

Standard Operating Procedure (SOP) 8: Data Collection, Version 1.0

Dall's Sheep Monitoring Protocol

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

Kumi L. Rattenbury and Joshua H. Schmidt

National Park Service
4175 Geist Road
Fairbanks, Alaska 99709

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U.S. Department of the Interior
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Natural Resource Stewardship and Science
Fort Collins, Colorado

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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 8 – Data Collection

Standard Operating Procedure #8
 Version 1.0 (03/01/2017)

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SOP 8- Contents

	Page
SOP 8.0 – Introduction	5
SOP 8.1 - Garmin GPS Units.....	5
SOP 8.1.1 - Observer's GPS Unit: Garmin 76csx	5
SOP 8.1.2 - Pilot's GPS unit: Garmin 296, 396, 495, 496	6
SOP 8.2 – Camera.....	7
SOP 8.3 – Field Computer Setup and Startup in the Field	8
SOP 8.4 – Starting ArcPad.....	9
SOP 8.5 – Setting GPS Preferences and Activating the USB-GPS	12
SOP 8.5.1 – When There's No GPS Fix.....	14
SOP 8.6 – Starting a New Flight Session in the Animal Marking ArcPad Applet.....	14
SOP 8.7 – Setting Auto-Panning and Configuration	16
SOP 8.7.1 - GPS Auto-Panning Percentage	16
SOP 8.7.2 – Configuration for the Custom Zoom Level and Toolbar Activation.....	16
SOP 8.8 - Finding a Transect.....	17
SOP 8.9 – Selecting a Transect to Start Flying.....	19

SOP 8.10 – Starting the Transect.....	20
SOP 8.11 –Going Off-Transect When Sheep are Sighted	21
SOP 8.12 – Data Collection for Sheep Groups.....	21
SOP 8.12.1 – Single Group in One Location.....	22
SOP 8.12.2 – Multiple Groups in One Location	23
SOP 8.13 – Paper Datasheet	25
SOP 8.14 – Resuming the Transect	28
SOP 8.15 – Changing Uphill Direction While On-Transect.....	30
SOP 8.16 – Ending the Transect and Entering Weather Data	31
SOP 8.17 – Editing Sheep Group and Weather Data.....	33
SOP 8.18 – Ending the Survey Session for the Day	34
SOP 8.19 – Trouble-shooting the Field Computer	34
Appendix SOP8-1 – Data Collection Cheat Sheet.....	35
Appendix SOP8-2 – Sample Datasheet	36

SOP 8.0 – Introduction

This SOP (**SOP 8 – Data Collection**) covers all aspects of data collection for the observer while in the survey aircraft. The observer is responsible for multiple pieces of equipment used to collect the primary (field computer, camera, external USB-GPS unit for the field computer) and secondary data (datasheets, pilot's GPS unit, observer's GPS unit). This SOP outlines the steps in starting up these equipment at the beginning of a survey flight; use of these equipment during flight and in-particular while surveying a transect; and at the end of the survey flight. **Appendix SOP8-1** is a one-page cheat sheet for observers to refer to while collecting data in the aircraft. The numbers on the cheat sheet refer to the sections of this SOP (**e.g., step 1 on the cheat sheet refers to SOP 8.1 – Garmin GPS Units**). **SOP 7** (Flying Transects) should be referred to in conjunction with **SOP 8**. **SOP 9** covers data downloading and editing that the observer will perform at the end of each survey day.

SOP 8.1 - Garmin GPS Units.

SOP 8.1.1 - Observer's GPS Unit: Garmin 76csx

Before getting in the plane, when you first get to your base camp/airstrip:

- 1) Turn Garmin GPS units on outside for 20+ minutes once you are at your base camp airstrip and anytime you've moved more than 150 miles from the last place you had the Garmin on. You are "initializing and downloading a fresh almanac for your GPS." Also set the Garmin to the current date and time (time zone) if it's wrong (hit Menu button → Main Menu → Setup → Time (should be 24 hour, US-Alaska, -09:00 offset, Auto). The big pad in the middle is a rocker pad to go up-down-left-right.
- 2) Clear old Waypoints and Tracks (download and delete if you want to keep them). You get to old Waypoints by hitting the Find button. You get to old Tracks (tracklogs) by hitting Menu button, then selecting Tracks icon.
- 3) Make sure Tracklog is Off until you're ready to fly. Go to Tracks page → turn track log to off using right-left rocker pad (center pad) and hit enter.
- 4) Go to Setup on the Tracks page. Uncheck the box next to "Wrap When Full". Set Record Method to Time by highlighting that area, scrolling to Time, and hitting enter button. Set Interval to 3 second. Pick and set a color for your tracklog/bread crumb trail. Scroll down to the Data Card Setup bar, click it, and check the box next to "Log Track To Data Card". Delete all previous tracklogs, assuming you've already downloaded them. You can't delete other things on the data card from here, and it might show that it's partially full.

When you're setting off for the day

- 1) Attach the Garmin 76csx to the external antenna. If you have a Gilsson brand antenna, you will need a Leatherman or pliers to remove the antenna. The antenna goes in the slot on the top right on the back of the Garmin. Be careful when removing the antenna at the end of the day – don't pull the port out of the Garmin.
- 2) Hit Menu button, select Tracks, turn Track Log "On". The Garmin is now tracking your path, making a point on the path every 3 seconds. If you're going to fly 8 hours and take a break in the middle, turn tracklog off during break, turn back on after break.
- 3) To collect waypoints (you only need to do this if your field computer has quit working) ask the pilot when to mark the sheep group. Hold Enter button down until waypoint page

pops up, hit OK, record pilot's waypoint number and your number on the datasheet. If you don't want to keep that waypoint while you're still on this page, hit Quit.

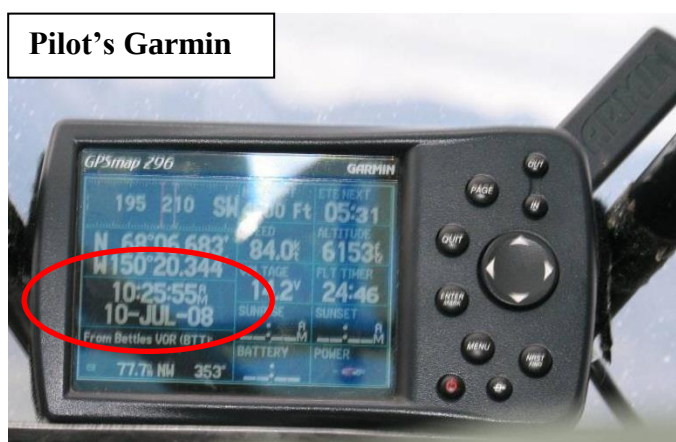
- 4) When you've finished for the day, and are about to land, turn Track Log to "Off" on the main Tracks page. Do NOT save your tracklogs on the Garmin – you will download an active tracklog file that evening. Turn the Garmin off.
- 5) If the computer dies, you will need to take waypoints for each sheep group in addition to taking a tracklog. When the pilot takes a waypoint for the group, you take a waypoint too – Hit Find button → 'OK'. Make sure you get the waypoint# from the pilot. Record your waypoint # as well as the pilot's.

SOP 8.1.2 - Pilot's GPS unit: Garmin 296, 396, 495, 496

- 1) The pilot must bring their own GPS unit, or you must provide one for him/her. The Project PI will give the pilot a chip with transects, start and endpoints and topographic maps loaded onto it that will fit in his/her GPS unit for navigation. The pilot may have to go to Map Menu → Map Information → Highlight and turn on those map layers individually.
- 2) Ask the pilot to set his/her tracklog to Record Mode=Fill, Interval=Time, Value= 3 seconds. If they won't or can't do this, that's OK. However the pilot will collect an Active Tracklog (even if it's not at a 3 second recording interval) that is a backup to the flight line you are collecting with the Animal Marking ArcPad Applet on the field computer.
- 3) Ask the pilot to take waypoints within a pre-designated range. The Project PI will set a 1000 range for each pilot and the pilot will start with that number for the first waypoint. For example, Jerry Lee's range for the WRST 2010 survey was 8000-8999, Sandy Hamilton's was 9000-9999, etc.
- 4) Ask the pilot to take a waypoint at the start and end of every transect, for every group of sheep seen on-transect, every group that may have been missed on-transect (i.e., you saw them after leaving the line to mark another group of sheep) and if there is time (i.e., it's not a busy survey with high sheep density), for any sheep or other wildlife (particularly predators) seen between transects.
- 5) When you've finished for the day, ask the pilot to turn Track Log to "Off" on the main Tracks page. Do NOT save your tracklogs on the Garmin. Turn Garmin off.

SOP 8.2 – Camera

- 1) Set camera time to GPS time as closely as possible at start of survey – this was probably already done for you by the Project PI.
- 2) At the start of a survey day in the plane turn on the camera. There is enough battery power to keep it on for an 8-hour day of flying. The camera will go to sleep, but wakes up when the shutter button is pressed.
- 3) Set camera to the running man (action) icon.
- 4) Turn the Auto Focus on.
- 5) Turn the Image Stabilizer on.
- 6) Take a photo of the pilot's and your GPS units. Make sure the date and time (date plus hour : minutes : seconds) are clear in these photographs (see below). It is imperative that you have time to seconds. We will link (GPS-Photo Link) all of your photos to the tracklog of both GPS units and need this date and time-stamped photo for this process.



- 7) If you see multiple groups in one area while flying on-transect, take a photograph or several of the group layout from the on-transect flight line and before you approach the groups. More than likely the groups will start running, disperse or coalesce when you fly over them to collect the composition data, and you can use these photographs to verify the original number and location of each group later in the office/base housing.
- 8) When you are flying over the group (off-transect) to collect the group composition and location information, take photographs of groups with more than four sheep or if any rams are present. This is really critical for very large and/or widely dispersed groups. Here are some instructions for photographing groups of sheep on-transect.
 - a. Make sure that the power is on.
 - b. Make sure that the camera is powered on, that it's on the running man (action) setting and that AutoFocus and Image Stabilizer are on.

