

TOPOGRAPHIC MAPS

MAP

2-D REPRESENTATION OF THE EARTH'S SURFACE

TOPOGRAPHIC MAP

A graphic representation of the 3-D configuration of the earth's surface. This is it shows elevations (third dimension). It provides a plane view of the land (the perspective of someone who is looking straight down at the ground from an airplane. In the USA the organization in charge of making standard topographic maps is the USGS (since 1882).

FEATURES (symbols) p. 97	RELIEF	(brown)	Hills, valleys, mountains, plains, etc.
	WATER FEATURES	(blue)	Lakes, ponds, rivers, canals, lagoons, etc.
	MAN-MADE STRUCTURES	(black, red)	Road, railroads, land boundaries, etc.
	CULTURAL FEATURES	(black, red, yellow)	Towns, cities, etc.
	VEGETATION	(green)	Forest, etc. (not in all maps)

ELEMENTS **SCALE**
DIRECTION AND LOCATION
TOPOGRAPHY

SCALE

Ration between two points on the map and the distance between the same two points on the ground.

Represents: **AMOUNT OF REDUCTION**. All topographic maps show a portion of the earth's surface in much smaller size that the surface area they represent.

USE:

MEANS TO DETERMINE:

- A) **DISTANCE** between any two points.
- B) The **AREA** represented.

SCALE –3 Forms

1. VERBAL

Verbally expressed

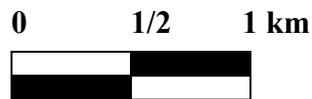
1 inch = 10 miles or (1 inch equals 10 miles)

1 cm = 10 km

The actual ground distance is compared of equated to a smaller dimension representing it on the map

2. GRAPHIC or Bar

1 mile



The scale is laid out graphically as a calibrated line or bar divided into a number of segments

3. FRACTIONAL, RATIO or REPRESENTATIVE FRACTION (R.F.)

1:24,000

1/24,000

$\frac{1}{24,000}$

Has no specific units.

The portion of the earth shown in the map has been reduced 24,000 times

UNITS OF MEASUREMENT

English System: Distance in miles

Elevation in ft

Metric System: Distance in kilometers

Elevation in m

(International)

SCALE CONVERSION

PROBLEMS:

1. Convert a R.F. scale of 1:125,000 to a Verbal scale.

This R.F. scale means that:

1 unit on the map is equal to 125,000 units on the ground

If we use the English System it means that:

1 inch = 125,000 inches

one inch on the map represents 125,000 inches on the ground

(1 mile = 5,280 in; 1 ft = 12 therefore 1 mile = 5,280 x 12 = 63,360 in)

1 in = 125,000 / 63,360 miles

Verbal Scale: 1 in = 1.97 miles

2. Convert a Verbal scale of 1 in = 1.5 miles to a R.F. scale.

1 in = 1.5 x 5280 x 12 in

1 in = 1.5 x 63360 in

1 in = 95040 in

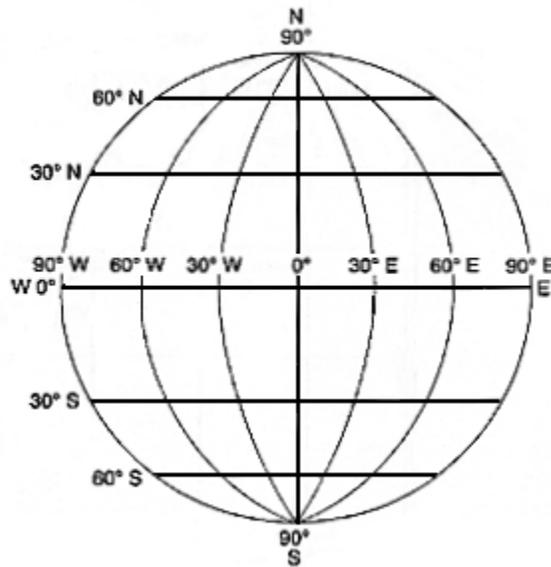
R. F. Scale 1: 95040

ORIENTATION / LOCATION

Most topographic maps use two arrows that meet at a common point to indicate direction (**TRUE NORTH** and **MAGNETIC NORTH**). The angle between these two arrows is the **MAGNETIC DECLINATION**. If not shown on a map it is assumed that the map is oriented with north up.



