Could a Significant Natural System in Southern Ontario be Overlooked?

Peter Alley
Working Group for the Land Between

Abstract

Natural landscapes in southern Ontario have been inventoried by identifying homogeneous ecological units. On this basis, 'representative' areas have been selected for protective management regimes. Unfortunately, this approach fails to recognize and assess ecotones or ecological transitions. There is one ecotone along the southern edge of the Canadian Shield (from Georgian Bay to the Frontenac Axis). Does existing land-use management leave it vulnerable?

The Problem

- The inventory of ecological systems in Ontario and protection of areas representative of each ecological type nears completion. Has anything important been missed?
- The inventory of ecozones, ecoregions, ecodistricts and so on has been prepared, based on a particular methodology, the hierarchical classification of homogeneous areas. Has the methodology led us to overlook any transition zones, or ecotones, as real ecological places?
- Recent research on ecotones suggests that they may be more than difficult-to-classify landscapes between two regions. Exclusive use of the search for homogeneity would mean that heterogeneity, as an ecological value, would be overlooked (Risser, 1995).

Some Hypotheses

Three hypotheses can be proposed about one important natural landscape in Ontario – a unique ecotone:

1. there is at least one distinct landscape (along the southern edge of the Canadian Shield) that has been overlooked by the classification methodology common in Ontario. It is so little recognized that it has no name. Call it The Land Between;
2. the Land Between has: a) ecological; and, b) economic and social values that make it worthy of protection; and,
3. the Land Between is threatened by development by forces that are changing in kind and accelerating.

Ecotones

"Within the past two decades research has revealed a new dimension to ecotones. They are recognized as being dynamic components of an active landscape, frequently playing significant roles in supporting high levels of biological diversity as well as primary and secondary productivity; modulating flows of water, nutrients, and materials across the landscape; providing important components of wildlife habitat; and acting as sensitive indicators of global change." (Risser, 1995: 324). Some are even characterized by their own unique ecological functions and biodiversity. That makes it valuable to identify an ecotone as an ecological entity. Some researchers have identified both scale and the pattern in the mingling of patches as important in determining how an ecotone behaves. (Risser, 1987). When the pattern is a heterogeneous mosaic it may escape a methodology seeking homogeneous units.

The prevailing view for 50 years before the 1980s was that ecotones are merely a composite of things sandwiched between homogenous ecological units. (Risser, 1995). Then, finding land in a transition zone that has more than x % of attribute 'A', could bring it into one adjacent class of landscape or the other. But that kind of classification may be misleading if the ecotone in fact has its own ecological structure, functions and rate of change.

Classification Methodology – Use and Validity

The results of the methodology of classification of ecological areas matter, because they affect how people think about an area. The selection process for protecting areas under the *Ontario Living Legacy* program has been based on choosing representation of each identified homogeneous class. Representation of these homogeneous areas is sure to miss heterogeneity, a characteristic of some ecotones. The Ministry of Natural Resources field guide for southern Ontario is an example of the approach (Lee *et al.*, 1998). Ecological land classification has been pursued this way in Ontario for over 40 years (Riley and Mohr, 1994).

