

## ES301 – Integrated Lab Project (35 pts)

Go to the ES301 class web site via [www.wou.edu/taylors](http://www.wou.edu/taylors). The following data files are located in the lab data section under the “Final Project” heading:

app_morph.xls	Microsoft Excel Spreadsheet with Appalachian Drainage Basin data
fracture.xls	Microsoft Excel Spreadsheet with Fracture Orientation Data (strike/dip)
bachpt.dat	A comma-delimited text file with x,y,z elevation data for Mt. Bachelor
newberry.xls	Microsoft Excel Spreadsheet file with Newberry Volcano Cinder Cone Locations

Note: Compile your take-home quiz products in a nice, neat, well-organized, professional-looking folder. Place your products (see below) in the order listed. Clearly label and organize all of your work.

### Task 1 – Digital Mapping with Surfer

Using surfer and the Mt. Bachelor elevation data (elevation in meters, Eastings and Northings in meters), create and print the following maps (include your name, a title, and make them look nice with labels and lines):

- A. Contour Map with Contour Interval of 10 meters
- B. Contour Map with Contour Interval of 20 meters
- C. Shaded Relief Map with Sun Azimuth of 335 and inclination of 45
- D. Shaded Relief Map with Sun Azimuth of 200 and inclination of 30
- E. A wireframe model
- F. Create a vector map and overlay in on the 10 m contour map
- G. Using the web link under the “final project” data section of the class web site, navigate to the Regional Ecosystem Office USGS Digital Elevation Model (DEM) web site. Download the archived \*.zip file of the USGS Bachelor Butte quadrangle, unzip it, and create a Shaded Relief map of the \*.dem grid file, with Sun Azimuth of 335 and inclination of 45. Put your name on it, map title, north arrow, and create a scale bar that accurately represents the scale of your shaded relief map.
- H. Using the web link under the “final project” data section of the class web site, navigate to the Regional Ecosystem Office USGS Digital Raster Graphics (DRG) web site. Download the archived \*.zip file of the USGS Bachelor Butte quadrangle, unzip it, and load the scanned \*.tif image as a “base map” into surfer. Scale the imported map so that it fills most of an 8.5 x 11 in sheet of paper, put your name on it, map title, north arrow, and create a scale bar that accurately represents the scale of your base map image.

### Task 2 – Rose Diagrams with Grapher

Using the fracture data from the web site, plot a rose diagram of the fracture data (show all of the fractures on one graph)

### Task 3 – Morphometric Analysis Using Grapher and Excel

The Appalachian morphometric data was collected from three watersheds (Fernow, Little River, and North Fork). Data on the app\_morph.xls workbook is organized into three worksheets, these include: Channel Slope (channel slopes of channel segments, drainage area upstream, locality), Channel Width (valley width, distance from drainage divide, locality), and Hillslopes (slope length, slope angle, aspect (azimuth direction that the hillslopes face), and locality).

A. Your job is to use a combination of Excel and Grapher to produce the following graphs / analytical products:

- X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) Fernow Area (with linear regression)
- X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) North Fork Area (with linear regression)
- X-Y Plot of Drainage Area (y axis) vs. Slope (x axis) Little River Area (with linear regression)
- X-Y Plot of Valley Width (y axis) vs. Distance from Divide (x axis) Fernow Area (with linear regression)
- X-Y Plot of Valley Width (y axis) vs. Dist. From Divide (x axis) North Fork Area (with linear regression)
- X-Y Plot of Valley Width (y axis) vs. Dist. From Divide (x axis) Little River Area (with linear regression)

- Rose Diagram of Hillslope Aspect Fernow Area
- Rose Diagram of Hillslope Aspect North Fork Area
- Rose Diagram of Hillslope Aspect Little River Area

- Polar Plot of Slope Gradient vs. Aspect Fernow Area
- Polar Plot of Slope Gradient vs. Aspect North Fork Area
- Polar Plot of Slope Gradient vs. Aspect Little River Area

- X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) Fernow Area (with linear regression)
- X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) North Fork Area (with linear regression)
- X-Y Plot of Slope Length (y axis) vs. Hillslope Gradient (x axis) Little River Area (with linear regression)

B. Examine all of your analytical output and write a 1-page summary of any significant bivariate relationships that you detected in your analysis.

**Statistical Summary – Filling in the Table Below**

	Hillslope Length Fern, Nfork, Lriv	Hillslope Gradient Fern, Nfork, Lriv	Valley Width Fern, Nfork, Lriv
Minimum Value	____, ____ , ____	____, ____ , ____	____, ____ , ____
Maximum Value	____, ____ , ____	____, ____ , ____	____, ____ , ____
Range	____, ____ , ____	____, ____ , ____	____, ____ , ____
Standard Deviation	____, ____ , ____	____, ____ , ____	____, ____ , ____
Variance	____, ____ , ____	____, ____ , ____	____, ____ , ____
Mean	____, ____ , ____	____, ____ , ____	____, ____ , ____
Median	____, ____ , ____	____, ____ , ____	____, ____ , ____
25 <sup>th</sup> percentile	____, ____ , ____	____, ____ , ____	____, ____ , ____
Number of Obs.	____, ____ , ____	____, ____ , ____	____, ____ , ____

**Task 4. Newberry Cinder Cone Analysis**

The data presented in the newberry.xls spreadsheet represents locations of 296 cinder cones at Newberry Volcano in central Oregon. The locations are given as Eastings (x coordinates- meters) and Northings (y coordinates – meters). Column C shows the cinder cone ID, sequentially-numbered from 1-296. By using Excel, your job is to:

- (A) Sequentially calculate the distance between cinder cone 1 and all the other cinder cones (i.e. create a set of line segments connecting points 1-2, 1-3, 1-4, 1-5.... 1-n). To calculate the distance between points, you will need to use the Pythagorean Theorem and right-triangle methods we discussed earlier in class. Use excel to write an appropriate equation to solve for the distance between the points. (hint: make a sketch of two points on graph paper with coordinate positions listed, sketch in rt. Triangle relations, this

will give you a visual as to how to approach the problem using Pythagorean's Theorem and the excel math functions). Make new columns on the spreadsheet showing the line segment numbers in sequential order, and the distance in meters between the two points.

- (B) (B) Sequentially calculate the azimuth orientation of the line segments formed between cinder cone 1 and all the other cinder cones (i.e. create a set of azimuths for line segments connecting points 1-2, 1-3, 1-4, 1-5.... 1-n). To calculate the azimuths between the points, you will need to use right-triangle and trigonometric methods we discussed earlier in class. Use excel to write an appropriate equation to solve for the azimuth between the points. (hint: make a sketch of two points on graph paper with coordinate positions listed, sketch in rt. Triangle relations, this will give you a visual as to how to approach the problem using trig. functions and the excel equations). **NOTE: remember that excel calculates trig functions in radians, you will have to convert from radians to degrees for your final answers.** Make new columns on the spreadsheet showing the line segment numbers in sequential order, and the azimuth directions (0-360) of line segments formed between the points.