

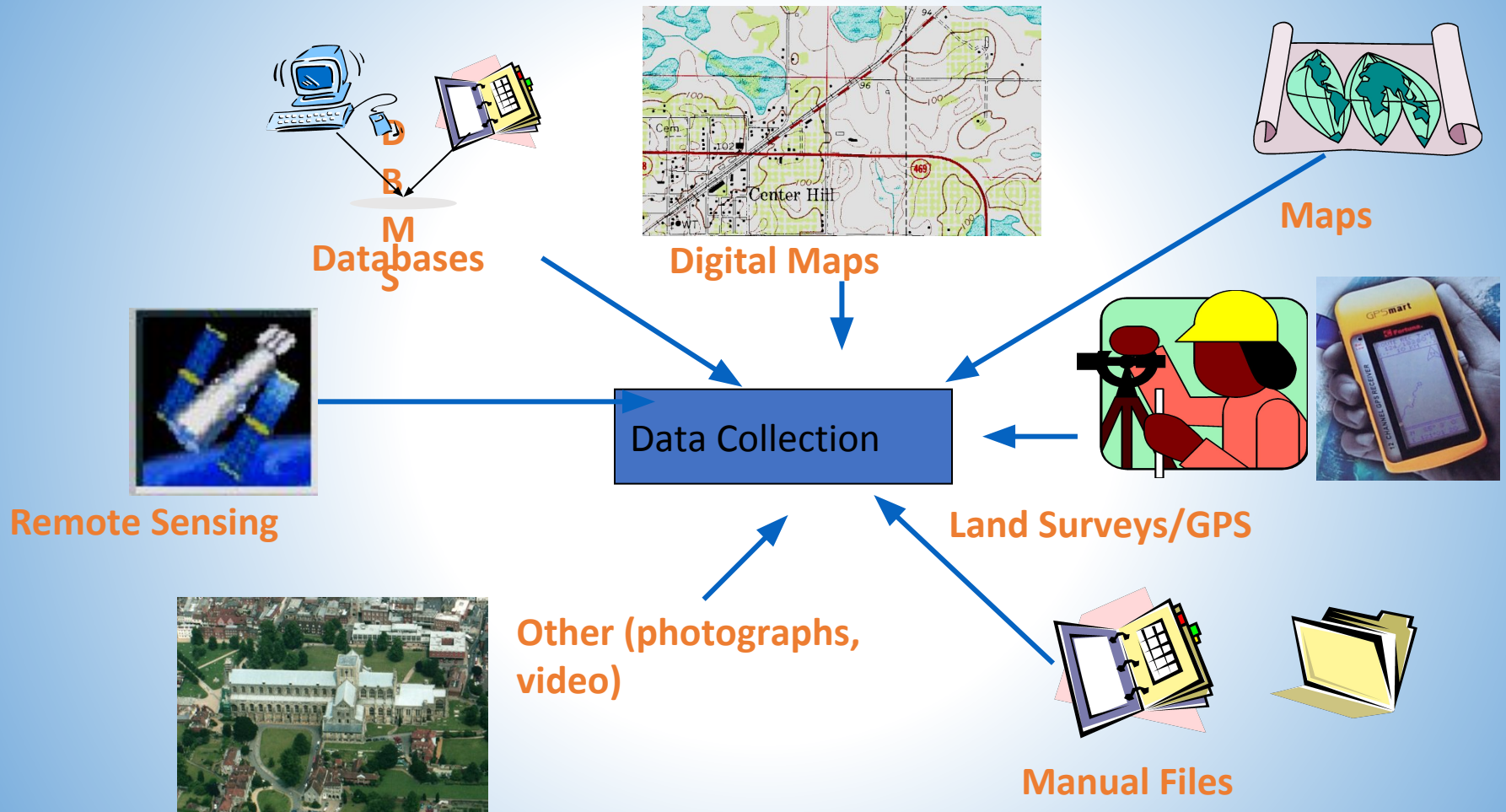
GIS Data Source

Dr. Tarendra Lakhankar

Questions Before Getting Data

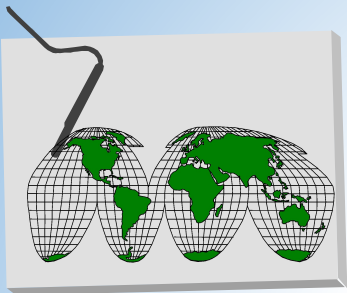
- Where can we get GIS data?
 - Government or commercial
 - Payment or not
 - Collection (new) or existing
- How can we get GIS data?
 - Format conversion
 - Quality/Accuracy
- What is the format?
 - Digital (raster or vector)
 - Non-digital (hardcopy)
 - Projection

Sources of GIS Data

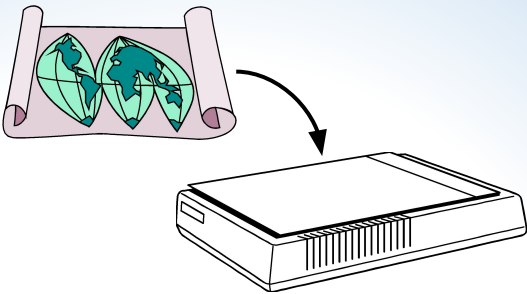


Data Collection is the MOST expensive and time consuming task

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

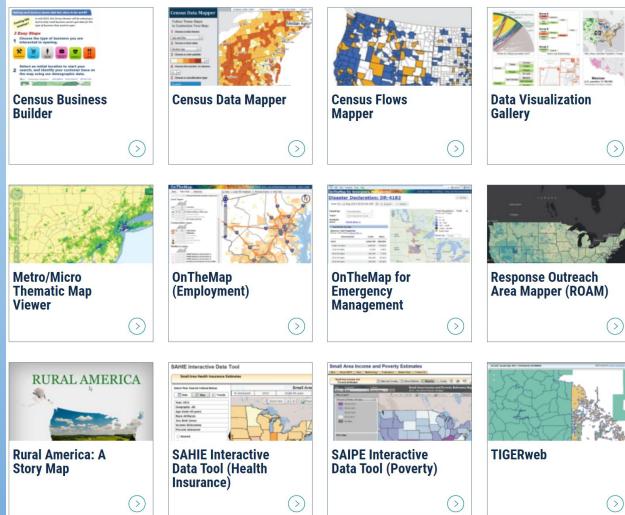
- Via Web searches (e.g., Google.com)
Many major data providers make their data available via the WWW
 - <http://www.esri.com/software/arcgis/arcgisonline>
=> nice base maps
 - https://en.wikipedia.org/wiki/List_of_GIS_data_sources
These are the best resources listed on GIS data websites.
 - <https://gisgeography.com/best-free-gis-data-sources-raster-vector/>



