Environmental Commissioner of Ontario

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Application For Review

Section 61, *Environmental Bill of Rights*

General Information About This Application

Under section 67 of the *Environmental Bill of Rights* (*EBR*) the minister must consider each Application for Review in a preliminary way to determine whether the public interest warrants a Review of the issues raised in your Application. Among otl factors, the minister must consider:

1. The ministry Statement of Environmental Values;
2. The potential for harm to the environment if the Review applied for is not undertaken;
3. The fact that matters sought to be reviewed are otherwise subject to periodic review;
4. Any social, scientific or other evidence that the minister considers relevant;
5. Any submission from a person who may be directly interested in the Review who has been notified about the Review;
6. The resources required to conduct the Review; and
7. Any other matter the minister considers relevant.

If the decision asked to be reviewed was made within the last five years with public participation consistent with the *EBR*, the minister will not determine that the public interest warrants a Review. This provision does not apply where it appears to the minister that there is other evidence that failure to review the decision could result in significant harm to the environment and that this evidence was not considered when t decision sought to be reviewed was made.

The personal information requested in this Application is gathered under the legislati authority of the *EBR*. All the information requested on this form is required by the *E.* for the minister to determine whether an existing policy, Act, regulation or instrumer of Ontario should be reviewed, or to decide whether there is a need for a new policy, Act or regulation.

The *EBR* does not allow the Environmental Commissioner of Ontario or the ministry disclose personal information about applicants. The *EBR* protects the personal information provided by applicants. Applicants' personal information may be disclos if the Review results in further government action outside of the *EBR* such as:

- a prosecution, or
- other administrative action

For more information on the requirements of this Application and how to use the *EB.* please contact:

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Instructions

1. **Type or print clearly in ink.**
2. **Ensure both applicants provide proof of Ontario residency.**
3. **Ensure both applicants sign and date the Application.**
4. **Answer all the questions.**
5. **Keep a copy of the Application and any supporting documents for your files.**
6. **Submit your original Application and supporting documents to the Environmental Commissioner of Ontario.**

1. Applicant Number One

►Wilton	Mike	L.
Last Name	First Name	Initial
RR#1		
Address		Apartment
Spring Bay	ONTARIO	P0P 2B0
City	Province	Postal Code
(705-377-5072)		( )same
Residence Telephone		Business Telephone

Declaration of Ontario Residency:

I _Michael L. Wilton am an Ontario resident and have been since May 14th, 1937
(Print Name) (Month, Year)

_____

(Date) (Signature)

2. Applicant Number Two

Euler	**David**	**L.**
Last Name	First Name	Initial
RR#4		

Address		Apartment
Echo Bay	ONTARIO	P0S 1C0
City	Province	Postal Code
(705-248-1494)		( )same
Residence Telephone		Business Telephone

Declaration of Ontario Residency:

I David L. Euler am an Ontario resident and have been since __August 1973_____
(Print Name) (Month, Year)

_____

(Date) (Signature)

#1(a) We request a review by the Ministry of Natural Resources of existing policies, namely,

Provincial Parks and Conservation Reserves Act, 2006. (Specifically, Sections 16 and 17)

OMNR. 2010. Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales. Toronto: Queen's Printer for Ontario. 211 pages. (Specifically, Section 4.2.1. (page 62).

OMNR. 2010. Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales – Background and Rationale for Direction. Toronto: Queen's Printer for Ontario. 575 pages. (Specifically, Section 4.2.1,(pages 167-171).

#2 the Ministry of Natural Resources should undertake a review to protect the environment because insufficient protection is provided against possible logging damage to ensure habitat sustainability for known and potential lacustrine (lake-inhabiting) brook trout *Salvelinus fontinalis* populations in Algonquin Provincial Park.

By exempting Algonquin Provincial Park from the ban on logging in all other Ontario Provincial Parks and Conservation Areas, the Ministry of Natural Resources has not protected the Park's ecosystems consistent with its status as a Provincial Park. As a result, unique features such as the many self-sustaining brook trout populations found in Algonquin Park are not given special recognition.

In the Forest Management Guide for Preserving Diversity at the Stand and Site Scale (The Guide), misinterpretation of relevant scientific literature has resulted in insufficient protection for brook trout habitat. Application of The Guide will lead to unsustainable conditions within headwater catchment basins that are crucial to self-sustaining lacustrine (lake-dwelling) brook trout populations. Algonquin Park possesses more than 250 known self-sustaining brook trout lakes, one of the highest concentrations of lake-spawning brook trout populations in the world. The requirements of this species to achieve and maintain sustainable reproductive success are extremely demanding, sometimes depending on tiny nursery creeks that are not shown on any map and are not specifically mentioned in The Guide, or its accompanying document, The Stand and Site Guide Background and Rationale for Direction (Background Document).

