RESTORING THE PROVINCIAL FOREST ECOSYSTEM IN TEMAGAMI, ONTARIO:

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by
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Introduction

Since the eastern white pine (*Pinus stobus*) is Ontario's provincial tree, it stands to reason that those ecosystems dominated by the provincial tree also be specially designated. However, because red pine (*Pinus resinosa*) is so often associated with white pine, the ecology of one cannot be considered in the absence of the other (Clark and Perera 1995, Carleton et al. 1996). Thus, I propose that white and red pine forest be officially designated Ontario's *Provincial Forest Ecosystem*. This report is about protecting the provincial forest ecosystem and restoring it to its pre-settlement levels in Temagami.

Although government policy and scientific evidence tell us that this pine ecosystem restoration should happen, the logging of endangered old-growth white and red pine forests continues. Surely we have the collective will to recreate a relatively small portion of the landscape that once "...generated the capital and jobs needed to nourish the settlement of Ontario, and ultimately led to the confederation of the provinces" (Aird 1985, pg. 1) but which now contributes a minor fraction to Ontario's current timber production. Historically, "people spoke out against the wasteful practices, but their voices were generally ignored. Neither the public nor the politicians were aroused enough to support a comprehensive program of pine management, even as sawmill after sawmill failed" (Aird 1985, pg. 1). The public has finally decided to speak out - 75% of Ontarians want the old-growth white and red pine forests of Temagami to be protected from logging. We have the policies, we have the scientific evidence, and we now have the public support - it doesn't get much clearer than that.

Government Commitments

The Random House Dictionary of the English Language defines "objective" as, "something that one's efforts are intended to attain". Those things that the Ontario Ministry of Natural Resources (MNR) intends to attain through forest management in the Temagami Management Unit (TMU) from June 1, 1997 to March 31, 1999 are described on pages 73 to 360 of the Contingency Forest Management Plan (CFMP) (MNR 1997). The scope of this report is limited to (a) a subset of the CFMP objectives and (b) the management of white and red pine forests in the TMU.

By signing their names to the CFMP, Sheila MacFeeters, E.J. Volpe and D.I. Farintosh have guaranteed with their professional reputation that the MNR intends to attain, in addition to other things, the following (MNR 1997):

1. "To maintain genetic diversity within tree species" (pg. 75),

2. "To ensure continued existence of ecological units, rare forest complexes will be protected" (pg. 76), and

3. To "move towards a natural level of biodiversity using our knowledge of the pre-settlement forest as a guide" (pg. 75).

Despite clear evidence that shelterwood logging of white pine forests significantly reduces the genetic diversity of white pine populations, despite knowing since 1992 that old-growth white and red pine forests are endangered ecosystems, and despite evidence that both white and red pine forests were much more abundant in the TMU just prior to European settlement, the MNR continues to promote the logging of these ancient ecosystems driving them closer and closer to extinction.

White and Red Pine Forest Available for Logging

Under the current Temagami CFMP, a total of 2,431 hectares of white and red pine forest is available for logging over the next two years (Table 1). Of this total, 325 hectares is old-growth white and red pine forest (largely white pine) (Table 1). For old-growth white pine this amount (317 hectares) is slightly less than the known old-growth white pine forest in all the other provinces of Canada combined (372 hectares, from Quinby 1993).

Genetic Diversity

The MNR has committed to maintaining the genetic diversity of the white and red pine populations in the TMU. Yet, in the CFMP they provide no evidence of a current knowledge of the genetic diversity of these populations, nor do they propose studies or mechanisms to assess the influence of logging on the genetic diversity of these populations. Even more surprising is the absence of a review of any of the relevant scientific literature on this topic. In particular, the work of G. Buchert (formerly of the MNR's Forest Research Institute) on the influence of shelterwood logging on the genetic diversity of two pristine white pine populations in the Algoma Region of Ontario (Buchert 1994, 1995a, 1995b, Buchert *et al*. 1996). He and his collegues showed that for seven different measures, genetic diversity of these white pine populations decreased from three to 54% (Figure 1, Figure 2) with a mean decrease of 28%. Almost one-third of the genetic diversity in these white pine populations was lost due to the kind of shelterwood logging proposed for the TMU. With this kind of scientific evidence, and no proposed forest genetics monitoring program, how can the MNR guarantee "to maintain genetic diversity within tree species" (MNR 1997, pg. 75)?

