

**Expert Comments on the Environmental Impact Assessment Report
for the Sisson Project (Tungsten and Molybdenum Mine),
New Brunswick
CEAR #11-03-63169**

re: EIA Report Section 8.6 – Terrestrial Environment

re: EIA Report Section 8.7 – Vegetated Environment

re: EIA Report Section 8.8 – Wetland Environment

**CCNB Action Inc.
180 St. John Street
Fredericton, N.B., E3B 4A9**

**506-458-8747
info@conservationcouncil.ca**

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CCNB Action Inc.

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Table of Contents (Sections in red are in this shortened version of the CCNB Action report)

1.	Introduction	... 1
1.1	Background to CCNB Action Inc.'s report	... 1
1.2	Expert reports commissioned by CCNB Action Inc.	... 2
1.3	Summaries of experts' main comments about the EIA report	... 4
1.4	Five significant shortcomings of the EIA report	... 10
1.5	Conclusions regarding the project	... 18
2.	Expert Reports	... 19
2.1	Impacts on the Atmospheric Environment, re: air quality	... 19
2.2	Impacts on Public Health, re: baseline health assessment	... 37
2.3	Impacts on Water Resources, re: ecological water balance	... 49
2.4	Impacts on Water Resources and the Aquatic Environment, re: water quality and fish and fish habitat	... 55
2.5	Comments on Section 3 Project Description, Impacts on the Aquatic Environment, Accidents, Malfunctions and Unplanned Events, proposed Follow-Up and Monitoring Program, and Conceptual Decommissioning, Closure, and Reclamation Plan	... 74
2.6(a)	Impacts on the Terrestrial Environment, re: wildlife and birds	... 92
2.6(b)	Impacts on the Terrestrial Environment, re: rare wildlife and forests	... 96
2.6(c)	Impacts on the Terrestrial Environment, re: protected natural areas	... 101
2.7	Impacts on the Vegetated Environment, re: rare vegetation communities	... 105
2.8	Impacts on the Wetland Environment, re: wetland protection	... 108
2.9(a)	Impacts on Labour and Economy	... 111
2.9(b)	Review of 43-101 National Instrument Technical Report (securities filing)	... 124
2.10	Comparing water management plans for Sisson mine to those of other mines in NB	... 133
3.	Comments on the EIA Report not in relation to VECs (Valued Environmental Components), such as matters of Sustainable Development and Need for the Project	... 137
3.1	EIA Report Section 1.3.5 Sustainable Development and the Precautionary Approach	... 137
3.2	EIA Report Section 1.3.6 Benefits to Canadians	... 139
3.3	EIA Report Section 2.1 About Northcliff Resources (the proponent)	... 140
3.4	EIA Report Section 2.2.1 About Tungsten	... 140
3.5	EIA Report Section 2.3 Need for the Project	... 141
3.6	EIA Report Section 2.5 Project Alternatives	... 142
3.7	EIA Report Section 9.0 Monitoring, Auditing, Reporting and Follow-Up	... 142
3.8	EIA Report Appendix D Environmental and Social Management System	... 142

4. About CCNB Action Inc.	... 144
Appendix A – CV of Inka Milewski	... 145
Appendix B – Biography and Publications of Lawrence Wuest	... 150
Appendix C - Biography of Dr. Antony Diamond	... 151
Appendix D – CV of Tracy Glynn	... 152
Appendix E – Resume of Stephanie Merrill	... 155
Appendix F – Article from Vancouver Sun, September 6, 2013	... 159
Appendix G – Details of Niagara Refining LLC APT Plant (New York), NYSDEC DEC ID: 9145200327: Permit Application	... 164

1. Introduction

1.1 Background to CCNB Action Inc.'s comments on the Environmental Impact Assessment Report for the Sisson Project

Northcliff Resources Ltd. (the proponent) has proposed to construct and operate a 30,000 tonnes per day tungsten and molybdenum mine approximately 60 kilometres northwest of Fredericton, New Brunswick (the Sisson Project). As described in the project's environmental impact assessment (EIA) report, the project would consist of a 145 hectare open pit mine, a 751 hectare tailings impoundment, numerous water management ponds, an ore crushing and processing plant, a water treatment plant, an ore storage area(s), a transmission line to bring power to the project site, and use of provincial roads. As proposed, the construction and operation of the mine will require the destruction of portions of streams that are headwaters of the Nashwaak River. The Nashwaak River, a tributary of the St. John River, is a main refuge for the endangered St. John River population of Atlantic salmon. The Villages of Napadogan and Stanley are located approximately 10 km and 20 km respectively from the proposed mine.

As the Sisson Project will have environmental impacts on areas of both federal and provincial constitutional jurisdiction, it is subject to two environmental assessment processes, one under the *Canadian Environmental Assessment Act (CEAA)*, and another under the *New Brunswick Environmental Impact Assessment Regulation - Clean Environment Act (NB EIA Reg.)*. Because the project commenced under the *CEAA*, the federal environmental assessment of the project will continue under that act rather than the *Canadian Environmental Assessment Act, 2012*, which repealed and replaced the *CEAA*. Due to the amount of ore to be processed, the Sisson Project is subject to a "comprehensive study" type of environmental assessment under the *CEAA* (rather than a "screening"). Provincially, the Minister of Environment has determined the Sisson Project is subject to a "comprehensive review" under the *NB EIA Reg.* A provincial comprehensive review sets out a number of steps in the environmental assessment process, such as the development of terms of reference for the EIA report, the writing and filing of the EIA report, and the holding of a public meeting(s) by the Minister of Environment.

The provincial and federal governments have agreed to conduct a "harmonized" environmental impact assessment process for the Sisson Project. The EIA report describes the harmonized process as being:

"Under this approach, both levels of government have agreed to cooperate in the carrying out of the EIA to meet the requirements of their respective legislation, beginning with Terms of Reference being issued jointly to define the scope of the EIA federally and how Northcliff will meet the Final Guidelines provincially. They have also agreed that a single EIA Report prepared by the Proponent to meet the requirements of the Terms of Reference would suffice to fulfill the respective provincial and federal EIA requirements. The CEA Agency will then prepare its comprehensive study report (CSR), relying upon the EIA Report and the results of the review process." (at p. 4-4).

On August 30, 2013, the Canadian Environmental Assessment Agency (CEA Agency) released the proponent's EIA report for the Sisson Project to the public for review and comment. The public has 45 days (to October 14, 2013) to submit its comments to the Agency, after which the Agency will consider them before writing its CSR for the project. At present, there is no official period of public review and comment under the provincial process although it is expected that comments made under the federal environmental assessment process will be forwarded to New Brunswick regulators for consideration.

The CEA Agency sometimes provides participant funding to individuals, not-for-profit organizations, and Aboriginal groups, to assist them in participating in a federal environmental assessment process, such as the comprehensive study for the Sisson Project. CCNB Action Inc. applied for and received participant funding. The main purpose of this funding was for CCNB Action to hire experts to review and provide comments on sections of the Sisson Project EIA report and later, the comprehensive study report for the project written by the CEA Agency. Funding is not available under the New Brunswick environmental assessment process to assist groups in their review of EIA Reports. The purpose of this report is to document the findings of CCNB Action's expert reviewers about the EIA report for the Sisson Project and to detail CCNB Action's position as to whether the construction, operation, and closure of the project should receive federal approval.

1.2 Expert reports commissioned by CCNB Action Inc.

CCNB Action Inc. had experts review and comment on various sections of the EIA report and on some of the different technical studies completed by the proponent in support of the EIA report. The reviewers were asked to focus their reviews primarily on:

- the methods used by the proponent to gather baseline information,
- the methods used by the proponent to conduct environmental effects analyses for the project alone and cumulatively,
- conclusions reached by the proponent, in particular those dealing with the significance of the environmental effects of the project, and
- various technical aspects of the project such as the design of the tailings dam.

Reviewers were asked *not* to comment on the merits of the project.

In order of their appearance in this final report, the experts' reports are:

1. Impacts of the project on the VEC - Atmospheric Environment, re: air quality.
 - Ms. Inka Milewski and Mr. Lawrence Wuest
2. Impacts of the project on the VEC - Public Health with a focus on the methodology used for the baseline public health assessment.
 - Ms. Inka Milewski
3. Impacts of the project on the VEC – Water Resources, re: ground water and ecological water availability.
 - Dr. André St.-Hilaire
4. Impacts of the project on the VEC – Water Resources, The VEC – Aquatic Environment (focus on fish and fish habitat), The VEC - Accidents, Malfunctions and Unplanned Events, and General comments on Executive Summary, Project Description, Summary of Key Predictive Studies.
 - Dr. Allen Curry

5. Comments on Section 3 Project Description (particularly water management and the design of the tailings storage facility),
Impacts of the project on the VEC – Aquatic Environment,
The VEC - Accidents, Malfunctions and Unplanned Events,
Comments on the proposed Follow-Up and Monitoring Program, and
Comments on the Conceptual Decommissioning, Closure, and Reclamation Plan.
 - Dr. David Chambers and Mr. Stu Levit, M.S., J.D. (Center for Science in Public Participation (CSP2))
 - Note: The report from CSP2 was commissioned by CCNB Action. CSP2 submitted their review directly to the CEA Agency on October 7, 2013, but it has also been included in this report for convenience.
6. Impacts of the project on the VEC – Terrestrial Environment.
 - CCNB Action (primarily the project's impacts on birds)
 - Ms. Tracy Glynn, M.E.S. (primarily the project's impacts on rare forests and wildlife)
 - Mr. Lawrence Wuest (primarily the project's impacts on protected natural areas)
7. Impacts of the project on the VEC – Vegetated Environment.
 - Ms. Tracy Glynn, M.E.S. (primarily the project's impacts on rare forests)
8. Impacts of the project on the VEC – Wetland Environment.
 - Ms. Stephanie Merrill, M.Sc.F. (primarily the project's impacts on regulated wetlands)
9. Impacts of the project on the VEC – Labour and Economy.
 - Dr. Rob Moir
10. General comments on the proposed water management plans for the project during operation and closure.
 - Mr. Roy Parker, M.E.S.

Finally, this report also includes comments on general EIA report requirements such as a discussion of the need for the project and its role in sustainability. These comments were provided primarily by Mr. Ramsey Hart, M.Sc.

1.3 Summaries of experts' main concerns about the EIA report

1.3.1 Summary of the reviewers' main comments about the EIA report: Atmospheric Environment

- Not enough data/information has been collected to say accurately what is the trace metal content of the ore, pit walls, waste rock, overburden, etc. Without this information, the types and amounts of air contaminants released by the project cannot be determined.
- Using the limited trace metal data that is provided in background studies for the EIA report, the reviewers calculate there is more arsenic in the project's ore than what is reported (EIA report = 41 mg/kg of arsenic; Reviewers = 64.8 mg/kg of arsenic).
- The use of 41 mg/kg of arsenic (vs. 64.8 mg/kg) in modeling for predicted air quality results in the under-estimation of the release of this contaminant. Also, the EIA report only uses arsenic concentrations from the ore in its modeling. This is the lowest concentration of arsenic for any of the potential pathways of air contaminants, other than soil. For example, the EIA report provides the mean arsenic concentration in the overburden as 143.3 mg/kg, which was not used in the report's calculation of trace metal air emissions. Arsenic concentrations are significantly higher in all emission pathways than the value used to estimate arsenic releases from the project.
- The drill core assays used to calculate trace metal content were not taken from random locations or locations that are representative of the entire mine site.
- Wind data provided in the EIA report does not reflect prevailing conditions and it was not collected from the highest point of the mine where tailings beaches will be located.
- Emissions of particulate matter (dust) from the site are under-estimated.
- The EIA report does not provide information on how much hydrogen sulfide and other pollutants the ammonium paratungstate (APT) plant will emit. Based on the reviewers' investigation of the predicted releases from an ATP plant in New York, it is clear the Sisson Project ATP plant will be a significant source of air pollutants.
- The Sisson Project will not contribute to the Canadian Council of Minister of the Environment's nationally-supported goal of "keeping clean areas clean".
- No environmental monitoring for future air quality is proposed for the project despite evidence that mines can release annually 5 to 30 times more dust than predicted in an EIA report.

1.3.2 Summary of the reviewer's main comments about the EIA report: Public Health

- The main concerns raised about the EIA report's section on the Atmospheric Environment are also applicable to the Public Health section. Additional concerns follow below.
- The most serious deficiency is that the EIA report did not evaluate the non-cancer health risk of the most common route of exposure to arsenic - ingestion of soil, water and food and dermal contact with soil. The human health risk assessment (HHRA) has incorrectly assumed that the health risks related to ingesting or inhaling arsenic are cancer-related only and that there are no toxicological reference values for non-cancer health effects via the oral or dermal route for adults or toddlers. As a result, the baseline (and project-related) human health risk assessment via ingestion of soil, water and food and dermal contact with soil has not been assessed for arsenic.
- The HHRA modeling domain is too small and does not cover the entire project Local Assessment Area (LAA). As a result, HHRA receptor locations in the community of Napadogan, and other locations at the edges of the LAA where people from Williamsburg, Currieburg, Boyds Corner, Fredericksburg and Stanley may spend recreation time, are not covered by the HHRA.

- Emissions of particulate matter and metals during the construction phase of the project and the potential seepage of metals from overburden piles during the construction phase have been excluded from the assessment.
- The Project + Baseline assessment of maximum acute and chronic human health risks from inhaling PM₁₀ emissions are incomplete and inaccurate.
- Particulate emission estimates during the operational phases of the project are significantly underestimated.
- Arsenic emission estimates during operational phases of the project are significantly underestimated.
- Sulphur dioxide (and other) emission estimates from the Project's ammonium paratungstate (APT) facility are significantly underestimated.
- Characterization of health risks for on-site workers are not reported or discussed.
- A sensitivity analysis of the HHRA results has not been done.
- Public and occupational health follow-up or monitoring will not be done.

1.3.3 Summary of the reviewer's main comments about the EIA report: Water Resources

- In spite of the fact that the analyses could benefit from some potential methodological improvements and specifications mentioned above, the assessments provided appear to be technically and scientifically sound. Some (probably small) risks associated with local, perhaps short term, changes in the hydrological budget and water routing for wetlands and aquatic life are scarcely treated.

1.3.4 Summary of the reviewer's main comments about the EIA report: Water Resources

- The EIA report is incomplete in many critical areas. For example, the EIA report was written before the all-important Metal Leaching/Acid Rock Drainage Potential Report (ML/ARD Report) was completed. The EIA report was submitted to the CEA Agency on July 31, 2013, while the ML/ARD was not completed until August 2013.
- This mine will need a water treatment plant (WTP) and this plant is the core of the mine's water management plan. However, the WTP is poorly described and the plans for it are not in the actual EIA report.
- The WTP was designed to deal with arsenic and antimony only, not the other many chemicals that will be in the tailings pond.
- Details for all water management at the mine site are not provided. For example, water management ponds are to collect and pump back any seepage or other surface water to the tailings pond. How will this be managed (e.g., secure pumping when required, overflow conditions) is not made clear in the EIA report.
- There are no plans to put a liner in the tailings pond to prevent seepage. Tailings pond seepage is a major source of acid rock drainage.
- Models used by the proponent do not model natural variability. The proponent uses averages where it has some information, yet the proponent knows and discusses variability in several places. Confidence limits are best estimated to be +/- 100% of the average.
- The EIA report speaks to potential outcomes, but gives no probability values of such as would be expected in an objective report on such an operation. Where risk is presented, it is consolidated into just a few categories. These risks are also the proponent's "judgment"; probabilities (%) need to be presented.

