

Introducing the Role of Beaver in Stream Ecosystems

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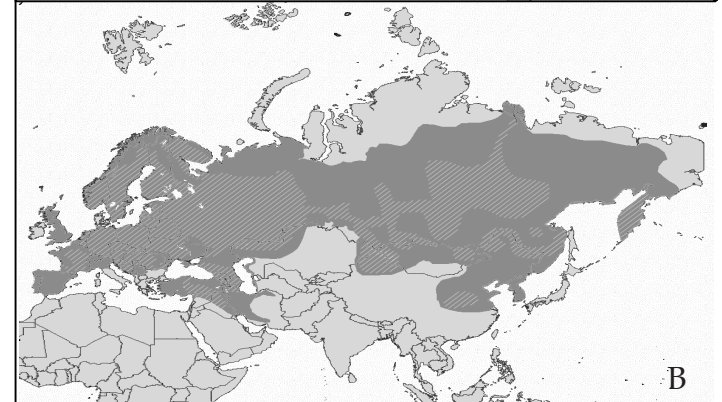
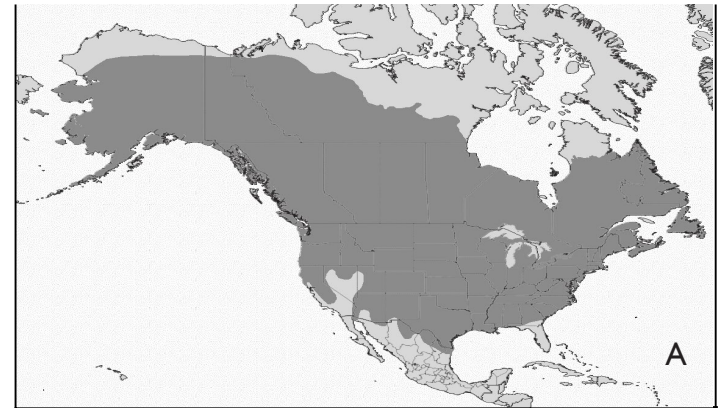


Life History Niche

- Largest rodent in North America (up to 90 lbs!)
- Ubiquitous within N. hemisphere temperate ecosystems
- Range from boreal to aridlands
- Habitat generalist; highly adaptable
- Common habitat ingredients: water + wood
 - Northern tundra and treeline range boundary: wood limitation
 - Southern range desert boundary: perennial streamflow and/or wood limitation

Worldwide distribution of beaver

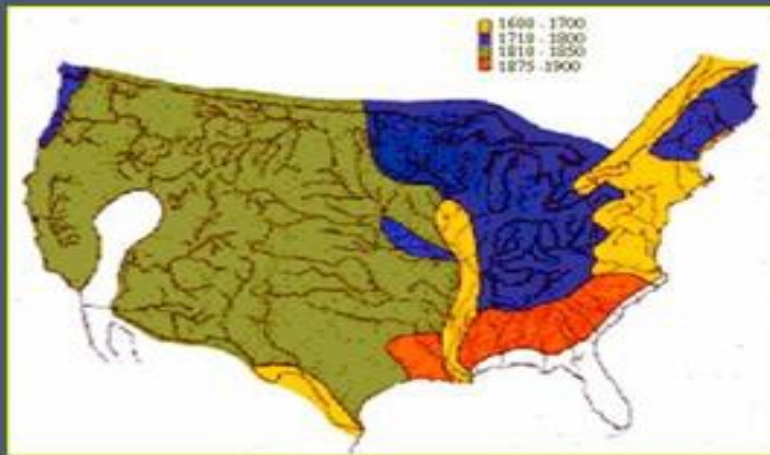
- *Castor canadensis* (N. America)
- Historically, 60–400 million pre-European settlement (Seton 1929)
- Currently, 6–12 million (Naiman et al. 1988), but estimates are crude
- Spatial distribution approaches its historical range
- *C. fiber* (Eurasian beaver)
- More limited current distribution, but expanding back to parts of its historical range



