FE 257. GIS and Forest Engineering Applications

Week 3

This week's topics

- Clip and erase processes
  - Chapter 6
- Selecting landscape features in a GIS
  - Chapter 5
- GIS Lab3: Determining land use and ownership patterns associated with streams

Next week

- Acquiring, creating, and editing GIS databases and examining errors
  - Read Chapter 3 to prepare for lecture and lab
- Buffering
  - Read Chapter 7 to prepare for lecture and lab
- Data input (GPS and other technologies)
  - Chapter 1

Geographic Information Systems

Applications in Natural Resource Management

Chapter 6

Obtaining Information about a Specific Geographic Region

Chapter 6 Objectives

- How a clip process works, and the products to expect at the conclusion of the process
- How an erasing process works, and the products to expect at the conclusion of the process
- How to use both clipping and erasing process to obtain information relevant to specific regions and natural resource management

Clipping and Erasing

- Important GIS processes for manipulating data
- Each leads to a new and different spatial database
- Clipping and erasing produce results that are almost opposite from one another

Clipping

- _____
- Two databases are required
  - The data to be clipped
    - Can be point, line, or polygon
  - The data that will serve as the "cookie cutter"
    - Must be a polygon
    - Anything outside the cookie cutter will be removed
- A new database is created from the result

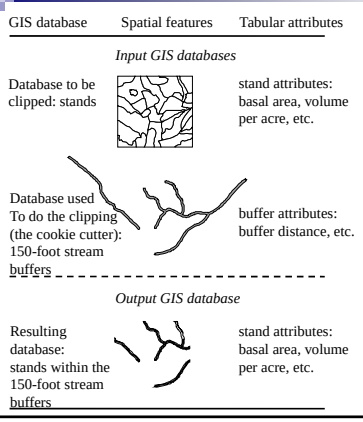


Figure 6.1. Clipping the stands within the 150-foot (45.7 m) stream buffers on the Daniel Pickett forest.

Clipping, behind the scenes…

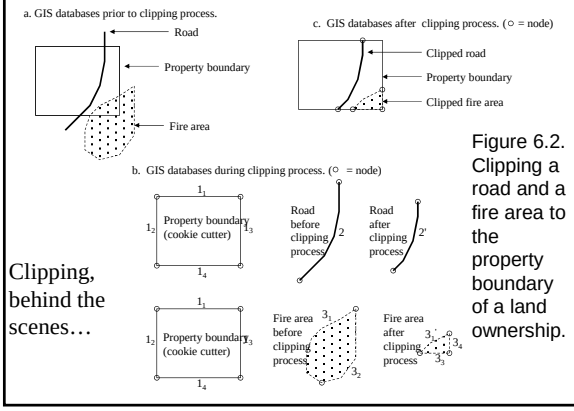


Figure 6.2. Clipping a road and a fire area to the property boundary of a land ownership.

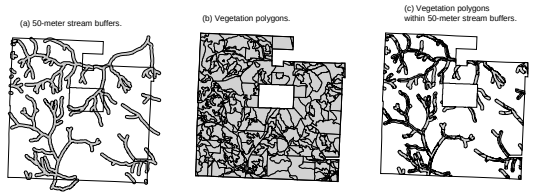


Figure 6.4. Clipping the stands within 50-meter stream buffers on the Brown Tract.

Table 6.1. Tabular data contained in the GIS database that resulted from clipping stands within 50-meter stream buffers

Stand number	Acres	Hectares	Age	Volume
1	0.63	0.25	52	12.7
1	3.06	1.24	52	12.7
2	12.37	5.01	46	13.3
2	2.16	0.87	46	13.3
2	0.06	0.02	46	13.3
2	1.80	0.73	46	13.3
2	0.53	0.21	46	13.3
3	4.47	1.81	51	16.6
3	3.24	1.31	51	16.6
. . . .				
270	0.14	0.06	2	0.0
283	4.03	1.63	43	1.5
Total	1,101.39	445.52		

Table 6.4. Length and type of streams within the streams GIS database used by the Brown Tract

Stream type	Miles	Kilometers
Fish-bearing / large	0.9	1.4
Fish-bearing / medium	3.1	5.0
Fish-bearing / small	4.9	7.8
Non-fish-bearing / large	0.0	0.0
Non-fish-bearing / medium	0.0	0.0
Non-fish-bearing / small	25.7	41.4
Total	34.6	55.6

Figure 6.9. Streams within the boundary of the Brown Tract.