- c. Hold the shutter down to take 3 shots/second to make sure you get them all in the fly-by.
 - d. If multiple groups have combined, photograph them together and note this on the datasheet.
 - e. Use the blue play button to look at the photos – they will not show automatically.
 - f. If you realize that you have not taken a GPS photo for the day, make a note to take it when you've finished the transect.
- 9) At the end of the survey day, turn the camera off and bring it with you back to the office/base housing to download the photographs and recharge the camera battery.

SOP 8.3 – Field Computer Setup and Startup in the Field

A laptop, ruggedized field slate, ToughBook or similar portable, field computer with a large screen (i.e., more like an iPad, not an iPhone) is used in the aircraft to record data. The field computers used for the 2009-2013 Dall's sheep surveys were ruggedized field slates from Xplore Technologies (Austin, Texas; also called tablet PC). An external USB-GPS unit such as the Garmin 18x is attached to the field computer to provide it with satellite location information. These protocols will refer to use of the Xplore field slates and the Garmin 18x. It is highly recommended that you do not use a field computer with a GPS unit attached to it, or that you disable this unit.

Note: There is no keyboard on the Xplore field slate. You use the stylus to enter everything right on the touch screen. Hold the stylus down on the screen over the area where you need to start writing and a keyboard window will appear. You can tap letter keys on this keyboard or there are options for handwriting letters and words with the stylus which the slate will interpret for you. All data entries for the sheep transect data forms have a number pad or drop-down menus for you to choose from so that you almost never need the keyboard. Any comments that you may have for a transect or group of sheep should be written on the paper data sheet – it's quicker and easier, and we will enter your comments into the geodatabase when going over the data after the survey. Additionally, to copy and paste, hold the stylus down on the keyboard, which is the equivalent of a right-click on the mouse. A menu will appear and you can copy, cut, paste, delete, etc. from here.

- 1) **Test the USB-GPS unit with the field computer at the survey base site before flying** to reduce errors and frustration during the flight. Turn the field computer on and get your GPS activated, make sure you have a signal and allow the external GPS to find itself on the ground at the bunkhouse. Follow steps 2-4 (below) to do this and leave the computer and the USB-GPS outside to establish its location for at least 20 minutes in one spot before you get in the plane and start surveying. After you have finished this test, make sure that 'Automatically Activate GPS' is NOT selected in GPS preferences in ArcPad; this should always be kept unchecked (turned off; see SOP 8.5, step 3a).
- 2) **Powering up the field computer:** When you are testing the field computer and external GPS unit on the ground before the survey flying starts, run the field computer on battery power. At the start of a survey day, start the field computer on battery power in the plane and work to establish a GPS connection and location. Once the plane has started up, you may plug the field computer into the inverter (e.g., iGo) and plug the inverter into the

plane's cigarette lighter outlet. Do NOT run the field computer on the plane's power before the plane has started up because it can blow the fuse for the outlet you are using.

- 3) **USB-GPS setup:** Fix the USB-GPS unit (e.g., Garmin 18x) somewhere on the aircraft's overhead crossbars. You can use zip-ties or electrical tape to get it to stay there. Attach the USB-GPS cable to the field computer. You can leave the external Garmin 18x taped to the crossbars for the full survey and just unplug and take the field computer home at night. If the Garmin 18x isn't working, hook up a Garmin 76csx by its USB cable to the field computer, attach an external Garmin or Gilsson antenna to the GPS and fix it to the crossbars of the plane and test this setup.
- 4) **Establishing a GPS connection:** Double-click on the Shortcut to Spanner.exe icon on the computer's desktop. It should tell you that it has found the external Garmin GPS and the ports for it (see figure below). If you click on that Spanner icon in your lower right menu bar, another window will show and will indicate that what GPS unit Spanner has detected (e.g., Garmin 18x) and what virtual serial ports (COM ports; e.g., COM1, COM3, etc.) it is transmitting to. Make sure that it has found your USB-GPS unit (e.g., Garmin 18x).

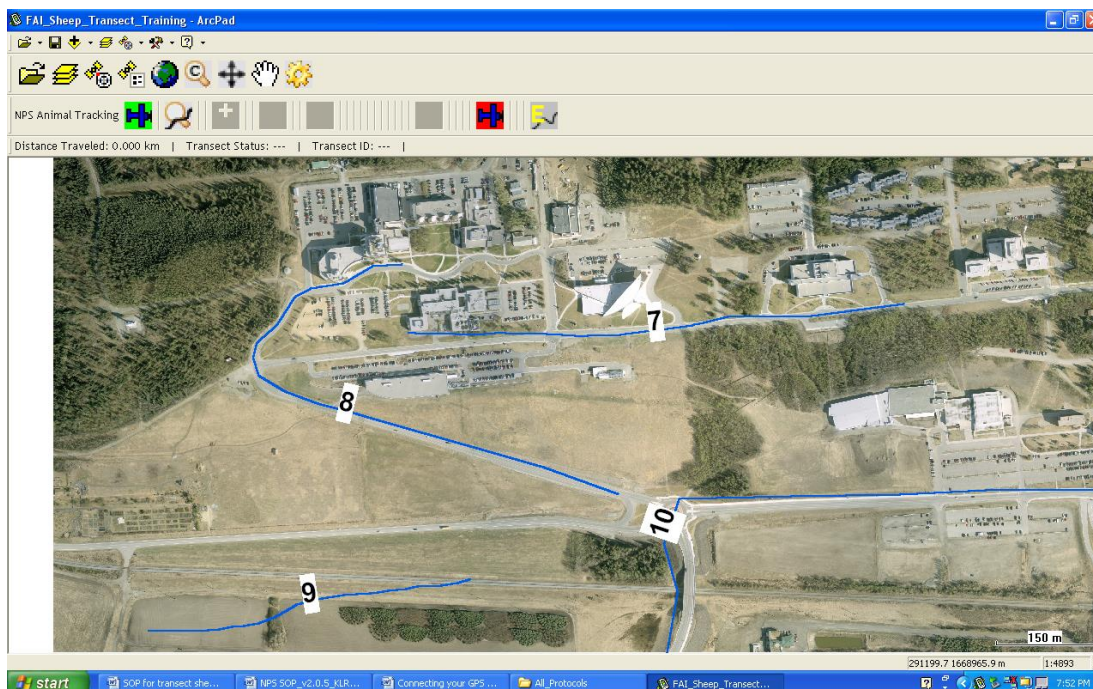


SOP 8.4 – Starting ArcPad

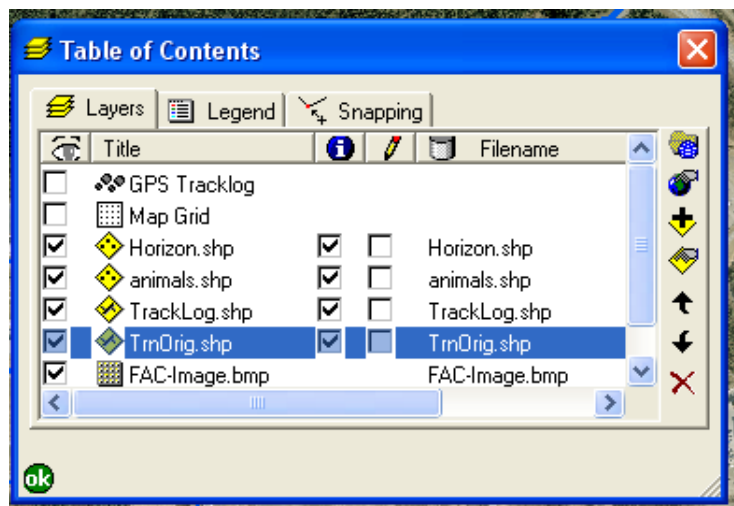
These instructions are for the current version of the Animal Marking ArcPad Applet v2.0.5, which is compatible with ArcPad 7.1.1.

- 1) Start the ArcPad project from the desktop (e.g., 'WEAR_survey.apm' or 'FAI_Sheep_Transect_Training.apm').
- 2) Make sure you're looking at a blank Survey file and there are no tracklogs, flight lines or animal groups showing from a previous flight. If it's blank, skip to step 4.
- 3) If there are data showing on your screen (e.g., on/off transects, animal groups, flight lines), close ArcPad and do the following:
 - a. Pull the Survey file out of the Applets folder (C:\Program Files\ArcPad 7.1\Applets\Survey) and save it to the desktop.
 - b. Load a blank Survey file back into C:\Program Files\ArcPad 7.1\Applets\ from the blank survey file folder specific to the survey that you're on (e.g., C:\ARCNSheep\SheepTrainingFAI\FAI_BlankSurveyFile\Survey).
 - c. Open the ArcPad project again.

- 4) Select the blue plane icon  on the NPS Animal Tracking toolbar. The transects for your survey should appear on the map and all transects should be blue (i.e., in “not flown” status). HOWEVER, they may not yet be labeled like you see below.

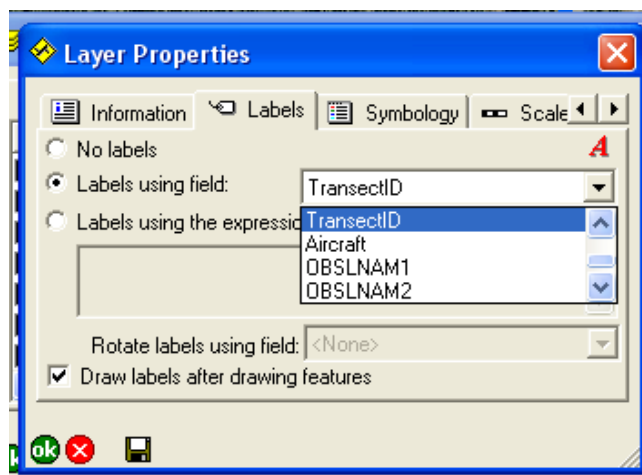


- 5) To label your transects, click the Layers icon  from the menu. This will open the Table of Contents window.
- a. Select (double-click on) the TrnOrig.shp (this is your Generated Transects shapefile).

