The Forestry Working Group
The Grand Council of the Crees (Eeyou Istchee)

The Nemaska Trapline Project

A Preliminary Review of Forest Regeneration on Traplines North of the 50th Parallel

The Nemaska Trapline Project

A Preliminary Review of Forest Regeneration on Traplines North of the 50th Parallel

The Nemaska Trapline Project

A Preliminary Review of Forest Regeneration on Traplines North of the 50th Parallel

INTRODUCTION

Known as Eeyou Istchee or "the people's land" to the Crees who inhabit this region, the forests of the James Bay watershed in northern Quebec have been subject to intensive industrial forestry operations over the last 20 years. Many, including the Crees, are questioning the long-term environmental impacts of these operations. Forestry moves further north each year, while research on forest regeneration lags far behind.

The Grand Council of the Crees (Eeyou Istchee) Forestry Working Group has begun to conduct its own modest research into forest regeneration north of the 50th parallel. Through an initial grant of $5000.00 US from the Patagonia Foundation, $10,000.00 CDN from the Cree community of Nemaska, the generous in-kind labour of a forestry technician from the Cree community of Ouje-Bougoumou and organizational and administrative assistance from the Grand Council, the Forestry Working Group was able to conduct the Nemaska Trapline Project in the fall of 1999.

Through this Project, aerial and ground surveys were conducted in one trapline of the community of Nemaska to assess free-growing forest regeneration in areas logged from 1987 through 1989. As this report details, the resulting data indicate relatively low success of forest regeneration in sampled areas.

Results of the Nemaska Trapline Project, field observations and implications for forestry regeneration north of the 50th parallel are outlined below. It is hoped that this preliminary survey will spark further research and discussion of the long-term and potentially irreversible environmental impacts of forestry in Canada's north.

BACKGROUND

The people who comprise the Cree Nation of Eeyou Istchee have inhabited the eastern region of James Bay for the past 1000 years, thriving as a nomadic hunting, fishing and gathering society. The Crees of Eeyou Istchee ranged over an area from approximately the 79^{th} meridian in the west to the 70^{th} meridian in the east, and from the 48^{th} parallel in the south to just north of the 56^{th} parallel.

Three centuries ago, coinciding with the arrival of European settlers, the Crees became active participants in the fur trade. Several trading posts were established throughout the Cree territory. Over time, many of these posts developed into permanent Cree communities. For example, Fort Rupert has become Waskaganish, Fort George has become Chisasibi and Poste-de-la-Baline has become Whapmagoostui or Great Whale. Nearly all of the nine existing Cree communities developed from, or in proximity to, former fur trading posts.

In 1975, the Crees' presence in this region was formally recognized through the *James Bay and Northern Quebec Agreement* (*JBNQA*). Arising out of pressure to develop the region's rich natural resources, the Crees and Inuit further north entered into the *JBNQA* with the province of Quebec and the federal government of Canada. Key among many provisions, this Treaty established a land and environmental regime that recognizes the Crees' continued right to the territory through a traditional subsistence economy and other types of future economic development. As part of this land regime, the *Agreement* established an environmental protection regime that was to safeguard the resources necessary for a viable subsistence economy.

Today, despite the pressures of the modern world, over a third of the 12,000 Crees of Eeyou Istchee continue to pursue hunting, fishing and gathering as a way of life. Crees still identify themselves as a hunting society, and the skills required to live from the land are now part of the regular school curriculum. Indeed, Cree hunters comprise one of the largest practicing subsistence cultures in the world.

Cree Trapline System of Land Management

Evolving from a nomadic hunting and gathering culture over the last 1000 years, the Crees have developed and refined a unique system of land and resource management. According to elders, Crees traditionally organized their hunting activities on the land along family and kinship lines. Each family or group returns to the same hunting or fishing grounds year after year. This does not exclude other families from using these areas; however, it means that permission is required from the "ouchimaw" or tallyman for access to the territory. It is the tallyman's responsibility to ensure that the family hunting territory, or trapline, has enough fish and game to support the group. In modern terms, the tallyman is the equivalent of a resource manager or game warden, determining where and when hunting can occur and who can harvest how much. Despite numerous changes over the past millennium, including the development of permanent communities, the family hunting territory or trapline system, with its associated customs of use and the land and resource management function of the tallyman, remains in place today and has become a cornerstone of Cree culture.

FORESTRY IN EEYOU ISTCHEE

According to Cree elders, forestry companies began cutting in their traditional territory in the early 1960s. In these years, forestry operations were mainly conducted during the winter months when horse teams hauled the wood out to the road or rail for shipping. Although the chainsaw had replaced the axe and crosscut saw, logging was still labour intensive, as crews of men were needed to cut, delimb, and load the logs on sleighs and then trucks and trains. At that time, the Crees served as a readily available labour source, and many Cree men camped with their families near the operations during logging season. Then, using the money from logging, they would buy provisions and head out to their hunting territories for the remainder of the year.

The Crees maintained this mutually beneficial relationship with forestry until the early 1970s. As tractors and skidders replaced the horse teams, and feller-bunchers supplanted chainsaws, the nature of work in the forestry industry changed. Cree men were no longer needed in the face of mechanization, and for the most part the benefits that Crees derived from forestry ended.

By the mid-1970s, mechanization had become the norm rather than the exception in Eeyou Istchee. As skidders and feller-bunchers churned out more and more wood at the roadside, the capacity of pulp and sawmills in the region increased with similar efficiency. Intrusive road networks and year-round logging operations were quick to follow. By the early 1980s, Cree traplines in the southern part of Eeyou Istchee (49^{th} parallel) near the community of Waswanipi were transformed by extensive clear-cutting and road building.

From the mid-1980s to the present, the forestry industry continued its growth in Eeyou Istchee. More traplines were affected by logging activities each year. During this period, the amount of land cleared annually increased from approximately 400 km^2 in 1985 to over 800 km^2 in 1998. Presently over 90 Cree traplines from 5 different communities have suffered some forestry-related disturbance.

THE TRAPLINES OF NEMASKA

Nemaska, the subject of this study, is located just south of the 52^{nd} parallel. Only two of Nemaska's 15 traplines have yet been affected by forestry activities. Both lie south of the community, half way between the 50^{th} and 51^{st} parallels. The affected traplines, N-20 and N-21, are located approximately 140 km north of Domtar's mill in Matagami and are intersected by the region's only highway (see Maps 1 and 2, pages 20 and 21). They have been logged on an increasing scale since 1987.

The tallyman of N-20 is Abel Jolly, who participated in the Nemaska Trapline Project. The tallyman of trapline N-21 is Lawrence Neeposh. Both N-20 and N-21 are inhabited full-time by trappers and their families, who subsist off moose, beaver, rabbits and other small game, and a variety of fish and birds. They also rely on forest vegetation, such as blueberries, for food and medicines. During the winter, they sell small game pelts to help purchase equipment and food staples.

Of the two affected Nemaska traplines, N-20 became the focus of this Project for several reasons. Not only is N-20 one of the most northern traplines to experience the effects of industrial forestry operations, but logging has occurred on this trapline for over 10 years. Hence N-20 offers a suitable time frame for an examination of the rate of regeneration in an area north of the 50th parallel. Trapline N-21, while located north of N-20, has been undergoing intensive logging only since 1995—an insufficient time frame for conclusive analysis of regeneration.

