The importance of floodplains to functioning river ecosystems

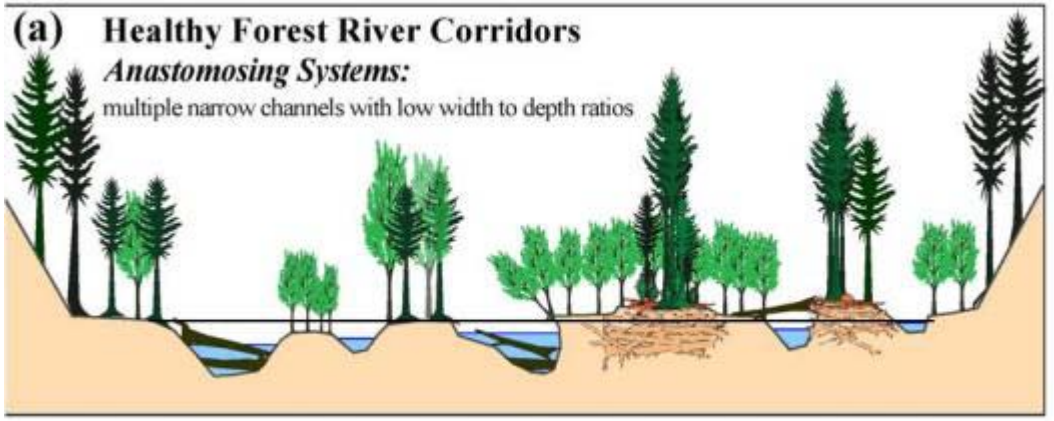
Photo courtesy of Tim Abbe

Today's talk

- What is a floodplain?
- What features are associated with floodplains?
- Why are floodplains important to aquatic ecosystem function?
- How do we disturb and alter floodplains?
- How do we restore floodplains?

What is a floodplain?

- Geomorphology
  - Flat, depositional feature of river valley
  - Adjoins river channel
  - Formed under current climate regime
- Hydrology
  - Land subject to 100 year flood event



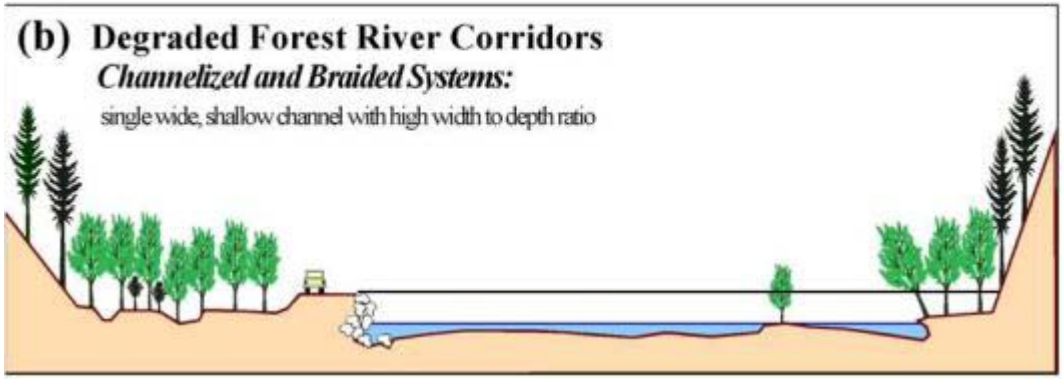
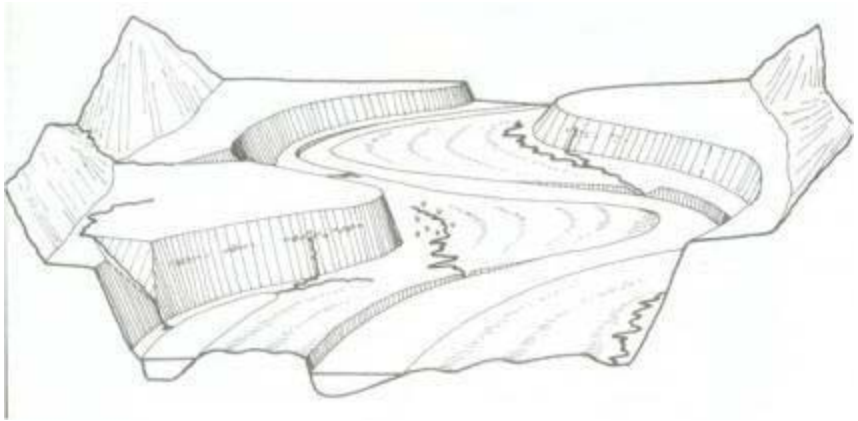
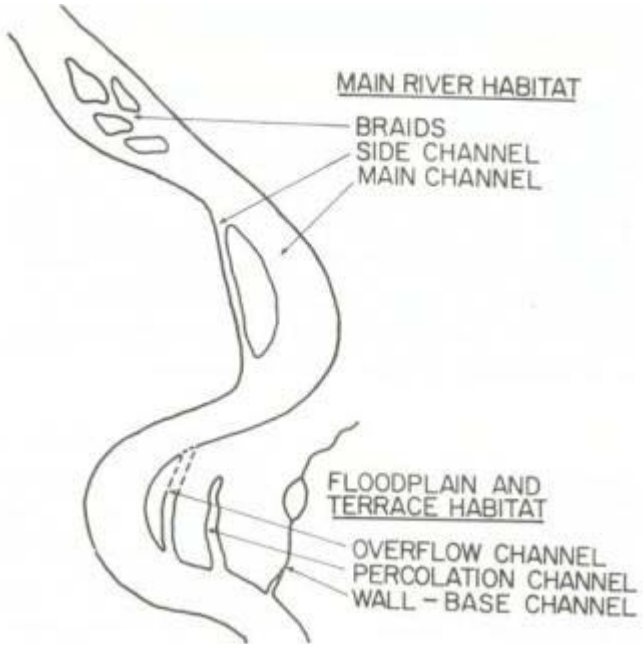


Photo and schematic courtesy of Tim Abbe

What is a floodplain?