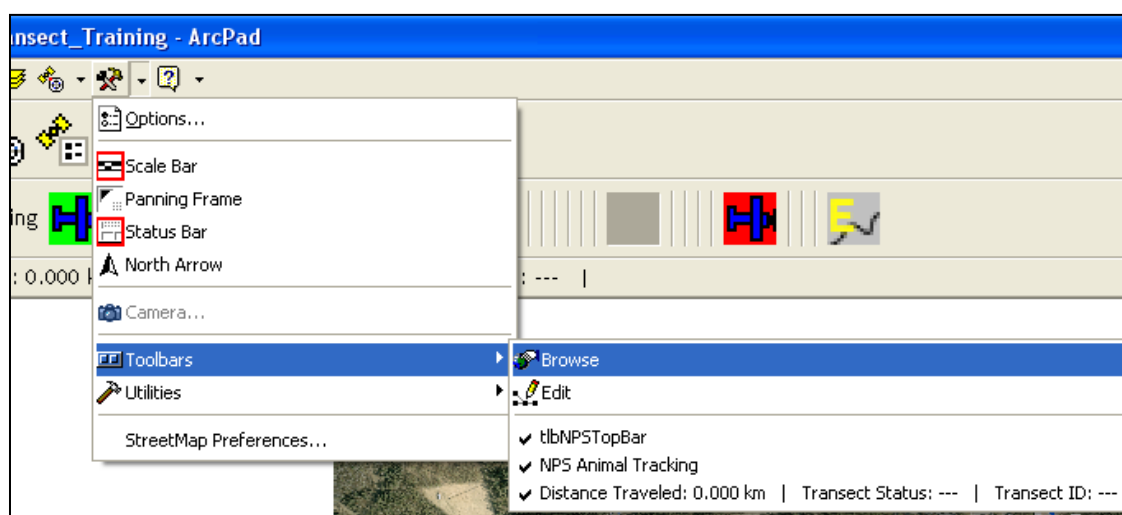


- b. On the Layer Properties window, select the Labels tab. Press the radio button for “Labels using field:” and scroll down to TransectID. To change the label font,

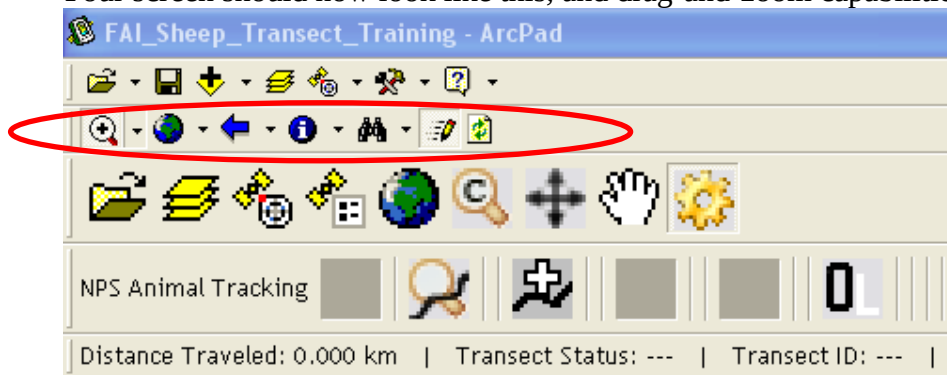
click on the red A in the upper right hand corner and you can pick your label color, font and font size.



- 6) To add the default ArcPad zoom toolbar to your view if desired (it has been hidden by the Animal Transects Tool because some users prefer fewer toolbars), open the Tools pull-down menu, pick Toolbars and select the Browse toolbar.

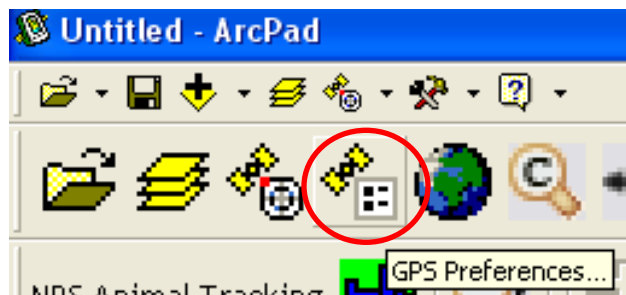


Your screen should now look like this, and drag-and-zoom capabilities are restored

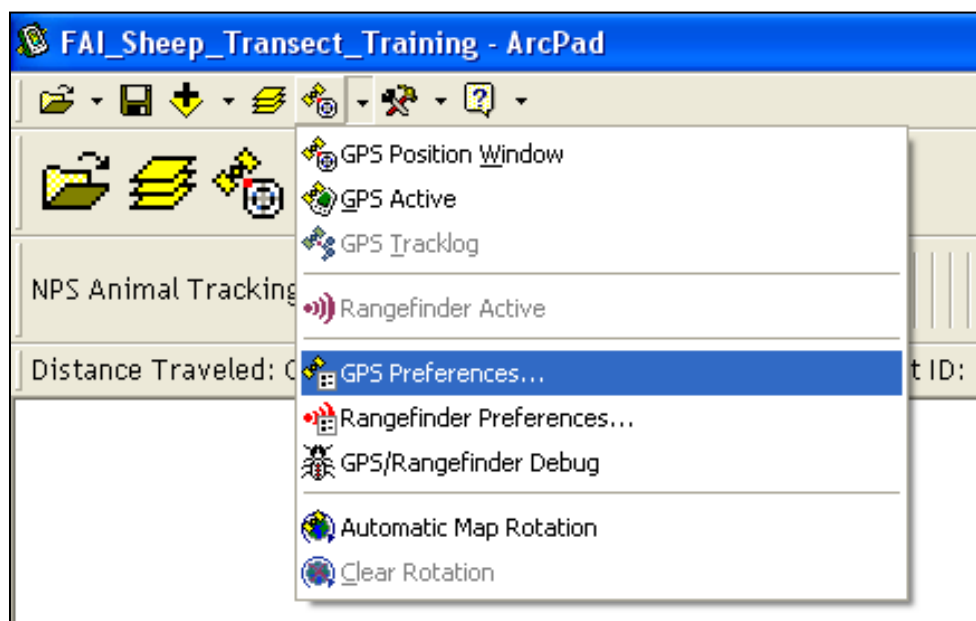


SOP 8.5 – Setting GPS Preferences and Activating the USB-GPS

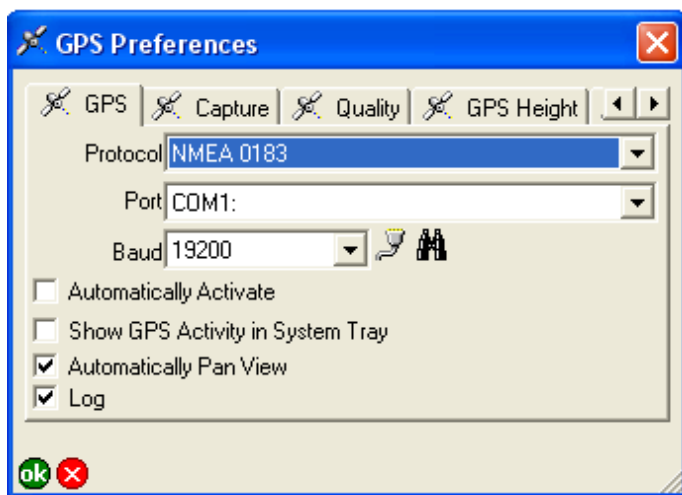
- 1) Make sure Garmin Spanner.exe is running (SOP 8.3, step 4).
- 2) To get to GPS Preferences:
 - a. Either hit the big GPS Preference button that GeoNorth put on its custom ArcPad toolbar,



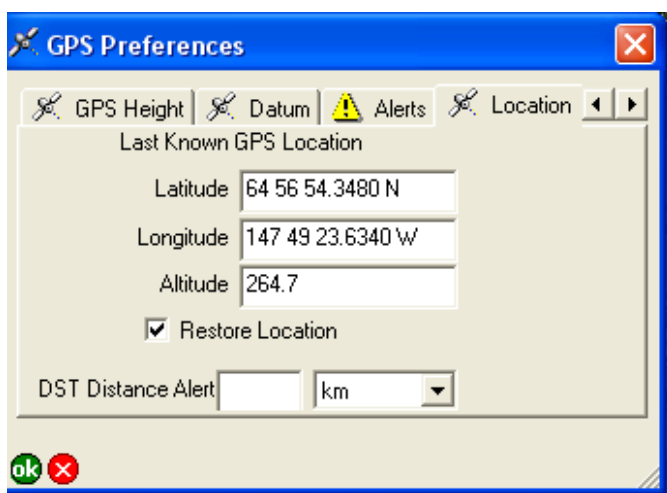
- b. Or, hit the arrow key to the right of the satellite icon  on the main, old school ArcPad toolbar to see the pull-down menu, then select GPS Preferences from the menu.



- 3) When the GPS Preferences window opens, go to the GPS tab.

