National Elevation Dataset

August, 2013 Release Notes

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Contents

Latest Release

The August, 2013 update of the National Elevation Dataset (NED) 1-, 1/3- and 1/9-arc-second collections was released on August 6, 2013. This marks the 73rd update of the 1-arc-second layer since bi-monthly revisions began in June, 2000. This release incorporates 13,942 square miles of new light detection and ranging (lidar) data into the NED 1/9-arc-second layer primarily over CONUS. The NED 1- and 1/3-arc-second layers were updated with 13,964 square miles of migrated high-resolution source data and 40,794 square miles of 5-meter Interferometric Synthetic Aperture Radar (IFSAR) source data over Alaska. There is also a large area of Canada included in the NED 1-arc-second layer for this update. All NED data are available via *The National Map* Viewer: http://viewer.nationalmap.gov/viewer/.

The next release is scheduled for October 1, 2013.

Highlight: Alaska, Denali/Mount McKinley IFSAR—by Kim Mantey

IFSAR coverage was recently acquired for large portions in the State of Alaska. One of the major features that are in the coverage boundary is Denali/Mount McKinley, the highest peak in both the United States and North America. The current surveyed elevation of this peak is 20,320 feet or 6,194 meters. This elevation was published in 1952, and was determined using photogrammetry. The IFSAR collected over this area reported a different maximum elevation than the published measurement. Flown in 2010, the derived Digital Elevation Model (DEM) puts the maximum elevation of Denali/Mt. McKinley at 20,237 feet or 6, 168 meters. There are several possibilities for the cause of this elevation difference. First, different compilation methods may affect the elevation of the summit. Second, temporal differences in the collection (1952 and 2010) may be contributing to the elevation difference. Other changes such as climate differences, advancements in technology, etc. may also be contributing to the difference in elevation. While the DEM produced from the raw IFSAR data shows a somewhat significant drop in elevation from the 1952 survey, the USGS takes no position in favor of either elevation.
The DEM data for Denali/Mount McKinley is available in the NED 1/3rd Arc-second, 1 Arc-second, and 2 Arc-second layers. Please see the image below for a preview of Denali/Mt. McKinley.

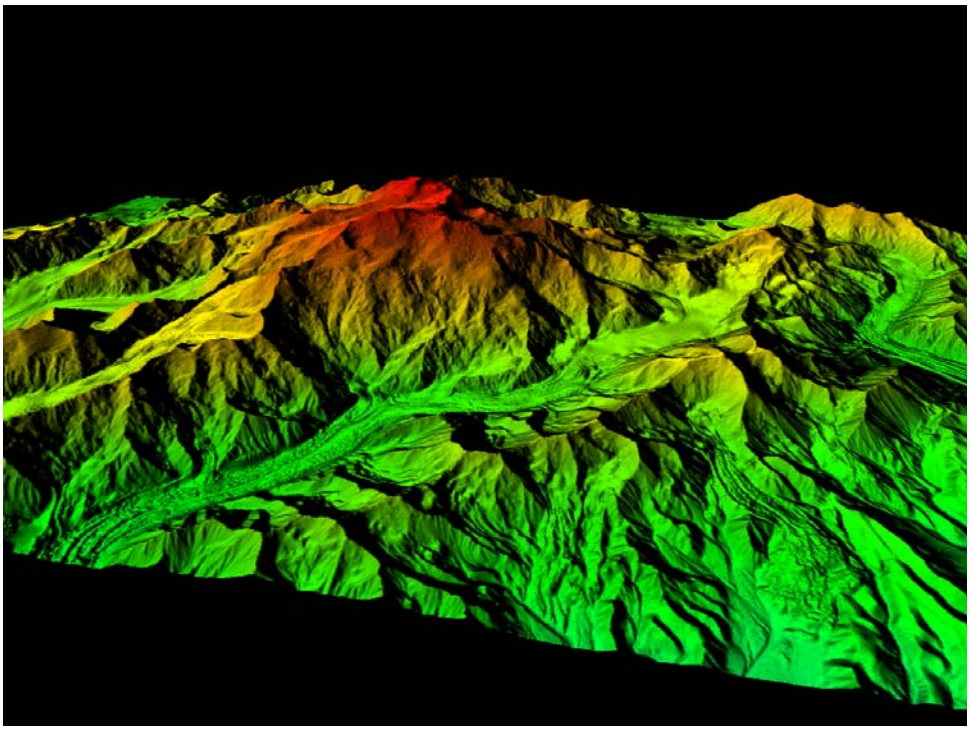

Figure 1. Alaska, Denali/Mount McKinley IFSAR

Highlight: Elevation for the North American Continent

The August update is also highlighted by the addition of 2,759,150 square miles of Canadian data to the NED 1-arc-second layer. This addition to the NED provides near full coverage of the North American continent. NED went international with an interagency collaboration with the Mexico's National Institute of Statistics and Geography (INEGI) resulting in the addition of Mexico in October, 2008. In 2012 a similar collaboration with the Natrual Resources Canada (NRCAN) Centre for Topographic Information-Sherbrook, Ottawa lead to the addition of Canadian data along the adjoining Canadian and US borders. The Canadian data and accompanying metadata were provided by NRCAN. Hopefully the user community will find this seamless elevation coverage of North America useful.

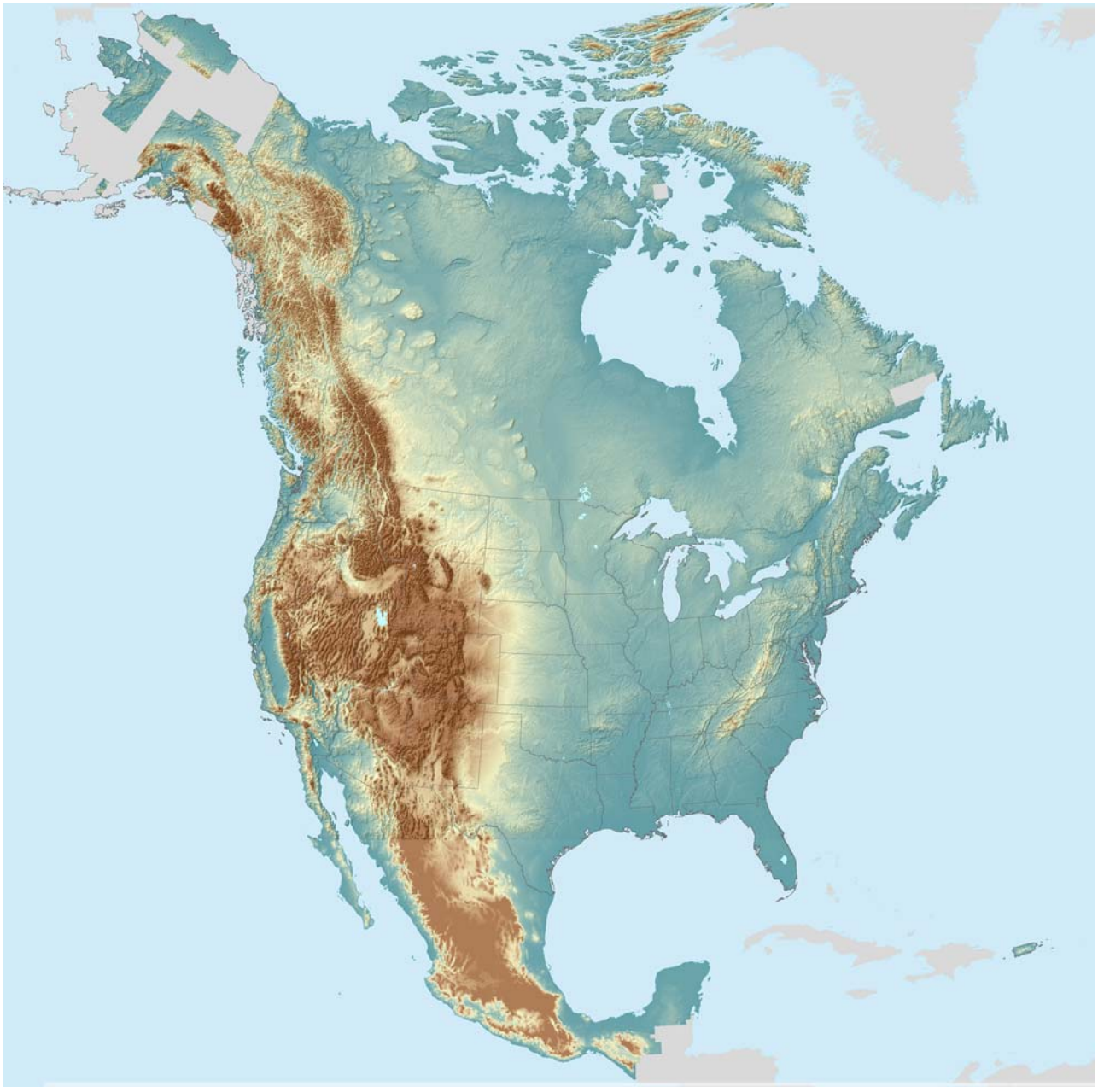

Figure 2. Elevation for the North American continent

TopoBathy

The August, NED Release marked the addition of the first set of topobathymetric data, Mobile Bay, into the NED. The June, 2013 release of the NED features the San Francisco Bay topobathymetric dataset. This 6023 square mile dataset is centered over San Francisco Bay, California and dramatically illustrates many prominent geophysical features of the area: the seafloor of the Golden Gate Strait separating San Francisco and Marin County; the San Andreas Fault, and the Farallon Islands and Escarpment to name a few.

