



United States Department of Agriculture

Introduction to the Geodatabase



**Geospatial Technology
and Applications Center**



Forest Service



Lesson overview

- What is a geodatabase
- Advantages of using geodatabases
- Components of a geodatabase
- Creating a file geodatabase
- Import GIS data / schema into geodatabase
- Geodatabase types
 - Single-User (Personal, File)
 - Multi-User (Enterprise - SDE)
- Adding map services to your map
- Connecting to the EDW

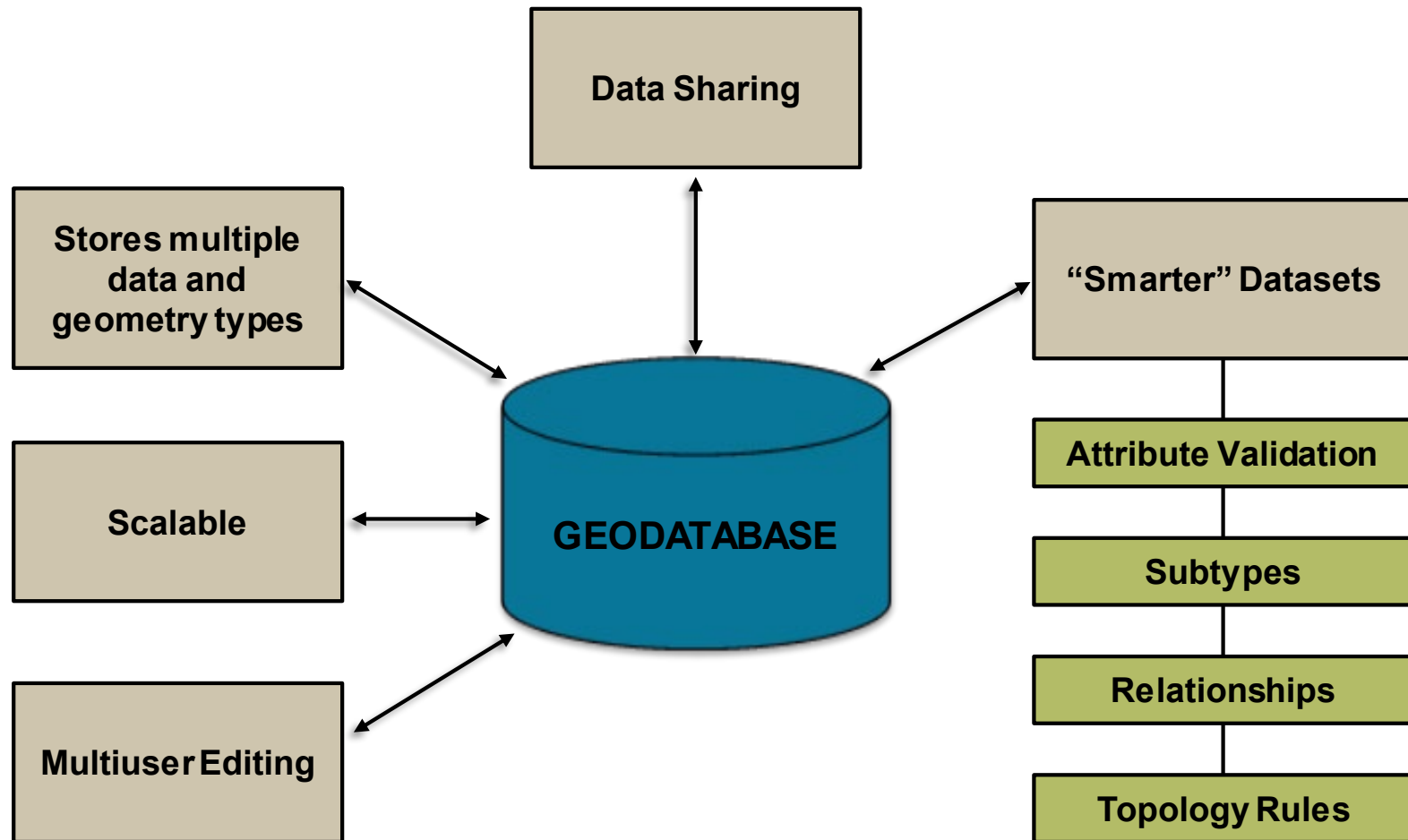


What is a geodatabase?

- ESRI Defines a Geodatabase as:
 - “A collection of geographic datasets of various types held in a common file system folder, a Microsoft Access database, or a multiuser relational DBMS, such as Oracle, Microsoft SQL Server...”.
- Geodatabases are:
 - Native to ArcGIS
 - Store geographic information in a relational DBMS
 - A comprehensive information model that represents and manages geographic information
 - Behaviors / Rules

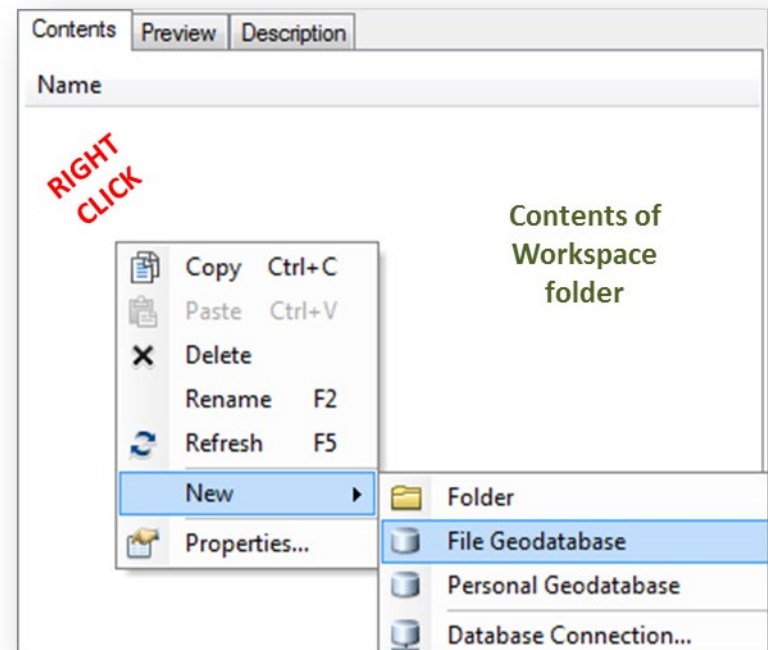
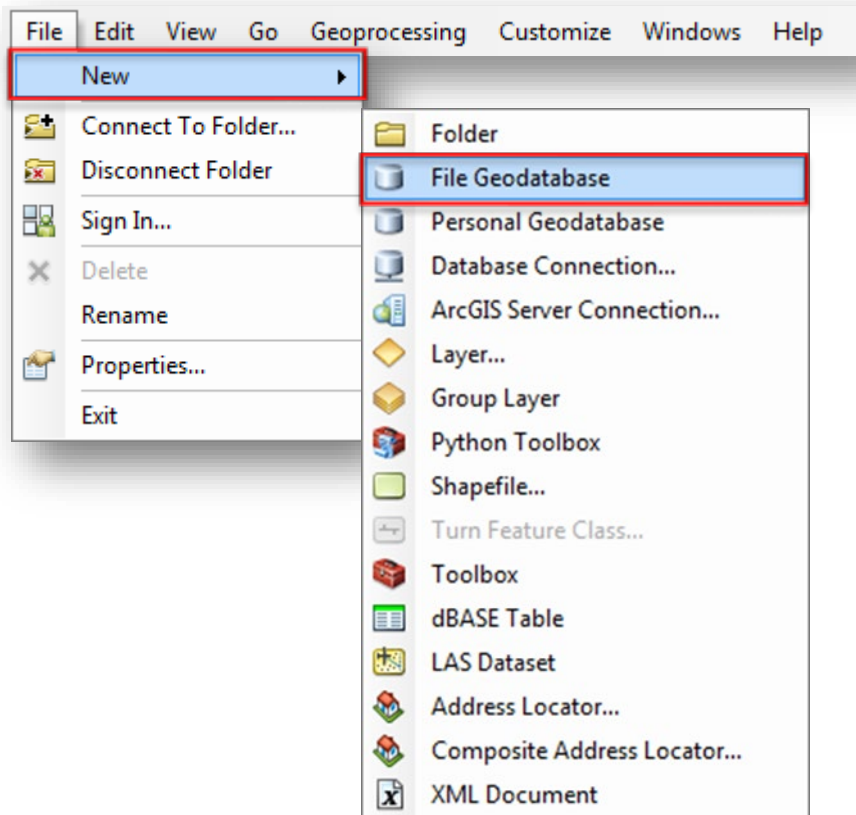


Advantages of the Geodatabase



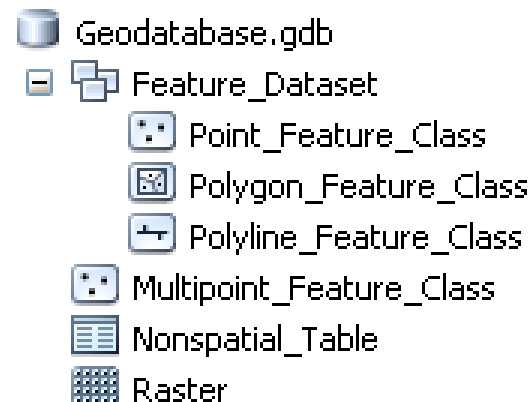
Create a File Geodatabase in ArcCatalog

- File | New | File Geodatabase



Components of a Geodatabase

- 3 Primary Components
 - **FEATURE CLASSES** - *Points, Lines, Polygons*
 - **FEATURE DATASETS** - *Collection of feature classes*
 - **NON-SPATIAL TABLES** - *Associated attribute data*
- Managed in ArcCatalog

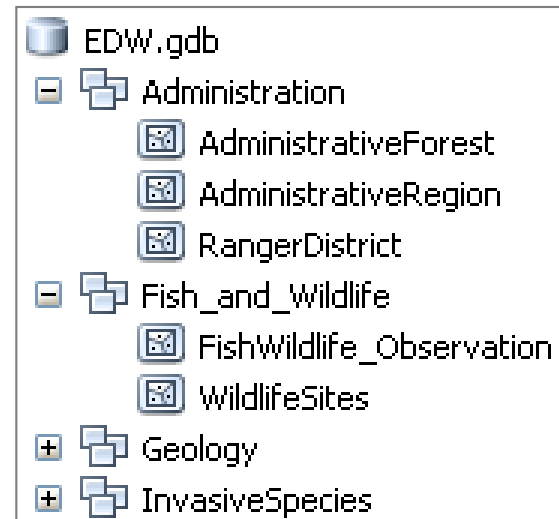


Components of a Geodatabase

- Feature Class
 - Features and attributes with the same geometry type
- Feature Dataset
 - Collection of related feature classes



**Geodatabase containing
Feature Classes**



**Geodatabase containing
Feature Datasets**

Components of a Geodatabase

■ Raster Datasets

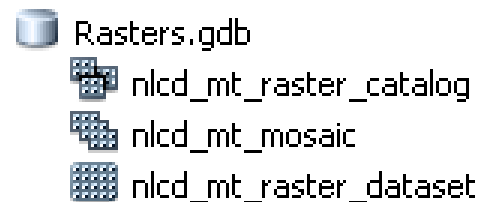
- Standalone raster stored as an individual thematic layer

■ Raster Catalog

- Collection of related raster datasets stored using the one spatial reference
- For displaying adjacent or overlapping rasters

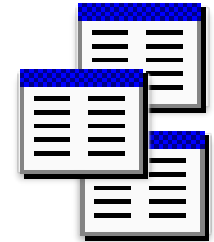
• Raster Mosaic

- Adjacent rasters are stored as a single raster dataset



Components of a Geodatabase

- Non-spatial Tables



- Tables contain rows
- All rows in the table have the same columns
- Each Column has a data type
 - Integer, Decimal number, Character, Date
- *Contain attribute data that can be related to features*

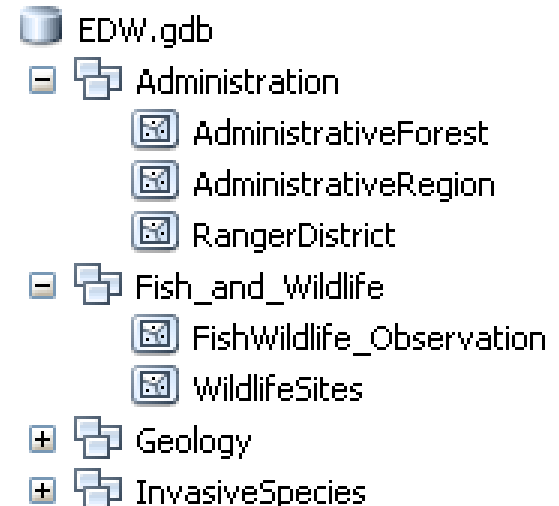
- Optional capabilities

- Attribute domains - *a list of predefined attribute values*
- Relationship classes - *relate objects in one class to objects in another*
- Subtypes - *designate a variation of real-world objects*
- Versioning – *allows multiuser editing of the same feature at the same time*



Create a Feature Dataset in ArcCatalog

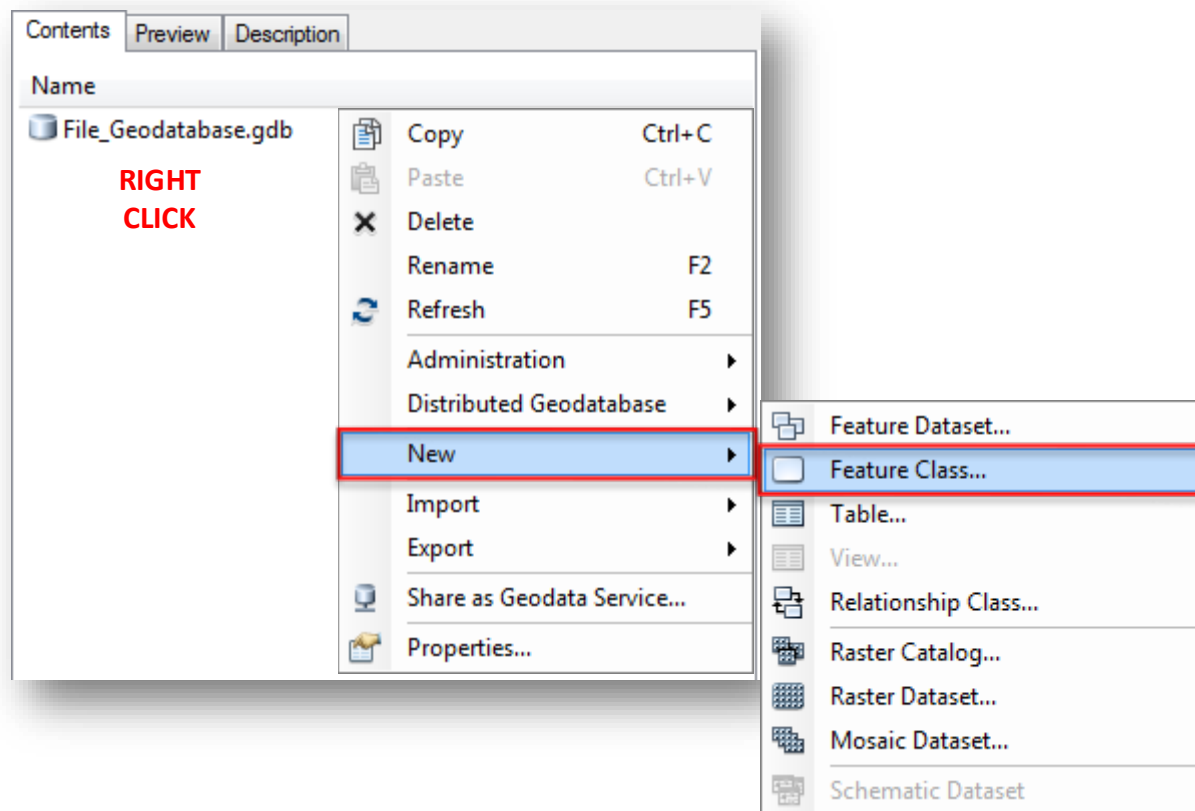
- Feature Dataset = collection of related feature classes
- Feature classes within a Feature Dataset have the same spatial properties:
 - Spatial reference (UTM, State Plane)
 - Spatial extent (Horizontal & Vertical)
 - Spatial relationship (Topology)
- Spatial edits require uniform spatial properties
- To create a Feature Dataset ...
 1. Right-click on geodatabase | New | Feature Dataset
 2. Assign coordinate system





Create a Feature Class in ArcCatalog

- Right-Click the Geodatabase / Feature Dataset
|New | Feature Class





Create a Feature Class in ArcCatalog

- New Feature Class Dialog

1. Right-click the geodatabase (or Feature Dataset)
2. New | Feature Class
3. Enter name & alias
4. Select feature type

- Optional

- Create new attributes
- Link to attribute domains

Create a Feature Class in ArcCatalog

- New Feature Class Dialog
 1. Right-click the geodatabase (or Feature Dataset)
 2. New | Feature Class
 3. Enter name & alias
 4. Select feature type
- Optional
 - Create new attributes
 - Link to attribute domains

New Feature Class

Field Name	Data Type
OBJECTID	Object ID
SHAPE	Geometry
Year	Text
dmg_type	Text
severity	Text
no_trees	Short Integer
host	Text
for_type	Text
pattern	Short Integer
Shape_Leng	Double
Shape_Area	Double

Click any field to see its properties.

