

Ten Years of Dragonfly Surveys:

What Johnson Creek Volunteers Taught a Climate Model

Johnson Creek Science Symposium – October 20, 2026

Zack Stack | Lewis & Clark College Biology Department

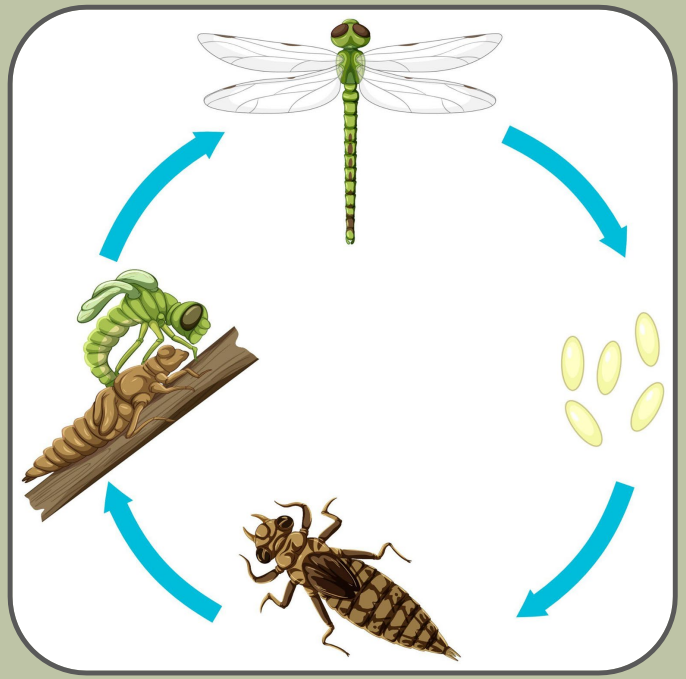
@bentforkz via iNaturalist

Dragonflies: the watershed's early warning system

Months to years underwater as predators

Sensitive to water quality, temperature, and habitat

Some species thrive in stormwater ponds, others need cold streams and bogs



Dragonfly & Damselfly Surveys





Four sites:
Brookside (since 2016)
Tegart/Ponza (since 2022)
Sunset Village (since 2022)
Brickworks (2025)

Species, abundance, sex, and life stage, year after year

2,195 observations of 32 species
as of the 2025 survey

Focal Species



Tolerant:
Cardinal Meadowhawk
Blue-eyed Darner
Pacific Forktail Eight-Spotted Skimmer
Blue Dasher

Focal Species





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Blue-eyed Darner
Pacific Forktail Eight-Spotted Skimmer
Blue Dasher

In between:
California Spreadwing
Variegated Meadowhawk
Vivid Dancer
Striped Meadowhawk
Flame Skimmer
Northern Spreadwing

Focal Species





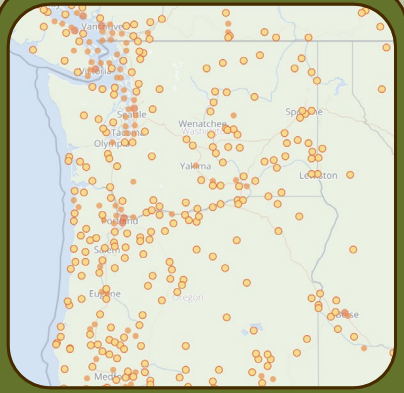


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Sensitive:
Black Petaltail (bogs)
Grappletail (lake outlets) River Jewelwing (flowing water)

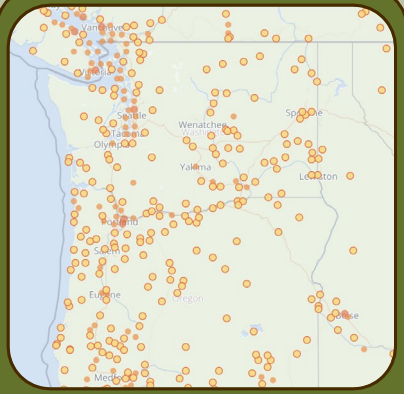
The Distribution Models



Species Distribution Records



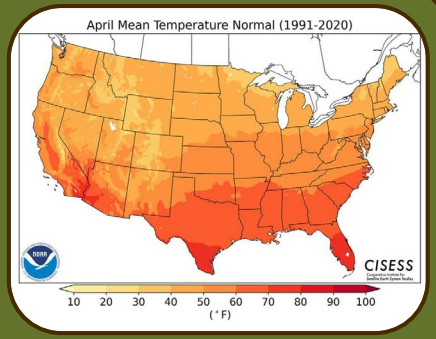
The Distribution Models



Species Distribution Records



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Records & Predictions for 4 Climate Variables:

Annual Mean Temperature

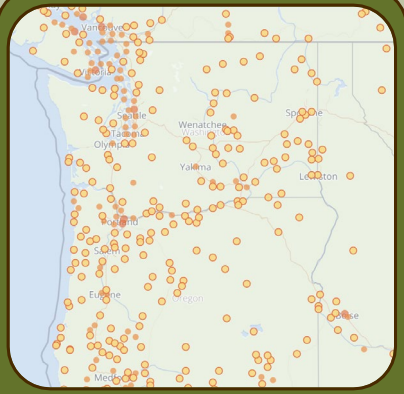
Mean Diurnal Range

Annual Precipitation

Precipitation Seasonality

Added NorWeST stream temperature data for stream species

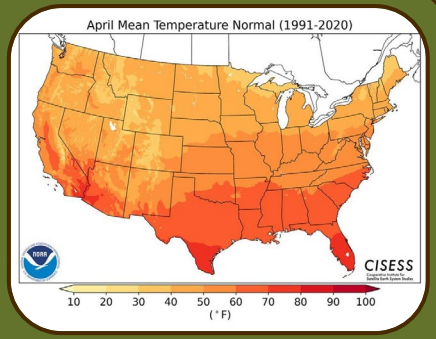
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Species Distribution Records



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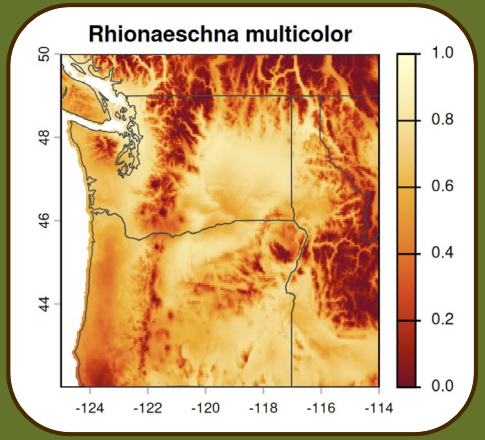
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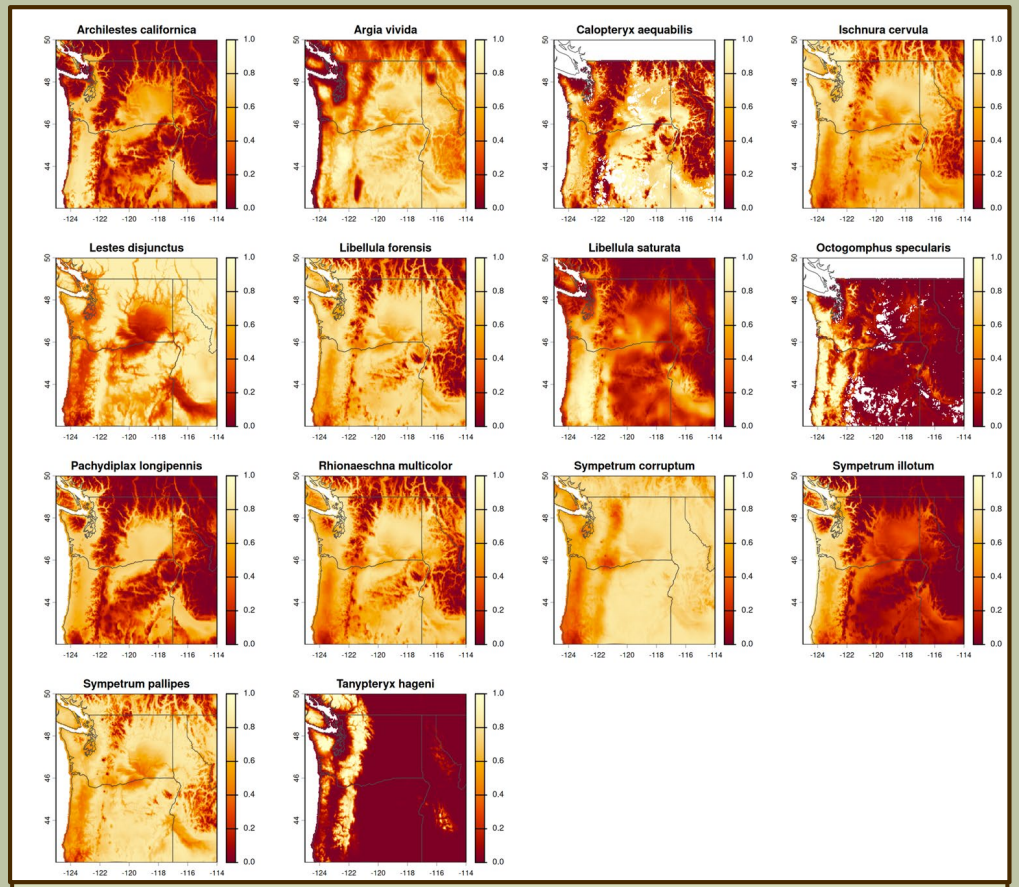
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Species Distribution Model

