CVPIA Science Integration Team Meeting

April 13, 2022

CVPIA SIT Meeting April 13, 2022

Agenda

- 10:00 **Welcome / Agenda Review**
- 10:05 **SIT 2022 Objectives – Progress and Timeline**
- 10:35 **SIT Subgroup Updates**
- 11:00 **Science Talk: "Evaluating the role(s) of the Butte sink and Sutter Bypass for Central Valley juvenile salmonid populations"** [update on 3-year study]– Flora Cordoleani (NOAA-NMFS and UC Santa Cruz)
- 11:30 **New Business?**
- 12:00 **Adjourn**

CVPIA SIT Meeting April 13, 2022

SIT 2022 Objectives Progress and Timeline

Look Ahead to Development of Next NTRS

- **2022:** Identify and propose desired model changes, make progress on info needs, focus on monitoring data (Oct 2022)
- **Winter 2022/2023:** Incorporate Chinook salmon model changes, recalibrate
- **Spring 2023:** Revisit SDM objectives, candidate restoration strategies
- **Summer/Fall 2023:** Develop new priority actions and info needs for Chinook salmon, steelhead, sturgeon
- **Early 2024:** Finalize next Near-term Restoration Strategy (in time to inform next Funding Opportunity)

2022 SIT Objectives – Progress

Objective 1: Provide a forum to communicate new science for anadromous fish in the Central Valley.

Progress: Ongoing

- Spring-run JPE Science Program (Brett Harvey)
- Chinook salmon marine distributions (Alex Jensen)
- Today: Sutter Bypass Growth Project (Flora Cordoleani)
- *More Upcoming*

2022 SIT Objectives – Progress

Objective 2: Finalize the release of Chinook salmon DSM v2.0 (model documentation and publishing).

Progress:

- Coming very soon!
- Will include FAQs on the DSM code, model inputs, etc.

2022 SIT Objectives – Progress

Objective 3: Develop/improve tools for SIT model visualization and exploration.

Progress:

- SIT Model Inputs: https://flowwest.shinyapps.io/cvpia-model-inputs/
- SIT Model Results: https://flowwest.shinyapps.io/DSM-results/
- New: Juvenile Movement Hypotheses (in use/development by Salmon Demographics Subgroup): https://flowwest.shinyapps.io/dsm-movement-hypothesis/
- SIT website improvements in progress

2022 SIT Objectives – Progress

Objective 4: Develop additional improvements to the Chinook salmon DSMs and finalize proposals to be ready for next round of Chinook salmon model updates (by Oct 2022).

Progress:

- Develop approach to better consider **climate change** in modeling/prioritization. *Initiated by Climate Change Subgroup*
- **Improve habitat estimates** where possible (including habitat change and updated flow inputs). *In progress with Habitat Subgroup*
- Improve Chinook salmon demographic, movement, and growth parameters/rulesets where possible.
  - **Movement rulesets** in progress with Salmon Demographics Subgroup
  - **Bioenergetics**: prey density dataset being compiled now, then will proceed with pilot simulations and sensitivity analysis of bioenergetics model (update SIT early summer?)

2022 SIT Objectives – Progress

Objective 4: Develop additional improvements to the Chinook salmon DSMs and finalize proposals to be ready for next round of Chinook salmon model updates (by Oct 2022).

Progress:

- **Predator Contact Points**: Analyzing predator diversion data now, initiated SAV removal study. SIT presentation late summer.
- **Food for Fish**: wrapping up final field season, will schedule final SIT presentation in late summer
- In development: Add San Joaquin spring-run Chinook to model (Erin Strange)

Contact Science Coordinator with anything else this month!

2022 SIT Objectives – Progress

Objective 5: Make progress in improving the steelhead and sturgeon decision support models.

Progress:

- Information needs gap analysis with existing work – in progress (sturgeon PWT project inventory in progress)
- FWS and BOR discussing today a path forward to support info needs
- OSU graduate student work
  - Aug: Sturgeon literature review (Erin Lunda)
  - Sept: Steelhead literature review (Lauren Diaz)
- Expect updated sturgeon beta DSM ~March 2023
- Expect updated steelhead beta DSM ~June 2023

2022 SIT Objectives – Progress

Objective 6: Learn from our existing monitoring data and improve monitoring coordination, guidance, and implementation.

Progress:

- Developing draft metrics from project monitoring data – review and get feedback from SIT in July/Aug
- Reanalysis of CWT data with additional years – present to SIT in late summer
- Improving calibration data (RST data, updating prespawn data, Chipps Island trawl data)
- Project monitoring coordination: Sac River Habitat Restoration Program Technical Advisory Committee (TAC)

2022 SIT Objectives – Progress

Objective 7: Continue making CVPIA-funded data available on EDI website.

Progress:

- Hand over to Erin Cain to showcase and celebrate!

EDI Data Portal

2022 SIT Objectives – Progress

Objective 8: Produce Adaptive Management Update by end of the year.

Access & Updates

April 2022 - FlowWest

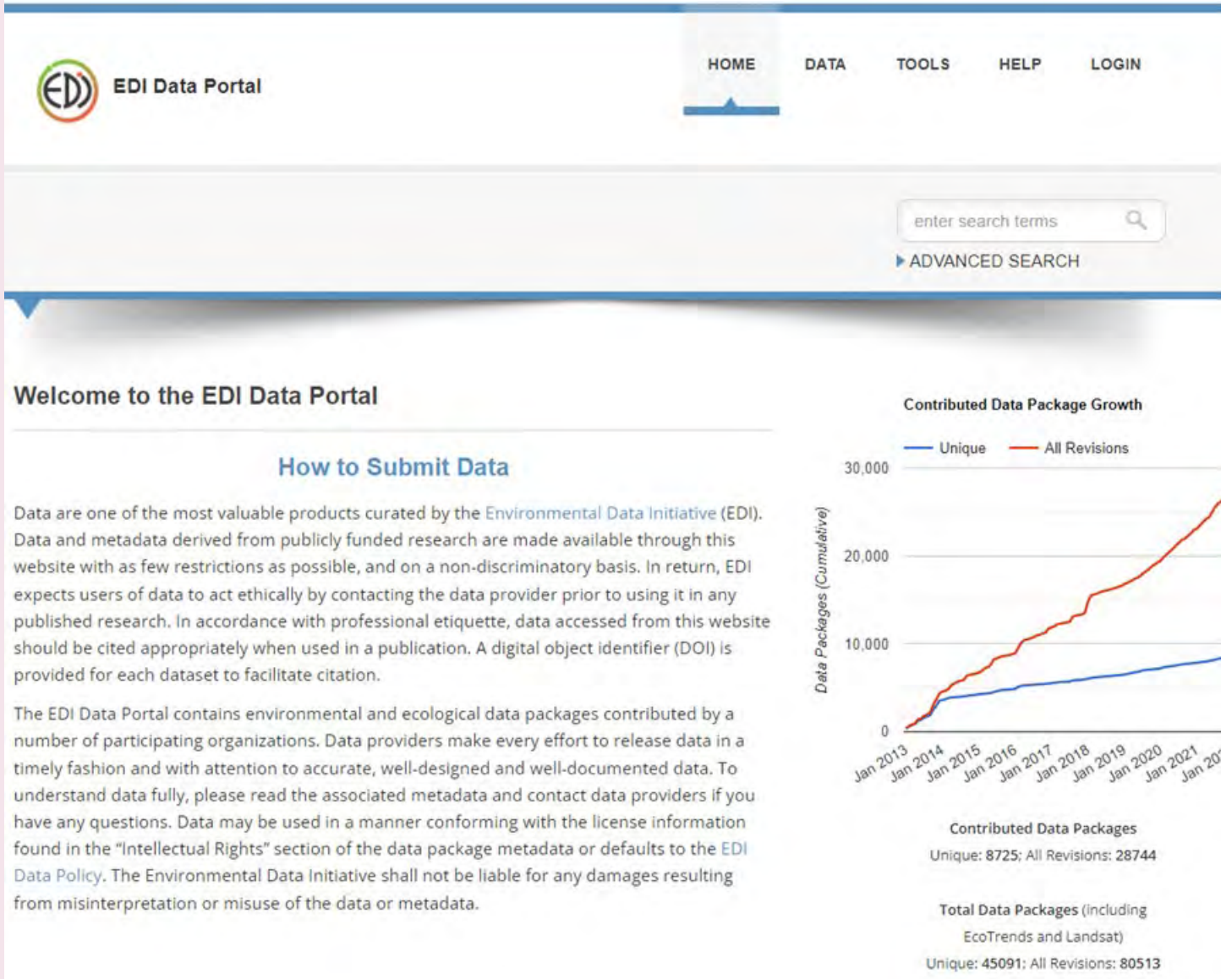
Data Access

FINDING THE EDI DATA PORTAL

EDI Data can be accessed directly from your web browser using the following steps:

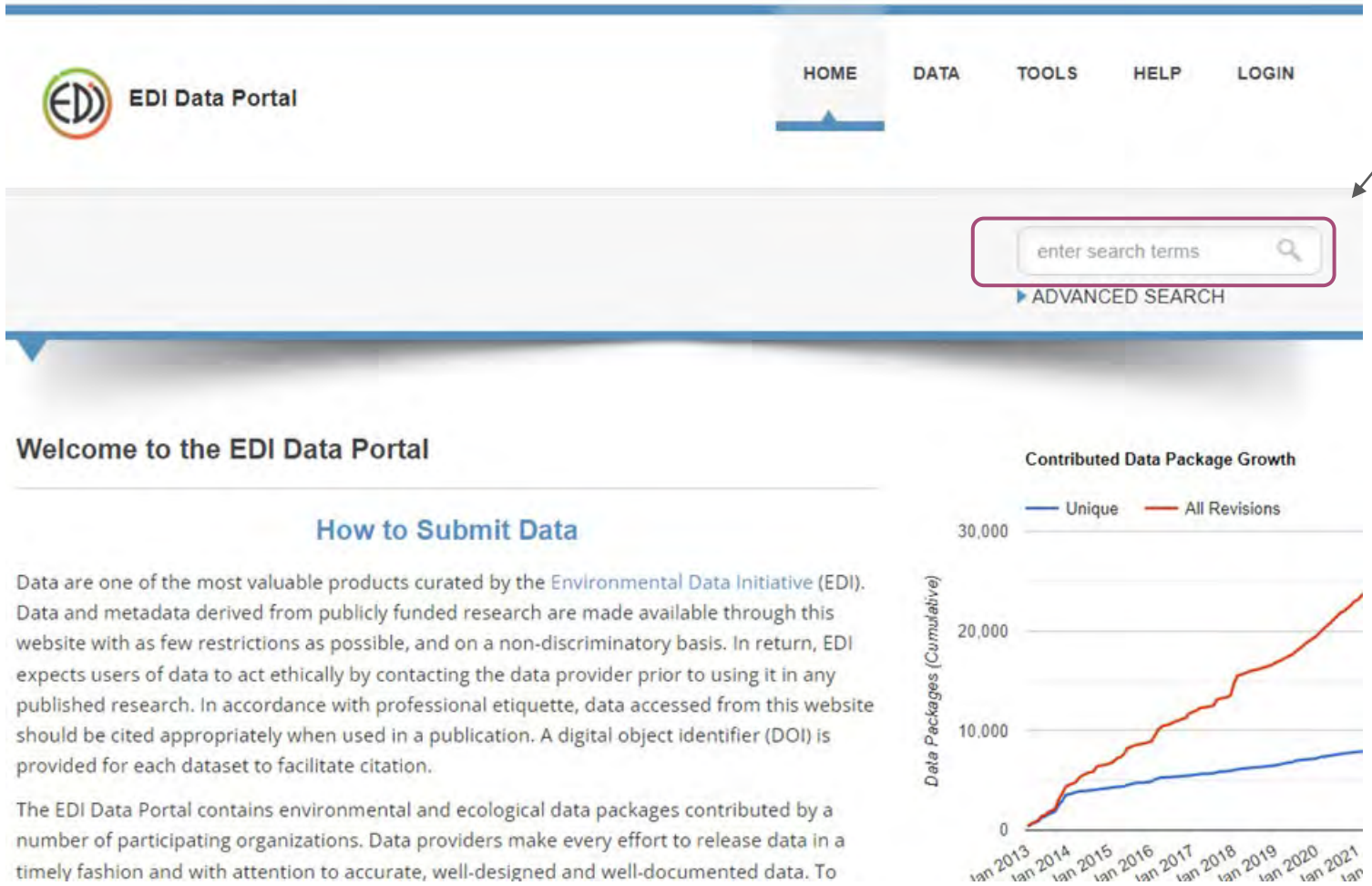
- Open preferred web browser
- Search ***"Environmental Data Initiative Portal"***
- Click on the first item that comes up:

  Data Portal - Home | Environmental Data Initiative (EDI)



Data Access

FINDING CVPIA DATA ON THE PORTAL



Locate the search bar on EDI portal home page

Search for ***"CVPIA"***

The CVPIA search will bring up all CVPIA funded datasets that are posted on EDI

Search Results

View Map of Search Results

Copy Query URL http://portal.edirepository.org:80/nis/simpleSearch?defType=edismax&q=CVPIA&fq=-scope:ecotrends&fq=-scope:lter-land

Terms used in this search: **CVPIA**

Displaying 1-7 of 7 matching data packages

Title	Creators	Publication Date	Package Id
Clear Creek Gravel Augmentations, 1996-2021	USBR Rupert, Derek	2021	edi.1010.1
Salmonid habitat use monitoring used to determine effectiveness of habitat improvement projects in the Sacramento River, CA	CSU Chico Banet, Amanda	2021	edi.749.1
Monitoring O. mykiss Life Stages on the Stanislaus River	U.S. Bureau of Reclamation Beakes, Micheal	2022	edi.1030.2
Juvenile Salmonid Emigration Monitoring in the Stanislaus River at Caswell Memorial State Park, California.	Pacific States Marine Fisheries Commission Day, Logan	2022	edi.935.2

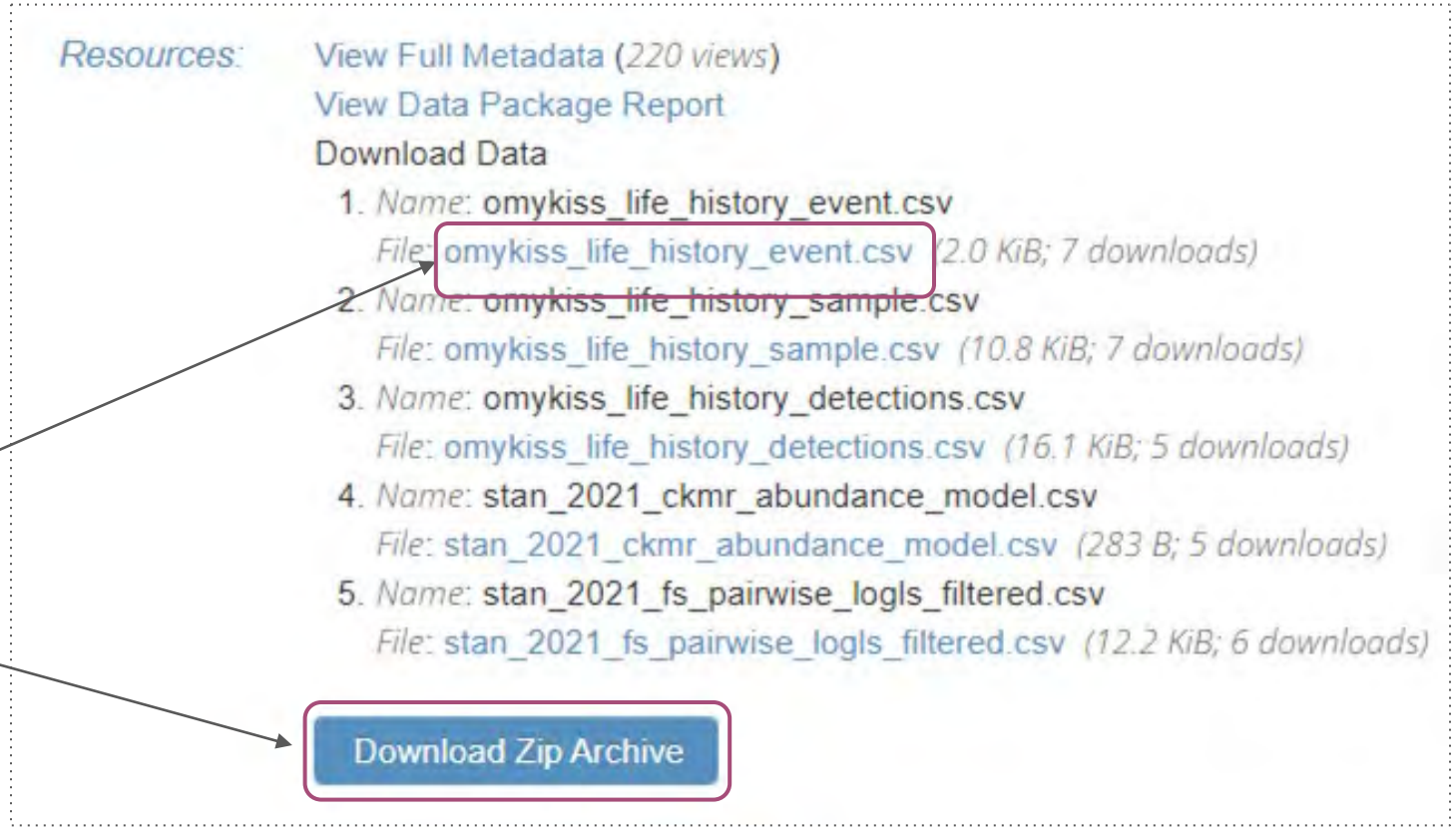
CVPIA Data Packages on EDI:

Stanislaus River - RST	Logan Day	edi.935.2
American River - RST	Logan Day	edi.1047.2
Stanislaus O.mykiss Monitoring	Mike Beakes	edi.1030.2
Sacramento Habitat Use Monitoring	Amanda Banet	edi.749.1
Contact Point Delta Predation Data	Reid Nelson	edi.740.1
Fish Food on Floodplain Farm Fields	Jacob Montgomery	edi.996.1
Clear Creek Gravel Augmentation	Derek Rupert	edi.1010.1

Data Access

DOWNLOADING DATA

1) Navigate to Data Package on EDI
2) Scroll down to the Resources Section on the Data Summary Page
3) Click on an individual csv file to download just that file
4) Or click on the blue Download Zip Archive button to download all datasets in package



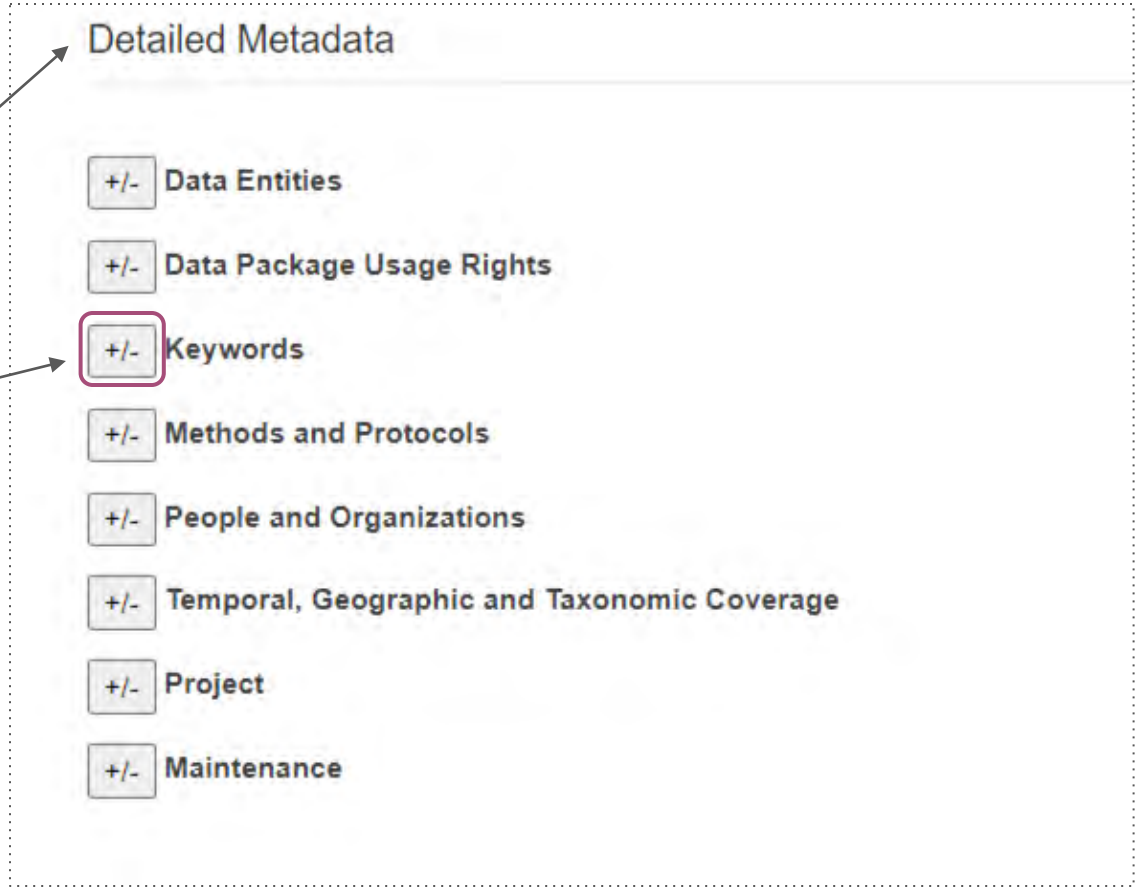
Walkthrough for LAR RST and Stanislaus *O.mykiss*.

Data Access

VIEWING METADATA

1) Click on the View Full Metadata link at the top of the page
2) Scroll to find the Detailed Metadata section
3) Click on the +/- button to open and close metadata sections to learn more about attributes, methods, keywords, funding…ect.

Walkthrough for LAR RST and Stanislaus *O.mykiss*.



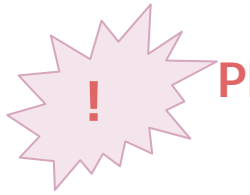
Datasets in the Queue:

Battle Creek RST Data - Natasha Wingerter

Clear Creek RST Data - Natasha Wingerter

Sacramento Gravel Augmentation and Habitat Data - John Hannon

Sutter Bypass Salmonid Growth Study - Flora Cordoleani



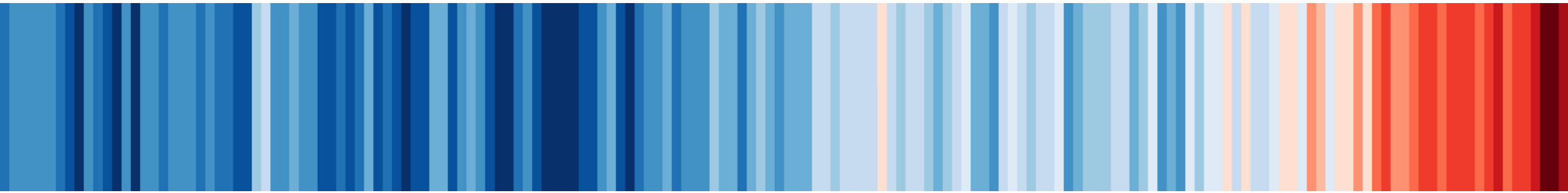
Please reach out to FlowWest or Megan if you have datasets to add

CVPIA SIT Meeting April 13, 2022

SIT Subgroup Updates

Climate Change Subgroup

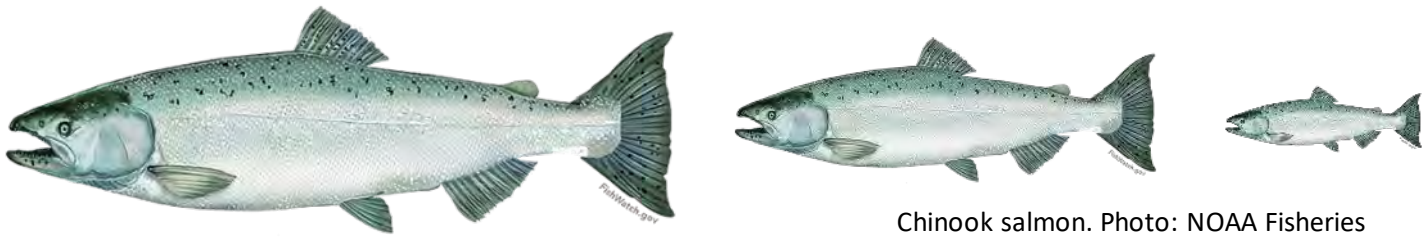
- Kickoff meeting was March 10, 2022
- Discussed desired outcomes, overview of climate change modeling in CalSim
- Next steps: schedule next meeting to review DSM flow and temp inputs for SIT model, further discuss climate change modeling, continue developing SIT proposal



Global temperature change since 1990. Credit: Ed Hawkins

Salmon Demographics Subgroup

- Met March 7, 2022
  - Re-reviewed current movement hypotheses and DSM rulesets used to represent them
  - Reviewed updated tool to look at results from different rulesets
  - Initiated discussion on potential new movement hypotheses to represent in DSMs
- Next Steps
  - Review/comment on compiled draft hypotheses (in progress)
  - 5/3 meeting: Decide hypotheses to evaluate in the tool
  - 5/19 meeting: Review tool results, finalize list of hypotheses
  - June SIT reportout



Chinook salmon. Photo: NOAA Fisheries

Habitat Subgroup

- Met April 1, 2022
- Good discussion and input from the subgroup on spawning habitat decay.
  - Looking for additional input from group on key assumptions using web app.
  - Will provide new spawning habitat input with decay late April for Jim / Adam to do sensitivity testing.
- Highly unlikely that TSC will be able to acquire bathymetry between Clear Creek and Red Bluff this year due to drought conditions.
- Fish food, inundation duration, and field validation in habitat inputs to be discussed at next habitat subgroup.

