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# **THE CANADIAN SOCIETY OF ENVIRONMENTAL BIOLOGISTS Bulletin**

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# CSEB Bulletin SCBE

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Front Cover: R.H. Murray, first Sulphur Fumes Arbitrator at Port Colborne, Ontario, 1959 (see article on 50th Anniversary of Ontario Ministry of Environment by W.D. McIlveen in this issue of the CSEB Bulletin)

Back Cover: Northern Flicker (*Colaptes auratus*) at a feeder in Edmonton, Alberta, February, 2022. Photo Credit: Gary Ash, CSEB Member.

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## CSEB BULLETIN 2022

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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](mailto:garyash@shaw.ca).

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## LE BULLETIN de la SCBE 2022

Vol. 79, Numéro 1, Printemps 2022

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

**Tout la correspondance d'affaires, y compris les abonnements, les changements d'adresse, les exemplaires retournés et les formulaires:** CSEB National Office, P.O. Box 962, Station F, Toronto, ON, M4Y 2N9. **Les lettres à l'éditeur:** Gary Ash, Editor, Courriel: [garyash@shaw.ca](mailto:garyash@shaw.ca)

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The views expressed herein are the writer's of the articles and are not necessarily endorsed by CSEB, which welcomes a broad range of viewpoints. To submit a piece for consideration, email [newslettereditor@cseb-scbe.org](mailto:newslettereditor@cseb-scbe.org).

## 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 to minimize environmental effects.
- to maintain high professional standards in education, research and management related to natural resources and the environment.

### OBJECTIFS de la SOCIÉTÉ

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

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

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# NATIONAL News

## PRESIDENT'S Report

By Curt Schroeder, CSEB President

Pronouncements of reconciliation with Indigenous people has become a strong message from all levels of government, business, and civil society in Canada. As we individually and collectively absorb the truth of our relationship with Indigenous people, elements of Indigenous culture and spirit are becoming more visible and part of the fabric of our national culture and values. Think National Indigenous Peoples Day. The connection with land that Indigenous people celebrate is challenging commonly held beliefs and understanding of our relationship with nature. A good example is the growing jurisprudence and use of the legal system to extend our understanding of the rights of nature.

For instance, in February 2021, in eastern Quebec, legal history was made when the people of Ekuanitshit and the regional municipality made a joint declaration to grant the Mutehekau Shipu (Magie Pie River) legal personhood and rights, the first resolution of its kind in Canada. This largely Indigenous led movement stands in contrast to non-Indigenous corporate law, giving nature legal equality that will hold governments accountable to any infringement of their rights. Given the crises in biodiversity and climate change, this new approach to protecting nature by legal means can only provide greater hope that all life on this planet has a future. For members of the CSEB, this can only invigorate our personal, spiritual and professional meaning.

### The Canadian Botanical Association

The CBA/ABC Bulletin may be of interest to some CSEB members. The CBA/ABC Bulletin is issued three times a year (March, September, and December) and is freely available on the CBA website. Hardcopy subscriptions are available for a fee.

For more information, see their website at the following URL: <http://www.cba-abc.ca/>

### CSEB VOLUNTEERS NEEDED

#### Website Assistant:

CSEB requires a volunteer to assist our Webmaster Brian Free with managing the CSEB Website. You should be familiar with using WordPress for website management, and able to gather relevant material for posting on the site. It would also be useful to have experience with MailChimp for sending out webinar and other notices, but training can be provided. For more information, please contact Brian Free at [bfree@cseb-scbe.org](mailto:bfree@cseb-scbe.org).

For more information, contact President Curt Schroeder at [schroederc@saskpolytech.ca](mailto:schroederc@saskpolytech.ca).

## SCIENCE TIDBITS

Submitted by John Retallack, CSEB Alberta Member

### INSECTS AND REPTILES

#### Butterfly Flight is More Complex Than it Appears

Researchers L. C. Johansson and P. Henningson from Lund University in Sweden analyzed the flight mechanisms of butterflies using silver-washed fritillaries (*Argynnis paphia*), [Journal of the Royal Society Interface, January 20, 2021, Volume 18 (174)].

With unusually large, short, and broad wings for their body size, the aerodynamics of butterfly flight has puzzled scientists for centuries. Using high-speed motion photography, the researchers were able to refine the description of the cupping action between the wings at takeoff. The wings in the first strokes at takeoff resembled the shape of an inflated pita that, when squeezed in the upward stroke, created an air-jet effect ultimately ending in a clap at the top of the stroke. The initial strokes propelled the insects forward rather than upward.

Co-author Per Henningson, notes, "The leading and the trailing edge are meeting before the central part, forming this pocket shape. We think that sort of behaviour is going to improve the clap because it forms an air pocket between the wings which, when the wings collapse, makes the jet even stronger and more efficient."

To test their theory, the researchers built two sets of mechanical clappers, one set rigid and the other flexible and more like butterfly wings. The flexible wings were able to generate improved efficiency of 28% during simulated take-off.

The authors did not assess sustained flight but speculated that the higher velocity clap and jet motion of their flexible wings may be limited to take-off and suggested a different wing action may be used during sustained flight.

#### And Chameleons Get Even Smaller

As the scientific world celebrates the discovery of more macrofauna, scientists in northern Madagascar have discovered what appears to be a 'spectacular case of extreme miniaturization' — a new smallest reptile — *Brookesia nana* (Scientific Reports Volume 11, Article number 2522).

The German-Madagascan expedition team in Madagascar discovered the new species in degraded montane rainforest in northern Madagascar, and it may already be threatened with extinction due to deforestation in the region.

Male specimens of *B. nana* have body lengths of around 13.5 mm, with an overall length of 22 mm. Females are slightly larger at about 29 mm.

Researchers were able to determine that diet of *B. nana* appears to be largely of mites from the rainforest floor.

# What Darwin's Missing Microscope Saw and Could Not See

Submitted by Loys Maingon, CSEB BC Director

One of the items that made the news in mid-December was the discovery and auction at Sotheby's of Charles Darwin's first microscope.<sup>1</sup> The story that comes with this discovery should interest not only fans of Darwin, but all naturalists.

The find revolutionizes our understanding of Darwin the naturalist, and what we know of his use of microscopes. Until this discovery, it was generally accepted that Darwin was gifted his first microscope by a mathematician friend, John Maurice Herbert, while he was a student at Christ's College, Cambridge, in 1831.<sup>2</sup> In fact, before he went on to Cambridge to graduate in "Natural Theology," Darwin followed in his father's footsteps to study medicine in Edinburgh. It seems that Darwin had very little inclination for medicine and even less for mathematics, and therefore was headed for a career in the Church of England. Upon graduating and stepping on the *Beagle* December 27<sup>th</sup> 1831, he escaped that fate largely thanks to his first microscope.

As is common to this day in most medical faculties, Darwin would have been required to have a medical microscope. It was a portable microscope (Figure 1) in a case 3 inches by 4 inches and 2 inches high.



Figure 1: Darwin's first microscope, picture from public domain, <https://kottke.org/21/12/charles-darwins-first-microscope>.

This microscope was cutting-edge technology for its time. It cost 11 pounds and 16 shillings, which is conservatively about \$1,100 in today's money, and was most likely a gift from his father. While at Edinburgh, in an effort to dodge math and medicine lectures as best he could, Darwin joined the local naturalist society, "The Plinian Society." He used his medical microscope to write his first

scientific paper on single-celled and micro-invertebrates that he collected from the banks of Edinburgh's estuary, the Firth of Forth.

Although this microscope did the job, unlike the one given to him by Herbert, which is the one he took on *The Beagle*, it was not specifically designed to study protists and other aquatic organisms. Nonetheless, for historians, that early work done on a "medical microscope" holds the key to questions on the unity of life that underlies Darwin's later work. These questions are encapsulated in the famous closing sentence of *The Origin of Species*: "From so simple a beginning, endless forms most beautiful have been, and are being, evolved."

The world of single-celled and micro-invertebrates remains to this day poorly known, with an estimated 88% of species still uncatalogued and unknown, and largely ignored because of the limitations of light microscopy. This is the realm of single-celled and microscopic multi-celled organisms that share photosynthetic abilities. It challenges the assumptions inherent to the facile division made between "plants" and "animals" at a macroscopic scale. This was re-classified several times, and always unsatisfactorily, as "Kingdom Chromista" by the late Thomas Cavalier-Smith (1942–2021), who held the Chair of botany at UBC from 1989–2000 before moving back to Oxford. In that sense, Darwin's inquiries into the origins and evolution of species began in a kingdom conveniently largely ignored by mankind that stood on its head everything that theology taught. It is the shape-shifting world of parasites, algae, and fungi rolled into one, essential to life as we know it and which makes a mockery of mankind's self-importance. And yet, Darwin obviously marvelled at its beauty.

Members of the Kingdom Chromista are all around us often usually invisible to the naked eye and sometimes transiently present wherever there is water in damp and wet environments. Chromistas all share in having photosynthetic organelles containing chlorophyll *c*. They originate from a red algal ancestor, and even its non-photosynthetic members can be shown to originate from ancestors that performed photosynthesis. As with many freshwater algae, their life cycle forms shift with season, temperature, and environmental chemistry.

Few organisms illustrate the complexities and contradictions of the Kingdom Chromista that confronted young Darwin better than *Ophrydium versatile*. Although this is technically classed by zoology as a sessile ciliate, it is often better described in texts dealing with algae. Like lichens, this protozoan meets its energy needs by hosting algae that excrete mono and di-saccharides that the non-photosynthetic zooid, known as a "peritrich" absorbs. In dark and low temperature nutrient environments (winter and fall), the peritrich lives individually in pond bottoms by actively scavenging bacteria, microalgae, and small crustaceans. A couple of photos taken February 15<sup>th</sup>, 2022 in a pond after snow melt at Buttle Lake can illustrate this part of the cycle. Figure 2 shows the peritrich swimming and opening its mouth, Figure 3 shows



Figure 2: *Peritrich* swimming (stoma upper left). Figure 3: Sessile *Peritrich* with stoma open (bottom).

the peritrich with its mouth open and its corolla of reduced cilia engulfing.

As temperatures warm with increased sunlight, the peritrich aggregate into colonies and live photosynthetically much like an algal ball. Figure 3 is a photo of *Ophrydium versatile* taken in August in a vernal pond near Rossiter Lake, BC. The theory, at least until recently, has been that the zooids are host to the green algae *Chlorella* or *Zoochlorella*. In the warmer sunnier seasons, until temperatures drop and passive solar energy is no longer sufficient, the algae's photosynthate keep the zooids alive.

The *Ophrydium* colonies are fragile gelatinous assemblages that can be fragmented easily. As with lichens, fragmentation can be a source of reproduction and dispersion. Fragments caught in a duck's plumage or on a mink's fur coat can transplant not only an *Ophrydium* zooid, but an entire pond ecosystem in one shot. The reason for this lies in more recent insights into *Ophrydium*, and into the nature of the "species" concept. Although the general description of *Ophrydium* as a species is correct, it has been challenged in two places thanks to advances in microbiology. First, it has been found that, as with lichens, the algae in *Ophrydium* are not just *Chlorella*, they can also be members of the Trebouxyphyceae, which are also the main photobionts in lichens. So there is a lot of variation in the species, which challenges the very individualistic concept of "species" itself.



Figure 3: *Ophrydium versatile* colonies in a pond by Rossiter Lake.

Second, that *Ophrydium* species were a simple fairly passive symbiosis was the theory until the late (and very great) Lynn Margulis (1938–2011), who authored the endosymbiotic theory of evolution in 1966, and went on to write *The Symbiotic Planet*

(1998), analyzed and compared the composition of *Ophrydium versatile* samples from British Columbia and Massachusetts. Rather than look at the peritrich itself as the species unit, B. Duval and Lynn Margulis looked at the composition of the gel matrix. They found that not only were the algae completely different species, but the saccharide gel matrix wasn't just the peritrich's secretion, it was home to euglenoids, helizoans, diatoms (*Nitzschia*, *Navicula*, *Gyrosigma*, *Cymbella*), filamentous and coccoid cyanobacteria, bacilliform bacteria, methanogenic bacteria, spirochaetes, fungal organisms, ciliates, rotifers, nematodes, and copepods. In other words, the *Ophrydium versatile* colony hosted an entire ecosystem representative of their entire environment. Like lichens, they were enclosed ecosystems unto themselves. In Margulis' assessment, individual *Ophrydium* is really a kind of super-cell:

“...the algae of *Ophrydium* are trapped into the service of the jelly ball community. Each 'individual organism' in this 'species' is really a group, a membrane bound packet of microbes that looks and acts as a single individual.”<sup>3</sup>

So what's in it for the *Ophrydium* zooid and its algal partner? The colony gel matrix assures the survival of representatives of the pond ecosystem, through the hot, low oxygen, and drought periods of the pond ecosystem. The zooids are both autotrophic (produce their own energy) and heterotrophic (capture and consume their preys' energy). The zooids don't just carry around their autotrophic solar energy and carbohydrate source, they also capture and “cultivate” their heterotrophic “farm.”

Of course, Margulis herself may be a victim of “social appearances.” As with lichens and all successful marriages, it is never really clear who is dominant. The zooid who provides shelter and micronutrients is as much a captive working for the algae as the algae is of the zooid. The colony stage of the species *Ophrydium* isn't just an individual, it is a Noah's ark of species for colonization from extreme environments in a time of extreme climates. In this respect, that would be consistent with the interpretation of Margulis and Mark McMenamin that *Ophrydium* is representative of the soft-bodied eukaryotic organisms characteristic of the Ediacaran age that evolved 635 million years ago after the deglaciation of the Cryogenian period.<sup>4</sup>

When we consider the limitations of Darwin's first microscope, we can only marvel at the perceptiveness and skill of Victorian zoologists. Figures 1 and 2 above are about 1200x magnification on a standard light microscope enhanced with illumination and photographic zoom. Even with these modern advances, it barely pushes the limits of light microscopy to identify an organism to species. Darwin's first two microscopes were limited to about 200x magnification under ambient light directed by a mirror. It took incredible perceptive skills to identify individual species, and record their features in ink drawings and watercolours. Many of these skills have been lost in our economically and technologically spoiled society, but can still be found in third world researchers. The skills involve using glimpsed intuitions into the structure of organisms, which while grossly correct, can also result in misinterpretation. Viewing depends on honed skill of interpretation.