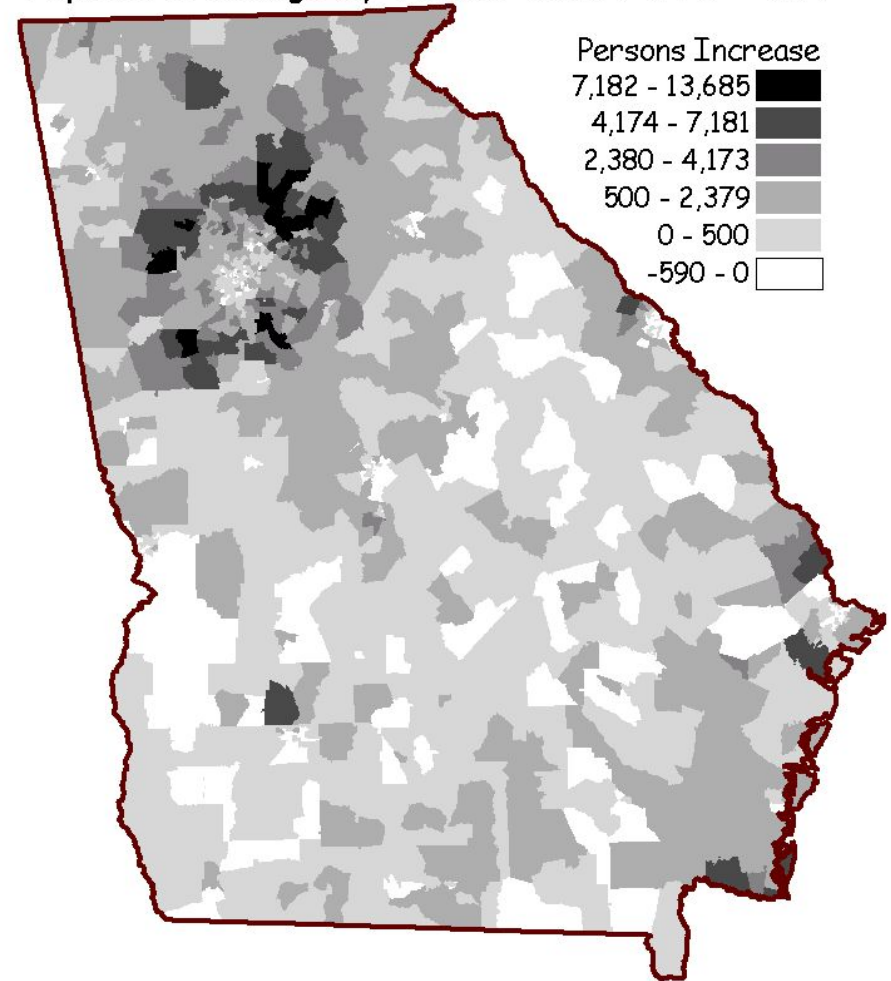
- TIGER system:
Topologically Integrated
Geographic
Encoding and Referencing
- Typically, vector polygons
with population, income,
health, age, etc.,
attributes.

Interactive Maps

Work with interactive mapping tools from across the Census Bureau.



Population Change by Census Tract, 1990 - 1999



<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>

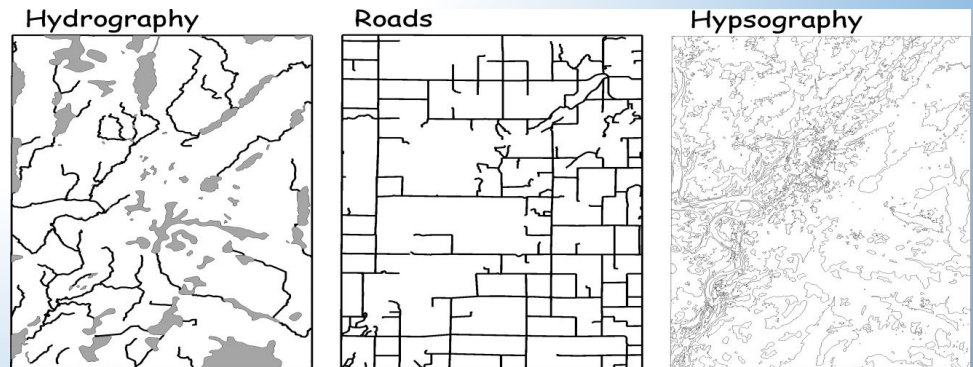
Federal Data Agencies

- <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

- 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)