- There is no adequate proposal of environmental funding to deal with the water issues for such massive landscape features of the open pit and TSF post-operations. \$50M may clean up the site (no details are provided for how this figure was arrived at), but it will never come close to handling the volumes of water in perpetuity.
- A breach of the tailings dam is not assessed in the EIA report. Although the chances of such may be small, they are not insignificant, and the impacts of such a breach on downstream water quality could be catastrophic. This needs to be assessed.

1.3.5 Summary of the reviewer's main comments about the EIA report: Aquatic Environment

- The main concerns raised about the EIA report's section on Water Resources are also applicable to the Aquatic Environment section. Additional concerns follow below.
- Not enough basic field work was done and where done, not always interpreted properly.
- Atlantic salmon in the St. John River are soon to be an endangered species and the Nashwaak River is officially recognized as the critical river for their survival, yet there is no planning for the risk of loss if any/some/all of the water management plans fail.
- The toxicity of water releases from the tailings pond to Sisson Brook has not been addressed fully.
- The EIA report says that fish habitat loss will be compensated by the removal of the Lower Lake Dam. The proponent has been told repeatedly by locals and scientists that this is not needed and as such it should not be proposed as the most likely habitat compensation scenario.
- A breach of the tailings dam is not assessed in the EIA report. Although the chances of such may be small, they are not insignificant, and the impacts of such a breach on downstream water quality could be catastrophic. This needs to be assessed.

1.3.6 Summary of the Center for Science in Public Participation's (CSP2) main comments and recommendations on the EIA report and proposed mine plans

Note: CSP2 submitted their comments on the project directly to the Agency on October 7, 2013, and are reproduced in Section 2.5 below for convenience.

- Regarding design of the tailings storage facility (TSF), CSP2 recommends *"A more sound approach in terms of controlling seepage would be to remove the native soils for use in reclamation, and to compact the remaining material to a specified density."*
- CSP2 raises concerns about how the tailings dam response to earthquakes has been modeled. They recommend *"If pseudo-static modeling was used to test for seismic stability, then a numerical model should be used to test the dam under seismic loading."* Their reason for this recommendation is that *"It is especially important that dynamic modeling be performed since the dam design has incorporated a modified centerline-type construction (which has an upstream-type component built on seismically unstable tailings). Today, few US regulatory agencies accept pseudostatic methods for seismic design of new dam projects."*
- Regarding the issue of alternatives for the design of the tailings dam, CSP2 states, *"The EIA does not explain whether the use of cycloned tailings for dam construction, which would probably require downstream-type construction, would provide better seismic stability than for the modified centerline design chosen as the preferred alternative."* It subsequently recommends *"It would be appropriate to have a full explanation of why a modified-centerline rockfill dam is better than a downstream dam constructed of tailings."*

- Like other reviewers, CSP2 discusses the incompleteness of the acid base accounting for the project: *"The overburden should be sampled for sulfur and carbonate to insure that no acid drainage will emanate from the overburden."*
- The EIA report is not clear about how much surplus water will need to be treated. "The TSF will have approximately 2 million m³/year of surplus water starting at about Year 8." (p.3-123) and; "Approximately 6 million m³/year of TSF pond water will be pumped to the WTP during Operation starting in Year 8 under average conditions." (p. 7-80) This is a discrepancy of 4 million m³/year."
- Like other reviewers, CSP2 discusses the cost of future water treatment. "... the volumes possible at Sisson Brook could require a financial surety in the \$100's millions. ... By failing to declare, whether through lack of information or analysis, it must be assumed that a financial surety for water treatment in perpetuity needs to be established. However, the financial analysis of this outcome is also not addressed in the EIA. Because of the financial risk it places on the public, this is a major omission in the EIA."
- CSP2 is particularly critical of the EIA report's failure to assess the impacts of a tailings dam breach. "Tailings dam failure is a low probability event, but also an event with high consequences. These consequences have never been ignored in any other EIS/EIA I have reviewed. To in essence assert that 'my engineering' could not possibly fail, in light of existing statistics, is arrogantly assuming that it is always the other guy (or gal) that will make a mistake – but not me. This is exactly the attitude that leads to accidents..."
- Regarding the proponent's plan for quarterly water quality monitoring, CSP2 states "Quarterly monitoring is not adequate to capture surface water variations. Weekly sampling is typical at most mines."
- "The [Conceptual Decommissioning, Reclamation and Closure Plan] should be completed at the mine-proposal stage, and certainly prior to permitting, to a sufficient degree to reasonably determine water treatment costs, reclamation costs, and assess the short and long term social, health, and economic impacts from the mine (including post-closure)."
- The CSP2 review contains other recommendations, such as those dealing with groundwater monitoring, determining the cost of the closure bond, and steps for reclaiming the site.

1.3.7 Summary of the reviewer's main comments about the EIA report: Terrestrial and Vegetated Environments

- Overall, sampling for wildlife other than birds is inadequate.
- From the bird surveys done, there are several Threatened Species in the project area whose protection needs to be addressed before the project proceeds: Common Nighthawk, Olive Sided Flycatcher, and Canada Warbler.
- The EIA report does not discuss the importance of insects to the ecosystem and makes no mention of rare butterfly species such as the early hairstreak, hoary elfin and hoary comma.
- How the project will affect the national recovery strategy for long eared bats (*Myotis* spp.) is not discussed in the EIA report.
- The impacts of habitat fragmentation are downplayed in the EIA report, especially when one considers the cumulative impacts of human activity in that area, the overall declining health of the Acadian forest type in New Brunswick, and the large vegetated area that the project is impacting.
- The project's impacts on lynx cannot be rated as "not significant" when no numbers are provided about how many lynx may die because of the project and the number of lynx in NB is not provided.

- The EIA report fails to acknowledge how the cumulative environmental effects of the project will contribute to deforestation and forest degradation at a time when the diversity of the Acadian forest should be restored.
- The EIA report fails to describe the potential effects of ecosystems and changes in the biota of terrestrial and freshwater ecosystems as a result of climate change in the future.
- The EIA report fails to develop a systematic approach to documenting how the project's environmental effects, such as to the atmospheric or aquatic environment, overlap with, and consequently impact on, candidate protected natural areas (PNAs). Many of the project's environmental effects will travel outside of the 1.5 km local assessment area chosen by the proponent to predict the impacts of the project on candidate PNAs.
- The EIA report does not assess the economic benefits of candidate PNAs as economic alternatives to the project, or the impact of PNAs as part of the environment's impact on the project.

1.3.8 Summary of the reviewer's main comments about the EIA report: Wetland Environment

- There is an over reliance on adhering strictly to the current provincial wetlands management policy which (as the proponent clearly states) does not regulate a large proportion of wetlands in the project development area, the local assessment area, and the regional assessment area. This leads to an underestimation of impacts due to a lack of requirements for compensation for this loss and an underestimation of the cumulative impacts, particularly when considered with future forestry activity which has the most impact on the unregulated wetlands (forested wetlands).
- The proponent does not go into detail about their proposed wetland compensation approach for mitigating the loss of wetlands functions of government regulated wetlands.
- The proponent relies heavily on future work to identify compensation measures. With a lack of detail it is impossible to comment on such things as watershed thresholds for wetland function loss and appropriate compensation to reflect the watersheds thresholds. This modeling should be undertaken.

1.3.9 Summary of the reviewer's main comments about the EIA report: Labour and Economy

- The EIA report is only dedicated to describing the economic benefits of mine, not its costs.
- The reviewer questions the use of an economic impact model (EIM) used to calculate the benefits of the project. Under EIMs, all expenditures by the project are a benefit. This includes the money spent to clean-up spills and floods of tailings.
- Even if one accepts the use of an EIM in the EIA report, the economic benefits of the mine have likely been over-estimated.
- A traditional cost-benefit analysis should have been used to improve our knowledge about the economic impacts of the mine.
- No details are provided about how the \$50 million in closure costs were estimated. The reviewer believes this amount to be a serious under-estimation.
- Based on the proponent's sensitivity analysis, the reviewer states that mineral price movements, especially in the price of APT, will have a significant effect on the viability of this project. He also notes that current prices for molybdenum are far below the proponent's assumed price of \$15/lb.

1.3.10 Summary of the reviewer's main comments about the EIA report: comparing the project to other mines

- From the parts of the EIA report the reviewer read, it is his view that overall the EIA report was very thorough and quite well done. He did raise some concerns about the project's plans for water management and the tailings storage facility (TSF). These follow below.
- A condition for allowing the project to proceed should be the requirement of a detailed plan to deal with emergencies such as a power failure, a pump(s) malfunction, and excessive precipitation.
- The EIA report does not provide a description of the spillway on the TSF or describe the design criteria for that spillway.
- It is not clear from the EIA report whether all of the water management components (WMP, pumps, pipes, and spillways) are designed to deal with these types of extreme rainfall events.
- Annual or at a minimum biannual inspections should be carried out to ensure the integrity of the dams surrounding the TSF versus the five year inspection period proposed by the proponent.
- It is not clear to the reviewer whether \$50 million is adequate to properly close the mine.
- The reviewer notes that very few mines commence operation and run uninterrupted for the predicted full operational life of the mine. Metal prices, technical problems and labour disputes can all result in temporary or premature closure of a mine. This issue is not discussed in the EIA. The reviewer asks that should an interruption in production occur, how will that affect the water management plan, the operation of the TSF and the treatment of the waste water?

1.3.11 Comments on the failure of the EIA Report to address Need for and Sustainability of the Project

- The business case for the mine is weak, therefore the proponent has failed to demonstrate a clear need for the project in its basic purpose – supplying tungsten.
- The EIA report does not explain how the project supports sustainable development today and meets the needs of future generations.
- The proponent's, Northcliff Resources, relationship with HDI is unclear, i.e., it seems as though HDI is the proponent. Other environmental assessments have raised serious concerns about the quality of the EIA reports for different HDI projects, such as the Prosperity Mine in BC.

1.4 Five significant shortcomings of the EIA report

CCNB Action's reviewers identified many ways the EIA report needs to be improved. However, after CCNB Action's own review, after reading our experts' reports and discussing the EIA report with them, and hearing from the public, CCNB Action has identified five overarching "themes" about the inadequacy of the EIA report. (Many of these same concerns were raised during the federal review panel's hearing for the EIA report for the New Prosperity Mine in B.C., an HDI (the partner of Northcliff Resources in the Sisson Project) project (see **Appendix F** of this report)).

1.4.1 The EIA report is fundamentally incomplete

There are many examples of how the Sisson Project EIA report is incomplete and as such needs to be revised before any further consideration of approving the project can take place. Some of the most glaring and vital are discussed below.

1.4.1.1 Acid Base Accounting for many potential sources of metal leaching and acid rock drainage were not complete at the time the EIA report was written

Metal leaching and acid rock drainage are two of the biggest and most obvious environmental effects of a metal mine. The assessment of these effects is fundamental to understanding the impacts of the Sisson Project. As such, they should have been top of mind when it came to completing the EIA report. Clearly they were not as the SRK 2013 ML/ARD Potential Characterization Report was not completed until August 2013, while the EIA report was submitted to the Agency on July 31, 2013. How any work or information from the ML/ARD report could have been included in the EIA report is unclear.

Further to this point, even the acid base accounting work in the ML/ARD report is incomplete. For example:

- **SRK ML/ARD Sec. 3.5:** "Additional overburden sampling is planned as part of geotechnical investigations in early fall 2013 and acid-base accounting analyses will be performed at that time."
- **SRK ML/ARD Sec. 4.5:** "Additional geotechnical investigations are planned for the fall of 2013 and ARD characterization is expected to occur at that time."

"Additional work will be required to understand the mobility of arsenic from overburden. These studies are planned for the fall of 2013. "

Regarding ML/ARD, the Terms of Reference for the EIA Report required that:

The discussion of ML/ARD should demonstrate that Northcliff has the necessary understanding, site capacity, technical capability and intent to identify, avoid, mitigate and/or manage ML/ARD in a manner which protects the environment through the life of the mine and after closure of the mine.

Given the proponent's cavalier treatment of the issue of ML/ARD in the EIA report, it is clear Northcliff has done none of this.

1.4.1.2 Details and statements regarding seepage from the tailings storage facility are either lacking or unsupported

At pages 7-79 and 7-80, the EIA report states:

7.6.2.2.1.3 TSF Embankment Drainage and Seepage Collection

Steady-state seepage analyses were completed using the finite element computer program SEEP/W to estimate the amount of seepage through the TSF embankments. It was assumed that a portion the embankment drainage and seepage will be captured by the embankment seepage collection system or intercepted and collected by groundwater pump-back wells downstream of the TSF. A small fraction of the total seepage was assumed to bypass the seepage collection systems and be lost to the environment downstream of the TSF.

Nowhere in the EIA report or supporting studies are the results of these analyses or actual rates of seepage provided. What is a "small fraction" is not quantified. Evidence that this information is not shared with the public or decision-makers can be seen in EIA report Figure 3.4.9 (at page 3-124) "Schematic of Mine Operational Water Balance". The legend figure states the source of the figure is Samuel Engineering 2013. However, closer inspection shows the figure was supplied on March 27 to the proponent by Knight Piesold. While similar, Samuel Engineering did not use this figure. Rather, this figure comes from the reference Knight Piesold 2013b. (Sisson Project – Feasibility Study Monthly Operational Water Balance. Prepared for Northcliff Resources Ltd. dated March 27, 2013.) This Feasibility Study was not placed on the CEAR website for this project.

Dr. Chambers (CSP2) 1-2 highlights the need for this information:

It is noted in the Knight Piesold Baseline Hydrogeology Report that:

- "● Till: Surficial geology mapping has identified basal and ablation tills up to about 10 m in the project area. The till is comprised of varying composition of sand, silt, gravel and clay. The ablation till may be more permeable than the basal till.
- Shallow, weathered bedrock: The presence of this zone in the upper 10 m to 20 m of rock is based on regional mapping as well as drilling in the project area."

With up to 10 m of till, potentially on top of fractured bedrock that could be an additional 20 m in depth, the likelihood of seepage under the starter (and fully constructed) tailings dam seems probable in some locations.

1.4.1.3 Hydrometeorology data is missing or seemingly ignored

- **Baseline Hydrometeorology Report Sec. 6.0:** A reasonable amount of hydrological and meteorological data has been collected at the project site. However, periods of limited or missing data exist within the records. The most notable of these is the lack of winter precipitation data at the Sisson climate station, as well as limited May freshet runoff data and winter discharge data. It is therefore suggested that ongoing data collection be continued and that the estimated values in this report be reviewed and updated once additional data become available.

