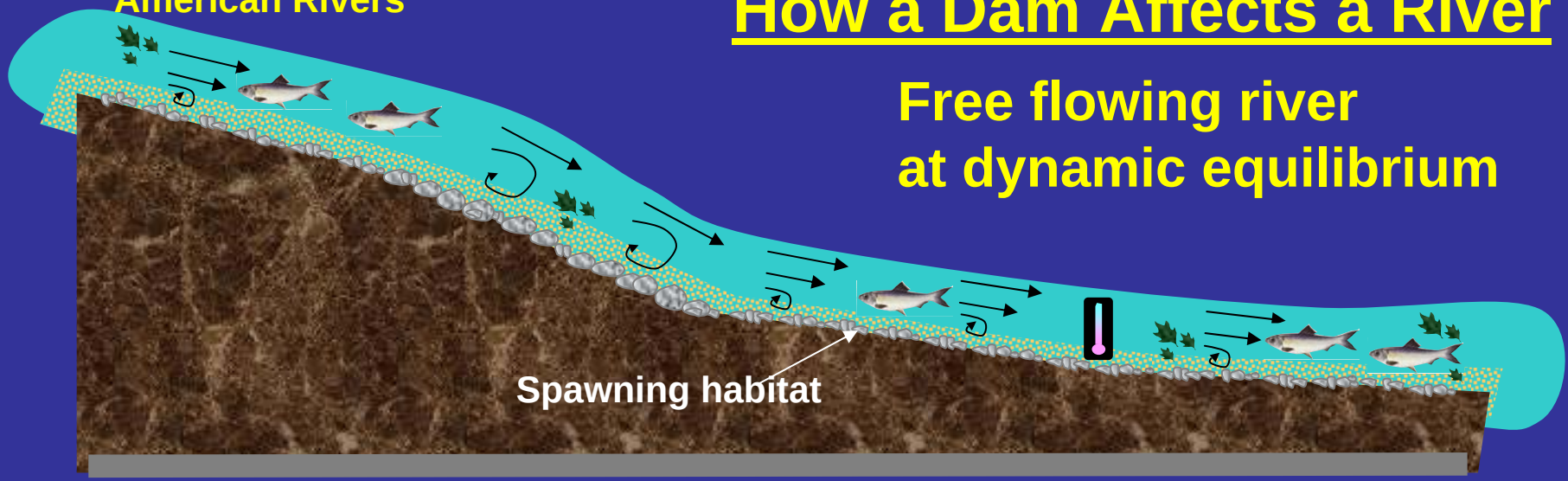
Small Hydro Development
Site Evaluation & Feasibility

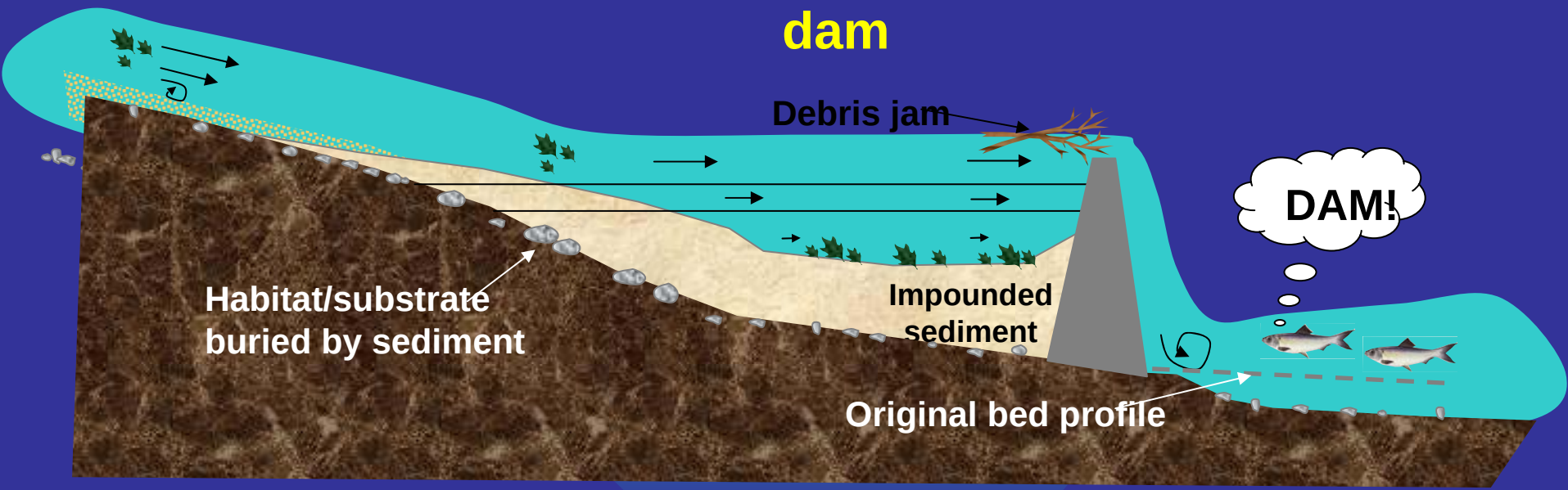
Graphic courtesy Laura Wildman
American Rivers

