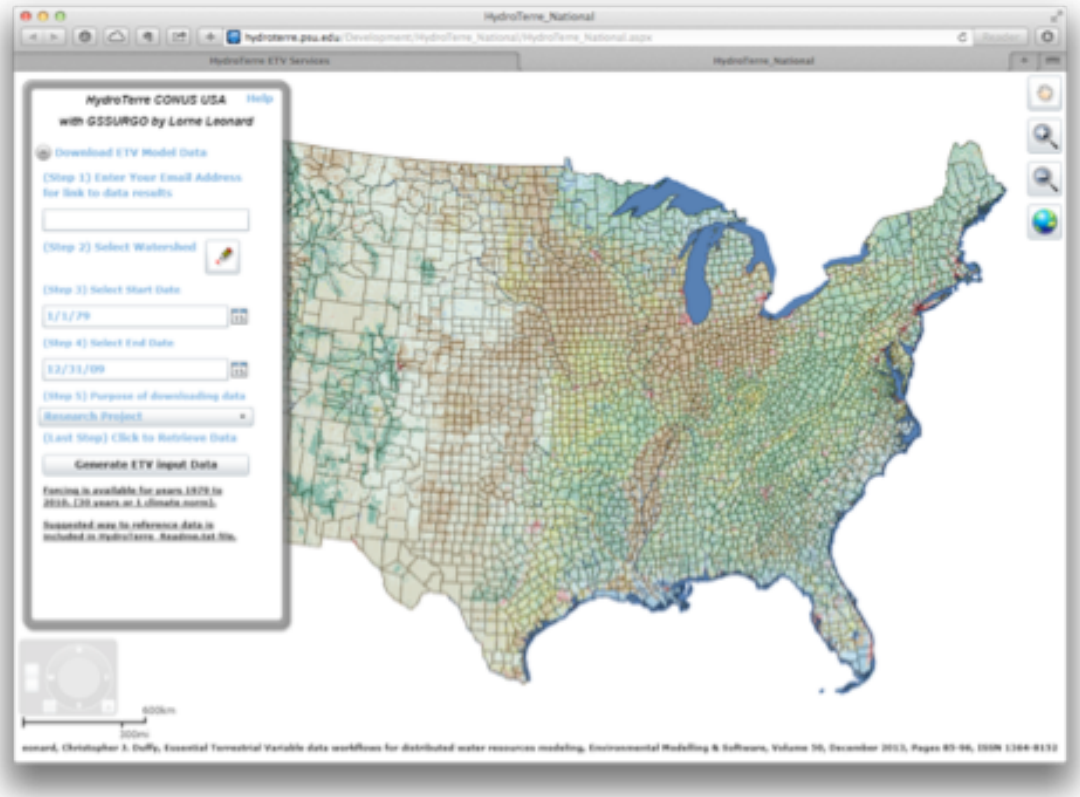
Data from HydroTerre

1 How to download the data from Hydroterre?

Visit the link
http://hydroterre.psu.edu/Development/HydroTerre_National/HydroTerre_National.aspx
or
click **ETV Services(Download ETV data)** at homepage of HydroTerre
http://www.hydroterre.psu.edu/

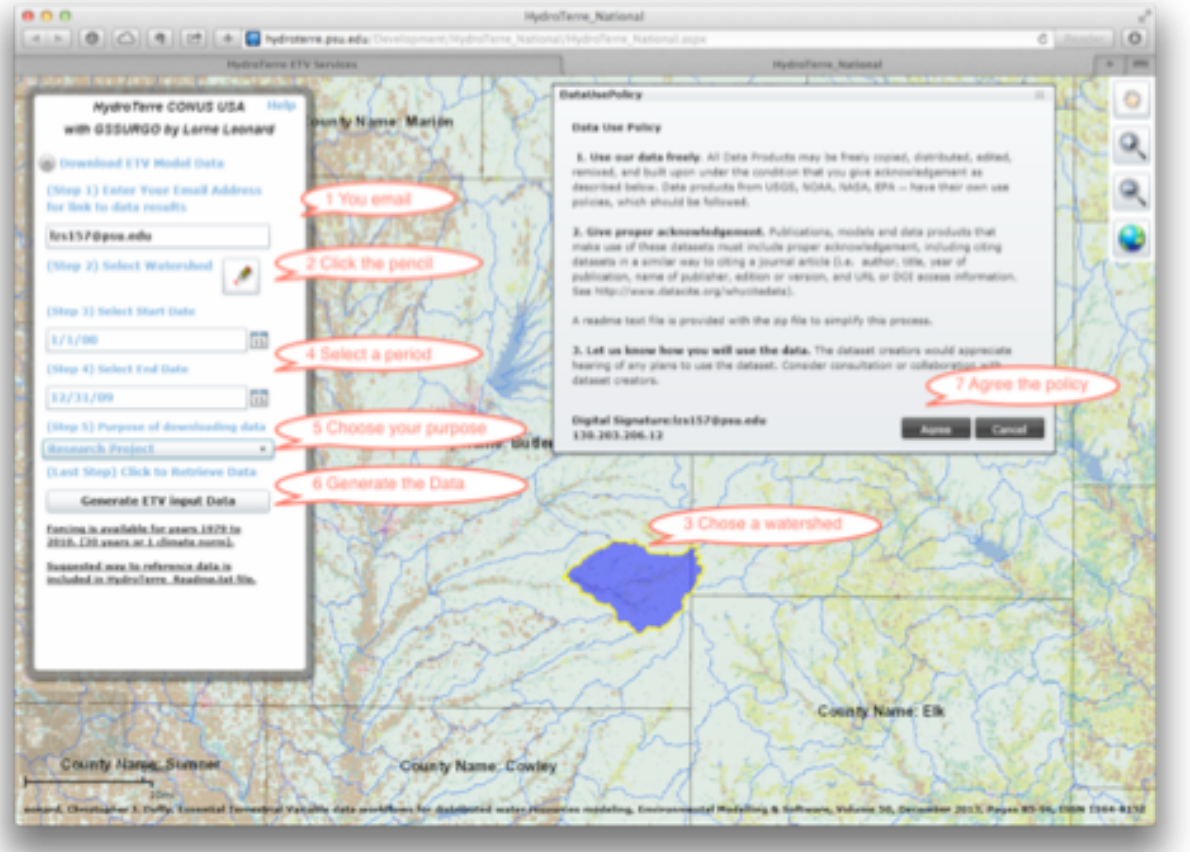
You will see an interface below:



