

Map Reading

Lesson Plan: NRES D1-1



Anticipated Problems

1. How are legal land descriptions interpreted?
2. How are topographic symbols and legends interpreted?
3. How is acreage measured on maps?
4. How is location determined from maps?



Terms

- acre
- base line
- contour interval
- contour line
- metes and bounds system
- principal meridian
- Public Land Survey System (PLSS)
- section
- topographic map
- township



Describing Land

- Lands in the United States are described using two legal land descriptions:
 - The metes and bounds system
 - Public Land Survey System (PLSS)



Metes and Bounds System

- The ***metes and bounds system*** is a method used to describe boundaries of a piece of land by listing the compass directions (bounds) and distances (metes) of the boundaries.
 - Commonly used wherever survey areas are irregular in size and shape.



Metes and Bounds System

- “Metes” is a boundary defined by the measurement of each straight run between terminal points and the direction.
 - Determined by a compass bearing or survey methods
- “Bounds” is a general boundary description, such as along a certain stream, fence, road, or existing building.

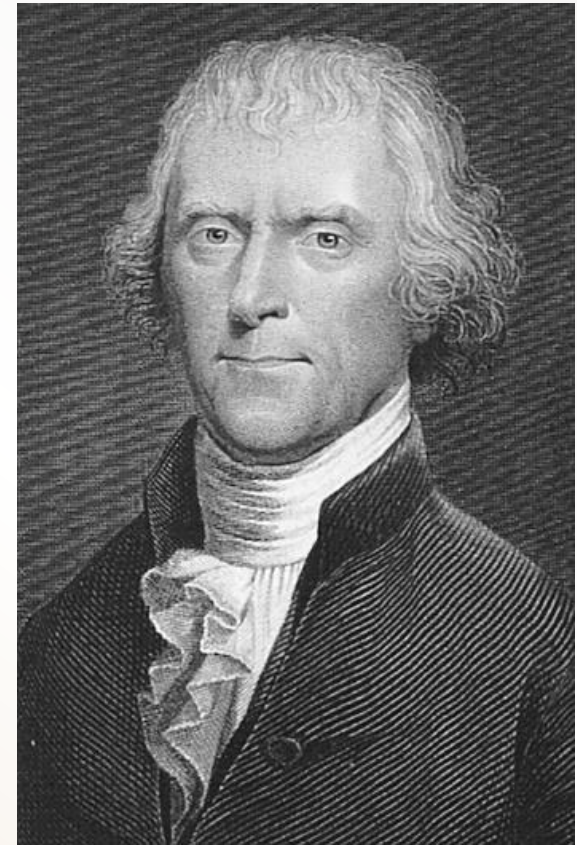


Public Land Survey System

- The ***Public Land Survey System (PLSS)*** is a method by which lands are subdivided and described.
 - Also called meridians and base lines or the rectangular system.
 - A rectangular system of surveys used for the subdivision of all public domain lands.

● ● ● | Public Land Survey System

- The agency that regulates PLSS is the Bureau of Land Management.
 - Originally proposed by Thomas Jefferson
 - Adopted in the Land Ordinance of 1785





Public Land Survey System

- In the Public Land Survey System, land is usually divided into townships and sections.
 - A ***township*** is a six-mile square, which is further subdivided into sections.
 - A ***section*** is a one-mile square. Found in the majority of the states including Illinois, Indiana, Wisconsin, South Dakota, Arkansas, Wyoming

Public Land Survey System

- A number of separate surveys are made with the Public Land Survey System.
 - In most cases, the surveys begin at a single point from which townships are surveyed north, south, east, and west.





Public Land Survey System

- The north-south line that runs through the initial point is a true meridian or the ***principal meridian***.
 - There are 37 principal meridians.
 - A name is given to each to distinguish the various surveys.

Public Land Survey System

- The east-west line that runs through the initial point is called a ***base line***, which is a line that runs perpendicular to the principal meridian.





Public Land Survey System

- Each township is identified with a township and a range designation.
 - The township designation is a description based on its location north or south of the baseline.
 - The township range designation describes its location east or west of the principal meridian.

