Data Visualization & Volume Calculation Using eCoastal Tools

Introduction	Introduction to eGIS: Survey Tools
Exercise A	Importing XYZ Coordinates into ArcGIS
Exercise B	Creating a TIN from Lidar Data
Exercise C	Creating Contours from TIN
Exercise D	Creating a Grid Surface from Lidar Data
Exercise E	Creating Grid Surface Boundaries
Exercise F	Comparing Grid Surfaces
Exercise G	Calculating Shoreline Change Using DSAS

Module Introduction

Overview

After hearing the lecture and given the topographic and hydrographic data for Panama City and Walton County, Florida, the student will be able to calculate and visualize erosion and accretion changes for the area using the eGIS tools and the Digital Shoreline Analysis System (DSAS).

Skills Learned

•Import distance/azimuth profile data and XYZ lidar data
•Create TIN
•Generate Contour Line
•Create Grid Surfaces
•Create Analysis Areas Boundaries
•Calculate Volume Difference between Surveys

Tools and Technology

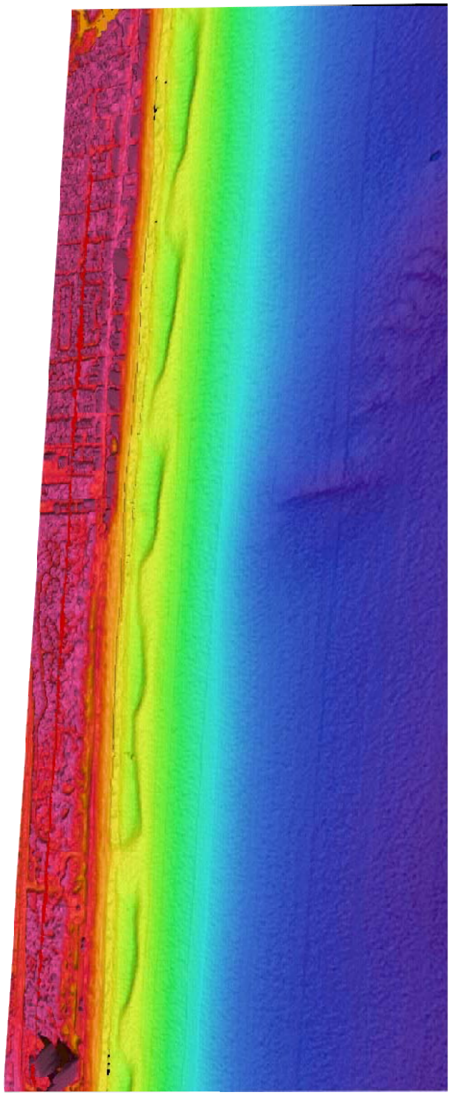
ArcGIS Components

- ArcMap
- ArcCatalog
- ArcToolbox

ArcGIS Extensions

- eGIS: Profile Loader
- eGIS: Survey Tools
- Spatial Analyst
- DSAS

Module Introduction



Working with Digital Data

Lidar data has proven useful for environmental monitoring, contour mapping, transportation planning, emergency management, military applications, orthorectification, forestry, oil and gas exploration, mining, hydrology, and shoreline management, to name a few.

By using remotely sensed data combined with ground reference points and specialized processing software, Lidar enables the measurement of Earth surface elevation for natural and manmade features.

Lidar datasets can be massive – some surveys can be terabytes in size! Many first-time lidar users are overwhelmed by the file size and amount of data. The tools in the following exercises will help you understand lidar formats and techniques for managing the data for analysis.

Data Visualization & Volume Calculation – Instructor Demonstration

Notes:

Exercise A: Importing XYZ Data into ArcGIS

Background

A common delivery format for lidar is a common delimited XYZ text file. In ArcGIS ArcMap, you can import tabular data and plot the geography in the mapping display.

Goal

After completing the exercise, you will be able to successfully import and plot the geometry of points stored in an ASCII text file.

Objectives

1. Student will be able to import ASCII text file
2. Student will be able to plot geometry of points

eGIS: Survey Tools

Lidar data is an integral part for data analysis in coastal engineering. The eGIS: Survey Toolbar was specifically designed for coastal engineers to simplify the formatting process of lidar datasets.

You can:

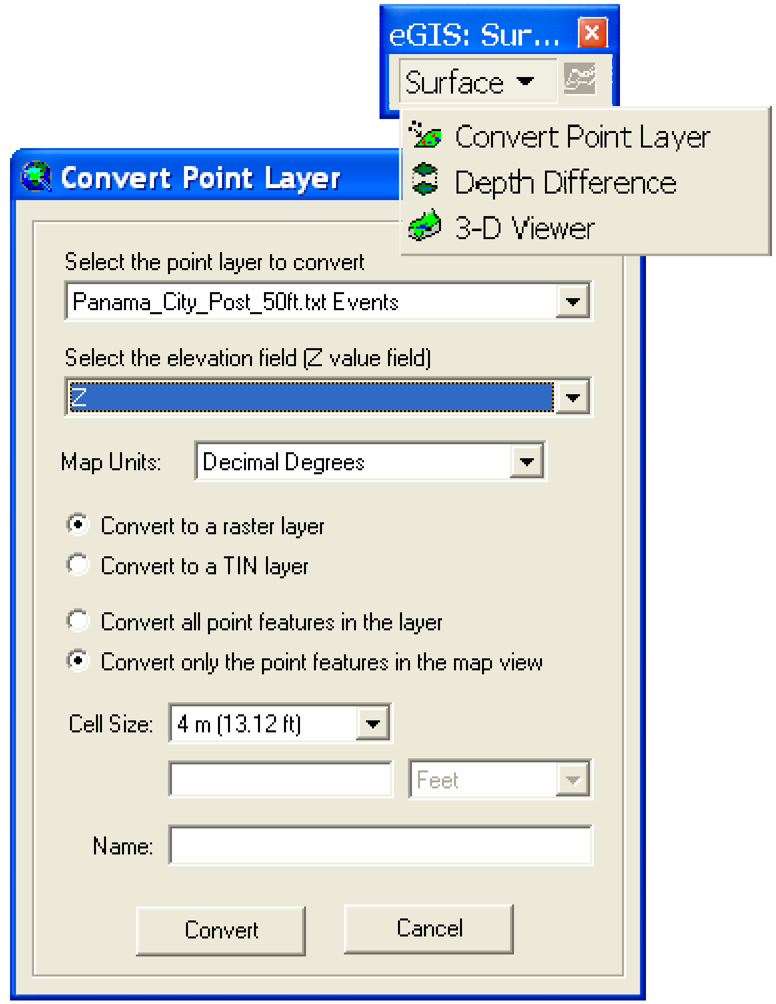
Generate contiguous TIN or grid surfaces based off of existing point files.

Calculate the Volume Difference between surveys.

Cut, extract and view Profile data from surfaces.

View surface in 2D window.

Before these tools can be utilized, lidar data must be properly formatted.



Exercise A: Importing XYZ Data into ArcGIS

Light Detection And Ranging (Lidar) data are composed of elevation measurements of the beach and offshore surfaces and are acquired through aerial topographic and bathymetric surveys. The file format used to capture the Lidar mapping data is referred to as “XYZ” where x is longitude, y is latitude, and z is elevation. Before you can look at the Lidar beach mapping data in ArcGIS, you must first acquire a dataset and then load the data set into ArcView.

In most cases, XYZ files are delivered as text files. In order for ArcGIS to recognize the contents of the text file, the file must be either comma or tab delimited and contain a header row. A comma-delimited text file should for formatted similar to the text below:

Header Row →

Comma-delimited data attributes.

```
X,Y,Z
-85.7126854,30.1302116,-6.35
-85.7126560,30.1300397,-6.36
-85.7126840,30.1299822,-6.67
-85.7126744,30.1297871,-5.82
-85.7126590,30.1297072,-5.76
-85.7126852,30.1295430,-5.51
-85.7126886,30.1294196,-5.32
-85.7126809,30.1293115,-5.00
-85.7127325,30.1302825,-6.42
-85.7128032,30.1302042,-6.73
-85.7127965,30.1300970,-6.57
-85.7127220,30.1299453,-7.02
-85.7127761,30.1298123,-6.48
-85.7127921,30.1297053,-5.98
```

Did You Know?

If you receive this error:

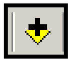
ArcGIS cannot read the format of your text file. Try adding a header row in your text file.

If your data is in the western hemisphere, all X values should be negative.

Lidar raw point data can also be known as "point cloud“ data.

ArcGIS does not support files with an *.xyz extension. To import a file of this type, first rename the file type suffix to *.txt or *.csv.

Exercise A: Importing XYZ Data into ArcGIS

Open the Grids.mxd from C:\Training. Using the "Add Layer" button,  , browse to the text file. The text file must have the extension *.txt or *.csv.

☐ Browse to **Panama_City_Pre_50ft.txt** in **C:\Training\Data\Survey_Data.**

Click **OK**.

Right-click on imported table and select '**Display XY Data'**.

Specify fields to use for **X and Y columns** using the respective drop-down lists.

☐ Denote X as the X field and Y as the Y field.

A coordinate system can then be selected by clicking on the '**Edit**' button.

To display the data in a standard coordinate system click on the '**Select'** button and browse to the desired projection.

☐ Select the **Geographic Coordinate Systems > World > WGS84**

After the coordinate system is selected click OK twice.

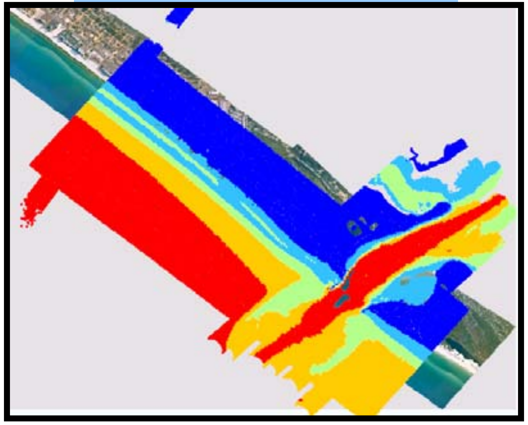
ArcMap then builds a point layer for the X,Y points.

To convert this temporary layer to a shapefile, right-click on the newly created layer and select **Data** from the drop-down menu. From the second drop-down box select **Export Data**. Save the file in the desired directory.

☐ Export the new shape to **C:\Training\Data\Survey_Data** and name it **Panama_City_Pre_50ft.shp**. When prompted, add the layer to the table of contents.

Did You Know?

X Fields	Y Fields
Easting	Northing
Westing	Southing
Longitude	Latitude



Using Symbology properties you can color-code elevations.

