

Geographic Information System (GIS)

Vector Data Analysis



Dr. Eman Omar

Outlines

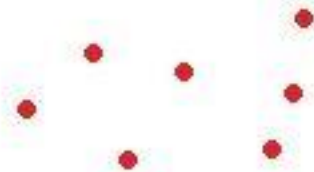


- Vector Data
- Buffering
- Overlay
- Pattern Analysis

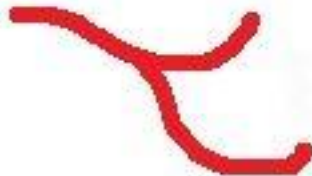
Vector Data



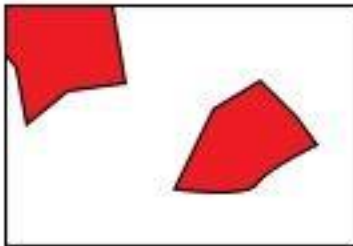
Vector



Points

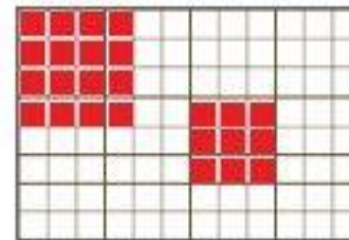
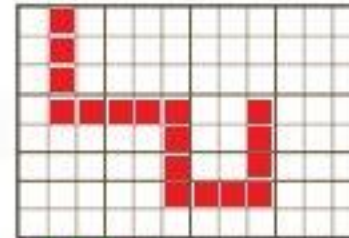
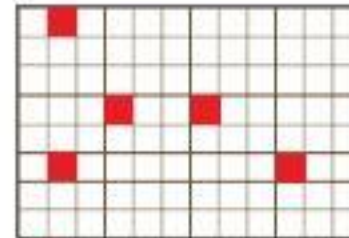


Lines



Areas

Raster



Buffering



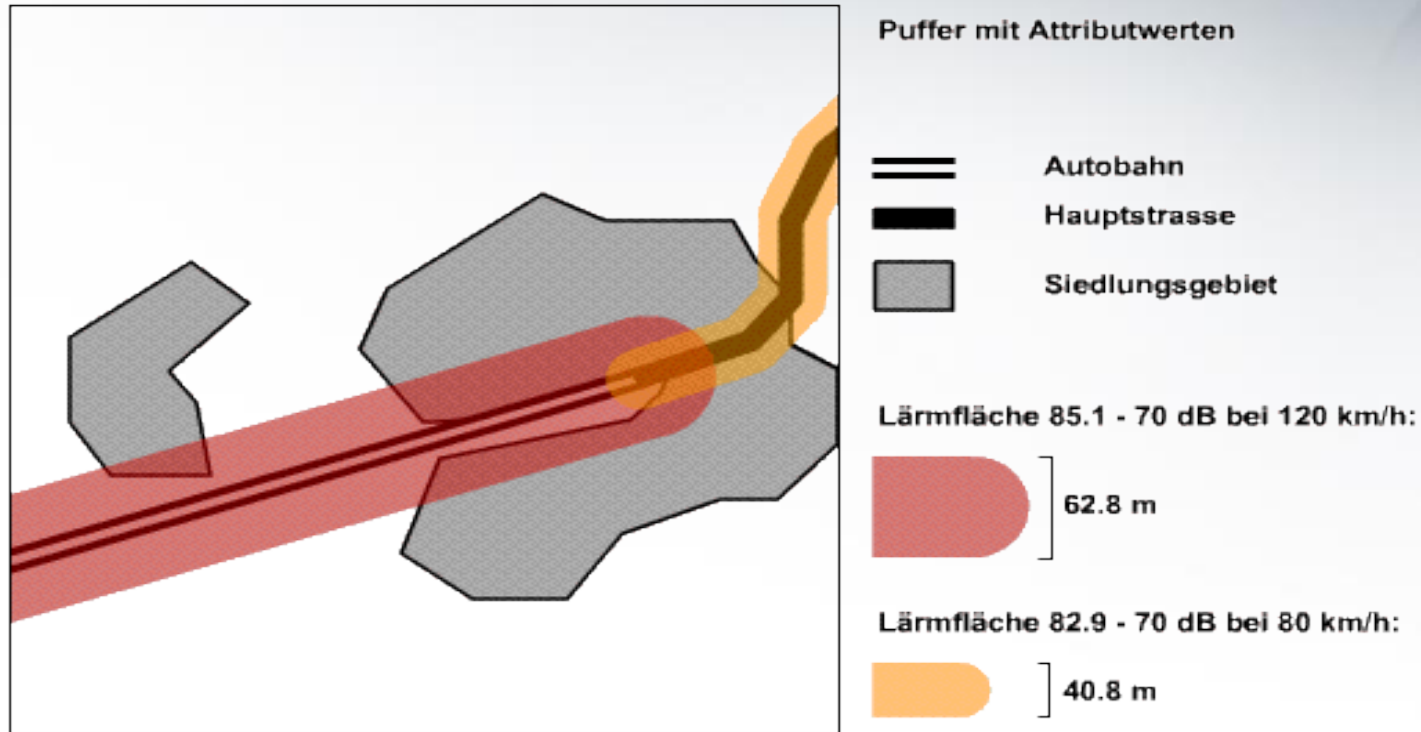
- **Buffering** separates a map into two areas
- one area that is within a specified distance of selected map features and the other area that is beyond.
- The area within the specified distance is called the **buffer zone**.
- Buffer zones are often used to protect the environment, protect residential and commercial zones from industrial accidents or natural disasters, or to prevent violence.

