

Future of the Wapato Reach Riparian Forest

Hydroregulation, restoration options, and the Sustainability of our Cottonwood Forests

Tom Elliott, Yakama Nation Wildlife Program
Kevin Fetherston, Natural Systems Design

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Presentation Outline

- **I. Problem statement**
- II. Hydroregulation Impacts on Downstream Floodplain Forests
- III. Suggested Strategies and Vision

Future of riparian forests in the Yakima river basin?

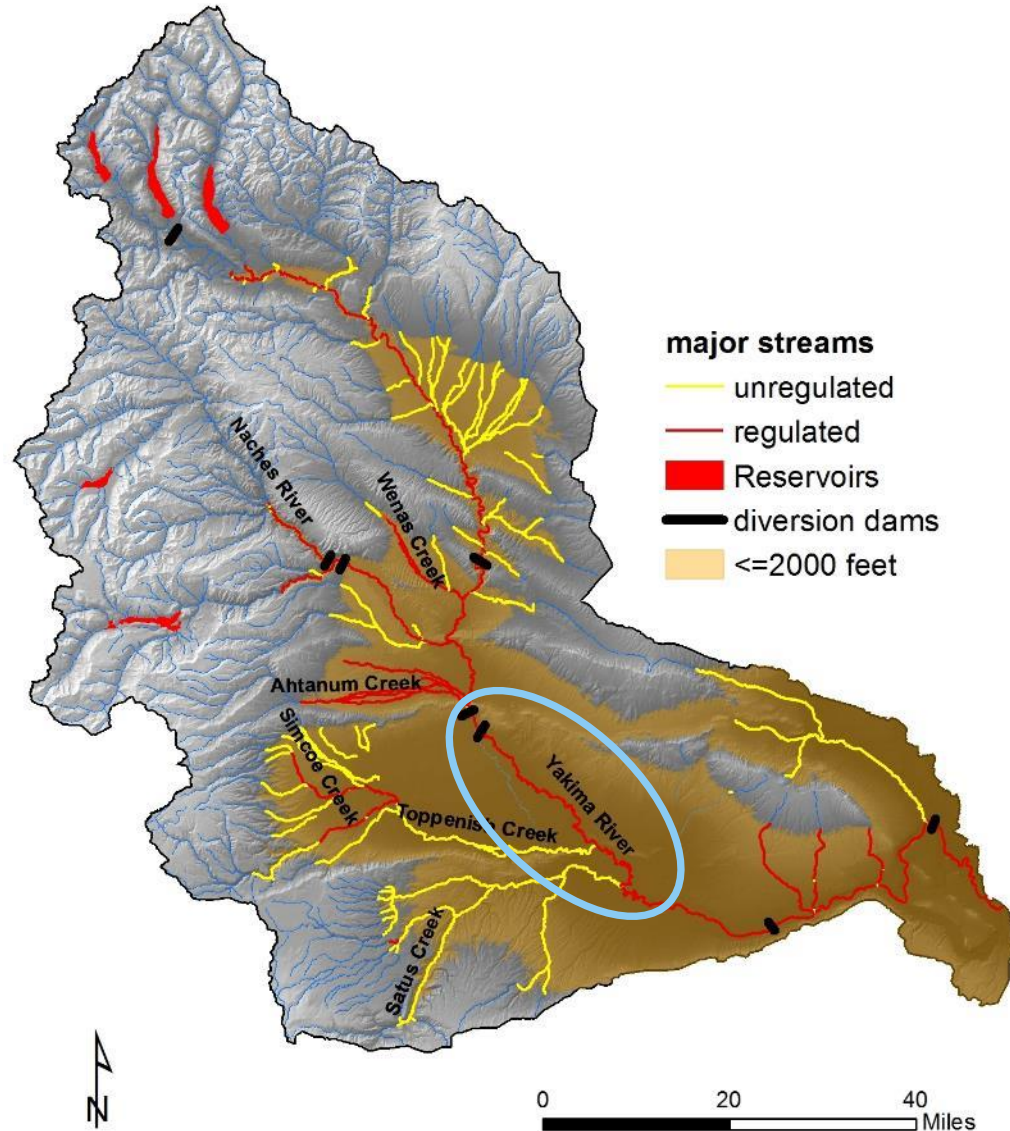
- PROBLEM 1: lowland riparian forests in the Interior West are **subject to hydroregulation**. Without intervention will these forest slowly diminish or even disappear functionally?
- PROBLEM 2: lowland riparian forests not subject to hydroregulation are forecast to suffer impacts due to climate change. How to sustain these forests in the future?
- Problem 3: Need a framework to strategically guide riparian restoration and sustainable management (stewardship) at landscape scales over decades