One way to indicate **LOCATION** is by **LATITUDE** and **LONGITUDE**
LATITUDE measured north or south of the equator along parallels.
LONGITUDE measured east to west of the Prime or Zero (Greenwich) meridian.



Example: New Orleans, LA 29° 57' North; 90° 04' West

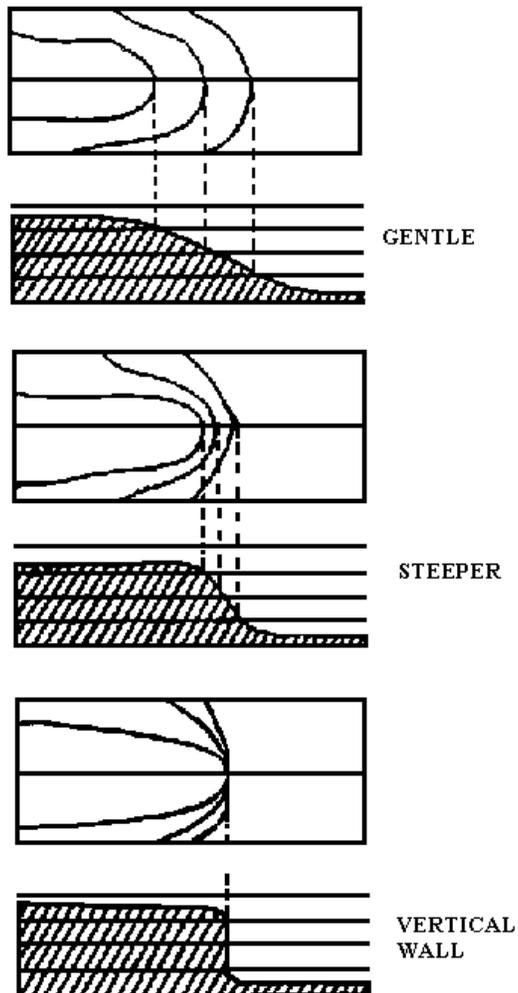
TOPOGRAPHY

Contour Line. Imaginary line that connects points of equal elevation. Shown in brown in standard USGS maps.

Contour lines can be thought of as an intersection of the topography with a horizontal plane.

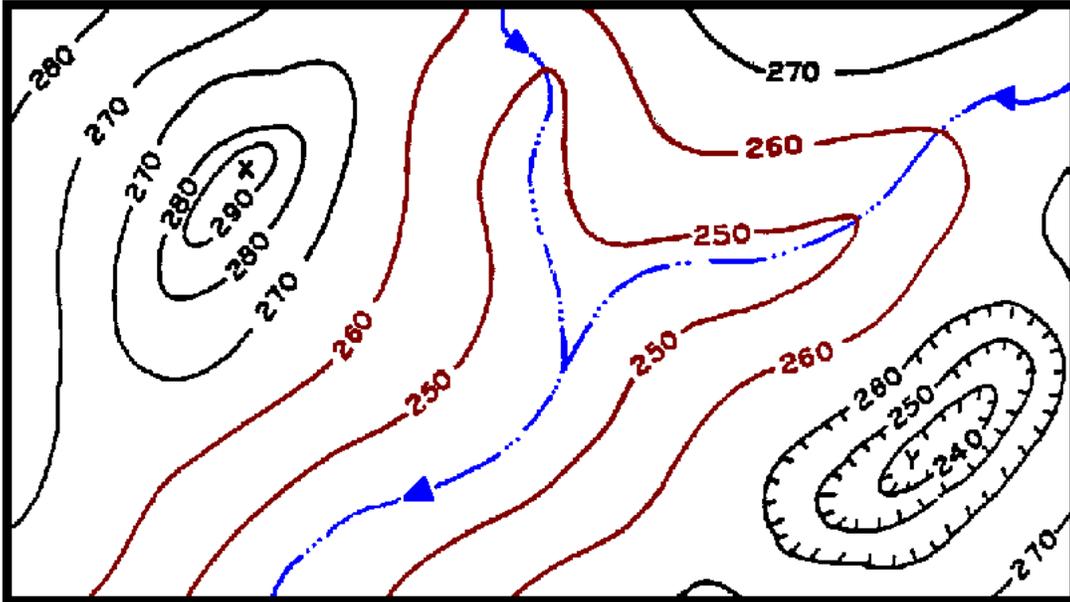
CONTOUR LINES -BASIC RULES

1. Contour lines **CONNECT POINTS OF EQUAL ELEVATION.**
2. **DIFFERENT** contour lines **DO NOT CROSS.**
3. **SPACING** between contour lines is related to the **STEEPNESS** of a slope.
WIDELY SPACED == GENTLE SLOPE
CLOSELY SPACED == STEEP SLOPE