#3 The following is a summary of the evidence that supports our Application For Review, by Topic.

The Provincial Parks and Conservation Reserves Act, 2006.

Algonquin Park should be subject to more stringent forest management guidance than all other Crown Forests in Ontario, if it is to retain its unique qualities. The Provincial Parks and Conservation Reserves Act, 2006 (ref. #3- "Parks Act")* states in Section 16 (1) "The following activities shall not be carried out on lands that are part of a provincial park or conservation reserve: 1. Commercial timber harvest … 4. Extracting aggregate, topsoil or peat ….". It further states in Section 17 (1) "Despite Section 16, timber may be harvested for commercial purposes in Algonquin Provincial Park …", and in section 18 (1), "Despite Section 16, (c) aggregate pits … that are authorized … may continue in accordance with existing licences".

Section 18(3-b) of the same Act states "…will ensure that the aggregate pits are managed so as to minimize environmental impacts and will be rehabilitated in a timely manner …" It is important to stress not only that aggregate removal will alter the level and flow patterns of groundwater (ref. #3- "Recharge-Discharge")*, but also that aggregate removal can never be sustainable, in the same way that vegetation can, and therefore cannot be rehabilitated, only "cosmetically landscaped".

***Reference material is available on the accompanying flash drive, where it is listed alphabetically by quoted title.**

Dr. A. Ernest Epp, a historian recently retired from Lakehead University, found the following quote as the original intended function of Algonquin Park:

> "Maintenance of Water Supply by preservation of the streams, lakes and watercourses in the Park; Preservation of a Primeval Forest through maintenance of the Park in a state of nature as far as possible, having regard to existing interests; and the preservation of native forests therein and of their indigenous woods as nearly as practicable; Protection of Birds and Animals in order to encourage their growth and increase; A Field for Experiments in Forestry, especially experiments in and practice of systematic forestry upon a limited scale; A Place of Health Resort which might serve as a sanitarium or place of health resort, since pine forests are of

> specific value in the cure of lung disease; and the Beneficial Effects of Climate in order to secure the benefits which the retention of a large block of forest would confer upon the climate and watercourses of the surrounding portions of the Province"[1].

From its beginning, Algonquin Park was given special provincial status, which should still be applied to this day. Over the years following the establishment of Algonquin Park, priorities have evolved, such that over 70% (the Utilization/Recreation Zone) of the Park is now managed primarily for wood production.[2] Good forest management can be compatible with the purpose of Algonquin Park, but separate stand and site guidance, specific to the Park, is warranted to ensure perpetuation of characteristics that are unique to Algonquin; in this instance, coldwater headwaters and self-sustaining brook trout lakes.

The Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales, and The Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales – Background and Rationale for Direction.

The "Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales", hereafter referred to as "The Guide", and the "Forest Management Guide for Preserving Biodiversity at the Stand and Site Scales – Background and Rationale for Direction", hereafter referred to as "The Background Document", are inter-dependent and will be discussed together.

A Summary of our Concerns:

1- No mention is made in the Guide or Background Document of nursery creeks, a critical component of self-sustaining brook trout populations.

2 – By misinterpreting aspects of the relevant literature the authors have underestimated the harmful effects of certain forest management practices.

3 - By allowing logging operations to proceed within the entire AOC (Area of Concern), other aspects such as the sustainability of successful brook trout reproduction will suffer, leading to eventual degrading as a result of negative cumulative effects over successive logging rotations.

4) - A glossary of terminology should be developed so that terms such as upwellings, seeps, lenses, "catchment", "sub-catchment", "watershed", "sub-watershed", "recharge area" and "discharge area" are clearly understood. A clear definition of "sustainable" in the context of The Guide and The Background Document should also be included.

5) – Terms such as "mitigate", "reduce" and "minimize" seek to foster the concept of sustainability, whereas they only mask the reality of successive reduction. These words should be replaced with words such as "eliminate" if true sustainability is sought.

6) – Extensive consideration into the science of genetics is warranted, especially into self-sustaining brook trout populations within the eight major watersheds that source on the Algonquin Dome.

7) – There is increasing evidence that logging can result in reduced soil-calcium levels, which in turn can negatively affect the aquatic food chain.

