COMPUTER ANALYSIS AND MAPPING OF HARVESTING DATA FOR THE MUSHKEGOWUK REGION

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This paper is a report on a project being carried out at Brock University, based on native harvesting data for eight Cree communities in the Mushkegowuck Region in the Ontario James Bay Lowlands: Fort Severn, Peawanuck, Attawapiskat, Kashechewan, Fort Albany, Moosonee, Moose Factory and New Post. [overhead] The project is part of the TASO research program that has been under way since 1982 under the direction of Dick Preston of the Department of Anthropology at McMaster University, and is noteworthy because of its use of the new technology of geographical information systems, or GIS, and its marriage of GIS with database management software on the one hand and computer graphics software on the other.

Three objectives of current TASO research include: (i) analysing participation by the Cree in wildlife harvesting activities, (ii) establishing the geographical boundaries of these activities, and (iii) estimating the yield of bush food harvested, and its economic and socio-cultural significance. [overhead] To this end a detailed questionnaire survey was conducted in 1990-91 in cooperation with the Omushkegowuk Harvesters Association, and our role at Brock has been to analyse the data and map the results.

We have done this with the aid of three different kinds of software: a database management system, a geographical information system, and a graphics program. [overhead]

A database management system, or DBMS, is a software package for the storage, manipulation and retrieval of data in a database. A database in turn is a collection of one or more data files or tables stored in a structured manner. There are three basic types of database structure, hierarchical, network and relational. The most powerful is the relational structure, which allows the user great flexibility in extracting information from the database. The DBMS used by us—Database Manager (a part of IBM's OS/2 operating system)—has this kind of structure.

A geographical information system, or GIS, is a software package for the analysis and display of data relating to the earth's surface, i.e. data that can be stored in the computer in terms of its geographical location. The field of GIS is one that has experienced extraordinary growth over the last decade, and is now a billion-dollar business worldwide. GIS has proven applications in any sector dealing with earth-based data, including forest management, geological exploration, locational analysis, archeological modelling, facilities management, vehicle routing, environmental monitoring and landuse allocation, not to mention waging war—the Gulf War being the first to take full advantage of GIS technology. The GIS we are using is SPANS, developed by INTERA-TYDAC, which is very strong in its spatial analysis and modeling capabilities and is particularly suited to work involving environmental data.

A graphics program, as the name implies, is a program for doing graphical work by computer. Programs of this type provide a variety of mouse-controlled drawing tools that mimic the motions of hand drafting and allow the user great flexibility in creating graphics on a computer monitor. We have been using Corel Draw, a sophisticated program capable of high quality output on Postscript-type printers.

In each community apart from Attawapiskat—which I will deal with separately—data was collected by administering a detailed questionnaire to 'potential hunters,' i.e. males over eighteen. The questions were asked orally and the answers recorded by the interviewer, himself a native from the community in question. The numbers interviewed ranged from 235 for Moose Factory to 13 for New Post, for a total of 716 hunters, representing an overall participation rate of about 55%. Non-participation was almost invariably a matter of unavailability rather than unwillingness to be interviewed.

The questionnare is in six main sections. [overheads] The first section is designed to establish a basic profile of the hunter, and the others document his harvesting activities in 1990/91 under the headings of Waterfowl, Fish, Furbearers, Big Game and Small Game. Questions ask about size of harvest (i.e. numbers of animals or fish caught, broken down by individual species and season), and also about location, expressed in terms of UTM 10 km grid squares as shown on NTS 1/250 000 scale maps. [overhead]

The questionnaire data was entered manually into a relational database using Database Manager. Two tables were created, a Wildlife Harvest File containing one record for each hunter and most of the questionnaire data, and a Locational Subfile containing the grid square information. [overhead]

The analysis performed to date has been of two types. The first, based solely on the data in the Wildlife Harvest File, involves the use of the querying capabilities of Database Manager to produce summary values, in particular counts of the numbers of each species caught, broken down by season and by community. [overheads] These counts are adjusted using correction factors based on the proportion of respondents to produce more realistic totals, and converted into harvest yields in kilogram-, protein- and dollar-equivalents.

