GIS Information in Ontario Parks

Monique Kuyvenhoven, Louis Chora and Libby McCalden
Ontario Parks

Abstract

Ontario Parks is currently building its Geographic Information Systems (GIS) using standards developed by the Government of Ontario. The first step to collecting spatial information for provincial parks is to get an accurate depiction of the actual boundaries of provincial parks. Through the park management planning process, Ontario's provincial parks are zoned on the basis of resource significance and recreational potential. Using GIS, we hope to define the basis for zone delineation more accurately, contributing to the management of parks, as well as to develop appropriate information standards. Zoning, along with Representation, and Classification are examples of some of the guiding management principles found in Ontario Provincial Parks: Planning and Management Policies *document. GIS plays a very important role in maintaining these guiding principles. Ultimately we hope to fill the province-wide gap of spatial information in Ontario's provincial parks, such as roads and campsites. Through the use of GPS units and other data collection methods, we hope to assemble a comprehensive source for all digital information relating to provincial parks. Communicating existing spatial information is also critical to park management. Sources for spatial information include hardcopy maps, an intranet site, and an online atlas. And finally we hope to co-ordinate mapping through the development of standards applicable to all areas of our business.*

Introduction

Geographic Information Systems (GIS) is a collection of spatially referenced data, corresponding attribute information, as well as hardware, software and personnel. Using GIS for analysis improves the decision-making process in natural resource management. GIS in Ontario Parks has several elements. The discussion below includes approaches for completing mapping, for developing appropriate standards, and for developing communication strategies.

GIS has been well established for a number of years, but as with any information technology, databases and other digital information can quickly become bulky, expensive, and difficult to maintain. The approach taken by the planning and research staff of Ontario Parks has been to focus first on foundational information, such as park boundaries, and then to build more detailed spatial information as time and resources permit. This allows for human resource capacity building, through the addition of GIS specialists on a project specific basis, as well as increased GIS ability among existing staff.

The objectives as outlined in the *Ontario Provincial Parks Planning and Management*

Policies, 1992 Update, known as the "Blue Book" (OMNR, 1992), are supported in man ways using GIS. Some of the guiding principles in this document that relate to GIS activ ities are: representation, zoning, classification, and access. GIS is becoming more acce sible and user friendly to park staff across the province. Because of this change, a nee has become apparent for consistent output of cartographic products. As a result, Plannin and Research section is developing a number of different mapping standards to addres the needs of the business area. The Ontario Ministry of Natural Resources (OMNR) i making substantial advancements in the housing and maintenance of spatial data, as wel as GIS standards and methodologies. Ontario Parks will be able to benefit from these ini tiatives as it evolves and continues to develop its own data and mapping standards Finally, communicating and distributing spatial information to decision-making staff i key to the success of GIS. Ontario Parks has implemented many different ways to do this often using web based technologies. Using these types of media platforms, Ontario Park staff can become more familiar with the use and benefits of spatial information.

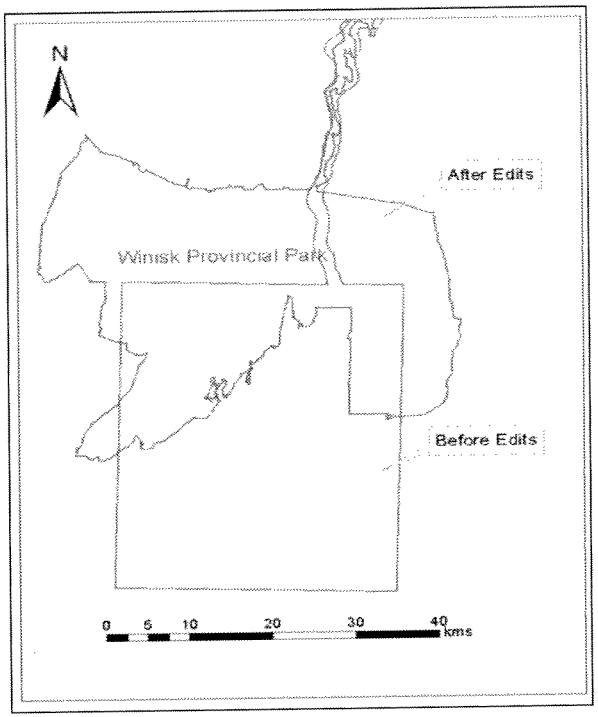
Spatial Base Data

Fundamental information for GIS, as it pertains to park management, is mapping spatially accurate park boundaries. Although previous attempts at mapping this information had been made, the accuracy was poor and there was a lack of maintenance of the information over time. Recently, all regulated provincial parks were reviewed according to their respective regulation plans and a new GIS coverage was built. As park boundaries are often reliant on other features, such as road allowances, rivers, lakes and railways, a source of base data was required. Within OMNR, a central repository exists for all spatial information called the Natural Resource Values Information System (NRVIS). This system provides the base information for defining applicable park boundaries. This successful review of provincial park boundaries (Figure 1) has had the benefit of ongoing maintenance through continuous feedback of park staff across the province. The ability of receiving feedback has been made possible through the establishment of permanent GIS support.

