

Standard Operating Procedure (SOP) 10: Using GPS-Photo Link, Version 1.0

Dall's Sheep Monitoring Protocol

Arctic (ARCN) and Central Alaska (CAKN) Inventory and Monitoring Networks

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Available online at <https://irma.nps.gov/DataStore/Reference/Profile/2238930>.

The main Narrative for the Protocol for Monitoring Dall's Sheep, Arctic (ARCN) and Central Alaska (CAKN) Inventory and Monitoring Networks is available from the NPS Inventory and Monitoring Arctic Network website (<http://science.nature.nps.gov/im/units/arcn/>), the NPS I&M Central Alaska Network website (<http://science.nature.nps.gov/im/units/cakn/>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpm/>).

SOP 10 – Using GPS-Photo Link

Standard Operating Procedure #10
Version 1.0 (03/01/2017)

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

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SOP 10.0 – Introduction

Photographs taken from the survey aircraft are linked to the pilot's or observer's GPS unit tracklog (or waypoints) so that the photographs can be given spatial coordinates and displayed in ArcMap. We will link the sheep photos to the tracklog at least two times during data processing following a survey. First, the photographs that were generically named as they were downloaded from the cameras (e.g., LW02Jul2011_photo1.jpg, LW02Jul2011_photo2.jpg, etc.) will be GPS-Photo Linked to the tracklog (SOP 10.1; then SOP 10.2 or SOP 10.5 depending upon the software version) so that they can be displayed in ArcMap (SOP 10.4) with the on-transect and sheep group location data that were downloaded from the ArcPad applet (SOP 9). Those generically named photographs are compared in ArcMap with their corresponding transect ID (from DBTracklog.shp) and sheep group ID (from DBAnimals.shp or the pilot's waypoints shapefile) and relabeled accordingly (e.g., photo LW02Jul2011_photo47.jpg may actually be Transect34_Group13_Photo1.jpg; SOP 10.4). The relabeled photographs are then GPS-Photo Linked again for the final version of linked photographs that will go into the data archives (i.e., you will repeat SOP 10.2 or SOP 10.5 with the relabeled photographs).

The Fairbanks NPS office currently has licenses for two versions of the GPS-Photo Link software: version 4.3.5 (instructions for use covered in SOP 10.2) and version 5.0 (instructions for use covered in SOP 10.5). Both are available to users in this office. Version 4.3.5 can be transferred between different computers via the internet. Please see the README_license info.txt file in O:\Data Management\Software\GPSPhotoLink for instructions on how to temporarily have one of the licenses transferred to your computer. Version 4.3.5 will not be upgraded because it has some features that make it easier and sometimes more reliable to use than version 5.0. When using either version of the GPS-Photo Link software, please make sure to check your final products - Google Earth files (SOP 10.3) and the ArcMap shapefiles and watermarked photos (SOP 10.4). GPS-Photo Link software is available for purchase from www.geospatialexperts.com (accessed 25 February 2012).

SOP 10.1 – Before Using GPS-Photo Link

1) You must have a photo of the pilot's GPS unit in order to GPS-Photo Link. This must be taken by the same camera of the same GPS unit that had the photos and tracklogs that you are linking. This photo should be relabeled as such for the respective survey day: Pilot'sInitialsDate_GPS-photo.jpg (e.g., LW02Jul2011_GPS-photo.jpg for pilot Lance Williams). If you don't have a GPS photo for a particular day's photos, go to a previous day to see if one was taken – however, it must be the same camera and the same GPS unit. You can use the time difference from the previous day (difference between time of photo and time of GPS – see NOTE in step III), or you can GPS-photo link all of the previous day plus the day that you're working on. If you can't find a GPS photo for that pilot's GPS, you can't GPS-Photo Link, but we can still hyperlink the photos to the waypoints.

2) Photo file names must be short, and must not start with a number. For the first round of GPS-Photo Linking, you will have generic names for the photos, such as LW02Jul2011_photo1.jpg, etc. We will GPS-photo link these photos first, then take the GPS-photo linked shapefile and import it into ArcMap to aid us in renaming the photos based on where they land on ArcMap and what transects and sheep groups the photos are associated with.

When you know what photo goes with what group, photo names for sheep groups should be:

'TransectX_GroupX_PhotoX.jpg'

(e.g., Transect34_Group13_photo1.jpg, etc.)

3) If photos of bears, landscape, etc. were taken on the sheep survey, you can re-label them:

'Pilot'sInitialsDate_blkbear1.jpg'

'Pilot'sInitialsDate_brnbear1.jpg'

'Pilot'sInitialsDate_landscape1.jpg'

'Pilot'sInitialsDate_thermokarst1.jpg'

'Pilot'sInitialsDate_snow1.jpg'

(e.g. 'SH07Jul2009_bear1.jpg' – just keep it short and make it systematic.)

4) Put all original photos in the following folder filing system:

If in the field, on the laptop:

C:\ARCN_CAKN_Sheep\SurveyNameYear\Photos\PilotInitialsDate\

For example:

C:\ARCN_CAKN_Sheep\Itkillik2011\Photos\LW02Jul2011\

If in the Fairbanks office, create the following folder filing system:

O:\Projects\ARCN00037_Dall's Sheep

Monitoring\Data\Year\SurveyNameYear\Photos\Original\PilotInitialsDate\

5) Put a copy of the projected (Albers Alaska) tracklog in with the original photos. The tracklog should be a point shapefile, where a point was collected at minimum every 3 seconds during flight. The TIME field must be in this format: 2009/07/07-13:45:36. LTIME (local time) field should be similar but with Alaska time: 2009/07/07 05:45:36. If it's not in this format, you may be able to take the date and time from the COMMENTS field and put it in the TIME field in the above format.

6) Create a 'Working' folder.

If in the field, on the laptop:

C:\ARCN_CAKN_Sheep\SurveyNameYear\Photos\Working\

If in the Fairbanks office, create the following folder filing system:

O:\Projects\ARCN00037_Dall's Sheep
Monitoring\Data\Year\SurveyNameYear\Photos\Working\

This is where GPS-Photo Link will create the watermarked photos, the picture shapefile (point shapefile), the Field-of-View (FOV) shapefile (polygon shapefile), and any other files you ask it to create (Google Earth, text file, website files, etc.).

7) Create a 'Final' folder.

If in the field, on the laptop:

C:\ARCN_CAKN_Sheep\SurveyNameYear\Photos\Final\

If in the Fairbanks office, create the following folder filing system:

O:\Projects\ARCN00037_Dall's Sheep Monitoring\Data\Year\SurveyNameYear\Photos\Final\

SOP 10.2 – Using GPS-Photo Link version 4.3.5

I. Select photos



Instructions about the numbered items on the screenshot are as follows:

1) Map the Camera Folder to the photos for the date/pilot you are working on using the ... button. For example:

O:\Projects\ARCN00037_Dall's Sheep Monitoring\Data\2011\Itkillik2011\Photos\Original\LW02Jul2011\

2) Map the Output Photo Root Folder to the file where the GPS-photos will be produced. Just map to the folder called Working. For example:

O:\Projects\ARCN00037_Dall's Sheep Monitoring\Data\2011\Itkillik2011\Photos\Working\

3) The New Folder where your GPS-photos will be stored should have the same name as the Original photo file. GPS-Photo Link will create the New Folder with this name. Name the New Folder here using pilot initials and date (e.g., LW02Jul2011). The full file address will then be:

O:\Projects\ARCN00037_Dall's Sheep Monitoring\Data\2011\Itkillik2011\Photos\Working\LW02Jul2011\

II. Select tracklog (or waypoint) file.

GPS-Photo Link GIS Pro - GPS Data - AG29Jun2009

GeoSpatial EXPERTS GPS-Photo Link

Select GPS data source.

