

CREATING & EDITING DATA

GIS Analysis | Winter 2016

What if I can't find perfect data?

- Edit existing data
 - ▣ Convert to another format (ArcMap conversion)
 - ▣ Sub-setting (definition query)
 - ▣ Update attributes (Open attribute table>start edit session>edit cell values>save edits>stop editing)

What if I can't find perfect data?

- Create your own data
 - ▣ GPS data collection
 - ▣ Digitizing (create features and add attributes)



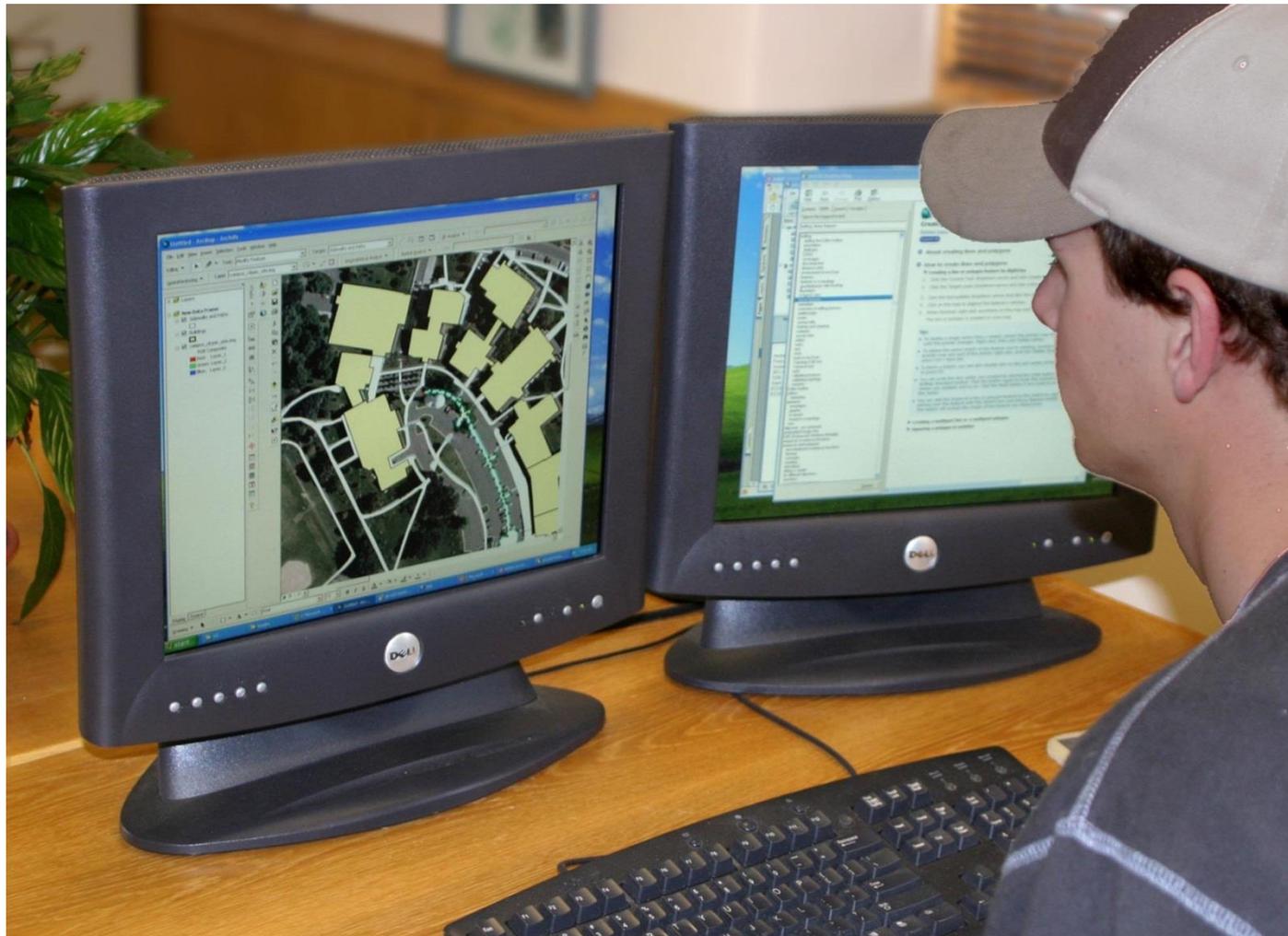
Creating data

Digitizing

Digitizing

- The process by which data from a map, image, or other hardcopy sources are converted into a digital format using GIS

On-screen (heads-up) digitizing. manually digitizing on a computer screen, using a digital image as a base



Hardcopy digitizing. capturing data from a paper or other hardcopy map using a digitizing surface and sensor



Why digitize?

