MOOSE CONFERENCE WORKSHOP - FORT SAN, APRIL 24-25

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INTRODUCTION

Elevated concerns for the environment and broad acceptance of integrated resource management objectives, at least in philosophy, has generated new approaches to environmental problem solving. The forest industry has been the target of significant scrutiny in recent years which has stimulated the development and acceptance of an integrated resource management approach. The emergence of micro-based Geographical Information Systems (GIS's) technology over the past 5 years has dramatically improved the capability of professional resource managers to load, manipulate and evaluate spatial data and opportunities to participate in decision-making processes.

Forestry and wildlife management lend themselves to GIS-based analysis for the integration of management objectives, a reality which has largely eluded both disciplines in the past. With GIS, both forestry and wildlife personnel can share common datasets, and through this sharing of information can better appreciate and understand the constraints and problems they each must address.

The 'Workshop' portion of the 26th North American Moose Conference and Workshop was designed to explore and to demonstrate the utility of GIS as a tool for the integration of management objectives of both commercial forestry operations and moose management.

THE WORKSHOP

The participants at the conference were divided into four equal groups of approximately 20 individuals organized on the basis of professional background (biologists, foresters) and discipline (management, research). The groups were each provided with a 1:12 500 scale Saskatchewan forest inventory map representing a forested area of 100 km^2. The maps contained information respecting winter and summer distributional surveys for moose and woodland caribou and other relevant data respecting unique features such as salt licks (Figure 1). With this information in hand, each group was charged with the following tasks:

1) To harvest up to 50%, even flow, of the mature wood over the next five years with special emphasis on diseased and overmature stands.
2) To manage to improve the quality of moose habitat and to increase the moose population from 0.2 moose/km^2 to 0.5 moose/km^2.

The teams were also informed that woodland caribou were a high profile species which carried high management priority and were protected from any sport harvest. Each group then appointed a chief forester, chief biologist and recording secretary In addition, an individual was elected from each group to act as a dispute mediator. The teams were requested to detail the features of an attribute database respecting habitat variables for moose, and to outline any regulations respecting cutover sizes, buffers and reservations. Therefore, each group essentially had the opportunity to establish their own guidelines, provided they met the objectives of the forest harvesting plan.

The workshop was not intended to be a simulation game. No single correct formula existed, rather many potential solutions. The objective of the exercise was to demonstrate the importance of effective dialogue between all forest interests in the design and acceptance of a plan of action, and the role of GIS in the assisting in the decision-making process. Planning is an art for which complexity increases in proportion to the number of variables.

