

Mapping

Wednesday, March 3rd

What is Mapping used for?

- Orientation, geography, and directions
 - Elevation, lat, long, etc.
- Supporting and delivering data to the public and professionals
- Organizing data into a visual medium
- Find and analyze trends
- Support research and education

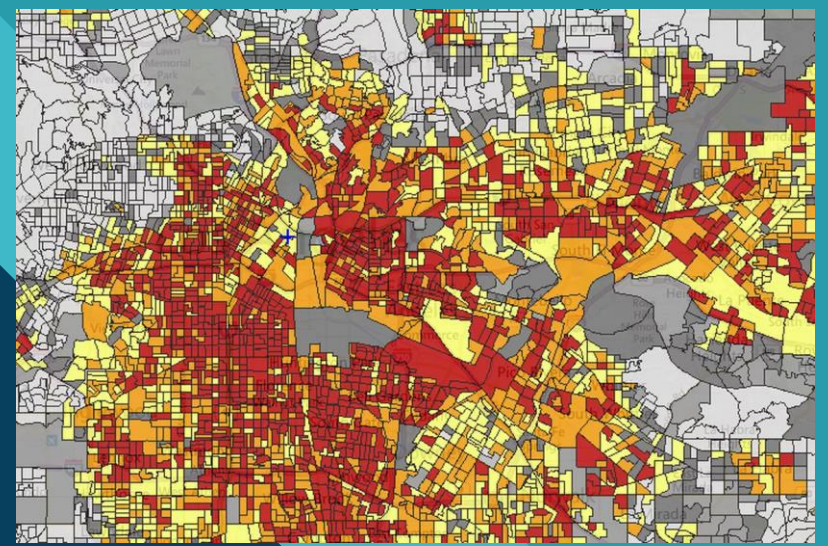


Photo: curbedLA

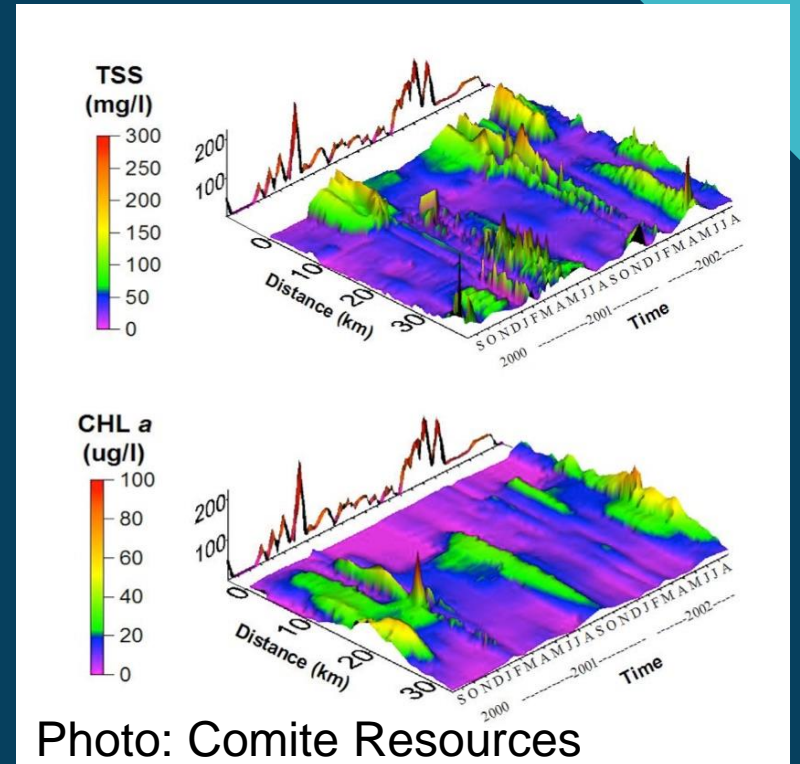
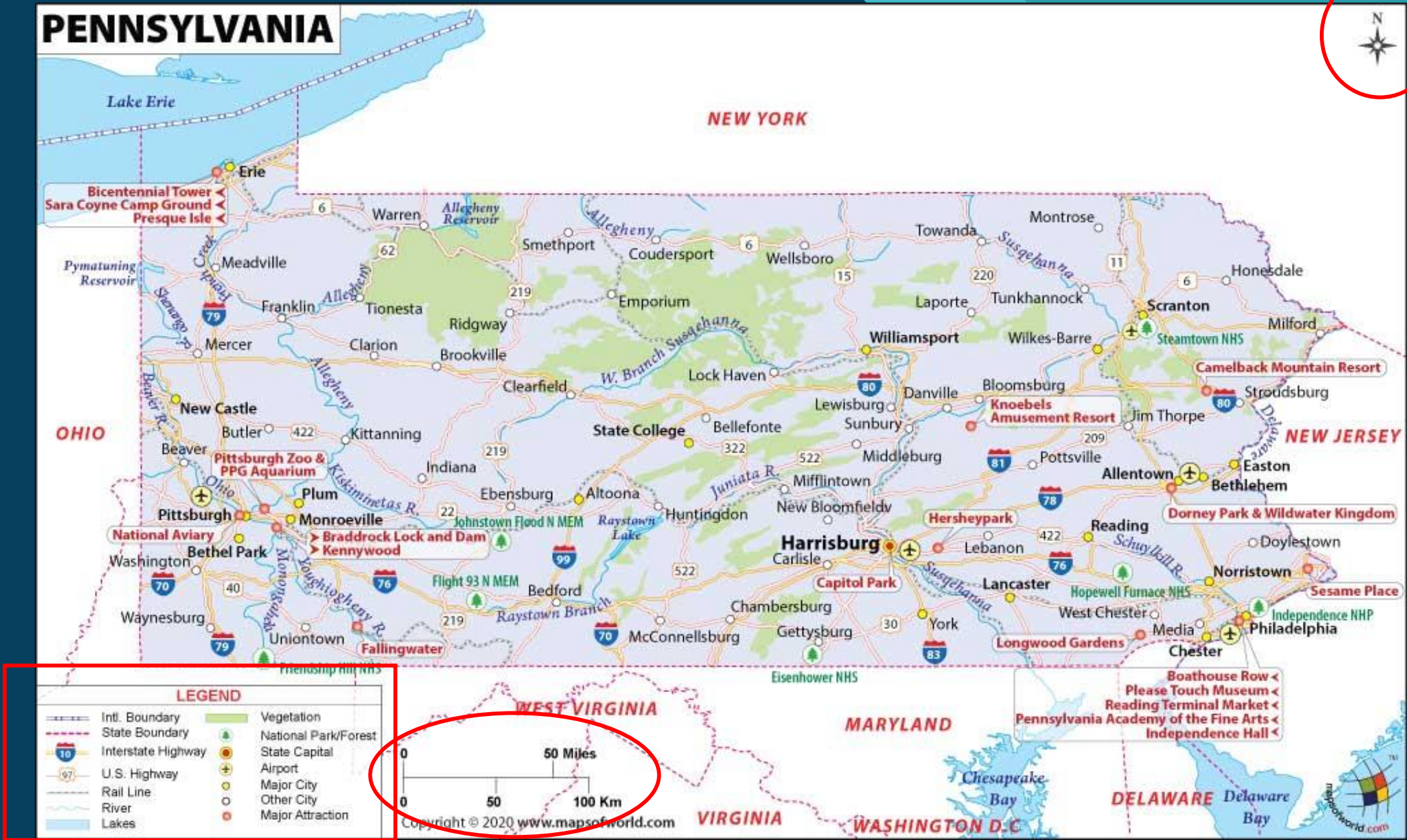


Photo: Comite Resources

Important mapping skills to have

- Properly reading a physical map
- Using GPS
- Watershed Delineation
- ArcGIS
 - **Analyze data spatially**

How to Read a Map:



GPS

- GPS stands for Global/Geographic Positioning System
- Used to pinpoint location through non-geosynchronous satellites
- Find coordinates and elevation
 - Cost effective, accurate, rapid
 - Environmental resources, hydrology, hazardous waste
- Informs GIS



Photo: Peterson Environmental

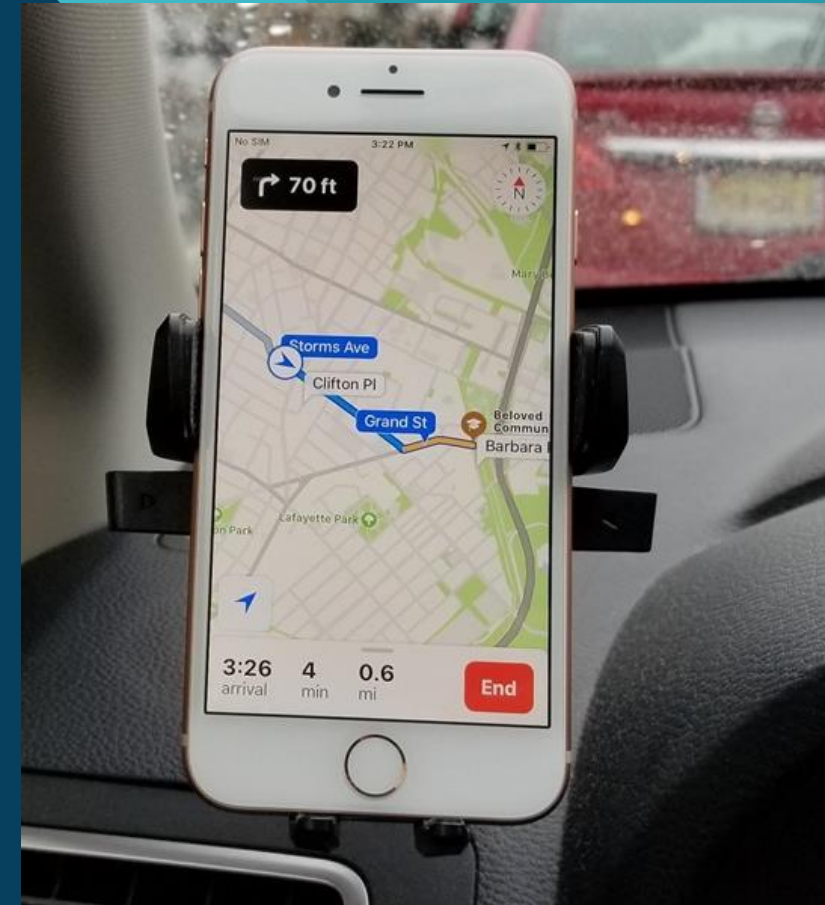


Photo: iosgadgethacks.com

Have you used maps to
explore information?

