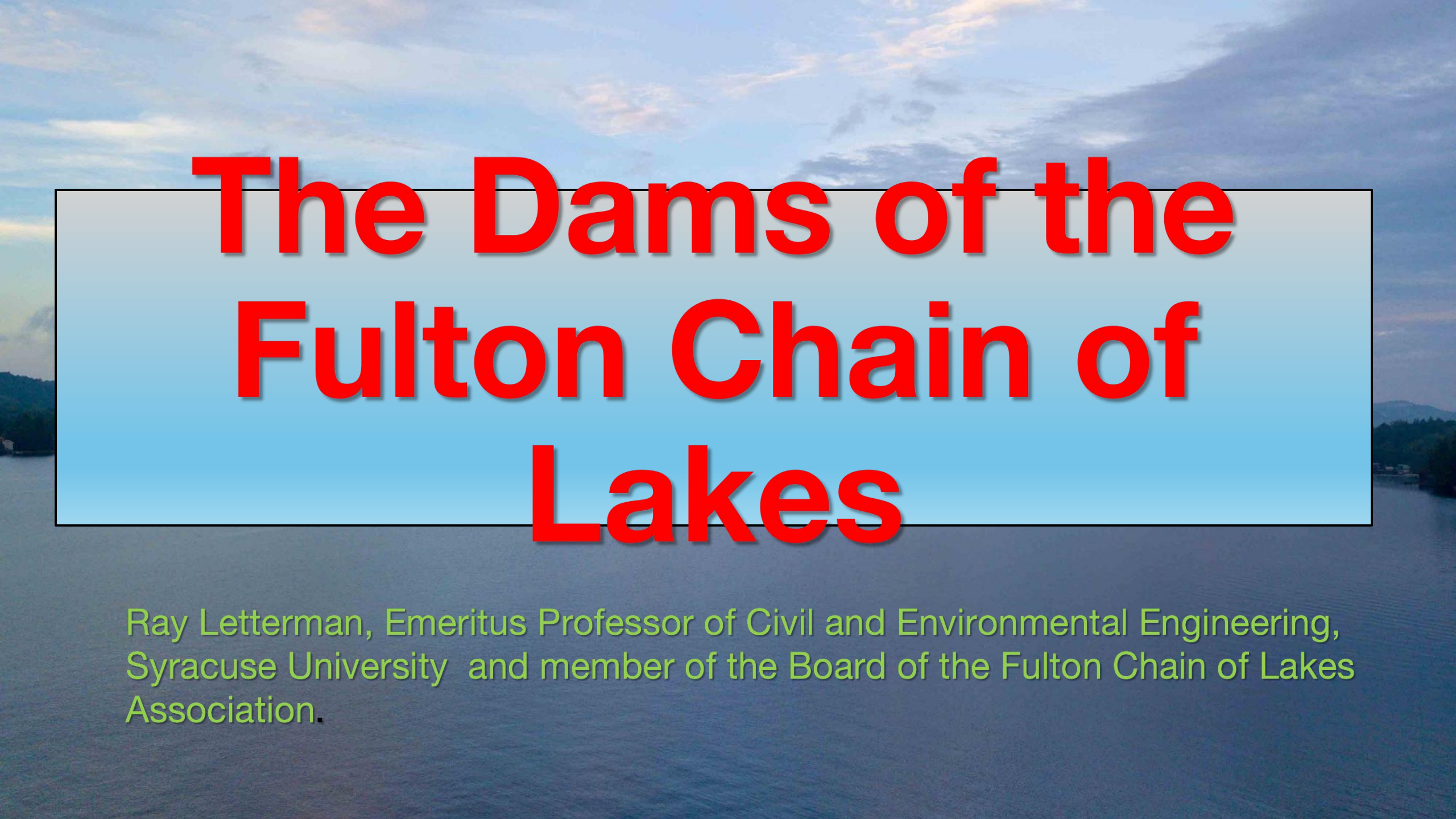


The background of the slide is a photograph of a calm lake under a blue sky with scattered white clouds. The water is dark blue and reflects the sky. In the distance, there are some trees and hills. The title text is overlaid on a light blue rectangular box with a black border.

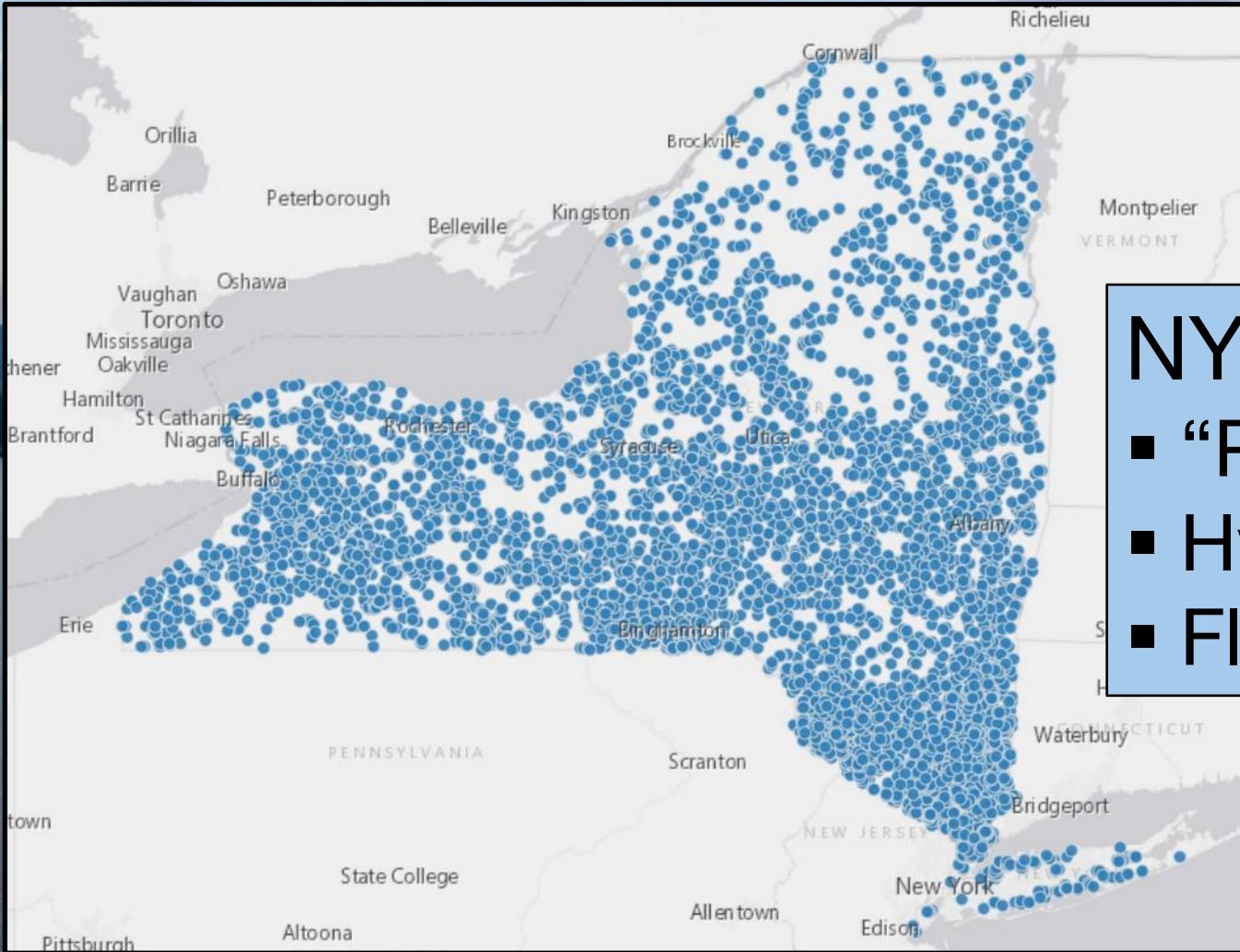
The Dams of the Fulton Chain of Lakes

Ray Letterman, Emeritus Professor of Civil and Environmental Engineering,
Syracuse University and member of the Board of the Fulton Chain of Lakes
Association.

Outline

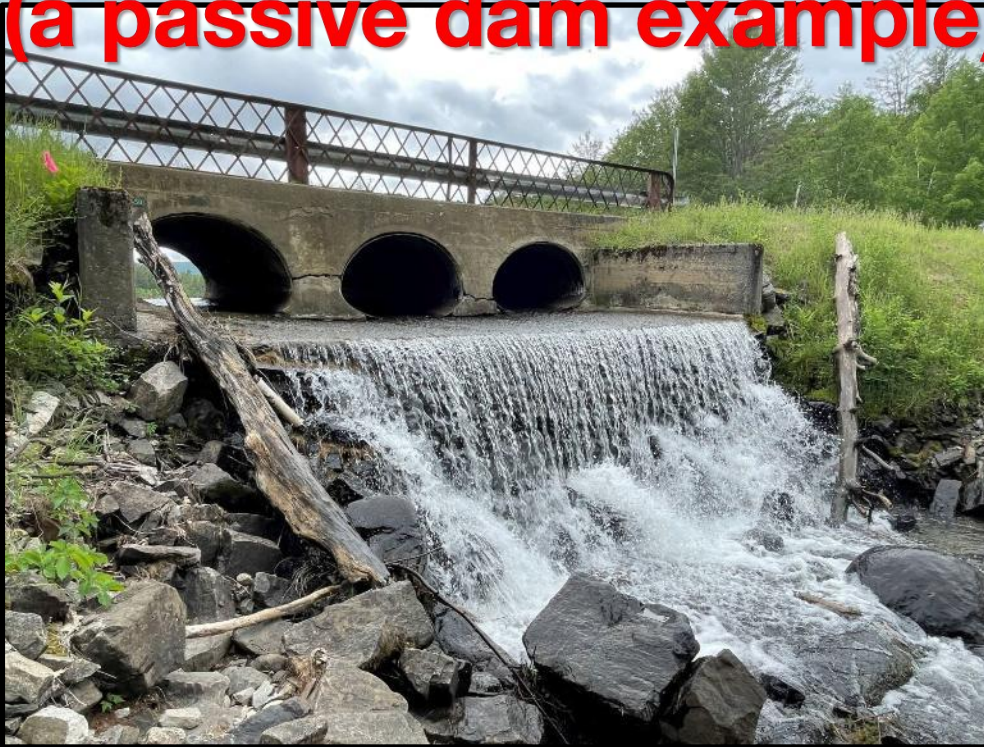
- **The dams of New York and the Adirondacks**
- **Types of dams - how and why they are used**
- **The dams of the Fulton Chain of Lakes – why and when they were built.**
- **Conflict about the water level in the Fulton Chain reservoirs**
- **Hydroelectricity, conservationists and the Black River Water War.**
- **Final note - Why are they working on the dams today.**

How many dams are in the Adirondacks?