Table 1. White and Red Pine Forest Area Available for Logging in the Temagami Management Unit from 1997 to 1999 (areas in hectares, from MNR 1997)

Forest Unit	Age Class	Allocated Forecast Harvest Area	Contingency Forecast Harvest Area
PwBw	**61-80**	**0**	**35**
	81-100	**302**	**114**
PwCo	**61-80**	**0**	**10**
	81-100	**411**	**381**
	101-120	**17**	**333**
	121+	**65**	**241**
PwSe	**81-100**	**20**	**173**
	101-120	**92**	**50**
	121+	**0**	**11**
Pr	**61-80**	**0**	**35**
	81-100	**0**	**80**
	101-120	**0**	**53**
	121+	**8**	**0**

Total Old-Growth White Pine (121+) = 317 hectares
Total Old-Growth Red Pine (121+) = 8 hectares
Total White Pine Forest = 2,255 hectares
Total Red Pine Forest = 176 hectares
Total White and Red Pine Forest = 2,431 hectares

KEY: PwBw = white pine-hardwoods; PwCo = white pine-conifers; PwSe = white pine-seed tree; Pr = red pine

Protection of Rare Forests

Old-growth white and red pine forest ecosystems are teetering on the brink of extinction in both Canada (Quinby 1993) and the United States (Quinby 1993, Noss *et al*. 1995). An endangered ecosystem has been defined by Noss *et al*. (1995) as one with less than 16% remaining and Quinby (1993, 1996) estimates that less than one percent of these ancient pine ecosystems remain. The MNR has been aware of this endangered status since 1992 when testimony was presented to the Environmental Assessment Board for the Class EA on Forest Management in Ontario (Quinby 1992). The Environmental Assessment Board (1994) supported this status assessment for old-growth white pine forest stating that:

> *...less than 1% of Ontario's original white pine forest remains. We do not quarrel with this estimate; it is clear that not much original white pine forest is left. We are persuaded that steps need to be taken to protect it.*

Just as endangered species are protected from the impacts of human activities, so too should endangered ecosystems such as old-growth white and red pine forests be protected from any further human exploitation (Wilson 1992, Orians 1993, Noss *et al*. 1995). A conservation strategy for old-growth red and white pine forest ecosystems that does not recognize their endangered status "while permitting a sustainable harvest of red and white pine" (MNR 1995) will only drive these endangered pine ecosystems closer to extinction. How can the MNR "ensure the continued existence of...rare forest complexes" (MNR 1997, pg. 76) if they continue to allow areas such as endangered old-growth white and red pine forests to be logged?

Figure 1. Changes in Old Growth White Pine Genetic Diversity Measures Due to Harvesting (from Buchert 1995a)