Topobathymetric data are created by merging topography (land elevation) and bathymetry (water depth) into a seamless elevation product useful for applications such as modeling sea level rise and storm surge.

The San Francisco Bay dataset was constructed using a combination of previously published topographic, bathymetric, and topographic/bathymetric merged datasets from the U.S. Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), San Francisco State University (SFSU), and the California Ocean Protection Council (OPC); ranging temporally from 1922 to 2010. It was developed in collaboration between the USGS Coastal and Marine Geology Program (CMGP) and the USGS National Geospatial Program (NGP). Additional topobathymetric databases are being prepared for southern Louisiana and the Hurricane Sandy impact area, and will be used by the USGS and others to advance research on coastal change processes and hazard vulnerability in those regions.

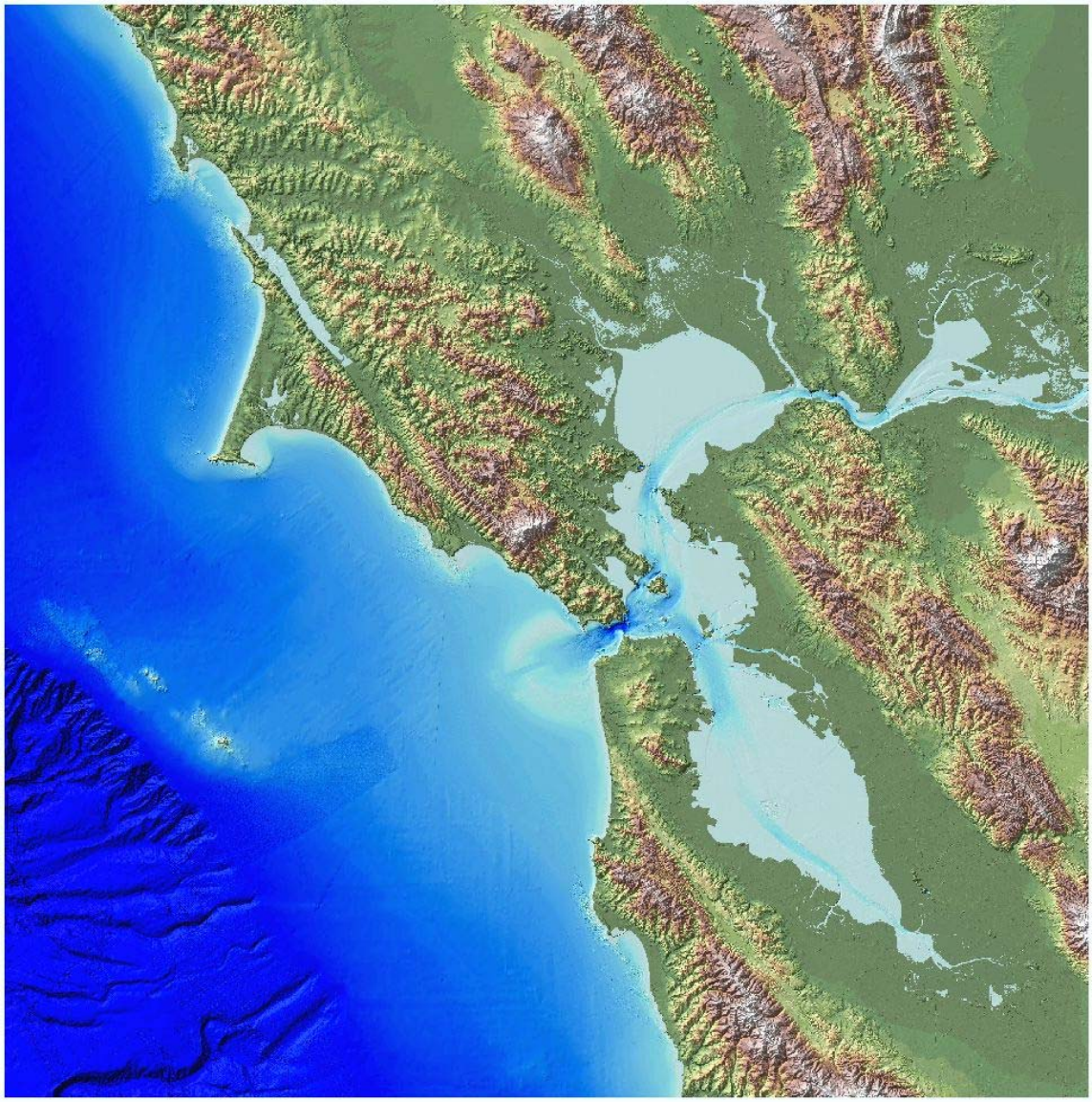

Figure 3. NED 1/9-arc-second San Francisco, California topobathymetric dataset

Areas where new data were incorporated in this and other recent releases are indicated in Figure 4.

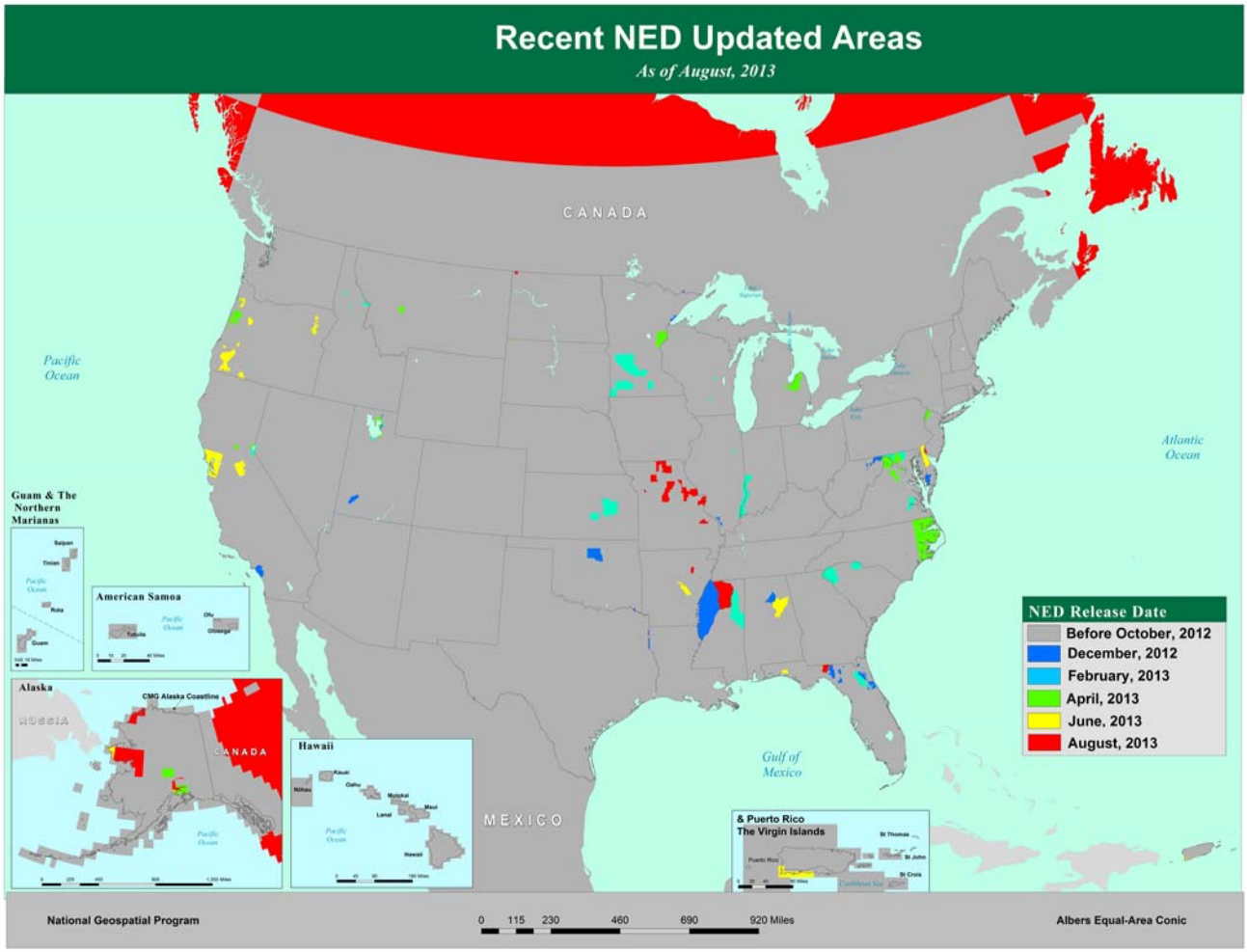

Figure 4. NED updated areas by release date -- August, 2013 release.