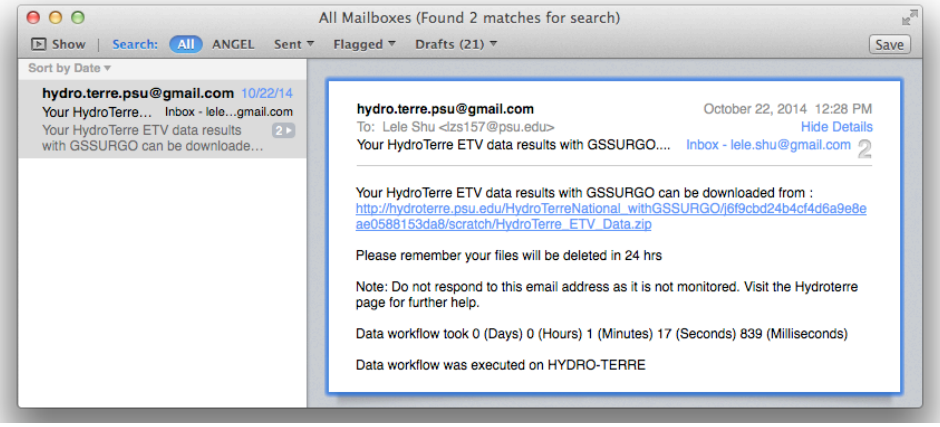
You must follow the steps below to send a data request to HydroTerre server.

0) Zoom in/out and stay on the best scale of the map.
1) Fill you email address.
2) Click the pencil button.
3) After step 2, click in map to select a watershed(which is in HUC12 scale).

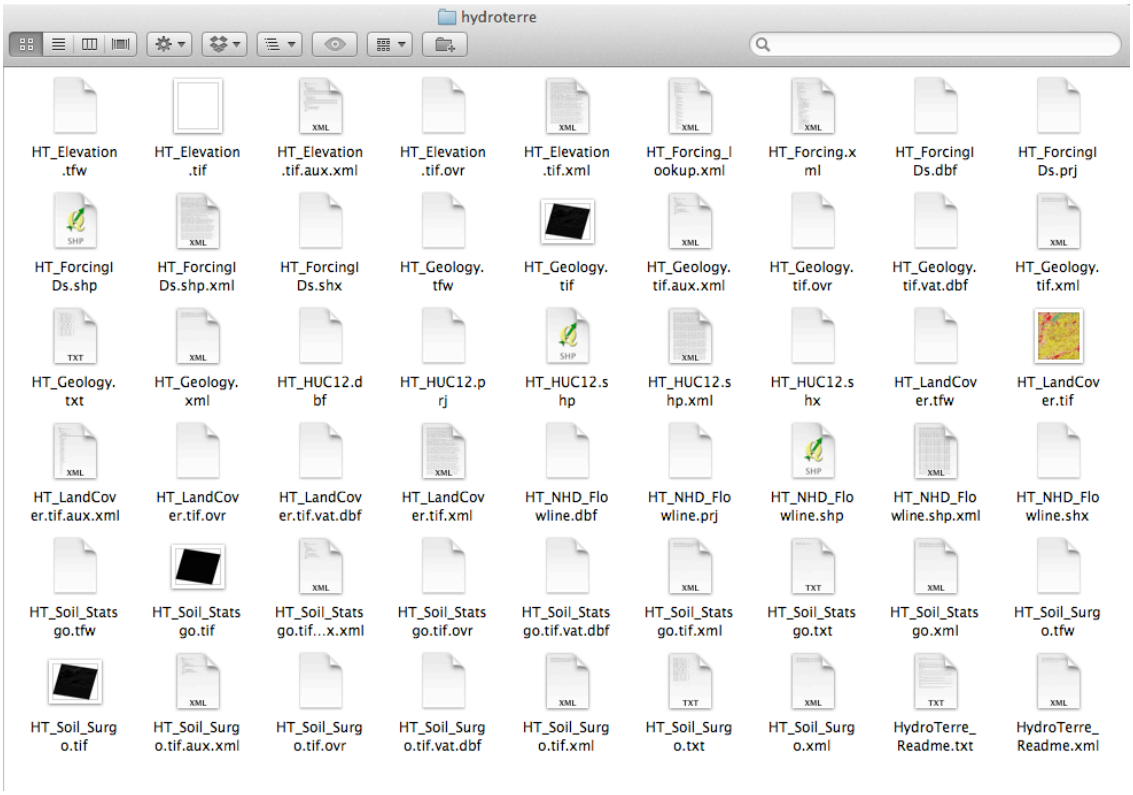
4) Select a period of forcing data. The forcing data from 1979/01/01 to 2009/12/31 are available online.
5) Select your purpose of using the data.
6) Click the button “Generate ETV Input Data”.
7) Read the policy in pop up dialog, and agree it.
   Then the server will start preparing the data you just requested.



Generally, the server takes 1 to 5 minutes to finish the data preparation, then you will receive a email from hydro.terre.psu@gmail.com. After clicking the link in the eamil, the data will be downloaded. **The data download link expires in 24 hours.**



All required data are compressed in a zip file. You need unzip the package to see all files.
Hydroterre provide all data of HUC12 scale for continuous land of whole United State. No matter which watershed (HUC12) you chose, the files in the folder should be like this (screenshot below).



2 Overview of data

Regard to Meta data of all data, you can visit HydroTerre website and click the **Meta Data References** tab or
http://www.hydroterre.psu.edu/HydroTerre/Help/DataSources.aspx

Basic information of spatial and forcing data is list in the following table.