How a Dam Affects a River

Free flowing river at dynamic equilibrium



River impounded by a dam



Upstream

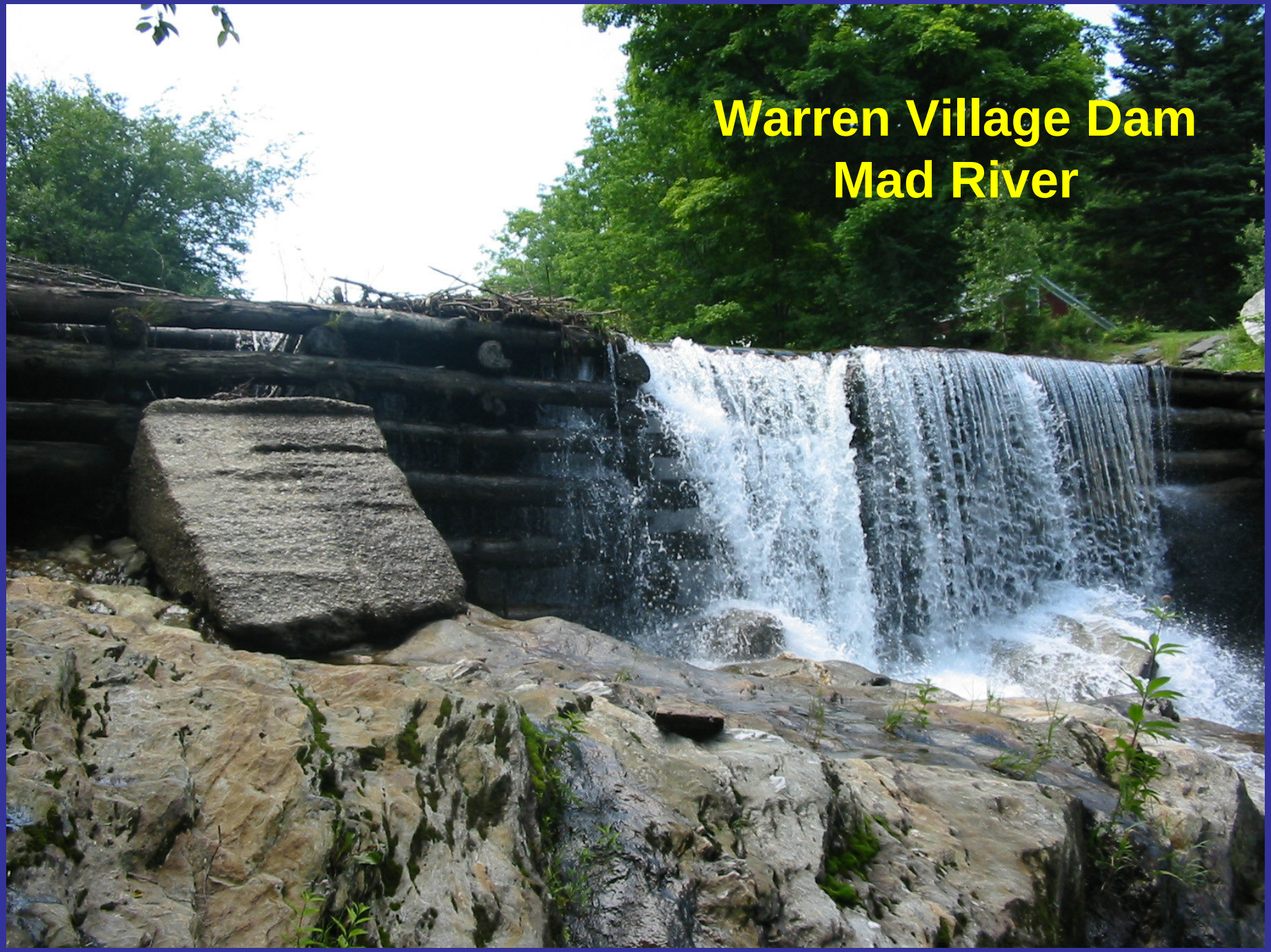
