LOS ANGELES COUNTY SANITATION DISTRICTS
Converting Waste Into Resources

Santa Clara River Temperature Study

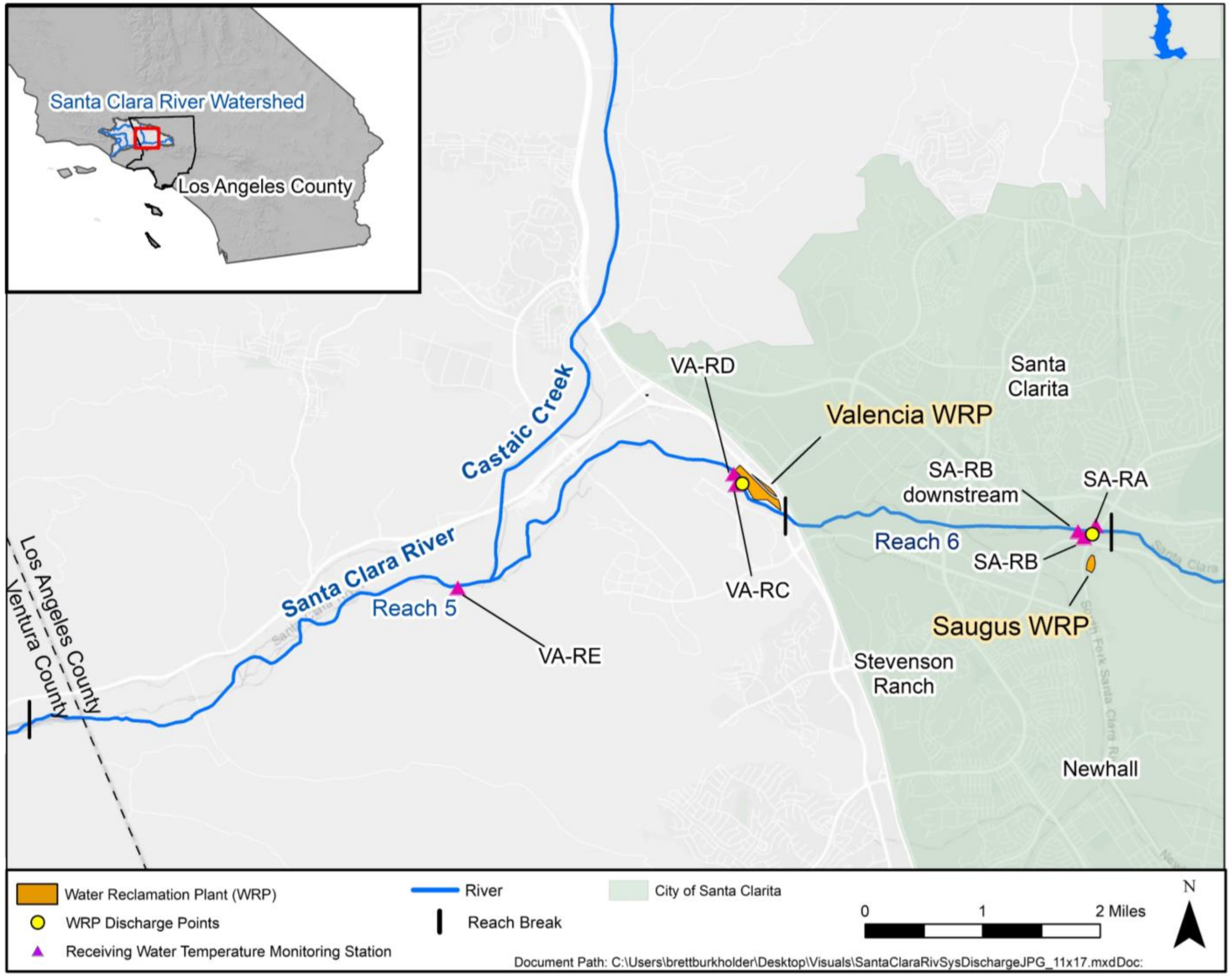
TAC Meeting

August 13, 2025

Today's Agenda

- Introductions
- Project Background
- Temperature Monitoring and Modeling Results
- Laboratory Fish Thermal Physiology Studies
- Benthic Macroinvertebrate Sampling / Stickleback Observations
- Next Steps

Santa Clarita Valley Sanitation District
Water Reclamation Plants




September 2023

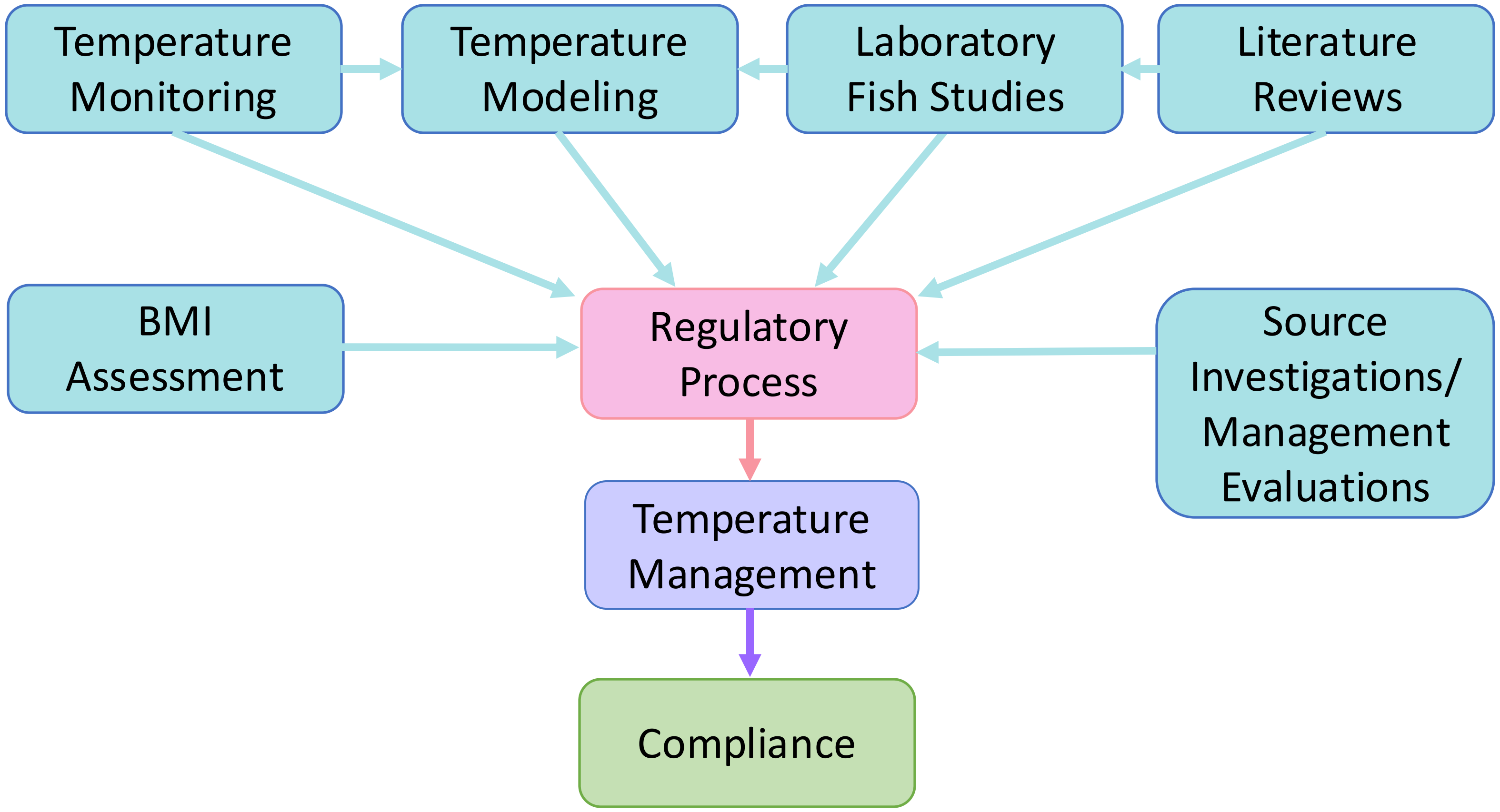

January 2024


September 2024

Santa Clara River Temperature Study

- Initiated in response to new temperature limits in WRP discharge permits (80°F and cannot alter river >5°F)
- Using **Unarmored threespine stickleback** (UTS) as **focal species**
- UTS thermal tolerances largely unknown; conducting lab studies at UC Davis with partially-armored surrogate
- **Temperature monitoring** (sensors, spatial surveys) and **modeling** used to characterize river conditions and effects of management actions
- Nature-based and mechanical cooling **management options** are being evaluated
- Continued analysis of temperature **sources** to WRPs (e.g., industrial waste) is in progress

Santa Clara River Temperature Study



Santa Clara River Temperature Study

NPDES Permit Compliance Milestones	
Submit and Begin Implementation of Pollution Prevention Plan (PPP) for Source Control	8/1/2022
Convene TAC and SAG	10/1/2022
Release the Request for Proposal to Retain Consultant to Evaluate Temperature Impacts in the Watershed and Management Options	2/28/2023
Finalize the Technical Workplan	2/28/2024
Prepare a Technical Workplan Progress Report	2/28/2025
Complete Implementation of Technical Workplan	2/28/2026
Notify LA Water Board of selected preferred project and identify regulatory approval process and present results of technical workplan at next scheduled board meeting	4/1/2026
Complete Preliminary Design	4/1/2027
Complete Environmental Review	10/1/2027
Design Preferred Project	7/1/2028
Issue Notice to Proceed for Project Work	7/1/2029
Complete Preferred Project	7/1/2030

Preliminary Steps

Technical Studies

Regulatory Process

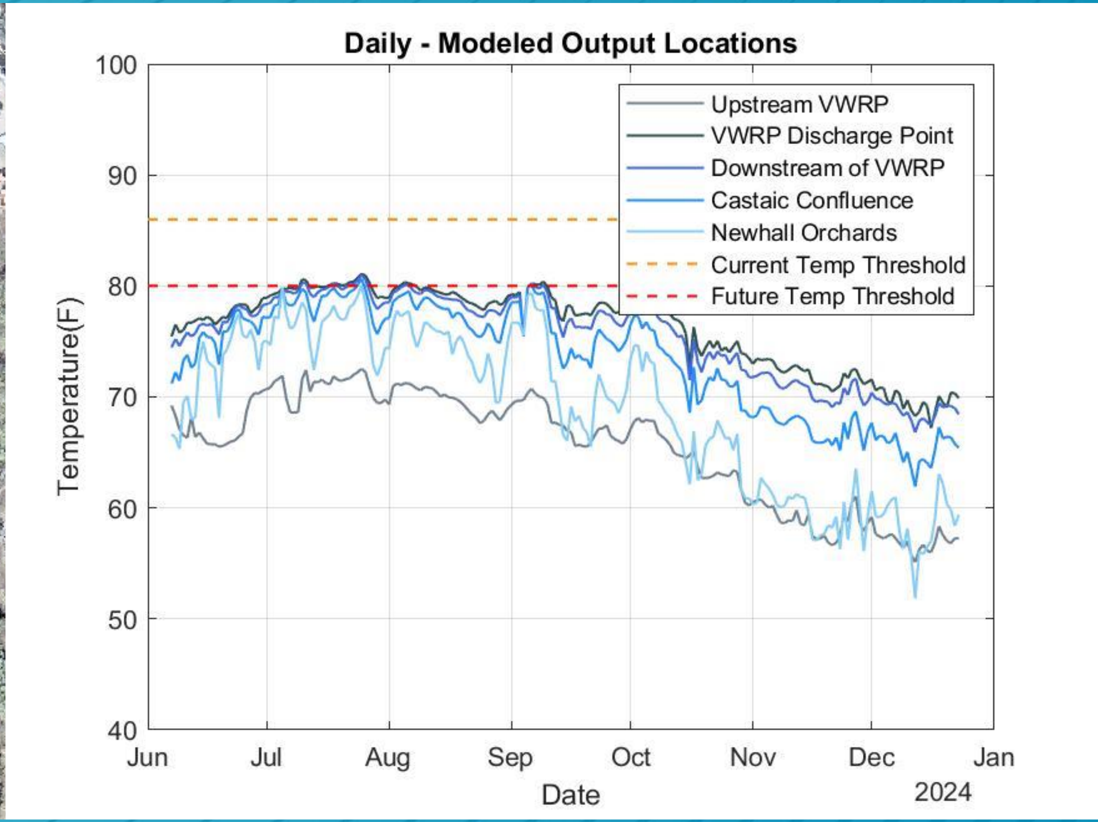
Project Design

Construction

Goals for Today

- Ensure temperature monitoring and modeling studies are clearly communicated and questions are addressed
- Provide updates on status of Phase 2 Fish Studies
- Discuss next steps and timeline

Temperature monitoring & modeling

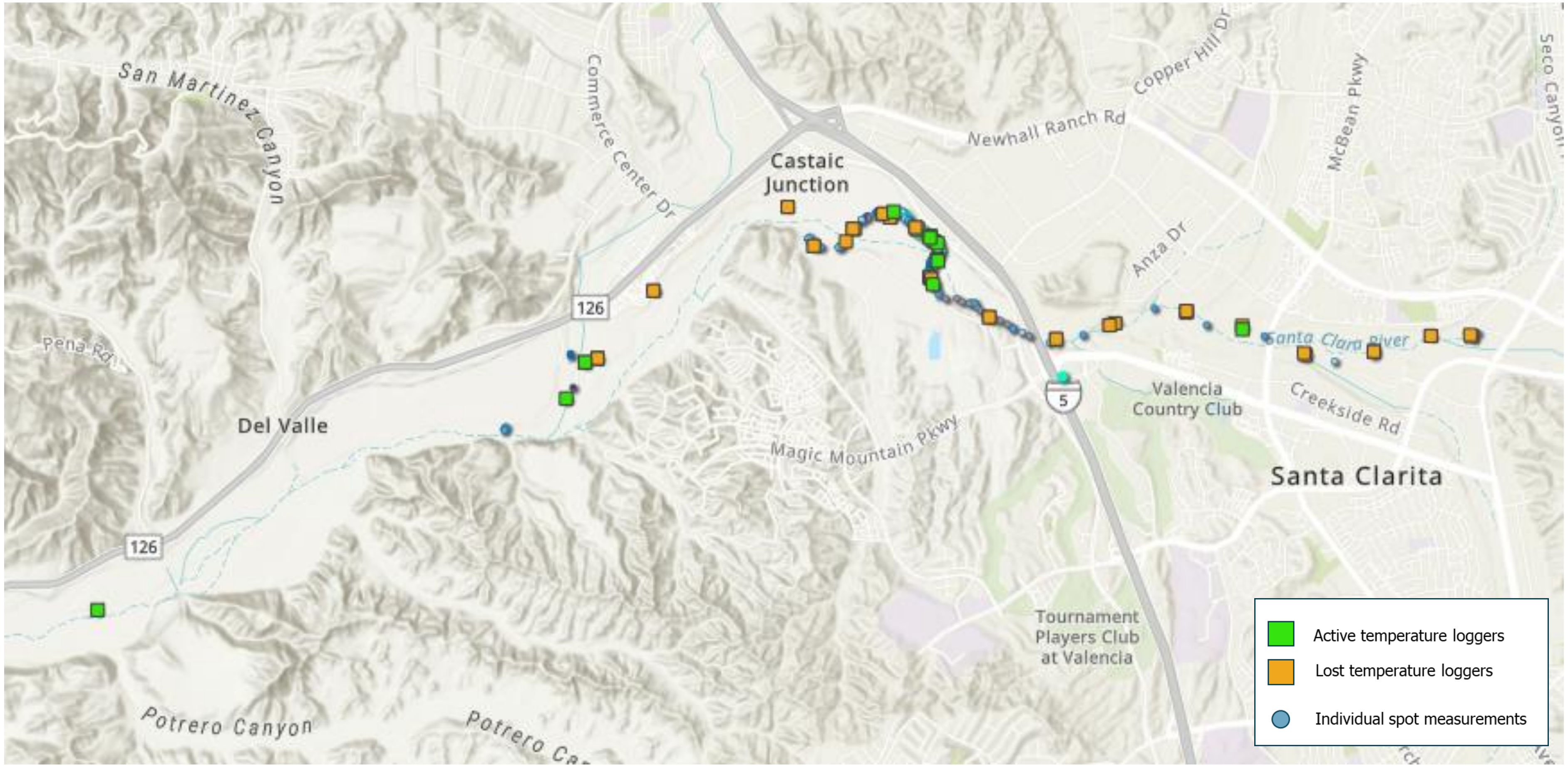


Outline of Discussion

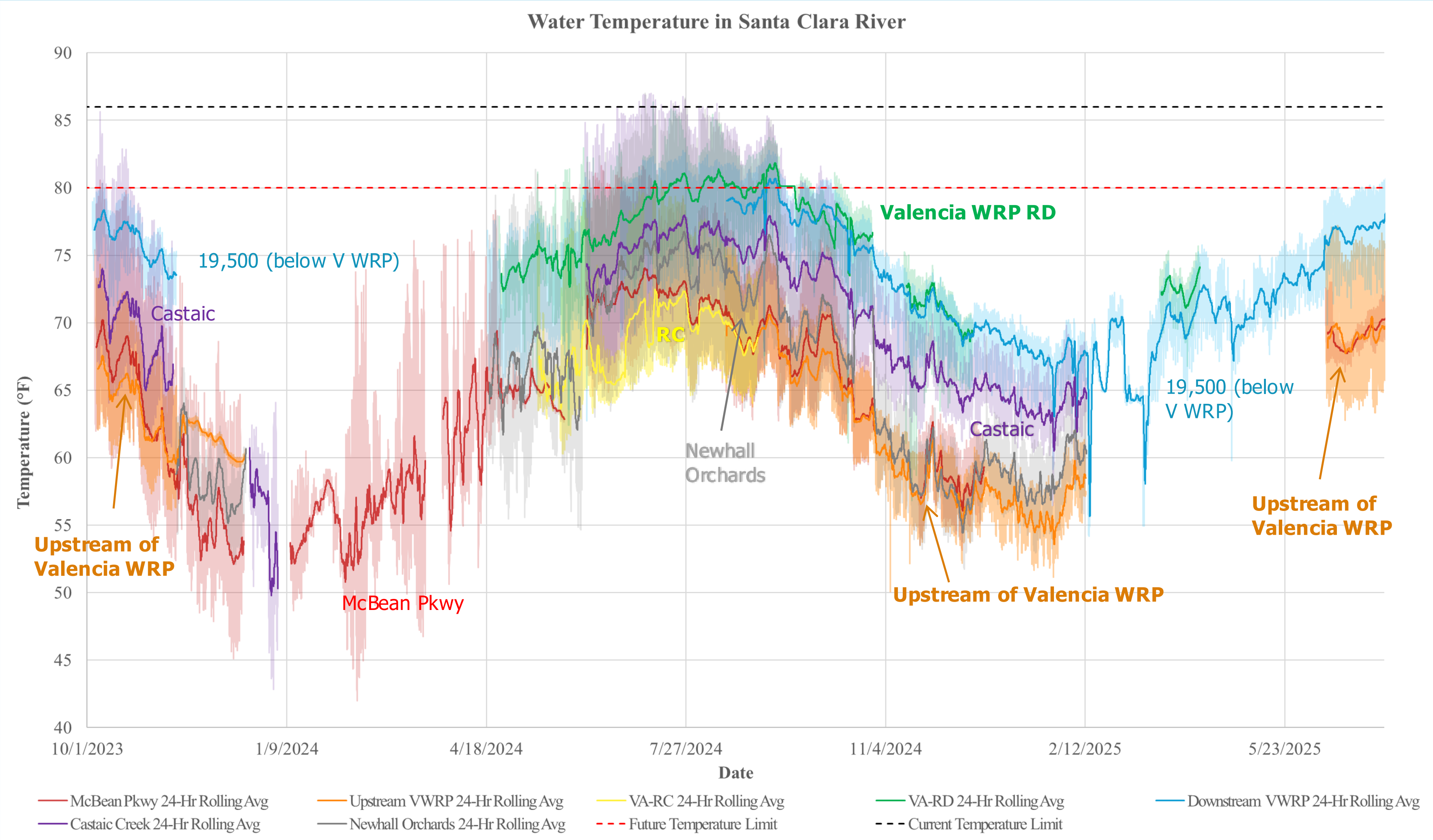
- Temperature monitoring results
- Temperature modeling
  - 2022 dry conditions
  - 2024 wet conditions
- Initial Findings