Also of interest, most of the forestry operations in trapline N-20 have been confined to the winter months, using temporary snow roads and bridges. The Forestry Working Group is interested in the environmental impacts of these temporary operations long after they were decommissioned.

Excerpts From an Interview with Abel Jolly—Tallyman of Hunting Territory N-20
September 22, 1999

…After being involved in the regeneration survey and seeing the adverse effects from forestry activities, I really don't know what will happen to my land. I was pleased to be able to participate in the survey and appreciate that people recognize my role and authority as "ouchimaw" of N-20. It was good to be able to fly over my territory in the helicopter, but I am very surprised how much wood can be cut down in such a short time. My impression is when the trees regenerate they will eventually be cut again.

I have eight sons and three daughters and 16 grandchildren who will look after the hunting territory when I retire and I hope they will continue to carry our traditions as I do. I find strength on the trapline and I just can't quit—the land has always sustained me and my family in so many ways. Although I cannot hunt as I used to, the hunt is getting so scarce. What will be left for the next generations? The animals that I harvest are getting hard to find. The trails that I use for travelling are lost and it can be difficult to find your way. Even the drinking water in our area is sometimes unfit to drink due to turbidity. Before it was easy to find good drinking water; now it is difficult.

Any developments that will have an impact on our traplines should look at ways to support trappers financially because they depend on the traplines for their survival. I have never agreed to logging . . . .

ECOZONE/ECOREGION

According to Environment Canada's ecological classification (96), Nemaska's trapline N-20 is located within the Abitibi Plains Ecoregion in Canada's Boreal Shield Ecozone (see Figure 1, below).

A humid mid-boreal climate characterizes the Abitibi Plains Ecoregion, with warm summers and cold snowy winters. The mean annual temperature is 1^{o}C, with an average summer temperature of 14^{o}C and an average winter temperature of –12^{o}C. Mean annual precipitation is between 725 and 900 mm.

Geologically, Archean granitic intrusives and volcanic rocks underlay the fine-textured lacustrine deposits of the Abitibi Plains. Elevation is highest in the south and west where bedrock outcrops and organic deposits are intermixed with level to undulating lacustrine deposits. As elevation decreases towards the northern portion of the ecoregion, the occurrence of organic soils increases, as does the occurrence of domed, flat and basin bogs. Mesisols and fibrisols characterize level, poorly drained areas within the Abitbi Plains, and humo-ferric podzols occur on sandy deposits in the south.

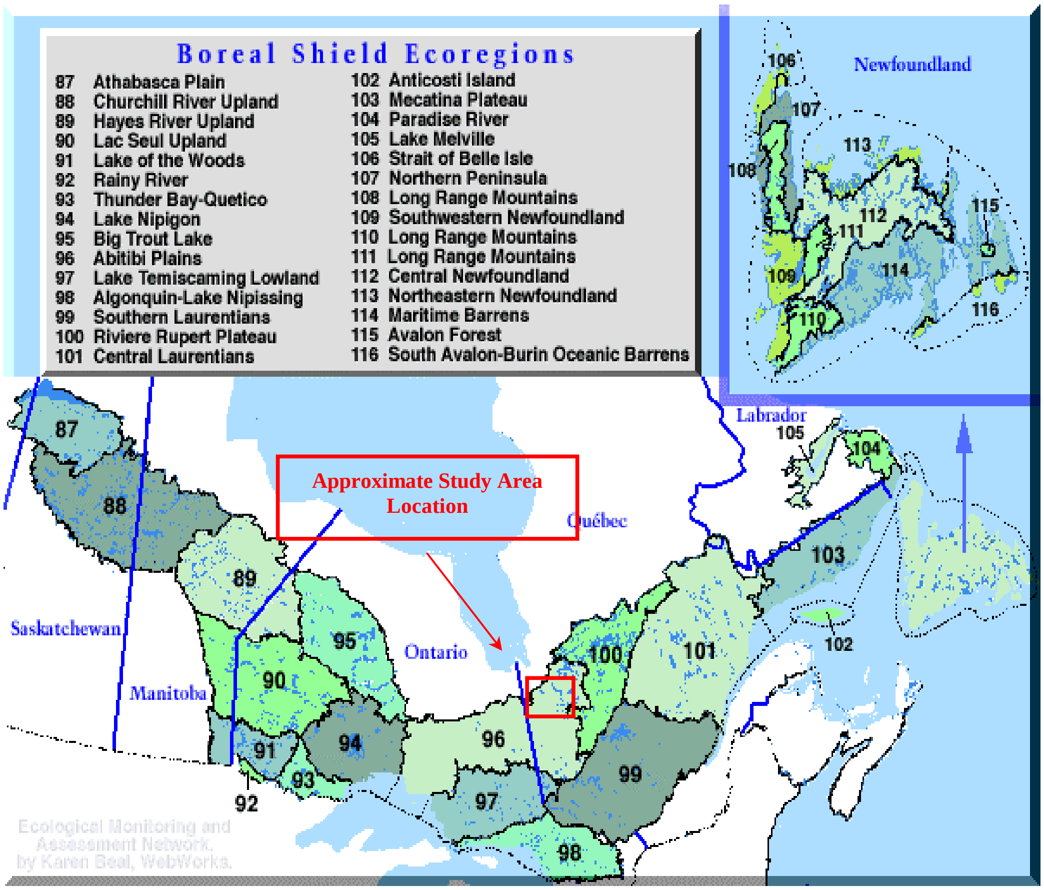


FIGURE 1: LOCATION OF THE ABITIBI PLAINS ECOREGION WITHIN THE BOREAL SHIELD ECOZONE. (Source*: A National Ecological Framework for Canada*, Environment Canada)

Forest stands within the Abitibi Plains Ecoregion are predominantly composed of white spruce (*Picea glauca*), balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). Pure stands of jack pine (*Pinus banksiana*), or associations of jack pine, paper birch and trembling aspen, are generally found on drier sites. Stands of black spruce (*Picea mariana*) and balsam fir characterize wetter sites such as the study area. Understory vegetation is typically moss, although lichen is also found in cold, wet sites.

Characteristic wildlife species within the ecoregion include moose, black bear, lynx, snowshoe hare, caribou, wolf and coyote. Sharp-tailed grouse, American black duck, wood duck, hooded merganser and the pileated woodpecker are the prevalent bird species.

THE SURVEY

The survey was conducted from September 21-23, 1999. The survey team consisted of Abel Jolly, the tallyman of trapline N-20, Matthew Tanoush, the Local Environmental Officer for Nemaska, Roger Lacroix, a forestry technician from the Cree community of Ouje-Bougoumou, and Geoff Quaile, an environmental analyst with the Grand Council of the Crees. For help with the survey methodology and related mapping, the services of Arbex Forest Resource Consultants Ltd. were engaged. Eric Thompson, a registered forester, served as on-site technical advisor. A helicopter and pilot from Heli-Wask were hired for the duration of the survey to provide access to winter-logged areas.

METHODOLOGY

Free-growing regeneration surveys were conducted throughout Trapline N-20 to determine stocking levels (trees/ha) and free-to-grow (FTG) status of crop trees in cut blocks logged from 1987 through 1989.

An aerial survey by helicopter was first undertaken to direct sampling to cut blocks in which regeneration success was inconclusive. From the air, the single 1990 cut block in the study area appeared to have a satisfactory regeneration success rate, and therefore was not sampled (see Figure 2, below). Cut blocks from later years were not surveyed, as insufficient time has passed since harvesting to assess regeneration under the regeneration methodology.

