Purpose

Topographic maps, depictions of the land surface features of an area, published by the U.S. Geological Survey (USGS) represent an easily obtained and inexpensive source of landscape information. USGS topographic maps are used by a range of citizens and professionals in public and private sectors for tasks such as site and regional planning, natural resource land management, environmental monitoring and planning, national defense, law enforcement, and outdoor recreation. Topographic maps portray a range of natural and cultural features. Some of the data used to create this atlas, such as topography, hydrology, and geology, originated with the USGS.

History

Although the USGS was preceded by four great civilian and military surveying efforts, including the General Land Office, none had the broad spatial extent or national mandate given in its enabling act. The purpose of this surveying program was to be: "...the classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." [158] To further this purpose, the Topographic Branch of the Survey was created in 1938, and the map products of this branch are to this day more identified with the USGS than any other of its numerous activities. In 1980 the National Mapping Division was formed from the Topographic Division and others, and now oversees the maintenance and management of topographic map production.[159]

Initially, information for the production of topographic maps was collected by field survey crews, who relied on the placement of physical benchmarks on the landscape, survey towers, tape and compass traverses, and aneroid barometers for determination of elevation.While the Survey began experimenting with the use of aerial photography in 1902, it was not until 1933 when the Survey was called upon to assist the Tennessee Valley Authority that aerial photography came into standard use for the production of topographic maps. With the launching of the Earth Research Technology Satellite (ERTS-1, later known as Landsat) in July of 1972, the Survey moved into the age of remote sensing and digital technology.[158] Even with these advances, by 1988, only 70% of the United States and its territories were covered by USGS topographic maps published at the commonly used 7.5 minute scale. To this day, most digital maps compiled by the Survey are compiled from existing analog maps. These digital maps are stored in the National Digital Cartographic Database, and consist of two types, Digital Line Graphs (DLGs), representations of data usually associated with topographic maps; and Digital Elevation Models (DEMs), matrices of elevation for regularly spaced points across the earth's surface.[159]

Methods and Products

Since 1882, the USGS has organized its mapping efforts by geographic coordinate lines, based on degrees of latitude and longitude. The Survey publishes maps in rectangular format, called a quadrangle map. Because the longitudinal (vertical) meridian lines converge at the poles, quadrangles are most square at the equator, and become proportionally more trapezoidal towards the north and south poles. Due to this, quadrangles closer to the poles cover a smaller area of the earth's surface than do quadrangles closer to the equator. In Figure 210, the shaded 15 degree by 15 degree quadrangle nearer the equator covers more area than the shaded 15 degree by 15 degree quadrangle nearer the Arctic Circle. Today, the 7.5 minute quadrangle, at 1:24,000, is the standard mapping scale. The map scale defines the ratio between the measure of a feature represented on the map relative to the measure of that feature on the earth's surface; at the 7.5 minute scale, one inch (2.5 cm) on the map equals 2000 feet (609.6 m) on the ground.[88]

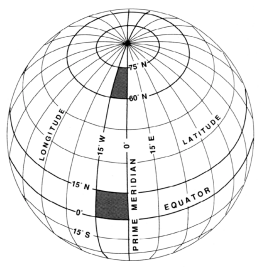


Figure 210. *A comparison of the coverage of quadrangle scales produced by the USGS: the highlighted quadrangle north of the equator covers a greater area than the quadrangle near the arctic circle.*[88]

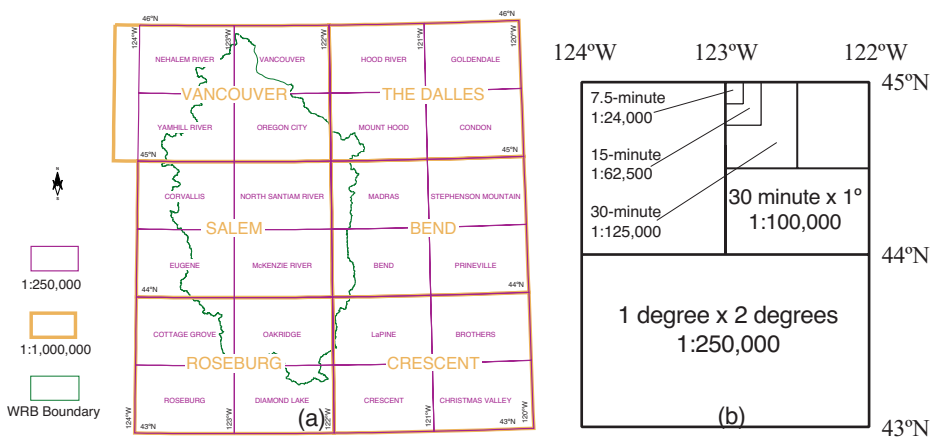


Figure 211. *The nested scales of quadrangle maps produced by the USGS in relation to (a) index map to 1:1,000,000 and 1:250,000 USGS quads intersecting the WRB, and (b) the geographic coordinate system .*

