



*Photo by Lee Gelatt*

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

River's Edge West, March 6, 2024

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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), Tsésthó'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 I:  
Upstream  
and  
Downstream  
Differences

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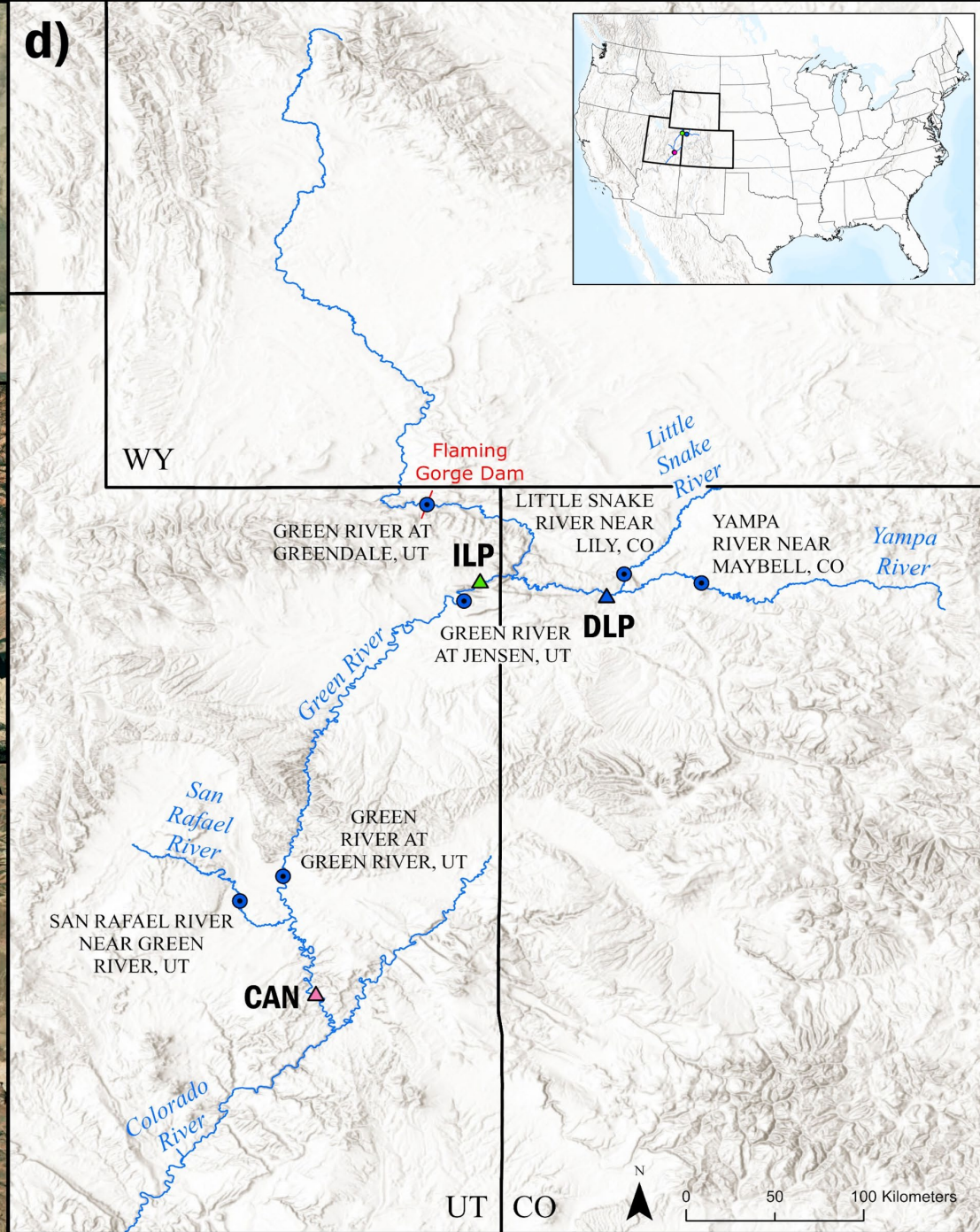
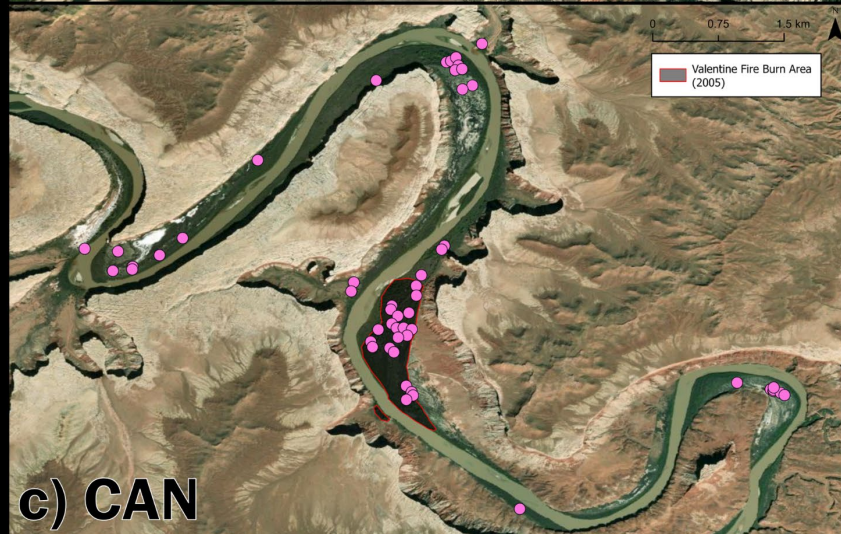
# Deerlodge Park (Dinosaur National Monument)