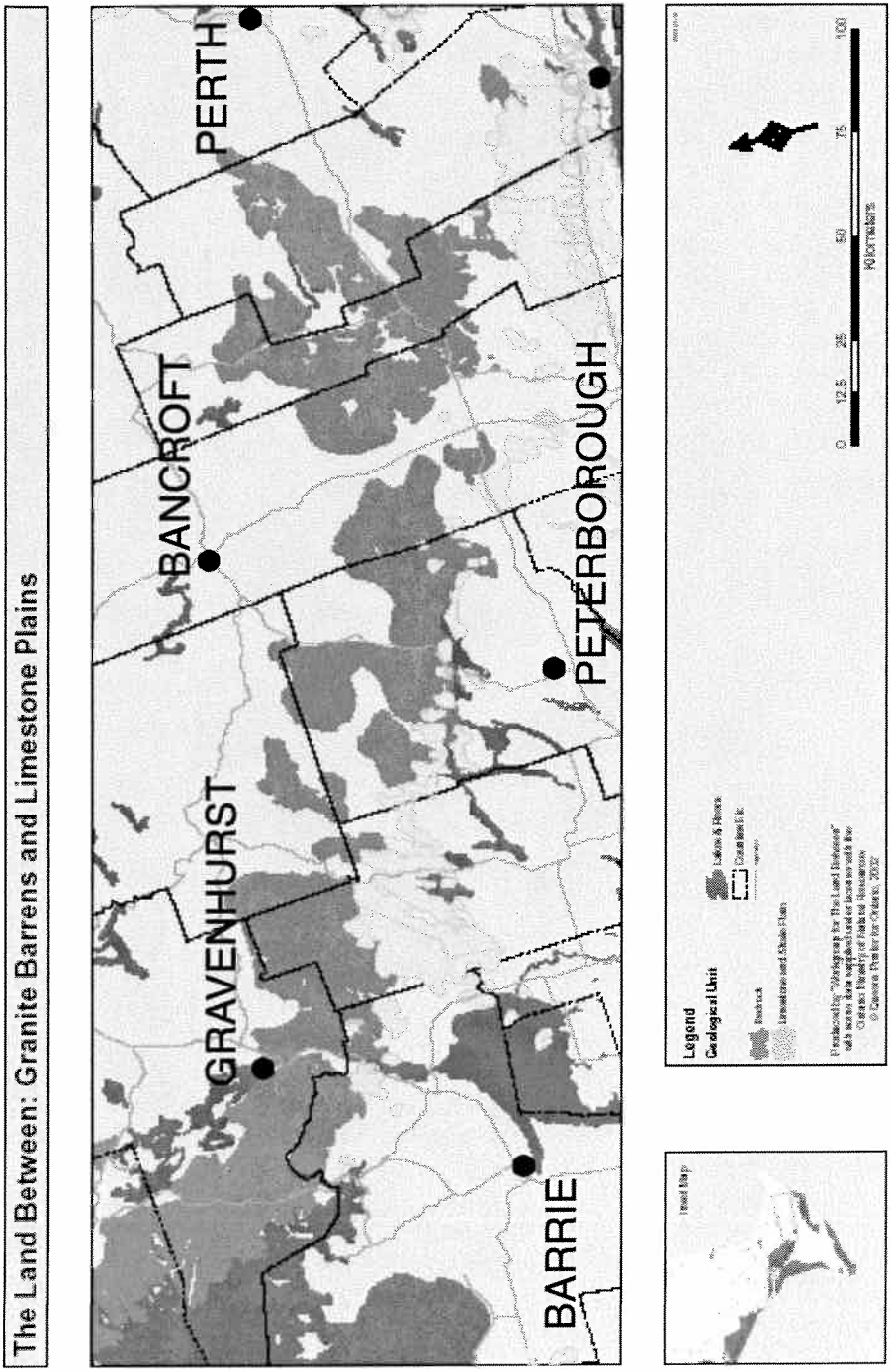
Validity of classification using a hierarchical search for homogeneous units comes entirely from whether it works for its purposes. If it fails to identify significant landscapes, as it does, that simply means alternative analytical tools should be used, instead or as well.

An Example – 'The Land Between'

A distinct landscape – Where is it?

The land between northern forests and farms of southern Ontario lies along both sides of the contact zone of the Canadian Shield. Its superficial geological core is 'granite barrens' and 'limestone plains'. Figure 1 shows the location of these features.

Figure 1. *'Granite barrens' (darker mid-gray) and 'limestone plains' (lighter mid-gray) (OMNR, 2003a).*



A distinct landscape – What is it?

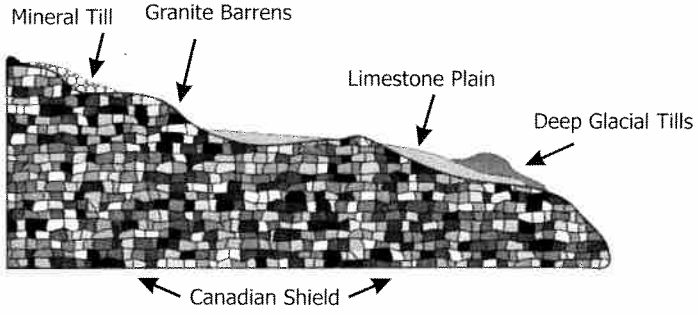
The character of The Land Between as an ecotone is shaped by three fundamental transitions in:

- geology,
- elevation; and,
- plant hardiness zones.

