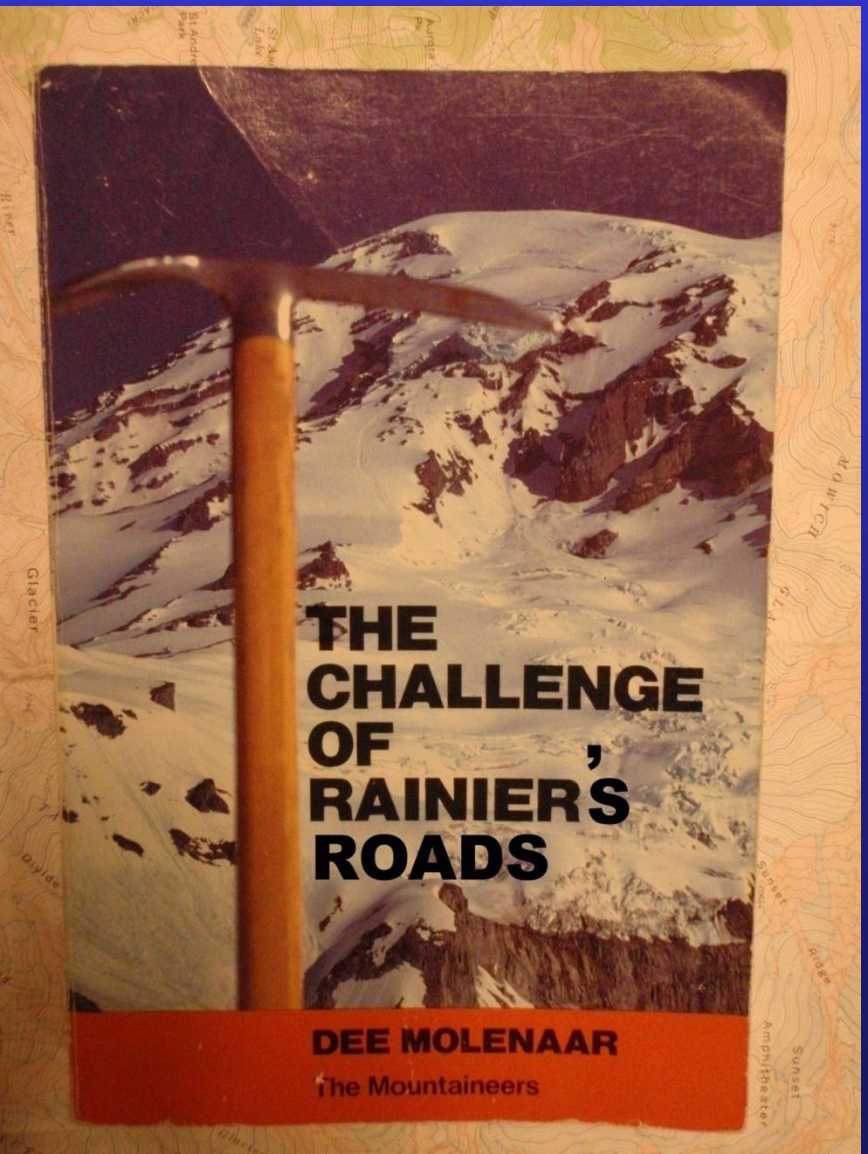
Next….Case studies



- The role of large trees in mediating stream channel movement.
- Current road challenges; and
- The importance of accounting for horizontal and vertical river changes.

First, some road considerations, or: why the park is not as dumb as it may seem….

- Park infrastructure is a cherished and protected cultural resource;

- 97% of park is in wilderness. Roads on a thin strip of non-wilderness.

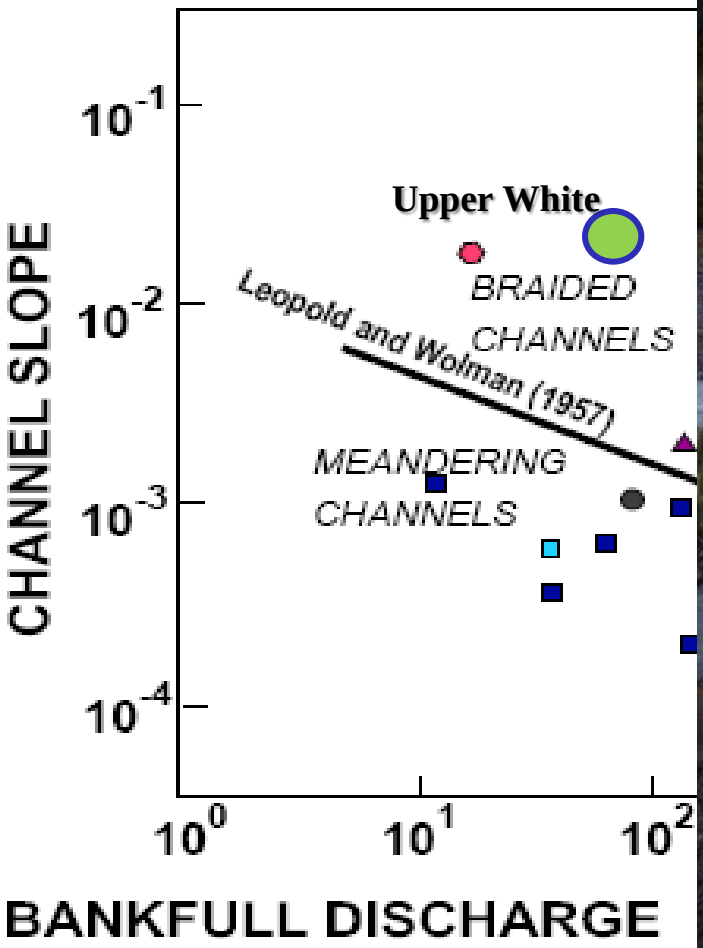
EXAMPLE 1: White River

The role of riparian forests in floodplain disequilibrium in an aggrading braided river:

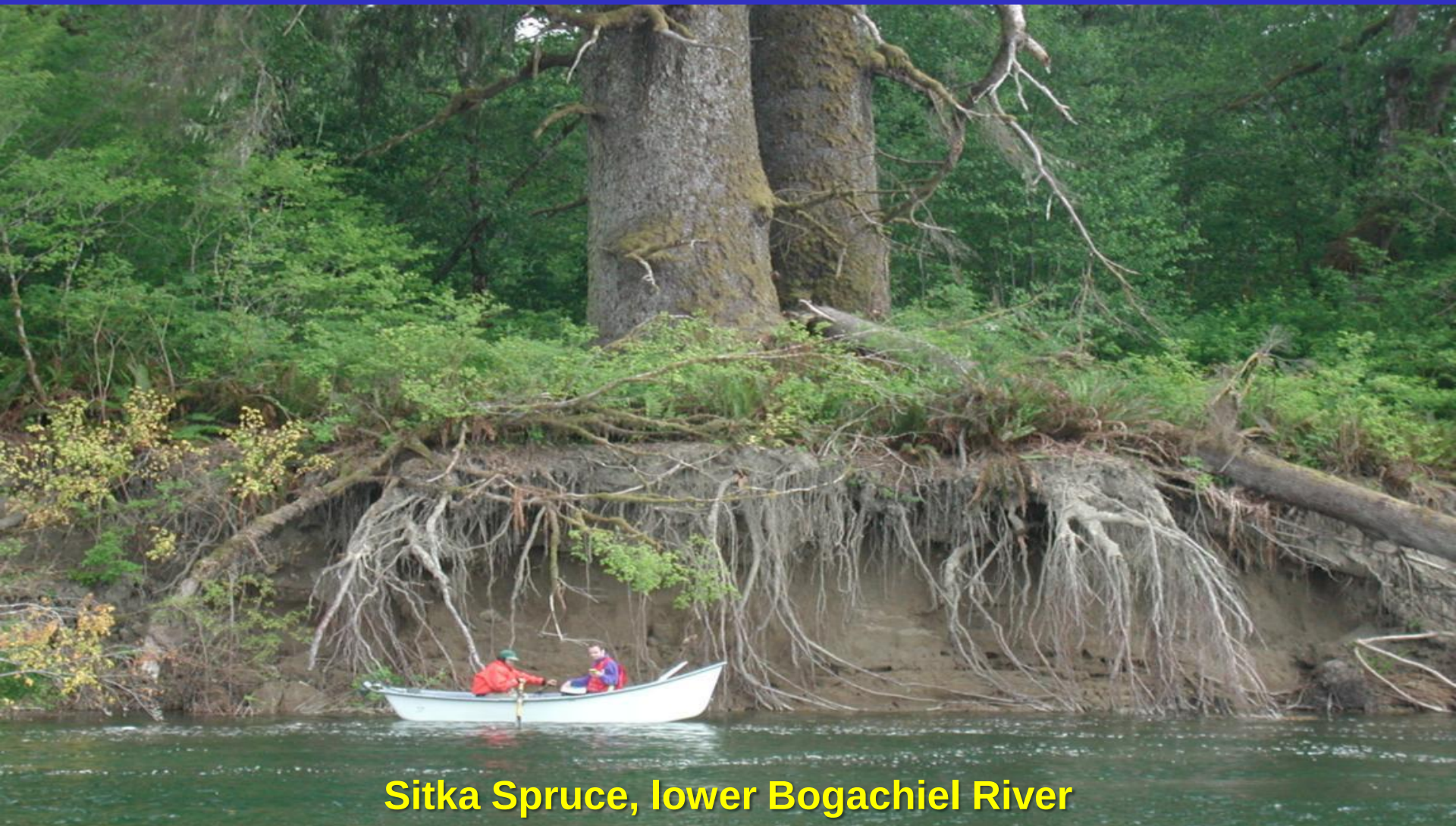
a newly recognized theory in geomorphology

On two recent occasions, 2003 and 2005, State Highway 410 near Crystal Mountain Boulevard was flooded and damaged.

Braided rivers at Mount Rainier



Bank erosion and root cohesion



Sitka Spruce, lower Bogachiel River

As the probability a fallen tree will be stable in the channel increases, so does the probability that erosive flows will be deflected away from the bank and slow the rate of erosion.

Recruitment of small trees has little influence on bank roughness and hydraulic conditions.

