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Global cartographic seamless database development: When a map is at the end of the GIS road

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Abstract:
Finding a place anywhere on the planet is a common expectation now-a-days. Even if the place is somewhat unknown, we would expect to find it in some database somewhere. As GIS professionals, we also seem to be accustomed to finding highly detailed and accurate data for virtually everywhere. Piecing thematic information for the world however, and accessing a database which has just the appropriate resolution for the scale of our map or project, seems to be far more complicated and laborious. In this presentation, we would like to share with you what we have learned at National Geographic - Maps about global seamless and consistent database development. Such databases can be used for fact mining, cartography, specific research or for "placing" other geospatial content such as magazine articles, sound or movie clips.

GIS and making maps
We all know that GIS is mainly a tool to analyze data of geospatial nature, but inevitably GIS professionals are asked to make maps to display the results of their analysis, or as a source for discussion, or a political/socioeconomic tool. However, GIS data is structured for "doing" GIS and GIS professionals are not the best cartographers (at least that I know). How does your organization deal with the two roles? Some expect GIS analysts to be cartographers and make maps; some expect cartographers to also be GIS technicians. Still others employ both GIS analysts and cartographers, and expect the two groups of professionals to speak the same language. In this presentation, we hope to clarify both points of view and find a way to bridge the disciplines and develop a common language, or at least a Thesaurus of sorts, to facilitate effective communication. We also hope to point you in the direction of other applications and uses that you can derive from this collaboration.

The cartographic point of view
When cartographers think of geographical data they are really thinking of two concepts: theme and scale. They refer to boundaries, coastlines, roads, towns and rivers as base data; satellite and any form of relief data as background data; and thematic data could either be the map topic or background. Cartographers also think of scale in terms of the area being covered such as a country, a region, or a continent, which translates to the level of detail necessary, not data precision or resolution. Since cartographers are visual creatures, they emphasize feature coincidence and visibility (such as a state boundary being invisible where it is coincident with a river) and feature appearance (such as drainage tapering to display relative river width). They also think of place names or feature labels as an entirely different class or "layer" of data. Relief, in their mind, may actually be a compilation of a hillshade, hypsometrically tinted DEM, and land cover data with a color variation based on the region's climate. Finally, cartographers fail to see why data (vector or raster) would not be appropriately coincident, if they cover the same geographical area.

The GIS point of view
When GIS professional think about geographical data they are thinking of data types and formats, attributes, metadata, coordinate systems and software. Data processing tools are grouped by the format of data upon which they perform analysis; data resolution is defined in terms of coordinate system units. Data is derived from a certain source with a certain precision without consideration to other data it may be used in conjunction with.

Data has attributes that define it and allow processing. Attributes can also be used for labeling features on map, but label placement is not usually a critical issue. Data is often acquired at the highest resolution, which is not necessarily the best display resolution for all cartographic representations.

Finding the way to speak a common language
Classifying geospatial data by its theme (base data vs. thematic vs. background) and its display scale are the two chairs that allow GIS professionals and cartographers to sit at the same table. Furthermore, customizing database structure and attributes for cartographic purposes allows the two groups to begin a conversation. Finally, developing a legend or a translation tool for GIS attribute codes (which provides for appropriate data subsetting), data set extents (which define the geographic scope of the data) and feature symbology (which allows display of features as specified in a style sheet), among other tools, are what allow GIS professionals and cartographers to be productive and work together towards map production for various purposes. A better understanding of each others' capabilities also enhances the potential data processing, map production and feature visualization capabilities.

Where in the world is…?
Creating geospatial databases **only** for cartographic production would be short-sighted. Remember that GIS is a tool? What if the map audience had certain questions about the proximity of features on a map or the extent of area affected by a certain event? Creating geospatial data which is scale-dependent and time-sensitive allows the geolocation of other data and events that may or may not be of a GIS nature. Such global seamless databases can be used as platforms for project collaboration, product location, and knowledge sharing.

Summary: yes we do speak the same language
As a GIS professional with a good knowledge of point, line and polygon topology; coordinate system transformations; and data acquisition from varied sources, I found walking in the cartographic word extremely difficult. I could not understand why map makers expect data from different sources to be coincident, why they wanted me to hide boundaries along rivers, why the font with which I label features is an issue, and why they want a land or water masks. I am sure that the misunderstandings were mutual, but by recognizing and dealing with them, we were able to develop a system which allows us to translate between GIS data and a map that satisfies cartographic purposes: the map scale and "extent" now had a parallel in our GIS framework, the map features and their symbology were defined in terms of feature attributes. More refined visualization techniques, such as relief and land cover integration, enable the map reader to better perceive the environment they are merely seeing on the map.

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