Filename	Data	Format	Projection
HT_Elevation	Elevation	GeoTiff	USA_Contiguous_Albers_Equal_Area_Conic_USGS_version
HT_Forcing	Forcing data	XML file	NA
HT_ForcingIDs	Rectangular coverage of forcing site	Shapefile Polygon	USA_Contiguous_Albers_Equal_Area_Conic_USGS_version
HT_HUC12	Boundary of	Shapefile	GCS_North_American_1

	HUC12 watersheds	Polygon	983
HT_NHD_FLOWLINE	Stream line of HUC12 scale	Shapefile Polyline	GCS_North_American_1983
HT_Geology	Soil in geology layers	GeoTiff	GCS_North_American_1983
HT_Geology_Albers	Soil in geology layers	GeoTiff	Albers_Conical_Equal_Area
HT_LandCover	Land Cover	GeoTiff	Albers_Conical_Equal_Area
HT_Soil_Surgo	Surface soil map from SSURGO	GeoTiff	GCS_North_American_1983
HT_Soil_Surgo_Albers	Surface soil map from SSURGO	GeoTiff	Albers_Conical_Equal_Area
HT_Soil_Statsgo	Surface soil map from STATSGO	GeoTiff	GCS_North_American_1983
HT_Soil_Statsgo_Albers	Surface soil map from STATSGO	GeoTiff	Albers_Conical_Equal_Area
HT_Soil_GGSURGO	Surface soil map from	Shapefile Polygon	GCS_North_American_1983
HydroTerre_Readme	Readme	Text file	NA

Parameters of three projections:

PROJCS["**USA_Contiguous_Albers_Equal_Area_Conic_USGS_version**",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM["Greenwich",0.0],UNIT["Degree",0.0174532925199433295]],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",23.0],UNIT["Meter",1.0],VERTCS["NAD_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PARAMETER["Vertical_Shift",0.0],PARAMETER["Direction",1.0],UNIT["Meter",1.0]]]

PROJCS["**Albers_Conical_Equal_Area**",GEOGCS["GCS_North_American_1983",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137,298.257222101]],PRIMEM["Greenwich",0],UNIT["Degree",0.0174532925199433295]],PROJECTION["Albers"],PARAMETER["standard_parallel_1",29.5],PARAMETER["standard_parallel_2",45.5],PARAMETER["latitude_of_origin",23],PARAMETER["central_meridian",-96],PARAMETER["false_easting",0],PARAMETER["false_northing",0],UNIT["Meter",1]]

GEOGCS["**GCS_North_American_1983**",DATUM["D_North_American_1983",SPHEROID["GRS_1980",6378137,298.257222101]],PRIMEM["Greenwich",0],UNIT["Degree",0.0174532925199433295]]

