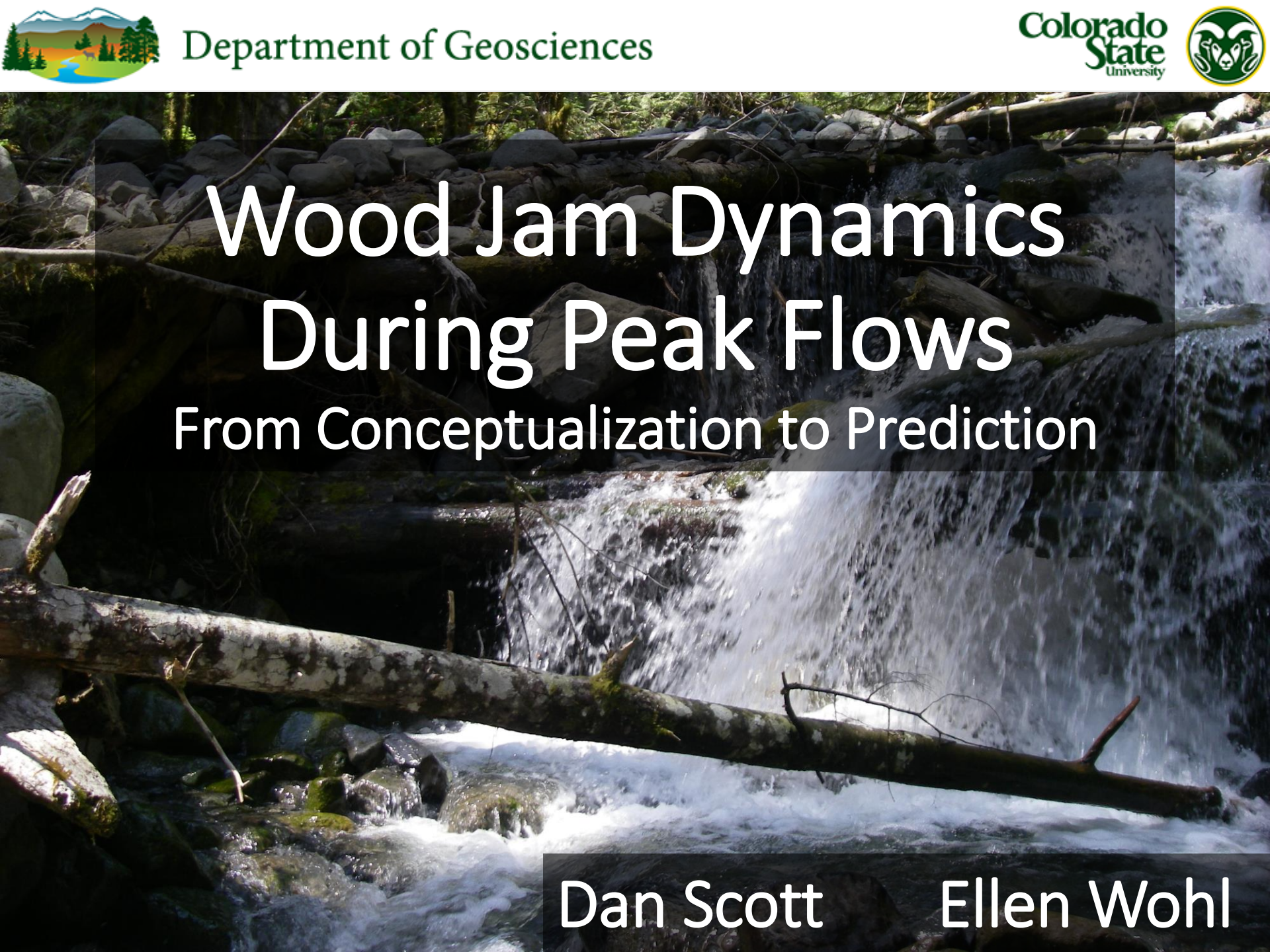
Department of Geosciences
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Wood Jam Dynamics During Peak Flows
From Conceptualization to Prediction
Dan Scott
Ellen Wohl

What have wood jams ever done for the river?

- Provide essential habitat
- Increase diversity and heterogeneity
- Regulate sediment dynamics
- Maintain healthy riparian zones
- Maintain ecological states
- Modulate connectivity

Facilitate animal movement?