FIGURE 2: AERIAL VIEW OF REGENERATION THE 1990 CUT BLOCK

Map 3 (see page 22) provides a large-scale view of the southeast and southwest cut blocks of trapline N-20, indicating the year of cut block harvest and the number of each sampled cut block.

In total, 205 fixed 2.26 metre radius plots ($16m^2$) were sampled in 11 cut blocks harvested from 1987-1989 (see Table 1, below). The total area represented by sample plots was 1840 ha, 48% of the total sample cut block area of 3819.5 ha. The 1987 cut blocks were the most heavily sampled at 66%. Fifty-four per cent (54%) of the 1988 blocks and 24% of the 1989 blocks were represented by sample plots.

Harvest	Block ID	Area (ha)	No. Plots
1987	8901 8904 8907 8909 8910	101.7 263.0 263.0 339.4 90.9	16 25 12 13 22
1988	9201 9202 9203 9208	194.9 185.0 121.2 50.5	34 19 19 8
1989	9500 9513	24.9 205.5	19 18
	Total	1840.0	205

TABLE 1: SUMMARY OF SAMPLED CUT BLOCKS

Methods for conducting the survey conformed to the Ontario Ministry of Natural Resources (OMNR) *Free-Growing Regeneration Assessment Manual for Ontario*. The intentions of the OMNR's regeneration assessment are:

- To determine the relative success of regeneration on any site;
- To provide resource managers with information to predict future stand development;
- To determine the need for future treatments on regenerated areas; and
- To relate regeneration success of different treatments for various species and sites.

Crop trees assessed in this survey included black spruce (*Picea mariana)*, balsam fir (*Abies balsamea),* trembling aspen (*Populus tremuloides),* jack pine (*Pinus banksiana)* and white birch (*Betula papyrifera).* Acceptable minimum heights for crop trees were 80 cm for *Picea* spp., 100 cm for other conifers, and 200 cm for hardwoods.

Stocking levels for sampled stands were classified according to OMNR guidelines as presented in Table 2, below.

TABLE 2: OMNR STOCKING CATEGORIES

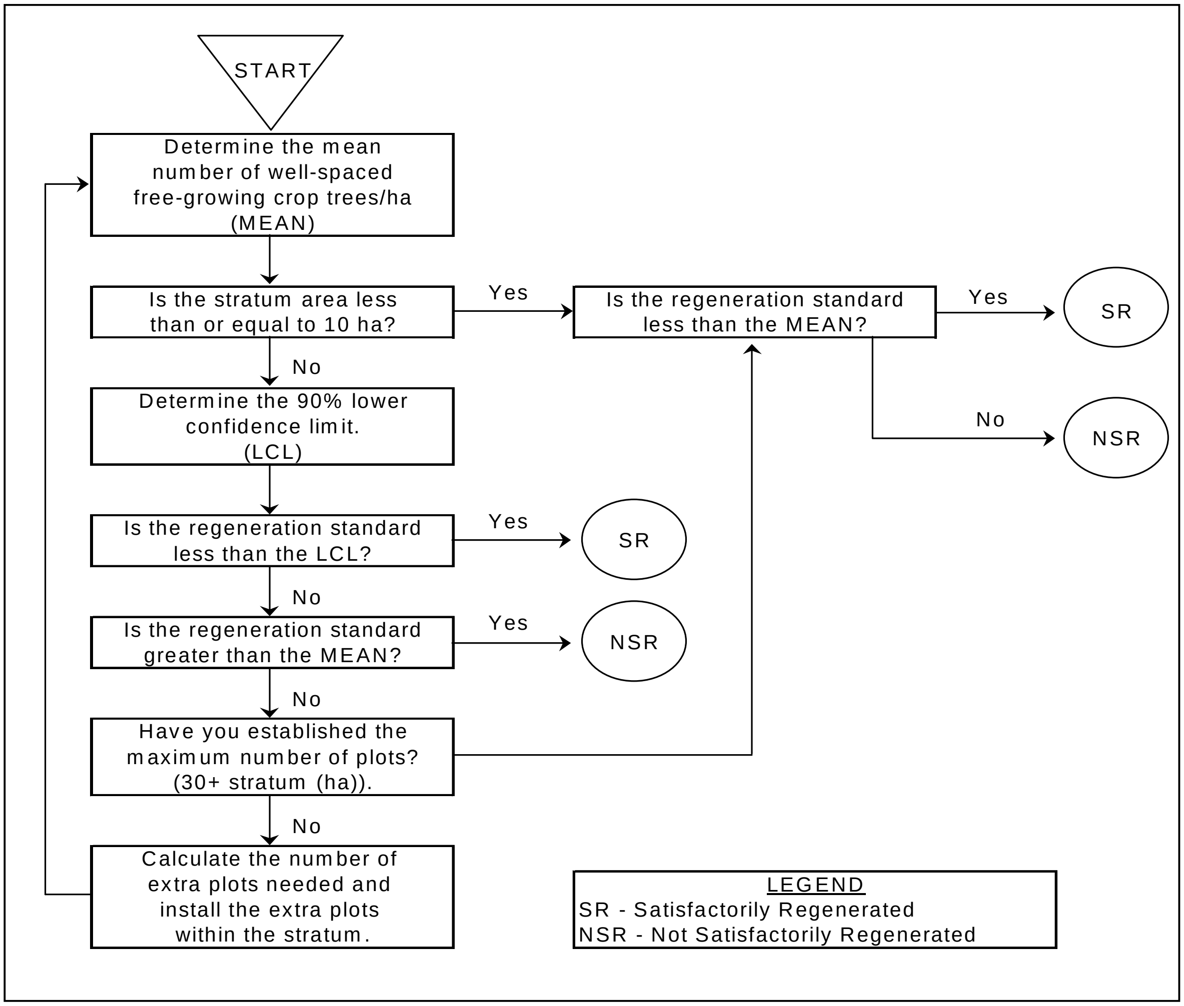
Stocking Category	Stems/ha
Very Low	<1,000
Low	1,001- 4,000
Medium	4,001 – 10,000
High	10,001 – 20,000
Very High	>20,001

According to OMNR guidelines, a regeneration standard of 900-1100 (mean=1000) well-spaced, free-to-grow (FTG) stems per hectare is satisfactory to ensure full occupancy of a future stand.

Regeneration status of sampled cut blocks in the study area was determined according to OMNR's guidelines (see Figure 3, below), through determination of the lower confidence limit (LCL) of the mean number of FTG stems/ha, and comparison with the mean regeneration standard of 1000 stems per hectare. Statistics required in the calculation of the LCL included the standard deviation (SD), the standard error (SE), and the confidence interval (CI) of the mean number of FTG stems/ha determined from the sample.

The results of this survey method are statistically defendable, and form the standard for auditing purposes in Ontario.