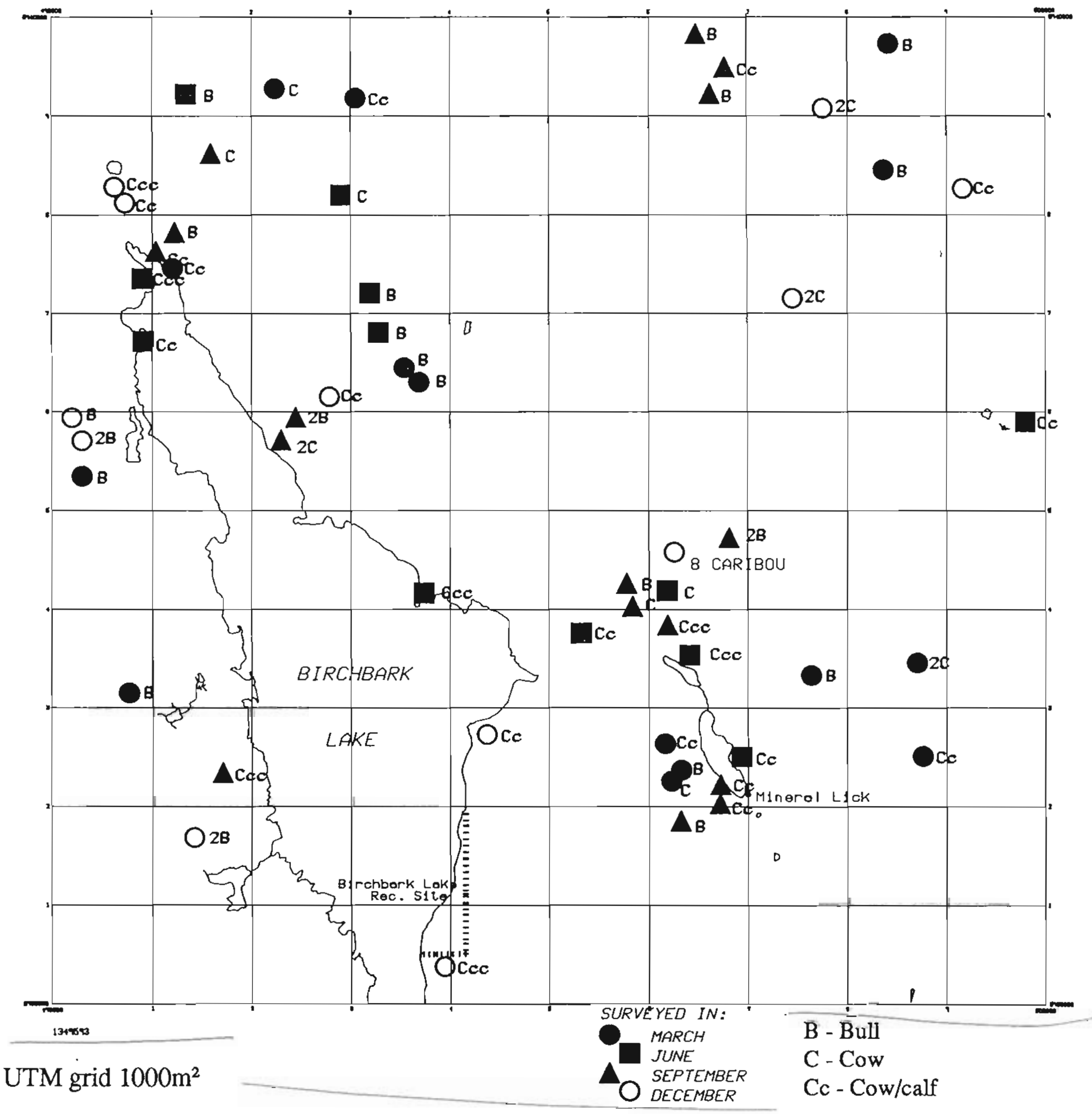

Fig. 1. Seasonal observations of ungulates associated with the experimental integrated resource management area for 26th N.A. Moose Conference Workshop.

The exercise was presented in terms of a real world management problem. Moose in the selected area are hunted and harvest was expected to continue throughout the 5 year forest operating plan. In addition, unregulated harvest exists and was expected to increase with improved access. At the end of the 5 years, all forest harvesting would cease until regeneration was sufficiently advanced as to provide moose populations with escape cover.

Moose Habitat Variables

The assumption was made that the wildlife managers were knowledgeable of the essential elements of moose habitat. As part of this exercise, each team was requested to spatially present the information and to give consideration to the following:

1) Nutrients
2) Thermal Cover
3) Security Cover
4) Winter Cover

5) Water
6) Essential Elements

The teams were requested to integrate their habitat classifications into the existing forest inventory ie. attach attributes on the basis of existing cover types. Ten major commercial cover types and four non-commercial cover types were identified:

H= Hardwood dominant stands primarily aspen

HS = Mixedwood stands dominated by hardwoods
Aspen/White Spruce
Aspen/Jack Pine
Aspen/Black Spruce

SH= Mixedwood stands dominated by softwoods
White Spruce/Aspen
Jack Pine/Aspen
Black Spruce/Aspen

S= Softwood dominated stands
White Spruce
Jack Pine
Black Spruce

Non- commercial

Lowlands= Fens and bogs, meadows
Treed Bogs -bogs dominated by presence of black spruce or tamarack
Open Meadows dominated by sedges and grasses

Shrubs=Riparian areas dominated by willows

Each group was provided with stand and age class tables on the height and density classes for the forest stand types as well as data on the understory shrub (stem densities, summer green foliage and stem biomass) and herbaceous vegetation (biomass) associated with most of these stand types.

