National Elevation Dataset

October, 2013 Release Notes

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Contents

Latest Release

The October, 2013 update of the National Elevation Dataset (NED) 1-, 1/3- and 1/9-arc-second collections was released on October 23, 2013. This marks the 74th update of the 1-arc-second layer since bi-monthly revisions began in June, 2000. This release incorporates 6595 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 13,817 square miles of migrated high-resolution source data and 22195 square miles of 5-meter Interferometric Synthetic Aperture Radar (IFSAR) source data over Alaska. All NED data are available via *The National Map* Viewer: http://viewer.nationalmap.gov/viewer/.

The next release is scheduled for December 3, 2013.

Highlight: Kansas, Flint Hills—by Leslie Lansbery

The Flint Hills is a region in Kansas that stretches from Marshall County in the north to Cowley County in the south, where they continue into Oklahoma and are known as the Osage Hills. The Flint Hills are Permian in age, approximately 250 million years old, and are comprised of limestone with bands of chert (flint) resulting from an epeiric sea that once covered the region. Erosion of the limestone over time has resulted in gently rolling hills capped with cherty gravel and covered by tallgrass prairie. The Flint Hills are home to most of the remaining Tallgrass Prairie land in the United States. The Tallgrass Prairie National Preserve is located in Chase County, KS.

References:
http://www.kgs.ku.edu/Extension/flinthills/flinthills.html

http://www.naturalkansas.org/FlintHills.htm

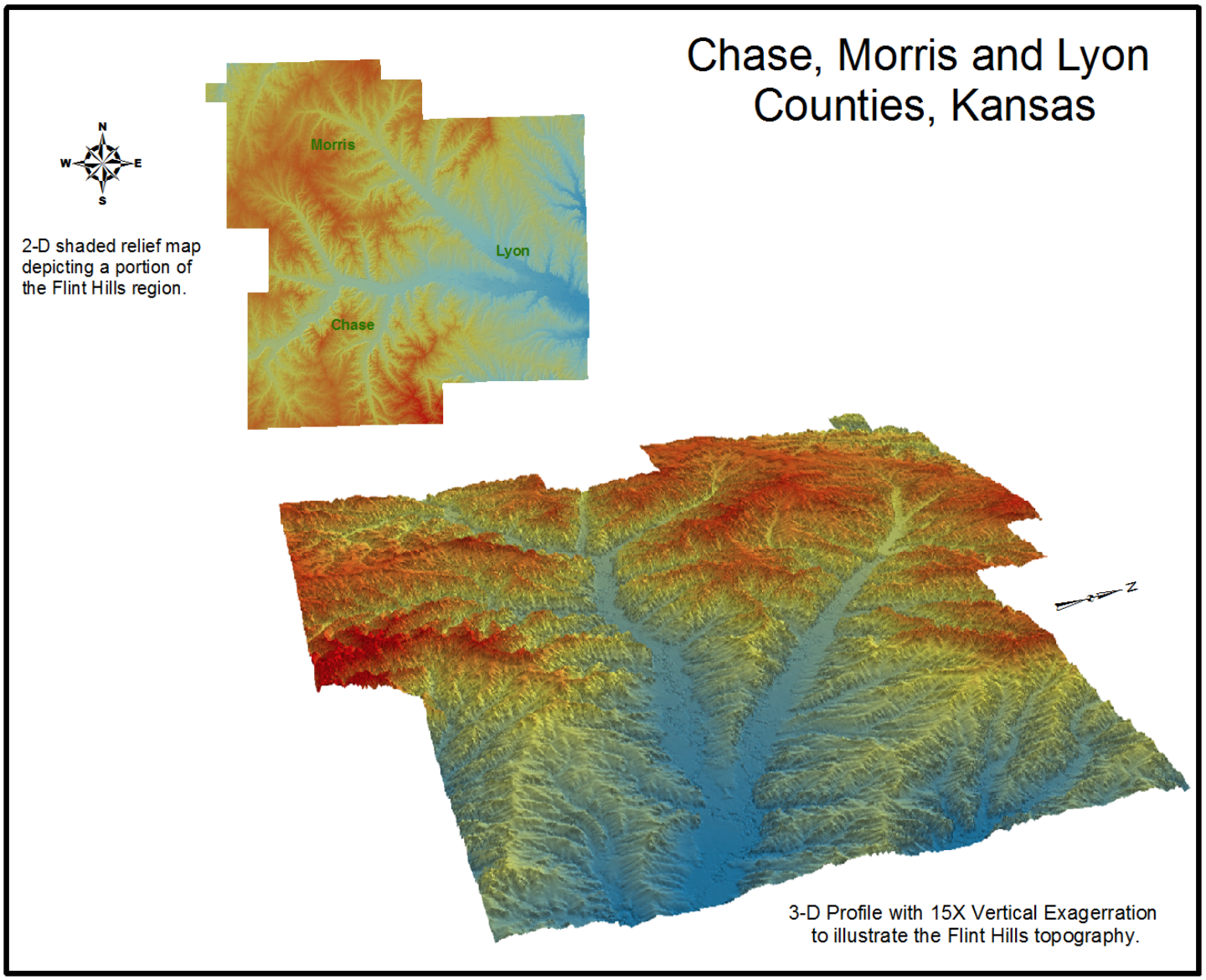

Figure 1. Kansas, Flint Hills

TopoBathy

The August, 2012 NED release marked the addition of the first set of topobathymetric data, Mobile Bay, into the NED. The June, 2013 NED release featured 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. Presently there are three topobathy datasets available through the *The National Map* Viewer: http://viewer.nationalmap.gov/viewer/ displayed on Figure 2. They are Mobile Bay, North Carolina and San Francisco Bay. 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.

