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Chapter V

From Print Formats to Digital:
Describing GIS Data Standards

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Introduction

The preceding chapter discussed how geographic and cartographic materials are traditionally described in libraries. With the growth of geospatial data, new methods of description needed to be developed to allow users, often with very different information needs, to find and retrieve relevant resources across different platforms and software systems. Geographic information systems are designed to allow the management of large quantities of spatially referenced information about natural and man-made environments, covering areas such as public health, urban and regional planning, disaster response and recovery, environmental assessments, wetlands delineation, renewable resource management, automated mapping/facilities management, and national defense. Powerful computers, advanced network capacities, and enhanced, distributed GIS software allowed the growth of the National Spatial Data Infrastructure (NSDI). Established by Executive Order 12906 in April 1994, the NSDI assembles "technology, policies, standards, and human resources to acquire, process, store, distribute, and improve utilization of geospatial data for a variety of

users nationwide" (Federal Geographic Data Committee, 2006a). The goal of the NSDI is to "reduce duplication of effort among agencies, improve quality and reduce costs related to geographic information, to make geographic data more accessible to the public, to increase the benefits of using available data, and to establish key partnerships with states, counties, cities, tribal nations, academia and the private sector to increase data availability" (Federal Geographic Data Committee, 2006b). However, the success of a national spatial data infrastructure depends on the development of a series of standards for that infrastructure. Infrastructure components encompass a variety of elements. Hardware and physical facilities store, process, and transmit information; software applications and software allow access, structure, and manipulation of information; and network standards and transmission codes facilitate interorganizational and cross-system communication (Hanson, 2006). When reviewing standards for geospatial data, one must look at standards for cartography, hardware and software, telecommunications, and information technology standards at national and international levels. Several thousand standards apply to computers, and this can be multiplied geometrically, if not exponentially, with the advent of network standards and integrated data formats. This chapter will address standards in geospatial data, interoperability and transferability, mark-up languages, and the development of the federal metadata standard for geospatial information.

What is Spatial Information?

By understanding how spatial information is defined and described, users can better access and retrieve the specific items they want. At the simplest level, spatial data is comprised of coordinates. A *coordinate* is a number that denotes either a position along an axis relative to an origin, given a unit of length or a direction relative to a base line or plane, given a unit of angular measure, such as latitude or longitude. The definitions of coordinates, points, lines, planes of reference, units of measure, and other associated parameters are referred to collectively as a *coordinate system*. Each coordinate system has its own distinct parameters and definitions. Two types of coordinate systems are geographic and projected coordinate systems. A geographic coordinate system is a reference system that uses a three-dimensional spherical surface to determine locations on the earth. Any location on earth can be referenced by a point with latitude and longitude coordinates based on angular units of measure. A projected coordinate system is a flat, two-dimensional representation of the earth. Using Cartesian (rectilinear) coordinates based on linear units of measure, a projected coordinate system is based on a spherical (or spheroidal) earth model, and its coordinates are related to geographic coordinates by a projection transformation. Geodetic data is spatial data expressed in latitude and longitude coordinates, in a coordinate system that describes a round, continuous, closed surface. One of the

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