

Standard Operating Procedure (SOP) 2: Generating Transects, 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 2 – Generating Transects

Standard Operating Procedure #2
 Version 1.0 (03/01/2017)

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SOP 2.0 - Introduction

This SOP describes how to generate transects for the survey area prior to the field season. In 2009 and 2010 GeoNorth, LLC was contracted to produce customized GIS tools for generating contour transects and collecting data for aerial distance sampling surveys of bears (*Ursus spp.*) and Dall's sheep. GeoNorth LLC produced the NPS Animal Tracking Project v2.0.5, consisting of the Transect Generation ArcMap Extension, which is compatible with ArcGIS 9.3 and 10.x and Windows XP (see Appendix SOP2-1), and the Animal Tracking ArcPad Applet v1.1.2, which is compatible with ArcPad 7.1 and Windows XP (see SOP 3). In 2013, Regan Sarwas with the NPS Alaska Region GIS office upgraded the Extension for Windows 7 by creating an Add-In that is used instead of the Extension (NPSTransectAddin [3].esriAddIn; see sections SOP 2.1-2.5). The Add-In is compatible with ArcMap 10.0 and 10.1 and works with GeoNorth's Animal Tracking ArcPad Applet v1.1.2. The Add-In has not been tested on ArcMap 10.2.

The ArcMap Add-In (or Extension if you're using Windows XP) is used to generate random transect lines at random locations or centered on a specified- or random-start grid within the survey area. It generates contour transects for mountainous areas and straight-line transects at random locations in flat areas based on a slope range (e.g., flat areas = 0-7° slope) and transect length designated by the user. It is also used to export geodatabase content to shapefiles. The Animal Tracking ArcPad Applet v1.1.2 is the consumer of the shapefiles generated by the Add-In and facilitates the collection of data on a field laptop in the survey aircraft. Finally, the Add-In is used to import the collected field data from the shapefiles into the geodatabase for analysis. At this time (2014 field season) ARCN and CAKN are still running non-networked, field computers operating Windows XP and ArcPad 7.1 and will continue to use the Animal Tracking ArcPad Applet v1.1.2 on these machines. In the near future, we will transition to an iPad application being developed by the NPS Alaska Region GIS office for data collection. Animal Tracking ArcPad Applet v1.1.2 will not be upgraded.

This SOP refers to the installation of the ArcMap Add-In. It then gives instructions for generating transects and exporting the transects and data pick lists to the ArcPad applet for in-flight data collection. SOP 3 describes how to set up the ArcPad applet on the field slate. SOP 8 explains use of the applet during data collection, and SOP 9 explains use of the Add-In to import those data back into ArcMap for processing prior to analysis. If you are still running Windows XP, see Appendix SOP2-1 for installation instructions of the Extension, and follow SOP steps 2.2-2.5 just as you would with the Add-In used in Windows 7.

SOP 2.1 – Installing the NPS Transect Add-In v3.0 for Windows 7

SOP 2.1.1 – NPS Transect Add-In Files

You should receive the following with the NPS Transect Add-In folder.

- NPSTransectAddin [3].esriAddIn. This is the Add-In that you will install into ArcMap in order to generate transects and set up your geodatabase and corresponding shapefiles for data collection.
- Instructions_install_Add-In.docx. You can follow these or go to SOP 2.1.1 below.

- NPS_Transect_Tool_DOTNET.mxd. This is the ArcMap project (also referred to as MXD in this document) where you will use the Add-In.
- NPS.gdb folder. The geodatabase within this folder contains the layers referenced by the NPS_Transect_Tool.mxd. This geodatabase is where the generated transects are stored and eventually where the field data will be stored.
- APLs folder: This contains the APL (ArcPad Layer) files which define the symbology used to display the shapefiles in the Animal Tracking ArcPad Applet.
- Animal_Tracking_ArcPad_Applet folder. Contents in this folder will be installed and used on your field computer in ArcPad 7.1. See SOP 3.2.1, SOP 3.2.2 and SOP 8 for installation and use instructions. Note that this is Windows XP compatible only and will not be upgraded.
- Fake_GPS_Extension folder. Contents in this folder will be installed and used on your field computer in ArcPad 7.1. See SOP 3.2.3. Note that this is Windows XP compatible only and will not be upgraded.

SOP 2.1.2 – Installation instructions

- 1) Close ArcMap if it is currently running.
- 2) Uninstall any prior versions of the NPS Transect Extension or Add-In by navigating to Start→Control Panel→Add or Remove Programs. Select the NPS Transect Tool from the list of programs and choose to uninstall it.
- 3) Save a copy of the NPS Transect Add-In folder to your C:\ drive and rename the folder with the survey name for which you are generating transects (e.g., 'WEAR2011_TrGenArcMapExt'). Open this renamed folder.
- 4) Double click on the NPSTransectAddin [3].esriAddIn file. A new window will open. Click on the Install Add-In button. You should see another window stating 'Installation succeeded.'
- 5) Open the ArcMap project (NPS_Transect_Tool_DOTNET.mxd). This is the only ArcMap project (MXD) that the Add-In will work with. You might not see the NPS Transects toolbar immediately but it has become part of your toolbar collection.
- 6) At the top of the ArcMap window, where the other toolbars are located, pick an empty area and right click. You should now see a list of available toolbars to add to your window and NPS Transects should be one of your choices. If the toolbar is not immediately visible go to the Customize menu and select Toolbars. Locate the NPS Toolbar, check mark it and it should open on the screen. Drag and drop it next to any existing toolbar. Save the MXD so it will remember the NPS toolbar. If the NPS toolbar buttons are not enabled, try restarting ArcMap and repeating this step.



Figure SOP2-1. The NPS Transects toolbar, which is used in the NPS_Transect_Tool_DOTNET.mxd to generate transects. The NPS Toolbar contains the

Straight-line Tool , the Buffer Tool  and the Transect Tool .

SOP 2.2 – ArcMap Geodatabase Layers

The purpose of the Add-In (or Extension if running Windows XP) and corresponding MXD is to generate survey transects and to collect data about Dall's sheep that are seen when flying the survey transects. The ArcMap layers within the geodatabase (NPS.gdb) display that data. The following sections describe each layer in the NPS_Transect_Tool_DOTNET.mxd. All of the layers and their data sources are projected in the NAD_1983_Alaska_Albers coordinate system.

- The Survey Boundary layer is/are a polygon/s of the survey area. This does not have to be a contiguous polygon. All Excluded Areas, Flat Areas, Random Points and Generated Transects must fall within the bounds of the survey area for which they were generated.
- The Excluded Areas layer encompasses polygons within the Survey Boundary but outside of your upper or lower elevation bounds. These are areas where transects should not be generated with the Survey Boundary because these areas are non-habitat such as ice fields, etc. Excluded Areas are generated in Step 1 (SOP 2.3.5) on the Transect Tool Form.
- The Flat Areas layer contains those polygon areas that are considered to be flat based on a user-specified slope (e.g., 0-7°). Flat Areas are generated in Step 2 (SOP 2.3.6) on the Transect Tool Form.
- The Random Points layer contains points randomly generated or generated in a grid within the Survey Boundary. They will not be generated within user-designated Excluded Areas but may fall within Flat Areas. Random points are generated by Step 3 (SOP 2.3.7) in the Transect Generation tool. Each of these points is the center point of the transects that are generated in Step 4 of the Transect tool.
- The Generated Transects layer is the final product (Step 4) of the Transect Generation tool (SOP 2.3.8). The transects (line feature) are generated to follow mountain contours at the elevation of their respective center points (i.e., associated Random Point), while in Flat Areas, straight transect lines are generated at random directions from their associated Random Point. Generated Transects represent the designated flight paths for the aerial survey.
- The DB TrackLog layer is a line feature displaying the on- and off- transect segments recorded while flying a transect. It is populated during the survey using the Animal Marking ArcPad Applet (see SOP 3, 8) and reimported to the MXD and geodatabase (see SOP 9). On-transect segments are those portions of the flight path where the pilot-observer team is actively following the generated transect line and looking for sheep uphill from the line. Off-transect segments are recorded when the team has flown away from the generated line either to investigate and then collect data about a sheep group that

was sighted, or to re-position the plane relative to the generated transect line or to the designated transect elevation. No segments are created between transects.

- The DB Animal layer is a point feature with data about each sheep group (location, count, composition, activity) seen while on-transect during the survey. It is populated during the survey using the Animal Marking ArcPad Applet (see SOP 3, 8) and reimported to the MXD and geodatabase (see SOP 9). Each group sighting can be identified by its particular survey, transect number, transect segment and animal group number (per transect).
- The GPSPointsLog layer stores points collected every second while in flight, on-, off- or between transects. It is populated during the survey using the Animal Marking ArcPad Applet (see SOP 3, 8) and reimported to the MXD and geodatabase (see SOP 9).
- The Horizon layer stores points that represent the horizon distance. It is populated during the survey using the Animal Marking ArcPad Applet (see SOP 3, 8) and reimported to the MXD and geodatabase (see SOP 9). For ARCN and CAKN's Dall's sheep surveys, we are not collecting horizon distance, although other users of these tools do (i.e., for bear monitoring by the Southwest Alaska Inventory and Monitoring Network, SWAN).

SOP 2.3 – Using the NPS Transect Add-In

The NPS Transect Add-In (or Extension if running Windows XP) generates contour transects in mountainous areas and straight-line transects at random angles in user-designated flat areas. The tool generates these transects at random or user-designated locations within a specified survey boundary. Several steps are required to generate transects including setting and configuring (and if necessary reprojecting [SOP 2.3.2]) the Digital Elevation Model (DEM) on which the flat and excluded areas and contour transects are generated (SOP 2.3.1); designating the survey boundary (SOP 2.3.3); generating the excluded areas within the survey boundary (SOP 2.3.5); generating the flat areas within the survey boundary (SOP 2.3.6); generating the random points on which the transects will be centered (SOP 2.3.7); and finally generating the transect lines (SOP 2.3.8). After designating the survey boundary, the user can track progress of the next four steps with a progress bar included in the tool; this is explained in SOP 2.3.4. Random points and transects can also be imported from a previously generated set (SOP 2.3.9). Once the set of transects are generated for a survey, layers from the geodatabase are then exported to shapefiles for data collection with the ArcPad applet (SOP 2.4, 2.5 and SOP 3). After data are collected, they are imported back into the geodatabase (SOP 9) and processed, including recalculating the perpendicular distance of each sheep group to the transect lines (SOP 11.3) and generating buffers for each transect based on the estimated strip width in order to calculate the effective sampling area (SOP 11.4).