Downstream

Upstream

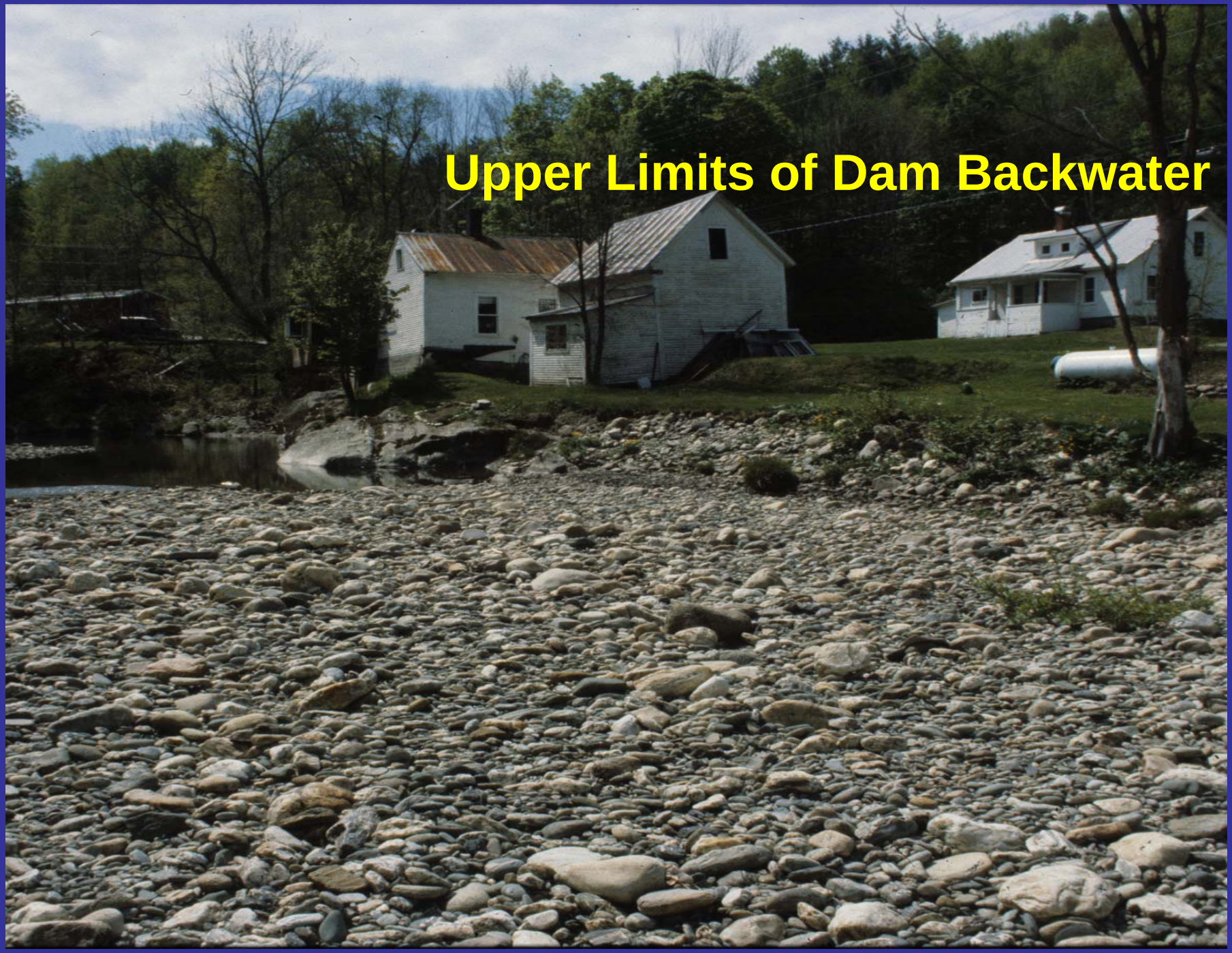
Downstream

Upstream

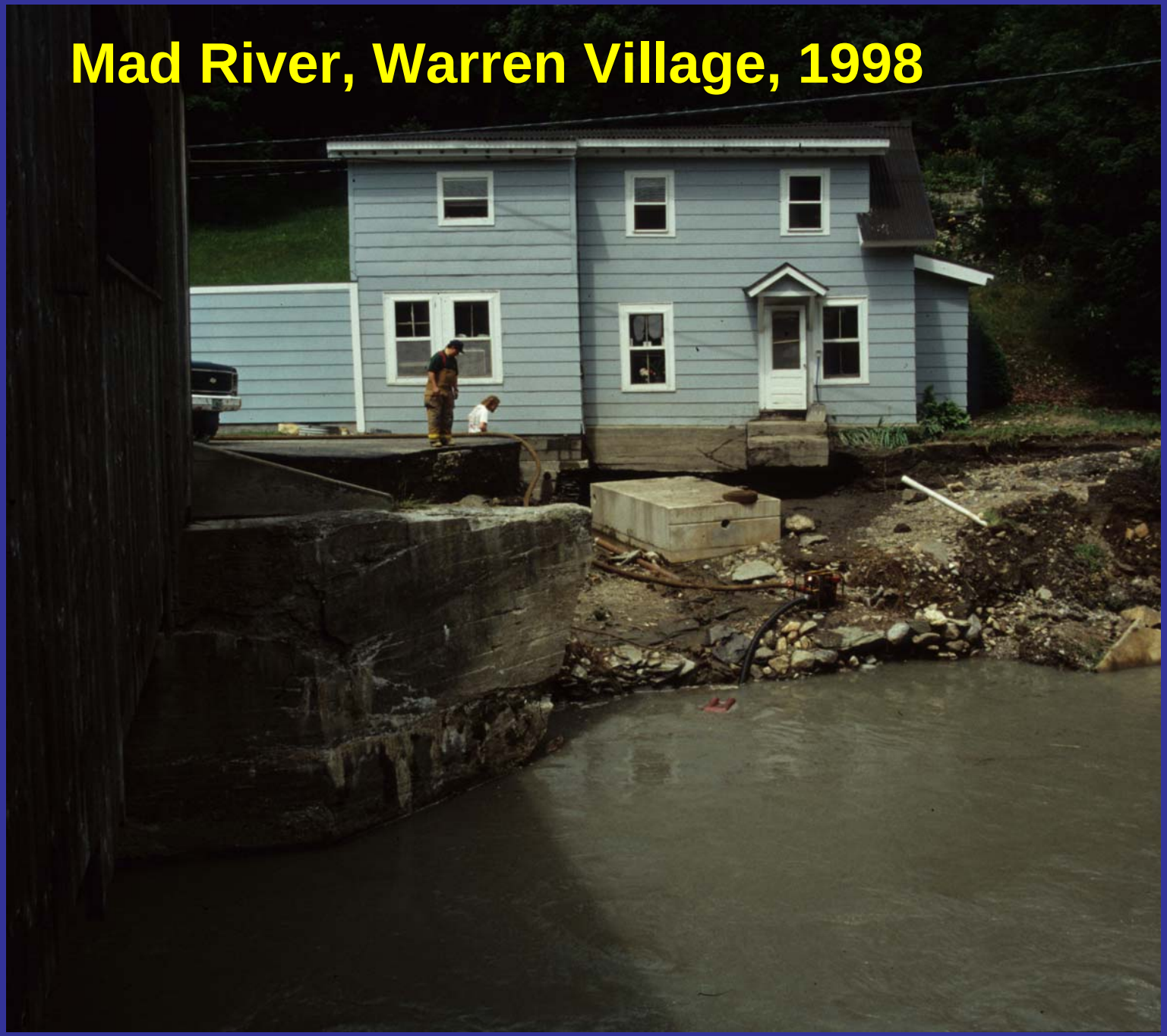
Downstream