FIGURE 3: FLOW CHART FOR DETERMINING THE REGENERATION STATUS OF A SURVEYED AREA (SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES 1997)



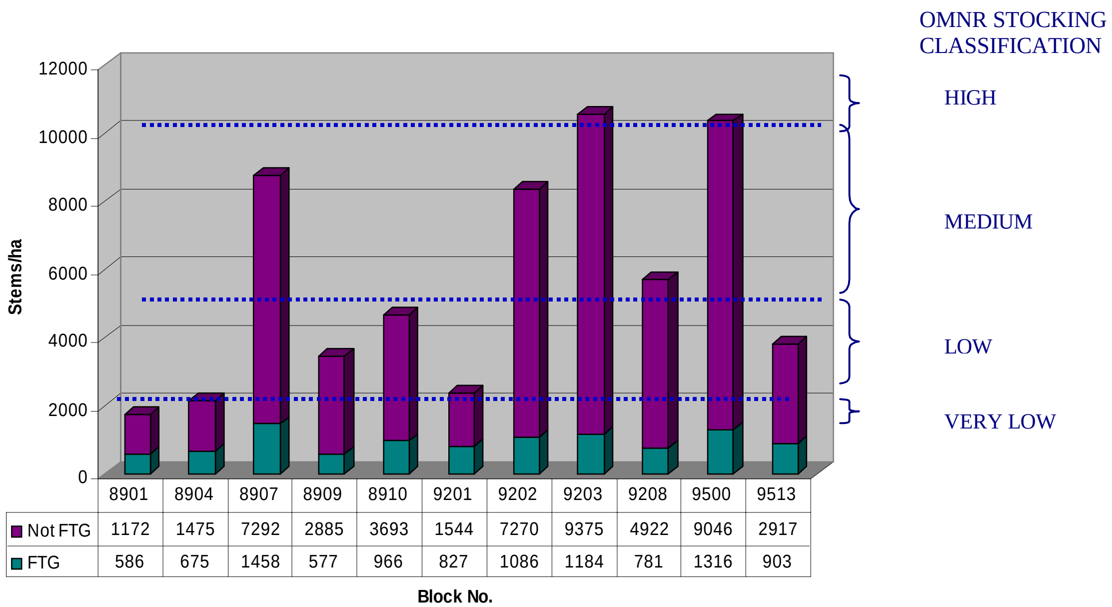
RESULTS

Stocking levels of sampled cut blocks and the number of free-to-grow stems per hectare are presented in Table 3 and Figure 4, below. Five of the sampled cut blocks maintain low stocking levels, four blocks have medium stocking, and two have high stocking levels.

TABLE 3: STOCKING AND FTG STEMS PER HECTARE IN SAMPLED CUT BLOCKS

Harvest	Block ID	Stocking (stems/ha)	OMNR Classification	Free-to-grow stems/ha	% FTG stem/ha
1987	8901	1,757.8	Low	585.9	33.3
	8904	2,150.0	Low	675.0	31.4
	8907	8,750.0	Medium	1458.3	16.7
	8909	3,461.5	Low	576.9	16.7
	8910	4,659.1	Medium	965.9	20.7
1988	9201	2,371.3	Low	827.2	34.9
	9202	8,355.3	Medium	1085.5	13.0
	9203	10,559.2	High	1184.2	11.2
	9208	5,703.1	Medium	781.3	13.7
1989	9500	10,361.8	High	1315.8	12.7
	9513	3,819.4	Low	902.8	23.6

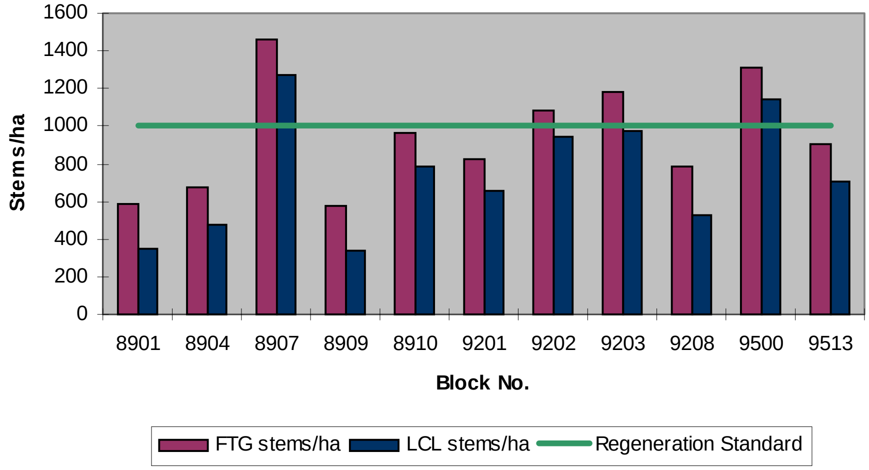
FIGURE 4:STOCKING AND FTG STEMS PER HECTARE IN SAMPLED CUT BLOCKS



Map 4 (see page 23) shows stocking levels for the sampled cut blocks in the study area.

As noted, OMNR guidelines set a mean regeneration standard of 1,000 well-spaced, free-to-grow trees per hectare to ensure full occupancy of a future stand. Figure 5, below, compares the mean FTG stems/ha and the estimated LCL determined for each sampled cut block, and permits evaluation of how sampled stands compare to the regeneration standard.

FIGURE 5:COMPARISON OF MEAN FTG STEMS/HA AND LCL TO DETERMINE REGENERATION STATUS



Where both FTG and LCL stems/ha fall below the regeneration standard, the cut block is considered to be not satisfactorily regenerated (NSR). Conversely, where both FTG and LCL stems/ha are above 1000, the block is considered to be satisfactorily regenerated (SR).

For instances where the number of FTG stems/ha is greater than 1000, but the LCL is below the regeneration standard, the OMNR guidelines suggest that additional plots be sampled to provide an accurate assessment. Cut blocks 9202 and 9203 fall into this category. However, the available sample data suggests that these stands may be approaching SR status.

Table 4 (below) and Map 5 (page 24), indicate the regeneration status of each of the sampled cut blocks in the study area.

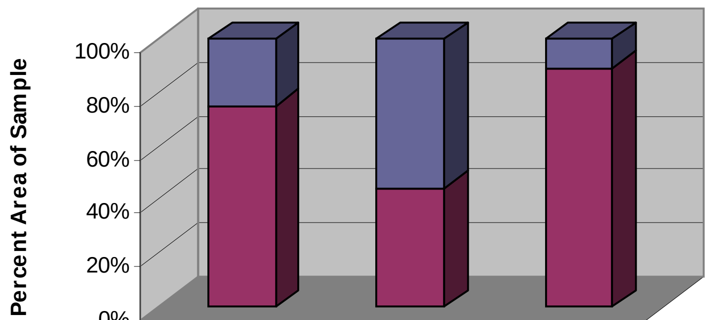
TABLE 4: REGENERATION STATUS OF SAMPLED CUT BLOCKS

Harvest	Block ID	Regeneration Status
1987	8901	NSR
	8904	NSR
	8907	SR
	8909	NSR
	8910	NSR
1988	9201	NSR
	9202	More plots required
	9203	More plots required
	9208	NSR
1989	9500	SR
	9513	NSR

When projected on the population, the findings indicate that significant areas of the 1987 and 1989 cut blocks—75% and 89%, respectively—are not satisfactorily regenerated (see

Figure 6, below). Results are inconclusive for the 1988 cut blocks, as more samples are required to confirm the regeneration status of cut blocks 9202 and 9203. However, samples taken in the remainder of the 1988 blocks (9201 and 9208) are adequate to determine their NSR status, indicating that a minimum of 44.5% of the sampled 1988 cut blocks is not satisfactorily regenerated.