Variations of Buffering

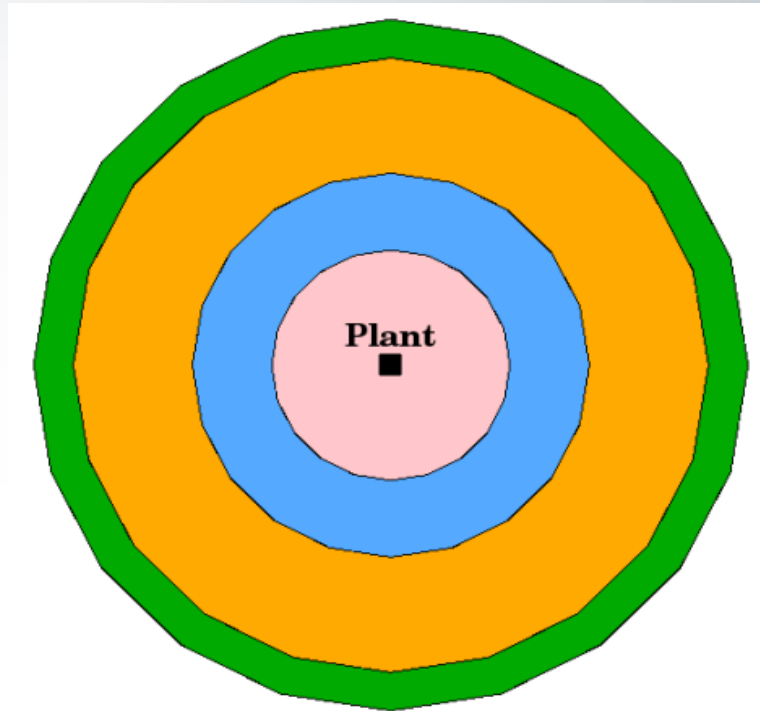


- Fixed vs. varying buffer distances
- Buffer rings
- Buffer zones on one side or both sides of spatial features
- Separate vs. dissolved buffer zones

