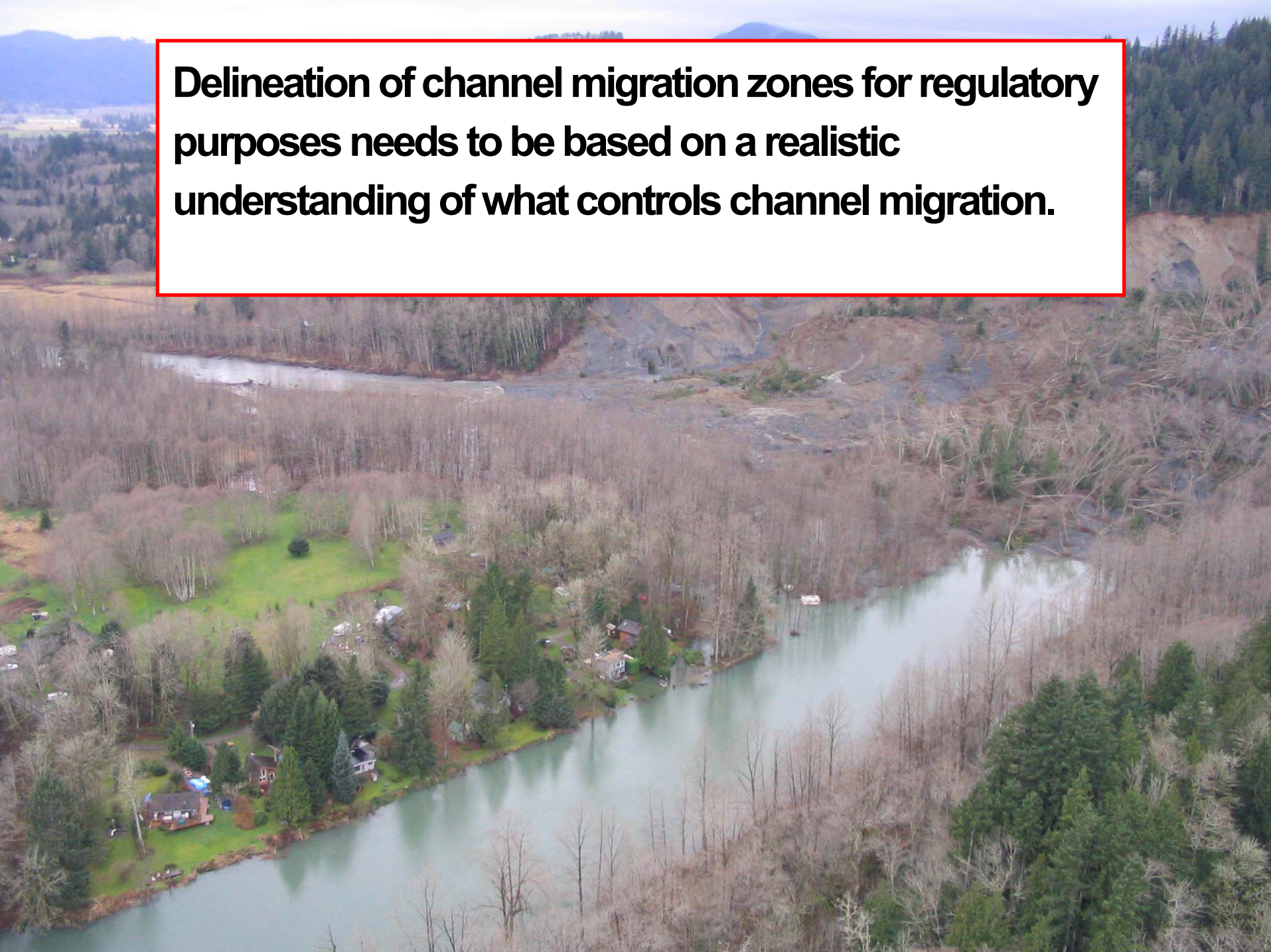
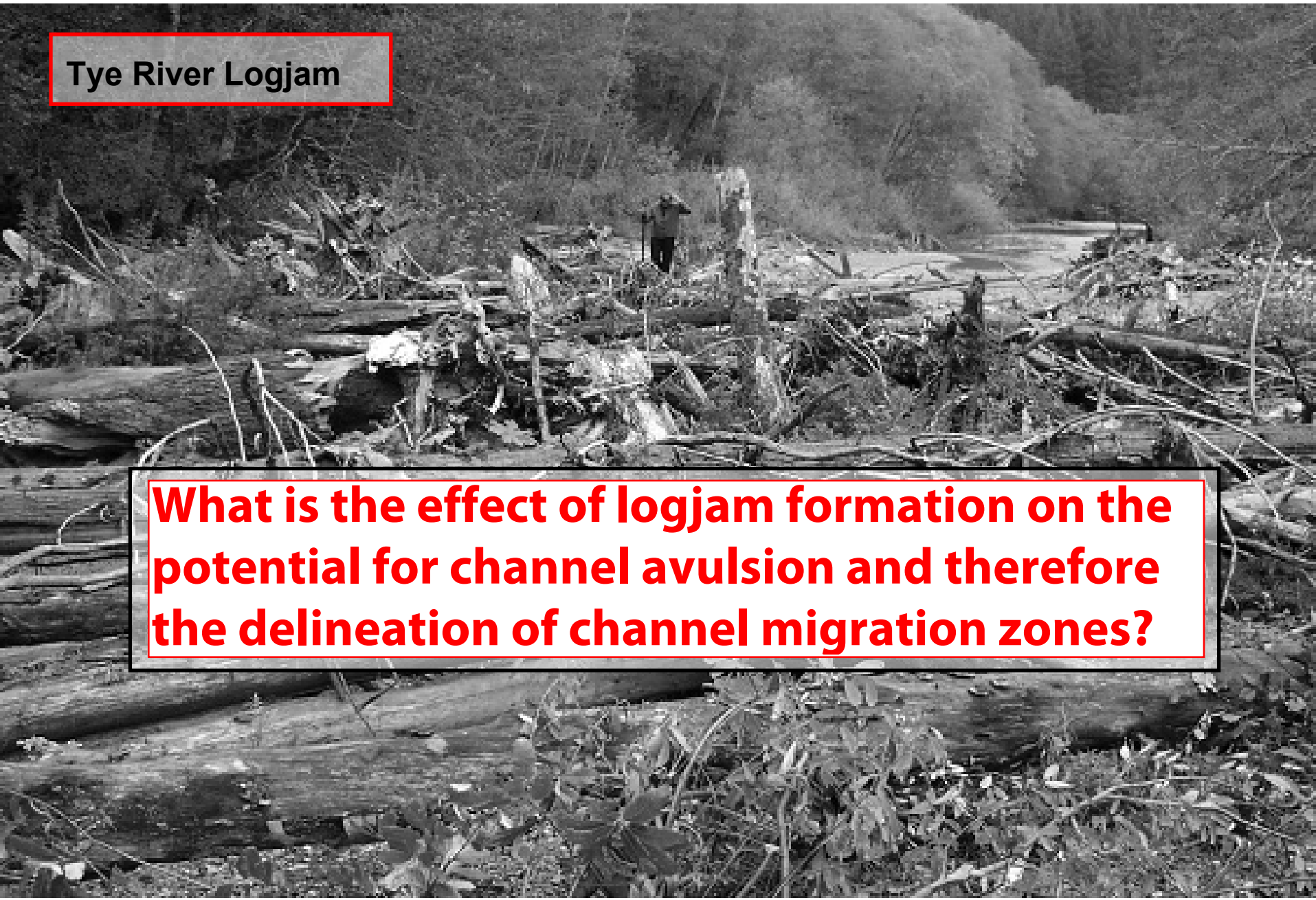
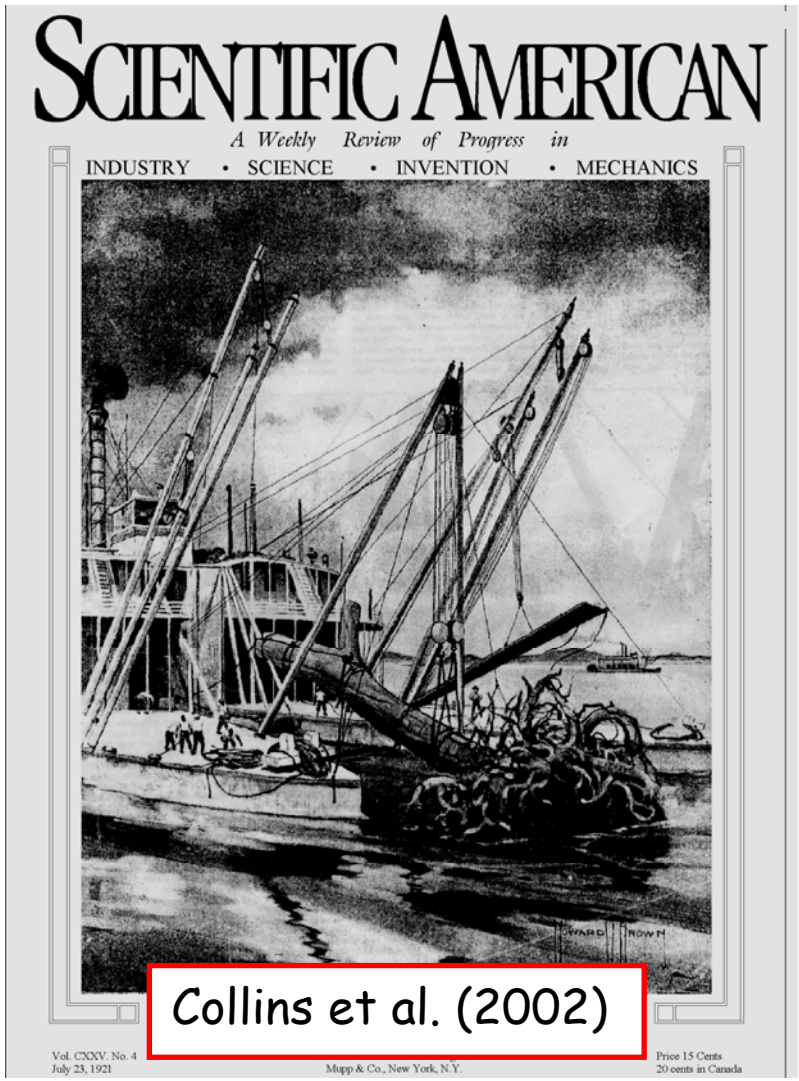
Influence of vertical channel change associated with wood accumulations on delineating channel migration zones Washington, USA,

