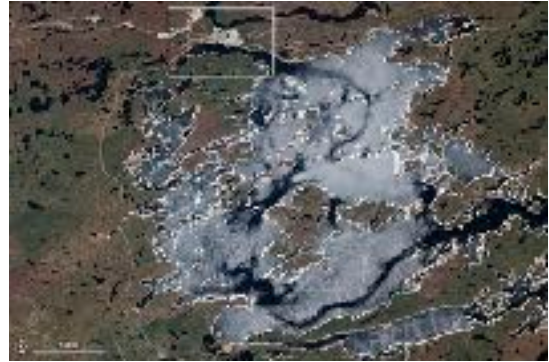


# “Clean” Hydropower Energy is a Myth



Hydro-Quebec Manic 5 Dam ( NHPR photo)



Eastman 1 Dam Reservoir NASA photo

## Hydro-Quebec’s Mega Dams are a Key Contributor to Global Warming and have Devastated the North Atlantic and Gulf of Maine Fisheries



To make climate change matters worse, Hydro-Quebec is planning to build more dams if Central Maine Power’s proposed NECEC “New England Clean Energy Connect” transmission line through Maine to Massachusetts is allowed to be constructed. The consequences of more dams and reservoirs will be an even warmer climate and bring more harm to the fisheries.

Hydro-Quebec is spending millions of public relations dollars to convince the citizens of New England and especially Maine that this transmission line is in the best interest of the climate and the environment. They will not tell the truth that a highly respected Canadian oceanographer, Dr. Hans Neu, first in 1964, tried to warn the Canadian government that large scale hydro dams in Quebec would further alter the climate and devastate the fisheries of the Gulf of St. Lawrence all the way to the Gulf of Maine.



# Primary Harmful Physical Changes Caused by Hydro Dams

- Heat pollution of the atmosphere and river water
- Extreme regional climate change and coastal waters warming
- Reduction of flow energy required to deliver nutrients to coastal waters and ocean currents
- Stagnation of ocean currents that control global weather

## Major Ramifications of the Physical Changes Wrought by Hydro Dams

- ✓ Loss of Arctic sea ice
- ✓ Sea Level Rise
- ✓ Destruction of the marine fisheries ecosystem
- ✓ Fragmentation of river related ecosystems
- ✓ Melting of the permafrost and methane releases
- ✓ Increased intensity of flooding and storms
- ✓ Cultural genocide
- ✓ Threatening United States national security due to climate change and destabilizing the world economy
- ✓ Mercury polluted water poisoning people and animals who consume fish

**Dr. Hans Neu warned that: hydropower, reservoirs, and flow regulation cause climate change and marine fisheries destruction.**

## **Who was Dr. Hans Neu?**

The late Hans Neu (d. 2005) was a Senior Research Oceanographer at the Canadian Bedford Institute of Fisheries and Oceans in Halifax, Nova Scotia. He was a specialist for 27 years in estuarine and coastal hydrodynamics. He has studied the physical oceanography of the major water-ways across Canada as well as on the continental shelf and in the north-west Atlantic.

Dr. Neu's publications and his warnings along with those of other scientists concerning harmful effects of hydro dams were ignored and even suppressed by Canadian and United States governments and the hydropower industry.

**The following are excerpts from Dr. Hans Neu scientific papers. See <https://friendsofsebago.org/history/> for full references.**

“In conclusion, fresh water regulation may prove to be one of the most consequential modification *man* can impose on nature. If we do not alter our course and give consideration to nature's needs there will be irreparable injuries inflicted on the environment for which future generations will condemn us.” Neu Part 1 1982 p. 47

“Life as we know it in our coastal waters and its level of productivity has evolved over thousands of years in response to these seasonal variations. Changing this pattern by reducing the flow of fresh water during the biologically active season of the year, or even reversing the cyclic flow altogether, represents a fundamental modification of a natural system. Such a modification must have far reaching consequences on the life and reproduction cycle in the marine environment of the region affected.” Neu 1982

**Dr. Hans Neu predicted the warming of the Gulf of St. Lawrence, Gulf of Maine, Scotian Shelf, James and Hudson Bays and the Arctic:**

“There is no doubt in the mind of the author that if Canada continues this development and the USSR follows its lead, the hydrological balance of our globe would be threatened. . . . “ Reference 12 (The passage of time has proven his prediction to be true)

“All these motions are either controlled or influenced by the amount of fresh water in the system. Retaining fresh water during the higher discharge season in spring and summer and discharging it to the system in the colder seasons of the year with

the intention of equalizing the run-off for power generation and navigation must alter the flow regime, modifying the salt and temperature structure of the system. The change most felt should be to temperature, giving a general rise throughout the year. This change should even modify the climate of the region.”