Data Resolutions Available

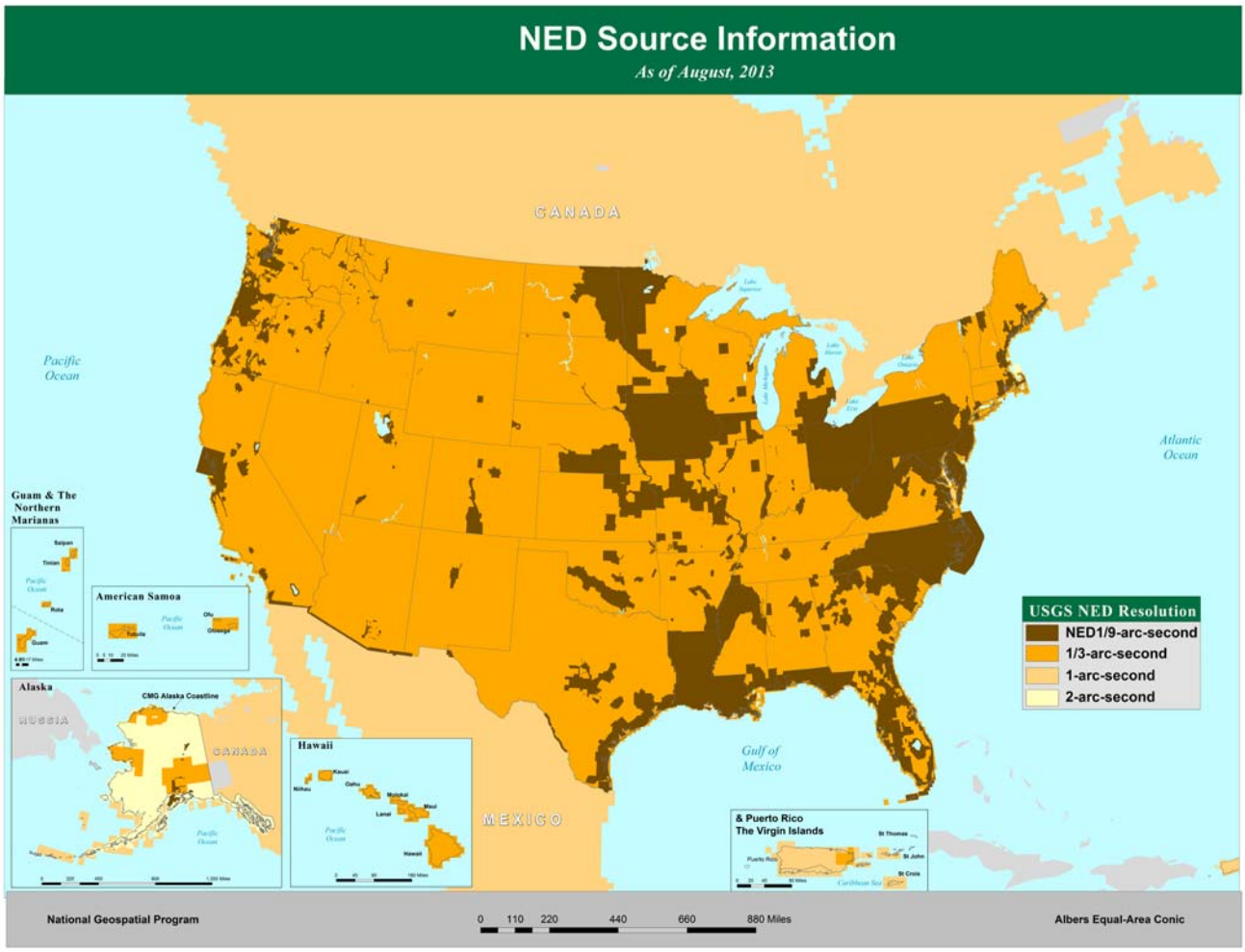

Figure 5. Composite of source data by resolution – August, 2013 release.

High-Resolution (1/9-arc-second) Data

The 1/9-arc-second NED is being developed from high-resolution source data (3-meter or better point spacing from lidar, photogrammetry, or other sources). Higher resolution layers are being updated through the integration of data from various sources using new technologies acquired through Federal, State, and local partners who provide access to the best available local information. As data are acquired and made available in the public domain, they are incorporated into the NED at a 1/9-arc-second resolution. Figure 6 shows the areas that reside in the NED 1/9-arc-second layer as of August, 2013.

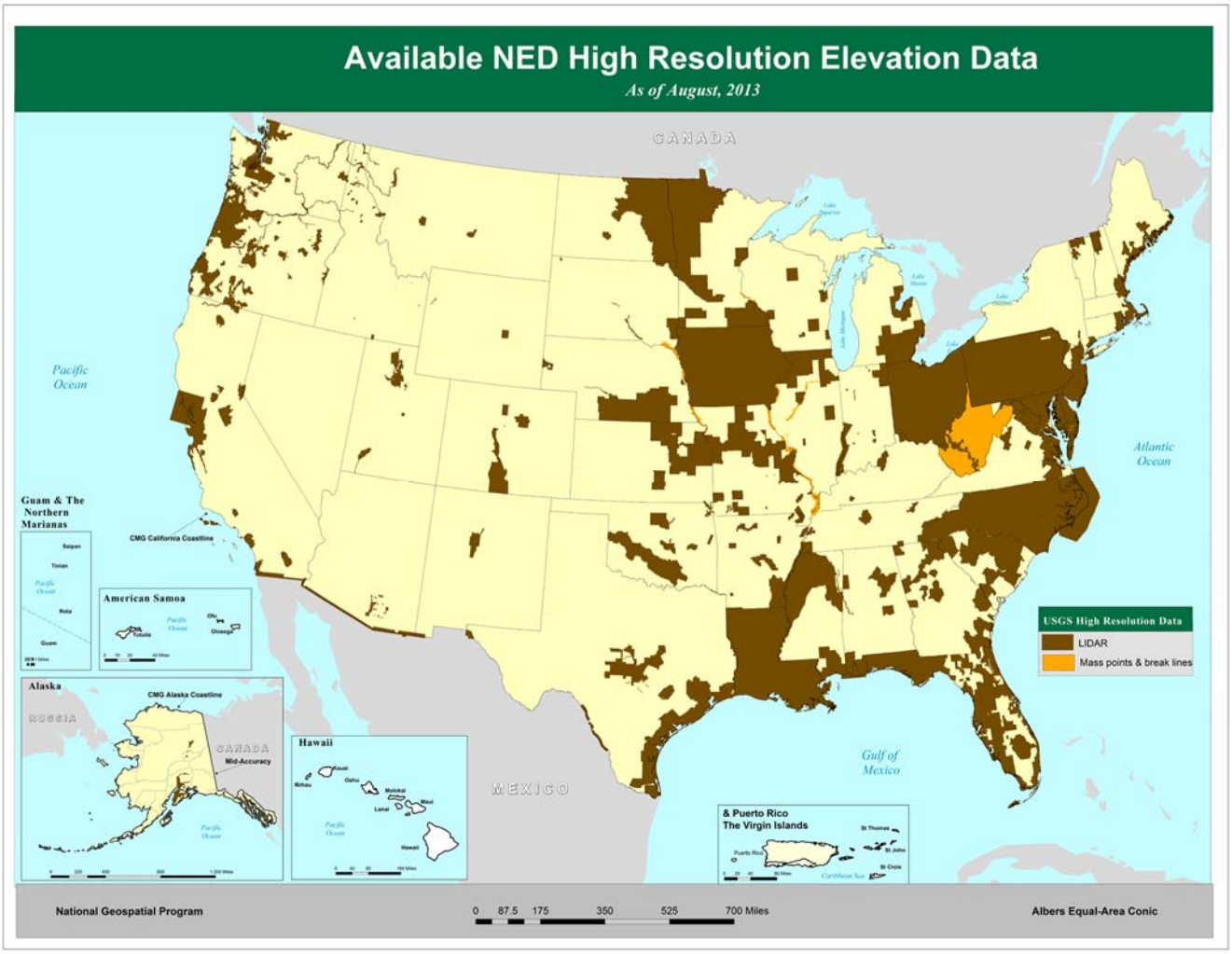

Figure 6. Available 1/9-arc-second data from all sources – August, 2013 release.

The following are NED 1/9-arc-second datasets released during the August, 2013 update.