WOOD IS GOOD

Wohl, E. (2013), Floodplains and wood, *Earth-Science Rev.*, *123*, 194–212, doi:10.1016/j.earscirev.2013.04.009.

Take Home

- Managers seek to understand when we can reintroduce or leave wood in rivers
- Wood jams are complex and will require extensive data to understand
- Our methodology involves integrating data from numerous investigators
- We will integrate these data into an evolving, context-aware, statistical model (decision tree classifier) to predict jam stability

Stability

- Jams shed and gain wood during peak flow
- Stability refers to the jam itself, not the wood within the jam

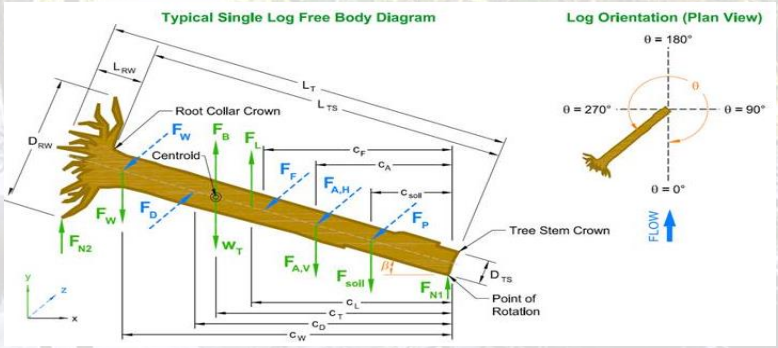
Objectives and Variability

Last Bessemer Creek,

South Fork Snoqualmie River, Central Cascades, WA

The Problem

- Wood jams can't be described by a simple force balance—too many interactions with other objects (banks, boulders, infrastructure)



Rafferty (2013)

- We lack a conceptual framework that can describe what happens to a jam during high flow based on low flow observations


Cache La Poudre Jam 1 at peak flow
Bushnell
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Exploring Wood Jam Dynamics During Peak Flows—Methods

Method	Question Answered
Measure jams before peak flow	What does the jam look like at low flow?
Observe subset of jams with timelapse photography	How does jam respond to peak flow?
Measure again after peak flow	How did the jam change?

1) Measurements need to be reproducible
2) Data need to be shareable
3) Data need to be used effectively and in context

What factors influence jam stability?


Bushnell
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06-08-2016 12:55:11

Jam Stable—Why?

- Nearly submerged
- Diurnal “shaking” (dilation)
- Pinning boulder much taller than jam and peak flow


Bushnell
59F15C
08-11-2016 18:00:41

Jam Mobilized—Why?

- Submerged for multiple nights
- Diurnal “shaking” (dilation)
- Lots of racked material

Summary of Current Findings

- Diurnal stage fluctuations (result of diurnal snowmelt fluctuations) “shake” jams over weekly timescales
  - Does this phenomenon happen in non-snowmelt systems?
  - Are the effects of this phenomenon cumulative?

- A jam is more than the sum of all its wood

Future Directions

- Need for standardized jam measurements
  - Thresholds are easier to identify than dimensions
- How do we accommodate context (e.g., region, tree species, tree size)?
  - Seek more fundamental understanding
  - Adaptive model that recognizes its own limitations

Questions?

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New Wood Jam Piece Terminology

Structural Elements: essential to maintaining jam stability (e.g., large pieces, key members)

Interference Elements: objects that change hydraulics or stage around jam (e.g., bank protrusions, sediment retained by jam)

Non-Structural Elements: objects that rest on other parts of the jam but don't contribute to stability when submerged (e.g., racked pieces, fine organic matter, fine sediment, small wood)

Potential Explanatory Variables

- Jam dimensions relative to channel morphology
- Porosity, and the dominant flow path for water as it encounters the jam
- Interaction between the jam and the channel margins or large, relatively immobile objects in channel (bridge piers, large boulders, etc.)
- Presence of: rootwads, live wood, multi-trunk pieces, floodplain, transported pieces

Exploring Wood Jam Dynamics


Bushnell
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05-13-2016 14:58:37

Very Stable Jam—why?

- "Skewered" pieces
- Bouyancy is function of displaced volume, so log angle matters