Moose Populations

Fictitious moose survey observation data for each of June, September, December and March were also provided.assuming equal visibility at each interval (Figures 1). In addition, one group of woodland caribou were also displayed.

Forest Harvesting Regulations

Established guide-lines respecting regulations on cutover size, stream and road buffers or reservations were not provided. Each group was requested to establish a set of rules important to achieving the objectives of integrated management.

GIS System Support

All information respecting forest overstory information and wildlife population survey results were stored in a digital format in the Terrasoft GIS (Digital Resource Systems, Nanaimo, B.C.). Each workshop group had their own GIS system and operator.

APPROACHES

Each of the four groups experienced difficulty in approaching the problem. In all cases, a preliminary group meeting was held, and then foresters and biologists within each group separated to conduct an initial planning strategy. Once the initial planning approach was determined, each group then reconvened to discuss approaches, concerns and differences. The foresters identified areas they wished to harvest and biologists identified areas where special management concerns existed.

Some of the subgroups of biologists approached the problem from a regulatory perspective while others rejected comprehensive guide-lines in favour of a habitat approach. For example, two of the four groups selected the US Fish and Wildlife Service Habitat Suitability Index (HSI) methodology to evaluate habitat quality while the other two groups adopted a somewhat less structured approach. The two groups adopting the HSI approach each decided to divide the project area into four equal-sized quadrants for habitat evaluation. The following variables were selected by each group using the HSI:

1.The percent of the area in shrub or forested cover ≤ 20 years old (food). Optimum between 25-75% of area.

2. The percent of the area in spruce/fir forest ≥ 20 years of age (cover). Optimum at 50% of area.

3. The percent of the area in upland deciduous or mixed forest ≥ 20 years of age (mixed stands, food and cover). Optimum at 25-75% of area.

4. The percent of the area in riverine, palustrine or lacustrine wetlands not dominated by woody vegetation. Optimum ≥ 50% of area.

* Note: the areas identified for cover in the pre-harvest evaluation were subtracted from the cover variable and added to the food variable. This was determined by digitizing the rough outlines of the cutovers.

One of the HSI groups used the GIS system to calculate HSI indices and used the display capabilities of the system during interactions with the foresters to explain their concerns. In this way, they were able to demonstrate to the foresters where particular concerns respecting food and cover existed. The other group preferred to integrate the initial forest harvesting plan with the HSI model, and then to run the model to predict changes in available food and cover at year 5 following cutting. This approach served to redirect the foresters to different quadrants following their joint planning session.

In all cases, the biologists were able to convince foresters of the need to consider such variables as buffers, cutover size or shape restrictions, distance from cover within the cutover, maintenance of winter thermal cover, leave blocks, harvest schedules and access controls. Recommended buffer sizes ranged from 100-200 m on major lakes, although some groups recommended selective winter logging be allowed within 40 m of lakeshores where slope (>45%) did not present a serious obstacle. Another group was prepared to permit logging to infringe on the buffers provided no more than 10% of the area would be harvested over the 5-year period and provided cutovers within the buffer zones did not exceed 2 ha in size. Recommended maximum distances from edge of cutover to winter cover varied from 200-400 m. All groups suggested protection of potential moose calving areas along a riparian complex bordering Birchbark Lake was important; the restrictions were generally recommended for the summer months only, provided that only selective winter harvest be permitted within a 100-200 m buffer.

A general consensus existed that a 15-20 year period would be required prior to harvest of the remaining 50% of the timber.

Support was mixed for access controls with recommendations varying from none to the use of road corridor game preserves and/or gating the primary haul road into the area. Others felt that careful planning to restrict visibility from the road to cutovers by use of treed reserves or buffers and the use of low quality bush roads and winter-only access would suffice to limit vulnerability of moose to harvest.

Three of the four groups recommended minimum 100 m buffers around the salt lick, although selective winter cutting for sawlogs should be allowed.

Two of the four groups opted to avoid the general area in which the caribou were observed, while a third recommended a moratorium on harvesting the area until a caribou research project was completed. These groups regarded the bog in which the caribou were located as a likely travel corridor which required special protection.