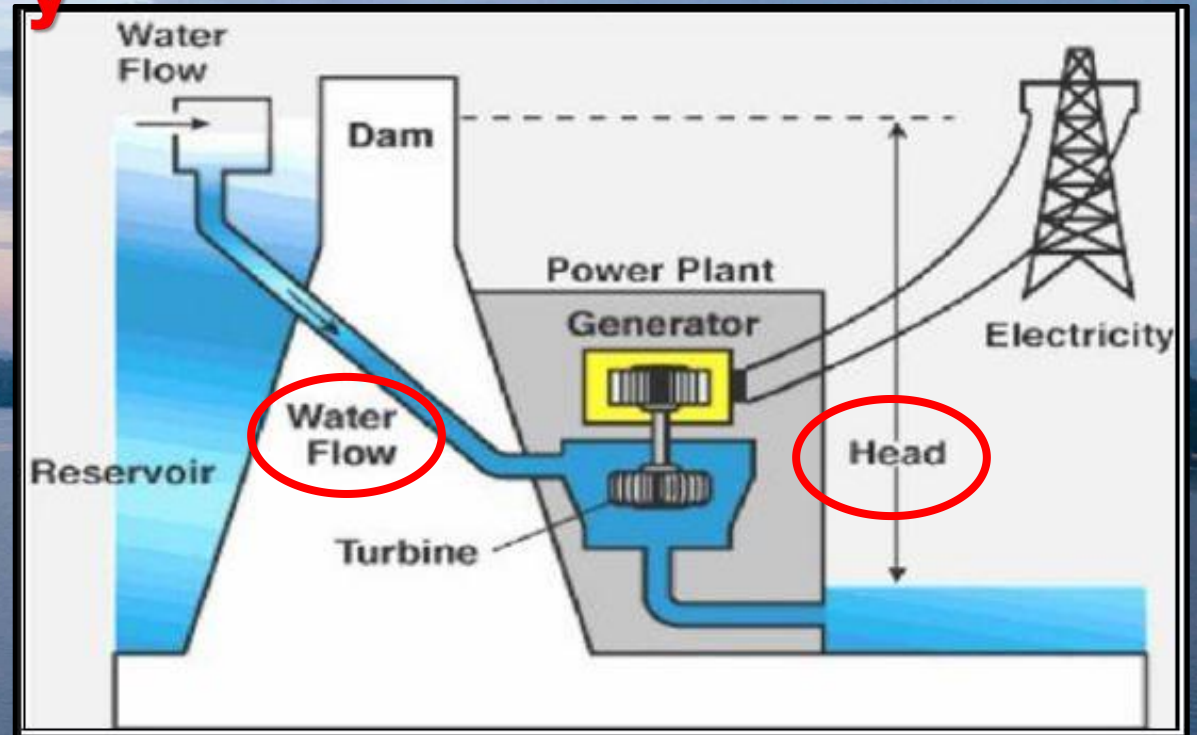


- NYSDEC lists 512
- “Passive” dams ~412
 - Hydroelectric ~40
 - Flow-regulating 13

Garnet Lake on Mill Creek (a passive dam example)