****Note – you may need to save your program, close and re-start ArcMap to show that it is completing the following steps to generate transects and your data drop-down lists.****

SOP 2.3.1 – Setting and Configuring a Digital Elevation Model (DEM)

An important step in using the Add-In is ensuring that the tool knows where to find a Digital Elevation Model (DEM) file. Most of the steps for transect generation require a DEM file.

It is recommended that the DEM be projected in the NAD 1983 Alaska Albers (see SOP 2.3.2), that it has been clipped to an area just outside of your survey boundary, and that the DEM file is stored on the C drive in a file pathway that does not include spaces or symbols (e.g., C:\TEMP). This will speed up the programs' ability to generate the ArcMap layers (SOP 2.2) and transects.

- 1) Open the NPS_Transect_Tool.mxd.
- 2) Set your workspace to your C:\TEMP folder: select the Geoprocessing menu→Environments →Workspace and update the Current Workspace and Scratch Workspace fields to 'C:\TEMP' and click OK.
- 3) Open the TransectToolForm (Figure SOP2-2) by clicking on  in the NPS Transects toolbar (Figure SOP2-1).

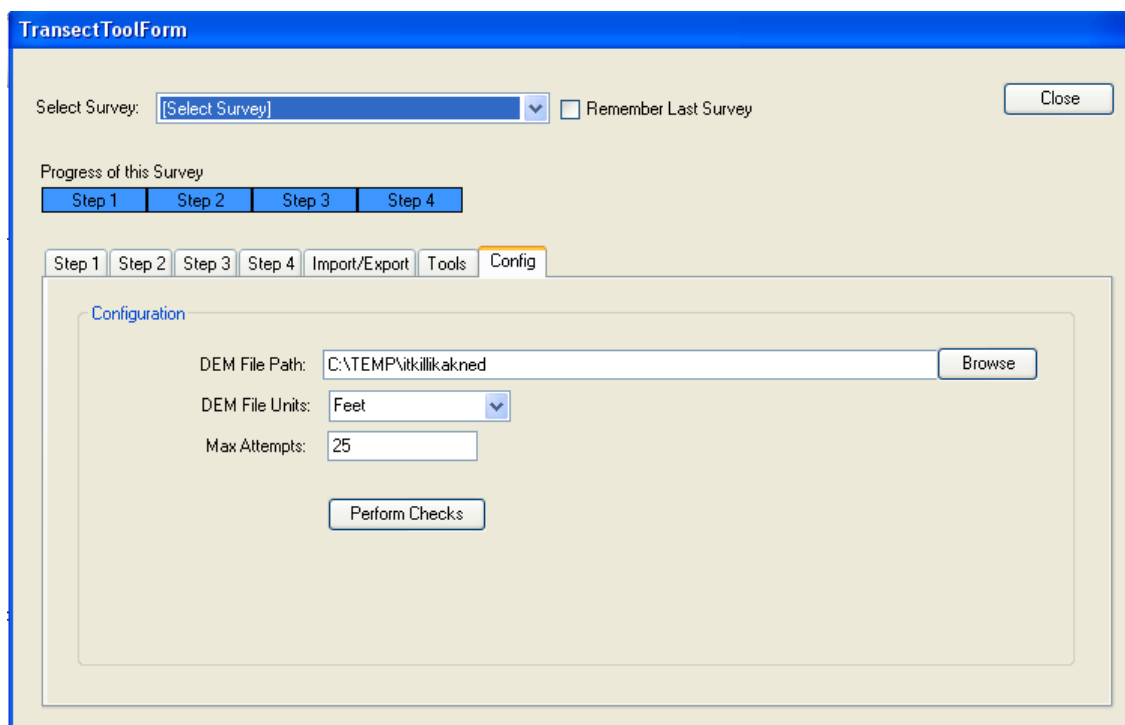


Figure SOP2-2. The Transect Tool Form showing where to set and configure the DEM prior to setting the survey boundary and generating transects. The file path shown is for 'C:\TEMP\itkillikakned'. The DEM is a 60-m resolution, National Elevation Dataset (NED) DEM that is projected in NAD 1983 Alaska Albers for the area surrounding the Itkillik subarea in GAAR (Figure 1.3, Protocol Narrative). The DEM File Units pertains to the elevation value for the DEM ('z' coordinate), which is in feet for this example.

- 4) Click the 'Config' tab.
- 5) Click the 'Browse' button next to the 'DEM File Path' field and browse to the location of the DEM file you wish to use. It is best if your DEM resides in the C:\TEMP folder. Click the DEM file to select it. The path to the DEM file should now be set in the 'DEM File Path' field.

- 6) Set the DEM File Units to the z-value units that your DEM is in (elevation in feet or meters). This will determine how the elevation fields are populated in the Generated Transects layer.
- 7) 'Max Attempts' is the number of times that the 'Generate Transect Lines' step (SOP 2.3.8) will attempt to draw the Transect at a random angle. The smaller the value specified, the fewer the attempts will be made to draw each transect, but the quicker the step will run. The greater the value specified, the more attempts will be made to draw each transect (also lowering the chance that a random point will be left without a transect, which complicates sample coverage), but the slower the step will run.
- 8) The Perform Checks button runs a series of tasks to check if a particular ArcMap environment is capable of properly running NPS Transect Tool. Click this button and you will get a text file in a new window (Info) stating the success of installing this program (Appendix SOP2-2). Of particular importance with this outlet are the warning signs if you have not yet set your workspace to the C:TEMP files.

SOP 2.3.2 – Reprojecting the DEM

It may become necessary to reproject your DEM (which is a raster file) to the projection of the 'Survey Boundary' feature class (layer) if the raster doesn't align with your boundary. You will know that they are not in alignment by the error message 'the boundary polygon for SurveyID [Survey ID name] is out of range of the Raster extent'.

- 1) If you have not already done so, you must first set the workspace to your C:\TEMP folder. Go to the Geoprocessing menu → Environments → Workspace and update the Current Workspace and Scratch Workspace fields to 'C:\TEMP' and click OK.
- 2) Select the Search window button in the Standard toolbar. Once the Search window opens, enter Project Raster and hit enter. Select 'Project Raster (Data Management)'.
- 3) From the Project Raster window, select the path to your DEM (this is the input raster) and select a path and name for the output raster (the name must be less than 13 characters). You should set a path to the C drive directly, or to C:\TEMP, and don't put spaces in the name. Occasionally the only way to get this to work is to just let the Project Raster tool select the path (it will pick C:\TEMP) and make up its own name for the reprojected raster.
- 4) Set the Output Coordinate System by hitting the button to the right of this field and when the Spatial Reference Properties window opens, click Select → Projected Coordinate Systems → Continental → North America → Alaska Albers Equal Area Conic.prj. The projection information will show up under Details. Then click OK and OK again in the Project Raster window to create your new raster. After creating the new raster, don't forget to go back to the Transect Tool window, click the 'Config' tab and reset your default DEM for generating transects (SOP 2.3.2).
- 5) If the output raster file name has an .img extension, and won't work with the Transect Tool, then repeat the Project Raster process and remove the .img before saving the new

raster. Without the .img extension, the raster file will be exported in GRID format. GRID files can only have file names up to 13 characters long.

SOP 2.3.3 – Setting the Survey Boundary

The Survey Boundary specifies the study area for a park unit or reference area (e.g., Itkillik subarea, GAAR or the western Baird Mountains, NOAT) within which the transects will be generated. For the ARCN and CAKN Dall's sheep monitoring program, these survey boundaries are not expected to change between survey years, although the locations of transects will. The survey boundaries exist as polygons in the Survey Boundary layer of the ArcMap project 'NPS_Transect_Tool.mxd' and the Survey Boundary feature class of the NPS.gdb associated with the ArcMap project. You cannot generate transects without first setting the Survey Boundary within the ArcMap project. It is recommended that you use a new, unaltered NPS Transect Add-In folder each time you generate transects. There are two methods to create survey boundaries in the NPS Animal Tracking Project – digitize (SOP 2.3.3.1) or import (SOP 2.3.3.2).

SOP 2.3.3.1 – Digitizing a Survey Boundary

In summary, you will open an ArcMap edit session and sketch a polygon(s) for the Survey Boundary layer in the NPS.gdb. Detailed instructions follow.

- 1) Open the NPS_Transect_Tool.mxd.
- 2) Make sure the Editor toolbar is showing. If you do not see an Editor toolbar, right-click on the upper region of ArcMap to view a list of toolbars. Check the box next to the Editor option, and an undocked Editor toolbar will appear. Dock the toolbar by dragging and dropping it near the other docked toolbars.
- 3) Click on the 'Editor' button in the Editor toolbar. Select Start Editing to open an editing session. A 'Start Editing' window will open.
- 4) The Start Editing window will ask you to pick the folder or database that has the layers and tables that you want to edit. Select one of the layers of the NPS.gdb from the checklist (e.g., Survey Boundary). Close the Start Editing window.
- 5) A Create Features window will open and dock to the right after you have selected to edit the NPS.gdb layers and closed the Start Editing window. Scroll down the list of editable layers until you get to Survey Boundary and double click on the Survey Boundary icon (grey square with red border).
- 6) Sketch out the desired polygon shape for the survey boundary on the map. A DEM file or another shapefile may be used as a background reference.

- 7) When you complete the sketch, the New Survey Boundary window will open (Figure SOP2-3) where you will record a name and information for the new survey boundary.

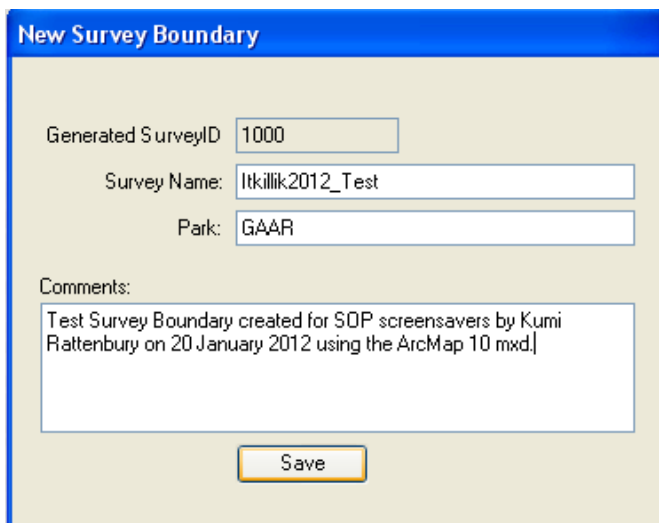


Figure SOP2-3. The New Survey Boundary form that appears after a Survey Boundary is digitized in an ArcMap Editing session (SOP 2.3.3.1).

The auto-generated Survey ID is displayed in a read-only field; for the example in Figure SOP2-3, the auto-generated Survey ID is '1000'. If the New Survey Boundary window did not open, try restarting ArcMap. Enter a Survey Name (e.g., DENA2011, Itkillik2011, SWRST2011), Park unit name by 4-letter code (e.g., DENA, GAAR, WRST) and any comments such as the date that the Survey Boundary was digitized. Click Save.

