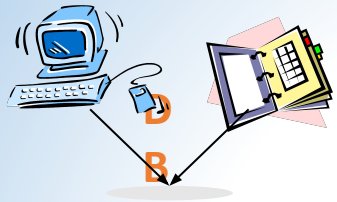
GIS Data Source

Dr. Tarendra Lakhankar

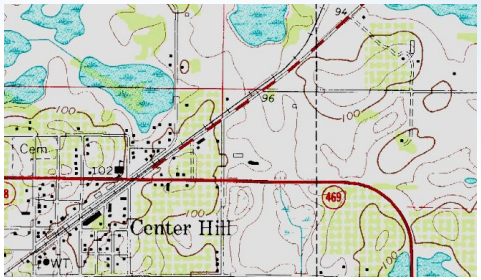
Questions Before Getting Data

- Where can we get GIS data?
  - Government or commercial
  - Payment or not
  - Collection (new) or existing
- How can we get GIS data?
  - Format conversion
  - Quality/Accuracy
- What is the format?
  - Digital (raster or vector)
  - Non-digital (hardcopy)
  - Projection

Sources of GIS Data



Databases

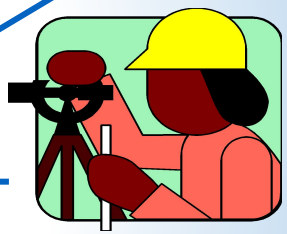


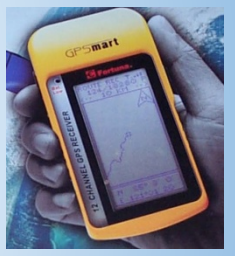
Digital Maps

Maps

Remote Sensing

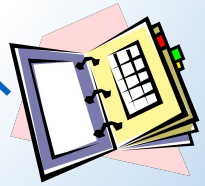
Data Collection

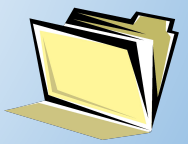




Land Surveys/GPS

Other (photographs, video)

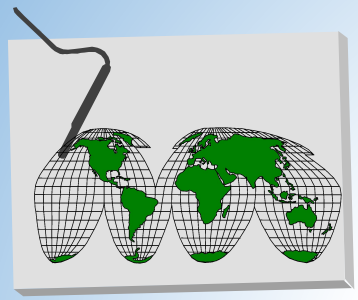




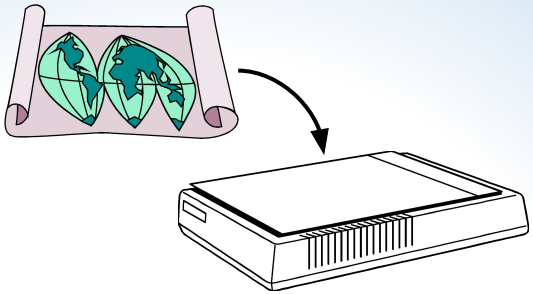
Manual Files

Data Collection is the MOST expensive and time consuming task

Five Main Methods



Manual Digitizing



Scanning

Existing Databases

Remote Sensing / Drone

Field Measurements

Mapit GIS

Where do we get Data?

- Data Collection is the MOST expensive and time-consuming task
- Often. Almost invariably, it's the costliest element of any project-- > 80%.

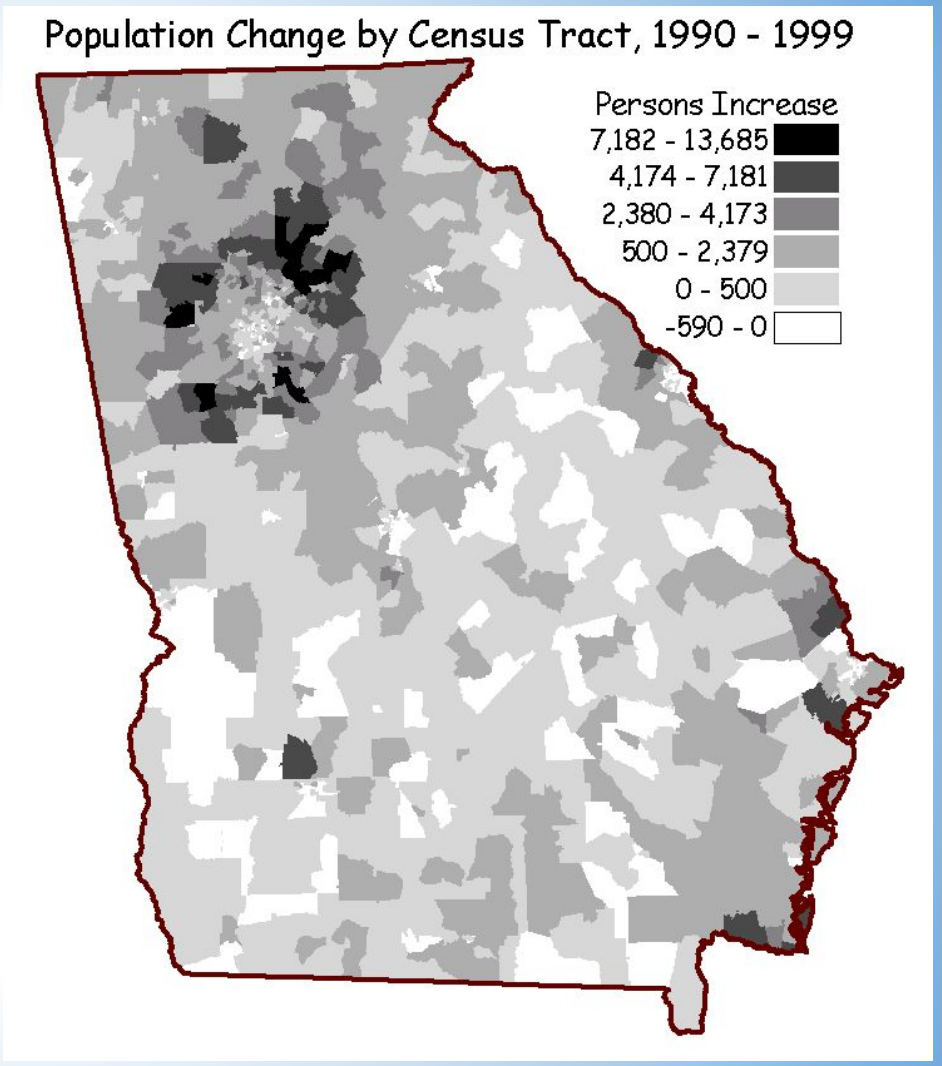
- Purchased
- Found from existing sources in digital form
- Captured from analog maps

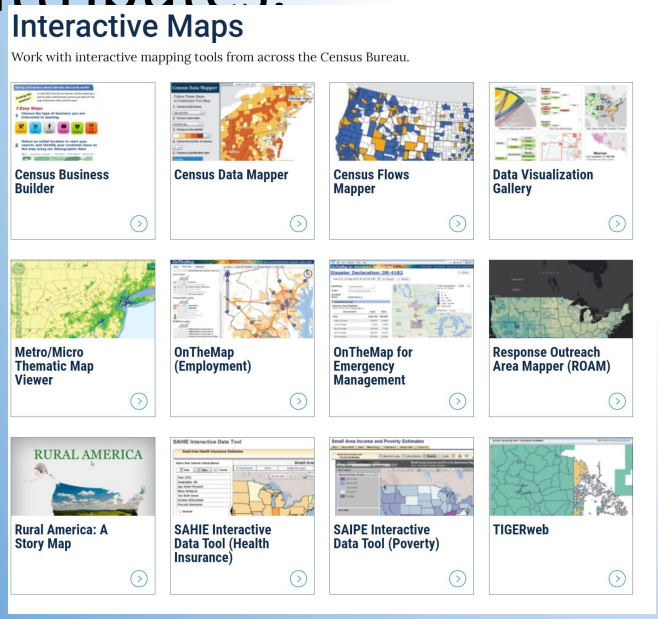
Finding Map & Digital Data Sources

- Via Web searches (e.g., Google.com)
  Many major data providers make their data available via the WWW
  - http://www.esri.com/software/arcgis/arcgisonline
    => nice base maps
  - https://en.wikipedia.org/wiki/List_of_GIS_data_sources
    These are the best resources listed on GIS data websites.
  - https://gisgeography.com/best-free-gis-data-sources-raster-vector/