Chris J. Brummer
Tim B. Abbe
Jennifer Sampson
and David R. Montgomery

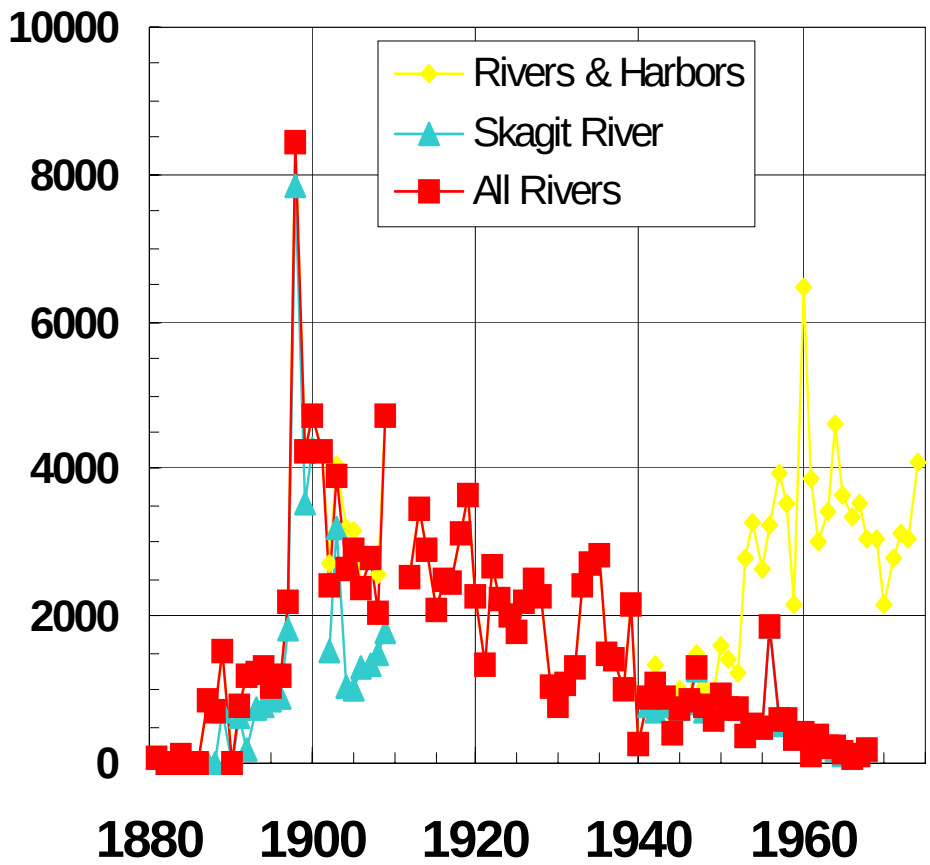

Delineation of channel migration zones for regulatory purposes needs to be based on a realistic understanding of what controls channel migration.


Tye River Logjam
What is the effect of logjam formation on the potential for channel avulsion and therefore the delineation of channel migration zones?

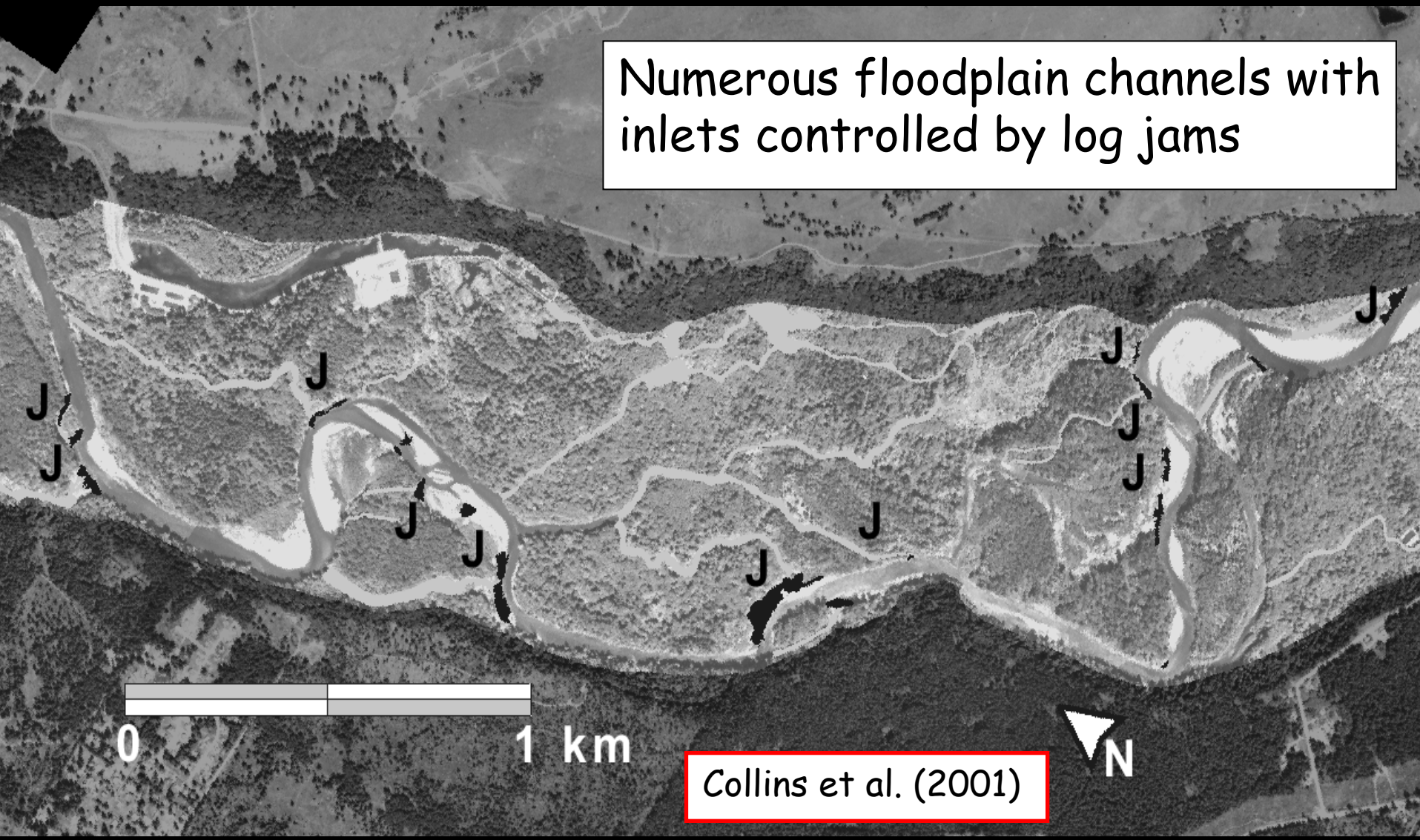
Army Corps of Engineers aggressively "de-snagged" American Rivers



