MAINTAINING ECOLOGICAL INTEGRITY IN GREAT BEAR LAKE AND ITS WATERSHED

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EXECUTIVE SUMMARY

In May 2005, the Great Bear Lake Working Group completed its Great Bear Lake Watershed Management Plan (GBLWMP). The Working Group recommended that the Management Plan be given legal force through the incorporation of chapters 4 and 5 of the GBLWMP into the Sahtu Land Use Plan.

The central theme of the GBLWMP is that the ecological integrity of the GBLW must be maintained for generations to come. Thus, among other things, proponents of commercial activities within the GBLW would be required to demonstrate that all aspects of their proposed activities are consistent with the maintenance of the ecological integrity of the GBLW. This test sets a higher standard than that currently in force in the GBLW or than that currently proposed in Draft 2 of the Sahtu Land Use Plan. This standard is necessary, however, to ensure that ecosystem health and function in the GBLW are protected and that the vision of the Sahtu people as expressed in the GBLWMP are realized.

Ecological integrity refers to the maintenance of the ecological functions of natural systems, and their long-term persistence without significant change to the ecosystem. Ecological integrity is defined in the GBLWMP as ecosystem health, or the natural condition of an ecosystem. Protecting ecological integrity means maintaining and protecting the various elements of an ecosystem such that the interactions between the biotic and abiotic (or living and non-living) elements of an ecosystem are not disrupted. An ecosystem that exhibits ecological integrity is able to recover from disturbance and return to a state that is "normal" for that ecosystem type.

The Great Bear Lake Working Group chose the concept/standard[1] of ecological integrity because of the very close fit between this concept and the concept of Déline's elders that the GBLW is one living system that we have a collective responsibility to protect. The concept of ecological integrity is a way of reconciling the traditional law of the Sahtugot'ine and the wider system of Canadian law currently in force in the GBLW.

Ecological integrity is a well-established concept. It is commonly used in the scientific literature. It is often used to assess impacts and threats to ecosystem and population persistence. The concept is based on the understanding that ecosystems with high ecological integrity support the full natural range of ecological functions and attributes of an ecosystem. The concept of ecological integrity provides a quantitative measure of the impacts of natural resource use on natural ecosystems that is defensible in terms of science and traditional knowledge/law.

The application of the concept of ecological integrity in the GBLW would likely have to develop in stages, as we gain experience in assessing and monitoring ecological integrity.

[1] To avoid having to repeat the expression "concept/standard of ecological integrity", this paper uses the words "concept" and "standard" interchangeably, to refer both to the concept of ecological integrity and to an enforceable standard of ecological integrity.

Through such experience, we can gradually develop a cohesive system for assessing, monitoring, and maintaining ecological integrity in the GBLW — and potentially throughout the Sahtu settlement area, if the concept is used in the larger Sahtu Land Use Plan.

In the short term, assessment of the ecological integrity impacts of proposed developments would need to be done on a case-by-case basis. In the mid term, the maintenance of ecological integrity in the GBLW provides an opportunity to develop a comprehensive system to protect ecological integrity and improve the environmental performance and reputation of the mineral and oil and gas industries in the GBLW. Such a system could include third party certification of mining and oil and gas activities. A systematic approach to maintaining ecological integrity in the GBLW and the development of a certification scheme would provide guidance for proponents, provide consistency, and could be used to increase the value of mineral, oil, and gas products as consumers adapt to paying higher prices for environmentally sustainable and certified products.

The forestry sector in many parts of southern Canada (and indeed throughout the world) provides us with an example of the successful application of the concept of ecological integrity and third party certification. Concerns regarding the degradation of forest ecosystems and the maintenance of ecological integrity in the forestry sector have led to the development of independent third-party certification standards to guide forest management practices. Pressures from the public, the environmental community, and global timber markets are encouraging forestry companies to pursue forest certification as a means of demonstrating the responsible management of their forestry operations. Certification is voluntary and allows certified companies to market their forest products as coming from a well-managed forest. This includes the use of the certifier's logo and allows companies to sell their products at a higher price.

The Forest Stewardship Council (FSC) is accepted internationally as the most environmentally rigorous forest management certification system available. The maintenance of ecological integrity is a fundamental tenet of the FSC certification system and is required by the FSC Canada Boreal Standard. Certification under the FSC system is gaining popularity in Canada and around the world. For example, in 2004 the Ontario government announced its intent to require the certification of all long-term forestry operations in Ontario by 2007. The majority of these operations are now certified. Currently, about half of the certified forests in Ontario are certified under the FSC system. The Ontario Ministry of Natural Resources has also developed a Collaborative Action Plan with FSC to reduce redundancies in audit requirements and facilitate the application of the FSC system in Ontario's forests.

The concept of ecological integrity is less commonly used in the oil, gas, and mining industries. However, the maintenance of ecological integrity during oil, gas, and mineral exploration and development is particularly important, given the finite nature of these activities. Non-renewable resource extraction operations do not persist in the long term.

After termination or abandonment of oil, gas, and mining activities, we will need to continue to use the land and must ensure that ecosystems are left intact.

While there are some examples of acknowledgment of or interest in the application of the ecological integrity standard in the oil, gas, and mining industries, ecological integrity is not yet a commonly used standard in these industries, and the maintenance of ecological integrity has yet to be required in the NWT.

The evaluation of the on-the-ground impacts of mineral and oil and gas exploration and development on ecological integrity is fundamentally important to the maintenance of the health of northern ecosystems. The mining and oil and gas industries are part of the northern economy. We thus need to find a balance between the exploitation of mineral and oil and gas resources and the maintenance of the integrity of our natural ecosystems. This balance has not yet been achieved.

Protecting ecological integrity in the GBLW presents an opportunity to develop a system to ensure the maintenance of the ecological integrity of the ecosystems on which we depend. Such a system could be developed collaboratively by the Sahtu Land Use Planning Board, community/aboriginal representatives, government, ENGOs, industry stakeholders and scientific and traditional knowledge experts. Demonstrating the maintenance of ecological integrity has both ecological and economic benefits and represents the future of sustainable land use in northern Canada. As we use our natural resources we must ensure that we do so without damaging the integrity of the ecosystems on which we rely.