- Alaska—Matanuska_Susitna Lot 2 2011—3134.22 square miles
- Arkansas—Upper White-Village Creek Watershed, 2012—185.12 square miles
- Florida—North Jefferson County Hydro-Flattened, 2007—462.83 square miles
- Missouri—Adair County, 2011—736.93 square miles
- Missouri—Cooper County, 2011—524.74 square miles
- Missouri—Howard County, 2011—285.75 square miles
- Missouri—Lincoln County, 2011—613.50 square miles
- Missouri—Livingston County, 2011—520.56 square miles
- Missouri—Montgomery and parts of Monroe and Audrain coutines, 2011—915.72 square miles
- Missouri—Putnam County, 2011—497.83 square miles
- Missouri—Randolph County, 2012—598.26 square miles
- Missouri—Ray County, 2011—45.34 square miles
- Missouri—St Francois County, 2012—284.89 square miles
- Missouri—St Louis County, 2012—689.75 square miles
- Missouri—Sullivan County, 2012—187.11 square miles
- Mississippi—Yazoo Delta Area of Misissippi, 2009—4139.92square miles
- New Jersey—Part of Salem County, 2008—93.34 square miles

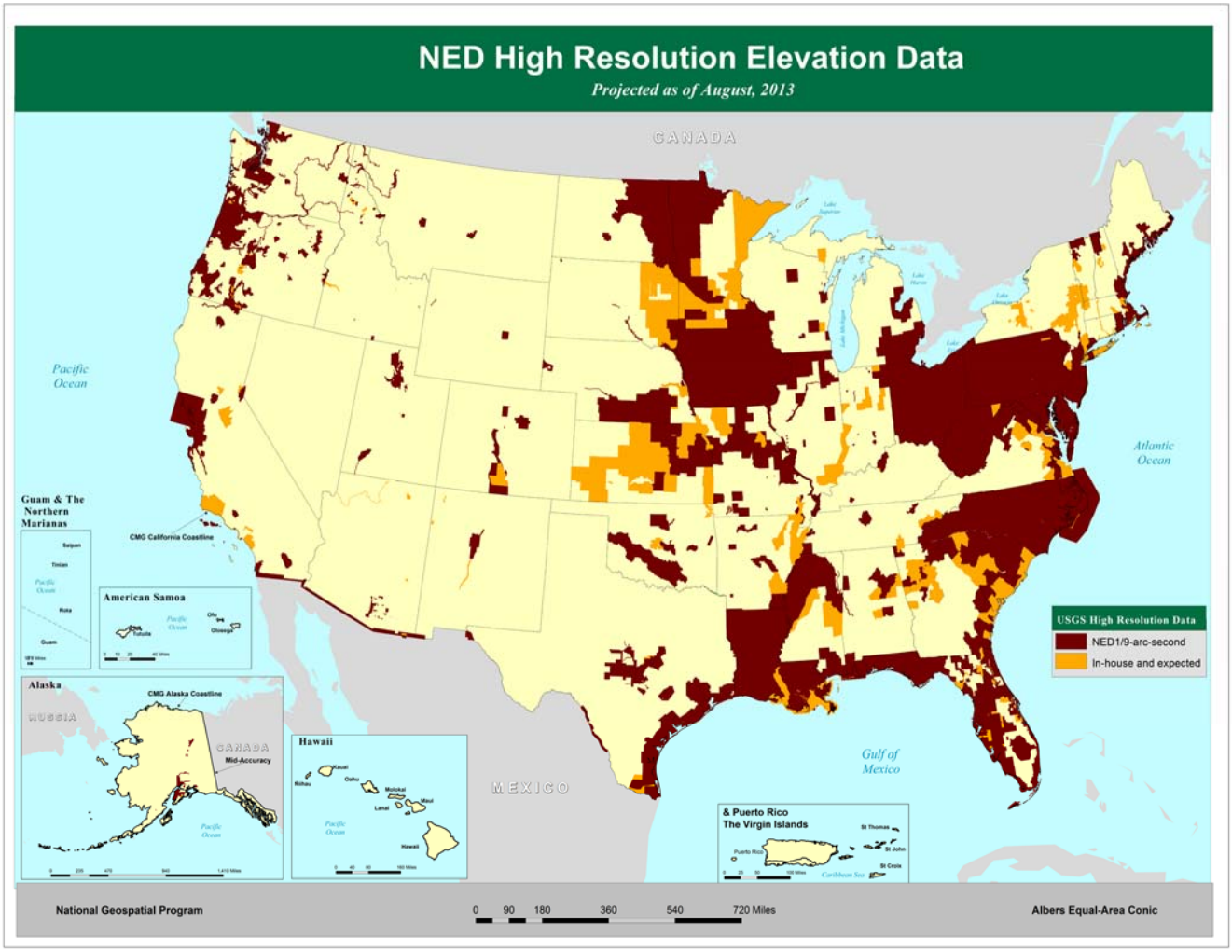

Figure 7. Available and anticipated high-resolution data – August, 2013 release.

1/3-arc-second Data

NED contains data for all of the contiguous United States, Hawaii, and its territories at a resolution of 1/3-arc-second (~10-meters). The current release of 1/3-arc-second NED (August 6, 2013) includes migrated high-resolution source data and IFSAR in Alaska (Figure 8).

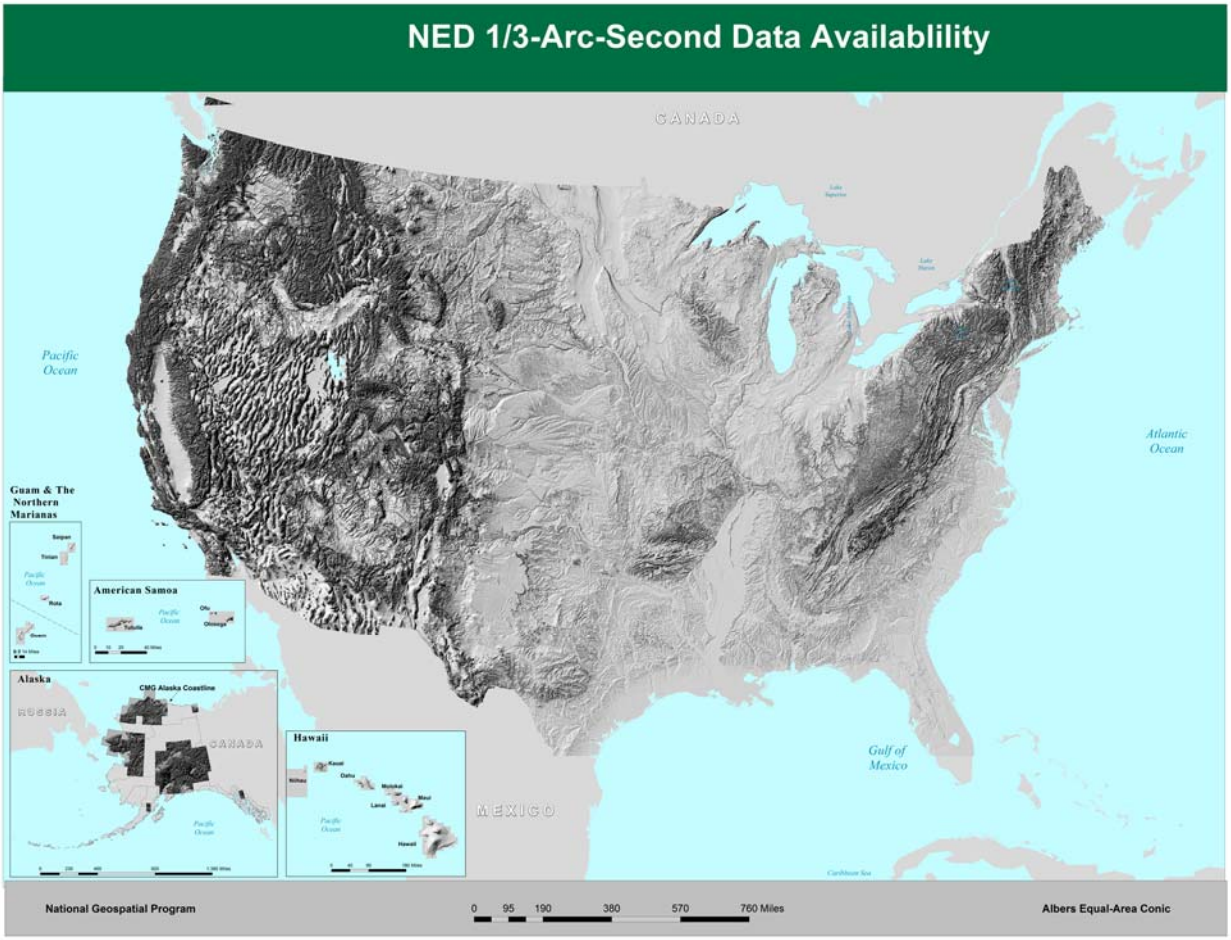

Figure 8. Available 1/3-arc-second NED.

Updates from High-Resolution Data

As higher resolution datasets are released into the 1/9-arc-second layer, they are evaluated as a source to revise the NED 1- and 1/3-arc-second layers (Figure 9). Several higher resolution datasets were used as source data for this update cycle. The intention was to keep the 1/9-arc-second layer in sync with both the 1- and 1/3-arc-second layers (allowing for a time delay because of differences in the data processing flows). Some 1/9-arc-second datasets do not meet certain criteria, such as the flattened water bodies or bare-earth DEM specifications, which are required for the NED 1- and 1/3-arc second layers and, therefore, will not be used as source for updates for those layers.

In Alaska, there are only specific areas covered in the NED 1- and 1/3-arc-second layer. Also, the Virgin Islands, Mexico, and Canada are only supported in the NED 1-arc-second layer.