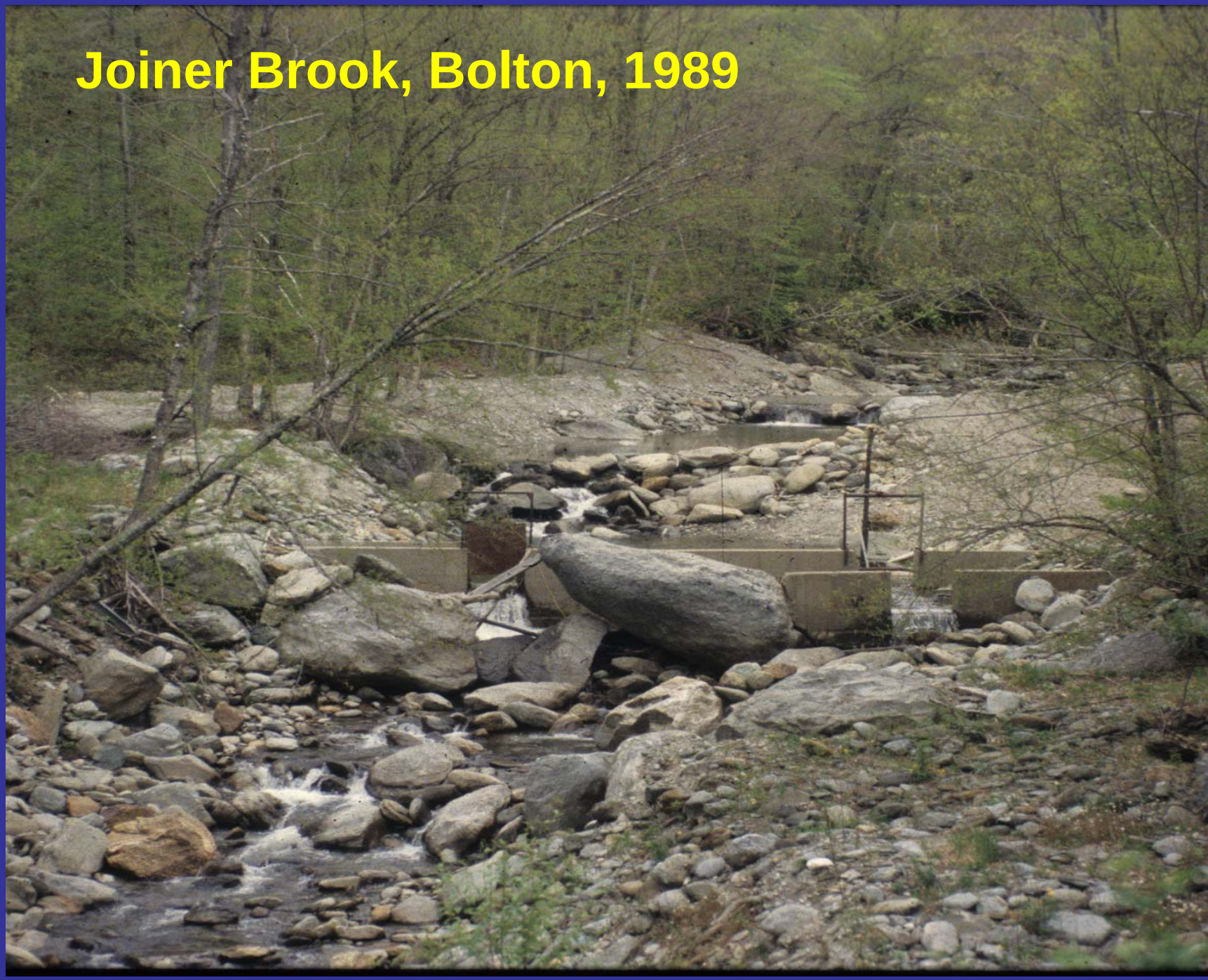

Warren Village Dam
Mad River

Sediment Transport
Discontinuity


Upper Limits of Dam Backwater

Mad River, Warren Village, 1998