One of the nine guiding principles in the Blue Book is zoning. Designating zones within a park help define and maintain the park's uses and management goals and objectives. Because our criteria for designating zone classes are based on size and location, GIS becomes an important tool for reporting. For example, Wilderness Zones must be at least 2,000 ha. Our strategy to complete the mapping of existing zones is complicated due to the nature of the available information. Only parks that have either an approved management plan or some kind of interim management statement will have zones defined. There are a number of problems with the current state of zoning. Firstly, these zones are often very generalised and drawn at a small scale of resolution (e.g., a large northern park with its zones mapped on an 8.5x11 size page). Secondly, it is very difficult to pinpoint on the ground exactly where the zone delineation exists. Our objective with this project is to not only map the zones accurately and consistently in a GIS, but to encourage park managers and planners to better define the lines so they are recognisable on the ground. The information we are using to accomplish this are NRVIS base data, global positioning systems (GPS) technology, infra-red photos, ortho-rectified air photos, and various other remote-

ly sensed imagery.

Figure 1. *Park boundary edits.*



Through the purchase of Trimble GeoXT GPS units, Ontario Parks now has the capability to undertake extensive resource data collection exercises at the field level. The integration of GIS and GPS with the use of these handheld units offers a lot of potential to capture, edit, analyse, and output natural resources information. With up to sub-metre accuracy, the Trimble GeoXT provides park staff with the ability to collect new data types and update existing data, while adhering to corporate data standards. The types of information we hope to capture, in addition to park zones, are: park interior infrastructure, such as roads and trails, campsites, hydro and other utility lines, as well as earth/life science surveys and detailed ecological land classification polygons. To ensure that data collection exercises are efficient and accurate, and that new or revised data are disseminated to appropriate data custodians, effective GIS/GPS project management is essential. We are meeting this need through such documents as the *Draft Methodology for Interior Park Zone Mapping*, where we provide a section specifically on standards for collecting GPS information.

Policy Implementation Using GIS

The policy outlined in the Blue Book states that different classes of parks are necessary to protect a variety of natural resources and environments as well as to meet changing soci-