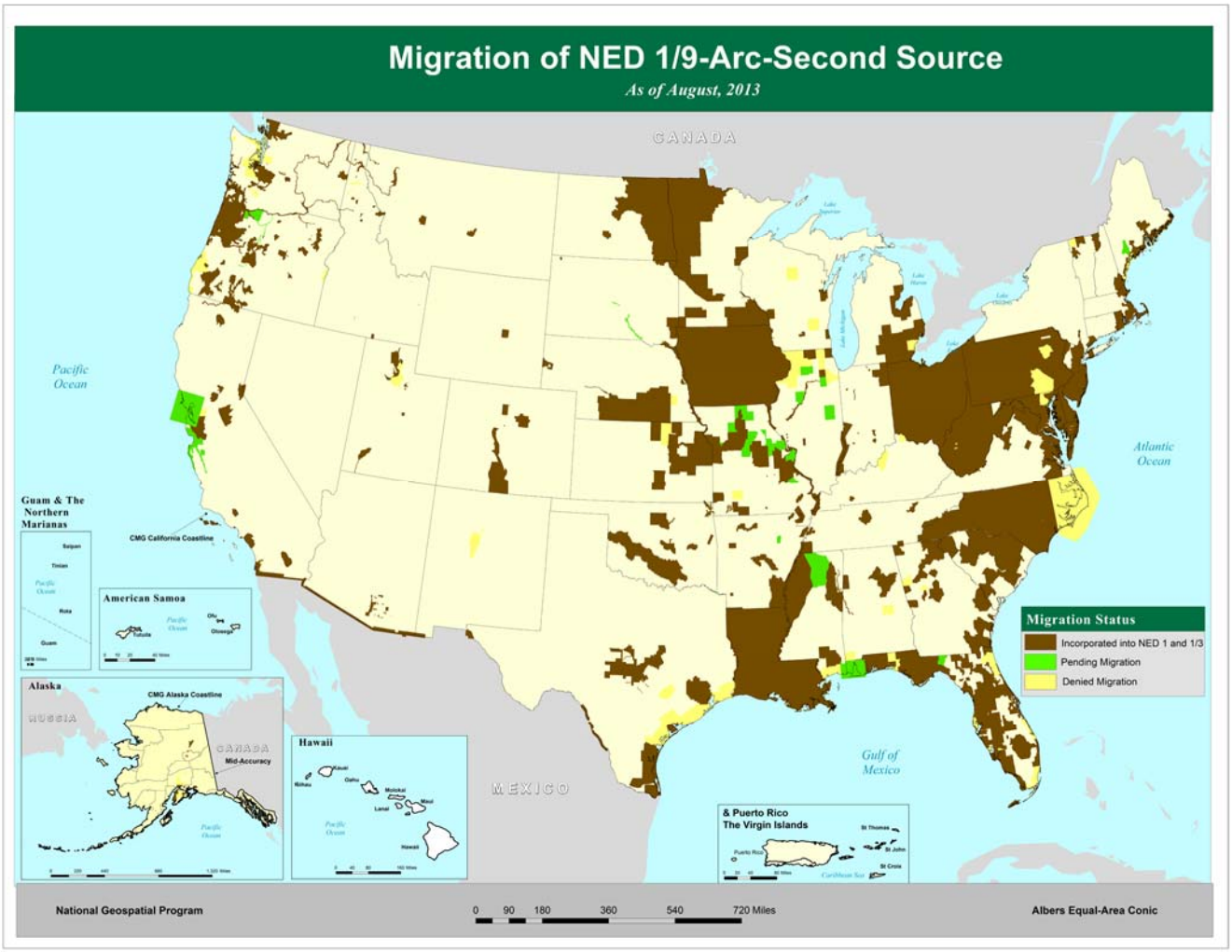

Figure 9. Migration status of NED 1/9 to other NED layers—August, 2013 release.

Mexico Available in the 1-arc-second Layer

Elevation data for the country of Mexico were added to the 1-arc-second NED in October, 2008. These data are a result of collaboration between USGS and Mexico's INEGI. The data were provided and quality control conducted by INEGI. Topographic staff at USGS Earth Resources Observation and Science (EROS) Center processed the data to improve edge matching, making the dataset seamless within itself and along the US / Mexico border.

Parts of Canada Available in the 1-arc-second Layer

Elevation data along the U. S. and Canada borders have been added to the 1-arc-second NED layer during the April, June, and October, 2012 updates. These data are the result of collaboration between USGS and NRCAN Centre for Topographic Information–Sherbrook, Ottawa. The Canadian data and accompanying metadata were provided by NRCAN. USGS EROS employees improved the topographic information along the international border by making the U.S. / Canada elevation data seamless in the 1-arc-second NED. These data complete the watersheds originating in the U.S. and fill a small void that existed between the two elevation datasets.

Alaska Highlights

Portions of Alaska are now available at resolutions of 1-, 1/3-, and 1/9-arc-second in addition to the complete coverage of Alaska at the 2-arc-second resolution. The recent additions to the Alaska collection consist of either IFSAR or lidar data. Per the statewide elevation plan, IFSAR will be the primary source for elevation data over Alaska. Currently, 26% of Alaska is covered by 10-meter or better source data.

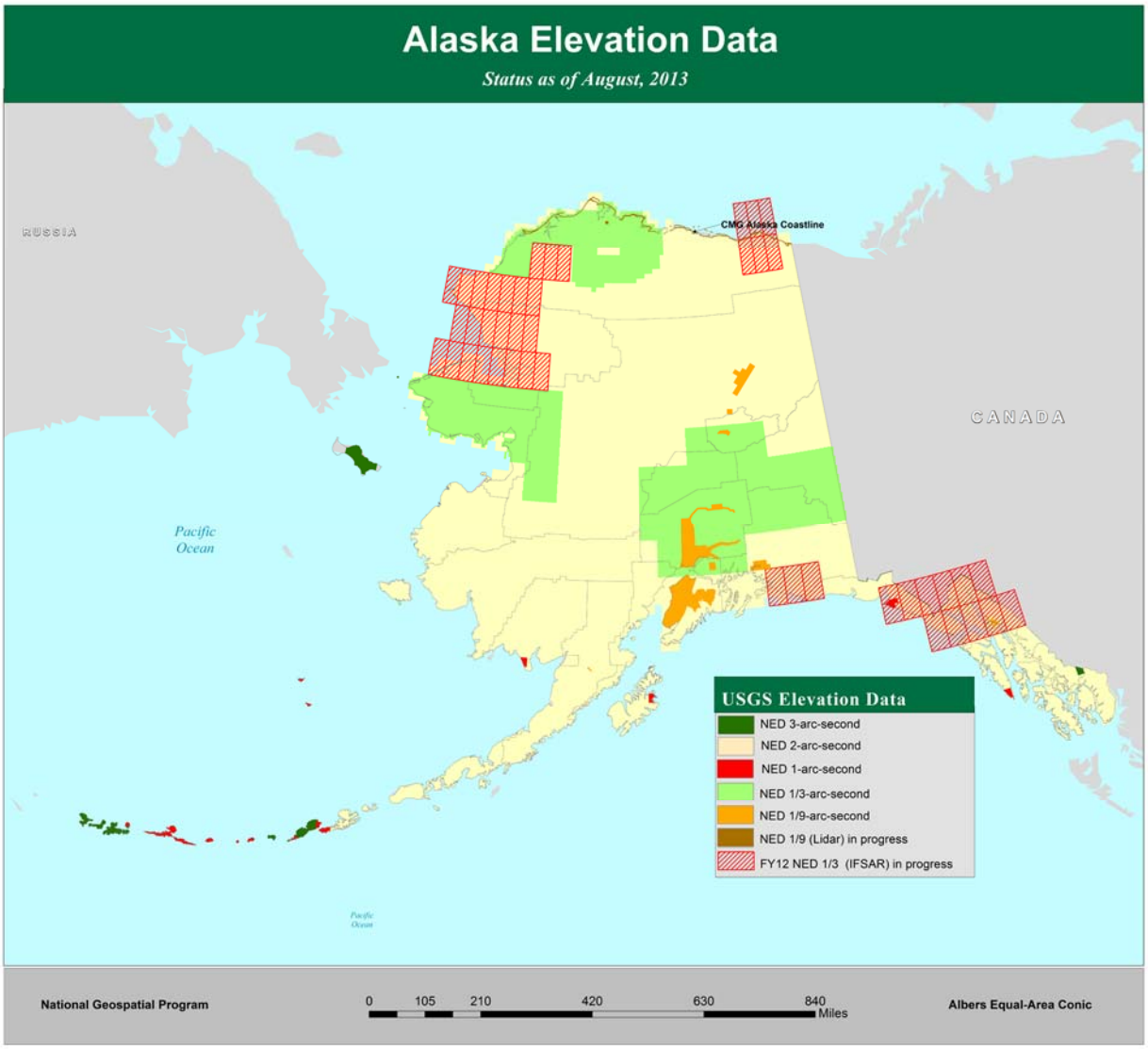

Figure 10. Available and anticipated Alaska elevation data.

Currency

Data currency (Figure 11) is an important aspect of a multiple source dataset such as the NED. Note that NED currency represents when the original source was generated or acquired depending on the data type. However, if the data is reprocessed due to new and improved processing techniques, the data still retains the original date the source was generated or acquired.