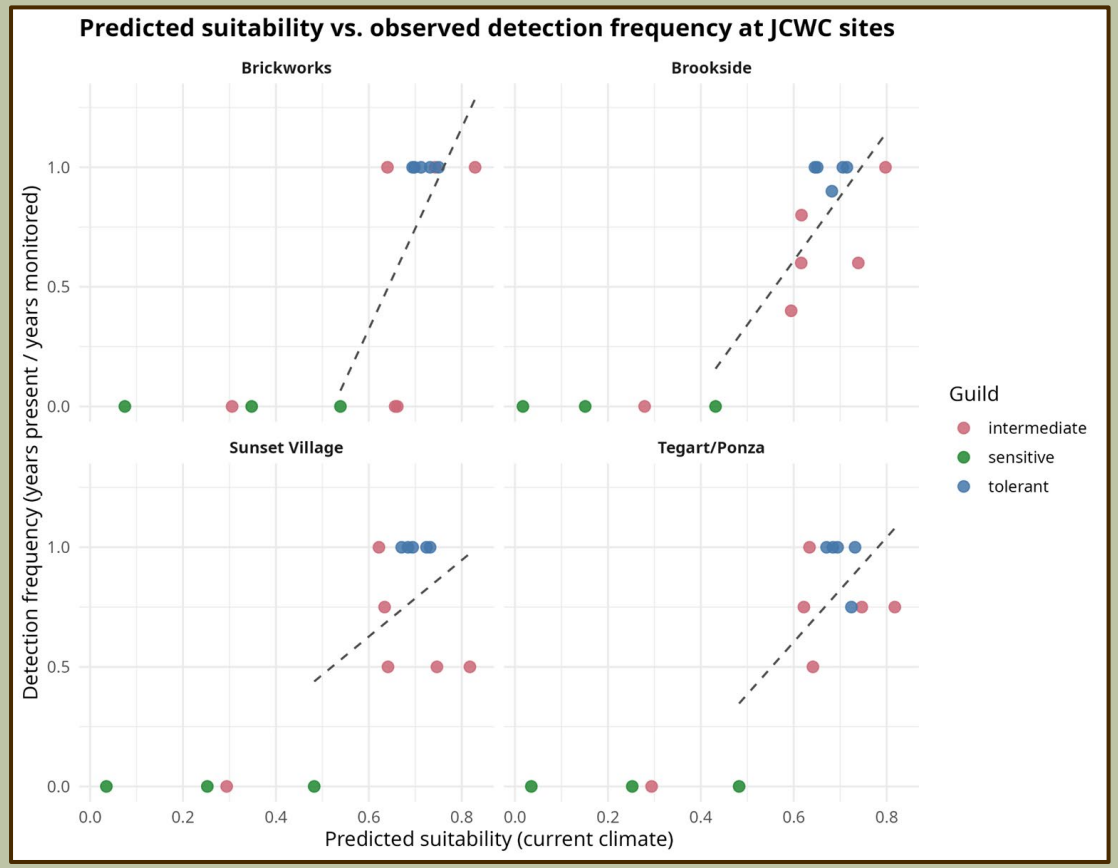


Predicted current climate suitability for all 14 focal species across the core study region is shown on a 0–1 scale where warmer colors indicate higher predicted suitability.