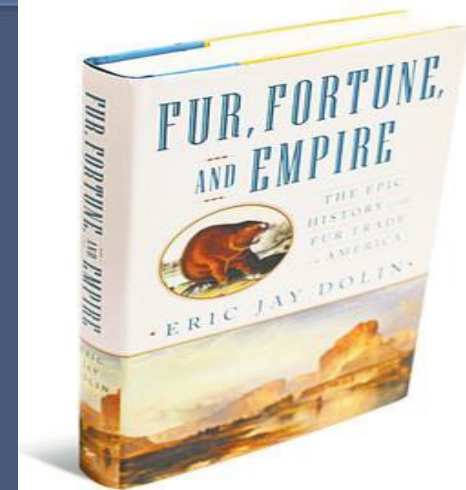
Pollock MM, Heim M and Werner D. 2003. *Hydrologic and geomorphic effects of beaver dams and their influence on fishes.*

300 year history of beaver extirpation in US - economic, not necessarily biological extirpation

Timing of Beaver Trapping
in the Lower 48 States



Map courtesy of Jim Sedell, USDA Forest Service (2001)



A HABITAT GENERALIST - AND HIGHLY ADAPTABLE

- Lakes
- Rivers and streams
- Abandoned channels on floodplains
- Wetlands



FROM BOREAL FORESTS....



Fred Hirschmann—Science Faction/Getty Images



<http://www.for.gov.bc.ca/dfn>

...TO DESERTS



Beaver Diet: A choosy generalist



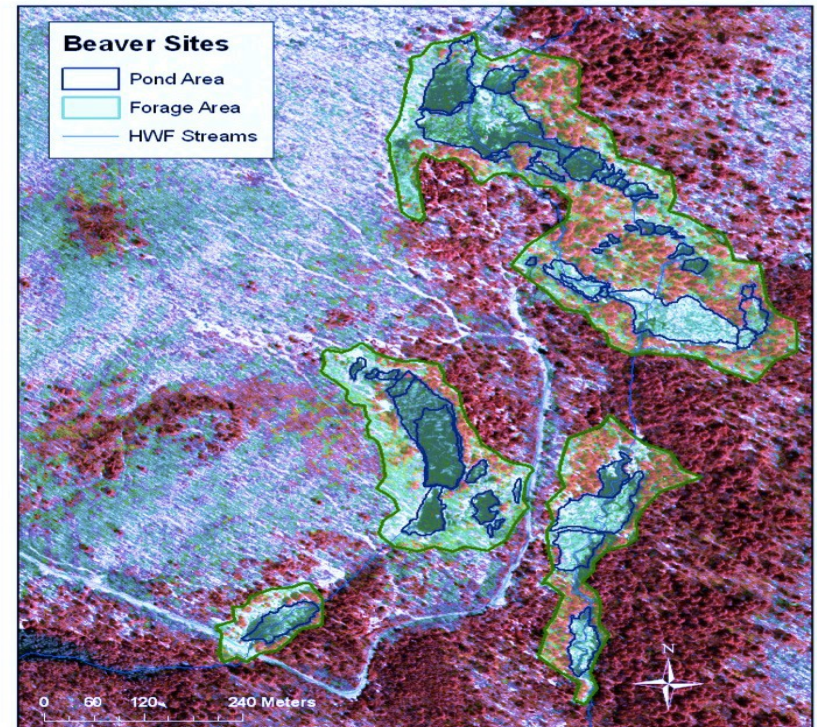
- Spring/Summer: herbaceous plants, including aquatic and riparian forbs, grasses, grains and row crops
- Fall/Winter: tubers, bark and cambium of cached woody plants
- Woody plants comprise most of winter diet; much less of summer diet
- Number of woody species consumed range along latitudinal gradient