Digital Census **Data**

- TIGER system: **T**opologically **I**ntegrated **G**eographic **E**ncoding and **R**eferencing
- Typically, vector polygons with population, income, health, age, etc., attributes.





http://www.census.gov/

Census TIGER/Line files

- Topologically Integrated Geographic Encoding and Referencing files https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html
- The core TIGER/Line Files and Shapefiles do not include demographic data, but they do contain geographic entity codes (GEOIDs) that can be linked to the Census Bureau's demographic data, available on **data.census.gov**.
- TIGER Geodatabases are spatial extracts from the Census Bureau's MAF/TIGER database for use with Esri's ArcGIS. The geodatabases contain national coverage (for geographic boundaries or features) or state coverage (boundaries within state).

International Agency - Data

- FAO: http://www.fao.org/faostat/en/#data/
- World Bank: https://data.worldbank.org/
- United Nations: https://data.un.org/

Federal Data Agencies

- USGS: http://www.usgs.gov/ngpo/
- USGS: http://ned.usgs.gov
- USGS: http://water.usgs.gov/maps.html
- USGS: http://earthexplorer.usgs.gov
- USDA: http://datagateway.nrcs.usda.gov/
- Geodata one stop: http://www.data.gov
- NOAA: http://www.climate.gov/maps-data
- EPA: https://www.epa.gov/enviro/data-downloads
- EPA: http://www.epa.gov/geospatial/
- Census Bureau: http://www.census.gov

Federal Data Agencies

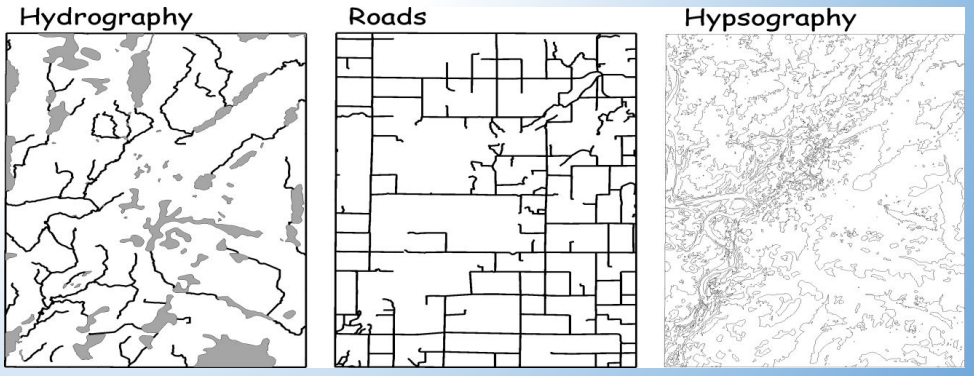
- https://www.ncei.noaa.gov/ National Centers Environ Information
- http://ngdc.noaa.gov National Geophysical Data Center
- http://www.nesdis.noaa.gov satellite and information service
- http://nodc.noaa.gov National Oceanographic Data Center
- http://ncep.noaa.gov National center environmental prediction
- http://earthdata.nasa.gov EOSDIS NASA DAAC centers
- https://highways.dot.gov/
- http://www.gis.fhwa.dot.gov/statepracs.asp Federal Highway Administration
- http://www.cdc.gov/gis Centers for Disease Control
- https://www.mapsofworld.com/ GIS Maps of World

USGS File Types

- The USGS has been a driving force in GIS. Some of the USGS formats date back to the 1980s just when Geographic Information System was emerging from its roots.
- These three USGS file types are:
  - Digital Line Graph (DLG)
  - Digital Raster Graphic (DRG)
  - Digital Orthophotos Quadrangle (DOQ)

Digital Line Graphs (DLGs)

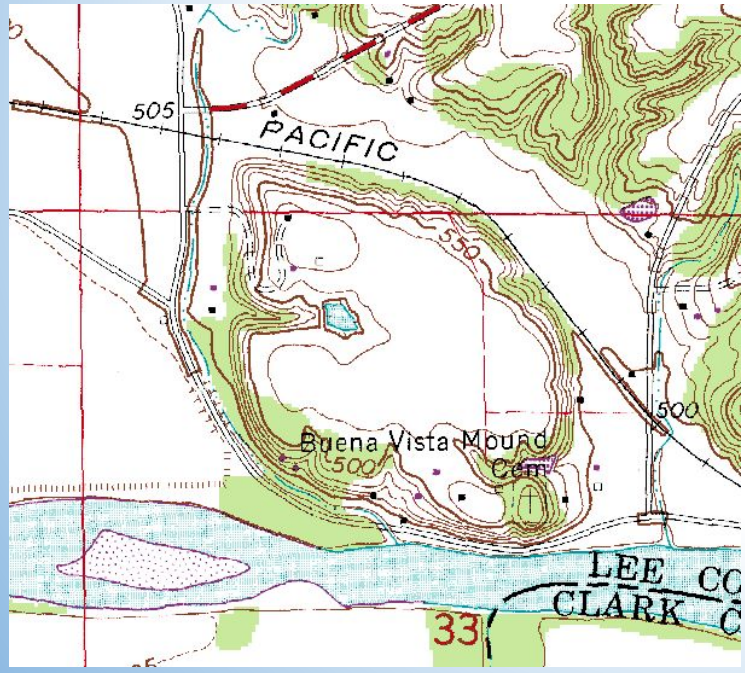
- Vector representations of most features portrayed on a USGS national series map
- Provided as separate themes (9 typically)
  - transportation data
    - (roads, railroads, pipelines, power lines, and airports)
  - hydrography
    - (water features).
  - hypsography
    - elevation contour information
- Three major groups:
  - 1:2,000,000-scale
  - 1:100,000-scale
  - 1:24,000-scale

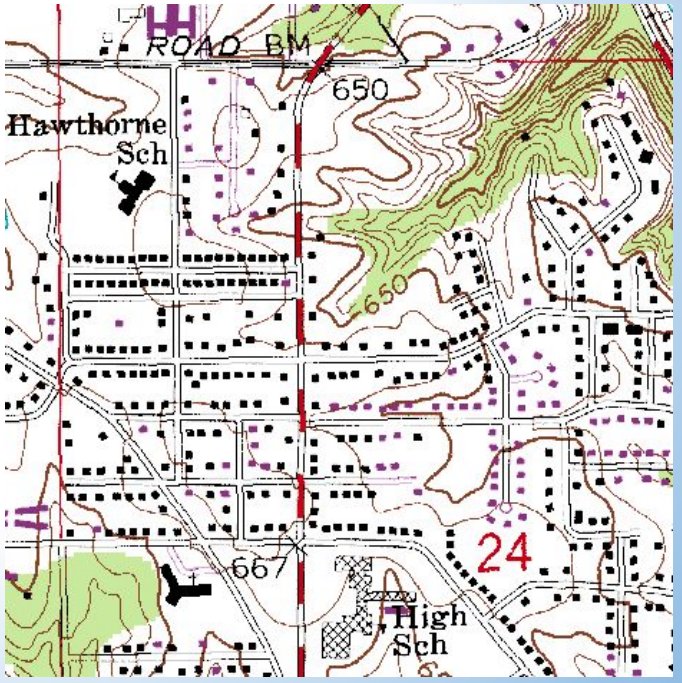


https://lta.cr.usgs.gov/DLGs

Digital Raster Graphic (DRG)

- A georeferenced raster image of a USGS Map, created by scanning the paper maps (ex: map in georeferencing lab)
- Topographic map georeferenced to the Universal Transverse Mercator projection.



