Assessment of final Algonquin Park zoning changes proposed by the Ontario Parks Board of Directors:

Ecological considerations

Planning and Research Section, Ontario Parks
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Introduction

The Minister of Natural Resources has asked the Ontario Parks Board of Directors ("the Board") to provide recommendations on how to "lighten the footprint of logging in Algonquin Park." This followed the Board's report on the review of proposed protected areas legislation in Ontario which recommended an independent review of Algonquin Park because of the exceptional challenges there. Algonquin is the only provincial park in which logging still takes place.

A subset of the Board known as the Algonquin Park Subcommittee has proposed several means to reduce the ecological footprint of logging, including possible changes to zoning. MNR has provided technical assistance and review. On August 3rd, the Subcommittee confirmed that their zoning proposal was finalized, and asked MNR to prepare three assessments. This is one of the three requested reports.

Assessment summary

The Board has identified four components to the zoning proposal *(Figure 1, Table 1)* with the following order of priority:

Component 1: Central Lakes and Lake Louisa areas

Component 2: Areas with a 200-metre setback from identified waterways

Component 3: 120-metre setbacks on all remaining canoe routes and lakes with self-sustaining brook trout populations, and 60-metre setbacks from portages

Component 4: Areas with a 200-500m setback from identified waterways

Table 1: Area summary of zoning proposal components

Individual components	Areas (ha)			
	Total	Water	Land	Managed available forest
Component 1	34,570	8,444	26,126	19,708
Component 2	66,185	29,120	37,065	21,658
Component 3	19,707	7,110	12,597	5,463
Component 4	28,972	406	28,566	23,762
Zoning scenarios (running totals)				
Component 1	34,570	8,444	26,126	19,708
Components 1 & 2	100,755	37,564	63,191	41,366
Components 1, 2 & 3	120,462	44,674	75,788	46,829
Components 1, 2, 3 & 4	149,434	45,080	104,354	70,591

As part of their zoning proposal, the Board has also recommended that MNR "maintain a 2,000- to 3,000-hectare budget for the completion of the Nature Reserve system in Algonquin, in areas where representation gaps have been identified outside of the Board's priority areas".

The proposal focuses largely on protecting aquatic ecological and recreational values by removing certain areas from the Recreation/Utilization Zone. These ecological values include many of Algonquin's 262 brook trout lakes. Algonquin Park has one of North America's best remaining naturally self-sustaining complexes of intact brook trout populations. Natural brook trout populations in cold water lakes across eastern North America have declined significantly over the past century.

The Board's zoning proposal also seeks to provide some measure of protection for wood turtle and Blanding's turtle populations along several waterway systems in Algonquin's east side. Despite measures such as driver education, speed bumps, and enhanced enforcement, there have been a number of occurrences of road mortality caused by motorized vehicles, particularly during the nesting period in June.

The proposed zones, if adopted, would also connect several of the existing Wilderness and Nature Reserve Zones, thereby enhancing the ecological integrity of these existing zones.

This report provides an ecological assessment of the Board's proposal based on the methodology described by Crins and Kor (2000). For more than 30 years, Ontario Parks has used these five criteria to identify, select, design, and assess proposed protected areas:

1. Representation of terrestrial life science, aquatic life science, and earth science features
2. Condition, or degree of freedom from anthropogenic modifications
3. Diversity, or heterogeneity of landscape components and species
4. Ecological functions, primarily connectivity, hydrological functions, size, shape, and limiting habitat components, and successional processes including the presence of old growth forest
5. Special features such as rare species and localized habitats for habitat specialists

Table 2 summarizes the findings of this assessment. In this table, each component is qualitatively rated as high, medium, or low for each of the five selection criteria. The remainder of this report describes our methodologies and findings based on these five selection criteria.

Table 2: Summary of ecological assessment of zoning proposal components

Com-ponent	Representation		Condition	Diversity	Ecological Functions	Special features
	Terrestrial	Aquatic*				
1	Medium	High	Medium	Medium	High	High
2	High	High	Low	Medium	Medium-High	High
3	Low	High	Medium	Medium-Low	Medium-Low	Low
4	High	Medium	Medium	Medium	High	Medium

* MNR does not have an aquatic representation framework. This assessment is based on the inclusion of significant brook trout lakes.

If more detailed planning takes place in future, the ecological values provided by the proposed zones could be enhanced by redesigning some of the boundaries to reflect considerations such as topography, representation gaps, rare species, localized habitats, and roads.