Geology

Looking at the geological complex, (Figure 2), we find three transitions in 20 to 40 km created by four areas of surficial geology. The core is two kinds of bare rock (Precambrian and Palaeozoic or sedimentary). Bare rock means <15 cm average depth of soil cover. (Lee *et al.*, 1998). The core lies between two kinds of till deposits: Canadian Shield with mineral till on the north and glacial deposits of the Great Lakes Lowlands on the south. The different chemicals and behaviours of the rock create differences in water and soil. Water and soil tend to be acidic in the granite barrens and the Shield except where the rock is marble. The marble, the limestone plains and the southern glacial tills are alkaline. Both kinds of water are mixed in rivers flowing through this complex.

Figure 2. *Model of cross-section of surficial geology of 'The Land Between'.*



Elevation

A change in elevation up the south slope of the Algonquin Dome coincides with the geological transition (Figure 3).

Plant hardiness

Plant hardiness Zone 4b in southern Ontario covers most of the core superficial geological elements (Figure 4). It reflects the changes in temperature and precipitation as one moves up the Algonquin Dome.

Working together, these features make The Land Between a distinguishable ecotone - an identifiable entity.

Figure 3. *Elevation with 'granite barrens' (black outline) and 'limestone plains' (white outline) shown.*

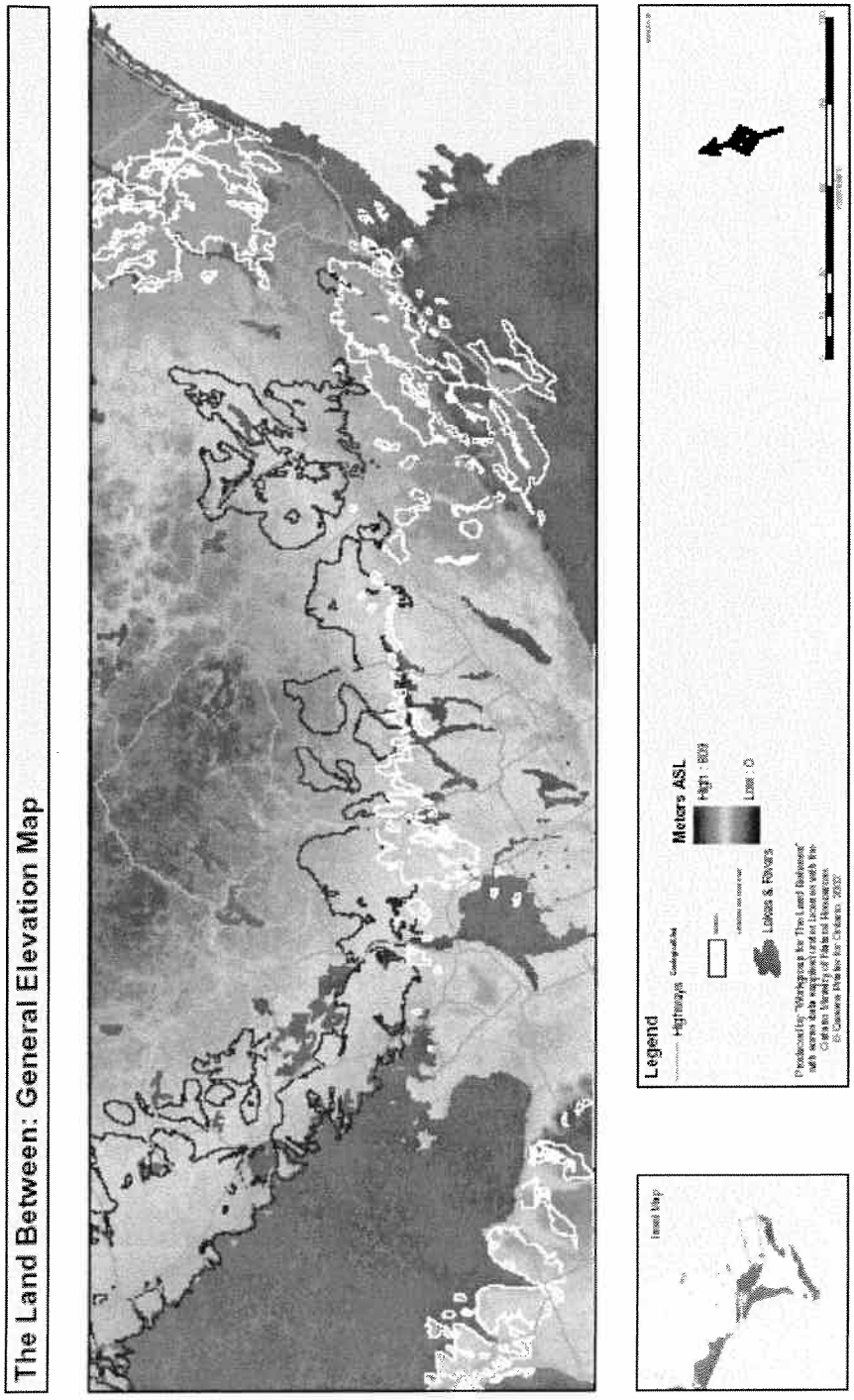


Figure 4. Map of plant hardiness zones in relation to granite barrens and limestone plains. (Agriculture and Agri-Food Canada, 2003).