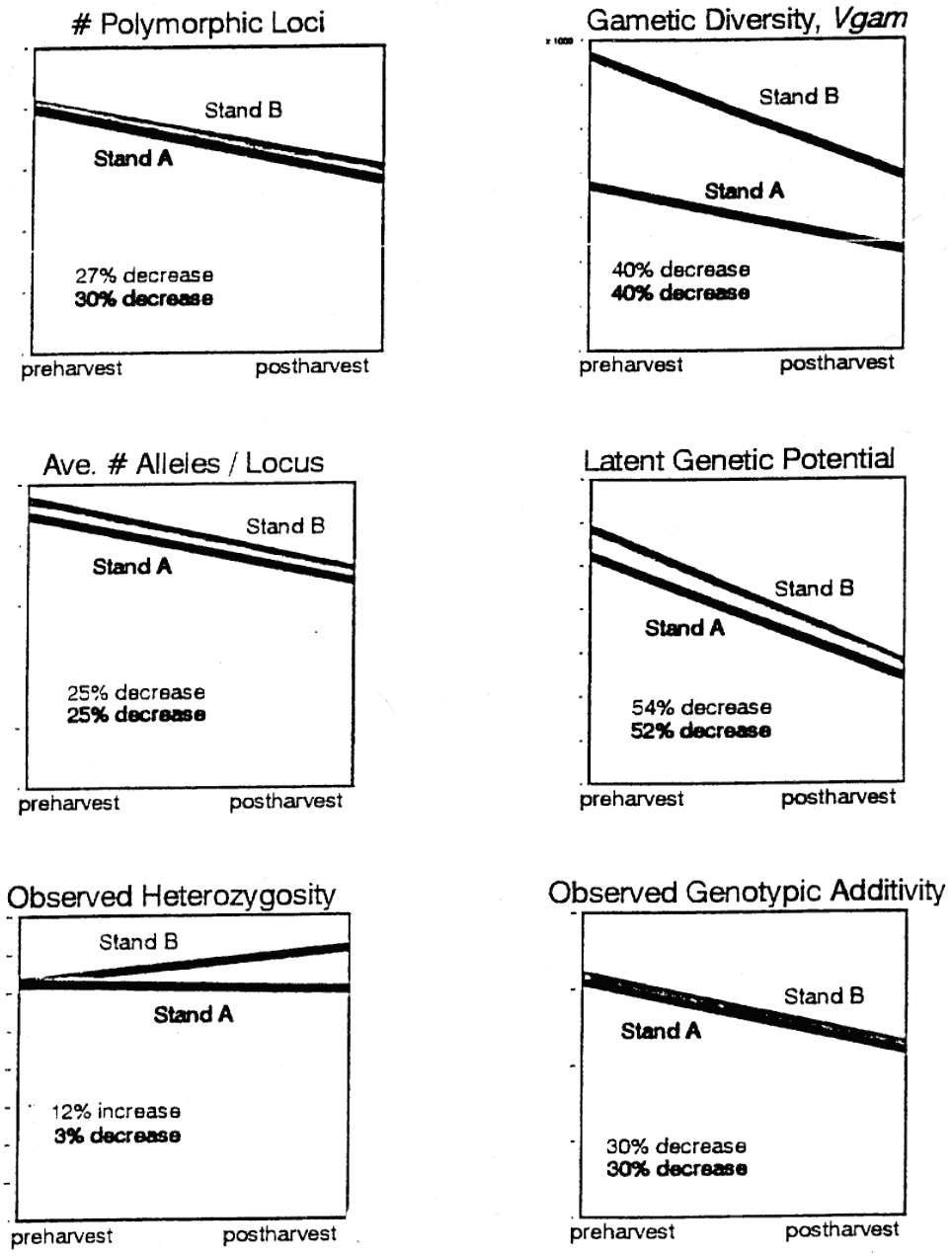
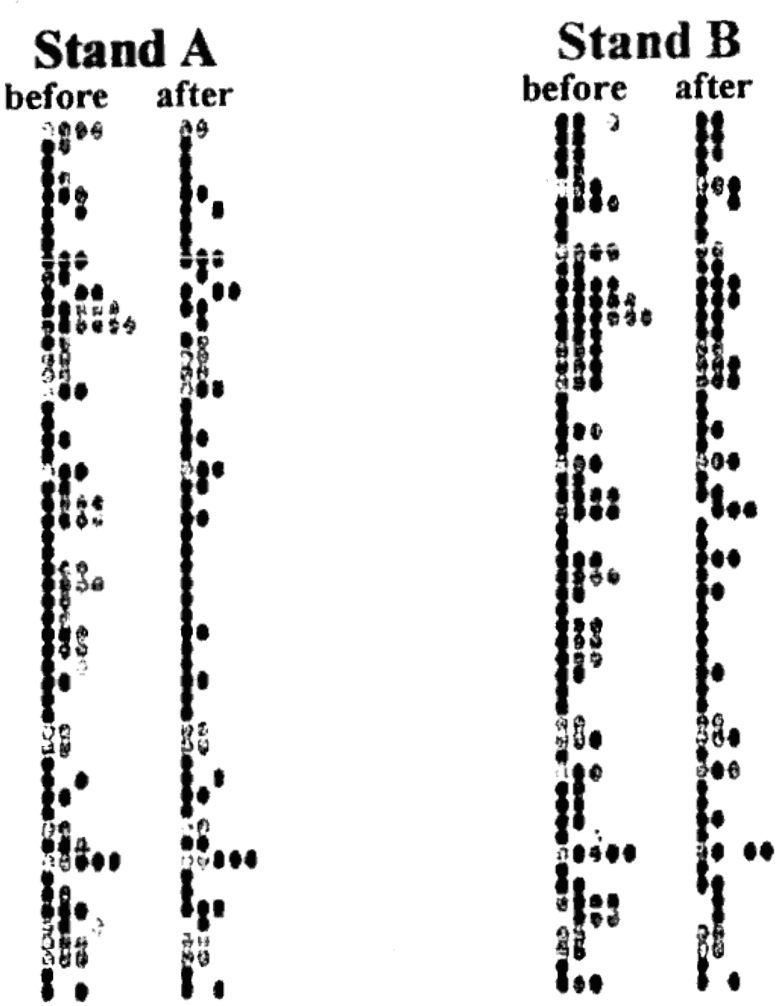


