Map making arrives in the 21st century

by Andy DeVolder

Two weeks ago when I was carving pumpkins with a group of friends, we were using those cool new patterns to trace our designs onto the pumpkins. The designs were on flat pieces of paper that we taped to the pumpkin, then we pricked our pattern into the skin of the pumpkin and cut out the design using handy little saws that came with the patterns. One thing I wondered aloud was how well the flat pattern fit on a curved pumpkin? There was considerable distortion in the pattern when it was wrapped around the curved surface, however we made the best of it and all of the jack-o-lanterns came out great, even Martha Stewart would have been proud. Transferring a flat design to a rounded pumpkin is the same sort of problem that map makers have been contending with for hundreds of years.

As the new fish and wildlife biologist here at the Kenai National Wildlife Refuge, my primary responsibilities are in managing the geographic information system, or GIS, and the loads of geographic data associated with it. Creating and thinking about maps is one of the things that I do on a daily basis. As early as AD 140, the Greek thinker Ptolemy produced a map of the earth that was spherical, but it was not until the voyage of the Victoria (1519-1522) when Ferdinand Magellan circumnavigated the world that we had conclusive evidence that the earth was not flat but round. From that first map, up to today, the issue of how to draw a round earth as flat image with minimal distortion has been a nagging map-making dilemma. Over the years, many different ways to represent the surface of the earth have been developed. Each way is called a map projection and the three used most in Alaska are the Albers Equal Area Conic, State Plane and the Universal Transmercator (UTM) Projection. Each projection has benefits over others, but unless you are making maps those are unimportant details.

As I mentioned GIS is more than making maps; it can be used to answer resource based questions or create models of real world processes. For instance, if you wanted to know how many lakes with a specific fish are within a certain distance from a good trail or road, we could plug that question (also called a query) into the GIS and create a map of lakes that meet those criteria. Since it is nearly impossible (and not practical) to inventory every acre of the two million the refuge manages, GIS can be used to produce models of the entire refuge.

You may recall the Kenai Lake fire that began in late June of 2001. Since firefighter and public safety is the primary concern of the Forest Service they requested a GIS analyst to help them map the fire. I responded to the call and arrived at the Kenai Lake Work Center in Crown Point. The first thing that fire managers wanted to know was the location of homes and other structures to formulate an evacuation plan if needed. I started by using the Kenai Borough parcel database information to discriminate between residential structures and vacant lots. I printed a series of detailed maps using high resolution satellite imagery as a base for firefighters to use in the event of rapid evacuation. Thankfully no evacuation was needed, but the maps provided the base for their effort to inform home owners of the potential for an evacuation. Throughout the week that I was on scene, I made other maps showing the progress of the fire, location of safety zones, drop points, fire crews, and public information maps. As you can imagine, having accurate and current maps provided for a high level of safety for firefighters and also served to inform the public of fire suppression progress and safety plans.

We are all very familiar with the spruce bark beetle infestation that has killed nearly every mature white spruce on the Kenai Peninsula. We are also all to familiar with the dry summers we have been having, burn bans, and increased wildfire risk. Do you know where the greatest wildfire risk on the Kenai Peninsula is? It could be in your back yard (I though it used to be in mine before we got the trees removed), however many factors contribute to wildfire risk including fuels, ignition sources and topography. Using GIS we can combine these factors into a model that will show where the range of wildfire risk for the Kenai Peninsula. As you might expect, the areas around towns and homes (where ignition sources are) that have spruce bark beetle-killed trees show the highest wildfire risk, and areas in the hinterlands of the refuge even with spruce bark beetle-killed trees show a lower risk (very

few ignition sources). Of course models do not totally represent the real world, rather it is our best estimation based on the available information.

Technology has evolved by leaps and bounds in the short time that I have been professionally doing GIS work. Computers have become faster and storage capacity has also increased dramatically, both of which contribute to faster modeling and more complex map production. One of our newest tools is a combination handheld GPS/GIS field computer. This little unit weighs about three pounds, has a nice GPS unit with five meter accuracy and a full color screen to display digital topographic maps, aerial imagery. We can load information about land ownership, vegetation types, and location of roads on to this unit too. When we get out to do field work, we can now record our observations or surveys directly to a digital file, or display our location in real time on digital topographic maps as we walk through the woods. We can also have the GPS record where we walk, tracing a line (such as along a stream) or capturing vary accurately located points perhaps to identify an eagle nest. Using GPS to locate features on the ground such as signs, outhouses, campgrounds, and access points will help us make better more accurate maps, which in the long run helps you, the refuge user. So GIS and GPS technology is not just for biological resources it is for anything that has a spatial location…which I suppose is everything! Now that's job security and many opportunities to out from behind my computer and get in the field.

Next time you look at a map, think about what went into making it accurate and reliable and the long history of map making. Be safe when you go out tonight and when you see all of those carved pumpkins give some thought to Ptolemy, Magellan (from who a company and a line of GPS receivers is named) and modern computer based GIS technology.

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