Mapping Refuge resource information: a high tech challenge

by Sue Schulmeister

The old cliche that a picture is worth a thousand words is especially true on the Kenai Refuge. Most people are visually oriented and like to see a map rather than text or tables. We have piles of paper maps of property boundaries, animal locations, roads, trails, campgrounds, and oil and gas development areas, and we are now learning how to put these maps on the computer.

Take locations of trumpeter swan nests, for example. In the past Refuge biologists flew aerial surveys and marked swan nest locations on a paper map, noting additional information on a data sheet. (This shifting of one's gaze back and forth from a sited critter to map and data sheet in a tightly banking aircraft is not for the weak stomached!)

After about 30 some years of accumulating maps in a file cabinet, it becomes harder and harder to retrieve information to answer such questions as: Which lakes do swans nest on?, Do swans nest in the same places year after year?, Does disturbance cause swans to vacate nest areas they have traditionally used?, Are numbers of swans nesting on the Refuge increasing or decreasing? Fortunately, computer spreadsheets and databases have arrived which retrieve and analyze some of the basic information, but these programs still don't "visualize" the data so that you can really see what is going on.

Now, however, we have a new high tech tool called a "Geographic Information System," or GIS, which can make computer maps. (The teenage version of this technology is games like SimCity and SimAnt, where the user creates a landscape for the game activity.)

A GIS is a combination of computer hardware, software, and geographic data, which can describe places on the earth's surface with geographic coordinates like latitude and longitude, and store information associated with a given place. With GIS, biologists can answer questions like, How large is the home range of a lynx?, What kind of plants occur in the areas the moose like best, or How has the forest changed over time? For swan nests we can display a map on the computer screen showing all the swan nests recorded on the Kenai Peninsula, either all at once or year-by-year, and with a click of a mouse we can look at the information for each nest.

For old surveys, we can take location data off of paper maps, either by hand or with a scanner, for entry into the GIS computer. With our new surveys, we use a GPS (Global Positioning System) electronic device mounted in the aircraft. When the plane is directly overhead of an animal, we press a button on the GPS and the location is automatically recorded in a digital memory. Back at the office we can download the GPS locations into the GIS computer and display them at the click of a mouse or print out a hard copy map.

We still use radio collars to locate many animals, such as wolves, lynx, and brown bears, but this requires many hours of flying time to find the animals and get in position to make the GPS measurement of their locations. A new generation of collars has a GPS device in collar, which transmits the animal's location every few hours. We can call up the satellite and download several days' locations into the GIS computer without ever leaving the office. These GPS collars are more expensive than the old radio collars. We have deployed GPS collars on brown bears and are planning to deploy a few more on moose this winter.

The GIS technology is great for printing beautiful poster-sized maps of any spatial information that you can imagine. We see GIS employed at every level of government from the Fire Department to the Borough, State, and Federal land management agencies. Nor has it been lost on the military. The real power of GIS, however, goes well beyond pretty maps to its ability to visualize complex questions. For example a real estate agent or the Borough Tax assessor might ask for a map of all privately owned parcels greater than 5 acres, above 800' elevation, on south-facing slopes, and valued at more than $50,000.

It is possible to make such a map because the information is stored in the computer in "layers," just like a stack of paper maps. For the Kenai Peninsula there is an elevation layer (like a contour map), an ownership layer (a plat map), a hydrology layer (streams and

lakes), and layers for roads, school and voting districts, power lines, and fire risk. Two foresters Marvin Rude and Andy DeVolder are now preparing a forest vegetation layer from aerial photography, which will show the tree species, and size and density of trees. This layer will be used to develop a forest fuels layer, which together with current weather forecasts will allow fire fighters to model the direction and rate of spread of a wildfire across the landscape. These GIS fire propagation models are already in use in the Lower-48 and they can be very useful in predicting where a fire will be in 12 or 24 hours.

As you can see the possibilities of Geographic Information Systems are endless. We certainly looking forward to studying the "big picture" of Refuge wildlife on a much grander scale than we would have ever thought possible a few short years ago.

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