Figure 2. Genetic Diversity Losses Due to Harvesting in Old Growth White Pine (from Buchert 1995b)



Restoration of Natural Biodiversity

The Plan

In the CFMP, the MNR recognizes that in Temagami, "there is...considerably less pine-dominated forest today" (pg. 16) and that "the composition of the forest has...been greatly influenced by human intervention...prior to the 1970s, there was little attention paid to appropriate regeneration of cutovers. This had the dual effect of removing conifer, particularly pine, and allowing mixedwoods and hardwoods to dominate the new forest" (pg. 17). Although the MNR acknowledges that the abundance of white and red pine forest in the TMU has decreased substantially, there has been no attempt to estimate the relative abundance of these forest types just prior to European settlement and design a restoration strategy to move towards that estimate. Such an estimate can be used as a "target for the restored system" (Meffe and Carroll 1995, pg. 412). Ecological restoration can also serve as an excellent technique for conducting field experiments to develop a better understanding of species and ecosystems (Ashby 1987).

How can the MNR "move towards a natural level of biodiversity", which for white and red pine forests would mean increasing their abundance, if they allow the destruction of the very source material for this restoration - namely the ancient pine forests? Both historical and paleoecological data can be used to estimate the pre-settlement amount of white and red pine forest in the TMU (Bourdo 1956, Davis 1989). Currently, white pine forest makes up 9% of the total productive forest area (471,800 hectares) in the TMU and about 6.7% of the total TMU area (632,000 hectares) (MNR 1997, pg. 20). Red pine forest currently makes up about 3% of the total productive forest area in the TMU and about 2.2% of the total TMU area (MNR 1997, pg. 20).

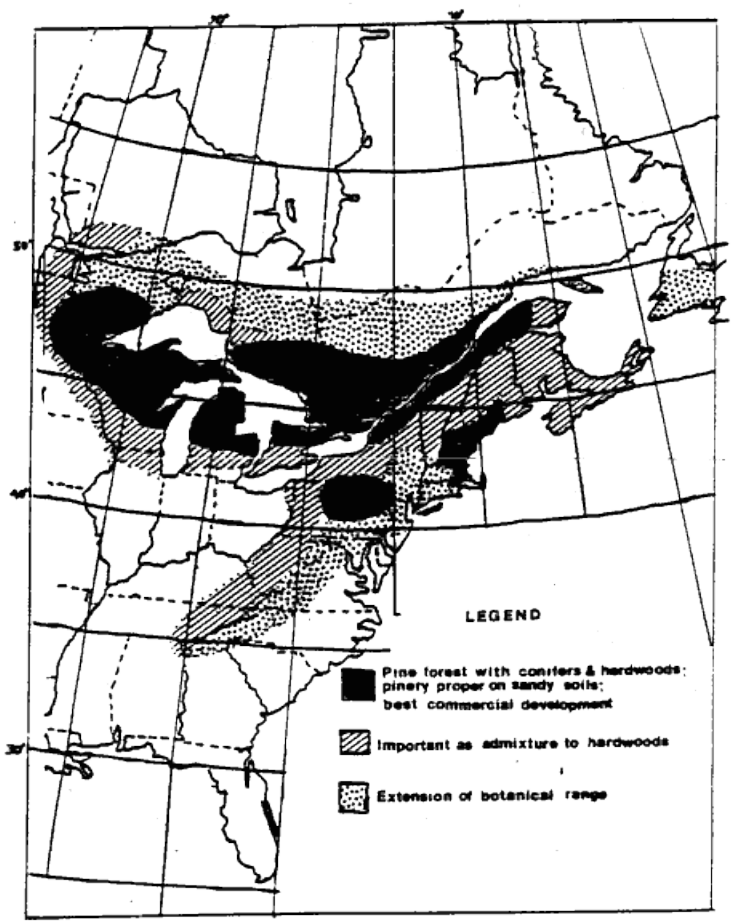
George R. Gray's Account

In 1900, G.R. Gray of Toronto led a general survey expedition to the Temagami region (Commission of Crown Lands 1901). The expedition included the area of the current TMU as well as an area of almost equal size bounded on the west by the Spanish River. According to Hodgins and Benidickson (1989, pg. 74), "Gray was especially interested in the white and red pine...[and] estimated 1,650 square miles of pine stands". Assuming that Gray's estimate included an area twice the size of the TMU, converting square miles to hectares, and using the total TMU area of 632,000 hectares, it is estimated that there were approximately 218,000 hectares of white and red pine forest in the TMU in the year 1900 which is a relative abundance of about 34%. Using this estimate, white and red pine forest area in Temagami would have to increase by 158,600 hectares or by a factor of three to reach pre-settlement levels.

