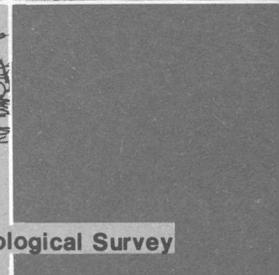
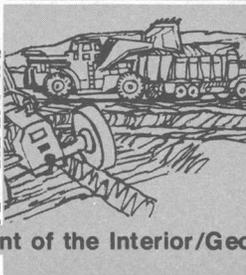
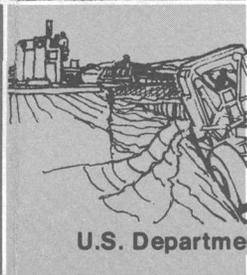
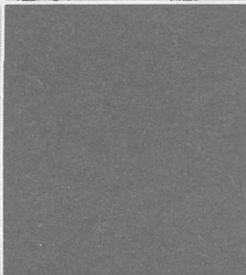
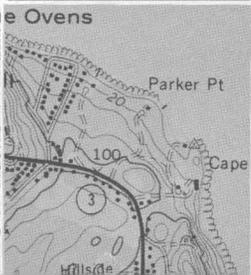
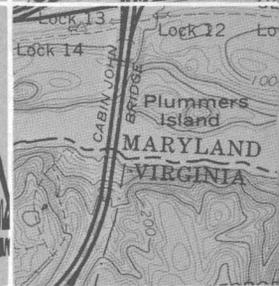
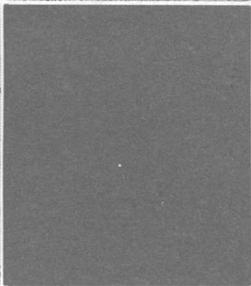
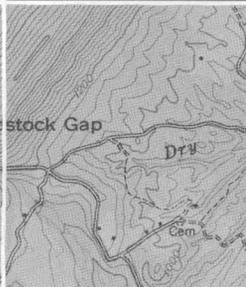
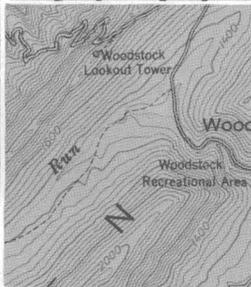
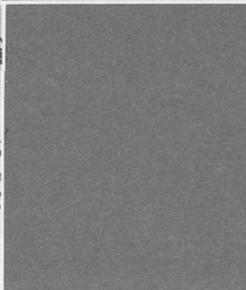
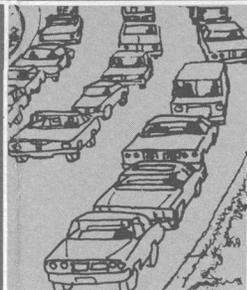
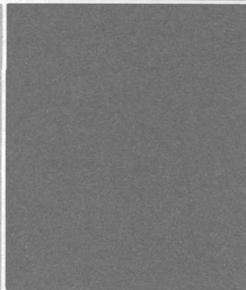
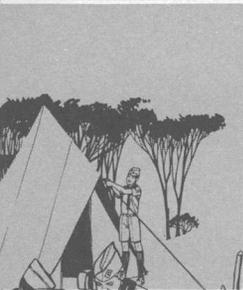


As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

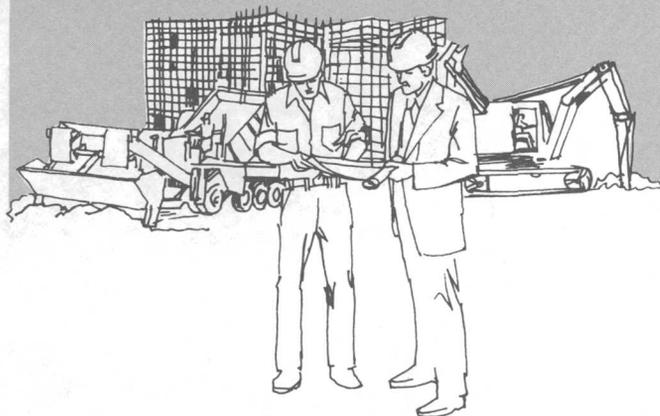
# Topographic Maps: Tools for Planning



# Topographic Maps:

## Tools for Planning

by George A. Kaufman



One of the principal objectives of the U.S. Geological Survey is to provide general-purpose topographic maps of appropriate scale and accuracy for all of the country.

