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THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Bulletin

In this Issue:

CSEB Bulletin SCBE

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In this issue

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Front Cover: Golder Associates Ltd. field biologist augering a hole for under-ice water sampling on Carson Creek, Alberta. Photo Credit: Kent Nuspl, Golder Associates Ltd.

Back Cover: Top: An early fall snowfall at the Banff Centre for Arts and Creativity, Banff, AB, site of the Thinking Mountains Interdisciplinary Summit, Oct. 2-5, 2018. Photo Credit: Peter Wells, CSEB Atlantic member, Halifax

Bottom: Blue Jay (*Cyanocitta cristata*) at a bird feeder in garden in Halifax, NS. Photo Credit: Peter Wells, CSEB Atlantic member, Halifax.

CSEB BULLETIN 2018

Vol. 75, Number 4, Winter 2018

The Canadian Society of Environmental Biologists Bulletin is a quarterly publication. The Bulletin 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 Bulletin 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 2018

Vol. 75, Numéro 4, Hiver 2018

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
Rédacteur en chef: Gary Ash
Impression: LaserText Digital Print & Copy Centre, Edmonton, AB.

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.

NATIONAL News

PRESIDENT'S Report

By Curt Schroeder, CSEB President

On October 29, 2018, the Regina City Council, made a bold decision. They voted unanimously to ask the administration to prepare a report on the implications to make the City of Regina rely 100% on renewable energy by 2050.

The economic opportunity could be enormous. It is estimated that in 12 years, there may be as many as 24 million jobs worldwide in renewable energy. Less reliance on coal (currently the dominant form of electrical energy in Saskatchewan) will mean less risk to our health. By some estimates, renewable energy will be the cheapest form of energy as early as 2020, putting money in the pocket of individual households.

Why is this important?

The world is moving toward renewable energy and greater energy efficiency. It's time that leadership emerge at the municipal level in dealing with such a large environmental crisis. The latest UN climate report (Oct. 8) describes the dire situation in which the entire planet finds itself. That is why this political decision is so important. At this moment, there are about 10 other municipal governments in Canada that have adopted similar strategies (in B.C., Alberta, Ontario, and now Saskatchewan).

The CSEB and its members are not new to understanding the impact of local action on issues of environmental concern, from small scale to large scale. Here is an important win. Hope other municipalities are watching.

Protect the Last of the Wild

> *"Global conservation policy must stop the disappearance of Earth's few intact ecosystems, warn James E. M. Watson, James R. Allan, and colleagues."*

As a conservation biologist, I am intrigued by an article just published in Nature (Nature 563, 27-30 (2018)) that speaks to the need to protect wilderness areas globally and the important role that Canada can play to contribute to preserve these areas within our borders. It can be accessed at the following URL:

https://www.nature.com/articles/d41586-018-07183-6

This issue touches upon many of the themes that are important to the CSEB including climate change, species conservation, protected areas, sustainable development, environmental policy, environmental education, local actions, among others.

Does this research article resonate with others as it does with me? If so, and you are interested in getting the word out, please contact me at curt.schroeder@saskpolytech.ca.

SCIENCE TIDBITS

Submitted by John Retallack, CSEB Alberta Member

Cosmos 2019

A new season of Cosmos is planned for airing in 2019. Ann Druyan (Carl Sagan's spouse) is returning as Executive Producer and Neil DeGrasse Tyson returns as the host. Druyan says: "If a society has any aspirations to become a democracy, our only hope is that the knowledge of science and other things is as widely distributed as possible." Regarding Sagan's likely opinion of the show, Druyan notes: "I think he'd be doing what we're doing. Telling those stories and trying to engage the broadest possible global audience in the scientific enterprise."

The new season will tackle some of the changes and newest discoveries since the 2014 series, but also some of the stories from the original series with Sagan that she didn't have the opportunity to feature in 2014.

Look for it in the spring of 2019 on FOX and National Geographic. It will definitely be worth the wait.

And Now Some Real Science!

Researchers at the University of Rochester Medical Center have shown, using mice, that low levels of alcohol consumption are good for brain health.

In summary, the studies indicated that low levels of alcohol consumption by mice (equivalent to about 2.5 drinks per day) may reduce inflammation of the brain and help the brain remove waste products, including the protein plaques associated with Alzheimer's and Parkinson's diseases.

The results included obligatory cautions about long-term negative effects of alcohol use and limitations on extrapolation from mice to humans…but mice are cute and have brains, like humans, so I'm going with the mice on this one!

Please take moment to appreciate the test subjects in this research. Mice have a tough life in the world of medical science but it is greatly appreciated.

Entopreneurship – the Business of Eating Insects

Would you eat bugs? (just a taxonomic FYI here…all bugs are insects but all insects are not bugs – send me an e-mail if you want to know more). If you would (or already do), you are in league with a couple of billion other people.

People around the world eat insects of various kinds with various preparation methods. And they appear to do this because they taste good. Insects are eaten fried, boiled, steamed, or raw. From hornets in Japan (adults and larvae), to agave worms in mescal in Mexico, termites in Laos, palm weevil larvae and caterpillars in Africa, and crickets and grasshoppers pretty well world wide,

insects as food has become almost globally ubiquitous – except in North America. But think about it, lobsters, crabs and crawfish are essentially insects that live in the water. In Louisiana in the Southern USA, crawfish are even referred to as 'mud bugs'. And I think it is safe to say a majority of people would willingly eat these shellfish. So why not insects?

There is a global movement to encourage the eating of wild insects. According to science (and you have to believe science, I guess), eating insects has a lower environmental effect than consumption of cows, pigs, and chickens. BTW…chickens eat lots of bugs so you are getting it second-hand anyway. For example, mealworms generate less than 10% of greenhouse gases, and pigs and most insects appear to be 100% edible, against only 40% of a cow.

It is up to you, but I am going to invoke the E-word and take a pass! Mass consumption of insects will surely affect ecosystems in the areas where consumption is rampant…please think of the birds and cute little Meerkats before you pick up a mealworm!

Quick Bio-Science Facts

Micro Reptiles:

The dwarf chameleons of Madagascar (*Brookesia* sp.) are the world's tiniest reptiles, slightly larger than ants. Although the ants in some parts of the world are big, these chameleons are generally only an inch or two long.

Short Life:

Labord's Chameleon (Madagascar) has the shortest lifespan of any land vertebrate. From hatching from the egg to adulthood, this chameleon grows at about 1 cm per week until it reaches the grand old age of about eight weeks.

Nature's Hardest Hitters – Mantis Shrimp:

Mantis Shrimp (marine crustaceans similar to lobsters) have the fastest punch of any creature. The force is so great they can actually create implosions that create light! Researchers at Duke University in North Carolina measured mantis shrimp generating a force of almost 2500 times their body weight…and all this in less than 800 microseconds.

Northern Lights:

Unfortunately, as inhabited spaces brighten, the opportunity to see the Northern Lights decreases. They are still a very common sight but do you know why they happen?

It all starts with the sun (150 million km away). A jet stream (solar wind) of charged particles from the sun interacts with oxygen and nitrogen molecules in Earth's upper atmosphere causing them to emit light —similar to the workings in a fluorescent light bulb. The solar winds follow earth's magnetic field and tend to concentrate in a ring of about 2500 km from the poles…they occur at north and south polar regions.

Although they seem closer, the auroras apparently occur at high altitudes…at about 150 km for the common green colours and more than 300 km for the less common reddish hues.

According to the Sámi people of northern Norway, they must be treated with respect since they are alive and able to communicate. And that brings up an interesting point…do they make a sound? The answer appears to be a resounding – maybe! While sound from 150 km distance cannot be heard, there is some suggestion the electrical forces at work may be able to affect auditory nerves and create apparent "sound".

Do You Want To Be Remembered Forever – Fossilization Might Be For you!

It has been estimated (B. Bryson in *A Short History of Nearly Everything*) that only one bone in a billion will be fossilized. And the chance of being found after that successful fossilization is probably in the same neighbourhood.

It seems humans are prime candidates for immortalization by fossilization. We have plenty of large, dense bones, and there are lots of us around…but there are a few conditions. There are an infinite number of ways for fossilization to fail but only a few that will help ensure success. Factors that help increase the odds of fossilization include the following:

- Get underground as quickly and deeply as possible!
- Burial in mineral-rich water (actually under sediments that are well percolated by anoxic/or low oxygen water) appears to enhance high quality fossilization.
- Burial under at least 50 cm of sediments helps avoid access by burrowing beasties.
- Avoid geologically active areas that tend to scramble the deposits.
- Find a burial location that will seem attractive to scientists several million years from now!
- Carry markers (e.g., precious metals or other persistent substances) that may enhance detection.

So, if you like to challenge the odds and are a bit of a risk-taker, fossilization might be for you.

Remember, diamonds are forever, but fossils properly preserved and discovered, will tell a story!

Boaty McBoatface

Did you ever wonder what happened to Boaty McBoatface? If you are not aware, "Boaty" surfaced in a naming competition for the newest polar ship being built by the United Kingdom. The name, Boaty McBoatface, won the competition, but the governing body decided the name was inappropriate and the ship was ultimately named the RRS Sir David Attenborough.

The UK National Oceanographic Center is building a fleet of these autonomous underwater vehicles (AUVs). Officially it is named Autosub Long Range (ALR), but that is just way too boring so to show they actually had a sense of humour, the first model was officially named Boaty McBoatface. These "Boaty-class" wireless vehicles are designed to navigate over great distances and are geared to stay on mission for weeks.

Boaty has recently completed a 48-hour test mission under the Filchner Ice Shelf on the southern edge of the Weddell Sea in Antarctica.

Boaty will operate from the Attenborough's deck once the Attenborough enters full service in 2019.

In Pursuit of Regulatory Certainty

By John Retallack, CSEB Alberta Member

This is sort of environmental science, since it was the opposition to various scientifically-derived conclusions that caused various project opponents to question the validity of the NEB regulatory process…in other words, because a vocal minority didn't like a result, the whole system needed to be changed!

The federal government has been working for a couple of years to assess several federal regulatory processes, most notably the *National Energy Board Act*, *Canadian Environmental Assessment Act*, *Navigation Protection Act*, and *Fisheries Act* to, as stated by Trudeau "…to restore public trust in project reviews". To be clear, the review process, led by the NEB, that is apparently so much in need of overhaul, was seen as a model and praised internationally. The public had trust in the processes employed by the Feds and provinces like Alberta until a vocal minority co-opted the discussion and managed to convince Trudeau otherwise, until he stood alongside advocates in claiming it lacked public trust.

Having been involved in the regulatory process for several of the major energy production and pipeline projects referenced in this dialogue, please believe me when I say the people involved in the energy companies, environmental/regulatory consulting companies that help shepherd applications through the regulatory process, and the provincial and federal regulatory agencies are some of the most competent, engaged, and passionate people I have worked with. The critical dialogue in some of the project planning meetings I have attended makes the "incisive public debate" witnessed in recent NEB hearings look like child's play!