Decadent cottonwood stand, Yakima River

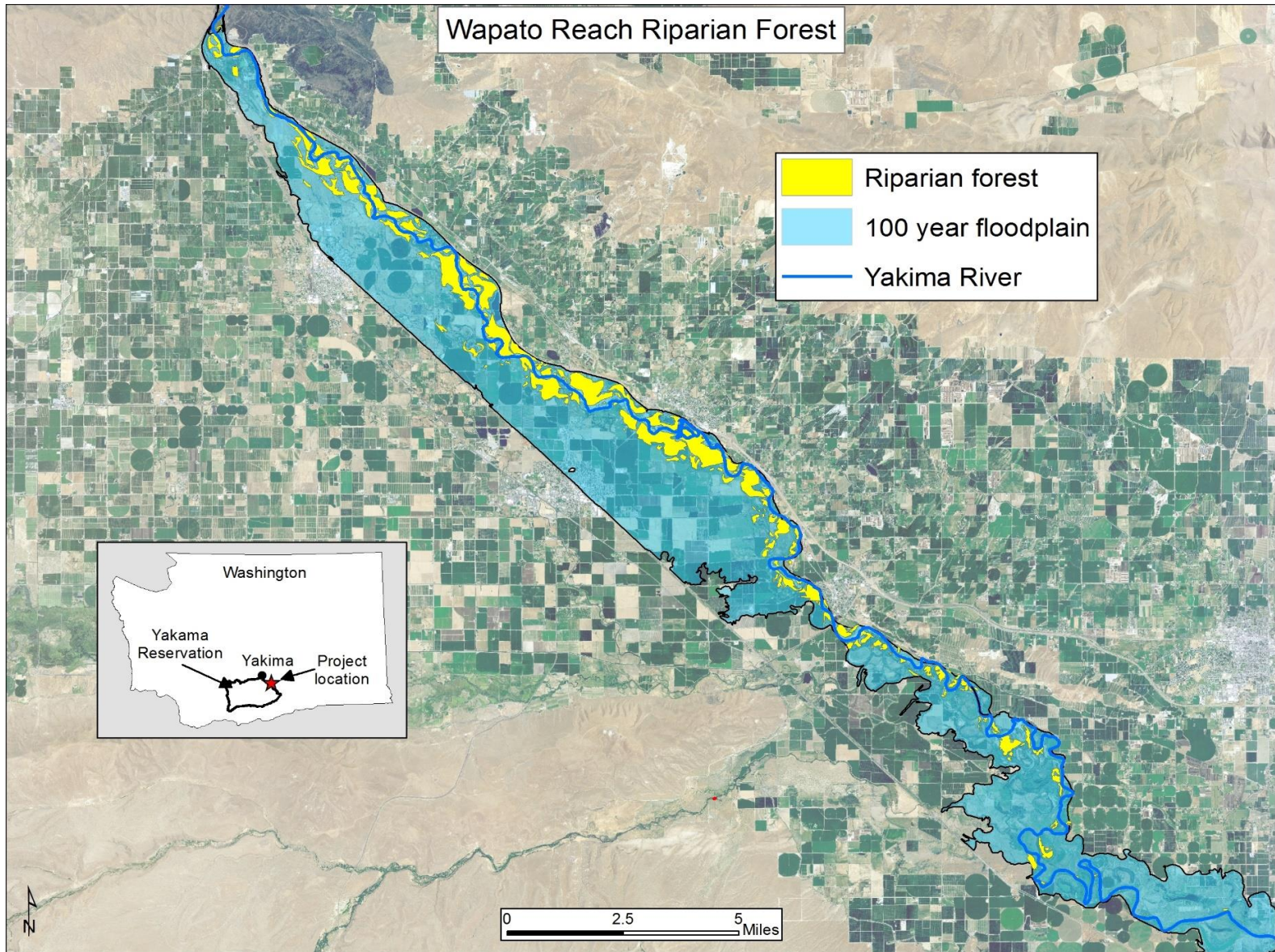
The Yakima River Basin – extent of flow regulation

- 5 storage reservoirs, 8+ major diversion
- 900 + stream miles < 2000 ft., 511 regulated, 406 unregulated
- 15,000 to 20,000 acres of lowland riparian forest
- Desert river in lowlands, totally dependent on flow from upstream



Dunes and cottonwoods, Satus Wildlife Area

Wapato Reach ~4,000 acres of high value forest





Floodplain habitat, high diversity

T. Elliott

Ecosystem services—flood
attenuation, sediment trapping,
carbon sequestration etc