The foresters in each group approached their task is a similar manner. First they identified the diseased stands which they were required to remove. Second they identified the mature and over-mature timber on which they were requested to focus attention. Third they identified sawlog areas. From these, the foresters determined the volumes of wood available and required over the next five years and then calculated an annual cut to meet these needs. The GIS systems were used extensively by the foresters to display specific cover types and calculate volumes of wood available in each group-defined area.

Silvicultural programs varied from intensive site preparation and planting of the softwood areas to an extensive approach of natural regeneration on the hardwood-harvested sites. Silvicultural activities were expected to be completed within two years following harvest.

Only one group completed a calculation of the costs of operation including road construction, harvesting, silviculture, and crown reforestation fees. Their total cost estimate of wood removal, with all moose concerns incorporated, was \$32.87/m^3 these costs were considered within the realm of normal operating costs for forest management in the region.

RESULTS

The proposed cutover plans of the four groups are given in Figures 2-5. Two of the

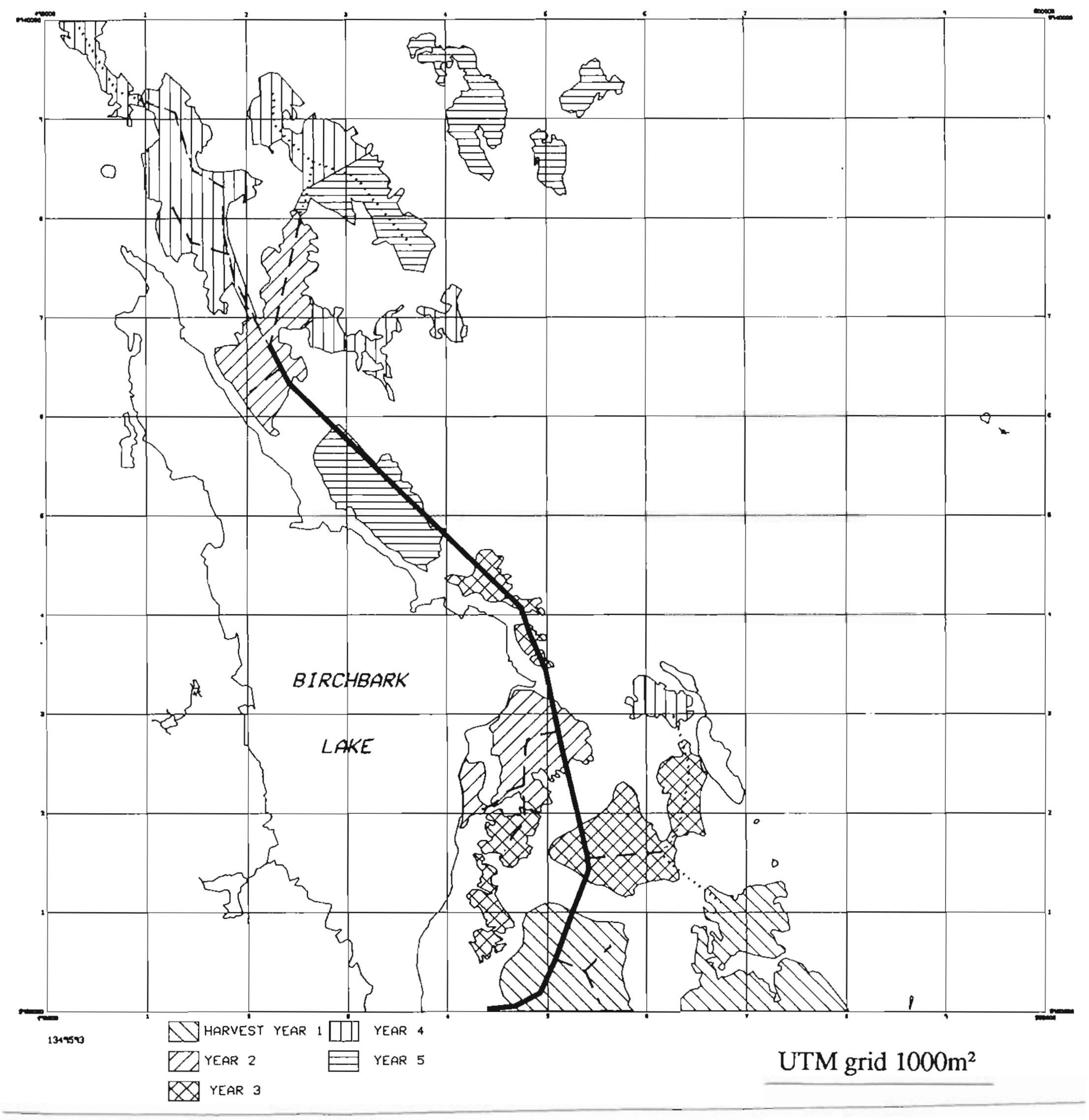

Fig. 2. Cut block design developed by Group One Management Team, 26th N.A. Moose Conference and Workshop.

