{02} Scale, Detail, Distance

Map Interpretation & GPS
Spring 2010
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SCALE

Issues of Scale

‡ A map's usefulness varies depending upon scale
‡ Trying using a globe to find your way around this campus…

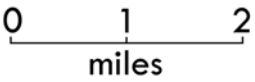
Map Scale

‡ The ratio between the size of a feature on a **map** and the size of that same feature in the **real world**.

Verbal scale

1 inch = 1 mile

Graphic Scale



Fractional Scale

1:63,360

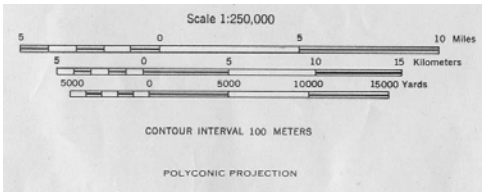
A Representative Fraction

‡ Also known as an **RF scale**
‡ Expressed as a ratio or a fraction
– **1:24,000 or 1/24,000**
‡ **The units are the same on both sides of the ratio!**
– 1 inch:24,000 inches
† not 1 inch:24,000 feet

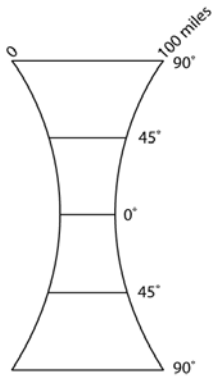
Engineering & Architectural Scales

‡ Plans will typically have a slightly different scale: 1" = 400'
‡ This is not the same as 1:400
‡ It is actually 1:4,800 (400x12)

Zero isn't at the end!



FRACTIONAL	1:63,360
VERBAL	1 inch = 1 mile
GRAPHIC	0 1 2 miles



Large v. Small

- A **large scale** map represents a **small area**
- A **small scale** map represents a **large area**

Large v. Small

1:2	1:4
1/2	1/4
$\frac{1}{2}$	$\frac{1}{4}$

So 1:2 is a **larger** scale, even though it covers a **smaller** area…

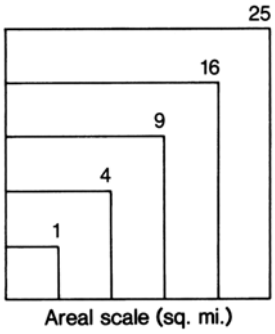
1:2	1:4
1/2	1/4
$\frac{1}{2}$	$\frac{1}{4}$
$\frac{1}{24{,}000}$	$\frac{1}{100{,}000}$

FRACTIONAL	*VERBAL*	*GRAPHIC*
1:100,000		
	1 inch = 4 miles	
		0 25 50 miles

FRACTIONAL	*VERBAL*	*GRAPHIC*
1:100,000		
	1 cm = 40 km	
		0 10 20 30 40 50 kilometers

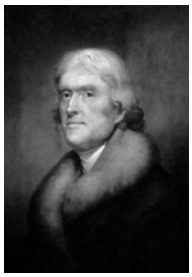
AREA

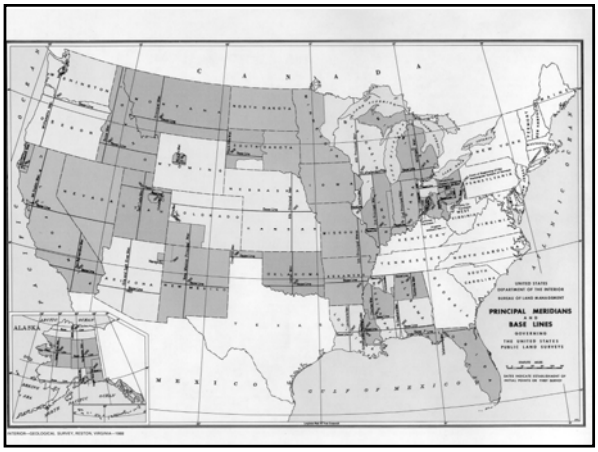
Areal Symbols

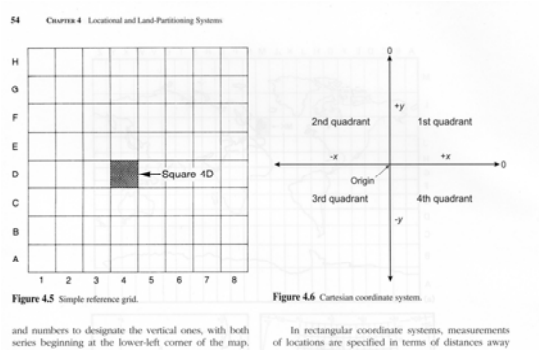


PLSS

‡ **Public Land Survey System (P.L.S.S.)**
- Developed to facilitate westward expansion of the US
- Often referred to as "Township and Range"







