REGIONAL News

BRITISH COLUMBIA News

Submitted by Loys Maingon, CSEB BC Director

Long-term Science or Short-term Politics?

Beyond the usual political ephemera of human transience, the only real news of public interest in BC before the Carney-Smith announcement of a new oil pipeline came in a July 25 article by Chandarpurkar et al. in *Science Advances* entitled: "Unprecedented continental drying, shrinking freshwater availability, and increasing land contributions to sea level rise."[1] It comes on the heels of growing evidence that oceans are warming as CO_2 levels continue to rise, temperatures are rising, seas are rising, and extreme droughts are re-shaping our ecosystems. As Figure 1 clearly indicates, based on data from 2003 to 2024, BC, and much of Canada, particularly the north and the Pacific Northwest of the North American continent from BC to Alaska, are deeply affected by a growing global drought, far more so than our neighbours to the south, who are already finding their aquifers seriously depleted.

This study focuses on the radical decrease of terrestrial water storage over the past twenty years which is setting a long-term trend indicative of things to come. To understand how serious this is, we only need to look at the current environmental, economic and political impacts of the global drought in Europe, based on the same data.[2] As per Figure 1, although the impact in Europe is nowhere as extreme as in BC: "Europe's drying trend will have "far-reaching" impacts, hitting food security, farming and water-dependent ecosystems, especially groundwater-fed habitats." In BC we can only expect the magnitude of the problem to be greater.

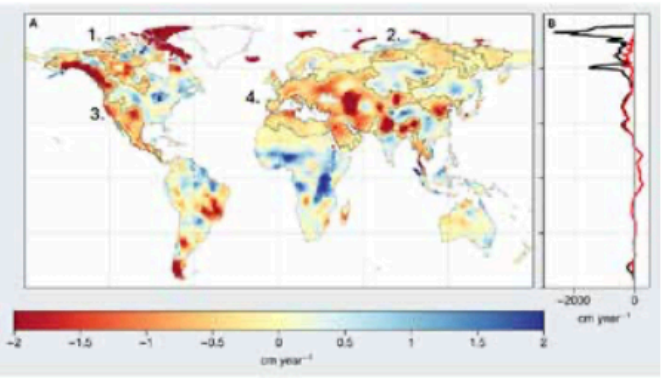


Figure 1: Map of Global Total Water Deficit Areas between 2003 and 2o24, from Chandarpurkar et al. Science Advances 11, 25 July 2025

The question it should raise is whether the future of our freshwaters matters to the public and to the politicians they elect?

In concert with our shrinking glaciers and diminished snowpack retention, the ability of our rivers and lakes and associated watersheds to retain sufficiently high surrounding water tables is declining catastrophically. This spring, streamflows across BC were below normal as a result of a cold late winter delaying snow melt combined with dry weather. While Vancouver Island rivers saw a slight rise with late March rains, most of BC saw low base flows lingering from the 2024 drought. The water deficit started early. Together with a renewed intense fire season, wells and rivers experienced drying out during the normal water deficit period between July and October.[3]

The BC picture is consistent with long-term projections and trends reported in the Chandarpurkar et al. study. A view of the same data from a short-term or monthly perspective, such as reported by Agriculture Canada in Figure 2, gives an entirely different experience. It is the short-term perspective that informs public perceptions and political policy-making. Absent is the long-term understanding of what this drought might mean for future generations. It is not a roadmap for environmental management.

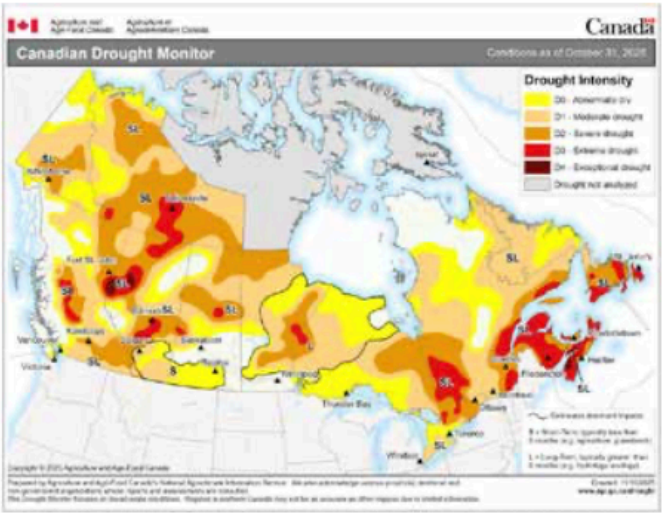


Figure 2: Drought Intensity (as of October 31, 2025) as reported by Agriculture and Agri-food Canada.[4]