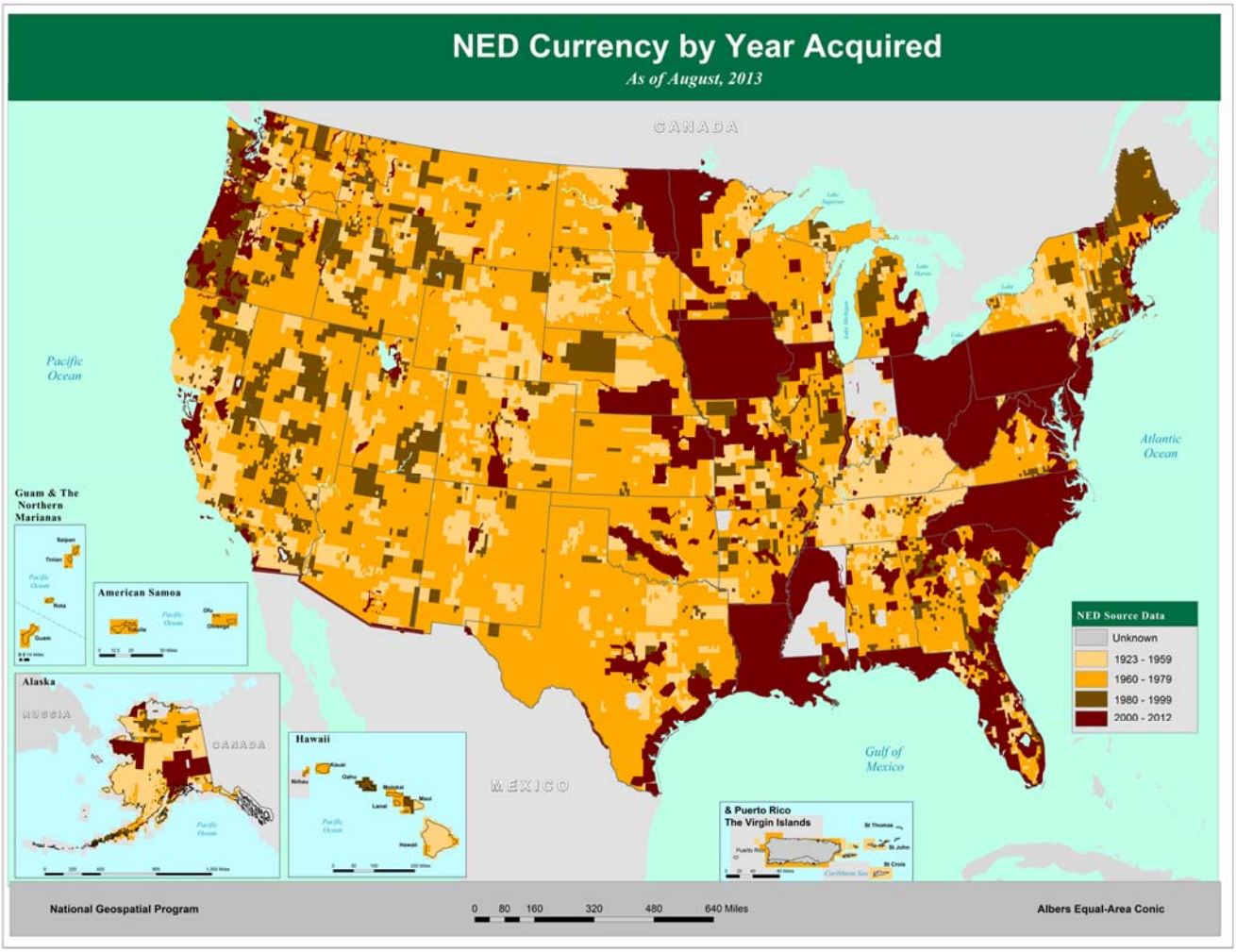

Figure 11. Currency of the NED shown by acquisition year – August, 2013.

Datums

All NED data are currently distributed in the North American Datum of 1983 (NAD83).

Production Methods

Figure 12 shows the production methods used to produce NED data. The number of DEMs created using older production methods is small and they will disappear as 30-meter data are replaced by higher resolution data. Production method, in conjunction with data resolution, source, and other factors, can be used to determine data quality.

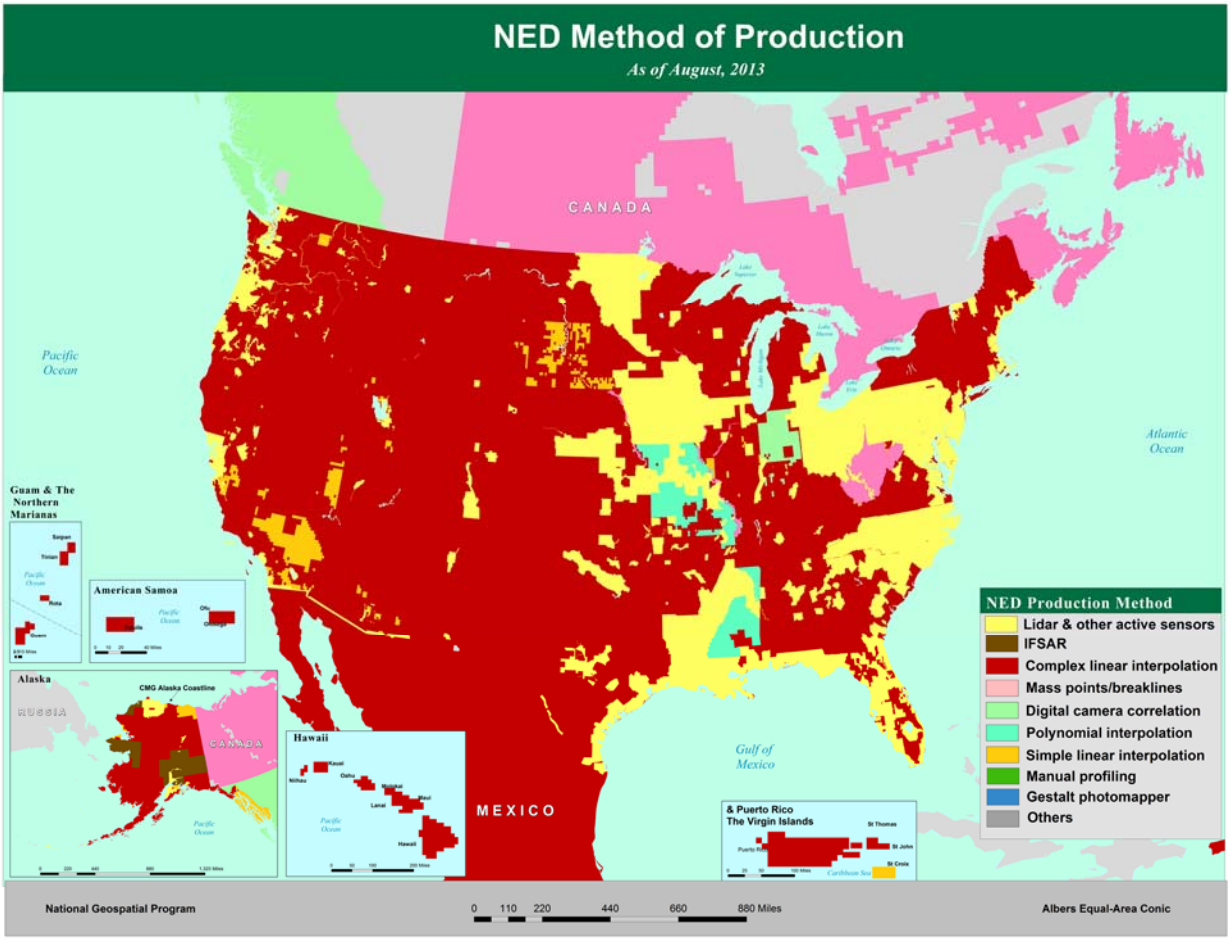

Figure 12. NED source data by production method – August, 2013 release.

The production methods are:

- Lidar, IFSAR and other active sensors including SRTM
- Complex linear interpolation from contours, often including hydrography (LT4X)
- Photogrammetrically compiled mass points and break lines
- Digital camera correlation, usually from line camera such as Leica ADS40
- Polynomial interpolation from contours, mass points, and break lines (ANUDEM)
- Simple linear interpolation from contours, (DLG2DEM and DCASS)
- Manual profiling via a mechanical or analytical stereo-plotter
- Gestalt Photomapper II (electronic image correlation)

Source Data

NED source data are selected from an ever-growing inventory of DEMs produced by USGS standard and other processes. With first consideration always being given to data quality, the selections to be integrated into the NED are made according to the following ranking and listed in the order of descending priority:

- High-resolution data, typically derived from lidar or digital photogrammetry, are often break line enforced. If collected at a ground sample distance no coarser than 5-meters, such data may also be offered within the NED at a resolution of 1/9-arc-second.

- Moderate-resolution data, other than that compiled from cartographic contours. These data may also be derived from lidar or digital photogrammetry, or less often by airborne IFSAR. A typical ground sample distance is ~10-meters commonly called “1/3-arc-second data.”

- 10-meter DEMs derived from cartographic contours and mapped hydrography. Most often, such data are produced by or for the USGS as a standard elevation product, and they currently account for the bulk of the NED.

- 30-meter (Level 2) cartographically derived DEMs. Similar in most respects to their 10-meter counterparts, though usually of lower overall quality.