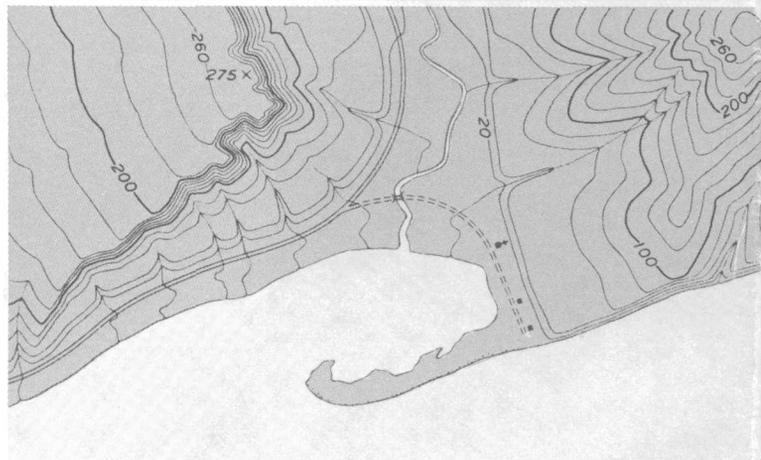
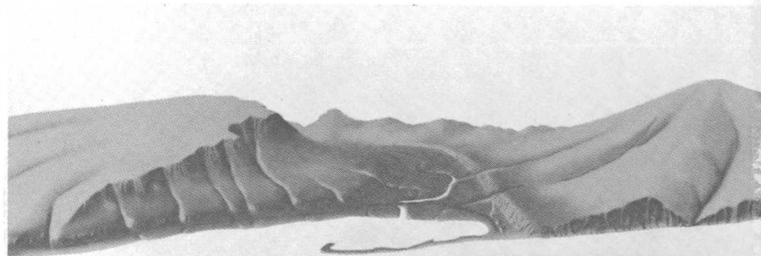
The Geological Survey was established by Congress in 1879 to consolidate four earlier organizations that had been engaged in topographic and geologic mapping and in the collection of information regarding the public lands. It soon became evident that no adequate classification of lands or conclusive geologic determinations could be made without suitable base maps. In 1882, a general plan was adopted for the Survey to produce a standard series of topographic maps. This original plan has been expanded to meet the needs of a growing Nation.

More than 7 million copies of maps of the National Topographic Map Series are distributed annually by the Geological Survey to engineers, scientists, industrial planners, real-estate dealers, hunters, fishermen, and other map users in all walks of life. About three-quarters of the maps are sold, and about one-quarter are made available free on request to educational institutions, public libraries, and government agencies.

# What Are Topographic Maps?

Topographic maps are a detailed record of a land area, giving geographic positions and elevations for both natural and man-made features. They show the shape of the land—the mountains, valleys, and plains—by means of brown contour lines (lines of equal elevation above sea level). In steep mountainous areas, contours are closely spaced; in flatter areas, they are far apart. The elevation of any point on the map can be estimated by referring to the elevations of the contour lines above and below it.

The network of streams, lakes, springs, and other water features is shown in blue; woodland features, in green; and the principal works of man, such as roads, buildings, railroads, and powerlines, in black. Urbanized areas are shown in a red tint.



How features are represented on a topographic map.

