



How is real-world data represented in a GIS?

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Outline



1. Overview of spatial data
2. Raster data
3. Vector data

Spatial Data



- Data with a spatial or location component
 - Spatial data – Where?
 - Attribute data – What? How much? When?
- Examples?

Spatial Data Representation and Storage

- Two primary approaches to representing and storing data
 - Raster
 - Vector

Raster Data

- Regular, uniform grid of cells (pixels)
- One value per cell
- Wall-to-wall

1	1	1	3	3	3	3	3	3
1	1	1	3	3	3	3	3	3
1	1	2	2	2	2	3	3	3
1	1	2	2	2	2	2	3	3
1	2	2	2	2	2	3	3	3
3	3	3	2	2	2	3	3	3
3	3	3	3	2	3	3	3	3
3	3	3	3	3	3	3	3	3
1 Residential 2 Water 3 Farmland								

Figure 11. Example of the structure of a raster data file.

Raster Data



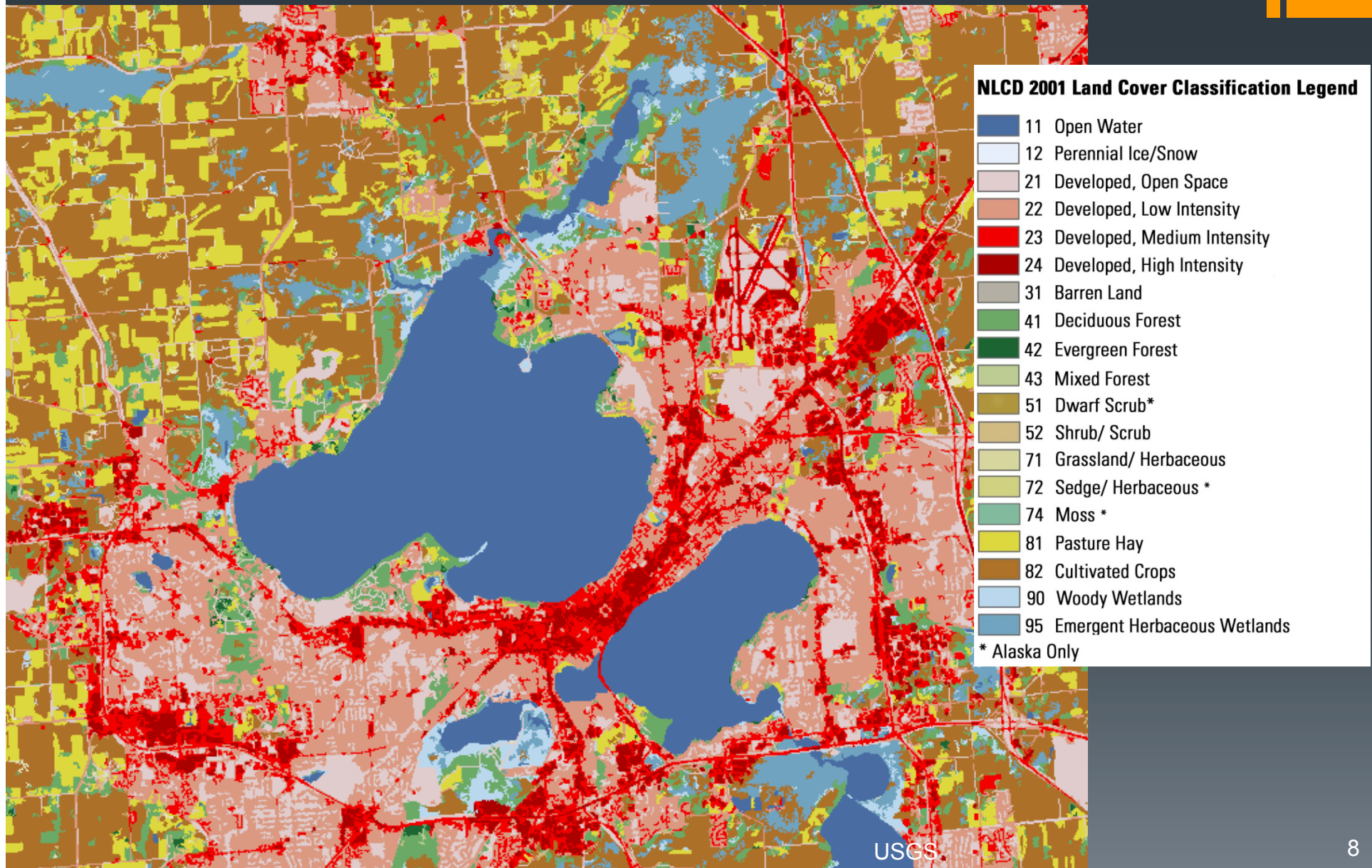
- Spatial data not stored explicitly for each cell
 - Coordinates of corner of raster stored
 - With uniform cell size, cell locations may be quickly calculated
- Multi-band raster → multiple attributes