- **Baseline Studies: KP hydrogeology Sec. 4:** The rate of groundwater recharge was estimated as about 8 % of the MAP (1350 mm) based on a watershed model for the project that was calibrated to regional streamflows at Narrows Mountain Brook (KP 2012e). The regional stream flow data currently provides the best approximation of the long-term distribution and volume of flow at the site. As additional precipitation and streamflow measurements (especially low flow measurements) are collected on site, the modelling work may be revised to use site data for calibration. Short warming periods in the winter result in a component of the winter snowmelt and therefore winter low flows may reflect both surface runoff and groundwater discharge.

This flow condition observed during this packer test indicates that the higher take is likely not indicative of the bulk permeability of the test interval. Given the uncertainty with the high take tests, the following was recommended:

- o Identify the packer tests as high take without assigning an actual hydraulic conductivity value, until there is greater certainty regarding the validity of the testing.
- o If required, carry out additional and more than one type of hydraulic testing (e.g. constant head, falling head, lugen) to better constrain whether the high take results are indicative of the site conditions or were influenced by the testing tool or method.
- o Recognize the implications of potentially high hydraulic conductivity values within the deposit area on engineering and environmental studies until additional testing is completed to gain a better understanding of the hydraulic conductivity values.

From the above quote, it appears as though the proponent chose to ignore results it didn't like and wait for better data. There is no evidence that further testing was done to determine the mine site's hydraulic conductivity values and as such it is unclear how the proponent reached conclusions regarding the rate of groundwater flow for the project.

1.4.1.3 Understanding the toxicity of water released to Sisson Brook

In the EIA report, the water quality at a node for Sisson Brook is not discussed (at page 7-92) despite it being the receiving waters for the water from the TSF and later, open pit. Instead, the closest water quality node that is discussed is at Napadogan Brook 5 (NAP 5), which is below the confluence of Sisson and Napadogan Brook. At NAP 5, the toxicity of Sisson Brook is diluted by Napadogan Brook, thereby not providing the public and decision-makers of what is the final water quality of Sisson Brook. This information is key if we are to understand the impacts of the project on water quality and fish and fish habitat.

The failure to discuss a water quality node at Sisson Brook provides another example of the poor quality of the background work done for the EIA report. The Predictive Water Quality study treats NAP 5 as an effluent discharge point. For example (at Predictive Water Quality Study page 5):

Beginning in Year 8, 6,000,000 m³/yr of excess water from the TSF is pumped to a water treatment plant (WTP) and discharged post-treatment to Napadogan Brook at the confluence with Sisson Brook. The WTP discharge rate is generally proportional to the baseline hydrograph of at the point of discharge. The discharge is further reduced during low flow months in late summer and mid-winter.

Everywhere else in the EIA report it is made clear that water will be discharged to Sisson Brook. Why the Predictive Water Quality Study used a different discharge is unclear. This lack of consistency results in vital information being lost to the EIA report.

Finally, the proponent's assertions that it will do future work to address gaps in data and analyses are not in keeping with the Agency's own guidelines regarding the completion of an EIA report:

"A commitment to implementing adaptive management measures does not eliminate the need for sufficient information regarding the environmental effects of the project, the significance of those effects and the appropriate mitigation measures required to eliminate, reduce or control those effects. Where additional information collection or studies are needed over the life-cycle of the project, such studies in themselves should not be considered "mitigation measures"."
(CEA Agency's 2009 Operational Policy Statement, *Adaptive Management Measures under the Canadian Environmental Assessment Act* at page 4, emphasis added)

The spirit of the 2009 OAP is that EIAs are not complete until all necessary baseline data is collected. Without this, the effects of a project cannot be fully assessed.

Recommendation:

- That the CEA Agency require the proponent to revise the EIA report to address all the concerns identified by CCNB experts and in this report.

1.4.2 No economic cost-benefit analysis

Common sense tells us that large open pit mining operations that dig up acid generating and metal leaching rock, emit contaminated dust, destroy the headwaters of clean and ecologically important rivers, fragment terrestrial landscapes, and have massive tailings ponds and dams, cause harm to the environment. These negative environmental effects also impact communities located near these mines. If these impacts and harm are significant, then these projects should not be approved by the public and environmental assessment decision-makers. However, sometimes they are when it is believed the economic benefits of a mine outweigh or justify the damage it causes to the environment and communities. Implicit in these decisions though is that the economic benefits of a mine are large enough to outweigh its environmental and social costs.

As has been detailed by Dr. Moir (see Section 2.9 below), without a cost-benefit analysis we don't have an accurate picture of the economic benefits, if any, of the Sisson Project. As Dr. Moir notes, the use of an economic impact model, like the one used by the proponent, for a different project showed that the project created a positive economic benefit, while using a true cost-benefit analysis showed this same project generated a negative economic loss to the community. Therefore, without an economic cost-benefit analysis for the Sisson Project, the public and decision-makers cannot make an informed decision about whether the economic benefits of the project justify the damage it will cause to the environment. Making this determination becomes even more difficult when the true closure costs of the Sisson Project are not known.

Recommendations:

- In consultation with Dr. Moir, have the proponent prepare an economic cost-benefit analysis for the Sisson Project for inclusion in a revised EIA report.

- Have the proponent provide a fully costed estimate of the long term closure costs of the Sisson Project for inclusion in a revised EIA report.

1.4.3 No assessment of the failure of the tailings dam

As will be detailed more fully below, and as much as the proponent would like this fact to go away, tailings dams fail! The failure of the Sisson tailings dam could release millions of tonnes of tailings and millions of cubic metres of supernatant water into the ecologically valuable Nashwaak watershed. While understated, the EIA Report does recognize the harm such a failure would cause. “At Sisson, a failure of the TSF embankment and resultant tailings or process water release could significantly affect downstream watercourses and habitats that have substantial ecological and societal value ...” (EIAR page 3-25, emphasis added). Despite a tailings dam failure posing the project’s biggest acute threat to the environment, the proponent chose not to assess its impacts.

8.17.2.1.1 Loss of Containment from Tailings Storage Facility (TSF)

“With the application of these standards and rigorous construction methods to ensure the structural integrity of the TSF embankments and components, the implementation of adaptive management measures as necessary over the life of the mine, and the legislated regulatory oversight, the possibility of a structural failure of a TSF embankment is so unlikely that it cannot reasonably be considered a credible accident or malfunction, and is thus not considered further in this EIA Report.” (EIAR page 8-698, emphasis added)

In his review of the EIA report for the Sisson Project (see Section 2.5 below), Dr. Chambers, who has 20 years of experience as an advisor on the environmental effects of mining projects both nationally and internationally, clearly explains why the above thinking is flawed.

This is the first time I have seen this glaringly overconfident statement made in an EIS/EIA.

In the 10 years since the ICOLD 2001¹ report the failure rate of tailings dams has remained at roughly one failure every 8 months (i.e. three failures every two years).² These dam failures are not limited to old technology or to countries with scant regulation. Previous research pointed out that most tailings dam failures occur at operating mines, and that 39% of the tailings dam failures worldwide occur in the United States, significantly more than in any other country.³

Tailings dam failure is a low probability event, but also an event with high consequences. These consequences have never been ignored in any other EIS/EIA I have reviewed. To in essence assert that ‘my engineering’ could not possibly fail, in light of existing statistics, is arrogantly assuming that it is always the other guy (or gal) that will make a mistake – but not me. This is exactly the attitude that leads to accidents – as has been proven many times in the aviation world. (emphasis added)

¹ Tailings Dams, Risk of Dangerous Occurrences, Lessons Learnt from Practical Experiences, Bulletin 121, International Commission on Large Dams, 2001.

² Data from <http://www.wise-uranium.org/mdaf.html> “Chronology of major tailings dam failures” as of March 22, 2011.

³ Reported tailings dam failures, A review of the European incidents in the worldwide context, M. Rico, G. Benito, A.R. Salgueiro, A. Díez-Herrero, H.G. Pereira, Journal of Hazardous Materials 152 (2008) p. 848.

Recommendation:

- Have the proponent complete a detailed environmental effects analysis of the failure of the tailings dam for the Sisson Project for inclusion in a revised EIA report. The assessment would include a modeling of the most likely worst case disaster scenario for such a failure describing, for example, the toxicity of the tailings and supernatant water, how much tailings and supernatant water would escape from the tailings storage facility, how far and to what depth the tailings and supernatant water would travel downstream, and what damage this would cause to communities in the watershed and the environment, including Atlantic salmon habitat, and for how long.

1.4.4 The closure plan is missing significant details

Several CCNB Action reviewers discussed the serious deficiencies of the proponent's closure plan. Mines with acid rock drainage and metal leaching leave long term environmental liabilities that must be managed. Without an understanding of the long term future environmental, social, and economic costs of the Sisson Project, we cannot make a fair determination of whether the project is sustainable, i.e., does it meet the needs of today without damaging the opportunities of future generations. Several of the key deficiencies of the closure plan are discussed below.

1.4.4.1 There is no accurate description of how much contaminated water will have to be managed after closure

The EIA report first states "the TSF will have approximately 2 million m³/year of surplus water starting at about Year 8" (EIA page 3-123). It then reports, "Approximately 6 million m³/year of TSF pond water will be pumped to the WTP during Operation starting in Year 8 under average conditions" (EIA page 7-80). Finally, the SRK (2013) Metal Leaching and Acid Rock Drainage Potential Characterization then describes in Appendix I (conceptual water treatment plant design) that the TSF, and after closure, the open pit will have an annual discharge of 1,280 m³/hr (or 11 million m³/year). This wide variation in water that will have to be treated after closure is never explained.

1.4.4.2 There is no accurate description for how long contaminated water will have to be managed after closure

The EIA report provides no details about how long post-closure that water will need to be treated, only that it will be treated for "as long as necessary" (EIA page 143). Is this 1 year, 10 years, 100 years, or more? This is not an idle question, for as Mr. Parker points out (Section 2.10 below), we already have closed mines in New Brunswick whose waste water requires long-term treatment. The lack of detail in the EIA report obviously does not assist in decision-making about the project.

1.4.4.3 Significant details about the conceptual water treatment plant are missing

The water treatment plant (WTP) is the key component of the closure plan for the mine, yet it is not described in any detail in the actual EIA report. Without the WTP, the environmental effects of the project post-closure on the aquatic environment will not be mitigated, in turn increasing their significance. Given the limitations of the conceptual design for the WTP, at present there is *no water treatment plant* for the Sisson Project. As the SRK 2013 report states:

In the event that water treatment for sodium or fluoride is required ... then the water treatment process proposed here will not be adequate. (SRK 2013 Appendix I, emphasis added)

The EIA report shows (at page 7-98) that post-closure, fluoride levels in water from the mine will be 2 to 3 times the CCME FAL guidelines (for the protection of aquatic life). The proponent can have no expectation that this continual exceedence, amongst others, will be permitted in the future. As a result, there is no actual plan for a WTP in the EIA report and a new conceptual WTP needs to be designed. The consequence of this is that any of the proponent's environmental effects analysis that relied on the existence of the flawed conceptual WTP must be redone, and if not redone, then without the mitigation of a WTP, the adverse environmental effects of the project on the aquatic environment must be considered to be significant.

1.4.4.4 The Terms of Reference regarding closure have not been met

At a minimum, the discussion of alternative means of carrying out the Project shall include a consideration of the following: ...

- alternative options for reclamation and closure. (TOR at page 22-23)

In response to this requirement, the EIA report (at page 3-77) states, "Northcliff has considered various options to achieve decommissioning, reclamation and closure of the Project site at the end of mine life." No details of these other options are provided. Clearly this is not enough information for the public and decision-makers to weigh these alternatives. It is also not in keeping with Environment Canada's 2011 *Guidelines for the Assessment of Alternatives of Mine Waste Disposal*:⁴

The alternatives assessment should objectively and rigorously consider all available options for mine waste disposal. It should assess all aspects of each mine waste disposal alternative throughout the project life cycle (i.e., from construction through operation, closure and ultimately long-term monitoring and maintenance). (at page 7)

Recommendations:

- Any plan for the decommissioning and closure of the project should be completed at the mine-proposal stage, and certainly prior to permitting, to a sufficient degree to reasonably determine water treatment costs, i.e., how much water and what is in the water, reclamation costs, and assess the short and long term social, health, and economic impacts from the mine (including post-closure).
- Prior to permitting the proponent should identify what long term and permanent water quality treatment may be necessary at the mine site. This includes but not be limited to discharges from the pit (including from pit walls that will not be submerged and pit discharges to groundwater).
- Permanent treatment should be avoided. The closure plan should more fully evaluate this and identify alternatives to perpetual treatment.

⁴ Available at: <http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=5ECBCE8B-7E50-49E3-B7AD-8C21A575E873>.

1.4.5 Costs of closure are not explained

Regarding this issue, Dr. Chambers writes

If there is surplus pit water that will require treatment it is reasonable to anticipate that this treatment will be required in perpetuity - forever. That presents clear long-term liabilities and costs to the Crown, Province, and public. These liabilities and costs should be fully evaluated and discussed ... (Section 2.5 below).

Similar concerns are raised by Dr. Curry (Section 2.4), Dr. Moir (Section 2.9), Mr. Parker (Section 2.10), and Mr. Hart (Section 3.0 Sustainability).

The proponent provides no details about how it arrived at a figure of \$50 million to cover the costs of decommissioning, reclamation, and closure of the project. In addition, all of the above reviewers believe this amount to be very inadequate for a project of this size. The average operational costs of water treatment for mines are estimated to be \$1.54 per m³.⁵ Accepting the proponent's figure of the project having 6 million m³ of surplus water/year, one arrives at roughly \$9 million/year being required to treat this water. The proposed \$50 million would be depleted in less than 6 years, without including reclamation costs such as for revegeatating the site.

Recommendation:

- Have the proponent provide a fully costed estimate of the long term closure costs of the Sisson Project for inclusion in a revised EIA report.

⁵ Zinck, J. and W. Griffith. 2013. Review of Mine Drainage Treatment and Sludge Management Operations. MEND Project: 603054. Report: CANMET-MMSL 10-058(CR).

1.4 CCNB Action's position on the EIA report and adverse environmental effects of the Sisson project

CCNB Action's report below shows that the need for the proposed tungsten and molybdenum mine has not been proven adequately. In addition, CCNB Action's expert reviewers collectively are of the opinion that because of missing vital data or data of poor quality, and inadequate sampling, methodology, and modeling done by the proponent, a large number of the Sisson Project's environmental effects cannot actually be determined. As a result, the EIA report does not fulfill the requirements for the conducting and reporting of the environmental assessment for the project as set out in the project's EIA terms of reference. CCNB Action experts are also of the opinion that based on the data that is available in the EIA report, in many instances the proponent has under-estimated the environmental effects of the project and mischaracterized the significance of these impacts, i.e., CCNB Action experts believe these adverse environmental effects of the project should be rated as significant.