Chris Jordan

The Colony

- Colony unit = 6–8 related individuals
- Avg. litters = 2–5 kits
- Young stay with parents at least 2 years
- Adults (>2 yrs) disperse to establish new lodge, 1 – 25k away from natal site
- Territories marked with scent mounds
- Home ranges tend to follow shorelines in lakes, ~1km in streams
- Colony saturation densities vary with landscape and region



John Stella

Aquatic Habitat is Critical to their Success



- Beaver more agile in water than on land; maximize time in the water
- Ponds provide cover from predators and foraging pathways
- Lodge includes underwater entrance, nest area above water

Location, location, location....

- Bank dens vs. aquatic lodges
- Caches are submerged or exposed



Yes, that's all well and good, but what we're really here to learn about is...

BEAVER DAMS



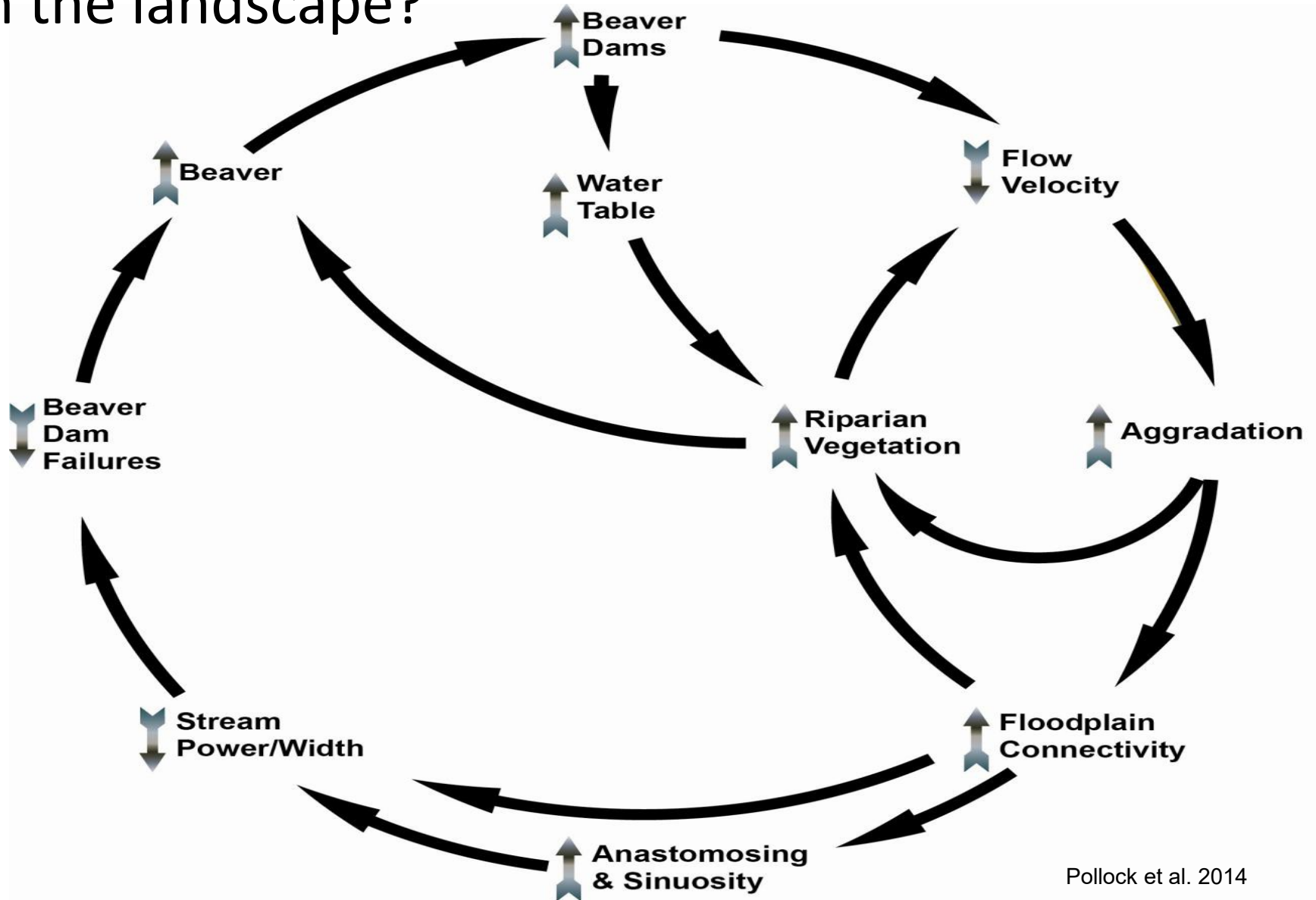
- Created to impound water around lodge
- Dam location / repair cued by running water
- Dams constructed of wood and available debris (e.g., plastic, metal)
- Where palatable species are rare, conifers are used more in dams, with hardwoods saved for the food cache