Types of Raster Data



- Thematic
- Continuous / Spectral
- Imagery

Raster - Thematic



Raster – Continuous / Spectral



Sam Batzli



Raster Strengths



- Simple data structure / processing
- Fast to render (draw on screen)
- Airborne and satellite imagery and data products derived from these are almost always raster

Raster Weaknesses



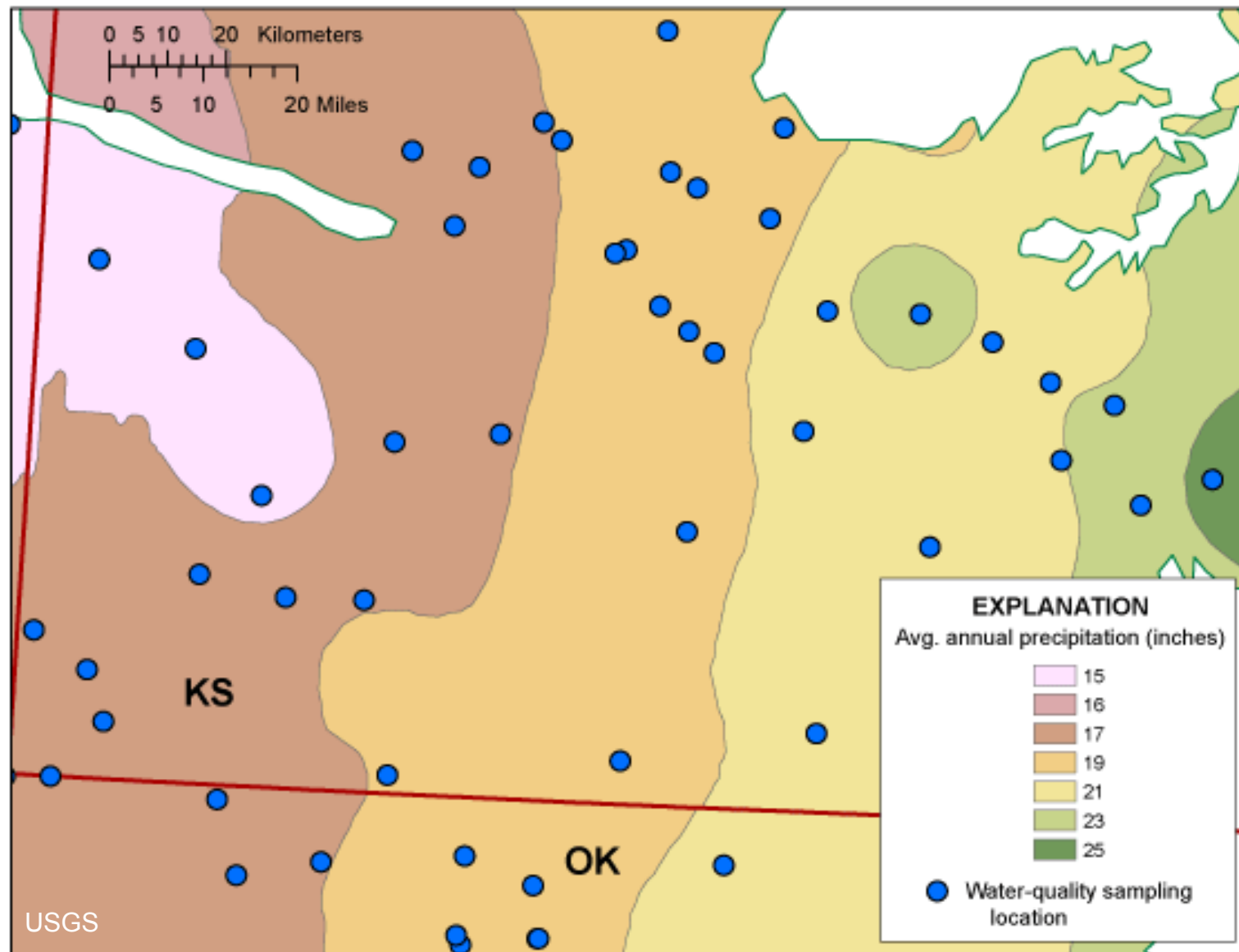
- Spatial precision limited by cell size
- Potentially very large files
- Only one attribute per raster layer
- “Blocky” appearance