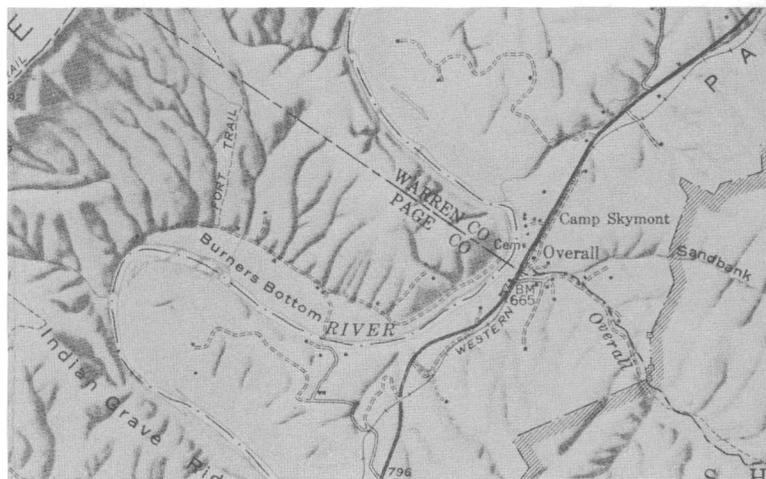
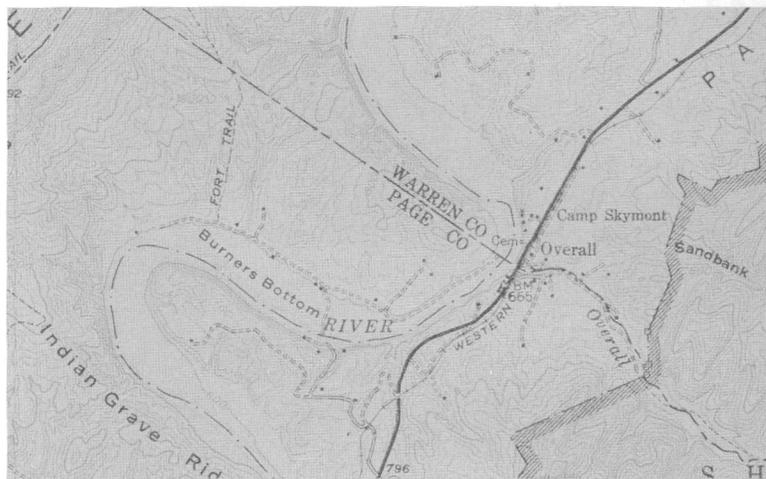
Topographic maps are an inventory of the physical features of the Earth's surface, including the names of many features. They clearly show the topography to the map reader, whether he is standing in the area or sitting in his home or in an office a thousand miles away.

The 7½-minute quadrangle map at 1:24,000 scale is the backbone of the National Topographic Program conducted by the Geological Survey. At this scale, 1 inch on the map represents 24,000 inches or 2,000 feet on the ground. This map covers a four-sided, almost rectangular area bounded by 7½ minutes of longitude and 7½ minutes of latitude. Because of the converging longitude lines, the actual area covered ranges from approximately 70 square miles in the south to 50 square miles along the Canadian border.

Topographic mapping in the 7½-minute series or in the 15-minute series (1 inch represents approximately 1 mile) is available for more than three-quarters of the United States. The entire country will eventually be covered by quadrangle maps in either of these two series.

Several series of small-scale and special maps are published to meet modern requirements. These include—

- 1:250,000 scale (1 inch on the map represents about 4 miles on the ground)—for use as topographic bases for other types of maps and for regional planning.
- State maps, at 1:500,000 scale (1 inch represents 8 miles)—for use as wall maps and for statewide planning.
- Shaded-relief maps, at various scales—for exhibits, for training in map reading, and for terrain study.
- National park maps, at various scales—for park management and development and for tourist guides.
- Antarctic topographic maps, at various scales—for scientific research.



The same features represented on a topographic map (top) and on a shaded-relief map (bottom).

- International Map of the World (IMW), at 1:1,000,000 scale—for broad geographic studies.
- United States base maps, at various scales—for regional and countrywide studies and for classroom instruction.
- National Atlas of the United States, with maps at various scales—for geographic reference purposes.