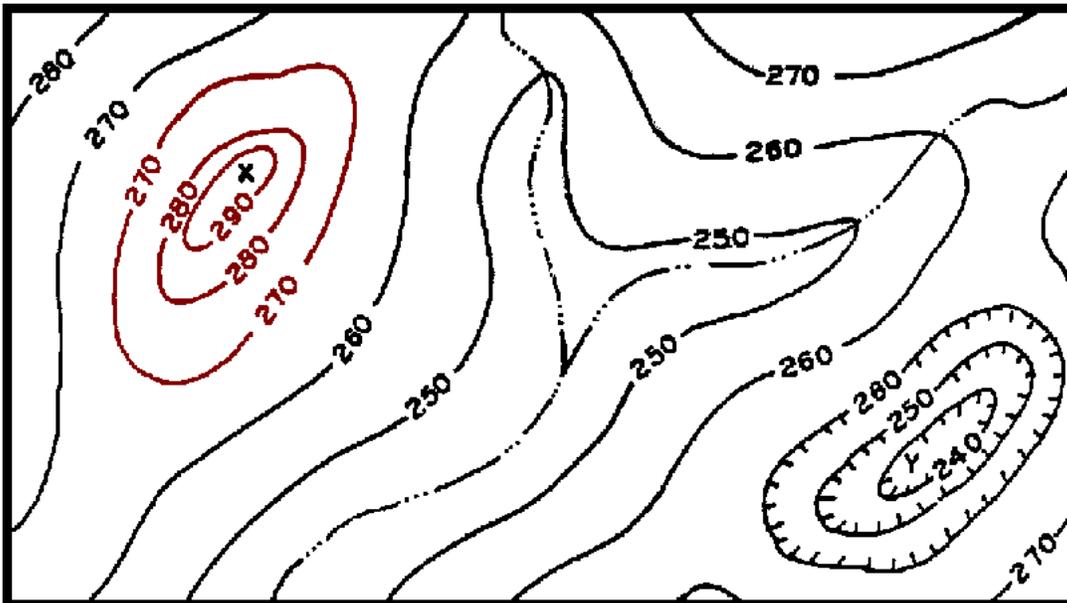
4. When contour lines **GO ACROSS STREAM VALLEYS** they form Vs, with their apices **POINTING UPSTREAM**.

"V"s
Contour lines form "V"s pointing upstream

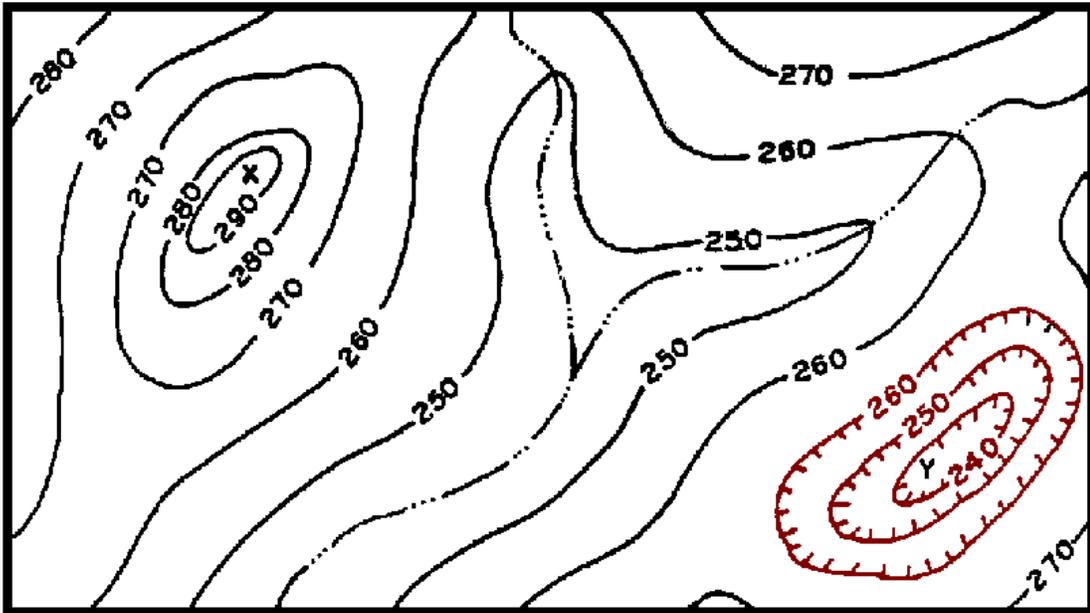


5. **HILLS, KNOBS, MOUNTAINS**, etc., are represented by **CLOSED CONTOURS**.