8) – Cumulative Effects can easily be overlooked through the passage of time and with changing personnel.

Epp, E. 2009. Before the Park was Created- the Settlement Era., In Algonquin Park: the human impact, Editors, D. Euler and M. Wilton. Algonquin Eco Watch,

[2] Ibid., Chapter 12

Discussion

Table 4.2a of (page 62) of The Guide (ref. #3- "The Guide") and Section 4.2.1(page 167) of the Background Document (ref. #3- "Background Document") deal with "groundwater recharge areas associated with brook trout spawning sites". However, there is no direct or specific reference to nursery creeks, the other necessary component of self-sustaining brook trout lakes. This is a necessary and integral part of successful self-sustaining brook trout reproduction. We deal with this sub-topic under "**Effects of Forest Management (Nursery Creeks)".**

Effects of Forest Management (Spawning Sites)

The authors of The Guide and The Background Document have misinterpreted the scientific literature, as illustrated in the following examples from the Background Document:

1). The Document contains the following quote from Curry and Devito (1996) (ref. #3- "Hydrogeology of Brook Trout etc.") who estimated the size of sub-catchments necessary to supply groundwater to maintain flow rates observed in brook trout nests; "These recharge areas may be up to 10 ha in size". This quote implies that recharge areas will never exceed 10ha in size. The authors of The Guide neglected to state that the study referred to a particular set of waters and that the recharge areas for those particular waters encompassed between 3 and 10 hectares. The full quote should have read as follows:

> Curry and Devito (1996) stated that "Recharge areas necessary to sustain discharge in the habitats were estimated to encompass 3-10 ha, or 1-97%, of the associated terrestrial catchment. A 90m buffer zone adjacent to the shoreline protected only 9-55% of the required recharge area. A hydrological approach to defining habitat protection measures is suggested."

The full quote from Curry and Devito (1996) should have been included, as it states that pre-set set-backs (areas of concern (AOCs)) are not practical, since each case must be considered individually. A further quote from the same paper states:

> "A 90m buffer zone would protect <9, <23, <55% of the recharge areas required to sustain the reproductive habitats at Dickson Lake, Meach Lake and Papineau Creek, respectively, assuming the critical areas for recharge are located adjacent to the nearshore zone."

Misconstruing the intent of the paper may have led to the decision to allow "regular harvest, renewal and tending operations" within the newly defined AOC.

2). The authors again quote Curry and Devito, 1996, "… it is even possible that harvesting may enhance groundwater discharge and increase the quality of spawning sites", which again is taken out of context because subsequent sentences say "Alternatively, a shallower water table could alter the temperature of groundwater delivered to the nearshore habitats and affect incubation success (Hokenson et al. 1973 (in Curry and Devito, 1996))" and "Stability may be jeopardized by fluctuating rates of groundwater discharge that occur after timber harvesting (Wright et al. 1990 (in Curry and Devito, 1996))."

Citations from the literature appear to have been chosen selectively so that the impact of timber harvesting within catchment basins can appear to be minimized.

Further, The Guide states under **Description**, "Groundwater recharge areas associated with known brook trout spawning sites ….", whereas the sentence should read "… known and potential spawning sites ….", since it is possible that potential sites may have either a small residual population that was

not detected, or that the population may have been extirpated by human activity such as logging or angling, but may be re-established via emigration from within the same watershed (ref. #3- "A phylogeographic survey of brook charr (Salvelinus fontinalis) in Algonquin Park, Ontario based upon mitochondrial DNA variation", ref. #3- "Addison and Wilson, 2010" and ref. #3- "Email from Chris Wilson").

Effects of Forest Management (Nursery Creeks)
Even though The Guide now states that "the mapped recharge area is an AOC", the fact that "regular harvest, renewal and tending operations are permitted within the AOC", virtually nullifies any protection that these tiny vulnerable nursery creeks require (see next paragraph – "Our Comments"). Lake-hatched brook trout fry require inflowing surface water (nursery creeks) during their first year of life, as protection against predators. These creeks must be pollution and silt-free, coldwater in nature, of constant flow (above and/or below ground) and with a plentiful invertebrate food supply (ref. #3- "A Summary of Brook Trout Spawning Requirements" and ref. #3- "Effects of Sediment Pulse etc."). More than half of nursery creeks identified (ref. #3 "Hydrogeology of Brook Trout etc.") were found to originate well beyond the (90m) AOC boundary, making them vulnerable to logging operations.