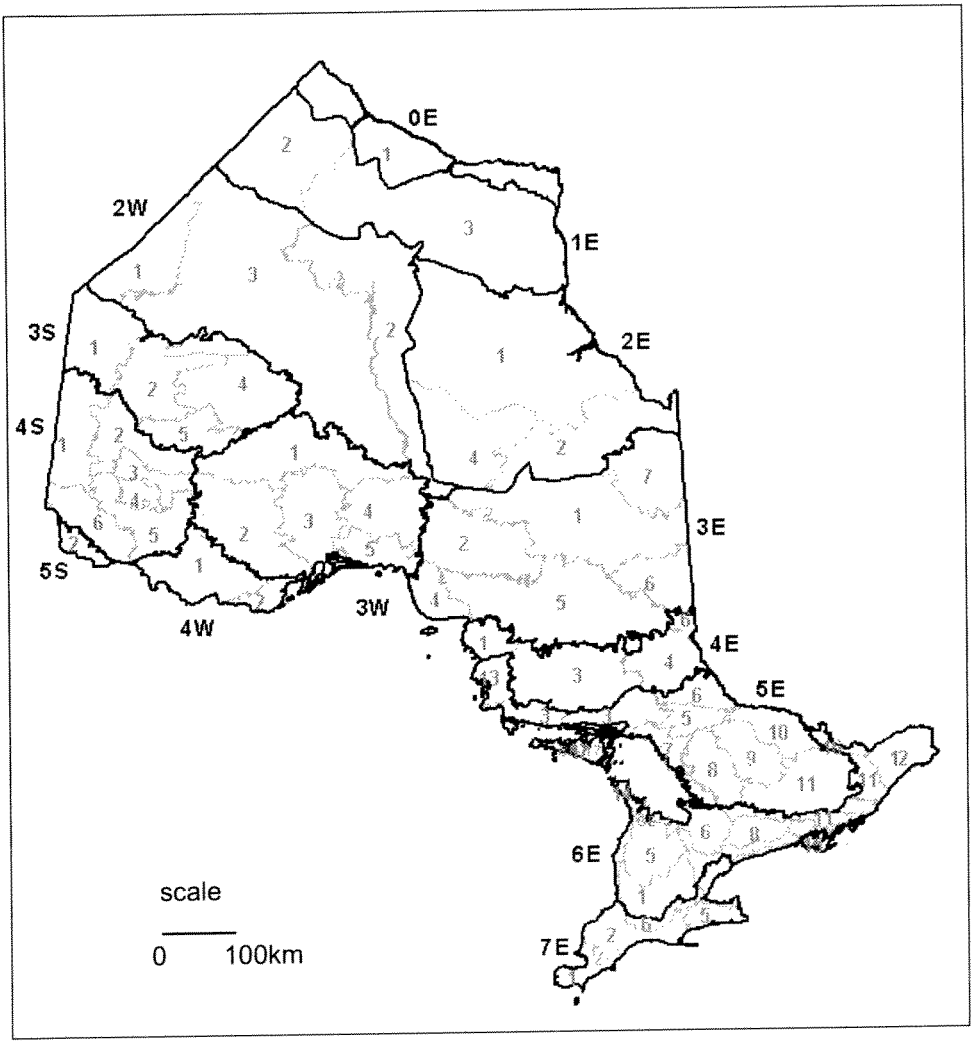
etal needs. Ontario Parks has established targets for representation of these classes o parks, and uses a system of ecological land classification to identify and justify them. Th original map of Ontario outlining different ecological districts and regions by Hills (1959 has since been refined by Crins and Uhlig (2000) as part of the larger Ecological Lan Classification (ELC) program. These changes incorporated new information on climat and landforms, made use of modifications by Jalava et al. (1996) in ecoregions 6E and 7E and defined lines using a better scale of mapping. The mapping for these revisions wa completed using NRVIS 1:20,000 or 1:10,000 scale water polygons as the provincial lan extent. Chapman and Putnam's *Physiography of Southern Ontario* (1984) was used t delineate ecoregions 6E and 7E, while the Ontario Land Inventory (OLI) was used t define lines in ecoregion 5E north to approximately 2E and 2W (Figure 2), where the dig ital information for OLI ends. Areas north of this were defined using *Soil Landscapes o Canada* (Anon., 1991) data. Targets for classification of parks, such as one wilderness class park for every ecoregion, or one natural environment class park for every ecodistrict is one of many uses of the ELC data set.

Representation, another one of the nine guiding principles in the Blue Book, takes an ecosystem approach to securing *"representative features of Ontario's natural and cultural heritage."* (OMNR, 1992) The process of defining natural features that still require representation in the protected areas system is called Gap Analysis (Crins and Kor, 2000). This method uses a combination of landform and vegetation values to identify areas of a minimum size that have not yet been protected. The GIS implementation of this methodology has been a liquid process. The different key "ingredients" required for the gap analysis includes landform data, vegetation data, and protected area boundaries. Subsequent information required for defining a candidate protected area can range from a number of different conservation values (e.g., habitat suitability mapping) to overlapping interest values (e.g., mining claims). Because of the nature of GIS and the age and quality of spatial data, the quality of different datasets is constantly being improved and updated. This has made it difficult to maintain currency of gap information. In the past we have used a terrain adjusted surficial geology coverage as a surrogate for landform values but we are currently using a more recent quaternary geology coverage. The same issues apply for the vegetation mapping. Landcover 28 (1999), a raster dataset that captures land cover types or classes throughout the province, seems to be the best provincial example of vegetation types, however, this is being updated regularly as well. Ideally, Forest Resource Inventory (FRI) data would be used for vegetation mapping, as this dataset captures a much finer scale. However, it cannot be merged into one seamless province-wide dataset for comparison.

The analysis process for gap analysis incorporates both the Landcover 28 and FRI data sets, looks at the combination of landform and vegetation types, and seeks out what has already been represented in a protected area by ecodistrict. The remaining combinations are defined as the gaps. The GIS will also apply information on the government's ability to regulate an area as protected, such as issues dealing with private land and mining claims. Finally, GIS layers will be applied that inform ecologists about the quality of the area, by indicating features such as headwaters, roadlessness and species at risk. We then rank areas according to their suitability for a candidate protected area. This output stage of the gap analysis process is still largely a manual one where people who are knowledge-

able in ecology and the area in question will need to sit down with the information and design candidate protected areas. In future planning, the GIS process will be as automated as possible, so that it uses less staff time and the results become more consistent and predictable.