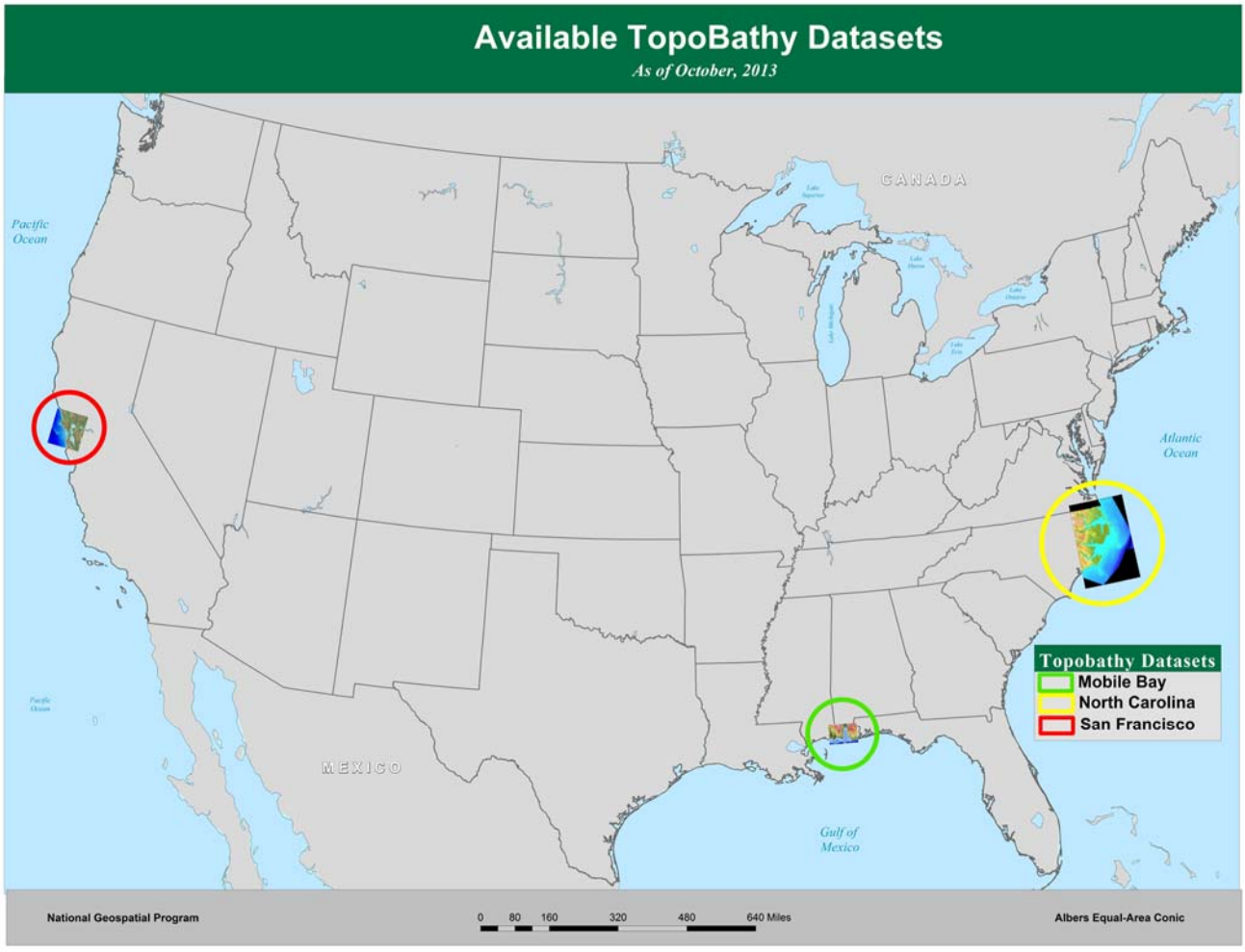

Figure 2. NED 1/9-arc-second available topobathymetric datasets

Areas where new data were incorporated in this and other recent releases are indicated in Figure 3.

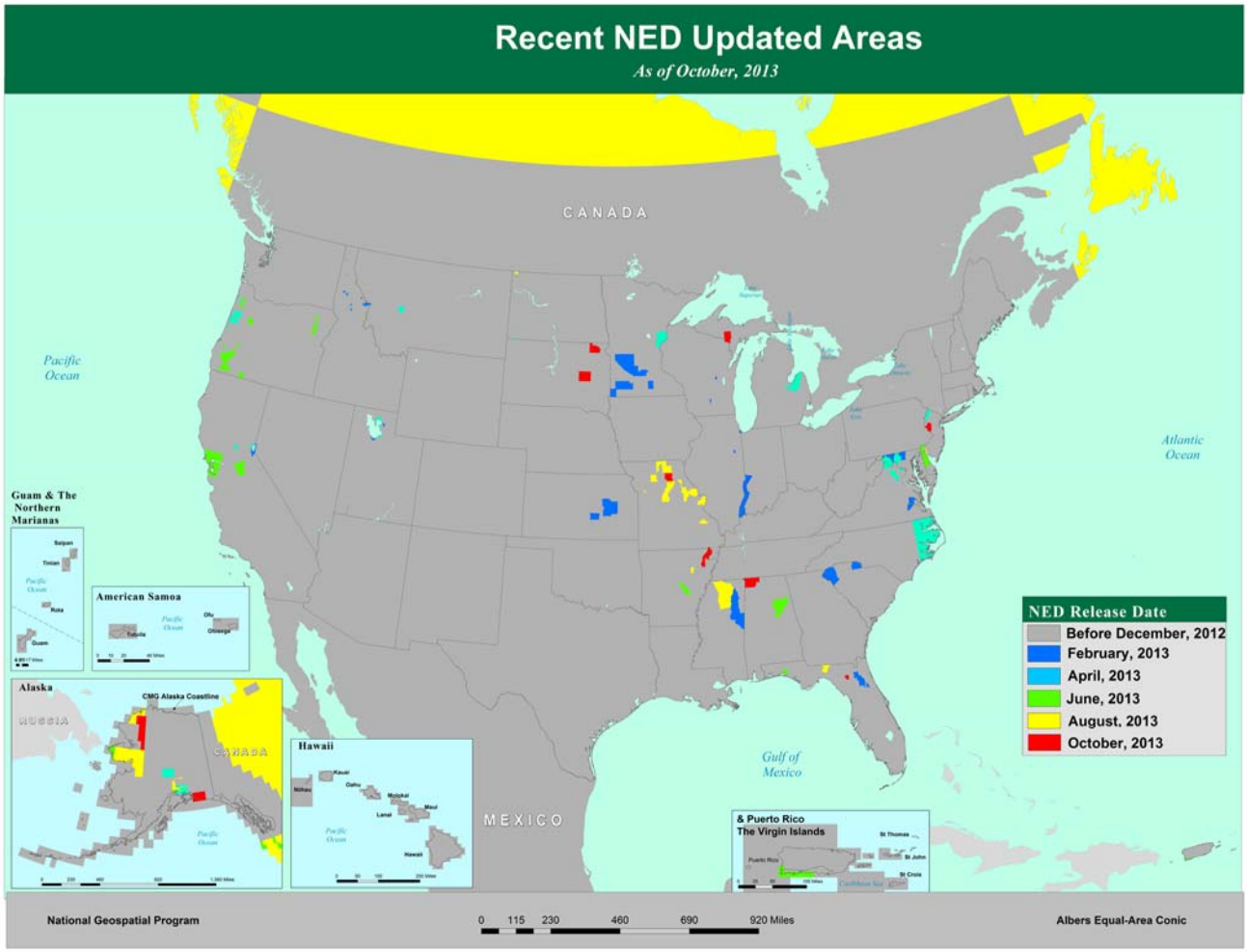

Figure 3. NED updated areas by release date -- October, 2013 release.