2.1 Vector Data

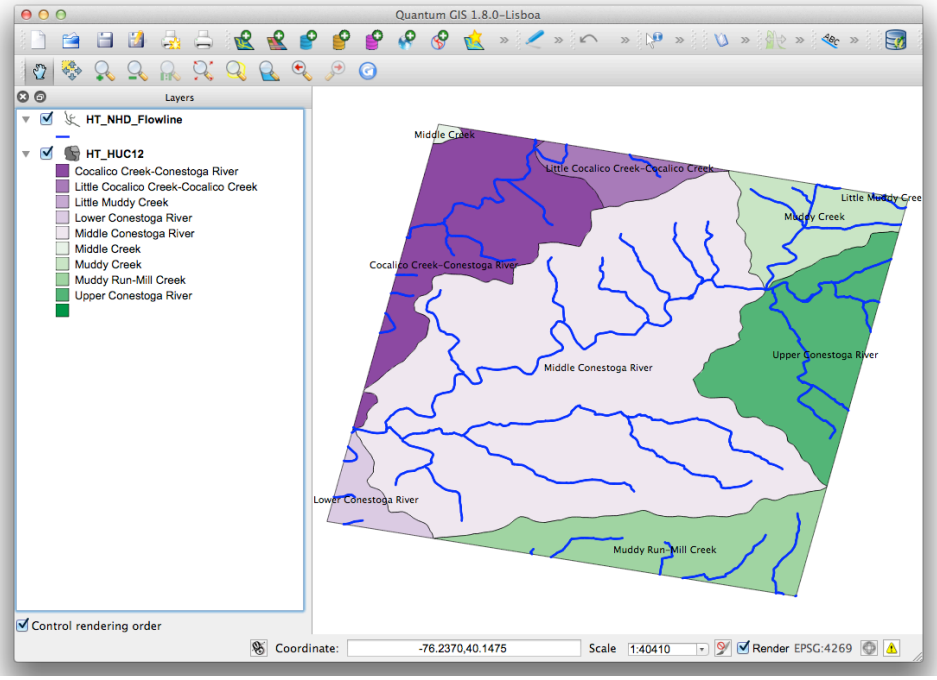


Figure 1 HUC12 & NHD_Flowline

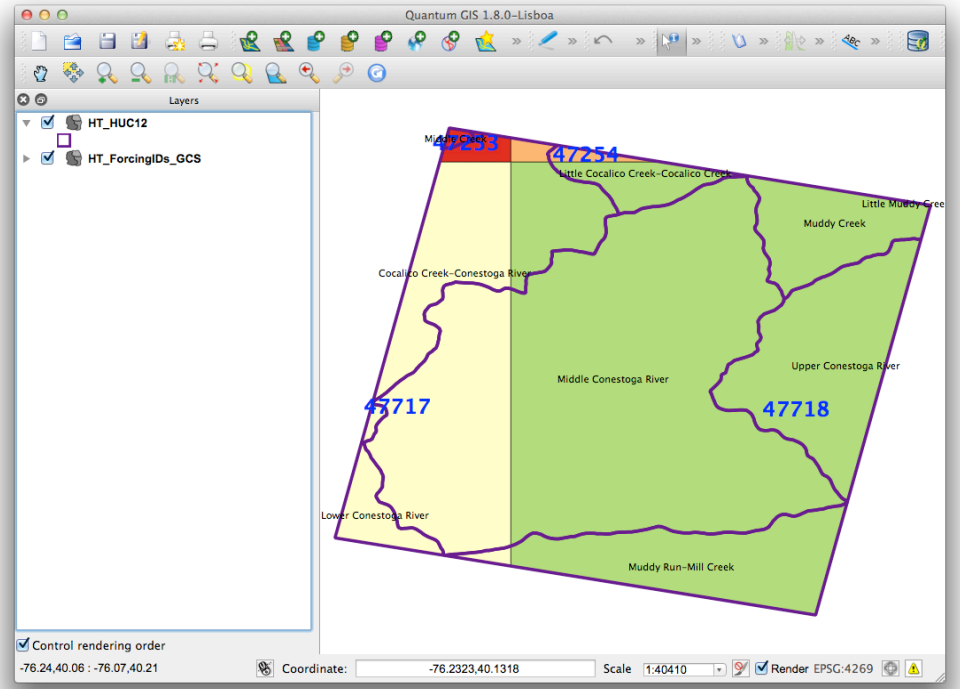


Figure 2 ForcingIDs

2.2 Raster Data

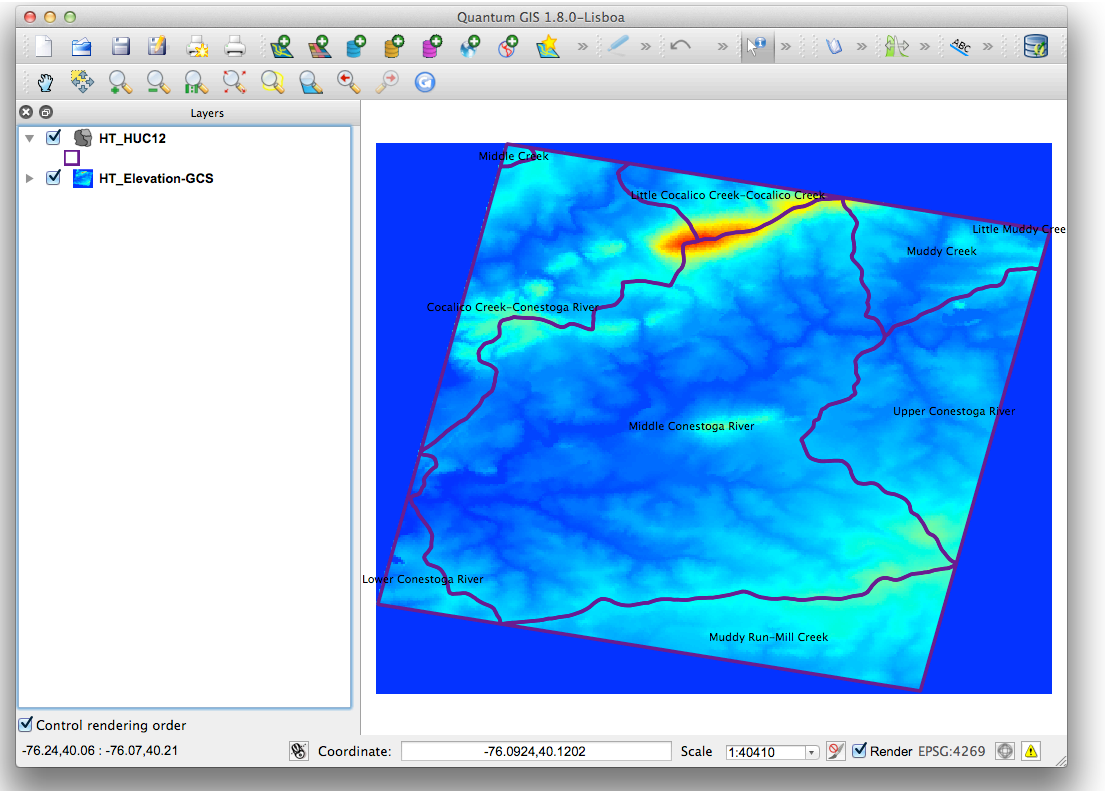


Figure 3 Elevation

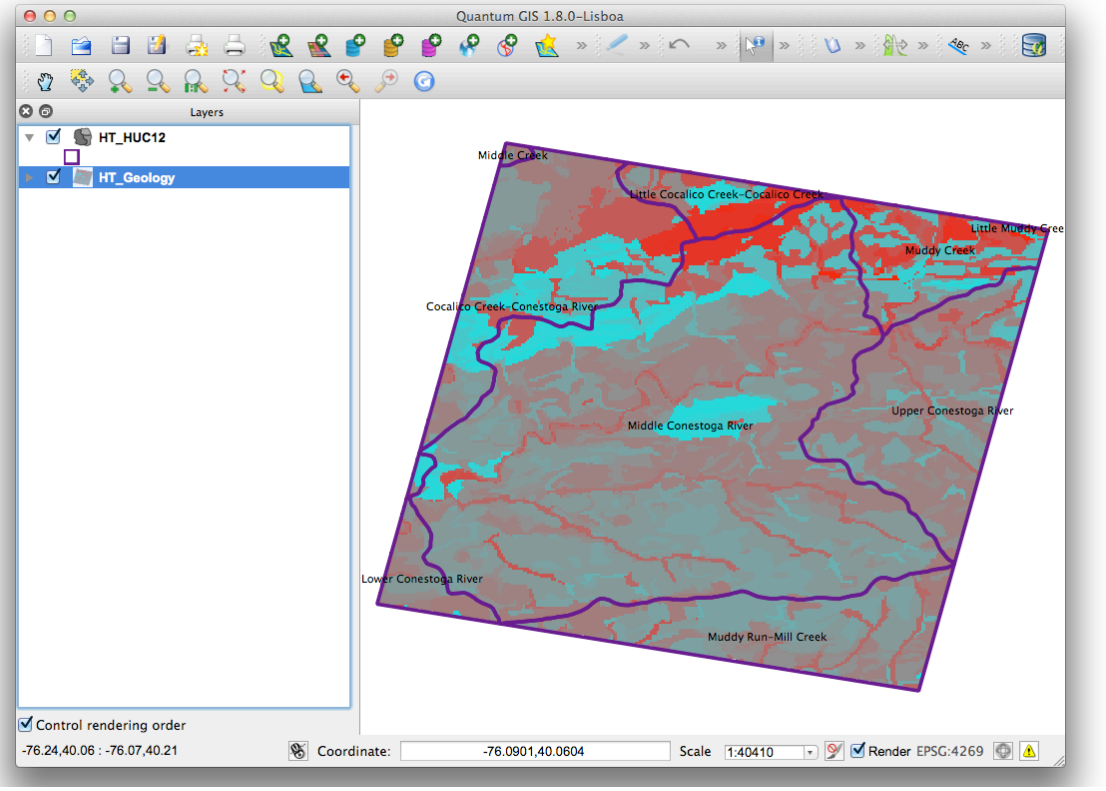


Figure 4 Geology

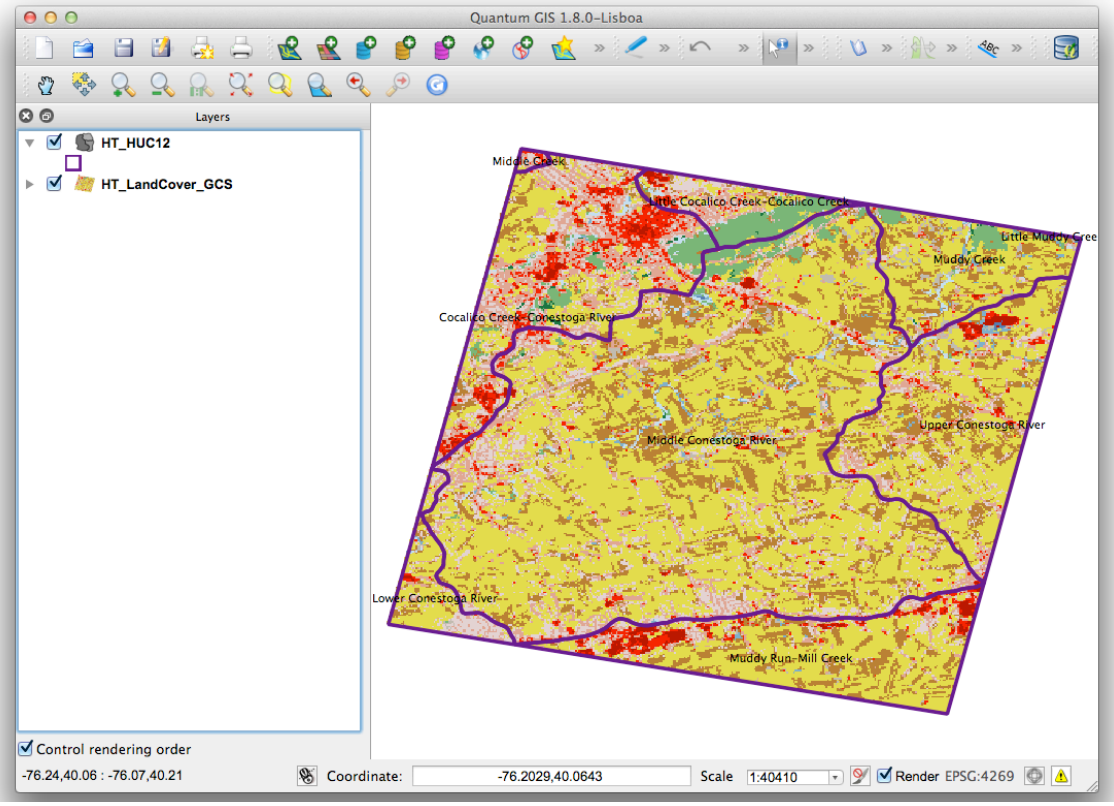


Figure 5 Landcover