In any regulatory process, industry looks for certainty. The regulatory process for large oil and gas projects takes years (and huge $$) from concept to application and approval. Any signals that there may be weaknesses and uncertainty in the system will cause companies to reconsider their investments (think Energy East). Change is very expensive and time-consuming. And if you haven't noticed, under the guise of critical second-thought, the current tactic being used by anti-project advocates (including provincial governments like BC) is to throw endless roadblocks into the process under the hope that they can "burn-down" proponents.

The oil and gas industry tends to vote with its feet. We are still a **long** way from zero oil and gas and if Canada doesn't provide the certainty and encouragement for capital expenditure, there are other opportunities out there for oil and gas companies to invest their money.

Thawing Permafrost in Canadian Arctic is Releasing Mercury

Three grad student researchers from the University of Alberta, studying eight different permafrost thaw slumps in the NWT, have found high fluvial concentrations of total mercury and methylmercury in water downstream of the retrogressive thaw slumps on the Peel Plateau. The concentrations were up to two orders of magnitude higher than upstream, reaching concentrations of 1200 nanograms per litre, and 7 nanograms per litre, respectively. These values are much higher than the last known Canadian record for total mercury of 18 nanograms per litre, which was measured in 2016.

The team's lead researcher, Kyra Alexandra St. Pierre, along with fellow graduate students Scott Zolkos and Sarah Shakil, noted that most of the mercury (>95%) was found in particle-bound form and potentially not bioavailable,

If the mercury can be uptaken by organisms in that form, it could bioaccumulate up the food chain, thereby affecting larger fish and predators (including humans) in low concentrations.

"Climate change is changing the way that these freshwater ecosystems are functioning. We never used to see these slumps really developing to the same scale in the past. Mercury previously stored in soils is now being reactivated in our modern chemical cycles and into modern ecology," St. Pierre said.

The study has been published in Environmental Science & Technology (2018). DOI:10,1021/acs.est.8b05348.

(Information source: Edmonton Journal; Environmental Science & Technology).

Check out the CSEB Video at
http://youtu.be/J7cOuDbBf9c **or**
https://www.youtube.com/watch?v=J7cOuDbBf9c

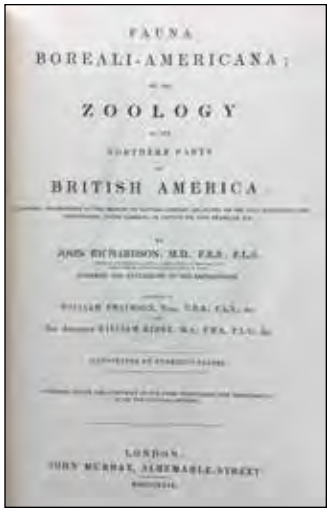
CSEB Research Webinars

Check the CSEB Website at
www.cseb-scbe.org
for upcoming webinars and registration information.

Fauna Boreali-Americana: a Cornerstone of Canadian Zoology

Submitted by Sean Mitchell, CSEB BC Regional Director

Preamble: *As working biologists we are mandated to "remain current" within our fields. While this is true and valuable, we should not lose sight of the work that came before us. The pioneers and pathfinders worked under conditions beyond our modern understanding and without tools we consider indispensable. Despite this, or perhaps because of it, they left us accounts of adventure and records that remain of scientific value, beautifully written prose and insights into cultures and environmental conditions long past. I suggest these old volumes continue to have profound lessons and insights for us. Time spent with an old leather volume in your lap, connecting with men such as Hearne, Drummond, Douglas, and Mackenzie, is a rare pleasure and has as much to teach as modern scientific journal articles.*


FAUNA
BOREALI-AMERICANA;
ZOOLOGY
BRITISH AMERICA
LONDON:

In 1824, thirty-five years before Origin of Species, a foundational book was published in England. The volume, published by John Murray, was the first in a collection of four authored by a remarkable naturalist; the quartet together represent the fundamental cornerstone of Canadian zoology. Though overlooked today, and often viewed as simply being of historical value, this man's work is arguably among the greats of scientific contributions, largely due to the conditions and events through which he worked. Darwin did not have to contend with starvation, murder, and cannibalism on his Beagle voyage. Linnaeus sent others out to the remote and difficult parts of the world to collect for him while he remained in safe Europe. Cuvier conducted his anatomical studies in the relative warmth, light, and privacy of a French laboratory. Though the Scot John Richardson – surgeon, naturalist, humanist, explorer – did not contribute to the conceptual structure of science as did these others, he did create the field of regional zoology and contributed an opus to Canadian biology.

Richardson's major work, F*auna Boreali-Americana: or the zoology of the northern parts of British America*, containing descriptions of the objects of natural history collected on the late northern land expeditions, under command of captain Sir John Franklin, R.N., consisted of four volumes: *Part First, containing the quadrupeds (1829); Part Second, the birds (1831); Part Third, the fishes (1836); and Part Fourth, the insects (1837).* The first three volumes were primarily Richardson's work, though he shared the birds with the authoritative ornithologist William Swainson. The fourth volume, insects, was written by the Reverend William Kirby, as this was outside of Richardson's area of expertise.

Richardson was no armchair biologist; he spent seven summers and five winters at and travelling among widely separated Hudson Bay Company posts and outlying camps throughout the British American Fur Countries – that is, the regions north of the Great Lakes, westward to the Rocky Mountains and east to Hudson's Bay. Between 1819 and 1827, the surgeon-naturalist travelled with the ill-fated John Franklin on multi-year overland expeditions, exploring and describing the lands and wildlife. His time on the land consisted not only of direct observation and sampling, but also requesting information and samples from the people of the country: the First Nations, trappers, traders, and travellers. He listened carefully and gave credence to First Nation accounts – what today we call Traditional Ecological Knowledge. He was, as were most Scottish naturalists, unique in his approach to the First Nations he interacted with – he respected them and sought to learn what they might teach him of the wildlife of this land.

From 1819 to 1822 Richardson accompanied Franklin on his first overland expedition. From York Factory on Hudson's Bay, they proceeded to Great Slave Lake where they wintered before carrying on, over the next two years, to the mouth of the Coppermine River and back to York Factory. Along the Coppermine, at the extreme northern end of their wanderings, they suffered hardships. Due to a series of poor decisions, lack of preparedness for an Arctic autumn, English arrogance, and an improvident assumption that they would be able to live off the local resources of the land, the party suffered extreme deprivation. Eleven of the 20 men in the party died. The days included starvation, death, murder, and cannibalism. Richardson had to kill a man that endangered all around him. Though Franklin would later derive greater fame for his mysterious disappearance in the Arctic, following this overland expedition, Franklin earned the sobriquet throughout England as "The man that ate his boots" – this title was an indication of the extreme lengths the men went to so that they could survive. Recovering from this disastrous journey, Richardson returned to the Fur Countries again from 1825 to 1827; this time entering the country via the St. Lawrence and Great Lakes, then working his way north to the mouth of the Mackenzie River. In all of these travels, the indomitable Scot collected specimens and information.

Returning to England and a position as administrator and doctor of the famed Haslar Naval Hospital, Richardson sat down to document not only his journeys, which he did as A*rctic Ordeal – the Journal of John Richardson, Surgeon-Naturalist with Franklin, 1820-1822*, but also the fauna of the recently explored land. The first line of the first of his books specifies the purpose of the project, *"The objects of Natural History collected by the last Overland Expedition to the Polar Sea, under the command of Captain Sir John Franklin, to which I was attached as Surgeon and Naturalist, being too numerous for a detailed account of them to be comprised within the ordinary limits of an Appendix to the narrative of the proceedings of the journey, I was desirous of making them known to the world in a separate work*."[1]. The result, unlikely to have been his original intention, was the most comprehensive, engaging, and readable compilation of wildlife of the area that would eventually be known as Canada. More than one hundred years after its publication, *Fauna Boreali-Americana* was recognized to have "e*stablished Arctic biology as a branch of*

natural history and was the first great work on regional zoology as we know the subject."[2]

The volumes are arranged as standard species accounts of the animal described. His descriptions include physical attributes and often behavioural anecdotes. Typical of explorer documents, much of the wildlife is viewed as a food source; what is edible, what is not; separating the palatable from the distasteful. He struggles to clarify species identification relative to previously described forms; working to understand which of his own are new and which are duplicates of species previously described, though incompletely. Richardson also takes a stab at biogeography, frequently trying to define ranges of species under consideration. In some cases he shows great zoological insight (he correctly separates pika from hare based on tooth structure), but at other times is too credulous (reporting that basking sharks are thought to eat whales). It is the ambitious nature of the effort combined with the eclectic nature of the information that results in the fascinating read that it is.

By today's standards, Richardson was a taxonomic splitter; for example, he gives descriptions of four sub-species of beaver – the American beaver, black beaver, spotted beaver, and white [albino] beaver[3]. The last three are simply color variations of the first. However, even his errors have lessons. We are provided with additional insight if we can overlook the taxonomy of the time. He comments on the white beaver, "*When the Indians find an individual of this kind, they convert the skin into a medicine bag, and are very unwilling to dispose of it.*"[4] Of the spotted beaver he says, "*Mr. Say mentions that an Indian had in the course of his life caught three specimens of Beaver with a large white spot on their breasts*."[5] From these, we gain understanding of First Nation values and relative abundance of these morphs; information that is simply neither collected and reported today, nor commonly reported in older literature.

Richardson's writing also provides insight into 19th Century science and challenges. Discussing the "Carrier Indian Dog,"[6] he notes, "*Mr. M'Vicar made me a present of an excellent example of this breed, which I intended to have brought to England; but it was stolen, and fell a sacrifice to the desire which a party of Canadian voyageurs had to partake of a meal of dog's flesh*."[7] Rarely today does the hired help eat our samples. The naturalist leaves a vivid passage of the conditions under which he worked. "*I acknowledge that my dissections being carried on in cold weather, and in an apartment into which light was admitted through a small parchment window, I may have mistaken a fold of peritoneum, or a band of vessels, for a duct*."[8]

The *Fauna Boreali* is an impressive accomplishment, not only due to size (total more than 1,400 pages) and scope (fish, birds, mammals, insects), nor the rigors of travel and collecting in 19th century Canadian wildlands (worthy of an essay unto itself), but equally importantly because of the lack of intellectual constructs to provide scaffolding and structure for the newly discovered biology. At the time Richardson was collecting and writing, the scientific world lacked the fundamental concepts we now take for granted and cannot do without. There was no rigorous species concept or defensible theory of evolution or understanding of mechanism of heredity. Richardson lived in a world without biogeography theory or concepts of glacial periods and their effects on landscapes and distributions of plants and animals. Taxonomy was a confused muddle, though Linnaean concepts provided some guidance. There was no photography for accurate records; investigators did not even have agreed upon standard measurements of attributes to allow comparison among species. Each individual, unless it clearly fit into an established morphology, was described anew and completely. Phenotypic plasticity was unappreciated and so any deviation from a near-Platonic ideal form was considered a new species. Richardson was trying to make sense of the multitude of new species in an undescribed land without any conceptual underpinnings to rely upon.