T. Elliott

Large woody debris material & aquatic
habitat forming processes

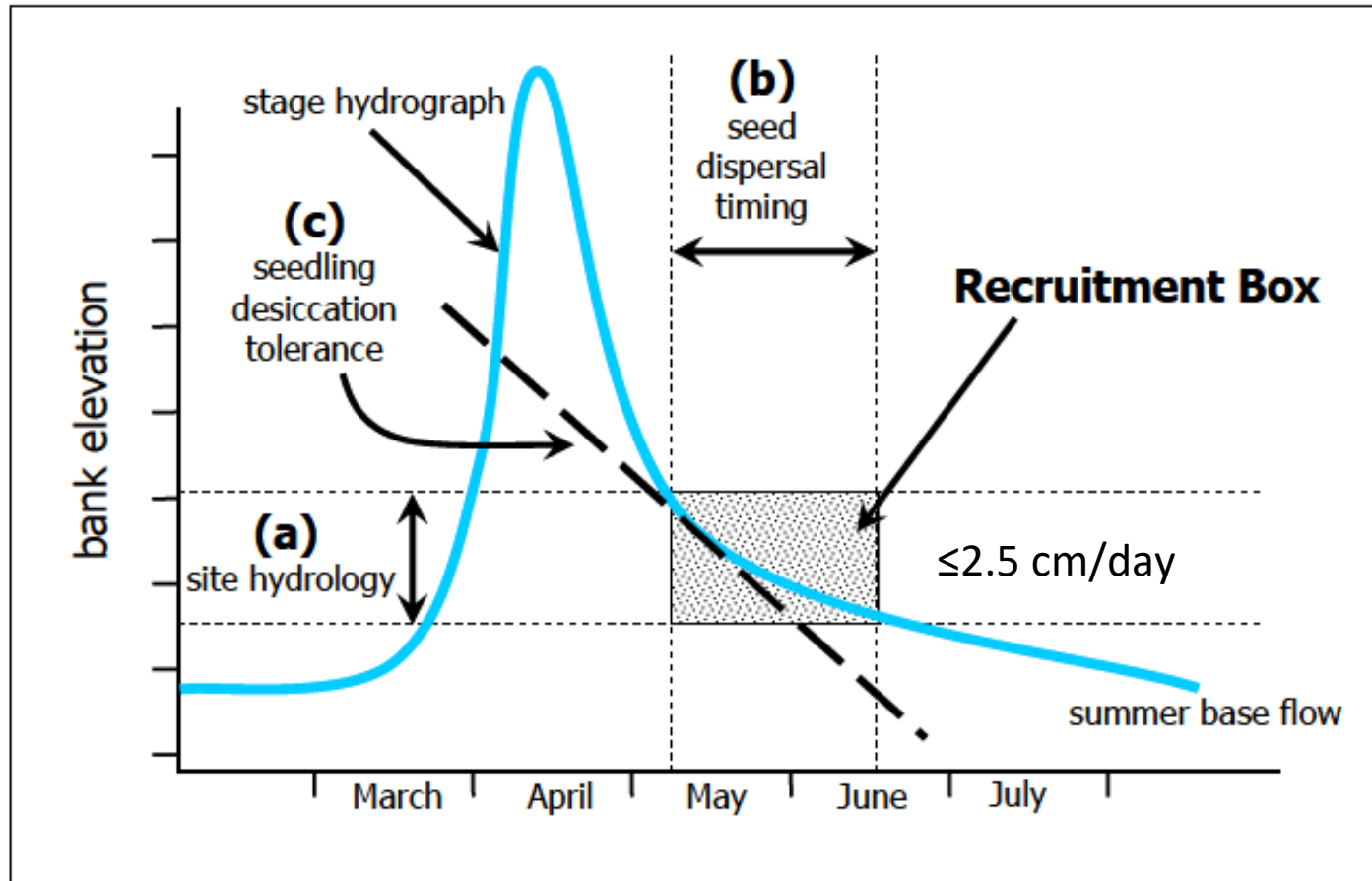
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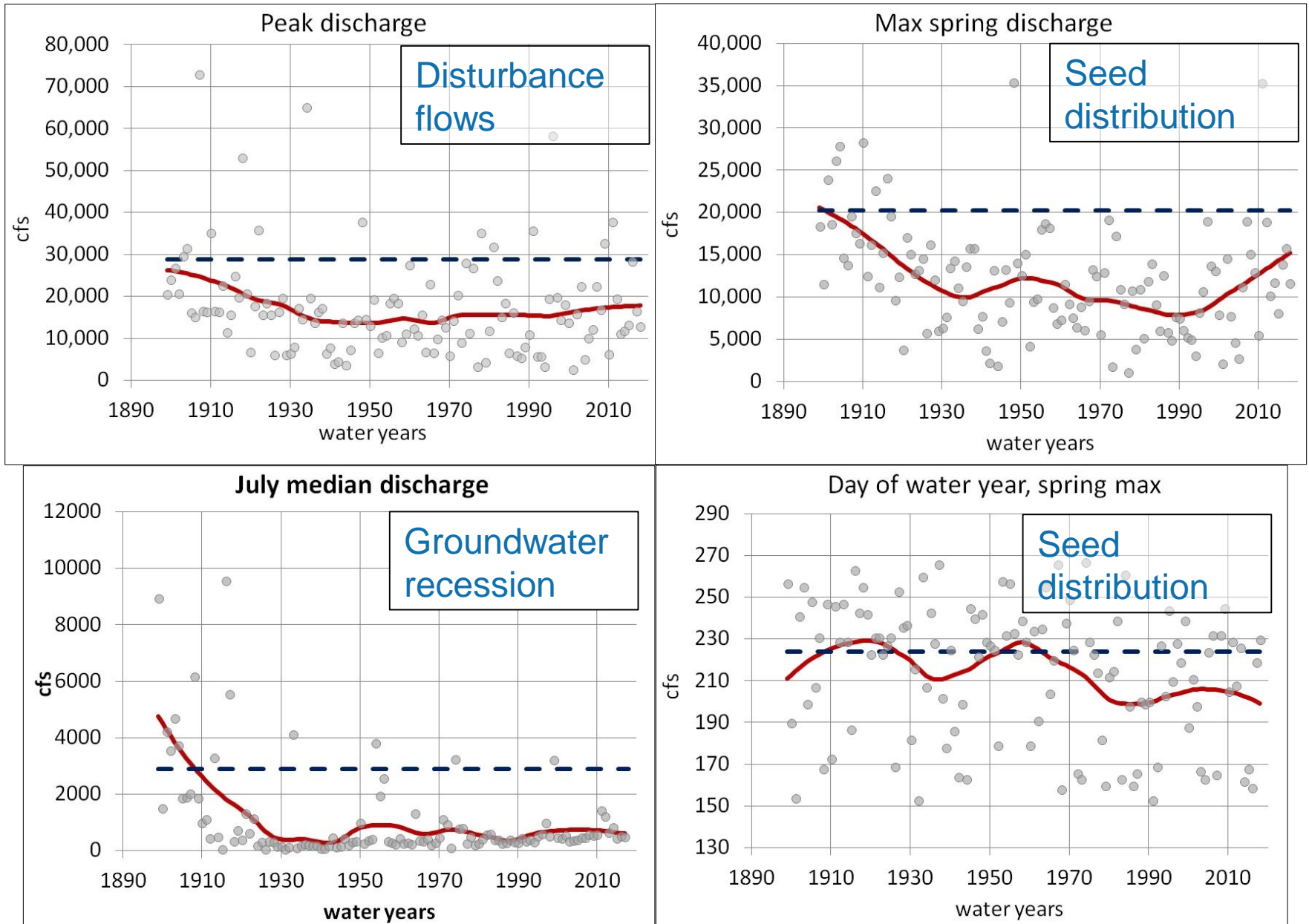
Cottonwood regeneration by seed-requirements:

- I. bare surface free of competing plants ✓
- II. Spring flows to deliver seeds on time and in the right place-the Goldilocks zone
- III. Surface moisture for germination
- IV. Slowly declining water table so roots can keep pace
- V. Protection from scour and deposition, can be location or low flow years

