Habitat Restoration in the Machias River Watershed :

The effects of the log drive era

2023 Maine Sustainability & Water Conference

March 30, 2023

The Shifting Baseline

“over time knowledge is lost about the state of the natural world, because people don’t perceive changes that are taking place.”

“due to short lifespans and faulty memories, humans have a poor conception of how much of the natural world has been degraded by our actions, because our ‘baseline’ shifts with every generation,” (Papworth, et. al., 2009).

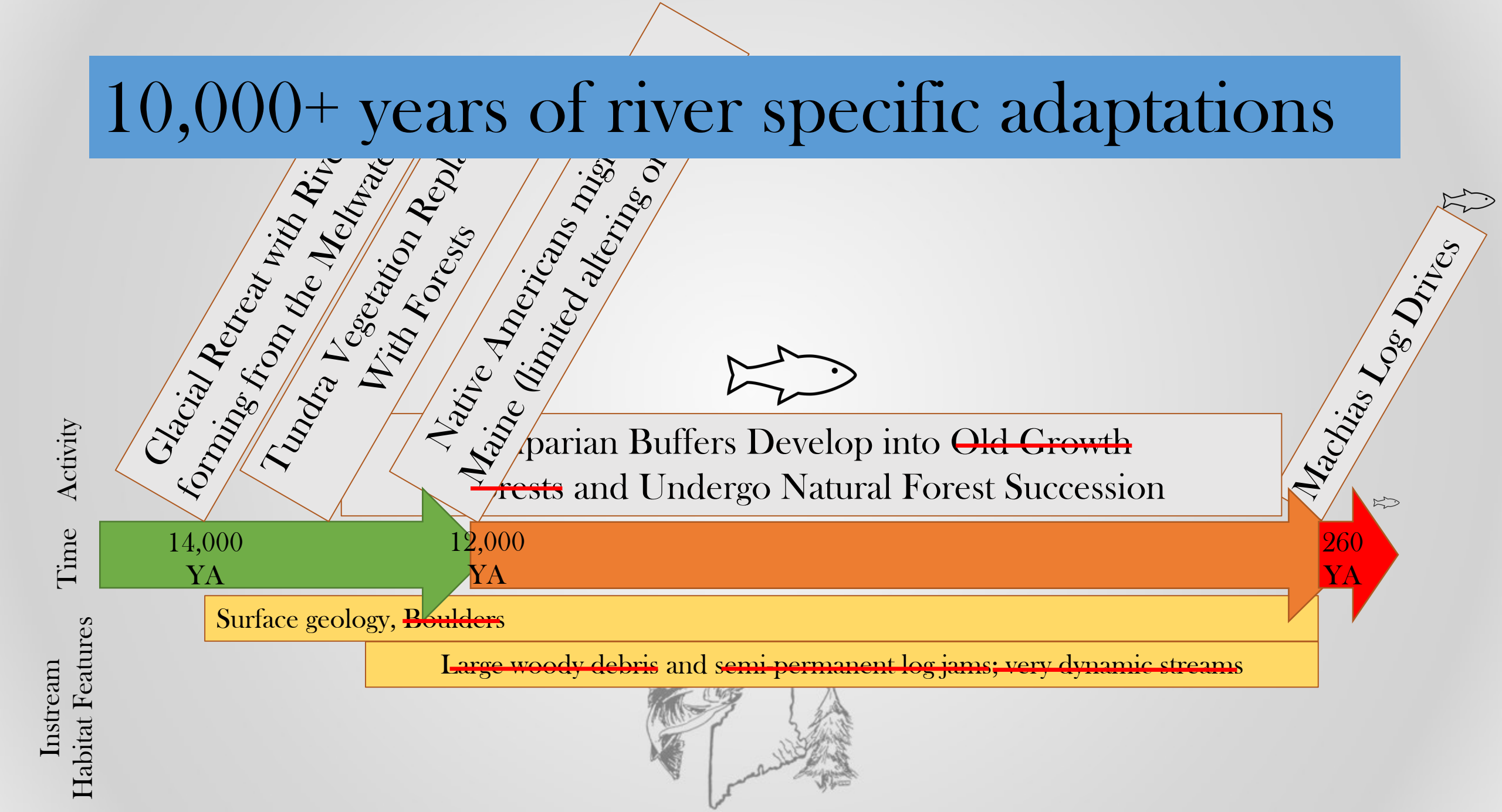
"The Machias River ranks with the St. John, the Allagash, and the Penobscot as one of Maine's most scenic and outstanding paddling rivers." (2017)

"The Machias River, one of Maine's wildest and most cherished waterways, flows for 76 miles from Fifth Machias Lake to tidewater in downtown Machias." (Machias Corridor Brochure)

What is our perception of "pristine"?

What is our perception of quality Atlantic salmon habitat?

10,000+ years of river specific adaptations



Old growth forest in the Adirondacks, NY. Keeton, et al 2007

Frank Dowling began river driving on the Machias River in 1908.

