



Groundwater Management Area 12 Fourth Joint Planning Cycle: Environmental Impacts

March 24th, 2026

Presented by:

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Steven Young, PhD, PE, PG

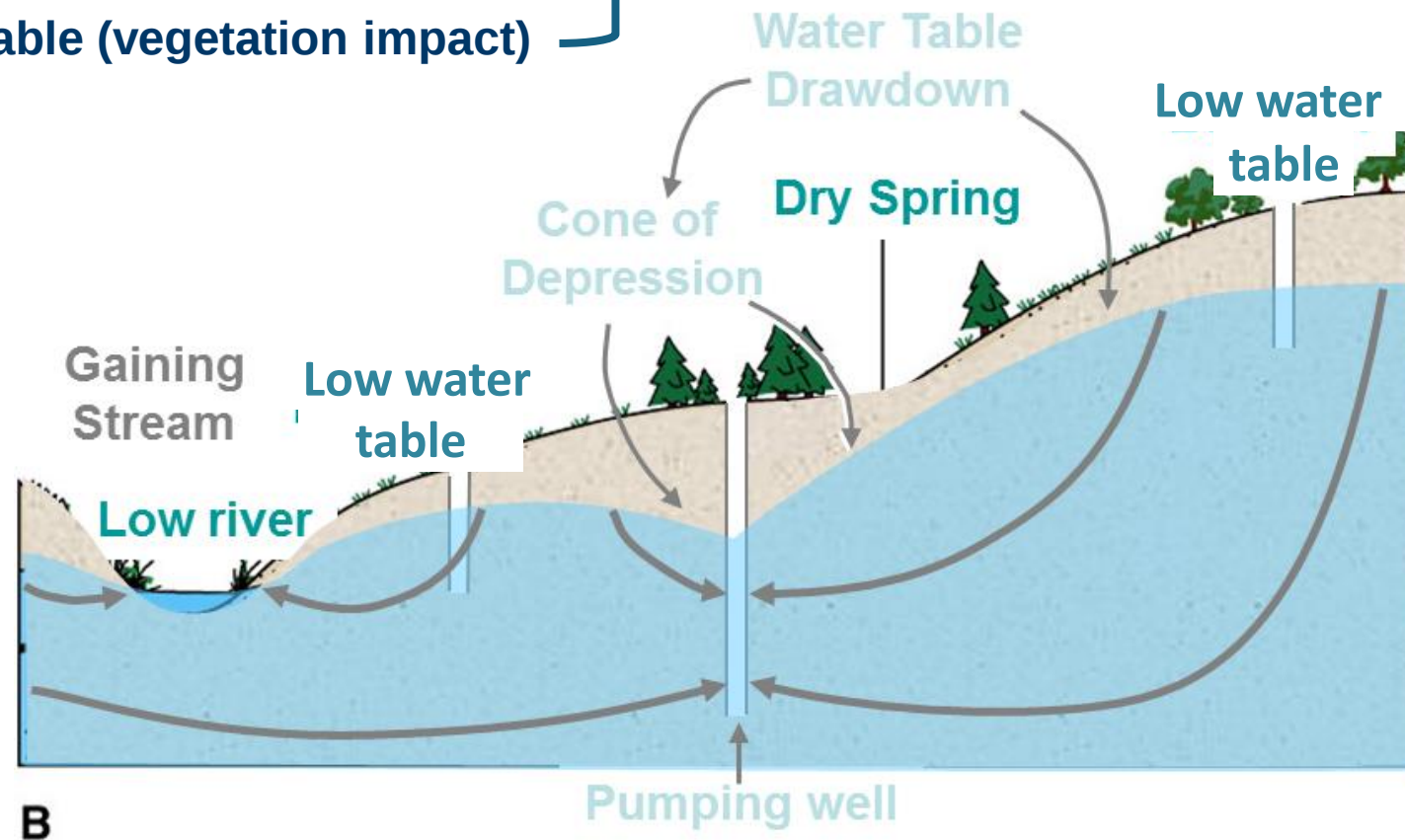
Shuo Yang, PhD



EXAMPLES OF HOW PUMPING CAN CAUSE ENVIRONMENTAL IMPACTS

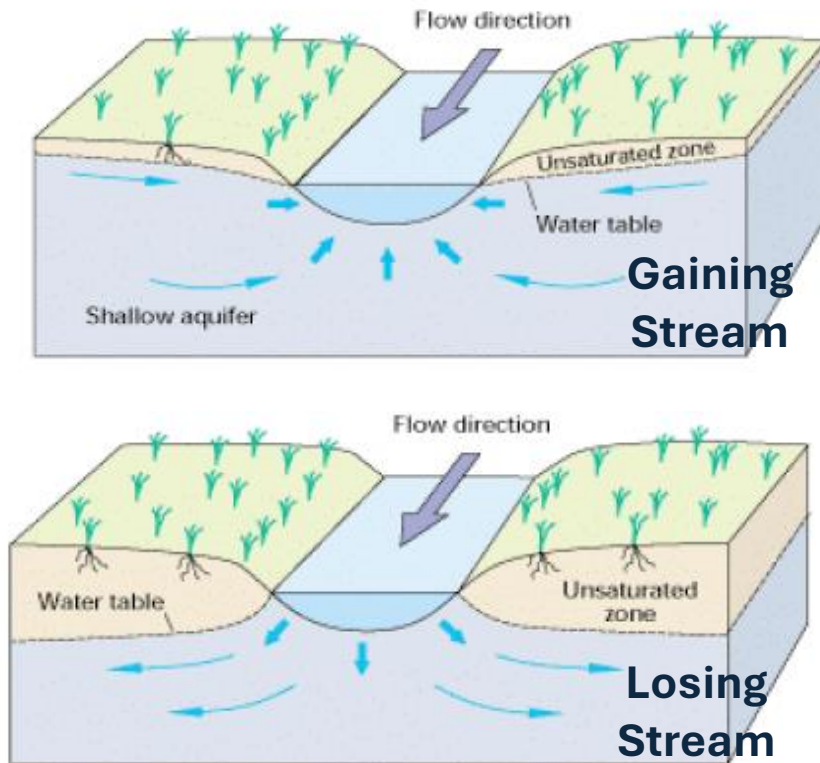
- Reduced flows to rivers
- Withdrawal from rivers (losing streams)
- Reduced spring flows
- Dried springs
- Lowered water table (vegetation impact)

Caused by lower of water levels



Conditions Associated with Gaining and Losing Streams

Stream gain or loss occur in RIV cells in groundwater models.

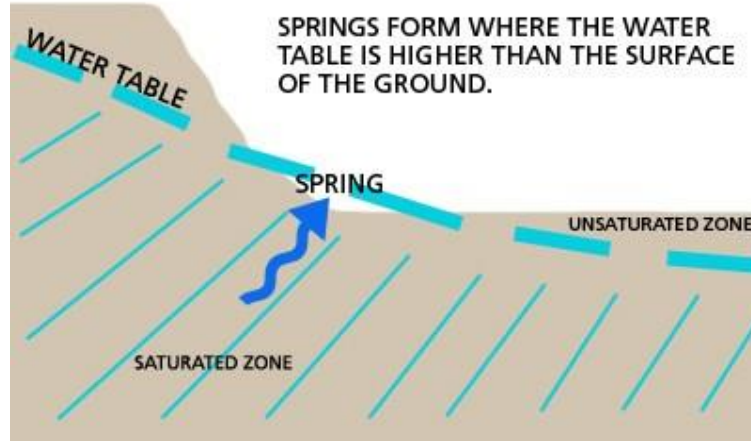


USGS Circular 1186, 1999

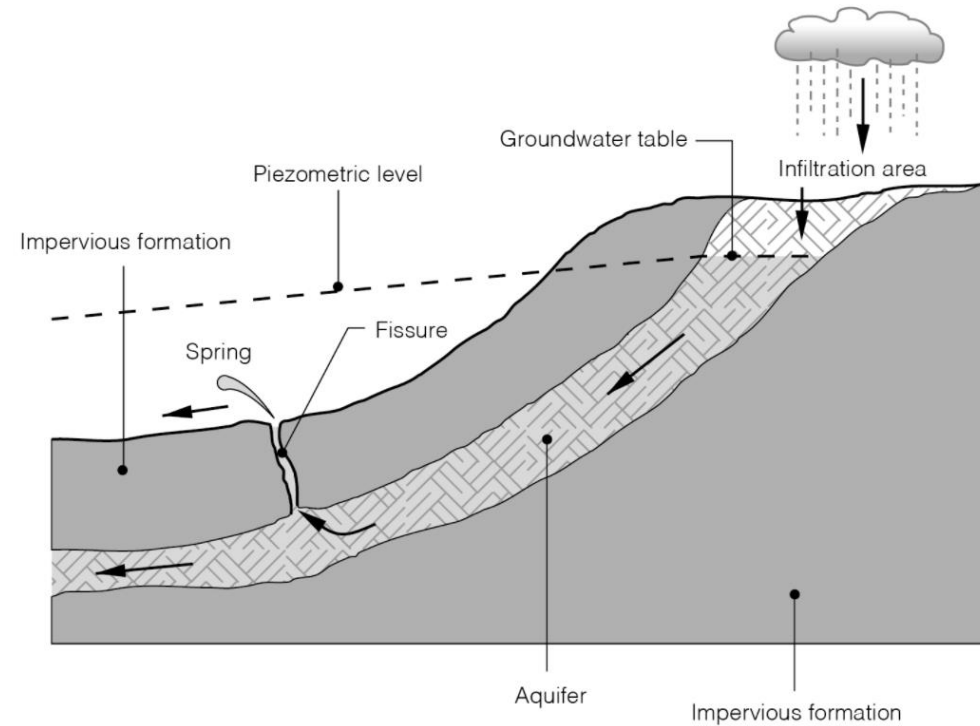
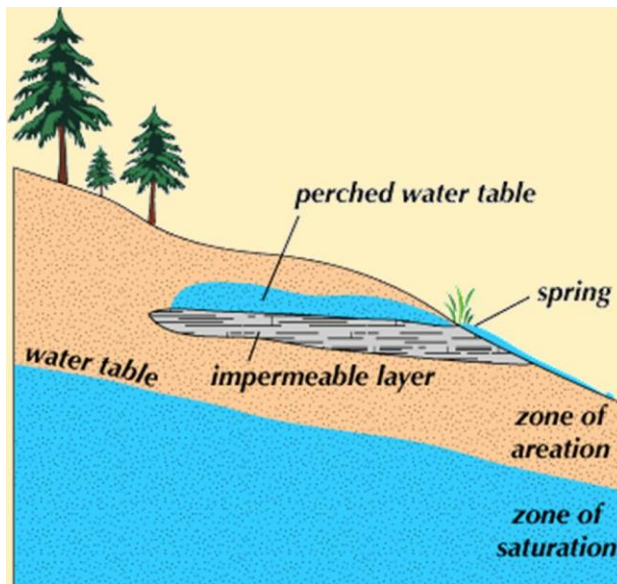
- Gaining:
 - Net discharge of groundwater to surface water “base flow”
- Losing:
 - Net discharge of surface water to groundwater “recharge”

The TCEQ rules define baseflow as “[t]he portion of streamflow uninfluenced by recent rainfall or flood runoff and is comprised of springflow, seepage, discharge from artesian wells or other groundwater sources, and the delayed drainage of large lakes and swamps.