Different Buffer Distances



Buffer Rings

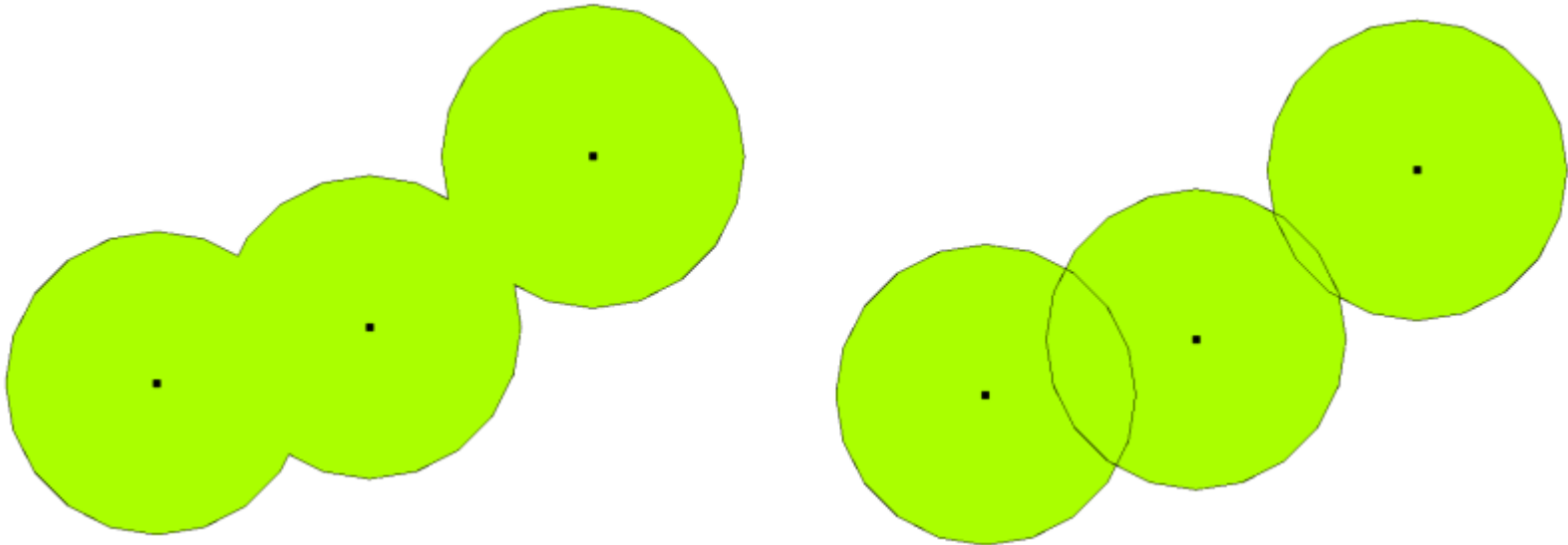


Buffering a point feature with distances of 10, 15, 25 and 30 km

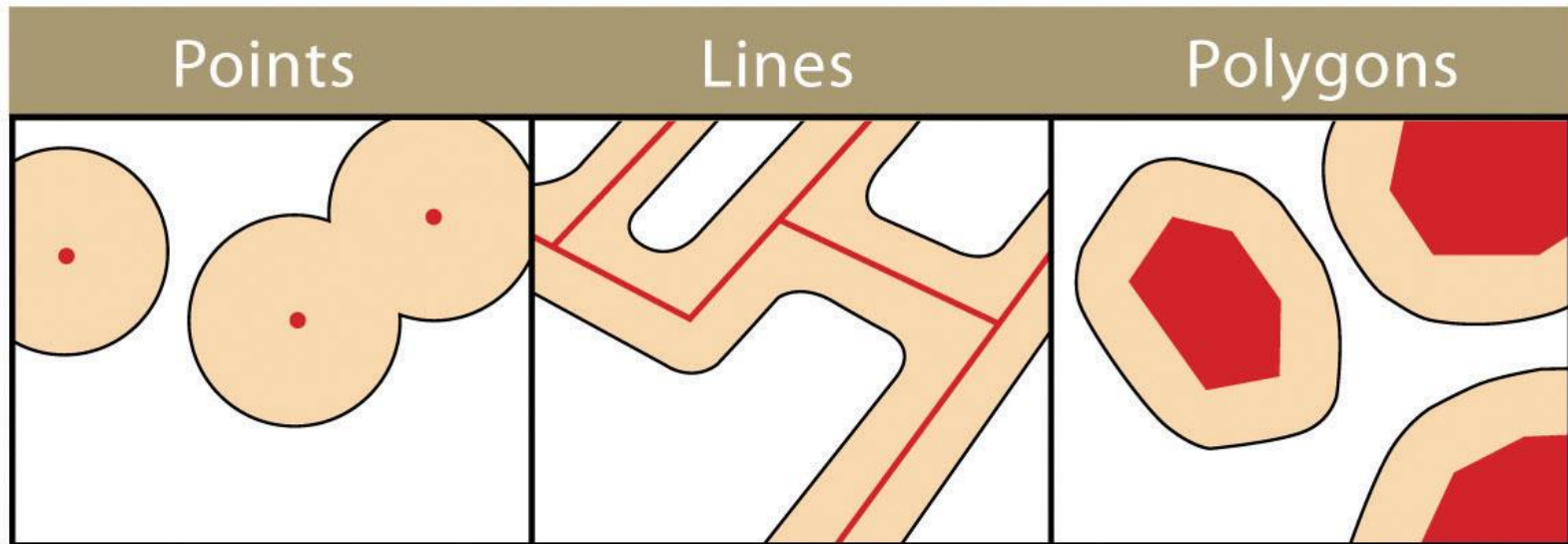
Dissolved Buffer Zones



- Buffer zones with dissolved (left) and with intact boundaries (right) showing overlapping areas.



Buffers around Red Point, Line, and Polygon Features



Map Overlay



- **An overlay operation** combines the geometries and attributes of two feature layers to create the output.
- The geometry of the output represents the geometric intersection of features from the input layers.
- Each feature on the output contains a combination of attributes from the input layers, and this combination differs from its neighbors.