Joiner Brook, Bolton, 1989

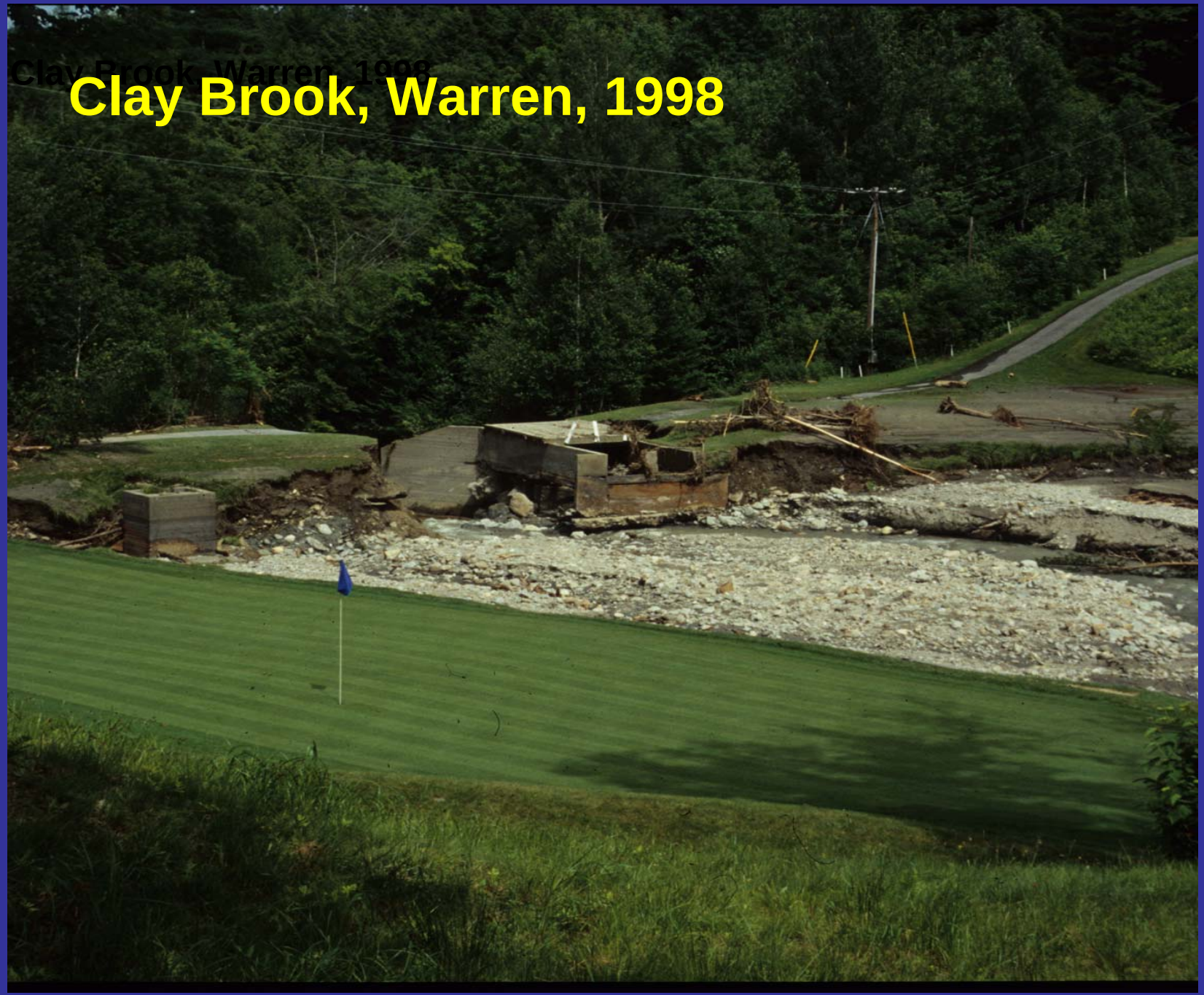
Downstream Channel
Incision Due to
Sediment Transport
Discontinuity