“When this river was first used, it must have been a mess…..bothered by hundreds of trees, which had been uprooted by water and toppled into it, to beat here and there until the brush, the trunk, with its roots, were all that was left. This debris became known as dri-ki, and in places there would be a hundred feet or more wide strip of this trash to impede the drive, bothering the passage of logs. And of course, there were rocks protruding above the surface in hundreds of places, together with an occasional island, each being a detriment to the hastening of the drive” (Dowling 1986).

Unraveling the history of the Machias River watershed

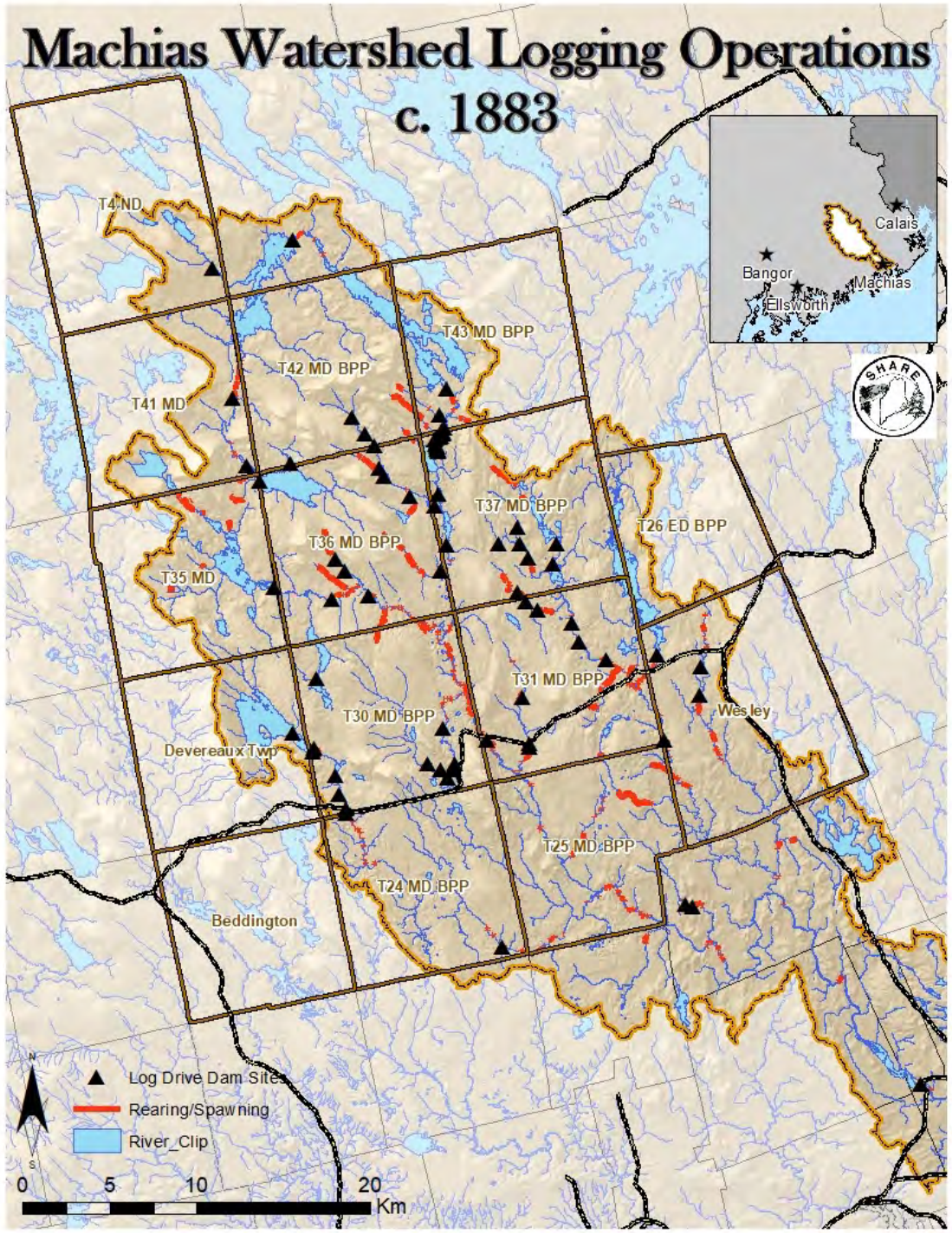
- Oral history: Bill Cherry, Nate Pennell, Bob Wright
- Old maps
- Books
  - Forestry History
  - The 1869 Water-Power of Maine
- University of Maine Folger Library Special Collections
  - S. W. Pope and Co.
  - Machias Lumber Company (John Ames and sons: Frank and Alfred)
  - Whitneyville Agency/Sullivan Lumber Company (Cornelius Sullivan)
  - 1986 interviews of Machias River log drivers
  - (1849-1961)
- Internet
- Ground truthing
- Lidar