Reading *Fauna Boreali*, though it is structured like a modern text with species account after account, is more akin to watching a movie than reading a textbook. There are stories within the accounts and, running as a thread through the volumes, a grand tale of a man trying to apply science in a harsh land without the tools to do so. We are introduced to important naturalists— Drummond, Douglas, Cuvier, Audubon, Le Sueur, Valenciennes — as they are brought in for 'cameos' through their contributions to Richardson's efforts. Through all of it, we get a glimpse of 19th century science in action. And Richardson is a fine writer. The narrative invites the reader to dig a little deeper into the travels and efforts of these early naturalists to make sense of their world for which they have insufficient tools. Richardson engages the reader — he is not only providing information, he is asking the audience to see the world through his, and the First Nations, perspective. There are lessons here for modern biologists— guidance and inspiration to help us see the ecology of our wildlife in more full and meaningful ways.

Notes:

1. From Richardson Fauna Boreali-Americana, Part First, the quadrupeds. (p ix)
2. Johnson, R.E. 1976. Sir John Richardson: Arctic explorer, natural historian, naval surgeon. Crane, Russak and Company. New York. (p 60)
3. Richardson names these sub-species as *Castor fiber*, *americanus* (American beaver); *Castor fiber*, var B, *nigra* (black beaver); *Castor fiber*, var C, *varia* (spotted beaver); *Castor fiber*, var D, *alba* (white beaver).
4. From Richardson Fauna Boreali-Americana, Part First, the quadrupeds. (p 114)
5. Ibid. (p 114)
6. Richardson provides four sub-species to the domestic dog he sees among First Nations of Canada. All are *Canis familaris*, but he further discriminates to Esquimaux Dog (*Canis familiaris* var A, *borealis*); Hare Indian Dog (*Canis familiaris*, var B, *lagopus*); North American Dog (*Canis famiilaris*, var C, *canadensis*); and Carrier Indian Dog (*Canis familiaris* var D, *novae caledoniae*).
7. From Richardson Fauna Boreali-Americana, Part First, the quadrupeds. (p 82)
8. From Richardson Fauna Boreali-Americana, Part Third, the fish. (p 16)

Letter Submitted by CSEB To the Federal Minister of Fisheries and Oceans

July 2, 2018

The Honourable Dominic LeBlanc
Minister, Fisheries, Oceans and the Canadian Coast Guard
200 Kent St.
Station 15N100
Ottawa ON K1A 0E6
Email: min@dfo-mpo.gc.ca

Subject: Proposed amendments to *Fisheries Act*

Dear Minister LeBlanc,

On behalf of the Board of Directors of the Canadian Society of Environmental Biologists (CSEB), I would like to acknowledge and congratulate your government for the proposed amendments to the *Fisheries Act*.

As biologists working in all watersheds and the three oceans of Canada, we work for the protection of fish and fish habitat and conservation of species. We believe that the spirit of many of the proposed amendments will benefit freshwater and marine fish, fish habitat, and other wildlife dependent upon these. In particular, the CSEB is supportive of the following amendments:

- Inclusion of all fish species in protection under the Act. This replaces the Commercial, Aboriginal, and Recreational (CRA) species categorization and will remove some uncertainty in conducting environmental assessment as any fish species present will result in a watercourse being unambiguously fish habitat and so subject to the *Fisheries Act*.
- A return to prohibition of activities based upon Harmful Alteration, Disruption or Destruction (HADD) of fish habitat. We believe that this concept is more pragmatically useful as impacts to physical habitat can be more readily and reliably quantified and documented then effects upon the fish themselves. This is a more conservative approach to protection of aquatic and marine systems.
- Enhancing the ability to create long-term, area-based restrictions to fishing activities for purposes of conserving marine diversity (e.g., marine refuges)

In addition to the amendments, our organization is encouraged by your commitment to having strong enforcement capacity and increasing the number of frontline fishery and habitat officers.

We believe that these general amendments are one step in the direction of more effective and efficient environmental protection and restoring the *Fisheries Act* to its former strength in environmental law. We support the spirit of the amendments. The attached brief article, published in our Spring 2018

Bulletin and advocating for the amendments, expands upon our support and perceived need for this legislation.

Sincerely,

Curt Schroeder, B.Sc., M.E.Des. President
Canadian Society of Environmental Biologists
c.c.: Board members
Enc.

Response to Letter To the Federal Minister of Fisheries and Oceans

Minister of Fisheries and Oceans

Ministre des Pêches et des Océans

Ottawa, Canada K1A 0E6

OCT 0 1 2018

Mr. Curt Schroeder
President
Canadian Society of Environmental Biologists
PO Box 962, Station F
Toronto ON M4Y 2N9

Dear Mr. Schroeder:

I am writing in response to your correspondence of July 2, 2018, addressed to my predecessor, the Honourable Dominic LeBlanc, concerning Bill C-68, *An Act to amend the Fisheries Act and other Acts in consequence*.

I appreciate your feedback, and I have forwarded your comments to Mark Waddell, Director General of Fisheries and Licence Policy, and Nicholas Winfield, Director General of Ecosystems Management, for their due consideration. As you likely know, the bill is currently before the Senate.

Should you have any additional input, I encourage you to send it to either of the following addresses:

Mark.Waddell@dfo-mpo.gc.ca

Nicholas.Winfield@dfo-mpo.gc.ca

Thank you for writing.

Yours sincerely,

Jonathan Wilkinson, P.C., M.P.
Minister of Fisheries, Oceans and the Canadian Coast Guard

Canada

REGIONAL News

BRITISH COLUMBIA News

Submitted by Loys Maingon, CSEB BC Director

Asking the Wrong Question: Redundant Government Policy or Resilience as a Pretext for "Business as Usual" with New Names

"Being in the midst of the sixth mass extinction, it is fitting to quantify the relative contribution of different mechanisms driving catastrophic biodiversity loss."

- G. Strona and C.J.A. Bradshaw

Eighteen years ago, the late William K. Stevens wrote an essay that picked up on Erlich and Erlich's metaphor of the planet as an airplane that was losing rivets, namely, the rivets of biodiversity.[1] The prevailing notion then, and too often now, is that somehow, we can afford the loss of some rivets with no real harm, because ecosystems are "resilient." At least, "resilience" is the prevalent dogma. If you listen to BC foresters, there is even talk of losing and replacing species to keep "healthy ecosystems," but that may be a strange interpretation of "healthy"—over-simplified systems with little redundancy. Stevens, like Ehrlich, assumed, perhaps incorrectly or over-optimistically, that a certain amount of species in any ecosystem were "redundant."

These days "resilience" seems to be on a par with "sustainability." In 2012, the findings of Reich et al. (2012) complemented an increasing number of findings since the 1990s that indicated that biodiversity acted as an independent variable "that controls ecosystem level functions, such as nutrient and biomass production." Peter Reich et al (2012) in "*Impacts of Biodiversity Loss Escalate Through Time as Redundancy Fades*" showed that biodiversity and ecosystem functioning increase monotonically; therefore, extinction produces an incremental decrease in ecosystem functioning.[2]

In that context, management based on the concept of "redundancy" becomes simply a tacit admission that we do not really understand the complexity and functioning of ecosystems that are being managed. This appears to be the case in the recent debates over the fate of Canadian polar bears and caribou populations. As pointed out by Dr. Andrew Derocher (University of Alberta) with regard to the imminent extirpation of the polar bear population at Svalbard, this is no longer a matter of saving individual species. We are witnessing the rapid dismantling and re-organization of entire ecosystems: "*We're restructuring a whole ecosystem. Sea ice is to the Arctic what soil is to the forest. Without sea ice we'll still have an ecosystem but it won't include polar bears and many other species.*"[3] (As every first-year geography student knows, a small shift in precipitation and/or soil temperature radically alters soil biota and functioning.) While it has long been known that species may shift under climate change, and that ecosystems could not move but would have to re-organize, insufficient consideration has been given to the cascade effect of interdependencies. Derocher puts his finger on the problem: basic changes in soil or water temperature entails a major re-organization of the interdependencies of species.

No man is an island, and no province or state really lives in isolation. To equitably evaluate a government's environmental action or inaction, it no longer suffices to do so within a framework of expectations that are limited to a comparison of the various political party policies. There is a need to re-evaluate policy in terms of its effective response to a novel rapidly evolving situation. The implementation of legislation to meet long-standing, but now possibly out-dated concerns, is being outstripped by the deteriorating global state of the environment. Thus, it comes as no surprise that representatives of Ecojustice and World Wildlife Federation have recently noted in the press that Canadian provincial and federal governments are failing to do enough to protect Canada's fauna, let alone its flora.[4] Of particular note in this matter is the fact that, with more than 18 months in power, BC still has no *Endangered Species Act*, an act that has been desired for at least four decades ever since President Nixon introduced the US *Endangered Species Act* in 1973.

The current state of affairs only raises more questions on this matter, as the concepts that have buttressed endangered species legislation for the past 45 years are themselves rapidly evolving, and possibly becoming obsolescent. While the conservation of endangered species should entail the preservation of habitat, it is unclear how that habitat is to be preserved if it is itself changing to the point that target species are displaced away from the selected habitat. As we preach the mantra that "it all hangs together," an increasing number of reports and studies are witnessing a great unravelling of ecosystems that the growing magnitude of climate change impacts is driving.

In this respect, one of the most interesting articles this semester has to be Giovanni Strona and Corey J.A. Bradshaw's modelling experiment "*Co-extinctions annihilate planetary life during extreme environmental change*."[5] The findings of this experiment challenge the re-assuring 2017 work of Sloan et al.,[6] which purported that, based on the extraordinary tolerance of tardigrades, life on earth has the capacity to "survive asteroid impacts, supernovae, and gamma-ray bursts."[7] Sloan et al. should have specified: "taken in isolation." As Strona et al. note, the problem with that contention is that it is strictly based on the known physiological tolerances only of individual species. The guiding assumption of Sloan et al. is that individual species exist in the real world without being ecologically connected to, and therefore, reliant on, other beings. In other words, as Strona and Bradshaw note, the approach taken by Sloan et al., suggests that biodiversity is merely a collection of independent individual objects rather than an interactive community of individuals.

