NLDAS Data Downloading Flowchart

1.Create and link Earth Data Account

Follow directions outlined **here**

2.Create Cookies on Linux

Log into deq4 and run the following lines in the command window

1.touch .netrc

2.echo "machine urs.earthdata.nasa.gov login
YOURUSERNAMEGOESHERE password
YOURPASSWORDGOESHERE" >> .netrc

3.chmod 0600 .netrc

4.touch .urs_cookies

3. Download Gridded Weather Data for Desired Year= Producing Time Series

Run the following line in the home directory

wget --load-cookies ~/.urs_cookies --auth-no-challenge=on --keep-session-cookies -np -r -NP -R ".xml" - c -N --content-disposition https://hydro1.gesdisc.eosdis.nasa.gov/data/NLDAS/NLDAS_FORA0125_H.002/<YEAR>/*

- ***This step downloads the raw data for an entire year for all NLDAS-2 grids in the country***
- ***Downloaded files are now saved as grb and grb.xml files in the directory titled backup/meteorology***

4. Extracting the Time Series for Desired Locations

Run the following line in the home directory

NLDAS2_GRIB_to_ASCII <IN_DIR> <OUT_DIR> <S.YEAR> <MONTH> <DAY> <HRS> <E.YEAR> <MONTH> <DAY> <HRS> <NUM.GRIDS> <COL> <ROW>

- **This step specifies the specific grids that want to be studied with time series**
- **Outputs txt file in the corresponding output directory given in the function as "OUT_DIR"**
  - Ex: x395y111zPP.txt = x<column>y<row>z<**two letter metric code**>.txt
- Two Letter Metric Codes for the various desired metrics

ET: Potential Evapotranspiration (inches/hour)

PP: Precipitation (inches/hour)

RH: Relative Humidity (fraction)

RN: Solar Radiation (langley/hour)

TT: Air Temperature at 10 meters (degree C)

VP: Vapor Pressure in (Pascals)

WD: Wind Speed (miles/hours)

5. Make QGIS map with NLDAS grid and land segments to determine overlap between grid cells and land segments

- **NLDAS Grid layer and land segment layers for QGIS can be found here**

6. Extracting Time Series for Desired Land Segments

Begin in the backup/meteorology directory and run the following line:

NLDAS2_ASCII_to_LSegs <ASCII_folder> <LSEG_folder> <start_year> <start_month> <start_day> <start_hr> <end_year> <end_month> <end_day> <end_hr> <LSEG_NLDAS_MAP>

- **You will need to make a directory within the LSEG_folder that outlines the timeframe you specified in the function. Formatted /startYearMonthDayHour- endYearMonthDayHour**
  - Ex: /2017010100-2017010123 outlines the first hour of Jan 1, 2017 to the last hour of Jan 1, 2017
- **<LSEG_NLDAS_MAP> is a .txt config file that contains a list of land segments and corresponding NLDAS grids that lie within the land segments.**
- **Outputs files in Lseg directory named <landseg.metric>**
- **Similar to Step 4, however, now creating time series based on land segments rather than grids**

AFTER COMPLETING ALL OF THESE STEPS, ALL DATA FOR EACH LAND SEGMENTS AND CONTAINING GRIDS IS STORED ON DEQ4

7. Create Alternative Methods for Calculating PET: Hamon and Hargreaves Samani Methods

- **R scripts created to functionalize PET methods found here**
- **Run R scripts on terminal for each land segments**
- **Outputs txt files for HPET (Hamon method PET) and HSPET (Hargreaves Samani method PET)**

8. Calculate Water Deficit using Summary Stats

- Summary Stats function found here, uses previously found data to produce data for: **max_temp_date, min_temp_date, min_temp, max_temp, max_precip_date, max_precip, min_precip_date, min_precip, annual_precip, max_consec_no_precip_hours, max_consec_no_precip_days, max_consec_PET>Precip_days, no_precip_days, precip_days, 7_day_min_temp, 7_day_min_precip, 30_day_min_temp, 30_day_min_precip, 90_day_min_precip, 90_day_min_precip**

9. Calculate Rolling Averages for Land Segments

- **Rolling Averages function found here, uses previously found data to produce 7, 30, and 90 day rolling averages for precipitation, temperature, Hamon PET, Hargreaves Samani PET, and water deficit using both Hamon and Hargreaves Samani methods**

10. Create Desired Graphs and Visualizations

- **Graphing rolling averages code found here**

11. TBD