Darwin's first microscope provided him with insight into the early life forms of this planet. His genius was to use his

interpretation of the phenomena of the unity of Chromista life forms to build on and interpret the evolution of macroscopic life. His handicap was his cultural baggage. He was a Victorian member of a culture of romantic individuality and, therefore, saw mainly the individual struggle for existence. As understanding and technology progressed researchers like Lynn Margulis, Thomas Cavalier-Smith, and James Lovelock increasingly built a symbiotic picture of life that is not really a contradiction of Darwin, but a furtherance of his original insight.

## References

- 1 <https://www.theguardian.com/science/video/2021/dec/16/darwins-lost-microscope-the-auction-of-a-history-making-box-of-brass-video>
- 2 <https://www.whipplemuseum.cam.ac.uk/explore/collections/microscopes/charles-darwins-microscopes> ; <https://www.darwinproject.ac.uk/john-maurice-herbert>
- 3 Lynn Margulis (1998) *Symbiotic Planet (Anew Look at Evolution.*” Basic Books, p.11.
- 4 Mark McMenamin (2000) *The Garden of Ediacara.* Columbia University Press.

# Climate Change Just One Fix for an Ailing Planet

Submitted by Patrick Stewart, CSEB Vice President and Atlantic Director

With the COP26 UN Climate Change Summit so much in the news, anyone might conclude that carbon dioxide in the atmosphere is the most important environmental issue facing humankind. After all, the summit’s website trumpets “climate change is the greatest risk facing us all”.

But at the beginning of this year, a group of leading environmental scientists presented a different and more disturbing view. Humans have truly wrecked the planet and its ecosystems almost beyond recovery, and climate change is only one—and not the most important one—of our collective impacts.

Presented in a perspective article in the scientific journal *Frontiers in Conservation Science* in early January [<https://www.frontiersin.org/articles/10.3389/fcsc.2020.615419/full>], 17 scientists, led by Dr. Corey Bradshaw of the College of Science and Engineering, Flinders University, Australia, summarized the long list of the devastating impacts humans have had on the environment.

Biodiversity loss and with it, the Earth’s very capacity to support complex life, is the biggest concern. Climate change affects biodiversity too, but it is the continued expansion of humans to occupy nearly every corner of the planet and use every last bit of resources, that is literally killing Nature and us in the bargain.

The message was unheralded, lost largely in the media storm post-US presidential election and inauguration in January 2021, not to mention COVID19 and the second wave upswing in cases in Canada and the pandemic around the world. Only a few major media outlets picked it up.

But for environmental scientists, it gave voice to what most of them already knew—the earth on nearly every front, is in extremely bad shape thanks to humans. We don’t and can’t realize the extent of the problem because it is so large and complex. And we can’t rely on our governments and politicians to do enough to fix it.

Rather than prescribing solutions, the article was a call for environmental scientists to stand up and be frank, to tell it like it is. No more ‘gilding the bitter pill’. All outcomes are going to be bad. All we can hope for is to make them less bad.

Burgeoning global society, both numbers, and the resources and industrialization and energy needed to support us, and their collective massive impact on nature are to blame. There are nearly eight billion people on earth and birth rates worldwide aren’t declining. The natural world simply can’t support us all.

The researchers, which included Paul and Anne Ehrlich, now in their eighties, who popularized the threat of massive population growth back in the sixties in their book *The Population Bomb*, noted that there are more humans on earth and we collectively weigh more, many

times more, than all other animals—insects, birds, fish, mammals, reptiles—on earth, combined. This is a serious imbalance on the world’s ecosystems. It didn’t used to be that way.

Our agricultural production and what is needed to sustain us is now greater than the Earth’s own natural productivity. In other words, humans now produce 170% of what the Earth’s ecosystems can produce naturally. [<https://www.mdpi.com/2079-9276/7/3/58/html>] Think about that one.

Another fact. The sum total of natural vegetation on the land is only half of what it was when humans adopted agriculture a mere 10,000 years ago.

Which means that the relatively thin protective layer of plants in the forests and grasslands that blanket the Earth and algae in the ocean—which use energy from the sun to live, store carbon, produce oxygen, and feed us and all other animals, as well as protect the Earth from becoming lifeless like all other planets in our solar system—is rapidly going.

Add to that, our activities have wiped out more than 20% of the species of plants and animals that used to exist on the planet, and placed a similar number in danger of extinction over the next few decades. So even biodiversity is going.

Life itself, the common force that drives all living things on the planet, the thing that makes the Earth unique in the universe and enabled it in past to survive cataclysmic events such as asteroid impacts, is fragile. And again it is in danger.

Not to mention some of the things we do so well, like producing vast quantities of plastics that threaten to overwhelm the ocean.

And of course the carbon dioxide we are responsible for, which threatens so much of our lives today through climate change.

And we still have poverty and famine around the world. Not very good stats!

The scientists who wrote the article are clear—politicians are not going to provide the answers. They ask “... what political or economic system, or leadership, is prepared to handle the predicted disasters, or even capable of such action?”

And our human tendency to be optimistic—“optimism bias” it is called—gets in the way and leads us to underestimate the severity of the crisis and ignore expert warnings. So we need a loud wake-up call.

It will be truly a daunting task. Look at the tremendous effort that brought climate change to the forefront of our awareness.

If you think it’s been a challenge for a well-off country like Canada to get all our citizens vaccinated against the coronavirus—something

that can have a direct impact on their health and that of their families—think of how difficult it will be to bring about the almost total change in our ways that will be needed when options won't be available or pleasant.

We also will need an economic system that is not based on growth, the scientists' group says. Ask any economist what they think of that! But we will have to find a way to work out the economics or risk the consequences.

Failure to appreciate that we're in deep trouble and failure to act... now, "will ... diminish our political capacity to mitigate the erosion of the ecosystem services [the many uses Nature is to us] on which Society depends".

It wasn't the scientists' purpose to provide answers. But their facts suggest that we have to come up with our own ways to stop

the moving train and focus on ways we can work within a new framework.

Of course controlling global warming must be a part. And governments, however unpredictable in their actions, must be important players, but ultimately their actions can only be a part of the solution.

Anything we do, as individuals and organizations and governments will help. We have to act now. We must do something, we must do more. There is enough information out there for each of us to find a way, just look for it. It may just be enough to give Nature a chance, and humans too, as one small part of it, a little more time.

*Reprinted with permission of the author from The Chronicle Herald, Sat. Nov. 13<sup>th</sup>, p. D4.*

### Species That Were Assigned a Status by COSEWIC at its Recent Species Assessment Meeting

The Committee on the Status of Endangered Wildlife had an on-line meeting from November 22–25 and November 29–December 1, 2021. At the meeting, 20 Designated Units comprising 11 different species of animals and plants were assessed. The statuses ranged from extinct or extirpated to endangered, threatened, and special concern. The impact of the COVID pandemic prevented the regular in-person meeting so fewer than the normal number of species were assessed, and it was not feasible to complete the normal press release.

**Summary of COSEWIC Wildlife Species Assessments, December 2021\*** — Submitted by Dr. David Richardson

*Wildlife species are sorted according to current status and then by common name.*

STATUS	COMMON NAME (POPULATION NAME)	SCIENTIFIC NAME	RANGE OF OCCURRENCE
Extirpated	Black-footed Ferret	<i>Mustela nigripes</i>	AB SK
Extirpated	Dwarf Wedgemussel	<i>Alasmidonta heterodon</i>	NB
Threatened	Eastern Foxsnake (Carolinian population)	<i>Pantherophis vulpinus</i>	ON
Threatened	Eastern Foxsnake (Great Lakes / St. Lawrence population)	<i>Pantherophis vulpinus</i>	ON
Extirpated	Greater Prairie-Chicken	<i>Tympanuchus cupido pinnatus</i>	AB SK MB ON
Extirpated	Greater Sage-Grouse <i>phaios</i> subspecies	<i>Centrocercus urophasianus phaios</i>	BC
Endangered	Greater Sage-Grouse <i>urophasianus</i> subspecies	<i>Centrocercus urophasianus urophasianus</i>	AB SK
Extirpated	Incurved Grizzled Moss	<i>Ptychomitrium incurvum</i>	ON
Endangered	Mountain Plover	<i>Charadrius montanus</i>	AB SK
Endangered	Northern Leopard Frog (Rocky Mountain population)	<i>Lithobates pipiens</i>	BC
Endangered	Sage Thrasher	<i>Oreoscoptes montanus</i>	BC AB SK
Endangered	Sharp-tailed Snake (Coast Mountains population)	<i>Contia tenuis</i>	BC
Threatened	Sharp-tailed Snake (Pacific Coast population)	<i>Contia tenuis</i>	BC
Extinct	Sockeye Salmon (Adams ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean
Endangered	Sockeye Salmon (Fraser-ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean
Endangered	Sockeye Salmon (Momich-ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean
Extinct	Sockeye Salmon (North Barriere-ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean
Extinct	Sockeye Salmon (Seton-S population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean

**Summary of COSEWIC Wildlife Species Assessments, December 2021\***

**Wildlife species are sorted according to current status and then by common name.**

Special Concern	Sockeye Salmon (Alouette-ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean
Special Concern	Sockeye Salmon (Coquitlam-ES population (original))	<i>Oncorhynchus nerka</i>	BC Pacific_Ocean

\* The review of classification of the Northern Leopard Frog (*Lithobates pipiens*), Western Boreal/Prairie populations, was also completed but the report was deferred to allow further consideration of the Designatable Unit structure.

## REGIONAL News

## BRITISH COLUMBIA News

Submitted by Loys Maingon, CSEB BC Director

### Reason in Chaos' Butterfly Storm

*"But when you pursue incompatible aims, the first casualty is logic."*

*(George Monbiot)*

It is February 28<sup>th</sup> and the IPCC has just released its latest report, the bleakest yet.<sup>1</sup> It makes clear that decades of ignoring science have brought us to the brink and "we are looking at a brief and closing window to secure a livable future", "no inhabited region escaping dire impacts." This dismal situation is not simply a product of failed politics, but a failure of reason to accept science and design policies in a timely fashion, as the facts before us have required for the last 50 years. This is the product of putting economics before science and reality. The doors to mitigation are now closing and even if we can restrain the continued rise in carbon, our only realistic coping strategy lies in adaptation to a dangerous situation aptly summed up in the headline: "*Climate change is Harming the Planet Faster Than We Can Adapt, U.N. Warns.*"<sup>2</sup> As with COVID-19, after five decades, the real problem in mobilizing nations to address the situation is a growing trend in irrationalism resistant to facts and increasingly violently hostile to science, driven to different degrees by politicians left and right who are beholden to economic agendas.

Nothing quite illustrates the state of irrational social chaos that conservation faces today as the recent fate of the National Butterfly Refuge, which has had to be closed down. The recent story carried in the February 6<sup>th</sup> issue of the *New York Times* makes for an edifying insight into the state of mind of North America's growing populist movement and its hostility to environmental and conservation concerns.<sup>3</sup> The National Refuge in Mission, Texas, lies on the border with Mexico. It has been a source of controversy since 2017 when the proposed building of Donald Trump's border wall threatened to destroy the integrity of the refuge. Staff opposition to the building of the wall resulted in an Internet rumor that the refuge was actually a cover for international pedophile sex trafficking. This completely false and irrational rumor was favoured and exploited by politicians advocating for the wall. As a result, the lives of staff and scientists working at the refuge have been put in danger, as has the future of the refuge itself and its endangered species.

The basic lesson of the National Butterfly Refuge is that conservation can no longer be assumed to be a bi-partisan or shared concern where facts and science are no longer treated as essential common ground. Where politicians and judges create an alternative reality that excludes or strays from the hard facts of science, they open the door not just to their political agendas, but to the irrationality of alternate facts and fictions that stoke violence. Just as Canadians never thought that they would see the irrationality of Washington's January 6<sup>th</sup> until the Ottawa Trucker's protest, so too may we also have been deluded into thinking that we will see no National Butterfly Refuge in Canada. We are already seeing environmental

violence emerge in the recent attack at a Coastal GasLink camp near Houston, B.C. That is an inevitable product of rule by injunction. Here, as at Fairy Creek, where significant impacts to, and cultural and environmental concerns for, the Morice river were dismissed by the courts in favour of the "irreparable harm" that would be "suffered" by Coastal Gaslink, we saw frustration turn to ugly violence.<sup>4</sup> Notwithstanding that this violence may be a response to the insensitivity of the national and provincial governments, the RCMP, and the law courts, violence, even as a last recourse, is a condemnable failure of reason on all sides. Injunctions need to be based on disinterested facts, not on facts favouring certain interests.

In this context, the passing of two giants of conservation ecology, Thomas Lovejoy (1941–2021) and E.O. Wilson (1929–2021), at the end of December 2021, may have marked the end of what future historians of science will look at as the golden age of classical conservation ecology. Thanks largely to the mathematical work of the Canadian-born ecologist, Robert H. McArthur (1930–1972), for much of half a century both Lovejoy and Wilson developed and advocated conservation principles based on reason substantiated by mathematics. Classical conservation ecology rested on the tacit acceptance by all parties of Daniel Moynihan's famous dictum: "*You are entitled to your opinion. But you are not entitled to your own facts.*"

Empirical facts established by reason and tested by experiment once formed the basis of a consensus of shared policies that guided the protection of our common good and common interest in the environment. They no longer do in a world driven by economic interests and dominated by alternative subjective realities that have grown increasingly hostile to hard science.

Regrettably, reason became a reviled word to the left in the 1980s, which was bent on liberating us from the straw man of Western Civilization, and to the right in the 1990s bent on finding ideological refuge in self-contradictory populist fundamentalist values. With the collapse of reason, so too came the undermining of mathematical reasoning on which the politically inconvenient physics and statistical probabilities of environmental and climate modeling rest. As Descartes argued, mathematics was not just a way to calculate, it also taught us a method to reason rigorously and correctly, based on the recognition of basic empirical facts rather than on opinion and belief. If we deny the facts and problems before us, as we have seen a significant proportion of the population do with regards to COVID-19, we slip into nihilistic irrationalism and invite historically normal authoritarian tendencies hostile to science and democracy. As I have often noted, as with democracy, science is not a given. It is a cultural artifact that came out of the Enlightenment's experiment in democracy, which is itself a fragile artificial construct. Both science and democracy need to be cultivated to be respected arbiters in civil social discourse. History shows that obscurantism and authoritarianism are the normal state of the human

condition. Science constitutes the rational common ground that restrains human frailty by recalling us to the facts. Without reason and science, narcissistic chaos knows no restraint.<sup>5</sup>

With the current rise of a science-denying populism, which correlates with the growing population and economic stresses exacerbated by climate change and biodiversity collapse, the ability of conservation advocates to elicit real support for much needed environmental targets, such as those set out at COP26, has become increasingly constrained, if not impossible. The Biden agenda is essential if this global civilization is to meet the imperatives set out at COP26. The current inability of the American administration to lead globally by implementing this agenda is consistent with the prevailing social and political inability to rationally acknowledge the seriousness of the problems we collectively face.<sup>6</sup> The United States situation is just a reflection of the global situation.

