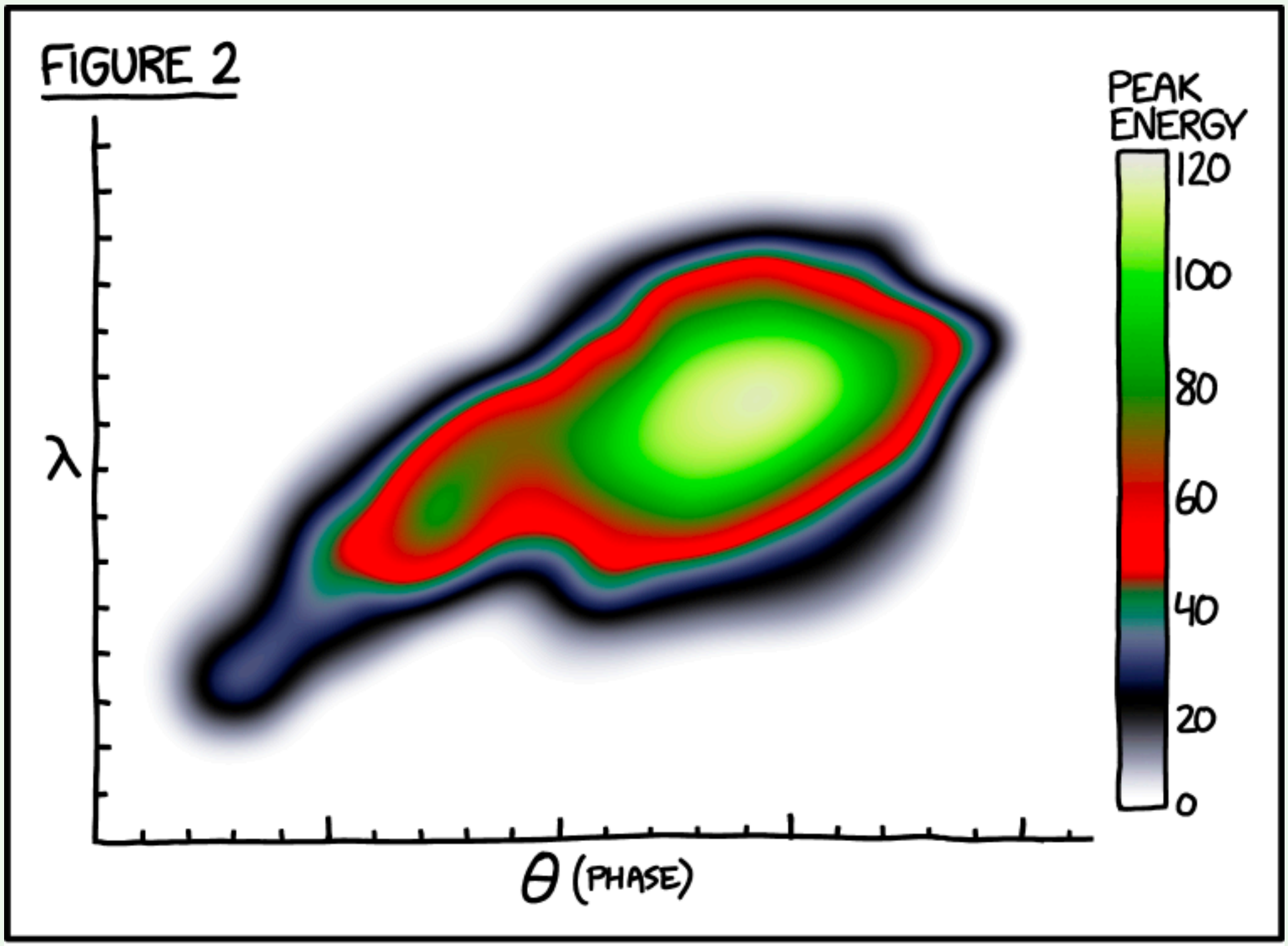
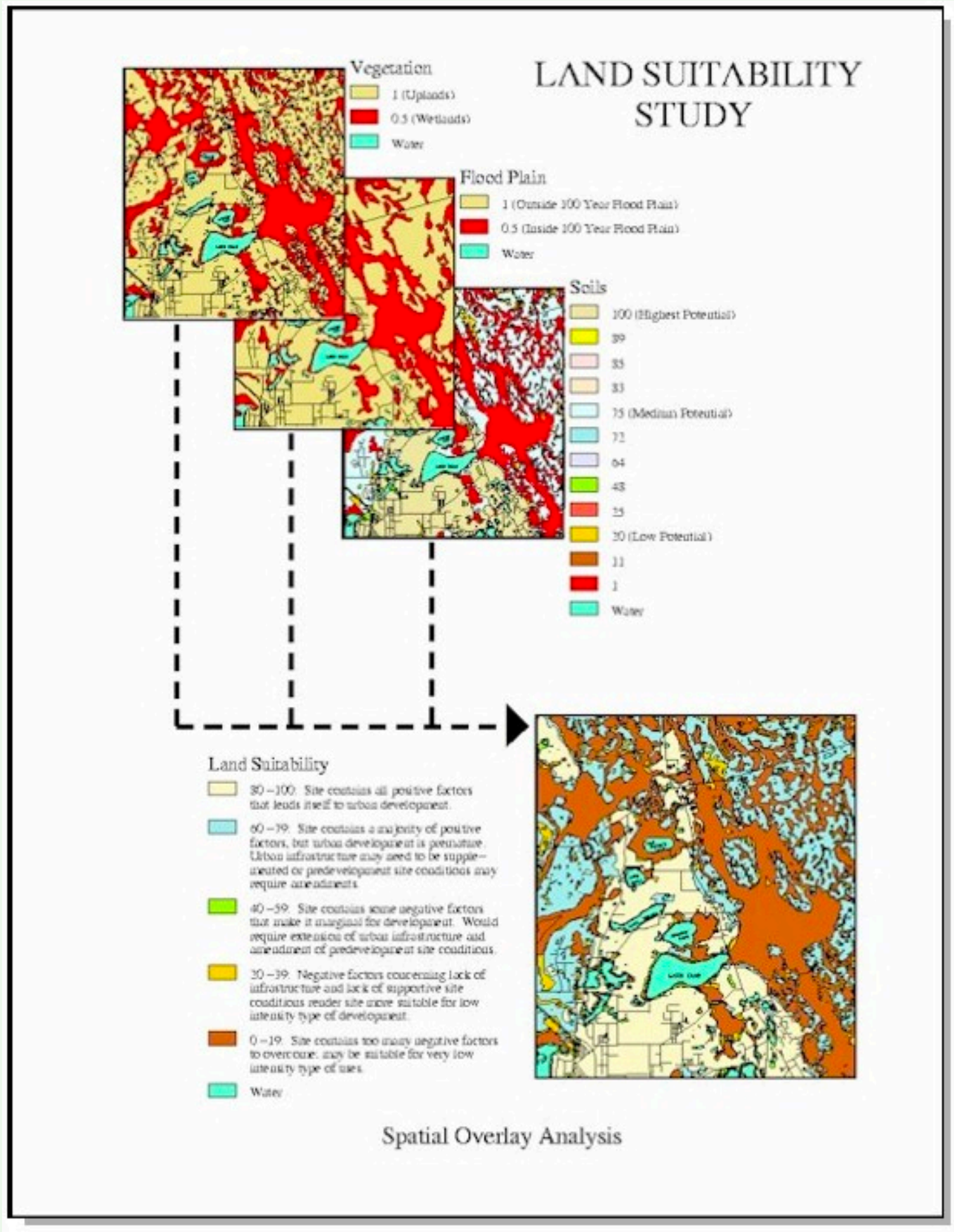


EVERY YEAR, DISGRUNTLED SCIENTISTS COMPETE FOR THE PAINBOW AWARD FOR WORST COLOR SCALE.

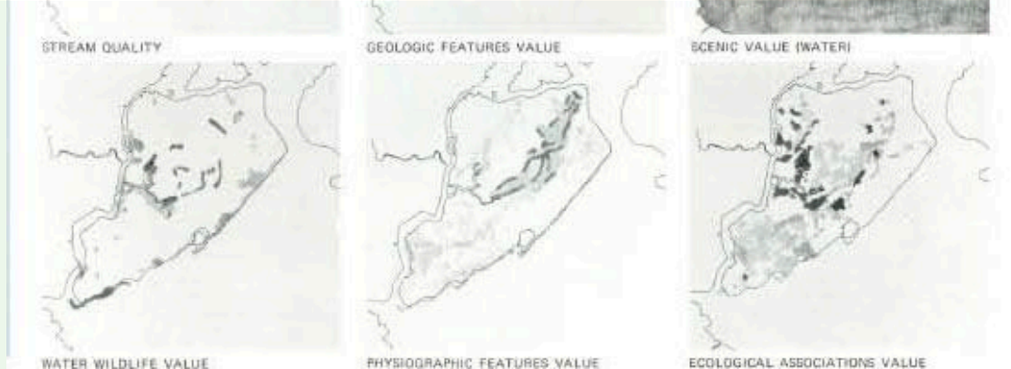
GEOG 358: Introduction to Geographic Information Systems

Vector Overlays

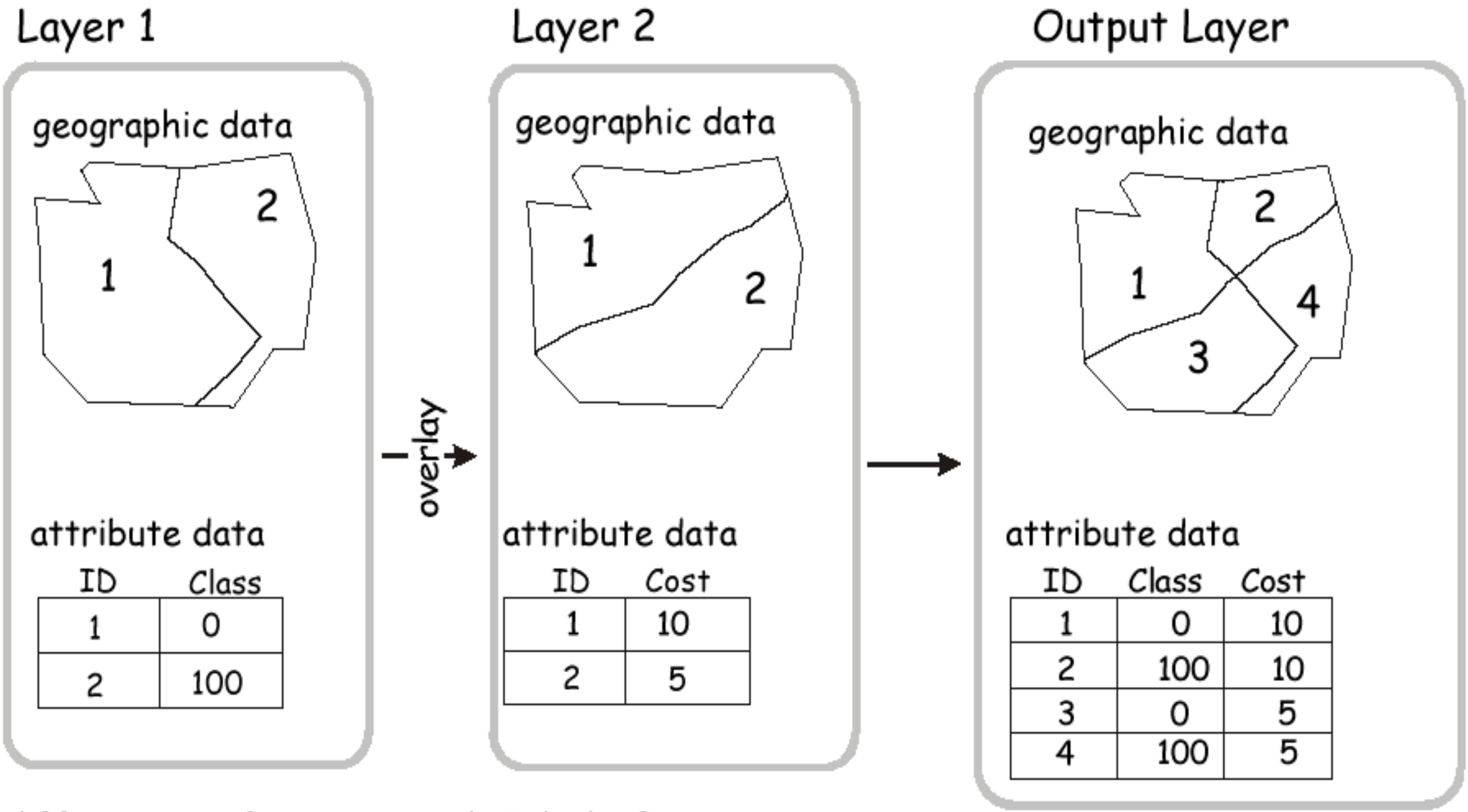


Site Suitability Analysis and Overlay

- Examines physical, biological, social, economic, and other factors to locate potential sites for certain purposes
- A manual process before GIS is available
  - Each criterion is a separate transparency map
  - All transparencies are placed on top of each other on a light table and suitable areas are identified
- The overlay function—linking data by location
- Was the driving force in the early development of GIS



An Overlay Example



Difference from spatial join?

Overlay creates new polygons/shapes

Results in 4 new polygons

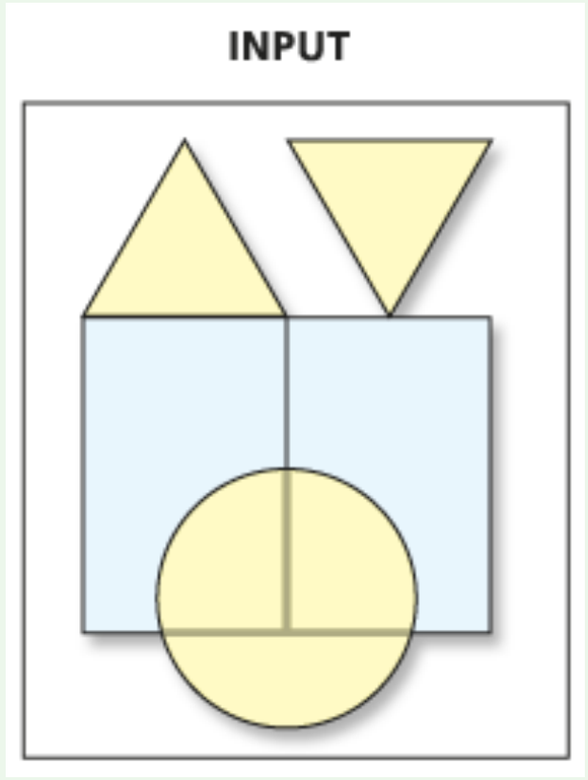
Overlay Functions in ESRI ArcGIS

- ArcGIS provides several overlay operations
  - intersect, union, clip, erase
- All the overlay operations compute geometric intersection and may create new features
- Many overlay operations combine attributes from the input layers
- They differ from each other in the *features which remain in the output layer*

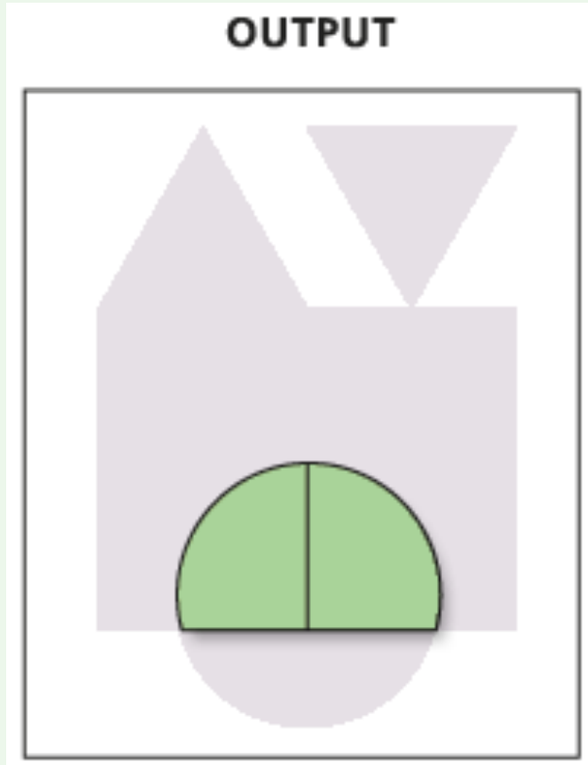
Intersect

- Only common features are kept in the output layer
- May have different output feature types