The use of the concept of ecological integrity in the GBLWMP — and potentially in the Sahtu Land Use Plan as a whole — is also consistent with the larger resource management regime in the Sahtu Settlement Area as a whole. Ecological integrity statements and standards would fit very well with the environmental assessment and regulatory regimes already in place in the Sahtu Settlement Area.

1 INTRODUCTION

Great Bear Lake (GBL) lies along the Arctic Circle in the central Northwest Territories, Canada. It is the ninth largest lake in the world in terms of surface area (31,326 square kilometers) and volume (2,292 cubic kilometers). Although historically it has experienced some mining impacts on its eastern shore, GBL is likely one of the last relatively pristine very large lakes in the world today. Great Bear Lake and its watershed (GBLW) are also the homeland of the "Sahtugot'ine" (the "people of Sahtu — or Great Bear Lake"). The lake's exceptionally cold water, high levels of dissolved oxygen, and low biological productivity make it a rare and potentially vulnerable ecosystem type (Great Bear Lake Working Group 2005). This homeland and rare example of pristine wilderness should be managed responsibly to ensure the maintenance of the ecological functions and character of the ecosystem. The maintenance of a clean, healthy environment in the GBLW implies the maintenance of the ecological integrity of this ecosystem.

From 2002 to 2005, the Great Bear Lake Working Group produced its Great Bear Lake Watershed Management Plan (GBLWMP): "The Water Heart": A Management Plan for Great Bear Lake and its Watershed (Great Bear Lake Working Group 2005). The Working Group was an *ad hoc* coalition of Déline elders and representatives of the Déline First Nation, the Déline Land Corporation, the Déline Renewable Resources Council, the Déline Self-Government Team, the Déline Uranium Team, the federal Departments of the Environment, Fisheries and Oceans and Indian Affairs and Northern Development, the territorial Department of Environment and Natural Resources, the Sahtu Land Use Planning Board, the Sahtu Renewable Resources Board, the Mackenzie Valley Environmental Impact Review Board, and the Canadian Parks and Wilderness Society - NWT Chapter. The Sahtu Land & Water Board was an observer of the management planning process.

The GBLWMP sets out the consensus of the Great Bear Lake Working Group on the future management of GBL. The Management Plan is based on the common concern of the Working Group that GBLW be kept "clean and bountiful for all time" (Great Bear Lake Working Group 2005). However, the GBLWMP has not been formally approved and has as yet no legal force.

The GBLW lies within the Sahtu settlement area, an area now governed by a constitutionally-recognized treaty — the Sahtu Dene and Metis Comprehensive Land Claim Agreement (SLCA) — as well as by several pieces of legislation.

Part 25.2 of the SLCA establishes the negotiated parameters of a comprehensive and potentially very powerful system of land use planning in the Sahtu settlement area. This system of land use planning is arguably the heart of the resource management regime established by the SLCA. As a negotiated element of a constitutionally-recognized treaty, we need to attend very carefully to the elements of this system. We need to give the elements of the SLCA's system of land use planning a large and liberal interpretation,

consistent with the fundamental objective of treaty law and section 35(1) of the *Constitution Act, 1982*. In *Mikisew Cree*, the Supreme Court of Canada said:

> The fundamental objective of the modern law of aboriginal and treaty rights is the *reconciliation* of aboriginal peoples and non-aboriginal peoples and their respective claims, interests and ambitions: *Mikisew Cree First Nation v. Canada (Minister of Canadian Heritage)* [2006] 1 C.N.L.R. 78 (S.C.C.) at paragraph 1 [emphasis added].

Section 25.2.9 of the SLCA establishes the force of an approved land use plan:

> 25.2.9 Upon approval of a land use plan, those authorities with jurisdiction to grant licences, permits, leases or interests relating to the use of land and water in the settlement area shall conduct their activities and operations in accordance with the plan.

Section 25.2.4 of the SLCA is particularly important for the purposes of this paper and the GBLWMP. This section establishes, among other things, the fundamental purpose of land use planning; the need to pay special attention to the well-being and rights of participants; the need to involve communities directly; the balance that must be struck between conservation and development; and the legitimacy of focusing on Great Bear Lake and its watershed. Section 25.2.4 reads:

> 25.2.4 The following principles shall guide land use planning in the settlement area:
>
> (a) the purpose of land use planning is to protect and promote the existing and future well-being of the residents and communities of the settlement area having regard to the interests of all Canadians;
>
> (b) special attention shall be devoted to:
>
> (i) protecting and promoting the existing and future social, cultural and economic well-being of the participants;
>
> (ii) lands used by participants for harvesting and other uses of resources; and
>
> (iii) the rights of participants under this agreement;
>
> (c) water resources planning is an integral part of land use planning;
>
> (d) land use planning shall directly involve communities and designated Sahtu organizations; and
>
> (e) the plan developed through the planning process shall provide for the conservation, development and utilization of land, resources and waters.

The Great Bear Lake Working Group was in consensus that the ecological integrity of the GBLW should be protected for generations to come. It sought to achieve this and give legal force to the GBLWMP through the incorporation of Chapters 4 and 5 of the Management Plan into the Sahtu Land Use Plan. The Working Group thus recommended the Management Plan to the Sahtu Land Use Planning Board in May 2005.

Although the SLCA was signed in 1993, a Sahtu Land Use Plan has yet — 16 years after the fact — to be finalized and approved. On April 30 2009, the Sahtu Land Use Planning Board released Draft 2 of its Sahtu Land Use Plan. In this draft, the Board recognized the possibility of treating the GBLW as a separate planning area, administered according to the GBLWMP, which would be incorporated into and given legal force through the Sahtu Land Use Plan. But the Board also noted questions as to whether the Management Plan is "approvable as is" (Sahtu Land Use Planning Board 2009).