- Ecology
  - Areas periodically flooded by lateral overflow of river or lakes.
  - Biota respond to change in environment
    - Individual
    - Community





Schematic courtesy of Petersen and Reid 1984

What features are associated with floodplains?

- Main channels
- Logjams
- Meander bends & scrolls
- Floodplain channels
- Beaver ponds
- Mid-channel islands

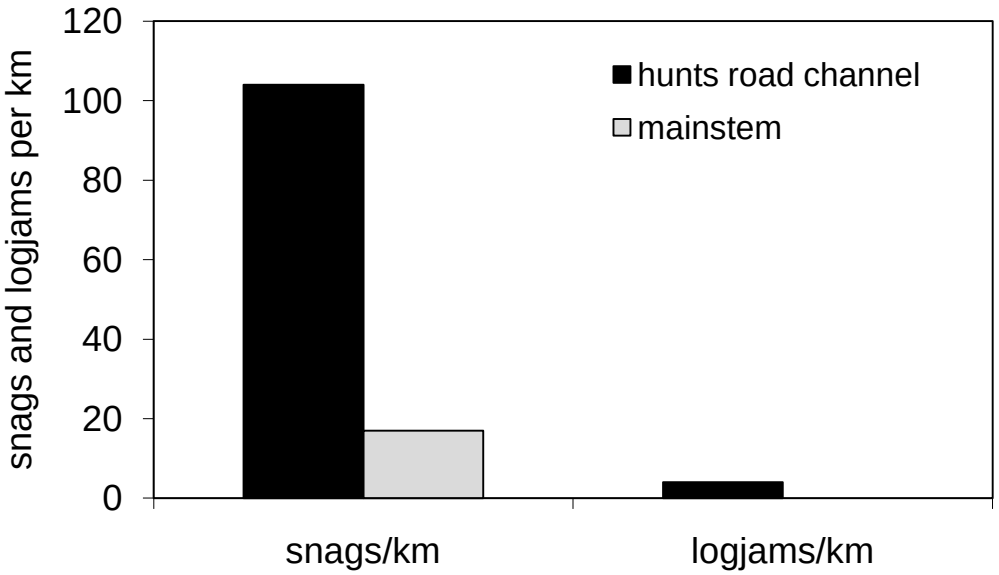
Why are floodplains important to ecosystem function?

