



THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Newsletter / Bulletin

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CSEB Newsletter Bulletin SCBE

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Front Cover: Loys Maingon lecturing on long-term coal impacts at Union Bay, BC

Back Covers: Top: Discussing enclosure study at Nature Conservancy of Canada; Bottom: Dr. Darlene Southworth, University of Oregon discussing truffles in Garry Oak ecosystems; Insert (left side): *Hyla regilla* shifting colours; Insert (lower right): Mycorrhizal truffle.

Photo Credit: Loys Maingon, CSEB BC Director

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CSEB NEWSLETTER 2015

Vol. 72, Number 2 Summer 2015

The Canadian Society of Environmental Biologists Newsletter is a quarterly publication. The Newsletter keeps members informed of the Society's activities and updates members on the current affairs and advances in the field of environmental biology. This publication draws together the widely diverse group of Canadian environmental biologists through a national exchange of ideas. Members are invited to contribute papers, photos or announcements that are of a national biological and environmental interest. Letters to the editor are welcome. This is a volunteer non-profit organization and we rely on your participation to make the newsletter a productive forum for ideas and discussion.

All business correspondence, changes of address, undeliverable copies and membership applications should be sent to: CSEB National Office, P.O. Box 962, Station F, Toronto, ON., M4Y 2N9. **Editorial correspondence:** Gary Ash, Editor, e-mail: gash@golder.com

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LE BULLETIN de la SCBE 2015

Vol. 72, Numéro 2 Été 2015

Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activités de la Société sur événements courant ainsi que les progrès qui font en sciences de l'environnement. Par un échange d'idées au niveau national, cette publication intéresse un groupe très diversifié d'environnementalistes Canadien. Les membres sont invités à contribuer des articles, photos (noir et blanc) ou des messages qui sont d'intérêt nationale en sciences biologiques et environnementales. Les lettres à l'éditeur sont bienvenues.

Tout la correspondance d'affaires, y compris les abonnements, les changements d'adresse, les exemplaires retournés et les formulaires: CSEB National Office, P.O.Box 962, Station F, Toronto, ON, M4Y 2N9. **Les lettres à l'éditeur:** Gary Ash, Editor, courriel: gash@golder.com

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The Canadian Society of Environmental Biologists



CSEB OBJECTIVES

The Canadian Society of Environmental Biologists (CSEB) is a national non-profit organization. Its primary objectives are:

- to further the conservation of Canadian natural resources.
- to ensure the prudent management of these resources so as to minimize environmental effects.
- to maintain high professional standards in education, research and management related to natural resources and the environment.

OBJECTIFS de la SOCIÉTÉ

La Société Canadienne des Biologistes de l'Environnement (SCBE) est une organisation nationale sans but lucratif. Ses objectifs premiers sont:

- de conserver les ressources naturelles canadiennes.
- d'assurer l'aménagement rationnel de ces ressources tout en minimisant les effets sur l'environnement.
- de maintenir des normes professionnels élevés en enseignement, recherche, et aménagement en relation avec la notion de durabilité des ressources naturelles et de l'environnement, et cela pour le bénéfice de la communauté.

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NATIONAL News

PRESIDENT'S Report

By Bill Paton, CSEB President

Your executive continues to work on formalizing a Workshop/AGM in Vancouver for early November, 2015. The theme chosen for this event is the investigation of the effects of oil and gas development on ecosystems and the environment. Current topics facing scientists, governments, and the public include relative safety of rail versus pipeline movement of bitumen and other oil products, the influence of fracking on groundwater, and climate change impacts. We have had significant experience of the impacts of oil spills in marine environments with the Exxon Valdez and more recent Gulf of Mexico oil platform leaks. Our knowledge of impacts on terrestrial, surface waters and arctic environments and their biota is significantly less but recent spills on rail and in the Bakken Oil Field indicate a clear need for monitoring and reclamation. As environmental biologists we will benefit from a workshop that provides the latest science and experience on these very important issues. Some recent literature that can begin our learning curve on these issues are as follows: "The Energy Footprint: How Oil, Natural Gas and Wind Energy Affect Land for Biodiversity and the Flow of Ecosystem Services". (2015). *Bioscience* 65:290-301; "Ecosystem Services lost to oil and gas in North America". (2015). *Science* 348 (6233):401-402.

The Society historically published a number of excellent proceedings of their annual workshops/conferences. These were refereed publications that carried value in the careers of academics and graduate students. To increase involvement in the Society of this group of environmental biologists, I have suggested that we might examine the on-line publication used by the Prairie Division of the Canadian Association of Geographers. It is the publication that is developed from their AGM. It can be viewed at pcag.uwinnipeg.ca/prairie-perspectives.html. The attractive feature of this publication is that they permit appendices with extended methodologies, etc.

The Society has also been asked to participate in Canadian science policy panels, which are held every year in Ottawa. If you have concerns with current national government policies in the environmental sciences, let us know and we can add those to current discussion panels this year.

Best regards

Bill Paton

Check out the CSEB Video at
<http://youtu.be/J7cOuDbf9c>

CSEB WORKSHOP & AGM

As noted in the President's Report, CSEB is planning on holding our annual Workshop and AGM in Vancouver in early November.

CSEB is looking for members to sit on the Organizing Committee to plan the 55th Meeting and Workshop to occur in late fall. The theme of the workshop is *Investigation of the Effects of Oil and Gas Development on Ecosystems and the Environment*.

We are looking for the following positions:

- Committee Chair
- Logistic Coordinator
- Program Coordinator
- Fund Raising / Sponsorship Coordinator
- Registration Coordinator

If you are interested in any of these positions or interested in helping out the committee, please contact Bill Paton at patonw@brandonu.ca.

Needed For CSEB Newsletter

- Guest Editors
- Article Contributors
- Regional News Contributors
- Chapter News Contributors

If you are interested in helping out, please contact:

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REGIONAL News

BRITISH COLUMBIA News

By Loys Maingon, CSEB BC Director

The Drought and Environmental Priorities in BC

British Columbia shares with California, coastal ecosystems and economies that are shaped and constrained by the vicissitudes of Pacific Ocean circulation. Simple shifts in temperature, from year to year can alter biotic distributions and productivity. When these shifts become markedly accentuated and continuous, they cross a threshold, and the entire basis of productivity and composition is likely to shift. This has direct consequences for the economies that depend on them both directly and indirectly. These facts and the considerations they entail will probably surprise some biologists who have long discounted the importance of abiotic factors in the shaping of ecosystems and their biota, much in the same way that classical economists have downplayed the importance of natural capital in the viability of regional economies. While the ongoing drought is not unusual in California, this current multi-year drought is different because of its anthropogenic linkages: *“a large ensemble of climate model realizations reveals that additional global warming over the next few decades is very likely to create ~100% probability that any annual-scale dry period is also extremely warm.”*¹

For BC, the implications of a prolonged and repeated California drought are greater than a simple change in water availability to maintain green lawns and the need to develop native xeric gardens to conserve water, which has now moved the city of Los Angeles to pay landowners to rip up their lawns, and plant native plants instead – and even offer to do this work for the landowners. Similar questions are already arising concerning Saanich’s Garry Oak development permit application by-law. Will it be cheaper to maintain and restore the currently endangered Garry oak ecosystems now, or should we pander to the wealthy landowner’s immediate horticultural tastes only to have to pay them to rip out lawns and non-adapted exotics in the coming decade?

