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THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Newsletter / Bulletin

In this Issue:

- **Passing of President Bill Paton**
- **CSEB Workshop on Oil and Gas Postponed**
- **BC Report - BC's Magic LNG Realism**
- **Alberta's NW Conservation Plan**
- **Atlantic News - BoFEP Workshop 2016**

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In this issue

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Front Cover: Clayton James (Fisheries Biologist, Golder Associates Ltd.) and his community assistant Ernest Boucher, ready to process Northern Pike captured in a hoop net on a creek flowing into Great Slave Lake, May 2016. Photo Credit: Paul Vecsei (Golder Associates Ltd.).

Back Cover: Upper - Paul Vecsei (Fisheries Biologist) and Ernest Boucher, implanting a passive integrated transponder (PIT) tag into a Northern Pike to determine it's spring migration movements. Lower Left - Catch from trap. Lower Right - Sampling catch. Insert: Paul Vecsei weighing the catch. Photo Credits: Clayton James.

CSEB NEWSLETTER 2016

Vol. 73, Number 2 Summer 2016

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 nonprofit 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:** garyash@shaw.ca

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LE BULLETIN de la SCBE 2016

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Le Bulletin de la SCBE est une publication trimestriel de la Société Canadienne des Biologistes de l'Environnement. Le Bulletin informe les membres des activité 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 diverssifié d'environnementalistes Canadien. Les membres sont invités a contribuer des articles, photos (noir et blanc) ou des messages qui sont d'intérêt nationale en sciences biologiques et environnementales. Les lettres à l'editeur sont bienvenues.

Tout la correspondence 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'editeur: Gary Ash, Editor, courriel:** garyash@shaw.ca

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The Canadian Society of Environmental Biologists

CSEB OBJECTIVES

The Canadian Society of Environmental Biologists (CSEB) is a national nonprofit 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.

NATIONAL News

PRESIDENT'S Report

Dr. William Paton

1944-2016

It is with great sadness that we announce the passing of CSEB President, Dr. William (Bill) Paton, age 72 in Brandon, Manitoba on Monday, June 13th, 2016. We will miss his leadership, his enthusiasm for the CSEB, and his friendship.

Born in 1944 and raised in rural Scotland, Dr. Paton joined Brandon University's Department of Botany (later Biology) in 1974. He taught at the university for 40 years, retiring in 2014 and earning the designation of Professor Emeritus.

Dr. Paton's extensive knowledge and willingness to help others are evident throughout western Manitoba in gardens and yards. He was a driving force in the establishment of the long-running HortLine, which was launched in 1976 and developed into a popular call-in show at radio station CKLQ. Dr. Paton continued to provide free horticultural advice to people from around the region throughout his life.

Dr. Paton joined CSEB in September 1995 and has been an active member of the Society first as the Manitoba CSEB Director, before moving on to 1st Vice President and in 2015 moved into the role of President.

Donations in memory of Bill may be made to the Dr. Bill Paton Memorial Scholarship Fund at Brandon University, c/o Brandon University Foundation, 270 18th Street, Brandon, MB, R7A 6A9.

In recognize Bill's service to CSEB, the Society has planted a tree as a memorial in his honour.

MEMBER'S LETTER

Submitted by Peter Wells, CSEB Member

Initiating a Renewed CSEB Discourse on Environmental Biology Issues Across Canada

The CSEB Newsletter/Bulletin, under Editor Gary Ash's tutelage, is constantly seeking engaging and timely articles from its members on work being conducted currently on regional issues (problems) of importance. The articles over the past many years, archived on the CSEB website, have been both interesting and valuable, representing the many activities and interests of members, and being an informal chronicle of Canadian environmental issues.

The Editor is always asking for input from members, an unenviable task, and amazingly, he is often short of content. In theory, and in practice, we should be pouring in articles on what we do and on what we consider to be the challenges of our time – problems that environmental biologists can help solve. Why is this not so? Are most of us too busy to jot a few lines about a project? Are you compromised because of your employment in industry or government? Do you just belong to the Society, without concern about what keeps it going and why? Membership has dropped dramatically in recent years – re-engaging with the Newsletter could directly help spur interest and new memberships. A strong newsletter is core to the Society's goals and to the collective contribution to environmental protection and conservation in Canada. CSEB needs your contribution.

Perhaps one way to encourage an increased input to the Newsletter is to have two additional kinds of articles: 1) Short overviews of members' personal stories and viewpoints - what each of us does and has done, and what we consider to be important areas in environmental biology; 2) Brief reviews and debates of core issues that are of concern to members and at the heart of the combined work of the Society? These also could contribute to the "Express talks" encouraged at the AGM Teleconference (such as was held December 2015) – a most interesting set of talks on oak trees (Loys Maingon), northern marine coasts (Bill Paton) and migratory fish passage past dams (Heather Levy and Norval Collins).

As well, the timely Regional News is vitally important too, the under-pinning of (2) as the news articles cover all sorts of topics. And, to put in a plug, I like book reviews – to know what is being published and whether a specific book in this broad field is worth acquiring as a key reference source.

From coast to coast, there are so many environmental challenges that require input and work from environmental biologists. These include the potential of increased tanker traffic and oil spills on the west coast, the melting of glaciers in BC and Alberta, the

ramifications of loss of both annual and multiyear ice in the Arctic Ocean, the effects on groundwater quality of fracking operations, habitat loss from the extensive clearcutting Nova Scotia's forests for biofuel, and the unknown effects on marine life and fisheries of Fundy tidal power development. Members could list many more, some being addressed, some being ignored at our peril. Check back issues of the Newsletter – has progress been made on the many problems described in recent years?

Let's work harder to hear from each other, share our experiences and knowledge, and track our progress. Such effort, if shared, will help our Editor in his quest to continue a very fine Newsletter, an essential read for all practitioners of environmental biology in Canada and beyond.