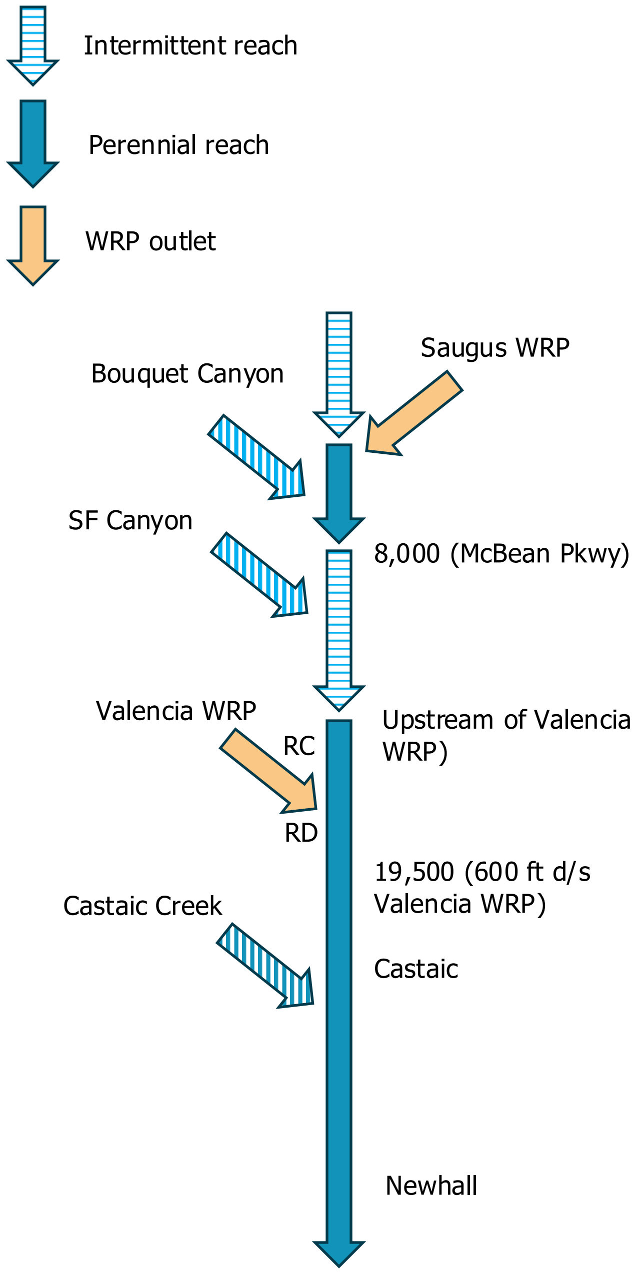
Temperature monitoring

Location of Temperature Monitoring Sites

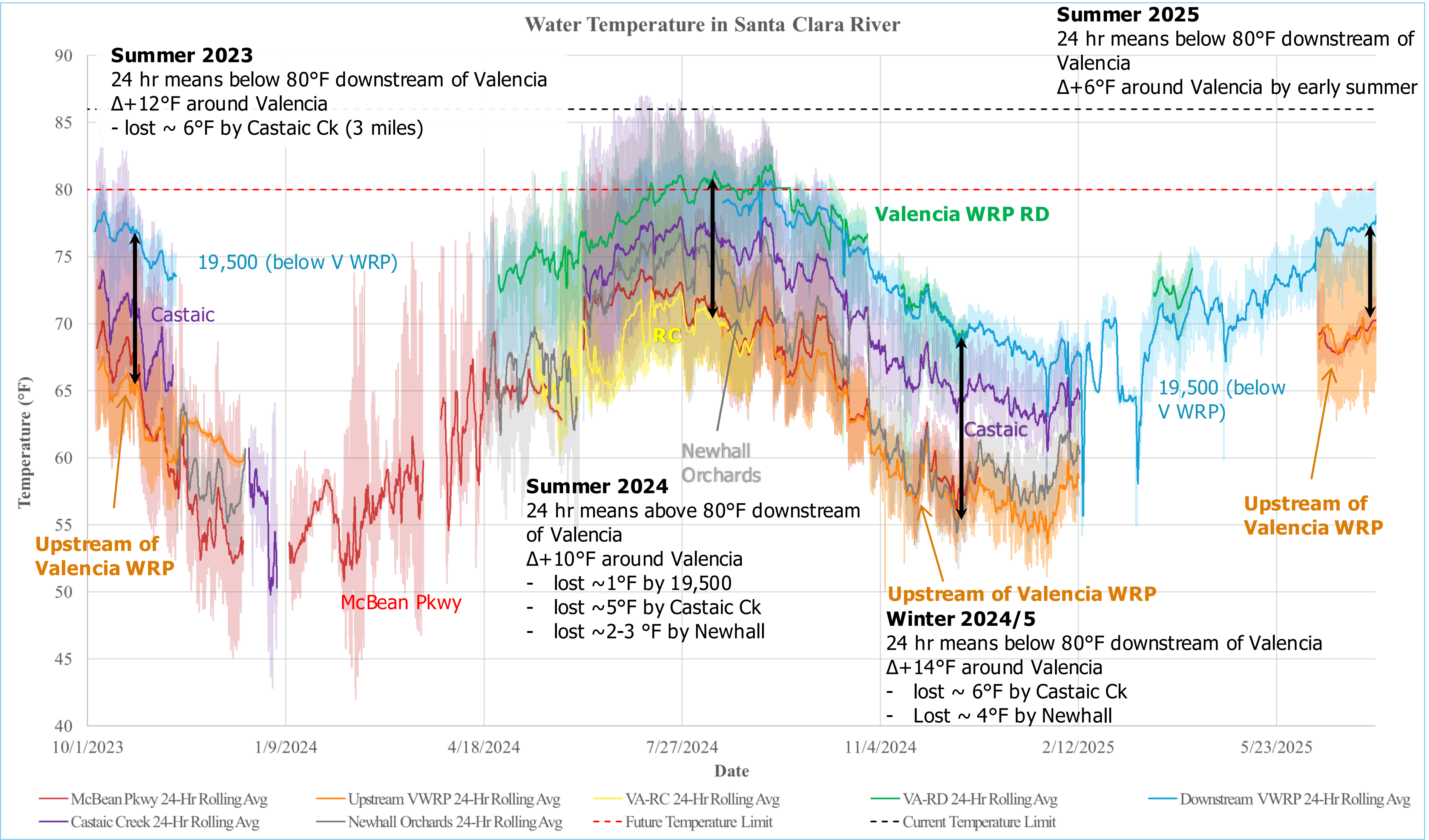


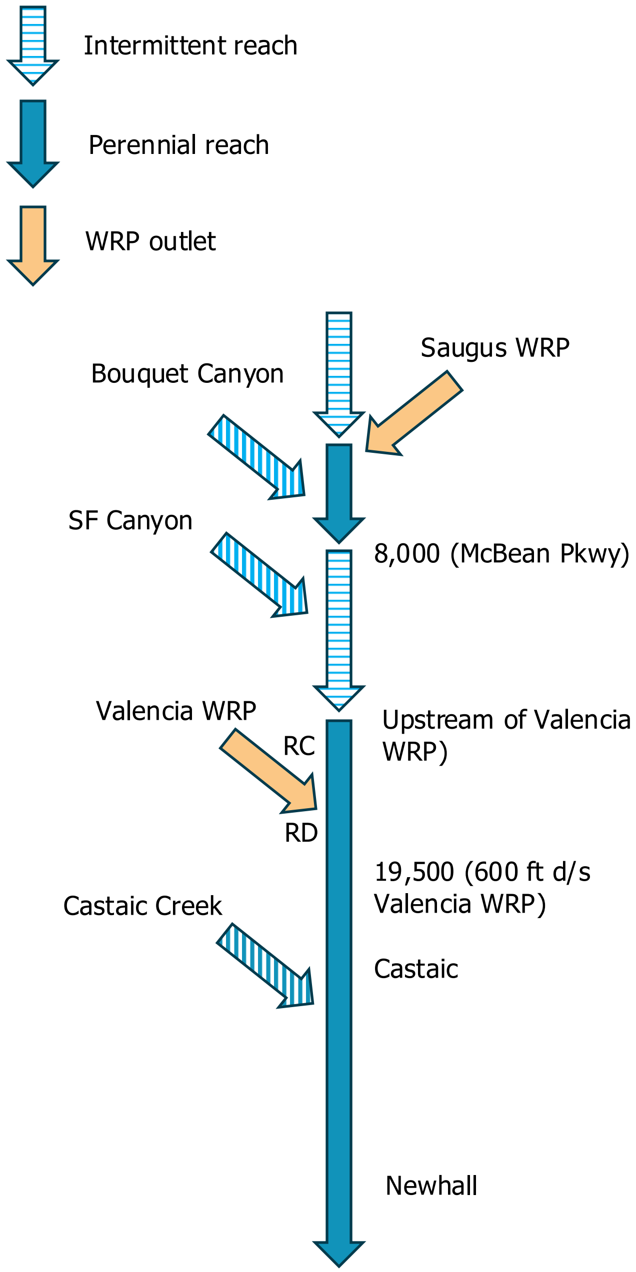
Results to date (selected locations for clarity)



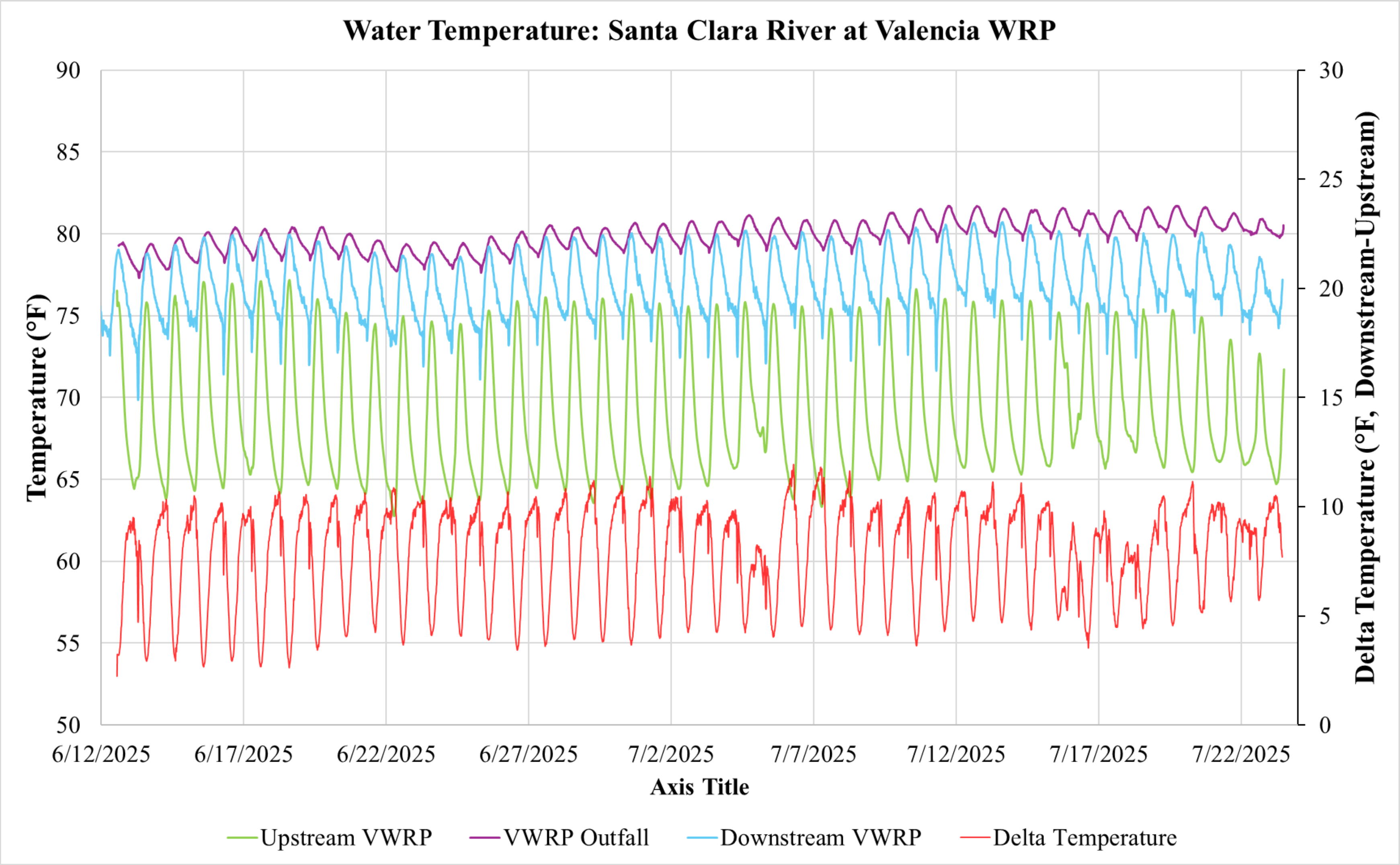


Results to date (selected locations for clarity)

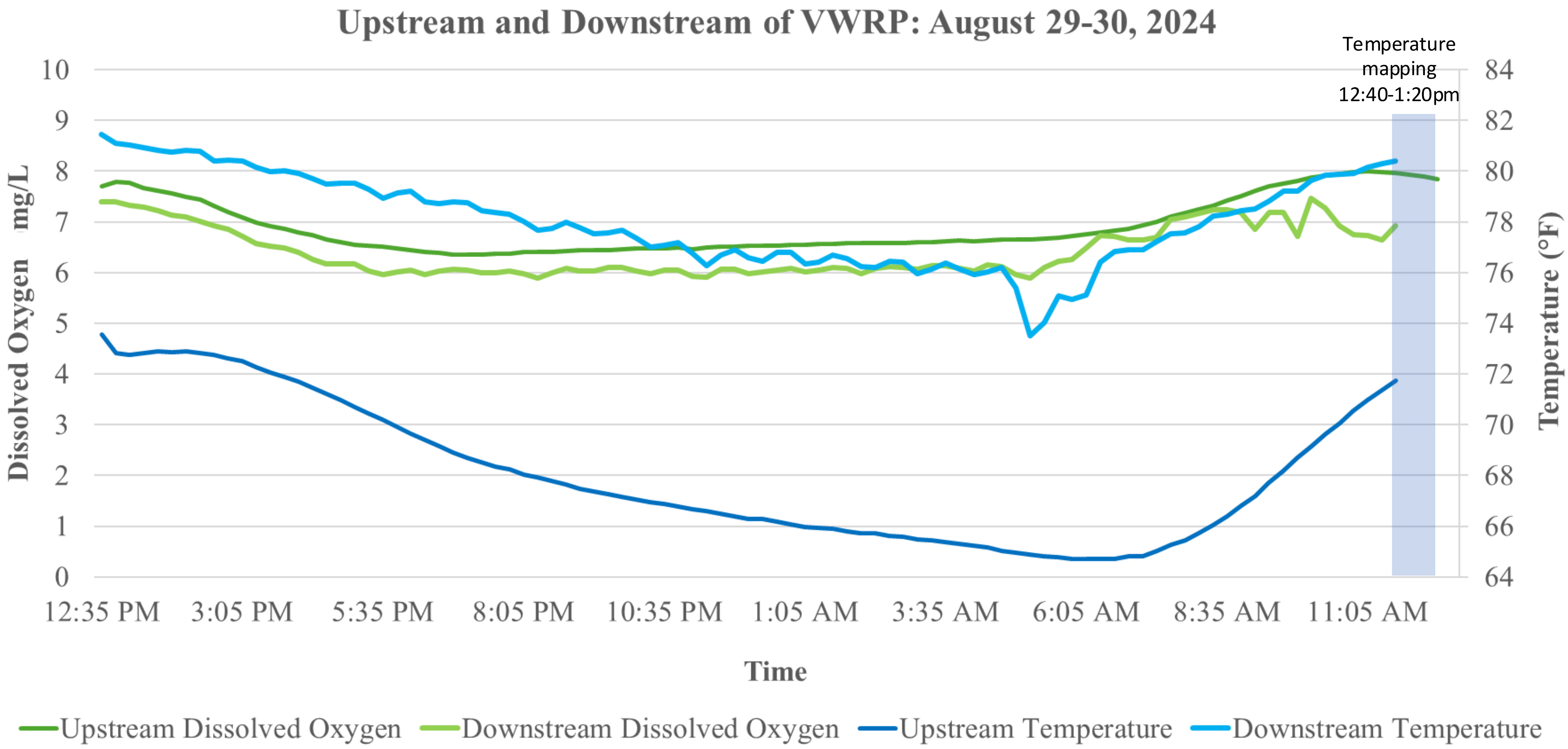




Recent Results



Dissolved Oxygen Monitoring (24 hours tied to intensive mapping efforts)

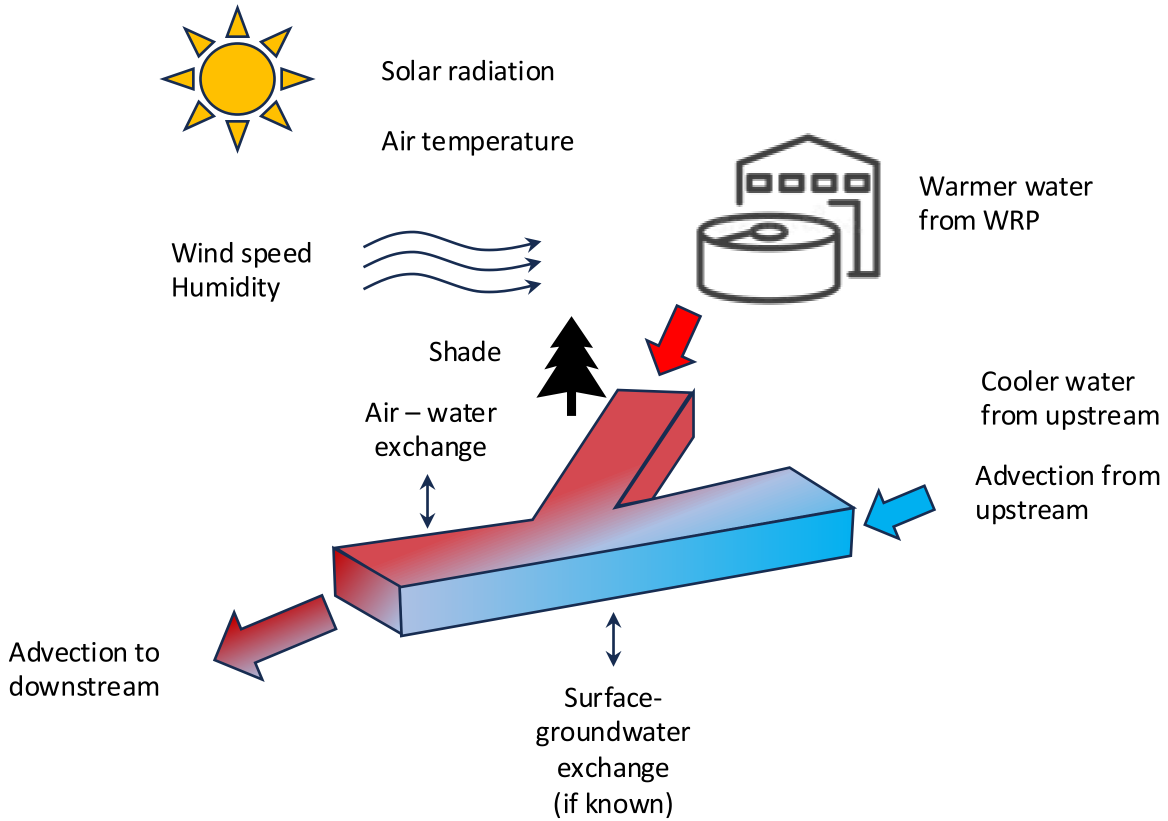


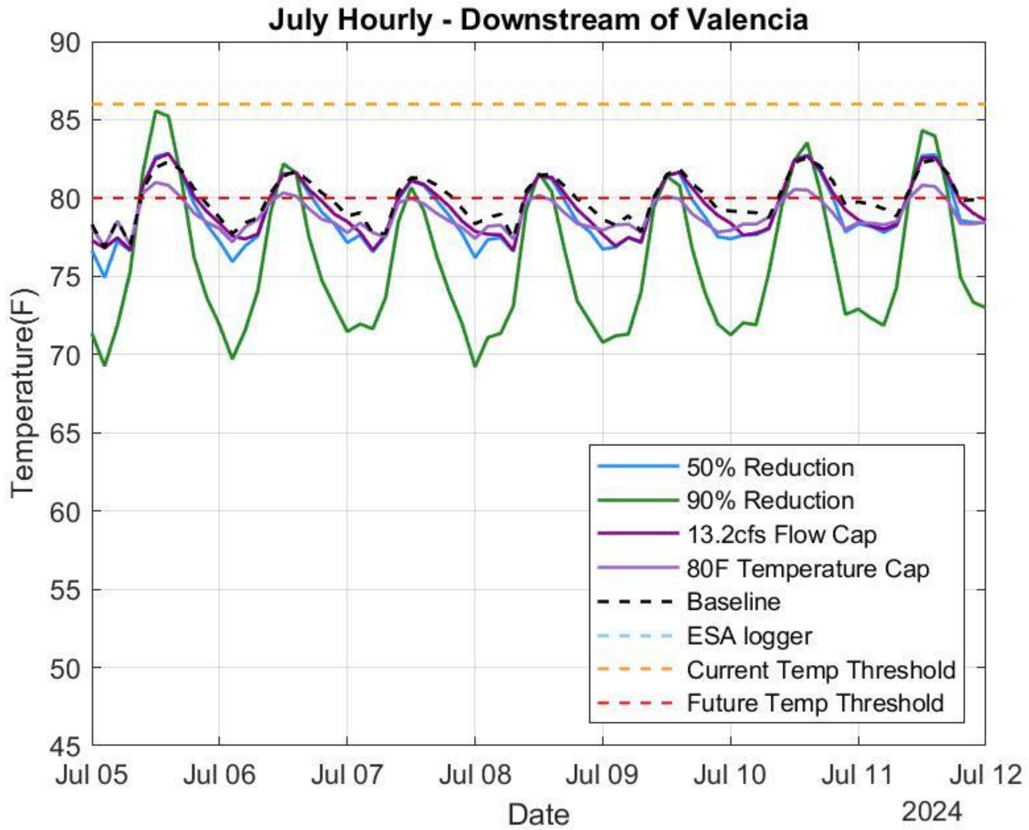
Temperature modeling

Temperature modeling

How much effluent flow reduction or cooling would be needed to comply with the new regulations during a range of year types (warm, cool, drought etc.)?