FIGURE 6: REGENERATION STATUS OF SAMPLED CUT BLOCKS BY HARVEST YEAR



	1987	1988	1989
SR	263	306.2	24.9
NSR	795	245.4	205.5

Cut Block Harvest Year

ALDER GROWTH

As the survey data indicate, 4 out of the 5 1987 cut blocks sampled produced an NSR rating. Here, unsatisfactory regeneration is linked to the dense layer of alder (*alnus)* species that has grown since the blocks were harvested (see Figures 7 and 8, below).

According to the Ontario Ministry of Natural Resources “many studies have indicated that stem diameter and biomass growth are more sensitive to different levels of competing vegetation than height growth. Height growth is among the highest priorities for resource allocation in young trees and therefore is the least sensitive growth variable to high levels of competing vegetation. When height growth is reduced, survival is threatened.” (OMNR 1993) In the survey site, heavy competition from alder species appears to have resulted in unsatisfactory regeneration of the conifer species in most of the 1987 cut blocks.

Studies by the OMNR indicate that large stands of speckled alder commonly form after spruce or fir are logged in wet areas, as clearcutting in lowlands is often followed by “watering-up” of the site. This is particularly true when cutting in swamps or treed fens, where the existing forest functions to keep the water table low through evapotranspiration. Removal of the overstory may promote alder growth, not only through increased light but also by raising the water table, especially in clay soils (OMNR 1991).

FIGURES 7 AND 8: EXAMPLES OF ALDER GROWTH DOMINATING THE 1987 CUT BLOCKS

Competition from speckled alder is often detrimental to conifer growth, as shading prevents or retards successful regeneration. As well, mechanical damage to conifer stems may result when heavy snow causes alder branches to bend onto the conifer crop trees.

Excessive competition from alder generally occurs on fresh and moist sites. In the absence of a chemical control program, or alternative regeneration strategies, stocking levels within the developing stands will remain highly variable and rotation periods for the developing stands will be extended. From a management standpoint, problems created by alder growth indicate the need for site-specific inspections of soil and moisture content to determine suitable harvesting strategies. In alder prone sites, clearcutting may not be a suitable option.

FOREST MANAGEMENT OBSERVATIONS

Aerial and field surveys undertaken during the Nemaska Trapline Project provided opportunities to assess, in the most general sense, the sustainability of forest management activities occurring on Cree traditional territory. These observations are at best cursory. Concerns regarding management practices, noted below, should be confirmed through further field assessment by professional foresters and/or biologists, as appropriate.

In compliance with Quebec regulations, it appears that 20-metre buffers/leave strips had been established around riparian areas (see Figure 9, below). However, winter road crossings were not cleared in all cases and, as a result, flooding has occurred in these areas (see Figure 10, below). It is possible that the logs used in the road alignment during winter harvest operations were covered in snow, and therefore missed during clean-up operations. Measures should be taken to restore these sites as soon as possible.

FIGURE 9 (left): RIPARIAN BUFFER BETWEEN CUT BLOCKS 8905 & 8909

FIGURE 10: FLOODING DUE TO IMPROPER CLEAN UP OF WINTER ROAD CROSSING IN BLOCK 9504

Another concern is cut block drainage and the associated siltation of nearby watercourses. As indicated in Figures 11 and 12, below, water draining off an adjacent road and cut block carries silt directly into a nearby stream which holds fish stocks harvested by trappers. The effect of the silt on fish stocks and water quality remains to be investigated; however, Abel Jolly comments on the general decline of water quality in the area (see box, page 4).

A final observation concerns the impact of heavy equipment on the forest floor. Even though most of the logging within the study area occurred during the winter months, it is evident by the preponderance of ruts left on the cut blocks that the equipment used to harvest this low lying area is not suitable for the soil texture and moisture content found in this region. The rutting, and its associated soil compaction and ponding, appears to impede future growth on these sites. Given that rutting was apparent on all but the driest sections (usually hillsides) of cut blocks, the potential for impeded growth is substantial (see Figure 13 and 14, below).

FIGURES 11 & 12: EROSION FROM ROAD AND CUT BLOCKS FLOWING INTO A NEARBY CREEK

FIGURE 13 ABOVE: AERIAL VIEW OF RUTS OF RECENT CLEAR-CUT NEARBY STUDY AREA
FIGURE 14 OPPOSITE: RUTS REMAINING ON CUT BLOCK WITHIN STUDY AREA

CONCLUSION

As indicated by the title of this report, the Nemaska Trapline Project was designed as a preliminary investigation of forestry operations north of the 50th parallel, in particular, the progress of natural forest regeneration. Since logging at this latitude is a recent phenomenon, corresponding research related to regeneration is scarce. For this reason, our findings should be viewed more as directional "sign posts" than broad conclusions for the state of regeneration north of the 50th. Bearing this in mind, there remain a number of conclusions to be drawn from our work.

As Figure 5 indicates, 7 out of the 11 cut blocks sampled in Trapline N-20 were determined to be not satisfactorily regenerated according to the regeneration standards set by the Ontario Ministry of Natural Resources. Of the remaining 4 cut blocks, 2 required additional survey plots and 2 were rated satisfactorily regenerated. Based on these results it appears that 10-12 years after harvest, several of the sampled cut blocks are not on schedule for regeneration to a healthy forest.

Given the random nature of this survey, it is tempting to conclude that the findings are indicative of regeneration success throughout the study area and local region. However, caution must be applied. Sample plots in this survey represented slightly less than half of the total cut block area. The percentage of area sampled ranged from a high of 66% for 1987 cut blocks to a low of 24% for 1989 cut blocks. More samples are required from the 1989 cut blocks before firm conclusions can be drawn. Moreover, the sole 1990 cut block within the study area was judged to be satisfactorily regenerated based on aerial reconnaissance alone.

Nevertheless, the survey does point to some serious concerns. First and foremost is the excessive alder growth that dominated the 1987 surveyed blocks. As discussed, the dominance of alder in these areas may lead to variable rates of regeneration on these blocks. Since research suggests that invasive alder growth seems to be related to soil and moisture content of the cut block, greater care should be applied in determining if local sites are suitable for large-scale (+ 75 ha) clear-cutting.

With respect to field observations of forest management practices a number of issues stood out. Starting with the positive, it appears that great care has been taken in preserving the prescribed buffers (20 m) around riparian areas. Conclusions were mixed on winter road crossings over watercourses as some appear to have had all bridging material (logs and debris) removed in the post season, however in other cases these materials were plowed into the watercourse. Similarly, we noted in some cases, examples of poorly planned drainage of cut blocks. This has led to erosion and siltation of nearby watercourses. Greater care must be applied in planning cut blocks with more intensive use of settling ponds and other flow control measures.

Part of the reason for widespread erosion can be attributed to the extensive rutting that has occurred on most the cut blocks observed. Despite a predominance of winter operations, it is evident that the machinery used in this area is not suitable to the moist soil conditions. The impacts of ruts were observed in the oldest (1987) cut blocks. It appears that rutting is not a concern to local forest managers as similar rutting damage was observed in more recent cut blocks outside of the study area. Cumulatively, the impact caused by this rutting will impede the regeneration over hundreds of hectares. Machinery with wide low pressure "balloon" tires should be used in this area, even during the winter.