Check out the CSEB Video at

http://youtu.be/J7cOuDbBf9c

Show it to colleagues and get them to join

John Lilley Undergraduate Scholarship in Environmental Sciences

In 2008, the John Lilley Environmental Scholarship was established in memory of our past President and long-time supporter and friend, John Lilley. The $500 scholarship is at the University of Alberta and is awarded to a student with superior academic achievement entering the second year of study for a Bachelor of Science in Environmental and Conservation Sciences in the Faculty of Agricultural, Life and Environmental Sciences. Selection is based on demonstrated involvement with a not-for-profit environmental organization and academic standing.

The recipients since 2008 have been as follows:

Year	Name	Year	Name
2008	Chen, Qiting	2012	Cherlet, Erin
2009	Veillard, Marie	2013	O'Neill, Megan
2010	Zhang, Daiwei	2014	Wheatley, Melissa
2011	Jacklin, Meghan	2015	Suhertan, Ellis

UNIVERSITY OF VICTORIA
PROFESSIONAL SPECIALIZATION CERTIFICATE IN ECOLOGICAL RESTORATION

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The ER program is offered online so you can meet your annual professional development requirements on your own schedule. Sign up for one course or the entire certificate!

Upcoming courses:

ER 504: Invasive Species and Novel Ecosystems
This course examines the biology of invasive species, focusing on the life-history adaptations and dispersal strategies that contribute to their success at both the individual and population levels. You'll also learn about options for control including preventative, cultural, biological and chemical methods. Finally, you'll explore novel ecosystems that are created when invasive species insert themselves into the fabric of natural ecosystems, and the problems they pose to traditional approaches to ecosystem management such as when an endangered species becomes dependent on an invasive species for its survival.
Dates: September 12 to December 4, 2016
Tuition: $750

ER 503: Restoration Ecology
This course provides advanced instruction on the ecological theory underlying restoration projects, emphasizing the unexpected connections that can have significant implications. The material in this course falls into two broad themes: ecological foundations (applications of ecology to advance restoration) and ecological practice (using restoration to solve a problem in ecology). Topics covered include ecological theories, vegetation dynamics, trophic interactions, adaptive management, and the use of decision-support tools. The course encourages you to broaden your approach to ecological restoration and deepen your understanding of the way nature works.
Dates: January 2 to April 2, 2017
Tuition: $750

To register for a course or apply for the program, use the online application form which can be found at: http://continuingstudies.uvic.ca/science-and-ecological-restoration/programs/ecological-restoration-professional-specialization-certificate

For more information, contact the program office at ecorestoration@uvic.ca or 250-721-8458.

REGIONAL News

BRITISH COLUMBIA News

By Loys Maingon, CSEB BC Director

BC's Magic LNG Realism

As we enter summer, possibly the most significant science news have been the renewed and more extensive coral bleaching of the Great Barrier Reef,[1] and the release of an unusual 52 page paper in *Atmospheric Chemistry and Physics*, entitled *"Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling and modern observations that 2 °C global warming could be dangerous."*[2] These considerations, together with the recently observed unprecedented storms in Australia, and the extent and rate of their impacts on the shoreline, should give us all cause to pause and reflect about where we will be headed by 2050. I would hope that for most of us, especially scientists, both the ongoing events and the rigor of the climate research done to date may be of some concern.

Events in eastern Australia and at the poles may seem far removed from us, but ultimately they are part of a global reality that shapes our economies and our cultures.

The recent cycle of bleaching of coral at the Great Barrier Reef, which is increasingly devastating about two-thirds of this unique complex ecosystem, has come as a surprise only to researchers who have not placed this ecosystem's future in the context of climate change trends. This phenomenon is not just about the UNESCO-protected Great Barrier Reef, a designated "World Heritage Site", which has for good reasons caught public attention. It is a global phenomenon that is affecting 93% of coral reefs whose total productivity supports half a billion people on this planet.[3] So in many ways, the world's coral reefs are our canaries in the coal mine; they are our touchstone to the one reality that we all have in common: the state of the planet.

The current collapse of the Great Barrier Reef is simply in keeping with modeling work published two years ago in *Nature*.[4] As the authors of that article already pointed out in 2013:

> *Mass coral bleaching events have become a widespread phenomenon causing serious concerns with regard to the survival of corals. Triggered by high ocean temperatures, bleaching events are projected to increase in frequency and intensity. Here, we provide a comprehensive global study of coral bleaching in terms of global mean temperature change, based on an extended set of emissions scenarios and models. We show that preserving >10% of coral reefs worldwide would require limiting warming to below 1.5 °C (atmosphere–ocean general circulation models (AOGCMs) range: 1.3–1.8 °C) relative to pre-industrial levels.*[4]

The conclusions of that research should be a reminder that, whatever the limitations of mathematical models, the scenarios they have modelled have so far confirmed a fairly accurate approximation of our currently developing climate-change reality.

The implications of the two basic points concerning the limits of modeling and the impact of climate change on oceans made in 2013 study are also reiterated and reinforced by the March 2016 article: "Ice melt, sea level rise and superstorms". In this peer-reviewed article, Hansen's team make the point that, as it is observed with increasing frequency, the models are extremely conservative. These same conservative estimates on which we based the urgency of the Paris COP21 climate change agreement have so far greatly under-estimated the rate of increase in temperatures, ocean rises and storm intensity.

Hansen et al.[2-8] propose that the models have not taken into account the impact of melting fresh water feedbacks at the poles and the ocean-warming mechanisms they drive. They argue that climate models do not factor in ice-sheet melting and its feedbacks. The rate of outflow at both Antarctica and Greenland create freshwater lenses, which increase and trap upwelling warmer water. Whereas, turnover and upwelling should normally homogenize the warm water column and allow excess heat to be released, the mechanism described by Hansen et al. stratifies the column and traps heat. As this novel mechanism is counter-intuitive, the explanation and its consequences are worth quoting:

> *Our principal finding concerns the effect of meltwater on stratification of the high-latitude ocean and resulting ocean heat sequestration that leads to melting of ice shelves and catastrophic ice sheet collapse. Stratification contrasts with homogenization. Winter conditions on parts of the North Atlantic Ocean and around the edges of Antarctica normally produce cold, salty water that is dense enough to sink to the deep ocean, thus stirring and tending to homogenize the water column. Injection of fresh meltwater reduces the density of the upper ocean wind-stirred mixed layer, thus reducing the rate at which cold surface water sinks in winter at high latitudes. Vertical mixing normally brings warmer water to the surface, where heat is released to the atmosphere and space. Thus the increased stratification due to freshwater injection causes heat to be retained at ocean depth, where it is available to melt ice shelves.*[5]

> *Almost counter-intuitively, regional cooling from ice melt produces an amplifying feedback that accelerates ice melt by placing a lid on the polar ocean that limits heat loss to the atmosphere and space, warming the ocean at the depth of ice shelves.*[6]

This mechanism increases polar ice melting rates non-linearly. Ice melt impacts are, therefore, exponential – they are not gradual – and therefore represent a major source of accelerated global disturbances. Paleoclimate data show that ice sheet melting has always been extremely rapid and resulted in sudden gradient shifts and altered ecological states. In "the real world", gradual transitions, that politicians seem to expect to be driven by economic policy, are a rare luxury.

"The real world," as the current environmental state of affairs that has made possible the world as we know it today – the world of ecosystem services that has given us our current population carrying capacity and relative prosperity—is therefore far more sensitive to ice melt than our climate models suggest. It doesn't matter where you live; if Greenland and Antarctic ice melts more quickly than expected, we should expect a much higher rate of ocean level increase this century than the models have predicted. Hansen et al. argue that ice-melt is probably already beginning to affect the ocean circulating system. The key point is that current models suggest a rise of 1 m by 2100. If Hansen's hypothesis is correct, multi-metre rise in ocean levels and increase in "superstorms" should be expected in a matter of decades: "*Doubling times of 10, 20, or 40 years yield multi-metre sea level rise in about 50, 100, or 200 years.*"[6] While we are not yet at a point of no return, we have substantial reasons to accelerate the move away from a fossil fuel economy, if we want to reach sustainable targets:

> *"If the ocean continues to accumulate heat and increase melting of marine-terminating ice shelves of Antarctica and Greenland, a point will be reached at which it is impossible to avoid large-scale ice sheet disintegration with sea level rise of at least several metres," the paper states. "The economic and social cost of losing functionality of all coastal cities is practically incalculable."*[8]

And that leads Hansen to conclude the obvious and lay out exactly what the ethical obligations of scientists are:

> *"If scientists don't say it, then politicians will tell you what's needed and that will be based upon politics rather than science. I don't see any reason to not make the whole story clear, or to draw a line and say 'I'm not going to step beyond this.'"*[8]

However BC – perhaps more than most of Canada – continues to live in a bizarre form of alternate reality within which climate change considerations are made to reassure the public that now inevitably witnesses climate change impacts almost monthly, while no actual action (if any) is taken to address a developing problem that is deeply anchored in reality. While Hansen and his colleagues distinguish between the reality of the climate models and "the real world," most of our governments do not. The political "real world" seems strictly based on expediency, short-term economic returns, and dubious economic models. The environment continues to be a concept to be paid lip service to, as the exploitation of "resources" continues to be the economic priority.

Mary Polak, BC's Minister of Environment, recently demonstrated the degree of contempt in which she holds the scientific community, and shortly thereafter treated the international stage to a demonstration of BC's "world-class climate leadership."

Although a series of excellent reports have pointed out that the continued accelerated development of fossil fuels is inconsistent with COP 21 targets, and will in fact cause us to continue to exceed our targets, BC's government continues to claim that the promotion of oil and gas infrastructure and the development of LNG, which has no known market, should be the centerpiece of climate change strategy.[7] That BC's LNG and continued oil and gas development are contrary to BC's environmental and climate change interests has been sufficiently clear to 90 leading climate scientists who signed a letter to that effect directed to Catherine McKenna, the federal Minister of Environment and Climate Change, stating clearly that: the *"project would add between 18.5 and 22.5% to British Columbia's (BC) total GHG emissions. This would make it virtually impossible for BC to meet its GHG emission reduction targets, and would undermine Canada's international climate change commitments."* [10]

The reaction of BC's Minister of the Environment was to denigrate the concern of these scientists by explaining to the public that: *"Their assumption from the beginning doesn't meet with reality."*[11] Following what is now common practice, the minister made futuristic claims that LNG was the "transition" fuel that would replace coal around the world, and new technology

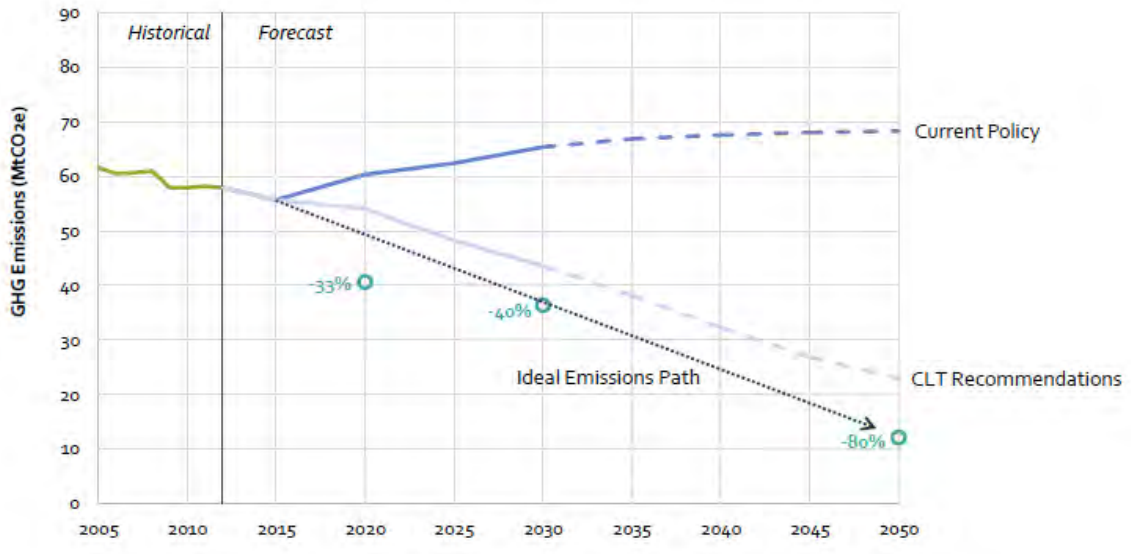

Figure 1: BC Climate Leadership Team Report, "Greenhouse Gas Emissions Forecast" page 26.

