National Elevation Dataset (NED) and Similar USGS Holdings

http://ned.usgs.gov/

Program Highlights

Data Product

- 1 arc second (30 meter) posting DEM
- 1/3 arc second (10 meter) posting DEM
- 1/9 arc second (3 meter) posting DEM

Advantages

- Most edge matching / seam issues from quad based DEMs have been fixed
- 1/3 arc second NED provides very close fidelity to quad contours
- Avoids many of the problems in original 30 meter DEMs. Good enough for A zone mapping.
- 1/9 arc second data generally good enough for detailed study
- Newer 1/3 and 1/9 arc second data increasingly are from LIDAR and other high-resolution data sources.

Disadvantages

- 1 arc second NED based on many sources with variable quality. Generally not suitable for hydraulics or floodplain mapping
- 1/3 and 1/9 arc second data not available everywhere, though 1/3 arc second covers nearly half of CONUS.
- 1/3 arc second quality varies based on original quad contour interval
- Small areas of 1/3 arc second data is resampled 1 arc second data and low quality. Generally occurs at state boundary where 1 arc second state and 1/3 arc second state appear on same quad tile. Area of 1 arc second state will be resampled data.

Program Overview

The USGS National Elevation Dataset (NED) has been developed by merging the highest-resolution, best quality elevation data available across the United States into a seamless raster format. NED has a consistent projection (Geographic) and elevation units (meters). Nationwide coverage is available for data at a 1 arc second (30 meter) post spacing; there also is substantial coverage at 1/3 arc second (10 meter) post spacing. The horizontal datum is NAD83, except for AK, which is NAD27. The vertical datum is NAVD88, except for AK, which is NAVD29. NED is a living dataset that is updated bimonthly to incorporate the "best available" DEM data. As more 1/9 arc second (3 meter) post spacing data covers the US, then this will also be added to the seamless dataset.

Data Details

NED is designed to provide National elevation data in a seamless form with a consistent datum, elevation unit, and projection. Data corrections were made in the NED assembly process to minimize artifacts, perform edge matching, and fill sliver areas of missing data. NED has a resolution of one arc-second (approximately 30 meters) for the conterminous United States, Hawaii, Puerto Rico and the island territories and a resolution of two arc-seconds for Alaska. NED data sources have a variety of elevation units, horizontal datums, and map projections. In the NED assembly process the elevation values are converted to decimal meters as a consistent unit of measure, NAD83 is consistently used as horizontal datum, and all the data are recast in a geographic projection. Older DEMs produced by methods that are now obsolete have been filtered during the NED assembly process to minimize artifacts that are commonly found in data

produced by these methods. Artifact removal greatly improves the quality of the slope, shaded-relief, and synthetic drainage information that can be derived from the elevation data. NED processing also includes steps to adjust values where adjacent DEMs do not match well, and to fill sliver areas of missing data between DEMs. These processing steps ensure that NED has no void areas and artificial discontinuities have been minimized. The artifact removal filtering process does not eliminate all of the artifacts. In areas where the only available DEM is produced by older methods, then "striping" may still occur.

(The following information about the accuracy of the NED is from Maune, D., (ed,), 2007, Digital elevation model technologies and applications: the DEM users manual (2nd edition), chapter 4. Courtesy of Dean Gesch, USGS.)

The accuracy of the NED varies spatially because of the variable quality of the source DEMs. As such, the NED inherits the accuracy of the source DEMs. In an effort to provide more information to users on the vertical accuracy of the NED, the data set has been tested by comparing it with an independent reference source of very high accuracy. The reference data are the geodetic control points that NGS uses for gravity and geoid modeling. The overall absolute vertical accuracy expressed as the root mean square error (RMSE) is 2.44 meters. As better sources of data are incorporated, the accuracy improves.

For some applications of elevation data, the relative, or point-to-point, vertical accuracy is more important than the absolute vertical accuracy. Whereas absolute accuracy accounts for the combined effects of systematic and random errors, relative accuracy is a measure of just random errors. Averaged over all 9,187 point pairs, the relative vertical accuracy is 1.64 meters.

One caveat to note about the accuracy assessment presented here is that even though the reference control point data set is large, the number of quadrangle-based USGS DEMs on which the points are located is relatively small. Thus, if users have a need for very specific accuracy information for the NED for a local area, a separate assessment should be done with suitable reference data just for that area.

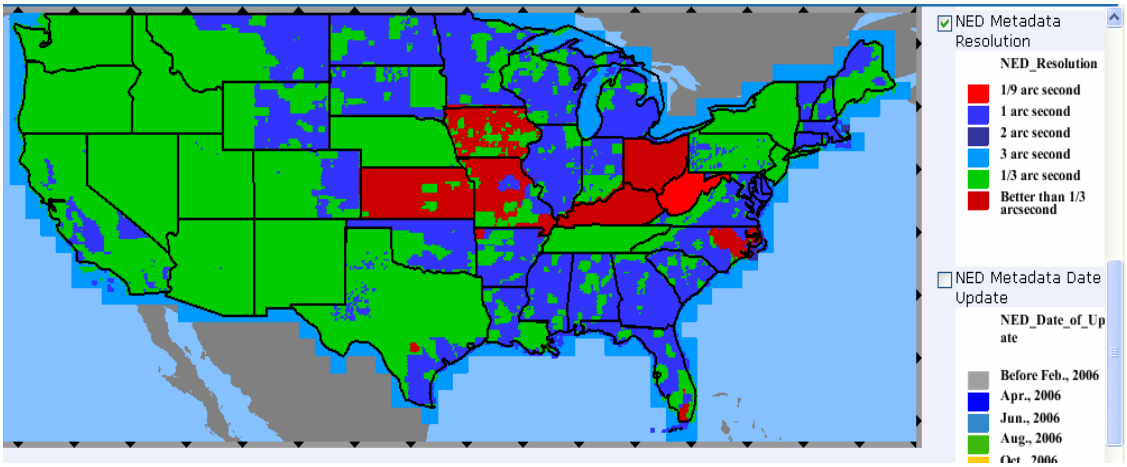
Data Applicability to Flood Mapping Program

- 1/3 arc second data provides very close fidelity to quad contours and is acceptable for Risk Class C (see MHIP Section 7.0 for definition of Risk Class C).
- 1/9 arc second data is generally good enough for detailed study.

Data Availability

The data dictionary, release notes, and update information can be found at http://ned.usgs.gov/Ned/downloads.asp.

Information about the best resolution available and methods of production are available through the USGS GISDATA Map Studio Interactive Viewer at: http://gisdata.usgs.net/website/usgs_gn_ned_dsi/viewer.htm. The following figure illustrates the resolution of data available on March 12, 2007:



An additional source for elevation data that has potential utility for Map Modernization is the Center for LiDAR Information Coordination and Knowledge (CLICK). Some of the available data resulted from a LiDAR investment that supports FEMA flood map modernization and can be found at the CLICK website http://lidar.cr.usgs.gov/index.php.

Data Ordering

In the Seamless Data Distribution System at http://seamless.usgs.gov, users specify the footprint of the data they require. Up to 1.6 gigabytes of data (transmitted in 100 megabyte units) can be downloaded for free in one request; through multiple requests, users can download more data for free. If a single request exceeds the 1.6 gigabyte limit, the system offers the option of providing the data on media for a fee to cover processing, handling, and mailing.