**Hydrology Lab Exercise**
**Application of Spreadsheet (Excel) Techniques to Oregon Climate Data**

## Introduction

Oregon climate data is available from the State Climatologists office in Corvallis.  Cooperative weather stations are set-up throughout Oregon, providing a historical record of weather data.  Some of these stations date back to the early part of the 20th century.  The types of climate data include precipitation (daily, monthly, yearly), air temperature, snowfall, etc.  Meteorological records represent a fundamental hydrologic data set from which to build an understanding of the Earth's hydrosphere.  The objective of this lab exercise is to use spreadsheet software (MS Excel) to analyze and interpret hydrologic data, in this case, climatological information.

## Methodology

The state of Oregon is divided into nine (9) climate zones, numbered from west to east across the state.  These zones include:

| | |
|---|---|
| Zone 1 | Western Coast Range / Oregon Coast |
| Zone 2 | Willamette Valley |
| Zone 3 | Klamath-Siskiyou Region |
| Zone 4 | High Cascades |
| Zone 5 | Klamath Basin |
| Zone 6 | Columbia Plateau |
| Zone 7 | High Lava Plains / Central Interior |
| Zone 8 | Wallowa / Blue Mountains |
| Zone 9 | Owhyee Uplands |

The Oregon climate zone map is shown below.
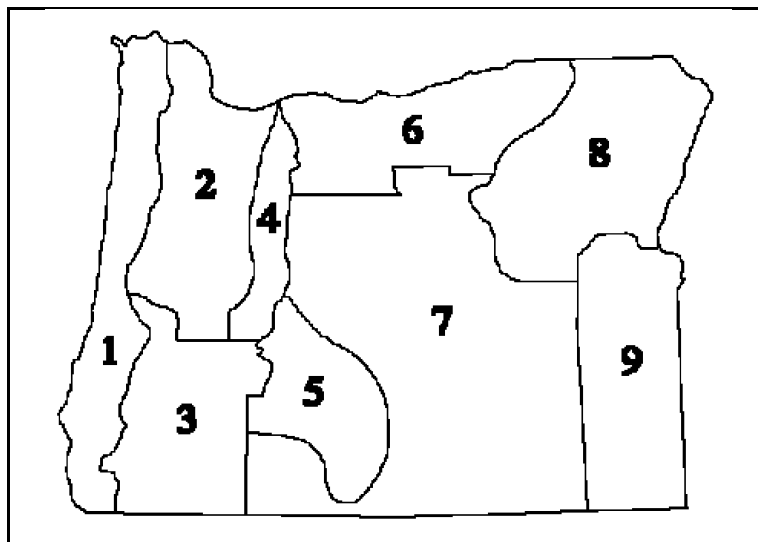
The instructor has downloaded a select set of historical precipitation data from weather stations located in Zones 1, 2, 4, and 7. This data is available as microsoft Excel worbooks (*.xls files) on the class web site (www.wou.edu/taylor follow hydrology links) under the heading of "Lab Data". This data is also located on the clas "K: \G476/576" network folder. The following files are available:

| Microsoft Excel Workbook | Web Site Link Name | Description |
|---|---|---|
| stationloca.xls | Oregon Weather Station Locations | Locations, elevations of all Oregon weather stations |
| zone1.xls | Oregon Climate Zone 1 (Coastal) Precipitation Data | Select monthly precipitation data from Coastal weather stations |
| zone2.xls | Oregon Climate Zone 2 (Willamette Valley) Precipitation Data | Select monthly precipitation data from Willamette Valley weather stations |
| zone4.xls | Oregon Climate Zone 4 (High Cascades) Precipitation Data | Select monthly precipitation data from High Cascades weather stations |
| zone7.xls | Oregon Climate Zone 7 (High Lava Plains) Precipitation Data | Select monthly precipitation data from High Lava Plains weather stations |

**Task 1- Saving Oregon Climate Data**

A. Download and save the Oregon climate data files to your I:\drive account. Make the following folder on your I:\ drive:                              G476\ORclimate

Save your files there. You can either download them from the website, or copy them from the class K:\ drive folder, using Windows Explorer.

**Task 2 - An example of how to download and save climate data from the Oregon State Climate web site.**

A. Use the available web browser and surf to        http://www.ocs.orst.edu/ocs_data.html

This will take you to the Oregon climate download site. The climate zone map is interactive, and serv as the entry to data sets.

B. Click on Zone 2, then on "Monthly means & extremes" for Temperature and Precipitation.

C. Select the "Dallas 2 NE" Station Data.  Save the data as a text file to your "I:\" drive

       File - Save As - "Plain Text" - tempdallas.txt

D. Import the text file into MS Excel (start Excel software), once in Excel...

       File-Open-"File Type = Text Files"- "I:\tempdallas.txt"

    At the text import wizard...