Data Resolutions Available

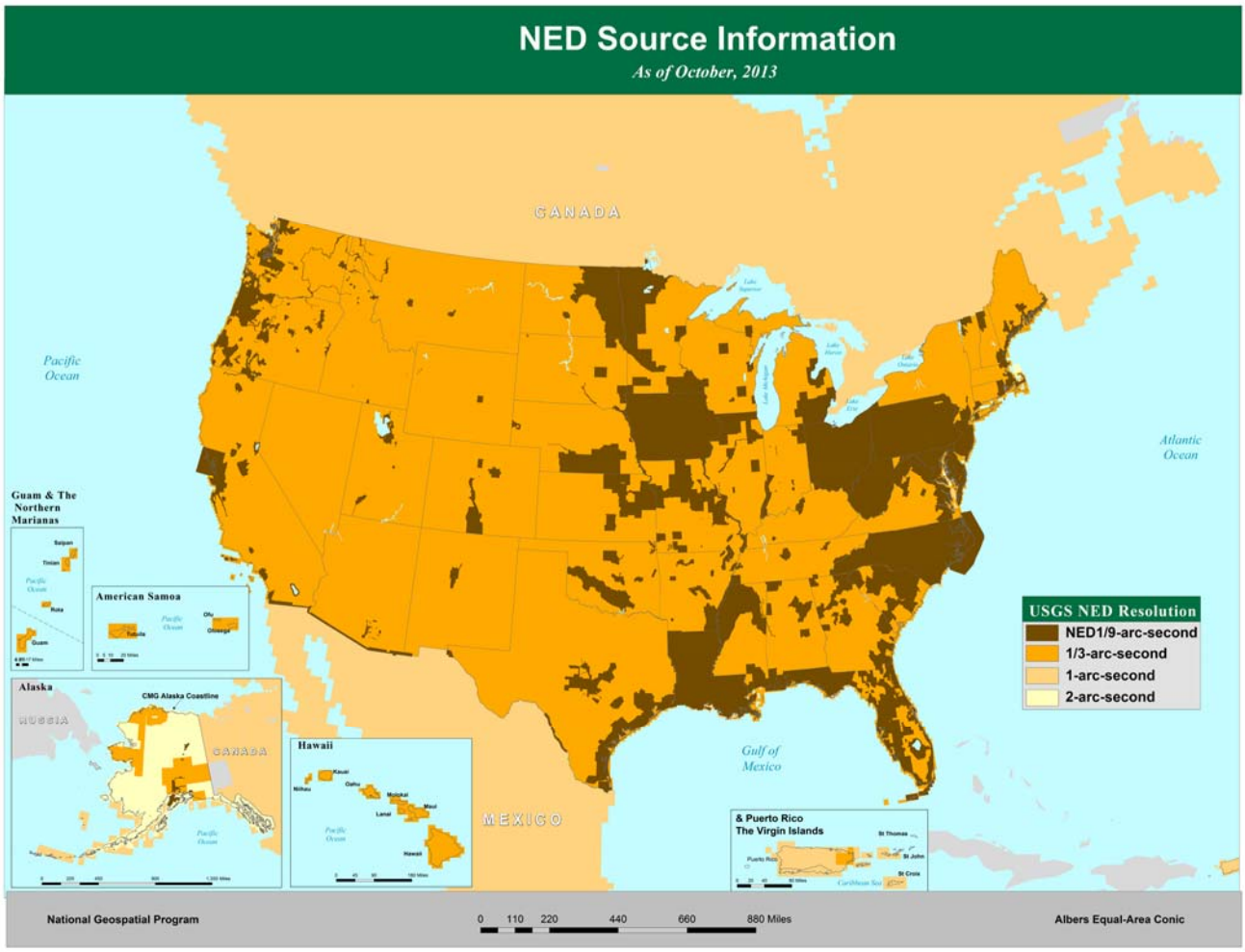

Figure 4. Composite of source data by resolution – October, 2013 release.

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 5 shows the areas that reside in the NED 1/9-arc-second layer as of October, 2013.

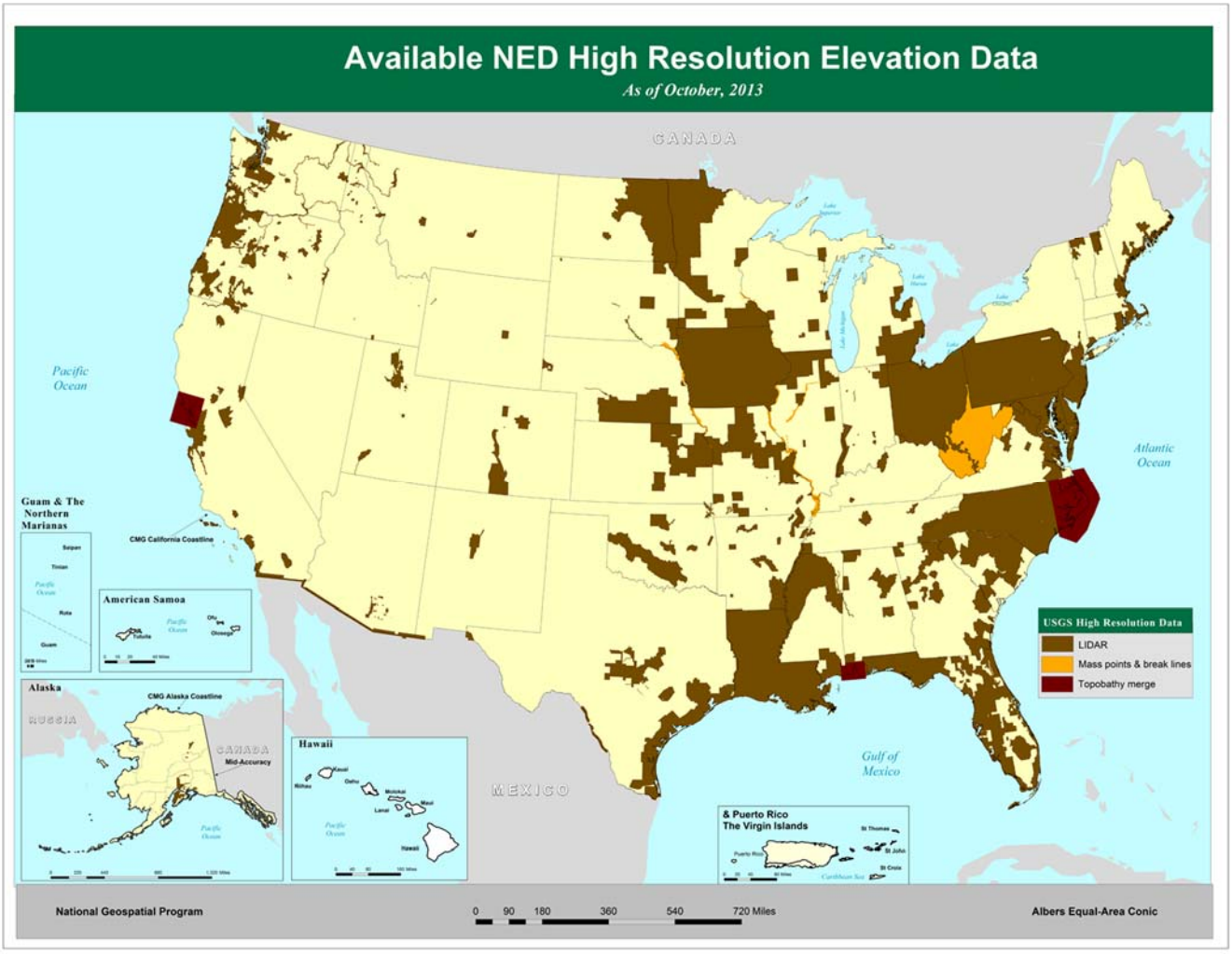

Figure 5. Available 1/9-arc-second data from all sources – October, 2013 release.

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

- Alabama—Colbert and Lauderdale counties, 2011—1378 square miles
- Arkansas—Lower St. Francis River-FEMA, 2012—981.54 square miles
- Florida—Suwannee River-Lot9-Area2, 2013—165.03 square miles
- Michigan—Dickinson County, 2012—788.39 square miles
- Missouri—Macon County, 2011—700.125 square miles
- New Jersey—Hunterdon County, 2006—436.072 square miles
- South Dakota—Beadle County, 2012,—1275.79 square miles
- South Dakota—Marshall County, 2010—870.36 square miles