Industrial plantation, Hoh River

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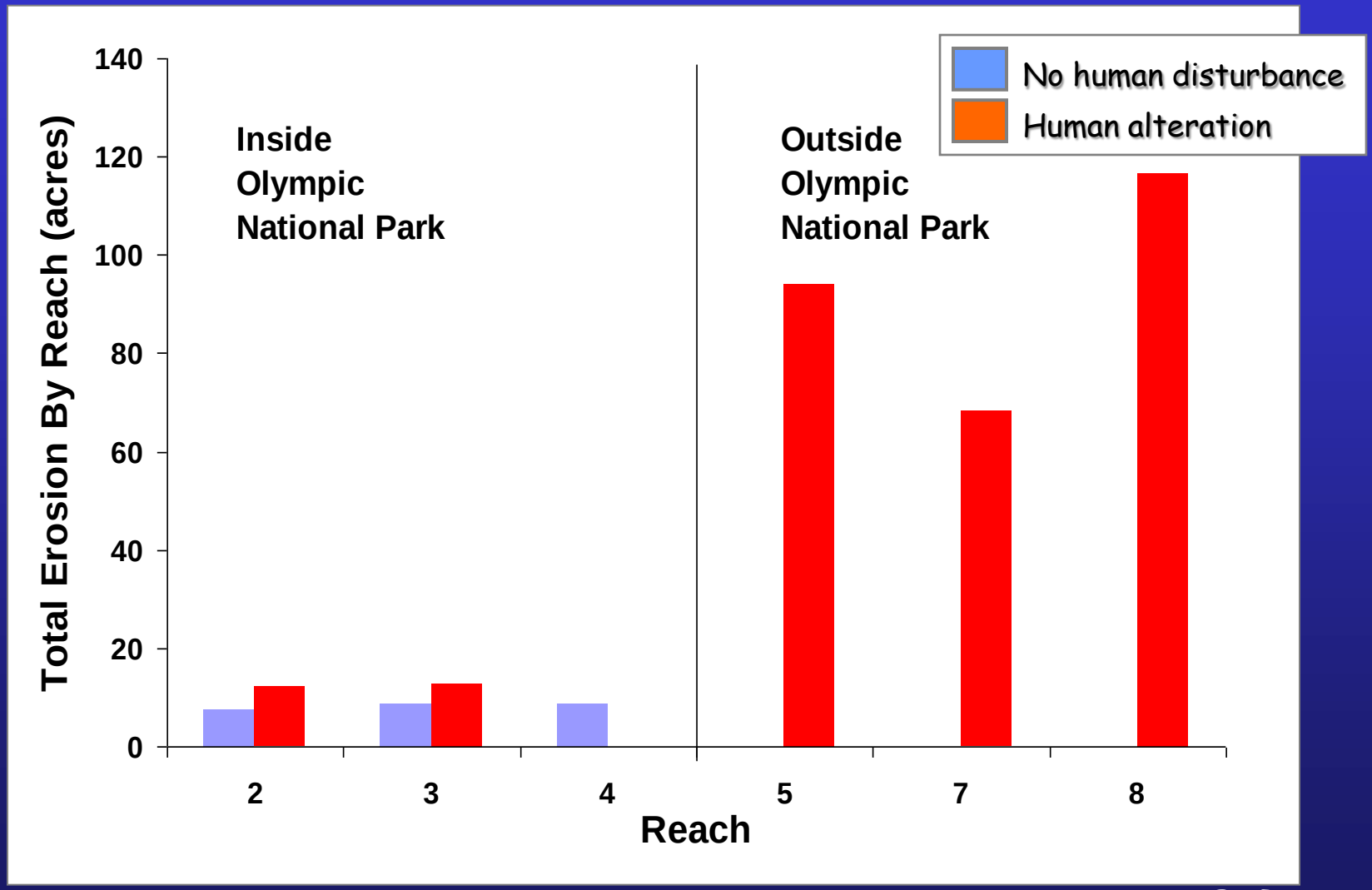
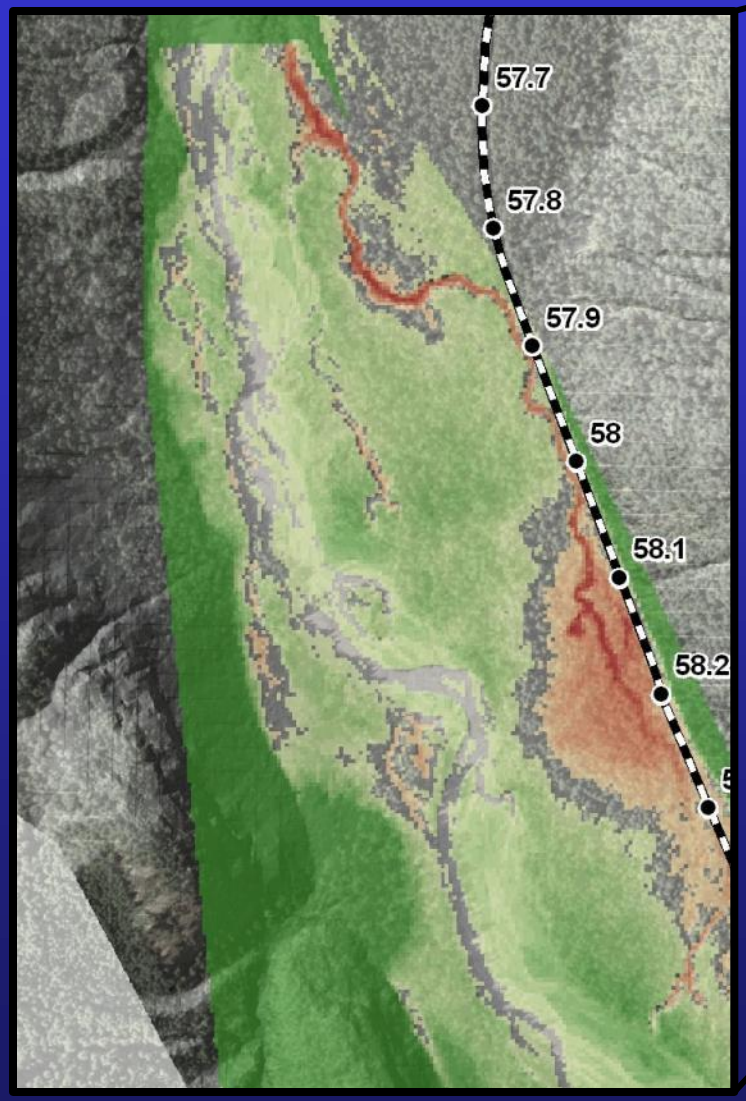
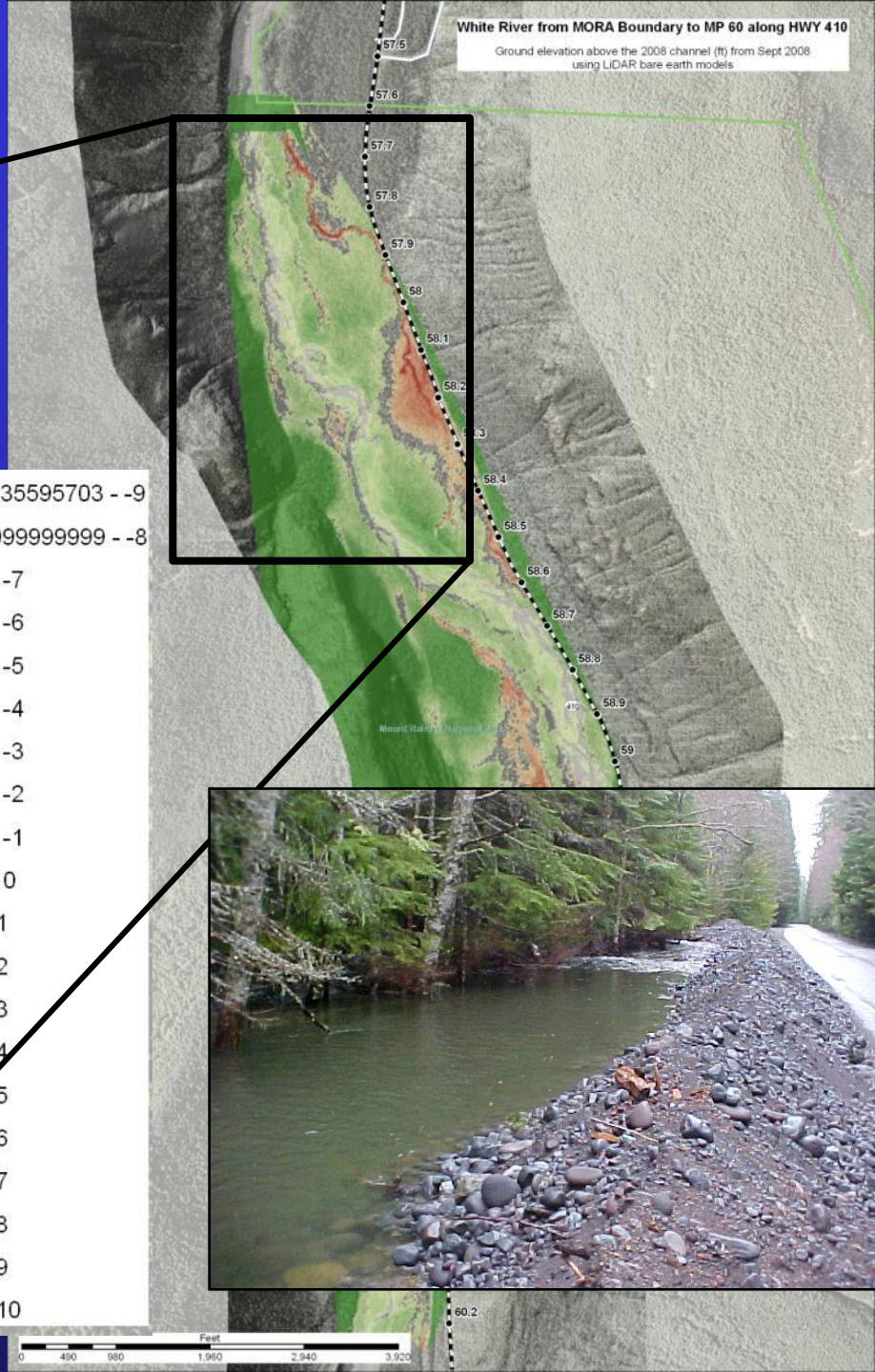


Classic braided river with young vegetation
(Sunwapta River, Alberta)