Exercise B: Creating a TIN from Lidar Data

Background

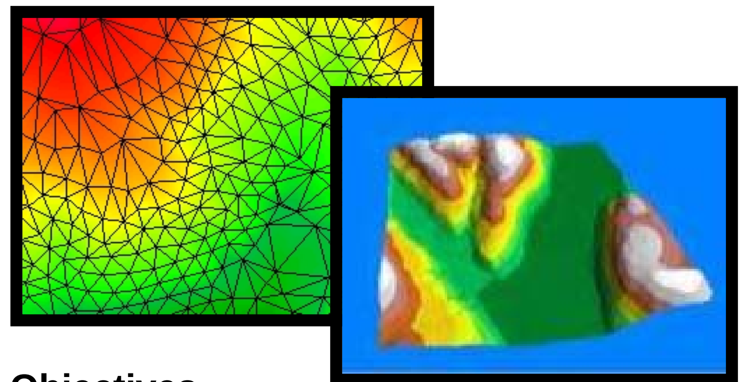
TIN (Triangulated Irregular Networks) datasets can be used to display and analyze surfaces. They contain irregularly spaced points that have x,y coordinates describing their location and a z-value that describes the surface at that point. The surface could represent elevation, precipitation, or temperature. A series of edges join the points to form triangles. The resulting triangular mosaic forms a continuous faceted surface, where each triangle face has a specific slope and aspect.

For vector GISs, TINs can be seen as polygons having attributes of slope, aspect and area, with three vertices having elevation attributes and three edges with slope and direction attributes.

The TIN model is attractive because of its simplicity and economy. TINS are much smaller and easier to generate than grids!

Goal

Using the eGIS: Survey Tools, create a TIN from an existing survey.



Objectives

1. Student will be able to create a TIN using the eCoastal interface
2. Student will be able to generate contours based off of user-defined TIN

Exercise B: Creating a TIN from Lidar Data

Users must first create a TIN prior to creating contours. To create a TIN, first zoom to the extents of the area of interest.

Using the eGIS: Survey Tools toolbar, from the “Surface” menu select “Convert Point Layer”.

Select the Point Layer.

☐Select **Panama_City_Pre_50ft**

Select the **Z** attribute for the elevation field.

Select the projections units of the layer. (e.g., WGS84 = Decimal Degrees, State Plate = Feet, UTM = Meters)

☐ Select **Decimal Degrees** as the Map Units

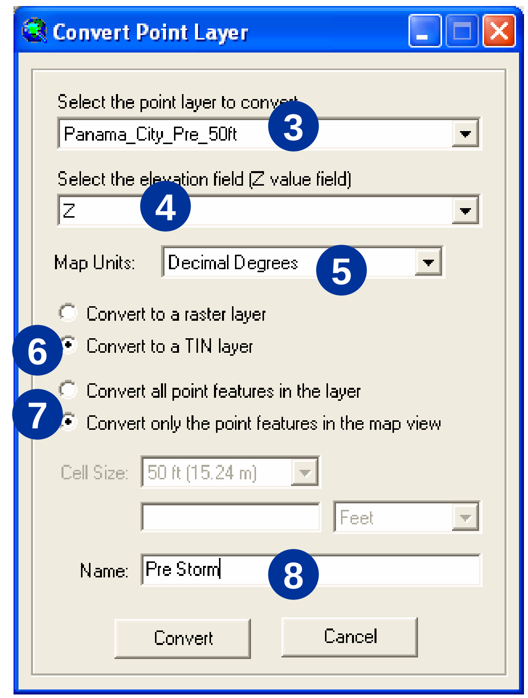
Select the **Convert to TIN** layer option.

You have the option to create a TIN on either the current map display (subset of layer) or convert all point features in the layer. **Convert only the point feature in the map view.**

Name the TIN layer.

☐ Enter **Pre Storm**

Click the Convert button. This creates a new TIN is stored in the C:\Workspace directory.



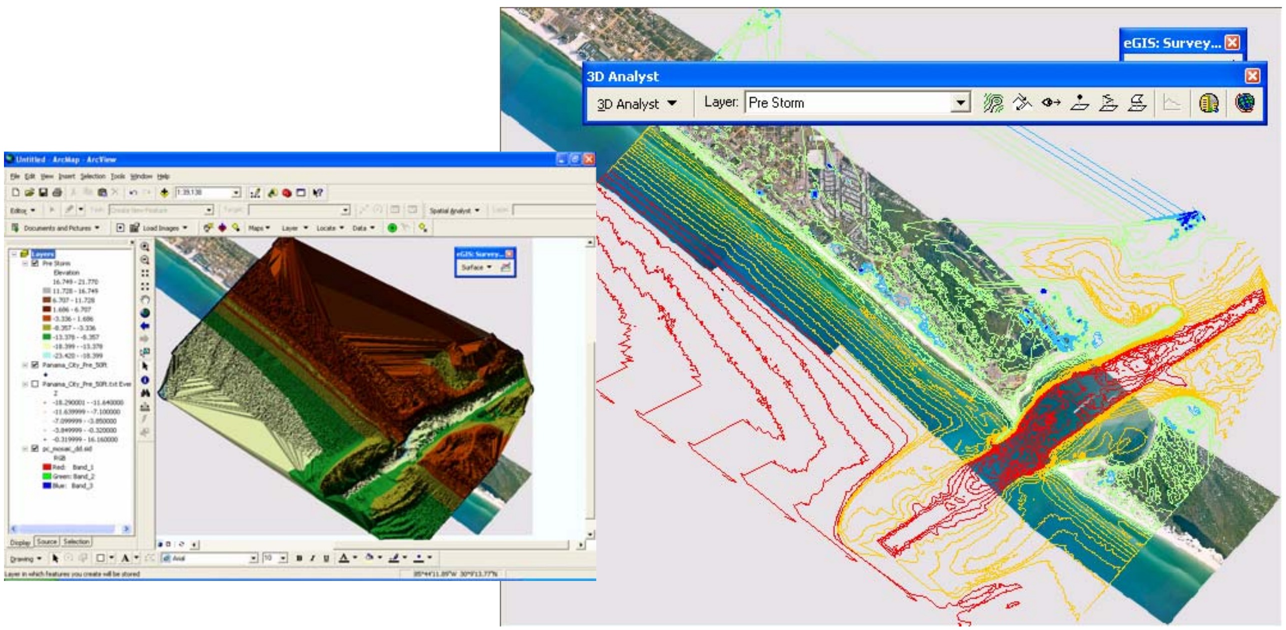
Exercise C: Creating Contours from TIN

To create contours from the 3D Analyst menu, select **Surface Analysis → Contour**.

Select the input surface and set the contour interval.

☐Enter ‘**1**’ for the Contour Interval.

Click OK to generate the contours. A new polyline shapefile will be created to reflect the contour surface.



Did You Know?

It is possible to show a range of heights with the generated contour layer.

Using a definition query, you can write a formula, such as :

CONTOUR < = 5 AND
CONTOUR > 0

Once applied, only the contours for 1 through 5 feet will be displayed.

Exercise C: Creating Contours from TIN

The contour polylines can be color-coded by depth. Using the symbology tools, we can apply a graduated color-scheme to the contour lines.

☐ Right-click on the name of the Contour layer in the Table of Contents, select **Properties**.

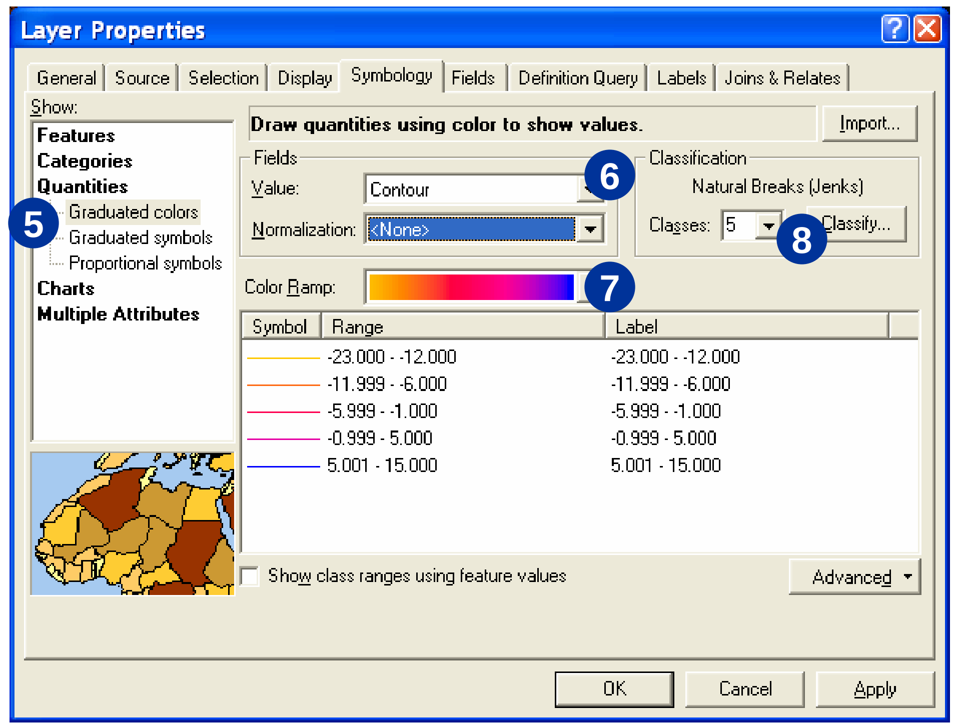
From the Symbology tab, select **Graduated** colors under the **Quantities** option.

Select the **Contour** field as the Value.

Select a desired color from the **Color Ramp**.

If you require additional classes, increase the number using the select box.

Click OK to submit the changes.



Exercise D: Creating a Grid from Lidar Data

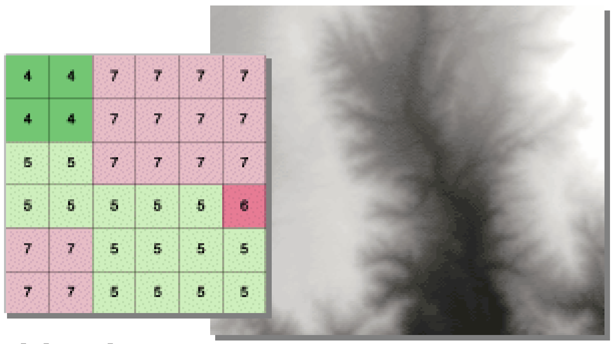
Background

Grid surfaces created using the Survey Tools are stored in a proprietary ESRI format (ESRI Grid) that supports integer and floating point raster grids. Grids are useful for representing geographic phenomena that vary continuously over space and for performing spatial modeling and analysis of flows, trends, and surfaces such as hydrology.

Spatial Analyst provides a rich set of tools to perform cell-based (raster) analysis. Of the three main types of GIS data (raster, vector, and tin), the raster data structure provides the most comprehensive modeling environment for spatial analysis. Cell-based systems divide the world into discrete uniform units called cells, based on a grid structure. Every cell represents a certain specified portion of the earth, such as a square kilometer, hectare, or square meter. Each cell is given a value to correspond to the feature or characteristic in which it is located, or describes the location, such as an elevation value or soil type.