- 8) Click on the Editor button again and select Save Edits. Alternately, click Stop Edits and choose YES when asked to save edits.
- 9) To confirm that your new survey boundary is valid, open the Transect Tool (click the button with the blue airplane icon on the NPS Toolbar) and make sure that you can select your survey by name or by the auto-generated ID number from the Select Survey dropdown list.

SOP 2.3.3.2 - Importing a Survey Boundary

Survey boundaries can also be imported from existing shapefiles.

- 1) The shapefile containing the boundary polygon(s) must be in NAD 1983 Alaska Albers. If it is not, the Shapefile can be projected to that coordinate system using ArcMap's Project tool. In ArcMap 10.x, use the Search option and enter 'Project'.
- 2) Open the NPS_Transect_Tool.mxd.

- 3) Click on the Transect Tool button  on the NPS Toolbar. The Transect Tool window will open. Select the Tools tab (Figure SOP2-4).

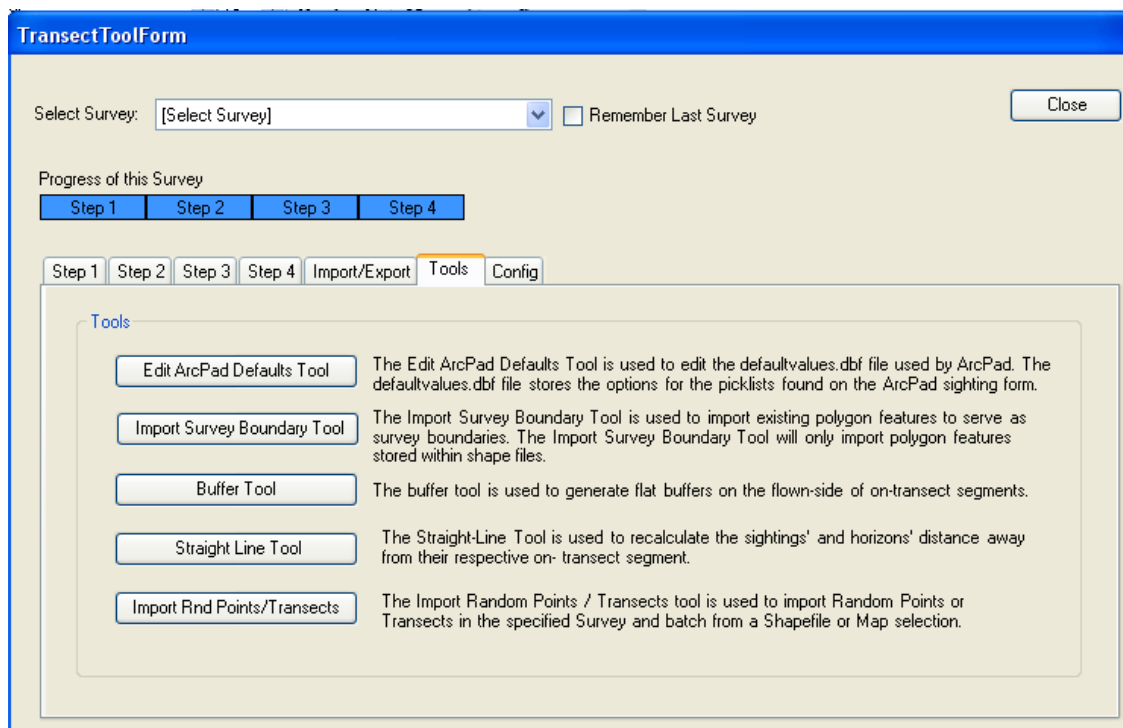


Figure SOP2-4. Screenshot of the Transect Tool window with the Tools tab selected.

- 4) Click on the Tools tab and click on the Import Survey Boundary Tool button. A new window will open (Figure SOP2-5).

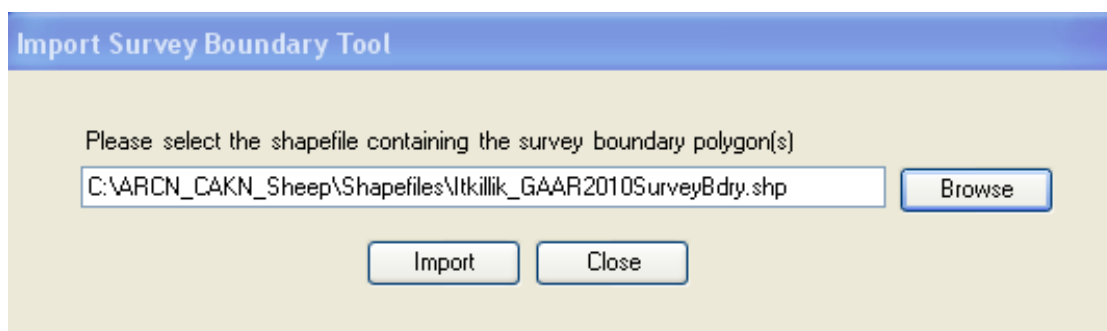


Figure SOP2-5. The Import Survey Boundary Tool window (SOP 2.3.3.2). In this example, a polygon shapefile for the Itkillik Preserve reference area is being imported as the Survey Boundary. The shapefile must be in NAD 1983 Alaska Albers.

- 5) Click the Browse button and navigate to the shapefile that needs to be imported. Click Open to select the shapefile. If the shapefile is in an incompatible coordinate system, an error will be reported. The shapefile should be projected in NAD 1983 Alaska Albers. Click the Import button.

- 6) A 'New Survey Boundary' form (Figure SOP2-6) will appear. It is slightly different from the form for a digitized survey boundary (Figure SOP2-3). However, if the imported shapefile already has fields for Comments and Survey Name (i.e., it is a previously used Survey Boundary), then the New Survey Boundary form does not open and all data for the new survey boundary will come from the corresponding fields of the imported shapefile. If this is the case, you will instead get an 'Import completed successfully' window – skip to step 7).

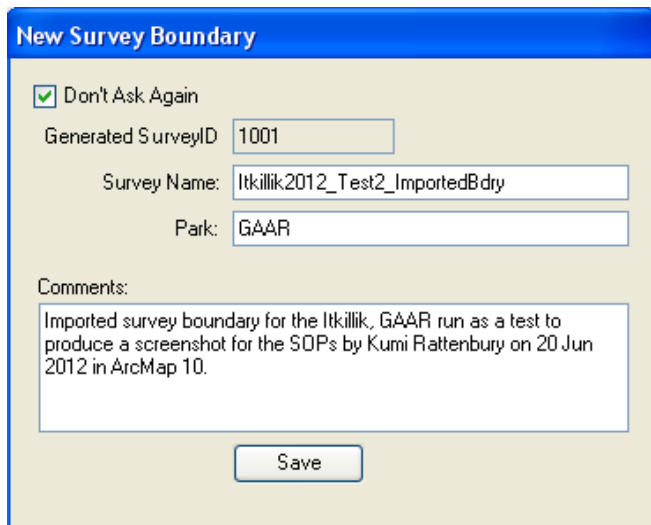


Figure SOP2-6. The New Survey Boundary form that appears after a Survey Boundary is imported from an existing shapefile (SOP 2.3.3.2).

If the New Survey Boundary form opens, the auto-generated Survey ID is displayed in a read-only field. Enter a survey name (e.g., DENA2011, Itkillik2011, SWRST2011), park unit name by 4-letter code (e.g., DENA, GAAR, WRST) and any comments such as the date that the Survey Boundary was digitized. The Survey Name that you enter will appear in the Select Survey dropdown list on the Transect Tool Form (Figure SOP2-4). If you do not specify a survey name on the New Survey Boundary form, the Survey ID number will be your option in the dropdown list. You can check the 'Don't Ask Again' checkbox on the New Survey Area form to import multiple areas without entering data for each area. Click Save.

- 7) The tool will run briefly and then an 'Import completed successfully' window will pop up; click OK. Then, if you are not going to import any other shapefiles, click 'Close' on the Import Survey Boundary Form and 'Close' on the Transect Tool Form.
- 8) To confirm that your new survey boundary is valid, re-open the Transect Tool Form (Figure SOP2-4) and make sure that you can select your survey by name or by the auto-generated ID number from the Select Survey dropdown list. You will have to close and re-open the Transect Tool Form after importing your shapefile before it will show in the Select Survey dropdown list.

- 9) If while importing the shapefile, an 'invalid grid size' error occurs, use ArcMap's Remove Spatial Index tool (Data Management Tools → Indexes → Remove Spatial Index) to remove the existing grid and try importing the shapefile again.

SOP 2.3.4 – Progress Bar

Once the DEM has been set (SOP 2.3.1 and 2.3.2), the Work Space Environments (Current and Scratch Work Spaces) have been set to C:\TEMP (SOP 2.3.1), and you have a Survey Boundary (SOP 2.3.3), you can now generate feature classes including transects. There are four main steps in this process: Step 1 - Generate Excluded Areas (SOP 2.3.5), Step 2 - Generate Flat Areas (SOP 2.3.6), Step 3 - Generate Random Points (SOP 2.3.7) and Step 4 - Generate Transect Lines (SOP 2.3.8). The Transect Tool Form (Figure SOP2-4) contains progress bars under the heading 'Progress of This Survey' to let the user know when the program has finished each step. Each progress bar has a corresponding tab below it. The steps must be completed in numerical order. Each progress bar will turn green if the step has been completed successfully, and remain blue if not (Figure SOP2-4).

Each step can take some time depending upon the Survey Boundary area, the DEM and the settings that you select for each step. When the step is finished processing, you will get a pop-up window such as Figure SOP2-7.

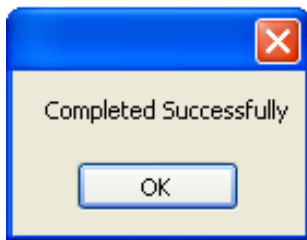


Figure SOP2-7. Screenshot of the pop-up window indicating successful creation of a feature class in the geodatabase (NPS.gdb).

SOP 2.3.5 – Generate Excluded Areas

The 'Generate Excluded Areas' step (Step 1 tab and progress bar) uses the DEM to generate polygons of areas that are above or below a user-specified elevation. Transect lines will not be generated within these polygons. Open the Transect Tool Form and click on the Step 1 tab.

Figure SOP2-8. The Transect Tool Form with the Step 1 (Generate Excluded Areas) tab selected. See SOP 2.3.5. In this example, the tool will create a feature class in the NPS.gdb for all grid cells of the DEM that are within the Itkillik2012_Test survey boundary (Itkillik2012_Test) and that are below 3000 ft. The DEM set under the Config tab has its elevation ('z') values in feet. No transects will be produced in these excluded areas.

