Role of storms and forestry practices in sedimentation in an Oregon Coast Range Lake

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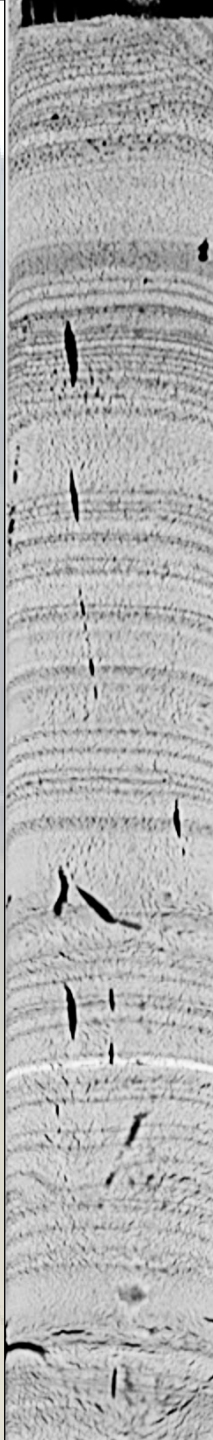
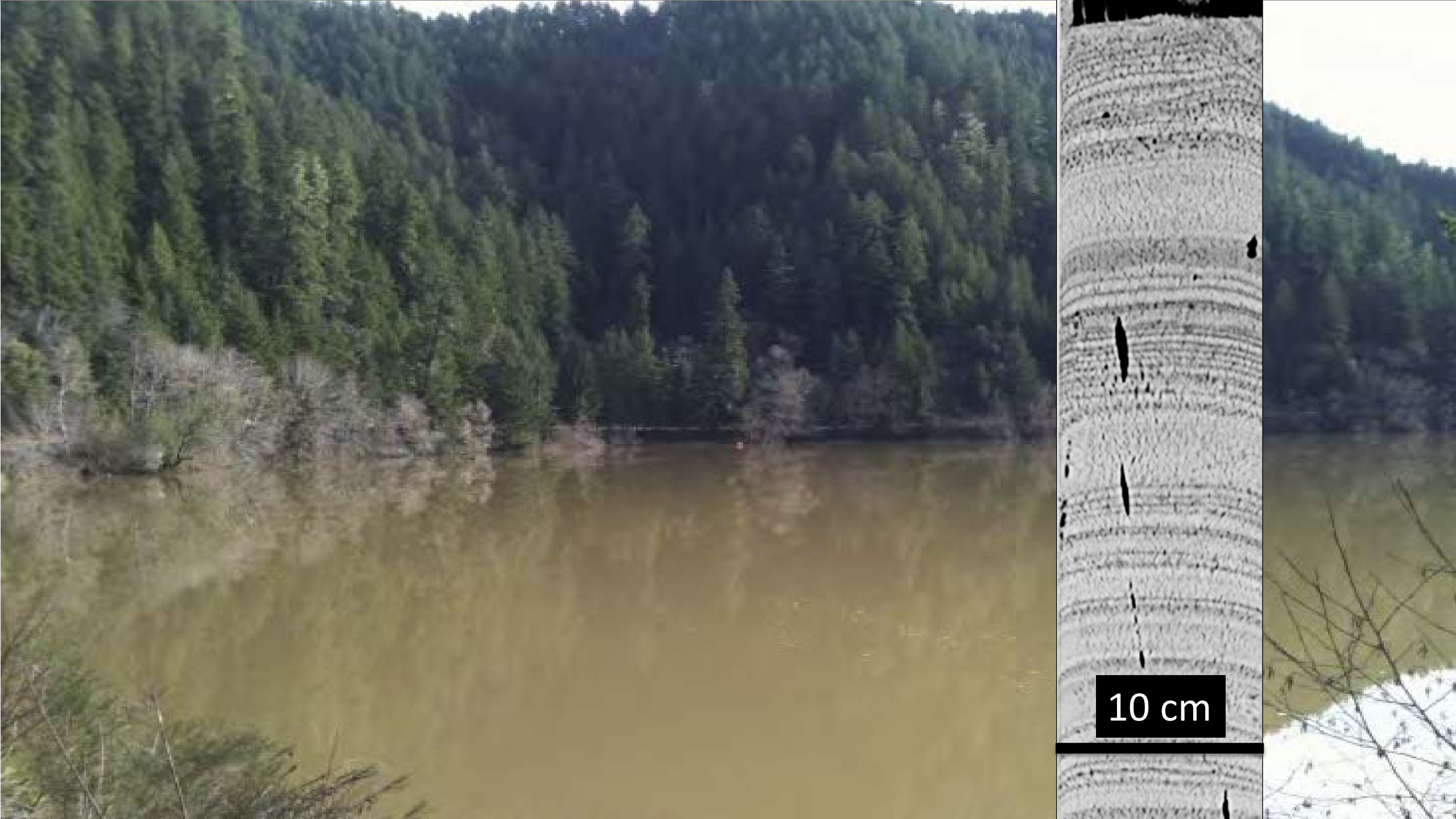
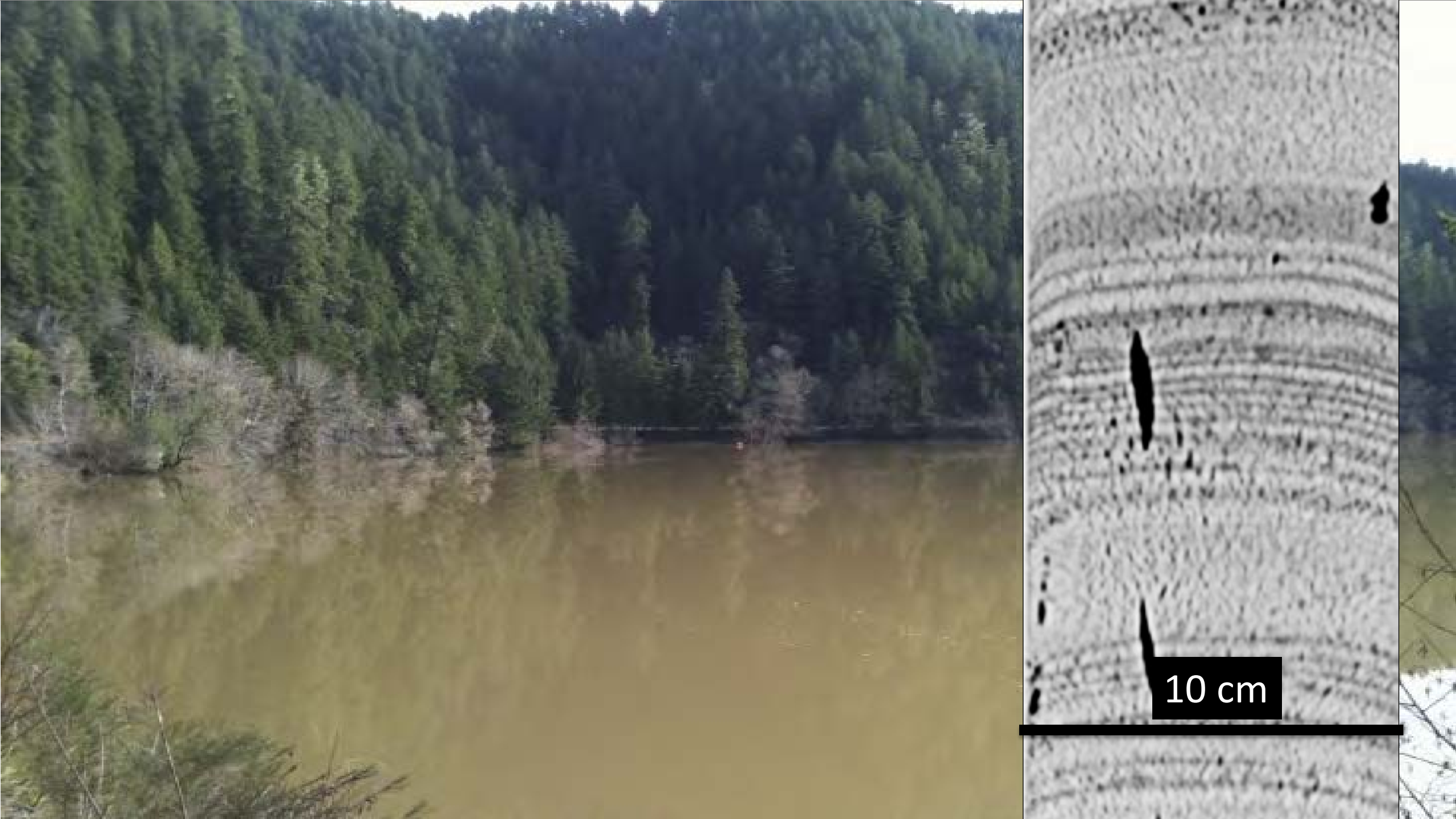
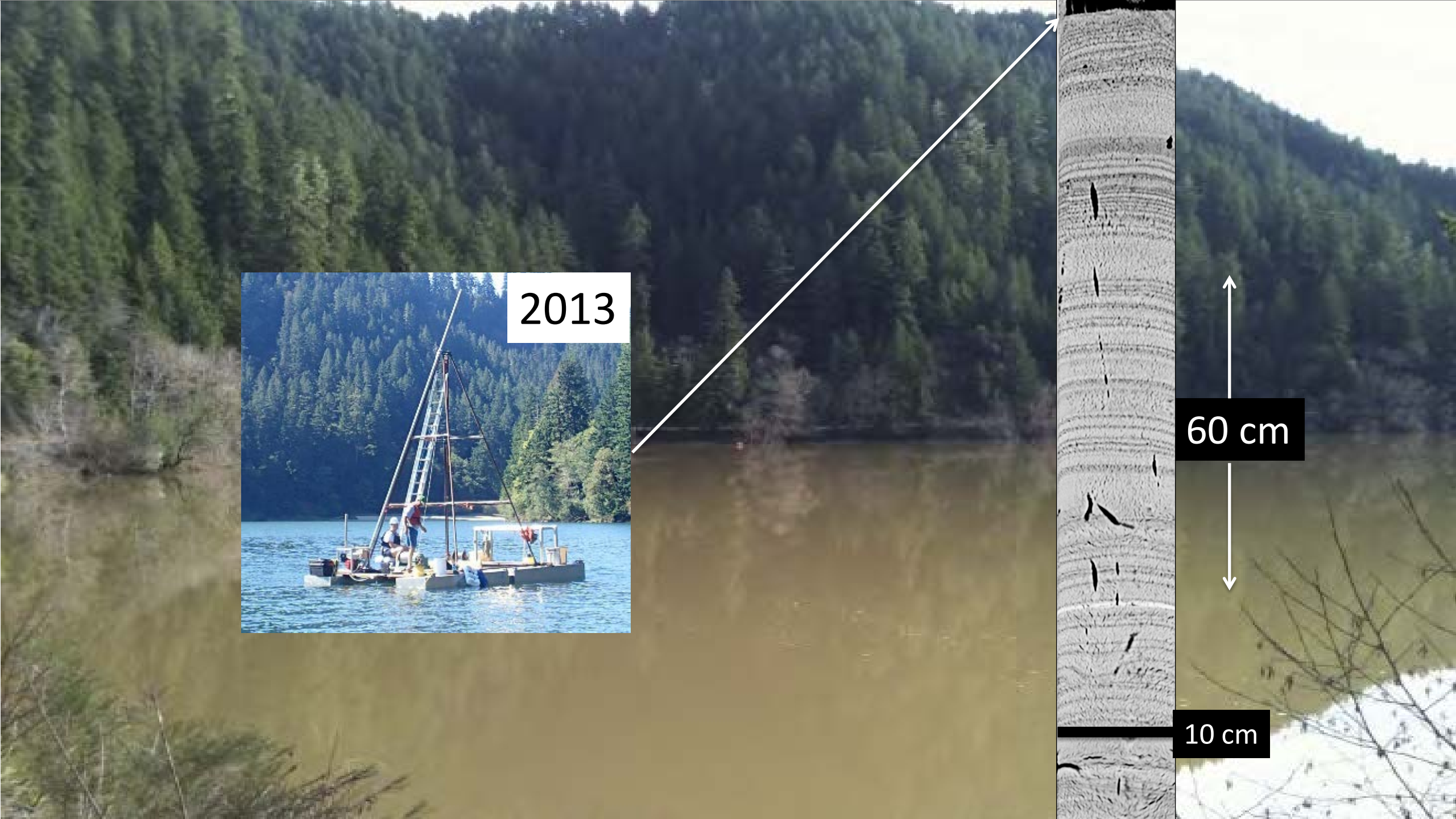
Outline