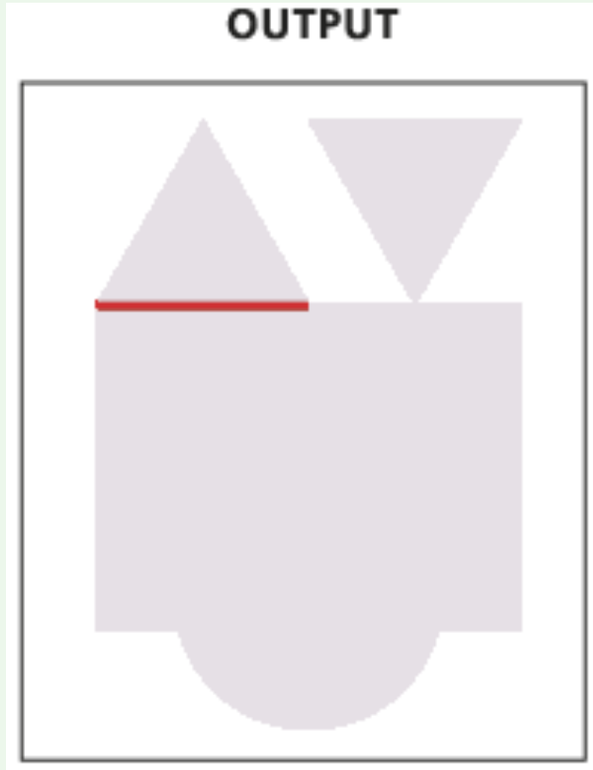
Intersect - Polygon and polygon



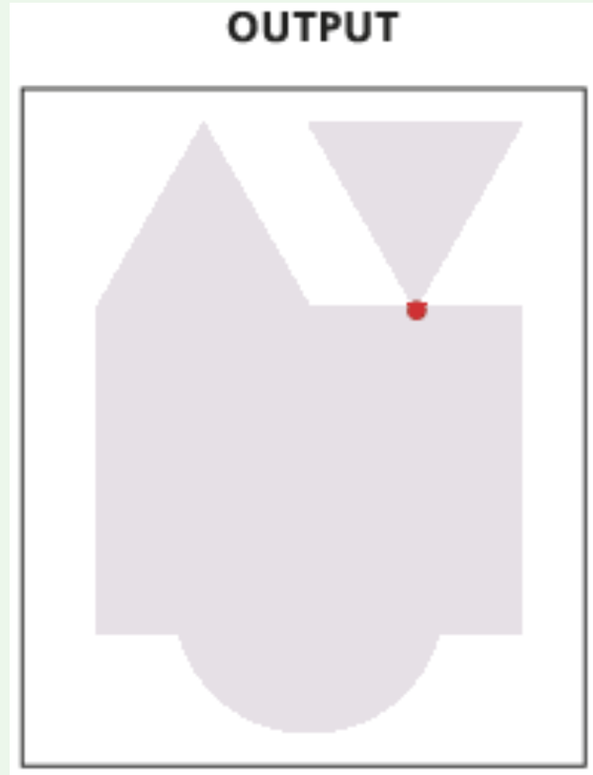
2-d output



1-d output

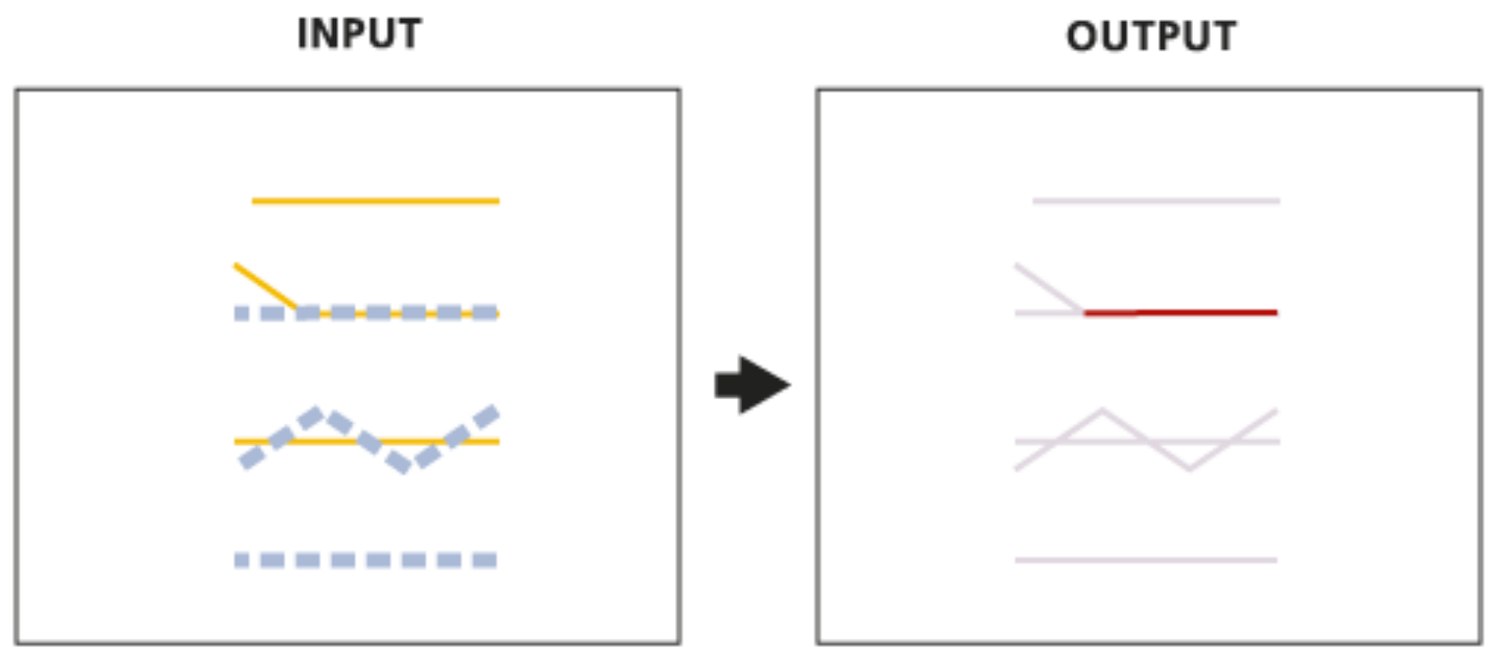


0-d output

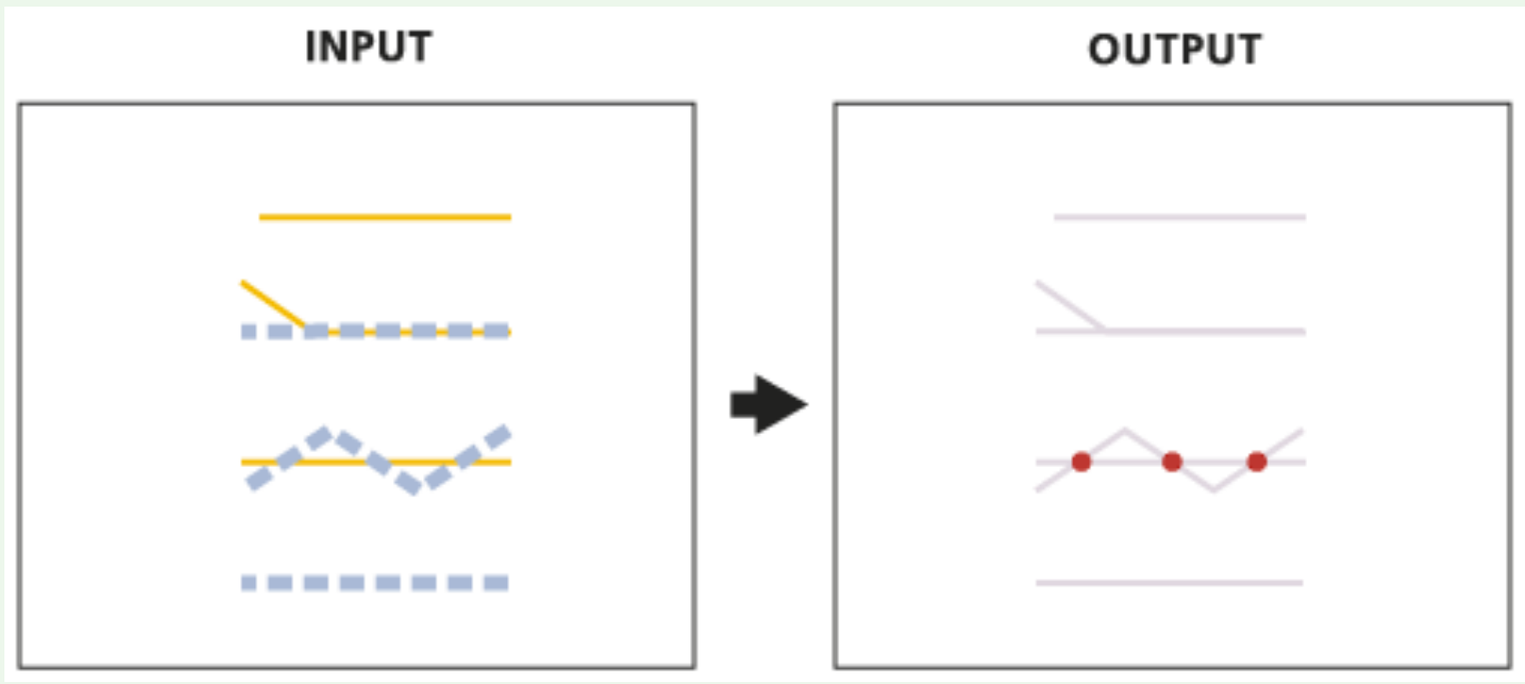


Intersect - Line and line

1-d output

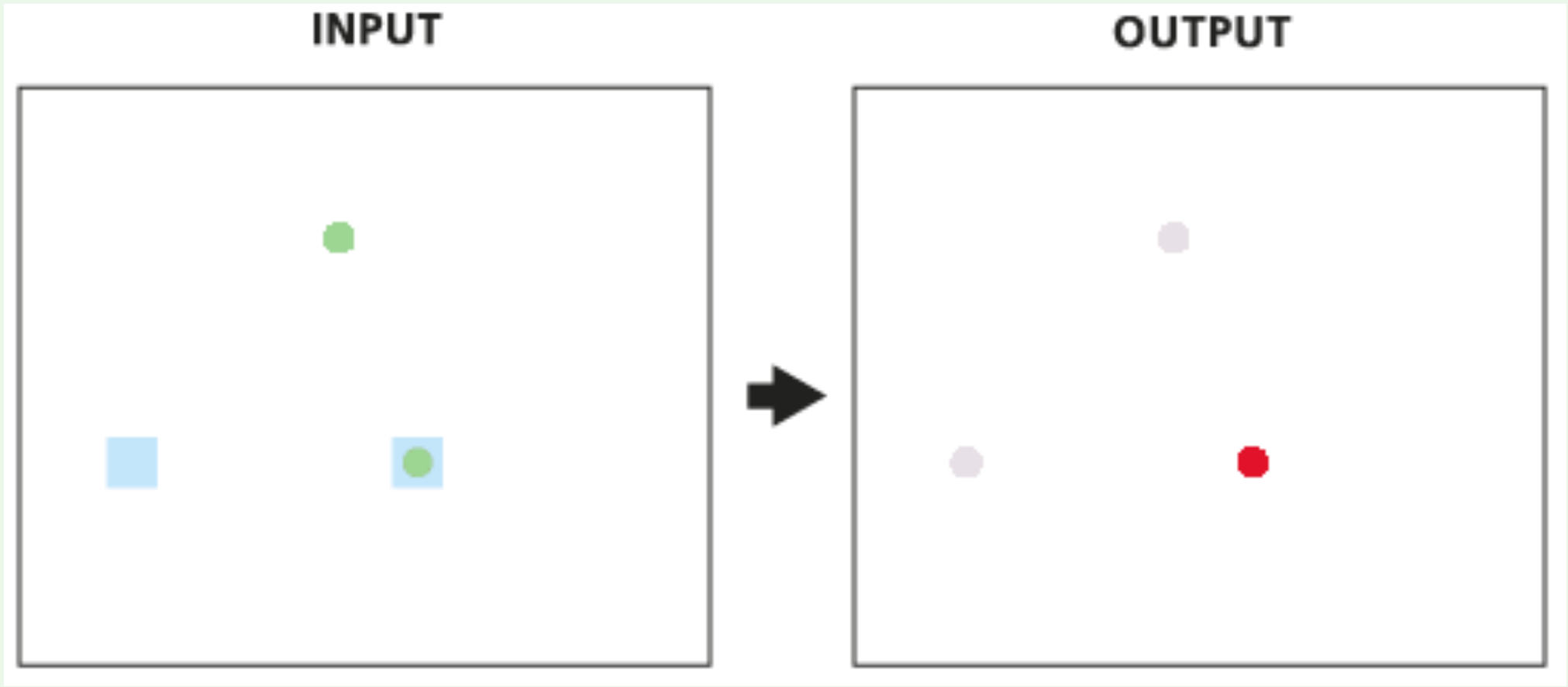


0-d output



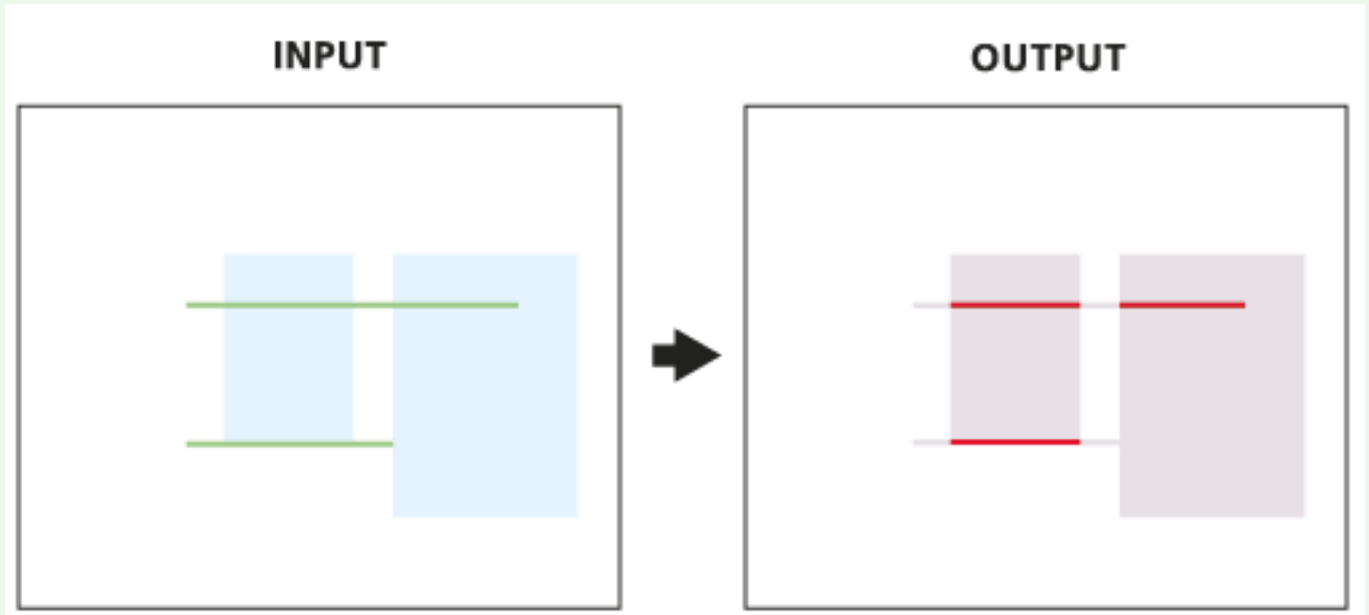
Intersect - Point and point

0-d output

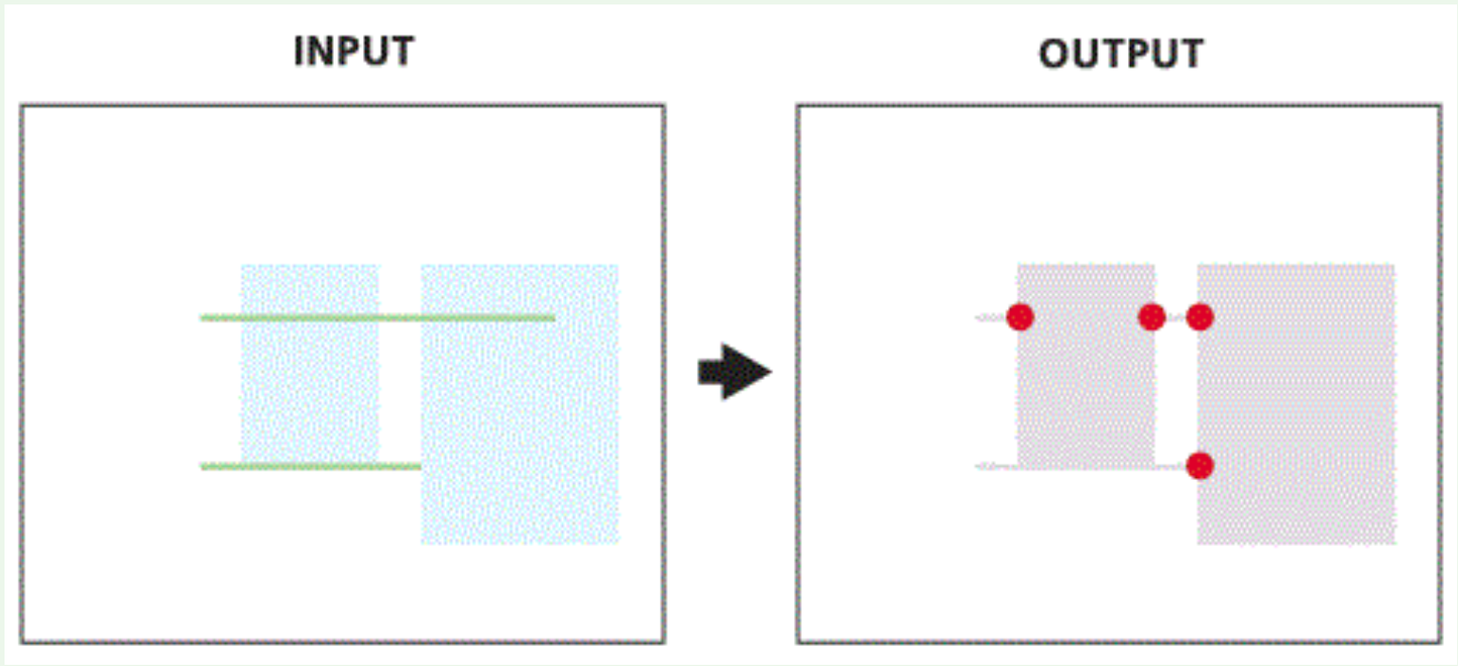


Intersect - Polygon and line

1-d output

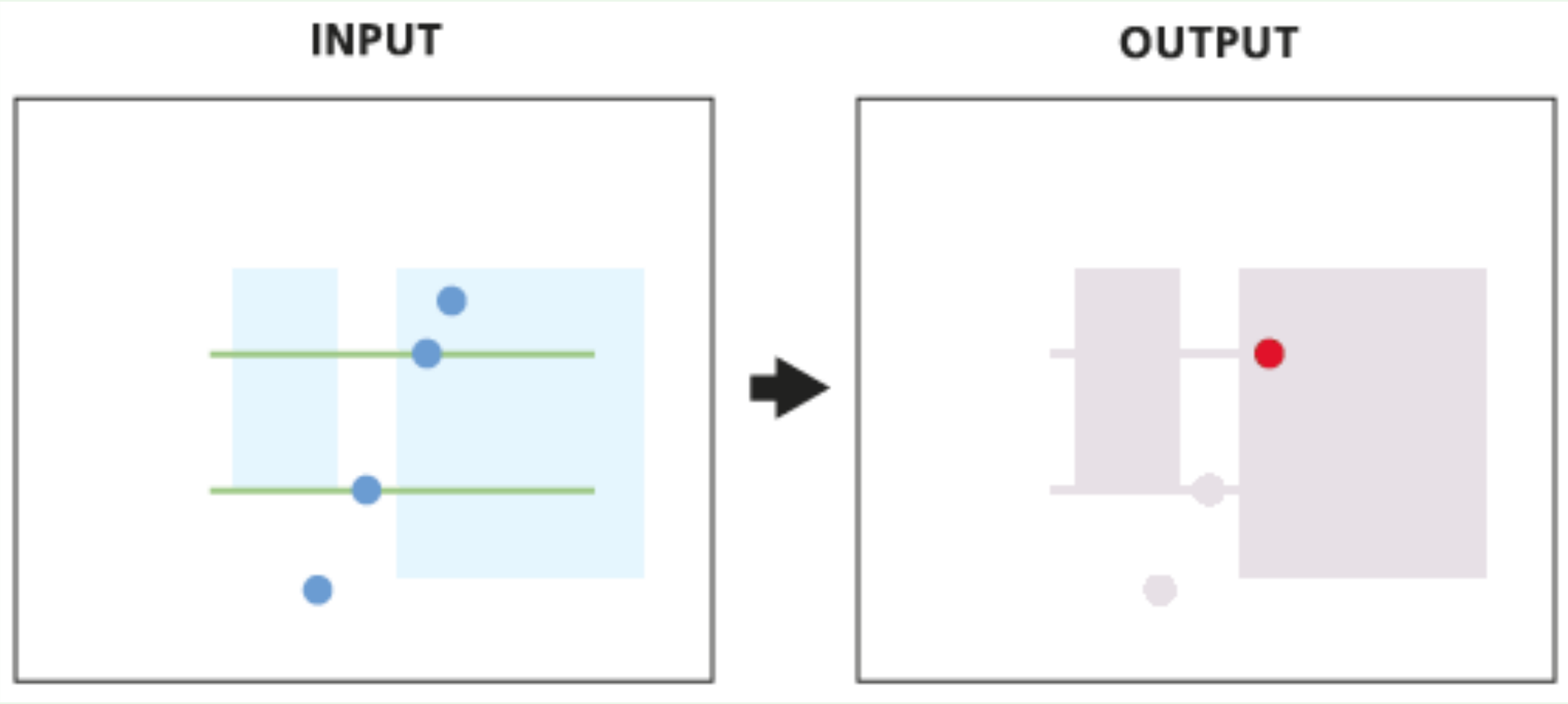


0-d output

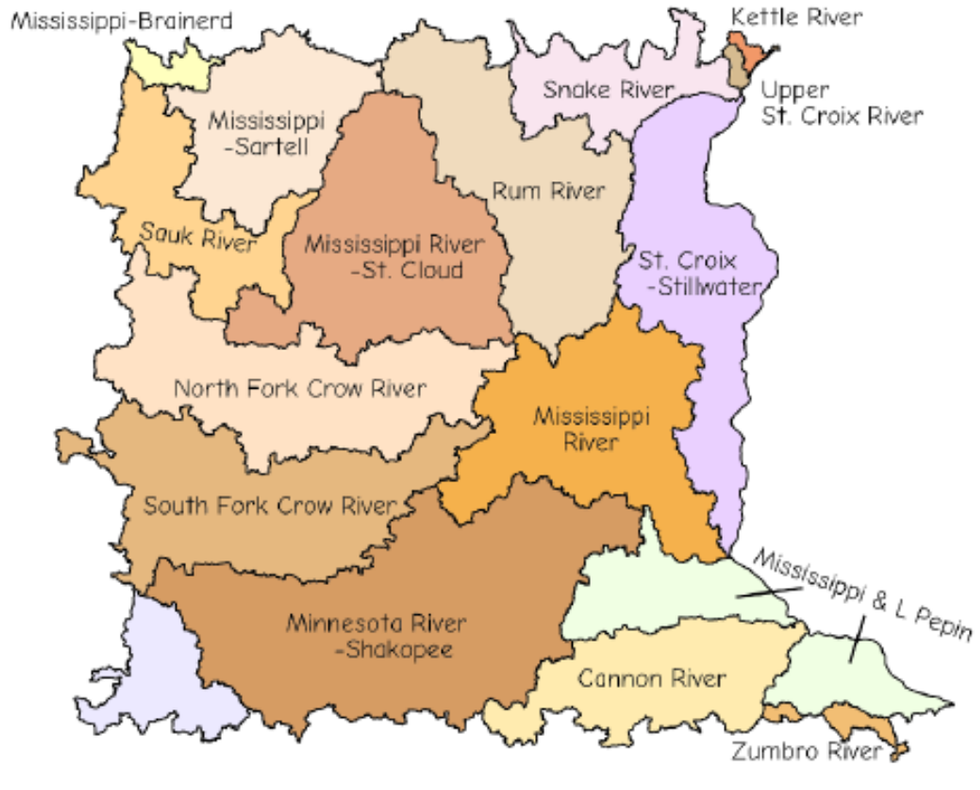


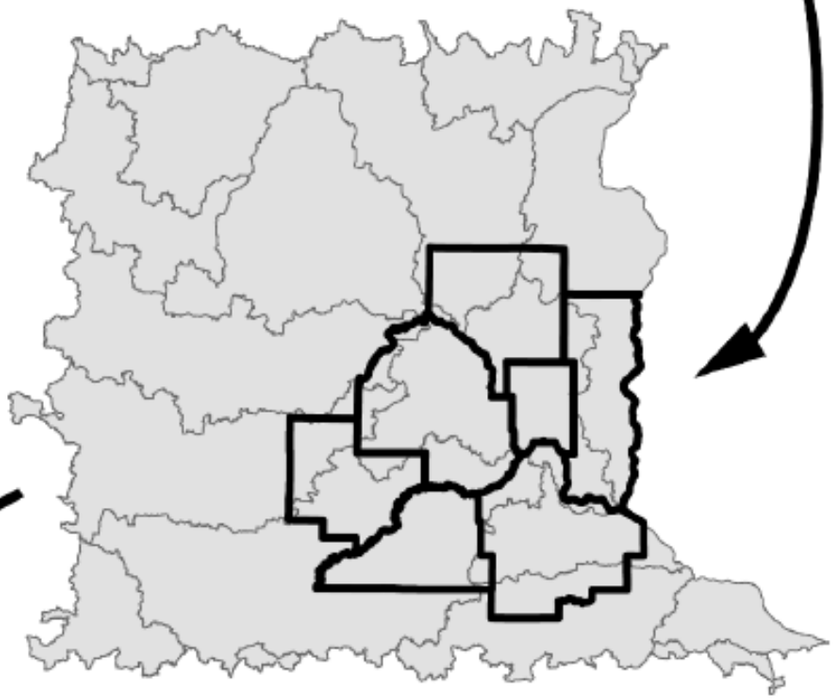
Intersect - Polygon or line and point

0-d output



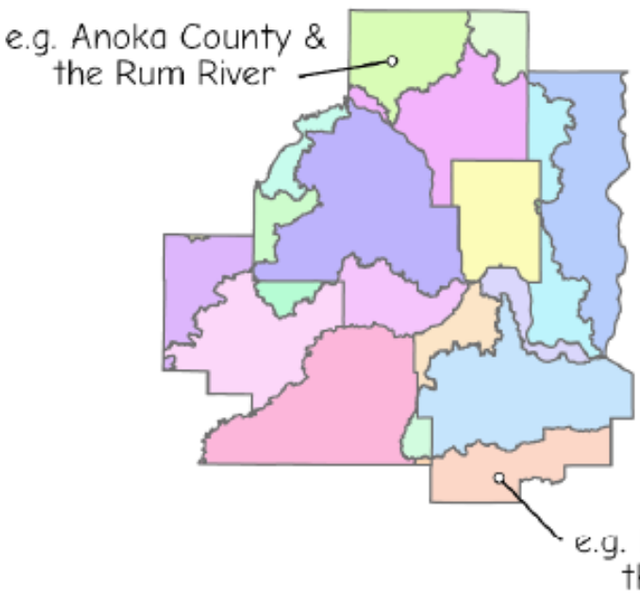
Intersect Catchments and Counties





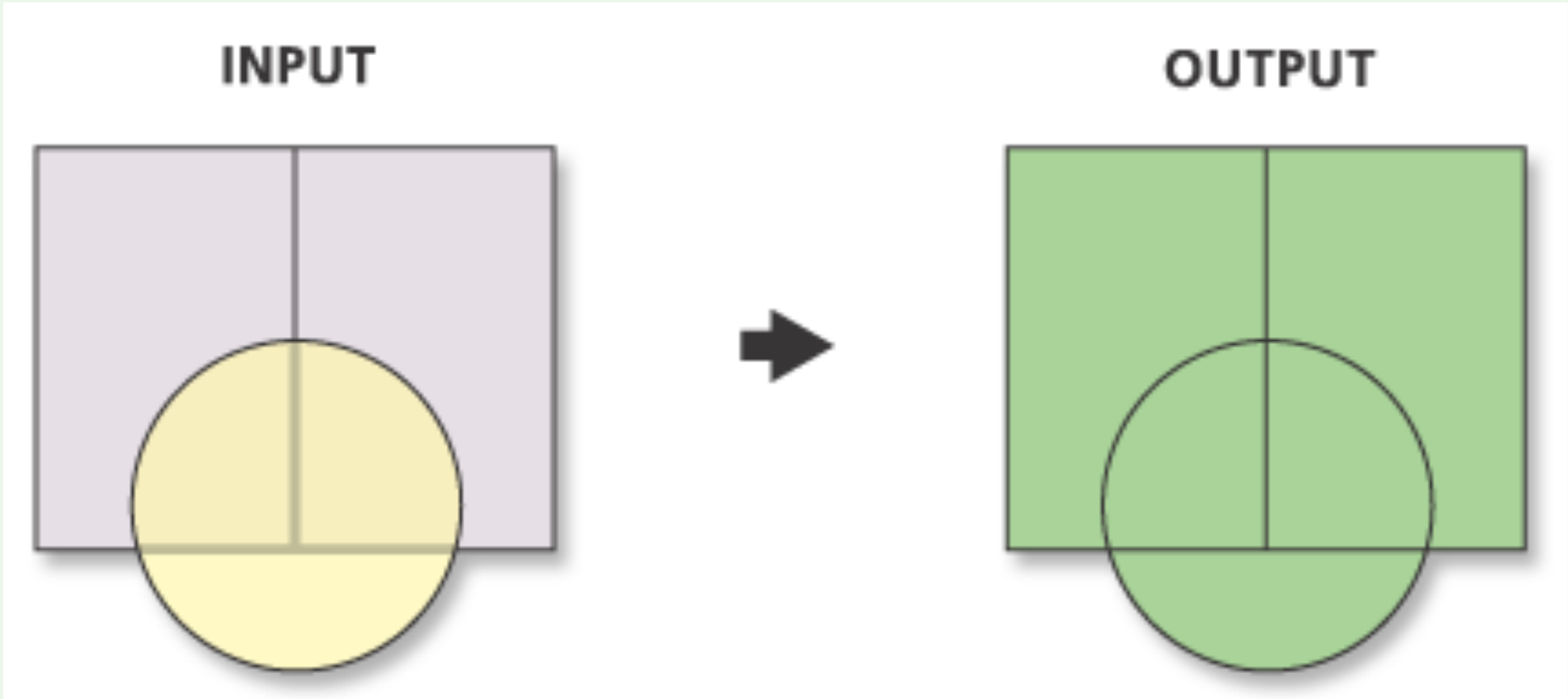