Land Use History – Machias River Watershed

(a few key bullets)

- A group from Scarborough, Maine settled Machias in 1762 for salt marsh hay and lumbering (untouched pine wilderness).
- Mill dams Machias and Whitneyville
- Obadiah Hill died during the log drive in 1786 and was buried on Dead Man's Island near Holmes Falls.
- In 1879, 2 million feet of lumber was driven from 5th Machias Lake to Whitneyville;
- The Machias River cut was 32 million feet in 1888
- The last drive down the main river was 1971
- St. Regis removed all dams associated with the drives in the 1970's
- Fletcher et al, (1986) stated that the Machias River was obstruction free except for a small water control dam and fishway at the outlet of Mopang Lake (which IFW subsequently removed)

Note: dams were subsequently rebuilt at Lower Sabao and Chain Lake by lake associations

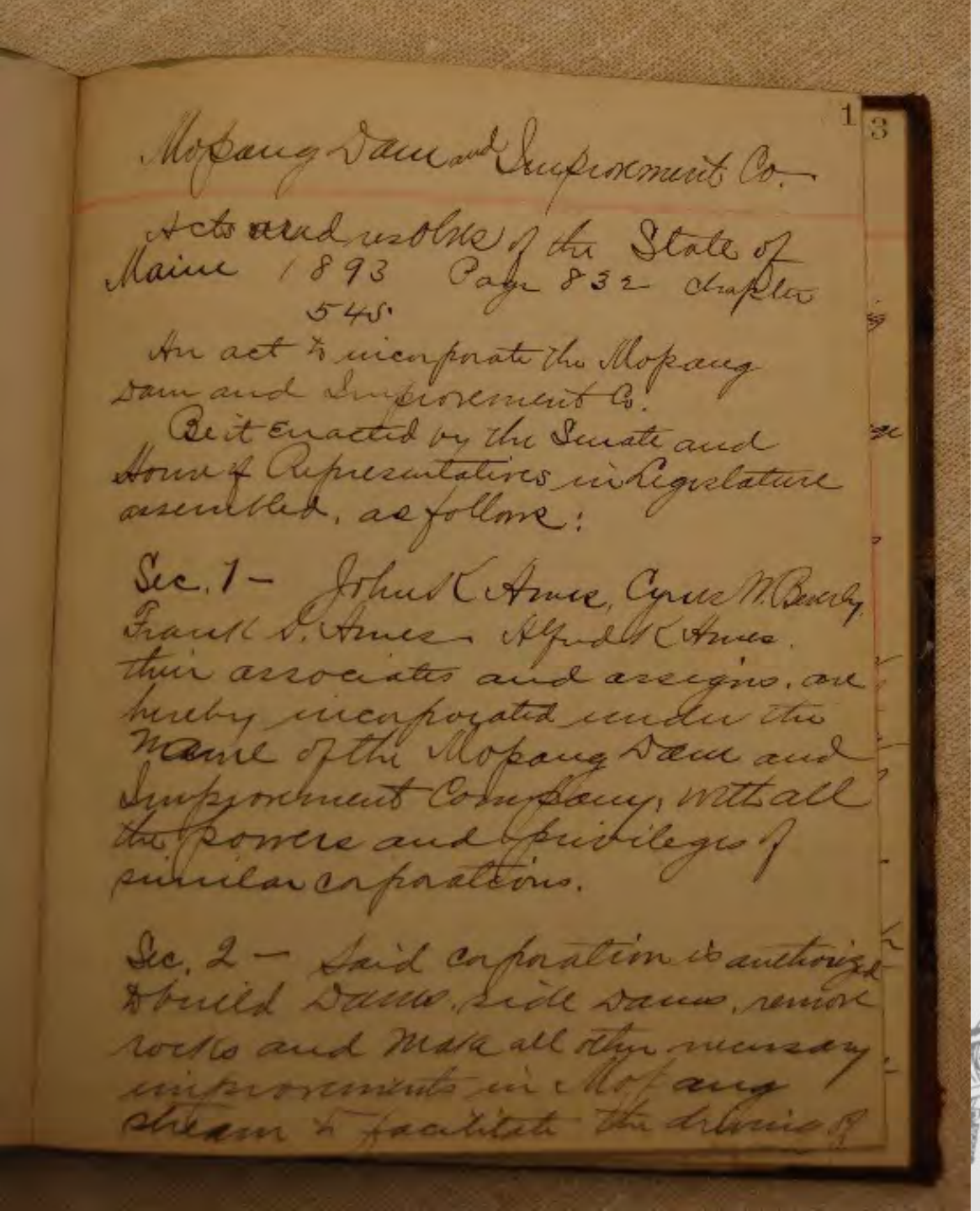


The January 30th, 1883, Machias Union Newspaper documented harvest operations in Townships 36, 43, 37, 42, 31, 30, 35, 4, 24, and 25

Lumber and Ships along wharfs, Machias 1880s
looking east from Bad Little Falls Photo Courtesy of Machias

The commercial forest industry was an economic driver for Machias, and the river drive was the means of delivering logs to the mills for two hundred years.