Hydroelectricity

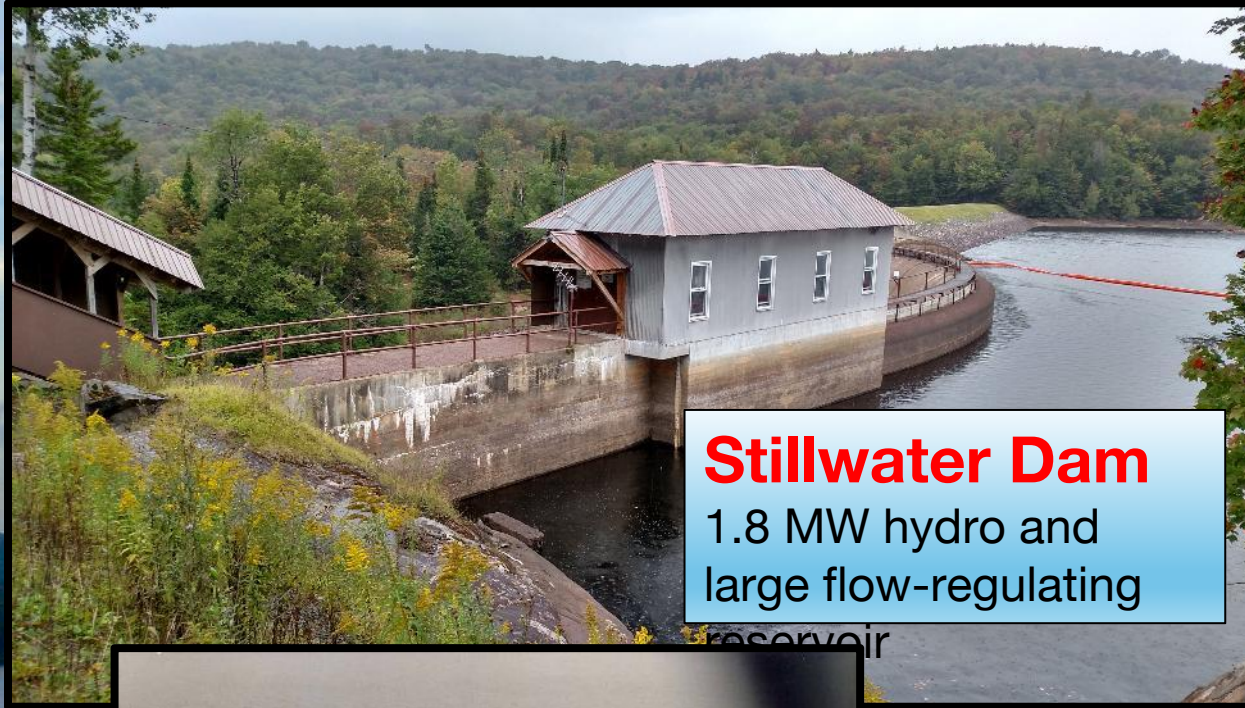


Power (e.g., megawatts, MW) = Flow rate x Head

Energy produced (MWh) (\$) = Power x Time

Interval

Beaver River Hydroelectricity Dams



Stillwater Dam

1.8 MW hydro and
large flow-regulating
reservoir

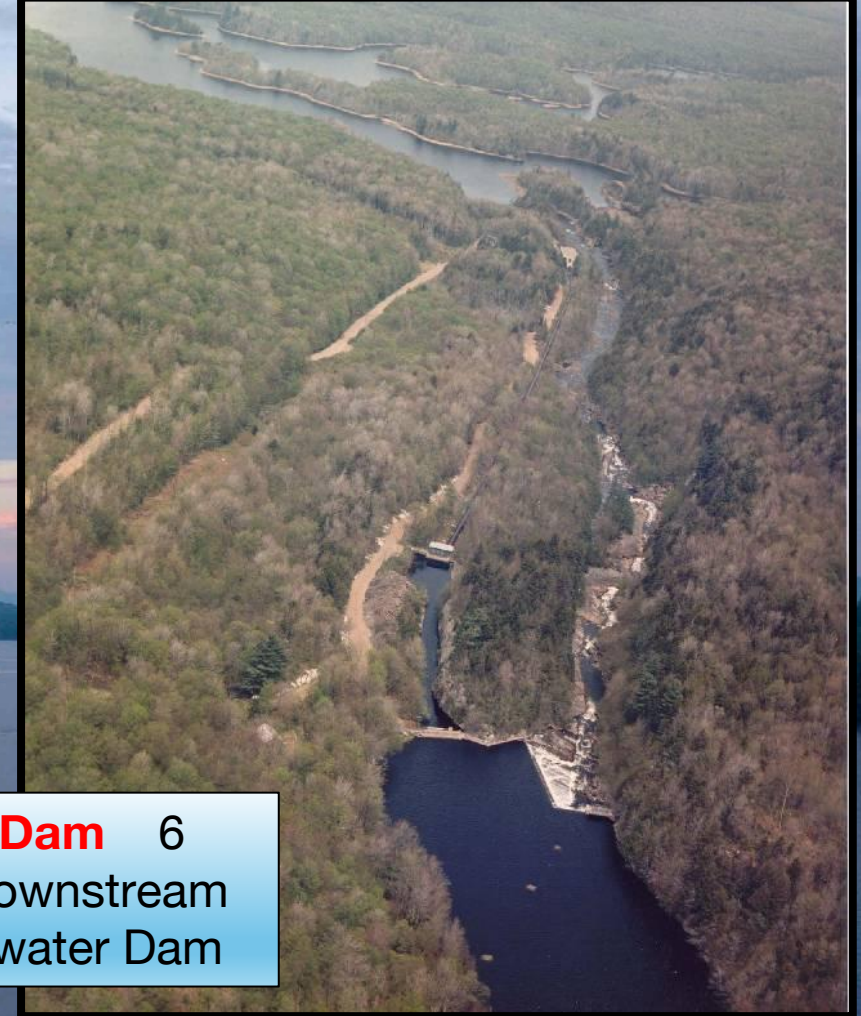


Effley Dam 3 MW

Downstream of
Stillwater Dam



Eagle Dam 6 MW Downstream of Stillwater Dam

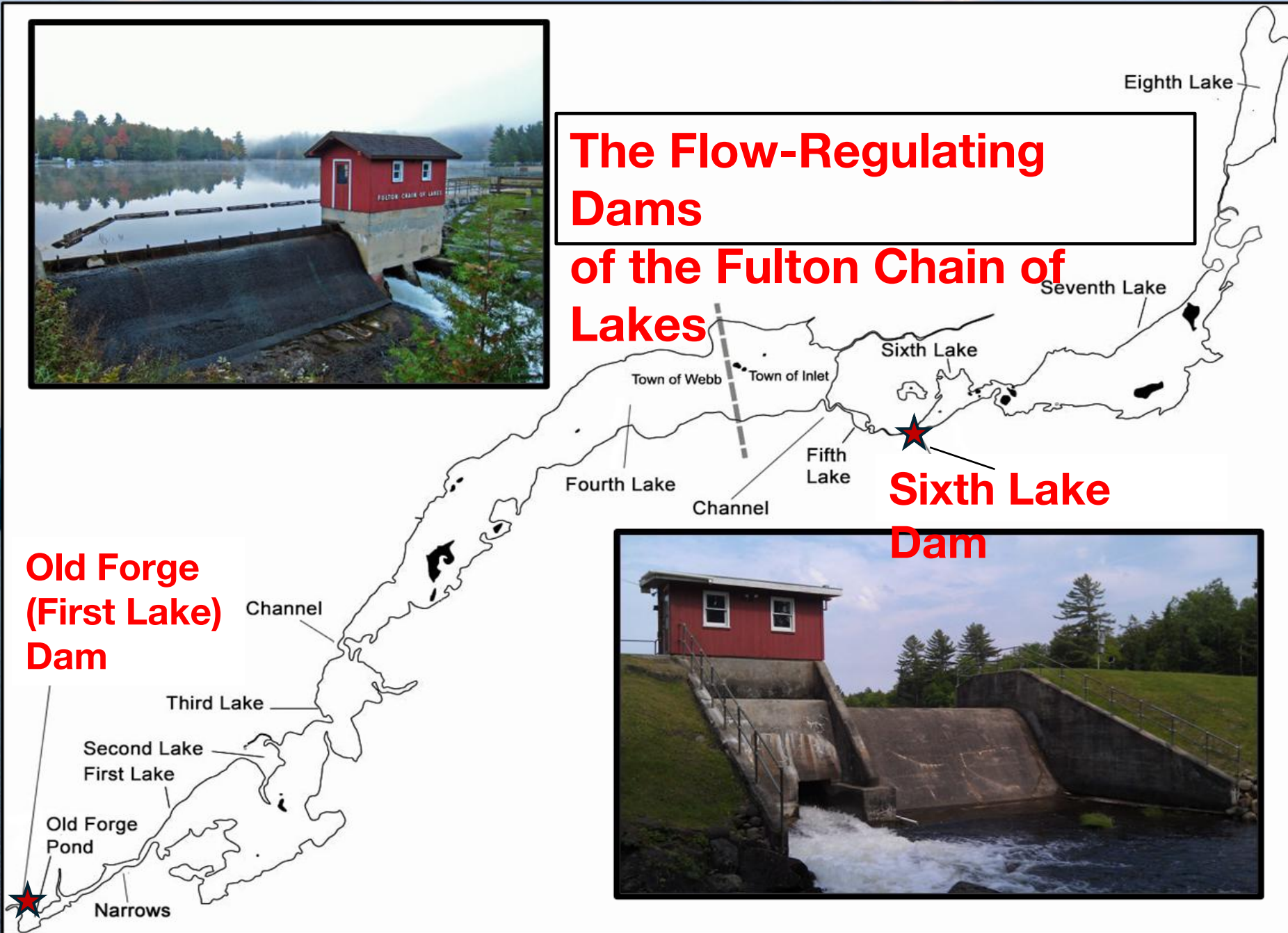


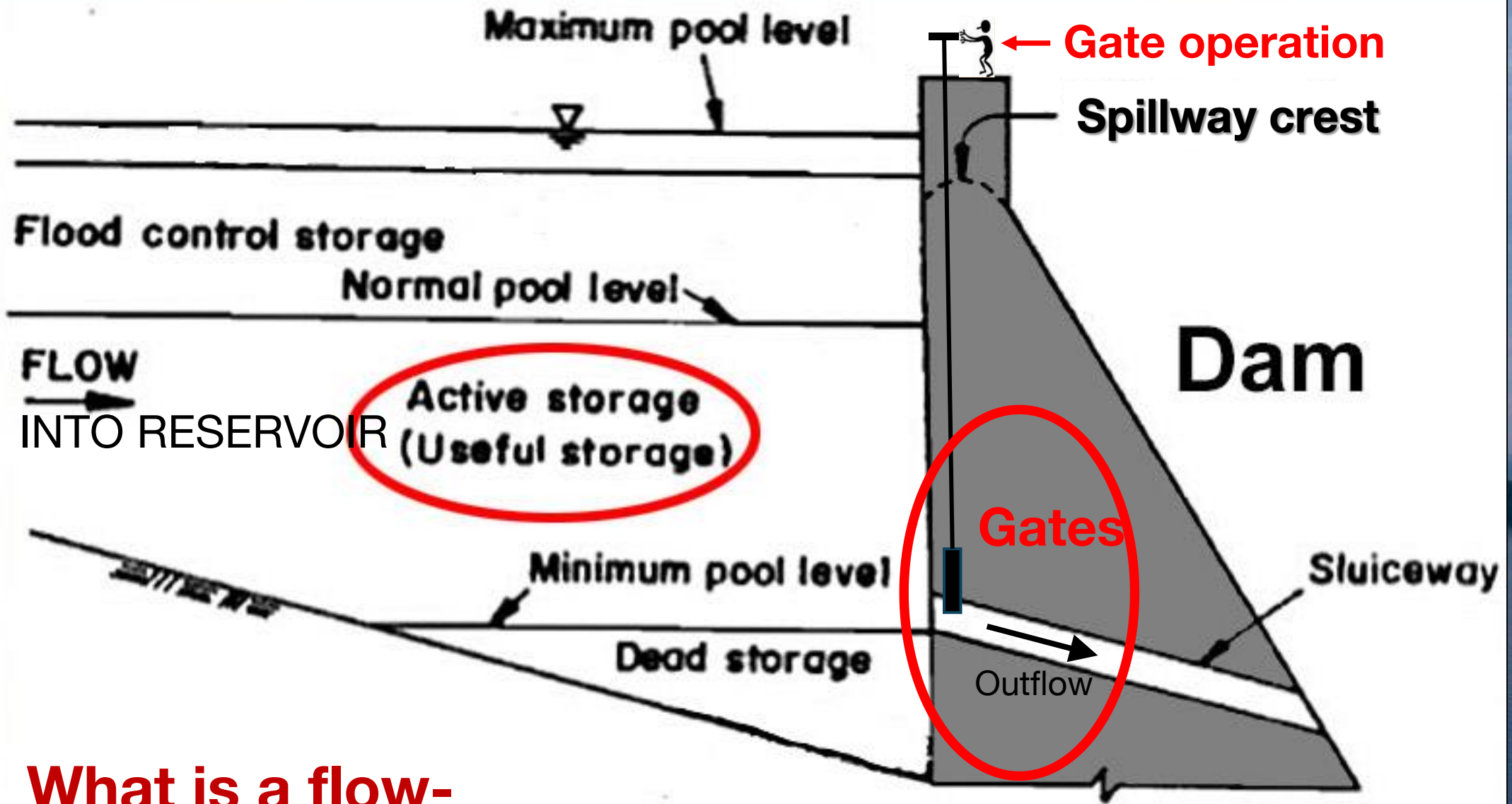
There are 7 more small, privately-owned
hydroelectric stations like these on the Beaver
River



The Flow-Regulating Dams of the Fulton Chain of Lakes

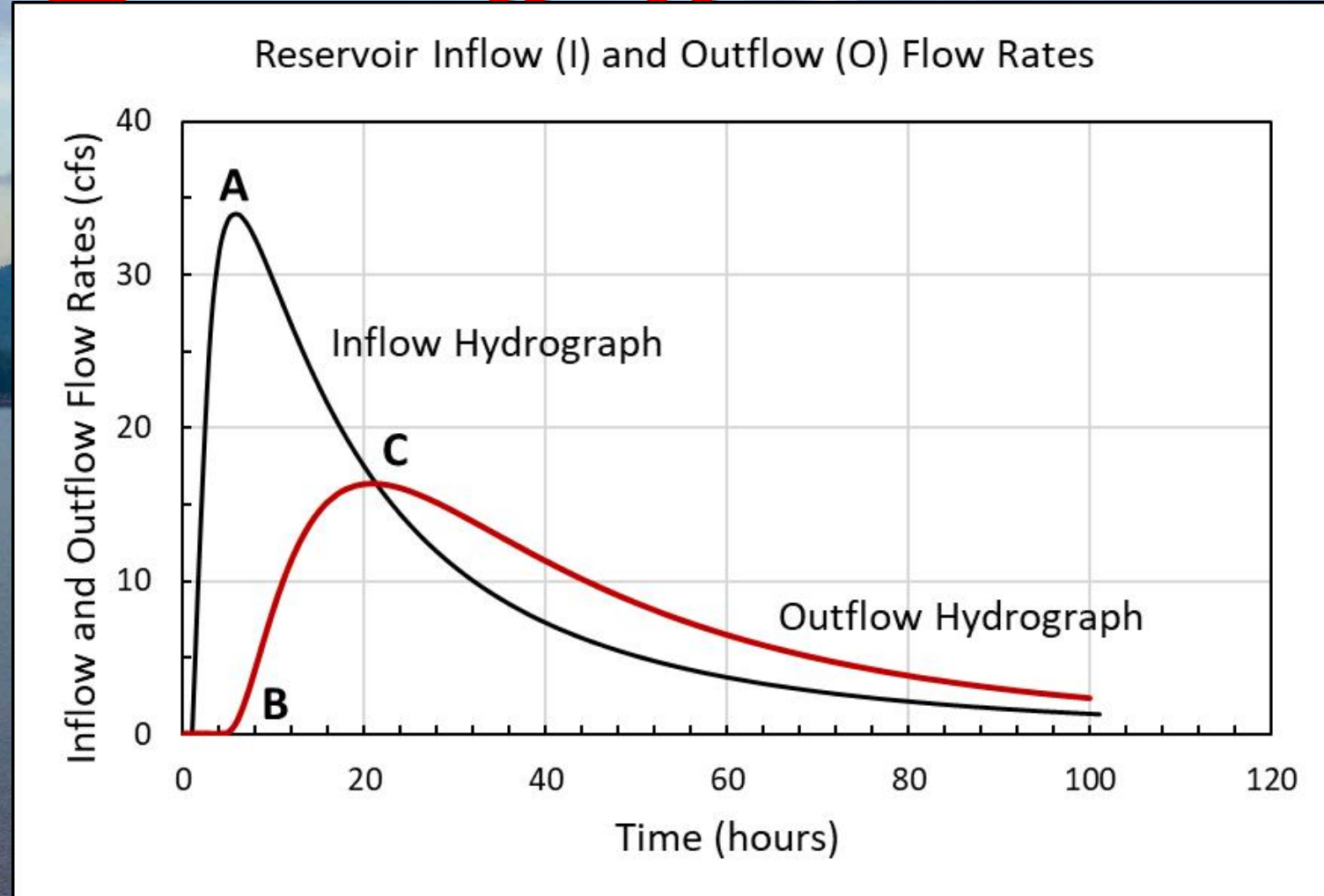
**Old Forge
(First Lake)
Dam**





What is a flow-regulating dam and reservoir?

Flood



The Reservoir at the Old Forge Dam

(First, Second, Third, Fourth, and Fifth)

About 900 million cubic feet of active storage
< Indian Lake Reservoir (5000 million)
< Stillwater Reservoir (5000 million)
< Great Sacandaga Lake Reservoir (30 billion)

How is Flow-Regulation Used

- Make a diversion of flow from a stream more reliable
- Generate more power (more hydroelectricity)
- Lower maximum flow rates during floods
- Dilution of wastewater discharges during droughts
- Increase the reliability of a drinking water supply
- Enhance recreational boating (rafting)
- Maintain fish habitat, etc.

