

Protecting Cultural Resources Through Forest Management Planning in Ontario

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Abstract

The Ontario Ministry of Natural Resources (OMNR) identifies and protects known and presumed cultural resources through the forest management planning process. The problem that presents itself to cultural resource managers in northern Ontario, as well as in much of the rest of the Canadian boreal forest, is one where resources are known to exist, but their exact locations are unknown. So how does one manage a resource that we know exists but do not know where it is? In the late 1980s, archaeological predictive modelling was identified by the OMNR as a means of addressing this situation and, given available knowledge, providing the best statement on the likely existence of archaeological resources. The OMNR sponsored three years of research and development that led to a first generation predictive model. This was followed by three years of pilot projects which served to expand the applied base of the model from the original research and development area around Thunder Bay and also to develop various means by which existing Ontario government digital databases could be incorporated into the archaeological predictive modelling process. The OMNR is at a stage where it is ready to employ archaeological predictive models as a cultural resource management tool in all new forest management plans.

This paper will present the current progress of the Ontario Ministry of Natural Resources' Cultural Heritage Inventory Protection Program (CHIPP) giving examples of archaeological predictive modeling efforts in northwestern and northeastern Ontario.

Background

In 1991, OMNR introduced the *Timber Management Guidelines for the Protection of Cultural Heritage Resources*. These guidelines outline the manner in which cultural heritage resources are protected through the forest management planning process. In addition to protecting known/verified archaeological sites, the guidelines explicitly state that areas determined to have a *high potential for archaeological sites* will also receive protection.

Forest Management Planning and Environmental Assessment in Ontario

In 1995, the Ontario government legislated the *Forest Management Planning Manual* that changed the manner in which forests were managed in the province. Among the many changes was the introduction of guidelines for the protection of numerous *values* that were not previously formally considered in planning. These included values such as woodpecker habitat, impact on tourism, and protection of cultural heritage values. While the protection of recorded archaeological sites has been a part of forest planning in Ontario for decades, it has never been formalized. It relies upon the personal interest of the plan author or the ability of

the regional provincial archaeologist to keep abreast of new forest management plans and schedules. It would be fair to say that in spite of honest efforts prior to 1995, cultural heritage protection was a low priority in forest management planning.

The new *Forest Management Planning Manual* identifies cultural resources as one of many values that must be considered and protected in the planning process. Seven steps are outlined in the guidelines to be followed when identifying and protecting cultural resources:

1. Prepare a thematic overview of the heritage for the management unit describing both the precontact and postcontact periods.
2. Assemble known site databases for all four categories of heritage resources: cultural landscapes, structural remains, archaeological remains and traditional-use sites.
3. Apply and document appropriate site potential models for the management unit or parts thereof. Assemble all relevant environmental and cultural data necessary to translate the models into maps *showing areas of high potential for heritage resources*.
4. Rank the importance of the various types of known resources.
5. Combine the maps of areas of high potential (Step 3) and of known sites (Step 2). The output of this step is the heritage component of the values map.
6. Identify where the areas selected for operations during the five year term of the Plan coincide with heritage resource components of the values map. These coincident areas are the areas of concern for cultural heritage.
7. Identify a specific prescription for each cultural heritage area of concern.

In summary, not only is the Ontario government committed to using archaeological predictive modelling to protect cultural heritage resources, it is required to!

Research and Development

In 1994, Lakehead University successfully completed predictive modelling research and development that was started in 1991, on behalf of OMNR. A steering committee that originally oversaw the development of the Cultural Heritage Guidelines provided advice and guidance on the research and development of the archaeological predictive modelling methodology.

Between July 1991 and March 1994, the OMNR and Lakehead University, through a memorandum of understanding, undertook research into the development of archaeological predictive models for use in forest management planning. This research took place through the Centre for Archaeological Resource Prediction (CARP), Department of Anthropology at Lakehead University. The project was geared to answer the question: "Can archaeological predictive modelling be done in northern Ontario?" In addition to the research and development work conducted, archaeological field surveys were carried out to collect baseline archaeological data and to provide initial indications of the predictive success of the archaeological predictive models.

The results of this work were presented to the OMNR in six volumes in March 1994 detailing the work completed and outlining a prototype predictive modelling methodology (Dalla Bona, 1994a; 1994b; 1994c; Hamilton and Larcombe, 1994; Larcombe, 1994; Hamilton, Dalla Bona and Larcombe, 1994). The Cultural Heritage Guidelines steering committee and OMNR accepted the report, acknowledging that this was simply the end of the beginning; more work needed to be done to take this research and development product and turn it into a tool for use in forest management planning across the province.