- 30-meter (Level 1) photogrammetrically derived DEMs. These are the oldest DEMs in the 7.5-minute series. These data were derived directly from stereo photography, either by a human operator or by an early form of electronic image correlation. They are typically marred by erroneous production artifacts that are addressed to the greatest practical extent by digital filtering within the NED production process.

- 2 arc-second DEMs are a standard USGS product. They are derived from cartographic contours at a scale of 1:63,360 over the state of Alaska, and a scale of 1:100,000 elsewhere.

- 1-arc-second SRTM data to date are only used in preference to 3-arc-second data in the Aleutian Islands.

- 3-arc-second DEMs are another standard USGS product, and are generally only used within the NED as a source of fill values over large water bodies.

The composition of source data within the August, 2013 NED release exhibits no 30-meter source over the contiguous United States. Also, a new trend has developed where the 10-meter source is declining as it is replaced by high-resolution source (Figure 13).

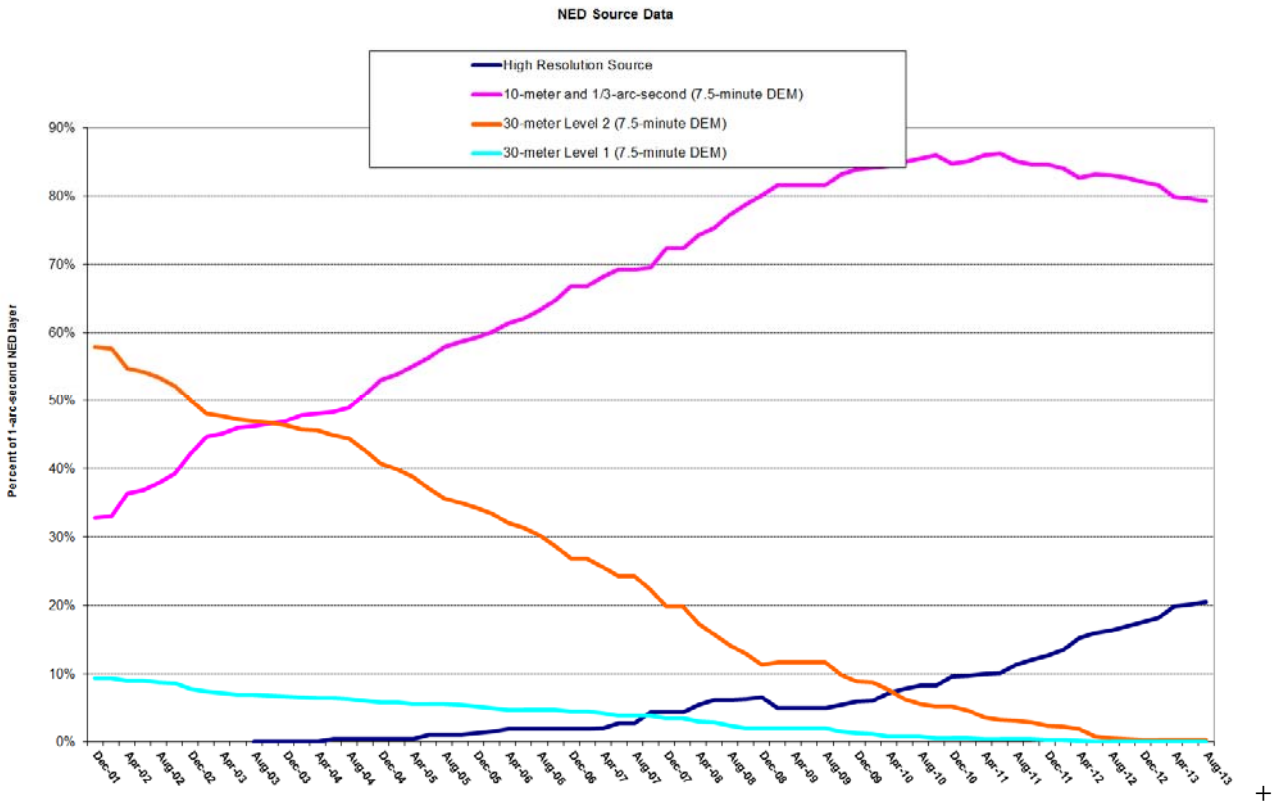

Figure 13. Type of 1-arc-second NED source data by release date.

NED Tile Processing

To address practical concerns of data processing and storage, with the exception of the 1/9-arc-second resolution, the NED is processed in 1x1-degree tiles coincident with integer degree boundaries of the Geodetic Reference System 1980 (GRS80) ellipsoid. A small amount of overlap is added to ensure that adjacent tiles are logically seamless. Additional tiles are added as required to accommodate new areas of coverage. (Table 1)

Release date	Number of tiles	Note
June, 2000	1,367	CONUS: 925 tiles; AK: 428 tiles; HI: 14 tiles
April, 2001	1,375	8 tiles added: Puerto Rico and Virgin Islands
June, 2001	1,387	12 tiles added: Pacific islands
August, 2001	1,392	5 tiles added: Pacific islands
October, 2008	1,651	259 tiles added: Country of Mexico
April, 2012	2,073	422 tiles added: Canadian data adjoining U.S.
June, 2012	2,159	86 tiles added: Canadian data adjoining Alaska
October, 2012	2,188	29 tiles added: Canadian data over Gulf of Maine
August, 2013	3,836	1648 tiles added: Canadian data over the rest of Canada

Table 1. Number of NED tiles and changes by release date.

In the current NED 1 and 1/3 releases, 50 tiles were updated, representing 5% of NED, excluding Alaska, Mexico and Canada, for which the extent of coverage is resolution-specific (Figure 14).

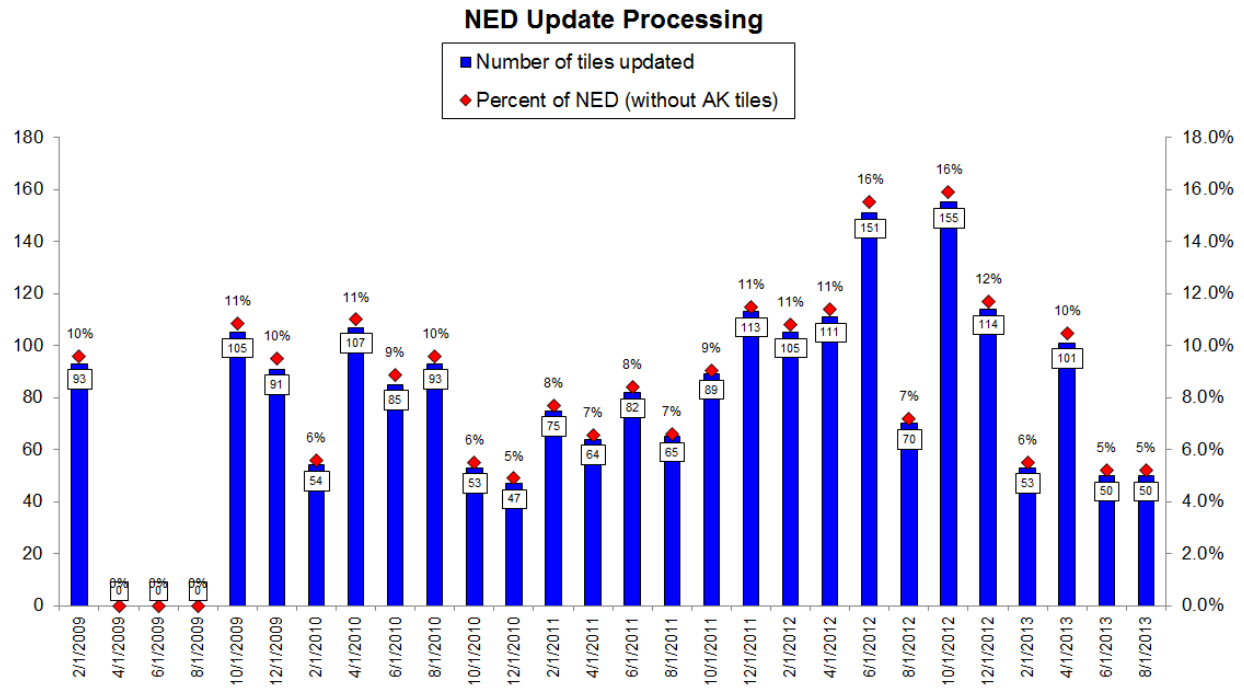

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Figure 14. Number and percentage of NED tiles processed by release date.

How to Obtain NED Data

Newly released and existing elevation data of the NGP are available for download via *The National Map* Viewer (http://viewer.nationalmap.gov/viewer/). For NED bulk data delivery via hard drive, contact USGS EROS Customer Service – custserv@usgs.gov (605-594-6151).

NED Data Source Index Viewer

The NED Data Source Index (DSI) Viewer has undergone a face lift and usability improvements. All NED layers are accompanied by spatial metadata that specifically describe information about each pixel. The NED DSI Viewer is located online at http://ned.usgs.gov/usgs_gn_ned_dsi/viewer.htm, and displays four of the most used NED spatial metadata fields. Other Viewer capabilities provide options for the user to select fields, zoom from one area to another, find a specific location, and identify spatial metadata for a particular pixel. The previous version of the NED DSI Viewer was a popular site, but over time has become constrained with the increased volume of NED data. However, the recent NED DSI Viewer improvements have provided ease of use and Viewer efficiency.

