CVPIA Science Integration Team Meeting

March 24, 2021

CVPIA SIT Meeting March 24, 2021

Welcome!

Some Logistics

- Please keep yourself muted when not speaking
- Please identify yourself when you do speak
- If you didn't receive a direct calendar invite for this meeting and would like to be added to the SIT email list, please contact megan_cook@fws.gov

CVPIA SIT Meeting March 24, 2021

Agenda

- 9:00-9:15 **Welcome, Agenda Review** – Megan Cook (FWS)
- 9:15-10:00 **FY20 Memo, Updated SIT Guidance, Review SIT 2021 Process** – Megan
- 10:00-10:10 BREAK
- 10:10-12:00 **Model Updates: Results of Prototyping Changes**
  - 10:10-10:40 **Updating survival in Sacramento River and delta**
  - 10:40-11:10 **Updating habitat inputs** and **adding winter-run Battle Creek habitat**
  - 11:10-11:20 BREAK
  - 11:20-12:00 **Feedback on late-fall-run habitat inputs** and **integrating Chinook salmon DSMs**
- 12:00-1:00 LUNCH BREAK

CVPIA SIT Meeting March 24, 2021

Agenda

- 1:00-1:15 **Subgroup Update: Monitoring** – Megan
- 1:15-1:40 **Proposal Update: Growth/Bioenergetics** – Mike Beakes (USBR), Corey Phillis (MWD), Jim Peterson (USGS/OSU)
- 1:40-1:55 **Summary of SJ Steelhead Monitoring Workshop** – Mike Beakes (USBR)
- 1:55-2:05 BREAK
- 2:05-2:25 **CVPIA Funding Process Update** – Matt Dekar (FWS), Rod Wittler (USBR)
- 2:25-2:50 **New Business** (All)
  - *O. mykiss* habitat size classes (Jim Peterson)
  - Project completion updates (Rod Wittler)
- 2:50-3:00 **Closing**

Interactive Polling

Something to Celebrate

Final NTRS is online!

http://cvpia.scienceintegrationteam.com/about/

Near-term Restoration Strategy

Highlights

- Priority restoration actions for Chinook salmon
- Priority information needs for Chinook salmon, *O. mykiss*, green and white sturgeon
- Executive Summary
- Appendix – SIT Monitoring Guidelines (updated)
- Appendix – Data Guidance for CVPIA Funded Projects
- Addenda and responses

FY20 Adaptive Management Update

Document for Review coming soon

Outline

- Summary of SIT activities
- Near-term Restoration Strategy finalization
  - Data Guidance
  - Monitoring Guidelines
- Proposals for model changes accepted by SIT
  - Add Battle Creek winter run Chinook
  - Update habitat inputs
  - Update temperature and survival relationship in the delta
  - Update flow and survival relationship in Sac River

FY20 Adaptive Management Update

Outline cont.

- Documents:
  - Juvenile Chinook Salmon Demographic Parameters Needs
  - Refine Habitat Modeling Priorities Input Needs
  - SIT Critical Monitoring Needs

SIT will have two weeks to provide comments on draft

Revised SIT Guidelines

Summary of Updates

- Edits to be consistent with Near-term Restoration Strategy
- Update and clarify process for proposing changes to DSMs
- Clarify pre-proposal and full proposal templates
- Add in flexibility to annual memo review timeline

Comments and edits requested by April 2 to megan_cook@fws.gov

http://cvpia.scienceintegrationteam.com/meetings/

Revised SIT Guidelines

Summary of Model Change Proposal Process

1. **Describe change to conceptual model**
   - Identify gap/modification needed, gather subgroup, describe data needed
   - New template for this “pre-proposal” available for review
2. **Present initial idea to SIT**
   - Get comments, feedback, direction from SIT
3. **Develop full model change proposal**
   - Describe needed modification and data to support change, get SIT thumbs up
   - **Next deadline:** October 2022 for proposals to enter step 4 prototyping
4. **Prototype model change**
5. **Discuss results of model change with SIT**
6. **Based on SIT input, finalize model change**

SIT Proposal Templates

NEW: Pre-proposal template

- Description of scientific rationale for the proposed change to the DSM
- Illustrations or diagrams of the conceptual changes to the model
- List of sources of info that can be used to inform the model component

UPDATED: Full proposal template

- Additional detail on items from pre-proposal
- Specific instructions on how to incorporate change into model

Comments and edits requested by April 2 to megan_cook@fws.gov
http://cvpia.scienceintegrationteam.com/meetings/

SIT 2021 Overview

NTRS Priorities
Restoration Actions and Info Needs

Prototype Model Changes
Based on proposals accepted by the SIT

SIT discusses and affirms model changes
Is the model improved?

March SIT Meeting

Model Calibration / Sensitivity Analysis
Does the model still make sense?

Spring/ Summer 2021

New Release of Model

Summer 2021

Run existing Priorities through updated Model

Assess revised output
Are existing priorities still supported?

Fall 2021

SIT Prioritization
Develop new candidate strategies, update priorities

Winter 2021-2022

SIT 2021 Schedule

June 23, 10am-12pm: SIT Call

- Topic: Updates from Subgroups and Modeling Activities

Aug 25, 10am-12pm: Ad Hoc Subgroup Call (open to all)

Topic: Review Model Calibration / Sensitivity Analysis results

Sept 15, 10am-12pm: SIT Call

- Topic: Updates and setup for October Meeting

Oct 13-14, 9am-3pm: SIT Meeting

- Topic: Hear results of the review of Model Calibration / Sensitivity. Run current strategy actions and info needs through the model – determine whether updates to priorities are warranted.

Dec 15, 10am-12pm: SIT Call

- Topic: Follow-up from October meeting

http://cvpia.scienceintegrationteam.com/meetings/

CVPIA SIT Meeting March 24, 2021

Prototyping Model Changes
Review Results

CVPIA SIT Meeting March 24, 2021

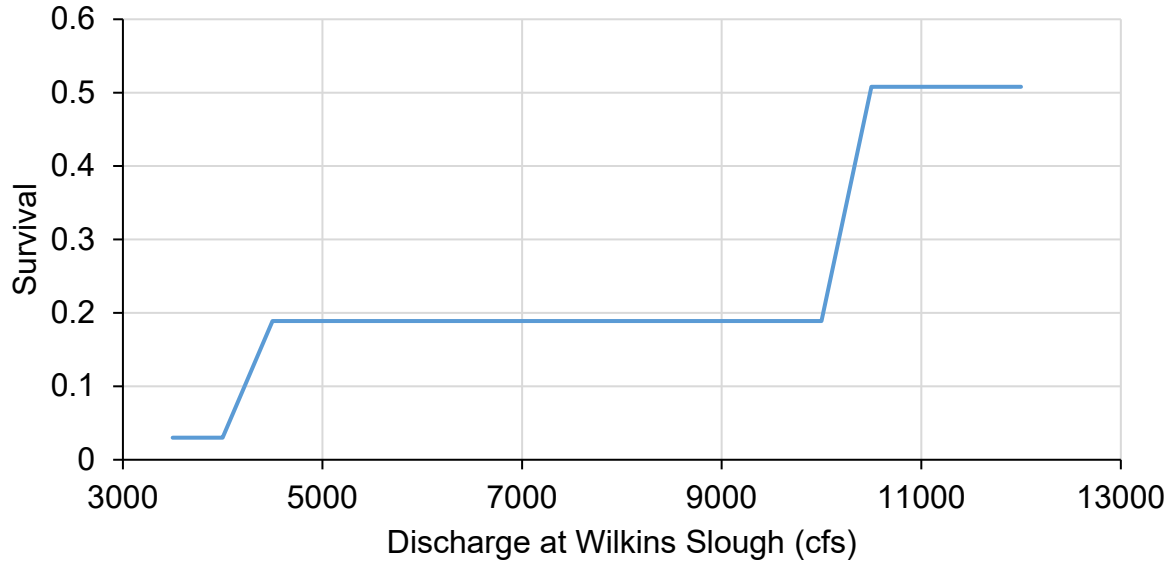
Prototyping Model Changes

Survival Updates

New Flow vs. survival relationship for the Sacramento River

Survival should vary in response to flow in the Sacramento River, with a step function. Specifically, survival for acoustic tagged spring-outmigrating (i.e., fall-run and spring-run) salmon smolts in the upper Sacramento (Deer Ck confluence to Verona):

- 3.0% for flows below 4,259 cfs as measured at Wilkins
- 18.9% for flows between 4,259 and 10,712 cfs
- 50.8% for flows above 10,712 cfs.



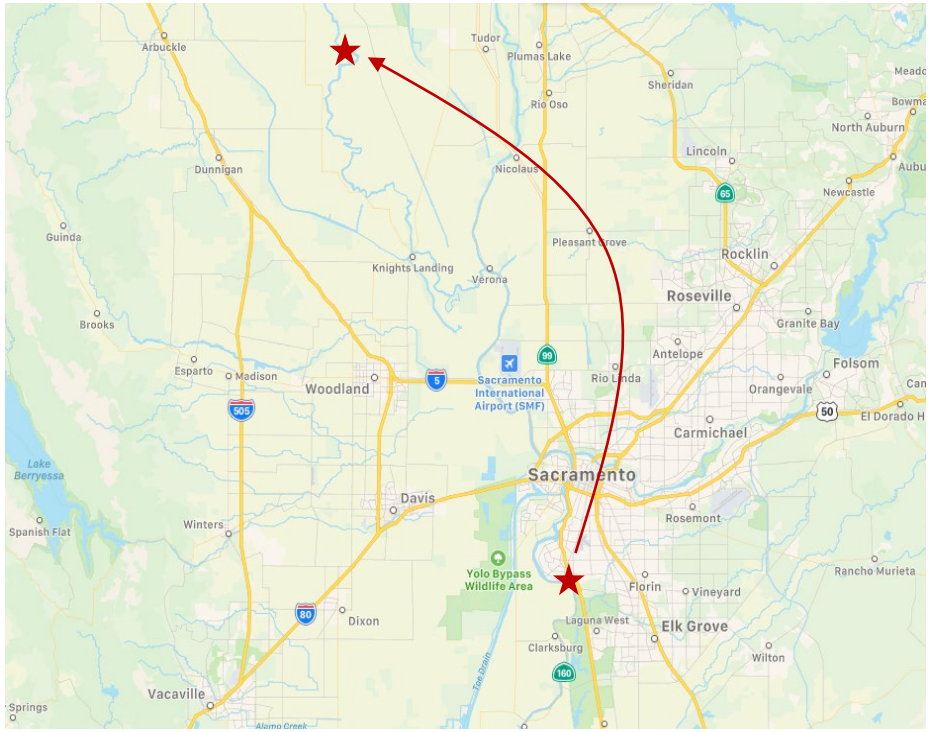
New Flow vs. survival relationship for the Sacramento River

Previous outmigrant survival model:

- Flows at Freeport
- Temperature
- Predator contact points
- Diversions
- Body size

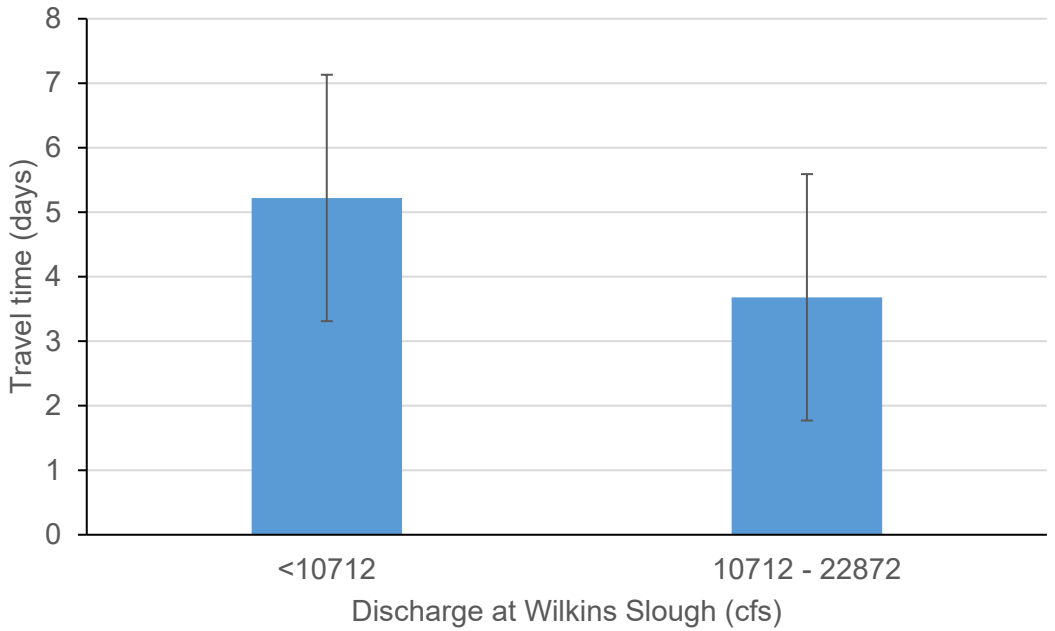
Flows at Wilkins Slough (CalSim node)
(80-95 mm fish)

Thoughts on incorporating size?



