Creating a Geologic Dataset of the Caribbean using ArcGIS

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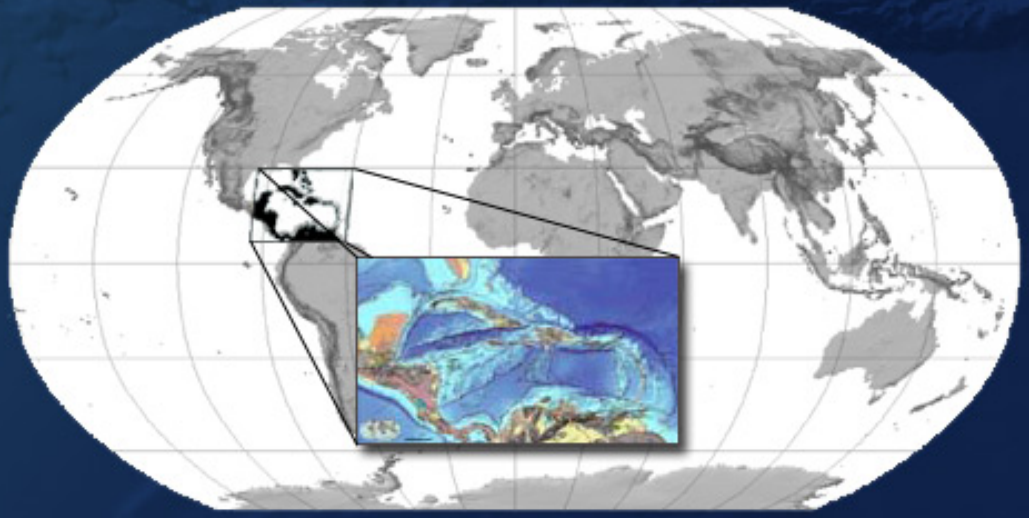

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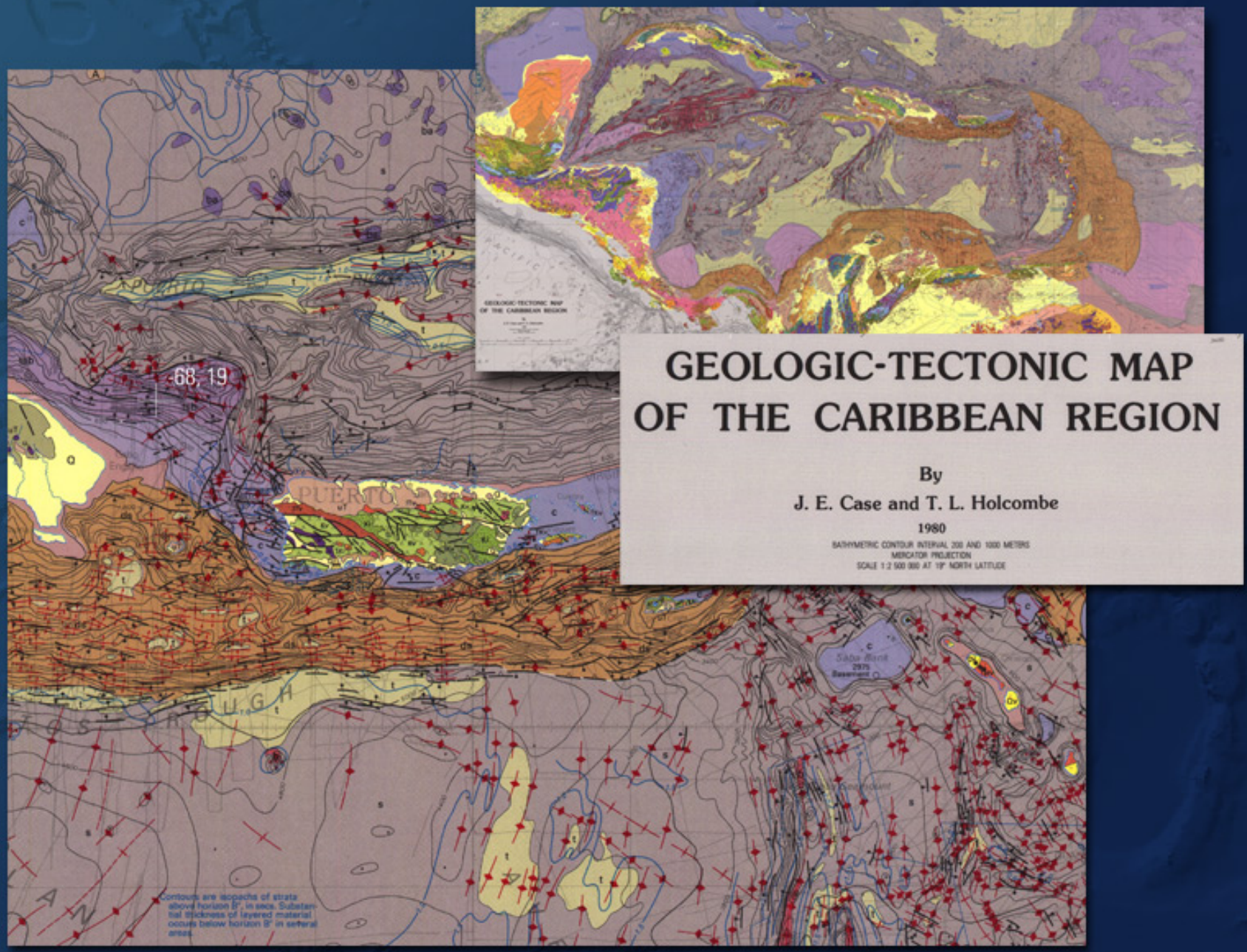
Overview

- Background of mapping project
- Data preparation (i.e. scanning, georeferencing, and digitizing)
- Review geodatabase concepts and creation
- Discuss topology rules and attributing with coded domains
- Share tips to help others



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World Energy Project

The World Energy Project conducts geologic studies that provide an understanding of the quantity, quality, and geologic distribution of world oil and gas resources.