Steelhead PWT

- Upcoming request for SIT input: feedback on draft Steelhead Monitoring Plan for Southern Sierra Nevada Diversity Group
  - Seeking feedback on design, conceptual model, hypotheses
  - Expected timing for input: early summer 2022
  - Stay tuned for more info!

Steelhead. Photo: NOAA Fisheries

Sturgeon PWT

- Underway now: PWT co-chairs have asked the PWT to update the sturgeon project inventory. Will be helpful to understand what is currently happening that supports the NTRS info needs.
- Please respond if you haven't already!

Green sturgeon. Photo: NOAA Fisheries

CVPIA SIT Meeting April 13, 2022

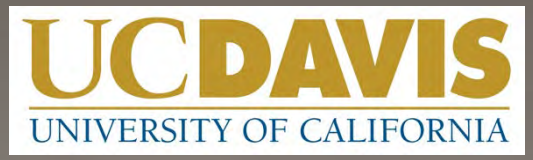
Science Talk: “Evaluating the role(s) of the Butte sink and Sutter Bypass for Central Valley juvenile salmonid populations”

Flora Cordoleani, NOAA-NMFS, UC Santa Cruz

Evaluating the role(s) of the Butte sink and Sutter Bypass for Central Valley juvenile salmonid populations

SIT meeting, April 13th 2022

Flora Cordoleani, Eric Holmes, Miranda Bell, Rachel Johnson, Carson Jeffres



3-year Fish Cage Experiment

5 regions

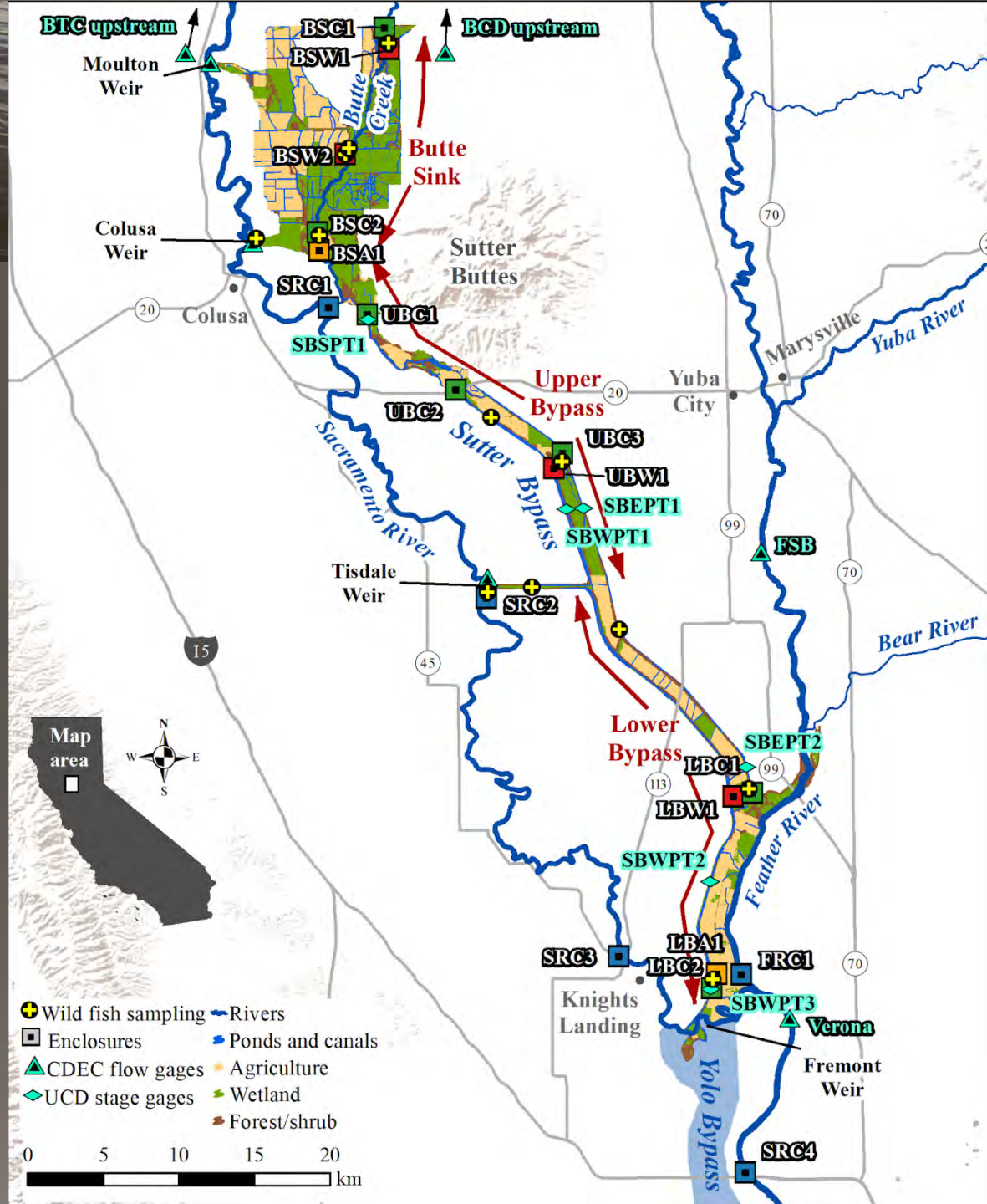
- Butte Sink
- Upper Bypass
- Lower Bypass Sacramento River
- Feather River

4 habitat types

- River Channel (2019-2021)
- Canal Channel (2020 & 2021)
- Off-channel wetland (2019-2021)
- Off-channel agriculture (2019 & 2021)

Cages

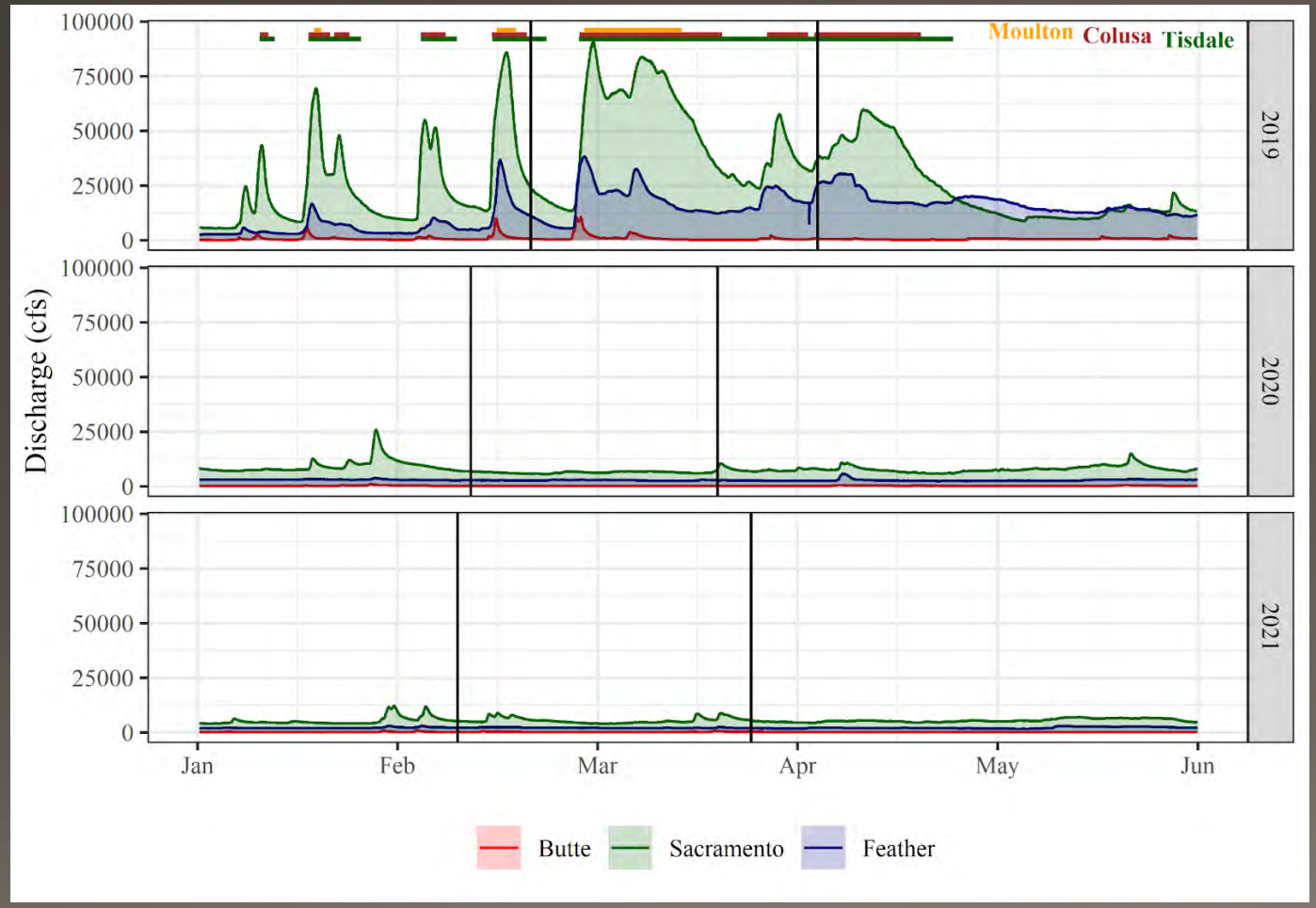
- 5 Individually PIT tagged salmon per cage
- From February to March/April of 2019, 2020 and 2021



3-year hydrology comparison

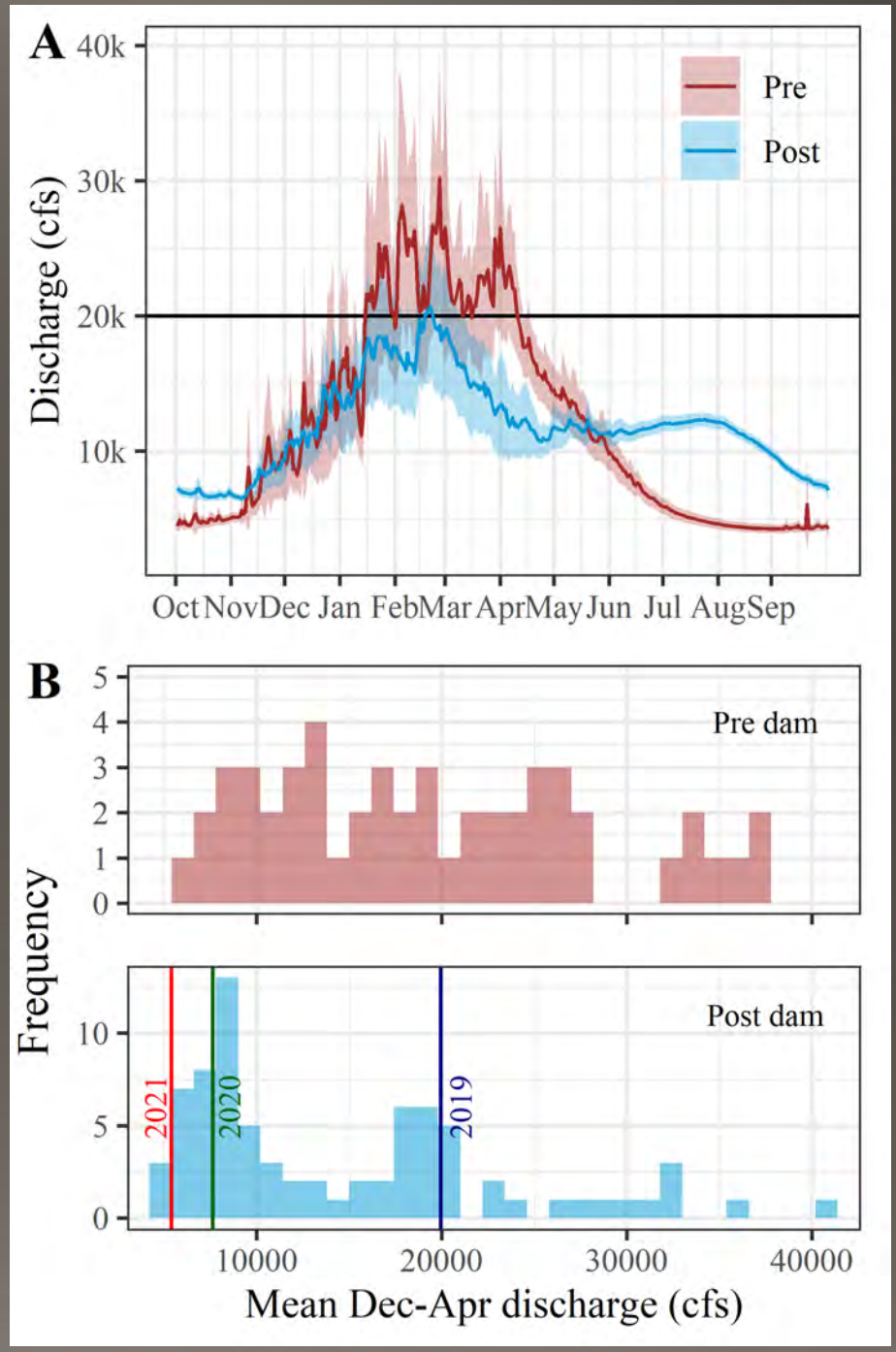
- 2019 = "wet" water year vs 2020 & 2021 = "dry" water year