What were the landscape scale impacts to the river and habitat?


Mopang Dam and Improvement Co.

Acts and Resolves of the State of Maine 1893 Page 832 Chapter 545

An act to incorporate the Mopang Dam and Improvement Co.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Sec. 1 – John C. Ames, Cyrus M. Beach, Frank D. Ames, Alfred C. Ames, their associates and assigns, are hereby incorporated under the name of the Mopang Dam and Improvement Company, with all the powers and privileges of similar corporations.

Sec. 2 – Said corporation is authorized to build Dams, side dams, remove rocks and make all the necessary improvements in Mopang Stream to facilitate the drives of

- St. Regis operated the log drives (1950's-1971) under a legislative grant from the Maine legislature which provided permission to use the Machias River for driving, including the authority to alter the river to enhance the drive. (Wright, 1986)

- Mopang Dam and Improvement Company (1893)

"with all the powers and privileges of similar corporations"

"to build dams, side dams, remove rocks, and make all other necessary improvements in Mopang Stream to facilitate the drive"

- Old Stream Dam and Improvement Company (1897)

- Machias Lake Dam and Improvement Company (1899)

STEP #1: Clear the river.

"They'd done a lot of work on it (the river). In other words, they'd gone up in the summer, and they'd blow rocks out of it, and they cut the sweepers….. And they built some crib work where they wanted to turn the water in a place (Richard Gaddis, 1986)"

STEP #2: Build Dams.

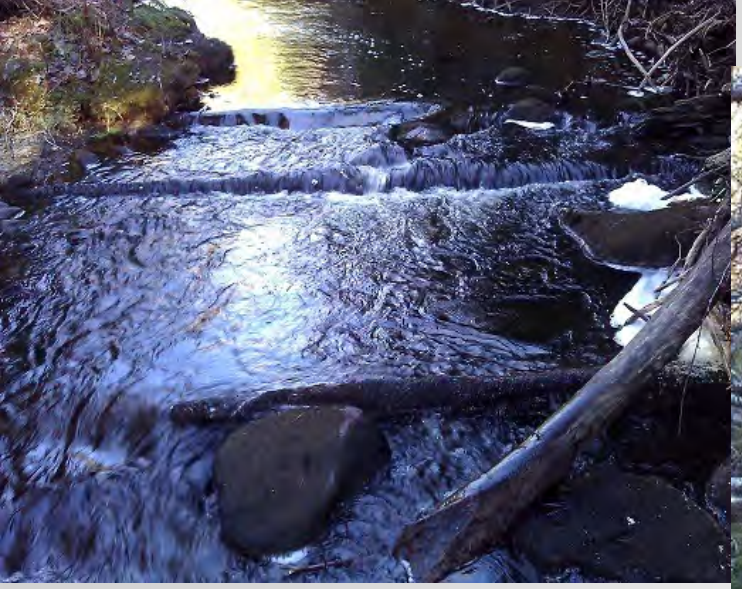
Dams on 3rd, 4th, and 5th Machias lakes which all had gates to manage the flow of water for the drive. Water was released at a rate that would maximize bankfull flow which would float the logs and keep them from hanging up in the riparian buffer. "Driving by squirts" referred to multiple releases of water during the drive rather than one release that would not sustain the drive down the length of the river (Charles Dowling, 1986)