At a time when BC still refuses to produce a Species-at-Risk Act, the Minister of Forests, Lands, and Natural Resources (Katrine Conroy's) recent response to a question from Adam Olsen (MLA) regarding the destruction of an endangered population of *Pseudocypbellaria rainierensis* at Fairy Creek illustrates how ideologically partisan and anti-science this government really is. The minister states: "*The Province manages species at risk by designating Identified Wildlife Management areas, parks, and ecological areas in order to conserve species and support biodiversity.*"<sup>7</sup> This statement encapsulates this government's narrow industrial mindset, which sees the environment only as economic "natural resources."

If there is any doubt about that, it should be laid to rest with John Horgan's latest statement in creating "The Ministry of Land Stewardship." This is essentially a third ministry responsible for the environment focused almost exclusively on natural resource economics. It was created to accommodate (or co-opt) First Nations' economic land-use priorities consistent with UNDRIP as they partner with the forest industry: i.e., "*The BC government says the new ministry will help address its natural resource sector goals of Indigenous reconciliation, economic stability, and environmental sustainability.*" Presumably, a new ministry was needed because the Ministry of Environment and Climate Change and the Ministry of Forests, Lands, and Natural Resources were found to have been poor or inadequate stewards of the environment. As John Horgan stated: "*The new Ministry for Land Stewardship reflects the fact that natural resources are foundational to our province, and they are the backbone of many local economies.*" Three ministries. None is really concerned with species at risk. All are concerned with economic priorities. They are only tangentially concerned with biodiversity, and only with species at risk that do not get in the way of resource economics.

As per Katrine Conroy's statement, the only species at risk that are to be protected are those that have the good fortune of being isolated in areas set aside for the often contradictory purpose of "conservation and recreation." This is exactly the logic of the American right, which re-introduced wolf hunts outside of Yellowstone and federal lands. It is the same logic that lies behind BC's own renewed controversial wolf cull that is currently being fought in courts by scientists at Pacific Wild<sup>8</sup>.

Simply put, in NDP BC, as in ultra-republican states, if an endangered species is not in a park or on federal land, it not only

has no protection, it is open game for deliberate destruction. That is the reality behind what is sometimes referred to as: "BC's species-at-risk management program." Without an act explicitly protecting species at risk, there is no real program apart from the unsustainable programmatic destruction of the environment at which the Ministry of Forests, Lands, and Natural Resources excels.

Contrary to the most basic science, the logical ramifications of the erroneous assumptions made in the minister's statement are threefold. First, the minister assumes that the representative sum of all biodiversity in BC, genetic and otherwise, can be found in the Noah's ark of protected areas. Second, contrary to the harsh reality set out in a succession of IPCC reports over the past 30 years, the minister naively assumes that these protected conservation areas are set-asides whose boundaries will not be affected by the very real ecosystem displacements expected to result from climate change this century. This problem was the subject of recent research by S. Dobrowski et al. (2021) that advocates the need for "dynamic conservation boundaries" to replace conventional static conservation practices.<sup>9</sup> Conservation by setting aside chunks of land with static boundaries is no longer commensurate with the shifting ecological reality around us. A dynamic view of the world is not part of this government's alternative reality. Third, following on the second assumption, this government demonstrates its contempt for both the science of climate change and the science of biodiversity. This is in spite of the release of United Nations IPCC and IPBES reports linking and stressing the importance of the need to address biodiversity if we are ever to come to terms with a runaway climate change. This government exhibits a dangerous primitive technological understanding of climate change. It remains largely unaware of the existential importance of nature and biodiversity for humanity.<sup>10</sup>

British Columbians, if not all Canadians, should be very concerned about the short-sightedness of governments that only see nature as a source of "natural resources" for at least two good reasons.

First, although BC is considered a leader in climate change in Canada, the magnitude of the problem is outstripping the disconnected mindset that informs an inadequate window-dressing.<sup>11</sup> The government is nowhere on track to begin to address increasingly well-documented ecosystem-level changes which, as per the latest IPCC report, are accelerating dangerously. Even back in 2017, BC's climate plan was already criticized for being written by Shell Oil Ltd.<sup>12</sup> BC's chosen industry partner has just lost a major lawsuit for climate disinformation and is now being investigated by Congress.<sup>13</sup> Notwithstanding this, BC's NDP government continues to partner with, and follow the leadership of, Shell Oil Ltd. In BC's new budget, Shell, whose representatives have long been associated with and sit on the board of "BC's Climate Solutions Council," has now partnered in setting up the new BC Centre for Innovation and Clean Energy for technological innovation and carbon capture.<sup>14</sup> This is simply buying into the mirage of technology to reassure the public that we can continue "business-as-usual," facts and reason notwithstanding.

This partnership is in keeping with the overall Paris and Glasgow approach to climate change that is largely technological. As a recent research letter in Science (25 February 2022) concerning heavy reliance on technology indicates, the most optimistic scenario suggests that the Paris approach has a "~33% chance of staying

within 2°C of warming,” but a more realistic assessment would indicate that pledges are more likely to “result in negligible global emissions reductions of 1% by 2030.”<sup>15</sup> That is where BC’s public representations that it is reducing emissions by 40% by 2030 seem to lie at odds with factual science. This vacuous short-sighted materialistic approach will have huge implications for biodiversity and ecosystem function and services, and the economy if only with regards to the productivity of “natural resources.” (A point that the authors of the latest IPCC report take great pains to reiterate once again: “*The IPCC sets out in the strongest terms to date that the climate crisis is inseparable from the biodiversity crisis and the poverty and inequality suffered by billions of people.*”<sup>16</sup>)

Second, by either marginalizing science or disregarding the factual importance and value of wilderness for biodiversity, this government invites public complacency that fosters irrational populism hostile to science and conservation of the kind Ottawa witnessed in the “Trucker’s Protest” of 2022. BC has been talking about sustainability for three decades, during which we have witnessed the continued and unprecedented destruction of intact watersheds and the promise of sustainable working forests, as confirmed in the introduction of the Gorley–Merkel report of 2021. We have never seen anything sustainable as we destroyed the environment. BC has been legislating climate plans and talking about climate solutions since 2007. Only politicians can feign wonder that they have lost public respect and confidence in public office from a substantial segment of the voting public.

It is painful to consider that, after half a century of environmental advocacy based on the best available science guided by the Enlightenment principles of reason and reasonability that culminated in *The Clean Air Act* (1970), *The Clean Water Act* (1972), and *The Endangered Species Act* (1973), the state of the planet has continued to deteriorate to such a point that we now face global climate and biodiversity emergencies that cannot be wished away. Scientists are increasingly concerned that we have crossed irreversible “tipping points,” as defined by the International Panel on Climate Change as:

*“A level of change in system properties beyond which a system reorganizes, often in a non-linear manner and does not return to the initial state even if drivers of the change are abated.”<sup>17</sup>*

As tipping points become more ominous, the decades-old practice of sidestepping the issue by calling for more research and more certainty, is now swept aside arbitrarily by outright denial and disregard for science. This is in effect what we are seeing the US Supreme Court do by agreeing to hear the “West Virginia lawsuit,” which aims to pre-emptively restrict the Environmental Protection Agency’s ability to regulate pollution from fossil-fuel fired power stations. This lawsuit is unusual because it argues against a hypothetical regulation with no specific case to provide a test.<sup>18</sup> The court is accepting to rule on “hearsay,” which is tantamount to making a determination without facts, thereby sidelining science. (Even legally this is logically tantamount to finding one guilty without being proven guilty.)<sup>19</sup>

Beyond the public show largely staged to reassure the public that was COP26, a growing body of research amassed before February 28<sup>th</sup> and not part of the release of the IPCC report, increasingly confirms that climate change continues to proceed faster than climate models have ever anticipated. The release of two major studies in December confronts us with hard facts. The first indicated that

the giant Thwaites Glacier appears to have initiated an irreversible process of disintegration, with the ice shelf likely to break apart and “shatter like a windscreen” with long-term implications for global sea levels.<sup>20</sup> In the Antarctic, as in the Arctic, the rapid disintegration of large glacial masses is driven by ocean warming. Following the release, in March 2021, of a literature review, aptly entitled “*The quiet crossing of ocean tipping points,*” which summarizes the processes and implications of how oceans have been quietly heating<sup>21</sup> and the research gaps that still allow us to hope that “these adverse impacts... can be minimized,” a more recent high resolution study leaves no doubt that tipping points have already been crossed.

“*The quiet crossing*” merely lays out the hypothetical implications of ecosystem and species changes that ocean tipping points would cause. The second research article, “*The recent normalization of historical heat extremes*” confirms the extent of the crossing today. It is based on one hundred years of sea surface monthly data analysed at 10 x 10. It makes abundantly clear that, as of 2014, the global ocean exceeded 50% threshold extreme heat. The South Atlantic crossed that barrier in 1998 and the Indian Ocean in 2007.<sup>22</sup> Climate change, therefore, is no longer a hypothetical future, but an already established factual reality we need to address now.

We live in a global village on an ocean-planet. Regional and local processes have planetary ramifications. What happens at the South Pole affects events in the North Pole because of the role that ocean circulation plays in climate and weather events. The collapse of an ice shelf drives flooding and ocean warming, which will raise winds and drive forest fires from California to British Columbia. Ocean warming means that we will be seeing ecosystem and species population collapses accompanied by decreases in ocean productivity and sea rise. The pattern of increased extremes of droughts and floods that we have seen over the past decade is set to increase. Of especial concern, wildfires are expected to increase by one third by 2050. While none of this is really new, the question is what the official federal and provincial responses are.

With the continued development of LNG, and the renewed interest in the Alberta oilsands, which are expected to expand to meet the energy needs of China and Europe in a politically and economically destabilized world, it is more unlikely than ever that nations will be able to meet emissions targets. Therefore the response to the climate and biodiversity emergencies lies more than ever in strategies to maintain the integrity of our intact systems and minimizing further impacts to those that are in recovery.

There is also the additional structural problem that industry and business penetration of university and government institutions such as the Pacific Institute of Climate Solutions and the BC Climate Solutions Council, which are the main sources of government information, favour industry paradigms that are resistant to transformational changes in status quo. If we have seen no substantial change over the past two decades, it is because these bodies continue to hold and promote traditional mechanistic models of nature as just “natural resources.” Although more biotic interpretations of the role of our forests are well-publicized by leaders in forestry research, such as Suzanne Simard, it is important to bear in mind that within the sphere of industry-funding and public outreach, to date people like Simard represent a minority voice, with minority clout.

Relying on models that minimize the role of intact forests in the regulation of regional climates may correlate with economic

interests, but it comes at a cost. For BC one of the most notable points in the new IPCC report that has caught public attention is a reference highlighted in bold that notes:

*“Field evidence shows that anthropogenic climate change has increased the area burned by wildfire above natural levels in western North America from 1984–2017 by double for the Western USA and 11 times [sic] higher than natural in one extreme year in British Columbia (high confidence).”*<sup>23</sup>

Forests are not just a biomass of carbon on a climate balance sheet. They are living systems. As per the biotic model, intact living forest systems have a capacity to create and control regional and continental micro-climates and hydrological cycles.<sup>24</sup> Any attempt to constrain rising temperatures depends on maintaining the integrity of forests at peak hydrological retention states. It is common knowledge that the older and more complex a living forest is, the greater is its ability to retain water and lower its flammability. As has long been known, deforestation causes increased heat absorption and water loss in deforested areas, and therefore is a driver of increased forest fires and carbon release.

Given that increased global temperatures are set to drive up the number of forest fires by 33 percent by 2050,<sup>25</sup> the question is not, as we have seen in the latest budget, whether BC can increase spending on firefighting. The real question is to what extent can BC afford to continue to deforest at the current rate that is necessary to maintain the forest industry and the expected revenues to provincial coffers in the new climate change environment? Current government “business-as-usual” policy is shaped around the false narrative that we can continue to expect high revenues by pretending that the resource is infinite, even as we see it collapse, and are told by science that it is collapsing. This sustainability talk is based on an effective denial of science.

At every level, maintaining the integrity of what we have left is now more important than ever. In that respect, the actions of both the federal and provincial government remain problematic in light of our growing climate and biodiversity emergencies.

In late 2020 and 2021, the Minister of Fisheries took two significant steps affecting BC’s fisheries. First, the minister ordered the closure of fish farms in the Broughton Archipelago by 2025,<sup>26</sup> and second, the minister weighed in to lower the allowable herring catch from 20% to 10%.<sup>27</sup> With regard to the latter, it should be remembered that the Comox/Lambert Channel herring spawn is the last remaining significant herring fishery left in BC, and that, even so, it is but a pale shadow of its former glory. The public, and environmental scientists, have been calling for a moratorium and management of this stock as a marine protected area for many years. While 10% represents a significant improvement, it still carries risks for both the integrity of the spawning population and for the recovery of all coastal herring populations. A moratorium remains imperative given the precariousness of ocean ecosystems in the novel environments expected with climate change.

That the federal attitude remains cavalier and inconsistent is further evidenced by inconsistencies in the fish farm moratorium.<sup>28</sup> Although nine farms have been closed in the Broughton Archipelago, and the rest are supposed to be phased out, in April 2021 a federal judge issued an injunction allowing fish farms to re-stock, and the DFO continues to issue permits for farms to expand. It seems that

the industry and DFO staff who support aquaculture have decided to bank on either the shifting fortunes of politicians and winds of policy, or on the economic opportunities that may lie in partnerships with First Nations under UNDRIP. Indeed, it seems that on hearing the good news environmentalists forgot to read the fine print in the minister’s “Mandate letter.” The weasel word lies in this clause: “Continue to work with the province of British Columbia and Indigenous communities on a responsible plan to transition from open net-pen salmon farming...”<sup>29</sup> As Justice Pamel opined in April, it is not “responsible” to “cause irreparable harm” to industry giants and their employees. Therefore, fish farms in BC may not be shut down by 2025 as long as there are vested interests in their continuity, and as long as economics trumps science. As with the forest industry, with UNDRIP, the future of fish farms may lie in developing partnerships with First Nations, unless priorities shift away from the lucrative exploitation of our “natural resources.”