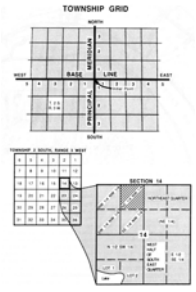
Baselines & Meridians

These give your origin point
- 6 mile grids are built off of the meridian and base line
  - † Townships (or Tiers) are counted north-south
  - † Range are counted east-west

Sections

‡ Each township and range square is divided into **36 sections**.

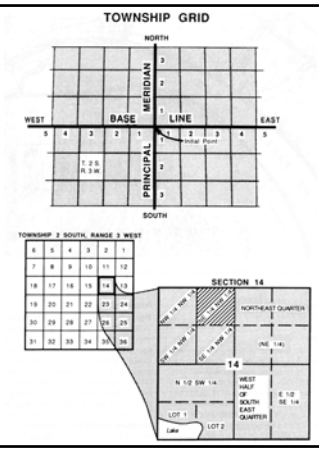
‡ Each section is therefore **1 square mile** or **640 acres**



Further division

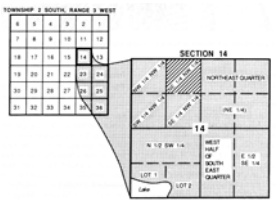
‡ Sections can then be divided into quarters, and then quarter quarters.
- an **aliquot** division of land.

‡ A "**lot**" is a portion of a section that cannot be conveniently divided into a square because of natural features.

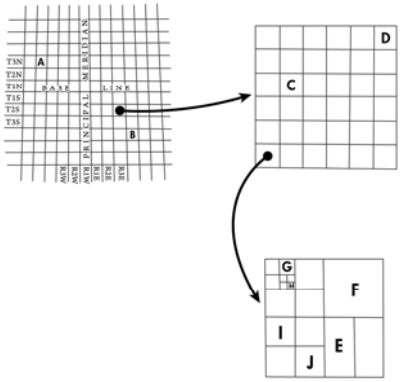


How do you describe it?

Start with the most specific and expand:



NE ¼, NW ¼, Sec. 14, T. 2 S., R. 3 W. San Bernardino Base and Meridian



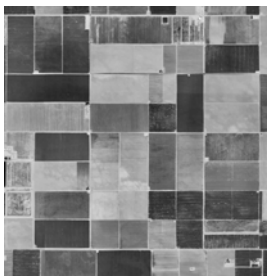
PLSS issues…

‡ Early surveyors weren't perfect!

‡ Irregularities exist due to crude instruments, difficult terrain, human error, etc.

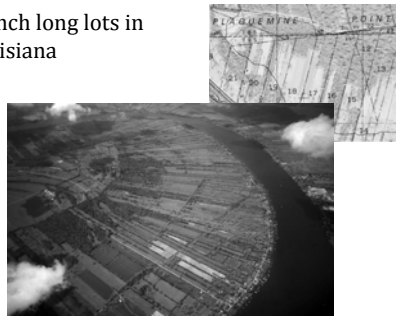
Effect on the landscape

‡ Best seen from the air



Other land divisions

‡ French long lots in Louisiana



DETAIL

Generalization

‡ A way for cartographers to convey information without having to go into prohibitive detail.

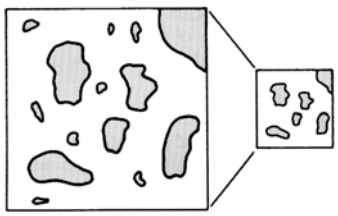
Why do we care?

‡ Affects the features of a map that are *not crucial to the map's intended use*.

‡ **It is important to know what a map was designed for before using it!**

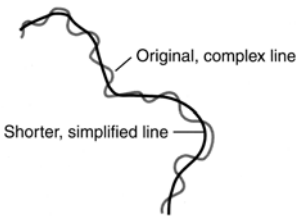
Types of generalization

Selection – keeping the important features at the expense of the less important ones.