HILLS, KNOBS or MOUNTAINS
Closed contours

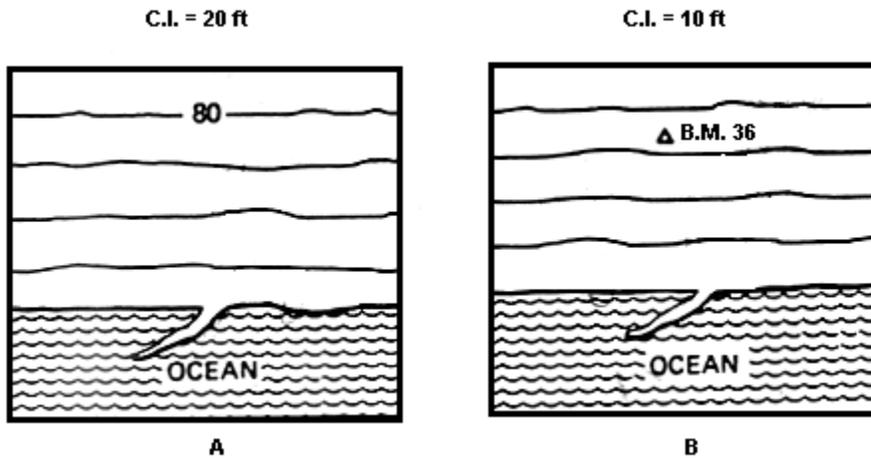


6. **CLOSED DEPRESSIONS** such as Volcanic and Meteor Craters, sinkholes, etc., are represented by **CLOSED CONTOURS** with **HACHURES** (small ticks that point downslope).



CLOSED DEPRESSION
Closed contour with hachures (ticks)

CONTOUR INTERVAL (C.I.) is the difference in elevation between any two adjacent contour lines. It's always constant in a map (unless otherwise specified).

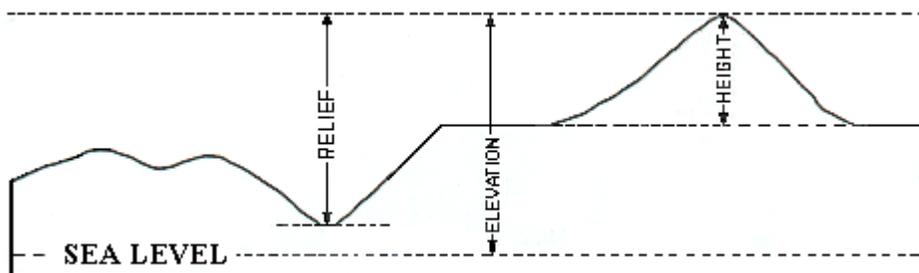


ELEVATION (ALTITUDE) is given in feet or meters above mean sea level. It's the vertical distance of a point above sea level.

BENCH MARK (B.M.) Place where the elevation has been determined accurately. Mark by a brass plate fixed to the ground.

RELIEF is the difference in elevation between the lowest and the highest point of a given area.

HEIGHT is the difference in elevation between an elevated topographic feature (i.e. a mountain) and its immediately adjacent base.

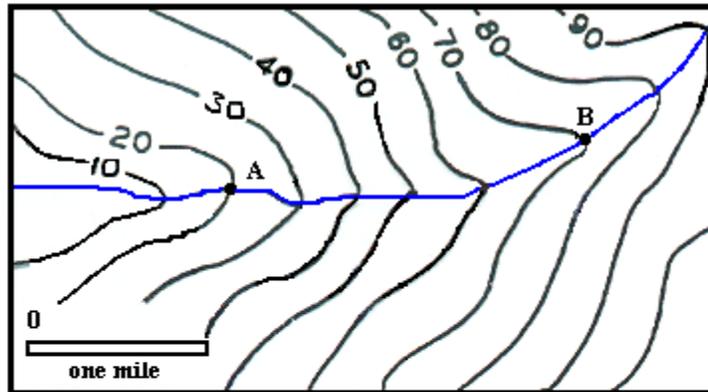


GRADIENT or SLOPE

Inclination of the Earth's Surface with respect to the horizontal.