Criterion #1: Representation

Terrestrial representation

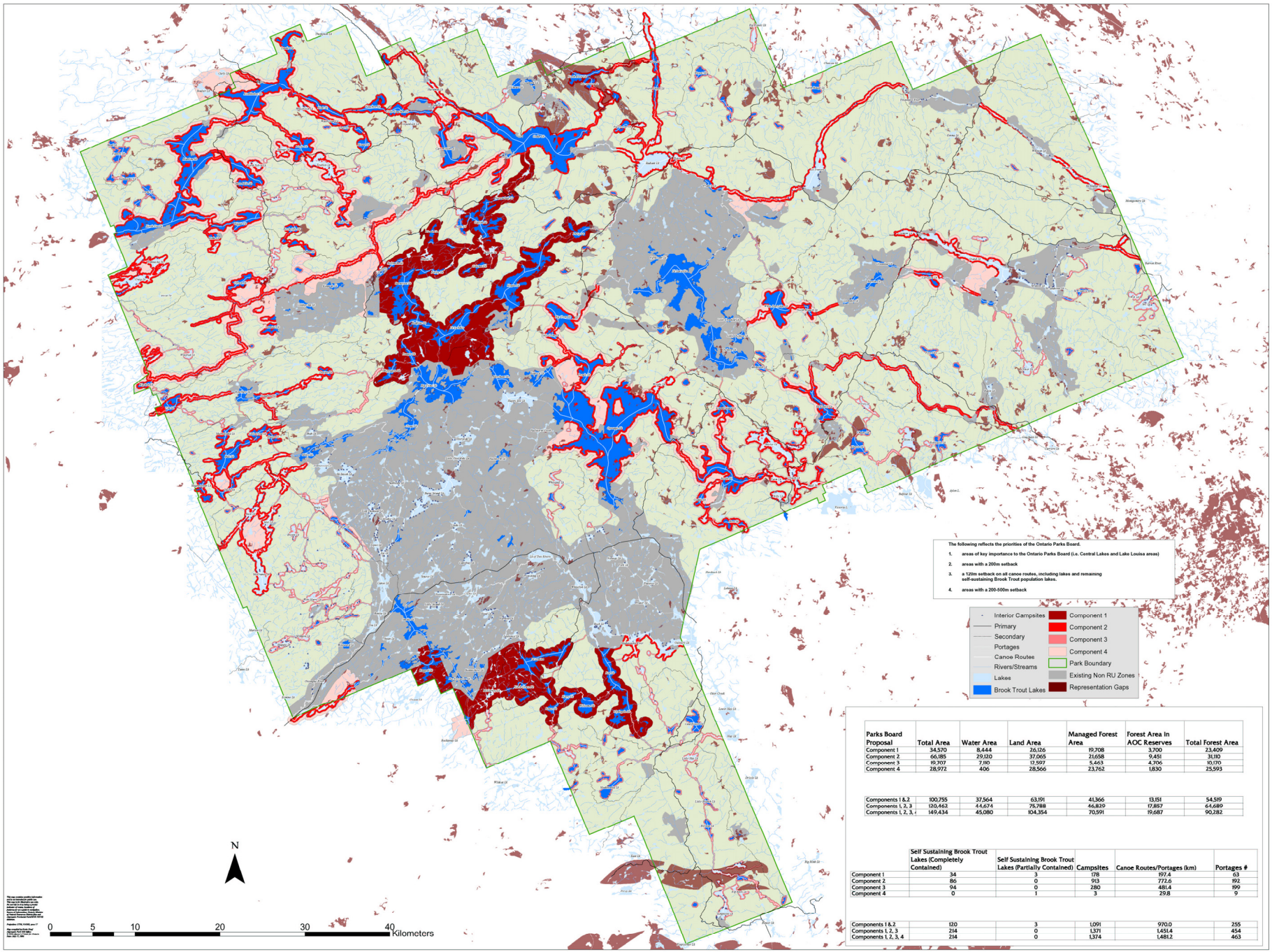
Ecological representation is based on the principle that the full range of Ontario's natural diversity should be systematically identified and protected. Fundamentally, protected area systems should include representative examples of the known biodiversity within ecologically defined regions. Examples of biodiversity that are not adequately represented within protected areas are known as gaps in representation.

Two different but complementary approaches to ecological representation are commonly applied in the Area of the Undertaking for Forest Management:

1. Representation based on landform/vegetation associations within ecodistricts, as developed by MNR. This methodology and results are described below.
2. Representation based on protected area criteria within enduring features, as developed by World Wildlife Fund Canada. This methodology and current assessment are described in *Appendix 2: Representation based on WWF-Canada enduring features.*

For representing terrestrial features, MNR uses naturally occurring landform/vegetation associations as surrogates to represent the range of biodiversity. MNR's requirements are to represent at least 1% or 50 hectares of each naturally-occurring landform/vegetation (L/V) association within each of Ontario's 71 ecodistricts. These are minimum requirements, and do not imply adequacy of representation (Crins and Kor, 2000).

Algonquin Park lies within Ecodistricts 5E-9 and 5E-10. To assess ecological representation for these ecodistricts, MNR used its recently-developed *GapTool* (Davis, 2006) and current spatial data sets that describe landforms, vegetation, ecodistricts, and protected areas.



Parks Board Proposal	Total Area	Water Area	Land Area	Managed Forest Area	Forest Area in AOC Reserves	Total Forest Area
Component 1	34,570	8,444	26,126	19,708	3,700	23,409
Component 2	66,185	29,120	37,065	21,658	9,451	31,110
Component 3	19,707	7,140	12,597	5,463	4,706	10,170
Component 4	28,972	406	28,566	23,762	1,830	25,593
Components 1 & 2	100,755	37,564	63,191	41,366	13,151	54,519
Components 1, 2, 3	120,462	44,674	75,788	46,829	17,857	64,689
Components 1, 2, 3, 4	149,434	45,080	104,354	70,591	19,687	90,282

	Self Sustaining Brook Trout Lakes (Completely Contained)	Self Sustaining Brook Trout Lakes (Partially Contained)	Campsites	Canoe Routes/Portages (km)	Portages #
Component 1	34	3	178	197.4	63
Component 2	86	0	913	772.6	192
Component 3	94	0	280	481.4	199
Component 4	0	1	3	29.8	9
Components 1 & 2	120	3	1,091	970.0	255
Components 1, 2, 3	214	0	1,371	1,451.4	454
Components 1, 2, 3, 4	214	0	1,374	1,481.2	463

Figure 1: Ontario Parks Board zoning proposal and currently under-represented terrestrial landform/vegetation features

Landform/vegetation associations were portrayed using the best available geological and vegetation information. In Ecodistricts 5E-9 and 5E-10, landforms are based on Ontario Geological Survey maps of quaternary geology, which are classified into a set of 20 landforms. In accordance with normal procedures, three of these landforms – cultural deposits, water, and unclassified – were omitted from the gap analysis. Vegetation is based on Forest Resources Inventory (FRI) data, which is classified into a set of 48 vegetation classes based on tree species composition and non-forest attributes. Of these, four vegetation types – open water, developed agricultural land, unclassified, and recent cutovers – were omitted from the gap analysis, also as normal.

Based on this information, Ecodistrict 5E-9 contains 288 naturally occurring landform/vegetation associations. Of these, 184 occur in Algonquin Park. The most common L/V association in Ecodistrict 5E-9 is "Precambrian intermediate to acidic bedrock / sugar maple forest", which occupies 230,962 hectares (over one quarter of the ecodistrict).

Ecodistrict 5E-10 contains 379 naturally occurring L/V associations. Of these, 200 occur in Algonquin Park. The most common L/V association in Ecodistrict 5E-10 is "Precambrian intermediate to acidic bedrock / white pine - red pine forest", at 55,606 hectares.

The analysis included all regulated and recommended provincial parks and conservation reserves. Within Algonquin Park, only the Wilderness, Nature Reserve, Natural Environment, and Historical Zones were considered protected. Algonquin's Recreation/Utilization, Access, and Development Zones were not considered to be protected.