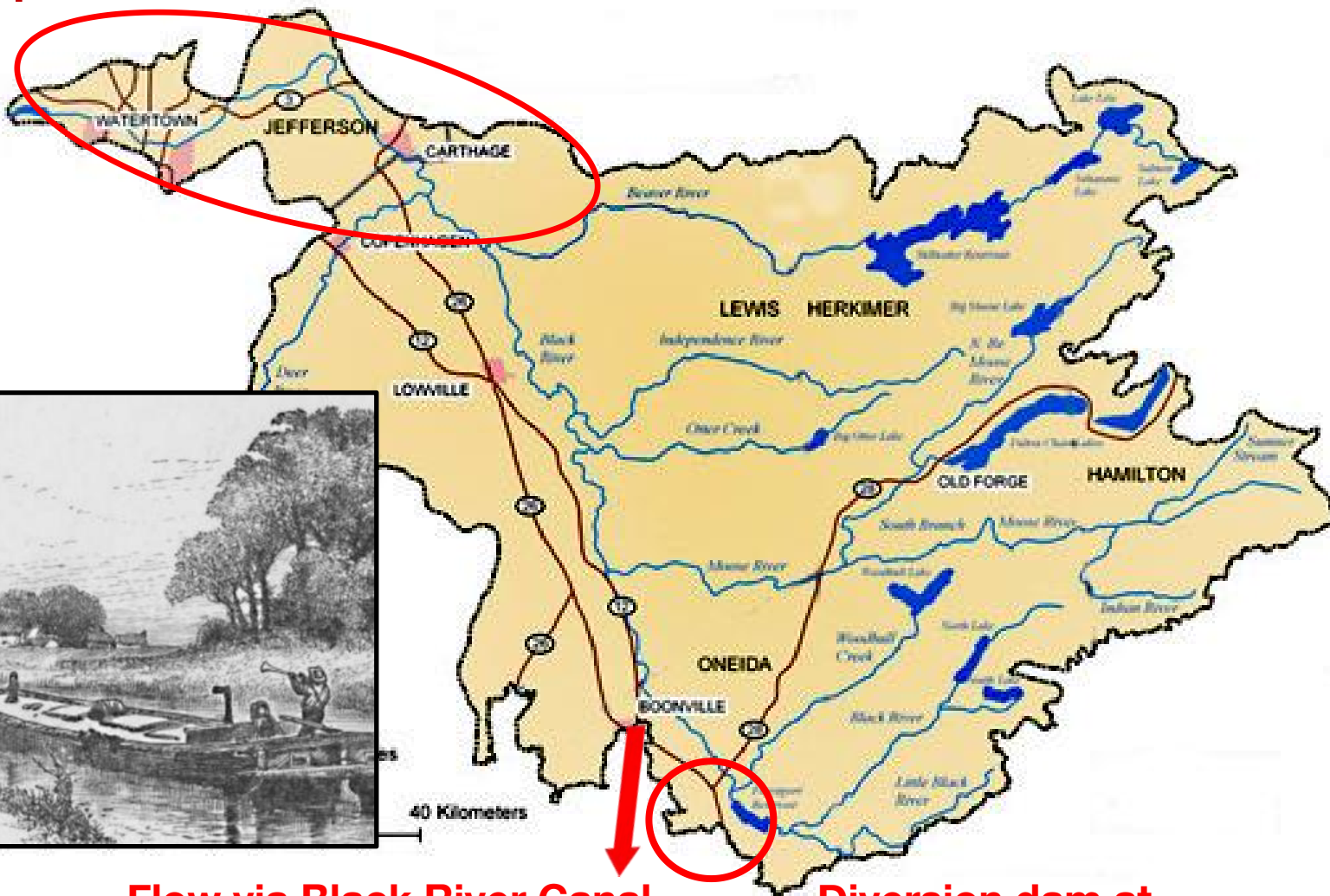
Why and when were the Fulton Chain dams built by

t

- In about 1850 the State (The Erie Canal Commission) started diverting Black River water out of the watershed and into the Mohawk River watershed to supply the very problematic summit section of the Erie Canal between Syracuse and Utica.
- This diversion worked very well for the canal but it aggravated the powerful mill owners on the Black River at Watertown. They demanded compensation – both financial and the construction of flow regulating dams and reservoirs.
- The State built these dams between the 1850s and 1883.
- The Old Forge and Sixth Lake Dams were built in 1882-83.

**Many water
powered mills**

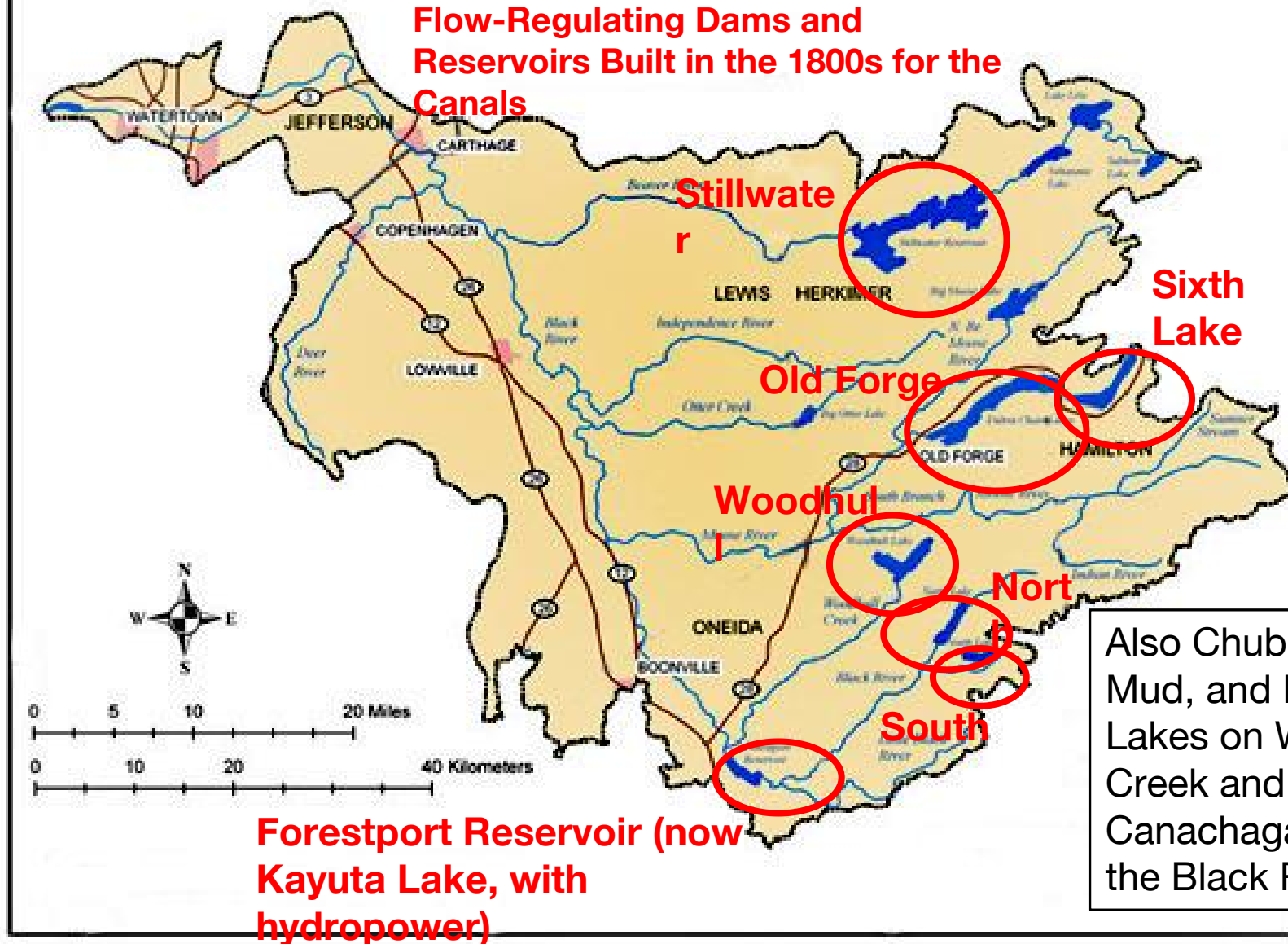
BLACK RIVER WATERSHED



**Flow via Black River Canal
to Erie Canal at Rome**

**Diversion dam at
Forestport**

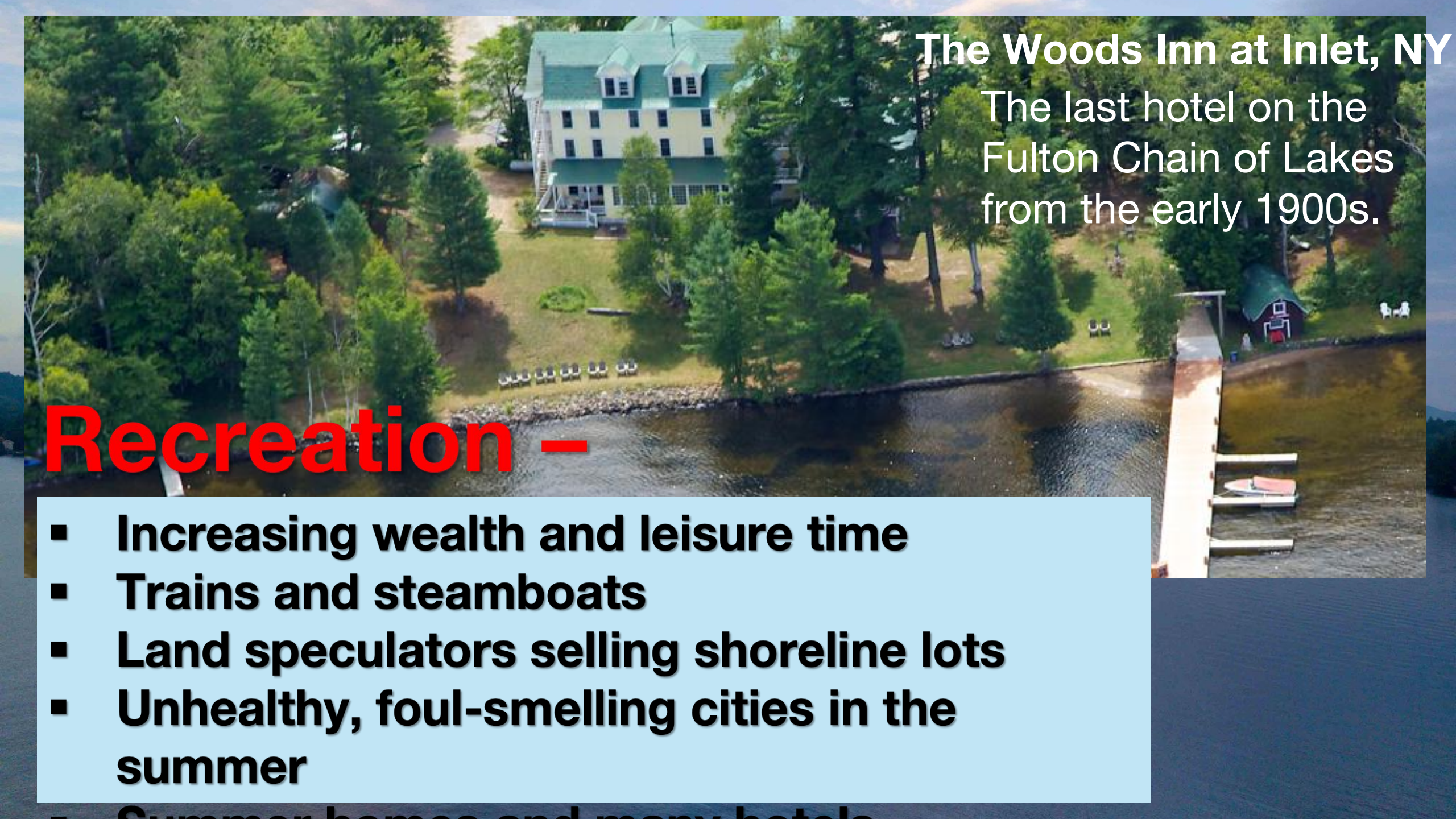
Flow-Regulating Dams and Reservoirs Built in the 1800s for the Canals



Also Chubb, Sand,
Mud, and Bisby Chain
Lakes on Woodhull
Creek and
Canachagala Lake on
the Black River branch.