Just as California is the largest contributor to the agricultural and economic wealth of the United States, contributing about 12% of population, domestic product, and cash farm receipts, BC is a major contributor to Canada’s energy and agricultural sectors. A prolonged drought affects water availability and everything connected with most economic projections of the current government. In some way or other, every economy depends on water quantity and quality.

As climate scientists and commentators remind us, even if it were not directly a product of climate change, the California drought is representative of conditions we should expect within the next decade.² This four-year drought brings into question many of the basic economic and cultural assumptions that made California North America’s Garden of Eden – the grocery powerhouse of North America, when post-war economists and financiers

endorsed the assumptions of the Bretton Woods Conference. The central assumption of the Bretton Woods system was that an economy of endless growth, and therefore of endless energy consumption, would solve postwar unemployment and poverty.³ The post-war prosperity has come to us at tremendous environmental costs. With declining aquifers and little surface input, water, which has always been the cornerstone of the prosperity of great civilizations, now challenges the future of the North American culture of endless growth and consumerism that grew out of Bretton Woods. California is just the canary in the coal mine. It is only a matter of time before the Midwest pumps out what remains of the Ogallala aquifer, and revisits the ecological lessons of the Dust Bowl. Without its historic access to a cheap source of irrigation, and with rising costs of long distance transportation, what was until now environmentally and ecologically unsustainable is now becoming economically untenable.⁴

The implications of the drought resonate all along the Northwest coast from Baja to California to Alaska. Last month, University of Washington researchers documented in an open-access article in *Geophysical Research Letters*, *“Causes and impacts of the 2014 warm anomaly in the NE Pacific”*⁵ that these conditions are caused by the presence of a large “blob” of water 2+°C above average from Mexico to Alaska. As noted by the authors: *“This is a taste of what the ocean will be like in future decades... it’s producing conditions that we think are going to be more common with global warming.”*⁶ Those conditions are quite visible in this month’s Snow Survey and Water Supply Bulletin (May 1, 2015)⁷ put out by the BC River Forecast Centre, and by the reactions of Fisheries and Oceans Canada (DFO) and National Oceanic and Atmospheric Administration (NOAA) researchers.

NOAA data show that this 2-3°C increase is affecting nutrient cycling in the north Pacific. These recent changes have triggered rapid changes in the distributions, productivity, and abundances of plankton, fish, mammals, birds, and reptiles. Some indicators include green sea turtles in Oregon, tuna and ocean sunfish in coastal Alaska, massive seabird die-offs in British Columbia, dramatic sea-lion mortalities in California, northward shifts of squid, and unusual abundances of jellyfish.⁸

The warm “blob” is also linked to low precipitation and high evaporation rates. Data show that most of the province suffers from a water deficit, and throughout ~50% of the province, the snowpack is down 12 to 50 percent. This translates into drought and heat wave extremes, as 20 forest fires are already (May 12) an early provincial source of concern.

Although the snowpack normally only contributes 4% of all the surface water in the province, that 4% is critical during the water deficit period (July to September) to supplement river flows during the early period of salmon returns. The graph below of the state of Vancouver Island snowpack shows that, as in California, the BC Coast has experienced increasingly precipitous snowpack and water retention declines for the past 4 years. As Figure 1

shows, in spite of abnormally high snowpacks in 2011 and 2012 that overshot the normal trend (100%), those gains were rapidly eliminated by deficits from 2013 to 2015, which confirm overall projections that coastal glaciers are shrinking and likely to disappear by 2050.

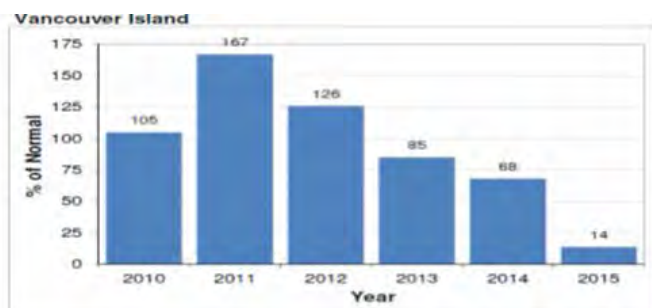


Figure 1. Snow Basin Index Graph 2010-2015 (Snow Survey and Water Forecast Bulletin – May 1, BC MFLNR)

This trend has significant economic and ecological repercussions throughout the province. Similarly, Figure 2, the map of basins on May 1, shows that even interior basins are already showing significant decreases, which can compromise the province's long-term hydro-electric potential, as well as the freshwater supply of the most densely populated areas of the province.

The long-term implications of these changes affect various projects that have dominated the news in the past three months. Although both the federal and provincial governments have granted permits for the Site C projects, notwithstanding questions that continue to surround this project and are the subject of ongoing court decisions, three aspects of the project are renewing discussions concerning its viability. First, the purpose for this increased supply of electricity has long been linked to the need for hydro power at Fort McMurray. With the collapse of the price of crude oil below \$60 a barrel and the subsequent scaling down of operations associated with the Alberta Oil Sands, as well as the undetermined position taken by the new Alberta NDP vis-à-vis the Oil Sands, the need for this electricity is increasingly unclear. The other half of the justification for the Site C project has been the need of hydro to support Liquid Natural Gas developments in the north-east of the province. That too is unclear, for although the provincial government has been able to gain the agreement-in-principle from most First Nations that would be affected by pipelines, key players at the potential terminals continue to be opposed to LNG pipelines. As well, the plummeting costs of LNG around the world, together with the reduction in the number of expected projects, do not validate initial government revenue projections. Second, if California is to cut back on agricultural production, debate is also being renewed about the wisdom of