Yet, it is the monthly map that guides political perceptions, in the same way that four-year election cycles guide policy. The monthly map has no baseline. It does not tell us about the cumulative changes to our hydrology and to freshwater ecosystems. It re-enforces a static illusion of an essentially unchanging landscape that can be engineered at will. It is a portrait of short-termism.

The drought, which has been growing for the past two decades, therefore comes as a "phantom event" to which a predominantly urban public has become passively accustomed. Most British Columbians are accustomed to receiving water at a turn of the tap from municipal systems. Sometimes these systems dry out, as happened in Dawson Creek this year when the municipality's

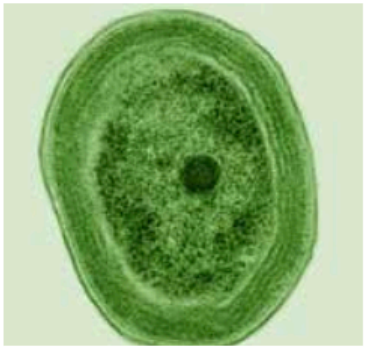
water source, the Kiskatinaw River, went dry.[5] The solution then is not to question our consumption or our contributions to climate change, but to seek a better source of water, which the same users will also eventually abuse and run dry. The drought only intrudes on urban lives when water health advisories, lawn watering restrictions, or wildfire smoke inconvenience the public's routines. However, phantoms tend to be recurrent.

"The Blob" that gripped the north Pacific Ocean between 2013 and 2016 and caused mass mortalities of marine and forest ecosystems, as well as droughts and wildfires, has receded from public memory. This year it has returned, and in all likelihood it is set to become a permanent or frequently recurring fixture of life in BC. The Canadian Integrated Ocean Observing System (CIOOS) and Berkeley Earth have reported a return of the Blob this year.[6] (We can now expect this to last to at least 2028.)

We forget or overlook the importance of temperature shifts, at our risk and peril. Ecosystems are not machines. They are complex assemblages of pyramids of interlocked and interactive organisms—essentially forming giant evolutionary microbial mats covering a geologically unstable planet. They regulate, stabilize, and even create, their environments. Our forests are just that—a giant complex evolution of microbes, dependent on the health and well-being of their microbiomes that regulate regional climates. And yet we continue to deforest for short-term employment and profit. As every microbiology student learns on day-one, all microbes are tightly dependent on three variables, temperature, pH, and water availability.[7] Temperature and humidity are inescapable constraints of the chemical and microbial foundations of life. Evolution is the struggle to overcome these constraints, notwithstanding that the entire edifice continues to rest on the stability of a microbial foundation we overlook, take for granted, and regularly abuse.

All systems, aquatic and terrestrial, depend on microbes and their microbiomes. Nothing quite proves this simple fact better than "*Prochlorococcus*," and recent discoveries about it. This simple 0.07 micrometre single-celled organism, discovered by accident in 1986 by Dr. Penny Chisholm, may be the most important organism in the biosphere.[8] It forms the basis of all marine food chains and is considered to be "the tiny organism that powers the planet." Its evolutionary relative gave rise to the biospheric chlorophyte revolution that made life as we know it today possible. Until this summer, it was assumed that given its greater genetic and regional diversity, it would be impervious to the myriad of environmental insults we might throw at it.