- Lots of data that only exists in paper or hardcopy maps
- Humans are good at interpreting information contained on old maps
- Provides sufficiently accurate data
- Low cost investment

Digitizing - The Process

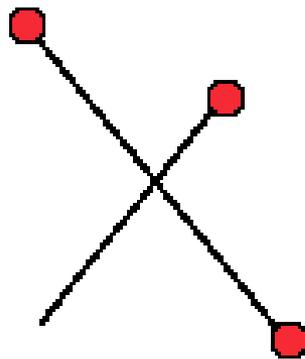
1. Display digital image on screen or place map on digitizing surface
2. Trace the location of feature boundaries
3. Repeat step 2 for every point, line, or polygon that needs to be captured

Modes of Digitizing

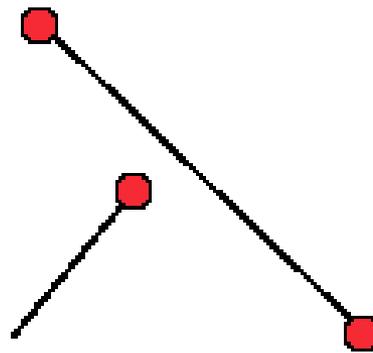
- **Point Mode.** Click a button to add each point (vertex or endpoint)
- **Stream Mode.** Points are automatically added at a fixed time or distance (can only be used for lines or polygons)

Digitizing Errors

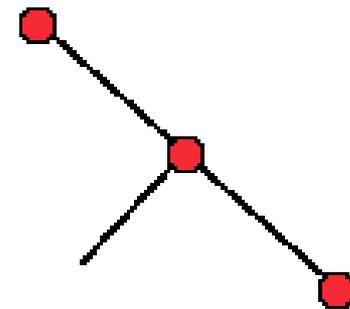
- **Undershoots.** Nodes that do not quite reach a line or another node
- **Overshoots.** Lines that cross over existing nodes or lines