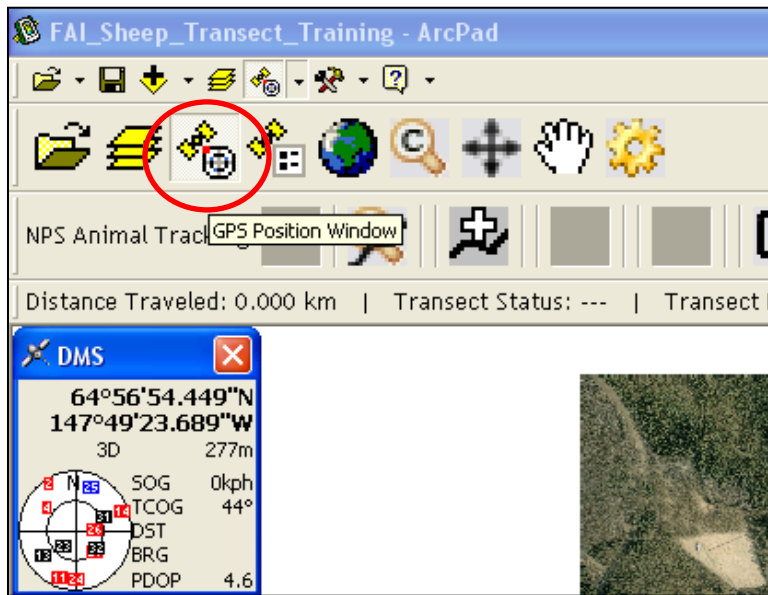


- Make sure “Automatically Activate” is not checked.
 - On the GPS tab, select ‘NMEA 0183’ from the drop-down menu for Protocol.
 - Click on the binocular icon. ArcPad will start looking for a GPS signal on each COM port. It will indicate when it has found one (e.g., COM1). This should be one of the COM ports which Spanner is transmitting to (see [SOP 8.3, step 4](#)). Select OK/Yes when it asks if you want to select the detected COM#. That COM# should now be listed for Port.
 - If you are using the Garmin 18x (preferred method), select Baud=19200.
- 4) Scroll to the ‘Location’ (far right) on the GPS Preferences window. Check the Lat/Long and make sure they are where you are by comparing the values with your handheld GPS (e.g., 76csx). If not, hand enter the Lat/Long, and check Restore Location, then OK.



- 5) Activate the GPS by hitting the GPS Position Window button  on the GeoNorth transect menu bar. The GPS should activate and the DMS (GPS position) window should

pop up showing the satellite locations overhead. You can close the DMS window if you want. You should also see your position marked at the center of the screen with .



SOP 8.5.1 – When There's No GPS Fix

If ArcPad is not communicating with the Garmin 18x, the DMS window will say “No Fix” and you will not be able to start a tracklog or record any location information. Don't panic. You have some options, though it's best to troubleshoot when you are on the ground.

- 1) Wait a while. Sometimes it will get a fix, even in the air.
- 2) If that doesn't help, restart Spanner.exe and ArcPad following [SOPs 8.3-8.5](#).
- 3) If that doesn't help, restart the field computer, Spanner.exe and ArcPad.
- 4) You can also use your Garmin 76csx as your external GPS in the same manner as the Garmin 18x – you just need its external antenna and USB cable to hook the 76csx to the field computer.

SOP 8.6 – Starting a New Flight Session in the Animal Marking ArcPad Applet

- 1) Click the  button on the NPS Animal Tracking toolbar not long after the plane takes off. This will load the maps and begin recording the flight line. The topographic or aerial photo background image and the generated transect lines should appear.
- 2) If there are data on the screen (not a blank Survey file), [see SOP 8.4, step 3](#).
- 3) If you get a warning message that says 'Backup point data was found in the Backup log file . . .' just say NO.
- 4) On the New Session form, fill in the data fields. Date is automatically entered for you. Pick 'Sheep-short form', your pilot, you, skip Observer Two, pick your aircraft tail

number. Click Finish. At a minimum, the animal, pilot and first observer must be entered for the session to begin.

New Session

Survey: FairbanksTraining2010

Survey Number: 1000

Flown Date: ☒ 6/26/2011

Animal: Sheep - Short Form

Pilot: L.OokMaNoHands

Observer One: J.Schmidt

Observer Two:

Aircraft: N1234Z

Cancel Finish

ok cancel

SOP 8.7 – Setting Auto-Panning and Configuration

If desired, you can change the GPS Auto-Panning Percentage (i.e., the automatic refresh/re-centering rate of your location cursor and map panning on your screen; SOP 8.7.1) as well as the zoom level for the Custom Zoom button and the visibility of the top, ArcPad default menu bar (SOP 8.7.2). These options are part of the Animal Marking ArcPad Applet.

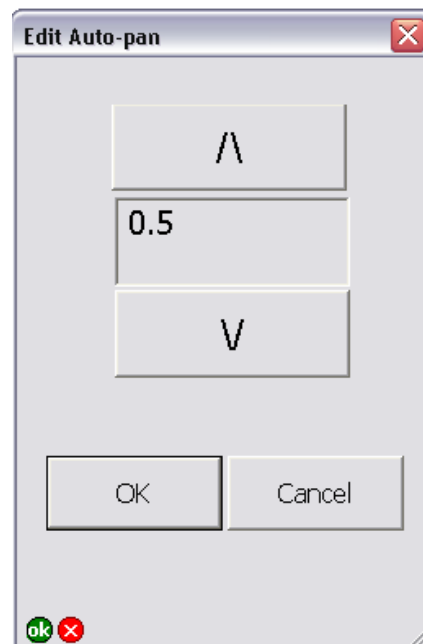
SOP 8.7.1 - GPS Auto-Panning Percentage

The GPS auto-panning percentage is the percentage towards the edge of the screen that the GPS cursor must reach before the map is automatically panned. The GPS auto-panning percentage is expressed as a value between 0 and 1. Set the GPS auto-panning percentage to 0 to re-center the map at every new GPS fix. Set the GPS auto-panning percentage to 1 to turn automatic map panning off. All other values (>0, <1) represent the percentage towards the edge of the screen the GPS cursor must reach before the map automatically pans. For example, a GPS auto-panning percentage of 0.80 indicates 80% towards the edge. This tool is on the NPS

Animal Tracking toolbar with the icon .

To edit the GPS auto-panning percentage, do the following:

- 1) While the GPS device is active, click the Edit Auto-pan tool button  on the NPS Animal Tracking toolbar. The Edit Auto-pan window will open.
- 2) Click the Up arrow to increase the percentage or Down to decrease the percentage. We recommend using something between 0.3-0.7, but you can test this while flying.
- 3) Click the Cancel button to abort editing the auto-pan settings.
- 4) Click OK to save the new auto-pan settings and exit form.



SOP 8.7.2 – Configuration for the Custom Zoom Level and Toolbar Activation

Before or during a flight, certain configuration settings can be altered to affect the way that ArcPad appears and behaves. To access the Configuration form, select the Configuration button



. The available configurations include:

Custom Zoom Level - This is the percentage of the full map extent that the screen will zoom to when you click the Custom Zoom  button. For example, if you set the Custom Zoom level to 50, then every time you click the Custom Zoom button, you will zoom to 50% of the full map extent, centered to your location cursor.

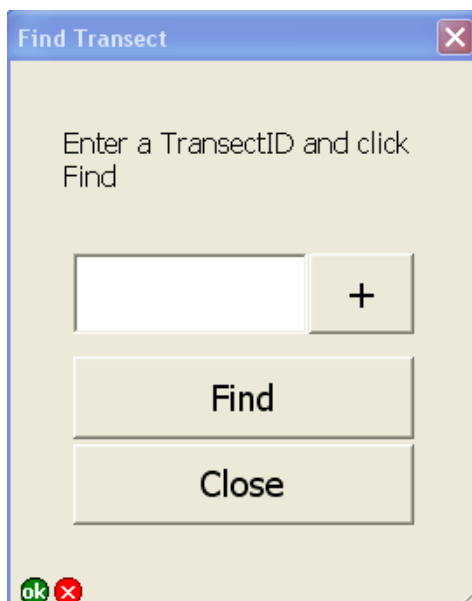
Hide/Show Main Toolbar - This allows a user to hide the ArcPad toolbar, the top most toolbar on the ArcPad screen.



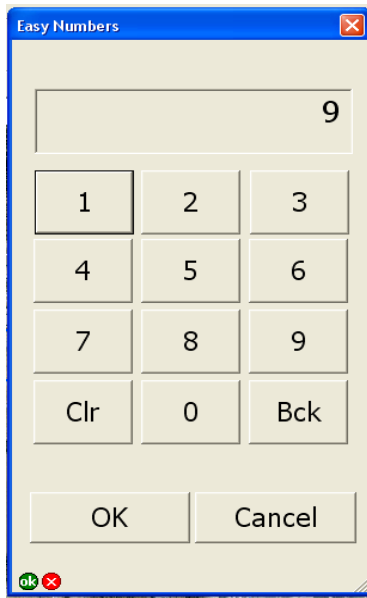
SOP 8.8 - Finding a Transect

Now that we have an active session, it's time to start flying transects. The Find Transect tool can be used to locate transects on your map.

- 1) Anytime after the Take Off /Load Map button  has been clicked and a New Session has been initiated, click the Find Tool button  on the NPS Animal Tracking toolbar. A Find Transect window will open.