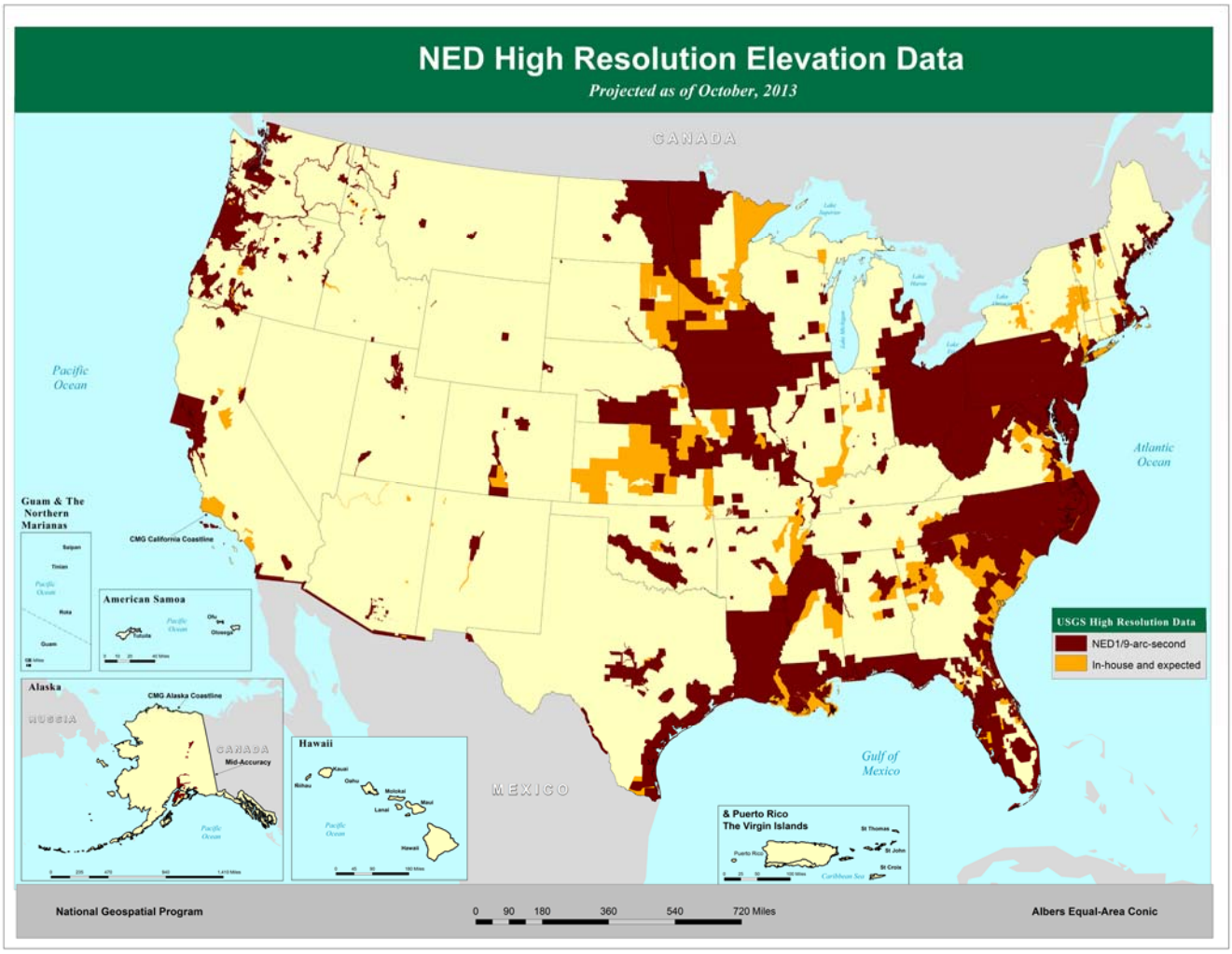

Figure 6. Available and anticipated high-resolution data – October, 2013 release.

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 (October 23, 2013) includes migrated high-resolution source data and IFSAR in Alaska (Figure 7).

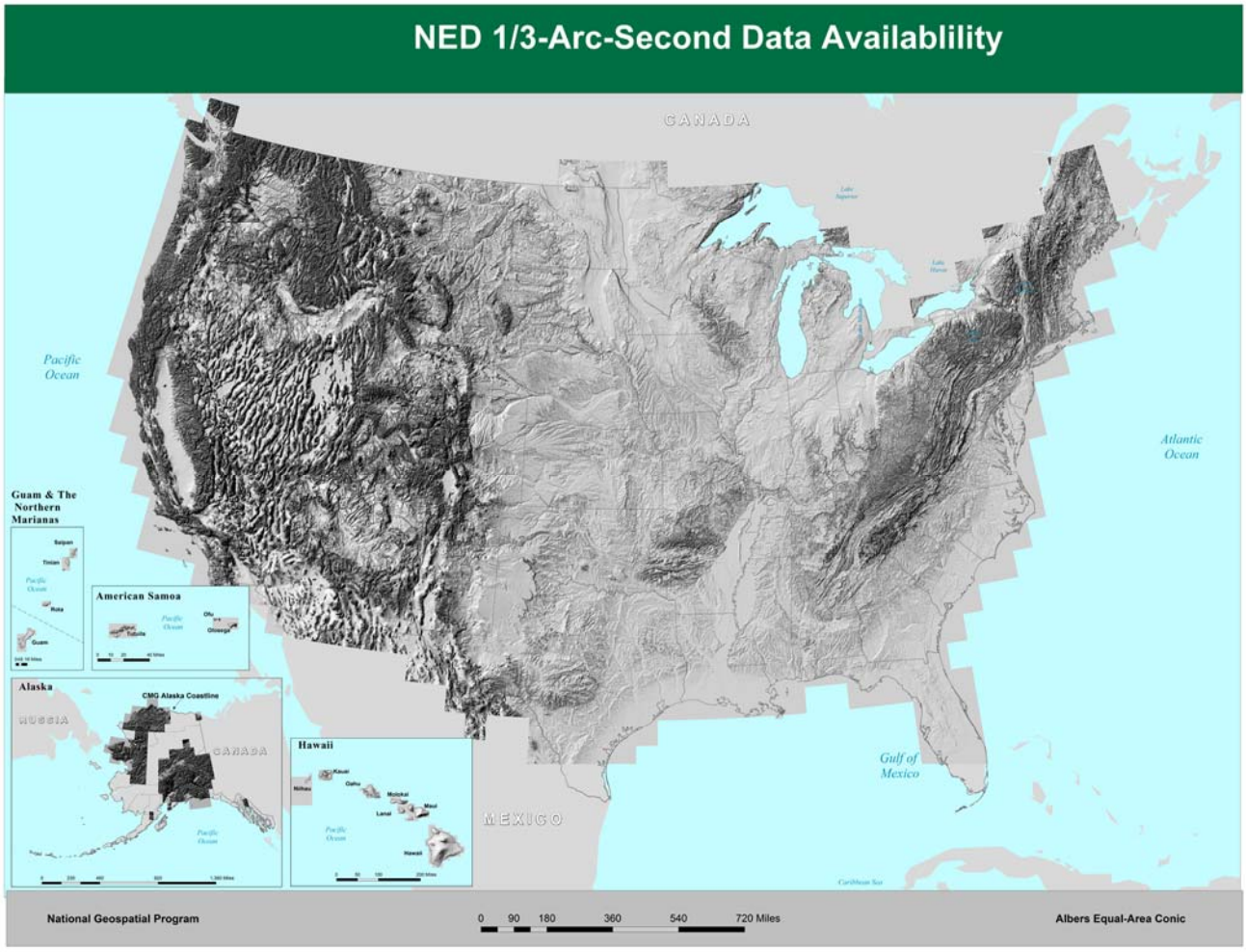

Figure 7. Available 1/3-arc-second NED.

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 8). 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.