Field Properties

Alias	OBJECTID
-------	----------

To add a new field, type the name into an empty row in the Field Name column, click the Data Type column to choose the data type, then edit the Field Properties.

< Back Finish

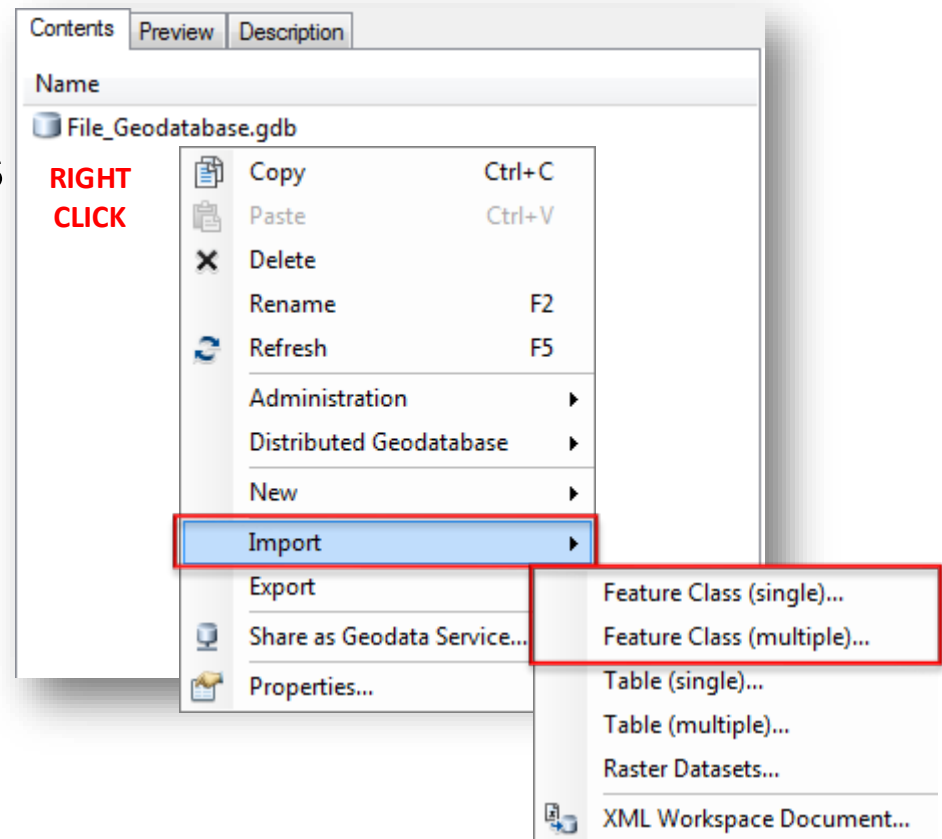
Import Data into the Geodatabase

- Right-click the geodatabase

1. Import | Feature Class
 - Single or Multiple
2. Browse to the data
3. Select and add data

Optional

- Repeat steps 2 & 3 for other datasets in different locations



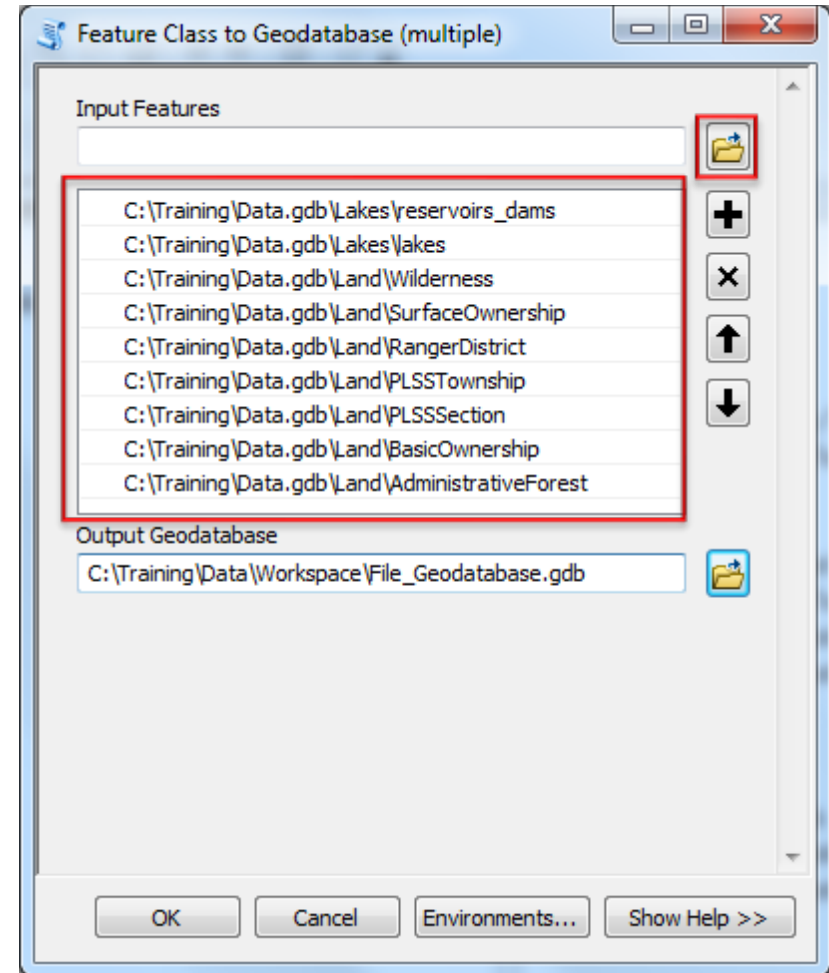
Import Data into the Geodatabase

- Right-click the geodatabase
 1. Import | Feature Class
 - Single or Multiple
 2. Browse to the data
 3. Select and add data

Optional

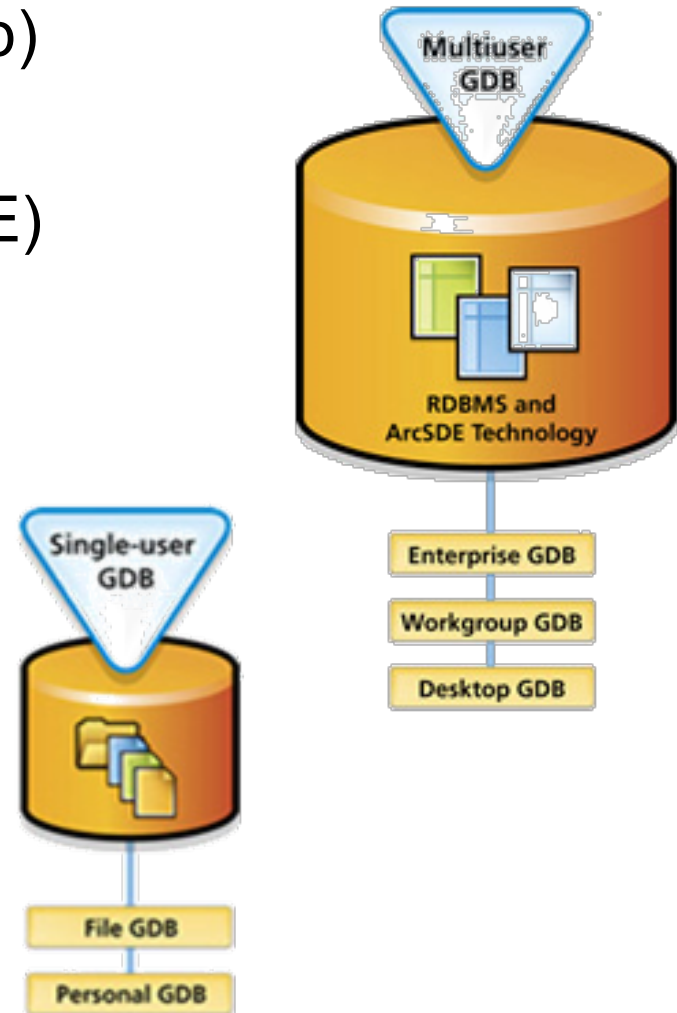
- Repeat steps 2 & 3 for other datasets in different locations

IMPORTED DATA WILL INHERIT THE SPATIAL REFERENCE OF THE FEATURE DATASET




Geodatabase Types


- Personal Geodatabase (*.mdb)
- File Geodatabase (*.gdb)
- Enterprise Geodatabase (SDE)



Single User Geodatabases

- Personal Geodatabase (*.mdb)
 - Stored in MS Access
 - Single user editing  Personal Geodatabase.mdb
 - 2 GB size limitation, 250,000 objects or less

Personal geodatabases are appropriate for smaller workgroups and for managing small to moderately sized datasets.

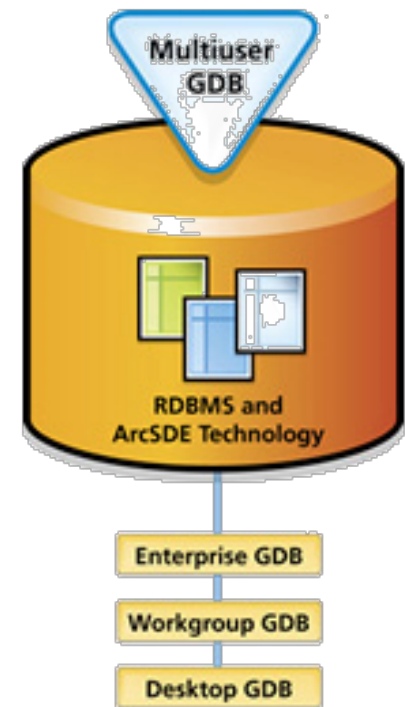
- File Geodatabase (*.gdb)
 - Stored in folders
 - 1 editor per feature class  File Geodatabase.gdb
 - Multiple viewers/queries
 - 1 TB per table or dataset



ALWAYS USE ARCCATALOG TO MANAGE YOUR GIS DATASETS

ArcGIS "SDE" Geodatabases

- Enterprise Geodatabase (SDE)
 - *UNLIMITED* editors and readers connections
 - ArcSDE - RDBMS (Oracle, SQL Server)
 - Storage capacity is only limited to the server that it is installed
 - Large-scale enterprise application setups
- Workgroup
 - 10 concurrent editors and readers connections
 - 10 GB Limit, Windows OS, supports versioning
- Desktop
 - 1 editor and 3 readers connections
 - 10 GB Limit, Windows OS, supports versioning



Enterprise Geodatabase (SDE)

- Versioning
 - Multiple simultaneous editors
 - Not a copy of the data
 - Edits are saved to a version (adds and deletes)
- Replication
 - Data is stored in more than one geodatabase (synchronized)
 - Not the same as DBMS replication
- Geodatabase archiving
 - Captures any and all changes made to a dataset
 - Read only copy





SDE Geodatabase Connections

- **Direct connections to SDE in Citrix ONLY!**
 - Managing / Editing GIS data
 - EDW data accessed through ArcCatalog/ArcMap
 - Connections are set up in ArcCatalog
- Enterprise map service connection
 - Online published map accessed through ArcGIS
 - Supports the enterprise data model
 - Multiple users can simultaneously access and use map services.
 - Updates are immediate





FS SDE Geodatabase Connections

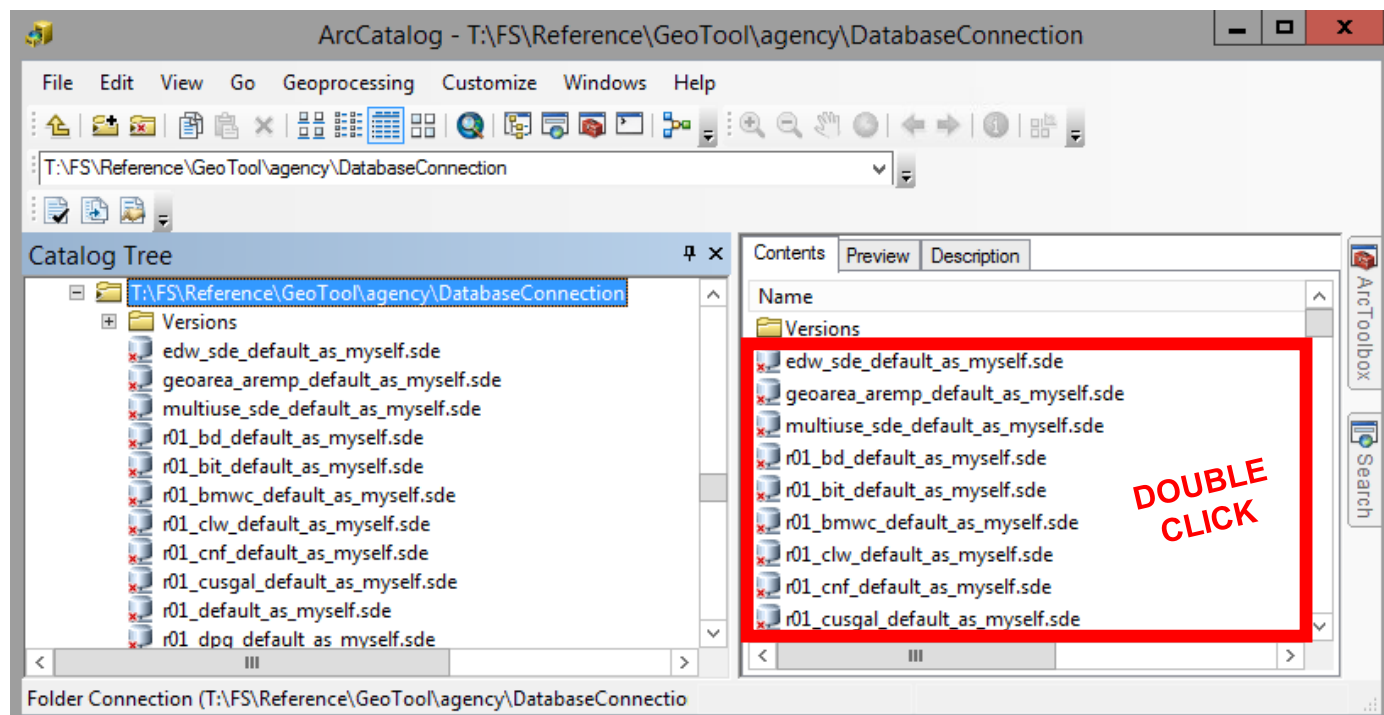
- Direct connections to SDE at the Forest Service
 - Active Directory authentication (Enterprise Users)
 - Identifies your level of access to a database, dataset, etc.
 - Connect to ArcSDE as_myself (/)
 - FS pre-existing connection files

T:\FS\Reference\GeoTool\agency\DatabaseConnection\



Connect to SDE via FS Pre-Existing Connection Files

- From ArcCatalog's Catalog Tree
 1. Browse to:
<T:\FS\Reference\GeoTool\agency\DatabaseConnection>
 2. In the Contents window, double click a connection file.