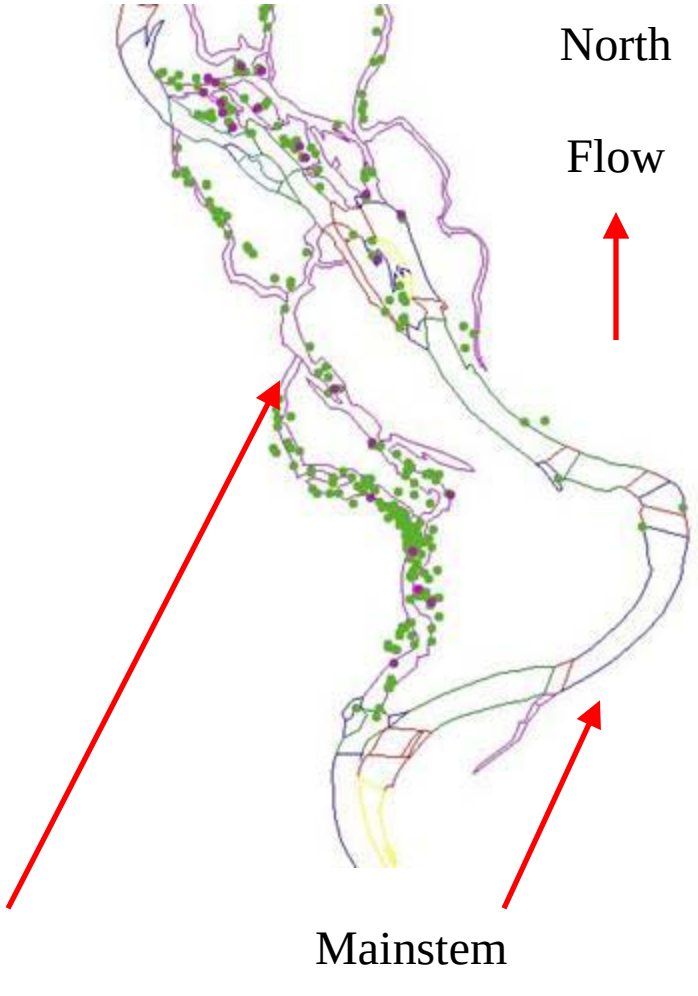
Photo courtesy of Dave Montgomery

Photo courtesy of Lauren Rogers

Repository of water, wood, sediment, & nutrients

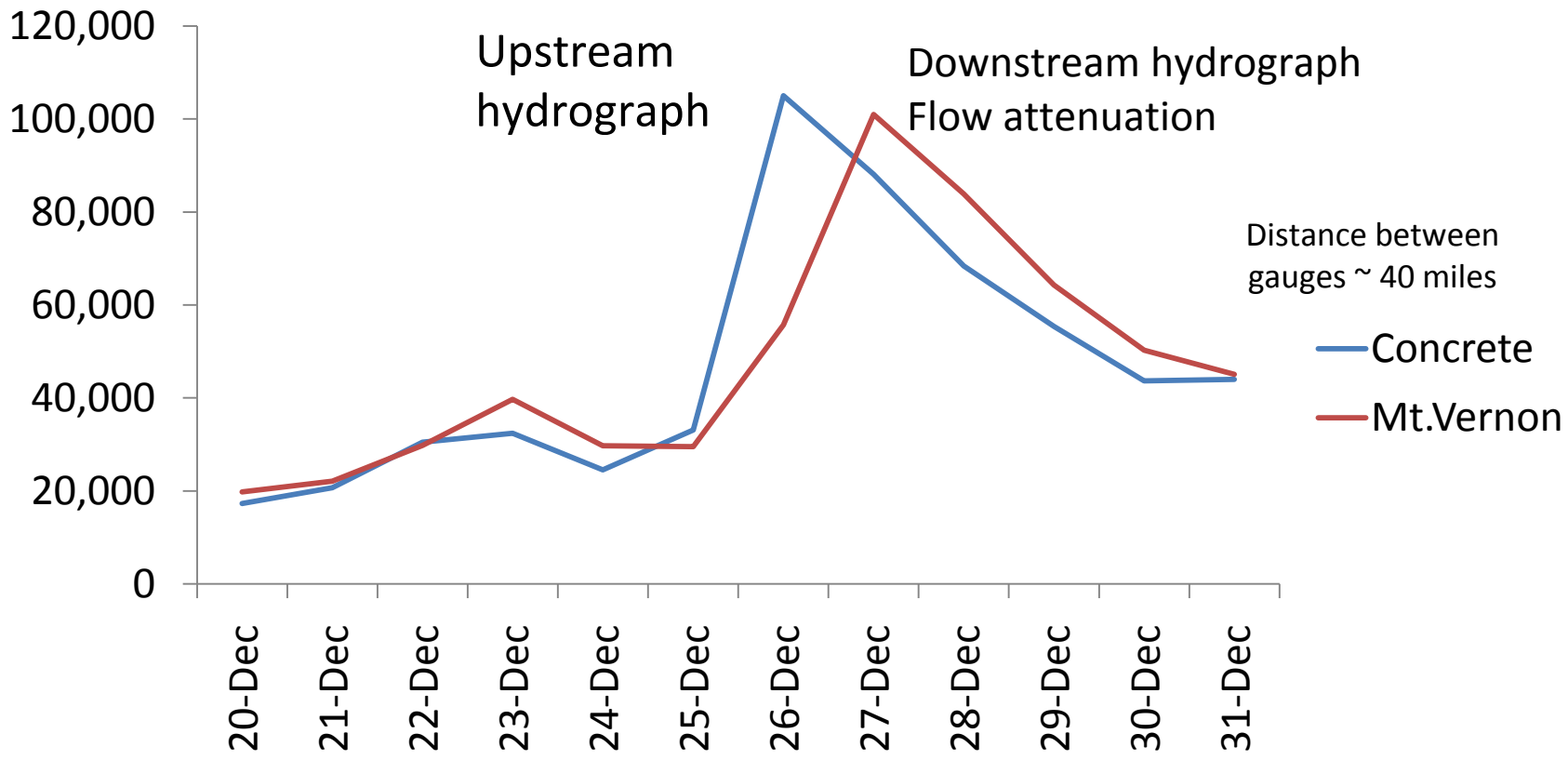
Lower Elwha River floodplain





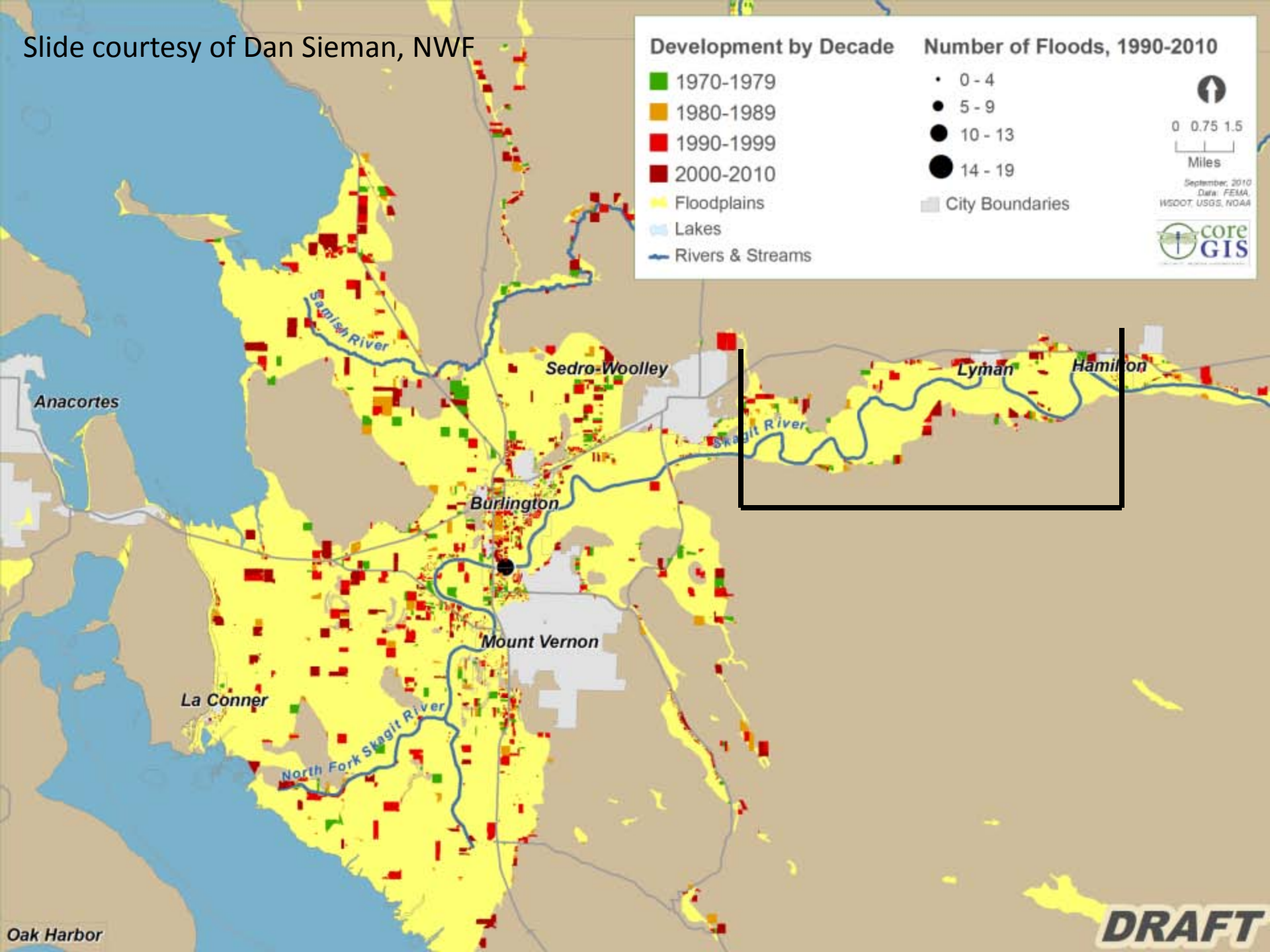
Pess et al. 2008

Attenuate peak flows



1980 Skagit River flood example

