Appendix A – National Elevation Dataset (NED) Release Notes

Release Notes

The October, 2011 update of the National Elevation Dataset (NED) 1/9-arc-second collection was released on October 5, 2011 and the NED 1- and 1/3-arc-second layers were released on October 19, 2011. These mark the 62nd update of the 1-arc-second layer since bi-monthly revisions began in June, 2000. This release incorporates new light detection and ranging (LiDAR) data in addition to new standard production 10-meter digital elevation models (DEMs).

The next release is scheduled for December 6, 2011.

Areas where new data were incorporated in this and other recent releases are indicated in Figure A.1.

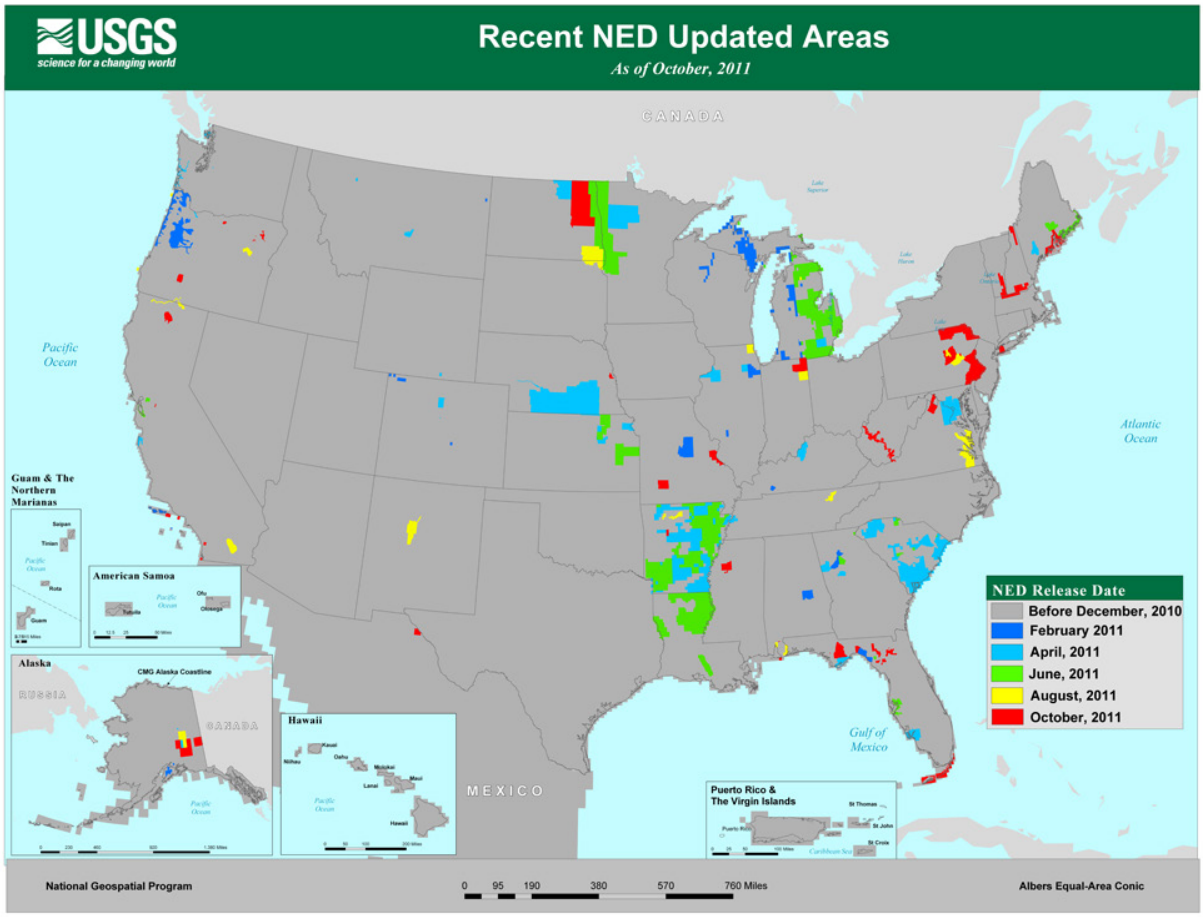

Figure A.1. NED updated areas by release date -- October, 2011 release.

Resolutions of Data Available

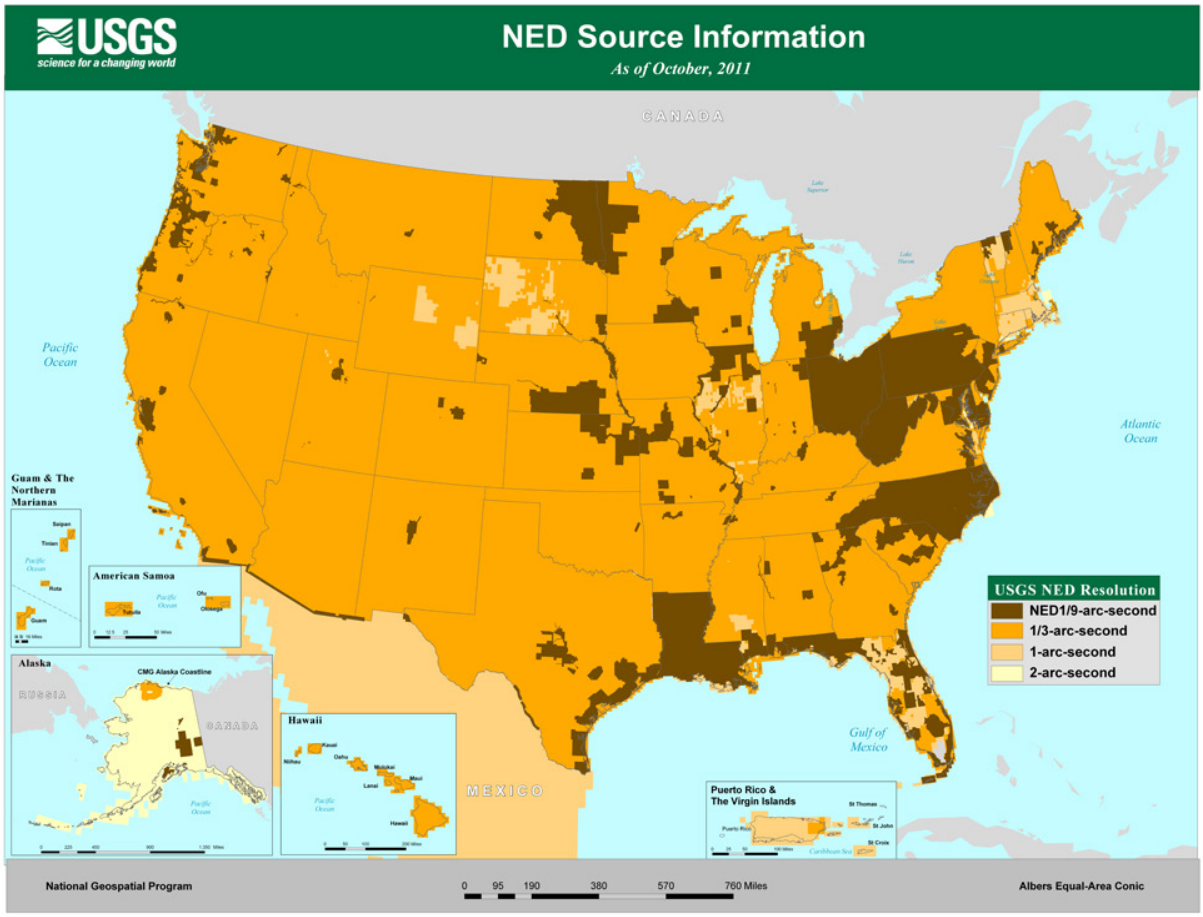

Figure A.2. Composite of source data by resolution – October, 2011 release.