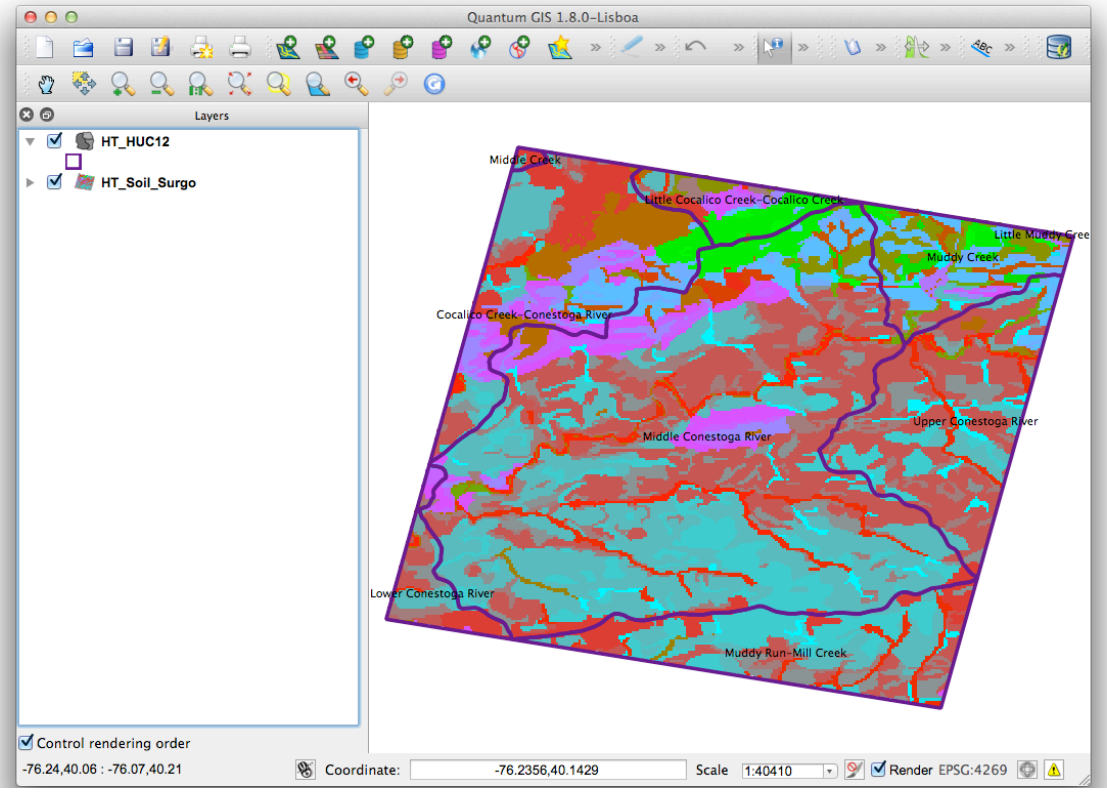


Figure 6 Soil_Surgo

3 Forcing Data

The forcing data is in XML format, you can read it through any text editor like Microsoft Notepad or Notepad++ or any browser like Microsoft Internet Explorer, Firefox, Safari etc. It looks like this:

Another better way to read the forcing file is using Microsoft Excel, which can parse the data format easily.