- 1) Select your Survey ID from the drop down list (the one that corresponds to your survey boundary). Excluded area polygons will only be generated within the selected survey boundary. The drop down list should include the survey name which you established when you either digitized or imported a survey boundary (SOP 2.3.3).
- 2) Next, enter an elevation value. The unit of elevation is determined from the DEM (the z-value) which will be, more often than not, in meters, but may be in feet as with the 60m NED we are currently using in the NPS Alaska Region.
- 3) Select whether the areas above or below the specified elevation value will be excluded. If 'Above Entered Elevation Range' is selected then all areas/cells in the DEM file with elevation values above the specified elevation value will be extracted, converted to polygons and aggregated. If 'Below Entered Elevation Range' is selected then all areas/cells in the DEM file with elevation values below the specified elevation value will be extracted, converted to polygons and aggregated.
- 4) Check the 'Replace All Excluded Areas for This Survey' checkbox if you wish to delete existing 'Excluded Area' polygons for this Survey ID.

- 5) Finally, click the 'Execute' button to run the 'Generate Excluded Areas' step. The resulting polygons will be stored in the 'ElvPoly' Feature Class in the NPS.gdb and displayed as the 'Excluded Areas' layer in the NPS_Transect_Tool.mxd (Figure SOP2-9). It may take some time for the tool to run this step, as with the other three steps, but you should see a running progress report on the Transect Tool Form to the right of the Progress bars and then a 'step completed' pop-up window as shown in Figure SOP2-7.

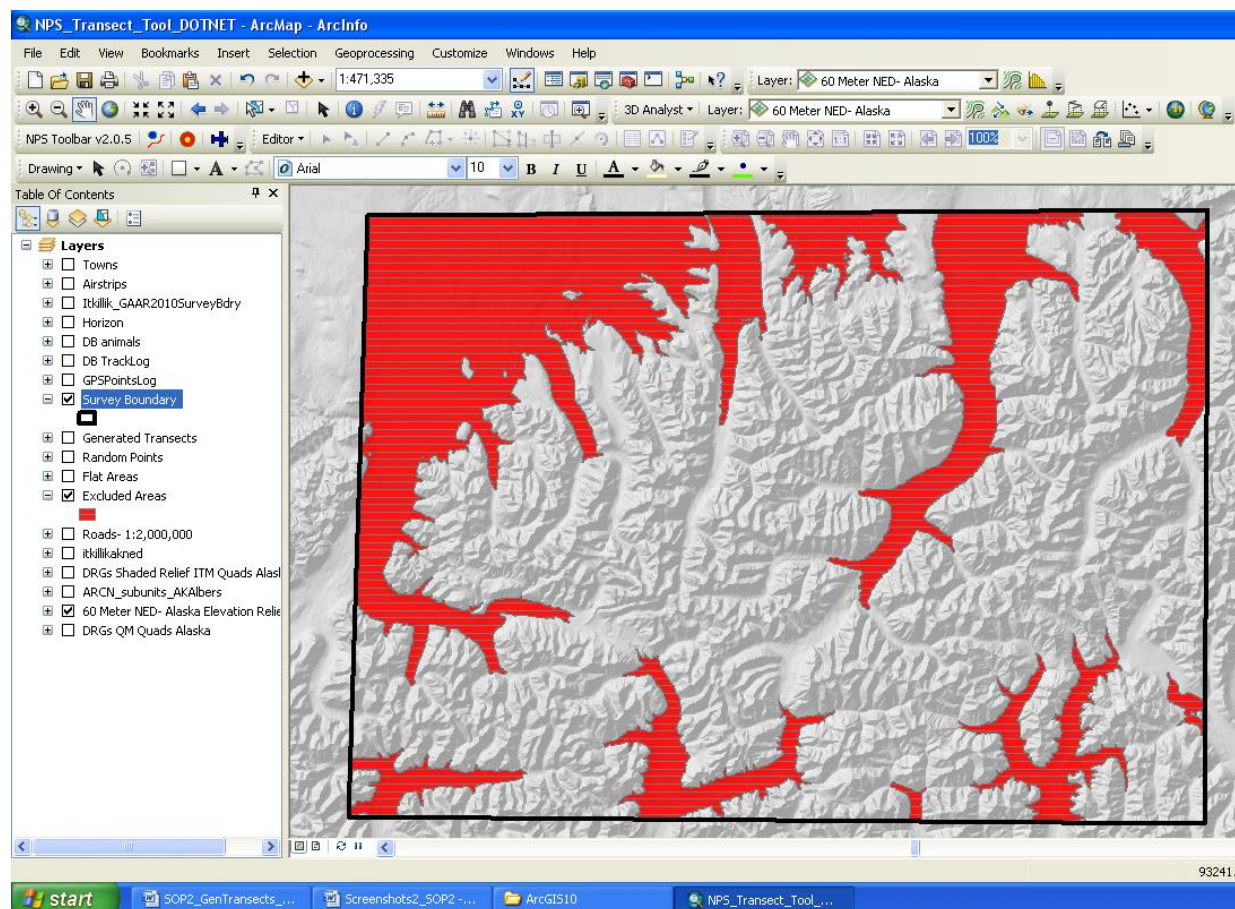


Figure SOP2-9. Screenshot showing the excluded areas (below 3000 ft.; red hatched polygons) that were generated within the Itkillik2012_Test Survey Boundary (black rectangle). No transects will be produced in the excluded areas.

SOP 2.3.6 – Generate Flat Areas

The 'Generate Flat Areas' step (Step 2 tab and progress bar) uses the DEM to generate polygons of areas that are within a specified slope range. These polygons will be deemed as flat areas and only straight transect lines – not contour lines - will be generated within these polygons. To generate flat areas, click on the Step 2 tab of the Transect Tool form (Figure SOP2-10).

Figure SOP2-10. The Transect Tool Form with the Step 2 (Generate Flat Areas) tab selected (SOP 2.3.6). See SOP 2.3.6. In this example, the tool will create a feature class in the NPS.gdb for all grid cells of the DEM that are within the Itkillik2012_Test survey boundary and have slope values between 0-7°. Straight line transects will be produced in these flat areas. Notice that Step 1 (Generate Excluded Areas) has been completed and that that progress bar has turned green.

- 1) First 'Select the Survey ID' of the survey boundary for which you wish to generate flat areas. Flat area polygons will only be generated within the selected survey boundary. The drop down list should include the survey name which you established when you either digitized or imported a survey boundary (SOP 2.3.3).
- 2) Next, enter a slope range in the 'From (degrees)' and 'To (degrees)' fields. Enter '0' for the 'From' field. A range of 0-7 degrees was used to generate flat areas for the 2009-2013 ARCN and CAKN Dall's sheep surveys. The 'Generate Flat Areas' step works by running an ESRI tool to calculate a slope value for each cell in a DEM. When the observer clicks the 'Execute' button, the cells with slope values within the specified range will be converted to polygons and the adjacent polygons aggregated.
- 3) Check the 'Replace All Flat Areas for This Survey' checkbox if you wish to delete existing 'Flat Area' polygons for this Survey ID.
- 4) Finally, click the 'Execute' button to run the 'Generate Flat Areas' step. The resulting polygons will be stored in the 'FlatAreas' Feature Class in the NPS.gdb and displayed as the 'Flat Areas' layer in the NPS_Transect_Tool.mxd (Figure SOP2-11). It may take some time for the tool to run this step, as with the other three steps, but you should see a

running progress report on the Transect Tool window and then a 'step completed' pop-up window as shown in Figure SOP2-7.

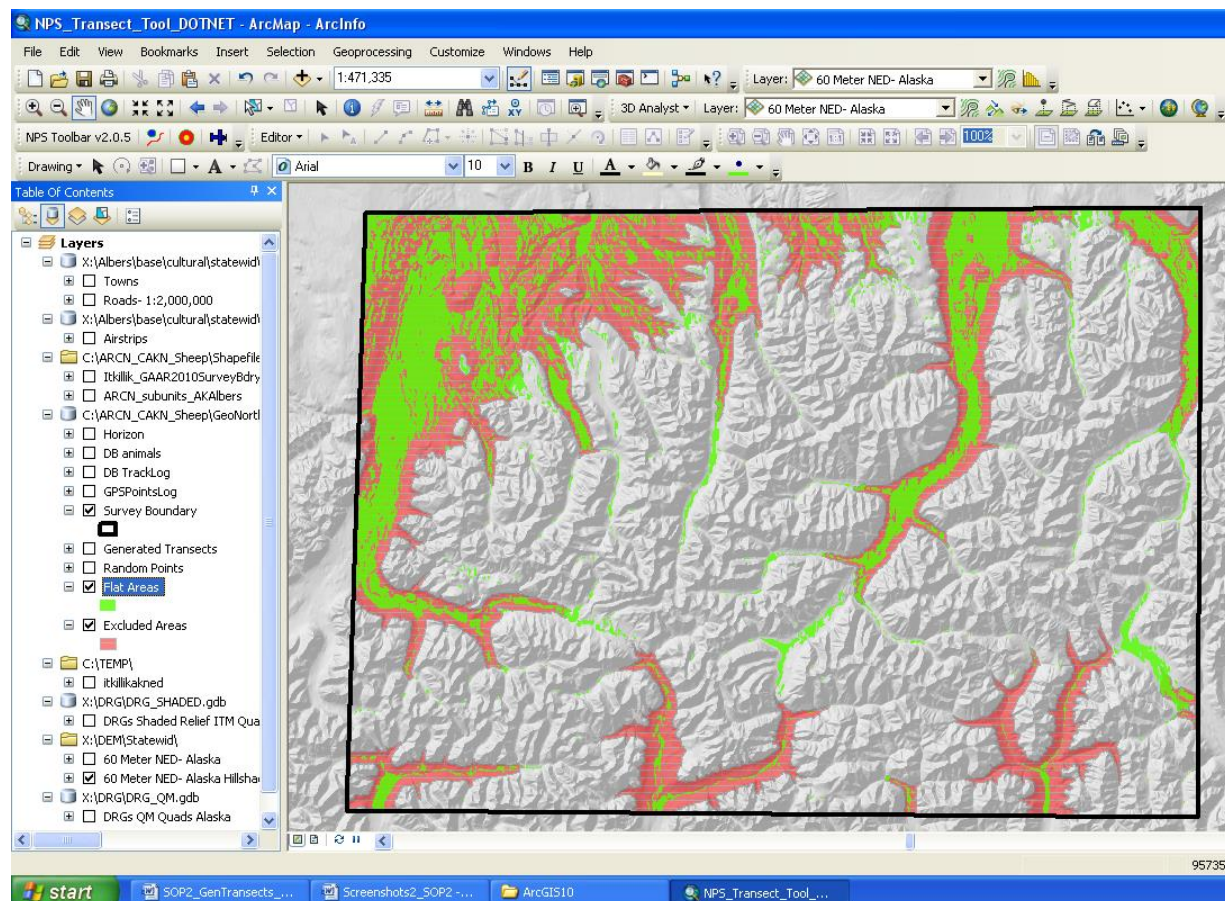


Figure SOP2-11. Screenshot showing the flat areas (0-7° slope; light green polygons) that were generated within the Itkillik2012_Test Survey Boundary (black rectangle). The excluded areas generated in Step 1 are also shown as red hatched polygons. Straight-line transects will be produced in these areas but not where they overlap the excluded areas.