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 populated through the integration of data from various sources using new technologies, and are acquired through partnerships with 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 A.3 shows the areas that reside in the NED 1/9-arc-second layer, as of October, 2011.

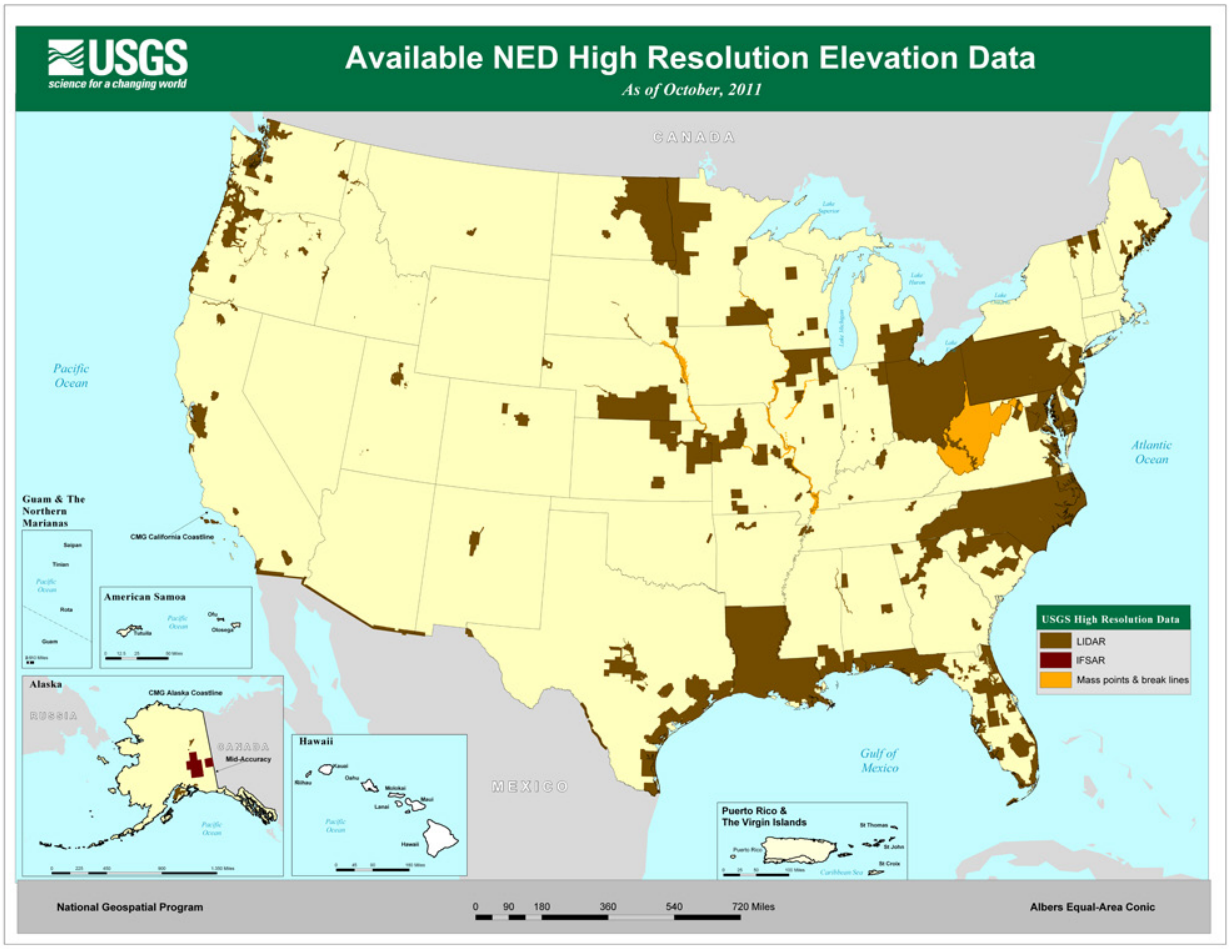

Figure A.3. Available 1/9-arc-second data from all sources – October, 2011 release.

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

- Alaska—Seven Cells of mid-accuracy IFSAR
- California—Mount Shasta
- Florida—Liberty County
- Florida—Suwannee River Basin
- Indiana—Lake Erie Project
- Missouri—Green, Jefferson and Ste. Genevieve Counties
- North Dakota—Red River Mapping Initiative, central and northeastern
- Nebraska—Papillion Creek Area, Washington County
- New York—Northeast Lidar Project, Nassau County, Long Island
- Oregon—Cottonwood Canyon and Crater Lake areas
- Oregon— Grande Ronde River Valley and Basin areas
- Pennsylvania—North and southeastern areas
- Virginia and West Virginia—Shenandoah Valley
- West Virginia—Shenandoah Valley, Bluestone Lake and Kanawha River Valley