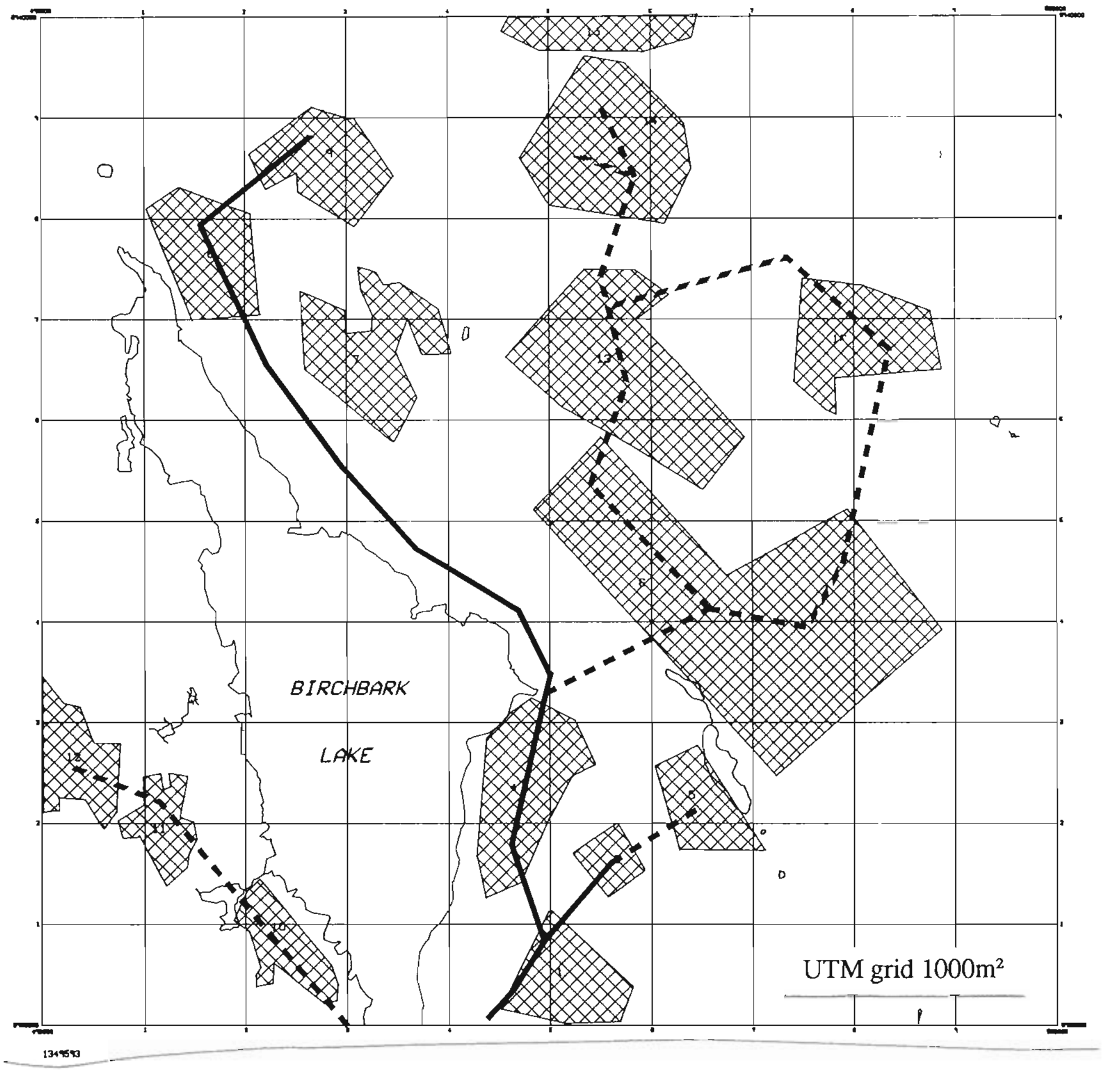

Fig. 3. Cut block design developed by Group Two Management Team, 26th N.A. Moose Conference and Workshop.

four groups (1 & 3) concentrated all harvesting activity along the east side of Birchbark Lake while Groups 2 & 4 tended to proposed harvesting programs which extended into other portions of the map areas. The pre- and post- harvest HSI calculations obtained for each quadrant by Groups 2 & 3 are given in Figure 6.

Group 2 projected a 45% increase in overall habitat suitability following harvest due to increased abundance of food compared to 33% for Group 3. However, both groups cautioned reliance on the models which were based on a different region and which equated all variables ie. no weighting of factors. Thus, moose habitat suitability improved primarily because of the predicted increases in food. In addition, issues respecting the importance of accounting for the spatial relationships between food and cover was also identified as a potential factor which deserves special attention in a more refined model.

Three of the groups tended to view woodland caribou as an important issue and that forest harvesting should avoid the general area of siting until further biological work had been completed, and agreed that this work