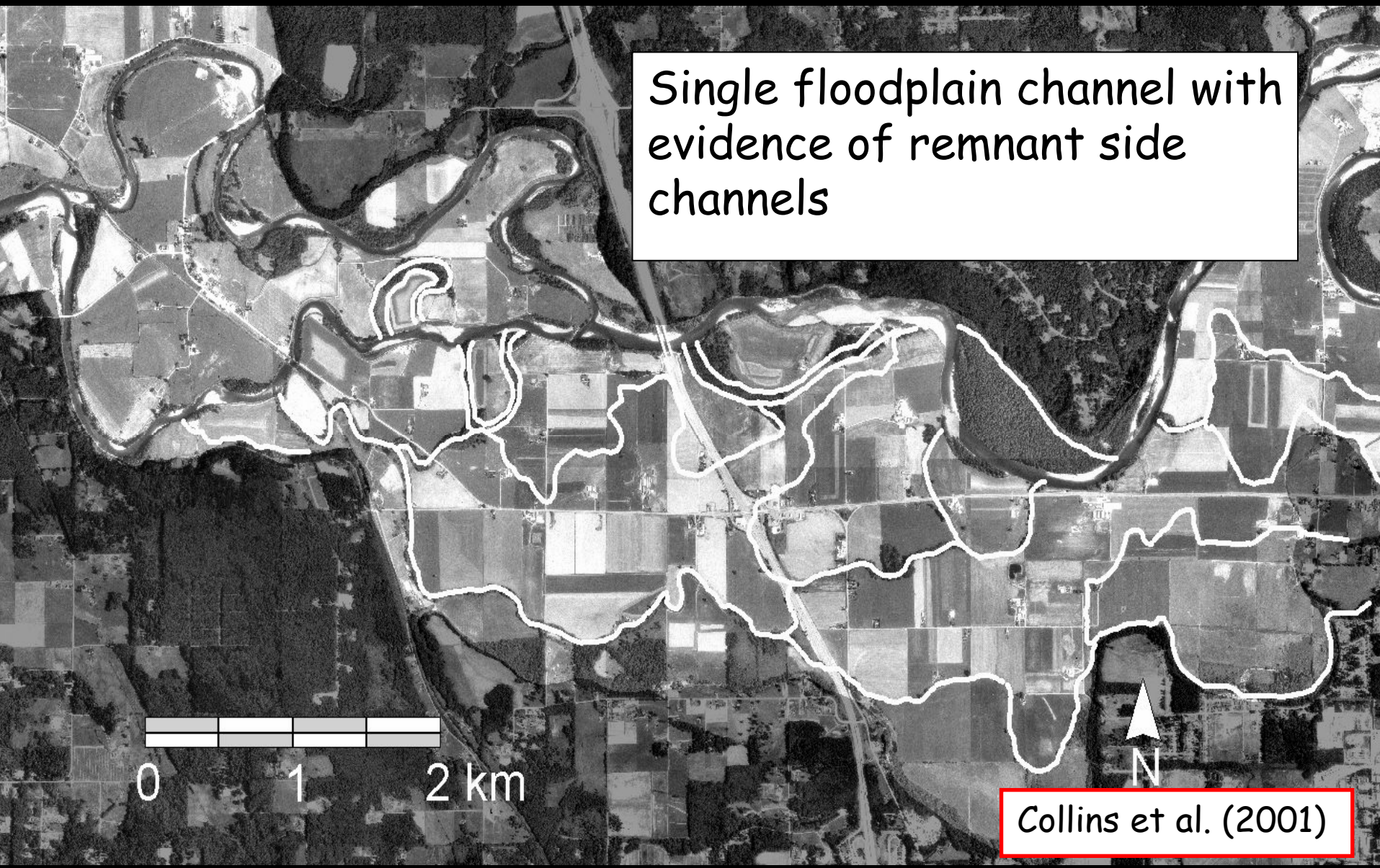
Collins et al. (2002)