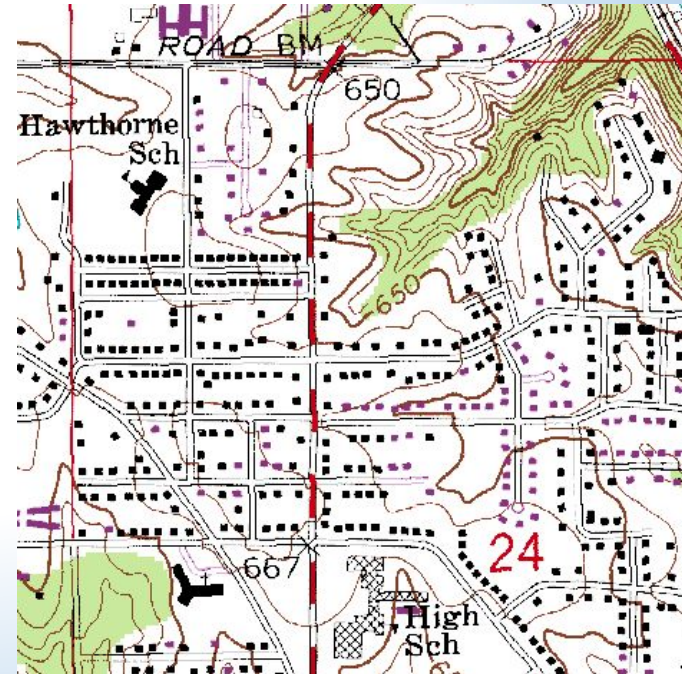
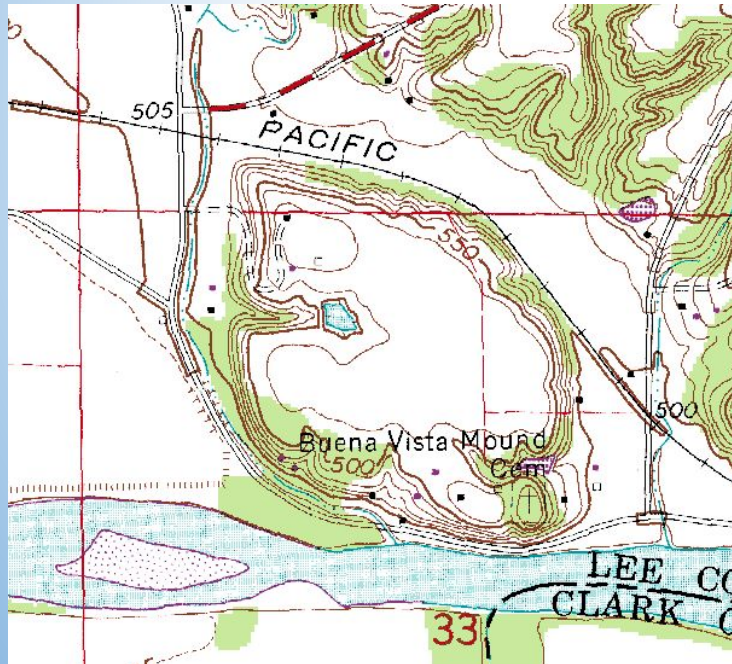
Digital Line Graphs (DLGs)

- 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



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.

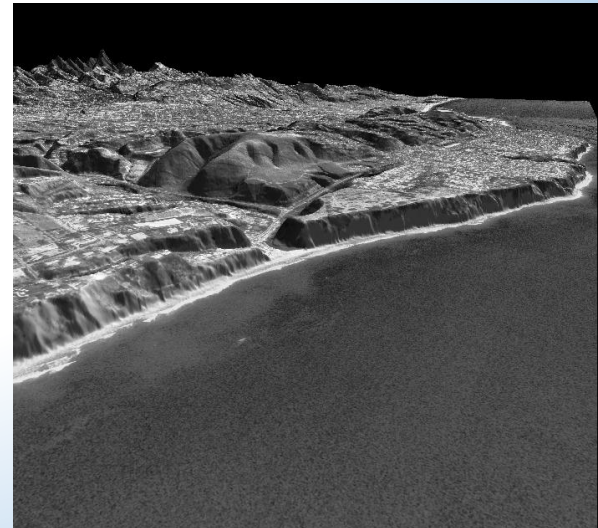


USGS 1:24,000 DRG

Digital Orthophoto Quadrangles (DOQs)

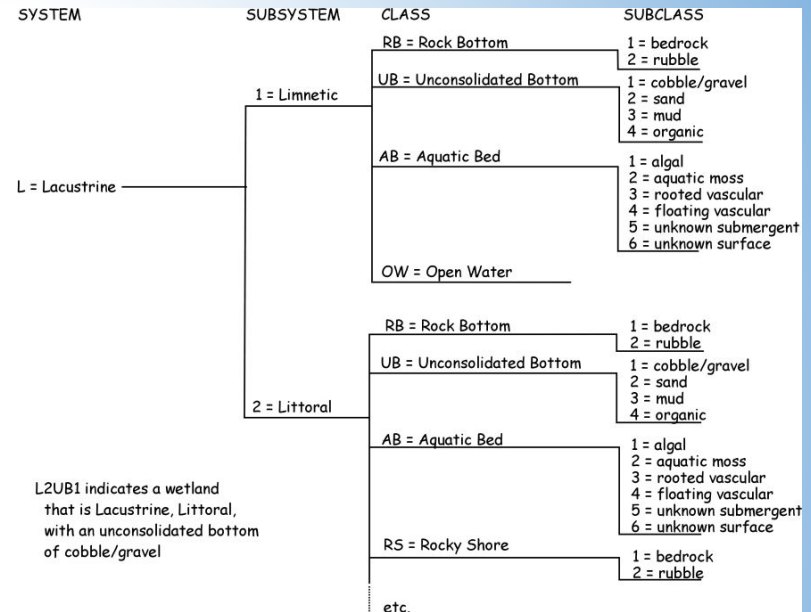
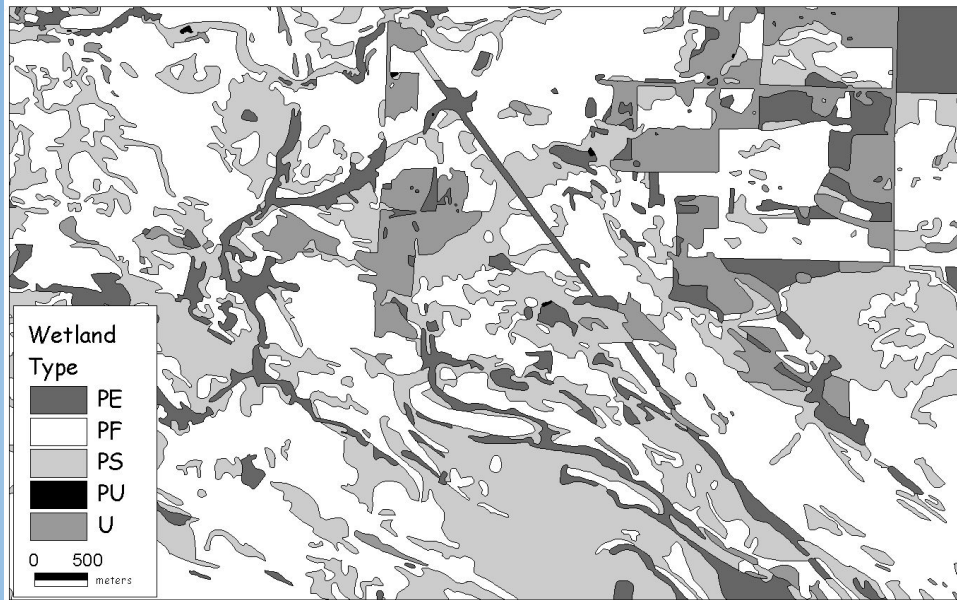
- Aerial photographs
- Scanned
- Corrected for distortions (camera, terrain etc.) to be orthographic
- MMU about 1 m; resolution = 1m/pixel
- Usually false-color IR
- Frequently used for updating land cover, GCP location, spatial changes etc.
- Flown approx. every 2 years
- Lead agency: USGS