New Flow vs. survival relationship for the Sacramento River

Accounting for travel time:

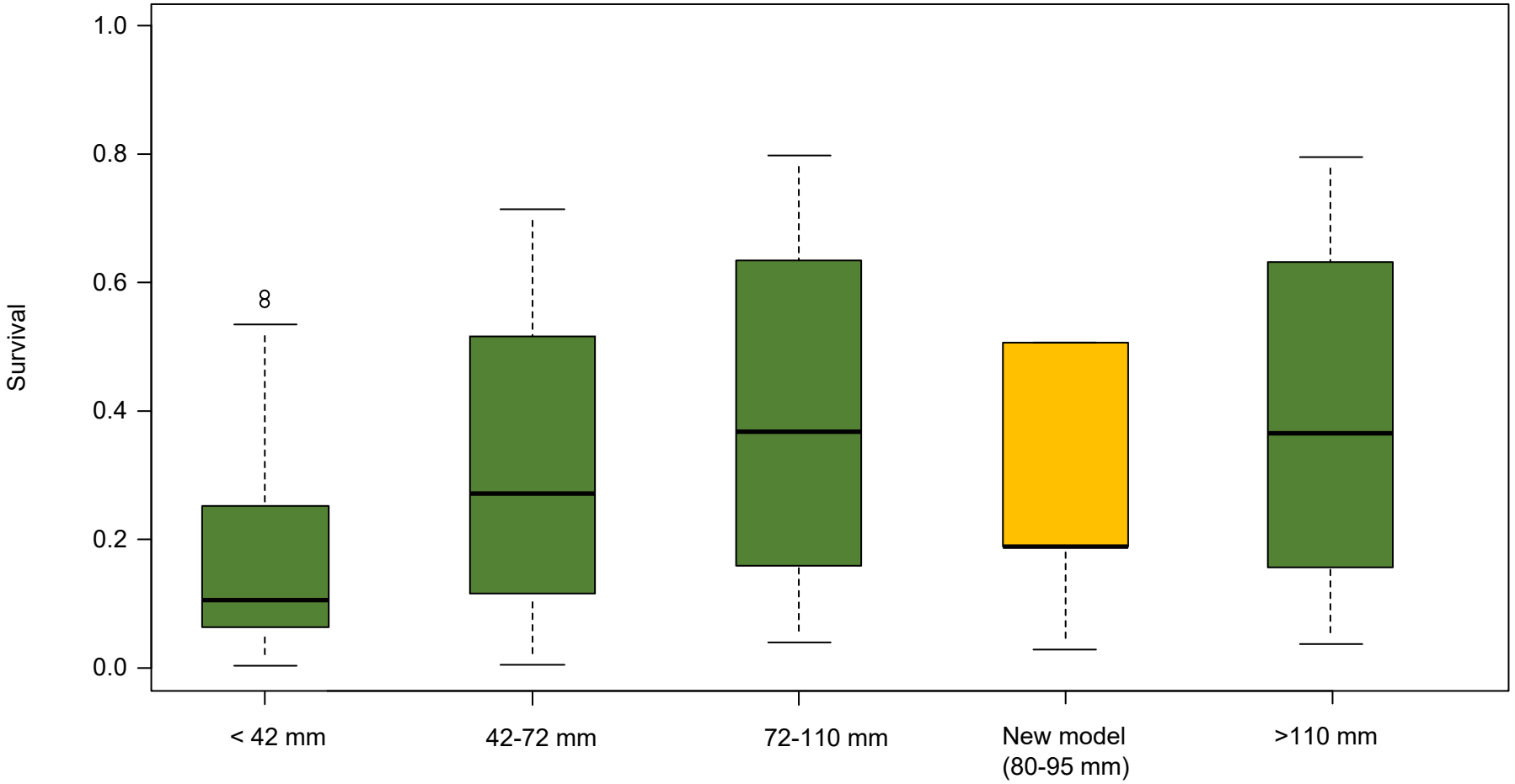


Apply survival to portion of month in the river, rest in delta.

Discussion point: thoughts on decreasing time step in future versions?

New Flow vs. survival relationship for the Sacramento River

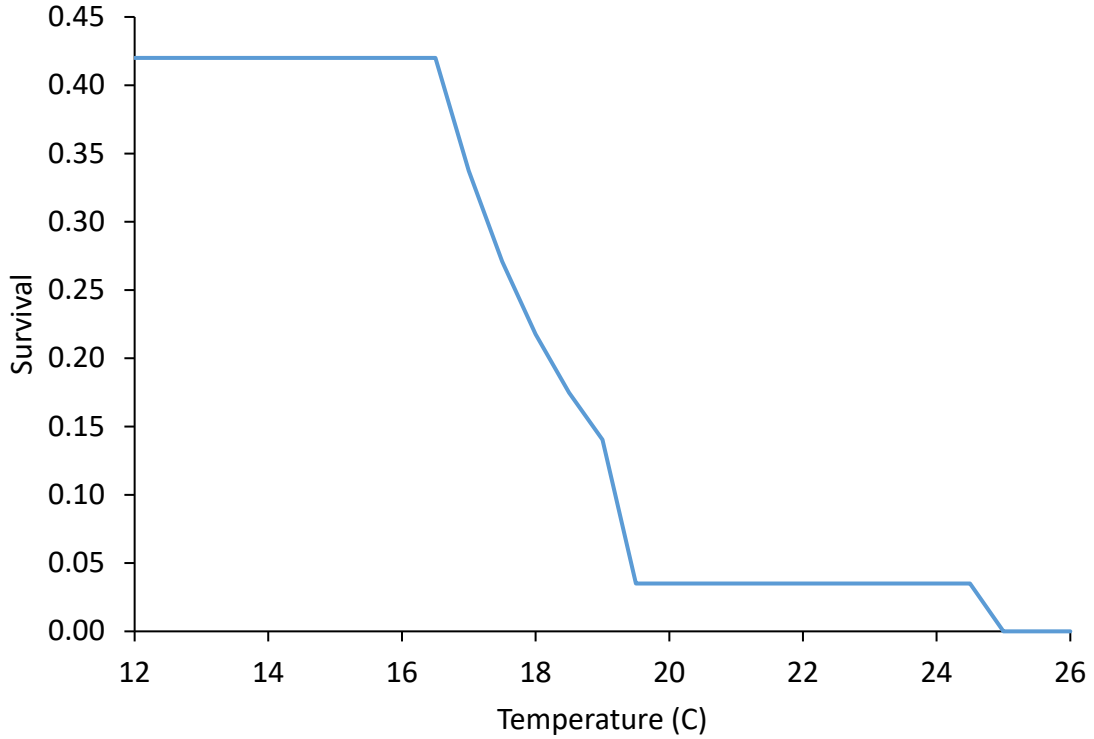
Compare predictions previous version vs new version 1980-2000



Temperature vs. survival relationship for the Delta

Change temperature: survival relationship for juvenile salmon Delta survival:

- 42% survival below 16.5 degrees C for Sacramento basin fish
- decreasing 55% per degree Celsius increase up to 19.5^{o}C
- At 19.5^{o}C survival goes to 3.5% until 25^{o}C when survival is zero.



Temperature vs. survival relationship for the Delta

Previous delta survival model:

- Temperature
- Predator contact points
- Diversions
- Body size

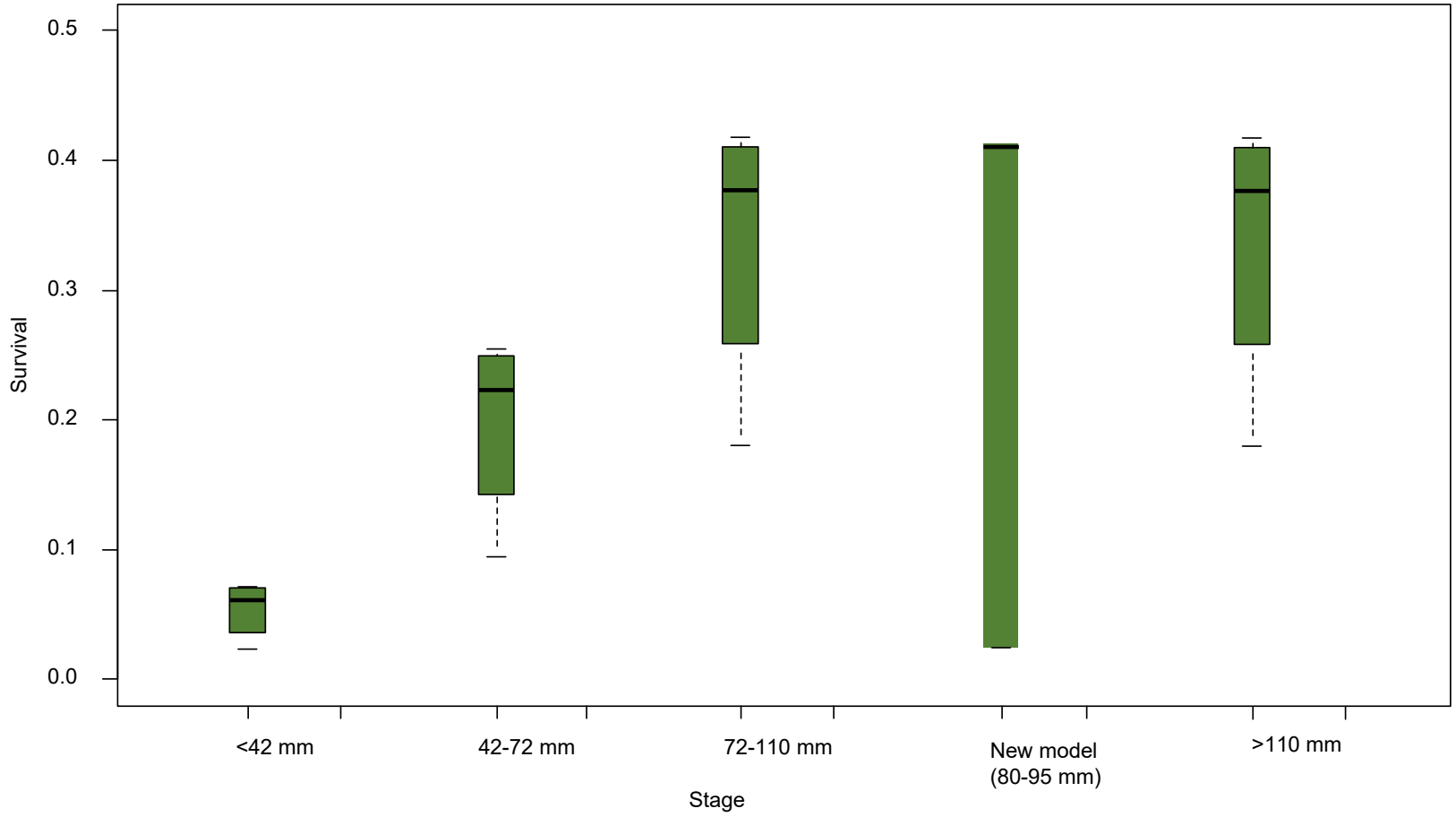
Temperature input:

- Analysis used GES gage
- Keep EMM gage in SIT model
- (may be worth revisiting in the future)

Thoughts on incorporating size?

Temperature vs. survival relationship for the Delta

Compare predictions previous version vs new version 1980-2000 North Delta



CVPIA SIT Meeting March 24, 2021

Habitat Input Improvement SIT Proposal

Prototyping Report

Prototyping Report Topics

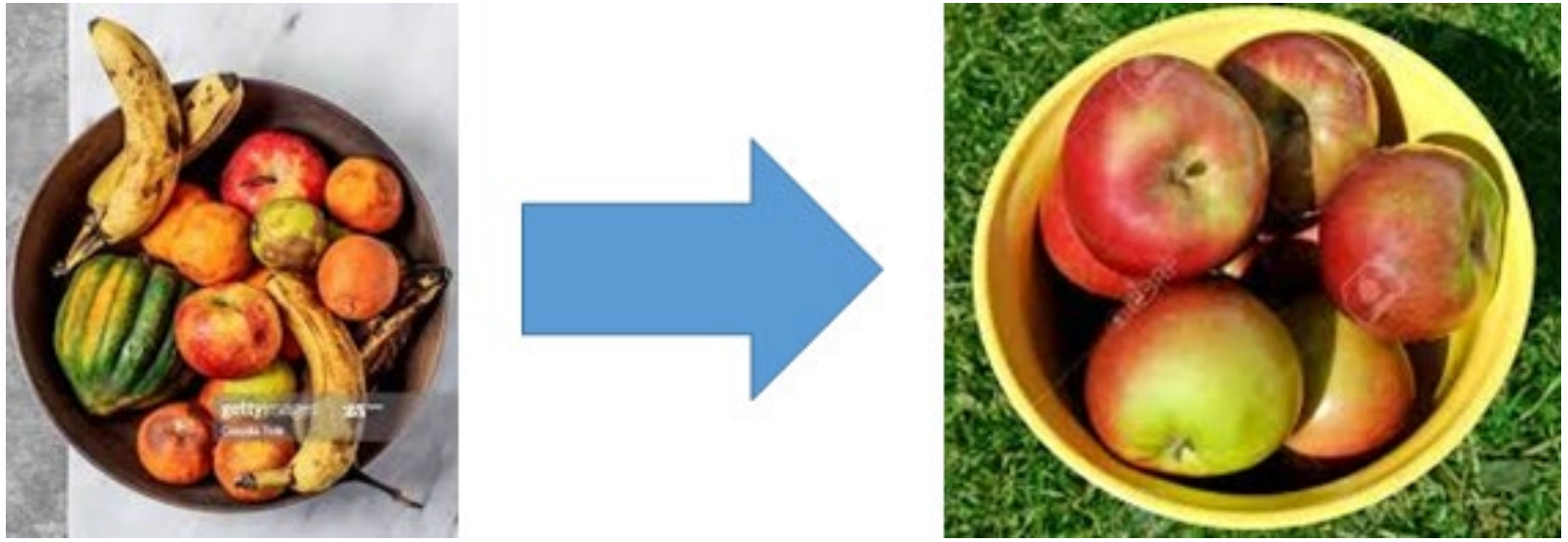
- SIT proposal process / status
- Objective of the SIT habitat input improvement proposal
- Refresher on difference between old and proposed new habitat inputs
- Habitat input prototyping on Deer Creek
- Next steps

SIT Proposal Status

- ***January 2020 - August 2020*** = pre-proposal & proposal development
- ***September 2020*** = presented full proposal to SIT and authorized prototyping
- ***September 2020 - February 2021*** = prototyping
- ***March 2021*** = prototyping presentation to SIT and SIT feedback
  - Looks good - proceed to LCM sensitivity and calibration testing for prototype watershed
  - Minor questions / comments - address and proceed to LCM testing
  - Red flags - loop back with subgroup / SIT to resolve before proceeding

Habitat Input Proposal Objective

Increase accuracy in each watershed and consistency across watersheds.



Replace scaled, subsampled, WUA with full 2D and binary suitability

Current Habitat Inputs (Best Case)

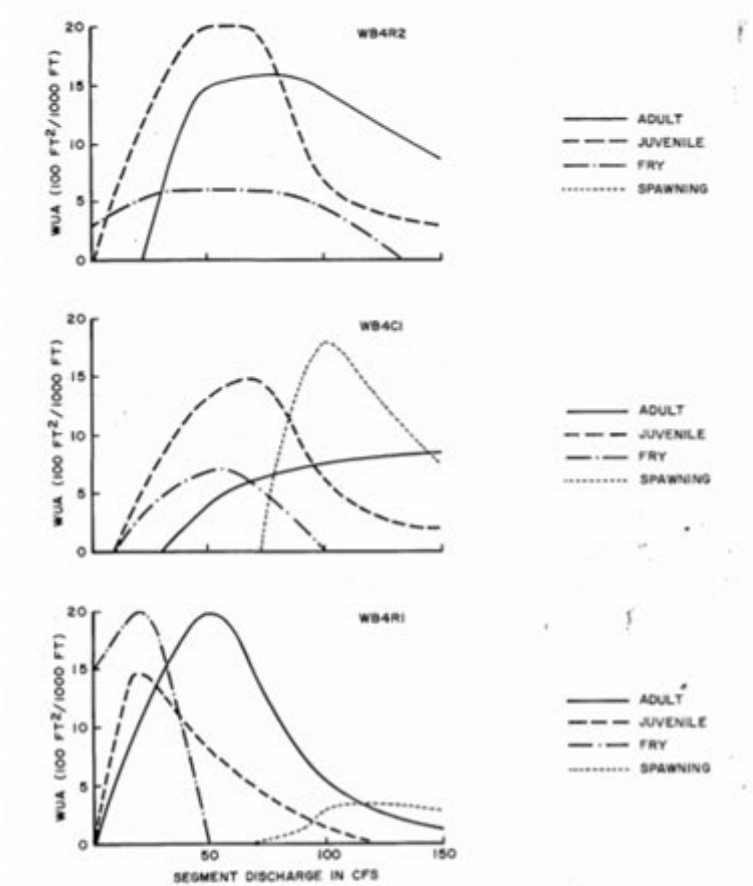


Figure 14. Weighted usable area for brown trout vs. discharge for three study reaches in segment IV of example.