1890 The Beginning of an Era of Major Change

- Logging declines
- Recreation grows
- Hydroelectricity begins
- Conservation becomes a priority (eventually)



The Woods Inn at Inlet, NY

The last hotel on the
Fulton Chain of Lakes
from the early 1900s.

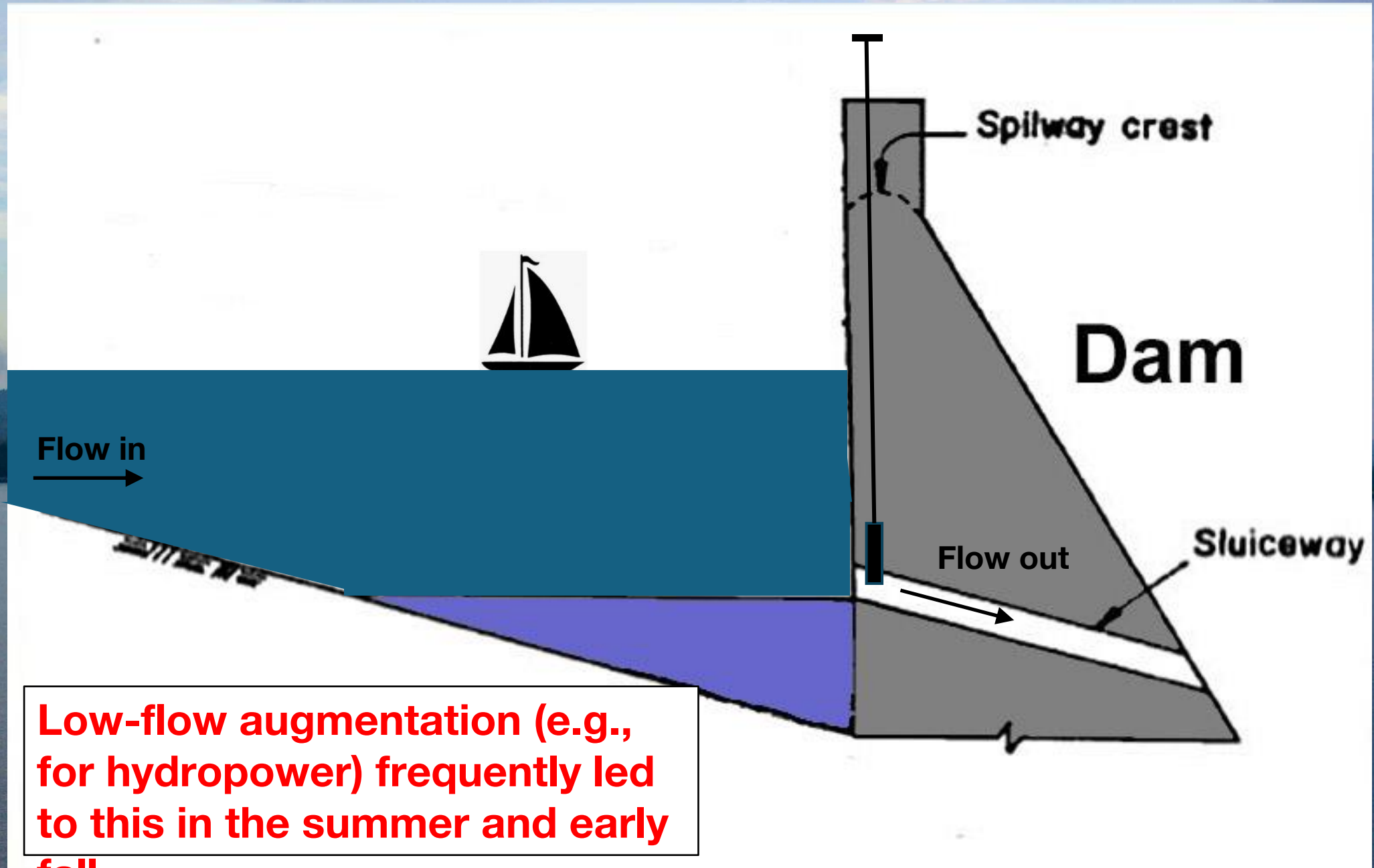
Recreation –

- Increasing wealth and leisure time
- Trains and steamboats
- Land speculators selling shoreline lots
- Unhealthy, foul-smelling cities in the summer

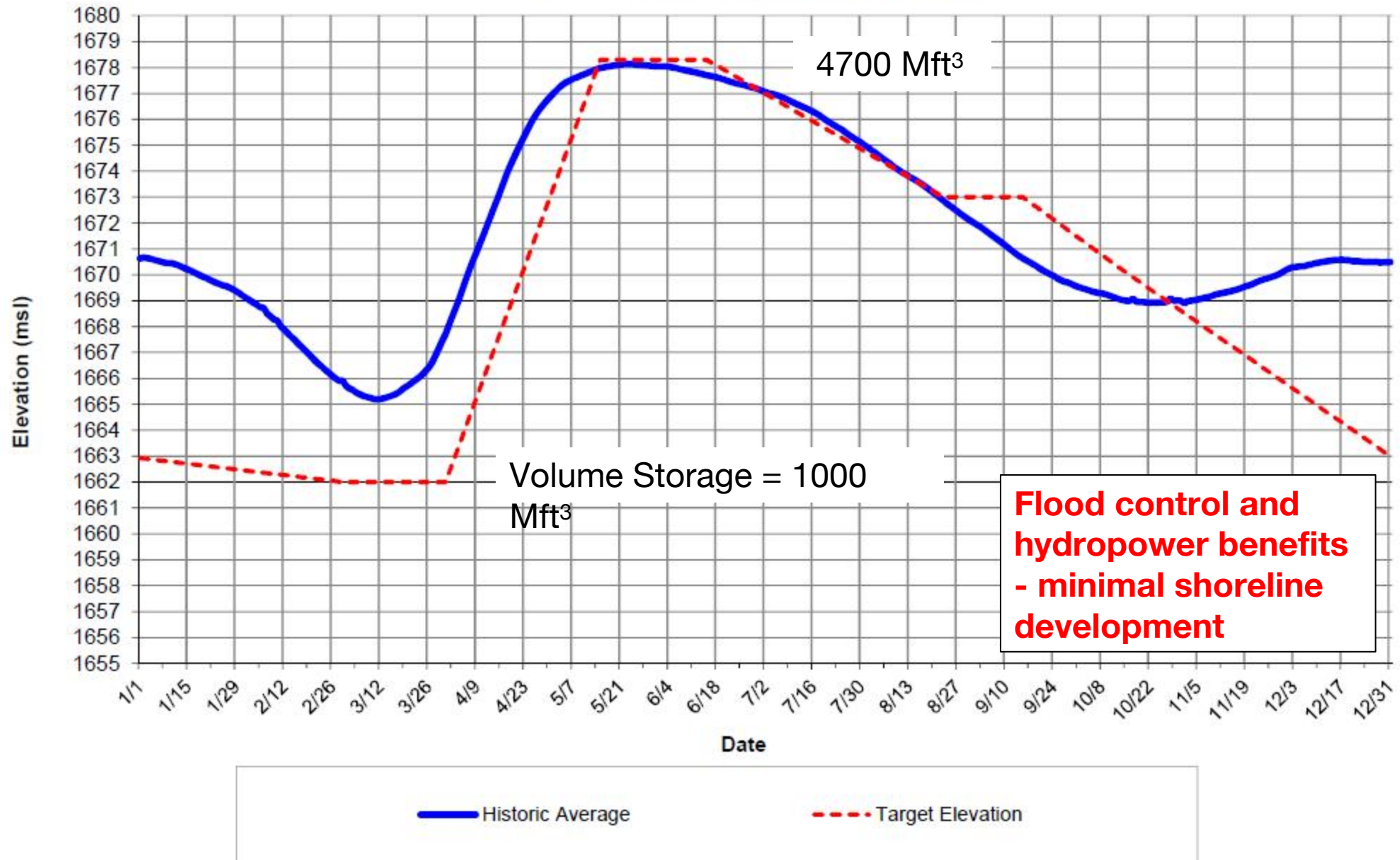
– Summer homes and many hotels

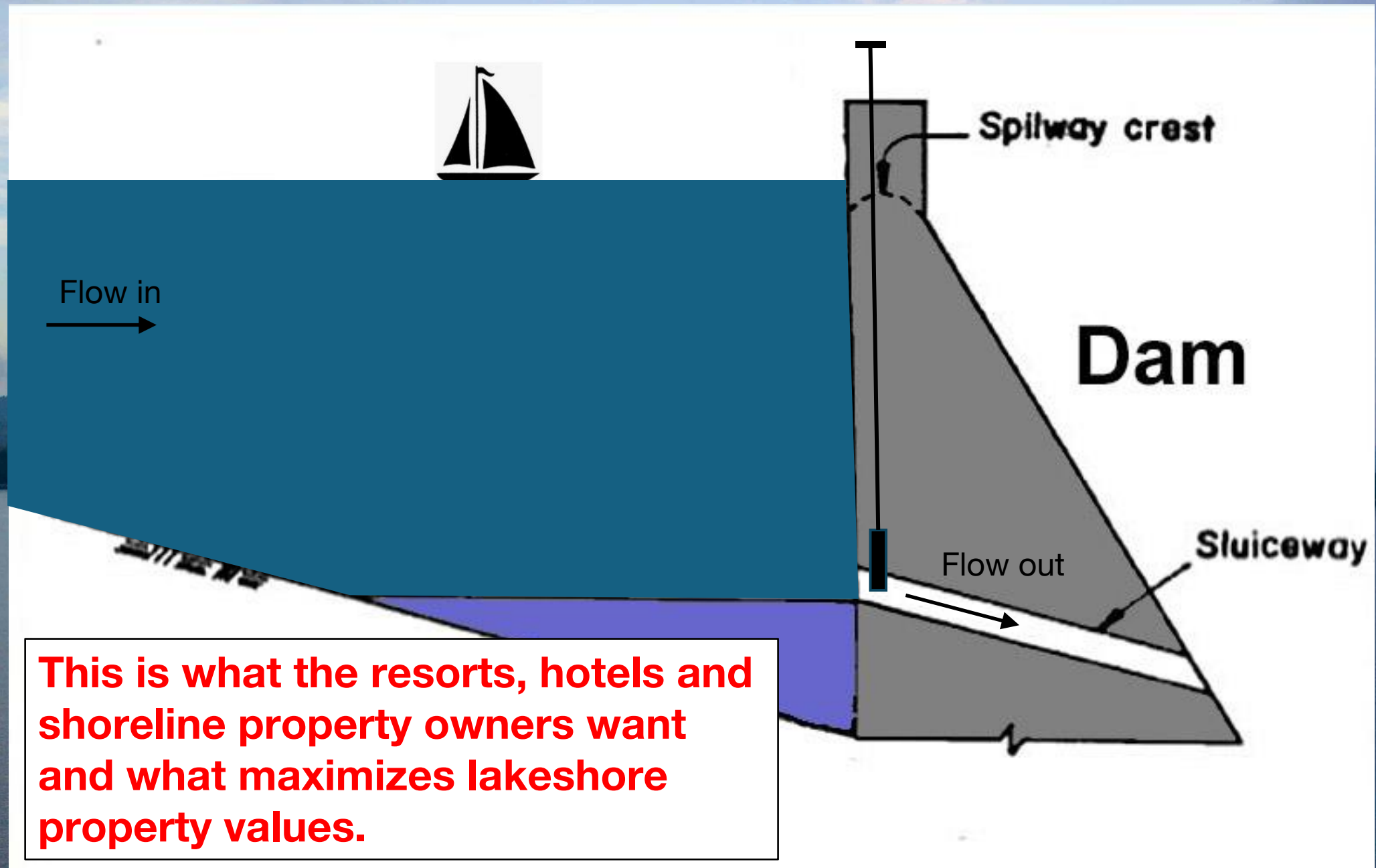
Conflict Over the Water Level in the Reservoirs