It is worth noting that this problem is one of the oldest in the history of science. It is, in point of fact, the key controversy that gave birth to science: the debate between Idealism and Nominalism in the late Middle Ages. For idealists, the reality of objects and words lies in their definitions, which gave them meaning, whereas nominalists believed that objects and the words referring to them only acquired reality through their performative function.[8] Arcane as this may seem, these two conceptions of reality continue to prevail in the human mind today, even in the scientific world. As Strona and Bradshaw point out:

> *"This ostensibly reassuring news highlights how some scientists still tend to disregard the role of co-extinctions within collapsing communities in driving global biodiversity loss, while focusing on individual species' tolerance limits as the only criteria relevant to species survival in a changing world."*

Sloan et al.'s perspective is regrettably one all too frequently adopted by a wide number of biologists involved in wildlife management, which informs and shapes government policy and implementation. Species do not exist independently of whole ecosystems, outside of museums, zoos or herbariums. There is a pervasive idealism that disconnects the nominalist reality of our ongoing mass extinction from the convenient assumption of day-to-day business-as-usual that the world about us is museum-like relatively stable and unchanging. **Figure 1** in Strona and Bradshaw illustrates what happens when organisms physiologically tolerant to extremes are inserted in an ecological context subjected to the instances of co-extinction.

Whether we consider the fate of tardigrades or polar bears, it seems that we can no longer dabble about the edges. We appear to be facing a significant environmental tipping point that we may be able to mitigate in the short-term but cannot entirely avoid. At least, that is what the release in early November of IPCC and WWF reports, followed by the F*ourth National Climate Assessment*[9] are trying to make amply clear to the political class, which appears to remain generally tone-deaf. The coldly-comforting thing is that it is becoming increasing clear to the mainstream that humanity is now facing large and unavoidable environmental changes.

Gone is the referential stability that used to guide compensation policy in conservation. Over the past 150 years, governments have created parks or conservation areas, including the 1992 United Nations Rio Conference proposal, which followed the Brundtland Report, to guarantee ecological sustainability by setting aside 12% of the global land mass as reserves, so that business-as-usual could proceed.[10] (As pointed out by E.O Wilson, the real requirement is 50% — and we are nowhere near that.[11]) While this may have been economically sustainable, it has been an ecological failure. The reliable stability marked by national parks and conservation areas that has served as a reference point in the mental maps of four generations is now a thing of the past. Iconic landscape-level ecosystems are changing before our eyes, as the New York Times can now confidentially point out: "*Your Children's Yellowstone Will be Radically Different*".[12]

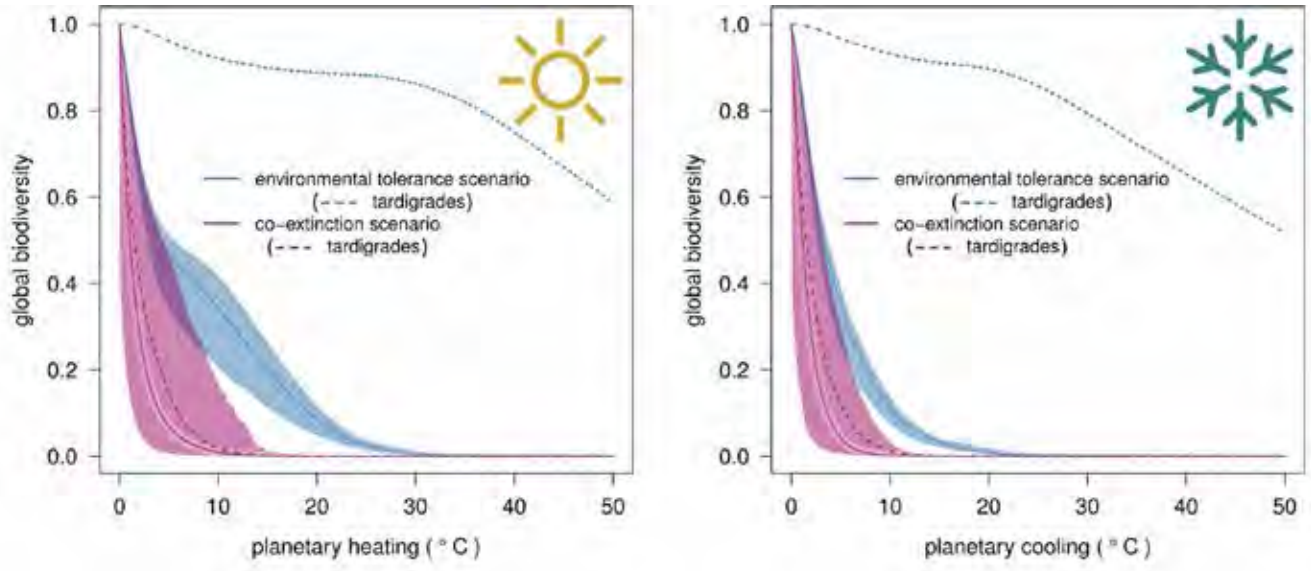


Figure 1. Co-extinctions reduce the robustness of planetary life to catastrophe. Response of global diversity to environmental change: progressive, monotonic increase ('planetary heating'; left panel) or decrease ('planetary cooling'; right panel) trajectories in local temperature. Species either go extinct based only on their tolerance to environmental conditions ('environmental tolerance' scenarios = blue curves), or where species go extinct not only when unable to cope with changed environmental conditions, but also following the depletion of their essential resources ('co-extinction' scenarios == magenta curves). Solid lines represent mean values, and shaded areas indicate the system boundaries (minimum-maximum) arising from 1000 randomly parametrized models (see Methods for details). Dotted lines show the decline in 'tardigrade' (extremophile) species richness in the environmental tolerance (blue) and in the co-extinction scenario (magenta) for both temperature trajectories.

(From: G. Strona and C..J.A. Bradshaw (2018)}

Ecosystems that depend on snow, just as polar bears depend on ice, are no longer seeing enough snow, forests are giving way to grasslands and are now home to low-nutrition invasive grasses that reduce soil moisture, accentuate drought conditions and fire, shifting millennial migration patterns and potential ranges of iconic mammalian species, to the point that parks established for their preservation are no longer suitable habitat for these species. Of particular note in these matters, studies that focus on the loss of iconic mammalian species do not account for the perhaps even more important collapse of invertebrate and floral species which effectively support these ecosystems.

For at least the past 20 years, we have known that we were exceeding the planet's regenerative capacity.[13] Anthropogenic climate change has merely been the accelerant that brought home the consequences of a global population explosion and the consumption associated with an ever-growing population. The illusion has been to pretend that somehow the collapsing regenerative capacity of the planet could be by-passed by the resilience of select individual species. The collective impoverishment of biodiversity and its contribution to ecosystem functioning has only become the focus of attention after 1990. The collapse of biodiversity is only now coming to general attention, perhaps because it has become all too obvious.[14] The road-map to these changes to be expected is fairly explicit in the latest IPCC report,[15] which lays out what broad ecological collapses are to be expected per half degree of global warming.

As **Figure 2** illustrates, the 2018 IPCC Special Report conservatively indicates that major impacts to ecosystems, in particular coral ecosystems, which are expected to disappear within the coming decades,[16] while coastal and arctic systems, which includes alpine ecosystems, will experience major upheavals by 2050, unless political will shifts by 2020 to reach targets by 2030.[17]

What is emerging is the realization that the climate change problem is largely a "cultural problem," and, therefore, solutions cannot simply be brought down from above. There is a need to increase public awareness and participation. The "cultural" dimension is not, as the media and government shills would have it, a matter of Western, Oriental, or First Nations cultures. It is a matter of living in a social environment shaped by global consumerism, in which problems are expected to be solved by "experts," without having to assume personal responsibility or question assumptions guiding daily life. It, therefore, is interesting that media response to the IPCC report and United Nations calls to action, has been to provide commonsense lists of what individuals can do.[18]

Of particular note, the American Fourth National Climate Assessment produced by and rejected by the Trump administration points to the fact that the interrelatedness of climate change impacts requires that public stakeholders be engaged: "*Failure to anticipate interconnected impacts can lead to missed opportunities for effectively managing the risks of climate change and can also lead to management responses that increase risks to other sectors and regions. Joint planning with stakeholders across sectors, regions, and jurisdictions can help identify critical risks arising from interaction among systems ahead of time.*"[19]

If we consider how climate change policy is being managed now, it is hard not to note that while the public is being reassured of government action, the public itself is not being engaged in decision-making and policy development. Government continues to rely on industry to shape policy rather than on independent science and public participation. Nowhere is this more obvious than in BC's proposed Bill 51, which was supposed to re-vamp environmental assessments, but only appears to perpetuate the source of the problem.

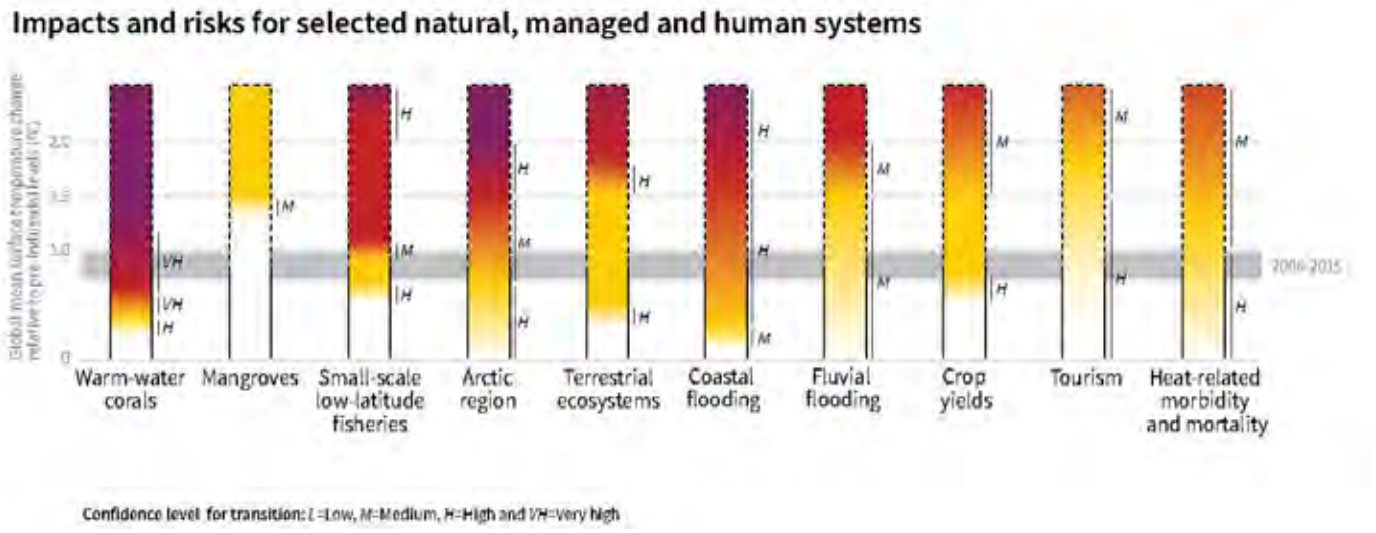


Figure 2. Impacts and Risks to Natural and Managed Systems between current global temperatures and 2 degrees (IPCC Special Report 2018). Five integrative reasons for concern (RFCs) provide a framework for summarizing key impacts and risks across sectors and regions, and were introduced in the IPCC Third Assessment Report. RFCs illustrate the implications of global warming for people, economies, and ecosystems. Impacts and/or risks for each RFC are based on assessment of the new literature that has appeared. As in AR5, this literature was used to make expert judgments to assess the levels of global warming at which levels of impact and/or risk are undetectable, moderate, high or very high. The selection of impacts and risks to natural, managed, and human systems in the lower panel is illustrative and is not intended to be fully comprehensive.