From a reading of our report below, it is evident the presently inadequate and incomplete EIA report for the project must be redone so that fundamental questions about the project can be answered, such as what is the actual trace mineral content of the ore, what is the acid generating potential of the mined rock, and what are the true economic benefits of the project? Based on the fact the EIA report is incomplete, our experts' findings that many of the project's adverse environmental effects are significant, and the application of the precautionary principle, it is CCNB Action's position that the adverse environmental effects of the project must be accepted as being significant. Given all of this, it is clear that at present the obvious risks posed to the environment by the proposed mine, such as the release of air contaminants, the physical destruction of valuable fish habitat, and metal leaching and acid rock drainage, substantially outweigh the unsubstantiated need for or benefits of the project. For this reason, it is the position of CCNB Action the project should not receive the approval of decision-makers until such time as fundamental errors and oversights in the EIA report are adequately addressed. It is only after the EIA report is properly completed that the public and regulators can return to the question of whether the project should receive approval.

Following from the above, we will be requesting that the Minister use her authority under s. 23(2) of the old *CEAA* and/or the CEA Agency use its authority under s. 23(2) of *CEAA 2012* to require the proponent, Northcliff Resources Inc., to redo and revise the EIA report so that the information gaps in it identified by CCNB Action's experts are filled. We will also ask that the current public comment period not be ended and that it be extended for 45 days following the submission of a revised EIA report by the proponent. If these revisions are not made, then CCNB Action will stand by its position that the adverse environmental effects of the Sisson Project must be deemed to be significant and because of the unsubstantiated need for the project, that these effects cannot be justified. As such, we will ask the CEA Agency to conclude in its comprehensive study report (CSR) for the project, "That even with the implementation of mitigation measures, the Sisson Project is likely to cause significant adverse environmental effects and that these effects cannot be justified."

2.6(a) Review of EIA Report for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Valued Environmental Component: Terrestrial Environment

Subject Area: Wildlife with a focus on Birds

EIA Report Section: Section 8.6 and Baseline Wildlife and Wildlife Habitat Technical Report (WTR)

Date: October 12, 2013

Antony W Diamond, Research Professor, Wildlife Ecology (speciality: bird ecology)
University of New Brunswick, Dept. of Biology and Faculty of Forestry & Environmental Management

1. Summary

- *I reviewed Ch.8.6, Terrestrial Environment, with particular attention to Sections 8.6.2 to 8.6.4, of the EIS Report, and the Baseline Wildlife & Wildlife Habitat Technical Report (WTR).*
- *Description of current conditions is appropriate for birds; survey methods used are up to professional standards, clearly described, and quantitative.*
- *Description of current conditions for other animal groups is inadequate; no quantitative information is given, merely general list of species detected by a variety of methods that are poorly or vaguely described – little better than a species list.*
- *Likely effects on populations of Species at Risk and Species of Conservation Concern (pp.8-313/314) are dismissed as negligible or zero because "habitat is available elsewhere". This is based on the statement (for each species) that "not all available habitats are typically occupied by [Canada Warbler] in the local area, and therefore it is expected that any individuals displaced from habitat as a result of the Project are likely to find suitable nesting habitat nearby." (The same statement is made for all 5 SARA species of bird). No source is given for this statement; it implies a rigorous definition (and modelling) of each species' habitat in the area, and mapping species-specific habitat models onto a habitat map of the area; there is no evidence that this has been done. There is no reference to such models having been developed – the statement is given as if it is a fact whereas it is evidently an opinion. The number of bird Species At Risk identified in the project area deserves much more serious attention with regard to both Significance and Mitigation.*

2. Review of methods used to study existing conditions (EIA Report section 8.6.2)

BASELINE WILDLIFE AND WILDLIFE HABITAT TECHNICAL REPORT

Methods (Section 3.1):

WTR 3.1.1 Wildlife. "collected baseline wildlife information by observing animals and animal sounds" (at p. 37) – *no mention of looking for sign (tracks, dung) or using camera traps for rare species. This sounds like casual observations rather than systematic quantified sampling. It is **clearly inadequate** for mammals (especially small and nocturnal species) and herptiles (reptiles & amphibia).*

WTR 2.3.1 Ungulates

Pellet count surveys were conducted June 11-12, 2008. Surveyors walked transects to visually identify the presence of scat or pellets from moose and deer. They observed evidence of moose and white-tailed deer during pellet count. No pellets from deer were observed; however a number of tracks were present

along the transects. Signs of both moose and deer were noted incidentally throughout the wildlife field program. *No data are presented; no information on number, length, duration of transects, or which habitat types were involved.*

WTR 2.3.2 Amphibians and Reptiles

Ground surveys for herpetile species (*i.e.*, amphibians and reptiles) were conducted between June 5-10, 2008 in conjunction with waterfowl and forest breeding bird surveys. Herpetile species were identified incidentally and in targeted potential habitats based on visual characteristics, and in the case of some frog species, auditory cues. *No data are presented; no information on number, length, duration or method of surveys, or which habitat types were involved.*

Forest Bird sampling however seems to have been carried out thoroughly and according to accepted standards, with the exception of surveys for owls and other nocturnal birds.

3.1.2 Early breeding birds – playback in old forest, early May 2011. OK but no actual breeding confirmed. *(Need to return later in season to find occupied nests – no mention of this having been done)*

3.1.3 Owl surveys – standard protocol (April 2011) – poor weather, only 1 Barred Owl detected! *Needed to be repeated in later years, 1 at least of which should have provided suitable weather*

Nightjars – US survey protocols, dusk, June 11-July 8 2011: 20 CONI at 14/61 stations; **likely breeding**, all over clearcut or regeneration or transmission corridors. Common Nighthawk is a species at risk, threatened under SARA, as are Canada Warbler, Olive-sided Flycatcher and Rusty Blackbird. *Strong evidence of breeding (from behaviour) – as strong as you can get without finding nests (did they try?) – of a significant number of a Threatened Species.*

3.1.4 Forest birds – 208 point counts (10 min each), June 11-July 8 2011; *data seem thorough & reasonable*

Summary/conclusions

- *Overall, sampling for wildlife other than birds is clearly inadequate.*

3. Review of results of studies of existing conditions

Species At Risk

Canada Warbler: 31 males (territories) in study area: densities ca. 4.81 territories/100 ha within 500 m of the PDA, and 3.65 territories/100 ha in the remainder of the Study Area. Most commonly observed within riparian wetland and near freshwater marsh habitats, and all detections within forest point counts were within 250 m of watercourses and wetlands. *A significant number of probably-breeding birds of a Threatened Species.*

Olive-sided Flycatcher: 18 detected: typically at edge areas near watercourses or open water wetlands. *A significant number of probably-breeding birds of a Threatened Species.*

Rusty Blackbird: 9 recorded in all. Densities 0.46 territories/100 ha in the Study Area, comparable to the 0.39 territories/100 ha recorded overall during the 2008 5-minute point counts. All in or adjacent to riparian wetland areas and beaver ponds. *Likely-breeding birds of a Threatened Species.*

No attempt seems to have been made to establish whether or not waterfowl are breeding in the area (no brood counts referred to – waterfowl records are referred to as "incidental"), or to target rare species that might be expected in the freshwater swamps and wetlands (e.g. Marsh/Sedge Wren, rails, grebes).

Summary / conclusion

- *Forest birds were surveyed properly, and results more or less in line with what would be expected; Canada Warbler perhaps more abundant than would be expected.*
- *Results for other wildlife taxa, including waterfowl and marsh birds, are inadequate, being based on poorly-described methods with similarly nebulous results.*
- *Referencing throughout is to public sources or proponent's field data, with no peer-reviewed literature referred to.*

4. Review of described mitigation measures (EIA Report section 8.6.4.2)

- *The only mitigation referred to is to avoid cutting vegetation during the birds' breeding season. Since various bird species breed at any time between Jan/Feb and August, it is very much to be doubted that they will observe this.*

5. Review of Determination of Significance (EIA Report section 8.6.6)

5.1 Review of definition of "Residual Environmental Effects Significance Criteria"

- *EIAR section 8.6.1.6 (For rare or threatened species or SOCCs) the proponent has used criteria that very few projects would meet, including "the likelihood of the long-term survival of these rare, uncommon and/or non-secure population(s) within New Brunswick is substantially reduced as a result;" by requiring the entire provincial population to be substantially reduced the proponent essentially ensures that the criterion cannot be met. A more biologically relevant land area – instead of the entire province of New Brunswick! – would be the LAA.*
- *For other wildlife the criterion is also much too broad in geographic scope: "such that the populations will not be sustainable within the Madawaska Uplands portion of the Central Uplands Ecoregion and the Valley Lowlands Ecoregion". Again, the LAA would be a more appropriate area over which to assess significant population reduction.*

5.2 Determination of Significance

- *Having used an inappropriate criterion for significance, the conclusion that no significant effects on birds will result is a foregone conclusion.*

6. Review of Follow-up and Monitoring (EIA Report section 8.6.7)

- *"No follow-up is recommended to verify the environmental effects prediction or the effectiveness of mitigation for the Terrestrial Environment. No monitoring programs are recommended for the Terrestrial Environment." (p.8-320, EIS Report)*
- *Monitoring impacts on wildlife responses in the area surrounding the immediate project area (LAA) should have been proposed, to test the prediction that (especially) SARs and SOCCs would simply move into vacant habitat nearby.*

7. Conclusion and recommendations

- *In my opinion the report does a poor job of assessing effects on wildlife other than migratory birds, and the conclusion of no significant effects is premature without (a) much better data on all wildlife other than forest birds, (b) development of species-specific habitat models for SARs and SOCCs to justify the statement that unoccupied but suitable habitat is available "nearby".*
- *Allusion to an "Avifauna Management Plan (AMP) to be submitted to Canadian Wildlife Service to address incidental take" (EIS p.8-311) is inadequate without giving details of that plan.*

8. Biography of Reviewer

CV of Dr. Antony Diamond – see Appendix C (short version: full CV available on request).

2.6(b) Review of EIA Report for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Valued Environmental Component: Terrestrial Environment

Subject Area: Rare Forests and Wildlife, excluding Birds

EIA Report Section: 8.6

Date: September 27, 2013

Tracy Glynn, PhD. Candidate, University of New Brunswick
Acadian Forest Campaign Director, CCNB Action Inc.

Sections of the EIA report for the Sisson Project (Tungsten and Molybdenum Mine) that deal with terrestrial environments and wildlife (excluding birds) (EIAR Sec. 8.6) are reviewed here.

1. Background to review

With reference to Conservation Forest in Sec. 8.6.2.2.1 (EIAR page 8-265), it is noted that there is 1,968 ha of Conservation Forest with a wildlife objective intersected by the LAA. Old Forest Wildlife Habitat make up 1,111 ha (53%) of this area, which is significant in a province that has reduced areas of Old Forest Wildlife Habitat. It is important to note that the province's Conservation Forest area was recently reduced, going against the recommendations of many wildlife biologists and forest ecologists. The amount of Crown forest set aside for Conservation Forest used to be 30 per cent but also has been reduced to 23 to 25 per cent. At the same time, the NB government has increased the amount of intensive forest practices. Plantations, for example, will go from 12 per cent now to a maximum of 28 per cent of the public forest in the next 50 years. These are significant changes to the public forest, which makes up 50% of the land base of the province. The loss of Conservation Forest in this area should be assessed in the larger context of a reduced Conservation Forest area in the province.

The LAA contains a total of 2,048 ha of managed wildlife habitats (EIAR page 8-266). It is noted that forestry operations have resulted in the loss of interior forests in and around the LAA. There are 72 interior forest stands within the LAA, eight of which are intersected by the mine site portion of the PDA. Seven of these eight stands intersected by the PDA range between 10.9 and 73.9 ha and are all or mostly within the PDA, the eighth is 179.2 ha with only a few ha within the PDA. The total area of the interior forest intersected by the LAA is 3,303 ha. There are 8 stands that intersect the PDA, totalling 374 ha.

For the last 20 years, forest management planning in New Brunswick has been based on maintaining minimum amounts of wildlife habitat; the Conservation Forest in the LAA are one of the last bits of old forest that certain animals, such as fisher and flying squirrels, must have in order to live and raise their young. Wildlife that need old spruce fir forest may not be able to tolerate the clearcutting, conversion, and plantations if there are not enough untouched stands of 375 ha with trees of a certain size and type (Forbes *et al.* 2009).

2. Review of proponent's discussion of existing conditions (EIA Report Section 8.6.2)

A total of 33 wildlife species (22 mammal, 11 herpetiles) and birds are noted in the LAA during field studies (EIAR Sec. 8.6.2.4, page 8-279). The reviewer notes that insects and other wildlife are not

mentioned here even though they play an important part of healthy forest ecosystems. There are rare butterfly species, including the rare early hairstreak, hoary elfin and hoary comma in the Buttermilk Ecodistrict that lies in Central New Brunswick and forms an elongated transitional zone between the Central Uplands Ecoregion and the Eastern Lowlands Ecoregion, the Ecoregions where the project's footprint covers, according to *Our Landscape Heritage* classification (NB DNR 2007).

The EIA notes that *Myotis* is one of two species that are not common or widespread in the area but that are potentially present (see page 8-282). *Myotis* are mouse-eared bats. The common name for *Myotis* should be included. The status of both *Myotis* species found in New Brunswick, the little brown bat and the northern long-eared myotis, are not mentioned in the EIA but both species are listed as endangered on the Department of Natural Resources website. Pertinent information about the species and status of the species is missing from Sec. 8.6.2.4 Wildlife (EIAR pages 8-266-299). A national recovery strategy is being prepared for mouse-eared bats by the federal government in consultation with the New Brunswick government. How the project will affect the national recovery strategy is not mentioned but should be included.

The proponent's work on the terrestrial section would have been improved by adding details about the eco-regions and eco-districts as outlined in the 2007 NB Department of Natural Resources document, *Our Landscape Heritage: The Story of Ecological Land Classification in New Brunswick*.

3. Review of environmental effects assessment re: Characterization of Residual Project Environmental Effects (EIA Report Section 8.6.4.3)

The impacts of habitat fragmentation are downplayed in the EIA report, especially when one considers the cumulative impacts of human activity in that area, the overall health of the Acadian forest type in New Brunswick, and the largely vegetated area that the project is impacting: "The majority of land-cover types identified for direct disturbance by the project (i.e., that which is within the PDA) are upland forests and wetlands" (EIAR page 8-312). In addition, the EIA report does not provide numbers of individuals for certain species. Without this information, the proponent can only assume regional wildlife populations are "healthy" (EIAR page 8-316). Reliance on these assumptions versus actual data makes the EIA report's conclusion that the project will not have a significant impact on wildlife suspect.