Dam/Pond Complexes

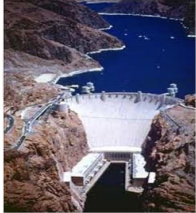
- Multiple dams create safe transportation corridors to connect large ponds
- Dams complexes grow over time, allowing beaver access to more food sources



What are the effects of beaver dam building activity on the landscape?



DAMS ARE POROUS... & TRANSIENT



Joe Wheaton



Joe Wheaton



Joe Wheaton

DAMS CHANGE NATURE'S CLOCK



Residence time of:

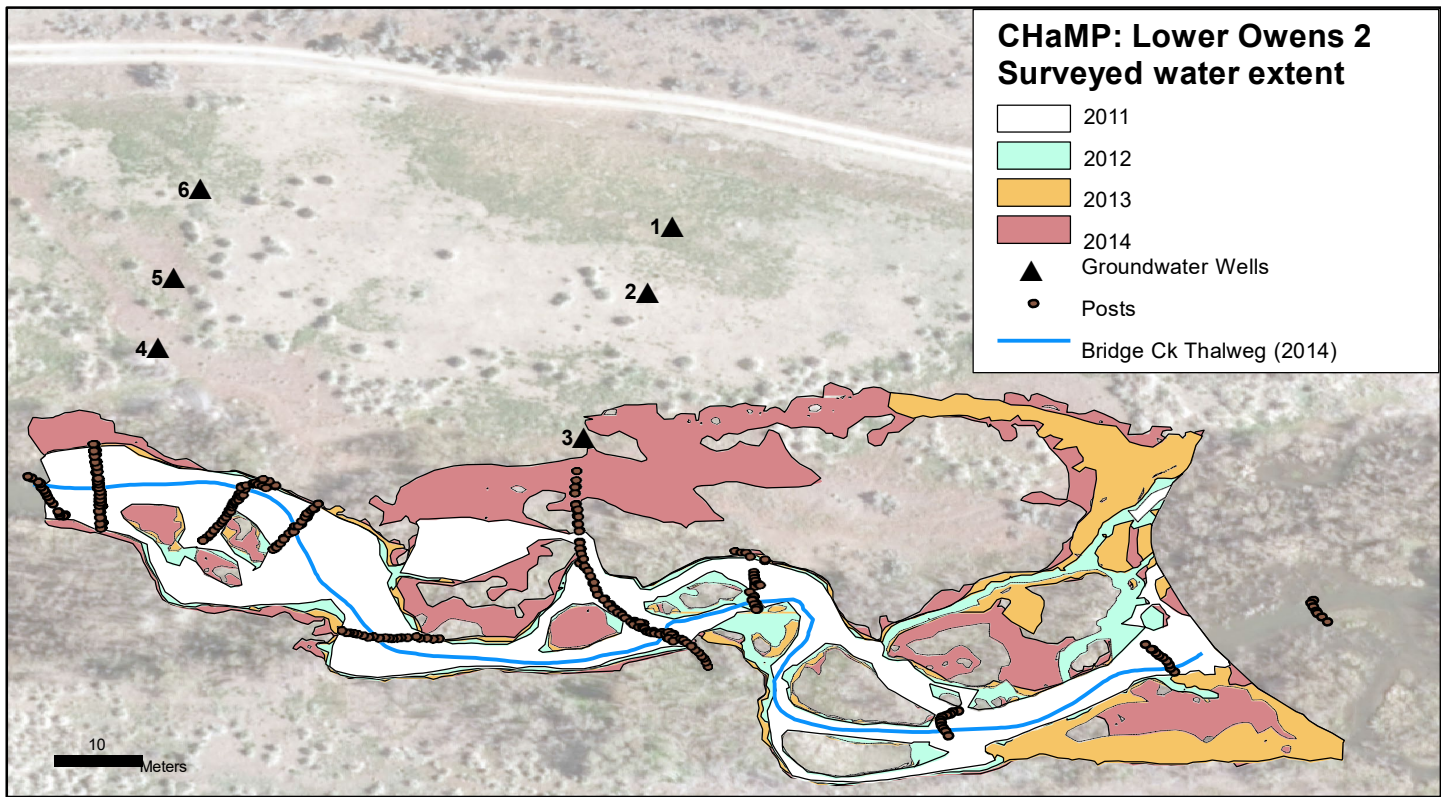
- Water
- Sediment
- Nutrients

What would time distributions look like when -

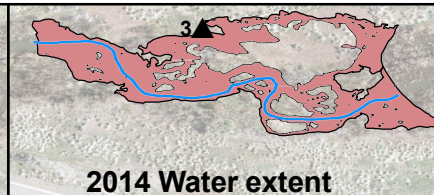
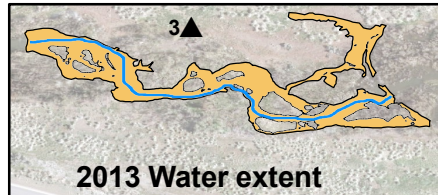
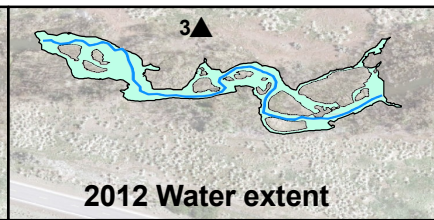
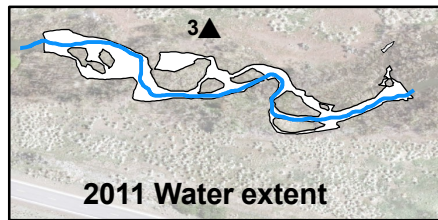
- Stream Undammed
- Dam present, Dam breached, Dam failed?

DAMS CREATE A DIVERSITY OF HYDRAULIC HABITATS...