Faced with the twin problems of climate change and biodiversity collapse, the first step to conservation may not lie in the urgency of an endangered species act, but in the rigour of the environmental assessment act based first on science and then on public participation. In this respect, BC's new *Environmental Assessment Act* falls short of expectations.

As reviewed by the University of Victoria's Centre for West Coast Environmental Law, Bill 51 fails to address many of the problems that plagued its predecessors.[20] And it fails largely to meet the very need for "*joint stakeholder participation*" "*to anticipate interconnected impacts*," as noted in the American "National Assessment."

While Bill 51 engages with First Nations, one has to wonder if this is mere window-dressing since the Bill does not meet the minimum standards set by the United Nations Declaration on Rights of Indigenous Peoples. Nor does it address the question of public or community participation; it refers to the need for "Community Advisory Committees," which have no legislated role and meet only if there is "sufficient community interest"(to be arbitrarily determined). Similarly, the bill allows for "regional assessments" outside of the project-specific assessment; however, it is not clear what would trigger a regional assessment, and the findings would be non-binding. That has to be the fulcrum of this new *Environmental Assessment Act*, assessments would continue to be non-binding and arbitrary, with decisions left entirely at the discretion of the minister.

In other words, although First Nations are invited to discuss the environmental impacts of projects on their territories, they in fact have little say on the outcome, which is a ministerial decision. Similarly, although "Community Advisory Committees" may be formed and meet, if the minister deems that it is in community interest, the recommendations are non-binding. As in the past, the only data that will be considered will be data proposed by the proponents. While the bill requires the creation of "technical committees" drawn from ministry staff, industry contractors, and First Nations, as is the current practice, the new bill effectively does not require that any member of the "technical committee" actually have any technical or scientific expertise necessary to evaluate the evidence" "*…..there are no requirements for independent studies, expert peer reviews, or panel hearings to test evidence*."[21] This is not just a legal problem. This is a problem that has to do with how our society actually views and relates to science. There is, in point of fact, very little difference between a government in Washington berating science and scientists, and a government in Victoria simply arbitrarily disregarding science in order to advance an economic or business agenda. Both disregard the magnitude of the climate change problems that humanity faces and the science behind this.

Bill 51, in fact, continues to authorize the minister to arbitrarily waive the need for an environmental certificate altogether. Just like the previous government, the current government arbitrarily promotes the fossil fuel industry. Such has been the case of dams in northern BC, illegally built without authorization by a subsidiary of Petronas, Progress Energy, for the development of LNG, which the government now supports.[22] Sierra Club is now taking the government to court because it granted environmental certificates without requiring any review.

There is a disturbing logic in all this, or at least there should be for anybody interested in science. The picture that emerges out of Bill 51 is not just that there is no change commensurate with the magnitude of the problems that we face, but that status quo is being maintained under another name, and politics will continue to have precedence over science.

Bill 51 follows on the heels of Bill 49, the "Professional Governance Act". Bill 49 may best be understood in terms of the content of Bill 51. Bill 49 provides the scaffolding for the role of professionals in Bill 51. This bill implements the first two recommendations of the Haddock Report, but it makes no mention of the other 119 recommendations that have bearing on the government's own mismanagement of the environment. Whereas the Haddock report recommended the creation of a Superintendent's office, which would oversee environmental professionals with enforcement capacity answering to the public and reporting to the Legislature and the Supreme Court, this bill severely limits the Superintendent's powers to simply reporting to the minister. Given that breadth of discretionary ministerial powers in Bill 51, the *Environmental Assessment Act*, and the continued reliance on information to be provided by the project proponents and evaluated by potentially unqualified personnel, Ministerial discretion in Bill 49 is unlikely to provide British Columbians with the required, objective, science-based environmental management this government was elected to provide.

It is not really clear that BC is really moving to address climate change, any more than Alberta, Saskatchewan, Manitoba, Ontario, or Ottawa. Yes, today BC joined Ottawa to impose a much-needed carbon tax across the country, because BC wants to be a leader in the fight against climate change.[23] It implemented a carbon tax in 2008, 10 years ago, with very little progress since. Ten years ago is eons ago at the rate that the world is currently changing. So that is against a background of a provincial government—like its federal counterpart— whose policies are largely out-of-step with every report on the actual state of the environment that has been published in the scientific literature, for at least the last 12 months. It is a bit like going to court to ban matches when a wildfire like California's Camp fire lights up the courthouse.

The policies that we are seeing this government implement are already redundant and too timid, because they are based on a misperception that our environment is somehow "resilient" and that it can continue to bear unprecedented economic insults if only we accept the now very-dated 1992 Rio Proclamation that our economy can be made "sustainable." The reality is that this same economy has collapsed 70% of insects and 60% of wildlife since 1970 and that this economy is endangering, and continues to endanger, future generations. We may expect the American president to receive reports that tell him as much and to not give these reports credence, but it is disturbing when governments that claim to know better are de facto not implementing progressive science-based policies, and just maintaining the status-quo.

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CSEB Regional Directors Needed

CSEB has Regional Director vacancies as follows:

- Territories
- Ontario
- Saskatchewan
- Quebec
- Manitoba
- Alberta

If you are interested in taking on one of these positions, please contact Curt Schroeder at schroederc@saskpolytech.ca. It is not an onerous task, and will greatly help strengthen the organization. Your help would be greatly appreciated.

ALBERTA News

Submitted by Brian Free, CSEB Alberta Member

Here's an update about some of Alberta's efforts to control invasive species:

Quagga and Zebra Mussells: Alberta appears to be "mussel free", after extensive veliger, substrate, and watercraft monitoring in over 90 lakes and reservoirs. This year, the monitoring program analyzed over 600 water samples for veligers and other traces of quagga and zebra mussels.

Whirling Disease, Affecting Trout and Whitesfish: The Canadian Food Inspection Agency has declared four Alberta watersheds infected with whirling disease including the Bow River, Oldman River, Red Deer River, and North Saskatchewan River drainages. This doesn't mean that the disease is found throughout these drainages, but it has been found within each one.

Flowering Rush: Herbicides are being used to eliminate this invasive species from Lake Isle, west of Edmonton, where there is a significant infestation. At Chestermere Lake, residents and city staff have been hand-digging flowering rush along the lake shore after water is drained for the winter in this Western Irrigation District reservoir.

Goldfish and Koi Continue to be Reported in Some Alberta Waters: As noted in our fall Bulletin, there was a lot of publicity about a kid catching a 16-pound Koi with a hot dog in a City of St. Albert pond. Other municipalities are also addressing their goldfish and Koi populations, but not with hot dogs.

Invasive Phragmites: This invasive reed species is being reported by public and municipal workers in various locations. Initial populations found in 2016 have shown no regrowth when treated by cutting in tandem with herbicide applications.

Prussian Carp: Reports of Prussian Carp surged last spring, as there was flooding in southern Alberta followed by a quick retreat of waters. The species is found from the Red Deer River watershed south to the Montana border. Control actions continue to focus on catching and killing the fish.

Pale Yellow Iris: A combination of hand digging and rubber barriers is being utilized to control this species at Wagner Natural Area just west of Edmonton.

There was an invasion of Ottawa Red Black fans for the Grey Cup game in Edmonton. Humiliation on the football field may have been the best deterrent against future incursions!!

Alberta Environment and Parks is seeking public input on the 2019-20 fisheries regulations. Alberta CSEB members can provide their input on proposed fisheries management objectives and 2019-2020 fisheries regulations by completing the online survey, open from November 21 to December 17, 2018. Survey questions are specific to individual waterbodies. Check it out at https://talkaep.alberta.ca/fisheriesregulations2019.

SASKATCHEWAN News

Submitted by Robert Stedwill, CSEB Saskatchewan Director

In late November, Environment Saskatchewan released its new Climate Resilience Measurement Framework to help measure resilience in the face of a changing global climate. Part of this framework is in response to the province's opposition to the federal government Canada-wide carbon tax.

The strategy is to measure 25 parameters with respect to performance and enhancement of the province's resilience to climate change. There will be targets established, but no penalties are attached for not meeting the targets.

Examples of specific measures are percentage of agricultural land area with a nutrient stewardship plan, which matches the right source and rate of fertilizer to the right time and place of application; greenhouse gas emissions from government owned buildings: provincial forest harvest designs; flood plain mapping for at-risk communities; and wildfire fuel management work on crown land.

According to the government release, this is an important component of the comprehensive plan reducing greenhouse gas emissions and achieving better results than a singular carbon tax policy.

The strategy also includes emissions reductions in electricity, upstream oil and gas, and industrial facilities that emit more than 25,000 tonnes of emissions each year. These commitments will reduce annual greenhouse gas emissions by 12 million tonnes by 2030.

The Climate Resilience Measurement Framework and other components of the province's comprehensive climate change strategy are available at www.saskatchewan.ca/climate-change.

MANITOBA News

Submitted by Robert Stedwill, CSEB Member

The province of Manitoba developed a comprehensive emerald ash borer (*Agrilis planippenis*) - EAB management plan in April of 2017. Although no known infestation of EAB had been detected at that time, the City of Winnipeg has now been declared an EAB regulated area whereby it is "prohibited to move firewood of all species, as well as ash trees, ash nursery stock, or ash wood (including wood chips, wood packaging, or dunnage), out of the regulated area without written permission from the Canadian Food Inspection Agency (CFIA). Moving these materials without permission could lead to fines and/or prosecution."

At this point, to the best of my knowledge, no infestations have been reported in Manitoba, although EAB traps have been set up in vulnerable areas across the province, including the City of Winnipeg. I believe that the proximity of EAB occurrences in Ontario at Thunder Bay and Minnesota have prompted the province to act.

Unlike the current zebra mussel (*Dreissena polymorpha*) infestations in Lake Winnipeg and the Red River, it appears that the Province of Manitoba is taking a far more serious approach to preventing widespread EAB infestations in the province.

With respect to zebra mussels, on October 17, the government announced streamlined enforcement efforts aimed at ensuring boaters and watercraft users follow all the required steps to prevent the spread of aquatic invasive species.