- Withdrawal of water by the State for the mills during drier periods (summer and early fall) in some years made transportation, commerce, and recreation on the reservoirs difficult.
- Property owners on the reservoirs threatened to sue.
- An agreement may have been reached with the State.

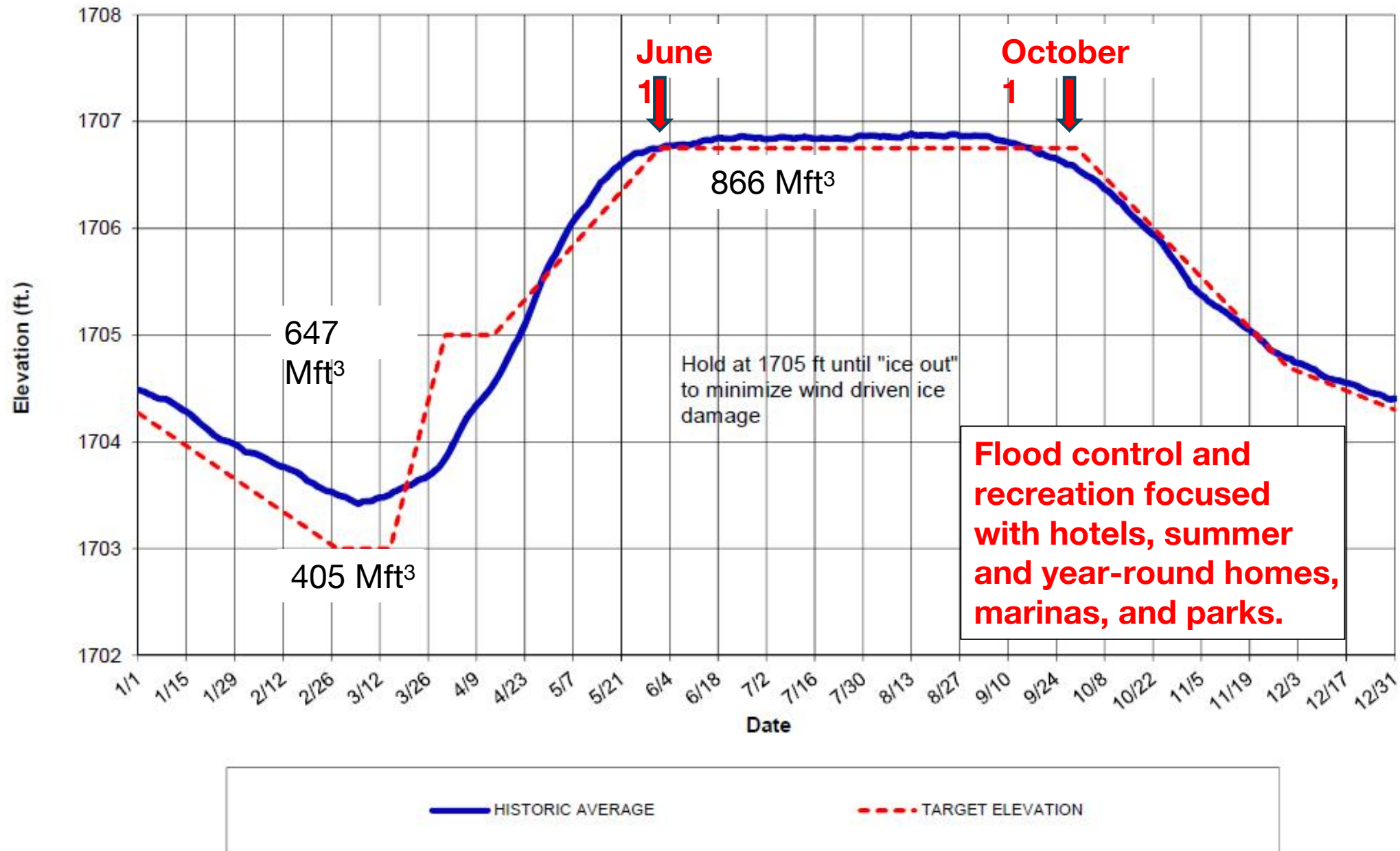


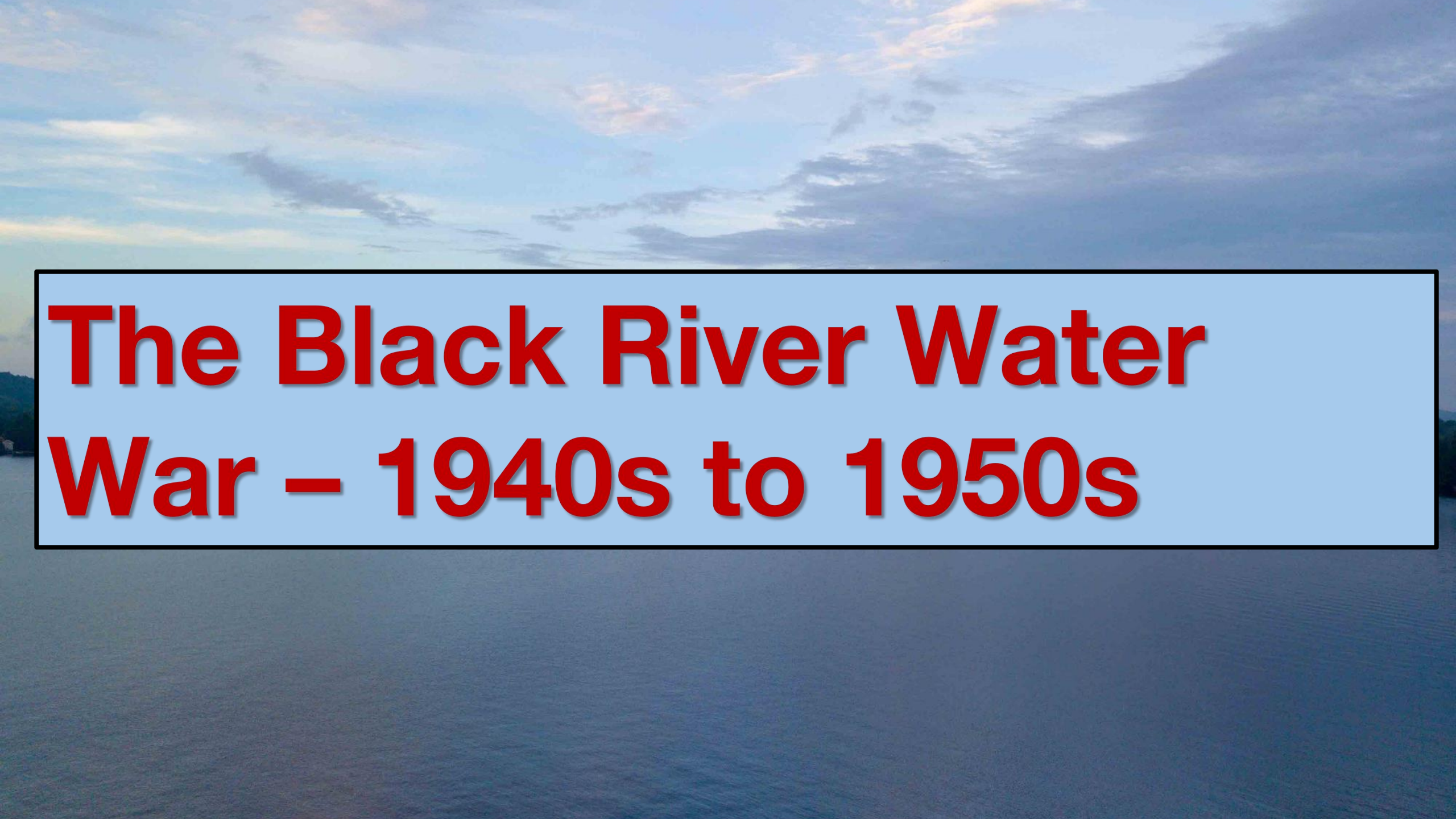
Stillwater Reservoir Historic Average and Operation Elevation





Old Forge Reservoir Target Elevation



The background of the slide features a wide river with gentle ripples on its surface, extending towards a horizon under a vast sky filled with soft, wispy clouds. The sky transitions from a pale blue near the horizon to a deeper blue at the top, with some clouds catching the light of a low sun, creating a serene and atmospheric scene.

The Black River Water War – 1940s to 1950s

The Black River Water War - Background

The Forever Wild Amendment that was added to the NYS Constitution in 1894 made building flow-regulating dams in the Forest Preserve essentially impossible.



The loggers had been causing concern especially downstate about the impact of intensive logging on water. In 1894 this led to the Constitutional amendment which made it illegal to cut, remove or destroy trees in the Forest Preserve.

The Forever Wild Amendment

Article XIV, Section 1 of the New York State Constitution

The lands of the state, now owned or hereafter acquired, constituting the forest preserve as now fixed by law, shall be forever kept as **wild forest lands**. They shall not be leased, sold or exchanged, or be taken by any corporation, public or private, nor shall the timber thereon be sold, removed or destroyed.

Hydroelectricit

In the late **y** 800s the State wanted to increase the use of hydroelectricity in New York by building more dams and reservoirs. (The State already owned the land in the Forest Preserve.)

They held hearings across the State

And there were
issues

Testimony before a State Senate Committee in Watertown in 1911

By the Chairman.

Q. I understand that some of the Fulton Chain owners expect to appear before us in Syracuse tomorrow and you could give us what might be termed the power owners' side of that controversy. I think it would be well to have it on the minutes.