- No overtopping events in 2020 and 2021



Central Valley hydrology

- Hydrograph modified
- "Normal" years have disappeared in the Sacramento River



Diverse and Dynamic Landscape

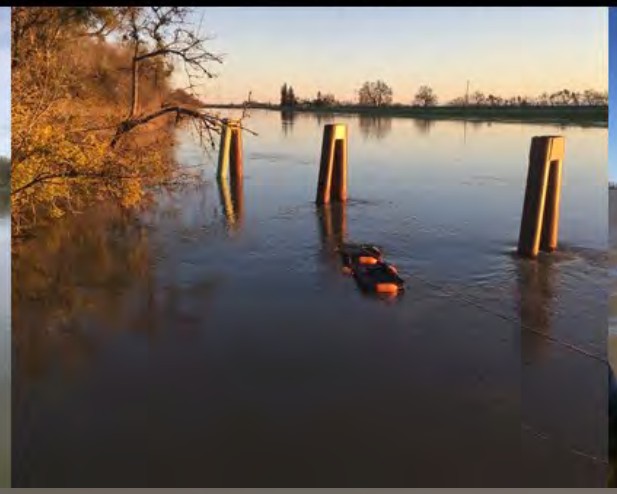
FRC1 (low flow)

SRC3 (low flow)

LBW1 (low flow)

FRC1 (high flow)

SRC3 (high flow)



LBW1 (high flow)

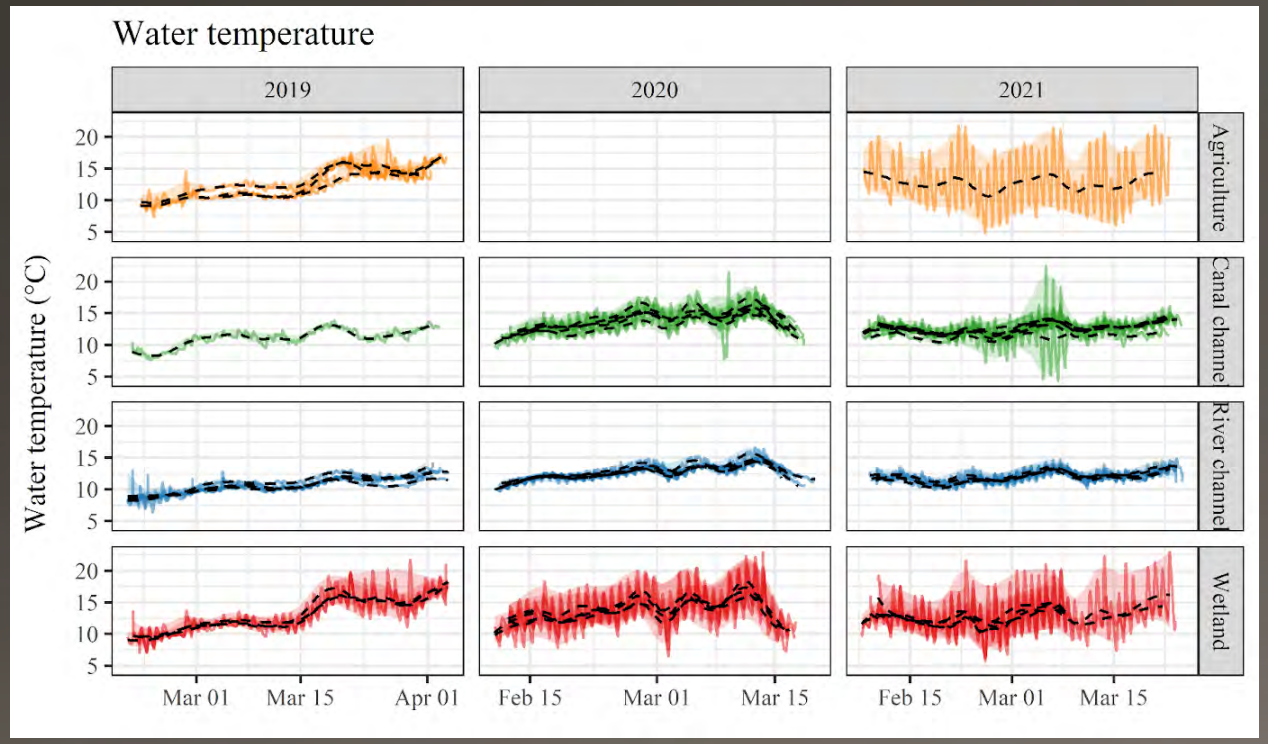
Sampling Steps

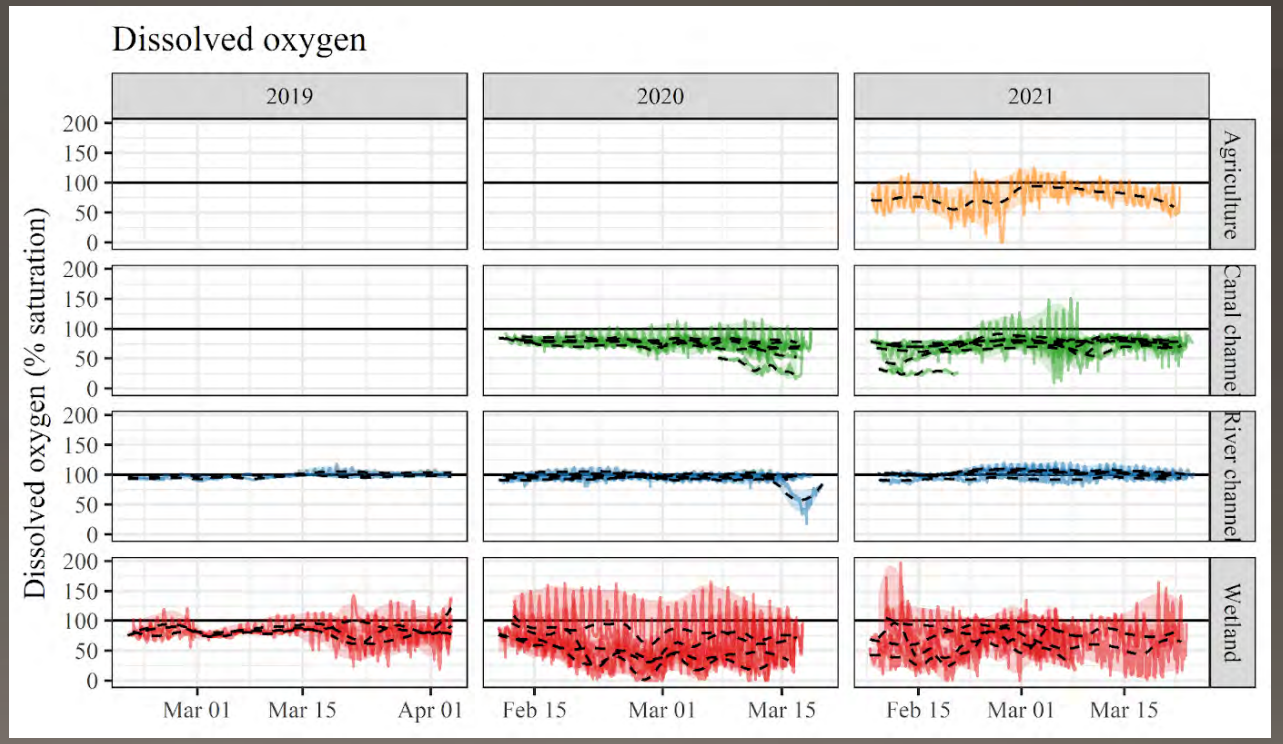
- Salmon measurement
- Water quality
- Lower trophic sampling
- Wild fish sampling
- Stomach contents

(Courtesy of Eric Holmes)

3-year water quality comparison

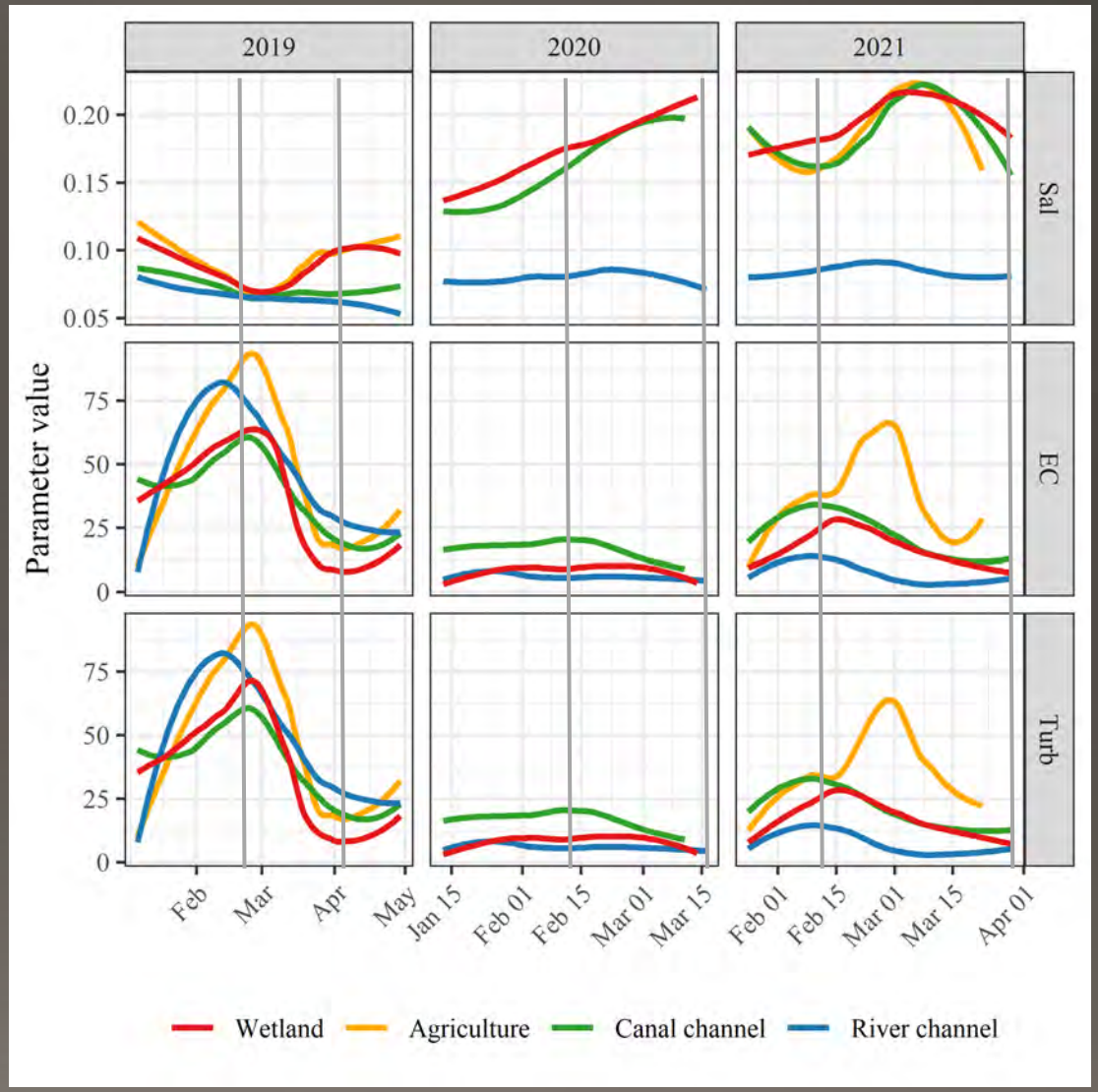
- More variable and higher water temperature in off-channel habitats
- More diurnal DO variation in off-channel habitats