Map Overlay

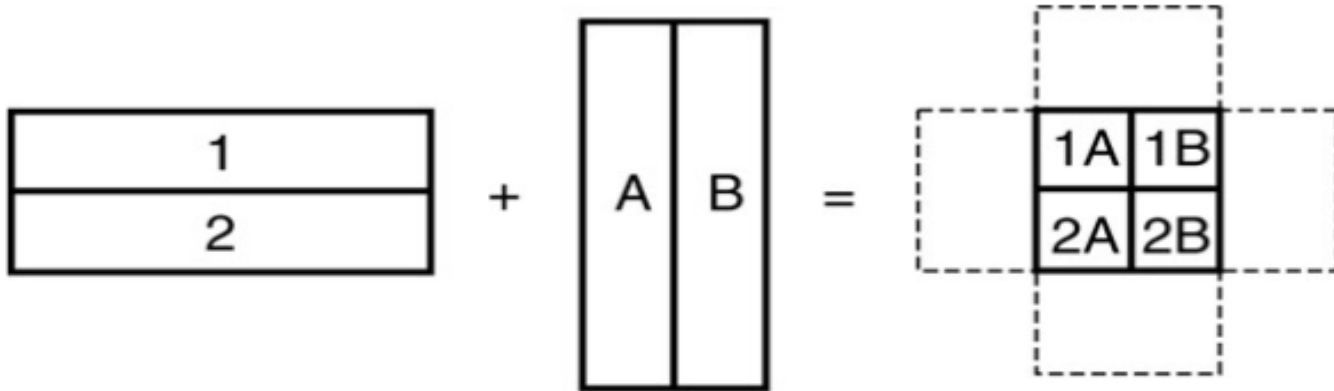


Figure 11.5

Overlay combines the geometry and attribute data from two layers into a single layer. The dashed lines are not included in the output.

Feature Type Map Overlay



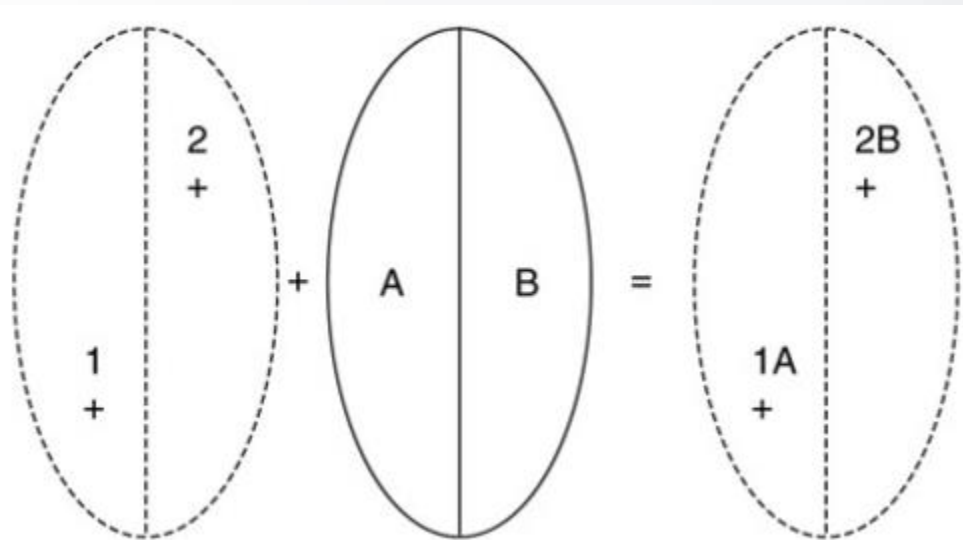
1. Point in Polygon
2. Line in Polygon
3. Polygon on Polygon

Point-in-Polygon



- The input is a point map (the dashed lines are for illustration only and are not part of the point map). The output is also a point map, which has attribute data from the overlay polygon map.

Point-in-Polygon

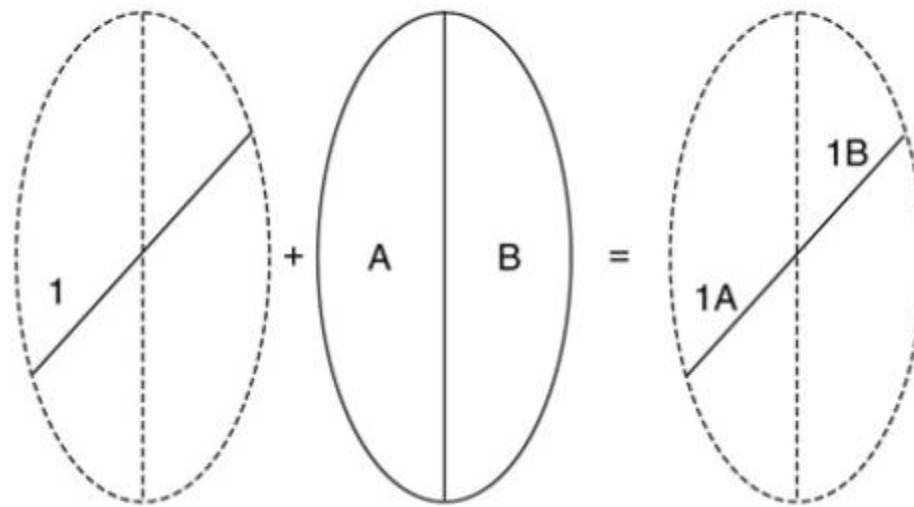


Line-in-Polygon



- The input is a line map (the dashed lines are for illustration only and are not part of the line map). The output is also a line map. But the output differs from the input in two aspects the line is broken into two segments, and the line segments have attribute data from the overlay polygon map.