- Background – lakes, climate, harvest
- Research questions
- Hypotheses
- Study site characteristics
- Approach
- Preliminary results
- Conclusions and future work




10 cm


10 cm


2013
60 cm
10 cm

2013

Start of WWII - 1939

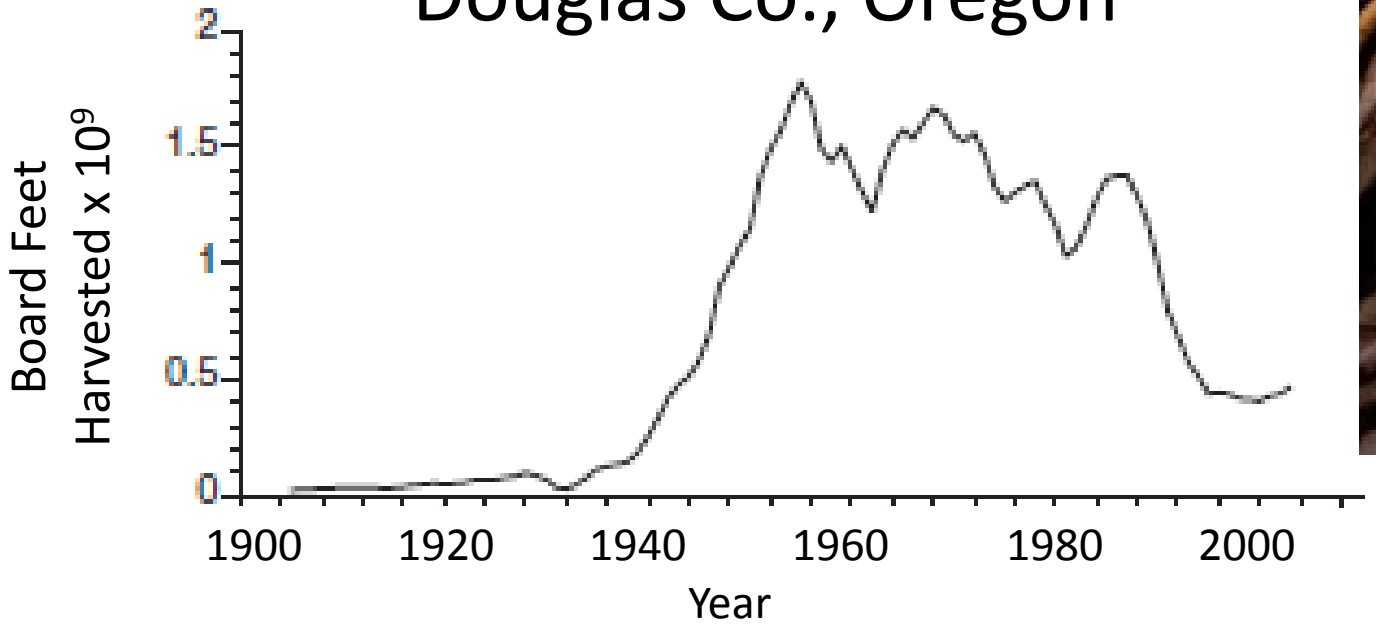
2013

Oregon Forest Practices Act 1972

Start of WWII - 1939

Background

Timber harvest –
Douglas Co., Oregon

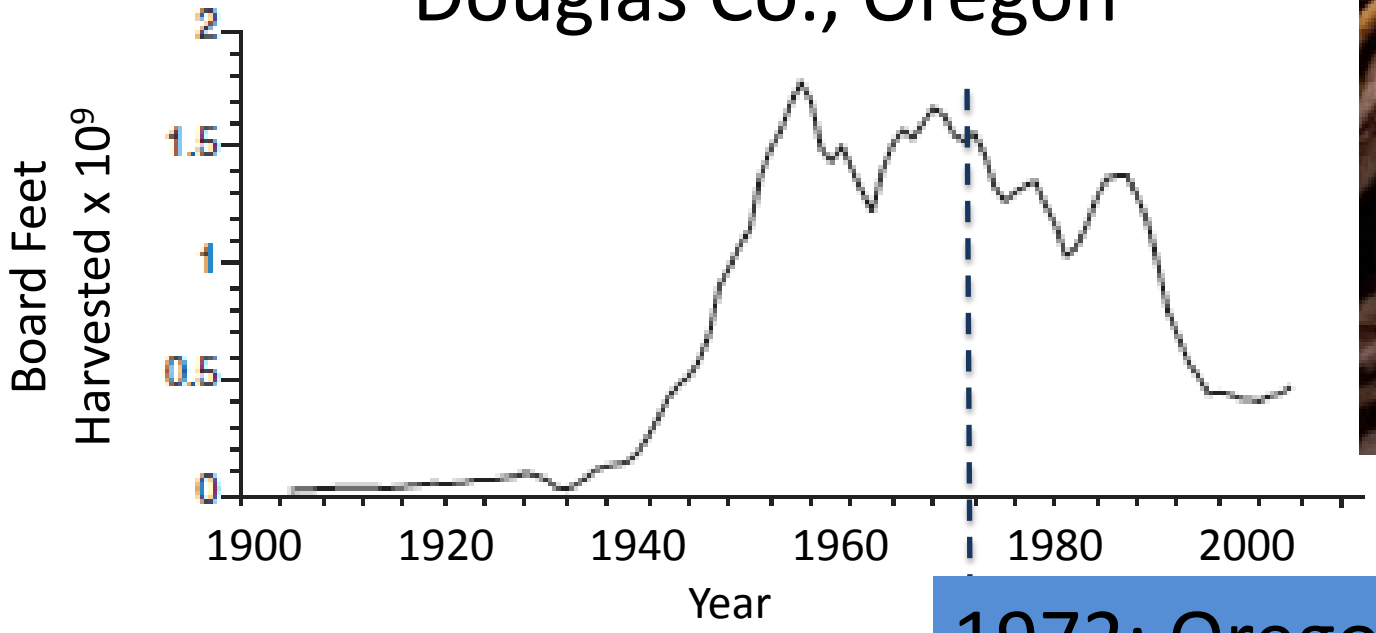



Source: Watershed Processes Group, OSU

Wheatcroft et al. 2013

Background

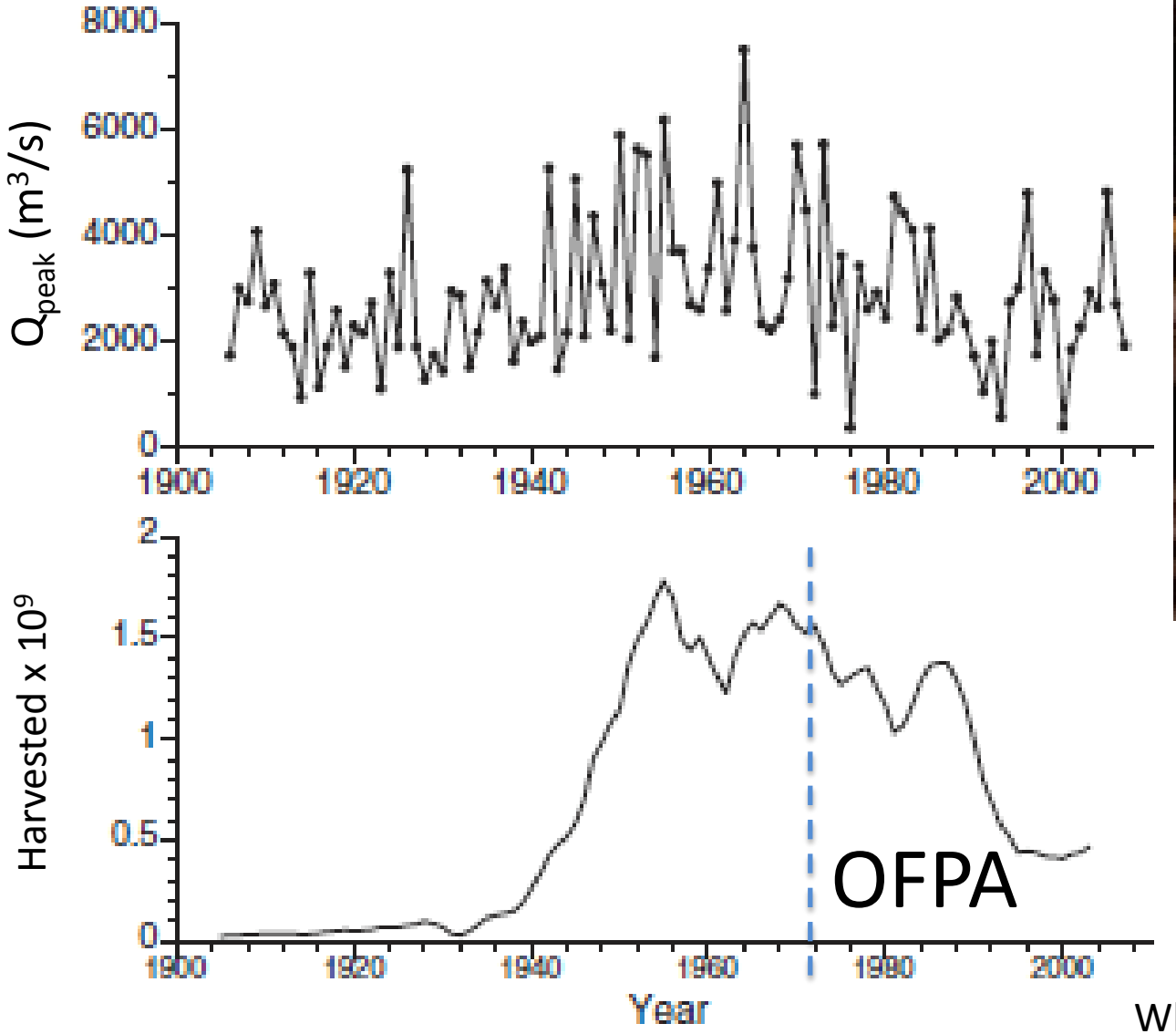
Timber harvest – Douglas Co., Oregon



1972: Oregon Forest Practices Act (OFPA)