Seedling recruitment strongly depends on river flows

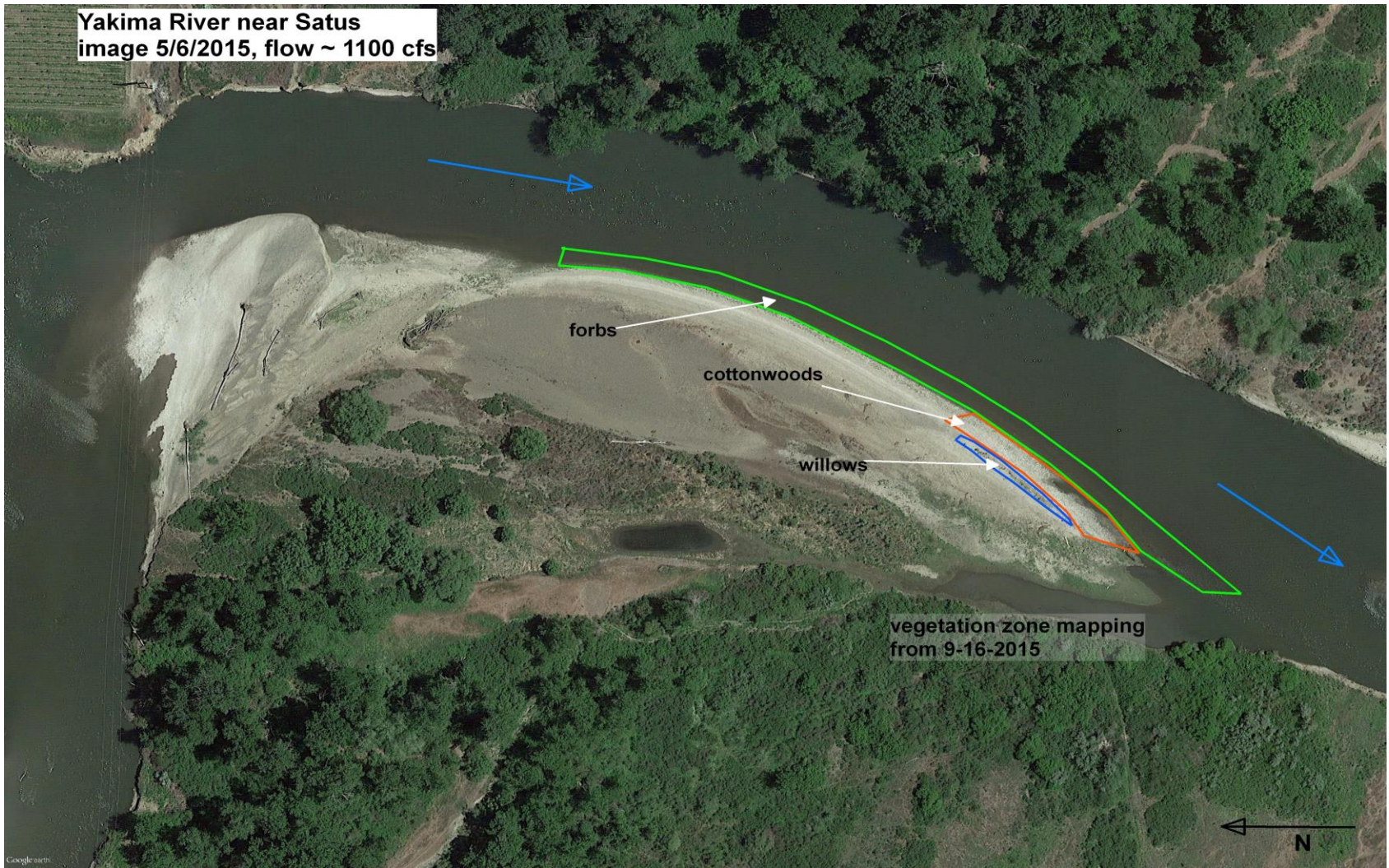


(Stella 2006)



