom	69
Linaria vulgaris	**yellow toadflax, butter and eggs**	**69**
Melilotus officinalis	**yellow sweetclover**	**69**
Caragana arborescens	**Siberian pea shrub**	**66**
Lonicera tatarica	Tatarian/bush honeysuckle	66
Campanula rapunculoides	creeping bellflower	64
Medicago sativa ssp. falcata	yellow alfalfa	64
Hordeum jubatum	**foxtail barley**	**63**
Senecio jacobaea	ragwort, stinking willie	63
Bromus inermis* ssp. *inermis	**smooth brome**	**62**
Alnus glutinosa	European alder	61
Cardus acanthoides, C. nutans, C. pycnocephalus, C. tenuiflorus	spiny plumeless thistle, nodding plumeless thistle, Italian plumeless thistle, winged plumeless thistle,	61
Cirsium vulgare	bull thistle, common thistle	61
Leucanthemum vulgare	**oxeye daisy, white daisy**	**61**
Hordeum murinum ssp. *leporinum*	leporinum barley, lepor barley	60
Elymus repens	**quackgrass, couchgrass, dog grass**	**59**
Medicago sativa ssp. sativa	Alfalfa	59
Sorbus aucuparia	**European mountain ash, rowan**	**59**
Trifolium repens	**white clover, ladino clover**	**59**
Linaria dalmatica	dalmation toadflax	58
Taraxacum officinale	**common dandelion**	**58**
Gypsophila paniculata	baby's breath	57
Potentilla recta	sulfur cinquefoil	57
Tanacetum vulgare	**common tansy, garden tansy**	**57**
Trifolium hybridum	**alsike clover**	**57**
Convulvulus arvensis	field bindweed, morning glory	56
Lupinus polyphyllus	**bigleaf lupine**	**55**
Phleum pratense	**common timothy**	**54**
Crepis tectorum	**narrow-leaf hawk's beard**	**54**
Ranunculus repens, Ranunculis acris	**creeping buttercup and tall buttercup**	**54**
***Stellaria media* at sea bird colonies**	**common chickweed**	**54**

Scientific Name(s)	Common Name(s)	Rank
Dactylis glomerata	**orchardgrass**	**53**
Trifolium pratense	**red clover**	**53**
Vicia villosa	winter vetch	53
Zostera japonica	dwarf eelgrass	53
Hypericum perforatum	St. Johnswort	52
Poa pratensis* ssp. *pratensis, P. pratensis* ssp. *irrigata, P. trivalis	**Kentucky bluegrass, spreading bluegrass and rough bluegrass**	**52**
Verbascum thapsus	common mullein	52
Digitalis purpurea	**purple foxglove**	**51**
Hieracium umbellatum	narrowleaf hawkweed	51
Rumex acetosella	**sheep sorrel**	**51**
***Fallopia convolvulus* (*Polygonum convolvulus*)**	**black bindweed**	**50**
Tagopogon dubius	yellow salsify, goat's bear	50

General File Management

In an effort to organize data that works well for each team and future users of the files, a suggested file structure is described.

1. In collaboration with your supervisor or IT staff, identify the appropriate place to store your data at your park that is accessible by you, secure, and routinely backed up. This may be on your local machine (C:\) or on a network drive. It is best to co-locate data for 2009 with previous data.
2. Relocate the past year(s) folder or create a folder (such as EPMT_(park code)) in this location that will contain ALL of your data, documents, etc. Within this folder, tiers of subfolders can be created.
3. The suggested file structure is depicted in Fig. 1 with each balloon representing a folder. This is definitely not exhaustive of the possibilities, but it is a framework to organize files, is adaptable for many years, and will be useful for others.
4. In the root folder, create an index document (index.doc or Project_Organizer.doc) in Word that directs people to the various files within the folders. Using hyperlinks will further facilitate others to find relevant information quickly.
5. At the end of the season, make 2 copies of the entire folder to CD or DVD. Label the CD/DVD with EPMT, Park Code, and year. Send one copy to the regional office and store another at your park.

***** All GPS data must be edited and uploaded to the regional drive by the end of every pay period (every 2 weeks).** This will ensure that the data is being processed correctly and timely on your part and that Whitney can process it into the national and statewide databases and make the data available for your use.

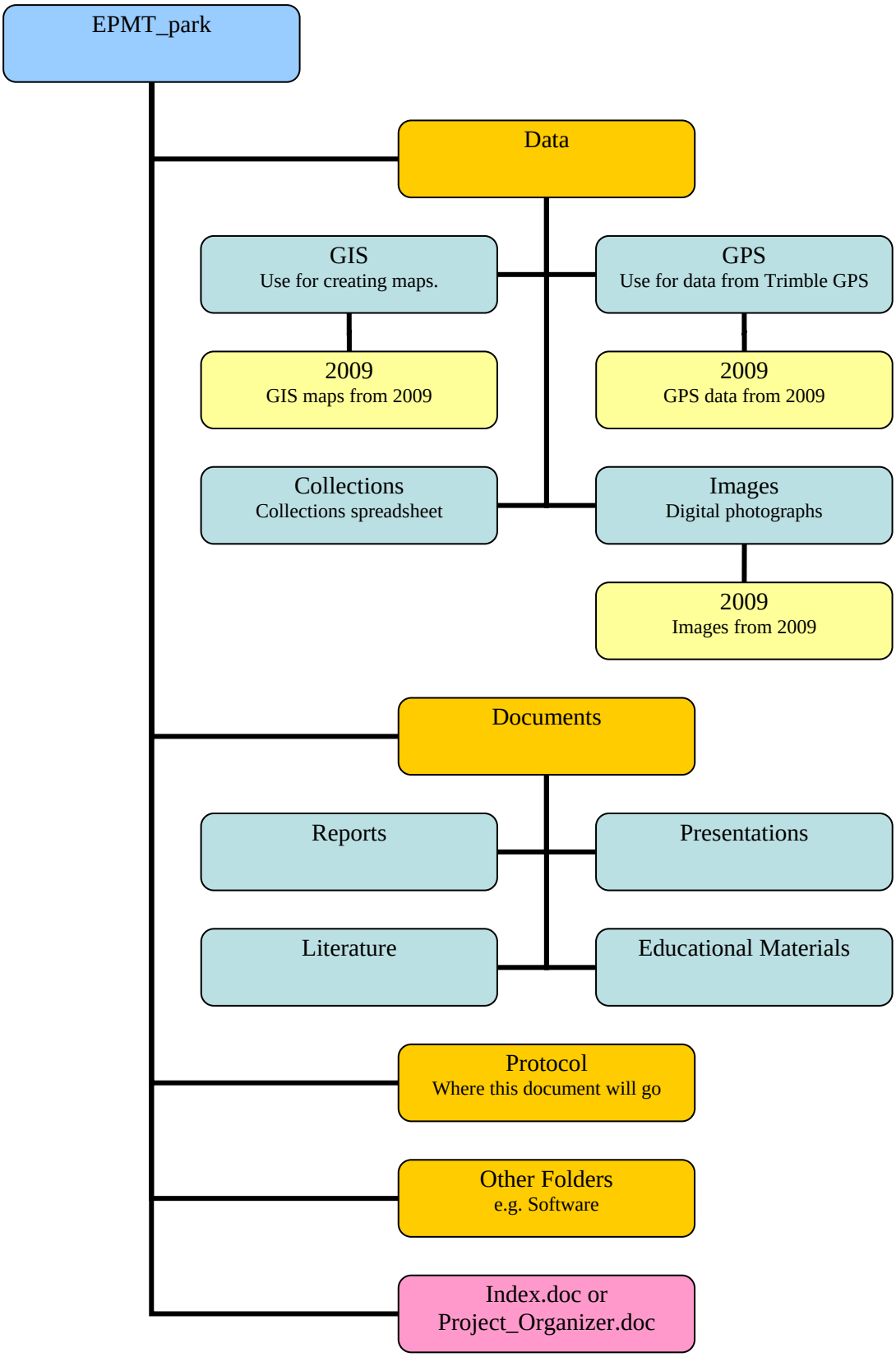


Figure 1 – Suggested file management structure for storing electronic files at your park. Please remember to copy all files to regional drive and/or to CD/DVD at end of season.

Setting up Trimble GPS Units

This protocol does not provide instructions on the operation of Trimble GPS units. The Alaska EPMT will be using primarily Trimble GeoXT receivers and TerraSync 3.30 and Pathfinder Office 4.10 software. More detailed protocols on GPS operation should be addressed through Trimble training provided by Joel Cusick (907-644-3549). Reviewing his training binder may be helpful. In addition, many GPS solutions are posted on the regional GPS web pages - http://inpakroms03web/rgr/gps/tips.htm and http://inpakroms03web/rgr/akgis/index.cfm?action=dsp&topic=gps&item=gps. Finally, these TerraSync guides provide good information – Getting Started Guide.

With that, let's jump right into the EPMT GPS protocol that lies at the heart of our data collection using the Trimble GPS.

GPS Software

- TerraSync (TS) is the software that operates on your GPS. The current version v3.30 is available from Trimble. You will need your TerraSync serial number to upgrade. To run this version, you must also upgrade to Pathfinder Office v4.10.

- Pathfinder Office (PFO) is the software that operates on your computer to process your GPS data. The current version v4.10 is available from Trimble. You will need your Pathfinder Office installation code (serial number) to upgrade.

- ActiveSync is the software that enables your computer to communicate with your GPS. For computers running Windows XP, the current version 4.5 is available online.

Let Whitney know if you are working with older software versions since settings may be different! It is best to uninstall previous versions and install new versions. Depending on your user settings for computer use, you may require an IT specialist to facilitate the software installations.

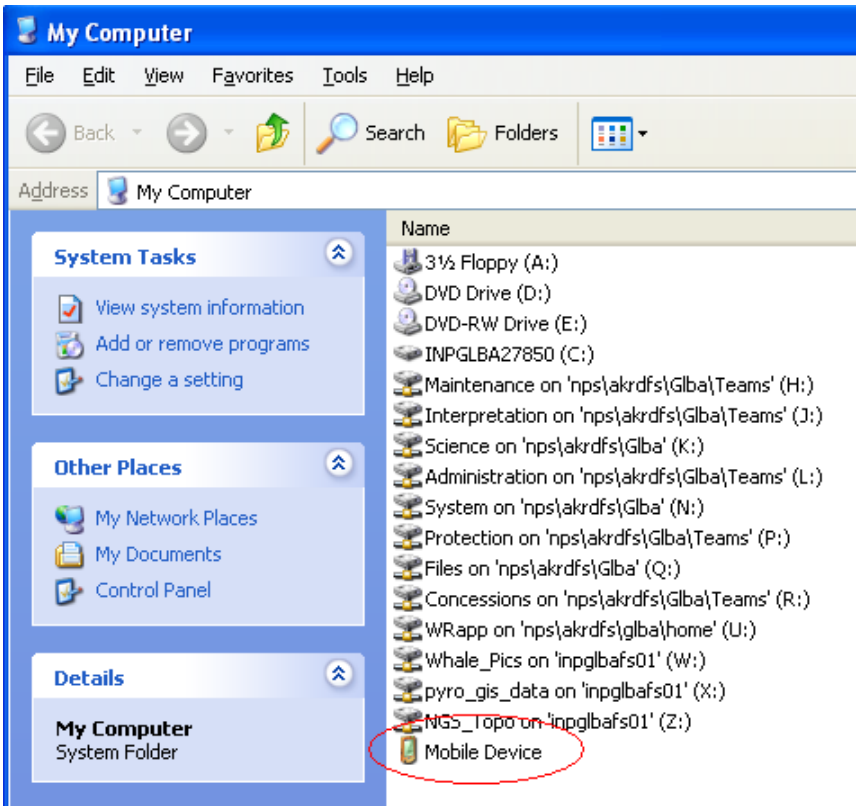
WARNING: If you have a GeoXT 2003 (two buttons on front), these should only be connected to a computer using a USB hub. There have been many cases of power surges frying the computers! The hubs buffer this surge.

GPS Housekeeping at Start of Season

What legacy data will you be carrying around with you this season? None, if you do the proper housekeeping! This will speed up your GPS unit and ensure plenty of storage space.

1. Using PFO, download all the rover files to a backup folder and notify your park's GIS personnel or past users of file locations.

2. In Windows Explorer with your unit connected to the computer, select the Mobile Device from My Computer.



3. Navigate to \Disk\My Documents\TerraSync (most likely location), copy all files to a backup folder on your computer, then delete them from your GPS. Look into other folders as well.
4. Backup your GPS unit (Start>Backup Now).
5. In TS on the GPS, use the File Manager (Data>File Manager) to delete all previous data that is no longer needed. For example, old rover files, data dictionaries, backgrounds, etc. Some background files may still be useable if made for a similar area or purpose.
6. Backup your GPS again.

GPS Transfers

To have the GPS communicate with the computer, you must have Microsoft ActiveSync installed on the computer. Once ActiveSync is installed, the GPS cradle is connected to the computer, and the GPS (already on) is placed in the cradle, the GPS should connect to the computer. If you have problems, try restarting the computer, reconnecting the GPS, and reconnecting the cradle. If you still have problems, try contacting one of us.

GPS Settings

Files must be initially transferred to the Trimble unit using the Data Transfer utility in Pathfinder Office. They are located in the GPS_Settings folder in 2009_OUTGOING. ***Never*** transfer Trimble associated files using Explorer or any other means besides the Data Transfer utility.

Transfer the following files to the GPS:

1. Configuration file (GeoXT2003Summer_09_TerraSync.tcf or GeoXHwithZephyrSummer_09_TerraSync.tcf) following the instructions in the associated word file. If you get an error on the GPS, you are likely not running the current version of TerraSync. For GPS receivers not using TerraSync, contact us.
2. Data Dictionary file (09_AKEPMT_master.ddf) after you have arranged the fields for your own convenience using the Data Dictionary editor utility in Pathfinder Office.
   a. **Do not** remove or add attribute values or data fields.
   b. Arrange the order of attribute values using the up and down arrows so that the ones you use most commonly are at the top of each list. For example, your initials and your park's locations.
   c. Set the values that you use for most records as defaults if desired.
   d. Any field you alter as described above must be altered in all feature classes (Pnt2Buf, Line2Buf, Poly, etc). An easy way to do this is by copying the data field you've altered (ctrl+c), then pasting it into the other feature classes (ctrl+v), and then deleting the duplicate unaltered field it replaces (Delete key).
   e. Save the modified file with your initials (e.g., 09_AKEPMT_WSR.ddf).
   f. Load this modified data dictionary onto your GPS unit. If possible, only use one data dictionary during the season.
3. Data files ([park]_[species code].imp) of data from previous years. In 2009, all past data was merged to show the perimeter of the greatest extent of the infestation mapped in the past. This reduces file size and eliminates cluttered overlapping polygons.