HT_Forcing.xml Open with MacVim

```
<?xml version="1.0" standalone="yes"?>
<PIHM_Forcing>
  <Forcing_File_Information>
    <File_Name>j00dd9c89ce9a4291bcdfe73098cff698\scratch\PIHM_Results
\HT_Forcing.xml</File_Name>
    <Type>Forcing</Type>
    <Version>3.0</Version>
    <Created>Monday, February 3, 2014 12:50:37 PM</Created>
    <Updated>Original</Updated>
    <User>PIHM Service</User>
    <Comment>Generated from PIHM Web Services</Comment>
  </Forcing_File_Information>
  <Forcing_Inputs>
    <HUC_ID_List>
      <HUC_ID>HUC12_020502040104</HUC_ID>
    </HUC_ID_List>
    <Start_Date>2000-1-1</Start_Date>
    <End_Date>2001-1-1</End_Date>
    <Database>NLDAS_HUC12s</Database>
  </Forcing_Inputs>
  <Forcing_Outputs>
    <Forcing_Count_List>
      <Forcing_Count>8785</Forcing_Count>
    </Forcing_Count_List>
    <Forcing_List>
      <Forcing_Record>
        <Index_Start>0</Index_Start>
        <Index_End>0.04166666666666667</Index_End>
        <HUC12_020502040104>
          <DateTime>2000-01-01T00:00:00-05:00</DateTime>
          <Precip_044921>0</Precip_044921>
          <Precip_044922>9.6E-06</Precip_044922>
          <Precip_045385>0</Precip_045385>
          <Precip_Avg>3.2E-06</Precip_Avg>
          <Temp_044921>-1.17999999999995</Temp_044921>
          <Temp_044922>-1.31999999999999</Temp_044922>
          <Temp_045385>-1.32999999999998</Temp_045385>
          <Temp_Avg>-1.27666666666664</Temp_Avg>
          <RH_044921>0.904319571918238</RH_044921>
          <RH_044922>0.898867577003922</RH_044922>
          <RH_045385>0.892347018647669</RH_045385>
          <RH_Avg>0.898511380898289</RH_Avg>
          <Wind_044921>288451.805610573</Wind_044921>
          <Wind_044922>289341.977431551</Wind_044922>
          <Wind_045385>292253.028781568</Wind_045385>
          <Wind_Avg>290015.60394123063</Wind_Avg>
          <RN_044921>0</RN_044921>
          <RN_044922>0</RN_044922>
          <RN_045385>0</RN_045385>
```

Book2 - Microsoft Excel

File | Home | Insert | Page Layout | Formulas | Data | Review | View | Table Tools Design

R1 Precip_Avg

	L	M	N	O	P	Q	R	S	T	U
1	Forcing_Count	Index_Start	Index_End	DateTime	Precip_047717	Precip_047718	Precip_Avg	Temp_047717	Temp_047718	Temp_Avg
2	8785	0	0.041666667	2000-01-01T00:00:00-05:00	0	0	0	0.92	0.97	0.945
3	8785	0.041666667	0.083333333	2000-01-01T01:00:00-05:00	0	0	0	0.8	0.83	0.815
4	8785	0.083333333	0.125	2000-01-01T02:00:00-05:00	0	0	0	0.69	0.69	0.69
5	8785	0.125	0.166666667	2000-01-01T03:00:00-05:00	0	0	0	0.57	0.54	0.555
6	8785	0.166666667	0.208333333	2000-01-01T04:00:00-05:00	0	0	0	0.38	0.37	0.375
7	8785	0.208333333	0.25	2000-01-01T05:00:00-05:00	0	0	0	0.19	0.21	0.2
8	8785	0.25	0.291666667	2000-01-01T06:00:00-05:00	0	0	0	0	0.04	0.02
9	8785	0.291666667	0.333333333	2000-01-01T07:00:00-05:00	0	0	0	-0.04	0	-0.02
10	8785	0.333333333	0.375	2000-01-01T08:00:00-05:00	0	0	0	-0.08	-0.03	-0.055
11	8785	0.375	0.416666667	2000-01-01T09:00:00-05:00	0	0	0	-0.12	-0.07	-0.095
12	8785	0.416666667	0.458333333	2000-01-01T10:00:00-05:00	0	0	0	-0.44	-0.38	-0.41
13	8785	0.458333333	0.5	2000-01-01T11:00:00-05:00	0	0	0	-0.77	-0.69	-0.73
14	8785	0.5	0.541666667	2000-01-01T12:00:00-05:00	0	0	0	-1.09	-1	-1.045
15	8785	0.541666667	0.583333333	2000-01-01T13:00:00-05:00	0	0	0	0.6	0.68	0.64
16	8785	0.583333333	0.625	2000-01-01T14:00:00-05:00	0	0	0	2.28	2.35	2.315
17	8785	0.625	0.666666667	2000-01-01T15:00:00-05:00	0	0	0	3.97	4.02	3.995
18	8785	0.666666667	0.708333333	2000-01-01T16:00:00-05:00	0	0	0	5.62	5.68	5.65
19	8785	0.708333333	0.75	2000-01-01T17:00:00-05:00	0	0	0	7.26	7.35	7.305
20	8785	0.75	0.791666667	2000-01-01T18:00:00-05:00	0	0	0	8.91	9.01	8.96
21	8785	0.791666667	0.833333333	2000-01-01T19:00:00-05:00	0	0	0	8.28	8.37	8.325
22	8785	0.833333333	0.875	2000-01-01T20:00:00-05:00	0	0	0	7.66	7.74	7.7
23	8785	0.875	0.916666667	2000-01-01T21:00:00-05:00	0	0	0	7.03	7.11	7.07
24	8785	0.916666667	0.958333333	2000-01-01T22:00:00-05:00	0	0	0	5.47	5.53	5.5
25	8785	0.958333333	1	2000-01-01T23:00:00-05:00	0	0	0	3.9	3.95	3.925
26	8785	1	1.041666667	2000-01-02T00:00:00-05:00	0	0	0	2.33	2.38	2.355
27	8785	1.041666667	1.083333333	2000-01-02T01:00:00-05:00	0	0	0	2.13	2.16	2.145
28	8785	1.083333333	1.125	2000-01-02T02:00:00-05:00	0	0	0	1.92	1.95	1.935
29	8785	1.125	1.166666667	2000-01-02T03:00:00-05:00	0	0	0	1.72	1.73	1.725