Forest encroachment into valley bottom & channel confinement

Height above water map





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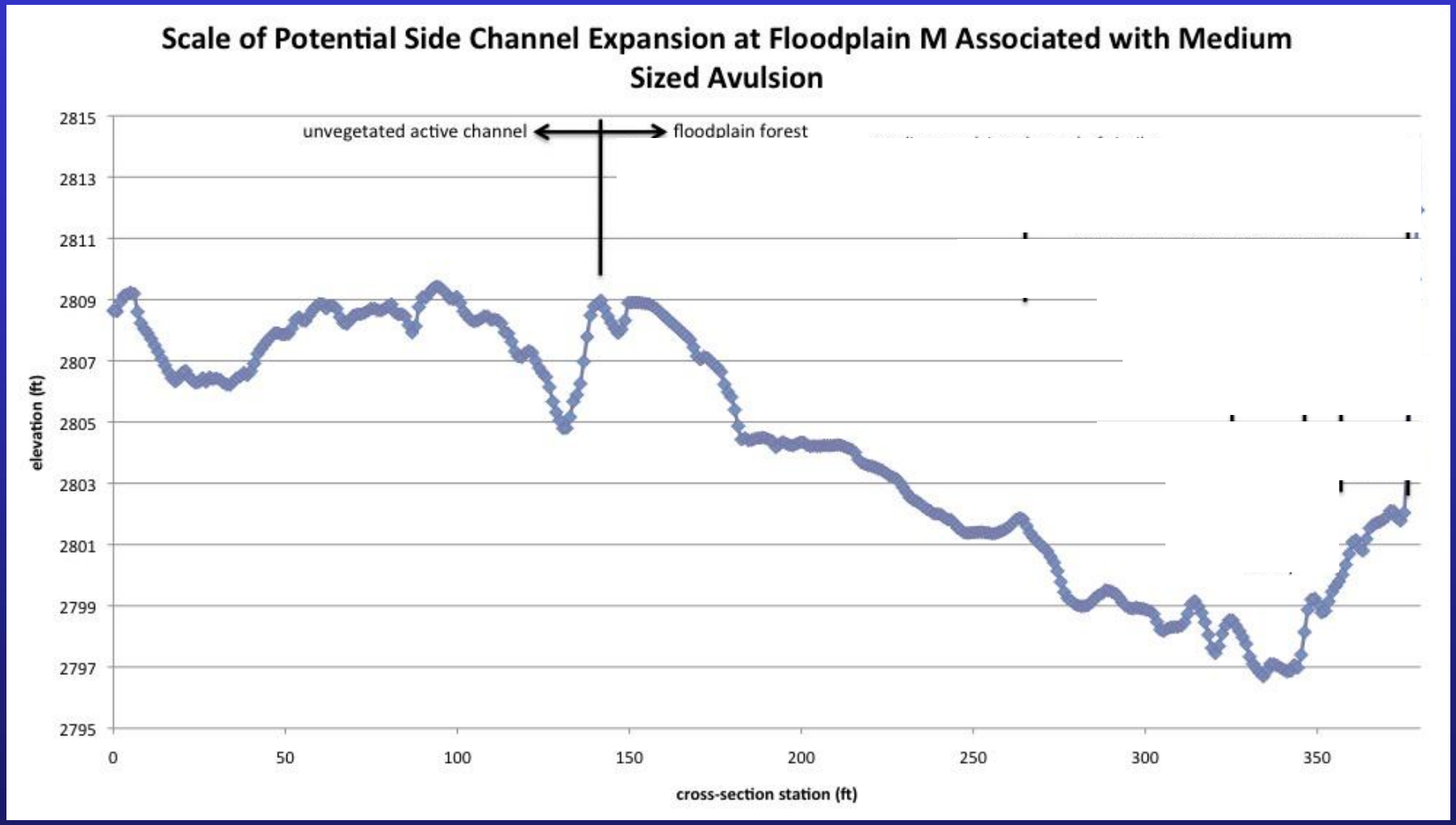
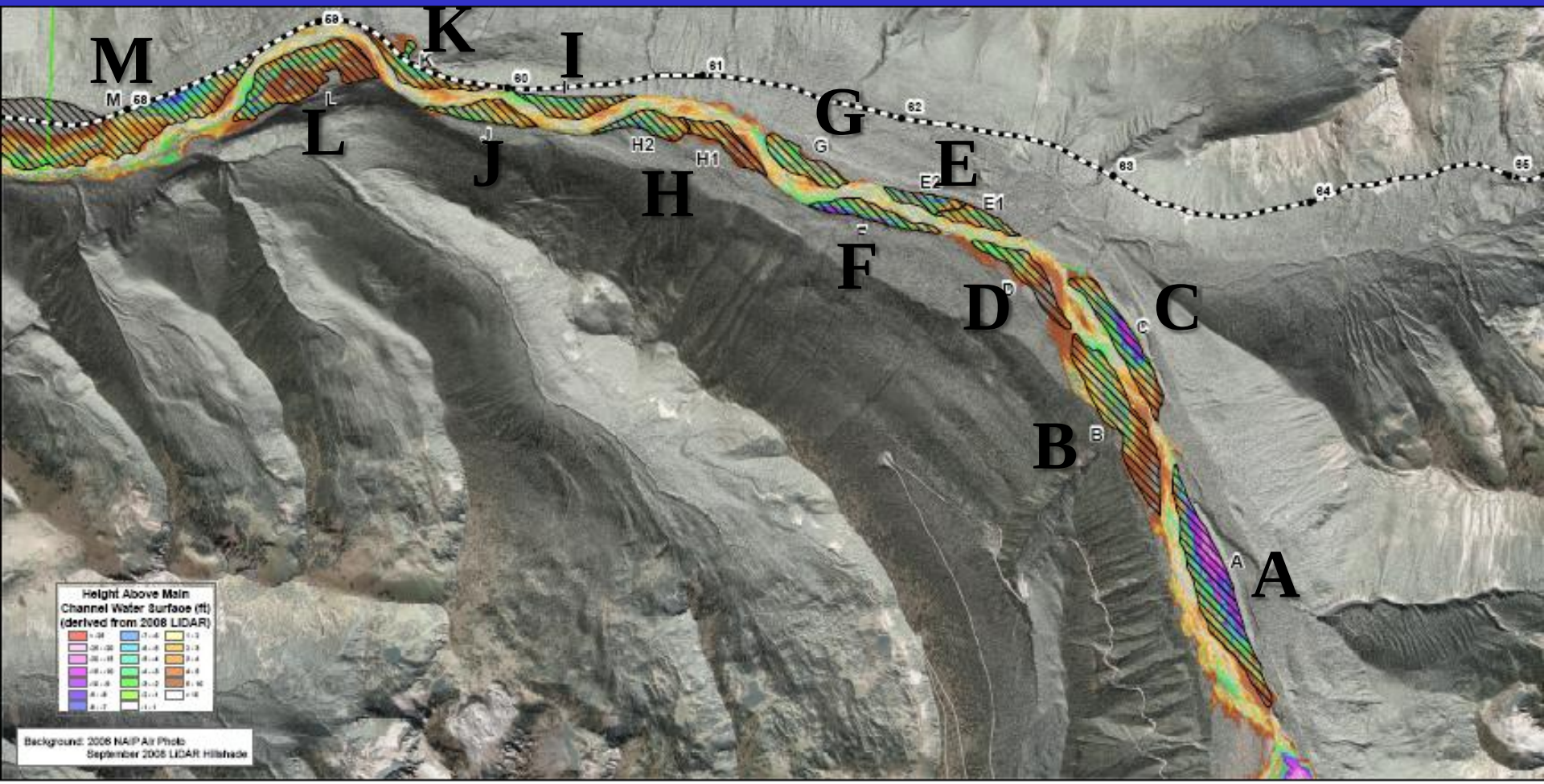


Upper White River floodplain delineation



White River Geomorphic Reach Analysis - HAWS with Floodplain Unique Identification