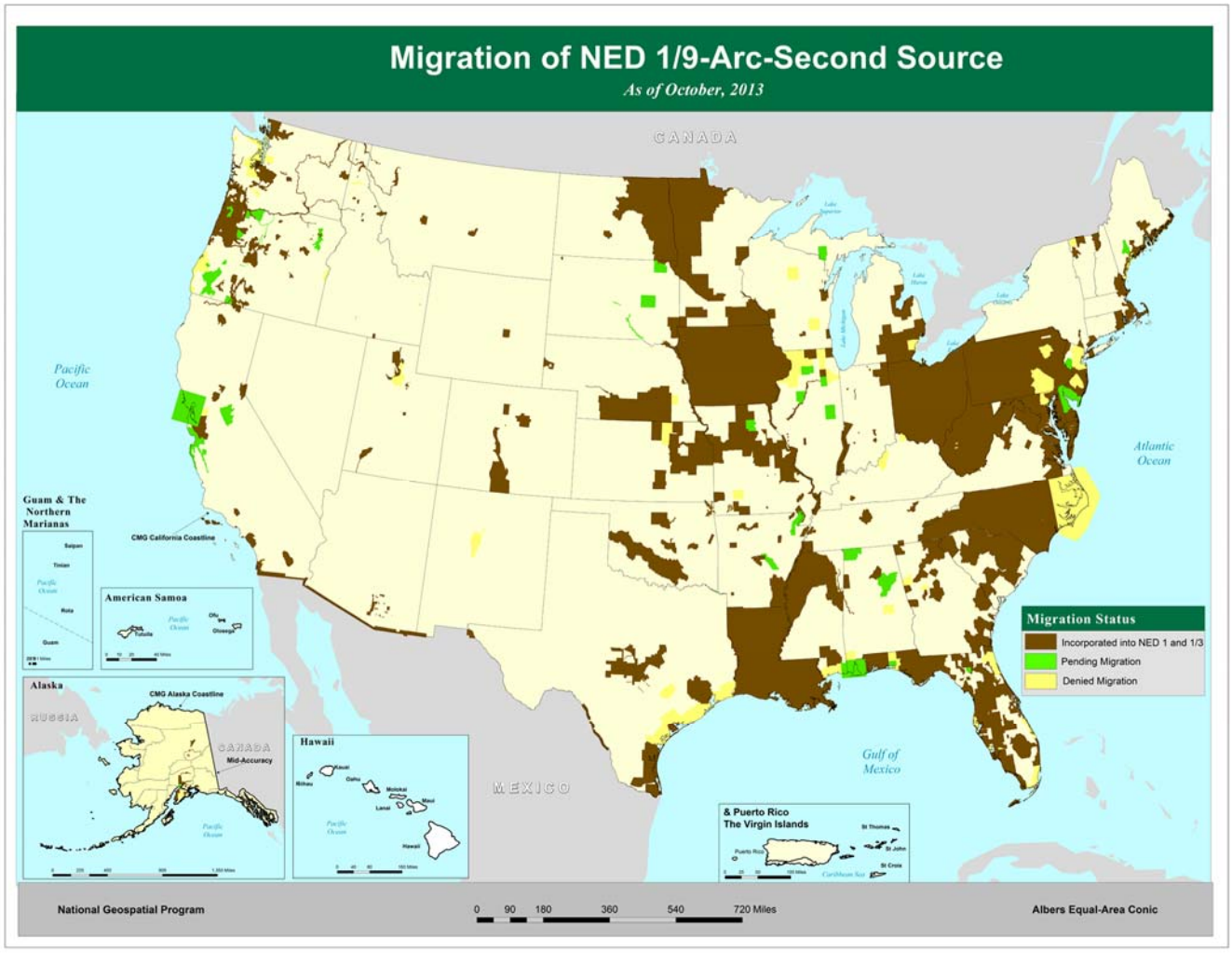

Figure 8. Migration status of NED 1/9 to other NED layers—October, 2013 release.

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 National Institute of Statistics and Geography (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.

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.

An additional 2,759,150 square miles of Canadian data were released into the NED 1-arc-second layer during the August, 2012 update. This addition to the NED provides near full coverage of the North American continent. . Hopefully the user community will find this seamless elevation coverage of North America useful.

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, 29% of Alaska is covered by 10-meter or better source data.

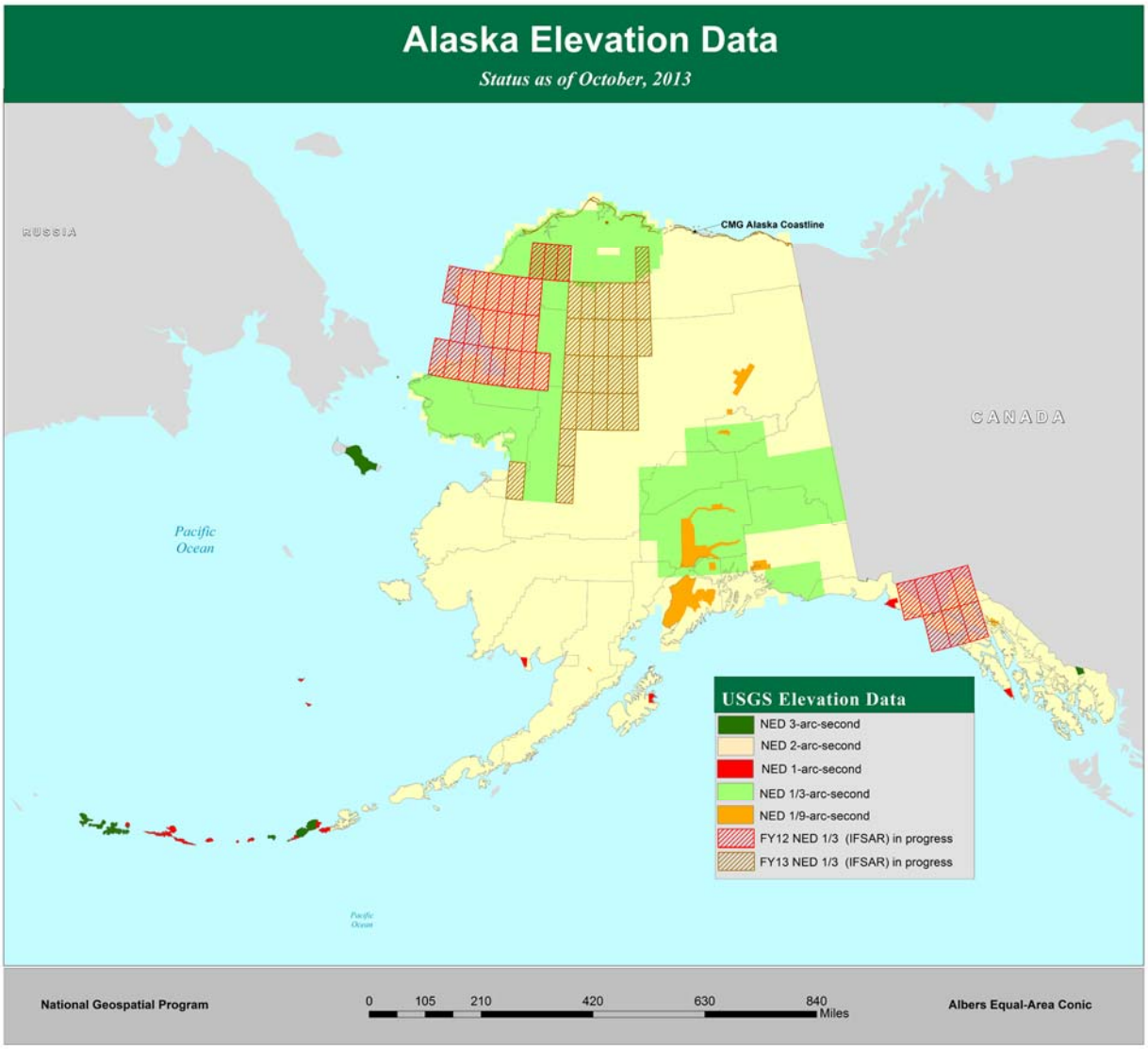

Figure 9. Available and anticipated Alaska elevation data.