Set time zone:

1. Go to the "Start" menu of the Trimble unit
2. Tap on "Settings"
3. On the "System" tab, tap on "Clock"
4. Verify that the time zone is set to "GMT-9 Alaska" and tap OK.
5. Is the time right after the unit has been outside and received satellite information?
6. Due to the recent changes in Daylight Savings Time, Mobile 2003 units and newer have patches to correct for the time of year shifts. See Joel Cusick's bulletin on updating time.

To standardize our Trimble units for data collection, we are using a configuration file that sets the most important GPS settings to predetermined values.

1. Open up TerraSync on the unit (tap F1)
2. Select "Setup" from the main menu.

3. Below the “Current Configuration:” box, tap on the box labeled “Change”
4. Select “GeoXT2003Summer_08_TerraSync” or otherwise from the menu and tap on “Load”
5. Tap on the “Logging Settings” box from the “Setup” screen.
6. By default, the antenna height is 1.5m. Click on the wrench icon and change the height to your own chest height. You should hold the GPS at this height to collect data. You can enter a height in feet (enter a value “4.25 ft”) and it will automatically convert to meters (“1.295 m”).
7. Still in “Logging Settings,” change the “Filename Prefix” (default ‘R’) to the first letter of your last name. If multiple users use the same GPS, assign individual letters to each unit (such as A and B) and do not modify.

GPS Background Images

Having a background file display on your GPS or in PFO can be very helpful to navigate to a new location or verify that data is correctly recorded. To get a background image to display, you must create a jpg file in ArcGIS, transfer the file, and verify the coordinate systems of the GPS.

1. Make a map in ArcGIS. Some helpful information may include a background photo, USGS topographic maps, NOAA charts, previous data, park boundaries, trails, etc.
2. Record what the map coordinate system is by double clicking on the “Layers” icon in the right navigation window. Look at the “Coordinate System” tab. The map should be in a projected coordinate system (Alaska_Albers_Equal_Area_Conic or NAD_1983_UTM_Zone_8N). Be aware that regional data was converted from NAD27 to NAD83 in 2006.
3. Once the data is arranged as you would like it and the screen has the map extent that you want (zoom in and out to export what is visible in the window), select “Export Map” from the “File” menu.
4. Experiment with different resolutions and qualities. Having a background image will slow down GPS map drawing, so you need to balance between speed and image quality. The higher the resolution and quality, the slower the image will redraw. Since map drawing is affected by how large the map is, you may want to create several smaller maps for different study areas so the GPS has less to redraw at any one time.
5. Check the “Write World File” option and save the map. Adding the resolution to the end of the file name will help remind you of what files are larger and smaller.
6. Open PFO (testing the image in PFO will save you much anguish with the GPS).
7. Select “Coordinate System” in the “Options” window. Define the coordinate system to match the exported map. This is only changing how the data is displayed, not how it is collected or saved. See Table 2 for the correct settings based on the projection of your image. If these options aren’t showing up, you probably do not have the most current version of coordinate system software. To fix, close PFO. Go to C:\Program Files\Common Files\Trimble\GeoData and backup current.csd (make a copy and paste in same folder). Then delete the file current.psd. Re-launch PFO, and it should rebuild the file and provide the needed options.

8. Make sure "Coordinate Units" is in meters and hit "OK."
9. Load the background in PFO by selecting "Background" from the "File" menu. Click "Add" and navigate to the image.
10. Change the coordinate system to match the coordinates you just established for PFO.
11. Select "OK" and the image should load.
12. Verify the image is correctly positioned by opening a data file (.ssf or .cor) and verify that the features align with the image.
13. Connect your GPS to the computer.
14. Using PFO, transfer the image to the GPS using the "Send" tab and "Add"ing a "Background."
15. On the GPS, go to "Setup" in TerraSync.
16. Change the "Coordinate System" to match those defined in PFO (Table 2).
17. Go to "Map" and under "Layers" select "Background File." Choose the correct file.
18. Under "Layers", make sure the "Background" option is checked. Image should display and you won't get an error if all the coordinate systems were properly assigned.

Collecting GPS Data

When you walk up to an infestation of exotic plants, the first question to ask yourself is: can this patch be best represented as a point, a line, or a polygon? Because all patches take up 2-dimensional space, they are all actually polygons. Using GPS units to map exact polygons takes more time, so we sometimes save time by mapping them as points or lines and using a "buffer distance" that the plants extend from the point or line.

In addition to mapping infestations, you should map areas with no exotic species to document that you looked in the area and aid in future monitoring. This is critical baseline data since the absence of exotics is as valuable as the presence of exotics. Use the "none" or "0" option for the data fields to record the absence of exotic plants.

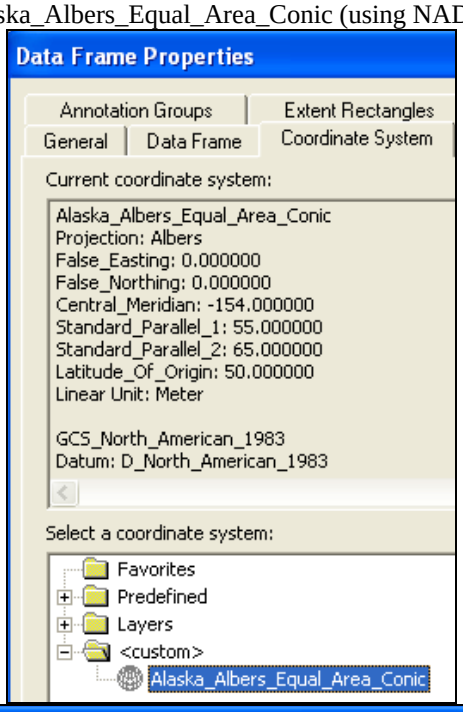
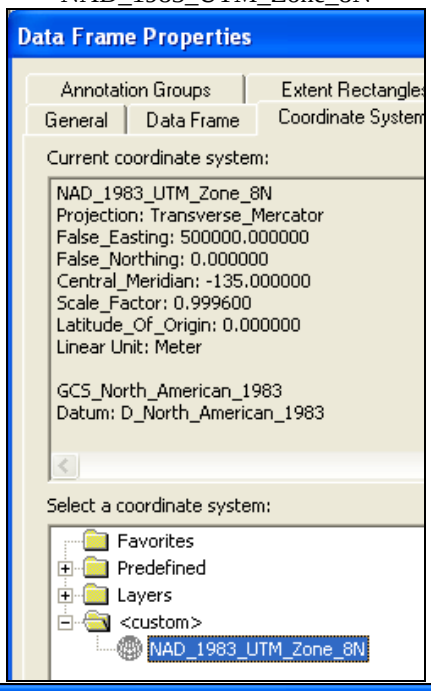
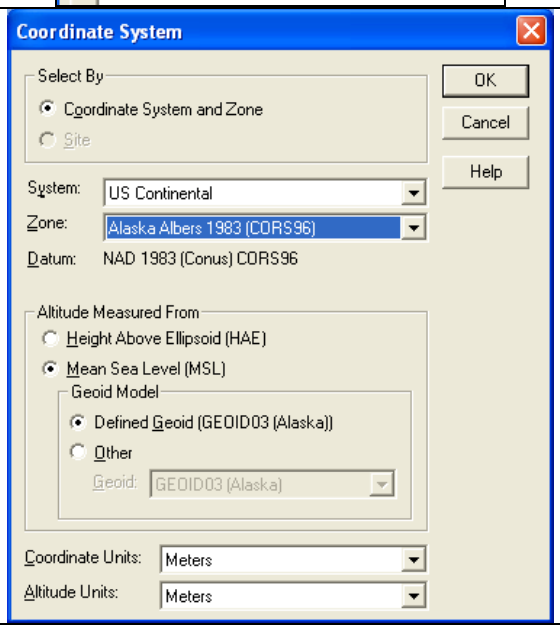
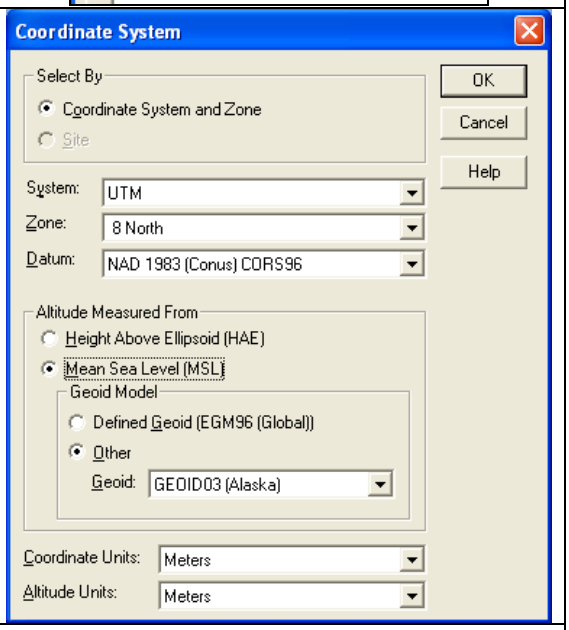
Points

- Use points on a very small patch of plants in a circular shape. Use a "buffer distance" representing the radius of the circle to capture the size of the patch.

Lines

- Use a line to represent a long string of plants along a roadside, shoreline, or similar edge. Apply a "buffer distance" equal to half the width of the linear patch and walk the midline of the patch.

Table 2 – Coordinate settings required for Albers or UTM (KLGO, GLBA, SITK) for use in ArcGIS, Pathfinder Office, and TerraSync.

	Albers (All other AK parks)	**UTM (KLGO, GLBA, and SITK)**
ArcGIS Coordinate System	Alaska_Albers_Equal_Area_Conic (using NAD83) 	NAD_1983_UTM_Zone_8N 
Pathfinder Office Coordinate System		
TerraSync Coordinate System	System: US Continental Zone: Alaska Albers83 (CORS 96) Datum: NAD 1983 (Conus) CORS96 Altitude Reference: Mean Sea Level (MSL) Altitude Units: Meters Geoid Model: Other Geoid: DMA 10x10 (Global) Coordinate Units: Meters Display USNG: Off	System: UTM Zone: 8 North Datum: NAD 1983 (Conus) CORS96 Altitude Reference: Mean Sea Level (MSL) Altitude Units: Meters Geoid Model: Other Geoid: DMA 10x10 (Global) Coordinate Units: Meters Display USNG: Off

Polygons

- Actual polygons are best used to map large or irregular shapes that are not well-represented by points or lines. They should be used to map most infestations of species ranked greater that 50 by the Alaska Natural Heritage Program, in order to provide sufficient precision to be able to document short-term changes in patch shape.

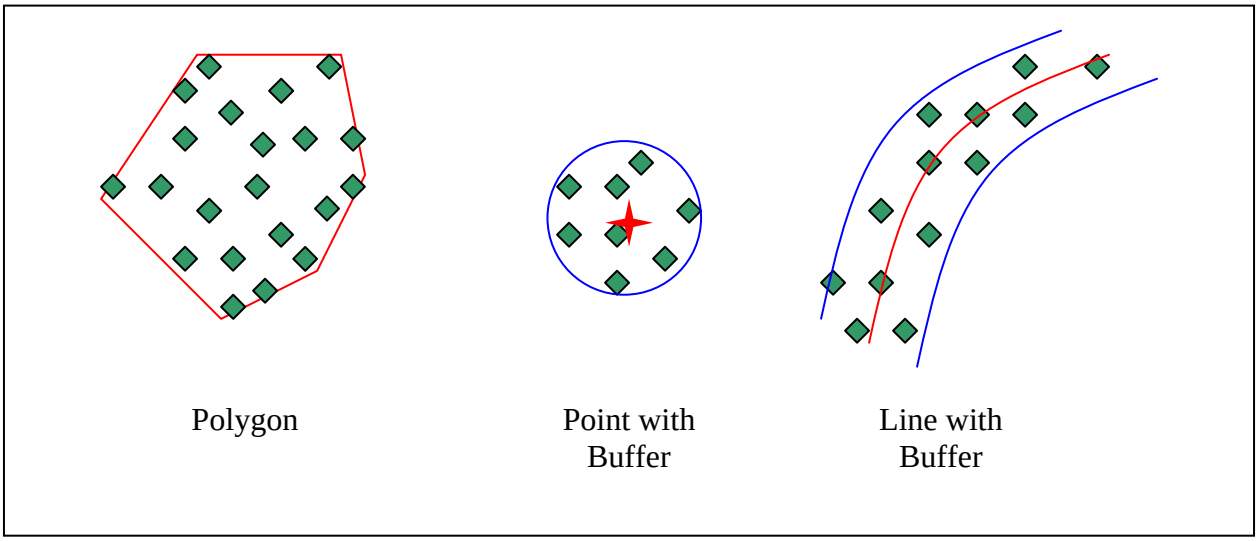


Figure 2 – Green squares represent invasive plant species. The three feature types for mapping infestations are displayed in red with blue buffers where applicable.

Data Dictionary Fields

The standardized data dictionary has fields that help systematically describe plant populations throughout the state.

Table 3 – Description of data dictionary fields used to map exotic plant infestations (Pnt2Buf, Line2Buf, and Poly).