SOP 2.3.7 – Generate Random Points

The 'Generate Random Points' step (Step 3 tab and progress bar) generates points which are later used as centers of origin for generating transects (Step 4). Before the random points can be generated, excluded and flat area polygons must already exist for that Survey ID. The two methods used to generate points are 'Random Generation' and 'Grid Format'. The 'Random Generation' method creates a specified number of points at random locations which fall within the selected survey boundary but not within any excluded area polygons.

The 'Grid Format' method generates points in a grid with a specified grid spacing distance. The 'Grid Format' method may generate grid points with or without a specified starting point. If no starting point is specified, the 'Grid Format' method will simply generate the grid points using the upper-left corner of the survey boundary's envelope as a starting point. Points will not be generated in any excluded area polygons. To generate random points, click on the Step 3 tab of the Transect Tool Form (Figure SOP2-12).

Figure SOP2-12. The Transect Tool Form with the Step 3 (Generate Random Points) tab selected. See SOP 2.3.7. In this example, the tool will create a feature class in the NPS.gdb of points, either randomly distributed in the survey area (Random Generation) or on a grid of specified spacing (Grid Format), within the Itkillik2012_Test survey boundary. These points are the points of origin for the transects that will be generated in Step 4. Notice that Steps 1 and 2 have been completed and their progress bars are now green.

- 1) First 'Select the SurveyID' of the survey boundary for which you wish to generate random points. The drop down list should include the survey name which you established when you either digitized or imported a survey boundary (SOP 2.3.3).
- 2) To use the 'Random Generation' method, select the Random Generation option and enter the number of points to be generated.
- 3) To use the 'Grid Format' method, select the Grid Format option. If desired, specify a starting X and Y coordinate; this must be in the coordinate system of the geodatabase – NAD 1983 Alaska Albers. Then set the distance between grid points (point spacing); this value should be in meters. Thus, if you want 10 km grid spacing, you will enter 10000.
- 4) Check the 'Replace All Random Points for This Survey' checkbox if you wish to delete existing random points for this Survey ID.
- 5) Finally, click the 'Execute' button to run the 'Generate Random Points' step. The resulting points will be stored in the 'TrnPoints' Feature Class in the NPS.gdb and displayed as the 'Random Points' layer in the NPS_Transect_Tool.mxd (Figure SOP2-13). It may take some time for the tool to run this step, as with the other three steps, but

you should see a running progress report on the Transect Tool window and then a 'step completed' pop-up window as shown in Figure SOP2-7.

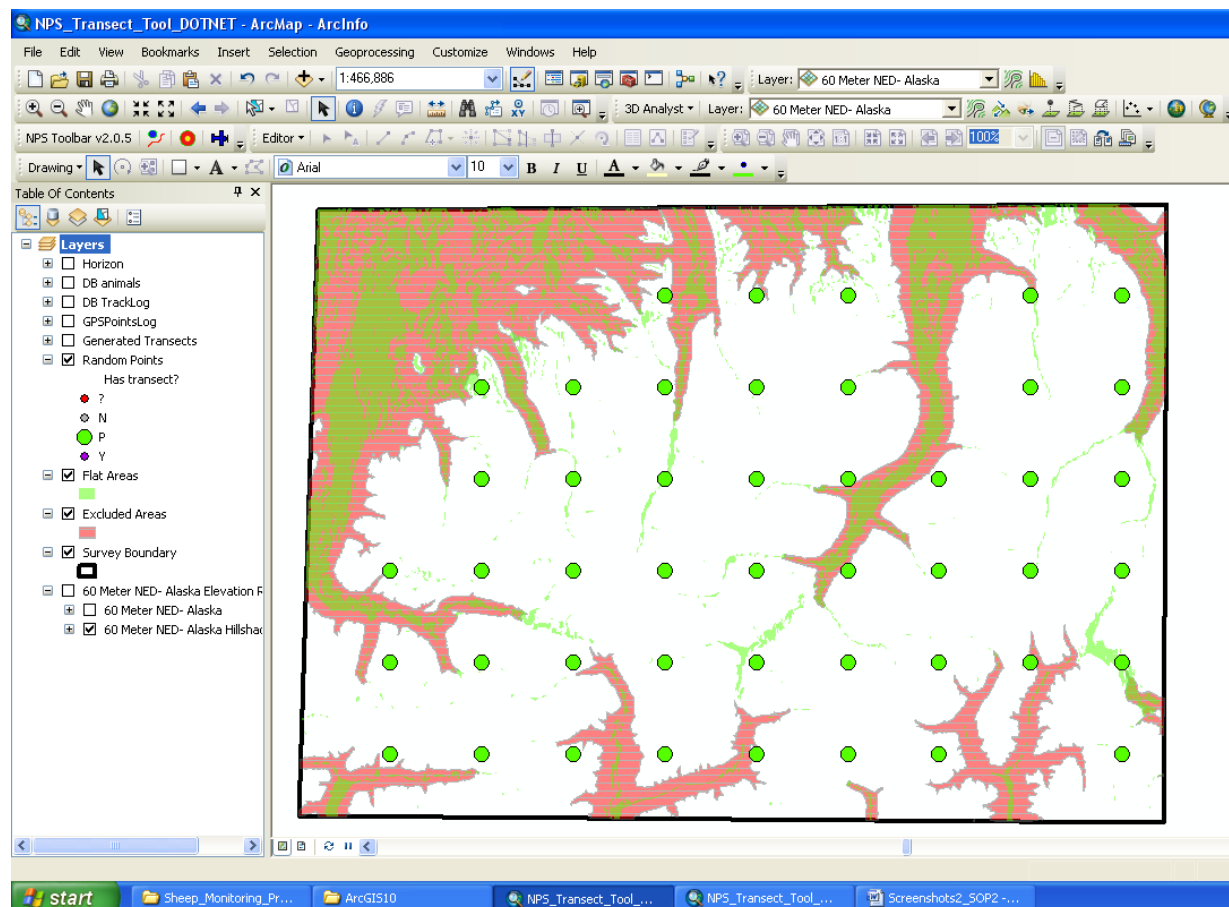


Figure SOP2-13. Screenshot showing the random points (light green circles) that were generated within the Itkillik2012_Test Survey Boundary (black rectangle). The flat and excluded areas are also shown.

SOP 2.3.8 – Generate Transect Lines

After the excluded areas, flat areas and random points have been generated (SOPs 2.3.5, 2.3.6 and 2.3.7, respectively), the 'Generate Transect Lines' step (Step 4 tab and progress bar) can be initiated. The tool generates straight transect lines for random points that are within the flat area polygons, and curved, contour transects for random points that are within the survey boundary but outside of the flat or excluded area polygons. The straight transects are composed of two straight lines drawn at random angles originating at their respective random points, whereas the contour transects follow mountain contours at the elevation of their respective random points with the random point as the center of the line. The tool starts drawing a transect in two directions, using the random point as the transect's center. The user specifies a minimum and a maximum transect length. If the transect generation tool runs out of terrain in either direction (e.g., it runs into the edge of a flat area polygon when drawing a straight transect or runs out of terrain at the specified elevation for a contour transect), then it will try to add additional length to the other transect leg. If the tool cannot meet the minimum transect length for both transect legs combined, then a transect will not be generated for that random point. To begin generating transects, click on the Step 4 tab on the Transect Tool Form (Figure SOP2-14).

Figure SOP2-14. Screenshot of the Transect Tool Form with the Step 4 (Generate Transect Lines) tab selected. See SOP 2.3.8. In this example, the tool is generating transects that will be in a feature class in the NPS.gdb within the Itkillik2012_Test survey boundary. Note the text to the right of the progress bars: thus far transects have been generated for 4 of the 46 points that were created in Step 3.

- 1) First 'Select the Survey ID' of the survey boundary for which you wish to generate transect lines. The drop down list should include the survey name which you established when you either digitized or imported a survey boundary (SOP 2.3.3).
- 2) Next, specify the minimum (Min) and maximum (Max) length of the transects. The units are always in meters (regardless of map units), which are the units of the NPS geodatabase (NPS.gdb). The 'Generate Transect Lines' process attempts to draw transects to the maximum length first and if the resulting transect is invalid (falls within excluded areas or outside the survey boundary) the 'Generate Transect Lines' process will then attempt to draw the transect to at least the minimum length and as far as possible towards the maximum length. If the transect cannot be drawn at the minimum length, the corresponding random point will then be marked off as abandoned and 'N' will be entered in the 'HasTransect' field of the random point feature class.
- 3) You can specify the number of transect lines to be generated although this number cannot exceed the number of random points. If the '# of Transects to Generate' field is left blank, the tool will attempt to generate transects for every random point for the selected Survey ID.
- 4) A 'Target Length' must be specified in meters. The pilot and observer will be alerted when they have flown past the target length on transect. The target length usually

corresponds to the maximum length specified when generating transects (Figure SOP2-14).

- 5) Check the 'Replace All Transect Lines for This Survey' checkbox if you wish to delete existing transects for this Survey ID.
- 6) Finally, click the 'Execute' button to run the 'Generate Transect Lines' step. The resulting lines will be stored in the 'TrnOrig' Feature Class of the NPS.gdb and displayed as the 'Generated Transects' layer in the NPS_Transect_Tool.mxd (Figure SOP2-15). It may take some time for the tool to run this step, considerably longer than the other three steps, but you should see a running progress report on the Transect Tool window and then a 'step completed' pop-up window as shown in Figure SOP2-16.