Similarly, the ambiguity of the federal government continues with regards to the Roberts Bank Terminal 2 project by the Vancouver Port Authority. Although the federal assessment resulted in a report advising the minister to reject the application, the minister’s decision has been held in abeyance since April 2020. This has enabled the Vancouver Port Authority to renew its efforts proposing to mitigate and offset known impacts. Once again, 12 noted environmental scientists have had to draft a letter reiterating what Environment Canada’s own scientists have repeatedly told the Canadian Impact Assessment Agency, all of which can be found in the agency’s own report rejecting the application.<sup>30</sup> This, as so much in BC, is a choice between two types of “irreparable harm”, short-term harm to the economy or long-term harm and impoverishment of the environment for generations to come. It is yet just another choice between business cravings and what scientists have been saying for decades.

The dire cost of rejecting or tacitly denying science is there for all to read in the latest IPCC report. Given the priorities of politicians, and the growing tone deafness of the courts, whose clear bias for the interests of business has brought them into public disrepute, it is not surprising that even the scientists are now throwing up their hands in disgust. When the BC Appeals Court reversed Justice Thompson’s ruling that suspended the Teale-Cedar injunction and effectively sent the ball back to the politicians to sort, it did so by denying that the protesters’ climate change concerns had any validity, and by criminalizing the protesters, and to add insult to injury it re-instated the injunction and extended it to September 26, 2022 by invoking once again the “irreparable harm” caused to Teale-Cedar.<sup>31</sup> By using a very narrow “letter of the law” approach, as South African judges did in Nelson Mandela’s trial, The Appeals Court bench forgot the great lesson of Justice Bertha Wilson, Canadian law rests on fiduciary contractual obligations that do not lie in the letter, but in the spirit of the law. A court that forgets that only brings itself into disrepute, as did South African courts under apartheid.

For any who care to read the IPCC report of February 28 2022, the BC Appeals Court judgment may well stand as one of the greatest ignominies in the annals of BC justice, if only because it is a judgment that encourages and abates everything that has been responsible for the calamitous future of humanity that the IPCC report outlines. It criminalizes, not the people who abuse public trust and profit from irreparable harm done to future generations, but a generation of mainly young people who listened to reason and followed what science had to say, and when they were given

no alternatives to protest, still found desperate creative means to protest as peacefully as possible, as Justice Thompson found. That they had no other options to save old-growth is obvious from the inability of Maingon and Neilson who exhausted every known legitimate avenue to prevent the destruction of species-at-risk at Fairy Creek.<sup>32</sup> If scientists can't save a species, how are poets to save a forest? Fairy Creek never saw the kind of violence now seen at Morice River, because those people still trusted that reason and science would still prevail in the courts, as they may yet.

To read the IPCC report and claim outrage and concern at failed climate leadership and for future generations is inconsistent with even a tacit approval of the Appeal Court's complicity in BC government's support for the indiscriminate environmental destruction wrought by corporations like Teale-Cedar, which drive climate change and destroy biodiversity. It, therefore, is not surprising to read that climate scientists are increasingly giving up on politicians. In a recent article "The Tragedy of Climate Science" in *Climate and Development*, Bruce Glavovic et al. (Dec. 2021) note that "*The science-society contract is broken*", and call for a moratorium on climate science and climate reporting, since governments do not seem to be concerned enough to act, and only encourage society not to heed reason.<sup>33</sup>

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## CSEB BULLETIN CONTRIBUTIONS NEEDED

Contributions of articles or news items are needed for the Summer 2022 edition of the CSEB Bulletin. Deadline for submission is 15 May 2022. Please send your submission to Gary Ash, CSEB Bulletin Editor, at [garyash@shaw.ca](mailto:garyash@shaw.ca).

## Saving Strathcona Provincial Park

- “*Et in Arcadia, ego*”

The unprecedented heat dome of June 2021 and atmospheric rivers of November 2021 herald big changes ahead for British Columbia’s ecosystems. This is not a one-off. It is an accelerating trend. It will return and be as normal as a West Coast winter rain by 2030. It is generally agreed that these extreme events inaugurate a new era of climate extremes that has been expected for some time. This raises two questions. What does this mean for Strathcona Provincial Park, and the BC Parks system in general? And, first, why should we care about biodiversity?

Biodiversity is important because it controls processes that regulate climate change. That was the central concern of the joint report of the IPCC (Intergovernmental Platform on Climate Change) and the IPBES (Intergovernmental Platform on Biodiversity and Ecosystem Services) released in June 2021, entitled *Biodiversity and Climate Change*. The IPCC and IPBES concluded with a joint statement that it is impossible to solve the climate change emergency without solving the biodiversity crisis.<sup>1</sup> Climate change and biodiversity are inextricably inter-related. It is not enough just to eliminate fossil fuels.

The events we now witness tell us what 1.1°C warming means. Somewhere between six to eleven years from now (2021), we can expect to cross the critical 1.5°C threshold, which most scientists understand should be avoided at all costs. However, it is clear from the latest IPCC report that: “*in the near term (2021-2040), 1.5°C is very likely to be exceeded.*”<sup>2</sup> A majority of the scientists who wrote the last report do not expect that nations will meet 1.5°C or 2°C targets.<sup>3</sup> What we see unfolding now will have enormous consequences for the distribution of most species, both terrestrial and aquatic, especially for the future survival of species-at-risk in BC in the coming decades.

Species distributions are synonymous with habitat distributions. There are no species without habitats. If habitats collapse or shift, so must species. To survive, species must have corridors and alternatives to find new habitats. The thresholds they will have to cross in the coming years have serious implications for the very survival of Strathcona Provincial Park as a whole as we know it today. This concern applies to all BC Parks across the province. The degree to which they will be affected by climate change will depend on three factors: the stability of their regional biomes, their size, and the degree to which they are biologically isolated. The smaller a park is, the more vulnerable it is, and the more difficult it will be for its resident species to find nearby alternative habitat.

A park, such as Strathcona Provincial Park, is not just a series of geological formations on which life is just an ornament. Its very rocks are embedded by life forms, such as lichens, that give them their colours and hues. They photosynthesize, hold water, and drive chemical cycles essential to life, and geological processes. As John Muir noted: “*everything is hitched to everything else.*” The park, therefore, is not just a generalized landscape for our recreation. It is a living biome shaped by its waters and snows that supports specialized vegetation that in turn releases the aerosols that give us “mountain highs” and create its winds and rains and microclimates. What happens when these essential elements reach their tolerance limits and disappear?

It might be easy to disregard these considerations if their reality and importance were not confirmed by recent research by Dobrowski et al. The title almost says it all: “*Protected-area targets could be undermined by climate change-driven shifts in ecoregions and biomes.*”<sup>4</sup> This research shows that climate change turns many of the assumptions that have guided conservation and park planning throughout the twentieth century on their head. We assumed that the world changed slowly. It no longer does. We also assumed that we could save and preserve static areas of land that would not change for generations to come. The basic problem is delineated as follows:

*“the impermanence of species assemblages, communities, and ecosystems pose a challenge to conservation frameworks that rely on protected areas with static boundaries. Conservation plans based on current geographic patterns of biodiversity may be insufficient to support future biota and natural processes and may fail to afford species access to suitable climates as the Earth warms. These challenges raise questions about the efficacy of the existing PA (Protected Area) network and how to expand its coverage under a warming climate.”*

As observed by Dobrowski et al., all official planning, including the much-touted KBAs (Key Biodiversity Areas) programme, which is central to Canada’s biodiversity conservation plan, *Pathway to Canada Target 1*, essentially remain products of a static boundary approach.<sup>5</sup>

The political interest in KBAs, and in *Pathway to Canada*, lies not in conservation per se, but in conservation that still prioritizes and preserves the economic interests of industry. In the KBAs own phrasing, data and boundaries “can help guide conservation investments and inform where development can occur.” KBAs are based on the twin assumptions that governments can continue to promote business as usual, while climate change is stabilized at 1.5°C. For reasons outlined above, we will pass 1.5°C by 2030 and if we continue business-as-usual in the most optimistic scenario, we will exceed 2.4°C. Neither of these assumptions is commensurate with the reality we face. While KBAs are an improvement, they do not represent the kind of dynamic approach needed to preserve biodiversity in the face of climate change.

Current park planning is now as obsolescent as BC’s road and drainage infrastructure planning. Just as the atmospheric rivers tested British Columbia’s engineering standards, and will call for an increase in standards as well as re-assessments of the limits of those standards and a revision of the viability of projects, they also threaten the future of Strathcona Provincial Park and most parks in the BC Parks system. If until now climate change has been treated as a remote afterthought in the idyllic mountains of Vancouver Island, this can no longer be so. Climate change is no longer an abstract concept. It threatens all conservation areas in ways for which traditional conservation and park planning are possibly even more woefully unprepared than were BC’s Emergency Services and Ministry of Transportation for recent events that were long forecast.

To understand what the heat dome and the atmospheric rivers mean for Strathcona Park, it may be instructive to learn from what is already unfolding in the iconic Yosemite and Sequoia National Parks. Ever since the establishment of Yosemite, first as a “protected area” in 1864 and then as a national park in 1890, parks were set aside as representative conservation areas of

regional ecosystems. The assumption was that the environment and ecosystems in which they were set would remain relatively unchanged for centuries. Changes we witness today give the lie to that assumption.

John Muir and countless mountaineers have noted that against the grandeur and awe of mountains, human beings seemed dwarfed by the sheer scale and power of nature. With climate change, all that has changed. As one observer who worked as an intern at Yosemite in 1992, and returned with her son this year, recently noted in an essay aptly entitled "*What I saw at Yosemite was devastating*": "Now, almost 30 years later, in what might be the most profound shift of all, the power dynamic between humans and Yosemite has changed. To see nature so vulnerable not only feels depressing, but wrong, disorienting and scary."<sup>6</sup> In what should be familiar for admirers of Strathcona Provincial Park, the shrinking and potential disappearance of glaciers leading to the disappearance of streams and reduction of mighty rivers to mere trickles has reduced ecosystems at Yosemite and Sequoia National Parks to mere shadows of what they were only a few years ago. With temperatures in the High Sierra valleys reaching 104°F (40°C), not only is hiking becoming hazardous to human health, it is endangering the survival of both plants and wildlife.

Everywhere on this planet the optimal temperature for photosynthesis is 21°C. Plants regulate their environment by orienting and releasing aerosols to maintain photosynthesis. Below that temperature, plants can slow down and close down to retain hydric cell environments and maintain life, until conditions to re-start return. Above that temperature, plants are stressed to retain the necessary hydric conditions for photosynthesis and cellular integrity. All around the world, trees and forest ecosystems are showing signs of heat stress, which is interpreted as part of a global forest dieback.<sup>7</sup>

On the West Coast, an annual succession of floods, drought, heat-waves, and wildfires are becoming as common and as expected as sunrise and sunset. They take their toll on trees, which are the backbone of our forests. In California, redwoods and giant sequoias, which were once reputed to be adapted ecologically to and dependent on periodic wildfires, are now overwhelmed by the new extreme wildfires such as we have seen in the last decade on the West Coast. In the last two years alone, Sequoia National Park has lost 20 percent of its iconic giant sequoias, and the trend is likely to continue. That is climate change at 1.1°C. As climate change progresses to 1.5°C and beyond, similar conditions are likely to be visited upon British Columbia with increasing mortalities of Nootka and red cedars and Douglas fir, which like the atmospheric rivers of November 2021, have long been predicted.<sup>8</sup> There is now an urgency to incorporate this rapidly changing reality into park planning.

Park planning must shift from static paradigms, such as the KBA, to dynamic planning. Dynamic planning means connecting the landscape so that species are provided with the opportunity to move to analog habitats. To survive, species must be provided with corridors to move as climate changes and threats increase, to habitats that are analogous to the ones they inhabit today. Parks in BC are physically isolated units because clearcutting has all too frequently been carried out right to their borders. Biologically, these areas are regionally disconnected by surrounding clearcut

operations which have destroyed even the soil fungal networks which would normally provide nutrient avenues for species shifts.<sup>9</sup>

If we are serious about addressing the dangers that climate change poses, we need to restore soil carbon networks and the biodiversity networks that depend on them. In a climate emergency, conservation priorities must guide economic planning, not vice-versa. As Glasgow COP26 showed climate change is unlikely to be addressed at COP conferences that focus on maintaining the economy and protecting the interests of the fossil fuel industries. It can, however, be addressed at home if we prioritize conservation values in planning, support inventory work, and carry out planning dynamically across the landscape, not in isolation.

Saving even a large park like Strathcona Provincial Park at a time of climate change will require that we move beyond the current thinking. As Dobrowski et al. observe, to address climate change, we need to connect existing protected areas and provide corridors for species movement. Much of the potential resilience of Strathcona Provincial Park lies in its size and central position on Vancouver Island. Within the landscape of Vancouver Island, it constitutes a vital biodiversity node. However, important parts of it, such as Forbidden Plateau, form narrow vulnerable projections in a landscape of clearcuts. Those areas of the park need to be expanded to recover the biological buffers that lost ecosystems surrounding the park formerly represented. In the case of the Forbidden Plateau extension, that would involve an incorporation of the watersheds associated with Comox Lake, and the extensive restoration of these areas from forestry damage.

Given that a large part of the problems posed by the need to develop dynamic boundaries lies in the impact of forestry operations on the resilience of the park's ecosystems to climate change, there is an urgent necessity to change policies that guide forestry. Within the paradigm of static boundaries, forestry has been given a free hand in the destruction of areas outside the preserved areas. The park was planned in isolation from forestry, and forestry was planned in isolation from the park. Their interconnections and interdependencies were rarely, if ever, considered. In dynamic planning, we have to recognize the impact of forestry and its importance for the park's role in maintaining biodiversity. Therefore in dynamic planning, forestry plans must incorporate and protect conservation area values. In other words, the park community, and parks staff must first understand the dynamic relationship and only then be involved in forestry planning. The Ministry of Environment and Climate Change and BC Parks must work with forestry and provide plans to protect long-term conservation values across the whole landscape. The overriding concern with climate change changes the social, political, and economic priorities. The lead in planning with "Natural Resources, Lands and Forest Operations" can no longer be forestry and the timber industry, but the Ministry of Environment and Climate Change. It requires that forestry and forestry owners and licensees work in concert with BC Parks in prioritizing climate change and biodiversity, and not the "timber supply," as the Forest and Ranges Practices Act suggests.