Washington State Route 410
Mt Rainier National Park

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Seattle, WA 98119

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Miles

Feet

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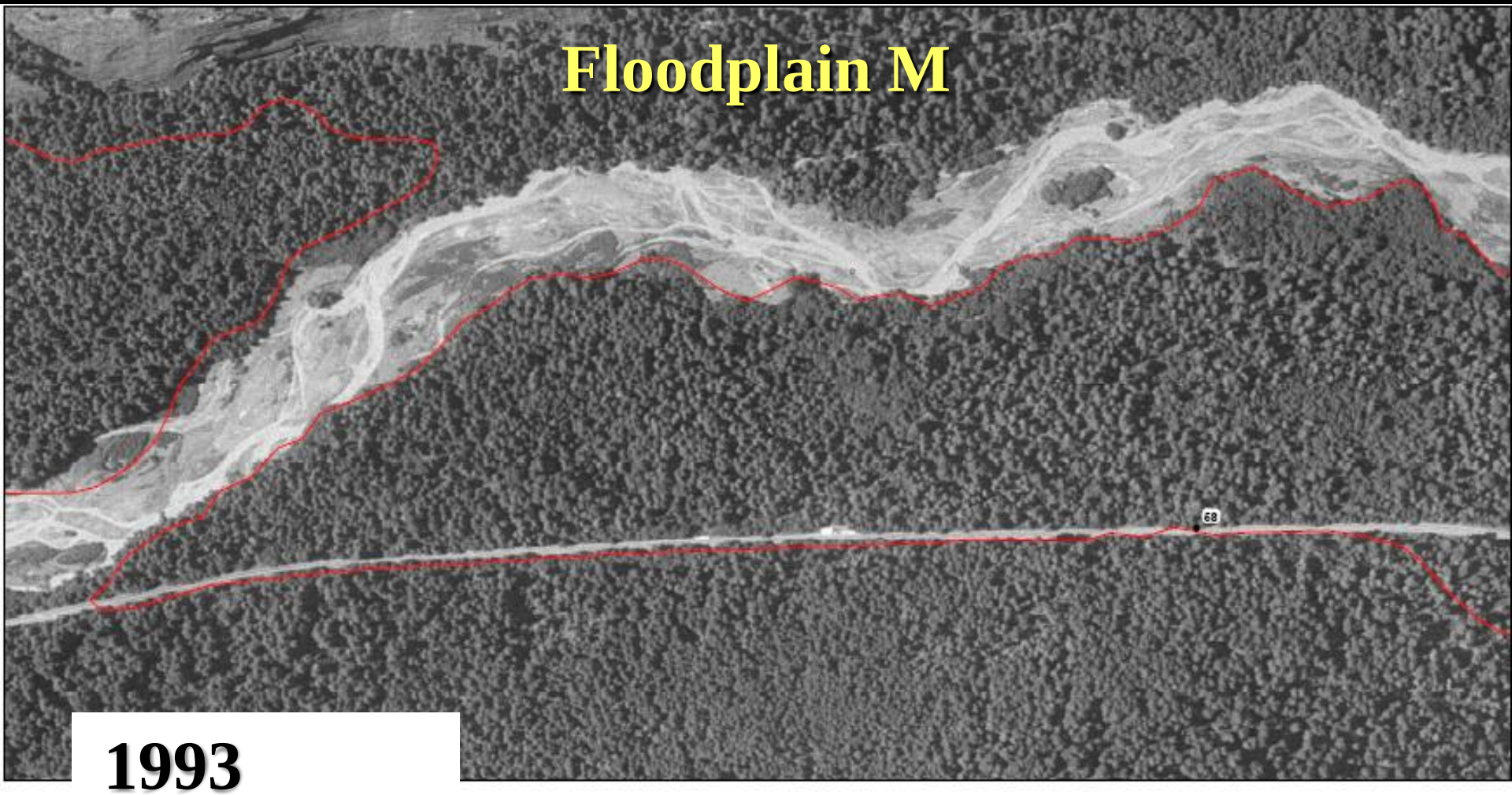
Floodplain M



1993

Height Above Channel Water Surface (ft) (derived from 2008 LIDAR)

September 2008 LIDAR Hillshade

White River Geomorphic Reach Analysis
Floodplain M

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0 162.5 325 650
Feet

Images of floodplains in disequilibrium

Avulsion pathways

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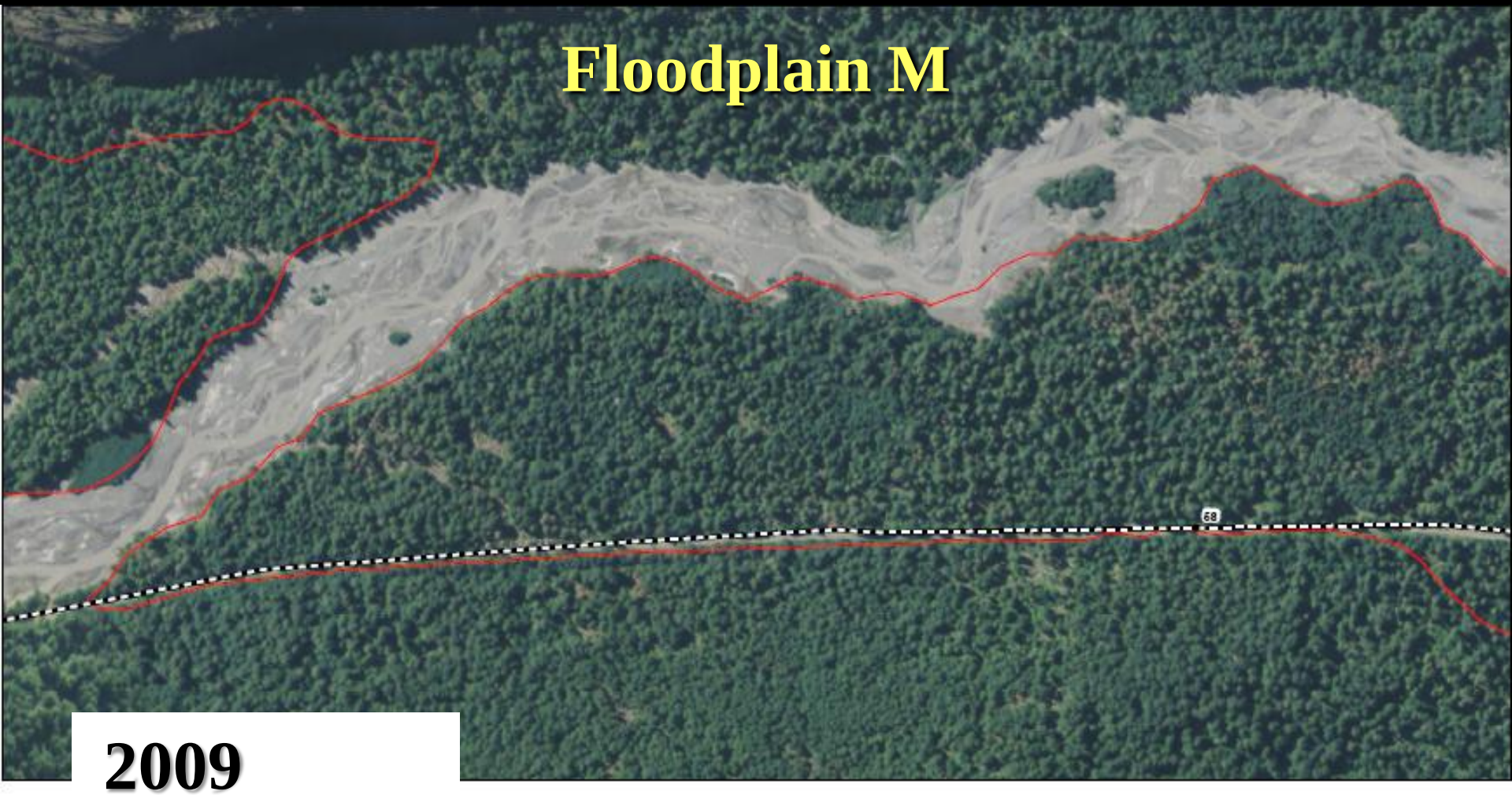
Floodplain M