(From the Background Document)
Direction and Rational:
"Regular harvest, renewal and tending are permitted within the AOC … harvest is not likely to produce effects dramatically different from natural disturbances."

(Our comments) - Natural disturbances such as wind-throw or fire do not include wood removal, skidding or road building/maintenance within coldwater groundwater catchment basins, which are vulnerable to compaction and rutting unless protected within the AOC. The literature indicates that compaction as a result of skidding and road building can redirect groundwater flow upward to become surface water flow, which will result in erosion, silting and reduced groundwater flow to seeps and upwellings. Johnson and Beschta,1980 (ref.# 3- "Logging Infiltration Capacity etc.") found that areas that had been heavily disturbed 3-6 years previously – skid trails, cable log paths and places where slash had been windrowed by tractors and then burned – "had reduced infiltration capacity and increased erodibility but also had partially recovered to prelogging conditions". It should be noted that within both the Uniform Shelterwood and Selection harvest systems, logged areas within Algonquin Park are re-visited every 20-30 years (Algonquin Park Forester, pers. comm.) and unless there are extenuating circumstances, the same access corridors are used each time adding to previous compaction, an example of a cumulative factor through time.

Since operations may proceed within the AOC, and even though the AOC supposedly encompasses the nursery creek and portions of the lake catchment basin (recharge-discharge area)(ref. #3- "The Guide"), there is real concern that through time, with successive rotations, the integrity of the functioning self-sustaining properties may be repeatedly (cumulatively) compromised and ultimately lost. Terrestrial invertebrates are an important component of young brook trout diets, especially during the summer months, when aquatic invertebrates are limited (ref. #3- "Sweka and Hartman, 2008"). Therefore, increased machine activity leading to siltation can negatively affect the supply of terrestrial creek-borne invertebrates available as food to young brook trout during their first year of life up nursery creeks (ref. #3- "Effects of sediment pulse on inverts and trout"). In addition, it is inevitable that the presence of heavy machinery within the AOC and the entire catchment area will lead to the

accidental introduction of ground pollutants such as anti-freeze, hydraulic fluid and various petroleum products (ref.#3- "Illegal Camp"), with even the intentional introduction of sodium chloride (NaCl), or road salt occurring (Algonquin Forestry Authority, pers. comm.). This is especially dangerous in headwater areas, since flushing rate is always lowest in the upper reaches of any drainage system. By allowing all normal operations in that portion of the catchment area outside the recharge area, the possibility exists that the groundwater table may be negatively influenced with respect to lenses, seeps and upwellings. For example, a decline in the lake surface level resulting from aggregate extraction within the catchment area could expose lenses, seeps and upwellings to the air, rendering them unusable for spawning.

The repeated use of such words as "minimize", "reduce" and "mitigate" (as used in **Rationale for Direction** (and throughout The Guide and The Background Document**)** are misleading when referring to such problems as rutting within the AOC (recharge area), since this implies that damage can be acceptable with each successive 20-30 year rotation. Inevitably, through time such reasoning will give rise to an ever-diminishing acceptable benchmark (with attendant cumulative increasing compromise), ultimately resulting in failure of the self-sustaining properties. The use of the word "eliminate" in such instances is more likely to achieve sustainability, since complete protection of the catchment and recharge areas is the only certain way to maintain sustainability. Nursery creeks can be very tiny (ref. #3- "Brook Trout Nursery Creek") and even minimal disturbance, such as low-levels of siltation, chemical pollutants, temperature fluctuation or reduced flow, might render them unusable.

(Log) Landings and Aggregate Extraction
(From The Background Document) – "Landings and aggregate pits are not permitted within the AOC."

(Our Comments) –

It is contradictory to say that "the mapped recharge area is an AOC" on the one hand and then to say that "regular harvest, renewal, and tending operations are permitted within the AOC" on the other hand. While the former appears to be a major concession to self-sustaining brook trout lakes, the latter appears to withdraw the majority of protection. For example, it appears that the authors have not only misinterpreted much of the literature, but have failed to consider the ramifications of protecting entire recharge areas, which in many instances are of significant size and in some/many cases should be considered to include the entire sub-catchment and even catchment basin, especially in adjacent lakes where recharge areas may overlap (ref. #3- "A Group of Algonquin Park Headwater Lakes"). Whereas previous AOC's included "no cut" zones, no mention is made here of any such provision. Does this mean that "slope-to-shore" will no longer be a consideration within AOC's, since the AOC now encompasses the entire recharge area? If "no cut" zones are to still be considered, what are the parameters?