GPS Data Source (Track Logs, Waypoints, or Files)

☐ Download

☒ Use GPS data in file

For Garmin data use : ☒ Track Logs ☐ Waypoints

☐ Use GPS data in photo or manually enter lat/lon

Timezone (Local Time)

Time Zone

☒ Auto adjust for daylight saving time, if needed

Datum / Position Format

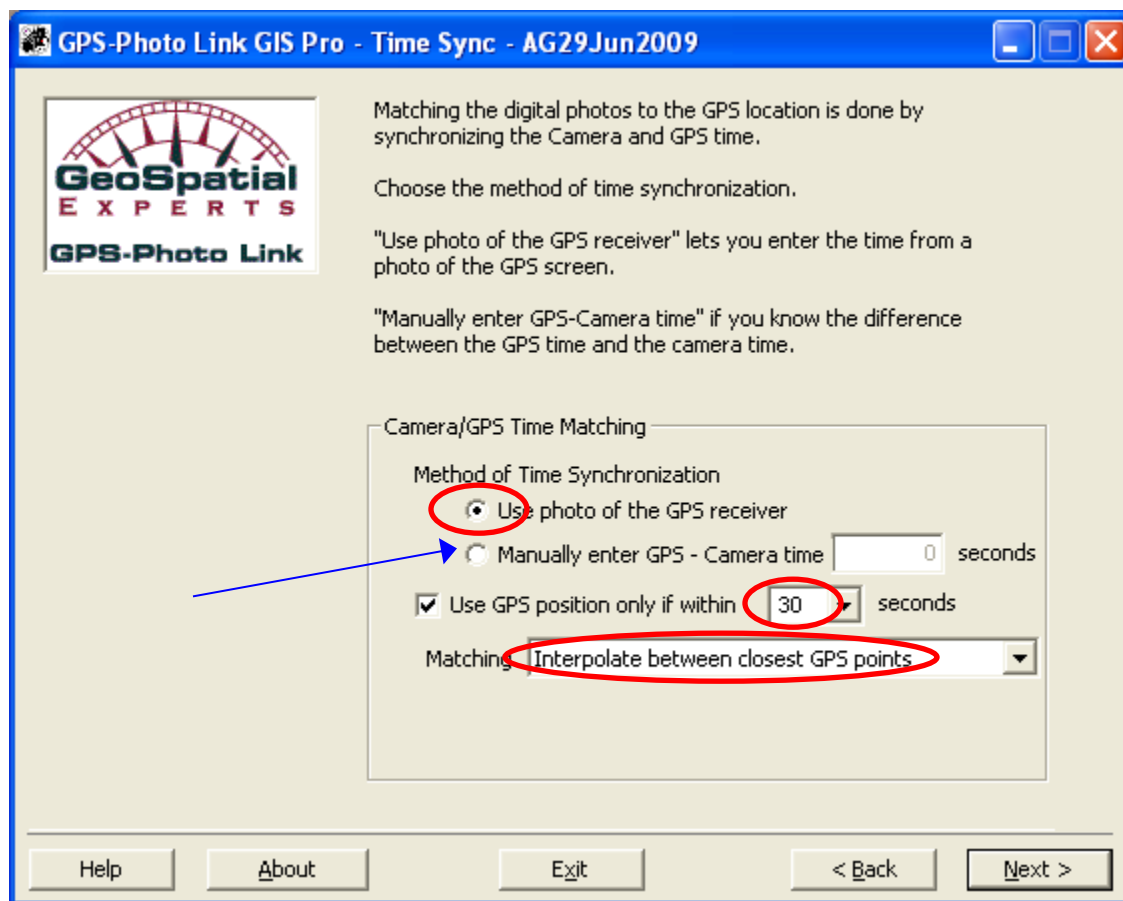
Select Datum / Position Format

Lat / Lon
NAD 83

Help About Exit < Back Next >

Pick the tracklog that you stored with the photos in the Original file (e.g., Original\LW02Jul2011\LW02Jul2011_TracklogPoints_AKAlbers.shp). Use 'Files of type' = Shape (*.shp) so that only the .shp (LW02Jul2011_TracklogPoints_AKAlbers.shp) shows for selection (otherwise you'll see all the photos and all the tracklog files). It will process the tracklog points – this may take some time.

III. Select time sync method.



You can change the interval for finding GPS position with 'Use GPS position only if within (blank) seconds' to something higher or lower depending on the interval that the tracklog points were recorded. Use Matching = Interpolate for tracklogs. You can use Match to closest point if you are GPS-photo linking to waypoints (but we're not doing that here, because most of the waypoint files are missing a time stamp in the appropriate field). When you hit next, a second screen will open, see below, part IV.

NOTE – if you do not have a photo of the pilot's GPS for the day's photos that you're working on, you can enter the time difference manually (blue arrow), based on the previous day's time difference (i.e., you will have had to make note of the time difference when GPS-Photo Linking that collection of photos). Take care to note if it's a positive or negative time difference.

IV. Time-sync photos to GPS time.

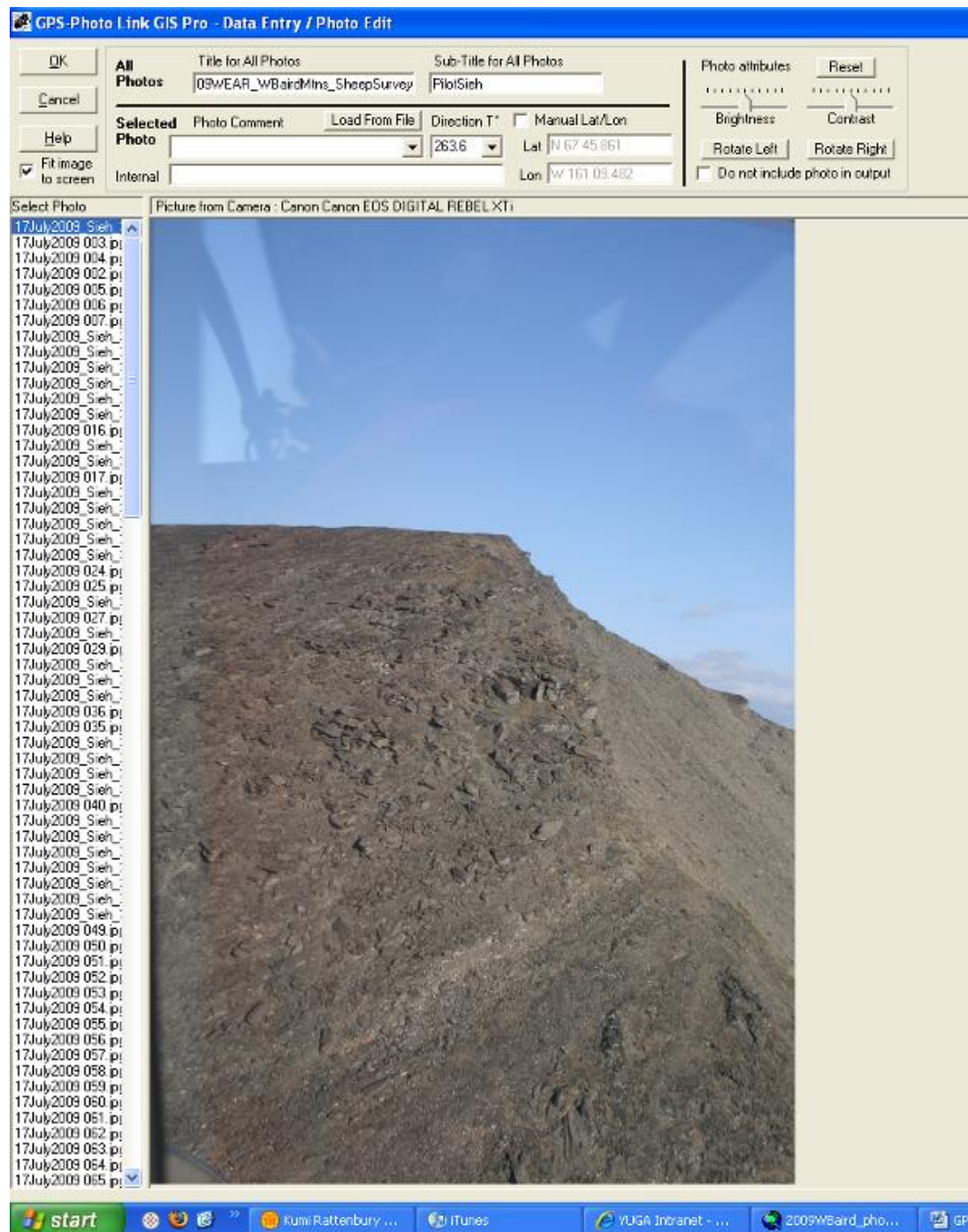


1) Select your GPS photo from the list on the left, it will then display.

2) Check mark 'Use this photo for time entry'. Set the GPS Time to the exact date, hour, minutes and seconds that is shown in the photo. The program will calculate the time difference.

NOTE – if you do not have a photo of the pilot's GPS for the day's photos that you're working on, and you manually entered a time difference in the previous step, circle 2) will already be filled in with the time offset.