The second type of analysis brings in the Locational Subfile data, and is geared to the production of maps of harvesting activity. It makes use of Database Manager and the SPANS GIS. The TYDIG digitizing software that accompanies SPANS was used to produce the necessary base maps. The next set of overheads show samples of the maps produced, as outputted directly from SPANS on an inkjet plotter. [overheads]

These maps are of two basic kinds: (a) distribution maps, identifying those grid squares where certain types of activity take place, and (b) intensity maps, showing the level of activity in each grid square, measured either as number of hunters or number of creatures caught. Within each group there are further breakdowns by community, species and season. There is also a breakdown by hunter type, each hunter having been classed (usually by a panel of his peers) as intensive, active or occasional depending on the number of harvesting activities he engages in and the amount of time he spends in the bush.

The maps shown so far are lacking in two important respects. First, they contain no data for Attiwapiskat, and second, they are not of publication quality. The next part of my paper discusses how these problems have been overcome.

It was mentioned earlier that the questionnaire survey did not include Attiwapiskat. Data for this community was collected independently for work on a doctoral thesis, and takes the form of transparent map overlays, usually one for each hunter, indicating harvesting activities by polygons (and sometimes lines). [overheads] We considered various ways of entering this data into the computer. One was to use a digitizer to capture the linework in x,y coordinate form, as we did with the coastline and rivers when preparing our digital base maps. But in the end we opted for manually converting the Attiwapiskat data into grid square form and inputting it via the keyboard. This had the advantage of making the data more or less comparable with that for the other communities. It involved preparing an overlay of the relevant part of the UTM grid, superimposing this on each of the map overlays in turn, and recording the grid squares in which various types of activity took place. This enabled us to fill a very big hole in our map of the overall distribution of harvest activity. [overhead]

The hole remains in most of our other maps, however, for two reasons. First, the Attiwapiskat survey did not provide breakdowns by season and hunter type. And second, the process of conversion from polygons to grid squares was used to produce distribution data only. Though we could have derived intensity data, we considered that it would have been too unreliable to be justifiable.

A word of caution is necessary concerning the information that we did obtain. We suspect that our map may suggest a greater degree of harvesting activity for Attiwapiskat than elsewhere, not because any significant difference exists, but because of the way the data was collected. The locational questions in the questionnaire used in the other communities were couched in terms like, 'where did you **kill most** of your. . .?' or 'where do you go **most often** for. . .?' and the hunter had to pinpoint grid squares on a map. This would tend to minimize the size of the area identified. In Attiwapiskat, on the other hand, the question was 'where do you hunt for. . .?' and the hunter simply had to draw a polygon on a map. This could well have had the opposite effect.

The second problem to be overcome was the fact that SPANS has limited mapping capabilities. It is excellent for generating a distribution, but the mapping process itself (selecting colours and symbols, annotating the map, arranging the layout, etc.) is cumbersome, and the quality of the output is not up to normal publication standards. Our solution has been to save the maps as AutoCad files and import them into Corel Draw, where they are easily edited before being printed on an inkjet or thermal plotter. [overheads]

As GIS analysis goes, the work described so far has been relatively straightforward. Basically it is simply a matter of constrained retrieval, i.e. using Database Manager to identify those records in the database that satisfy certain conditions, creating totals as necessary and using SPANS and Corel Draw to map the results. At the same time, however, this type of work would have been very difficult, if not impossible, to carry out without a GIS.

More recently, we have gone a step further and used SPANS itself as the instrument of constraint. By digitizing the watershed of the

Moose River Basin and using SPANS's point-in-polygon capabilities we have been able to extract summary data for the Basin only. This is something that would not have been possible with Database Manager alone. [overhead]

Our main task has been to analyse and map the data at hand, but we have also been trying to develop procedures that can be used by the native peoples themselves. Ultimately it is hoped that this type of work, carried out locally by a Native Land Use Secretariat under the auspices of the Mushkegowuk Tribal Council, will become a regular part of the regional planning process. There seems little doubt, based on our experience at Brock, that the Database Manager/SPANS/Corel Draw combination affords an effective means of monitoring native harvesting activity, one that could be adopted relatively easily in areas like the Mushkegowuk Region.