Yields

Extent of the clipping layer, boundaries and attributes of both layers



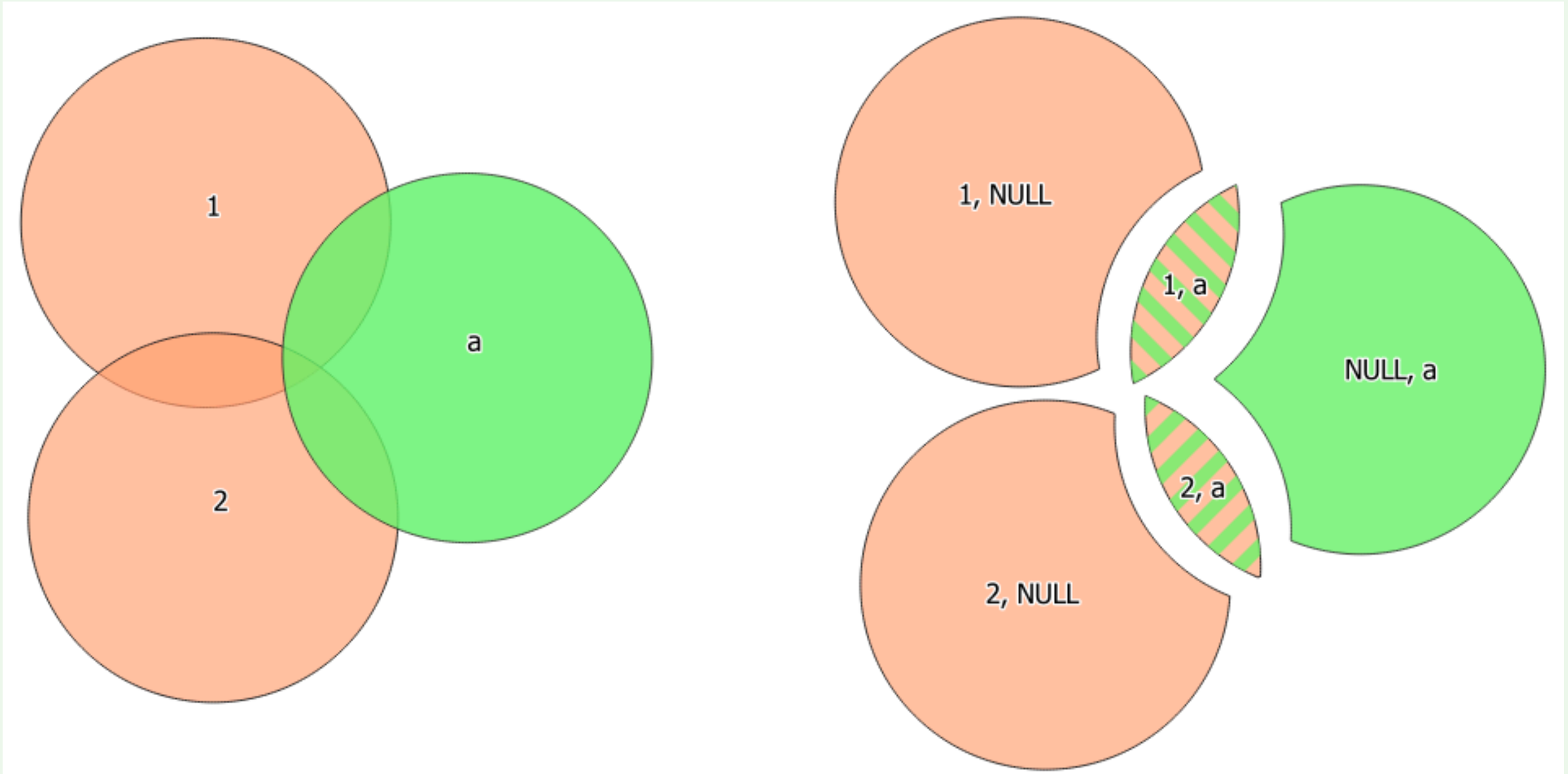
Union

- All the input features are kept in the output
- Some attribute values may be missing for some features

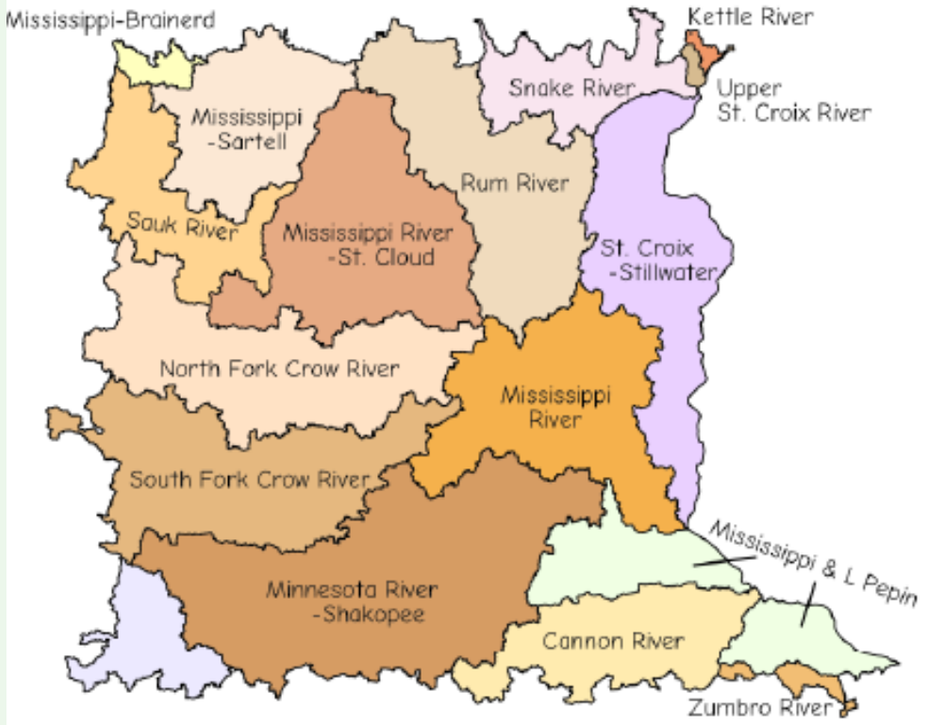


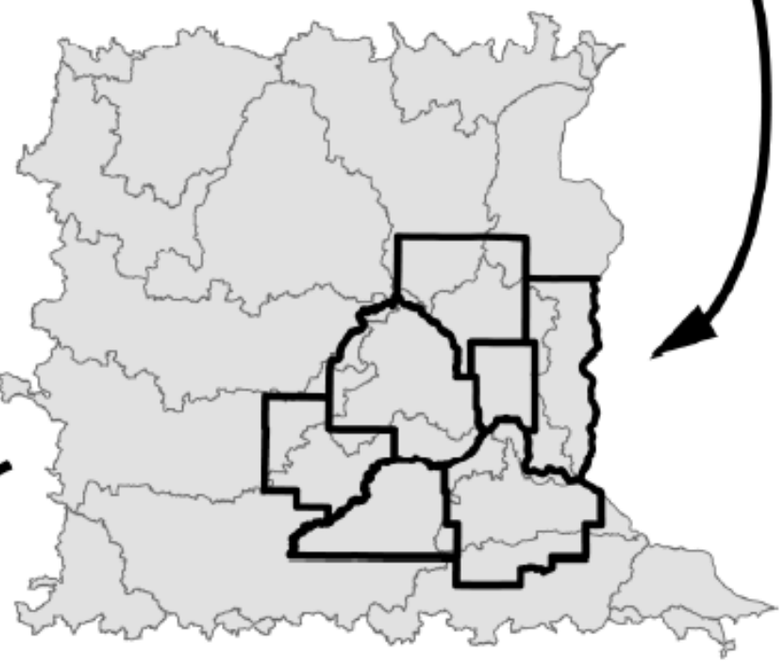
5 features

- All the input features are kept in the output
- Some attribute values may be missing for some features



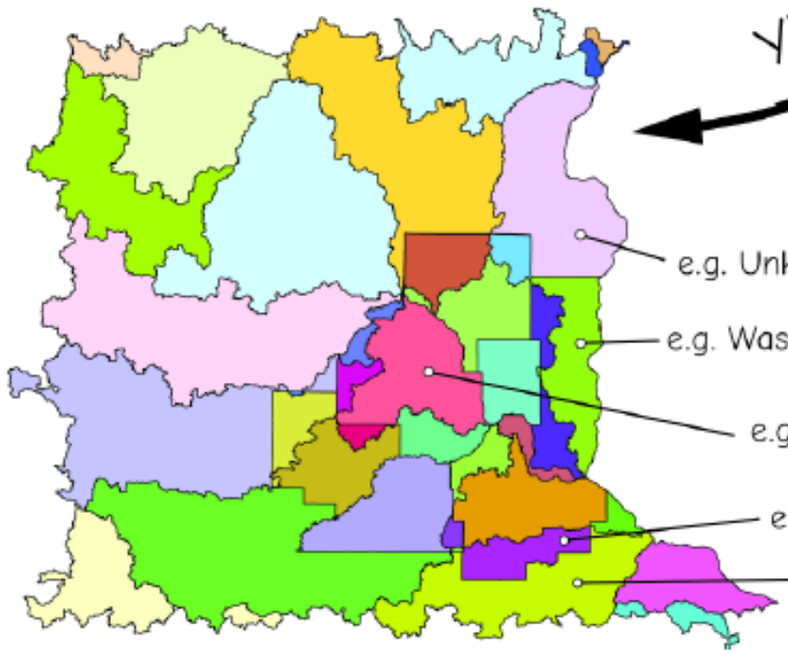
Union Catchments and Counties





Yields

Extent of both layers,boundaries and attributes of both layers, but note "unknown" or null values in non-overlapping regions



e.g. Unknown county & St. Croix-Stillwater River

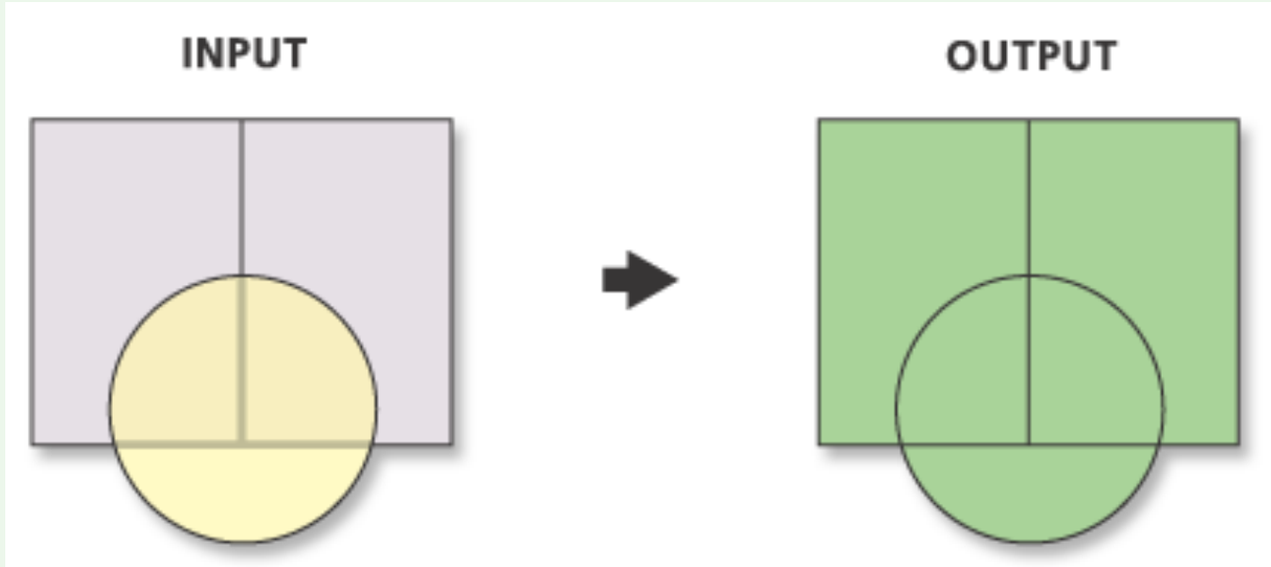
e.g. Washington County & St. Croix-Stillwater River

