Lab 13: Introduction to Cartographic Modeling

What You'll Learn: This Lab will primarily review and apply skills from previous Labs (especially Labs 8 through 11). This lab will focus on buffering, creating binary flags or indicators, dissolving, and union/intersection.

You will estimate the size of the prime ruffed grouse habitat at the Cloquet Forestry Center (CFC), Carlton County, Minnesota.

Because most is review, we will not provide step-by-step instructions as we have in previous labs. If you have questions, please first refer to earlier labs and videos.

Data: \Lab13, including, in UTM15, NAD83, meters coordinates:
- *Cloquet_roads.shp*, a roads layer
- *Cloquet_streams.shp*, a streams/lakes layer
- *Cloquet_vegetation.shp*, a vegetation layer (attribute codes are described at the end of these instructions)
- *Iverson_drg.img*, a digital raster graphic of a USGS 7.5 topographic

What You'll Produce: A map of CFC with areas of with identified areas of high-quality ruffed grouse habitat.

Background: Ruffed grouse is a northern game bird species that thrives in disturbed forest ecosystems. The best grouse habitat is found in a mosaic of aspen patches burned or clear-cut every 40 to 50 years. This mosaic provides food and cover in proximity, and refuge from predators. See related PDF's in \Lab13 data directory.

Optimum ruffed grouse habitat should consider proximity to:
- Brushy areas and young aspen stands for cover and summer food. Here we'll select aspen stands that are 19 to 34 years old.
- Mature aspen stands with an understory of hazel or ironwood that provide food in fall, winter and spring. In this analysis we'll select aspen stands older than 34 years
- Dense sapling aspen stands to provide brood cover, here stands 18 years old or younger.
- Away from areas with old tall conifers that serve as winter roosts for raptors. In this analysis, we will select conifer stands more than 105 years old.

Note that you want areas that are **near all three** aspen/birch ages (this is an **AND** combination), and not near tall conifers. This will involve selecting stands that meet a criterion and buffering around these stands. An overlay of the various criteria buffers is then used to identify the suitable ruffed grouse habitat.

Processing steps:
Use the vegetation layer to <u>identify the Aspen or Birch Stands</u> in the CFC (see labs 7, 8 & 9 for methods). A table at the back of this lab contains the codes for vegetation type (C_type) and for establishment year (Origin). From the establishment year you may get age, by subtraction. Assume you are doing this in 2006, the year the data were produced.

You need to identify Aspen or Birch (select by attributes) and export these stands to a separate feature layer, naming it something like *AspenBirch.shp*. Then open the *AspenBirch* attribute table and alternately select the young, intermediate, or old tree stands, exporting each to create three new feature layers.

Remember; use the **Select by Attributes** menu from the table and use species and/or age to select a specific set of polygons. Then, right click on the source layer in the Table of Contents window, and then left click on **Data → Export Features**. This saves your selected records as new layer*.*

Out of the 506 Vegetation records, 111 are Aspen or Birch *(use the C_Type or Cover_Type fields; either one works to for selection; see codes at end of this document)*

Once the Aspen or Birch are selected then further subdivide by age class *(use the Origin field and use the SQL Expression box not the "Clause" builder, e.g.: ORIGIN >= '1988' for the Young feature layer; Note "clause" builder does not allow >= when using a Text field): for an example of the SQL Expression box, see the Summary Overheads for Lab Exercise, page 6.*

- 30 records are Young; less than or equal to18 years, from 2006 back through 1988
- 25 records are Intermediate; between 19-34 years, from 1987 through 1972 (*ORIGIN < '1988' AND ORIGIN >= '1972')*
- 30 records are Old; 34 years and over, from 1971 to 1888 *(ORIGIN > '0' AND ORIGIN < '1972')*

Don't use the records with 0 values in the ORIGIN field. (They are of unknown age.)

After creating each age class layer:
- **Buffer** each layer at 300 meters. *(remember to select the Dissolve option)*
- Overlay the three layers using the **Union** or **Intersect** commands to create a *CoverFood* layer.

Intersect is perhaps easiest for combining the three age class layers into the *CoverFood* layer. If you do use Union make sure you add a "binary indicatory" to each of the three buffer layers and then select and export the overlapping records using that those three indicators.

You now need to subtract the areas in *CoverFood* that are near older conifers, potential raptor perches:

– Select those records of the *Cloquet_vegetation* that are White Pine, Red Pine, Jack Pine, Scotch Pine, or White Spruce (C_Type = J or C_Type = R or C_Type = W or C_Type = D or C_Type = WS).

– Save this interim layer.

– Then select those records of the interim layer that are older than 1900 (Origin > '0' and Origin < '1901') and Export to a new features layer. Note you will need to select the SQL button on the Select Layer by Attribute; then type in the query.
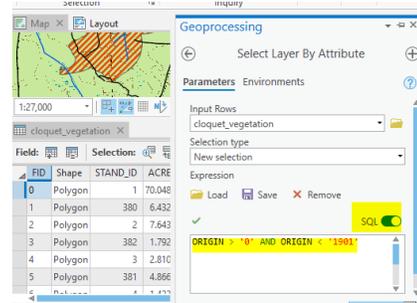
You should have 21 records in your Old_Conifer layer.