—smoothed line • data - QU av

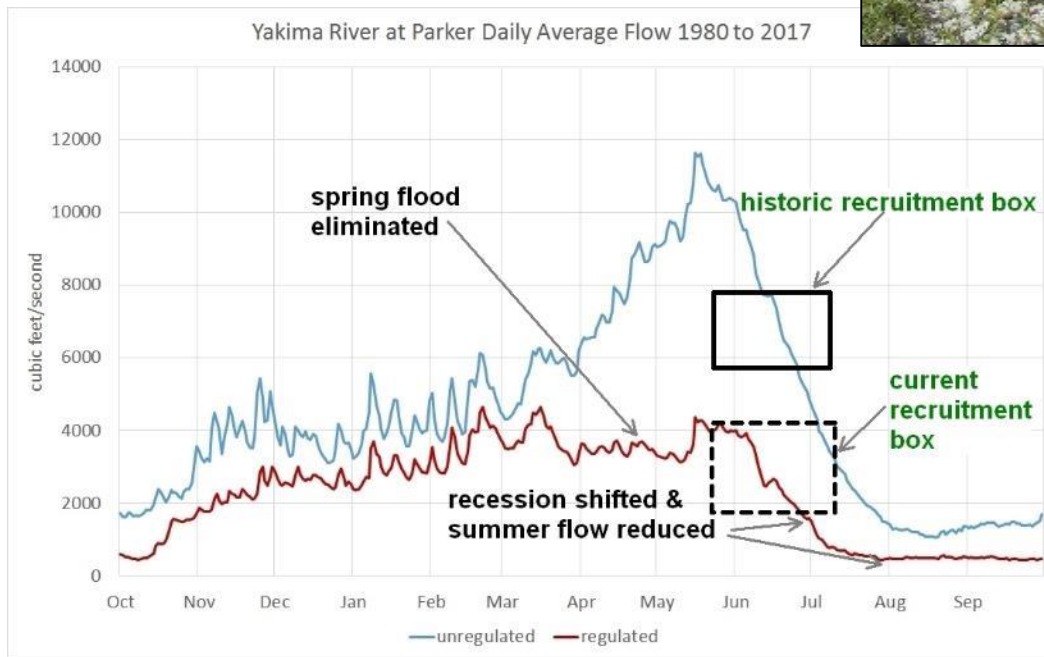
Limited recruitment



Riparian vegetation zones on gravel bar near at Satus Wildlife Area

Wapato Reach-Regulation Drives Decline

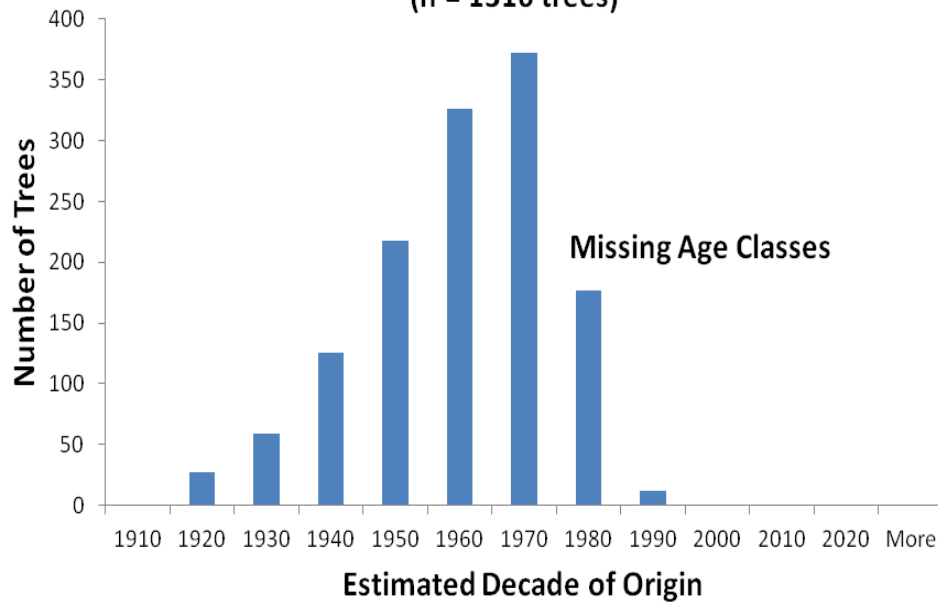
- Observed and documented lack of recruitment
- Seedlings establish too low
- Destroyed by scour or deposition in floods



Cottonwood reproductive failure downstream of dams

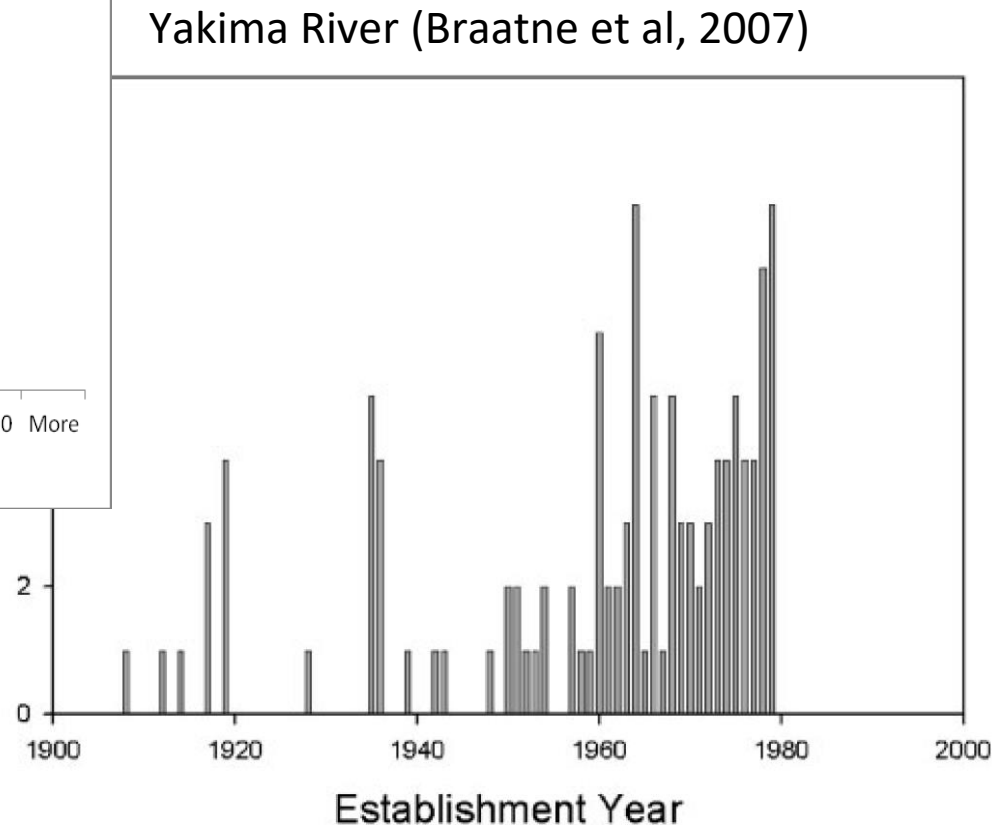
Cottonwood Estimated Year of Origin

(n = 1316 trees)