To address the climate emergency, BC Parks needs to move beyond recreation, important as that is. As per Dobrowski et

al., the climate emergency makes the role of conservation and biodiversity in BC Parks increasingly important for the survival of this province's key biodiversity nodes such as Strathcona Provincial Park. To be serious about assuming that role, BC Parks needs to be able to map species biodiversity in the parks and ecological reserves.

To a large extent, that is the under-funded work that the Strathcona Wilderness Institute (SWI) has been doing for the last three years. SWI has been compiling and mapping species distribution lists, and promoting public education through workshops and webinars, in spite of COVID. To date, eight people, on foot, have reliably mapped at least 1682 species, which include many species references new to the park and even to the island. (The current list on the SWI Data page on INaturalist is incomplete.) That is the backbone of the information that BC Parks has appropriated and incorporated on its INaturalist page. SWI's work makes Strathcona Provincial Park the best biologically-documented park in the BC Park system. To realistically address the challenges of climate change, this is work that needs to be done in all of BC's provincial and national parks.

In 1989, Strathcona Park was saved by the public from government mismanagement. Once again, the public needs to weigh in to demand that the Ministry of Environment and BC Parks develop modern park plans based on dynamic boundaries, not static boundaries. That is essential if we are to meet the challenges of the climate emergency for the benefit of future generations. This will require a large and long public engagement in the park planning process. It is beyond the boundaries of conventional institutional thinking and capabilities that are beholden to government and industry. We need to think differently about geographical boundaries as well as institutional boundaries. The latter requires rethinking the abusive world of institutional privilege.

The public has now gathered enough information necessary to better manage the park's biodiversity, for the benefit of the public. It has done so by providing essential biological data needed to develop the modern dynamic landscape planning that it has the right to expect. This is essential information needed to meet the challenge of the day: the climate and biodiversity emergencies. The information is limited but it is enough to plan for the restoration of soil fungal and biodiversity networks essential for enhanced carbon capture as well as the identification and creation of analogue habitats. The tools and the knowledge are readily available to address climate change. Is there the will?

Therefore, the only question that needs to guide forestry and BC Parks is — do we take climate change seriously?

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## ALBERTA News

Submitted by Brian Free, CSEB Alberta Regional Director

### Coal Policy

In my Spring report last year, I explained how the Government of Alberta had rescinded Alberta's Coal Policy. One important feature of this policy was to protect sensitive lands in the Eastern Slopes of the Rocky Mountains from coal mining. These alpine and foothills areas are highly valued for their scenic landscapes and biodiversity and they include the headwaters for major rivers in central and southern Alberta.



A public reaction against the removal of this policy prompted the government to reinstate the policy and establish a panel to conduct public consultations on the future of coal

mining. The panel has now released its findings and the Alberta government has committed to act on their recommendations.

Some expected actions include the following:

- All new coal-related exploration and development activities in the Eastern Slopes will continue to be restricted. The 1976 coal policy remains in place.
- Activities already in progress for active mines and advanced projects can continue.
- Land use planning, intended to account for the cumulative effects on the landscape of natural resource development and other activities, will address issues related to coal mining.

As the release of selenium into the environment from coal mining operations was raised as a public concern, a selenium management review will be conducted to examine Alberta's current regulatory requirements and how other jurisdictions address this issue.

For more information about the Panel's report and the government's reaction, see <https://www.alberta.ca/coal-policy-engagement.aspx>

### Chronic Wasting Disease (CWD)

Alberta Environment and Parks is partnering with Saskatchewan's Ministry of Environment and the Alberta Conservation Association on a project led by researchers from four universities in western Canada. The project will examine five potential

antigens and two different oral delivery platforms to help prevent the spread of Chronic Wasting Disease.

CWD is a prion disease affecting members of the deer family. Without being treated or managed, CWD reduces overall populations of deer, is always fatal to infected animals, and results in prions contaminating the environment.

An effective oral vaccine for CWD has the potential to significantly reduce prevalence and geographic spread of this disease in wild cervids.

Perhaps the next research project will figure out how to get the deer to swallow a pill. 😊

## SASKATCHEWAN News

*Submitted by Curt Schroeder, CSEB President and Saskatchewan Member*

In December 2021, one free ranging White-Tailed Deer outside Saskatoon had a confirmed case of COVID-19 virus. Saskatchewan is not alone, with cases found in Manitoba, Quebec, and Ontario, as well as northeastern United States.

An interdisciplinary team of Canadian scientists recently published a preprint in bioRxiv reporting the presence of COVID-19 in several Canadian provinces. There is now evidence that the COVID-19 virus is more widespread in White-Tailed Deer than previously thought. Exactly how humans are transmitting the virus to deer is not clear, but it is likely to occur through contaminated drinking water or sewage, though direct contact, through an intermediate host, or through farming could be other means of infection.

Though deer-to-human transmission has not been observed, the possibility is there according to the scientists.

This points to the need for better surveillance to monitor the health of animal and human populations.

Other cases of COVID-19 transmission are known to occur from animals to humans in farmed mink and hamsters. Hunters and venison butchers are being advised to wash their hands regularly, wear gloves, eye protection, and masks where there is a possibility of exposure to respiratory tissue and fluids, especially indoors. Corona viruses are killed by normal cooking temperatures and so far, there is no evidence that properly cooked venison can spread the COVID-19 virus.

*Extracted February 27, 2022; <https://www.cbc.ca/news/science/covid19-deer-may-spread-to-humans-1.6366023>; Canadian researchers discover 1st possible case of deer spreading COVID-19 virus to a human*

### 2022 Canadian Ecotoxicity Workshop (CEW)

CEW will take place in Winnipeg, MB in October, 2022.

For information, see <http://ecotoxcan.ca/>

## MANITOBA News

*Submitted by Robert Stedwill, CSEB 2<sup>nd</sup> Vice President & Sask. Chair*

Power utilities are in the business of generating and transmitting electrical power to customers, be they large industrial or commercial consumers, or residential customers.

Prior to the mid 1970s, environmental matters were not top of mind, and were only grudgingly attended to, to adhere to regulatory requirements. Since that time, electricity companies have been more proactive in their approach to environmental issues, so that employees are now in tune to regulatory requirements and the social license that allows them to operate.

Manitoba Hydro's recently completed its Keeyask Project, a 695-megawatt hydroelectric generating station on the lower Nelson River, which was developed in a partnership between Manitoba Hydro and four Manitoba First Nations: Tataskweyak Cree Nation, War Lake First Nation, York Factory First Nation, and Fox Lake Cree Nation. That social license of working with First Nations goes a long way towards environmental acceptance, along with the normal regulatory approval to build and operate the facility.

It appears now that Manitoba Hydro employees have an instilled environmental ethic, which goes beyond that required by law. Following are three examples:

### Nesting Island Enhancement

Manitoba Hydro's Northern Boat Patrol identified a secondary use for wooden debris salvaged from the facility's reservoir and waterways. Primarily done for safety reasons on a regular basis, the collected debris is used to further enhance a nesting habitat built for colonial waterbirds (gulls and terns) to encourage further population growth in the area.

During the construction phase of the Keeyask Project, a dedicated nesting island was built for gulls and terns to replace their traditional nesting habitat in the former Gull Rapids area.

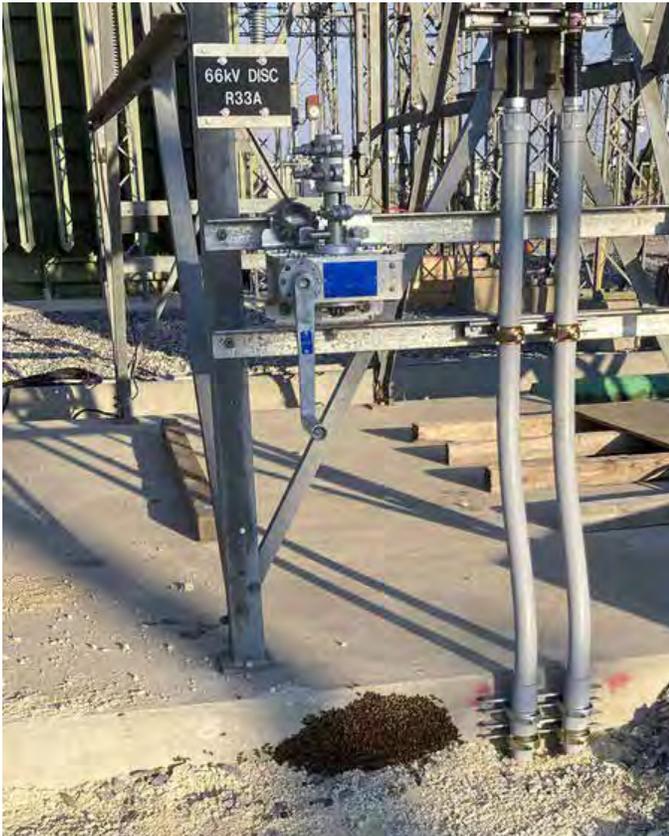
During the summer (2020), "we have seen common terns (*Sterna hirundo*) nesting, and ring-billed gulls (*Larus delawarensis*), which is really promising," said Rachel Boone, Environmental Licensing and Protection. "Before winter set in, we just needed to make some further accommodations to provide young chicks some shade and protection from predators, and also to create microhabitats for plant growth."

The Northern Boat Patrol is further naturalizing the habitat by arranging wood debris across the island. The nesting island will be monitored over the next 15 years to see how the birds are using the area, and to make any additional adjustments to further successful growth of their populations.

### Honey Bee Swarm Relocation

Earlier this past summer, a construction crew went to test breakers at the Rosser Switching Station and came across a huge swarm of honeybees making a home in the station. The four-person crew, one of whom was very allergic to bee stings, was concerned that

during testing when breakers shake and shudder, the bees would swarm. Delaying the tests, the crew devised a plan for the next day if the swarm was still there.



“We knew our crew would probably be safe for the remaining time of the first day if we kept clear and didn’t bother them, but had a plan in place if they were still there in the morning.”

Some of the bees had departed by the following morning, but a significant number remained, so the crew contacted a local beekeeper who came to assist. The remaining bees were taken back to assimilate with a hive on his own apiary.

The question remains as to why the bees had chosen the switching station? According to the apiarist, the bees encountered were bees from a “split colony” (where a colony is undesirably about to have two queens due to the birth of a new queen) and had taken its leave to find a new nest. The switching station was not the new nest, but a transitory overnight stop. The bees discovered the following day were ones that had failed to swarm earlier with the old queen, and would likely have died had they not found a new colony to amalgamate with.

### **Boreal Chorus Tree Frogs Hibernate - Correct? Not so, apparently at the Keeyask Hydroelectric Station.**

A Boreal Chorus Tree frog (*Pseudacris maculata*) was discovered in late winter of 2020-21 hopping around inside the station by a contractor. Highly unusual, to say the least, as these frogs typically hibernate under the snow next to the ground.

“Home” for the frog happened to be in a pool of stagnant water under a wooden hatch cover, where two more were discovered.

The theory was that they were inadvertently brought into the station on some piece of equipment that had been outside during the winter. As temperatures rose, the frogs came out of hibernation.



Concern over their survival came when it wasn’t deemed feasible to take them outside and get them to hibernate again, as their energy reserves would have been depleted having come out of hibernation earlier, and there were no insects in January upon which to feed. The three were put into a refrigerator to slow their metabolism down, and a source of food sought. Quarter inch live crickets were sought to be kept in a terrarium.

It took three or four days to feed each frog: One day to let them wake up, one day to feed them a cricket or two, one day to observe and feed more if needed, one day to let them digest, and then back into the fridge to sleep, hopefully until warmer weather arrived and insects plentiful.

*Information has been gleaned from Manitoba Hydro’s Keeyask newsletter, website, and discussion with a former contractor.*

## **NOTICE OF CSEB ANNUAL GENERAL MEETING**

To be held on  
April 6<sup>th</sup>, 2022

10:00 AM PDT (1:00 PM EDT)

By Teleconference Call

Please join the AGM from your computer, tablet or smartphone through this link:

<https://meet.goto.com/231813061>

Get the app now and be ready when your first meeting starts: <https://meet.goto.com/install>

Check [www.cseb-scbe.org](http://www.cseb-scbe.org) for more details.

# ONTARIO News

By W.D. McIlveen, CSEB Ontario Member

## History of the Ontario Ministry of the Environment

The Ontario Ministry of the Environment (MOE) came into being in 1972. This would make 2022 the 50<sup>th</sup> Anniversary of its start and an appropriate time to celebrate that fact. Over a much longer time frame, there have been many changes relating to environmental matters in the province. It is rather difficult to pin one particular date to the start of those concerns or to an action that resulted from those concerns. The year 1972 is about as good as any to use as an anniversary reference year for the present account for which I will briefly summarize some major events throughout the history of MOE and its formative period.

Environmental issues predated the existence of MOE by a great many years. One of the things that was a problem early on was water contamination by sawdust and other waste from sawmills. Laws to control that problem were introduced as early as the 1840s but apparently the rules were not enforced. Because the sawmill industry was so small at the time, the problem was rather limited in scale. When the *Reciprocity Treaty* of 1854 with the United States was made, this led to a boom in the Canadian saw mill industry. What before was only negligible waste became a much greater problem. In May, 1873, the federal government enacted the *Act for the Better Protection of Navigable Streams and*

*Rivers*. Over the years, the Act has seen various modifications but its main purpose was to control physical problems for watercraft movement along rivers. The structures of concern were bridges, booms, dams, and causeways as well as docks, wharves, and other structures. It really only applied to the sawmill waste when it built up in such a manner that it impeded the movement of boats.

The Parliament of Canada first passed the *Fisheries Act* in 1868 under the constitutional authority provided by the *Constitution Act, 1867*. The *Fisheries Act* sought to conserve and protect Canada's sea coast and inland fisheries. This was to be done to ensure that there was no negative alteration of fish habitat and that there to be no deposition of deleterious substances into water bodies frequented by fish. One of first pollution-based law-suits in Ontario was filed against the sawmill at Balaclava. The complaint launched by a nearby grist mill complained that between 1904 and 1909, sawdust from the upstream sawmill was negatively affecting the gristmill operations. With great reluctance, the sawmill at Balaclava installed a burner to dispose of the waste.