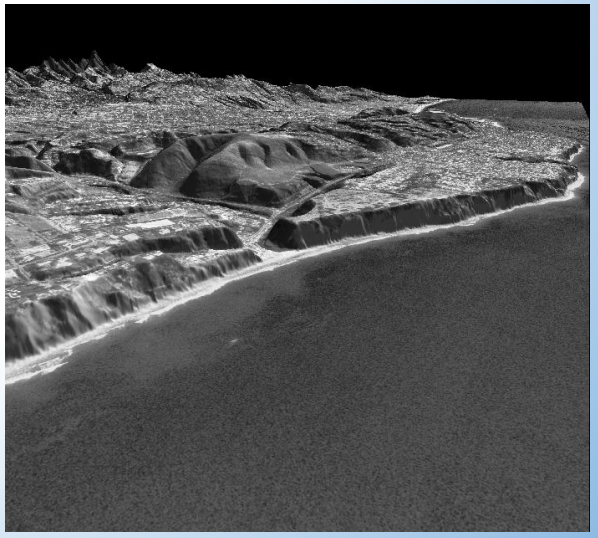


USGS 1:24,000 DRG

Digital Orthophoto Quadrangles (DOQs)

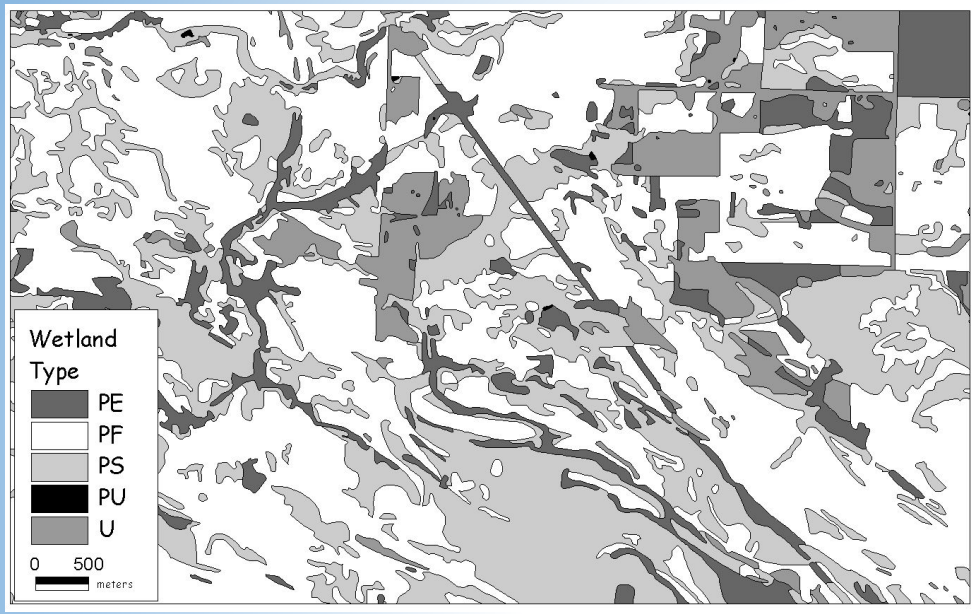
- Aerial photographs
- Scanned
- Corrected for distortions (camera, terrain etc.) to be orthographic
- MMU about 1 m; resolution = 1m/pixel
- Usually false-color IR
- Frequently used for updating land cover, GCP location, spatial changes etc.
- Flown approx. every 2 years
- Lead agency: USGS

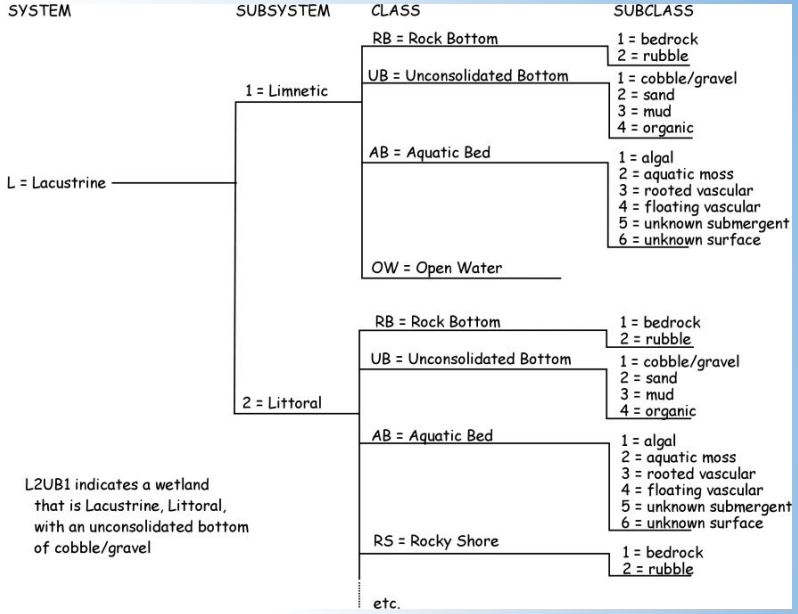
MMU stands for Minimum Mapping Unit.
This is the smallest resolvable unit within the data.



U.S. Fish and Wildlife Service (USFWS)

