USGS science for a changing world

The National Map

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Introduction

The National Map comprises a variety of products and services that provide the Nation with access to base geospatial information to describe the landscape of the United States and its territories. *The National Map* (*http://nationalmap.gov/*) supports data download, digital and print versions of topographic maps, geospatial data services, and online viewing. Customers can use geospatial data and maps to enhance their recreational experience, make life-saving decisions, support their scientific missions, and for countless other activities. Nationally consistent geospatial data from *The National Map* enable better policy and land management decisions and the effective enforcement of regulatory responsibilities.

The National Geospatial Program (*http://www.usgs.gov/ngpo/*) of the U.S. Geological Survey (USGS) manages *The National Map*. Partners and other organizations produce and maintain a vast array of high-quality geospatial data. A significant objective of the National Geospatial Program (NGP), through the Partnership Network (*http://liaisons.usgs.gov/geospatial/*), is to leverage these assets through mutually beneficial partnerships that ensure the ongoing availability of current data consistent with National Spatial Data Infrastructure (NSDI) principles.

The National Map Products and Services

The National Map embodies 11 primary products and services and numerous applications and ancillary services.

Data Products and Online Services

The geospatial data available from *The National Map* include boundaries, elevation, geographic names, hydrography, land cover, orthoimagery, structures, and transportation. The Office of Management and Budget (OMB) has designated the USGS as the lead or colead agency (fig. 1) under Circular A–16 for elevation, geographic names, hydrography, land cover, and orthoimagery. Web viewing and download services are available for each of the eight data layers.

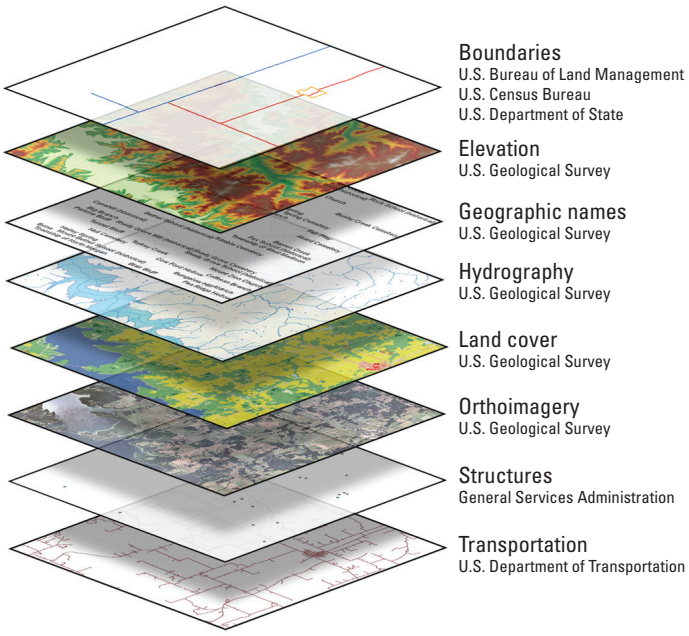

Figure 1. Eight base layers of *The National Map* and associated Office of Management and Budget Circular A–16 thematic lead agencies.

National Geospatial Program Mission

The National Geospatial Program:

- Organizes, maintains, publishes, and disseminates the geospatial baseline of the Nation's topography, natural landscape, and built environment through *The National Map*, a set of basic geospatial information provided as a variety of products and services
- Fosters a general understanding of broad geographic patterns, trends, and conditions through The National Atlas of the United States of America®
- Increases the efficiency of the Nation's geospatial community by improving communications about geospatial data, products, services, projects, needs, standards, and best practices

Boundaries (Government Units) Dataset.—The boundary data layer represents major civil areas including States, counties, Federal and Native American lands, and incorporated locales such as cities and towns. These data are useful for understanding the extent of jurisdictional or administrative areas for a wide range of applications, including demographics, natural disaster response, recreational activities such as hiking and backpacking, or resource management. The USGS obtains incorporated, unincorporated, county, State, and Native American area boundaries from U.S. Census data releases annually. Federal land boundaries are obtained from the Bureau of Land Management or directly from the source Federal agency if appropriate. The boundary data obtained from the source agency are transformed to a common data model to be rehosted and served from *The National Map*.

National Elevation Dataset.—The National Elevation Dataset (NED) is a seamless raster image dataset at multiple resolutions. NED data are available at 1-arc-second [30-meter (m)] resolution for all the conterminous United States, with 92 percent coverage at ⅓-arc-second (10-m) resolution and 12 percent coverage at 1/9-arc-second (3-m) resolution. Partnerships with a wide variety of Federal, State, and local cooperators to acquire higher resolution elevation data, primarily from light detection and ranging (lidar) sources, are the principal means used to continually improve the NED. While significant areas of new, higher resolution elevation data are being acquired, NED resolution for Alaska is primarily 2 arc-seconds (60 m).