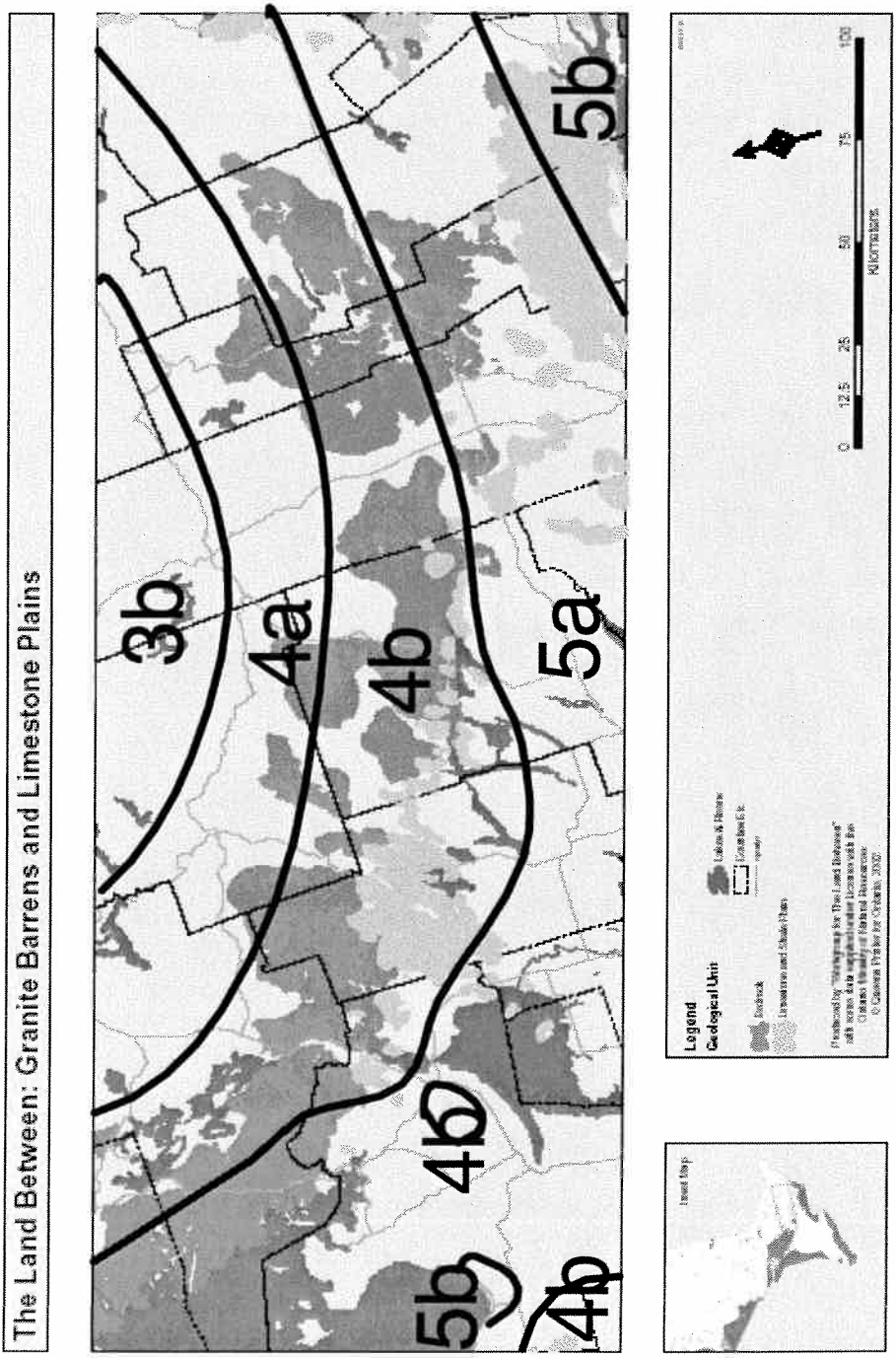
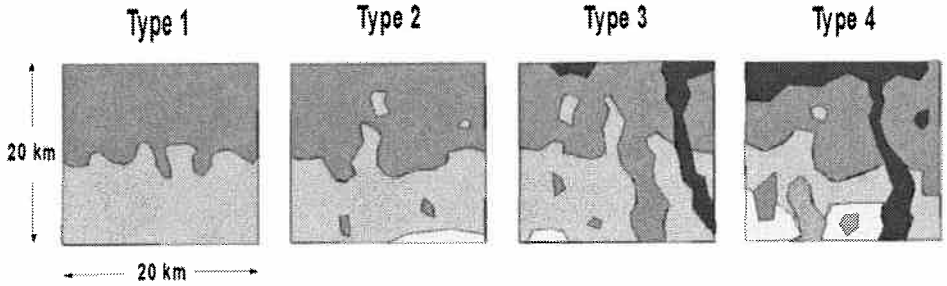