Topographic maps portray the shape and elevation of the landscape primarily though the use of contour lines. A contour line is a line of constant elevation above (or below) a specific reference elevation, in this case mean sea level. Contour lines never cross, although intermediate contours merge in steep terrain, and may form loops. Contours are placed at regular vertical intervals, usually 20 feet, though they may also represent 5- 10- or 40-foot (1.5- 3.1- or 12.2-meter) intervals on a 7.5 minute quadrangle, with a bolder lined index contour every fifth line, or 100 feet, to facilitate orientation. Supplementary contours, portrayed as dotted lines, indicate 5-foot intervals in flat terrain. Benchmarks, represented by a black X, are points of elevation known with greater certainty. They are established by methods compatible with geodetic accuracy standards, and are physical markers on the ground. Spot elevations, less accurate than benchmarks, supplement the contour lines to plus or minus 3/10 of the contour interval. National map accuracy standards permit up to 10% of points tested to be more than 1/2 of a contour interval from actual elevation, and/or more than 1/40 of an inch (0.6 mm) horizontally from actual position.[160] At the 1:24000 scale of the 7.5 minute maps 1/40 of an inch equals 50 ft (15.24 m) on the ground.

USGS topographic maps use general color themes to denote various features (Fig. 212). Contour lines are in brown (and described above), water features are in blue, cultural features are generally in black, although some features such as earthen dams may be portrayed in brown as well, and vegetation is in green. Buildings are represented in two categories, those of primary human use (filled black squares), and those of secondary use (open black boxes). Many of these features are edited heavily in urban areas, defined as areas with over one thousand people per square mile, which have a pink tint applied to them. Other miscellaneous features represented on USGS maps include power and telecommunication transmission lines, pipelines, air facilities, oil and gas fields, and mines. Vegetation is recorded when it exceeds 20% cover of the landscape for an area greater than one acre (0.4 ha), and 6 ft (2 m) or more in height - tall enough to conceal troops or fugitives - with the same consideration for clearings within vegetated areas. Permanent agriculture such as orchards and vineyards is represented as are National Parks, Game Preserves, and publicly owned forests.[160]