Line-in-Polygon

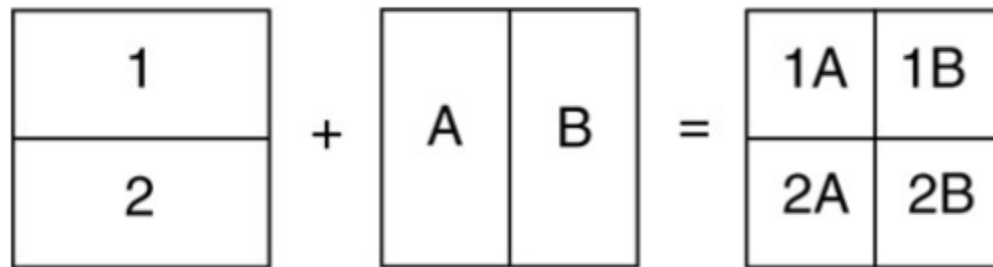


Polygon-on-Polygon



- The two maps to be overlaid have the same area extent.
- The output combines the geometry and attribute data from the two maps into a single polygon map.

Polygon-on-Polygon



Map Overlay Methods

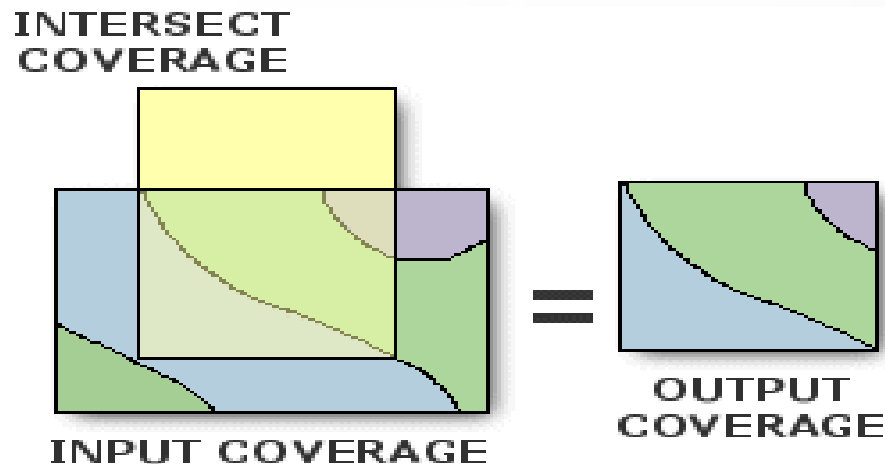


- Intersect (AND)
- Union (OR)
- Identity (OR/AND)
- Symmetric Difference (XOR)

Intersect (AND)



- Intersect (input map) AND (overlay map)
INTERSECT preserves only those features that fall within the area extent common to both the input and overlay maps.



Intersect (AND)

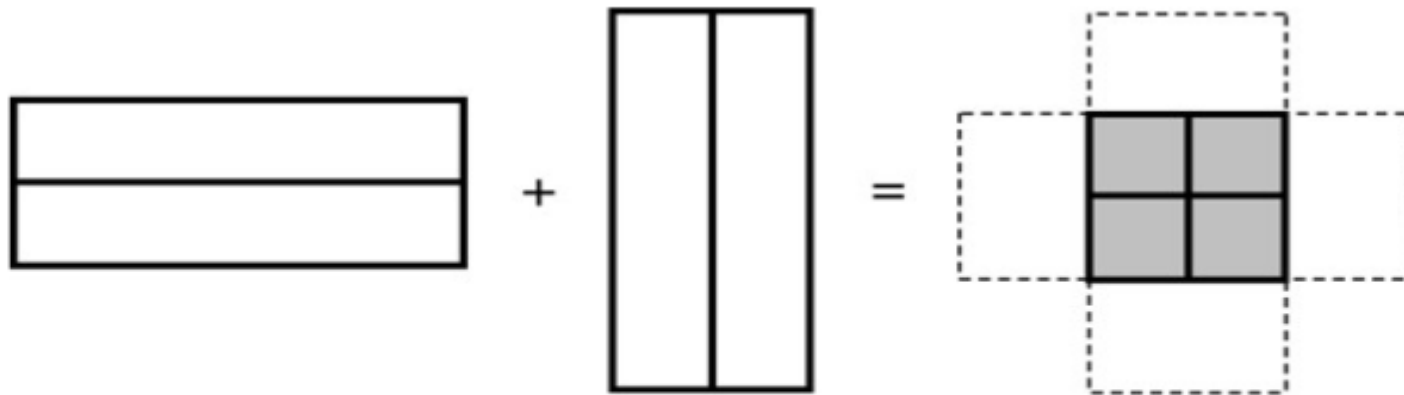


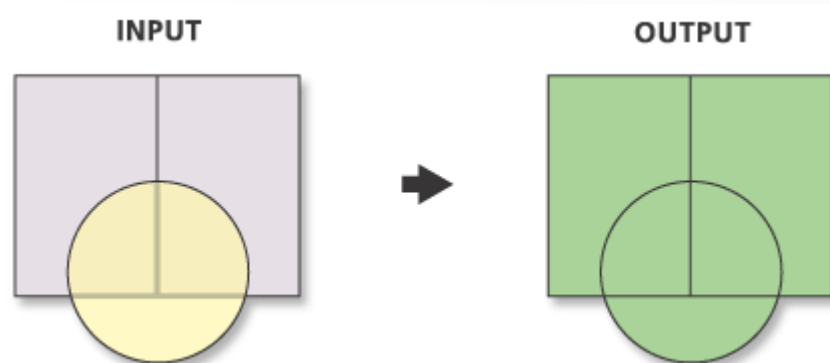
Figure 11.10

The Intersect method preserves only the area common to the two input layers in the output. (The dashed lines are for illustration only; they are not part of the output.)