Wolcott Pond Brook, 1995

Downstream
Jones Road
Wolcott, 1995

Rowell Brook, Bradford, 1998
Private Drive

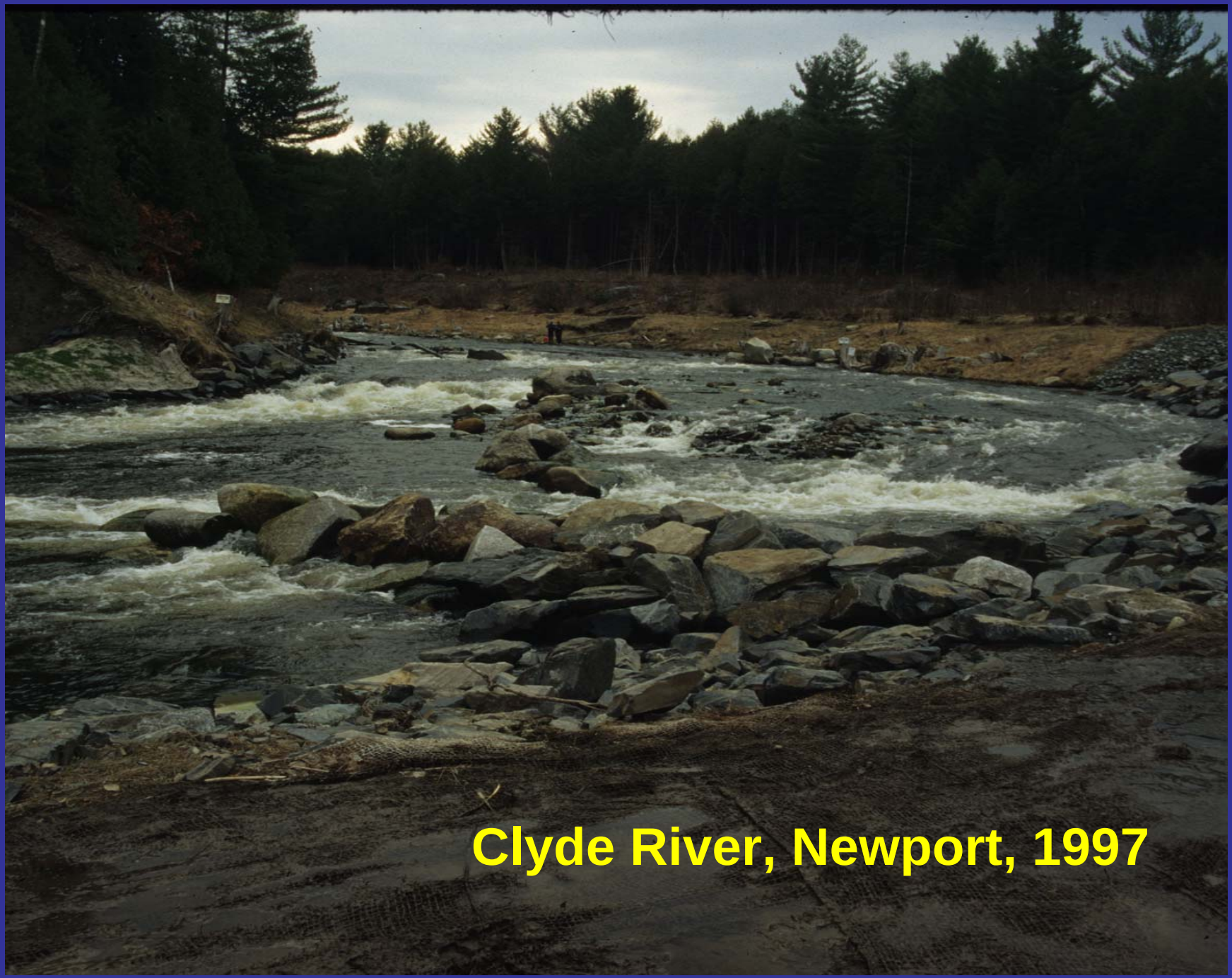
North Montpelier Pond
Kingsbury Branch, 1989


