ODICINIAL DATA

# Mapping Point Locations along Drill Pad Surveys

These instructions enable you to create point shapefiles of sampling locations along a drill pad. You need to install the extension **Distance and Azimuth Tools** created by Jeff Jenness AND **Animal Movement** created by the USGS (available at <u>http://arcscripts.esri.com/</u>). Using MS Excel and ESRI ArcView 3.x software, you perform the following:

- in MS Excel input field data and calculate angles/distances
- export to dBase
- in ArcView add table as event theme
- use Distance and Azimuth extension to calculate adjusted locations and plot as point shapefiles
- use Animal Movement to create a minimum convex polygon of the drill pad

*Extra* instructions are included at the end to create polygon shapefiles of the drill pads.

URIGINAL DATA	
Drillpad.xls	an MS Excel spreadsheet of field data with the following critical fields: DPNumber, Species, LeftRight, DistAlongLine, Azimuth, SampleDist, SampleAngle, UTM_N_E, Dimension, ShiftRadians, X_UTM, Y_UTM, DimX, DimY, DeltaX, DeltaY, X, Y
CREATED DATA	
Drillpad.dbf StartPts.shp LinePts.shp	exported spreadsheet of formatted, critical fields shapefile created from the Drillpad.dbf Event shapefile created from mapping points using Distance/Azimuth tool on the Samples event theme with the fields: DistAlongLine and Azimuth
SamplePts.shp	shapefile created from mapping points using Distance/Azimuth tool on the Linepts.shp theme with the fields: SampleDist and SampleAngle
EndPts.shp	shapefile created from mapping points using Distance/Azimuth tool on the Samples event theme with the fields: DimY and Azimuth

The following table should help you understand the various field attributes required for use in ArcView 3.x.

Field	Definition						
DPNumber	The drill pad number; e.g. DP01						
Species	Four letter code as recorded from the data sheet						
LeftRight	"R" or "L" recorded from data sheet to indicate position of observation						
DistAlongLine	ne The location along edge of drill pad						
Azimuth	The compass direction walked along edge of drill pad						
SampleDist	The perpendicular distance from the edge of the sample observation						
SampleAngle	The perpendicular angle from the edge of the sample observation – tricky calculation!						
UTM_N_E	Renaming of the original "Location UTM" field (the GPS point)						
Dimension	Renaming of the original "Drill pad dimension" field						
ShiftRadians	The azimuth in radians (for use in the delta calculations)						
X_UTM	Extraction of the easting from "UTM_N_E"						
Y_UTM	Extraction of the northing from "UTM_N_E"						
Dim X	Extraction of the X dimension from "Dimension"						
DimY	Extraction of the Y dimension from "Dimension"						
DeltaX	Change in X position through trigonometric calculation and "LeftRight"						
DeltaY	Change in Y position through trigonometric calculation and "LeftRight"						
Х	Start (actual) easting position						
Y	Start (actual) northing position						

## Steps in MS Excel

- 1. Open **Drillpad.xls** in MS Excel
- 2. Carefully check records for data quality, omissions, etc.
- 3. Make sure column headings do NOT contain spaces
- 4. Correct as necessary
- 5. Transpose the species data so that there is a record for each observation (this may require reading off the data sheet)

#### Calculate the new required fields:

6. Add the following new required fields to new columns and calculate as follows:

New Column Heading	Function
X_UTM	= VALUE(RIGHT(UTM_N_E,7)))
Y_UTM	=VALUE(LEFT(UTM_N_E,7))
LeftRight	Record this from the data sheet
SampleAngle	= IF(LeftRight="R",360-(90-Azimuth),(90+Azimuth))
ShiftRadians	= PI()/180*(90-Azimuth)
DimX	=VALUE(LEFT(Dimension,3))
DimY	=VALUE(MID(Dimension,6,3))
DeltaX	=IF(LeftRight="R",0,SIN(ShiftRadians)*DimX)
DeltaY	=IF(LeftRight="R",0,(DimX*COS(ShiftRadians)))
Х	=X_UTM - DeltaX
Υ	=Y_UTM + DeltaY

★ Substitute the corresponding cell values in place of the field names!