Photos of Prochlorococcus



Work by a team led by Dr. François Ribalet at Washington University published in September in *Nature Microbiology*, indicates that *Prochlorococcus* is sensitive to temperatures above 28°C. Its reproductive rate declines above that temperature:

> *"Prochlorococcus division rates appear primarily determined by temperature, increasing exponentially to 28 °C, then sharply declining. Regional surface water temperatures may exceed this range by the end of the century under both moderate and high warming scenarios. Under these future conditions, our global ocean ecosystem model suggests a possible 17–51% reduction in Prochlorococcus production in tropical oceans. Even with the inclusion of hypothetical warm-adapted strains, models show significant production declines in the warmest regions, suggesting that thermal adaptation may not prevent negative impacts. These results highlight the potential vulnerability of Prochlorococcus-dependent marine ecosystems to future warming."*[9]

Ribalet's work focuses on subtropical and tropical Pacific Ocean. Even if this decline were restricted to that region alone, it would have calamitous implications for the world's ocean fisheries and the populations that depend on them. That may be the least of our concerns given that "*a reduction in Prochlorococcus populations may disrupt mutualistic relationships with other organisms such as SAR11, the ocean's most abundant heterotrophic bacteria, potentially destabilizing the microbial community and altering carbon cycling."*

The foundation of all of our ecosystems is microbial. This, together with other discoveries about microbial ecology, indicates that the microbial world is far more vulnerable than we are accustomed to believe, or that politicians and economists are able to conceive.

This comes in the wake of growing evidence of a global plankton biomass decrease as ocean temperatures increase. The decline of *Prochlorococcus* observed by Ribalet is consistent with work published in 2010 by Daniel Boyce et al. at Dalhousie. Boyce et al.'s research was triggered by satellite observations that chlorophyll concentrations were declining. Based on Secchi-disc measurements going back to 1900, they were able to conclude that phytoplankton has been diminishing at an average rate of 1% per year since 1900. Since 1950, "phytoplankton numbers have plummeted 40%."[10]

The recent work of Crispin Mushinda et al. from the same institution further confirms a 1-2% decline in plankton biomass per year between 1960 and 2017 in the North Atlantic ,with regional variations in diatom and dinoflagellate ratios. Pointedly, they conclude that *"There is accumulating evidence that climate warming over the last century is altering ocean conditions, primary productivity, chlorophyll concentration, and the biogeography of key phytoplankton taxa."*[11] If ocean ecosystems shift with microbial ecology, all talk about Marine Protected Areas to perpetuate unsustainable fisheries, is moot, because it is based on the same illusion of a stable static planet as Figure 2. If the microbial foundation of food webs shifts, then the stability of the entire ecological pyramid on which they are built comes into question. If the biogeography of phytoplankton shifts, then so are all higher taxa dependent on it likely to be re-organized.

Unsurprisingly, ocean productivity is declining together with declining plankton biomass and rising ocean temperatures. While politicians may quibble the concern of scientists that we may be

crossing critical barriers and tipping points, the basic facts remain. First, life as we know it depends on microbiomes we take for granted. Second, microbes that sustain the web of life respond to subtle shifts in temperature. Changes in microbial ecology can alter entire ecosystems on whose stability both our health and our prosperity depend. There is no point talking about, "resilience," "restoration," "mitigation," or "adaptation," if the foundation for these buzz words shifts.

As indicated by Figure 1, of concern for British Columbian ecosystems, and ecosystems affected by the drought and the loss of terrestrial water retention across Canada, is the fate of freshwater ecosystems on which our health and economy and biodiversity depend. Water is not just an elemental resource to be mined. Natural waters are organic dynamic systems. It is said that "lakes are sentinels of climate change."[12] Lakes are very sensitive to climate change. What happens in lakes and reservoirs determines what happens in rivers that flow from them. To be very blunt, if lake temperatures rise beyond critical limits, not only will resulting de-oxygenation and other biogeochemical cycles be affected and fish populations decline in the lake, but the resulting environmental signal will be carried downstream. If open water in a reservoir heats to 30°C, then surface water released downstream in open conditions will tend to stay around the same temperature. If water is released from a hypolimnion dam, the outflow will be colder for some distance, but it will remain subject to the same regional insolation rates, and it will heat to the same surface temperatures, unless it is transported in large volumes capable of buffering fluctuations in water's heat capacity. In other words, all the best intentions and all the best and most expensive restoration and conservation efforts will come to nought if surface temperatures cannot be controlled at source. "Adaptation" would mean adaptation to a subtropical flora and fauna.