Figure 1 shows the locations of currently under-represented landform/vegetation associations in and around Algonquin Park.

Table 3 summarizes the under-represented landform/vegetation associations that are contained within the Board's zoning proposal. *Table* 4 summarizes how these protecting these features would contribute to terrestrial representation for Ecodistricts 5E-9 and 5E-10.

Table 3: Under-represented landform/vegetation associations within zoning proposal components

Component	Number of different under-represented L/V associations contained (# of features)	Area of under-represented L/V associations contained (ha)
Ecodistrict 5E-9 (West side of Algonquin and surroundings)		
Component 1	25	268
Component 2	36	438
Component 3	36	342
Component 4	33	412
Ecodistrict 5E-10 (East side of Algonquin and surroundings)		
Component 1	6	61
Component 2	60	1,210
Component 3	52	334
Component 4	39	381

Table 4: Contribution of zoning proposal components to landform/vegetation representation

Zoning scenario	Size of regulated protected areas within ecodistrict (ha)	L/V associations represented to minimum requirements (#)	Area of all L/V association representation requirements achieved (ha)
Ecodistrict 5E-9 (West side of Algonquin and surroundings)			
Current Zoning	101,862 ha (11.6%)	90 of 288 (31.2%)	9,841 of 16,577 ha (59.4%)
Component 1	135,662 ha (15.5%)	93 of 288 (32.3%)	10,069 of 16,577 ha (60.7%)
Components 1 & 2	180,708 ha (20.6%)	98 of 288 (34.0%)	10,360 of 16,577 ha (62.5%)
Components 1, 2 & 3	193,732 ha (22.1%)	98 of 288 (34.0%)	10,670 of 16,577 ha (64.4%)
Components 1, 2, 3, 4	217,974 ha (24.9%)	101 of 288 (34.0%)	10,825 of 16,577 ha (65.3%)
Ecodistrict 5E-10 (East side of Algonquin and surroundings)			
Current Zoning	56,704 ha (7.1%)	95 of 379 (25.1%)	9,145 of 17,663 ha (51.8%)
Component 1	57,454 ha (7.2%)	96 of 379 (25.1%)	9,192 of 17,663 ha (52.0%)
Components 1 & 2	79,316 ha (10.0%)	112 of 379 (29.6%)	9,978 of 17,663 ha (56.5%)
Components 1, 2 & 3	85,920 ha (10.8%)	114 of 379 (30.1%)	10,169 of 17,663 ha (57.6%)
Components 1, 2, 3, 4	92,803 ha (11.7%)	117 of 379 (30.9%)	10,281 of 17,663 ha (58.2%)

Thus, the full proposal would complete minimum representation requirements for 11 additional landform/vegetation associations in Ecodistrict 5E-9, and 22 additional landform/vegetation associations in Ecodistrict 5E-10. Though not reflected in *Table 4,* the proposal would also bring the representation of other L/V associations closer to the 1% / 50 hectare threshold.

These representation achievements are relatively modest for these reasons:

1. Many of the under-represented terrestrial features in the two ecodistricts occur only outside of Algonquin Park *(Figure 1)*, so cannot be addressed in this exercise.
2. Several of Algonquin's current Wilderness and Nature Reserve Zones are focussed on representing terrestrial features. As a result, many terrestrial features with the Park are already represented to minimum requirements.
3. The proposal focuses on Algonquin's west side, with 116,112 hectares in protective zoning proposed in Ecodistrict 5E-9 and 36,099 hectares in Ecodistrict 5E-10. More under-represented features occur on Algonquin's east side, within Ecodistrict 5E-10.
4. With a couple of minor exceptions, the components have not been adjusted to include adjacent or nearby under-represented features, and the boundaries cut through many under-represented features. Representation could be improved with some minor adjustments to these proposed zone boundaries. *Appendix 1:* provides a list of the under-represented features (i.e., representation gaps) contained within each of the components, and those located close to the components.
5. The proposal focuses on protecting aquatic functions and recreational values, rather than representing terrestrial features. However the Board has recommended that MNR "maintain a 2,000- to 3,000-hectare budget for the completion of the Nature Reserve system in Algonquin, in areas where representation gaps have been identified outside of the Board's priority areas". As shown in *Figure 1,* several large concentrations of

representation gaps are not addressed in this zoning proposal. These are described in *Table 5.*

Table 5: Large concentrations of under-represented features not addressed in proposal

Location	Predominant L/V associations
North River Lake, Merganser Lake to Big George Lake	Precambrian basic-intermediate bedrock / sugar maple forest, open marsh/fen/bog
Cedar Lake to Rana Lake Nature Reserve Zone	Precambrian basic-intermediate bedrock / white & red pine, other forest types
North of Petawawa River near Schooner Rapids	Organic deposits, glaciofluvial outwash / black spruce, tamarack, other forest types
West-southwest of Radiant Lake	Precambrian basic-intermediate bedrock / sugar maple, other forest types
Crotch Lake to Alsever and Chainy Lakes	Organic deposits, Precambrian basic-intermediate bedrock / sugar maple, black spruce, other forest types
East and southwest of Wilkins Lake	Organic deposits / sugar maple, red maple, other forest types
North of Big Rock and Kingscote Lakes	Precambrian basic-intermediate bedrock / sugar maple, other forest types

Thus, many of the large representation gaps are areas of Precambrian basic-intermediate bedrock. Only a portion of these features would need to be protected in order to meet minimum representation requirements.

If the Board's recommendation that MNR "maintain a 2,000- to 3,000-hectare budget for the completion of the Nature Reserve system in Algonquin, in areas where representation gaps have been identified outside of the Board's priority areas" is adopted, representation could be improved through additional planning, with consideration of features listed in *Table* 5 and *Appendix 1.*

Aquatic representation

As outlined in *Nature's Best* (OMNR, 1997), it is an MNR natural heritage objective "to identify, evaluate and select areas that embody the provincially significant geological, aquatic and terrestrial diversity of the Province." *Nature's Best* (OMNR, 1997) provides a broad outline of the elements of aquatic diversity that are to be represented, as follows:

> Aquatic diversity can be described, in general terms, at five main levels of organization: drainage basins and watersheds, waterbodies, biological communities, species of aquatic organisms, and genetic diversity.

MNR has not completed the development of an aquatic representation framework. In lieu of such a framework, this assessment is based on the protection of significant brook trout lakes.