★ SampleAngle equation may be different – use equations appropriate to the data at hand as the above may not always work because of the azimuth!!!

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7. COPY and PASTE each formula in the rest of the corresponding column cells

#### Format and export to dBase:

- 8. Optionally, add a unique field e.g. ID and fill with sequential unique numbers
- 9. Optionally, copy and PASTE VALUES into a new worksheet
- 10. Format the columns with appropriate number types, decimals, etc.
- 11.SAVE the spreadsheet
- 12. SAVE AS a dBase file; e.g. Drillpad01.dbf
- 13. Close MS Excel

### Steps in ArcView 3.x:

- 1. Start a new project in ArcView 3.x
- 2. Open a new View but do not add any data yet
- Choose VIEW → PROPERTIES and set the Map and Distance Units = meters
- Add the Distance and Azimuth Tools extension (choose FILE → EXTENSIONS and click on the tool and then click OK)

#### Add the points as an event theme:

- 5. In the Table GUI, add the **Drillpad01.dbf** as a Table
- 6. In the View GUI, choose VIEW  $\rightarrow$  ADD EVENT THEME
- 7. Select the appropriate X and Y fields for Drillpad01.dbf and click OK

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- 8. Turn the event theme on
- 9. Make the event theme active
- 10. Choose THEME → CONVERT TO SHAPEFILE
- 11. Save as StartPts.shp
- 12. Add the new shapefile to the view
- 13. Save the project

### Create new point shapefiles for sampling locations (2-step process):

14. Click on the DISTANCE/AZIMUTH TOOLS button



- 17. Select **StartPts.shp** as the input
- 18. Select **Distalongl** as the DISTANCE field
- 19. Select **Azimuth** as the AZIMUTH field
- 20. Hold the shift key to select all fields for output
- 21. Click OK
- 22. Type a name for the output shapefile; e.g. LinePts.shp
- 23. Click OK
- 24. Click on the DISTANCE/AZIMUTH TOOLS button

-Selectinput Theme -	Select	Select the fields to
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26. Click OK

25. Using the same method (second choice), create a new shapefile using the following parameters:

- Input Theme: LinePts.shp
- DISTANCE Field:
   Sampledist
- AZIMUTH Field:
   Sampleangle
- Select all fields for ouput to new shapefile
- Output name:
   SamplePts.shp

# Extra Steps in ArcView

To create a polygon shapefile for each drill pad, you need start and end points merged into one file. Simply create a new shapefile of the end points from the original **Drillpad.dbf** event theme, then merge with the start points, and finally join using Animal Movement's MCP tool.

- 1. Add in the *GeoProcessing* extension
- 2. Click on the DISTANCE/AZIMUTH TOOLS button
- 3. Using the same method as above, create a new shapefile using the following parameters:
  - Input Theme: Drillpad01.dbf
  - DISTANCE Field: DimY
  - AZIMUTH Field: Azimuth
  - Output all fields
  - Output name:
     EndPts.shp
- 4. Click OK
- 5. Choose VIEW → GEOPROCESSING WIZARD

<ol> <li>Select at least two themes to merge:</li> </ol>	About Merge
Endpts.shp - Point	This operation appends the
Samplepts.shp - Point	features of two or more then
Linepts.shp - Point	into a single theme. Attribu
Startpts.shp - Point	same name
Use fields from: Startpts.shp - Point	
2) Specify the output file: Output File:	
NOTE: The fields in the output will be the same fields as the first theme.	More about Merge

- 6. Select MERGE as the operation and click NEXT
- 7. Select EndPts.shp and StartPts.shp as the themes to merge (use either fields)
- 8. Save to a new output name: e.g. MergePts.shp
- 9. Click FINISH
- 10. Add and make MergePts.shp the active theme
- 11. Choose HOME RANGE → MINIMUM CONVEX POLYGON
- 12. Enter an output name; e.g. **DP01poly.shp**
- 13. Click OK



★ REPEAT for another drill pad. You may find that the geometry and angles get a little tricky with certain azimuths for the drill pads. You will need to carefully check that the plotted sample locations match with those on the data sheets – perhaps a very laborious process but not nearly so as on-screen digitizing (which is also less accurate)!