The overall less than satisfactory progress of regeneration found in this study demonstrates the need for intensive review of the impacts that present forestry activities will have on boreal forest ecosystems at these latitudes. The results of this preliminary study indicate that in this region, the future forest will be something less than what was present prior to logging operations. The implications of these potentially altered ecosystems needs to be considered with respect to habitat and the long-term viability of fish and game populations.

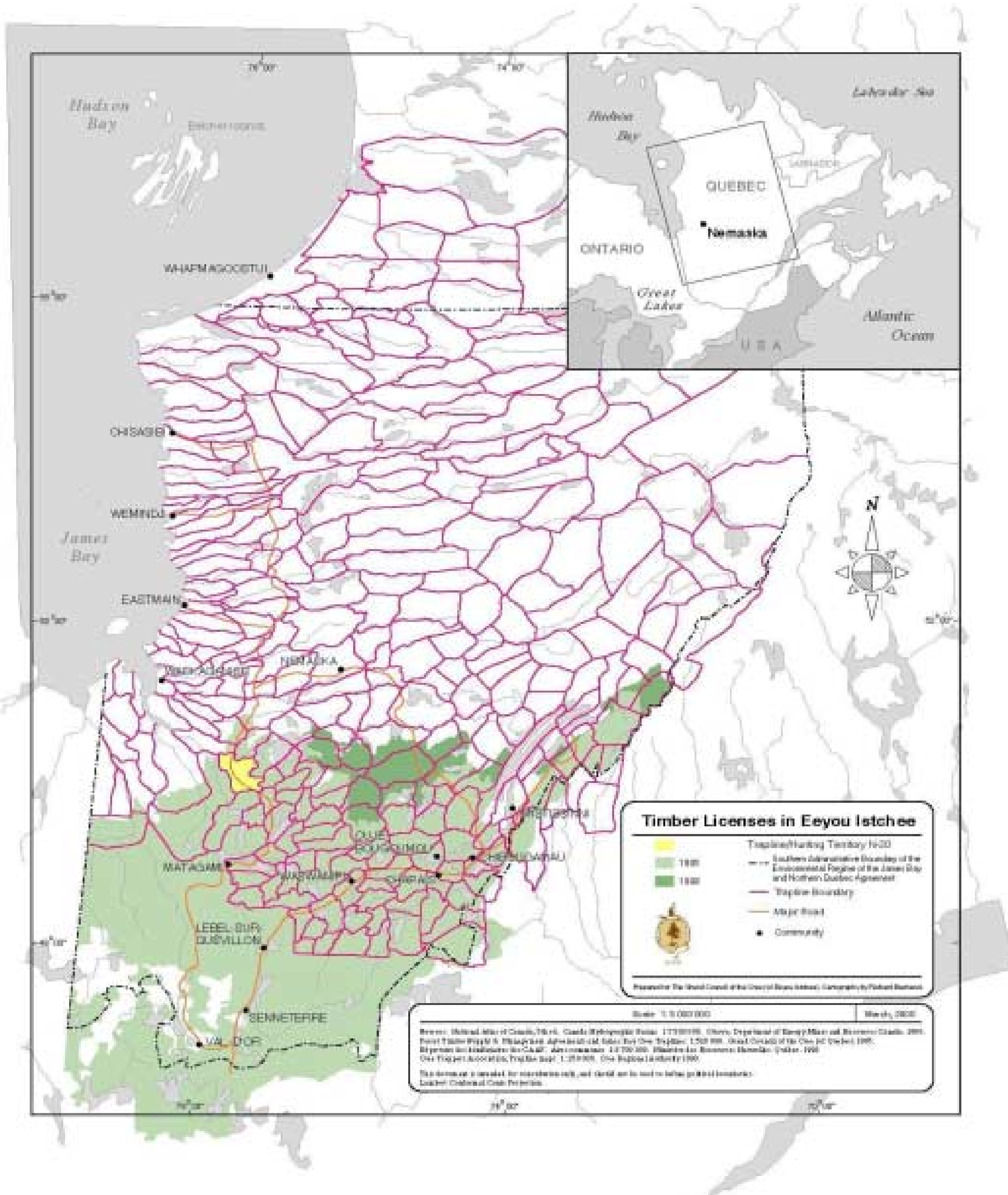
The viability of fish and game are of particular concern for the Cree ouchimaw or tallymen who continue to subsist primarily from these resources. It is clear that activities in and around this study area have already had an impact on the availability of game species as was pointed out by Abel Jolly, the tallyman for N-20 and participant in this study. Through direct observation, he has already found problems with water quality and a scarcity of animals to hunt.

It is unfortunate that there is no formal scientific vehicle for Abel Jolly's observations on how forestry operations are changing the local environment. His direct experience along with the experience of many other Cree hunters in the region could serve as an important source of information to assist in determining the long-term implications of industrial logging in the northern boreal forest. Given that Cree hunters spend a great deal of time in the boreal forests year after year, they are uniquely placed to provide ongoing monitoring and could even assist foresters and biologists in prescribing appropriate local harvesting methods to ensure that critical habitat remains and a healthy forest is able to renew itself in a timely fashion.

In the absence of institutional study utilizing the direct knowledge of the Cree hunters, the Grand Council of the Crees and the local Cree communities will continue, with the guidance of the local hunters, to investigate the impacts of large scale industrial forestry on Cree traplines.