The proposal focuses largely on protecting some of Algonquin's 262 brook trout lakes. Algonquin Park has one of North America's best remaining naturally self-sustaining complexes of intact brook trout populations. The most recent independent audit for the Algonquin Park Forest (KBM, 2003) noted that "virtually all the naturally reproducing brook trout lakes in the

Recreation/Utilization Zone have road access within 500 metres". In fact, Components 2 and 3 of the Board's proposal, which are 200-metre and 120-metre buffers around important waterways, contain over 80 kilometres of primary and secondary roads *(Table 7)*, and presumably additional tertiary roads. Pending more detailed planning, some existing roads may be closed or realigned in the future, reducing access to brook trout lakes.

Table 6 summarizes brook trout lake representation within Algonquin Park, currently and under the Board's proposed zoning.

Table 6: Representation of self-sustaining brook trout lakes

Zoning scenario	Brook trout lakes completely enclosed within protective zoning (#)	Brook trout lakes partially enclosed within protective zoning (#)	Brook trout lakes with no protective zoning (#)
All of Algonquin Park – Total of 262 brook trout lakes			
Current zoning	48 lakes (18.5%)	38 lakes (14.6%)	174 lakes (66.9%)
Component 1	82 lakes (31.3%)	33 lakes (12.6%)	147 lakes (56.1%)
Components 1 & 2	168 lakes (64.1%)	11 lakes (4.2%)	83 lakes (31.7%)
Components 1, 2 & 3	262 lakes (100%)	0 lakes	0 lakes
Components 1, 2, 3, 4	262 lakes (100%)	0 lakes	0 lakes

Thus, the proposal would complete protective zoning for all 262 naturally self-sustaining brook trout lakes in Algonquin Park:

- Component 1, the Central Lakes and Lake Louisa areas, contain a significant number of self-sustaining brook trout lakes. Those in the Central Lakes are particularly significant because their brook trout populations are relatively genetically intact.
- Component 2 proposes 200-metre protective zoning for many brook trout lakes, and so also contributes substantially to aquatic representation in this respect.
- Component 3 proposes 120-metre protective zoning for the remaining brook trout lakes not included in Components 1 and 2. Though narrow, this buffer provides some degree of enhanced hydrologic protection in comparison with current forest management guidelines.
- Though Component 4 does not increase the number of brook trout lakes enclosed, it provides substantively enhanced protection for many that are minimally enclosed by other components. This is discussed more fully under *Criterion #4: Ecological functions.*

Criterion #2: Condition

An underlying principle of Ontario's protected areas system is to secure the best examples of the full range of the province's natural heritage. The ecological condition of a site helps to determine its significance within an ecodistrict. The conservation value of an area is considered inverse to the level of ecosystem modification, so the focus is on anthropogenic disturbances.

Table 7 summarizes the length of primary and secondary roads, areas of timber harvesting since 1975, and number of gravel pits in each component.

Table 7: Anthropogenic disturbances within zoning proposal components

Zoning com-ponent	Land Area (ha)	Length of roads (km)		Timber harvesting 1975-2005 (ha)	Gravel pits (#)		Campsites (total of 3,490 in park)	All trails & portages (km)
		Primary	Secondary		Active	Historic		
Comp. 1	26,126	3.8	24.4	14,364	2	11	178	45.6
Comp. 2	37,065	27.9	21.2	11,085	1	11	913	198.4
Comp. 3	12,597	11.4	20.6	3,713	0	1	280	249.9
Comp. 4	28,566	21.7	12.6	14,847	2	12	3	24.1

Table 7 also summarizes the backcountry campsites and trails within the components. Though recognized as important park values, these recreational developments and their uses do have some impacts on the ecological condition of these areas. Ideally, we also would have considered other anthropogenic disturbances such as:

- Tertiary roads
- Waterway crossings, such as dams, culverts, bridges
- All terrain vehicle (ATV) usage
- Non-native species
- Utility corridors
- Structures such as hydro facilities, cabins, and hunt camps

As evident from *Table 7,* considerable industrial activities have taken place in these areas. In particular, Components 2 and 3, which are 200-metre and 120-metre buffers around important waterways, contain over 80 kilometres of primary and secondary roads.

If more detailed planning takes place, boundaries could be reviewed to consider tertiary roads and other anthropogenic disturbances such as those listed above.

Criterion #3: Diversity

Diversity refers to the heterogeneity of landscapes and species within a proposed site. Sites with greater variety of physical habitats tend to support a wider array of biodiversity because of the range of habitat conditions they provide.

We assessed landscape diversity based on the number and distribution of naturally-occurring landform/vegetation associations (*Table 8).* We assumed that landform/vegetation associations in specific components were natural. There is little variation among components in this respect.

Because this assessment involved no fieldwork component, we lacked information to assess diversity at the species level. However, known occurrences of provincially rare species are documented in the *Criterion #5:* Special features section.

Table 8: Landscape diversity of proposal components based on landform/vegetation features

Zoning component	Area of component (ha)	Naturally-occurring L/V associations (#)
Ecodistrict 5E-9 (West side of Algonquin) – Total of 288 L/V associations		
Component 1	33,800	108
Component 2	45,046	125
Component 3	13,024	117
Component 4	24,242	120
Ecodistrict 5E-10 (East side of Algonquin) – Total of 379 L/V associations		
Component 1	750	29
Component 2	21,862	147
Component 3	6,604	134
Component 4	6,883	119

Criterion #4: Ecological functions

Ecological functions refer to the ecological role of the site within the broader context of the surrounding landscape and watershed. These, in part, determine how well a feature is being maintained within the boundaries of the protected area. For example, if a proposed protected area includes a large wetland or a brook trout lake, this criterion considers whether its headwaters are protected.

Ecological functions are assessed here in terms of:

- Hydrological functions
- Size, shape and connectivity
- Confirmed old growth trees

The primary ecological value around which the Board's zoning proposal is designed is lakes that support naturally self-sustaining brook trout populations. The zoning proposal generally has taken a buffering approach, using 120-metre, 200-metre, and 500-metre buffers along water bodies that are considered to be of importance for natural brook trout populations.