# Island Park (Dinosaur National Monument)



# Canyonlands (Canyonlands National Park)

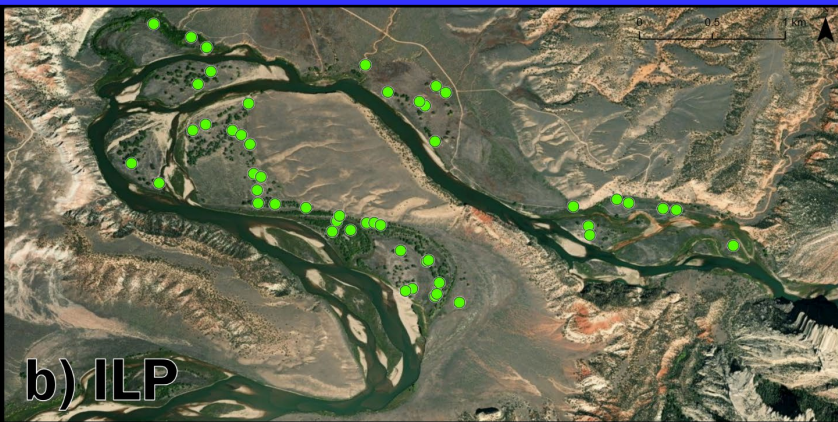




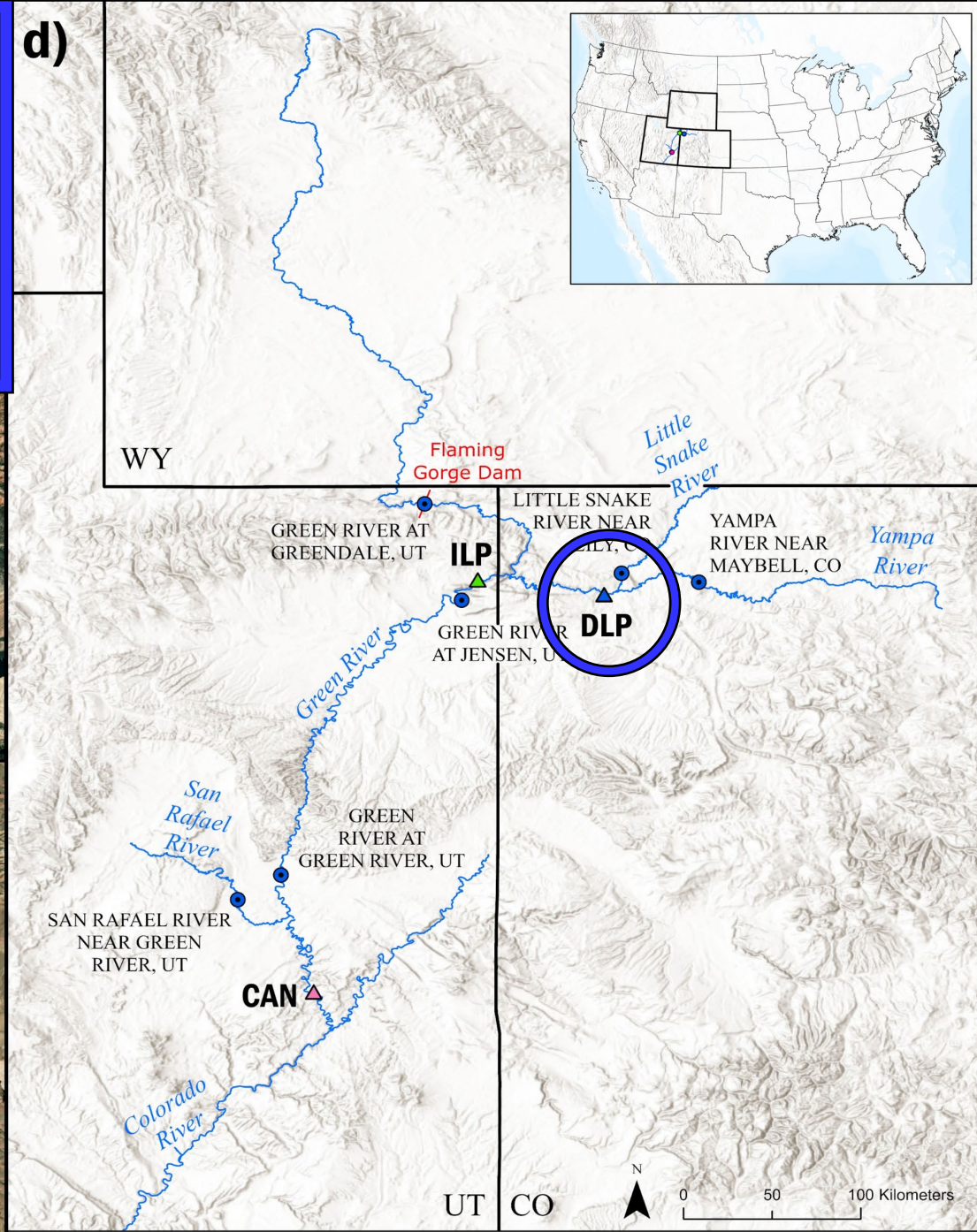
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# Canyonlands (Canyonlands National Park)