Overshoot



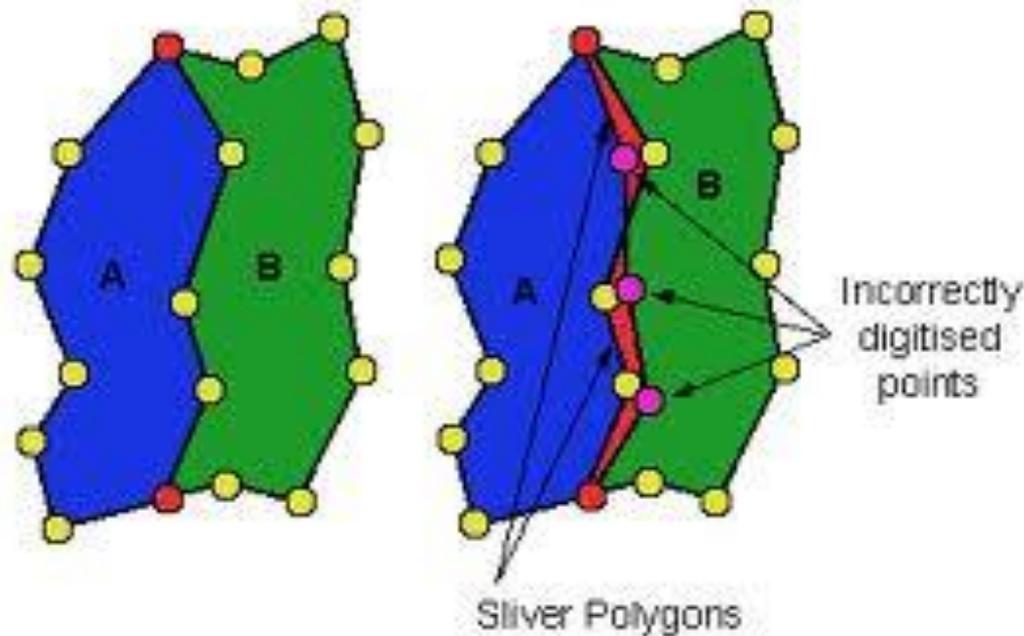
Undershoot



Correct

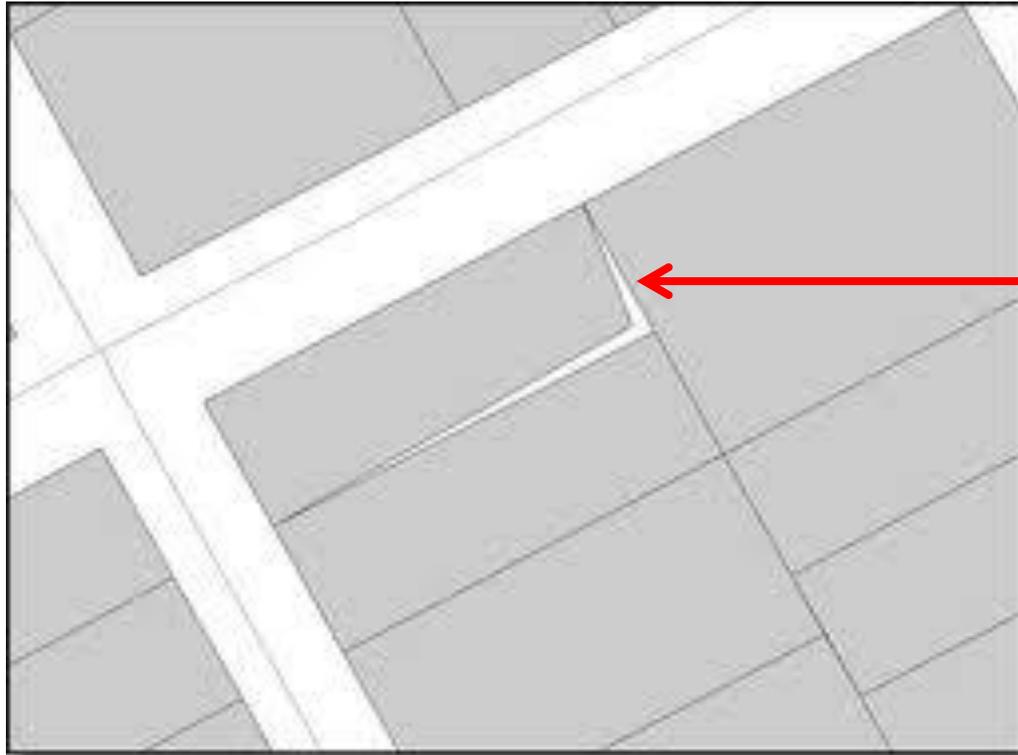
Digitizing Errors

- ❑ **Overlaps – Sliver Polygons.** Small, narrow polygons where polygons incorrectly overlap



Digitizing Errors

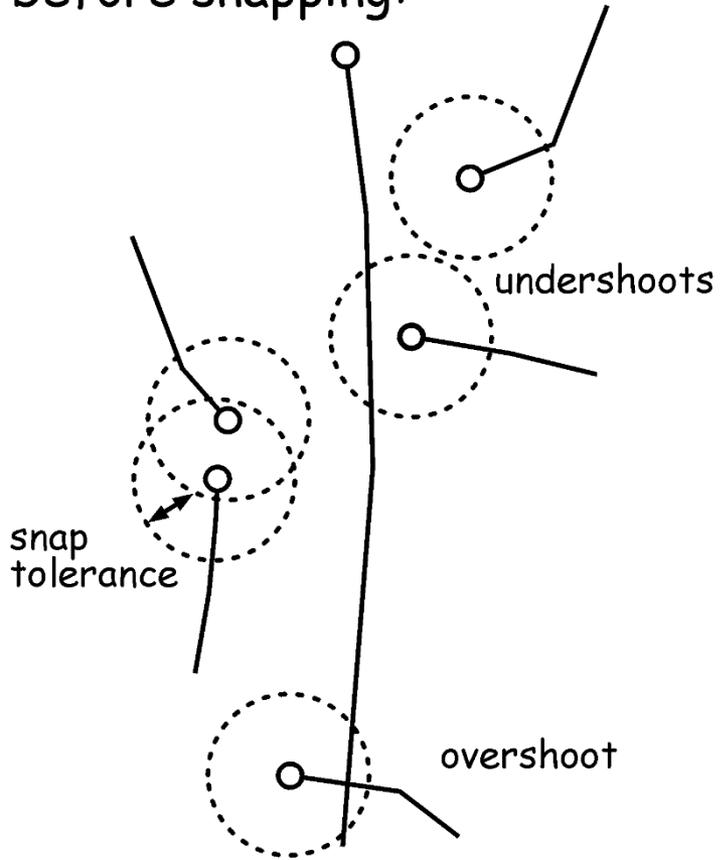
- **Gap.** A hole in a polygon layer where no feature exists