Lidar Point Cloud Data Availability

Most of the high-resolution DEM are being generated from lidar bare earth point data. NED distributes the elevation data but does not distribute the bare earth point cloud data. A complementary USGS activity provides the lidar point cloud data for download (http://earthexplorer.usgs.gov/).

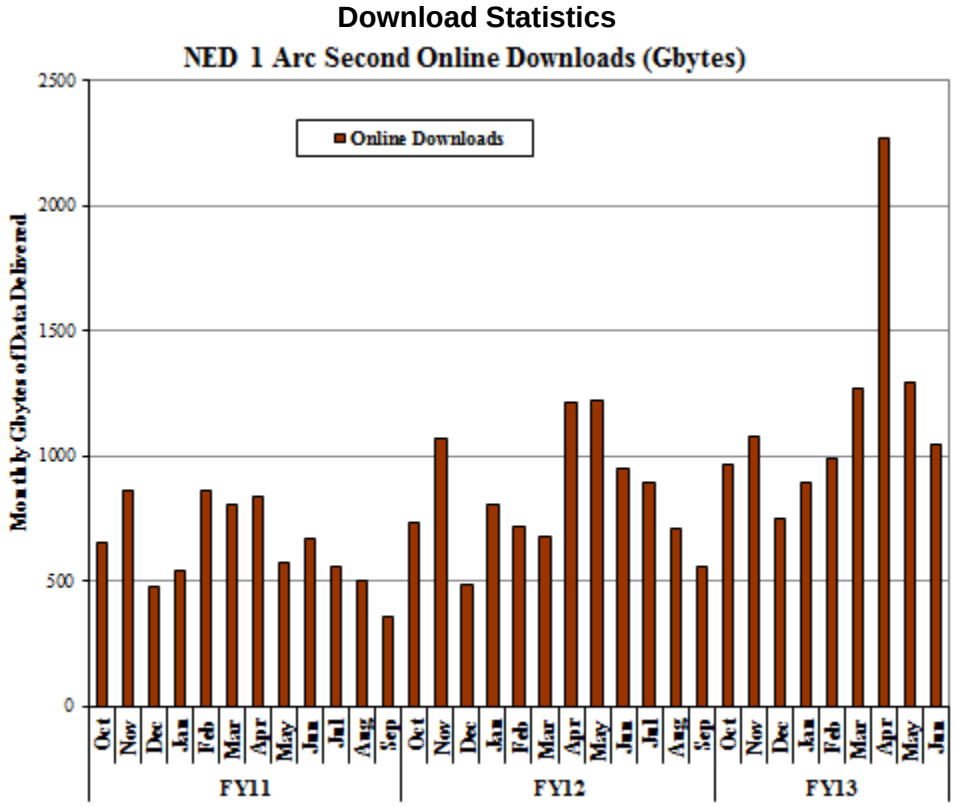
Additional Information Available

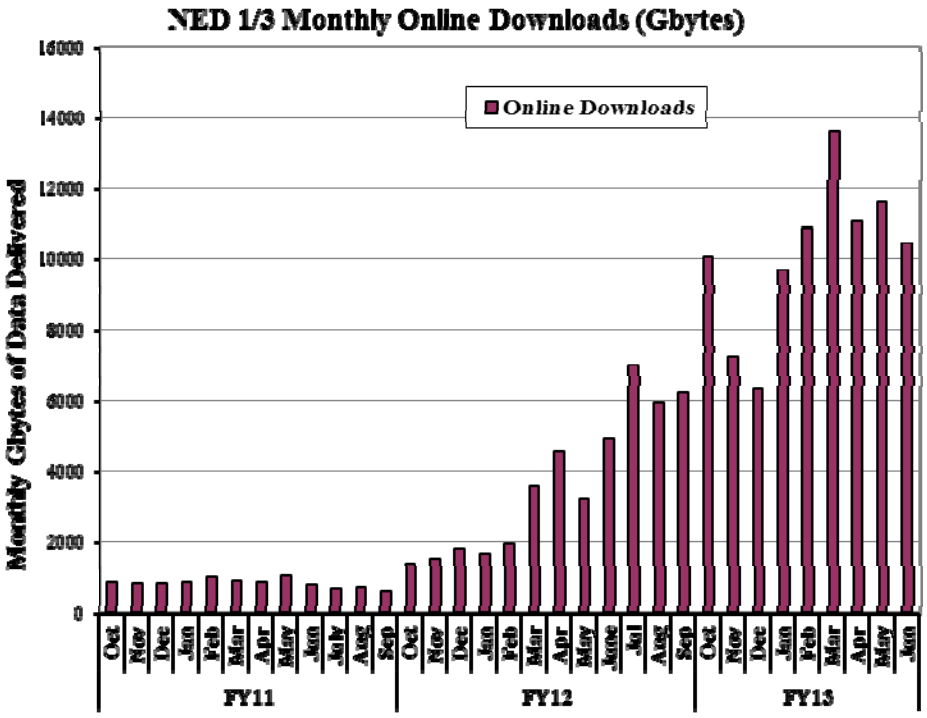
The following are available from the NED Web site (http://ned.usgs.gov/metadata.asp)

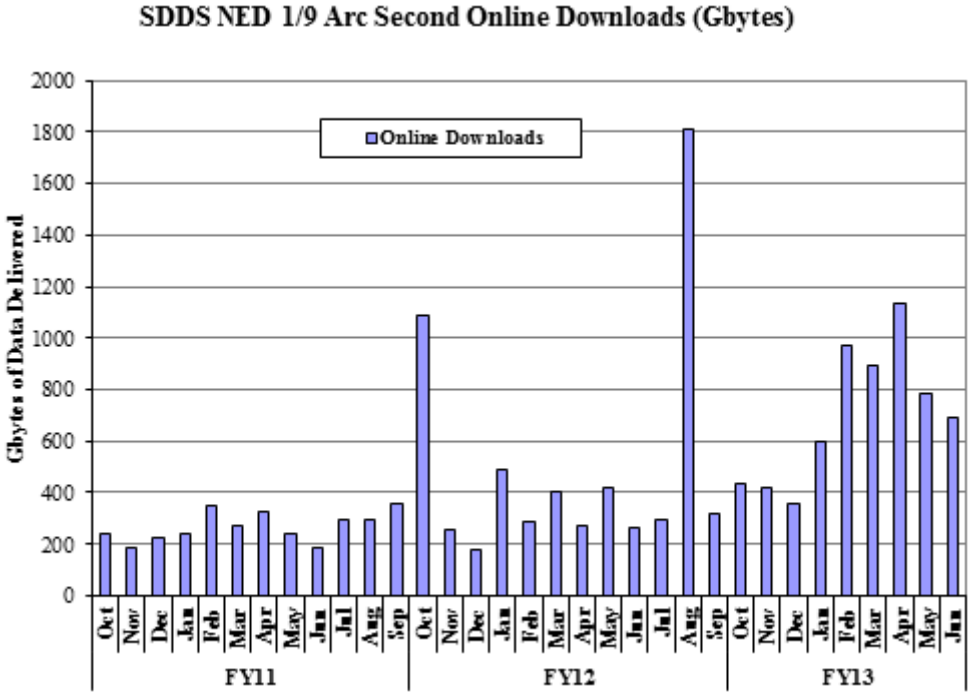
- the NED spatial metadata in shapefile (.shp) format
- the NED data dictionary with definitions of the attributes of the spatial metadata coverage
- previous issues of the NED Release Notes
- spatial metadata shapefiles of previous releases

No new information was added to the FAQ list on the NED home page (http://ned.usgs.gov)

Distribution Statistics




NED 1/3 Monthly Online Downloads (Gbytes)
Online Downloads
Monthly Gbytes of Data Delivered
16000
14000
12000
10000
8000
6000
4000
2000
0
Oct Nov Dec Jan Feb Mar Apr May Jun July Aug Sep
Oct Nov Dec Jan Feb Mar Apr May June Jul Aug Sep
Oct Nov Dec Jan Feb Mar Apr May Jun
FY11
FY12
FY13


SDDS NED 1/9 Arc Second Online Downloads (Gbytes)
Online Downloads
Gbytes of Data Delivered
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep
Oct Nov Dec Jan Feb Mar Apr May Jun
FY11
FY12
FY13

Terminology

Lidar– light detection and ranging – an optical remote sensing technology that can measure the distance to, or other properties of, a target by illuminating the target with light, often using pulses from a laser.

IFSAR – Interferometric Synthetic Aperture Radar – a radar remote sensing technology that can measure the distance to, or other properties of, a target by illuminating the target with radar.

SRTM – Shuttle Radar Topography Mission – a joint project between the National Imagery and Mapping Agency (now the National Geospatial-Intelligence Agency) and the National Aeronautics and Space Administration (NASA) to produce digital topographic data for 80% of the Earth's land surface (all land areas between 60º north and 56° south latitude), with data points located every 1-arc-second (approximately 30-meters) on a latitude/longitude grid using a radar interferometry sensor on the space shuttle.