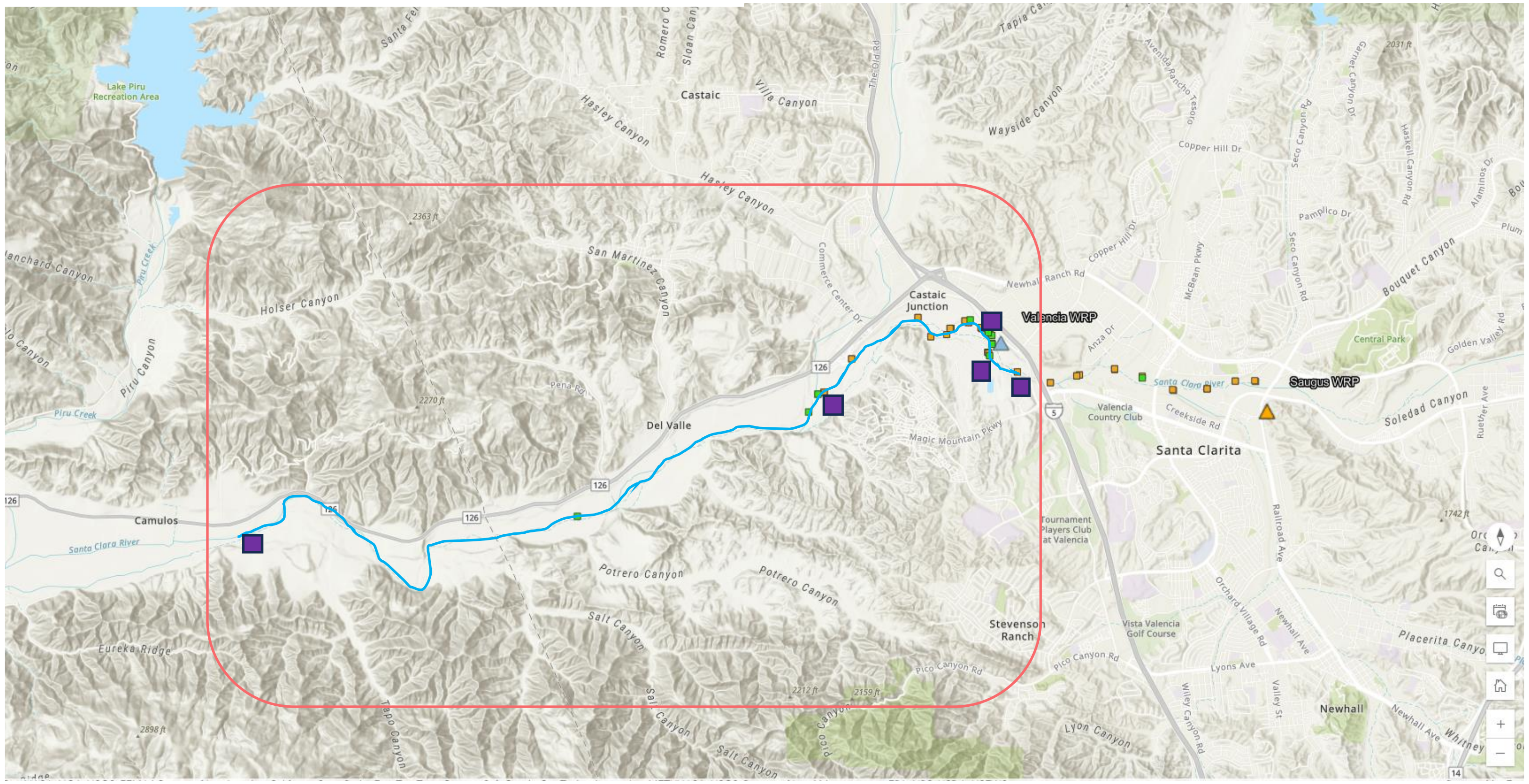
CE QUAL 2 water quality model





Temperature model

- Temperature logger (continuous, active)
- Temperature logger (continuous inactive)
- Temperature model extent
- Key temperature loggers for model



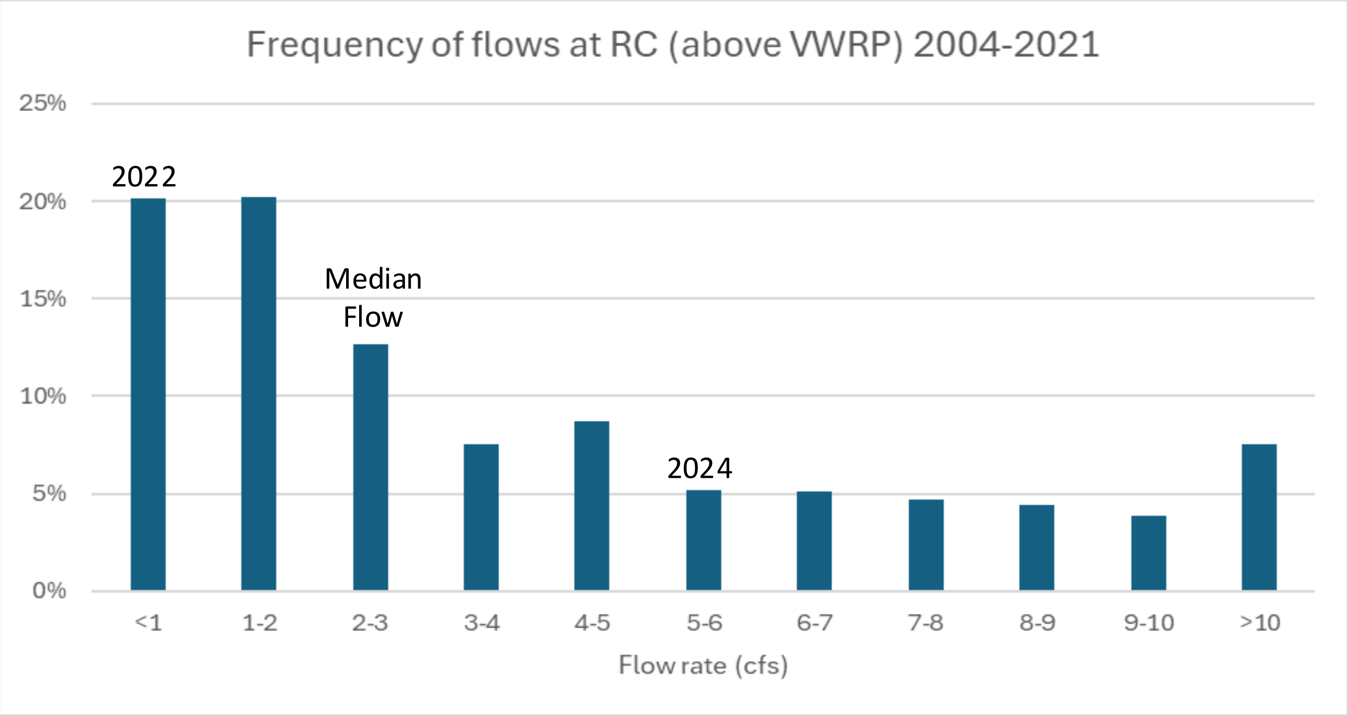
- CE-Qual-W2 model
- Model extends from 110 ft upstream of the Valencia WRP to approx. 55,000 ft (10.44 miles) downstream of the treatment plant
- Model study period:
  - 6/6/2024 to 12/23/2024
  - 6/4/2022 to 12/30/2022

Modeling scenarios

	2022 (June – December)	2024 (June – December)
Average air temperature	69°F	67°F
Average flow upstream of Valencia WRP	0.4 cfs	5 cfs
Scenarios		
Existing conditions	✓	✓
50% reduction in Valencia WRP discharge	✓	✓
Cap Valencia WRP discharge to 80°F or less with cooler	✓	✓
100% reduction in Valencia WRP discharge	✓	✓

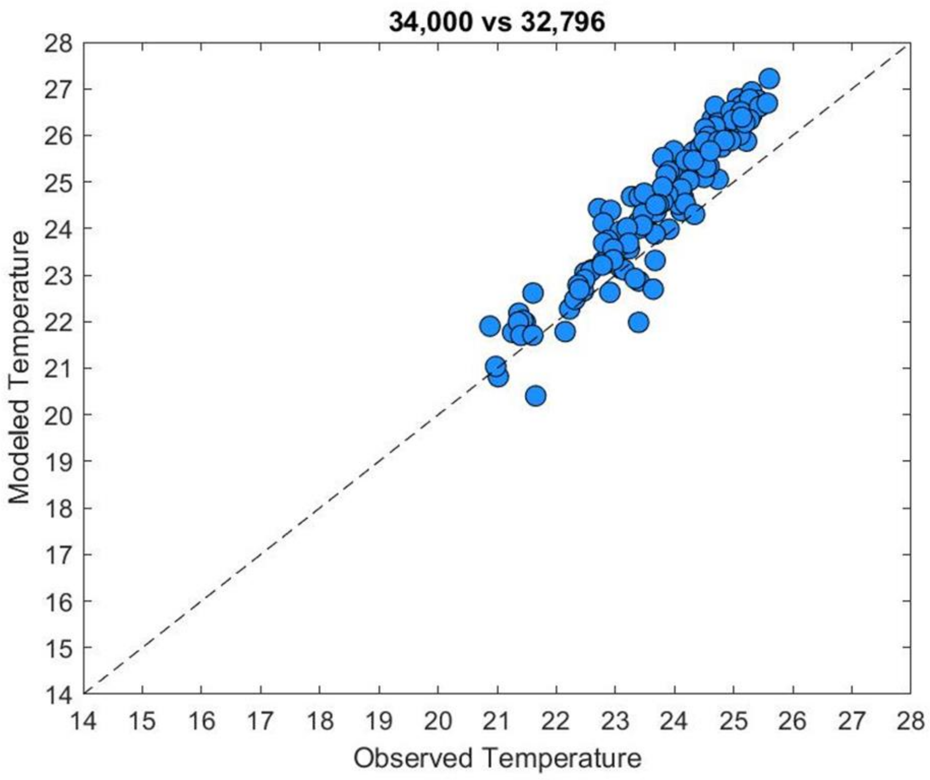
Modeling scenarios

	2022 (June – December)	2024 (June – December)
Average air temperature	69°F	67°F
Average flow upstream of Valencia WRP	0.4 cfs (5th percentile flow)	5 cfs (68th percentile flow)
Existing conditions		
50% reduction in Valencia WRP discharge		
Cap Valencia WRP discharge to 80°F or less with cooler		
100% reduction in Valencia WRP discharge		



Modeling Caveats and Performance

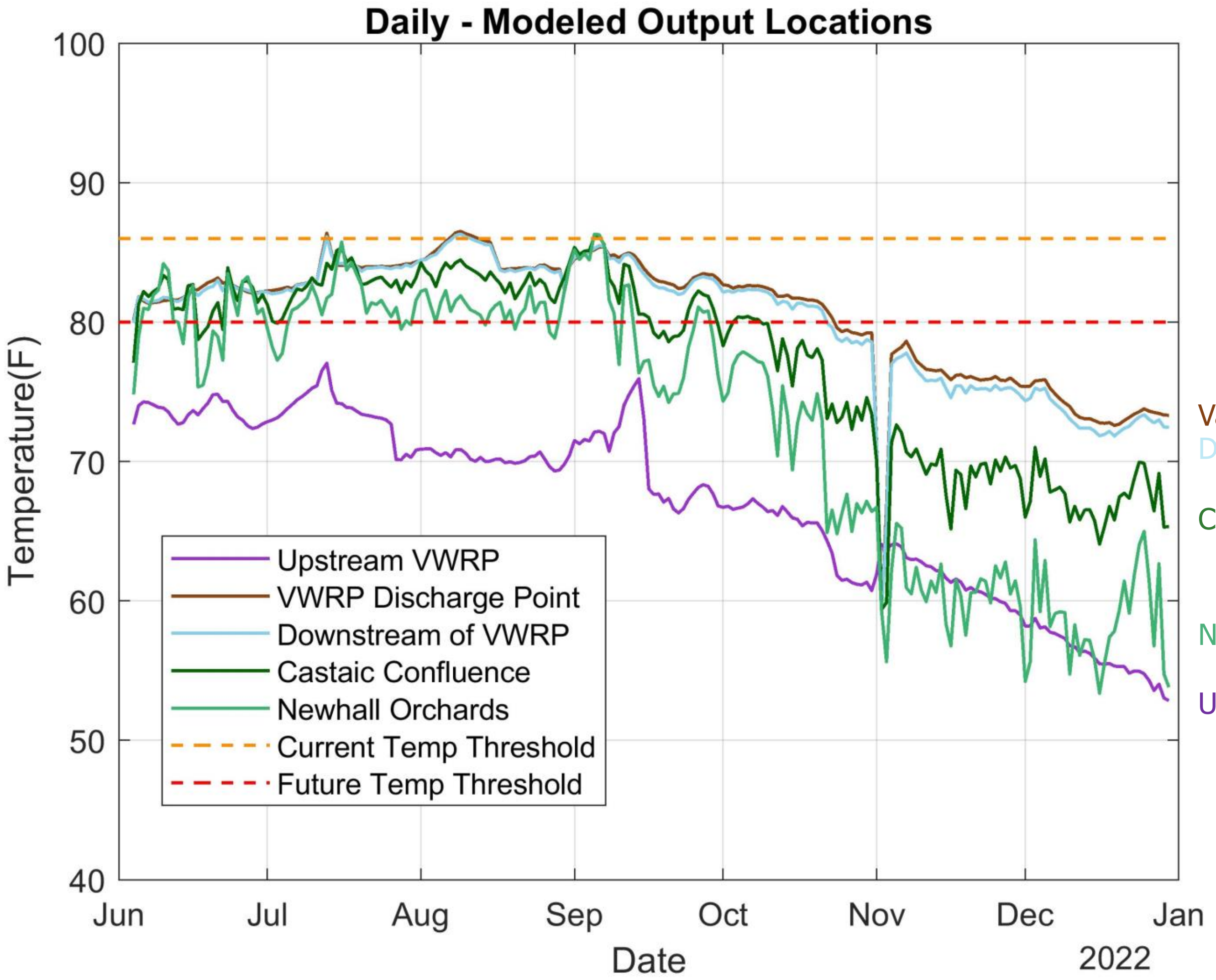
- Model is well calibrated to Castaic Creek confluence but becomes less reliable with increasing distance downstream due to flow inputs that are not gauged (groundwater upwelling, Castaic Creek, Potrero Canyon, San Martinez Grande, etc).
- Simulating flows <1 cfs created numerical stability challenges – treat 2022 simulations with caution until additional tests have been performed



Modeled versus monitored temperatures upstream of Castaic Creek confluence

2022 modeling

2022 – Existing Conditions

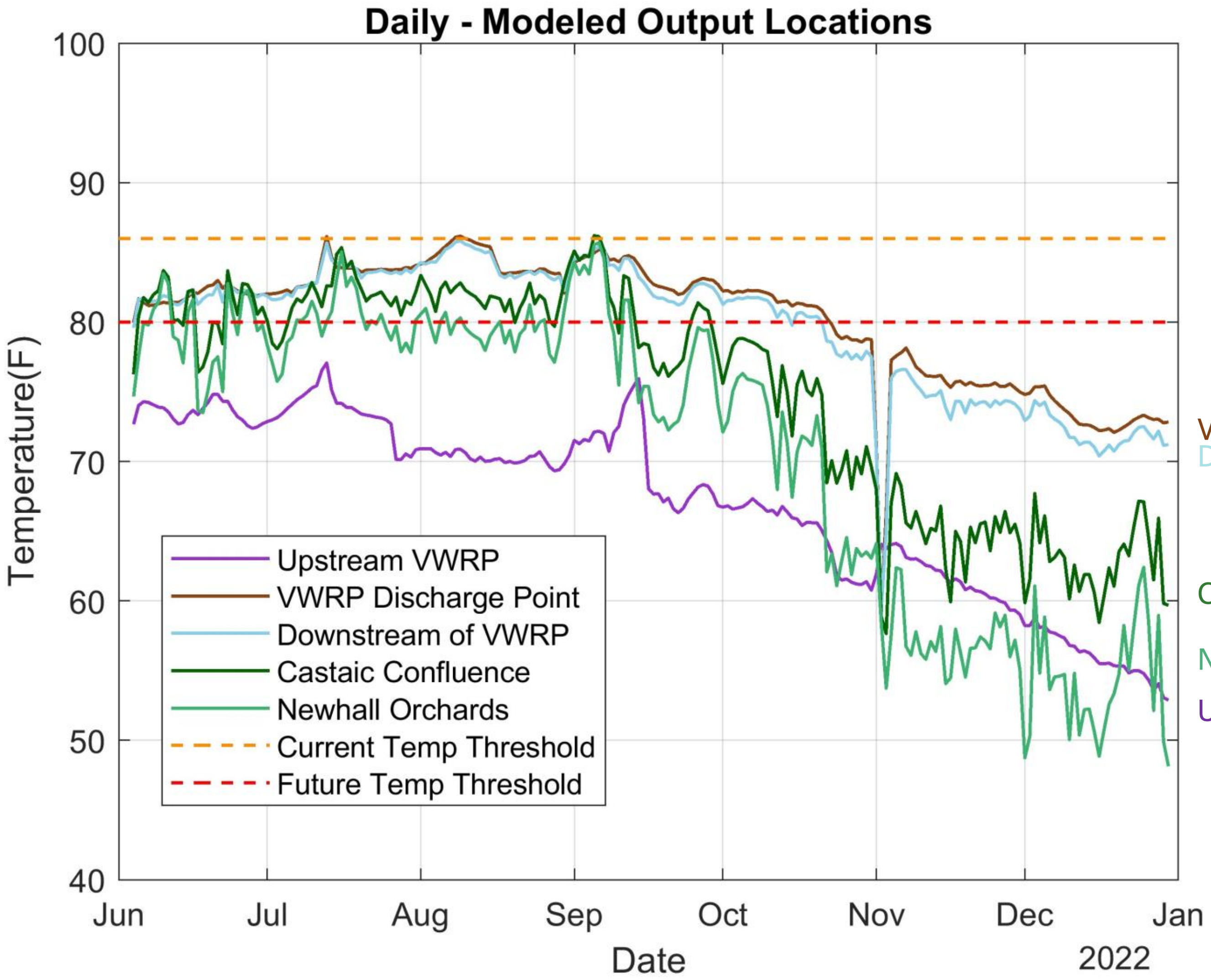


80° F exceedances downstream of VWRP

- Threshold exceeded for extended period during study period
- Cumulatively 139 days above 80°F
- Δ5°F exceeded throughout study

Note: Existing model condition does not include flows from Castaic Creek

2022 – 50% Reduction in VWRP discharge

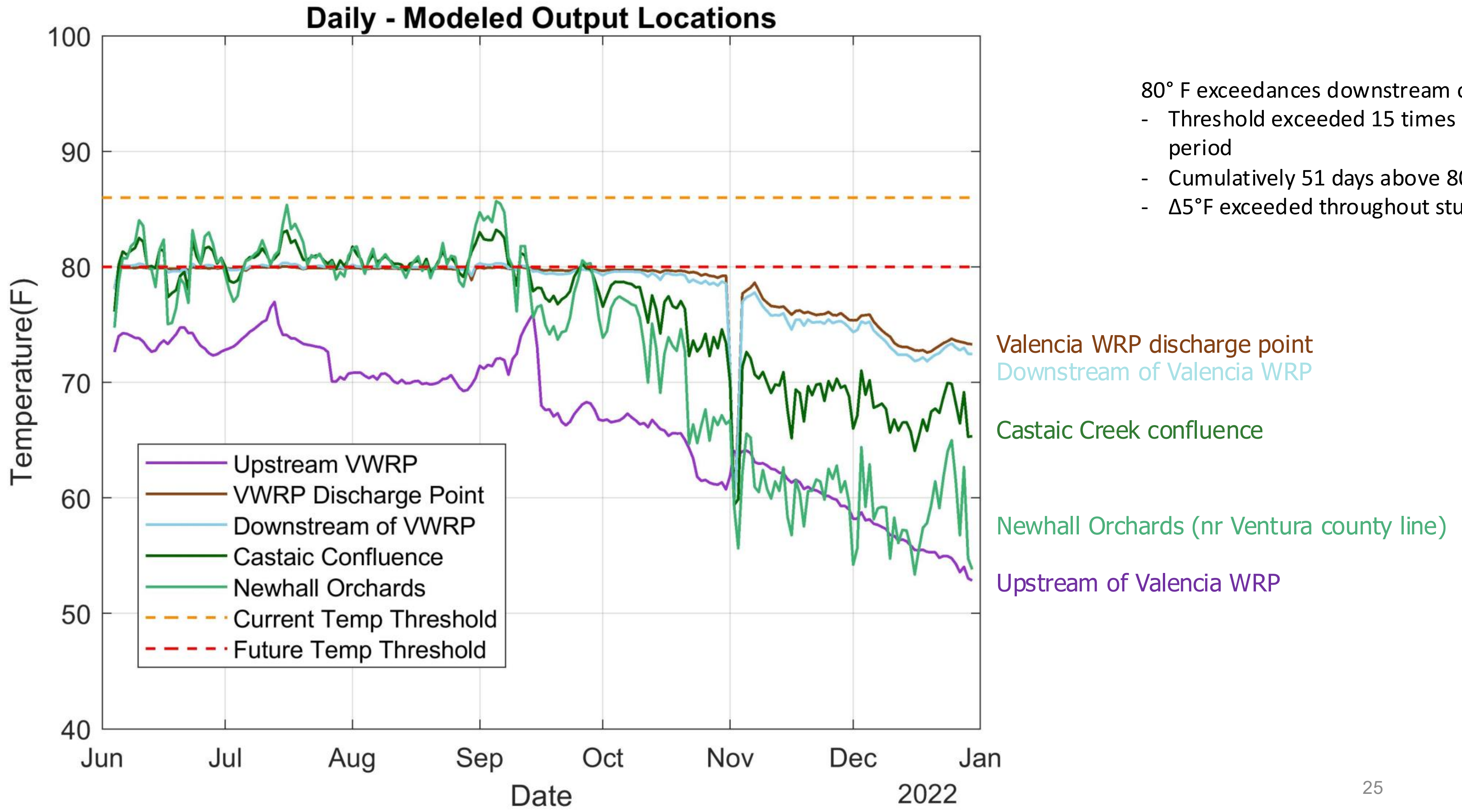


Valencia WRP discharge point
Downstream of Valencia WRP
Castaic Creek confluence
Newhall Orchards (nr Ventura county line)
Upstream of Valencia WRP

80° F exceedances downstream of VWRP

- Threshold exceeded for extended period during study period
- Cumulatively 138 days above 80°F
- Δ5°F exceeded throughout study

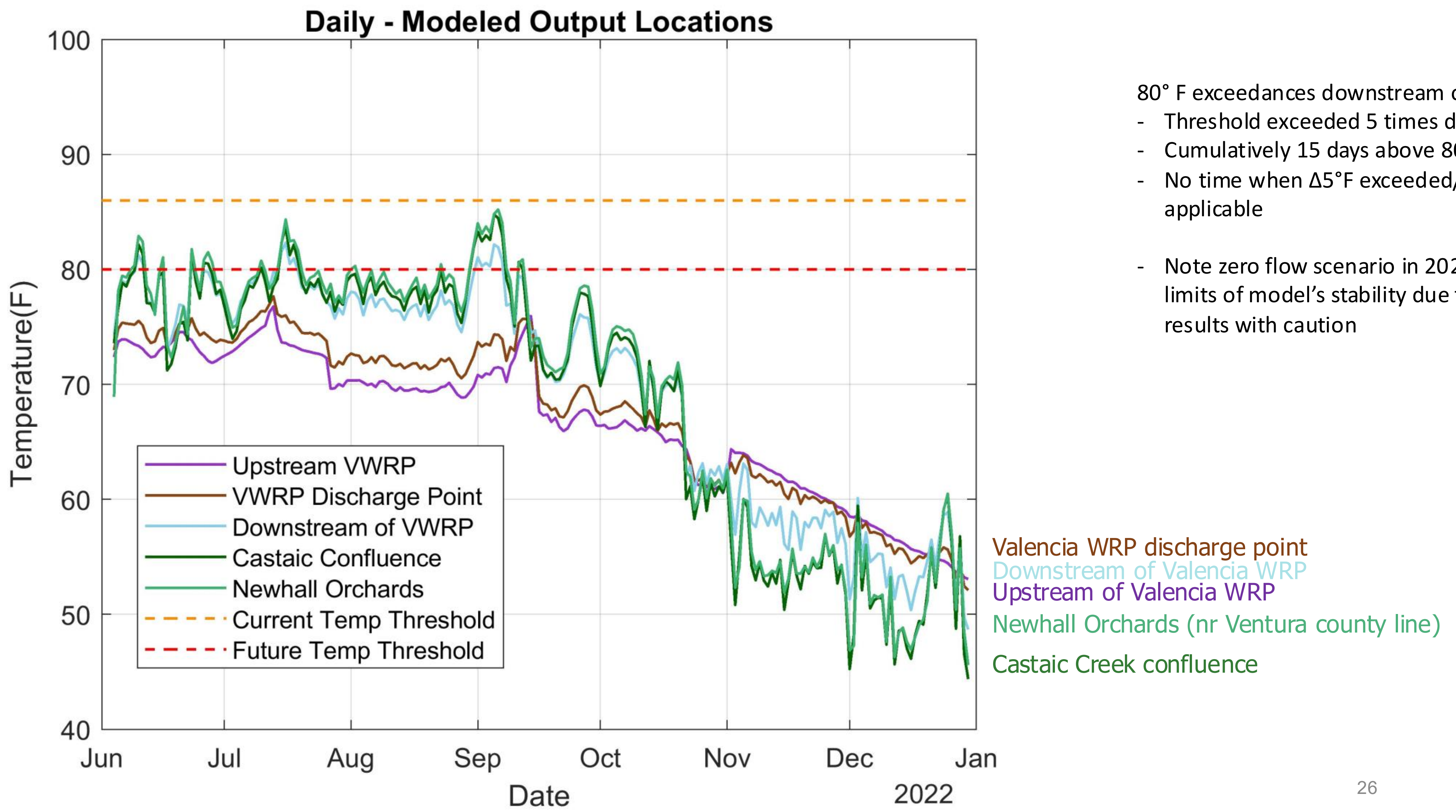
2022 – VWRP discharge capped at 8O°F



80° F exceedances downstream of VWRP

- Threshold exceeded 15 times during study period
- Cumulatively 51 days above 80°F
- Δ5°F exceeded throughout study