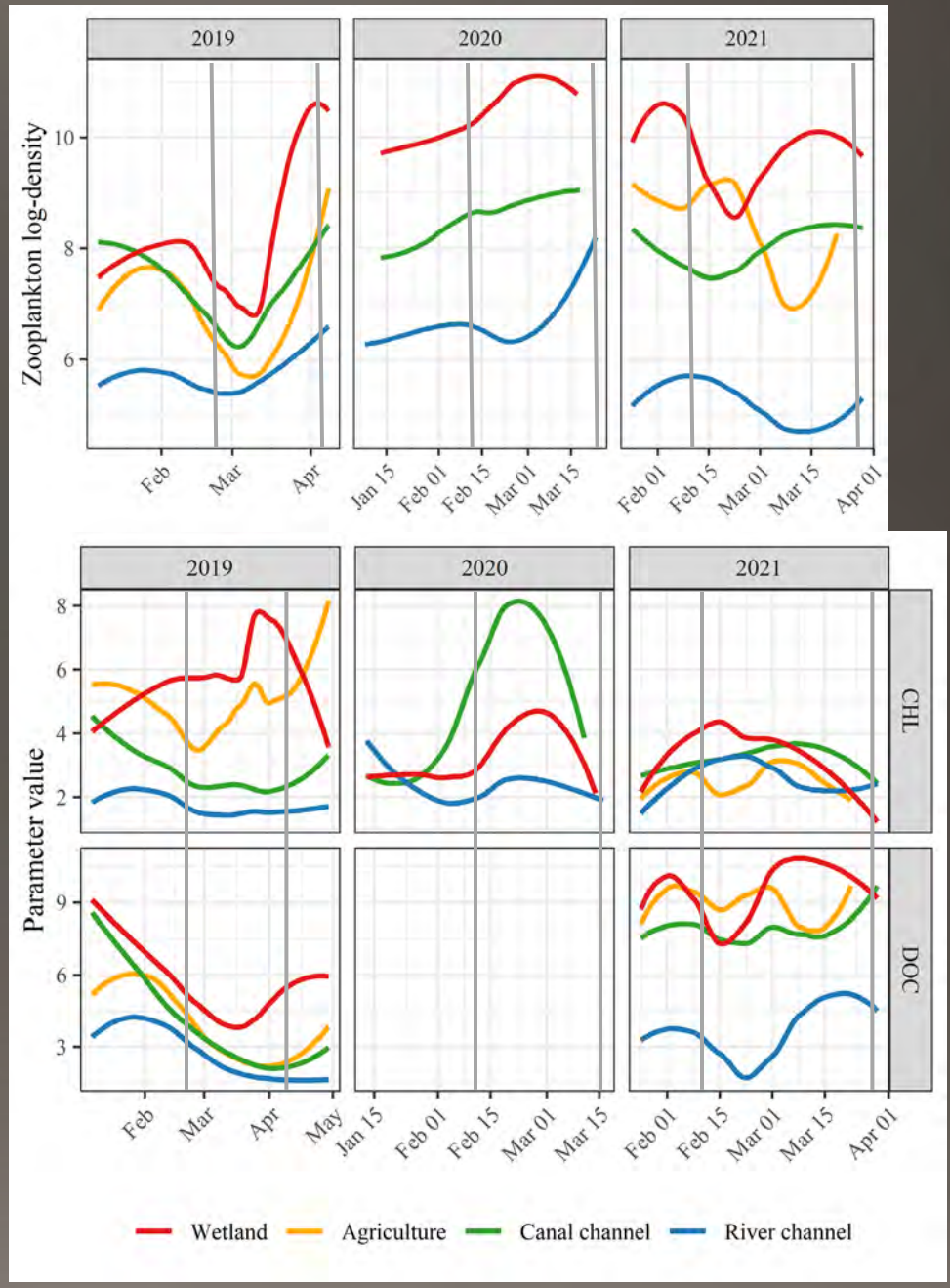
3-year water quality comparison

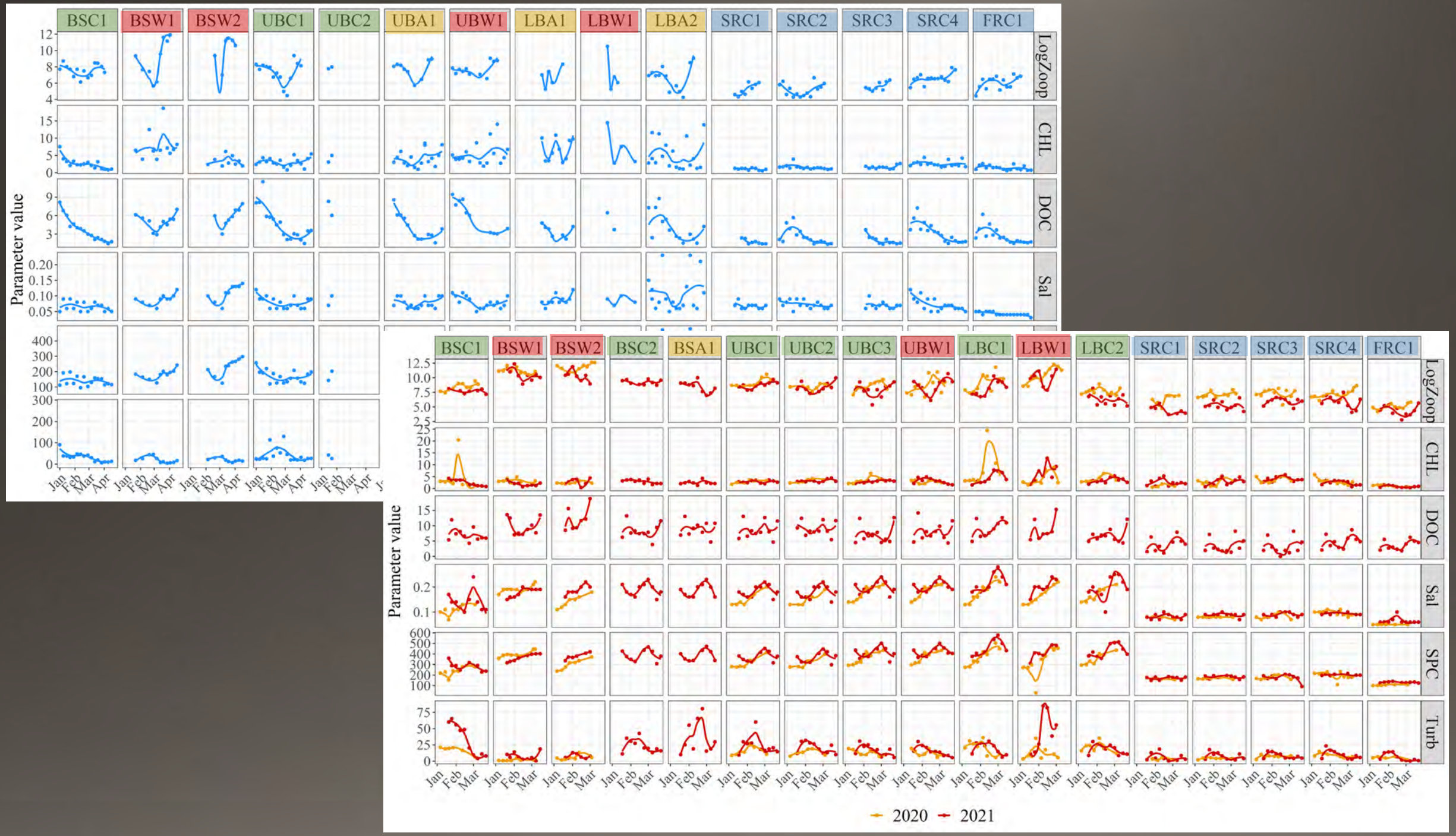
- Similar conditions in 2019 vs increased water residence time in off-channel habitats in 2020 and 2021
- Butte Creek canal receives input from off-channel habitats



3-year foodweb productivity comparison

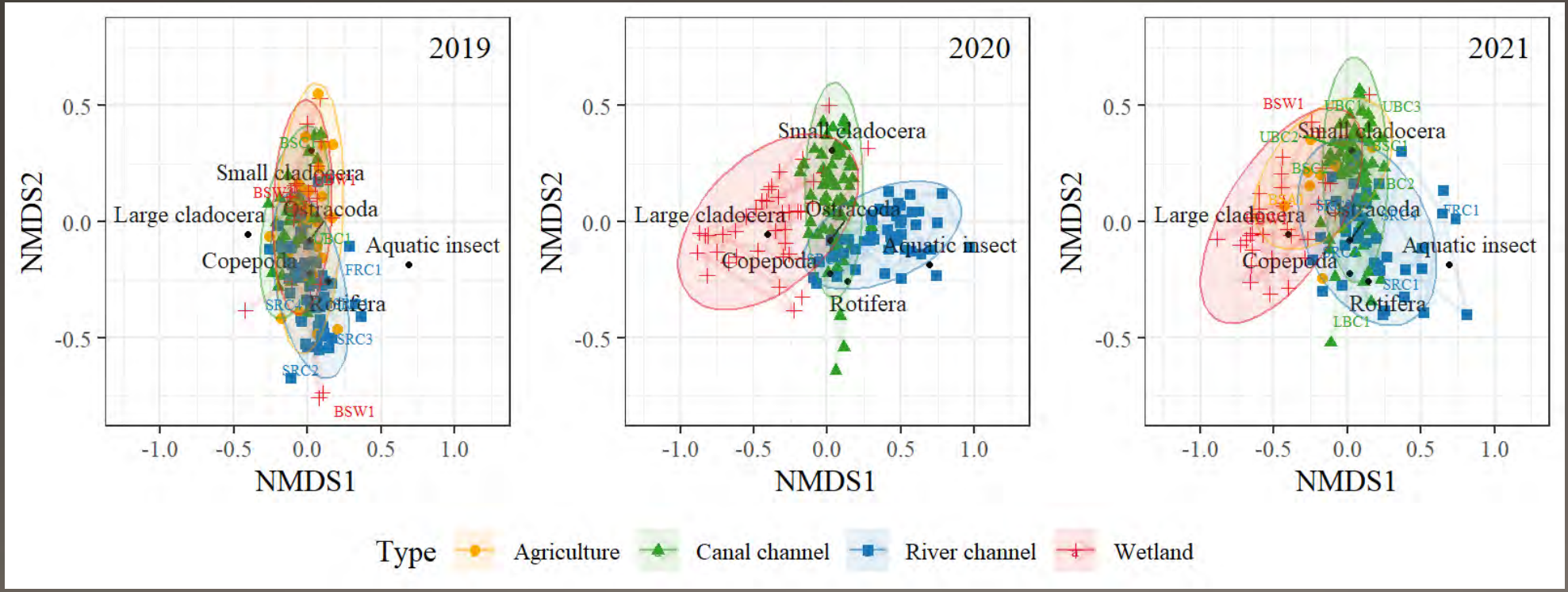
- Increased productivity in off-channel and Canal habitats
- Importance of both autotrophic and heterotrophic (detrital) foodweb paths




BSC1
BSW1
BSW2
UBC1
UBC2
UBA1
UBW1
LBA1
LBW1
LBA2
SRC1
SRC2
SRC3
SRC4
FRC1
BSC2
BSA1
UBC3
LBC1
LBW2
LBC2
LogZoop
CHL
DOC
Sal
SPC
Turb
Parameter value
Jan
Feb
Mar
Apr
2020
2021