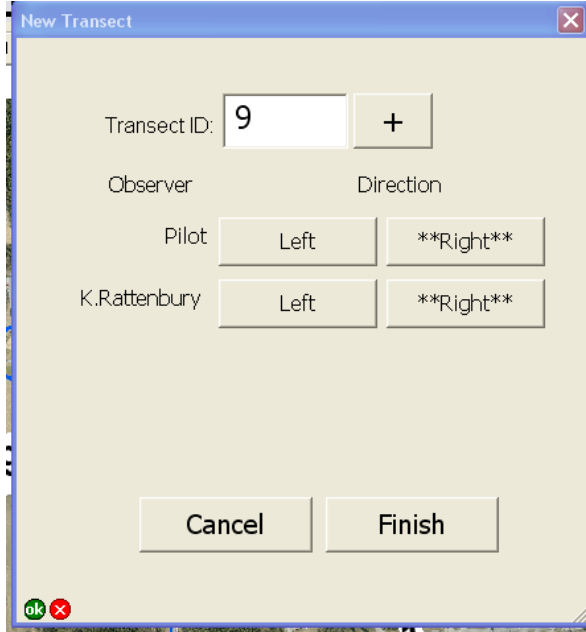
- 2) Click the + button to open the Easy Numbers pad.



- 3) Enter the ID # for the desired transect using the stylus on the Easy Numbers pad. 'Clr' will clear the full transect number you've entered, and 'Bck' will backspace. Hit OK. If this isn't what you wanted to do at all, hit Cancel, and then Close on the Find Transect window.
- 4) Back on the Find Transect window, click Find, and you will be zoomed to the transect (although it can't hold that position if you have an active GPS going). The 'found' transect will remain highlighted though.
- 5) If you want to cancel this process and not go to a transect, hit 'Close'.
- 6) If the Transect cannot be located, a message will appear that there isn't a transect with that number.

SOP 8.9 – Selecting a Transect to Start Flying

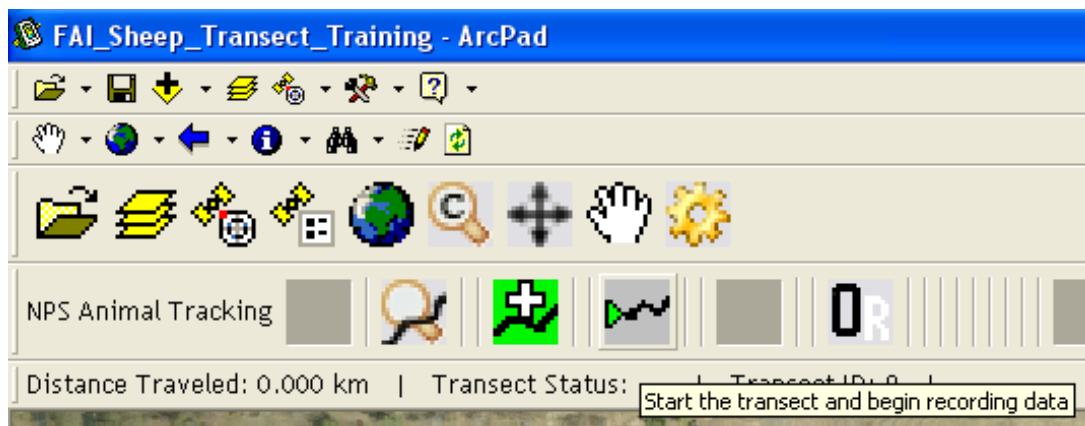
- 1) Click the  button on the NPS Animal Tracking toolbar, it should turn green.
- 2) The New Transect worm form will pop up. Use the + button to get to the number pad, and enter the transect # that you're going to start flying.



- 3) Pick Left or Right based on which way uphill is for you for this transect. This is really important. The tool will pick the same direction for you and the pilot.
- 4) Click Finish. After doing this, wait until you reach the actual beginning of the transect.

SOP 8.10 – Starting the Transect

Just as you approach the beginning of the transect, click the Start Transect  button on the NPS Animal Tracking toolbar. The applet will start recording an On-Transect segment in the DBTracklog shapefile. You will not see this line on your map until you go off-transect to mark a group of sheep or you end the transect. However you should see your position marker  moving along the flight line.



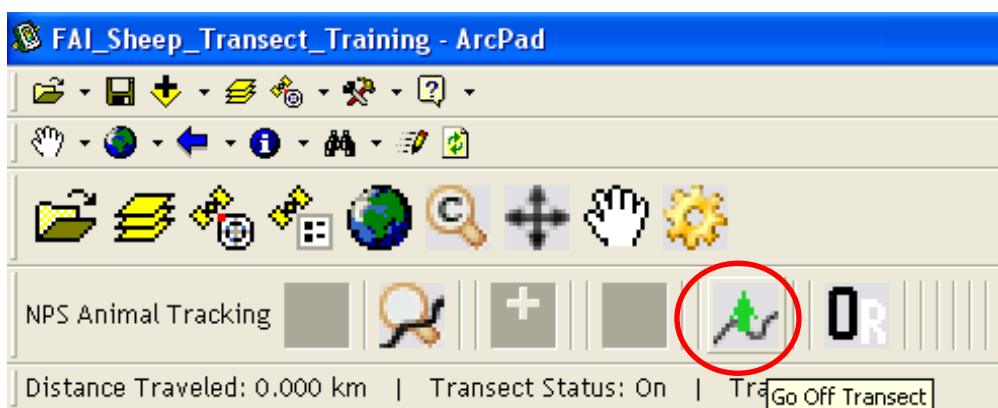
The pilot should fly ~300ft Above Ground Level (AGL), making an attempt to follow the transect as much as possible. It is not critical that every twist and turn in the transect is followed exactly. For example, sharp turns will be smoothed out because of the limitations of the plane, turbulence, etc. [See SOP 7](#) for more details regarding survey flying protocols.

SOP 8.11 –Going Off-Transect When Sheep are Sighted

When you see a group of sheep while flying on an on-transect segment,

- 1) Keep flying on-transect and scan for additional groups in the vicinity ([see SOP 7](#)).
- 2) If you see more than one group of sheep, take several photos from the transect line. This will help you in the evening to verify the groups' initial/original locations (where they were when you saw them from the transect line) and to distinguish between groups in your data if they start running and disperse or coalesce when you fly over them to mark their locations and collect composition data.
- 3) Leave the transect in a direction that takes you back over what you've flown (rather than farther along the transect).
- 4) At the same time that you leave the transect to circle back, click the Go Off Transect

button  on the NPS Animal Tracking toolbar. The applet will change your DBTracklog line from an On-Transect segment to Off-Transect. You will now see the previous On-Transect segment on the map as a green line, and the Sheep – Short Form data form will pop up.



- 5) If it turns out that your target was not a group of sheep (e.g., white rocks occasionally can be mistaken for sheep), have the pilot return to the transect line where you left off and click **Resume Transect** on the Sheep – Short Form. If it was sheep, go to [SOP 8.12](#).

SOP 8.12 – Data Collection for Sheep Groups

Count, composition and activity information as well as a GPS location are recorded on the field computer in the ArcPad applet for all sheep groups seen on-transect. For the ARCN and CAKN sheep surveys, we use the Sheep – Short Form to record these data. This option was set when you started the session for the day. There is also a Sheep – Long Form with more sex-age classes, but it is difficult to tell yearlings from ewes and different curl sizes for rams from a fixed-wing aircraft and thus we do not use this form for our surveys. The Long Form would be more appropriate if surveys were conducted by helicopter.

Any sheep groups seen after leaving the transect (i.e., when you are flying off-transect) to start recording data for another group do not count in the main analysis and should not be recorded on

the field computer. The pilot should collect a waypoint for any groups that were missed-on-transect as described above and for any groups below the transect line. The data for the missed and below-transect groups should be entered on the paper datasheet. Any sheep seen while flying between transects can be recorded on the datasheet with the pilot's waypoint if there is time.

SOP 8.12.1 – Single Group in One Location

A 'Sheep – Short Form' window will also open when you click the Go Off Transect button



. This form is the data entry form for the DBAnimals shapefile and where you will enter the composition and activity data and mark the location for the observed group of sheep.

- 1) As soon as you've determined that you're looking at sheep (and not a white rock) click **Mark Animal** to initiate data entry for that group. This will set a point down on the map (DBAnimals is a point shapefile). You will use the Update Position button later (see SOP 8.12, step 4) to mark the group's initial location. Always hit the **Mark Animal** button first, and then enter the composition (sex-age class size) information on the form. You should see your transect number and group number at the top of the form – automatically entered by the applet.