Then you have used GIS!!

What is GIS?

- **Geographic Information System**
- Allows multiple layers of information to be visible
- Allows us to visualize and interpret information
- Display and analyze data **based off a location**
- Computerized in **1963** by Roger Tomlinson in Canada
- Environmental Systems Research Institute, Inc. (Esri) was founded in 1969
 - Consulting firm that combined computer mapping and spatial analysis for land developers and resource managers
 - Developed and released commercial GIS in 1981

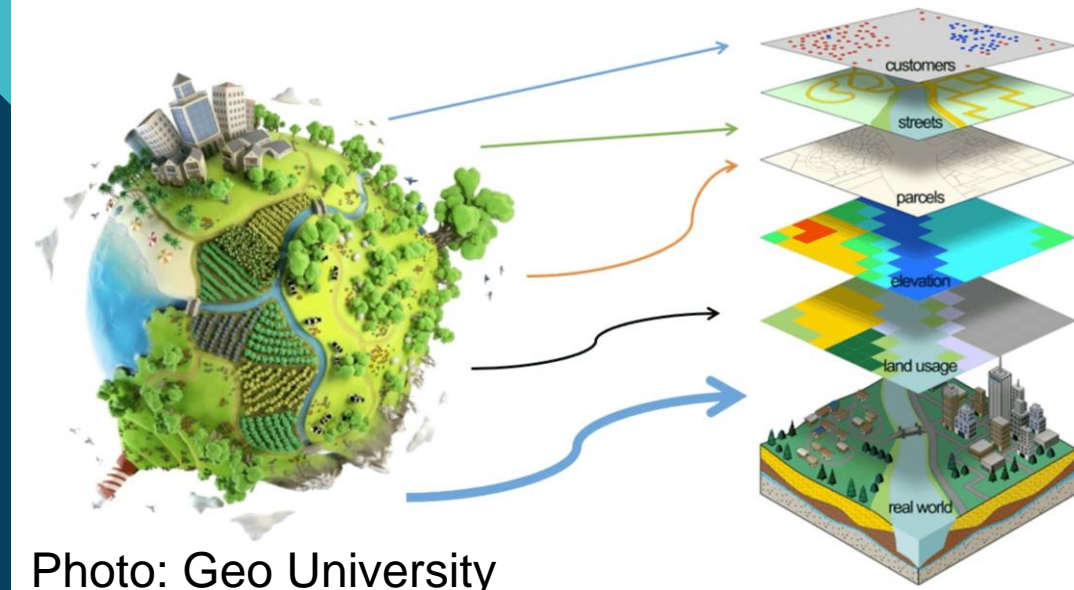


Photo: Geo University



Photo: Esri 7

GIS Answers Questions

- Where is it?
- What is at ___?
- What has changed?
- What patterns/relationships exists?
- What if?

GIS in Everyday Life: Location Based Intelligence

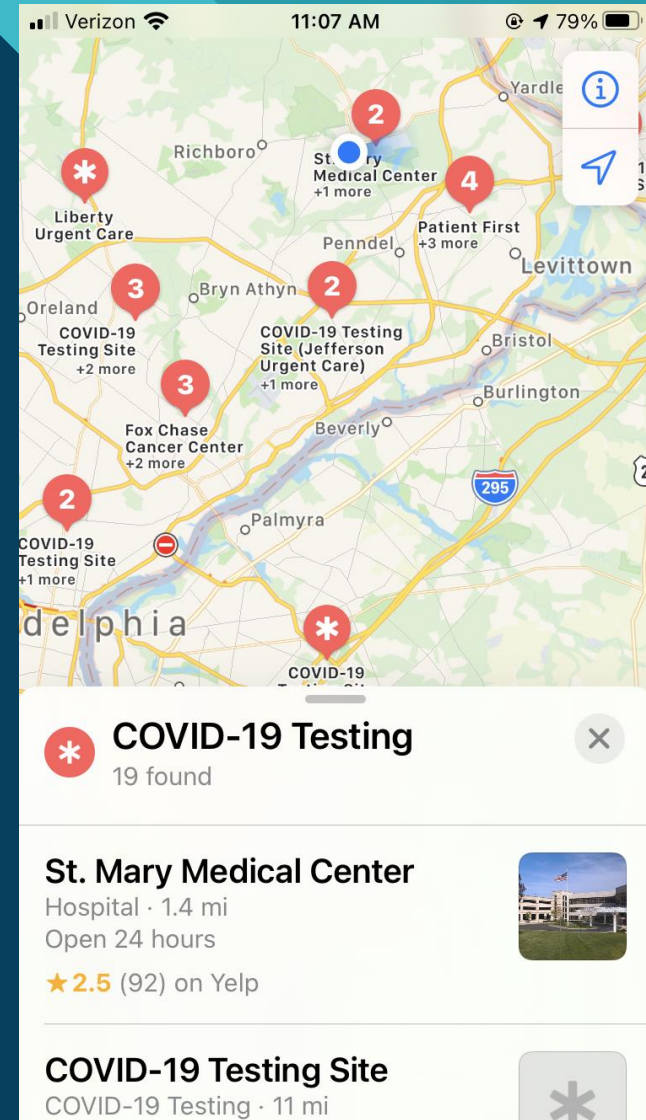
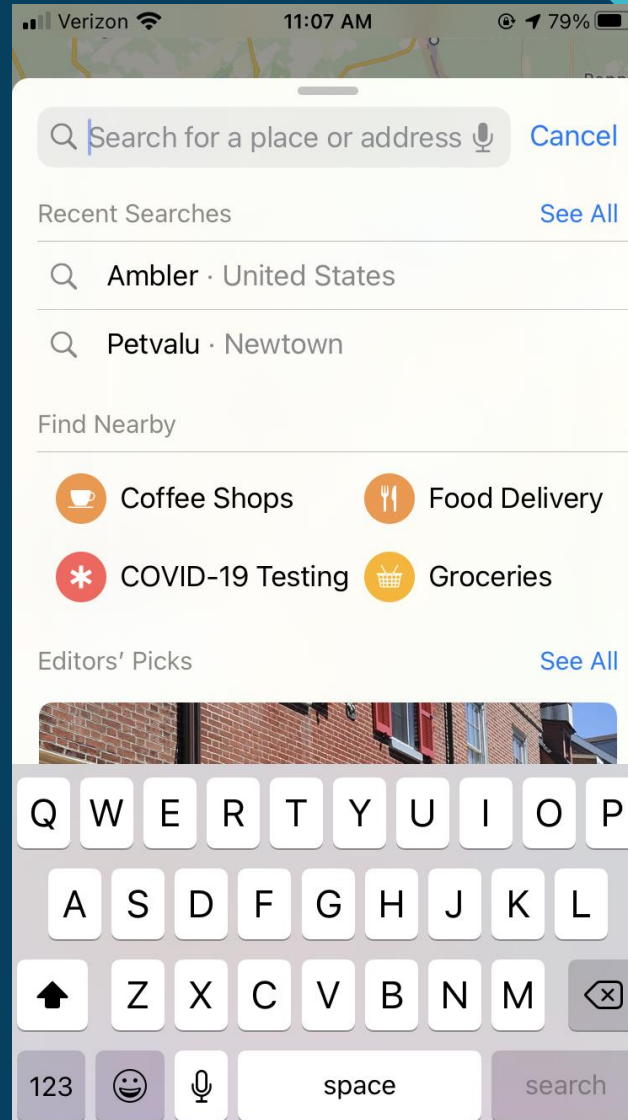
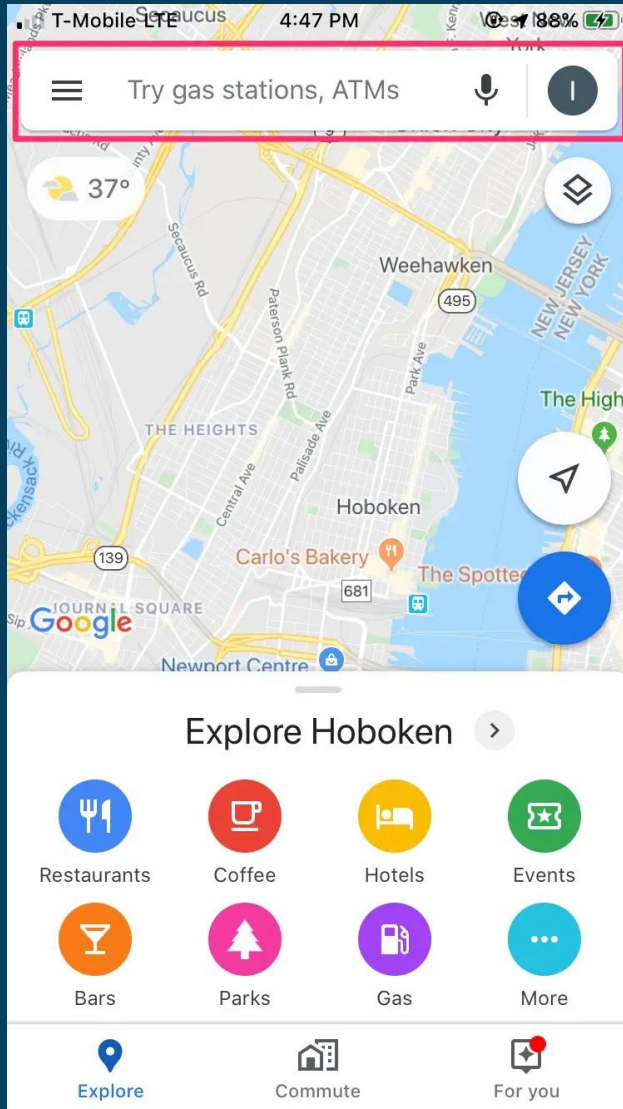