As an example of the above, Sec. 8.6.4.3.2 on wildlife (EIAR page 8-315) argues that Canada lynx will easily find habitat elsewhere. Canada lynx prefers habitat that are beneficial to snowshoe hare, usually in forests with dense vegetation and shrubbery. Numerous studies have shown that lynx populations are influenced by that of the snowshoe hare. As hare populations become larger or smaller, so do the lynx populations. The EIA notes that snowshoe hare were the most frequently recorded species in both transects. The reviewer disagrees that degradation of habitat for the snowshoe hare and the Canada lynx with this project will be unlikely to affect the regional population of this species. Inter-species competition is not addressed where Canada lynx with home ranges that overlap with the PDA could be forced into areas and therefore in competition with other Canada lynx, bobcat, and competition with and predation by fisher and coyote. As well, the EIA report infers at page 8-315 that there is unoccupied lynx habitat just waiting for lynx displaced by the project to move to. There are two problems with this position. First, if the lynx population is healthy, as the EIA report suggests, then it is ecologically unlikely there is unoccupied lynx habitat. On the other hand, if there is unoccupied lynx habitat near the project, then this suggests the lynx population is not as robust in the RAA as the EIA concludes. Finally, changes to forested landscape and access brought about by forest management, road development and mining may threaten lynx recovery.

Given the above, it is clear the project will impact lynx populations in the region. However, the EIA report does not provide data about the number of lynx in New Brunswick, which is not surprising as, "The population size and trends for the lynx population in New Brunswick is poorly understood" (NB DNR undated). Without this data, and contrary to the blithe conclusions of the EIA report, the significance of the loss of one, two, or more individual lynx to a population of an unknown size cannot be determined.

Affected herpetile species in the RAA are also said to be common with secure status in the province (EIAR page 8-315). However, on EIA report page 8-286, wood turtles are recorded as found just outside the LAA. Wood turtles are listed as at risk species by the New Brunswick Department of Natural Resources and listed as threatened by COSEWIC. Furthermore, how the proponent's project will affect species' national and provincial recovery strategies for both the Canada lynx and wood turtle are not outlined but should be.

The above also highlights one of the proponent's efforts to downplay the impacts of the project on wildlife and wildlife habitat. The EIA uses a very small LAA (1.5 km perimeter around the PDA), thereby keeping the number of individuals of a species that could be impacted by the project to a small a number. Then it uses a very large RAA to support its contention that the project will not have significant impacts on these species. While disingenuous, it also ignores the fact that different species have different ranges, mobility, etc. Finally, the reviewer notes that the LAA for the acoustic environment has a 10 km perimeter, which is "the maximum anticipated area within which Project-related environmental effects are expected" (EIAR page 8-35). It is unclear to me, and not explained in the EIA report, why humans can hear and be disturbed by noise from the project up to 10 kilometres away and wildlife will only suffer these same effects only up to 1.5 kilometres away.

4. Review of cumulative environmental effects assessment (EIA Report Section 8.6.5)

The reviewer disagrees with the proponent's assessment that "forest harvesting and other activities on Crown land are strictly managed by NBDNR through provincial objectives and standards that are revisited and updated every five years (NBDNR 2005) for many variables including vegetation communities, fish and wildlife habitat, timber and wood supply, and recreation and aesthetics." New Brunswick's forestry operations on Crown land are criticized for ever-expanding intensive forestry practices that include clearcuts and herbicide spraying that wipe out swaths of forest and wildlife habitat, reduce biodiversity, and cause run off into rivers and streams. Only fragments of intact forest remain in New Brunswick. Maps produced by Global Forest Watch Canada in 2000 revealed that no remaining large intact forests (500 square kilometres or more) exist in New Brunswick. The remaining 299-500 square kilometre blocks of forest in New Brunswick disappeared between 2000 and 2006, according to data from Global Forest Watch. Two disturbing observations stand out in these maps: 1) There are no large blocks of ecologically intact, undisturbed natural forests in the province of New Brunswick outside of protected areas, which cover only 3 % of the province; and 2) None of our major watersheds have more than 25 per cent intact forest cover (Global Forest Watch 2010). Global Forest Watch Canada used medium-resolution satellite imagery as well as some medium-resolution Landsat data and ground and aerial photography verification to generate the maps.

The Acadian forest type has been listed as one of six endangered forests in North America in a study by the World Wildlife Fund (Davis *et al.* 2001). New Brunswick makes up a large portion of the Acadian forest. Ensuring that the Acadian forest is properly managed here in New Brunswick is key to

maintaining this unique forest region. The EIA fails to acknowledge that the project will contribute to deforestation and forest degradation at a time when the diversity of the Acadian forest should be restored.

It is further noted that the EIA fails to describe the potential effects of ecosystems and changes in the biota of terrestrial and freshwater ecosystems as a result of climate change in the future. One report that the EIA should reference is the 2013 study, *Potential Effects of Climate Change on New Brunswick Freshwater and Terrestrial Ecosystems* by Arielle DeMerchant, Dr. Tom Beckley and Dr. Shawn Dalton. The report describes the views and opinions of leading scholars, researchers, and managers regarding potential macro-level ecosystem effects and changes in the biota of terrestrial and freshwater ecosystems as a result of climate change. The clearing of forest for the forestry industry and large industrial projects like mining can no longer be justified but rather larger tracts of the Acadian forest of New Brunswick must be conserved and restored so that the forest is resilient in a future of climate change. Forests also trap and store carbon dioxide and therefore play a major role in mitigating climate change.

5. Review of Determination of Significance (EIA Report Section 8.6.6)

The reviewer disagrees with the proponent's assessment that the environmental effects of the project on the terrestrial environment and wildlife are not significant. While the impacts of different aspects of the project on a variety of wildlife are summarized on pages 8-308-309 of the EIA report, the reviewer feels that the proponent fails to adequately address the local loss of habitat for a variety of species including Canada lynx and wood turtle, species being pushed to the brink of extirpation in this province. The proponent argues that "wildlife habitat types within the LAA are common and found throughout Central New Brunswick." However, how the project accompanied by planned forestry operations both within and outside the LAA and RAA will contribute to the further loss of old forest stands and mature forest stands, habitat for a variety of wildlife, is not mentioned or assessed by reviewing future forest management plans, which are also subject to change. It is assumed that Canada lynx and other wildlife will find similar suitable habitat outside the RAA but this does not take into account future planned activities and habitat destruction in these outside areas, which includes potential shale gas exploration and development (page 8-319). How climate change will affect the project's residual and cumulative impacts on wildlife is also missing, which should be included when assessing residual project and cumulative environmental effects.

6. Review of Mitigation, Follow-up, and Monitoring

The reviewer disagrees that mitigation measures, including the management of forestry activities by NBDNR for the protection of wildlife will minimize the environmental effects to wildlife populations such that they are not substantive. As mentioned above, the provincial government's management of public lands has and continues to be criticized by a number of the province's biologists and forest ecologists for failing to protect wildlife populations.

The reviewer disagrees with the proponent's recommendation to not to do any follow-up or monitoring to verify the predicted environmental effects of the project on the terrestrial environment (EIAR page 8-320). Given the uncertainty of effects of habitat loss on wildlife, some of them currently threatened species, requires follow-up and monitoring.

7. Conclusion

In a time of climate change, we should be conserving and restoring our Acadian forests and terrestrial environments so that they are resilient in the future. While the project does not occupy a large spatial area, any loss of very ecologically important and ever diminishing Acadian and old forests and wildlife habitat in New Brunswick should be treated as significant. Also, the proponent's treatment of the project on New Brunswick's forests in combination with other projects is disingenuous. It first relies on its position that New Brunswick is home to large tracts of old or mature forest and as such the project will not have a significant effect on the terrestrial environment and wildlife. Relying on this forest on one hand, the proponent then does not properly describe the decline and state of the forest and its potential effect on wildlife outside the project area.

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9. CV of Reviewer

CV of Tracy Glynn – see Appendix C.

2.6(c) Review of EIA Report for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Valued Environmental Component: Terrestrial Environment

Subject Area: Protected Natural Areas

EIA Report Section: 8.6

Date: October 5, 2013

Lawrence Wuest
Consultant in Quantitative Ecology

EIA Report Section 8.6.2.2.3 Protected Natural Areas (PNAs)

The proponent fails to develop a systematic approach to documenting project LAA overlap with, and consequent impact on, candidate PNAs (CPNA). The reasons for the areal extent of the LAAs applied to individual VECs are never adequately defended by reference to peer reviewed science. The proponent only examines the overlap of existing and candidate PNAs with a single LAA from a single VEC. This is totally inadequate given the scope of the project and leaves the EIA report incomplete.

The reviewer notes that in EIA report 8.6.2.2.3, the proponent incorrectly assumes that undeveloped mineral claims and petroleum licenses to explore constitute "resource use". The proponent states: "Another [candidate] PNA (PNA #325) overlaps the southwest corner of Northcliff's mineral claim boundary, apparently in contradiction of the stated PNA objective to avoid areas for resource use." The candidate PNAs that do overlap the LAAs of interest for the Sisson Project do not include any current "resource use" by mineral or petroleum interests, e.g., an actual working mine, and thus PNAs have every right to compete with the proponent for the use of the land base in this area.

Although clearly an oversight, the proponent has not examined, nor did the final terms of reference for the Sisson Project EIA require the proponent to examine:

- 1) the overlap of all VEC LAAs with existing and candidate PNAs.
- 2) the economic benefits of candidate PNAs as economic alternatives to the project.
- 3) the impact of PNAs as part of the environment's impact on the project.

Addressing 1) above, the proponent has confined LAA overlap with existing and candidate PNAs to the LAA of the Terrestrial Environment VEC (EIAR Sec. 8.6.2.2.3). In Sec. 8.6 the proponent states "Managed conservation areas including interior forest, deer wintering areas, old forest wildlife habitat, protected natural areas (existing and proposed) will not be affected substantially by the Construction and subsequent Operation of the Project" (at EIAR p.8-247). The EIA report fails to provide evidence in support of this contention.

The proponent has assumed a 1.5 km buffer about project facilities, the PDA, as the extent of the LAA for wildlife habitat, and for the terrestrial Environment VEC as a whole. This is a highly questionable assumption given that the proponent's LAA for the Atmospheric Environment VEC is 25 km by 25 km. The assumption also flies in the face of published research on mine emissions and their areal extent. The 1.5 km buffer is contradicted by recent peer reviewed studies of the occurrence of heavy metals from mining activities in biota 20 km to 30 km from the source (Hasselbach *et al.* 2004; Aznar *et al.* 2008; Pilgrim and Schroeder 1997). The proponent has failed to consider this research and to incorporate the

findings into its modeling of dust and water emissions. The proponent's conclusions about impacts of the project on candidate PNAs are compromised by this oversight and require revision. The proponent's current conclusions regarding PNAs are not credible.

Based on the available mapping of VEC LAAs in Sections 8.2 to 8.17 of the EIA report, the reviewer has analyzed the overlap of candidate PNAs with the LAA of the Atmospheric Environment VEC. This VEC LAA overlaps with 5 candidate PNAs as illustrated in Figure A1 below adapted from EIA report Figure 8.2.1. Without exact geo-location of Figure 8.2.1, the calculation of LAA overlap is approximate only, but some statistics are exact.

- Atmospheric Environment LAA overlap with CPNA #183 is 712 ha
- Atmospheric Environment LAA overlap with CPNA #325 is 551 ha
- Atmospheric Environment LAA overlap with CPNA #240 is 494 ha
- Atmospheric Environment LAA overlap with CPNA #150 is approximately 3100 to 3200 ha

In addition to the above, there might be a small overlap with CPNA #311 at the boundary of the LAA. Total project LAA overlap with CPNAs is estimated to be 4944 ha. This is several orders of magnitude higher than the figures reported by the proponent for the Terrestrial Environment LAA (EIAR Sec. 8.6.2.2.3). There is no rationale given for the lack of consideration of the overlap of the LAA for Atmospheric Environment. There will be pollutant pathways into PNAs emanating from the project. As Milewski and Wuest (2013; CCNB Action Report Section 2.1 above) have shown earlier in this review of the EIA report for the project (see CCNB Report Section 2.1 above), elevated levels of pollutants in air and snowmelt will be exhibited throughout the LAA for the Atmospheric Environment, and as a result they will find their way into the candidate PNAs. The pollutants will include PM containing higher than acceptable levels of arsenic and other trace metals, as well as hydrogen sulfide gas, sulfur dioxide gas, and ammonia.

Pursuant to the point of using an LAA larger than the terrestrial Environment LAA chosen by the proponent for PNA interaction, it has been observed by Gurd *et al* (2001) that mammalian population survival decreases below 270,000 ha of connected protected habitat. The Canadian Parks and Wilderness Society: New Brunswick Chapter has quoted some scientific literature suggesting a minimum PNA size of 25,000 ha (CPAWS 2013). Given that agglomerations of connected habitat like that in the LAA in the Upper Nashwaak are disappearing quickly in New Brunswick, it is important that the connections of these PNA clusters be protected from the deleterious effects of industrial emissions. The proponent has not addressed this issue as part of the environment's impact on the project.

Addressing 2) and 3) above, given the proponent's unsubstantiated and incomplete conclusions regarding candidate PNAs, the proponent has subsequently failed to consider the loss of economic potential of the affected PNAs resulting from mine operations at Sisson. The proponent has not shown evidence that it has considered current literature on the economic value of PNAs (e.g. Wilson *et al*. 2010) in assessing the interaction of the project with the environment.

The proponent has failed to properly evaluate the economic potential of the proposed PNAs as an alternative to the project, a project whose emissions will destroy the economic and ecological potential of the PNA areas. The proponent has also failed to consider the PNAs as part of the environment's impact on the project as discussed in EIA report Sec. 8.16.

Finally, the proponent has failed to appreciate the increased risk to PNA #150 from a tailing dam disaster. The proponent has described the risk of dam failure as not credible. The risk of a dam failure may not be high but it is a credible risk, with approximately 3 tailing dam failures every two years in the world. The impact of a failure on the ecological and economic value of the candidate PNAs must be considered as part of the bonding of this project.