As of October 18th, enforcement officers had the option to issue a ticket with a specific fine that can be paid voluntarily in court. Previously, offenders had to appear in court in order to resolve their charges. Individuals now face set fines for a variety of offences including possessing a prohibited species, such as zebra mussels, failing to stop at watercraft inspection stations, or failing to remove their drain plug when transporting watercraft.

In addition to the new system of set fines, penalties, depending on the offence, would start at $174 for failing to possess a transportation authorization for a watercraft that has not been decontaminated, and climb through a variety of steps, including a $2,542 fine for failing to decontaminate a watercraft.

ONTARIO News

Submitted by Barbara Hard. CSEB Ontario Director

Chimney Swift Habitat Compensation Plan, Former School Property, Hamilton, Ontario

Photo 1: Chimney Swift (Photo Credit Mike Veltri).

An Environmental Impact Statement (EIS) and a Species at Risk Habitat Compensation Plan were completed to support a planning application for a new subdivision on a former school property located in the urban area of the City of Hamilton (the "Site"). The Site is approximately 5.72 hectare (14.13 acres) in size and was, until the year 2018, in part, occupied by a vacant school building with chimney stack and a parking lot. The remainder of the Site includes grassed areas that were used as soccer fields and other school activities.

Natural environment surveys completed for the EIS included three season vegetation surveys (spring, summer, and fall), breeding bird, incidental wildlife, and Species at Risk (SAR) surveys (City of Hamilton 2015). All surveys were carried out using accepted standard survey protocols. Vegetation communities were classified using the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998).

Chimney swift (*Chaetura pelagica*) (Photo 1), which is listed as threatened under ESA (OMNRF 2018) and the federal *Species at Risk Act* (SARA 2002) and is considered uncommon in the Hamilton area, was observed during the breeding bird surveys flying around and into the chimney stack of the vacant school. Barn swallow (*Hirundo rustica*), listed as threatened under ESA and SRA, was observed feeding on insects on the soccer field

in the western portion of the Site, and the soccer fields of the neighbouring new school offsite during the fall vegetation survey. Barn swallow nests were not observed on or in the old school building. No other SAR were found at the Site. Eastern bluebird (*Sialia sialis*), a locally uncommon species, was heard during the breeding bird survey.

SAR are protected in Ontario under the *Endangered Species Act* (ESA 2007) and its Ontario Regulation (O. Reg.) 242/08 (as amended). In addition, in accordance with Policy 2.1.7 of the Ontario Provincial Policy Statement (PPS), development and site alteration are not permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements and the Urban Hamilton Official Plan (UHOP) (MAH 2014). Under the UHOP, new development and site alteration are not permitted within provincially significant wetlands, significant coastal wetlands, or significant habitat of threatened and endangered species (City of Hamilton 2013).

Mitigation measures are not required for barn swallow as there will be no impact from the development on this SAR, nests were not observed on or in the old school building, and the soccer fields of the new school will remain intact and available.

Because the proposed development included demolition of the school as well as the chimney, mitigation measures were required to mitigate impacts to chimney swift. As part of the permitting process, a "Notice of Activity" was submitted to the Ontario Ministry of Natural Resources and Forestry (OMNRF). Mitigation measures, such as providing alternative habitat, were required to offset the demolition of the chimney.

Different options were considered for habitat compensation. Leaving the existing chimney stack was not considered a viable option, as the school building and chimney were slated for demolition. Therefore, as part of the Habitat Compensation Plan, an artificial chimney for habitat compensation under O. Reg. 242/08 Section 23.8 was designed and constructed (Photo 2).

The artificial chimney is 2.5 m high, the interior is built out of plywood, insulated with foamboard and the exterior covering consists of medium brown wood. A wooden top cap that completely covers the exterior diameter of the structure is affixed on top of the tunnel. Caulking was applied to prevent water leaking inside the perimeter of the cap and down the walls. A rectangular hole, approximately one half the size of the interior tunnel area, cut in the top cap allows access by the swifts but helps reduce the amount of rainwater and mid-day sunlight getting into the structure. The cap and outside walls were treated/painted to be waterproof.

Photo 2: Chimney structure.

The chimney was installed 350 m from the existing school chimney in the northern portion of the Site prior to demolition. In addition, a planting plan using locally sourced native trees and shrubs was developed for a Vegetation Protection Zone, which protects the artificial chimney by acting as a buffer and at the same time attracts flying insects for chimney swift for foraging.

Chimney swift monitoring follows the Ontario Swift Watch Monitoring Protocol developed by Bird Studies Canada (Birds Canada, not dated). In the summer of 2018, chimney swifts were not observed at the artificial chimney. Monitoring and annual reporting to OMNRF will initially be carried out for three years (i.e., three breeding seasons) as required by O. Reg. 242/08. If chimney swifts are not observed using the chimney in that time period, monitoring and reporting will continue for a further two years.

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Article Prepared by Barbara Hard, Ph.D., Arcadis Canada Inc., Waterloo, Ontario

ATLANTIC News

Submitted by Peter Wells, CSEB Atlantic Member

- **The Lahey report on the management of Nova Scotia's forests**—In August 2018, Professor William Lahey of the University of King's College, Halifax, NS, completed a contracted report – *An Independent Review of Forest Practices in Nova Scotia*. This report outlines an approach forward for the more sustainable use of the provinces forests and was written in response to the growing concern about the loss of the province's forests, especially through clearcutting and using wood as a so-called biofuel. The report calls for much less clearcutting on crown land. It is essential reading for anyone concerned about our forests and their wildlife. See http://novascotia.ca/natr/forestry/Forest_Review/. Lately, there has been considerable concern about the slowness of the NS government, under Premier McNeil, to address the report's recommendations, especially as it seems clearcutting continues on a daily basis, even faster before the province decides to act (Chronicle Herald, Oct. 31, A10).
- **Building salt caverns for natural gas storage could threaten an estuary**—There is considerable continued concern that the Alton Natural Gas Project on the Shubenacadie River estuary will harm the river and its fish. This project will build large gas storage caverns for natural gas coming from the offshore but in the process of building the caverns, will be flushing out large quantities of a salty brine into the river. Construction work is currently on hold, with Environment and Climate Change Canada saying that the brining operation must be managed so that no substances deleterious to fish or fish habitat are deposited into the river. See the article in the Chronicle Herald Nov. 7, 2018, A9, and www.altonnaturalgasstorage.ca/
- **The pulp mill at Pictou – a saga continues – an effluent pipe or not!**—The Northern Pulp mill at Pictou, NS, has an effluent treatment system facility that empties into Boat harbour but which is required to close by January 2020 (Chronicle Herald, Nov. 6th, A9). The alternative to using Boat harbor is to build an effluent pipe with disposal of treated effluent directly into the Northumberland Strait. This is being actively opposed by numerous groups in NS and PEI, as fishermen are concerned about the impact of such effluent (apparently 70-90 million litres daily) on their fisheries, such as herring, and the marine ecosystem of the Strait as a whole. They are currently blockading Pictou harbor to prevent the mill's survey boats from working out the best route of the undersea pipeline to the Strait and the location of its final outfall. As well, at the heart of the issue

is whether the mill's effluent disposal plan should undergo a provincially controlled Class 1 environmental assessment or whether it should undergo a more rigorous and independent assessment by the federal government. There is considerable information on this issue on the Chronicle Herald website, as well as at http://northernpulp.ca/environment/effluent-treatment-facility-replacement-project/

- **Status of the North Atlantic right whales this summer**—This was a better year for the right whale in our waters, with three reported deaths north of Cape Cod, compared to 18 in 2017, and the population apparently being close to 500 individuals now (Chronicle Herald Nov. 13th, A5; see https://baleinesendirect.org/en/right-whales-the-situation-in-2018/). DFO's monitoring continues, as well as the restrictions on vessel speed and the positioning of fishing gear in the Gulf of Saint Lawrence.
- **BoFEP (Bay of Fundy Ecosystem Partnership) – Bay of Fundy Issues**—Proceedings of the 12th BoFEP Bay of Fundy Science Workshop were published in Sept. 2018, and are available on the BoFEP website at www.bofep.org. Talks covered tidal energy, fisheries ecology and management, monitoring and contaminants, integrated coastal management, dykelands and tidal restoration, the new Oceans Protection Plan by the Government of Canada, and marine protected areas. Three panels were held: oceans literacy and awareness, information use at the science-policy interface, future research needs, and BoFEP's continued role as an NGO. There were also three keynote addresses: Dr. Kimberley T. A. Davies – An Uncertain Future: The Right Whales' Fight against Environment, Biology, and Ocean Urbanization; Dr. Tony R. Walker – Drowning in Debris: Solutions for a Global Pervasive Marine Pollution Problem; and Dr. Graham R. Daborn – The Bay of Fundy and its Future. The abstracts of the 41 paper sessions, 18 poster sessions, and 3 keynote addresses, as well as notes from the three panel sessions are included in the Proceedings. BoFEP just had its AGM and now has a rejuvenated steering committee of 24 to lead the group into the future, communicating on Fundy issues, and holding workshops and other fora to address and help resolve key environmental problems facing the bay.
- **New book on the oceans released**—A new book on the oceans, produced and edited by a university team in Halifax, was published by Brill/Nijhoff (Leiden/Boston) in October. It is *"The future of Ocean Governance and Capacity Development" – Essays in Honor of Elisabeth Mann Borgese (1918-2002)*. It is a set of very readable essays on all aspects of ocean governance, penned by more than 80 contributors. There are 10 essays on ocean science, from ocean health to the role of citizen science. We are now striving to raise monies (16K) to have full free access to the books contents available on the Brill website, as the hard copy is quite expensive, limiting its global access and usefulness in teaching and research. That said, please encourage your local library to purchase a copy or have a family member stuff one into your Xmas stocking!

- **GOM Symposium 2050 being planned for Nov. 2019**—A Gulf of Maine 2050 International Symposium—Challenges and Opportunities for Regional Resilience—is being planned for November 4-8th, 2019, to be held in Portland, ME (see attached poster). This symposium will be focused on understanding the primary drivers of climate change and the significance to the GOM/BofF ecosystem such as warming waters, sea level rise, and ocean acidification. The gulf is one of the ocean areas undergoing rapid warming, with ramifications for ocean productivity, presence and migration of species, contribution to more intense storms, and more severe toxic algal blooms, amongst other changes. A planning workshop will be held in St. Andrews in April 2019, to develop strategic scenario papers for the conference itself; these are intended to "provide strategic insight about how potential changes related to climate and other factors could impact the Gulf of Maine environmental, community, and economic conditions over the next 30 years" (Ref: the poster). The primary contacts are Andrew Pershing at apershing@gmri.org and David Stirling at the Huntsman Marine Science Centre, St. Andrews, NB.

The Thinking Mountains Interdisciplinary Summit Conference, Banff, AB, Oct 2-5th, 2018.