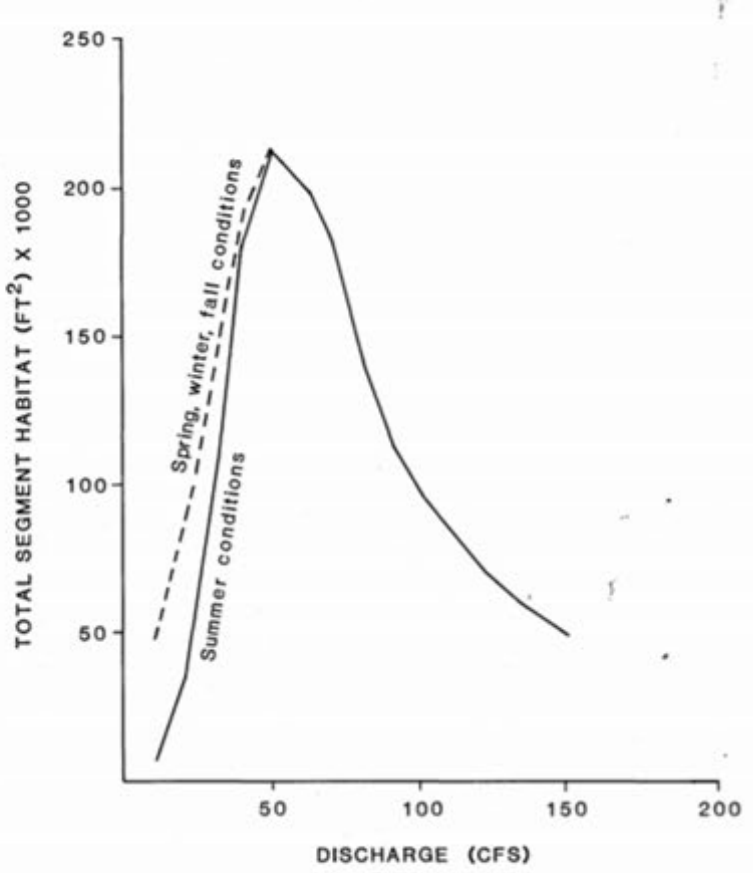


Figure 15. Total adult brown trout habitat in segment IV as a function of discharge under summer (solid line) and nonsummer conditions (dashed line).

SIT Proposal for Improved Habitat Inputs

- Submodels Affected
  - Juvenile Survival
  - Adult In-river Survival
  - Reproductive Success
  - Juvenile Migration Success
- Submodel Parameters Affected
  - Spawning habitat
  - In-channel rearing habitat
  - Floodplain rearing habitat

SIT Proposal for Improved Habitat Inputs

- Hydraulic model outputs (2D) from entire river and floodplain
- Spawning and instream rearing
  - Suitability criteria applied in binary manner
  - Spawning limited to suitable substrates
- Floodplain rearing
  - Suitability criteria applied in binary manner
  - Growth and survival benefits proportional to inundation duration
  - Role of cover, connectivity, and food to be finalized through work described in the habitat input update charter

SIT Proposal Suitability Ranges

Species	Lifestage	Location	Suitable Depth Range (feet)	Suitable Velocity Range (feet)	Source
Fall Run Chinook	Adult Spawning	Instream	0.41 - 6.69	0.09 - 6.30	Gard 2019 (Chspawn tab - Clear fall column)
Fall Run Chinook	Juvenile Rearing	Instream	0.41 - 5.31	0.00 - 3.07	Gard 2019 (Chjuv tab - Clear fall column)
Fall Run	Juvenile	Floodplai			

Habitat Input Prototype on Deer Creek

- Old input = regional (instream) and scaled 1D (floodplain)
- Fall Run DSM scaled old input by 2X for calibration***
- Recent lidar, bathy, and high res photos (2017-2019)
- Highly resolved 2D hydraulic model for CDFW Prop 1 project
- Extensive ground-based habitat observations

Old Habitat Input

Deer Creek

Sadie Gill, Mark Tompkins

July 2020

Future Data Improvements

Update with new Flowwest 2019 data.

Instream Spawning and Rearing Habitat

Data Source: Calculated with a relationship between flow and mean weighted usable area from watersheds in the region with modeled habitat

No watershed specific instream spawning or rearing habitat data was available for Deer Creek. Instream spawning and rearing data were developed using similar watersheds in the Upper-mid Sacramento River Region to create a regional approximation.

Floodplain Rearing Habitat

Data Source: Deer Creek Watershed Conservancy (DCWC) 1D HEC-RAS model

Fall Run

A 11.8 mile portion of the entire mapped rearing extent of 18.4 miles was modeled using Deer Creek Watershed Conservancy (DCWC) 1D HEC-RAS model. Of the entire mapped rearing extent, 11.8 miles were classified as low gradient and 6.6 miles were classified as high gradient based on a geomorphic analysis of long profile slopes and valley widths. The floodplain area per unit length was determined for the modeled extent and used to approximate areas for the non-modeled extent. The area per unit length was scaled by a factor of 0.1 for the high gradient extent. There was no scaling factor applied to the low gradient extent.

Old Habitat Inputs to Fall Run DSM

Explore CVPIA Model Inputs | About

Select Region: Deer Creek | **Select Category**: Habitat | **Select Data Type**: Monthly In-channel Rearing Area | **Select Species**: Fall Run

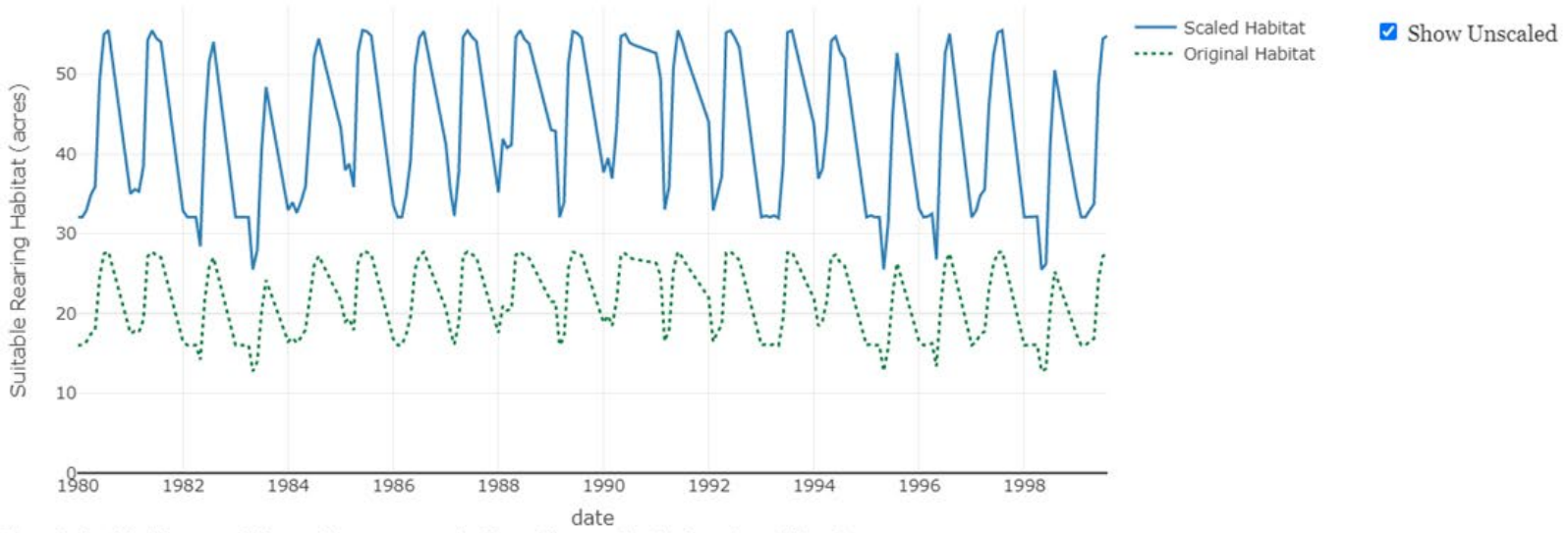
Deer Creek

Monthly In-channel Rearing Area

Estimated monthly in-channel rearing habitat area available in acres. Used to govern filling and movement of juveniles within tributaries. More info

Summary Statistics

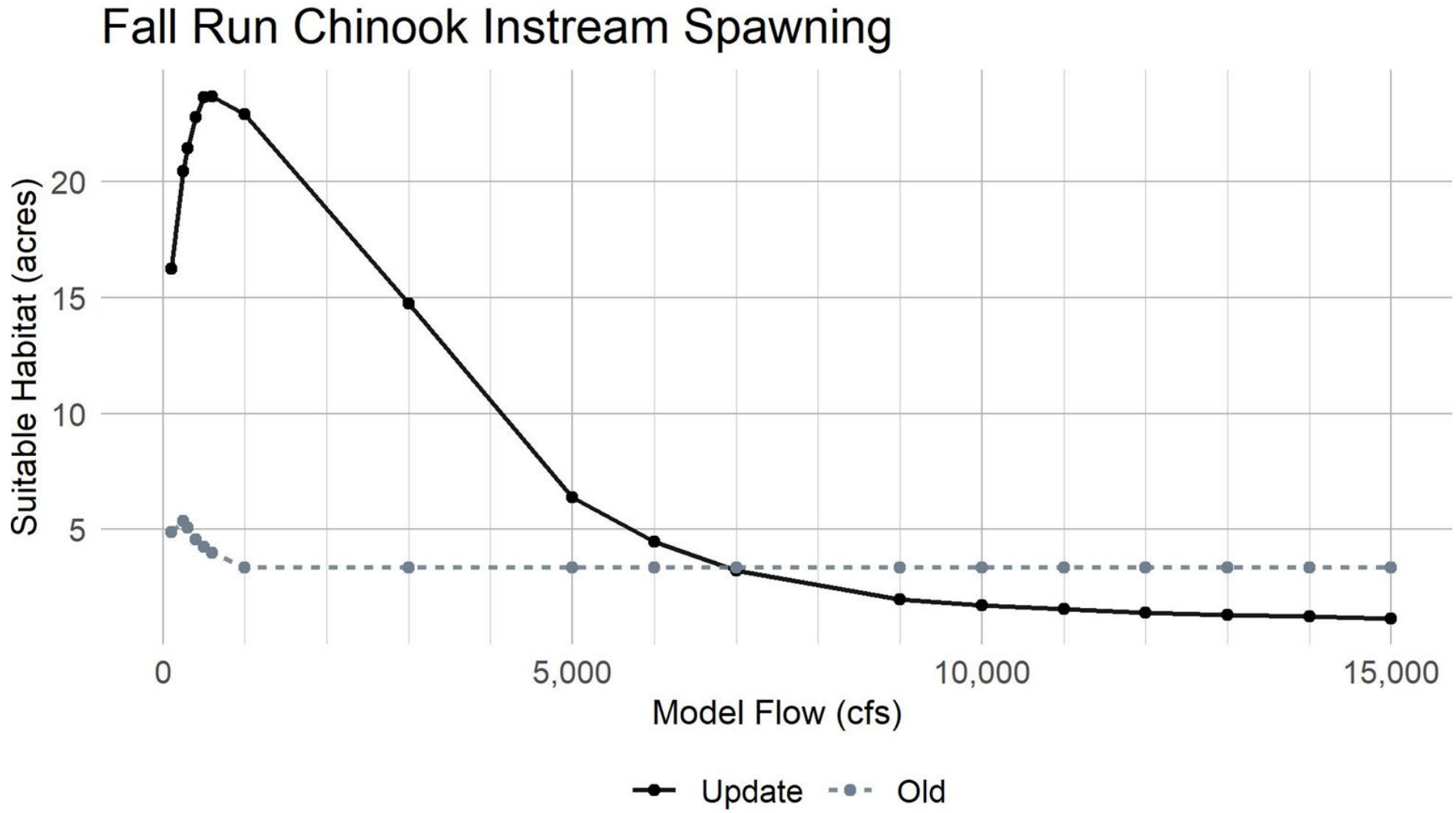
Stat	Scaled Habitat (acres)	Original Habitat (acres)
minimum	26	13
q1	33	16
median	39	20
mean	42	21
q3	54	27
maximum	56	28



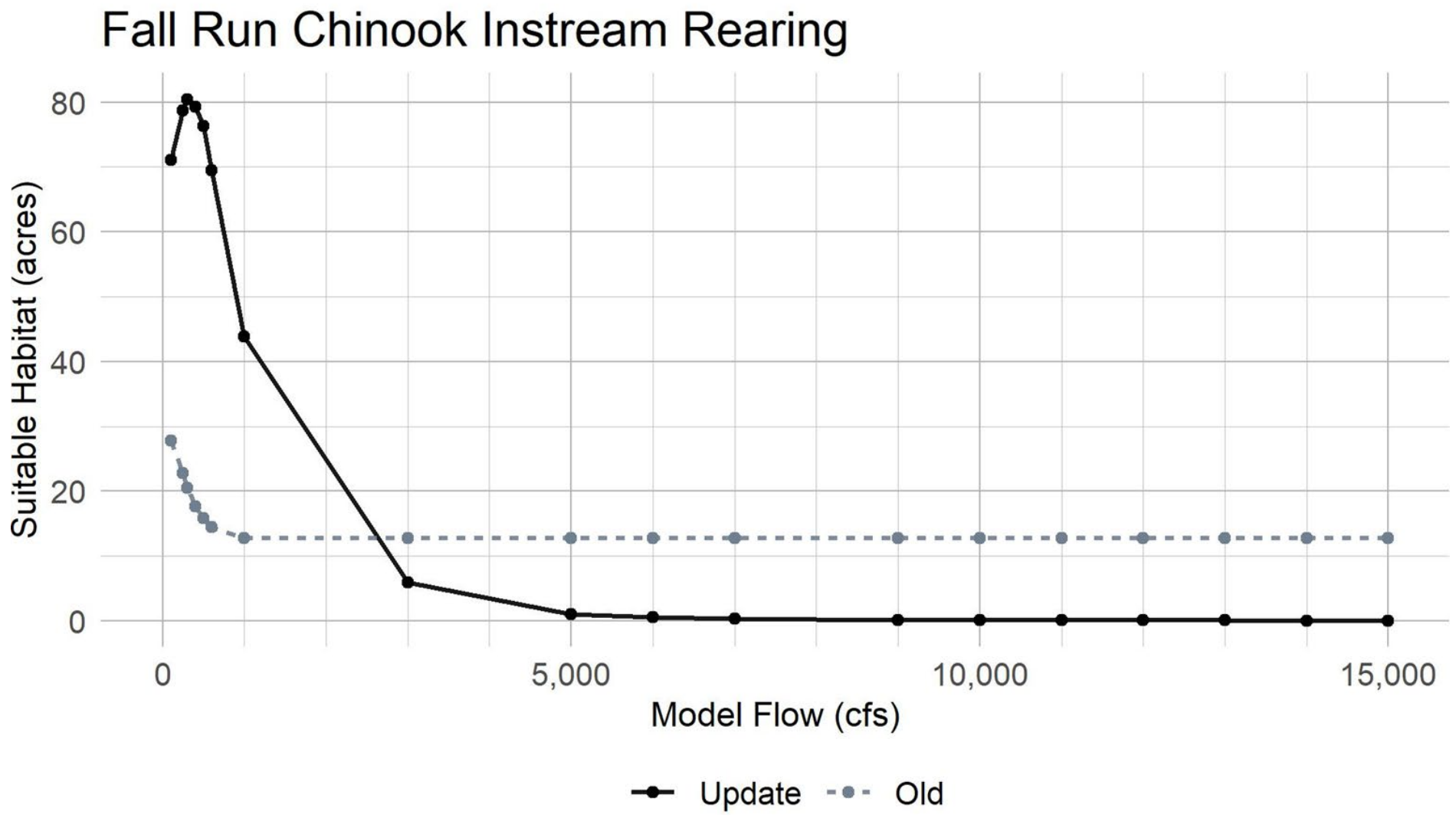
*The original habitat modeling values were scaled by a factor of **2** during the calibration process.*