Goal

Using the eGIS: Survey Tools, create an ESRI Grid from an existing survey.

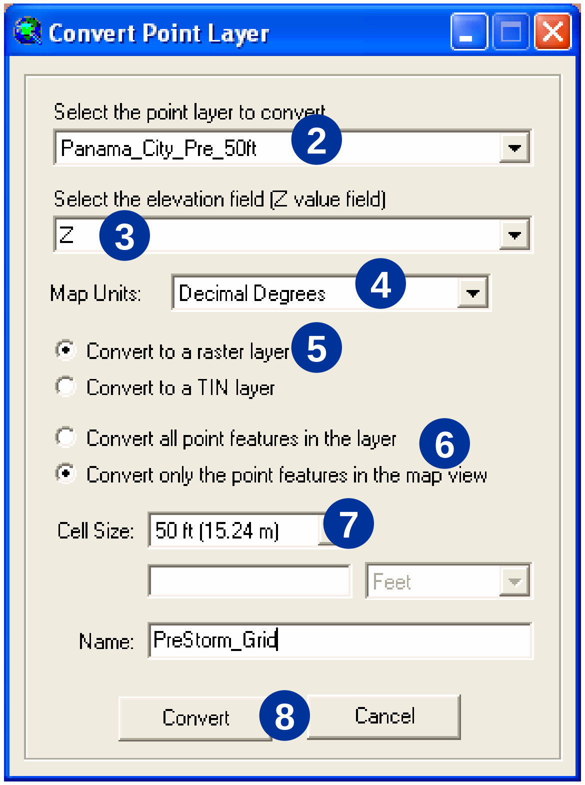


Objectives

1. Student will be able to create a Grid using the eCoastal interface.
2. Using Survey Tools and options available in Spatial Analyst, the student will be able to compute volume differences between surveys.

Exercise D: Creating Grid Surfaces from Lidar Data

Using the eGIS: Survey Tools toolbar, from the '**Surface**' menu select '**Convert Point Layer**'. This application uses the **Inverse Distance Weighted (IDW)** interpolation method to generate the user-defined grid. Using the form below, the user can select the desired cell size and analysis area for the new grid surface.



Using the Convert Layer tool, select the Point Layer to convert.

☐Select **Panama_City_Pre_50Ft.**

Select the Elevation Field.

☐ Select **Z**

Select the map units of the layer.

☐ Select **Decimal Degrees**

(e.g., WGS84 = Decimal Degrees, State Plate = Feet, UTM = Meters)

Select "**Convert to raster layer**".

You have the option to create a raster grid on either the current map display (subset of layer) or convert all point features in the layer.

Select the desired cell size.

☐ Select **50ft**.

Name the raster grid layer.

☐ Name the grid, **PreStorm_Grid***

Click **Convert**. This creates a new grid stored in the C:\Workspace directory.

***Be sure to keep the Name of the grid LESS THAN 13 characters.**

Exercise E: Creating Grid Surfaces Boundaries

Background

Once the XYZ data has been formatted for use within a GIS, surfaces can be interpolated to represent the elevations. Using the Spatial Analyst extensions and eGIS Toolbox, surfaces can easily be generated.

Raster surfaces can easily be created from point data using the Spatial Analyst extension. A GUI interface has been provided in eCoastal to assist in the creation of raster grid surfaces.

Prior to creating any surfaces, polygon boundaries can be created to reflect the extent of the survey.

Goal

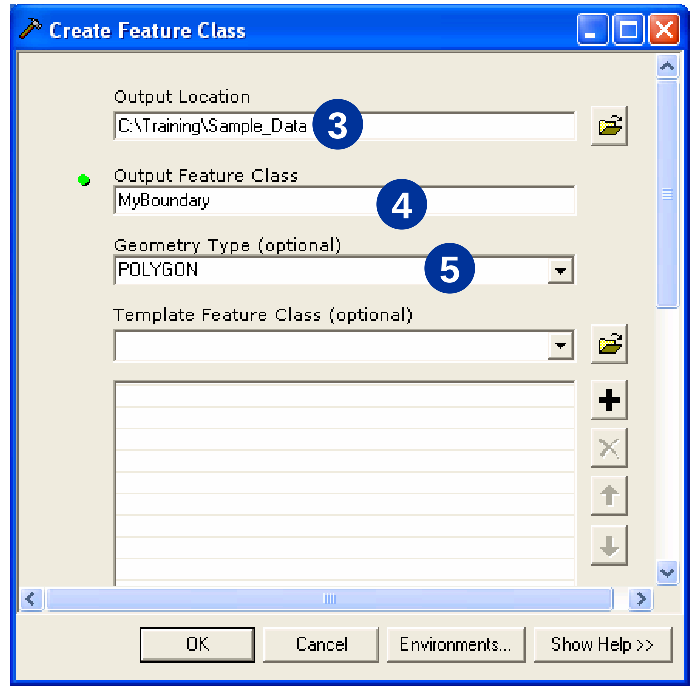
Using the eGIS: Survey Tools, create a bounding polygon on an existing survey.

Objectives

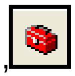
1. Student will be able to generate a new polygon shapefile and sketch a boundary layer.
2. Student will understand the process of creating grid surfaces
3. Student will be able to browse the available options of the Convert Point Layer tool.

Exercise E: Creating Grid Surfaces Boundaries

Boundaries can be created in Inroads, SHOALS Toolbox, or ArcGIS. The following are instructions to create a polygon shapefile that represents the survey boundary in ArcGIS.



Step 1. Create Empty Polygon Shapefile.

1. In ArcMap, click on the ArcToolbox icon, , from the Main Menu toolbar. This will open an ArcToolbox pane to the left.

2. Browse to **Data Management Tools → Feature Class → Create Feature Class**. Double-Click on **Create Feature Class**.

3. Enter in the Output Location

   ☐ Enter **C:\Training\Data\Survey_Data**

4. Enter in the Feature Class Name

   ☐ Enter in "**MyBoundary**"

5. Select the Geometry Type

   ☐ Select **POLYGON**

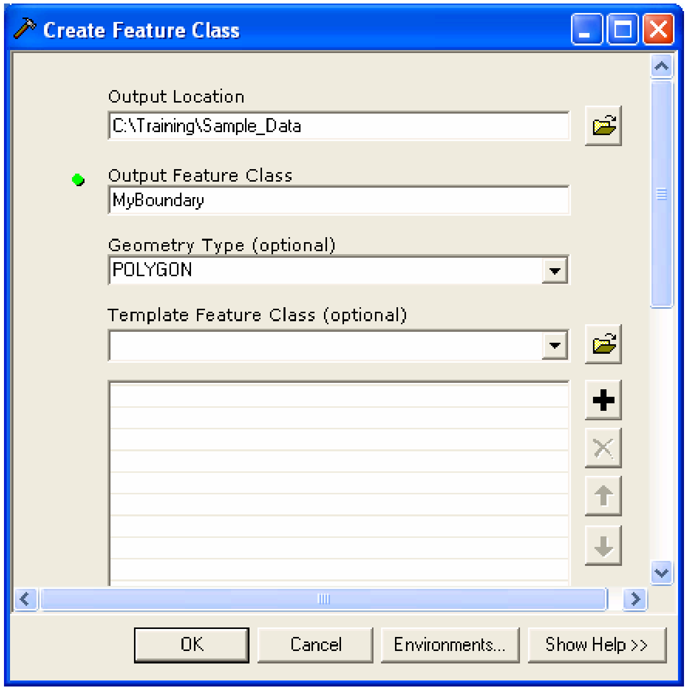
Exercise E: Creating Grid Surfaces Boundaries

Boundaries can be created in Inroads, SHOALS Toolbox, or ArcGIS. The following are instructions to create a polygon shapefile that represents the survey boundary in ArcGIS.

6. Click OK.

   ☐ Close the ArcToolbox window by clicking the “x” in the right hand corner of the pane.

7. The newly created feature class will be added to ArcMap’s Table of Contents.



Exercise E: Creating Grid Surfaces Boundaries

Step 2. Add Geometry to Shapefile

1. Turn on the Editor Toolbar (Tools → Editor Toolbar)

2. From the Editor Toolbar, select Editor → Start Editing.

   ☐ Select the workspace, **C:\Training\Data\Survey_Data**, of your shapefile from Step 1.

3. Make sure the C:\Training\Data\Survey_Data\ directory is in the list and click **Start Editing**.

4. From the Editor Toolbar, select the "Sketch" Tool (red outlined tool above) and click to drop vertices for the boundary of your survey. Check to ensure the Task is set to 'Create New Feature'.

   ☐ Sketch a boundary around Panama_City_Pre_50ft.shp

5. When sketch is finished, right-click and select '**Finish Sketch**'.

6. From the Editor Toolbar, select Editor → Stop Editing. Click **Yes** to Save Edits.

Exercise E: Creating Grid Surfaces Boundaries

If you would like to crop the newly created raster surface by an existing polygon shapefile, the Spatial Analyst Options can be adjusted.

1. From the Spatial Analyst menu, select “Options”.

2. On the General Tab, select “**MyBoundary**” from the **Analysis Mask** option.

3. Click OK.

4. To perform the crop action, from the Spatial Analyst menu, select **Raster Calculator**

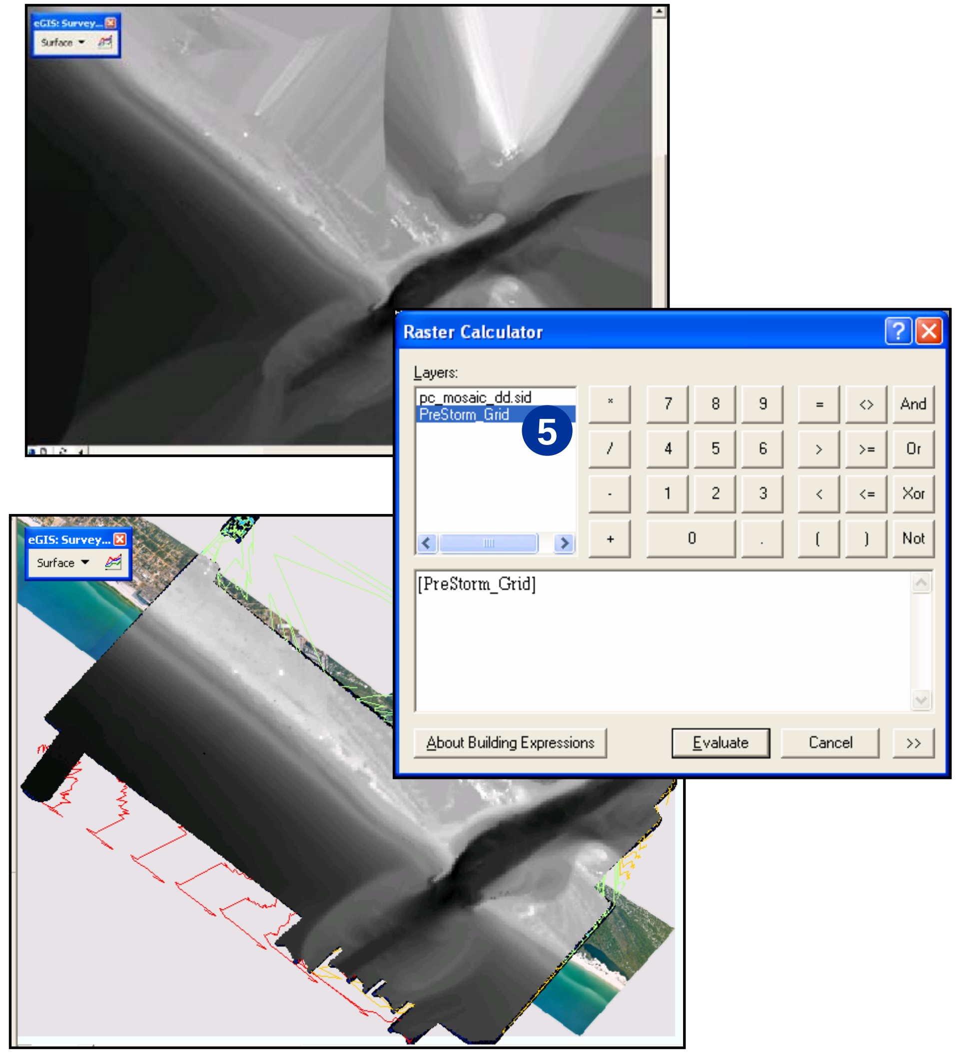
5. Double click on the grid surface, **PreStorm_Grid**. This will add the name of the layer in the evaluation box.