Photo: Business Insider

GIS in Everyday Life: Real Time Data

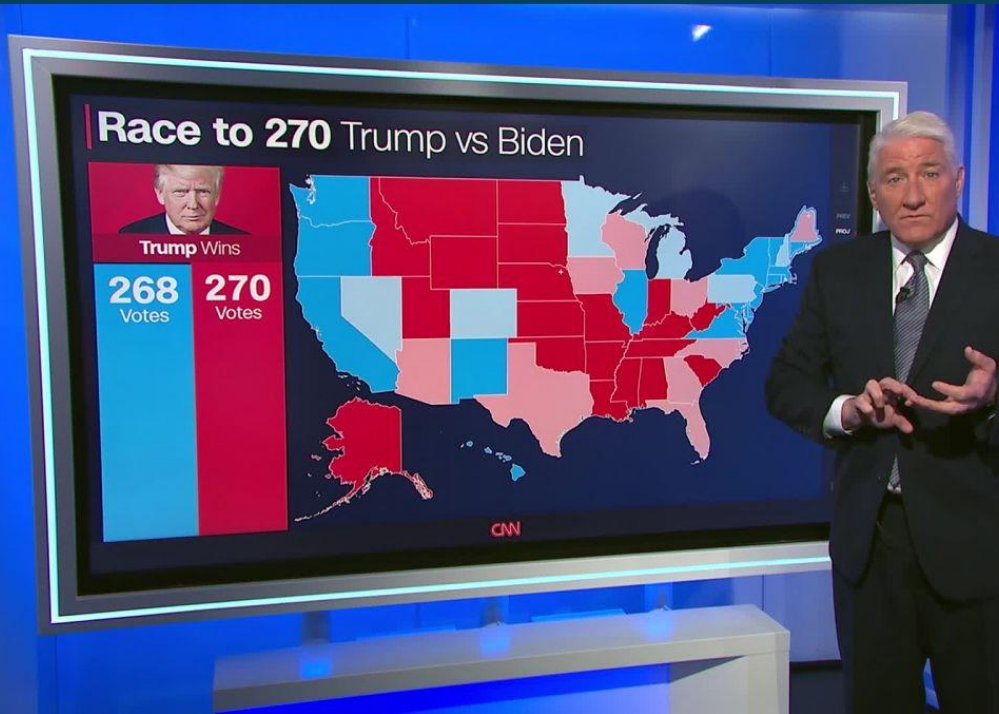


Photo: CNN

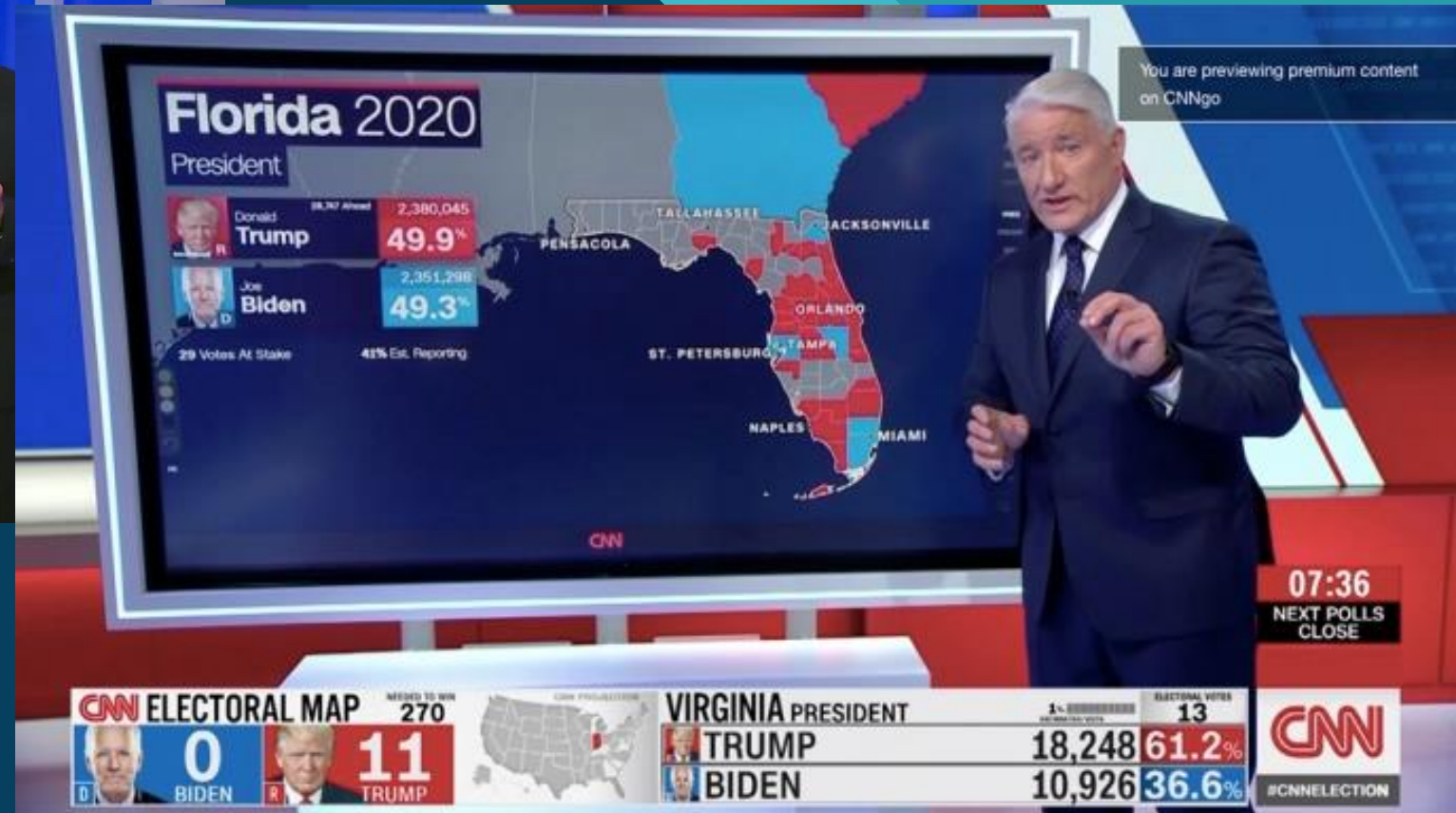


Photo: Variety

GIS in Everyday Life: Collecting Data and Location-Based Information to inform Public



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Common Patterns of Use for GIS



Photo: Esri

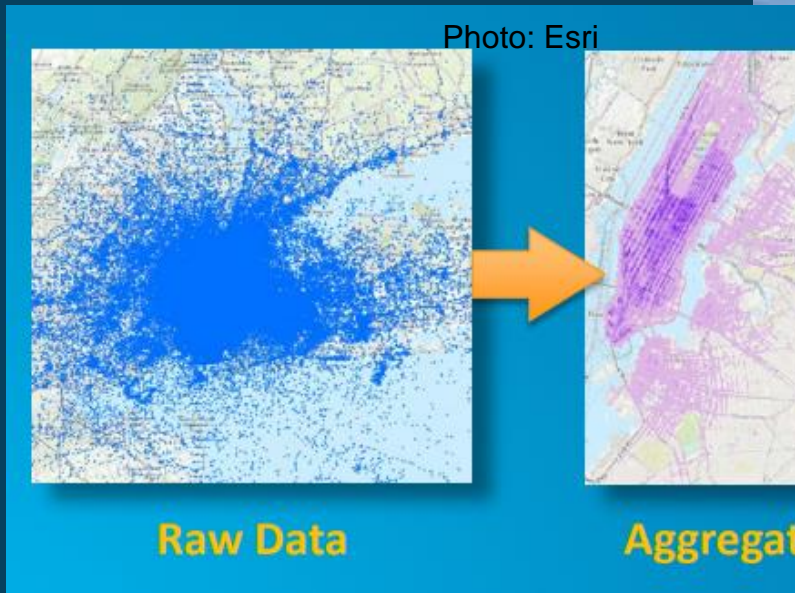
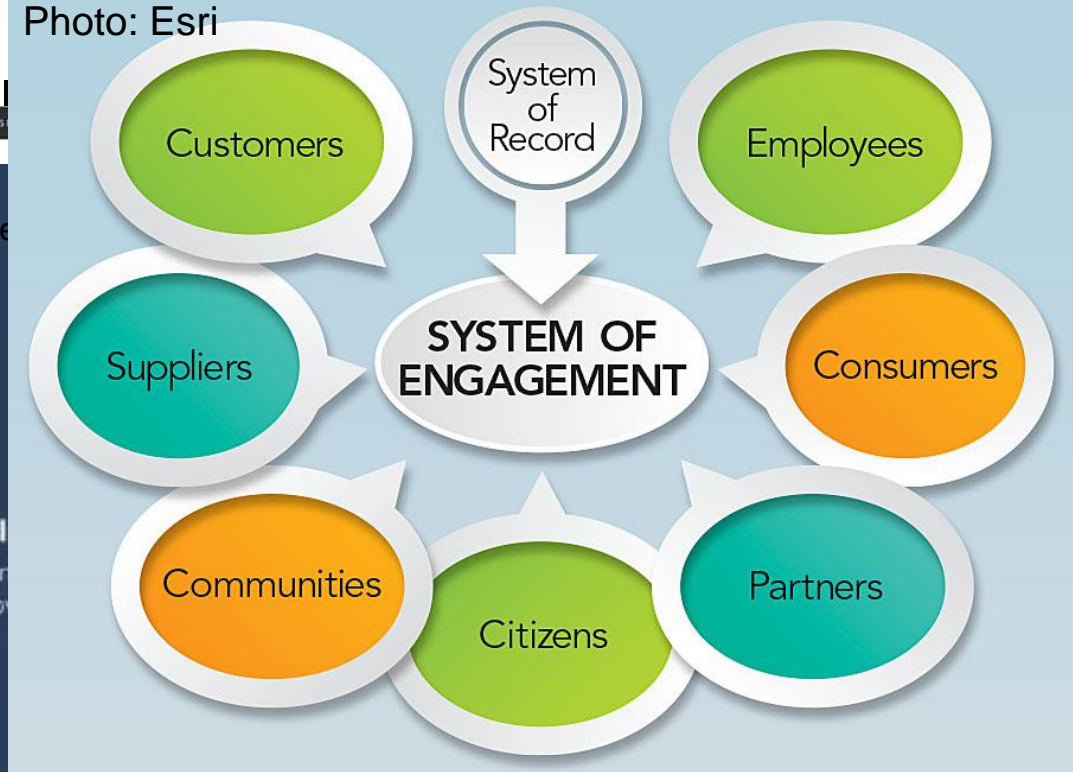