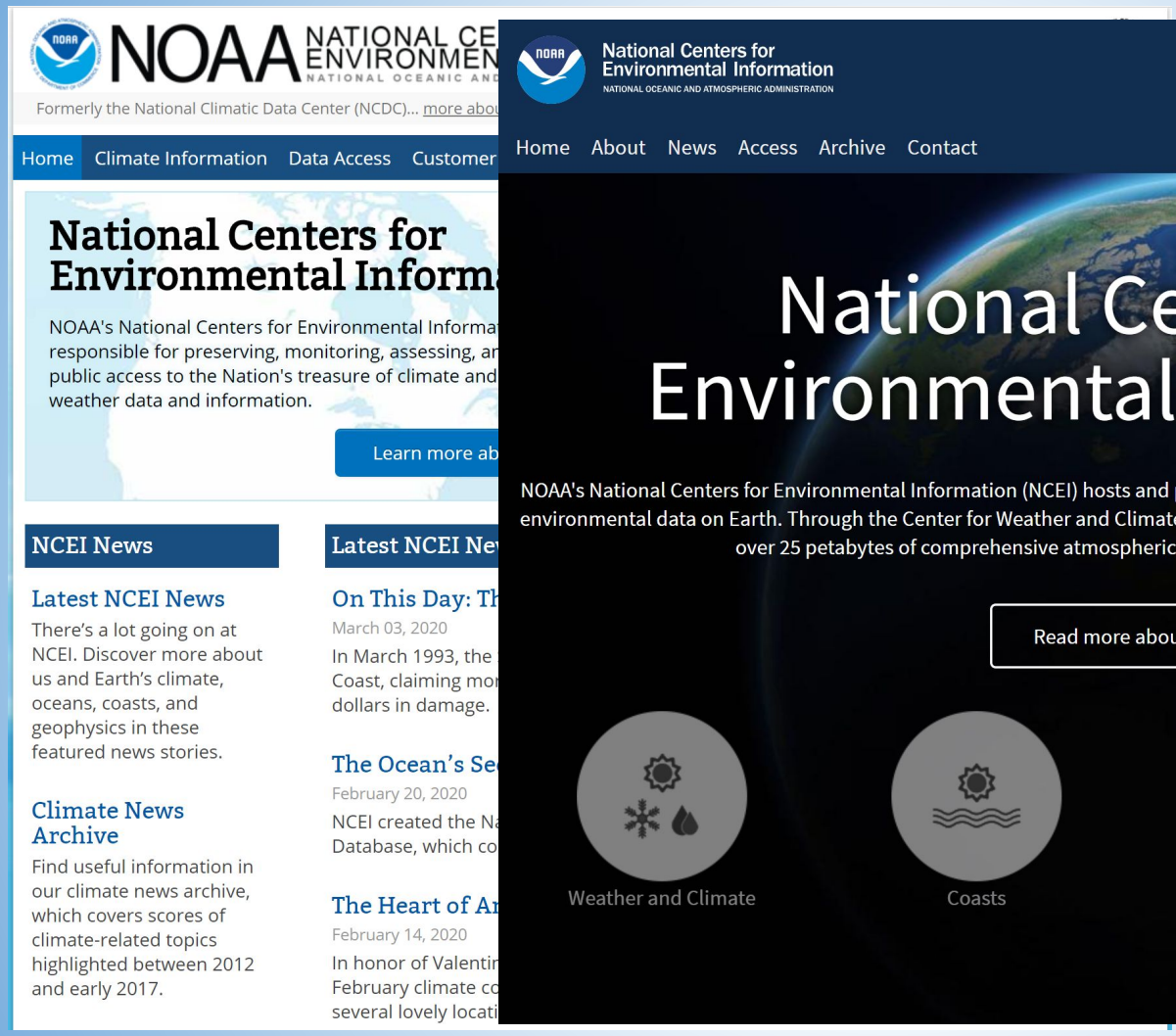
https://www.fws.gov/GIS/





- Data on location and condition of wetlands in the USA
- Produced by US Fish and Wildlife Service
- Decadal updates planned, started in 1970s, not all digital
- Combination of aerial photo interpretation (spring photos) and field visits

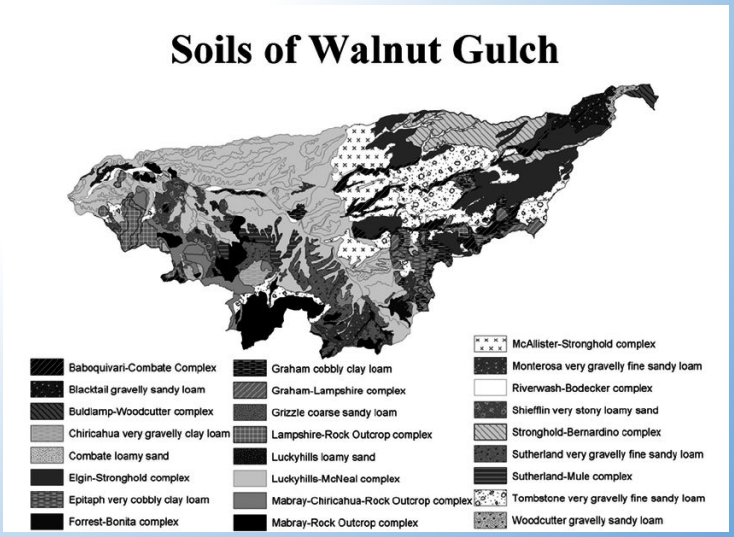
National Centers for Environmental Information



http://www.ncdc.noaa.gov/

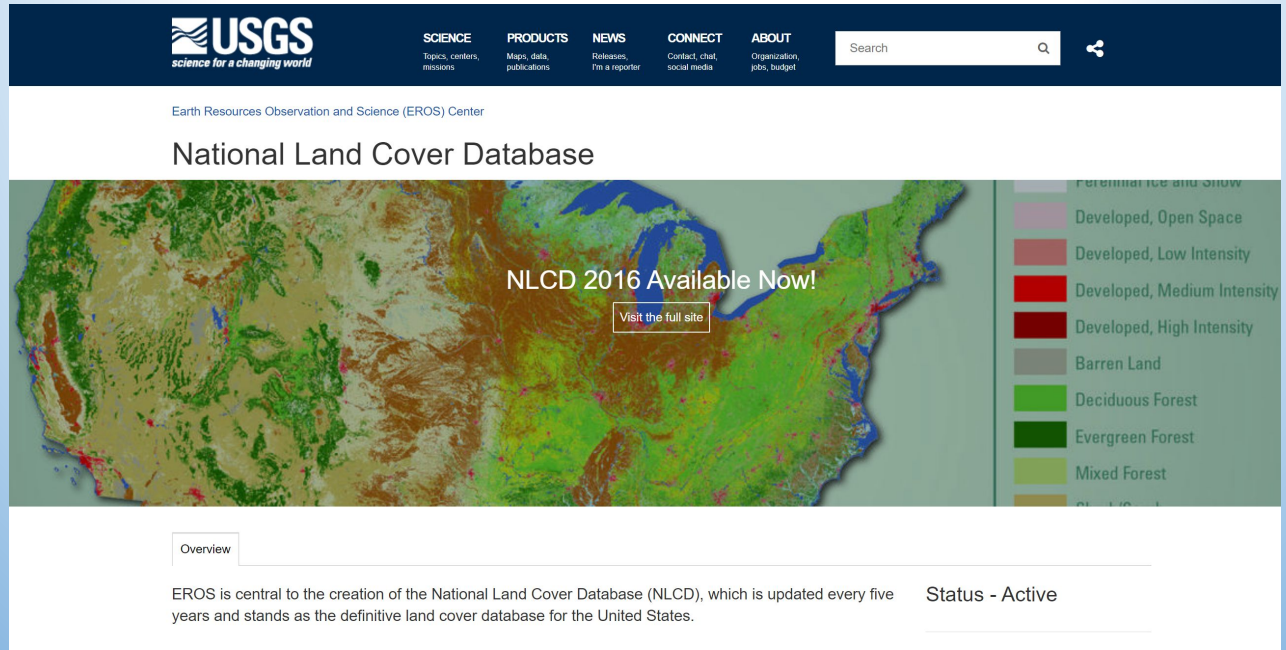
Digital Soils Data

- The USDA Natural Resource Conservation Service (NRCS) digital soils datasets: http://datagateway.nrcs.usda.gov/
  - NATSGO – National soil geography; highly generalized
  - STATSGO – State soil geographic data; intermediate scale and resolution, is less detailed map.
  - SSURGO – Soil survey geographic data; most spatial and categorical detail, county level data.
- 1:12,000 to 1:7,500,000-Scale Digital Soils Information.



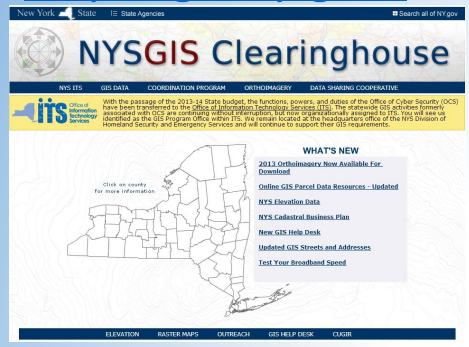
National Land Cover Database

- Earth Resources Observation and Science (EROS) Center is central to the creation of the National Land Cover Database (NLCD), which is updated every five years and stands as the definitive land cover database for the United States.
- NLCD is generated in cooperation with Federal agencies working together to produce current, nationally consistent, land cover products for all 50 states and Puerto Rico.
- NLCD is used for thousands of applications that require information on landcover location or where it is changing. The latest iteration is NCLD 2016.