Union (OR)



- Union (input map) OR (overlay map) UNION preserves all map features from the input and overlay maps by combining the area extents from both maps.



Union (OR)

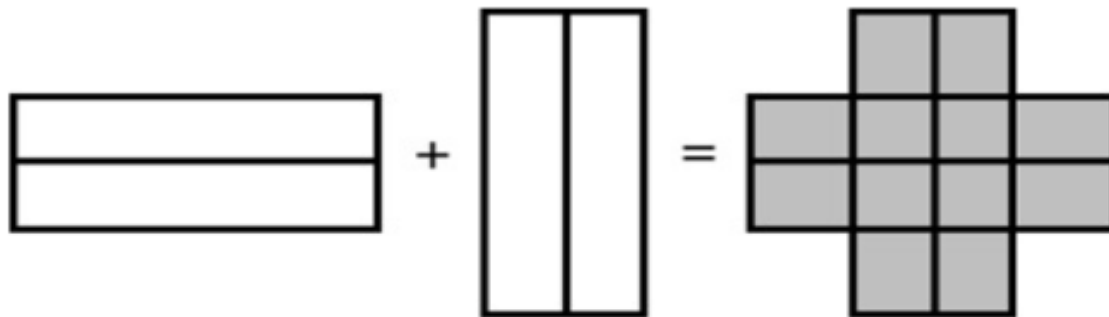


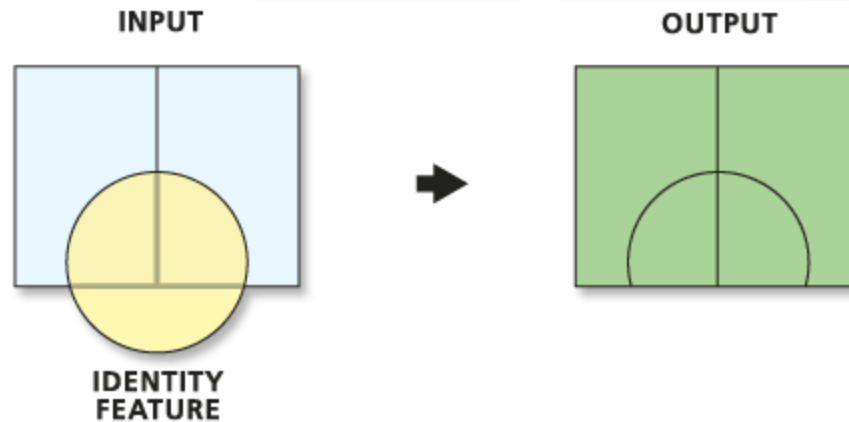
Figure 11.9

The Union method keeps all areas of the two input layers in the output.

Identity



- Identity (input map) OR (input map AND Identity map) preserves only map features that fall within the area extent defined by the input map.