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

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Formerly the National Climatic Data Center (NCDC)... [more about](#)

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Search NCEI

National Centers for Environmental Information

NOAA's National Centers for Environmental Information (NCEI) is responsible for preserving, monitoring, assessing, and providing public access to the Nation's treasure of climate and weather data and information.

[Learn more about NCEI](#)

NCEI News

Latest NCEI News

There's a lot going on at NCEI. Discover more about us and Earth's climate, oceans, coasts, and geophysics in these featured news stories.

Climate News Archive

Find useful information in our climate news archive, which covers scores of climate-related topics highlighted between 2012 and early 2017.

Latest NCEI News

On This Day: The 1993 Storm

March 03, 2020
In March 1993, the Coast, claiming more than \$1 billion in damage.

The Ocean's Secret

February 20, 2020
NCEI created the National Oceanic and Atmospheric Administration Database, which contains the world's largest archive of oceanographic data.

The Heart of Alaska

February 14, 2020
In honor of Valentine's Day, NCEI highlights several lovely locations in Alaska.

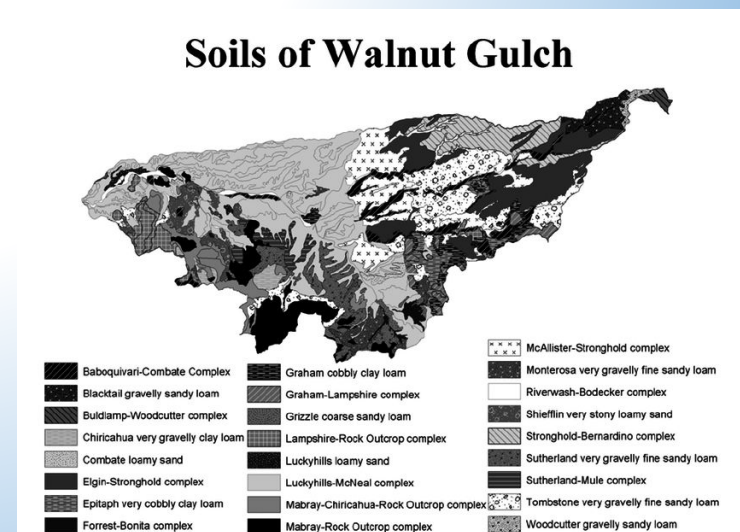
[Read more about NCEI](#)

- Weather and Climate
- Coasts
- Oceans
- Geophysics

<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.

USGS
science for a changing world

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Earth Resources Observation and Science (EROS) Center

National Land Cover Database

NLCD 2016 Available Now!
Visit the full site

Perennial Ice and Snow
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forest
Evergreen Forest
Mixed Forest

Overview

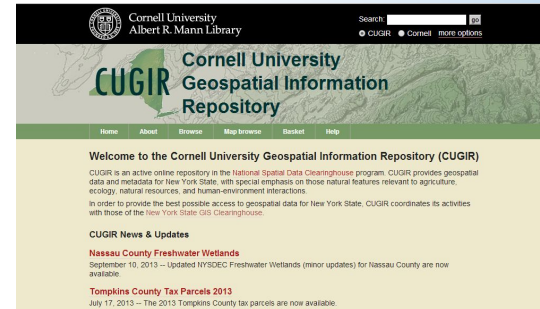
EROS is central to the creation of the National Land Cover Database (NLCD), which is updated every five years and stands as the definitive land cover database for the United States. Status - Active

Statewide data also available: New York

<http://gis.ny.gov/>



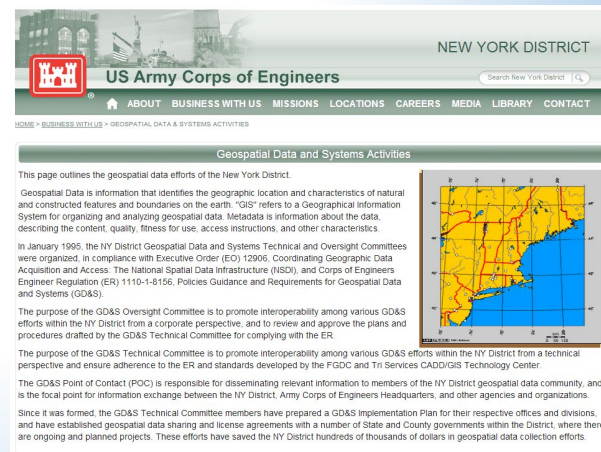
<http://cugir.mannlib.cornell.edu/>



<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>



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New York Water Science Center

Coastal Science

Beach and Barrier Dynamics, Flood Hazards, Nearshore Environmental Health, Tide and Wave Hydrodynamics, Wetlands, Climate and Land-Use Change

projects

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Home

The New York Water Science Center (NYWSC) provides research and data about water-related issues. The NYWSC provides high-quality, timely, and unbiased scientific data, [reports](#), and [other information](#) that are widely accessible and understandable and that benefit science interests of all levels of government, Tribal Nations, academia, nongovernmental organizations, and the private sector.