6. Click the **Evaluate** button.

7. This will generate a <u>temporary</u>, clipped, raster surface and add it into the Table of Contents.

☐ Turn **off** PreStorm_Grid to see the extents of the new cropped grid surface.

☐ Rename the “Calculation” layer **PreStorm_Clipped**



Individual Exercise

1. Create a new ArcMap Project File.
2. Import ASCII text file in ArcMap
   (C:\Training\Data\Survey_Data\Panama_City_Post_50ft.txt)
3. Plot the XY Coordinates
4. Create a Post Storm TIN
   (Save as Post Storm in C:\Training\Data\Survey_Data)
5. Create 2 foot contours from the Post Storm data
6. Create bounding polygon
   (Save in C:\Training\Data\Survey_Data as MyPostStormBoundary.shp)
7. Create a 50 ft. grid surface from the Post Storm data (Name the grid PostStorm)
8. Clip the Post Storm data based on boundaries of Survey and rename the
   Calculation layer, PostStorm_Clipped
9. Save the ArcMap project file as Creating_Grids.mxd in C:\Training\MXD
10. Close ArcMap

Exercises A, B, C, D, E

Exercise Summary

This five exercises provided you a brief introduction to working with Lidar data in the ArcGIS environment. Lidar data can easily be distributed in an XYZ format, however minor formatting changes are required prior to loading the data into ESRI software. Once the XYZ data are plotted, users can use tools available in ArcGIS's 3D or Spatial Analyst. In this exercise we were able to create a TIN, contours, and a Grid surface from the Lidar data.

END OF EXERCISE A, B, C, D, E

Exercise F: Compare Grid Surfaces

Once two grid surfaces have been created, the user can compute the volume differential between the pre- and post- surfaces.

1. Using the eGIS: Survey Tools toolbar and selecting the “Depth Difference” option from the “Surface” menu, the user can define the settings for the analysis.

2. Start a **new** ArcMap project and add in the **PreStorm** and **PostStorm** grid surfaces stored in C:\Training\Data\Survey_Data.

3. Select the Base survey
   ☐ Select **PreStorm**

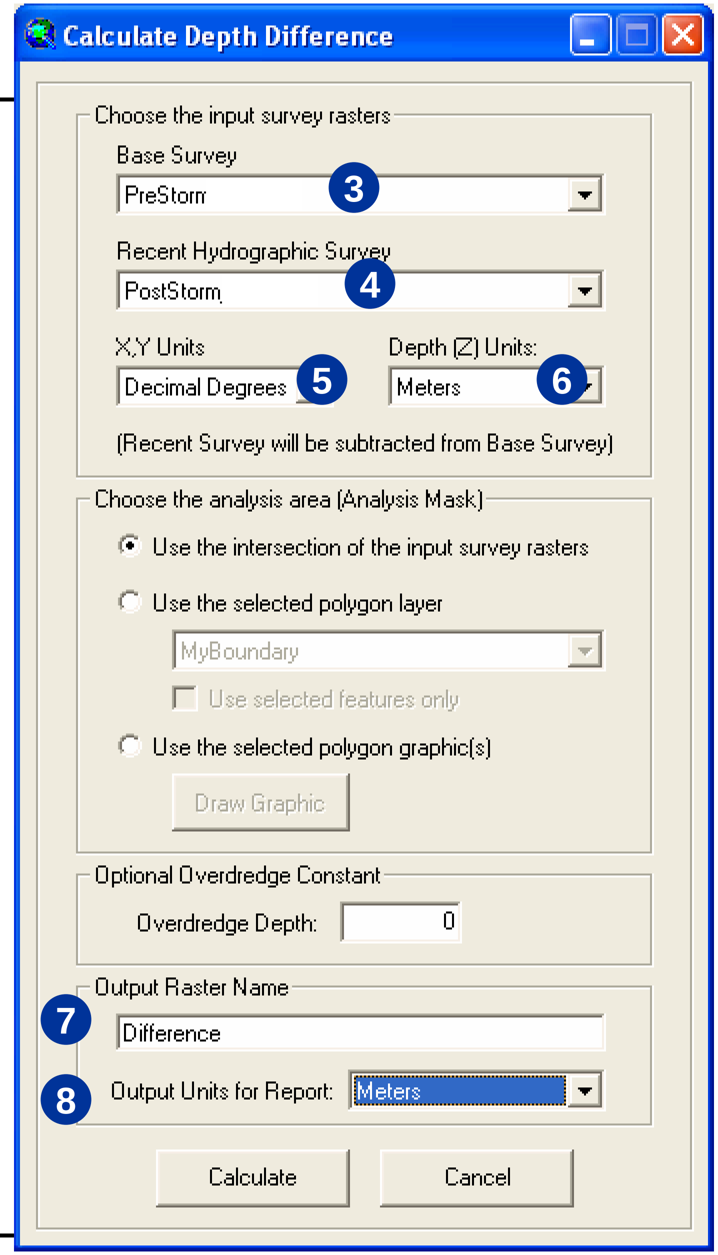
4. Select the Recent Hydrographic survey
   ☐ Select **PostStorm**

5. Select the XY units.
   ☐ Select **Decimal Degrees**

6. Select the Z units.
   ☐ Select **Meters**

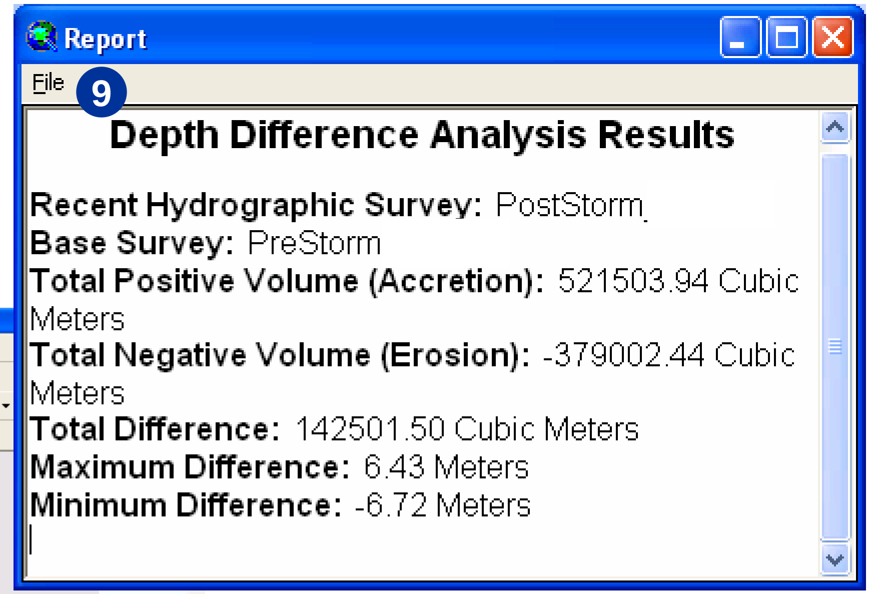
7. Set the Output Settings
   ☐ Name the Raster “**Difference**” and set Meters as the Output

8. Click **Calculate**

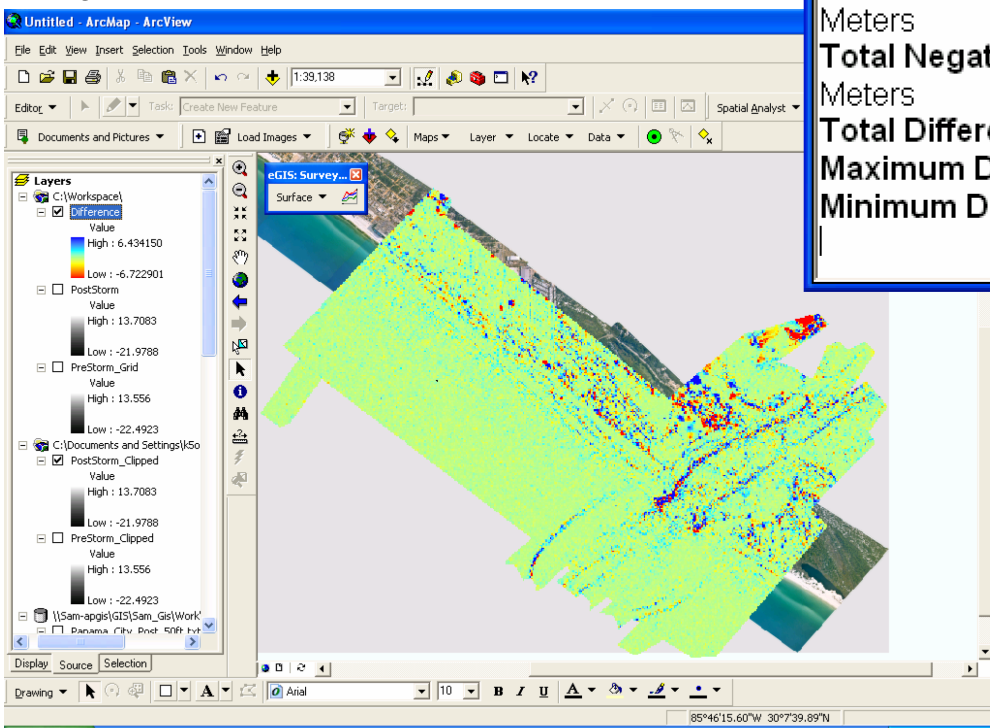


Exercise F: Compare Grid Surfaces

9. The result window will appear. To save results, select File → Save As. You **do not** need to save the results for this exercise.



