

Area Encyclopedia Article

Area

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An accurate map requires precise geographic characterization of the land surface it represents. The two-dimensional extent of a region, or its area, is essential information for scientists whose studies include a geographic component. Land area measurement, however, is particularly critical for governments, industries, and individuals concerned with land management.

Human societies, beginning from the first agronomic civilizations of northern **Africa**, the Middle East, and China, and continuing with the modern geopolitical array of countries and cultures, have parceled their land between individuals, industries, cities, and nations. Geographers, from the ancient Egyptians and Greeks, to present-day remote **satellite remote sensing** and geographic information systems (**GIS**) specialists, have worked to devise methods of measuring land area, and of surveying land parcel boundaries.

Because the solid Earth has **topography**, and the twodimensional plane of the Earth's curved surface is defined by three variables—longitude, **latitude**, and elevation—accurate calculation of land area is often quite complex. An area measurement of a topographic surface requires summation of the areas of measured rectangles small enough to capture areal variations introduced by variations in elevation. This summation can be accomplished by measuring and adding a sufficient number of small land areas, or by using integral calculus to compute the area of a three-dimensional surface. Both methods require precise measurement of geographic coordinates; the second also requires measurement of an elevation value at each survey point. In the Roman Empire, surveying (*limitatio*) and erection of measured survey markers (*terminatio*), preceded construction of geographic systems called *cadastres* that were composed of linear structures like roads and canals, and measured in *actus* (an *actus*) equaled 120 Roman feet, or 35.5 meters.

Cartographers during the fifteenth and sixteenth centuries, and European colonial surveyors in the seventeenth and eighteenth centuries, added surveyed elevations to their geographic systems by beginning surveys at sea level and calculating relative gain and loss of elevation at benchmarks. Today, satellite-aided global positioning (**GPS**), aeronautical and **space** remote sensing, and computer-assisted mapping of geographical information (GIS), have greatly enhanced the accuracy of land area measurements. However, most present-day land area surveys, including real estate appraisals and assessments of agricultural and forestry lands, measure land area by projecting the earth's three dimensional surface on to a flat surface. So, as it was in Rome, it is today; a hilly modern acre covers more area than a flat acre.

See Also

Archeological Mapping; History of Exploration Ii (Age of Exploration); Physical Geography; Surveying Instruments