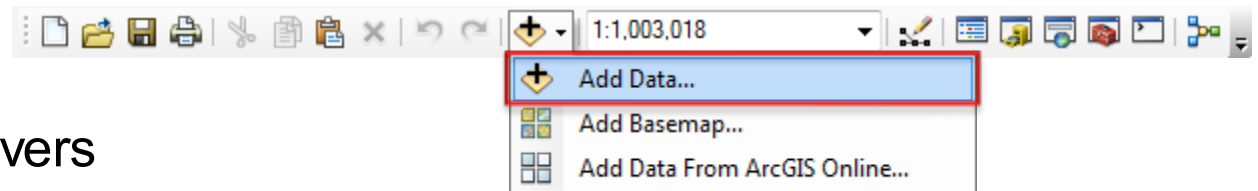
Map Services

- The term “map service” can have a broad definition describing a “web-based feed of GIS data”.
- Map services can be used as a component in web-based interactive mapping applications such as ArcGIS Online and ArcMap.
- The Forest Service uses ESRI’s ArcGIS Server software to create GIS Services.

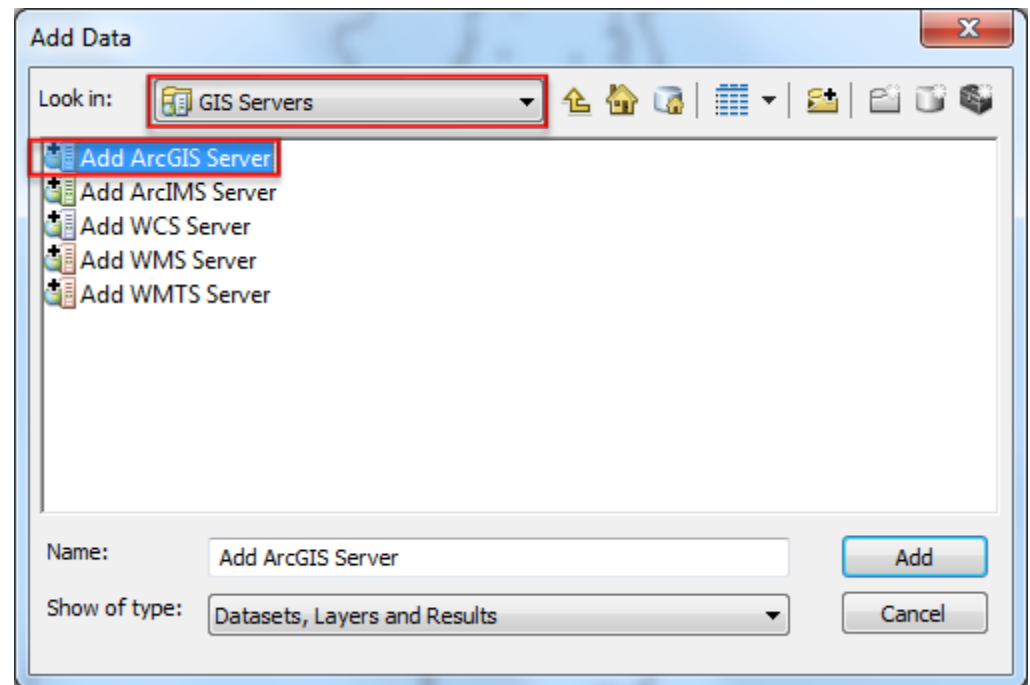


Adding a FS Map Service to Your Map

1. Click the Add Data button |then select Add Data...

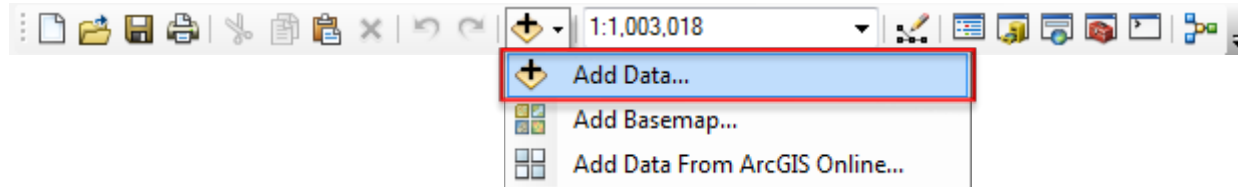


2. Select GIS Servers
3. Double Click Add ArcGIS Server

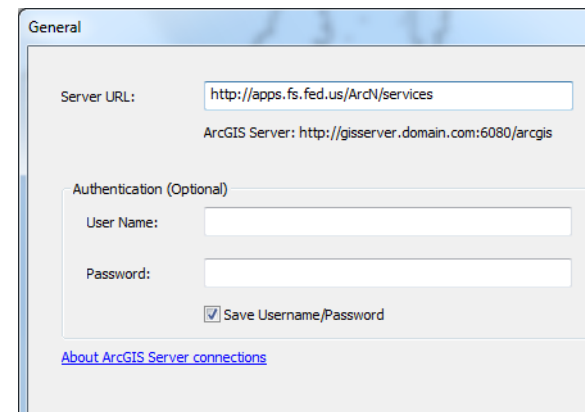


Adding a FS Map Service to Your Map

1. Click the Add Data button | then select Add Data...



2. Double Click GIS Servers
3. Double Click Add ArcGIS Server
4. Select Use GIS Services
5. Enter the server URL
6. Click Finish



Internal Enterprise GIS web services

<https://apps.fs.usda.gov/arcn/rest/services>

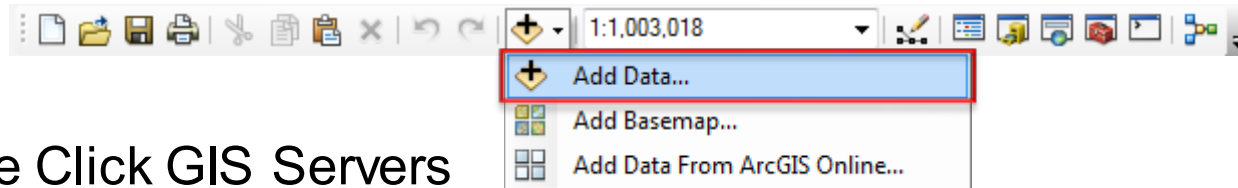
External Enterprise GIS web services

<https://apps.fs.usda.gov/arcx/rest/services>



Adding a FS Map Service to Your Map

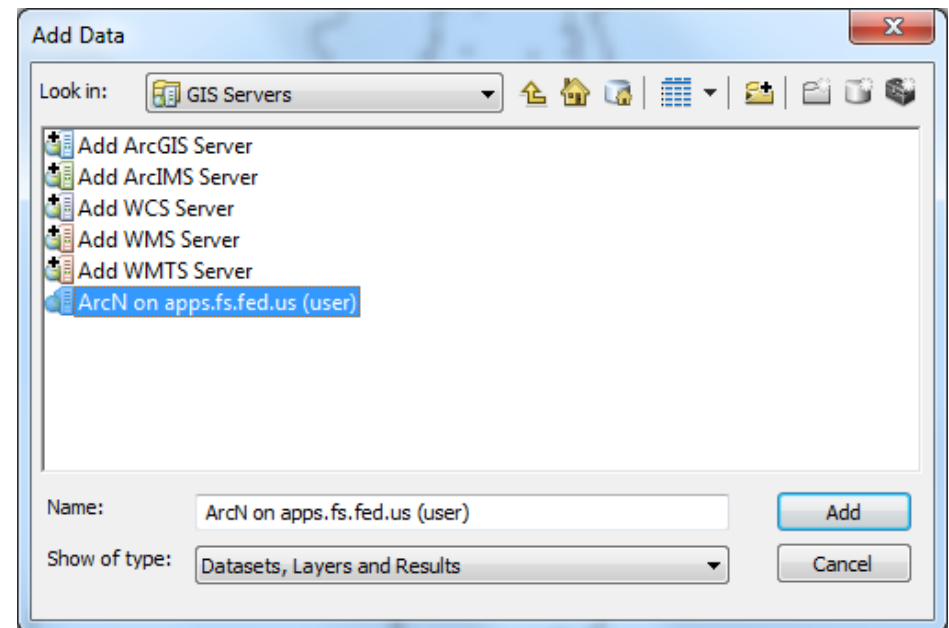
1. Click the Add Data button | then select Add Data...



2. Double Click GIS Servers
3. Double Click Add ArcGIS Server
4. Select Use GIS Services
5. Enter the server URL
6. Click Finish

NOTE TO CITRIX USERS:
Creating database
connections in Citrix
creates files in your home
directory.

**CITRIX HOME DIRECTORY
HAS A 1000 MB LIMIT**





Sources for GIS Map Services

- TIGER - Topologically Integrated Geographic Encoding and Referencing
 - <http://www.census.gov/geo/maps-data/data/tiger.html>
- FEMA - Federal Emergency Management Association
 - <https://www.fema.gov/national-flood-hazard-layer-nfhl>
- USGS - United States Geological Survey
 - <https://www.usgs.gov/products/maps/gis-data>
- Geo.Data.gov
 - <https://www.data.gov/geospatial/>
- ESRI's ArcGIS Online - Forest Service Page
 - <https://usfs.maps.arcgis.com/home/index.html>
- USFS Enterprise Data Warehouse SharePoint
 - <https://ems-team.usda.gov/sites/fs-cio-edwts/default.aspx>





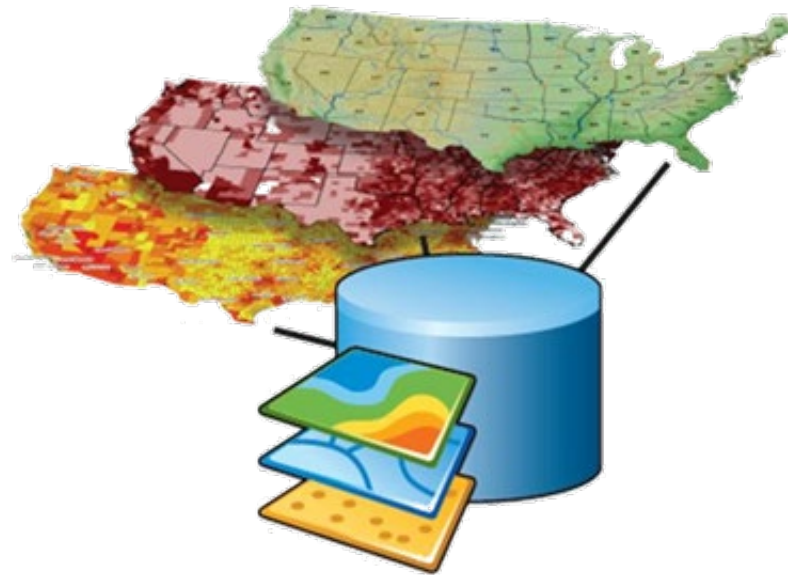
Conclusion on Geodatabases

- Centralized GIS data management
- Continuous sets of features
- Advanced feature geometry (X, Y, Z & M values)
- Feature Subtypes
- Flexible rule-based topology
- More accurate data editing
- Feature linked annotation
- Geometric networks
- Linear referencing
- Versioning
- Disconnected editing





Demonstration





United States Department of Agriculture

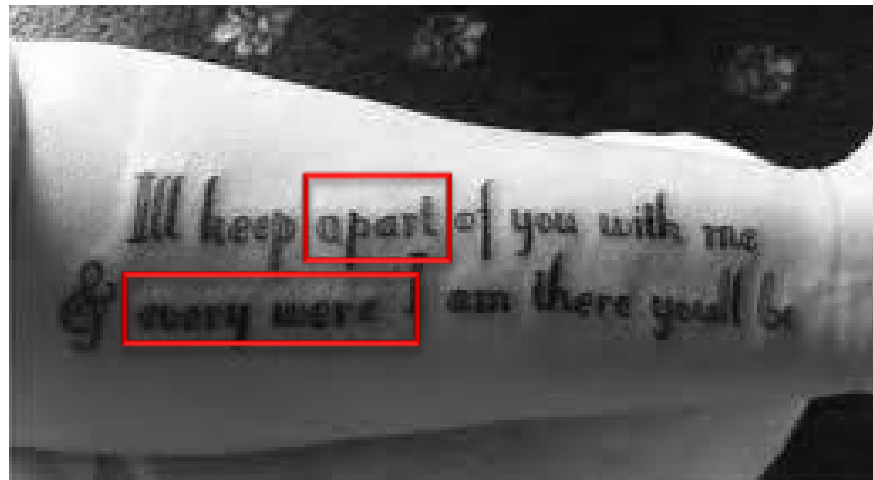
Attribute Domains



Forest Service



Have you ever made a mistake when editing an attribute table?





Overview

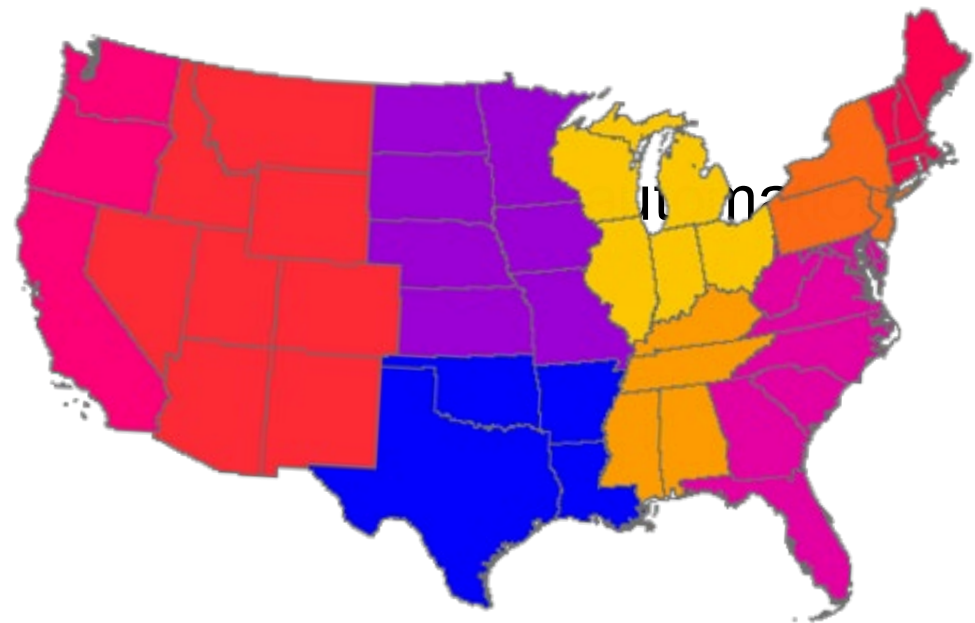
- Subtypes
- Attribute domains
 - Coded Values
 - Range
- Attribute validation
- Creating subtypes and attribute domains in ArcCatalog
- Associating domains with tables and feature classes
- Editing data with domains
- Geodatabase Schemas





Subtypes

- Organizes data into categories
- Ensures accuracy of attributes
- Feature class must reside in a geodatabase
- Improves performance
- Faster editing
 - Preset attributes allows for data entry





Attribute Domain

- A list of values for an attribute
- Owned by the geodatabase where it exists
- Attribute domains help prevent data errors by providing:
 - List of attributes for an editor to select
 - Ability to validate edits
- Domains can be shared with other features classes in the same geodatabase

When editing attributes pointing to an attribute domain, only those values stored in the attribute domain can be used



Coded Value Domain

- Coded Value Domain
 - Coded values with matching descriptions
 - FS = Forest Service
 - BLM = Bureau of Land Management
 - PVT = Private Land
 - Codes are stored in the geodatabase

Domain Name	Description
dom_SMALeasableMinEn	Leasable Mineral Entry
dom_SMALocatableMinE	Locatable Mineral Entry
dom_SMAOHVDesig	OHV Designation
dom_SMASalableMinEntr	Salable Mineral Entry
dom_SMASFP	Special Forest Products
dom_SMAStatus	Status
dom_VRMgtClass	VRM Management Class
SMAName	SMAName

Domain Properties:

Field Type	Text
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
VRM 1	VRM 1 Preserve the existing landscape
VRM 2	VRM 2 Retain the existing landscape
VRM 3	VRM 3 Partially retain existing character of the land
VRM 4	VRM 4 Allows for major modifications of existing c
No VRM	No Inventoried VRM