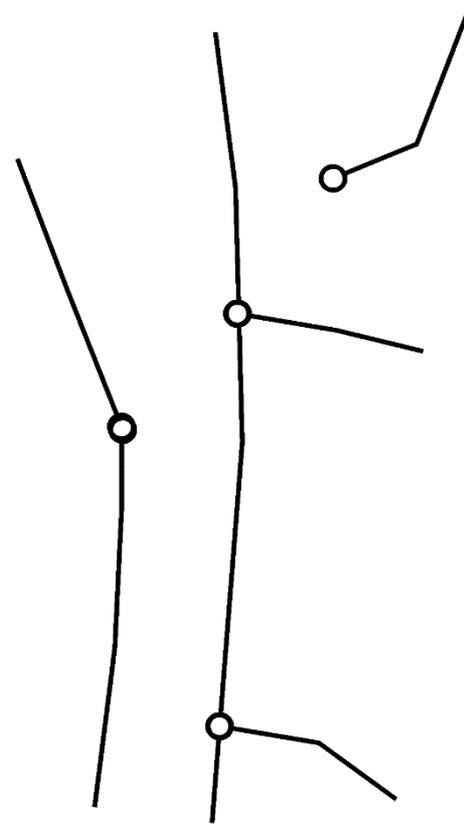
How to Reduce Errors

- **Node snapping.** Automatically connects lines together at node points
- **Line snapping.** Automatically connects a line to the middle of another line – inserts a node at line crossing and clips any overshoots
- **Snap tolerance.** Minimum distance between features (vertices closer than this distance are moved to the existing point)

before snapping:



after snapping:





Topology

What is Topology

- Spatial relationships between connecting or adjacent features (are features 'good neighbors'?)
- Should be enforced while digitizing to reduce errors

Topology & ArcGIS

- Depends on the data structure
 - ▣ Coverages – explicitly defined in .aat file
 - ▣ Shapefiles – not explicitly defined, but can be built and calculated within a map document
 - ▣ Geodatabases – calculated on-the-fly if stored as object-oriented feature behavior (rules)

Topology & Geodatabases

- Rules are (user) created & implemented
- http://help.arcgis.com/en/arcgisdesktop/10.0/help/001t/pdf/topology_rules_poster.pdf

ArcGIS® Geodatabase Topology Rules

Topology in ESRI® ArcGIS® allows you to model spatial relationships between feature classes in a feature dataset. Topology rules allow you to define those relationships between features in a single feature class or subclass or between two feature classes or subclasses. Topology rules allow you to define the spatial relationships that meet the needs of your data model. Topology even enforces violations of the rules that you can easily find and manage using the editing tools found in ArcMap®.



How to read these diagrams:



Topology rule name



Generalized description of rules to use elsewhere.

The green box is used to describe the rule.

Polygon

Must not overlap

Two polygons must not overlap. Overlapping polygons are not allowed.

Use this rule to make sure that no polygons overlap or touch polygons in the same feature class or subclass.

Polygon

Must not have gaps

Two polygons must not have gaps. Gaps between polygons are not allowed.

Use this rule when all of your polygons should form a continuous surface with no voids or gaps.