Identity

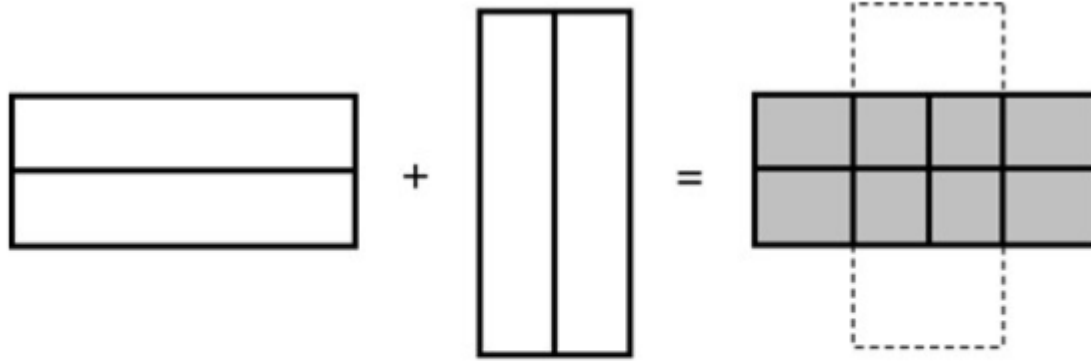


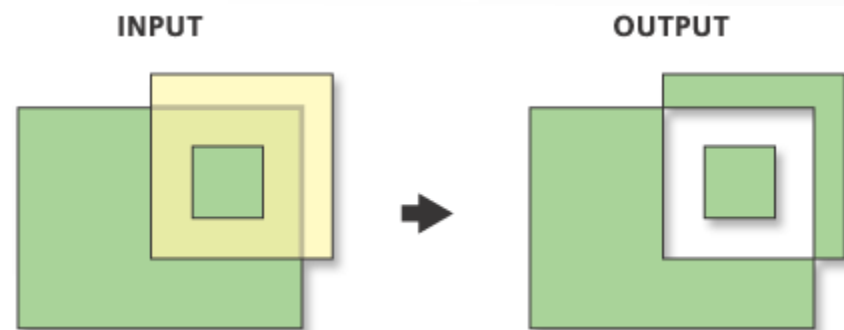
Figure 11.12

The Identity method produces an output that has the same extent as the input layer. But the output includes the geometry and attribute data from the identity layer.

Symmetric Difference



- Symmetric Difference (input map) XOR (overlay map) preserves features that fall within the area extent that is common to only one of the inputs. In other words, Symmetric Difference is opposite to Intersect in terms of the outputs area extent.



Symmetric Difference

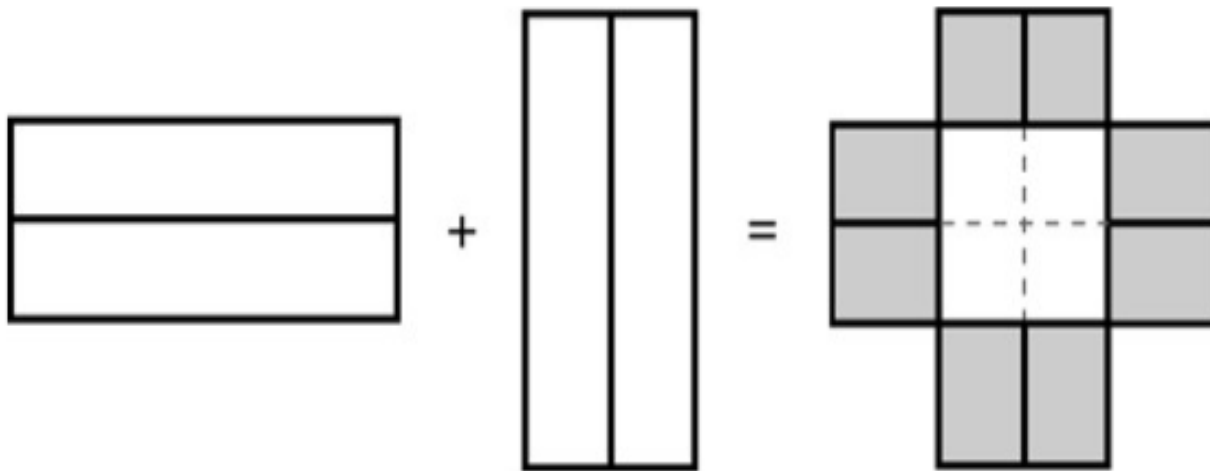


Figure 11.11

The Symmetric Difference method preserves only the area common to only one of the input layers in the output. (The dashed lines are for illustration only; they are not part of the output.)

Pattern Analysis



- Pattern analysis refers to the use of quantitative methods for describing and analyzing the distribution pattern of spatial features.
- At the general level, a pattern analysis can reveal if a distribution pattern is random, dispersed, or clustered.
- At the local level, a pattern analysis can detect if a distribution pattern contains local clusters of high or low values.

Pattern analysis

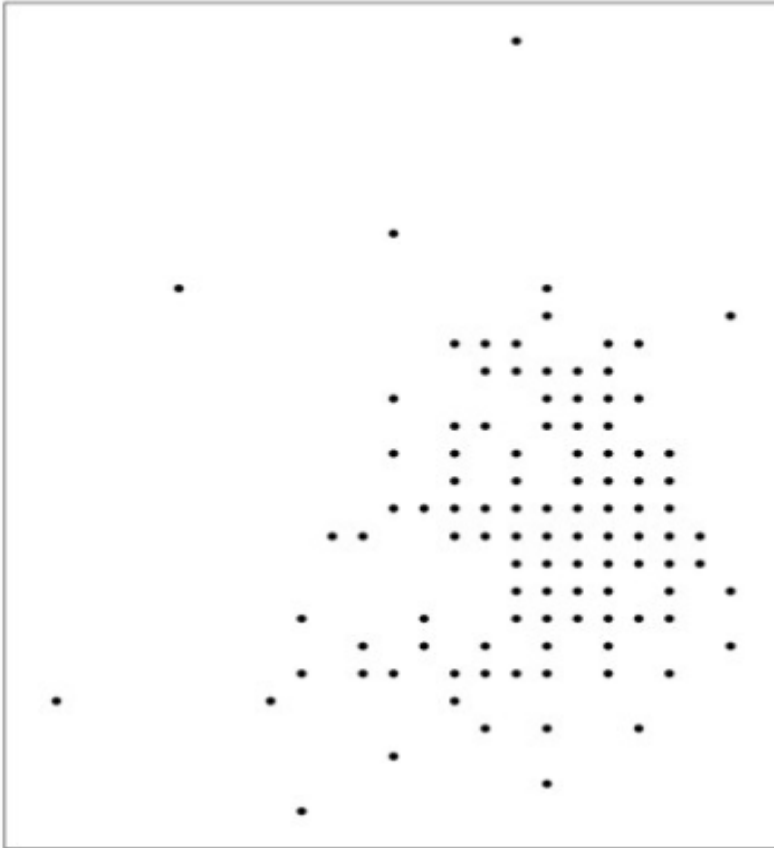


Figure 11.16
A point pattern showing
deer locations.