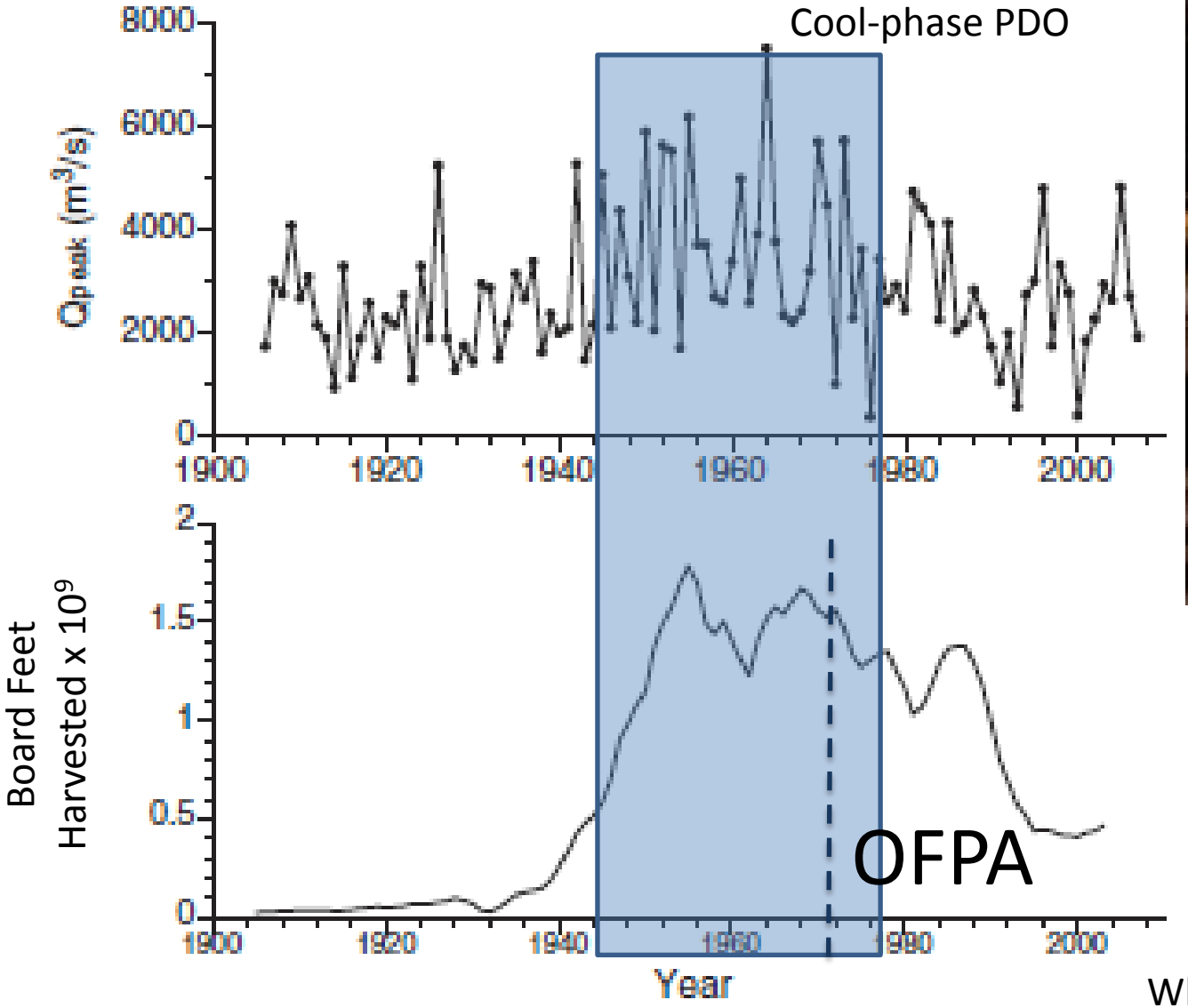
Wheatcroft et al. 2013

Background



Wheatcroft et al. 2013

Background



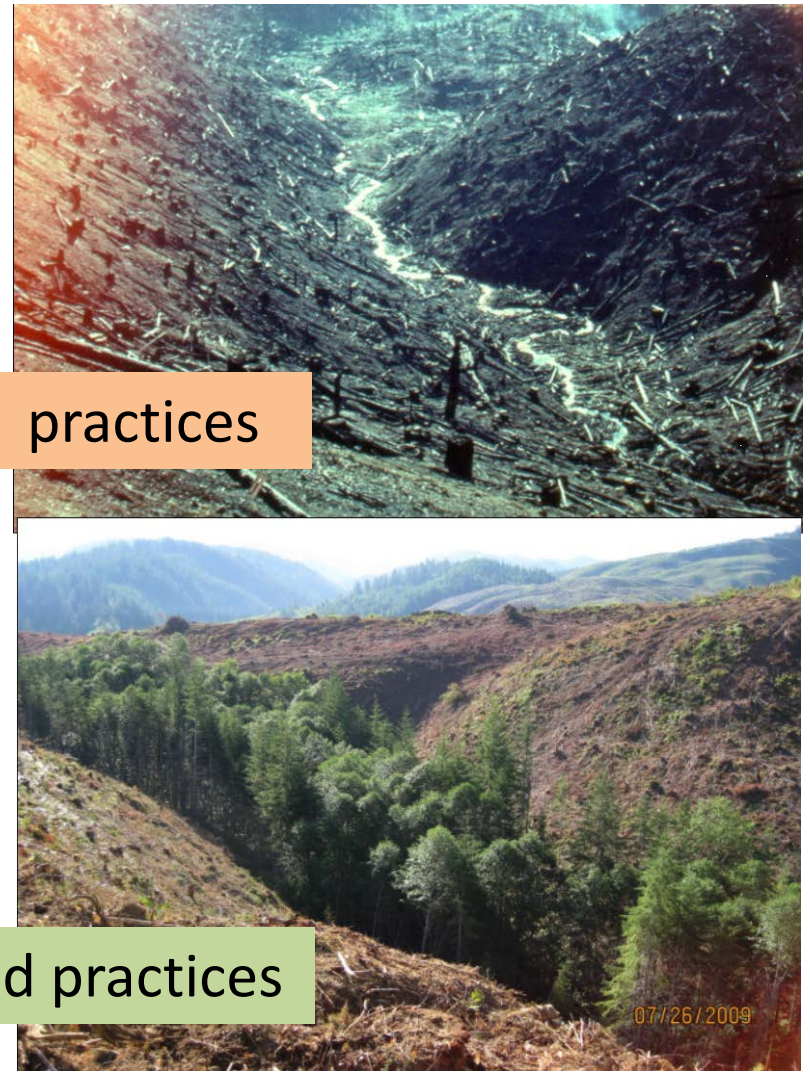
Wheatcroft et al. 2013

1972: OFPA

BETTER

From Poor to ~~Best~~ Management Practices (BMPs):

- Riparian buffers
- Better road construction
- Smaller parcels
- Lower-impact harvesting
- Slope & stability



Source: Alsea Watershed Study

Research Questions for current work:

What is the impact of
historical (pre-OFPA) & contemporary (post-OFPA)
harvesting practices
on lake sedimentation rate?