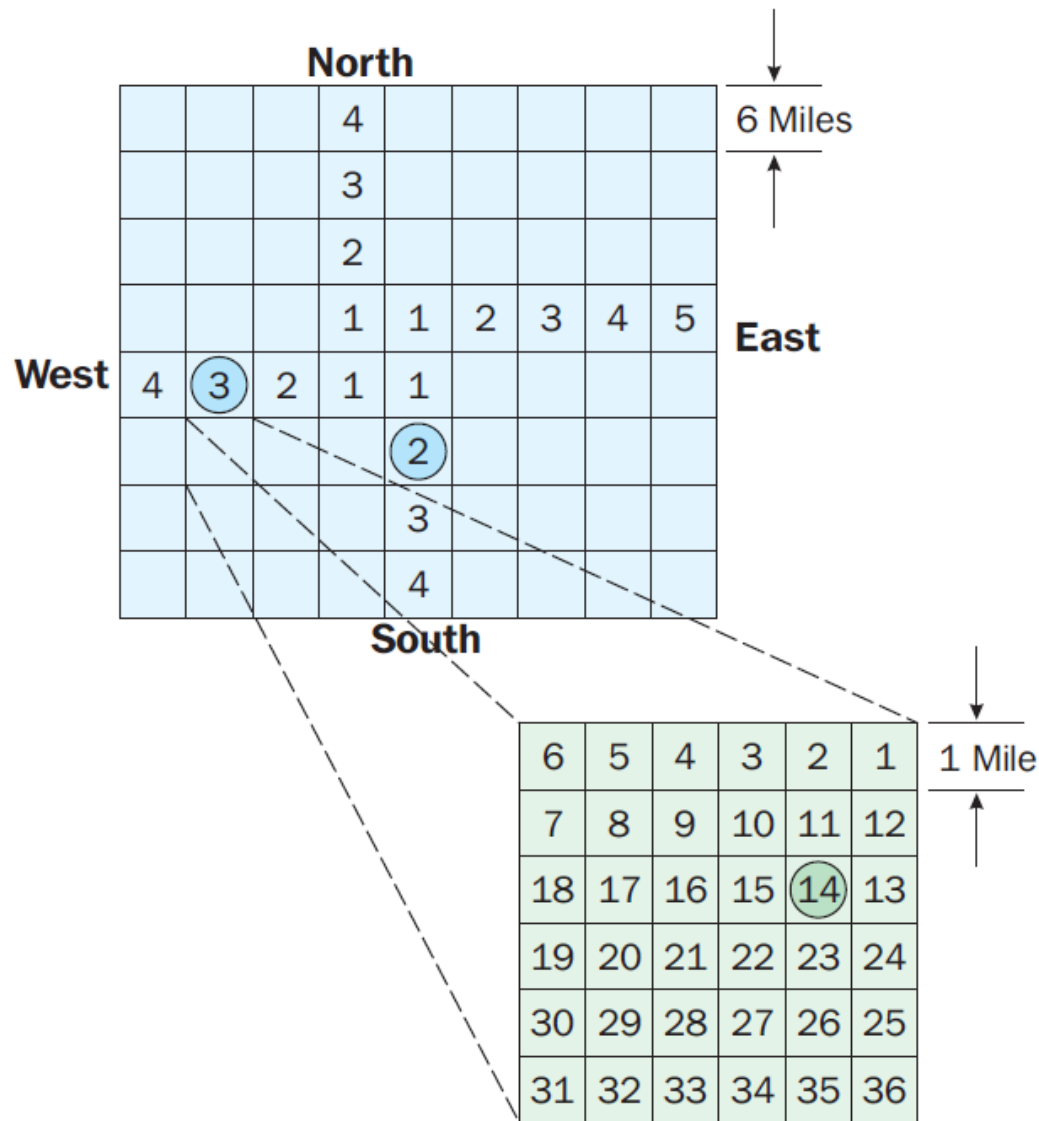


Public Land Survey System

- A legal land description of a section includes the state, principal meridian name, township, and range designations with directions as well as the section number:

Florida, Tallahassee principal meridian, T15S, R20E, sec5

PUBLIC LAND SURVEY SYSTEM



Township 2 South, Range 3 West, Section 14

(Courtesy, Bureau of Land Management)

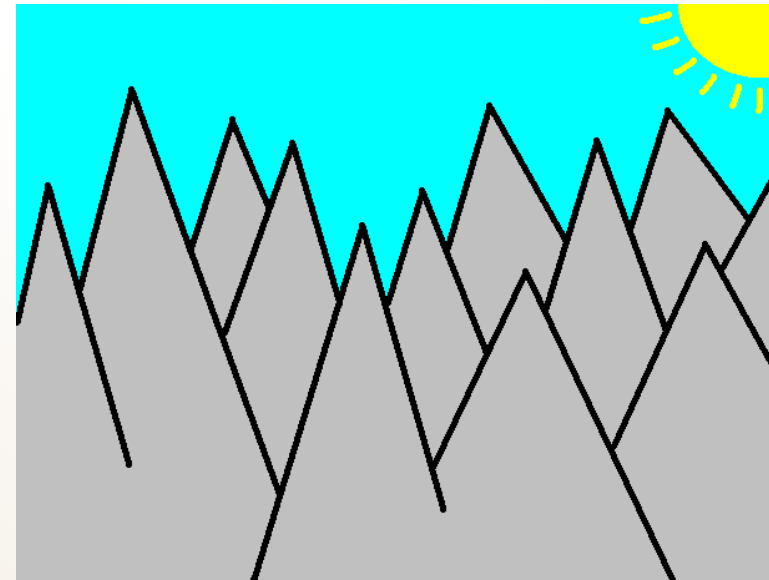


Topographic Map

- Many maps represent a two-dimensional surface of a real-world location or object.
 - A ***topographic map*** is a map that shows a third dimension by using contour lines to express elevation change on the surface of the earth.

