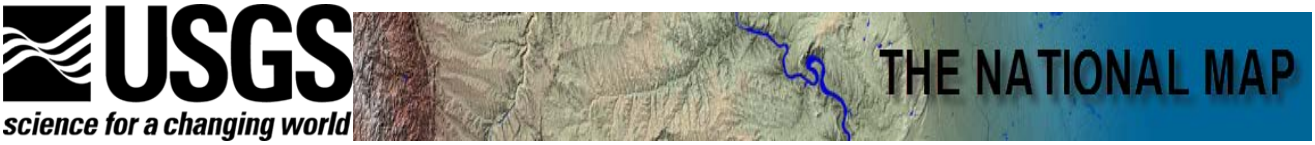

National Elevation Dataset

December, 2012 Release Notes

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Contents

Latest Release

The December, 2012 update of the National Elevation Dataset (NED) 1-, 1/3- and 1/9-arc-second collections were released on December 4, 2012. This marks the 69th update of the 1-arc-second layer since bi-monthly revisions began in June, 2000. This release incorporates 14,551 square miles of new light detection and ranging (LiDAR) data into the NED 1/9-arc-second layer. The NED 1- and 1/3-arc-second layers were updated with 28330 square miles of migrated NED 1/9 source data and 4507 square miles of standard production 10-meter digital elevation models (DEMs).

Note that the NED 1- and 1/3-arc-second data will be available through prepackaged downloadable 1 degree tiles and bulk data delivery. However, these data will no longer be available through dynamic downloads.

The next release is scheduled for February 5, 2013.

Highlights

Highlights featured in the December release include high resolution elevation data over an area in the Ozark-Ouachita region highlighting Mima Mounds, a peculiar geomorphic phenomenon easily revealed in the lidar data. In addition, a new and improved NED Data Source Index Viewer is available.

Mima Mounds—by Tom Jerris,

High-resolution elevation data derived from lidar technology is capable of capturing relatively low topographic features such as Mima Mounds, a peculiar geomorphic phenomenon. These commonly grass-covered domes of earthen material range in diameter from 2.5 to 15 meters and can reach heights of 3 meters. Mima Mounds are named after one of the locales in which they are found, Mima Prairie in Washington State, however they located in other parts of the United States and the world. Figure 1 is taken near the Faulkner and Pulaski County border in Arkansas. Berg (Geology 1990) provides a map of mound distribution in the United States and suggests their formation is due to seismic activity. Dalquest and Scheffer (1942) and Scheffer (1946) provide more hypotheses on Mima Mound formation. With the distribution of high-resolution elevation provided by the US Geological Survey, perhaps a renewed interest in these curious formations will lead scientists to formulate a definitive theory on Mima Mound formation.

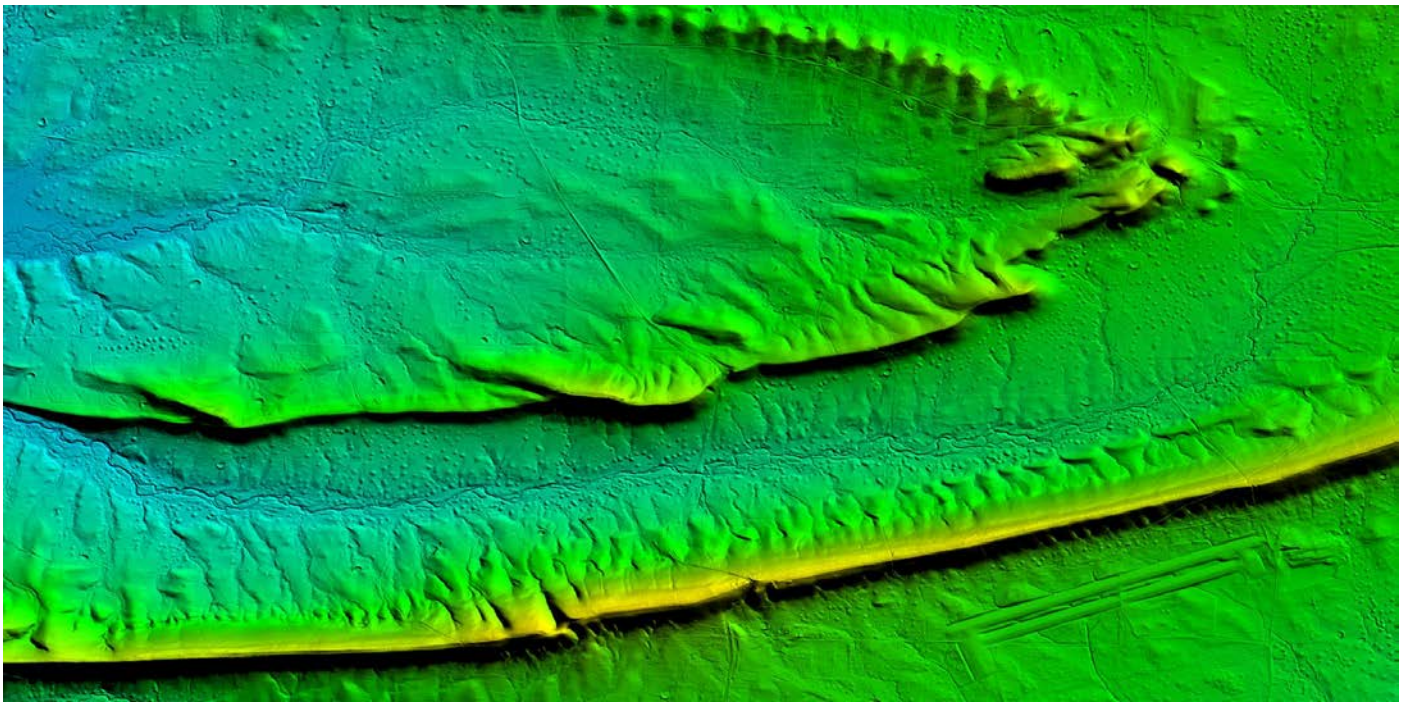


Figure 1. Area near the Faulkner and Pulaski County border, Arkansas.

References cited:

Berg, Andrew W. Formation of Mima mounds: A seismic hypothesis. *Geology*. March 1990.Dalquest,

Walter W., Scheffer, Victor B. The Origin of the Mounds of Western Washington. *Journal of Geology*. January 1942, pp. 68-84.Sheffer,

Victor B. The Mystery of the Mima Mounds. *The Scientific Monthly*. Vol 65, No. 4, October 1947, pp. 283-294.

NED Data Source Index Viewer—By Sandra Poppenga

The NED 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 new 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.

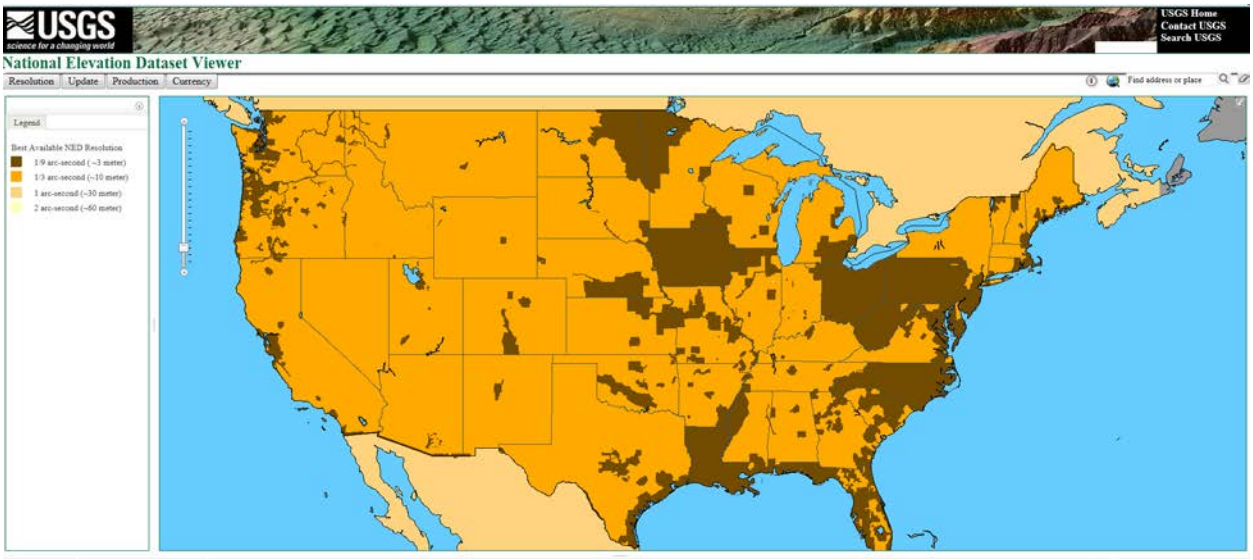


Figure 2. New look of the National Elevation Data Source Index Viewer.