Figure 2. *Ecoregions and ecodistricts of the ecological land Classification (ELC) system for Ontario (Crins and Uhlig, 1996).*



Mapping Standards

The vision of GIS in the Planning and Research section is to support the growth of GIS across existing Ontario Parks staff and to build capacity to make GIS a part of normal business. As with any learning opportunity, it is often a slow process that requires nurtur-

ing and support. One of the strategies to accomplish this in the long term is to provid detailed mapping standards documents that not only standardise the output, but also pro vide a tool for learning. One of the best examples of this has been the *Recreatio Mapping Standards* (Kuyvenhoven, 2000). This document not only gives explicit instruc tions on how to create a map document but also what symbols, colours, and layout to us (Figure 3). This benefits both the users, by giving instructions, and the recreation inven tory co-ordinator, by standardising the product output of all inventories. The mappin symbols used to build the standards were used in conjunction with other mapping stan dards initiatives within OMNR, such as the forest management planning mapping stan dards.

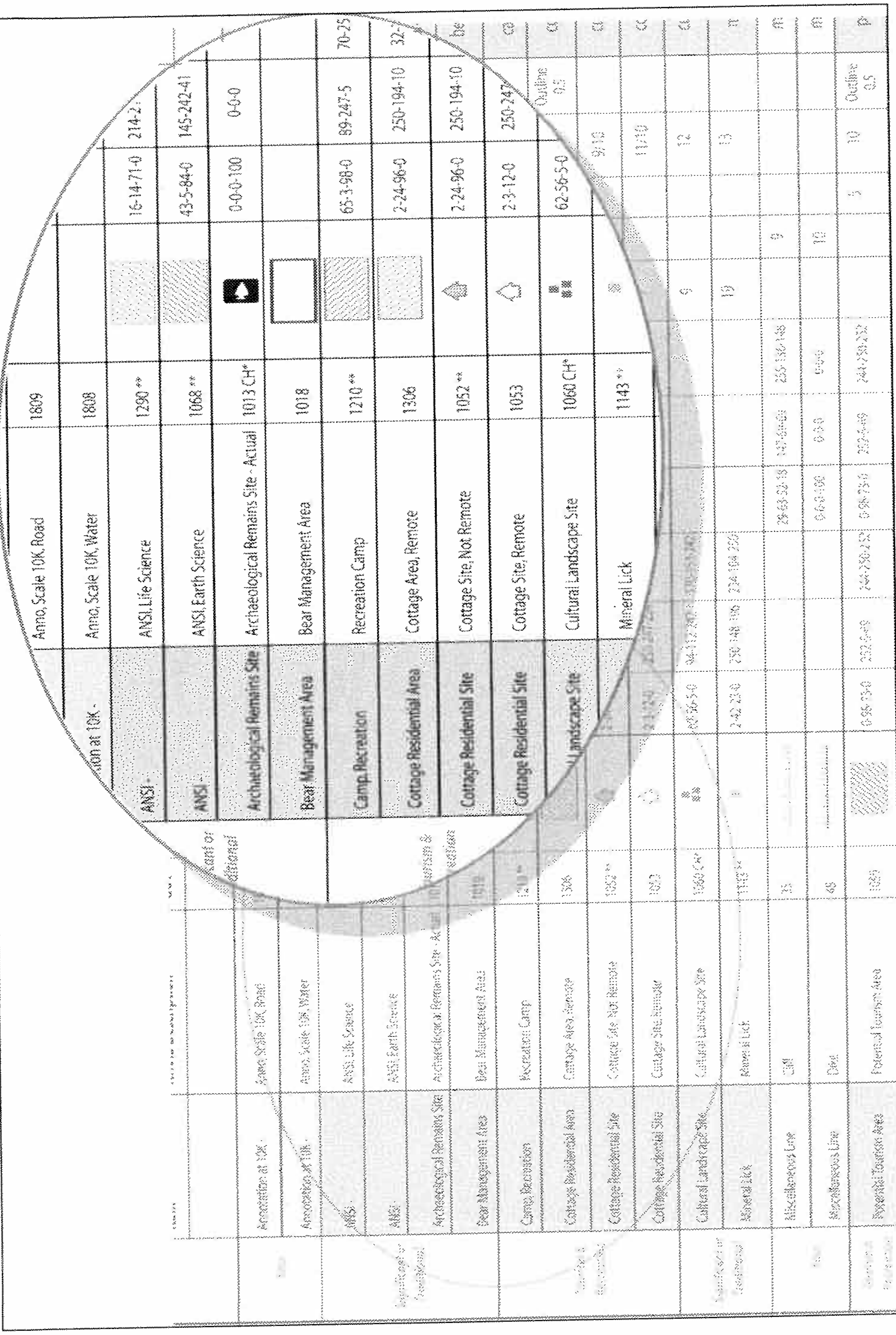
In order to expand the usage of mapping standards in Ontario Parks, future planning wil include the development of a more generalised mapping standards document. This docu ment will include information on how to use the corporate identity symbols, as well a information on components required for every map product, such as the north arrow an wording for disclaimers. It will also include layout options for a variety of scenarios, suc as management planning maps, inventory maps, and general information maps. A draf document on digitizing interior zones, which also includes detailed standards on usin various GPS technology, will be referenced, as will new standards for briefing note maps. The mapping standards document will provide any Ontario Parks staff member to view all information related to mapping in the OMNR.