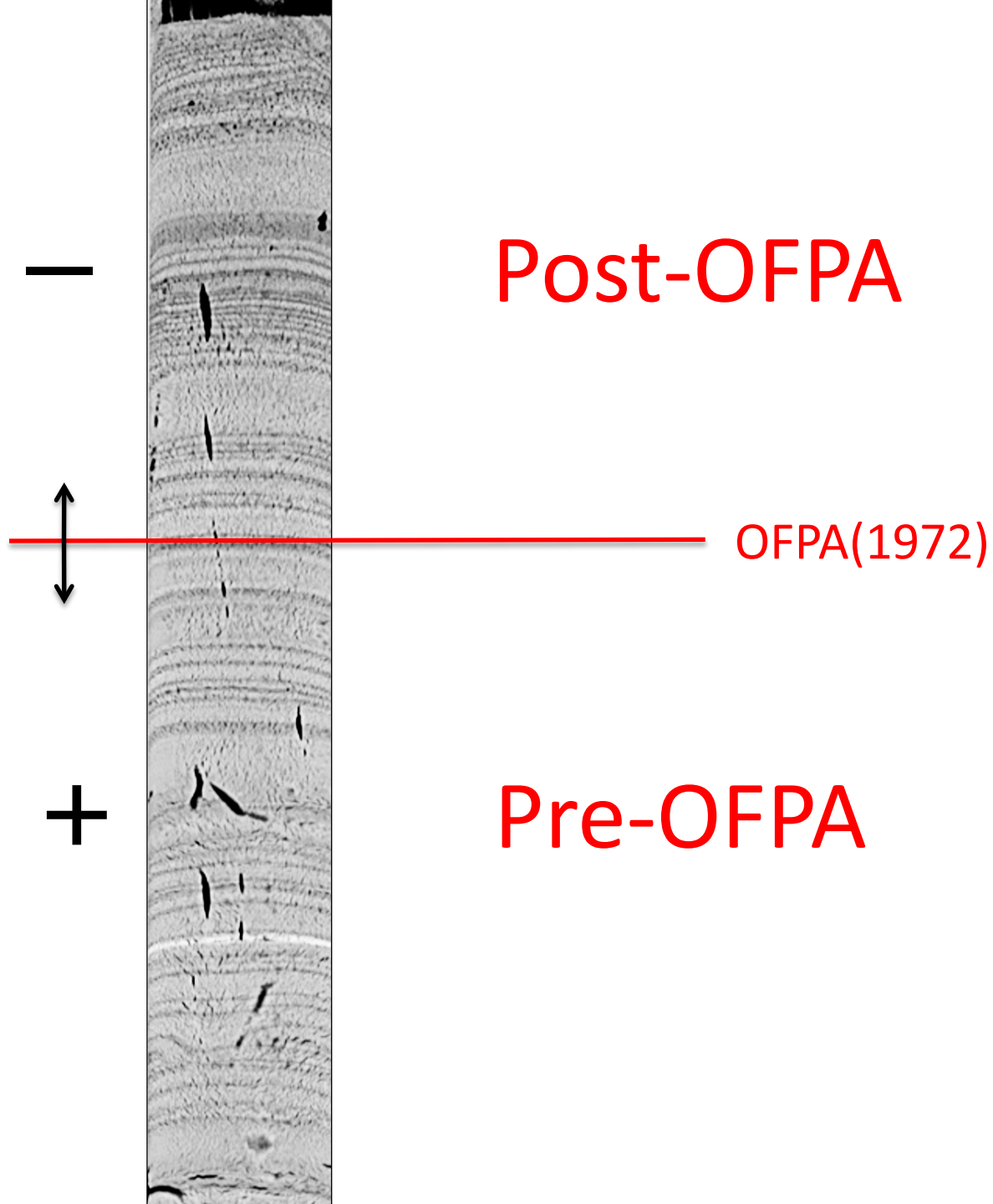
AND

Can we detect forestry practice changes
in the lake sediment and if so,
what is the effect?

Hypothesis

Sediment layer thickness decreases after OFPA

- less impact to land
- better buffers



Hypothesis

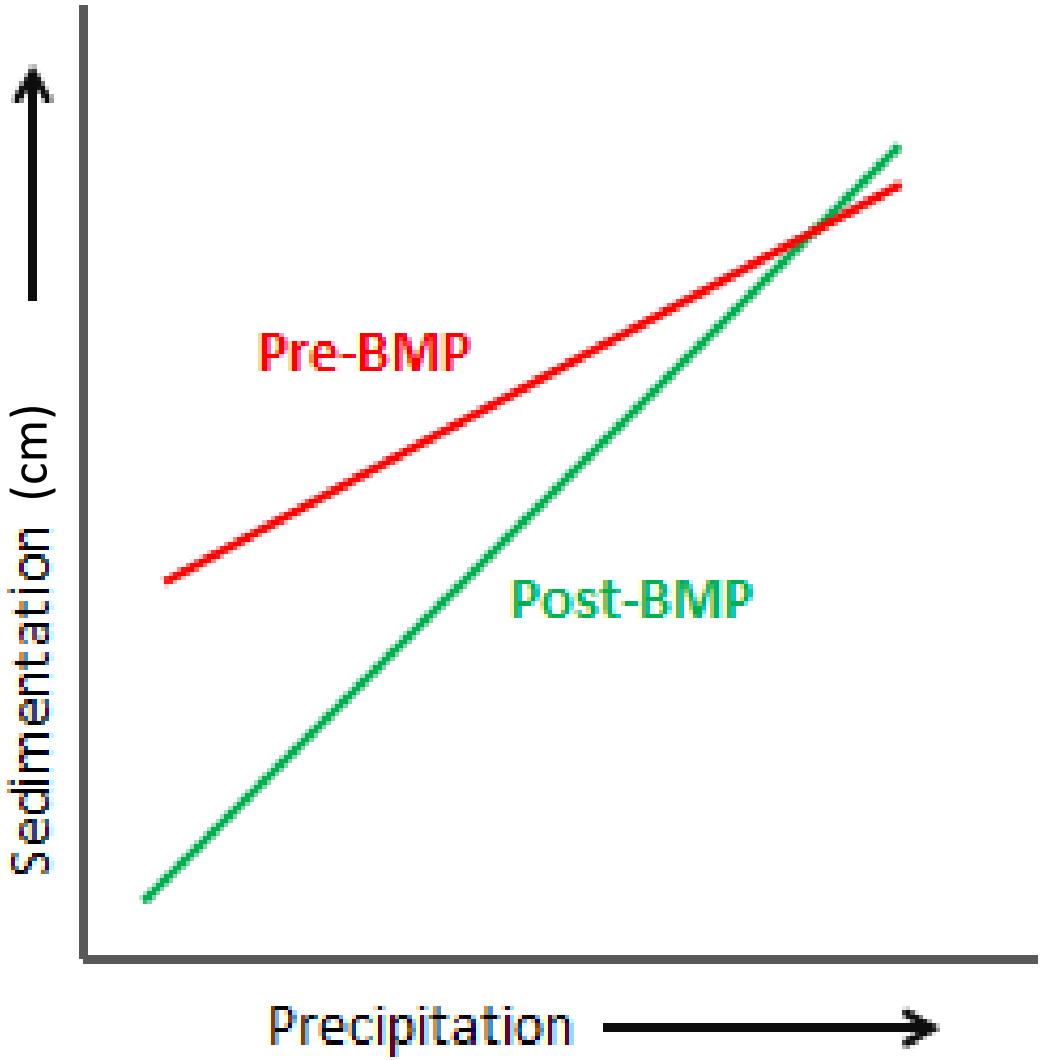
Sediment thickness post-OFPA:

Low precip:

less sediment thickness

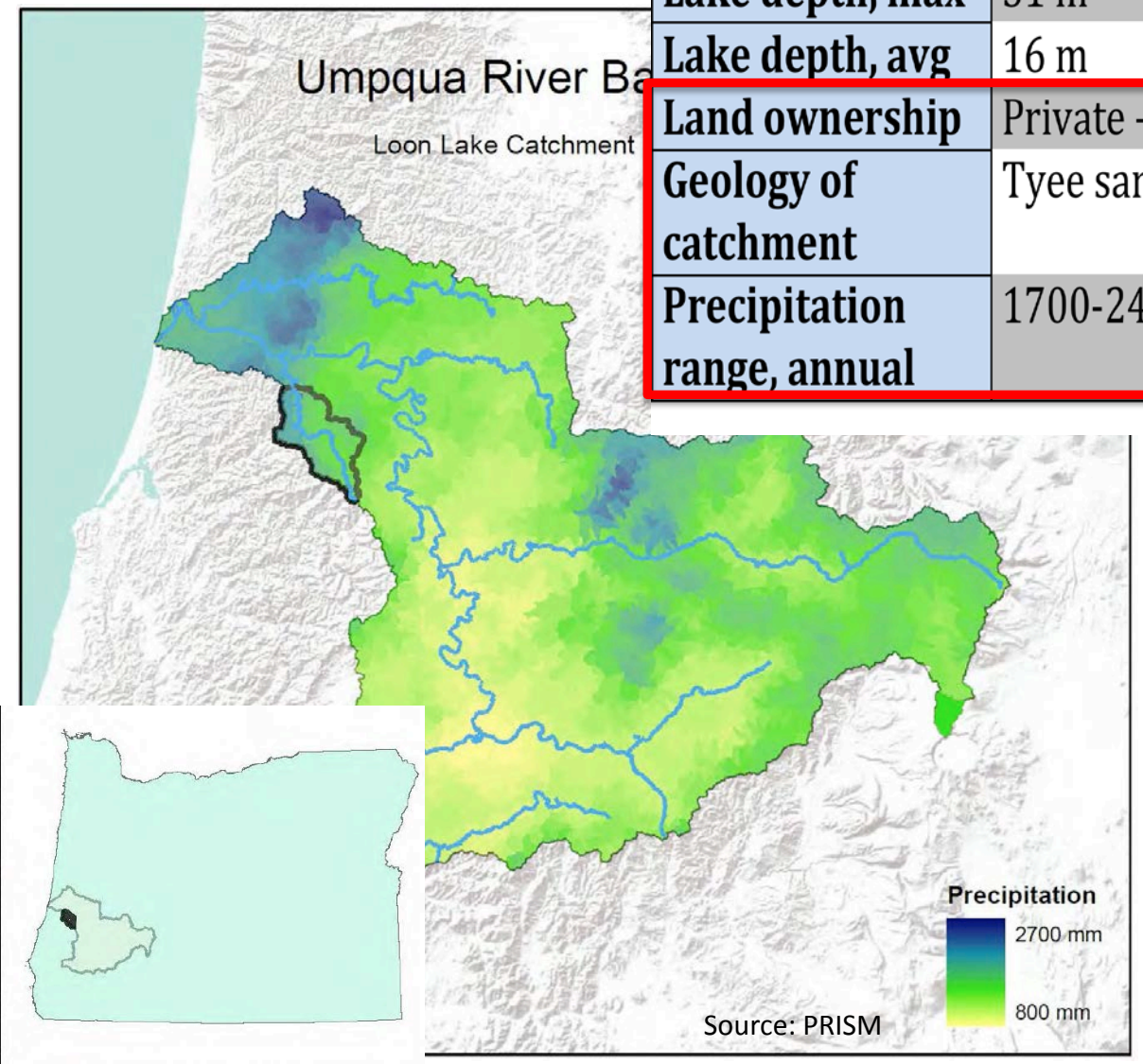
Extreme precip:

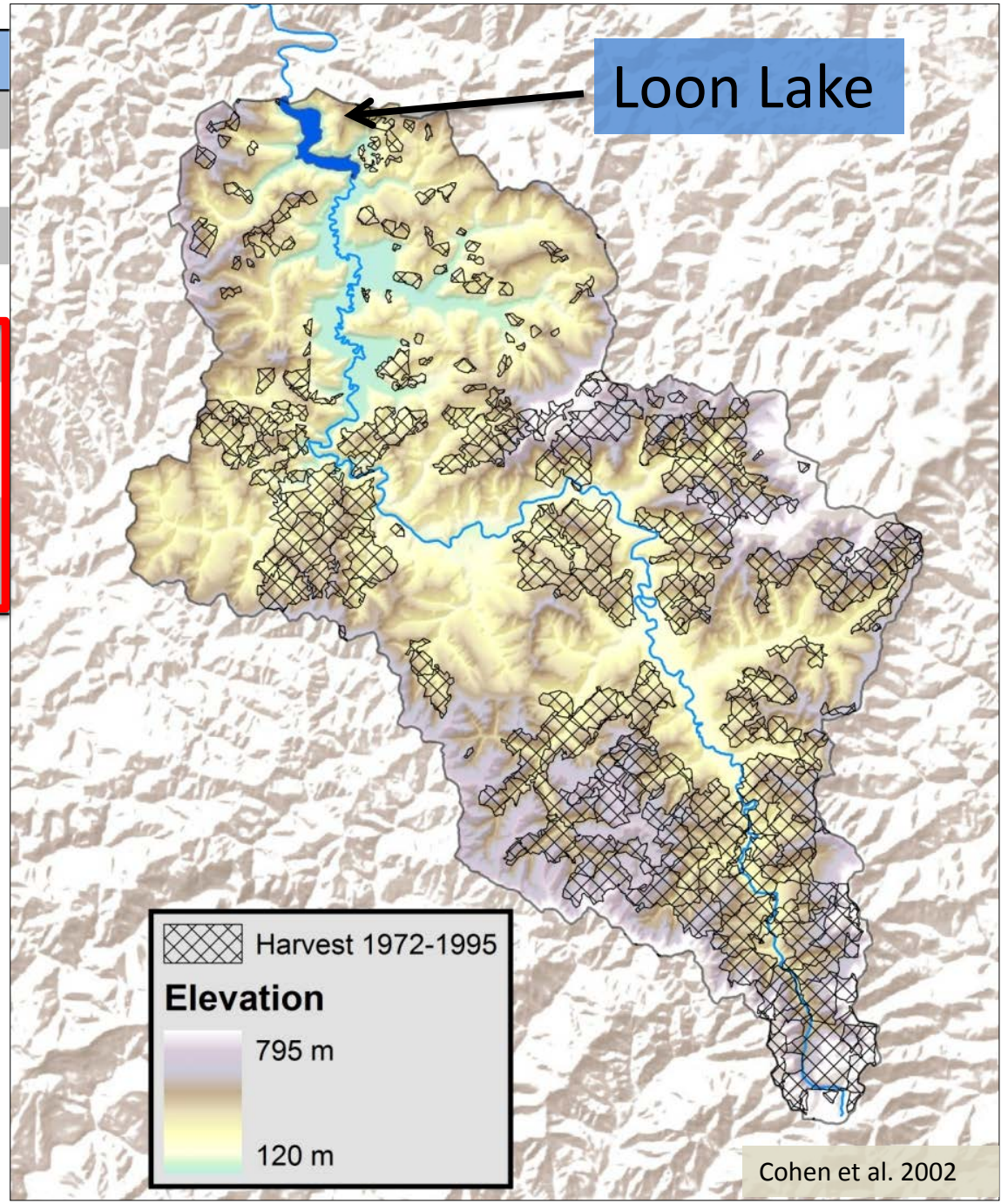
BMPs break down



Study site

Loon Lake Characteristics	
Catchment area	230 km^2
Lake area	1.19 km^2
Lake depth, max	31 m
Lake depth, avg	16 m
Land ownership	Private – 74%
Geology of catchment	Tyee sandstone
Precipitation range, annual	1700-2400 mm





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Source: U.S. Geological Survey, 1978. View looking north.

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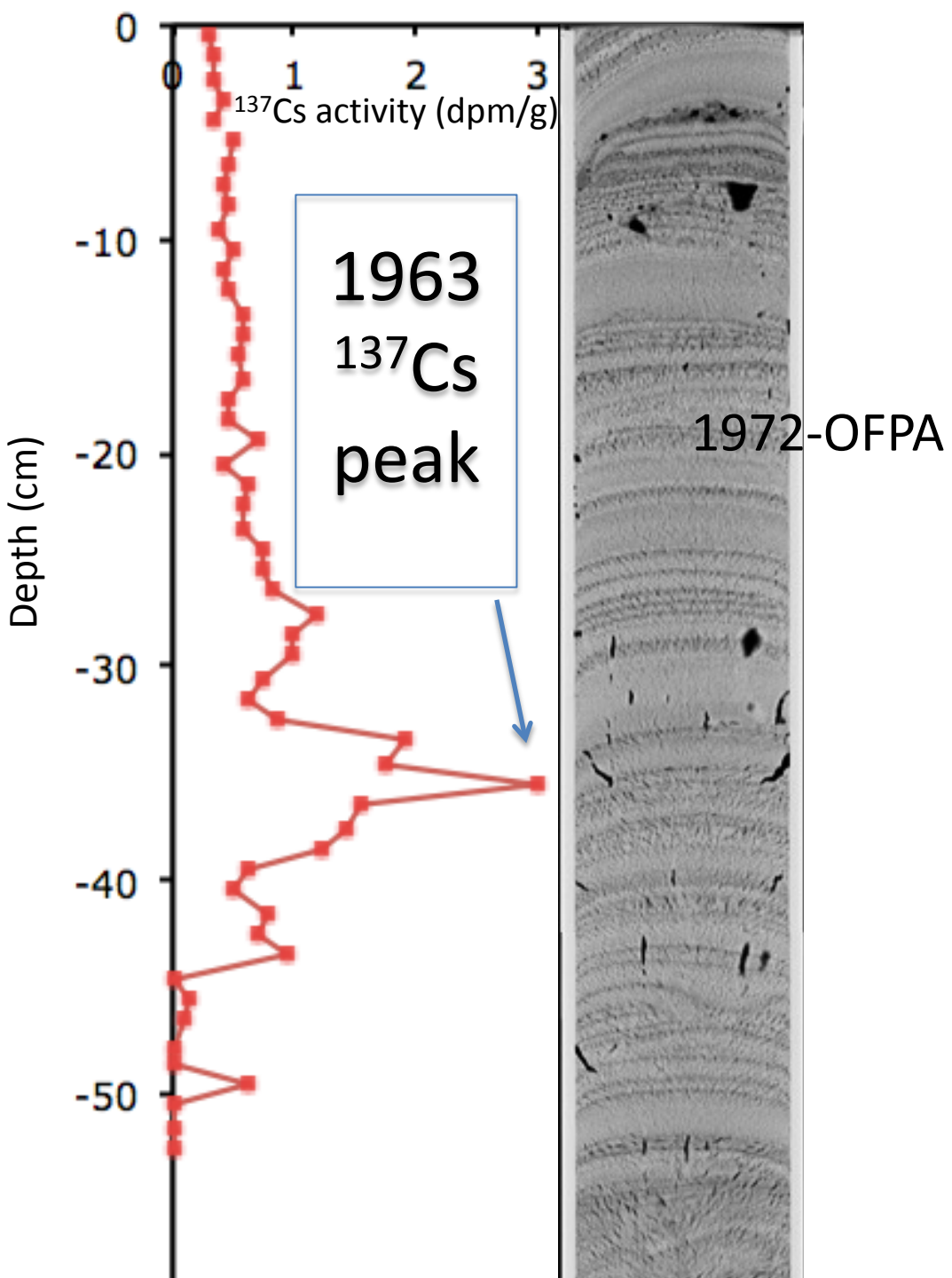
Approach

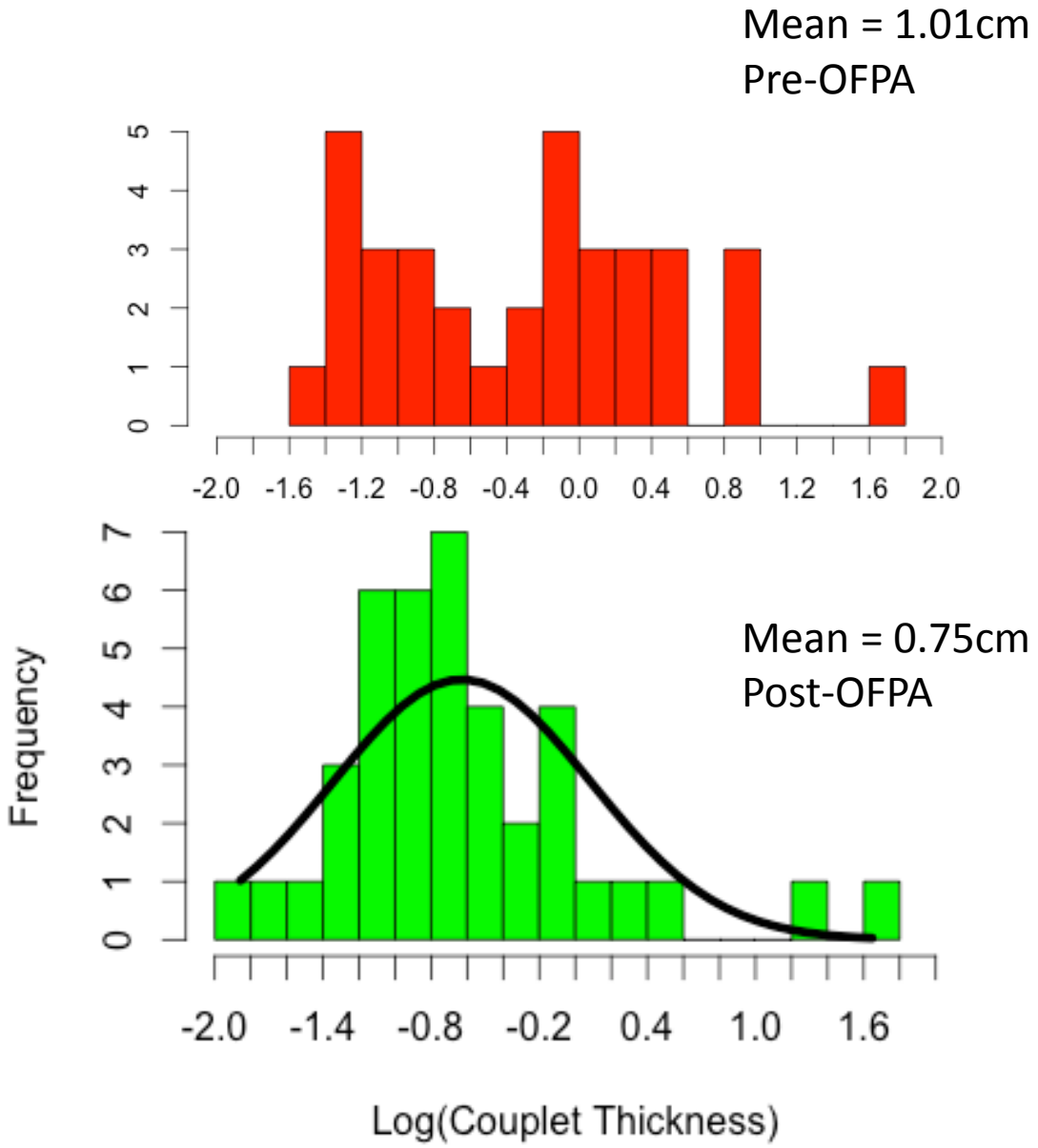
- Coring
- Chronology
  - ^{137}Cs peak 1963
  - Annual layers (varve counting)
- Layer thickness
- Precipitation/discharge
  - nearby gaging station
- Particle size analysis
- Magnetic Susceptibility