TopoBathy

The August, 2012 NED Release marked the addition of the first set of topobathymetric data into the NED. 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 initial dataset is centered over Mobile, Alabama shown in Figure 3 and was constructed using a combination of 71 disparate topographic and bathymetric datasets from the U.S.Geological Survey (USGS), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Army Corps of Engineers (USACE); ranging in temporal variation from 1917 to 2011. It was developed in collaboration between the USGS Coastal and Marine Geology Program (CMGP) and the USGS National Geospatial Program (NGP). In the next five years, the CMGP has plans to expand its research and modeling along the northern Gulf of Mexico coastline, and San Francisco and Chesapeake Bays.

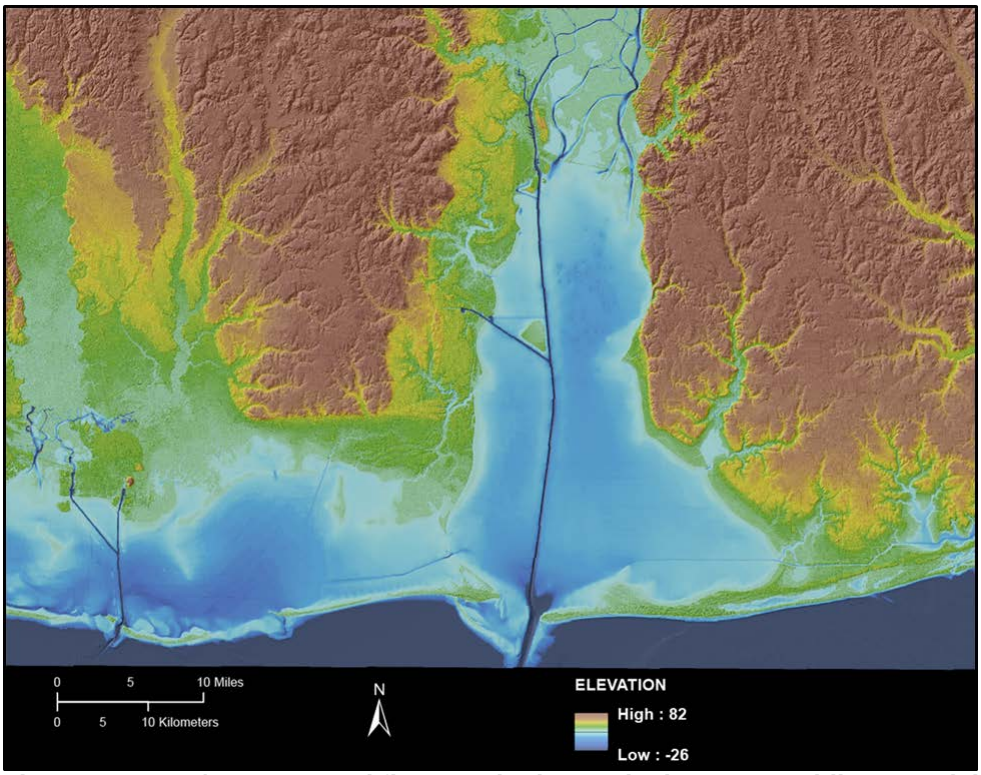


Figure 3. NED 1/9-arc-second first topobathymetric dataset—Mobile Bay, Alabama.

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

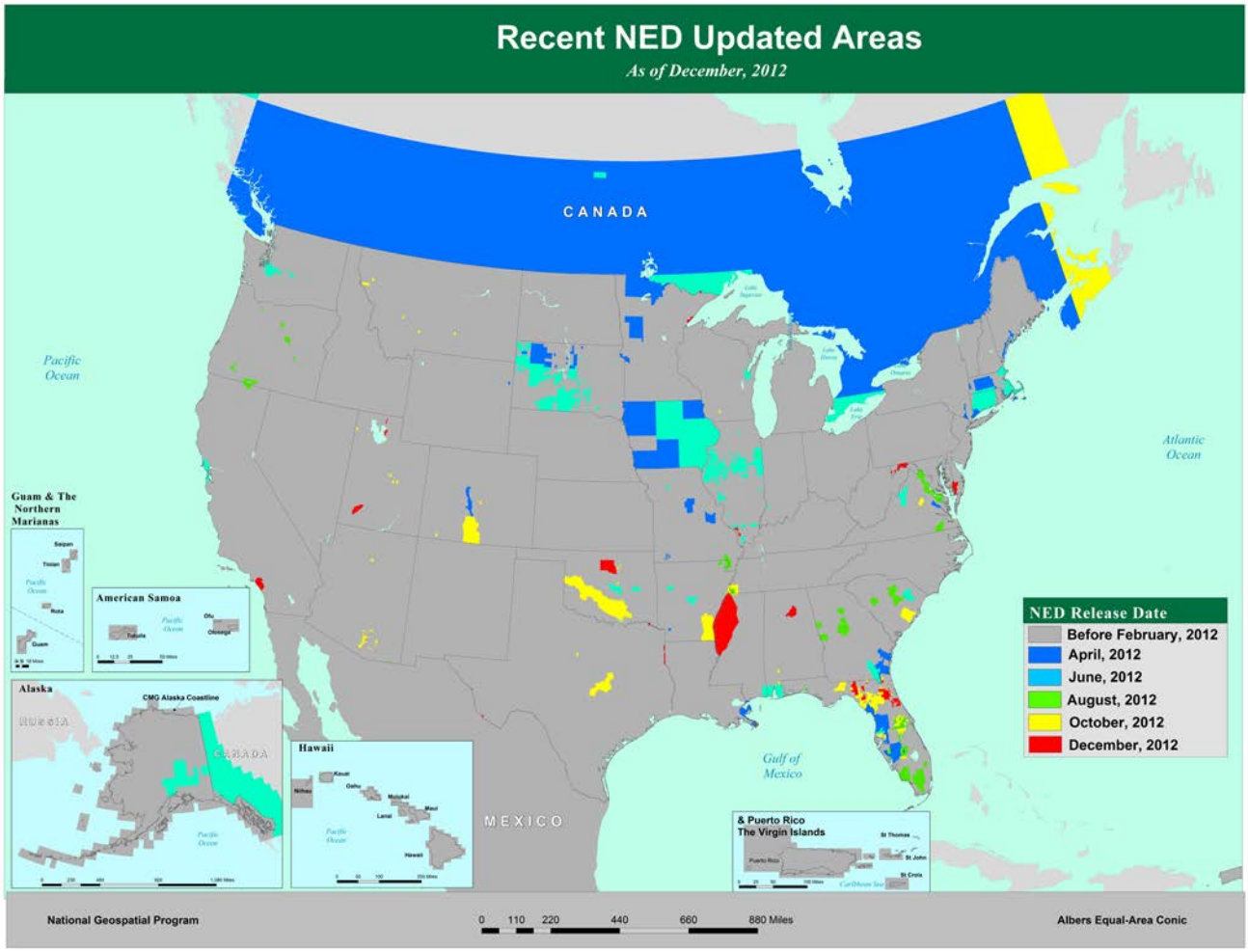


Figure 4. NED updated areas by release date -- December, 2012 release.