This looks like a lot!

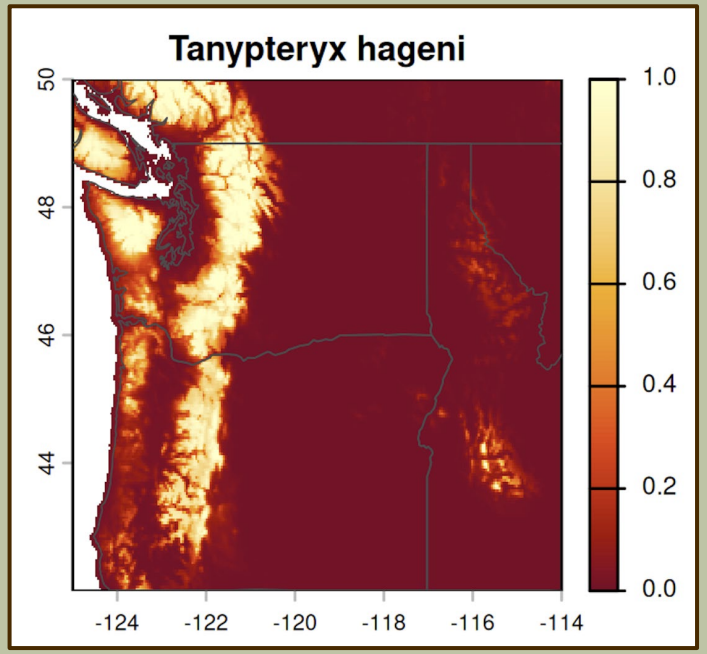
Let me explain what's important…

Did the Maps Match Up With What You Saw?

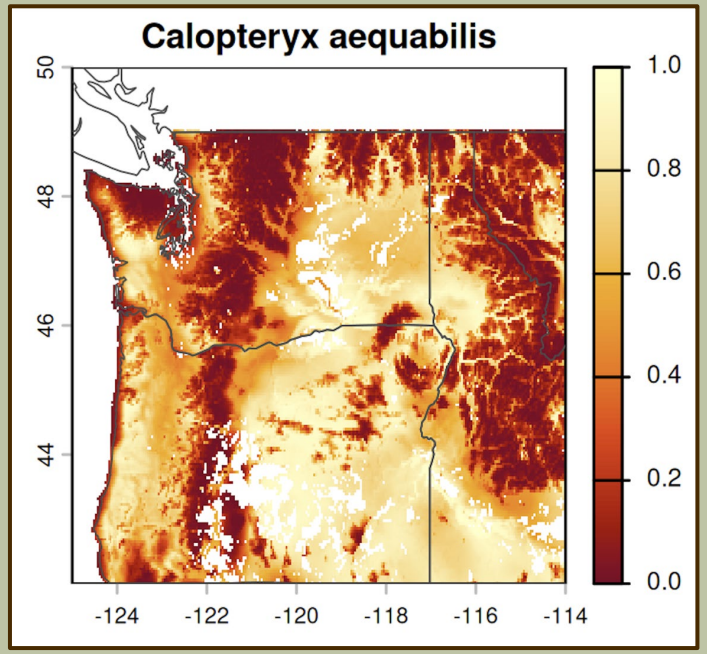


Yes, moderately,
and not by chance
Match score: r_s= 0.40
p = 0.0065

Did the Maps Match Up With What You Saw?