Gradient = $\frac{\text{Difference in elevation}}{\text{Horizontal separation on the map}}$ (in feet or meters)
(in miles or km)

Units: ft/mile (feet per mile) or **m/km** (meter per kilometer)



GRADIENT OR SLOPE = DIFFERENCE IN ELEVATION / DISTANCE
[feet / mile]

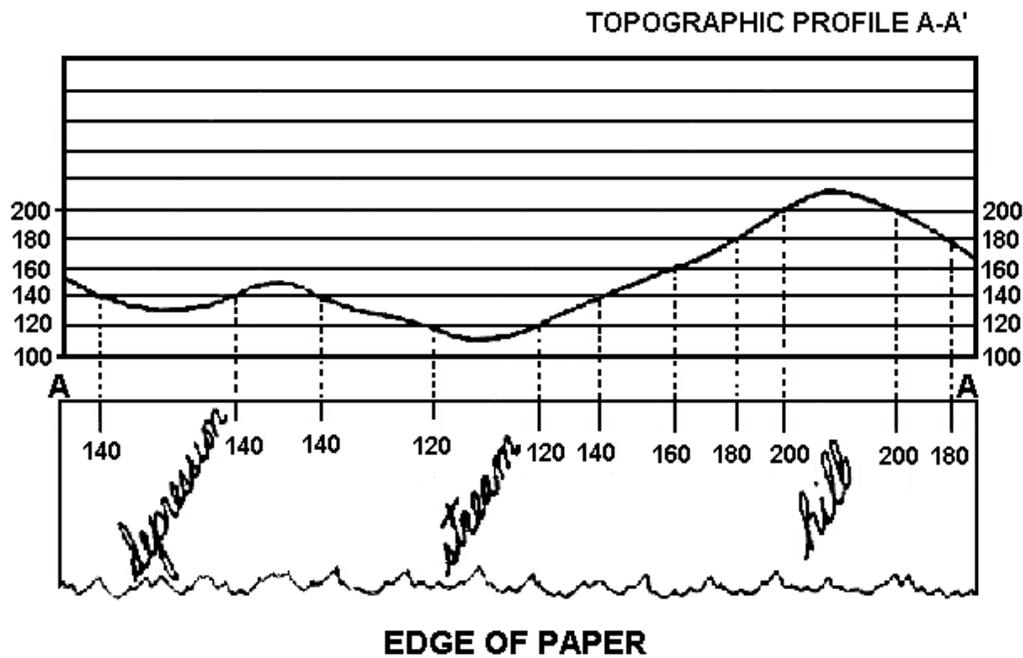
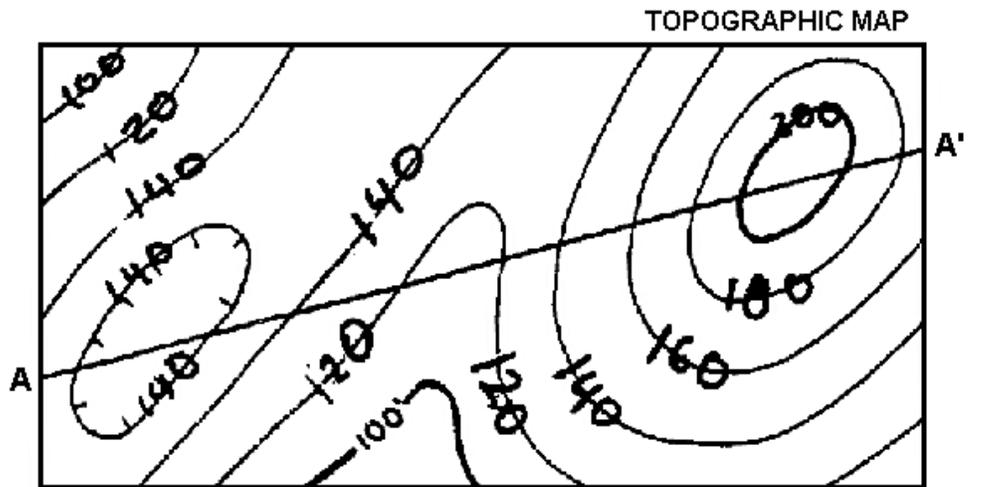
Gradient B-A = (70-20) ft / 2 miles

Gradient B-A = 50 ft / 2 miles

Gradient B-A = 25 ft/mile

TOPOGRAPHIC PROFILE or CROSS SECTION. (p.101)

Diagram that shows change in elevation of the land surface along a given line. (side-view, silhouette or skyline). It is formed by the intersection of a vertical plane and the earth's surface.