Blethen Island
Vina
© 2021 Google
Google Earth

Instream Spawning Habitat - Old vs. Update



Instream Rearing Habitat - Old vs. Update



Explore CVPIA Model Inputs | About

Select Region: Deer Creek | **Select Category**: Habitat | **Select Data Type**: Monthly In-channel Rearing Area | **Select Species**: Fall Run

Deer Creek

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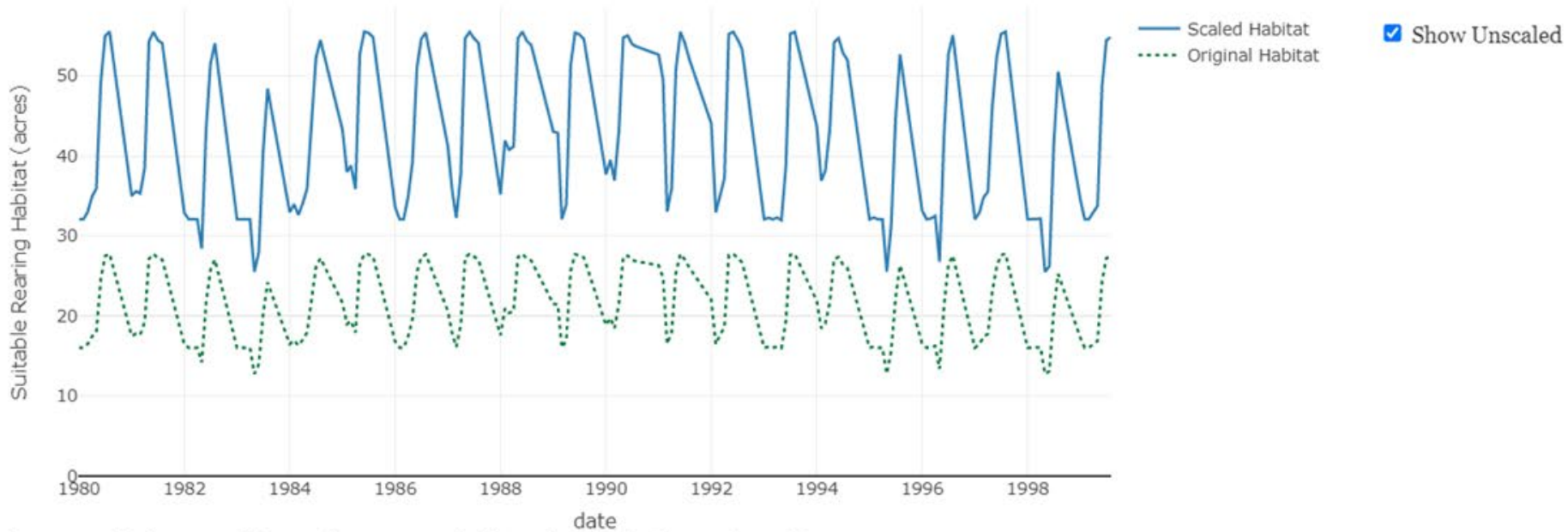


*The original habitat modeling values were scaled by a factor of **2** during the calibration process.*

Select Region Deer Creek

Select Category Flow

Select Data Type Monthly Mean Flow

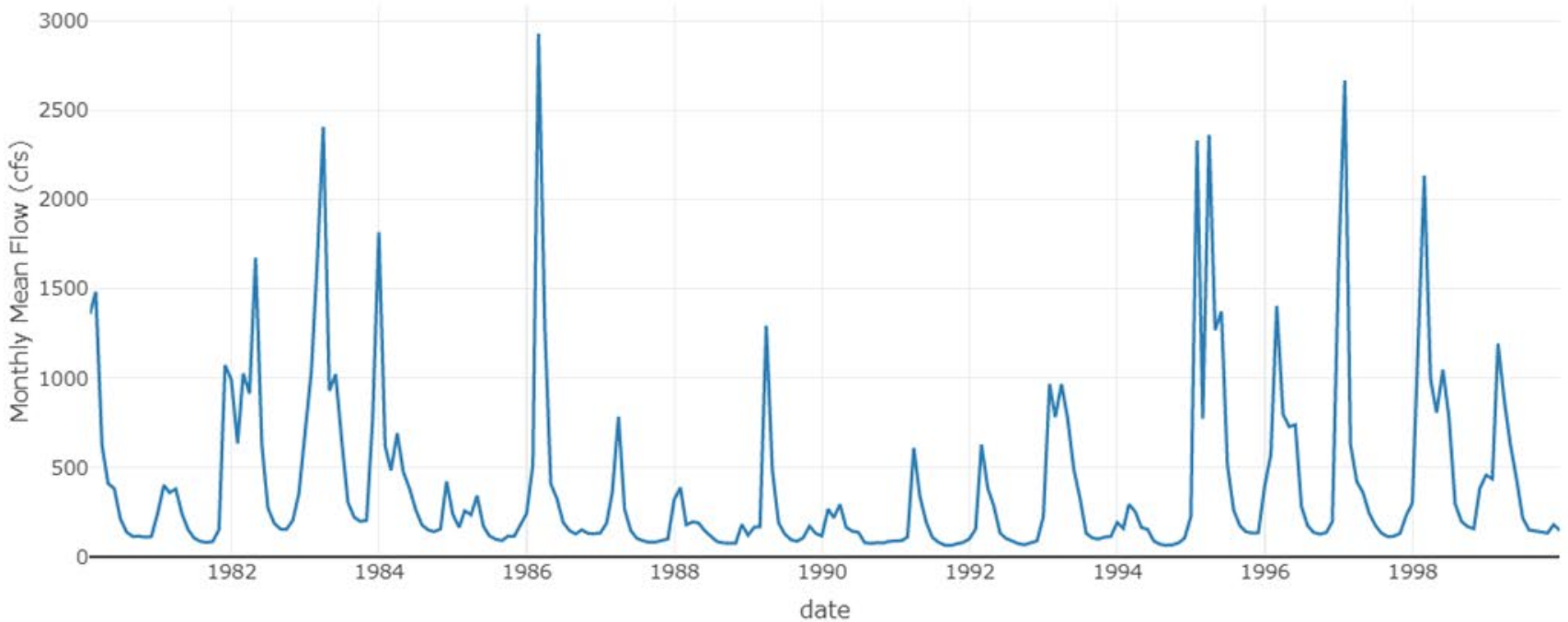
Deer Creek

Monthly Mean Flow

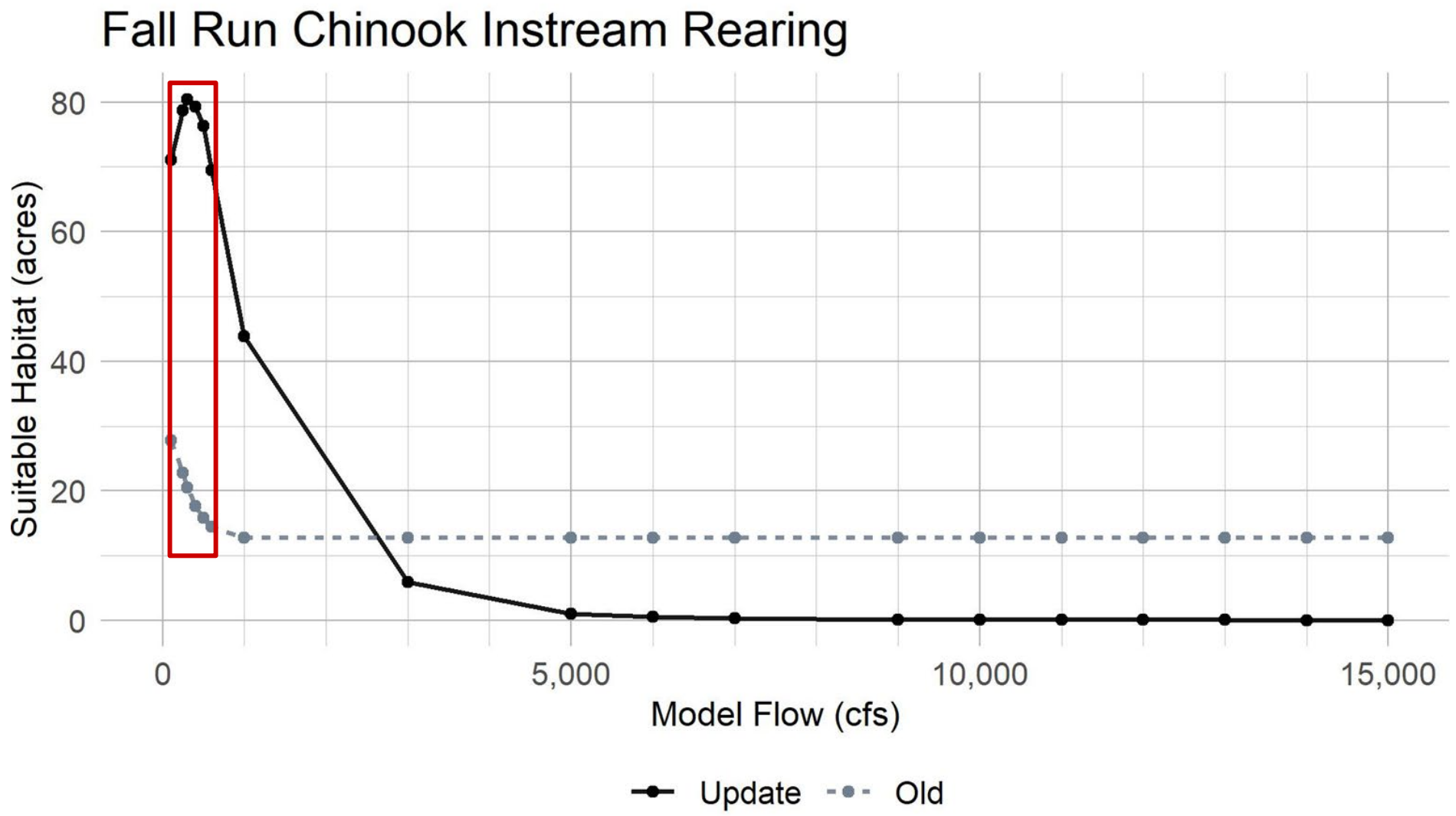
CalSim II modeled monthly mean flow in cubic feet per second. Used to calculate habitat areas. More info

Summary Statistics

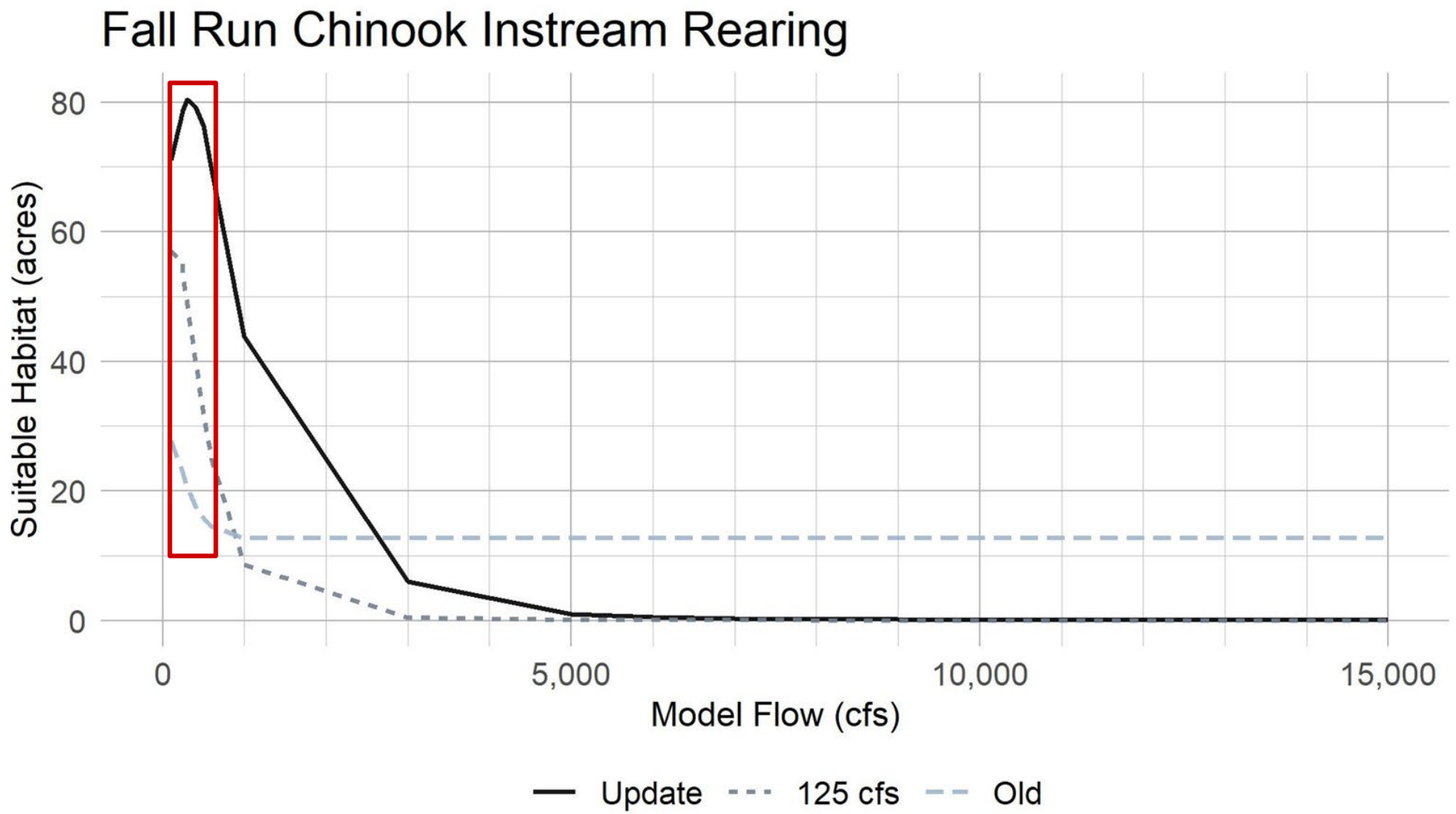
Stat	Flow (cfs)
minimum	64
q1	117
median	190
mean	402
q3	442
maximum	2,931