– Buffer *(remember Dissolve option)* this layer at 50 meters (this creates and adjacent raptor perch area)

– Erase the adjacent raptor perches from your cover/food habitat layer, via ArcToolbox **→ Analysis → Overlay → Erase**.

Summarize the result to estimate the total size of the potential grouse habitat, in acres or hectares. If you need, refer to Lab 9 near the end of part 2 for summarizing statistics of polygons *(remember to do Multipart To Singlepart)*. There should be 13 polygons in your final Singlepart layer.

Produce a map that includes the prime habitat, roads, streams, and topographic DRG background. Include a descriptive legend that explains the process and the total size and units (acres or hectares), of potential grouse habitat in a text box, or in the legend.

You may want to use a transparent fill for the habitat polygons to improve the appearance of the map.

Also include the usual 1) title, including a description of the map and your name, 2) north arrow, 3) scale bar, and 4) a complete, descriptive legend (no odd or filename labels).

Share Layout Export as a PDF *(Resolution (DPI) =300 Image Quality=Faster)*

Here is an example of the general appearance of the final output map.
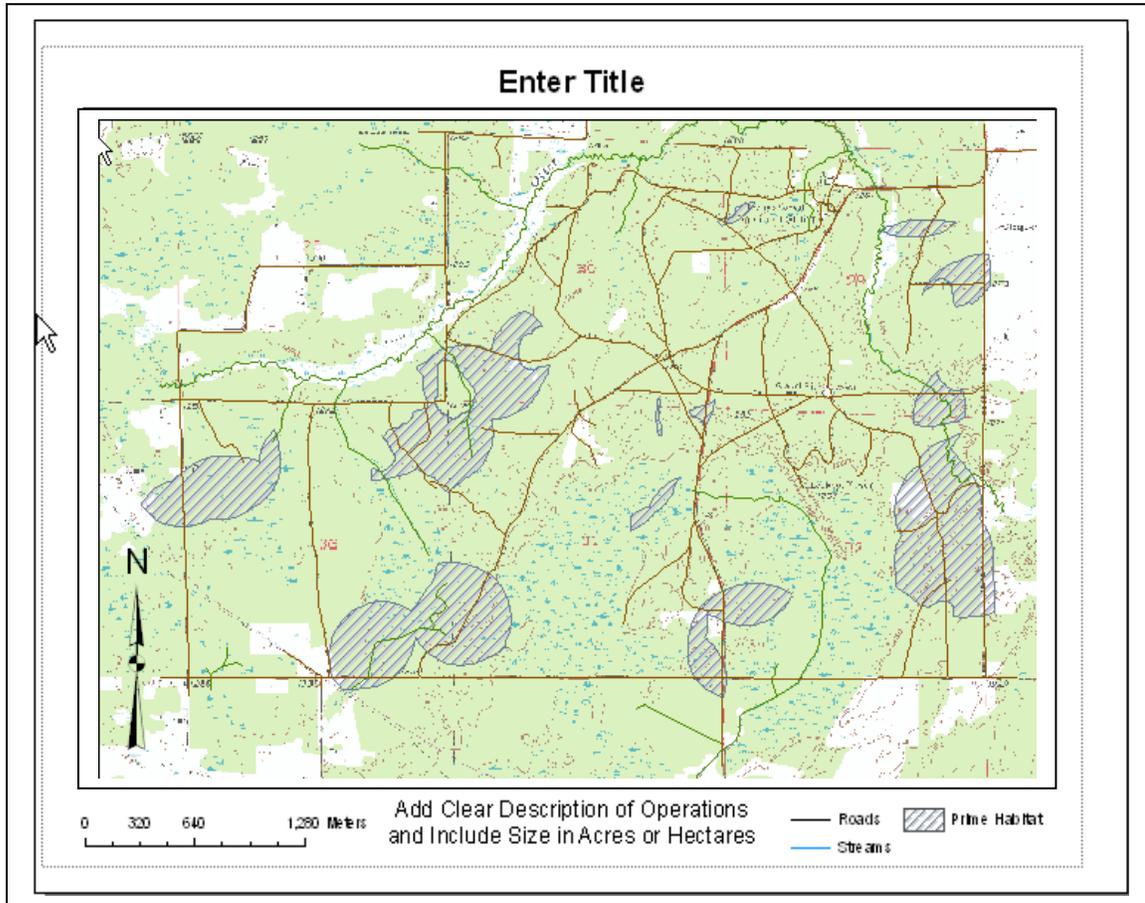
Vegetation Codes:
For the vegetation layer of *cloquet_vegetation.shp*

C_TYPE	Species	SIZE_CL	Size class
R	Red pine	a	Seedlings (0-1")
W	White pine	b	Saplings (1-5")
J	Jack pine	c	Poles (5-9")
A	Aspen	d	Small saw timber (9-14")
D	Scotch pine		
WS	White spruce	**DENS_CL**	**Density class**
S	Black spruce	I (1)	Poor (10-40% crown closure)
B	Birch	II (2)	Medium (40-70% crown closure)
C	White cedar	III (3)	Good (over 70% crown closure)
F	Balsam fir		
T	Tamarack		
Q	Mixed swamp conifers		
E	Swamp - bottomlands, hardwood		
U	Swamp - upland, brush		
L	Lowland brush		
G	Grassland		
M	Marsh		
SX	Non-productive		
CO	Recent cutover		
PX	Experimental planting		
O	Open		