Resolutions of Data Available

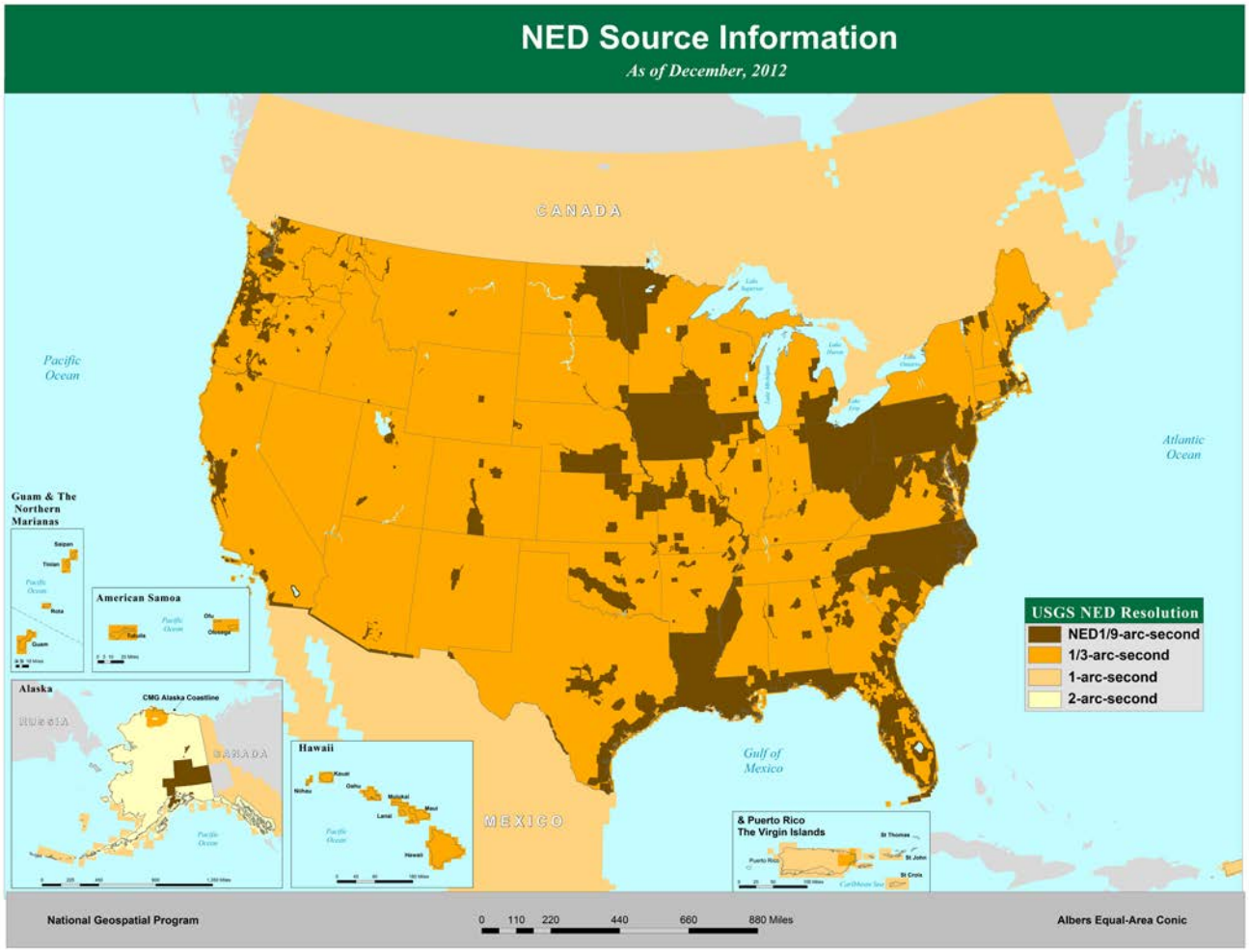


Figure 5. Composite of source data by resolution – December, 2012 release.

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 December, 2012.

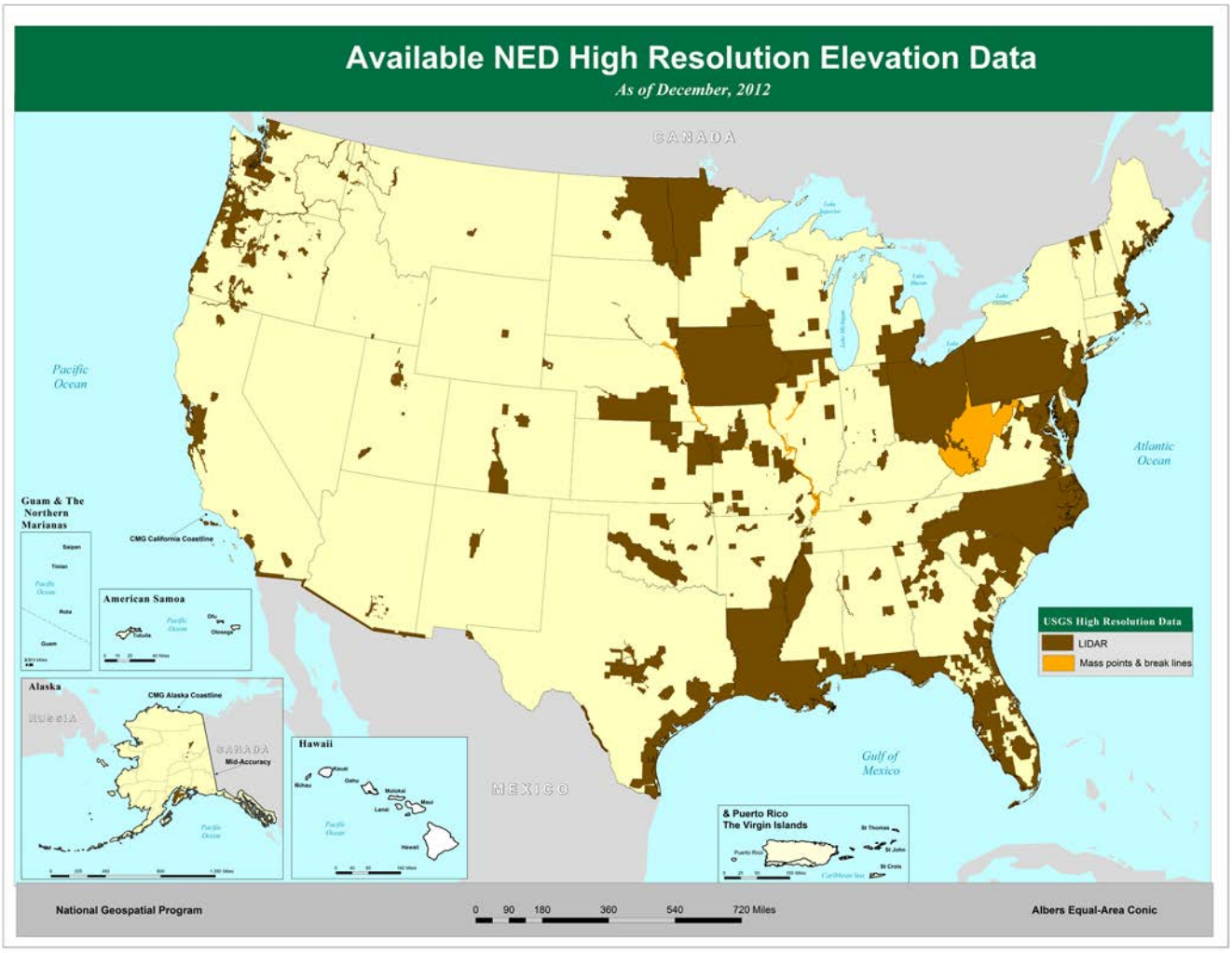


Figure 6. Available 1/9-arc-second data from all sources – December, 2012 release.

The following are NED 1/9-arc-second datasets released during the December, 2012 update.

- Alabama—Blount County, 2010—690 square miles
- California—Orange County, 2011—681 square miles
- Maryland—Wicomico and Somerset Counties, 2012—605 square miles
- Mississippi—Yazoo Delta Region, 2009—9856 square miles
- Oklahoma—Stillwater, 2010—1732 square miles
- Oklahoma—Sugar Creek (Caddo County), 2010—343 square miles
- Utah—Bear River, 2011—31 square miles
- Utah—Cedar Valley, 2011—498 square miles
- Utah—Ogden area, 2011—115 square miles