A. The only point I wish to emphasize in this connection is the fact that as storage reservoirs are built there is a tendency among people to acquire property interests along the (shore) line of the reservoirs and the lakes or ponds created by them, then to build summer homes there, and then to claim that we haven't any right to draw the water down, because it causes them inconvenience.

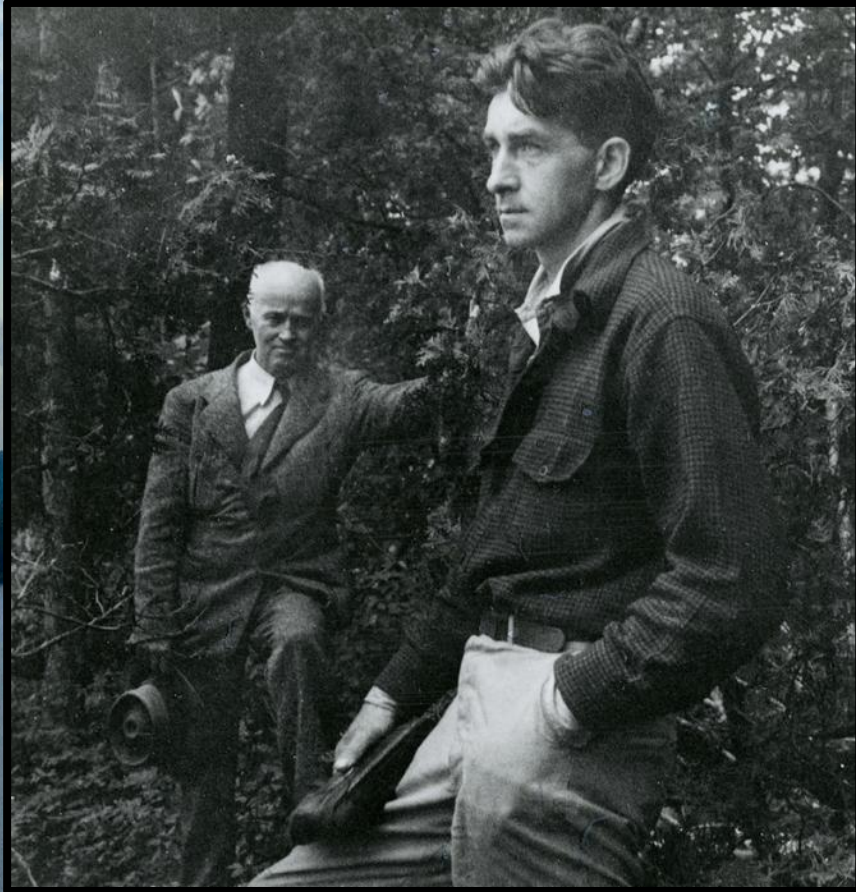
The Black River Water War - Background

- The Burd Amendment of 1913 opened the door to the exploitation of Forest Preserve land (3% of it) to construct and maintain dams and reservoirs. The **three allowed uses** were:
- Municipal Water Supply (New York City - Catskill Reservoirs)
- Water for the NYS Canal System (the NYS Barge Canal)
- The Regulation of River and Stream Flow (Hydroelectricity)

The Black River Water War - Background

- In 1915 the State passed the Machold Storage Law
 - Allowed river regulating districts to be formed (public benefit corporations)
 - The Districts can build, operate and maintain flow-regulating dams and reservoirs
 - Funded by assessing just two downstream beneficiaries
 - Hydroelectric utilities that are able to make more electricity
 - Land owners in downstream flood plains.
 - Most of the income came from the hydroelectric utilities
 - Today the dams are operated and maintained by the Hudson River Black River Regulating District (HRBRRD).

The Black River Water War - Background



The Conservationists

Adirondack Moose River Committee

"Schaefer led the charge against the dams in one of the largest and most successful grassroots environmental campaigns in legal history." Adirondack Research Library at Union College

Paul Schaefer (1909-1996)

The Black River Water War – First the

Courts

- Conservationists and others challenge one of the reservoir projects (Panther Mt.) in the State Supreme Court in 1949. Claim that:
 - The Black River Regulating District is not the “State”.
 - Primary beneficiary is private enterprise (power companies).
- State Supreme Court challenge succeeds. BRRD is the “State”, but taking public property (Forest Preserve land) for private purposes is unconstitutional, and building a reservoir for hydroelectric power is a private purpose.

The Black River Water War – Then the State Legislature

- Stokes Act passed by the state legislature in 1950.
- The Regulating District claims the Act is unconstitutional and fights it in the US Supreme Court.
- Defenders of Stokes Act win (1951) in the U.S. Supreme Court.
- Ostrander Constitutional Amendment to State Constitution ratified in 1953. No more **flow-regulating dams** in the Forest Preserve.
- A few more legal and legislative efforts in the 1950s and later by the Regulating District fail (decisively).

Who won the “War”?

Successfully defending the Stokes Act all the way to the US Supreme Court was a major accomplishment for the conservationists and the environmental and wilderness protection efforts that followed.

The win in the Supreme Court slowed the building of dams by the State in the Forest Preserve.

The 1953 NYS Constitutional Amendment that removed flow-regulation from the list of allowed purposes of reservoirs built in the Forest Preserve helped end flow-regulating dam/reservoir construction.

Why the dams on the Fulton Chain are being rebuilt

From 1978 Letter to Governor Hugh Carey from US Army Corp of
Engineers

The following dams in your state have previously been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. They are now to be assessed as unsafe:

Rehabilitated Old Forge Dam





Rehabilitated Sixth Lake Dam



Who Builds the Best Dams in the World





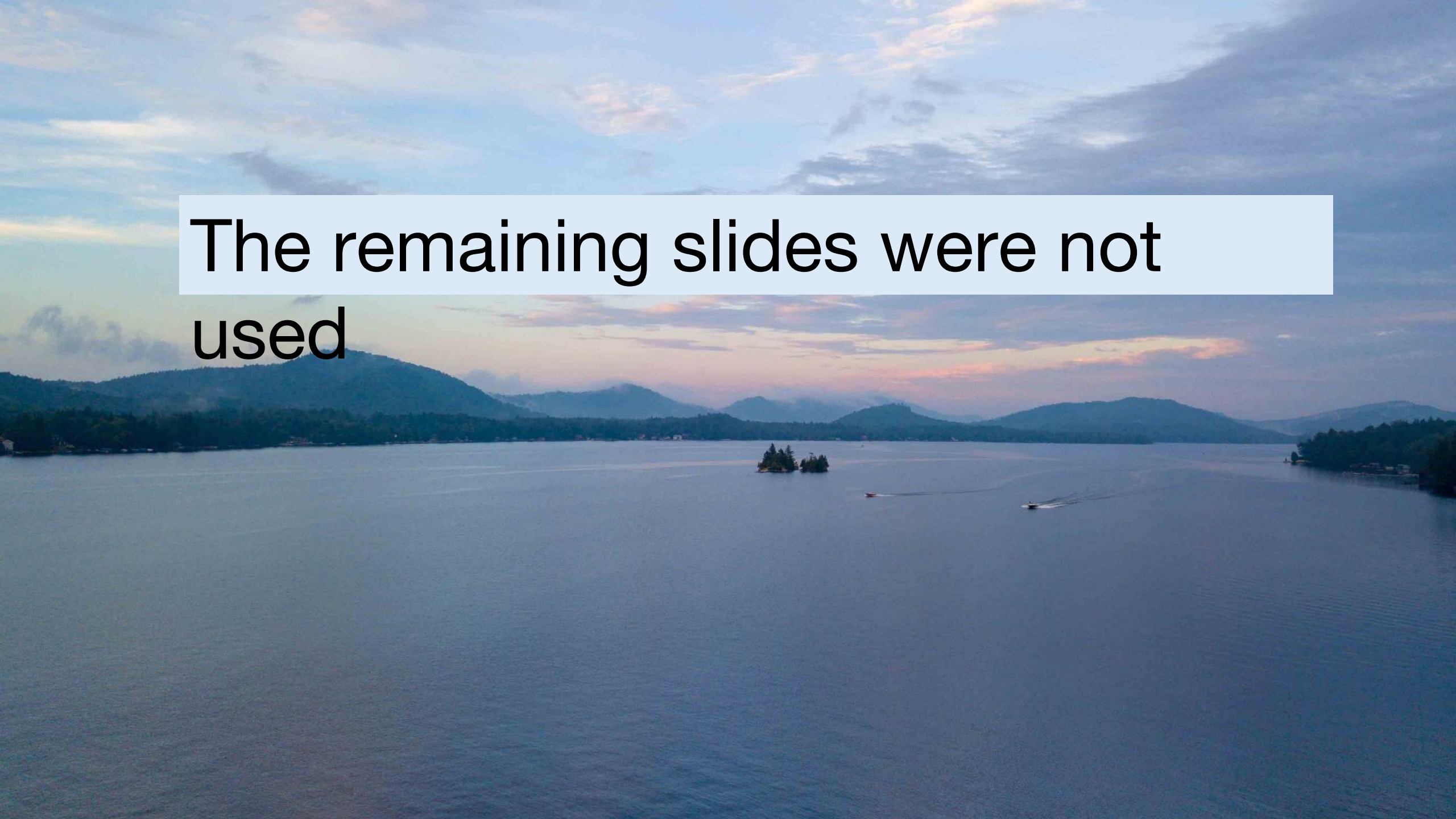
Before the Colonists (In “Eager” by Ben Goldfarb)

And in New York’s Adirondacks, wrote Harry Radford, “it is evident that every lake and pond was occupied, and every river, brook, and rill, from the largest to the most insignificant, thickly peopled with these industrious and prolific animals. They seem to have completely possessed the land, and to have been abundant almost beyond our present conception.”

Harry W. Radford, Adirondack Preservation, in Timber and History of the Adirondack Beaver (Albany: J. B. Lyon, 1908), p. 396.