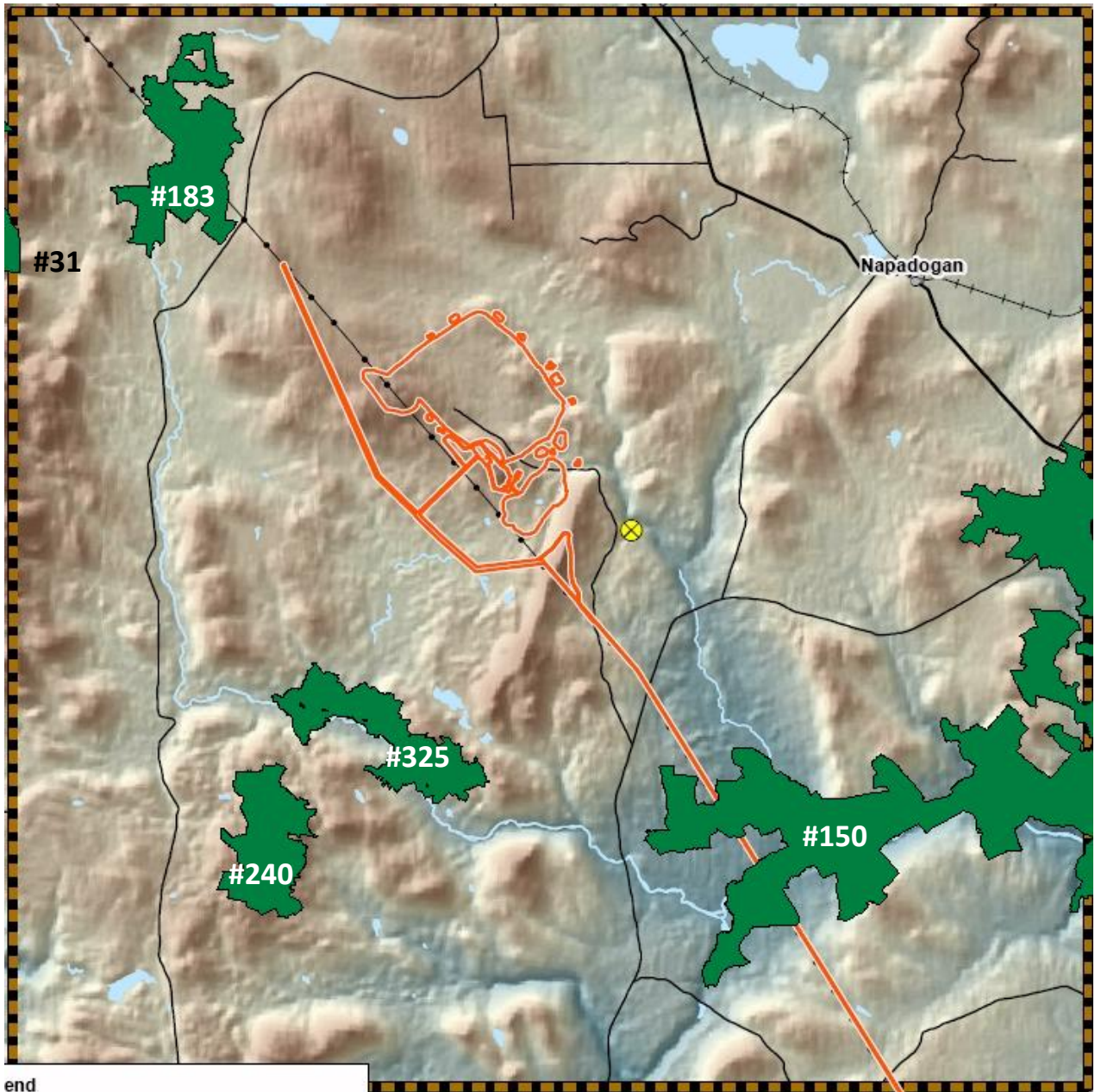


Figure A1. Sisson Project: Atmospheric Environment LAA Overlap with Candidate Protected Natural Areas ■ Adapted from Stantec(2013) EIA Report: Figure 8.2.1

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Publications of Reviewer

Biography and Publications of Lawrence Wuest – See Appendix B.

2.7 Review of EIA Report for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Valued Environmental Component: Vegetated Environment

Subject Area: Rare Vegetation Communities

EIA Report Section: 8.7

Date: September 27, 2013

Tracy Glynn, PhD. Candidate, University of New Brunswick
Acadian Forest Campaign Director, CCNB Action Inc.

Sections of the EIA report for the Sisson Project (Tungsten and Molybdenum Mine) that deal with Species at Risk and rare vegetation communities (EIAR Sec. 8.7) are reviewed here. In addition, many of the reviewers comments on the project's impacts on those sections of the EIA report for the project that deal with the VEC Terrestrial Environment (EIAR Sec. 8.6) are applicable to this review.

1. Comments

The PDA and LAA cross several Old Forest Communities as identified by NB DNR in their Standards and Guidelines for Identification of the 2012 Old Forest Community and Old Forest Wildlife Habitat Land Base (EIAR page 8-363). The reviewer feels that the importance of the Old Forest Communities is understated in the EIA. The importance of conserving Old Forest Communities was highlighted ten years ago in the province's 2004 forest inventory. The forest inventory noted that the area of mature forest (average tree age of 80 years) had been reduced by approximately 35% from its historic levels in New Brunswick and old growth forest (average dominant tree age of 150 years) had been reduced from 50% of the forested land base to less than 5% of the current land base (Mosseler *et al.* 2003). The most recent cycle of forest inventory is in preparation (Dick 2013). The Acadian forest type has been listed as one of six endangered forests in North America in a study by the World Wildlife Fund (Davis *et al.* 2001). New Brunswick makes up a large portion of the Acadian forest. Ensuring that the Acadian forest is properly managed here in New Brunswick is key to maintaining this unique forest region. The EIA fails to acknowledge that the project will contribute to deforestation and forest degradation at a time when the diversity of the Acadian forest should be restored.

It is noted that Nodding ladies'-tresses, a Species of Conservation Concern (SOCC) plant, was observed at one location within the LAA (EIAR page 8-364). How the project will affect recovery strategies for that species is not mentioned. Furthermore, it should be noted that researchers are finding that reduced diversity of forest stands is reducing the diversity of herbaceous plants (Ramovs and Roberts 2003) and bryophytes in New Brunswick (Ross-Davis and Frego 2002).

With regards to the assessment of cumulative environmental effects, industrial land use is mentioned but is not described and does not include potential shale gas exploration and development in the RAA. SWN Resources currently holds a license to explore for shale gas in the area. The reviewer disagrees with the statement that "past, present and future industrial land use within the RAA is limited and not predicted to act cumulatively with the project on the Vegetated Environment" (EIAR page 8-365) because it does not adequately address future industrial activity including shale gas exploration or development. The EIA fails to acknowledge the full extent that the project will contribute to deforestation and degradation of forests and vegetated environments at a time when the diversity of

the Acadian forest and vegetated environments should be restored, considering the current overall health of the Acadian forest.

Further on the issue of the cumulative impacts of the project on forests, forest scientists have noted that the Department of Natural Resources has favoured softwood communities in forest management to the detriment of hardwood species and vegetation communities. Mixedwood communities with less than 50 percent hardwood component have been replaced by softwood communities or plantations (Coon *et al.* 2005). Replacing mixedwood and hardwood forest communities with softwood forest communities has made the Acadian forest a less resilient forest. Resilience refers to the ability of an ecosystem to absorb external influences and remain intact (Holling 1973). Vegetation communities are a major biological component of forests and directly influences, or is influenced by, several other ecological attributes of forest ecosystems including "stand structure, forest growth and productivity, epiphytic bryophyte and lichen composition, and soil properties including faunal community" (Banner *et al.* 2008). The project will contribute to loss of and degraded vegetated environments and will also affect the previously mentioned ecological attributes of forest ecosystems.

Another failing of the EIA report is that it fails to describe the potential effects of climate change on the vegetated environments in the future. One report that the EIA should reference is the 2013 study, Potential Effects of Climate Change on New Brunswick Freshwater and Terrestrial Ecosystems by Arielle DeMerchant, Dr. Tom Beckley and Dr. Shawn Dalton. The report describes "the views and opinions of leading scholars, researchers, and managers regarding potential macro-level ecosystem effects and changes in the biota of terrestrial and freshwater ecosystems as a result of climate change." In a time of climate change, we should be conserving and restoring our Acadian forests and vegetated environments so that they are resilient in the future.

The reviewer disagrees with the proponent's recommendation not to do any follow-up to verify the predicted environmental effects of the project on vegetated environments (EIAR page 8-370). Given the uncertainty of effects of the project on vegetated environments, including Nodding ladies'-tresses, a SOCC, requires follow-up and monitoring beyond five years.

Finally, the proponent's work on the vegetated environment section of the EIA report would have been improved by adding more specific details about the eco-regions and eco-districts as outlined in the 2007 NB Department of Natural Resources document, Our Landscape Heritage: The Story of Ecological Land Classification in New Brunswick.

2. Conclusion

In a time of climate change, we should be conserving and restoring our Acadian forests and vegetated environments so that they are resilient in the future

While the project does not occupy a large spatial area, any loss of very ecologically important and ever diminishing Acadian and old forests in NB should be treated as significant. Also, the proponent's treatment of the project on NB's forests in combination with other projects is disingenuous. It first relies on its position that there is lots of forest in NB and as such the project will not have a significant effect on the vegetated environment. Relying on this forest on one hand, the proponent then does not properly describe the decline and state of the forest outside the project area.

3. References cited by Reviewer

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4. CV of Reviewer

CV of Tracy Glynn – see Appendix C.

2.8 Review of EIA Report for the Sisson Project (Tungsten and Molybdenum Mine) - New Brunswick, CEAR #11-03-63169

Valued Environmental Component: Wetland Environment

Subject Area: Wetland Protection

EIA Report Section: 8.8

Date: September 30, 2013

Stephanie Merrill, MSc.F.
Director Freshwater Protection Program,
CCNB Action Inc.

1. Summary

I reviewed Section 8.8 - Wetlands Environment of the EIA report, with a particular focus on the cumulative impacts of the Sisson Project on wetlands in the PDA and LAA. In summary, there is an over reliance on adhering strictly to the current provincial wetlands management policy which (as the proponent clearly states) does not regulate a large proportion of wetlands in the PDA, LAA, and RAA. This leads to an underestimation of impacts due to a lack of requirements for compensation for this loss and an underestimation of the cumulative impacts, particularly when considered with future forestry activity which has the most impact on the unregulated wetlands (forested wetlands).

2. Review of assessment of project related environmental effects re: Wetland preservation (EIA Report Section 8.8.4)

2.1 Review of described mitigation measures (EIA Report Section 8.8.4.2)

It is my position that the proponent's mitigation plans to lessen the impacts of the project on surrounding wetlands are not described in enough detail in the EIA report for the public and decision makers to truly gauge whether they will be effective. For example:

- The proponent does not go into detail about their proposed wetland compensation approach for mitigating the loss of wetlands functions of government regulated wetlands.
- The proponent identifies that there could be "positive" environmental effects by compensating for lost wetlands; however the proponent does not detail what these might be. Furthermore, the proponent does not define "positive" effects; re-creating the wetland function lost does not necessarily provide a net positive effect but only neutralizes the lost incurred by the project.
- The proponent relies heavily on future work to identify compensation measures. With a lack of detail it is impossible to comment on such things as watershed thresholds for wetland function loss and appropriate compensation to reflect the watersheds thresholds. This modeling should be undertaken.

Given the above lack of specificity about the possible mitigation of the project's impacts on wetlands, i.e., is it clear they actually work?, it is premature of the proponent to determine that the project will not have significant effects on the wetland environment.

2.2 Review of environmental effects assessment re: Characterization of Residual Project Environmental Effects (EIA Report Section 8.8.4.3)

After reading the EIA report, it is my view that not all of the project's residual environmental effects on the wetland environment have been properly characterized. For example:

- The proponent indicates that there is an 'unknown' extent of indirect loss of wetlands due to the drawdown effect of the open pit. This unknown impact, combined with the fact that unmapped wetlands are not considered for 'avoidance, mitigation and compensation' strategies by the NB provincial government (and therefore not the proponent), results in the potential for a compounding wetland function loss without documentation.
- There is no modeling of hydrological changes and the proponent relies heavily on adaptive management to determine the impact on regulated wetlands, but not unregulated wetlands.
- The proponent argues that the loss of wetlands that provide hydrological function to the receiving watercourses that will themselves be lost is not a significant environmental impact. The loss of the relationship between the two should indeed be characterized as significant for their inherent value and not dismissed because they are not utilized or consumed by humans.
- The proponent indicates that "... treated surplus water will be released from the Project to the former Sisson Brook channel and may present an opportunity for positive environmental effects on wetlands ..." (EIAR page 8-422) without detailing how this could be. Furthermore, the proponent does not acknowledge or identify any impacts (or not) from releasing surplus water potentially contaminated with heavy metals and reagents from the processing plant and the APT plant. Dissolved oxygen may also be an important factor to consider in assessing the impacts of releasing surplus water.
- The proponent justifies the lack of regulation and the subsequent impacts on unmapped wetlands to the fact that they are forested wetlands and do not have the relative ecological function or values as other wetland types. It is my position that the proponent, as is reflected in the EIA report, under-appreciates the long term absorption capacity and vernal pool habitat for important invertebrates that forested wetlands provide.

3. Review of cumulative environmental effects assessment (EIA Report Section 8.8.5)

The EIA report's treatment of the cumulative environmental effects of the project on the wetland environment is deficient for several reasons.

- The EIA report does not mention potential oil and gas activities, including shale gas and pipelines that are identified in economic development plans and by exploration licences given in the LAA.
- The proponent inaccurately relies on the provincial regulations managing wetlands when speaking of the cumulative effects of current and future forest activity. The majority of wetlands that would be impacted by forestry activity are not regulated under the *Watercourse and Wetland Alteration Regulation* as per the current operating procedure (forested wetlands) and therefore the EIA report does not accurately describe potential cumulative impacts to wetlands. The potential cumulative impacts on all wetlands are greater than stated. This is compounded by the fact that it seems the proponent is only predicting the cumulative impacts of the project over the current 5-year forest management plan and not the entirety of the project.
- The proponent does not mention the potential cumulative impacts that might occur in changing climatic conditions, specifically higher precipitation rates. How is the increasing flow rates reflected in the loss of wetland function (in addition to other lost water features)?

4. Review of Determination of Significance (EIA Report Section 8.8.6)

The proponent's determination that the residual cumulative environmental effects of the project on the wetland environment will not be significant needs to be revisited. For example, the proponent relies on

future work to determine this cumulative impact particularly on wetlands outside the PDA. No modeling was attempted to be done at this stage. As a result, the proponent states they are moderately confident in the significance of the impact. It is recommended that modeling be undertaken to increase the confidence level. This is especially important because there is no regulated compensation requirement for unmapped wetlands (which are mostly forested wetlands) and therefore there is potential for a net loss of wetland function.

5. Review of Follow-up and Monitoring (EIA Report Section 8.8.7)

- Given a potential underestimation of the cumulative impacts on all wetlands, particularly in the LAA, the recommended follow up or monitoring may be understated. Currently no recommendations are made in the EIA report.
- Modeling may show an increased cumulative impact on all wetlands in the LAA and therefore it would be appropriate to implement follow up and monitoring. And, given that the cumulative impacts on all wetlands are stated as unknown it would seem reasonable that follow up and monitoring would be needed.

6. Conclusion and recommendations

In summary, there is an over reliance on adhering strictly to the current provincial wetlands management policy which (as the proponent clearly states) does not regulate a large proportion of wetlands in the PDA, LAA, and RAA. This leads to an underestimation of impacts due to a lack of requirements for compensation for this loss and an underestimation of the cumulative impacts, particularly when considered with future forestry activity which has the most impact on the unregulated wetlands (forested wetlands). Some more appropriate hydrological modeling that includes the changes to the unmapped forested wetlands would give a better sense of the residual environmental impacts, not just for mapped wetlands, the significance of these impacts, and the need for mitigation measures.

7. Resume of Reviewer

Resume of Stephanie Merrill – see Appendix D.