[Read more about NYWSC](#)

Current Water Conditions



Current water conditions in New York

[View conditions...](#)

Science



New York WSC science projects

[View NYWSC Science](#)

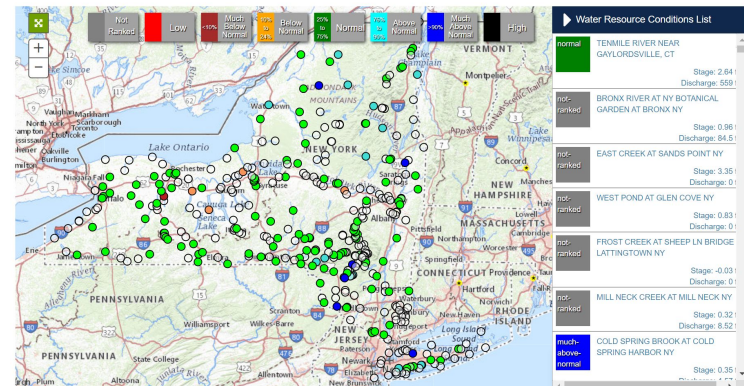
NY WSC Quick Links

- Explore some of our most popular science topics, data, and tools
- [Map NYWSC Projects](#)
- Laboratory
- Geophysics
- Coastal conditions in Southeastern New York
- StreamStats
- Flood Inundation Mapper
- Geospatial Applications

New York Current Water Conditions


Overview Groundwater Surface Water Water Quality

BASEMAP



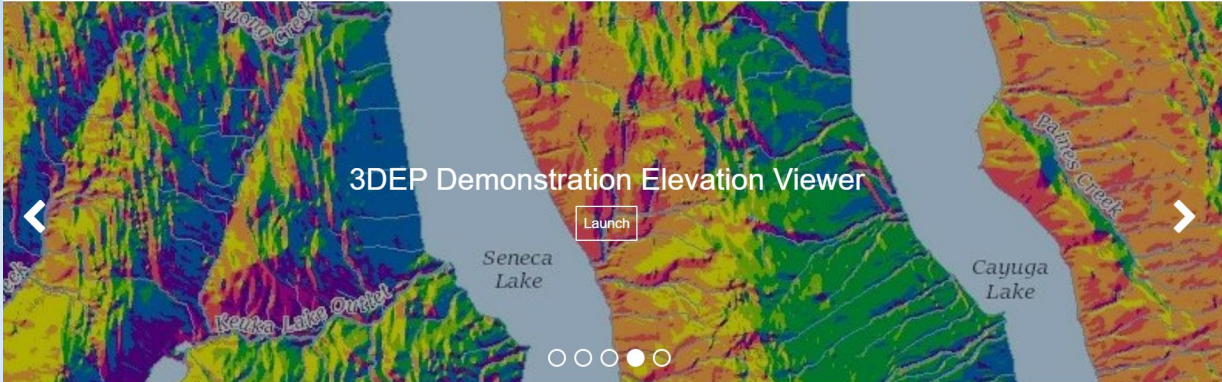
ID	Station	Stage	Discharge	Class	Percentile	% Median	% Mean	Date
01200000	TENMILE RIVER NEAR GAYLORDSVILLE, CT	2.64 ft	559 ft ³ /s	● Normal	49.85%	99.82%	77.6%	2020-03-24 21:15:00
01302020	BRONX RIVER AT NY BOTANICAL GARDEN AT BRONX NY	0.96 ft	84.5 ft ³ /s	● Not Ranked	57.64%	116.71%	96.2%	2020-03-24 20:30:00

National Map Data



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Topics, centers, missions
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The National Map - Data Delivery




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- FAQS

Home

The National Map Data Download and Visualization Services

This site provides applications and web map services for "Topographic Information for the Nation". This information includes topographic maps and geographic information system (GIS) data for elevation, hydrography, watersheds, geographic names, orthoimagery, governmental units/boundaries, transportation, and land cover. [Change notifications](#)

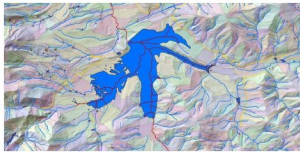
Topo Maps



Current US Topo and Historical Topo Maps

[Get Maps](#)

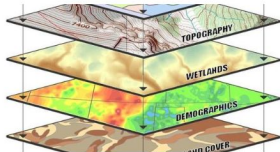
GIS Data



GIS Data Download

[Get GIS Data](#)


Applications & Visualization Services



Applications & Data Visualization Services

[Apps & Services](#)

National Elevation Data (NED)



SCIENCE
Topics, centers, missions

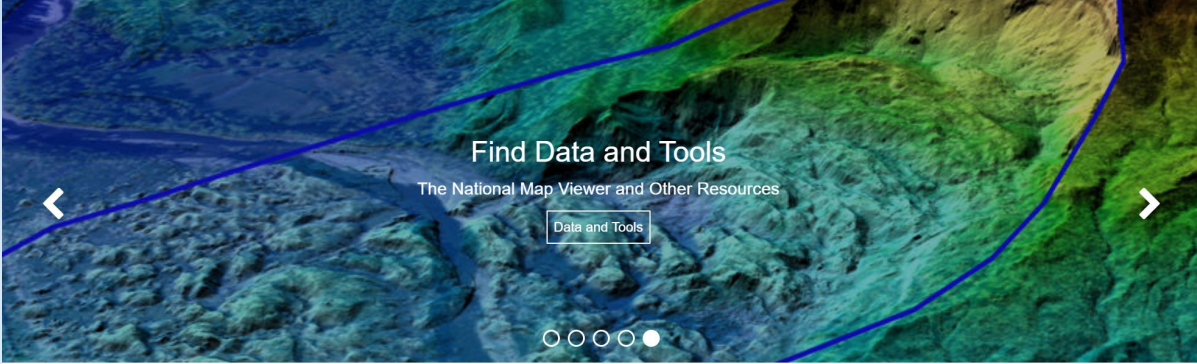
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3D Elevation Program



Find Data and Tools
The National Map Viewer and Other Resources

[Data and Tools](#)

HOME

WHAT IS 3DEP?