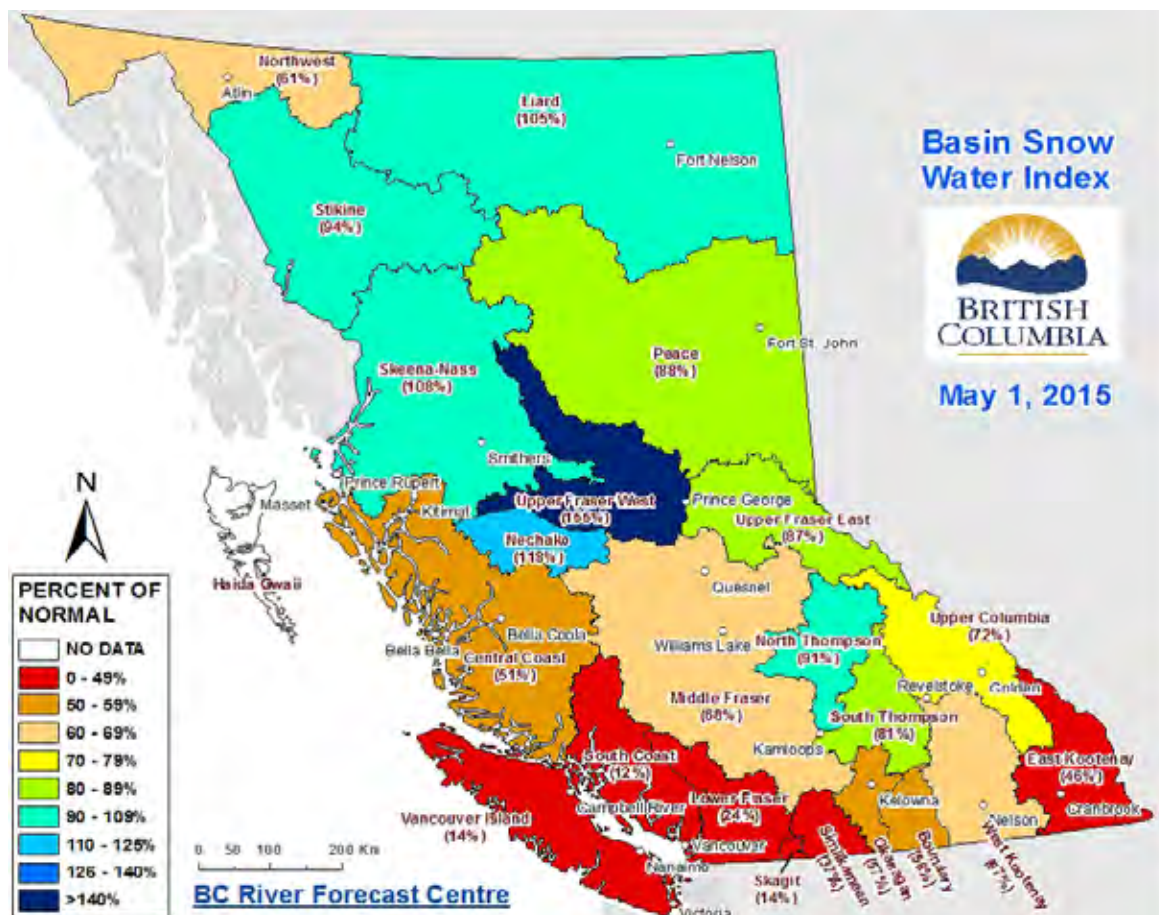


Figure 2: Basin Snow Water Index Map – May 1, 2015 (Snow Survey and Water Forecast Bulletin – May 1, BC MFLNR)

flooding some 13,000 hectares of prime productive agricultural land that could be needed, and enhanced by a changing climate, to meet regional needs. Finally, if declines in the snowpack and water availability are to continue as projected in coming decades, it is not clear that Site C can maintain the proposed hydro-electric potential it is being built for. This economic reality exacerbates the doubts already cast on the business logic of the project, under a favourable climate scenario. The fate of this last government mega-project therefore is still unclear. It may represent a last anomalous attempt to use a fading technology, when alternative and decentralized energy seems to be gaining in popularity and economic efficiency. In short, Site C may stand as another white elephant, largely out of step with newer technological advances in localized energy, such as Elon Musk, CEO of Tesla Motors, advocated this week.

Similarly, the mining sector has been dominated by two projects, both part of Imperial Metals Corporation concerns: the Red Chris Mine and the Mount Polley Mine. In both cases, the concerns have been largely tied to issues of water quality and First Nations rights. As documented by Wade Davis (2011 and 2015 *Sacred Headwaters: The Fight to Save the Stikine, Skeena and Naas*) the location of the Red Chris mine places it at the juncture of the headwaters of some of the most culturally and economically important rivers for the BC First Nations. After much controversy, Imperial Metals reached an agreement with the Tahltan Nation and the province. The Red Chris mine began operations in February 2015 and is currently being commissioned. It is overshadowed with controversies that still surround the renewal of an operating permit for the Mount Polley mine, which suffered a catastrophic dam failure in August 2014 and resulted in the widespread contamination into Quesnel Lake and tributaries. As in all such cases, preliminary research indicates that it will take years to understand the full impacts of the release of contaminants downstream.⁹ In both cases, the government of Alaska has felt it necessary to join both First Nations and environmentalists in their expression of concerns at the lack of a review of current mining regulations and regulatory enforcement. It is not clear that the government of BC has taken note of these concerns, since no changes to current mining regulations have been proposed, or are being publicly weighed.

Finally, as “the blob” develops and underscores the vulnerability of marine fisheries, DFO and the provincial environment ministry got another black eye for failing in their general stewardship responsibilities to marine fisheries and their handling of salmon fish farm transfers, with Justice Rennie ruling—once again—that DFO has not been respecting its own rules and regulations that prohibit the transfer of diseased fish to open marine pens. Alexandra Morton and Norwegian researchers have successfully made the case that farmed salmon can be carriers of piscine reovirus (PRV), which causes heart and skeletal muscular inflammation (HSMI). This comes against claims by the DFO and the aquacultural industry that there is no evidence that farmed salmon are PRV infected. If infected fish were released into the wild, PRV would infect wild fish (including wild salmon) populations and result in HSMI, as they have conclusively been shown to have done in Norway. Therefore, infected fish, or carriers of PRV should not be transferred outside infected pens into marine net pens, as per the requirements of aquaculture regulations.¹⁰

Justice Rennie appears to have taken a precautionary approach, and has ruled that Minister Gail Shea could not just rely on advice from the Marine Harvest, that there was no conclusive evidence that the PVR infected fish would not transmit PVR and cause HSMI outside the original PVR infected population to wild fish populations. Justice Rennie has ruled that the minister had to provide scientific evidence that the fish are not carriers and that PVR does not cause HSMI: “*The evidence suggests that the disease agent (PRV) may be harmful to the protection and conservation of fish, and, therefore, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*” Although the ruling appears to prevent aquaculture operations from continuing to transfer infected fish to marine pens, it is unclear what steps the provincial and federal government will be taking to protect the interests of the aquacultural industry. Back in 2012 the provincial government proposed The *Animal Health Act*, which would effectively have made it a criminal offense enforceable with a \$75,000 fine, to publicly reveal the existence and/or whereabouts of diseased farm stock. This, therefore, would have made the findings, and the notoriety of this case impossible.¹¹ It is also possible that regulations governing the transfer of diseased organisms may be re-written to enable the transfers to continue.