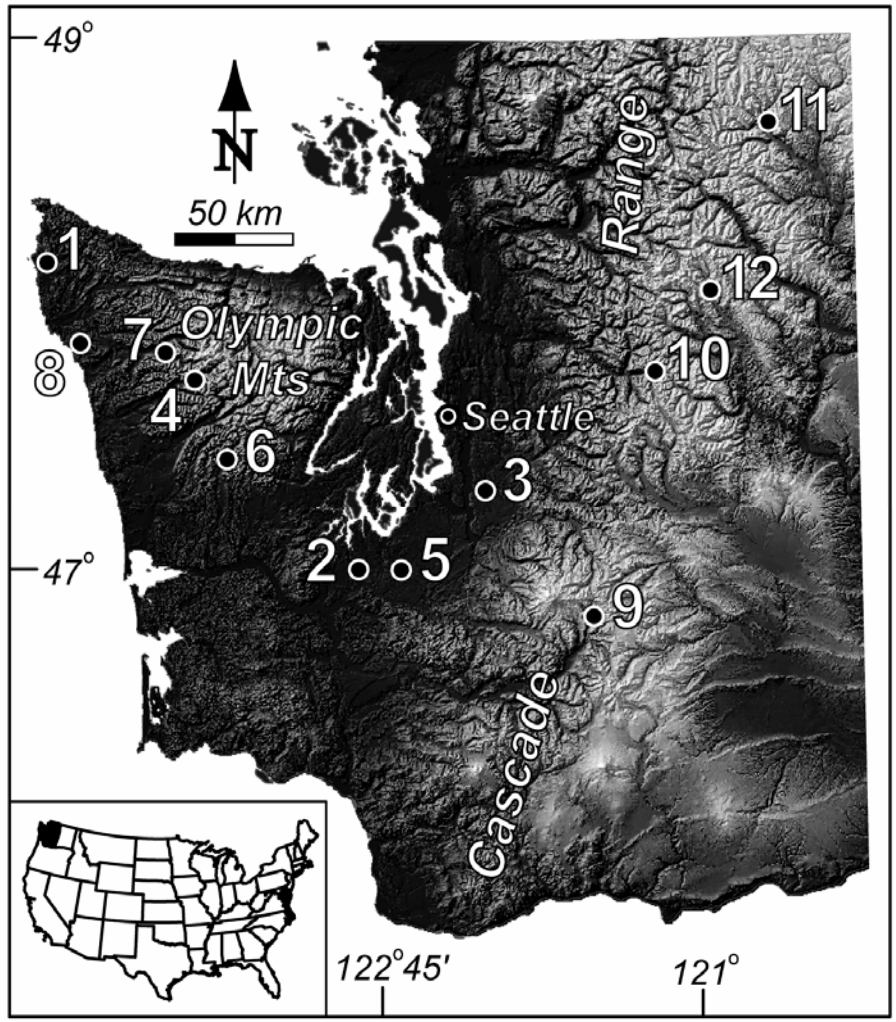
Nisqually River Floodplain



Stillaguamish River, Washington

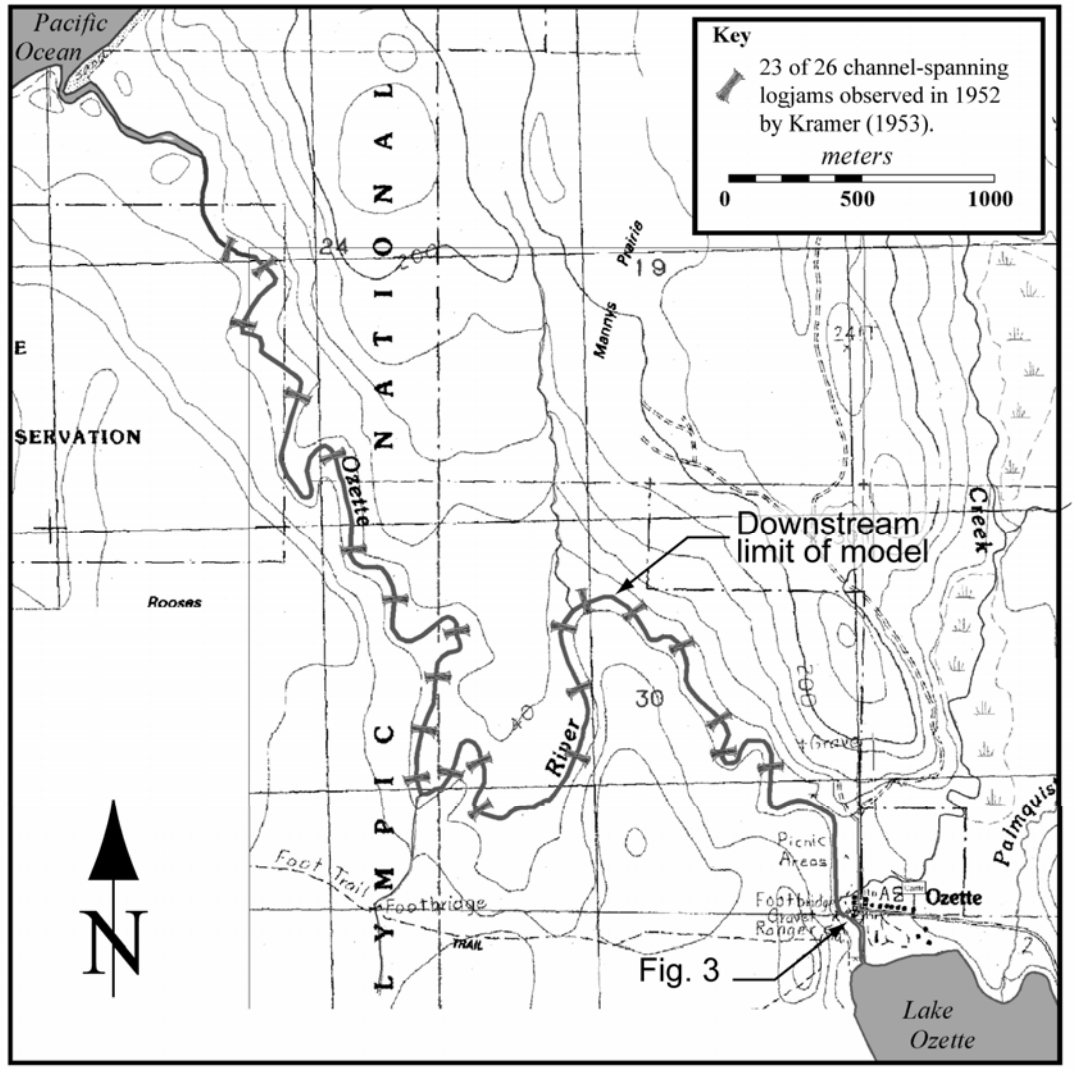


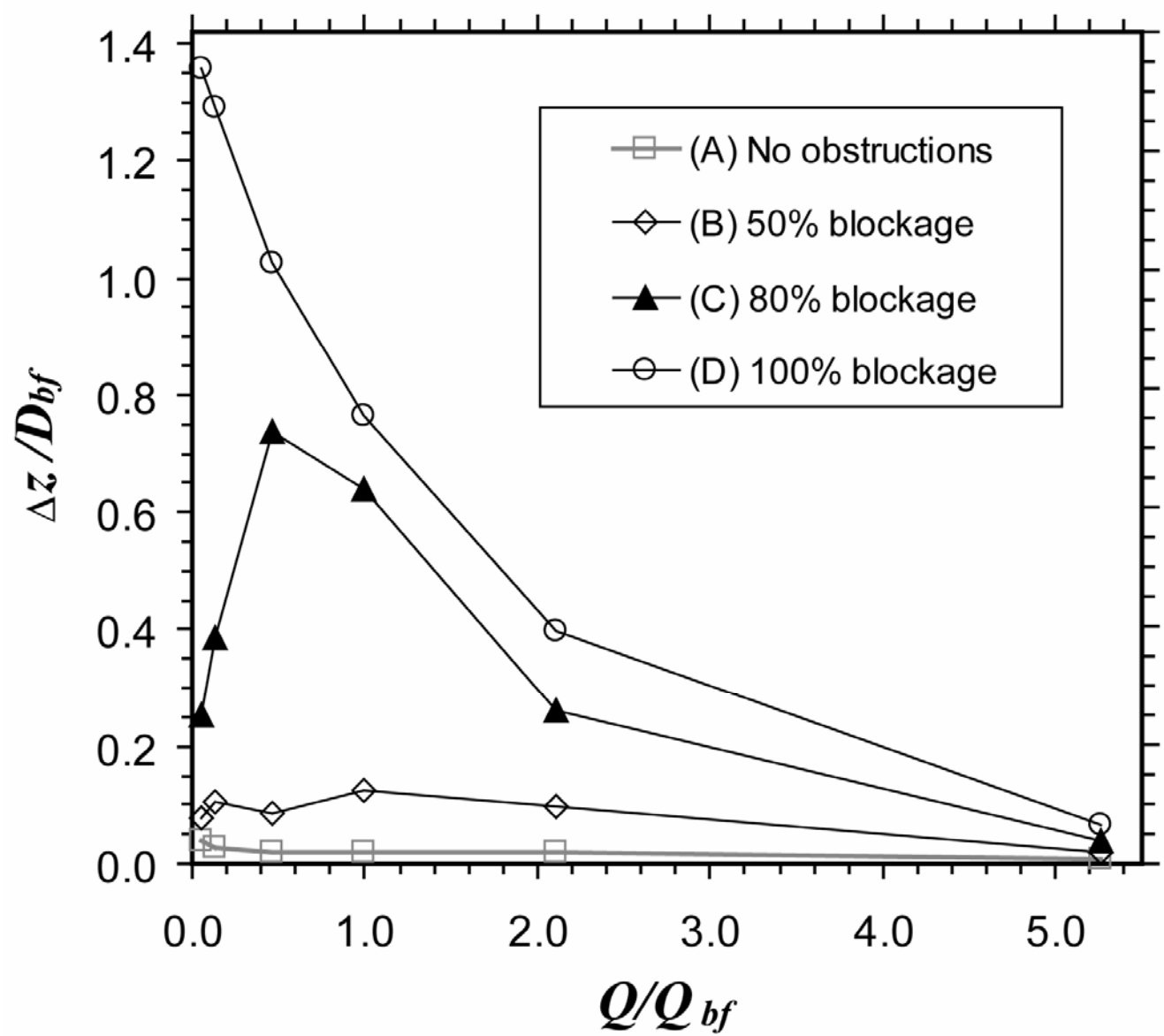
We studied channel reaches where logjam-induced backwater and aggradation could be quantified to evaluate the potential effect on avulsions, and therefore channel migration, once large trees are reintroduced to Western Washington rivers.



