## Effects of Summer and Winter Drought on Cottonwood Growth, Wind River Wyoming

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Wind River downstream of Riverton, Wyoming, May 2, 2014, from Google Earth

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## GOALS

- 1. Use cottonwood tree rings and Traditional Ecological Knowledge to explore the last 250 years of river flow in Wind River Indian Reservation.
- 2. Assess how climate change and water management might affect cottonwood growth and survival.

## FUNDING IS FROM THE BUREAU OF INDIAN AFFAIRS



## Wind River upstream of Boysen Reservoir, May 2017

Wind River Indian Reservation Cottonwood Study Sites Legend Cored Tree Flow Gage

Crowheart Near USBR Wyoming Canal Gage

NWIS Wyoming Canal Gage

Dam Site Wind River Near Kinnear, WY Boysei Reservo

> Wind River Above Boysen Reservoir

Wind River at Riverton, WY

Little Wind River Near Riverton, WY

Google Earth

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Cottonwood Study Site Boysen 56 Trees at Randomly Selected Points

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2000 ft

Google Earth

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Cottonwood Study Site Diversion Dam 63 Trees at Randomly Selected Points

Diversion

Dam

Wyoming Canal

A N Cottonwoods are mostly narrowleaf cottonwood (*Populus angustifolia*) near Diversion Dam and plains cottonwood (*Populus deltoides* subspecies *monilifera*) near Boysen Reservoir.

Hybrids between the two species are also common.







Russian olive *Elaeagnus angustifolia* Invasive

Bullberry *Sherpherdia argentea* Native





Dead cottonwood trees along the Wind River above Boysen Reservoir, 6/24/17. Is recent death and dieback of trees related to flow?

200 ft

ight green trees are Russian-olive.



Rings provide information about climate and flow from before the beginning of the flow record. This tree suggests a strong drought occurred in 1842.



Photomicrograph of tree rings in a core from the flood plain of the Wind River downstream of Diversion Dam, Wyoming. Photo by Richard Thaxton.

Tree Ring Width at Boysen Site vs. Average Annual Growing Season (May-Sept) Flow



**Boysen Death Date Distribution** 

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Most standing dead trees died following 2008. 6 Trees killed by the drought of 2001 are apparently already lying down. 5 Frequency 3 2 1 0 2000 2005 2010 2015 1995 **Calendar Year** 

Live vs Dead Trees Raw Ring Width

— BOD Raw Ring Width — BOC Raw Ring Width



Tree Ring Width at Diversion Dam Site vs. Average Annual Growing Season (May-Sept) Flow



Growing Season (May-Sept) Precipitation

—LDC Chron —Precipitation



Growing Season (May-Sept) Mean Max Temperature

—LDC Chron —Mean Max Temperature



Tree Ring Width at Diversion Dam Site vs. Average Winter (Nov-Mar) Flow

 Crowheart – Wyoming Canal Flows Diversion Dam Ring-Width Index 1.3 1.2 400 1.1 Ring-Width Index 6.0 1 240 Discharge (cfs) 160 Winter diversions for power generation at Pilot Butte 120 Reservoir ended in 1973. 0.8 80 There is often no persistent snow cover in late winter at 0.7 0.6 40 1950 1960 1970 1980 1990 2000 2010 **Calendar Year** 



Cottonwood growth at the Boysen Site can be used to reconstruct flows back to the early 1800s, but we must account for age and trees now dead.

It is possible that flow diversions during dormant season have affected cottonwood growth at the Diversion Dam Site.

Not the last word. Other changes in Dam Operation in the 1970s could have affected sediment transport and canal seepage.