This was the third of the Thinking Mountains conferences (see www.thinkingmountains.ca), organized by the University of Alberta with multiple sponsors. Highlights included the release of the Alpine Club of Canada's State of the Mountains report, available as a PDF from the Alpine Club of Canada at https://www.alpineclubofcanada.ca/web/ACCMember/Community/Publications/State_of_the_mountains.aspx; an excellent overview of international mountain science by Martin F. Price of Perth College, University of the Highlands and Islands, Scotland (also see his small Oxford Press book on mountains); and for members of CSEB, sessions of interest such on mountain sustainability, managing water resources, studies on headwaters as dynamic study systems, mountain ecology, the role of repeat mountain photography, and the status of Kananaskis country in Alberta (people, ecology, planning and wildlife). This last

session was particularly interesting, with a paper given by John Paczkowski of Alberta Environment and Parks "*Monitoring wildlife corridors and habitat patches around Canmore, Alberta*"; 200 cameras recorded wildlife and people in the corridor over a 24 month period, with the data showing how animals such as bears, wolves, and cougars overlap in location with walkers, hikers, and skiers on a regular basis, and the biggest problem to wildlife being off-leash dogs. A Proceedings for this conference is expected soon. The next conference will be in 2021. CSEB should perhaps consider being a co-sponsor, given the number of topics germane to the environmental biology and ecology of mountains.

The WWF Living Planet Report 2018

Released in Fall 2018, "The Living Planet Report documents the state of the planet—including biodiversity, ecosystems, and demand on natural resources—and what it means for humans and wildlife. Published by WWF every two years, the report brings together a variety of research to provide a comprehensive view of the health of the Earth". From their website, 16/11/18.

TERRITORIES News

Submitted by Sharleen Hamm, RPBio, CSEB Territories Director.

While in Rankin Inlet, NU recently, I was able to catch up with Gabriel Nirlungayuk, the new Regional Director General for DFO's recently announced Arctic Region (read the press release here: https://www.canada.ca/en/fisheries-oceans/news/2018/10/fisheries-and-oceans-canada-the-canadian-coast-guard-and-inuit-tapiriit-kanatami-announce-new-arctic-region.html).The Arctic Region will be headquartered in Rankin Inlet, will be the eighth standalone region within Department of Fisheries and Oceans' (DFO) jurisdiction, and will encompass four regions of Inuit Nunangat (Inuvialuit, Nunavut, Nunavik, Nunatsiavut). Boundaries of the Arctic Region are yet to be determined. Greater inclusion of Inuit Qaujimajatuqangit (IQ) in resource management and decision making is a priority for the new region.

Elsewhere in the North…..the Nunavut Wildlife Management Board held a public hearing in Iqaluit, NU, in mid-November to consider the Government of Nunavut's Polar Bear Co-Management Plan (the Plan; view it here: https://www.nwmb.com/en/public-hearings-a-meetings/public-hearings-1/2018/nwmb-in-person-public-hearing-to-consider-the-government-of-nunavut-proposal-on-the-revised-nunavut-polar-bear-co-management-plan-2/proposal-for-decision-4). Currently, Memorandums of Understanding (MOUs) are in place for each polar bear population in Nunavut, which have directed polar bear management to date. MOUs between the Hunters and Trappers Organizations (HTOs), Regional Wildlife Organizations (RWOs) and Department of Environment were first adopted in 1993 and updated in 2004. The Plan, developed by a co-management working group, will replace the MOUs and is intended to be comprehensive, territory-wide, and to direct future conservation actions. A scientific approach to polar bear management, including monitoring and modelling to determine sustainable harvest rates, has proven useful and will continue under the new Plan, once approved. The new Plan also considers improved collection and use of IQ and increased Inuit participation in all aspects of management. Over the last 50 years, western science indicates that polar bear numbers have recovered from population lows observed in the 1950s and 1960s. However, public safety is an emerging concern as human-bear interactions are increasing, brought about by a combination of an increase in bear numbers, changes in bear distribution and changes in Inuit settlement on the land. Check out this link for more information on polar bears in Canada: https://www.polarbearscanada.ca/en.

Below submitted by Anne Wilson, CSEB Territories Director.

Day lengths are shortening, and the deep freeze is setting in. Most of the NWT and NU are forecast to experience near-normal temperatures into the new year, with parts of the south-western NWT having higher than normal precipitation, and the southern part of Baffin Island having lower than normal precipitation. But to put these predictions in context, the historical percent correct rate is overwhelmingly not better than chance!

Have you looked through the 2018 Intergovernmental Panel on Climate Change Special Report on Global Warming of 1.5°C yet? It was released in October 2018 and to quote the press release,

> *"One of the key messages that comes out very strongly from this report is that we are already seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes," said Panmao Zhai, Co-Chair of IPCC Working Group I.*
>
> *The report highlights a number of climate change impacts that could be avoided by limiting global warming to 1.5ºC compared to 2ºC, or more. For instance, by 2100, global sea level rise would be 10 cm lower with global warming of 1.5°C compared with 2°C. The likelihood of an Arctic Ocean free of sea ice in summer would be once per century with global warming of 1.5°C, compared with at least once per decade with 2°C. Coral reefs would decline by 70-90 percent with global warming of 1.5°C, whereas virtually all (> 99 percent) would be lost with 2ºC.*

In the North, we can expect to see extensive thawing of permafrost, which has huge implications for structures that rely on it for containment or foundations, and for landforms. Limiting the warming to 1.5°C would require unprecedented changes, and the use of carbon capture technologies to reach net zero carbon levels. The current trajectory has global temperatures reaching 1.5% above pre-industrial levels (and continuing upwards) by about 2040. This doesn't happen uniformly—there are already land areas in many regions that have exceeded 1.5% above pre-industrial levels, with consequences for human life as well as flora, fauna, and energy costs. I recommend giving the report a read; it can be found at http://www.ipcc.ch/report/sr15/.

There are a few development activities to highlight in the NWT and NU:

- In the Environmental Assessment forum, Baffinland Iron Mines has applied to increase production to 12 Mtpa (double), which involves construction of a north railway to transport ore to the marine port for shipping to markets. If the already permitted south railway is constructed, production would

eventually increase to 30 Mtpa. The expansion is undergoing concurrent review for the environmental assessment and the water licence, with EA hearings scheduled for next May in Pond Inlet.

- Two of the Northern mines have proposed disposing of tailings in mined-out pits, and this is undergoing review. Current closure plans involve reconnecting the pits to the large, pristine, lakes that they are adjacent to, once water quality is acceptable, and the addition of tailings raises questions for closure. It will be important to understand the groundwater flow direction and quality, and the likelihood of stratification of the pits.
- The TliCho All-Season Road construction contract has been awarded, and this will open up the development of the Fortune NICO mine (gold/copper/cobalt) in the western NWT.
- Canadian Zinc Corp. (now re-named NorZinc Ltd.) received a positive decision on the 184 km all-season Road EA, and will now be able to proceed to permitting of the access route to the Prairie Creek lead-zinc-silver mine.
- The Giant Mine Remediation Team will be submitting the Type A Water Licence application in January, which will kick off intensive review and stakeholder meetings.

The diamond mines in the NWT are now subject to the *Metal and Diamond Mining Effluent Regulations* (which replace the *Metal Mining Effluent Regulations*) as of June 1, 2018. This will bring additional reporting and monitoring requirements to the three operating diamond mines. The updated legislation will also have some new effluent criteria requirements for operating mines, as well as some changes to monitoring requirements.

Municipal wastewater management continues to be a challenge in the North, and a new document has been circulated for review: *W203 Municipal Wastewater Treatment in Northern Communities using Lagoon and Wetland Systems (New Standard)*. The draft report is available at https://publicreview.csa.ca/Home/Details/3176 under "Natural Resources" (once you sign on) and comments are accepted until January 16, 2019.

In closing I would like to wish everyone a happy and restful Christmas, with time spent in whatever activities are meaningful and bring good cheer!

From the Nov. 23, 2018 Yellowknifer: *Photo: John Nagy, ENR, GNWT*

Bathurst and Bluenose-East Herds Continue to 'Decline Significantly'

by Avery Zingel

Northern News Services

The latest population surveys conducted by the Department of Environment and Natural Resources (ENR) indicate both the Bathurst and Bluenose-East caribou herds "continue to decline significantly," officials announced on Nov. 20.

"The news that I am sharing with you today is not good. The really troubling results are for the Bathurst and Bluenose-East herds," said Minister Robert C. Mcleod, announcing the decline of both herds.

Surveys completed in June 2018 show the Bathurst herd has more than halved in size, from 20,000 animals in 2015 to 8,200 in 2018. Both populations shrank despite co-management and work to protect the herds, he said.

In response to questions from Yellowknifer about whether the federal government could institute a federal safety net order under the Species At Risk Act, McLeod responded that he hopes it won't come to that. "That's always a possibility," he said, adding that it could happen if the federal government finds the "made in the NWT approach" to be unsatisfactory. The federal environment minister may only recommend a safety-net order if there are no other federal laws that will ensure protection and if the minister is of the opinion that the laws of a province or territory do not effectively protect a species' critical habitat.

In July 2018, eight of the NWT's nine barren-ground caribou herds (all but the Porcupine herd) were listed as species at risk under the territory's species at risk legislation. The designation triggers a legal requirement to develop a recovery strategy for the herds within two years. Management plans are already in place for several of the territory's herds. The Bluenose-West and Bathurst herds surveyed this summer are showing more stable populations. The Bathurst herd rose from 2,500 animals in 2015 to 4,500 in 2018, states a Nov. 20 news release from ENR. The Bluenose-West herd has been stable for the last decade and stands at 21,000 animals. The Tuktoyaktuk Peninsula population is estimated to have declined from 1,900 animals in 2015 to 1,500 animals. Traditional knowledge from Inuvialuit and Gwich'in peoples indicate historical fluctuations in caribou herds, with both "sharp declines and rapid increases in the past," said McLeod.

Despite that historical knowledge, the herds must be managed on an ongoing basis using scientific and traditional knowledge, he said. McLeod reached out to Indigenous governments and the renewable resources boards to "start immediate work" to create joint proposals with affected Indigenous governments.

"We need to avoid the temptation to look for easy explanations. We cannot afford to be a one-issue government," he said, adding the government must balance social, economic and environmental priorities. There are nine herds that spend all or most of their time in the NWT. With major declines in herds, most of them use a smaller "core range" compared to their historical ranges, said Joe Dragon, deputy minister of ENR.

Caribou species have historically followed stark declines and population expansion, as part of a "natural ebb and flow," said Dragon. However, "the decline within three years is very alarming," he said. "While populations are low it is important that we work together to protect caribou." ENR will now consult with Indigenous governments to push forward with three year management plans, which will go through the renewable resource boards and go to public hearings. In the face of significant decline in the Bathurst herd, all resident and outfitter harvests closed in 2009. In 2010, the size of Indigenous harvest of the herd was reduced from an estimated 5,000 animals per year to 300 animals per year, with 150 tags allocated to Tlicho people and 120 to the Yellowknives Dene First Nation.