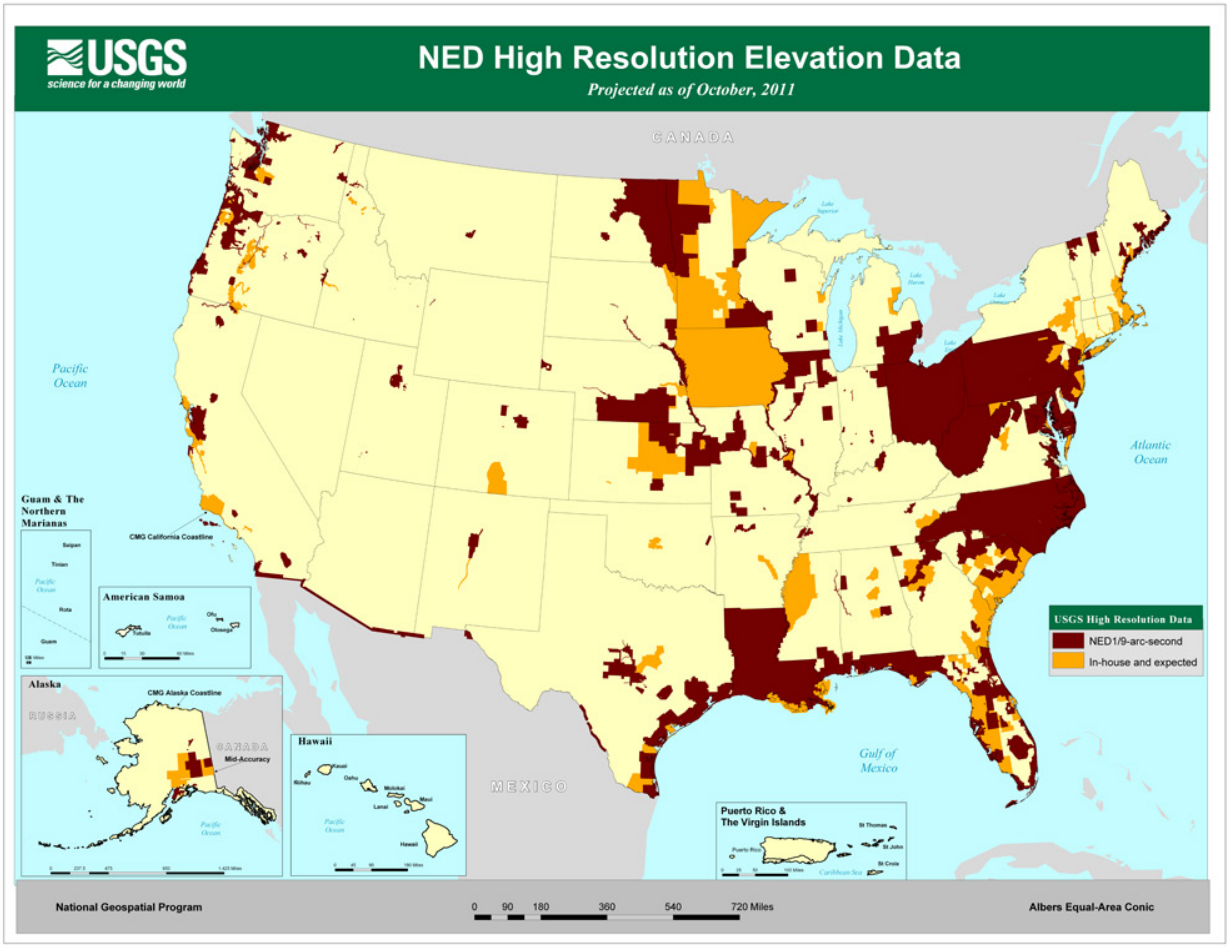

Figure A.4. Available and anticipate high-resolution data – October, 2011 release.

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 (October 19, 2011) includes all USGS 10-meter and 1/3-arc-second DEMs produced as of September 6, 2011 (Figure A.5).

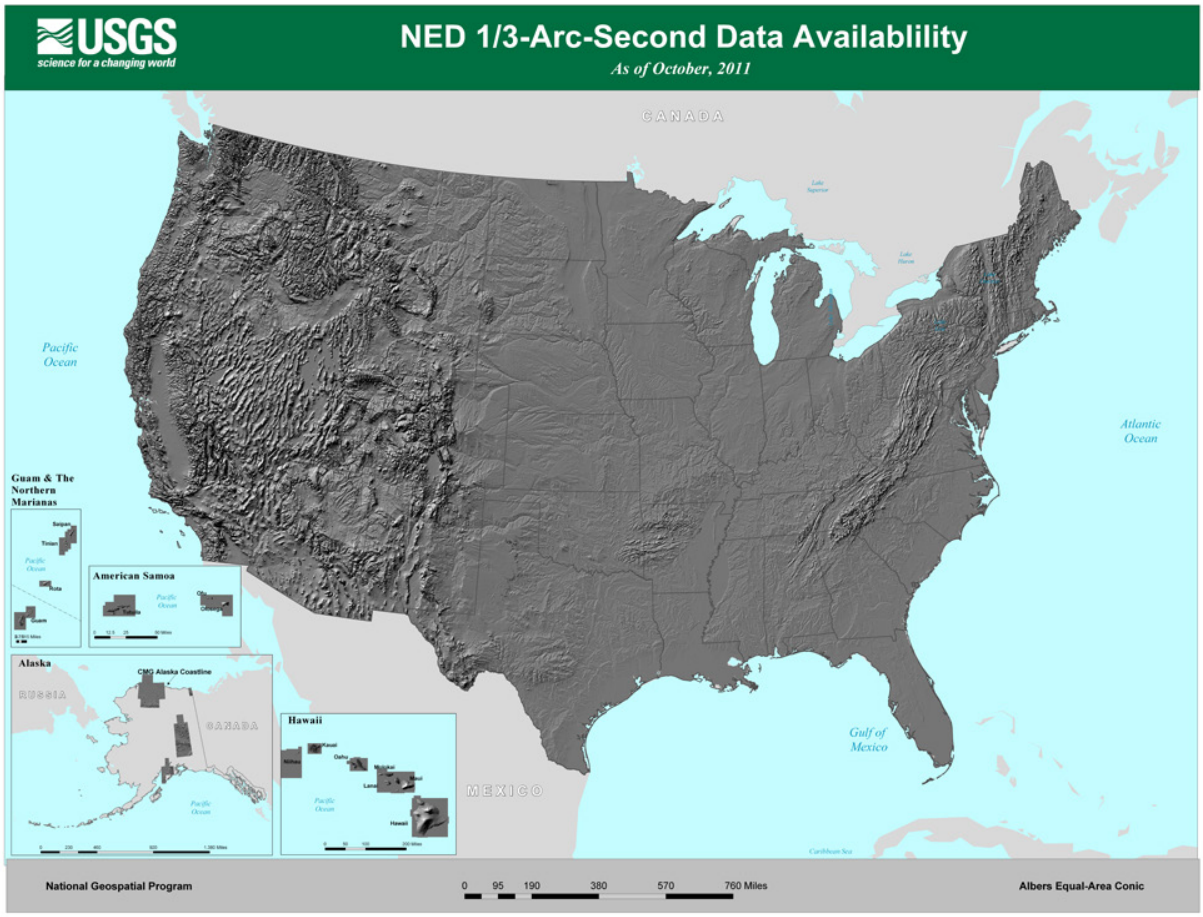

Figure A.5. Available 1/3-arc-second NED.

Source data with a resolution of 10-meters or higher currently exists for 96% of the United States (excluding Alaska). To complete 1/3-arc-second coverage for areas outside the State of Alaska, the remaining areas are derived by oversampling 30-meter source data. Figure A.6 shows the distribution of source data resolutions. The spatial metadata delivered with each order describe the resolution of the source data used over any given area. As higher resolution source data become available, the 1/3-arc-second data derived from 30-meter DEMs are being replaced. It is anticipated that all oversampled 30-meter source data will be replaced by the end of fiscal year 2012.