Application of the *Fisheries Act* should have applied to the situation surrounding the E.B Eddy Paper mill at Hull, Quebec. The mill started to operate in 1885 within sight of the Ottawa parliament buildings. Progress towards meeting the requirements was slow and conditions of legislation were not achieved until 1903. In 1880, saw-mill owners on the Ottawa River were exempted from the 1873 Act's prohibition on the dumping of sawdust; a similar exemption was made again in 1885. A principal mill-owner was the iconic lumber baron, J.R. Booth. Other mill

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*Sewage Biosolids management tank, Oakville.*

owners complained bitterly about the legislation saying that the rules would be their ruination and a lot of employees would be put out of work. Those complaints were heard by those in power at the time, so the environment suffered even with some useful legislation in place.

In 1908, the Senate of Canada introduced in legislation regarding the pollution of navigable waters. The legislation was not passed by the Commons owing to dissolution of Parliament. A major typhoid outbreak in Ottawa in 1911 caused reintroduction of the legislation by the Senate. That legislation was wider in scope than most provincial efforts to safeguard sources of water supply but again it was not passed.

All of the legislation relating to water pollution concerns to this point was a federal initiative. The *Baldwin Act* (Municipal Act) in 1849 set out responsibility for the federal government and the local municipalities. At this point, which predated the formation of Canada, the current Province of Ontario often deferred to the federal authority. But after Confederation, new responsibilities were taken on by the provinces.

The first piped water supply in Ontario was in Toronto in 1837 but this was accomplished as a private service. It was not until the passage of *The Municipal Waterworks Act*, 1882, that municipalities were able create communal water systems. The legislation made it possible, though still optional, for municipalities to create water systems within their jurisdictions. Disasters such as cholera in Kingston in 1849 and fires in Hamilton in 1854 demonstrated the need for municipal water supplies.

With passage of the *Public Health Act* in 1884, the Provincial Board of Health was created. That Board ensured the safety of drinking water as well as sewage works, septic systems, and disposal of contaminants into watercourses. It was not until 1943 that changes to the *Municipal Act* allowed municipalities to finance waterworks projects by a user rate. The Depression, war (WWII), and general population growth made the then existing water supply systems out-dated and overloaded. It was not until 1956 that the Ontario Water Resources Commission (OWRC) was created and reporting to the Ontario Department of Health. The mandate of OWRC was management of provincial water resources, including water treatment and supply through financial support to build and operate water treatment and sewage disposal systems, as well as supervision and control of the province's water resources.

Early issues for OWRC predating the existence of MOE still involved pollution from paper mills. A high-profile case that dates from that period was Dryden Chemicals Ltd. Their operation to produce chlorine for bleaching paper at the nearby paper mill released mercury into the English Wabigoon River system between 1962 and 1970. That problem has not been completely resolved.



*Dryden paper mill, 1959, B.E. Jaquith slide.*

While water pollution was being revealed as an issue, air quality was also a developing concern. Air quality at Sudbury was of special note. The discovery of copper ore at Sudbury in 1883 led to the development of the rather extensive mining camp there.

The copper component of the ore was valuable. Sulphur and nickel were unwanted parts of the Sudbury ore. Initially, the raw ore was roasted on large piles of wood to remove the sulphur through burning. Several such piles made a roast yard. The burning meant huge clouds of smoke were released at ground level and then they rolled across the ground. Here, the smoke was able to damage any nearby vegetation.



*Victoria Mine Roastery, Sudbury area 1980 Roastery in foreground, slag in background.*

*“In August, 1888, a roast pile was built and started burning in the middle of a dense growth of spruce and birch trees. Again mind triumphed over matter and the woods fell before the stench. The roast yard was a success.” --- D.H. Brouse (1889) Official of Canadian Copper Co.*

In total, the largest of the nine roast yards was the O'Donnell Roast Yard west of Copper Cliff. The other roast yards were distributed around the Sudbury area. Smelters that came along later also released sulphur dioxide but it was dispersed over larger areas thanks to the smoke stacks. At the same time, the land around Sudbury was being developed for agriculture. Farms were being created on lands made available under the *Free Grants Act* of 1906. Native vegetation was also being damaged. Damage caused to crops led to significant conflicts between mining interests and farming interests.

The first arbitrator in these disputes was Alexander Irving who was the local sheriff of the Sudbury district from June 1907 until September, 1932. Irving awarded damages as he saw fit in the period from 1909 to 1914. The provincial government tried to distance itself from the problem. As well, as World War I progressed, the demand for nickel increased and as a result, metal production increased and even more damage to crops and other vegetation followed.



*Liming of soil at Coniston, 1978*

Formerly, the nickel was processed in USA and from there was being sold to Germany. Military strategy during the War dictated that such sales should be terminated immediately. In response, a nickel refinery was built at Port Colborne to control production and

sales of the important military commodity. With more nickel production, there were more complaints from farmers. A major lawsuit was launched all the way to the Supreme Court of Ontario. In response, an Order-in-Council made in 1915 withdrew 19 townships from further agricultural development. The next government action on the matter was to pass the *Industrial and Mining Lands Compensation Act* of 1918. That act made it possible for the mining companies to purchase 'smoke easements' from local landowners. An easement, once arranged, meant that a land owner had no further option to sue the mining company for the damage. Two *Damage by Fumes Arbitration Acts*, passed in 1921 and 1924, allowed for appointment of an official Sulphur Fumes Arbitrator. The Sulphur Fumes Arbitrator, who was a staff member of the Department of Mines, determined the validity of the claims for damage, much like Sheriff Irving had done. Although Sudbury represented the major point of concern, the Arbitrator could also become involved at other mining facilities around the province. When the MOE was formed, the duties of the Arbitrator were eliminated and his general role of assessing the impacts of industrial and other sources was taken over by MOE staff.

In that same general time frame, other air quality situations were revealed as a problem. One issue was revealed by a CBC television program called the Air of Death on October 22, 1967. It was about the situation at Port Maitland where a phosphate fertilizer plant was releasing excessive amounts of fluoride. The fluoride was absorbed by vegetation causing damage to sensitive plant species, which in turn caused toxicity to cattle feeding on the local vegetation. The case caused such a furor that an Order of Council on November 6, 1967, was raised to form a commission to look into the problem. That Commission reported back to the government on September 25, 1968. The speed of that report must be one of the fastest such processes that Ontario has ever seen. One consequence of the situation was the formation of the Phytotoxicology Section that was responsible for assessing the impacts of pollutants on vegetation and soil.

Before the Port Maitland situation, the Ontario Government had established a Select Committee on Air Pollution and Smoke Control and it reported in 1957. It recommended the formation of an Air Pollution Control Commission (comparable to the Water Resources Commission) to revise existing but out-of-date legislation within a new Act. The new *Air Pollution Control Act*, 1958, which was administered by the Department of Health, was not greatly different from earlier air quality standards. Industry was still protected as the Act did not apply to operations designated in the existing *Damage by Fumes Arbitration Act*.

When the *Air Pollution Control Act*, 1967 came into effect on January 2, 1968, the control and prevention of air pollution in Ontario became the full responsibility of the Ontario Government. Prior to that date, air pollution control had been under municipal jurisdiction. The province had only functioned in an advisory capacity. Many of the responsibilities for environmental matters had been carried out by the Department of Health. Those roles were subsequently carried out by the new Department of Energy and Resources Management, which administered the *Environmental Protection Act* of 1971. In 1971, the Department was reorganized and renamed as the Department of the Environment. It carried on with that name until 1972, and

included an Administrative Services Branch, the Air Management Branch, the Waste Management Branch, and the Conservation Authorities Branch.

In 1972, the Department of the Environment was amalgamated with the Ontario Water Resources Commission and the Toronto Air Quality Inspectors. Staff from the former Department of Health included those in Air Quality, Waste Management, Pesticides, and Phytotoxicology. The result was the beginning of the **Ontario Ministry of the Environment**.

At different times, the Ministry found itself at the centre of the news. There have been many fires. The high-profile ones include the Hagersville Tire Fire; Plastimet Fire in Hamilton, and the Mississauga Train Derailment. Sometimes spills make the news. Any chemical spills demand some sort of MOE involvement. Notable spills include PCB accidentally lost along Highway 17 in Northern Ontario in 1985, train derailments such as that at Melbourne, the chemical blob in the St. Clair River downstream from Sarnia, and the Walkerton crisis. By comparison to the notable ones, many spills are trivial but their sheer numbers are quite amazing. From 1988 to 2000, 2475 oil and 1584 chemical spills were reported in the Toronto area. All situations require some appropriate level of management. The diversity of spills, fires, and other mishaps, with or without hazardous chemicals, can be quite amazing and complex. The chemicals involved can cover much of the periodic table as well as including various mineral compounds and organics. The emissions involve releases from spill situations as well as those that have longer-term fugitive emission characteristics. The Ministry needs to be nimble and capable of responding to many different situations.

The Air Pollution Index, which later was renamed the Air Quality Index, was introduced in early 1970s. It was calculated based on different air contaminant parameters. These included concentrations of ground-level ozone ( $O_3$ ), nitrogen dioxide ( $NO_2$ ), and fine particulate matter ( $PM_{2.5}$ ). Over time, the index was refined but generally the index was dependent on ability of technology to measure different pollutants quickly and to send the data to a control centre. The index is now known as the Air Quality Health Index and it includes measures of sulphur dioxide, carbon monoxide, and total reduced sulphur compounds. All the measured parameters are incorporated into a numerical value for the index. The index is determined at 39 stations across Ontario. Generally, air quality in Ontario is good, and concentrations of air contaminants are largely declining over time. There are still occasional instances where certain chemical concentration criteria are exceeded. Overall, situations where local air quality is newsworthy are very rare.

During the 1980s, acidic precipitation was a hot topic in the news. The impacts of acidic deposition became particularly evident in sensitive lakes in the Greater Sudbury area during the 1970s. This work was the basis for more intensive investigations that led to the acid rain program. The Acidic Precipitation in Ontario Study (A.P.I.O.S.) was established in 1979 by the Ontario MOE. It included studies of the impacts on water and the wildlife within those lakes (lakes), soils and vegetation, air quality, and economic considerations. Certain acidic lakes were treated with lime. Over time, air quality standards (mainly  $SO_2$  emissions) were improved but it was determined that 50 to 70% of the acidity was due to emissions carried into Canada from the United States

via long-range transport. Concerns over acidic precipitation have declined considerably over the years but the problem is not totally solved. News articles relating to environmental matters that once involved acidic rain have been replaced by stories with concerns over global warming.

Garbage disposal is a major concern for all citizens of the province. It is easily understandable why no one likes this material. One need only watch the number of trucks moving along major transportation routes to realize the magnitude of the materials in transit at any given time. At some point, all of the material involved will eventually need disposal. Management of the waste represents a significant responsibility for MOE. This includes waste disposal site management, recycling programs, and incinerators. Great strides have been made in recent years with undeniable progress in recycling various materials. There is still a very long way to go to eliminate the problem completely but the success so far should be very encouraging for all citizens to stick with the program or even to expand the rate of waste reduction and recycling.

One of the notable things that was introduced by the New Democratic Party under Ruth Greer was the Environmental Bill of Rights (EBR), 1993. It came into effect in February 1994. The EBR allows citizens an opportunity to comment or participate in decisions that could affect the quality of air, water, land, or wildlife within Ontario.

The Drive Clean program came into effect in April 1999. That program was designed to ensure that automobiles met a certain standard with respect to emissions control of certain pollutants. Over the years, many of the worst-offending vehicles were removed from the road. While changing technology subsequently improved some aspects of vehicle performance, the functioning and cost of the program met some criticisms. In April 1, 2019, the Drive Clean program was cancelled by the Doug Ford government mainly on the basis of cost to car owners.

Various pieces of legislation that dealt with the environment have been introduced over the years. The *Environmental Assessment Act* 1975 was established to integrate environmental factors into planning and decision-making processes; to prevent degradation of environmental quality; and to facilitate public participation in the environmental assessment process. In 2020, the Ford government used its legislative majority to push through revisions to the Act, supposedly to ‘modernize’ it. The streamlining and other changes in the new act were strongly opposed by various environmental groups. The *Environmental Protection Act* 1990 stated that its purpose was to provide for the protection and conservation of the natural environment. The topics covered by the act included such matters as ozone depleting chemicals, the cessation of coal use for power generation, litter and waste management, and spills.

In the intervening period, the Walkerton tragedy occurred in May 2000. That led to a major inquiry led by the Honourable Dennis O’Connor. The conclusions were that the *E. coli* contamination of the water supply was at least partly due to the Mike Harris government’s “distaste for regulation”. In response, the government introduced the *Safe Drinking Water Act*, 2002. That act brought in such features as mandatory drinking water standards, better training and certification of operators, licensing

of all municipal drinking water systems, regular review of drinking water standards, accreditation of testing labs, and vigilant enforcement of the regulations. So, some good did come of a very bad situation.

Over its lifetime, the Ministry of the Environment has seen several name changes. It retained the original 1972 name until 1993. In 1993, it was merged with the Ministry of Energy to form the Ministry of Environment and Energy. The arrangement lasted until 1997 but again in 2002, the two main responsibilities split up again. After the 2014 Ontario election, responsibility for the management of the now obvious climate change issue was assigned to the Ministry’s portfolio. On June 24, 2014, its name was changed to become the Ministry of the Environment and Climate Change. Following the 2018 Ontario election, the Ministry’s name and structure was changed once more to become the Ministry of the Environment, Conservation and Parks on June 29, 2018.

While there have been assorted changes to the names and structure of the Ministry, many core functions remained in place. These included water and air quality management, environmental assessment, and laboratory services. The Ministry also adapted when new areas of concern became evident. One such need was the issue of hazardous contaminants, which emerged as a distinct Hazardous Contaminants Branch in 1982. At different times, various agencies, boards, and commissions were set up. The list includes the Environmental Assessment Board, the Environmental Appeal Board, the Pesticides Advisory Committee, and the Ontario Waste Management Corporation. Only time will prove what new changes will come into effect. Political motives can be expected to affect what happens on all these fronts but a need to protect the environment will remain for the foreseeable future. A high-quality environment is needed to ensure the welfare of all.

Over time, the work done by MOE or successor agencies has dealt with a huge number of situations. Some problems have seen total elimination, particularly when a point source is cleaned up or closed. Some sites have legacy issues such as contaminated soils or sediments, which present definite challenges. Long-range transport or ‘area’ sources (i.e., traffic and industrial emissions, or acidic precipitation precursors) are more difficult to control. Global warming and climate change represent the largest issue facing the planet and the human species relying on it. If that cannot be resolved fairly quickly, many more dire conditions will have to be faced. The global climate is not just a local, provincial, or national problem. It is an urgent international concern that requires a whole other approach if the problem is to be resolved. Actions from the MOE and its forerunners have done much to improve life of all kinds throughout Ontario over the years. That same general kind of work is still very much needed and deserves all of the public support that can be mustered.