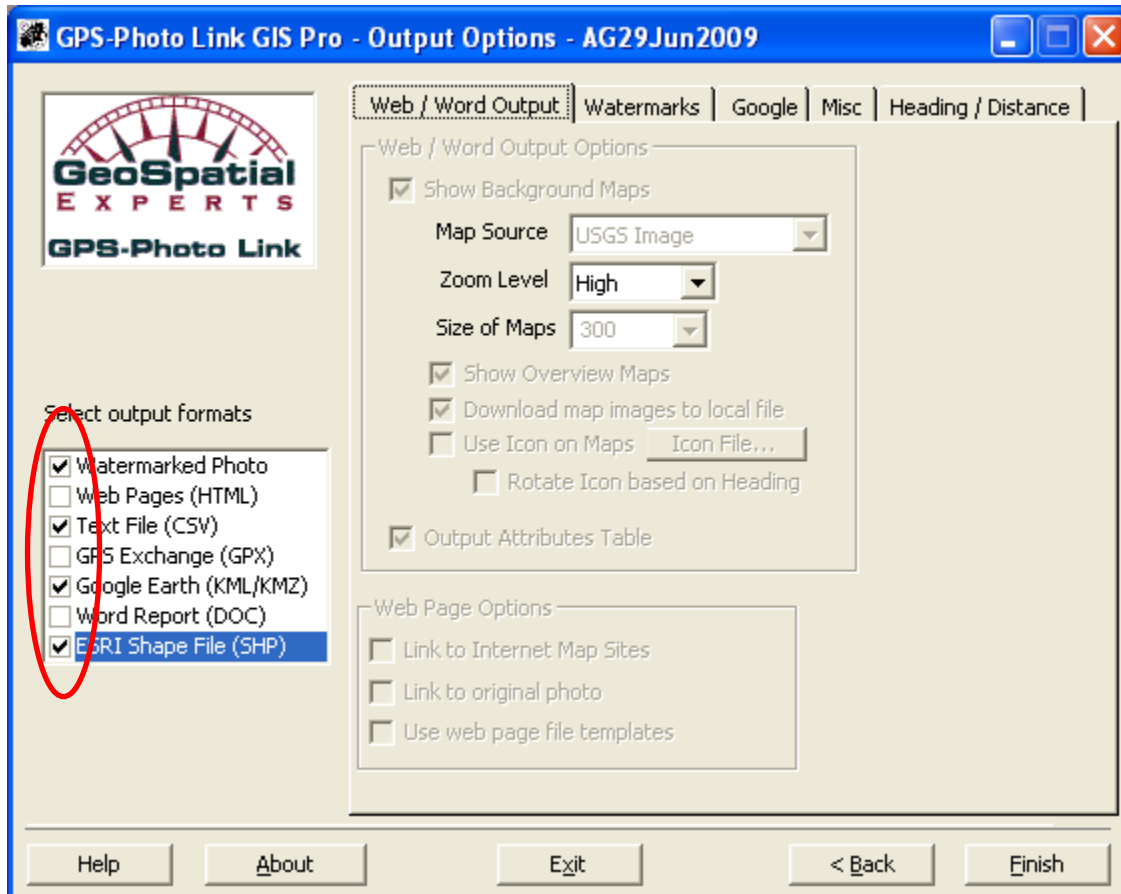
V. Enter a Title and Sub-Title for all photos. Title should be the survey name, e.g., 'Itkillik2011_SheepSurvey' or 'WRST2011_SheepSurvey'. Sub-Title should be the pilot's name, e.g. 'PilotSieh'. You can add Photo Comment for selected photos (individually or batch with select-all), but this is not necessary.



GPS-Photo Link will think for a while and stall out on the time sync screen (see part III) – and you won't be able to do or select anything with the program. Eventually, the window shown in section V1 (Select Output Options) will pop-up.

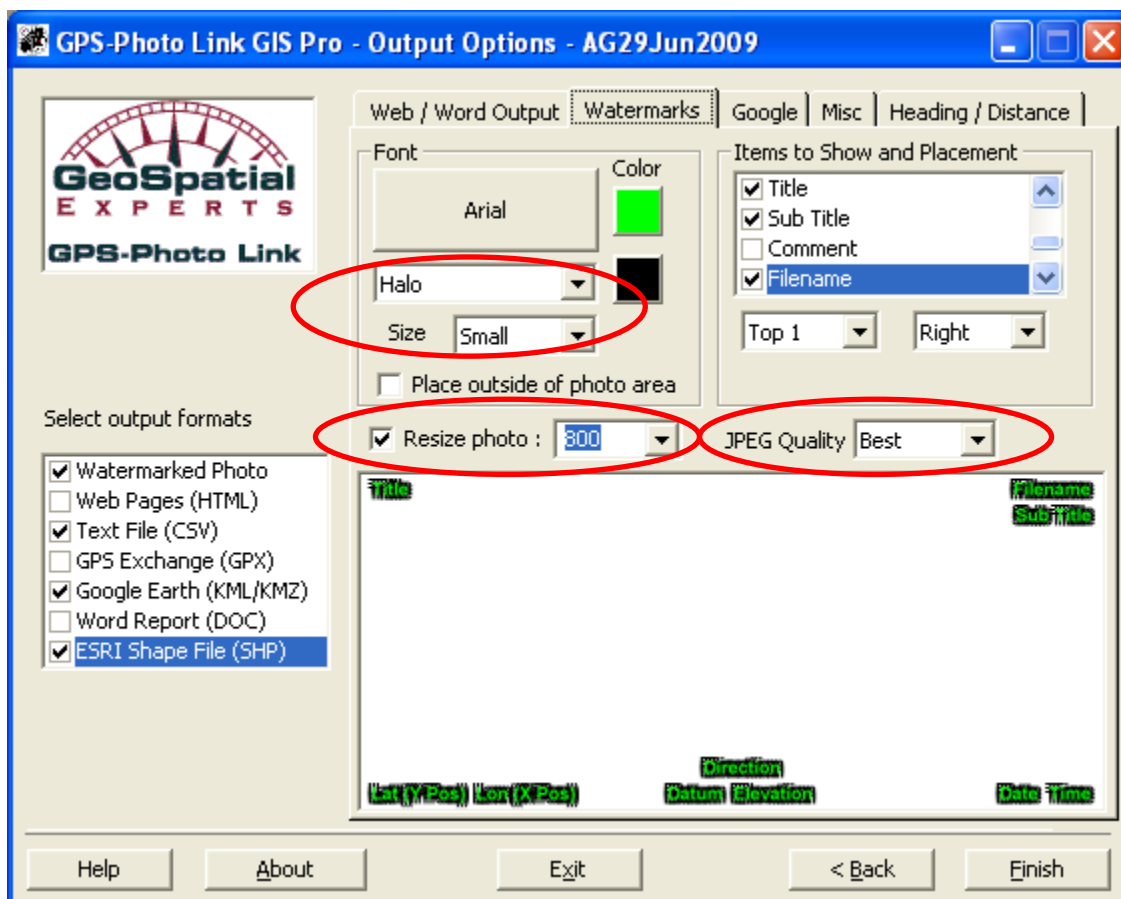
VI. Select Output Options (final products).

Select watermarked photos, text files, ESRI Shapefiles and Google Earth files. Check those boxes, and then move to Watermarks tab (do NOT hit Finish yet).



VII. Select Output Options (continued) – Watermarks for photo.

Use the screenshot below as your example to establish the watermark locations for your GPS-photo. Title in upper left (survey name), Filename upper right (original photo name), Sub-Title just below Filename (use Top 2 and Right for placement – this is pilot's name), Lat and Long lower left (left, bottom 3), Direction (plane was moving) in Center Bottom 2, Datum and Elevation in Bottom 3 center and Date and Time in Bottom 3 right. Then move to the Google tab (again, do not click Finish yet).



VIII. Select Output Options (continued) – Google tab.

Make sure this tab looks like the example below (all of the selections), and then move to the Misc tab (again, do not hit Finish yet).

The screenshot shows the 'GPS-Photo Link GIS Pro - Output Options - AG29Jun2009' dialog box with the 'Google' tab selected. The 'Icon Options' section has 'Use symbol' selected, 'Camera' chosen from the dropdown, 'Size' set to 'Small', and 'Label' set to 'Filename'. The 'View in Description Box' section has 'Comment', 'Photo', 'Watermarked Photo', 'Link to Watermarked', and 'Link to Original Picture' checked. The 'Output Options' section has 'Lock points to Ground (uncheck for Aerial Photos)' checked. The 'Select output formats' list on the left includes 'Watermarked Photo', 'Text File (CSV)', 'Google Earth (KML/KMZ)', and 'ESRI Shape File (SHP)' checked. The 'Attributes Table' checkbox is unchecked. The 'Show Field of View' section has 'Pie Piece (2D)' selected. The bottom buttons are 'Help', 'About', 'Exit', '< Back', and 'Finish'.