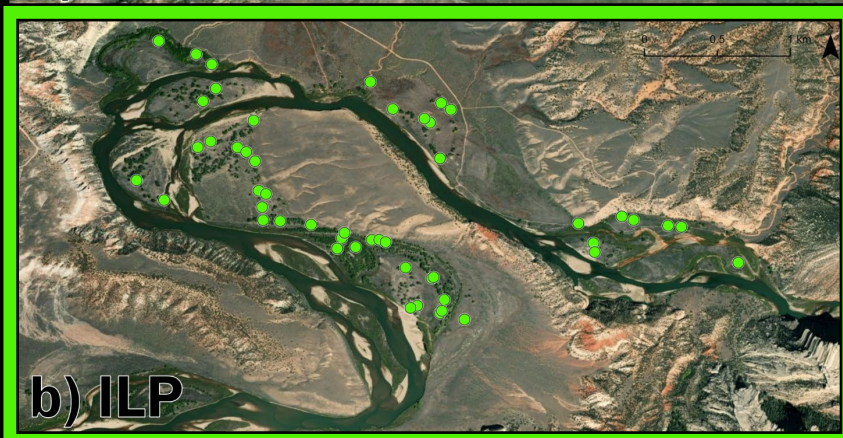




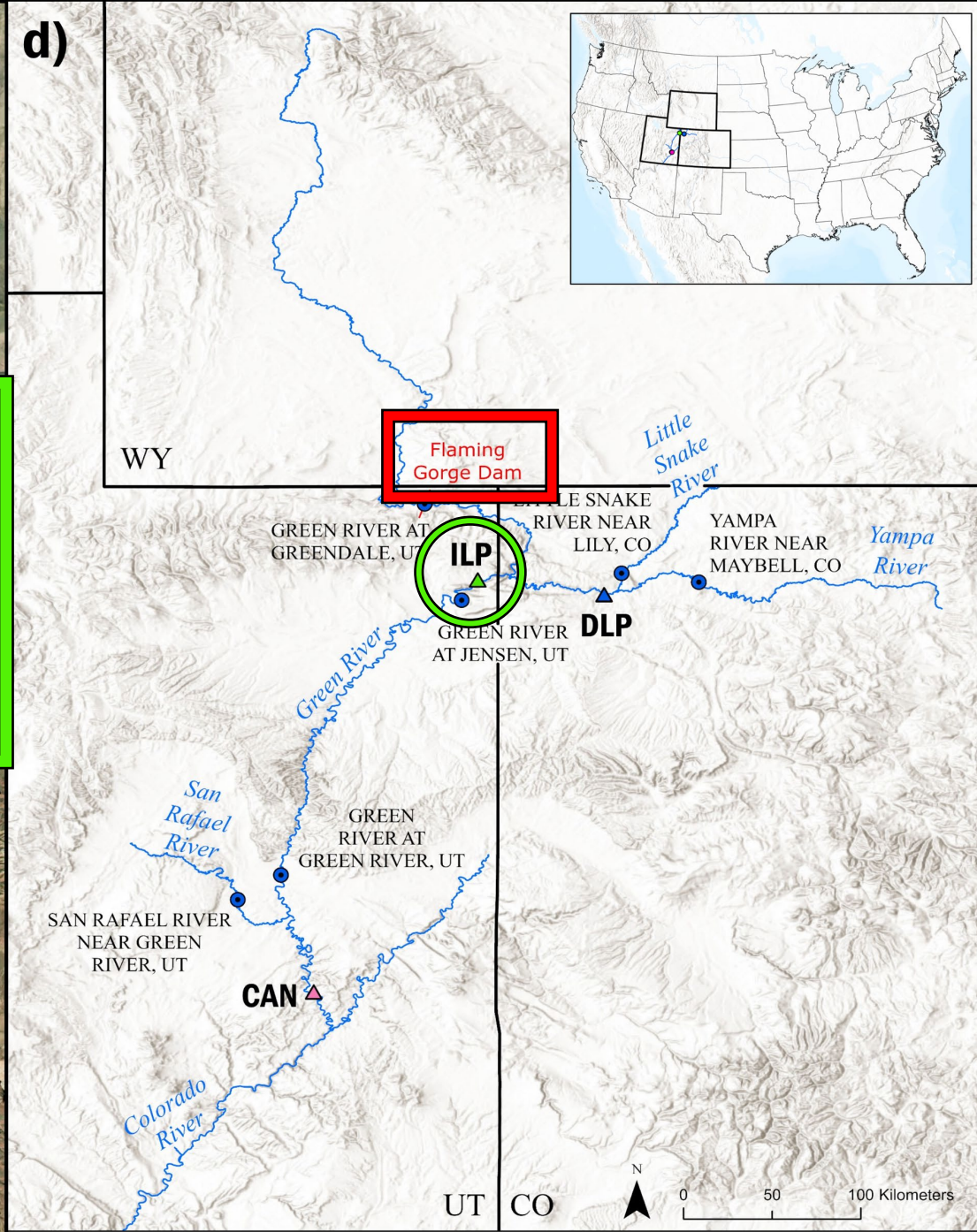
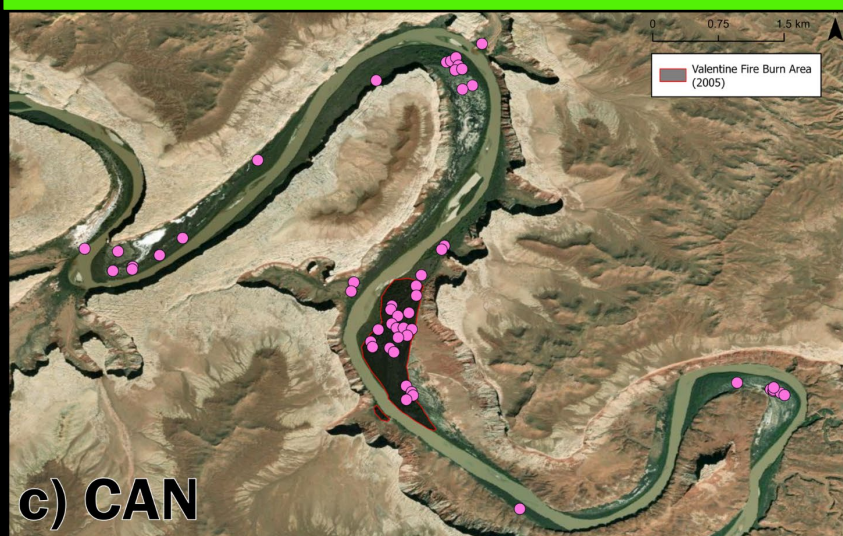
# Deerlodge Park (Dinosaur National Monument)



# Island Park (Dinosaur National Monument)



# Canyonlands (Canyonlands National Park)





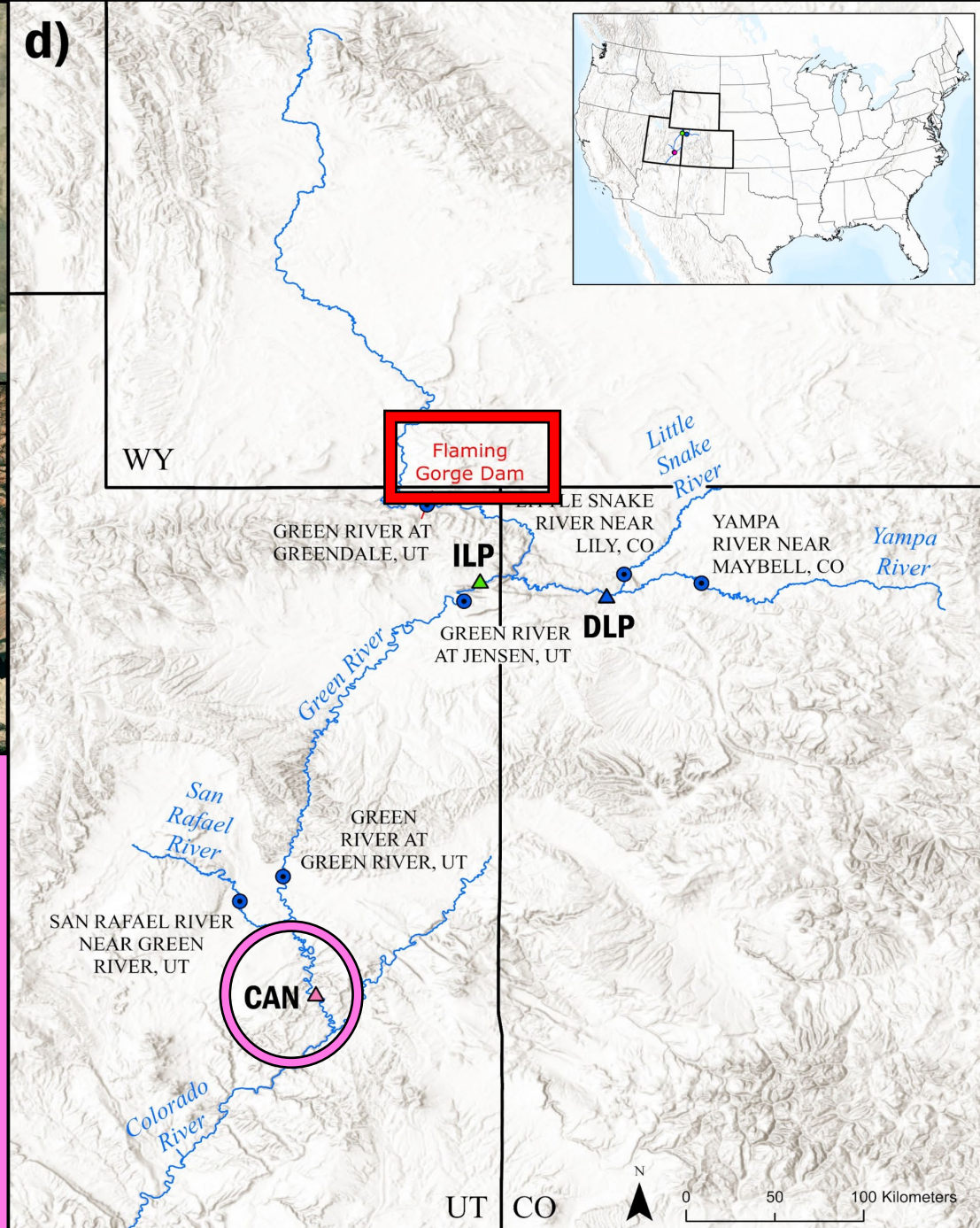
# Deerlodge Park (Dinosaur National Monument)