Preliminary results: *Sediment thickness*

Lamination thickness (cm)	Pre-OFPA n=35	Post-OFPA n=40
Mean	1.01	0.75
Median	0.84	0.50
S.D.	0.94	0.95

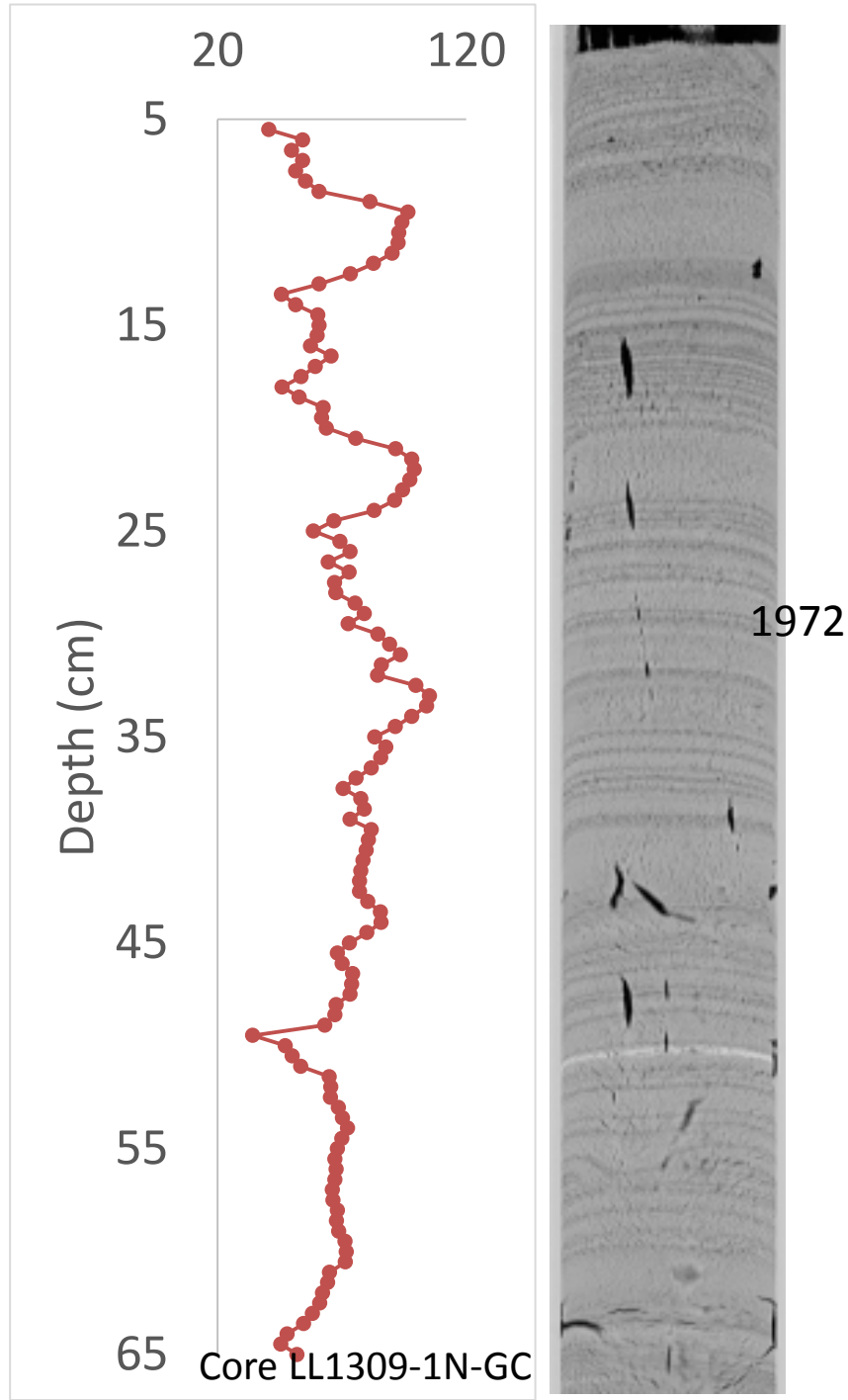
- Suggestive evidence of reduction in sedimentation rates
- Two sample t-test, p = 0.07
- Climate not taken into account



Preliminary results: *Magnetic Susceptibility*

M.S. SI ($x10^{-5}$)	Pre-OFPA n=48	Post-OFPA n=72
Mean	72.7	70.0
S.D.	13.4	16.5

Two-sample t-test
P = 0.34

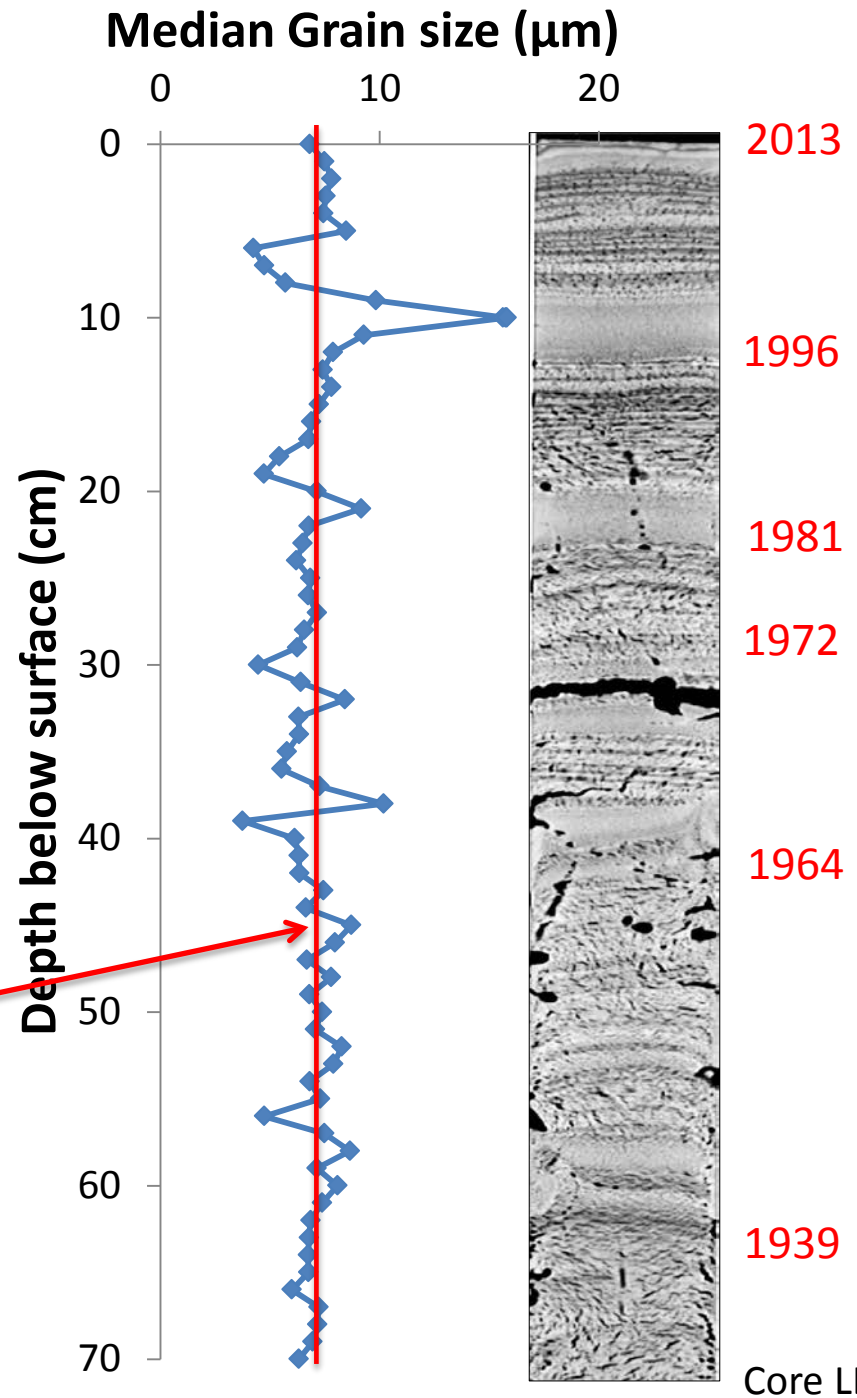


Preliminary results:
Grain size

Median grain size (µm)	Pre-OFPA n=30	Post-OFPA n=33
Mean	7.28	6.97
S.D.	2.04	1.29