“Careful studies are therefore required to find the effect of these man-made hydrological changes on the system and to find ways of counteracting them.” Neu 1964

**In a 1982 report, “Man-Made Storage of Water Resources - A Liability to the Ocean Environment.? Part I and Part II,” he made the following observations and prediction: he made the following prediction in regards to Gulf of St. Lawrence.**

“The next big decline (in fisheries stock) probably will be in the early or mid-eighties” and “will be worse, since regulation will have increased further in the meantime.”

**Dr. Neu predicted in 1982 that the next big decline after the 1975 decline would be worse because the LaGrande River hydro project was coming on line. The decline was not only worse, but it has lasted over 30 years and appears to be irreversible.**

**Dr. Neu as early as 1964 stated in regards to impacts of dams and flow regulation of rivers entering the Gulf of St. Lawrence :**

“All these motions are either controlled or influenced by the amount of fresh water in the system. Retaining fresh water during the higher discharge season in spring and summer and discharging it to the system in the colder seasons of the year with the intention of equalizing the run-off for power generation and navigation must alter the flow regime, modifying the salt and temperature structure of the system. The change most felt should be to temperature, giving a general rise throughout the year. This change should even modify the climate of the region.”

“Careful studies are therefore required to find the effect of these man-made hydrological changes on the system and to find ways of counteracting them.” Neu 1964

“In the biological field, it is well established that the major activities in the ocean occur in the coastal zone, including the Continental Shelf. This is the area where changes due to runoff regulations have their major impact.” (Neu 1976)

“In the Estuary and Gulf of St Lawrence these changes should have had a significant impact on the environment and on the marine biology of the lower St

Lawrence system and offshore region, probably as far south as the New England states (Neu, 1970, 1971, 1973, 1968).”

“It is therefore not unreasonable to presume that large-scale changes have already been inflicted upon the marine life of the Atlantic region of Canada and may even have adversely affected the fish stocks of the entire western North Atlantic.” (Neu 1976)

**Dr. Hans Neu describes the actions of flow regulation changes in regards to storing the spring freshet in reservoirs and releasing the warmed stored waters six months later in the winter:**

“Run-off is transferred from the biologically active to the biologically inactive period of the year. This is analogous to stopping the rain during the growing season and irrigation during the winter, when no growth occurs.” (Neu 1982)

**Hans Neu’s warnings apparently were ignored in the 1970’s as reported in Canadian newspapers. Dr. Hans Neu was not the only scientist to write about the harmful impacts of dams and flow regulation on marine ecosystems.**

Many in the scientific community, particularly in the U.S., have remained silent over these high reductions in the spring runoff which exceed “a common universality, namely if spring runoff diversions cross 25 to 30 percent of its perennial norm than a coastal ecosystem’s dynamic equilibrium will be irrevocably distorted.” (Michael A. Rozengurt 2003)

“Little-known outside aquatic science, freshwater runoff is crucial to healthy fisheries. Dr. Michael A. Rozengurt and his colleagues have shown a real physical threshold for safely blocking runoff from fish: No more than 25 percent of this freshwater flow to the sea can be blocked before fisheries are doomed to an inevitable decline. In the U.S., the former Soviet Union and elsewhere, the story’s the same. Canadian oceanographer Hans Neu has shown we’ve already got the world’s highest rate of blocked freshwater flow. For his trouble in trying to alert the federal government to this research he was virtually run out of his job at the Bedford Institute.” (Research shows Canada’s dams are salmon’s doom by Dianne Murray in Windsor Star March 5, 1974)

“Dr. J. S. Nelson, president of the Canadian Society of Environmental Biologists, says the Canadian government has not called for a single environmental study at the outset of any major development”..... “Hans Neu, an engineer-scientist with the Bedford Institute near here, said the environment is becoming another