# Island Park (Dinosaur National Monument)



# Canyonlands (Canyonlands National Park)







Tree Height and Percentage  
of Live Canopy

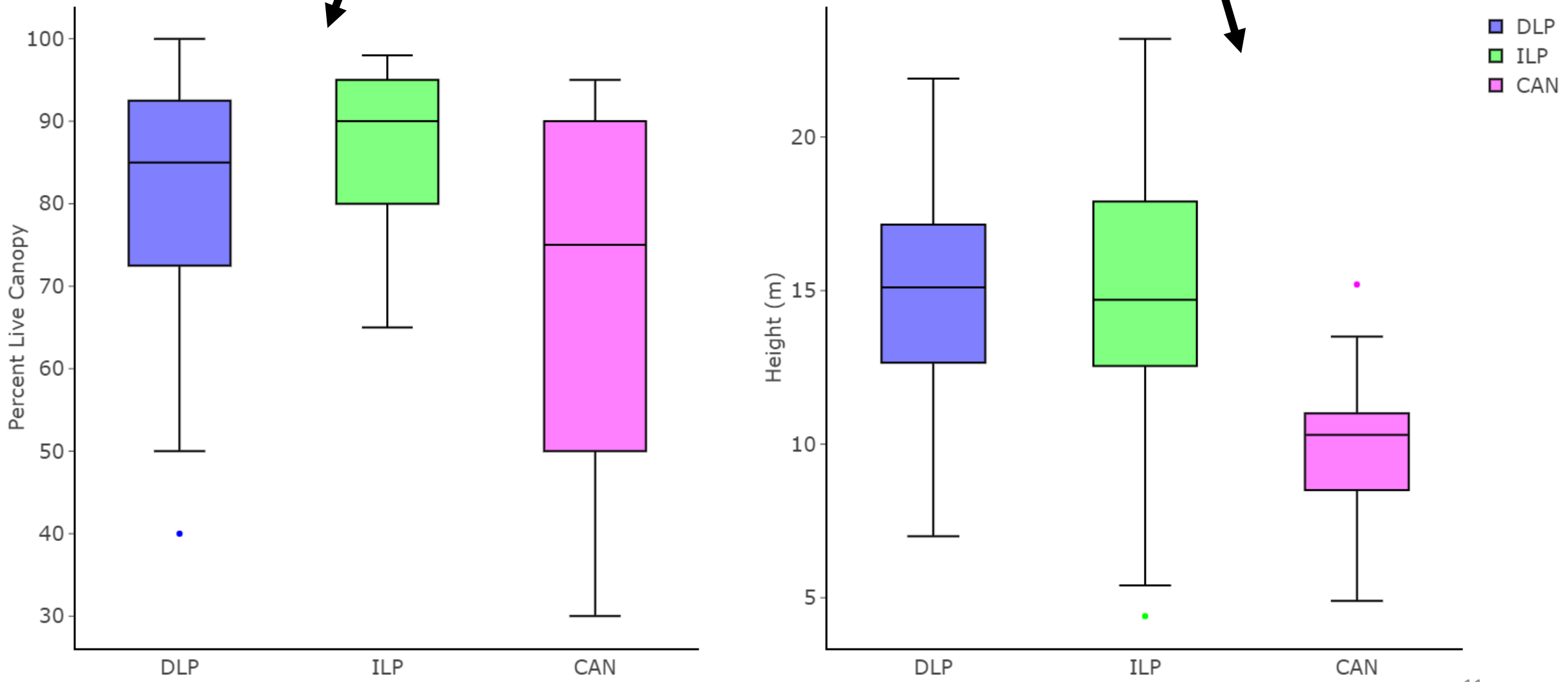


Increment Cores and Ring  
Width Measurements



# Percentage of live canopy and tree height are lower at Canyonlands

lower at Canyonlands





# Upstream

40.53, -108.99



*Photo by Lee Gelatt*



# Downstream

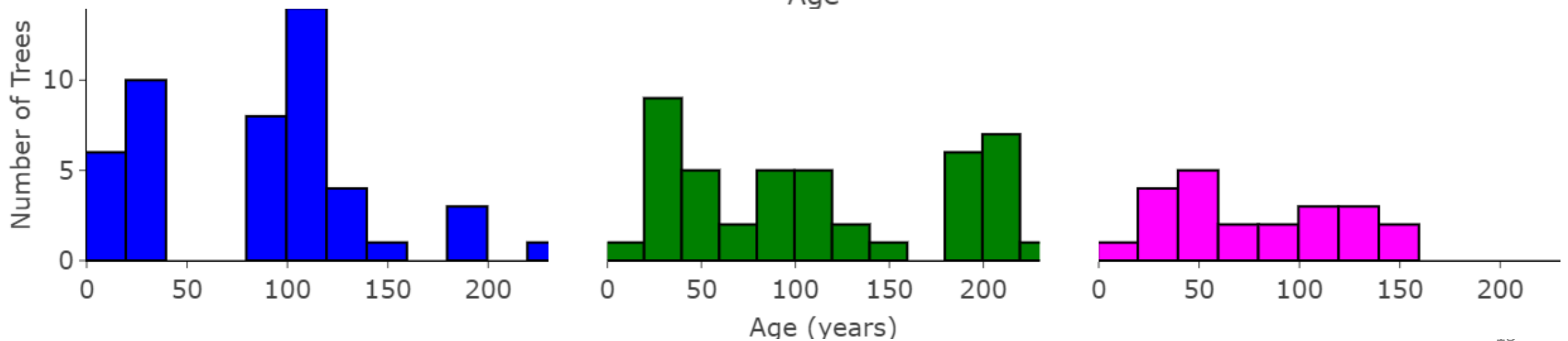
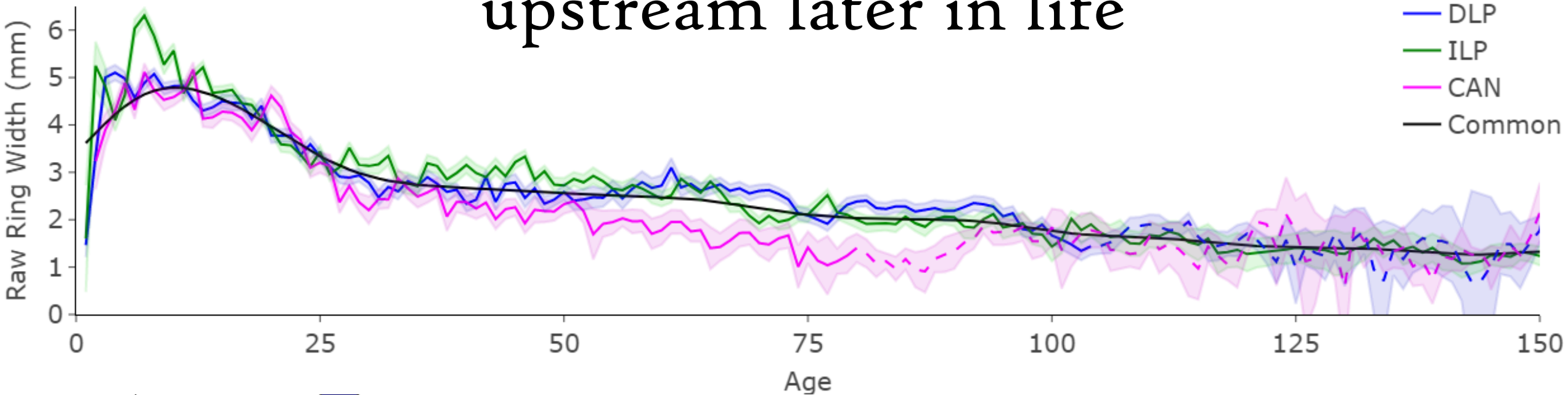
38.40, -110.02