10. A new surface is created representing the volume change between the surfaces.



Here, red areas indicate erosion and blue areas indicate accretion.

Exercise F: Compare Grid Surfaces

1. Once two grid surfaces have been created, the user can compute the volume differential between the pre- and post-surfaces.

2. Using the eGIS: Survey Tools toolbar and selecting the Profile Tool the user can click, hold and drag to draw a profile across a section of the surveys.

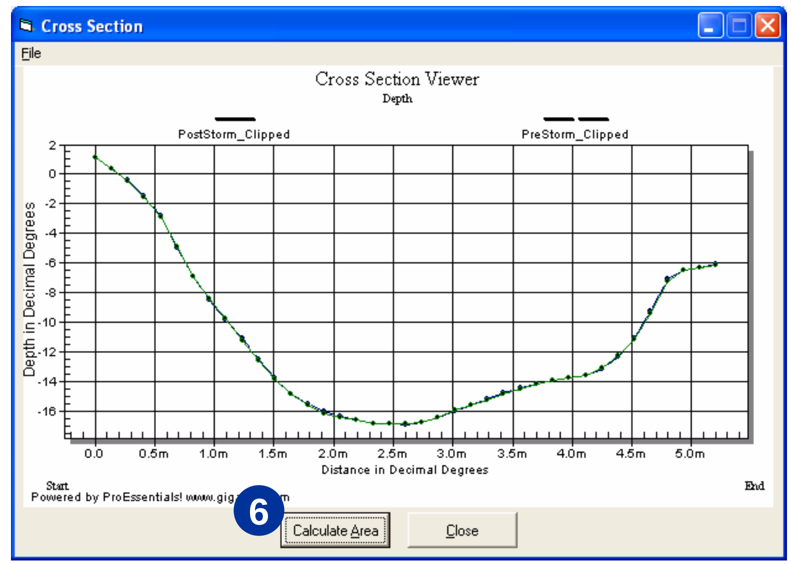
   ☐ Draw a line across the channel

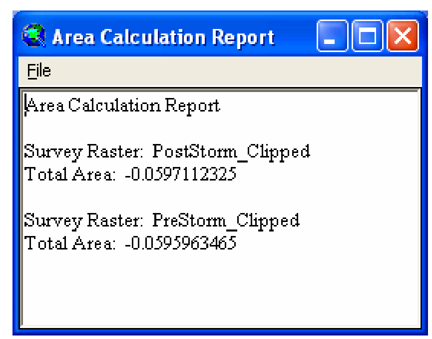
3. Double-click to finish the sketch.

4. The Cross-Section Viewer dialog will appear showing the relationship between the surveys.

5. To save or export this graphic, click the respective option from the File menu.

6. To calculate the area under the curve, click the "Calculate Area" button.





Exercise F: Compare Grid Surfaces

1. A 3D Viewer utility has been added to allow the user to view the surfaces in a quick, 3D environment.

2. To launch this tool, select the '3-D Viewer' option from the Surface menu of the Survey Tools.

3. Raster Grid surfaces must already be loaded in the Table of Contents.

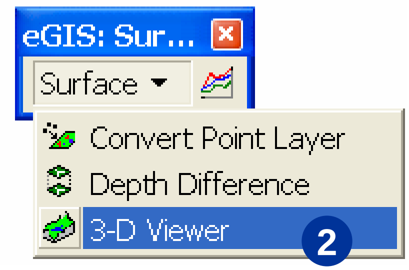
4. Select a Grid surface from the Raster Layer selection box.

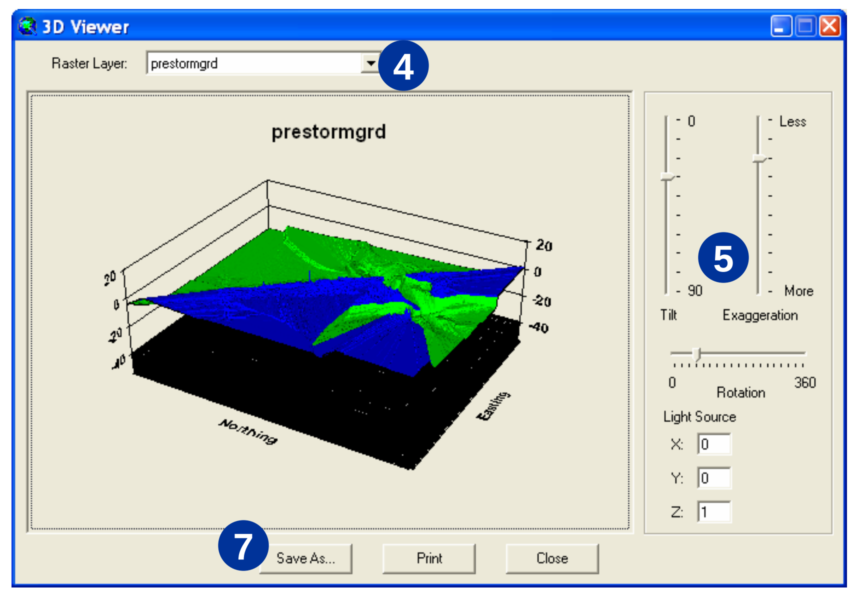
5. The surface will be plotted in the 3D Viewer.

6. Use can modify the control values for Light Source, Tilt, Exaggeration, and Rotation.

7. If you are satisfied with the display and would like to keep the image, click on the Save As.. button and save the image as a bitmap. You do not need to save the graphic for this exercise.

8. If you prefer to only show a subset of the survey, the Spatial Analyst Analysis Extent and the Raster Calculator can be used to clip the surface.





Exercise F: Compare Grid Surfaces

9. Zoom into the west jetty of the Pre-Storm Grid surface.

10. From the Spatial Analyst menu, select Options.

11. On the Extent tab, change the Analysis extent to read ‘Same of Display’. With this option selected, all future calculations will only be computed with the extent defined here.

12. Click OK to dismiss the dialog.

13. From the Spatial Analyst menu, select Raster Calculator.

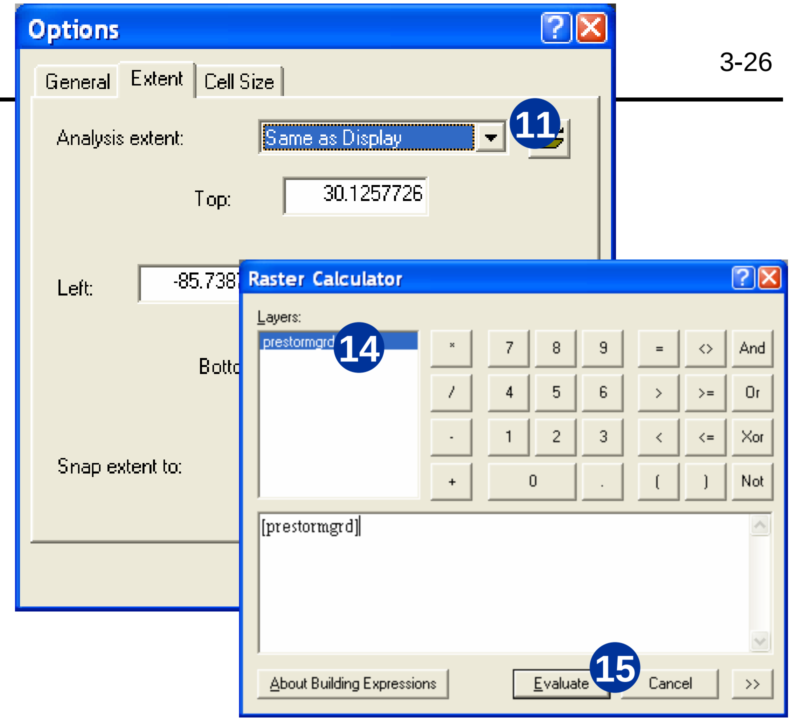
14. Double-Click on the Pre-Storm Grid layer.

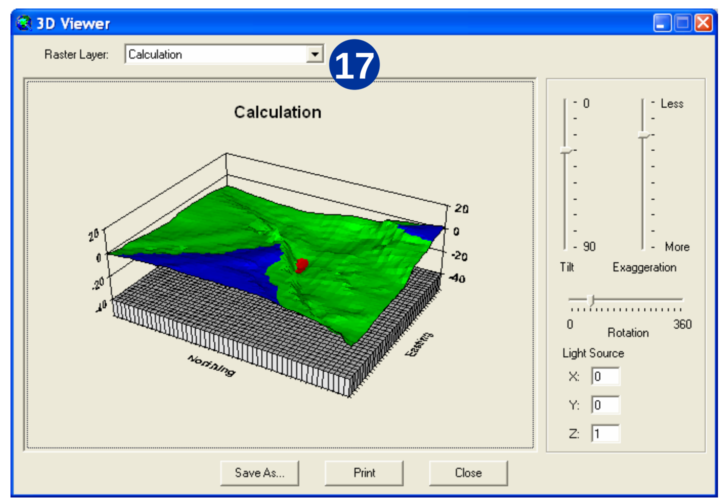
15. Click the Evaluate button. A new surface will be generated that is a subset of the main surface.

16. Select the 3-D Viewer tool from the Surface menu of the Survey Tools toolbar.

17. Select the ‘Calculation’ layer (newly created Grid surface) from the Raster Layer selection box.

18. The survey subset will be displayed.





Individual Exercise

Using the **post-storm survey** located in the C:\Training\Data\Survey_Data directory:

1. Using the Raster Calculator, create a new Grid surface that is 10 meters greater than the **PostStorm** Grid. Rename the new surface, "**10MetersMore**".
2. Using the eGIS: Survey Tools toolbar and selecting the Profile Tool, drag to draw a profile across a section of the surveys. Is the result was you expected?

   ____

   ____

   ____

3. Using the Depth Difference Calculator, use the **PostStorm** Grid as the base survey and **10MetersMore** as the recent survey.

   Why is the newly generated grid one color?

   ____

   ____

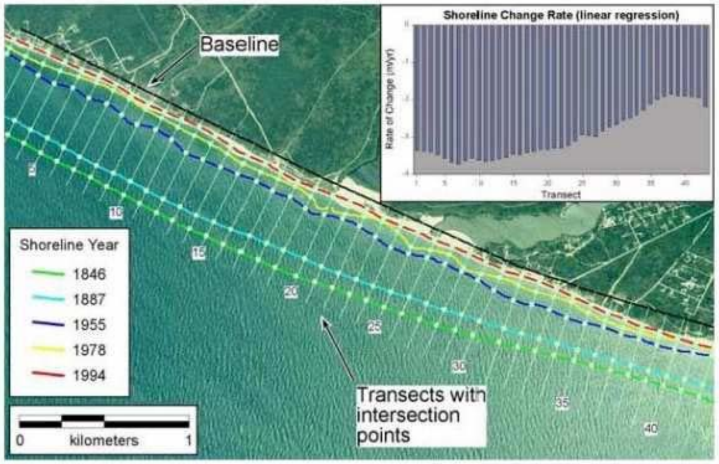
   ____

END OF EXERCISE F

Exercise G: Using the DSAS Extension

The Digital Shoreline Analysis System (DSAS) version 3.0 is a software extension to ESRI ArcGIS© v.9+, developed by USGS, that enables a user to calculate shoreline rate-of-change statistics from multiple historic shoreline positions. A user-friendly interface of simple buttons and menus guides the user through the major steps of shoreline change analysis.