would be developed to reduce impacts. In hearing these assertions made by the minister, the public assumes that BC's government has a consistent and progressive climate change policy. Indeed, the province's often heard claims of being an international "Climate Leader" were repeated a few days later by the minister and the premier at the signing of Pacific North America Climate Agreement in San Francisco.[12] The political reality is otherwise, as pointed out by Andrew Weaver, who has correctly pointed out that BC is a "Climate laggard."[13]

In 2015, BC's government appointed a "Climate Change Leadership Team" consisting largely and almost exclusively of well- known government supporters. In late October the team produced the rosy report tasked to build all assumptions around and supporting the government's LNG strategy and consisting of 32 recommendations.[13] As Figure 1 below shows, even supporters of the current government have to admit that while the Campbell government took early baby steps to develop progressive climate policies in 2005, the Clark government has since 2011 dismantled those policies and the institutions that supported them, and has taken a radically contrary direction.

As Andrew Weaver has pointed out, BC has consistently failed to meet its GHG emissions targets, will not meet the 2020 target, and is currently the third largest polluter in Canada. Current government policy has also amended *The Clean Energy Act* to exclude emissions from liquefaction in the LNG industry, and thereby improve the image, not the reality of accounting.

Furthermore the government has shut down programs that facilitated and financed "transitions", such as the Pacific Carbon Trust. Although BC touts its reputation as being one of the first to institute a carbon tax, the tax was halted as of 2011 and is now only a vestige. The BC Hydro "Live Smart" program that supported households has been eradicated. Even Cap and Trade enabling legislation has been repealed to make life easier for big source emitters. In Weaver's words: *"We have a new* ***Greenhouse Gas Industrial Reporting and Control Act*** *that introduces an "emissions intensity" framework that is more about supporting an LNG industry than limiting emissions."*[14]

In this light, it should be increasingly obvious that the LNG reality alluded to by Minister Polak is largely at odds with the reality that drove 90 scientists to direct a letter to the federal Minister of Environment. While the minister's words seem to magically conjure a world where one can "grow the economy" without consequences for nature and the planet, the magic quickly yields to scientific pragmatism. The distant seemingly unimportant events in Australia, Antarctica, or Greenland are sufficiently removed to have an unsettling air of unreality, but they are essential to our daily existence.

That is largely the context for the current environmental concern of a large number of BC residents who have come to distrust the provincial and federal governments' pronouncements and their relation to the National Energy Board, all of which seem to favour short-term pro-business priorities. Perhaps it is the proximity to the ocean and its impact on our climate, but a sense of the long-term impact of oil and gas development is a growing concern in BC. Ironically, in a province where the government gives little support to alternatives, there is a growing interest in developing alternatives that comes with a growing and well-articulated rejection of the development of fossil fuel infrastructure, and which includes a rejection of an LNG economy. A substantial segment of the population understands that science's reality does not seem to give us the luxury of "transitioning" as we should have 40 years ago, when science first made the problem and its implications clear to us.

That rejection has become the focus of the concerns expressed by municipalities in the Fraser Valley and by First Nations, in which Mayor Gregor Robertson has taken the lead. In many ways this is not surprising. At the COP21 Paris conference Justin Trudeau drew heavily on Mayor Robertson's well-known environmentally progressive image, to bolster his own credibility. The problem now lies in how ready we are to acknowledge the reality of the problems posed by climate change, and the extent to which we realize that we live in an increasingly highly connected world, where chaos is indeed on the wing of a butterfly.

The problem put to us in Hansen et al.'s paper, is essentially whether politicians are ready to acknowledge the urgency of our situation, and acknowledge that science must be boosted to be the basis of decision making.[15]

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ALBERTA News

By Brian Free, CSEB Member

The IPTACRDAIS has arrived in western Canada! No, this is not some new virus strain or heavy metal band. This is the Inter-provincial-territorial Agreement for Coordinated Regional Defence Against Invasive Species. Focusing initially on zebra and quagga mussels, Alberta, British Columbia, Saskatchewan, Manitoba, and Yukon Territory have signed this agreement to prevent and manage aquatic invasive species on a regional basis.

The agreement enables increased coordination between jurisdictions in western Canada to share resources and coordinate planning related to both prevention and response to aquatic invasive species such as:

- pre-planning of watercraft inspection stations to maximize efforts on shared highway crossings; and
- increased ability to share resources from other provinces, for example people and expertise, to assist in a rapid response in the event of any mussel detection.

The initial focus of this agreement will be on aquatic invasive species, with an emphasis on zebra and quagga mussels because they are an imminent threat to all five jurisdictions. Zebra and quagga mussels pose a major threat to Western Canada's aquatic ecosystems and water-operated infrastructure such as irrigation, hydropower, and municipal water systems.

Switching from species with explosive population potential, Alberta's caribou are a threatened native species and their populations are declining. The Alberta government is developing a number of range plans for the different caribou populations

to try to maintain their numbers. The difficulty is in balancing habitat protection with ongoing natural resource development.

Protecting the Little Smoky and A La Peche caribou herds inhabiting the foothills north of Jasper National Park is particularly challenging. A few decades ago, most of the area was wilderness. Today, up to 95% of that area is disturbed. Based on recommendations from an independent mediator, the Alberta Government announced that it will ensure the oil and gas industry restores over 10,000 km of legacy seismic lines in the Little Smoky and A La Peche ranges. As well, the forest industry will reschedule and alter timber harvesting in the area. The Government intends to increase the Little Smoky population and reduce reliance on wolf control by establishing a caribou-rearing facility to protect maternal caribou and their offspring from predation.