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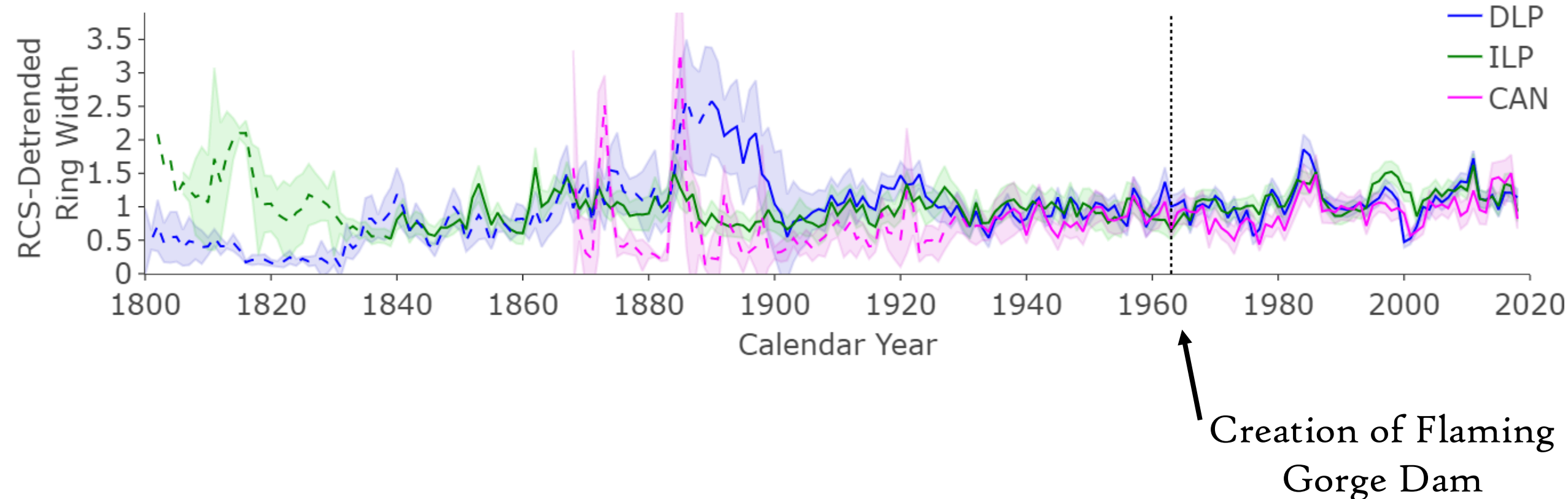
# Canyonlands trees grow slower than trees upstream later in life



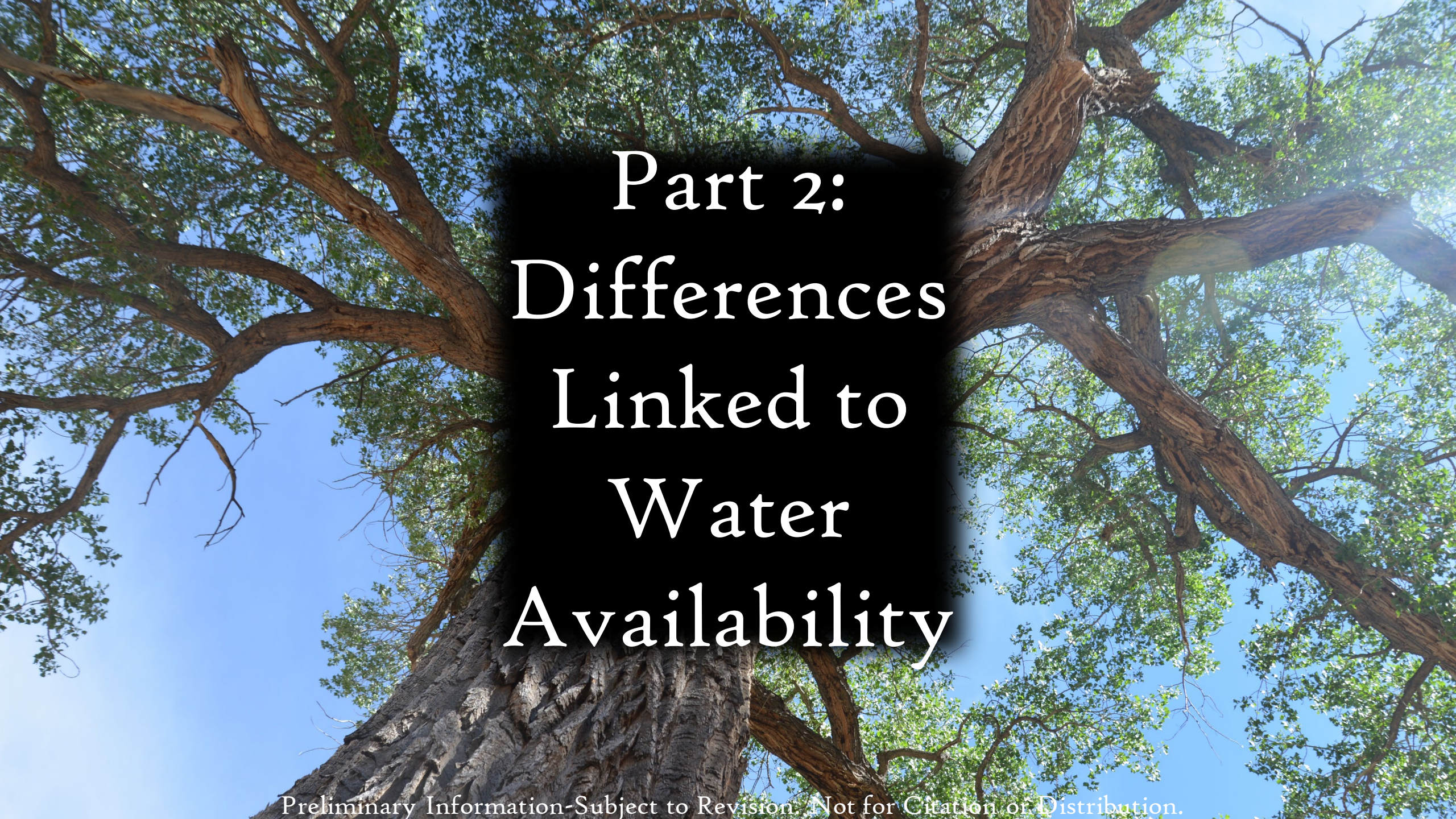
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However, there is no visible growth decline in the ring-width chronology