As the examples and concerns I have listed above may indicate, in BC, environmental science and the environmental priorities that come with basic science appear to be taking a back seat to political whimsy. There appears to be a profound disconnect between science and everyday politics to the detriment of any semblance of sustainability. This is reminiscent, as is Site C, of the cornucopian ethos of the W.A.C. Bennett years. And there are reasons for those similarities. BC is a land of extremes, particularly of extreme wealth and extreme poverty. With extreme wealth of boom and bust economies comes an extreme liberty to destroy natural capital with little regard for environmental consequences, or penalties which are generally paltry given the extent of environmental damage. Since 2008, we have been in a stagnant or declining economy, which has been seeing the once-much-touted stimuli of mega-projects, such as the LNG development diminish with the passage of time, and all the expectations linked to the Northern Gateway project stumble against environmental and First Nations opposition, only to be stymied by the long-term collapse of the Alberta Oil Sands, and now finally ruled out by a new NDP government in Alberta. Old-style political booster and job-creating mega-projects like the Site C dam, which is the last unfinished of the W.A.C. Bennett era projects, now present a public nostalgic aura that is strangely out of place against the politically poorly understood but radically evolving environmental reality that is climate change.

This week Oliver Geden put out a singularly significant comment in *Nature*, which is relevant to this discussion: “*Policy: Climate advisers must maintain integrity*”.¹² In the light of the apparent inability of politicians to grasp the environmental and economic realities that climate change is imposing on us, it is increasingly important for scientists not to compromise the integrity of science’s leadership in the public eye by acquiescing to political expediency. As Geden succinctly puts it: “*Scientific advisers must resist the pressures that undermine the integrity of climate science. Instead of spreading false optimism, they must stand*

firm and defend their intellectual independence, findings, and recommendations – no matter how politically unpalatable.” Geden’s recommendation applies not only to climate scientists: it needs to apply to all branches of science. To do otherwise is to give credence to political flummery such as “*The Animal Health Act*” of 2012, which might have protected business interests, but would have endangered the public good in a flagrant disregard of factual reality.

The business of science is facts, however unpalatable they may be to politics. The responsibility of science is to the public whose taxes directly or indirectly support all our scientific institutions from the education of future scientists to our research institutions, even the private research institutions, which receive tax breaks are effectively subsidized by the public. With the developing drought at a time of economic uncertainty, BC faces tremendous environmental and economic challenges largely because decisions have been made that are out of sync with the environmental reality about us. Political guidance cannot be construed out of misinformation. The public is best served by the facts it deserves to know, by science that shows leadership beyond the daily pablum of political flim flam.

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ALBERTA News

By Brian Free, CSEB Member, and Sheri Dalton, CSEB Alberta Regional Director

A fresh wind blew across the province on May 5. After about 40 years in power, the Alberta Progressive Conservatives lost the provincial election to the Alberta NDP. The PC party dropped to third place with the Alberta Wildrose Party becoming the Official Opposition. This is a monumental change!

An NDP Government in Alberta? Get ready to celebrate a green revolution? Let’s not get ahead of ourselves....

Looking at the Alberta NDP election platform, the main policy categories are as follows: Diversified Economy, Education, Fair Fiscal Deal, Health Care, Honest Government, and Other Commitments. We were surprised and disappointed that environmental policy fell under the catch-all “Other Commitments”. Nevertheless, below are the main statements offered about their environmental policies, with some personal comments added in italics..

“Action on the environment:

(5.9) We will establish a green retrofitting loan program that will assist Alberta families, farms and small businesses to reduce their energy usage affordably, which will reduce environmental impacts and create jobs in the construction industry.

We like the sounds of this, but we’ll need to see some details to fully understand the implications.

(5.10) We will phase out coal-fired electricity generation to reduce smog and greenhouse gas emissions and expand cleaner, greener sources, including wind and solar and more industrial co-generation in the oil sands, all of which will improve both the environment and the health of Albertans.

Less reliance on carbon-intensive fuels like coal is a smart idea. However, other sources of electricity will have impacts that need to be well managed.

(5.11) We will end the PCs’ costly and ineffective Carbon Capture and Storage experiment and reinvest the 2015/16 component of this project into construction of public transit, which will help reduce families’ transportation costs and reduce greenhouse gases and other air pollutants.

Carbon capture and storage involves capturing greenhouse gas emissions from large industrial emitters and injecting them underground for storage. This diverts the emissions from entering the atmosphere.

(5.12) We will strengthen environmental standards, inspection, monitoring and enforcement to protect Alberta’s water, land, and air. We will build standards based on independent science and international best practices, designed transparently in careful consultation with Albertans.

Science-based environmental standards are something the CSEB can support. Strengthened inspections, monitoring, and enforcement are positive moves, but they will require an investment in program budgets and staff resources to be effective.

(5.13) We will take leadership on the issue of climate change and make sure Alberta is part of crafting solutions with stakeholders, other provinces, and the federal government. First steps will include an energy efficiency strategy and a renewable energy strategy.

Influencing the federal position on climate change will be a significant challenge for this Alberta government.

(5.14) We will ban gas drilling in urban areas.

A good idea related more to human safety than to environmental concerns.

(5.15) And we will protect the Castle Wilderness Area.

The Castle Wilderness Area is in the southern Rocky Mountains, just north of Waterton Lakes National Park. Some parts are protected, but timber harvesting, oil & gas exploration, and unregulated off-highway vehicles are threatening other parts of this sensitive area.

This Alberta NDP platform has many good ideas, but many important environmental issues are not addressed: endangered species, watershed stewardship and others. We'll learn more about the new government's position on these and other issues in the weeks and months to come.

Clean Air Strategic Alliance

By Joseph Hnatiuk, CSEB Alberta Director

The Clean Air Strategic Alliance (CASA) in Alberta was established in March 1994 as a new way to manage air quality in Alberta. The CASA is a multi-stakeholder partnership. It is composed of representatives selected by industry, non-government organizations and government. Every partner is committed to a comprehensive air quality management system in Alberta. I currently represent the Canadian Society of Environmental Biologists (CSEB) and Alberta Environmental Network (AEN) on the Odour Management Team.

The vision of CASA states "The air will have no adverse odour, taste or visual impact and have no measurable short or long term adverse effects on people, animals or the environment".

The mission notes that "The Clean Air Strategic Alliance is a multi-stakeholder alliance composed of representatives selected by industry, non-government organizations, and government to provide strategies to assess and improve air quality for Albertans, using a collaborative consensus approach".

The CASA's mandate is to:

- Implement the Comprehensive Air Quality Management System (CAMS) for Alberta;
- Conduct strategic air quality planning for Alberta through shared responsibility and use as a consensus-building, collaborative approach; and
- Prioritize concerns with respect to air quality planning in Alberta and develop specific actions or action plans to resolve plans and activities to resolve those concerns.

Responsibility for specific air quality planning is shared among stakeholders. Regulatory implementation, licensing, compliance, control and enforcement remain with existing government agencies.

The CASA supports three air quality management goals:

- Protect the environment by preventing short and long term adverse effects on people, animals and ecosystems;
- Optimize economic efficiency; and
- Promote pollution prevention and continuous improvement.

In January 2013, the Odour Management Team (OMT) was formed to design a process that would assist various stakeholders to engage in a focused discussion directed at advancing odour management in Alberta. The work of the team was divided into seven cross-cutting topics. The topics included the following:

- Complaints;
- Odour Assessment;
- Prevention/Mitigation;
- Enforcement/Role of Regulation;
- Health;
- Information/Communication/Awareness; and
- Continuous improvement.