● ● ● | Topographic Map

- A ***contour line*** is a line drawn on a map connecting points of equal elevation above or below a reference surface, such as mean sea level. Contours make it possible to measure:
 - Height of mountains
 - Depths of the ocean bottom
 - Steepness of slopes








Topographic Map

- A topographic map also includes symbols that represent such features as vegetation, bodies of water, roads, and other human-made structures.
 - Reading a topographic map requires the ability to interpret various symbols.



Colors in a Topographic Map

- The most prominent features of a topographic map are the colors.
 - Vegetation is green
 - Water is blue
 - Densely built-up areas are gray or red

Perennial lake/pond	
Intermittent lake/pond	
Dry lake/pond	

Compliments of U.S. Geological Survey

<http://egsc.usgs.gov/isb/pubs/booklets/symbols/topomapsymbols.pdf>



Lines in a Topographic Map

- Straight, curved, solid, dashed, and dotted lines are used for many features.
 - The colors of the lines usually indicate similar types of information.



Symbols in a Topographic Map

- A number of point symbols are used to illustrate certain features (e.g., buildings, campgrounds, springs, water tanks, mines, sink holes, and wells).
 - Names of places and features are shown in a color corresponding to the feature type.



Contours in a Topographic Map

- Brown lines of different widths are used to represent topographic contours.
 - Since each contour is a line of equal elevation, contour lines never cross.
 - An experienced map reader can determine the general shape of the terrain with a quick look at the contour lines.



Contours in a Topographic Map

- Index contour lines are drawn wider than other contour lines. These lines show elevation values in several places along the lines.
- Narrower intermediate and supplementary contour lines are found between the index contour lines. They show more details of the land surface shape.
- Contour lines drawn closely together represent steep slopes. Widely spaced contour lines or an absence of contour lines indicate relatively level ground.

Contours in a Topographic Map

CONTOURS

Topographic

Index



Approximate or indefinite



Intermediate



Approximate or indefinite



Supplementary



Compliments of U.S. Geological Survey

<http://egsc.usgs.gov/isb/pubs/booklets/symbols/topomapsymbols.pdf>



Contour Interval

- The elevation difference between adjacent contour lines is the ***contour interval***.
 - The distance of the interval is selected so the map is easy to read.
 - A map of a relatively flat area might have a contour interval of 10 feet or less.
 - A map of a mountainous area might have a contour interval of 100 feet or more.



Measuring Acreage on a Map

- An ***acre*** is a rectangle that is 4×40 rods or 66×660 feet.
 - The area of an acre is 160 square rods; 4,840 square yards; or 43,560 square feet.
 - Elevation does not matter in land survey because the type of terrain does not impact acreage.



Measuring Acreage on a Map

- Calculating square and rectangular acreages.
 - Locate the area to be measured on the map
 - Find the scale in the legend and to note how many feet or miles are represented per inch.
 - The sides of the parcel should be measured in inches.
 - The inches should be converted to feet or miles based on the map's scale.



Measuring Acreage on a Map

- For areas expressed in square feet, it is necessary to divide by 43,560 to get acres.
 - If the parcel is 2 inches by 4 inches on the map
 - And the scale is one inch equals 500 feet
 - The parcel is 1,000 feet by 2,000 feet or 2,000,000 square feet (45.91 acres).



Measuring Acreage on a Map

- For areas expressed in square miles, it is necessary to divide the square miles by 640.
 - If a parcel measures 0.5 inches by 1.2 inches on a map with a scale of 1" equals 1 mile
 - The area would be 6 square miles
 - There are 640 acres in a square mile, which is also known as a section.
 - Multiply by 640 to determine that there are 384 acres in the parcel of land.

● ● ● | Ability to Read a Map

- The ability to read a map is an important skill for those working in natural resources because it could prevent people from getting lost.





Ability to Read a Map

- Maps have vertical lines and horizontal lines that form small squares on each side called grid squares, which are drawn to scale.
 - On military maps, they are often 1,000 meters in length.

● ● ● | Ability to Read a Map

- To find a location on a map, first determine the scale of the grid on the map being used.



FIGURE 2. Reading a map. (Courtesy, U.S. Fish and Wildlife Service)



Ability to Read a Map

- The vertical lines and horizontal lines are identified with a name for each line.
 - Horizontal lines are numbered sequentially.
 - Vertical lines are labeled with letters sequentially.



Ability to Read a Map

- To find the location of a point with given coordinates, such as F7:
 - Find the vertical line labeled "F"
 - Find the horizontal line labeled "7"
 - The two lines can be followed to the point where they intersect.



Review

- In the Public Land Survey System how is land usually divided?
- What do contour lines measure on a map?
- What colors are often used on a topographical map and what do they represent?
- What is the formula for measuring acreage on a map using square miles?