The central theme of the GBLWMP is that the ecological integrity of the GBLW must be maintained. The Management Plan proposes that several Conservation Zones be established in the GBLW, and that the remainder of the watershed (including GBL itself) be managed as a Special Management Zone. Sections 4.5.2a&b and section 4.5.3(a)(i) (which pertain to the Special Management Zone) of the GBLWMP state:

> 4.5.2.a. The GBLW is part of the natural and cultural heritage of the Sahtugot'ine, other Canadians, and indeed the world. The lake and its watershed must be protected for generations to come. The conservation of renewable resources and the maintenance of the ecological and cultural integrity of the GBLW must be the first priority in all management decisions affecting the lake and its watershed. All activities in the GBLW must be consistent with the maintenance of the ecological and cultural integrity of the GBLW.
>
> 4.5.2.b. The management of the Special Management Zone must also accommodate the use, by Déline individuals/organization and others, of renewable and non-renewable resources, provided that such use is consistent with the terms of the SLCA and the policies, conditions and prohibitions of this Management Plan. Wherever possible, proponents and the appropriate authorities must act to prevent adverse impacts. Applicants for permits, licences and other authorizations in the Special Management Zone must *demonstrate* to the appropriate authorities, including, as the context requires, the SLUPB, the MVEIRB, the SL&WB, the SRRB, the DLC and authorized inspectors, that all aspects of their activities are consistent with the maintenance of the ecological and cultural integrity of the GBLW and, without limiting the generality of the foregoing, with the conditions and prohibitions set out in Parts 4.5.3, 4.5.4 and 4.6.2 below. …
>
> 4.5.3.a Through the conditions they attach to permits, licences and other authorizations in the Special Management Zone, the Sahtu Land and Water Board and other appropriate authorities shall ensure that each authorized party or the prospective assignee of that party:
>
> > i. establishes and maintains a site-specific research and monitoring program that is appropriate to the nature and scale of its proposed activity(ies) and adequate to demonstrate that all aspects of its activity(ies) are consistent with the maintenance of the ecological integrity of GBLW ecosystems; … (Great Bear Lake Working Group 2005).

According to the GBLWMP, all activities in the Special Management Zone (and indeed throughout the GBLW) must maintain the ecological integrity of the ecosystem. To ensure that the purposes of the GBLWMP and section 25.2.4 of the SLCA are achieved, applicants for permits and licences in the GBLW would be required to *demonstrate* that all aspects of their activities are consistent with the maintenance of ecological integrity in that ecosystem. This would require an initial assessment of the potential impacts of development and subsequent monitoring of these impacts to assess their extent and magnitude. The maintenance of ecological integrity can only be demonstrated by assessing and monitoring the *on-the-ground* impacts of activities in the GBLW.

The standard of ecological integrity is a higher one than that currently in force in the GBLW, or than is currently recommended in Draft 2 of the Sahtu Land Use Plan. This higher standard is consistent, however, with section 25.2.4 of the SLCA. It also reflects the uniqueness of the GBLW ecosystem and the concern for the maintenance of the ecology of this ecosystem expressed by the various members of the Great Bear Lake Working Group, including Déline's elders. This standard would also appear to be consistent with the purpose of Draft 2 of the SLUP, as expressed in its vision. This vision includes a commitment to sustainable resource development that does not adversely affect the land, waters, and wildlife of the SSA (Sahtu Land Use Planning Board 2009). It expresses a desire to maintain a clean, healthy environment for future generations.

This paper examines the feasibility of using the concept of ecological integrity in the management of the GBLW. It addresses the concern that ecological integrity may be "vague" or "unenforceable". It discusses:

- **the concept of ecological integrity and the potential use of this concept, as set out in the GBLWMP, in the management of the GBLW; and**
- **the increasing use of the concept of ecological integrity nationally and internationally, particularly in the forestry sector, and the growing demand on the part of consumers and governments that resource developments be certified according to ecological integrity standards.**

Please note that, for the sake of brevity, this paper does not discuss the concept of cultural integrity (or resident and community well-being, as set out in section 25.2.4 of the SLCA and in section 4.5.2.a&b of the GBLWM). Note also that this version of the paper includes a final section for those interested in how an ecological integrity statement might be prepared.

2 ECOLOGICAL INTEGRITY

Ecological integrity is defined in Section 4.1 of the GBLWMP as ecosystem health, or the natural condition of an ecosystem (Great Bear Lake Working Group 2005). The GBLWMP states that an ecosystem has ecological integrity when:

- the structure and function of the system (or the particular collection of species in the system and the processes by which they are related) are not impaired by human-induced stresses; and
- the system retains its resilience, in the sense that the diversity of organisms in it and the processes that support them are likely to persist." (Great Bear Lake Working Group 2005)

The Great Bear Lake Working Group chose the concept of ecological integrity because of the very close fit between this concept and the concept of Déline's elders that the GBLW is one living system that we have a collective responsibility to protect. The concept of ecological integrity is a way of reconciling the traditional law of the Sahtugot'ine and the wider Canadian legal system — including the evolving values of Canadian society that the latter legal system is to represent. We live, as Déline's elders and scientists throughout the world have informed us, in one global ecosystem to which we need better to adapt.

As the concept is used in the scientific literature, ecological integrity refers to the maintenance of the ecological functions of natural systems, and their long-term persistence without significant change to the ecosystem. Ecological integrity has been defined as "the capacity of an ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar, undisturbed ecosystems in the region" (Karr and Dudley 1981). Protecting ecological integrity means maintaining and protecting the various elements of an ecosystem such that the interactions between the biotic and abiotic (or living and non-living) ecosystem elements are not disrupted. An ecosystem that exhibits ecological integrity is able to recover from disturbance and return to a state that is "normal" for that ecosystem type.