Photo: Esri

Photo: GIS Ge

Photo: Esri



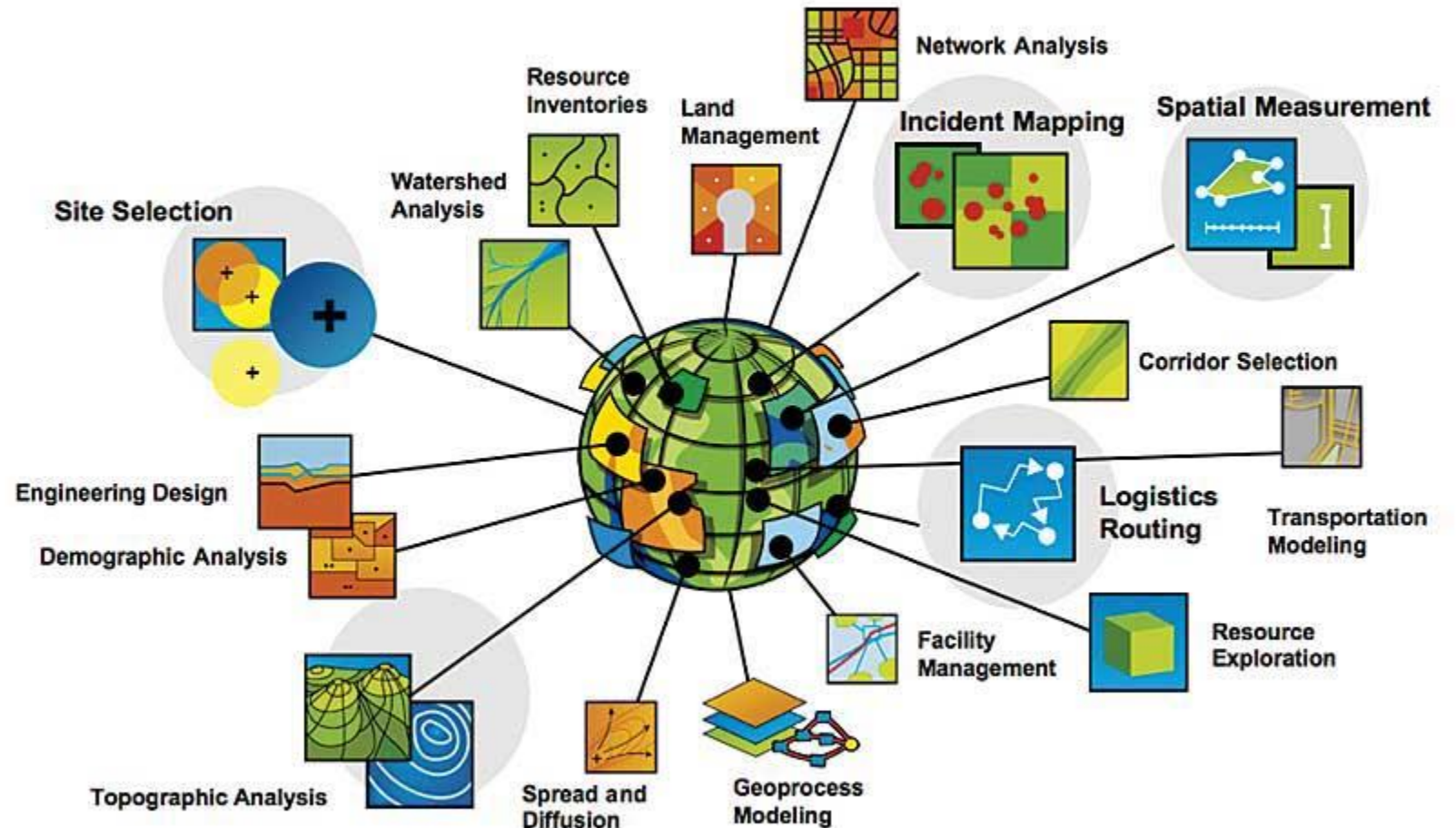
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Who uses GIS?

- Environmental Scientists and Researchers
- City planners and developers
- Marketing and Advertisement
- Health care organizations
- Businesses
- Political scientists and government officials
- Real estate marketers
- And more!

GIS Is Being Applied Around the World

Across Many Disciplines, Professions, and Organizations



Becoming an Instrument of Evolution

Examples of GIS in Environmental Field

Forest Fire Management (and other disaster management)

Forest fire hazard mitigation in
Lebanon using remote
sensing and GIS

Forest Fire Risk Map



Vegetal cover



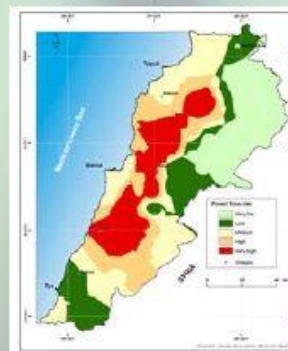
Fuel type



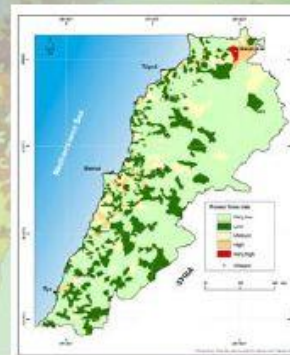
Slope gradient



Slope aspect

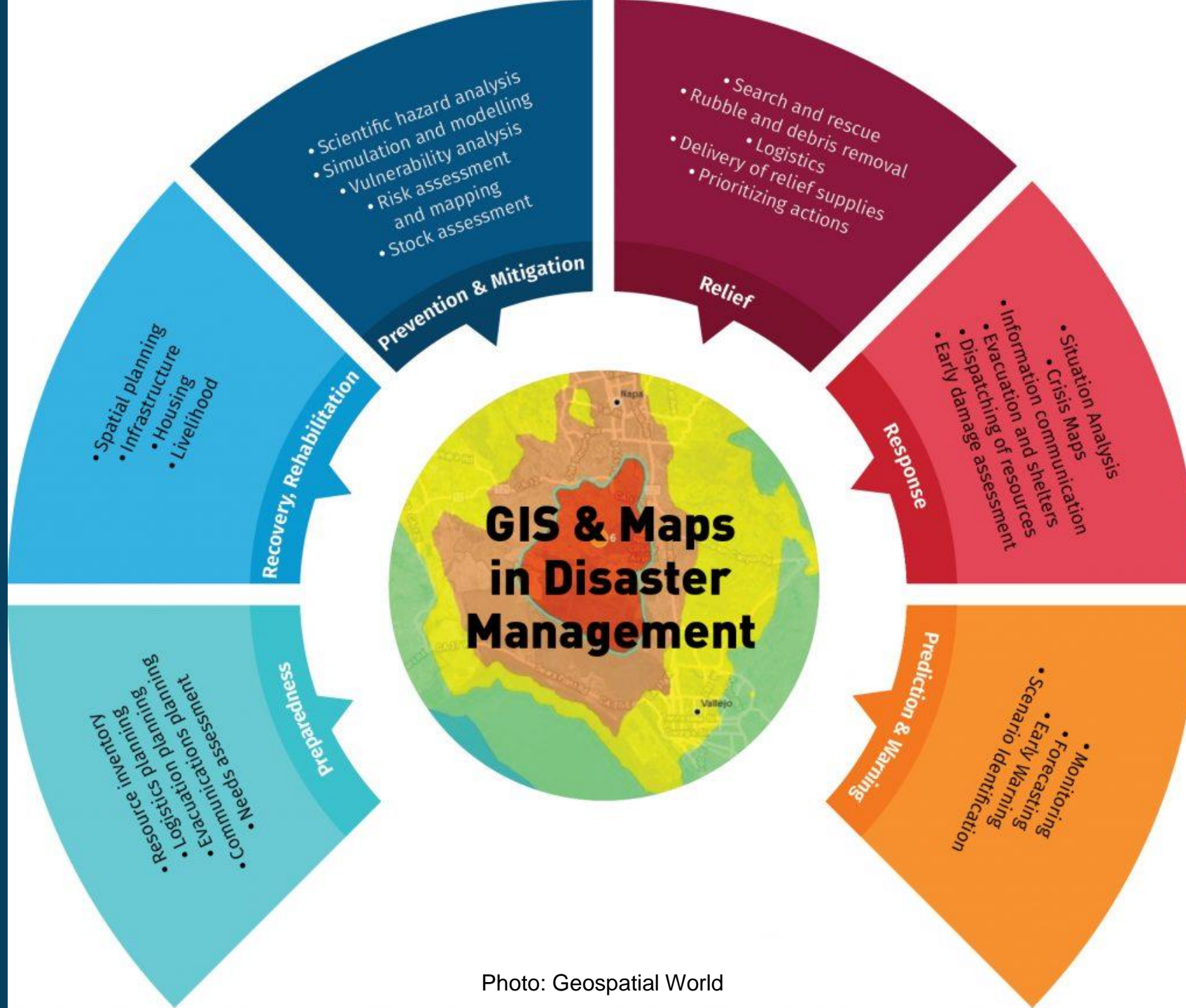


Evapotranspiration



Fire occurrence map

- Map different factors to find vulnerabilities
- Create hazard maps
- Create fire simulation