GPS-Photo Link GIS Pro - Output Options - AG29Jun2009

Web / Word Output | Watermarks | **Google** | Misc | Heading / Distance

Icon Options

☐ Use photo

☒ Use symbol

Size: Small

Label: Filename

Camera

Rotate symbol based on heading

Select output formats

☒ Watermarked Photo

☐ Web Pages (HTML)

☒ Text File (CSV)

☐ GPS Exchange (GPX)

☒ Google Earth (KML/KMZ)

☐ Word Report (DOC)

☒ ESRI Shape File (SHP)

View in Description Box

☒ Comment

☒ Photo

☐ Attributes Table

☐ Thumbnail

☒ Watermarked Photo

☐ Original Photo

☒ Link to Watermarked

☒ Link to Original Picture

☐ Link to Web Page

Output Options

☐ Include Track Logs

☒ Lock points to Ground (uncheck for Aerial Photos)

☐ Show Field of View

☒ Pie Piece (2D)

☐ Cone (3D)

Help | About | Exit | < Back | Finish

IX. Select Output Options (continued) – Misc tab.

Make sure tab looks as displayed below, then move to Heading / Distance tab (again, don't hit Finish yet).

The screenshot shows the 'GPS-Photo Link GIS Pro - Output Options - AG29Jun2009' window. The 'Misc' tab is selected. A red circle highlights the 'Format' section, which includes dropdown menus for 'Lat / Lon' (DD MM.MMM), 'Grid' (0.01 m), 'Elev' (meters (m)), 'Date' (MM/DD/YYYY), 'Time' (HH:MM:SS am), and 'Time Zone' (Local). Below the 'Format' section is a 'Thumbnail photo size' dropdown set to '140' pixels. The 'File Renaming Options' section has two checkboxes: 'Rename output files using' (unchecked) and 'Rename original photo' (unchecked). The 'Start Photo Numbering at' field is set to '1'. On the left, the 'Select output formats' section lists several options: 'Watermarked Photo' (checked), 'Web Pages (HTML)' (unchecked), 'Text File (CSV)' (checked), 'GPS Exchange (GPX)' (unchecked), 'Google Earth (KML/KMZ)' (checked), 'Word Report (DOC)' (unchecked), and 'ESRI Shape File (SHP)' (checked). The bottom of the window has buttons for 'Help', 'About', 'Exit', '< Back', and 'Finish'.

X. Select Output Options (continued) – Heading/Distance tab.

The screenshot shows the 'GPS-Photo Link GIS Pro - Output Options - AG29Jun2009' dialog box. The 'Heading / Distance' tab is selected. The 'Heading (Picture Direction)' section has 'GPS Track' selected. The 'Distance to Object' section has 'Manual' selected with a value of '1000' and 'Meters' as the unit. The 'Select output formats' list on the left includes 'Watermarked Photo', 'Text File (CSV)', 'Google Earth (KML/KMZ)', and 'ESRI Shape File (SHP)'. The 'Create Field Of View Shape File' checkbox is checked. The 'Heading Options' section is at the bottom.

GPS-Photo Link GIS Pro - Output Options - AG29Jun2009

Heading / Distance

Heading (Picture Direction)

- ☒ GPS Track
- ☐ Compass
- ☐ Memo: Memo 1
- ☐ Use for all: 0

Distance to Object

- ☐ None
- ☐ Laser
- ☐ Memo: Memo 1
- ☒ Manual: 1000

Units: Meters

☐ Calculate new position from heading and distance

☒ Create Field Of View Shape File

Heading Options

- ☐ Output heading using Magnetic degrees
- ☐ Adjust Heading (use when taking aerial photos)

Left 0 degrees

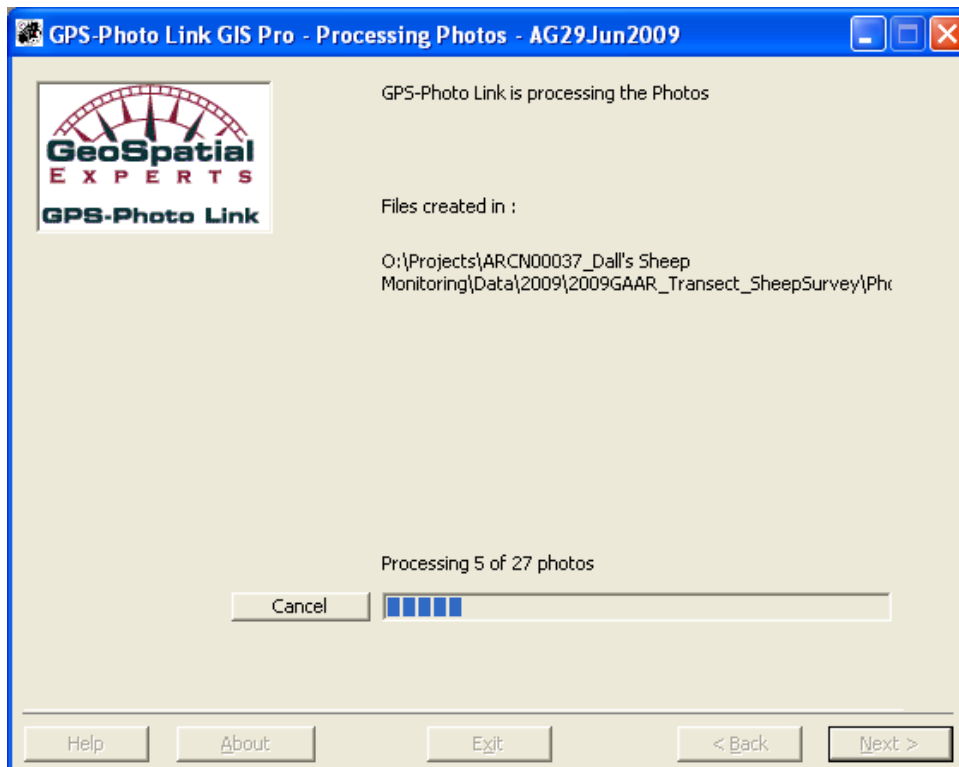
Select output formats

- ☒ Watermarked Photo
- ☐ Web Pages (HTML)
- ☒ Text File (CSV)
- ☐ GPS Exchange (GPX)
- ☒ Google Earth (KML/KMZ)
- ☐ Word Report (DOC)
- ☒ ESRI Shape File (SHP)