Ecological integrity is a well-established ecological concept. It is commonly used in the scientific literature. It is often used to assess impacts and threats to ecosystem and population persistence (Nel et al. 2009). The concept is based on the understanding that ecosystems with high ecological integrity support the full natural range of ecological functions and attributes of an ecosystem (Karr and Chu 1995). The concept of ecological integrity thus provides a quantitative measure of the impacts of natural resource use on natural ecosystems that is defensible according to science and traditional knowledge/law.

Ecological integrity is used as a measure of ecosystem health and environmental impacts in various sectors including conservation planning (Mattson and Angermeier 2007), freshwater ecology (Nel et al. 2009), the oil and gas sector (ENR, EC, INAC 2009), and the commercial forestry sector (FSC Canada Working Group 2004).

The application of the concept of ecological integrity in these sectors can provide us with some guidance as to how ecological integrity may be maintained in the NWT while allowing for the continued development of natural resource-based economies.

3 APPLICATION OF EI IN THE GBLW

The application of the concept of ecological integrity in the GBLW may have to develop in stages, as our experience in assessing and monitoring ecological integrity improves in the GBLW. Through such experience, we can gradually develop a cohesive system for assessing, monitoring, and maintaining ecological integrity in the GBLW.

3.1 SHORT TERM

In the immediate term, assessment of the ecological integrity impacts of proposed developments would likely need to be done on a case-by-case basis. Applicants for land use permits would prepare ecological integrity statements or assessments as part of their permit applications, for review by the Sahtu Land Use Planning Board. These statements should include:

i. **Activities:** Describe the nature, scope, and location of proposed activities.

ii. **Values/Indicators:** Describe ecological integrity values or indicators for the proposed project.

   a. These ecological integrity indicators should include species with special conservation status or ecological importance, habitat values, and water quality indicators. A rationale should be provided for the selection of each ecological integrity indicator. It may be useful for applicants to consider the Valued Components chosen by the NWT Cumulative Impact Monitoring Program when selecting these indicators to allow for the exchange of mutually beneficial data.

iii. **Potential Impacts:** Assess the potential impacts of the proposed development of the chosen ecological integrity indicators.

iv. **Objectives:** Identify specific objectives (or required outcomes) for the maintenance of ecological integrity in the GBLW.

v. **Monitoring:** Detail an ecological integrity monitoring plan that should include baseline studies begun prior to development activities and that should be continued after these activities have finished.

vi. **Contribution to EIA:** Be prepared according to similar methodologies and be useful in meeting the requirements of environmental assessment — albeit to the higher standard of ecological integrity — in force in the wider Sahtu Settlement Area.

3.2 MID TERM

In the mid term, the maintenance of ecological integrity in the GBLW provides an opportunity to develop a comprehensive system to protect ecological integrity and improve the environmental performance and reputation of mining and oil and gas exploration and development in the GBLW. This system would certify that companies operating in the GBLW were maintaining the ecological integrity of the ecosystem. Such a certification system would draw on the lessons learned from the experiences of proponents preparing ecological integrity statements in the GBLW, those reviewing those statements, and environmental certification systems in other sectors. As discussed below, certification has become common in other industrial sectors such as forestry and is starting to develop in the mining sector in other countries.

An environmental certification system for companies operating in the GBLW would provide both environmental and economic benefits. Such a system could be developed collaboratively by local communities, the Sahtu Land Use Planning Board and other regional management authorities, government, ENGOs, the mining and oil and gas sector and the scientific and traditional knowledge communities. A certification system would provide clarity and guidance for proponents preparing ecological integrity statements and for those evaluating those statements. It would also provide economic benefits to proponents. The mining and oil and gas industries sometimes have a negative reputation in Canada and in other parts of the world. A certification system that included independent third party audits would allow companies to assure consumers that they are not adversely affecting the natural environment through their exploration and development activities. This sort of assurance has been demonstrated to be something for which consumers are willing to pay a higher price. A certification system would also help companies assure themselves that they are operating in an environmentally responsible manner.

4 EXPERIENCES IN CERTIFICATION: FORESTRY

Concerns regarding the degradation of forest ecosystems and the maintenance of ecological integrity in the forestry sector have led to the development of independent third-party certification standards to guide forest management practices. Pressure from the public, the environmental community and global timber markets is encouraging forestry companies to pursue forest certification as a means of demonstrating the responsible management of their forestry operations. Certification is voluntary. It allows certified companies to market their forest products as coming from a well-managed forest. This includes the use of the certifier's logo and allows companies to sell their products at a higher price.

Certification that requires the maintenance of ecological integrity has been successfully applied in the forestry sector in Canada and around the world. The Forest Stewardship Council (FSC) is an international organization that sets standards for ecologically and socio-economically sustainable forest management. The FSC forest management

standard is accepted internationally as the most ecologically rigorous certification standard (FSC Canada 2009). The FSC certifies forest management to a benchmark standard developed collaboratively by individuals and organizations involved in forest management. While FSC has developed 10 Principles and Criteria for forest management internationally, regional standards are developed to reflect the characteristics of the relevant forest type (FSC Canada Working Group 2004).

FSC Canada has developed the National Boreal Standard as a basis for certifying forests within the Canadian boreal forest. The Standard identifies practices that should be employed in a well-managed Canadian boreal forest. It sets out principles, criteria, and indicators that must be met in a forest that is being considered for certification. It also requires that the landscape level impacts of forest management be taken into account, even though the larger landscape is not included in the forest management area to be certified. Unlike other certification regimes, the FSC certifies individual forests rather than forest management companies, and thus the granting and renewal of certification depends on the impacts of forest management on the ground. **This paper discusses the FSC Canada National Boreal Standard as it was designed for an ecosystem type found in much of the NWT.**