For some other herds in northwestern Alberta, permanent protection will be given to 1.8 million hectares of caribou range.

For more information about caribou management and to read the mediator's report, go to http://aep.alberta.ca/fish-wildlife/wildlife-management/caribou-management/caribou-action-range-planning/default.aspx

Conservation Planning in Northwestern Alberta

by Richard Schneider, University of Alberta

The Alberta Land-use Framework (LUF) was developed as a regional planning framework to manage growth and to balance the economic, environmental, and social goals of Albertans. One of the main mechanisms for achieving environmental goals under the LUF is the establishment of new conservation areas, following the precedent established with the Lower Athabasca Regional Plan. These conservation areas also contribute towards the Government of Alberta's commitment to protect 17% of ecosystems under the Convention on Biological Diversity, which was reconfirmed in the Alberta Environment and Parks 2016 business plan.

The experience gained with the first two regional plans indicates that short timelines limit the amount of research and analysis that can be done once the actual planning process begins. The planning teams must generally work with the information that is available to them at the time. In the case of the Lower Athabasca Region, considerable conservation planning had already been done through development of the Terrestrial Ecosystem Management Framework, and this effort was of significant benefit to the LUF planning process. No equivalent planning framework exists for northwest Alberta.

The Northern Alberta Conservation Area Working Group was established in March 2015 to undertake a study of conservation options to support the province's regional planning process in the Upper Peace, Lower Peace, and the Upper Athabasca planning regions. It is anticipated that the province will begin planning in these regions in the near future. Our objective was to provide scientifically-grounded information on conservation planning, including the optimal location of new conservation areas, leaving the decision of how much land to protect (i.e., the balance between economic and environmental goals) to the regional planning process.

Our approach to identifying conservation priorities was grounded in the principles of systematic conservation planning. We also sought alignment with the Convention on Biological Diversity, the LUF's planning criteria for conservation areas, and the planning approach used by Alberta Parks. Our working objective was to design a reserve system that provided the greatest overall conservation benefit, given limits on the amount of protection available. Not knowing how much land would ultimately be available for protection, we produced reserve designs across a range of sizes. The reserves were generated using the Marxan

conservation planning software, which identified optimal designs for representing a wide range of conservation features across multiple scales. Our analysis also incorporated disturbance intensity, climate change, and resource conflict.

The summary report for our study is now available. This report describes the inputs and methods used to generate the reserve designs, and it provides a series of maps that illustrate the steps in our analysis, leading to the identification of a set of regional priority sites. The report and supporting data have been provided to the Government of Alberta for use in upcoming regional planning initiatives, and are available to the public at:

http://www.ace-lab.org/index.php?page=asca&atlas=12.

Please contact Richard Schneider at NACAWG@gmail.com for additional information.

SASKATCHEWAN News

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

Hard to believe, as I write this, the days are getting shorter! It is just after the summer solstice and for all intents and purposes, summer has arrived in Saskatchewan. As a retired biologist, or rather, one who is not practicing, I can only offer opinions of an environmental nature for the newsletter, and must leave the preparation of technical papers to my fellow provincial members who are practicing in the field.

I have had a chance now to look at Saskatchewan Environment's website, as well as a glancing through a few of the local newspapers that have accumulated over the past week, and there really isn't much to talk about from a Saskatchewan perspective. Let me share my perspective with you on two things though; namely public education and secondly, the transition to green energy.

The issue of public education has always been of great concern to me when it comes to the environment, and how we as a species need to care for it. I have had some great educators and mentors over the course of my career and I have tried to convey what they have shared with me on to others. I think about the recent passing of Lyle Benko here in Saskatchewan, who was heavily involved in educating at all levels of the school system about things environmental. His passion for sharing his knowledge with young people was unparalleled, except by that of Bill Paton, our CSEB President, who passed away earlier this month, both of whom excelled at teaching. I was honoured to have known both these gentlemen.

The concern I have though, is the message getting through? In 2014, the consumption of electricity in Saskatchewan was virtually unchanged during Earth Hour, whereas in 2015 the drop in consumption was considerable at 9%. To date I have no source as to what extent the drop (hopefully) was in 2016. I was not encouraged when I saw many lights burning on my street this past March during Earth Hour. I am encouraged though by the fact that people are now openly talking about climate change, recognizing that it is a gradual thing, and that they might not see dramatic effects in their lifetimes, but believe that their children and grandchildren will.

Strangely, the two items that I wanted to share my perspective on have morphed into one. Since April 22, 1970, when Earth Day was first proclaimed, the reaction by the public has been "ho hum". However, recent events such as the Fort McMurray wildfire in Alberta, the flooding at various locations across the country, and the droughts in the United States have become the two-by-fours that have been needed to get people's attention to the seriousness of matters pertaining to the environment. That includes government agencies as well. I was flabbergasted to read that on June 16th of this year, our provincial government has signed an agreement with Alberta, British Columbia, Manitoba, and Yukon Territory to co-ordinate a regional defence on invasive species, with an initial focus on aquatic invasive species, primarily zebra and quagga mussels. These prolific mussels were first believed to have been introduced into the Great Lakes in the 1980s – and it became quickly apparent, they were invasive! This was 30 years ago! And we are only reaching an interprovincial agreement now? Sometimes I think it takes a crisis for people to take action (albeit somewhat late) – hopefully, it will not be too late for western Canada.

Finally, as more and more people come to understand the issue of climate change, there will be a period of time to transition to greener generation, particularly in terms of Alberta and Saskatchewan, with their coal fired electrical generation. I think people can understand this, and that it will not happen overnight. Shutting down 2000 MW of coal fired generation in Saskatchewan and replacing it with renewables is not an easy undertaking, nor inexpensive. Strangely, Saskatchewan's carbon capture project in Estevan can be part of the transitioning to renewables. In other words, clean up the current carbon emissions, while you explore and transition to cleaner renewable generation.

Maybe I'm trying to put too much of a positive spin on this billion dollar plus project, but when you think of the thousands of coal fired megawatts around the world, it might be part of the solution in the short-term. Recognize, of course, that there are downsides to renewable energy, which are seldom discussed.