Maps by Kuchler and by Spaulding and Fernow

Two maps showing the location and relative abundance of eastern white pine forest were used to estimate the pre-settlement amount of white and red pine forest in the TMU. First, the eastern white pine range map produced by Spaulding and Fernow (1899) shows three levels of abundance in eastern North America including "best development", "important admixture" and "extension of botanical range" (Figure 3). The TMU falls within the "best development" category.

Figure 3. Range of Eastern White Pine Forest in North America with Three Abundance Classes (Spaulding and Fernow 1899)



Next, the Great Lakes Pine Forest map provided by the Minnesota Natural Heritage Program (1989) as adapted from Kuchler (1964) (Figure 4), was used to estimate the area dominated by eastern white pine forest for the "best development" category on the White Pine Range Map. From the Great Lakes Pine Forest Map, it was estimated that 43% of the "best development" category in Minnesota, Wisconsin and Michigan was dominated by Great Lakes Pine Forest, which included forests composed primarily of eastern white, red and jack pine.

To get an estimate just for the eastern white and red pine forest component, it was assumed that the Great Lakes Pine Forest Map was dominated equally by the three pine forest types. In other words, it was assumed that two-thirds of 43%, or 28.4% of the White Pine Range Map category "best development", which includes the TMU, was dominated by eastern white and red pine forest around 1900. According to this estimate, white and red pine forest area in the TMU must increase by 123,200 hectares or by a factor of two to reach pre-settlement levels.

Pollen Data

The relative abundance of fossil pollen found in the sediments of lakes and wetlands can be used to reconstruct historical vegetation composition. However, because there are differences in the amount of pollen produced by each tree species, relative species abundances derived from pollen

data must be corrected in order to more accurately represent the relative abundance of vegetation (Davis 1969). The best way to derive these correction factors is to collect present day pollen from the species of concern and relate it quantitatively to present day population abundance.

The results of two pollen studies - one historical and one modern - were combined to estimate the relative abundance of pre-settlement white and red pine in the TMU. Dr. J. McAndrews, of the Royal Ontario Museum and the University of Toronto, produced a pollen diagram from a core taken from a bog located just inland of the west shore of Lake Temagami (Gordon 1990) (Figure 5). For the period around 1900, this pollen diagram shows that the relative abundance of white pine was approximately 45% and that the relative abundance of the combined category jack pine-red pine was about 22%. Assuming that red pine made up half of this combined category, red pine made up 11% of the fossil pollen at this point in time.

There are no corrective factors for fossil pollen from the Temagami region. There are, however, corrective factor data for a very similar forest region, namely lower Michigan. In a study by T. Webb (1974) of Brown University, modern pollen and vegetation data were analyzed to examine differences in relative abundance of many tree species including white pine and the combined category jack pine-red pine (Figure 6). By examining the abundance patterns in Figure 6, it was determined that relative abundance values for pollen should be (a) reduced by a factor of 2.0 (50%) to approximate the relative abundance values of the white pine population and (b) reduced by a factor of 2.2 (56%) to approximate the relative abundance values of the red pine population.

Using these corrective factors with Dr. McAndrews' data, it is estimated that the pre-settlement relative abundance of white and red pine forest in the TMU was 27.3%. According to this estimate, white and red pine forest area in the TMU must increase by 116,300 hectares or by a factor of two to reach pre-settlement levels.