Two-sample t-test, p=0.25

Overall mean = 7.12 µm



Core LL1309-02aN-PC

Preliminary conclusions

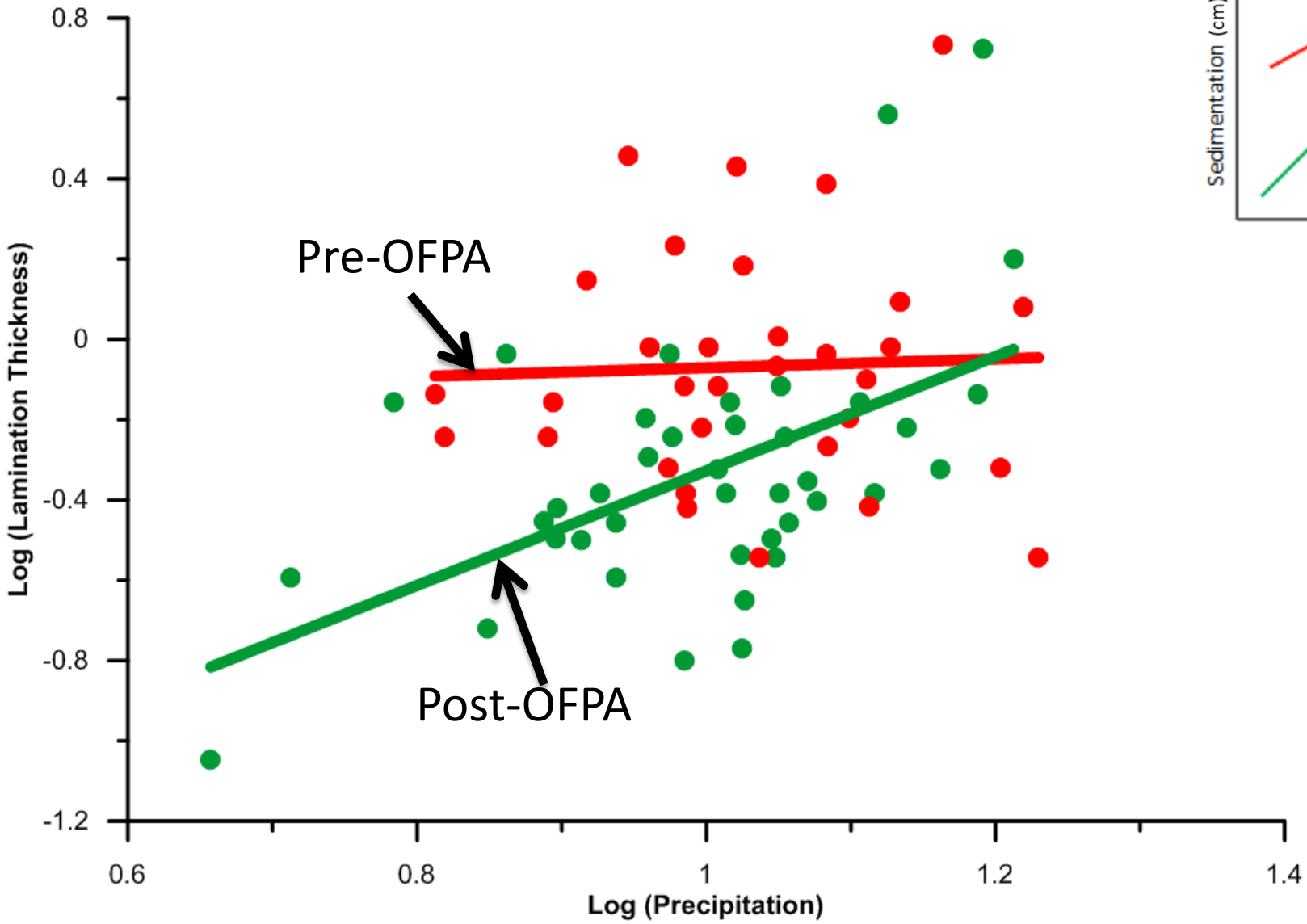
- Sedimentary archive is useful for identifying and investigating events in the catchment.
  - Use to identify time and distinguish large events
  - Grain size distribution is different pre- and post-OFPA,
    but no significant difference in means of grain size median and magnetic susceptibility
- There is suggestive evidence that overall lamination thickness declines after Oregon Forest Practices Act (OFPA).

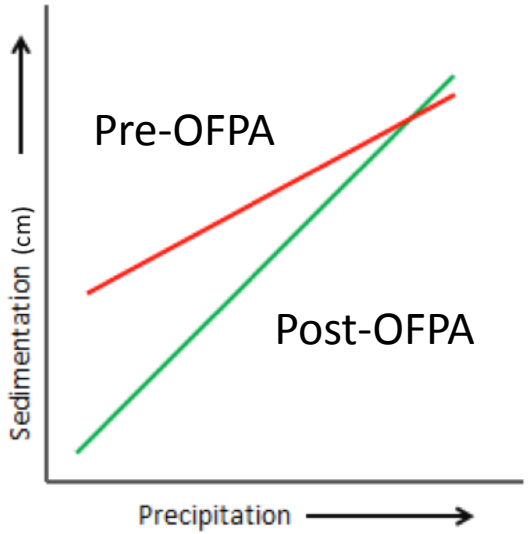
Future Work

1. Further vet climate data
2. Examine storm layers/extreme magnitude events
3. Quantify harvest pressure in the catchment
4. Investigate sediment source/transport processes

   C, N, stable isotopes, and biomarkers

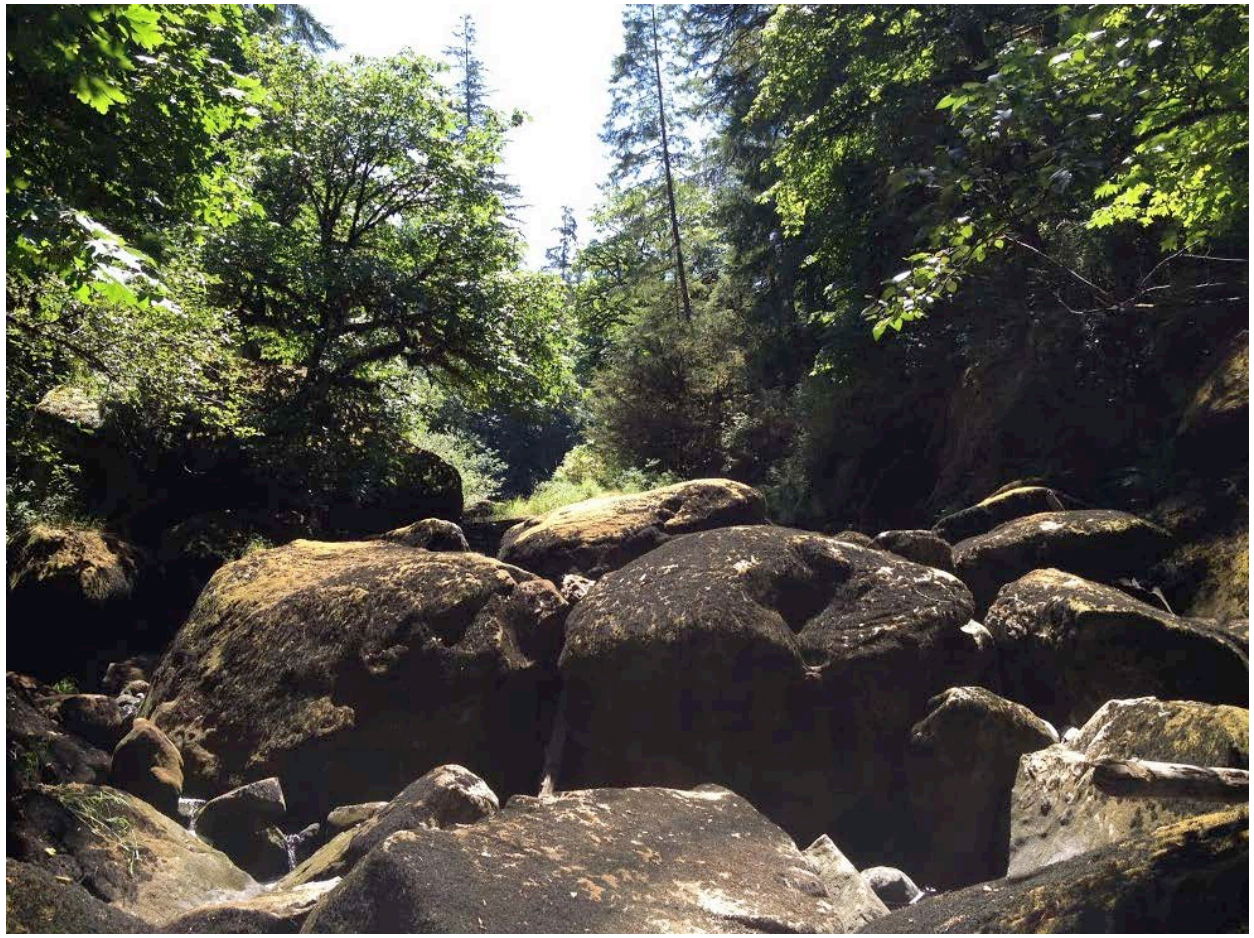
Other preliminary results: *Sediment thickness*





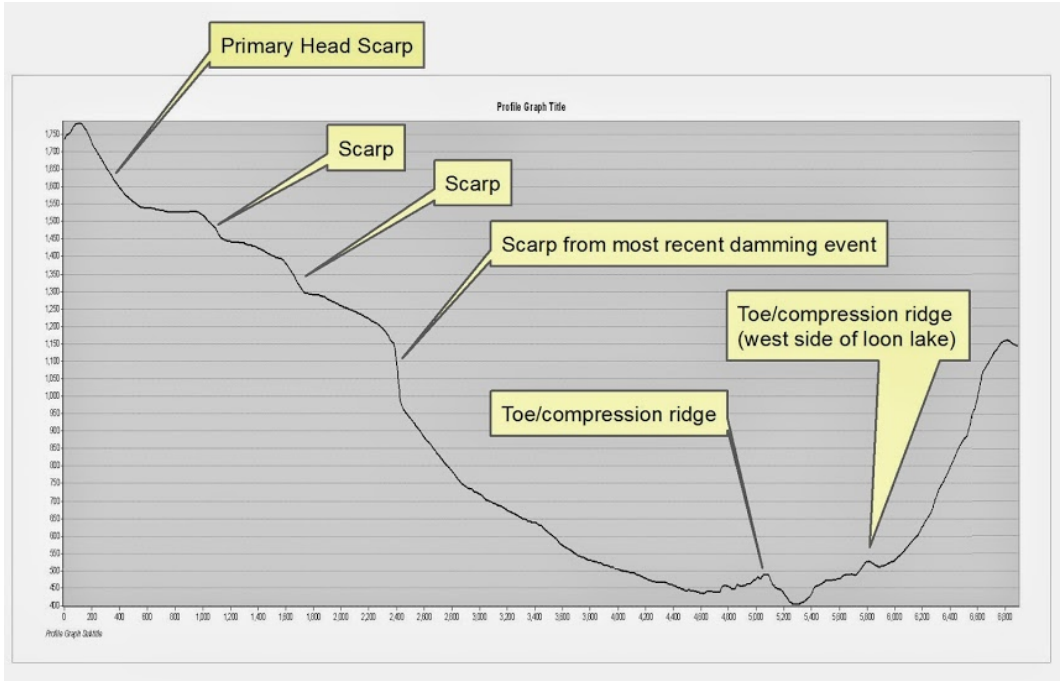
Questions?