GOVERNANCE

COLLABORATION AND PARTNERSHIPS

PROGRAM BENEFITS AND USES

STANDARDS AND SPECIFICATIONS

DATA & TOOLS

PUBLICATIONS

NEWS

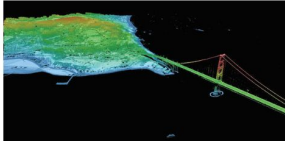
MULTIMEDIA

CONNECT

Home

To respond to growing needs for high-quality elevation data, the goal of 3DEP is to complete acquisition of nationwide lidar (IfSAR in AK) by 2023 to provide the first-ever national baseline of consistent high-resolution elevation data – both bare earth and 3D point clouds – collected in a timeframe of less than a decade.


Data Download and Visualization



The National Map Data Download, Applications, & Visualization Services

[Access Data](#)

Broad Agency Announcement (BAA)



The BAA provides detailed information on how to partner with the USGS and other Federal agencies to acquire high-quality 3D Elevation data.

[BAA Link](#)

3DEP Quick Links

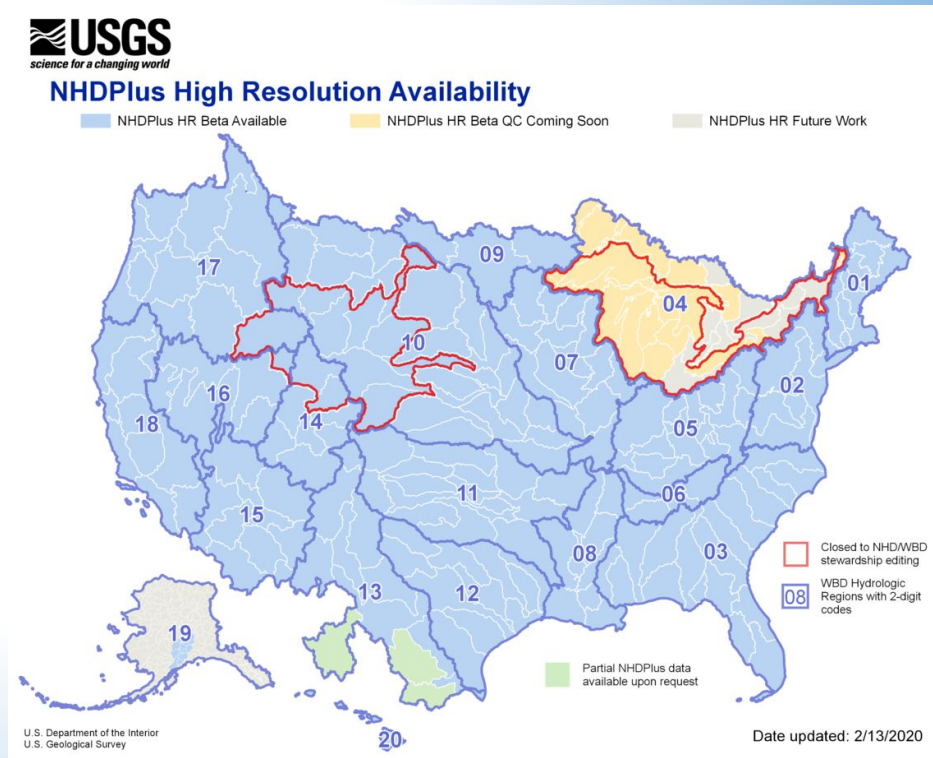
- [The National Geospatial Program](#)
- [Download Elevation Products](#)
- [USGS Lidar Specification](#)
- [3DEP Publications and Factsheets](#)
- [User Engagement Office](#)
- [SeaSketch - U.S. Mapping Coordination](#)
- [U.S. Interagency Elevation Inventory](#)

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>

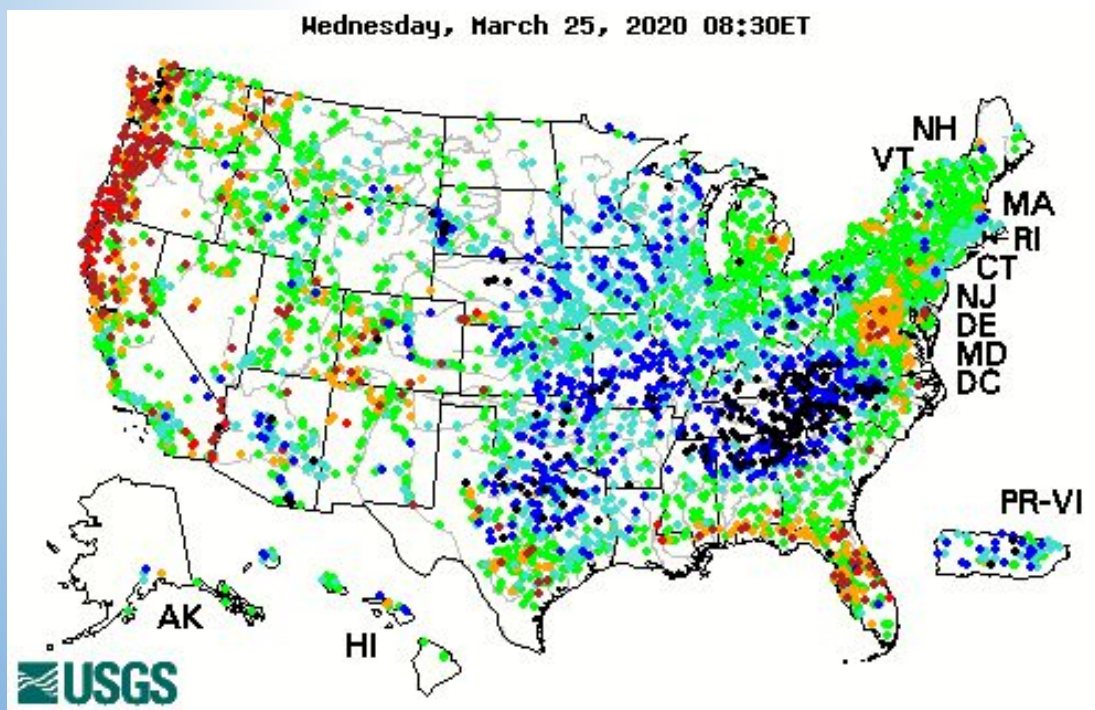
The screenshot shows the USGS National Hydrography website homepage. At the top is the USGS logo and navigation menu with categories: SCIENCE, PRODUCTS, NEWS, CONNECT, and ABOUT. A search bar is also present. The main header reads "National Hydrography" and features a large image of a river with the text "Learn about National Hydrography Products" and "NHD, WBD and NHDPlus High Resolution". Below this is a "Get Info" button. The left sidebar contains a "HOME" section and a list of links: ABOUT NATIONAL HYDROGRAPHY PRODUCTS, ACCESS NATIONAL HYDROGRAPHY PRODUCTS, DOCUMENTATION AND SPECIFICATIONS, RESOURCES, STEWARDSHIP AND COMMUNITY, GOVERNANCE, and BENEFITS AND APPLICATIONS. The main content area has three columns: "Update National Hydrography with the Markup App" (with a "Go There" button), "NHDPlus HR - the Next Generation of National Hydrography" (with a "Learn More" button), and "Get the NHD Newsletter to keep up with the latest Hydrography info" (with a "Read More" button).