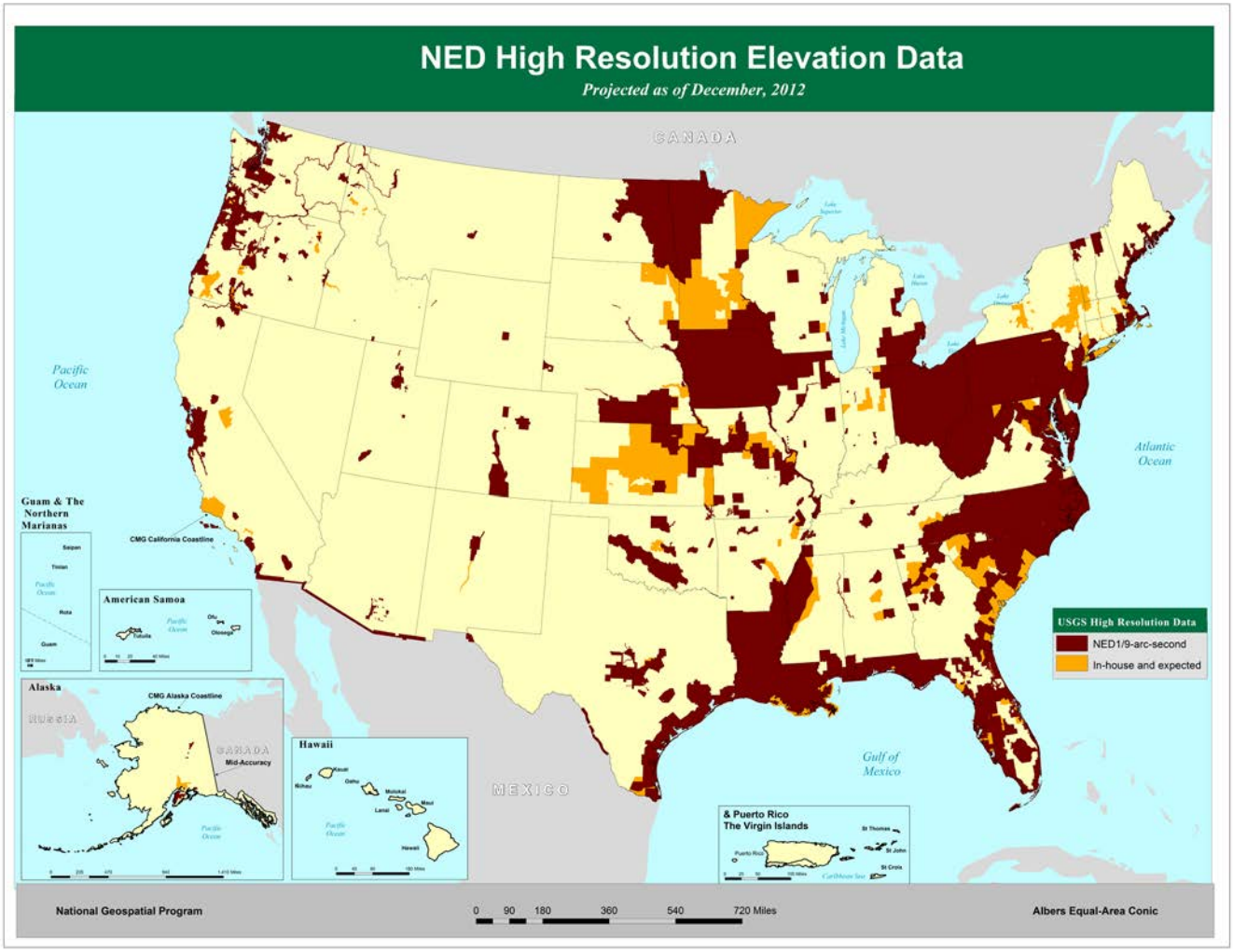


Figure 7. Available and anticipated high-resolution data – December, 2012 release.

1/3-arc-second Data

NED contains data for all of the contiguous United States, Hawaii, and many Pacific Islands at a resolution of 1/3-arc-second (~10-meters). The current release of 1/3-arc-second NED (December 4, 2012) includes all USGS 10-meter data as of November 1, 2012 and NED 1/9 migrated source data (Figure 8).

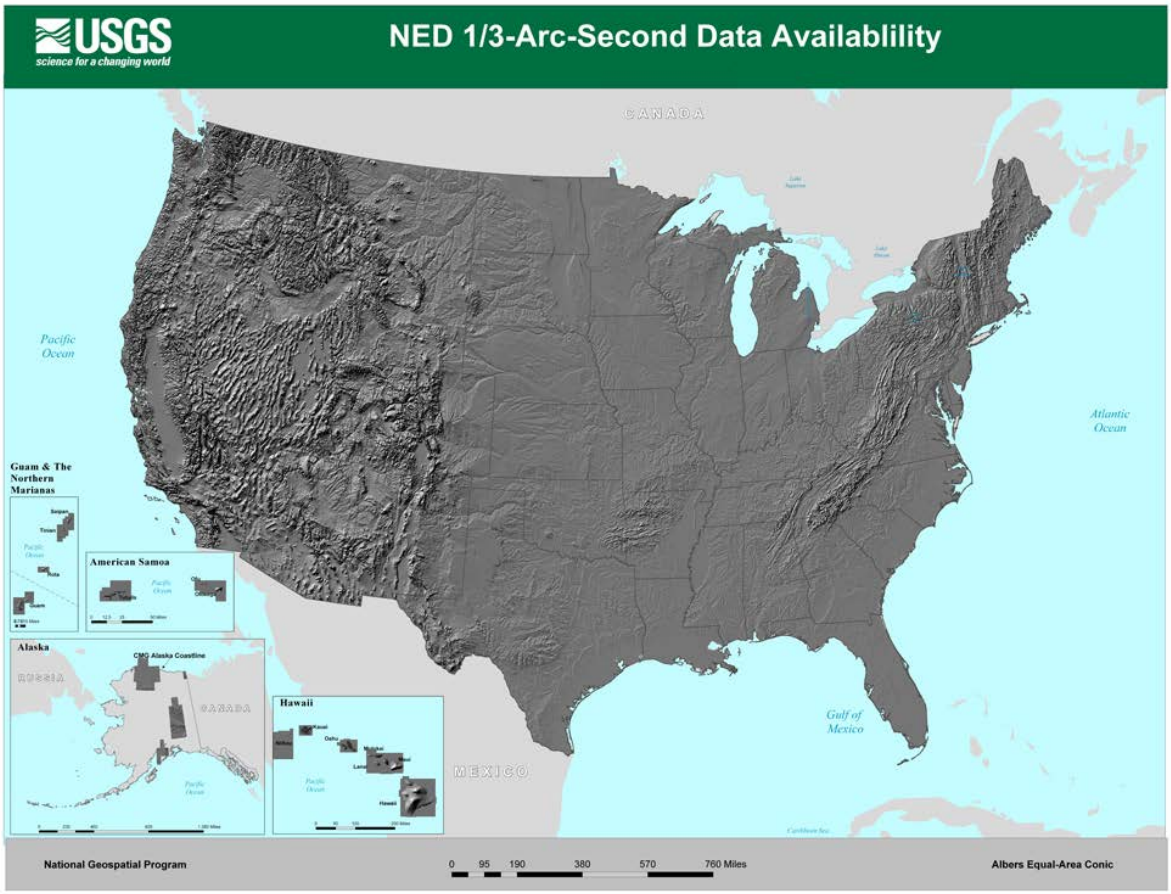


Figure 8. Available 1/3-arc-second NED.

Source data with a resolution of 10-meters or higher currently exists for all of the United States (excluding Alaska) as of this release. Figure 9 shows the completion of USGS standard 10 Meter DEM production.