Line or Polygon

Must be larger than cluster tolerance

Two lines or polygons must be larger than the cluster tolerance. Lines or polygons smaller than the cluster tolerance are not allowed.

Use this rule to apply to all line and polygon feature classes that participate in the topology.

Line

Must not have pseudonodes

Two lines must not have pseudonodes. Pseudonodes are not allowed.

Use this rule to clean up data with inappropriately subdivided lines.

Polygon

Contains point

Two polygons must contain a point. Points not contained by polygons are not allowed.

Use this rule to make sure that all polygons have at least one point within their boundaries. Overlapping polygons are not allowed.

Polygon

Contains one point

Two polygons must contain one point. Points not contained by polygons are not allowed.

Use this rule to make sure that there is one-to-one correspondence between features of polygon feature class and point feature class.

Line

Must not have dangles

Two lines must not have dangles. Dangles are not allowed.

Use this rule when you want lines in a feature class or subclass to connect to other lines.

Line

Must not self overlap

Two lines must not self overlap. Self-overlapping lines are not allowed.

Use this rule with lines whose segments should never occupy the same space as another segment on the same line.

Polygon

Must be covered by feature class

Two polygons must be covered by a feature class. Polygons not covered by a feature class are not allowed.

Use this rule when each polygon in one feature class or subclass should be covered by all the polygons of another feature class or subclass.

Polygon

Boundary must be covered by

Two polygons must have their boundaries covered by another feature class or subclass. Polygons whose boundaries are not covered by another feature class or subclass are not allowed.

Use this rule when polygon boundaries should be coincident with another line feature class or subclass.

Line

Must not overlap

Two lines must not overlap. Overlapping lines are not allowed.

Use this rule with lines that should never occupy the same space with other lines.

Line

Must not self intersect

Two lines must not self intersect. Self-intersecting lines are not allowed.

Use this rule when you only want lines to touch at their ends without intersecting or overlapping themselves.

Polygon

Must not overlap with

Two polygons must not overlap with another feature class or subclass. Overlapping polygons are not allowed.

Use this rule when polygons from one feature class or subclass should not overlap polygons of another feature class or subclass.

Polygon

Must be covered by

Two polygons must be covered by another feature class or subclass. Polygons not covered by another feature class or subclass are not allowed.

Use this rule when you want all polygons to be covered by some part of another single polygon in another feature class or subclass.

Line

Must not intersect

Two lines must not intersect. Intersecting lines are not allowed.

Use this rule with lines whose segments should never occupy the same space with other lines.

Line

Must be single part

Two lines must be single part. Lines that are not single part are not allowed.

Use this rule when you want lines to be composed of a single series of connected segments.

Polygon

Area boundary must be covered by boundary of

Two polygons must have their area boundaries covered by another feature class or subclass. Polygons whose area boundaries are not covered by another feature class or subclass are not allowed.

Use this rule when the boundary of polygons in one feature class or subclass should align with the boundaries of polygons in another feature class or subclass.

Polygon

Must cover each other

Two polygons must cover each other. Polygons that do not cover each other are not allowed.

Use this rule when you want the polygons from two feature classes or subclasses to cover the same area.

Line

Must not intersect with

Two lines must not intersect with another feature class or subclass. Intersecting lines are not allowed.

Use this rule with lines whose segments should never come in contact with lines in another feature class or subclass.

Line

Must be covered by feature class

Two lines must be covered by a feature class. Lines not covered by a feature class are not allowed.

Use this rule when each line in one feature class or subclass should be covered by all the lines of another feature class or subclass.

Point

Must be coincident with

Two points must be coincident with another feature class or subclass. Points not coincident with another feature class or subclass are not allowed.

Use this rule when points from one feature class or subclass should be aligned with points from another feature class or subclass.

Point

Must be disjoint

Two points must be disjoint. Points that are not disjoint are not allowed.

Use this rule when you only want points to touch at their ends and not intersect or overlap.

Line

Must not intersect or touch interior

Two lines must not intersect or touch interior. Lines that intersect or touch interior are not allowed.

Use this rule when you only want lines to touch at their ends and not intersect or overlap.

Line

Must be covered by boundary of

Two lines must be covered by the boundary of another feature class or subclass. Lines not covered by the boundary of another feature class or subclass are not allowed.