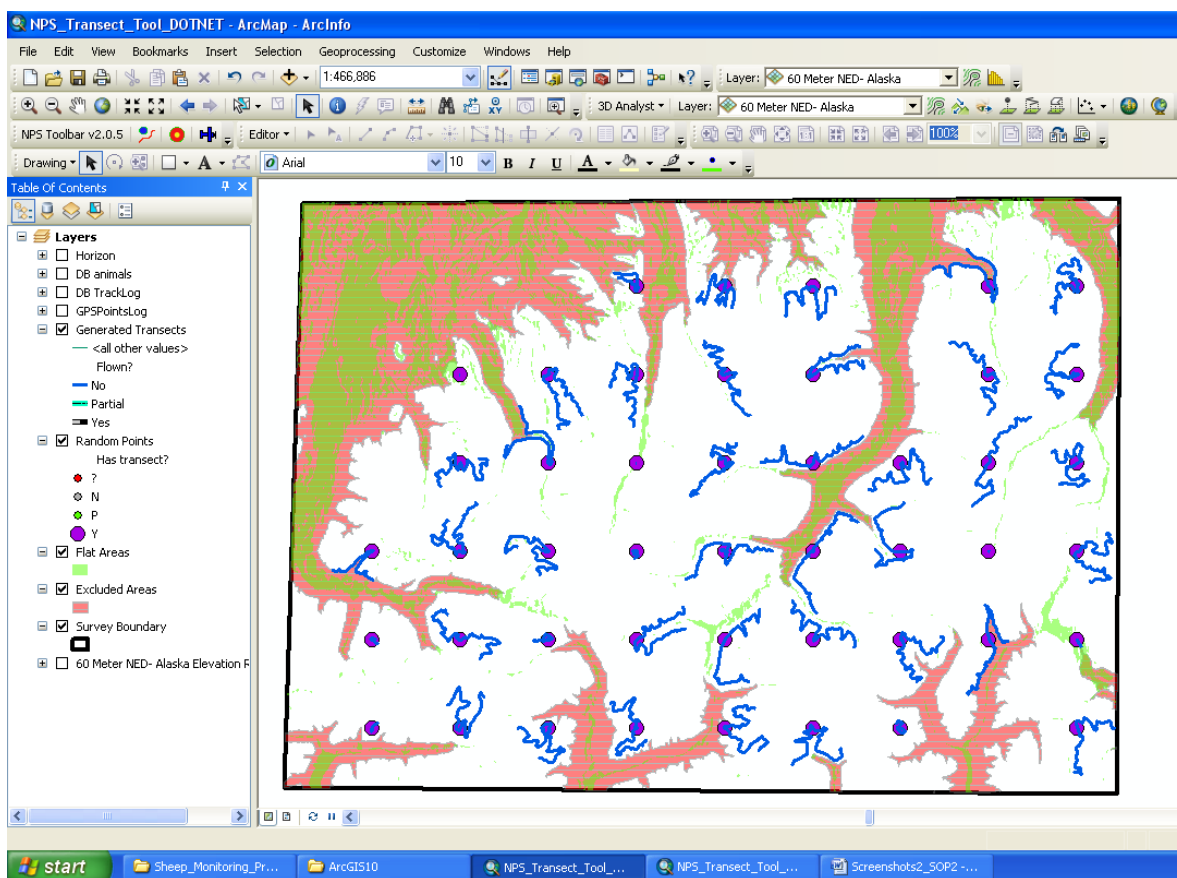


Figure SOP2-15. Screenshot showing transects (blue lines) that were generated within the Itkillik2012_Test Survey Boundary (black rectangle). The flat and excluded areas are also shown, as well as the random points, which are now purple indicating that a transect of at least 100 m in length has been generated for that point.

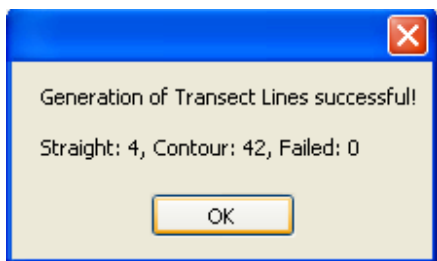


Figure SOP2-16. An example of the 'step completed' message that the Transect Tool produces after generating transects. This example corresponds to the transects that were generated in the example in Figure SOP2-15. Four straight-line transects were generated in flat areas and 42 contour transects were generated.

- 7) If the generated transect is less than a survey-specified, pre-determined minimum length (e.g., the generated transect is < 15 km when the Target Length is 20 km or < 12 km when the Target Length is 15 km), you must go into an ArcMap Editing session and extend the transect (in both directions if possible) at the same elevation until the total transect length exceeds that minimum length. If you cannot digitize an adequate length transect (i.e., there is not enough terrain at the transect elevation), you will create and digitize a new transect at the same elevation on the nearest mountain (i.e., a 'part two' for the original transect). If necessary, digitize a 'part three' so that the combined length of the original transect, plus its part two and part three is between the survey-specific, predetermined minimum length and the Target Length. This produces multi-part transects (Figure SOP2-17a), and segments of multi-part transects are flown in consecutive order. The second and third parts to the original transect should be labeled '1000 + the original transect number' and '2000 + the original transect number', respectively (see the examples in Figure SOP2-17). This procedure is often necessary for transects generated at the upper elevation limit of a survey area, and ensures that all elevations are sampled in proportion to availability (Walsh et al. 2010). However, try to not add more than 1-2 extra parts to a multi-part transect. Rather than making a lot of little parts around hilltops, digitize a transect along a short ridgeline or saddle that is below the target elevation to connect hilltops that are at the target elevation. If transects are digitized along ridgelines or saddles lower than the target elevation, the distance between hilltops should be < 1 km and the difference in elevation between the target elevation and the elevation of the ridgeline or saddle should be < 500 ft. See Figures SOP2-17b, c.

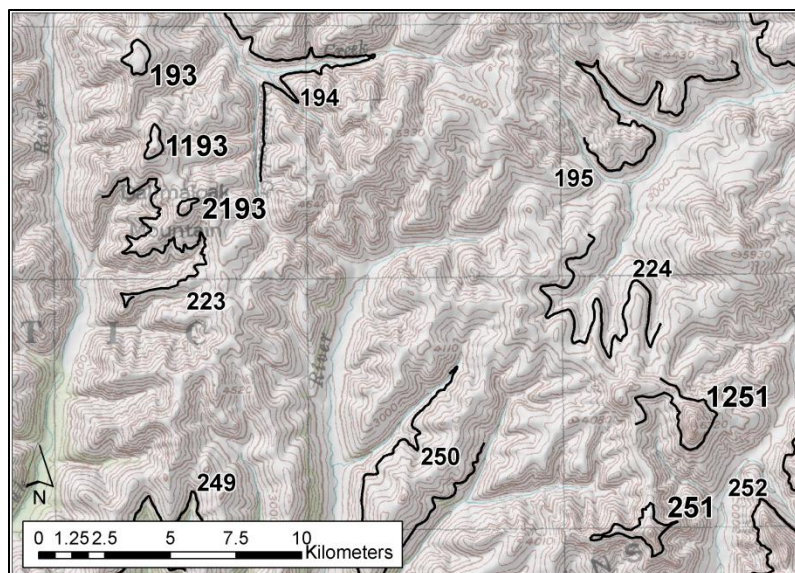


Figure SOP2-17a. Multi-part transects generated for a Dall's sheep survey, Gates of the Arctic National Park and Preserve, Alaska, 2010. Lines 193, 1193 and 2193 compose a three-part transect at 1,400 m elevation, totaling 12 km in length. Lines 251 and 1251 compose a two-part transect at 1,400 m elevation, totaling 20 km in length. All other transects shown here are single-part transects of 15-20 km in length.

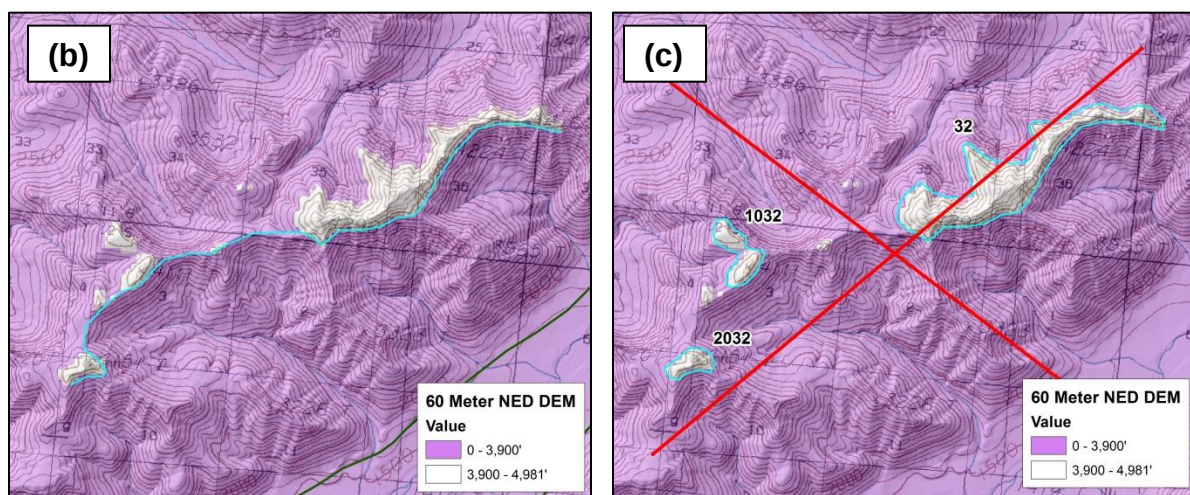


Figure SOP2-17b and SOP 2-17c. Transect at high elevation digitized to connect nearby hilltops at the target elevation (b) compared with a multi-part transect in the same are (c). If transects are digitized along ridgelines or saddles lower than the target elevation (b), the distance between hilltops should be < 1 km and the difference in elevation between the target elevation and the ridgeline or saddle elevation should be < 500 ft.

- 8) **NOTE – If you digitize new transects at all (as part of multi-part transects or where the ArcMap add-in tool was not able to generate a transect, you should re-import the set of new transects into the gdb. See SOP 2.3.9 (below).** After doing this, check the elevation of those re-imported transects. If the elevation changes for a transect, which is common with hand-digitized transects especially those spanning ridgelines (Figures Sop2-17b), the import tool picks an elevation within that range that may not match the target elevation. After checking the elevations, recalculate the endpoint coordinates for

all transects. To do this, one by one, right click on each of the fields (columns) for PROJTD_X1, _Y1, _X2, _Y2 and DD_LAT1, _LONG1, _Lat2, _LONG2 and select Calculate Geometry. Under Property pick the X/Y Coordinate value for that column (e.g., Y Coordinate of the Line Start for DD_Lat1) and select the appropriate unit for that column (Meters for PROJTD columns and Decimal Degrees for DD columns). It is also recommended that you adjust the TARGETLEN column to match or approximate the Shape_Length column for multi-part transects. Next, if desired re-number each transect (in TransectID) so that transect numbering follows a recognizable pattern across the survey area (the imports are just labeled consecutively after the highest numbered transect that was properly generated).