Buttons: Help, About, Exit, < Back, Finish

XI. Click Finish.

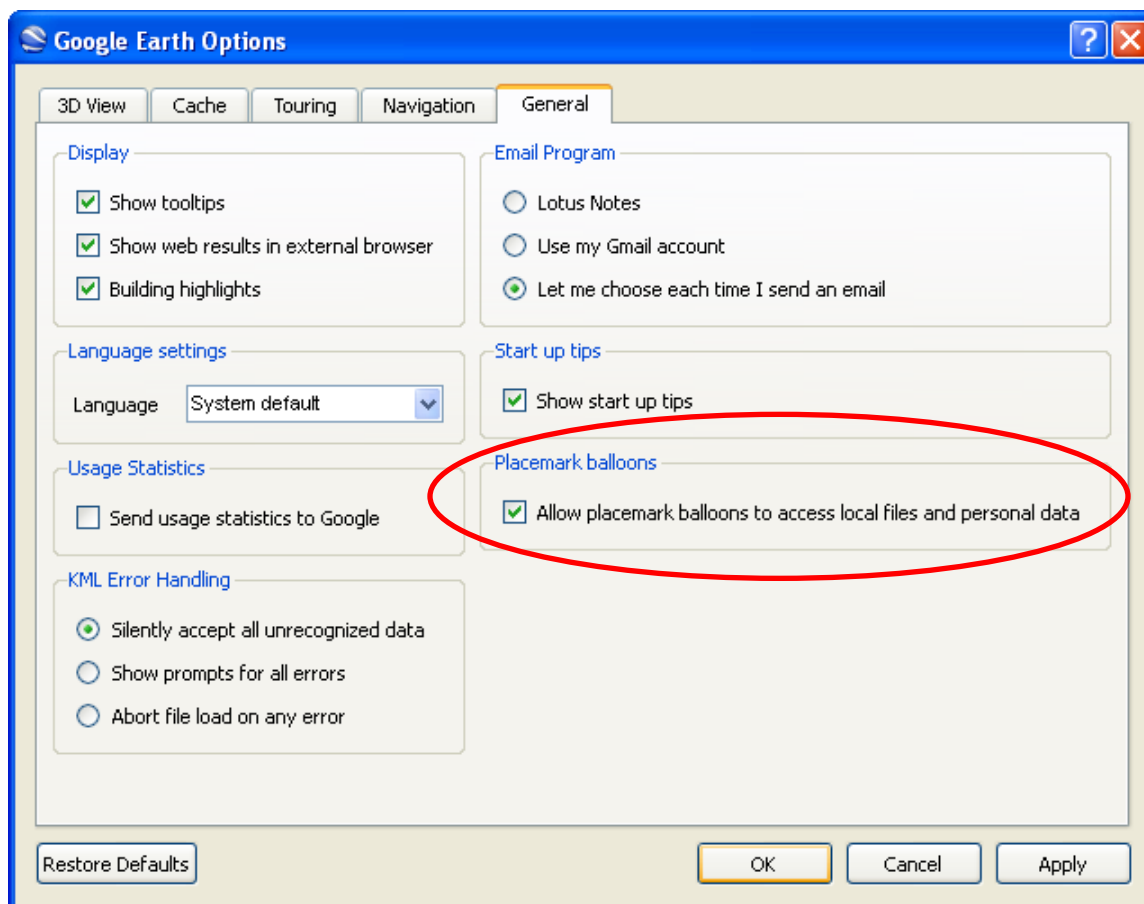
GPS-Photo Link will start processing your photos. This may take some time if you are processing a lot of photos at one time (e.g., more than 50). GPS-Photo Link will sit on the following screen while it's processing the photos, and then it will show you that X number of your total photos were linked to GPS locations when it's finished.



You can then 'Browse the Output Folder' to see your watermarked photos and the new shapefiles of your photos. And you can go to Google Earth and view your .kml and .kmz files (SOP 10.3). You should also open your GPS-Photo Linked shapefiles in ArcMap (SOP 10.4) to check the GPS-photo linking process and to then use the linked photos to check count and composition of sheep groups and to rename the original photos with their Transect # and Sheep Group #.

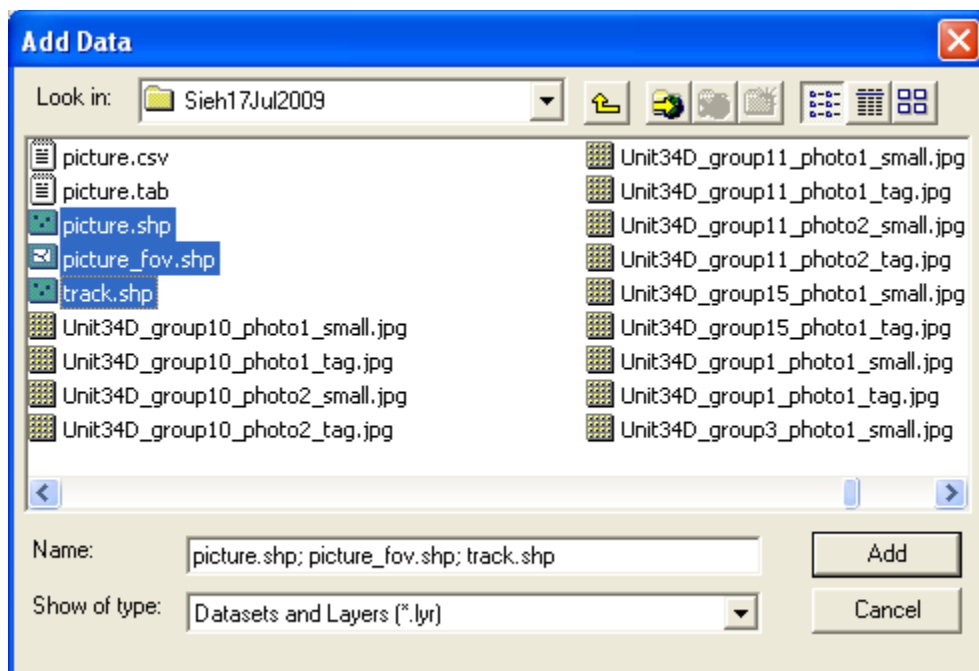
SOP 10.3 – View the GPS-photos in Google Earth

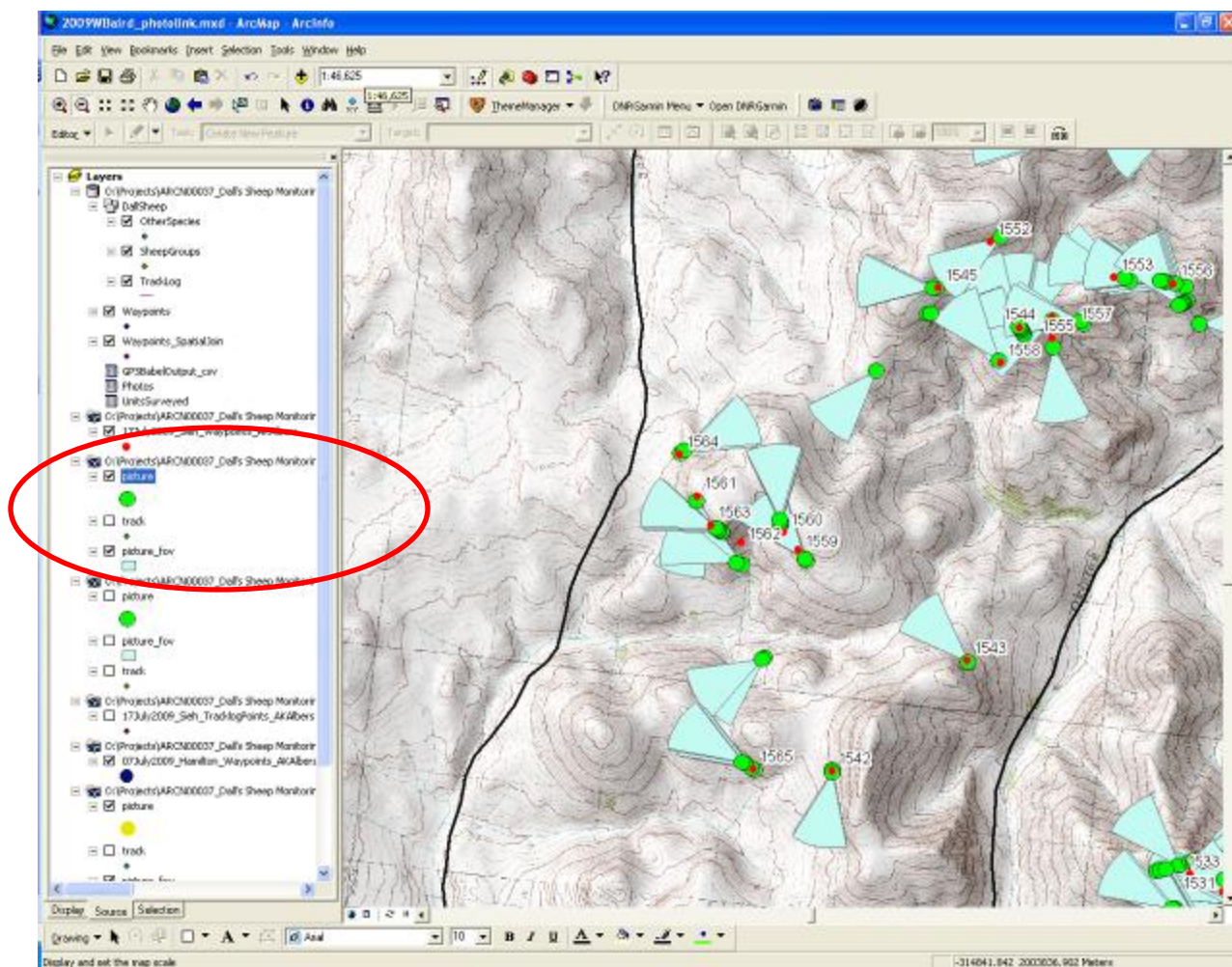
Open Google Earth from the last page of GPS-Photo Linking process, or open Google Earth on your computer, then navigate to and open the kml or kmz files in the folder where you stored your GPS-Photo Link products (e.g., Photos\Working\AG24Jun2009). The photos will appear on the map as purple camera icons labeled with photo name. Click on one or two of these and check to make sure that the links to the watermark and original photo are working by clicking on the blue-font 'Watermarked Picture' and 'Original Picture' labels in the bottom left corner. If they do not, make the following set up changes for Google Earth. Click the Tools pull-down menu, and select Options. On the General tab, select the options as shown in the screenshot below (in particular, select the option for placemark balloons) hit apply, then OK. You may need to restart Google Earth, but then the links to the watermarked photo and the original photo should be functional.