Figure 5. Model of types of mosaic of physiography.



A distinct landscape – A mosaic, not a blend

Gosz suggests that to analyze physiography at an ecotone landscape level, use a wide view (Gosz, 1993.) In a scale of about 20 x 20 km squares, the physiographic picture of The Land Between is a mosaic. The core exposed rock is an east-west chain of low relief 'granite barrens' (technically, metamorphic rock with patches of igneous rock within the east end) with strips and stepping stones of 'limestone plain' (including alvars) along the south side. Interruptions add to the irregularity of the core – narrow north-south intrusions of thicker tills and lacustrine deposits from the regions north and south of it. The mosaic of The Land Between falls into Types 3 and 4 in the illustration of mosaic patterns (Figure 5).

Values worth protecting – Ecological: unique mosaic ecotone; biodiversity

Consider the ecotone as an entity, for its unique character and the resulting species diversity. Theory and experience elsewhere suggest that a place with so many kinds of transition and such a pronounced mosaic will have unique ecological functions that make it a distinguishable ecological place. The mosaic juxtaposition of types of physiography makes the ecotone a place of edges. The changes in rock and soil types, the differences in wet/dry conditions, and the ph difference sharpen many edges of the mosaic. The mixture creates a diversity of habitat.

Species diversity in the 20 x 20 km plot, and often in a plot as small as 3 x 3 km, is an observable result. While alternating wet and dry conditions in thin soil or bare rock may be so harsh they limit species diversity within small patches, in a wider view, the ensemble of the mosaic probably enhances it. What is the evidence so far?

- Birds are viewed by some as a good indicator of species diversity - more bird species, more diversity of all kinds;
- (In) *"the area between Kingston and the southern end of Georgian Bay...the number of species found is exceptionally high."* (Cadman *et al.*, 1987: 29);
- The 'granite barrens' are *"part of a landscape that does have a high level of biodiversity. As many as 500-600 species of vascular plants may be represented within an area of several square miles."* (Catling and Brownell, 1999: 402); and,
- The Land Between is the northern limit for some species and the southern limit for others; and contains patches of Atlantic Coastal Plain species and species at risk. (Reid and Bergsma, 1994).

Values worth protecting – Economic and social values

Important economic and social activities depend on maintaining natural characteristics of The Land Between. Tourist resorts and services to cottages are central to the economies of nearby towns. Although the transition zone is south or north of much of 'cottage country', cottages are its dominant settlement type. There are a few villages or hamlets, mostly along the edges. In many municipalities the number of seasonal residents far outnumbers permanent ones. Both residents and visitors use the area for most outdoor recreational activities that a natural area can provide. There is some forestry and a little trapping. The Land Between is an economic and cultural amenity for residents in towns nearby and in cities 1½ to 2 hours drive away - Greater Toronto Area, Barrie, Kingston and Ottawa.