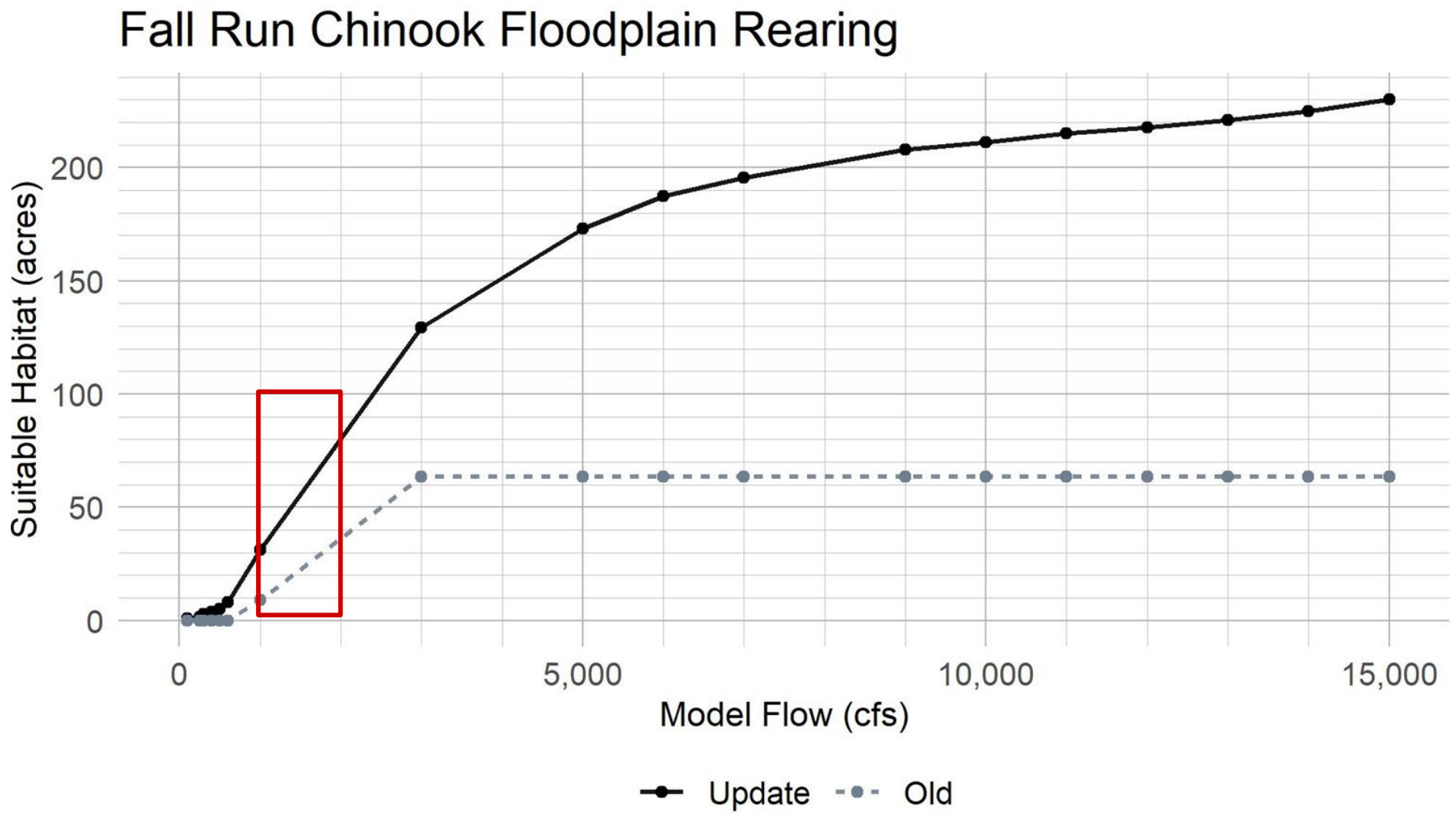
Instream Rearing Habitat - Old vs. Update



Instream Rearing Habitat - Old vs. Update



Floodplain Rearing Habitat - Old vs. Update



Next Steps

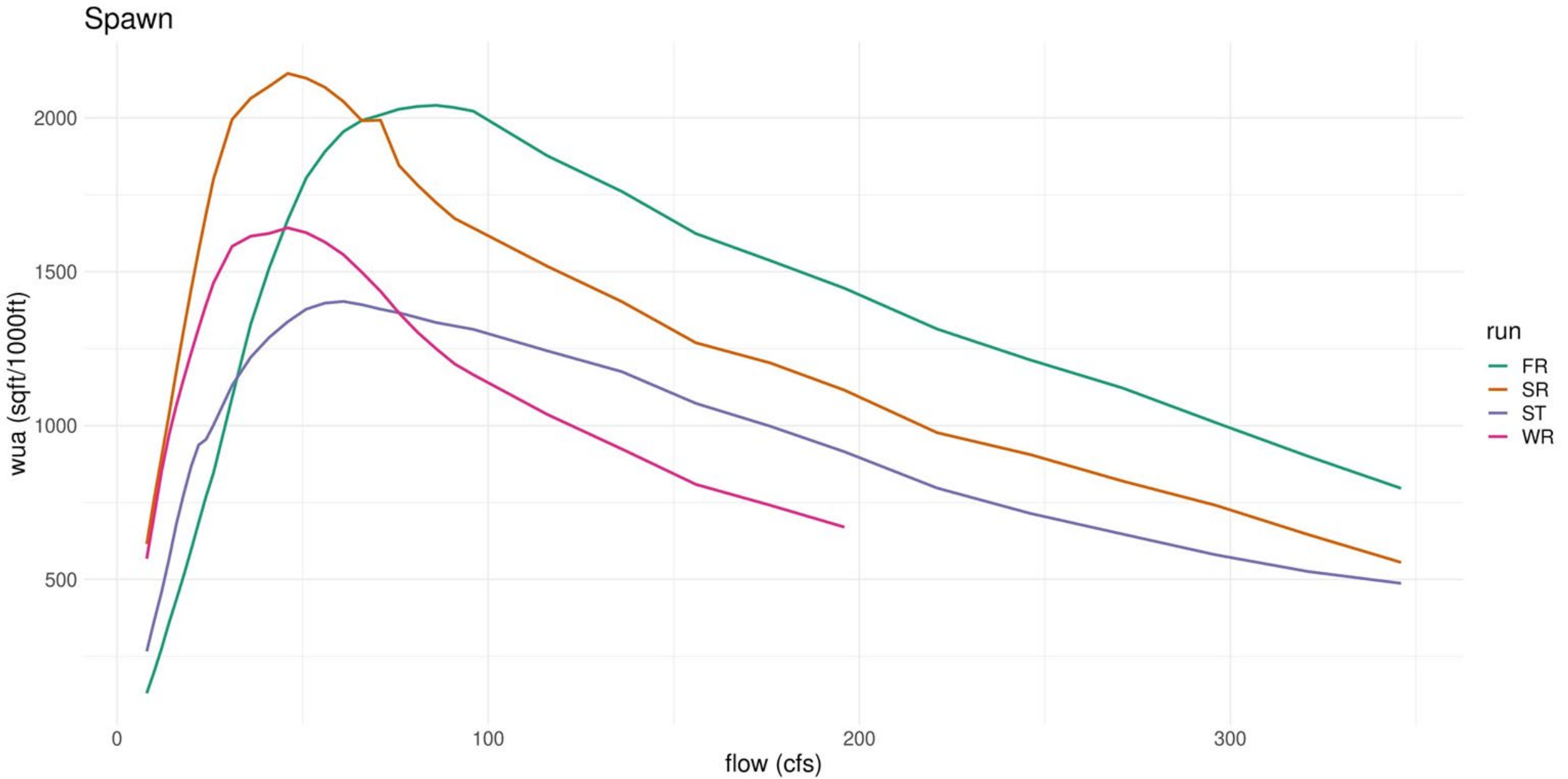
- Solicit SIT feedback (today)
- Finalize perennial (instream) delineation rule
  - Perhaps test DSM sensitivity to lower / higher flow delineation?
- Test DSM calibration and sensitivity for Deer Creek and report back to SIT
- Assuming SIT approval of DSM testing, replace old habitat inputs with updates as available
  - Charter = 2021 through 2024
- Recommend DSM improvements around inundation duration, food availability & conduct field verification
  - Charter = 2021 through 2024

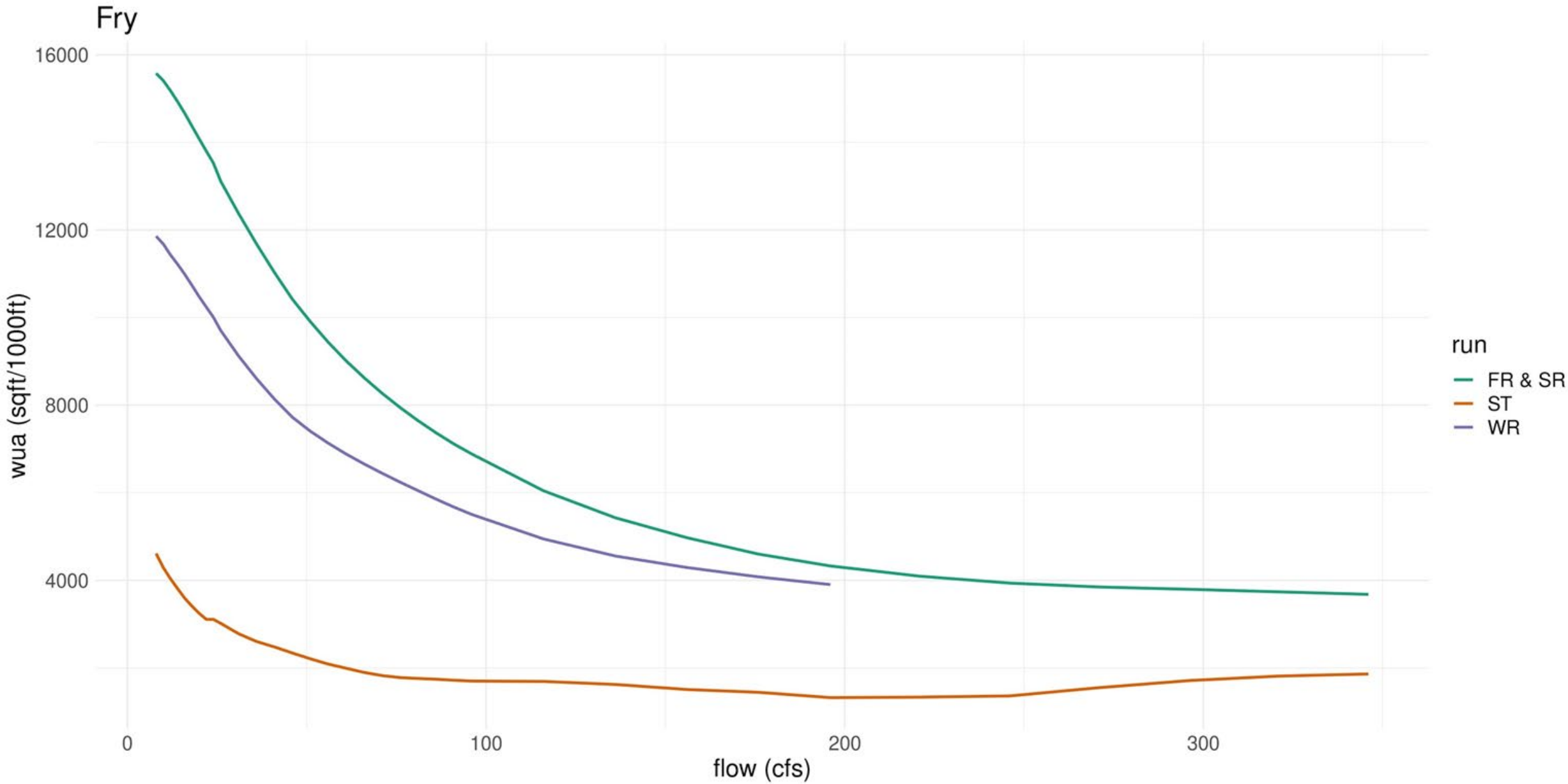
CVPIA SIT Meeting March 24, 2021

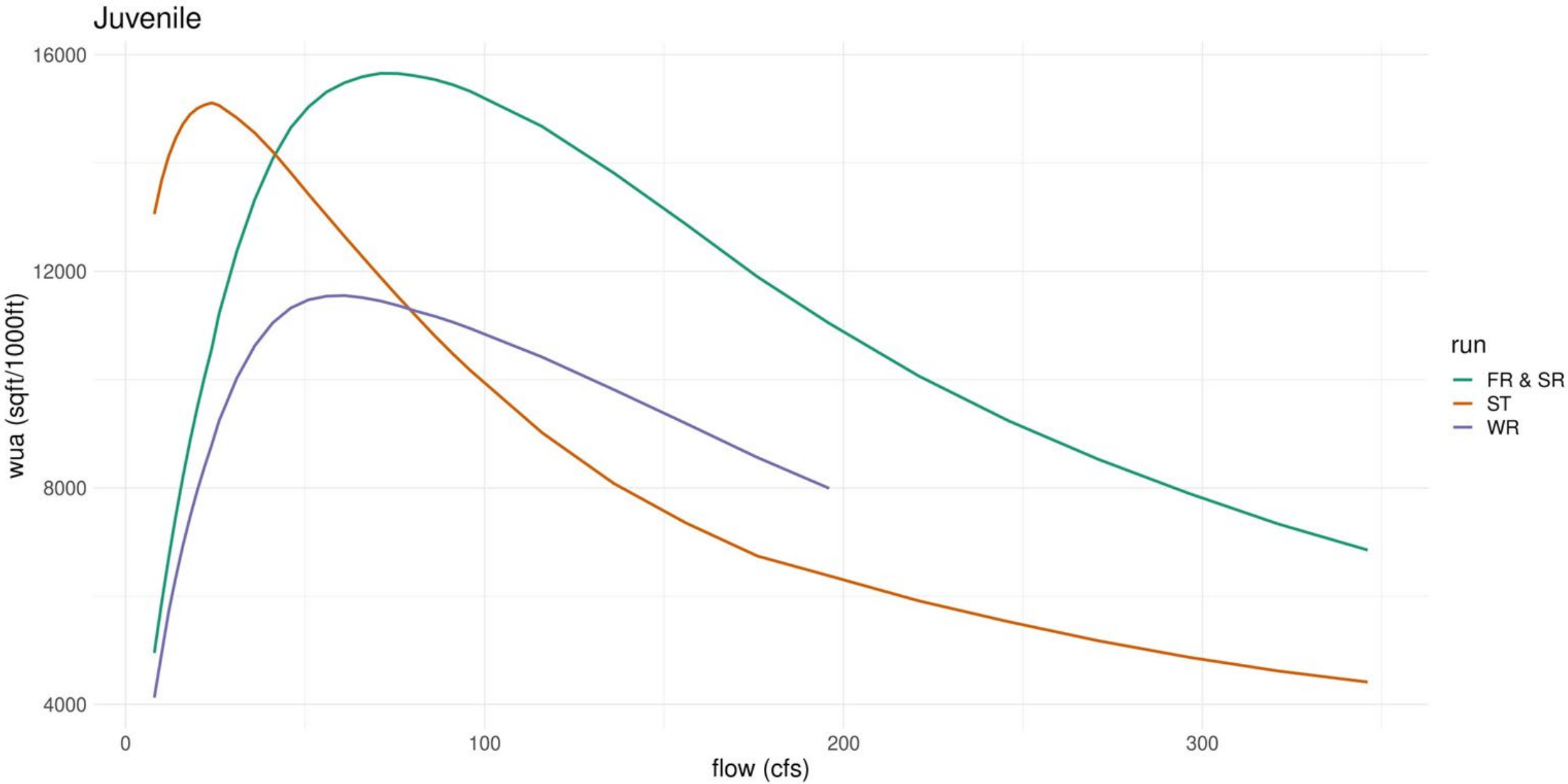
Model Updates

Results of adding winter-run Battle Creek Chinook salmon habitat

Battle Creek Winter Run


Spawn
2000
1500
1000
500
wua (sqft/1000ft)
0
100
200
300
flow (cfs)
run
FR
SR
ST
WR