A comprehensive review of the hydrogeological aspects of coldwater headwater supply sources to known and potential self-sustaining brook trout lakes is warranted, as this is an aspect of fisheries management that experts acknowledge as being very incompletely understood (ref. #3- "Hydrogeology of Brook Trout etc." and ref. #3- "A summary of Brook Trout Spawning

Requirements"). This is further illustrated by the fact that even though there are many figures including illustrations in the Background Document relating to various aspects of forest management, plus the fact that the term "recharge area" is often used, nowhere were we able to find either a definition of that term or an illustration of that most significant phenomenon. The terms "recharge area" and "catchment (or sub-catchment as used in the literature)" are not or may not be synonymous, but the lack of definitions adds to the confusion. As of 1996, there were between 170 and 250 known self-sustaining brook trout lakes in Algonquin Park (ref. #3-2 "A Summary of Brook Trout Spawning Requirements" and ref. #3- "General Features of Brook Norm Quinn"). Since there are likely additional verifiable and potential lakes as yet unidentified, that means that there are more than 250 different scenarios involving known coldwater headwater recharge areas (AOC's) within the Park, all of which must be carefully preserved for the future, since each is unique. This aspect of hydrogeology is especially difficult to interpret, since it occurs underground and requires physical intrusion to be fully understood, after which the system may have been significantly altered. Further, protection within only the recharge area, rather than the entire catchment (or sub-catchment) area, could lead to degradation of the lake's self-sustaining capability.

Source Water

Two complex scenarios, representing "either end of the spectrum", have not been carefully thought through and warrant extensive review and discussion prior to Algonquin Park coming under the jurisdiction of the Forest Management Guide for Preserving Biodiversity at the Stand and Site Scale in 2015. These scenarios represent the problem that source water is a complex ecological interaction and needs careful study and consideration before it is included in a Guide or Document.

– A very significant physical law is that "The water table (groundwater) will follow the nap of the earth" (ref. #3- "recharge-discharge" and ref. #3- "Groundwater – Nap of the Earth, (fig. 7-1)"). A "small" aggregate deposit, of relatively steeper slope, adjacent to a small headwater lake, either in the form of glacial deposition such as an esker or a drumlin (ref. #3- "An Algonquin Park Headwater Lake" and ref. #3- "Aggregate Pit Adjacent to Headwater Lake"), or, in the form of generally higher elevation partially surrounding a larger headwater lake such as Dickson Lake (Curry and Devito, 1996) which supports multiple seeps or lenses and nursery creeks, will indicate that the groundwater level adjacent to the lake is elevated above the lake level. If a lense or lenses are present below the lake surface giving rise to upwellings, and if groundwater is giving rise to above ground flow upslope from the lake (a potential nursery creek), then the "stage is set" for a potential or already functioning self-sustaining brook trout lake, with the adjacent aggregate deposits providing the groundwater source. Disturbance of the adjacent groundwater source(s) can give rise to (at least) 2 resulting effects:
First. Removal of ground cover (trees, vegetation etc.) can reduce the amount of evapotranspiration, actually increasing groundwater availability and flow (ref. #3- "Dave Webster Hydrogeology in Algonquin Park"). However, conversely, lack of vegetative cover, as will occur during "regular harvest, renewal, and tending operations … within the AOC", can give rise to greater groundwater temperature and flow fluctuations since vegetative cover provides a "dampening effect" on these 2 variables (Hokenson et. al. 1973 and Wright at. al. 1990, in Curry and Devito, 1996).
Second. Since groundwater follows the nap of the earth, removal of aggregate, as for road building or maintenance, will alter the infrastructure or "bulk" of the aggregate deposit, with a corresponding lowering of the water table (groundwater source), which will in turn reduce groundwater flow to the potential or known self-sustaining brook trout lake (ref. #3- "Wilton Poster Presentation-5(B), from

"Algonquin Park: the human impact", Editors D. Euler and M. Wilton). Hatva (1994) (ref. #3- "Effect of Gravel Extraction on Groundwater") states that "Gravel extraction causes changes in seepwater, as well as in the elevation of the groundwater table and its variation".
It is likely that in the event of aggregate removal, nursery creeks would be negatively affected before upwellings, seeps and lenses as the nursery creeks arise from a higher elevation, i.e. further upslope. All variables must remain functional if the original self-sustaining "upwellings,-seeps-and-lenses-plus-nursery-creek" combination is to continue functioning.

