Appendix II: Planning Tools

EVALUATING SLOPE

Definition: Slope is the steepness of the land expressed as the amount (in percent) of vertical fall per 100 feet of horizontal distance. For example, a 3% slope means a three foot change in elevation per 100 feet of horizontal distance.

Importance of slope: Slope along with soil texture (sand, loam, clay) and ground cover determines how fast water will drain from an area. Water drains quickly from steep slopes, however erosion may be a problem. Flat surfaces may result in saturated soils. Slope can be managed during road design and layout.

Estimating slope: Slope can be divided into three broad categories: *flat*, *moderate*, and *steep*. Standing downhill, and facing uphill, try to look level back into the hill. To help keep your line of sight level, face uphill with your arm stretched out in front of you with a pencil (or a rolled up dollar bill) pointing up out of your fist. Looking over the tip of the pencil will keep your sight level. Estimate the horizontal, level distance between you and where your line of sight hits the ground. Divide the height distance by horizontal distance to determine the percent of slope. Instruments can be obtained to increase accuracy: an Abney level for $100+, a clinometer for $100, or a slope gauge for $40.

Other sources of slope information:

- USGS topographic maps
- Soil surveys
- Soils maps

Appendix II: Planning Tools

EVALUATION OF AERIAL PHOTOS

Definition: Aerial photographs or "maps" are high altitude photos taken in a very concise and systematic manner. Although maps can be made in color and even infrared, the most commonly used aerial photos are black and white. The top of the map is usually north.

Information provided:

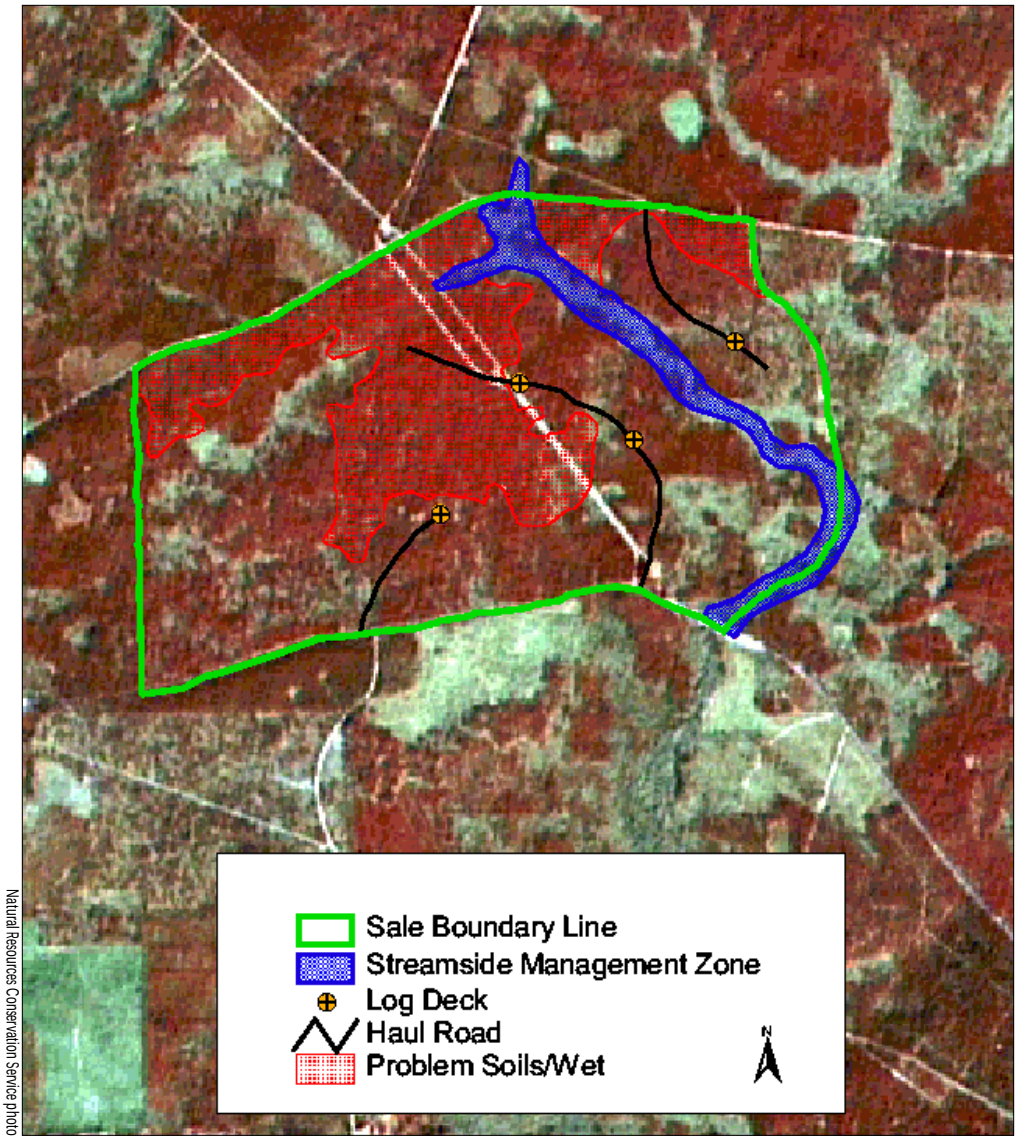
- Boundaries and timber types (for example, on aerial photos, pines appear darker than hardwoods)
- Drainage patterns
- Roads, buildings, etc.