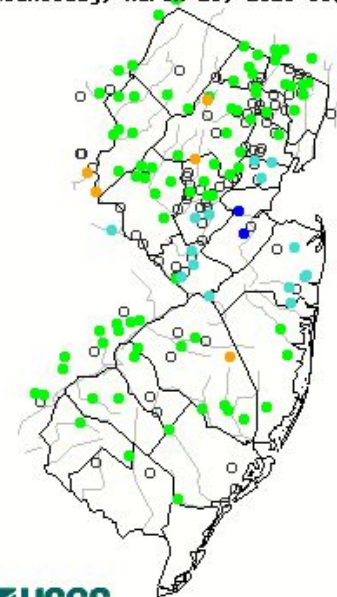
USGS national water datasets

- 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>



Wednesday, March 25, 2020 08:30ET



[New Jersey Streamflow Table](#)

[New Jersey Lake and Reservoir Table](#)

[New Jersey Groundwater Table](#)

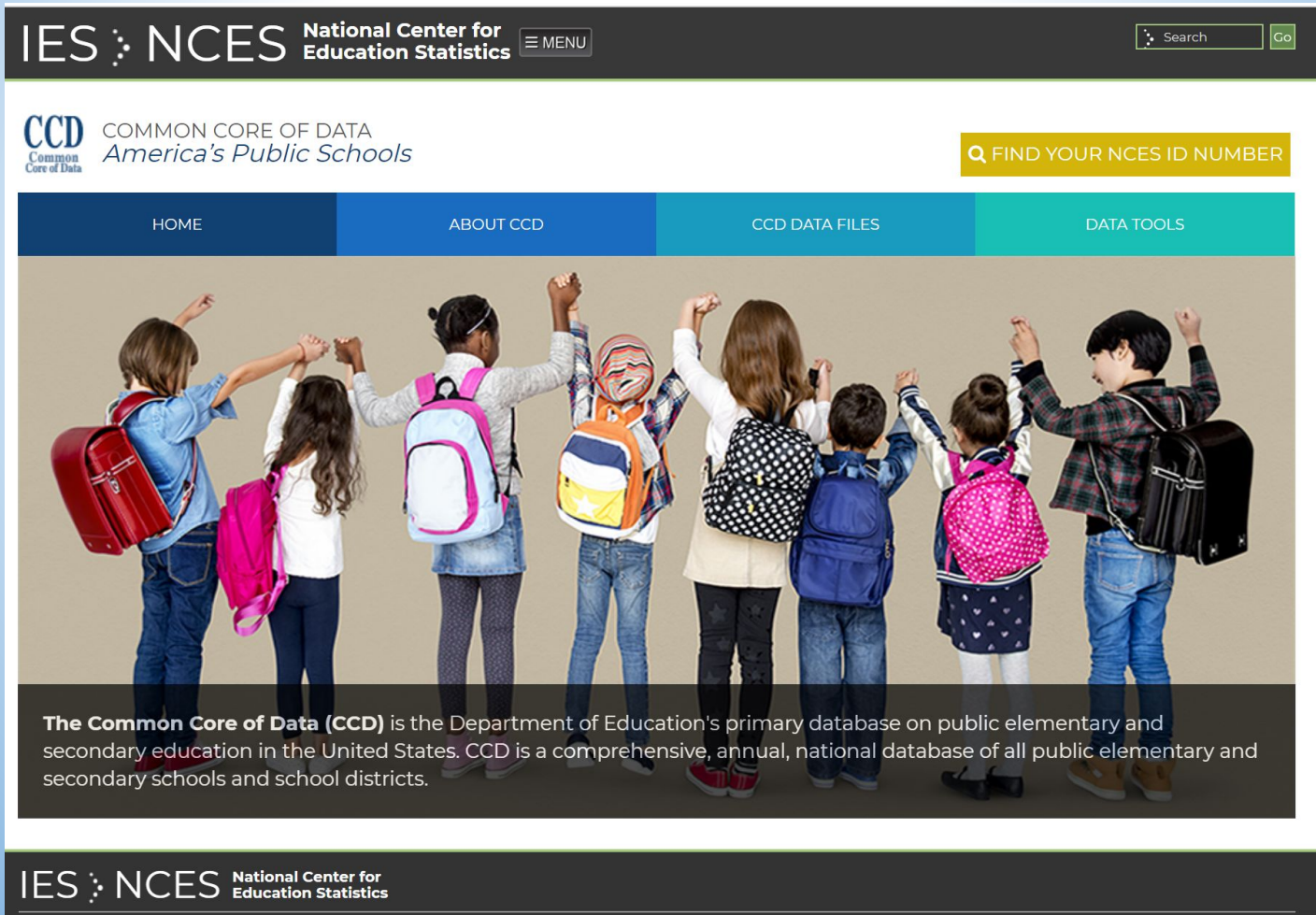
[New Jersey Water-Quality Table](#)