## Who Uses Topographic Maps?

The people who use topographic maps do not fit into any one category, and yet they all have one thing in common: each user wants information about the surface of the Earth—information that can best be shown on a topographic map. Map users include:

Archeologists	Map librarians
Architects	Meteorologists
Assessors	Military personnel
Biologists	Naturalists
Border patrol officers	Oceanographers
Chemists	Planners
Climatologists	Police and security agents
Conservationists	Predator and rodent controllers
Economists	Real-estate developers
Engineers	Recreationists
Entomologists	Registrars
Ethnologists	Salesmen
Foresters	Sportsmen
Geographers	Statisticians
Geologists	Students
Health officials	Surveyors
Industrial engineers	Teachers
Insurance agents	
Land appraisers	
Land managers	
Lawyers	



## How Are Topographic Maps Used?

Almost any project dealing with shape, size, location, slope, or configuration of land can be aided by topographic maps. A poll of map users listed more than a thousand varied purposes for which topographic maps are useful.

### Bases for other maps

Industries and planning agencies use standard-accuracy topographic maps of the Geological Survey as bases for more specialized maps. Scale and detail can be adjusted to suit individual needs. Specialized data can be superimposed directly on the topographic base map. Some of the special adaptations of topographic maps are:

Aeronautical charts	National park maps
Census maps	Population maps
County planning maps	Physiographic maps
Drainage basin maps	Road maps
Flood zoning maps	Shaded-relief maps
Geologic maps	Soil maps
Industrial zoning maps	Weather maps
Land ownership maps	
Land-use and crop maps	

### Highway planning

The planner of major highways knows that good topographic maps provide ready-made field reconnaissance. If the maps are available, he studies them carefully before selecting a preliminary route for a new highway. A topographic map will tell him about the features of the land, approximate amount of cut and fill, drainage, where bridges may be needed, degree of economic development of the area, and other useful information such as the location of gravel pits. Topographic maps are also used in planning minor roads, such as logging, ranch, access, and national forest roads.

## Selecting airport sites

Airports must be located near population centers and must be accessible by road; yet they must be far enough away from populated areas so that air traffic will not present a city hazard and land can be acquired at reasonable cost. Obviously the topographic characteristics of the land are of prime importance in selecting suitable sites for landing strips and assuring a location of maximum visibility. Topographic maps are a valuable source of information about these and other factors in airport planning.

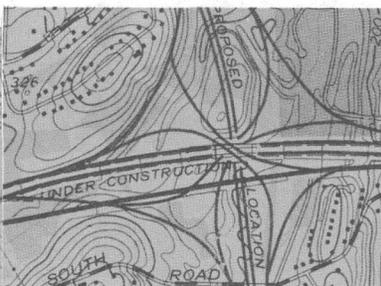
## Selecting industrial sites

Before an industry invests money in a new plant, it needs much information that can be

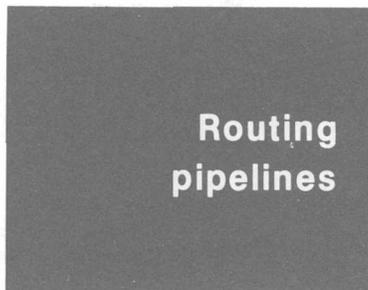
supplied by topographic maps. Of great interest is the amount of water available for industrial purposes. Geological Survey quadrangle maps can be used as aids in water-supply studies and in computing potential water storage.

Topographic maps are useful in selecting undeveloped land that can be acquired at minimal cost, in estimating the cut or fill necessary to prepare a site, and in planning sewer systems and access roads. The cost of building on a particular site as estimated from topographic maps is an important factor in selection. Growing communities and railroads seeking to attract new industry to an area often prepare brochures containing photographs and maps of industrial sites.

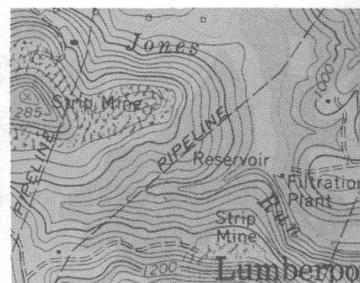
How topographic maps are used for planning development.