Conditions Associated with Springs

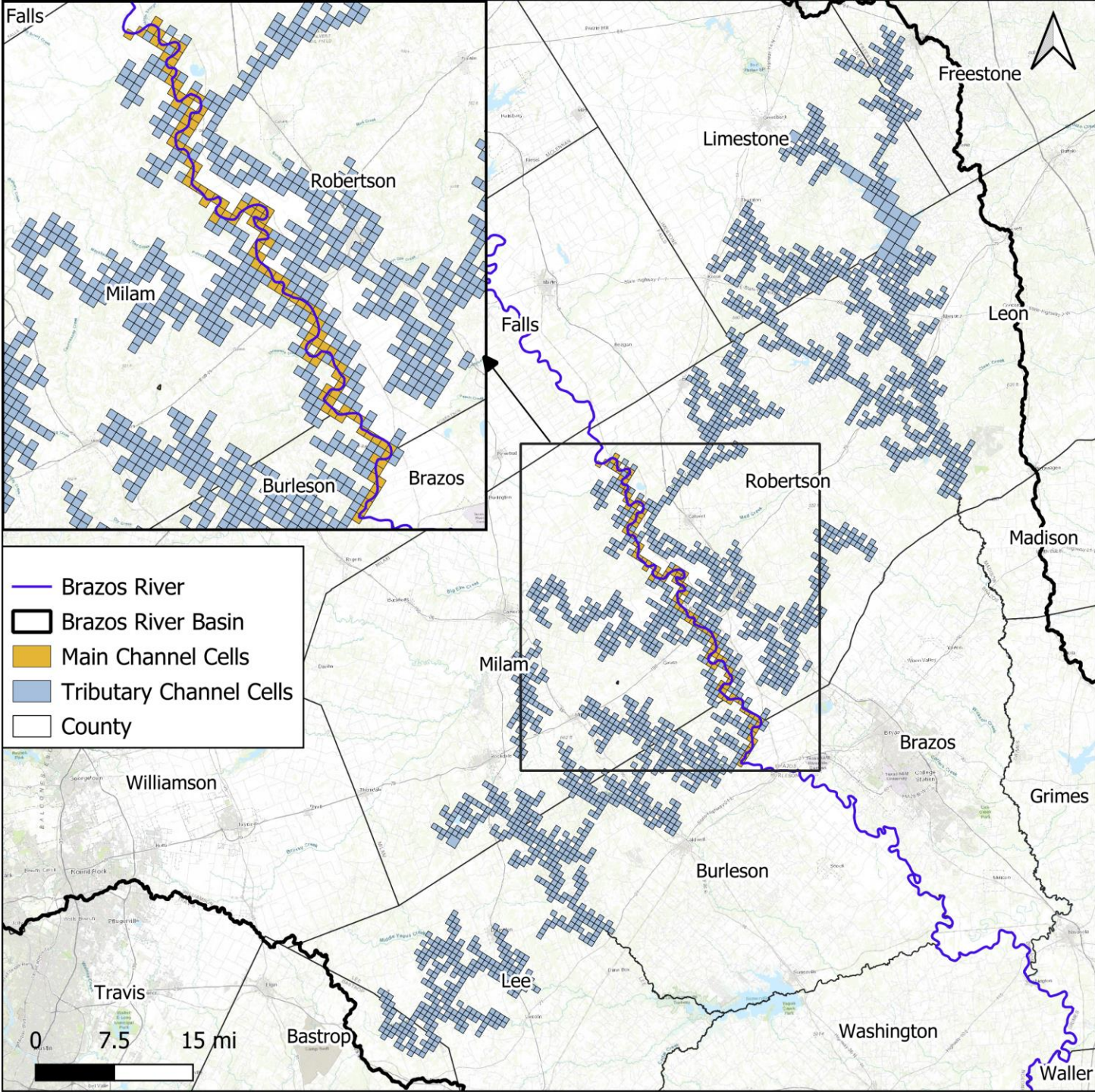
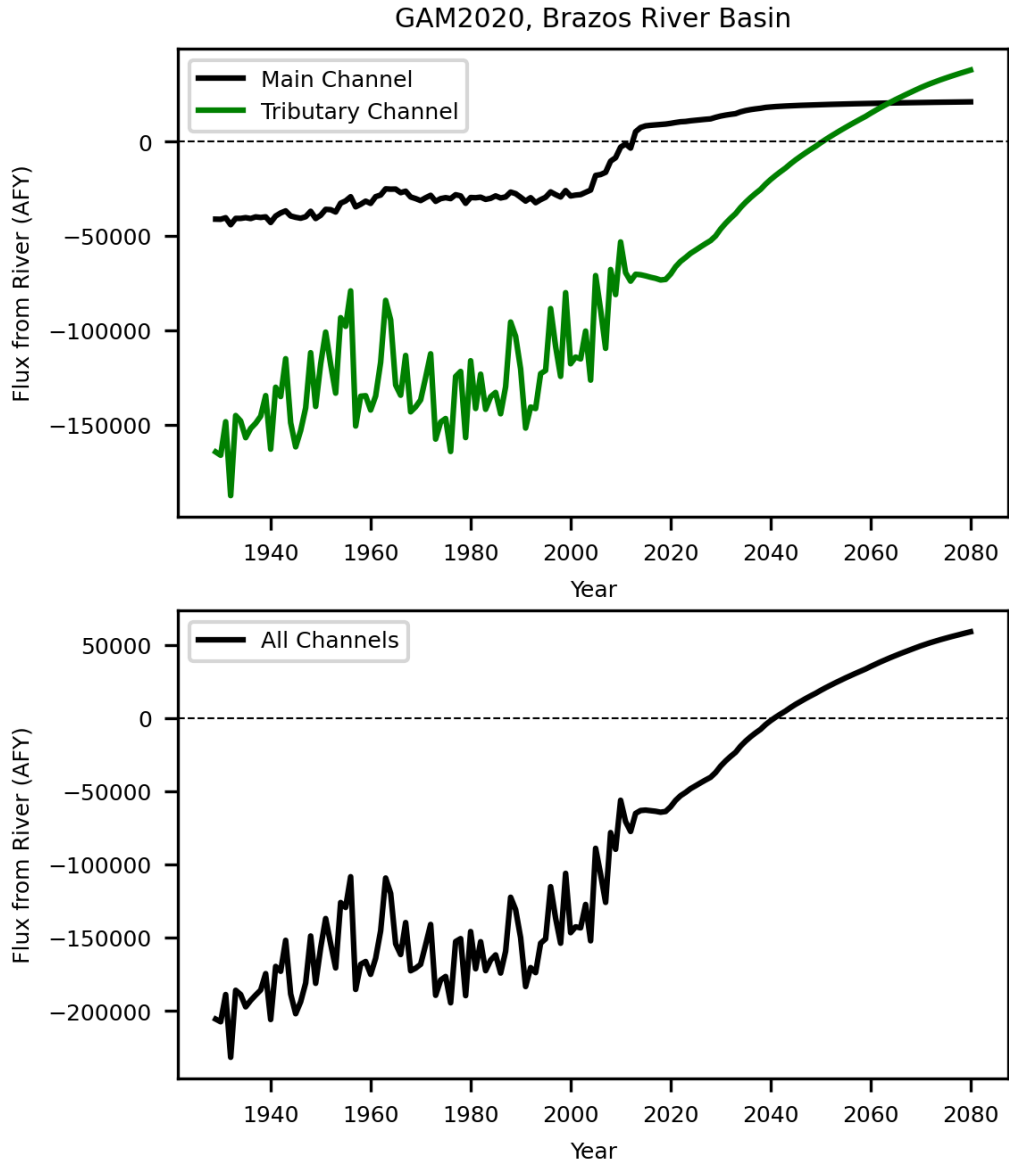


Spring flows occur in DRN cells in groundwater models.



Brazos River Basin – GW-SW Interactions (RIV Cells)

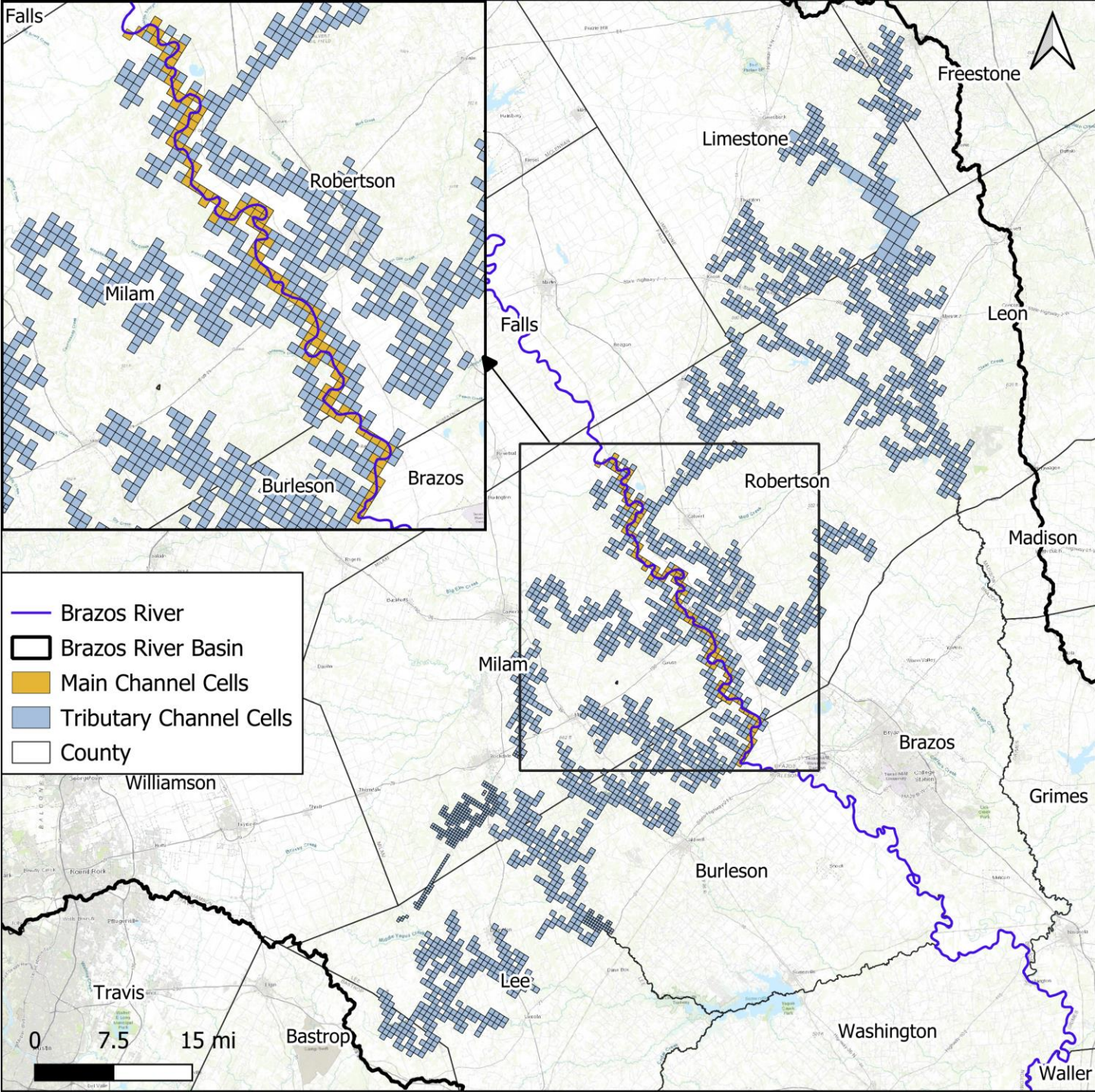
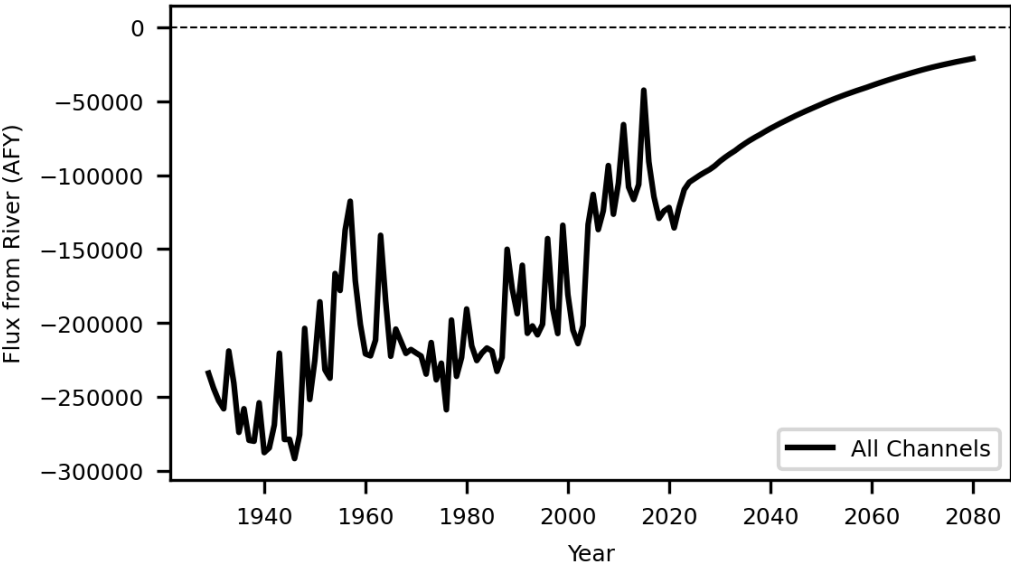
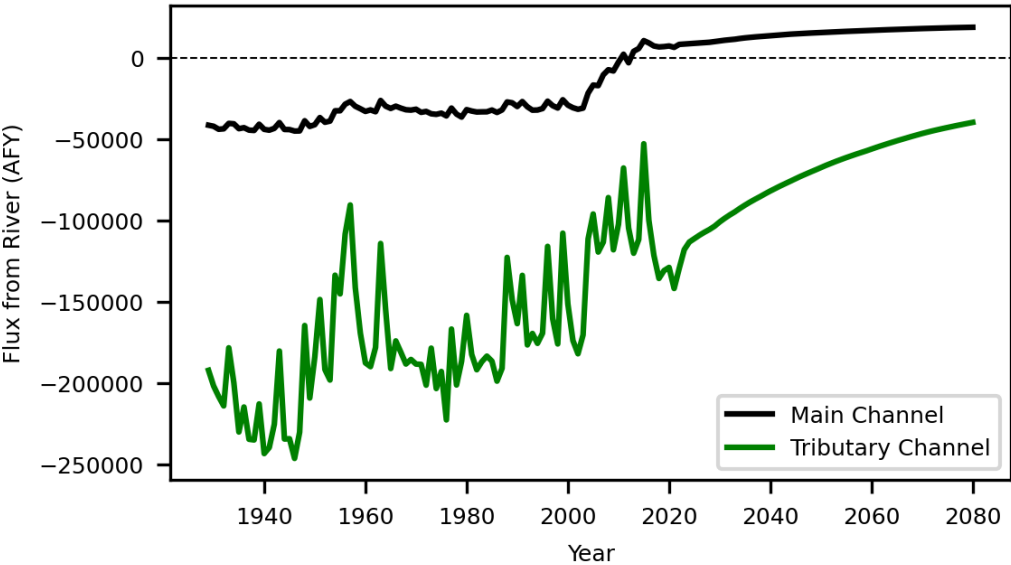
GAM2020, PS4-2 Modified



Brazos River Basin – GW-SW Interactions (RIV Cells)