e.g. Hennepin County & Mississippi River

e.g. Dakota County & Cannon River

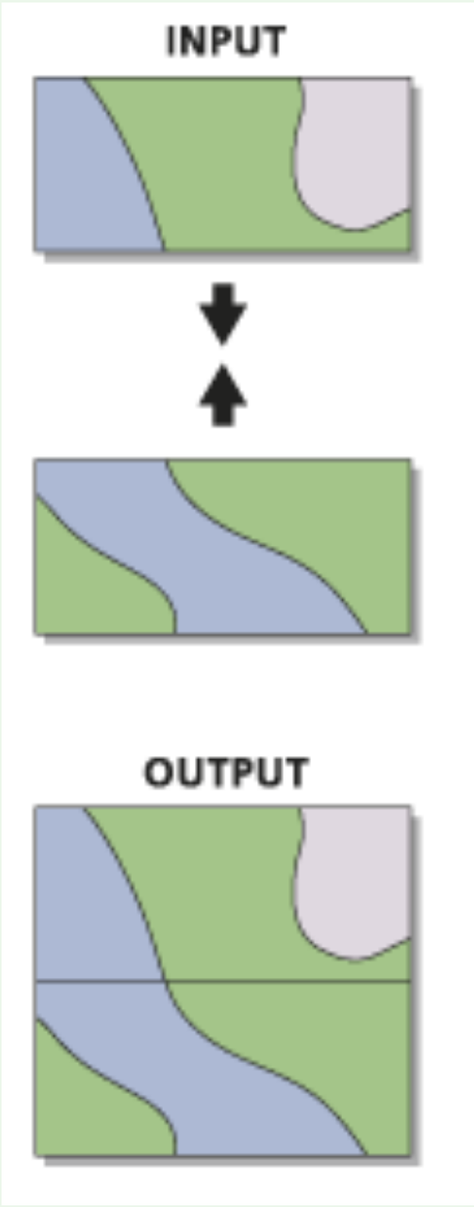
e.g. Unknown County & Cannon River

Merge vs. Union



Vertical combination of two layers

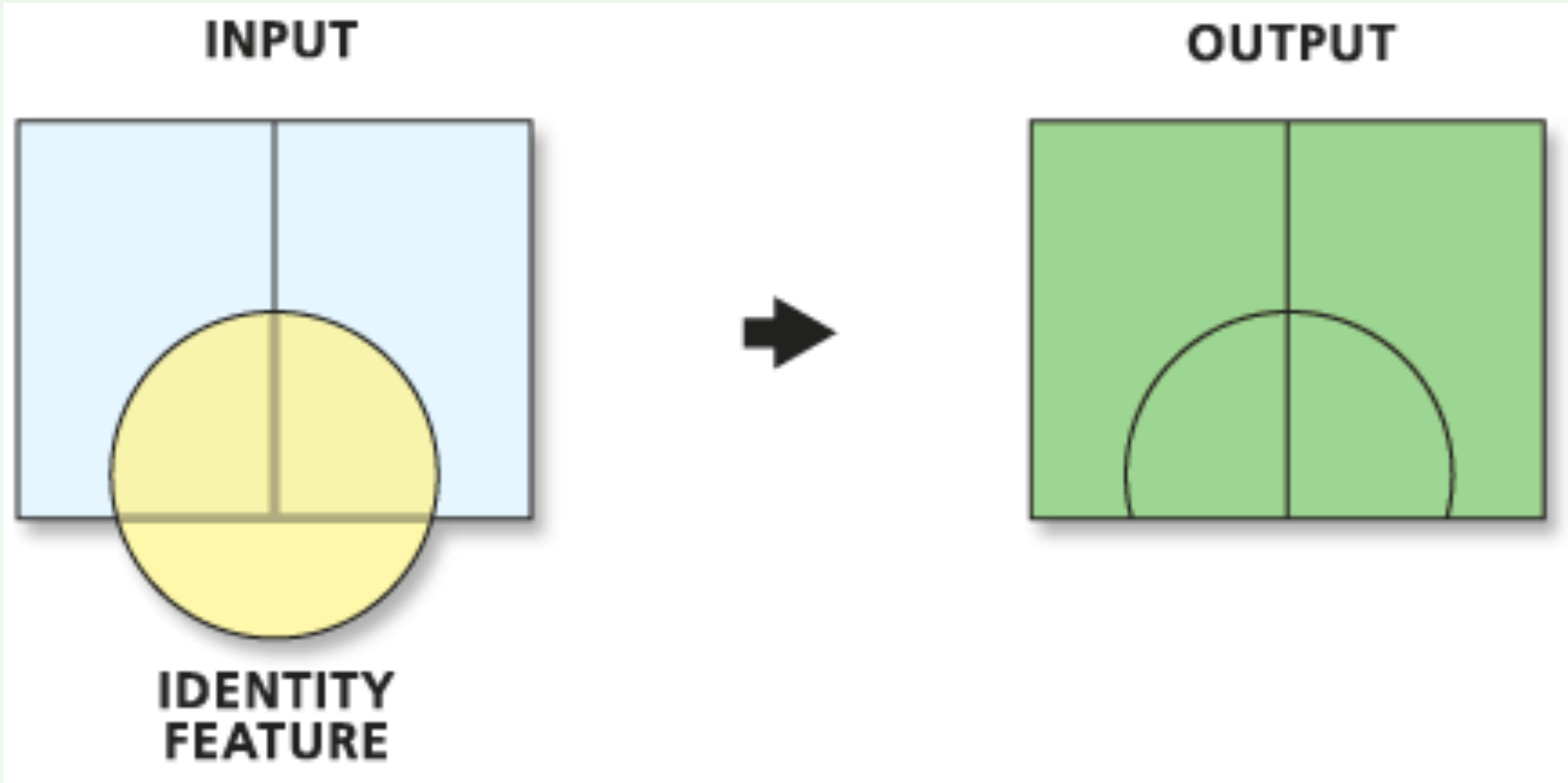
Having different attributes



Horizontal combination of two layers

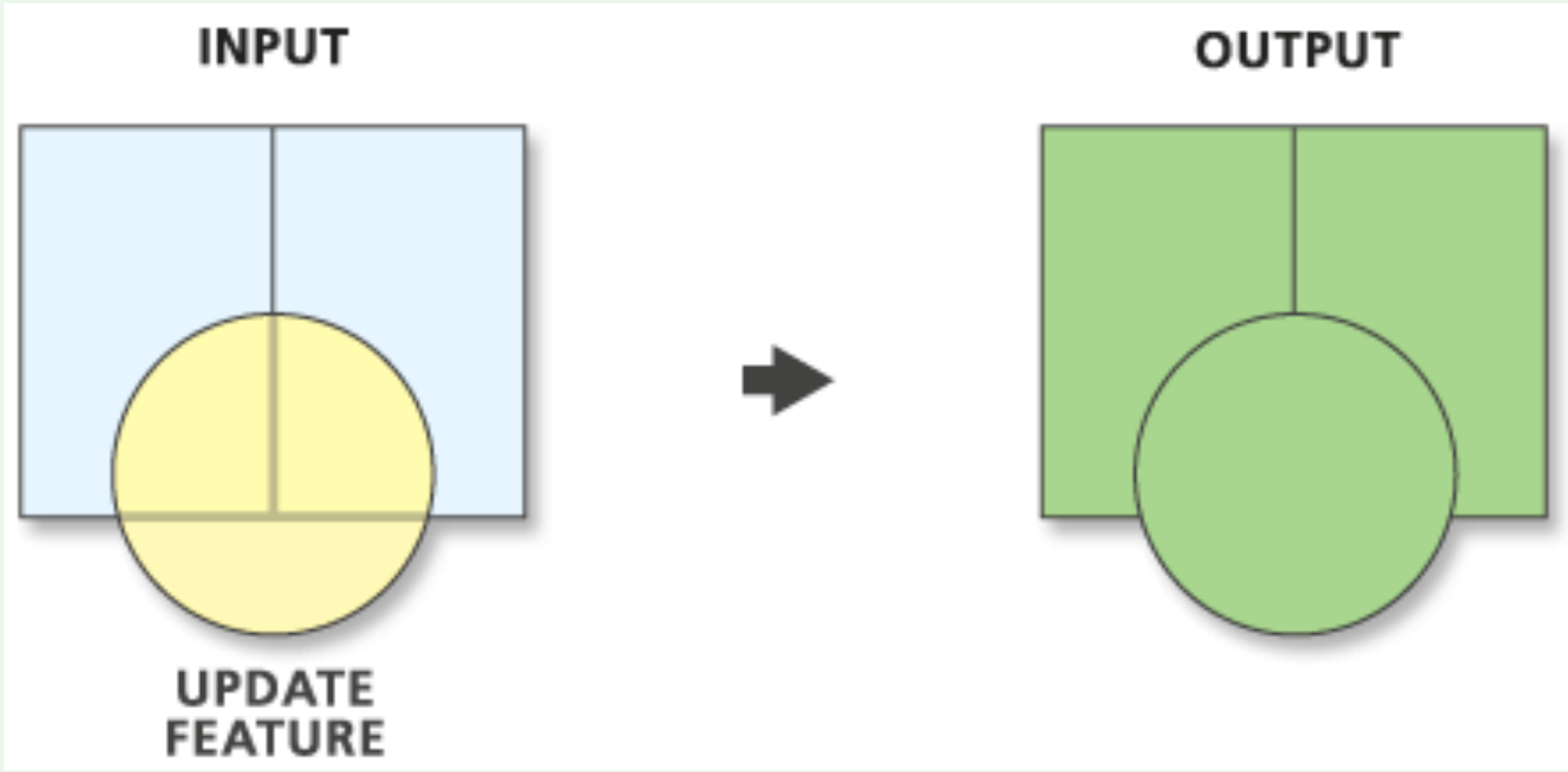
Identity

- Assigns the attributes of identity features that overlap input features to the output



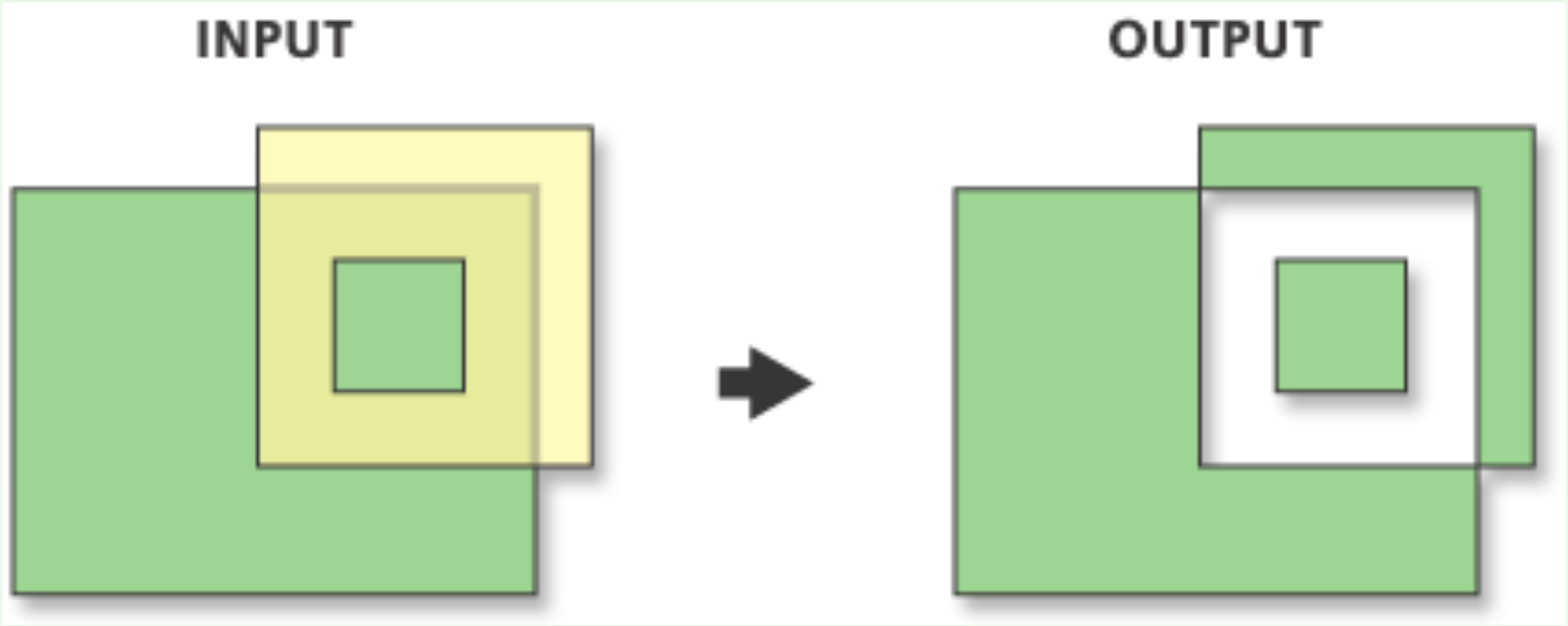
Update

- Updates the input with the geometry and attributes of the update features



Symmetrical difference

- Creates a new feature class based on the features that do not overlap

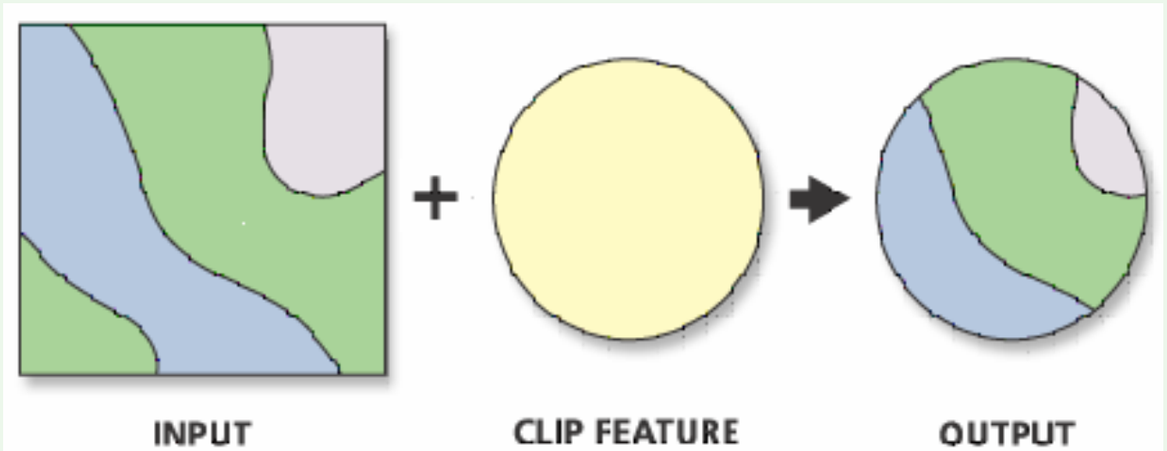


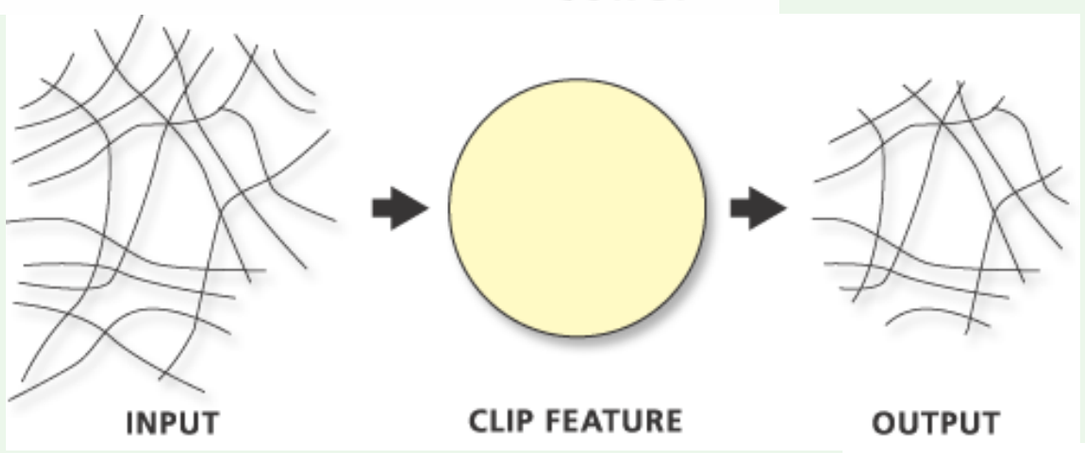
Miscellaneous Overlay Operations in ESRI ArcGIS

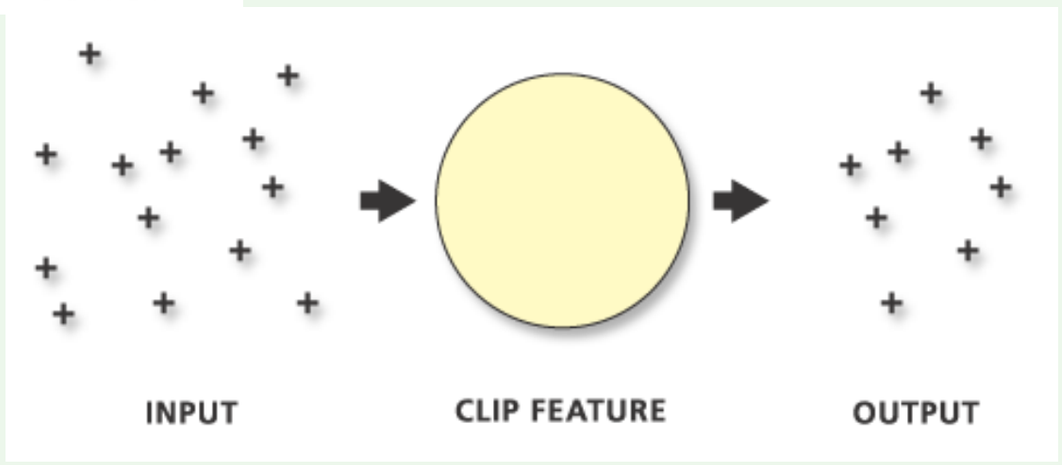
- Other overlay operations only involve geometric processing
- Attributes are not combined in the overlay process
- Those operations include **clip**, **erase,** and split

