Determining The Best Elk Hunting Location Near Eugene, Oregon

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Comment [PLG1]: See separate poster with the maps.

I. Objective

Hunting elk is one of the most challenging yet rewarding activities for the select recreational enthusiast. Most elk hunters never have the opportunity to shoot an elk each season let alone even spot one. This is where individual hunter or hunting parties are looking for an advantage to increase their chances of locating an elk. Hunters typically rely on traditional field craft and tricks of the trade that are usually more hearsay and superstition than anything else. The purpose of this project will be to utilize information technology for a true scientific advantage in elk hunting.

The objective of this project is to determine the most convenient, likely, and lawful location to find elk just outside of Eugene, Oregon city limits. The power of GIS and Remote Sensing will be harnessed in order to achieve this goal. There will be several tools, methods, and steps involved in this process.

The major steps involved in this analysis are:

1. Locating datasets.
2. Combining necessary raster and vector datasets.
3. Achieving shortest distance to hunting grounds.
4. Determining proper area of study.
5. Knowledge of elk behavior and habitat.
6. Analyzing vegetation types used by elk.
7. Locating sufficient water sources for elk.
8. Elk and human terrain analysis.
9. Use map algebra to combine all analysis efforts for final results.

II. Datasets and References

"1/3-Arc Second National Elevation Dataset." Map. *The National Map Seamless Server*. Web. 23 Mar. 2010. <http://seamless.usgs.gov>.

"All About Elk." *Rocky Mountain Elk Foundation*. Web. 23 Mar. 2010. <http://www.rmef.org/AllAboutElk/>.

"Driving Directions Results from 1390 Luella St Eugene, Oregon to [3974-3999] Marcola Rd Springfield, Oregon." *MapQuest*. Web. 23 Mar. 2010. <http://www.mapquest.com>.

"Finding Your Elk." *Weatherbyman Custom Guns (WCG), Incorporated - Savannah, TN*. Web. 25 Mar. 2010. <http://inextinc.com/hunting/findthatelk.html>.

"Forest Ownership (western Oregon)." Map. *Western Oregon Industrial Forestland Ownership, Assembled from Various Sources by Oregon State Forestry Science Lab, 1:24,000. Oregon Spatial Data Library*. Web. 23 Mar. 2010. <http://navigator.state.or.us/sdl/data/shapefile/k24/west_forestown.zip>.

"Managing Small Woodlands For Elk." *Woodland Fish and Wildlife* (March 1992). Print. World Forestry Center (WFC) 4033 SW Canyon Road Portland, Oregon 97221.

"National Agriculture Imagery Program (NAIP) Orthoimagery for Zone 10 Oregon State Quarter Quadrangle SPRINGFIELD, NE." Map. *The National Map Seamless Server*. Web. 23 Mar. 2010. <http://seamless.usgs.gov>.

"Oregon Roads Tiger Line Files." Map. *U.S. Department of Commerce U.S. Census Bureau Geography Division*. 2000. *Oregon Spatial Data Library*. Web. 23 Mar. 2010. <http://http://navigator.state.or.us/sdl/data/2000census/roads.zip>.

"Oregon Streams Tiger Line Files." Map. *U.S. Department of Commerce U.S. Census Bureau Geography Division*. 2000. *Oregon Spatial Data Library*. Web. 23 Mar. 2010. <http://navigator.state.or.us/sdl/data/2000census/streams.zip>.

"SW McKenzie (219B)." Map. *Oregon Department of Fish and Wildlife*. Salem, OR, 2008. Web. 23 Mar. 2010. <http://www.dfw.state.or.us/maps/controlled_hunts/unit%2019/219B_southwest_mckenzie.pdf>.

"UGB_2009.shp." Map. *Dept. of Land Conservation and Development, 1:24,000 (2009). Oregon Spatial Data Library*. Web. 23 Mar. 2010. <http://navigator.state.or.us/sdl/data/shapefile/k24/UGB_2009.zip>.

"Vegetation/Species." Map. *OregonGAP Analysis Program, Vegetation, 1:100,000. Oregon Spatial Data Library*. Web. 23 Mar. 2010. <http://navigator.state.or.us/sdl/data/shapefile/k100/gap_vegetation.zip>.

III. Locating Home and Hunting Area of Interest

The initial analysis involved locating the Erb residence in Eugene, Oregon and then finding the closest hunting grounds. The first dataset used was the "SW McKenzie" map by the *Oregon Department of Fish and Wildlife (ODFW)*. It had to be converted to PNG and then imported into ArcGIS. Next, it was geo-referenced to the "Tiger Files Road Lines."

The house was located and a 5-mile buffer was placed around it to locate the closest hunting grounds. The closest grounds were found to the NE in the Coburg Hills above the McKenzie River. A convenient intersection was located on the *ODFW* map to show the start point of the hunt. The area was identified as the Bureau of Land Management (BLM) land on the "Forest Ownership File", which is public land and legal to hunt on.

An inset was created by *MapQuest* for driving directions from the house to the hunting start point. This simplified the process and allowed for more time to be spent on other analysis processes. The 17-2-8 forest road was not included on the "Tiger Files" or *MapQuest*, but it was observed on the *ODFW* map. To show the forest road, an inset was created with a small portion of *ODFW* map seen.

The "Home to Hunting Grounds" map includes "NAIP" imagery from the *USGS Seamless Server*. There are "Tiger Lines" placed on top of the imagery to show explicitly defined roads in the surrounding area. "The Streams File" was included to show further reference.