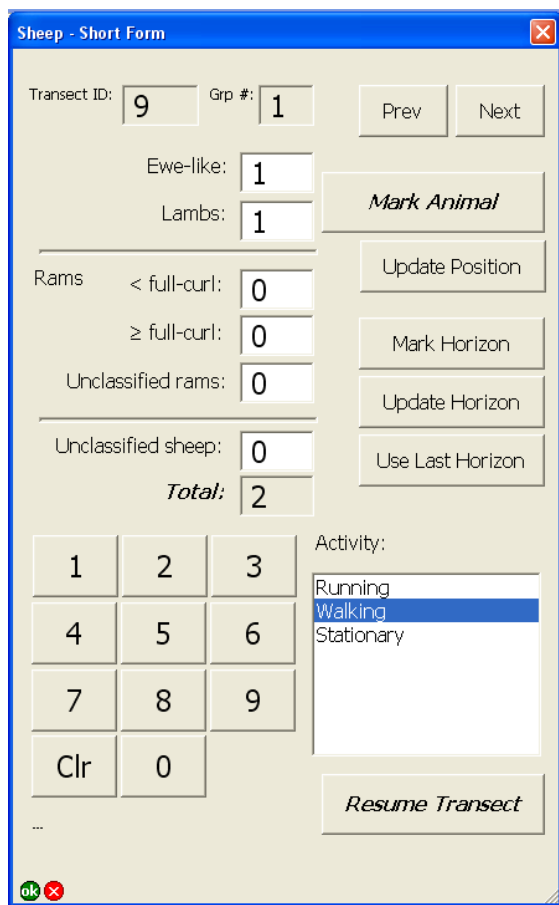
- 2) Click on the field next to each composition class, and use the number pad to enter the number of sheep in that composition class (ewe-like, lambs, < full-curl rams, ≥ full-curl rams, unclassified rams [indeterminable curl-size] and unclassified sheep). The default is 0, so if there are no sheep in that composition class for this group, you do not need to enter anything in the count field.
- 3) For Activity, click on the highest level of activity (Stationary, Walking, Running) seen by any member of the group of sheep. Stationary includes lying down, standing and feeding (if not moving while feeding). For example, for a group of five sheep, if one is walking and the rest are lying down or feeding, pick Walking.
- 4) As the pilot flies over the ORIGINAL LOCATION where the group was when you saw it from the transect click the Update Position button. The pilot will tell you when to hit Update Position. You can ask them to make another pass over the location if you don't hit Update Position at the right time.
- 5) If you made a mistake and hit the **Mark Animal** button too many times or when there wasn't a sheep group, enter 999 in the data field next to Ewe-like and pick any category under Activity. The 999 will clue in the people doing data QA/QC to eliminate that group.
- 6) Take photographs of the sheep group if there are more than four sheep or if there are any rams present. This is really critical for very large and/or widely dispersed groups. See **SOP 8.2** for more information about camera setup and use. Here are some general tips
 - a. Make sure that the camera is powered on, that it's on the running man (action) setting and that Auto Focus and Image Stabilizer are on.
 - b. Hold the shutter down to take 3 shots/second to make sure you get them all in the fly-by.
 - c. If multiple groups combine, photograph them together and note this on the datasheet.
 - d. Use the blue play button to look at the photos – they will not show automatically.
- 7) On the paper datasheet (see also **SOP 8.13**), write down the transect number, group number, composition data, group total number, the pilot's waypoint (critical!) and in the Comments field, any issues (e.g., turbulence, nausea, etc.) that may have affected sightability or the count and composition data. You can then use the paper datasheet to check the field computer data and make any edits in the evening.
- 8) If there were multiple groups of sheep in one off-transect section, see **SOP 8.12.2**.

SOP 8.12.2 – Multiple Groups in One Location

If there are multiple groups in one area (> 100 m apart), you must have seen them while on-transect for them to count in the data analysis.

- 1) Take several photos from the transect line. This will help you in the evening to verify the groups' initial/original locations (where they were when you saw them from the transect line) and to distinguish between groups in your data if they start running and disperse or coalesce when you fly over them to mark their locations and collect composition data.

- 2) Follow **SOP 8.11** to leave the transect. When you click the Go Off Transect button , the Sheep – Short Form will pop up.



- 3) Click the *Mark Animal* button as many times as there are groups, then scroll between the groups using the Prev and Next buttons to fill in the composition and activity data and then update the position of each group. If you enter group composition and activity data and then hit *Mark Animal*, it will reset to 0 and assign what you just entered to the previous group. *Always hit Mark Animal first, and then enter the group information on the form.*
- 4) Click on the field next to each composition class, and use the number pad to enter the number of sheep in that composition class (ewe-like, lambs, < full-curl rams, ≥ full-curl rams, unclassified rams [indeterminable curl-size] and unclassified sheep). The default is 0, so if there are no sheep in that composition class for this group, you do not need to enter anything in the count field.
- 5) For Activity, click on the highest level of activity (Stationary, Walking, Running) seen by any member of the group of sheep. Stationary includes lying down, standing and feeding (if not moving while feeding). For example, for a group of five sheep, if one is walking and the rest are lying down or feeding, pick Walking.

- 6) If you need to edit data for a particular group, use the Prev and Next buttons to scroll through the groups. The selected group showing on the data form will also be highlighted on the map with a blue box.
- 7) If you decide that the position of the point was marked in the wrong place, use the Prev and Next buttons to highlight the point to be changed, have the pilot fly over the correct location, and click the Update Position button. This will change the location of the selected point to the current position of the plane. Be sure that the correct point is highlighted (blue box around the point) before updating the location.
- 8) If you made a mistake and hit the *Mark Animal* button too many times or when there wasn't a sheep group, enter 999 in the data field next to Ewe-like and pick any category under Activity. The 999 will clue in the people doing data QA/QC to eliminate that group.
- 9) Take photographs of the sheep group if there are more than four sheep or if there are any rams present. This is really critical for very large and/or widely dispersed groups. See SOP 8.2 for more information about camera setup and use. Here are some general tips
 - a. Make sure that the camera is powered on, that it's on the running man (action) setting and that Auto Focus and Image Stabilizer are on.
 - b. Hold the shutter down to take 3 shots/second to make sure you get them all in the fly-by.
 - c. If multiple groups combine, photograph them together and note this on the datasheet.
 - d. Use the blue play button to look at the photos – they will not show automatically.
- 10) On the paper datasheet (see also SOP 8.13), write down the transect number, group number, composition data, group total number, the pilot's waypoint (critical!) and in the Comments field, any issues (e.g., turbulence, nausea, etc.) that may have affected sightability or the count and composition data. You can then use the paper datasheet to check the field computer data and make any edits in the evening.

SOP 8.13 – Paper Datasheet

The paper datasheet is critical for two things – (1) taking notes about any field computer or USB-GPS problems that have affected your transect line and/or group locations in ArcPad, and (2) for recording primary data if the field computer dies or the USB-GPS conks out. Always try to reboot the field computer several times if you are having problems before ditching it. You can also call Scott Miller 907-455-0664 with computer/computer GPS questions. Here's the low-down on the datasheet, particularly for the second instance where you're relying entirely on the datasheet and the pilot's GPS. See also the sample data sheet in Appendix SOP8-2.

Transect surveys

National Park Service Alaska Region
Dall's Sheep Survey – Data Sheet

Park (or general survey area) _____

Date (e.g., 8 Jul 2008) _____

Pilot _____

Observer _____

Aircraft type/N# _____

Weather/Search conditions. Time

Cloud cover: Clear ... <1/2 ... ≥1/2 ... Overcast

Precipitation: None ... Rain ... Snow

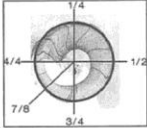
Turbulence: None ... Light ... Moderate

Intensity: None ... Occasional ... Intermittent ... Constant

Temperature: _____ °F

Comments / other conditions that might affect data quality:

Entry/Edit Date	Initials



Tran- sect #	Group #	Ewe- like	Lambs	Sub Rams < 4/4 curl	Full Rams ≥ 4/4 curl	Unclass Rams	Unclass Sheep	Total	Waypoint (from pilot)	Comments (Stationary, Walking, Running; Snow, Clouds; Off-transect; Other species, etc.)

National Park Service Alaska Region

- 1) Use a new datasheet each day – multiple transects can go on one datasheet. Be sure to enter the transect number in the left-hand column, next to the group ID number and data.
- 2) Fill out the top part of the datasheet completely at the start of the day. Ignore the top right hand corner – that box is for data entry when we're back at the office. If the computer is dead, make sure you get start and stop times for each transect to help us determine transect length from your tracklog. If the computer is working, ignore this section. Have the pilot take waypoints at start/end as well – this will help mark off the transect as well.
- 3) Get all weather data from the pilot.
- 4) The big comments box can be used to note computer problems, or for recording things that affect the quality of the survey like patchy snow cover, observer nausea, observer sleeping, pilot off-transect, too many sheep scattering to follow adequately, etc.
- 5) Each transect that you complete should be entered on at least one line. If there were no sheep, enter 0 sheep next to transect #. If there are sheep on the transect, then see step 6.
- 6) Each sheep group gets its own line (row). Give the group an ID number in numerical order for the transect. For each line, please record the transect number; group ID number; number of ewe-like, lambs, < full-curl rams, ≥ full-curl rams, unclassified rams, unclassified sheep and total sheep; and the waypoint number from the pilot's GPS. The pilot will help to classify the sheep (sex/age data). IF the pilot classifies the rams further

- by curl size (e.g. $\frac{1}{2}$ curl, $\frac{3}{4}$ curl) – write those information in the Comments field for that group. If you can't tell if it's < or > full curl, put the ram in the unclassified ram category.
- 7) Record the pilot's waypoint for each group. Record your Garmin's waypoint as well if the field computer has crashed.
 - 8) If the field computer has crashed, enter group activity (Stationary, Walking, or Running) in the Comments field. Stationary includes lying down, standing and feeding (if not moving while feeding). Report the highest level of activity seen by any member of the group of sheep. For example, for a group of five sheep, if one is walking and the rest are lying down or feeding, pick Walking.
 - 9) You can also use the Comments section for each group to note any edits that you may need to make back in the office to the field computer data for that group (e.g., recount sheep based on photo, move group upslope, couldn't record data accurately from plane).
 - 10) Sheep groups that were missed on-transect (i.e., you saw them after leaving the line to mark another group of sheep) are also recorded on the datasheet. This is the only place where this data will be entered, and these data will be used in future analyses of sightability. Each of these missed-on-transect groups should be recorded on its own line with the transect number, 'missed-on-tr' entered for group number, the composition class numbers, total sheep in the group, pilot's waypoint and group activity. In the Comments field, please note the group activity per **step 8**, as well as where the missed-on-transect group was seen (e.g., 'near group 1' that was seen on-transect).
 - 11) If there is time (i.e., it's not a busy survey with high sheep density on-transect), you should record on the datasheet any sightings of sheep or other wildlife (particularly predators) seen between transects. Use one line per sighting. Do not enter a transect or group number with these data, but do record the pilot's waypoint number. Be sure to specify that they are off-transect sheep, bears, eagle, etc. If the sighting was of a predator species, please add in the Comments field if the sighting was near a transect or group of sheep.
 - 12) You should also write down the pilot-recorded waypoints for the start and stop of each transect in case your GPS conks out and you need to use his tracklog and start/end waypoints to recreate your on-transect line. You can enter this in the Comments field for each transect, or enter these waypoints on their own lines.
 - 13) You do not need to write down photo numbers.
 - 14) Bring all datasheets back to the base camp at the end of the day and make sure your data are complete on it per these instructions.