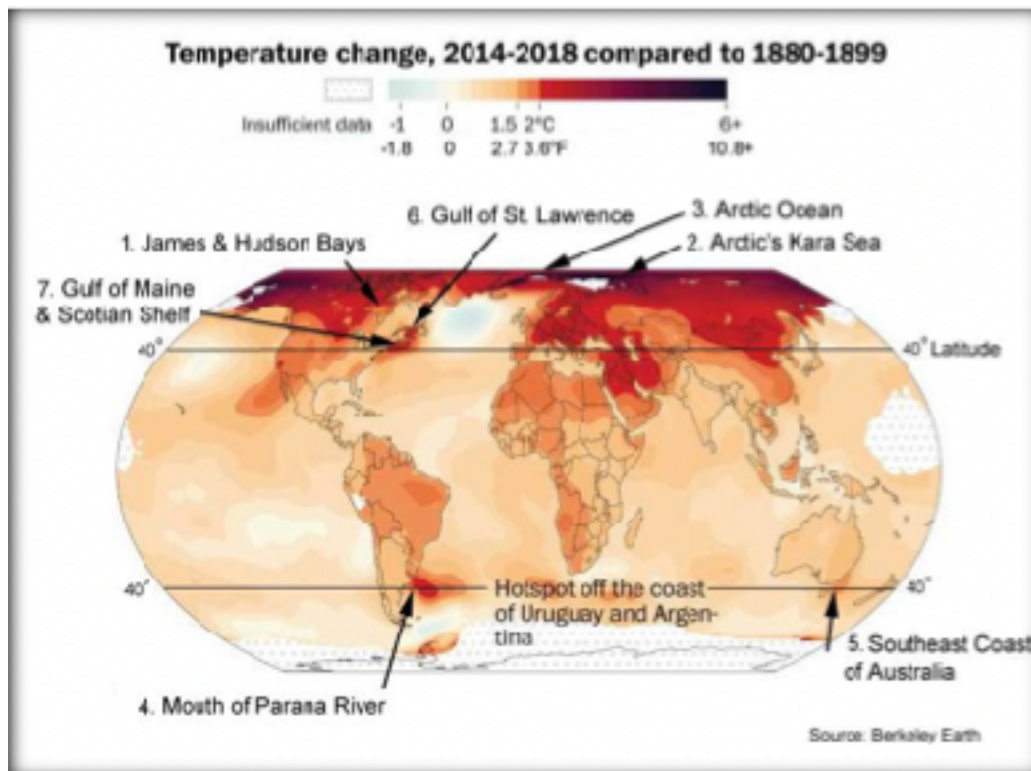
business....”a political football”.... “we have to take a closer look at the environment before we continue exploitation.”, (Environmental Studies Lacking in Ottawa Journal October 26, 1971)

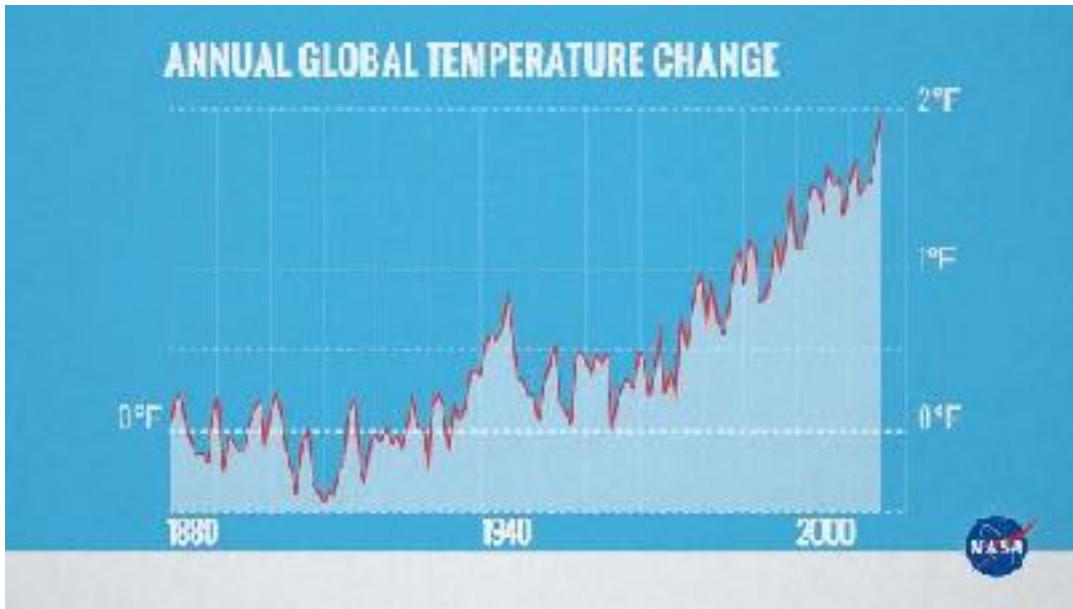
”Also, biologist Wilfred Carter makes it sound like there’s no relevant research, when in fact Canadian government scientists have been muzzled by their director general on this issue for some time.”**“Hans Neu does not go along with that assessment. He is an expert in hydrology at the Bedford Institute of Oceanography here and he feels hydro power may be far dirtier than most people realize. Instead of looking upriver for the effects of a dam, Neu looks at the ocean into which the river waters eventually spill.”**( Dams stop nature’s ways on mighty rivers by Bruce Little in Calgary Herald February 25, 1974)