- **Located within the Central Energy Resources Team in Denver, Colorado**
- **World divided into 8 energy regions**
- **Region 6 includes Caribbean area, Central America, and South America**
- **Digital geologic maps provide reference for geologists and others**

http://energy.cr.usgs.gov/oilgas/wep/

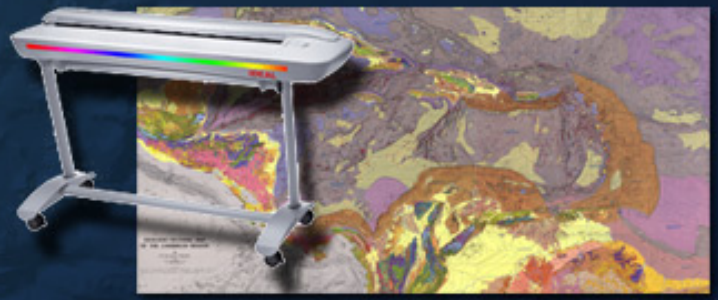
Data Sources

Geodatabase Data Layers	Source
Surface Geology	Geologic-Tectonic Map of the Caribbean Region, USGS, 1:2,500,000 (paper) Map of Commonwealth of the Bahamas, 1:1,000,000 (paper) Geologic Units of the Conterminous U.S., USGS, 1:2,500,000 (digital)
Oil and Gas Field Centerpoints	Petroconsultants International Data Corp., Inc., 2002 database
Geologic Provinces	Modified from USGS, DDS-60, World Petroleum Assessment (digital)
Annotation	All labels stored as stand-alone annotation
Topology	For surface geology and provinces

Base Layers	Source
Political Boundaries	Digital Chart of the World, NIMA, 1:1,000,000
Major Cities	ESRI Data & Maps 2000 (CD 1)
Topography and Bathymetry	GTOPO30 and General Bathymetric Chart of the Oceans (GEBCO)

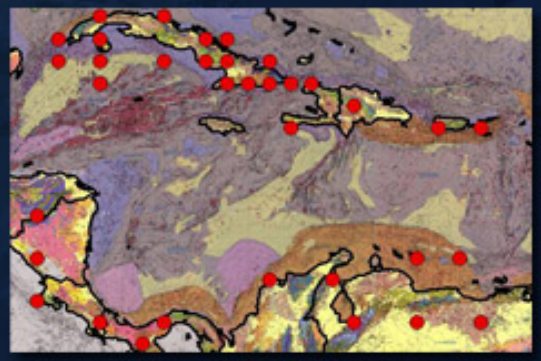
Data Preparation

- **Scanning**



40” Ideal Scanner
300 DPI, RGB
JPEG format
2 plates merged

- **Georeferencing**



ArcMap 8.3
56 control points
3rd order polynomial trans.