Appendix B – Biography and Publications of Mr. Larry Wuest

Lawrence Wuest is a sculptor and forest ecologist specializing in Quantitative Ecology and Spatial Analysis. He has a B.S. in Physics from Washington University. He has been a researcher in environmental issues since 1975, and has contributed to research in high energy physics, cancer diagnostics, fire science, aquatic microbiology, geographic analysis and forest ecology. He has lived in the Upper Nashwaak for 35 years, and has a passion for the Acadian Forest of the Nashwaak Watershed. He was a participant in the New Brunswick Ecological Land Classification Working Group 1994-2004. He is also the designer and creator of the sculpture symbolic of the New Brunswick Human Rights Award.

- Wuest, L, and Betts, M.G. 2010. Quantitative tracking of the vegetative integrity and distinctness of forested ecological communities: A case study of plantation impacts. *Can. J. For. R.* 40: 330-346.
- Betts, M, Diamond, A.W., Forbes, G.J., Frego, K., Loo, J., Matson, B., Roberts, M., Villard, M.A., Wissink, R. Wuest, L. 2005. A comment on the plantations and biodiversity debate in New Brunswick. *The Forestry Chronicle* 81(2):265-269.
- Wuest, L.J., Mureika, R.A. and Nickerson, B.G. 2003. Information Entropy of Non-probabilistic Processes. *Geographical Analysis*. Vol. 35 No. 3. 215-248.
- Roberts, M.R. and Wuest, L.J. 1999. Plant communities of New Brunswick in relation to environmental variation. *Journal of Vegetation Science*. 10:321-334.
- Wuest, L.J. 1997. Landscape pattern from an information entropy perspective. Presentation to the Joint Annual Meeting of the Atlantic Society of Fish and Wildlife Biologists and Atlantic Cooperative Wildlife Ecology Research Network. Alma, NB Canada .
- Wuest, L.J. 1997. An examination of mesoscale climate in UTM 21H. Report to the New Brunswick Fundy Model Forest Committee. Sussex, NB Canada.
- Zundel, P.E., Hovingh, A.J., Wuest, L., MacElveney, D. and Needham, T.D. 1996. Silviculture systems for the production of energy biomass in conventional operations in Atlantic Canada. Report of UNB Applied Stand Dynamics and Management Group to The International Energy Agency.
- Wuest, L.J. 1996. Statistical Analysis of Tree Species Communities, Vegetational Structure and Marten Track Occurrence in North Central New Brunswick. Report to NBDNRE Fish and Wildlife Branch.
- Roberts, M. R. & Wuest, L. J. 1994. Vegetation communities and their relation to environmental factors in New Brunswick. Report to New Brunswick Dept. Of Natural Resources.
- Holder-Franklin, M. A., Thorpe, A. & Wuest, L. J. 1992 Evaluation of tests employed in the numerical taxonomy of river bacteria. *J. Microbiol. Methods* 15, 263-277.
- Holder-Franklin, M. A., & Wuest, L. J. 1983. Factor Analysis as an Analytical Method in Microbiology. In M. Bazin, (Ed.) *Mathematics in Microbiology* (pp. 139-169). London: Academic Press
- Holder-Franklin, M. A., & Wuest, L. J. 1983. Population Dynamics of Aquatic Bacteria in Relation to Environmental Change. *Journal of Microbiological Methods*. 1 209-227.
- Holder-Franklin, M. A., & Wuest, L. J. 1978. Factor Analysis in Ecological Research. *Am. Soc. Microbiol. Abstr. Annu. Meet.* 178, 94.
- Holder-Franklin, M. A., Franklin, M., Cashion, P., Cormier, C. & Wuest, L. 1978. Population Shifts in Heterotrophic Bacteria in a Tributary of the Saint John River as Measured by Taxometrics. In M. W. Loutit & J. A. R. Miles (Eds.), *Microbial Ecology* (pp. 44-50). Berlin: Springer-Verlag.
- Steward, F. R., Wuest, L., & Waibel, R. T. 1977. Some Characteristics of Fires Within Uniform Fuel Matrices. AICHE-ASME Heat Transfer Conference, ASME 77-HT-71, Salt Lake City, Utah.
- Miller, R., Wuest, L., & Cowan, D. 1972. Volume Analysis of Human Red Blood Cells I - General Procedures. *Series Haematologica* Vol. V,2 105-127.
- Miller, R., & Wuest, L. 1972. Volume Analysis of Human Red Blood Cells II - Nature of the Residue. *Series Haematologica* Vol. V,2 128-141.

Appendix C – Biography of Dr. Antony Diamond

Education:

- B.A. Zoology, Queens' College Cambridge 1966.
- M.Sc. Ecology, Aberdeen, 1968.
- Ph.D. Zoology, Aberdeen, 1971.
- Post-Doc Research Fellowship, Oxford University (D. Lack, F.R.S.) and University of West Indies, Jamaica, 1970-73.

Employment:

- Scientific Administrator, Cousin Island Seychelles, 1973-75.
- Lecturer/Senior Lecturer, Zoology Department, University of Nairobi, Kenya, 1976-80.
- Research Consultant, Oxford & Ottawa, 1980-87.
- Coordinator, Acid Rain Program, Canadian Wildlife Service, Ottawa, 1987-88.
- Officer-in-Charge, Prairie & Northern Wildlife Research Centre, Canadian Wildlife Service, Saskatoon, 1988-94.
- Adjunct Professor, Biology Dept., University of Saskatchewan, 1988-96.
- Research Professor, University of New Brunswick, and Director, Atlantic Cooperative Wildlife Ecology Research Network (1994-2009) and Atlantic Laboratory for Avian Research (2009-present), 1994-present.

Related Activities:

- Member Royal Society of London Expeditions to Aldabra Atoll, Indian Ocean, 1967-69, and Cayman Islands, 1975.
- Member NSERC Grant Selection Committee 18, 1990-1993
- Member Doctoral Prizes Committee, NSERC, 1997-99
- Member ad-hoc committee, Ecological Field Stations, Major Facilities Access Grant Program, NSERC, 1996, 1998.
- Panel Reviewer, Estuarine Indicators program, U.S. Environmental Protection Agency, July 2000.
- Member of Science & Technology Advisory Board, Environment Canada, 2000-2005.
- Member of federal Council of Science and Technology Advisors, 2000-2002.
- President, Society of Canadian Ornithologists, 1998-2000.
- Elective Member (1990), Fellow (2010), American Ornithologists' Union.
- Member and Vice-Chair, Scientific Advisory Committee on Protected Natural Areas, New Brunswick, to 2013.
- 130+ peer-reviewed papers published or in press; editor/co-editor 4 books, co-author 1 book (14 national editions, 9 languages).
- >40 graduate students supervised to date.

Research Interests:

Evolutionary ecology of birds, especially in relation to conservation, roles in ecosystems, and as indicators of ecosystem health.

Appendix D – CV of Tracy Glynn

488 Charlotte St., Apt. 5, Fredericton, NB E3B 1L8 Canada

Tel: 506 440-5922

Email: tracy.a.glynn@gmail.com

PROFESSIONAL EXPERIENCE

- 2006 - current **Acadian Forest Campaign Director**
Conservation Council of New Brunswick/CCNB Action
Implementing a province-wide campaign to protect the Acadian forest, including research, public and school-based outreach, media work, lobbying and interventions.
- 2008 - current **Lecturer, Environmental Praxis**
Environmental and Society Program, St. Thomas University
The course deepens students' understanding of environmental praxis through critical texts and collective practice.
- 2010 - 2012 **Lecturer**
Department of Social Work, St. Thomas University
Courses discussed social action, social movements and how institutions and policies affect peoples' lives in New Brunswick, in Canada and around the world.
- 2011 **Lecturer, Environmental Perspectives**
Environmental and Society Program, St. Thomas University
The course explored how society has attempted to understand and act on different forms of environmental degradation.
- 2009 - 2010 **2009/2010 Gordon Global Fellow**
Walter and Duncan Gordon Foundation
Examined through a gender lens the situation of indigenous women in Guatemala, Indonesia and Canada affected by mining.
Drafted policy recommendations aimed at addressing problems of gender inequality and lack of empowerment of women in mine affected communities.
- 2003 - 2005 **Teaching Assistant**
Memorial University of Newfoundland, Department of Biology
Taught lab component of first and third year biology courses.
- 2003 **Resource Development Coordinator**
Canadian Crossroads International - Atlantic Regional Office, Halifax, NS
Researched and wrote country handbooks for overseas volunteers.
Archived photographs/materials.
- 2000-2002 **International Campaigner**
CUSO placement at Mining Advocacy Network (JATAM), Jakarta, Indonesia
Developed international campaign for national network of NGOs, community groups.
Organized the International Mining Workshop at the UN PrepComm IV in Bali.
Acted as project officer for the English newsletter and website.
Responded to field developments through producing action alerts and media releases.
Lobbied governments at all levels inside and outside of Indonesia.
Networked with NGOs, indigenous communities, academics and journalists.
Organized press briefings and special events.
Managed program budgets and wrote funding proposals and financial reports.

EDUCATION

2011-2015	PhD Student, Interdisciplinary Studies, University of New Brunswick
January 2006	Masters of Science (Environmental Science), Memorial University of Newfoundland
2002-2003	Environmental Studies at Dalhousie's School of Resources and Environmental Studies
1999	BSc., Advanced Major Biology, St. Francis Xavier University

LANGUAGES

- Bahasa Indonesia
- French (Reading/Aural comprehension)
- Spanish (Basic/Learning)

ACTIVITIES

- Founder, Editor and Contributor, NB Media Co-op
- Board of Director, Mining Watch Canada
- Chair, Fredericton Committee for the New Brunswick Coalition for Pay Equity
- Founder, Chair, Fredericton Chapter, Conservation Council of New Brunswick
- Founder and Organizer, Cinema Politica Fredericton
- Organizer, 2006 N.B. Social Forum
- Steering Committee Member, Crown Lands Network
- Founder and Organizer, Fredericton Peace Coalition
- Organizer, Maritimes-Guatemala Breaking the Silence Network
- Organizer, Atlantic Regional Solidarity Network
- Chair, Mining Caucus, New Brunswick Environment Network, 2011-2012
- Supporting Body Member, Mining Advocacy Network (based in Indonesia)
- Editor, Mines and Communities website, minesandcommunities.org
- Board Member, *The Dominion*, an independent magazine of Media Co-op, 2009-11
- Founding Advisor, Small Change Fund, 2010-2011
- Opinion Columnist, *The Current* and *The Muse*, 2006
- Steering Committee, Newfoundland/Labrador Environment Network, 2004-5
- Chair, MUN Project Green Action Committee, 2004-5
- VP/Member At Large, Teaching Assistants' Union of Memorial University, 2004-5
- Returned Volunteer Representative/Volunteer, CUSO Atlantic Area Council, 2004-5
- Member, Trading Options Coalition, Halifax, 2003
- Member, Energy Issues Committee, Ecology Action Centre, Halifax, 2003
- Volunteer, L'ARCHE, 1995-99, community-based organization providing integrated daytime activities for adults with intellectual/physical handicaps.
- Volunteer, X-Project, 1997-98, peer mentoring at-risk children.
- Organizer, Action for Equity, 1995-1997, student society promoting gender equity.

AWARDS

- Gordon Global Fellowship, 2009-10
- New Brunswick Environmental Network award for environmental justice, 2009
- CIDA/AUCC CanadaCorps Scholarship, 2005
- Province of Newfoundland and Labrador Environmental Award, 2005
- Graduate Student Union Award for Excellence in Community Service, 2005

PUBLICATIONS

Books, magazines, non-referred journals

Glynn, T (2013). It's bigger than bling-bling and the banks: Invoking an anti-capitalist praxis in feminist activism at mining sites. *Women and Environments International Magazine*. Toronto: York University.

Co-authored chapter in *The People Behind Colombian Coal: Mining, Multinationals and Human Rights* (2007). Edited by Aviva Chomsky, Garry Leech and Steve Striffler.

Mining Advocacy Network (2004). *Mining in the New Millennium*. Jakarta: JATAM.

Papers in conference proceedings

Siti Maimunah, Hasanuddin, Aminuddin Kirom, Glynn, T. (2002) *Rio+10: Pertambangan dan Penghancuran Berkelanjutan*. Jakarta: JATAM.

Mining Watch Canada, Project Underground. (2002) Indonesia Case Studies: Minahasa & Nusa Tenggara. *Submarine Tailings Disposal Toolkit*. Berkeley: Project Underground.

Global Mining Campaign. (2002) Poboya-Paneki Forest Park, Indonesia. *Digging Deep*. Washington D.C.: Mineral Policy Center.

CONFERENCES

Presenter, Women's Worlds Congress, University of Ottawa, Ottawa, ON. July 2011.

Speaker, St. Thomas University Human Rights Week, Fredericton, NB. October 2008.

Speaker, New Brunswick Social Forum, Fredericton, NB. September 2008.

Presenter, Atlantic Provinces Council for the Sciences (APICS) Environmental Studies Conference, St. Francis Xavier University, Antigonish, NS. March 2008.

Organizer, Acadian Forest Science Conference, Fredericton, NB. October 2007.

Poster Presenter, Joint Meeting of the Geological Association of Canada, the Mineralogical Association of Canada, the Canadian Society of Petroleum Geologists and the Canadian Society of Soil Sciences, Halifax, NS. May 2005.

Speaker, "Mining and Sustainable Development -Two Apparently Contradictory Concepts: Challenges for the WSSD." Hosted by Third World Network. PrepComm IV, World Summit for Sustainable Development, Bali, Indonesia. June 2002.

Speaker, Drafter, Steering/Organizing Committee, International Mining Workshop (on the occasion of Fourth Preparatory Committee of the World Summit for Sustainable Development). Hosted by Mining Advocacy Network (JATAM). Bali, Indonesia. May 2002.

Participant, Building A Global Mining Campaign, International Meeting of NGOs, Activists, and Community Leaders. Hosted by Mineral Policy Center. Virginia, US, December 2001.

Organizer, International Conference on Submarine Tailings Disposal/Drafter, Manado Declaration on Submarine Tailings Disposal. Hosted by Mining Advocacy Network (JATAM). Manado, Sulawesi, Indonesia. May 1, 2001.

APPENDIX E – Resume of Stephanie Merrill

Stephanie E. Merrill, MSc.F
38 Huron Avenue
Fredericton NB
E3A 1J7

506.458.8747
water@ccnbaction.ca

1. Academic Degrees

MSc.F	University of New Brunswick	2009	Forestry & Environmental Management
BSc.	University of New Brunswick	2004	Biology (Aquatic Ecology)

2. Work Experience

2010-Current Director, Freshwater Protection Program, Conservation Council of New Brunswick / CCNB Action, Fredericton, New Brunswick.

Research, writing, community campaigning and advocating for improved protection policies for freshwater in New Brunswick. Work to date has included extensive understanding and work on issues and impacts to water resources and NB water policy. Focus on networking and facilitating community organizations; social media, web communications, community engagement on St. John River watershed management and governance.

2009-2010 Research Associate, Rural and Small Town Programme, Mount Allison University, New Brunswick

Primary and secondary applied research on issues related to sustainability of rural communities and small towns, in partnership with communities and their organizations. This research combined the theory of traditional academic research with the experiences and realities of particular rural communities. Projects included an Integrated Community Sustainability Plan, municipal climate change adaptation survey, youth housing in PEI feasibility study, and a literature review of factors associated with successful post-secondary education to workforce transitions for Aboriginal youth.