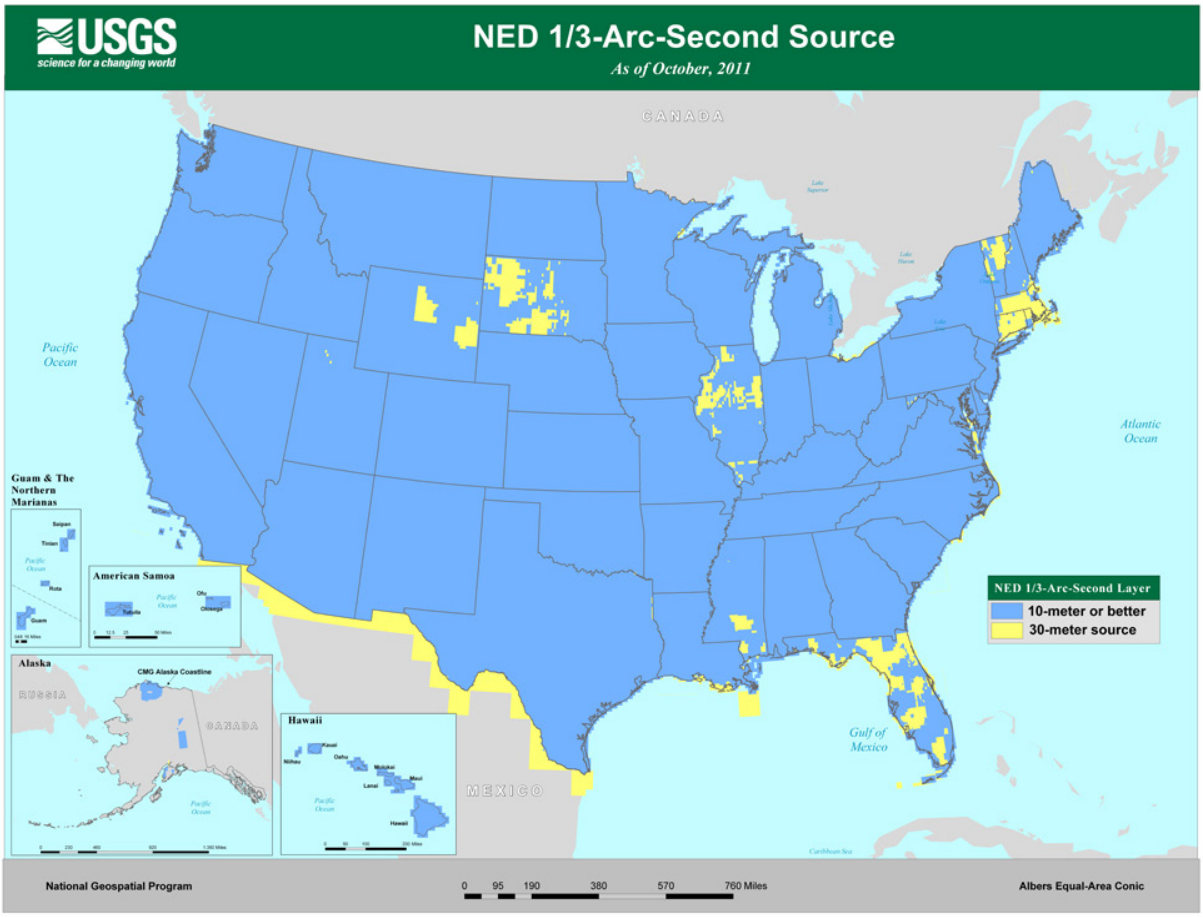

Figure A.6. 1/3-arc-second NED, October 2011 release, by source resolution.

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 A.7). Several higher resolution datasets were used as source data for other NED layers 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 1/3-arc-second layer. Also, Puerto Rico, the Virgin Islands and Mexico are only supported in the NED 1-arc-second layer.

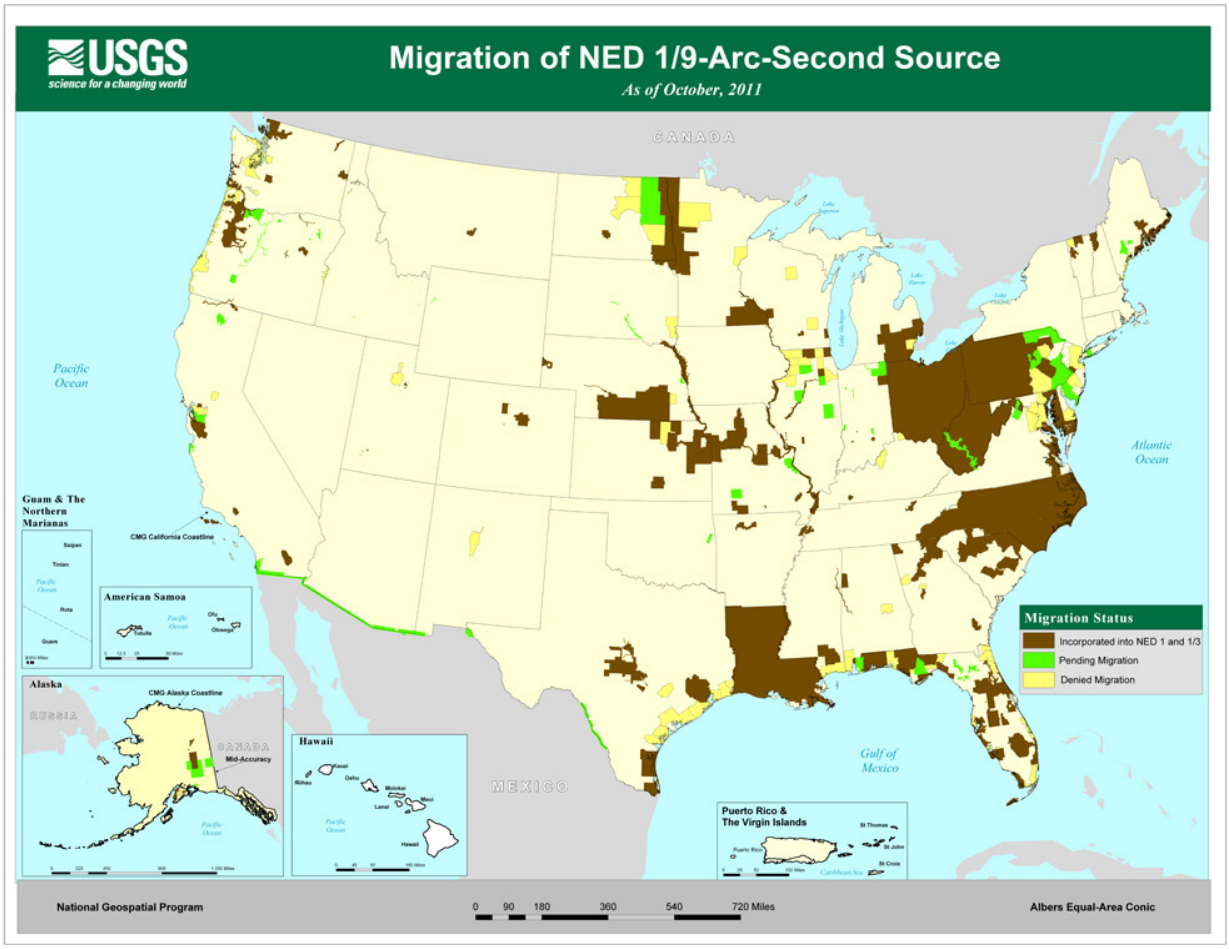

Figure A.7. Migration status of NED 1/9 to other NED layers--October, 2011 release.