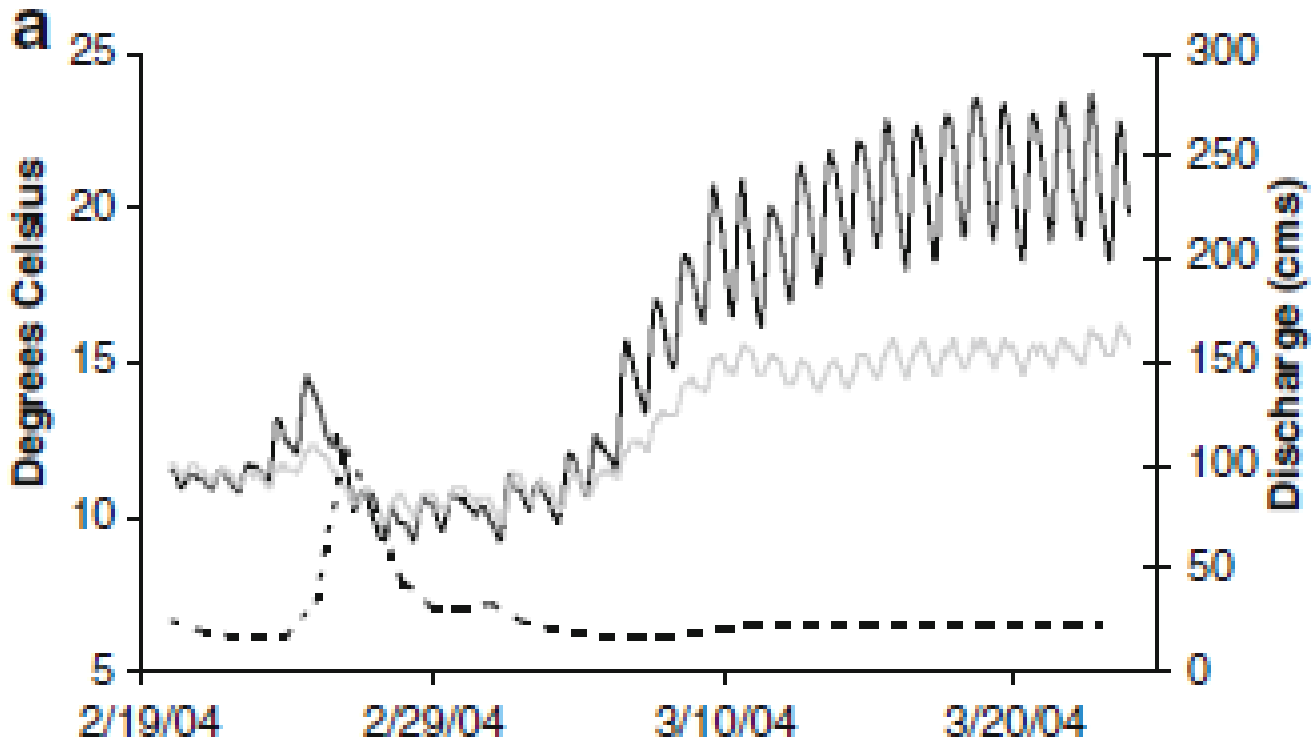
Slide courtesy of Dan Sieman, NWF




20
4.19 km
©2011 Google
©2009 Google
Image U.S. Geological Survey
Imagery Date: Apr 30, 2009
48°30'32.30" N 122°04'58.68" W elev 0 m
Eye alt 14.47 km

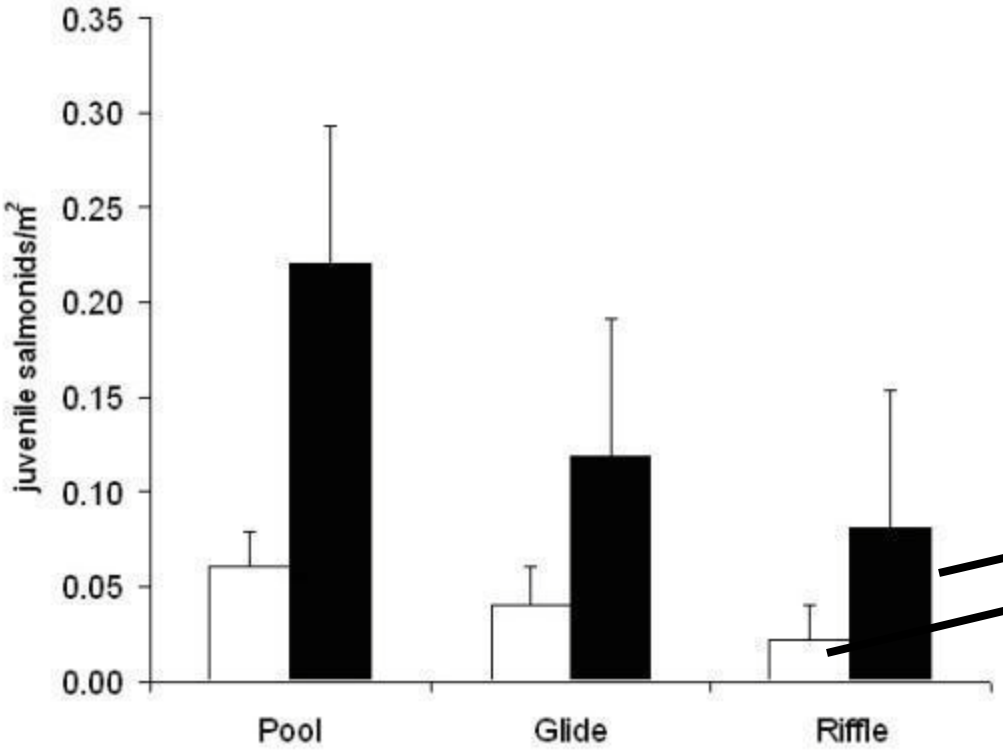
Increased residence time of water, wood, & nutrients