SOP 10.4 – View and Check the GPS-photo Shapefiles in ArcMap

Open ArcMap (e.g., the NPS_Transect_Tool.mxd for your survey). Click the Add Data button, browse to the Photos→Working→PilotNameDate folder and add the picture and picture FOV shapefiles to ArcMap. See the next two screen shots. To look at the photos from ArcMap, open the GPS-Photo Link tool: View→Toolbars→Check mark GPS-Photo Link and a small toolbar will open with a camera icon on the left. Select the camera icon and click on any of your 'picture' points. The photo thumbnail should flash on ArcMap and a larger version with watermarks should open in a separate window. If the thumbnail or watermarked photos don't show, your file name is too long. You will need to shorten the photo name in the Originals folder and start over.





Next add the waypoints shapefile for the same pilot and date, and compare the photos and their point locations to the sheep group waypoints. You can also check the photo locations to your DBAnimals shapefile. By zooming into the photo, you will use the photo to check your count and sex-age composition for each sheep group that has corresponding photos. You can use the photographs to correct the count/composition in DBAnimals.shp, but only if there are definitively more sheep in the photograph and if at least two sheep biologists recommend a composition change (e.g., for ram curl-size). Never reduce the number of sheep in the tabular data for a group based on the photo – the photo may miss a portion of the group. Also, be careful to not confuse or combine groups based on the photographs.

If this is the first round of GPS-Photo Linking for this set of photographs, you will rename the photographs (in the Originals folder) accordingly based on their location (e.g., photo LW02Jul2011_photo47.jpg GPS-photo links definitively as Transect34_Group13_Photo1.jpg). The relabeled photographs are then GPS-Photo Linked again for the final version of linked photographs that will go into the data archives. You will repeat **SOP 10.2 or SOP 10.5** with the relabeled photographs and indicate to GPS-Photo Link to place this final set of watermarked and properly labeled photographs with their corresponding picture.shp and picture_fov.shp files in the Final folder.

SOP 10.5 – Using GPS-Photo Link version 5.0

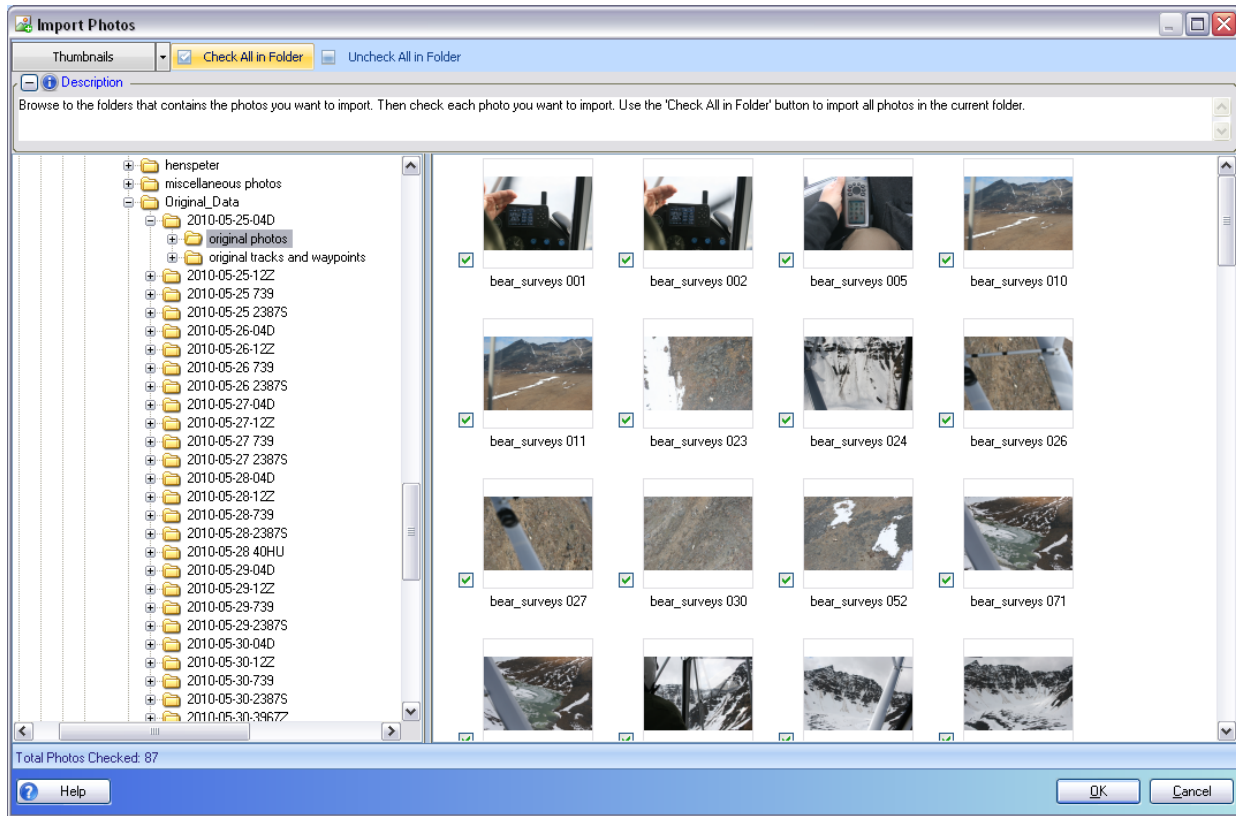
These protocols were written by M. Henspeter on 20 June 2011 for the ARCN Brown Bear Vital Sign Protocols and SOPs. The Brown Bear protocol labels photographs differently than the convention used for the Dall's sheep protocols (e.g., aircraft tail number instead of pilot initials). Please use the photograph naming convention from **SOP 10.2** for the Dall's sheep photographs even if you are using GPS-Photo Link software version 5.0 and following **SOP 10.5**. Make sure you already have a folder filing system per **SOP 10.1**, and be sure to check your GPS-Photo Linked photos and shapefile when you are finished using GPS-Photo Link version 5.0 (**SOP 10.4**).

- 1) Copy original images to be geotagged to a working folder under plane subfolder (ex. Working_Photos→Untagged→Aircraft04D)
- 2) Go through photos and reduce image population by removing obviously blurred/scenic/duplicate images. This will speed up the process later on, and simplify tagging.
- 3) Create 'new project' in GPS-Photo Link and give it an appropriate title