To provide a suitable area of study, a 2-mile buffer around the hunting start point was created. This was determined to be far enough to give the average hunter room to operate and also be manageable for the purpose of the project. The BLM land within the 2-mile buffer was then clipped to show the prescribed area of study.

IV. Study of Elk Behavior and Habitat

A brief study of elk behavior and their habitat was conducted in order to further analyze additional datasets. "The Oregon Gap Vegetation Dataset" was the first of interest, as it can classify the different vegetation types throughout the state. The type of vegetation that elk eat or shelter in had to be studied in order to correctly analyze this dataset.

It is known that elk are grazers and enjoy mostly grasses. Green moist grass is the most nutritious and desirable for them. They will migrate up to 50 miles a day, up and down mountain

ranges, and into valleys, in search of the best food and shelter. They mainly travel depending upon seasons, as the vegetation stays more moist at higher elevation when it is hot, and the valleys are less snow-covered when it is cold (RMEF).

When quality grass is scarce or they want some variety, elk will choose alternative types of vegetation. Most common are forbs and legumes; they will even resort to shrubs and tree bark (WFC 1992). They begin eating this way starting fall and into winter, which is hunting season.

Other types of habitat elk utilize are for shelter and cover. They will often seek shelter during extreme weather, when they feel threatened, stop eating, or to bed down (WCG). Shelter is most often found in thick forests or shrubs, in order to hide. These are also undesirable areas to hunt because the line of sight is too short to see and make a shot.

Using this knowledge of elk habitat, the vegetation can be classified as either feed or shelter. Feed areas are good hunting grounds because of the open areas and elk being vulnerable. Shelter areas are disadvantaged hunting areas because of the elk's ability to hide and to hear encroachers.

The feed classifications included from the "Oregon GAP Vegetation Dataset" are extensive, which include grasses and a few others to be explained. The obvious ones are old fields, abandoned cropland, and pastures/hay. The less obvious are clear-cuts and burn sites, because of the very nutritious baby vegetation that grows at these sites. Oak woodlands were also included due to the fact that in Oregon they are thinly placed with lots of grass in between.

The shelter classifications simply include everything else, which are basically forests. The shelter classifications include coastal and valley riparian forest and shrubs, mixed hardwoods-conifer forests, silver fir, Siskiyou mixed conifer forests and woodlands, and western Oregon douglas-fir hemlock forests.

Water is also an essential part of elk habitat. The only water sources in this hunting area are creeks and they are at their highest elevation. As a result, the creeks will be very small and probably seasonal or precipitation dependent. That being said, elk will usually tap any available water sources every day, usually around dusk and dawn (RMEF). These are ideal places to see any wildlife as a hunter, especially if there is an open line of sight.

V. Elk and Human Terrain Analysis

Oregon terrain is known as being very rugged; especially the areas hunters are forced to hunt. It seems all the flat terrain is developed, farm land, or privately owned and all the mountainous terrain is private lumber land, public BLM, or state land. The goal of this project was to find the closest and most convenient location to Eugene, so finding the best terrain was less of a priority.

To display the terrain in an easily interpretable way, a "Hill Shade" of "NED 1/3"" data was created. It shows the extreme steepness of the Southern tip of the Coburg Hills, which could be considered a canyon carved out by the McKenzie and Mohawk Rivers. Hunting in this area will be physically exhausting and possibly unfavorable for elk to graze on.

To analyze the hunt-ability of the terrain, a "slope layer" was created from the "NED 1/3"" data. It was classified and into three simple classes: 0-25%, 26-40%, and 41% and higher. Even 25% would be very uncomfortable to hunt on, but do-able, and might have elk grazing. 26-40% would be very slow-going and extremely exhausting for humans, and elk would not be very comfortable eating there. A 41% slope would be considered possibly dangerous, almost too difficult to move, and elk in this setting would want to keep moving, rather than stay put. The 0-25% slope was the only classification considered hunt-able in this scenario.

VI. Combined Analysis with Map Algebra

The final product is the combined analysis to show the best locations to hunt from all the previous products. The layers created for the final analysis are the "feed/shelter raster", "slope raster", and "streams raster." When these layers are placed into a map algebra Boolean equation, the result shows how each pixel is classified as ideal or not for hunting.

Before the layers were ready for calculation, they had to be re-classified as either 1 for "go" or 0 for "no-go". The formula used was that feed and slope both have to equal 1, or any water equals 1. Creeks usually have fairly low slope percentage according to their direction of flow and they usually provide some line of sight even in the woods. The final result cuts the hunt-able area down considerably from the previous analyses, but creates confidence that there are superior hunting spots.

VII. Conclusion

The objective was obtained to determine the most convenient, likely, and lawful location to find elk just outside of Eugene, Oregon city limits. The location is absolutely convenient to go hunting; less than five miles from the house. The likeliness of finding elk was determined by choosing the proper data sets and analyzing them according to knowledge of elk habitat. The location is lawful according to the "ODFW map", outside of city limits, and on public BLM land.

To properly evaluate this GIS hunting product, the theory will have to be tested in the field for next hunting season. This product can be used by old-fashioned terrain association or GPS. What will likely happen once the terrain is seen with open feeding areas, the traditional field craft habits will commence and the map will be pushed to the side having served its purpose.

An advantage of this analysis is that if this hunting ground does not work, it has set the method to find new ones. This area may prove to be far too steep and a lesson will have been learned. This map is an excellent way to reconnaissance the hunting area before committing valuable time to hunt an area with no prior knowledge of it. With additional refinement of the methods used and better techniques learned over time, this may become an effective and popular hunting tool.