Figure 4. Great Lakes Pine Forest of the United States (from Minnesota Natural Heritage Program 1989 and Kuchler 1964)

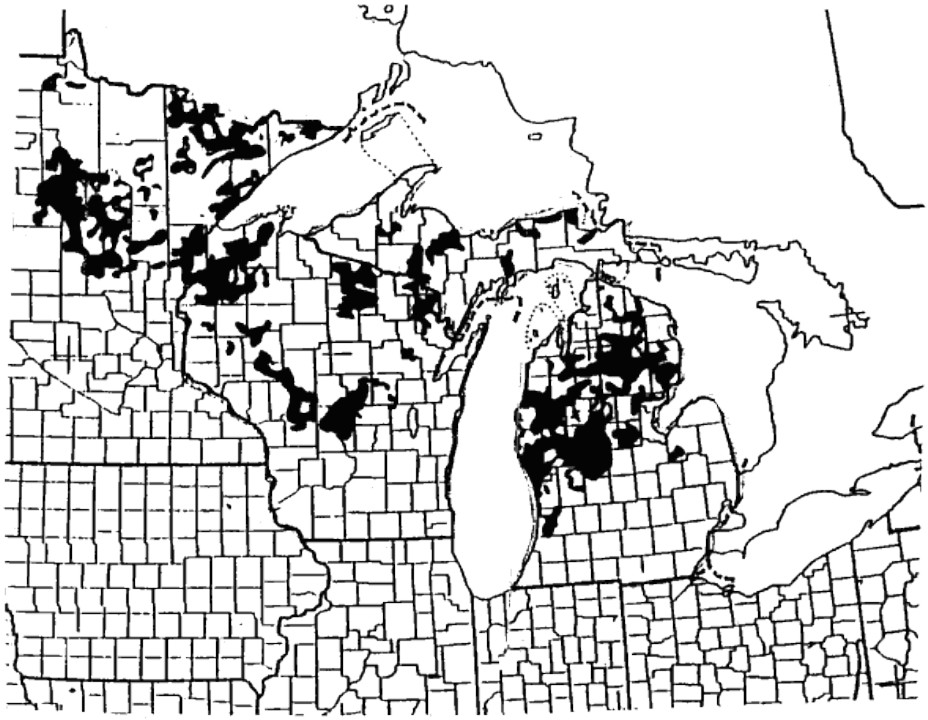


Figure 5. Pollen Diagram of Three Pines Bog (from Gordon 1990)

