

Brief communication

Use of satellite telemetry data, GIS, and HTML to create an interactive display of caribou movements

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Introduction

Caribou from the Teshekpuk Herd in northern Alaska are an important subsistence resource for a number of native villages, and much of the herd range is within the National Petroleum Reserve–Alaska (NPR). Because interest in oil and gas development within NPR has recently increased, a cooperative study was undertaken to gain a greater understanding of herd distribution and movements.

It is often difficult to get an intuitive feel for the temporal aspect of caribou movements using maps depicting a series of caribou locations. In an effort to make caribou movement data more accessible to the general public, we used satellite telemetry data collected over a 10-year period from female caribou of the Teshekpuk Herd to create interactive animations of caribou movements. Here we present a method to create an interactive display using only basic knowledge of Geographic Information Systems (GIS) software and web page production.

Methods

Satellite data were collected from 27 different caribou of the Teshekpuk Herd for varying lengths of time during the period 1990–1999 as part of a coop-

erative study by the North Slope Borough, Alaska Department of Fish and Game, and U.S. Bureau of Land Management. Data were screened and one location of the highest quality rating score (provided by Argos, Landover, MD) was selected per duty cycle (generally one location per 48 hours).

Geographic Information Systems (GIS) are used to compile spatial data as a series of computer “layers” that allow the user to make detailed maps and explore spatial relationships among layers. We used this technology to create a series of maps that could be combined to form animations of caribou movements. Using ArcView GIS 3.2a (ESRI Inc., Redlands, CA), we developed a series of animations depicting caribou movements over this 10-year period. These animations were created with GIS and compiled in Hyper Text Markup Language (HTML) with text and figures to create an interactive computer display that could be used by anyone with basic knowledge of web browsers. Different animations were created for the entire 10-year period, annual movements, seasonal movements (winter, spring migration, calving and post-calving, insect season, late summer, and fall migration and rut), a sample of individual animals, and for movements near subsistence hunting areas. A total of 16 animations were included in the final display.

Software

We created image files (JPEG format) in ArcView GIS 3.2a using ArcView Tracking Analyst Extension. Image files were then converted to Windows Media™ Format files (extension .WMV) files using ImageN (<http://www.pixoid.com>) and Windows Media Encoder v.8 software. Windows Media™ Format files, text, and image files were combined in an HTML framework using Netscape Composer to create a graphical user interface viewable on computers with up-to-date web browsers and Windows Media Player or other software capable of playing WMV files.

The ArcView Tracking Analyst Extension allows the user to change symbols based on the location or the value of a data field, specify the speed of movements, the length of time symbols remain on the screen, and colors of symbols and arrows. Users create the background using standard GIS layers.

Conclusions

The use of animation clearly reveals the large annual variation in wintering areas and large differences in daily movement rates for this herd. This interactive display can be adapted for school groups, subsistence

hunters, the general public, or scientists. Animations are effective for quickly portraying a large quantity of data to any audience, and they should be useful for educating the public and user groups about herd range, seasonal movements, and annual variation in distribution. Caribou movement animations also provide biologists with another tool to understand range use and identify important habitat and range areas. This method is easy to use and presentations with single or multiple animals can be made with basic skills in GIS and HTML.

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