The above tasks are at various stages of completion and the OMT expects to have the final Best Practice Guide (BPG) to be submitted to the CASA Board by the end of September 2015.

Please stay tuned for the final product.

SASKATCHEWAN News

By Robert Stedwill, CSEB Past President & Sask. Chapter Chair

The snow is gone, and the mosquitos have arrived. What can I say, summer in Saskatchewan? Actually, summers in this province are pretty exceptional, just not long enough.

However, with the snow gone, the Government of Saskatchewan has just announced its spring forest renewal projects are underway, with approximately 2.2 million new trees – two trees per Saskatchewan resident – to be planted in Saskatchewan's northern forest. Saskatchewan's population currently sits at 1.1 million and change; although in 2012 it had been forecast at only 1,079,958. The province is definitely growing population wise.

With respect to the Province's forests, Saskatchewan's economy used to be more agriculturally-based; however, an increase in diversity has resulted in agriculture and forestry making up 6.8% of Saskatchewan's GDP, with finance making up 17.1%, mining/petroleum (13%), and education, health, and social services (11.9%) being the top economic sectors of Saskatchewan. No wonder the province has been more fortunate with the slump in oil price than other jurisdictions. Needless to say, economic activity has been going at a breakneck speed with their associated environmental issues. New subdivisions, highways, industry, power lines and power stations all contribute cumulatively to negative impact.

Recently though, I have been encouraged by a decision of the provincial government to not proceed with the review of a new golf course proposed on one of the last parcels of native prairie in close proximity to the City of Regina, currently used for summer hiking and recreational cross country skiing in the winter. Public protest carried the day. Last weekend I was further encouraged when the City of Regina hosted one of its hazardous waste days

(twice per year), only to discover that there was a line up to get in! For what normally took 10 minutes in previous years, took a little more than an hour as responsible citizens arrived in droves to drop off hazardous waste.

My hope is that as people arrive and call Saskatchewan home, that they bring their good environmental habits with them!

MANITOBA News

Submitted by Bill Paton, CSEB President.

Assiniboine River Basin Initiative Progressing

The Assiniboine River Basin Initiative (ARBI) becomes a legal, stand-alone entity as of July 1. Manitoba has pledged an additional \$50,000 beyond an initial \$50,000 announced last year to start ARBI, but Saskatchewan and North Dakota have not contributed yet.

The Board now has 51 members and about 25 met with ARBI's executive committee in Moosomin, Saskatchewan in late March and drafted a mission statement, terms of reference and a work plan and budget for this summer. The basin initiative encompasses an area of about 162,000 square kilometres, and takes in the Souris, Qu'Appelle and Assiniboine rivers, for which there are currently eight regional watershed management plans.

Source: Manitoba Co-operator March 26, 2015.

Oil Spills Continue

An oil train derailed and caught fire May 6 close to the small town of Heimdal, North Dakota. Despite treatment to remove volatile inflammable gases an explosive ignition occurred in six cars of the 109 car train. A fortunate rainfall likely stopped the fire from spreading to nearby grasslands. An EPA official was expected soon to assess impacts on surface water. Since 2006, the U.S. and Canada have seen at least 24 oil train accidents involving a fire, derailment or significant fuel spilled according to federal accident records.

Source: Winnipeg Free Press May 8, 2015.

The clean up of 30,000 litres of bitumen spilled from a rail tanker continues after 13 cars derailed on the Canadian National Railway's main line in western Manitoba. The spill occurred just north of Carberry early evening March 11. Environment officers from Manitoba Conservation and Water Stewardship will monitor cleanup operations. This accident follows a fiery derailment on the 7th of March just outside Gogama in northern Ontario. In that incident, the track and a bridge were destroyed and oil was found in the mouth of the local river system. There have been three recent derailments in northern Ontario, including two along a 40 km stretch south of Timmins.

Source: Winnipeg Free Press March 13, 2015.

Concerns Raised in Winnipeg about the Energy East Pipeline

TransCanada Corporation is in the approval stage of its \$11 billion conversion of its natural gas line to ship 1.1 million barrels of crude oil per day from Alberta and Saskatchewan to refineries

in Eastern Canada. It's double the length of the controversial Keystone XL pipeline. If approved Energy East would see expansions at four pumping stations in Manitoba.

The Wilderness Committee, Manitoba Wildlands and the Manitoba Energy Justice Coalition have raised concerns with the Manitoba government and Manitoba Hydro. The environmental groups have called on the provincial government to hold public hearings by the Manitoba Clean Environment Commission. The National Energy Board is expected to carry out hearings early next year.

Source: Winnipeg Free Press May 8, 2015.

Cosmetic Pesticide Bans Impact Manitoba

Last summer, the provincial government passed new legislation restricting the use of some of the herbicides Manitobans have used for decades to control weeds in their lawns. The legislation applies to all mowed turf areas on residential, commercial, government and institutional properties. The products are the phenoxy-acetic acids (2,4-D) and roundup (glyphosate).

Roundup has recently been assessed as a probable human carcinogen by the World Health Organization. The major product being used by lawn-care companies is an iron-chelate formulation with higher cost and limited published research on its efficacy against major annual weeds.

TERRITORIES News

Submitted by Anne Wilson, CSEB 1st Vice-President and Territories Director

NWT and NU Summer 2015 Regional Update:

Odds and ends:

As spring progresses, lake ice is disappearing, and breakup on the rivers has occurred. Spring runoff has played havoc with water clarity in many communities. Yellowknife, Dettah and Ndilo are under a boil water advisory due to high turbidity levels, and this is unusual in occurrence and duration. Most of us take convenient access to potable water completely for granted, and this reminds me to be grateful for the amenities of daily life in Canada!

A blue-green algal bloom has coated the bottom of a Yellowknife-area lake, with slimy sludge for the first time in 2013, and getting much worse over the past two years. It would be interesting to know if other lakes are experiencing this phenomenon, and what has changed for this lake. Most lakes are extremely nutrient-limited (phosphorus), and algal blooms are so uncommon in these oligotrophic systems as to make news headlines when one like this happens. <http://www.cbc.ca/news/canada/north/algae-bloom-coats-yellowknife-s-jackfish-lake-with-sludge-1.3075172>

Forest fires are already burning in the NWT. Residents and the GNWT are gearing up for another bad fire season, as the forecast is for a hot, dry summer. Last year's fire season was the worst on record, with the territorial government spending more than \$56 million to fight fires that burned more than 3 million hectares.

Last newsletter I mentioned the environmental assessment hearings underway for a uranium project in Nunavut, and the Nunavut Impact Review Board recently released their decision.