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.

Alaska Highlights

Portions of Alaska are now available at resolutions of 1-, 1/3- and 1/9-arc-second (Figure A.8). The most current data is radar-derived, either from IFSAR or from the SRTM. The inclusion of SRTM data in the Aleutian chain is particularly significant as it replaces 3-arc-second DEMs, which are generally of poor quality and are cast in the World Geodetic System of 1972 (WGS72). The first LiDAR data of the Kenai Peninsula was added to the 1/9-arc-second layer in September, 2009 adding to the small amount of data covering the port city of Valdez added in December, 2008. Additional LiDAR datasets were released in July and August of 2010, including two more Kenai areas and Yukon Flats. The original Kenai dataset

released in September, 2009 was reworked to fill the many data voids in December, 2010. A large portion of central Kenai area was added in February, 2011. A pilot area of mid-accuracy 5-meter IFSAR was added during the April, 2011 update as well as a small piece of LiDAR data along the northern coast. An additional ten cells of the 5- meter IFSAR were added during the August and October 2011 releases. The 5-meter IFSAR data are going into all the NED resolution layers including the NED 1/9-arc-second data layer and will be the primary source for elevation data over most of Alaska per the statewide elevation plan.

The resolution of existing Alaska data and of the data anticipated in the upcoming year is shown in Figure A.8.

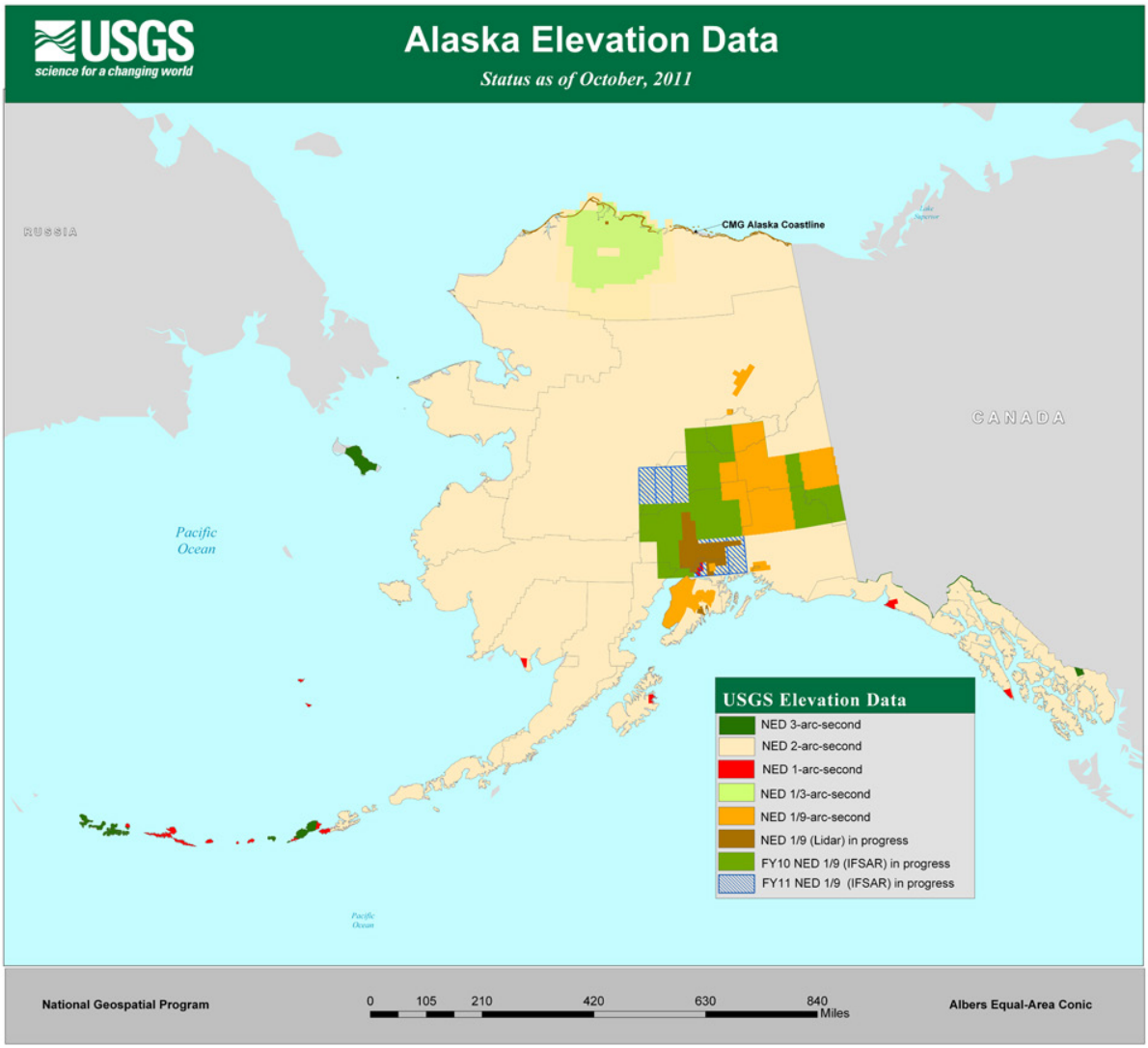

Figure A.8. Available and anticipated Alaska elevation data.

Currency

Data currency (Figure A.9) 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.