Fry
16000
12000
8000
4000
wua (sqft/1000ft)
0
100
200
300
flow (cfs)
run
FR & SR
ST
WR


Juvenile
16000
12000
8000
4000
wua (sqft/1000ft)
0
100
200
300
flow (cfs)
run
FR & SR
ST
WR

CVPIA SIT Meeting March 24, 2021

Input on late-fall-run Chinook salmon habitat

Approach for
Late Fall Run Chinook Salmon DSM

1. Who are the late fall run Chinook salmon experts?

2. Same model structure as fall/winter/spring run Chinook salmon DSMs

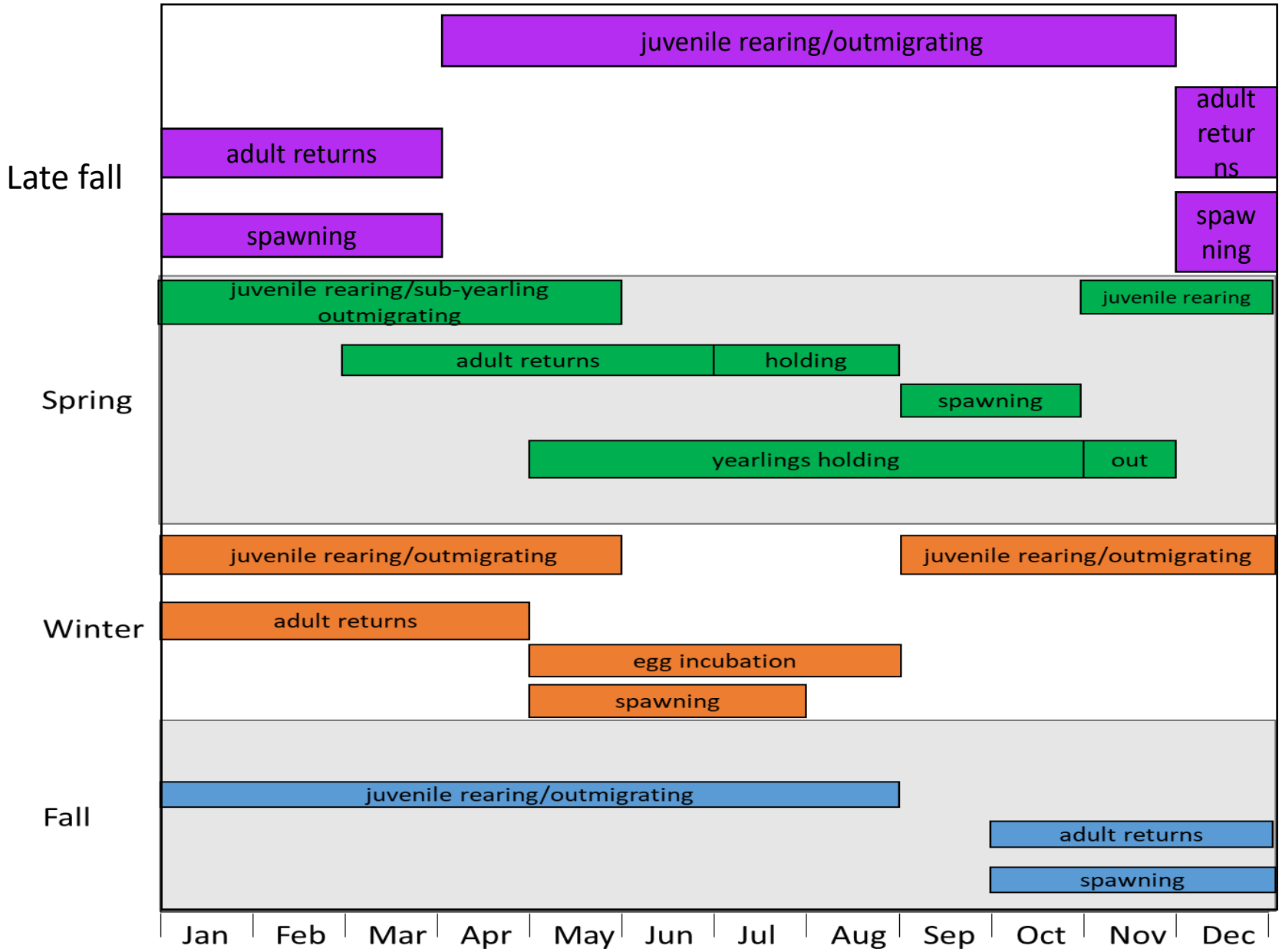
3. Same DSM inputs as fall run Chinook salmon?

4. Adult estimates (GrandTab)
    - Battle Creek 2000 – 2018
    - Clear Creek 2003 – 2018
    - Upper Sac 1971 – 2018 (Note: zeroed out 1994 – 1997)
    - Calaveras River NO DATA
    - Any others?

For calibration, seeding the model, and specifying where populations are/can go

5. Adjust timing (next slide)

Approach for Late Fall Run Chinook Salmon DSM



Integrating Chinook Salmon DSMs

Formal integration of Chinook salmon DSMs

Are we at a point that we want to take this on?
If so, who needs to be in the conversation (subgroup)?

- Notes
  - Has always been on the list of things to do
  - We currently evaluate strategies across runs, but as separate steps
- Pros:
  - Reduce the number of model runs needed (4 model runs becomes 1)
  - Different runs will compete for space with each other (more realism)
- Cons:
  - Increase model run time (uncertain by how much)
  - Substantial increase in model complexity
    (number of parameters, calibration, and sensitivity analyses)
- Decisions to be made
  - How do we avoid double counting habitat?
  - What is the ruleset for habitat competition?
  - Should we share more parameters across runs for the calibration/sensitivity analyses?
  - More to come, but won't know till we are in the weeds…

CVPIA SIT Meeting March 24, 2021 Agenda

- 12:00-1:00 LUNCH BREAK
- 1:00-1:15 **Subgroup Update: Monitoring** – Megan
- 1:15-1:40 **Proposal Update: Growth/Bioenergetics** – Mike Beakes (USBR), Corey Phillis (MWD), Jim Peterson (USGS/OSU)
- 1:40-1:55 **Summary of SJ Steelhead Workshop** – Mike Beakes (USBR)
- 1:55-2:05 BREAK
- 2:05-2:25 **CVPIA Funding Process Update** – Matt Dekar (FWS), Rod Wittler (USBR)
- 2:25-2:50 **New Business** (All)
  - *O. mykiss* habitat size classes (Jim Peterson)
  - Project completion updates (Rod Wittler)
- 2:50-3:00 **Closing**

CVPIA SIT Meeting March 24, 2021

SIT Proposal Update:
Growth/Bioenergetics

Corey Phillis, MWD

Mike Beakes, USBR

Juvenile growth sub-model

ISSUE OF CONCERN:

Current SIT life-cycle model does not account for temperature or prey in the growth transition matrices. Model lacks capability to evaluate:

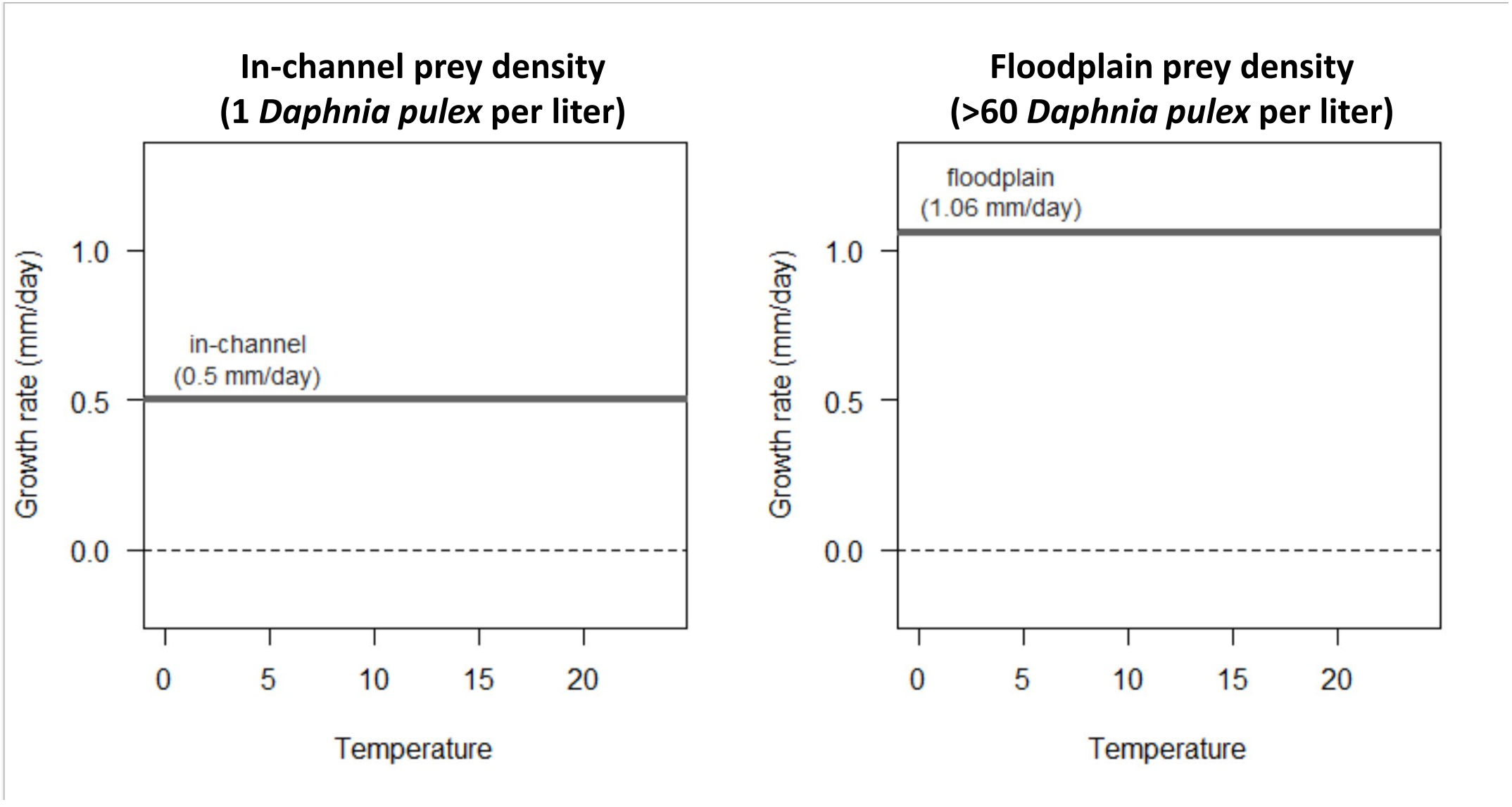
- Change in growth rate through the rearing period as river temperatures warm
  + consequences of management alternatives that address temperature
- Tributary-specific growth rates
  + restoration action best suited to tributary's intrinsic growth opportunity (temp and prey)
- Trophic subsidies from managed floodplains

PROPOSED CHANGE TO MODEL:

Update growth transition matrices with mass-specific growth rates (Ω)

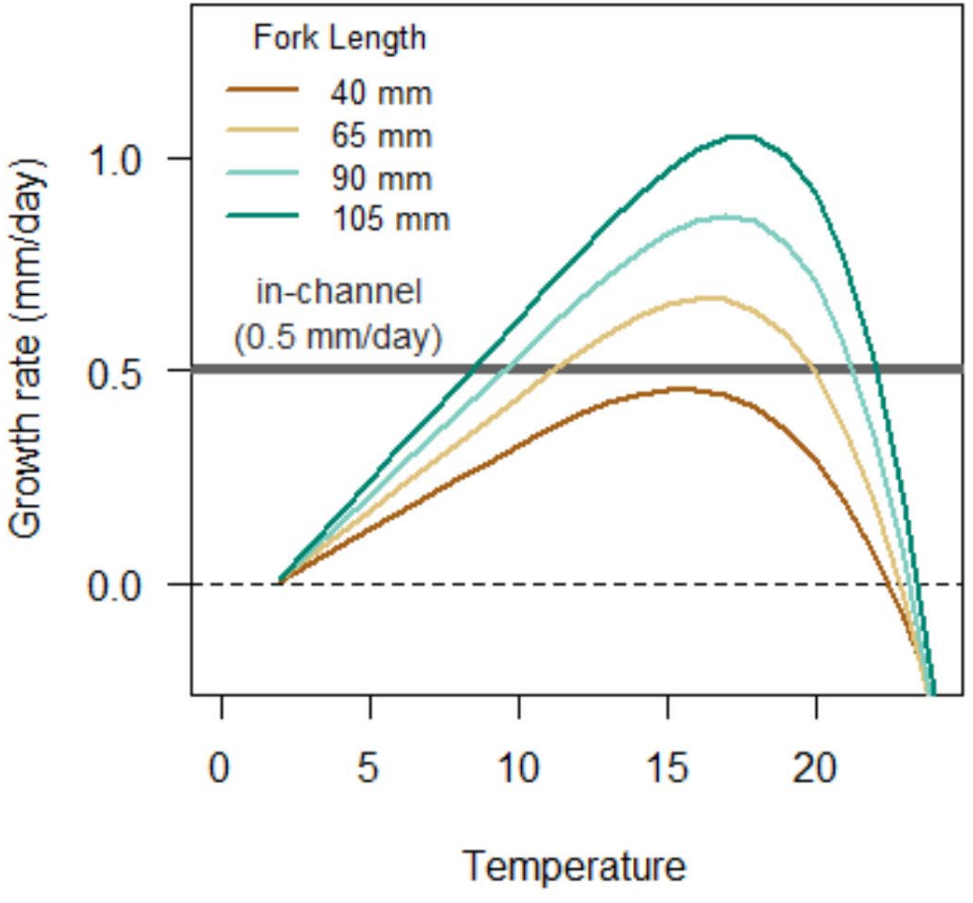
- Ω estimated from bioenergetics model requiring ***prey density***, ***temperature***, and ***initial fish mass***