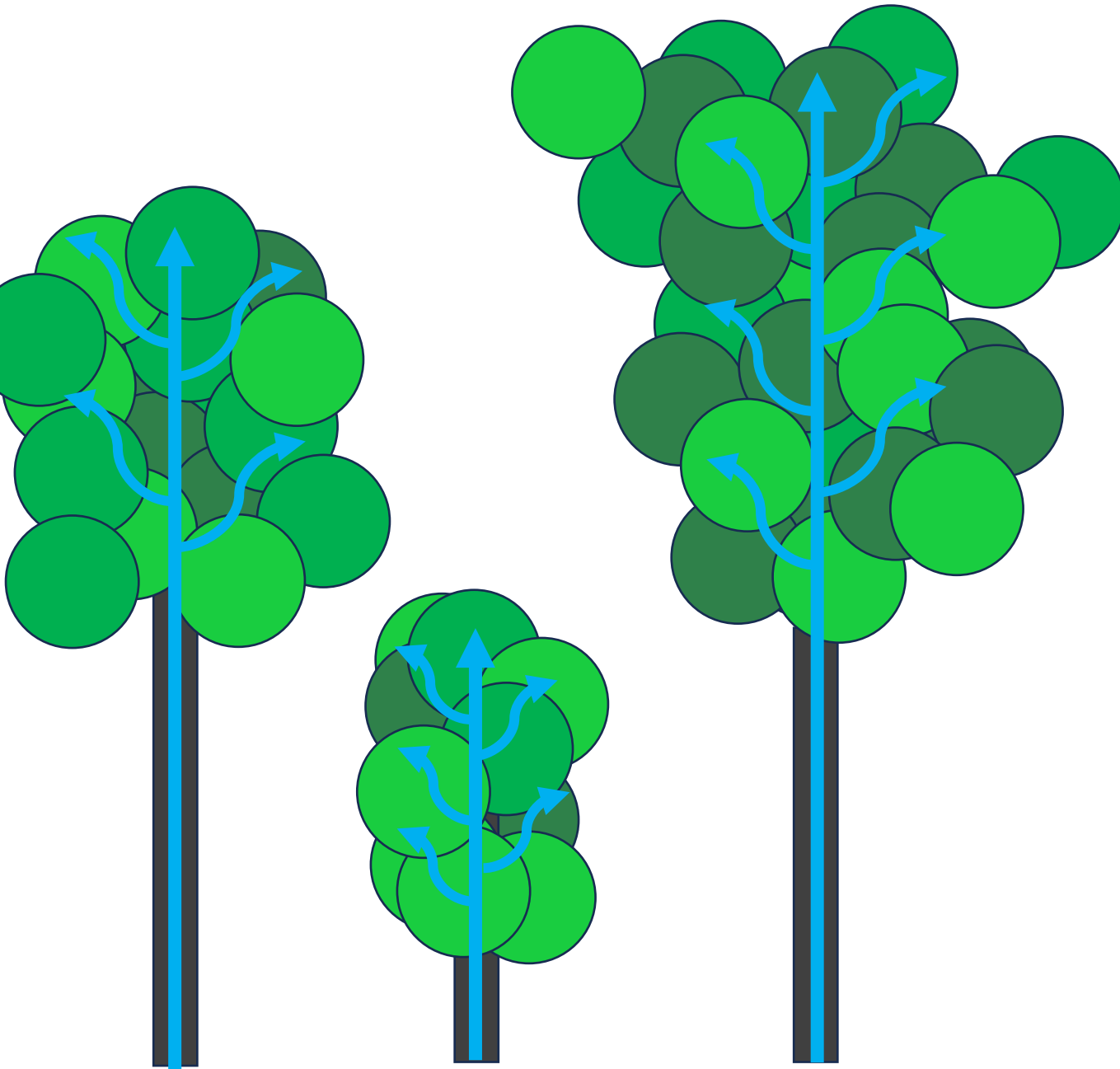




Part 2:  
Differences  
Linked to  
Water  
Availability

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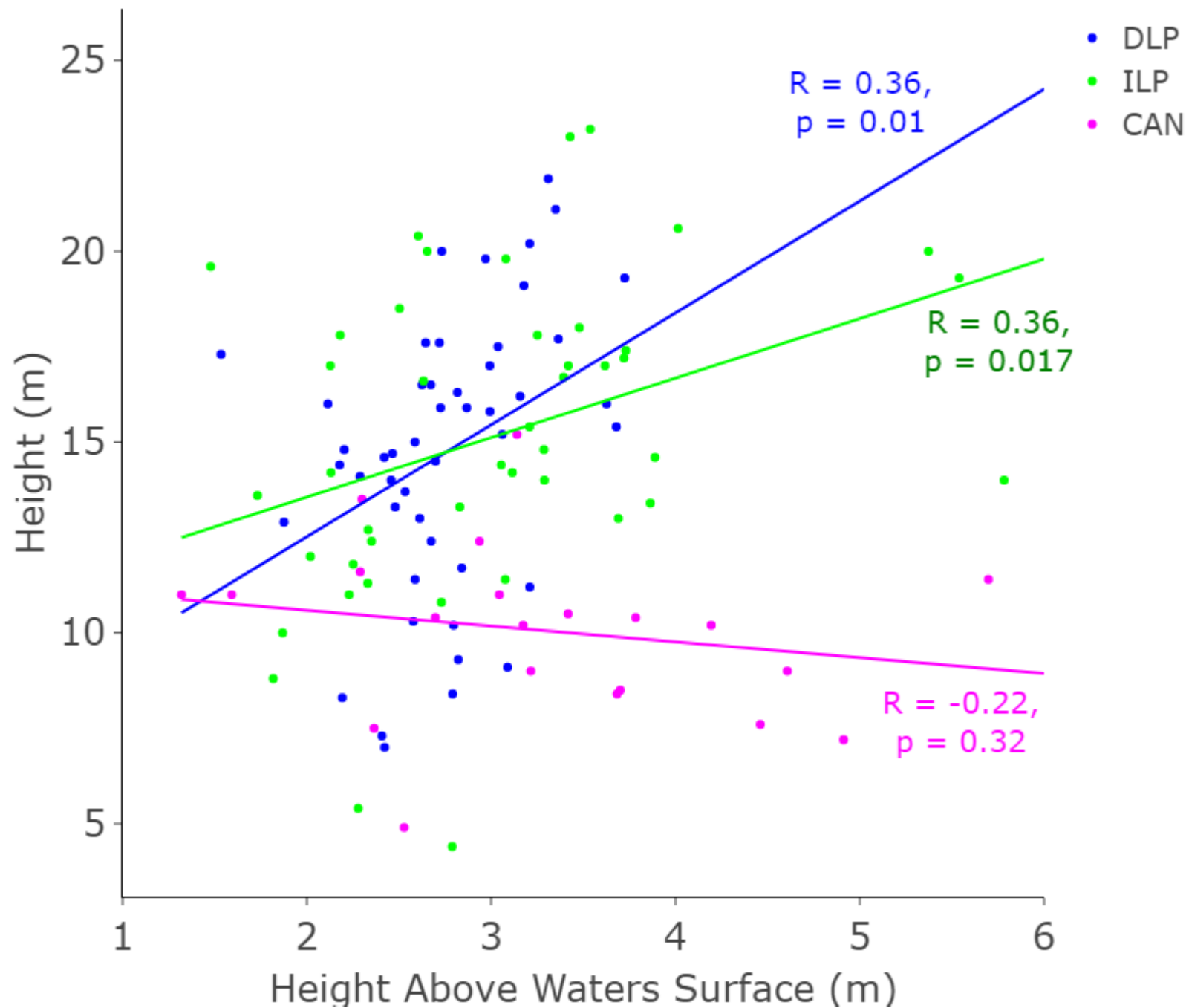