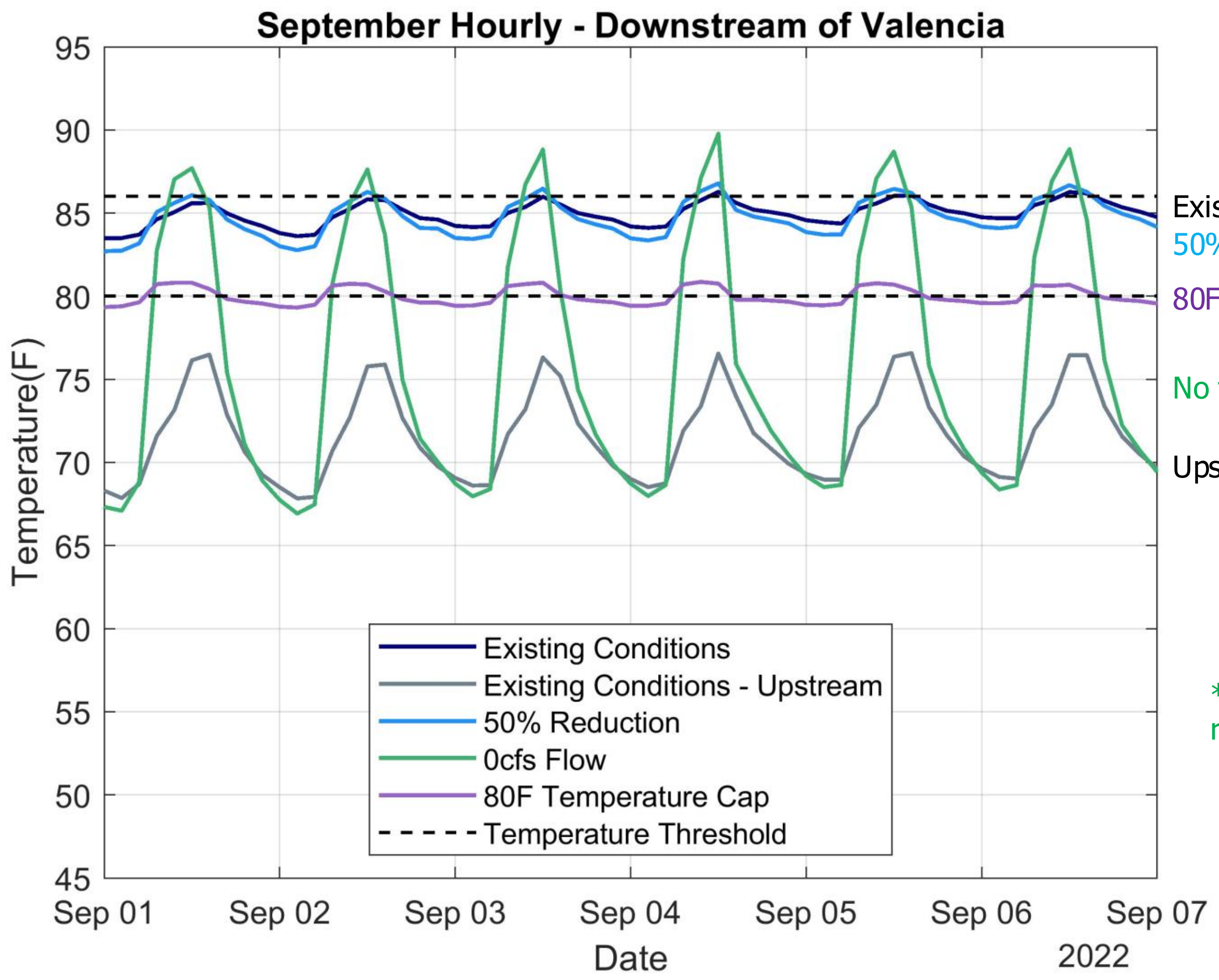
2022 – zero VWRP discharge



80° F exceedances downstream of VWRP
- Threshold exceeded 5 times during study period
- Cumulatively 15 days above 80°F
- No time when Δ5°F exceeded/threshold not applicable

- Note zero flow scenario in 2022 conditions is at limits of model's stability due to low flow – treat results with caution

2022 Hourly data



Existing conditions

50% flow reduction from Valencia WRP

80F temperature cap

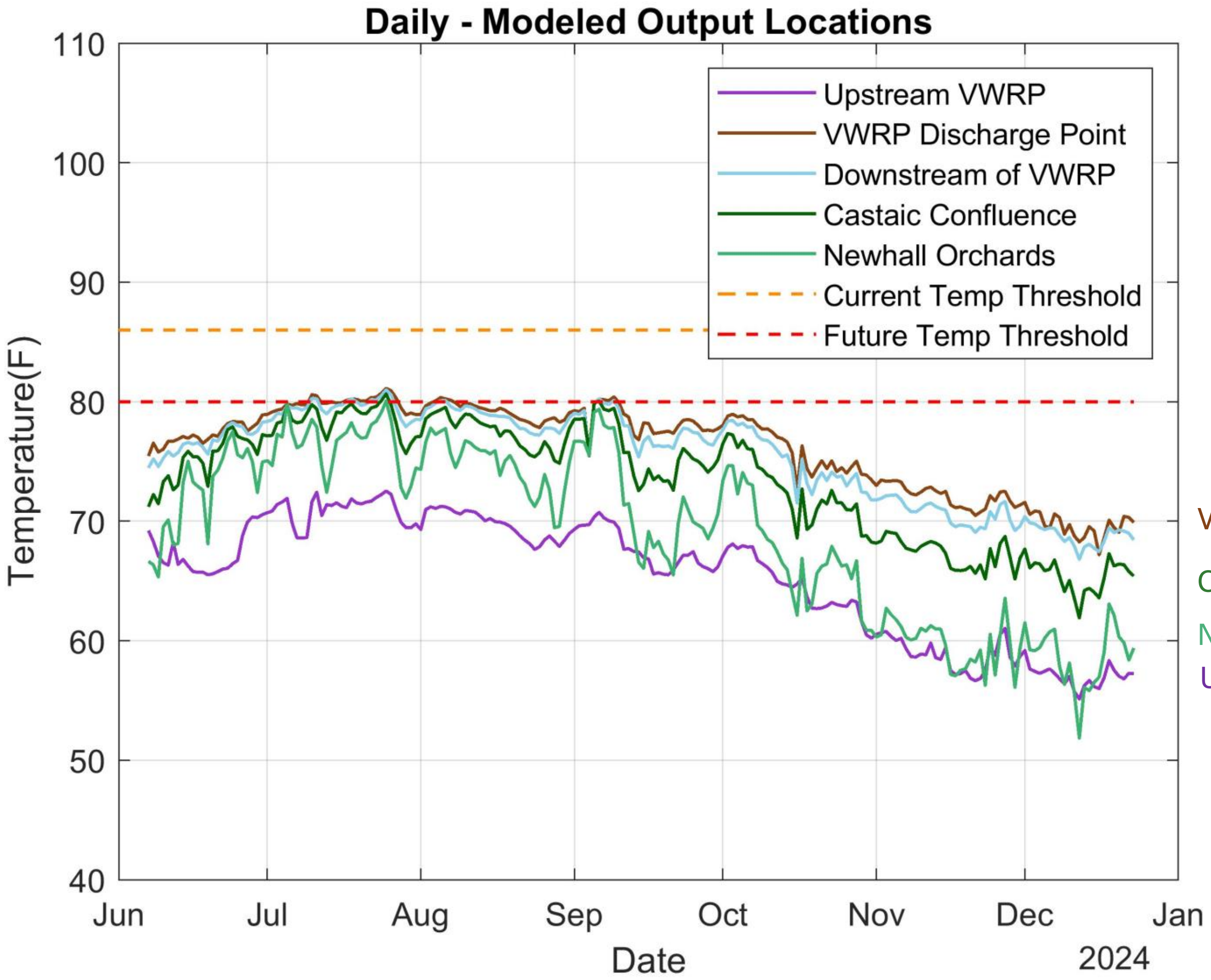
No flow from Valencia WRP *

Upstream of Valencia WRP - existing conditions

* No flow from Valencia scenario is at limits of model. Treat results with caution.

2024 modeling

2024 - Existing conditions



Valencia WRP discharge point

Castaic Creek confluence

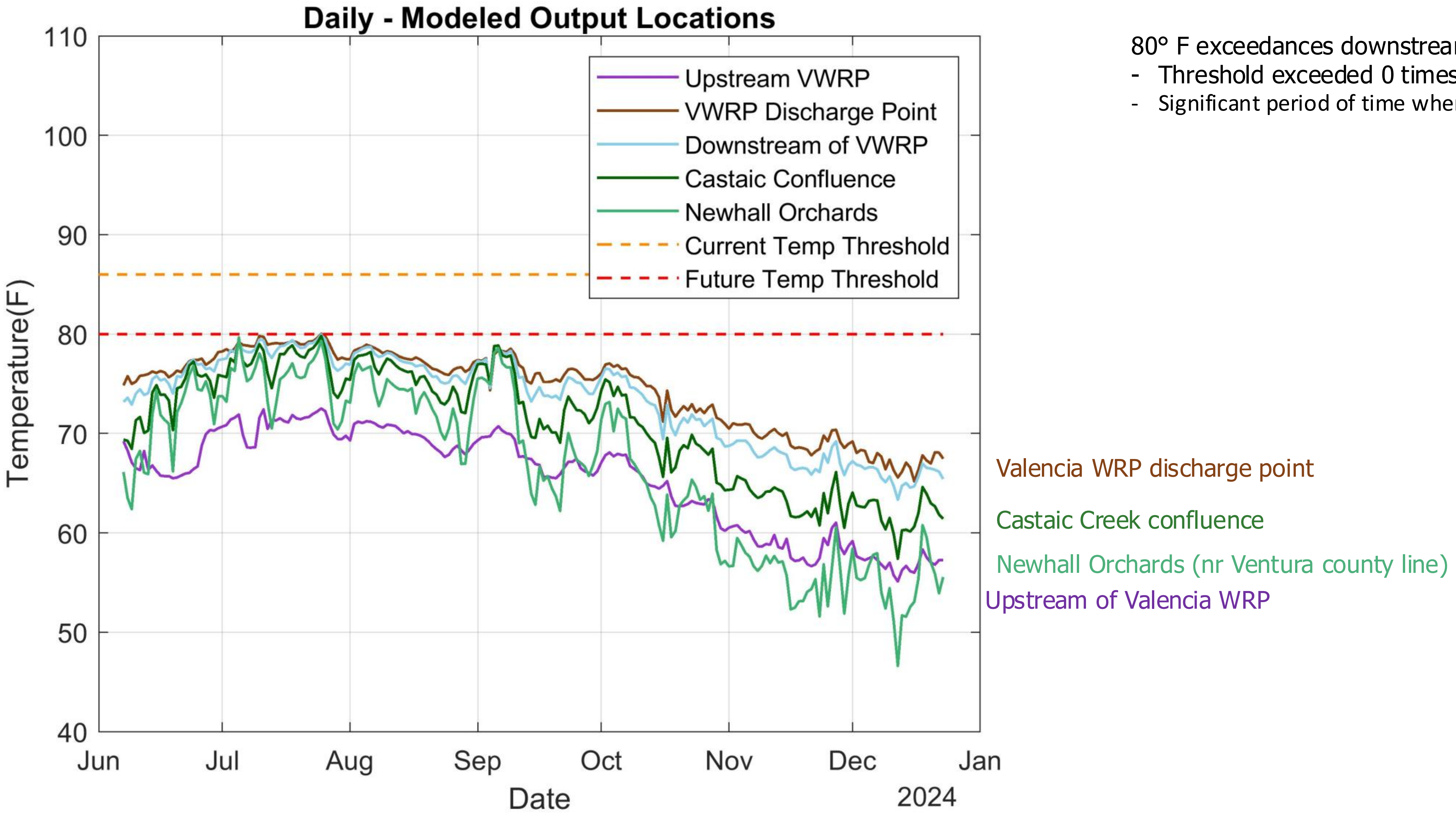
Newhall Orchards (nr Ventura county line)

Upstream of Valencia WRP

80° F exceedances downstream of VWRP

- Threshold exceeded 6 times during study period
- Cumulatively 13 days above 80°F
- Significant period of time when Δ5°F exceeded

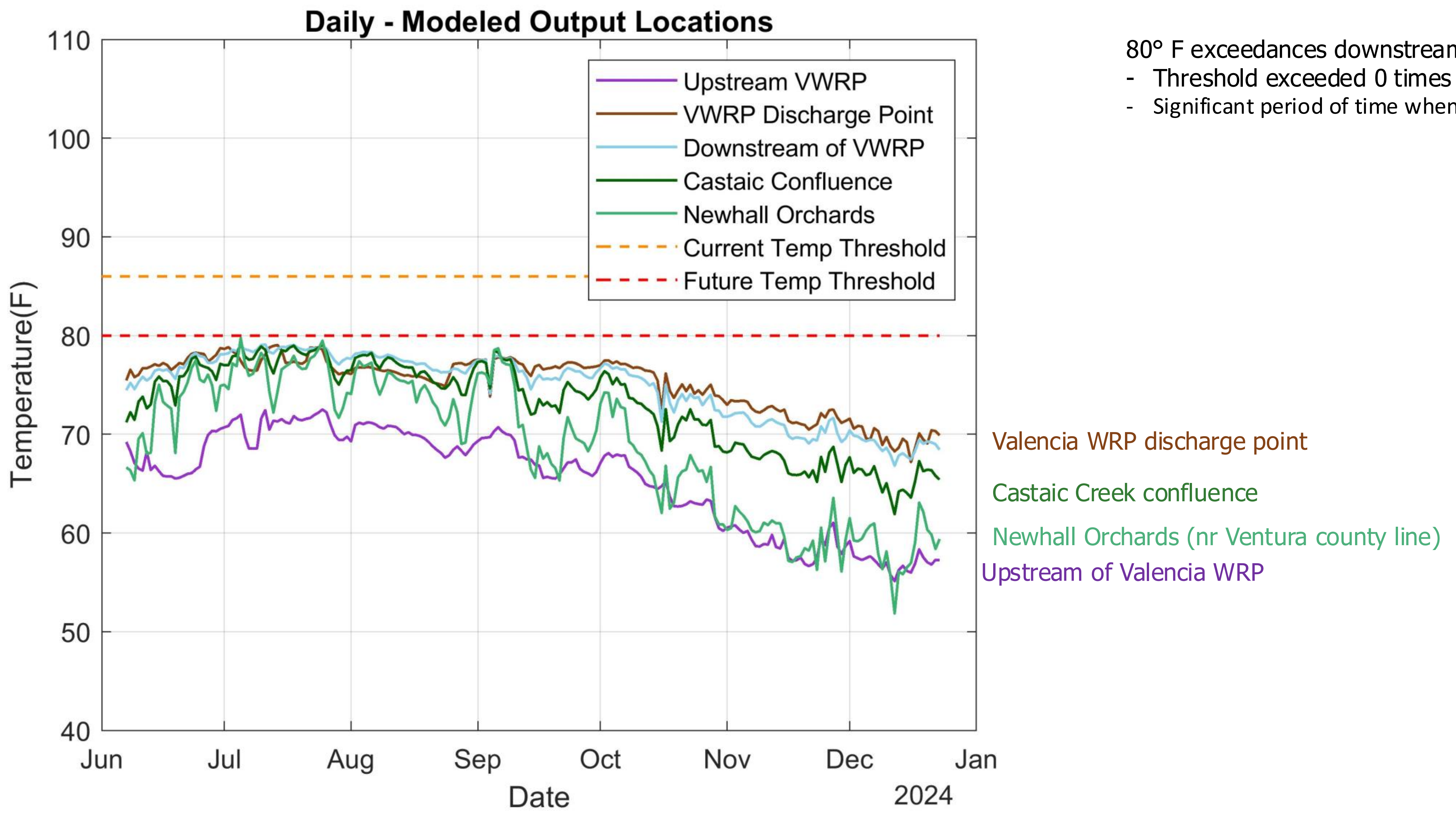
2024 - 50% VWRP discharge reduction



80° F exceedances downstream of VWRP

- Threshold exceeded 0 times during study period
  - Significant period of time when Δ5°F exceeded

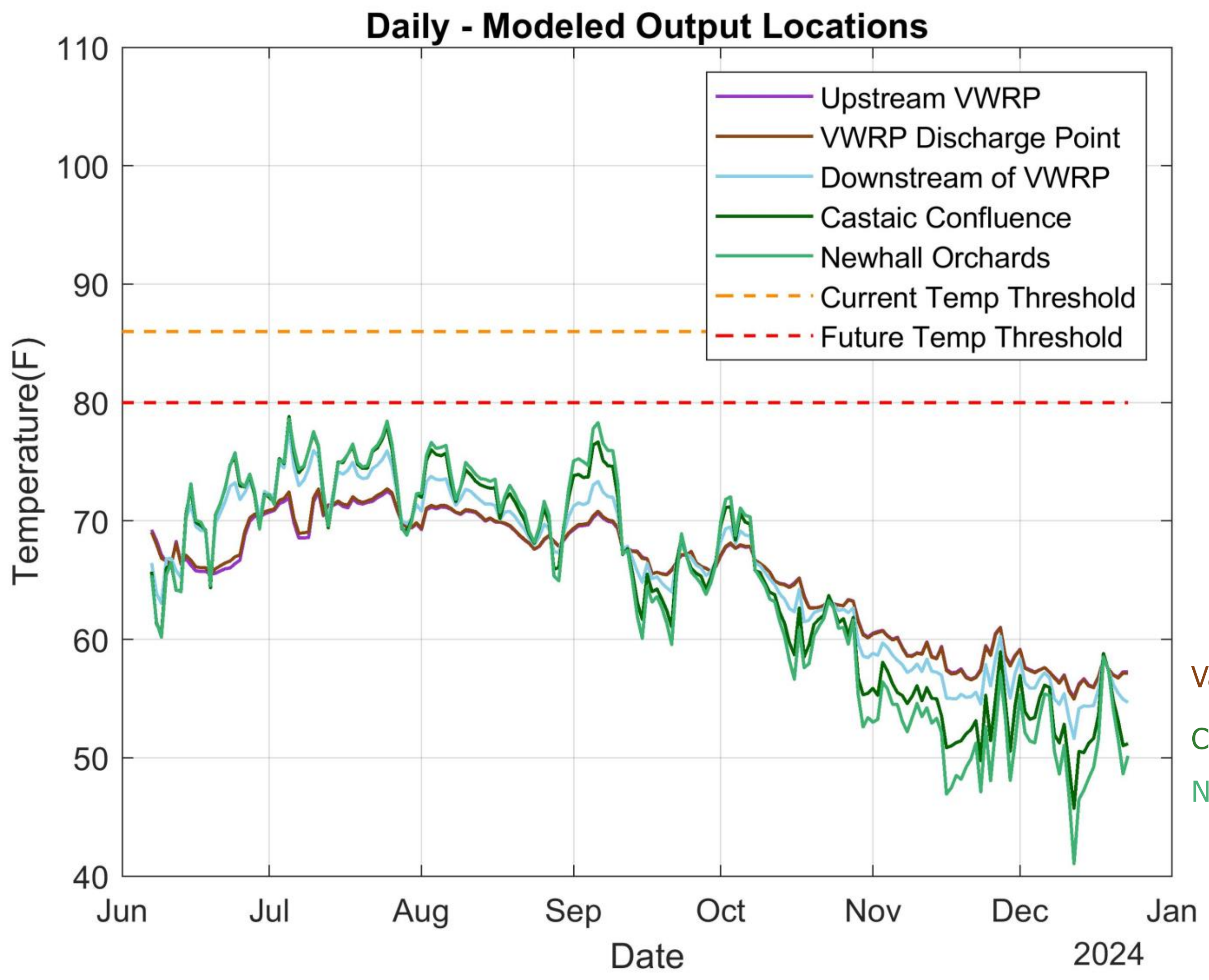
2024 - VWRP discharges capped at 80°F or less



80° F exceedances downstream of VWRP

- Threshold exceeded 0 times during study period
- Significant period of time when Δ5°F exceeded