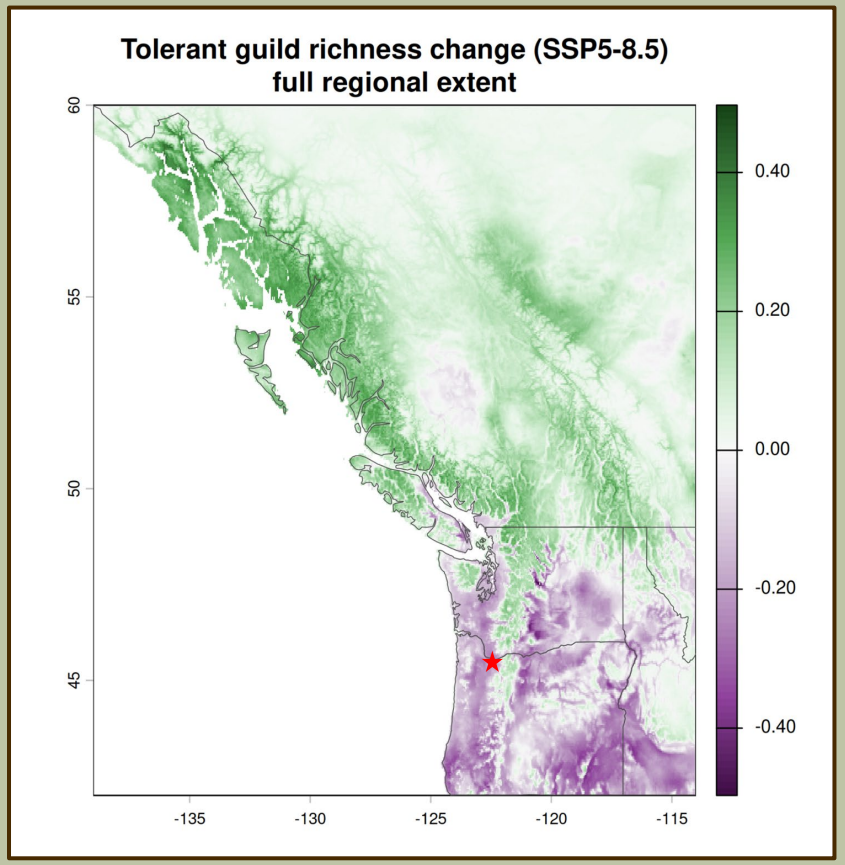


Black Petaltail: map said poor fit. Never found. ✓



River Jewelwing: map said decent fit. Never found. ✗

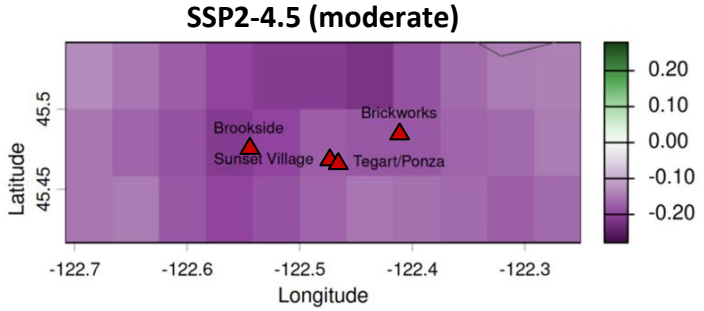
The Twist

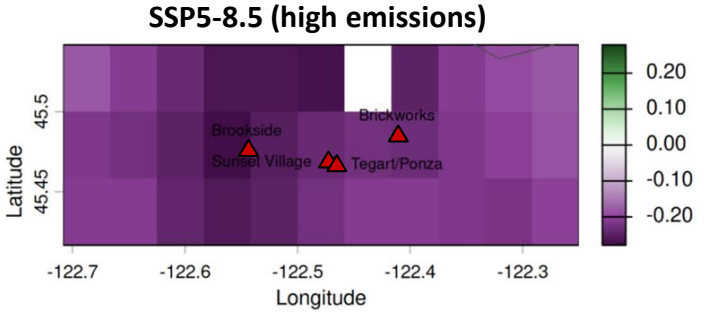


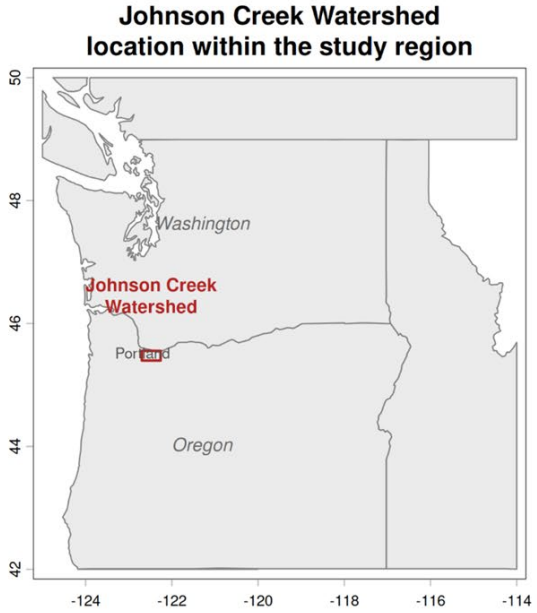
Gaining in the region but losing here

Tolerant species:
more suitable climate in the northern PNW and into BC

The Twist







In Johnson Creek: the same species lose it