Location_Name	This is the general area where the activity takes place with several possible in and around each park unit. For a description of each area, see the LocationID table below. Note that a single LocationID must either be inside or outside of the park boundary; pay careful attention to this in choosing the appropriate one. You should certainly arrange these in the order of your most common usage.
Disturbance_Type	Because most of Alaska's exotic plants grow only on disturbed sites, we are tracking what disturbance types are being invaded by what species in NPS units. The options are listed in the Disturbance Type table below. The most frequently applicable type is fill importation, which includes roadsides and construction sites.
Site_Description	The location description is an opportunity for you to delineate in words the exact location, as well as any information about that location that might be important. The first provision should enable someone who looks at a table of your data to understand where within the LocationID the work took place without having to use GIS. Take the time while editing to be complete. The second provision

	should note if there is special significance in the location, such as remoteness, proximity to a stream or river, or potential to be easily spread into other areas.
Buffer_Distance_M	This is the buffer distance in meters that will be used to convert points and lines into polygons. If you imagine the shape you will be creating, the buffer distance should extend the point or line to the boundary of the infestation at its maximum distance from the center point or line. The buffer distance will therefore be half the width of a linear shape or the radius of a circle around a point. The GPS unit can also offset a line so that you may walk the edge of a linear infestation, offset the line to the middle of the infestation, and assign a buffer distance according to its width. The buffer for uninfested roads and trails should generally be 5 meters, measured from the centerline of a trail or the barren edge of a road.
Taxon	This is the dominant exotic plant species of a particular infestation. All species that have been reported from Alaska NPS units are on this list. If the species of concern does not appear on the list or you are uncertain of its identity, enter "Other" and note the species or uncertainty in the Comments field. If the mapped area is free of exotic plants, enter "None." Remember to record species ranked greater than 50 precisely rather than as part of another species' infestation.
Phenology	The dominant phenology at the time of the exotic species is especially important for control timing and future planning. "rosette" is for plants that are still young and have not reached their full size. "no_flower" is for plants that are full size, but they are not currently flowering or producing seed. "full_flower" are plants that are currently flowering. "in_seed" are plants that are currently producing seed. "stand_dead" are plants that are standing dead. If there are no exotics present, enter "none". You can clarify in the comments if the species has multiple phenologies. **If you are monitoring a location for a species and it is not redetected, put the name of the species being searched for in Taxon and select "not_detected" in phenology. This will allow us to better track eradications.**
%_Cover	The cover class percentage of the dominant exotic species is a critical measure of an infestation's density. Imagine yourself suspended directly above the polygon you are mapping, including the buffer applied to points and lines. The value you enter is the percentage of the entire area that is covered from this angle by the material of the exotic species, with options of 1, 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95, and 100. This is much easier to do with small areas than with large ones, so start by practicing with small patches and be conservative with your estimates (i.e., do not overestimate). Note that there is a correlation between this value and the buffer distance or size of a polygon: as the buffer distance increases for a particular group of plants, their percent cover of the total area decreases. Do not worry if most of the time the value entered is 1, for this is common with the non-woody, dispersed plant populations we are dealing with. It is most important to record accurately the extent and density of an infestation.
Stem_Count	This is a stem count of the dominant exotic species. Only enter a value when you are certain that you can provide a relatively accurate count of individual plants. If the action is a control event, this is much easier since each person can count the number of plants he or she controls. If the action is not a control event, do not record a value over 100 unless you have carefully counted the plants. You will find during control that there are almost always more plants than you saw at first. If you don't count the plants, leave the field with the default, -9, which indicates no plants counted. A zero should only be used if there are no

	plants.
Action	"Inventory" is the first documentation of a particular infestation, whereas "Monitor" is a follow-up visit to a previously inventoried site from this year or previous years. "Treatment" is the first control effort for a particular infestation and "Retreatment" applies to any subsequent control efforts in either the same or successive years. "Manual" involves pulling or digging. "Mechanical" involves actions like mowing, weed-whacking, chain-sawing, etc. "Chemical" involves the use of herbicides.
%_Treated	Percentage of area treated – 0, 1-25%, 26-50%, 51-75%, 76-95%, 96-100%. Make notes in comment field what was/wasn't treated. For example, removed all flowering plants or many seedlings left.
Control_pers_hrs	Actual person hours spent doing control work for all people involved.
CntrlEffrt	For planning and evaluation, it is helpful to have a relative indicator of the control effort required for a particular infestation. This can be projected if the infestation is not controlled or actual if it is. To standardize, "low" refers to an infestation that could be manually controlled by one person in less than an hour. "Medium" infestations could be controlled by one person in less than an 8-hr. day. "High" infestations would require multiple people or multiple days to control.
Is_Exhaustive	If all the exotic plants encountered were recorded, enter "yes." If only a subset of species are recorded, enter "no." In general, you should record all species; however, if you are trying to map a particular species very accurately, you may want to use this option to ignore other species.
Comments	This is a free-for-all for you to convey anything that seems important about an infestation or uninfested area, such as: control might not work for a particular reason; species' identity is uncertain or not listed in the species list; components of the native plant community; potential for spread if left untreated; data collection is incomplete; where to look if hidden; invading undisturbed plant community; apparent source of infestation; similar native species in the same area; need for monitoring, etc. You are free to use shorthand in the field as long as you make it intelligible during editing!
Park_Unit	Associated park is the four-letter code for whatever park unit you're working in, which should be set as the default value.
Is_Inside_Park	If the area mapped is located on park land, enter "yes"; if it lies outside of the park boundary or on inholdings, enter "no".
Recorder_Name	These are the initials of the person using the Trimble unit. Set your initials as the default value.
Team_Name	If you are performing the activity in question alone or with help, enter "AKEPMT". If you are recording the accomplishment of volunteers or SAGA, enter "Volunteer", or of other NPS personnel, enter "Other".
2Taxon, 3Taxon… 2Phenology, 3Phenology… 2%_Cover, 3%_Cover… 2StemCount, 3StemCount…	We have provided additional fields for 9 more exotic species other than the dominant species at a particular site. In general, we prefer that you record each species individually with its own shape rather than use these additional fields. This option is provided to save you time when there is a whole complement of species infesting the same area and you don't have time to map them individually. Remember that if the extents of each species are not the same, this option should not be used. For each additional species, you must also enter the phenology, percent cover, stem count, action, and control effort (see above) using additional fields provided.

2Action, 3Action… 2Control_Effort, 3Control_Effort…	
StartDate, StartTime	Don't worry about these fields, because the unit creates them automatically for each feature recorded.

Table 4 – Description of generalized locations for field Location_Name.

Park Unit	LocationID	Location Description	In Park?
BELA	serpentine_springs	Serpentine Hot Springs and ATV trails radiating out from there	yes
CAKR	dmts_rd	road from Red Dog Mine to port	yes
CAKR	kakagrak_hills	abandoned military base and airstrip	yes
CAKR	kotzebue	Kotzebue and surroundings	no
DENA	first_mile	park road from the entrance at the Parks Highway to headquarters, including headquarters, housing, sled dog area, etc	yes
DENA	kantishna	inholdings at the end of the park road after Wonder Lake	yes
DENA	mckinley_village	development along Parks Highway outside the boundary	no
DENA	nenana_river	banks of the Nenana River	no
DENA	park_rd	park road between headquarters and Kantishna	yes
DENA	parks_hwy	Parks Highway along boundary	no
DENA	railroad	along railroad tracks, near depot, including airstrip	yes
DENA	south_side_denali	Denali south of the Alaska Range	yes
GAAR	kuyuktuvuk	Kuyuktuvuk watershed, including Oolah Pass	yes
GAAR	noatak_river	along Noatak River	yes
GLBA	bartlett_cove	frontcountry Glacier Bay, including lodge	yes
GLBA	beardslees	Beardslee Islands	yes
GLBA	dry_bay	Dry Bay and vicinity	yes
GLBA	dundas_bay	Dundas Bay and surrounding areas	yes
GLBA	east_arm	coastline of the East Arm of Glacier Bay	yes
GLBA	glacier_bay_other	Other areas of park not in Dry Bay, Dundas Bay, or main Glacier Bay	yes
GLBA	gustavus	Gustavus and surroundings	no
GLBA	main_bay	the portion of Glacier Bay to the south of the two arms	yes
GLBA	west_arm	coastline of the West Arm of Glacier Bay	yes
KATM	10000_smokes_rd	entire road leading to the valley of 10000 smokes	yes
KATM	brooks_camp	brooks camp and surrounding area	yes
KATM	katm_outer_coast	anywhere along the katmai coastline	yes
KATM	king_salmon	King Salmon and surroundings	no
KATM	lake_camp	entire lake camp road, boat ramp area, and parking area	yes
KEFJ	exit_glacier	Exit Glacier Road and associated development and trails	yes
KEFJ	kefj_outer_coast	anywhere along the Kenai Fjords coastline	yes

Park Unit	LocationID	Location Description	In Park?
KEFJ	seward	Seward and surroundings	no
KLGO	chilkoot_trail	the Chilkoot Trail Unit	yes
KLGO	dyea	Dyea and surroundings	yes
KLGO	dyea_road	Road to Dyea and surrounding area not in park	no
KLGO	klondike_hwy	Klondike Highway above Skagway, except for White Pass Unit	no
KLGO	skagway	Skagway and surroundings	no
KLGO	white_pass	the White Pass Unit	yes
KLGO	white_pass_railroad	Railroad corridor outside of White Pass unit	no
LACL	lacl_outer_coast	anywhere along the outer coast of LACL	yes
LACL	port_alsworth_nps	NPS headquarters in port alsworth and surrounding areas	yes
LACL	port_alsworth_town	town of port alsworth and surrounding areas	no
LACL	twin_lakes	anywhere around twin lakes	yes
SITK	sitka	Sitka and surroundings	no
SITK	sitka_park	Sitka National Historic Park	yes
WRST	chitina	Chitina and surroundings	no
WRST	copper_center	Copper Center and surroundings	no
WRST	copper_rvr	along Copper River	no
WRST	edgerton_highway	Old and New Edgerton Highway from Richardson Highway to Chitina	no
WRST	glenallen	Glenallen and Glenn Highway	no
WRST	kennicott	Kennicott (Town and Mine Site), Bonanza Ridge and Root Glacier Trails	yes
WRST	may_creek	NPS compound, airstrip, and surrounding roads and trails	yes
WRST	mccarthy	McCarthy and surroundings	yes
WRST	mccarthy_rd	region from Copper River bridge to Kennicott River plus ATV trails	yes
WRST	nabesna_rd	Nabesna Road and ATV trails	yes
WRST	remote_airstrip	Peavine, Huberts, Tana, Jake's, C-N confluence, Chisana so far	yes
WRST	richardson_highway	Richardson Highway from Gakona Junction (north) to Edgerton Highway (south) , except for Copper Center	no
WRST	slana	area outside of the park at the entrance to the Nabesna Road	no
WRST	tok_cut_off	along Tok Cut-off from Slana to Gakona Junction	no
WRST	viscenter	headquarters and visitor center complex	yes
YUCH	coal_creek	coal creek camp and surrounding areas	yes
YUCH	yukon_river	along Yukon River	yes
	other	DESCRIBE LOCATION IN COMMENTS	

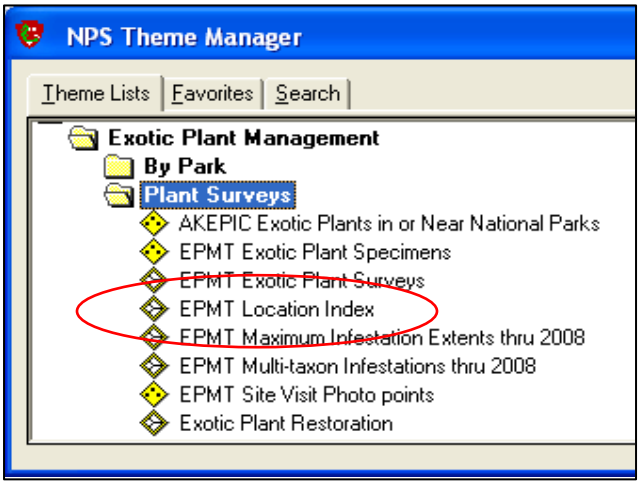


Figure 3 – EPMT location index in Theme Manager.

To visually see the delineation of each LocationID, refer to the "EPMT Location Index" theme in ArcGIS that can be loaded using NPS Theme Manager (Fig. 3).

Table 5 – Description of the disturbance types for field Disturbance_Type.

Disturbance Type	Disturbance Description
ABDHOME	Abandoned Homesite
ANIMAL	Animal Related Disturbed Site
BRSHCUT	Mechanical Brush/Tree Cutting
COASTAL	Coastal/Beach
FLIMPRT	Fill Importation (e.g. Road or Railroad)
GLACIER	Glaciation
GRAZING	Grazing
HRBCIDE	Herbicide Application
LOGGING	Logging
MATEXTR	Material Extraction (e.g. Quarry)
MINING	Mining
MOWING	Mowing
ORVDST	ORV Disturbance
OTHER	Other Mechanical Substrate Alteration
PLOWING	Plowing
RIVER	River Action
SLIDE	Landslide/Avalanche
STREAM	Stream Action
THERMAL	Thermal Disturbance
TRMPLNG	Trampling
VOLCANO	Volcanic Action
WIND	Wind Disturbance/Erosion
WLDFIRE	Wildfire
WNDTHRW	Windthrow
NONE	No Disturbance

General Tips for Using the GPS

1. While recording a feature, hold the unit head-high and away from your body, so that it can "see" more sky.
2. The logging interval (how often the unit records a position within a feature) has been set in the data dictionary to one second for points and five seconds for lines and polygons. This is the desired interval; however, when satellite availability is marginal the 5 seconds may be too long to collect sufficient points. In this situation, temporarily change the logging interval to 1 second
    1. While in the Data view (because you're collecting a feature) tap "Options"
    2. Select "Logging Interval" and change the "Logging Interval" to "1s"
    3. When good satellite coverage resumes, readjust the interval to "5s"

- We recommend recording at least 15 positions for points and enough positions for lines and polygons to delineate the shape (more around corners and curves, fewer for straight sections).
- For the integrity of the data, it is a good idea to begin a new rover file every few hours rather than using the same one all day. Also, make sure each event (different location, different crew, etc) is in a separate rover file.
- Remember that you can always press "Pause" to stop the recording of positions temporarily while the feature is still open. This is helpful if you have to maneuver around an object, but you do not want to map your deviation.
- Stopping and resuming a feature. If you are mapping a large area with multiple common species (such as a long road) and suddenly stumble upon an unusual species, you should map the unusual species more accurately then lumping it into the larger polygon. In this case, stop the existing feature, map the specific feature, then resume the original feature.
    - If the new feature will be a point (including photo point or collection), then use the "Nest" option:
        1. Pause the feature you have been collecting.
        2. Within the data screen, select "Options" > "Nest" > and select appropriate feature type.
        3. Record the new feature.
        4. When you are complete and hit OK, you will return to the feature that you originally paused.