## Heat Pollution

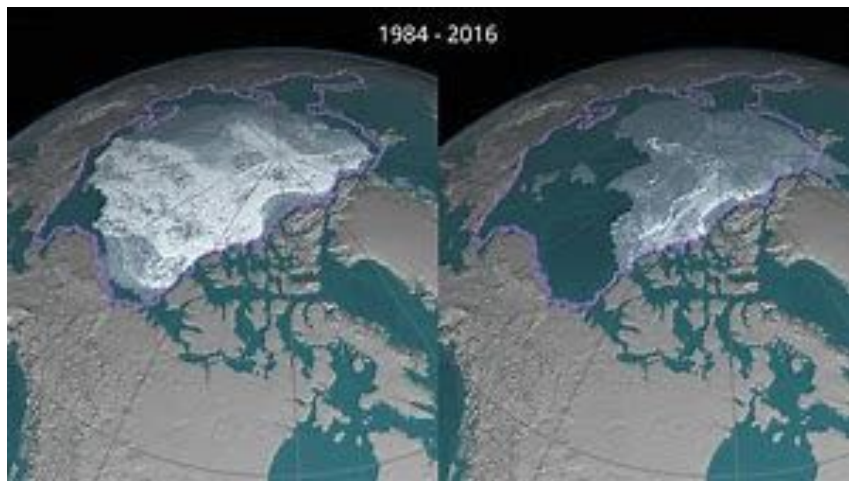
The acceleration in the melting of the Arctic ice has been documented and corresponds with the proliferation of reservoir hydroelectric dams by Russia and Canada. Although scientist opinion varies, global warming appears to be more an Arctic and northern hemisphere phenomenon.

By 1950, 5,000 dams taller than 50 feet had been constructed in the world. Today, it is estimated that there are over 60,000 such large dams. There has not been one study on how all these dams, especially those in high latitude regions, are having enormous impacts on the climate.