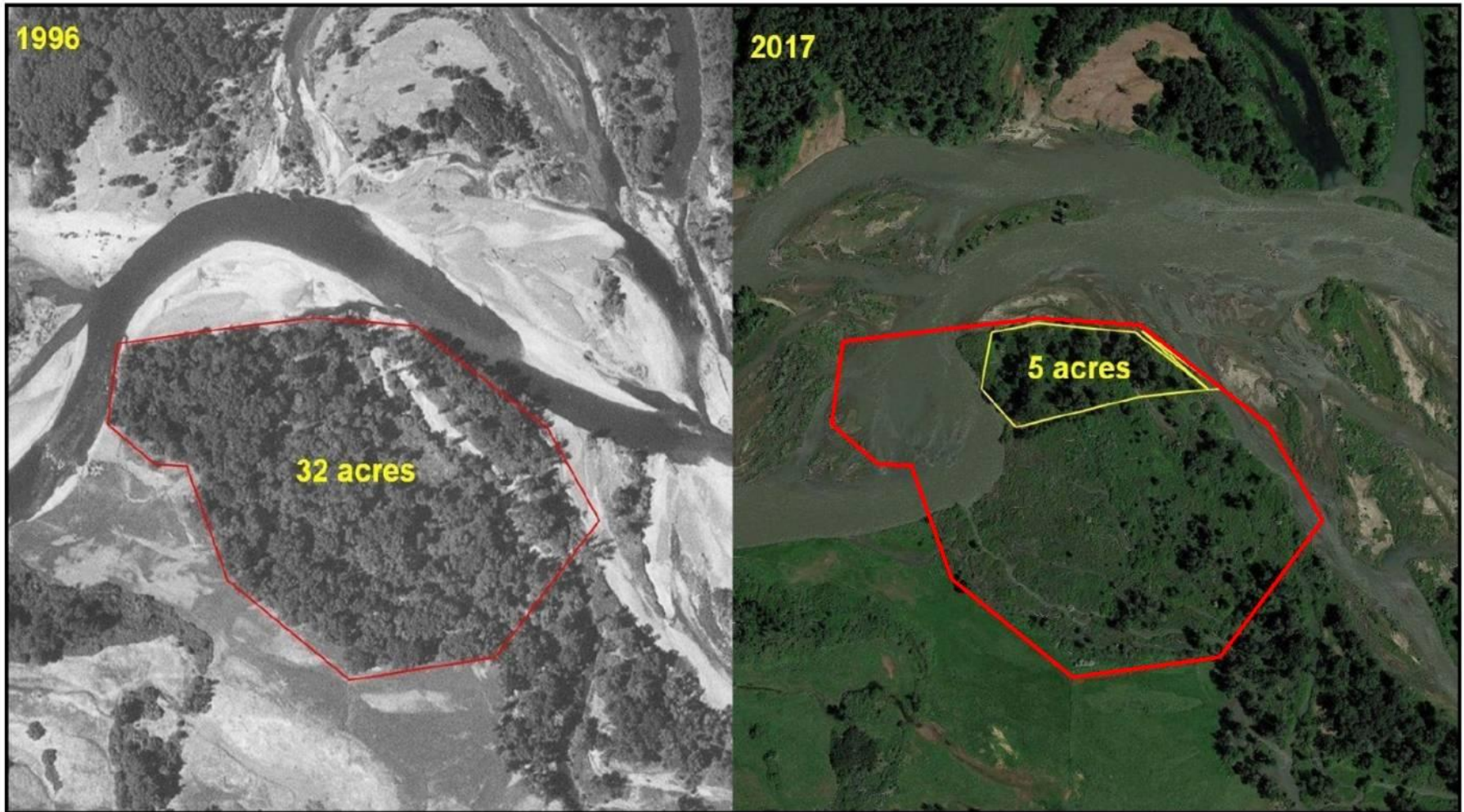


Missing Age Classes

Rio Chama, NM (Fetherston 2012)



River processes still drive forest loss



Cottonwood forest loss from bank erosion and fire near Toppenish, WA.

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Strategies for Long-term Restoration & Management-Ranked in rough order of cost

- Flow management (spring pulse flows, recession management, water conservation)
- River engineering (wood replenishment, set back levees, floodplain contouring)
- Herbivory control
- Planting (at elevations informed by future flows, in side channels)
- Novel strategies (directed evolution, translocation of species ...)
- Combine strategies
 - Gonzalez et al 2018, Perry et al 2015, Capon et al 2013

Vision for Wapato Reach Riparian Restoration

- 10-20 year plan to restore age structure, maintain or increase extent, and manage weeds along 50 river miles
- Being developed by Yakama Nation with support from Yakima Integrated Plan (state, county, federal, non-profit)
- Funded through 2022 by Integrated Plan and Natural Resource Conservation Service
- Technical paper in spring 2018, concise plan in summer 2018, start implementation fall and winter 2018-2019
- Strong adaptive component to identify best approaches



Active recruitment in side channel near Toppenish

Questions?