Scale: Aerial photos come in many scales such as 1" = 660', 1320', etc. It is important to know the photo scale before using.

Sources for aerial photo information:

- Natural Resources Conservation Service
- Farm Services Agency
- Louisiana Department of Agriculture and Forestry
- Private vendors

Forest Hill, Louisiana



Natural Resources Conservation Service photo

1:24,000

Aerial photographs are valuable planning tools.

Appendix II: Planning Tools

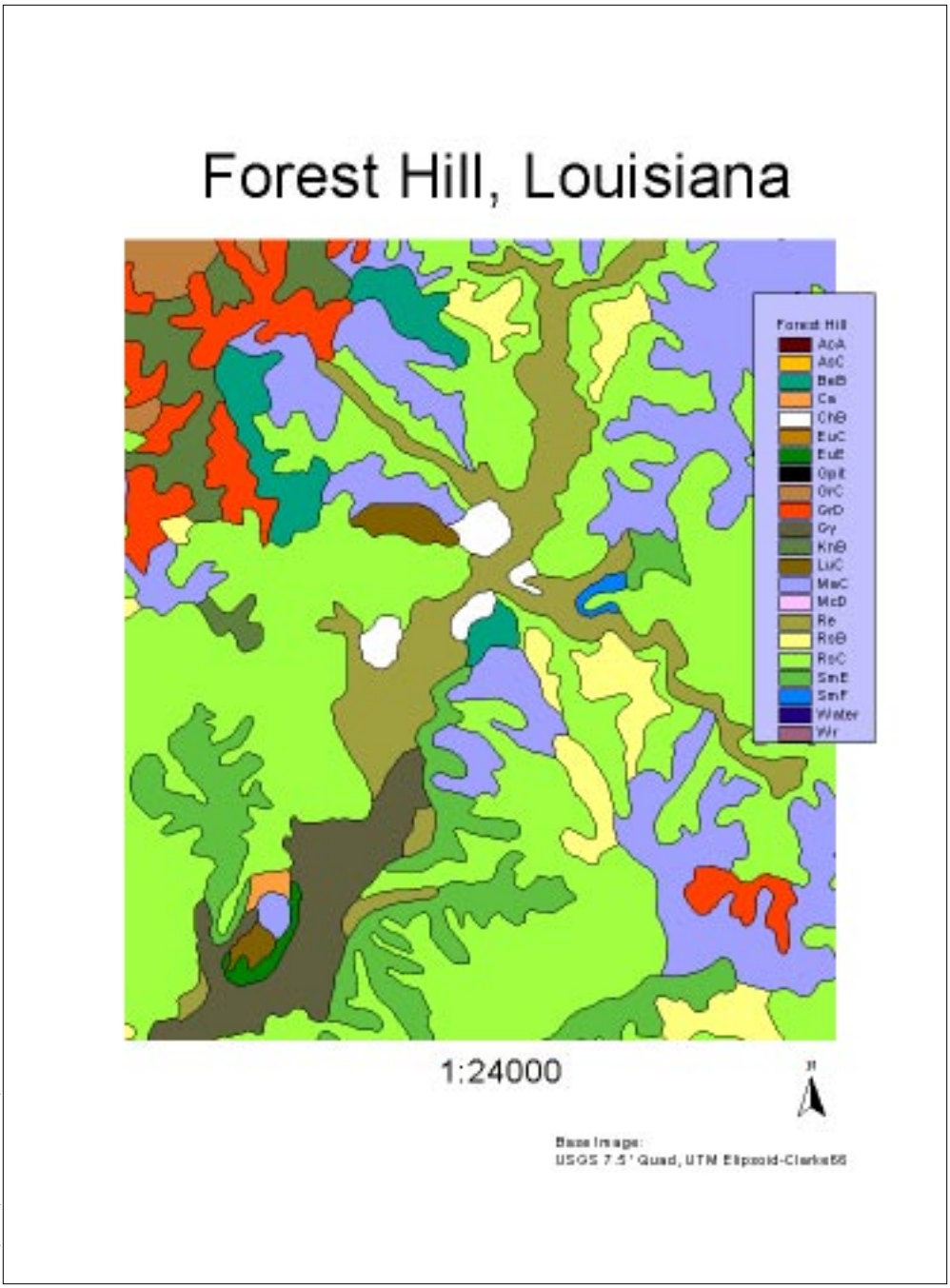
EVALUATION OF SOIL MAPS

Definition: Soils maps are aerial photographs on which the types are delineated. Soils are classified, mapped, and published by the Natural Resources Conservation Service into a book called a Soil Survey. A Soil Survey can be obtained at your local NRCS office.

Use for soil maps:

- Plan routes
- Avoid problem areas such as wet areas
- Plan where and how to cross streams
- Estimate slopes that may be encountered
- Determine drainage patterns

Soil surveys and soils maps are important planning tools, but an on-site check of the exact soil type and slope is essential.



Natural Resources Conservation Service map

Soil maps are available in each Louisiana parish. They are available to the public at the local (USDA) Natural Resources Conservation office.

Appendix II: Planning Tools

EVALUATION OF TOPOGRAPHIC MAPS

Definition: Topographic maps or "quad sheets" are printed maps that portray the relief of the landscape. In addition, they also display physical features such as roads, buildings, rivers, and creeks.

Scale: The most common used topographic map is the 7.5 minute map which has a scale of 1:24,000 or 1 inch = 2,000 feet. In any case, scale is displayed at the bottom of the map.