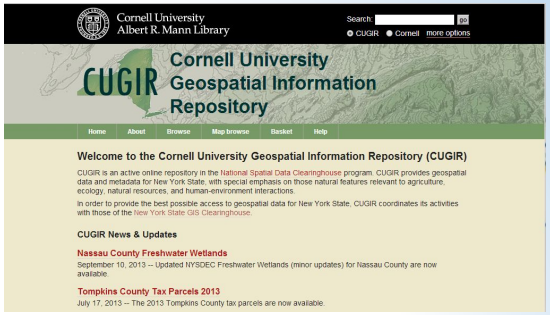


Statewide data also available: New York

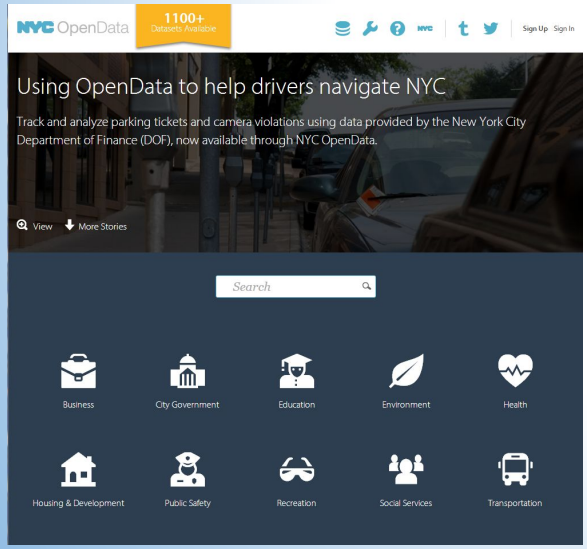
http://gis.ny.gov/



http://cugir.mannlib.cornell.edu/



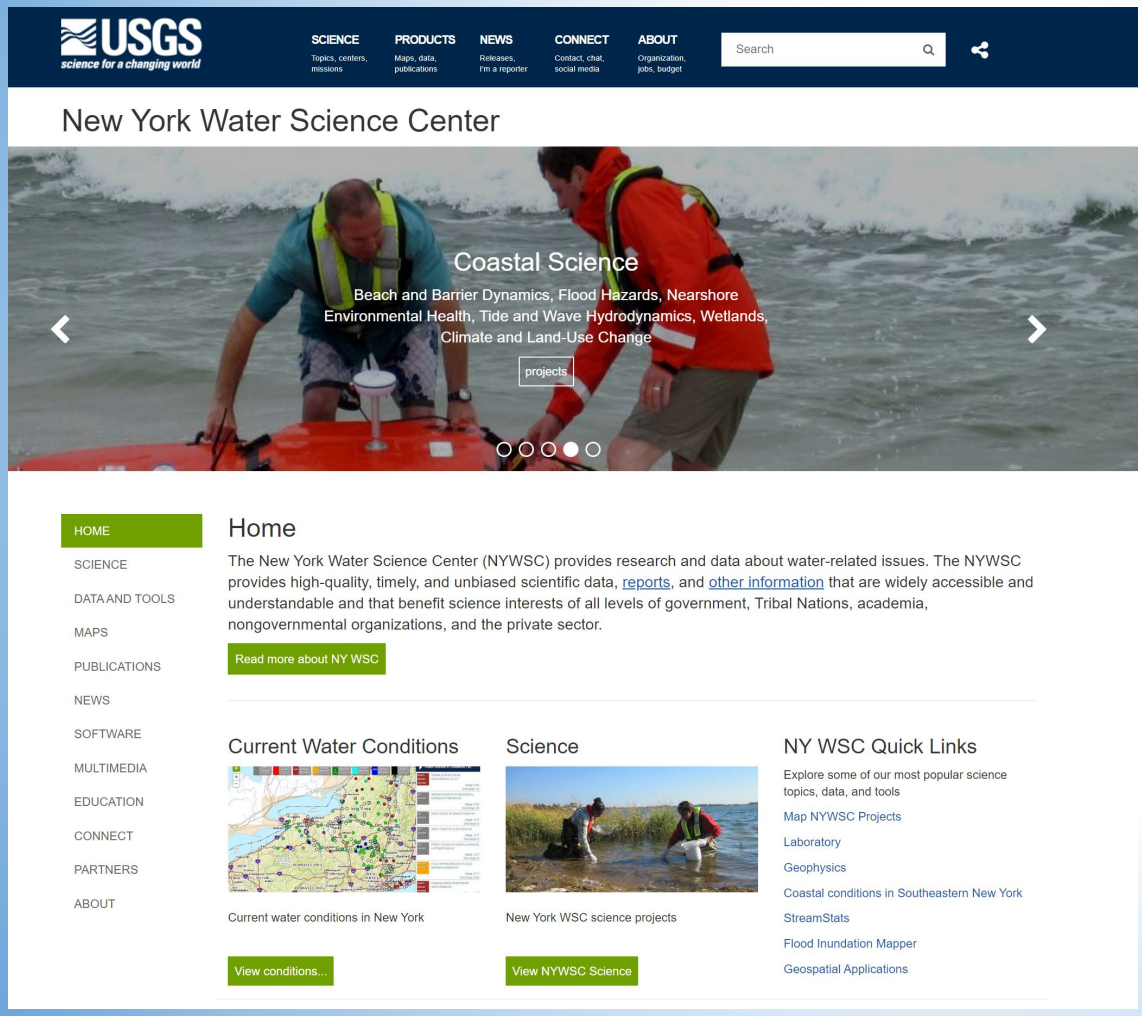
https://data.cityofnewyork.us /

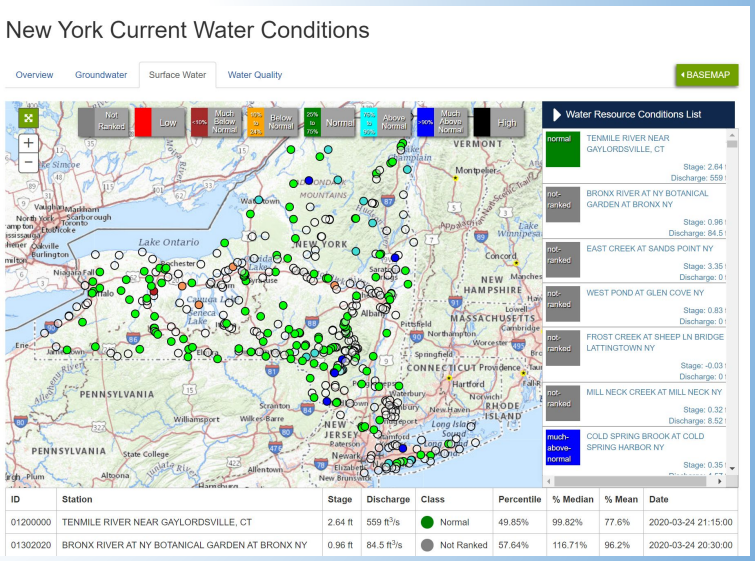


http://www.nan.usace.army.mil/BusinessWithUs/GeospatialDataSystemsActivities.aspx