Air Quality Data

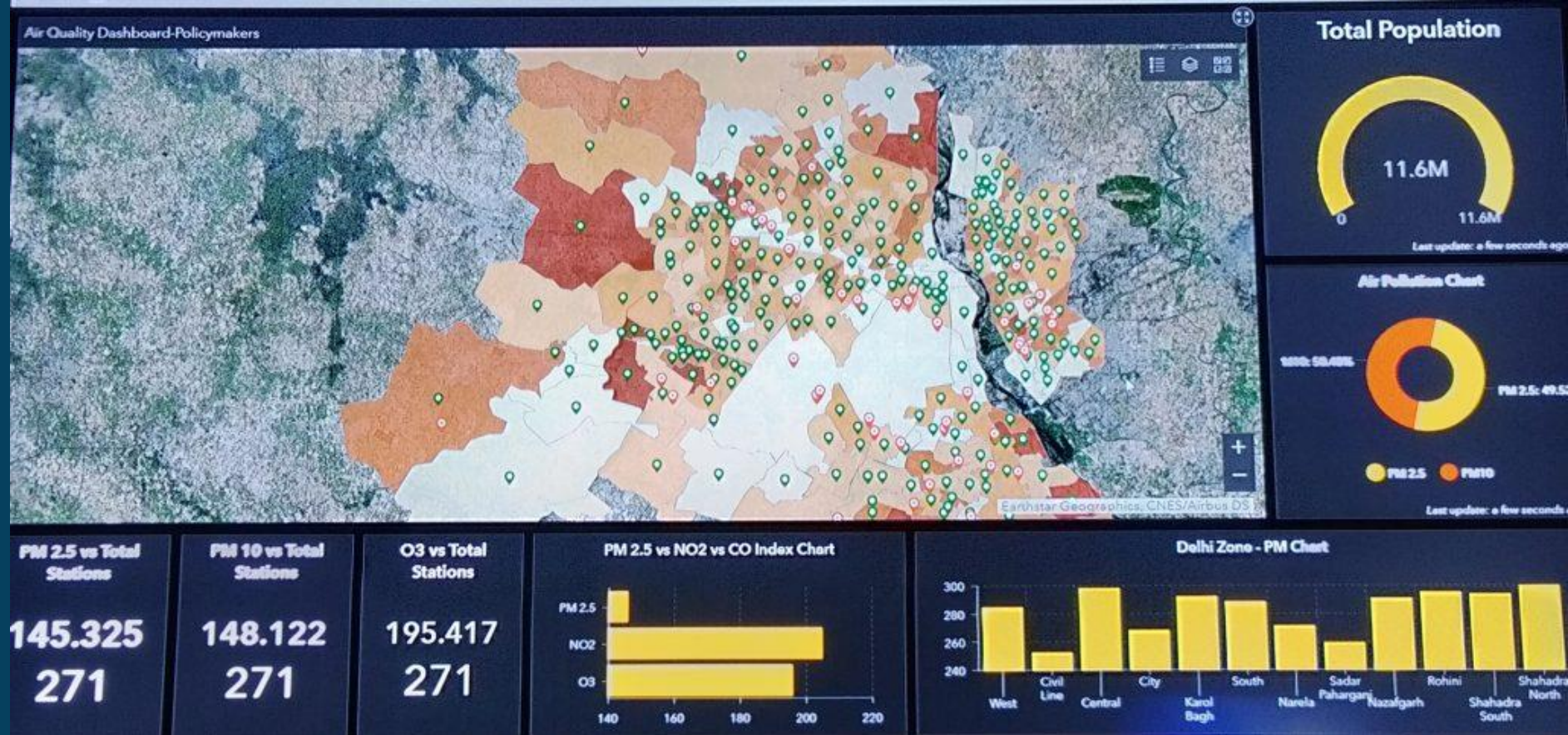


Photo: Geospatialworld.net

- Collect and analyze data from sensors
- Predict where emissions occur within an area
- Track air quality for air quality warnings
- Understand how to reduce emissions

Trail Mapping and Public Outreach

The screenshot displays the TrailLink website interface. At the top, the browser address bar shows the URL `trailink.com/trailsearch/?mmloc=18966&sort=trail_name&length=0%7c5`. The TrailLink logo, featuring a green arrow and the text "TrailLink by Rails-to-Trails Conservancy", is in the upper left. Navigation links include "My TrailLink", "Explore Trails", and "About". A search bar indicates "111 Results" and "Search 18".

On the left, a sidebar lists sorting options: "Map View" (selected), "Sort by", and "Filter". Below this, a list of filters is shown, with "Name" selected. The main content area is divided into two columns of filters:

- Activities:** ☒ Any Activity, ☐ ATV, ☐ Bike, ☐ Birding, ☐ Cross Country Skiing, ☐ Dog Walking, ☐ Fishing, ☐ Geocaching, ☐ Hiking, ☐ Horseback Riding, ☐ Inline Skating.
- Surfaces:** ☒ Any Surface, ☐ Asphalt, ☐ Ballast, ☐ Boardwalk, ☐ Brick, ☐ Cinder, ☐ Concrete, ☐ Crushed Stone, ☐ Dirt, ☐ Grass, ☐ Gravel.

Additional filters include "Type" (Any Type, Canal, Greenway/Non-RT, Rail-Trail), "Length" (Any Length, 0-5 Miles, 5-10 Miles, 10-20 Miles, 20+ Miles), and "Accessible" (checked). An "Apply" button is located at the bottom of the filter panel.

The bottom of the page features a map of the Harrisburg, PA area, showing various trails marked with green icons. A small inset image shows a gravel path with the text "State: PA Gravel". Below that, a trail listing for "Audubon Loop Trail" is shown, including a 2.5 mi distance, a 5-star rating, and the state and surface type (PA Asphalt).

Story Map Example

- [Story Map Example](#)
- Combines geospatial data with photos, videos, and audio
- User friendly and designed for a broad audience
- Used to engage public

Countless Uses for GIS in Environmental Field

- Population demographics
- Animal migration patterns and habitats
- Representing long term trends in climate and land use (i.e. deforestation)
- Land use and population density
- Soil and bedrock information
- Watersheds, water quality, and hydrology
- Parcels, political boundaries, land ownership
- Energy sectors
- Agriculture and food production
- Ocean depths and trenches, as well as land elevations
- Hazard mitigation and future planning

How to learn GIS

- ArcGIS
 - Video tutorials
 - Play around with maps
 - Develop a familiarity
 - Free account for noncommercial use
- Take classes
 - Universities
 - GIS, Cartography, spatial analysis, data management, etc...
 - Some community colleges
 - Certifications
- On the job training

Benefits of Learning

- Higher than average job growth
- Looks good on a resume / More hireable
- Can be used in many different job types
- Solve real world problems
- Becoming more widespread in use

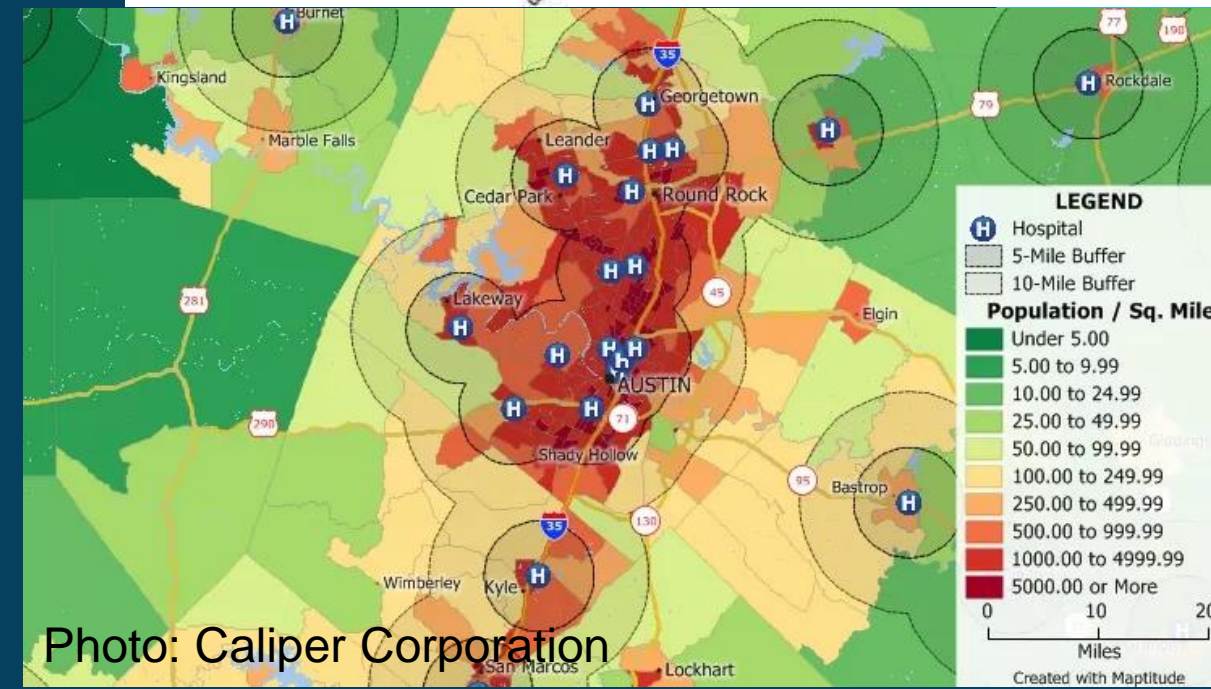
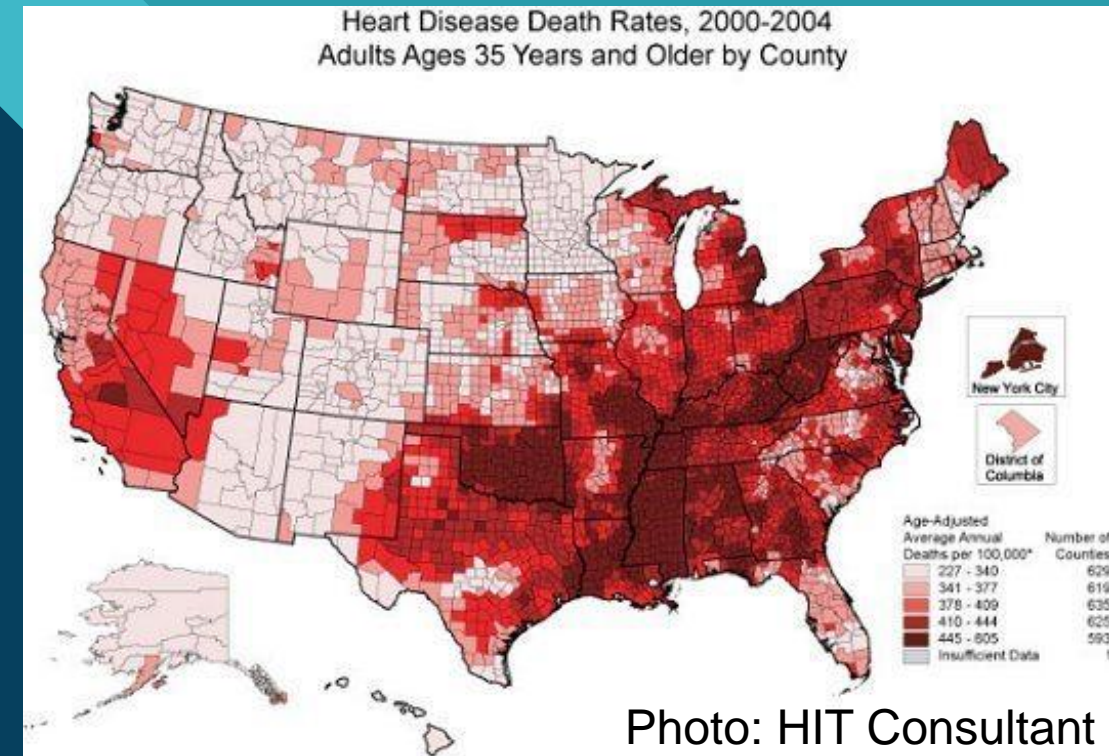
Titles to look out for

- GIS Intern
- GIS Technician
- GIS Specialist
- GIS Analyst
- GIS Coordinator
- GIS Project Manager