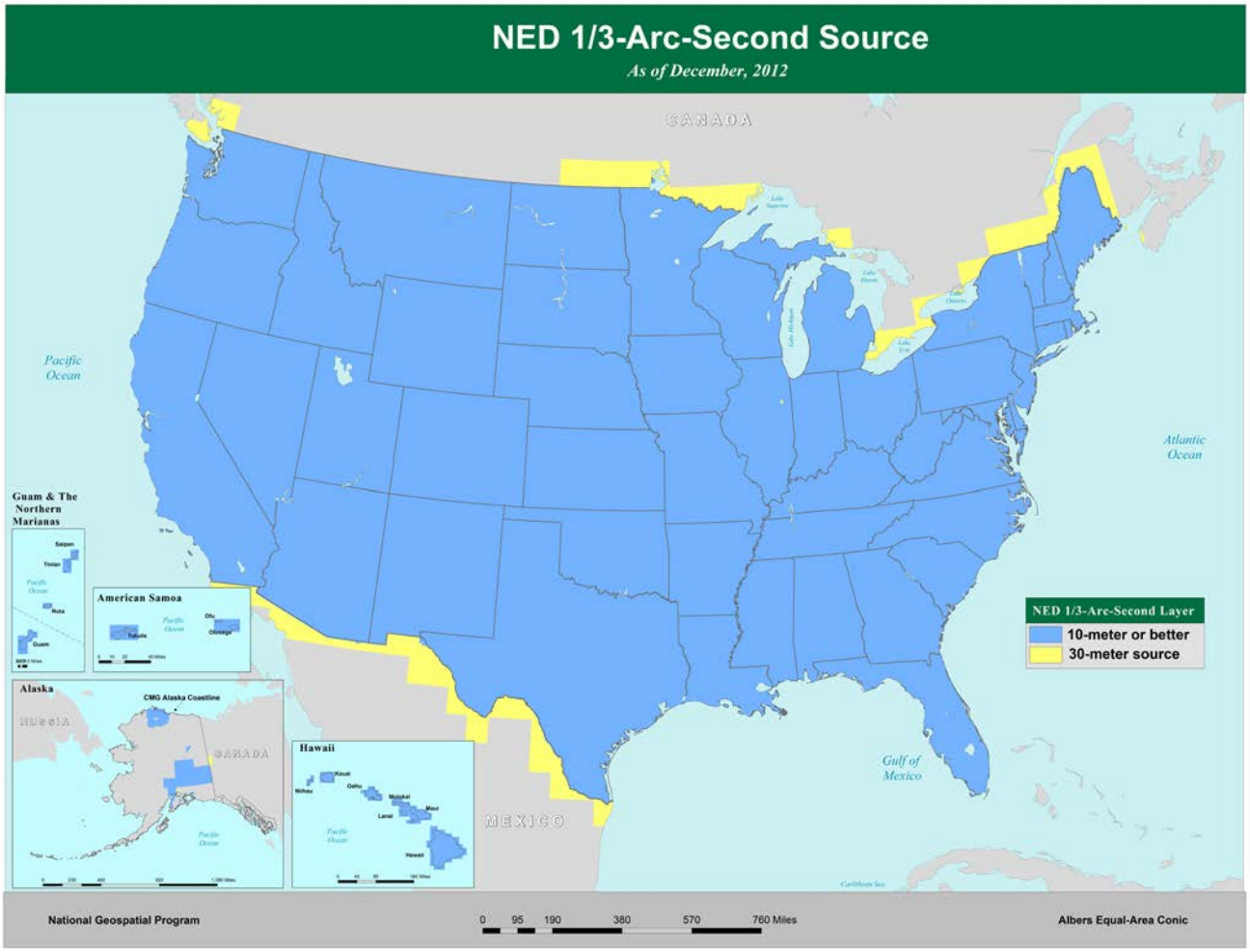


Figure 9. 1/3-arc-second NED, December, 2012 release by source resolution.

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 10). 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, Puerto Rico, the Virgin Islands, Mexico, and parts of Canada are only supported in the NED 1-arc-second layer.

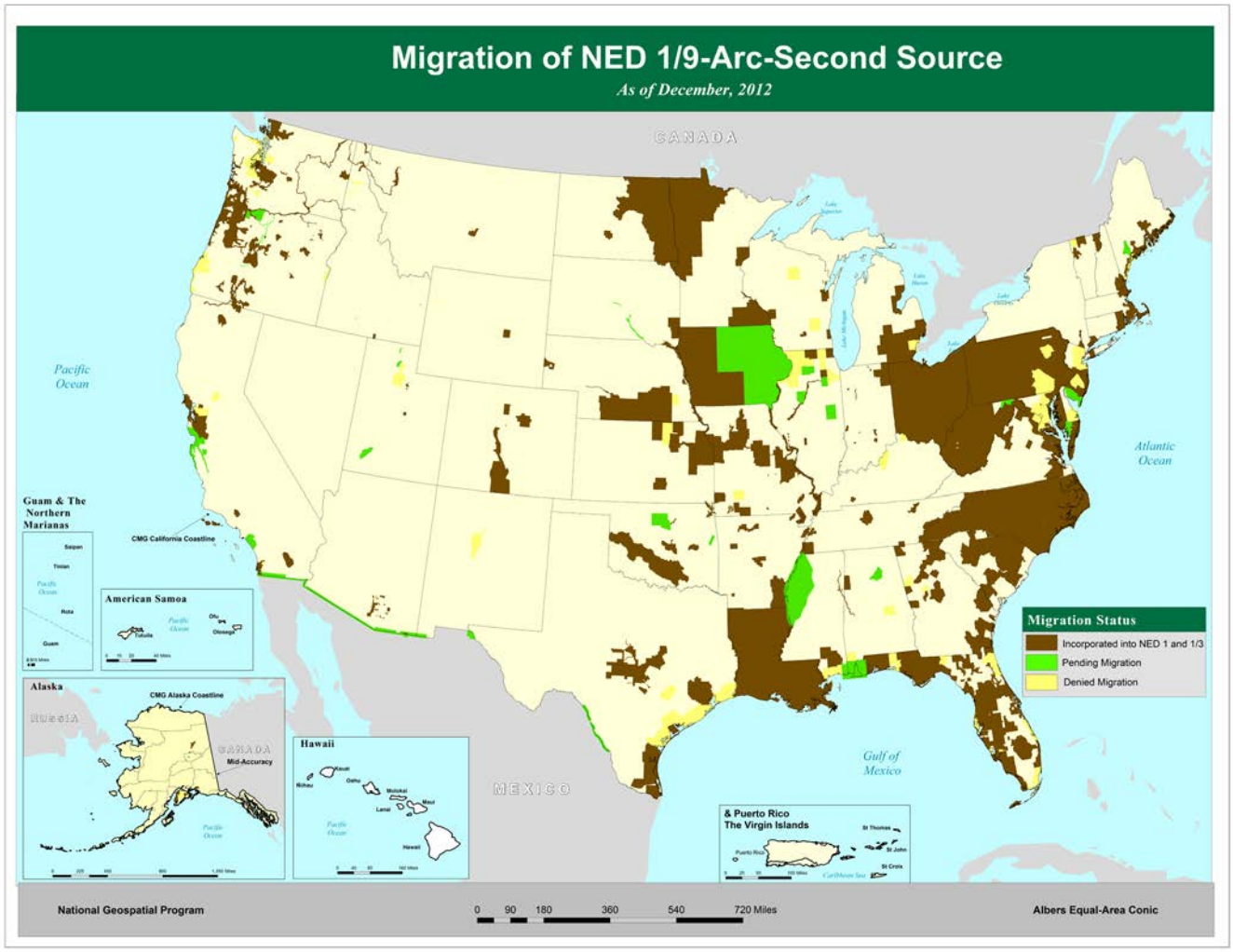


Figure 10. Migration status of NED 1/9 to other NED layers—December, 2012 release.

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 National Institute of Statistics and Geography (INEGI). The data were provided and quality control conducted by INEGI. Topographic staff at USGS EROS 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 Natural Resources Canada (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. The recent additions to the Alaska collection consist of either Interferometric Synthetic Aperture Radar (IFSAR) or LiDAR data. Per the statewide elevation plan, IFSAR will be the primary source for elevation data over Alaska. Currently, 15.77% of Alaska is covered by 10-meter or better source data.

Timeline of Alaska additions:

- August, 2008—Addition of Shuttle Radar Topography Mission (SRTM) data in the Aleutian chain
- December, 2008—Addition of the first LiDAR collection in Alaska over the port city of Valdez
- September, 2009—LiDAR area of the Kenai Peninsula
- July-August, 2010—LiDAR over Yukon Flats and additional areas of Kenai Peninsula
- February, 2011—LiDAR over a central Kenai Peninsula
- April, 2011—Pilot area of mid-accuracy 5-meter IFSAR and a small piece of LiDAR along the northeast coast
- August, 2011-April 2012— Addition of 27 more 1 degree cells of mid-accuracy 5-meter IFSAR central Alaska

The resolution of available and anticipated Alaska data for the coming year are shown below in Figure 10.