    - If the new feature will be a line or polygon, then stop, map the new one, and resume:
        1. In TerraSync, stop the current feature by clicking "OK."
        2. Map the new feature.
        3. To resume the original feature, in the menu where you usually pick the feature type, switch "Collect" to "Update Features."
        4. Select the feature you want to resume. It is probably the second closest distance, and you will be able to see the comment along the bottom of the screen.
        5. Click "Begin" followed by "Log."

6. Select “Continue Feature (Append)” to continue adding points to the original feature.
7. End the feature like normal.
8. To collect a new feature, you will need to change “Update” back to “Collect.”
9. You will only be able to update recent features, so do not map multiple new features and plan to return to the original feature.

- Turn on/off sounds when collecting positions
    1. On the Start Menu tap on “Settings”
    2. On the “Personal” tab, select “Sounds and Notifications”
    3. On the “Volume” tab, check “Programs” and “Notifications” and adjust the volume bar.
- Offset feature. In general, you should map the boundaries with buffer as exactly as possible; however, sometimes you will be unable to map an edge because of satellite coverage (e.g., under trees, next to a building) or physical barriers (e.g. river, fallen trees). In these cases, you can map a set distance from the target and set the offset and direction. The offset applies to the whole feature, so plan ahead!
    1. With the feature already open, select “Offset” from the “Options” menu.
    2. For a line or polygon, the direction is the direction the target is from you as you walk the segment. The horizontal distance is the distance that you are from the target edge.
    3. For a point, you have 5 options: Distance-Bearing, Distance-Distance, Triple Distance, Bearing-Bearing, Triple Bearing. See this QuickStart file for more information.

Monitoring

All control sites from previous years should be monitored and retreated this summer. The reason for this is that we need to know what is working and what is not. Beyond this, it is generally recommended for any exotic plant control that the site be monitored into the future, because there may still be a seedbank in the soil or plants may resprout. For control sites where there are exotic plants present upon return, control the site again and plan to return within a month or so to evaluate the effectiveness.

Loading Data Files

A merge of all previous years’ data has been transformed into species specific data files for each park (example GLBA_BROINE.imp) for use on the GPS units. Once transferred to your GPS unit using PFO, the data files can be used in one of two ways

Data file as background

As a background, the polygons are visible on the "Map" screen, and you can collect features in a rover file, but the attribute information of the data file is not accessible. You can load multiple background files, which would allow a background image plus several taxa.

- Within TerraSync, select "Map" screen. From the "Layers" menu, select "Background Files." Make sure the "Show Data Files" is selected. Select the data file(s) to display.
- The polygons are now loaded as a background image.
- None of the attribute information is accessible, but you can navigate to the polygons and collect features in a rover file.

Data file as existing data file

When the data file is loaded as an "Existing Data File", the polygons are visible on the "Map" screen, and you can view the attribute information, but you can not collect new features or open other rover files.

- Within TerraSync, select "Data" and "Existing."
- Highlight the appropriate taxon data file and select the "Open" button.
- The data file is now open like a rover file, but you **should not** collect new features.
- Under "Options" in either "Data" or "Map," you can "Filter" the data. For example, you could filter by park or by management action. The filtered polygons will display as green.
- From the "Data" screen you can see the distance to the nearest polygons.
- Any polygon's attributes can be opened by highlighting it in the "Data" screen and selecting "Begin." From the "Map" screen, you can select a polygon using the "Select" arrow from the upper left menu. This will display the summary labels. By selecting "Update Selected Feature" from the "Options" menu, you can then see all of the polygon's attributes. Do not log positions since this would change the data!!!
- To collect new features, you must return to the "Data" screen, "Close" the data file, and reopen a rover file or begin a new rover file.

Navigating to Previously Recorded Polygons

Particularly when treating and monitoring previously documented sites, it is important to be able to relocate a site. Using the "Map" screen is generally much easier than using the "Navigation" screen.

Using Map screen

With a data file loaded as either a background or existing data file, you will see the polygons relative to your position. As you walk, your trail will display, and you will be able to modify your path to get to your target. If this is not enough, you can set "Nav Start" and "Nav Target" through the "Options" menu. "Nav Start" should be "GPS," which is your current position (a single flag will appear). Click on the screen where you want to go and then select "Nav Target" as "Map Point" (two crossed flags will appear). The blue line connecting these two locations is the direct path. Under "Options", selecting "Cross-Track Light Bar" will display a bar at the top

of a map that will indicate the relative direction you need to go to get to the target (this only works when you are moving).

Alternatively, you can set the "Nav Target" to the polygon desired if the data file has been opened in the Data screen. By selecting the polygon, under "Options" you can then set the target as either the "Start/End" or generally better the "Centroid."

Using Navigation screen

Set the "Nav Start" and "Nav Target" as described above. The "Navigation" screen will display a number of variables of your position relative to the target, including distance, heading, bearing, etc. that are selectable by you. The cross-track bar will display on the top as well to show relative direction of travel needed. The central circle also shows the desired path. Holding the GPS in front of you, the arrow within the circle points in the desired direction. You need to be moving for the GPS to provide directional information.

Restoration

For parks engaged in restoration activities, a polygon feature should be collected to record the total number of person hours, what native species were added, and in what form the native plants were. Additional fields for a revisit date and description of care/maintenance and survival rate are included, but they may be easier filled in after the fact in PFO.

Table 6 – Description of attributes within feature Restoration.

Location_Name	This is the general area where the activity takes place with several possible in each park unit. For a description of each area, see the LocationID table (Table 4). Note that a single LocationID must either be inside or outside of the park boundary; pay careful attention to this in choosing the appropriate one. You should certainly arrange these in the order of your most common usage.
Disturbance_Type	Because most of Alaska's exotic plants grow only on disturbed sites, we are tracking what disturbance types are being invaded by what species in NPS units. The options are listed in the Disturbance Type table (Table 5). The most frequently applicable type is fill importation, which includes roadsides and construction sites.
Site_Description	The location description is an opportunity for you to delineate in words the exact location, as well as any information about that location that might be important. The first provision should enable someone who looks at a table of your data to understand where within the LocationID the work took place without having to use GIS. Take the time while editing to be complete and also try to be concise. The second provision should note if there is special significance in the location, such as remoteness, proximity to a stream or river, or potential to be easily spread into other areas.
Comments	This is a free-for-all for you to convey anything that seems important about a restoration, such as purpose, what exotic species you are trying to prevent, suggested maintenance or additional restoration, etc. use all lower case for consistency except for proper names.
Park_Unit	Associated park is the four-letter code for whatever park unit you're working in, which should be set as the default value.

Is_Inside_Park	If the area mapped is located on park land, enter “yes”; if it lies outside of the park boundary or on inholdings, enter “no”.
Recorder_Name	These are the initials of the person using the Trimble unit. Set your initials as the default value.
Team_Name	If you are performing the activity in question alone or with help, enter “AKEPMT”. If you are recording the accomplishment of volunteers, enter “Volunteer”, or of other NPS personnel, enter “Other”.
Hours	This is the total person hours (number of people multiplied by the number of hours) that were spent restoring the area.
Native_taxon	A text field to record the scientific name of the native species used during restoration.
#_Planted	Number of individuals planted. If seeds, describe the volume or weight and clarify in the comments.
Type	Form of the native plant. This is a list including cutting, fruit, individual, rhizome, runner, seed, seedling, stem, and transplant.
2Native_taxon, 3 Native_taxon … 2#_Planted, 3#_Planted … 2Type, 3Type…	Additional fields for 4 more native species used during restoration.
Revisit_Date	Date of site revisit. This field is most likely to be filled out in the office using PFO after the initial polygon feature collection.
Care_Maintenance	Description of any care or maintenance that occurred at the site after the initial restoration. This field is most likely to be filled out in the office using PFO after the initial polygon feature collection.
Survival_Rate	Description of the survival rate of the native plants added to the restoration area. This field is most likely to be filled out in the office using PFO after the initial polygon feature collection.

Processing GPS Files in PFO

All GPS data that you collect this summer will be processed using Pathfinder Office (PFO) software, Trimble’s desktop data management software. At the beginning of the season, make sure the software is updated and that it will continually update by selecting the option in the help menu (Fig. 4). Depending on your park’s computer settings, you may not be able to automatically update software. Talk to your local IT staff for assistance.

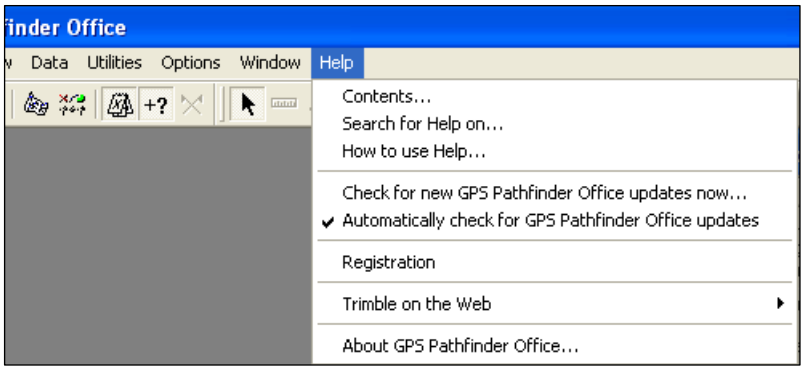
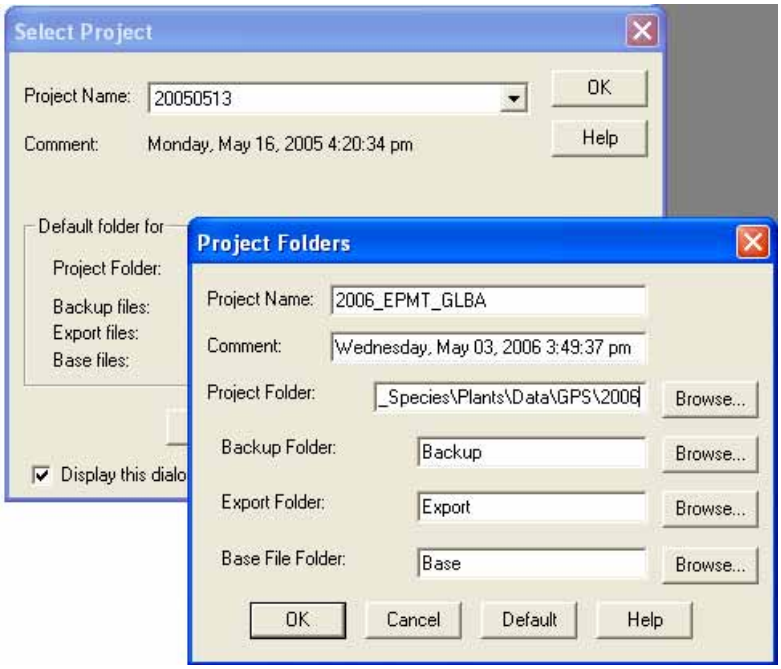


Figure 4 – Enable Pathfinder Office to automatically update by selecting the option in the "Help" menu.

Setting up a Project

1. Open GPS Pathfinder Office (PFO).
2. The first time you download GPS files for the season, create a new project for your park by selecting "New"
3. Give the "Project Name" the title "2009_EPMT_(park code)" and browse to the …\Data\GPS\2009 folder for the "Project Folder."

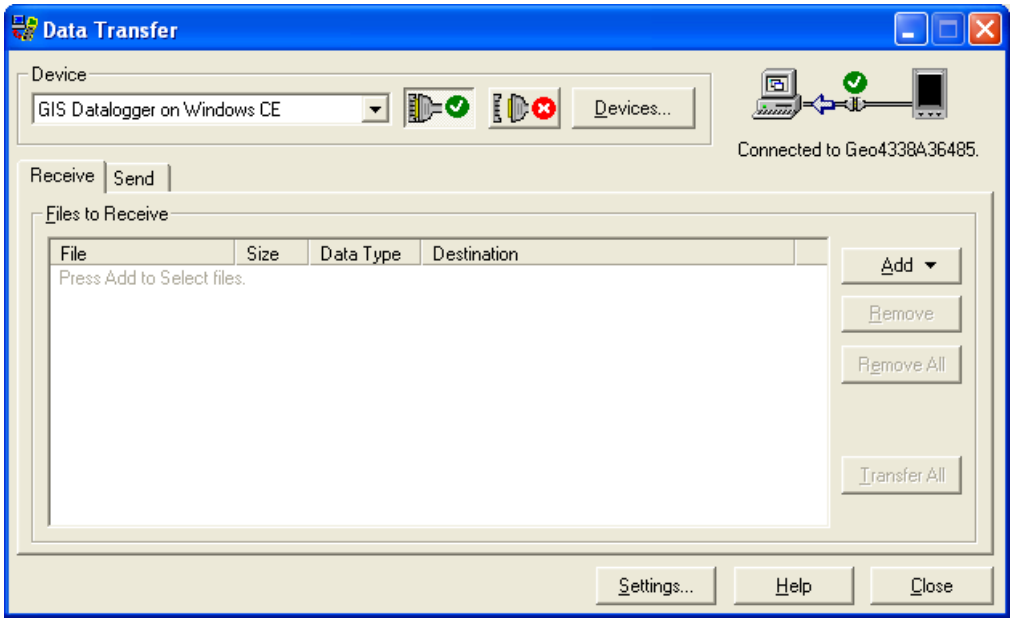


4. Select "OK"
5. Click "Yes" when it asks, "Folder already exists Do you want to continue?"
6. Creating the new project creates 3 new folders within …\Data\GPS\2009 – Backup, Base, and Export.
7. In Explorer, create one more folder (Final_Edits) within the project folder.

8. For the rest of the season, select the project name from the drop down menu that appears in the “Select Project” screen.