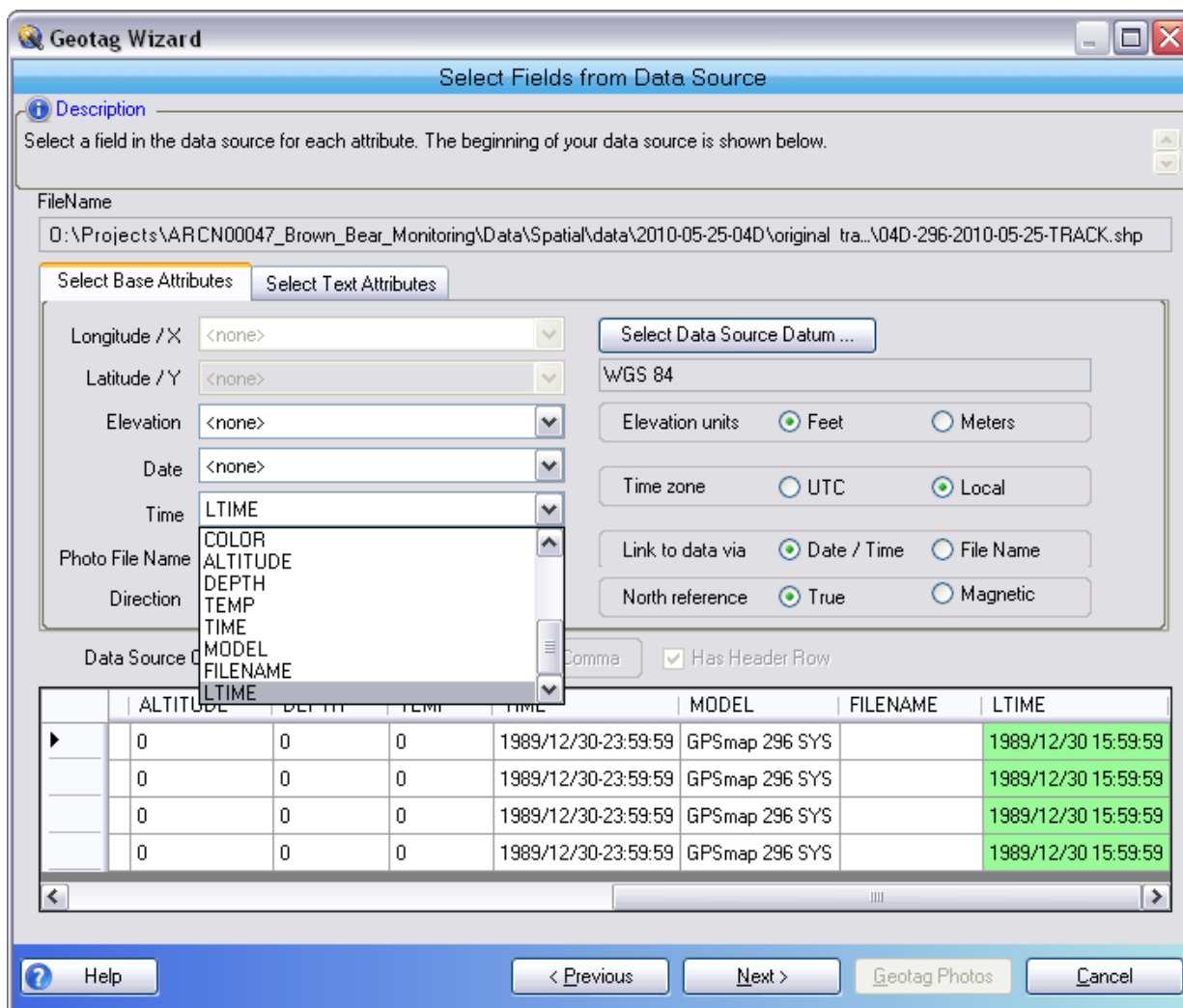


****(see footnote at end of document)****

- 4) Click 'Import Photos', and navigate to the desired network or local folder with the desired day from within the desired plane subfolder. Select whichever appropriate folder contains the original photos from the day and either select 'Check All in Folder' or specifically check the desired images.



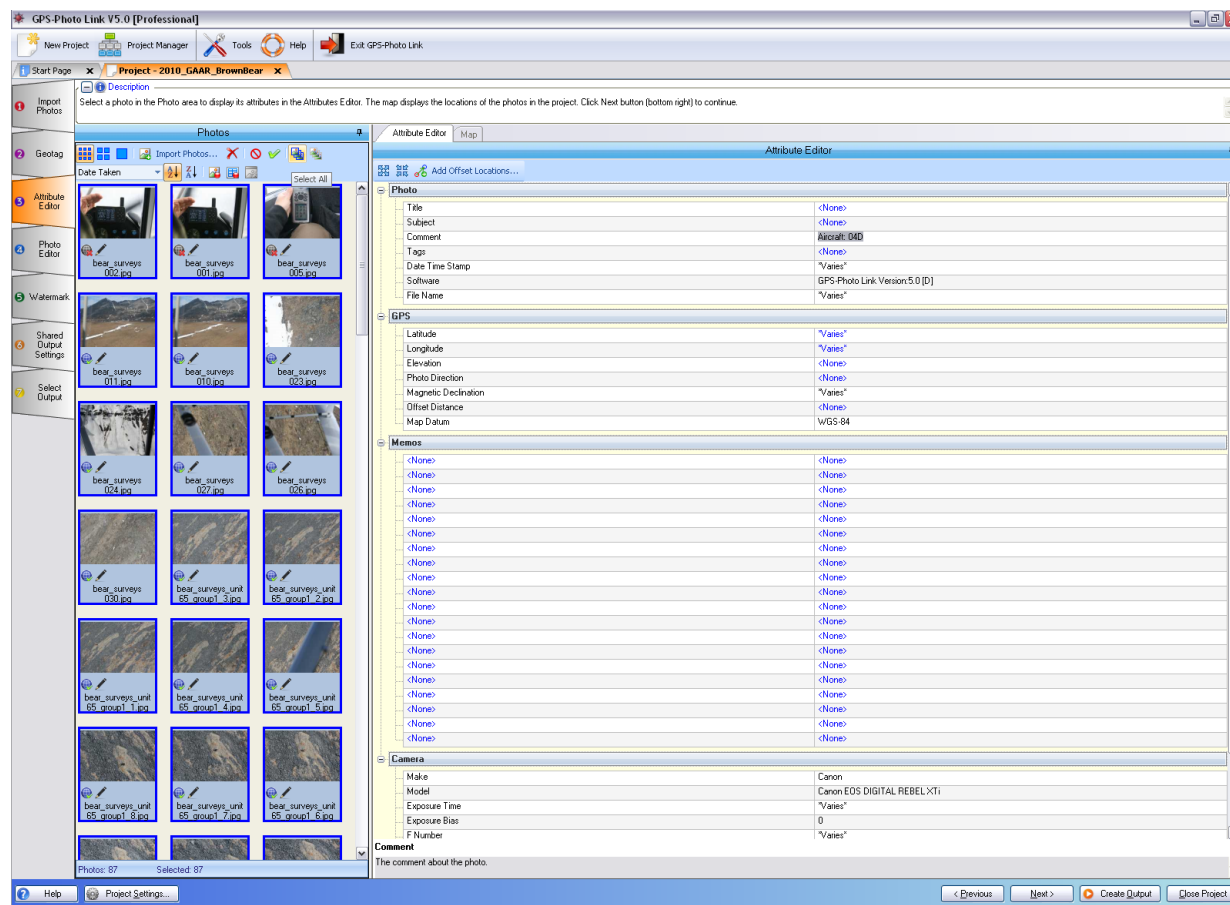
- 5) Click 'Next' and precede to the 'Geotag' tab. Click the 'Geotag Wizard' button and select "Use GPS File (.GPX, .SHP or .CSV). The default GPS position match threshold is 2 minutes, which works well. Click 'Next' and browse to the corresponding trackfile for the plane and day to match the photos.
- 6) Depending on previous data management, you may choose to select the original trackfile from the desired plane and day (which would tag ALL photos from that plane and day), or select an edited trackfile from the specific survey unit, or set of units (which would tag ONLY photos from within the survey area). Select the desired track and hit 'Open', then click 'Next'.
- 7) Set all fields to '<none>', then change the 'Time' field to 'LTIME' from the dropdown menu, and set the time zone to 'Local'.