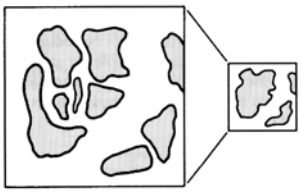
Types of generalization

Simplification – the process of making the line work on the map less complex than it truly is on the ground.



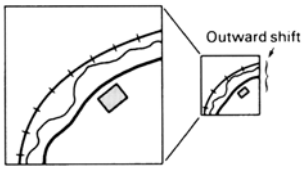
Types of generalization

Combination – combining two or more smaller areas into one larger one for easier representation on the map



Types of generalization

Locational shift & size exaggeration – the process of moving features or increasing their size in order to show them on the map.

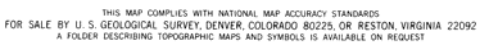


Accuracy

‡ Being able to accurately measure distance and size on a map requires an accurate map.

‡ US National Map Accuracy Standards

‡ Still not perfect!



Date of publication

‡ Remember that the map's **date** reflects its accuracy – a problem with most topo maps

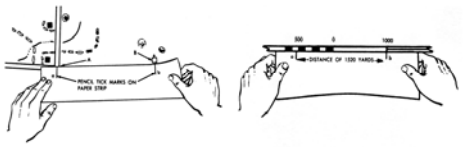
DISTANCE

Taking direct measurement

‡ We will assume that we are measuring relatively short distances
- Eliminates the need to account for the curvature of the Earth.

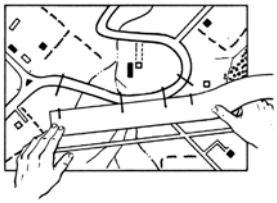
‡ We will also assume that we are using equidistant projections

Scaling



What about curves?

- Move your paper around the curve and continue to tick off the distance.
- More segments = more accuracy



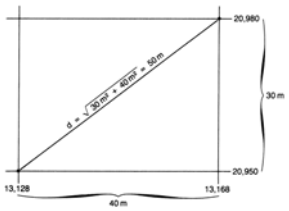
A map measurer

Other methods

- Map dividers
- A pipe cleaner
- String
- Your compass

Indirect methods

- Pythagorean theorem: $\mathbf{a^2 + b^2 = c^2}$
- This is where using a grid coordinate system is useful



What about Google?

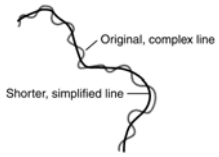
- Yes, you can input two points into Google Maps (or any other program)
- But this only uses a route system – roads must exist between the two points.

Potential error

‡ Poor measurement
‡ Generalization
‡ Terrain variation

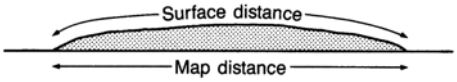
Measurement & generalization

‡ "Measure twice, cut once"
  – Repeat your work to reduce error
‡ Think about generalization



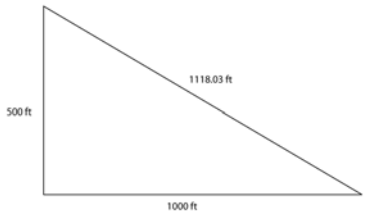
Slope

‡ We are looking at maps **orthographically**, which means that the terrain can look flat.
‡ Walking up and walking down affect distance, not to mention level of difficulty…



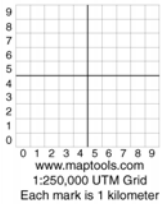
Correcting for slope

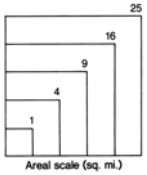
‡ Good ol' Pythagoras ($a^2 + b^2 = c^2$)



Finding Area

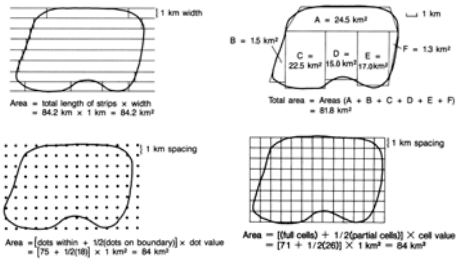
‡ Areal scales
‡ UTM map rulers





Polar planimeter

Other methods



Don't forget to use the map

"Start from the known and work toward the unknown."

- A PLSS section = one square mile
- A PLSS section = 640 acres
- *If you're dealing with something that is roughly the size of a quarter section you know it is roughly 160 acres.*

Remember

‡ You need to know how important accuracy is when measuring a map.

- This affects map choice, care in measurement, need to reduce error, etc.