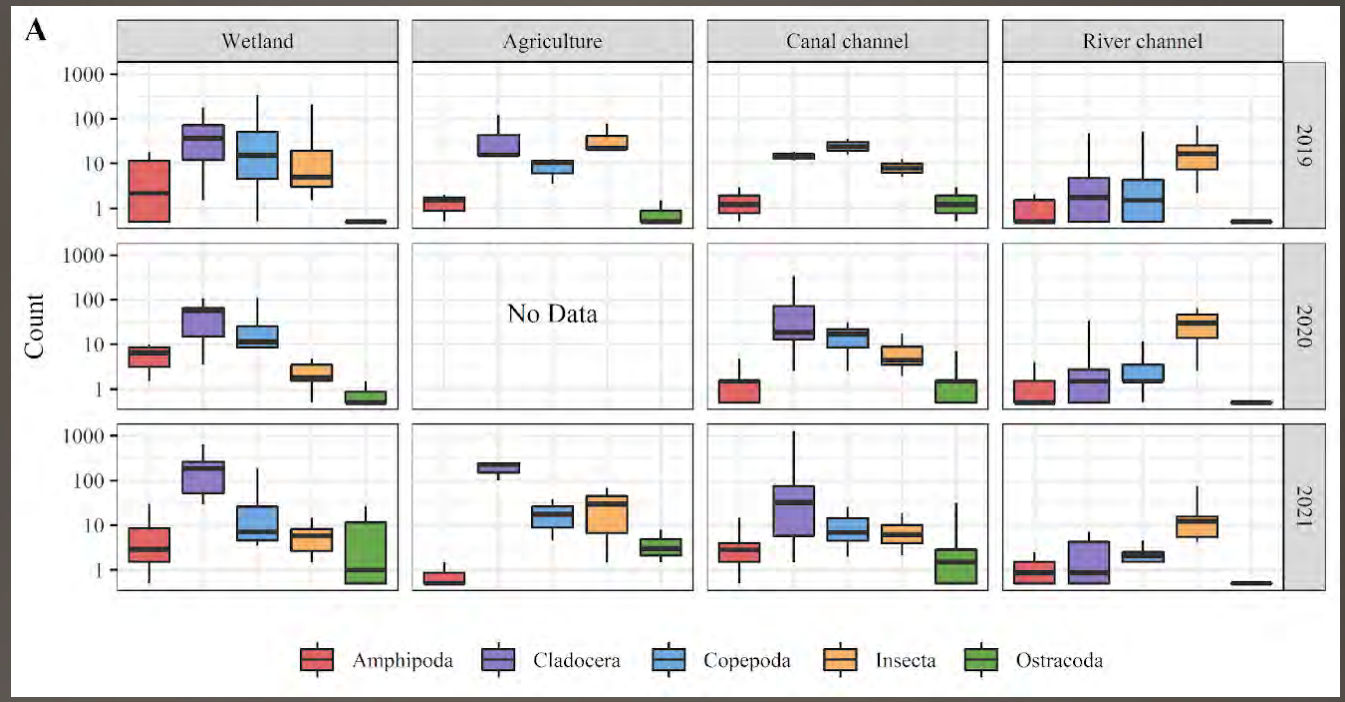
3-year zooplankton composition comparison

- More homogenous communities in the wet year, 2019.
- In low flow 2020 and 2021, more distinction between habitat type communities:
  - Wetland = large and small bodied Cladocera + Copepoda
  - River = Aquatic Insect + Rotifera + Ostracoda + Copepoda
  - Canal = mix between Wetland and River
  - Agriculture = mix between Wetland and Canal



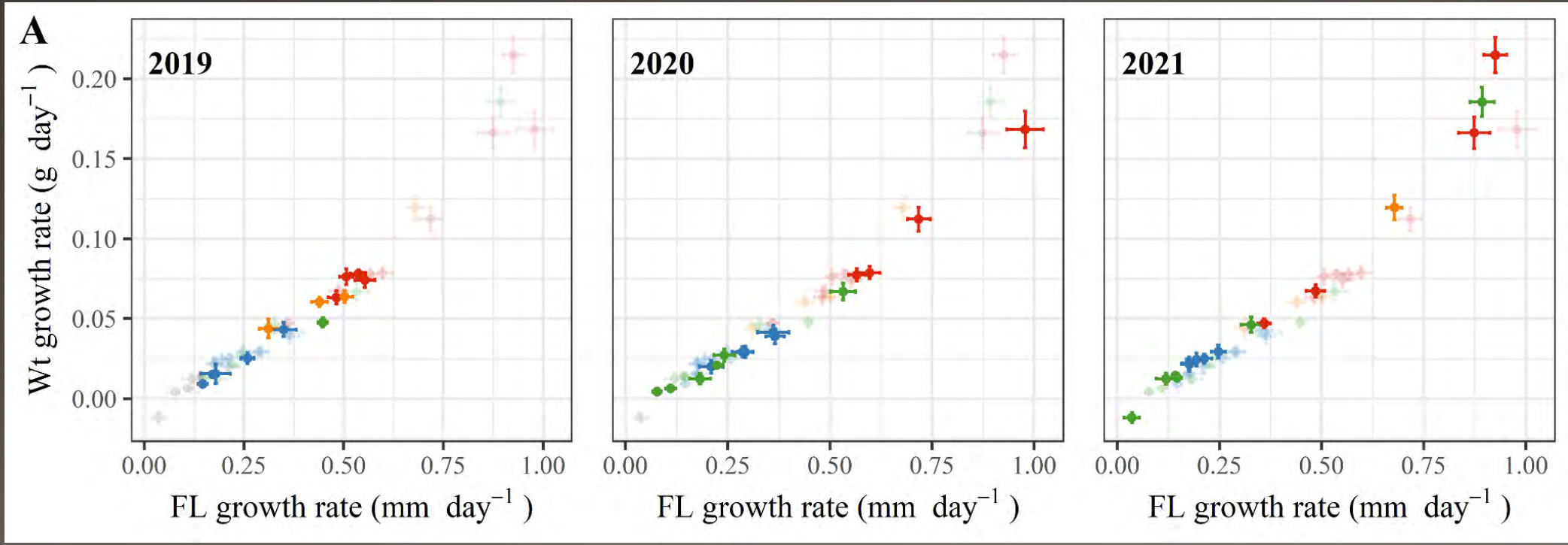
3-year salmon diet comparison

- Similar diet within each habitat type across all years:
  - Wetland = **Cladocera + Copepoda,** Amphipoda + Insecta
  - Agriculture and Canal = similar to wetland with less amphipoda
  - River = **Insecta** + Cladocera + Copepoda



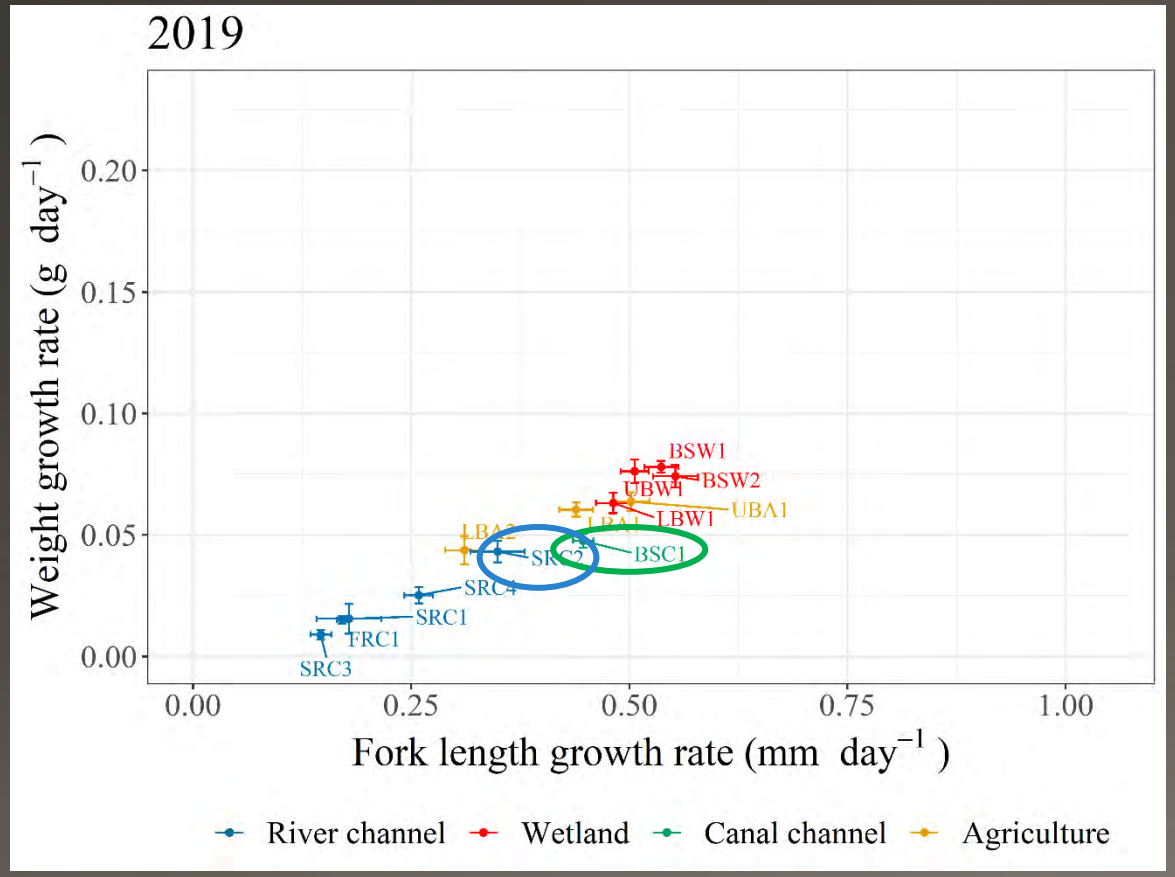
3-year cage fish growth comparison

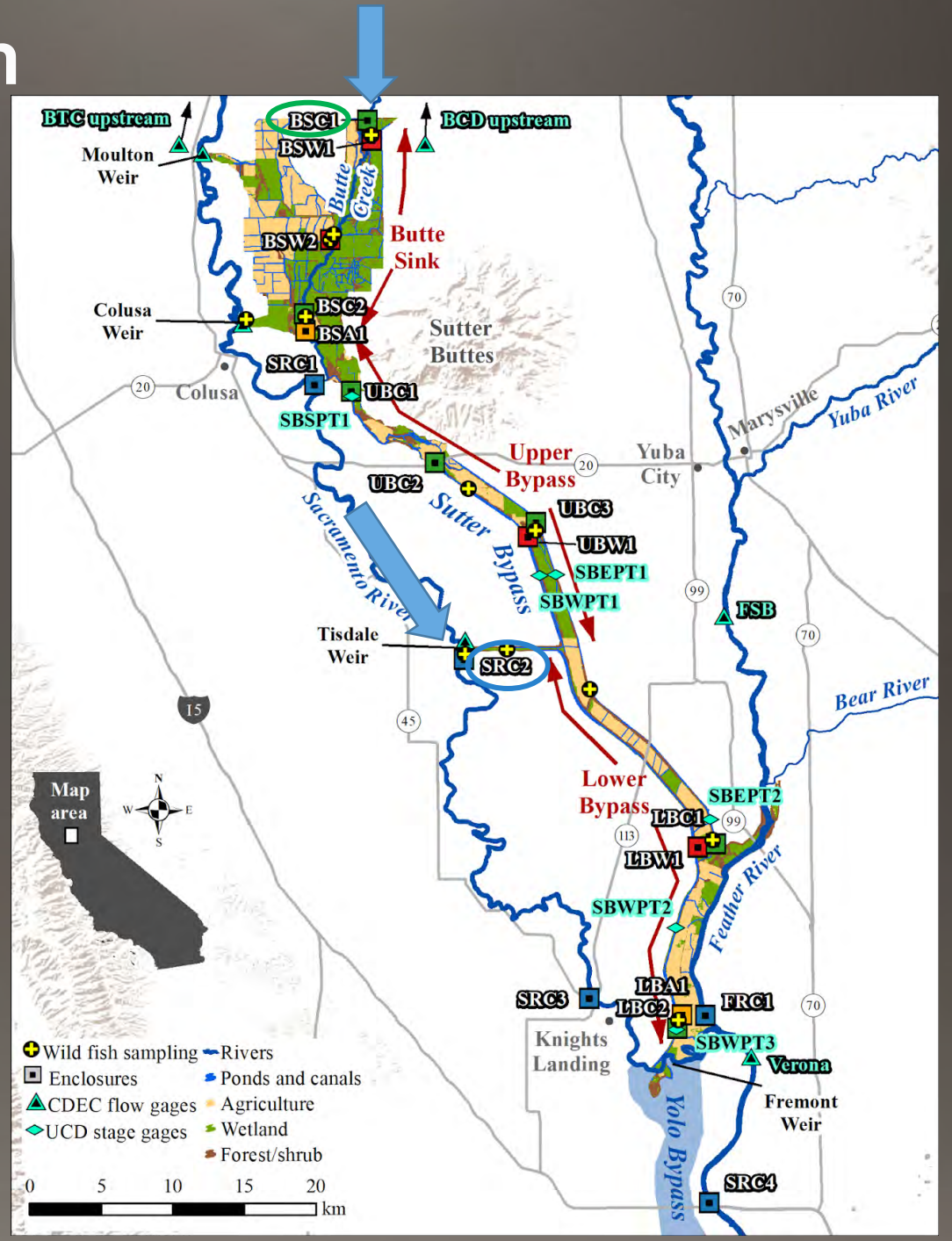
- Off-channel wetland = fastest growth rates & channel sites = lowest growth rates across all years
- The gap between the fastest and slowest growing sites was smaller under wet conditions (2019) than dry conditions (2020 and 2021)
- Largest growth rate reaching 1 mm/day and 0.22 g/day



