

Research Methods Team Topics (Jay (leader), Elizabeth, Brian)

Scientific Method (An introductory lesson with direction provided through examples)

1. Ask question/solve a problem
 - *Provides parameters
 - *Critical thinking exercise to establish parameters
 - *PBL emphasis - Scenario introduction
 - *How, what, when, why, where - observations
2. Background research
 - *Educational resources
3. Formulate hypothesis
 - *What are the components of a hypothesis
4. Test hypothesis
 - *Data acquisition
5. Analyze data
 - *Statistical evaluation
6. Communicate results
 - *Technical writing skills

Laboratory Exercise - Research Methods

Apply scientific method and PBL in the field

- Directed study
 - *Provide scenario or problem
 - *Students to search for information/background data
 - *Guide them toward hypothesis creation
 - *Students collect data - provided by instructor
 - *Graph data, statistical analysis
 - *Students write report/summary, give presentation
 - *Extension to this exercise - more independent study

Remote Sensing Fundamentals

Electromagnetic spectrum

- Spectral range

Atmospheric windows

- Corrections
- Interference

Platforms - satellite, aircraft, ground-based, balloon, radiosonde

Resolution - spatial and temporal

Data products

- Land cover/land use
- Temperature
- Atmospheric constituents
- Vegetation extent and health
 - *Net Primary Productivity (Chl.)
- Cloud cover/snow cover
- Ice
- Ozone
- PM - derived from aerosol data

Data format

- Accuracy/Precision
- Bytes
- File type
- MODIS data converter

Data accessibility

- EOS Gateway
- Google Earth

Satellites - History and background

Satellite Orbits

Data Acquisitions

- Camera types
- Camera angles
- Sensors and bands

Laboratory Exercises - Remote sensing fundamentals

EOS Gateway

Data Interpretation - instructor supplies surface temperature map of campus, land use data, why?

Season

File manipulations

Fire

EM lab - currently done by Audrey, link to data use/data interpretation

Cartographic Fundamentals - Mapping Science

Mapping fundamentals

- Scale
- Types of maps
- Lat/long - Cartesian coordinate system
- Projections
- Types of projections
- Distortion
- Applications

Laboratory Exercises - Cartographic Fundamentals

Topo map exercises - compute slopes, watersheds

Projection comparison

Identifying location using lat/long

Scale

GIS Basics

Definition

- Applications

Data types

- Tabular data
- Vector data
- Raster data

Software packages/vendors and capabilities

- ESRI
- NASA World Wind
- ERDAS Imagine
- Google Earth

Laboratory Exercises - GIS Basics

ArcGIS tutorial

- Basic Functions/Tools
- Rectifications - Georeferencing, georectification
- Projections
- Data import
- Scanning/digitizing data
- Select by location and attribute
- Creating layers from selection
- Queries, joins, and relates
- Measuring features
- Adding fields
- Buffers

GPS Basics

Overview and history of GPS

- Applications
- Data import/export

Scientific/mathematic concepts

- Satellite system
- Accuracy/precision/error
- Interference Selective Available

Laboratory Exercises - GPS Basics

Directed Lab

- Input coordinates
- Toggle through screens
- Navigate

Waypoints, tracks, navigation

- Export data to GIS

Geocache

- Provide coordinates
- Students seek coordinate location

Boundary Delineation

Type of boundaries

- Property
- Tribal land
- National/state/local/county etc
- Physical
 - *Rivers
 - *Mountains

*Watersheds

-Atmospheric

Historical importance - how established and changed

-Cultural influence

-Treaties

-Boundary migration (river migration, wars, erosion, physical processes)

-Socio-political importance

Importance of boundaries

-Defense/strategic

-Resource management

-Establishes geopolitical union

Laboratory Exercises - Boundary Delineation

Watershed delineation

Links between natural and geopolitical

Using historical data records and remote sensing to analyze change in landforms, rivers, etc