Modeled effect of removal of historic logjams from the Ozette River.

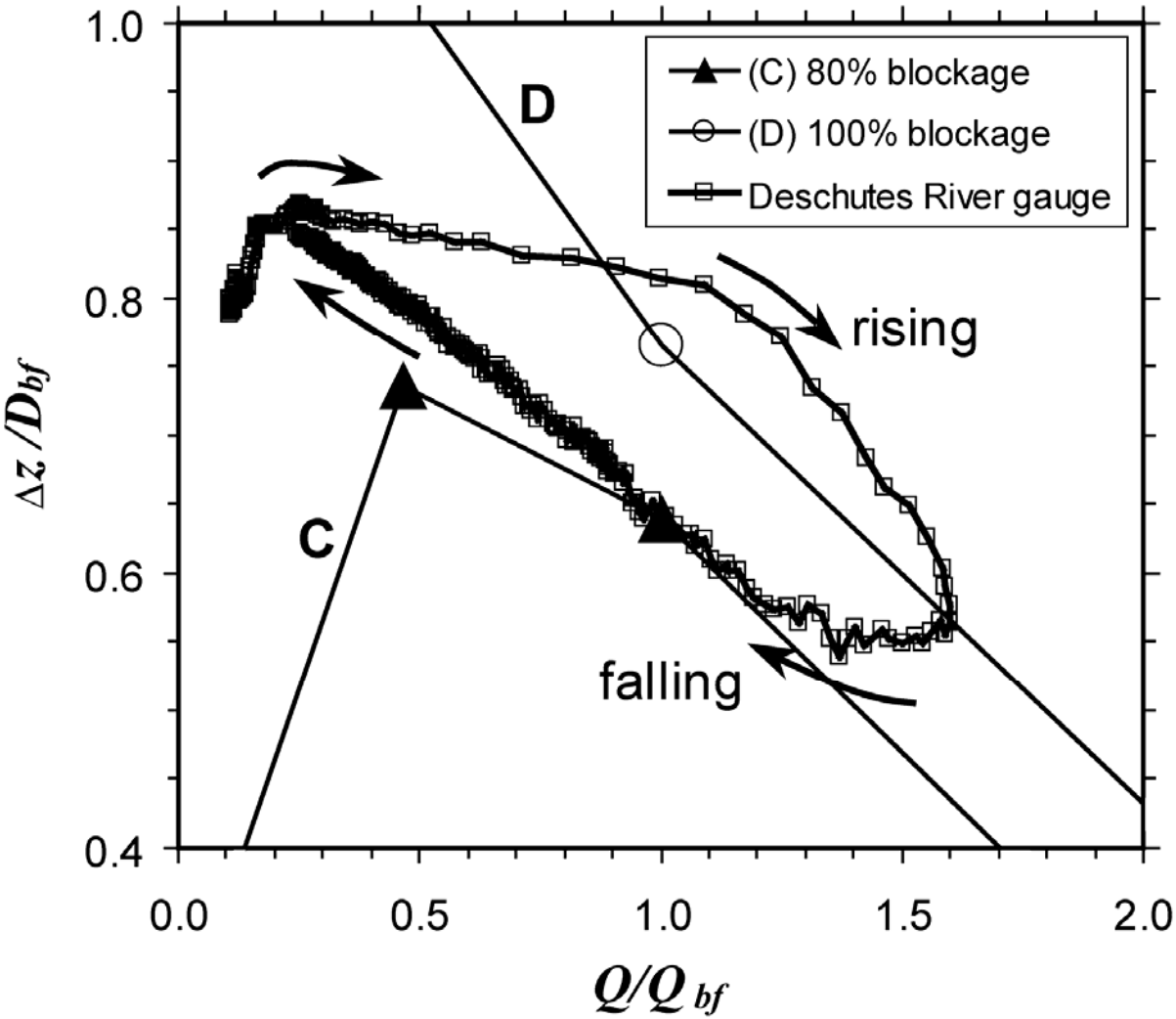
Found that logjam obstructions could locally elevate the water surface level well above bank full stage.



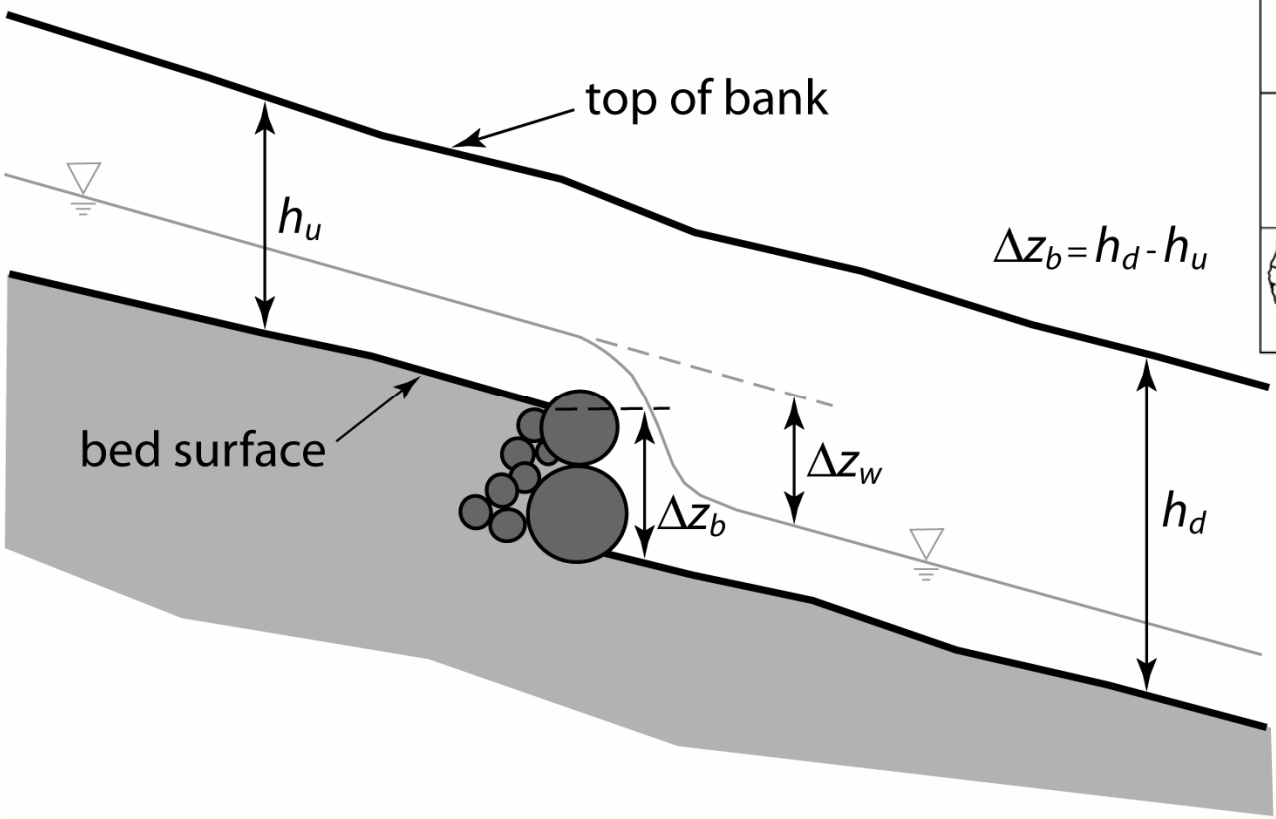

1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
1.0
2.0
3.0
4.0
5.0
Δz /D bf
Q/Q bf
(A) No obstructions
(B) 50% blockage
(C) 80% blockage
(D) 100% blockage

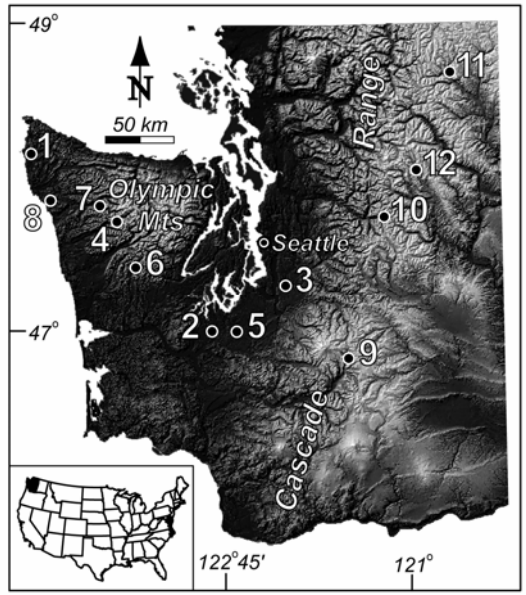

Deschutes River Logjam
A model for restored rivers?