Clip

- Extract input features that fall inside clip features

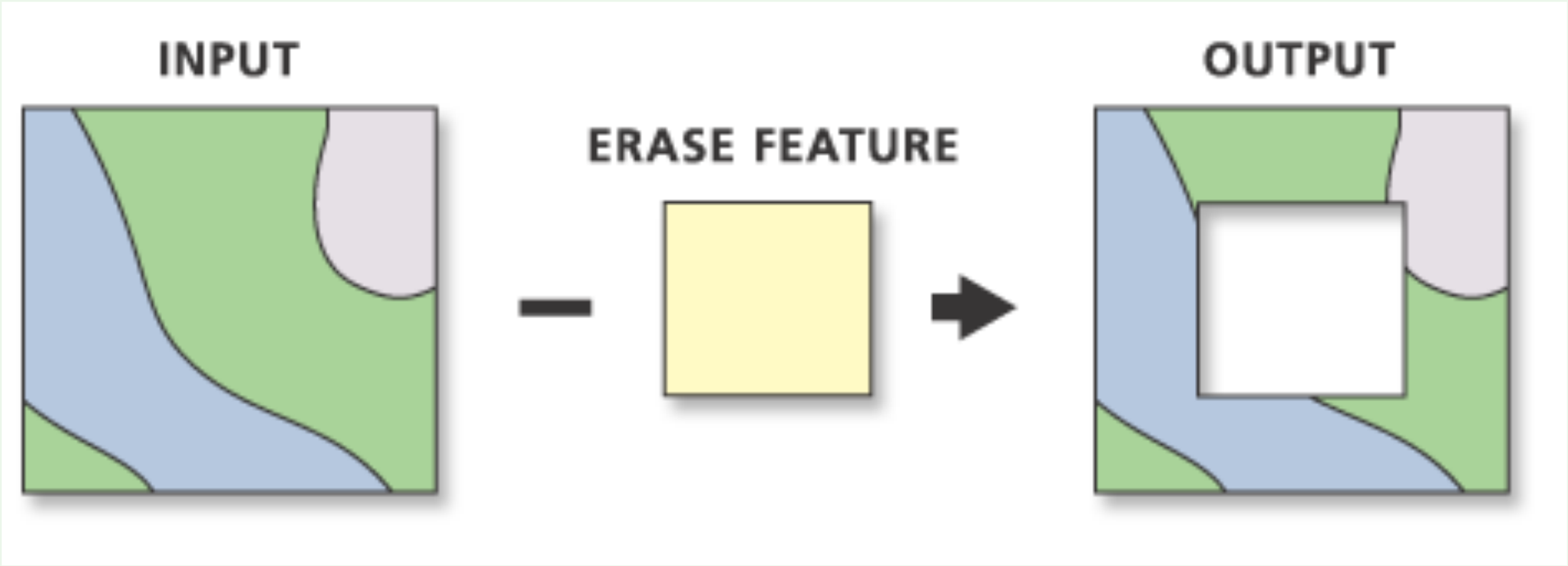






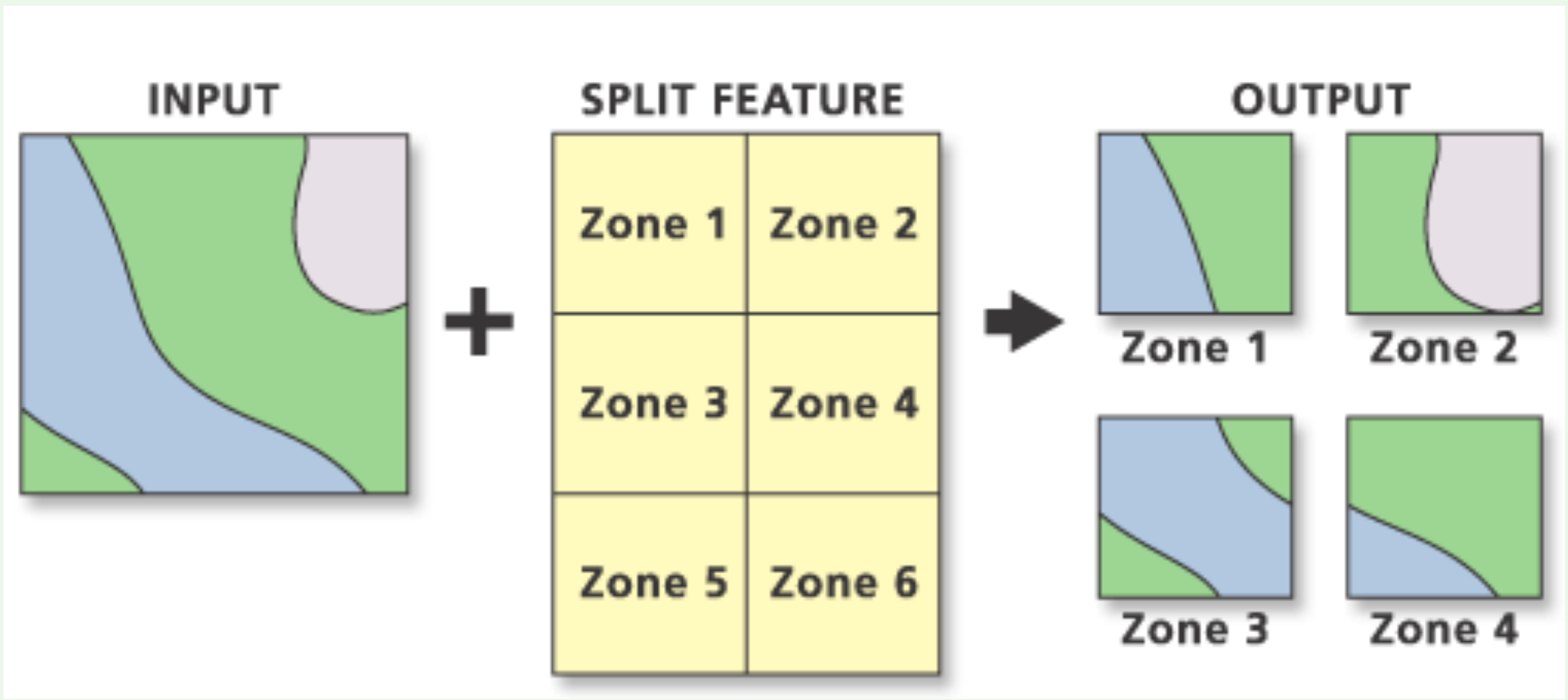
Erase

- Remove input features that fall inside erase features



Split

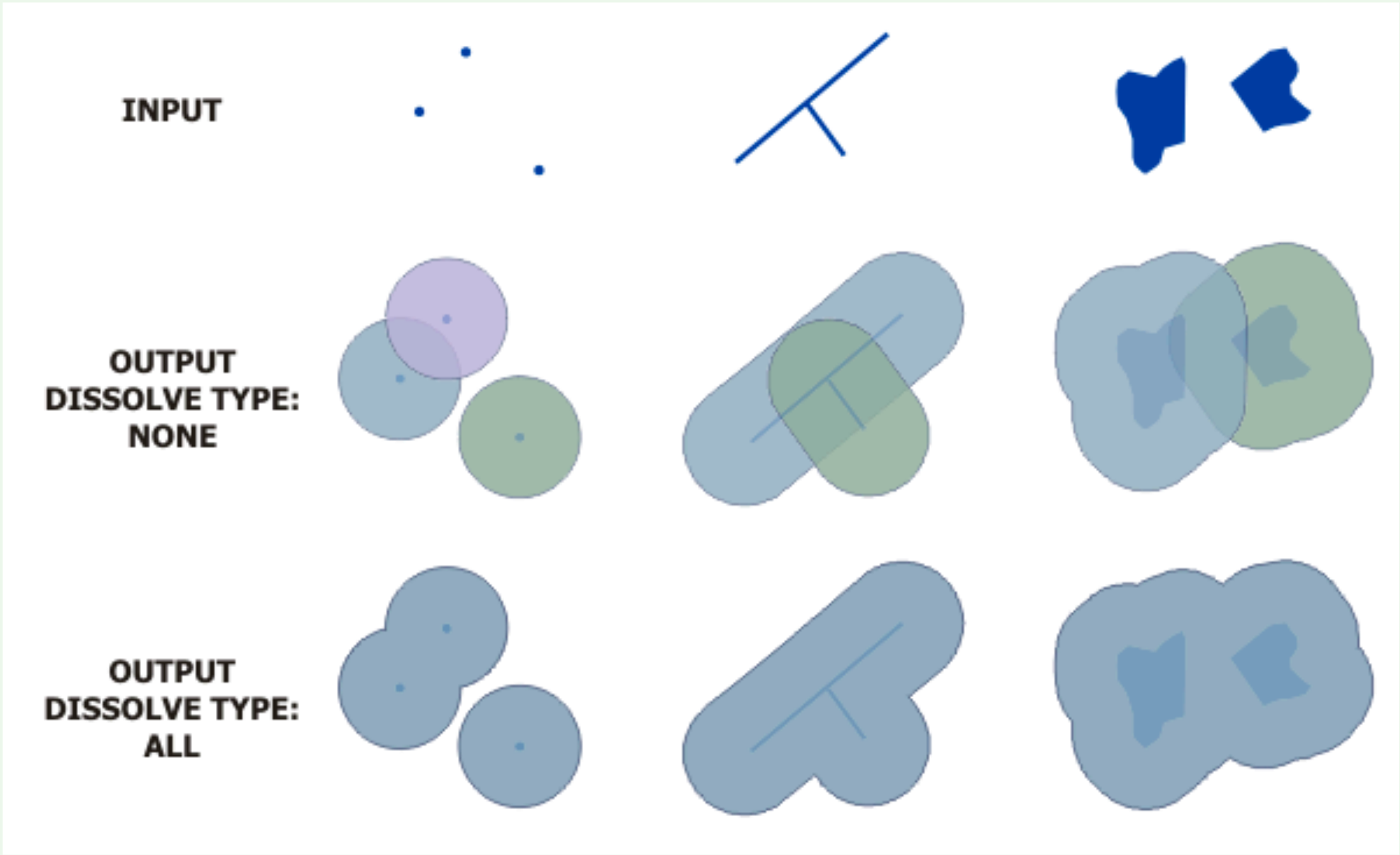
- Creates a subset of features from an input



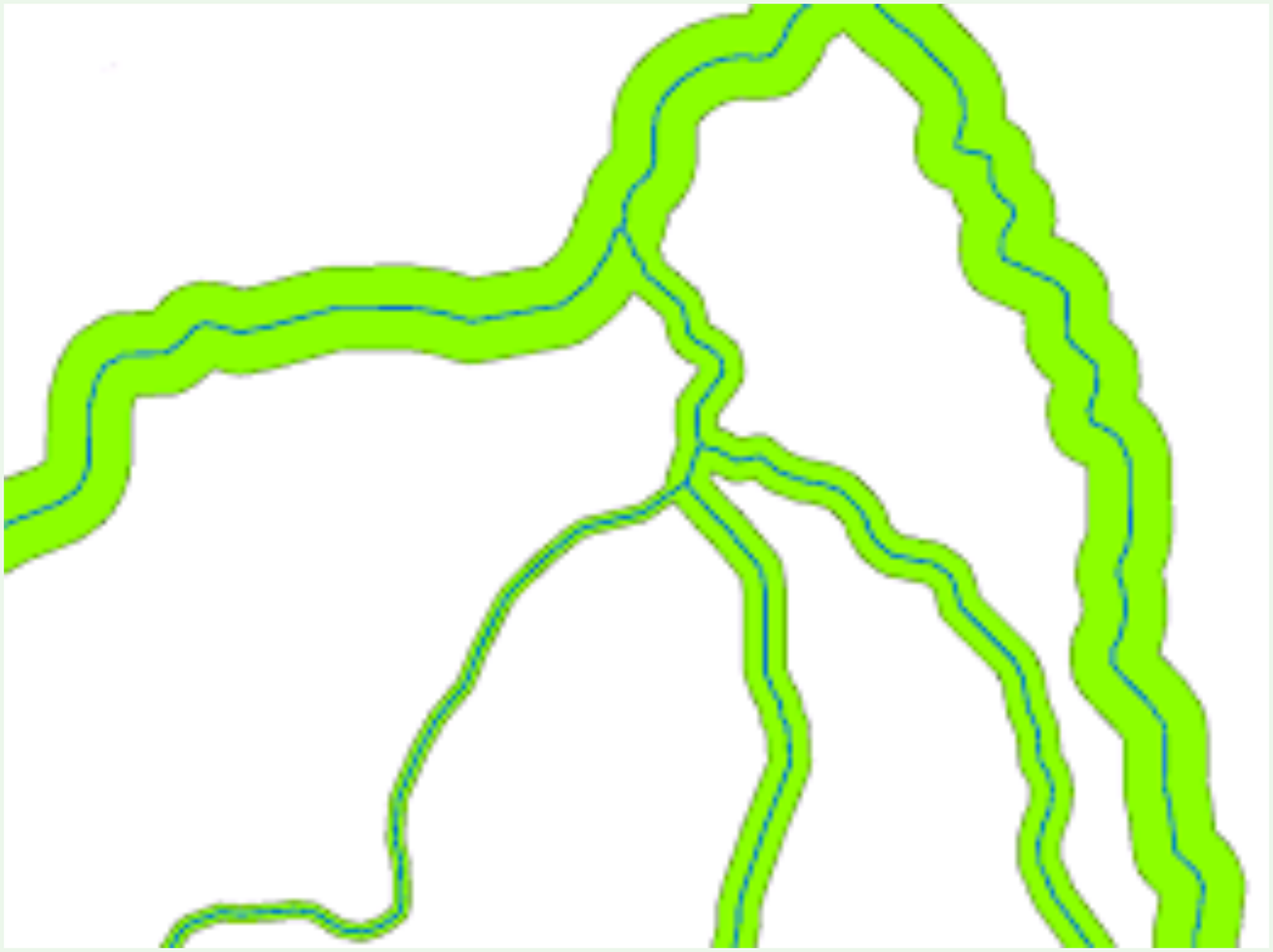
Proximity Analysis

- Types of proximity analysis in GIS
  - Buffer--region that is within a specified distance from a feature
  - Proximal region--region that is closer to a feature than to any other features
- Buffers and proximal regions are always polygons
- Buffers and proximal regions can be generated for point, line, and polygon features