OPMAN, PS4-2 Modified

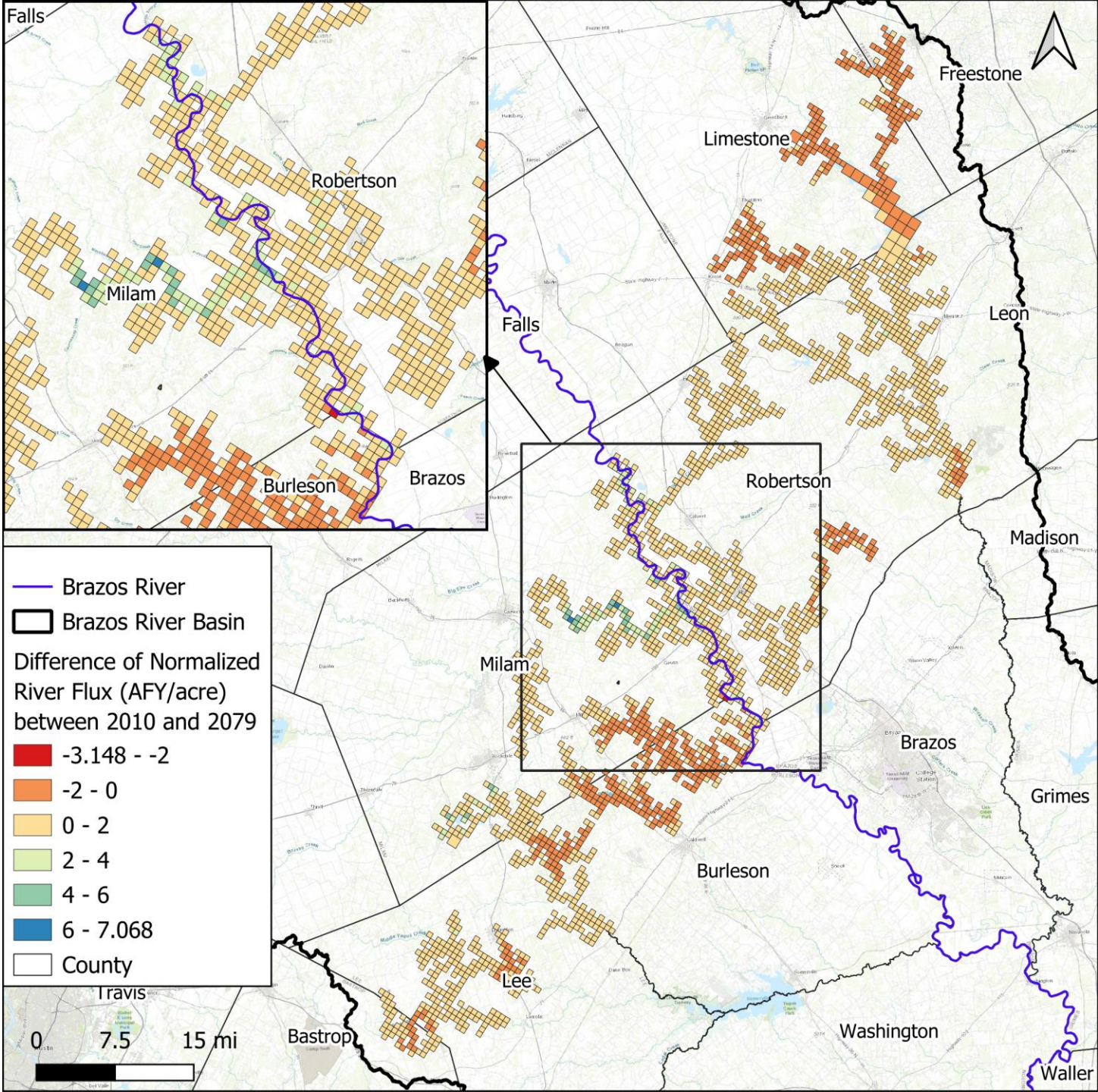
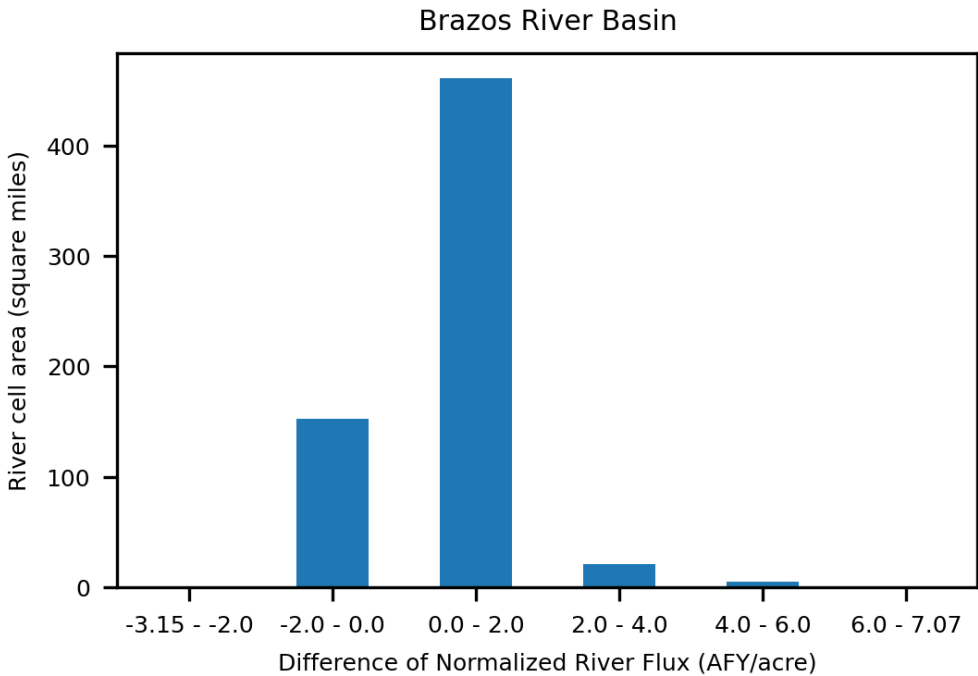
OPMAN, Brazos River Basin



Brazos River Basin – GW-SW Interactions (RIV Cells)

GAM2020, PS4-2 Modified

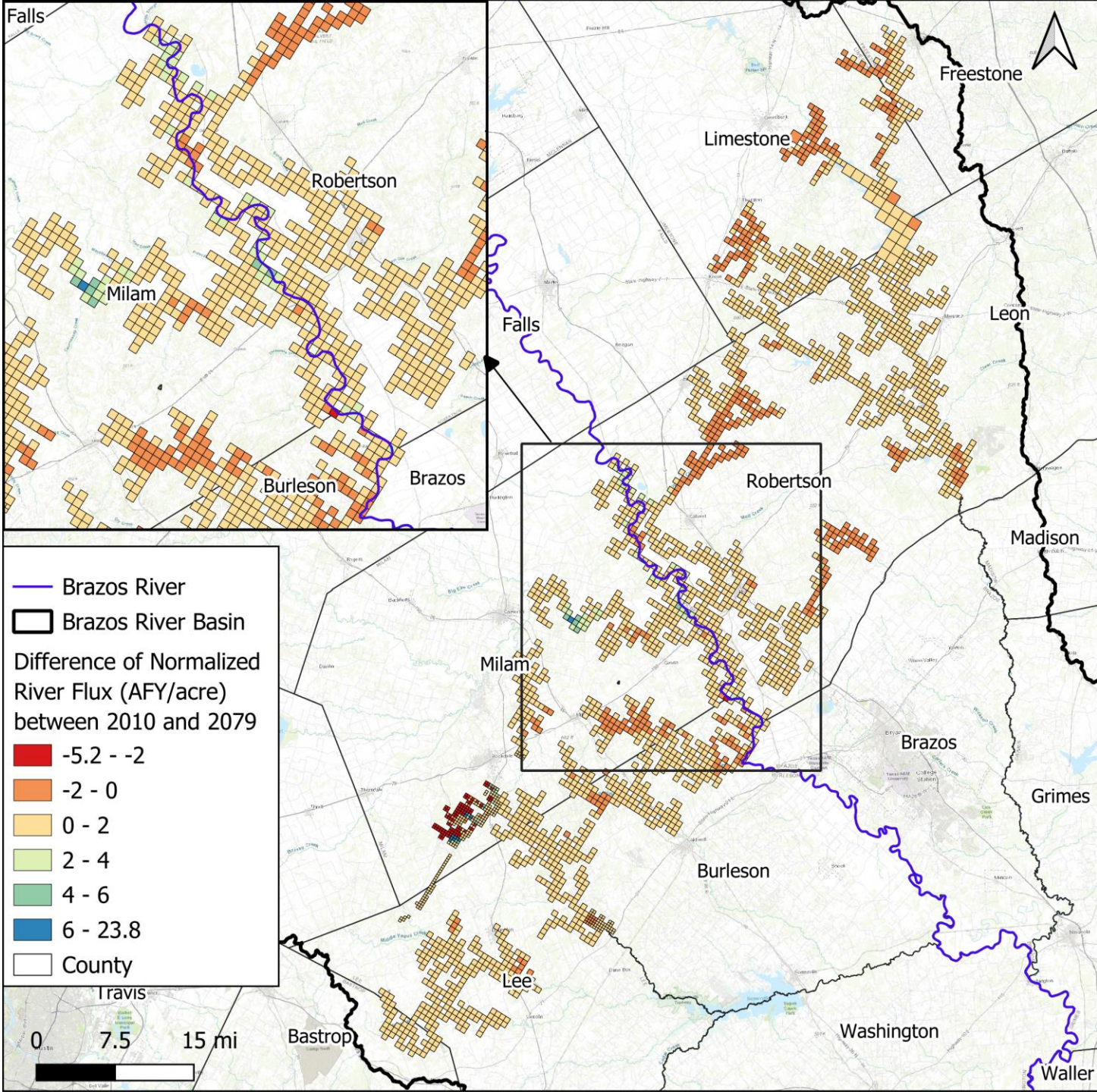
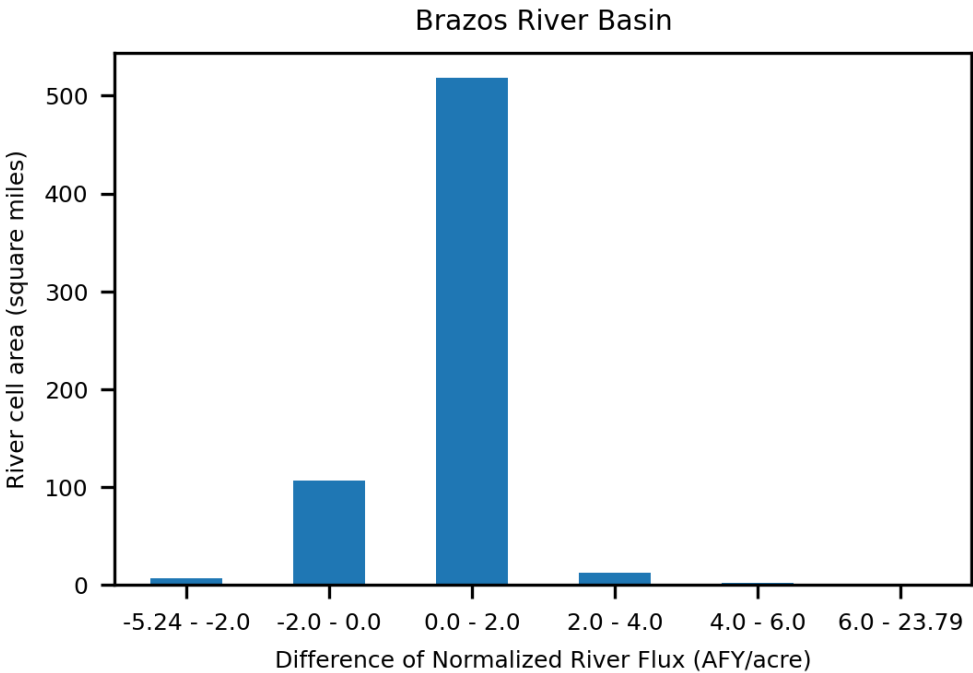
- **Less baseflow:** Positive values of river flux difference;
- **More baseflow:** Negative values of river flux difference.



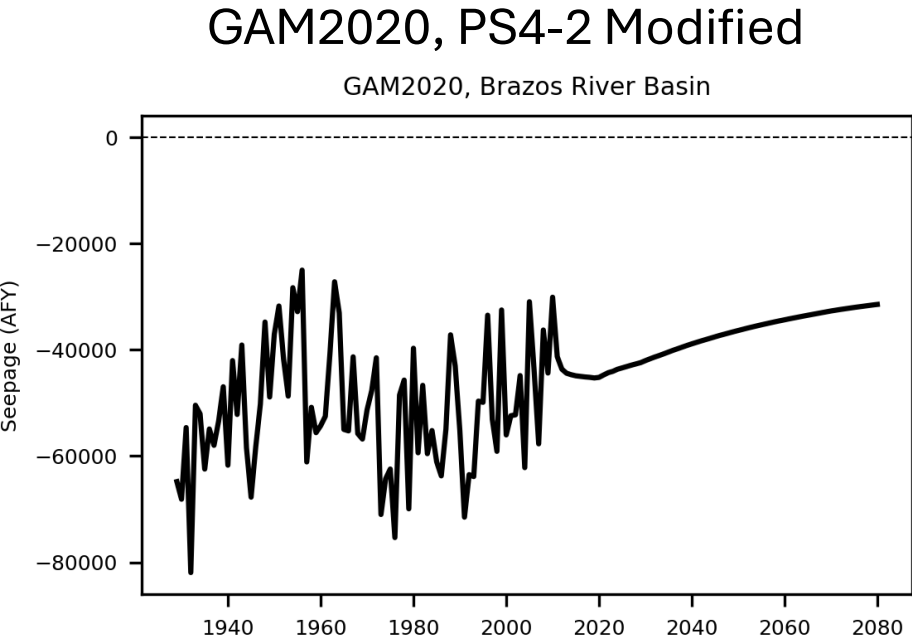
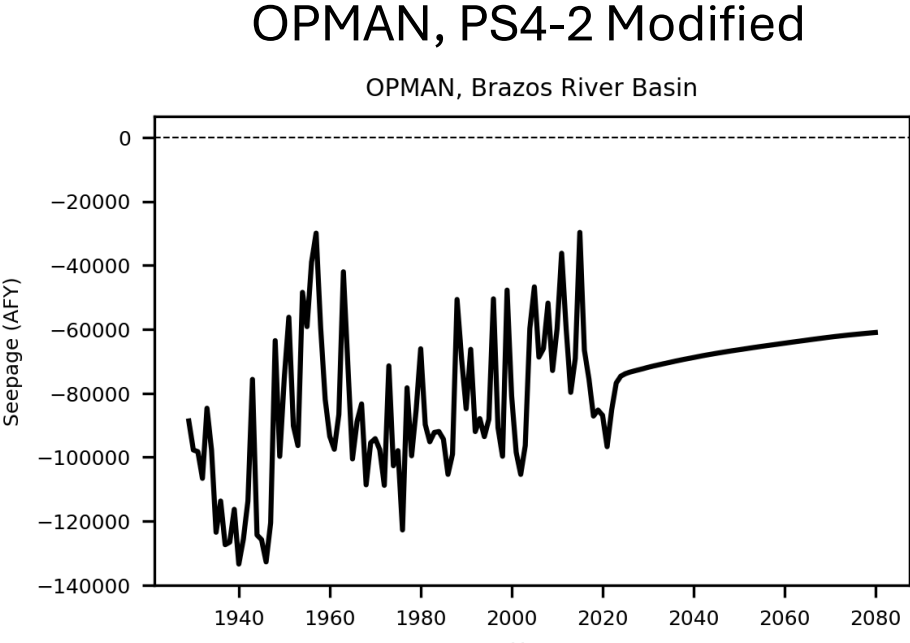
Brazos River Basin – GW-SW Interactions (RIV Cells)

