Introduction to Geographic Information Systems
Workshop Outline

- Introduction
- How Does it Work?
- Finding Data
- Software
- Hands on
- GIS in the Classroom
What is a Geographic Information System?
What Questions can GIS Answer?

- **Location**
  - What is at?
  - Where is it?

- **Condition**
  - What is the status of specific features?

- **Trends**
  - What has changed since?

- **Patterns**
  - What spatial patterns exist?

- **Modeling**
  - What if?
Examples of Applied GIS Across Disciplines

• Urban Planning, Management & Policy
  - Zoning, subdivision planning
  - Economic development
  - Emergency response
  - Crime analysis

• Environmental Sciences
  - Environmental Impact Analysis
  - Hazardous or toxic facility siting
  - Groundwater modeling and contamination tracking

• Political Science
  - Redistricting
  - Analysis of election results
  - Predictive modeling

• Civil Engineering/Utility
  - Locating underground facilities
  - Designing alignment for freeways, transit
  - Coordination of infrastructure maintenance

• Business
  - Demographic Analysis
  - Market Penetration/ Share Analysis
  - Site Selection

• Education
  - Attendance Area Maintenance
  - Enrollment Projections
  - School Bus Routing
Example Maps

Food Insecurity in the United States

Crime Map New Orleans

Colorado Transportation Map
How Does it Work?

- Represent the real world by processing data and applying it in map form
- Allows geographic features in real world locations to be digitally represented so they can be presented in map form and manipulated to address a problem
- The geographic features are linked to a database
- Analysis are run on the relationship between layers using the information contained in the database
Data Layers
Vector Data File Types

What is a shapefile

- Vector
  - Point
  - Line
  - Polygon
- Stores a single feature class
- Consists of multiple files
- Usable in multiple GIS & GPS Apps

- Shape File .shp
  - Most common
  - Shapefiles are composed of 3 mandatory files .shp, .shx and .dbf.
  - .shp is a mandatory Esri file that gives features their geometry. Every shapefile has its own .shp file that represent spatial vector data. For example, it could be points, lines and polygons in a map.
  - .shx is the index file that stores the index of the feature geometry.
  - .dbf is a standard database file used to store attribute data and object IDs.
Data Types: Raster

A raster is made up of equal-sized cells arranged in rows and columns.

Not every object or phenomena has distinct boundaries.
Raster Data File Types

- .PNG
- .JPEG
- .TIFF
- .GIF
Finding Data

**Data.gov**
Repository for federal, state, local, and tribal government data

**ArcGIS Open Data**
Over 25,000 free GIS datasets from U.S. federal, state, and local agencies, as well as international.

**Geolode**
Collaborative catalog of open geodata websites around the world

**OpenGeoportal**
Collaboratively developed, open source, federated web application that allows you to discover, preview, and retrieve geospatial data

**OpenStreetMap**
Wiki based project that creates and distributes free geographic data for the world.
Software

ArcGIS by ESRI

QGIS

Policy Map
ArcOnline

1. Open Browser and go to www.arcgis.com/home

2. Sign in with ArcGIS account

3. Search for Population Trends
   - Select map titled: USA Population Trends by EsriTrainingSvc
   - Read description of map

4. Select Open in Map Viewer
Interface Features

1. About
2. Content
3. Legend
4. Add
5. Basemap
6. Navigation
Activity Objectives

- Search for Map
- Examine Population Change
- Answer Geographic Questions Using a Data Table
- Compare Population Trends
Why Use GIS in the Classroom?

- Impact
- Increased Cognition
- Equitability
- Effectiveness
Learning Goals and Objectives

1. Ask Geographic Questions
2. Acquire Geographic Data
3. Explore Geographic Data
4. Analyze Geographic Data
5. Act on Geographic Knowledge
Reflection

- Current Assignment/Project
- Data
- Rethink Assignment/Project
- Share
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