SIT Temperature-Independent Growth

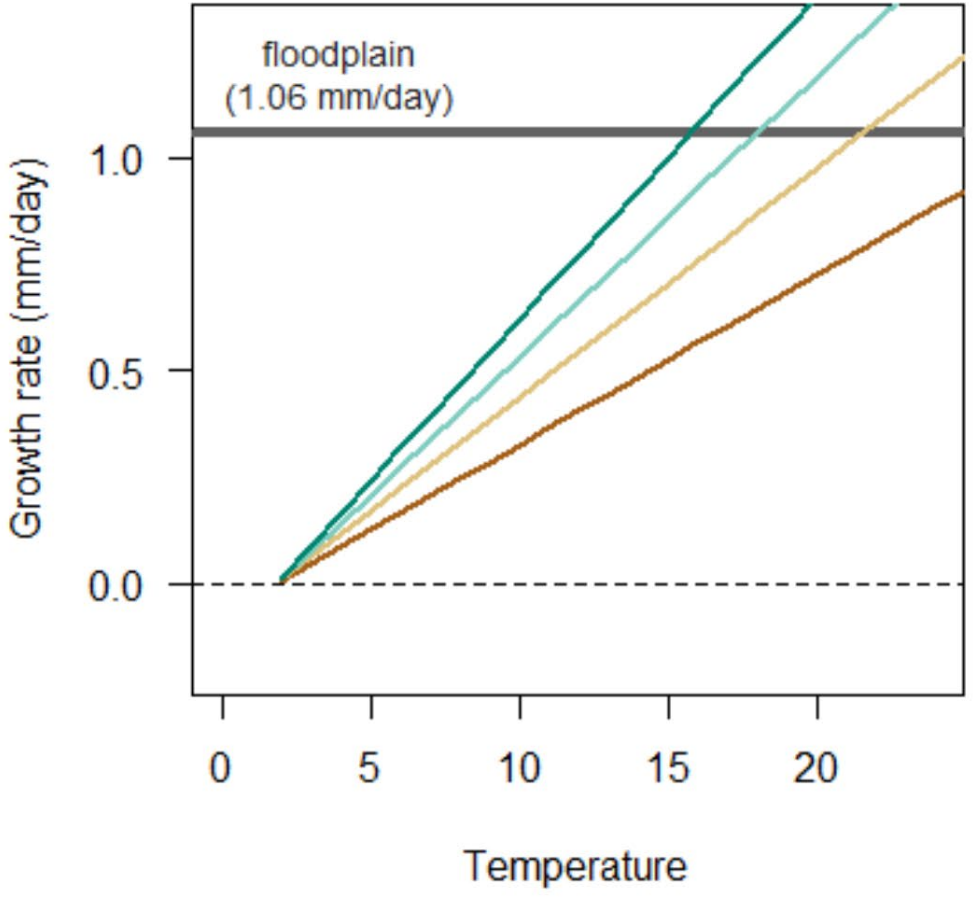


Temperature-Dependent Growth

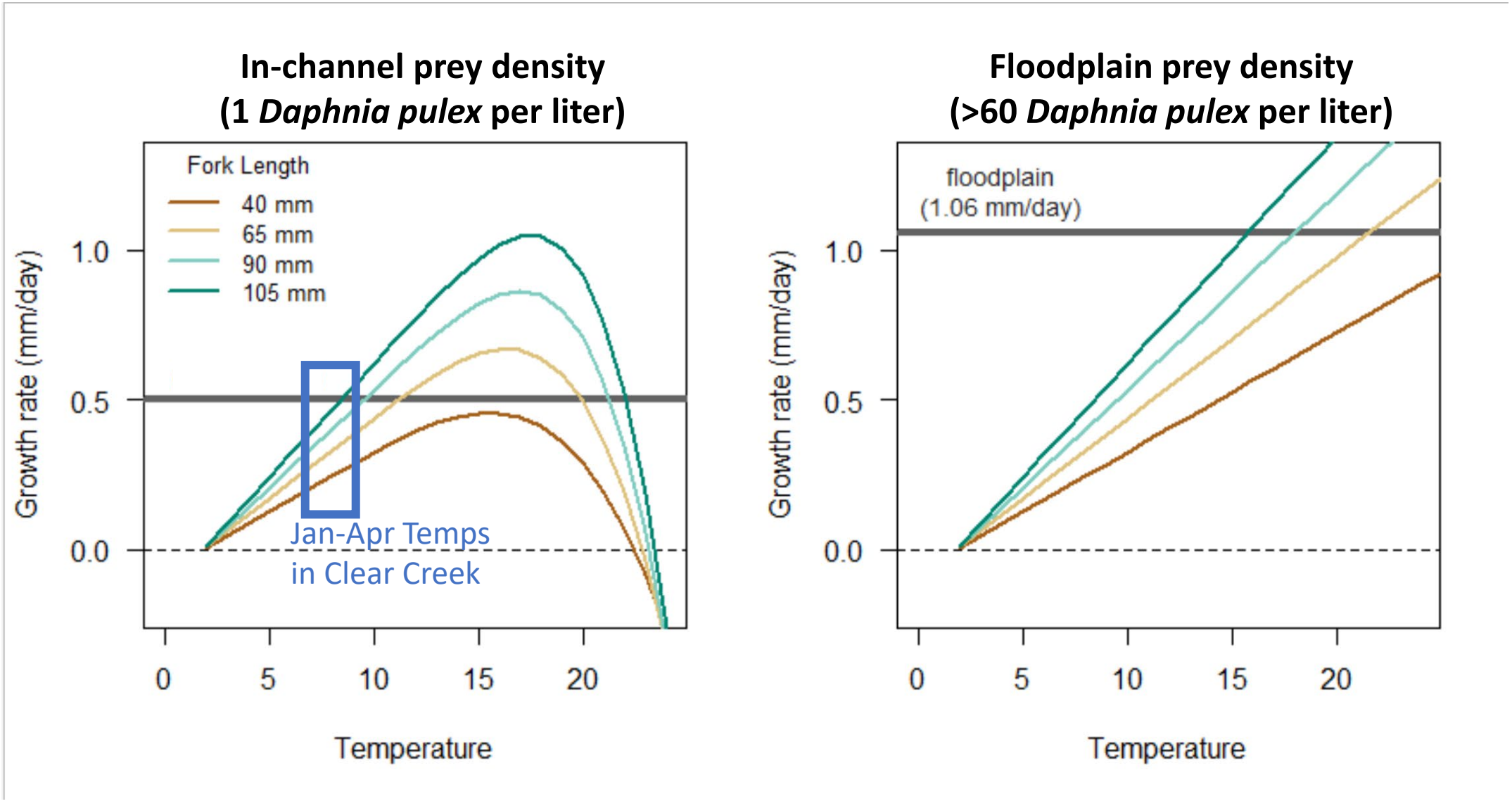
In-channel prey density
(1 *Daphnia pulex* per liter)



Floodplain prey density
(>60 *Daphnia pulex* per liter)



Growth rate varies with watershed temp



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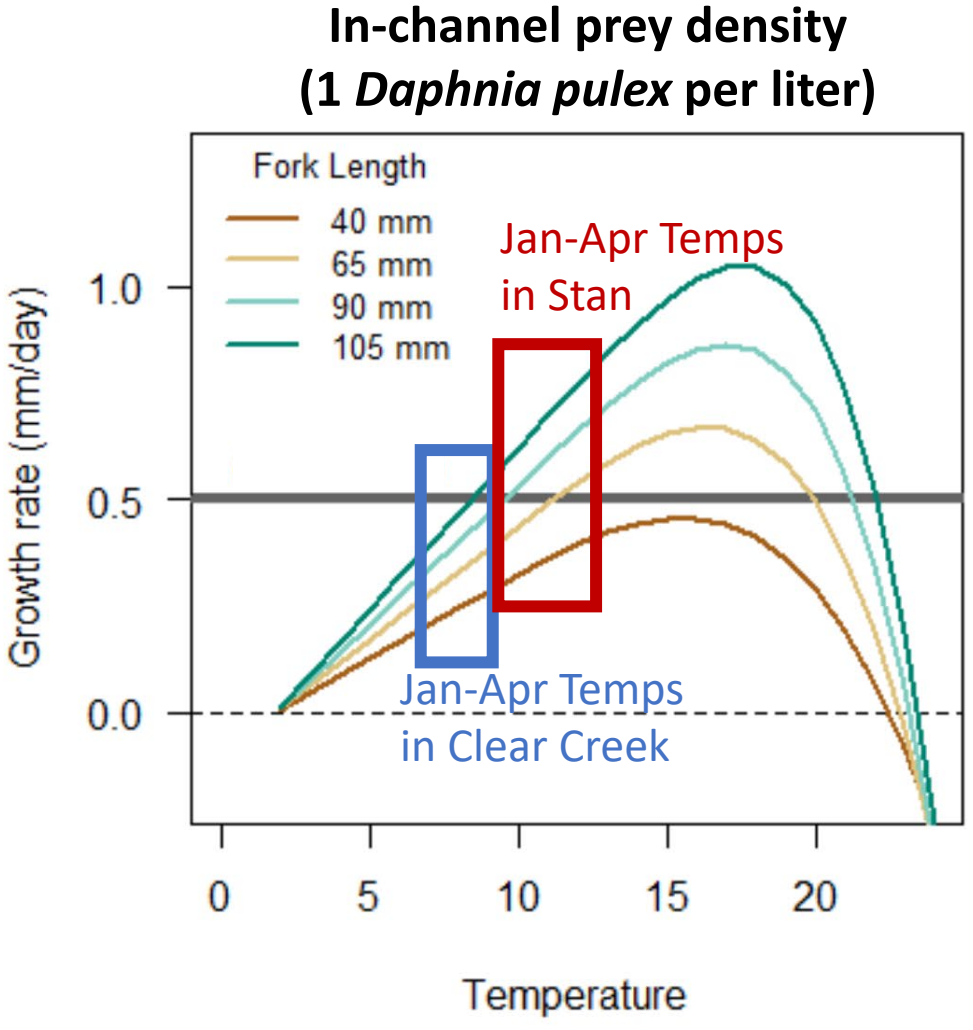

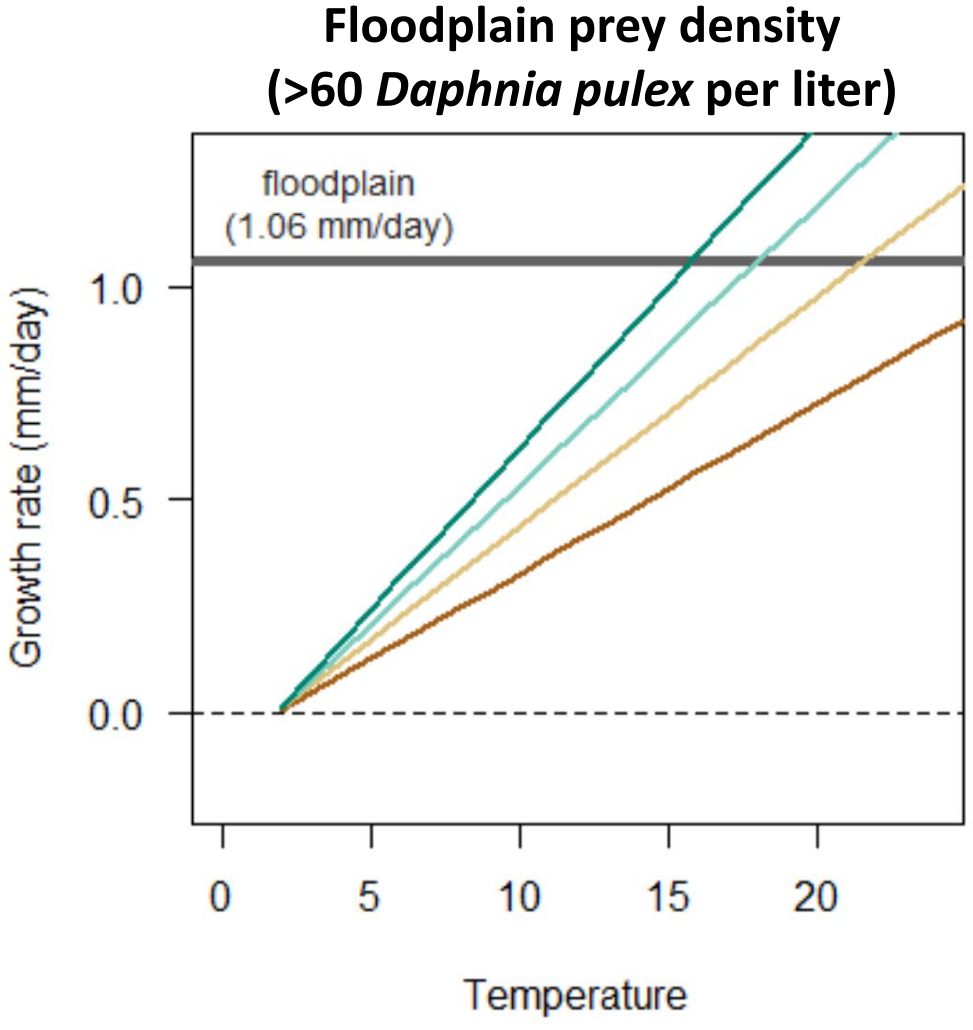

Growth Transition Matrices

Current Approach

Two habitat specific transition matrices, independent of temperature

In-channel (0.5 mm/day)

	s	m	l	vl
s	0.003	0.997	0.000	0.000
m	0.000	0.508	0.492	0.000
l	0.000	0.000	0.814	0.186
vl	0.000	0.000	0.000	1.000

Floodplain (1.06 mm/day)

	s	m	l	vl
s	0.000	0.588	0.412	0.000
m	0.000	0.032	0.950	0.018
l	0.000	0.000	0.086	0.914
vl	0.000	0.000	0.000	1.000

(above assumes floodplain accessible 4 of 4 possible weeks)