Selected rivers with known riparian decline due to dams

Green River, CO

San Pedro River, AZ

Rio Chama, NM

Rio Grande, NM

Missouri, MT

Marias, MT

St. Mary, AB

San Joaquin, CA

Bow, AB

Truckee, NV

Colorado, CO

Sacramento, CA

Boise, ID

Snake River, ID

Bridge, BC

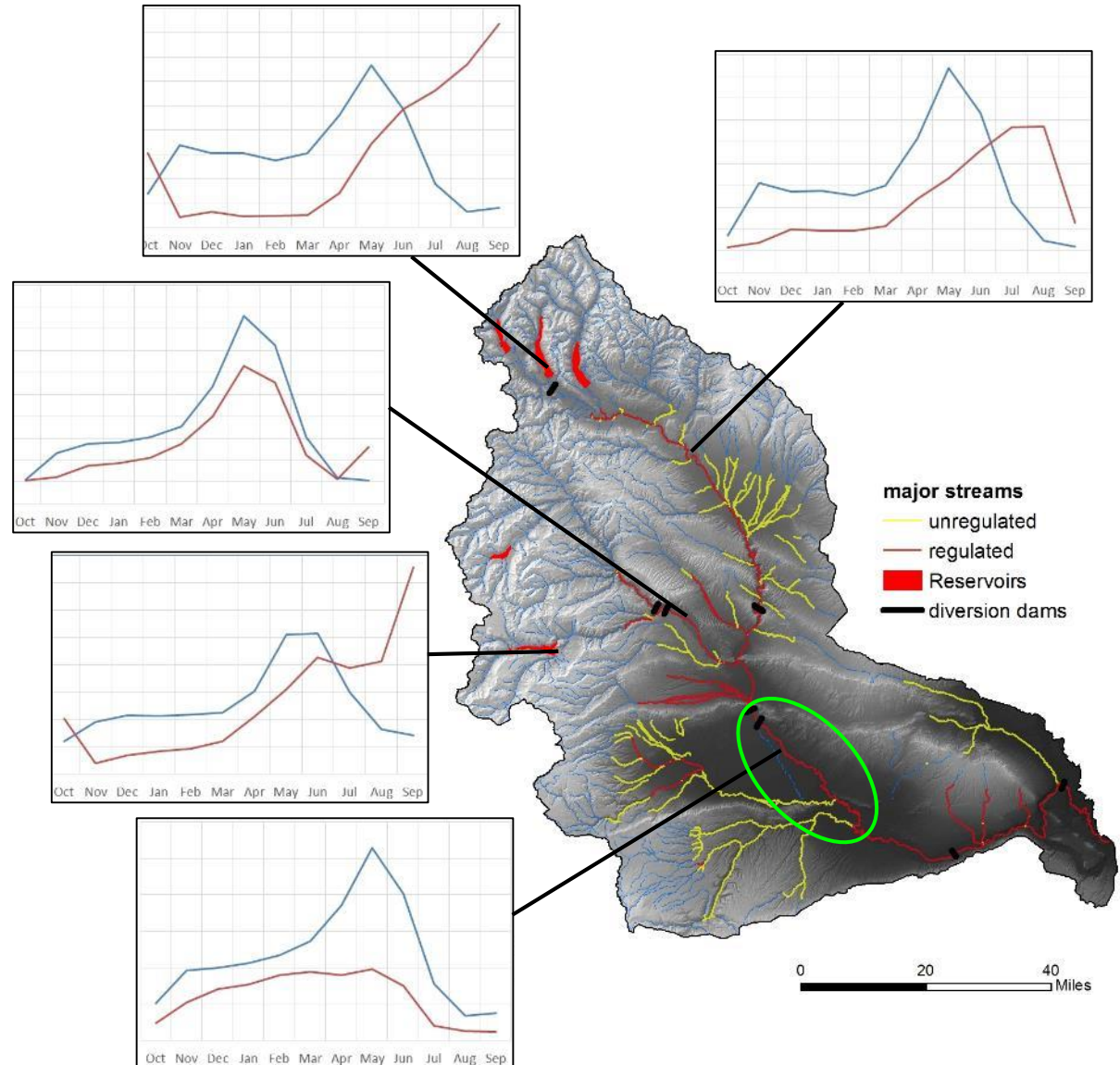
Skagit, WA

Kootenai, ID

Redwater, MT

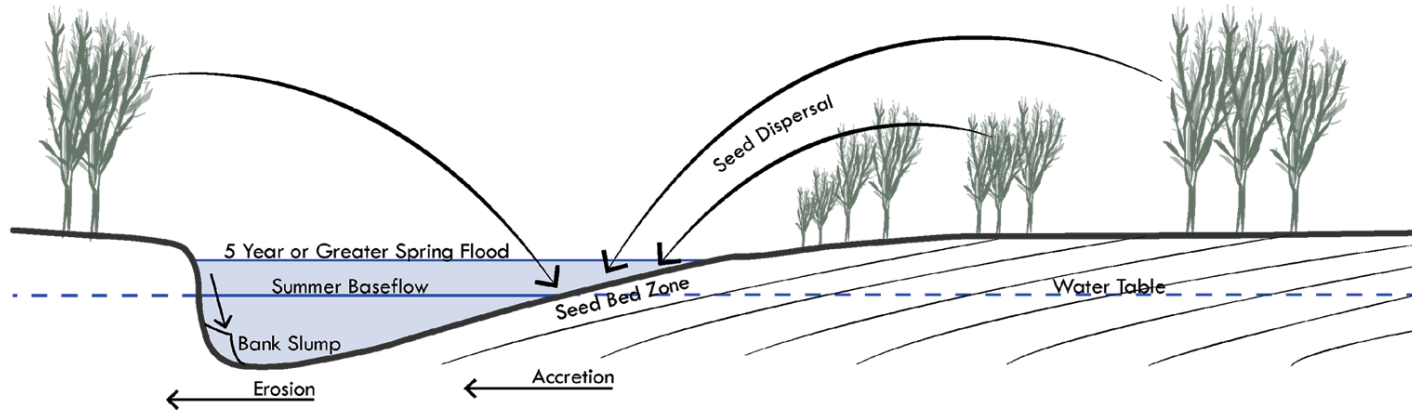
Hydrologic Effects of Regulation

- Key flow components altered, differs by reach
- **Snowmelt flood timing and size**
- **Snowmelt recession**
- **Summer flows**
- Recruitment likely impaired in all regulated reaches
- 12,600 acres lowland forest regulated, 5,700 unregulated