3-year cage fish growth comparison

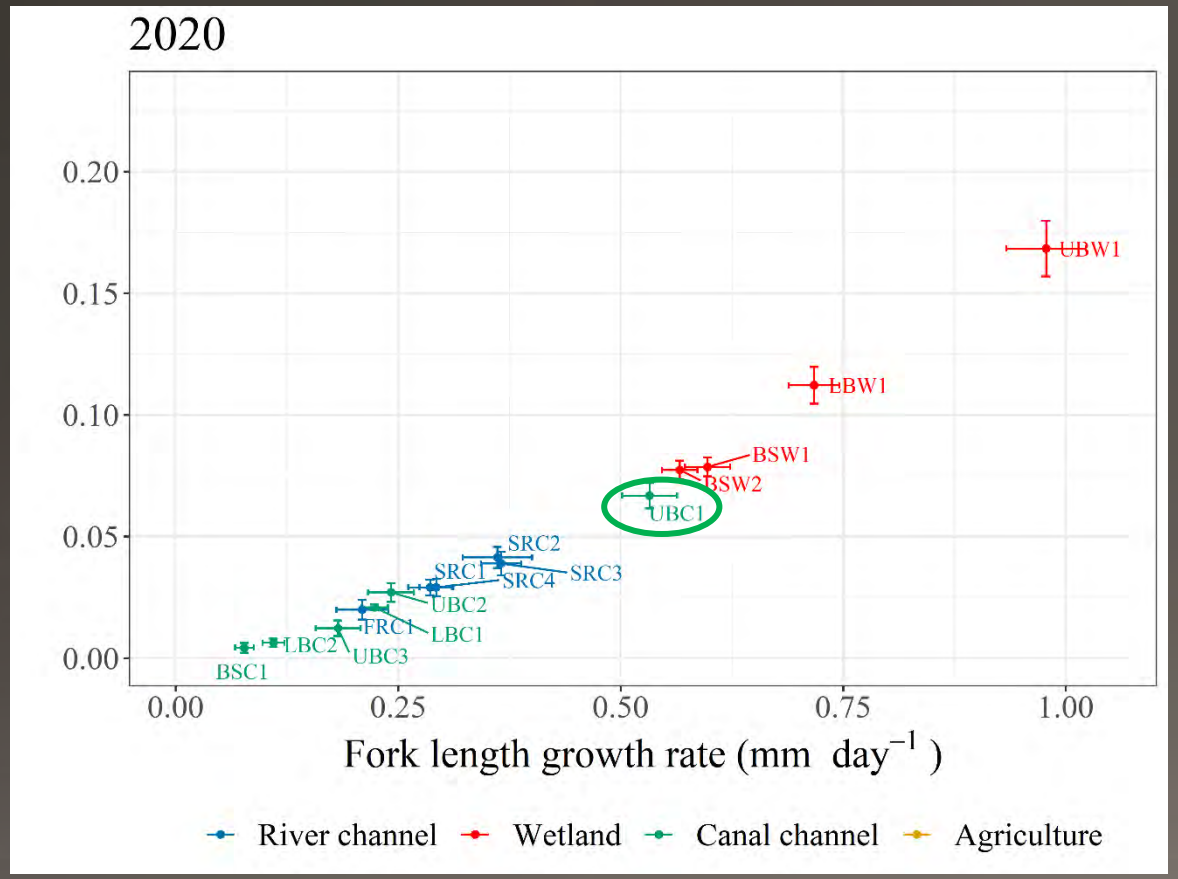
- High BSC1 growth likely due to upstream rice field draining
- High SRC2 growth due to BSOG water?

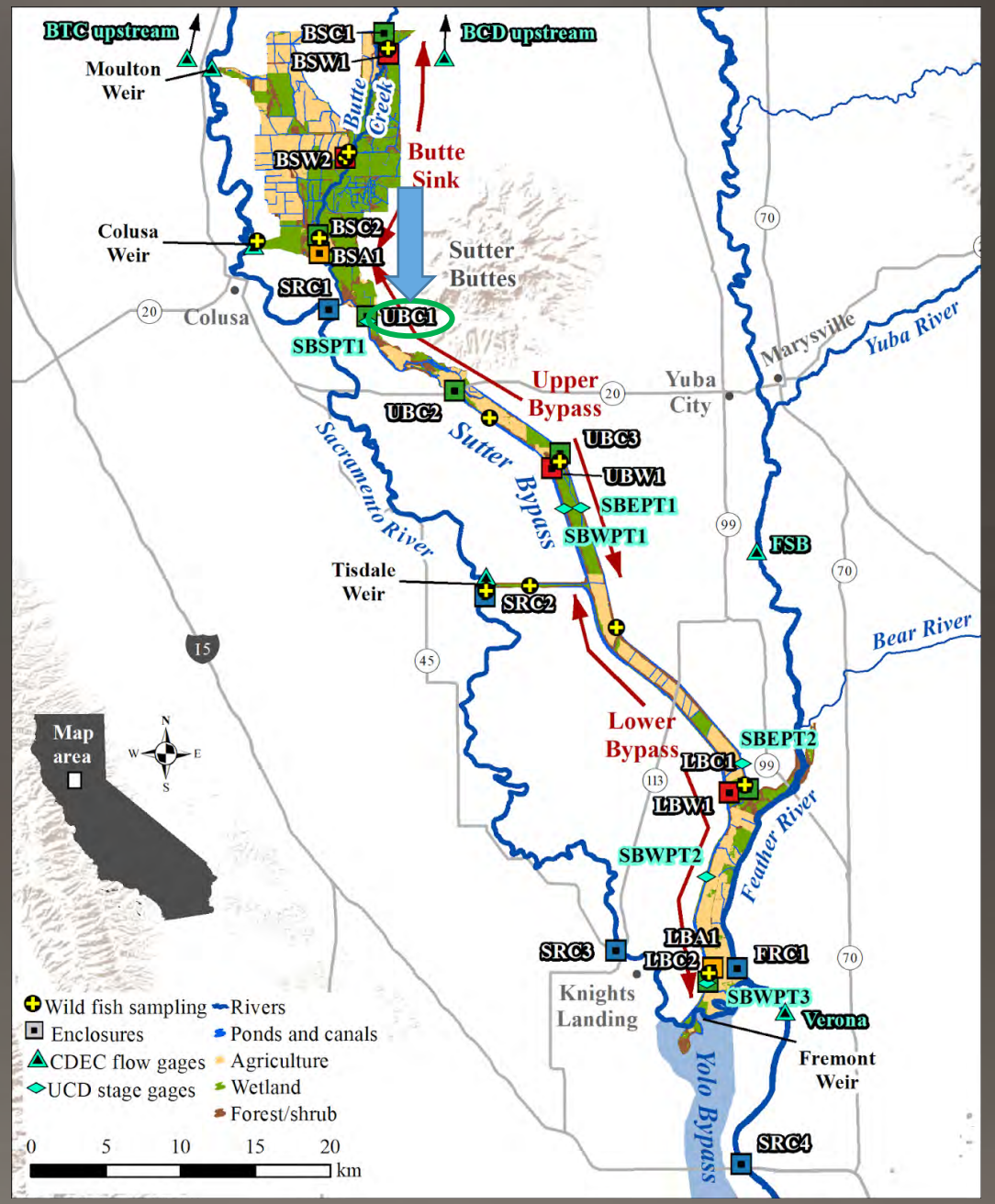




3-year cage fish growth comparison

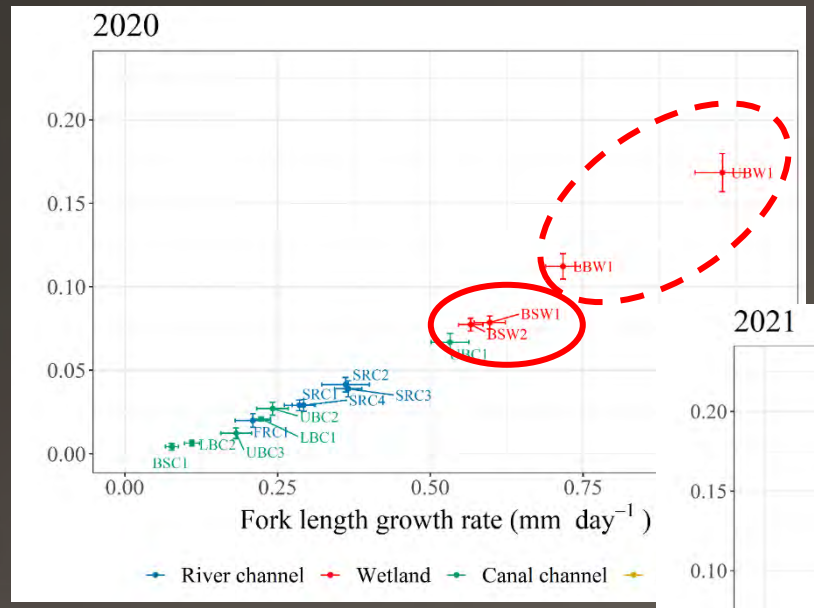
- High UBC1 growth likely due Butte Sink and Butte Slough draining