OPMAN, PS4-2 Modified

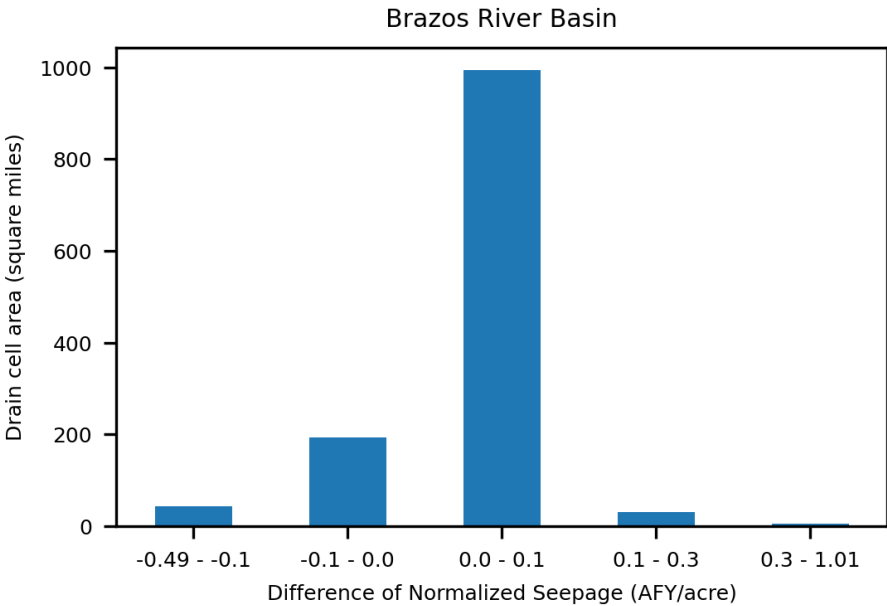
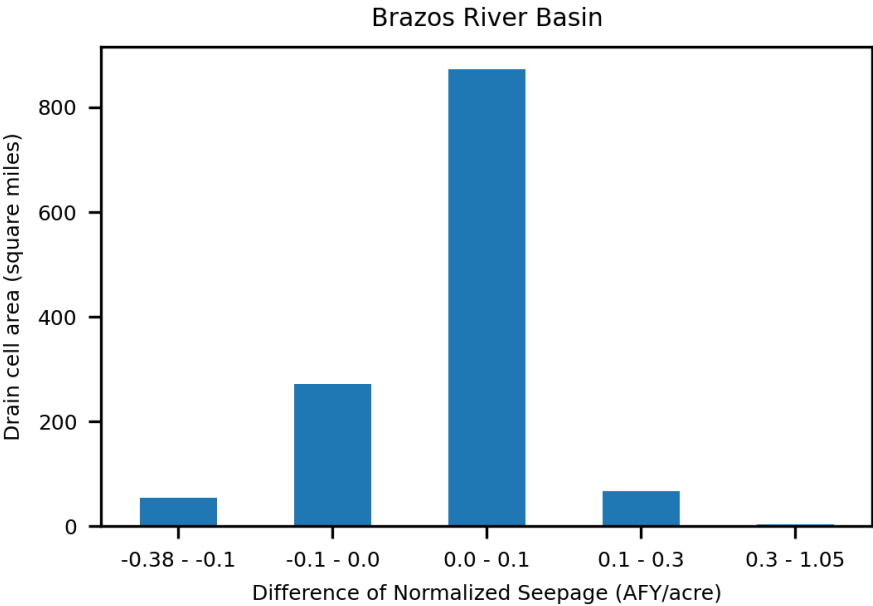
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Brazos River Basin Springs/Seeps (DRN Cells)



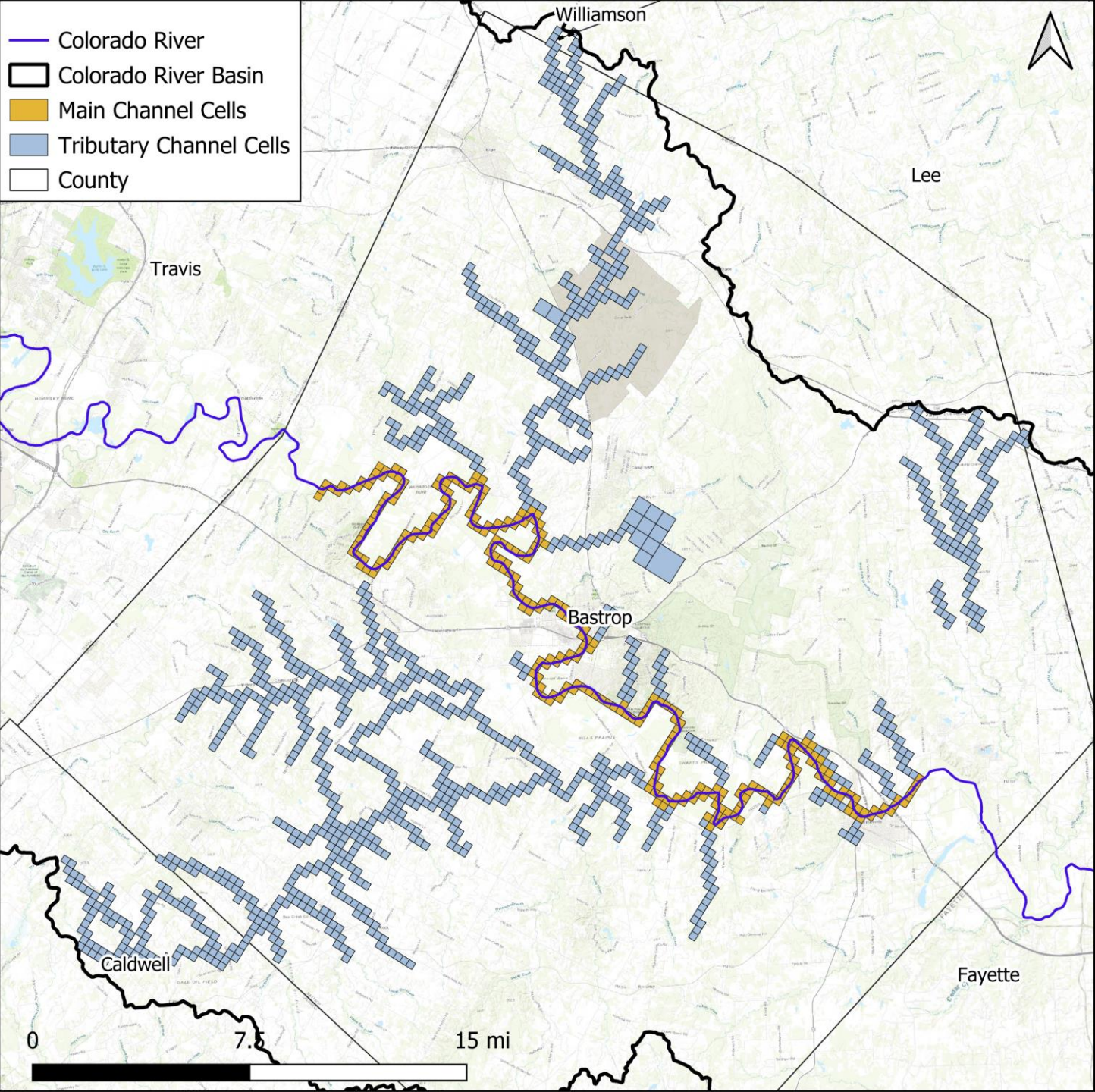
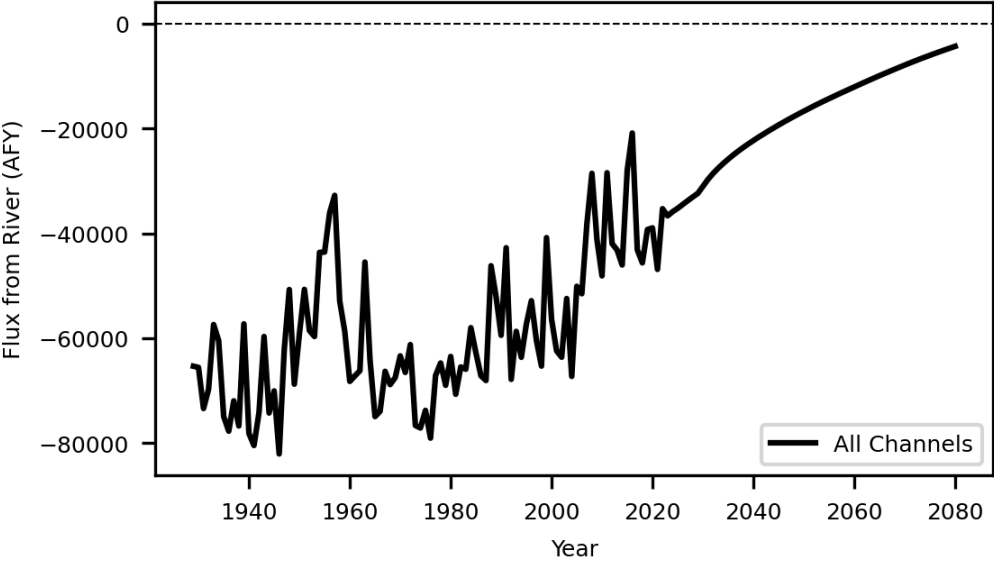
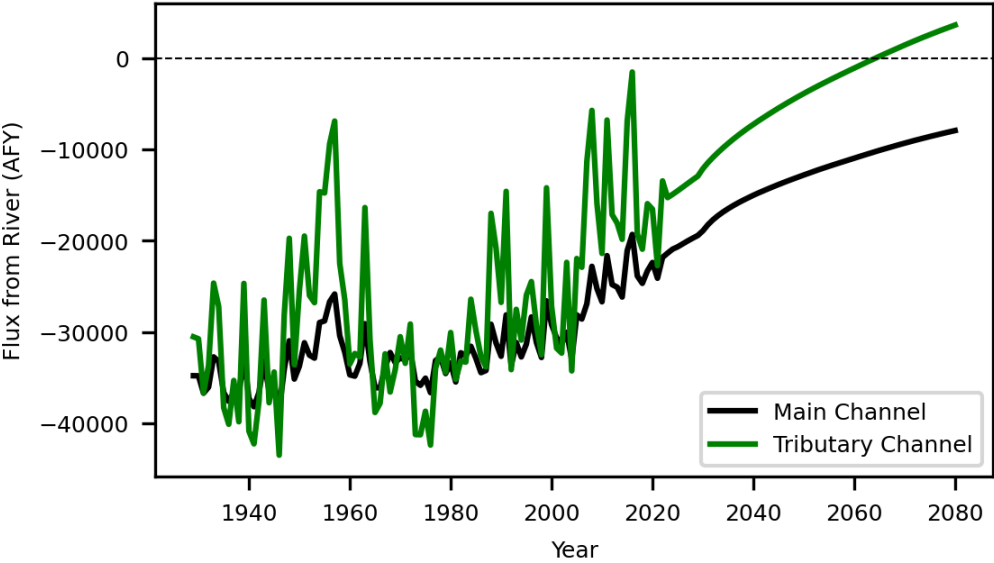
- **Less spring flow:** Positive values of seepage difference;
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Colorado River Basin – GW-SW Interactions (RIV Cells)