SOP 8.14 – Resuming the Transect

- 1) After recording the location(s), composition and activity level of the sheep group(s) in that off-transect section, fly back to the transect line where you left off (see SOP 7 for more details).
- 2) As you arrive back at the transect, click the *Resume Transect* button on the Sheep – Short Form. The pilot can clue you in to when you are back on-transect.

Sheep - Short Form

Transect ID: 9 Grp #: 1 Prev Next

Ewe-like: 1
Lambs: 1 Mark Animal

Rams < full-curl: 0 Update Position
≥ full-curl: 0 Mark Horizon
Unclassified rams: 0 Update Horizon

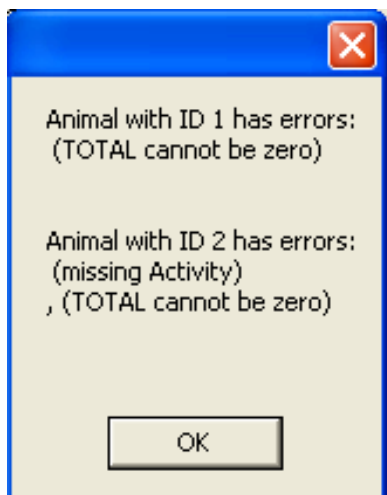
Unclassified sheep: 0 Use Last Horizon
Total: 2

Activity:
Running
Walking
Stationary

Resume Transect

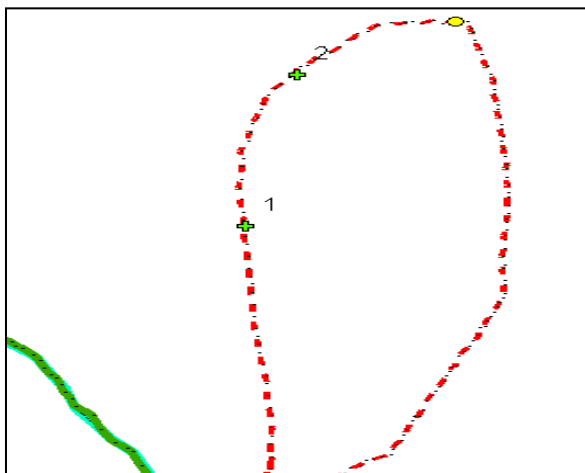
ok

- 3) If one of the groups is missing an entry for Activity or Total sheep is 0, you will not be able **Resume Transect**, and you will see the following error message.



Tell the pilot you are not yet ready to go back on-transect. He/she should then circle with the plane over an area that you have already flown (rather than farther along the transect line) until you have completed the missing data entries. Use the Prev and Next buttons on the Sheep – Short Form to find the group(s) with the missing information. If you made a mistake and hit the *Mark Animal* button too many times or when there wasn't a sheep group, enter 999 in the data field next to Ewe-like and pick any category under Activity. The 999 will clue in the people doing data QA/QC to eliminate that group.

- 4) If all data are complete per step 3 when you click *Resume Transect*, the Sheep – Short Form will close and you will be back on-transect. Your previous off-transect segment when you were collecting sheep group data will now show on the screen as a red dotted line.



- 5) Continue along until you reach the end of the transect, or until you see another group of sheep. If you see another sheep group when you are back on-transect, repeat SOPs 8.11 through 8.14. Don't panic if you forget to click *Resume Transect* at the correct time. These lines can be edited back in the office in ArcMap. However, do make note that such edits are needed on your paper datasheet.

SOP 8.15 – Changing Uphill Direction While On-Transect

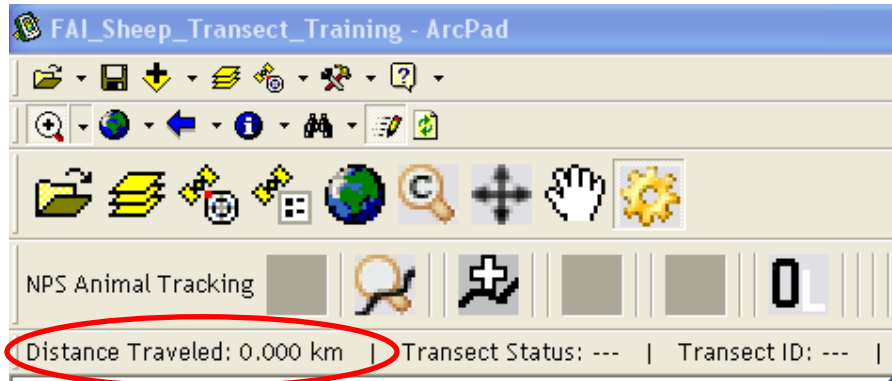
If you switch directions while on-transect, such as you start a transect and then part way through fly a loop in the opposite direction in a box canyon (see SOP 7), hit the Pilot's view direction button just before and just after flying that loop. The example below shows that the pilot and observer are currently looking uphill on the left side of the plane while on-transect. If they change directions on-transect such that uphill is then on the right side of the plane, the observer will hit this button and the symbol will change to **O_R**.



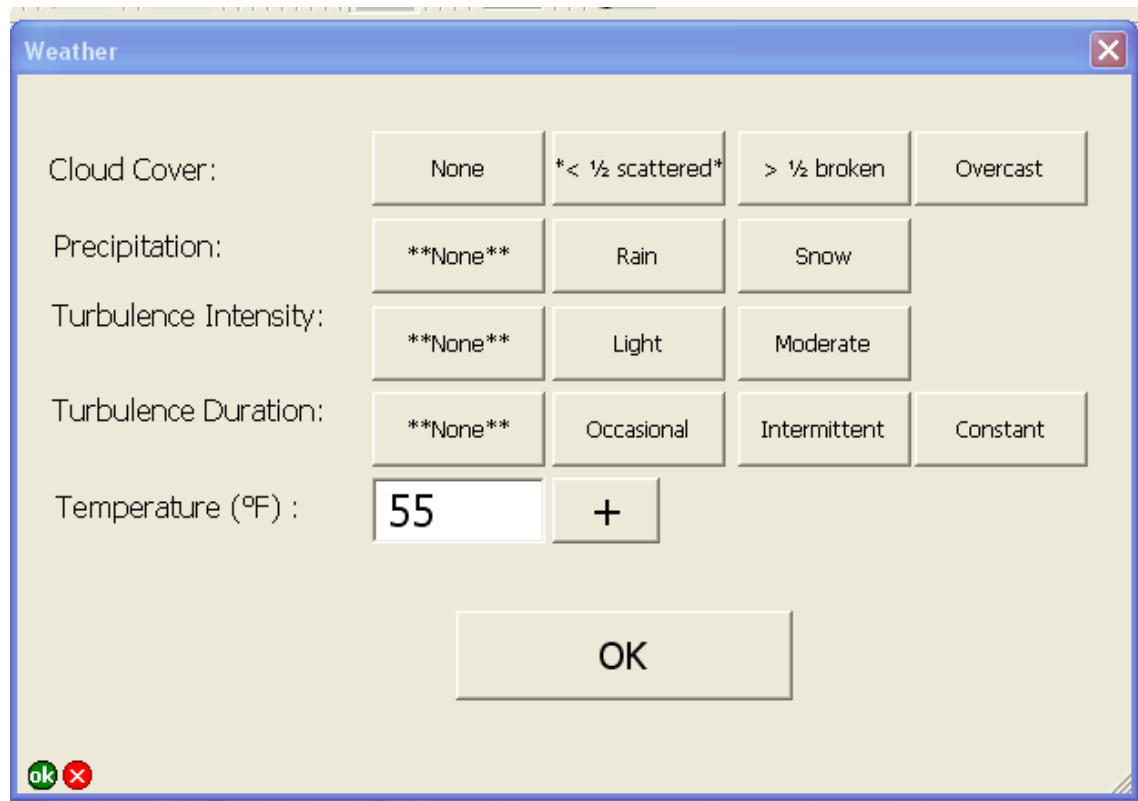
SOP 8.16 – Ending the Transect and Entering Weather Data

The project PI will designate a transect target length prior to each the survey. This is typically 15 or 20 km. Try to cover this distance for each transect (unless it is a multi-part transect - see Figure SOP7-14 for an example of a multi-part transect).

- 1) As you near the end of the generated transect line on your screen, pay attention to the Distance Traveled below the NPS Animal Tracking toolbar. The Distance Traveled updates as you fly and is a sum of your On-Transect segments only.



- 2) If you have not yet hit the target length, keep flying past the generated transect end.
- 3) When you have reached the target length (the sum of all of your on-transect segments totals that length), a warning window will pop up that you have reached the end of the transect. Click End Transect. However, if you know that you made some mistakes hitting the Go Off Transect and/or Resume Transect buttons and feel that there were areas where you marked On-Transect segments that should really be Off-Transect segments, then you will need to keep flying until your Distance Traveled equals that offset plus the target length. Instead of clicking End Transect on the warning window, click OK, continue flying and when you are at the correct Distance Traveled to make up for that offset, click the End Transect button .
- 4) If you have not yet seen the warning window but know that you have reached the correct target length, click the End Transect  button.
- 5) Once you have ended the transect the Generated Transect line will change to a black and gray checkered line to indicate that it has been flown. The Start Transect  and Select Transect  buttons will be restored on the NPS Animal Tracking toolbar so that you can select and start the next transect. The Weather form will also appear once you have ended the transect.
- 6) On the Weather form, select the dominant weather conditions while you were on-transect. The pilot should specify the Turbulence Intensity and Duration - those choices apply to specific categories he/she would have learned in flight school. If turbulence or precipitation varied on the same transect, indicate this on the paper datasheet. Ask the pilot for the current air temperature.