Geographic Names Dataset.—The USGS maintains the Geographic Names Information System (GNIS), which is the authoritative database of official U.S. geographic names and is developed in cooperation with the U.S. Board on Geographic Names (BGN) (*http://geonames.usgs.gov/*). The NGP serves as the executive secretariat for the BGN, which is a Federal interagency body empowered by Public Law 80–242 (61 Stat. 456) to approve and issue standard geographic names for use on all material (data files, documents, maps, and reports) published by the Federal Government and its contractors. These geographic names include cultural and physical features, such as bays, hospitals,

mountains, populated places, and valleys. The GNIS does not contain road or street names, nor does it define the extent of features; however, the GNIS contains attributes to help determine the relative extent of features.

National Hydrography Dataset.—The National Hydrography Dataset (NHD) provides mapping coverage of the surface waters of the United States consisting of 7.5 million miles of rivers and streams and 6.5 million lakes and ponds. The NHD provides a complete network that supports the analysis of any type of movement (for example, effluent dispersion, navigation, and sediment transport) by surface waters. Stewardship support services and extensive training are provided to partners interested in assisting in the maintenance of the NHD. The NHDPlus, developed by the U.S. Environmental Protection Agency, extends the power of the NHD by integrating additional geospatial data to generate drainage areas, flow velocity estimates, and flow volume.

National Land Cover Database.—The National Land Cover Database (NLCD) 2001 provides consistent land cover data for all 50 States and a data framework that allows flexibility in developing and applying each independent data component to a wide variety of applications. Components in the database include normalized imagery for three time periods per Landsat path or row; ancillary data, including 30-m NED data derived into aspect, slope, and slope position; per-pixel estimates of percent imperviousness and percent tree canopy; 16 classes of land cover data derived from the imagery, ancillary data, and derivatives; and classification rules, confidence estimates, and metadata from the land cover classification. The NLCD was developed using a mapping zone approach, with more than 60 zones in the continental United States and Alaska. NLCD 2006, which was released in February 2011, quantifies land cover and land cover change between 2001 and 2006 and provides an updated version of NLCD 2001 land cover and imperviousness.

Orthoimagery Dataset.—Through cooperative partnerships, the USGS acquires and disseminates high-resolution digital orthoimagery data that have the accuracy and reliability of a base map. The resolution of the imagery in the USGS digital orthoimagery dataset varies from 1 m to 1 foot or finer. The USGS relies primarily on its partnership with the U.S. Department of Agriculture National Agriculture Imagery Program for 1-m-resolution, leaf-on imagery acquired on a 3-year cycle. Higher resolution data are obtained in partnership with the National Geospatial-Intelligence Agency (NGA), State, local, and tribal partners.

Structures Dataset.—USGS data portray selected structures data, including the function, name, location, and physical form from best available sources. Structures data support disaster planning and response and homeland security organizations and topographic mapping and resource planning needs. Structures data are acquired through partnerships with Federal and State entities. The USGS integrates structure data with the names data from the GNIS. The reconciled content is loaded into *The National Map* database and thus, Federal agencies and State entities have a common base for operating activities and a shared baseline for exchanging transactional data updates.

Transportation Dataset.—Transportation data consist of airports, railroads, roads, and other features associated with the transportation of people or commerce. The data include the address ranges, classification, location, and name or route designator for most roads. Transportation data support mapping and geographic analysis (such as for disaster planning and response). *The National Map* Viewer (*http://viewer.nationalmap.gov/viewer/*) features U.S. Census Bureau, Federal Aviation Administration, and U.S. Forest Service transportation data that can be downloaded, as well as road data as a layer that can be viewed but cannot be downloaded because they are derived from a commercial road dataset.

Map Products and Online Services

In 1879, the USGS was entrusted with the responsibility for mapping the country and has been the primary civilian mapping agency of the United States ever since. More than 200,000 USGS topographic maps have been published in paper form in scales primarily ranging from 1:20,000 to 1:250,000. The best known USGS maps are the 1:24,000-scale topographic maps, also known as 7.5-minute quadrangles. The 7.5-minute map series was officially completed in 1992, and only minor revisions have been made to the printed product in recent years. While the NGP is converting all the historic topographic map products to a digital format, hard copy maps are available for sale through the online USGS Store (*http://store.usgs.gov/*) and business partner retailers. The NGP began releasing digital topographic (US Topo) maps in October 2009.