Threats – development

Bedrock covered with thin soil has low (limestone) or very low (granite) absorptive capacity. Small bodies of surface water make water quality vulnerable. An increasing proportion of a growing population will bring more people to The Land Between. Two forces cause this:

- Population in the four urban centres mentioned is forecast to grow by 1.5 million people by 2015 (Compilation of data from Ministry of Finance.) Foot and Stoffman predict that the combination of this population growth and changes in demographic mix means that, while *"only 8% of households own a leisure property, that percentage will increase."* (Foot and Stoffman, 1998.) Recreational visits will similarly increase; and,
- Retiring baby boomers, and some before retirement, will increasingly make their permanent homes in The Land Between, thus increasing the quantity and kind of development. For example, on one typical lake, the proportion of year-round residents has increased from about 1% of total cottages 20 years ago to over 10% today. Is there a tipping point after which this sparsely settled landscape quickly loses its remaining naturalness? If so, where is it? How close are we? Protective action is likely urgent. The cumulative effects of land uses damage the ecotone's wilderness character. Among them are road access, larger building footprints, dammed watercourses, golf courses, shoreline modification, motorboat wakes, ATVs, lawns, pesticides, herbicides, septic beds, escaped cultivated plants and so on.

Threats – no coherent land-use management

Unfortunately, there is no coherent land use management scheme to give priority to environmental protection of The Land Between as an entity. The forces of population change are unavoidable, but development can be steered. Both land use management that gives priority to environmental values and environmental education for users can reduce harm to the environment.

Ownership and stewardship are fragmented. About 60% of the area is in private hands. The Government of Ontario owns most of the remainder, of which about half, in homogeneous patches, is protected in Parks and Conservation Reserves. There are signals MNR may dispose of the unprotected parts (OMNRb, 2003). Even land trusts look only at their own small pieces, without consideration of the whole.

Threats – Low recognition

The Land Between suffers from low recognition so it was easy to overlook in classifying Ontario's ecology and in anyone's land-use management. It does not even have a name. Three reasons for low recognition are worth mentioning, in order to understand partially why deeper questioning has not occurred and why there is no land-use plan for the landscape as an entity:

- After 1854, the Colonization Roads were built on a north-south axis. Transportation, economic development, social and political patterns and culture followed. That kept residents from looking east and west;
- The landscape is a small part, in population and area, of each of the eight 'county' jurisdictions it passes through, usually at one of their edges. So, there is little incentive for local politicians or planners to pay much attention to it or, especially, to recognize it as part of a larger landscape. Similarly in Provincial administration there is marginal attention to it because it straddles the border of MNR's ecoregions (5E and 6E) and several of its administrative districts and, now, of Ontario's Smart Growth Regions; and,
- Only recently has satellite imagery allowed us to 'see' the core of this remarkable ecotone lying across Ontario.

Conclusions

The description of The Land Between suggests the hypotheses are reasonable and merit formal testing:

- a distinguishable transitional landscape that has not been identified by Ontario's classification methods;
- valuable ecologically, economically and socially; and,
- with threats to its natural character.

Now that we have both the theory and the technology to help us see The Land Between, can we continue to ignore it?

Further studies

The analysis presented here invites research to test these hypotheses or related ones. Natural science questions about this landscape leap out, especially looking at it as an ecotone – characteristics (inventories, structure, functions, processes, change, appropriate scale for analysis and so on); comparisons with other ecotones; and natural values that are worth protecting. What is the occurrence and distribution of species at risk within it? What is the state of biodiversity here? Does The Land Between work as a wildlife corridor? What roles does it play for water? Is there a tipping point?

There is plenty for research in other disciplines or in multidisciplinary studies:

- What are the population and development pressures and their effects? What will happen as pressures grow? What is the nature and prognosis of damage? Which are the damaging uses and which are benign?
- With existing land-use management, what are the economic values of the landscape as an entity, now, and 10 or 20 years on? What alternative management regimes are available? Which uses are compatible and which must be separated, or even prohibited in some places? To what extent are highways, existing or planned, a barrier to wildlife? Can that be reduced?
- Who benefits and who loses from coherent land-use management? How do industrial uses of the landscape (forestry, mining, quarrying) fit in?
- What are the ecological boundaries? For land-use management there are also economic, social and political issues to consider in setting boundaries and zones for uses. How would First Nations claims and interests affect boundary choices?

The Land Between might be a useful 'canary in the mine' for global warming. Some species or systems might be indices because they are under a degree of stress from living on edges. Special legislation in Ontario guides development in the Niagara Escarpment and Oak Ridges Moraine as these landscapes cross regional, county and other municipal jurisdictions. What can be learned from the social and political processes which led, over about 20 years each, to final legislation? How is it working?

The Land Between is an abrupt mosaic ecotone in southern Ontario. It still retains a degree of wilderness. The impending pressures for development make it urgent for numerous studies to be done as quickly as possible, if they are to be useful in changing to coherent land-use management for The Land Between.

Acknowledgments

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