Clay Brook, Warren, 1998

NO
SWIMMING
ALLOWED

Clay Brook Restoration 2004

Citizens Utilities #11
Clyde River, Newport, 1994


Clyde River, Newport, 1997

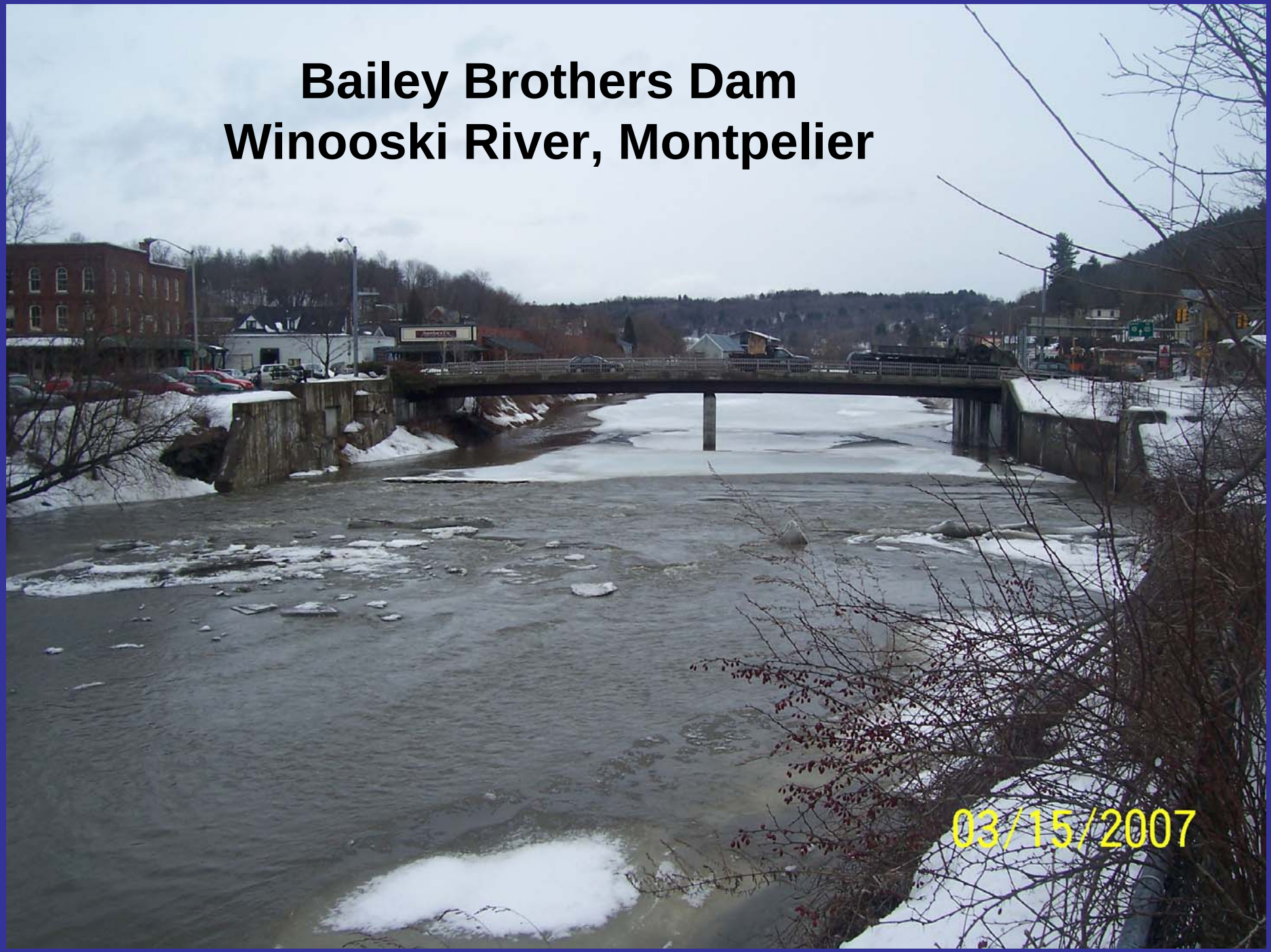
Debris

Ice Transport Capacity

Bethel Mills Dam
Third Branch

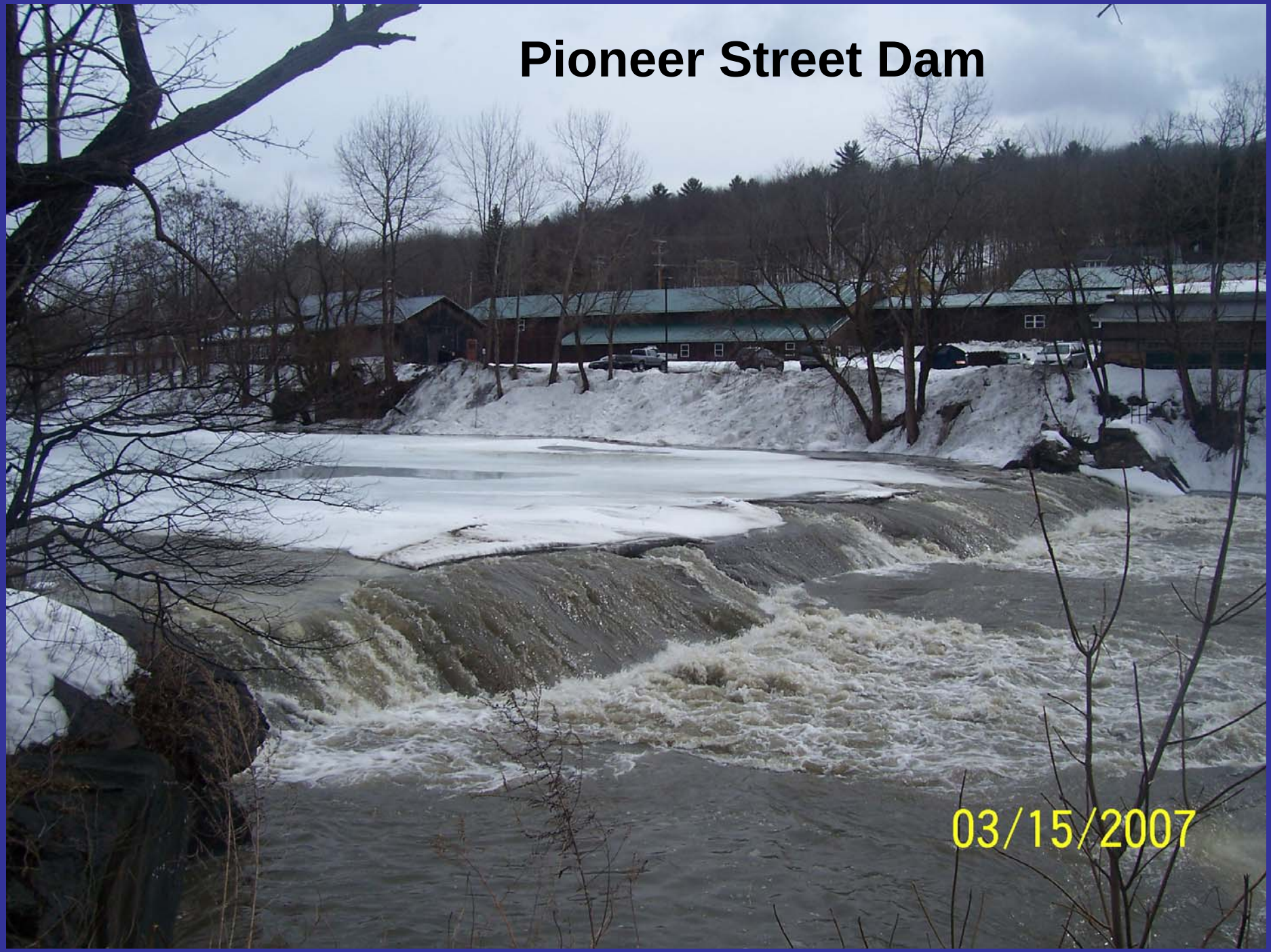
VT 78 East Highgate
Missisquoi River

VT 78 East Highgate
Missisquoi River


Bailey Brothers Dam
Winooski River, Montpelier
03/15/2007

03/15/2007

03/15/2007


Pioneer Street Dam
03/15/2007

03/15/2007

A Necessary
Grade Control?