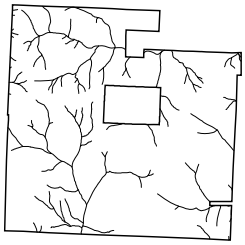


Table 6.5. Length and type of streams within the boundary of the Brown Tract

Stream type	Miles	Kilometers
Fish-bearing / large	0.0	0.0
Fish-bearing / medium	2.1	3.4
Fish-bearing / small	2.8	4.5
Non-fish-bearing / large	0.0	0.0
Non-fish-bearing / medium	0.0	0.0
Non-fish-bearing / small	23.3	37.5
Total	28.2	45.4

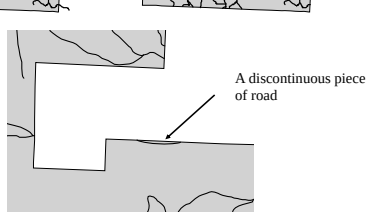


Figure 6.8. Potential challenge with a clip operation result

Erase

- _____
  _____
- Used when part a database is to be “cleared”
- Two databases are required
  - The data to be erased
    - Can be point, line, or polygon
  - The data that will serve as the “cookie cutter”
    - Must be a polygon
    - Anything inside the cookie cutter will be removed
- A new database is created from the result

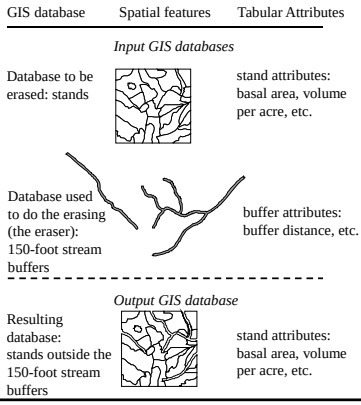
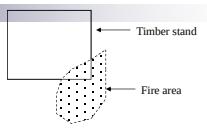


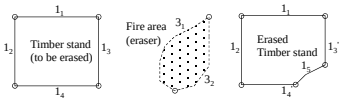
Figure 6.10. Erasing the stands within 150-foot stream buffers from the Daniel Pickett stands GIS database.

Erasing, behind the scenes (Figure 6.11)…

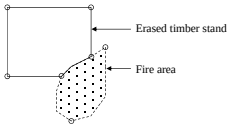
a. GIS databases prior to erasing process.



b. GIS databases during erasing process. (◦ = node)



c. GIS databases after erasing process. (◦ = node)



Erasing in action…

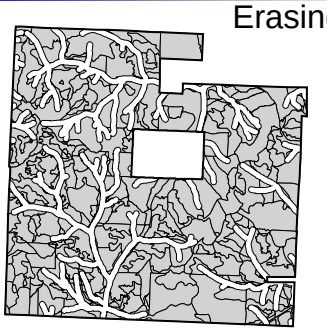


Figure 6.12. Vegetation polygons (stands) outside of 50-meter buffers on the Brown Tract.

Geographic Information Systems

Applications in Natural Resource Management

Chapter 5

Selecting Landscape Features

Chapter 5 Objectives

- Methods to select landscape features from a GIS database;
- The meaning of the term '*query*', when applied spatially or referentially; and
- Methods you can use to develop a description of the resources located on a landscape.

Selecting features from a GIS database

- _____
- Selecting all or no features manually or automatically
- Selecting features based on some criteria
- Selecting features from a previously selected set of features
- Switching (inverting) selections
- Selecting features within some proximity of other features

Select one or more features manually

- Usually involves use of mouse or other pointing device
  - Click on the object(s) in graphical window
  - Click on a database record
- Can also involve drawing a selection box
- Shift or control keys on keyboard used to select multiple features

Selecting all or no features manually or automatically

- _____
  _____
  - Most packages will allow you to select all features with a few clicks
- There are typically “clear all selected features” options available
  - Important for subsequent operations

Selecting features based on some database criteria

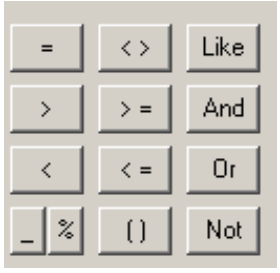
- Can be tedious and error-prone if done manually
- Most GIS programs offer a menu or wizard through which you can build *queries*
  - A query is simply a question, or set of questions, used to request information about a resource contained or described in a database
- Queries allow us to make a range of requests from our databases

Query operations

- Attributes, conditional operators, and values input by the GIS user are evaluated
  - typically if the query statement is true, landscape features and records will be selected
- Operations can be single criterion
  - Stand age >= 25
- Operations can be multiple criteria
  - Stand age >= 25 and stand species = Douglas Fir

Conditional operators

Be careful what you ask for!