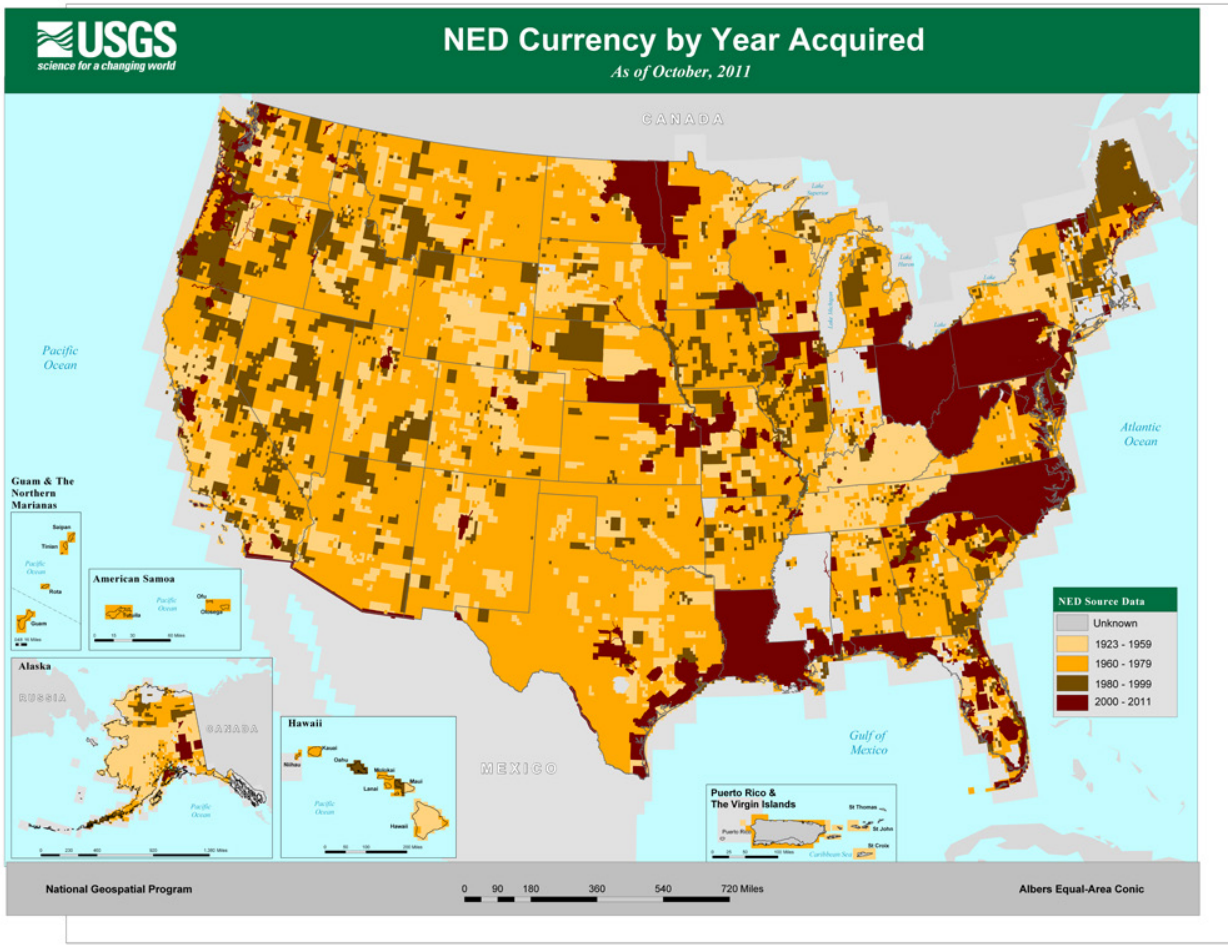

Figure A.9. Currency of the NED shown by acquisition year – October, 2011.

Datums

All NED data are currently distributed in the North American Datum of 1983 (NAD83). Prior to April, 2008, NED data over Alaska were cast in the North American Datum of 1927 (NAD27).

Production Methods

Figure A.10 shows the production methods used to produce NED data. Older production methods are small and 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.

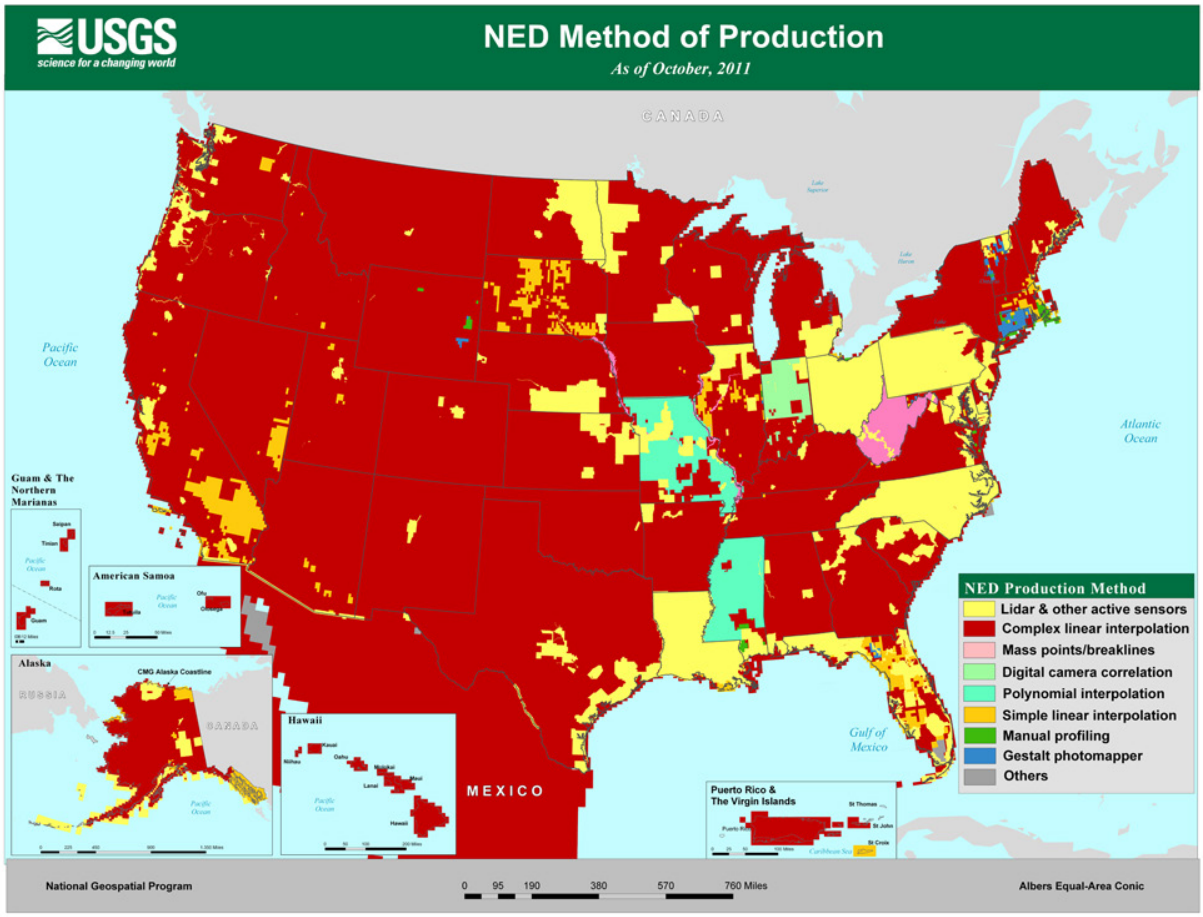

Figure A.10. NED source data by production method – October, 2011 release.

The production methods are:

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

Source Data

NED source data are selected from an ever-growing inventory of digital elevation models (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:

1. 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.

2. Moderate-resolution data, other than that compiled from cartographic contours. This data may also be derived from LiDAR or digital photogrammetry, or less often by airborne interferometric synthetic aperture radar (IFSAR). A typical ground sample distance is ~10-meters commonly called "1/3-arc-second data."

3. 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.

4. 30-meter (Level 2) cartographically derived DEMs. Similar in most respects to their 10-meter counterparts, though usually of lower overall quality.

5. 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.

6. 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.

7. 1-arc-second Shuttle Radar Topography Mission (SRTM) data to date are only used in preference to 3-arc-second data in the Aleutian Islands.

8. 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, 2011 NED release continues the trend seen in previous releases with an increase in coverage from 10-meter or better sources (Figure A.11).