CODES

DESCRIPTIONS

VRM Managed Label	VRM Managed Class
VRM 1	VRM 1 Preserve the existing landscape
VRM 2	VRM 2 Retain the existing landscape
VRM 3	VRM 3 Partially retain existing character of the landscape
VRM 4	VRM 4 Allows for major modifications of existing character of the landscape



Coded Value Domain

- Coded Value Domain
 - Coded values with matching descriptions
 - FS = Forest Service
 - BLM = Bureau of Land Management
 - PVT = Private Land
 - Codes are stored in the geodatabase
 - Field types allowed: Integer, Float, Text and Date

CODES		DESCRIPTIONS	
VRM Managed Label		VRM Managed Class	
VRM 1		VRM 1 Preserve the existing landscape	▼
VRM 2		<Null>	
VRM 3		VRM 1 Preserve the existing landscape	
VRM 4		VRM 2 Retain the existing landscape	
		VRM 3 Partially retain existing character of the landscape	
		VRM 4 Allows for major modifications of existing character of the landscape	
		No Inventoried VRM	

Range Domain

- Range Domain
 - Range of numbers
 - Minimum and maximum usable values
 - Example: 0 thru 5
 - Field types allowed: Integer, Float, Double and Date
 - Validated with the Validate Features Command

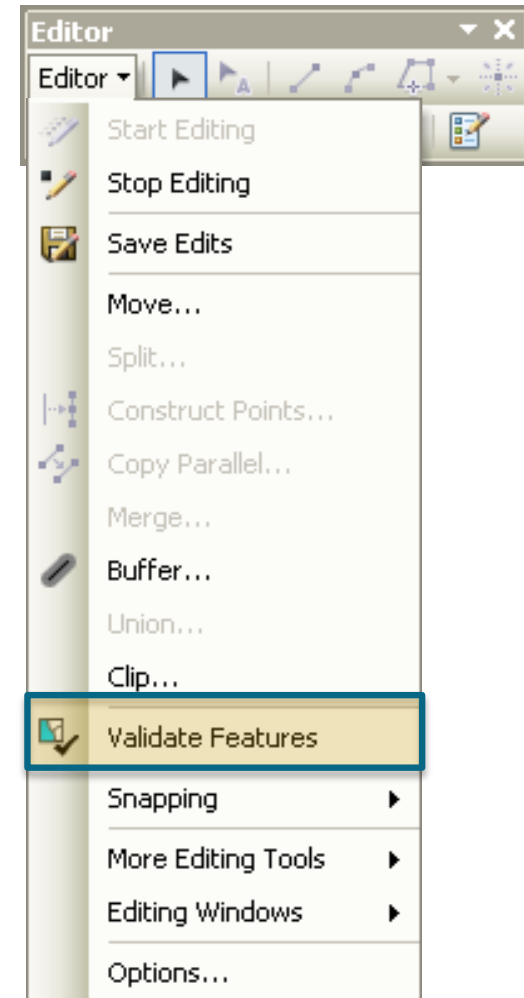
Domain Properties	
Field Type	Short Integer
Domain Type	Range
Minimum value	0
Maximum value	5
Split policy	Duplicate
Merge policy	Default Value

CODES		DESCRIPTIONS	RANGE of VALUES
VRM Managed Label	VRM Managed Class		VRM Managed Number
VRM 1	VRM 1 Preserve the existing landscape		1
VRM 2	VRM 2 Retain the existing landscape		2
VRM 3	VRM 3 Partially retain existing character of the landscape		3
VRM 4	VRM 4 Allows for major modifications of existing character of the landscape		4

Validate Features Command

- Can validate features existing in:
 - Geodatabase tables, feature classes
- Validates
 - Domains
 - Subtypes
 - Relationship classes
- Does not validate manual attribute entries
- Does not validate topology

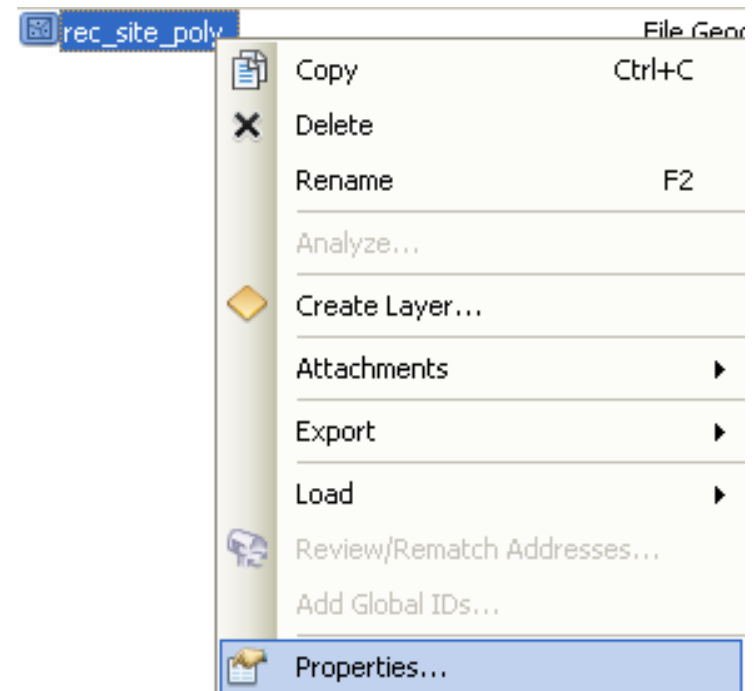
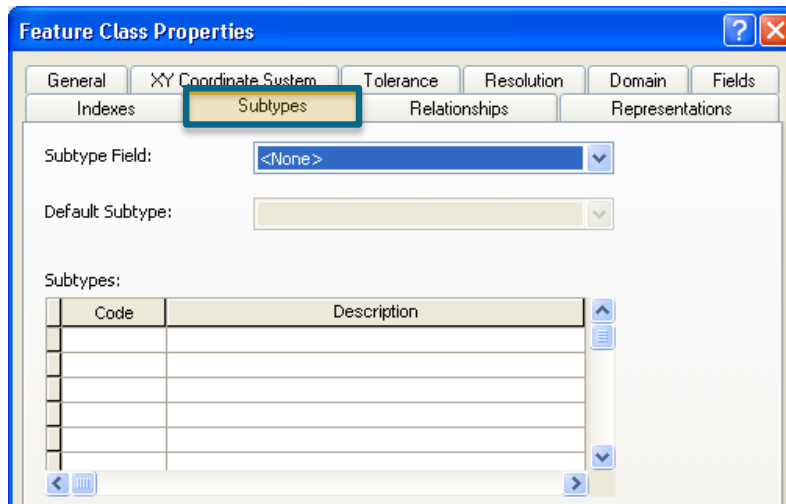
NOTE: Invalid attributes from LEGACY data will not be identified as errors, even if the attribute does not exist in the referenced domain



Creating Subtypes

- From ArcCatalog

1. Right-click the feature class or table to which you want to add subtypes
2. Select Properties
3. Select the Subtypes tab



Creating Subtypes

1. Right-click the feature class or table to which you want to add subtypes
2. Select Properties
3. Select the Subtypes tab
4. Select the field to which you are adding a subtype from the Subtype Field drop-down arrow

The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' dropdown is open, showing a list of fields including '<None>', 'CmpStsNum', 'CmpStsRVTrlNum', 'CmpStsShelterNum', 'CmpStsTentNum', 'GpCmpStsNum', 'GpPcncSiteNum', 'PcncSiteNum', 'ResCmpStsNum', and 'RVTrlUpTo'. The 'Default Subtype' is set to '<None>'. Below, the 'Subtypes' table is empty. At the bottom, the 'Default Values and Domains' table lists fields and their domains.

Field Name	Default Value	Domain
RecSiteName		
RecSiteLabel		
UseType		dom_RSUseType
RecType		dom_RSRecType
DevStatus		dom_RSDevStatus
DevLevel		dom_RSDevLevel

Creating Subtypes

1. Right-click the feature class or table to which you want to add subtypes
2. Select Properties
3. Select the Subtypes tab
4. Select the field you are adding a subtype from the Subtype Field drop-down arrow
5. Enter a Code and Description for each subtype
6. Enter a default value
7. Select a domain from the Domain dropdown
8. Click Apply and Okay

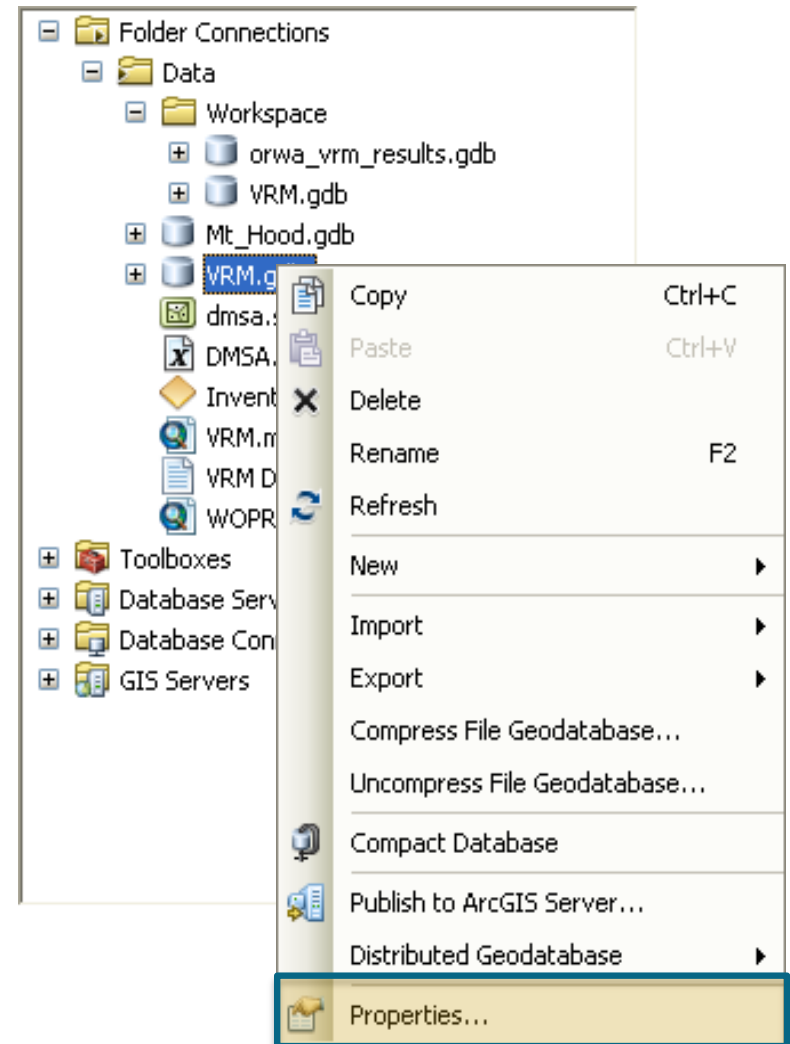
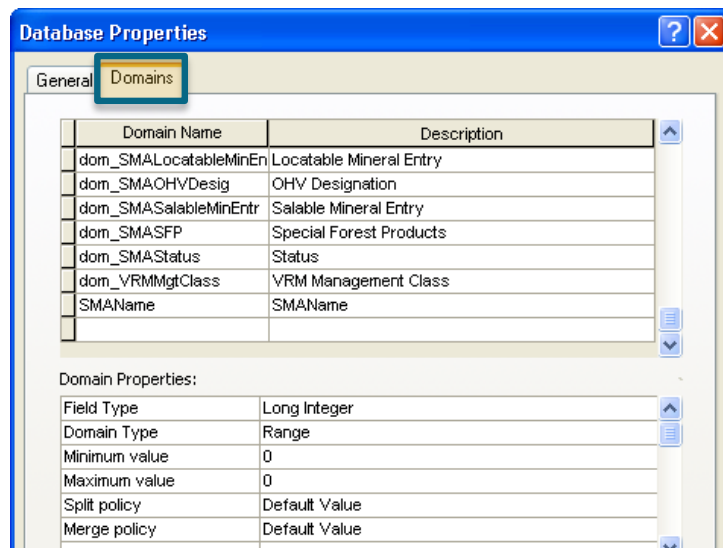
The screenshot shows the 'Feature Class Properties' dialog box with the 'Subtypes' tab selected. The 'Subtype Field' is set to 'CmpStsTentNum' and the 'Default Subtype' is '0 Campsites'. Below this is a table for defining subtypes with columns 'Code' and 'Description'. The table contains six rows with codes 0 through 5, all with the description 'Campsites'. At the bottom, there is a section for 'Default Values and Domains' with a table listing fields and their default values and domains. The 'ResCmpStsNum' field is highlighted, showing a default value of 0 and a domain of 'dom_RSNum'. Other fields listed include CmpHost, ResCabin, ResGpCmpSts, ResPcncSite, and ResGpPcncSite, each with their respective default values and domains.

Code	Description
0	0 Campsites
1	1 Campsite
2	2 Campsites
3	3 Campsites
4	4 Campsites
5	5 Campsites

Field Name	Default Value	Domain
CmpHost	No	dom_RSHost
ResCmpStsNum	0	dom_RSNum
ResCabin		
ResGpCmpSts		dom_RSNum
ResPcncSite		dom_RSYesNo
ResGpPcncSite		dom_RSYesNo

Creating Attribute Domains

- From ArcCatalog
 1. Right-click the geodatabase
 2. Click Properties
 3. Select the Domains tab



Creating Attribute Domains

- From ArcCatalog

1. Right-click the geodatabase
2. Click Properties
3. Select the Domains tab
4. Enter a Domain Name and Description
5. Select the correct Field Type
6. Choose a Domain Type

The screenshot shows the 'Database Properties' dialog box with the 'Domains' tab selected. It contains a table of existing domains and a section for defining a new domain.

Domain Name	Description
dom_SMALocatableMinEn	Locatable Mineral Entry
dom_SMAOHVDesig	OHV Designation
dom_SMASalableMinEntr	Salable Mineral Entry
dom_SMASFP	Special Forest Products
dom_SMAStatus	Status
dom_VRMMgtClass	VRM Management Class
SMAName	SMAName
dom_VRM	VRM Management Areas

Domain Properties:

Field Type	Long Integer
Domain Type	Range
Minimum value	Range
Maximum value	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

Buttons: OK, Cancel, Apply

Creating Attribute Domains

Database Properties

General Domains

Domain Name	Description
dom_SMAOHVDesign	OHV Designation
dom_SMASalableMinEntr	Salable Mineral Entry
dom_SMASFP	Special Forest Products
dom_SMAStatus	Status
dom_VRMMgtClass	VRM Management Class
SMAName	SMAName
dom_VRM	VRM Management Areas

Domain Properties:

Field Type	Short Integer
Domain Type	Range
Minimum value	0
Maximum value	5
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description

**RANGE
DOMAIN**

Database Properties

General Domains

Domain Name	Description
dom_SMAOHVDesign	OHV Designation
dom_SMASalableMinEntr	Salable Mineral Entry
dom_SMASFP	Special Forest Products
dom_SMAStatus	Status
dom_VRMMgtClass	VRM Management Class
SMAName	SMAName
dom_VRM	VRM Management Areas

Domain Properties:

Field Type	Text
Domain Type	Coded Values
Split policy	Default Value
Merge policy	Default Value

Coded Values:

Code	Description
VRM 1	VRM 1 Preserve the existing landscape
VRM 2	VRM 2 Retain the existing landscape
VRM 3	VRM 3 Partially retain existing character of the land
VRM 4	VRM 4 Allows for major modifications of existing ch
0	No Inventoried VRM

**CODED VALUE
DOMAIN**

Associating domains with tables and feature classes

- From ArcCatalog
 1. Right-click the feature class select Properties
 2. Activate the Fields tab
 - a) Select the field name
 - b) Select domain name
 3. Click Apply and Ok

The screenshot shows the 'Fields' tab in ArcCatalog. The main table lists fields with their names and data types. The 'VRMILabel' field is selected. Below the table, the 'Field Properties' section is open, showing the 'Domain' property set to 'dom_VRM_Codes'.

Field Name	Data Type
OBJECTID	Object ID
Shape	Geometry
VRMinvenCI	Text
VRMILabel	Text
VRMINum	Short Integer
Shape_Length	Double
Shape_Area	Double

Click any field to see its properties.