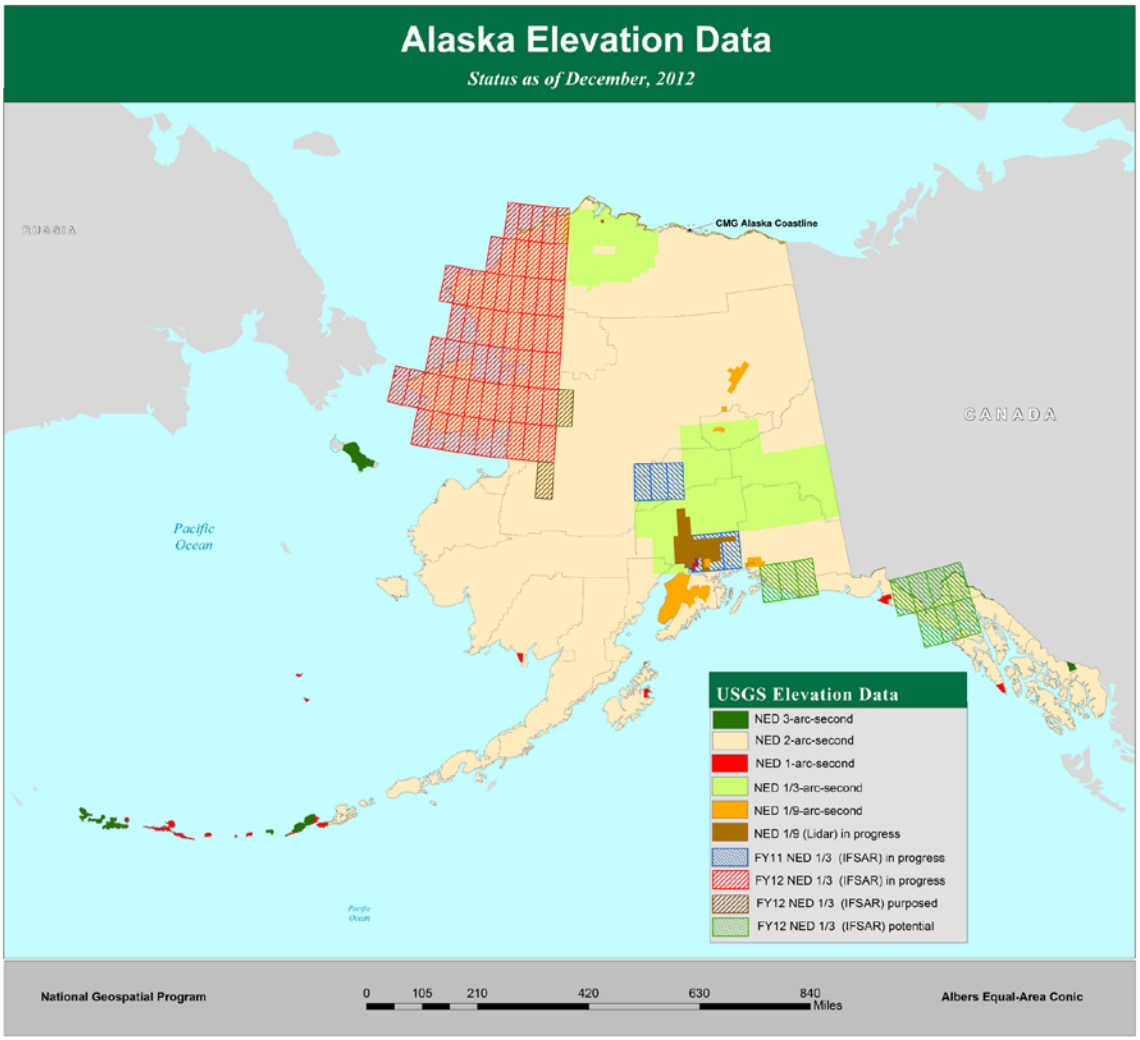


Figure 11. Available and anticipated Alaska elevation data.

Currency

Data currency (Figure 12) 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.

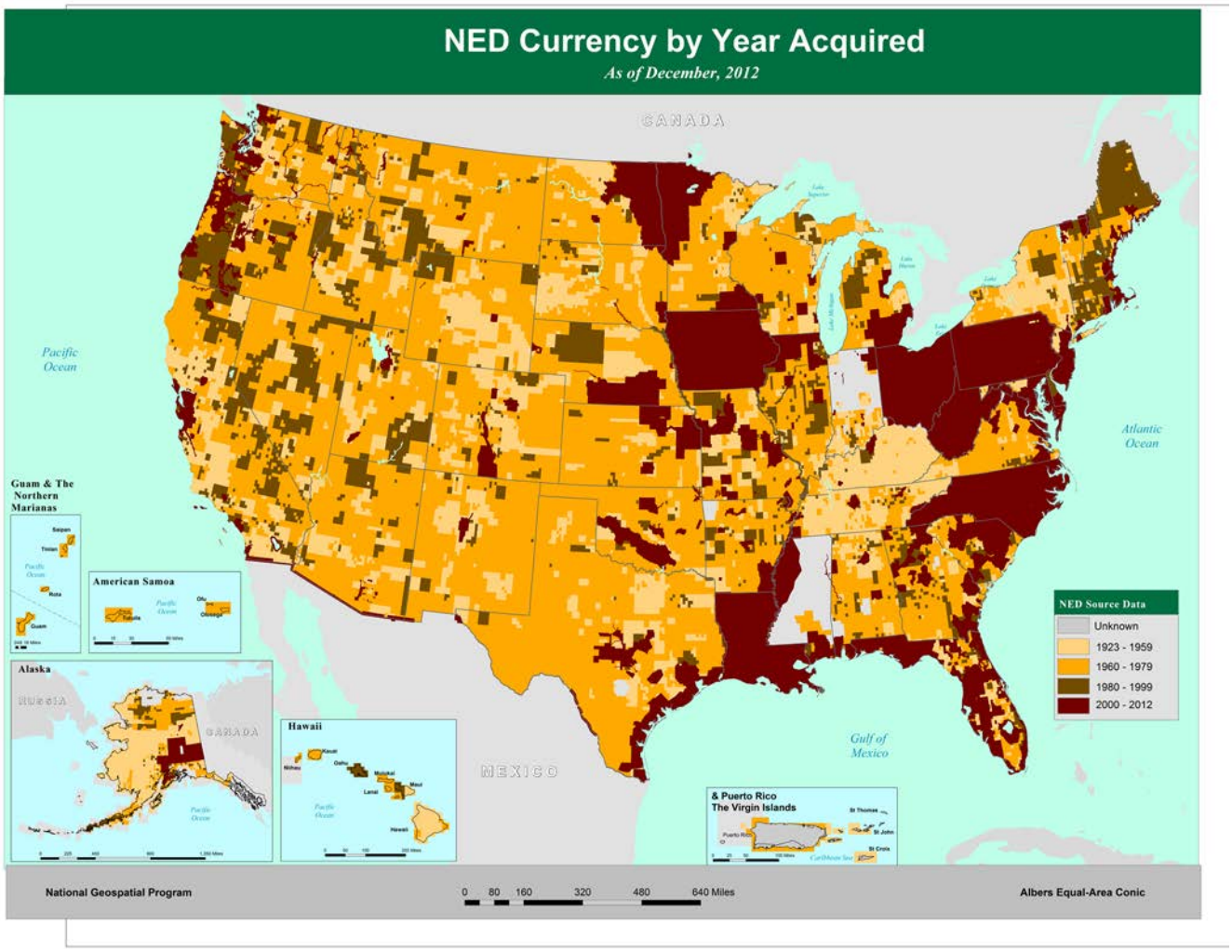


Figure 12. Currency of the NED shown by acquisition year – December, 2012.

Datums

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

Production Methods

Figure 13 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.