Summary:

1. Evaluate the effect of the project on upstream flooding including ice jams.

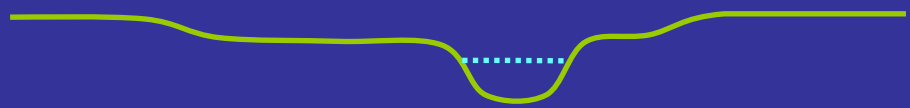
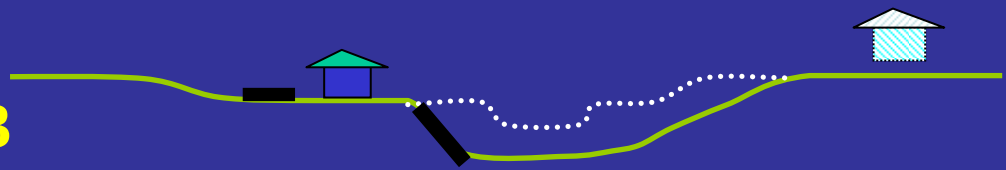
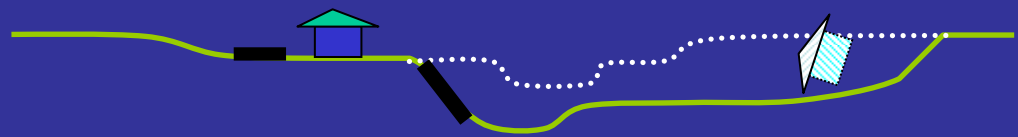
2. Take account of the community or individual investment vulnerability to flood loss or damage.

3. Consider the extent to which sediment transport discontinuity is a consequence and whether the condition should be perpetuated.

4. Will the power production benefits unreasonably compromise the social, economic and ecological benefits that rivers in dynamic equilibrium can provide your communities?

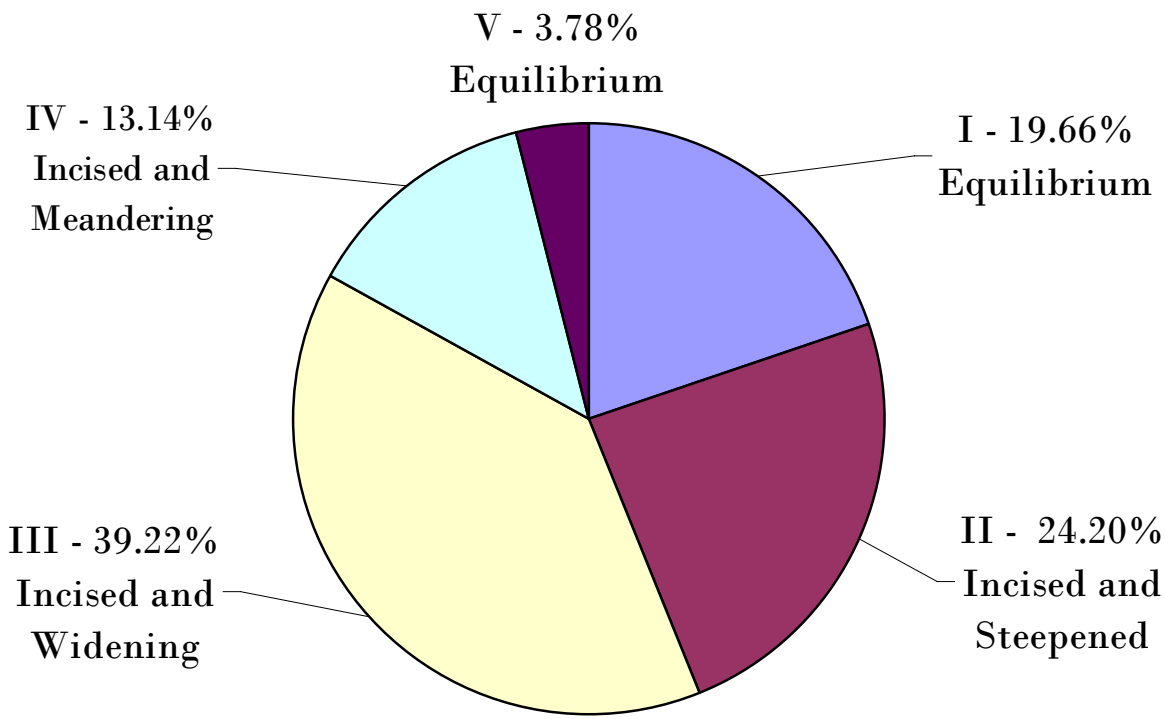
The Physical Imperatives of Fluvial Systems are Predictable and are Temporally Connected at Time Scales Spanning Generations

Explaining Channel Evolution and Fluvial Geomorphic Equilibrium

Stage			
1	Pre-1800		Equilibrium condition
2	Pre-1900	Modification of watershed inputs, channels & floodplains 	Geomorphic response begins
3	1927		Widening to balance energy with boundary conditions
4	1973		Developing new flood plain
5	20??		Equilibrium condition

After Shumm, et.al.

Evolution Stage	*Number of Segments*	*Percent Segments*	*Number of Miles*	*Percent Length*
I	208.0	19.66%	167.5	22.13%
II	256.0	24.20%	147.5	19.49%
III	415.0	39.22%	316.8	41.84%
IV	139.0	13.14%	102.4	13.53%
V	40.0	3.78%	22.8	3.01%
Total	1,058.0	100.00%	757.1	100.00%

These statistics are representative of the statewide loss of 70% of the ecological potential of our fluvial systems. It is not too late to gain much of this back but we must act forcefully and decisively now.

Percentage of Assessed Stream Segments in Various Stages of Evolution