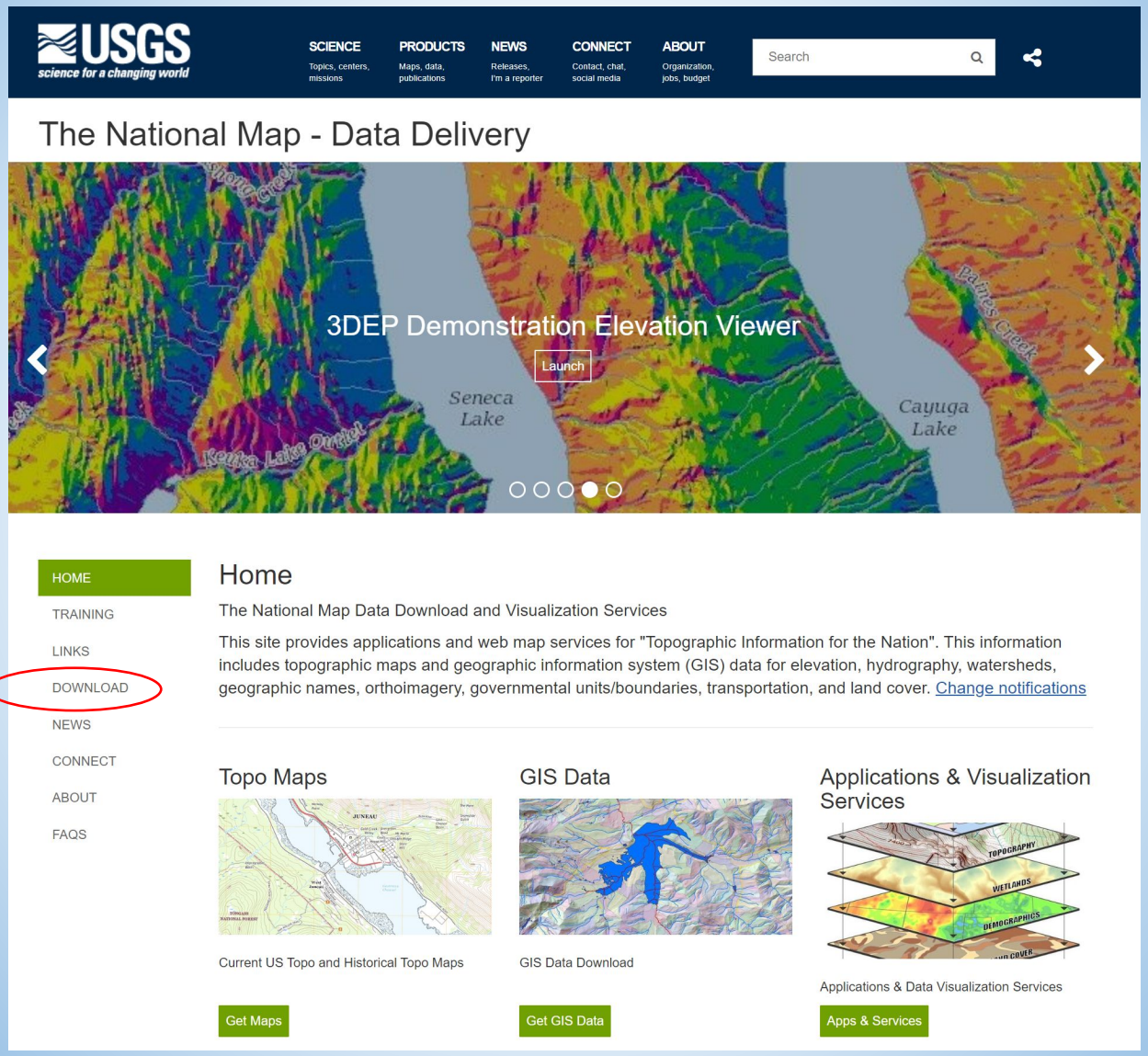
USGS New York Water Science Center

https://www.usgs.gov/centers/ny-water

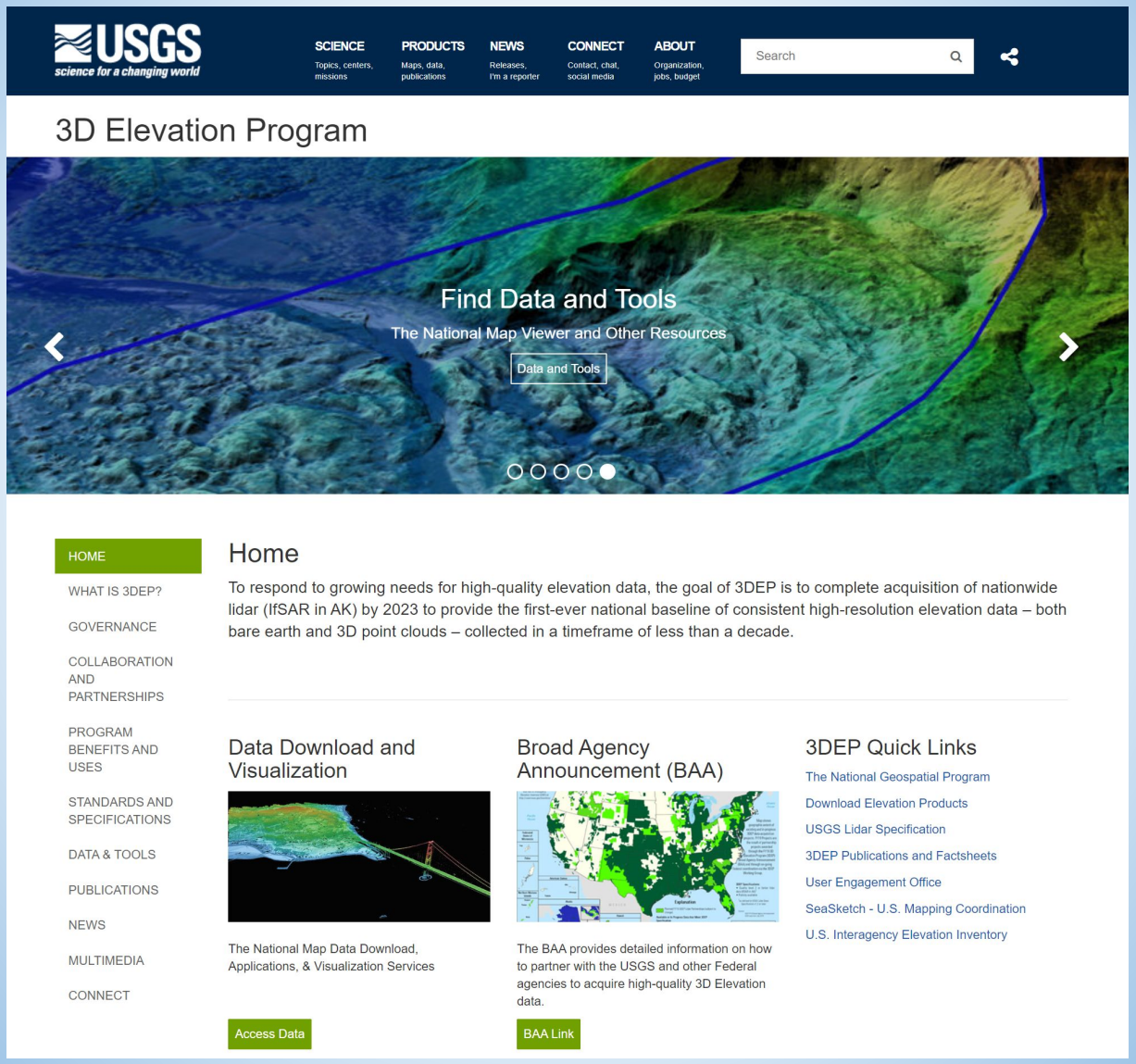




National Map Data



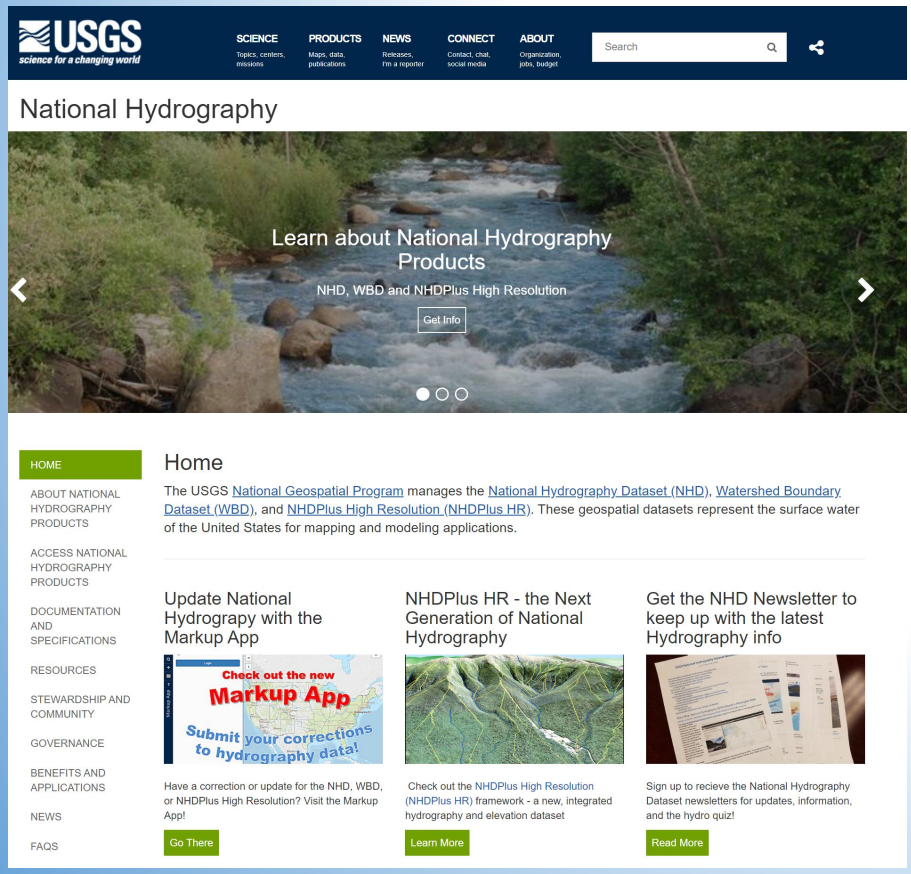
National Elevation Data (NED)