A screenshot of a 'Weather' data entry window. The window has a blue title bar with the text 'Weather' and a close button (X) in the top right corner. The main area is a light beige color. It contains five rows of data entry fields:

- Cloud Cover:** Four buttons labeled 'None', '* < 1/2 scattered*', '> 1/2 broken', and 'Overcast'.
- Precipitation:** Three buttons labeled '**None**', 'Rain', and 'Snow'.
- Turbulence Intensity:** Three buttons labeled '**None**', 'Light', and 'Moderate'.
- Turbulence Duration:** Four buttons labeled '**None**', 'Occasional', 'Intermittent', and 'Constant'.
- Temperature (°F) :** A text input field containing the number '55' and a '+' button to its right.

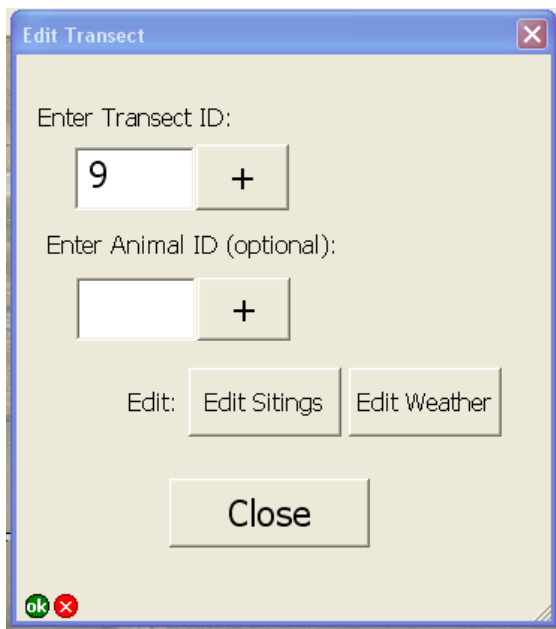
Below these fields is a large 'OK' button. In the bottom left corner, there are two small circular icons: a green one with 'ok' and a red one with an 'X'.

- 7) Repeat SOP 8.9 through SOP 8.16 for all transects flown on the same day.

SOP 8.17 – Editing Sheep Group and Weather Data

At any time outside of an Off-Transect session, you can edit any sheep group data or weather data for any transect(s) already flown that day.

- 1) Click the Edit Transect  tool button on the NPS Animal Tracking toolbar, The Edit Transect form will open.



- 2) Use the + button to access the Easy Numbers pad to enter the Transect ID you wish to edit.
- 3) If you know the Animal ID for a particular sheep group needing editing, you can also enter that.
- 4) Click Edit Sitings (this is not a misspelling – this is how it is on the form) to edit sheep group data on the Sheep – Short Form and Edit Weather to access the Weather form.
- 5) The required form will open up in edit mode. When a form is in edit mode, horizons and sighting positions cannot be updated and new sightings cannot be created – only data relating to the previously recorded sheep group or previously flown transect can be edited.
- 6) Click Next or Prev to navigate through all the sightings within the selected transect and make changes where necessary.
- 7) When all changes have been made, click the Close button to return to the Edit Transect form.
- 8) From the Edit Transect form, the user can select another transect to edit or click Close to exit and return to the map.

SOP 8.18 – Ending the Survey Session for the Day

- 1) At the end of the day, when the plane is headed back to the airstrip, click the  button on the NPS Animal Marking toolbar to end the day's survey session and prepare the data for export to ArcMap.
- 2) Turn off ArcPad – you do not need to save the project, but it's not a bad idea to do that.
- 3) Turn off the field computer and unplug it from the pilot's power supply.
- 4) Turn off the tracklog on your Garmin 76csx. Go to Menu → Tracks → Tracklog Off. Do NOT save this tracklog here on the Garmin – you will download it as an active tracklog.
- 5) Turn off the camera.
- 6) Bring the field computer and its power cord, the camera, your Garmin GPS unit, the pilot's Garmin GPS unit and your datasheets back to the bunkhouse/office.

SOP 8.19 – Trouble-shooting the Field Computer

If the computer shuts down while in the plane, try to reboot it a few times. If it's a total loss, get out your datasheet and your Garmin Map76csx. Hook up the Garmin antenna. The pilot's tracklogs and waypoints are the new DBTracklog and Mark Animal – the pilot will need to log waypoints at the start and end of each transect, and for every sheep group. You will record the start and stop waypoints (from the pilot's Garmin) for each transect, plus all of the on-, missed-, below- and off-transect sheep group waypoint numbers and composition data on the paper datasheet. Your Garmin is the new backup – take on-transect sheep group waypoints when the pilot does. See both the Datasheet ([SOP 8.13](#)) and Garmin GPS protocols ([SOP 8.1](#)) for more detail.

Appendix SOP8-1 – Data Collection Cheat Sheet

1) Hook Garmin 76csx GPS to antenna. Menu → Tracks → Track Log On.	GPS Track ON
2) Take photo of GPS. Make sure date/time stamp is clear in the photo.	GPS photo
3) Turn on field slate (AFTER plane has powered up). Plug in Garmin 18X USB-GPS antenna. Turn on Spanner.exe (hit shortcut icon).	Slate on, USB-GPS in, Spanner.exe on
4) Start ArcPad project from desktop: e.g., 'FAI_Transect_Training.apm'. Make sure you're looking at a blank Survey file (no previous data).	ArcPad On
5) In ArcPad, go to GPS Preferences, select GPS tab, uncheck Automatically Activate, click binoculars icon to find working COM#, Baud=19200. Go to Location tab, enter current Lat/Long, check Restore Location, OK. Then, select GPS Active. (If Garmin 18x doesn't work, use 76csx; or Ambicom: Port=USB to Serial, Baud=4800).	 GPS Preferences, then  activate GPS
6) Start a New Session by clicking. Select Sheep-Short Form, your pilot, you, your aircraft tail number. Finish.	 Start day
7) If desired, set GPS Auto-Panning Percentage (.1 is quick refresh rate, .9 will let your cursor go to map edge before re-zoom/re-center) and the ArcPad Configurations for Custom Zoom level and top menu bar visibility.	 Set pan  Configurations for Custom Zoom 
8) If desired, Find (locate) Transect. Use + button to get to # pad, hit 'Find', hit 'Close'.	 Find transect
9) Select upcoming transect by clicking  , which will turn green. Use + button to get to # pad, and enter desired transect #. Pick direction (left/right) that is uphill. Hit Finish.	 Select transect.
10) At start of transect, click  to start transect tracklog. GPS must be active (step 5).	 Start transect
11) When you see sheep, scan for more sheep. Click the Off-transect button as you leave the transect. The Sheep – Short Form will open.	 Go off-transect
12-13) Hit Mark Animal button as soon as you're sure you're looking at sheep. Fill in number of each sex-age composition class. Enter max Activity level of group. Update Position as you fly over original position of group. Take photos and record comp data and pilot waypoint on datasheet. Repeat for other groups in same area. Use Prev/Next to scroll between groups.	Mark Animal , Comp, Activity, Update Position, Photo, Datasheet
14) Resume Transect . Repeat steps 12-13 for other sheep in same area.	Resume Transect
15) If you needed on transect, change the Pilot's (and your) view direction.	 Switch view direction.
16) End transect after you have flown designated target length. Enter Weather data with pilot's help. Repeat steps 9-16 for all transects that day.	 End transect
17) If desired, Edit Animal Sightings and weather when not on transects. Enter transect #. Use Prev/Next to scroll between sheep groups.	 Edit animals, weather
18) Land/end session for the day. Close ArcPad. Turn off Tracklog on Garmin 76csx. Power off field slate, camera, Garmin 76csx.	 End day

*Numbers refer to sections in SOP 8 (e.g., step 1 is detailed in SOP 8.1).

Appendix SOP8-2 – Sample Datasheet

Transect surveys

National Park Service Alaska Region

Dall's Sheep Survey – Data Sheet

Park (or general survey area) GAAR

Date (e.g., 8 Jul 2008) 6 Jul 2010

Pilot Lance Williams

Observer Stacia Backensto

Aircraft type/N# Cub N9104D

Weather/Search conditions. Time 8:00 am

Cloud cover: Clear . . . <1/2 . . . ≥1/2 . . . Overcast

Precipitation: None . . . Rain . . . Snow

Turbulence: None . . . Light . . . Moderate

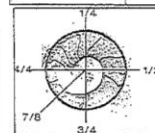
Intensity: None . . . Occasional . . . Intermittent . . . Constant

Temperature: 40 °F

Comments / other conditions that might affect data quality:

Down drafts on Transect 3.
Low clouds on Transect 4 – did not survey.

Entry/Edit Date	Initials



It's OK to circle more than 1
Please indicate if weather changed during the day

Transect #	Group #	Ewe-like	Lambs	Sub Rams < 4/4 curl	Full Rams ≥ 4/4 curl	Unclassified Rams	Unclassified Sheep	Total	Waypoint (from pilot)	Comments (Stationary, Walking, Running; Snow, Clouds; Off-transect; Other species, etc.)
3	1	1	1					2	2105	- start 2104. Stationary
3	2	2						2	2106	ewe, yearling - walking - end tr 2107
6	0	sheep						0	—	start 2108, end 2109
OFF	OFF	1	1					2	2110	running between transect 6 and 7
7	0	sheep						0	—	start 2111, end 2112
8	1			2				2	2114	start tr 8 at 2113 waypt no photos - 3/4 curl, 3/4 curl
8	2			1	1			2	2115	1/2 curl
8	3	2	1					3	2116	fix resume transect on off-tr end tr 8 at 2117
OFF	OFF	transit bears							2118	saw 2 cot brown bears by transect 8
9	no sheep							0	—	start 2119, end 2120
10	no sheep							0	—	start 2121, end 2122

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