Near complete blockage on rising limb,
80% blockage on falling limb of hydrograph.

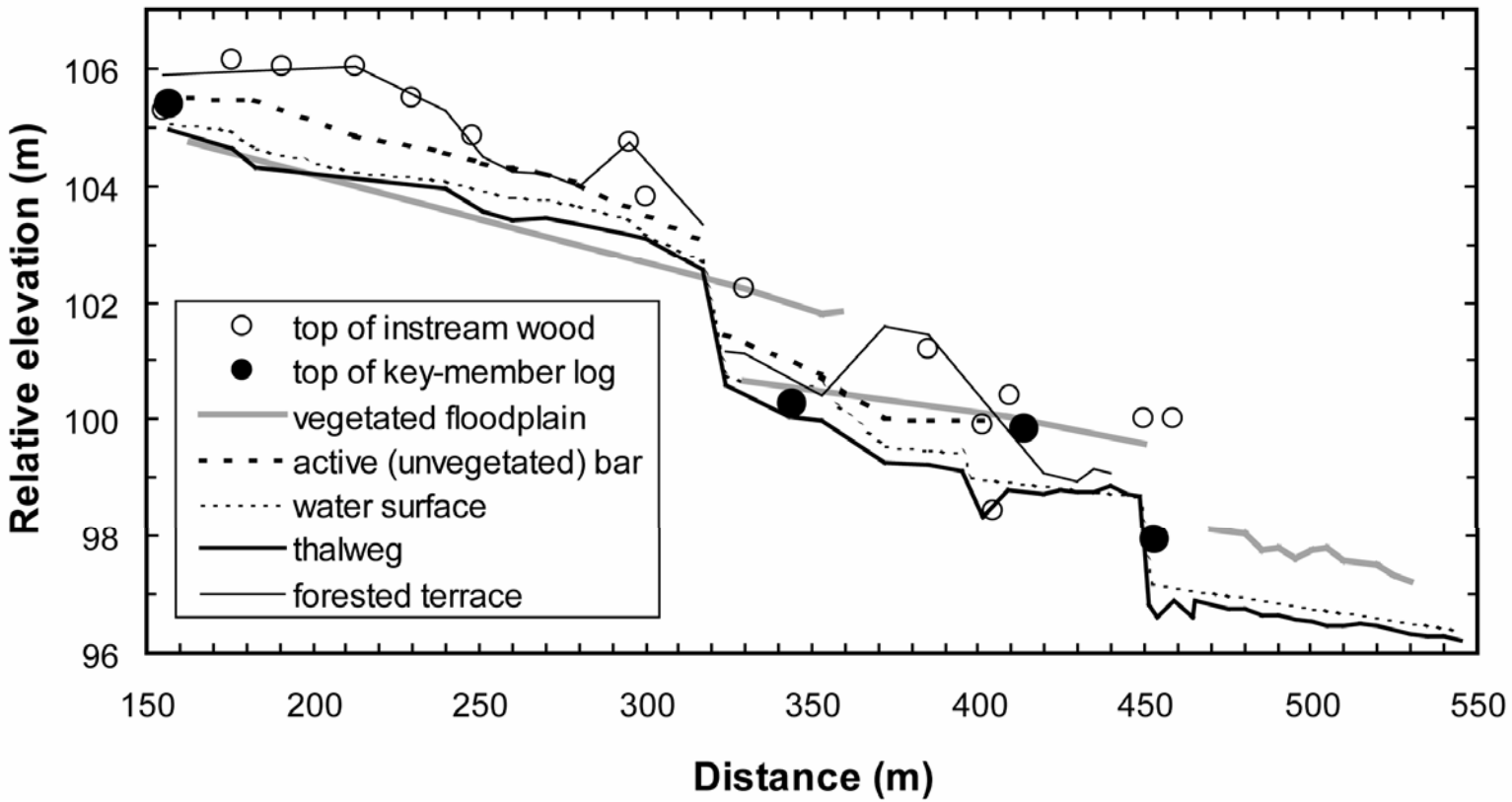


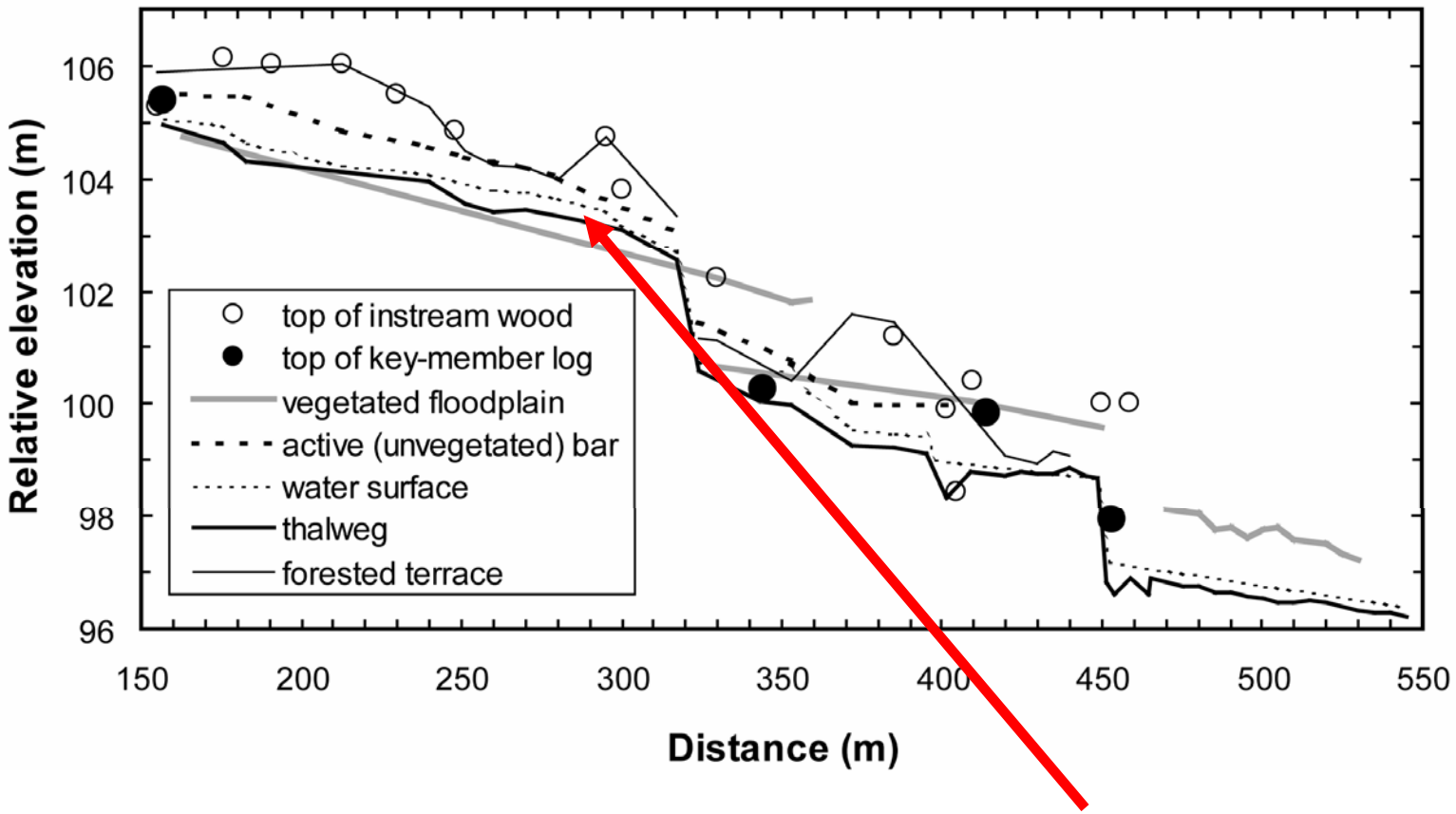
We measured the direct effect of logjam induced aggradation at eleven sites around Washington State.