Relief: Changes in elevation are shown by a series of contour interval lines. These lines represent a point's elevation above sea level. Any point along a line is the same elevation as any other point on the same line. The closer the contour lines are to each other, the steeper the slope. The elevation distance between the lines is usually 5 or 10 feet. This information is given at the bottom center of the map. The elevation is frequently printed along several of the contour lines.

Determining slope: Determine the elevation change between two points from the contour lines, being sure to use the proper contour interval. Divide this change by the distance between the two points, using the scale at the bottom of the map. Multiply by 100 to get the percent slope.

Natural Resources Conservation Service map

Topographic maps are available from most forestry and engineering suppliers.

Appendix II: Planning Tools

EVALUATION OF DRAINAGE AREA

Definition: Drainage area, or watershed, is the total number of acres which drain to a common point, such as a culvert, creek crossing, or bridge. Determining the acreage in the watershed is important in sizing culverts, locating stream crossings, or locating bridges.

Using topographic maps: Topographic maps show changes in elevation by a series of contour lines. These lines can be used to determine which slopes drain through an area. To determine the watershed, it is helpful to remember two things:

- On hilltops, contour lines will form a small, roughly circular shape.
- On contour lines with fingerlike projections, the fingers point uphill.

The watershed can be defined by drawing arrows in the direction of drainage to the common point.

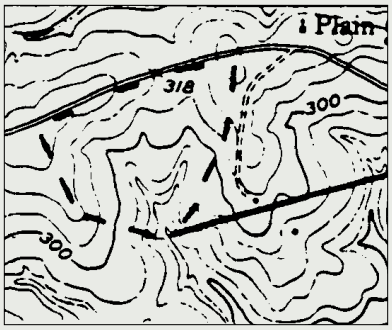
Determining areas: After the watershed is drawn, the number of acres in the area can be estimated. For a topographic map with a scale of 1:24,000 (a 7.5 minute map) the table below can be used as a quick guide.