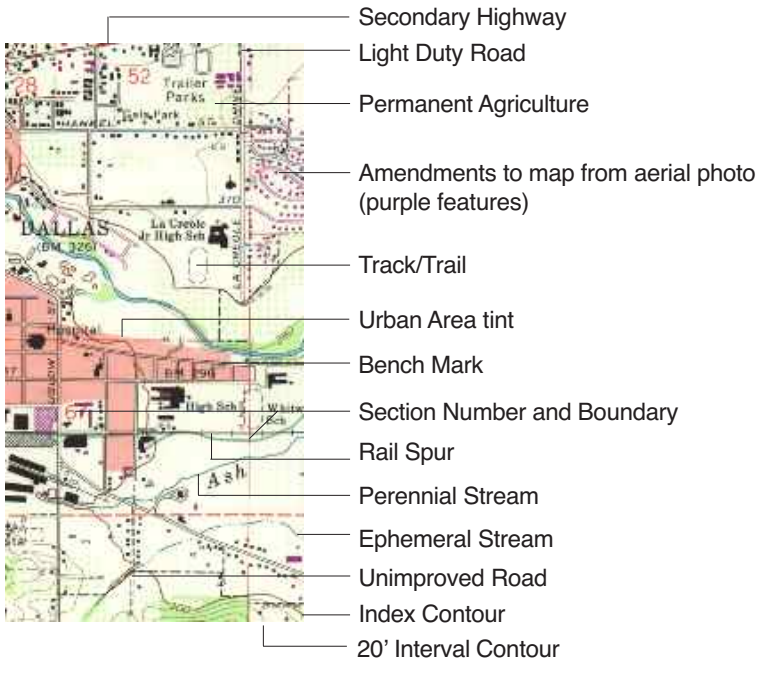
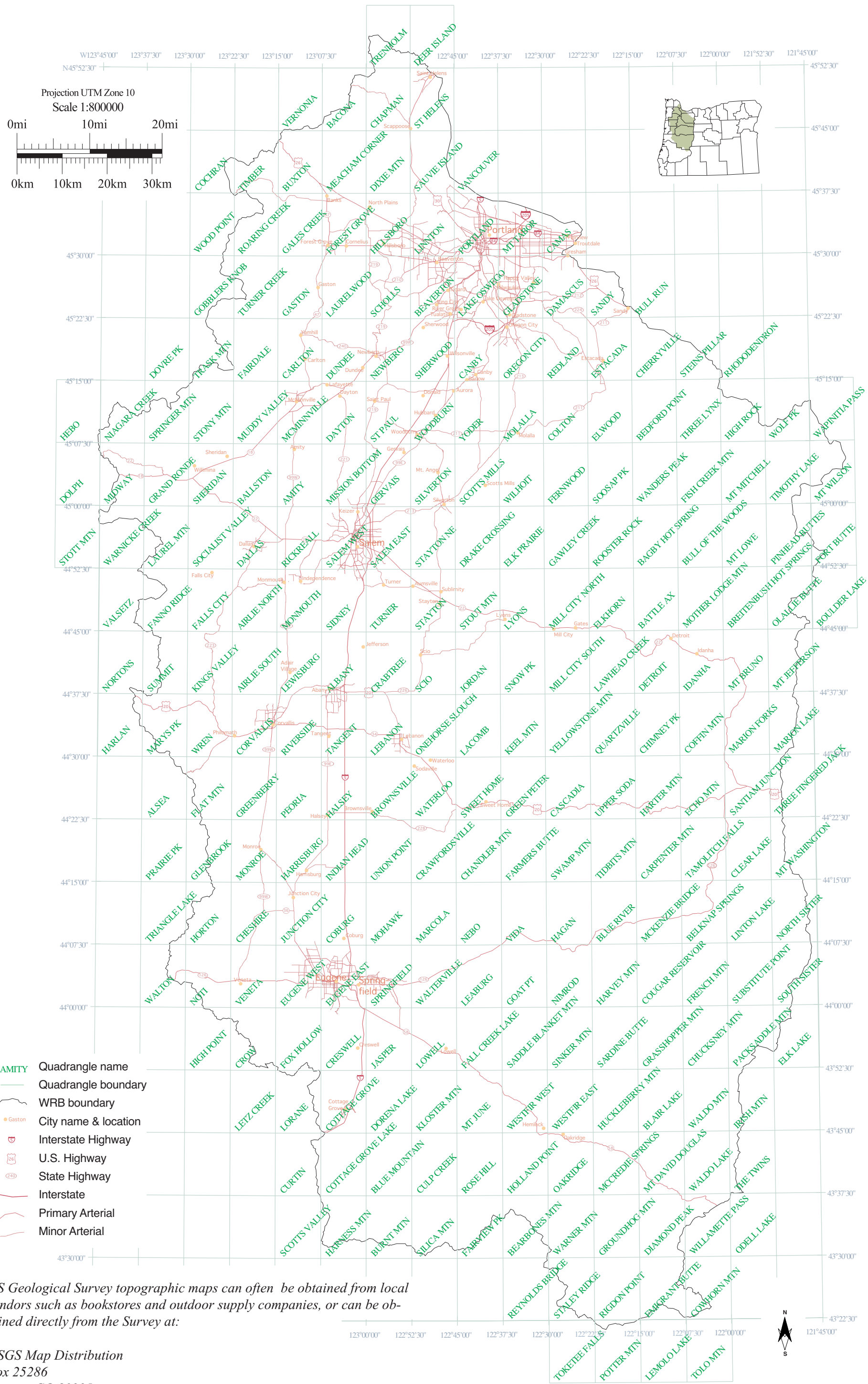


Figure 212. *Features represented on a USGS 7.5-minute topographic quadrangle map. Scene portrayed is eastern Dallas, OR; 44°55' N, 123° 19' W)*

Map 34. USGS 7.5-minute Topographic Quadrangle Maps



US Geological Survey topographic maps can often be obtained from local vendors such as bookstores and outdoor supply companies, or can be obtained directly from the Survey at:

USGS Map Distribution
Box 25286
Denver, CO 80225
or call 1-800-USA-maps