- **Digitizing**

Heads-up digitizing
ArcMap 8.3
Zoomed to 1:250,000
Auto-complete polygon

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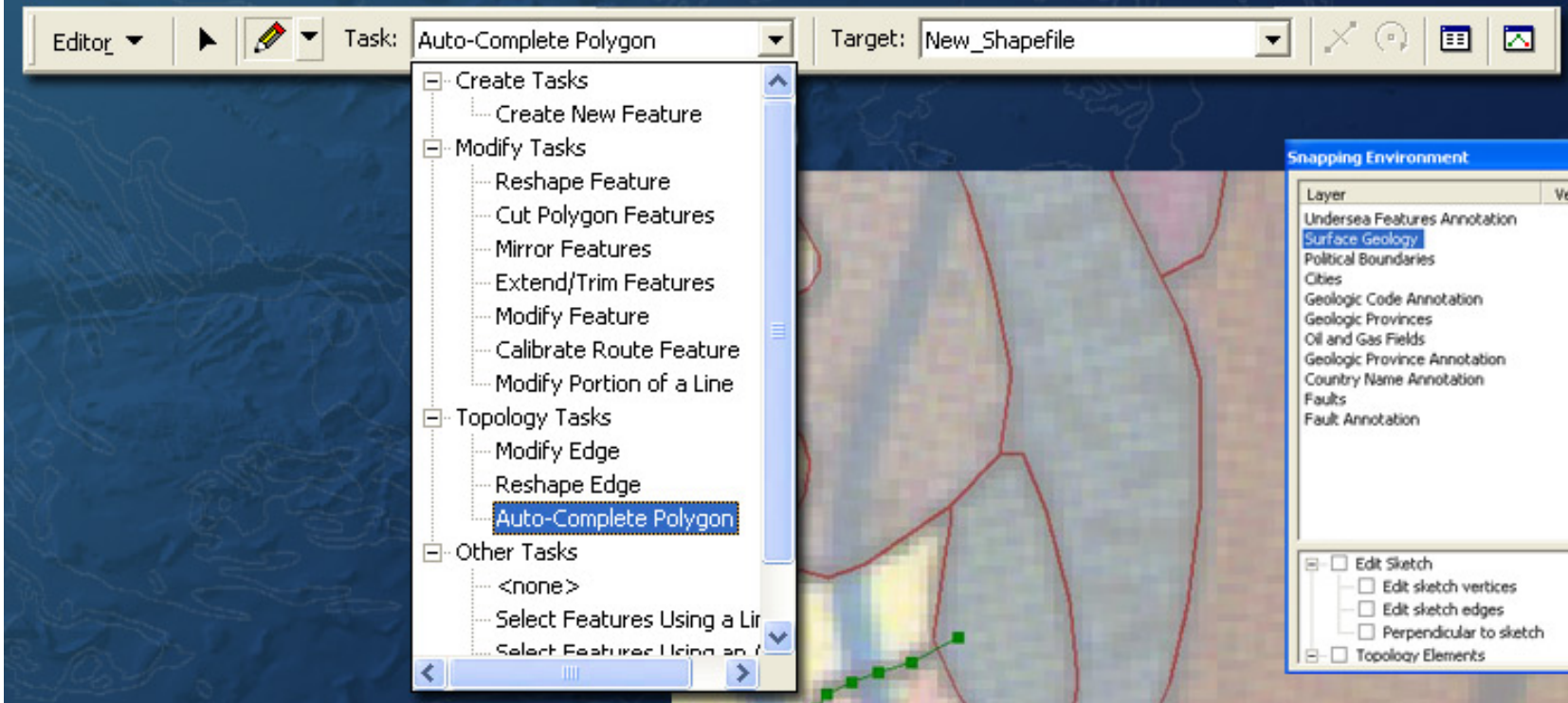
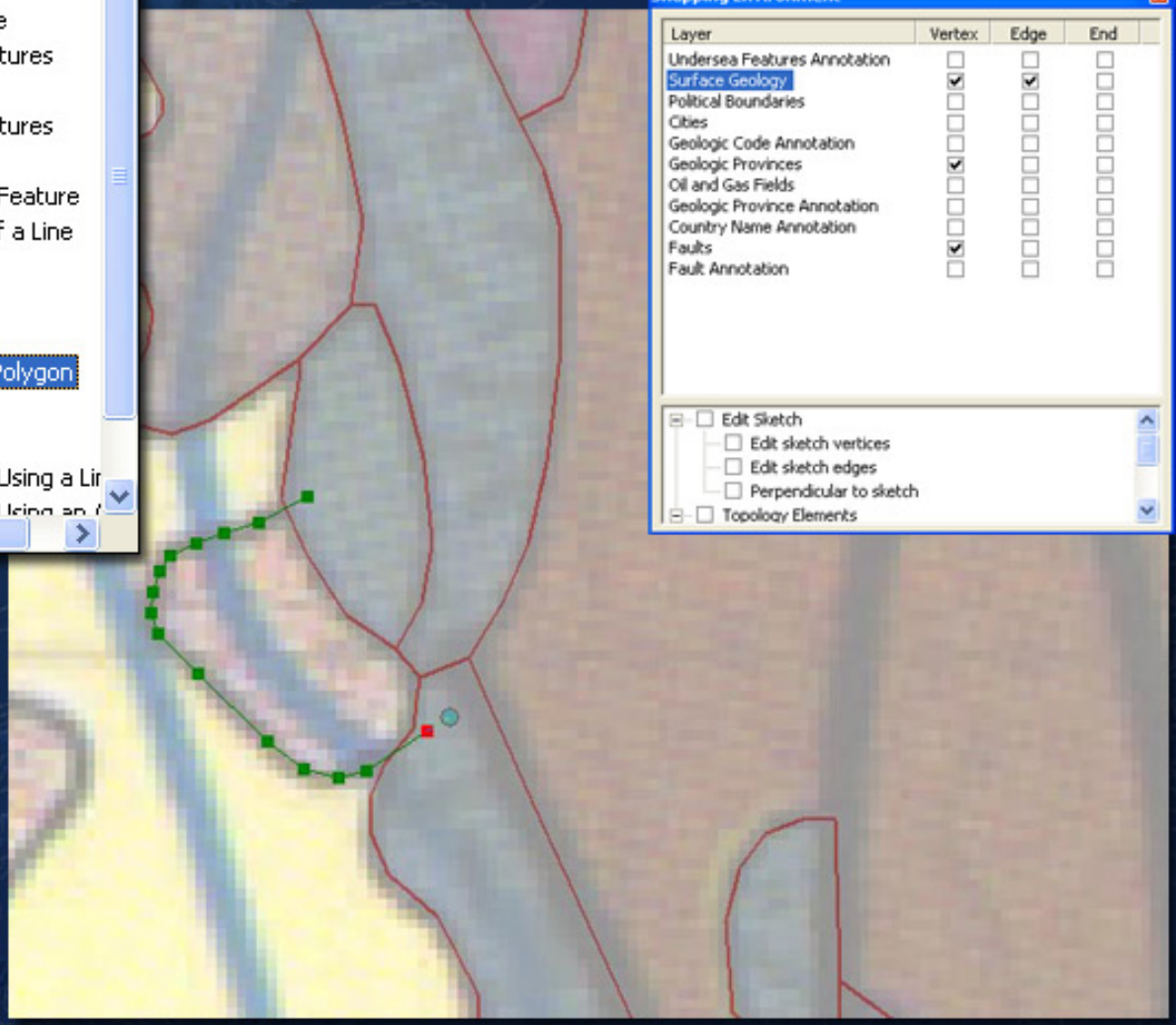
Digitizing





6343 polygons

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Geodatabase Concepts

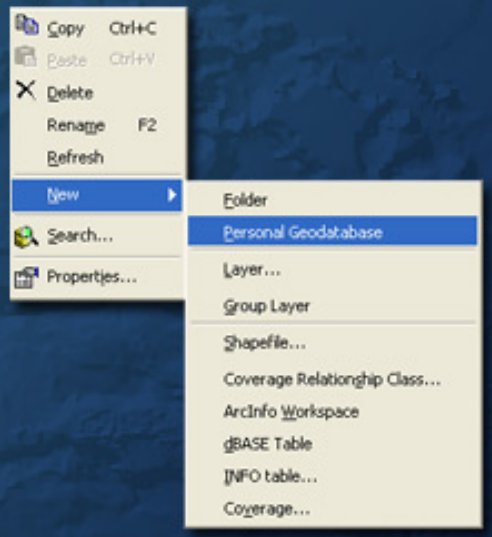
Why we used a personal geodatabase:

- **Stores feature classes, feature datasets, topology, relationships, and annotation**
- **Advanced functionality (topology; domains)**
- **Distributable**
- **Transferable**
- **Simplifies data storage**
- **Works in ArcGIS and ArcReader**
- **Ensures data integrity**

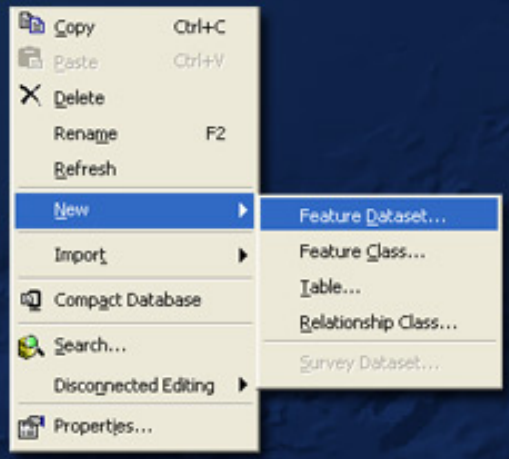
Geodatabase Creation

Created in ArcCatalog

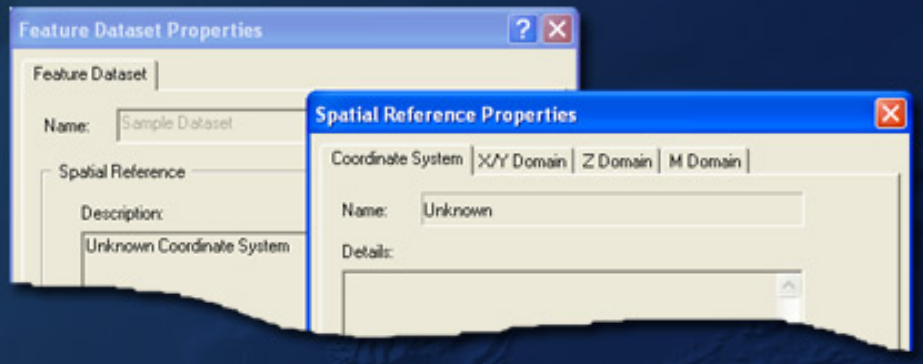
Right-click →



→ **Right-click** →



Spatial reference set manually in feature dataset properties
(be sure all feature classes will fit in X/Y Domain)



- OR -

Can be set automatically by importing a dataset.

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Geodatabase Topology

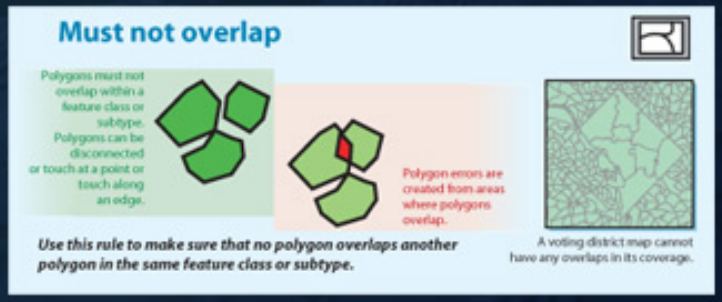
What is geodatabase topology?

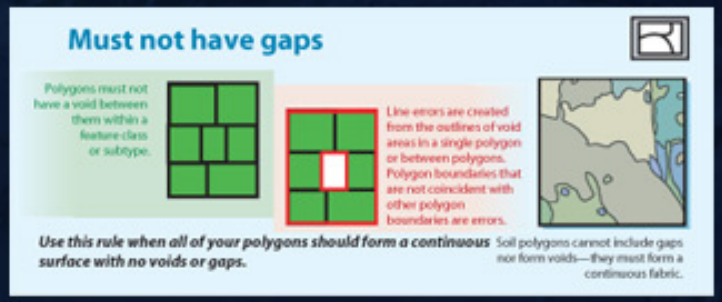
- A rule-based method to define spatial relationships between one or more features
- Models coincidence, connectivity, and adjacency
- Provides editing environment for managing topology
- Stored in a feature dataset
- More accurately models reality
- Improves data integrity

Establish Topology Rules

26 topology rules available in ArcGIS 8.3 Geodatabase

2 used for the surface geology polygon feature class





To create a topology, using ArcCatalog:

- Right-click on feature dataset
- Choose New > Topology
- Follow Topology Wizard

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Topology Wizard

1) name the topology

2) enter a cluster tolerance

Cluster tolerance is defined as the distance in which all verticies are considered identical and will be snapped when validated.

By default, it is set to precision defined in spatial reference.

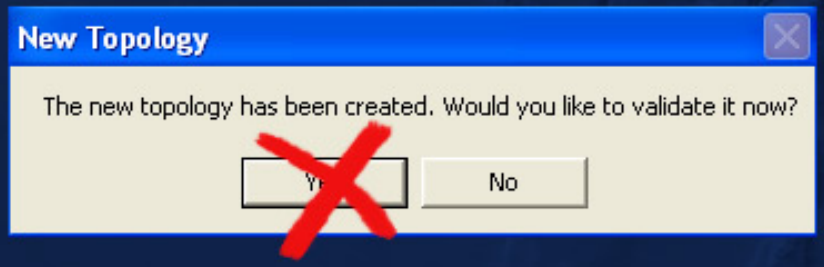
Rule of thumb: set cluster tolerance 10x smaller than highest accuracy data.