[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/>



The screenshot displays the website for the National Center for Education Statistics (NCES), specifically the Common Core of Data (CCD) section. The header features the IES and NCES logos, the text "National Center for Education Statistics", a "MENU" button, and a search bar with a "Go" button. Below the header, the CCD logo is accompanied by the text "COMMON CORE OF DATA" and "America's Public Schools". A yellow button labeled "FIND YOUR NCES ID NUMBER" is positioned to the right. A navigation bar contains four tabs: "HOME", "ABOUT CCD", "CCD DATA FILES", and "DATA TOOLS". The main content area features a photograph of eight diverse children with backpacks, seen from behind, holding hands in a circle. Below the photo, a text box explains that the CCD is the Department of Education's primary database on public elementary and secondary education in the United States. The footer repeats the IES and NCES logos and the text "National Center for Education Statistics".

IES : NCES National Center for Education Statistics

CCD COMMON CORE OF DATA
Common Core of Data America's Public Schools

Q FIND YOUR NCES ID NUMBER

HOME ABOUT CCD CCD DATA FILES DATA TOOLS

The Common Core of Data (CCD) is the Department of Education's primary database on public elementary and secondary education in the United States. CCD is a comprehensive, annual, national database of all public elementary and secondary schools and school districts.

IES : NCES National Center for Education Statistics

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.

IPUMS NHGIS

NHGIS GEOMARKER NATIONAL HISTORICAL GIS

HOME | SELECT DATA | MY DATA | FAQ | HELP | LOG IN

DATA
SELECT DATA
MY DATA HISTORY
API

USER RESOURCES
ABOUT NHGIS
FAQ
DATA AVAILABILITY
USER'S GUIDE
OVERVIEW OF DATASETS
GEOGRAPHIC CROSSWALKS
ENVIRONMENTAL SUMMARIES

DOWNLOAD U.S. CENSUS DATA TABLES & MAPPING FILES

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. [Read more.](#)

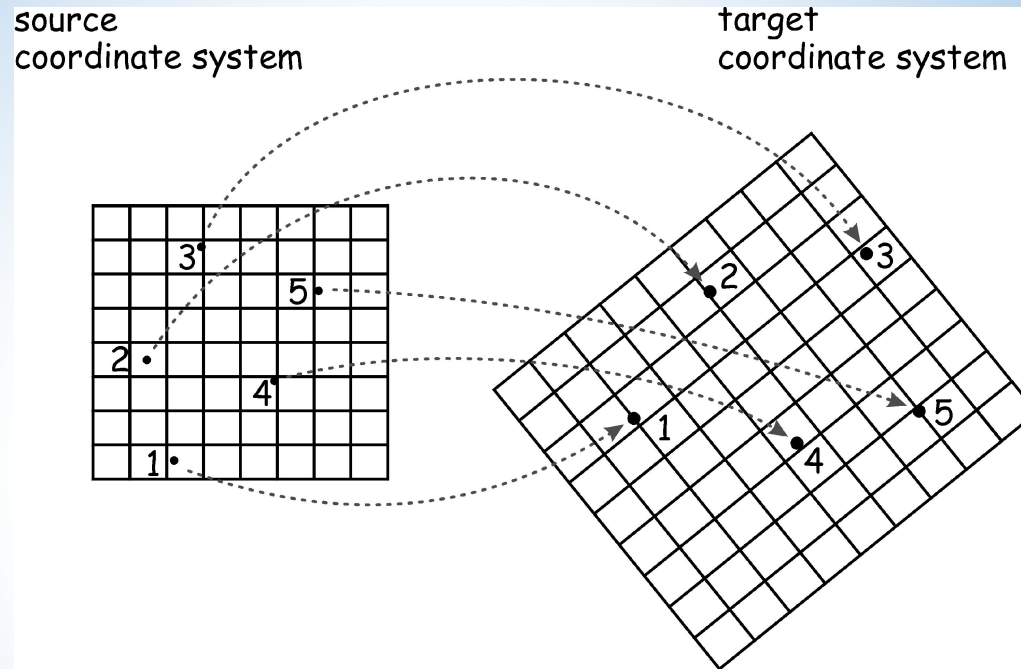
START HERE: [Get Data](#)

[WHAT IS IPUMS?](#)

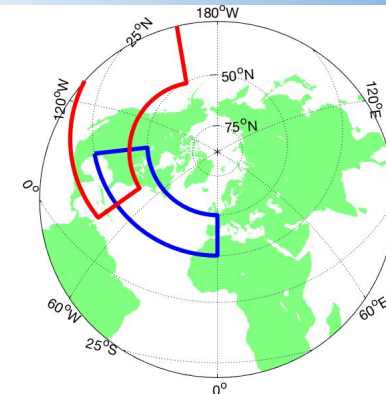
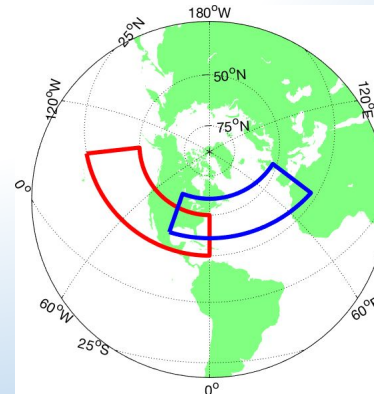
Geo-referencing

Coordinate Transformation and Georeferencing

The digitized world versus the “real world”

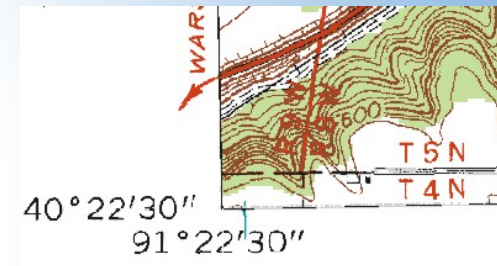


- Airplane heading
- Photo on scanner
- Paper map orientation on digitizing tablet
- Distortions, etc.



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.