**Planning  
highways**



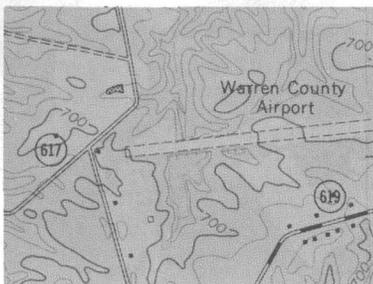
**Routing  
pipelines**



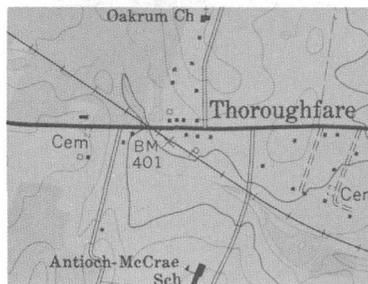
**Locating  
boundary lines**



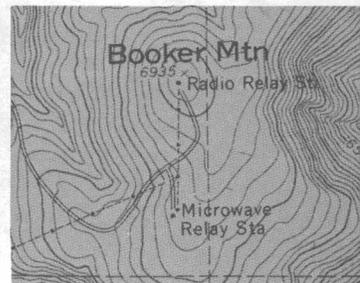
**Locating  
airport sites**



**Selecting  
industrial sites**



**Planning  
communication  
facilities**

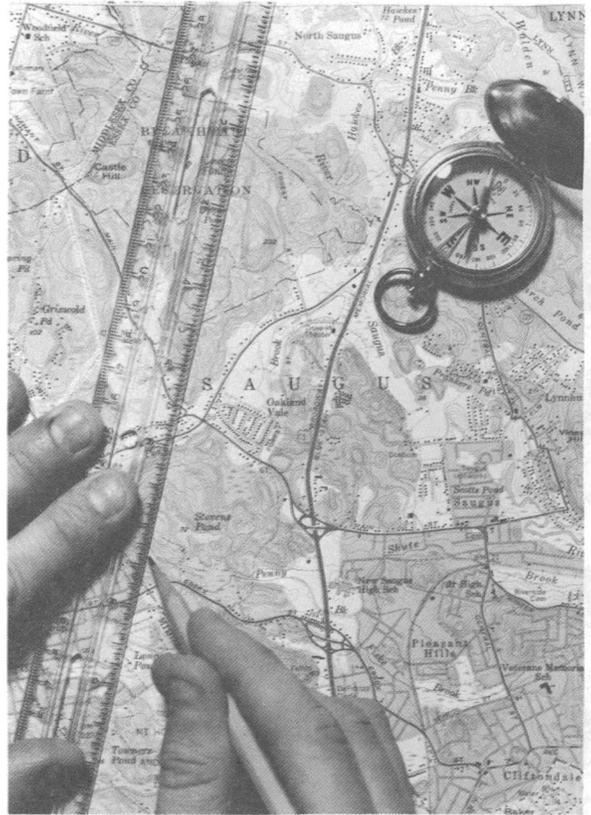


## Selecting pipeline and powerline routes

Private and public utility companies use topographic maps for preliminary planning in the office. Planners may select the general route of the proposed line on 1:250,000-scale maps, each covering about 6,000 square miles. For detailed study and estimates of right-of-way costs, 1:24,000-scale maps are used. An approximate idea of the most economical route can be obtained from topographic maps before going to the field.

## Making cadastral (property) surveys

Topographic maps show fence lines and timber-cutting lines, as well as section lines and corners. Boundary lines and some located-boundary markers are shown for cities, counties, States, and national parks and forests. One important use of such boundary information is in logging operations, to avoid possible trespass. Many private surveyors use topographic maps to spot boundaries and corner markers in an unfamiliar area.



True north is marked.

## Locating communication facilities

Television stations, radio stations, and radar installations all require an unobstructed site for transmission and reception of signals. Profiles determined from topographic maps permit economical selection of sites where signals will have the greatest possible range.

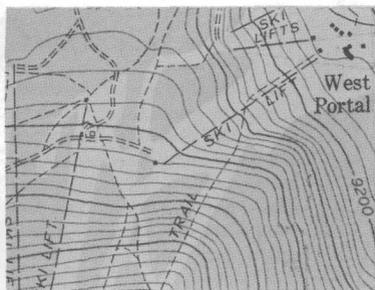
## For agricultural research

Topographic maps have many uses in agricultural research such as the preparation of maps showing areas of climatic and soil conditions best suited for specific crops. Soil scientists study these plant-climate maps to find drainage patterns, sheltered areas, and the elevation at which freezing will occur.