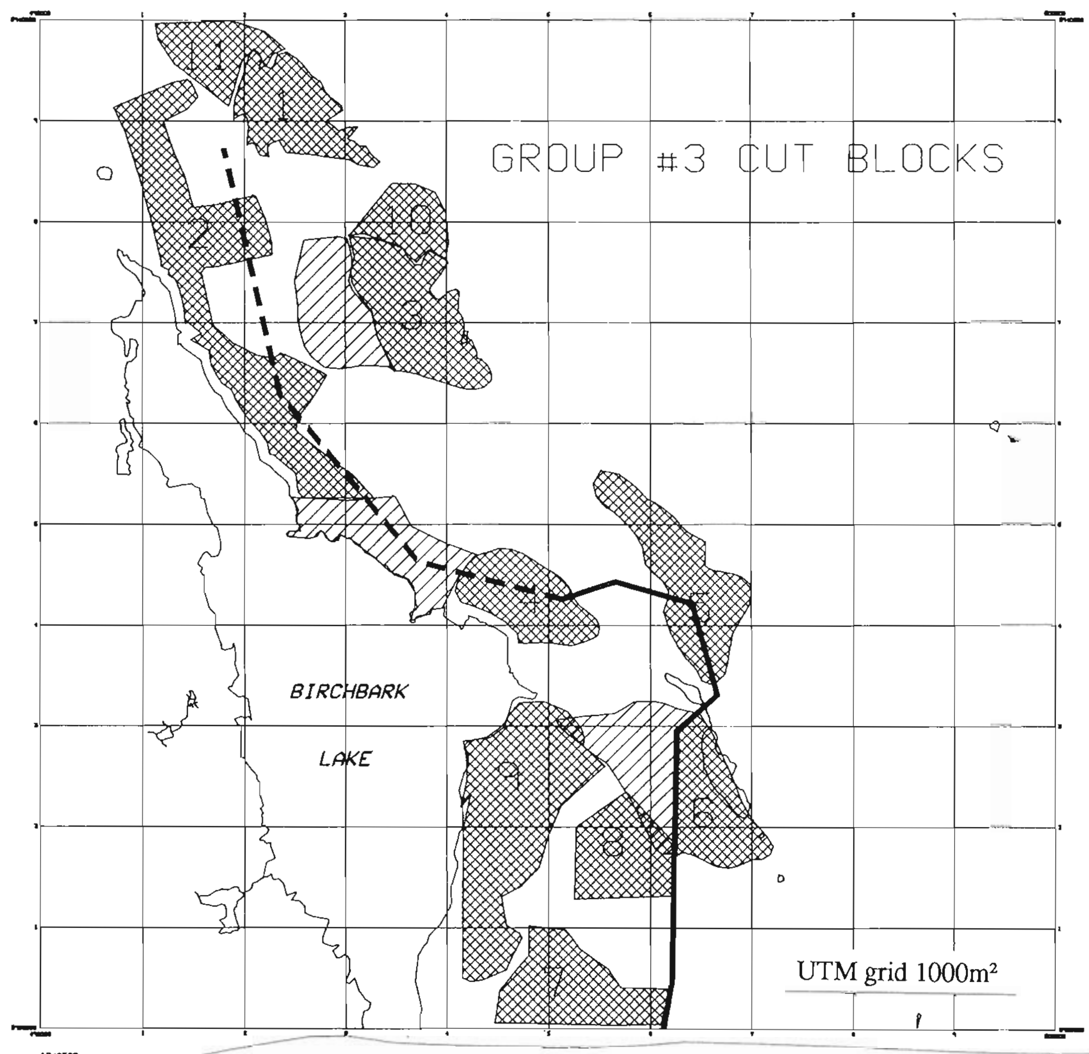

Fig. 4. Cut block design developed by Group Three Management Team, 26th N.A. Moose Conference and Workshop.

should be jointly funded by government and industry. However, one of the groups (Group 2) using the HSI-GIS approach believed that moose and caribou could not both be managed simultaneously within the map area, and that with forest harvesting, moose would be favoured over caribou. This resulted in an allocation of cutting blocks close to where the caribou had been sited.

The important considerations when viewing the proposed harvest operations is the flexibility which exist in cutover designs, and the fact that the presence of GIS systems allowed both foresters and biologists to view forest harvesting and moose management using a common dataset. Thus, GIS became a tool which enhanced the ability of the participants in the exercise to make a decision which was mutually acceptable, and which was based on available data.

Following completion of the exercise, each group had the opportunity to explain their rationale for their approach and cutover design. All conference participants then had the opportunity to express their preference for a cutting plan design. Group four was judged to have the most appealing design based on the delegate response. It is interesting to note