2009

Height A
Channel Water Surface (ft)
(derived from 2008 LIDAR)

September 2008 LiDAR Hillshade

White River Geomorphic
Reach Analysis
Floodplain M

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Feet

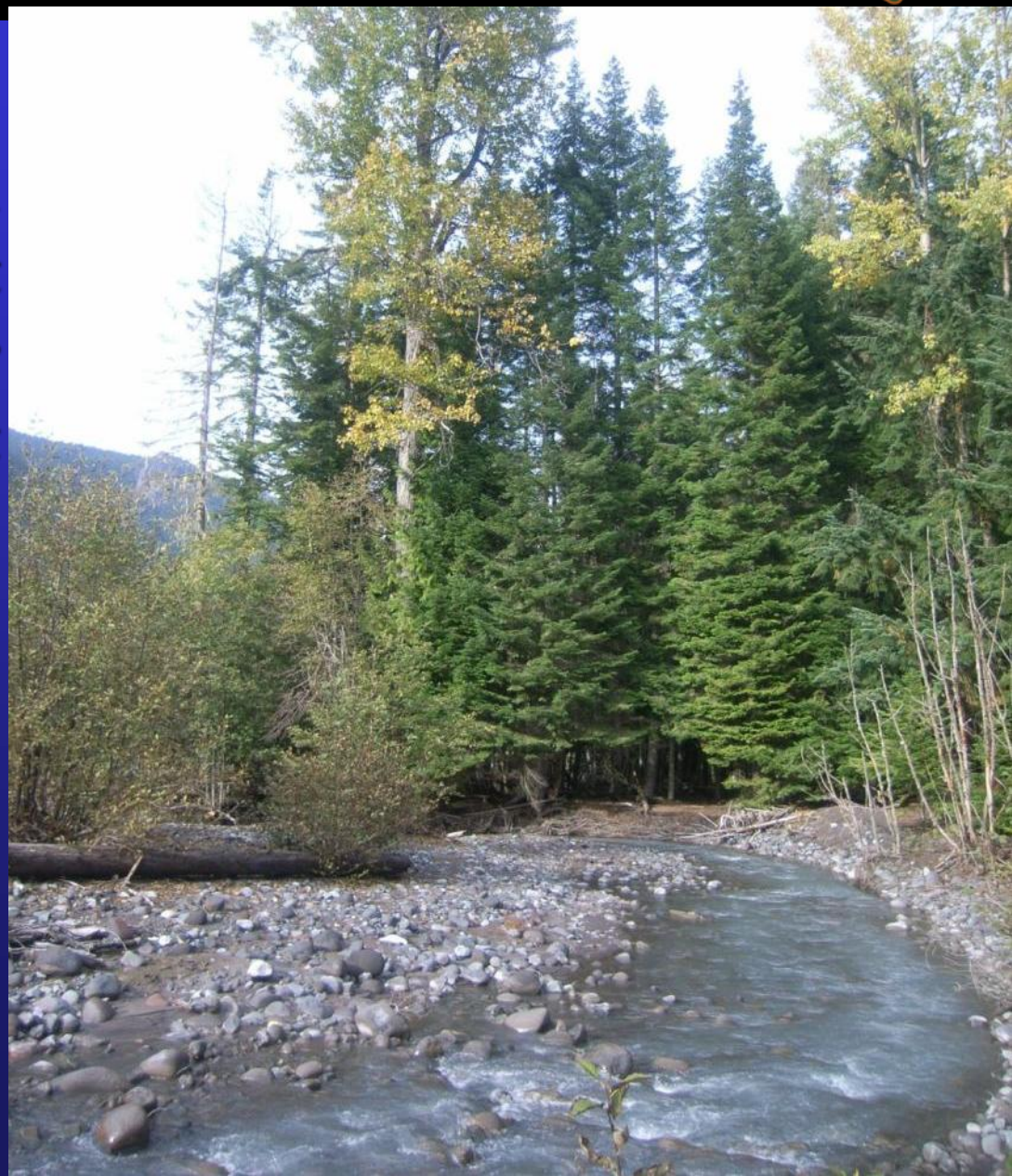
10/22/09

Images of a floodplain in disequilibrium

Channel headcut

Burial of Doug Fir old growth at least 500 years old.

Example of braided channel up against forested floodplain near side channel headcut