To manage the Bluenose- East herd, the Advisory Committee for Cooperation on Wildlife Management recommended an interim harvest limit of 1,800 animals, with 80 per cent bulls in 2015. In 2016, the Wek'eezhii Renewable Resources Board (WRRB) determined that 750 animals could be harvested within the Wek'eezhkii boundary, in support of the Sahtu Renewable Resources Board's Deline plan to harvest up to 150 animals, 80 per cent of which would be bulls. Deline implemented its own community-based caribou conservation plan, which allows for community self-regulation of caribou harvesting. Since 2010, Tlicho communities and Deline have primarily harvested from the Bluenose-East herd, with some harvest from Kugluktuk and Nunavut. Bathurst and Bluenose-East herds continue to 'decline significantly'.

Note: The Cape Bathurst herds surveyed in summer 2018 are showing more stable populations than the Bathurst and Bluenose-East populations. The Cape Bathurst herd rose from 2,500 animals in 2015 to 4,500 in 2018.

Book Review

By Bob Gainer, CSEB Alberta Member

Doubt and Certainty in Climate Science

by Alan Longhurst

This is an eBook that I downloaded free, 250 pages mostly 500 words per page; a lot of paper and toner! It took me a long time to make some sense of the topics that aren't my field of expertise. Three years ago, it was recommended reading in the CSEB 72 (4):6 by Judith Curry, and it has taken me this long to try and highlight one chapter (of 11 total). In three pages, I have tried to consolidate 33 pages of Arctic science that resonated with me.

Longhurst is a British-born Canadian who was an oceanographer and climatologist all his life. He is extremely well regarded, was in charge of several programs at Scripps, La Jolla (1967-71) and became Director-General and Research Scientist at the Bedford Institute of Oceanography, Nova Scotia from 1977-86. He wrote this from 2012-15 when he was almost 90, in response to what he perceived to be the public's exposure to only a single factor determining climate change; that is, atmospheric CO_2. Compared to him, I am a total simpleton when I attempt to present here a Farley Mowat style take on the Arctic icepack.

More than anything, this is about Confirmation Bias and Science. Farley and I have it about equal. Almost all the old men my age (mid seventies) are convinced it was much colder when we were growing up. I am sure of that, from longer farming seasons with which I am still affiliated, life-long bird watching and field biology, wildlife management and its enormous changes, my body, etc., and in Western Canada, I am surrounded by anthropogenic CO_2 production. Global Warming fits so I should quit my whining and pay my carbon tax.

Longhurst admits to his oceanographic Confirmation Bias, but does a review of several not so obvious climate sciences that may or may not support his views, including the atmospheric CO_2 group. What he objects to is that the Confirmation Bias of the anthropogenic atmosphere CO_2 group is not recognized, by them or seemingly by the public, when it is obvious that climate change is not single factorial.

The best illustration for me was Chapter 8 on Polar Regions, which I have condensed here. The Arctic Ocean is a tiny ocean, 3.7% of the ocean surface, and very shallow and fresh because of its extensive coastline. Despite its small size, it gets 11% of the world's freshwater, almost all from Siberia that has five rivers draining into it the size of the Mackenzie River or much larger (like the Lena). Near its approximate center the North Pole, it has more depth and, salt water being heavier, salinity. Approximately 50% of the coastline is Russian, 25% Canadian, 10% American and 15% Danish (Greenland) and Norwegian.

Of the warm saline water that enters the Arctic, 90% comes from the Gulf Stream that whips eastward around Norway and mostly deflects towards the Pole by the coastal shelf. The Russian coastline does not have the extensive network of Queen Elizabeth Islands, so enough of the warm saline water follows the coast to keep the shipping season open most years. Another 10% of the warm saline water that enters the Arctic comes from the Japanese current that mostly diverts eastward around Alaska and is deflected to the Pole by the coastal shelf of the Queen Elizabeth Islands. Almost all the water that exits the Arctic is via the Labrador Current between Greenland and the Canadian Islands. Rarely is there an ice-free shipping season in the Canadian Arctic.

The most obvious factor in ice formation is the ratio of freshwater from the northern river drainage to the salt from the effects of the Gulf, Japanese, and Labrador ocean currents. Rivers flood some years and are almost dry others, ocean currents are determined by (to me) an endless number of reasons. Over the Pole is a vortex, part of the generalized north-south tropospheric frontal mass system that brings cold air down from the relatively shallow (half the height of the equator's) polar stratosphere. When it comes to forming ice, the thermal mass of seawater at sea level is 3,500 times that of surface air. Longhurst, of course, thinks that water temperature and salinity means a lot more to the formation of pack-ice in the Arctic Ocean than people like Farley and I recognize.

For instance, if for whatever reason, e.g., frontal systems, jet-streams, *el nino*, solar storms, wobbling axis., the river volumes are exceptionally high and their water overfills the Arctic, it will block the Gulf and Japanese warm saline water from coming in and send more saline water out the Labrador route. The Arctic Ocean will be colder, less saline, and the formation of winter sea ice will be maximum. The summer sea ice minimum, that determines the shipping lane, involves multiple years and is less easy to predict.

Greenland receives attention for its glaciers. These are ice-streams descending from the high continental core of the Island where snow deposits are buried, compacted and based on their weight will over time flow downhill to the coast. Most scientists agree that the ice-cap is growing in mass centrally but losing it at the coasts. The anthropogenic surface temperature group want to confine the difference to post 1975 or less with modern temperature data, satellite information, and increased CO_2 levels. The anthropologists want to include the past 1000 years and the early Viking settlements. The geologists have pretty well figured out the last 10,000 years and the Holocene ice-age, glacier cores, tree rings, spore dating, etc. Greenland has the cold Labrador Current flowing south past its west coast but a variable amount of the warm Gulf Stream creeps up northward along its continental shelf. On Greenland's east coast, most of the Gulf Stream is barrelling by northward but a small, variable amount of cold arctic outflow is creeping along the coast southward. The west coast has glacier retreat but the east coast not.

Antarctica is very different. Whereas the Arctic is a shallow bowl of an ocean surrounded by landmasses, Antarctica is a landmass surrounded by ocean. It is a high landmass, 5,000 metres that almost enters the shallow, polar stratosphere. The landmass is approximately centered on the Pole, and it is mostly circular with a peninsula that points south towards the South American tip. The eastward flow around the continent of the Antarctica Circumpolar current has very few interruptions, essentially only the peninsula. Freshwater complications are minimal. Especially in the winter, the Polar vortex drives cold stratospheric, even lower mesospheric, air into the troposphere and down the mountain slopes to the coast.

Climate science has had a higher profile here for much longer than any other place in the world, and the pattern of the air flow and ocean currents is much more predictable. Also, this is where the hole in the ozone layer was described and was the first planet geo-engineering accomplishment by world leaders when they met in Montreal in 1987. Actually, the decreasing ozone hole in the stratosphere is making the continent cooler by about 1% a year. There is general agreement that the continent is cooling, the overall increase in mass balance of the continental ice shelves and sea-ice is increasing, and that the surrounding ocean is warming (the opposite of the western edge of the peninsula jutting out into the warming ocean: a minor component of the entire coast). The three glaciers that cover the continent and extend out into the sea are many times thicker than pack ice. Although attached, they are actually floating (an exception is the west sheet that is actually based on the ocean floor).

Winter ice does not cover the Antarctic sub-polar air mass region as it does in the Arctic, but despite the ocean being significantly warmer in recent years, there has been an increase in the little winter ice cover there is. The simplest explanation is that the colder air blowing down the continental slopes both causes ice formation and exports it out to sea. Anthropogenic surface air temperature is little discussed by most climate scientists here. Climate changes are more consistent with simpler ideas.

Suffice it to say that Longhurst did convince me that there is a lot more to climate change than my glib knowledge of Western Canada. For instance, I read a recent newspaper article about Kilimanjaro not being snow-topped anymore because of global warming. Records, downwind at the nearby Serengeti Research Center, show a steady decrease in temperature (Sinclair et al. 2008; Serengeti III p.194) but the explosive growth of two gigantic cities nearby, Dar es Salaam and Nairobi, and their local, not global effect on the mountain, are not mentioned in the article. Even I question this article's conclusion. A more open mind may be Longhurst's motive.

Alan Longhurst's Doubt and Certainty in Climate Science can be downloaded in pdf format from https://judithcurry.com/2015/09/20/new-book-doubt-and-certainty-in-climate-science/

Evidence Call for Grey Literature

The Canadian Centre for Evidenced-Based Conservation and Environmental Management (CEBCEM) at Carleton University needs your help with three ongoing systematic reviews:

"Do fish passage facilities and culverts promote fish movement at barriers? A systematic review"

Aim:

The primary objective of this systematic review is to determine the extent to which fish passage facilities [including engineered structures (e.g., Denil, pool and weir, vertical slot or other orifice, elevators), trap and transport programs, and nature-like fishways] and culverts facilitate upstream and downstream passage of fish at barriers.

What are we looking for:

The review team is sourcing key data on this topic in the form of:

- Academic research and theses
- Unpublished academic research and theses
- Unpublished negative/non-significant results
- Consultancy or internal reports
- Government papers or policy documents
- Monitoring and evaluation data
- All other literature "that is produced on all levels of government, academics, business, and industry in print and electronic formats, but which is not controlled by commercial publishers" (4th International Conference on Grey Literature, 1999).

Get in touch:

If you can provide any grey literature (or relevant published material) on this subject, please send any information to jessicataylor3@cunet.carleton.ca.

Evidence Call for Grey Literature

The Canadian Centre for Evidenced-Based Conservation and Environmental Management (CEBCEM) at Carleton University needs your help with three ongoing systematic reviews:

"Are captive breeding programs for imperilled freshwater fishes and mussels effective achieving conservation targets in the wild? A systematic review"

Aim:

The objective of this systematic review is to evaluate the effectiveness of captive breeding programs at achieving conservation targets for imperilled freshwater fishes and mussels. This includes information on any components of captive breeding, including:

- Collection of wild individuals for use in captive breeding programs
- Details on how individuals are raised in captivity (e.g., methods, assessments)
- Post-release monitoring of captive bred individuals in to the wild
- Assessment of success/failures.

What are we looking for:

The review team is sourcing key data on this topic in the form of:

- Academic research and theses
- Unpublished negative/non-significant results
- Consultancy or internal reports
- Government papers or policy documents
- Monitoring and evaluation data
- All other literature "that is produced on all levels of government, academics, business, and industry in print and electronic formats, but which is not controlled by commercial publishers" (4th International Conference on Grey Literature, 1999).

Get in touch:

If you can provide any grey literature (or relevant published material) on this subject, please send any information to Lisa.Donaldson@carleton.ca.

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