Sheet1 Sheet2 Sheet3

Ready 100%

4 Tool of converting HydroTerre data to PIHM and PIHMgis

All data downloaded from HydroTerre can be opened and edited with GIS tool. When we use the data in PIHM or PIHMgis, we have to convert the data formats.

Both ARC Grid and ARC ASCII Grid are supported in PIHMgis. So the conversion tool is to (1) convert the raster data in GeoTiff to ARC ASCII Grid file, (2) parse the forcing data in XML format, (3) calculate Leaf Area Index (LAI) and Roughness Length (RL) based on land cover types in land cover map, (4) and generate a forcing data in the format PIHM supported.

The conversion tool has separated versions for Mac OS and Windows platforms. The installation of Geospatial Data Abstraction Library (GDAL, http://www.gdal.org) is necessary for both platforms.

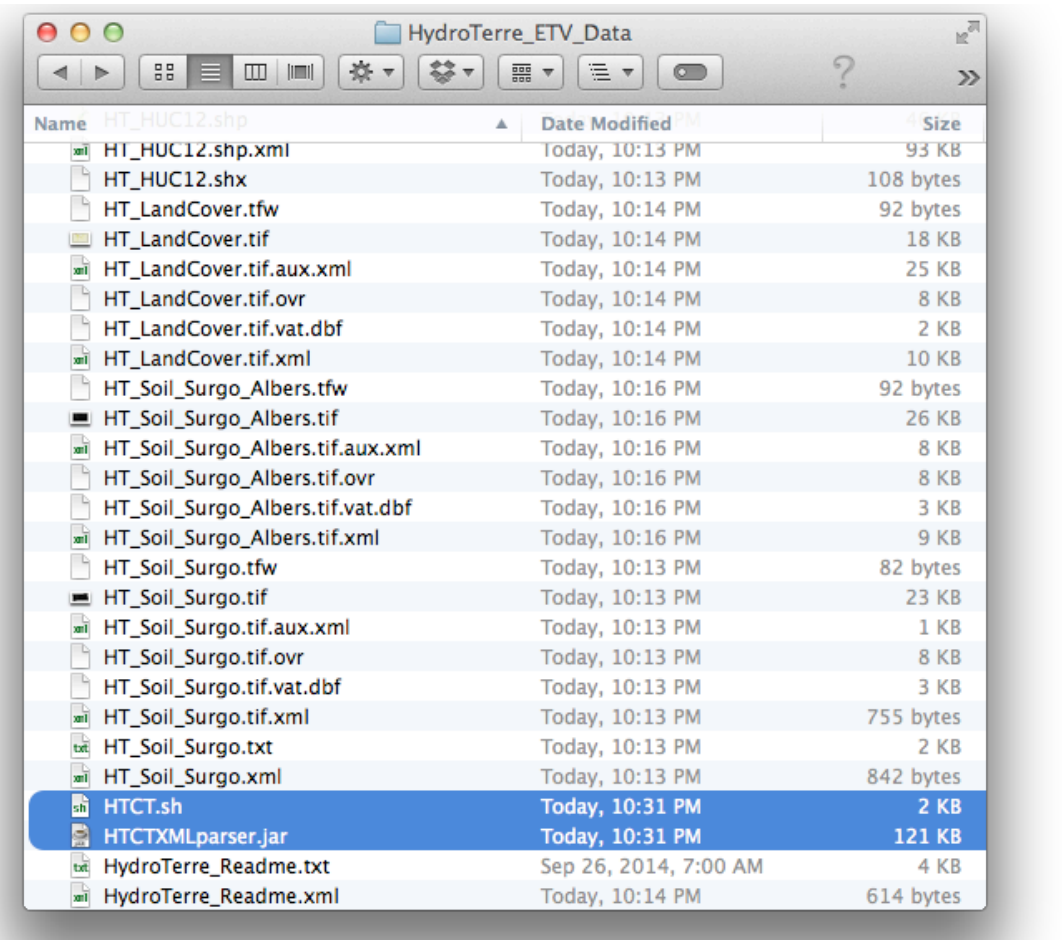
4.1 On Windows

The Windows version of the tool is in development, and will be available online in a month on HydroTerre and PIHM website.