Field Properties

Alias	VRMILabel
Allow NULL values	Yes
Default Value	
Domain	dom_VRM_Codes
Length	6

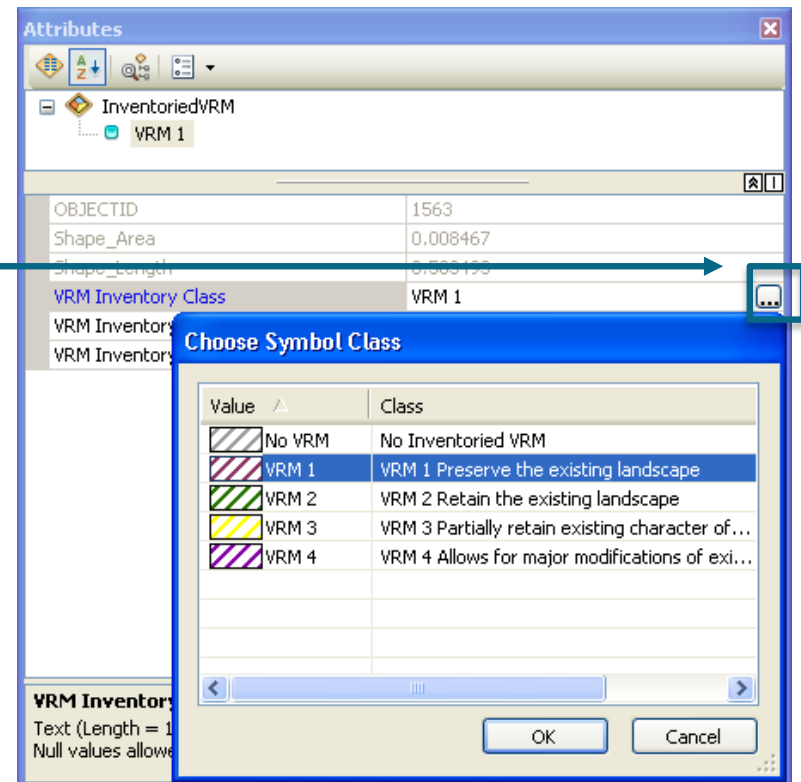
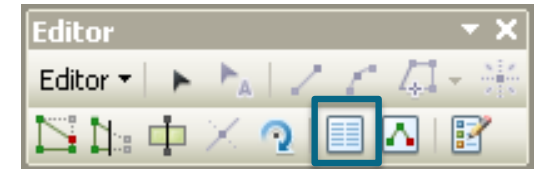
Import...

To add a new field, type the name into an empty row in the Field Name column, click in the Data Type column to choose the data type, then edit the Field Properties.

Editing attributes with domains

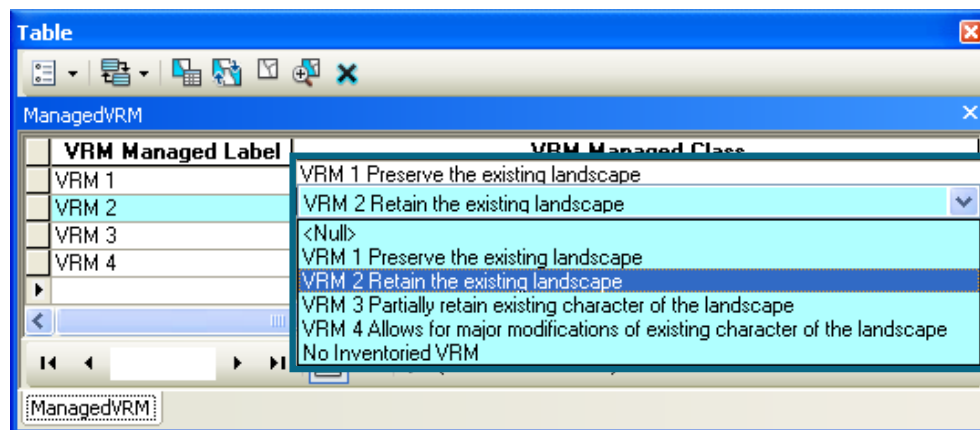
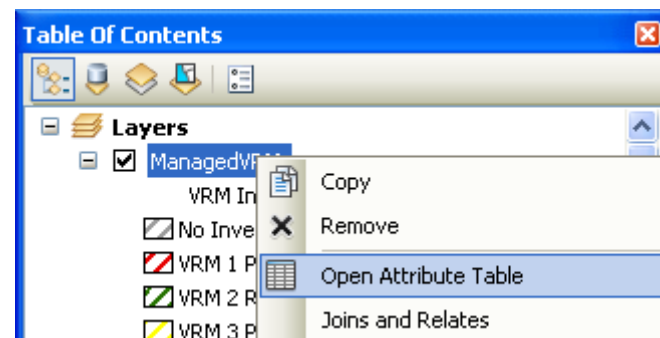
- From ArcMap (Attributes window)

1. Start an Edit session
2. Select the feature (or record) to edit
3. Open the attributes window then click the Choose Symbol Class icon
4. Select the appropriate attribute value from the domain list and click OK
5. Save your edits



Editing attributes with domains

- From ArcMap (Attribute Table)
 1. Start an Edit session
 2. Open the attribute table
 3. Select the appropriate attribute from the list of values
 4. Save your edits





Geodatabase Schemas

- A file storing information about the physical structure of a database.
 - Defines field names / attribute domains
 - Defines the integrity and behavior of a geodatabase
 - coordinate systems, topologies, relationship classes, domains, field names and types, etc...
 - Export Schema to a Geodatabase Workspace XML
 - Share geodatabase schema

```
<xs:complexType name="Field">
  <xs:sequence>
    <xs:element name="Name" type="xs:string"/>
    <xs:element name="Type" type="esriFieldType"/>
    <xs:element name="IsNullable" type="xs:boolean" minOccurs="0"/>
  </xs:sequence>
</xs:complexType>
```

- What to learn more:

http://downloads.esri.com/support/whitepapers/ao/XML_Schema_of_Geodatabase.pdf

Exporting a Geodatabase Schema

- From ArcCatalog

1. Right-click the Geodatabase and choose Export | XML Workspace Document...
2. Click Schema Only, specify a name and location for the XML file

This wizard lets you export data from this geodatabase to an XML workspace document file.

Exporting data from: C:\Training_Development\Geodatabase\attribute_domains\instrutor\Data\VRM.gdb

What do you want to export:

☐ Data

☒ Schema Only

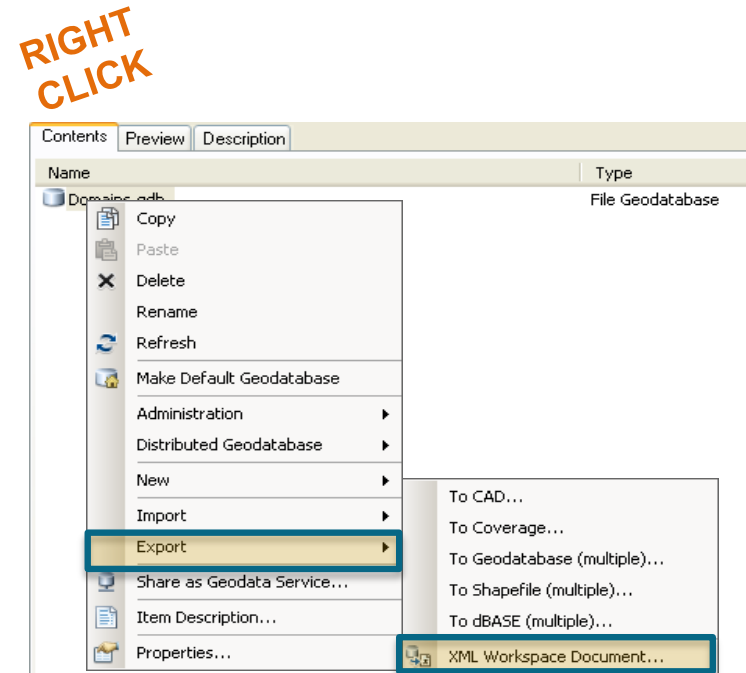
How do you want the geometry to be represented in the XML document:

☒ Binary (smaller)

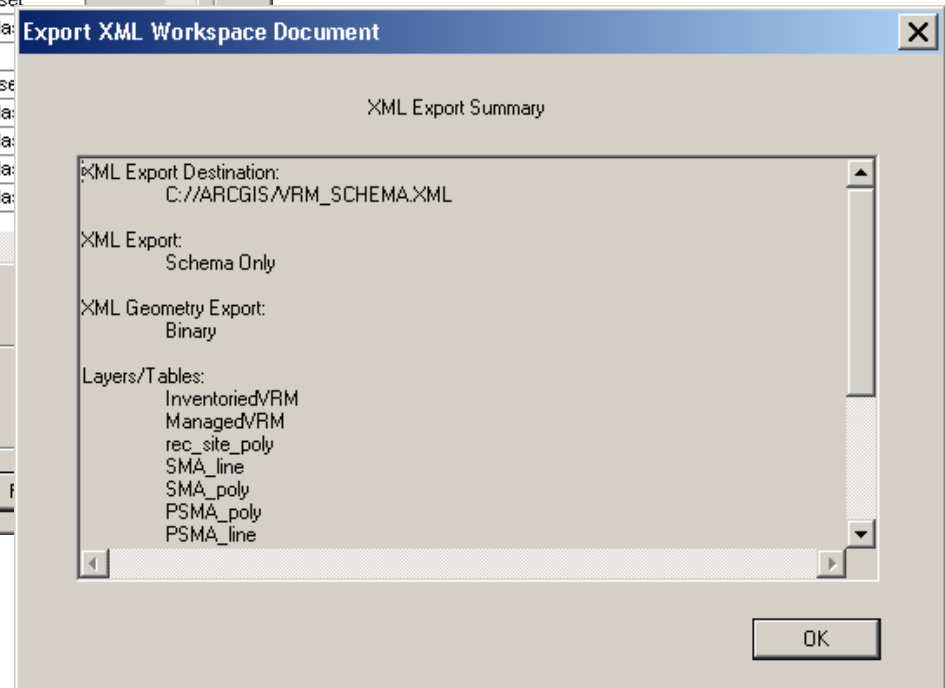
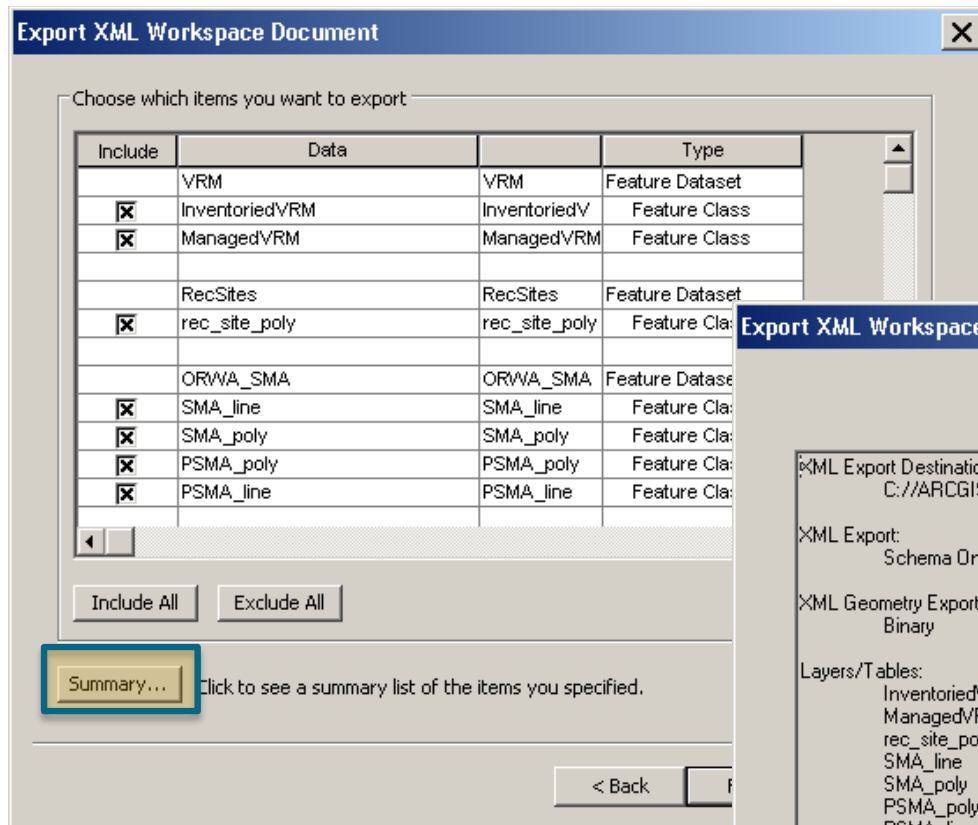
☐ Normalized (larger)

Specify the output XML file:

C:\Data\XMLeport.xml



Exporting a Geodatabase Schema

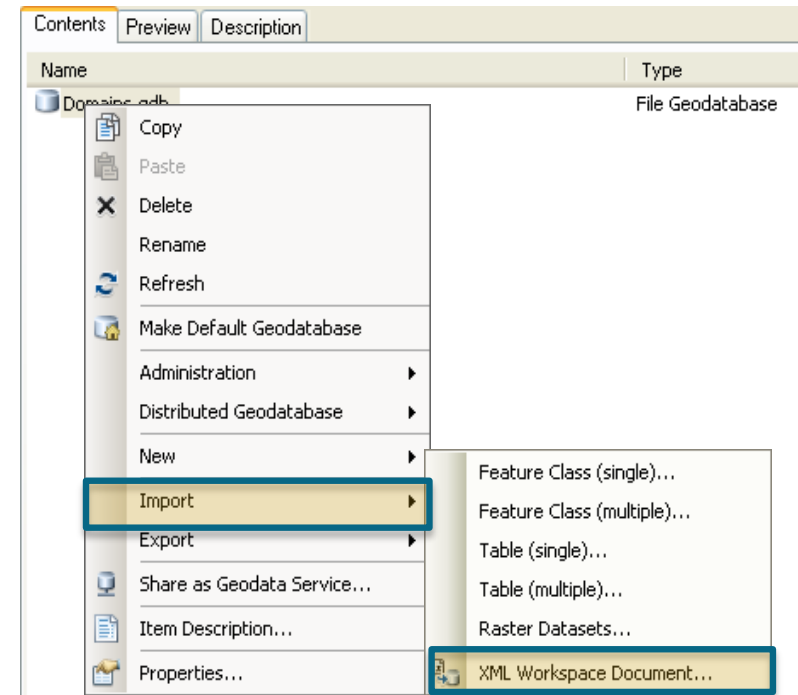


Importing a schema

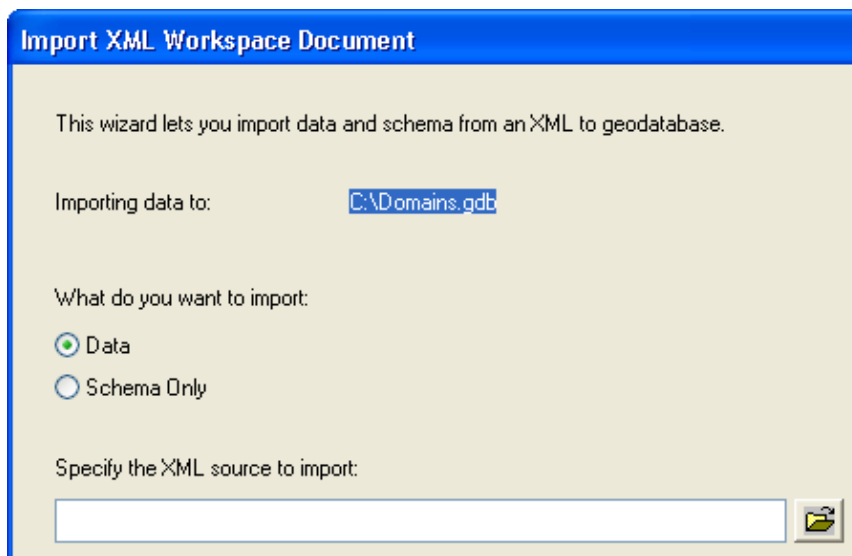
- From ArcCatalog

1. Right-click the Geodatabase and choose Import
2. Select XML Workspace Document...

RIGHT
CLICK



3. Select your choice of Data or Schema Only
4. Navigate to the XML file
5. Click OK





Data Management Toolset

Domains toolset

Tool	Description
Add Coded Value To Domain	Adds a value to a domain's coded value list.
Assign Domain To Field	Sets the domain for a particular field and, optionally, for a subtype. If no subtype is specified, the domain is only assigned to the specified field.
Create Domain	Creates an attribute domain in the specified workspace.
Delete Coded Value From Domain	Removes a value from a coded value domain.
Delete Domain	Deletes a domain from a workspace.
Domain To Table	Creates a table from an attribute domain.
Remove Domain From Field	Removes an attribute domain association from a feature class or table field.
Set Value For Range Domain	Sets the minimum and maximum values for an existing Range domain.
Sort Coded Value Domain	Sorts the code or description of a coded value domain in either ascending or descending order.
Table To Domain	Creates or updates a coded value domain with values from a table.