3) select participating feature classes

4) change ranks (if > 1 feature class)

5) set topology rules

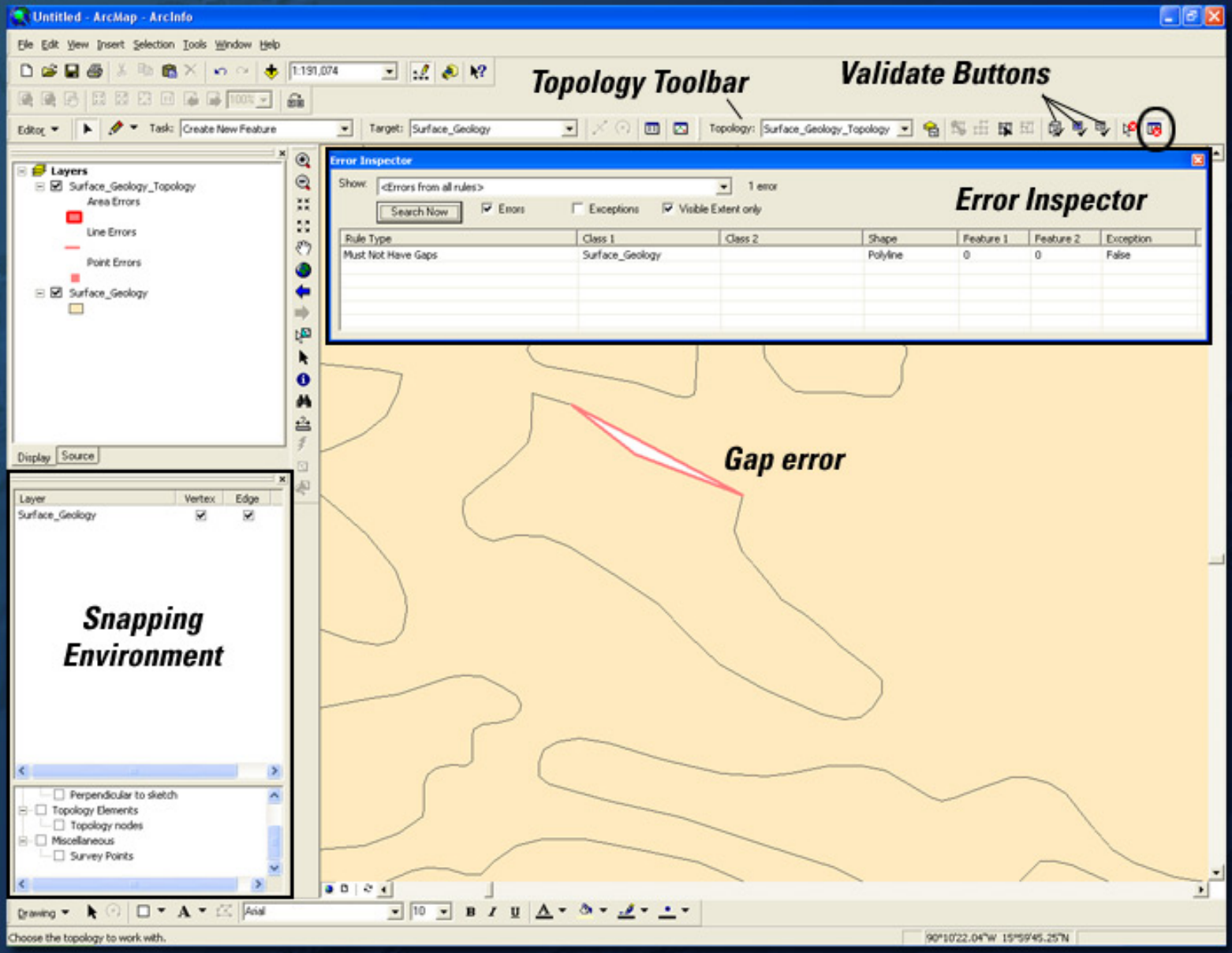
6) review and click finish



Just say NO!

Only validate in an ArcMap editing session to undo changes.

