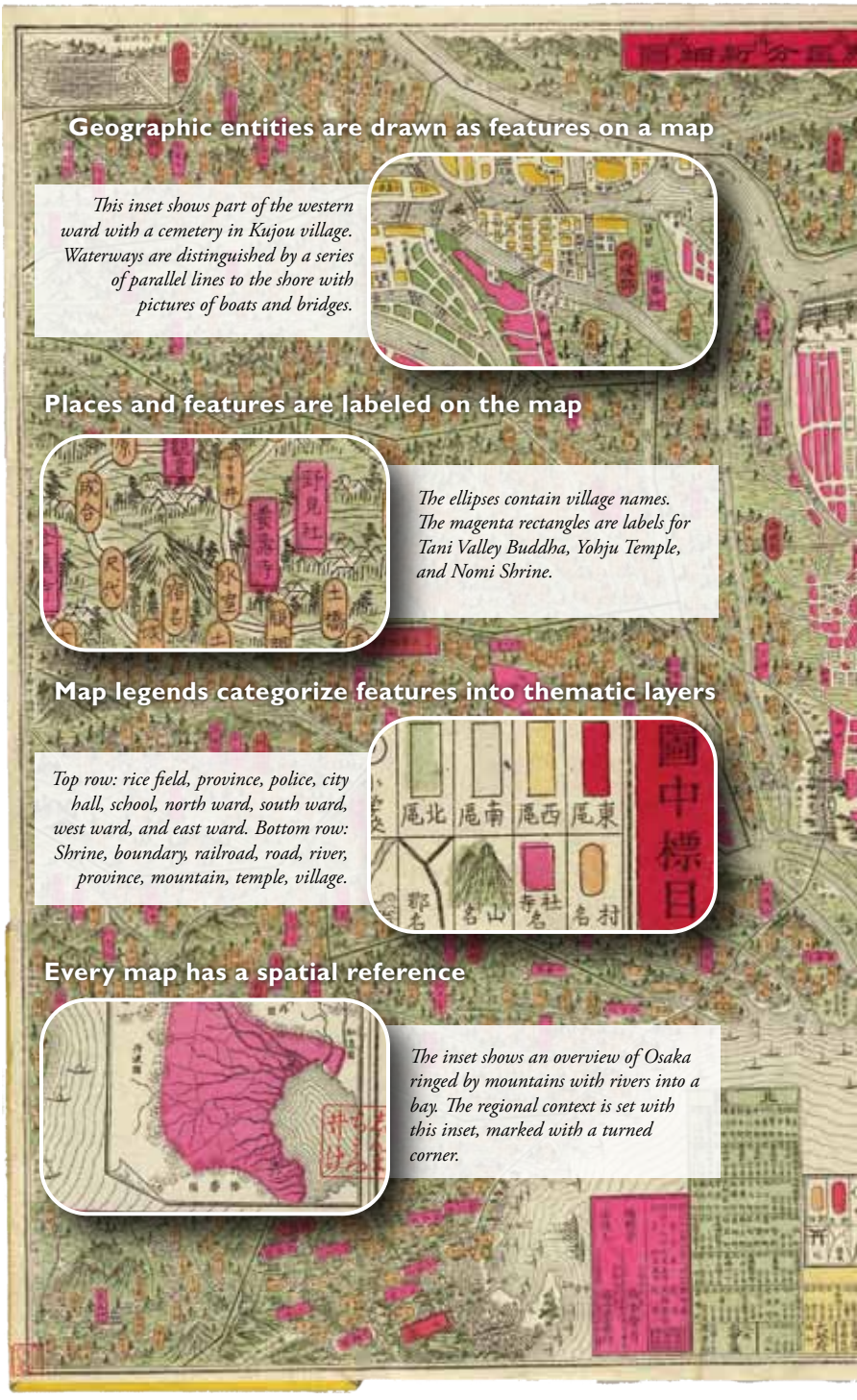
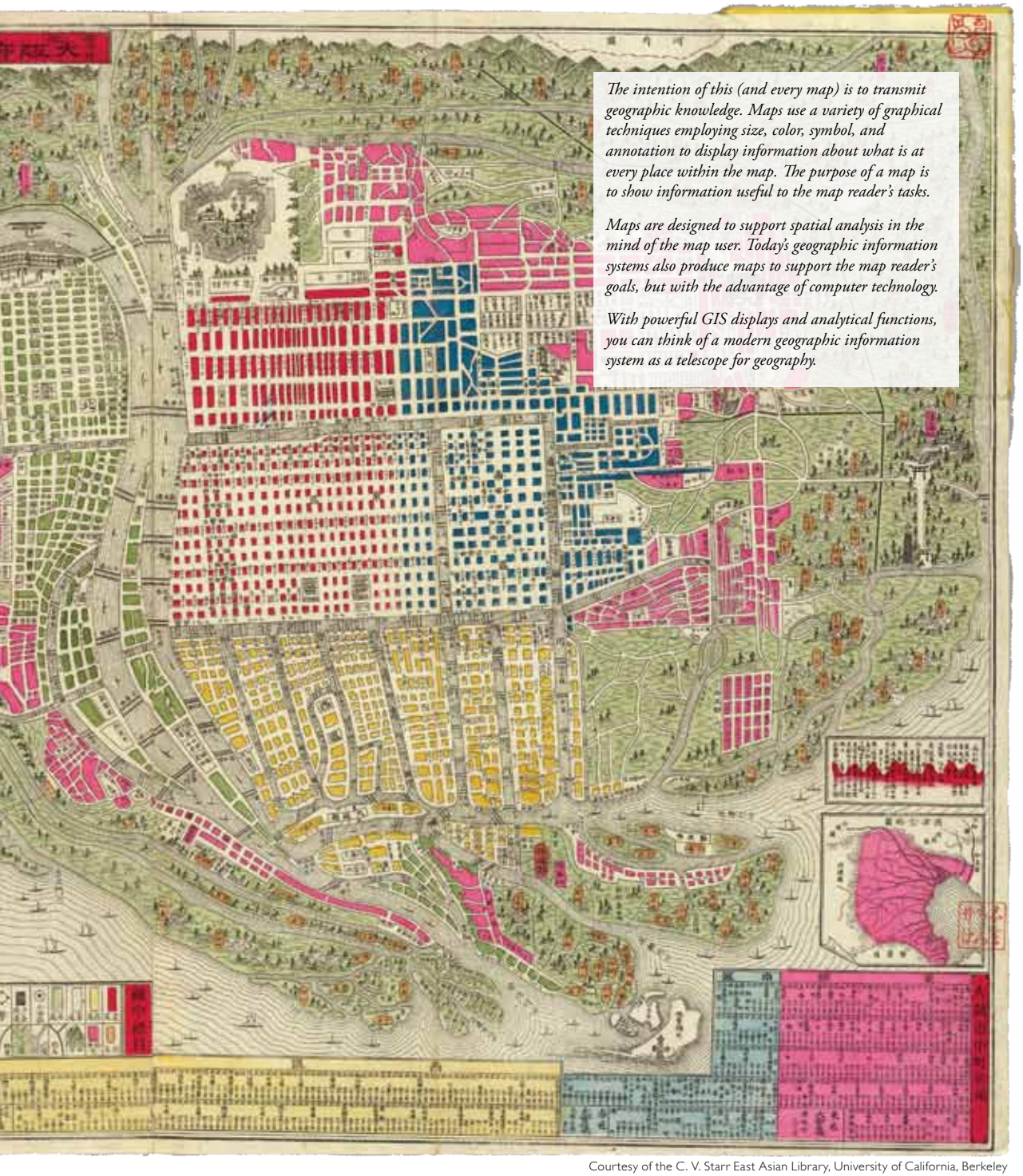
A map is how people share geographic information. Take a close look at this remarkable map from 19th century Japan designed to guide visitors through Osaka.