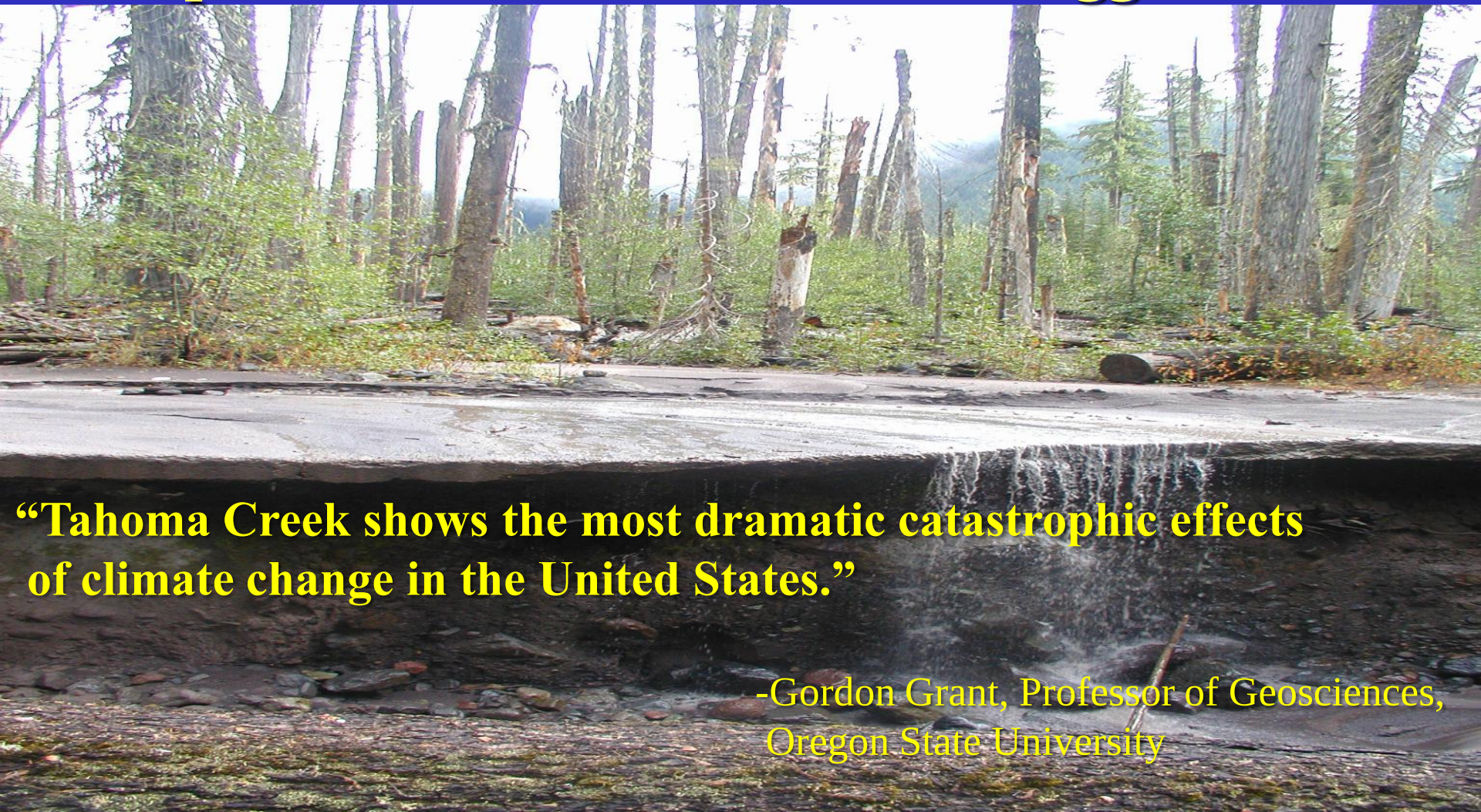
Standing forest “sieves” downed wood — plugging hole.

This mechanism helps prevent total main stem avulsions.

Several multi-acre areas of valley-bottom old growth are being smothered by recent aggradation in the park.

But sometimes it goes too far….

EXAMPLE 2: Tahoma Creek – Morphologic response associated with channel aggradation



"Tahoma Creek shows the most dramatic catastrophic effects of climate change in the United States."

-Gordon Grant, Professor of Geosciences, Oregon State University

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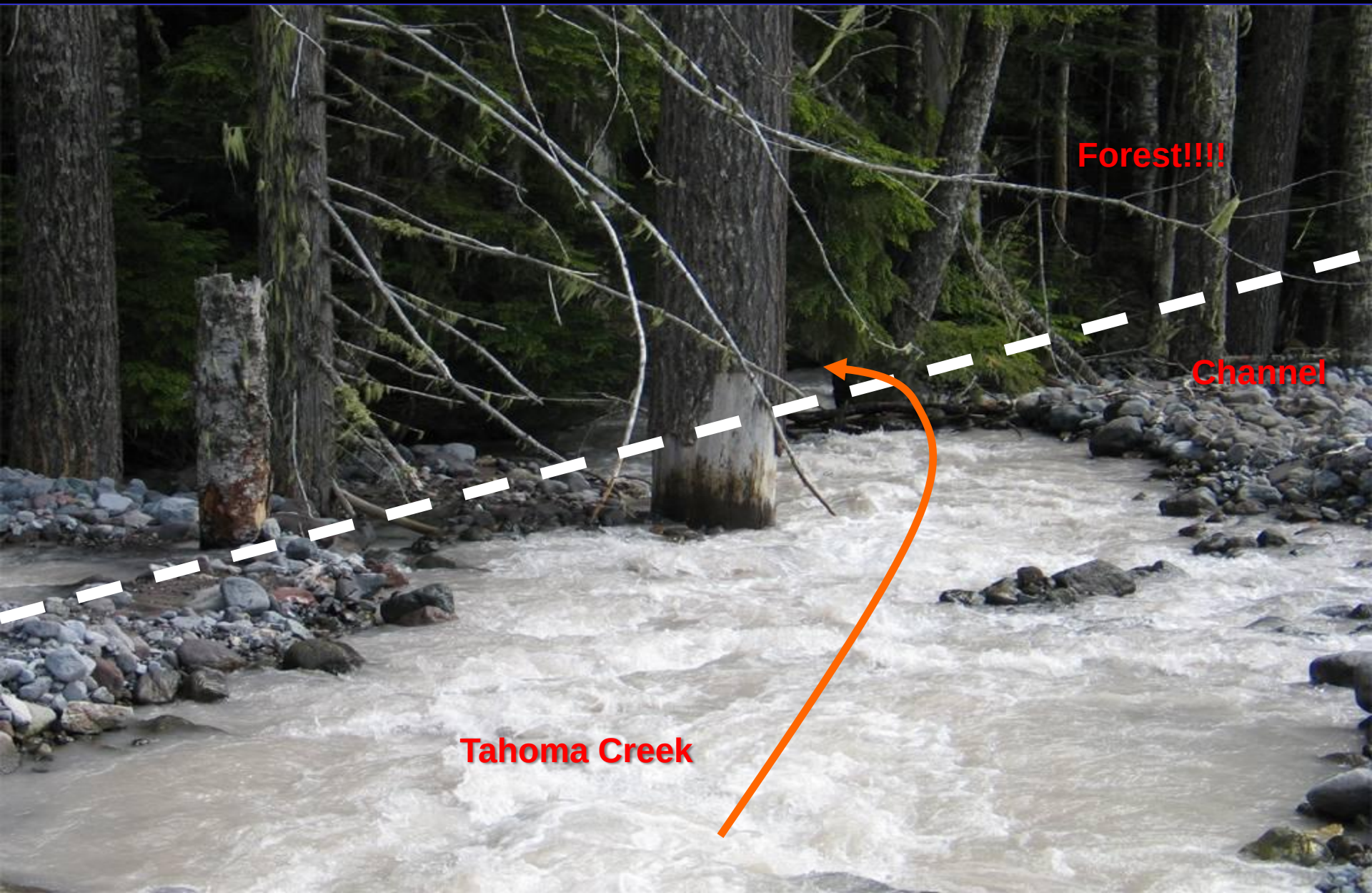

Our old friend, Aggradation….

Tahoma Creek "falling" off of main channel.