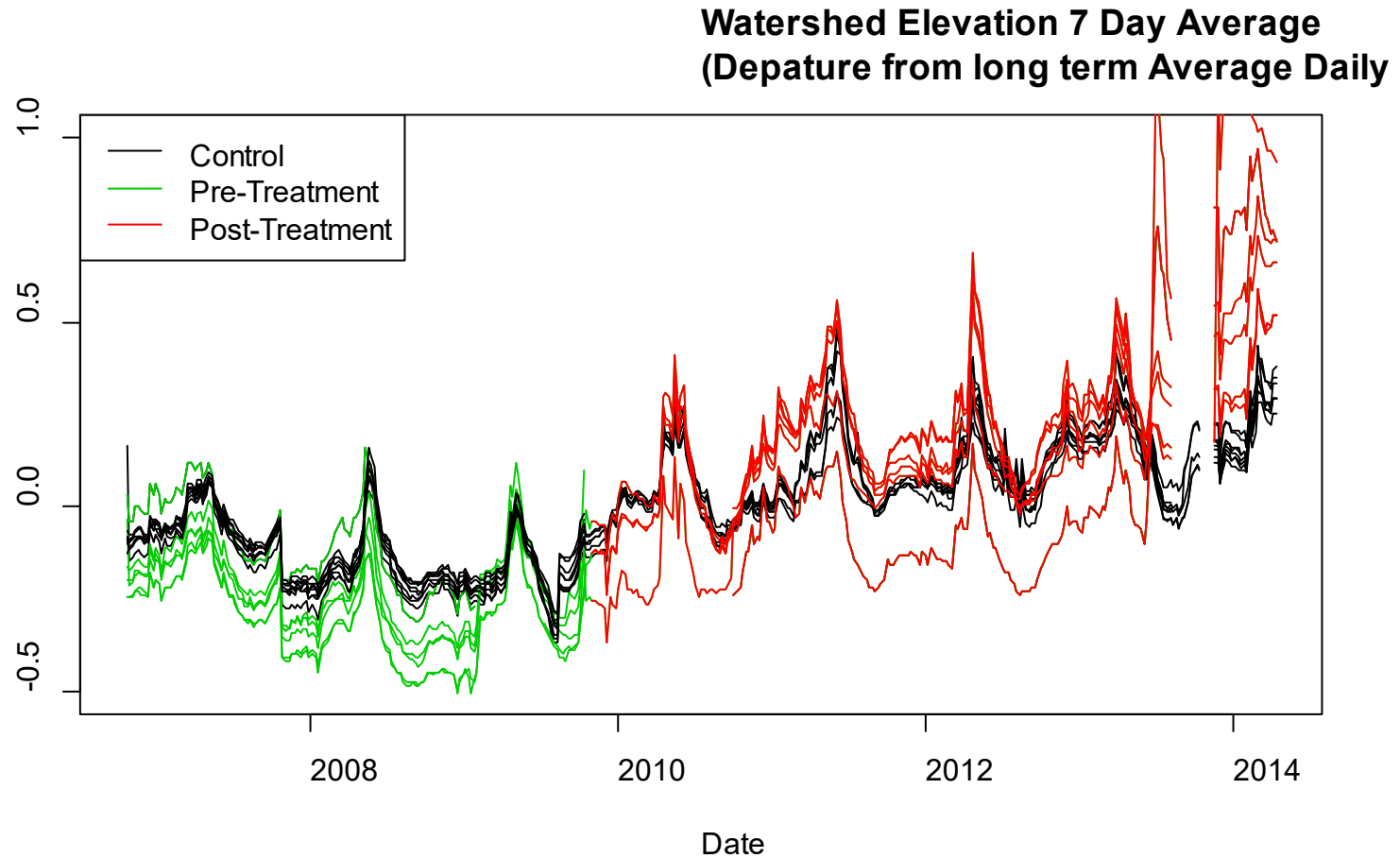
Carol Volk



Dams spread water out...

Dams back water up (and down)...

7 Day Ave Water Elevation Depar



Dam building activity drives the ecological feedbacks that beaver are known for



- Shallower water table
- Increased groundwater moisture
- Forest species composition and size distribution
- Multi-stemmed growth
- Woody species regeneration

Beaver impacts: landscape conversion

- Beaver change landscape from terrestrial to aquatic
- Most landscape change occurs in first 20 years



John Stella

Beaver impacts: increase wetland area

- Increased landscape diversity
 - Wright et al. 2002
- Waterfowl habitat
- Increased amphibian habitat
 - Karraker and Gibbs 2009



Beaver impacts: forest structure

- Removal of understory and canopy trees
- Open up canopy to understory/unpalatable species



Photo by Anna M. Harrison

The Dynamics of Beaver Dam Complexes Form Landscapes

