PROBLEM 1

> ? *The Yellowstone National Park, renowned for its exceptional and unique wildlife as well as flora, seeks to gain further insights into the relationships between the terrain's slope and the kind of (coniferous) trees found there. Use raster mapping operations and/or calculations to locate appealing areas with a great variety of different trees. Concentrate on those trees that are in climax.*

Once I loaded the data layers, I immediately converted the *Slope* (obtained from *Elevation*) to grayscale by applying a proper color ramp. From the point of visualization, the *Slope* layer should merely serve as an background image:

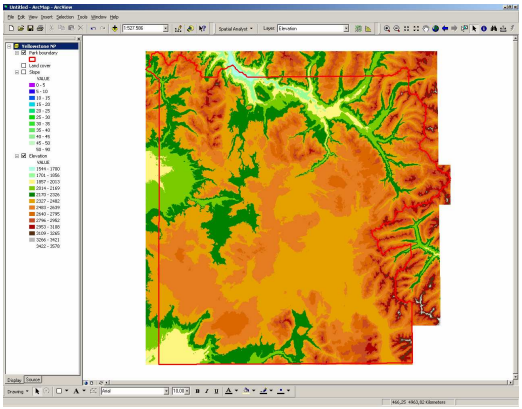


Figure 1 *Elevation, initial view*

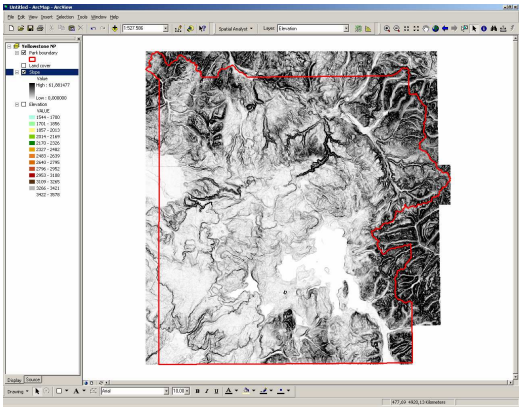


Figure 2 *Slope*

Adding the *Land cover* layer, it contains the kinds of trees, results in a quite distorted image:

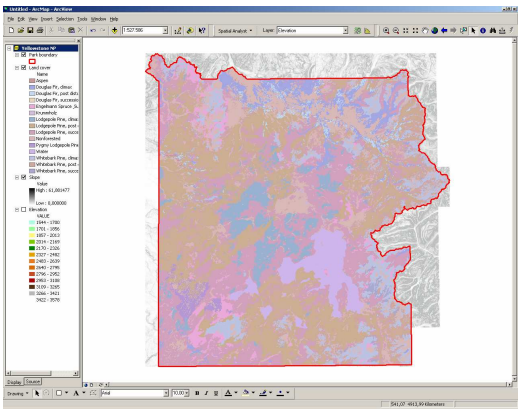


Figure 3 *Land cover*

The main reason of that overwhelming complexity is a surplus of information. The layer's attributes include more than necessary, hence I can omit many of them.

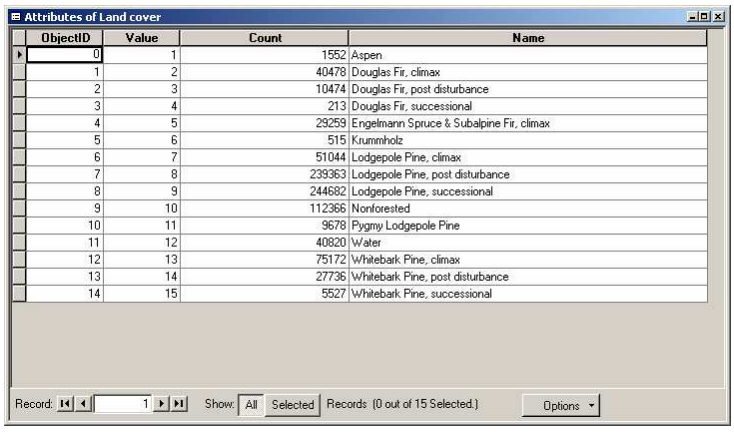


Figure 4 *Land cover's attributes*

The only interesting trees are:

ID (Value)	Name
1	Aspen
2	Douglas Fir
5	Engelmann Spruce & Subalpine Fir
7	Lodgepole Pine
11	Pygmy Lodgepole Pine
13	Whitebark Pine

Table 1 *Trees in climax*

A reclassification extracts just these six values. The appropriate tool can be found in the *Spatial Analyst→Reclassify*.

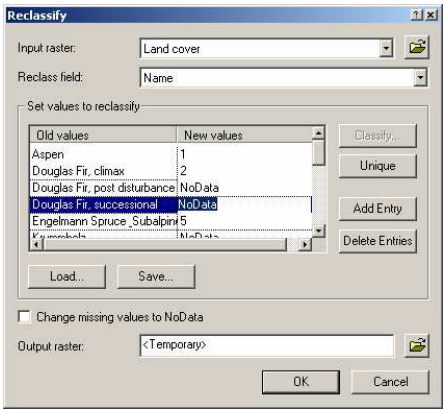


Figure 5 *Reclassify*

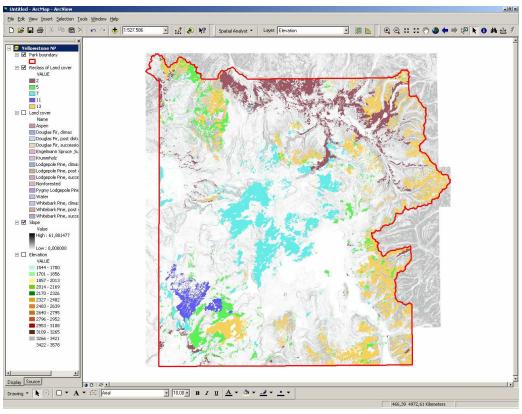
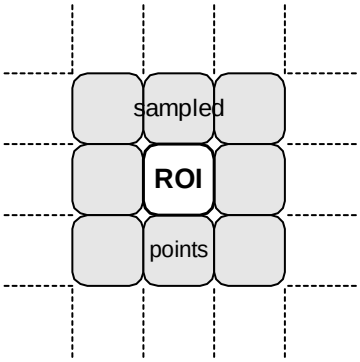