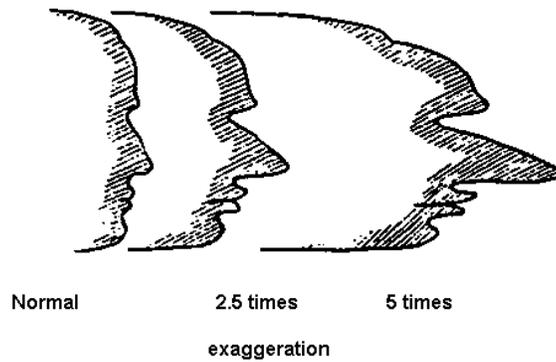
VERTICAL EXXAGERATION. (V.E.) (p.102)

Is used to emphasize topographic variations.

V.E. = Vertical (grid) scale / Map (horizontal) scale.

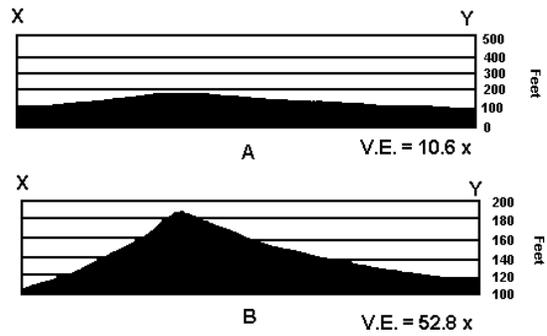
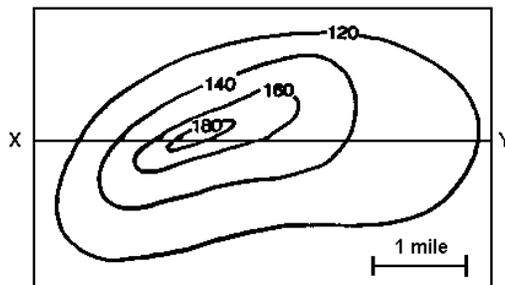
(both have to be in R.F. form)

Example: 1:4,800 / 1:63,360 = 13.2 x



$\text{Vertical Exaggeration} = \frac{\text{vertical grid scale}}{\text{map scale}}$
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$$V.E. = \frac{1:1,200}{1:62,500} = \frac{62,500}{1,200} = 52 \text{ x.}$$



CHARACTERISTICS OF CONTOUR LINES (Figure 9.5, p.150)

The following characteristics of contour lines govern the construction and reading of contour maps:

- 1.. Every point on the same contour line has the same elevation.
2. A contour line always rejoins or closes upon itself to form a loop, although this may or may not occur within the map area. Thus, if you walked along a contour, you would eventually get back to your starting point.
3. Contour lines never split.
4. Contour lines never cross one another; however, if there is a steep cliff, they may appear to overlap because they are superimposed on one another.
5. Slopes rise or descend at right angles to any contour line.
 - Evenly spaced contours indicate a uniform slope
 - Closely spaced contours indicate a steep slope
 - Widely spaced contours indicate a gentle slope
 - Unevenly spaced contours indicate a variable or irregular slope
6. Contours usually encircle a hilltop; if the hill falls within the map area, the high point will be inside the innermost contour (however, see discussion of depression contours).
7. Contour lines near the tops of hills or bottoms of valleys always occur in pairs having the same elevation on either side of the hill or valley.
8. Contours always bend upstream where they cross stream valleys.
9. If two adjacent contour lines have the same elevation, a change in slope occurs between them. For example, adjacent contours with the same elevation would be found on both sides of a valley bottom or ridge top.
10. Small depressions may be encircled by contours with hachures (short lines perpendicular to the contour line) on the downhill side. A hachured contour has the same elevation as the normal (unhachured) contour immediately downhill from it.