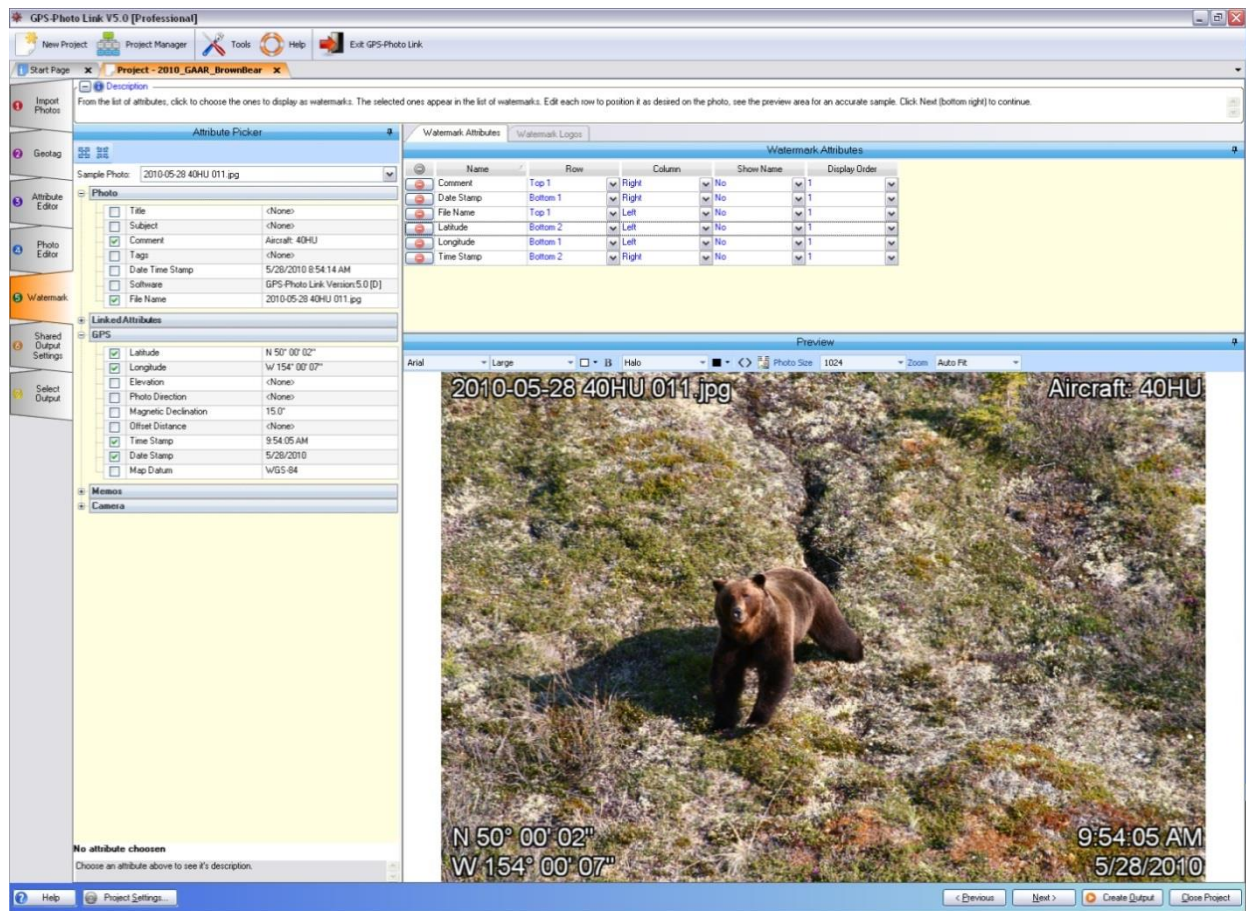
- 8) Click 'Next' and select "Use a photo of the GPS receiver. . ." and click 'Next' again. At the next screen it is easiest to maximize the window, and then click on the desired image containing the time field from the aircraft or handheld GPS unit. Enter the GPS time into the 'GPS Date & Time' field. If the GPS unit in the image does not have a seconds field displayed, simply change the seconds field to 30.
- 9) Click 'Next' and at the next screen click the 'Geotag Photos' button. The progress bar will run, and final dialog box will list the actual number of images tagged. Depending on which track (edited or original) was used, and when the GPS active log was cleared, all or just a few images may be tagged.



- 10) Click the 'Next' Button to move on to the 'Attribute Editor' tab. Click the select all button, and then enter the aircraft tail number (ex. "Aircraft: 04D) into the 'Comment' field. Depending on if you are tagging an entire plane day of images, or just a specific survey unit, you may or may not want to enter the specific survey unit into the 'Subject' field.

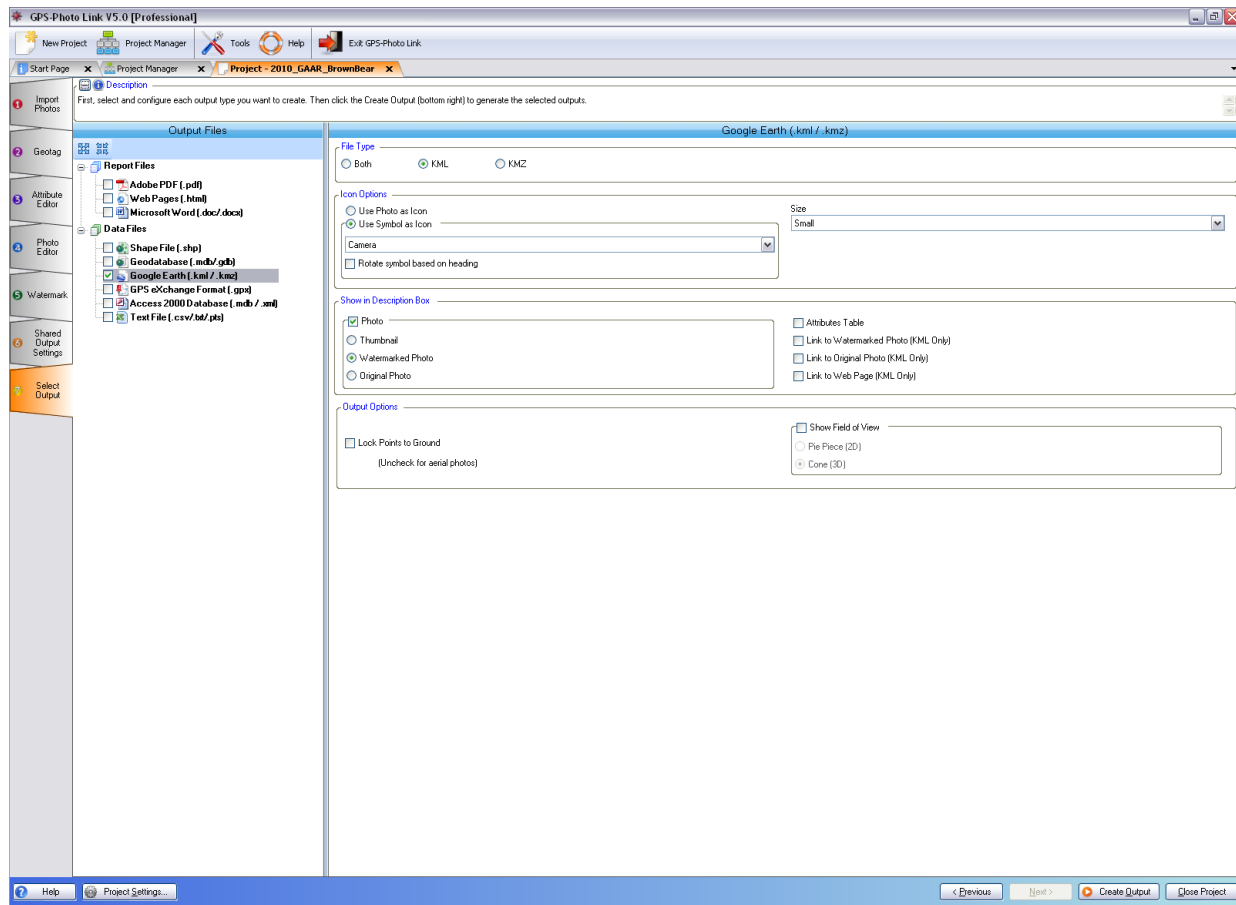


- 11) Click 'Next' to move to the 'Photo Editor' tab, but unless there are specific images that need attention, simply click 'Next' again to move on to the 'Watermark' tab.
- 12) Check the boxes for the desired fields under the 'Photo' and 'GPS' attribute picker options. These can be moved around using the 'Watermark Attributes' row, column, and display order options. For this protocol the 'Comment', 'Date Stamp', 'Time Stamp', 'File Name', 'Latitude', and 'Longitude' were selected. If you are tagging a specific unit, you may also want to include the 'Subject' field. Do NOT use the 'Date Time Stamp' under the 'Photo' option box, as this will stamp the internal camera time.
- 13) Change the 'Photo Size' to 1024 (or other preferred output size), and change font size to Large.



14) Click 'Next' to go to the 'Shared Output Settings' tab, and simply uncheck all of these if you are not producing a geotagging report. Click on 'Static Maps' and uncheck the three options. Click 'Next' to move on to the 'Select Output' tab.

15) For Google Earth select 'KML', and change the icon size to Small. Under the 'Show in Description Box' options select 'Watermarked Photo', and uncheck all other options.



16) Click 'Create Output'

*****NOTE:***** As of 6/23/2011, Photolink v5.0.45 saves all tagged images in a local 'Output' folder (in this case C:\Documents and Settings\MAHenspeter\My Documents\GPS-Photo Link\2010_GAAR_BrownBear). Since GPS-Photo Link makes each tagging batch as a new folder, you will probably want to title your project title by date and plane only. You will have to extract these tagged images from the output folder (there will also be a thumbnail and a resized non-tagged version of the photo). Place images in a working folder under plane subfolder (ex. Working_Photos→Geotagged→2010_5_28→Aircraft40HU).