Communication

One of the methods Ontario Parks has chosen to communicate relevant spatial data is through the use of an internal, online atlas. The types of information that is available to the user are protected area boundaries, ecological land classification boundaries, many different administrative layers such as MNR districts and park zones, base data such as roads and rivers, and provincial treaty areas. The user can view information at three dif- ferent scales of detail, can query information by making layers active and can print map layouts of their current view. The atlas is also used as a bibliographic tool for users to retrieve documents such as management plans and inventories. Future development includes adding query functionality, adding measuring and buffering tools, including more digital documents, and adding more spatial layers.

Recently, we have launched an internal facing web site that contains information on all types of planning and research business. Tools such as templates, guidelines, fonts, and methodologies are all available to staff centrally. Added to this, several standard maps have been created and are available through the intranet for users to download and print. We've included maps that are often the subject of request to our GIS staff, such as park administrative zones or maps of the park system. In doing this, we hope to minimise the GIS staff time used filling single requests, otherwise known as "one-offs".

Figure 3. *Sample recreation mapping standards.*



Conclusions

GIS technology provides Ontario Parks with the necessary tools to make informed dec sions regarding natural resources management. There are many projects underway, suc as base data development and maintenance, park zone mapping, ELC mapping and ga analysis, all of which contribute to the overall goals and objectives of Ontario Parks. Th strategy for GIS development ensures that the priorities of the business are met, and nc compromised by workload issues. Flexibility in the strategy allows for users to benefi from new technologies and to assess priorities on a regular basis.

As GIS technology matures, Ontario Parks will be well positioned to continue to play a important part in meeting the needs of decision-makers and in advancing the agenda o protected areas in Ontario.

References

Anonymous. 1991. *Soil Landscapes of Canada: Ontario – South.* Map Portfolio. Agriculture Canada Publication S240/B: Ottawa, ON.

Chapman, L.J. and P.F. Putnam. 1984. *The Physiography of Southern Ontario. Third Edition.* Ontario Geological Survey, Special Volume 2. Toronto, ON.

Crins, William J. and Philip S.G. Kor. 2000. *Natural Heritage Gap Analysis Methodologies Used by the Ontario Ministry of Natural Resources.* Ontario Ministry of Natural Resources: Peterborough, ON.

Crins, William J. and Peter W.C. Uhlig. 2000. *Ecoregions of Ontario: Modifications to Angus Hills' Site Regions and Districts – Revisions and Rationale.* Ontario Ministry of Natural Resources: Peterborough, ON.

Hills, G.A. 1959. *A Ready Reference to the Description of the Land of Ontario and its Productivity.* Ontario Department of Lands and Forests, Division of Research: Maple.

Jalava, J, J.L. Riley, D.G. Cuddy and W.J. Crins. 1996. *Natural Heritage Resources of Ontario: Revised Site Districts in Ecological Site Regions 6E and 7E.* OMNR Unpublished Draft. Natural Heritage Information Centre, Ontario Ministry of Natural Resources: Peterborough, ON.

Kuyvenhoven, M. 2000. *Recreation Inventory Mapping – Template Guide.*

OMNR (Ontario Ministry of Natural Resources). Unpublished Document. Ontario Ministry of Natural Resources: Peterborough, ON.

OMNR (Ontario Ministry of Natural Resources). 1992. *Ontario Provincial Parks: Planning and Management Policies, 1992 Update.* Queen's Printer for Ontario: Toronto, ON.