The OMNR has taken a staged approach to the introduction of this model as a management tool. Stage 1 involved small-scale testing to evaluate the effectiveness of the modelling methodology and the manner with which it fits into forest management planning schedules. Stage 2 involved applying the model to an entire forest management unit and evaluating the model in light of the new procedures required by the *Forest Management Planning Manual* (1996). Stage 3 involved applying the model to a large area – one or more management units – with a large heritage site database primarily for model verification and testing.

During the entire model staging process, field surveys were carried out to evaluate the strengths of the modelling assumptions; evaluate the relevance of the variables used; and conduct archaeological surveys in areas 'not traditionally' surveyed.

Pilot Projects

In April 1994, OMNR initiated pilot applications of the model. These pilot projects were undertaken in two management units: the Dog River/Matawin Management Unit and the Geraldton Management Unit (Figure 1). The purpose of the pilot project was to apply the prototype predictive model in a 'real-world situation' and to conduct field surveys in support of the model. Field surveys were carried out in both units with approximately 60% of survey time spent in areas of high archaeological potential and 40% of time spent in areas of less than high potential.

The primary goal of the pilot project was to confirm that predictive modelling is an appropriate means of identifying cultural heritage resource potential and that this information could be provided in a timely and effective manner to timber management planning teams. It also was expected that:

- (a) The field surveys would provide information in determining the correspondence between areas of archaeological potential and verified precontact cultural resources;
- (b) The geographical scope of the applicability of the model would be increased through field surveys further to the east of Thunder Bay District;
- (c) The challenges of implementing precontact cultural heritage resource predictive modelling in the current timber management plan would be identified and discussed;
- (d) The approximate costs of conducting precontact prehistoric cultural heritage resource predictive modelling as a component of the timber management planning process would be identified; and,

- (e) The personnel necessary and the approximate time required to conduct prehistoric cultural heritage resource predictive modelling would be identified and discussed.

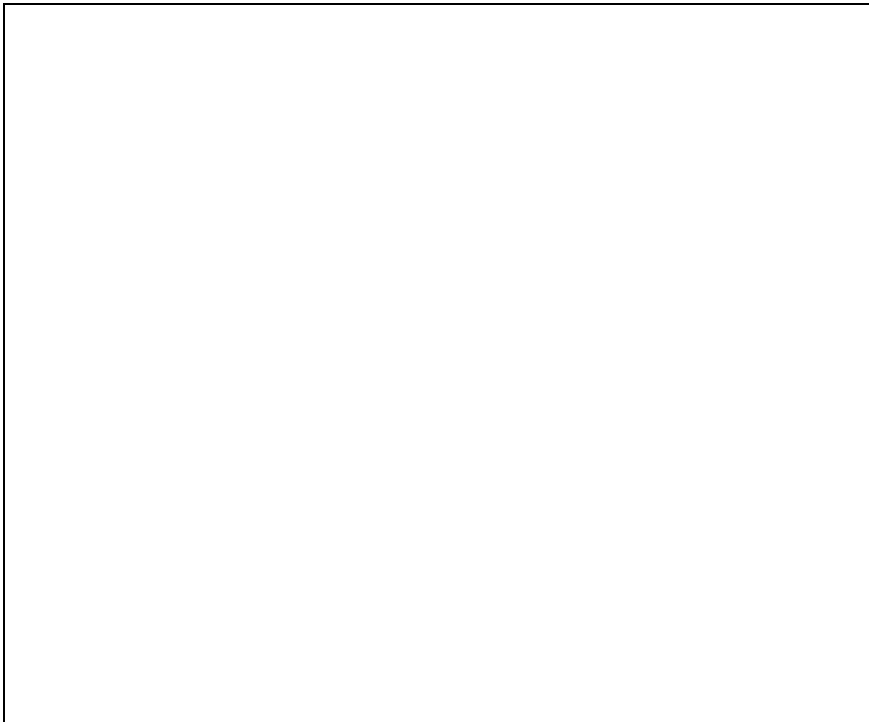


Figure 1: Location of Pilot Project Study Areas

The pilot study areas within the management units were selected according to one criterion. It was necessary that timber harvesting activities were to be scheduled within each area. This would provide an indication as to the overlap between areas identified as high potential for cultural resources, areas protected by existing forest management guidelines and areas scheduled for normal timber harvesting.