The maintenance of ecological integrity is a fundamental tenet of the FSC certification standard. FSC defines ecological integrity as "the quality of a natural, unmanaged or managed ecosystem in which the natural ecological processes are sustained, with genetic, species, and ecosystem diversity assured for the future" (FSC Canada Working Group 2004). Forest managers must commit to the protection and maintenance of the ecological integrity of the forest in the long-term (FSC Canada Working Group 2004). Principle 6 (Environmental Impact) of the National Boreal Standard explicitly addresses the effects of forest management activities on the ecological integrity of the management area. The objective of this principle is to ensure that "Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and by so doing, maintain the ecological function and integrity of the forest" (FSC Canada Working Group 2004). To ensure this objective is met, the standard requires the assessment of environmental impacts, the protection of species at risk, the establishment of conservation zones, and the maintenance of ecological functions and values. This involves a thorough initial understanding of the natural ecology of the management area, including, for example, ecological classification of the management area, mapping threatened species habitat, water-body classification, the identification of spawning areas, historical frequency and distribution of natural ecosystem processes/disturbances (such as forest fire), and nest locations of birds of prey. Further, the forest management company must develop a program to monitor the environmental impacts of activities in the forest management area. The initial assessment and subsequent audits by independent third-party auditors examine pre-development planning and assessment, the adequacy of subsequent monitoring, and on-the-ground environmental impacts of forestry activities.

Forest certification is rapidly gaining popularity in Canada and around the world. Currently, 19% of Canada's managed forests are certified under the FSC system (FSC

Canada 2009). The area of forest certified under the FSC system has increased six-fold since 2005. Forest certification is particularly widespread in Ontario. On April 1, 2004, the Ontario Minister of Natural Resources announced that Sustainable Forest Licence holders (companies or individuals holding long-term forest management licences) would be required to certify themselves to an accepted performance standard by the end of 2007 (Ontario Ministry of Natural Resources 2008). Three certification standards meet the requirements of the Minister. They are:

1. The Canadian Standards Association Sustainable Forest Management Standard, approved by the Standards Council of Canada;

2. The two standards of the FSC Principles and Criteria for Forest Management that are applicable to Ontario - FSC Standards for Well Managed Forests in the Great Lake St. Lawrence Forests of Ontario and Quebec (draft) and the National Boreal Standard; and,

3. SFI Inc.'s Sustainable Forestry Initiative.

The majority of Ontario's Sustainable Forest Licence holders are now certified. Currently, about half of the certified forest area in Ontario is certified under the FSC system (Ontario Ministry of Natural Resources 2008). In response to the popularity of the FSC certification system in Ontario, the Ontario government has further demonstrated its support of the FSC certification system through the creation of a Collaborative Action Plan between the Ontario Ministry of Natural Resources (OMNR) and FSC Canada. The purpose of the Collaborative Action Plan is to increase access to FSC certification on Crown lands in Ontario (Ontario Ministry of Natural Resources 2008).

The success of the FSC certification system in Canada and the support for the FSC system expressed by the Ontario government demonstrate the feasibility of applying the principle of ecological integrity to natural resource use in the GBLW.

5 OIL, GAS, AND MINING

The concept of ecological integrity is less commonly used in the oil, gas, and mining industries. However, the maintenance of ecological integrity during oil, gas, and mineral exploration and development is particularly important, given the finite nature of these activities. Non-renewable resource extraction operations do not persist in the long term. After termination or abandonment of oil, gas, and mining activities, we will need to continue to use the land and ensure that ecosystems are left intact. This necessity is acknowledged by Environment and Natural Resources (ENR), Environment Canada (EC), and Indian and Northern Affairs Canada (INAC) in their draft guidelines for oil and gas exploration in the NWT (ENR, EC, INAC 2009), which state that the guidelines "must promote the protection of ecological integrity throughout the NWT" including the application of the precautionary principle. However, the guidelines do not actually *require* the maintenance of ecological integrity.

The application of third party certification of environmental and social performance in the mining sector has recently been evaluated in Australia by the Mining Certification Evaluation Project (MCEP) (Solomon et al. 2006). The project began the process of developing a set of principles and criteria for environmental and social performance of mining companies that may be used to develop measurable and auditable on-the-ground performance standards. The MCEP participants included various mineral exploration and development companies and the World Wildlife Foundation. The principles and criteria developed during the project were acceptable to project participants and stakeholders.

The two examples described above represent basic first steps in a move toward the protection of ecological integrity during oil and gas and mineral exploration and development and the formation of a certification system to guide this protection. However, ecological integrity is not yet a commonly used concept in the mineral and oil and gas industries and the maintenance of ecological integrity has yet to be required in the NWT. The evaluation of the on-the-ground impacts of mineral and oil and gas exploration and development on ecological integrity is fundamentally important to the maintenance of the health of northern ecosystems. The mining and oil and gas industries are an important part of the northern economy. We thus need to find a balance between the exploitation of mineral and oil and gas resources and the maintenance of the integrity of our natural ecosystems. This balance has not yet been achieved.

Protecting ecological integrity in the GBLW presents an opportunity to develop a system to ensure the maintenance of the ecological integrity of the ecosystems on which we depend. Such a system could be developed collaboratively by industry stakeholders and scientific and traditional knowledge experts. Demonstrating the maintenance of ecological integrity has both ecological and economic benefits and represents the future of sustainable land use in northern Canada. As we use our natural resources we must ensure that we do so without damaging the integrity of the ecosystems on which we rely.

6 EXAMPLE: APPLICATION FOR LAND USE PERMIT

This section suggests a way of proceeding with the practical application of the concept of ecological integrity in the GBLW in the short term (Part 3.1 above). For illustration purposes, it uses the example of an application for permit to conduct mineral exploration in the proposed Edaiila Conservation Zone. Edaiila was chosen as a surrogate for the GBLW as a whole because more ecological information is available for Edaiila than for most other parts of the watershed. Please note however that the example below is for illustration purposes only. It suggests only an approach. It is not intended as a complete application.

6.1 PROJECT DESCRIPTION

Type of Development: Mineral exploration

Principle Activities:

Field camp facilities
Drummed fuel caches
Prospecting
Sampling
Ground geophysical surveys
Geophysical mapping

Location: Edaiila Conservation Zone

Period of Permit: November 2011 – March 2012

6.2 ECOLOGICAL INTEGRITY VALUES / INDICATORS

This section of the application should be prepared in consultation with local community members using a combination of traditional ecological knowledge, scientific expert opinion, a review of the scientific and grey literature, and baseline ecological studies conducted by the proponent.