Use this rule when you want to make sure that one coincides with the boundaries of polygons.

Point

Must be covered by endpoint of

Two points must be covered by the endpoint of another feature class or subclass. Points not covered by the endpoint of another feature class or subclass are not allowed.

Use this rule when you want to model points that are coincident with the ends of lines.

Point

Point must be covered by line

Two points must be covered by a line. Points not covered by a line are not allowed.

Use this rule when you want to model points that are coincident with lines.

Line

Must not intersect or touch interior with

Two lines must not intersect or touch interior with another feature class or subclass. Lines that intersect or touch interior with another feature class or subclass are not allowed.

Use this rule when you only want lines to touch at their ends and not intersect or overlap with lines in another feature class or subclass.

Line

Must be inside

Two lines must be inside another feature class or subclass. Lines that are not inside another feature class or subclass are not allowed.

Use this rule when you want lines to be contained within the boundaries of polygons.

Point

Must be properly inside polygons

Two points must be properly inside polygons. Points that are not properly inside polygons are not allowed.

Use this rule when you want points to be completely within the boundaries of polygons.

Point

Must be covered by boundary of

Two points must be covered by the boundary of another feature class or subclass. Points not covered by the boundary of another feature class or subclass are not allowed.

Use this rule when you want points to align with the boundaries of polygons.

Line

Must not overlap with

Two lines must not overlap with another feature class or subclass. Overlapping lines are not allowed.

Use this rule for lines that should never occupy the same space with lines in another feature class or subclass.

Line

Endpoint must be covered by

Two lines must have their endpoints covered by another feature class or subclass. Lines whose endpoints are not covered by another feature class or subclass are not allowed.

Use this rule when you want to model the ends of lines in one feature class or subclass that are coincident with points in another feature class.



Creating data

Geocoding

Geocoding

- The process of transforming an address (or some other description of a location) to an actual point on the earth's surface

Geocoding Workflow

1. Create or obtain table with addresses or locational information



2. Find an address locator (or create one)



3. Use the address locator to Geocode



4. Review results



5. Rematch or correct addresses

Geocoding Workflow



Demo in ArcGIS



Editing Data

Why edit?

- Create new data
- Update existing data
 - ▣ Errors and inconsistencies are inevitable in data entry
 - ▣ Data changes over time
 - ▣ More accurate position data

Editing Steps

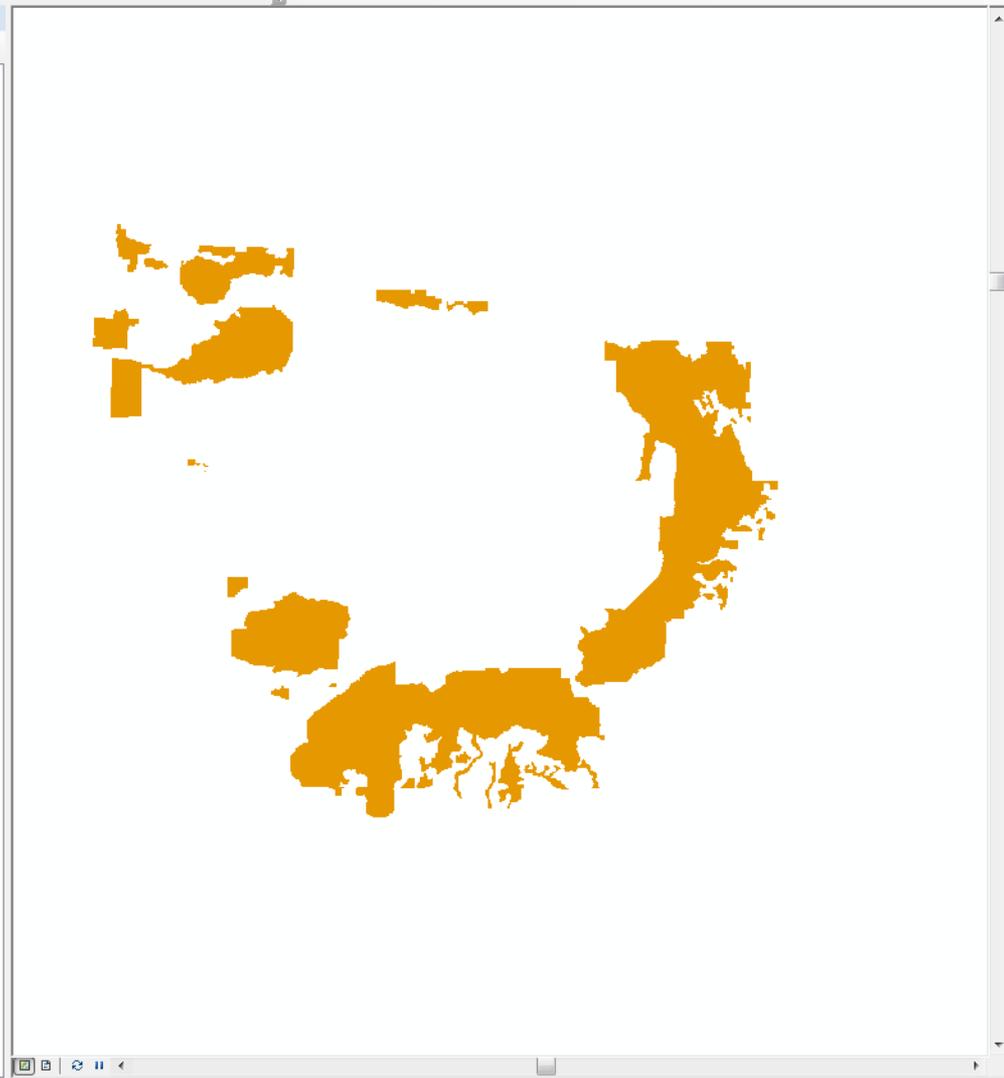
1. Start an editing session
2. Define what you will edit
 1. Set editing environment (i.e. snapping)
 2. Select layer(s)
 3. Select feature template(s)
 4. Select feature