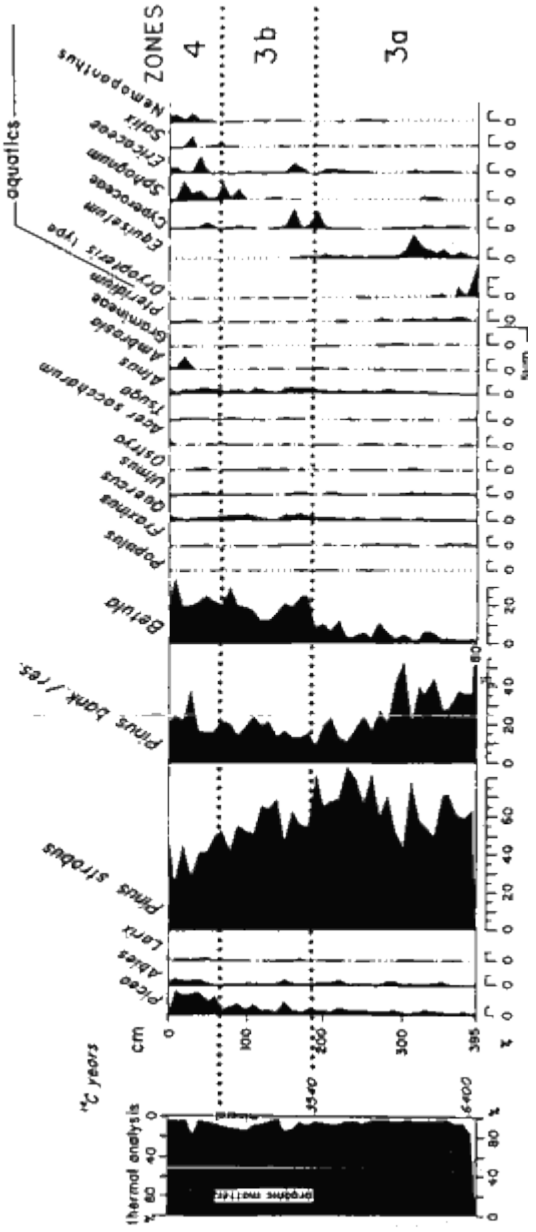
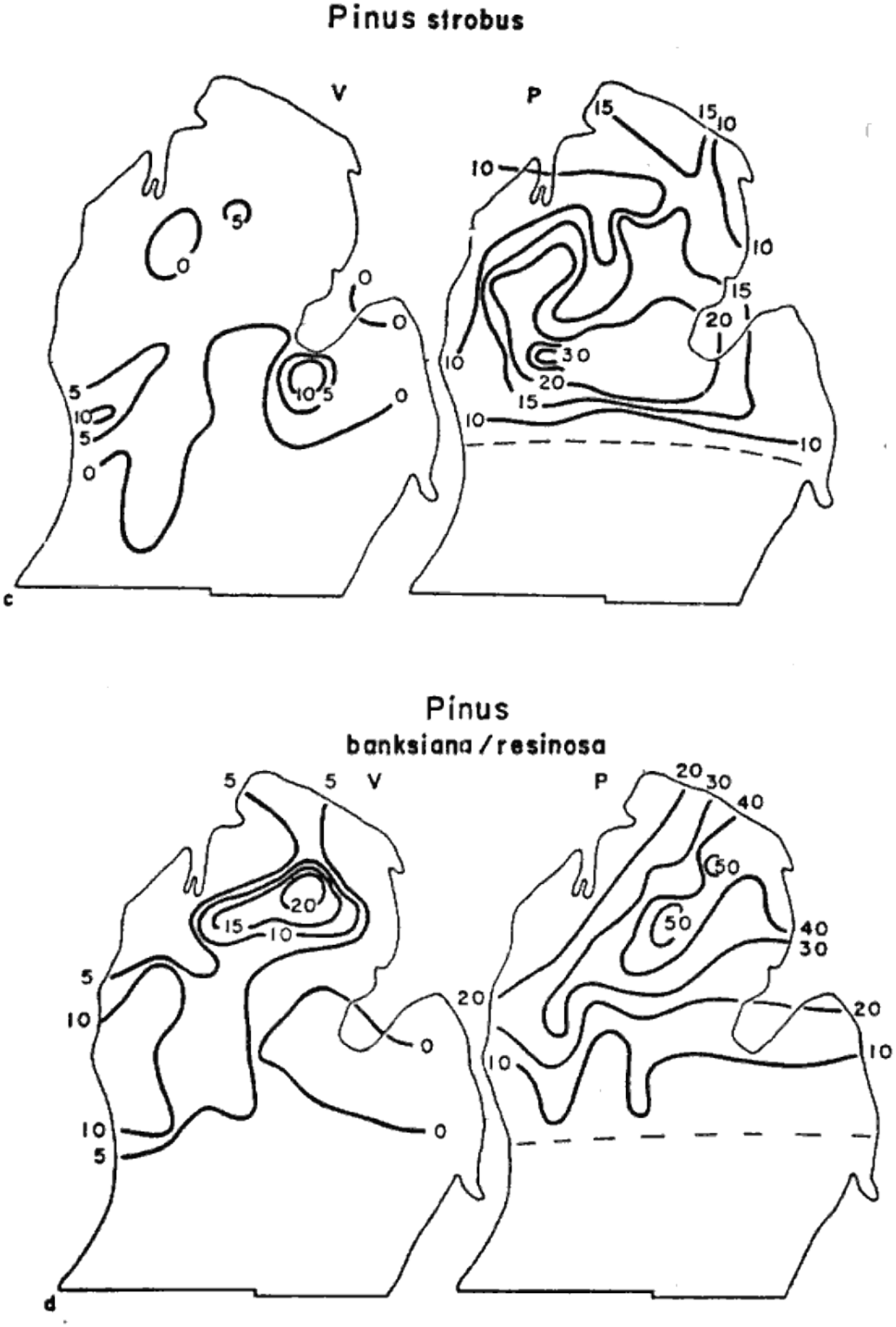


Figure 6. Maps of the percentages of white pine (*Pinus strobus*) and jack pine-red pine (*Pinus banksiana-Pinus resinosa*) in Lower Michigan; vegetation map on the left, pollen map on the right (isolines show relative abundance in percent; from Webb 1974)



Restoration Target Summary

The values derived from the three methods used to estimate the amount of pre-settlement white and red pine forest in the TMU are all quite close. The estimate drived from Gray's expedition (34%) is roughly 6% higher than the estimates derived from the pine range maps (28.4%) and the pollen data (27.3%). The similarity between the estimates derived from the maps and the pollen data, however, is quite remarkable considering the very different sources of data. Although there is no precident for using an average of these three estimates as a restoration target, the composite estimate indicates that roughly 30% of the pre-settlement TMU forest was dominated by white and red pine. Using this as the restoration target for white and red pine forest in the TMU, roughly 133,500 hectares should be restored.