Currency

Data currency (Figure 10) 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.

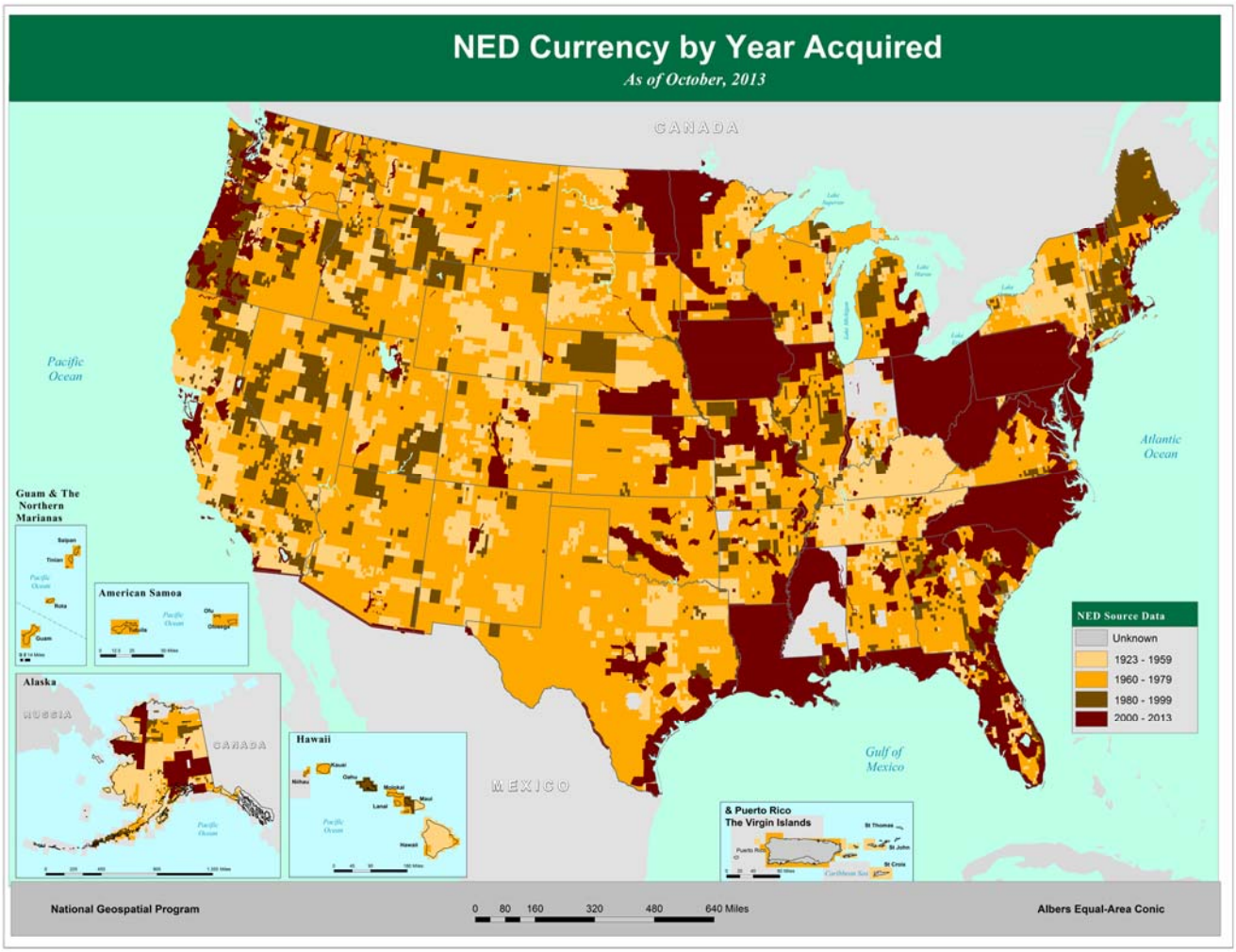

Figure 10. Currency of the NED shown by acquisition year – October, 2013.

Datums

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

Production Methods

Figure 11 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.

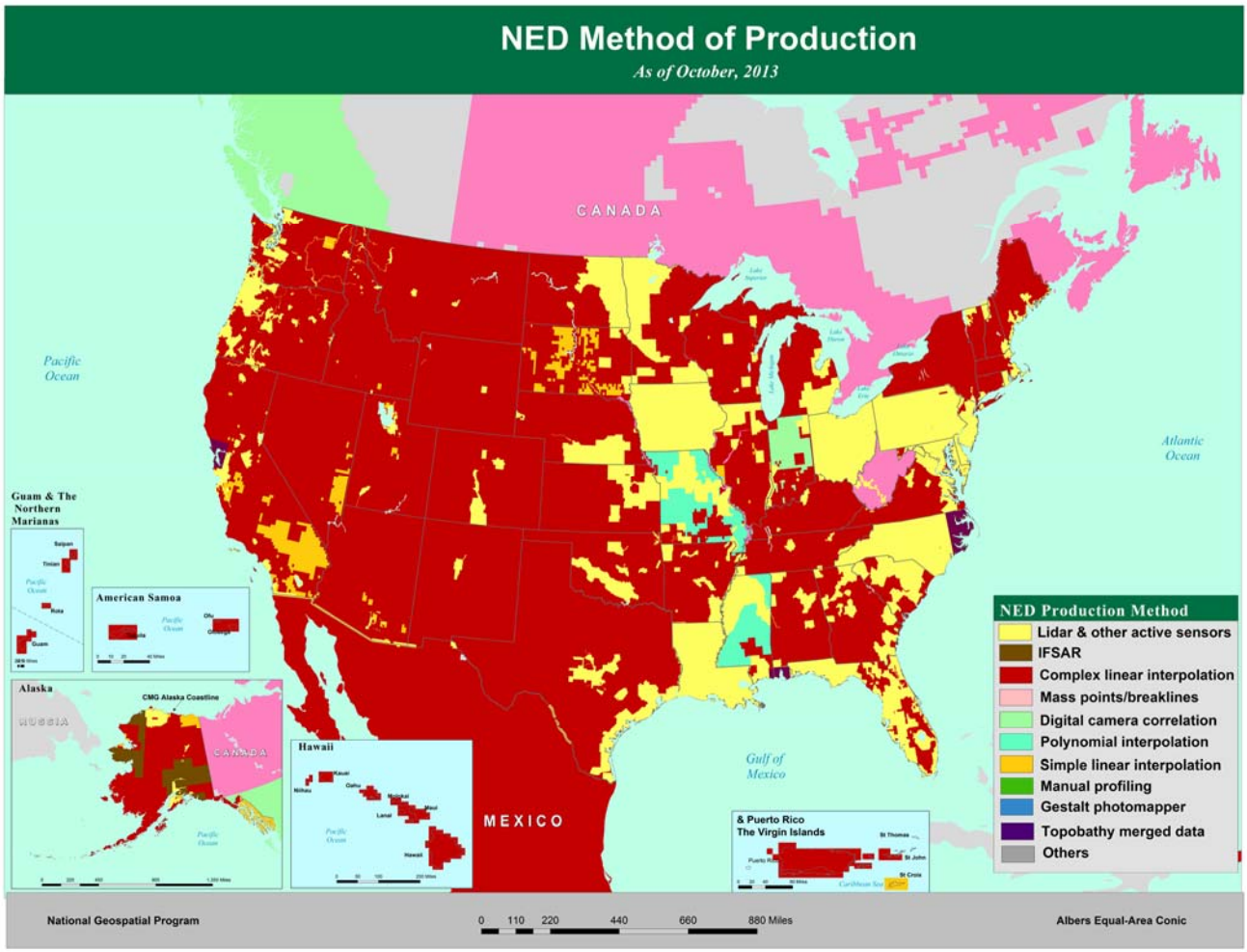

Figure 11. NED source data by production method – October, 2013 release.