6.2.1 KEY SPECIES

The following are species with special ecological or conservation status and are thus good indicators of ecological integrity or may be sensitive to mineral exploration in Edaiila. There are no known plant species of conservation concern in Edaiila. However, if present, ecologically important or sensitive plant species should be included in this section. This section should include maps of species occurrence within Edaiila based on available data and the baseline study to be conducted pre-exploration.

6.2.1.1 Barren-ground Caribou – Bluenose-East Herd (Rangifer tarandus groenlandicus):

Rationale:

Barren-ground caribou has been identified by the elders of Déline as a species of high cultural and ecological importance in Edaiila (Nesbitt 2008). The Bluenose-East herd has declined from about 104,000 in 2000 to about 66,200 in 2006 (Environment and Natural Resources 2008). The elders of Déline are thus concerned that the Bluenose-East herd be protected from stresses that may cause further population declines.

Members of the Bluenose-East herd use Edaiila in very large numbers in late August, September, and October (Nagy et al. 2005; Nesbitt 2008). Although small numbers of

Bluenose-East caribou remain in Edaiila throughout the winter, this is not a period of high use.

6.2.1.2 Woodland Caribou – Boreal Population (*Rangifer tarandus caribou*):

Rationale:

The Committee on the Status of Endangered Wildlife In Canada (COSEWIC) lists the woodland caribou boreal population as Threatened due to population decreases throughout its range (Thomas and Gray 2002). The population is listed as Threatened under the Canadian Species At Risk Act (SARA). Boreal woodland caribou are listed as Sensitive in the NWT. The COSEWIC report on the status of woodland caribou (Thomas and Gray 2002) notes that the boreal woodland caribou population is sensitive to industrial development. Development degrades and fragments woodland caribou habitat. Of particular concern are trails and roads associated with development as they facilitate predation by providing increased access to caribou by predators (James and Stuart-Smith 2000; Thomas and Gray 2002; Wittmer et al. 2007). Woodland caribou are known to avoid resource extraction developments and areas of high human activity (Dyer et al. 2001; Nesbitt 2008).

Woodland caribou use Edaiila year-round but their specific land use within Edaiila is unpredictable. The population in Edaiila is estimated at 400 – 500 individuals (Nesbitt 2008). Some woodland caribou calve in Edaiila in June (Nesbitt 2008).

6.2.1.3 Peregrine Falcon (*Falco peregrinus*):

Rationale:

The Peregrine Falcon (subspecies *anatum*) is listed as a Threatened species under SARA. The *anatum*/*tundrius* sub-population complex is listed as Special Concern by COSEWIC and has no listing under SARA. Current threats include human interference at nest sites, habitat alteration, habitat loss, and small population sizes (SARA 2009a).

Peregrine Falcon may be found throughout Edaiila (EBA Engineering Consultants 2006). However, no population surveys have taken place within Edaiila.

6.2.1.4 Short-eared Owl (*Asio flammeus*):

Rationale:

The Short-eared Owl is listed as a species of Special Concern by COSEWIC and under SARA. Threats include destruction or reduction of grassland habitat, wetland drainage,

urban expansion, and collisions with aircraft (SARA 2009b). The Short-eared Owl nests on the ground and thus nests are threatened by use of machinery and increased predation.

The Short-eared Owl uses tundra areas for nesting and is likely found in Edaiila during the spring and summer months (EBA Engineering Consultants 2006; SARA 2009b).

6.2.1.5 Rusty Blackbird (*Euphagus carolinus*):

Rationale:

The Rusty Blackbird is listed as a species of Special Concern by COSEWIC and under SARA and as May Be At Risk in the NWT. Canada represents 70% of the Rusty Blackbird's breeding range (SARA 2009c). Although estimates of the Canadian population are imprecise, this population is believed to have declined significantly since the 1960s (SARA 2009c). The worldwide population is believed to have declined by about 85%. The Rusty Blackbird is primarily threatened by conversion of its wintering habitat in the Mississippi Valley, USA (SARA 2009c). It is also threatened by wetland conversion.

The Rusty Blackbird nests in boreal forest and is found in Edaiila during the spring and summer months.

6.2.1.6 Grizzly Bear (*Ursus arctos*):

Rationale:

The Grizzly Bear (Northwestern population) is listed as species of Special Concern by COSEWIC and has no listing under SARA. The Grizzly Bear has an extensive distribution throughout parts of Canada, USA, and Eurasia. The Grizzly Bear has been extirpated from the Canadian Prairie Provinces and many populations in Eurasia are small and endangered (SARA 2009d). The population of Grizzly Bears in the NWT is estimated at 3,500 to 4,000 (Environmental and Natural Resources 2005). Suitable grizzly habitat must provide adequate food supply, denning sites, and protection or isolation from human disturbance (Environment and Natural Resources 2005; SARA 2009d). Threats include hunting, habitat degradation by mining, forestry, agriculture, residential development, recreation, and the development of roads and linear features (SARA 2009d). Linear developments are of particular concern. Grizzly Bears will avoid linear features, reducing the availability of large areas of habitat (SARA 2009d). Roads also increase human access, leading to increased mortality due to hunting.

Grizzly Bears are found in Edaiila. They are more common in tundra areas but are found in forested areas as well (Environment and Natural Resources 2005).

6.2.1.7 Wolverine (*Gulo gulo*):

Rationale:

The western population of Wolverine is listed as Special Concern by COSEWIC but has no status under SARA. Wolverine has no status under the NWT Species At Risk Act but has an NWT General Status Rank of Sensitive. Although wolverine has disappeared from most of eastern and south central Canada, it is still found throughout the NWT in the northern boreal forest and tundra (Environment and Natural Resources 2005). There are no population data for wolverine in the NWT. Wolverines have a low reproductive rate, low population density, and have large home ranges of several hundred square kilometers. Elimination of wilderness areas has been a factor in wolverine decline in Canada (Environment and Natural Resources 2005). Environmental and Natural Resources (2005) suggests that mineral exploration may have negative impacts on wolverines. Mineral exploration and development increase human access, leading to increased hunting and trapping. Vehicle use in wolverine habitat can lead to habitat alienation, decreasing the effective size of wolverine habitat (SARA 2009e). In addition, developments often attract wolverines, which may then be killed as nuisance animals (SARA 2009e).