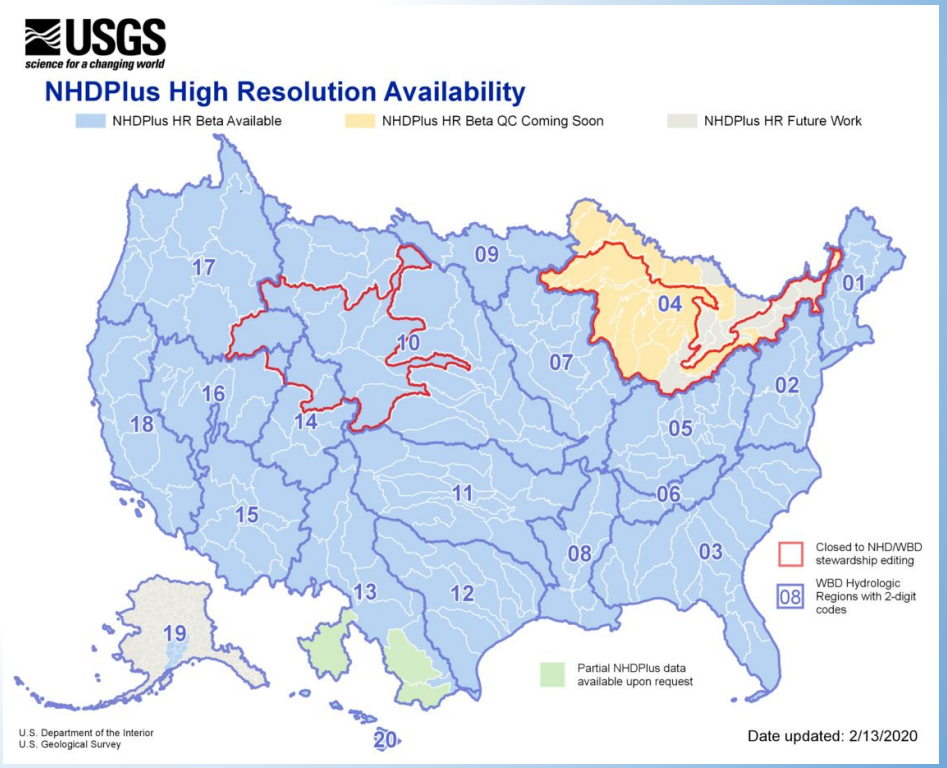


National Hydrography Dataset

- The National Hydrography Dataset (NHD) represents the water drainage network of the United States with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream-gages.

https://www.usgs.gov/core-science-systems/ngp/national-hydrography

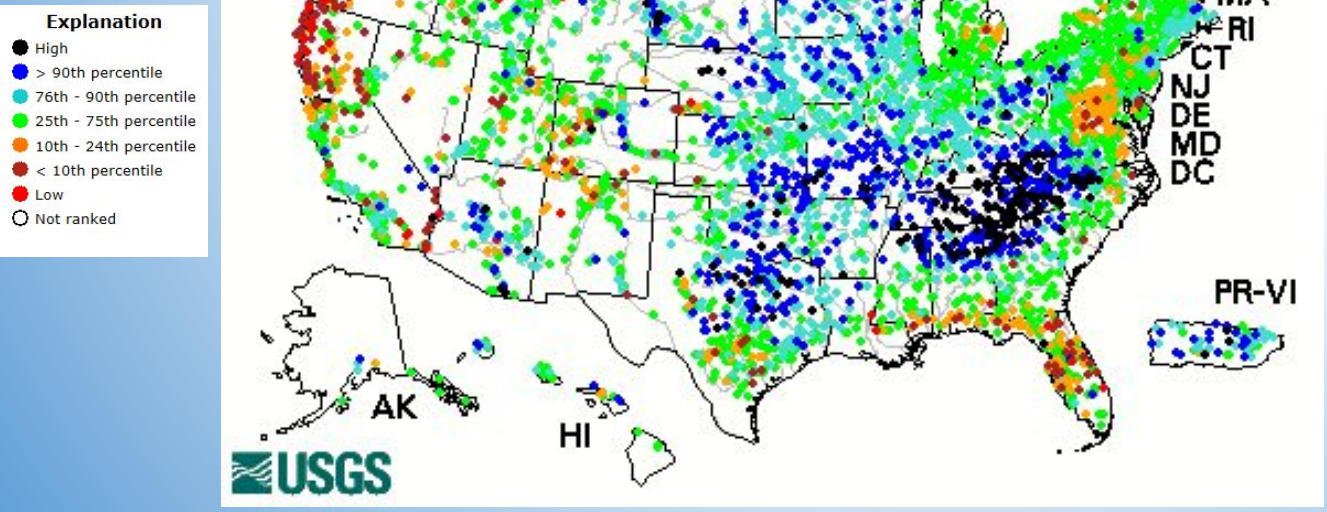


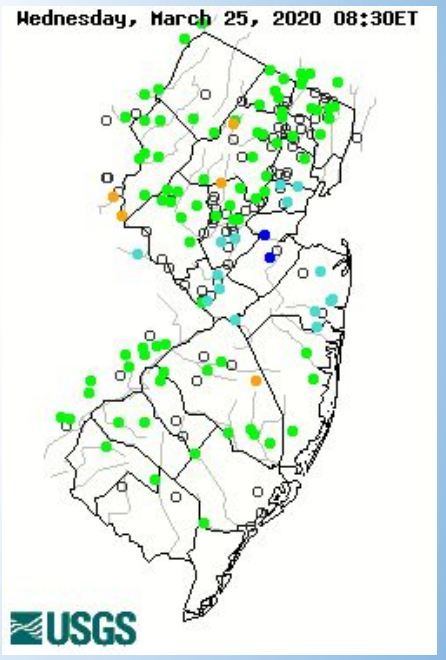


USGS national water datasets

- Surface-water data, such as gage height (stage) and streamflow (discharge), are collected at major rivers, lakes, and reservoirs.
- Groundwater data, such as water level, are collected at wells and springs.