The impacts of climate change are magnified in freshwater ecosystems, making freshwater ecosystems the most vulnerable ecosystems, as limnologists have known and reported for decades, at least as far back as W.B. Hynes' classic (1975) paper *"The Stream and its Valley.*[13] That point was made again in a recent study with the self-explicit title: "Extreme warming of Amazon waters in a changing climate."[14] This study of 10 Amazon lakes reported that Amazon waters, which normally average between 29° and 30°C, are now regularly experiencing extremes of 42°C, resulting in high mortalities of fauna and shifts in flora.

Ironically, similar shifts were observed this summer in a BC reservoir and in Vancouver Island rivers. Based on personally collected data for the Strathcona Wilderness Institute in July and August, Buttle Lake surface water, which should have averaged between 18° and 20°C in the summer, averaged between 23° and 24°C and reached up to 29°C in some wind-protected bay areas. Lake temperatures in BC that normally support a cold-adapted flora and fauna were able to reach near-Amazon normals. The sample is limited, but it may be indicative, because "The Blob" is becoming a new normal, and because, as reported earlier, BC experienced low baseflows in the spring[15]. Similarly, the main channel of the Tsolum River below the hamlet of Headquarters averaged 28°C in August, an observation concurred by similar downstream records of the Tsolum River Restoration Society.[16] In keeping with these impacts, at Buttle Lake, Secchi disc measurements confirmed that clarity reached 20 m or more, indicating a virtual collapse of phytoplankton, which is inconsistent with previous provincial sampling of this hypo-oligotrophic lake.

Unfortunately these local observations do not appear to be entirely inconsistent with provincial and national trends. Three years ago, a group of leading Canadian freshwater scientists led by J. Desforges et al. put out an urgent call for the need to better protect Canadian freshwater ecosystems in the *Canadian Journal of Fisheries and Aquatic Science*: "The alarming state of freshwater biodiversity in Canada."[17] Their findings indicated that although Canada is home to some of the greatest surface area of freshwater in the world, our data gaps show that management is guided by a prevalent state of blissful ignorance:

> *"Overall, 11.7% of all freshwater species of plants and animals assessed were found to be "at risk" (i.e., listed as "Threatened", "Endangered", or "Extirpated") and 17.9% identified as "Special Concern". We found that 37.9% of species lacked sufficient data to enable their status to be assessed. Data gaps in Canada's assessment of its freshwater species were most prevalent in invertebrates (excluding freshwater mussels)."*

Unfortunately this elicited only 76 citations in the science world, demonstrating the extent to which freshwater ecosystems are undervalued and under-studied. It also confirms that expressions of concern by leading scientists do not seem to have shattered the foundations of the political establishment's priorities .

It, therefore, is no surprise that given political tone-deafness, this was followed up by a more recent, if somewhat disingenuous article by Stephen Cooke et al. in *Freshwater Science* "Our Failure to Protect the Stream and its Valley: A call to back off riparian development".[18] The authors attempt to dilute the urgency of the Deforges' article by claiming that Hynes was unclear about what he meant by ,"valley", and may have wanted to refer only to lower valleys, not whole watersheds. For the record, anyone who cares to read Hynes' original article will find that Hynes repeatedly and frequently uses the word "watershed" interchangeably with "valley." Only parties whose interests may be exceedingly tied to those of forestry and mining would come up with such poppycock.

This genuine concern for the state of our waters may have had no more impact on politicians than others, because it shares in the same political and moral ambiguity. We talk about sustainability, but our practice and tacitly continue to support a vision of life that promotes unsustainable growth. It is not just development in riparian zones that is the problem—it is the focus on development *per se* that drives climate runaways and related environmental impacts that spur on our environmental crisis. One cannot have one's cake and eat it. Yet, that is the standard fare of politicians.

Fortunately, sanity sometimes surfaces. That we can no longer "pick and choose" in order to continue business as usual and pretend that we can pursue environmentally sustainable agendas, is obviously clear to a majority of younger academic researchers. In an opinion piece published in *Le Devoir* on November 12, 2025, over 450 university science researchers from across Canada signed a letter to Prime Minister Mark Carney calling for a shift in priorities.[19] As a Google search can quickly tell us, while the Prime Minister regularly receives all kinds of open letters about climate change from special interest groups and environmental organizations, letters from academic researchers are not regular fare. This letter

went largely unreported in the English media in Canada, revealing the usual pro-business bias of mainstream media.