2024 - zero VWRP discharges



80° F exceedances downstream of VWRP

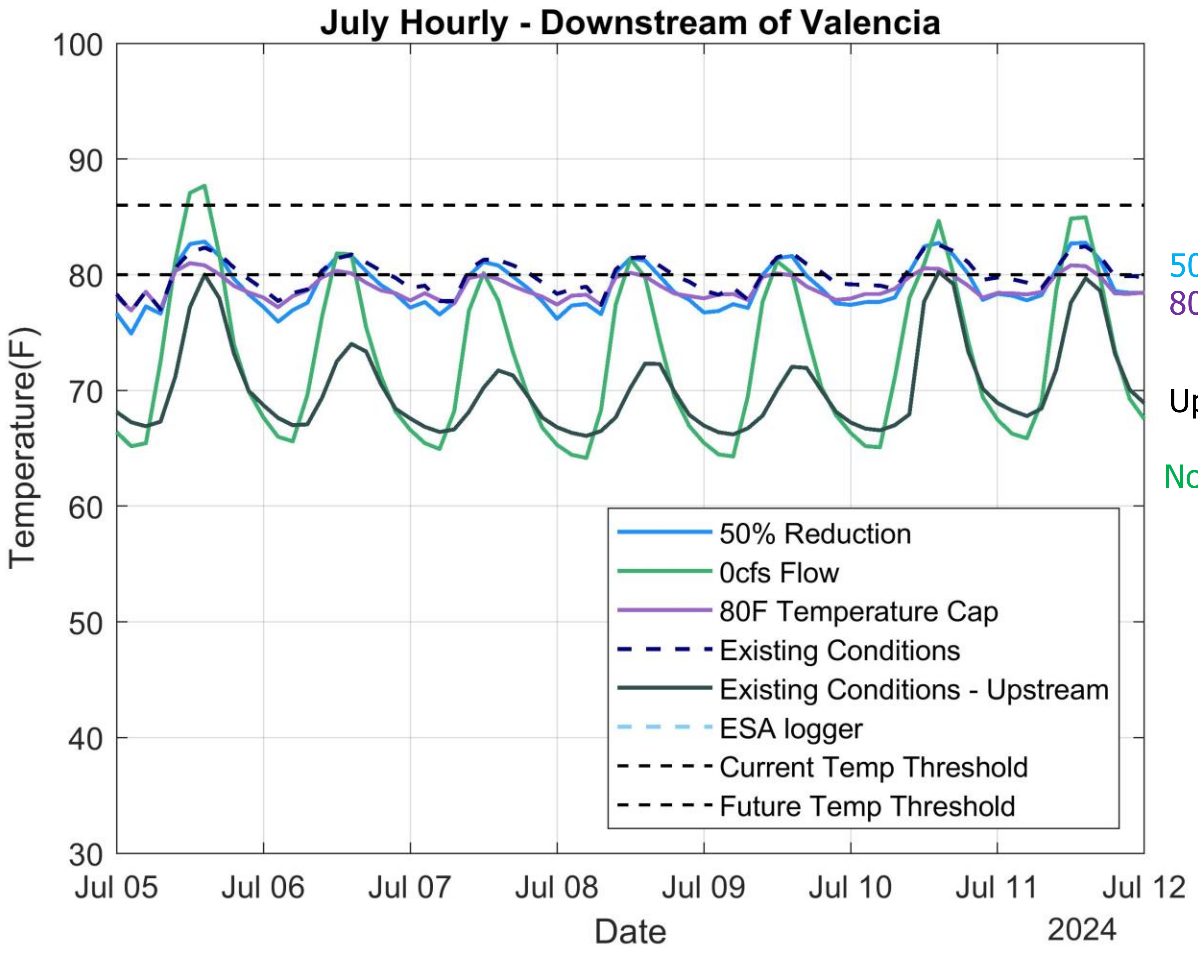
- Threshold exceeded 0 times during study period
- No time when Δ5°F exceeded/threshold not applicable

Valencia WRP discharge point Upstream of Valencia WRP

Castaic Creek confluence

Newhall Orchards (nr Ventura county line)

2024 Hourly results

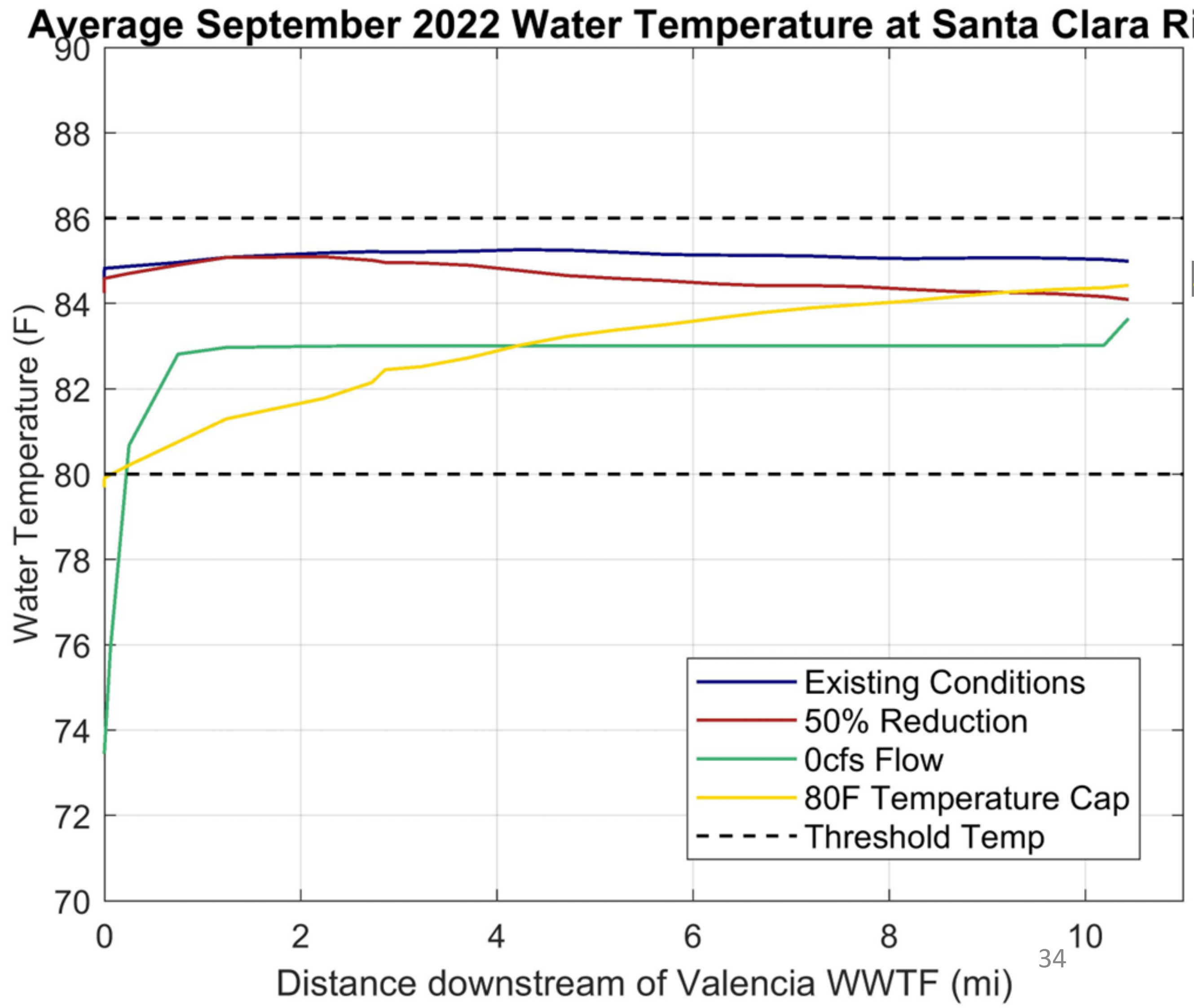


50% flow reduction from Valencia WRP
80F temperature cap

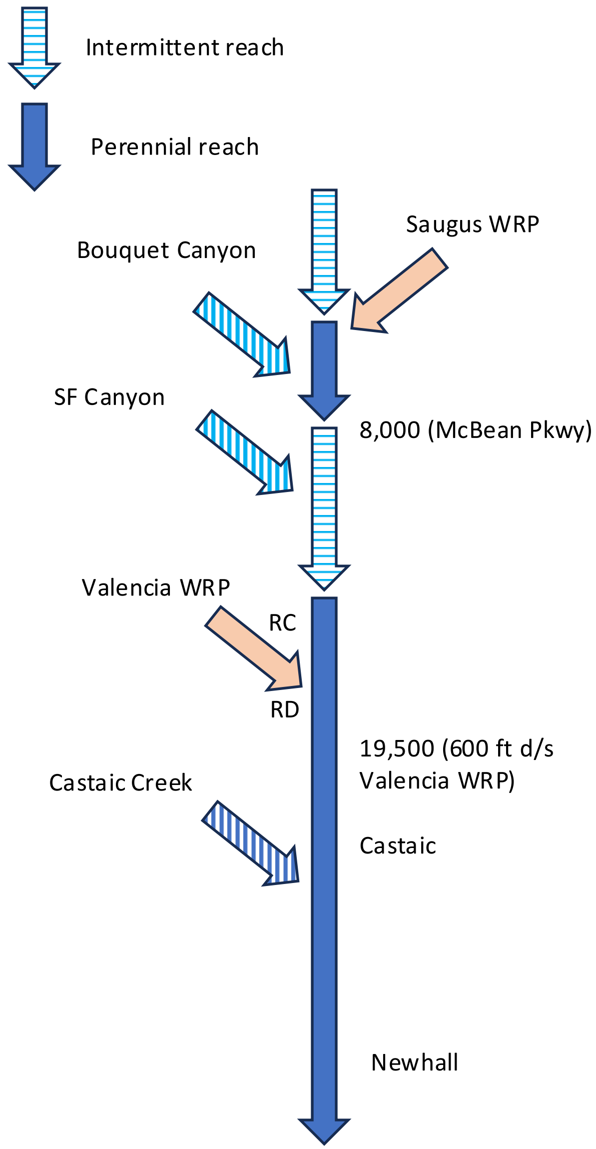
Upstream of Valencia WRP - existing conditions

No flow from Valencia WRP

Downstream effects of potential treatments



Existing condition
80F temperature cap
50% WRP discharge
No WRP discharge



Modeling results

	2022 (June – December 209 days)		2024 (June – December 199 days)	
Average air temperature during simulation	69°F		67°F	
Average flow upstream of Valencia WRP during simulation	0.4 cfs		5 cfs	
Scenarios				
	80°F Exceeded (Downstream VA)	**Upstream-Downstream Difference >5°F**	**80°F Exceeded (Downstream VA)**	**Upstream-Downstream Difference >5°F**
Existing conditions	139 days (67%)	Throughout simulation	13 days (7%)	Throughout simulation
50% reduction in Valencia WRP discharge	138 days (66%)	Throughout simulation	0 days	Throughout simulation
Cap Valencia WRP discharge to 80°F or less with cooler	51 days (24%)	Throughout simulation	0 days	Throughout simulation
100% reduction in Valencia WRP discharge	15 days (7%)	None/NA	0 days	None/NA

Modeling conclusions (preliminary)

- Modeled river temps exceeded 80°F less frequently during a wet year than a dry year under existing discharge conditions (dilution effect)
  - **River and wastewater temperatures are influenced by ambient conditions/ water year type**
- During a dry year, downstream river temps would exceed 80°F even in absence of WRP discharge due to climate
- During a dry year, downstream river temps would exceed 80°F even when the discharge was cooled to 80°F
- The us-ds temp difference was greater than 5°F under all modeled scenarios w/discharge
  - **Is Delta 5° F an appropriate metric in all conditions? e.g., when flow temperatures are within UTS thermal tolerance range?**

Thermal Physiology Study

Phase Two Project Updates

UCDAVIS
DEPARTMENT OF WILDLIFE, FISH AND CONSERVATION BIOLOGY

Conducted By:
C. J. Cooper, K. W. Zillig, N. A. Fangue

Summary of Phase One Findings

CT_{MAX} ranged between 89.9 - 92.7°F

UILT showed impacted survival at chronic temperatures >81.7°F

Resistance times show ability to withstand high temperatures (~86°F) for 12-24 hrs

Temperature Preference: behavioral-selection of cooler temperatures when available (mean: 64.4°F, range: 51.3°F - 75.4°F)

Aerobic Scope reveals metabolic capacity is maximized at temperatures above 70°F but precipitously declines as temperatures approach lethal thermal limits.

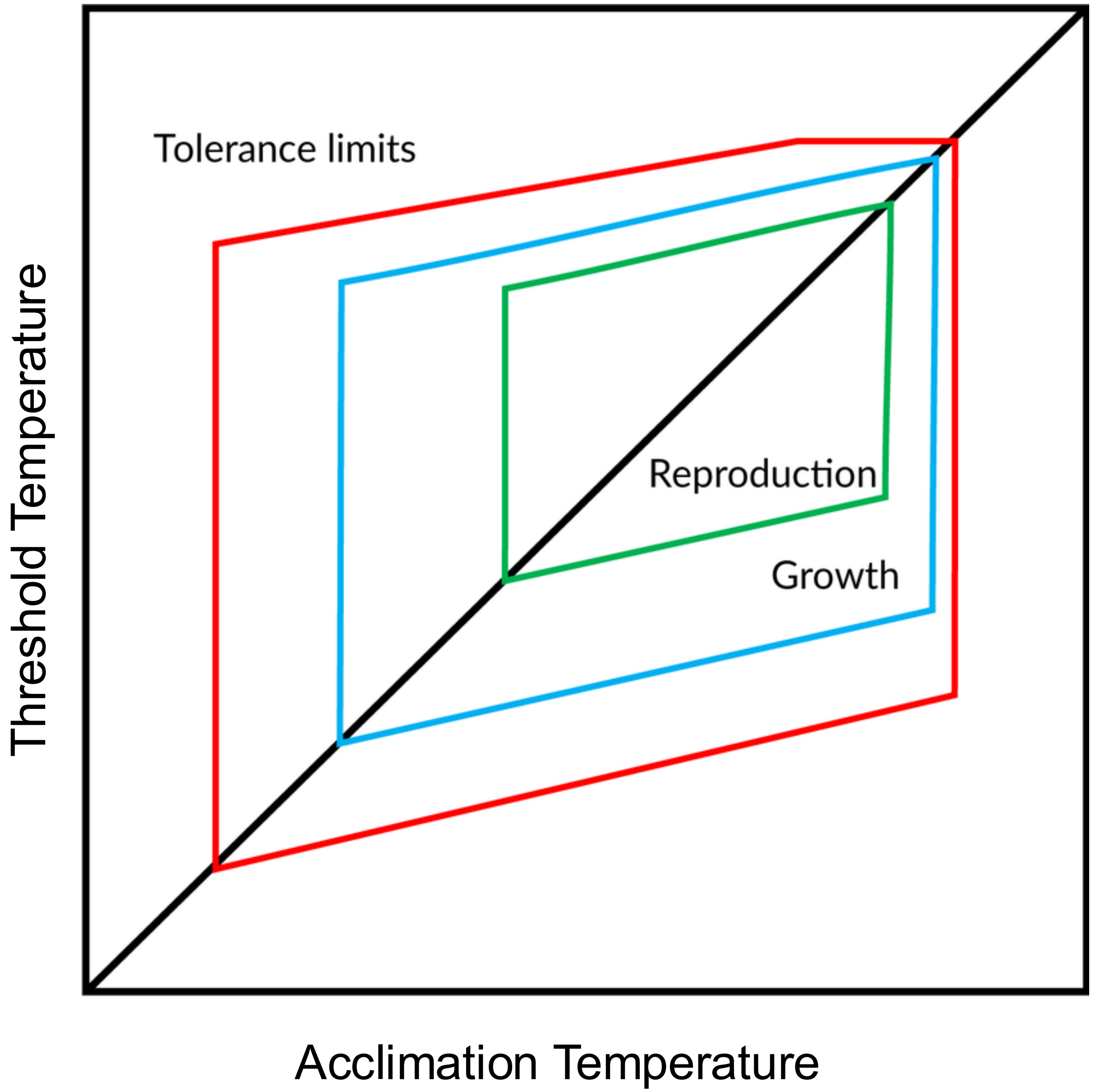
Phase Two Goals

Measurements like CT_{MAX} and UILT characterize outer limits for survival

Different biological processes will have different, often narrower operational ranges

Measuring different ranges yields more comprehensive understanding of fish's needs

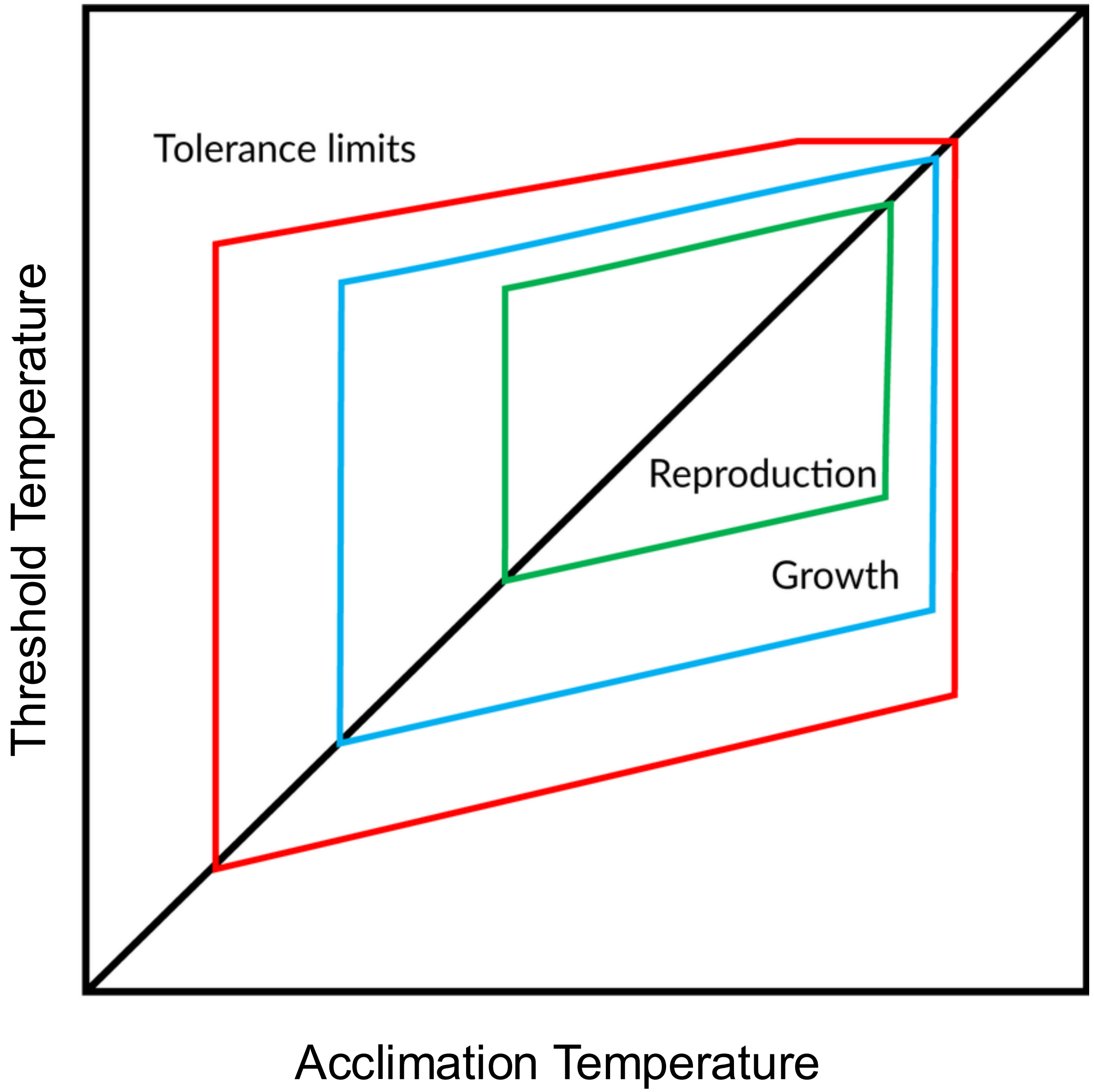
→ *No "one optimal" temperature*



Phase Two Goals

“Phase 1” study focused on classic, fundamental thermal physiology

E.g. “Routine maintenance costs” and directly lethal limits of tolerance



Phase Two Goals

"Phase 1" study focused on classic, fundamental thermal physiology

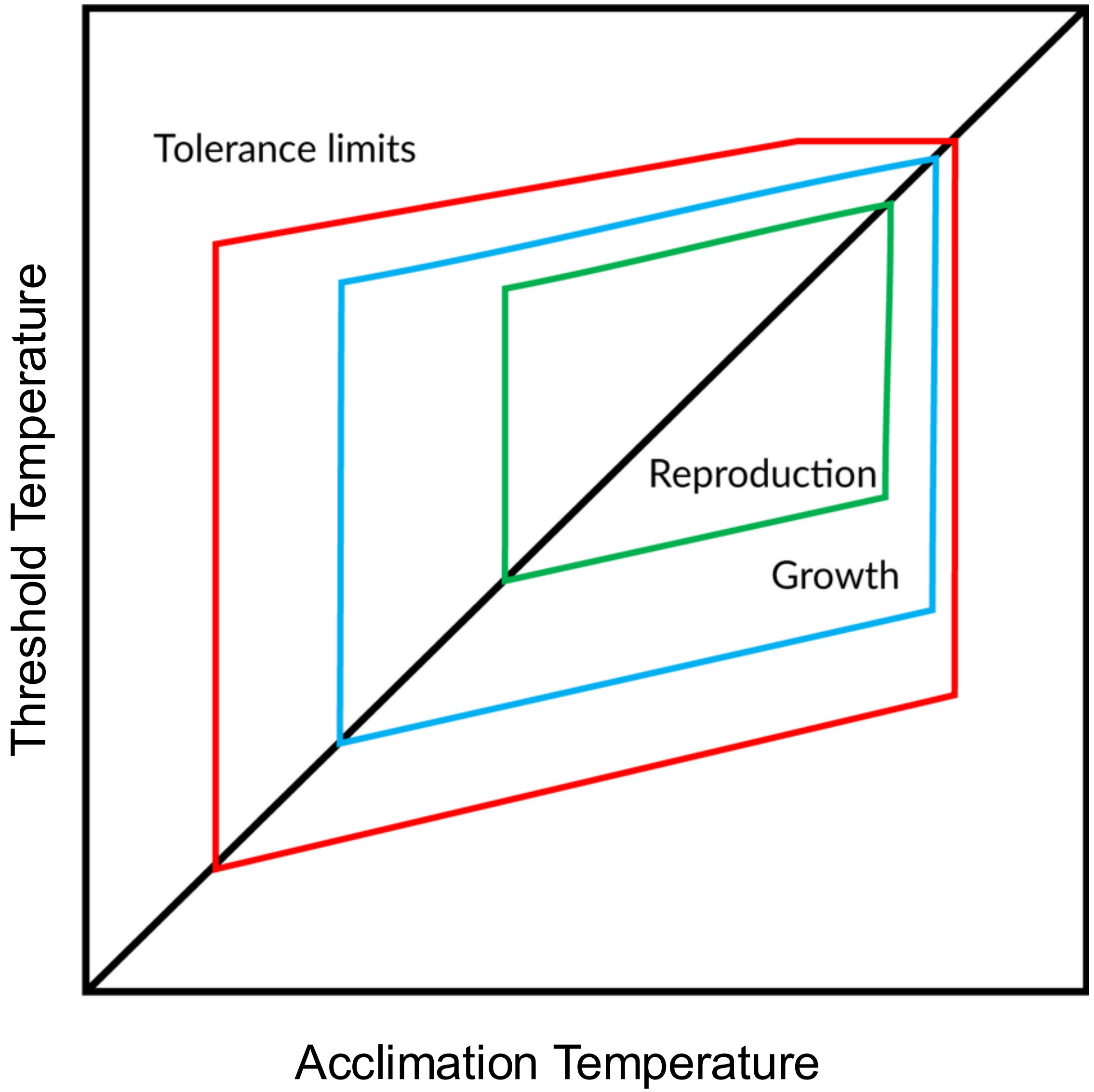
E.g. "Routine maintenance costs" and directly lethal limits of tolerance

Phase Two adds additional ecological, temperature-dependent traits (e.g. reproduction)

Questions:

1) How will temperature affect other life stages? Or spawning and recruitment?