4.2 On Mac OS

0) Download and install GDAL support (http://www.gdal.org).
   Download and install Java Runtime Environment or Java Development Kit (https://www.java.com).
   Download Conversion tool in zip format and unzip it.
1) Copy the two files (**HTCT.sh** and **HTCTXMLparser.jar**) to the folder where unzipped spatial raster data locates.
   For example, if the folder path is:
   /Users/username/Downloads/HydroTerre_ETV_Data, you must copy the two files of conversion tool to this

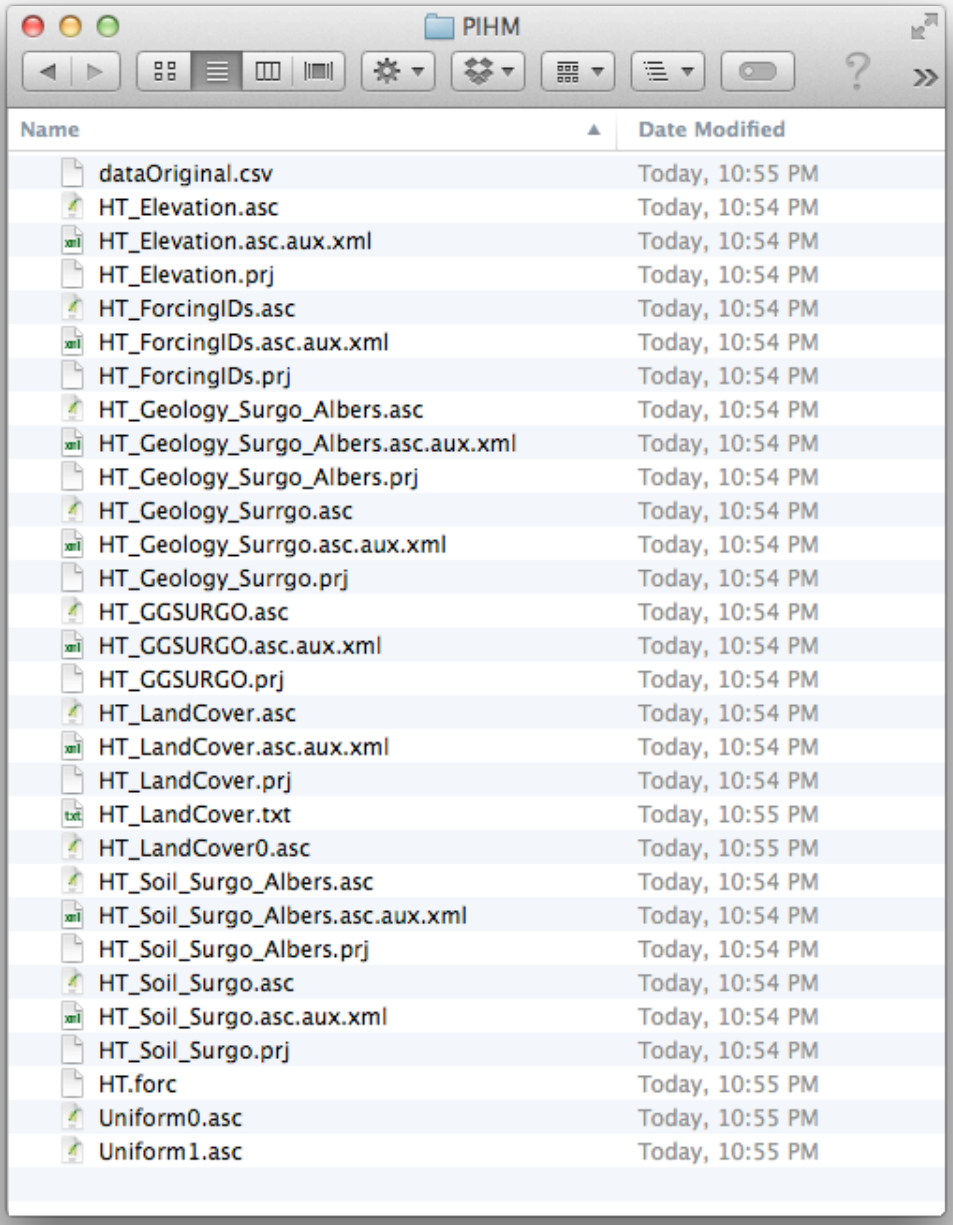
folder.



2) Open terminal in **/Applications/Utilities/Terminal**, or search Terminal in SpotLight on up-right corner of your screen. Enter command:
cd /Users/username/Downloads/HydroTerre_ETV_Data
(Please change the path based on the folder of your data unzipped).

3) Run the Conversion Tool with a command:
./HTCT.sh
The program will take 1 to 10 minutes to finish, depending on the size of forcing data.

The converted spatial and forcing data are saved in **PIHM/** of the data folder.


PIHM
Name
Date Modified
dataOriginal.csv Today, 10:55 PM
HT_Elevation.asc Today, 10:54 PM
HT_Elevation.asc.aux.xml Today, 10:54 PM
HT_Elevation.prj Today, 10:54 PM
HT_ForcingIDs.asc Today, 10:54 PM
HT_ForcingIDs.asc.aux.xml Today, 10:54 PM
HT_ForcingIDs.prj Today, 10:54 PM
HT_Geology_Surgo_Albers.asc Today, 10:54 PM
HT_Geology_Surgo_Albers.asc.aux.xml Today, 10:54 PM
HT_Geology_Surgo_Albers.prj Today, 10:54 PM
HT_Geology_Surrgo.asc Today, 10:54 PM
HT_Geology_Surrgo.asc.aux.xml Today, 10:54 PM
HT_Geology_Surrgo.prj Today, 10:54 PM
HT_GGSURGO.asc Today, 10:54 PM
HT_GGSURGO.asc.aux.xml Today, 10:54 PM
HT_GGSURGO.prj Today, 10:54 PM
HT_LandCover.asc Today, 10:54 PM
HT_LandCover.asc.aux.xml Today, 10:54 PM
HT_LandCover.prj Today, 10:54 PM
HT_LandCover.txt Today, 10:55 PM
HT_LandCover0.asc Today, 10:55 PM
HT_Soil_Surgo_Albers.asc Today, 10:54 PM
HT_Soil_Surgo_Albers.asc.aux.xml Today, 10:54 PM
HT_Soil_Surgo_Albers.prj Today, 10:54 PM
HT_Soil_Surgo.asc Today, 10:54 PM
HT_Soil_Surgo.asc.aux.xml Today, 10:54 PM
HT_Soil_Surgo.prj Today, 10:54 PM
HT.forc Today, 10:55 PM
Uniform0.asc Today, 10:55 PM
Uniform1.asc Today, 10:55 PM