Maybe next time.

MANITOBA News

Submitted by Gary Ash, CSEB Newsletter Editor

With the sudden passing of Dr. Bill Paton, who typically provided Manitoba News for the CSEB newsletter, we now are in a need for a replacement both for a CSEB Manitoba Director and Manitoba contributor for the CSEB Newsletter/Bulletin. Neither of the positions are very demanding — the primary function of the Manitoba Director is to sit on the CSEB Board of Directors, and to promote the activities of CSEB and membership in Manitoba. The Newsletter contributor should be prepared to prepare the Manitoba News for the newsletter on a quarterly basis. Typically we need only a few paragraphs, although longer submissions are always welcome. If you are interested in either of these positions, please contact either Anne Wilson, acting President (anne.wilson2@canada.ca) or Gary Ash, Newsletter Editor (garyash@shaw.ca).

ATLANTIC News

Submitted by Peter Wells, CSEB Atlantic Member

Highlights of "Fundy in Flux": the 11th BoFEP Bay of Fundy Science Workshop.

The 11th BoFEP Bay of Fundy Science Workshop was held in Fredericton, NB, June 8-11th. It was entitled: **Fundy in Flux: Challenges for Science, Policy and Society**. It was attended by 57 people with an interest in environmental issues in the bay.

Sessions were held on a national network for ocean observation; seabirds; tidal power and renewable energy; coastal monitoring; mudflat ecology; ocean health index; MPAs and coastal management; aquatic ecology; geology; and governance for sustainable resources. The breadth of topics illustrates the diversity of the issues and research associated with the Bay of Fundy, and the many contributions of environmental biologists and researchers in other fields being made to understand the short and longer term changes taking place in this coastal region, including its watersheds. Of note especially is the work conducted to attempt to understand the potential effects of tidal power development on the fisheries and other natural resources in the upper bay. As well, the work on the Ocean Health Index for the south western part of the bay is achieving wide recognition, and is actively linked to other initiatives in Canada and internationally to describe "health" comprehensively for a coastal region.

The Proceedings of the Workshop are in preparation.

See: www.bofep.org for more information.

Science in Canada and the Maritime Region – Nurturing A Brighter Future

EDITORIAL by Peter Wells, CSEB Atlantic member

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With the change in federal government in Ottawa in October, 2015, a heavy weight has been removed from its public service, employees and programs. One could almost hear the collective sigh of relief, certainly evident at the Canadian Science Policy Conference held shortly afterwards in Ottawa. Does this change in government and its pronouncements on science and evidence based policy beckon a brighter future for public, university and private sector science in Canada? If so, what are some of the science priorities for this region? These questions and others are addressed here to stimulate a discussion within NSIS and the Nova Scotia science community.

As public service science recovers, major challenges are facing us. Whole programs and important committees and advisory groups, with scarce skilled personnel, need to be resurrected. Rebuilding the civil service, i.e. hiring lots more civil servants, is never a popular activity for any government; it does not garner much popularity with the public or many votes at the next election. Furthermore, the significantly reduced, core (i.e., most important) departments and agencies, without essential programs, become the "new normal". Memories fade about what was once in place. This is a form of 'knowledge extinction', eloquently discussed by author, J. B. MacKinnon, in his recent book, *The Once and Future World* (MacKinnon 2014). However, with public input and guidance from all concerned quarters (NGOs such as NSIS, the Public Service Alliance of Canada, the universities and various specialized research institutes, enlightened citizens, and others), policies can be (re)established to guide the rejuvenation of essential science programs. This is critical to the public good, and to Canada's economic, social, environmental and cultural future.

One of these programs, closed down despite contributing to the health and sustainability of Maritime marine resources (i.e. fisheries), was the environmental chemistry and toxicology research program of Fisheries and Oceans Canada (DFO). Formerly, a number of research units were in place across the country that conducted applied studies on various water pollution topics/issues of priority, e.g., oil pollution, pesticides, endocrine disrupting chemicals, contaminants in fish tissues, ocean acidification, chemical effects in marine mammals, and others. This research was and is fundamental to the protection of fishery resource species and aquatic ecosystems across Canada, from east to west, north to Arctic seas, and south to the Great Lakes. The research work supported the policies and legislation of DFO, as well as that of other departments with responsibilities for the health of aquatic ecosystems, habitats and species, e.g. Environment Canada (EC, now Environment and Climate Change), Natural Resources Canada, and Health Canada.

This type of science is particularly important to North West Atlantic waters, faced with the prospect of warmer and more acidic conditions, the risk of nearshore oil spills and blowouts in the offshore, exposure to toxic chemicals from land-based sources and shipping accidents, and other threats. Some of these threats are addressed in recent DFO ecosystem status reports and in studies contracted under the HOTO (Health of the Oceans) initiative of DFO and EC. They clearly showed the need for the underlying science.

But not all is lost. To the federal governments' credit, they have appointed young Ministers to the portfolios of Innovation, Science and Economic Development (ISED), Environment and Climate Change, and DFO. The Minister of ISED recently announced six new research chairs for NS universities (The Chronicle Herald 2016a) with a total of 21 new and renewed Atlantic Canadian research chairs in total, all good signs of a new approach and recognition for regional science. Most recently, new operational monies have been allocated to DFO; one hopes some of it will be used to resurrect the lost aquatic environmental programs.

Given the change in attitude and policies of the new federal government regarding science, and their clear statement in support of evidence-based policies (see the Canadian Science Policy Conference, Nov. 2015), what are the opportunities for advancing core science and science support in the Maritimes, and in Nova Scotia in particular?

What topics especially require support? Support and innovation is required not only for our public service but for all sectors.

Why is this so important to our region? What do we lose if such support, intellectual engagement, new and innovative ideas, and new and renewed programs are not forthcoming? How do these questions relate to keeping our young people in our Region? Why should Atlantic citizens care? There are many such questions, all requiring thoughtful debate and informed answers. They should be discussed and debated within the NSIS and other provincial bodies.