2) What is the role of refugia/recovery periods in natural, dynamic temperatures?



Summary of Phase 2 Experiments

Objectives in Scope of Work:

- Collect new cohort of adult fish for spawning and experiments
- Characterize effects of thermal cycle on thermal tolerance and Acclimation
- Effects of temperature on male parental care behavior
- Determine temperature effects on incubation of embryos, survival, and development
- Characterize acute thermal limits of juveniles

2025 Field Collections

2025 Field Collections

<u>Part 1: March 17th - 20th</u>

- Adult Partially Armored Threespine Stickleback (PATS) were collected from lower Santa Clara River
    - Site 1: Todd Barranca (34.302° N, 119.110° W)
    - Site 2: TNC Prairie Pacific (34.351° N, 119.055° W)
- Fish held at United Water Conservation District property (Saticoy, CA near Freeman Diversion)
- Team from UC Davis, ESA and UWCD

2025 Field Collections

<u>Part 1: March 17th - 20th</u>

- Found mostly in shallow, vegetated channels or pools with slower flow
- Water temperatures:
    - Todd Barranca 3/18, 9 am: 12°C (54°F)
    - Todd Barranca 3/18, 2 pm: 24°C (76°F)
    - UWCD Holding Channel 3/19, 8 am: 15°C (58°F)
- Captured via dip net and seine net

2025 Field Collections

<u>Part 1: March 17th - 20th</u>

- Some mature males, few gravid females. No juveniles.
- Kept adults and avoided exceptionally small fish or poor condition fish
    - Mean Mass: ~0.9 grams
- 748 PATS transported to UC Davis Center for Aquatic Biology and Aquaculture (CABA) on 3/20

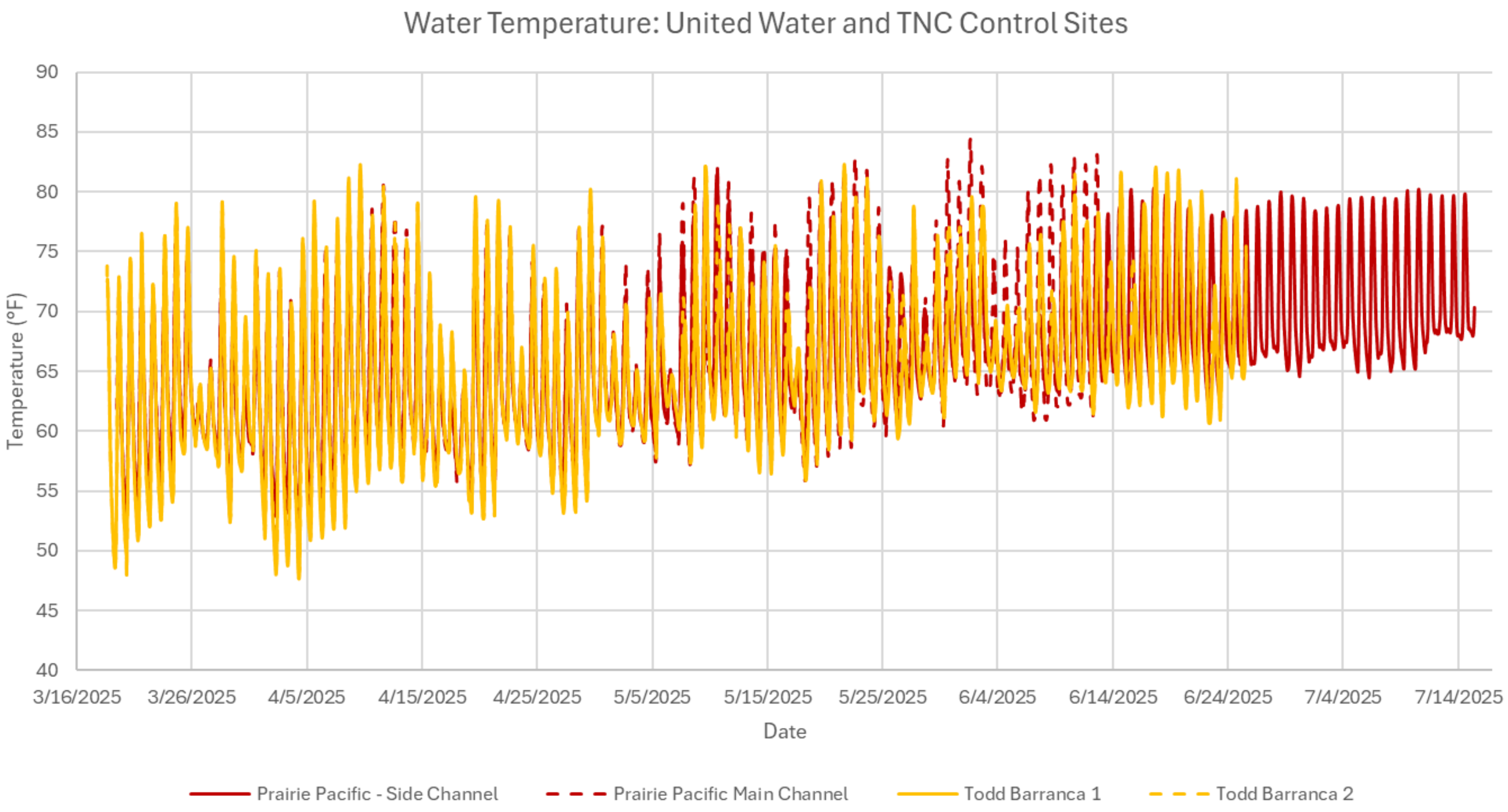
2025 Field Collections

<u>Part 2: July 14th - 16th</u>

- Second trip targeting collection of juveniles and gravid females
- Targeted TNC Prairie Pacific site
- 44 females (17 suitably gravid) and 120 juvenile PATS transported to UC Davis Center for Aquatic Biology and Aquaculture (CABA) on 7/16

Water Temperature at PATS Collection Sites

- What are temperatures where wild PATS are present?
- 2 Hobo loggers installed at each collection site
    - March - June (TNC Prairie Pacific)
    - March - July (United Water)
- Daily maxima ~70F to 83F
- Daily fluctuation swings up to 15-25F

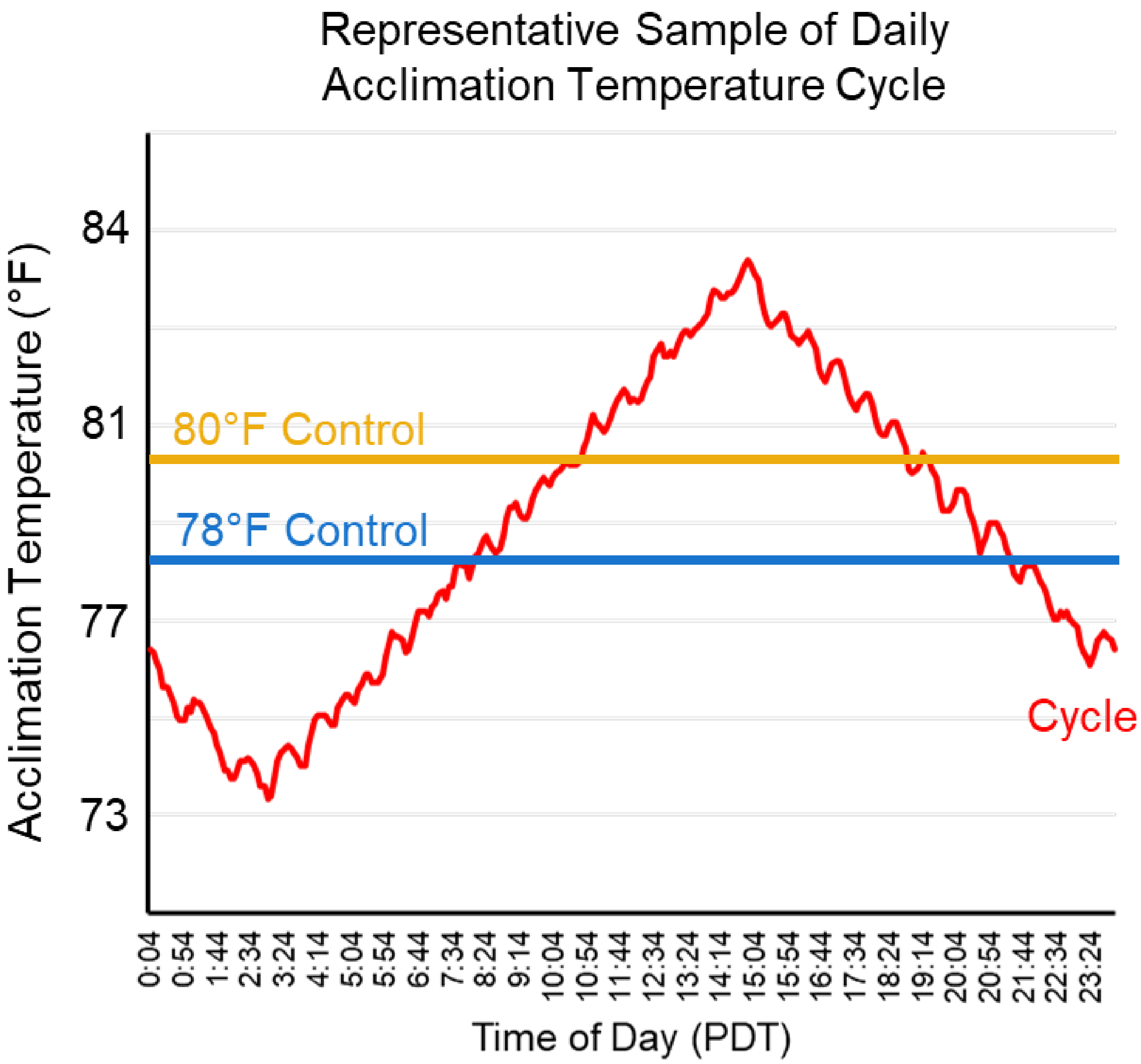


Cycling Temperature Experiments

Thermal Cycling

<u>May – June 2025</u>

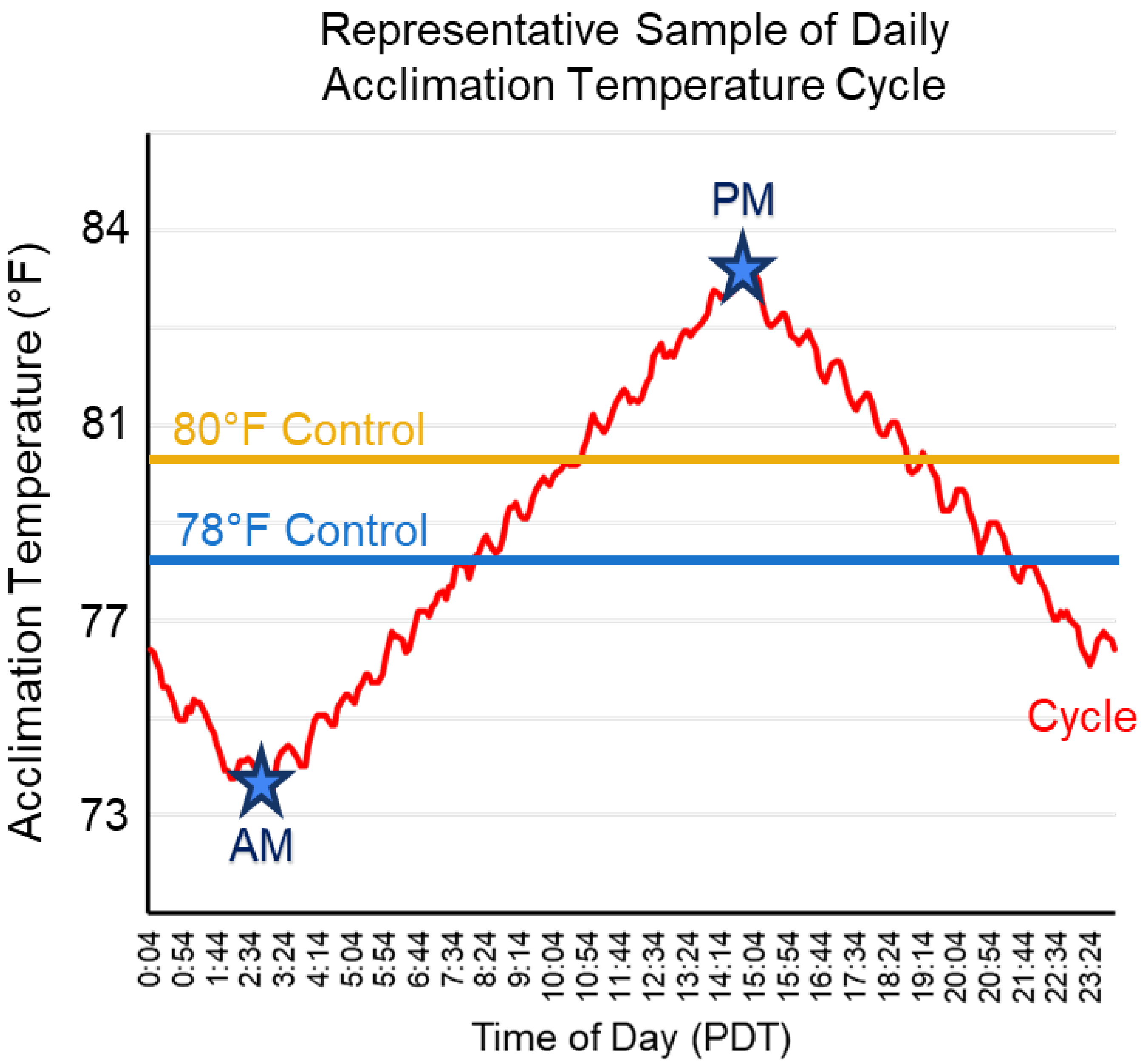
- Acclimate adult fish to cycling (73 – 83 °F, mean of 78°F) and constant (78, 80°F) control temperatures



Thermal Cycling

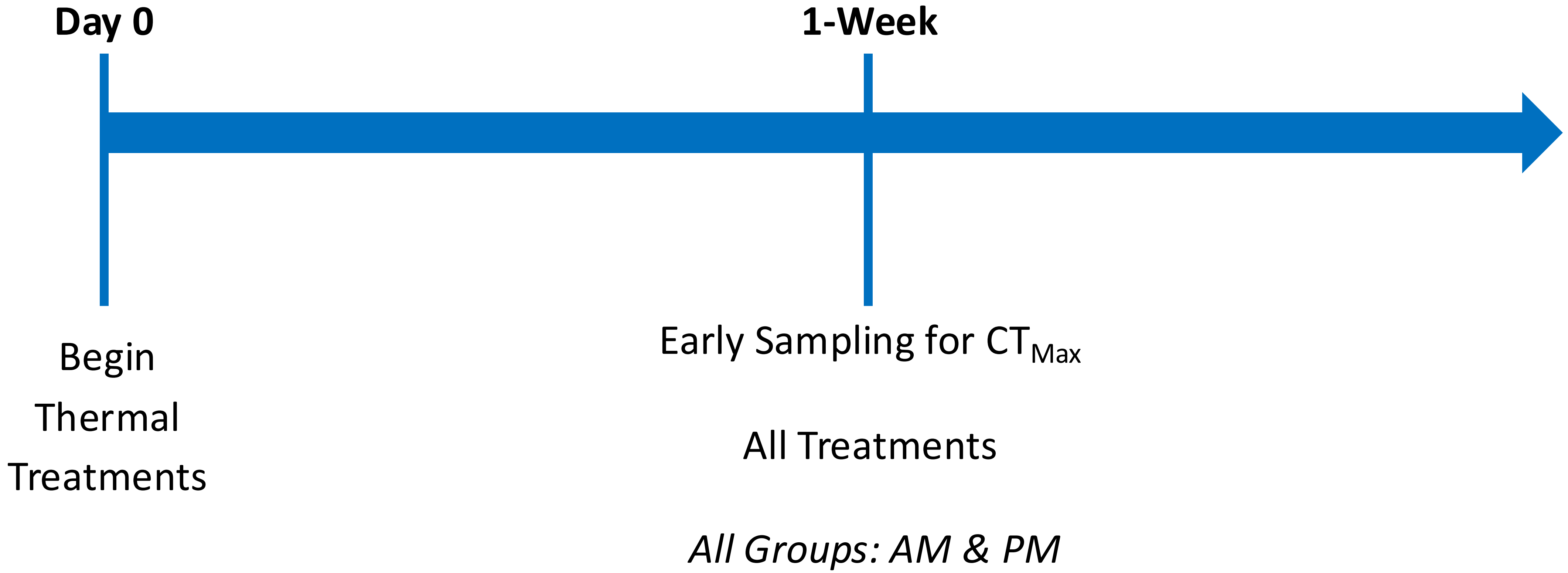
<u>May – June 2025</u>

- Acclimate adult fish to cycling (73 – 83 °F, mean of 78°F) and constant (78, 80°F) control temperatures
- Measure acclimation survival
- Characterize changes in CT_{MAX} at 2 time points during daily cycle
    - E.g., AM and PM and peak and trough of cycle

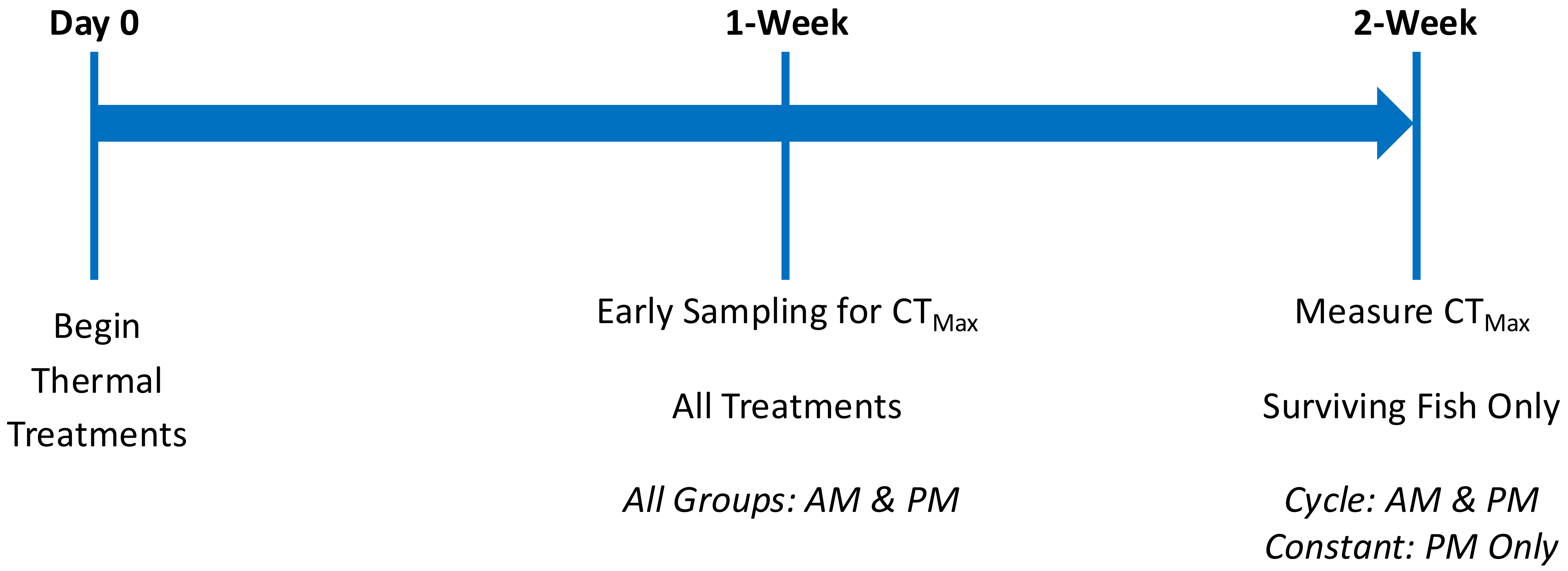


Thermal Cycling – Acclimation and Sampling Timeline

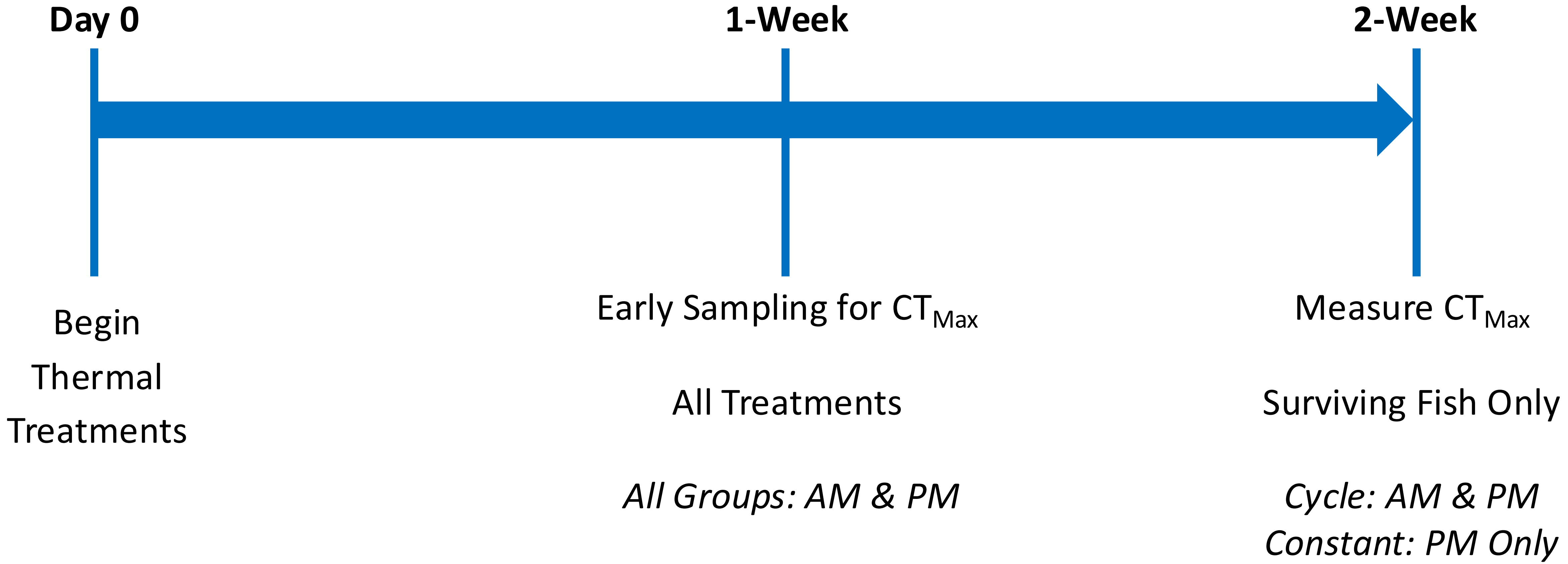
Thermal Cycling – Acclimation and Sampling Timeline