This map uses several cartographic techniques for thematically representing the city:

- City blocks are drawn with colors coded by ward.
- Waterways are mapped with parallel lines and symbols of ships.
- Place names are annotated throughout the map.
- Feature types are classified through a map legend.
- Addresses and distances are shown in tables referenced to the map.

Many layers of rich information combine to produce this definitive city map. By reading this map, a visitor can locate any place in Osaka by address, and find the best route and distance to that place.





The intention of this (and every map) is to transmit geographic knowledge. Maps use a variety of graphical techniques employing size, color, symbol, and annotation to display information about what is at every place within the map. The purpose of a map is to show information useful to the map reader's tasks.

Maps are designed to support spatial analysis in the mind of the map user. Today's geographic information systems also produce maps to support the map reader's goals, but with the advantage of computer technology.

With powerful GIS displays and analytical functions, you can think of a modern geographic information system as a telescope for geography.

Courtesy of the C. V. Starr East Asian Library, University of California, Berkeley

Think of a map as a geographic information system that you can fold and put in your pocket.

Maps work because they follow a well-evolved set of practices to present geographic information.

Maps present a view of a geographic area. Representations of real-world entities are drawn with point, line, and polygon symbols and are also shown with imagery.

Points, lines, polygons, and images on a map are organized into thematic layers. A collection of points can be used to represent cities or well locations. Lines show features such as road systems or river networks. Polygons describe areas and are often used to depict buildings, states, or countries. Imagery shows a picture of the landscape captured from airplanes or satellites.

Maps apply symbols thematically. Rivers are typically blue lines, roads may be red or black lines. City blocks might be color coded by zone. The map legend is a symbolic inventory of all the types of features in a map.

Thematic layers are the starting point for modeling our world. Maps combine many thematic layers over a common geographic area. These thematic layers not only contain collections of similar entities, but also model their attributes, relationships, and behavior.

This USGS 7.5 minute quadrangle map of Point Reyes, California from 1916 demonstrates the use of point, line, and polygon symbols.

MAP LAYERS AND THE GEODATABASE

The same elements and principles used to create maps are employed by ArcGIS to construct modern geographic information systems.

In ArcGIS, the geodatabase is the native data structure for the storage and analysis of geographic information. Just like maps contain a collection of many thematic layers, the geodatabase is a collection of thematic datasets.

Each dataset stored in a geodatabase can be thought of as a thematic layer which is used to represent real-world entities. Just like the thematic layers on a map, each dataset in a GIS is a layer —a logical collection of features such as wells, parcels, rivers, roads, and so on. Like the map projection information defined for a map, each dataset in a geodatabase has a spatial reference. This spatial reference is used to position thematic layers when they are overlaid on a map.

Datasets representing satellite and aerial photo imagery are also stored in a geodatabase. These are used as a foundation for other thematic layers or to represent continuous surfaces and thematic data. Imagery is georeferenced so that it is also aligned with other datasets.

Geographic information systems reference geographic datasets stored in a geodatabase by overlaying these datasets as thematic layers on a map. In this sense the geodatabase is a key aspect to modern geographic information systems.

Geodatabase
Mexico

Point feature class
City

The cities of Mexico are drawn by population with circle symbols graduated both in size and color.

Line feature class
River

The major rivers of Mexico are drawn with lines color coded for river classification.

Line feature class
Highway

The highway system of Mexico is drawn with colored lines for highway types.

Polygon feature class
State

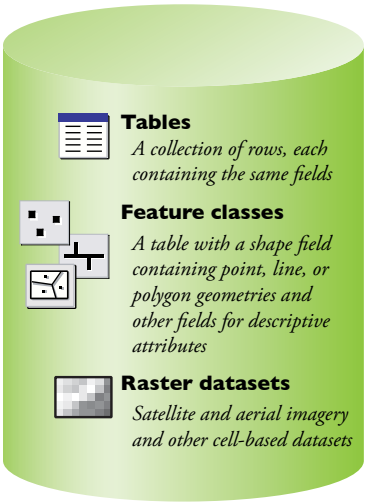
The United Mexican States (Estados Unidos Mexicanos) are shaded with random colors and labeled with their name.

Raster dataset
EarthImagery

The land is captured in this raster mosaic combining many satellite images to produce a cloud-free view of the landscape.

In its simplest terms, the geodatabase is a collection of geographic datasets stored using a database management system (DBMS) or file system. However, the geodatabase has several other key aspects:

- The geodatabase is the native data structure for ArcGIS and the primary data format used for editing, representing and managing geographic data in ArcGIS.
- The geodatabase has a data model that is implemented as a series of simple data tables holding feature classes, raster datasets, and attributes. In addition, advanced GIS data objects add GIS behavior, rules for managing spatial integrity, and tools for working with numerous spatial relationships of the core features, rasters, and attributes.
- The geodatabase has a transaction model for managing GIS editing workflows such as adding, deleting, and updating features and attributes.
- The geodatabase provides a common foundation for accessing and working with all geographic data in a variety of files and formats.



The geodatabase is designed to represent real-world entities using imagery and simple features: points, lines, and polygons. Various types of geographic datasets can be created using these simple features. There are three fundamental geographic datasets used in a geodatabase: tables, feature classes, and raster datasets.

- Tables are used to manage descriptive information as attributes, such as records of ownership, measurements at a location, or qualities of objects.
- Feature classes are thematic datasets which represent geographic features such as parcels, utility lines, and wells. Feature classes are tables with a spatial field. An additional column with a shape field is used to specify a geometry of point, line, or polygon.
- Raster datasets represent imagery of the earth and other continuous surfaces. Each raster image is stored as a distinct thematic layer.

It is from these fundamental geographic datasets that you will begin to build a GIS. As the requirements for your system extend past this fundamental information model, the geodatabase can adapt through application logic used to extend the capabilities of these datasets to model spatial relationships, improve data integrity, and add dynamic behavior.