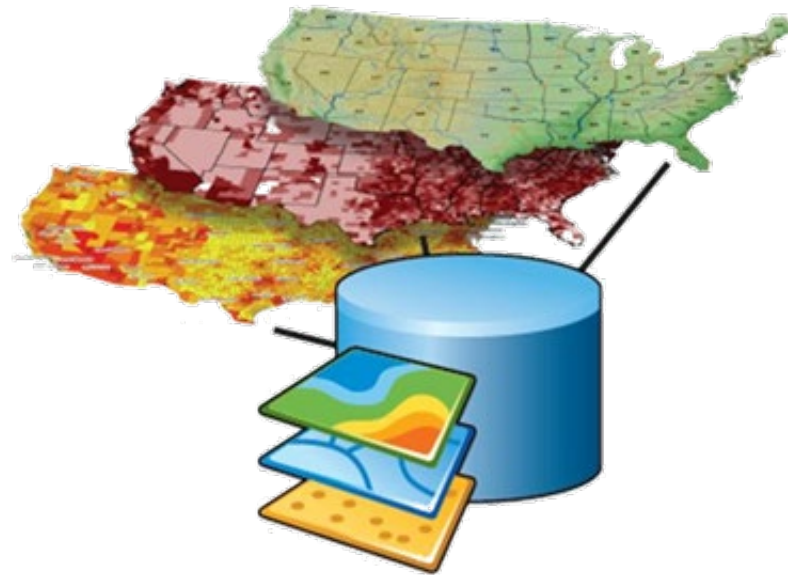
Subset Toolset

Tool	Description
Add Subtype	Adds a new subtype to the subtypes in the input table.
Remove Subtype	Removes a subtype from the input table using its code.
Set Default Subtype	Sets the default value or code for the input table's subtype.
Set Subtype Field	Defines the field in the input table or feature class that stores the subtype codes.





Demonstration





United States Department of Agriculture

Geodatabase Topology



Forest Service



Geodatabase Topology

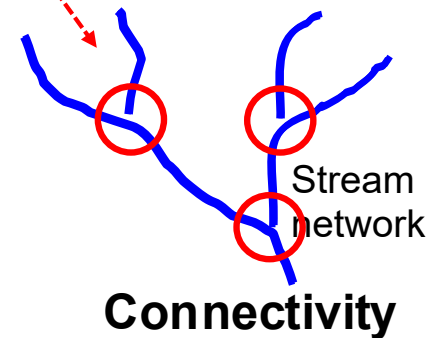
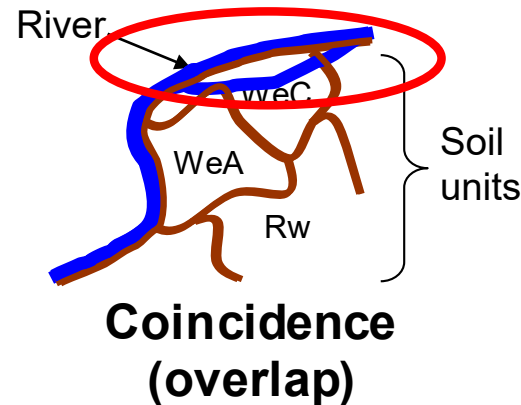
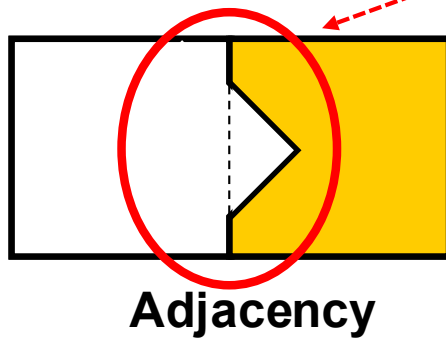
- Create Geodatabase Topology
 - What is topology?
 - Requirements of Geodatabase topology
 - Topology layer
 - Topology rules
 - Reporting and fixing topology errors





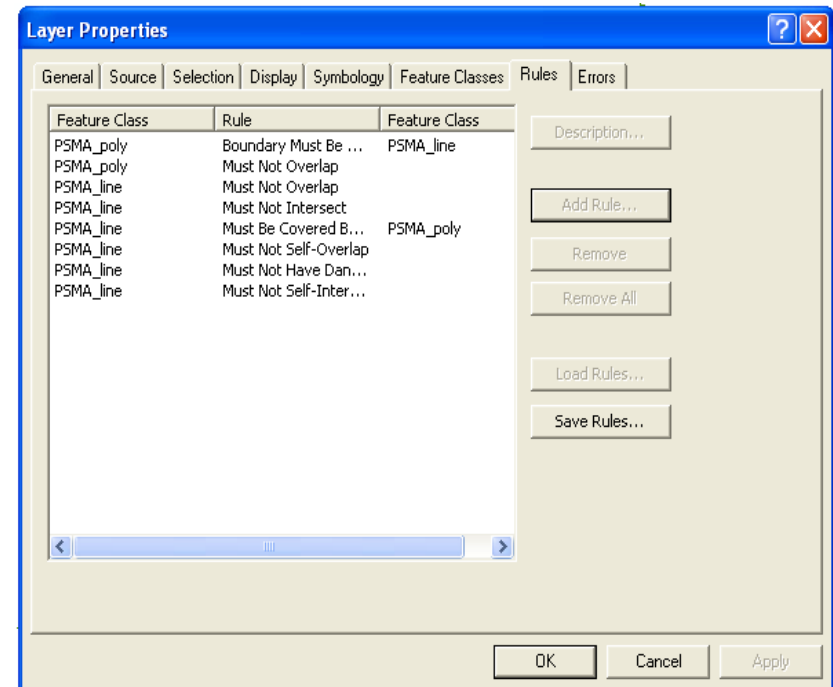
Topology

- Rules ensuring participating feature classes conform to a desired behavior
- How topology is used:
 - Data maintenance
 - Data construction
- Topology examples:



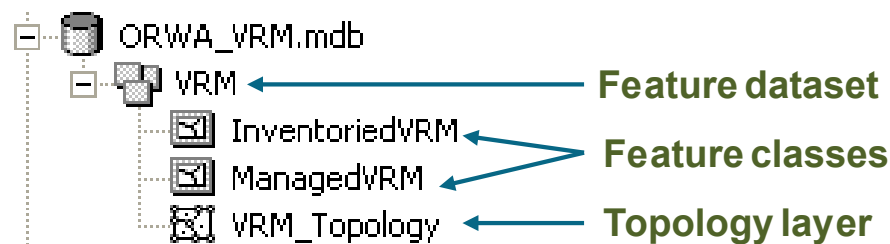
Geodatabase Topology

- Only applicable to geodatabases
- Stores topology rules outlining what features can/cannot do
- Flags topology errors, but does not fix them
- Does not prohibit any edits that break rules



Geodatabase Topology Requirements

- Geodatabase topologies only exist within feature datasets containing Topology layers
- Participating feature classes must have the same spatial reference
- You specify which feature classes participate in topology

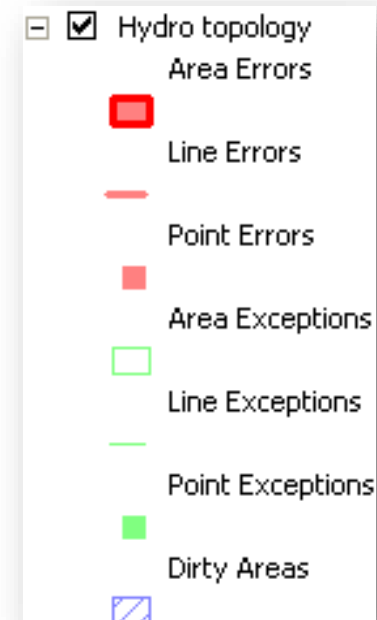


**ALL FEATURE CLASSES MANAGED BY A TOPOLOGY LAYER ARE
SIMULTANEOUSLY EDITED**

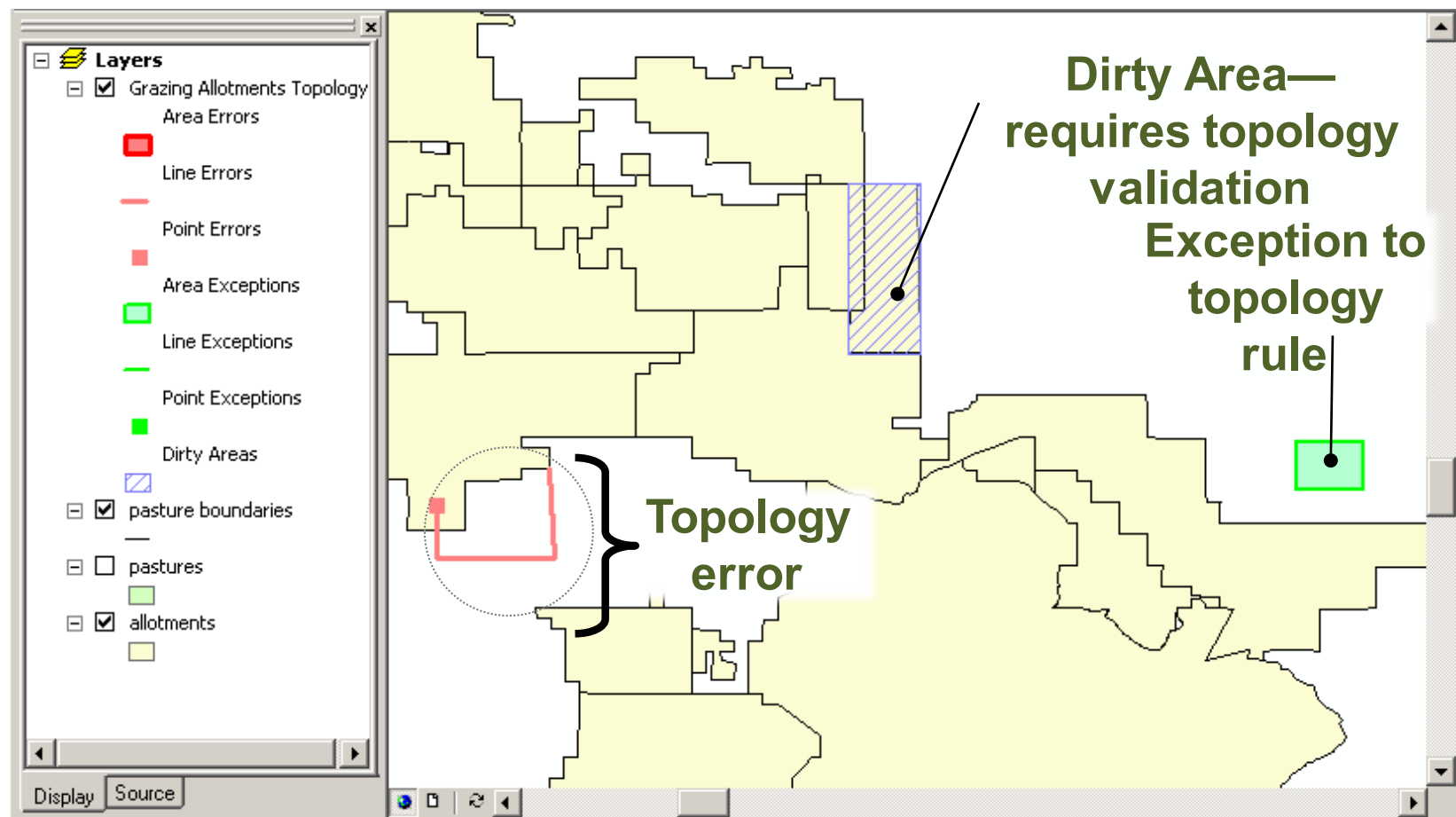


Topology Layer

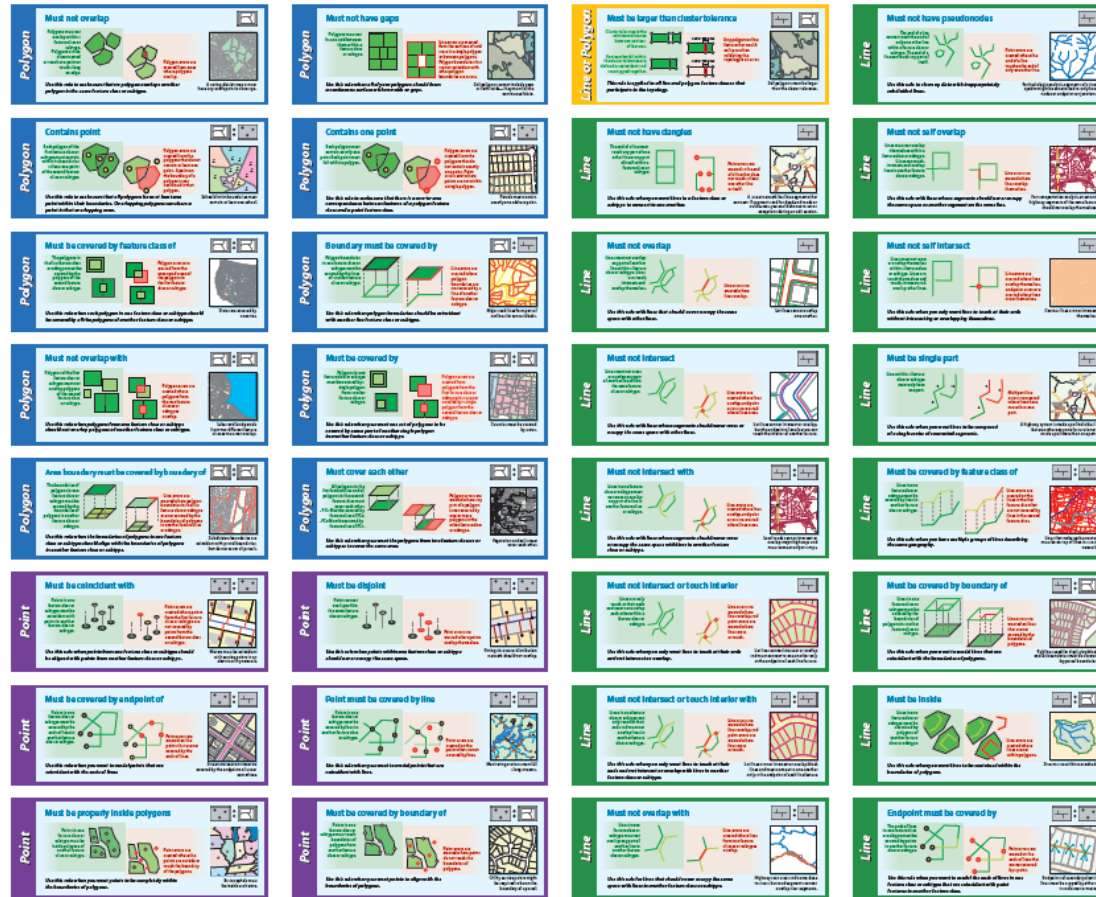
- Manages participating feature classes
- Stores
 - Rules - ensure that features conform to a specified behavior
 - Errors – violations of topology rules
 - Represented by red symbols
 - Exceptions - allow you to override the rules of a topology
 - Represented by green symbols
 - Dirty Areas – non-validated edits
 - Represented by blue diagonally hatched polygons
- Symbology of a Topology layer can be modified from the Layer Properties