Working with Topology



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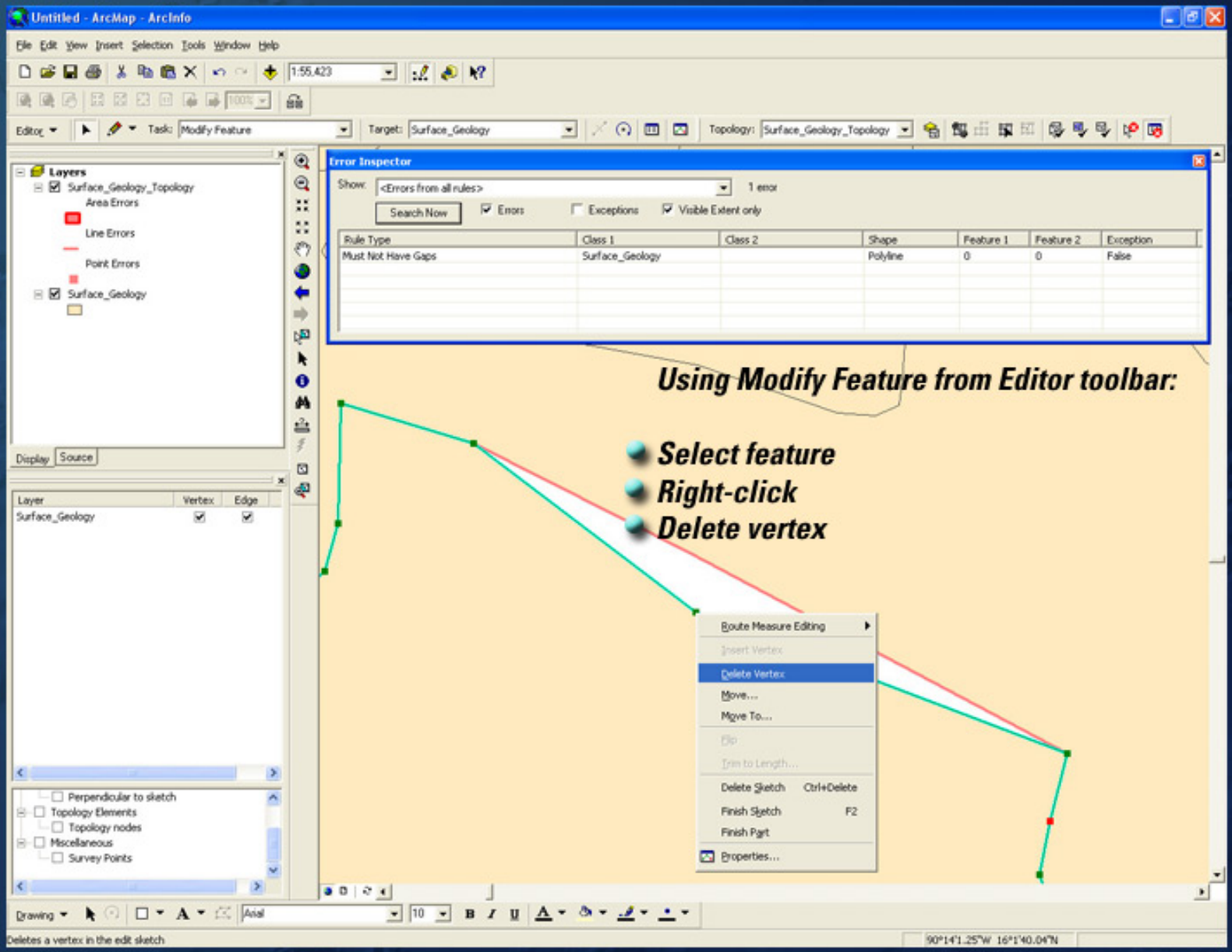
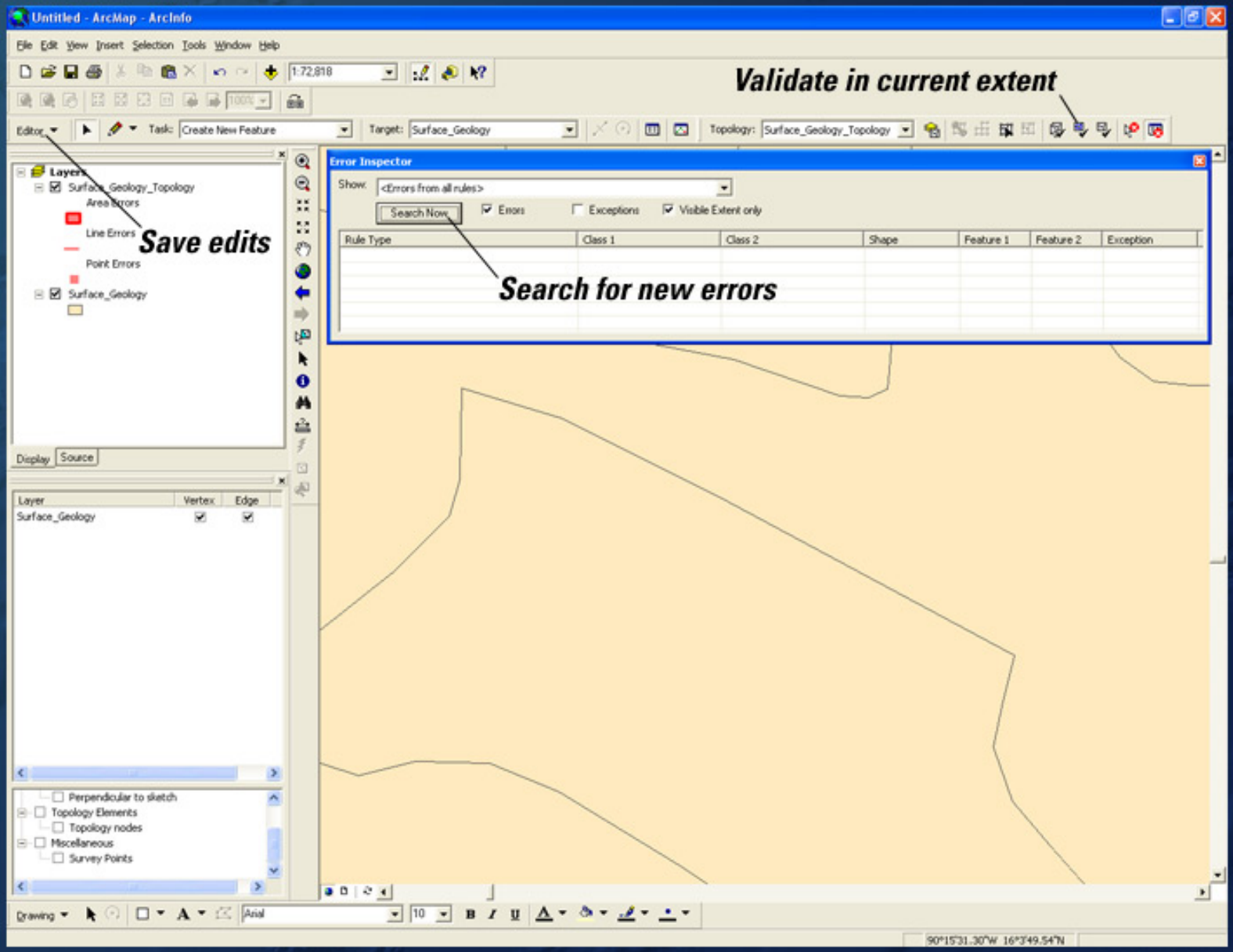
Working with Topology