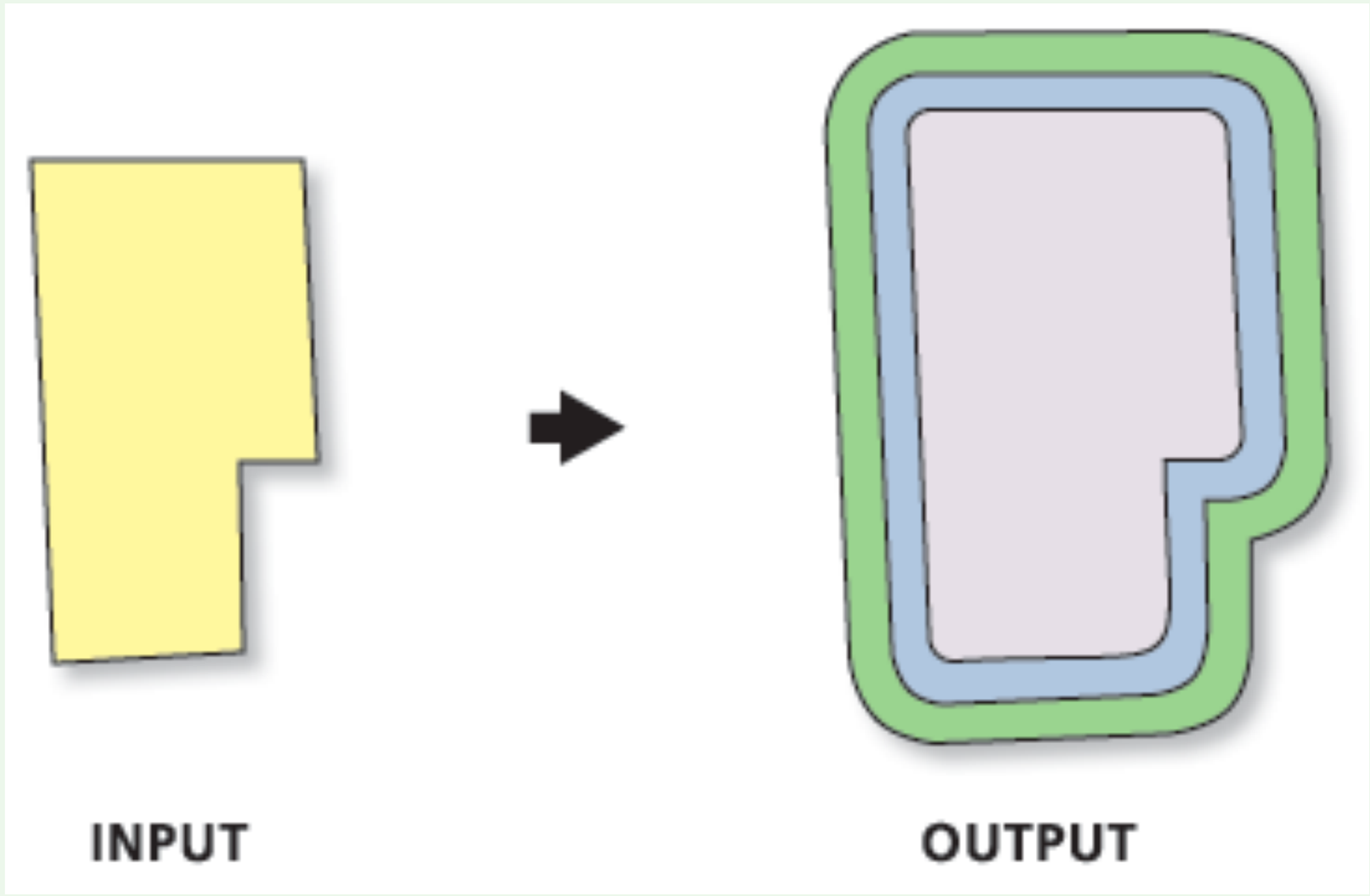
Buffering



Variable Buffer Width

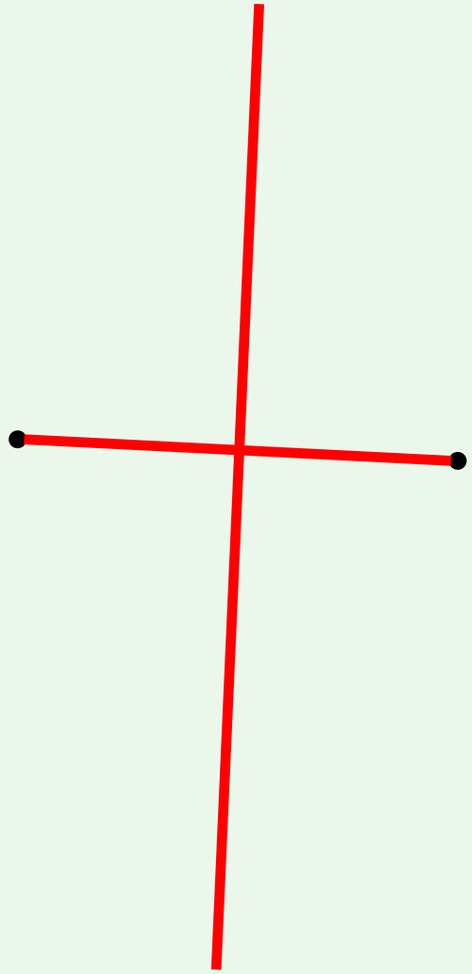


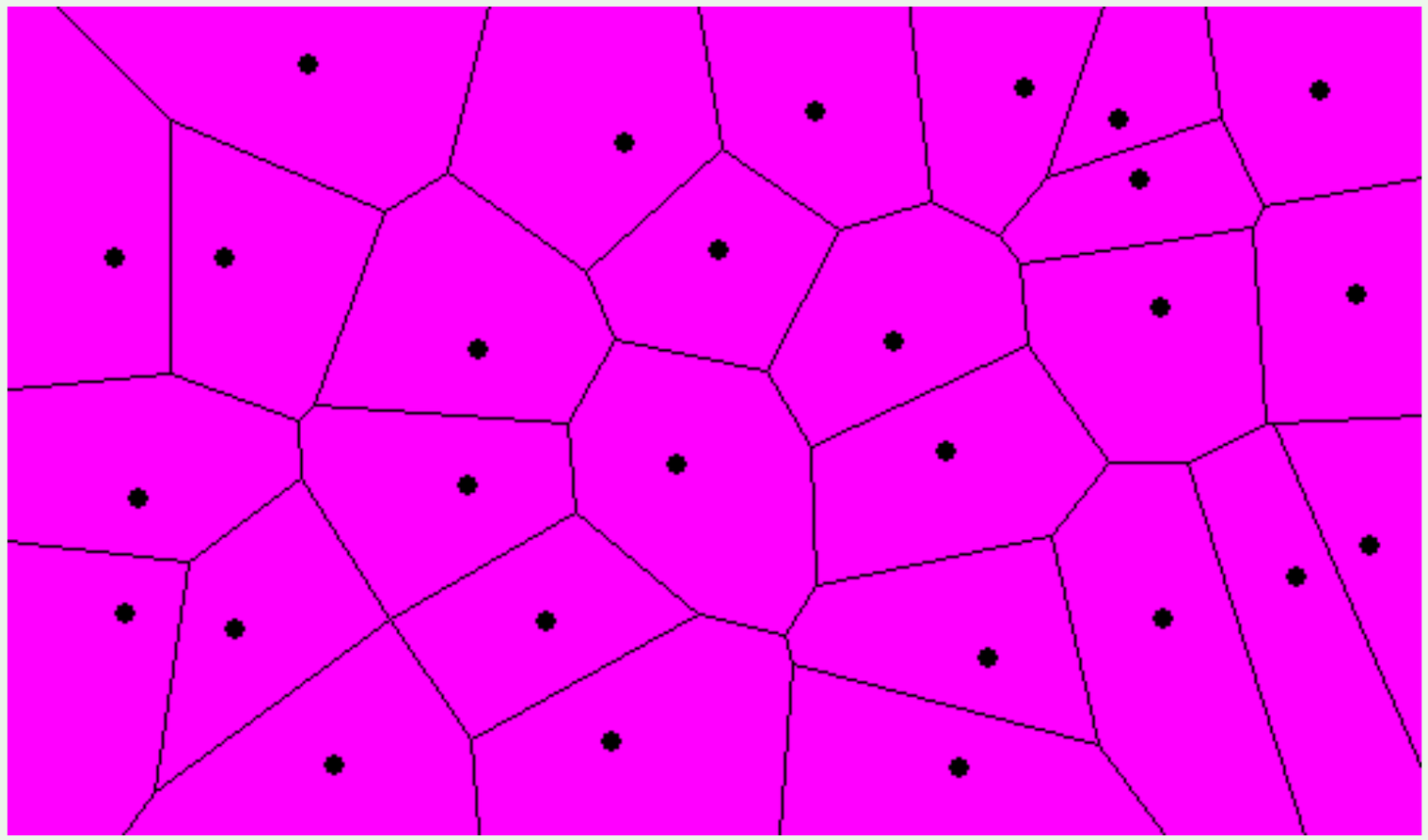
Buffering - multiple rings

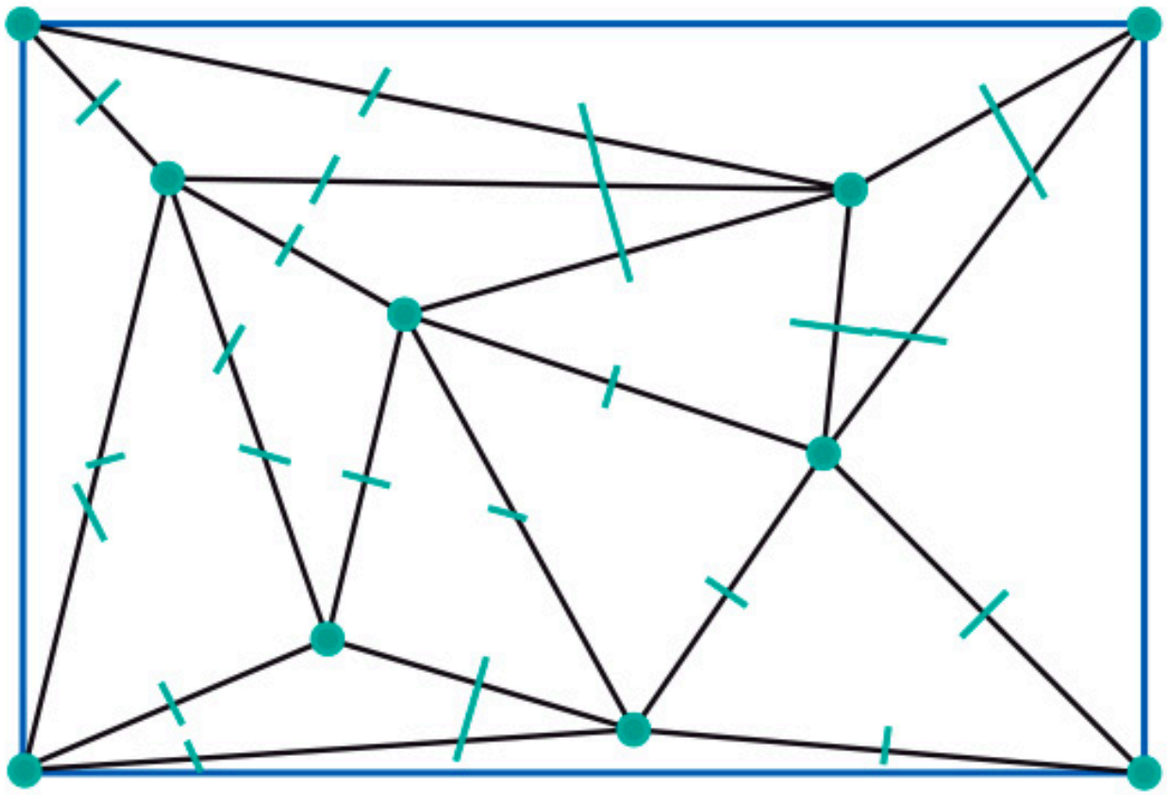


Proximal Region

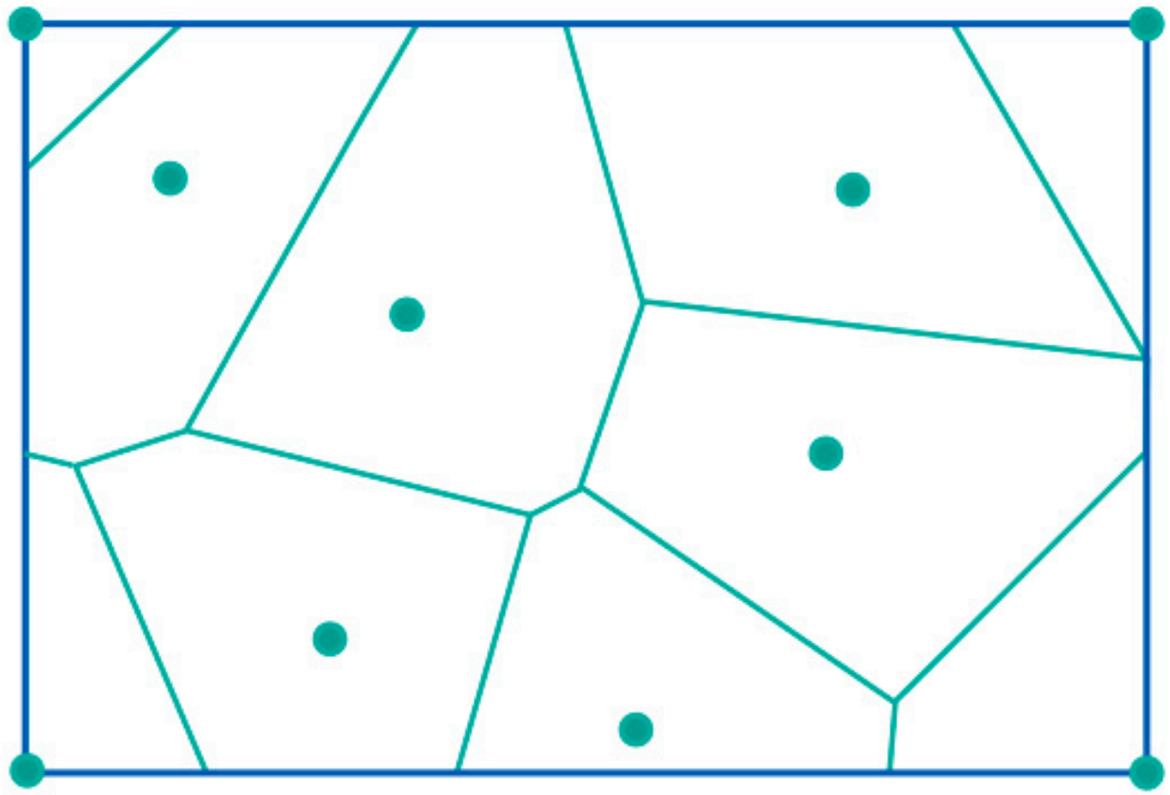
- Thiessen polygons represent the proximal regions surrounding a set of points
- Each location within a Thiessen polygon is closer to the point enclosed by the polygon than to any other point
- Also called Voronoi cells







Delaunay triangulation



Thiessen polygons

Dissolving Polygons

- Combine polygons which have the same value in the "dissolving" field(s)
  - Shared boundaries are removed.
  - Polygons are not necessary adjacent (multipart polygon)
- Reduce the number of polygons
  - The number of polygons in the output layer is equal to the number of unique values in the "dissolving" field(s)

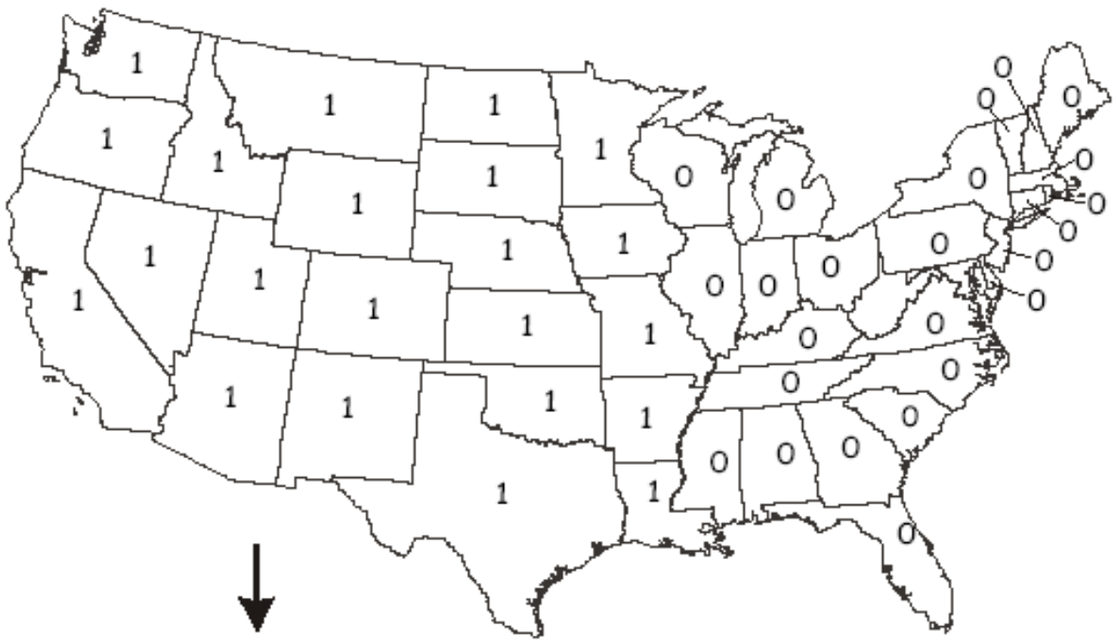
Dissolving Polygons

States west of the main branch of the Mississippi River assigned 1, east of the River assigned 0

Classification table

state name	is_west
Alabama	0
Arizona	1
Arkansas	1
Colorado	1
Connecticut	0
....	...
Wyoming	1

Dissolving Polygons

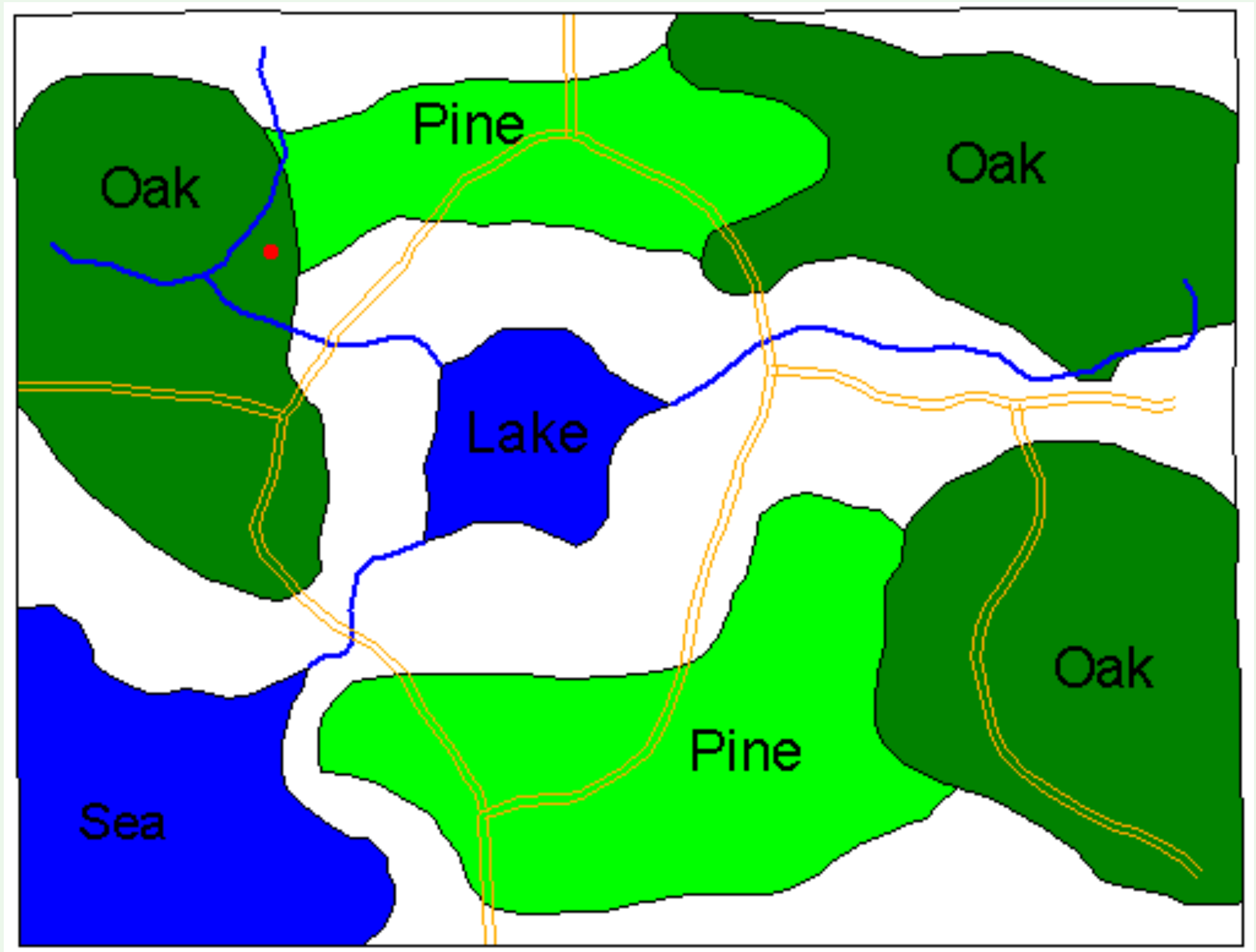


Boundaries are removed when they separate states with the same value. **The dissolve attribute is_west.**

Dissolve Table

state name	is_west	dissolve value
Alabama	0	E
Arizona	1	W
Arkansas	1	W
Colorado	1	W
Connecticut	0	E
....	...	...
Wyoming	1	W

A Logging Application



License Restrictions

- No trees may be cut down within 10 km of the shrine.
- No trees may be cut down within 1 km of the sea, the lake or any rivers to help prevent land erosion.
- The logging sites must be within 5 km of existing roads for easy access by heavy logging equipment.
  - Conservation laws will not allow any new roads to be built
- Where are the suitable forest stands?
- What are the areas of these stands?

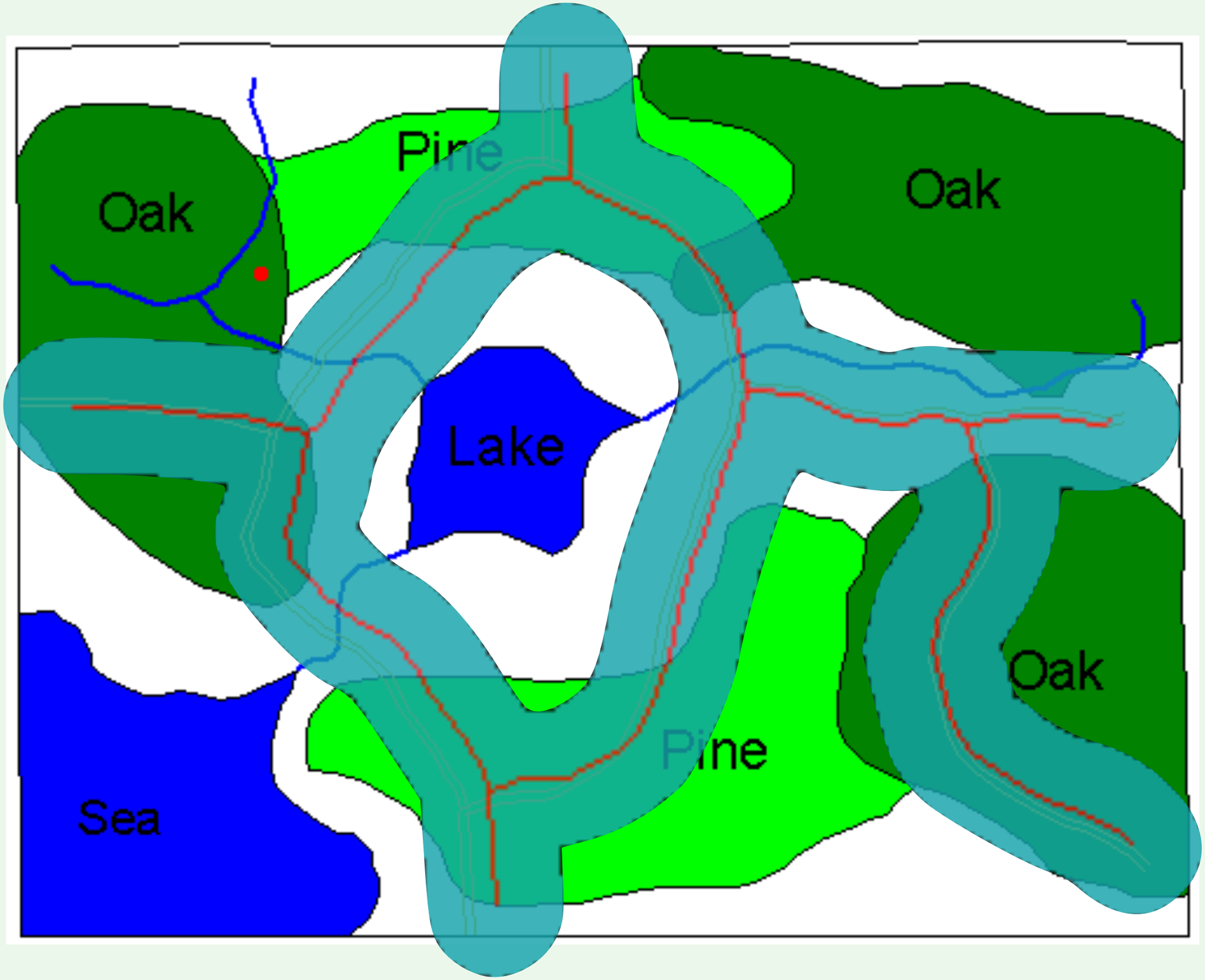
License Restrictions

- No trees may be cut down within 10 km of the shrine.
  - 10 km buffer of shrine
- No trees may be cut down within 1 km of the sea, the lake or any rivers to help prevent land erosion.
  - 1 km buffer of sea and lakes
  - 1 km buffer of rivers
- The logging sites must be within 5 km of existing roads for easy access by heavy logging equipment.
  - 5 km buffer of roads
- Where are the suitable forest stands?
- What are the areas of these stands?