OPMAN, PS4-2 Modified

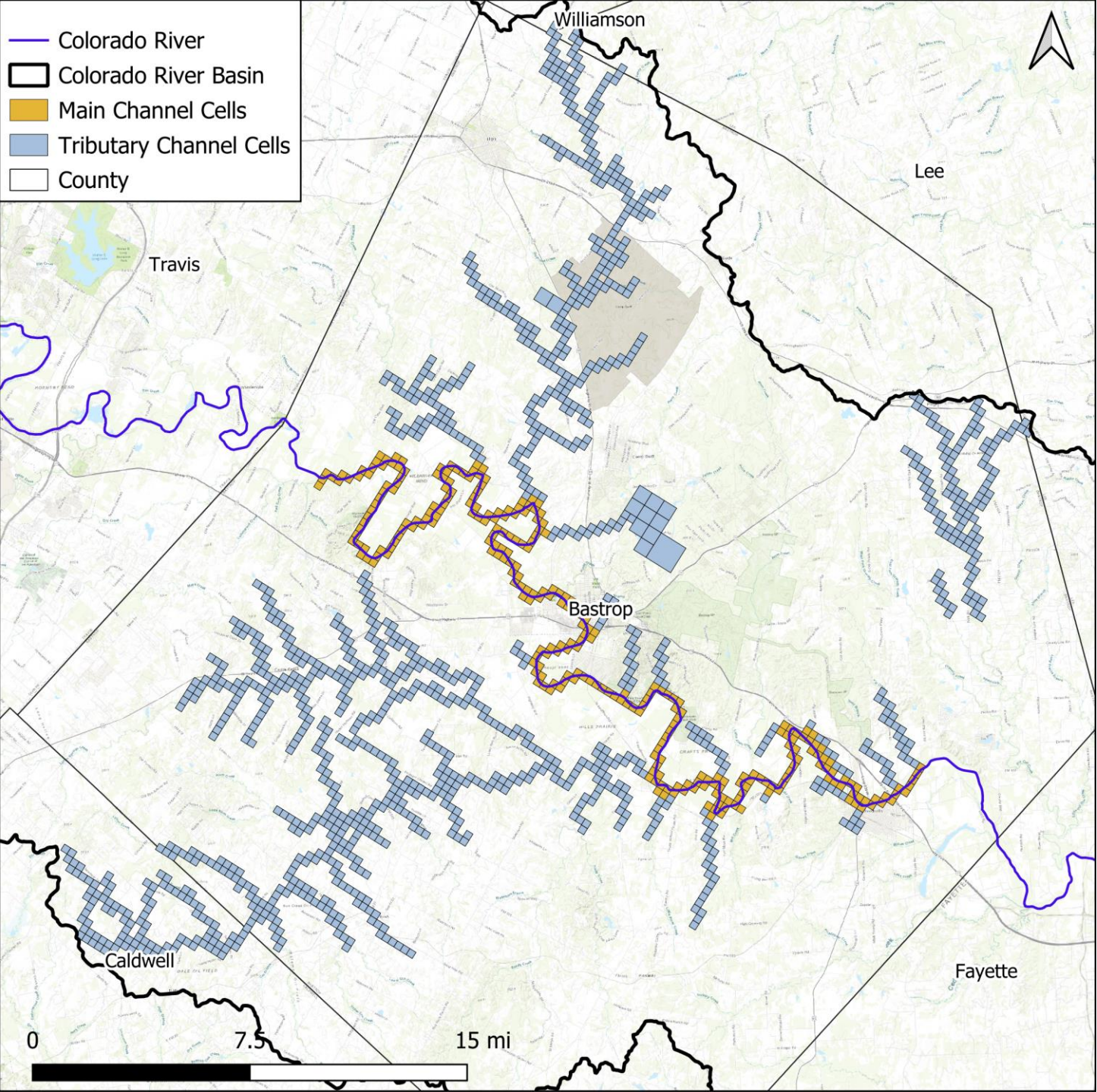
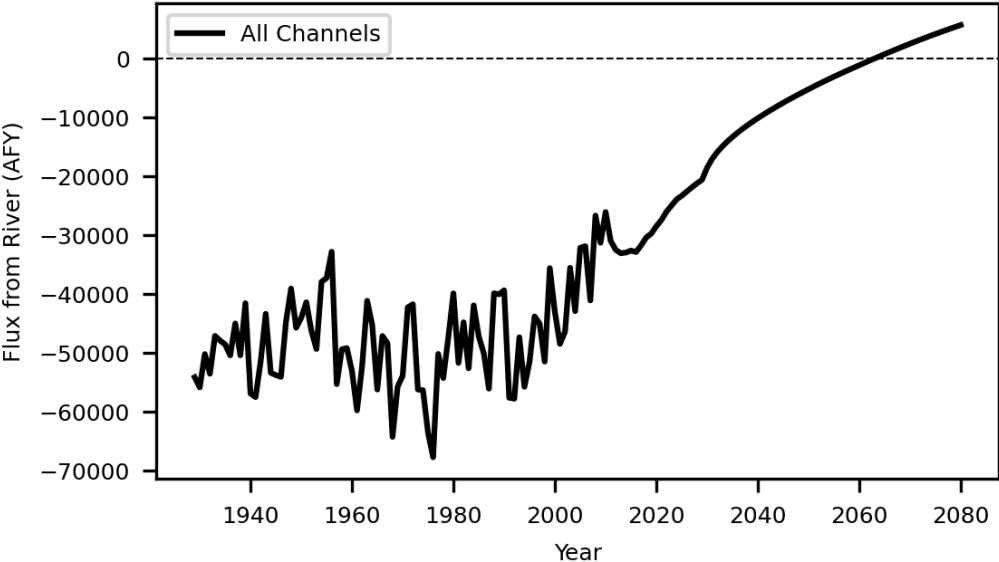
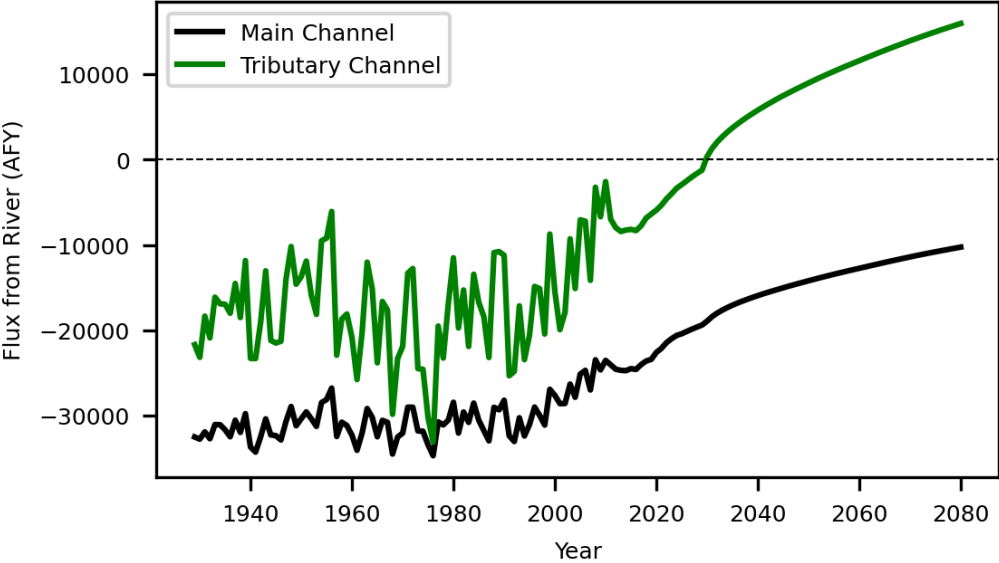
OPMAN, Colorado River Basin



Colorado River Basin – GW-SW Interactions (RIV Cells)

GAM2020, PS4-2 Modified

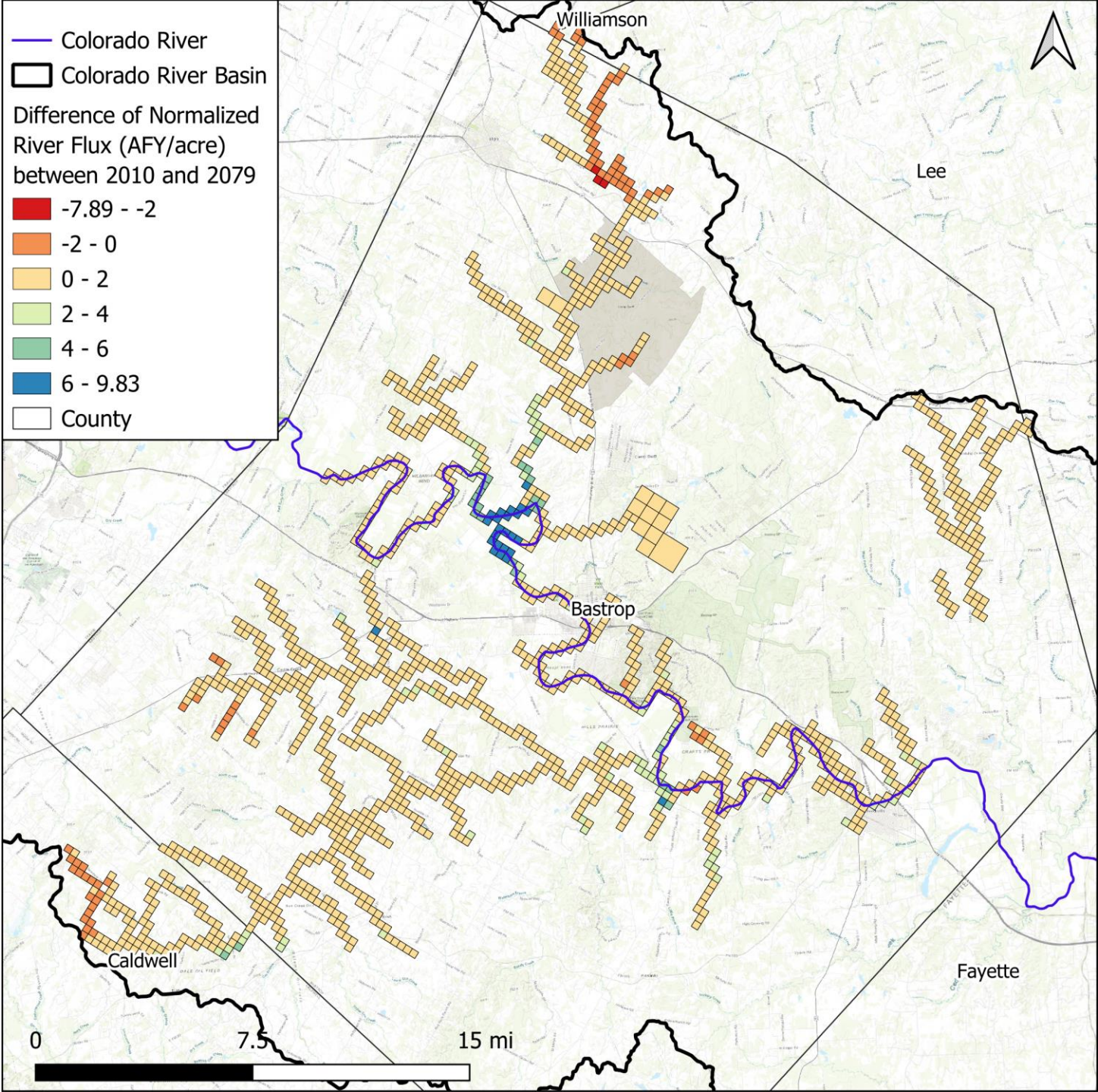
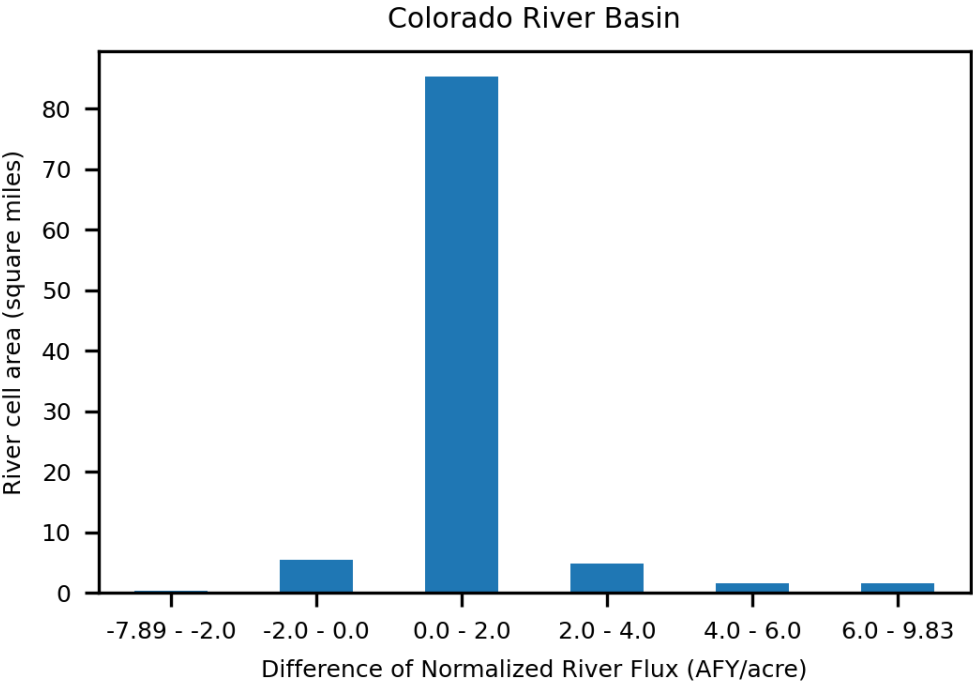
GAM2020, Colorado River Basin