Complete the Topology Edit



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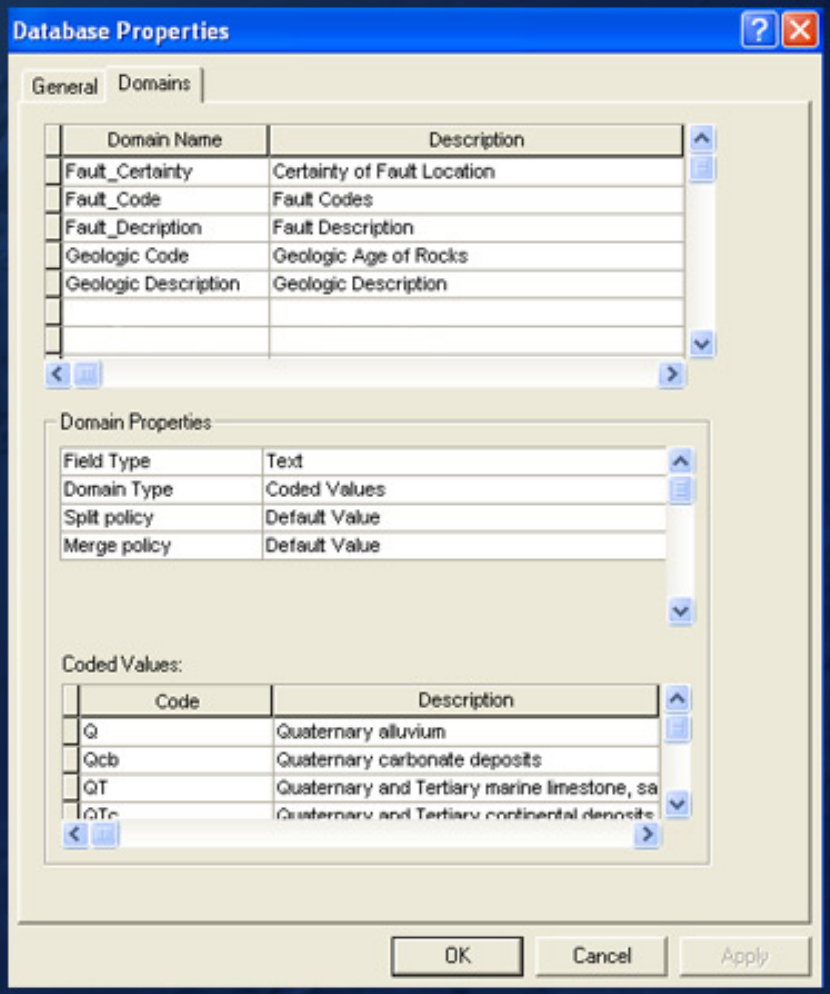
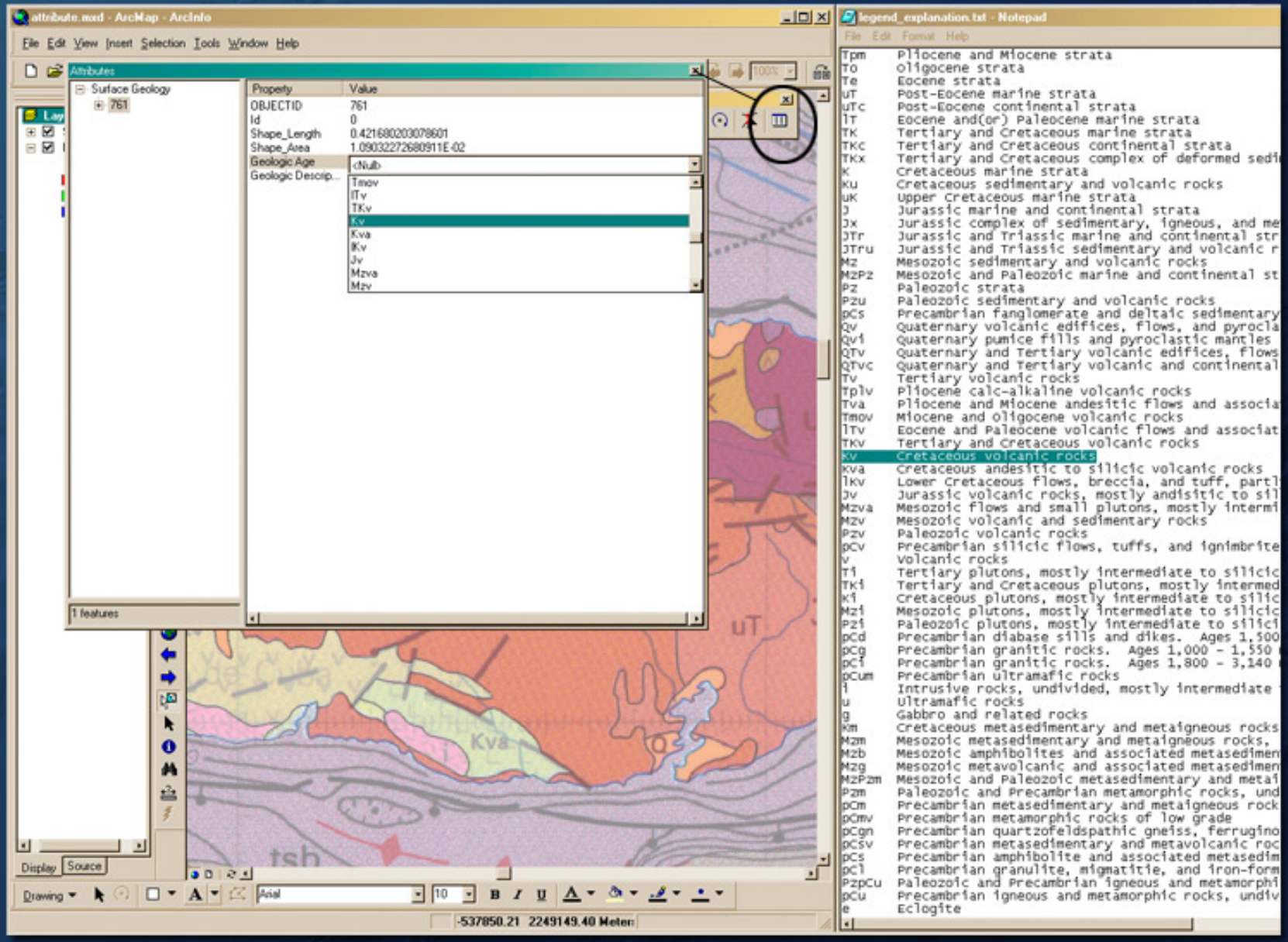
Attributing with Domains