- **Private and Government mostly**

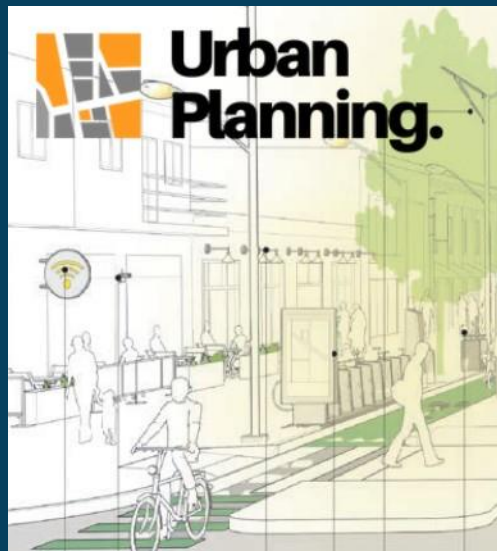
Career Highlight: Public Health Geography

- Interdisciplinary Career Path
- Track disease spreads
- Find trends in health issues
 - What may be causing a cancer cluster in a specific area?
 - What are the impacts of climate change on health?
- Combat disease from cultural and geographic standpoints
- Make decisions about where to build and send medical supplies and health care centers



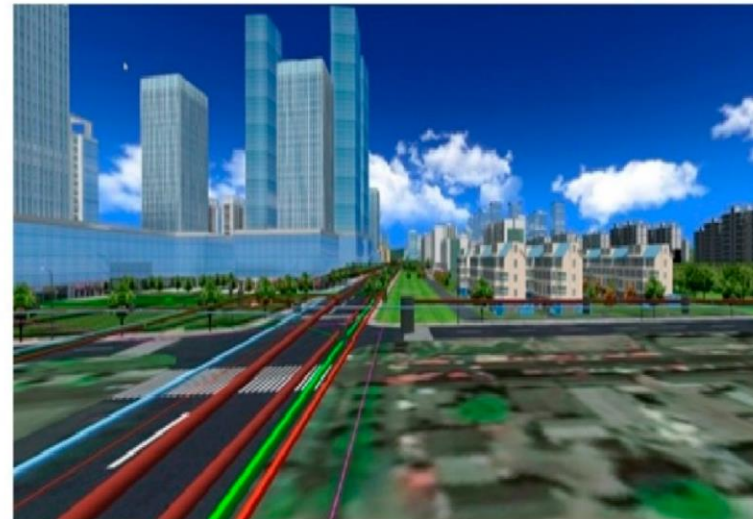
Career Highlight: Urban Planning

- Improve sustainability in cities and make data-based decisions on land use
 - Study transportation patterns to make cities more accessible
 - Find appropriate locations for housing
 - Integrate sustainable solutions to reduce carbon footprint
- Work with business to find locations for new facilities

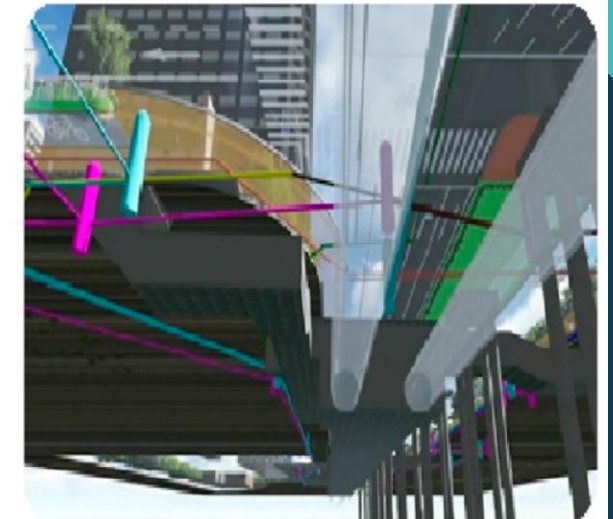


(a)

Photos: MDPI



(b)

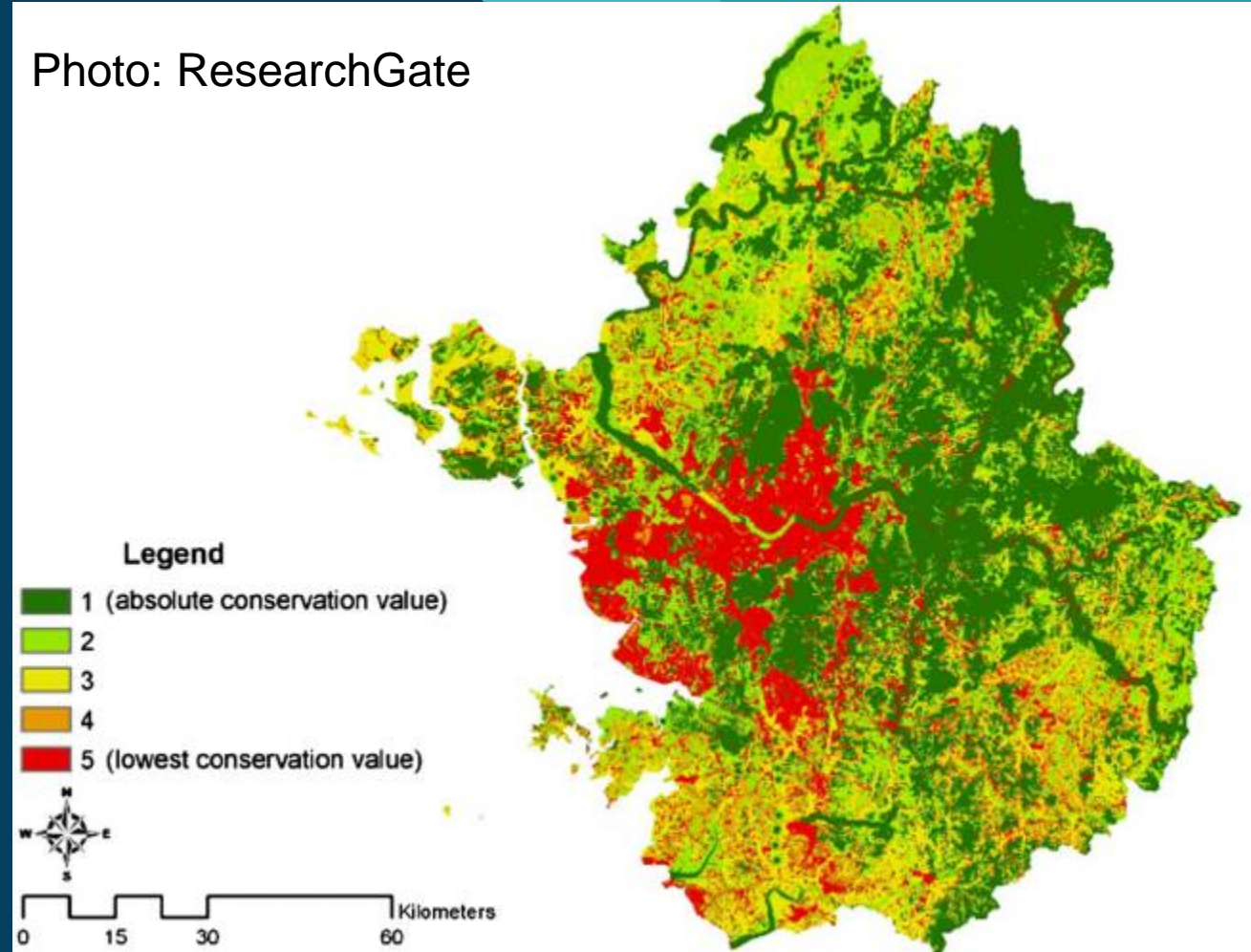


(c)

Career Highlight: Environmental Conservation and Land Management

- Find ideal locations for renewable energy infrastructure
- Track deforestation and other land use changes
- Designate areas of conservation
 - Define wildlife areas
 - Designate protected landscapes

Photo: ResearchGate



Discussion

- How does GIS help users with data visualization?
- How does GIS help users with data analysis?

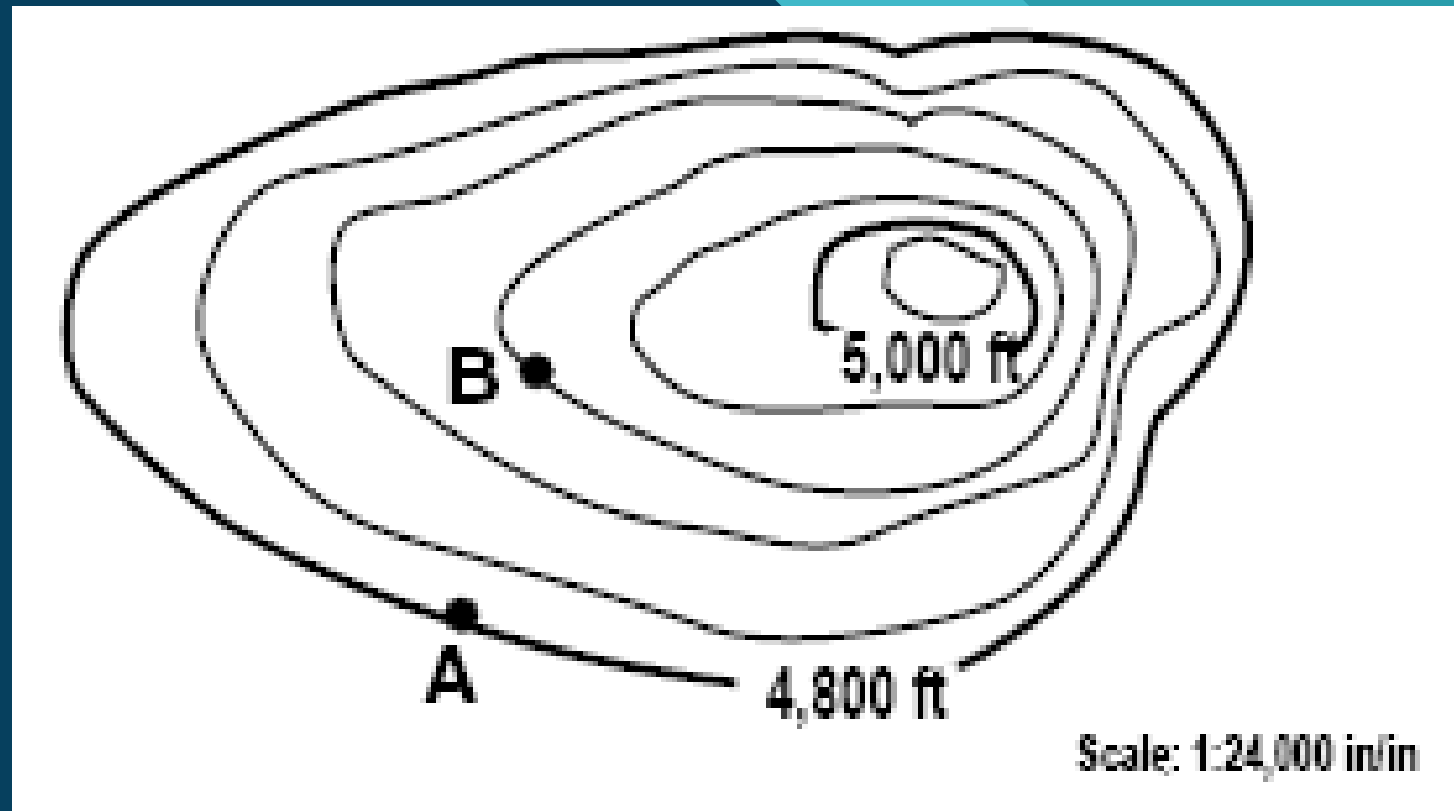


Questions?