Brook trout are known to require groundwater seepage at different life history stages. For example, adult brook trout seek out shallow groundwater seepage areas for spawning in the autumn of each year. Groundwater inputs are critical to the maintenance of stream brook trout populations by providing sufficient base flow levels and maintaining low water temperatures.

We conducted a preliminary examination of the microwatersheds supporting these lakes through the use of 1:50,000 scale topographic maps. These maps, although coarse in scale, provide a guide as to the lay of the land (topographic highs, etc.) and the main stream, pond, and lake systems.

Generally, the buffering approach has done a relatively good job of incorporating the microwatersheds that feed those brook trout lakes that do not, themselves, constitute headwater lakes. There are small portions of each proposed sub-zone that would benefit from some minor

re-design, however, to take account of the local headwaters. These minor adjustments could help to maximize the ecological integrity of the proposed zones.

The 500-metre protective buffers in Component 4 provide a precautionary approach. A 500-metre buffer has a much higher probability of protecting the source water for these hydrological systems than the narrower buffers in Components 2 and 3. The proposed 500-metre protective zones are likely to eliminate the risk of disturbance to unmapped streams, seeps or recharge zones which in turn may influence groundwater dynamics in the lakes.

The hydrologic characteristics of lake basins are determined largely by geology and topography. These features, of course, are not linear in nature. A more ecologically based approach would be to model the heights of land adjacent to all brook trout water bodies, based on a digital elevation model, and use this line to ensure protection of the hydrological integrity of such waters. The resulting variable-width boundary would be somewhat analogous to a skyline or viewshed reserve, but would be based on protection of local hydrological features, in keeping with stated values, and also with the protected area selection and design principle of maintaining ecological functions. *Table 9* includes a summary of these considerations.

Conservation science holds that smaller, more isolated protected areas are less likely to maintain ecological integrity than larger, more connected ones. Larger, connected protected areas help facilitate movement of organisms without having to cross barriers such as roads or developed areas, and disturbance events such as fires or blowdown are not likely to affect the whole area at once. Thus, sites that adjoin or connect existing protected areas are favoured for protection. Regularly shaped protected areas also have less perimeter, generally leading to fewer adjacency issues such as blowdown, nest parasitism, predation, and changes in micro-climate.

Wilderness zones within provincial parks generally constitute relatively large consolidated blocks of lands and waters. Components 2 and 3 depart from that approach in some ways, being focused on buffers adjacent to water bodies. Components 1 and 4 contain substantial blocks of land around focal lakes, or are contiguous with other wilderness zones and nature reserve zones. Components 2 and 3 tend to be narrower, more linear corridors; however, these corridors do provide connections to existing or proposed wilderness and nature reserve zones. *Table 9* includes a summary of these considerations.

To help assess the proposal in terms of old growth forest, we reviewed a recent report (Henry and Quinby 2006). This review is documented in *Appendix 3: Assessment of confirmed old growth trees. Table 9* includes a summary of these considerations.

Table 9: Assessment of ecological functions

Zoning component	Brook trout protection	Shape	Connectivity	Confirmed old growth trees
Component 1	High	High	High	High
Component 2	High	Medium	High	Medium
Component 3	Medium	Low	Medium	Low
Component 4	Medium	High	High	High

Criterion #5: Special features

This selection criterion relates primarily to populations of species and vegetation communities known to be rare in Ontario, and localized features important to their persistence.

The Board's proposal focuses on self-sustaining brook trout lakes on the west side of the park. Localized features important to the persistence of brook trout include lakes capable of supporting self-sustaining populations, seeps, springs, and spawning areas.

A secondary focus of the proposal is the protection of wood turtle and Blanding's turtle populations on the east side. Important localized features for these species include nesting sites and hibernacula. Wood turtles prefer to nest in sandy-gravely deposits along watercourses and for that reason are attracted to nearby gravel roads. Wood turtle require three specific habitat components: sufficiently deep sections of river for hibernating; open exposed banks or beaches for nesting; and a wide diversity of riparian vegetation. Recent genetic work from Ontario shows very little genetic isolation between populations – which means that either these populations are managing to intermix, or that these genes mutate very slowly. Recent research also concludes that wood turtles are not disturbance dependent.

Also as noted earlier, if all of the proposed components are incorporated within protective zoning, the proportion of brook trout lakes fully protected (within the protective zoning categories, Wilderness, Nature Reserve, Natural Environment) in the park will increase from the current 18.5% to 100% *(Table 6)*.

Components 2 and 4 afford some protection to wood turtle and Blanding's turtle populations near waterways on the east side of Algonquin. Component 2 would provide 200-metre waterway buffers without logging activities or new roads. Although this likely would help to reduce mortality, traffic on existing roads would continue to be a problem unless further measures were taken. Component 4 would strengthen this protection by providing a wider buffer around some waterways, and by connecting several existing nature reserve zones, thereby allowing turtles to move more safely between habitat components.

In addition to brook trout and wood turtle, a number of provincially rare species have been reported in some of the proposed protective zones. *Table 10* summarizes what is known of the occurrences of provincially rare species by component. Sensitive species are not listed here.

In addition to these occurrences of provincially rare species, the Eastern wolf (*Canis lycaon*) [S4, Special Concern] is known to occur throughout the entire park. Given the sizes of wolf pack territories, it can be presumed that Eastern wolves are found in each proposed zone, at least during parts of each year.

Table 10: Occurrences of provincially rare species (excluding sensitive species)

Component	Species	MNR Status	Location
Component 1	Ski-tailed emerald	S3? – Vulnerable?	Longer Lake
	Eastern milksnake	S3 – Vulnerable	Hogan Lake
	Beaverpond clubtail	S2 – Imperilled	Along Louisa Creek
	Least clubtail	S3 – Vulnerable	"