### The Genesis of Environmental Protection in Ontario

Beginnings is a project initiated by the Environmental Commissioner of Ontario in celebration of the 20<sup>th</sup> anniversary of the Environmental Bill of Rights. See <http://www.environmentalbeginnings.ca/welcome/>

# ATLANTIC News

By Peter Wells, CSEB Atlantic Member

## Environmental Issues/Concerns in Nova Scotia

Once again, there are many environmental issues and topics of concern in Nova Scotia; these are briefly presented here, based on local news reports. The reader will see that the topics are much the same as previously described. It appears that positive change is glacially slow or not at all in this province, despite the importance of many issues for local citizens and the environment (e.g., water quality, endangered wildlife).

First though, this is the 40<sup>th</sup> anniversary of the loss of the Ocean Ranger, an off-shore oil drilling rig unprepared for emergencies that sank in a storm on February 15<sup>th</sup>, 1982, taking with it the entire crew of 84 men. This anniversary is being marked throughout Atlantic Canada (Dodd et al. 2022), remembering the loss of life, the impact on families, and the effect the accident had afterwards for developing safety regulations and guidelines for the whole offshore oil and gas industry. Progress has been made since 1982 but at a shocking human price.

Mid-fall, 2021, the issue in the global mind was climate change, due to the COP (Conference of the Parties) 26<sup>th</sup> November meeting in Cornwall, England (Lethbridge 2021; Stewart 2021; Surette 2021). Many had high hopes for some breakthroughs—for some serious and attainable goals and schedules for reducing green-house gases (CO<sub>2</sub> and NO<sub>x</sub> emissions), especially from the rich developed countries. Concerns this year for Canadians were propelled by the BC floods and “heat dome”, western USA and BC fires, and the ongoing prairie drought, not to mention “the topsy-turvy” weather systems (try living in coastal Maritimes now). The aim is to keep the global temperature rise below 1.5°C. Despite the rhetoric, the meeting ended with a few hard to meet promises, and one felt let-down—if this is how a modern society addresses “the issue of the century”, future generations will be truly challenged and perhaps over-whelmed. With too many people, all wanting to live like my generation (“the spoiled baby boomers”— Surette 2021), it will be a very different world for humans and all other organisms (our overall biodiversity) inhabiting this planet. A suggestion—perhaps CSEB should develop its own climate change and biodiversity action plan, rather than be nibbling around the edges of “environmental biology” on less pressing problems.

Moving on to perhaps less urgent, familiar but still pressing problems, fish farms and aquaculture [Campbell 2021a,b; 2022b,c] continue to dominate the local coastal news. Open pen Atlantic salmon farms seem to be immune from regulations governing size, the latest travesty being letting the Digby County salmon farm (owned by Cooke) at Kelly’s cove in Annapolis Basin off the hook for illegally expanding its operation over many years. Local communities are outraged and the Ecojustice lawyer representing them at a hearing concluded that “*aquaculture companies can break the law with impunity and with assistance from the government bodies meant to hold them accountable*” (Campbell 2022c). Salmon farms expand and proliferate

regardless of coastal community concerns for water quality and impacts on the few remaining native salmon, and other species.

Another fisheries issue is one of protecting young or elvers of the American Eel (*Anguilla rostrata*) in a number of rivers where they are being fished commercially, despite their status as a threatened species under the *Species at Risk Act* (SARA) due to a decline in overall population numbers (Sylliboy 2022). This issue is of concern to the local Mi’Kmaq who seek a balance between the commercial fishery and the moderate livelihood fishery.

The decline and mismanagement of the provinces forests, despite the 2018 Lahey report recommendations, continues to be in the news (Beswick 2021; Campbell 2021c; Cole 2021). Progress by government is very slow putting recommendations about ecologically-based forestry into place, and environmental groups are becoming more vocal and demanding a stop to forestry on crown lands. Of course, the forestry industry is fighting back, claiming progress in how the forests are managed (Cole 2021) in the face of a declining forest industry. Sadly, the landscape changes are visible when one flies over Nova Scotia in the winter time, especially over the south west part of the province—huge clear-cuts stand out sharply and one wonders about the pursuant impacts on wildlife, from moose to song-birds, and on the many watersheds.

Amazingly, the pulp mill Northern Pulp remains in the news (Beswick 2022a,b,c) as the company not only sues the province for its forced closure, but it also continues to develop a plan for final effluent treatment, were the mill to reopen. All of this is occurring despite continued public opposition to any treated effluent being allowed to enter local waters.

A number of other water pollution issues are in the news. The Alton Gas storage project has been terminated but the lands developed for gas storage have to be decommissioned and restored (Campbell 2022a). A rare victory was scored by environmental groups in their push for a ban on the pesticide glyphosate (Campbell 2022d); the Federal Court of Appeal ordered PMRA (Health Canada’s Pest Management Regulatory Agency) to reconsider its approval of the pesticide, given the scientific evidence that it is a probable carcinogen; glyphosate, commercially sold as Round-Up™, has been controversial for years and is still being used extensively for weed control by farmers, the electrical power industry, and gardeners. A major study was recently published on Gulf of Maine contaminants of concern (Apeti et al. 2021), showing a host of newly studied persistent chemicals in mussel tissues throughout the Gulf, the ecological and human health risks as yet undetermined. The legacy of old NS gold mines and downstream contamination by the tailings continues; remediation of 66 sites across the province require assessment (Bruce 2022a,b; Campbell 2021d; Kirby 2021; Kosters 2021). Lastly, the province’s mink farms remain a concern due not only to the water pollution (manure) from the farms but also due to the threat of viral disease affecting the minks and potentially humans (Lazare 2021); local lakes and streams near the farms are greatly impacted by algal blooms due to the nutrient run-off.

On a brighter note, there has been progress in habitat and ecosystem protection in the Province. Purchase of the Owls Head crown land (thought to be a provincial park) is not going ahead,

due to persistent public pressure and outrage (Campbell 2021e; 2022e,f; Miller 2021); however, the land is still unprotected and adjacent lands are changing hands due to absurdly low prices and huge demand. The public is being assured by the Province that Owls Head crown land “will be protected, one way or another” (Campbell 2022f). Three kinds of rare and sensitive lichens have been found in some forests designated for cutting, bringing that to a temporary halt (Campbell 2022g). Along the same lines, protests have continued on behalf of the mainland moose in Digby County (Campbell 2021f), with demands that forestry stop on crown lands. Finally, a really bright note—the nature Conservancy of Canada has purchased a large (1,094 hectares) forested site in southwestern NS for protection, study, and recreation; it is mature Acadian forest, with lakes and wetlands, and considered an important biodiversity site (Campbell 2022h).

To conclude, the CSEB really needs to expand its presence in this Province and throughout Atlantic Canada. There are many issues, as above, demanding the involvement of environmental biologists of all stripes and vocations. A more visible presence could only be positive and contribute to more success protecting the landscapes, waterways, and biota that are continually under threat, despite government policy that this is an era of environmental sustainability. Their delay at implementing the Lahey report recommendations puts a lie to their commitment and demands more concrete action by groups like CSEB to ensure accountability and positive action.

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## A Tribute to Professor Edward O. Wilson, Harvard University

Dr. E.O. (Ed) Wilson, one of America’s most recognized and influential biologists in the 20<sup>th</sup> and 21<sup>st</sup> centuries, sadly passed away over the Xmas holidays at the age of 92, after a long and highly productive career and retirement.

His many writings of papers and books, on topics ranging from ants (his scientific specialty), to island biogeography and ecology, biodiversity, sociobiology, environmental ethics, and global conservation, have been a major source of inspiration and information for many of us in the environmental sciences over recent decades. I was fortunate enough to hear Wilson talk about some of these topics at an environmental toxicology and chemistry meeting many years ago, an experience recalled for its content as well as by the reception that he received, applauded like a rock star by the huge audience of young and older scientists.

Dr Wilson was a global expert on the taxonomy and ecology of ants, his specialty from a young age. He was also a specialist on the topic of biological diversity or biodiversity, having written cornerstone volumes on the topic (Wilson 1992, 2002) much ahead of its time. In this context, to protect the planet’s species, he recommended setting aside half of the earth’s surface for conservation (Wilson 2016).

Highly relevant to the objectives and work of our EIUI research program, and illustrated by his many other books, especially the one on consilience (Wilson 1998), Wilson was a champion and practitioner of knowledge synthesis on many biological

and environmental topics of global significance (Wilson 1998). As noted on the E O Wilson Foundation website (accessed Jan 7<sup>th</sup>, 2022)—he once shared “*We are drowning in information, while starving for wisdom. The world henceforth will be run by synthesizers, people able to put together the right information at the right time, think critically about it, and make important choices wisely*”. This is at the heart of our attempts to understand the variables at play at the science-information-policy interface, ensuring that relevant environmental information continues to be expertly summarized and translated in a timely fashion for policy and decision makers in government.

Noted on the E O Wilson Foundation website (Half Earth Day discussions – Sir Tim Smit) is that scientists often do not have a huge audience compared to other sectors of society. Hence, one of the challenges is to find and engage public audiences on critical topics. Wilson attempted to bridge this gap with his later writings which highlight in plain language the environmental issues that humanity faces (Wilson 2002, 2016) and the need to adjust our economic growth and consumption ethos accordingly.

Within the science community, including the social sciences, Dr Wilson will be long remembered for his scientific and philosophical writings and lectures. His works will be cited well into the future. One hopes that his concerns about global biodiversity will lead to forward looking and timely policies and practical solutions. May we all live up to his exemplary work ethic and his dedication to humanity’s future, in this challenging time of a global pandemic, a climate crisis, freshwater shortages, and society’s need to address such critical issues without delay. Read “*Consilience*” and “*Half-Earth*” and be inspired.

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Submitted as a blog post, Peter Wells, EIUI, Jan. 17, 2022.

## TERRITORIES News

Submitted by Anne Wilson, CSEB Territories Director

Although day lengths are increasing rapidly this time of year, the North is experiencing periods of extreme cold. This is predicted to persist, with below-normal temperatures until April, particularly in the NWT. That is reminiscent of winters in the 1990s and before, when it was not uncommon to have stretches of six weeks without temperatures going above -40°C!

In 2019, the MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition set off to collect extensive environmental datasets for a full annual cycle in the central Arctic Ocean. There have been three overview articles published February 7<sup>th</sup> in the journal *Elementa*:

- Overview of the MOSAiC expedition: Snow and sea ice. <https://online.ucpress.edu/elementa/article/10/1/000046/119791/Overview-of-the-MOSAiC-expeditionSnow-and-sea-ice>
- Overview of the MOSAiC expedition: Physical oceanography. <https://online.ucpress.edu/elementa/article/10/1/00062/119792/Overview-of-the-MOSAiC-expeditionPhysical>
- MOSAiC expedition: Atmosphere. <https://online.ucpress.edu/elementa/article/10/1/00060/119789/Overview-of-the-MOSAiC-expedition-Atmosphere>

Data analysis is ongoing for the hundreds of observations collected during the one-year expedition, from Sept. 2019 to Oct. 2020. This will build a picture of changing conditions in the Arctic, and provide insights into climate change processes in the North as well as informing future research and work.

On a “local” level, Nunavut is experiencing an outbreak of rabies in foxes. This is not unusual, and can occur in cycles of 10-15 years with variation in severity. Given the distances between communities reporting cases (e.g., Cambridge Bay, Tuktoyaktuk, Iqaluit, Chesterfield Inlet, Arctic Bay), I am curious about the means of transmission and whether Arctic foxes travel great distances. A question for the Arctic Fox conference listed below!

## Conferences:

There are a few interesting conferences on the radar for 2022:

- ArcticNet Annual Scientific Meeting Dec. 5-9, 2022, Toronto, ON [Conferences on climate change in the Arctic - ArcticNet \(ulaval.ca\)](https://conferences.onclimatechangeintheArctic-ArcticNet.ulaval.ca)
- Climate Change and Environmental Sustainability (CCES) 2nd Edition Sept. 1-3, 2022 (In-person and virtual) <https://www.ierek.com/events/climate-change-and-environmental-sustainability-cces-2nd-edition#introduction>
- Cryosphere 2022 - International Symposium on Ice, Snow, and Water in a Warming World August 21-26, 2022, Reykjavik, Iceland <https://www.cryosphere2022.is/>
- Arctic Science Summit Week 2022, Mar. 26 – Apr. 1, 2022; Tromso, Norway <https://assw.info/>
- C\*Sci22 Connected Where You Are, May 23–26, 2022; (hybrid virtual/regional) <https://citizenscience.org/c-sci-2022/>
- The 6<sup>th</sup> International Conference in Arctic Fox Biology, August 26–29, 2022 Longyearbyen, Svalbard <https://www.npolar.no/en/arrangement/arctic-fox-conference-2022/#toggle-id-1>

## Notes on Northern Development and Activities

Activity has slowed substantially in Nunavut and the NWT for environmental assessments and regulatory processes. There are several of the larger projects moving through to development or expansion, and others delayed or deferred. In the NWT, there are three actively producing mines, all mining diamonds, and Nunavut has three producing gold mines, and one iron-ore mine. Exploration seems to have slowed down, although according to the NWT & NU Chamber of Mines web site, there are numerous (25+) advanced exploration projects with known deposits. Targets

include gold, silver, base metals, tungsten, rare earth elements, diamonds, and uranium. Of these, we are only seeing activity at fewer than 10 with any ongoing activity, and perhaps two that may proceed to development in the next few years.

Some of the current reviews include the following:

- Nighthawk's NWT gold exploration project in the area of the historic Colomac Mine has triggered Type A permits, which will be the subject of public hearings in April.
- The Baffinland Iron Ore mine expansion environmental assessment hearings were completed, and the company is awaiting the EA decision from the Nunavut Impact Review Board. Baffinland has applied to increase production in order for the project to remain economically feasible. Concerns include effects on marine mammals and sea birds, and increases in emissions given the increased shipping involved. If the NIRB releases a positive decision, the next process will be amendment of the Type A Water Licence with technical meetings and public hearings.
- Remediation projects continue for the Giant Gold Mine and will be commencing again for the Rayrock historic uranium mine site.
- Future anticipated activities may include expansion at the Meliadine Gold Mine, and remote underwater mining of diamond pits.