Guide for Area Estimation on 7.5-Minute Topographic Maps

Facsimile / Shape	Acres
Head of pencil eraser	5
Dime	40
Nickel	50
Quarter	70
1" X 1" square	90

Estimating Storm Runoff for Culvert Sizing

Sample Topographic Map

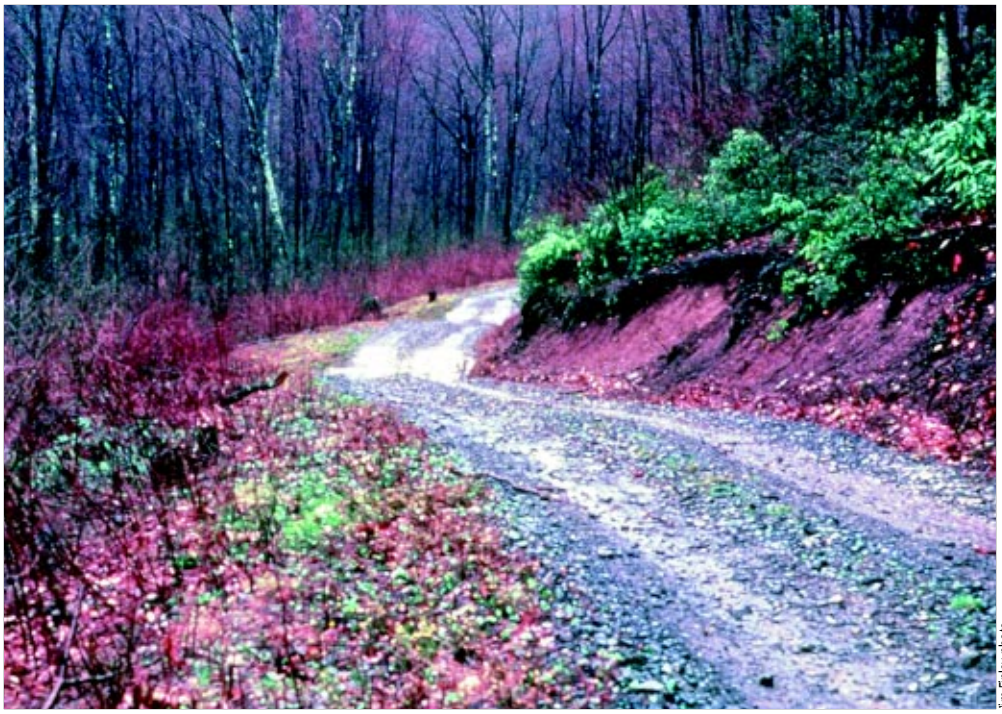


Estimation guidelines

- Using appropriate maps (like topo map, left), estimate the drainage area for the stream crossing site.
- Using either a soils map or testing the texture by feel, determine if the drainage is predominantly sandy, loamy or clayey.
- Determine the average slope class (flat, moderate or steep) of the drainage area. Although most drainage areas will be either flat or moderate, do not consider the crossing site only, but the whole drainage area.
- Using the table below, determine the runoff for a 5-inch, 24-hour storm for the appropriate drainage area, soil type and slope class.

Peak Runoff from A 5-Inch Storm, in Cubic Feet per Second

Acres	Flat Slopes			Moderate Slopes			Steep Slopes		
	Sand	Loam	Clay	Sand	Loam	Clay	Sand	Loam	Clay
5	4	9	15	6	12	19	8	14	20
10	7	14	24	11	21	35	15	27	40
15	9	19	32	14	29	47	21	39	57
20	11	23	40	17	35	60	26	50	75
25	12	26	47	20	42	70	30	60	92
30	14	30	52	23	47	80	35	70	110
35	15	32	60	25	52	90	40	77	125
40	17	35	65	27	57	100	43	85	140
45	18	37	70	30	62	120	47	95	150
50	19	40	75	32	67	140	50	100	165
75	25	52	100	42	87	160	67	130	230
100	30	65	120	50	110	190	80	170	290



Jim Finley photo

An example of rolling dips on a permanent road.