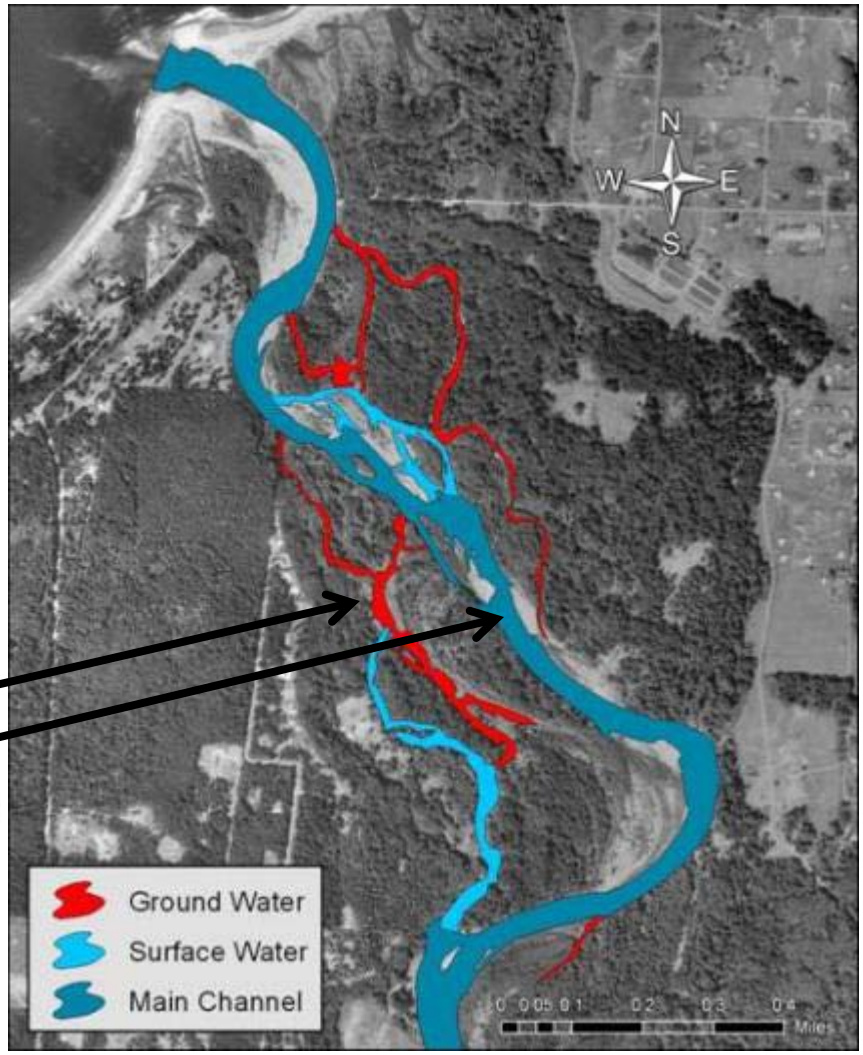
Dashed line – discharge, light grey – river, solid black - floodplain



Jeffres et al. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river. Environmental Biology of Fishes