# The Hydraulic Cost of Being Tall

The hydraulic pathway is longer for taller trees  
– water has to fight harder against gravity

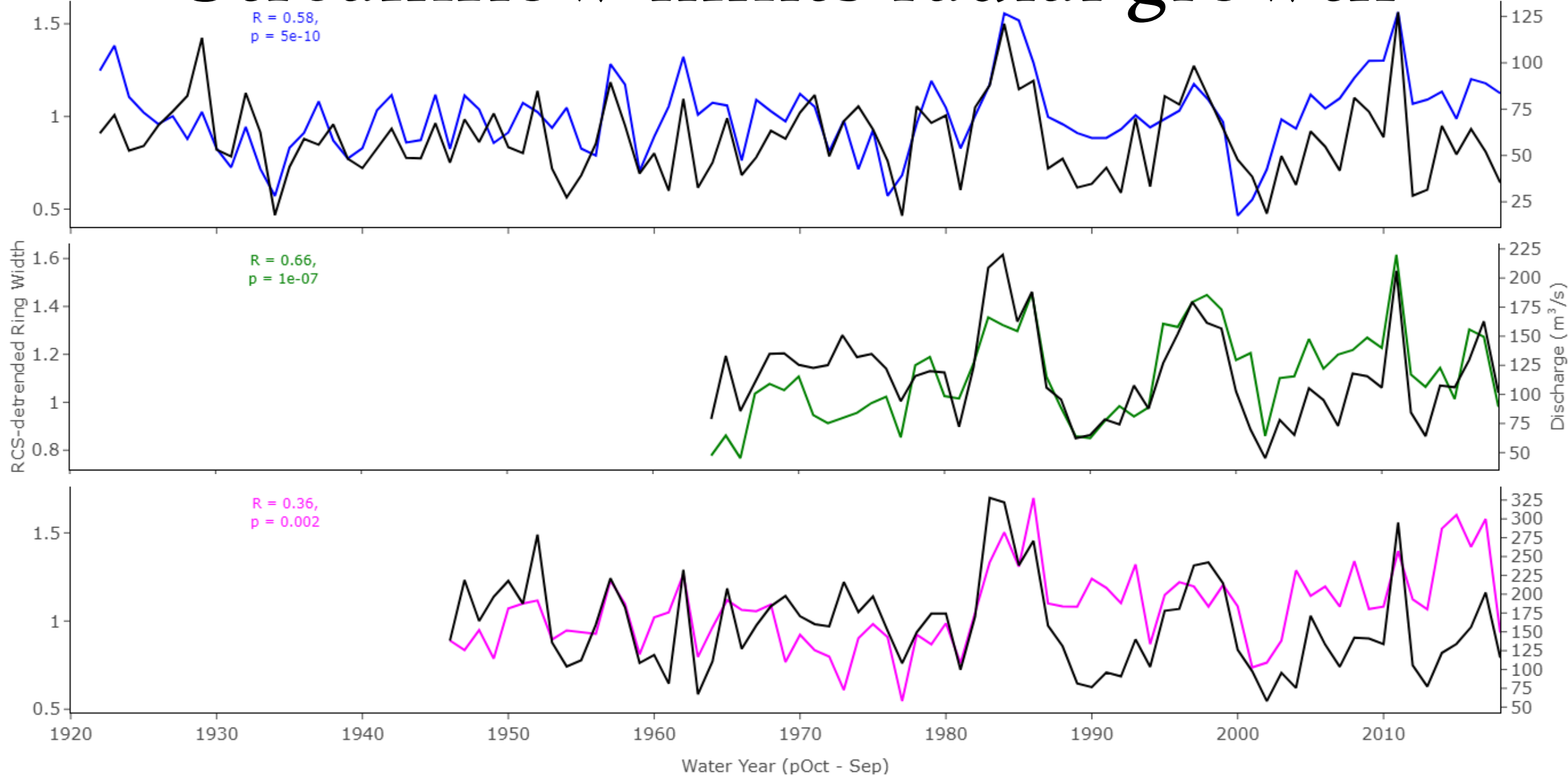


Height above  
water surface  
affects CAN  
trees  
differently






# Streamflow limits radial growth



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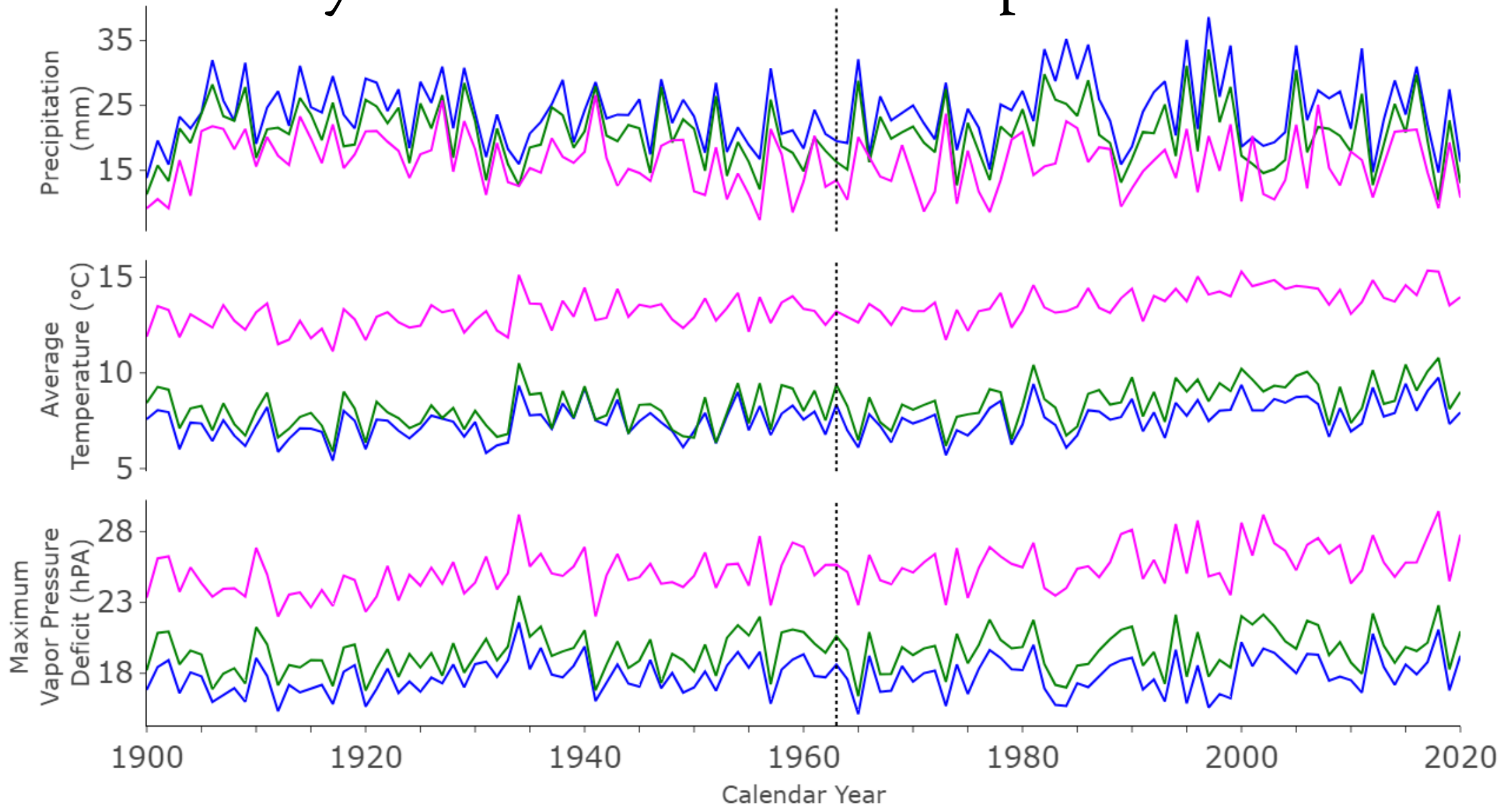


Part 3:  
Increasing  
risk factors