Likely why: we're already near their warm edge

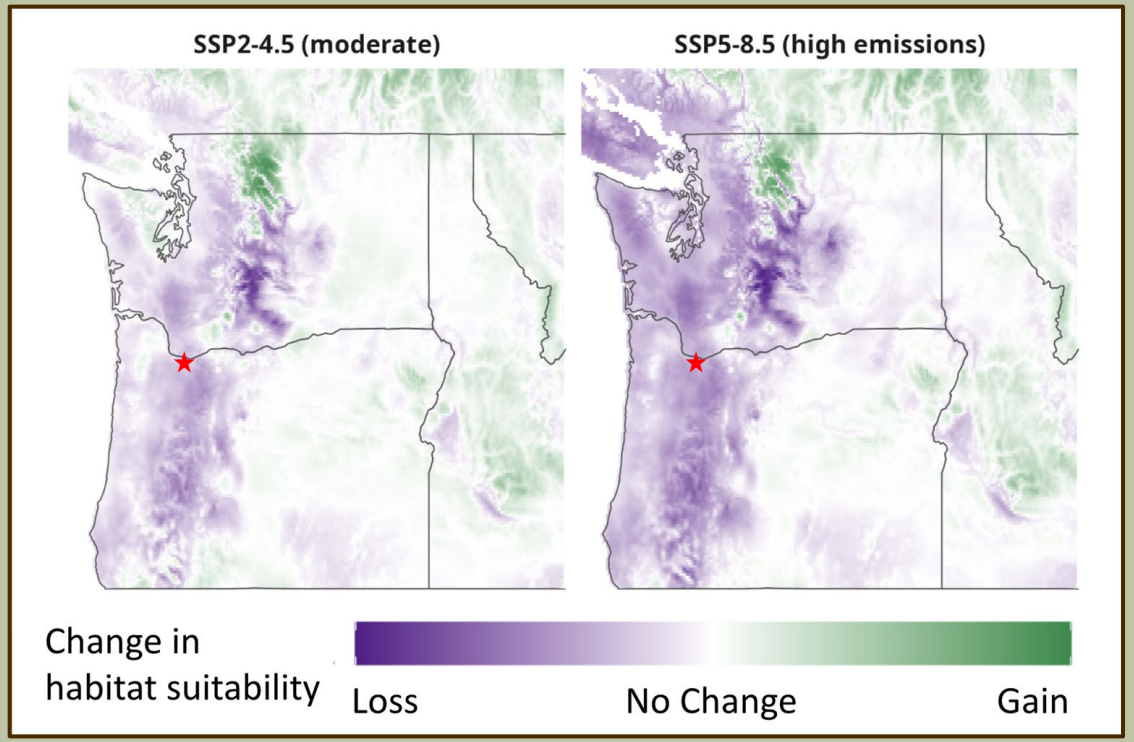
Species to watch: Variegated Meadowhawk

Not seen at any site in 2024 or 2025

Model: Johnson Creek's climate less suitable by 2041-2060 (high-emissions scenario)

Two explanations now, not one



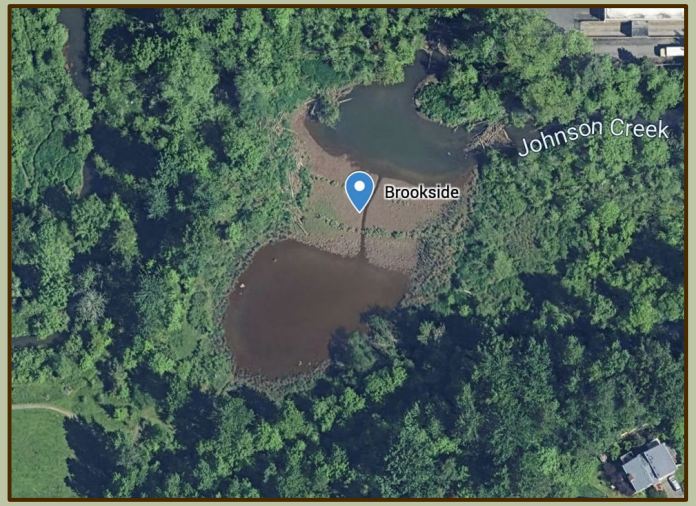


Adding to the 2025 survey report: Brookside's open water

18-19 species (2016-19)
then 15-16 as the wetland dried and filled in (2020-24)
and back to 18 in 2025