DSAS uses a time series of vector shorelines to calculate shoreline change. Shorelines can be digitized from a variety of sources, including: DOQQ aerial photgraphs, NOAA T-sheets, USGS quadrangle maps, or derived from LIDAR data. The vector shorelines used in the following example were derived from LIDAR data.



For more information on DSAS visit:
http://pubs.usgs.gov/of/2005/1304/

Thieler, E.R., Himmelstoss, E.A., Zichichi, J.L., and Miller, T.L., Digital Shoreline Analysis System (DSAS) version 3.0; An ArcGIS© extension for calculating shoreline change: U.S. Geological Survey Open-File Report 2005-1304.

E. Robert Thieler
rthieler@usgs.gov
tel: 508-457-2350

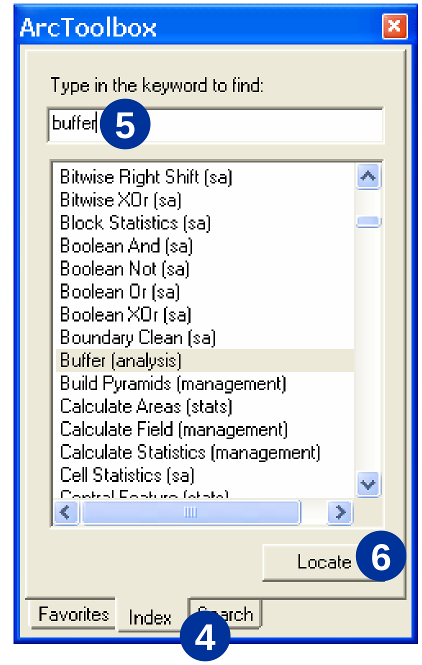
Exercise G: Using the DSAS Extension

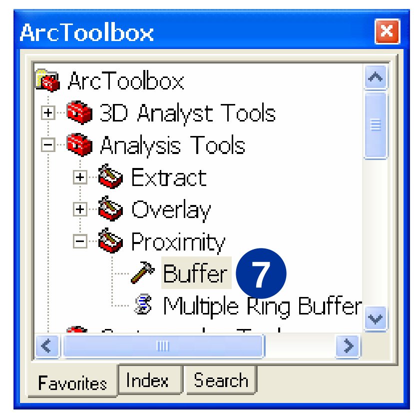
The DSAS extension requires data to exist in a particular format prior to calculating the rate of change. The following characteristics of a dataset must exist:

- A user-created baseline must exist.
- Attribution for **DATE** and **ACCURACY**.
- If there are multiple records in the attribute table for a single date, they must be **merged** into a single record.
- Multiple shoreline files must be appended into a single **feature class**.
- DSAS requires the data to be in meter units in a projected coordinate system, such as UTM or State Plane.

Our first step will be to create a baseline shoreline. The baseline is created by the user and serves as the starting point for generating transects. The DSAS extension generates transects that are cast perpendicular to the baseline at a user-specified spacing alongshore. The transect/shoreline intersections are used by the program to calculate the rate-of-change statistics. Once way to create a baseline shoreline is to buffer an existing shoreline.

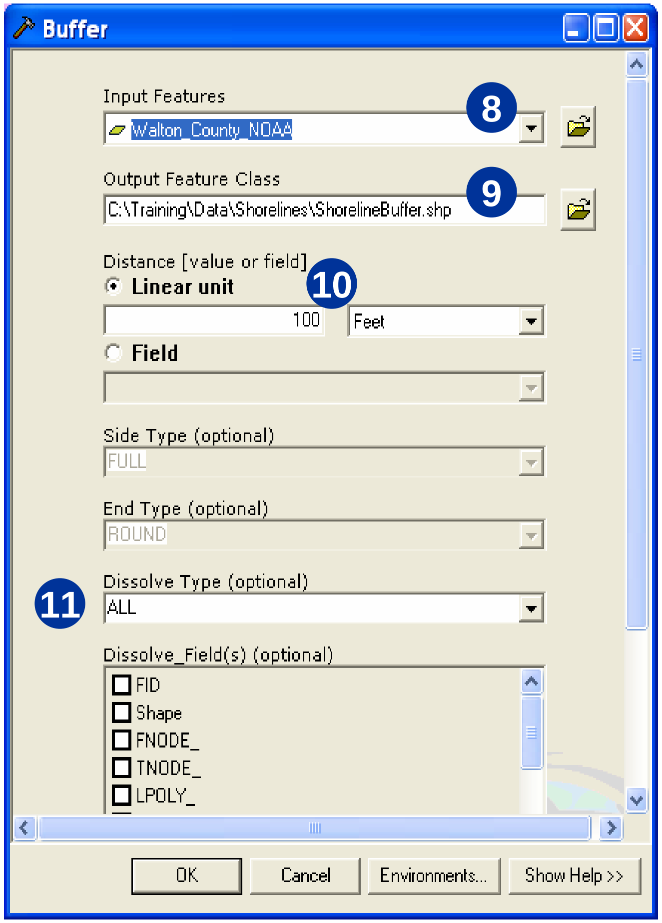
1. In ArcMap, create a new map document.
2. Using the Add Data button, browse to **C:\Training\Data\DSAS** and add in the **Walton_County_NOAA** shapefile.
3. Click on the ArcToolbox icon, , to launch the ArcToolbox window.
4. Click on the **Index** tab, near the bottom of the ArcToolbox window.
5. Type the keyword '**buffer**' in the Find input box.
6. Click the **Locate** button. The Locate button will bring you directly to the tool in the toolbox.
7. Double-Click on the **Buffer** tool to begin the Buffering process.

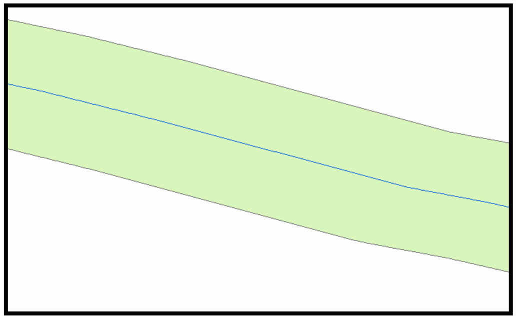




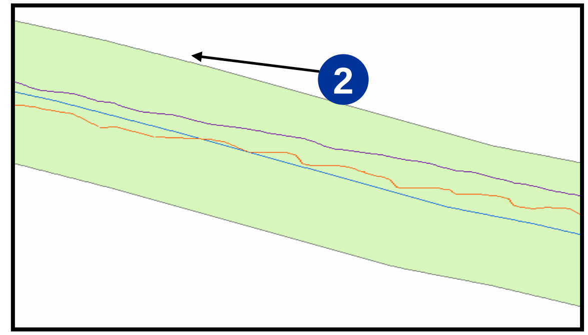
Exercise G: Using the DSAS Extension

8. Select **Walton_County_NOAA** for the Input Features option.
9. Browse to **C:\Training\Data\DSAS** and name the new Output Feature class, **ShorelineBuffer.shp**.
10. We will be creating a 100 feet buffer around the shoreline. Select the **Linear Unit** option, and enter **100** and select **Feet** as the units.
11. Since the feature is a multipart polyline, we would like to dissolve the borders of the buffer. Select **ALL** for the **Dissolve Type** option.
12. Click **OK**.
13. Once the Buffer process is complete, close the processing window. The new layer will be added to the Table of Contents. Move ShorelineBuffer below the Walton_County_NOAA layer and zoom in. Notice the 50 feet buffer around the shoreline.