This should be deeply concerning, because this letter should be of particular interest to all Canadians interested in what the scientific community has to say. The scientific community is not a "special interest group," nor should it be treated as such. In fact, this shows that public interest NGO's get more media coverage than does the scientific community, which is the purveyor of objective facts and reports on verifiable data. It is not the custom of the scientific community to engage in high profile public action, therefore, when the scientific community expresses the necessity to speak out, Canadians should at least be given the opportunity to know what the scientific community has to say, independently of government and business, from the horse's mouth.

The letter that came out at the start of COP30 in Brazil is aptly entitled in the *Le Devoir* version: "The Importance of Climate Leadership in Canada." It is the product of a cross-Canada team of academic researchers who form part of "Sustainable Canada Dialogues" formed in 2014, based at McGill University, with over 80 permanent team members across Canada.[20] The authors express profound concern at the Carney government's apparent about turn on climate priorities and its proposals to override environmental assessment legislation in order to expedite "major projects" and "projects of national importance." They also underline the fact that the planet's capacity to adapt to increasing greenhouse gases is reaching its limit, that Canada is experiencing increasingly aggressive forest fires and droughts driven by climate change. Significantly, they also point out that our economy faces a precarious future, because it is largely out of step with global trends.

The letter is a well-founded complaint urging the prime minister to honour climate priorities that remain unfulfilled and use the opportunity to develop large infrastructure projects of national importance to meet climate objectives, rather than renege on them. Ten years ago, Sustainable Canada Dialogues prepared a road map for a low-carbon Canadian economy that Canada has failed to follow. Had we followed that road map, we would now be largely independent from the vicissitudes of the American economy. China and the European Union have become leaders in alternative energy, with China increasing the development of renewable energy over the last five years by 240% while Canada has barely developed 15%. In the long term, the planet's future clearly lies in the development of a low carbon economy, and we are far from being leaders. To now build Canada's economy on fossil fuel priorities is to continue to be tightly linked to the American economy, which is in severe decline.

Ironically, this letter, which talks about a road map, came out at about the same time that the Brazilian Minister of Environment called for a road map to transition economies away from fossil fuels. One would have thought that that was the purpose of the COPs ever since the first COP at Río in 1992? This is a stunning—if unwitting—admission that for 30 years we have been spectators of treadmill politics. It reveals just how disconnected from reality the participants seem to be. The road map has existed for three decades and China is taking up the leadership with India, Africa, and Latin America rapidly transitioning to electric energy drawn from alternatives, with concerning implications for America's global hegemony.

Ironically, the question one has to ask is why 33 years after Río and 10 years after Paris, neither COP participants nor the politicians responsible for the national economic strategy seem to be able to come to terms with the reality of an evolving global drought and climate change. Both scientists and Alberta farmers, who face conditions unseen since 2000, understand the problem. With only 40% of normal precipitation, Alberta farmers are anticipating lower crop yields for 2026.[21] Alberta farmers understand the climate implications of our energy usage as well as Canadian scientists. The difference seems to be that Alberta farmers seem to frame their predicament as part of living in "next-year country" within the short-term logic of Figure 2. Scientists frame the same information and experience within the long-term logic of Figure 1.

So perhaps we are collectively wrongly framing questions about "the national interest", a term that has conveniently been left entirely undefined in Bill C-5, (*One Canadian Economy Act*). Nobody knows exactly what the "national interest" is supposed to be. There is no legal definition. Perhaps it might be better to begin by asking whether it is in the national interest to exacerbate the causes of the drought? Surely, it is not in "the national interest" to contribute to the causes of a drought, which is likely to destroy both our access to freshwater and the health and productivity of our freshwater ecosystems, and by extension diminish our agricultural potential and food security? From that perspective, drought actually unites Canada. We all have an interest in addressing this drought.