Wolverine habitat is present in Edaiila and thus wolverine is assumed to be present in Edaiila.

6.2.2 HABITAT VALUES

The habitat values identified in this section include:

- Absence of linear development
- Wilderness areas
- Undisturbed nest sites
- Undisturbed denning sites
- Lack of human disturbance
- Adequate supply of food sources such as: caribou, moose, small mammals, fish, berries
- Intact coniferous forest
- Intact wetlands
- Intact ground and forest lichen communities

Edaiila is an area of relatively pristine wilderness that contains no permanent settlements or development. It thus provides habit for a variety of plants and animals not included in this application. **This analysis will focus on habitat used by the identified Key Species above. Alternatively, this section could be developed according to individual habitat values rather than the species that rely on them**. This section should include maps of habitat values within the study area as identified by satellite data and the baseline study to be conducted pre-exploration.

6.2.2.1 Barren-ground Caribou – Bluenose-East Herd (*Rangifer tarandus groenlandicus*):

Edaiila provides important habitat for the Bluenose-East caribou herd, particularly during the months of August, September, and October (EBA Engineering Consultants 2006; Nesbitt 2008). Barren-ground caribou are present in Edaiila in high densities from August to October. In late October/November, the majority of the herd leaves Edaiila for its wintering grounds to the north and south of GBL. However, some individuals remain in Edaiila in small numbers throughout the winter. The herd passes through Edaiila in March and April on its way north to the calving grounds.

Barren-ground caribou use a variety of food sources and habitats depending on availability, snow, ice, wind, insects, and predation (EBA Engineering Consultants 2006). During the winter months, caribou select upland areas to avoid deep snow (Kelsall 1968). Lichen is an important food source for caribou year-round (Kelsall 1968). Winter foraging habitats include tundra and areas near large ice surfaces to avoid predators (EBA Engineering Consultants 2006). In the spring, new plant growth along lakeshores and wetlands is a particularly important source of food. In summer, caribou feed on vascular plants, grasses, forbs, sedges, and mushrooms (EBA Engineering Consultants).

6.2.2.2 Woodland Caribou – Boreal Population (*Rangifer tarandus caribou*):

Woodland caribou use coniferous forest as their primary habitat. Woodland caribou live in small family groups in the forested area of Edaiila throughout the year. They favour mature or old growth coniferous forest that offers high concentrations of ground and tree lichens (EBA Engineering Consultants 2006). In winter, woodland caribou prefer uplands, bogs, and south-facing slopes to avoid deep snow. In summer, forest edges, meadows, and marshes provide new plant growth, sedges, grasses, and horsetails (EBA Engineering Consultants 2006). Woodland caribou calve in Edaiila in June (Nesbitt 2008).

6.2.2.3 Peregrine Falcon (*Falco peregrinus*):

Abundance of prey and nesting sites are the primary factors that affect the size of Peregrine Falcon populations (Bromley 1992). Primary prey are small mammals, small birds, ducks, ptarmigan, and fish (Bromley and Buckland 1995). Peregrine Falcons usually nest on cliff ledges or in crevices, 50 to 200m above ground (SARA 2009a). Peregrine Falcons exhibit high nest-site fidelity, returning to nest sites year after year. Particularly high-quality nesting habitat may exist in the southeast corner of Edaiila (EBA Engineering Consultants 2006).

6.2.2.4 Short-eared Owl (*Asio flammeus*):

Short-eared owls favour large areas of open habitat (SARA 2009b). Primary habitat includes marshes and deep grass fields. The short-eared owl hunts and roosts in young conifer plantations and marshes in winter. It uses tundra habitat in summer.

6.2.2.5 Rusty Blackbird (*Euphagus carolinus*):

The Rusty Blackbird nests in boreal forest, particularly on the shores of wetland areas (SARA 2009c). It uses the edges of boreal forests and rarely enters the forest interior. As such, it requires boreal forest habitat along forest edges and intact wetland areas.

6.2.2.6 Grizzly Bear (*Ursus arctos*):

Grizzly bears use a variety of habitats, including tundra and boreal forest (SARA 2009d). Grizzly habitat use often reflects the growth and availability of different foods. Suitable grizzly habitat includes sufficient food supply, denning sites, and isolation from human disturbance. Grizzly bears avoid areas of linear disturbance and human activity and thus human disturbance can limit the size of available habitat.

6.2.2.7 Wolverine (*Gulo gulo*):

Wolverines have a low reproductive rate, low population density and large home ranges. They thus require large areas of undisturbed habitat to maintain viable populations (SARA 2009e). Wolverine habitat includes both tundra and boreal forest. Ungulates, such as caribou, are a primary food source for wolverine and thus wolverine are more abundant where ungulates are common.

6.2.3 WATER AND SEDIMENT QUALITY

Water and sediment quality have effects on both natural ecosystems and human water use. This section should include maps of water bodies in the exploration area. Baseline water and sediment quality conditions should be established prior to beginning exploration activities.

NWT CIMP has identified the following water and sediment quality parameters (Indian and Northern Affairs Canada 2007):

Primary Parameters:

Physicals:
Water Temperature

pH
Conductivity
Turbidity/Color
Dissolved Oxygen
Total Suspended Solids
Total/Dissolved Organic Carbon
Major Ions
Nutrients
Total/Dissolved Metals

Organics:
Polyaromatic Hydrocarbons

Bacteria:
Fecal Coliform
Fecal Strep.
E. coli.