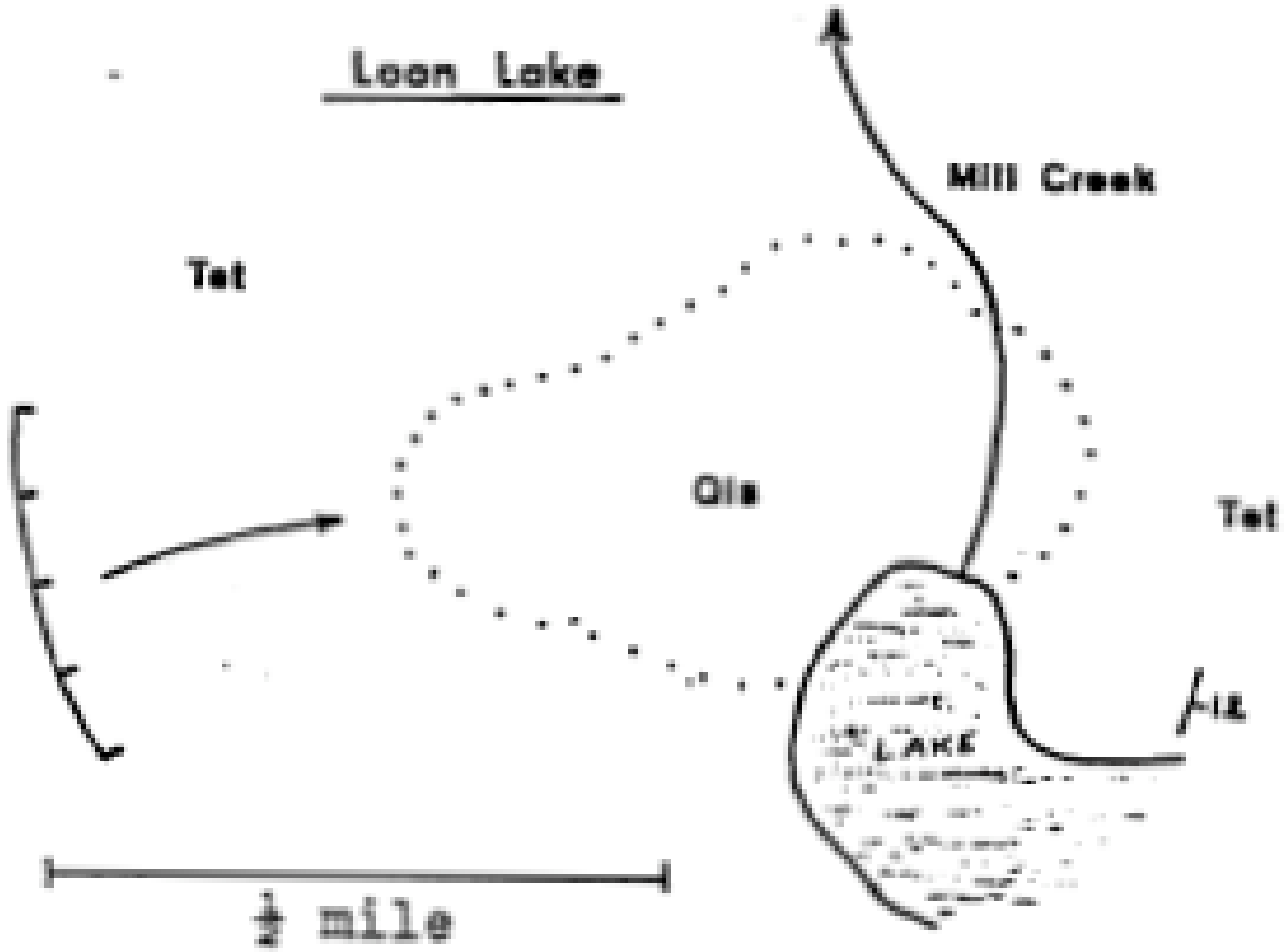
Contact Kris Richardson, richakri@onid.orst.edu

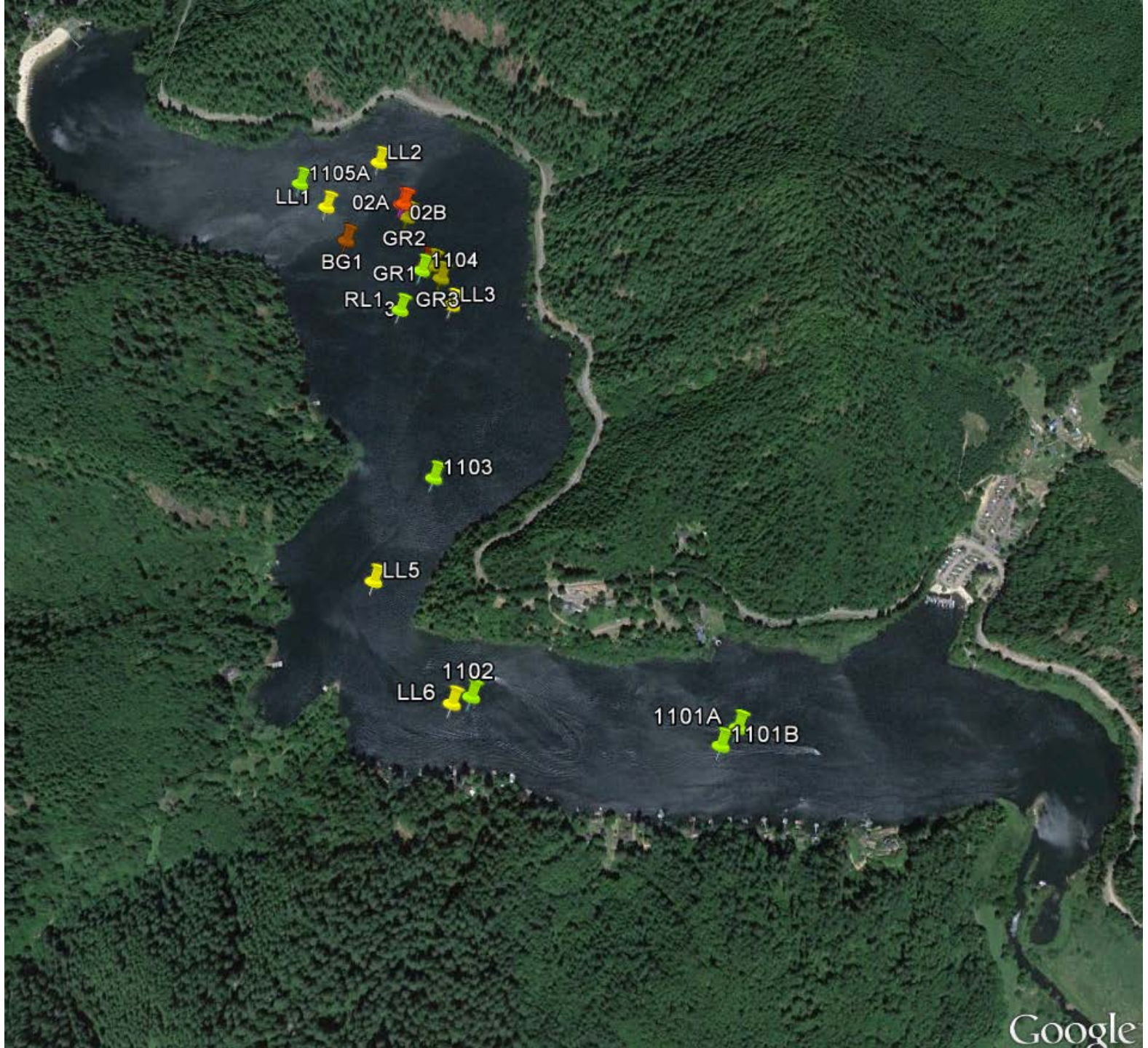


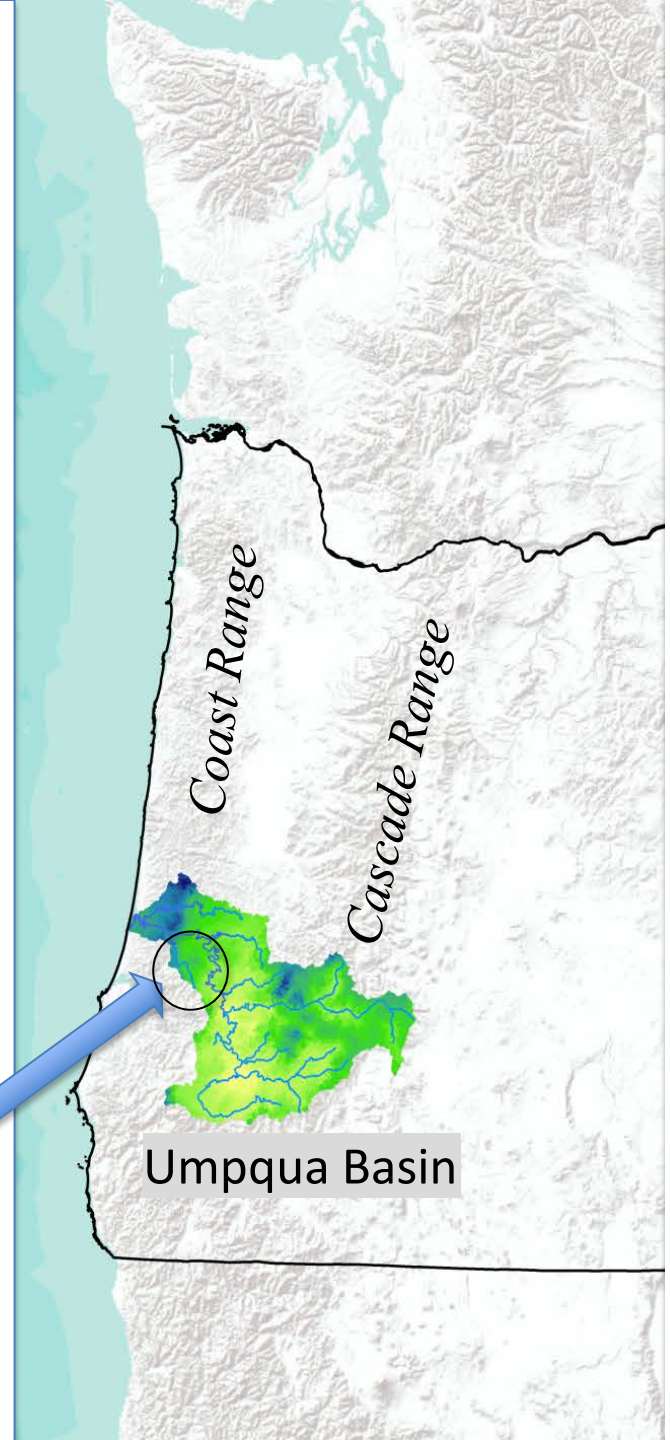
Sandstone boulders viewed upstream, downstream at Loon Lake outlet falls


07/02/2014


Primary Head Scarp
Profile Graph Title
Scarp
Scarp
Scarp from most recent damming event
Toe/compression ridge
(west side of loon lake)
Toe/compression ridge


Loon Lake
Mill Creek
Tet
Qls
Tet
LAKE
½ mile


LL2
1105A
LL1
02A
02B
GR2
BG1
1104
GR1
RL1
GR3
LL3
1103
LL5
1102
LL6
1101A
1101B
Google



Loon Lake