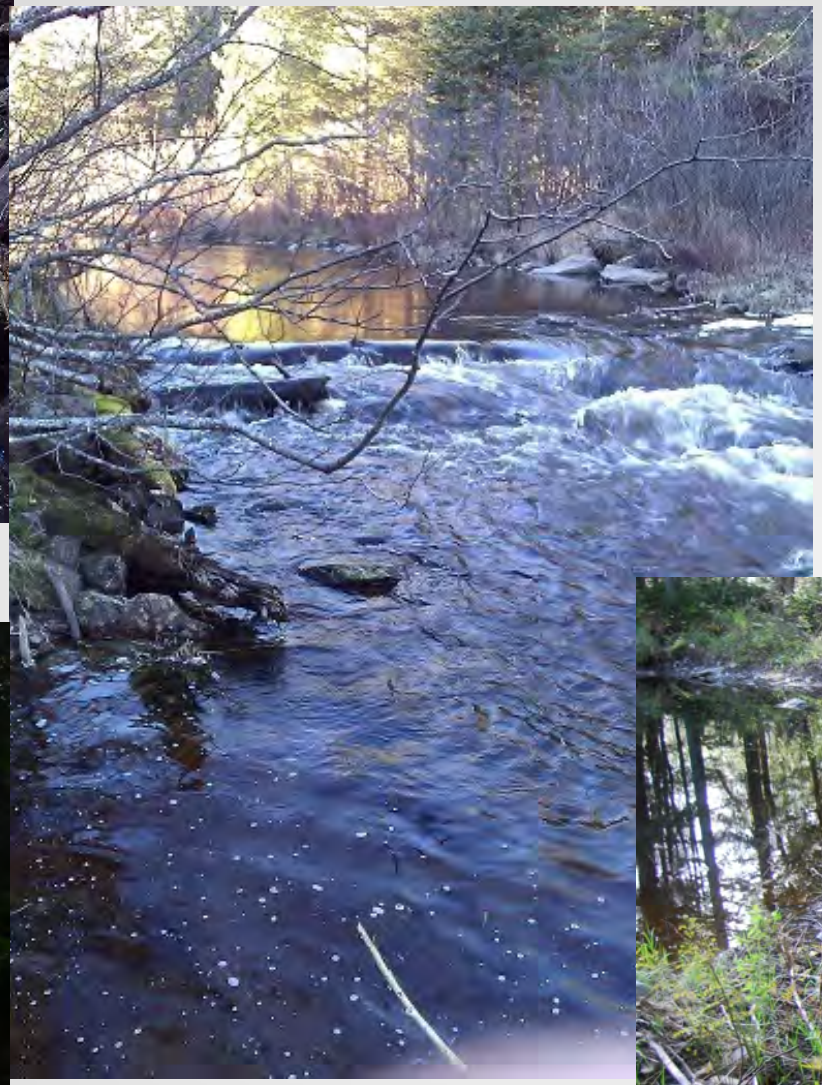
Bob Wright was a master river driver for St. Regis Lumber Company on the Machias River from 1952 to 1971. During this era of the final drives on the Machias River, St. Regis owned and operated 9 dams: Wabassus, Mopang Lake, 3rd Machias, 4th Machias, Lower Saboa, Canaan Dam, 2nd Lake Old Stream, Chain Lake, and Whitneyville.

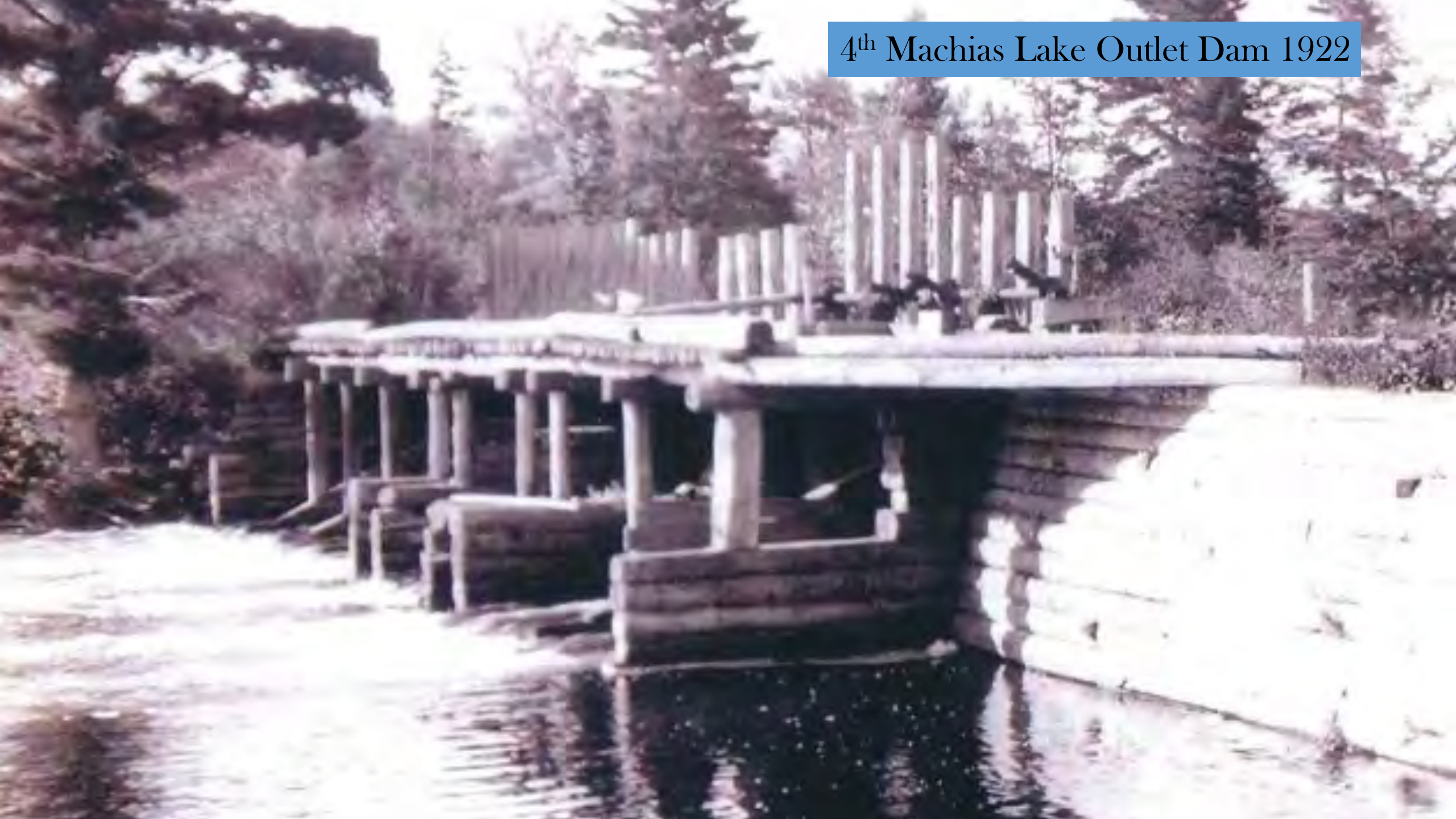
(Many other are lost to history out of sight/out of mind-----50+ ground thruthed so far)