Queets River

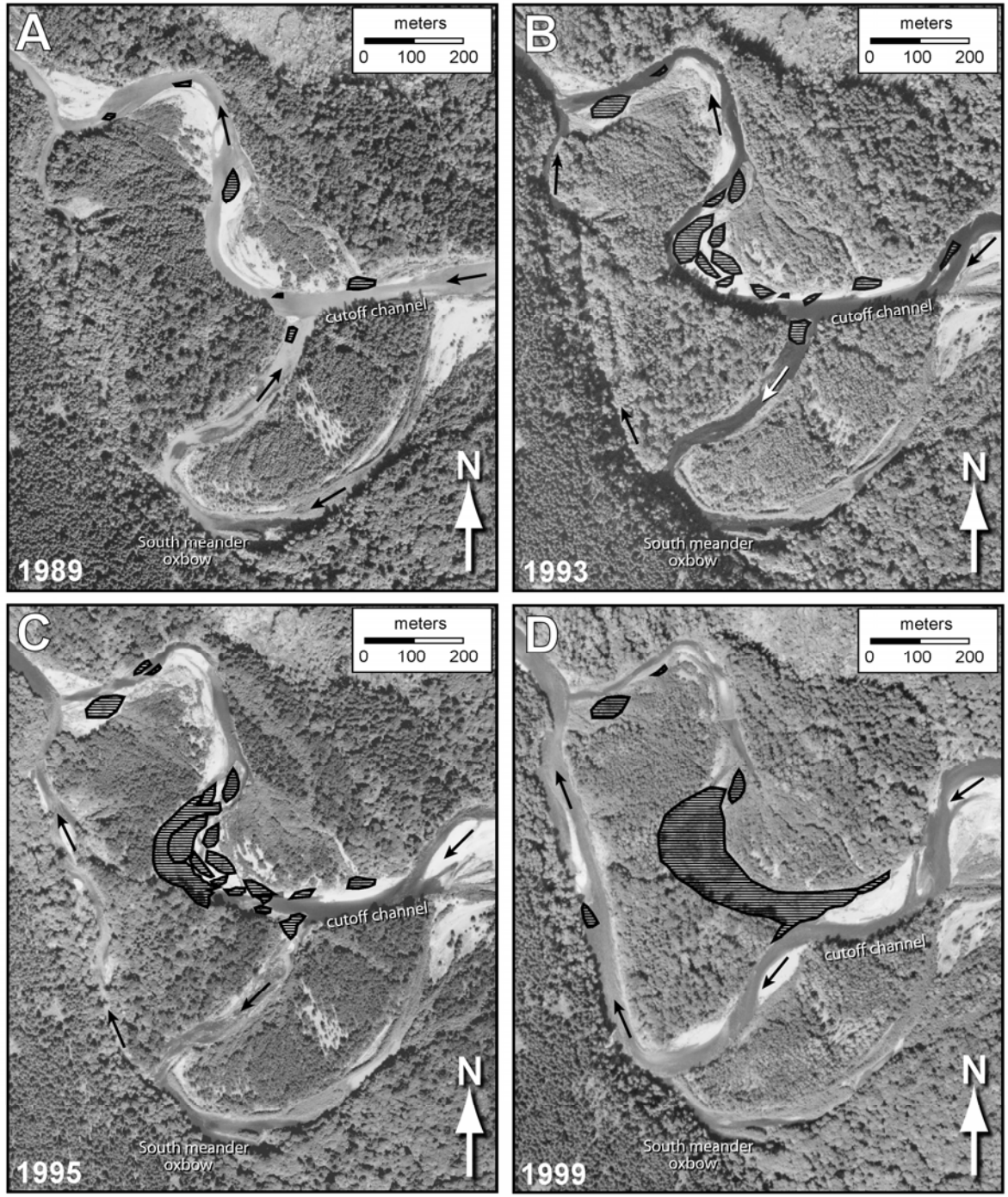




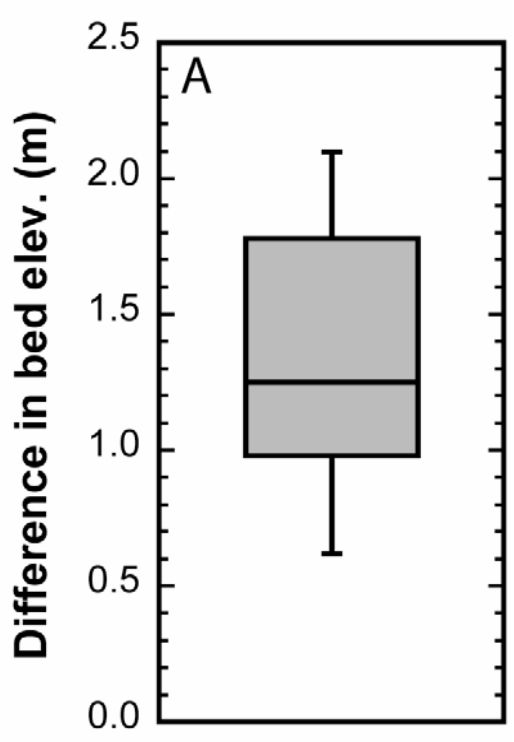
Notice the thalweg elevation locally above the floodplain surface.