Transferring Rover Files

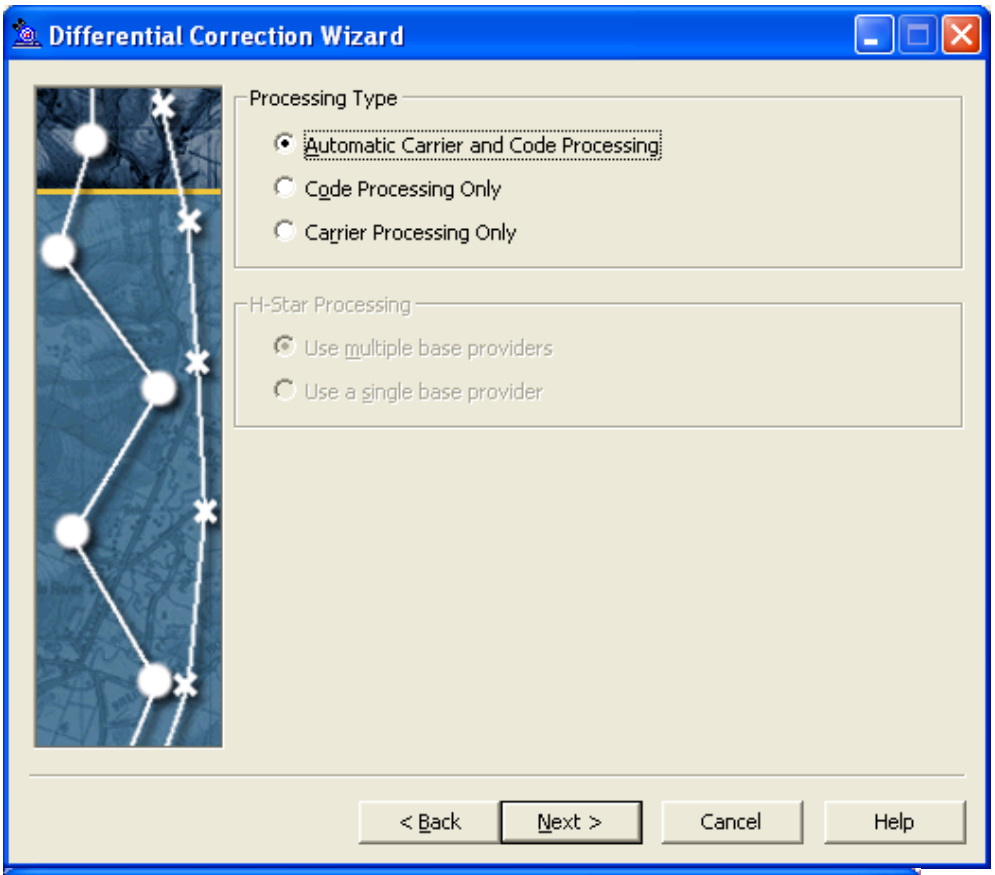
1. Transfer your rover files (.ssf) from the GPS unit to this folder as soon as possible after data collection.
2. In PFO, select “Utilities” > “Data Transfer”

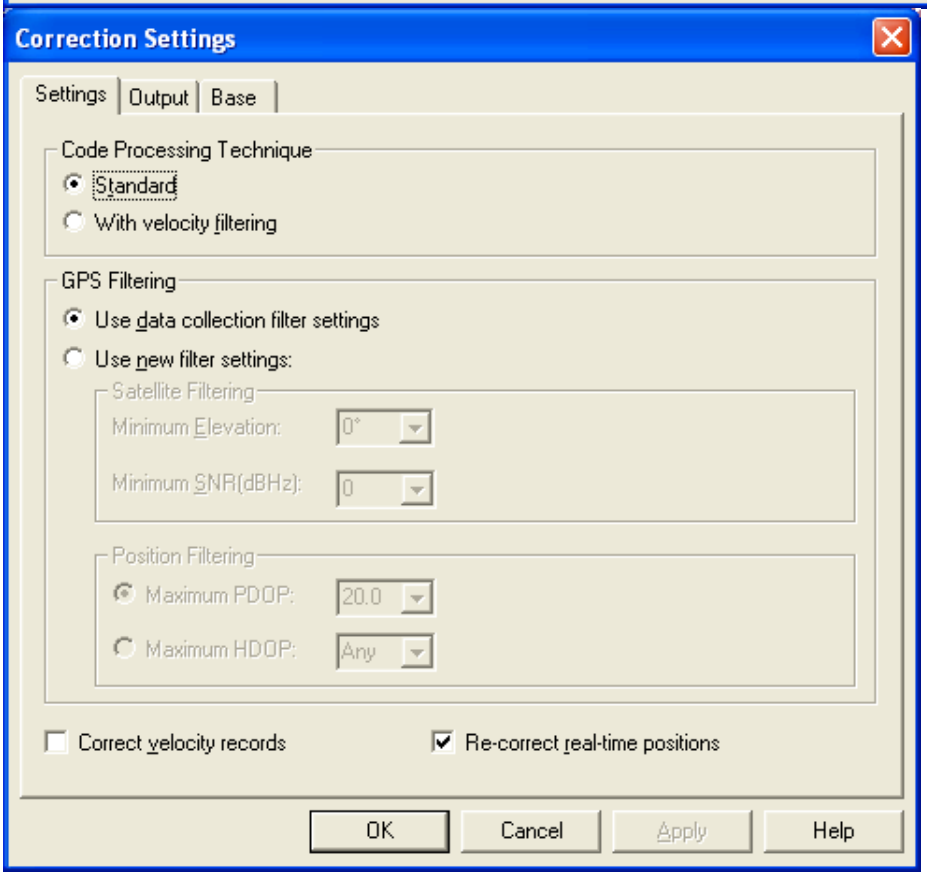


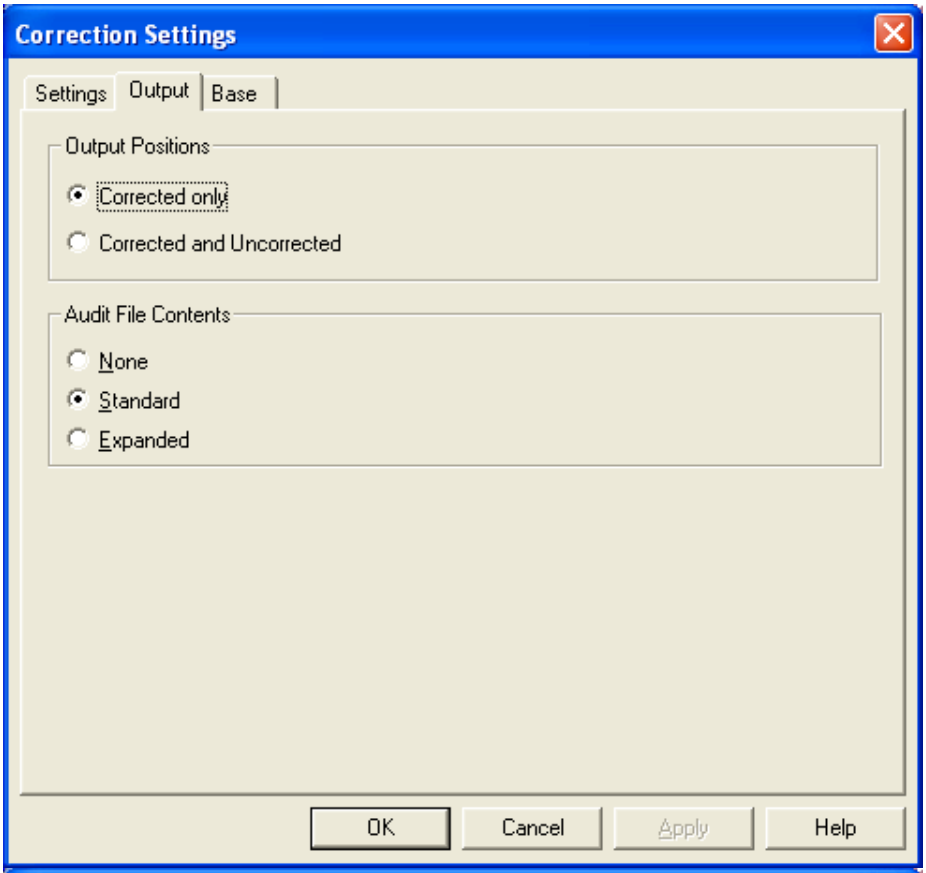
3. Make sure the device is “GIS Datalogger on Windows CE”
4. If Activesync has created a connection, the GPS should connect (status in upper right) automatically or when you click the button with the green circle with check mark.
5. Click “Add” and “Data File”
6. Select all the files needing to be transferred.
7. Click “Transfer All.”
8. Back up your rover files immediately in the project Backup folder.

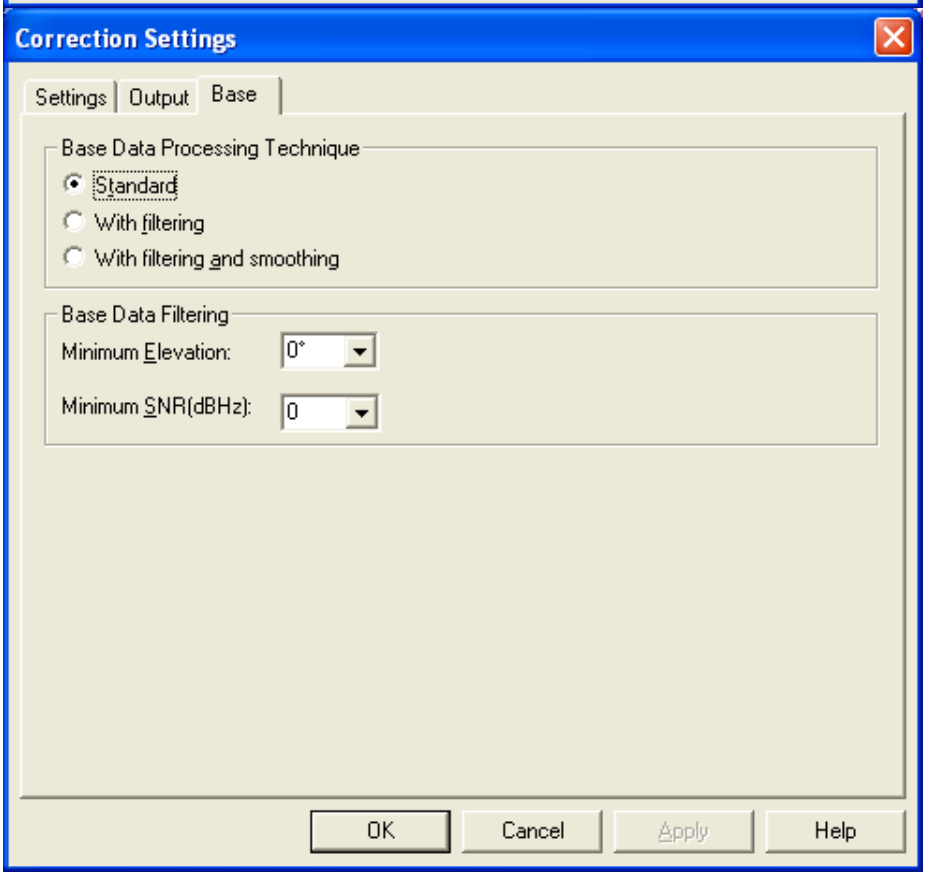
Differentially Correcting Rover Files

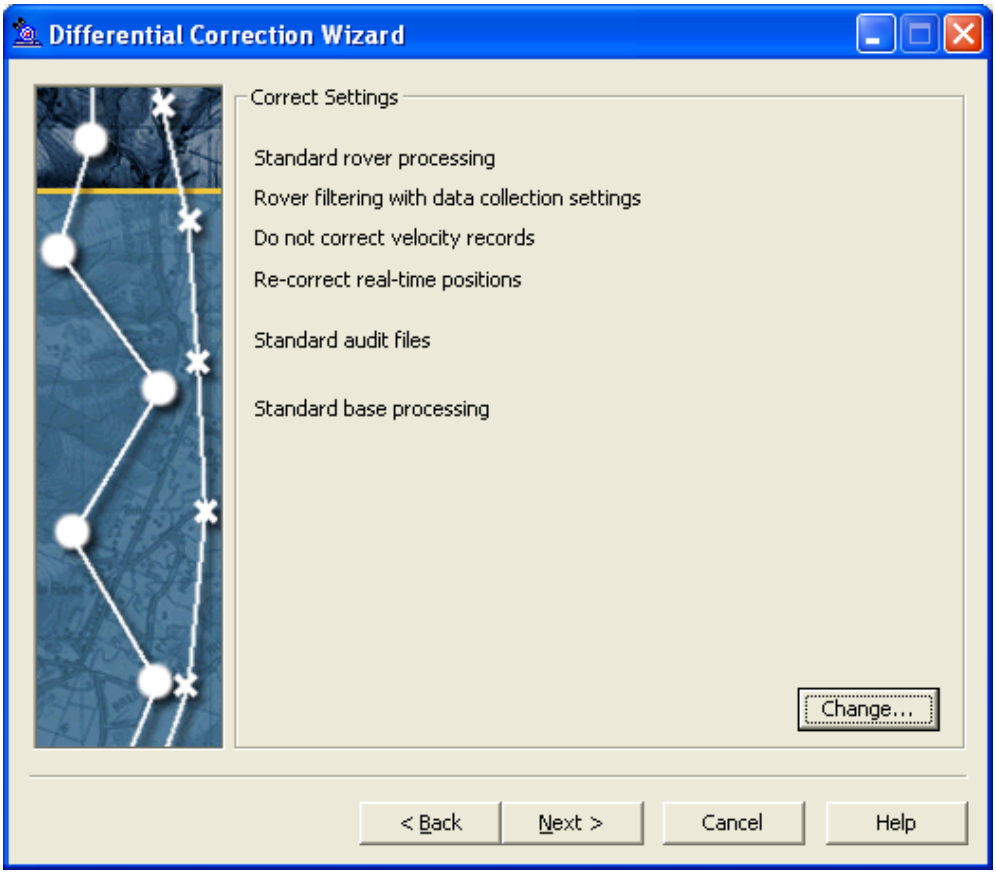
1. In PFO, select “Differential Correction” from “Utilities.”
2. Add the file that needs to be corrected. To get the quality control values for the rover log spreadsheet, you need to process files individually.
3. Verify the differential correction settings.