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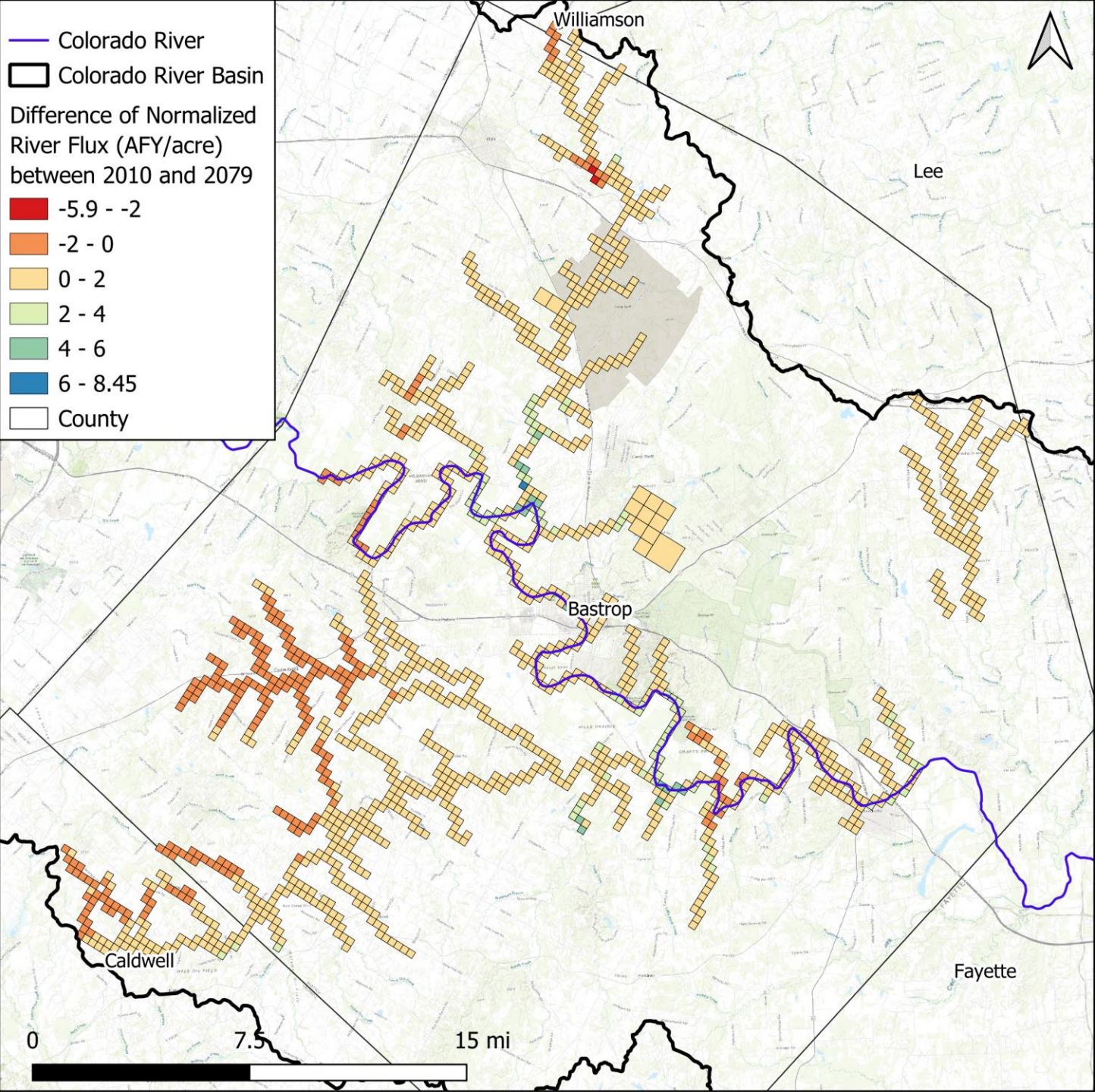
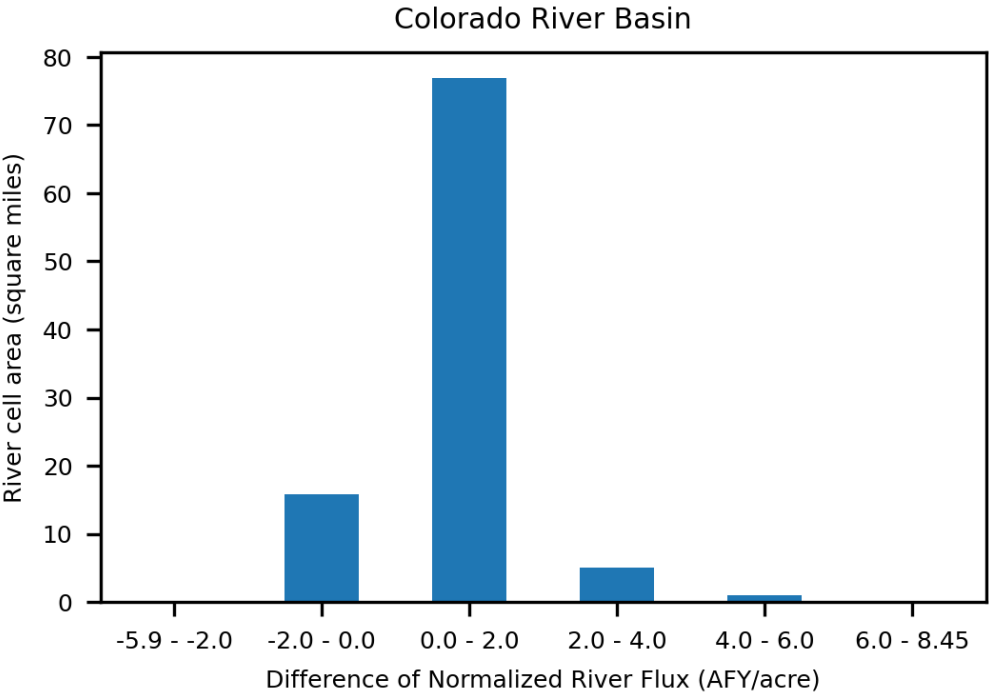
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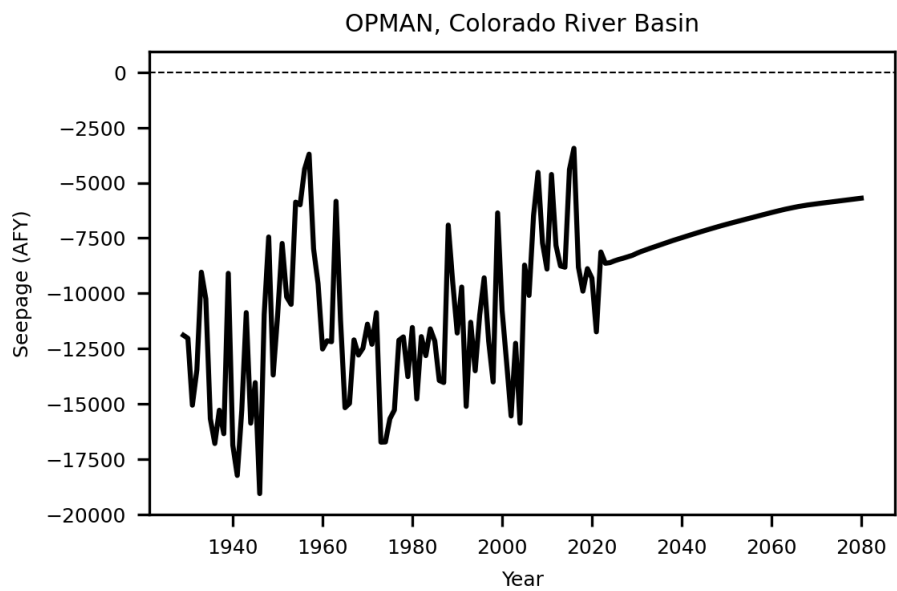
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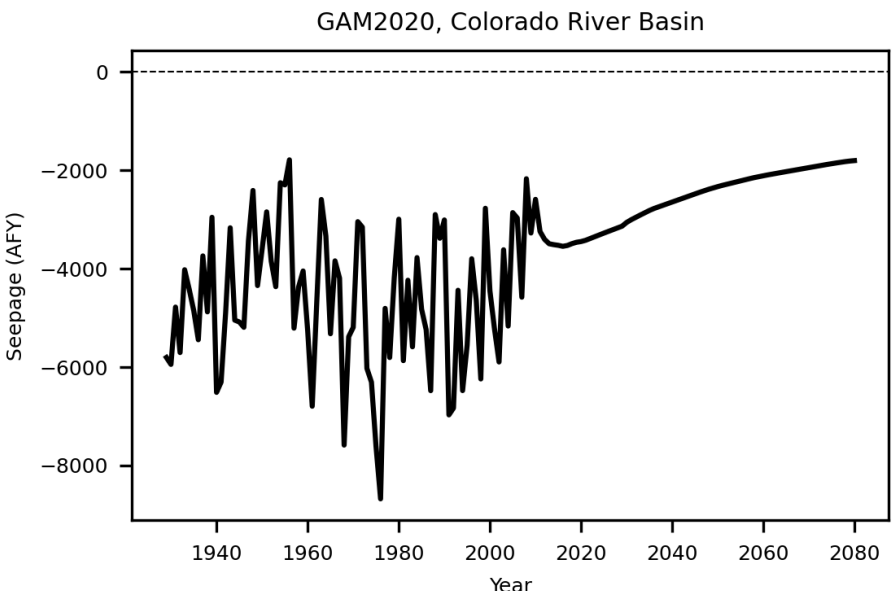


Colorado River Basin Springs/Seeps (DRN Cells)

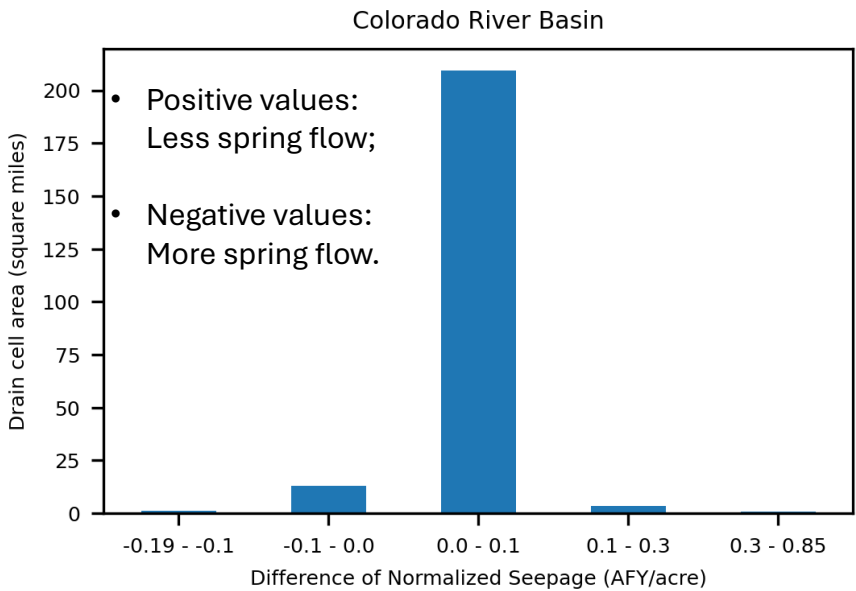
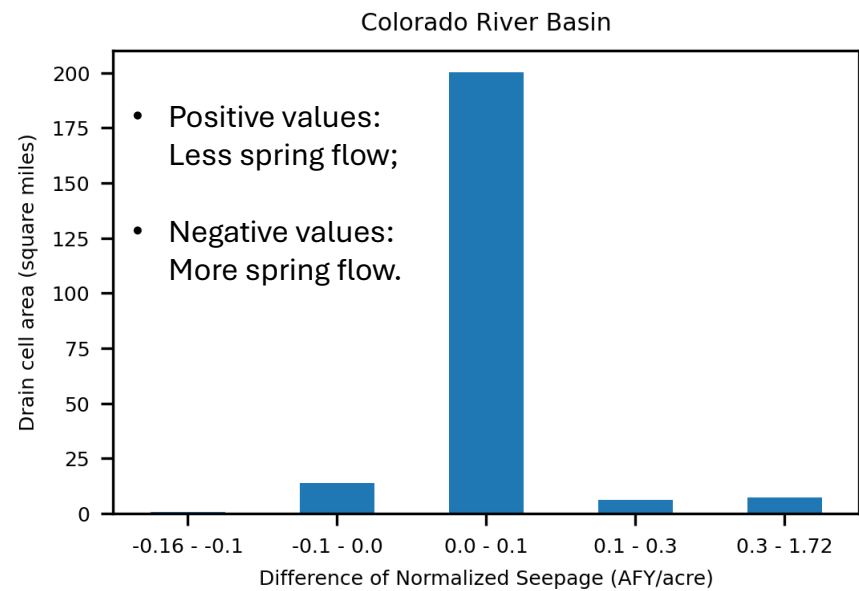
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GAM2020, PS4-2 Modified



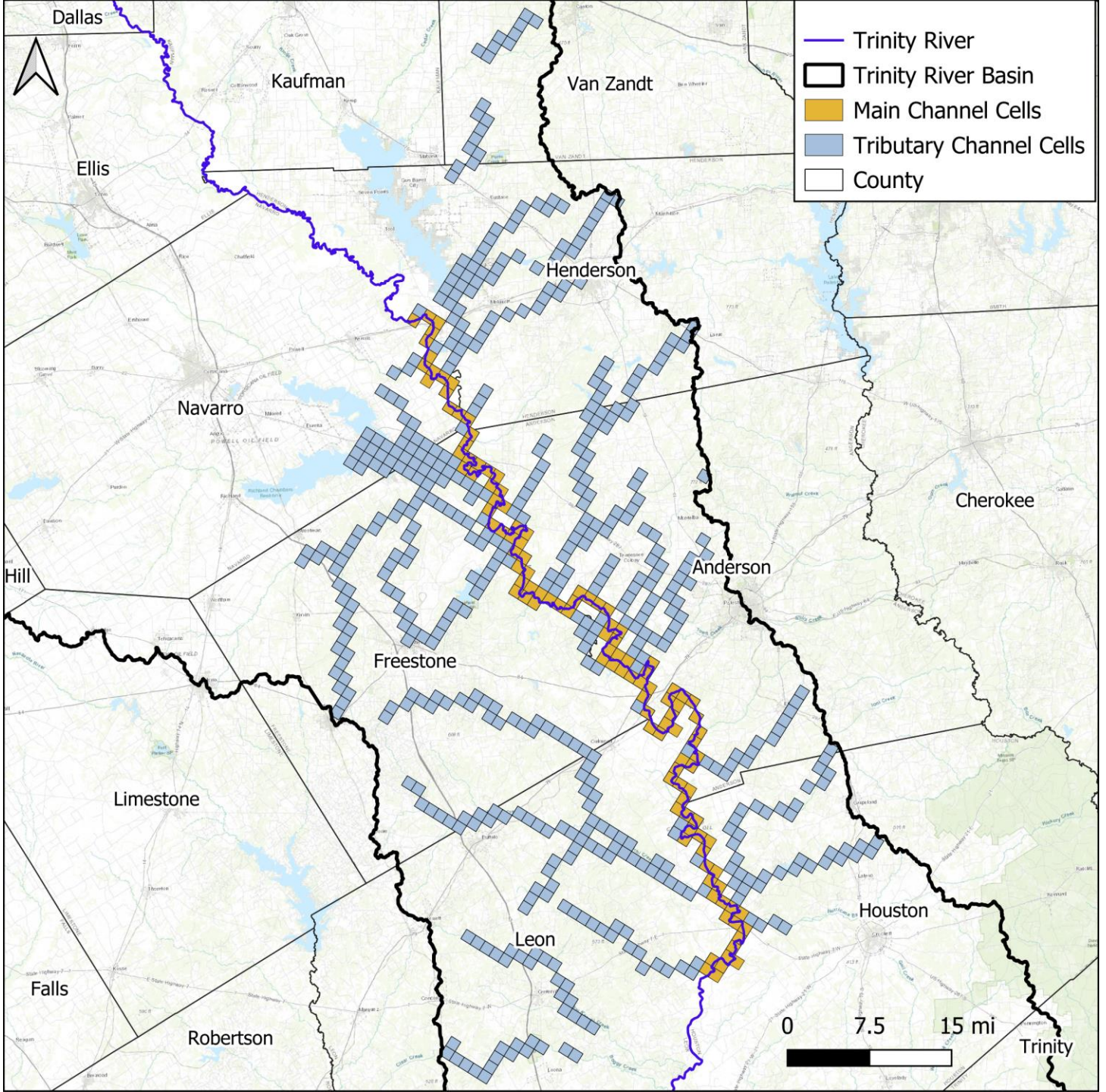
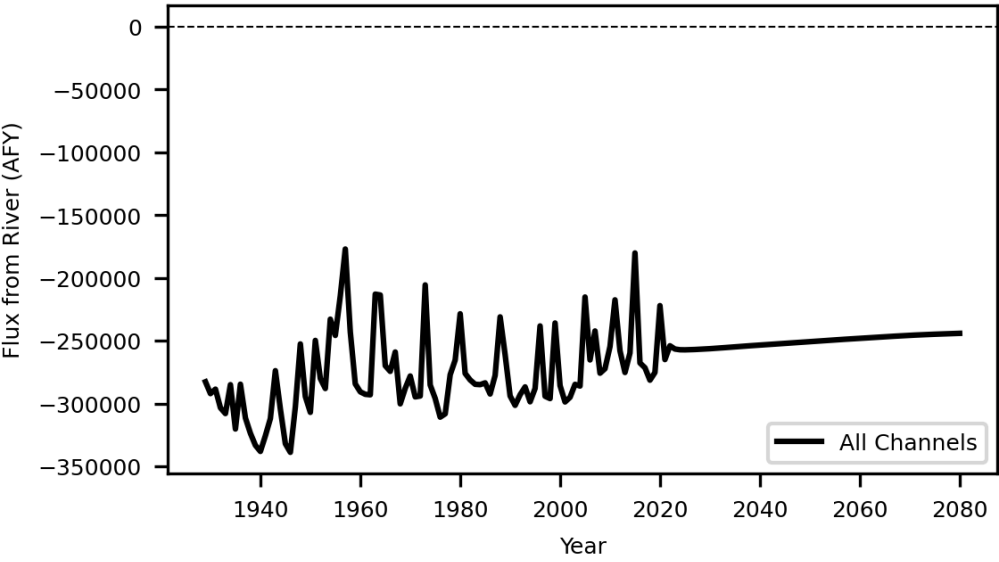
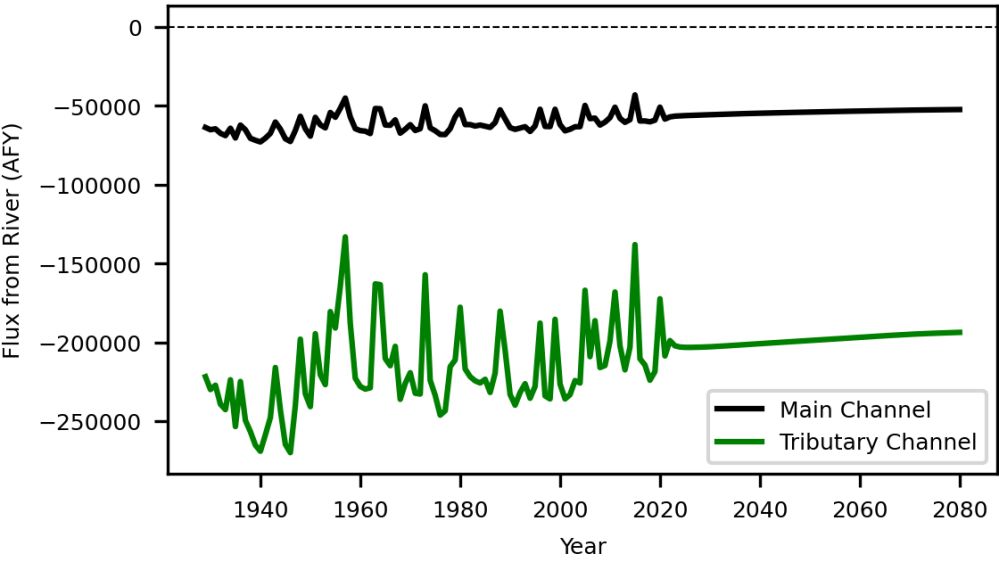
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Trinity River Basin – GW-SW Interactions (RIV Cells)