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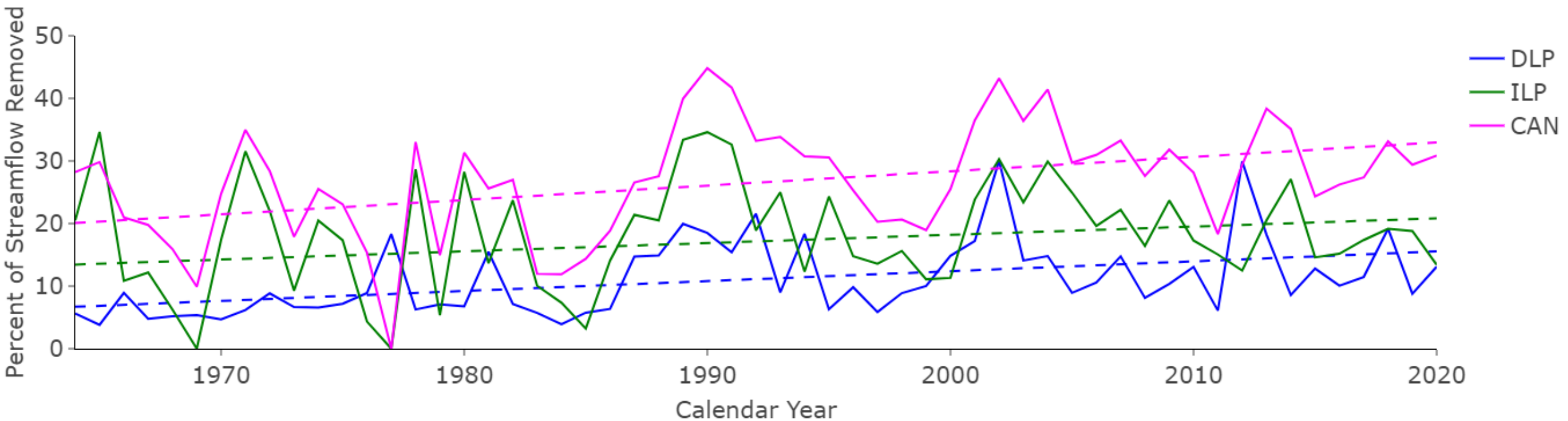
# Canyonlands is drier than upstream sites



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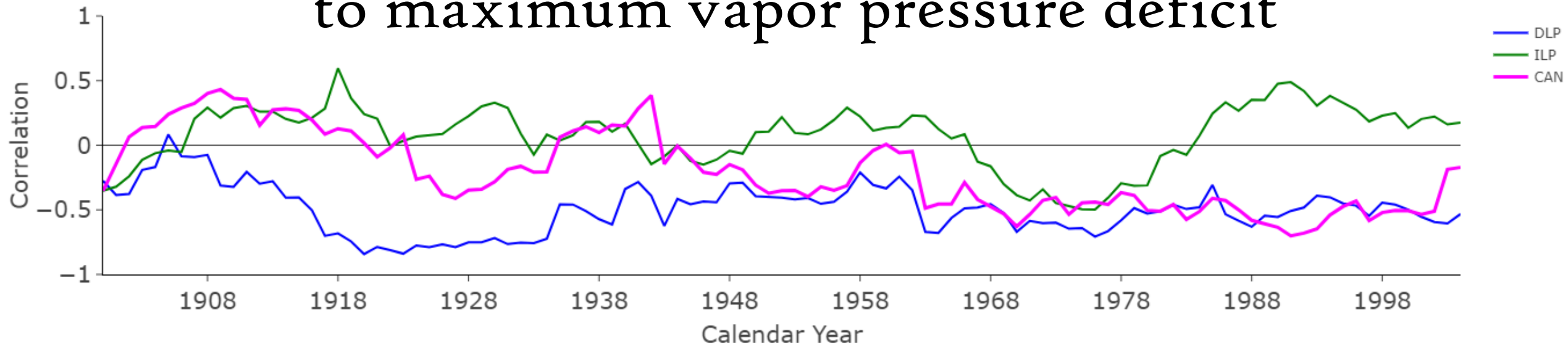


# More streamflow is diverted upstream of CAN than at other sites





# 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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