Pattern analysis

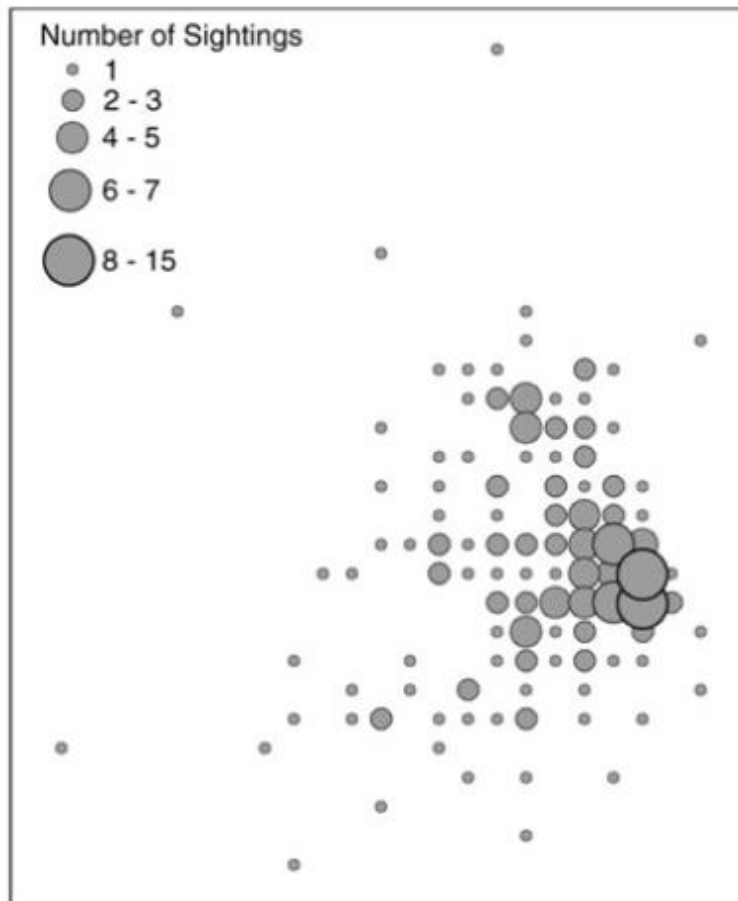


Figure 11.18
A point pattern showing
deer locations and the
number of sightings at
each location.

Pattern analysis

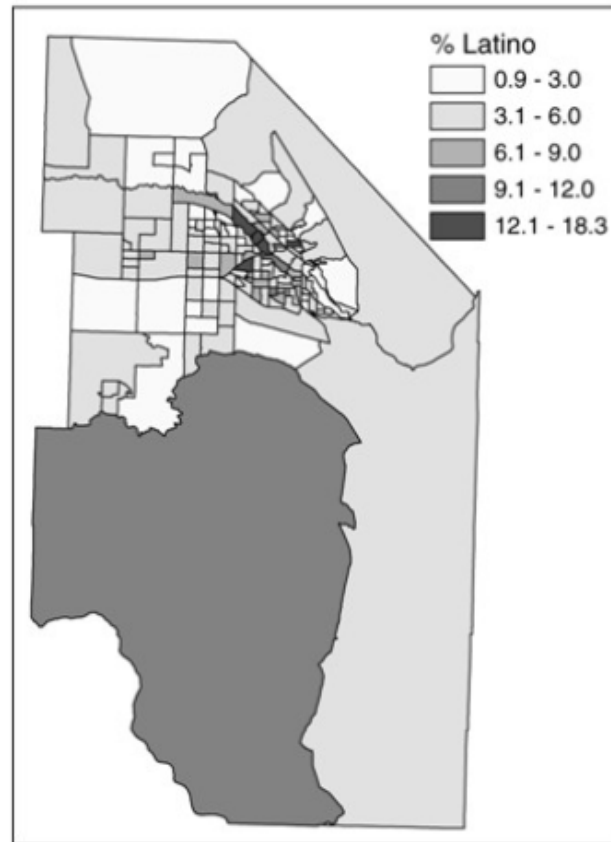


Figure 11.19
Percent Latino population
by block group in Ada
County, Idaho. Boise is
located in the upper center
of the map with small
sized block groups.



Thank You
Questions ??