That is in fact where the letter of 450 academic researchers might have begun, had the authors not shared in the economic interests of government and business to perpetuate the illusion that an economy of endless growth can be sustained by reaching "net-zero" objectives. As Dr. Joëlle Gergis, the lead author of the United Nation's Intergovernmental Panel on the Climate Change's Sixth Assessment Report, has taken pains to point out the entire premise of achieving "net-zero" while sustaining economic growth rates, is delusional: "the political distortion of net zero is an insidious loophole that distracts from the scientific imperative to eliminate the primary cause of our overheating planet - fossil fuels…. The dilemma we face is simple: genuinely respond to the scientific reality of our predicament or endure the consequences of this profound moral failure for centuries to come."[22]

The economic necessity to respond to American attacks on the Canadian economy should be taken as an opportunity to re-direct and reshape our economy in line with the progressive direction taken by new emerging economies. It should not be just another effort to perpetuate the same unsustainable practices that are now bringing us to the brink. And yet this is what we are witnessing.

The priority has to be the protection of our freshwater resources without which neither life nor the economy are possible. The delusion otherwise was laid bare by Bill Gates' recent much-publicized essay, "Three Simple Truths". While he is right that life will endure in spite of climate change, he errs and misleads on several issues, particularly as regards his priority to improve human life. Life will endure, but it will not be of the same quality. He misleads when he suggests that although it will be hotter, working people in cities like Los Angeles will just use more air conditioning. That would require water, which, as Chandarpurkar

et al.'s research shows, will be a much scarcer resource, and particularly so when it is prioritized to cool data centres needed to support Mr. Gates' lucrative AI.

Though we may laud Gates' philanthropic intentions, it might be important to note that Gates' public magnanimity is underwritten and paid for by the public. Indeed, the public has just provided Microsoft, and therefore Gates, with a loan of $1 billion to re-start the defunct nuclear reactor at Three Mile Island. Notwithstanding public opposition to this project, as a lender financing this project, the public, not Mr. Gates, will hold all the risks and liabilities for Three Mile Island's performance. Mr. Gates' philanthropy would not be necessary if this kind of money were invested directly into public and environmental causes that would make his concerns about our wellbeing entirely superfluous. A billion dollars can go a very long way in environmental restoration and adaptation and is therefore a much better investment.

Central to Gates three half truths is the contention that well-being correlates with prosperity. That is a half-truth because for the last half-century, study after study have shown that the relationship between energy consumption (wealth) and wellbeing and happiness is a curve that peaks around 75 giga-joules per year per person.[23] Happiness and well-being decline thereafter. The average North-American consumes about 275 giga-joules. All of which proves the old axiom: "Wealth is not happiness."

The objectives of Bill C-5 may, therefore, hinge on the flawed logic behind it. If it promises Canadians prosperity and happiness, it fails as disastrously as Bill Gates' arguments when it comes to the notion of the endless wellbeing and prosperity. Everything reaches a natural limit—even oil and gas. After months of announcements of controversial mining projects to be facilitated and mainly exempted from environmental assessments, Mr Carney may have crossed a Rubicon. The notion of building a pipeline exempt from environmental assessments to the Pacific might fly in the halls of the Canada Club in Toronto or The Oilmen's Club in Calgary. The same notion does not fly as well in the houses of BC First Nations, or in Haida Gwai. The notion of lifting a 50-year-old oil tanker-ban in order to sail through the most dangerous waters in Canada, where ships regularly lose the engine mounts, has gin-filled pigs flying. Then, there is the whole notion of making agreements for in-province projects without consulting the province in which the project will occur; that's a political lead balloon likely to fall on its authors. And the question remains: Exactly what prosperity and well-being comes from destroyed ecosystems and freshwater sources? Will anyone but the public own the liability?

But most seriously of all, any notion that we can disregard and exacerbate the threat that a renewed Blob, and growing climate change, currently pose for Canadian freshwaters and agriculture is a cavalier disregard for "the scientific reality of our predicament." Surely, we should and can do better, if only by respecting our scientists and our environmental laws.

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The Evolutionary Snow Lichen

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What's in a microbial mat left by receding snow? And what is it doing there?

Figure 1: Microbial mat left by receding snow, Mount Washington BC, Paradise Meadows (5 June 2025 8:00 AM)