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)
- Topobathmetric merge

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 October, 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 12).

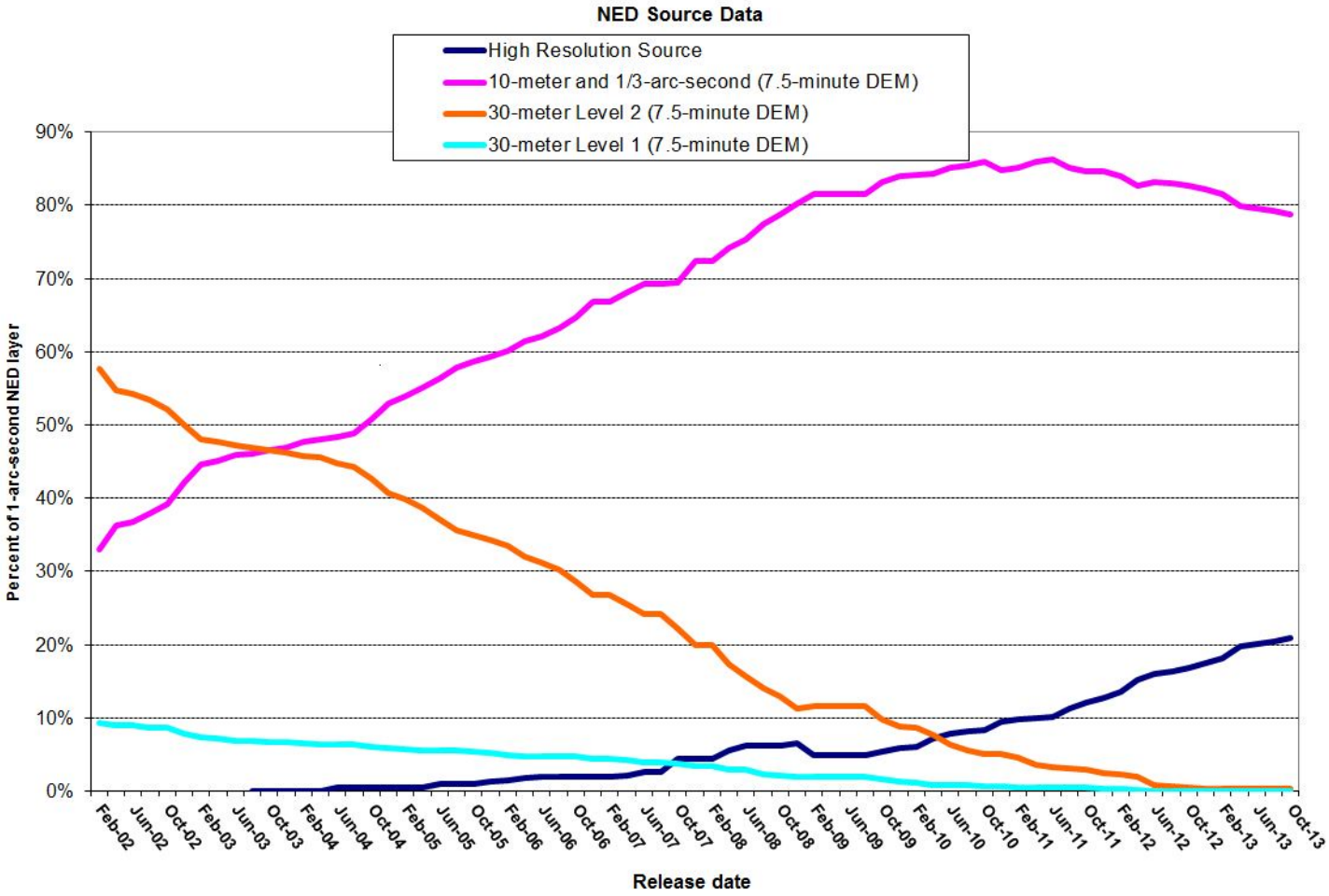

Figure 12. Type of 1-arc-second NED source data by release date.

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, 26 tiles were updated, representing 3% of NED, excluding Alaska, Mexico and Canada, for which the extent of coverage is resolution-specific (Figure 13).

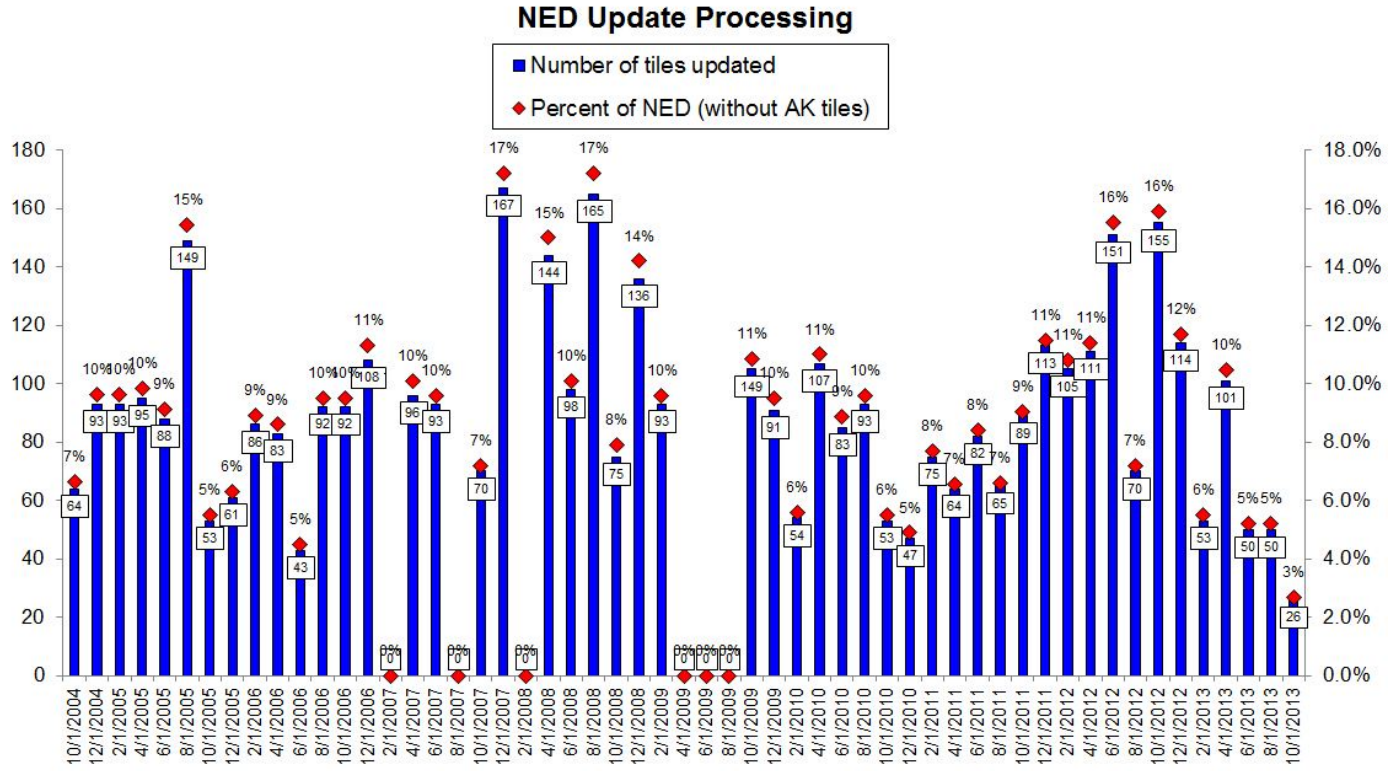

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Figure 13. Number and percentage of NED tiles processed by release date.