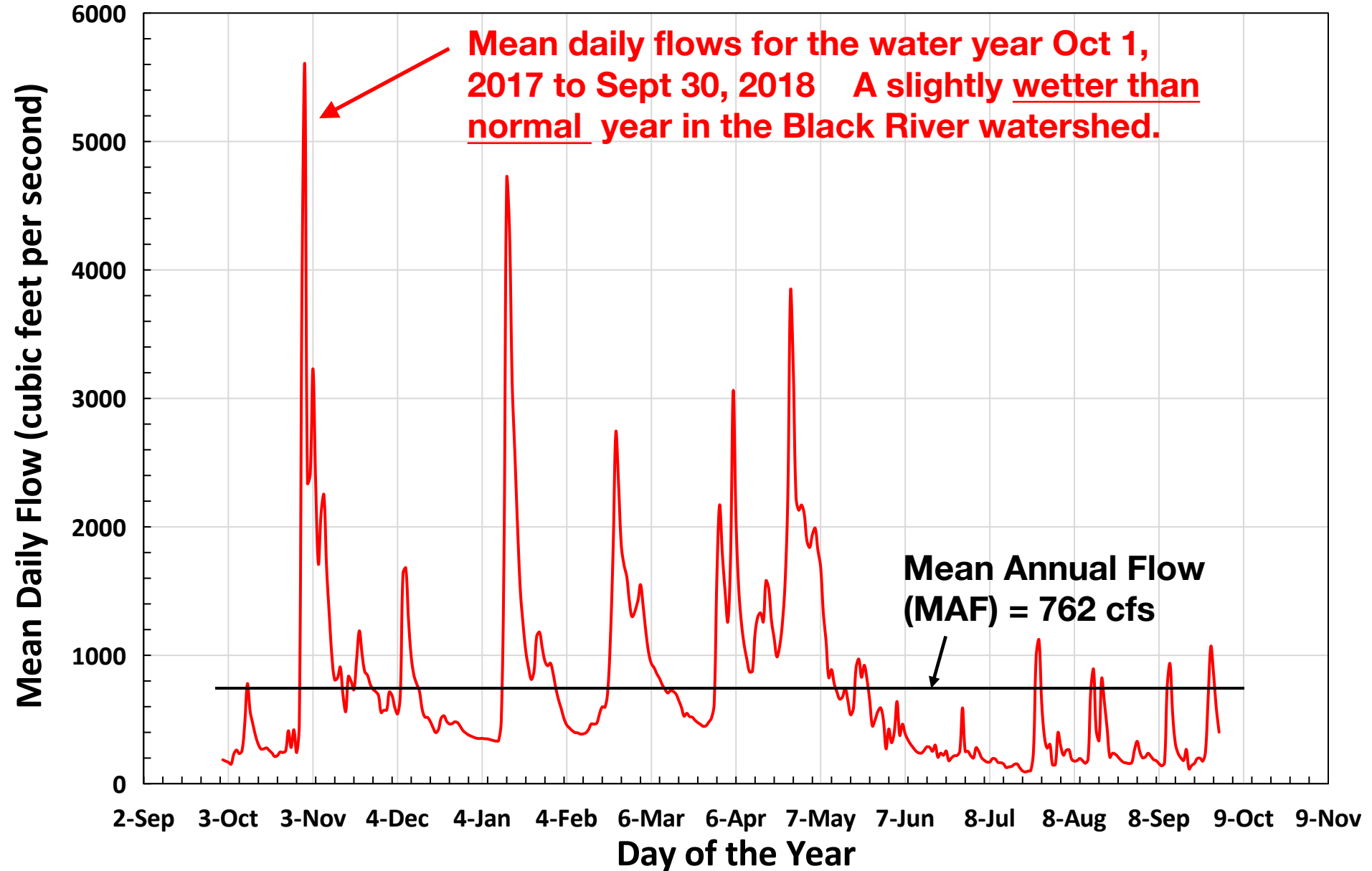
The remaining slides were not
used



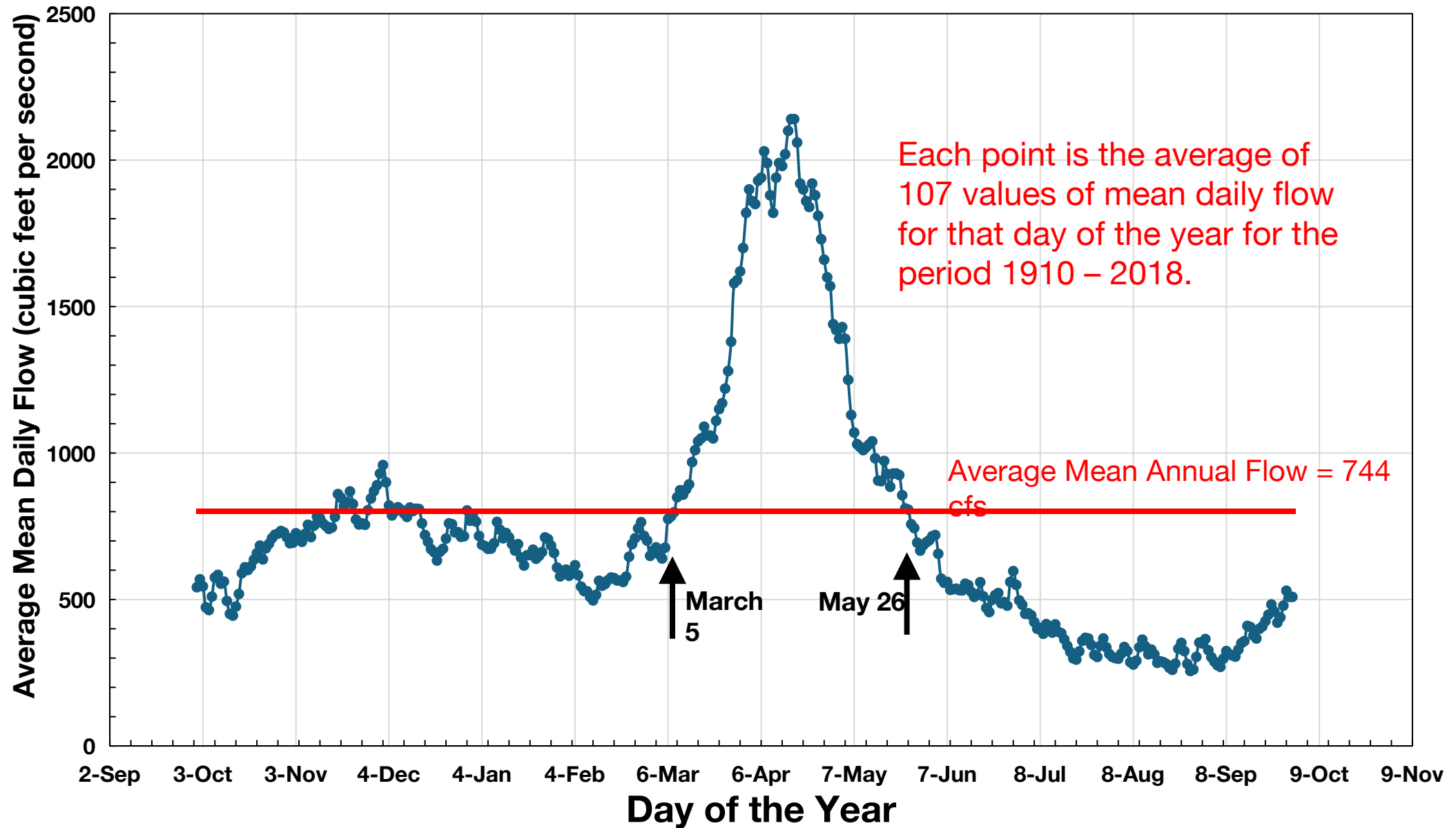
The Variability of Streamflow



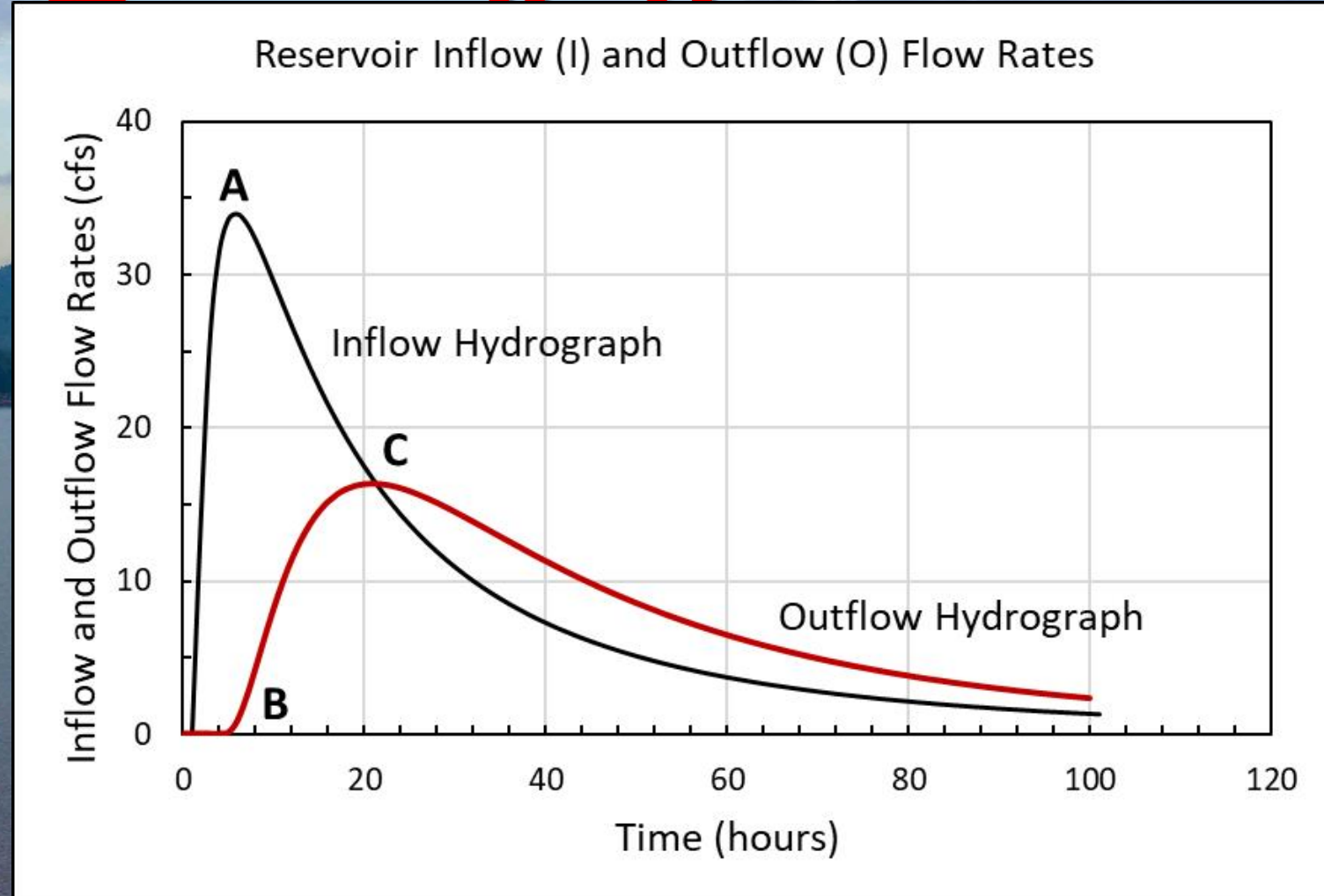
Mean Daily Flows - Black River at Boonville - 2017-10-1 to 2018-09-30



One Hundred and Eight Years of Streamflow - Average of the Mean Daily Flows Black River at Boonville – USGS Data from 1910 to 2018



Flood





The Loggers

The

Log drive

- In the beginning water transport of logs (1830+) was critical.
- Loggers built log-crib dams.
- The railroads became important in the late 1800s.
- The last log drive on the Moose River was in about 1950.



The Erie

Canal

- The Erie Canal had a serious water supply problem
- Water was diverted from the Black River to help solve the problem.
- During dry periods the mill owners became very upset and demanded compensation from the State and the construction of flow-regulating dams and reservoirs.