Greater habitat use by salmonids



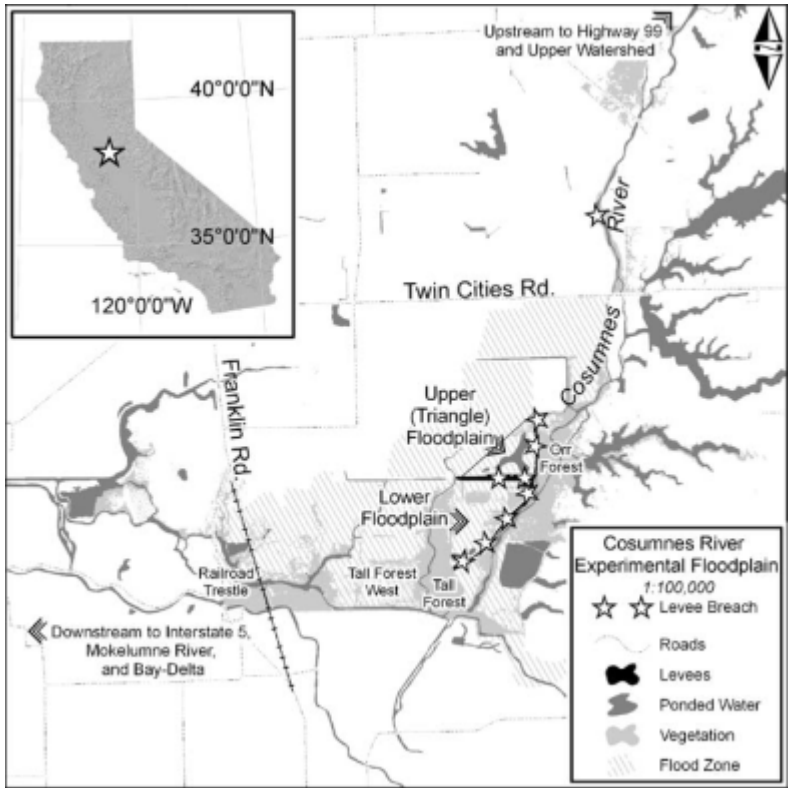


Clear = main stem

Black filled = floodplain

Pess et al. 2008

Better condition factor for outmigrating salmonids



Below floodplain Floodplain

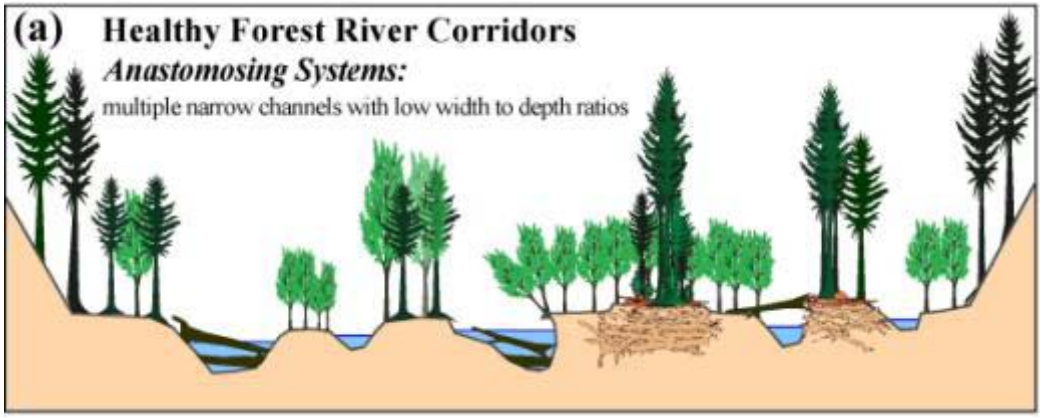
Jeffres et al. 2008
Enclosed experiment, same age Chinook

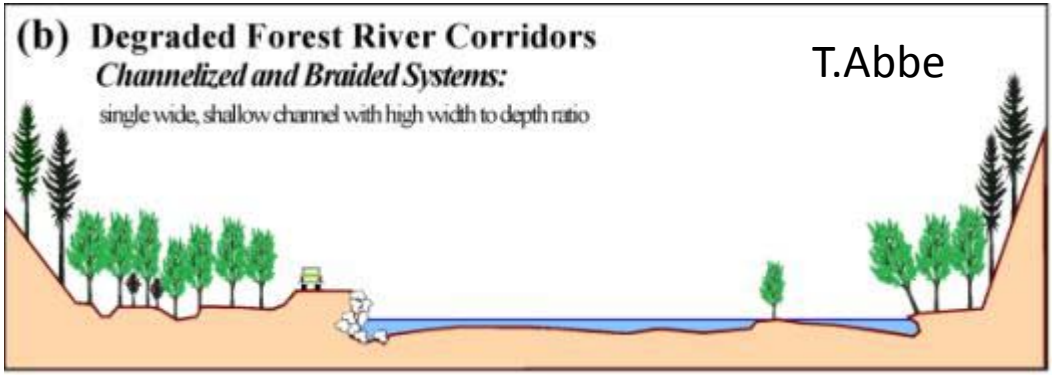
How do we disturb and alter floodplains?