Selecting features from a previously selected set of features

- This may be useful when trying to avoid a long query statement – one that contains multiple criteria
  - may be hard to enter and organize
- Process involves splitting a query into smaller components

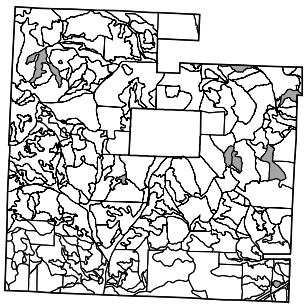


Figure 5.1. Stands on the Brown Tract that meet the following criteria:
age ≥ 30 and age ≤ 40 and MBF ≥ 9 and land allocation = "even-aged."

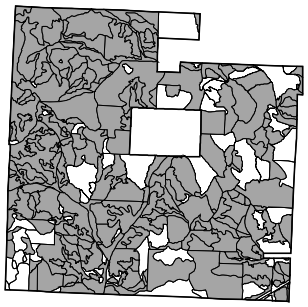


Figure 5.2. Stands on the Brown Tract that meet the following criterion: age ≥ 30.

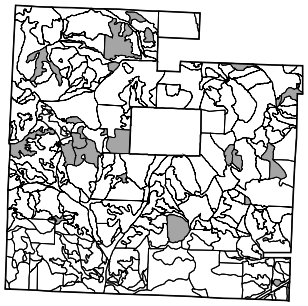


Figure 5.3. Stands from the previously selected set (age ≥ 30) on the Brown Tract that meet the following criterion: age ≤ 40.

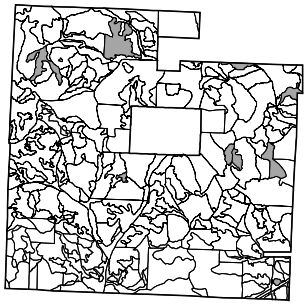
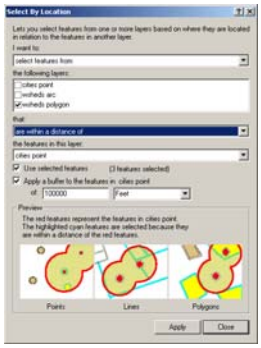


Figure 5.4. Stands from the previously selected set (age ≥ 30 and age ≤ 40) on the Brown Tract that meet the following criterion: MBF ≥ 9.

Queries can also be proximity based

- Select features
  - within 100 meters of features in another database
  - are adjacent to features in another database
- Can specify that only sub-selections will be considered in the other database
- _____
  _____

Proximity selection wizard in ArcGIS



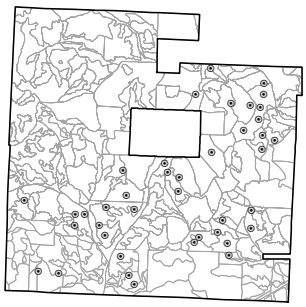


Figure 5.6. Permanent plot point locations within older stands on the Brown Tract.

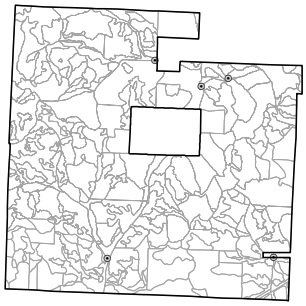


Figure 5.7. Water source point locations within 30 meters of roads on the Brown Tract

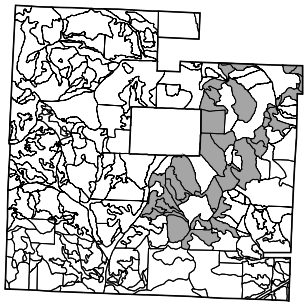


Figure 5.8. Stands adjacent to research areas on the Brown Tract.

Problems with queries

- Syntax errors
- Wrong operator
- Wrong attribute
- Sub-selections already in place
- Taking a query result without considering whether the value is realistic