Differential Correction Wizard
Processing Type
Automatic Carrier and Code Processing
Code Processing Only
Carrier Processing Only
H-Star Processing
Use multiple base providers
Use a single base provider
< Back
Next >
Cancel
Help

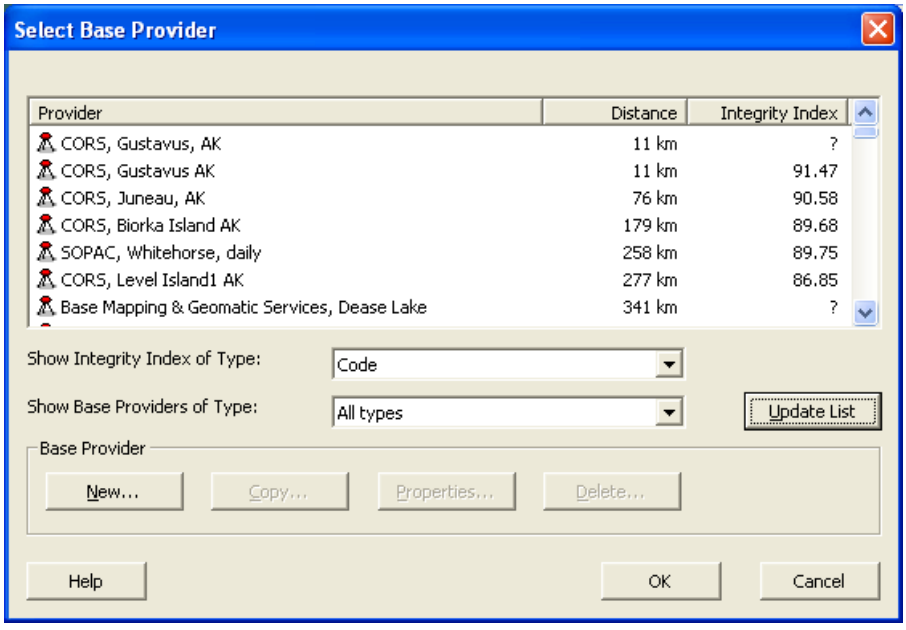

Correction Settings
Settings
Output
Base
Code Processing Technique
Standard
With velocity filtering
GPS Filtering
Use data collection filter settings
Use new filter settings:
Satellite Filtering
Minimum Elevation:
0°
Minimum SNR(dBHz):
0
Position Filtering
Maximum PDOP:
20.0
Maximum HDOP:
Any
Correct velocity records
Re-correct real-time positions
OK
Cancel
Apply
Help


Correction Settings
Settings
Output
Base
Output Positions
Corrected only
Corrected and Uncorrected
Audit File Contents
None
Standard
Expanded
OK
Cancel
Apply
Help

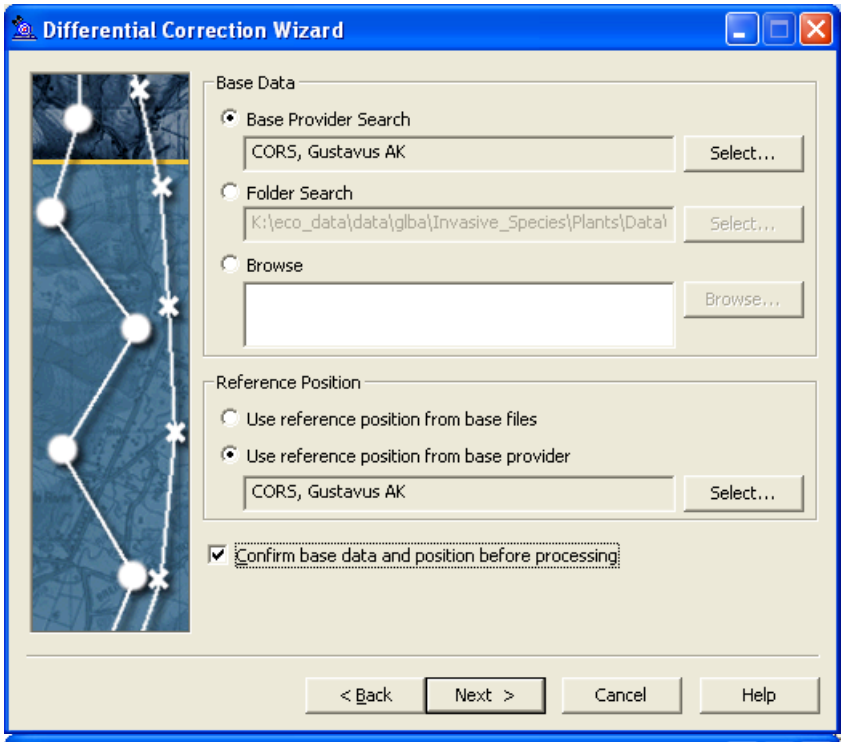

Correction Settings
Settings
Output
Base
Base Data Processing Technique
Standard
With filtering
With filtering and smoothing
Base Data Filtering
Minimum Elevation:
0°
Minimum SNR(dBHz):
0
OK
Cancel
Apply
Help

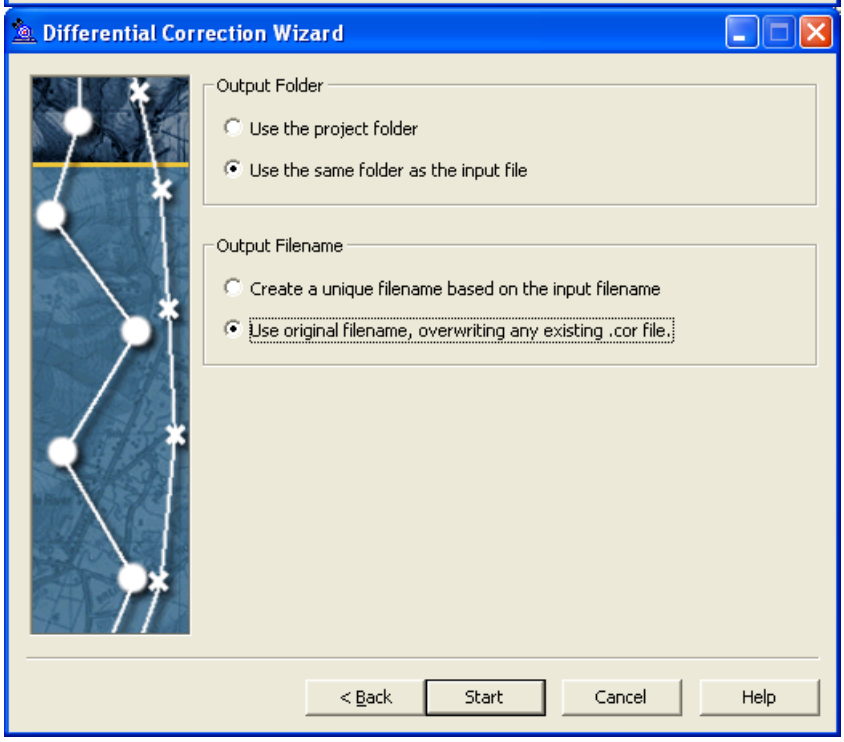


4. Select a base station. Generally, you want to select the closest base station to where the data was collected. Sometimes you may have to select a different base station. Update the base provider list periodically by selecting "Update List." Talk to Whitney, Joel Cusick, or other people locally at your park if there are questions about which base station to select.



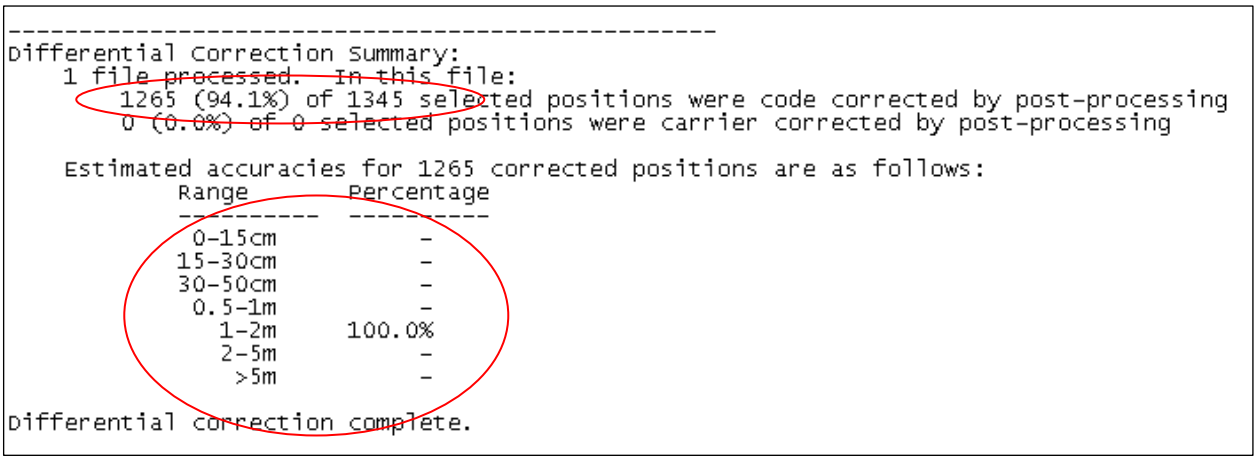
5. Do not change any of the base station information or reference positions.





6. Correct files by clicking “Start”
7. Assuming good differential correction (ideally over 90%), fill out rover file status log using values that appear at the end of differential correction or that are saved in a text

file in the project folder (see image below). This file is **really, really important** for Whitney to troubleshoot issues at the end of the season.



8. If the file did not correct well:
   a. try other nearby base stations,
   b. wait a few days and try again (files being corrected against may become available),
   c. contact Whitney. We may be able to download files manually. Alternatively, the data collected may be sufficient without correction.
9. Back up your .cor files immediately by copying them into the project Backup folder.

Editing Files

In order to ensure high data quality, review and edit every rover file within a few days of the data collection.

1. Copy your corrected files from the project folder into the "Final_Edits" folder and add the prefix "edited_" to each file name. For example, R051015A.cor becomes edited_R051015A.cor. Copying and renaming the file before editing ensures that you do not overwrite the original corrected file when you begin editing.
2. Check the validity of positions, once differentially corrected, to make sure they match what you recorded in the field. Using a background image will help with this.
3. For point features, click "Delete" in the Feature Properties window to see that the positions are a reasonably tight cluster. The "Delete" does not delete your positions but it gets rid of the feature grouping the positions. You may need to delete whacky points (using the "Delete" in the "Position Properties" window), such as points more than a few meters from the center of a point (when you inadvertently walked away while still collecting positions). Once the feature looks good, you should click "Undelete" in the "Feature Properties" window to regroup the positions.
4. For a line or polygon, you will need to delete positions that double back or cause loops in the feature. Generally the positions with the highest value in "Horiz. Precision" should be deleted since they have the most likely error.

5. Document position deletions in the rover log.
6. If a feature was recorded as the wrong type (e.g. line collected as point), contact Whitney for assistance.
7. Review the attributes attached to each features to check that the information is accurate and complete.
8. Elaborate on location descriptions or comments and eliminate any bad data. If you wrote in shorthand only understandable by you, now is the time to convert it to complete thoughts! Your comments will be viewable by the public, so make them understandable and appropriate for ALL AUDIENCES. Species can be abbreviated by using the first three letters of the genus and species. For example, *Leucanthemum vulgare* would be leuvul.
9. Take the necessary time to make your data as finished as possible. These files will be transformed into GIS data at the end of the season for anyone to peruse. Did you leave any fields blank? Are all the attributes correct? Do they make sense?
10. In the project folder, maintain a status spreadsheet park_rover_file_status_2009.xls (save the spreadsheet locally with your park code as a prefix) to keep track of which files still need to be edited. List any issues, deletions, deviations from the protocol, or field notes you had for each rover file.
11. Copy the Final_Edits files into the project Backup folder.
12. Periodically burn a CD of or otherwise backup the project folder and upload all raw, corrected, and edited rover files (.ssf, .cor, and edited.cor) and log to the 2009_INCOMING folder at the end of every pay period.
13. Once you have finished editing a file, you are done with it until the end of the season.
14. Once all edited files are complete, let us know and we will transform them into GIS files to ensure consistency among park units and send them back to you for your reference in preparing the seasonal report.

Whitney's Editing Strategy – I think it's most efficient to first look at the shapes of all the features and do the necessary deletions of positions to make the shapes true to life. I'll do this for the entire cor file. I then start at the beginning again and quickly flip through the features looking at the attributes for blank data fields (yes, even I sometimes forget to populate a field). I populate the field if I can accurately recall what it should have been. I then start at the beginning for the last time to carefully review the attribute information, replace any shorthand, and otherwise clarify comments. This strategy works for me to assure the spatial and attribute data get the attention they both need.

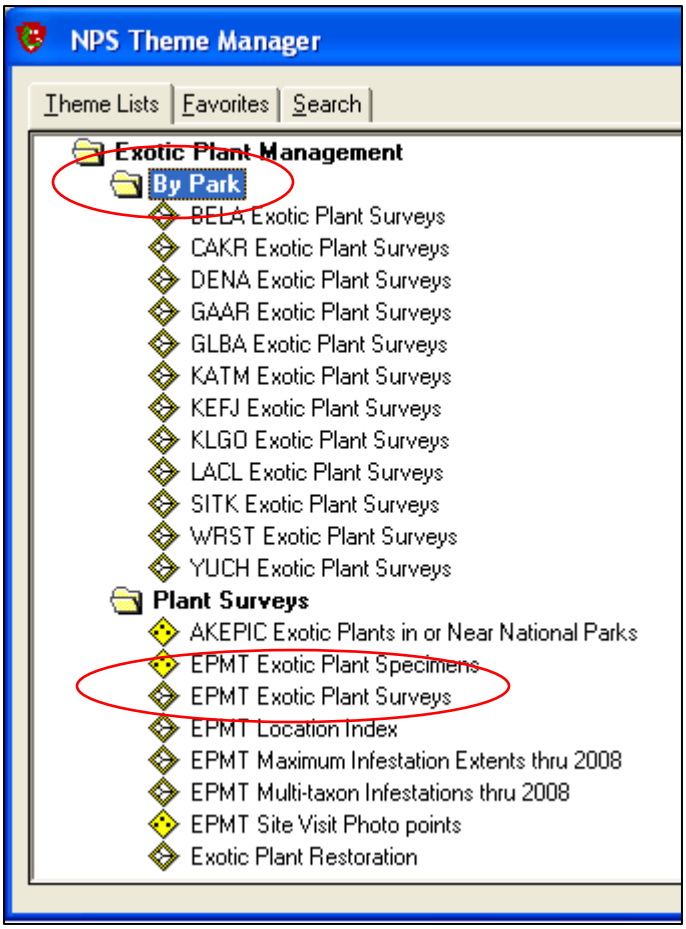


Figure 5 – Location of historic EPMT data in NPS Theme Manager.

Historic EPMT Data

This protocol does not describe how to use ArcGIS; however, it does describe how to review all historic EPMT data for the entire region. From NPS ThemeManager (Fig. 5), load either all of the regional data (Exotic Plant Management > Plant Surveys > EPMT Exotic Plant Surveys) or park specific data (Exotic Plant Management > By Park > (Park Code) Exotic Plant Surveys) by dragging the name into ArcMap. Information about the polygons can be found using "Identify" or selecting the polygons and looking at the "Attribute Table." Note: the themes may not work in earlier versions of ArcMap, so upgrade to ArcGIS 9.2.