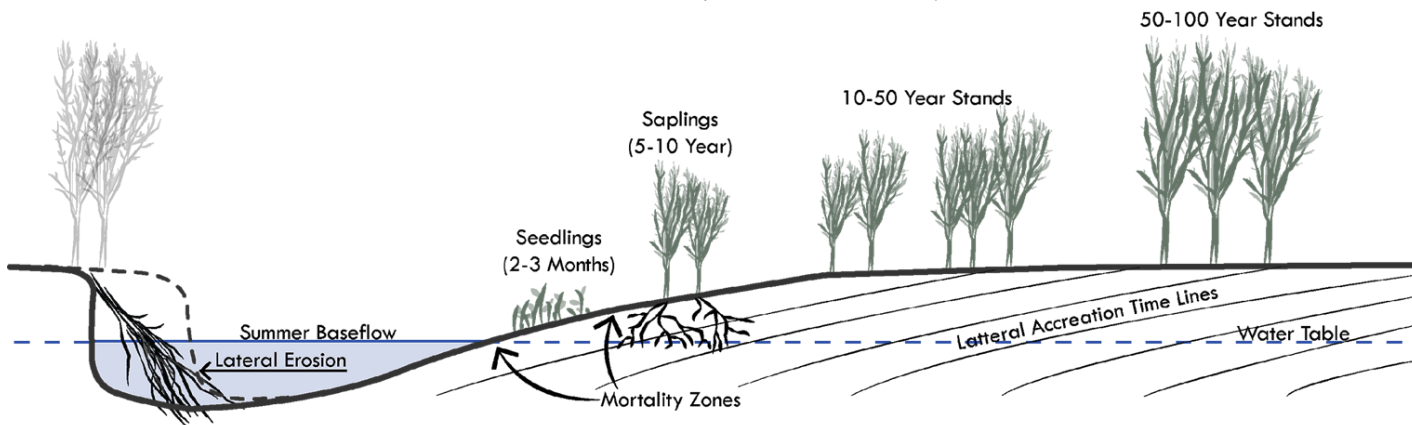


Populus Spp Sexual Reproduction–Seedling Safe Sites

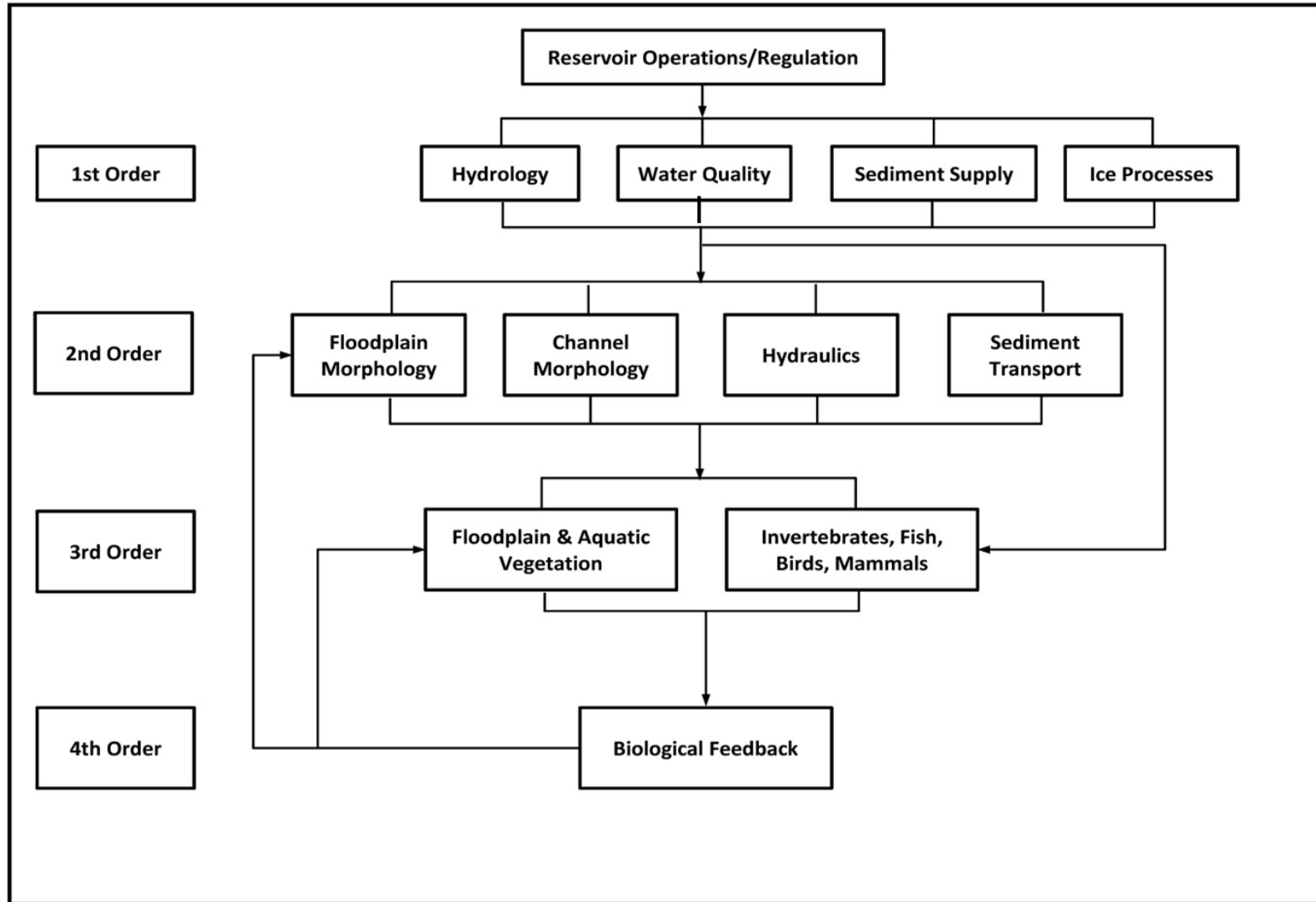
SEED DISPERSAL AND GERMINATION



ESTABLISHED SAPLINGS WITH NEW SEEDLING COHORT (5-10 YEARS LATER)



Physical and Biologic Impacts of Dams–A Cascade of Effects



(Modified from Petts 1984; Jorde et al. 2008; Burke et al. 2009)