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Database of the "North America Tapestry of Time and Terrain" Map

Data Series 1150

U.S. Department of the Interior
U.S. Geological Survey

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Abstract

This dataset contains over 20,000 polygons representing geologic age and rock class, as depicted in the 2003 map entitled "The North America Tapestry of Time and Terrain" (NATTT). The creation of the NATTT map dataset was done in part by a commercial vendor and finalized by the U.S. Geological Survey (USGS), in Esri geographic information system (GIS) format. This dataset has companion layer files, which mirror the symbology used in the original NATTT map publication. The data are intended to be used at the scale of the published source map (1:8,000,000).

Introduction

In 2000, the U.S. Geological Survey (USGS) published a distinctive map, entitled "A Tapestry of Time and Terrain," which showed a generalized depiction of the geology in the conterminous United States, draped over shaded-relief topography (Vigil and others, 2000). In 2003, that map concept was extended geographically, and the resulting new map was published at 1:8,000,000 scale as "The North America Tapestry of Time and Terrain" (Barton and others, 2003). The North America Tapestry of Time and Terrain (NATTT) map was prepared in cooperation with the Geological Survey of Canada and the Mexican Consejo Recursos de Minerales.

These two Tapestry maps have proven to be a popular, compelling visualization of the Nation's geology and landscape. They have been highly useful for many purposes, including classroom education and commercial resale. The maps are effective educational tools because they provide a clear visualization of the geologic history of North America through the interrelation of rock type, geologic time, and topography. Regional processes active at the land surface, as well as continental-scale tectonic events, are exposed on the maps, in the three dimensions of space and in the fourth dimension, geologic time.

The NATTT map consists of one large map and four smaller maps: the large map shows the wide range of ages of the bedrock that underlies North America; the four smaller maps show the distribution of the principal rock types—sedimentary, igneous (as two subtypes, volcanic and plutonic), and metamorphic. Both Tapestry maps were published as conventional offset-printed maps, in paper and PDF formats. However, the geographic information system (GIS) and desktop-publishing files from which these maps were produced were not made available.

This new publication contains the GIS data from the NATTT map (Barton and others, 2003), which, in turn, includes map data from the earlier Tapestry map (Vigil and others, 2000). For this new publication, the data files for the NATTT map were retrieved, modified as needed, and processed into a usable GIS database format. The GIS files contain over 20,000 polygons that represent geologic age and rock class. In addition, layer files are provided to facilitate a symbolized display of the map that is similar to that of the original NATTT map publication (Barton and others, 2003).

Processing Steps

The desktop-publishing files (in Adobe Illustrator format) and GIS files (in ArcInfo coverage format) containing the linework used for the production of the NATTT map were retrieved from computing facilities in the USGS offices in Menlo Park, California. The map data in these source files, which had been organized into four geographic quadrants, consisted of the line features, the various attributes such as geologic age and rock type, and the map symbology associated with these feature attributes. The four quadrants were merged into a single feature class, and errors in the resultant dataset were evaluated.

Numerous parts of the single feature class were found to have problems related to topological relationships. Topological problems included polygons that overlapped or had gaps between them, as well as significant misalignments between polygons along quadrant boundaries. Such topological errors were estimated to number in the thousands. In addition, unsystematic registration shifts were observed at latitude-longitude intersections (most notably, in the northern regions) throughout, likely a legacy of the offset-printed version of the NATTT map. It is likely that these errors were introduced into one or more of the numerous iterations of the NATTT map over its history of compilation. To remedy these errors and return a topologically clean feature class, topological rules were imposed using GIS software. The feature class was then overlain on and compared to a georeferenced version of the published NATTT map and also to the Geologic Map of North America Database (Garrity and Soller, 2009).

The polygons were symbolized according to their geologic-age and rock-class attributes, using a color palette that approximates that of the published NATTT map. Colors were adjusted to match the original colors in red-green-blue (RGB) color space. Topological tests were devised to identify polygon gaps, overlaps, and slivers. After the polygons were checked for attribute accuracy and topology, the NATTT map dataset was separated into two shapefiles, one containing geologic age features and one containing rock class features. Note that the Hawaiian Islands dataset contained geologic-age attributes only, as the Hawaiian Islands dataset that represents rock class did not exist in the offset-printed NATTT source map.

The larger North America feature class was then merged with the Hawaiian Islands feature class to create a single dataset. Intersection was applied to both input datasets to create a single dataset that has attributes containing both rock class and geologic age. This ensured that each combination of rock class and geologic age was represented by an individual polygon. Feature-class symbology was then exported to layer files and bundled with the associated geospatial products.

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