Time Log

All of our data must be entered into a nationwide NPS database (APCAM – the lien Plant Control and Monitoring database) that requires very specific information about the amount of time spent and people involved in every activity we perform, not only in the field but also in the office.

To ensure consistency between all the parks, Whitney will be doing all the data entry in APCAM. In order for this to happen, however, we will require very specific information on the time you spend on individual activities on a daily basis from the moment you read this protocol until the last day you work for the EPMT in 2009. We know that this seems extreme, but there is no other way to satisfy the database requirements and minimize database angst.

1. Copy the spreadsheet park_time_record_2009.xls to your local folder and change "park" to your park's acronym.
2. At the end of each day, make a log of what happened.

3. Every line NEEDS to have a date, start time, and stop time. Do not just assume the row above, etc.
4. All work time activities should be accounted for, including:
   - Administrative Tasks
   - APCAM data entry
   - Budget/Finance
   - **Control Work**
   - **Data Collection**
   - Data Management
   - Education & Outreach Activities
   - Equipment Maint/Repair
   - Formal Meetings Attended
   - GIS/GPS Work
   - Hiring Activities
   - Meeting
   - Misc Park Activities
   - NEPA related
   - Partnership development
   - Personnel Management
   - **Prepare for training/travel**
   - Presentation Preparation
   - Project Planning
   - Report Writing
   - **Restoration**
   - Time Lost Due to Injury
   - Training
   - **Travel**
5. The bold categories are super critical to get accurate: number of people, time, and location id.
6. If the activity is associated with a GPS rover file, record those file(s) in your time log.
7. Each person routinely associated with the EPMT should account for their activities on an individual line. So, even if Whitney and Jeff are both controlling oxeye daisies from 10:00 to 12:00, there should be two lines with each of their initials. If people not usually associated with EPMT work are assisting, they can be accounted for them in the "Number of other people" field and then describe who they are in the description. Alternatively, each EPMT team member can keep their own log.
8. Alternatively, each EPMT person at a park should maintain their own log with one person ensuring that others/volunteers are accounted for consistently.
9. Locations, initials, etc can be modified by adding/deleting values from the "Pull-down menus" worksheet.
10. All grey fields will automatically calculate. Do not modify the formulas. If the hours is negative, then the times are entered wrong (PM is in 24-hr time). If the grey fields do not display values, then talk to Whitney.
11. As with all important files, back this one up on a regular basis.

Table 7 - An example of a 1-day trip in GLBA with two EPMT staff and another NPS employee. The fields shaded gray are automatically calculated.

Day of Week	Date	Time Start	Time End	Activity Category	Location	Park	Activity Description	Rover File Associated with Activity	Weight (lb)	EPMT Person Initials	Number of other NPS staff	Number of volunteers	Number of other people	Total People	Hours	Total People Hours
Mon	6/2/2008	8:00	10:00	Prep & Cleanup	Office	GLBA	Prepare for field work			WSR	1			2	2.00	4.00
Mon	6/2/2008	10:00	11:00	Travel	Travel	GLBA	Skiff to Strawberry Island			WSR	1			2	1.00	2.00
Mon	6/2/2008	11:00	15:30	Control Work	main_bay	GLBA	control perennial sowthistle	R060215a	35	WSR	1			2	4.50	9.00
Mon	6/2/2008	15:30	16:30	Travel	Travel	GLBA	Return to BC			WSR	1			2	1.00	2.00
Mon	6/2/2008	9:00	10:00	Prep & Cleanup	Office	GLBA	Prepare for field work			JAH				1	1.00	1.00
Mon	6/2/2008	10:00	11:00	Travel	Travel	GLBA	Skiff to Strawberry Island			JAH				1	1.00	1.00
Mon	6/2/2008	11:00	15:30	Control Work	main_bay	GLBA	control perennial sowthistle			JAH				1	4.50	4.50
Mon	6/2/2008	15:30	16:30	Travel	Travel	GLBA	Return to BC			JAH				1	1.00	1.00
Mon	6/2/2008	16:30	17:00	Prep & Cleanup	Office	GLBA	clean-up field gear			JAH				1	0.50	0.50

Photo Management

***** All photo data must be edited and uploaded to the regional drive by the end of every pay period (every 2 weeks).** This will ensure that the data is being processed correctly and timely on your part and that Whitney can process it into the national databases and make the data available for use.

Photos are an excellent tool for exotic plant management, not only to document infestations and sites for our own internal purposes, but also to convey to others what we are dealing with and what we have accomplished. Several excellent photo opportunities include:

- Before and after photos of infestations that are controlled
- Volunteer events – work in action
- New or uncertain species, range expansions, or particularly nasty infestations
- Close-ups of particular species to aid in identification
- Restored plant communities
- Educational events
- Yourselves and others working with exotic plants

You should be taking photos essentially everytime you are outside! That said, we can only use these photos later on if we keep them organized and collect relevant information about them.

Taking Photos

Use the GPS "Photo_pt" feature that will later be coupled with GPS-Photo Link by Whitney to bring the photo together with the position and attribute information.

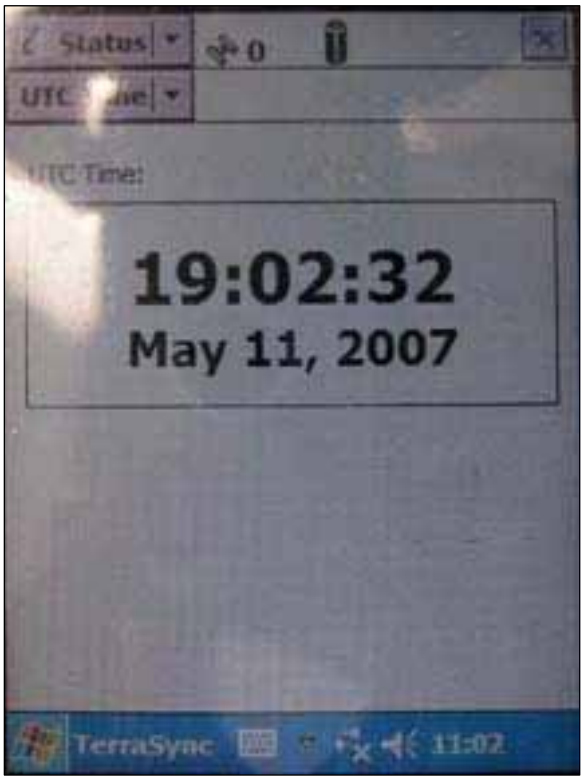


Figure 6 – Screen shot of GeoXT showing UTC time with seconds. Alaska daylight savings time is 8 hours less. This screen is essential for linking to the photo time for GPS-Photo Link.

Before taking photos:

- Set the camera's clock to be as close to the GPS clock as possible (8 hours less than UTC time during AK daylight savings). Recheck at least monthly!!!
- Resolution should be as high as reasonable given memory constraints, with the preferred filesize (for a .jpg) being greater than 1 MB per photo.
- **Before** you take your first picture of the day, take a picture of your GPS screen showing the time **with seconds**. This is **critical** for the GPS-Photo Link software. Within TerraSync Status>UTC Time (Fig. 6) has the time. Verify the image is legible. Several photos are better than one that is unclear. Be aware that the screen is very reflective and not easy to take a good picture of clearly. Holding the GPS at an arms length or using the macro (flower) setting when the GPS is closer may also improve the focus.

When taking photos:

- **Before** you take the photo, collect a "Photo_Pt" feature using your Trimble unit at the spot where you are standing when taking the photo.
- **After** the Photo_Pt is collected, take your photo(s) of the same scene. If the subject of the photo changes such that your description is no longer valid or your position changes, you need to record a new Photo_Pt before taking the next photo.

Table 8 – Description of attributes within Photo_Pt feature on GPS.

Photographer	Initials from drop down menu
Location_Name	Standard locations from drop down menu
Comments	Short description/title of image. Such as "Visitor Center dandelions." This description will later be watermarked onto the image with GPS-Photo Link.
Internal	Longer description/comment. Such as, "Area will be treated next week." This comment will be embedded in attributes and not displayed on image. Record more specific location/event information here. This is what will give lasting value to the image!
LookDir	Direction you are facing to take the image.
Filename	Record image number/file name. This may be feasible in the field or easier to do as you edit images in PFO.

Managing Photos

We recommend that you manage your photos – meaning upload, organize, and delete useless photos – at the same time that you are editing your spatial data in Pathfinder Office.

- Maintain subfolders by event, such as 20090613_Weed_Pull, that will help you and us locate a photo.
- Step through the "Photo_pt" features in Pathfinder Office with an image browser window open at the same time and ensure that the attribute information is complete. If incomplete, modify the attributes to be accurate. Ensure that the image name is in the Filename field.
- Delete any photos that are unusable – blurry, too dark/light, etc.
- If there are images that do not have Photo_Pt features, modify the filename by putting a "z" at the beginning of the filename to flag us not to link it to a position.
- Always keep the original, unmodified, unedited images. **DO NOT** rotate, resize, brighten, or darken any original photo since you risk losing all data collection time embedded in the photo. If you want to edit an image, resave it with another name, such as [original filename]_edited.
- At the end of every pay period, transfer all photos you have to the regional drive.
- Whitney will process the photos using GPS-PhotoLink and the data collected with your Trimble, such as the example (Fig. 7)

Figure 7 – How an image taken after a Photo_Pt can be combined in GPS-Photo Link to incorporate the position and field comment. A shapefile is also generated that contains the additional attribute information.

Two "money" shots from each park are needed this year. Examples of great pictures are those that tell a story about the work that we do and show the majesty of the place. Think about the background and the subject. Getting NPS uniforms and arrowheads in the shot helps. These will take some time and likely some staging. Here are two great examples from the past.

Voucher Specimens

What to Collect

In order to back up our observations of plants in the field, voucher specimens should be collected under certain circumstances:

- Any species previously unrecorded in a park unit should be collected.
- Any species that you cannot positively identify should be collected following consultation with others to ensure it is not rare. Photos and a GPS point can be a good interim measure to help id the species, particularly if there are few specimens.
- Any species with a significant range expansion or found in remote areas should be collected, with priority given to species of greater concern.

In 2009, make an effort to fully collect all specimens previously reported but not collected. Refer to the table AK_EPMT_Master_Exotics.xls for a list of all the species reported for each park with a column for when the plant was collected. Data for collection years before 2005 were taken from the I&M database NPSpecies and may need verification with your park herbarium. Let Whitney Rapp know of any changes needed to this spreadsheet. Verify that you have the necessary permission to collect within your park.

How to Collect

1) A photo should be taken of the whole plant prior to collection following the photo protocol.
2) A GPS "Specimen_Pt" should be recorded to account for as many fields as possible.

Specimen_Pt fields on GPS

Collection_Date	Date specimen collected
Collector_Name	Initials of collector
Taxon	Scientific name of species if known
Park_Unit	Park abbreviation
Location_Name	Standard locations from each park
Specific_Locality	Field to make more specific description of location
Habitat	Field to make more specific habitat description
Soil_Texture	clay, silt, sand, loam, gravel, or other – see table below for descriptions
Soil_Moisture	dry, moist, wet, or other
Exposure	N, NE, E, SE, S, SW, W, NW
Slope_Site	flat, gentle, steep, other
Species_Abundance	rare, infrequent, common, abundant, other
Assoc_Spp	Field to enter other nearby native and non-native species
Notes	Any additional notes or clarification on fields
Photographed?	Yes/No – All specimens SHOULD be photographed
Collnum	*Collection number. Initials followed by number. e.g. WSR001
Photo_filename	*Filename of specimen photo
Determiner	*Person who identified the specimen
Determiner_Date	*Date determiner identified the specimen
NPS_Accession	*NPS accession number
NPS_Catalog	*NPS catalog number
Native	*Nativity of specimen – Yes, No, or Unk
Collection_number	*Identifying number of specimen (initials followed by number)

* these fields are likely best populated in the office in PFO.

3) Collect the specimen. All parts of the plant should be represented, including roots and flowers or fruits, and should be preserved using a plant press or heavy books with newspaper. Each species should be dried within newspaper and labeled with the information below or a unique collection number (initials followed by a number – WSR001, WSR002) that relates back to the master table.

Review the University of Alaska Museum's collection recommendations (http://www.uaf.edu/museum/collections/herb/projects/reports/instructions-for-plant-co/).

Information about the specimen collected should be recorded in the spreadsheet (park ID)_Collections_2009.xls. It may not be feasible to record all fields, but an effort should be made to populate as many fields as possible. Fields in bold in the table below are required. Use the "Specimen_Pt" data collected on your GPS.

Collnum	Initials followed by number. e.g. WSR001
Park	Four letter park acronym. e.g. GLBA, DENA
Scientific Name	Best identification possible. AKNHP will verify all identifications and modify as necessary.
General Locality	General location of specimen. e.g. Parks Highway or Bartlett Cove.
Specific Locality	Specific location of specimen. e.g. 1.5 miles from park boundary on east side of road.
Lat (DD)	Latitude in decimal degrees. e.g. 59.68595
Long (DD)	Longitude in decimal degrees. e.g. -135.56987
GPS/Map	Source of lat/long - from GPS or calculated from map.
Map Datum	Map datum used for lat/ long (NAD27, 83 etc).
Elev	Elevation of collection.
Elev unit	ft or m
Habitat	Describe habitat. e.g. roadside, coastal meadow, riparian, spruce forest
Soil Texture	Soil texture. Clay = smallest particle size (<3.9 µm – not gritty in your mouth); a marble-sized hunk rolled between your fingers will form a ball. Silt = small particles (3.9-62.5 µm – will feel gritty in mouth); a marble-sized hunk rolled between your fingers may form a ball. Sand = larger particle size (0.0625 mm -2 mm); a marble-sized hunk rolled between your fingers will not form a ball. Loam = relatively even concentration of sand, silt, and clay; a marble-sized hunk rolled between your fingers will seem to form a ball, but it will fall apart once pressure is released. Gravel = largest particles (2-75 mm)
Soil Moisture	Soil moisture (wet, moist, dy, other)
Exposure	Which way the site faces (N, S, E, W, etc)
Slope	Angle of site (flat, gentle, steep)
Abundance	Relative abundance of species at location (abundant, common, infrequent, rare)
Assoc. spp.	Other native or non-native species growing in the area.
Collector(s)	Enter as: Heys, J. Enter multiple collectors separated by commas with "&" before the last collector: Heys, J. & Rapp, W.
Collection Date	full date (6/25/2006)
Determiner	Person who identified specimen.
Det Date	Date specimen was identified (9/27/2006).
Photo#	Name of digital image or full path to image.
NPS Accession #	Generally, the entire set of specimens will receive the same accession number from the park's curator.
NPS Catalog #	Each specimen will get a unique number from the park's curator. If 3 common dandelions are collected, make 3 separate rows, each with its own catalog #.
Notes	Any other taxonomic or collection notes/comments, such as flower color (some blossoms fade with drying, some colors intensify), odor, conspicuous use by animals, specimen looks like a hybrid or doesn't match descriptions, etc.