2009-2010 Research Assistant, Université de Moncton, Faculty of Forestry, Edmundston, New Brunswick

Contracted research on forest management in Labrador, Newfoundland. This project involved a content analysis of Forest Management Plans in order to evaluate the effectiveness of incorporating ecosystem-based management principles to forest planning. The project was

especially focused on determining the evolution of including Aboriginal and non-Aboriginal cultural values and participation into forest management. This work culminated with a peer reviewed publication in the Canadian Journal of Forest Research.

2007-2008 Research Assistant, Landcare Research Ltd., Nelson, New Zealand

Canadian Water Network/UBC Internship in the Motueka River Integrated Catchment Management Programme. The various research topics included environmental farm planning, river substrate characterization, aerial photography digitizing, GIS/theolodite surveying, social network analysis, environmental (stream monitoring/riparian structure & function/native vegetation) education.

2007-2008 Canadian Water Policy Fellow, Walter and Duncan Gordon Foundation, Ontario

Awarded one of four annual (first ever in Atlantic Canada) Water Policy Fellowships under the Foundation's Fresh Water Resources Protection Programme. Developed and carried out a research project on private riparian land stewardship in partnership with the Canaan-Washademoak Watershed Association, including proposal writing, budgeting, scientific study design, data collection and analysis, interpretation and report writing.

2006-2007 Research Assistant, Canadian Water Network Knowledge Translation Project

Development and administration of surveys, interviews, Delphi methods and workshops with key informants in the Water Resource sector (Regional, National and International) in order to identify information gaps in knowledge translation between scientists / agencies / professionals and community groups.

2001-2009 Research Assistant, Environment and Sustainable Development Research Centre, University of New Brunswick

Research support for the activities of the Centre, including two community-based watershed groups. Responsibilities included administration duties (meeting and event organization, management committees), biophysical monitoring of urban and rural streams (water quality monitoring, fish populations and habitat assessment) and coordinating community engagement opportunities (urban stream awareness activities).

2. Publications

Merrill, S. and Hendricks, L. 2012. Making Connections on the St. John River: A river tour series connecting the "State of the St. John" to local community priorities for action. Fredericton, NB: CCNB Action, WWF-Canada and Canadian Rivers Institute. 18 pgs.

Wyatt, S., Merrill, S., and Natcher, D.C. 2011. Ecosystem Management and Forestry Planning in Labrador: Does Aboriginal Involvement Make a Difference? *Canadian Journal of Forest Research* Vol. 41: 2247-2258.

Merrill, S. 2010. Shale Gas Exploration in New Brunswick: What you need to know. Fredericton, NB: Conservation Council of New Brunswick. 14pgs.

Merrill, S., Bruce, D. and Marlin, A. 2010. Considerations for successful transitions from post-secondary education to the work-force for Aboriginal youth. Sackville NB: Rural and Small Town Programme.

Bruce, D. and Merrill, S. 2010. Youth housing options for 16-18 year olds in Charlottetown and Summerside, PEI. Sackville, NB: Rural and Small Town Programme.

Merrill, S., Zwicker, G., and Bruce, D. 2010. Cumberland County Integrated Community Sustainability Plan. Amherst, NS: Municipality of the County of Cumberland and Rural and Small Town Programme.

Merrill, S. and Zwicker, G. 2010. Capacity for climate change adaptation in New Brunswick municipalities. Sackville NB: Rural and Small Town Programme.

Merrill, S. 2009. An Exploration of Private Riparian Landowners in the Canaan-Washademoak Watershed: Ownership patterns, values and attitudes, and perceived and actual stewardship of different land tenure types. Masters Thesis. Faculty of Forestry and Environmental Management, University of New Brunswick. Fredericton, New Brunswick.

Snowdon, E. and Merrill, S. 2009. Fredericton's urban forest: A Fredericton Area Watersheds Association report on the structure and function of Fredericton's urban forest. Fredericton Area Watersheds Association. University of New Brunswick: Fredericton.

Merrill, S. 2008. The perceived and actual riparian zone management on recreational and residential lands along Washademoak Lake, New Brunswick. Toronto: Walter and Duncan Gordon Foundation.

Merrill, S. 2007. A characterization of the private riparian landowners in the Canaan-Washademoak Watershed. In: Valuing the contribution of private woodlots to society: a focus on riparian areas in a New Brunswick watershed. Report to the Canadian Model Forest Network.

4. Professional Associations and Volunteer Organizations

Nashwaak Watershed Association Inc.
Board of Directors, volunteer
2012-Present

Canadian Water Resources Association, NB Branch
Treasurer
2011-Present

New Brunswick Media Co-op
Volunteer contributor and Environmental Justice Advisor
2010- Present

Comments on EIA Report for Sisson Project, CEAR #11-03-63169
CCNB Action Inc. October 11, 2013

Waterlution – A Water Learning Experience

Atlantic Associate

2010-Present

*includes formal facilitation training (Banff Centre) and workshop delivery

Appendix F – Article from Vancouver Sun, September 6, 2013

Government experts raised red flags on proposal to build mine: summary of concerns

(Available at:

<http://www.vancouversun.com/business/2035/Government+experts+raised+flags+proposal+build+m+mine+summary+concerns/8880799/story.html>.)

The following is a summary of the concerns raised by federal and provincial government experts during the Canadian Environmental Assessment Agency review of Taseko Mines' New Prosperity Mine proposal.

1. Deteriorating Fish Lake Water Quality & Unproven “Aquarium” Lake Recirculation

Environment Canada

“The Proponent’s modelling suggests water quality in Fish Lake may be marginal for the protection of aquatic life.” (EC Panel Submission, July 25, 2013, CEAR #738, p. 10).

“There are few, if any, examples of lake recirculation at the scale proposed by the Proponent” (EC Panel Submission, July 25, 2013, CEAR #738, p. 11).

“Environment Canada is concerned that the recirculation mitigation measure proposed to manage water quality and the biological productivity of Fish Lake is unproven at this scale ... the high level of uncertainty regarding the Proponent’s recirculation scheme is a particular concern given the stated goal of preserving Fish Lake.” (EC Panel Submission, July 25, 2013, CEAR #738, p. 12).

Natural Resources Canada

“The Proponent has estimated from the base of the TSF [Tailings Storage Facility] during the post-closure period at 760 m³/day. NRCAN considers this value to be unrealistically low for a 12 km³ impoundment ... NRCAN estimated seepage through the base of the TSF to be approximately 8250 m³/day or 11 times the value estimated by the proponent”. (NRCAN Panel Submission, July 4, 2013, CEAR #587, p. 27, confirmed in NRCAN’s closing remarks, CEAR #1123, August 21, 2013).

Department of Fisheries and Oceans

“The Proponent’s mitigation and adaptive management plan to preserve the functioning of Fish Lake using a recirculated closed system uses unprecedented and untested technology ... DFO is

not aware of any examples of wilderness lakes or watersheds that have been subject to a recirculation program.” (DFO Panel Submission, July 23, 2013, p. 14, CEAR #691).

“The New Prosperity Mine configuration was modified by from the original plan to prevent the immediate destruction of Fish Lake to create a tailings pond. In the New Prosperity Mine configuration, the Fish Lake watershed could be extensively altered, requiring intensive engineering efforts to maintain flows and lake levels. While Fish Lake itself would not be directly destroyed, as noted by the Proponent in the 2012 EIS, the lake is predicted to experience eutrophication and contamination with development of the mine.” (Supplemental DFO Panel Submission, August 4, 2013, CEAR #886, p. 15).

Ministry of Energy and Mines

“MEM believes that in the context of preserving Fish Lake and its tributaries there remain uncertainties around the ability to limit and collect the expected volumes of seepage from the TSF, and the ability to effectively treat water to maintain water quality in Fish Lake and its tributaries. This leads MEM to conclude that, as detailed in the EIS and supporting documents, the ability to prevent adverse effects to Fish Lake and its tributaries from a water quality perspective is uncertain.” (MEM Panel Submission, August 6, 2013, CEAR #873, p. 3).

“Taseko has proposed relying on adaptive management including water treatment to mitigate adverse effects to Fish Lake water quality and to conclude no significant adverse effects to Fish Lake. Since the effectiveness of the proposed treatment processes to decrease metal concentrations to the design specifications has not been fully provided, MEM believes that Taseko’s conclusion of their ability to prevent adverse effects to Fish Lake is also uncertain.” (MEM Panel Submission, August 6, 2013, CEAR #873, p. 2).

“Recirculation of Fish Lake flows in an effort to preserve the ecological values of Fish Lake and its tributaries is a very significant commitment. Fresh water diversion and flow augmentation through pumping and piping are sometimes applied at BC minesites, however not typically at this scale or for this length of time.” (MEM Panel Submission, July 19, 2013, CEAR #655, p. 16).

“The predicted average model results indicate BC fresh water aquatic life water quality guidelines will be exceeded in Fish Lake, Upper Fish Creek, and Tributary 1 for aluminum, cadmium, iron, lithium, selenium, silver and thallium. Predicted average pit lake concentrations also exceed guidelines for antimony, arsenic, cobalt, mercury and zinc.” (MEM Panel Submission, July 19, 2013, CEAR #655, p. 20).

“MEM notes that the proposed membrane water treatment, sulphide reduction, and ion exchange water treatment technologies are not widely used in mining applications, and none are currently in use at British Columbia minesites. The information provided on water treatment in the supplemental response provides very high level concepts but does not provide design level information that demonstrates that target objectives can be met. Water treatment is a primary mitigation strategy for this project and it should be demonstrated to be feasible at the EA phase, especially since it is key to conclusions on project related effects.” (MEM Comment on

Adequacy of June 5, 2013 Supplemental Information, Submitted June 14, 2013, CEAR #541, p. 2).

“Seepage from the TSF is a very significant management issue for the Prosperity project, given the directive to protect the integrity of Fish Lake. There is large uncertainty regarding the spatial extent and hydraulic conductivity of the TSF till foundation materials and the current assumptions of its effectiveness to limit seepage have not been justified are considered potentially not conservative. Sensitivity analyses show that significantly higher seepage rates than used in the water quality loading models could occur.” (MEM Panel Submission, July 19, 2013, CEAR #655, pp 14-15).

Ministry of Environment (Forests, Lands and Natural Resource Operations)

“Concerns have been raised ... over the possibility of deteriorating water quality in the Fish Lake system. This could result in the loss or reduction of the productive capacity of the lake and unsuitable water quality for other uses including wildlife habitat use. These concerns stem from the high degree of uncertainty surrounding the capability and feasibility of the water quality mitigation measures (i.e. mixed levels of success for treatment and the lack of previous experience combining treatments on a lake) to treat water so as to avert irreversible impacts to water quality and aquatic life. Should such a scenario play out, there is a substantially greater risk of irreversibly damage to the Fish Lake ecosystem and the wildlife use of the system either directly by exposure to algal bloom toxins or indirectly by avoidance of the area due to poor water quality.” (BC Environmental Assessment Office Panel Submission, July 19, 2013, p. 16/56 of PDF, CEAR 654).

2. Long-term Liabilities to Taxpayers & Questionable Economics of the Project

Ministry of Energy and Mines

“While detailed costing is reviewed at the Mines Act permitting stage when setting the financial security requirements, the full costs of treatment should be fully evaluated by the Proponent at the EA stage as it has the potential to affect the economics of a project. MEM expects that the amount of financial security that could be required to fund this scale of long-term liability would be very high and are likely unprecedented in the province.” (MEM Panel Submission, July 30, 2013, CEAR #787, p. 5).

“In addition to the requirements for Fish Lake water treatment, the open pit lake may require water treatment before spilling at Year 48. The potential additional treatment requirements and costs associated with it have not been scoped in the EA or in these review comments.” (MEM Panel Submission, July 30, 2013, CEAR #787, p. 5).

“An assessment of the potential effects to predicted water quality in Fish Lake, Fish Lake Tributaries, and the pit lake are documented in the Impact Assessment starting on pages 761, 764, and 769, respectively. The summary water quality effects assessment for Fish Lake, Fish Lake tributaries, adjacent streams and rivers and adjacent lakes all conclude that water quality

conditions could become significantly adverse (pages 793-796) if left unmitigated.” (MEM Panel Submission, July 19, 2013, CEAR #655, p. 21).

“MEM concludes it is reasonable to assume that TSF water will need to be relayed to the open pit in the long term and Fish Lake may require re-circulation for at least 100 years, and perhaps in-perpetuity.” (MEM Panel Submission, July 19, 2013, CEAR #655, p. 21).

“Based on preliminary cost information submitted for project configuration T2 (IR#4a), it appears that the costs for water treatment and for some aspects of water management, may not have been fully factored into the project. Water treatment is a significant undertaking, and the current proposed water treatment systems are known to be very expensive. The proponent should consider the full costs of these environmental protection requirements, as they have the potential to significantly affect the economics of the project.” (MEM Panel Submission, July 19, 2013, CEAR #655, p. 27).

3. Risks to Taseko River & Other Nearby Lakes

Environment Canada

“Environment Canada is concerned that the Proponent may have underestimated the potential impacts of the Project on water quality in Wasp Lake, Little Onion Lake and Big Onion Lake. Given that these lakes drain to the Taseko River, Environment Canada is also concerned that the Proponent may have underestimated impacts on water quality in the Taseko River.” (EC Panel Submission, July 25, 2013, p. 19, CEAR #738).

Department of Fisheries and Oceans

“Natural Resources Canada recently expressed concern that Taseko’s seepage rate estimates for the TSF [Tailings Storage Facility] may be 11 times higher than those modelled in the EIS [Environmental Impact Statement] ... as a result, groundwater seepage estimates that were modelled in the EIS may be underestimated. If actual baseline groundwater seepage contributions into Taseko River are significantly higher than those modelled, then development of the Project could result in impacts to Taseko River that have not been considered by the Proponent.” (DFO Panel Submission, July 23, 2013, p. 13, CEAR #691).

B.C. Ministry of Environment

“There are concerns regarding the modelling of groundwater movement and the lack of on-site monitoring wells. Furthermore the mitigation method of recycling the water back from intercepting wells downslope may not be effective because the pathways for groundwater movement are not completely understood. There exists the potential for the movement of contaminated groundwater from the mine site into other surrounding watersheds downslope including the Taseko River” (BC Environmental Assessment Office Panel Submission, page 7/56 of PDF, CEAR 654).

“Water from the seepage ponds are to be discharged to Big Onion Lake and Wasp Lake. These lakes are expected to see deteriorating water quality. Creeks leading from these lakes go to Beece Creek and Taseko River, highly valuable fish streams. Pit Water is expected to be discharged to Fish Creek long after the mining is completed. This water will receive little dilution in Fish Creek before it enters Taseko River” (BC Environmental Assessment Office Panel Submission, page 35/56 of PDF, CEAR 654).

*NOTE: This document does not try to provide a comprehensive list of comments on impacts to Tsilhqot’in culture, rights and use.

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