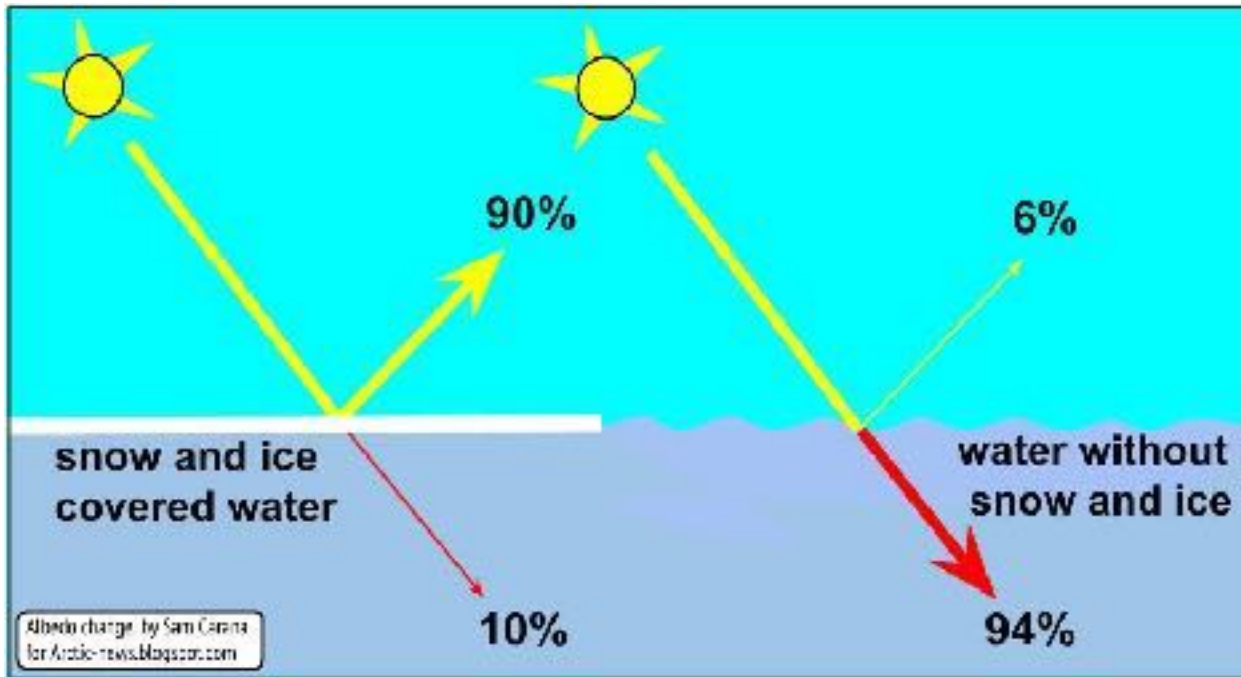


Appearance of a tipping point around 1990 occurred when a steep rise in global warming was evident. This was after a decade in Canada, Russia, and other northern countries when some of the largest dams were built. It coincided with the devastation of marine fisheries in northern waters.



NASA photo

Loss of sea ice amplifies warming because open water will absorb more heat. Loss of sea ice formation reduces the salt water density which affects global ocean currents. Arctic sea ice is very sensitive to changes in temperature of freshwater flow from rivers.



This decrease of sea ice has accelerated in the past 20 years as “ice loss fuels Arctic amplification - the force that’s speeding up northern warming. As the ocean’s protective lid thaws, more sunlight enters the water, causing more warming, leading to yet more ice loss in a feedback spiral.” (J. Stroeve and C. Katz National Geographic 2019)

“Arctic amplification” warming is a complex revolving interaction of physical forces. It is critical that its originating causes be included in its scientific study. Unbiased study would certainly incorporate the impacts of hydro dams and flow regulation.

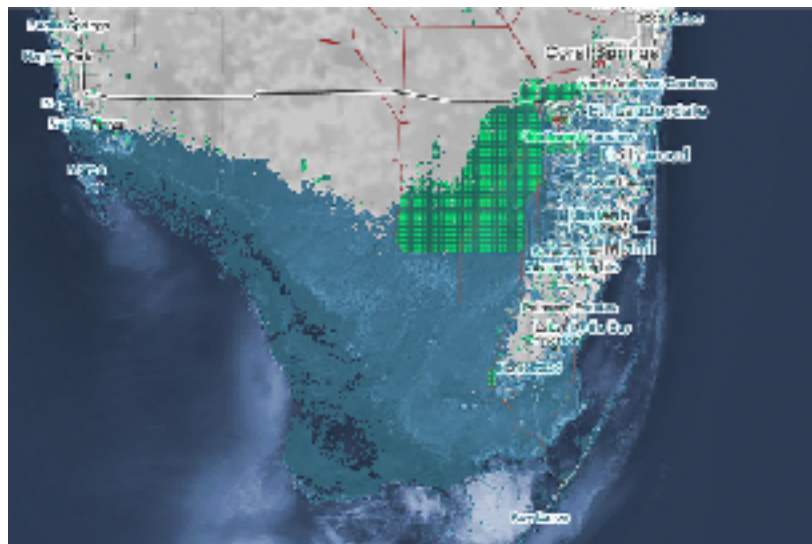
Russia and Canada have built numerous mega dams on northern rivers and more dams are planned. A major engine that drives the world’s deep ocean currents is the Arctic Ocean. The freshwater flow and the freezing and thawing of sea ice are fuel for this engine. World governments have given no consideration as to the impacts of these mega dams.





NASA- John Sontag photo

Greenland firn aquifers. Water pockets the size of Lake Tahoe are embedded in the glacier surface. The Greenland ice cap and glaciers are melting rapidly as Arctic amplification force increases. Because of this newly recognized Arctic amplification, sea level may rise many more feet than predicted in the next 80 years.