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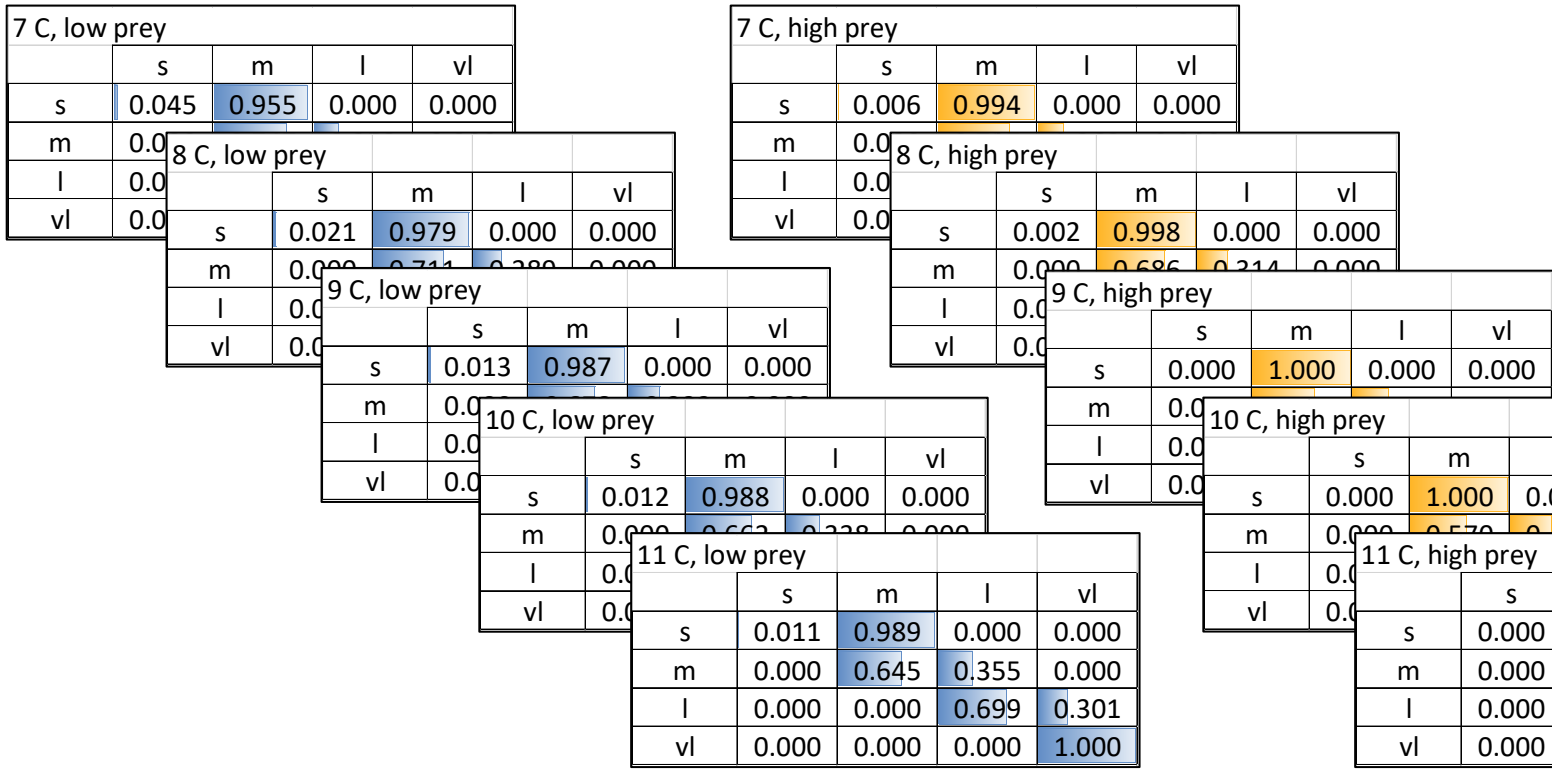
Proposed Modification to SIT Code

Individual transition matrices for each temperature-prey density combination



Next steps

- Share updated proposal with SIT by June 2021
- Work with Jim and Sadie to integrate bioenergetics code into SIT model (Spring/Summer)
- Work with Megan to develop data ask for prey densities (Spring/Summer)
  - identify SIT members to identify available prey data for watersheds and habitats
  - Assign prey densities to (e.g.) 6 categories of prey availability (1 = mainstem Sac R., 6 = Yolo Bypass)
- Bioenergetics sensitivity analysis (Summer/Fall)
  - Temperature
  - Prey density
  - Other?

CVPIA SIT Meeting March 24, 2021

Summary of San Joaquin Steelhead Monitoring Workshop

Mike Beakes, USBR

Monitoring Steelhead Populations in the San Joaquin Basin

DSP-BOR Workshop Feb 2021

CVPIA Science Integration Team Meeting

March 24, 2021

Workshop Purpose

BOR: Proposed Action

4.10.5.12.3 Additional Measures

- "Within 1 year… sponsor a workshop for developing a plan to monitor steelhead populations within the San Joaquin Basin and/or the San Joaquin River downstream of the confluence of the Stanislaus River, including steelhead and rainbow trout on non-project San Joaquin tributaries."

NMFS BiOp – "get better information about CCV steelhead which may inform development of beneficial actions to increase steelhead abundance or survival"

Workshop Structure & Scope

Three half-days composed of technical presentations followed by hour-long breakout sessions.

General topics included:

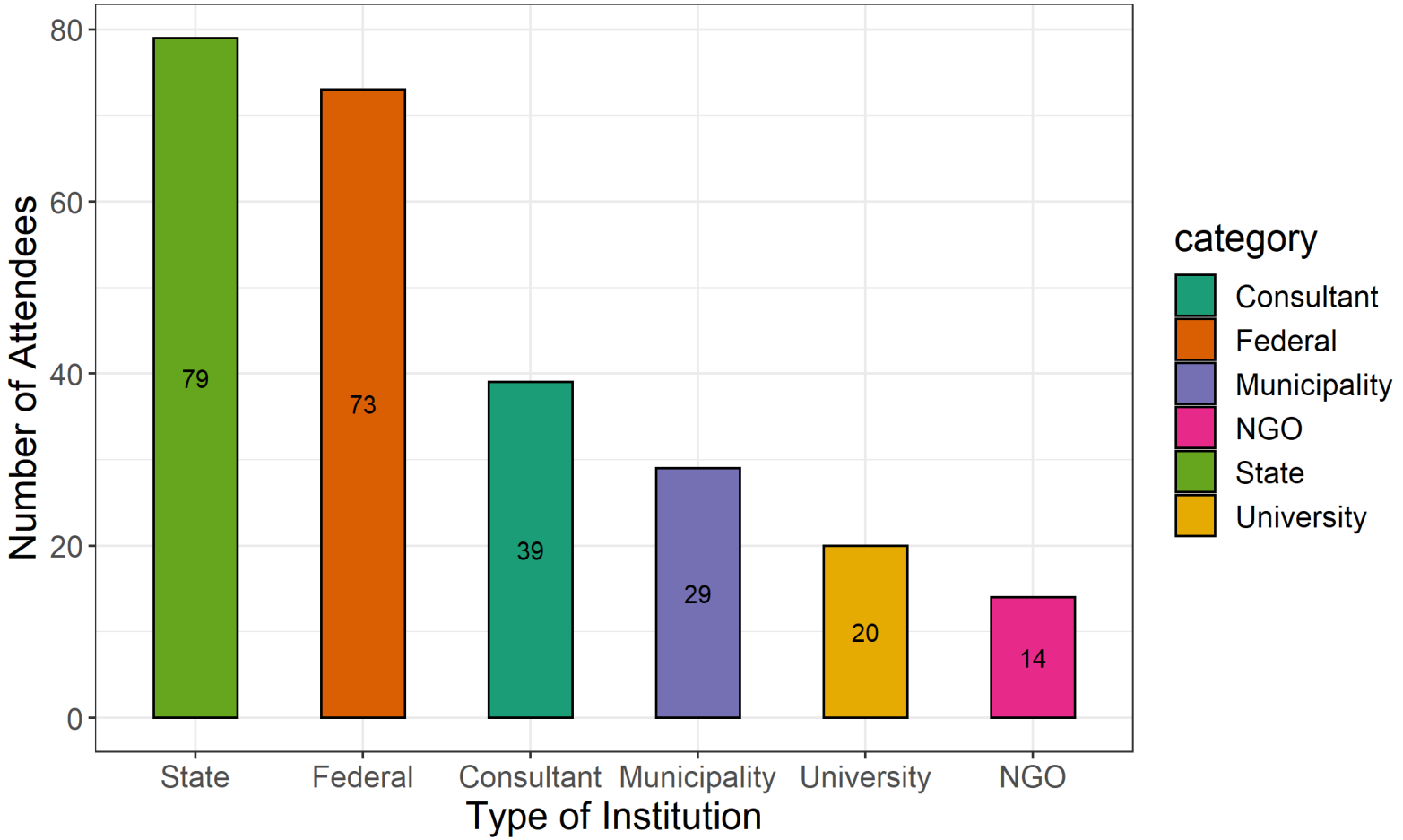
Day 1: Management Challenges and Monitoring Framework for *O. mykiss*

Day 2: Historic and Ongoing Steelhead Monitoring Programs in the Central Valley

Day 3: Exploring Analytical Approaches for Measuring the Impact of Management Actions

Broad Interest and Workshop Attendance

Registrants included 254 people from 72 different institutions

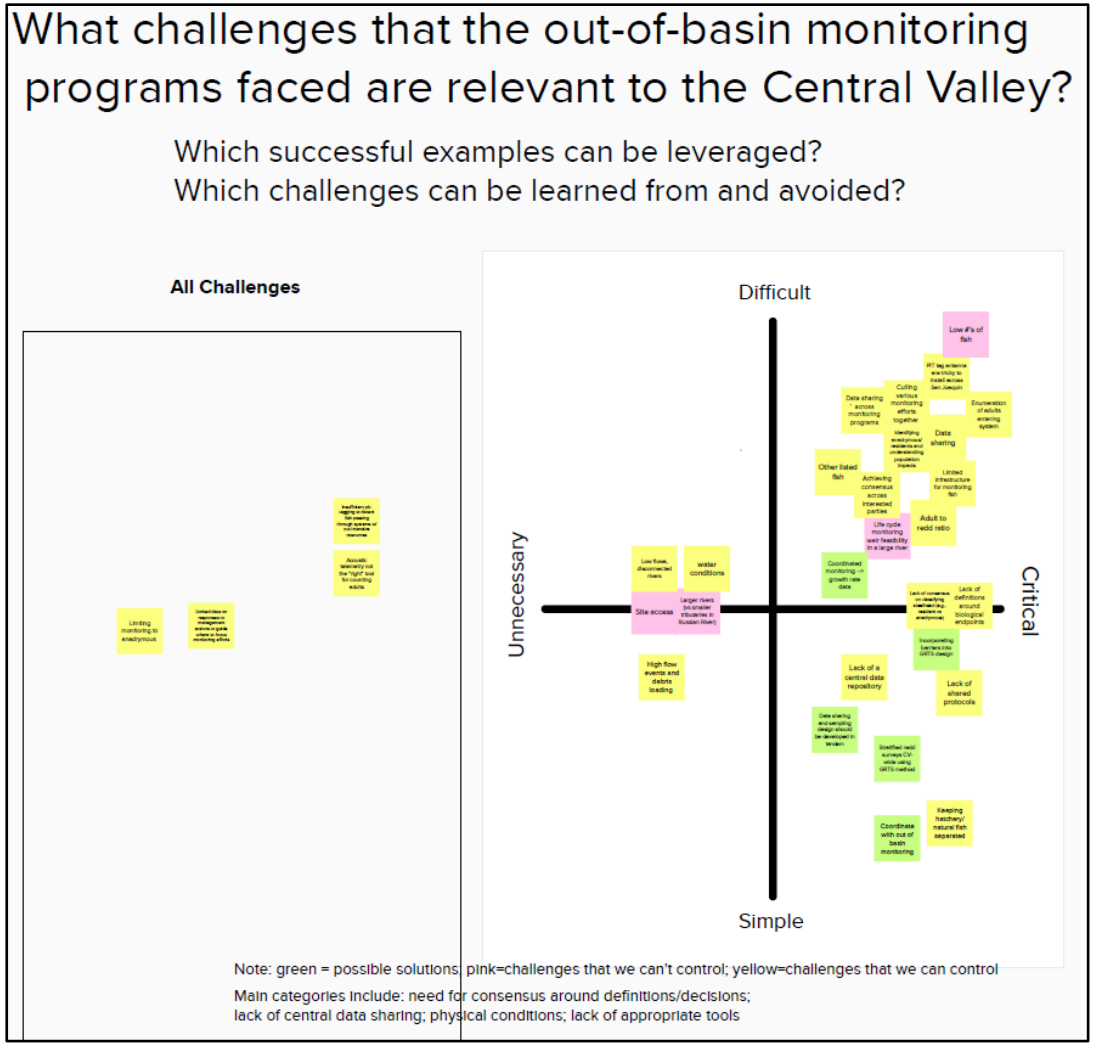


Workshop Generated Abundant Material

Material produced during the workshop will inform development of the San Joaquin Basin monitoring plan. Important material included:

- Fact sheets
  - Workshop Objectives and Regulatory Background
  - *Oncorhynchus mykiss* Monitoring and Research Gap Analysis
  - Life-History Variation in *Oncorhynchus mykiss*
  - California Central Valley Steelhead Distinct Population Segment
- Three days of technical presentations available online
  - https://www.youtube.com/watch?app=desktop&v=bVurhXbRQ_o
  - https://www.youtube.com/watch?app=desktop&v=DaqeF5SYS84
  - https://www.youtube.com/watch?app=desktop&v=2cZ5RHaX9UA
- Breakout sessions guided with Mural
  - Murals captured participant input on mentoring challenges and priorities

Mural in a Nutshell



- Online collaborative tool
- Provided mechanism for participants to convey concepts and vote on priorities
- Developed ~20 murals
- Murals were archived with DSP
- Currently processing feedback from all breakout sessions

Next Steps

Reconvene agency members that assisted with the Long-Term Operations non-flow action steelhead charter spring 2021

Host meetings to discuss workshop scope/content, and how workshop can inform:

- Steelhead life-cycle monitoring on Sacramento tributary CVP/SWP watershed
- The San Joaquin Basin Monitoring Plan

Additional agency members and stakeholders may be invited to participate in drafting sections of the monitoring plan

Aiming to have a complete draft of monitoring plan by fall 2021

CVPIA SIT Meeting March 24, 2021

Update on CVPIA Funding Process

Matt Dekar, FWS

Rod Wittler, USBR

New Business?

Huge THANK YOU to…

all of our speakers today

all of you for attending and participating

our diligent notetaker Priscilla Liang

SIT 2021 Schedule

June 23, 10am-12pm: SIT Call

- Topic: Updates from Subgroups and Modeling Activities

Aug 25, 10am-12pm: Ad Hoc Subgroup Call (open to all)

Topic: Review Model Calibration / Sensitivity Analysis results

Sept 15, 10am-12pm: SIT Call

- Topic: Updates and setup for October Meeting

Oct 13-14, 9am-3pm: SIT Meeting

- Topic: Hear results of the review of Model Calibration / Sensitivity. Run current strategy actions and info needs through the model – determine whether updates to priorities are warranted.

Dec 15, 10am-12pm: SIT Call

- Topic: Follow-up from October meeting

http://cvpia.scienceintegrationteam.com/meetings/