How a Topology Layer Appears in ArcMap



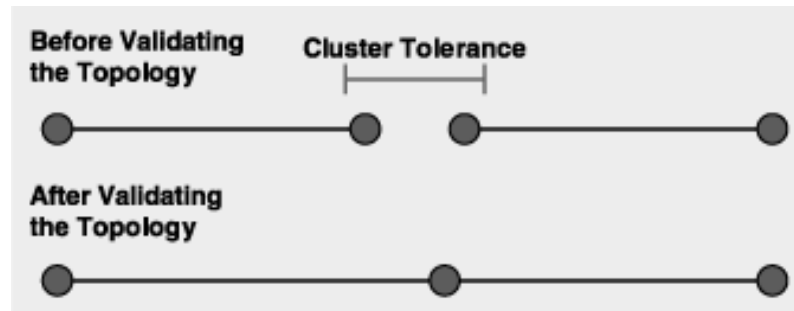
Topology Rules



http://resources.arcgis.com/en/help/main/10.1/01mm/pdf/topology_rules_poster.pdf

Automatic Rule: Cluster Tolerance

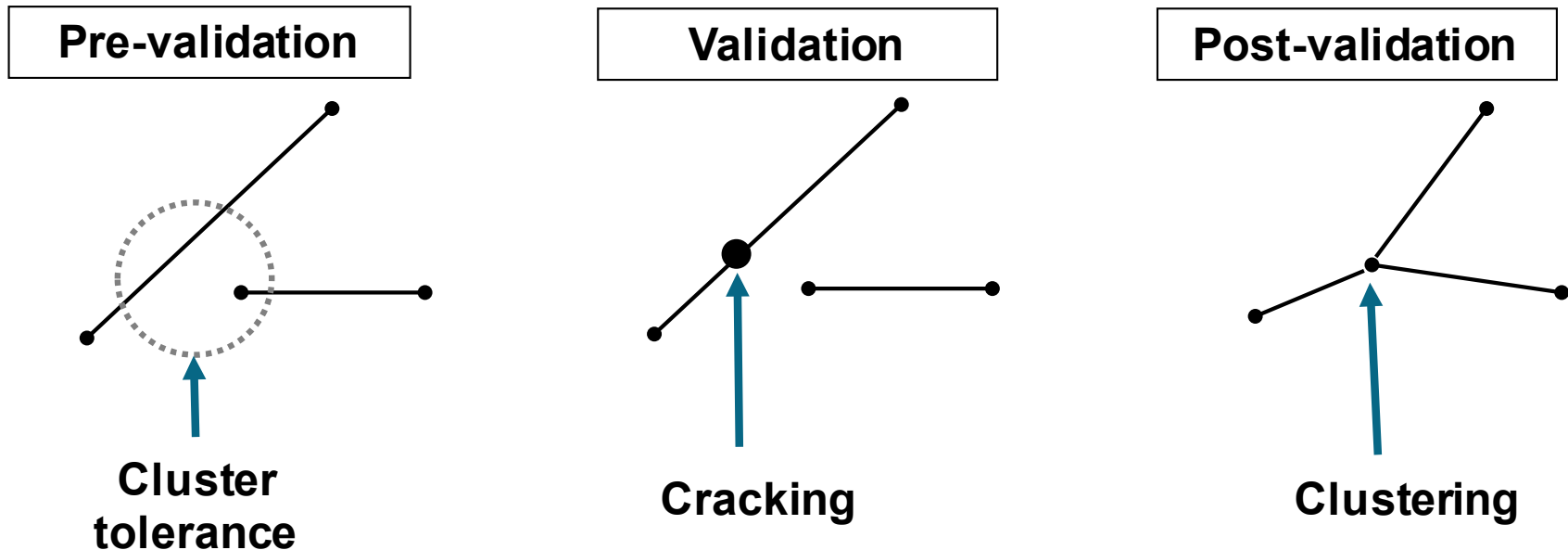
- Feature must be larger than Cluster Tolerance
- Applied during validation
- Vertices within the Cluster Tolerance snap together





Cluster Tolerance: Snapping

- Clustering: moving features to create coincident geometry
- Cracking: insertion of vertex to which other features snap



ONCE YOU SAVE YOUR EDITS, THE CRACKING PROCESS IS IRREVERSIBLE.

Ranks



- Controls snapping priority between FC's
- Ranking based on feature class's reliability
 - Assign higher ranks to less reliable data

New Topology

Each feature class in a topology must have a rank assigned to it to control how much the features will move when the topology is validated. The higher the rank, the less the features will move. The highest rank is 1.

Enter the number of ranks (1-50):

Specify the rank for a feature class by clicking in the Rank column:

Feature Class	Rank
 InventoriedVRM	1
 ManagedVRM	2



Topology Toolbar

- In geodatabase topology, use toolbar for
 - Editing topology elements
 - Validating topology
 - Find/fix topology errors



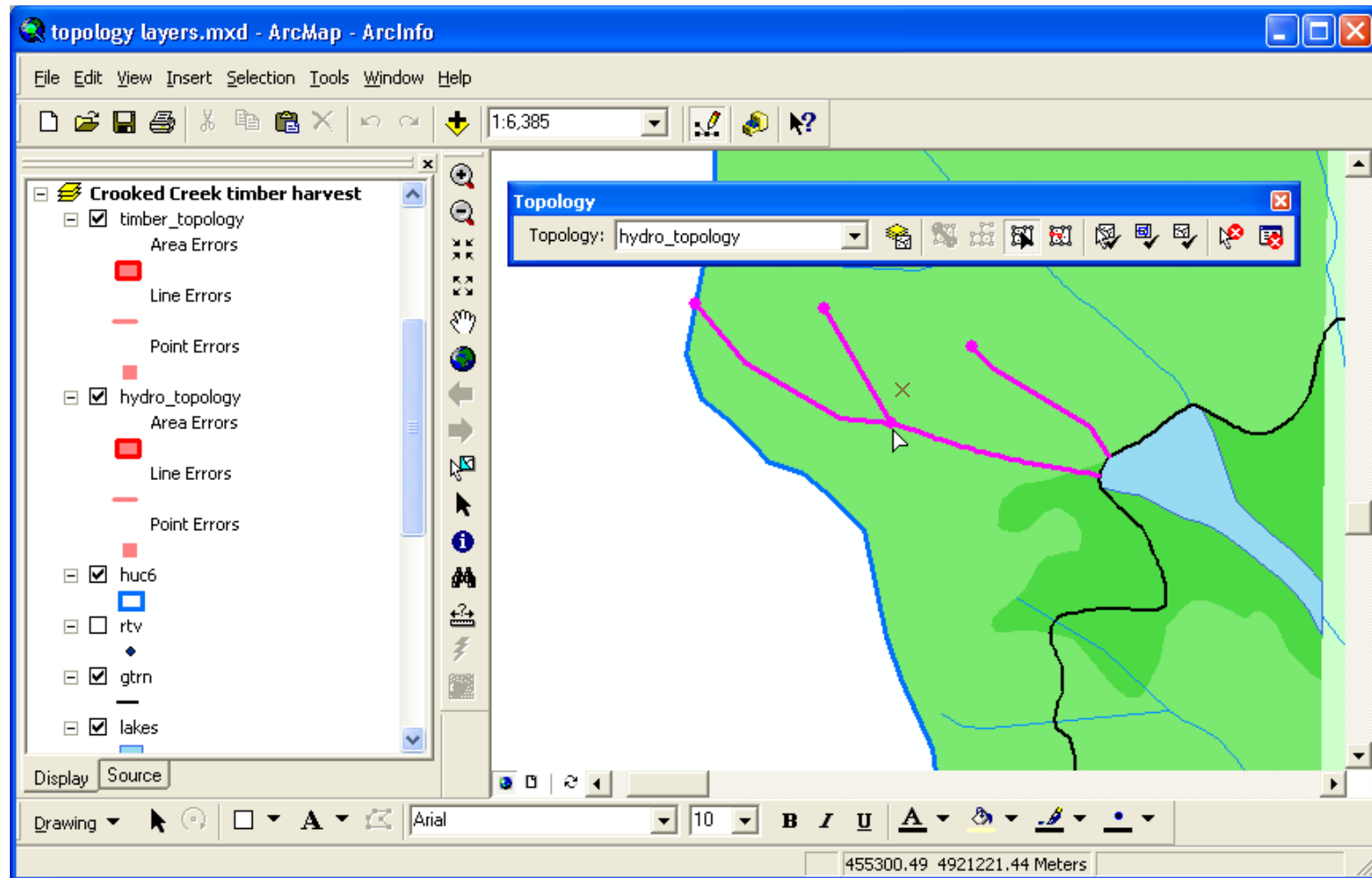
**Topology Edit
tool**

**Validation
tools**

**Report and
fix topology-
rule
violations**




Topology Edits

- Select edges, nodes, or vertices





Topology Validation

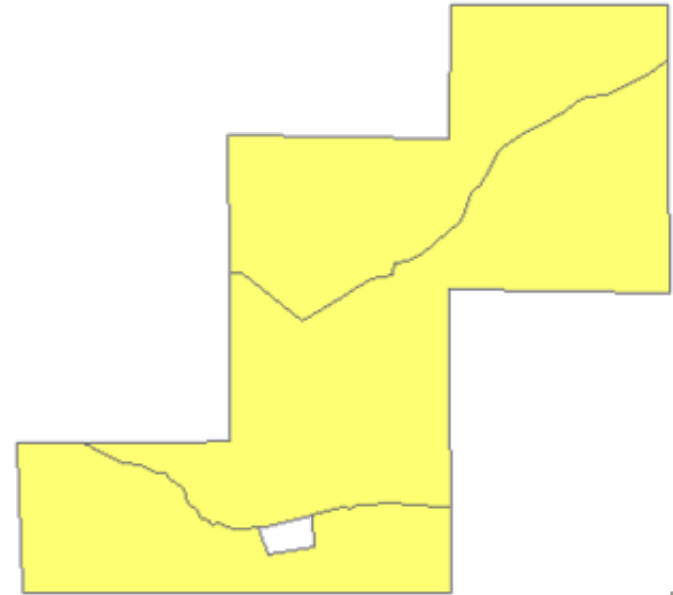
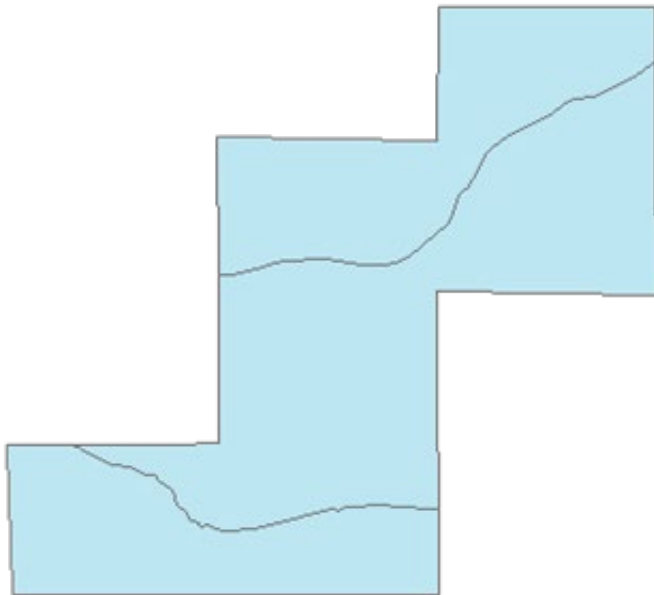
- Do feature modifications violate topology rules?
 - No, but the modification will create a dirty area
- Applies only to Dirty Areas of Topology layer
- Three ways to validate:
 - Validate User-Specified Area ()
 - Validate Current Extent ()
 - Validate Entire Topology ()
- Your edits are incomplete until...
 - Dirty Areas are validated
 - Topology errors corrected





Topology Errors

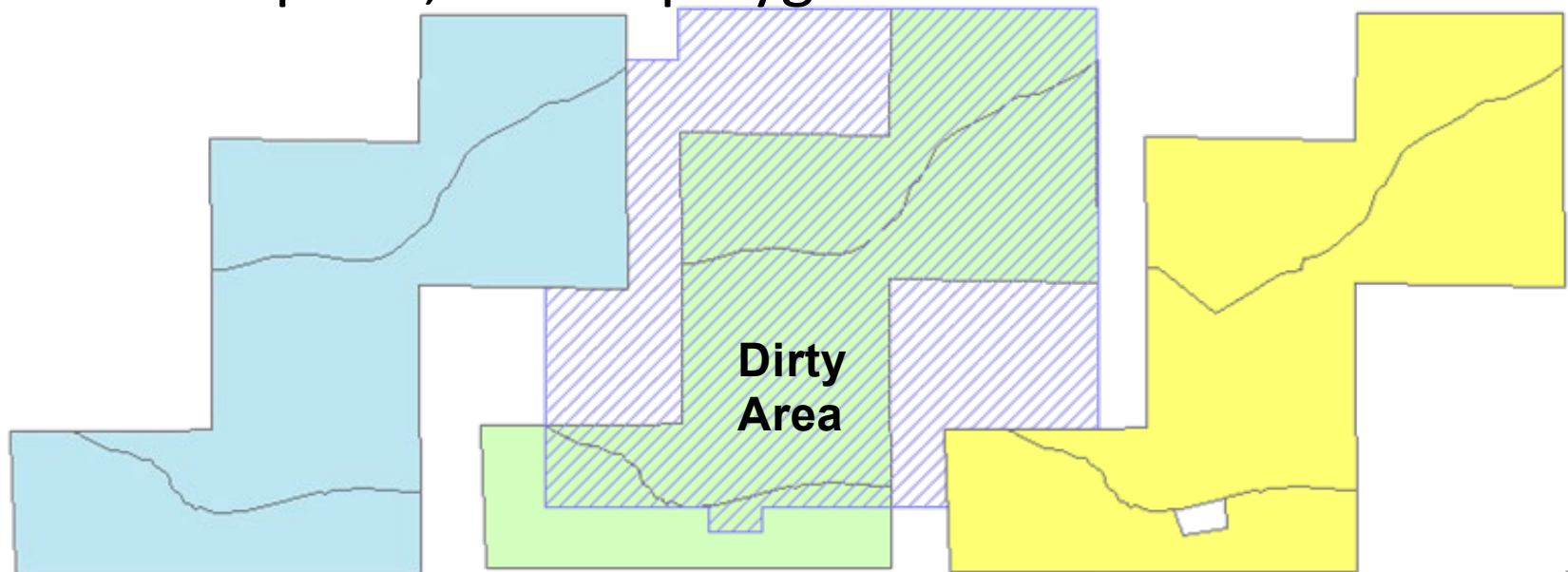
- Occur when topology rule is violated
- Error symbol drawn on map:
 - Red point, line or polygon