New Times -Broward and Palm Beach photo

**Florida flooding-** Estimated sea level rise in 80 years. The Government of Florida and their citizens are unaware of the link between the mega dams, global warming, and sea level rise.

## The Relationship of Marine Ecosystem Food Chain Devastation and The Construction of Mega Dams and Flow Regulation

**-Nutrient Availability:** Dams and flow regulation reduce the flow of nutrients to the sea where they would be utilized by marine diatoms and plankton. These microscopic plants are the foundation of marine food chains.

**-Estuary Function:** Flow regulation alters the physical nature of estuaries which are the cradle of marine life. The vast majority of marine species are dependent at some point in their life cycle on river estuaries. “Nothing is more fundamental to the functioning of an estuary than the timing and quantity of freshwater delivery to the mixing zone.” Montagna 2002.

**-Habitat Range:** Heat pollution of river water created by dam reservoirs and flow regulation change ocean and coastal habitat range of a large number of marine species.

**-Transport and Migration of Marine Life:** Flow and temperature pattern changes by the dam operations disrupt the transport of egg, larval and young of foundation species thus affecting the reproduction success of many species at all levels of the food chain.



NOAA photo. Microscopic Silica-Shelled Diatoms

In the North Atlantic, healthy saltwater diatom populations are supported by the direct delivery of nutrients from rivers. Also, unregulated high river flows during the spring runoff provide the energy for coastal current upwellings that deliver nutrients to the surface sunlit zone. Dams and flow regulation have caused reduction in diatom populations worldwide and especially in the Northwest Atlantic. The loss of diatom numbers has harmed fisheries, increased ocean acidity, and contributed to climate change. Diatoms act as a biological engine that provides the earth with over 20-50 percent of its oxygen, controls atmospheric CO<sub>2</sub> levels, safely sequesters carbon in the ocean depths, and are the most important foundation of the marine food chain. Given the importance of diatoms, it is regrettable that governments and scientific

communities have not addressed the alarming decline of diatoms in relation to dams and flow regulation.

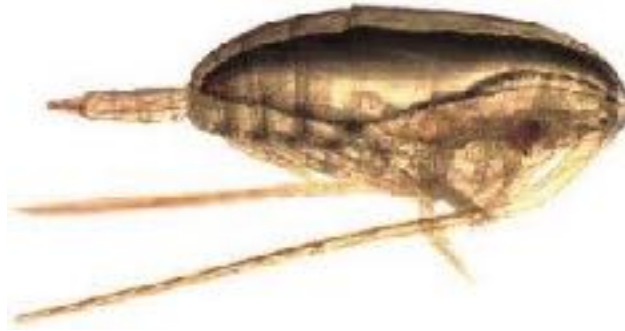


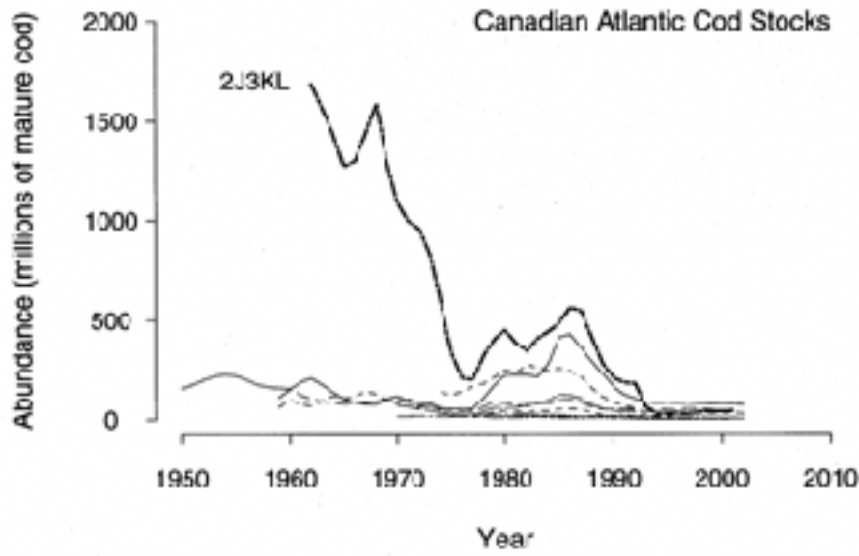
Photo: C.B. Miller/K. Tande, NOAA Northeast Fisheries Science Center.