The Governor-General of Canada, David Johnston, recently pointed out that Canada has a culture of research excellence, with many recipients of international awards, prizes and other types of recognition (Johnston 2016). This was underlined recently by the 2015 Nobel Prize for Physics awarded jointly to Dr. Arthur McDonald (Canada) and Dr. Takaaki Kajita (Japan) for their research leadership and discoveries about solar neutrinos and nuclear reactions in the sun. Dr. Arthur McDonald is a Nova Scotian by background and education, bringing great honor to his home province, as did Willard Boyle, born in Amherst and also a physics Noble laureate, awarded in 2009. Johnston stated in his uplifting article: "Together, in every sphere of activity, let's build on our momentum and make sure the world acknowledges and celebrates the truly stellar achievements of Canadian trailblazers". These two men were trailblazers, indeed!

Although risking the un-intentioned exclusion of many hard working and productive persons and their achievements, some other, recent Nova Scotian science trailblazers must be mentioned. The National Research Council, Halifax Laboratory's biotoxin metrology group continues to makes fundamental advancements identifying new algal toxins with highly sensitive chemical techniques, hence contributing to the health safety of shellfish products from the Atlantic fishery (Quilliam 2016). Last year, Dr. Axel Becke of the Chemistry Department, Dalhousie, won the distinguished NRC Herzberg Medal for achievements in the field of computational chemistry. And the young are contributing too – the 13 year old Rachel Brouwer of Bedford, NS, won a gold medal in a Canada-Wide Science Fair for "a new, life-saving, water pasteurization unit, made of inexpensive and accessible materials, and designed for people in developing countries" (The Chronicle Herald 2016b). Each year, the NSIS receives marvellous scientific papers written by young scientists as part of a Nova Scotia science writing competition. However, once through graduate school, many newly trained PhDs go for long periods of time without appropriate employment, a loss to our research oriented community and a problem that should be resolved quickly in order that our region may stay competitive and attractive for such young researchers (Thorpe 2015).

Amongst others in the region, Dalhousie University is a leader in ocean research through its Ocean Tracking Network and MEOPAR, both programs so important in this era of climate change and overexploitation of fisheries resources. There are many other associated research programs in biology, oceanography, and marine affairs. A long association with the Bedford Institute of Oceanography is a vital and promising link, but only if Canada from coast to coast can renew its aging research fleet and restore its government research staff (Pickrill 2015). There is also new research on the use and influence of marine environmental and fisheries information, through the Environmental Information: Use and Influence (EIUI) program (see www.eiui.ca), gaining new insights into the science-information-policy interface in ocean management (MacDonald et al. 2016). Acadia University in Wolfville continues to conduct original and innovative research on the potential impact (or not) of in-stream, tidal power generating units on the Bay of Fundy environment, its living resources and wildlife. Cutting edge ecotoxicological research on persistent organic pollutants is conducted at the University of New Brunswick (UNB) – Saint John campus, and fundamental ecological research is conducted at Mt. Allison University and UNB-Fredericton. Many other examples exist across a wide spectrum of scientific fields, and the research is published widely, including at times in the pages of these Proceedings (PNSIS). Hopefully, the PNSIS will reflect a sample of this new work over the next few years.

Especially pertinent to Maritime Canada is the continued work of the Council of Canadian Academies, focused on "science advice in the public interest", most recently with expert panel reports on Canadian ocean science (CCA 2013) and the Alberta oil sands (CCA 2015). As mentioned earlier, the recent statements of support for science of the new government were given at the CSPC in Ottawa; the new Minister of Science gave a rousing and well-received speech to delegates, promising new funding and collaboration.

To summarize, how can the NSIS contribute to this new period of science support for Canada and the Maritime Provinces? What do members think about this opportunity? Should we become more active in producing consensus documents on regionally important and sometimes controversial science-based topics in the public sphere, analyses that could assist policy and decision making (CCA 2013, 2015, Leach and Rennie 2015, MacDonald et al. 2016)? What sorts of themes and topics should NSIS have for its well-attended, annual lecture series? What else should the Society do, to supplement the program of lecture series, science essay contest and funding of science fairs, to encourage young people to choose a career in science, and especially to stay in this region for professional positions in industry, academia government and non-government organizations, hence contributing to the region's economy and future?

For Nova Scotia and the Maritimes to thrive in the 21st century, in a highly competitive world, we should be communicating to the public, media and politicians on issues of the day, problems that require scientific enquiry and advice, and be encouraging new ideas and approaches to regional science. NSIS may have a role here but what it does is decided by its Council, Members, and our interested public. Perhaps a special meeting or round table discussion with Members would help set some new policy directions and goals for NSIS. Your ideas and contribution are needed in this new period of Canadian science support and communication, to ensure the wellbeing of our citizens, care for the environment and a brighter future for science across the Maritime region.

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TERRITORIES News

Submitted by Anne Wilson, CSEB Vice President.

NWT and NU Regional Update:

This time of year, I miss the extended daylight hours north of 60; in most of the communities the sun doesn't set, and in the rest, there is anything from a few hours of darkness to just twilight. Summers are short but there is an abundance of growth, migrating birds, and activities of the natural world bursting forth in the few months between freezing seasons. This year the forest fire season is thankfully off to a slower start, with only 18 hectares so far affected by wildfire. However, above seasonal temperatures are expected for June, and there are areas of high fire danger with gusting winds and possibilities of lightning strikes. The seasonal temperature forecast shows a high probability of above normal temperatures in the central and high Arctic, but the precipitation forecasts are not so bold: there is about a 30% chance of higher than normal precipitation, a 30% chance of lower than normal precipitation, and a 40% chance of near normal precipitation. That covers all the bases! A friend mentioned the early return of mosquitoes (and black flies will follow soon) – but we agreed that managing those was a small price to pay for being outside in summer in the NWT!

We are getting excited about progress on the next Canadian Ecotoxicity Workshop, to be held in Edmonton Sept. 25-28, 2016. Short courses will kick things off, followed by the expanded scope workshop sessions – previously it was focused on aquatic toxicity issues, but now broadened to all ecotoxicity topics. CEW brings together academia, consultants, regulators and industry to attend relevant sessions on current topics, and provides a great networking opportunity. Information is available at http://ecotoxcan.ca. All biologists welcome!