Photo courtesy of Dave Montgomery

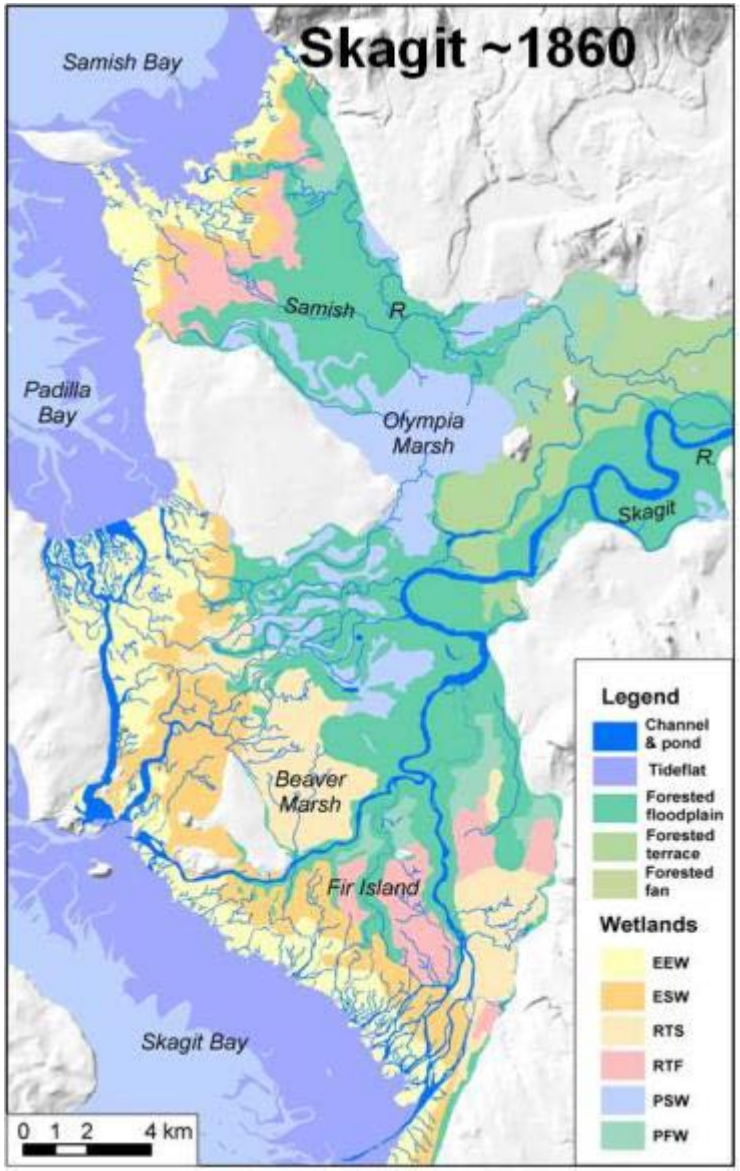
Photo courtesy of Lauren Rogers

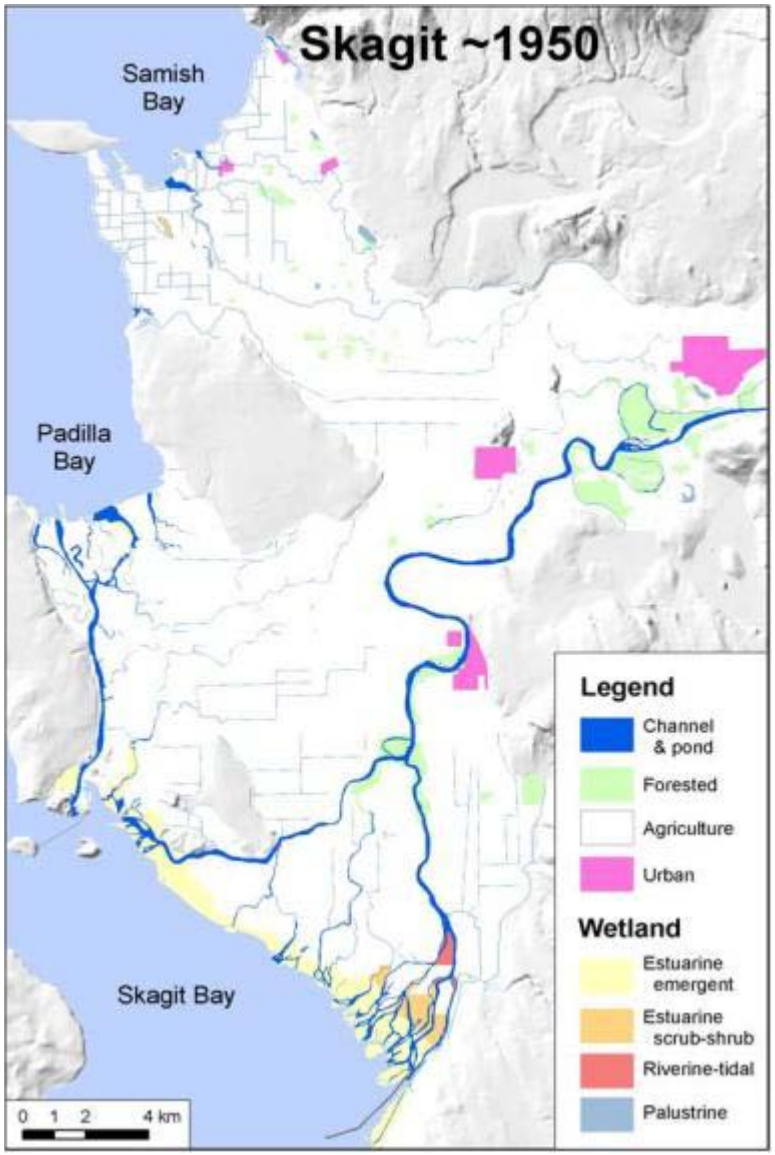
Levees alter flow patterns & vegetative succession





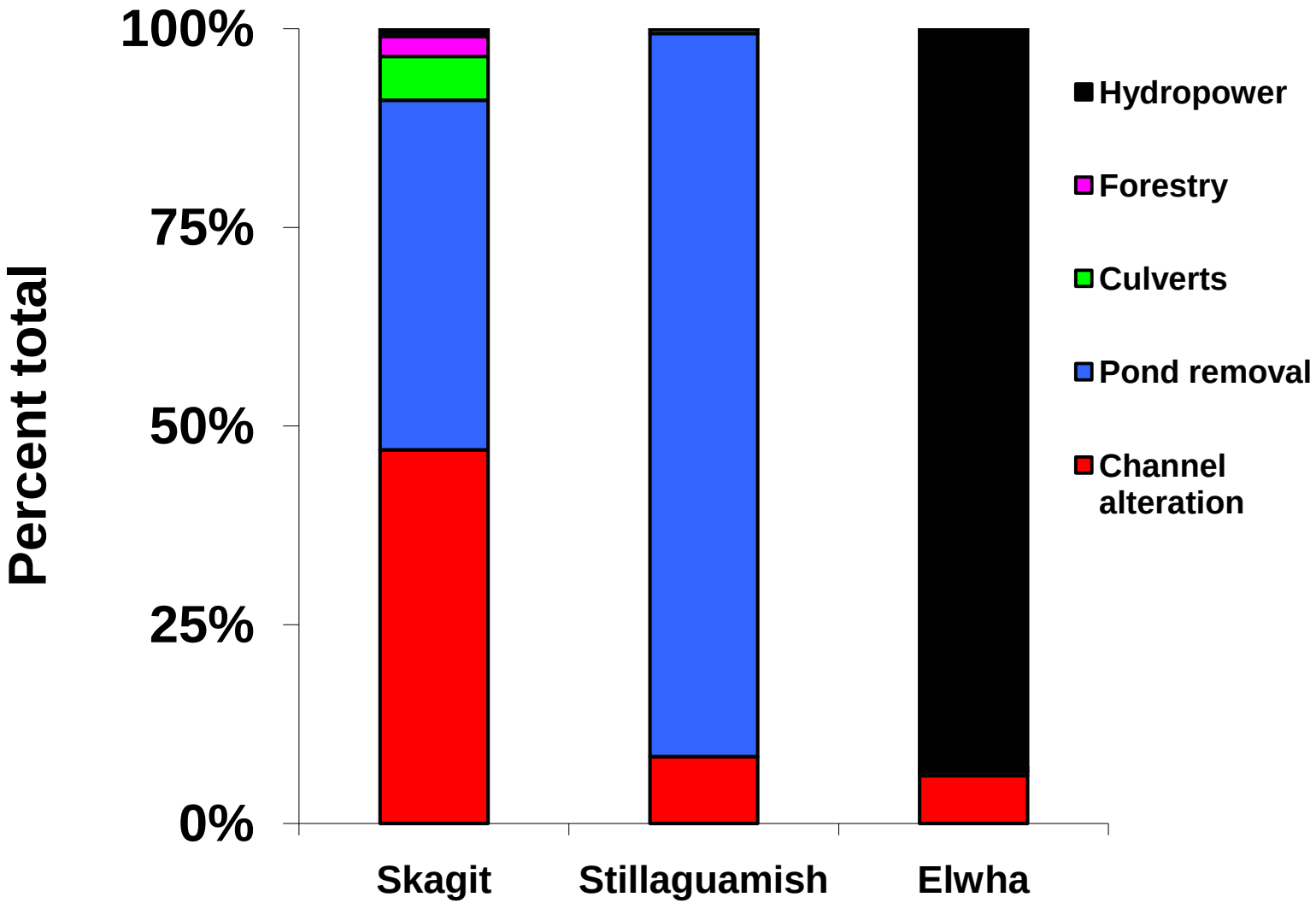
Floodplain development can lead to loss or isolation of floodplain habitats





Figures courtesy of Brian Collins – University of Washington

Floodplain habitat isolation differ by basin



Pess et al. 2003, Beechie et al. in prep

How do we restore floodplains?