Secondary Parameters:

Clarity
Total mercury

Organics:
Extractable Organochlorine
Pesticides
Polychlorinated Biphenyls (PCB)
Dioxins/Furans
BTEX

6.3 POTENTIAL IMPACTS AND ECOLOGICAL INTEGRITY OBJECTIVES

This section is intended to examine potential impacts of mineral exploration and identify ecological integrity objectives associated with those potential impacts.

6.3.1 POTENTIAL IMPACTS

6.3.1.1 Field camp facilities

Potential impacts include:

Introduction of foreign species

Contamination of soils or water bodies from garbage, human waste, wastewater, and fuel spills
Noise pollution
Animals attracted to garbage and food waste
Linear development
Habitat use is affected by human presence
Habitat use is affected by noise from aircraft

6.3.1.2 Drummed fuel caches

Potential impacts include:

Contamination of soils or water bodies from fuel spills or leakage

6.3.1.3 Prospecting

Potential impacts include:

Contamination of soils or water bodies due to fuel or oil spills
Noise pollution
Linear development
Habitat use is affected by human presence

6.3.1.4 Sampling

Potential impacts include:

Contamination of soils or water bodies due to disposal of sampling waste materials
Habitat use is affected by human presence

6.3.1.5 Ground geophysical surveys

Potential impacts include:

Habitat use is affected by human presence
Habitat use is affected by noise from aircraft

6.3.1.6 Geophysical mapping

Potential impacts include:

Habitat use is affected by noise from aircraft

6.3.2 ECOLOGICAL INTEGRITY OBJECTIVES

These ecological integrity objectives reflect the potential ecological impacts identified in the previous section.

6.3.2.1 Introduction of Foreign Species

Objective: Prevent the introduction of foreign species

The introduction of foreign species may lead to competition with native species, limiting their survival and reproduction. Foreign species may become invasive, aggressively competing with native species.

All equipment and clothing will be thoroughly cleaned before going into the field. Foreign species will not purposely be brought into the field.

6.3.2.2 Contamination of Soils or Water Bodies

Objective: Prevent contamination of soils or water bodies from garbage, human waste, wastewater, and fuel spills.

Incorrect disposal of waste materials and wastewater can lead to contamination around areas of human land use, particularly field camps.

Garbage will be stored in secure containers and removed from the field twice weekly. Wastewater such as grey water used for cleaning will be treated prior to disposal in the field. Incinerating toilets will be used in the field camp. Field camps will not be located near water bodies.

Fuel caches will be monitored weekly for structural integrity during exploration activities. Fuel caches will not be left in the field after the cessation of exploration activities.

If spills do occur, the proponent should have a restoration plan in place.

6.3.2.3 Noise Pollution

Objective: Minimize noise pollution.

Noise pollution can cause changes in animal behaviour and habitat use.

Pilots will fly at 300m above ground level (Canadian Environmental Assessment Agency 2009). Motorized ground vehicles will not be used.

6.3.2.4 Attracting Animals to Waste Products

Objective: Avoid attracting animals to waste products.

Animals may be attracted to garbage, grey water, and human waste. Animals attracted to waste materials at camp sites may become nuisance animals and may have to be killed.

Garbage will be stored in secure containers and removed from the field twice weekly. Wastewater such as grey water used for cleaning will be treated prior to disposal in the field. Incinerating toilets will be used.

6.3.2.5 Linear Development

Objective: Minimize linear development.

Linear development fragments habitat and may be avoided by some animals, modifying behaviour and habitat use. Linear development may also increase predation in forested areas.

Exploration activities will take place during the winter months and thus linear developments such as roads will not be necessary.

6.3.2.6 Changes In Habitat Use: Human Presence

Objective: Minimize changes in habitat use caused by human presence

Human presence in the field can cause animals to avoid areas of their habitat, reducing the functional size of their habitat.

Field crews will consist of no more than 6 people. All waste materials will be removed from the field.

Areas of high-quality habitat should be identified and mapped during the baseline study. These areas should be avoided.

6.3.2.7 Changes In Habitat Use: Noise From Aircraft

Objective: Minimize changes in habitat use caused by noise from aircraft.

The presence of aircraft can deter habitat use by some animals, changing behavioural patterns and reducing the functional size of their habitat.

Pilots will fly at 300m above ground level (Canadian Environmental Assessment Agency 2009). Helicopter use will be strictly minimized, and the proponent should prepare a plan to demonstrate this minimization.

6.3.2.8 Habitat Damage

Objective: Prevent damage to habitat.

Physical damage to habitat may occur during field operations.

Conducting exploration during the winter will minimize the habitat damage experienced by the ecosystems in Edaiila. Very high quality habitat will be identified and mapped. Exploration will not take place in high quality habitat areas. Employees will be trained to recognize and avoid important habitat features such as lichen communities.

6.3.2.9 Demonstrating the Maintenance of Ecological Integrity

The proponent would integrate the results of the above analyses to demonstrate that all aspects of its proposed activities are consistent with the maintenance of the GBLW ecosystem(s).

6.4 RESEARCH AND MONITORING

The proponent would develop a research and monitoring program to detect and monitor the ecological impacts of exploration in Edaiila. The results of the monitoring program would be used to modify operations and inform restoration programs, if necessary.

Baseline ecological studies would be conducted prior to beginning exploration activities during August 2010 and January 2011. The purpose of baseline studies would be to establish an understanding of the ecosystem in which exploration will take place. We need to understand the pre-exploration ecosystem to be able to detect ecological changes caused by exploration activities. Baseline studies would be conducted in August and January to provide an understanding of both the summer and winter ecosystems.

Baseline studies and subsequent monitoring would focus on identified key species, habitat values, and potential impacts.

Monitoring would be conducted alongside exploration activities. Monitoring sites would include a set of randomly chosen sites within the area of exploration activities. Monitoring would also include areas of particularly high or intensive land use, such as at

the field camp site. Data would be collected twice weekly during operations. Post-operations, monitoring data would be collected at all sites the following summer and following winter. This would help detect impacts that persist post-operation and would inform restoration activities.

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