We assume from diagrams available in the literature (ref. #3- "recharge-discharge" and ref. #3- "Groundwater-Nap of the Earth (Fig. 7-1)") that the division between two recharge areas is the height-of-land separating them. According to The Guide this boundary would supposedly represent the outer edge of the AOC of a smaller self-sustaining brook trout lake that depends on a single groundwater source, e.g. a single esker adjacent to the lake. However, if the outer boundary of the groundwater source is the top-centre of, say an esker, which will invariably be an excellent source of aggregate (as well as groundwater), then the far side of the esker becomes available as an aggregate source. Removal of aggregate from the "far side" of the esker will cause that groundwater source to lose infrastructure or bulk, consequently causing the water table to drop, leading to negative consequences for the self-sustaining brook trout lake. Obviously in cases like this, the entire groundwater source must be protected – placing the boundary of the AOC beyond the height-of-land and leading to an exception in The Guide.

In the case of a large lake, such as Dickson Lake (in Algonquin Park), which supports multiple spawning and rearing sites, the groundwater sources may flow from more than one recharge area or a large recharge area, creating a potentially extremely large AOC, particularly since aggregate removal from beyond the height-of-land could negatively affect the groundwater within areas like the Dickson Lake recharge area, which arguably supports the most significant self-sustaining brook trout population in Algonquin Park.

ADDITIONAL FACTORS:

Genetics

The loss of any self-sustaining brook trout population from within Algonquin Park would mean an unacceptable genetic loss and a serious abrogation of our responsibility to future generations.

Danzmann and Ihssen (1995) (ref. #3- "A phylogeographic survey of brook charr (Salvelinus fontinalis) in Algonquin Park, Ontario based upon mitochondrial DNA variation") suggest that Algonquin Park brook trout may be derived from 2 distinct ancestral origins. Further they feel that "hatchery females had minimal spawning success and/or their progeny had poor survivorship in the wild". This suggests that hatchery stocking in Algonquin Park has not diluted original genetic stock in self-sustaining brook trout lakes, and that extraordinary habitat protection efforts are warranted to ensure their future success. Addison and Wilson (2010) (ref. #3- "Addison and Wilson 2010") "… suggest that local watersheds may be the most appropriate management scale for lacustrine brook trout populations in watersheds where physical characteristics provide the potential for migration and gene flow". While this implies that unique genetic characteristics may be transmitted within a watershed, it

is unlikely that these would be transmitted across the eight major watershed barriers (heights-of-land) on the Algonquin Dome**, thus emphasizing the importance of preserving self-sustaining brook trout populations within the eight major watersheds (ref. #3- "Email from Chris Wilson").
Eight major rivers, i.e. the Muskoka, Magnetawan, South, Amable du Fond, Petawawa, Bonnechere, Madawaska and York, source on the Algonquin Dome (ref. #3- "Presentation1"), the high country between Georgian Bay and the Ottawa River, which consists in large measure of Algonquin Park.

** Algonquin Park managers attempting to introduce or rehabilitate a self-sustaining brook trout population should not use stock from another watershed within the Park.

Calcium Deficiency
There is serious concern among scientists that calcium deficiency resulting from excessive acid precipitation, plus low buffering capacity in granitic rock such as that found in Algonquin Park, is leading to reduced forest growth rates through successive rotations of commercial timber removal (ref. #3- "Watmough & Dillon FEM 2003" and ref. #3- "Shaun Watmough Presentation BOD Mtg. 2010").
Jeziorski and Yan (2006) (ref. #3- "Yan Papers–2") have identified that the aquatic food chain may be interrupted when crustacean zooplankton suffer insufficient calcium levels in softwater lakes.
Further, Cairns and Yan (2009) (ref. #3- "Norm Yan–1") state "The widespread decline in aqueous calcium (Ca) is emerging as a newly recognized stressor in freshwater ecosystems in regions with historically high acid deposition, especially when coupled with multiple logging cycles".
It is likely that the latter situation will be exacerbated by continued logging activity within coldwater headwater recharge areas, further suggesting that such activities are putting self-sustaining brook trout populations at risk. A moratorium on logging within recharge AOC's, as well as the surrounding catchment areas, should be considered, at least until this phenomenon is more completely understood.

Cumulative Effects
While simultaneous negative factors such as ground pollutants, soil compaction, calcium loss and aggregate removal, may not individually lead to measurable decline within recharge areas as well as the surrounding catchment areas, these factors in combination with recurring logging activity every 20-30 years constitute gradual negative influences that through time will lead to cumulative degradation.