Thermal Cycling – Acclimation and Sampling Timeline

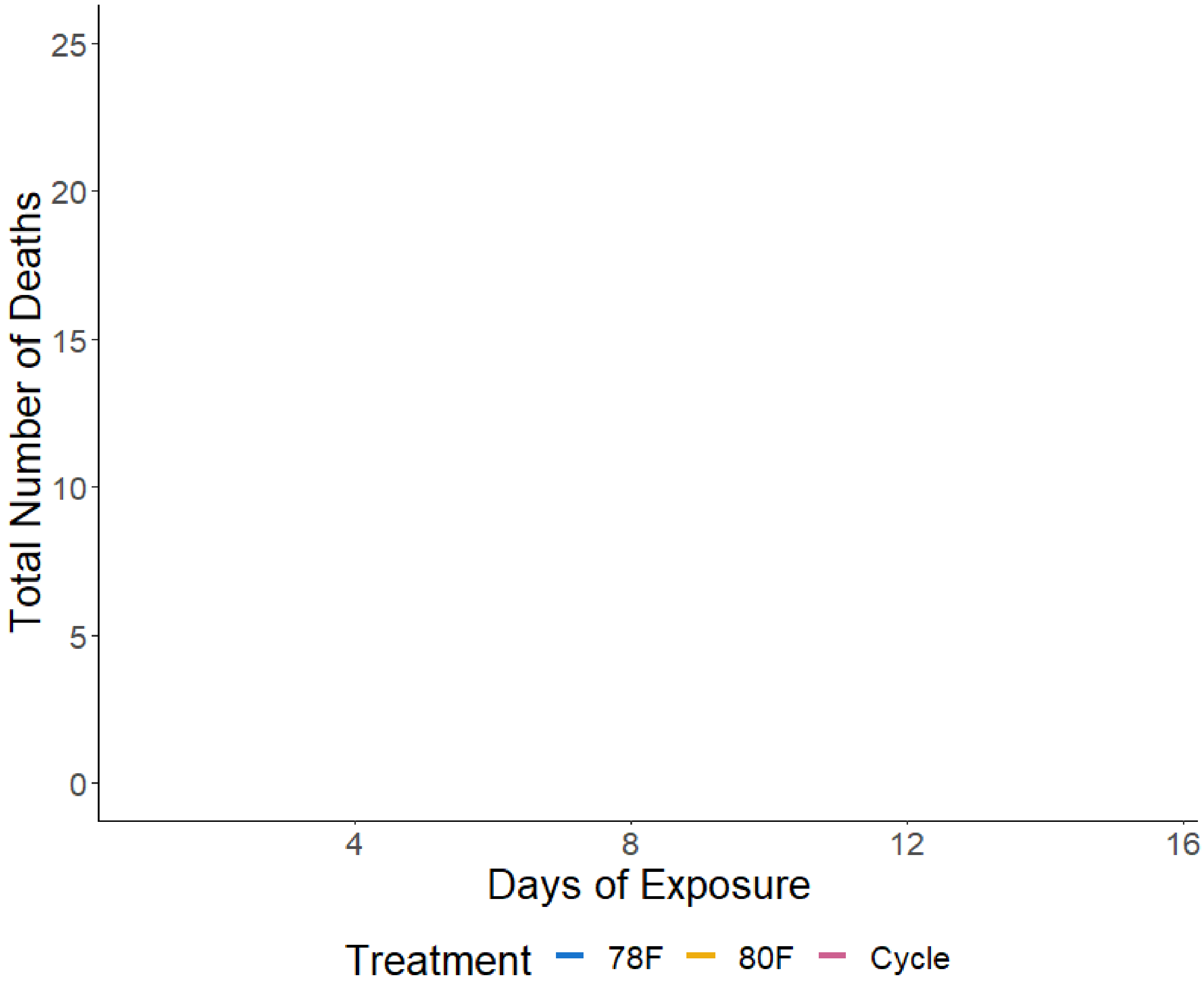


Thermal Cycling – Acclimation and Sampling Timeline



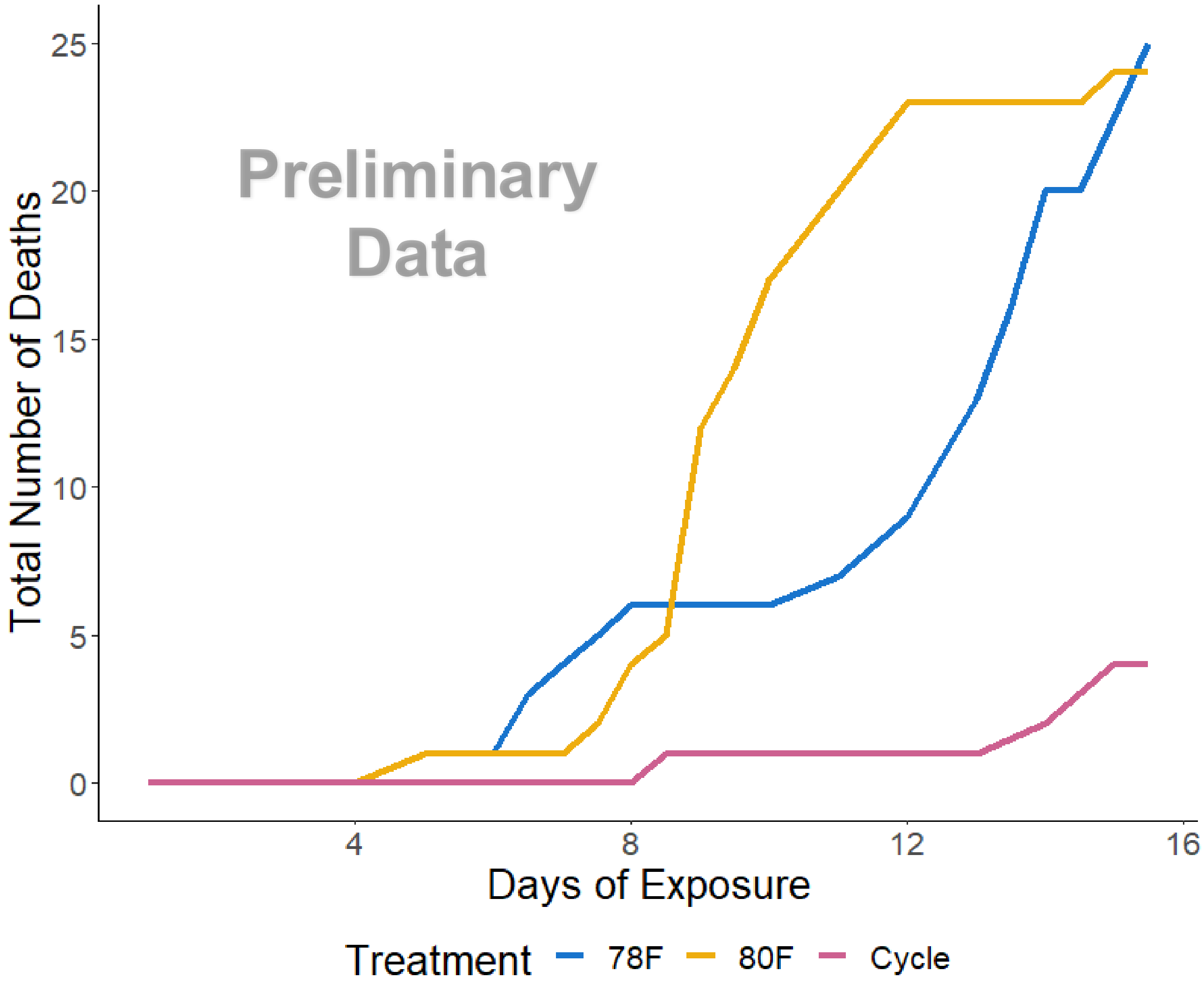
***Continuous sampling of mortality throughout 2-week acclimation period*

Thermal Cycling – Exposure Survival

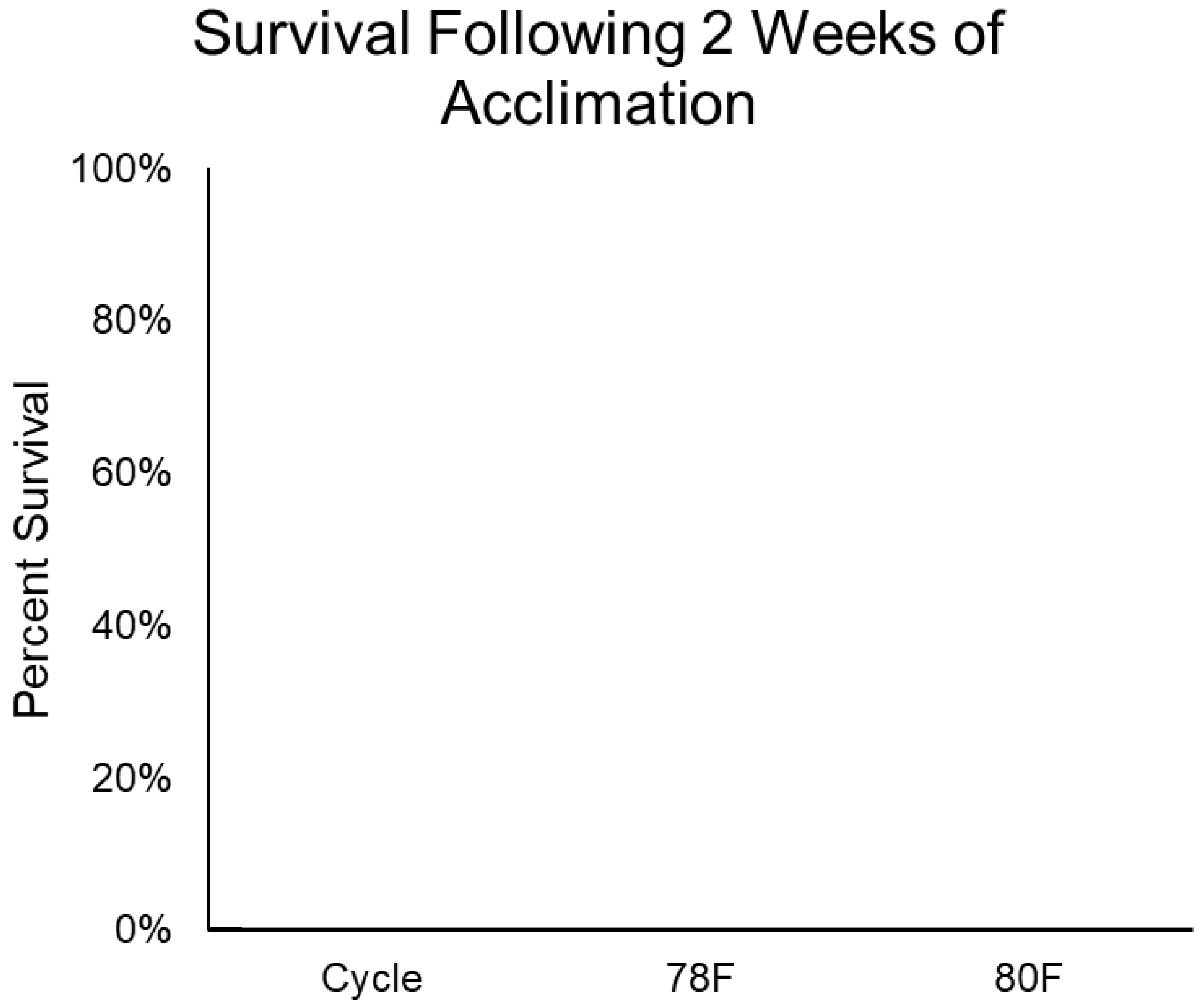


Thermal Cycling – Exposure Survival

- Monitored survival for n=36 fish in each group
- Onset of mortality occurred ~1 week into acclimation for constant temperature groups
  - Seems to agree with observations from 2024
- Mortality occurred at slower rate for cycling fish

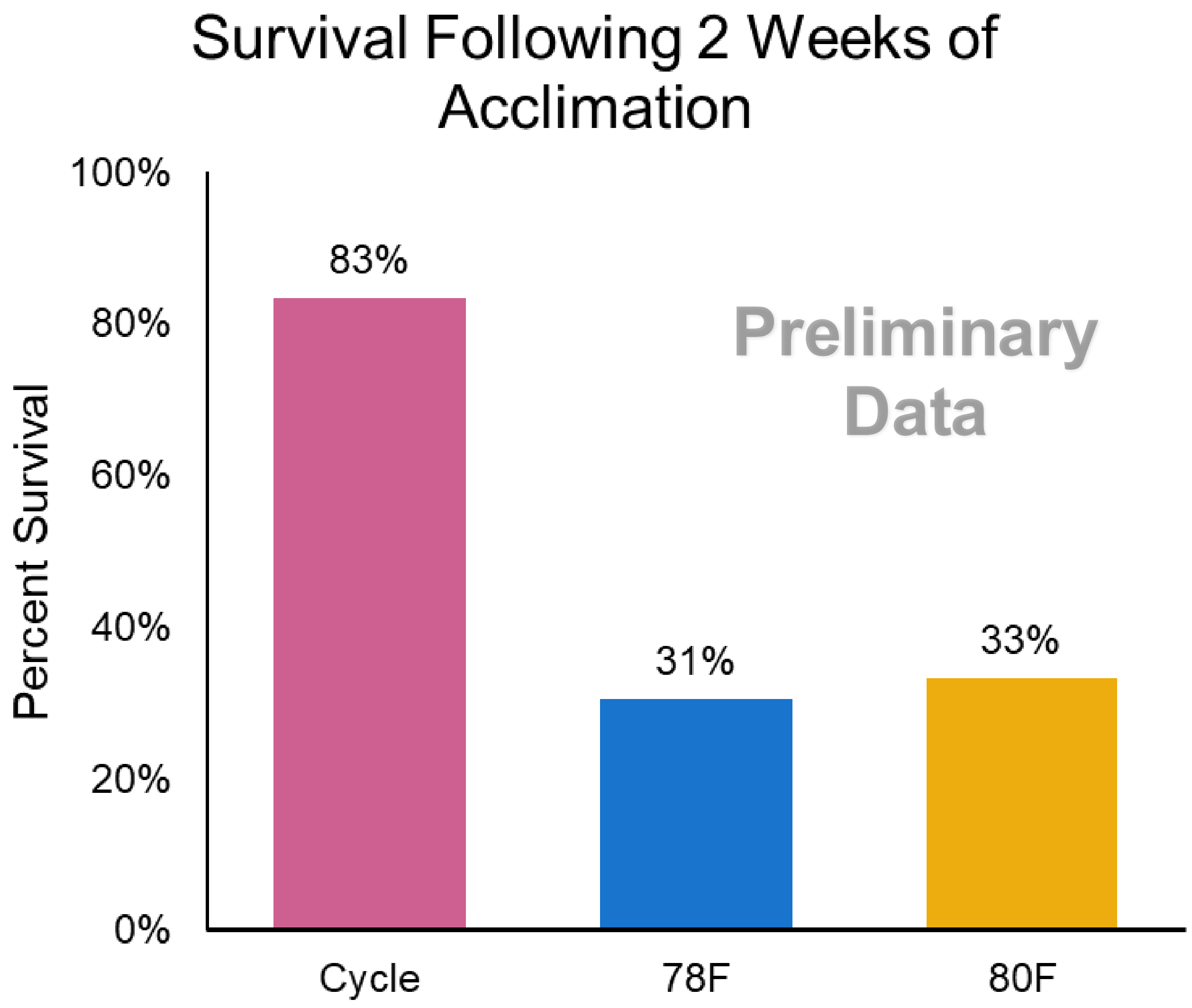


Thermal Cycling – Exposure Survival



Thermal Cycling – Exposure Survival

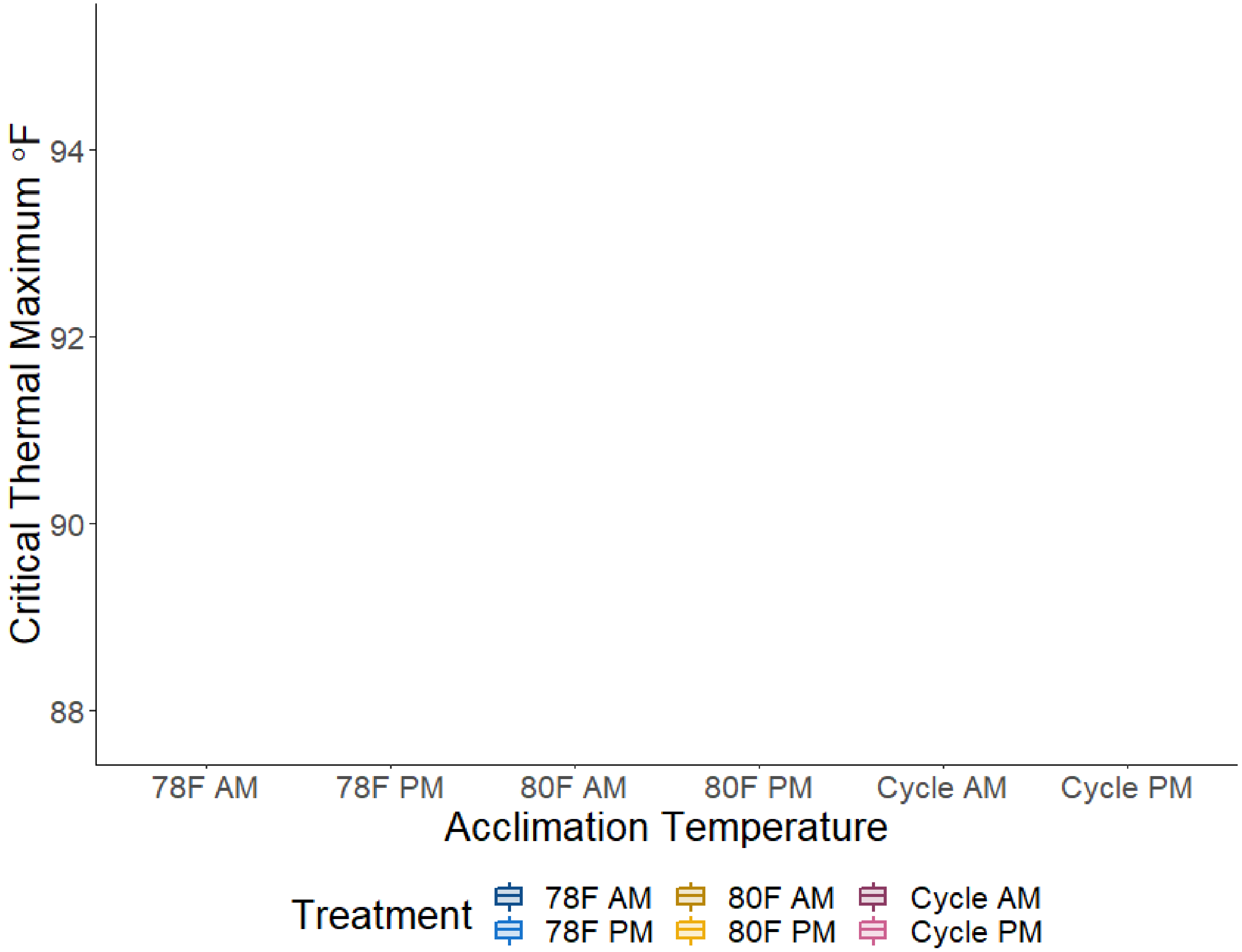
- Survival was 83% for cycling temperature fish, compared to 31 – 33% for constant temperature fish
    - *Note: control temperatures included mean (78°F) of the cycle*



Thermal Cycling – CT_{MAX} at 1-Week Timepoint

CT_{MAX} measured for PATS in Year One:

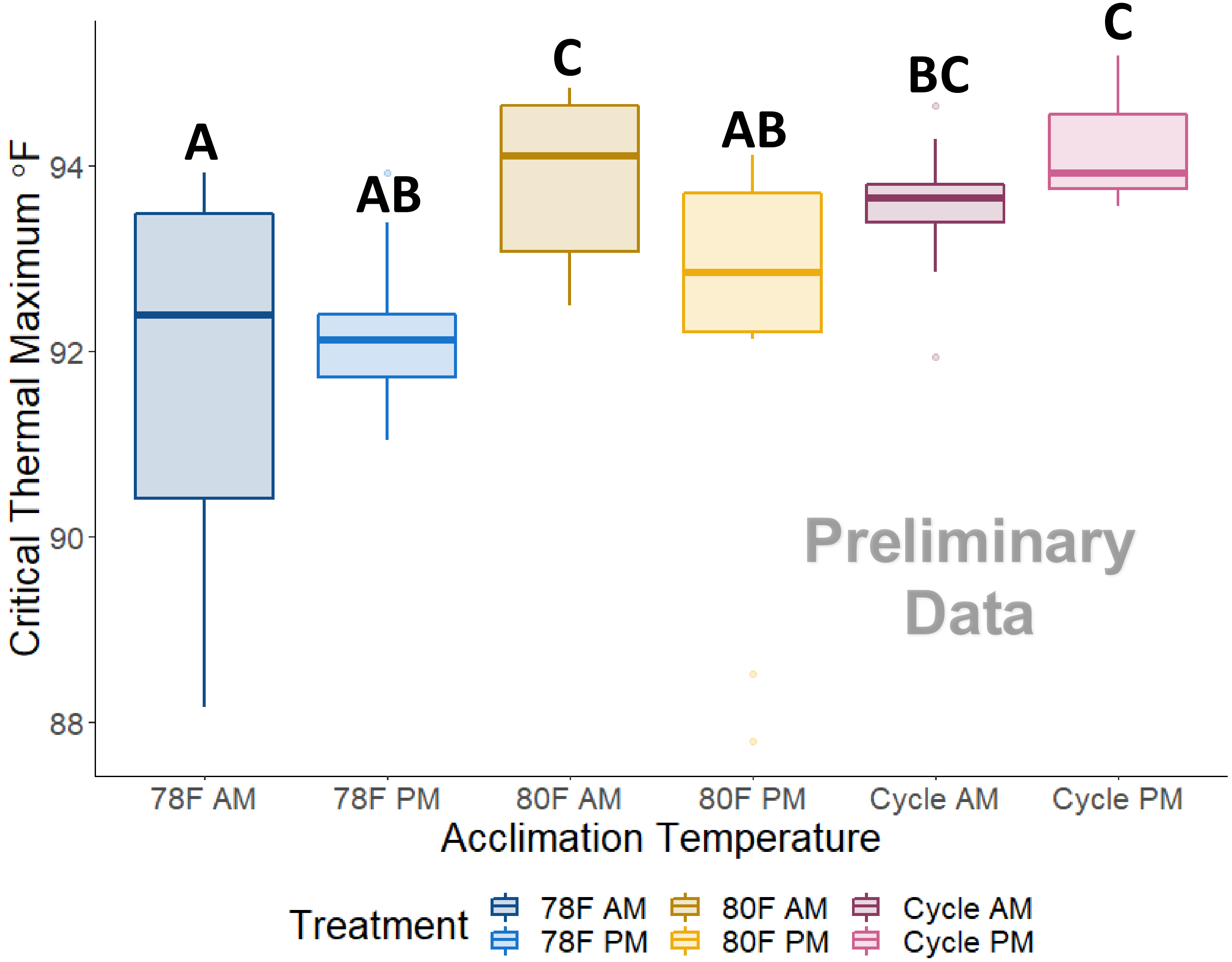
Acc. Temp (°F)	CTM (°F)	95% C.I. (°F)
60	89.9	(88.9 – 90.7)
65.5	90.0	(88.9 – 91.0)
73	91.8	(89.7 – 93.7)
77	92.7	(90.9 – 94.4)