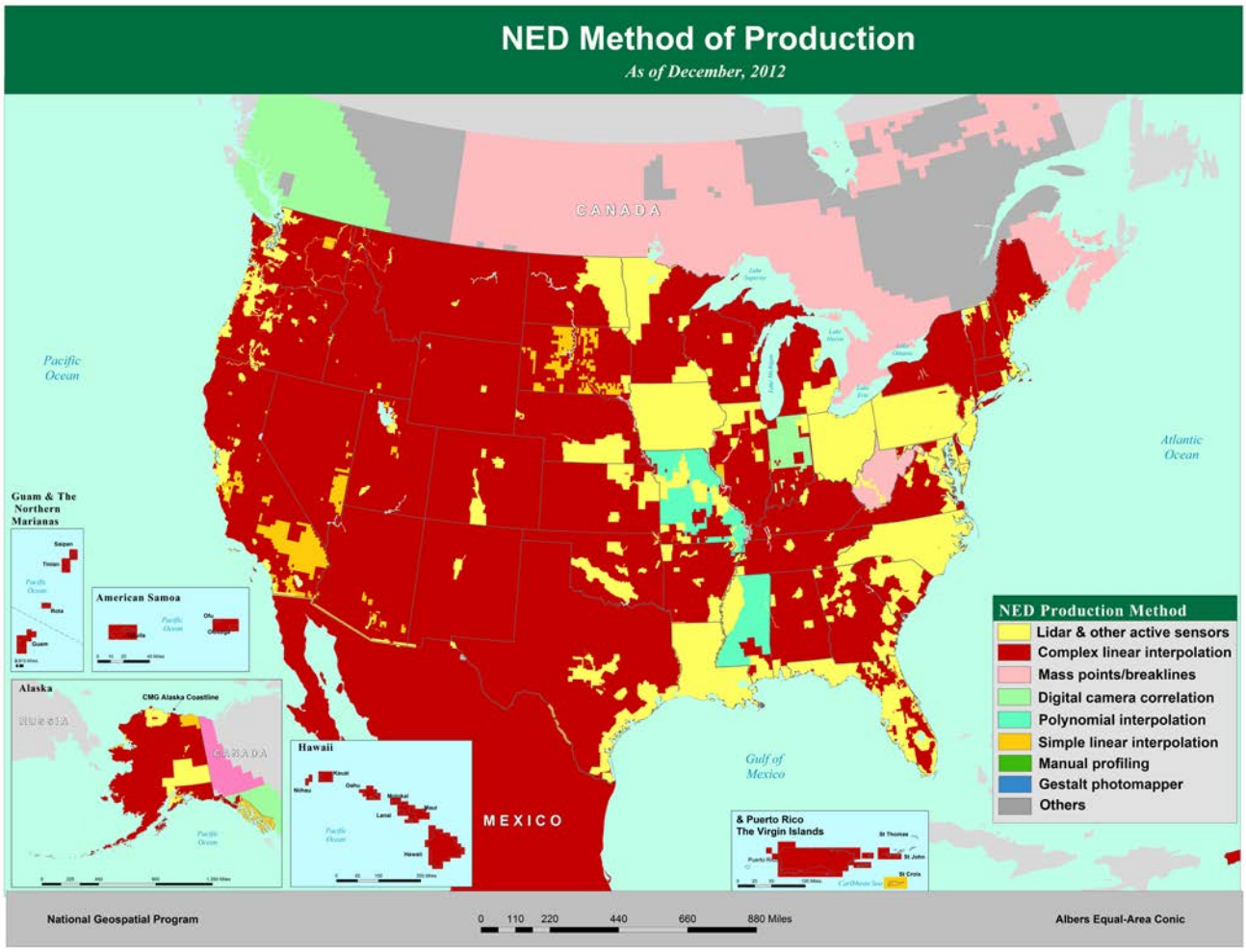


Figure 13. NED source data by production method –December, 2012 release.

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 December, 2012 NED release continues the trend seen in previous releases with an increase in coverage from 10-meter or better sources to the point that there is very little 30-meter source in the NED 1/3-arc-second layer. However a new trend has developed this year where as the 10-meter source is declining as it is replaced by high-resolution source (Figure 14).

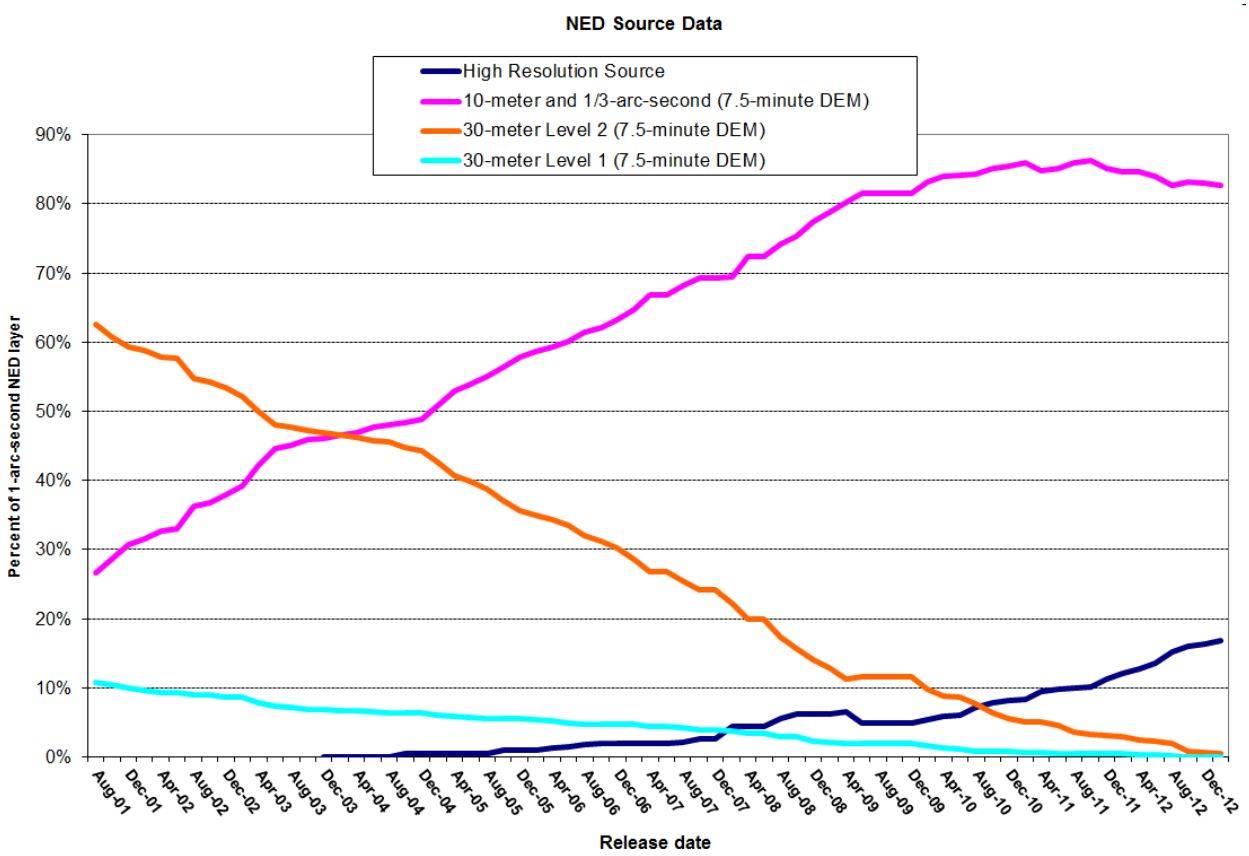


Figure 14. Type of 1-arc-second NED source data by release date.

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

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

In the current release, 114 tiles were updated, representing 12% of NED, excluding Alaska and Mexico, for which the extent of coverage is resolution-specific (Figure 15).

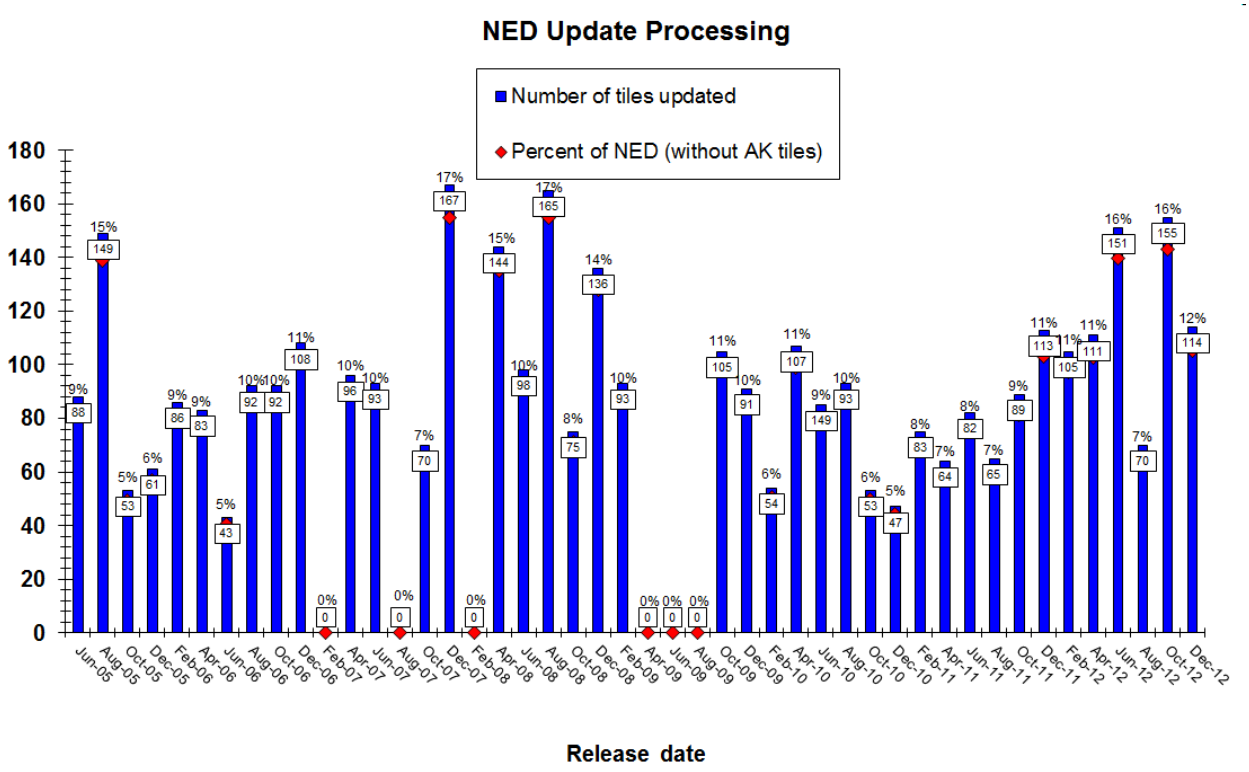


Figure 15. Number and percentage of NED tiles processed by release date.