In the Burrows Lake study area (Geraldton Management Unit) approximately 50% of the land south and east of Burrows Lake was allocated for normal harvest and harvesting activities had been ongoing in adjacent areas for decades. In the Kashabowie study area (Dog River/Matawin Management Unit), the forest east of the lake was harvested as recently as 1992 and approximately 30% of the forest west of the lake was scheduled for harvest between 1995 and 2000. Both the Kashabowie Lake and Burrows Lake areas are in different management units and both are harvested by different companies. As a result, the shapes of the cuts, the amount of reserves and the density of the cuts vary. This proved to be an advantage to the pilot study because a greater range of variability in the interaction between forest management planning and archaeological predictive modelling could be examined and commented upon.

Pilot Results

The Kashabowie Lake application of the model proved to be successful. Two independent archaeological surveys identified eight archaeological sites in the study area. According to this model, high potential areas make up 10% of the landbase and located within this area are 75% of the known sites. Statistical tests support the observation that archaeological sites are associated with high potential areas in a manner that would not normally be expected by chance. If this predictive model had been used as a component of forest management planning, then there would have been 66 hectares of land in the study area that would have fallen within areas slated for forest harvest.

The Burrows Lake application of the predictive model also proved to be successful. Two independent archaeological surveys identified 37 archaeological sites in the study area. According to this model, high potential areas make up approximately 12.5% of the landbase and located within these areas are almost 90% of the known sites. Statistical tests support the observation that archaeological sites are associated with areas of high archaeological potential in a manner that would not normally be expected by chance. If this model had been used as part of the forest management planning process, then approximately 190 hectares of land, identified as high potential, would have fallen within areas slated for forest harvest.

Two of the questions asked quietly amongst those involved in the pilot projects were:

1. Are the cultural heritage guidelines necessary? and,
2. Does the application of the other guidelines already protect enough high potential area?

The pilot projects suggest that the application of the other forest management guidelines protects only 50% of those areas identified as high potential. The remaining 50% of high potential falls in areas that could be subject to forest management activities. Most importantly, the evaluation of the modelling results from the perspective of forest management planning activities suggests that incorporating high potential into planning does not introduce problems/issues not already encountered during planning.

Management Unit Application

The success of the pilot applications gave an indication that the model was reasonably successful and it would be appropriate to proceed to the next stage. The Caribou Management Unit (Figure 2) was the first management unit in Ontario to fully implement the new *Forest Management Planning Manual*. From a predictive modelling point of view, the Caribou Unit provide one end of the scale of challenges that face this program. There existed no digital data for the Caribou Unit with which to create a predictive model and there were no known archeological sites recorded to exist within the boundaries of the unit. These challenges necessitated that all archaeological predictive modelling work essentially be started anew.

In the end, a model was generated for 800,000 hectares of forest – for which all the digital data was created from "scratch". Archaeological surveys were initiated to: (a) obtain preliminary information about the types of artifacts/sites occurring in

the unit; and, (b) to gain information about the density/distribution of sites in areas “not normally surveyed.” Approximately 15% of the landbase was identified as high archaeological potential. Twenty-three archaeological sites were discovered as a result of the surveys: 22 were found in areas of high potential and one was found in an area of medium potential. Although the surveys did not strictly follow the rules of sampling procedures, they do provide additional evidence that sites are being found in areas of high archaeological potential to a greater degree than in areas of less than high potential.



Figure 2: Location of Caribou Forest Management Unit

The Distribution of Archeological Potential

Conventional perceptions of the distribution of archaeological sites include the notion that cultural heritage can be protected by simply reserving areas around larger water bodies. Indeed many archaeological predictive models reflect this notion which may be termed the ‘hi-lighter effect’ where doughnuts of high potential may be found around all the major lakes in a given area. This may not be the most accurate reflection of where people conducted activities throughout the past and correspondingly where the evidence for these activities may be found – i.e., archaeological sites.

The methodology used in OMNR’s predictive modelling efforts is somewhat more representative of the notion that different parts of the landscape may have been attractive in the past – and not all of those parts are located next to a sandy beach on a lake. For example, in the west central part of the Caribou Management Unit, the manner in which archaeological potential is distributed is highly influenced by a glacial lake beach that circles through the centre of this

area. Across the rest of the area, potential is not evenly distributed with the bulk of "low potential" being found in northwest.