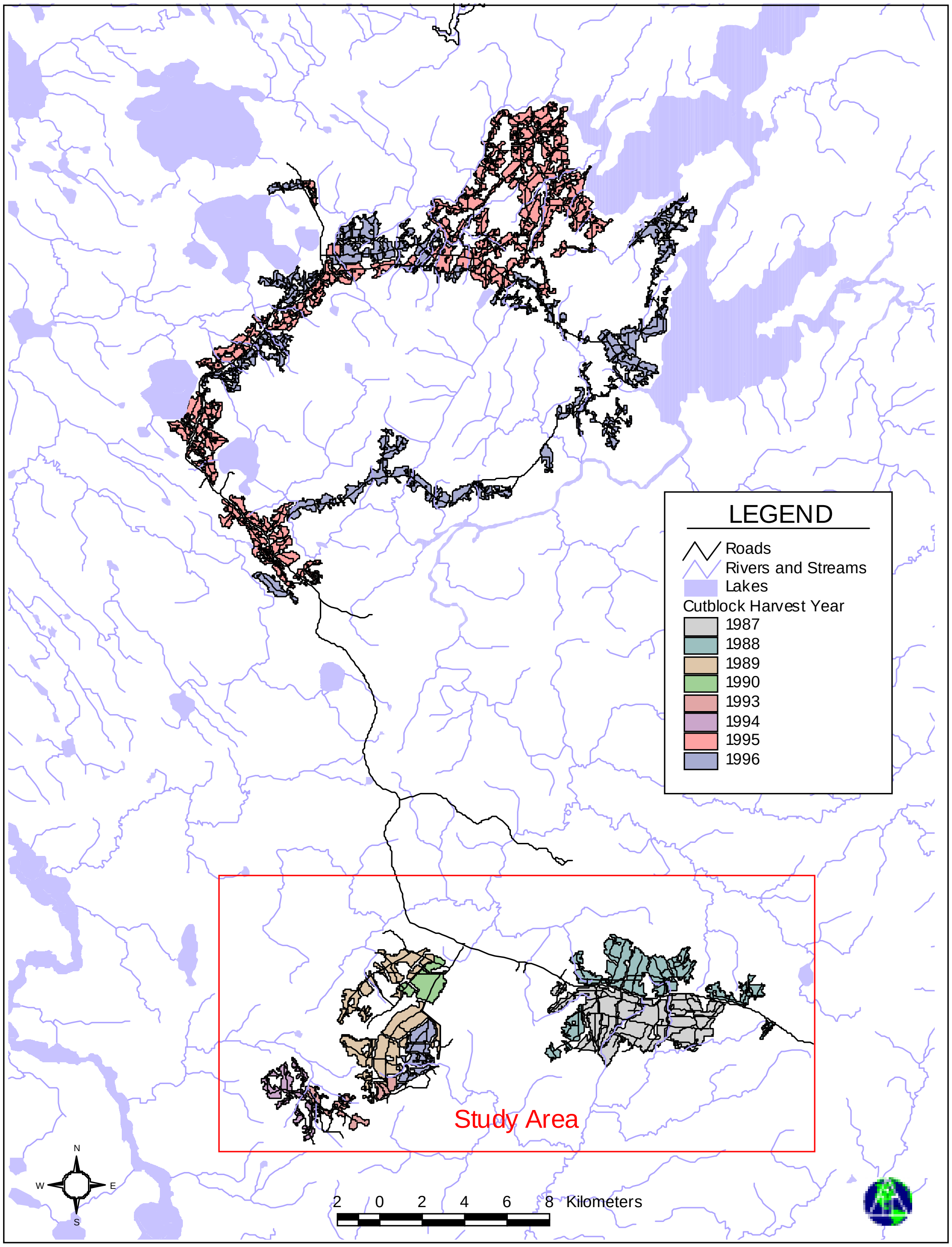
MAPS

MAP 1: REGIONAL LOCATOR MAP



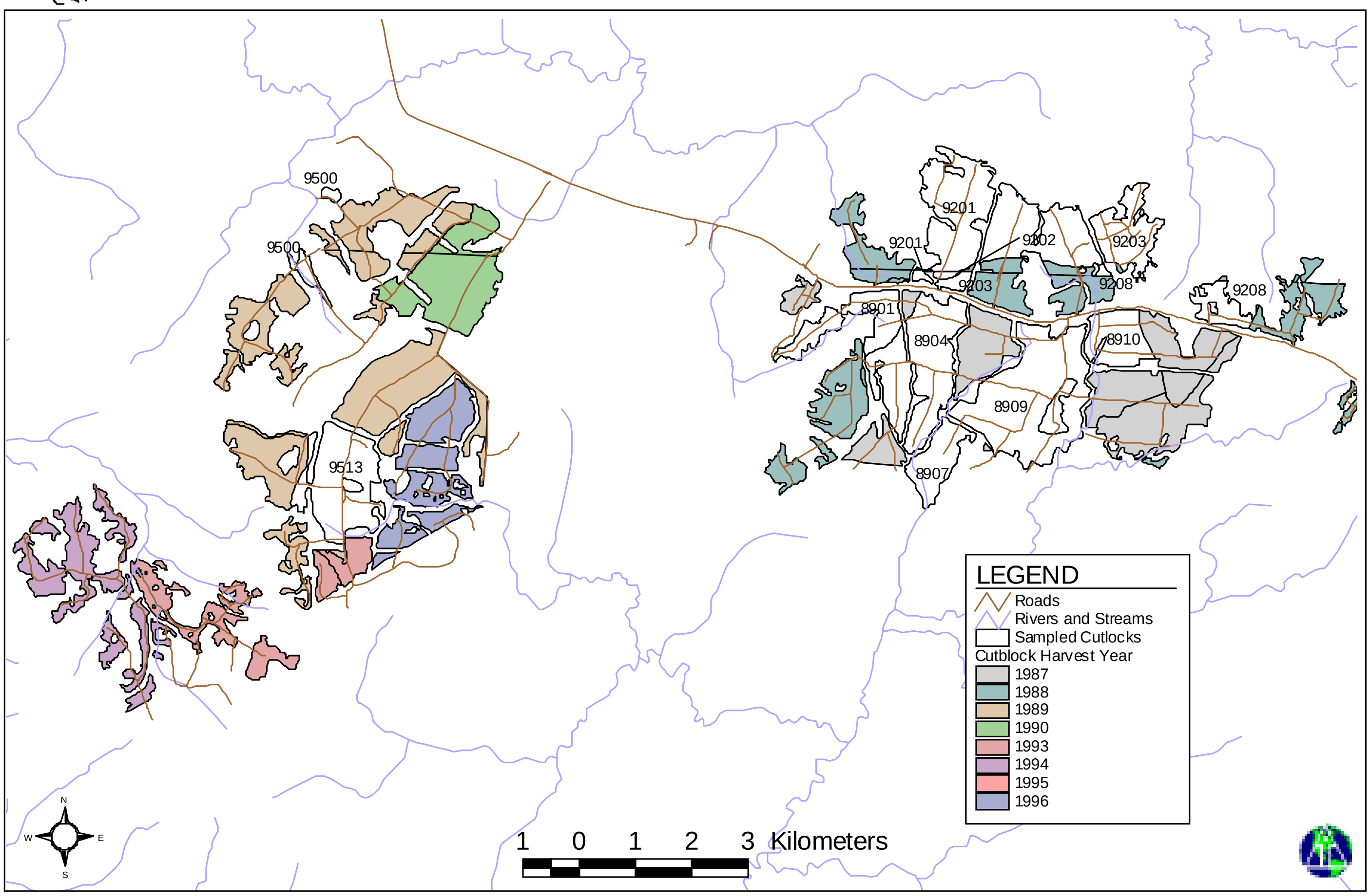
Cree Regional Authority

MAP 2: LOCATOR MAP, CUT BLOCK REGENERATION ASSESSMENT



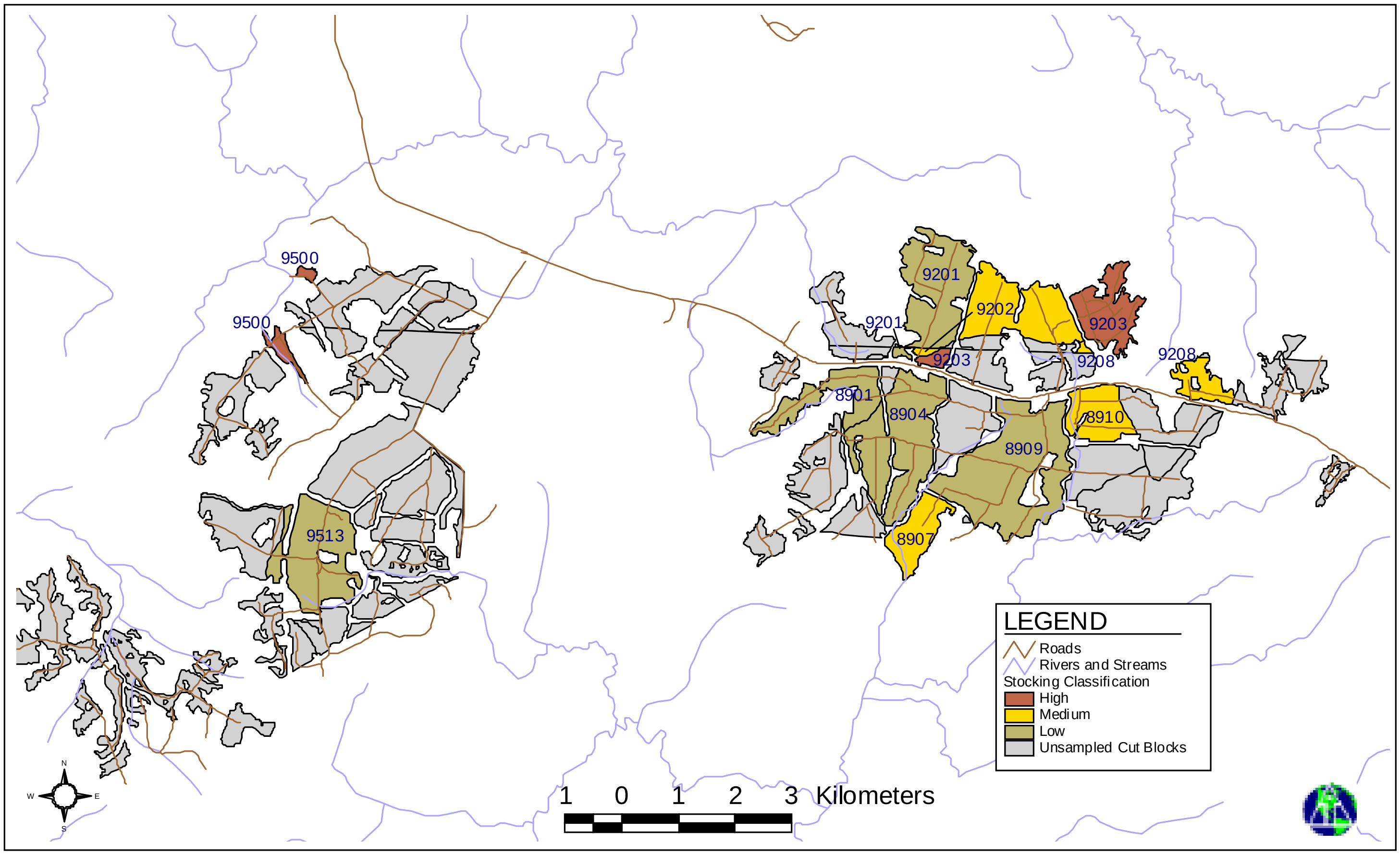
Cree Regional Authority

MAP 3: SAMPLED CUT BLOCKS



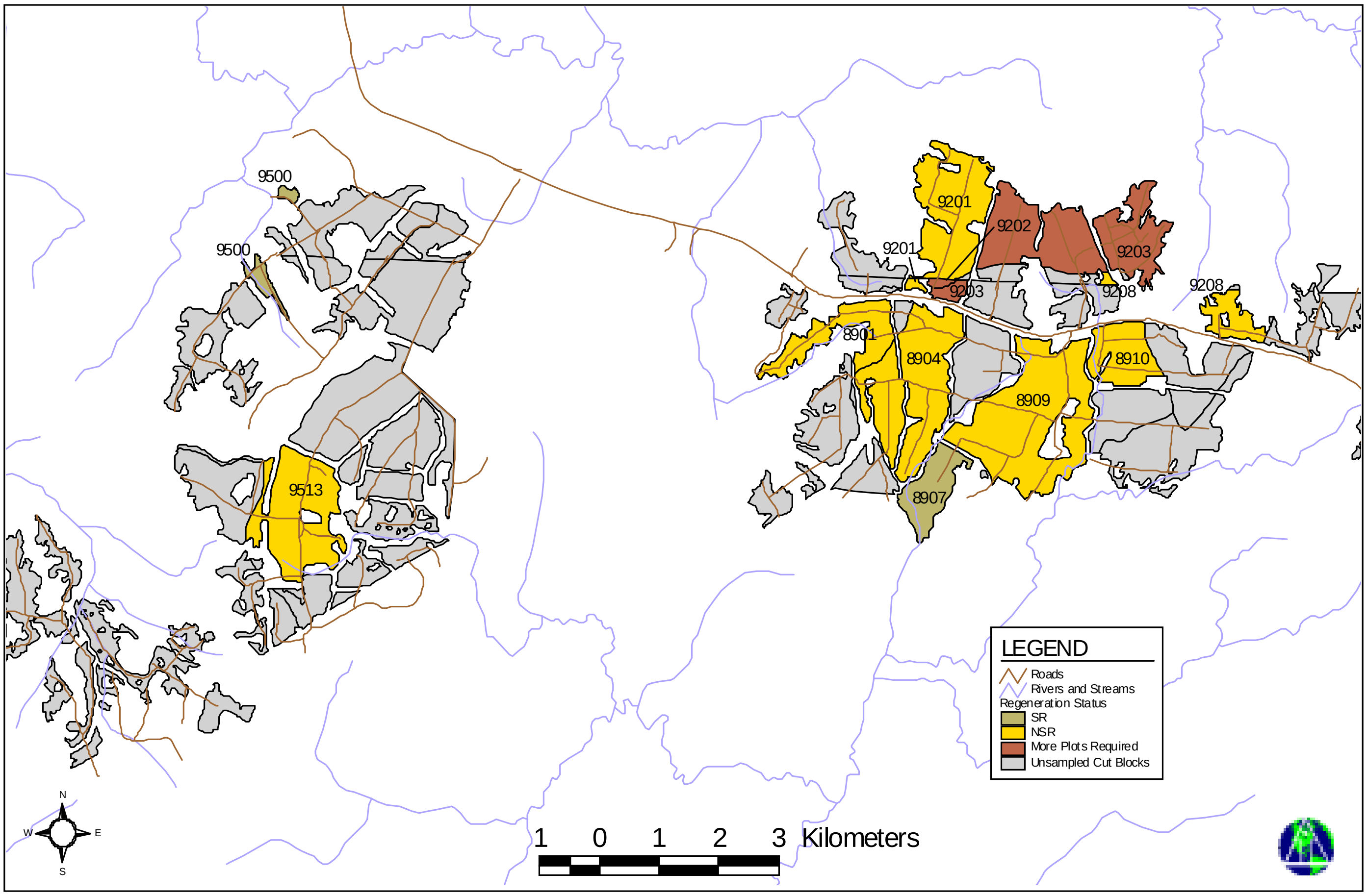
Cree Regional Authority

MAP 4: OMNR STOCKING CLASSIFICATION OF SAMPLED CUT BLOCKS



Cree Regional Authority

MAP 5: REGENERATION STATUS OF SAMPLED CUT BLOCKS



REFERENCES

Bell, F. Wayne. *Critical Silvics of Conifer Crop Species and Selected Competitive Vegetation in Northwestern Ontario,* Thunder Bay: Northwestern Ontario Forest Technology Development Unit 1991.

Environment Canada*.* *National Ecological Framework for Canada*. Ottawa: 1997

Jeglum J.K., Kennington D.J.. *Strip Cutting in Black Spruce: A Guide for the Practicing Forester*. Forestry Canada, Ontario Region, Great Lakes Forestry Centre. Ottawa: 1993

Ontario Ministry of Natural Resources. *Silvicultural Guide for Great Lakes-St. Lawrence Conifer Forest in Ontario Version 1.1*. Toronto: Queens Printer 1998

Ontario Ministry of Natural Resources. *Free Growing Regeneration Assessment Manual for Ontario (draft)*. Toronto: Queens Printer 1997