Geography 476

Distance measures and buffers

Reading:

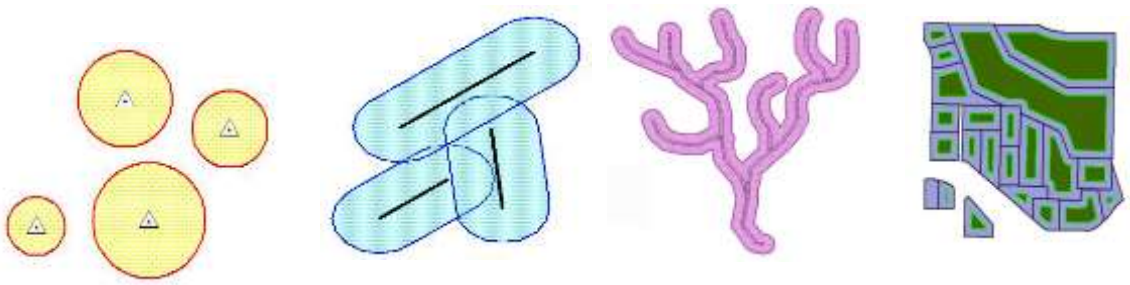
Chrisman Ch 6: 153-168

Learning objectives. After this reading and lecture you should be able to:

- Describe the difference between buffer on vector data and distance operations on rasters
- Explain the importance of geometry for calculation of vector buffers
- Explain the importance of the square root of 2 for raster distance measurements
- Use criteria based on distance operations as overlay components.
- Describe how a Voronoi diagrams are different from vector buffer and raster distance operations

Distances measures and buffers

A buffer spreads a category (zone) outwards to grab more space.
This transformation makes polygon or raster areas for use in other analyses.



- Exclusionary buffers are quite common in regulations. "
- Setbacks are common in zoning.

In either case, the edge of objects form the basis for sending a contour outwards or inwards.
A fixed distance is used in place of a more careful study of the actual hazard/risk.

Before buffers... John Snow MD battles cholera in London circa 1855

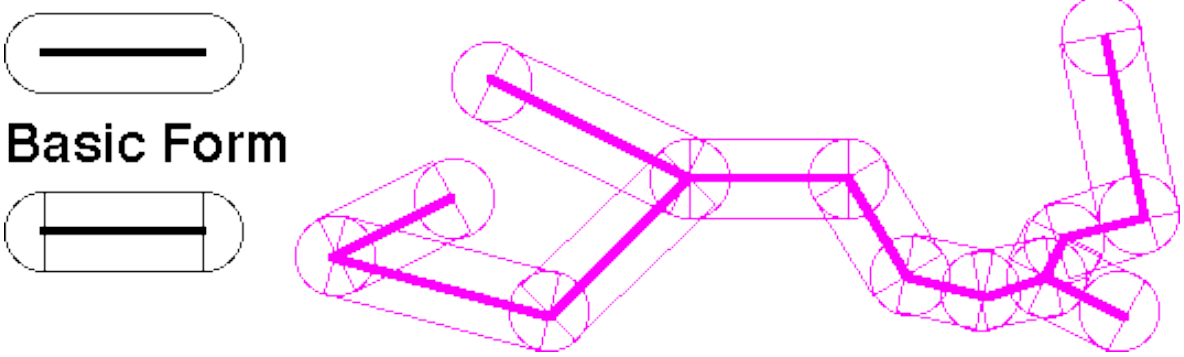
Vector geometry: Pythagorean Theorem:

$a^2 + b^2 = c^2$

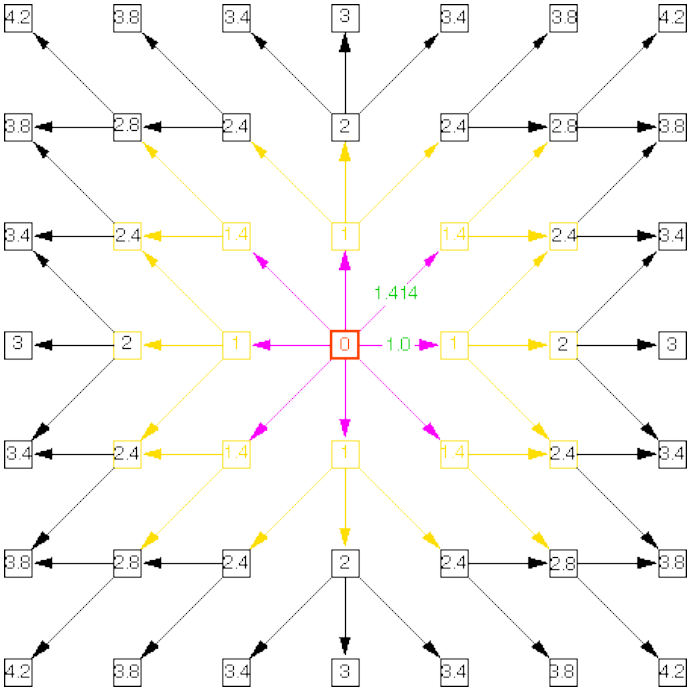
Equation of a line: $y = mx + b$

Construction of Buffers:

Vector: fixed distances create contours (isolines of equal distance) gives a precise location for a specific regulation, gives zones between...
Each segment throws out a zone around it (two half circles and one rectangle).
To generate a buffer, construct these objects around each segment, overlay all the objects, aggregate to remove duplicate areas.