## Closing

If you are connected to activities in the Yukon, Northwest Territories, or Nunavut, doing work north of 60° that you would like to highlight in the newsletter, or running some seminars or other training opportunities, please let us know. The CSEB provides a valuable networking and communication forum, and a voice for biologists on any issues to be raised. There is also the option of instigating other CSEB activities—both of the fun and/or of the educational variety—with colleagues in the North. Please email your thoughts to Anne Wilson at [anne.wilson@ec.gc.ca](mailto:anne.wilson@ec.gc.ca). There is also an opening for another Territories Director—please contact Curt Schroeder or myself if you would like to take on this role!

## Rainfall in the Arctic Will Soon be More Common Than Snowfall

*Changes will happen decades earlier than previously thought!*

November 30, 2021 — More rain than snow will fall in the Arctic and this transition will occur decades earlier than previously predicted, a new study led by the University of Manitoba (UM) reports.

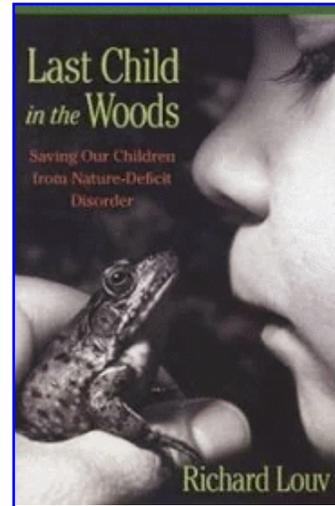
Projections from the latest models, published by an international team of researchers led by UM in the journal *Nature Communications*, show a steep increase in the rate and range of precipitation expected to fall in the Arctic, and that most of these future events will be rain. This shift is occurring due to rapid warming, sea ice loss, and poleward heat transport in the Arctic.

For more information, see <https://news.umanitoba.ca/rainfall-in-the-arctic-will-soon-be-more-common-than-snowfall/>

*(Thanks to Sharleen Hamm for recommending this article)*

## BOOK Review

Submitted by Bob Gainer, CSEB Alberta Member



### Last Child in the Woods. Saving our children from nature-deficit disorder

by Richard Louv,

Workman Publishing Co., New York 2008

Available from [Amazon.com](https://www.amazon.com) for \$12.11 USD

Louv's book was recommended to the audience by Brian Keating at his lecture this December in Camrose, Alberta. Keating is a very prominent, high profile local outdoorsman, naturalist, photographer, environmentalist, and

expedition leader specializing in "civilized" wildlife adventures in Africa, the Arctic, and Antarctica. Because of COVID, he has had to confine his adventures these last two years primarily to his yard in Calgary, on the banks of the Bow River. He learned how to build homes for Canada Geese, mallards, squirrels, woodpeckers, and to build bird feeders that can outsmart raccoons and magpies, relatively ordinary and not normally interesting subjects.

Keating is a professional media personality and has all the latest electronic "gadgets", nest cams, trail cams, webcams, spycams, and electronic equipment in general to make great presentations of his subjects as latest family members. He also resurrected his old "pickemuptrock" camper to visit lesser known campgrounds, mostly in southern Alberta but as far north as Lesser Slave Lake; especially the birding and wildlife viewing hotspots. Keating highly recommended Louv's book because one of its themes is that you can find interesting biology in the simplest, most humble, non-spectacular surroundings. It is not necessary to go to great places to know about nature, it can be witnessed and appreciated just about anywhere that humans let it exist. Not really what people want to hear when contemplating spending big bucks on one of his "civilized" tours, but Brian Keating could sell me and many other nature lovers in the audience ocean front property anywhere he wants, so if anything he probably made a few sales.

Louv's book is about much more than backyard biology, although it includes that. This book's main theme is that more nature in modern day children's life is the solution to a lot of what ails them. He is a teacher by training who several years ago started writing books describing the joy of outdoor activities culminating in this book that has brought him much attention in the Education Academia. My experience with education courses compared to the mostly science courses I have taken is that they have been long on style and short on content. However, I have spent several weeks working through what he has to say and found important messages, a few I will try and emphasize. Anyone else would find my review lacking I am sure.

What I thought was his most important point is that there are at least seven different types of intelligence recognized: linguistic, mathematical, spatial, physical, musical, interpersonal, and intra-personal. He presents the eighth one, nature intelligence. He says that exposure to nature is important to all children, but especially so to the child with extra nature intelligence. I understand this point because of my obvious other intelligence deficiencies and how important nature has been to me. I reemphasize education academia does not benefit from my intelligence makeups.

Louv says that biology is not taught properly. He says that teaching should emphasize natural history much more, especially local, down to earth, easily appreciated natural history. I agree, I remember the agony of all the bugs courses I took with grasshoppers, frogs, rats, cats, etc., all pickled in formaldehyde that I had to dissect and that were pretty much a waste of time. Plasticine models could have functioned just fine. Also a lot of the biological principles emphasized in my education were about African lions, wolves, bears, whales, and sharks. They were spectacular and sensational, but what about local wildlife, however humble it may be. The biological principles are the same. Actually most "ecological" principles now, like in population biology, are computer models, boring to a nature intelligence. Naturalists are more like poets than engineers. The most distressing part of biology for me was seeing some of the collections of study skins of animals and birds in museums and universities all over the world that probably wiped out populations of birds and animals, such as raptors in certain areas and valleys, for people to measure them and describe them to "lump or split" their speciation arguments.

Louv points out that it is so much easier for parents to have children confined indoors to TV and smart phones because of the gangs and drugs and kidnappers on the streets. This has led to activity and obesity problems in the children while their parents are often super fit and good looking. As for outdoor public places, all levels of government have to be aware that any space they provide has gigantic landowners liability issues, which almost totally influences their decisions to provide as little as possible. It means there are no nearby places for a child to learn about on their own. He talks about the need for people in the USA to create cities in the Midwest of about 40,000 in size out of much smaller dying towns, to spread out the population as much as possible to take advantage of all that space and make natural spaces much more plentiful and accessible. Despite the fact that most governments are in agreement with this principle, the people aren't and they move to the megalopolises on the coasts. The best example is the southern California area that stretches north from the Mexican border for almost 1,000 km and east from the Pacific coast about 200 km with at least 50 million people. Wyoming with 10x that area has 1/100 the population.

Louv describes hundreds of people in history who have made great contributions, Teddy Roosevelt, the patron saint of the national parks, is one of the greatest, and Eleanor probably just as important. Both grew up outdoors (he does neglect to mention many of the other thousands of historical figures without outdoor backgrounds who made great contributions). Poets and artists have made great livings out of idolizing nature's beauty and now film producers (like, ahem, Brian Keating). His point though that without these historic figures with nature intelligence and access to nature the world would be a poorer place.

Being an educator, Louv addresses the giant gorilla having a bowel movement in schools now, attention deficit disorder, and several other mental health issues. Ecopsychology is a well established field and uses "biophilia" to deal with a whole spectrum of psychiatric problems, like pet therapy in senior's homes, or working on farms or petting zoos for hands on contact with animals, and living conditions unlike what they would find at home or in their school. Louv also thinks that humans have an inner need to attach themselves to a landscape they are familiar with.

Louv says that biology teachers aren't trained to teach natural history or aren't able to provide students with farms or zoos or natural areas to identify plants, rocks, soil, birds, animals, or clouds that they will encounter. What they do find easy to present are all the topics that the media have "jacked" up like catastrophes, our impending world coming to an end because of global warming, endangered species, the end of the Amazon, no more polar bears, elephants, and giraffes because of habitat destruction, etc. I remember the incredibly powerful 1965's song "The Eve of Destruction". I really did think then that the end of the world was soon. In elementary drill, I was taught to hide under my desk when we practised nuclear bomb drills. This glorified these activists whose knowledge and skills were about tactics that scare and shame people into making them feel guilty and support their cause. They are actually pathetic biologists peddling doom and gloom that is not good for young people's mental health but the media don't care, "if it bleeds, it leads".

Local and down to earth natural history is hard to teach and doesn't receive support. When families do go camping now, it is mostly "windshield" tours between campgrounds. Very few tents now, or hikes with binoculars and cameras to identify plants or animals. An actual naturalist is the endangered species. Hunting and fishing have been shamed now by PETA and such groups but that still leaves bird watching, plant identification, photography, and just enjoying the feeling of being in nature.

The most important nature experience for the vast majority of people now is film. "The media is the message" said Marshal McLuhan. It is all about color and flashy movements and a narrator who "knows what the animals are thinking". The scenes that are the most dramatic have been staged, and prey animals that are being predated are tranquilized. If it makes it to your living room, you can be sure it is not biology, it is fake.

Louv points out that Finland consistently leads the world every year for their standard of education. Again this is my brief representation of what he says, but it is that there is far less pressure on children to achieve standards, yet their results are better. A child is allowed to find out what type of work appeals to them and then develop on it. Basically the child is allowed to profile themselves based on what their type of intelligence is and develop based on what they desire to learn. This leads to a better and higher educated population and teachers have a much higher social standard and are more respected. Computer and smart phones are not involved until high school, despite the economy of Finland being highly dependent on its "IT", such as Nokia, a Finnish based smart phone.

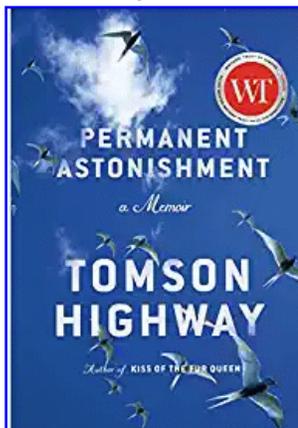
Louv thinks spirituality is a big part of nature intelligence. A trip into nature is like going to a meditation center or being a part of a religion that appeals to you. We all have mental health issues and these forms of spirituality are very restorative. He goes on to say that faith based stewardship of nature is important, not

like cult groups that fear monger and only pretend to be caring environmentalists without the nature based intelligence and conservation as a type of spirituality. Our time on earth really is a brief opportunity to do what is right.

This book is almost 15 years old now and many of the authors recommendations have been acted upon. As I said in my introduction, academic Education is not my strong suit and the interpretations, generalizations or opinions I present will be much different from anyone else's. I agree wholeheartedly with everything he presents. Some of his visions though, of creating dying small towns on the prairies into cities of 40,000, haven't received much success. I do see a slow movement of people from big cities and high priced real estate to the much more affordable small prairie towns like my nearby town Hanna. We have all the basic services, even fibre for Internet and other communications. Unfortunately it is mostly retired people that are moving here and they do take full advantage of our natural surroundings and hiking trails. The children in our school are mostly from local rural families who get their natural setting at home. Maybe we can convince Brian Keating to be our realtor and sell families on our relatively low cost access to nature for children.

## BOOK Review

Submitted by Bob Gainer, CSEB Alberta Member



### Permanent Astonishment: A Memoir

by Tomson Highway

Penguin Random House Doubleday,  
Canada, 2021

Available from [Amazon.ca](https://www.amazon.ca) for \$32.95

Tomson describes himself as being what in Cree is called “two spirits”. In European society, you are either hetero or homosexual, no grey area, but natives in general are more accepting of the grey area. In addition to his sexuality, he was exceptionally small for his age until

he entered puberty when he was 16 and grew to over six feet after he had left the Residential school. Predictably, he was abused lots but because of his exceptional effort and ability to learn music, languages, and schoolwork in general, he survived. Tomson's father must have recognized that he had two sons who were two spirited, Tomson and his younger brother Rene, and told them to go to the whiteman's schools to learn how to save their race, which both have done exceptionally well at doing. Tomson's father must have been very intuitive.

Tomson's father and mother, Joe and Balazee Highway, are of course a product of the first Riel Rebellion in the Red River area in 1870, the exceptionally intelligent and insightful Louis one. Sir John A. put a bounty on the heads of all the natives and metis in the area that spoke French and were Catholic, starting with Louis's, which meant they had to run as fast and as far away as possible. Louis chose to go the the USA. Brochet is really Chipewyan not

Cree territory but for Sir John A.'s bounty (actually Tomson's parents probably knew Farley Mowat who spent the summers of 1947 and 1948 near the four corners and who spent part of the 1948–49 winter in Brochet). The West was a small connected world 150 years ago.

Tomson has nothing but a great love for the country he grew up in, his large family, his educational opportunities, and his success in life. He is an accomplished author of drama, fiction and non-fiction, and primarily makes his living as an internationally renowned concert pianist and stage performer. His brother Rene who died recently was an internationally accomplished stage dancer. Tomson says the reason for their success is growing up in a really fantastic outdoor setting, a loving and supportive family and their opportunity to go to school. Louv would be proud of them.

Continuing on with my own experience with my wife, she came to High Level in northern Alberta at the age of 30 from Britain, with a medical degree to practise on natives, deliver their babies, and marry their local vet (me!). After five years and two babies (three actually, her biggest baby was... ahem), the family moved north to Fort Smith to deliver and treat more natives and have another of her own and after a few more years move to south central Alberta to raise three kids (four...ahem), practise and deliver other peoples' for 20 years, do a residency in psychiatry, and move to Camrose to shrink all the victims she can up there, including a quite significant “two spirit” component, now into her 70s with no sign of slowing down. She never complains or wallows in self pity (like some...ahem) and just repeatedly reminds me that this country is such an incredible opportunity for people who want it.

Britain has a sort of class society based on how noble and royal-like and well trained in speech and manners a person's upbringing was that basically favours the Londoners. Scots are a long ways from London and as classiness goes are rather frowned upon. Now of course the Scots are just as class conscious and the speech and life style of the Glasgow Edinburgh urban centers are favoured. The rural counties not, and there is one rural county that is especially despised, Fife. Of course, Fife has its class consciousness and the most despised area is the little port town of Methil. Of course, Methil has it class system. My wife grew up in lower Methil in a one room flat above a shop that shared an outdoor toilet with everyone on the block. The chances of this wee wretch from lower Methil becoming an educated, successful professional in Britain was zero. The chances of her being pregnant after her first period were pretty high. Except that this wee wretch that basically grew up abandoned to the outdoors in and around the Methil area was made perfectly aware of this by her grandmothers. Her only way out was to do well at school and so she worked at it, hard. Both grandmothers commonly referred to her as “a right birky wee bissim” meaning she has lots of the inner strength that Tomson Highway is made of. She kept making the different academic levels until she got into med school, where her accent caught up with her. She survived the now significant social abuse at med school and the first chance she got she left Britain with a wee bit of a chip on her shoulder. Like Tomson, she says that a childhood outdoors, a reasonable homelife and the opportunity to learn schoolwork was all she needed. Louv and Tomson would be proud of her. And she does have a crush on Brian Keating so I need to up my game so to speak. Luckily Keating is already married to an MD and probably would run for his life.

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