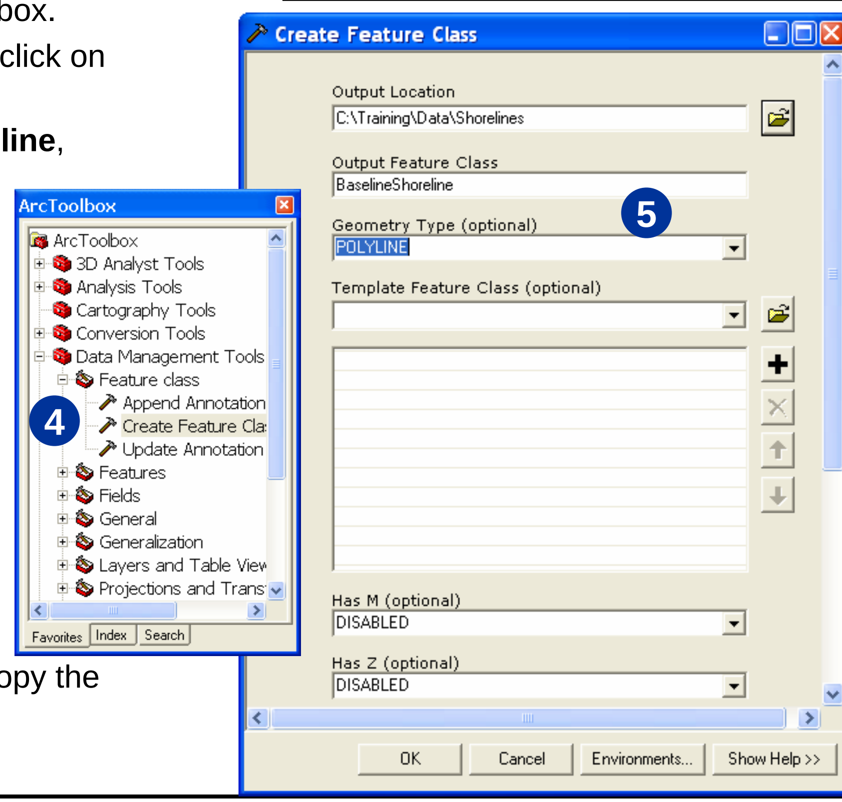




Exercise G: Using the DSAS Extension

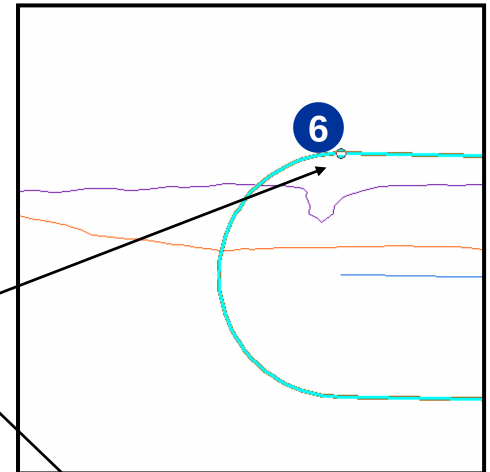


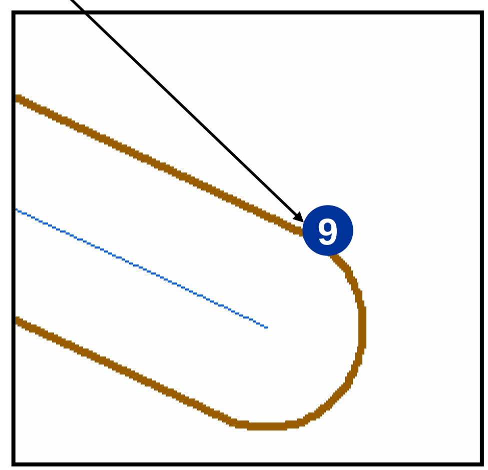
1. Using the Add Data button, add in the Pre and Post Hurricane Ivan data, located in **C:\Training\Data\DSAS**. Notice all shoreline fall within the buffer polygon.
2. Our next step will be to alter the buffer polygon and create a single polyline from the landward boundary.
3. Create a new POLYLINE feature class using the ArcToolbox.
4. From Data Management Tools → Feature Class, double-click on Create Feature Class.
5. Create a new **POLYLINE** Feature Class, **BaselineShoreline**, in **C:\Training\Data\DSAS**. The new polyline shapefile will be added to the Table of Contents once the process is complete.
6. Our next step will be to *copy* the geometry of the polygon features of the ShorelineBuffer and *paste* them into the new polyline feature class.
7. From the Editor menu, select **Start Editing**. Be sure the **BaselineShoreline** shapefile is in the editing workspace.
8. Use the Selection tool, , to select the feature of the **ShorelineBuffer** layer.
9. From the **Edit** menu, select **Copy**.
10. Select the **Edit** menu again and select **Paste**. This will copy the geometry of the buffer and place it as a polyline in the **ShorelineBuffer** shapefile.

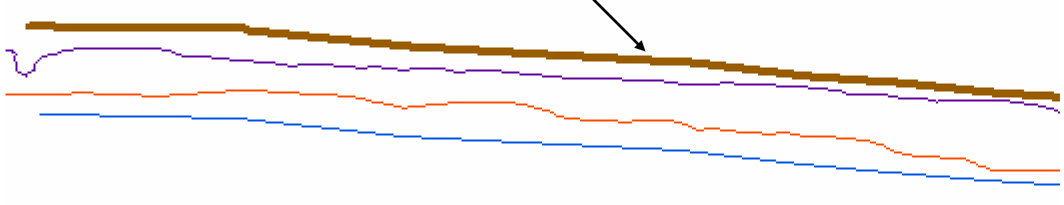


Exercise G: Using the DSAS Extension

1. Verify that you are still in an Edit Session for the **BaselineShoreline** layer.
2. Zoom in to the left boundary of the BaselineShoreline layer.
3. Click the **Edit** tool.
4. Click to select the line of the **BaselineShoreline** layer.
5. Click the **Split** tool on the Editor toolbar.
6. Click where you want to split the line. Click at the bend in the polyline.
7. The line is split into two features.
8. Zoom to the right boundary of the BaselineShoreline layer.
9. Repeat steps 4 – 6.
10. Now that the polyline is split into multiple parts, we can delete the line segments that are no longer needed.
11. Use the feature selection tool, , and select the line segment at the bottom of the buffer.
12. Press the Delete key on your keyboard. This will remove the bottom arc. The polyline should now look like this (bold line). From the **Editor** menu select **Stop Editing**. **Save** your changes.







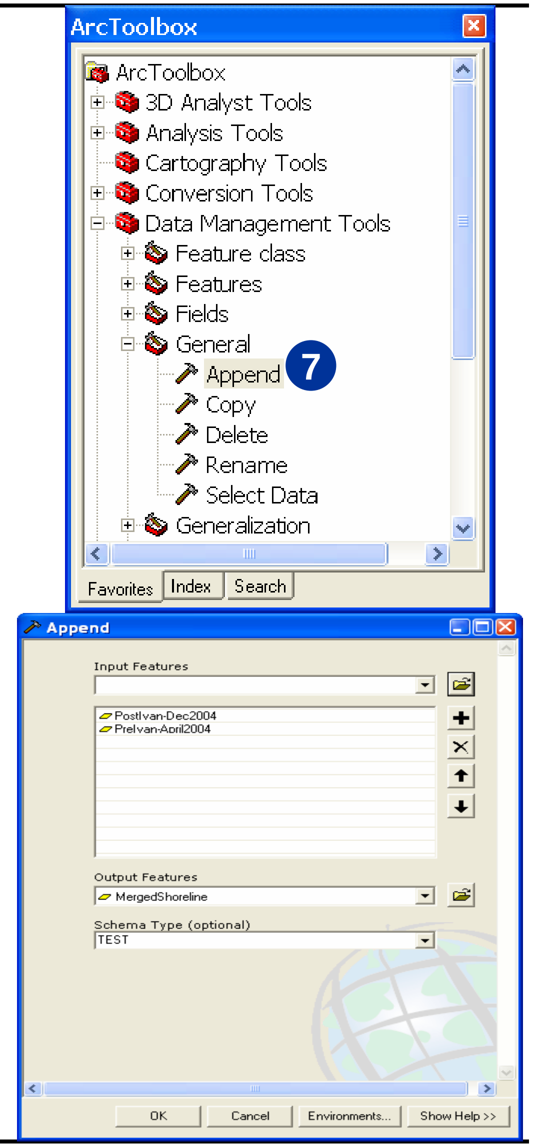
Exercise G: Using the DSAS Extension

1. The **Baseline** layer must be assigned a projection. Using the ArcToolbox, define the NAD1983 datum, UTM Zone 16N to this layer.
2. In the ArcToolbox browse to Data Management Tools → Projections and Transformations → and double-click on Define Projection.
3. Select the **BaselineShoreline** as the Input Layer.
4. Click the properties button to set the projection.
5. Click the Select button on the Spatial Reference Properties form.
6. Browse to Projected Coordinate Systems → UTM → NAD 1983 → NAD 1983 UTM Zone 16N.prj
7. Click Add.
8. Click OK, OK and Close to remove the processing window. The layer's projection has now been defined.

Exercise G: Using the DSAS Extension

We now have 3 separate shapefiles representing 3 different years. DSAS requires that all records be appended into a single feature class. We will use the ArcToolbox to append the features into one.

1. Create a new polyline feature class named **MergedShoreline** and save in C:\Training\Data\DSAS.
2. DSAS required 2 fields exist in the feature class to store the date and accuracy of the shoreline. Right-click on the **MergedShoreline** layer and open the attribute table.
3. Click on the **Options** button.
4. Click on **Add Field**
5. Name the field, **DATE_** and set the data type to **Text**. Click OK.
6. Add another field, **ACCURACY** with the data type **Short Integer**. Click OK and close the attribute table.
7. From the ArcToolbox browse to Data Management Tools → General → and double-click on **Append**.
8. Add the Pre- and Post- layers are the input layer.
9. Select Merged Shoreline as the Output feature.
10. Click OK to merge all files into one.

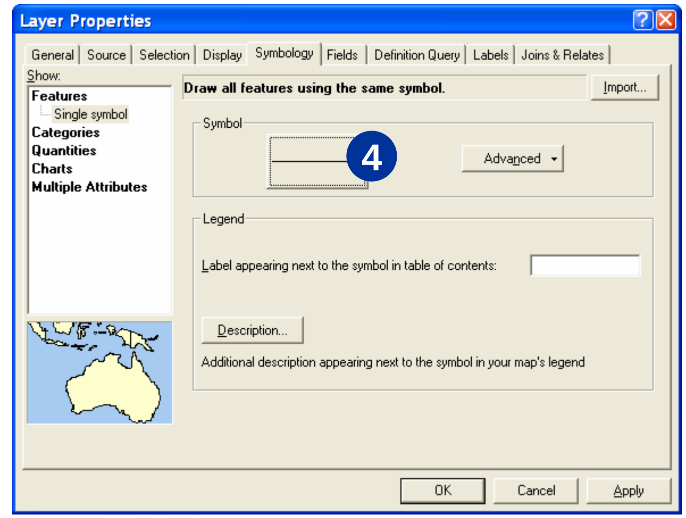


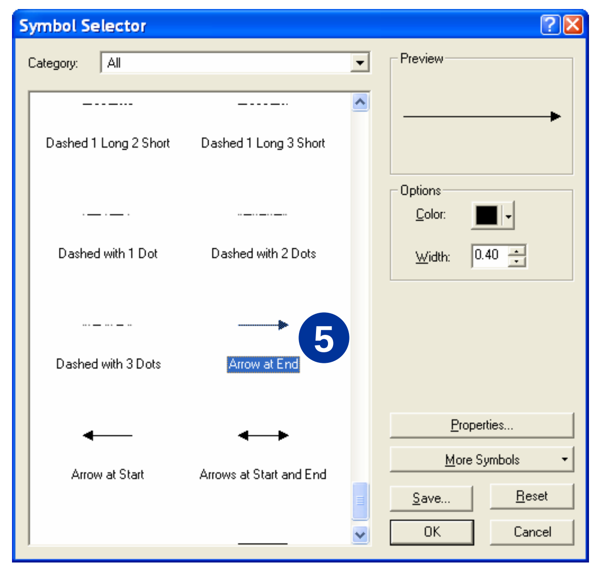
Exercise G: Using the DSAS Extension

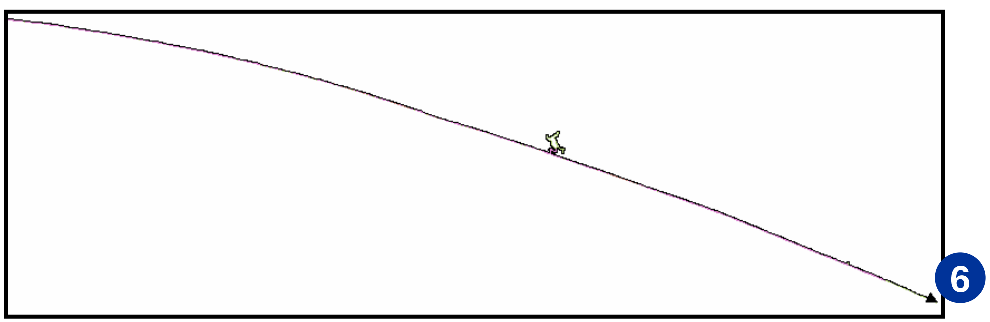
Before generating transects, ensure that all baseline segments flow in the same direction, so that your transects will cast properly.

To check the flow direction:

1. In the Table of Contents, right-click on the **BaselineShoreline** layer.
2. Select **Properties**.
3. Click on the **Symbology** tab.
4. Click on the Line symbol button.
5. Scroll down and find the **Arrow at End** symbol. Select this symbol and click OK twice.
6. Right-click on the BaselineShoreline layer and select **Zoom to Layer**. Notice that one arrow exists and it is pointing to the **right**. This will determine which direction we should cast our transects.