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).

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

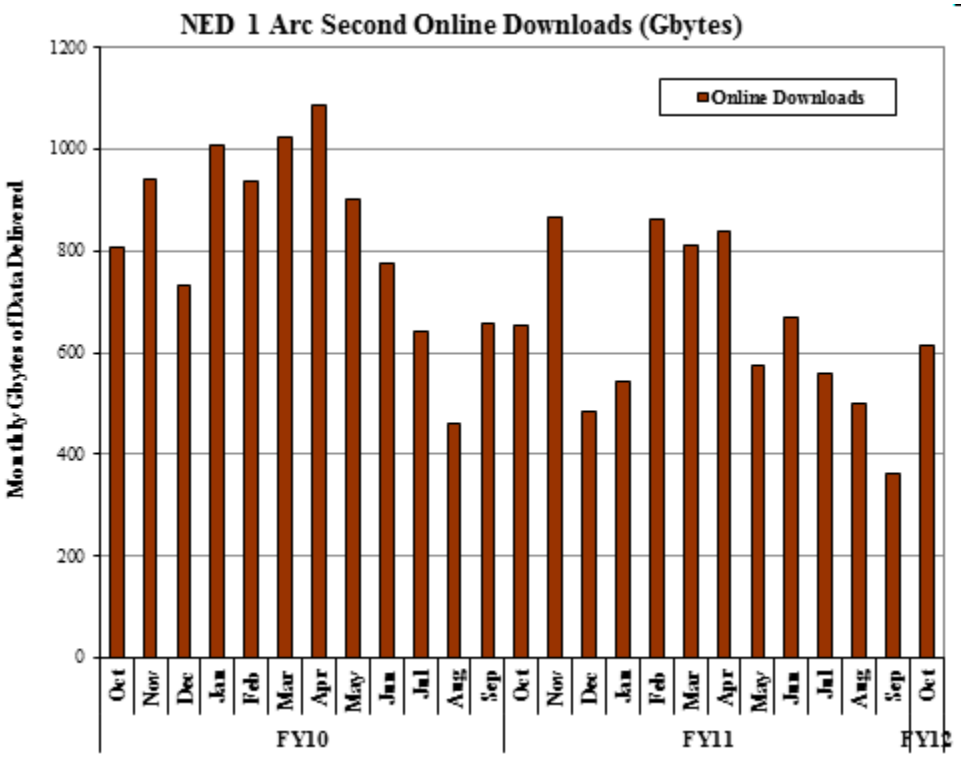
The following are available from the NED Web site (http://ned.usgs.gov/Ned/metadata.asp):

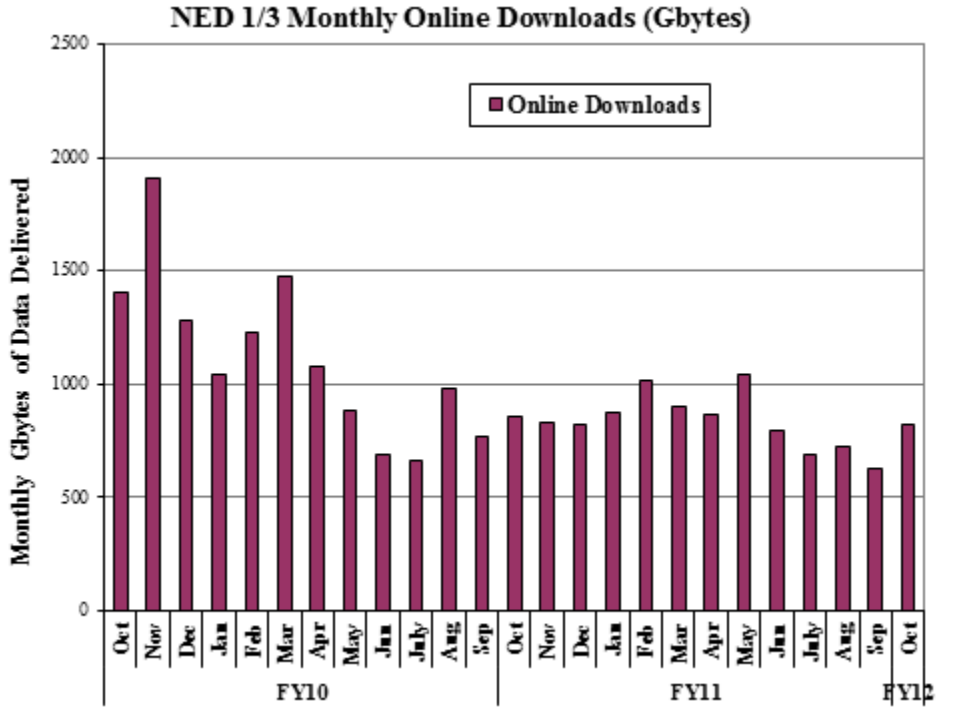
- the NED spatial metadata in shapefile (.shp) format
- the NED data dictionary with definitions of the attributes of the spatial metadata coverage
- previous issues of the NED Release Notes
- spatial metadata shapefiles of previous releases

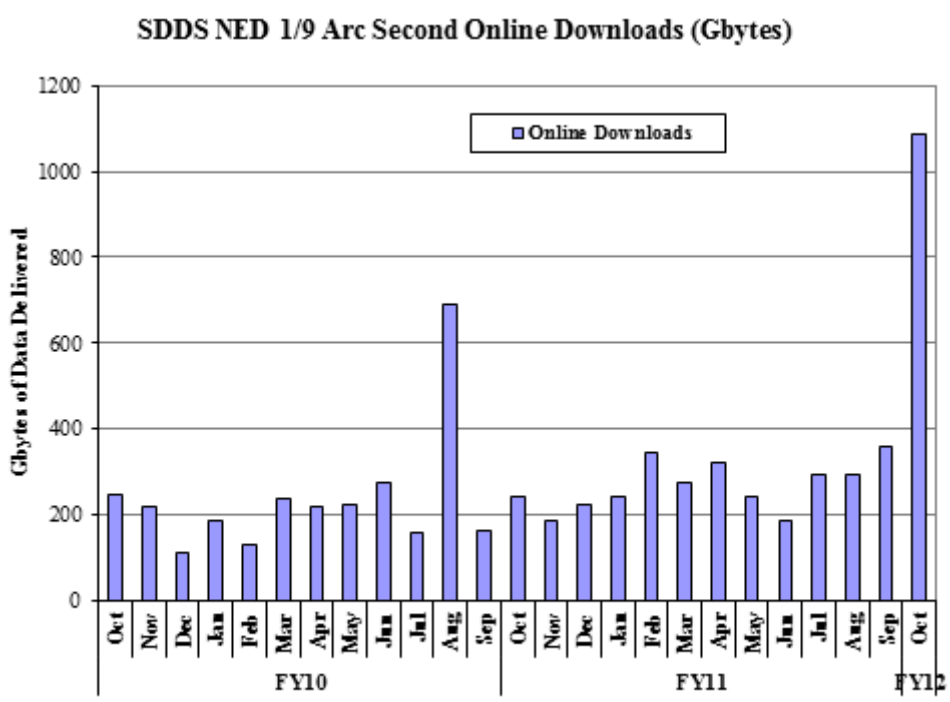
No new information was added to the FAQ list on the NED home page (http://ned.usgs.gov)

Distribution Statistics

Download Statistics







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.