This was a difficult one, and I was very curious to see how the Board would deal with the divergent testimony they heard. Credible scientists gave evidence regarding how risks could be managed and mitigated; the Inuit land owners and residents gave impassioned presentations describing the fragile and precious natural capital, and the many past mistakes and reasons for distrust to underscore adamant and pretty much unanimous opposition to the project. The Board denied the project, on the basis that the proponent had no plans to proceed to development for another two decades, and it was not possible to know conditions at the time of development (e.g., caribou herd status, socio-economic conditions) sufficiently to draw conclusions about impacts. I think this was a prudent and defensible decision.

We've all heard the saying "necessity is the mother of invention", and I would add financial drivers to that as well! I was pleased to read in the news that Avalon recently won an award for green innovation from the NT and NU Association of Professional Engineers and Geoscientists. Getting a drum of diesel fuel to their exploration camp cost \$500-\$600 per drum, and a drum lasted about 32 hours. By installing a solar power system and hooking it up to the batteries and generator system, the fuel consumption was cut to about a fifth. At that rate the payback on investment will be well worth it!

Mining and other development news

Ongoing environmental assessments underway in the NWT and Nunavut include:

- Jay Expansion - Ekati Diamond Mine (Dominion Diamond Ekati Corp). The Jay Pipe is located under Lac du Sauvage, and is proposed to be accessed by constructing a ring dike around the kimberlite pipe. The Developer's Assessment Report release, first round of information requests and responses, and technical sessions have been completed, and a second round of information requests is underway.
- The Mackenzie Valley Highway project has been reduced in scope, due to funding realities, and now consists of 333 km of all-season gravel road connecting Wrigley and Norman Wells. The original proposal was almost 500 km longer to the north, so the impact assessment scope and terms of reference are being revised.
- The Giant Mine Remediation project is awaiting Ministerial approval for finalization of the environmental assessment report, before it can proceed to the regulatory processes. Meanwhile, liabilities on surface must be managed to prevent environmental damage from occurring. For example, surface runoff and drainage must be managed to protect Baker Creek and to prevent excessive water going into less-than-stable open pits.
- Prairie Creek Mine (Canadian Zinc Corp.): The road EA continues with the recent release of the Developers Assessment Report, and the company is working to assemble financing needed to take the mining project into production.
- The Meliadine Gold project water licence application is expected shortly.
- Sabina's Back River gold project is undergoing

environmental assessment, and the Final Environmental Impact Statement will be out in Oct.

- Areva's Kiggavik Uranium Mine project was the subject of public hearings in early March 2015 in Baker Lake. The Nunavut Impact Review Board rejected the proposal, based on uncertainty around the proposed 2-decades-hence start date.

In the regulatory forum, several mining projects are moving towards development or have applied for amendments to their water licences, or renewals.

- Snap Lake Diamond Mine (DeBeers Canada Inc.) has applications in for amending their water licence to allow higher discharge limits on total dissolved solids. Treatment will be necessary, and that solves some problems and causes others – disposal of brine residuals, and lots of them. Public hearings were held in Yellowknife in March 2015. With no clear agreement on acceptable levels to discharge, it will be interesting to see where the Mackenzie Valley Land and Water Board goes with this one.
- Diavik is proceeding with construction of the A21 dyke, to allow them to access ore from an underwater pipe. The water licence renewal process continues.
- North American Tungsten Limited's Cantung Mine water licence is up for renewal, and this is an opportunity to evaluate how the new water treatment system is working. The renewal also covers the use of dry stack tailings, a first in the territory.
- Fortune Minerals has not advanced further, and is working on financing to move the project to construction. Road access is also an issue.
- Canadian Zinc Corp.'s Prairie Creek Project is seeking financing to proceed.
- DeBeers Canada Gahcho Kue Diamond Mine is under construction, and continuing monitoring work.
- The Avalon Rare Metals project is on hold, while the company does further work and lines up financing prior to going to water licence hearings.
- Baffinland's Mary River iron ore mine is in production, with ore mined and stockpiled for shipment next open water season. They have applied for an amendment to do more shipping from the Milne Port, proposing 10 months a year (icebreaking). The public hearings were held recently.
- The Meadowbank Gold mine's Type A Water licence renewal application has made its way through public hearings at the end of April. In an adjacent process, Agnico Eagle Mines is looking at an expansion with the Ameruq ore body. It is a satellite resource, so a 50 km road would need to be constructed and this ore would extend the mine life by several years.
- The Lupin gold mine has been in "care and maintenance" for years, and the new owners have renewed the water licence with the stated intention of developing the Ulu deposit and reopening the mill.

HOBO Remote Monitoring Station Data Logger

The HOBO RX3000 is Onset's next-generation remote data logging station that provides instant access to site-specific environmental data anywhere, anytime via the internet.

- Support for a broad range of sensors
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- The Nanisivik and Polaris lead zinc mines have been issued closure licences, which cover the final monitoring phase.
- Several municipal water licences are up for renewal in Nunavut, with Iqaluit's likely to be the most controversial of the list.

Full details for current environmental assessments are available on the Board's web site at <http://www.reviewboard.ca/registry> and regulatory files at <http://www.mvlwb.ca/Boards/mv/SitePages/registry.aspx>.

Closing:

If you are connected to activities in the Yukon, NT or NU, there is a vacancy for a Director, and I would love to welcome someone on board. If you are doing work north of 60 that you would like to highlight in the newsletter, or running some seminars or other training opportunities, please let us know. The CSEB provides a valuable networking and communication forum, and a voice for biologists if there are any issues to be raised. There is also the option of instigating other CSEB activities – both of the fun and/or of the educational variety - with colleagues in the North. Please email your thoughts to anne.wilson@ec.gc.ca.

Warming North a Breeding Ground for Ticks

Cases increasing in moose populations as temperatures rise, say biologists

By Meagan Leonard

Source: Reprinted from Northern News Services

Friday, May 15, 2015

Northwest Territories

A photo of a mangy moose running across Highway 3 between Behchoko and Yellowknife May 2 has people talking about ticks. And according to regional biologists, the North's warming climate means this could be a sight that becomes more common.

An official with the Department of Environment and Natural Resources (ENR) says the number of reported cases has been steadily climbing and though the pests do not yet pose a significant threat to moose populations, he is monitoring the situation closely.

Regional biologist for the North Slave region Dean Cluff says the warming climate is encouraging more moose to move north while also providing a breeding ground for ticks.

"It's warming up so as the moose move into the territory these larvae are surviving," he said.



A moose infected with ticks. It takes an infestation of around 50,000 ticks to kill an animal. Although moose in NWT typically carry a few hundred at a time, animal carcasses in the south have been found with as many as 100,000 on them. - photo courtesy Dr. Bill Samuel, University of Alberta

Cluff says it takes upwards of 50,000 ticks on one animal to kill it and typically infected moose in the NWT are only found to carry few hundred at a time. However, ticks can debilitate an animal making it more susceptible to exposure, starvation and predation. He says he has seen “ghost moose” where all the brown guard, or outer layer, hair has fallen out leaving just the grey under-layer.

“That is a problem if it’s still late winter because the insulating value of the hair is gone and then they can starve,” said Cluff.

“They also spend a lot of time grooming instead of feeding and so they starve or they’re more vulnerable to predation.”