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

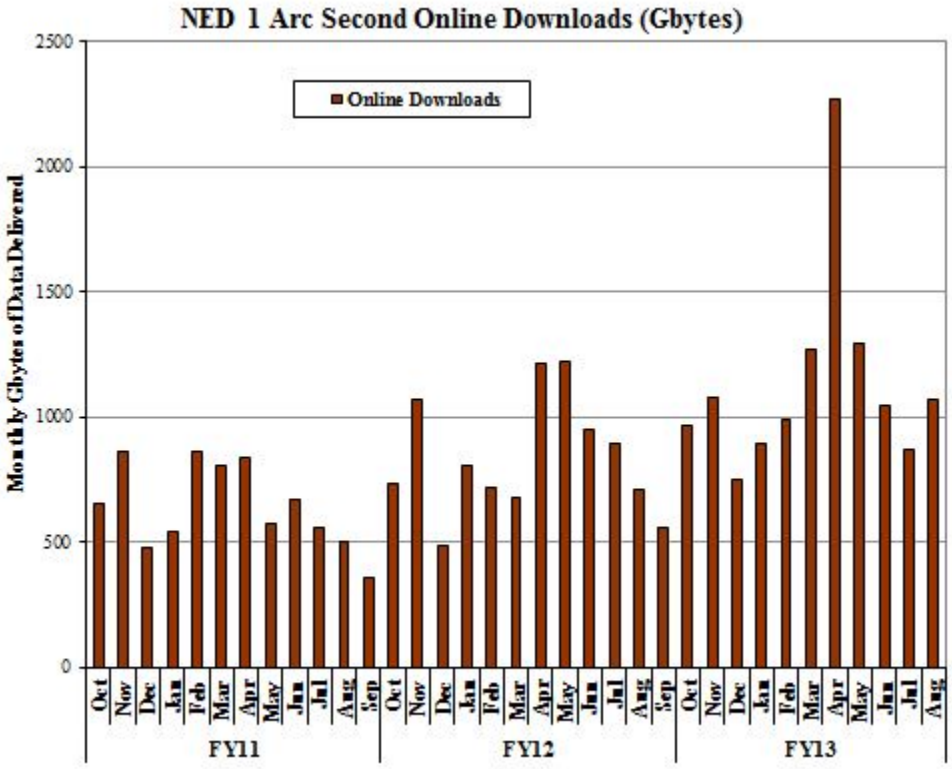
The following are available from the NED Web site (http://ned.usgs.gov/metadata.asp):

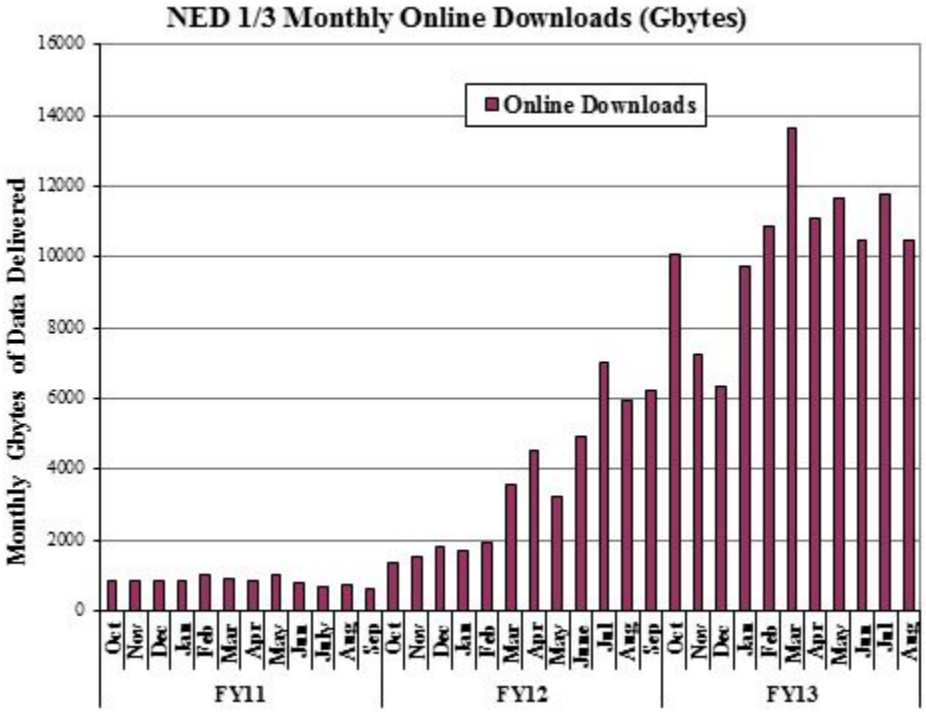
- the NED spatial metadata in shapefile (.shp) format
- the NED data dictionary with definitions of the attributes of the spatial metadata coverage
- previous issues of the NED Release Notes
- spatial metadata shapefiles of previous releases

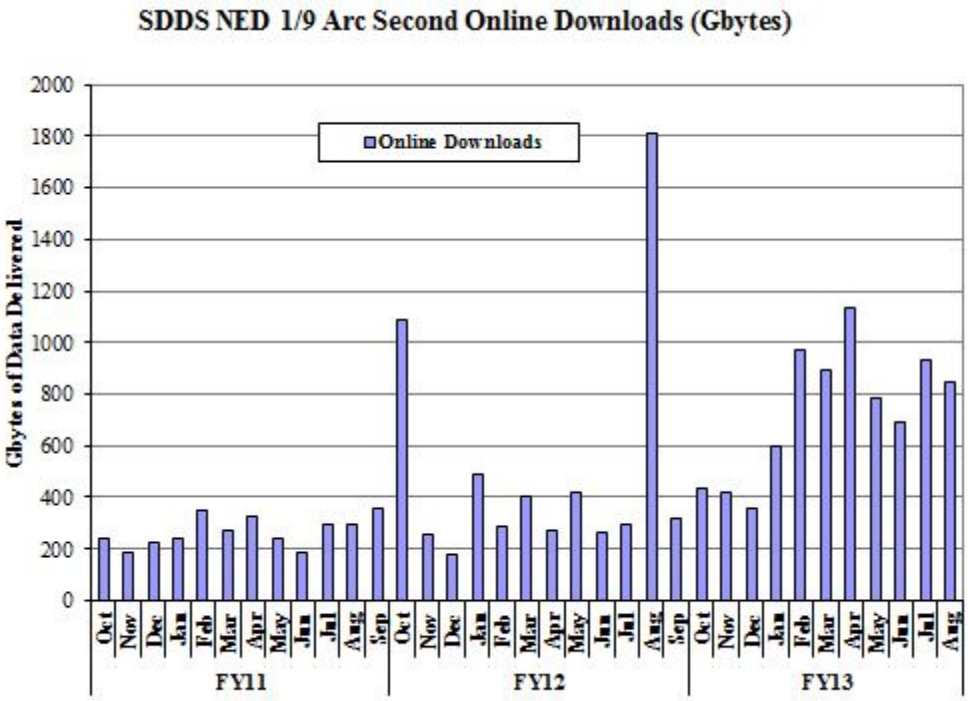
No new information was added to the FAQ list on the NED home page (http://ned.usgs.gov)

Distribution Statistics

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.