Component	Species	MNR Status	Location
	Brush-tipped emerald	S3 – Vulnerable	"
	Ocellated emerald	S3 – Vulnerable	"
	Lake emerald	S2S3 – Imperilled/Vulnerable	Southwest of Lake Louisa
	Moustached clubtail	S3 – Vulnerable	Ragged Lake
	Ski-tailed emerald	S3? – Vulnerable?	Big Porcupine Lake
	Red-shouldered hawk	S4B – Special Concern	South of Lake Louisa
Component 2	Braun's holly-fern	S3 – Vulnerable	Laurel Lake
	Deepwater sculpin	S4 – Apparently secure	Cedar Lake
	Moustached clubtail	S3 – Vulnerable	Radiant Lake
	Brush-tipped emerald	S3 – Vulnerable	"
	Forcipate emerald	S2 – Imperilled	"
	Boreal snaketail	S3 – Vulnerable	"
	Rusty snaketail	S3 – Vulnerable	"
	Eastern milksnake	S3 – Vulnerable	"
	Cloud sedge	S3 – Vulnerable	Lake Travers and Poplar Rapids
	Least clubtail	S3 – Vulnerable	"
	Williamson's emerald	S3 – Vulnerable	"
	Long-stemmed waterwort	S3 – Vulnerable	Petawawa River from Lake Travers to Crooked Chute
	Clinton's club-rush	S2 – Imperilled	"
	Extra-striped snaketail	S2 – Imperilled	"
	Threadfoot	S2 – Imperilled	Petawawa River northwest of McManus Lake
	Northern Long-eared Bat	S3? – Vulnerable?	Butt Lake
	Northern Long-eared Bat	S3? – Vulnerable	Little Trout Lake
	Blanding's turtle	S3 – Vulnerable	Rain Lake
	Red-shouldered hawk	S4B – Special Concern	"
	Least clubtail	S3 – Vulnerable	Crow River
	Moustached clubtail	S3 – Vulnerable	Opeongo R. north of Booth Lake
	Clamp-tipped emerald	S2 – Imperilled	Godda Lake
	Williamson's emerald	S3 – Vulnerable	"
	Shortjaw cisco	S2 – Imperilled	White Partridge Lake
	Long sedge	S3 – Vulnerable	Bonnechere R. south of Basin Lk
	Thread-like naiad	S2 – Imperilled	Barron River
	Least clubtail	S3 – Vulnerable	"
	Moustached clubtail	S3 – Vulnerable	"
	Rusty snaketail	S3 – Vulnerable	"
Component 3	Blanding's turtle	S3 – Vulnerable	Sec Lake
Component 4	(no known occurrences)		

In summary:

- Components 1 and 2, and to a lesser extent Components 3 and 4, include features important to the persistence of brook trout

- Components 2 and 4 include features important to the persistence of Blanding's turtles and wood turtles
- Components 1 and 2 contain the most known occurrences of provincially rare species.

If more detailed planning takes place, zone boundaries could be reviewed to consider occurrences of species at risk and localized features important to their persistence.

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References

Crins, W.J. and P.S.G. Kor. 2000. Natural heritage gap analysis methodologies used by the Ontario Ministry of Natural Resources: Version 2.0. Open File Natural Heritage Technical Report 2000-1. Ontario Ministry of Natural Resources, Lands and Natural Heritage Branch, Natural Heritage Section, Peterborough, Ontario. 27p.

Davis, R.G. 2006. GapTool users guide. Ontario Ministry of Natural Resources, Peterborough, Ontario. 51p + app.

Henry, M. and P. Quinby. 2006. A Preliminary Survey of Old-Growth Forest Landscapes on the West Side of Algonquin Provincial Park, Ontario. Research Report No. 32. Ancient Forest Exploration & Research.

Iacobelli, T., H. Alidina, A. Blasutti and K. Kavanagh. 2003. A landscape-based protected areas gap analysis and GIS tool for conservation planning. World Wildlife Fund Canada. Toronto, Ontario. 30p.

KBM Forestry Consultants Inc. 2003. Algonquin Park Forest Independent Forest Audit 1997-2002. Prepared for the Ontario Ministry of Natural Resources by KBM Forestry Consultants Inc. 38p + app.

Ontario Ministry of Natural Resources. 1997. Nature's Best: Ontario's Parks & Protected Areas – A Framework and Action Plan. Queen's Printer for Ontario. 41p.

Appendix 1: Locations of contained and nearby under-represented L/V associations

Zoning component	Under-represented L/V associations contained (# and ha):	Locations of under-represented L/V associations contained:	Locations of nearby under-represented L/V associations not contained:
Component 1	Ecodistrict 5E-9: 25 features 268 ha Ecodistrict 5E-10: 6 features 61 ha	Catfish Lake Calumet Lake Perley Lake Plumb Lake Robinson Lake Burntroot Lake Redpine Lake Lake La Muir Hogan Lake Philip Lake Big Porcupine Lake Lake Louisa	Narrowbag Lake Redpine Lake Shippagew Lake Hogan Lake Philip Lake Rence Lake Welcome Lake
Component 2	Ecodistrict 5E-9: 36 features 438 ha Ecodistrict 5E-10: 60 features 1,210 ha	Craig Lake Amable du Fond River north of Kioshkokwi Lake Mouse Lake Cauchon Lake Hurdman Lake West end of Cedar Lake (mostly) South side of Cedar Lake (mostly) South of Gibson Lake along Nipissing River (mostly) East of Gibson Lake north of Nipissing River (partly) Northeast of Rain Lake Crow River northeast of Big Crow Lake (rest in 500 m buffer) Between Proulx and Little Crow Lakes (rest in 500 m buffer) Northeast end of Proulx Lake (rest in 500 m buffer) Creek east of Proulx Lake (partly) Boot Lake (partly) Farm Lake (3 small polygons) West side of McKaskill Lake Grand Lake (8 polygons) North of Barron River (mostly contained)	Lauder Lake Whitebirch Lake Mink Lake Hurdman Creek North side of Cedar Lake to Rana Lake (major gap) South side of Devil's Chute Nature Reserve Zone North River and Merganser Lakes (major gap, mostly not contained) North River from North River Lake to Allan Lake (mostly not contained) East of Big George Lake West end of Radiant Lake Southeast side of Radiant Lk Petawawa River southeast of Schooner Rapids, south side South side of McManus Lake East side of Birchcliffe Lake (mostly not contained) Tim River south of Longbow L East of Queer Lake Bonnechere River west of Hydro-line (3 polygons) (partly contained) Bonnechere River south of Basin Lake to park boundary (7 polygons) (partly contained) Clemow Lake (2 polygons) (partly contained)