STEP #3: Drive logs.

The dams today







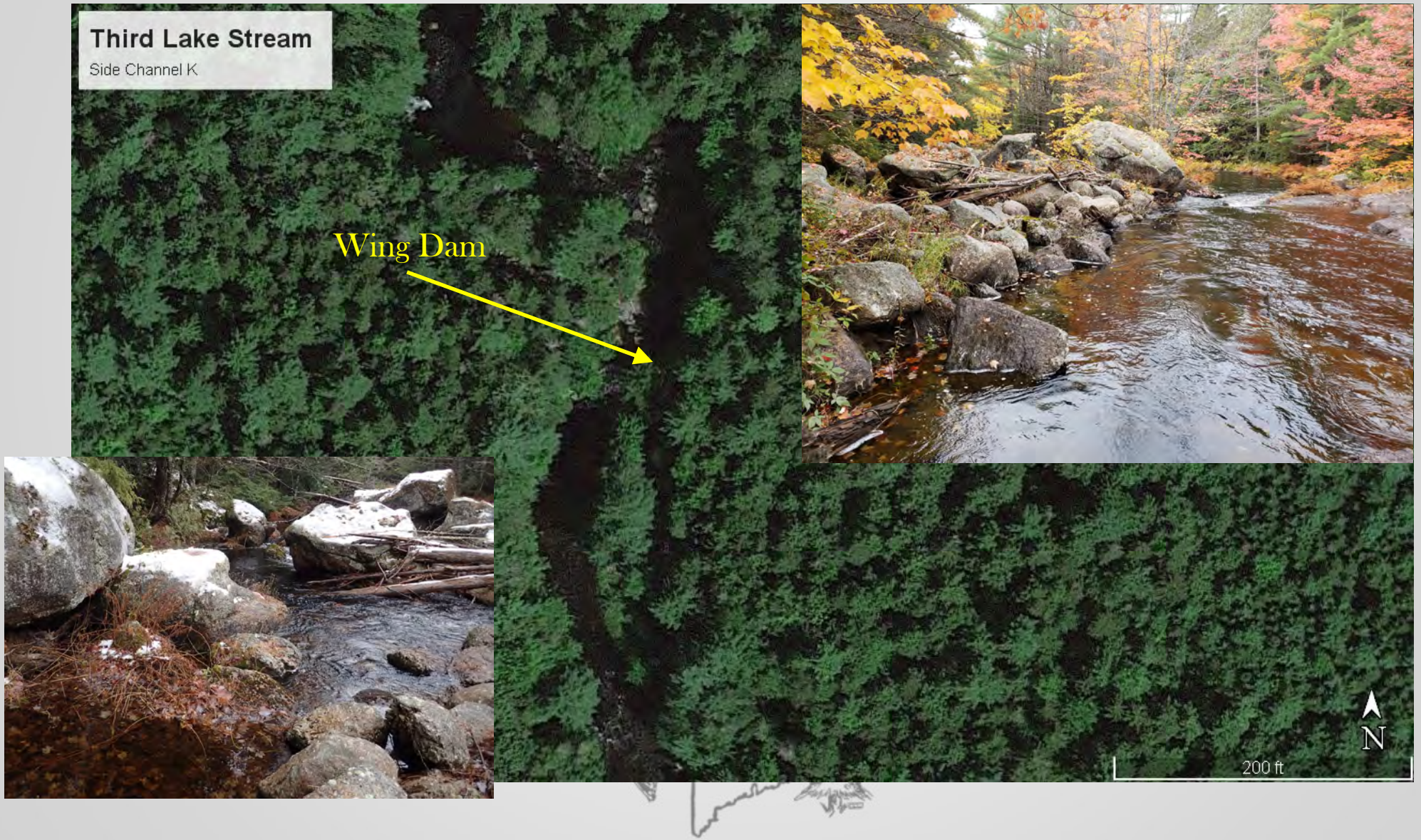
4th Machias Lake Outlet Dam 1922

4th Machias Lake Outlet Dam

Holmes Brook (Machias River)