- Established through properties
- Ensures accurate attributes with a drop-down selection while editing
- Description is displayed in attribute table; also when identifying and labeling
- **Note:** exports had code in place of description; fixed by joining LUT (.dbf) with shapefile and re-exporting



Attributing with Domains



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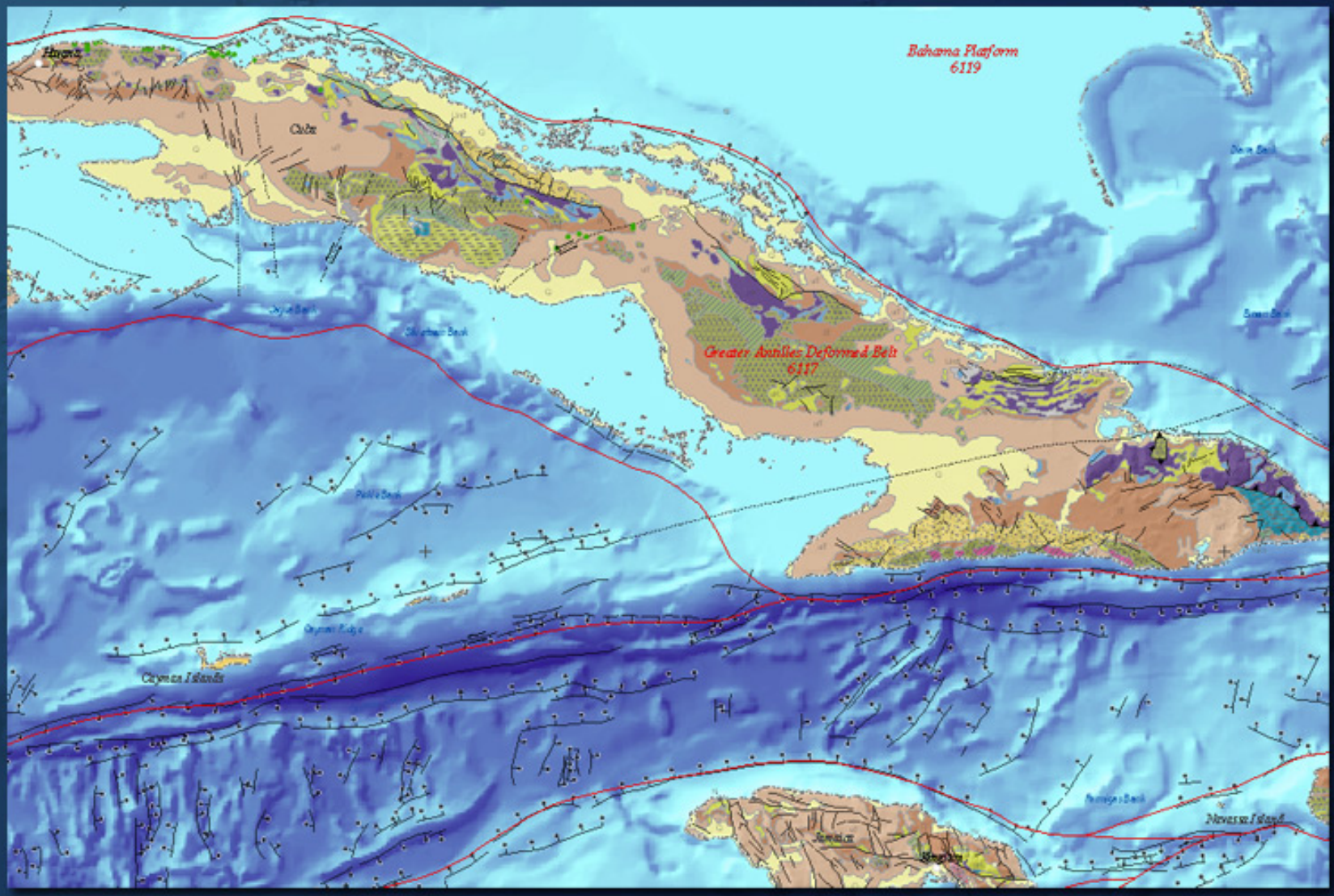
USGS OFR 97-470-K



Screen-capture of Map Showing Geology, Oil and Gas Fields and Geologic Provinces of the Caribbean Region

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CD-ROM Interface (HTML & Javascript)

Download data (.mdb, .shp, and .e00)

View metadata (.html, FAQ, and .txt)

View or download MXD, PMF, PDF or IMS maps

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Summary

- ArcMap 8.3 and the Geodatabase were effective tools in creating the Caribbean surface geology dataset.
- Auto-complete polygon and snapping in ArcMap were very efficient in digitizing process.
- Geodatabase topology and attributing with domains increased data integrity.
- Using the geodatabase also allowed for convenient data storage, distribution, and integration into team's SDE geodatabase.
- Saved several weeks worth of time!
- I recommend exploring geodatabase capabilities for your projects.

Contacts and Links

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Caribbean Geology website:
http://greenwood.cr.usgs.gov/energy/WorldEnergy/OF97-470K/

World Energy website:
http://energy.cr.usgs.gov/oilgas/wep/index.htm