*Calanus finmarchicus*. These copepods are the favorite food for North Atlantic Right Whales and many other species during their life cycle. They are important for the overall stability of the ocean ecosystem. Copepods rely on healthy plankton populations such as diatoms to maintain their high numbers in concentrations for successful feeding by larger fish and mammals.

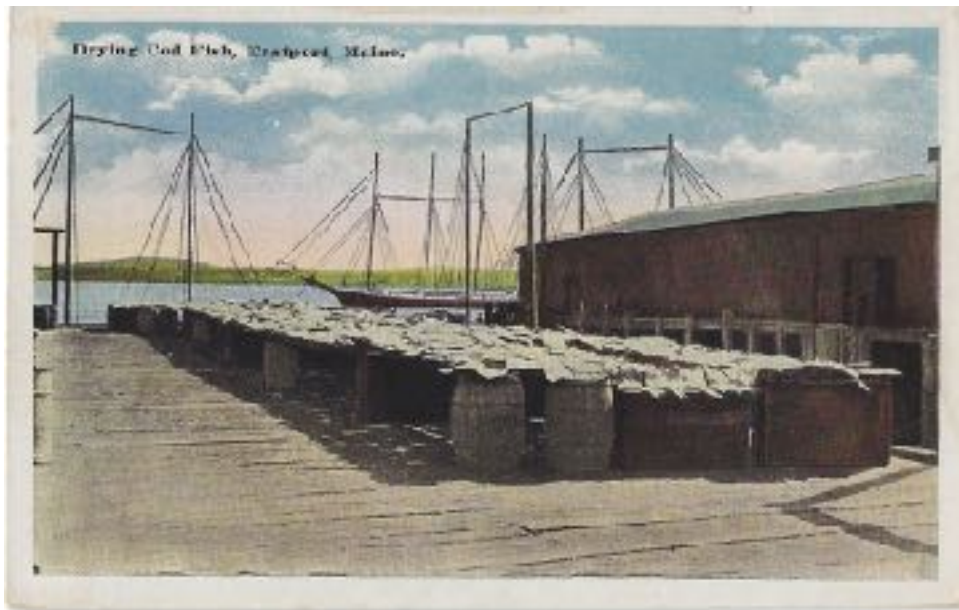


NOAA photo. Northern Atlantic Right Whale

Northern Atlantic Right Whales are threatened with extinction because populations of their most important food, *Calanus finmarchicus*, are shrinking in the Gulf of Maine due to the heat pollution from reservoirs, flow regulation affecting diel and lateral migration, and reduced nutrient passage by dams. The *Calanus finmarchicus* decline coincides with the construction of more Hydro Quebec and Canadian dams. This all fits the Hans Neu prediction published in the early 1980's.



[sararegistry.gc.ca](http://sararegistry.gc.ca)



Canadian cod stocks crashed after several Hydro Quebec mega dams were built just as Hans Neu predicted they would. The scene of cod drying depicted in this early 20th century postcard was typical of every fishing port in the Gulf of Maine. Canadian and US governments blame past overfishing and climate change for the demise of the cod, yet they refuse requests for study of the impacts of the dams and flow regulation for the steep decline of the ocean fishery.



NOAA photo Atlantic Salmon

Atlantic Salmon are endangered because of dams without passage and dwindling ocean food supply, as in the Gulf of Maine. From 1969 to 1993 Hydro Quebec built 7 mega reservoir hydroelectric facilities which have starved the fisheries of many species to the point of extreme depletion.

Complete references and other supporting documents available at: <https://friendsofsebago.org/2019/03/30/research-collection/>

## **About Friends of Sebago Lake (FOSL)**

FOSL was organized in 1992 by residents of the Sebago Lake, Maine region who needed a voice to advocate for the protection of Maine's second largest lake from the damaging impacts of highly unnatural flow regulation. FOSL recognized the need for an advocate to promote freedom of scientific investigation and unbiased study of the impacts of dams and flow regulation on lakes and rivers and their flow continuums to the oceans. Presently, FOSL is a leader in assembling existing information about the impacts of dams, reservoirs, and flow regulation on climate change and freshwater and marine ecosystems.

For more information, email: [\*\*friendsofsebago@yahoo.com\*\*](mailto:friendsofsebago@yahoo.com)

Contact: Roger Wheeler, President- Friends of Sebago Lake