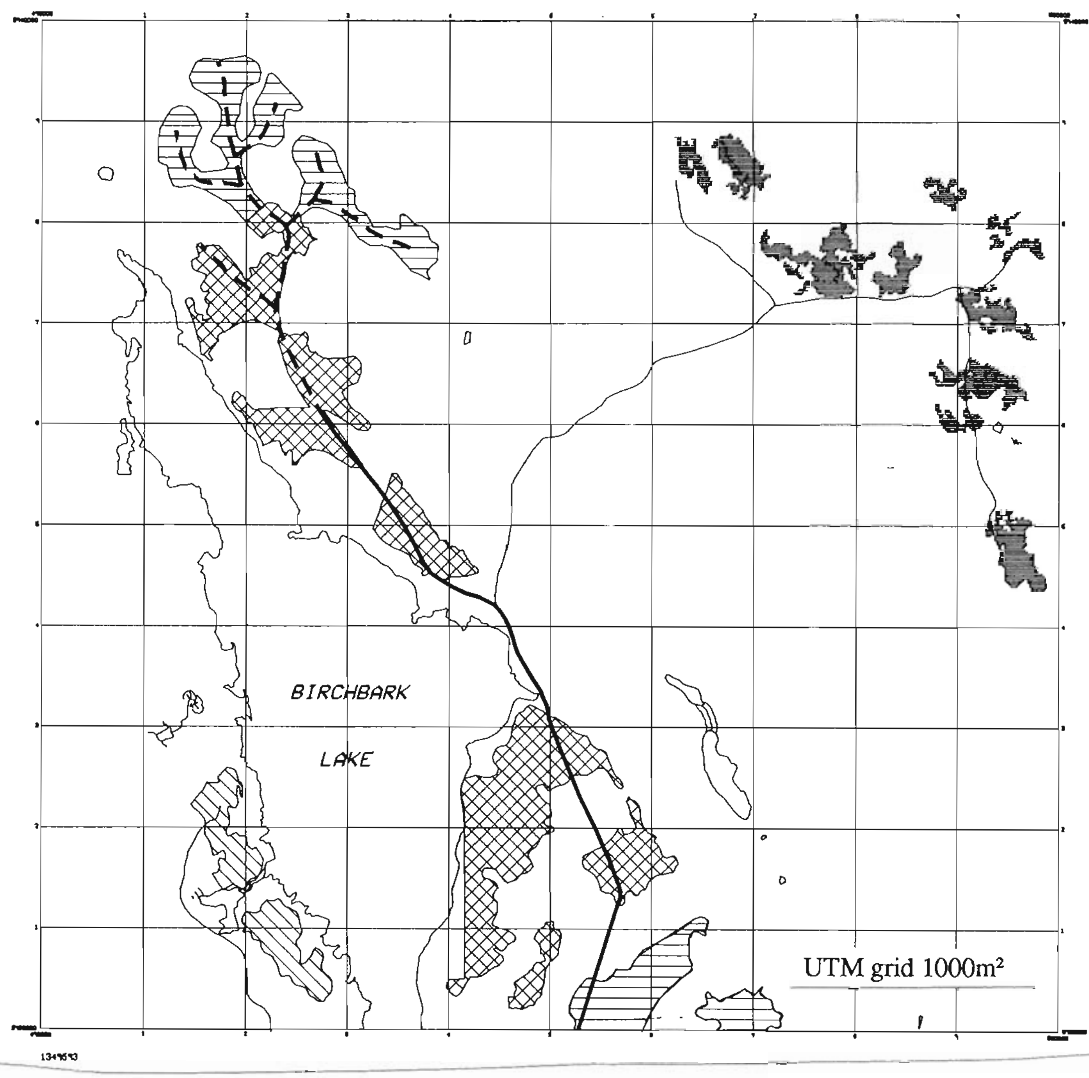

Fig. 5. Cut block design developed by Group Four Management Team, 26th N.A. Moose Conference and Workshop.

that Group 4 biologists and foresters appeared to have trouble in reaching concensus on a final product and were the only group to have a substantial shortfall (30%) in wood harvest. They did however, come to terms with large permanent reserves on the calving areas, full protection for caribou, selective harvesting along lake shores, and winter harvesting of hardwood stands on the southeast side of Birchbark Lake. A forester in the group suggested that too much time was spent negotiating and not enough planning. In response to the shortfall, the group identified alternate cutting blocks in the northeast portion of the map area for which wood volume calculations were not conducted.

DISCUSSION

GIS systems proved to be a valuable tool for integrated planning of forest harvesting operations. The availability of digital forest inventory cover maps combined with understory characteristics of each stand type, provided the baseline information which permitted foresters and biologists to collectively appreciate the project area.

	HSI VALUES			HSI VALUES		
NW	Group 2	Preharvest	0.43	Group 2	Preharvest	0.15
		Postharvest	0.54		Postharvest	0.20
	Group 3	Preharvest	0.42	Group 3	Preharvest	0.14
		Postharvest	0.42		Postharvest	0.15
	HSI VALUES			**HSI VALUES**		
SW	Group 2	Preharvest	0.34	Group 2	Preharvest	0.23
		Postharvest	0.58		Postharvest	0.36
	Group 3	Preharvest	0.23	Group 3	Preharvest	0.25
		Postharvest	0.48		Postharvest	0.31

NE (upper right box); SE (lower right box)

Fig. 6. Pre- and post- harvest moose HSI calculations determined by Groups 2 and 3.

GIS offered some immediate benefits to the planners participating in the exercise:

1. Ability to visually display stand cover and age classes throughout project area.
2. Ability to attach understory attributes to various stand types for evaluation of moose food and cover needs.
3. Ability to spatially display potential wood sources and calculate volumes.
4. Ability to overlay temporal and spatial features of different forest harvesting programs on moose habitats.
5. Ability to interact with digital databases to make management decisions and to evaluate over time the results of different approaches.
6. Recognition that a number of different potential opportunities exist within forest harvest planning exercises to achieve any stated objective.
7. Development of a framework within which both foresters and biologists can jointly develop and agree upon a management plan.

The objective of the workshop was to demonstrate the utility of GIS as a tool to assist foresters and biologists in the integrated management process; this objective was achieved.