Zoning component	Under-represented L/V associations contained (# and ha):	Locations of under-represented L/V associations contained:	Locations of nearby under-represented L/V associations not contained:
Component 3	Ecodistrict 5E-9: 36 features 342 ha Ecodistrict 5E-10: 52 features 334 ha	Several under-represented features are partly contained, but are listed at right because less than half their area is contained	Kakasamic Lake (partly) South of Three-mile Lake West of Osler Lake (partly) North of Birchcliffe Lake (partly contained) Gouinlock Lake (partly) Small lake west of Gilmour Lk Southeast of Bissett Lake (partly contained) East of Gibson Lake (partly) Portage between Nipissing River and Lynx Lake (partly contained) Tim River southwest of Shippagew Lake South of Rence Lake (partly) Northwest of Madawaska Lk Between Madawaska River and Cauliflower Lake South of Little Hay Lake South of Hay Creek North of Skunkitten Lake North of Big Rock and Kingscote Lakes East of Big Rock Lake South of Cedar Lake South of Philip Lake East of Annie Bay Between Farm Lake and Shirley Lake (2 polygons) (partly contained) North of Mudville Lake (small amount contained) Thomas Lake Southeast of Thomas Lake Wright Lake portage (partly) North of Animoosh Lake (partly contained) Alsever and Chainy Lakes (small amount contained) Vireo Lake West of Wilkins Lake (2 polygons) East of Wilkins Lake South of Robitaille Lake East of Robitaille Lake South of Carcajou Bay West of Clover Lake South of St. Francis Lake

Zoning component	Under-represented L/V associations contained (# and ha):	Locations of under-represented L/V associations contained:	Locations of nearby under-represented L/V associations not contained:
Component 4	Ecodistrict 5E-9: 33 features 412 ha Ecodistrict 5E-10: 39 features 381 ha	North Tea Lake Craig Lake Kioshkokwi Lake South of Winifred Lake along Nipissing River Southwest of Loontail Lake along Nipissing River South of Nadine Lake along Nipissing River Along Nipissing River south of Carl Wilson Lake (partly contained) South side of Nipissing River southeast of Carl Wilson Lake Calumet Lake to Cedar Lake (3 small polygons) North of McCraney Lake West boundary south of Hwy. 60 (3 polygons) West of Proulx Lake South of Proulx Lake, north side of West Arm, Lake Opeongo (some in 200 m buffer) Between East and West Arms of Lake Opeongo North side of East Arm, Lake Opeongo (partly) East side of Annie Bay (partly) Hailstorm Creek to Graham Creek (5 polygons) (partly) Sproule Bay South of Round Island Lake (2 polygons) (partly) Between Booth Lake and Annie Bay (4 polygons) (mostly) North side of White Partridge Lake (partly) North Branch Lake (2 polygons) North of McKaskill Lake (3 polygons) (partly) Northeast side of Grand Lake (3 polygons) (partly)	South of Nadine Lake west of Nipissing River East of Nadine Lake north of Nipissing River (partly contained) Southeast of Carl Wilson Lake along Nipissing River South side of Crow River, northeast of Big Crow Lake North side of Crow River northeast of Big Crow Lake Northwest of Little Crow Lake Sprould Bay East side of Lake Opeongo (2 polygons) Round Island Lake (3 polygons) South of McCarthy Bay West of Shirley Lake North of Shirley Lake Shall Lake (3 polygons) (limited amount contained) South of North Branch Lake East side of McKaskill Lake (3 small polygons) Grand Lake

Appendix 2: Representation based on WWF-Canada enduring features

World Wildlife Fund Canada has developed an approach to ecological representation based on "enduring features". MNR and WWF-Canada recognize one another's approaches as useful and complementary in ensuring that the range of biodiversity is represented within protected area systems. The two approaches have been used together in conservation planning initiatives in Ontario such as Lands for Life and Forest Stewardship Council forest certification. From time to time, the organizations have worked together to prepare "overlapped gap maps" that show the representation priorities of both approaches. Under-represented features that coincide with both representation approaches may be considered the highest priority for protection.

The enduring features approach uses abiotic surrogates of biodiversity: surficial materials, topography, elevation, and shorelines. Because the approach is applied consistently across Canada, analyses are based on nationally available data sets, which tend to be coarser than those used in the MNR approach.

WWF-Canada defines an enduring feature as "a landscape element within a natural region characterized by relatively uniform origin of surficial material, texture of surficial material, and topography-relief". These features are derived from the Soil Landscapes of Canada. These enduring feature polygons are scored according to these criteria (Iacobelli *et al.* 2003):

1. Sizes of protected area vs. recommended sizes. Protected area sizes are based on the largest single block protected and total area protected. Recommended sizes were derived using fire disturbance information.
2. Connectivity and adjacency of protected areas. Protected area sizes are based on contiguous complexes that intersect the enduring feature. Recommended sizes were derived using fire disturbance information.
3. Environmental gradients: Percentage of elevation classes within enduring feature protected.
4. Inclusion of important physical habitat types: Proportion of shorelines and riparian corridors within enduring features protected.
5. Habitat quality: Density of roads and utility corridors within protected areas.

Thus, the approach incorporates some protected area design principles such as size, shape and connectivity, which are addressed under *Criterion #4:* Ecological functions in the MNR approach. Based on the total scores, each enduring feature is categorized as either A: Adequately represented; B: Moderately represented; C: Partially represented; or D: Little or no representation.

Figure 2 shows the results of WWF-Canada's representation assessment for Ecodistricts 5E-9 and 5E-10. Similar to the MNR representation approach, the enduring features analysis shows that the west side of Algonquin is better represented than the east side, and that some of the largest representation gaps are concentrated outside the Park. Within the Park, the WWF-Canada analysis highlights three enduring features with "little or no representation" *(Figure 2)*.