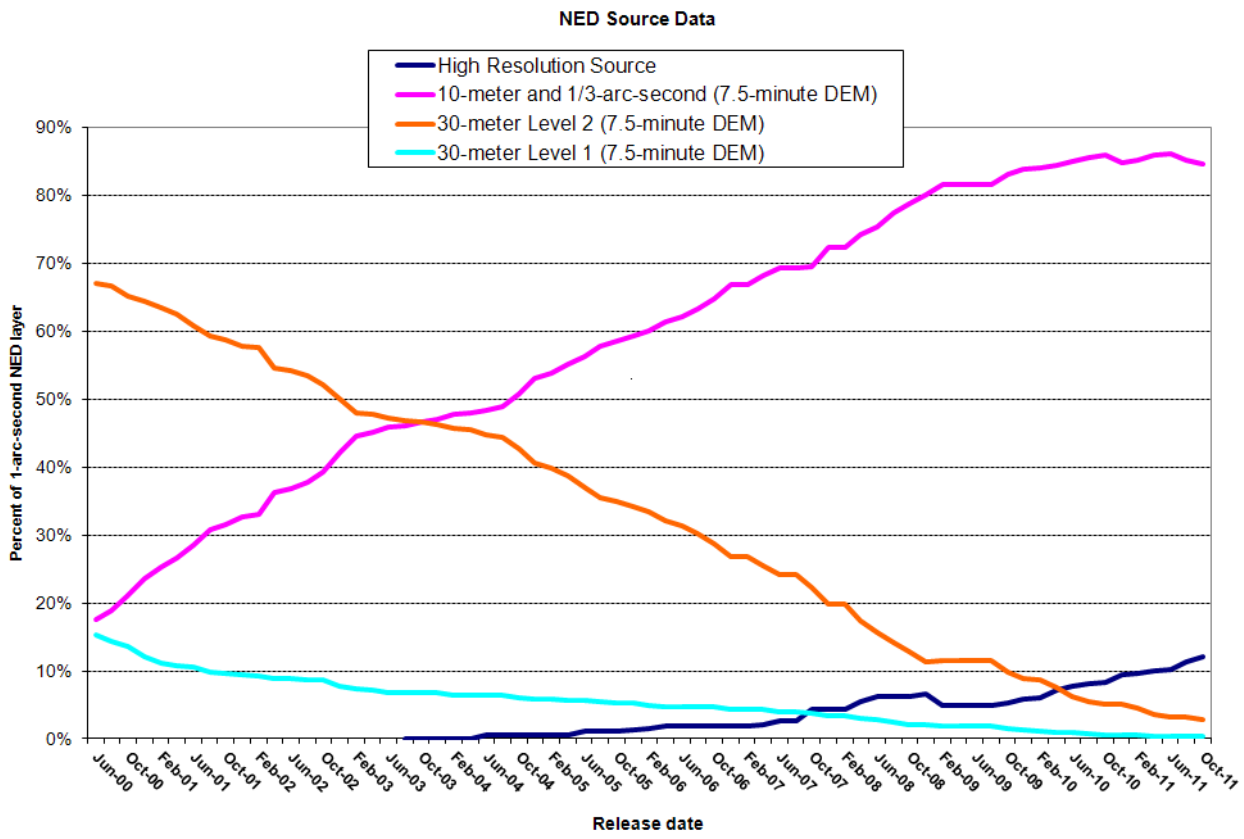

Figure A.11. Type of 1-arc-second NED source data by release date.

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 A.1)

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

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

In the current release, 89 tiles were updated, representing 9% of NED, excluding Alaska and Mexico, for which the extent of coverage is resolution-specific (Figure A.12).

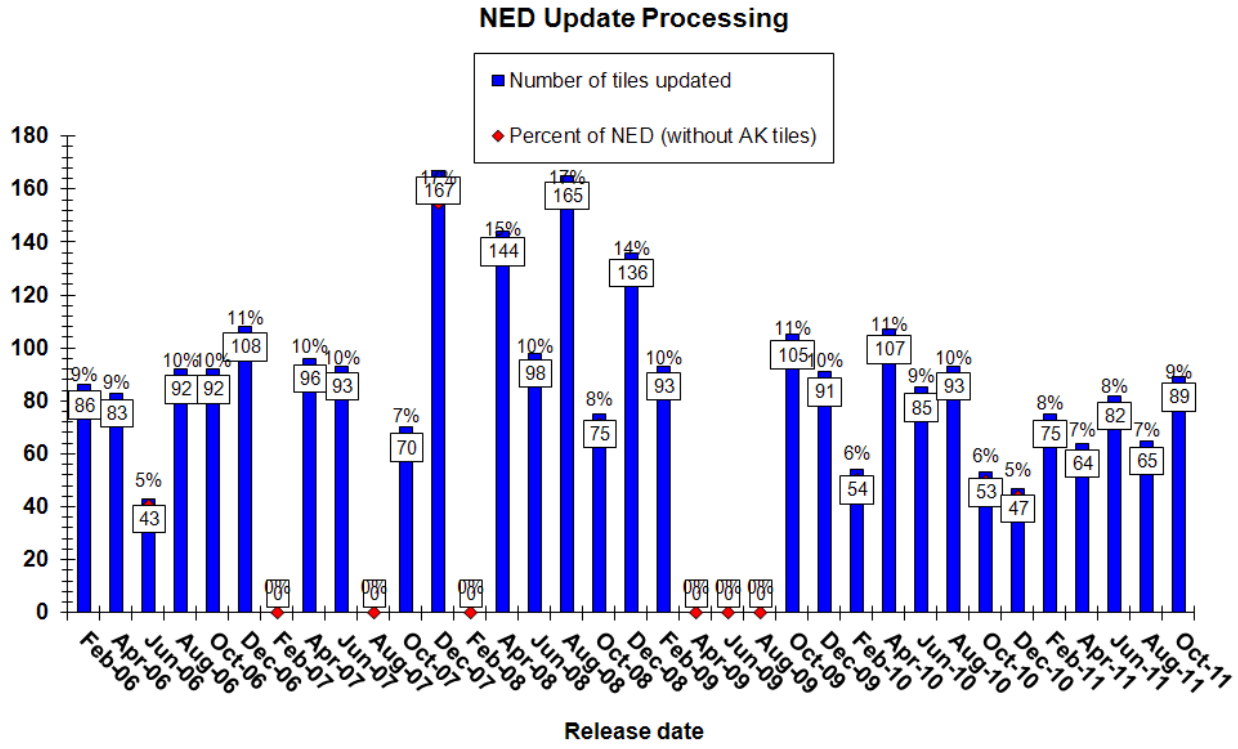

Figure A.12. Number and percentage of NED tiles processed by release date.

How to Obtain NED Data

A number of tools are available for accessing elevation data and mapping services at http: //seamless .usgs.gov. Newly released and existing elevation data of the National Geospatial Program are available for download as tiled datasets via The National Map Viewer (http://viewer.nationalmap.gov/viewer/) or The National Map Seamless Server (http://seamless.usgs.gov/website/seamless/viewer.htm) . 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 data 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 to the NED is the Center for Lidar Information Coordination and Knowledge (CLICK) which provides LiDAR point cloud data for download (http://lidar.cr.usgs.gov/).