Just south of a major east/west river system near the south central part of the Caribou Management Unit, an area has been harvested during the past five years and bush roads are evident in aerial photographs. Archaeological potential is highly influenced by a series of eskers which dominate this area. These eskers trend northeast to southwest and according to archeological wisdom, eskers are highly significant features because: 1) they served as easily accessible, well drained travel corridors for both people and animals; and, 2) they serve as possible sources of raw material for stone tool manufacture. It is important to note, that although there is a major waterway flowing across the northern part of this area, the bulk of high potential is located well away from the water – in fact, the bulk of high potential is located within areas already having undergone forest harvesting.

Some 50 km to the east in the Fairchild Lake area, archaeological potential is distributed in a uniform manner across the area. This is due to the occurrence of uniform post-glacial geology. Still, there is a considerable block of high potential occurring behind the point of land, south of Fairchild Lake.

These three examples show that high archaeological potential is not found in similar places across the Caibou Management Unit. Indeed, in modelling reality, the results show that certain localized features influence the determination of potential in different ways in different parts of the management unit.

Full Application

The final step in staging in the use of this predictive modelling methodology involved applying it to an area where there was a rich cultural heritage database with which to gauge the success of the model. A most appropriate area in northern Ontario is Temagami. As a result of almost a decade of intensive land use planning and inventory collection, the Temagami region boasts a comprehensive cultural heritage database that includes traditional sites, spiritual sites, and pre-/post-contact archaeological sites. The Temagami region is also blessed with an abundance of digital data making the application of a predictive model a relatively straightforward process. As a result, the model was applied to two management units, an area of more than 1.75 million hectares.

The resulting model identified 18.2% of the landbase as high potential, 73.8% of the landbase as medium potential and 8% of the landbase as low potential. The model can be considered successful due to the number of known sites that are captured by areas of high potential. In this application, almost 84% of the known sites are accounted for in the high potential areas, which themselves only account for 18.2% of the landbase (Table 1).

Again, the introduction of the model into the forest management planning process poses no problems from a procedural or technical point of view. Indeed, the map of potential is presented as a straight yes/no map; either there is potential or there is not. In this respect there can be no confusion about whether a locality is considered to require protection under the guidelines.

Difficulties do arise however when every single location identified as high potential is equated with the existence of an archaeological site. High potential areas are an expression of probability – each mapped grid cell of high archaeological potential does not equate to an archaeological site. Rather, the map should be interpreted such that the likelihood of encountering an archaeological site is greater in areas identified as high potential than in areas *not* identified as high potential.

Category	% of Landbase	% Known Sites (# of Sites)
High Potential	18.2%	83.8% (186/222)
Medium Potential	73.8%	16.2% (36/222)
Low Potential	8.0%	0% (0/222)

Table 1: Results of predictive model application in the Temagami Management Unit

Summary of Model Development

The research and development of a predictive modelling methodology applicable to the boreal forest of Ontario resulted in an approach that the Ontario Ministry of Natural Resources could use to manage a resource that was known to exist – but the exact location was unknown. Over a four year period, a series of test applications slowly introduced the model into the forest management planning process. This phased introduction enabled the OMNR to gauge: the suitability of the model for the task; the requirements of the modelling methodology; and the suitability of existing data sources for archaeological predictive modelling. Also, this phased approach enabled further testing of the modelling methodology to take place in a wide variety of locations across the province and provided OMNR with a measure of confidence regarding the model's predictive capabilities and success.

In addition to the above, the staged approach to the modelling identified some of the paths that OMNR can take in the full implementation of this model across the province in every new forest management plan that is written. Land use planning approaches, methods of writing prescriptions, and means of dealing with unverified resources are challenges that still confront this process and are being addressed at the present time.

Current Challenges/Future Directions

As the OMNR expands its application of this predictive modelling methodology, mistakes will be made. Heritage resources may be discovered in areas where they were not expected and sites may be accidentally impacted. If we learn from these mistakes, and evaluate why we are finding things outside our expectations, then our ability to predict these occurrences in the future will improve. This necessitates an excellent feedback loop where information gained from the application of a model in one area is fed back into the system to ensure the best possible application of the model in other areas.

While the model is currently a broad spectrum model, not specifically dealing with particular time periods or particular site types, this may evolve to be the case in the future as we gain more information about the density and distribution of sites in northern Ontario.

It will be a challenge to work with foresters and educate the profession and the industry to the various aspects of cultural heritage data. Concurrently, it will be a challenge to educate the cultural heritage community that various land uses, including forestry can be allowed to continue while ensuring the protection of cultural resources.

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