Digital Topographic Maps.—US Topo maps (fig. 2) can be downloaded for free from the USGS Store or *The National Map* Viewer. The output of US Topo (*http://nationalmap.gov/ustopo/index.html*) is a georeferenced map in GeoPDF format that has the look and feel of the historic 1:24,000-scale topographic map but includes slightly different content in digital format. As of 2011, 37,500 US Topo maps have been released that include elevation contours, geographic names, hydrography, orthoimagery, and roads. As many as 100 US Topo maps are produced daily, whereas each historic 1:24,000-scale topographic map took 5 years to complete. The NGP is working on plans, procedures, standards, and performance criteria to meet the goal of updating US Topo maps on a 3-year cycle, using available new data and including additional base layers when data content meets specified standards and levels of completeness.

Historic Topographic Maps.—All scales and editions of the maps published by the USGS since the inception of the topographic mapping program in 1884 are being scanned and made available in GeoPDF and GeoTIFF formats. As physical and cultural features changed over time, the topographic maps were updated and revised, and new editions were printed. These maps are often useful to environmentalists, genealogists, historians, scientists, and others researching a particular geographic location. This georeferenced, high-resolution scanning effort serves the dual purpose of creating a master catalog and digital archive of the irreplaceable collection of topographic maps in the USGS Reston Map Library as well as making the maps available for viewing and download from *The National Map* Viewer.

***The National Map* Viewer and Data Access.**—The online user interface of *The National Map* is the Viewer (fig. 3), which allows a user to interactively view *National Map* data as a map, customize the view, print a map, and download the data for use in geographic information systems (GIS). The Viewer provides public access to high-quality, integrated *National Map* data from Federal, State, local, and tribal partners. Map tools allow the user to navigate the map (pan and zoom), identify features, and perform queries and other functions, such as take measurements and spot heights, get coordinates, and create export annotations. The Viewer was developed in partnership with the NGA and other entities. Unlike many others, the Viewer allows geospatial data to be downloaded directly or viewed with Open Geospatial Consortium (OGC) Web mapping services (WMS) and keyhole markup language (KML). Partner Web mapping services that are registered in the Geospatial One-Stop (GOS) portal as online geospatial services are also available to overlay onto *The National Map* base map.

The National Map Supporting Activities

There are other activities within the NGP that provide significant support to *The National Map*—geospatial technical operations, partnership network, geospatial research, and emergency operations.

Figure 2 (facing page). US Topo map for the Coffeyville East, Kans., quadrangle.

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 15S
10 000-foot ticks: Kansas Coordinate System of 1983
(south zone)
and Oklahoma Coordinate System of 1983
(north zone)

Imagery.....NAIP, July 2008
Roads.....National Transportation Dataset, 2006
Names.....GNIS, 2008
Hydrography.....National Hydrography Dataset, 2008
Contours.....National Elevation Dataset, 2005

UTM GRID AND 2009 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
TB / TA
Grid Zone Designation
15S

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET

This map was produced to conform with version 0.5.10 of the draft USGS Standards for 7.5-Minute Quadrangle Maps.
A metadata file associated with this product is also draft version 0.5.10

KANSAS

QUADRANGLE LOCATION

Independence	Liberty	Mound Valley
Coffeyville West	Coffeyville East	Veleda
Elliott	South Coffeyville	Haytrick Mound

ADJOINING 7.5' QUADRANGLES

ROAD CLASSIFICATION

Interstate Route
US Route
Ramp
State Route
Local Road
4WD

Interstate Route · US Route · State Route

COFFEYVILLE EAST QUADRANGLE
KANSAS
7.5-MINUTE SERIES

COFFEYVILLE EAST, KS
2009

Geospatial technical operations efforts by the National Geospatial Technical Operations Center (NGTOC) (*http://ngtoc.usgs.gov/*) and the Earth Resources Observation Science (EROS) Center (*http://eros.usgs.gov/*) focus on developing and enhancing the usefulness of geospatial products and services; acquiring new geospatial data; assessing the geospatial data for accuracy, quality, and integration into nationwide datasets; archiving of raster and vector imagery; and improving public access to the geospatial data through online viewing and data downloading. NGTOC and EROS also perform research and development into new processes and technology in the implementation of *The National Map*, and one of their most critical roles is providing technical services to assist partners in the acquisition and maintenance of geospatial data that become part of *The National Map*. Finally, NGTOC and EROS develop and provide access to *National Map* products such as US Topo.

Partnerships provide significant cost savings, reduce redundancy in geospatial data acquisition and stewardship, and ensure availability of common base data to a broad range of users and applications. NGP's Partnership Network (*http://liaisons.usgs.gov/geospatial/*) comprises headquarters liaisons, who coordinate with Federal agencies and national organizations, and State-based USGS geospatial liaisons, who are distributed across the Nation to coordinate efforts of the USGS and other Federal entities with State, local, and tribal groups. Liaisons work with these organizations to identify geospatial data requirements and standards, evaluate partnership opportunities, develop agreements, participate in State, regional, and local geospatial data councils, and provide outreach to user communities. Many of these organizations produce and maintain a vast array of current, accurate geospatial data. As a result, a large majority of data in *The National Map* is the product of jointly funded partnership agreements aligned with the goals of the NGP.