At the end of the season:

1. Obtain the accession number and catalog numbers from your park's collections curator.
2. Verify that each specimen is identified by at least its Collection Number.
3. Communicate with Whitney at the end of the season about sending specimens for mounting or mounting and labeling specimens locally.

4. Ensure the table (park ID)_Collections_2009.xls is transferred to your park's incoming folder within the regional folder.

Phenology Log

Throughout the season, record when exotic species first flower and first set seed using the park_Phenology_2009.xls spreadsheet (save the spreadsheet locally with your park code as a prefix). It may be easiest to print out the sheet and routinely write down the dates throughout the season. Then, enter the information into the spreadsheet. If you visit several park areas periodically that you suspect have different phenologies, record dates on separate sheets for these different locations. Printing this spreadsheet on weather resistant paper and storing it in the GPS pouch serves two purposes. Not only will you have it in the field to record dates, but if you space out on the name of a species to record in the GPS, the sheet may trigger your memory since it has common names!

Seasonal Report

The seasonal report for your park is your chance to summarize what you've learned and accomplished with regard to exotic plant management. These are immensely valuable for record-keeping and future planning, and it will also demonstrate to your supervisor the quality of your work. There is no page limit for this, because it is more important that you get across what you did and found this summer, no matter the length. Be as thorough as possible with this. Feel free to borrow from previous years rather than recreating the wheel. The best reports build on the information from previous years!

Items to be covered in the report:

- Abstract/Executive Summary – a succinct summary of the season that could include total number of species inside/outside of park, areas surveyed, new species found, species eradicated, acres inventoried/infested/treated, etc. This may be your only opportunity to inform someone!
- Introduction - you do not need to provide an overview of why invasive plants are a problem for Alaska. Instead, focus on your park unit's history of exotic plant surveys and management efforts - the context of your work in 2009
- Methods - explain how you chose where to survey, where you surveyed, how thoroughly/frequently you surveyed each area, and what control methods and personnel you used, but don't go into detail about the data collection protocol (cite that you followed this protocol).
- Results – this should be the focus of your report. Let the reader know what you found and did, so that the data does not have to speak for itself. Include:
    - Accomplishments (Prevention, Detection, Inventory, Control, Monitoring, Restoration, Education, Contacts, etc.) – use your time log to remind yourself of all the activities you have been involved in

- Summarize 2009 exotic plant distribution (diversity and relative species abundance in frontcountry and backcountry) in comparison to what you know of results from previous years. Highlight any new species or situations of particular concern. Are there eradicated populations? Are any species colonizing natural areas? Let us know!
- Include a table that includes all the invasive species documented in and around your park at any time. This should be the list from AK_EPMT_Master_Exotics_2009.xls and any additional species documented in 2009. If there are species on our master list that you do not believe should be there, let us know. Include in this table if you observed it in 2009 and what parts of the park it was seen (e.g. Park Headquarters, Park Road, Backcountry, Outside Park). If the species has been eradicated, include it in the list but indicate that when it was last observed.

- Discussion and Recommendations - Make recommendations for next year to improve how things can be done at your park or regionwide. Be thorough with everything that could be done, even if it seems unlikely to happen. Also include anything else you think is important! You've spent a summer working with and thinking about this issue, so offer your perceptions, concerns, ideas, problems, etc.

Use the common and scientific names that appear in the master exotics table so that they are consistent throughout your report and the region. Common names should not be capitalized unless they have a proper name (eg. European mountain-ash and common dandelion). Scientific names should have the genus capitalized and be italicized with the exception of abbreviations used (eg. *Taraxacum officinale* ssp. *officinale* and *Melilotus* spp.)

Maps are optional. If you would like to make maps in GIS with the 2009 data, let Whitney know by September 1 so the data can be transformed to a shapefile.

As far as timing goes, the data processing must be complete by Sept. 1 at the latest and preferably earlier so that we can troubleshoot any problems or inconsistencies that arise. Determine who at your park should review the document. Draft reports should be sent to EPMT regional staff at least two weeks prior to your end date or Sept. 15th (whichever is earlier) for review. If that presents a problem, let us know. In any event, if you have any questions or issues, give us a call or email.

Look at reports from all parks and years for ideas on form and content to improve your report!

Although not required, the NPS report templates may be used - http://www.nature.nps.gov/publications/NRPM/index.cfm#Templates.

The *Editorial Style Guide for Park Science and Natural Resources Year in Review* is another refernce for writing NPS reports - https://science1.nature.nps.gov/naturebib/biodiversity/2007-6-5/Editorial_Style_Guide.pdf

Please provide at least a version in MS Word. Acrobat PDF versions can also be made if they are compatible with version 5.0 or later.

Thank you for your participation this summer!! Please give Whitney any suggestions about how we can improve this protocol and the program. We hope that you are interested in continuing to work with the Alaska Exotic Plant Management Team in the future.

Table of invasive species mapped in and around Alaska NPS units through 2008

Taxon	Common_name	Ranking	CAKR	DENA	GLBA	KATM	KEFJ	KLGO	LACL	SITK	WRST	YUCH	Total Acres	Total Parks
Aegopodium podagraria	bishop's goutweed	(blank)		0.159	0.783								0.942	2
Allium schoenoprasum	wild chive	(blank)			39.971				1.176				41.147	2
Alopecurus pratensis	meadow foxtail	(blank)			0.023								0.023	1
Amaranthus retroflexus	pigweed	(blank)							0.078				0.078	1
Aquilegia	columbine	(blank)					0.000						0.000	1
Arabis glabra	tower rockcress	(blank)									0.000		0.000	1
Arctium minus	common burdock	(blank)			0.000								0.000	1
Brassica rapa	field mustard	(blank)		0.466			0.000						0.466	2
Bromus inermis	smooth brome grass	62		0.590	12.978			1.482	0.081		196.026	0.056	211.214	6
Campanula medium	Canterberry bells	(blank)			0.000								0.000	1
Capsella bursa-pastoris	shepherd’s purse	40		1.579	0.785	3.711		0.692	0.078		0.318	3.426	10.589	7
Caragana arborescens	Siberian peashrub	66									0.026		0.026	1
Centaurea montana	perennial cornflower	(blank)			0.318					0.226			0.544	2
Cerastium fontanum	mouse-ear chickweed	36			343.933			1.639		3.343			348.916	3
Cerastium tomentosum	snow in summer	(blank)								0.110			0.110	1
Chenopodium album	common lambsquarters	37		3.671				1.223	11.158	0.456	2.640	4.799	23.947	6
Cirsium arvense	Canada thistle	76			0.815								0.815	1
Crepis tectorum	narrowleaf hawksbeard	54		14.957		0.003	0.029	4.597			2.374	0.056	22.017	6
Dactylis glomerata	orchard grass	53			0.146								0.146	1
Descurainia sophia	flixweed	41	0.000	0.272							0.772		1.044	3
Digitalis purpurea	foxglove	51								0.592			0.592	1
Elymus repens	quackgrass	59			3.656			0.822			193.992	0.012	198.483	4
Erysimum cheiranthoides	wormseed mustard	(blank)		3.102				0.143			0.000		3.245	3
Euphrasia nemorosa	common eyebright	(blank)						1.521					1.521	1
Galeopsis bifida	hempnettle	40						0.198					0.198	1
Galeopsis tetrahit	hempnettle	40			0.001			0.268			0.003		0.271	3
Hieracium aurantiacum	orange hawkweed	79			0.276								0.276	1
Hordeum jubatum	foxtail barley	63		2.702	0.036		0.000	1.190			7.929		11.857	5
Hypochaeris radicata	hairy cat's ear	(blank)			4.945								4.945	1
Impatiens glandulifera	ornamental jewelweed	82						0.049					0.049	1
Lamium album	white deadnettle	(blank)			0.009								0.009	1
Lappula squarrosa	European stickseed	44		0.049							2.277		2.326	2
Lepidium densiflorum	common pepperweed	25		0.532							0.081	1.901	2.515	3
Leucanthemum vulgare	oxeye daisy	61		0.378	14.470	0.020	0.027	0.972	0.175	1.466	194.817		212.325	8
Linaria vulgaris	yellow toadflax	69		1.085	0.069		0.108	6.437		0.153	193.948		201.800	6
Lolium perenne	perennial ryegrass	41			11.885								11.885	1
Lupinus polyphyllus	bigleaf lupine	55		0.024	388.116			0.056					388.196	3
Lychnis chalcedonica	maltesecross	(blank)			0.000								0.000	1

Taxon	Common_name	Ranking	CAKR	DENA	GLBA	KATM	KEFJ	KLGO	LACL	SITK	WRST	YUCH	Total Acres	Total Parks
Matricaria discoidea	pineapple weed	32	0.000	4.573	32.299	11.896	0.147	3.065	17.555	0.569	344.457	19.955	434.517	10
Medicago lupulina	black medic	48									0.034		0.034	1
Melilotus alba	white sweetclover	81		4.651				12.859			35.554		53.064	3
Melilotus officinalis	yellow sweetclover	69		0.366			0.480				0.045		0.891	3
Mentha	mint	(blank)			0.003								0.003	1
Myosotis asiatica	alpine forget-me-not	(blank)			0.021					0.022			0.044	2
Myosotis scorpioides	true forget-me-not	(blank)			0.135					0.301			0.436	2
Papaver nudicale	Icelandic poppy	(blank)					0.000						0.000	1
Papaver somniferum	opium poppy	(blank)									0.000		0.000	1
Phalaris arundinacea	reed canarygrass	83			5.984			0.030		1.167			7.181	3
Phleum pratense	common timothy	56		0.484	50.187		0.125	2.159	0.078	1.226	0.511		54.771	7
Plantago major	common plantain	44		8.846	315.433	1.717	1.012	6.622	7.144	4.230	374.910	52.603	772.517	9
Poa annua	annual bluegrass	46			6.057							0.985	7.042	2
Poa pratensis	Kentucky bluegrass	52			0.007			0.129		0.021			0.157	3
Polygonum aviculare	prostrate knotweed	45		0.537	0.032	0.040		2.056	0.078		194.048	4.171	200.961	7
Polygonum convolvulus	black bindweed	50		0.466							0.003		0.469	2
Polygonum cuspidatum	Japanese knotweed	87		0.000						0.183			0.183	2
Prunus avium	sweet cherry	(blank)								0.268			0.268	1
Ranunculus acris	tall buttercup	54			0.122		0.000	2.124		2.825			5.072	4
Ranunculus repens	creeping buttercup	54		0.000	2.684			0.542		15.564			18.790	4
Rheum rhabarbarum	rhubarb	(blank)			0.778						0.029		0.807	2
Rosa rugosa	rugosa rose	(blank)			0.254					0.028			0.281	2
Rubus idaeus	red raspberry	(blank)			3.605								3.605	1
Rumex acetosella	common sheep sorrel	51			0.696	1.431	0.018	11.557	0.081	0.318		0.359	14.461	7
Rumex crispus	curled dock	48					0.000	0.143		1.138			1.282	3
Sagina procumbens	birdseye pearlwort	(blank)								0.216			0.216	1
Senecio sylvaticus	woodland ragwort	(blank)						0.000					0.000	1
Senecio vulgaris	common groundsel	36						0.198					0.198	1
Silene latifolia	bladder campion	42									0.000		0.000	1
Silene noctiflora	night-blooming cockle	42		0.466				0.198			0.078		0.743	3
Silene vulgaris	bladder campion	42						0.143					0.143	1
Sonchus arvensis	perennial sowthistle	73			2.421			0.000					2.421	2
Sonchus oleraceus	annual sowthistle	(blank)		0.000									0.000	1
Sorbus aucuparia	European mountain-ash	59			2.930					10.205			13.135	2
Spergula arvensis	corn spurry	32		0.466									0.466	1
Stellaria media	common chickweed	42		0.727	1.964			0.341	5.540		0.006	2.353	10.931	6
Symphytum officinale	common comfrey	(blank)			1.987								1.987	1
Tanacetum vulgare	common tansy	57			0.044			0.003					0.047	2
Taraxacum officinale ssp. officinale	common dandelion	58	0.000	58.128	869.418	6.100	12.891	64.533	10.447	10.191	241.298	17.436	1290.442	10
Thlaspi arvense	field pennycress	(blank)						0.000			0.001		0.001	2

Taxon	Common_name	Ranking	CAKR	DENA	GLBA	KATM	KEFJ	KLGO	LACL	SITK	WRST	YUCH	Total Acres	Total Parks
Trifolium hybridum	alsike clover	57		0.723	0.001		0.199	0.154			211.145	7.753	219.974	6
Trifolium pratense	red clover	53		0.538	14.165		0.000	2.709		1.348	0.401		19.162	6
Trifolium repens	white clover	59		3.883	143.395	0.000	0.305	21.571	1.392	5.620	207.847		384.013	8
Tripleurospermum maritima	false mayweed	(blank)		0.000									0.000	1
Tripleurospermum perforata	scentless false mayweed	48		2.069							0.014		2.083	2
Triticum aestivum	common wheat	(blank)		0.043	22.833								22.876	2
Veronica serpyllifolia	thyme-leaf speedwell	(blank)			0.006								0.006	1
Vicia cracca	bird vetch	73		0.018				0.033			2.366		2.418	3
Viola tricolor	Johnny-jump-up violet	(blank)			0.015								0.015	1
		Total Acres	0.000	116.550	2300.690	24.918	15.343	152.460	55.061	61.789	2407.950	115.866	5250.626	
		Total Species	0	7	6	1	3	4	1	2	5	1	9	