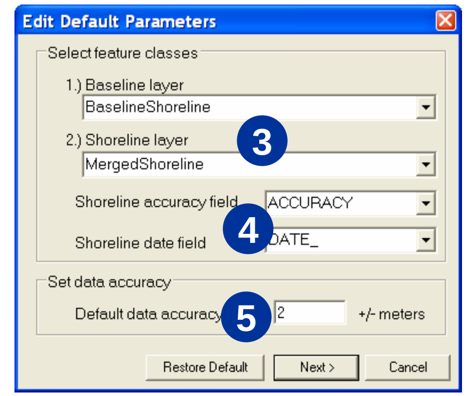


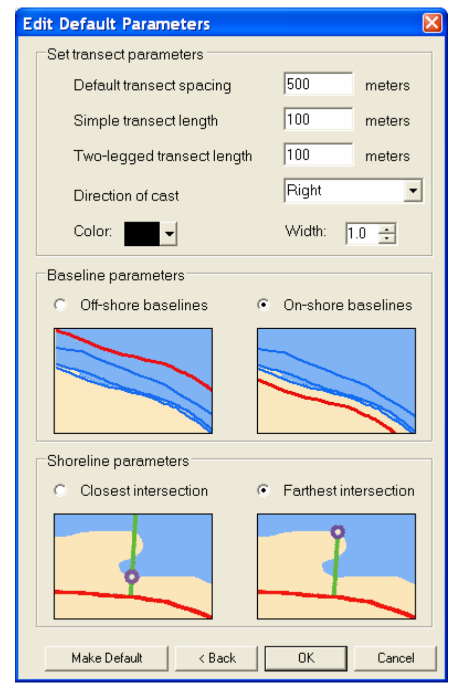


Exercise G: Using the DSAS Extension

Now that we have the data formatted for use in the DSAS extension, we are ready to cast transects and calculate shoreline change.

1. To begin, in ArcMap, go to Tools -> Customize -> Shoreline Toolbar (if it does not turn on automatically)
2. Click on the **Set/Edit Default Parameters** tool.
3. Select the Baseline and Shoreline Layer as the input feature classes.
4. Select the **accuracy** and **date** attributes of the **Shoreline** layer.
5. For this example, we will be using a data accuracy of **+/- 2** meters. Enter this value into the form. Click **Next**.
6. The next screen is used to set the parameters for the transects. The user can set line spacing, direction of cast, baseline and shoreline parameters. Set the following values.
   - Default transect spacing = **500** meters
   - Sample transect length = **100** meters
   - Two-legged transect length = **100** meters
   - Direction of cast = **Right**
   - Baseline Parameters = **On-shore** baselines
   - Shoreline Parameters = **Farthest** intersection
7. Click **OK**.

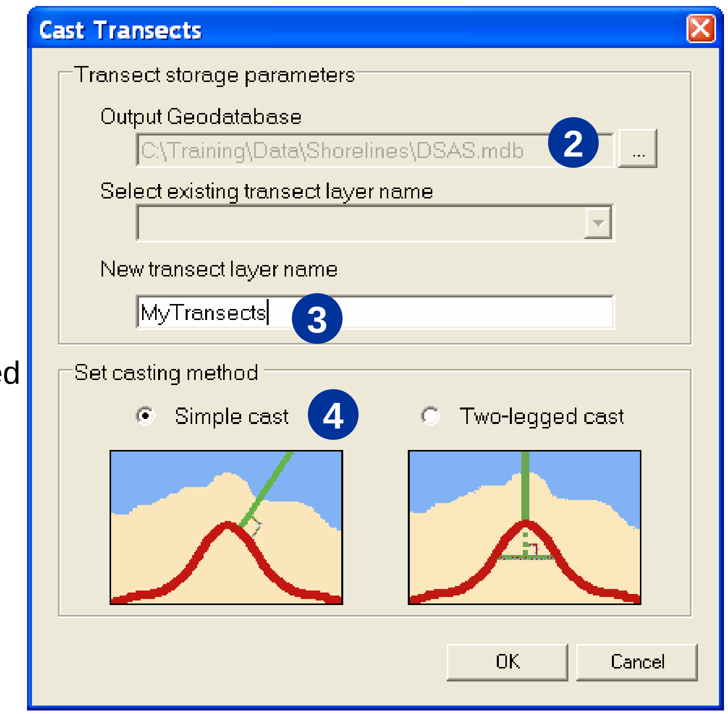




Exercise G: Using the DSAS Extension

Once the default parameters have been set, transects can be cast. The user must specify the location of the geodatabase where the resulting transect and intersect files will be stored. The user is also able to select either simple or two-legged casts for newly generated transects.

1. From the DSAS toolbar, select the **Cast Transects** tool.
2. Browse to C:\Training\Data\DSAS\DSAS.mdb for the output geodatabase.
3. We will be creating a new transect feature class. Name this dataset **MyTransects** in the "New transect layer name" input box.
4. Set the casting method to **Simple cast**.
5. Click **OK**. The extension will begin to process and cast the transects. Upon completion the new transect layer will be added to the Table of Contents.

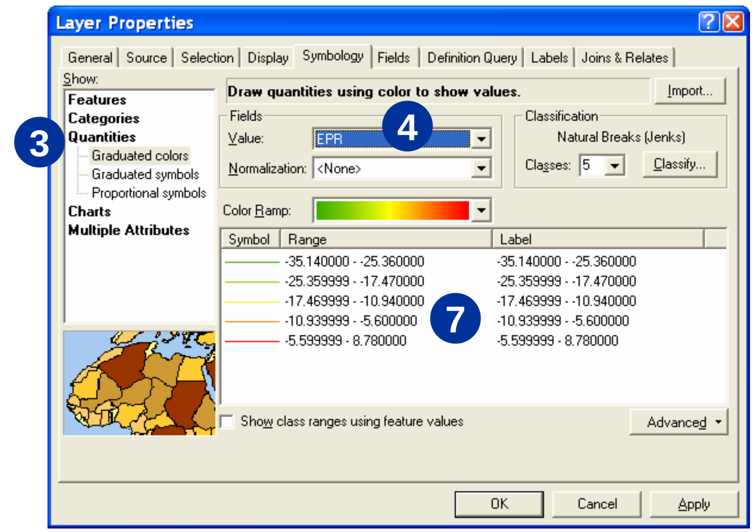


> Note: If you cast transects and nothing happens, make sure the value of the ID field in the Baseline attribute table has a value <u>other than zero</u> for each line segment.

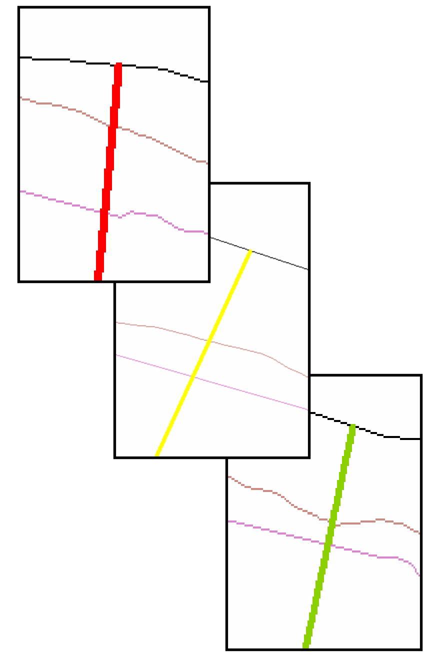
Exercise G: Using the DSAS Extension

Once the transects are cast, using the symbology options in ArcMap, the user can view the rate of change.

1. Right-click on the **MyTransects** layer and select Properties.
2. Click on the **Symbology** tab.
3. Under the **Quantities** category, select **Graduated colors**. This will allow us to color the transects based on an attribute value.
4. Select **EPR** as the Value field.
5. Select the Green-Yellow-Red ramp.
6. On our map we would like Red to represent erosion and green to represent accretion, so we will flip the colors.
7. Right-click anywhere in the symbology preview box and select **Flip Symbols** from the context menu.
8. Notice the color ramp is flipped. Click **OK** to close the layer properties.



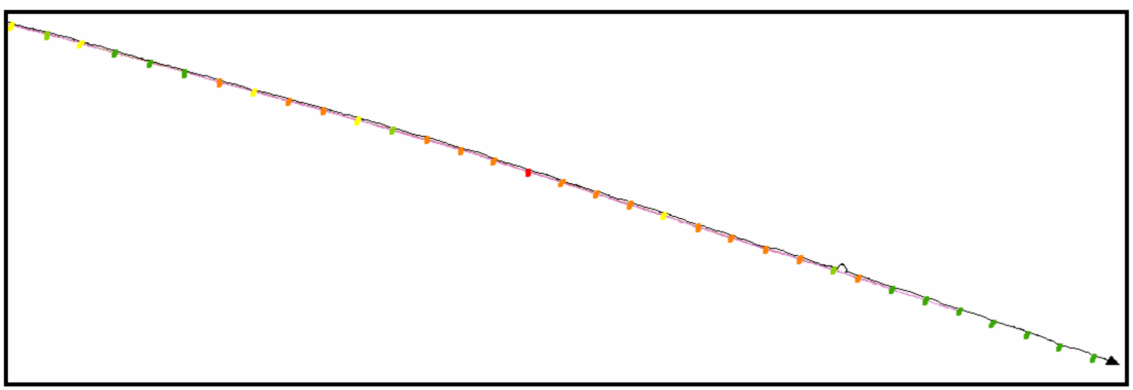
Exercise G: Using the DSAS Extension



We used the end point rate (epr) to symbolize the transect features on the mapping display. EPR is calculated by dividing the distance of shoreline movement by the time elapsed between the earliest and latest measurements (i.e., the oldest and the most recent shoreline).

The major advantage of the epr is its ease of computation and minimal requirement for shoreline data (two shorelines). The major disadvantage is that in cases where more than two shorelines are available, the information about shoreline behavior provided by additional shorelines is neglected. Thus, changes in sign or magnitude of the shoreline movement trend, or cyclicity of behavior may be missed.

☐ In the mapping display, zoom into green and red colored transects. Verify distances between the Pre- and Post- storm shorelines are greater with the red transects.



For details on transect attribution, visit http://pubs.usgs.gov/of/2005/1304/images/pdf/DSASv3_guide.pdf

Module Summary

Volume Calculation & Data Visualization Using eCoastal Tools

This module provided instructions and insight on the steps necessary to create surfaces from lidar data and use of the Digital Shoreline Analysis system to calculate shoreline change. You should now be able to calculate and visualize erosion and accretion changes for the area, by viewing and analyzing the generated surfaces or generating shoreline change transects with the DSAS extension. The eGIS: Survey Tools were created to assist the user by providing a GUI interface to common practices of the coastal engineer.