       -click on the fixed width radio button, click on next
       -set "column line breaks" at the appropriate position so that the data will import in columns
       -click on next, then click on finish

    Check your imported data to make sure that none of the data columns have been improperly truncated

    Save your imported file as a microsoft workbook
       File-Save As-Save As Type = microsoft workbook - tempdallas.xls

    Now go through your workbook file and adjust the column widths, text formatting, etc., so that the da
    are readable.  Note: during the import, the top rows of title text have been cut into columns, this is no
    big deal, just retype titles and delete the messy parts.

    Save your final product.  There... that's what you need to do to fetch data from the Oregon Climate
    web site, and get it into a workable Excel format!!

    Print out your final, formatted, tempdallas.xls worksheet, and incorporate into your lab folder.

## Task 3.  Familiarize Yourself with  the Oregon Station Climate Data

A. Create a new working Excel file on your I:\ drive       call it   climatelab.xls

    **this is where you will build your final "answer" sheets for the exercise.

B. Look at the Oregon climate files that you have saved to your working directory.  These files include:
stationloca.xls, zone 1.xls, zone2.xls, zone4.xls, and zone7.xls

    Familiarize yourself with the datasets, and see what is in each file.  NOTE: there are multiple
    worksheets in each workbook, use the arrow keys in the lower left screen of excel to shift across all o
    the worksheets.  You should be able to find the following weather stations:

       Zone 1: Alsea, Brookings, Canary, Elkton, Falls City, Laurel Mountain, Newport, Seaside,
       Summit, Valsetz

Zone 2: Bonneville, Corvallis, Cottage Grove, Eugene, McMinnville, Salem, Scott Mills, Silv Ck Falls, Stayton, Troutdale

Zone 4: Detroit, Detroit Dam, Government Camp, Santiam Pass

Zone 7: Bend, Brothers, Fossil, Hart Mountain, Lower Hay Creek, Klamath Falls, Madras, OO Ranch, Pelton Dam, Redmond, Valley Falls


** stationloca.xls  lists all the weather stations for Oregon, organized alphabetically**


## Task 4 - Set up your climatelab.xls file

A. Let's get your "answer sheet" ready for data input.  Open your climatelab.xls file

B. Double click on "sheet1" tab, and rename the worksheet:          ORstaloca

C. Open your stationloca.xls file, leave the other file open.  Click on the "windows" menu item and n that both files are listed as open at the bottom.  You can have as many excel workbooks open at the same time as you want.  To toggle between them, just go to the windows menu item, and click on the listed sheet... this will get you around your open files.

D. Highlight and copy all data in the stationloca.xls file,  use the copy icon, now "toggle" to your climatelab.xls file, put your pointer in the first cell (A1), and use the paste function to paste all the dat into your new workbook.  Remember, your "climatelab.xls" file will serve as your "answer sheet".

E. Try inserting more worksheets into climatelab.xls

Insert-Worksheet

put about 4 or 5 new worksheets in, so that you have plenty of space to work.


## Task 5. - Sorting Data

A. In your working file (climatelab.xls), sort the station location data:

- highlight all of the data, but not the column titles

Data - Sort - by station ID, ascending, then by Station Name, Ascending

** this will organize the data by climate zones, and alphabetically

NOTE: save your work continually!!!

**Task 6. - Climate Summary**

A. In your working file (climatelab.xls), rename a worksheet "climate summary"

B. Using your original data sets, create the following summary table, with the following column headings:

Oregon Climate Summary

| Climate Zone | Station ID | Station Elev. | Average Monthly Precipitation | | | | | | | | | | | | Average Annual Precipitation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | J | F | M | A | M | J | J | A | S | O | N | D | |

C. Complete the following tasks, and tabulate the results on your working file:

(1) Compute the average monthly precipitation for all stations in all four zones
(2) Compute the total average annual precipitation (for all months) for all stations in all four zones.
(3) Create a scatter plot of average annual precipitation (x axis) vs. elevation (y axis) for:

Zone 1 (all stations in the set)
Zone 2 (all stations in the set)
Zone 4 (all stations in the set)
Zone 7 (all stations in the set)

(4) Format your final data tabulations and charts in "report ready" format (make them look good!)
(5) Print out all of your statistical summaries, and charts, assemble into lab notebook.

Remember: write cell equations only once, and the the copy-paste functions as much as possible.  Toggle between worksheets, cut and paste often.

# Hint: when you have calculated a numeric value in a cell, and you copy that cell to another location, use the following "paste" method:

## Edit-Paste Special - Values

This will prevent you from copying your formula, but will preserve the actual value that was originally calculated.