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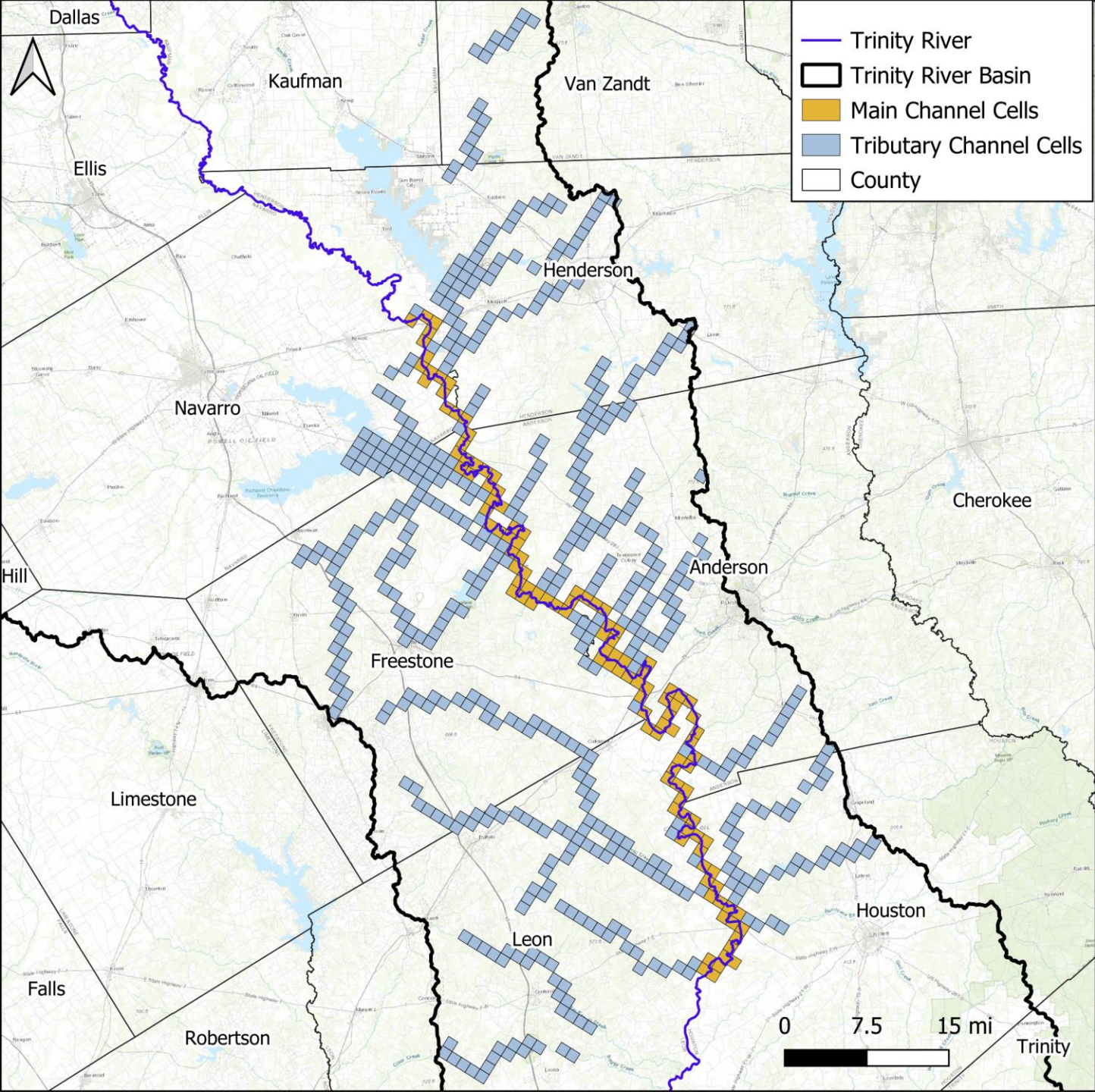
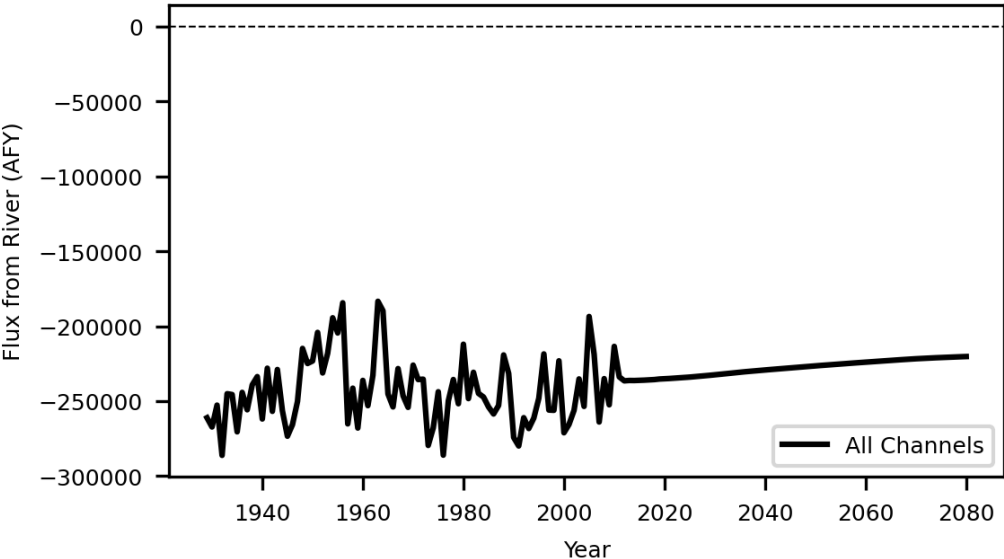
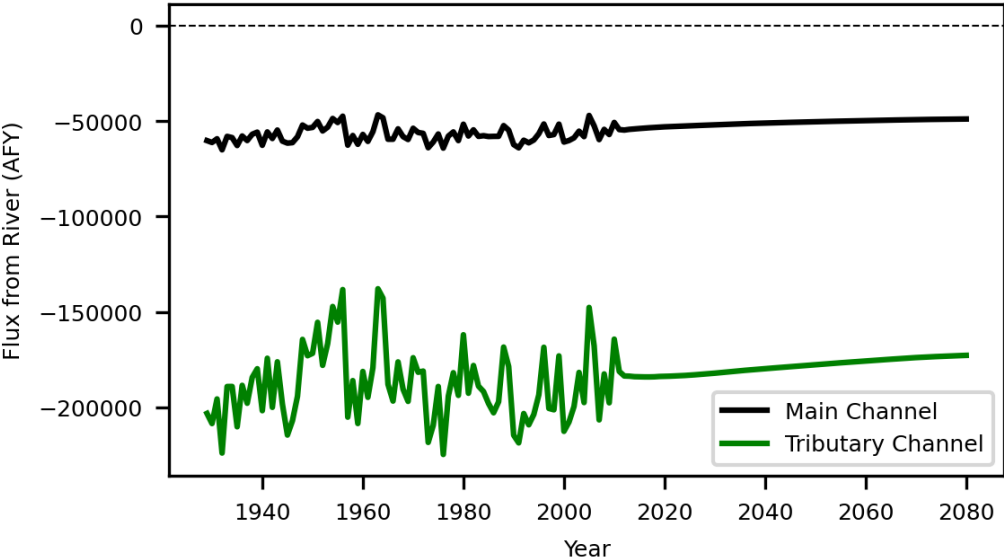
OPMAN, Trinity River Basin



Trinity River Basin – GW-SW Interactions (RIV Cells)

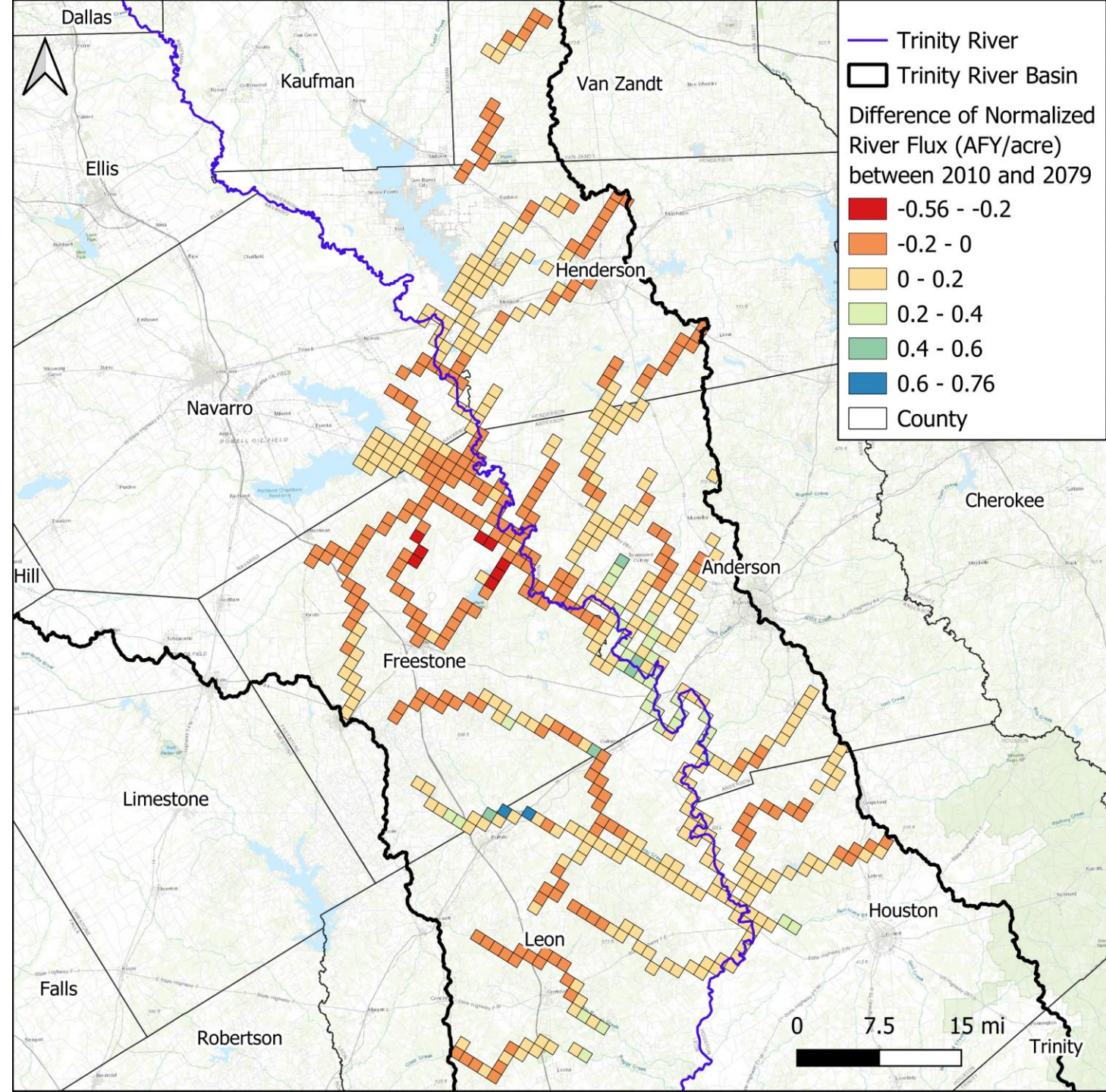
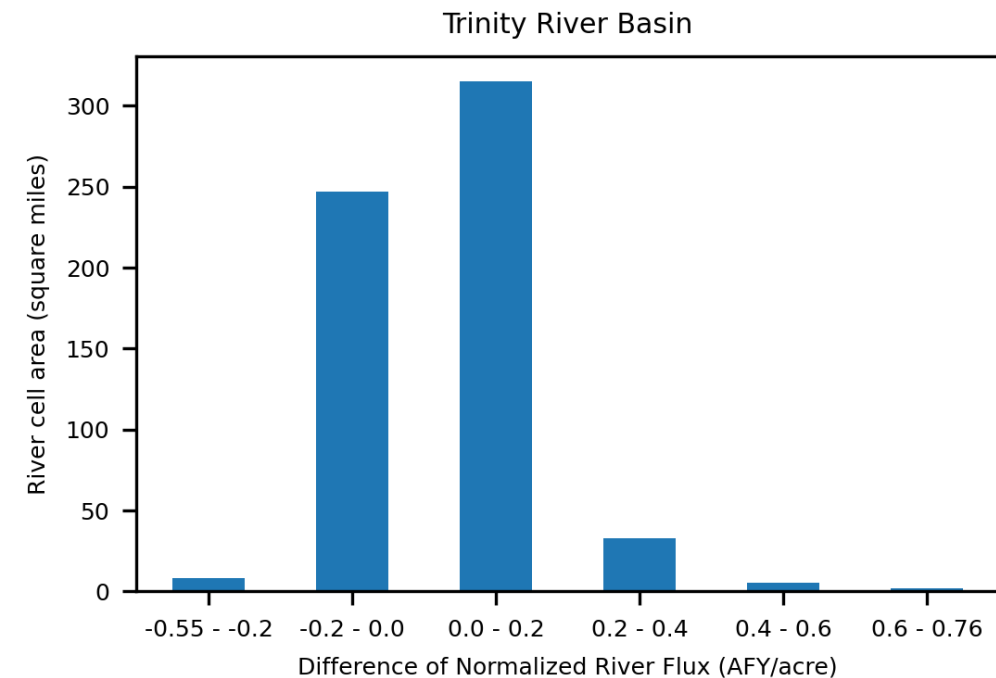
GAM2020, PS4-2 Modified