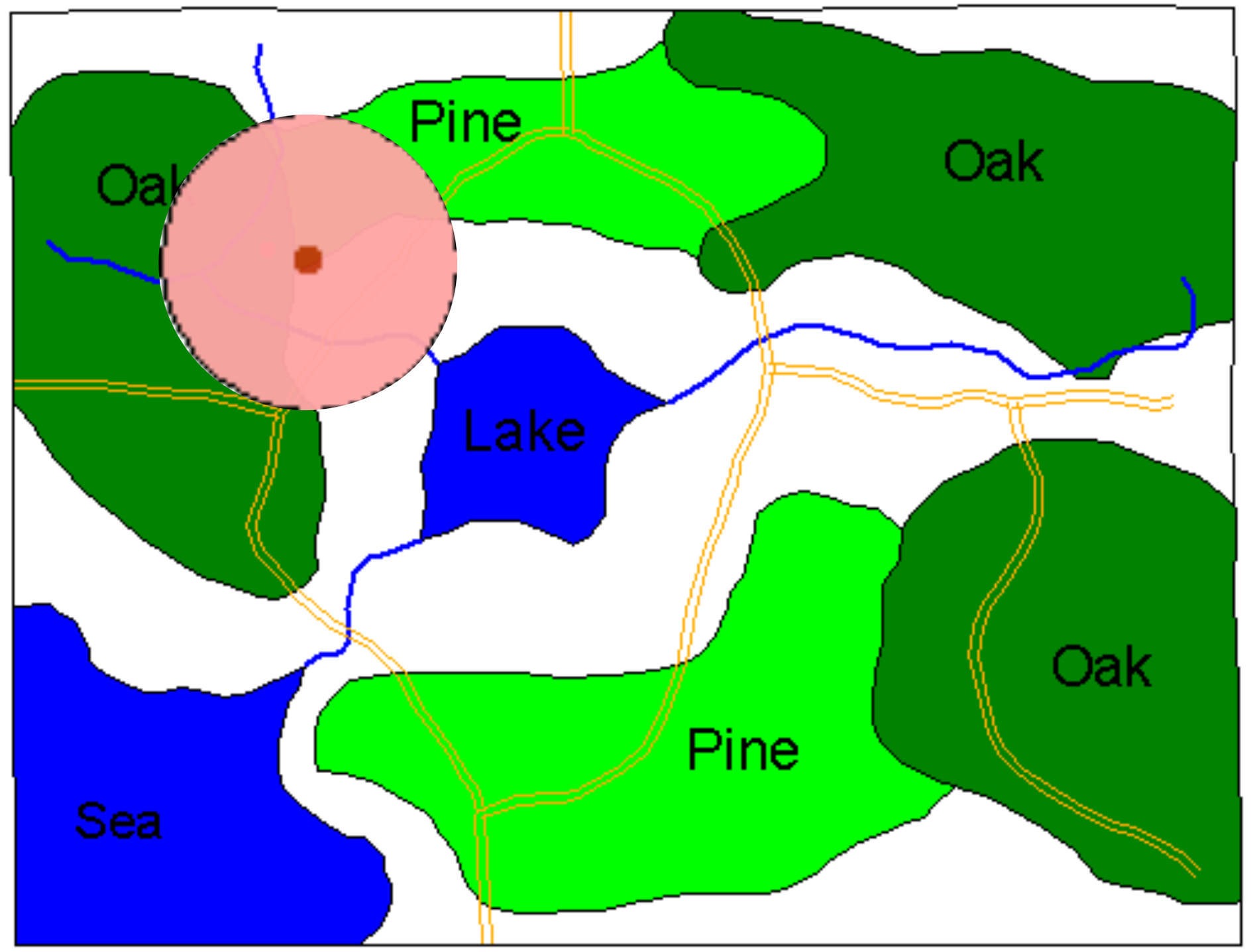
Road buffer
- shrine buffer
- water buffers

Permissible logging areas

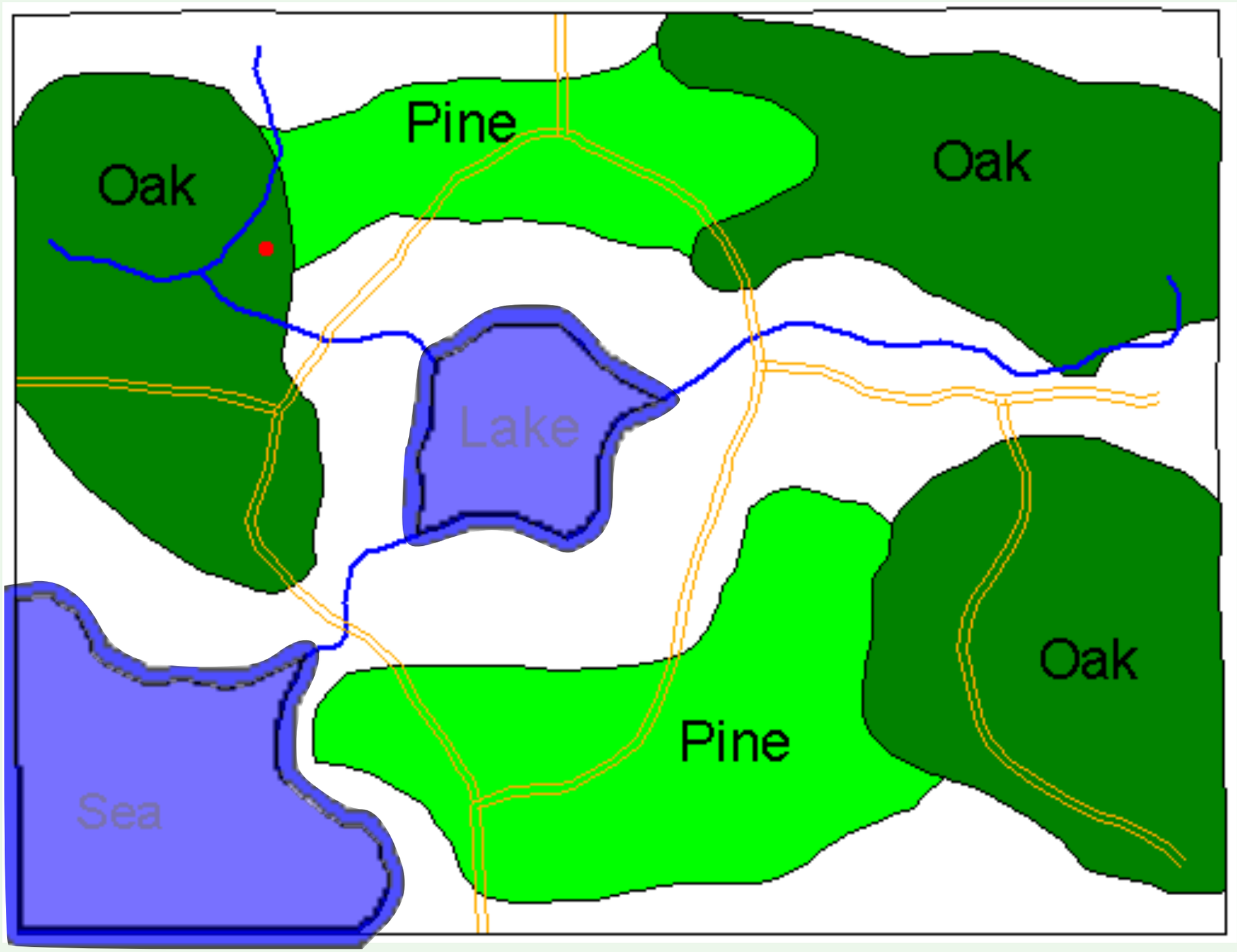
Maximum Accessible Logging Area
5 km buffer of roads



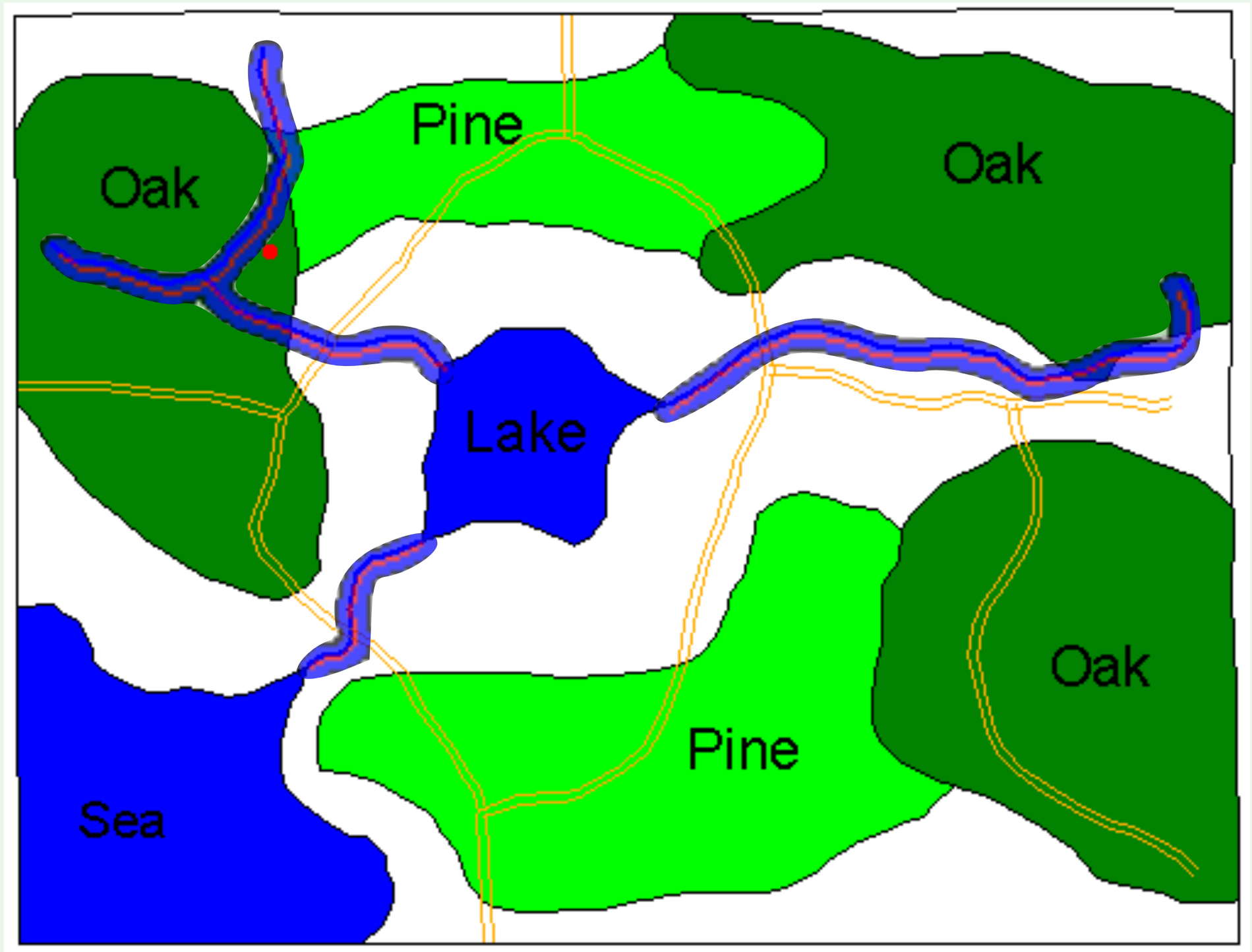
Environmental Exclusion Zones
10 km of shrine



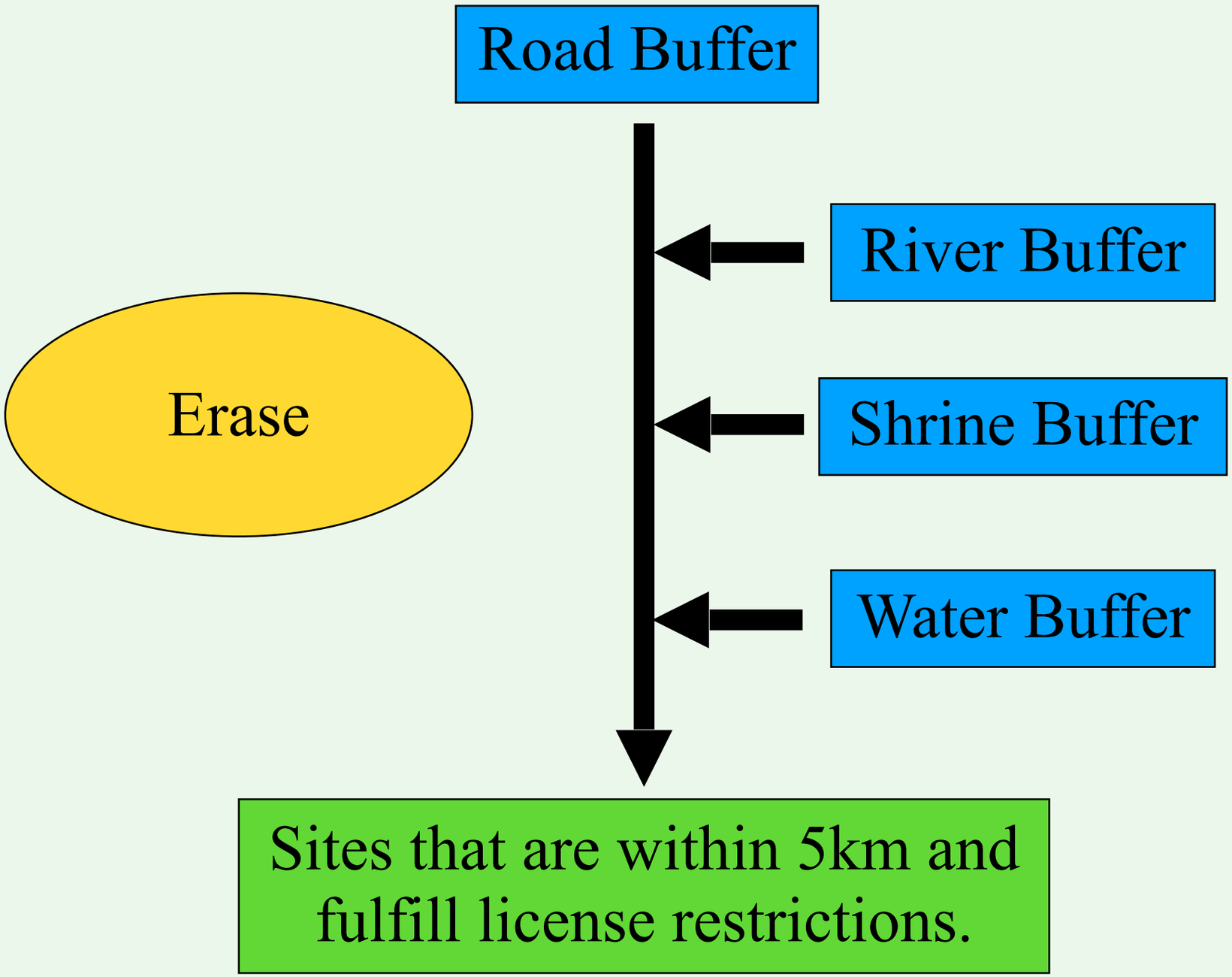
Environmental Exclusion Zones
1 km of sea and lake



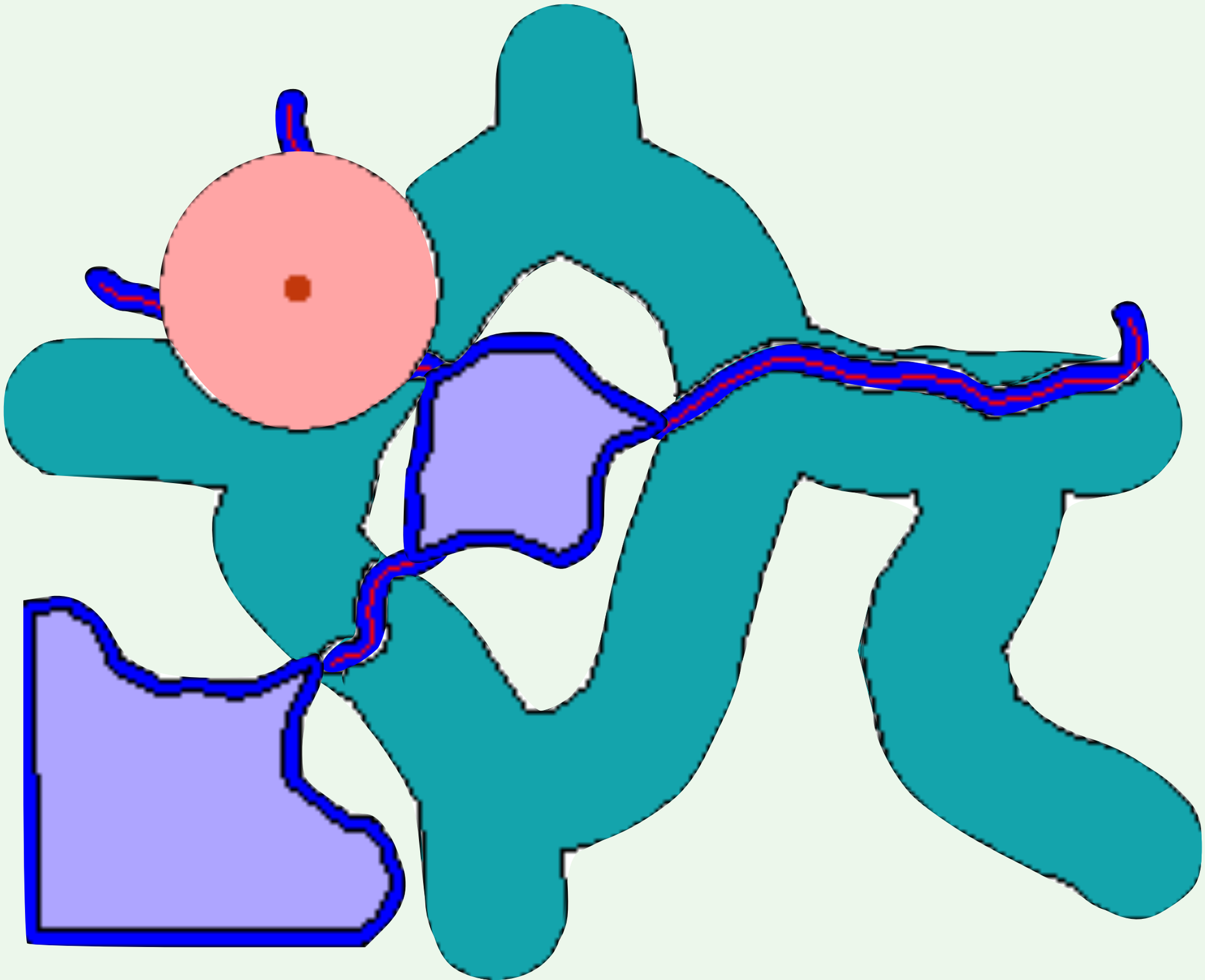
Environmental Exclusion Zones
1 km of rivers