Topography and Watershed Delineation

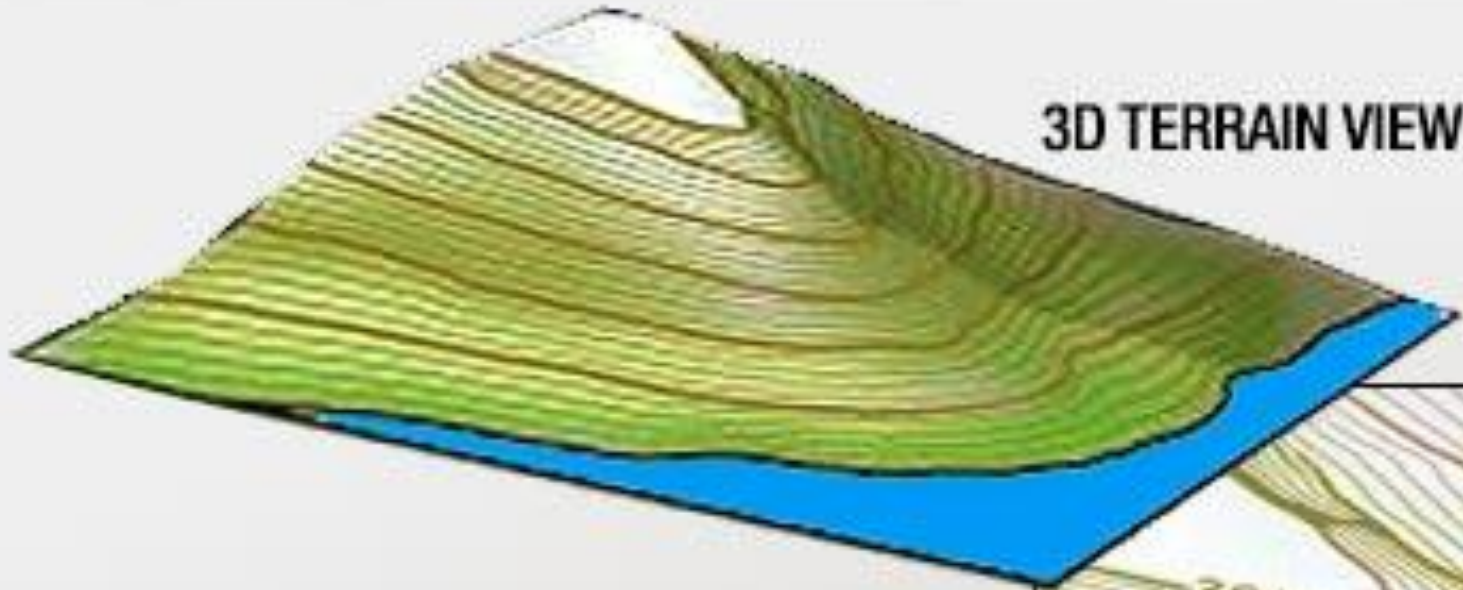
Topographic Maps

- Topography is the study of elevations
- Each contour line shows a different level of elevation



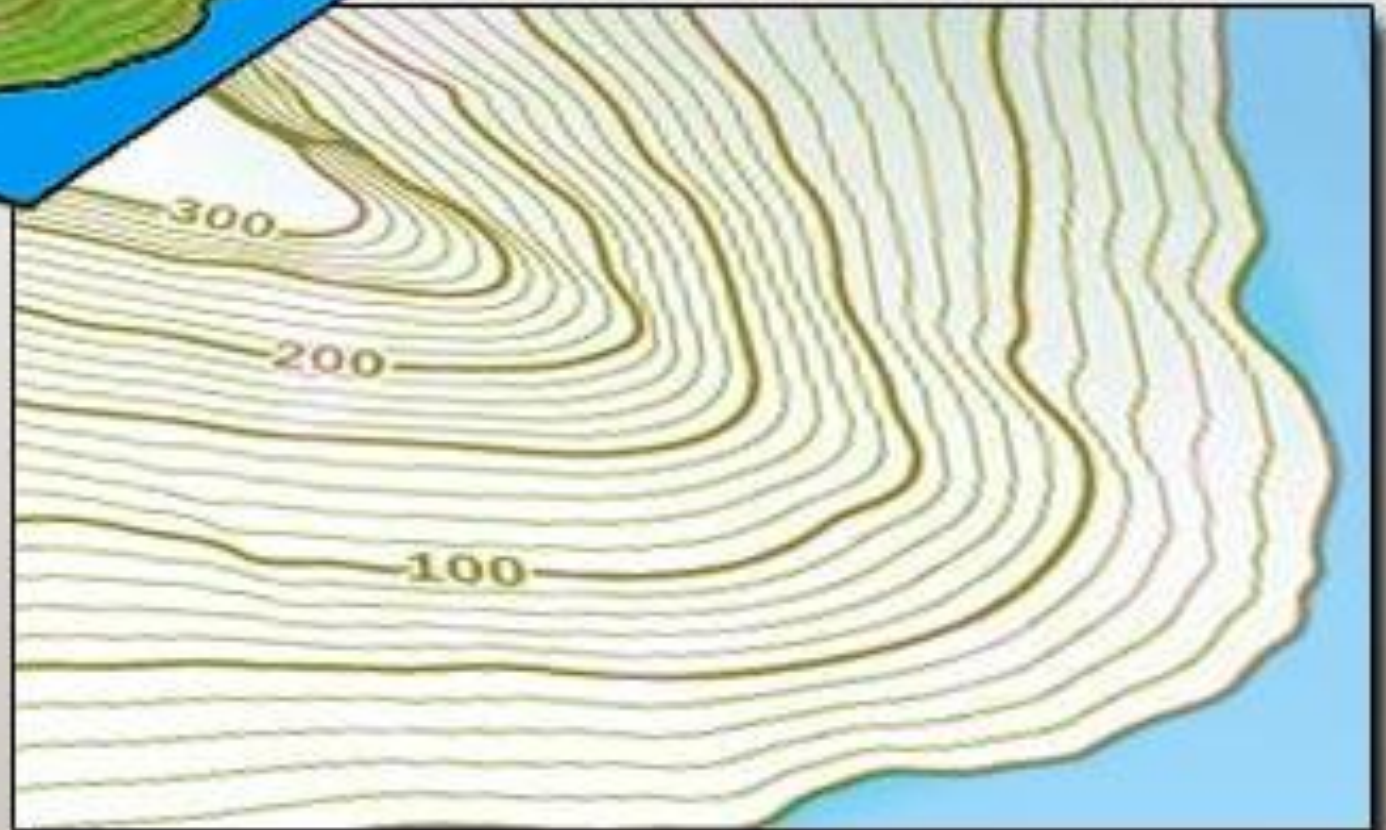
Topographic Map Contour Lines

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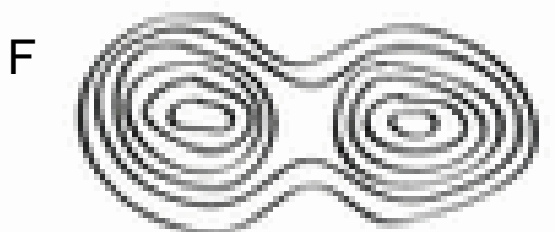
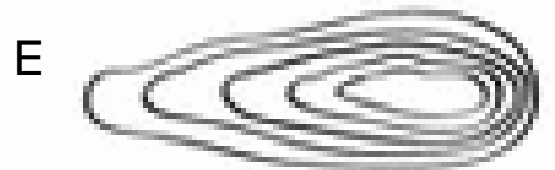
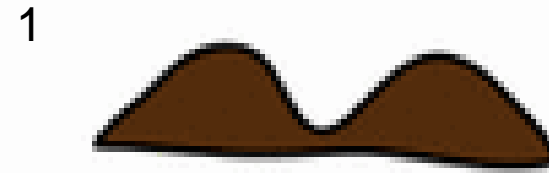


3D TERRAIN VIEW

TOPOGRAPHIC MAP



Contour lines are lines drawn on a map connecting points of equal elevation. Contour lines show the elevation and the shape of the terrain.