Although there is no easy way to alleviate the pests, cold temperatures and forest fires help keep the larvae population under control says Cluff. Female ticks fall from a moose in the spring and lay their eggs in the forest brush. After the eggs hatch, larvae spend the summer there and then latch onto a moose in the fall.

“The only real way to get rid of them would be to put a flea collar on the moose,” he said.

“What really does control them is fires, so when you’ve got eggs or larvae in the ground and a fire goes through that kills them.”

If winters continue to get shorter and warmer, the North could face a situation similar to Alberta or Quebec, where hunting bans have had to be put in place as ticks become more numerous.

“In Minnesota, New Hampshire and Quebec, the moose populations are getting down to the point where no hunting is allowed,” he said, adding moose in those areas can have up to 100,000 insects on them at any one time.

Although ticks have been known to feed on many members in the moose family such as caribou, deer, and elk, moose have not adapted to the insects as well as other species and, therefore, are at the highest risk.

Moose are relatively new to North America. They are believed to have come across the now-underwater ice bridge from Asia only

10,000 years ago, while evidence shows deer have been here for millions of years. This means elk and deer have developed ways to mitigate tick infestations while moose haven’t.

“Deer and ticks have been in North America for maybe a million years and evolved together,” said Cluff.

“Elk and deer also seem to be able to groom a little bit better and remove those ticks.”

University of Alberta professor emeritus Bill Samuel specializes in the influence of parasites on large mammals and says large counts of tick-related deaths in moose have been occurring since the early 1900s.

“In central Alberta in the winter of 1981/82, many hundreds, like some thousand or more died,” he stated in an e-mail to News/North.

“(We) found an average of 82,900 ticks on those moose. That is just under five ticks per square centimetre of skin.”

Samuel said if temperatures continue to climb in the NWT this type of scenario - previously unheard of in the North - could be a real possibility.

“If autumns are mild in temperature and snow comes a little later, then the larvae on the vegetation stand a better chance of surviving longer,” Samuel said.

“If winters are shorter, when a female tick drops from a moose to lay eggs, more might survive.”

Cluff emphasized at this point threat to the territory’s endangered caribou population is low, as the animals do not usually spend time in exposure areas.

“We don’t see ticks on caribou (because) caribou are on the tundra in the summertime, and then they come into the trees in the winter,” Cluff said. “Ticks don’t drop off until the spring or summer and the caribou have already left — if they were around in the summer it might be more of an issue.”

Fortunately, this particular species of tick is not a health risk to humans and do not pass on infections such as Lyme disease, says Cluff.

“It’s a one-host tick. It doesn’t drop off and go to another host — it always is on the same moose for its lifetime,” he explained. “There’s no risk if you handle a moose that has ticks, and it’s an external parasite so it doesn’t affect the meat in any way—it’s still edible.”

Cluff says ENR encourages anyone who encounters a moose displaying signs of a tick infestation to report it.

“It’s present in the system, it warrants monitoring but it’s not a population-level concern at this point,” he said.



A moose with tufting fur, which indicates it may be infected with ticks, runs across Highway 3 between Yellowknife and Behchoko May 2

WHY HABITAT COMPENSATION UNDER THE FISHERIES ACT FAILS - THE CASE OF SANDY POND

R. John Gibson (rjgibson@nf.sympatico.ca) and John D. Jacobs (jjacobs@nl.rogers.com)

Compensation for aquatic habitat that is destroyed by industrial development under permit from the Fisheries and Oceans Canada (DFO) has been criticized on a number of points by fisheries scientists and conservationists, including ourselves (Gibson, 2012; Hutchings and Post 2013; Jacobs 2015). Not least of these is the fundamental question as to how any compensation can be offered that is equivalent to the destruction of an entire ecosystem, such as a natural lake, particularly when it may contain genetically unique populations.

As a signatory to the United Nations Convention on Biological Diversity, Canada has undertaken to “develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes...” (<http://www.cbd.int/> and <http://www.biodivcanada.ca/>). However, the Government of Canada has shown itself to be less than committed to the biodiversity convention. It has progressively weakened protection of Canadian waters and aquatic biodiversity under the Canada *Fisheries Act*, through a series of amendments and regulations, including a major revision in 2012 (Jacobs 2015). Instead of biodiversity protection, the language of fish habitat compensation has been replaced by the concept of *offsetting*, where the primary criterion is maintaining equivalent *productivity capacity*, and there are detailed procedures offered for achieving that objective (DFO 2014).

Setting aside for the present the larger issue of whether biodiversity is really being protected, we focus here on a case where a development project, Vale's Long Harbour smelter project, Placentia Bay, west side of the Avalon Peninsula, Newfoundland, was approved. This involved the re-classification of Sandy Pond, a deep isolated post-glacial lake known for trophy brook trout (*Salvelinus fontinalis*) of 3 – 5 lbs, as a Tailings Impoundment Area (TIA) for toxic wastes. A habitat compensation plan was accepted, and we ask to what extent this narrower effort itself was adequately designed and properly carried out.

Most of the environmental work was carried out by the environmental services firm, AMEC. A habitat compensation plan was submitted in 2008, which proposed to create a new pond in a small valley near Sandy Pond, and expand and rehabilitate existing ponds. (AMEC 2008). That plan was substantially revised in 2011, and the main ‘compensation’ changed to be improvement of fish access (for salmon, *Salmo salar*, and brown trout, *Salmo trutta*) in Forest Pond, a lake on the main stem of Salmon Cove River, Conception Bay, on the east coast of the Avalon Peninsula. This was to be done primarily by removing a partial vegetation barrier at the outlet of the pond.

A detailed critique of the plan showed it to be grossly inadequate in terms of the estimates of the kind and amount of habitat that was lost from Sandy Pond and that no new fish habitat would likely be created (Gibson 2012, 2014). Nevertheless, work has gone

ahead on the Salmon Cove River based on that plan (McCarthy and Brown 2011; McCarthy et al. 2015).

The compensation for loss of 45 ha of pristine waters by creating the TIA involved removal of instream vegetation from the outlet of Forest Pond, the second pond upstream from the outlet. This vegetation blockage was about 100 m long and about 15 m wide. It had developed in the last 17 years, due possibly to enrichment from sewage inflows. Its removal purported to compensate for 12.12 ha of the (incorrectly) estimated 18.11 ha fish habitat lost by the destruction of Sandy Pond. As well, spawning gravels were placed upstream of Forest Pond, compensating for a further 0.2 ha of the lost fish habitat.

The ‘blockage’ at the outlet of Forest Pond consisted mostly of alders, but also substantial amounts of various grasses (sod) as well as berry and other low bushes. The channel was considered to be completely blocked to fish migration with flow braiding out or going under bushes and roots, etc. However juvenile salmon occurred upstream, although in fewer numbers than in previous studies, so the blockage was only partial.