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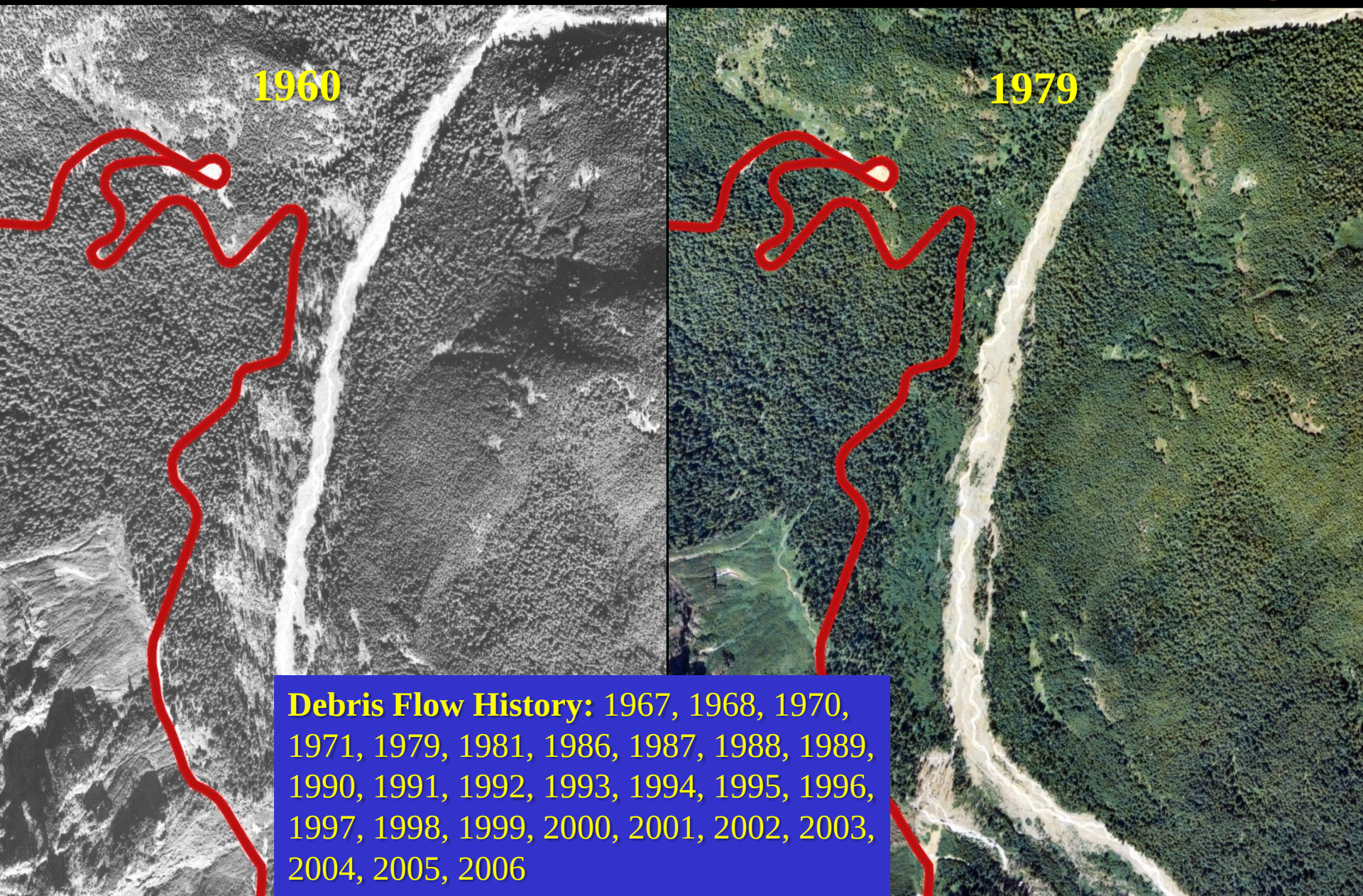

Debris Flow History: 1967, 1968, 1970, 1971, 1979, 1981, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006

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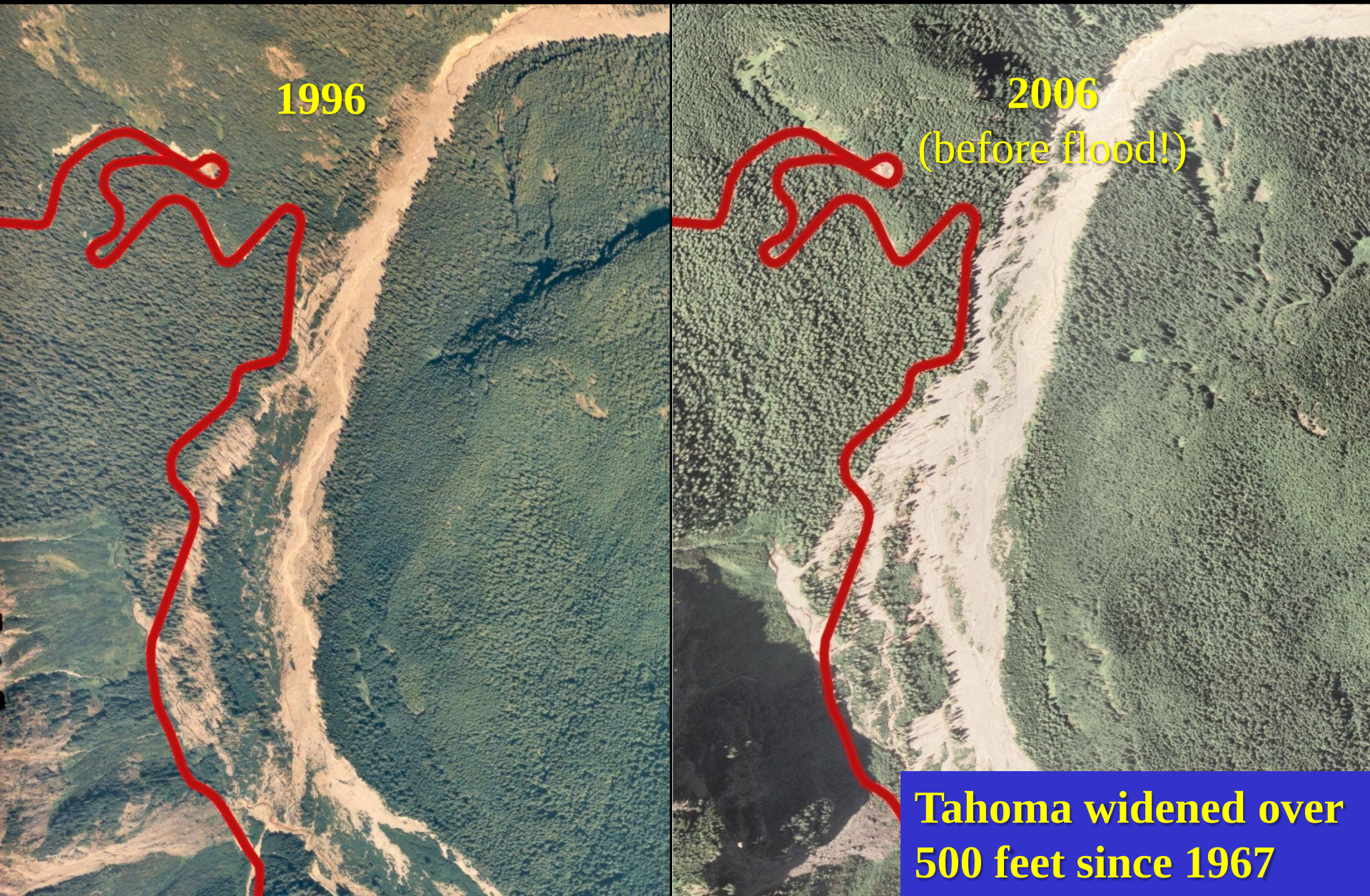

After thousands of years of encroaching trees, debris flow aggradation is now winning in Tahoma Creek, and there are major avulsions.