Additional Information Available

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

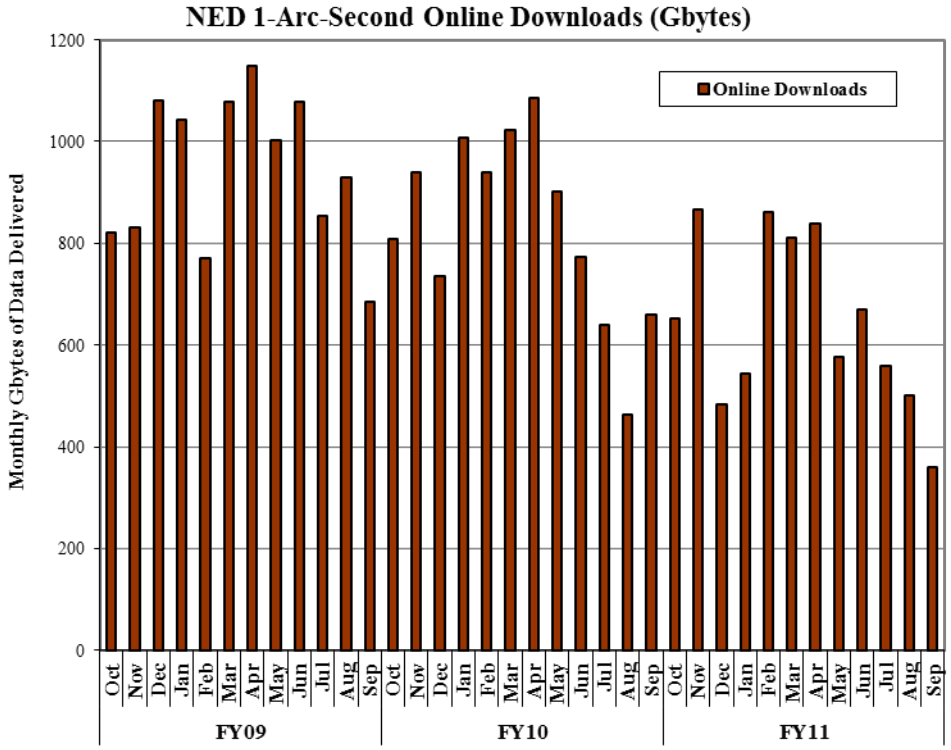

Figure A.13. NED 1-Arc-Second Online Downloads (Gbytes)

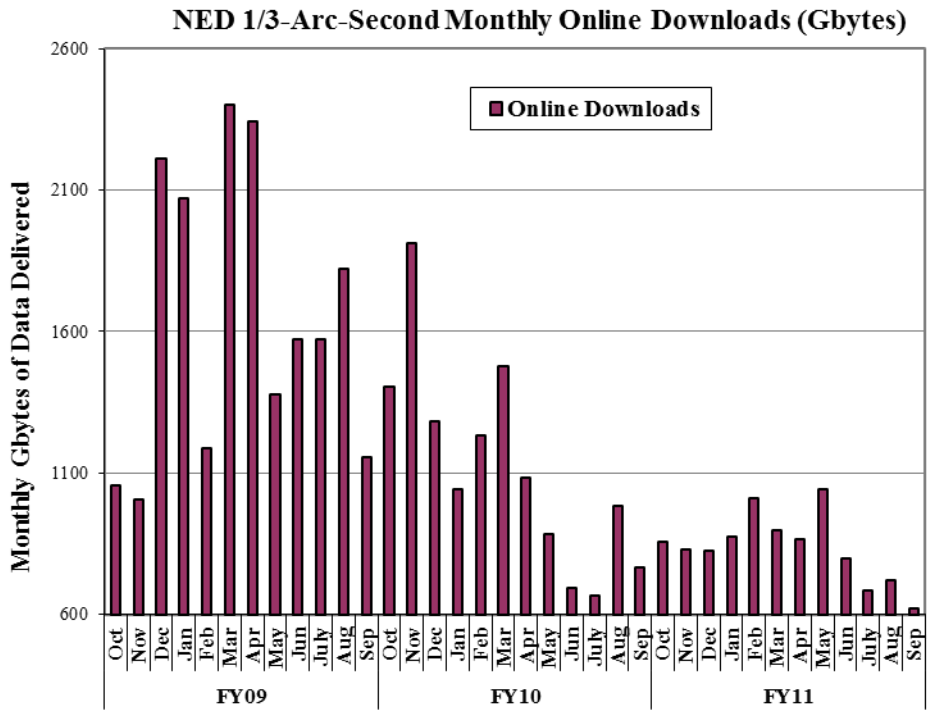

Figure A.14. NED 1/3-Arc-Second Monthly Online Downloads (Gbytes)

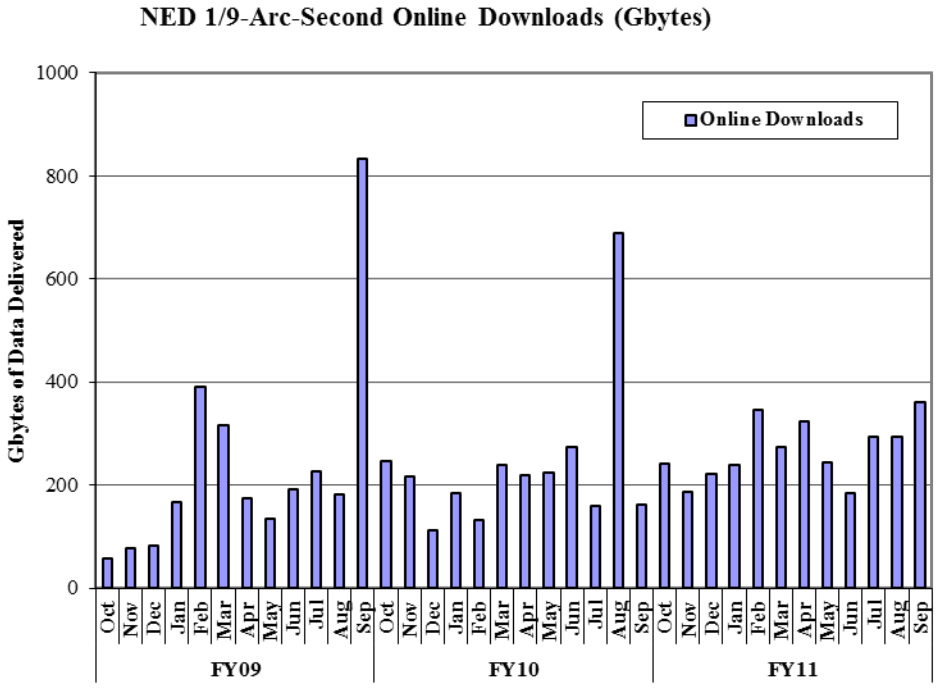

Figure A.15. NED 1/9-Arc-Second Online Downloads (Gbytes)

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.