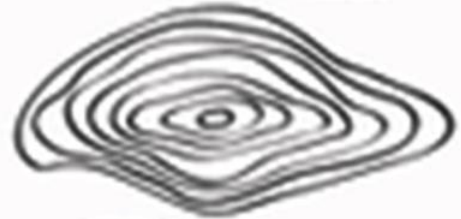


Answers

A



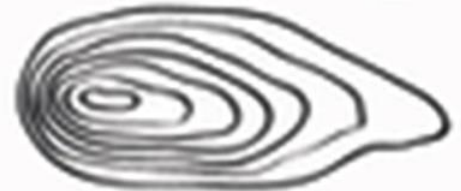
B



C



D



E



F



2



5



4



3



6



1



Watershed Delineation

- Used to create a map/boundary of watersheds and sub watersheds
- Can determine where water will eventually flow

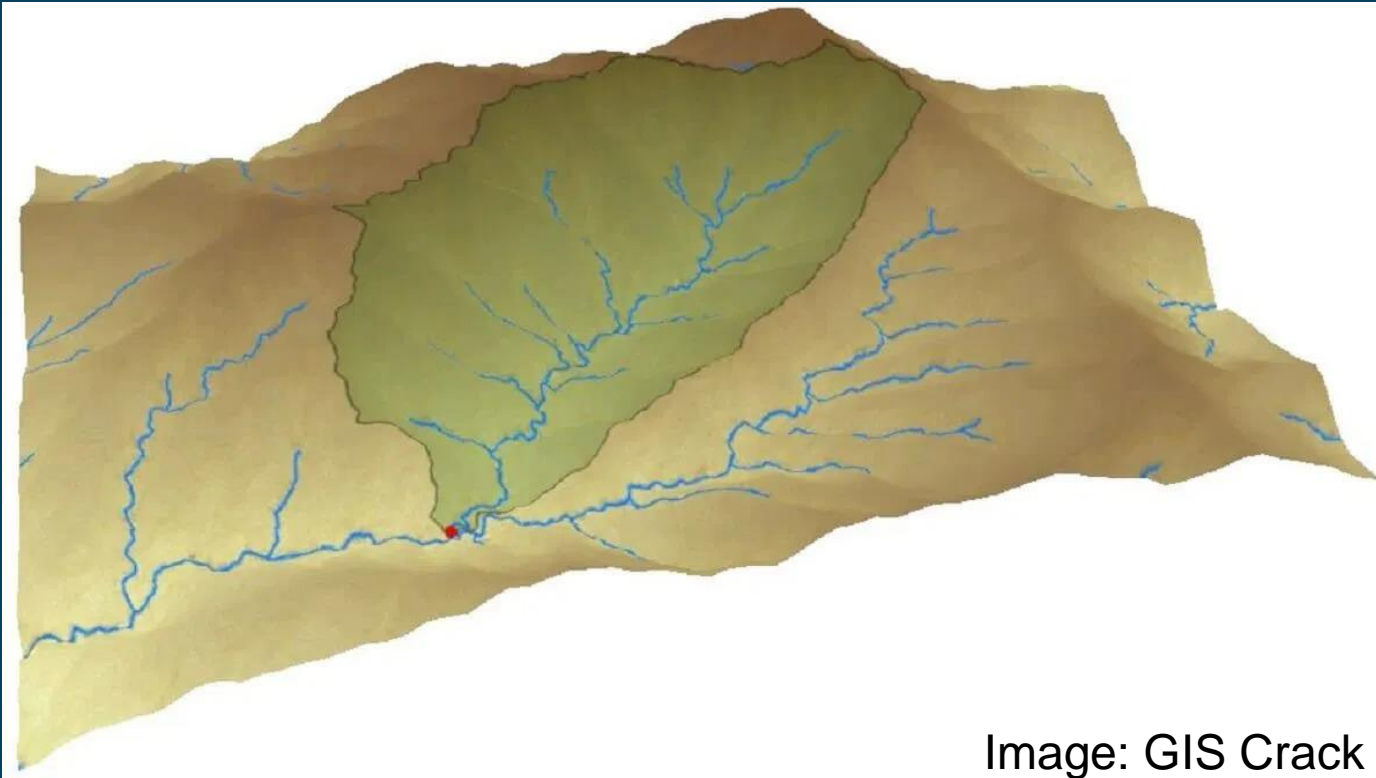


Image: GIS Crack

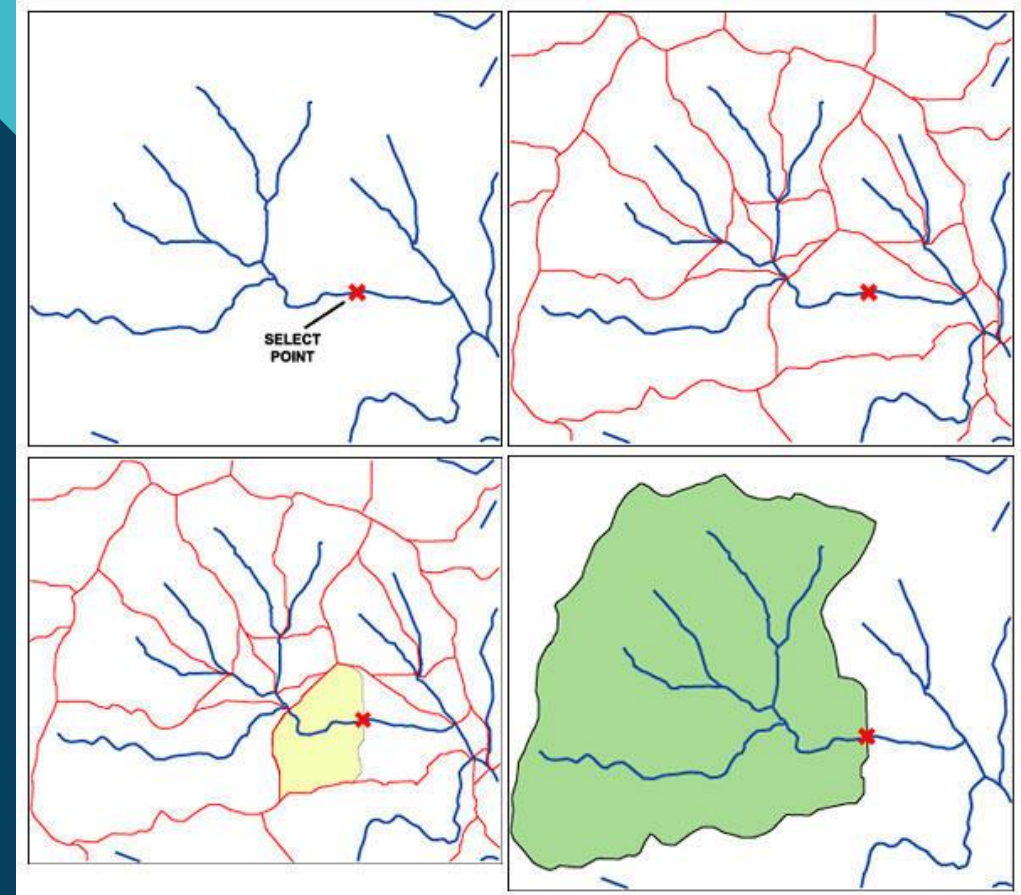
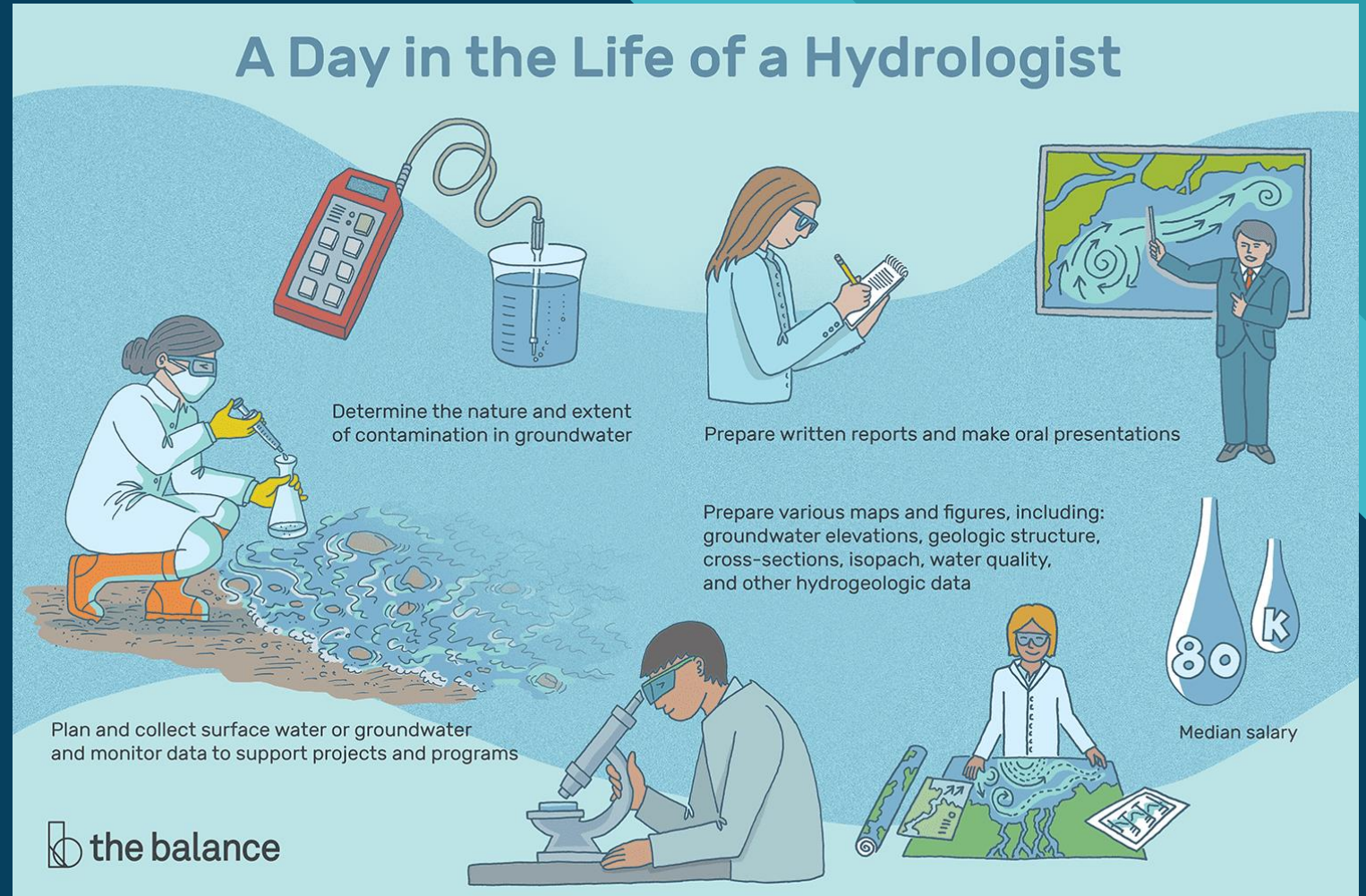


Image: USGS

1. Identify outlet
2. Identify high points
3. Connect ridges
4. Map out watershed

Career Highlight: Hydrologist/Wetland Specialist

- Monitor water quality, water circulation, and physical properties of watersheds
- Conduct watershed and storm water studies
- Prepare visual maps and figures on watersheds and water quality data



Career Highlight: Environmental Consultant

- Create environmental assessment reports
- Provide analysis and insight on environmental concerns for public and private companies



Assignment

- Personal Audit
- Follow instructions of pdf to find your footprint in either water, carbon, or waste

All Assignments Due Next Week!!

Next and *last* session: Resume Building, Wednesday, March 10th
at 6:00-7:00 pm