Machias River; Rt 9

Wing Dams – Upper Machias



1930 Machias River Log Drive

Machias River Drives

- West Branch Machias ca. 1950

- Last Drive Machias River 1971

Threat Assessment

Determining the root cause of habitat degradation and the scope of the problem

- The two-hundred-year history of riverine modifications during the log drive era fundamentally presents the most significant suite of impacts to instream habitat in the Machias River watershed. Systematic removal of all complexity elements is #1 (in my opinion).
- The Maine Atlantic Salmon Commission initiated studies of the Machias River watershed in 1949 (Fletcher 1955). During the summer of 1951, a survey team undertook a detailed physical inventory of the Machias River drainage to determine the extent and availability of suitable spawning areas, location and composition of nursery areas, location and characteristics of natural and man-made obstructions, availability of resting pools, and other physical data affecting the salmon population in the river.
- The baseline for habitat location, quantity and quality began after over 150 years of instream impacts when Atlantic salmon populations were already at very low numbers of adults returning.
- It is likely not possible to determine the true location, quantity and quality of Atlantic salmon habitat prior to settlement of Machias. (In my opinion)

1762 Machias settled

Log Drive Era

1951 Habitat Surveys

1971 Last Machias Drive

1988 Climate Change

~~Dams~~ & Marine Survival

2000 ESA listing

Challenges

- Holocene streams predominantly multi-channel (anabranching) systems in low gradient depositional reaches
- Log drives impacted every linear foot of mainstem and many tribs
- Boulders were placed by the glaciers
- Incised channels in sediment starved reaches
- Old Growth forest takes centuries to age, die, and recruit in mass to the rivers
- Shifting baseline:
  - ✓ No record of what was
  - ✓ Pristine?
  - ✓ Sediment starved?????
- Research and scientific literature is “from away”

“Anthropocene rivers are largely imprisoned in the banks of their history” (Brown et al 2018)

The “Ah Ha” Moment

- Magilligan et al (2008) “The geomorphic function and characteristics of large woody debris in low gradient rivers, coastal Maine, USA”
- Kasprak et al (2011) "A Lidar-Derived Evaluation Of Watershed-Scale Large Woody Debris Sources And Recruitment Mechanisms: Coastal Maine, USA“
- Walter and Merritts (2008) Natural streams and the Legacy of water-powered mills.
- Cluer and Thorne (2013) “A stream evolution model integrating habitat and ecosystem benefits”
- Castro and Thorne (2019) “The stream evolution triangle: integrating geology, hydrology, and biology.”
- Powers et al. (2018) A process-based approach to restoring depositional river valleys to Stage 0, an anastomosing channel network