SOP 2.3.9 – Importing Random Points and/or Transects

Random points and transects can also be imported into the NPS geodatabase (NPS.gdb) and assigned to a survey using the Import Rnd Points/Transects tool under the Tools tab of the Transect Tool Form. Random points and transects can be imported from shapefiles or from selected points or lines of those shapefiles. The selection of points or transects cannot be from an existing NPS.gdb feature class. To import transects or random points, do the following:

- 1) Open the NPS_Transect_Tool.mxd.
- 2) Choose the transects or random points to import by either identifying the shapefile they are contained in or by adding the shapefile to the map and selecting those points or lines that will be imported. Note: a DEM file would need to be set in the Config tab and it would need to cover the area of all of the transects or random points that will be imported.
- 3) Click on the Transect Tool button  on the NPS Toolbar. The Transect Tool Form will open. Select the Tools tab (Figure SOP2-4).
- 4) Click on the 'Import Rnd Points/Transects' button, which will open the 'Import Transects / Random Points' window (Figure SOP2-18).

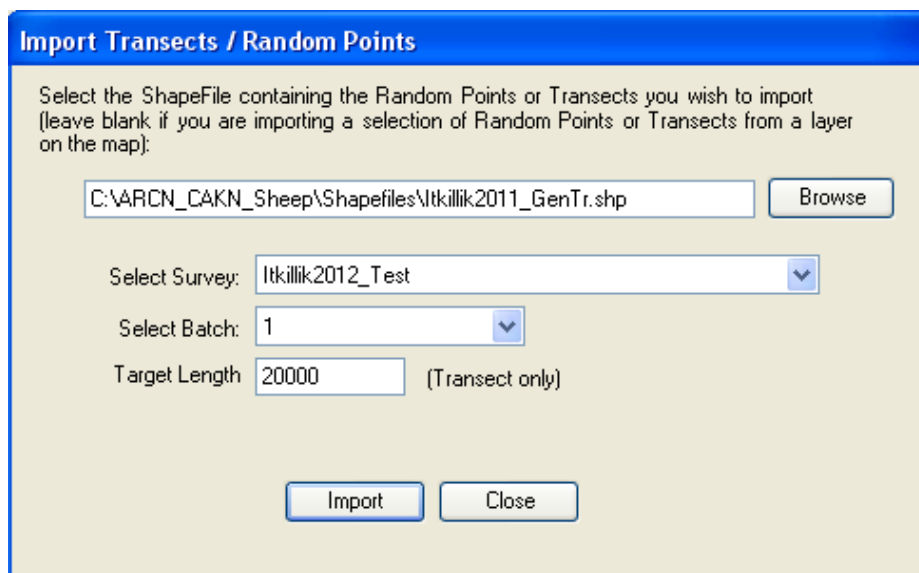


Figure SOP2-18. The 'Import Transects / Random Points' window. See SOP 2.3.9. In this example, a shapefile called ltklik2011_GenTr.shp has been selected to be imported to the NPS.gdb for the Survey ID 'ltklik2012_Test'. This set of transects was produced for the 2011 survey but we may want to repeat the same transects in 2012. The target length for all imported transects is 20,000 m.

- 5) If a selection of transects or random points have already been made, the Select Survey and Select Batch pick lists will already be enabled. If not, these will be disabled until the user browses to the shapefile containing the transects or random points and selects the file.
- 6) Select the Survey ID to which the transects or random points will be imported. The drop down list should include the survey name which you established when you either digitized or imported a survey boundary (SOP 2.3.3). The default Select Batch (batch 1) will be selected automatically. If there are multiple batches of existing transects or random points for the Survey ID, then the user can select which of those batches to import to. New batches are created when the user un-checks the 'Replace All Random Points/Transects for This Survey' checkbox before executing the Generate Random Points or Generate Transect Lines steps. If no transects or points were previously generated for the NPS.gdb, then batch 1 is the default.
- 7) If transects are being imported, a 'Target Length' (TARGETLEN) in meters must be specified. The pilot and observer will be alerted when they have flown past the target length. The target length usually corresponds to the maximum length specified when generating transects (SOP 2.3.8, Figure SOP2-14) or less for multi-part transects.
- 8) Click the 'Import' button. Imported points will be added to the 'TrnPoints' Feature Class in the NPS.gdb and displayed as the 'Random Points' layer in the NPS_Transect_Tool.mxd (similar to Figure SOP2-13). Imported transects will be added to the 'TrnOrig' Feature Class of the NPS.gdb and displayed as the 'Generated Transects' layer in the NPS_Transect_Tool.mxd (similar to Figure SOP2-15). It may take some time

for the tool to run this, but you should see a 'step completed' pop-up window as shown in Figure SOP2-19 when it has finished. You may need to re-label Transect ID.

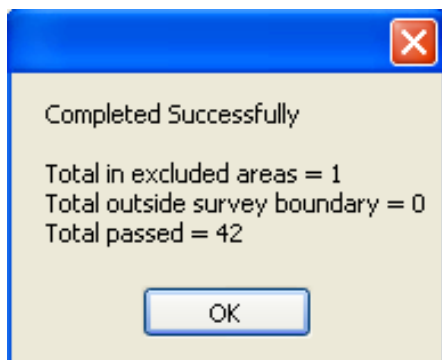


Figure SOP2-19. An example of the 'step completed' window that appears after transects have been successfully imported to the NPS.gdb geodatabase. The transect in the excluded area can be deleted in an ArcMap editing session.

SOP 2.4 – Edit ArcPad Defaults Tool

Before exporting the transects to the Animal Tracking ArcPad Applet, you need to set some data pick lists that will be exported with the transects. The applet contains pick lists for survey-wide data (e.g., observer name, pilot name and plane tail number), for sheep group sightings (e.g., activity) and for flown transects (e.g., cloud cover, turbulence intensity, turbulence duration). These pick lists obtain their data options from a file called 'defaultvalues.dbf'. The Edit ArcPad Defaults tool is used to modify the pick list options. The defaultvalues.dbf file is then exported with the transects to the Animal Tracking ArcPad Applet. You need to run this tool before exporting your files to the applet. Any changes that are made to the pick lists will be included with the next export to ArcPad (SOP 2.5).

- 1) Open the NPS_Transect_Tool.mxd.
- 2) Click on the Transect Tool button  on the NPS Toolbar. The Transect Tool Form will open. Click on the Tools tab (Figure SOP2-4).
- 3) Click the Edit ArcPad Defaults Tool button to open the tool window (Figure SOP 2-20). Click the Pick Lists tab. To the left is a list of all of the pick lists used by the Animal Tracking ArcPad Applet. Not all pertain to the sheep surveys. The ANIMAL, GROUPTYPE, INCRBYTEN, PCTCOVER and PCTSNOV pick lists are specific to SWAN's bear monitoring program and are not used for the Dall's sheep surveys.

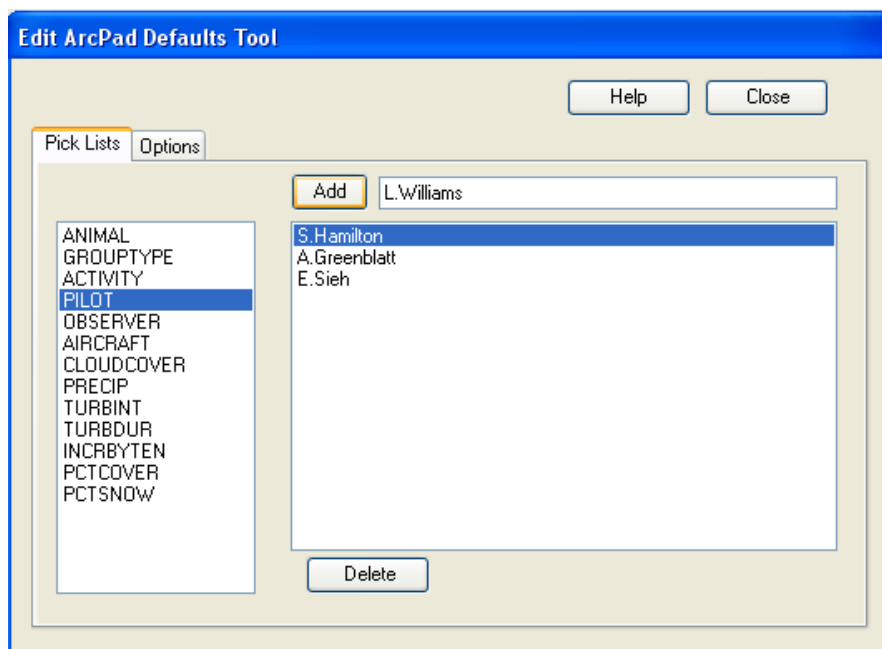


Figure SOP2-20. The Edit ArcPad Defaults Tool form showing the Pick Lists tab. In this example, we added three names to the Pilot pick list for data collection during an upcoming survey. These pick lists will be exported to ArcPad with the transects.

- 4) Select the pick list you wish to edit. The current options for the selected pick list will be displayed to the right. The Pilot, Observer and Aircraft pick lists may not have any options yet for a new survey.
- 5) To add a new option to a pick list, select the pick list name on the left, then type the text for the new option in the Add field and click the Add button. For the ARCN and CAKN Dall's sheep transect surveys, there are some standard options for these pick lists (Table SOP2-1). Please note that with the current Add-In version, when you add an option to a list, you will not immediately see it on the list. You have to save and close the ArcMap project and reopen it to see it on the list and before you export to ArcPad (SOP 2.5).

Table SOP2-1. Standard pick list options for transect survey data collection for ARCN and CAKN's Dall's sheep monitoring program.

Pick List Name	Standard Options for ARCN and CAKN's Dall's sheep surveys
ACTIVITY	Stationary, Walking, Running
PILOT ¹	First initial.Last name (e.g., L.Williams)
OBSERVER ¹	First initial.Last name (e.g., J.Schmidt)
AIRCRAFT ¹	Tail number (e.g., N5512Z)
CLOUDCOVER	None, <½ scattered, >½ broken, Overcast
PRECIP (precipitation)	None, Rain, Snow
TURBINT (turbulence intensity)	None, Light, Moderate
TURBDUR (turbulence duration)	None, Occasional, Intermittent, Constant

¹The pick lists for PILOT, OBSERVER and AIRCRAFT need to be set for each survey because those options change between surveys. However, there is a standard format for entering those options into the Edit ArcPad Defaults Tool as shown in the table.

- 6) To delete an existing option, select the option and click the Delete button below.
- 7) There is also an Options tab on the Edit ArcPad Defaults Tool form (Figure SOP2-21). In the current software version (2.0.5), the only option is to enable or disable the horizon button on the sheep data collection forms. We do not use the horizon function for the ARCN and CAKN sheep surveys so this can be unchecked. The horizon function is used for SWAN's bear surveys.