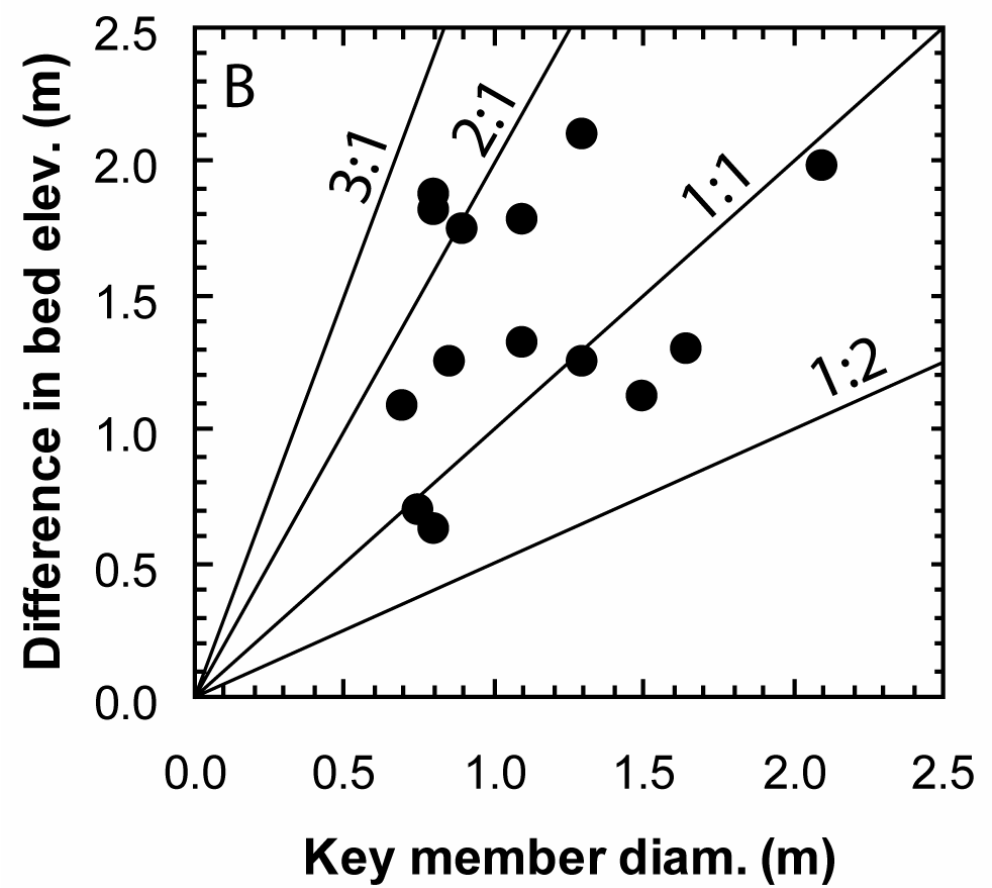
Nisqually River

Channel switched flow direction between 1989 and 1993 after initiation of large log jam.



West Fork Satsop River

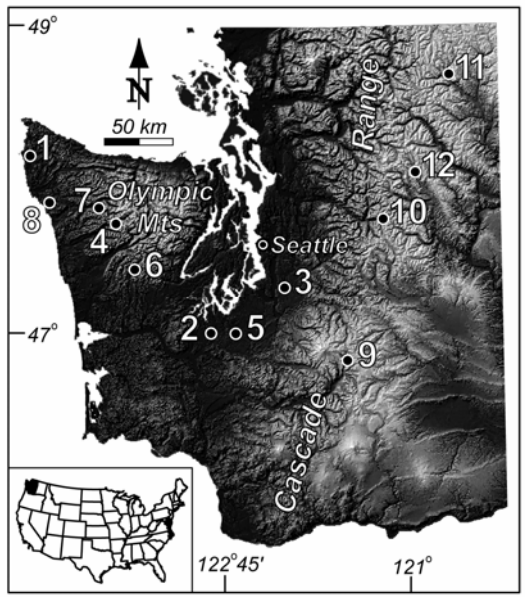




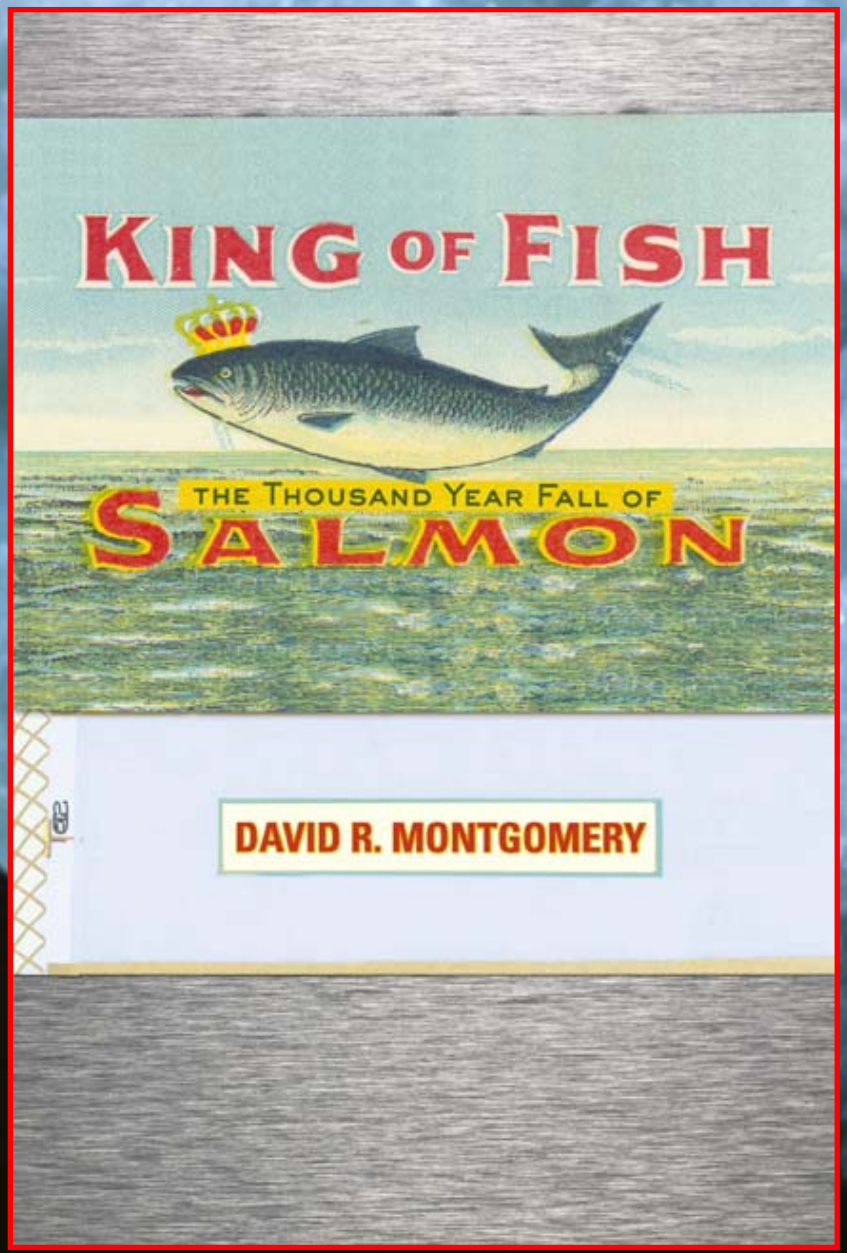
Direct aggradation of 0.5 to 2.0 m upstream of logjams; corresponds to about one to two times the key member log diameter.

Montgomery et al. (2003) argued that areas within one or two meters above the bank full elevation provided a reasonable estimate of the potential area of channel avulsion due to logjam driven aggradation.

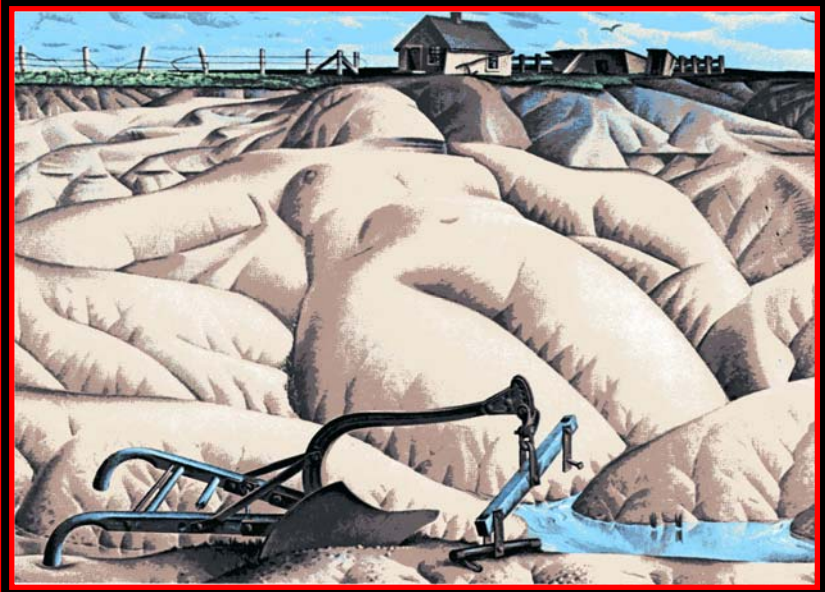
Our surveys of other sites around Washington State also revealed local elevation of channel bed from log-jam mediated aggradation of 0.5 to 2 m.



One of the few salmon conservation strategies that might work over the long run would be to restore a network of forested river corridors along river floodplains.



DIRT



The Erosion of Civilizations