The “gold standard” for riverine habitat restoration

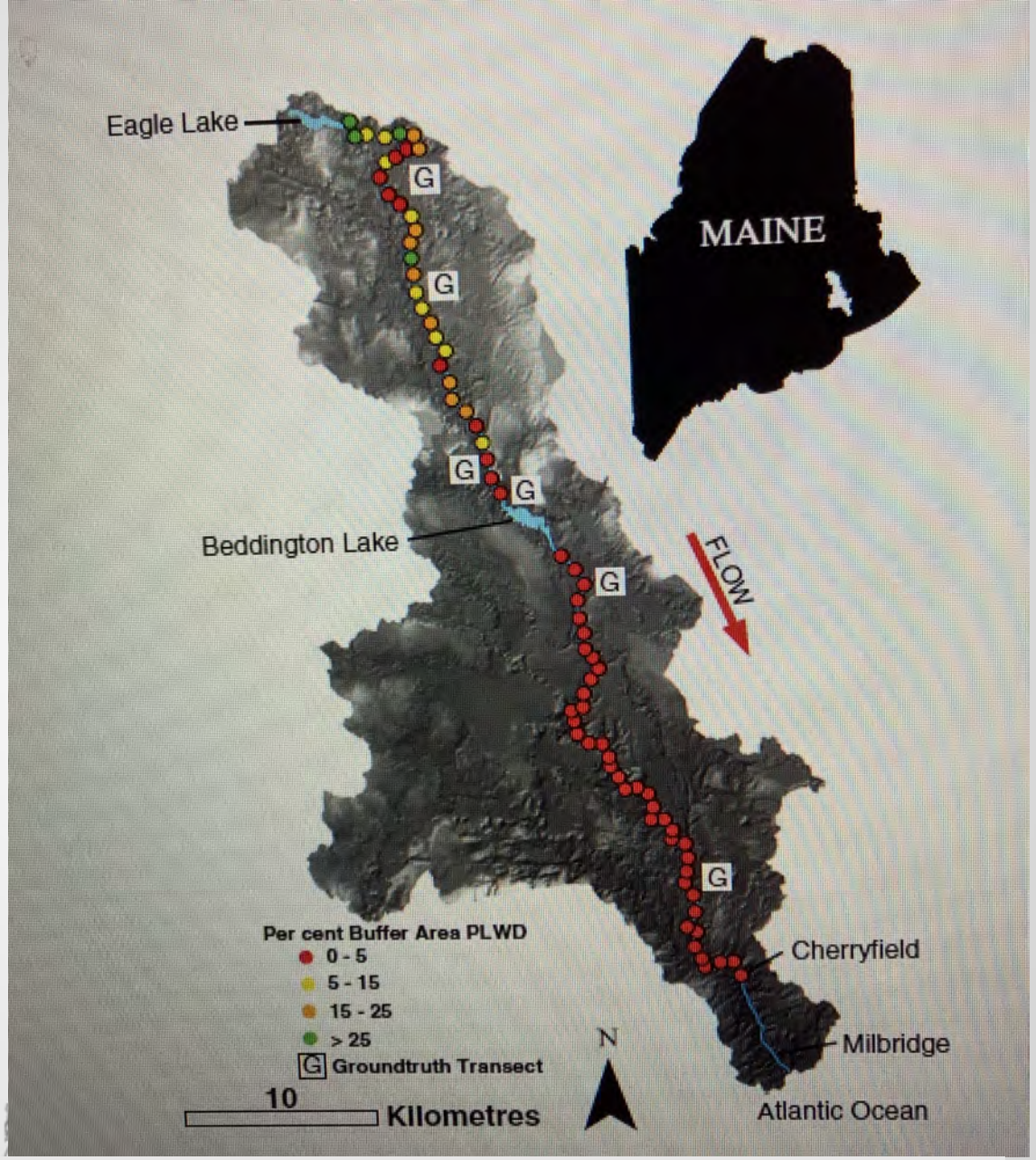
Accepting the Challenge

- Science based
  (educate yourself)
- Educate stakeholders
  (including regulator)

Upcoming workshops

LWD additions (October 2023)

Process Based Restoration (January 2024)



LIDAR assessment of Potential LWD
In the riparian buffer (Kaprak et al 2011)

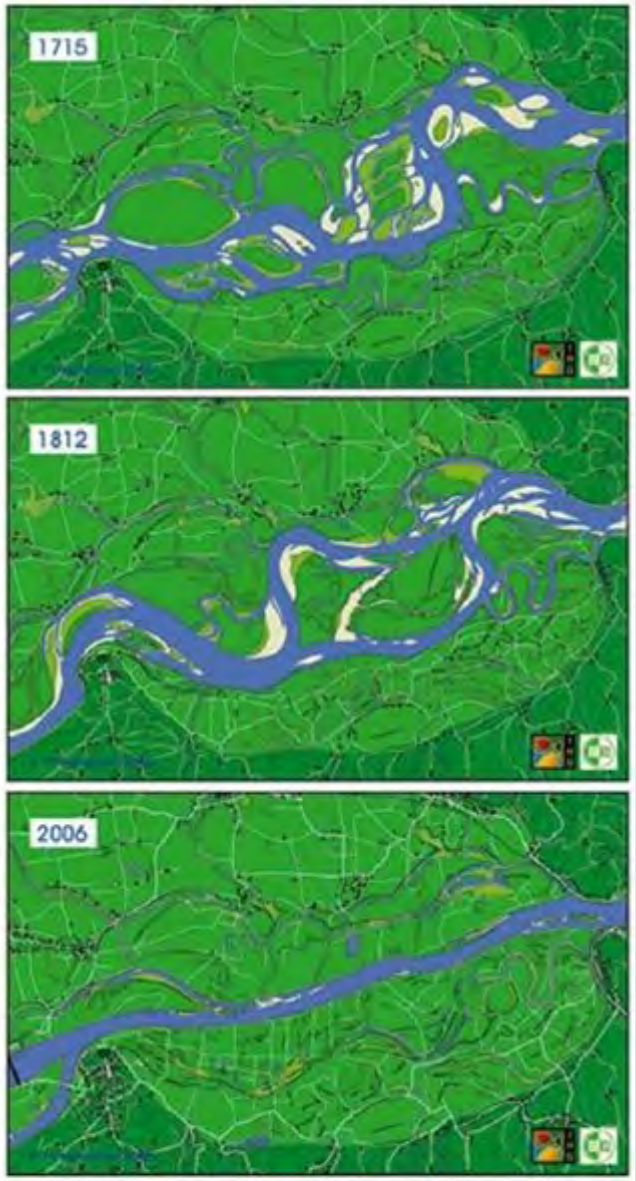


Fig. 6. Channel changes of the Danube River in the Austrian Machland floodplain from 1715 to 2006.Credit: FWF project Machland 1715-1991. Nr. P14959-B06.

Take Home Message

Recognize that the beginning of freshwater habitat degradation occurred 100's of years ago rather than a few years before the listing.

"The Shifting Baseline"

Questions?