Topology Errors

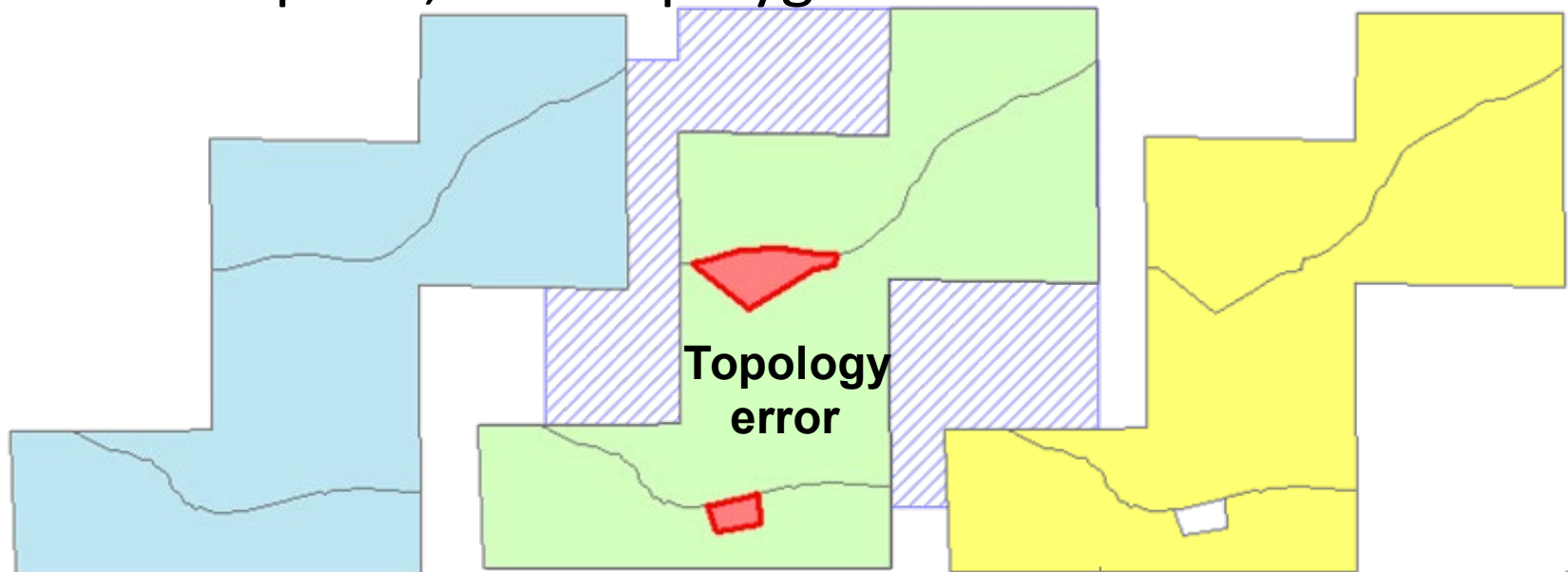
- Occur when topology rule is violated
- Error symbol drawn on map:
 - Red point, line or polygon






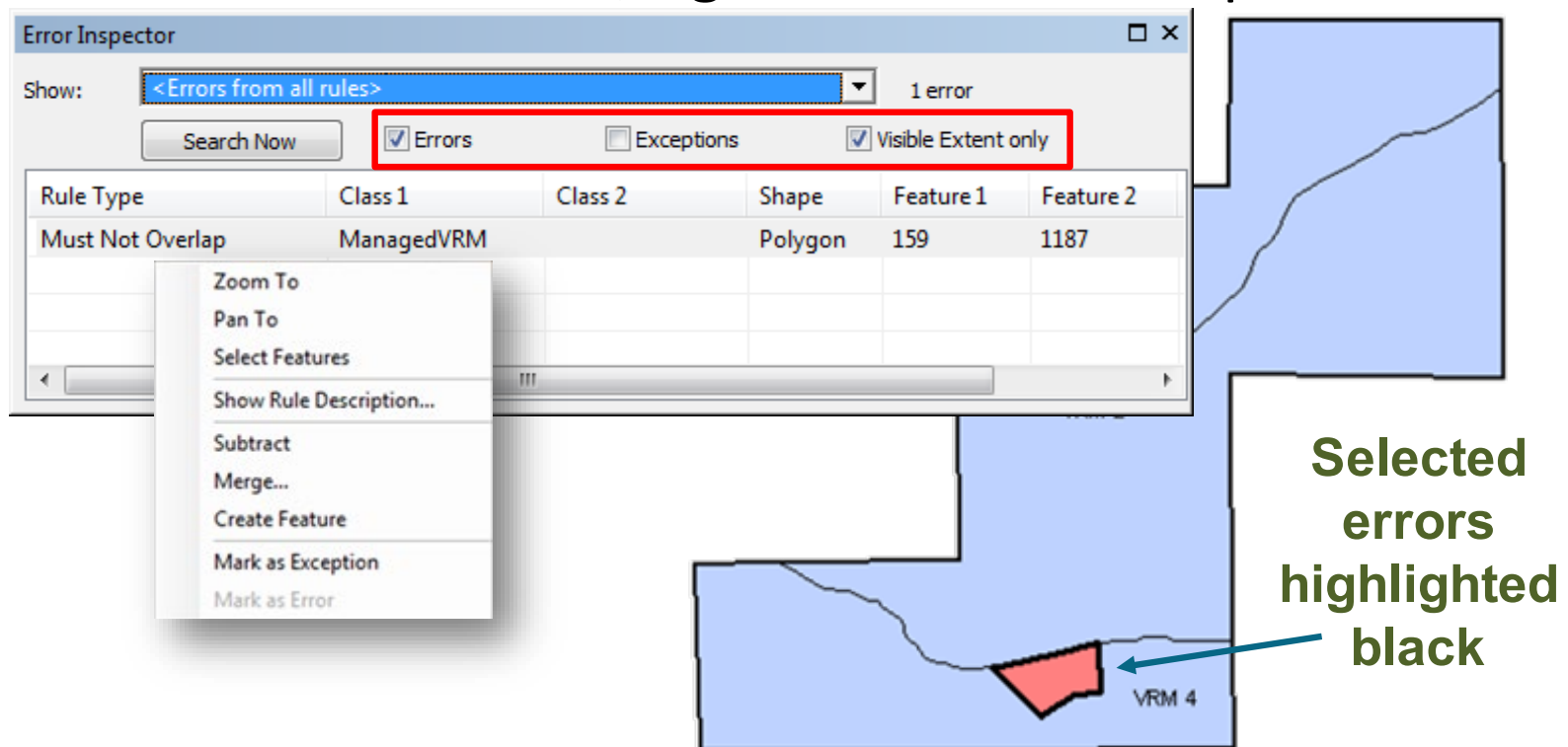
Topology Errors

- Occur when topology rule is violated
- Error symbol drawn on map:
 - Red point, line or polygon



Reporting Topology Errors

- Error Inspector button 
- Show all errors or just the errors for one topology rule
- Left click to select error; right click for more options




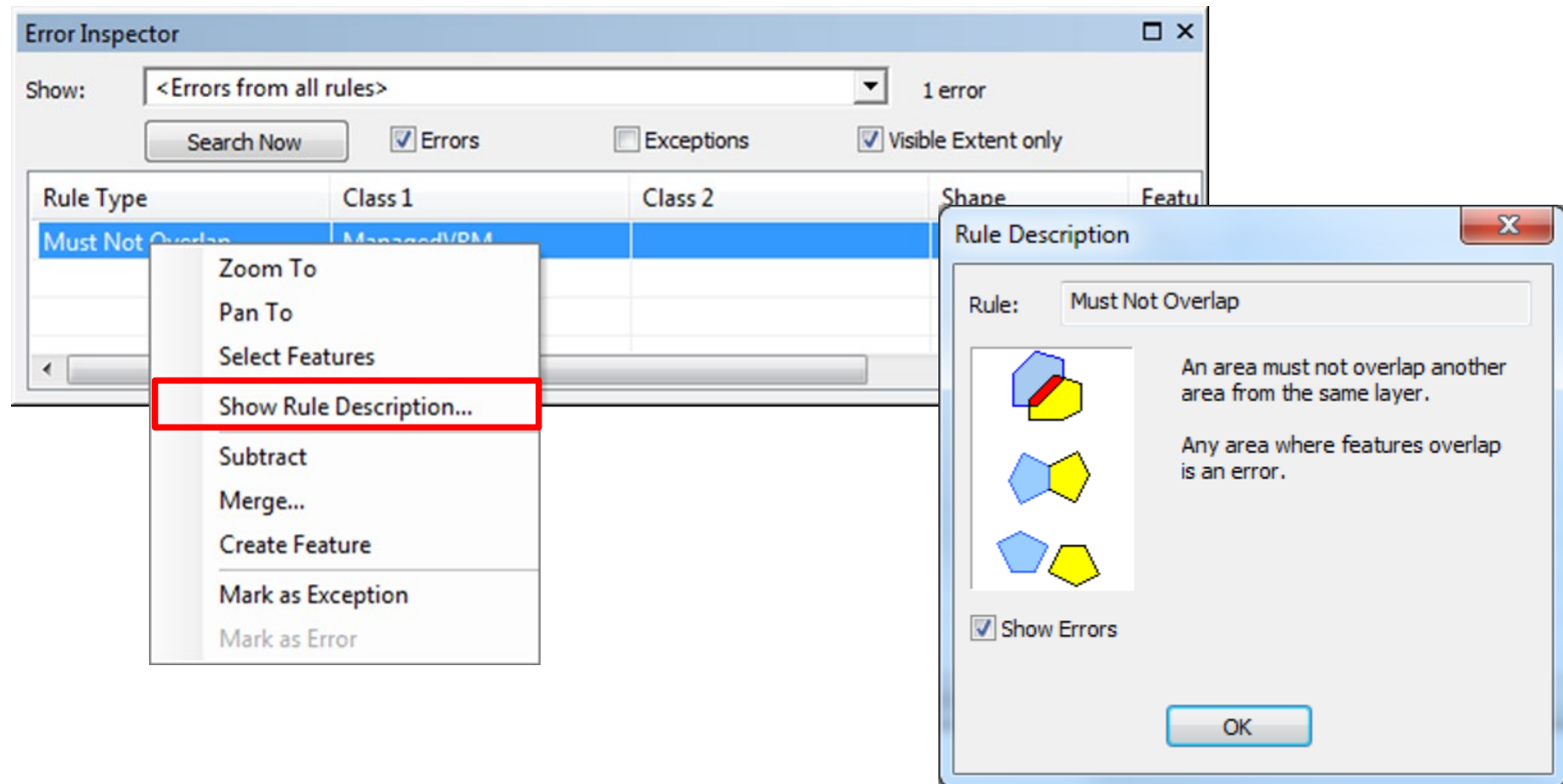
The screenshot shows the 'Error Inspector' window with the 'Show:' dropdown set to '<Errors from all rules>' and '1 error' displayed. The 'Errors' checkbox is checked, and the 'Visible Extent only' checkbox is also checked. A table lists the error details:

Rule Type	Class 1	Class 2	Shape	Feature 1	Feature 2
Must Not Overlap	ManagedVRM		Polygon	159	1187

A context menu is open over the table, showing options: Zoom To, Pan To, Select Features, Show Rule Description..., Subtract, Merge..., Create Feature, Mark as Exception, and Mark as Error. The map below shows a blue area with a red polygon labeled 'VRM 4' highlighted with a black border. A blue arrow points to this polygon with the text 'Selected errors highlighted black'.

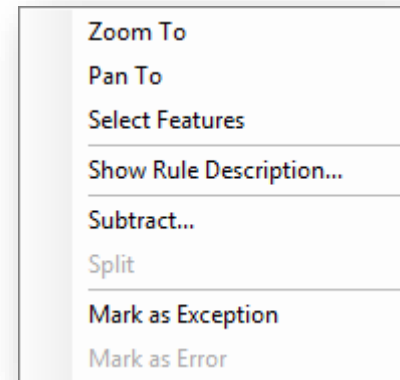
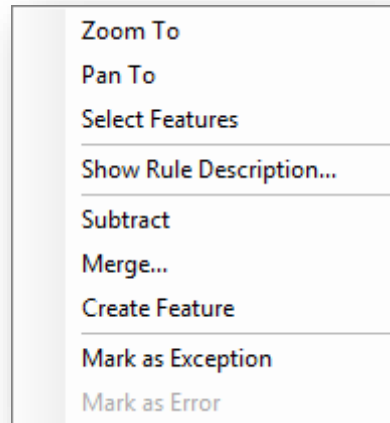
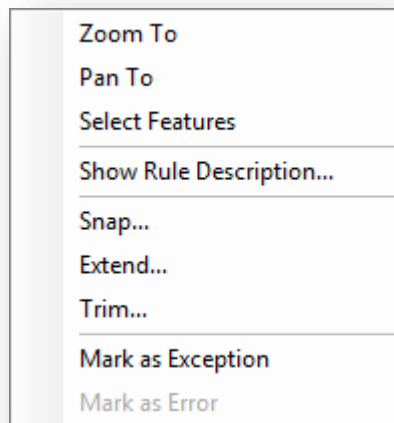
Interactively Selecting Topology Errors

- Fix Topology Error tool ()
 - Select topology error > right click on error to identify rule violation > correct error and re-validate



Correcting Topology Errors

- Option 1: Use functions provided with Topology tools



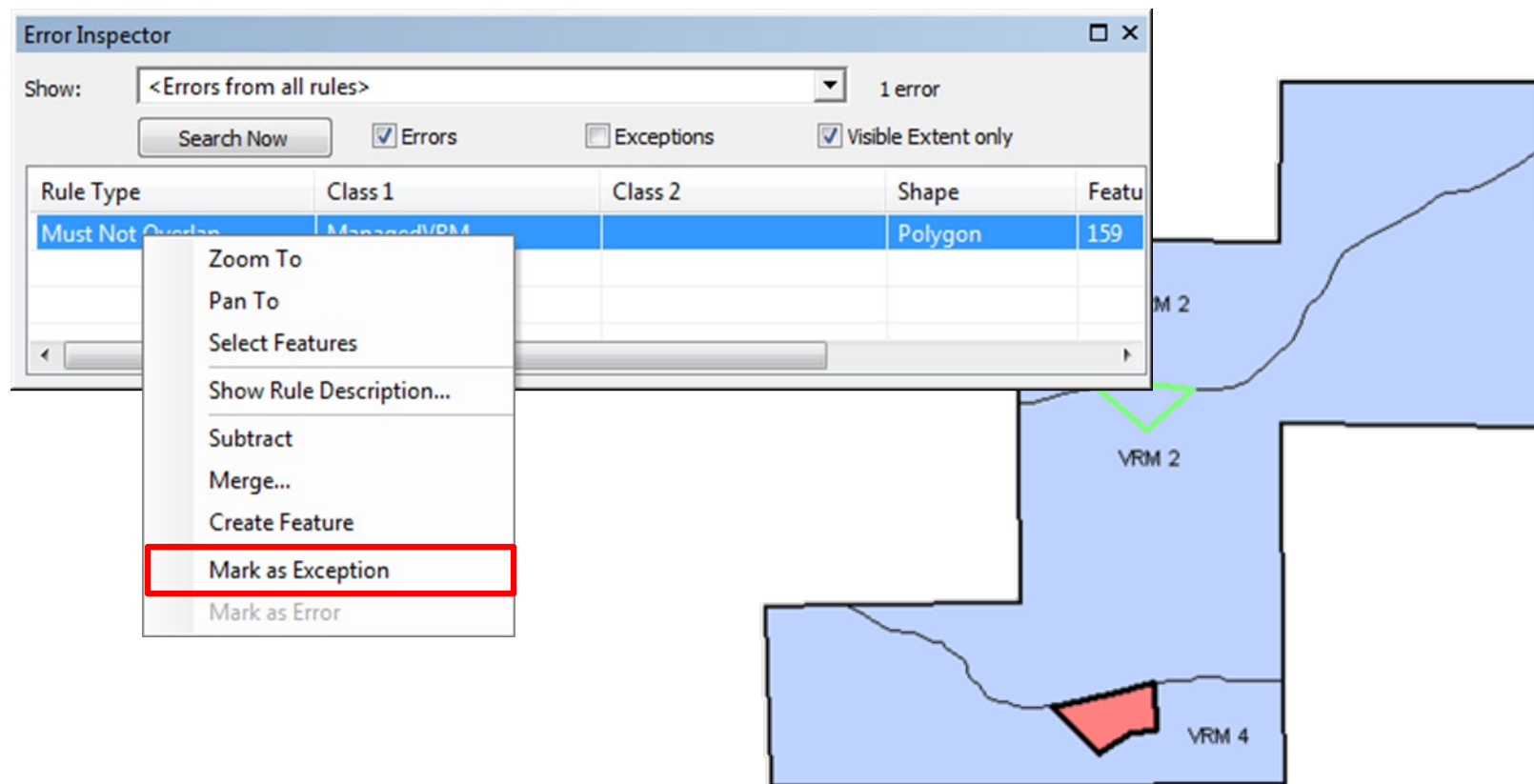
- Option 2: Manually edit problem features
- Option 3: Mark error as an exception



Auto-correction tools intended for SIMPLE fixes

Exceptions

- Method for by-passing a topology rule
- Exception applies only to selected topology error





Geodatabase Topology

- Create Geodatabase Topology
 - What is topology?
 - Requirements of Geodatabase topology
 - Topology layer
 - Topology rules
 - Reporting and fixing topology errors

Topology Help Files - Start > All Programs > ArcGIS > ArcGIS Desktop Help

ESRI Online Training - Creating and Editing Geodatabase Topology





Demonstration