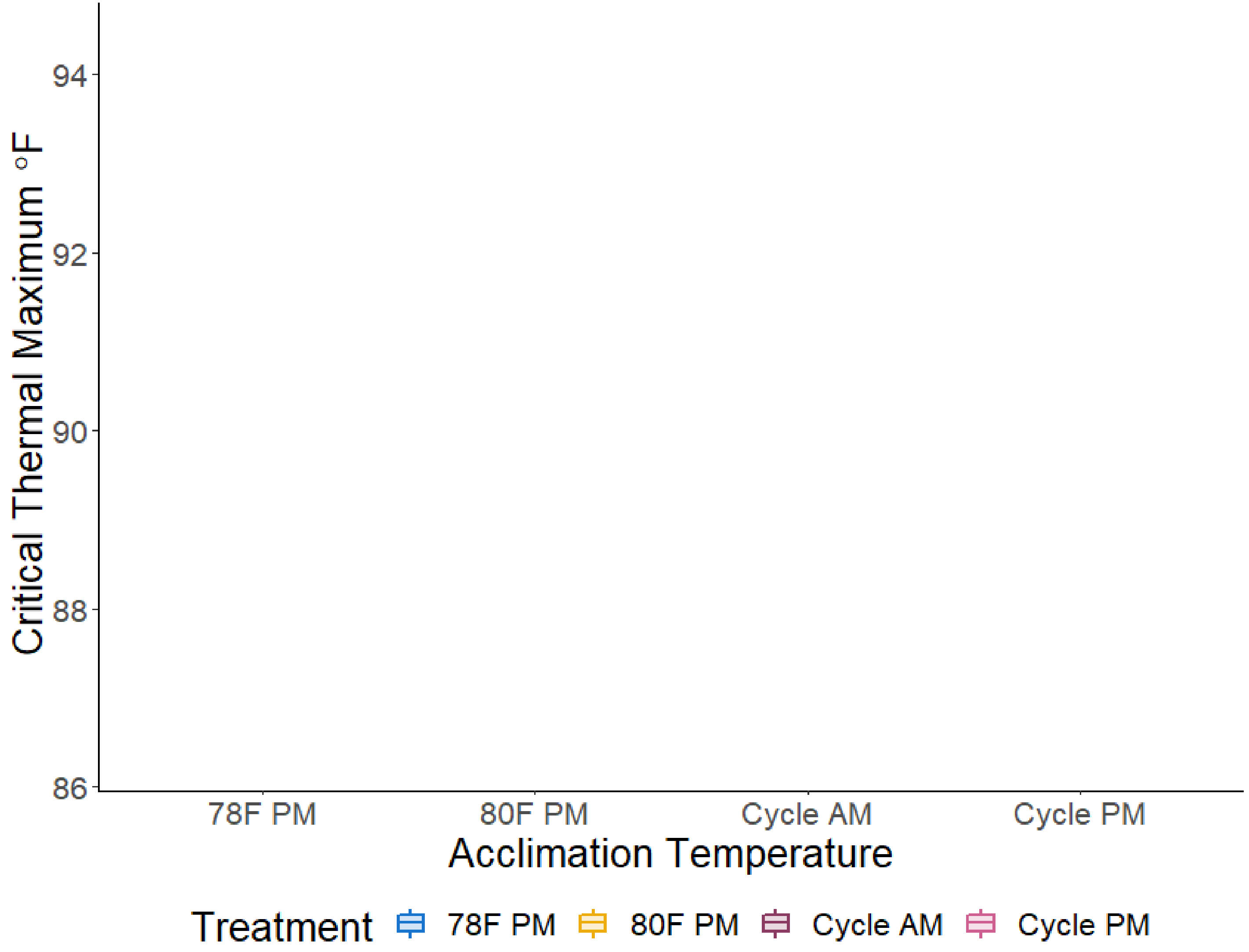
Thermal Cycling – CT_{MAX} at 1-Week Timepoint

CT_{MAX} measured for PATS in Year One:

Acc. Temp (°F)	CTM (°F)	95% C.I. (°F)
60	89.9	(88.9 – 90.7)
65.5	90.0	(88.9 – 91.0)
73	91.8	(89.7 – 93.7)
77	92.7	(90.9 – 94.4)

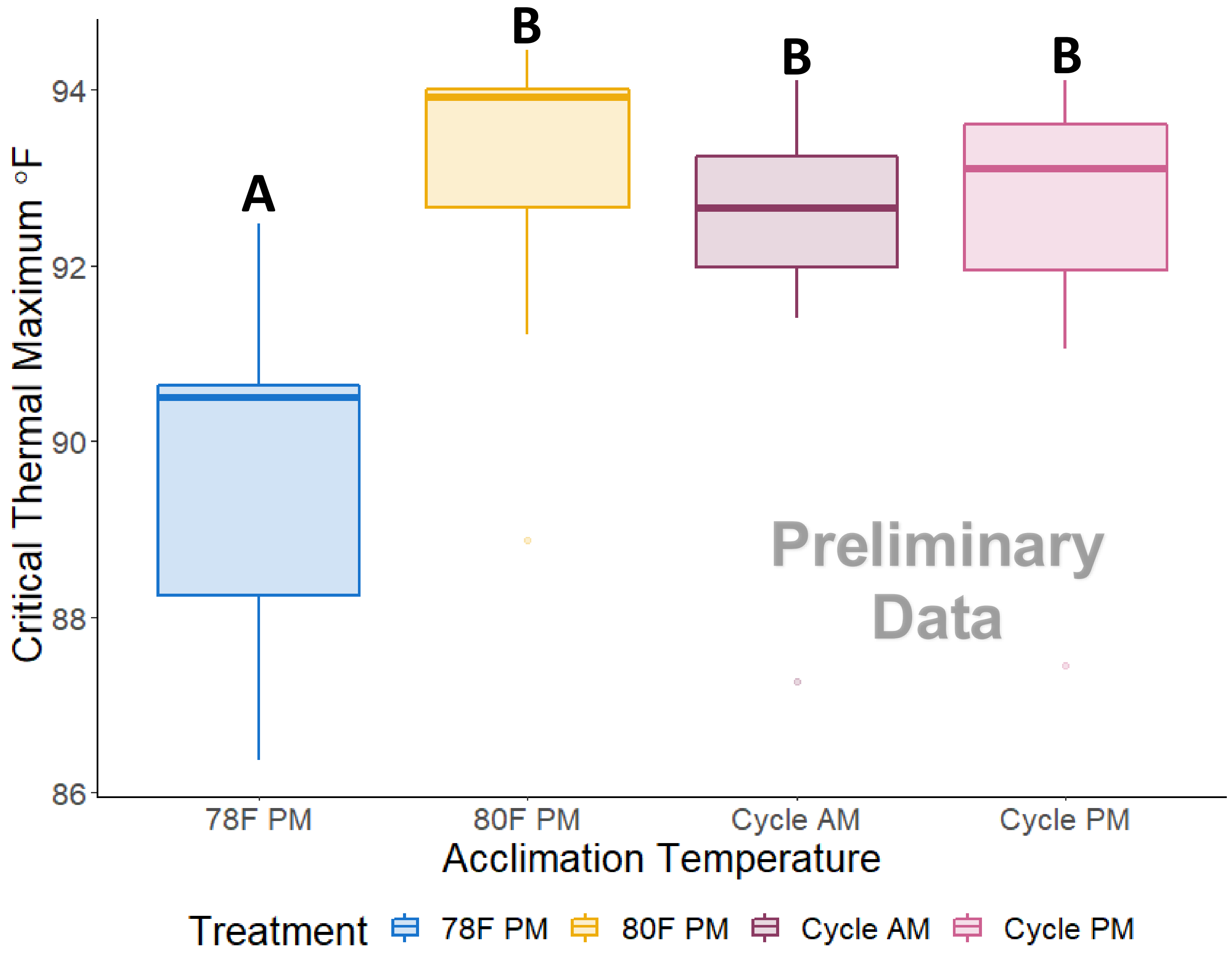


Thermal Cycling – CT_{MAX} at 2-Week Timepoint



Thermal Cycling – CT_{MAX} at 2-Week Timepoint

- Thermal tolerance for cycling fish was not higher than fish acclimated to 80°F
- No difference between AM and PM sample for cycling fish



Note: Fish are acclimated very close to (or within) chronically lethal temperatures

Preliminary Analysis Take-Aways

Fish may not gain additional thermal tolerance from cycling temperatures, but experience increased survival

- Daily fluctuations/overnight temperatures may provide refugia from exposure to high temperatures during day

Disclaimer: Measured responses applicable to exposures within two weeks

Spawning and Behavior Experiments

Juvenile Temperature Tolerance

<u>Summer 2025</u>

- Collect juveniles from lower SCR
- Acclimate groups of juveniles to 4 temperatures
    - Ranging between 60 - 77 °F
- Measure differences in CT_{MAX} between acclimation temperatures and compared to adult fish

Embryo Incubation

<u>Summer 2025</u>

- Artificially spawn and produce >750 viable embryos
- Incubate groups of embryos to 6-8 temperatures
    - Ranging between 60 - 77 °F
- Measure hatch success, time to hatch and length at hatch

Male Spawning and Parental Care

<u>Summer 2025</u>

- Expose adult males in natural-simulation tanks to 4 temperatures
  - Ranging between 60 °F - 77 °F
  - Coordinate thermal tolerance study
- Measure changes in adult male behavioral traits (e.g. nest building)

Timeline of Phase 2 Physiology Experiments

- **March and July 2025:** Fish collections and transition to captivity
- **Spring 2025**: Cycling temperature experiments
- **Summer 2025 and Fall 2025:** Juvenile and spawning experiments
- **Winter 2025:** Data analysis and presentation of findings

Benthic Macroinvertebrate Sampling

- Purpose
  - Characterize general condition of stream community using California Stream Condition Index (CSCI)
  - Assess food resource availability for fish
- Study approach - Sampling plan, index, statistical analysis
  - Permitting
  - Sampling Plan: Sample 2 upstream and 2 downstream sites at each WRP location (June 10-11, 2025; potential September 2025)
  - Obtain CSCI scores to inform habitat condition
  - Characterize BMI community US vs DS of WRP discharges

Saugus BMI Sampling – June 10, 2025

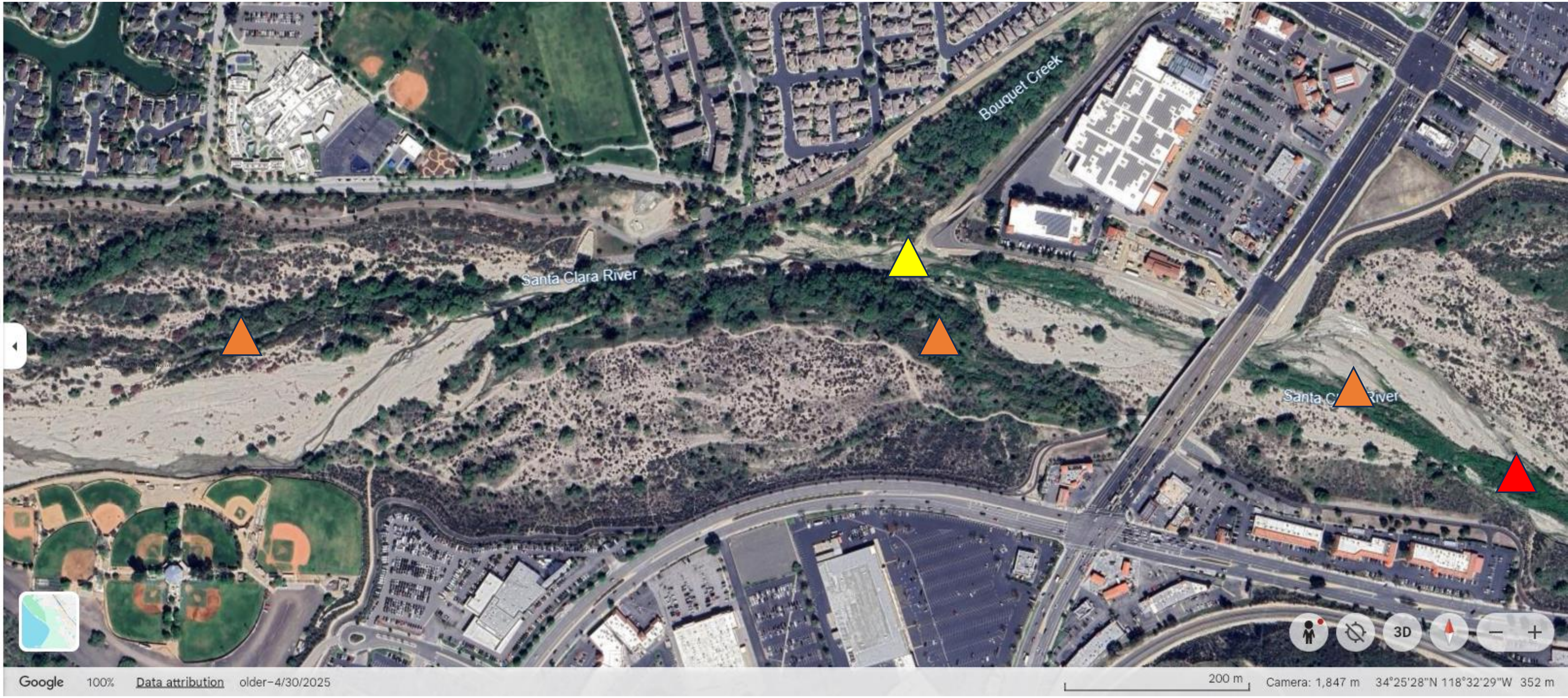
Proposed Sample Location · Sample Location · Stickleback Observed · Temperature Logger

Valencia BMI Sampling – June 11, 2025

★ Sample Location

BMI Sampling and Stickleback

Stickleback Observations - 2025



June 10   June 25   July 23*

Stickleback and Stream Observations

SCR Site RA June 10, 2025

Stickleback and Stream Observations

SCR Site RA June 10, 2025

SCR Site RA July 23, 2025

Stickleback and Stream Observations

Upstream of SCR Site RA July 23, 2025

Stickleback and Stream Observations

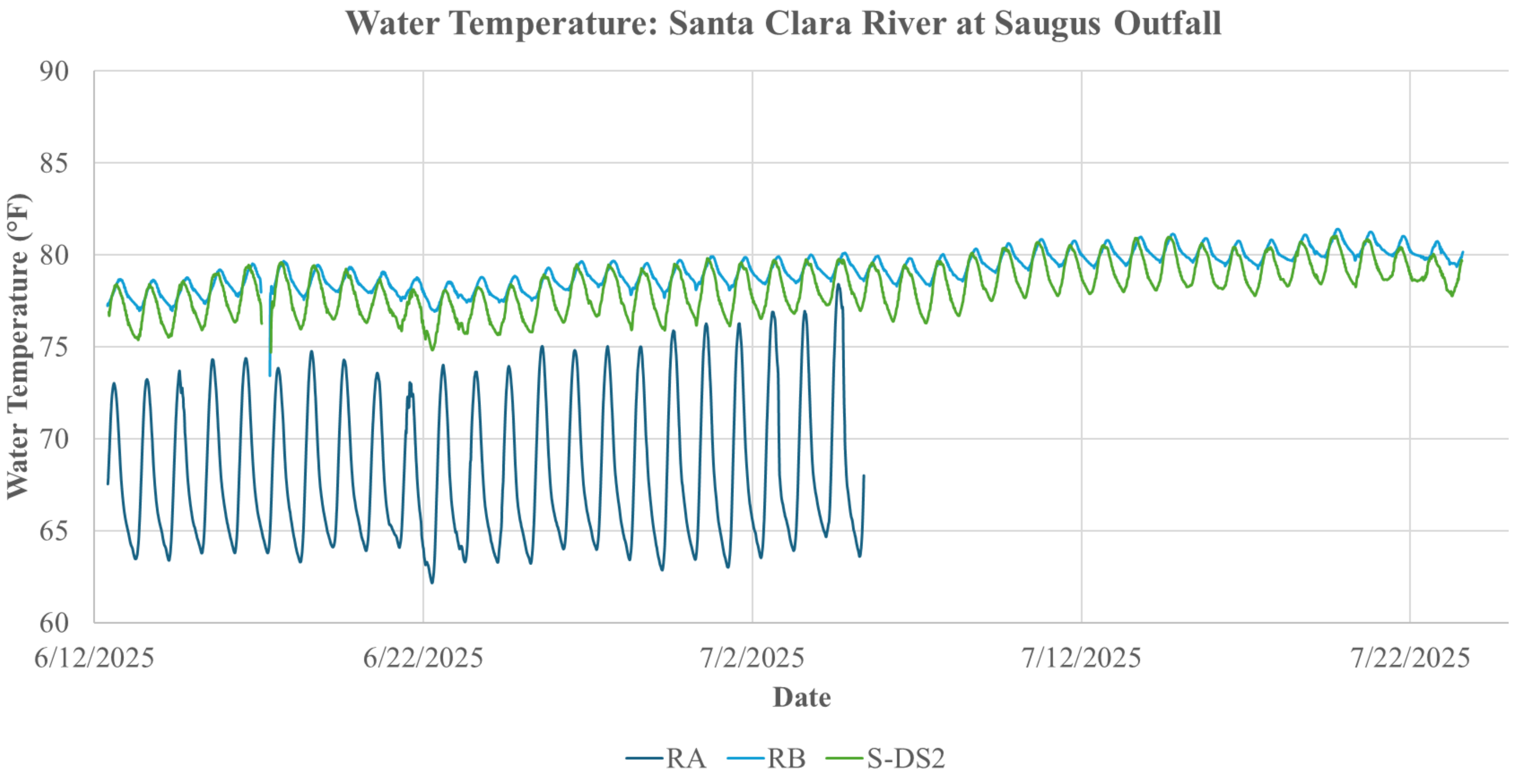
Bridgeport Park Area June 11, 2025

Bridgeport Park Area July 23, 2025

Stickleback and Stream Observations

- Mainstem SCR in Saugus area connected and flowing 2024-July 2025
- Suitable stickleback habitat present
- Stickleback source
  - Immigration from US/DS SCR?
  - Bouquet Canyon?
- Water Temperatures

Stickleback and Stream Observations



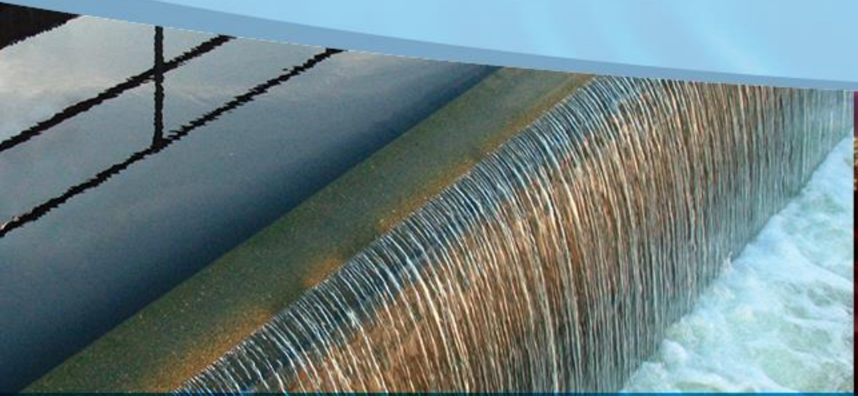
Feedback and Next Steps

- Ensure temperature monitoring, modeling, and fish laboratory studies have been clearly communicated and questions are addressed
- Conduct second potential BMI monitoring event – late summer 2025
- Continued river temperature monitoring with sensors at least through summer 2025
- Continued temperature management and wastewater source investigations – through 2025
- Next TAC meeting anticipated early 2026 to review summary of study results

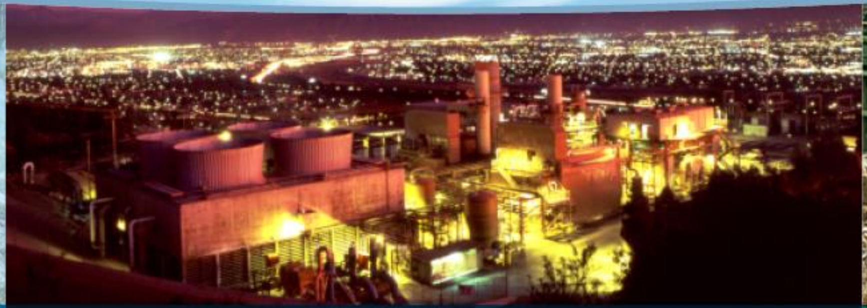
LOS ANGELES COUNTY
SANITATION DISTRICTS
Converting Waste Into Resources

OUR MISSION

To protect public health and the environment through innovative and cost-effective wastewater and solid waste management and, in doing so, convert waste into resources such as recycled water, energy, and recycled materials.



WATER RECYCLING



GREEN ENERGY

MATERIALS RECYCLING