https://waterdata.usgs.gov/nwis





New Jersey Streamflow Table

New Jersey Lake and Reservoir Table

New Jersey Groundwater Table

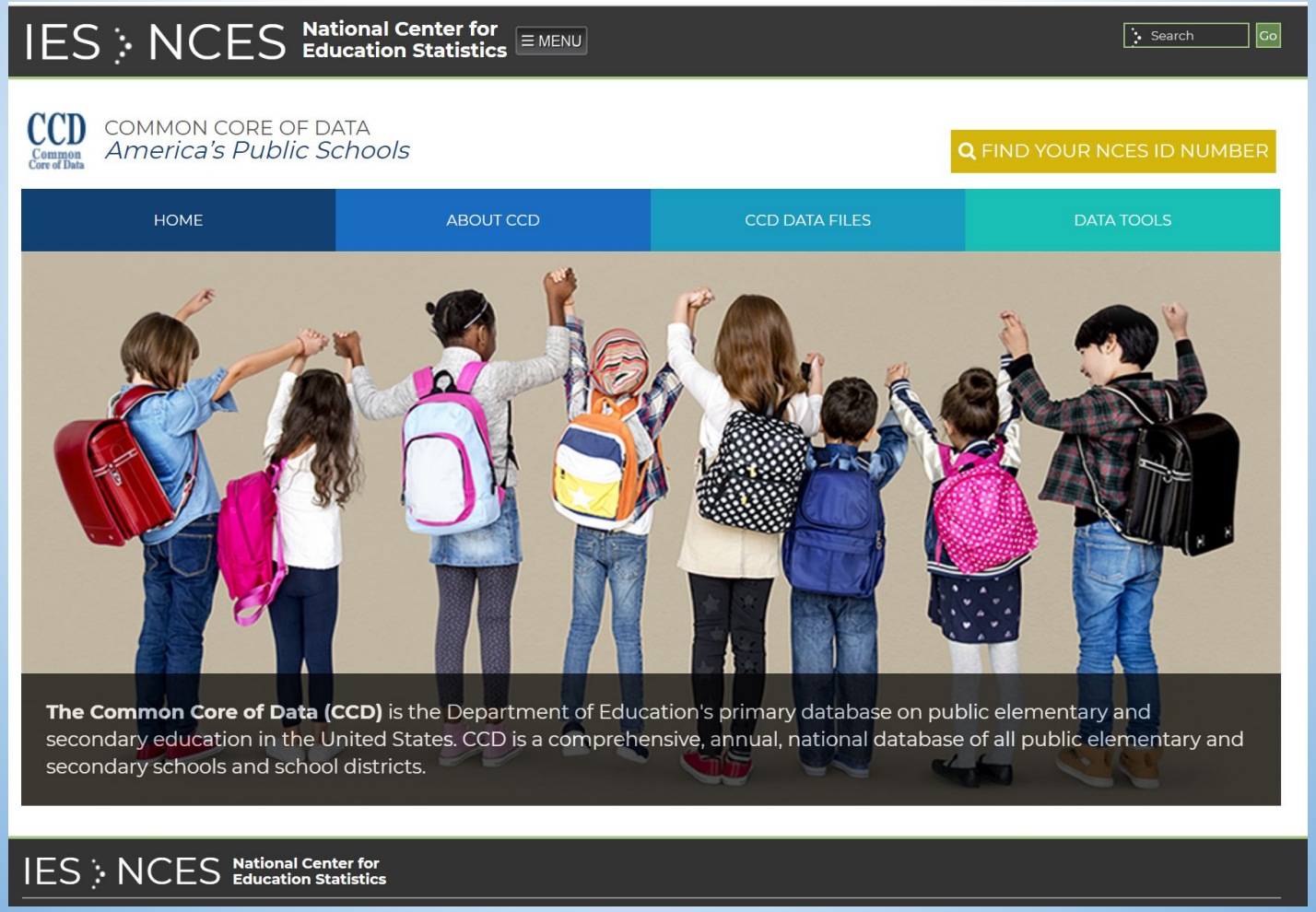
New Jersey Water-Quality Table

New Jersey Weather Table

New Jersey Tide Table

National Center for Education Statistics

- The National Center for Education Statistics (NCES) is the primary federal entity for collecting and analyzing data related to education. https://nces.ed.gov/ccd/



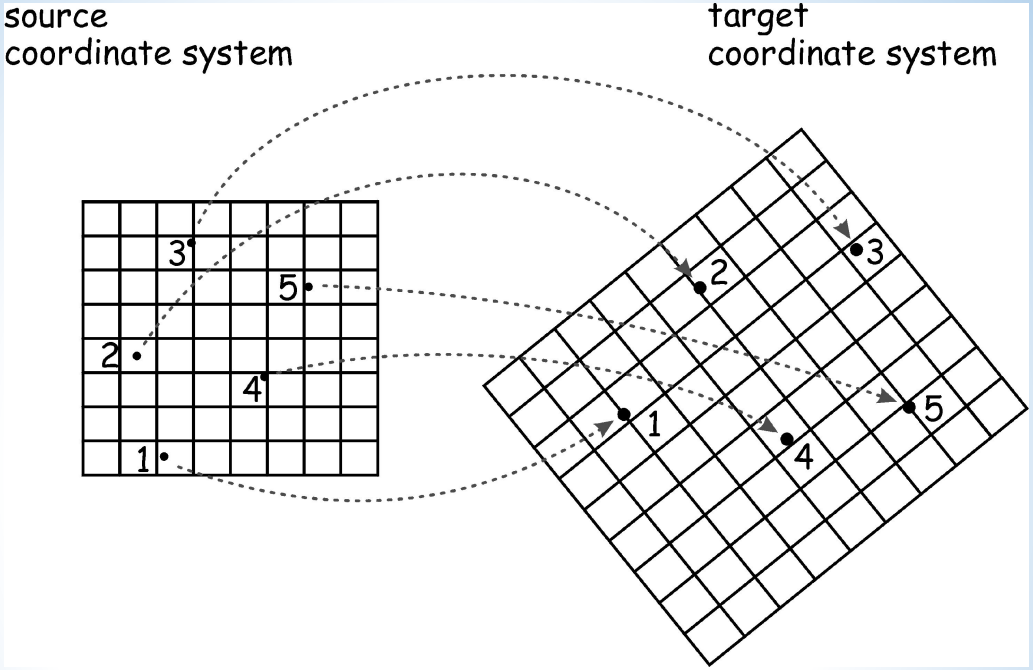
National Historical Geographic Information System (NHGIS)

- The National Historical Geographic Information System (NHGIS) provides easy access to summary tables and time series of population, housing, agriculture, and economic data, along with GIS-compatible boundary files, for years from 1790 through the present and for all levels of U.S. census geography, including states, counties, tracts, and blocks.

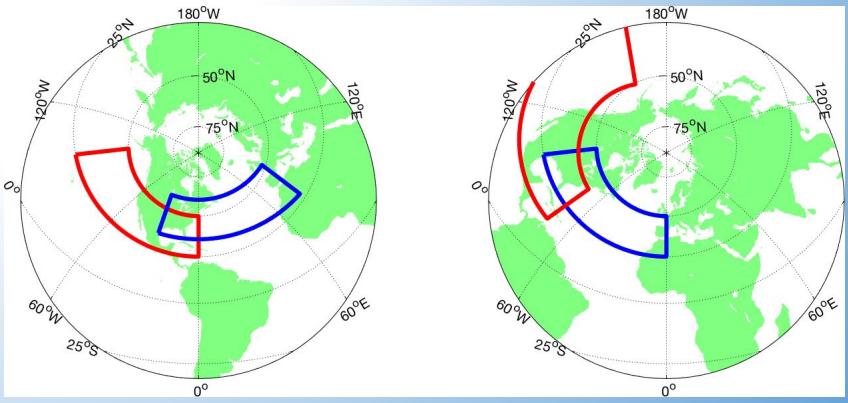
Geo-referencing

Coordinate Transformation and Georeferencing

The digitized world versus the “real world”

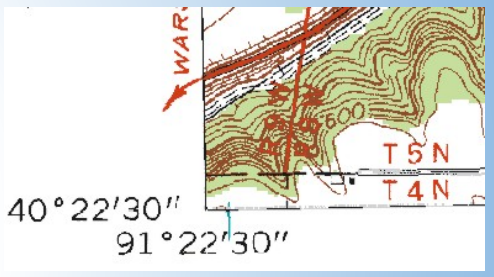


- Airplane heading
- Photo on scanner
- Paper map orientation on digitizing tablet
- Distortions, etc.



Control Points

- **Georeferencing**: The process involves identifying a series of ground **control points**—known x,y coordinates—that link locations on the raster dataset with locations in the spatially referenced data.
- **Control points** are locations that can be accurately identified on the raster dataset and in real-world coordinates.



Georeferencing Example

Historic map georeferenced to the basemap.