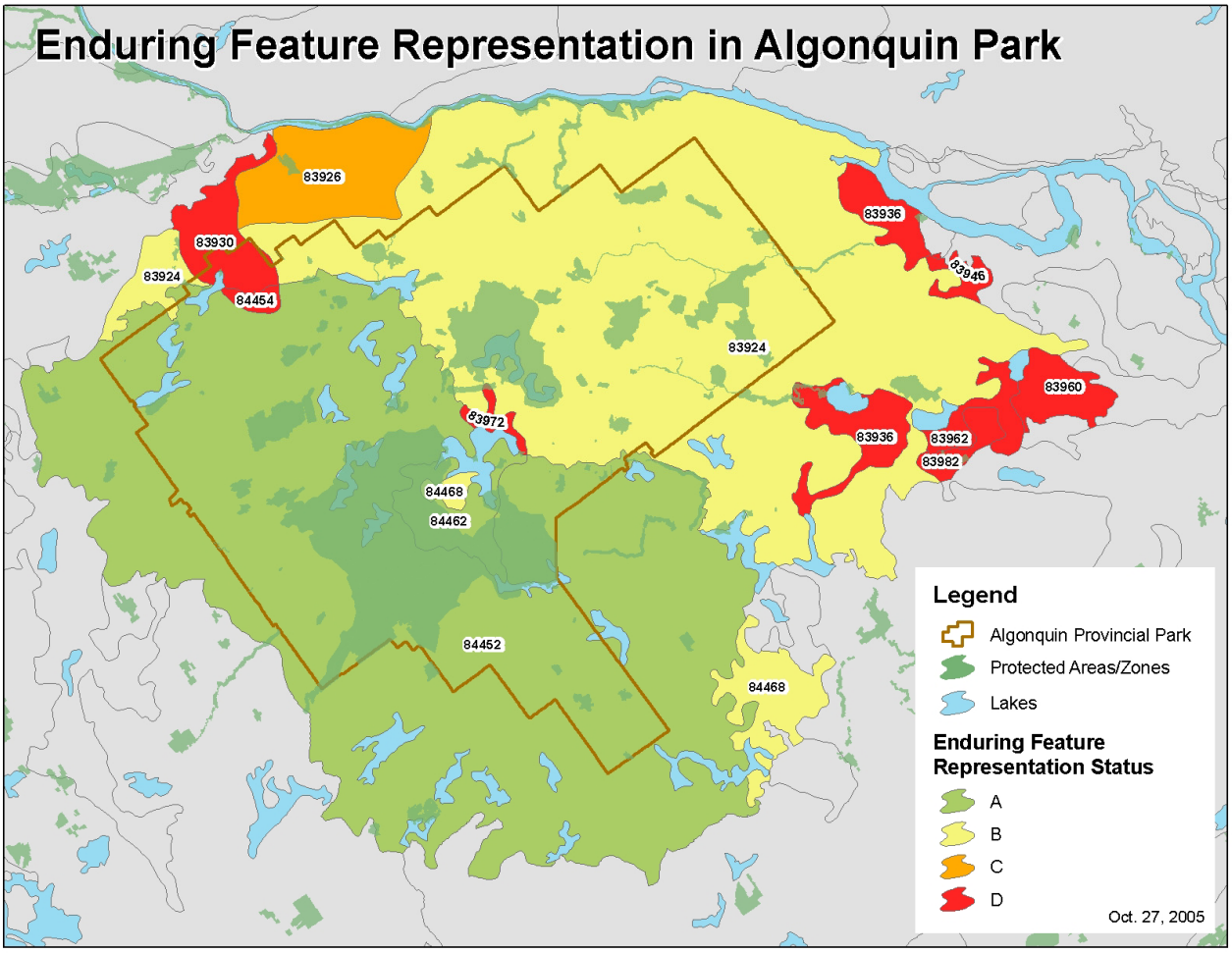

Figure 2: Ecological representation based on WWF-Canada's enduring features approach

Enduring feature 83972 in Ecodistrict 5E-10 extends north of the East Arm of Opeongo Lake to the Crow Lake Blowdown Nature Reserve Zone, and includes the Opeongo Red Pine Nature Reserve Zone. Small portions of this enduring feature are included within Components 2 and 4 of the Board's proposal. This area contains several MNR representation gaps, most of which are not included in the Board's proposal.

Enduring features 84454 (Ecodistrict 5E-9) and 83930 (Ecodistrict 5E-10) encompass the eastern portion of Kioshkokwi Lake to the Park boundary, and include Lauder, Whitebirch, Mink and Cauchon Lakes. Portions of these enduring features are included within Components 2 and 4 of the Board's proposal. This area contains some MNR representation gaps north of Cauchon Lake that are not included in the Board's proposal.

Based on visual inspection, portions of Components 2 and 4 occur in all three of these enduring features with "little or no representation". More significant portions of Components 2 and 3 also occur in Ecodistrict 5E-10 which is categorized as "moderately represented". We did not have access to WWF-Canada's tool called "AoR Analyst" to assess whether the Board's proposal would be sufficient to change the representation status of these areas. If desired, this analysis could likely be conducted through working with WWF-Canada.

Appendix 3: Assessment of confirmed old growth trees

To help assess the Board's zoning proposal in terms of old growth forest, we reviewed a recent report released by a group called Ancient Forest Exploration & Research (Henry and Quinby 2006). The report is titled "A Preliminary Survey of Old-Growth Forest Landscapes on the West Side of Algonquin Provincial Park, Ontario."

In preparing this report, the group sought out areas of old growth forest based on existing documents and visited several sites. This report does not provide a systematic assessment of old growth, but rather an opportunistic survey. The report does include recommendations to conduct a complete inventory of old growth, and to protect those areas within Algonquin Park.

Roughly half of the old growth sites confirmed by Henry and Quinby (2006) are within existing Wilderness and Nature Reserve Zones. The Board's proposal lines up well with the remainder of the sites they visited, as follows:

Cache Lake South area

- Sampled trees 1-16 all are found within the Harness Lake Wilderness Zone, south of Highway 60 and east of Smoke Lake.

Big Trout – Shippagew area

- Tree 17 is in the Burnt Island Wilderness Zone.
- Trees 18-21 are contained within Component 1, Central Lakes area.

Burntroot Lake area

- Trees 22-30 all are within Component 1, Central Lakes area.

Nadine Lake area

- Trees 31 and 32 appear to be within Component 2, the 200-metre buffer of the canoe route running from Little Osler Lake north toward Erables Lake . It is possible these trees are just beyond 200 metres within Component 4, the 500-metre buffer.
- Trees 33-37 are within the Nadine Lake Nature Reserve Zone.

Erables Lake area

- Trees 38-44 are all situated within Component 4, the 500-metre buffer along the west shore of Erables Lake.

Thus, all of the measured trees are contained within either existing protective zoning, or proposed protective zoning. *Table 9* summarizes our assessment of these considerations for each component. These findings were factored into our assessment of *Criterion #4: Ecological functions.*