Figure 6 *Reclassified layer*

Remark: To remove an entry from the data set, I had not had to press the *Delete Entries* button but to replace the value by *NoData* as seen in Figure 5.

The main task, locating remarkable regions of interest, requires to sample the close environment of each point. ArcMap calls that feature *Neighborhood Statistics*; it is available via the *Spatial Analyst*, too. It helps in counting the variety of trees (i.e. different kinds) in a specified area, e.g. 3x3. In theory, the maximum number is six (although nine cells in the environment !), the minimum is one. A neighborhood of 3x3 is demonstrated in Figure 7.



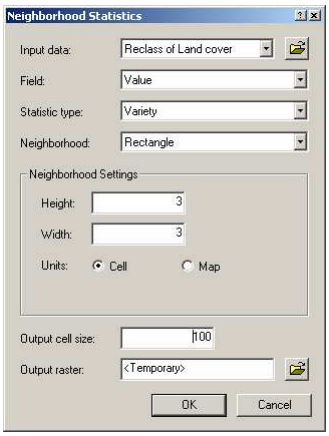


Figure 7 *Idea of Neighborhood Sampling*

Figure 8 *Neighborhood statistics*

Surprisingly, there is not a noticeable large variation; the max. observed variety is just three but extremely seldom, though.

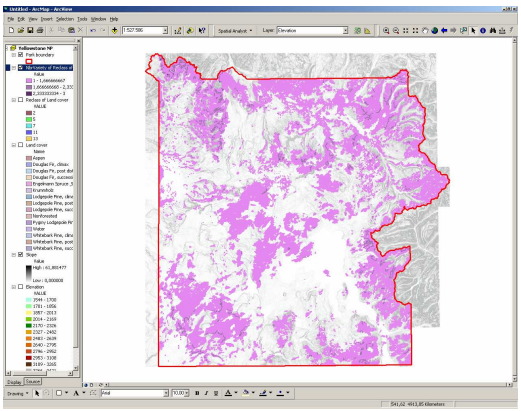


Figure 9 *Variety of trees*

In the next step, I desire to reason the yielded distribution of variety. Therefore, I collect data about the average slope, i.e. the mean of areas covered the specified varieties.

The *Spatial Analyst* → *Zonal Statistics* does the hard work for me.

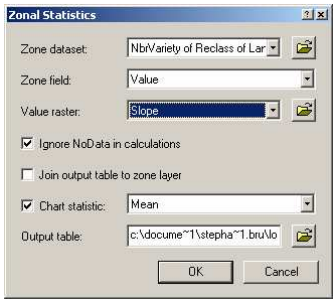
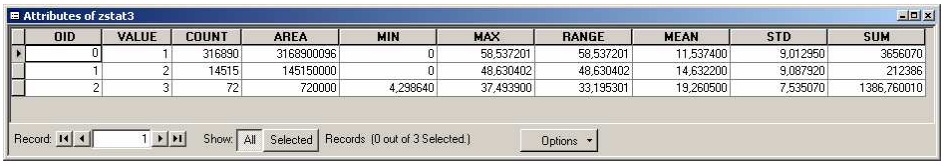


Figure 10 *Zonal Statistics*

The output is two-fold: the program prints a table with many statistical values (Figure 11) and, in addition, draws a diagram visualizing the facts (Figure 12).



OID	VALUE	COUNT	AREA	MIN	MAX	RANGE	MEAN	STD	SUM
0	1	316890	3168900096	0	58,537201	58,537201	11,537400	9,012950	3656070
1	2	14515	145150000	0	48,630402	48,630402	14,632200	9,087920	212386
2	3	72	720000	4,298640	37,493900	33,195301	19,260500	7,535070	1386,760010

Figure 11 *Statistics*

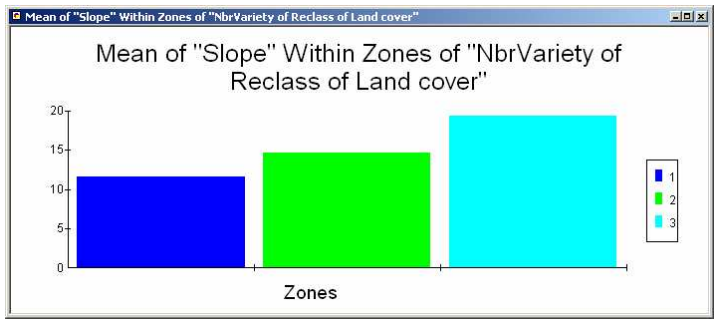


Figure 12 *Mean Slope*

The Yellowstone National Park's eastern region seems to be more diverse and interesting to the visitor because of its variety of coniferous trees. On the other hand, the larger slope found there may obstruct an intensive flow of guests.