

ES476/576 Hydrology
Lab Exercise: Introduction to Surfer and Digital Mapping

This lab introduces standard digital mapping techniques using the software program Surfer 8.0. Log-on to your favorite network computer in NS218A.

Task 1. - USGS Digital Elevation Models

The US Geological Survey has 7.5-min digital elevation models available for Oregon (with elevation data on a 10-m x 10-m grid). The DEM's are grid data with elevations of the land surface for quadrangles across the United States. These files are in a native *.dem grid format supported by the USGS, surfer software has the ability to import them.

A. Visit the class web site at: www.wou.edu/taylor - go to hydrology class page.

In the lab data section, you will see two files to download:

- [Monmouth 7.5-minute Quadrangle, 10-m Digital Elevation Model \(*.zip\)](#)
- [Marys Peak 7.5-minute Quadrangle, 10-m Digital Elevation Model \(*.zip\)](#)

Right-click, save-file-as to a special subfolder on you H:\drive.

-.zip files are in a compressed, "zipped" format to make them smaller in size so they can be easily downloaded, you can uncompress by using "winzip" software on the start-programs menu or using WindowsXP file explorer, winzip will uncompress the *.zip into the original *.dem file format. Make sure you keep track of the file naming conventions when they are copied and extracted to your folder.

- start surfer, from the "map" menu, choose shaded relief, and select any one of the *.ddf files in your monmouth folder, surfer will import the DEM and display it as a shaded relief map.

Use the text icon / tool and put your name and map title on the map
Print the map and include in your lab packet.

- now try choosing "contour map" from the map menu, and make a contour map of the monmouth quad.

Use the text icon / tool and put your name and map title on the map
Print the map and include in your lab packet.

- experiment with the other map types, and try adjusting the parameters of each... see what happens when you change the options of the map.

B. On your "H:\Class" drive, you will find ES476/576 \ surfer lab folder, with a sub-folder entitled "Mary's Peak DEM".

- use surfer and the "map" menu, create the following and print the results:

(use the text tool to put a title and name on your maps).

- (1) mary's peak contour map, with a contour interval of 100 ft
- (2) mary's peak shaded relief map
- (3) mary's peak vector map

(4)An overlay of the contour map and vector map for Mary's Peak (hint: create both maps on the same plot, use edit-select all, then go to map-overlay maps)

include print outs in your lab packet for this week.

Task 2 - Contouring Raw Data

In your H:ES476\surfer lab folder, you will find the following files:

orprecip.xls	excel file with precipitation data for oregon
orstaelev.xls	excel file with weather station locations and their elevations
orcount.shp	these are ArcView GIS files with an outline of OR counties, surfer can
orcount.shx	
orcount.dbf	import the county shapes as a "base map".

all data positions are recorded in longitude (x direction) and latitude (y direction)... in decimal degrees.

A. Copy and Save all of the above files to your I:\ drive so that you can work with them.

B. Use Excel to open the *.xls files from above, and see what the data looks like.

C. Steps to creating contour maps in Surfer:

Step 1: collect raw X, Y, Z data and save in an Excel file... I've already done this for you, here.

Step 2: Grid the Raw Data (you must convert the data into a continuous grid network, so that surfer can map them), in surfer, do the following:

- Grid-Data - choose the orprecip.xls file

under the data tab, make sure that the x value in long, the y = lat, and the z =rainfall_in
under the general tab, make sure the "kriging" method is chosen, just use the default

settings

under the general tab, note that the "grid" file will have a "*.grd" extension
check out the other tabs, but leave all settings as default
click OK and save the grid file to your H:\ drive

- now do the same grid process for the orstaelev.xls file, save the grid file to you I:\drive

Step 3: Make a contour map from the *.grd file for the orprecip.grd file (the precip. data)

choose Map-Contour Map-select the grid file, set the contour interval to "10 inches" and see what happens

In the same plot window, choose Map - Base Map, and import the orcount.shp file (this should overlay the counties on the rainfall contour map. **If both maps do not exactly line**

up, try Edit-select all-Map-overlay maps.

Try double clicking on any part of the map, add text and lines to make it look good, print it out.

Save your work as a *.srf project file to your H:\drive (this will save everything you've imported and drawn)

Step 3A - now try making a new map with the orstaelev.grd file. This will basically be a topo map of the entire stat of oregon. Make sure X = long, Y = lat, and Z=elev_ft, like you did above. Overlay the orcount.shp base map, title, label and print.

Set the contour interval of the map to 500 ft, see what happens, adjust as necessary for a good looking product.

Save this *.srf project to your H:\drive as well.

Print all maps, and put your name on them for inclusion in the lab packet.