Geospatial research is conducted by the Center of Excellence for Geospatial Information Science (CEGIS) (*http://cegis.usgs.gov/*), which identifies and collaborates on geographic information science research issues of national importance. CEGIS basic research activities are guided by the published recommendations of the National Academy of Sciences and priorities established by the NGP management team based on long-term program direction and goals. Most CEGIS basic research efforts are in support of *The National Map*, but also include investigation of emerging technologies (such as the semantic Web and social media) and their effects on the NSDI and the emerging geospatial Web.

The Emergency Operations Office (*http://www.usgs.gov/emergency/*) ensures coordination and rapid availability of *The National Map* and other geospatial information for effective response to natural and other disasters by emergency responders, land and resource managers, and scientists. Procedures are established for acquisition, processing, and archiving of nonproprietary geospatial data; discovery, access, and delivery of data; and providing relevant geospatial products and services during and immediately after emergency events. These activities enable interdisciplinary integration of government assets to improve the value of data and services to responders and citizens in cases of emergency.

Relation of *The National Map* to The National Atlas of the United States of America®

The National Atlas of the United States of America® (*http://nationalatlas.gov/*) uses datasets of a highly generalized framework from *The National Map* as the cartographic foundation for thousands of thematic maps. More than two dozen Federal agencies collaborate in the National Atlas to provide accurate, integrated, and reliable geospatial information about America's natural and socioeconomic landscapes. Most National Atlas products are clearly designed for public use and include wall maps, innovative page-sized printable maps, and an interactive mapmaker for crafting custom maps. The National Atlas also includes multimedia articles about National Atlas maps as well as maps that illustrate how the Nation changes. All National Atlas data are fully documented and provided at no cost for download or direct use on the Internet. The data available from the National Atlas are provided at a scale where 1 inch on the map is roughly 16 miles; US Topo maps from *The National Map* are at a scale of 1 inch equals 2,000 feet.

Additional Information

Information about the National Geospatial Program is available at *http://www.usgs.gov/ngpo/*. For more information about *The National Map*, visit *http://nationalmap.gov/* or e-mail *nationalmap@usgs.gov*.

By Larry J. Sugarbaker and William J. Carswell, Jr.

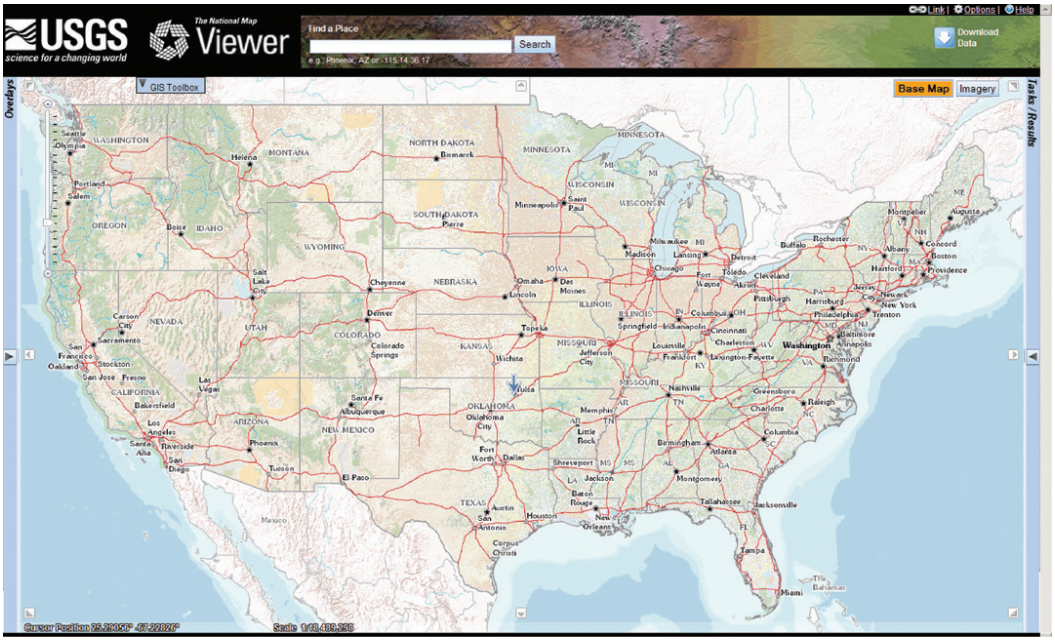

Figure 3. Screen capture from *The National Map* Viewer.