Salmon stocks generally are reduced around the island of Newfoundland (e.g., Hustins 2015), so fewer salmon could be expected than found in earlier years. No figures are presented on adult salmon, so it is not possible to say whether adult salmon were able to negotiate the vegetation blockage or not. Smelt (*Osmerus mordax*) were reported as present in earlier studies (Anon. 1984), but are not mentioned in the present work, although they are an important component of such ecosystems.

The enhanced spawning areas showed an increase in juvenile salmon and brown trout densities in 2012 – 2014 compared with studies in 1984 and 2010. The blockage was removed in 2011, so it was claimed that adult salmon had increased upstream. However, no measurements of juvenile salmonids were made in the enhanced area before 2012, and no comparisons made with other suitable spawning sites before and after the enhancements, so an increase in spawning escapement cannot be demonstrated.

It was claimed that spawning habitat had previously been identified as limiting, however stream mapping by DFO (Anon. 1984) showed a total rearing area in Salmon Cove R. of 1102 rearing units (a unit = 100 m²) and that there were 316 spawning units (i.e., 28.7% of the river bed area). Symons (1979) suggests that 25% of the total rearing grounds should provide sufficient nursery area, so in fact it is unlikely that spawning areas were indeed limiting.

Local anecdotes claimed that in the early 1900s adult salmon escapement was “in the thousands”. However the calculated total adult returning salmon related to rearing habitats was estimated to be of the order of 165 – 331 fish (Anon. 1984). With sea survival of 10% about 331 adult returns could be expected, and at 5% sea survival about 165 adult salmon. In fact, sea survival

has decreased in recent years (Chaput 2012), declining to 5% or less. DFO reported an angling catch in 1984 of seven grilse (salmon that mature after one winter at sea). The mean angling catch in 1980 - 84 was 24 grilse. This was before the vegetation obstruction developed at the outlet of Forest Pond. The DFO egg spawning target for conservation requirements is 240 eggs/100 m² of fluvial habitat, which would require about 123 female grilse for maximum preferred spawning.

In conclusion, calculations of the Sandy Pond fish habitat were incorrect and pelagic and deep water use by the large trout and the smelt in Sandy Pond were not included (Gibson 2012). Therefore, fish habitat requiring compensation was underestimated. Now we have shown that the compensation of possibly increasing salmon escapement to provide a small run into Salmon Cove River is questionable and not supported by the available data. Therefore, the 'compensation' approved under the habitat compensation provisions of the *Fisheries Act* does not create any new habitat and may not increase present salmon escapement into Salmon Cove River. It, therefore, is inadequate compensation for the destruction of the unique ecosystem that was Sandy Pond.

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CSEB By-law Change and Transition to New Not for Profit Act

In 2011, the governing law for federal not-for-profit corporations was replaced by The Canada *Not-for-profit Corporations Act* (NFP Act). All federal NFPs are required to transition to the new Act requirements. The Act has specific requirements related to membership and meetings that have to be included in By-Laws. In order to transition to the new Act, CSEB must amend its By-laws to include the required items.

A membership vote was undertaken in the spring of this year and the results were unanimous support of the By-law change and Transition proposal.

Thank you to the membership for acting on this federal requirement for CSEB.

Karen March, Secretary-Treasurer

How You Can Help the CSEB

- **Contribute to the quarterly newsletter and/or website.** Give us an article on something you are interested in
- **Write a short paragraph about what you have been doing, articles or reports you have written**
- **Provide us with points of views on issues.** Your Executive is always interested in learning what issues concern you
- **Write a book review for the newsletter**
- **Become a Chapter Chair, or offer to join the Board of Directors**
- **Promote CSEB - put up a poster, distribute membership forms** - download from our website
- **Set up a Chapter** - contact any Director for help
- **Organize a CSEB event** - contact any Director for help
- **Attend the annual conference and maybe present a paper on your work.**

Migratory birds are an important part of Canadian biodiversity. These birds as individuals, as well as their nests and eggs, are protected everywhere in Canada under the [Migratory Birds Convention Act, 1994 \(MBCA\) and its regulations](#). Migratory birds can be inadvertently harmed as a result of many activities including, but not limited to, mowing, clearing trees or vegetation, and draining or flooding land. Planning ahead can assist you, and your clients, in complying with the law and help make proactive avoidance and mitigation decisions for any activities that might have detrimental effects on migratory birds, their nests and eggs. For more information:



www.ec.gc.ca/paom-itmb



Les oiseaux migrateurs sont un élément important de la biodiversité canadienne. Ces oiseaux, en tant qu'individus ainsi que leurs nids et leurs œufs sont protégés partout au Canada en vertu de la [Loi de 1994 sur la convention concernant les oiseaux migrateurs \(LCOM\) et de ses règlements](#). De nombreuses activités peuvent par mégarde tuer ou faire du tort à des oiseaux, ou encore détruire ou

déranger leurs nids ou leurs œufs. Ces activités comprennent, sans toutefois s'y limiter, la coupe d'arbres et d'autres végétaux, le fauchage, le drainage ou l'inondation des terres. La planification à long terme peut vous aider, ou aider vos clients à respecter la loi et à réduire au minimum le risque d'effets néfastes sur ces oiseaux, leurs nids ou leurs œufs. Pour plus de renseignements :

www.ec.gc.ca/paom-itmb

CSEB Regional Directors Needed

CSEB has Regional Director vacancies as follows:

- Territories
- Quebec
- Atlantic
- Saskatchewan
- Manitoba

If you are interested in taking on one of these positions, please contact Bill Paton at patonw@brandonu.ca. It is not an onerous task, and will greatly help strengthen the organization.

Your help would be greatly appreciated.

CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS LA SOCIÉTÉ CANADIENNE DES BIOLOGISTES DE L'ENVIRONNEMENT

FORMULAIRE D'ABONNEMENT MEMBERSHIP AND NEWSLETTER/SUBSCRIPTION APPLICATION

Regular Members: persons who have graduated from a college or university in a discipline of biological sciences, and who are or have been professionally engaged in teaching, management, or research related to natural resources and environment.

Student Members: persons who are enrolled in an accredited college or university in a discipline of the biological sciences, and who are preparing themselves for professional work in teaching, management, or research related to natural resources and to the application of sound ecological principles to management of the environment.

Associate Members: persons who support the purposes and activities of the Society but who do not qualify for Regular or Student membership.

*Complete this form and return with cheque payable to:
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Membres Réguliers: les personnes ayant un degré ou diplôme d'un collège ou une université dans une discipline des sciences biologiques et qui sont ou qui ont déjà été engagé professionnellement en aménagement, enseignement ou recherche tenant à l'environnement ainsi que ressources naturelles.

Membres Étudiants: les personnes qui étudient dans un collège ou une université reconnu dans une discipline des sciences biologiques, et qui se préparent à travailler comme professionnel soit en enseignement, aménagement ou recherche tenant aux ressources naturelles et à l'application de principes écologiques à l'aménagement de l'environnement.

Membres Associés: les personnes qui supportent les activités et les objectifs de la Société mais qui ne se qualifient pas comme membre régulier ou étudiant.

*Complétez cette formule et retournez avec un chèque payable à:
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