Mining and Other Development News

There continues to be activity in the mining sector, although economic conditions have affected the industry. Ongoing environmental assessments (EAs) underway in the NWT and Nunavut include:

- Prairie Creek Mine (Canadian Zinc Corp.): The company has submitted further information in support of the EA, but has hit a snag with their airstrip – this cannot be permitted in a National Park. Technical meetings on the road EA have been scheduled for mid-June. The company is also working to assemble financing needed to take the mining project into production.
- The environmental assessment is proceeding for an access road upgrade in Howard's Pass through the western NWT, for the Selwyn mine project (YT). The Terms of Reference have been issued, and scoping is underway.
- The Meadowbank Gold mine is looking at an expansion with the Amaruq satellite resource ore body, which would extend the mine life by several years. A 50 km road is being constructed for the ongoing exploration/feasibility work. The Final Environmental Impact Statement is to be released June 30th to kick off the EA process.
- Sabina's Back River gold project (NU) has undergone environmental assessment, and the Nunavut Impact Review Board (NIRB) decision report has concluded concerns about caribou are too significant for the project to proceed.
- Baffinland's Mary River project has applied to increase the shipping season to year-round; the Phase 2 EIS submission has been delayed to Sept. 2016.
- TMAC Resources is looking to bring the Doris North gold mine into production, contingent on approvals for expansions in the Hope Bay Belt. Technical sessions have been held on the revised project description issues, and there seems to be substantial resolution. The NIRB decision on amending the project terms and conditions is expected shortly. Following that, the water licence would need to be amended.
- Revised terms of reference were issued last February for the impact assessment of the Mackenzie Valley Highway project, now reduced to 333 km of all-season gravel road connecting Wrigley and Norman Wells. This EA is still waiting on the submission of the Developer's Assessment Report.

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

- Jay Pipe 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. Following on the positive Environmental Assessment decision, the company is now filing water licence and land use permit applications.
- Snap Lake Diamond Mine (DeBeers Canada Inc.) has been amending plans to reflect the care and maintenance status. If there are no strong economic drivers to reopen the mine, or if no appropriate potential purchaser comes forward, the mine may move to full closure.
- Agnico Eagle Mines Inc. received a positive decision from the NIRB last April, for the expansion of the Vault pit to Phaser Lake. Next steps will involve the application to the Nunavut Water Board, likely by July.
- Diavik is proceeding with the second season of construction of the A21 dyke, to allow them to access ore from an underwater pipe. They had applied for an amendment to how TSS is regulated under their water licence, and were surprised with an amendment that was more stringent than the original conditions from which they were seeking relief. It will be interesting to see how this plays out.
- North American Tungsten Limited's Cantung Mine is being managed by the federal government, which has custody and control of the site and is sorting out what plans and licence requirements need to be met in closure status.
- Fortune Minerals has not advanced further, and is working on financing to move the project to construction. The road access issue is being addressed with the territorial government proposing construction of an all-season road.

- DeBeers Canada Gahcho Kué Diamond Mine is under construction, and pushing for completion of construction shortly. There are a number of regulatory submissions under review; these have been revised to reflect the shift to operations, and to update monitoring.
- The Avalon Rare Metals project is on hold, due to financing.
- Agnico Eagle Mines' Meliadine Gold project has received its Type A water licence, but construction will be delayed a year while Agnico Eagle focuses on the Amaruq project.
- 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. There are some administrative issues to work out first though, and monitoring requirements are outstanding.
- The Giant Mine Remediation project team is exploring remedial development options prior to submitting an updated water licence application. Terms of the long-expired water licence still apply however, and the mine is still complying with the MMER requirements.
- Hearings were held for the Iqaluit water licence, and good progress is being made on waste management issues.

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.wilson2@canada.ca.

CSEB CONFERENCE/WORKSHOP POSTPONED

The proposed CSEB Conference/Workshop on Impacts of Oil and Gas Developments on Ecosystems and the Environment that was to be held in Vancouver October 14-15, 2016 has been postponed, as the main organizer was Dr. Bill Patton, who passed away in early June.

If anyone is interested in championing a workshop on this or another topic in 2017, please contact our acting President, Anne Wilson at anne.wilson2@canada.ca.

UPCOMING Meetings

Wildlife Society, Canadian Section AGM & Canadian Society for Ecology and Evolution Conference. July 7-11, Memorial University, St. John's, Newfoundland. For information, see http://cstws.ca/canadian-section-agm/ or http://csee-scee.ca/?cat=64.

American Fisheries Society, 146th Annual Meeting. August 21-25, Kansas City, Missouri. For information, see the AFS website at http://fisheries.org.

ICCE 2016: 5th International Conference & Exhibition on Clean Energy, August 22-24, Montreal, QC. For more information, see http://icce2016.iaemm.com/Home.php

Canadian Ectoxicology Workshop. September 25-29, Edmonton Alberta. For information, check the CEW webpage at http://ecotoxcan.ca.

Canadian Conference for Fisheries Research and Society of Canadian Limnologists Annual Meeting. January 5-8, 2017, Hyatt Regency, Montral, QC. For more information, see http://www1.uwindsor.ca/glier/ccffr/ccffrccrp-2017.

CSEB WEBSITE - Comments Welcome

Check out our new website, if you have not already signed on. We believe that it is a much needed upgrade from our old website, and now we also accept credit card payments directly through our secure site for both renewing and for subscription to the National Research Board of Canada journals at a considerable savings to retail purchase.

We would appreciate any comments on the new website, as well as any content you think might be of interest to the rest of the society. Send any suggestions to Brian Free at bfree@cseb-scbe.org.

We are also looking for help in the maintenance of the website (i.e., we need a webmaster). The site uses WordPress, so if you are familiar (or would like to learn) with using WordPress for adding and maintaining content on the CSEB website, please contact Brian Free at Bfree@cseb-scbe.org.

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