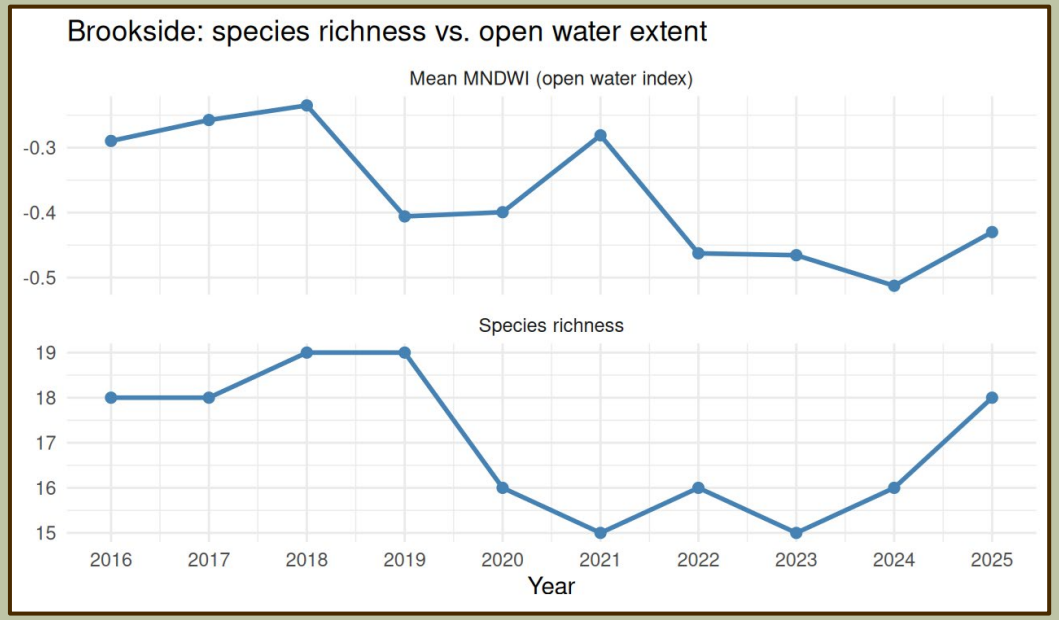


Brookside wetland on 1 July and 20 August, 2025, looking out across the southern pond to the vegetated berm. (CASM Environmental)

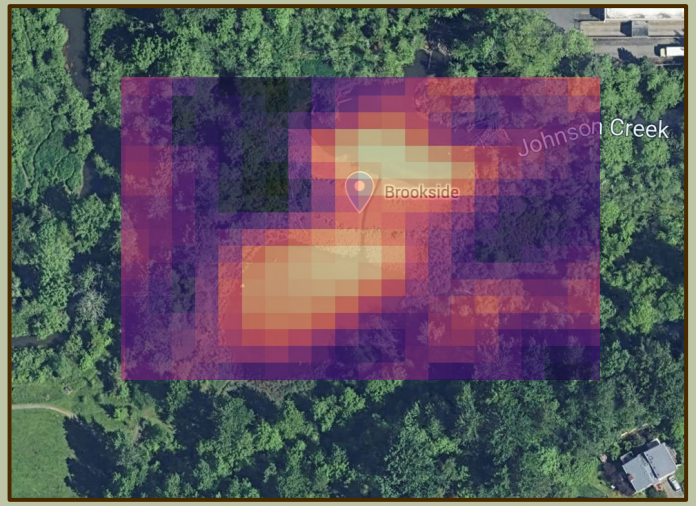


Brookside Aerial View

Adding to the 2025 survey report: Brookside's open water



High early, low in 2020-24, rising in 2025
Moderate correlation: r_s= **0.44, p = 0.21**
Not every year fits: 2021 had high water and low richness



Brookside with Sentinel-2 Band 1 overlay

What This Means For You

1. **Continue surveying!**

1. Watch the species the maps flagged

1. Watch the water

Thank You!

JCWC Volunteers, Sara Volk, Zee Searles Mazzacano and Greta Binford



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