Raster: measures distance to center of each cell, comes in steps of cell width

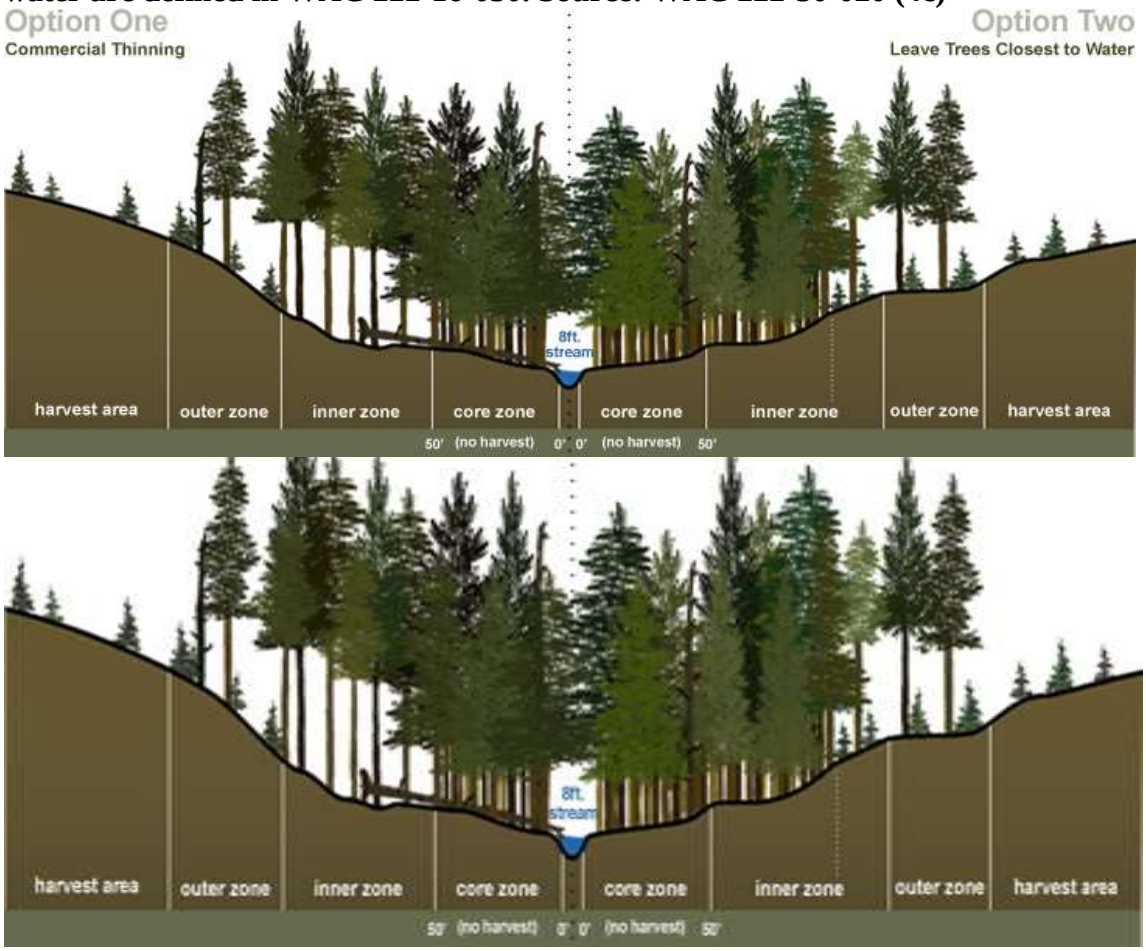


Example:
Timber, Fish Wildlife Agreement, Washington State

Riparian Management Zone (RMZ) Requirements

Water Type & Width	Maximum RMZ Width
Class 1&2 >75'	100'
Class 1&2 <75'	75'
Class 3 > 5'	50'
Class 3 < 5'	25'

Note: a minimum width of buffers is set to 25' for all water types and widths. Classes of water are defined in WAC 222-16-030. Source: WAC 222-30-020 (4c)



Siting criteria for landfills in Illinois counties

Illinois Landfill siting study: uses exclusionary logic mostly with buffers:

CRITERIA \ COUNTIES	Crawford	Lake	Will	Champaign	Whiteside
100 year floodplain	X	X	X	X	7920
Wetlands	X	X	X	X	5820
Airports (turbojet)	10000	10000	10000	10000	10000
Historic sites	1000	200	X	-	1320
Endangered species	500	X	X	X	X
Developed areas	1500	500	-	-	-

`Committed' devel.	1500	500	-	-	-
Geologic material type	-	X	-	X	-
Surface waters	1000	600	-	500	-
Public water supply	2500	500	500	1000	5280
Other water wells	-	-	-	200	-
Oil wells	250	-	-	-	-
Incorporated areas	-	-	X	7920	1320
Rural dwellings	-	-	-	-	1320
Cemeteries	500	-	-	X	5820
Schools	10000	500	500	7920	5820
Hospitals	10000	500	500	-	-

Source: Lindquist (1991) *GeoInfoSystems* Table 1, selected for key differences.

X denotes simple exclusion; figures are buffer distances in feet;
- indicates criterion not used in that county.

Voronoi zones around points

Voronoi network (dark thinner lines) divides the region into areas closer to a particular point than any other (formed by pendendicular bisectors of lines between neighboring points).
The Delaunay trinagulation (thicker grey lines) is the network of the connections between points that have a nearest neighbor relationship.