Map control points indicate the height of land features.

## Skiing



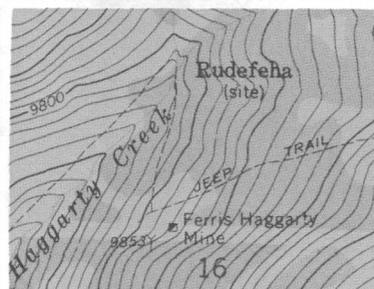
## Fishing



## Camping



## Exploring



How topographic maps are used for planning recreation.



A hike is planned.

## Planning recreation areas

Careful and imaginative planning is needed to create an enjoyable recreation area, and topographic maps can be useful at every stage of the selection and construction. Planners study maps to find promising spots for fishing, camping, skiing, or other facilities, and to find possible access routes into these areas. If locations pass this preliminary test, the maps are examined more closely to evaluate the water supply, fire hazard, and relative safety of the site. Then shelters and other conveniences are constructed where they will be most useful.

## Planning personal recreation

Anyone planning a camping, fishing, hiking, or boating trip will find that topographic maps are a practical guide. Many hunters use topographic maps to plan their hunting trips from their armchairs. Even a simple walk through the woods can be more enjoyable and adventurous with a topographic map.

## Assessing and managing natural resources

Topographic maps are used as bases to show the location, extent, and availability of such natural resources as water, minerals, and timber. To experts, such maps indicate problems and potentialities of resources.

Topographic maps are important aids for people who are concerned with problems of water and its distribution. The hydrologist can obtain information concerning watersheds and distribution of runoff. The engineer can use them in determining size and positioning of dams for water storage or flood control. They are sources of basic data for studies of all aspects

of the hydrologic cycle from precipitation until the water is absorbed into the atmosphere or discharged into the sea.

Since 1897, when the Geological Survey cooperated with the Department of Agriculture in a special survey of potential sites for national forests, the topographic map has become an increasingly valuable tool in the development, use, and conservation of the Nation's forest lands. All phases of timber management, from planning current and future operations to maintaining records of past activities, require the constant use of maps. They are useful in planning access roads, in developing reforestation, and in planning insect-control measures. In fire control and firefighting, they are used to locate sites for fire towers and to select the proper geographic positions for constructing firebreaks. In the event of fire, maps supply the topographic information needed to determine probable fire behavior and to show firefighting crews how to reach an area and where to work.

Every well-planned geologic investigation depends upon a prior topographic survey—geologic maps are plotted on topographic bases—and exploration for minerals depends upon topographic maps. In mining operations, engineers may use topographic maps to plan restoration of land that has been torn apart by strip mining and to predict how the ground will settle when a large mass of ore is removed.



Pinpointing a smoke location on a topographic map by using an alidade.

## How To Obtain Topographic Maps

Indexes showing published maps for areas east of the Mississippi River, including Minnesota, Puerto Rico, and the Virgin Islands are available free on request to the:

Branch of Distribution  
U.S. Geological Survey  
1200 South Eads St.  
Arlington, VA 22202

Indexes showing published maps for areas west of the Mississippi River, including Alaska, Hawaii, Louisiana, Guam, and American Samoa are free on request to the:

Branch of Distribution  
U.S. Geological Survey  
Box 25286, Federal Center  
Denver, CO 80225

Residents of Alaska may request indexes directly from:

Distribution Section  
U.S. Geological Survey  
Federal Bldg., Box 12  
101 12th Avenue  
Fairbanks, AK 99701

These indexes list special maps, addresses of local map reference libraries, local map dealers, and Federal map distribution centers. An order blank showing prices and giving detailed instructions for ordering maps is included with each index.

This publication is one of a series of general interest publications prepared by the U.S. Geological Survey to provide information about the earth sciences, natural resources, and the environment. To obtain a catalog of additional titles in the series "Popular Publications of the U.S. Geological Survey," write to either one of the above Branches of Distribution.