File Collection & Preparation

Files must be downloaded, unzipped, & projected. They are sourced from: https://prism.oregonstate.edu/normals/ (https://prism.oregonstate.edu/normals/)

In [ ]:
```
# Import packages & set workspace
import arcpy
import requests as r
from zipfile import ZipFile

arcpy.env.workspace = r'C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\
Labs\Lab2\Lab2_take2.aprx'
```

In [ ]:
```
# Sample url: 'http://services.nacse.org/prism/data/public/4km/<element
>/<date>'
base = 'http://services.nacse.org/prism/data/public/normals/4km'
res = '4km'        # This defines the data resolution
element = '/ppt'   # Precipitation
date = '_all'   # PRISM variable for all normals

r.get(base + element + date)    # API call for the data
```

In [ ]:
```
 # unzip file
with ZipFile('PRISM_ppt_30yr_normal_4kmM2_annual_bil.zip', 'r') as zipO
bj:
        # Extract all contents into PRISM_data folder
    zipObj.extractall('PRISM_data')
```

.bil files must match the map projected coordinates

In [ ]:
```
# Project .bil files into map projection - USA_Contiguous_Albers_Equal_Area_Conic
arcpy.Tmp.BatchProjectRaster(r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_01_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_02_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_03_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_04_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_05_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_06_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_07_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_08_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_09_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_10_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_11_bil.bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\PRISM_data\All_Normals_ppt\PRISM_ppt_30yr_normal_4kmM2_12_bil.bil", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albers%Name%", "PROJCS['USA_Contiguous_Albers_Equal_Area_Conic',GEOGCS['GCS_North_American_1983',DATUM['D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],PRIMEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]],PROJECTION['Albers'],PARAMETER['False_Easting',0.0],PARAMETER['False_Northing',0.0],PARAMETER['Central_Meridian',-96.0],PARAMETER['Standard_Parallel_1',29.5],PARAMETER['Standard_Parallel_2',45.5],PARAMETER['Latitude_Of_Origin',37.5],UNIT['Meter',1.0]]", "NEAREST", "4676.76577530616 4676.76577530615", None, None, "GEOGCS['GCS_North_American_1983',DATUM['D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],PRIMEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]]", "NO_VERTICAL")
```

Visualize with Animated Time Slider & Space Time Cube

First convert .bil to netCDF animation.

This allows for the conversion of multiple time associated data into a multidimensional mosaic.

It's a multi-step process:

In [ ]:
```
# Create Mosaic Dataset
arcpy.management.CreateMosaicDataset(r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb", "ppt_30yr_all", "PROJCS['USA_Contiguous_Albers_Equal_Area_Conic',GEOGCS['GCS_North_American_1983',DATUM['D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],PRIMEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]],PROJECTION['Albers'],PARAMETER['False_Easting',0.0],PARAMETER['False_Northing',0.0],PARAMETER['Central_Meridian',-96.0],PARAMETER['Standard_Parallel_1',29.5],PARAMETER['Standard_Parallel_2',45.5],PARAMETER['Latitude_Of_Origin',37.5],UNIT['Meter',1.0]]", None, '', "NONE", None)
```

In [ ]:
```
# Add Rasters to Mosaic Dataset
arcpy.management.AddRastersToMosaicDataset("ppt_30yr_all", "Raster Dataset", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_01_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_02_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_03_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_04_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_05_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_06_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_07_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_08_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_09_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_10_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_11_bil_bil;C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_all_albersPRISM_ppt_30yr_normal_4kmM2_12_bil_bil", "UPDATE_CELL_SIZES", "UPDATE_BOUNDARY", "NO_OVERVIEWS", None, 0, 1500, None, '', "SUBFOLDERS", "ALLOW_DUPLICATES", "NO_PYRAMIDS", "NO_STATISTICS", "NO_THUMBNAILS", '', "NO_FORCE_SPATIAL_REFERENCE", "NO_STATISTICS", None, "NO_PIXEL_CACHE", r"C:\Users\mmMary\AppData\Local\ESRI\rasterproxies\ppt_30yr")
```

In [ ]:
```
# Calculate Fields for the Variable of interest & TimeStamp
arcpy.management.CalculateField(r"ppt_30yr_all\Footprint", "Variable", "'ppt'", "PYTHON3", '', "TEXT")
arcpy.management.CalculateField(r"ppt_30yr_all\Footprint", "TimeStamp", """DateAdd(Date(2010,0,1), $feature.OBJECTID-1, 'month')
""", "ARCADE", '', "TEXT")
```

In [ ]:
```
# Build Multidimensional Info
arcpy.md.BuildMultidimensionalInfo("ppt_30yr_all", "Variable", "TimeStamp # #", "Variable # #")

# Display layer properties & disable time  ??????

import arcpy, datetime
lyr = arcpy.mapping.Layer(r'C:\Project\Data\Time\TemperatureWithTime.lyr')
if lyr.supports("TIME"):
    lyrTime = lyr.time
else:
    print "No time available on the layer"
```

In [ ]:
```
# Make Multidimensional Raster Layer
arcpy.md.MakeMultidimensionalRasterLayer("ppt_30yr_all", "ppt_30yr_MultiD_3", "ppt", "ALL", None, None, '', '', '', None, '', "-2950369.1484 -1493460.28786507 3000585.29697136 1716251.6967", "DIMENSIONS")
```

In [ ]:
```
# Create Space Time Cube from Multidimensional Raster Layer
arcpy.stpm.CreateSpaceTimeCubeMDRasterLayer("ppt_30yr_MultiD_3", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\ppt_30yr_SPT_3.nc", "ZEROS")
```

In [ ]:
```
# Visualize Space Time Cube in 3D
arcpy.stpm.VisualizeSpaceTimeCube3D(r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\ppt_30yr_SPT_3.nc", "PPT_NONE_ZEROS", "VALUE", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\ppt_30yr_SPT_3_VisualizeSpaceTimeCube3D")
```

In [ ]:
```
# Cube can also be visualized in a 3D scene -- OPTIONAL STEP

# Convert layer to a package that can put into the scene

arcpy.management.Create3DObjectSceneLayerPackage(r'c:Temp\ArcGISProTemp22088\',
                                                 r'c:\ppt_30yr_SPT_3.nc", "PPT_NONE_ZEROS", "VALUE", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\Lab2_take2.gdb\STC_.slpk',
                                                 arcpy.SpatialReference(4326), None, 'DESKTOP')

arcpy.management.MakeSceneLayer(r"c:\Temp\stc.slpk", "Layer_name")
```

In [ ]:
```
# Save the temporary Multi-Dimensional scene layer
arcpy.management.SaveToLayerFile("ppt_30yr_MultiD_3", r"C:\Users\mmMary\Documents\GIS_Classes\GIS_5572\Labs\Lab2\Lab2_take2\ppt_30yr_MultiD_3_Layer.lyrx", "ABSOLUTE", "CURRENT")
```

Export the animation

In [ ]:
```
# Can this be done with arcpy?
```