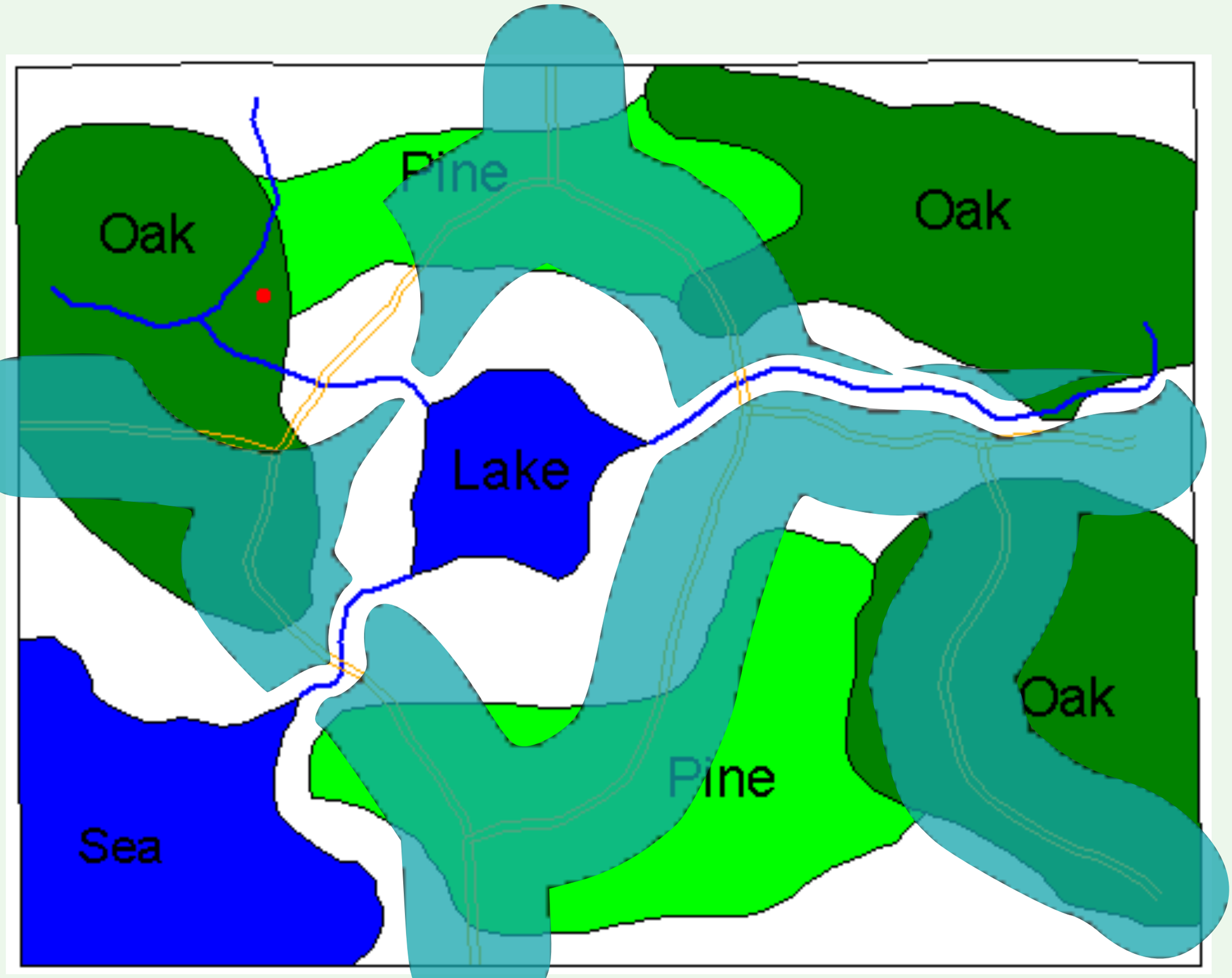
River, Shrine, and Water Buffers



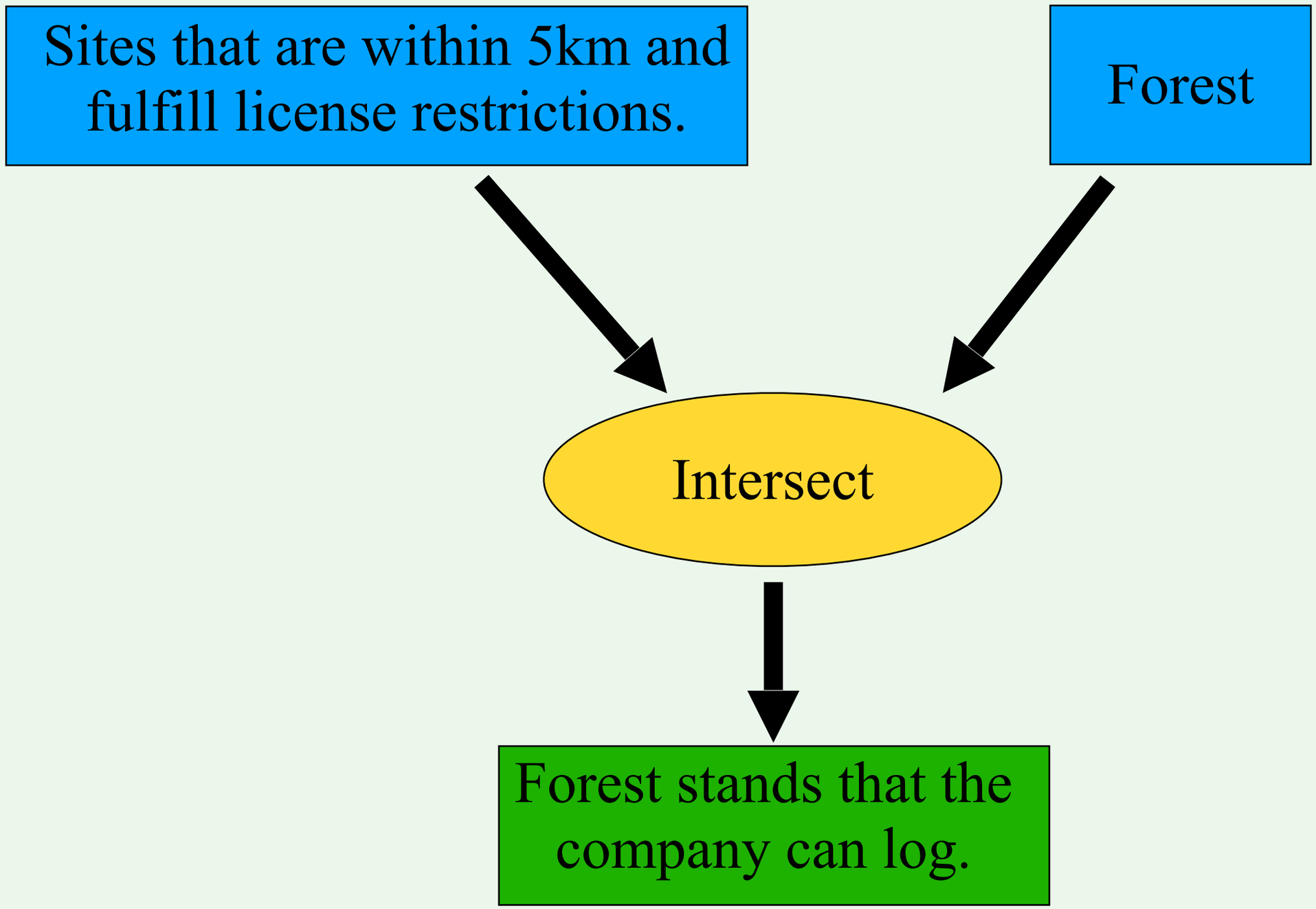
Erasing Buffers from Logging Area



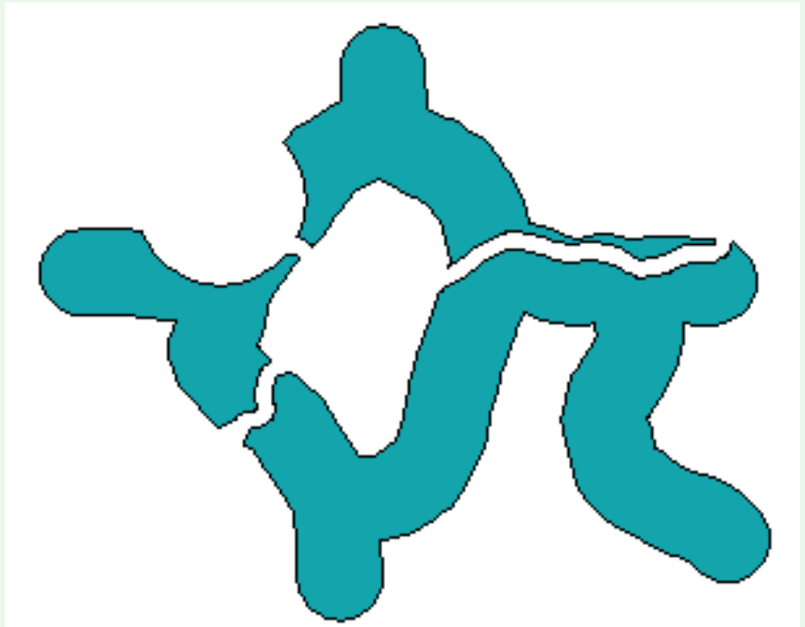
Permissible logging areas

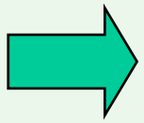


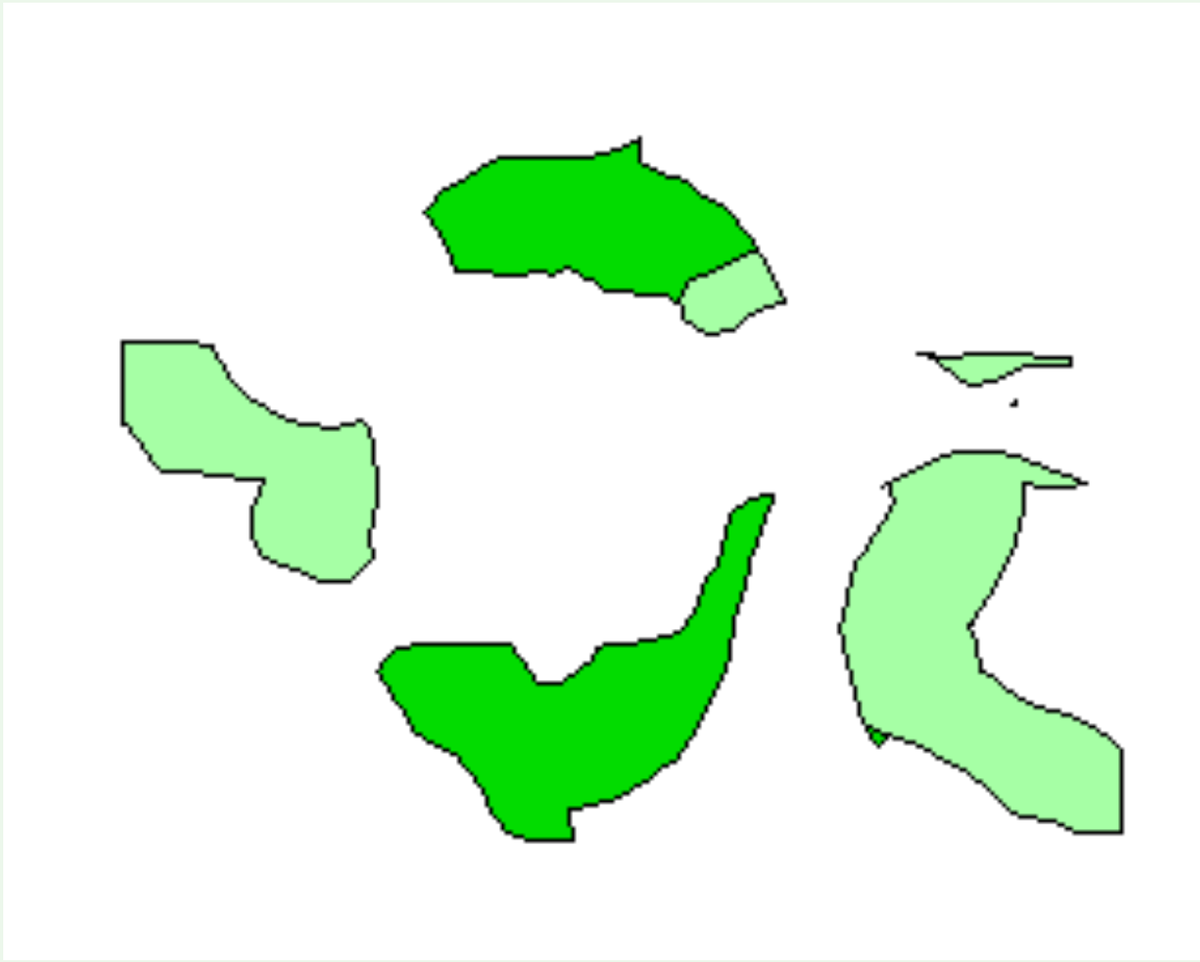
Intersect Logging Area with Forests

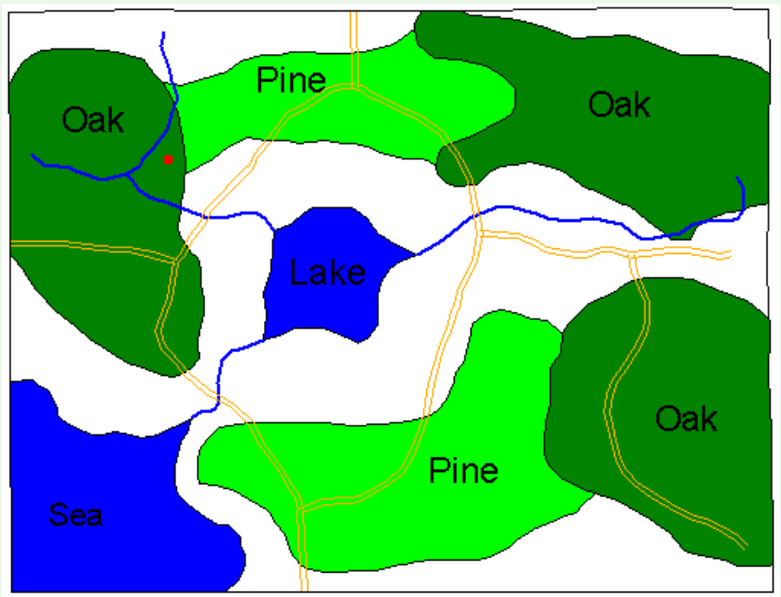


Intersect With Forest







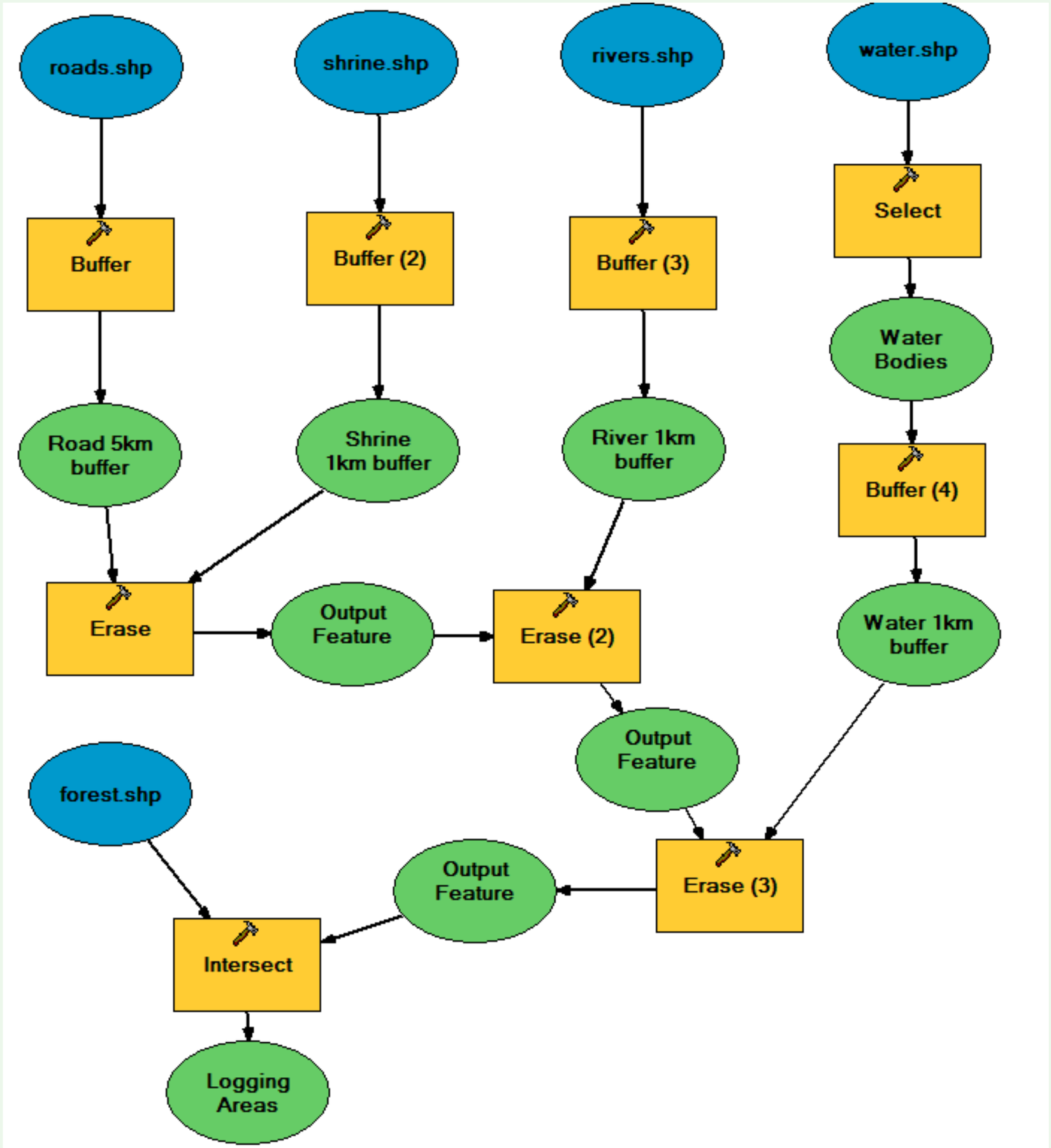


Calculate Total Area for Pine and Oak Forest

Attributes of Log Forest

FID	Shape*	FID_roads_	Id	FID_forest	AREA	PERIMETER	TYPE
0	Polygon	0	0	0	525920000	118600.68	Oak
1	Polygon	0	0	1	305010000	89871	Pine
2	Polygon	0	0	2	534600000	91203.352	Oak
3	Polygon	0	0	3	554330000	89999.141	Oak
4	Polygon	0	0	4	562760000	115559.219	Pine

Record: 1 Show: All Selected Records (0 out of 5 Selected.) Options



Spatial Analysis Using ESRI ModelBuilder