Editing Steps

3. Perform task – build feature, erase all/part of feature, move vertex or feature, split/add to feature, etc.
4. Edit attributes – add/change values
5. Save, save, save
6. Did I mention save your work?



- Start Editing
- Stop Editing
- Save Edits
- Move...
- Split...
- Construct Points...
- Copy Parallel...
- Merge...
- Buffer...
- Union...
- Clip...
- Validate Features
- Snapping
- More Editing Tools
- Editing Windows
- Options...



Create Features

LSOG

LSOG

Construction Tools

Select a template.

ArcMap Editing Basics

- Must be in an editing session to make changes to your data features or attributes
- To start an editing session
 - ▣ Editor toolbar OR
 - ▣ Right-click on layer
- Can only work from data stored in a single location

Snapping

- Toolbar & 'Options' dialog



ArcMap Tips & Shortcuts

- <http://www.esri.com/library/brochures/pdfs/arccgis-desktop-tips.pdf>

Editing Features

Function	Shortcut	Introduced
Create a segment parallel to an existing one.	Ctrl + P or Constrain Parallel on Feature Construction toolbar	9.1
Create a segment perpendicular to an existing one.	Ctrl + E or Constrain Perpendicular on Feature Construction toolbar	9.1
Create a segment at an exact angle.	Ctrl + A	9.1
Create a segment at an exact length.	Ctrl + L	9.1
Create a segment at an exact angle and length.	Ctrl + G	9.1
Enter coordinate by value.	F6	9.1
Delete the sketch.	Ctrl + Delete	9.1
Finish the sketch.	F2	9.1
Finish a part of the sketch to create a multipart feature.	Shift + double-click	9.1
Undo last edit.	Ctrl + Z	9.1
Add a point to a sketch by delta x,y.	Ctrl + D	9.3
Temporarily suspend snapping (especially useful when tracing along features).	Spacebar	9.1
Open the Edit Sketch Properties window.	P	10.0
Toggle between feature creation, Edit, and Edit Annotation tools when one is active.	E	9.1
Edit tool: Move the selection anchor (the "x") for a selected feature.	Hold down Ctrl while you hover over the selection anchor. When the pointer changes to the "move" pointer, click the selection anchor and drag it to the new location.	9.1
Edit tool: Toggle through selected features within the selection tolerance to select the correct one when there are multiple overlapping features.	N or click the selection chip.	9.1