Public Support

A review of the Public Consultation documentation within the CFMP revealed that 190 of 290 repondents or 66% favoured protection of (a) "Temagami's wilderness" and/or (b) "Temagami's old-growth white and red pine forests". The majority of the 190 referred specifically to old-growth pine. Similar findings were obtained by Oracle Research in September of 1996. A random survey of 1,250 Ontarians aged 18 years and older found that "75% stated that they agree with the idea that all the remaining old-growth red and white pine in the Temagami region be preserved...18% of respondents stated that they did not know...Of those who expressed an opinion...92% agree with the idea that all old-growth red and white pine in the Temagami region be preserved" (Oracle Research 1996).

Results of the Public Consultation process are sometimes criticised as being skewed in favour of the environmental protection position due to deliberate organized efforts to promote public participation by non-profit environmental groups. Such a phenomenon could only be occurring if, compared to the results of the Public Consultation process, a random survey of the general public showed less support for the environmental protection position. In this case, a survey of the general public actually showed greater support for environmental protection (75%) compared with the Public Consultation population (66%). There is no doubt that the Ontario public supports the protection of all remaining stands of old-growth white and red pine forest in Temagami.

Summary

It is proposed that white and red pine forest be officially designated as Ontario's *Provincial Forest Ecosystem*, that all of Temagami's remaining white and red pine forest be protected and that white and red pine forest in Temagami be restored to pre-settlement levels. This proposal is supported by government policy, scientific evidence and public demand.

In the Contingency Forest Management Plan (CFM) for the Temagami Management Unit (TMU), the Ministry of Natural Resources (MNR) has made a commitment to (1) "maintain genetic diversity within tree species", (2) "ensure continued existence of ecological units [by protecting] rare forest complexes", and (3) "move towards a natural level of biodiversity using our knowledge of the pre-settlement forest as a guide".

Despite these commitments, however, the MNR has made a total of 2,431 hectares of white and red pine forest available for logging over the next two years. Of this total, 325 hectares is endangered old-growth white and red pine forest. This amount of old-growth white pine forest is slightly less than the known old-growth white pine forest in all the other provinces of Canada combined.

The MNR provides no evidence of a current knowledge of the genetic diversity of white and red pine populations in Temagami, nor do they propose studies or mechanisms to assess the influence of logging on the genetic diversity of these populations. Recent research has shown that genetic diversity of white pine populations decreases by as much as 54% due to shelterwood logging that is proposed for Temagami.

Old-growth white and red pine forest ecosystems are teetering on the brink of extinction in both Canada and the United States and the MNR has been aware of this endangered status since 1992. Just as endangered species are protected from the impacts of human activities, so too should rare and endangered ecosystems such as old-growth white and red pine forests be protected from any further human exploitation.

The MNR recognizes that there is considerably less white and red pine forest in Temagami today than there was prior to 1900. However, there has been no attempt to estimate the relative abundance of these forest types in Temagami's pre-settlement forest landscape. Such an estimate can be used as a restoration target. Moving towards a natural level of biodiversity for white and red pine forests means increasing their abundance, not decreasing their abundance as is proposed in the CFMP.

Both historical and paleoecological data can be used to estimate the pre-settlement amount of white and red pine forest in Temagami. Approximately 30% of Temagami's pre-settlement forest was dominated by white and red pine. Using this as the restoration target, roughly 133,500 hectares of white and red pine forest should be restored in Temagami.

There is no doubt that the Ontario public supports the protection of all remaining stands of old-growth white and red pine forest in Temagami. A review of the Public Consultation documentation within the Contingency Forest Management Plan revealed that 190 of 290 repondents or 66% favoured protection of Temagami's ancient forests. Similar findings were obtained by a random survey of 1,250 Ontarians which found that 92% of Ontarians expressing an opinion favour the protection of Temagami's ancient white and red pine stands.

In the Contingency Forest Management Plan, the MNR has espoused worthy conservation policies and objectives designed to maintain and restore the biodiversity of the Temagami region. However, their proposed actions including the approval of continued logging of endangered ecosystems and their lack of specific proposed studies to achieve their objectives has resulted in an impressive academic exercise to justify the status quo. This status quo approach continues to degrade genetic diversity by using shelterwood logging, continues to move closer to eliminating rare ecosystems by logging ancient pine stands and continues to ignore the natural level of biodiversity as an operational management criterion by failing to develop restoration targets for white and red pine forest.

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