Downstream decreases in cottonwood live canopy and growth along the Green River, USA

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I would like to recognize the tribes with ancestral homelands located within the Green River system, including:

Núu-agha-tuvu-pu (Ute), Tséstho’e (Cheyenne), Newe Sogobia (Eastern Shoshone), Apsáalooke (Crow), Timpanogos, Nuwuvi (Southern Paiute), Diné Bikéyahs, Pueblos

https://native-land.ca/
Take-aways

• Cottonwoods in Canyonlands National Park are shorter, have less canopy volume, and are slower growing compared to cottonwoods upstream in Dinosaur National Park.

• Growth differences are caused by moisture limitation.

• Cottonwoods at Canyonlands are more vulnerable to future declines because of decreases in flow availability and an increasingly hotter and drier climate.
Part 1: Upstream and Downstream Differences
Deerlodge Park (Dinosaur National Monument)

Island Park (Dinosaur National Monument)

Canyonlands (Canyonlands National Park)

Preliminary Information - Subject to Revision. Not for Citation or Distribution.
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(Dinosaur National Monument)

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Tree Height and Percentage of Live Canopy

Increment Cores and Ring Width Measurements

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Percentage of live canopy and tree height are lower at Canyonlands.
Upstream
40.53, -108.99

Downstream
38.40, -110.02

Photo by Lee Gelatt

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Canyonlands trees grow slower than trees upstream later in life
However, there is no visible growth decline in the ring-width chronology.
Part 2: Differences Linked to Water Availability

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The Hydraulic Cost of Being Tall

The hydraulic pathway is longer for taller trees – water has to fight harder against gravity.
Height above water surface affects CAN trees differently.
Streamflow limits radial growth

R = 0.58, p = 5e-10

R = 0.66, p = 1e-07

R = 0.36, p = 0.002

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Part 3: Increasing risk factors
Canyonlands is drier than upstream sites
More streamflow is diverted upstream of CAN than at other sites
Canyonlands trees are becoming more sensitive to maximum vapor pressure deficit
Conclusions

• Cottonwoods in Canyonlands National Park and the benefits they provide are at risk because of increasing temperatures and flow diversions

• Consider tree height when evaluating riparian forest health and potential loss of ecosystem services

Questions? Contact me!

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