Vector Data

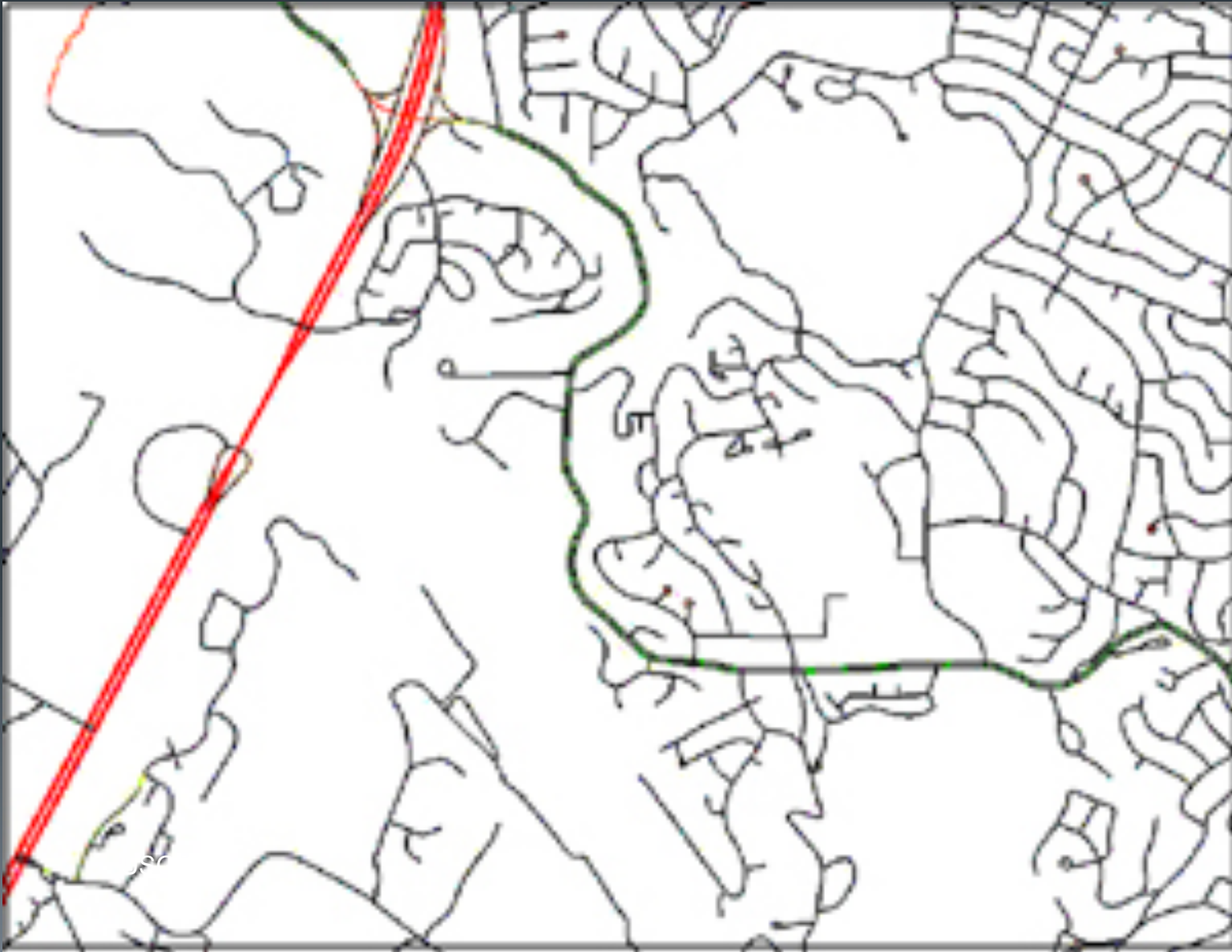


- Represents objects with *discrete boundaries*
- Three types of vectors
 - Point
 - Line
 - Polygon
- Each object may have unlimited attributes
- Object have unique IDs which link to their attribute data stored in a table
- Attributes may be numerical or text

Vector - Point



Vector - Line



Vector - Polygon

Table Of Contents

Layers

- ☒ USA Soil Survey
 - ☒ Soil Survey Geographic
 - Dominant Order
 - Alfisols
 - Andisols
 - Aridisols
 - Entisols
 - Gelisols
 - Histosols
 - Inceptisols
 - Miscellaneous area
 - Mollisols
 - Oxisols
 - Spodosols
 - Ultisols
 - Vertisols
 - Water
 - ☒ State Soil Geographic
 - ☒ Global Soil Regions