Photo courtesy of Dave Montgomery

Photo courtesy of Lauren Rogers

Revetment removal & buried setback levee
Pautzke Project – Green River

Revetment removal & buried setback levee
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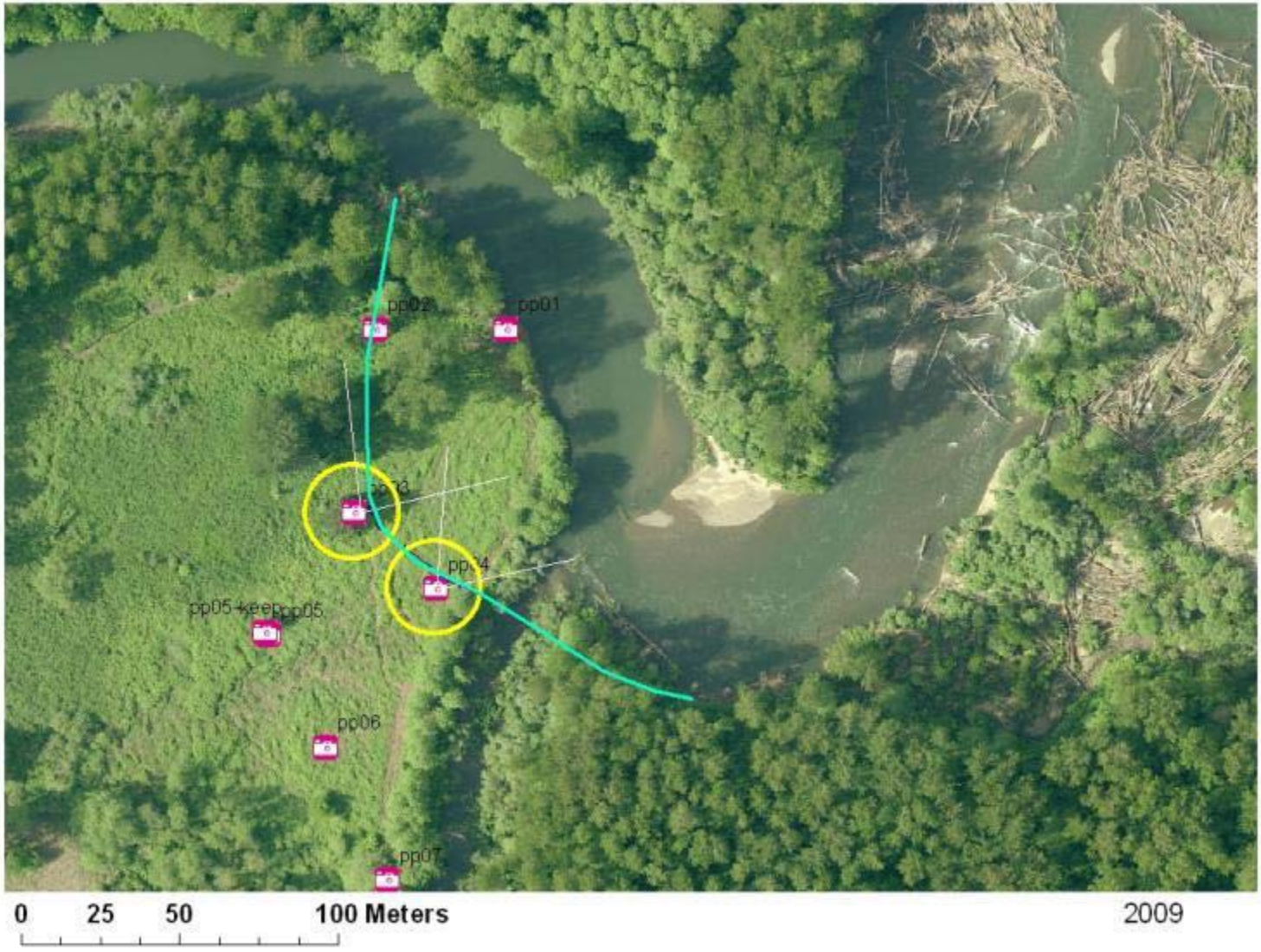


Photo point #3
Photos courtesy of Josh Latterell, King County
August 14, 2009

Photo point #3

Photos courtesy of Josh Latterell, King County

February 16, 2011

Photo point #4

Photos courtesy of Josh Latterell, King County

August 14, 2009


Photo point #4
Photos courtesy of Josh Latterell, King County
February 16, 2011

Summary

- What is a floodplain?
  - Geomorphic
  - Hydrologic
  - Ecological
- What features are associated with floodplains?
  - Slower water areas, accompanying vegetation & obstructions
- Why are floodplains important to aquatic ecosystem function?
  - Repository and increased residence time of water, wood, & nutrients
  - Attenuate peak flows, enhance low flows
  - Slower water environments for juvenile salmonids during critical times of their life cycle
- How do we disturb and alter floodplains?
  - Isolate or disconnect the floodplain from its main channel
- How do we restore floodplains?
  - Allow for main stem to access floodplain during a suite of flow events
  - Allows for natural processes of sedimentation and erosion

Resources

- Historic floodplain conditions
  - http://riverhistory.ess.washington.edu/

- Examples of floodplain restoration efforts
  - Tolt River
    - http://www.kingcounty.gov/environment/animalsAndPlants/restoration-projects/tolt-restoration.aspx
  - Chinook Bend, Snoqualmie River –
    - http://www.kingcounty.gov/environment/waterandland/natural-lands/ecological/chinook-bend.aspx
  - Preston, Raging River –
    - http://www.kingcounty.gov/environment/waterandland/natural-lands/ecological/raging-river-plan.aspx