GAM2020, Trinity River Basin



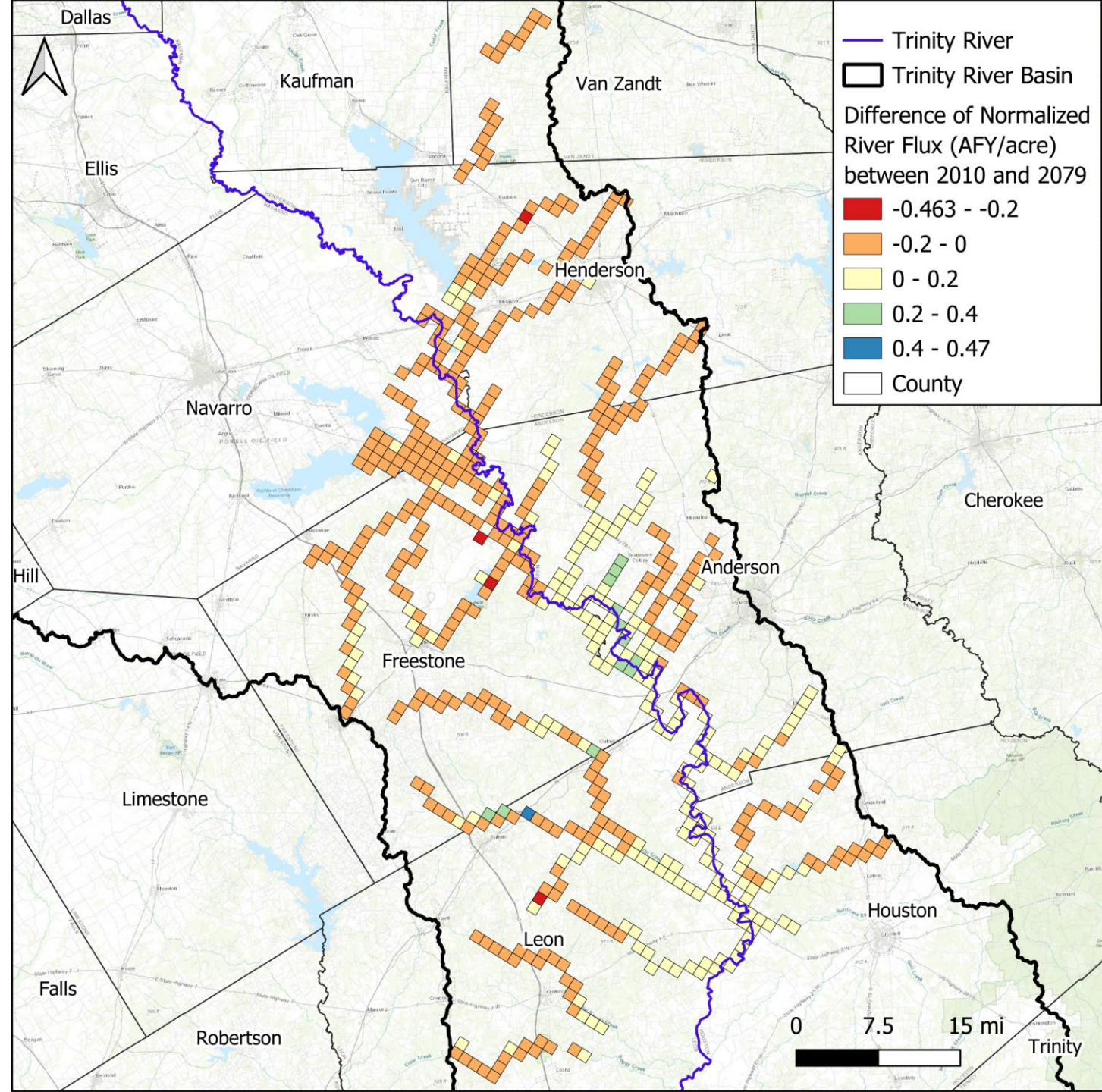
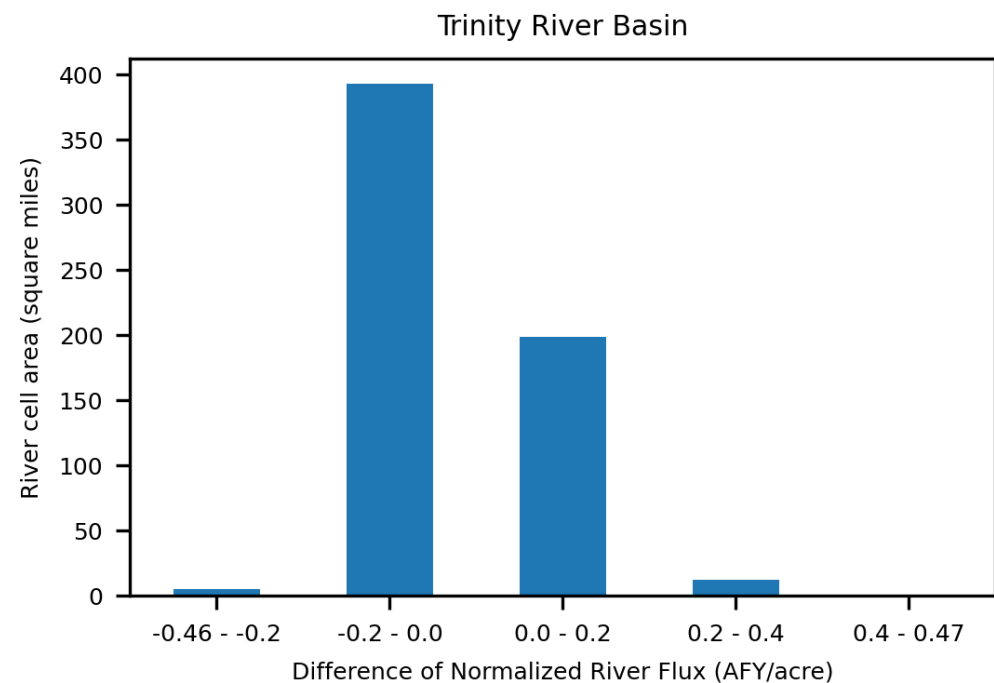
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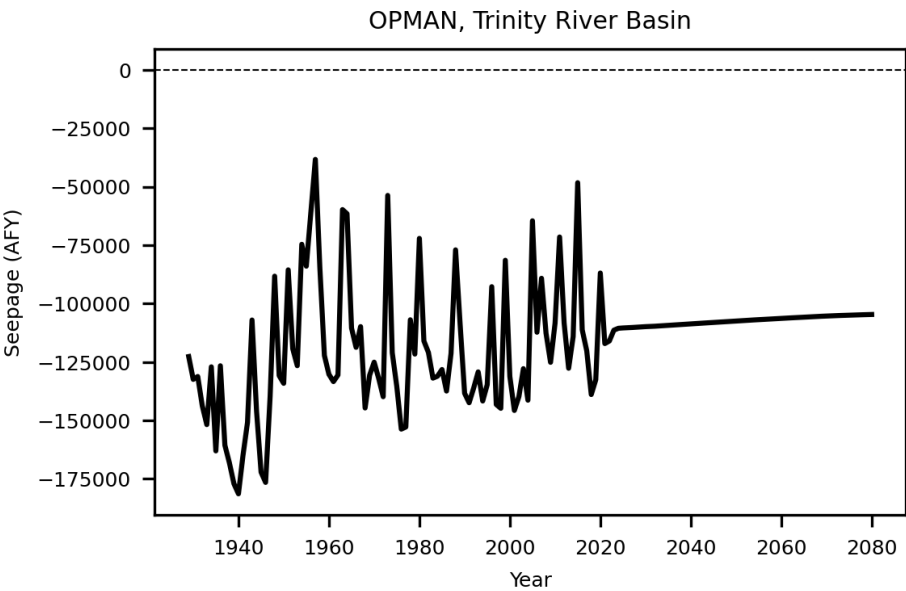
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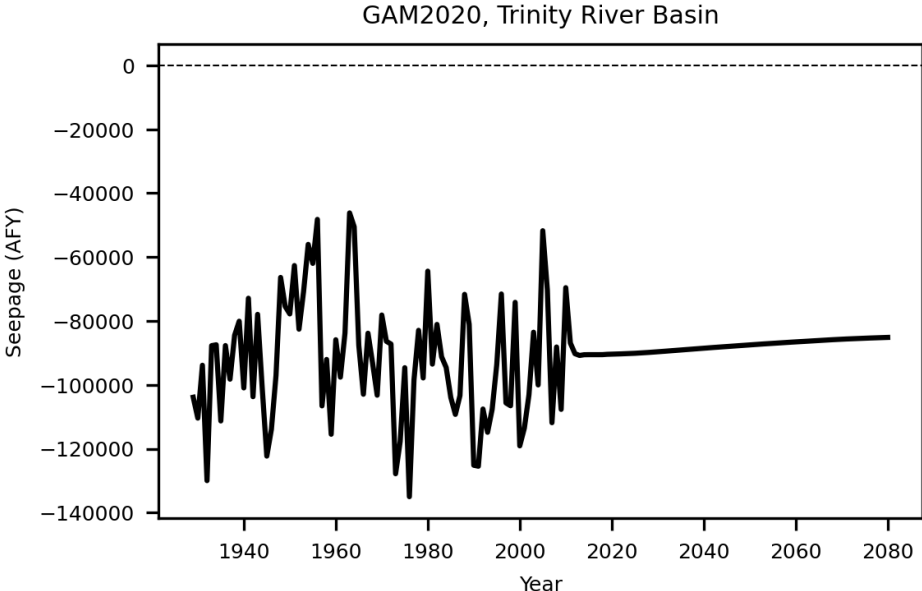


Trinity River Basin Springs/Seeps (DRN Cells)

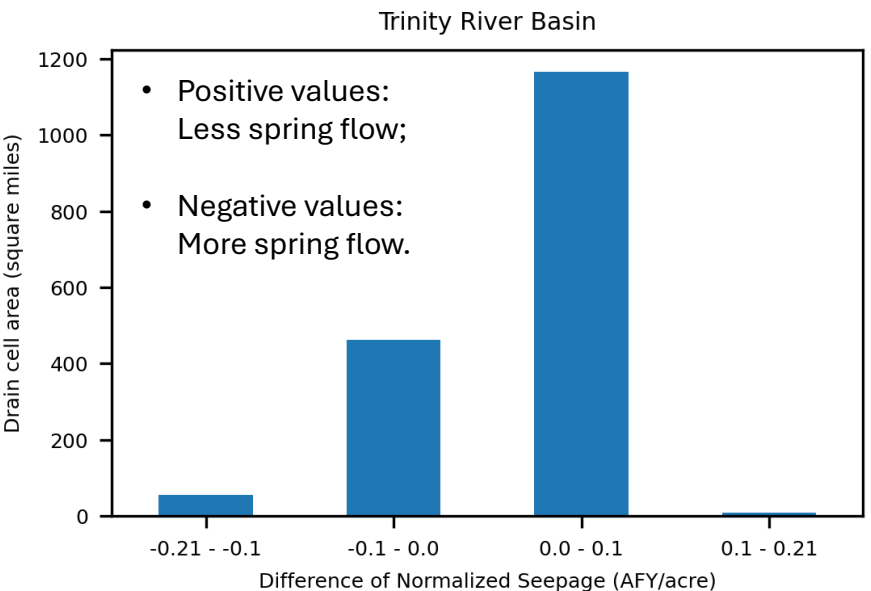
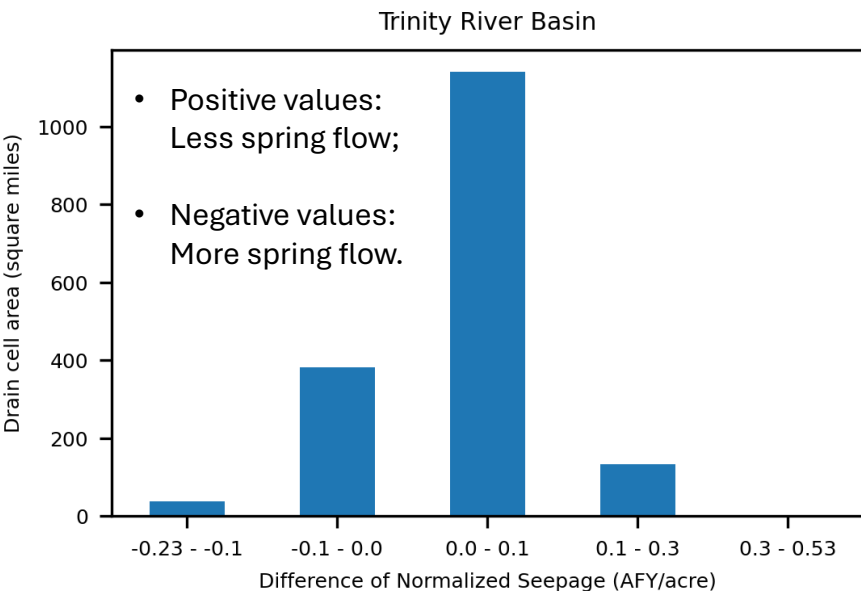
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Thank you!
&
Questions?