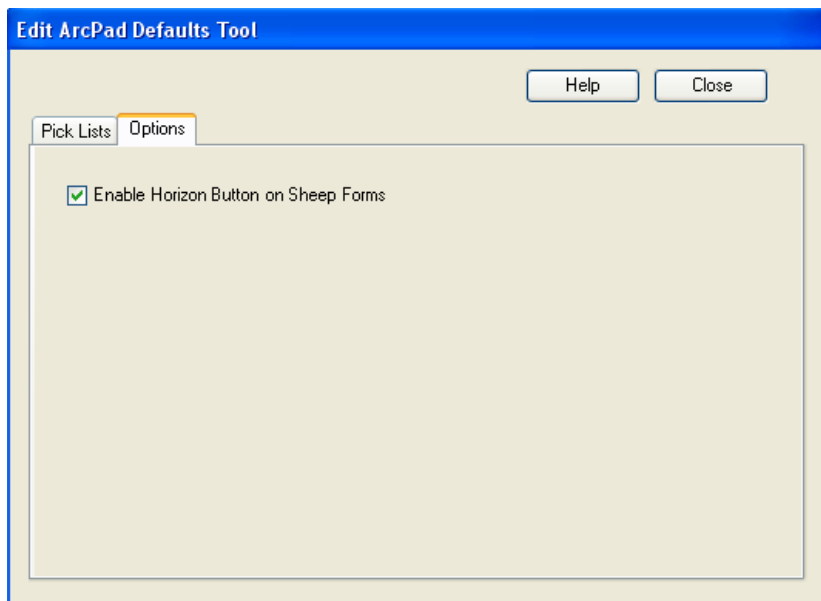


Figure SOP2-21. The Edit ArcPad Defaults Tool form with the Options tab selected.

SOP 2.5 – Exporting Files for the Animal Marking ArcPad Applet

After generating transect lines (SOP 2.3) and modifying the pick lists (SOP 2.4), those files may now be exported for use in the Animal Tracking ArcPad Applet. You will generally export your files to a thumb drive that will then be used to upload the exported files to the field computer running ArcPad (SOP 3).

- 1) With the current version of the Add-In, save and shut down the ArcMap project and reopen it.
- 2) Click on the Transect Tool button  on the NPS Toolbar. The Transect Tool Form will open.
- 3) Go to Tools→Edit ArcPad Defaults Tool and make sure your pick-lists are populated the way you want them (SOP 2.4, Figure SOP2-20).
- 4) Click on the 'Export/Import' tab (Figure SOP 2-22). This tab is where the transects can be exported to shapefiles for ArcPad and where data collected in the field can be imported back into the geodatabase (SOP 9).

Figure SOP2-22. The Transect Tool Form with the Import/Export tab selected. In this example, we are exporting the transects and associated data shapefiles as well as the pick lists to file pathway: C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205. The Export tool will create a new folder called 'Survey' within the SOP_Screenshots_GeoNorth205 folder that will contain all of the exported files. Note that we have completed Steps 1-4 and thus have files ready for export. Also make sure that you have made any adjustments to your pick lists (via the Edit ArcPad Defaults Tool), saved and restarted ArcMap before running the export process.

- 5) Select the survey name. The drop down list next to 'Select Survey' should include the name for your survey boundary.
- 6) Prepare a thumb drive or a file pathway that you will export your transects to. You will export to a USB thumb drive so that you can transfer the exported files to the field slate that you will use in the plane to record data. We recommend that you create and use the following naming system when exporting to the field slate thumb drives:
F:\SurveyName_BlankSurveyFile, where Survey Name is area+year (e.g., Itkillik2012) and F:\ is the thumb drive.
- 7) Click the 'Browse' button next to the 'Export Path' field and navigate to the file pathway or the storage device you wish to export to (e.g., F:\Itkillik2012_BlankSurveyFile for a thumb drive export). Click the folder (e.g., Itkillik2012_BlankSurveyFile) to select it. The path to that folder should now be in the 'Export Path' field (Figure SOP2-22).
- 8) Click the 'Export' button. The Export tool will create a new folder called 'Survey' within that folder (e.g., within the Itkillik2012_BlankSurveyFile folder) that will contain all of the exported files. Do not change the name of the 'Survey' folder. The exported files in the 'Survey' folder include the following.

- 'TrnOrig' is a line shapefile containing the generated transects for the Survey ID that was selected.
- 'DBAnimals' shapefile is an empty point shapefile for storing data about the sheep groups seen on-transect.
- 'DBTracklog' is an empty line shapefile for storing the flight path while on transect.
- 'Horizon' is an empty point shapefile for storing horizon marks for animal sightings. This shapefile is not currently being used in the ARCN and CAKN Dall's sheep surveys, but is used for SWAN's bear surveys.
- 'GPSPointsLog' is an empty point shapefile for storing all GPS points obtained during the entire flight. A point is recorded every second.
- APL files for each of the shapefiles mentioned above. These APL files contain the symbology (symbol shape and color) for displaying the shapefile features.

Appendix SOP2-1 – Installing the GeoNorth NPS Animal Tracking Project v2.0.5 for Windows XP

Prior to the 2014 season, we were still running Windows XP and could use the GeoNorth NPS Animal Tracking Project v2.0.5 and corresponding Transect Generation ArcMap Extension. In this Appendix we retain the instructions for using this Extension for posterity. If you use this Extension, follow these instructions then go back to SOP 2.2 through 2.5.

If you receive the NPS Animal Tracking Project as a compressed file, use WinZip or another program you are familiar with to uncompress the file contents into another location. You will then see the following main sub-folders.

- Transect_Generation_ArcMap_Extension (covered here, Appendix SOP2-1)
- Animal_Tracking_ArcPad_Applet (covered in SOP 3.2.1 and SOP 3.2.2)
- Fake_GPS_Extension (covered in SOP 3.2.3).
- NPSTransectTool – Project SourceCode (C#) – This code was upgraded to produce the Add-In used in Windows 7.
- NPS SOP_v2.0.5.doc – Ignore this and use this SOP instead.
- NPS_Transect_Tool_v2.0 Installation.docx. – Ignore this and use this SOP instead (see subsection below).

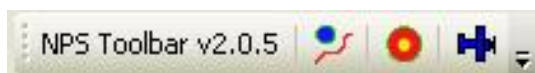
Contents of the Transect_Generation_ArcMap_Extension Folder

The Transect_Generation_ArcMap_Extension folder contains two folders: (1) ArcGIS10 and (2) ArcGIS93. Enter the folder which pertains to the version of ArcGIS (10 or 9.3) that you are running. Within each of these two folders are the following folders/files.

- NPS_Transect_Tool_vX.X.X_ArcGIS_9.3.msi or NPS_Transect_Tool_vX.X.X_ArcGIS_10.msi. This is the installer for the NPS Transect tool. The 'v.X.X.X' represents the current version number. The latest version, which was used to generate transects for the 2011 sheep surveys was v.2.0.5. For v. 2.0.5, there is an installer for ArcGIS 9.3 and another for ArcGIS 10 (in separate folders) – please use the appropriate installer based on the ArcGIS version you are using.
- NPS_Transect_Tool_DOTNET.mxd. This is the ArcMap project (also referred to as MXD here) where the 'Transect Generation ArcMap Extension' resides as VBA (Visual Basic for Applications) scripts.
- NPS.gdb folder: The geodatabase within this folder contains the layers referenced by the NPS_Transect_Tool.mxd file. This geodatabase is where the generated transects are stored and eventually where the field data will be stored.
- APLs folder: This contains the APL (ArcPad Layer) files which define the symbology used to display the shapefiles in the Animal Tracking ArcPad Applet.

Installing the Transect Generation ArcMap Extension

- 7) Close ArcMap if it's currently running.
- 8) Uninstall any prior versions of the NPS Transect Tool by navigating to Start→Control Panel→Add or Remove Programs. Select the NPS Transect Tool from the list of programs and choose to uninstall (remove) it.
- 9) Save a copy of the Transect_Generation_ArcMap_Extension folder to your C:\ drive and rename the folder with the survey name for which you are generating transects (e.g., 'WEAR2011_TrGenArcMapExt'). Go into this folder and into the appropriate subfolder ('ArcMap9.3' or 'ArcMap10') based on the ArcGIS/ArcMap version that you are running. Double-click the NPS Transect Tool installer file (the *.msi file, e.g., NPS_Transect_Tool_v2.0.5_ArcGIS_10.msi).
- 10) An Installer wizard window will open. Accept all default settings until the installation is complete.
- 11) Open the ArcMap project (NPS_Transect_Tool_DOTNET.mxd) in the folder that pertains to the ArcGIS/ArcMap version that you are running (ArcGIS9.3 or ArcGIS10). This is the only ArcMap project (MXD) that the NPS Transect Tool v2.0.5 will work with. You might not see the NPS Toolbar immediately but it has become part of your toolbar collection.
- 12) At the top of the ArcMap window, where the other toolbars are located, pick an empty area and right click. You should now see a list of available toolbars to add to your window and the NPS Toolbar v.X.X.X (e.g., NPS Toolbar v.2.0.5 for the current version) should be one of your choices. If the Toolbar is not immediately visible, select the Customize menu, then Toolbars. Locate the NPS Toolbar, check mark it and it should open on the screen (see screenshot below). Drag and drop it next to any existing toolbar. Save the MXD so it will remember the NPS toolbar. If the NPS toolbar buttons are not enabled, try restarting ArcMap and repeating this step.



Appendix SOP2-2 – Sample Text Output when Perform Checks is selected from the Config tab on the Transect Tool Form (SOP 2.3.1).

ArcGIS Version:

!!!Could not read Realersion info!!!

ArcGIS Build:

!!!Could not read Build info!!!

DEM File Path:

C:\TEMP\itkillikakned

OK

DEM file projection:

Albers_Conical_Equal_Area

MXD projection:

NAD_1983_Alaska_Albers

Main FeatureClasses paths:

SurveyBoundary:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb\SurveyBoundary

ElvPoly:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb\ElvPoly

TrnPoints:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb\TrnPoints

TrnOrig:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb\TrnOrig

Workspaces active in MXD:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb

Scratch Workspace Path:

C:\TEMPOK

Current Workspace Path:

C:\TEMPOK

Scratch Workspace Path Security:

OK

Current Workspace Path Security:

OK

Path to DLL:

c:\program files\GeoNorth\nps transect tool v2.0

Path to Database:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS.gdb

OK

Path to MXD:

C:\ARCN_CAKN_Sheep\SOP_Screenshots_GeoNorth205\Regen_Pts\ArcGIS10\NPS_Transect
_Tool_DOTNET.mxd

OK