Identify

Identify from: <Top-most layer>

VT007
VT007

Location: -8,148,512.686 5,517,284.212 Meters

Field	Value
OBJECTID	34852835
Map Unit Symbol	VeB
Map Unit Key	281761
Map Unit Name	Vergennes clay, 2 to 6 percent slopes
Map Unit Kind	Consociation
Map Unit Acres	13367
Map Unit Highly Erodible Class	Potentially highly erodible land
Map Unit Water Erodible Class	Potentially highly erodible land
Map Unit Wind Erodible Class	Null
Farmland Class	Farmland of statewide importance
Dominant Order	Alfisols
Dominant Sub-Order	Udalfs
Dom. Cond. Order %	100
Dom. Cond. Suborder %	90
Dom. Cond. Hydrologic Group	Soils in this group have high runoff potential when thoroughl
Dom. Cond. Hydrologic Group %	100
Dom. Cond. Drainage Class	Moderately well drained
Dom. Cond. Drainage Class %	90
Dom. Cond. Hydric Rating	Yes
Dom. Cond. Hydric %	5
Dom. Cond. Non-irrigated Capability Class	Erosion - some limitations that reduce the choice of plants o

Vector Strengths



- Very efficient storage (no data stored for areas not of interest)
- Precise location information for each object
- Conducive to network analysis (e.g. most efficient driving route between two locations)
- Allows quick and precise calculation of the area of polygons

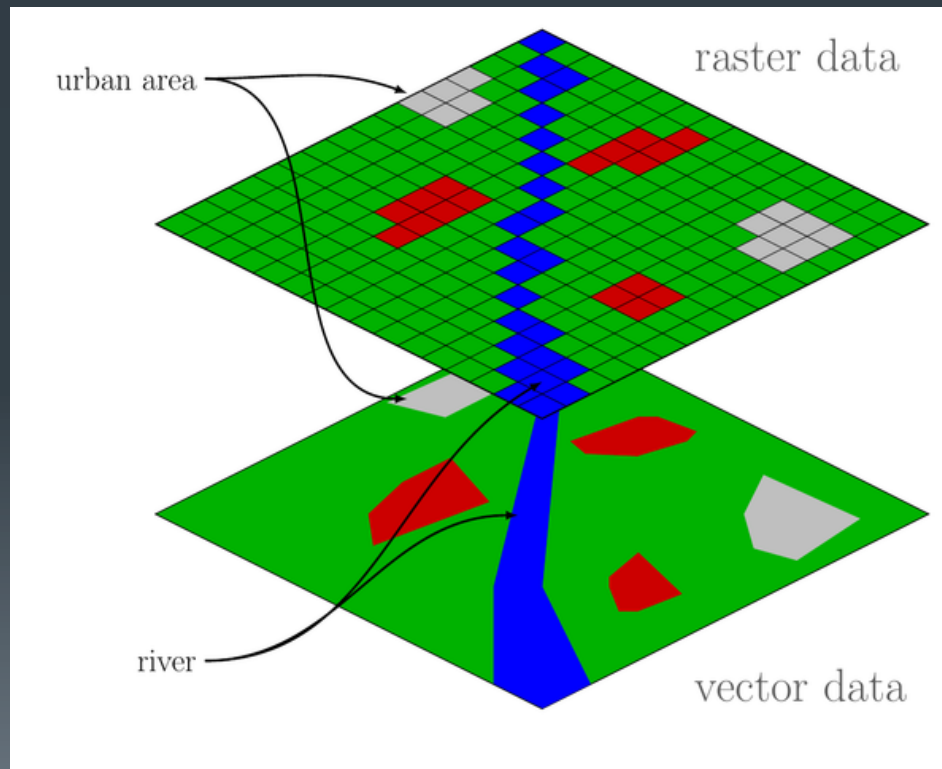
Vector Weaknesses



- Complex data structure
- Processing tasks more difficult than with raster
- Not appropriate for most remotely sensed data

Is it clear-cut?

- Most data *could* be stored in multiple formats



Summary

- Information in a GIS consists of both spatial and attribute data
- Raster – uniform grid of cells, one value per cell
- Raster a good format for
 - Wall-to-wall data
 - Continuous phenomena
 - Temperature
 - Rainfall
 - Land cover
 - Aerial photographs / satellite imagery

Summary

- Vector – features with distinct boundaries, many attributes
- Data that could logically be represented as a point, line, or polygon are best stored in vector format