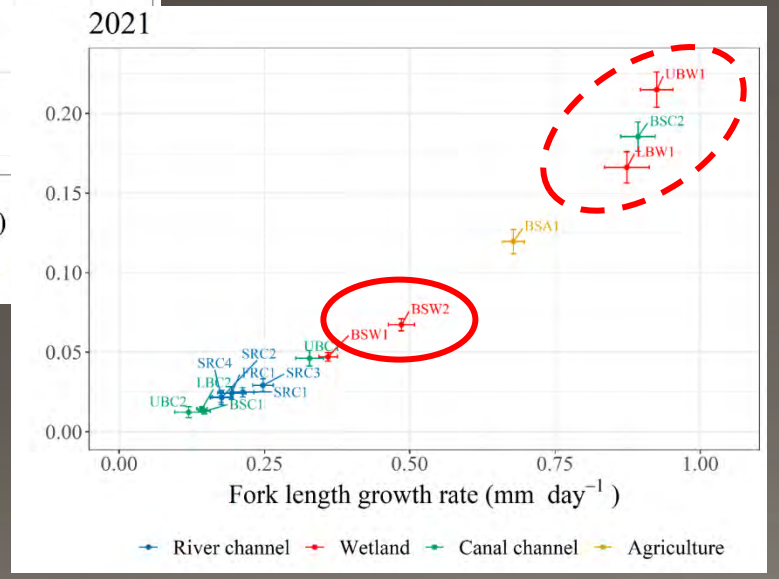


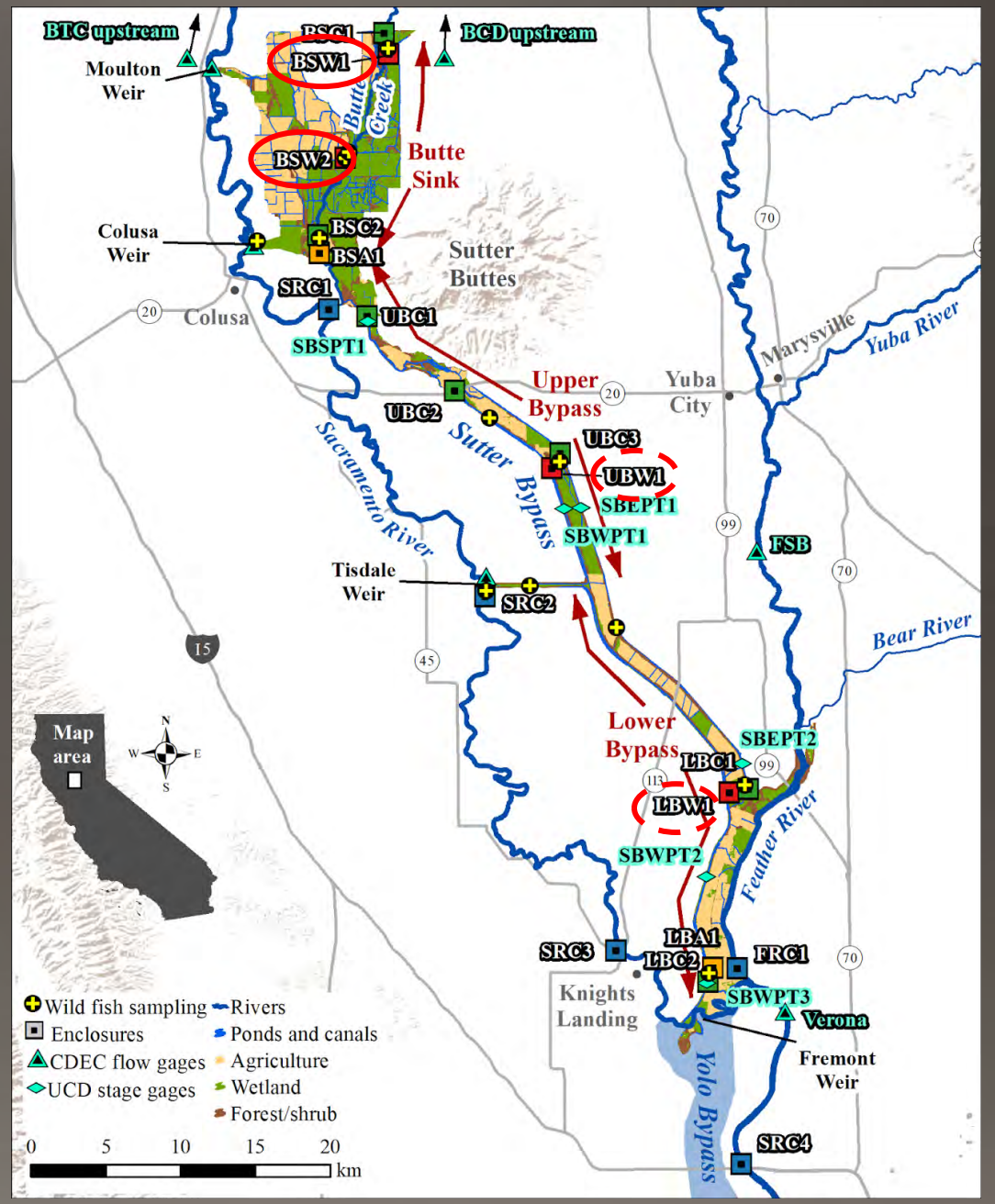


3-year cage fish growth comparison

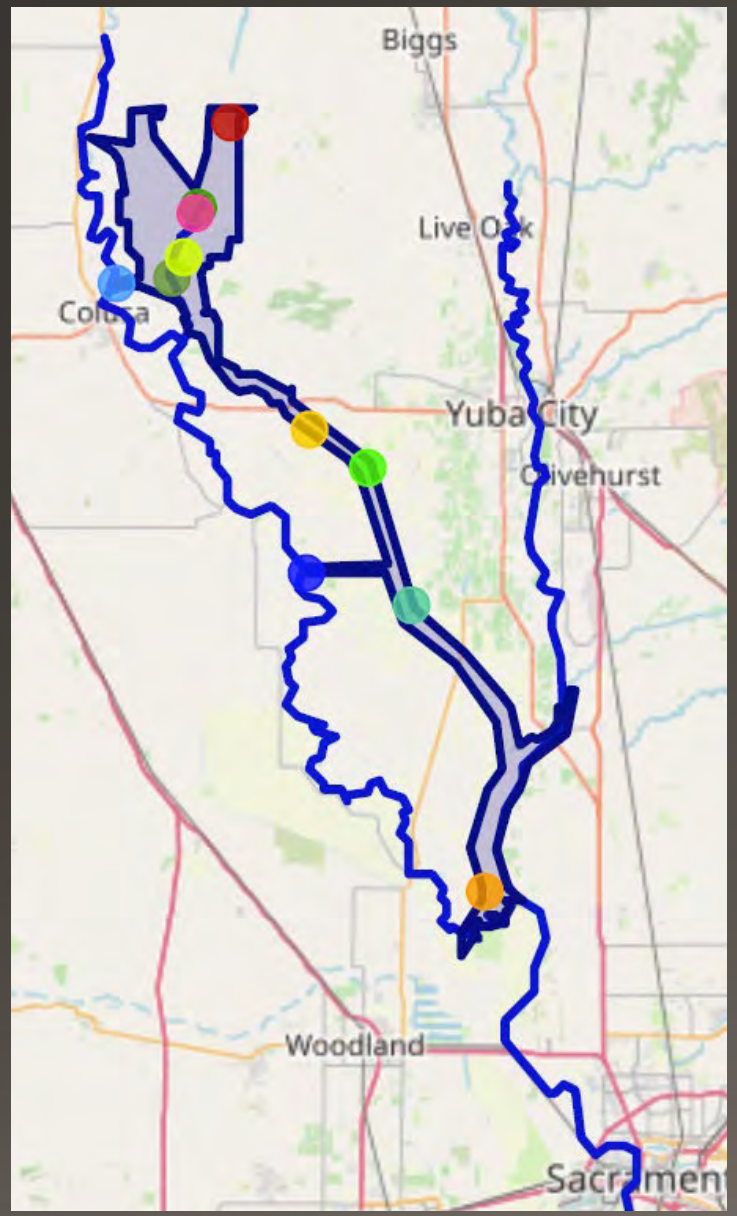
- Higher growth in UBW1 and LBW1 in 2020 and 2021 thanks to constant water circulation vs BSW1 ad BSW2 where water was more stagnant

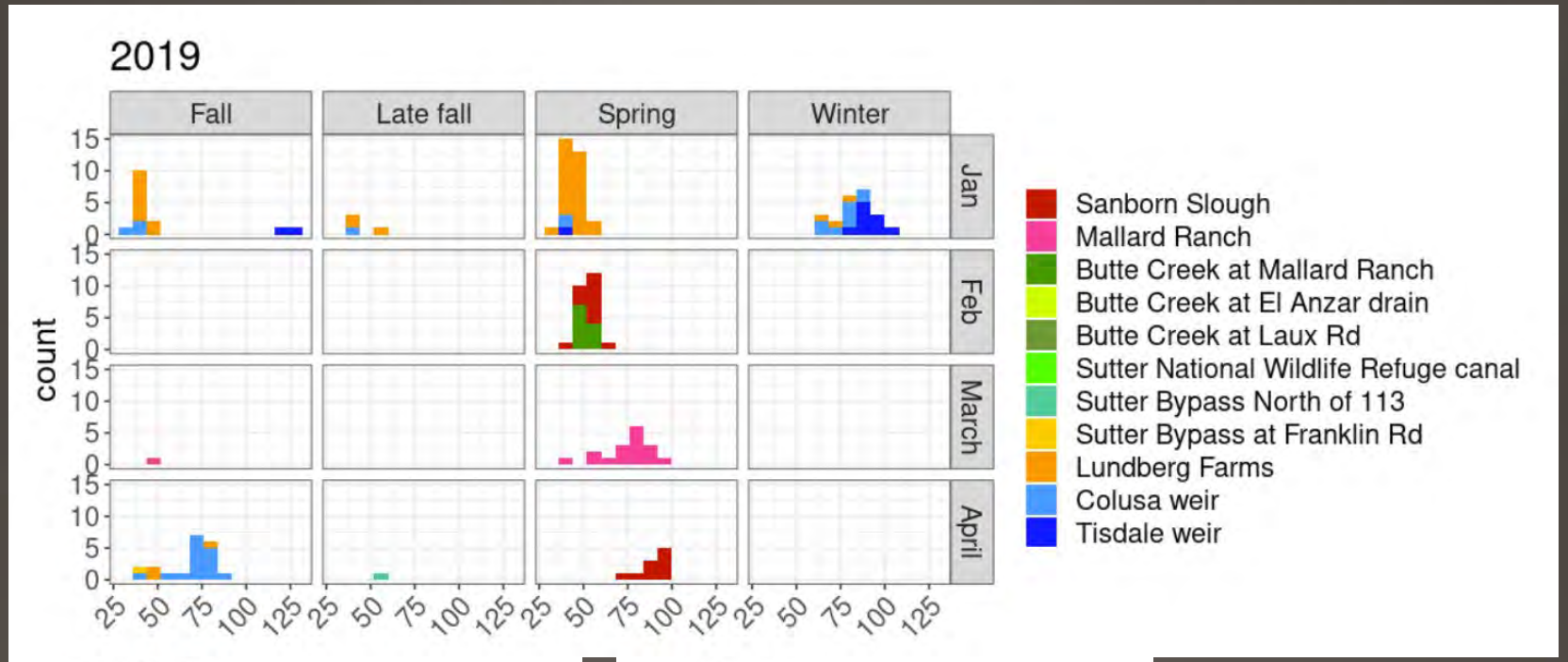


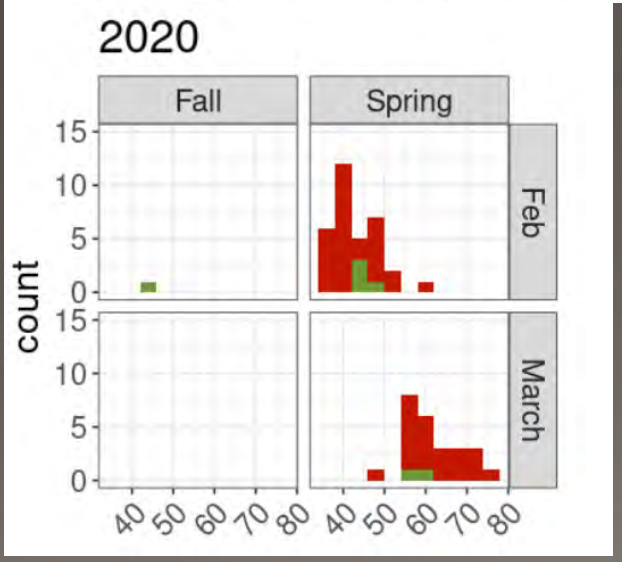


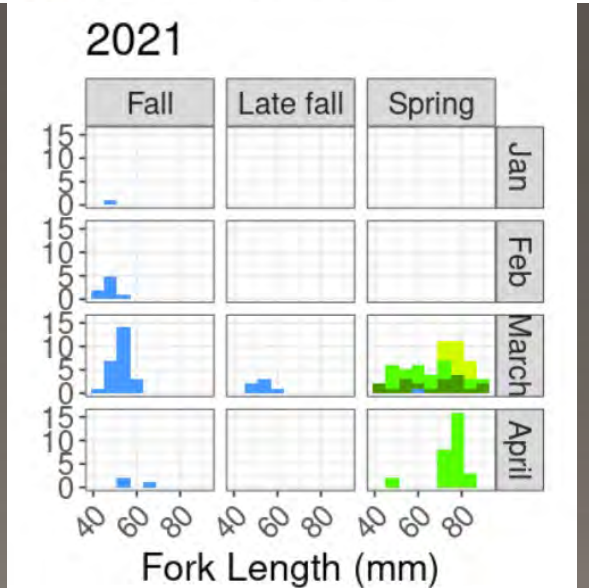


3-year wild fish sampling comparison





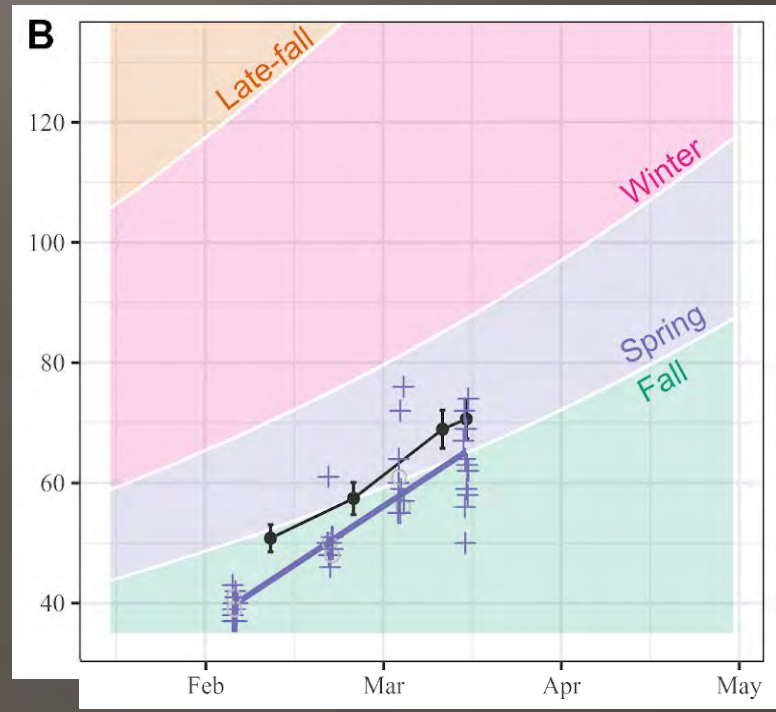


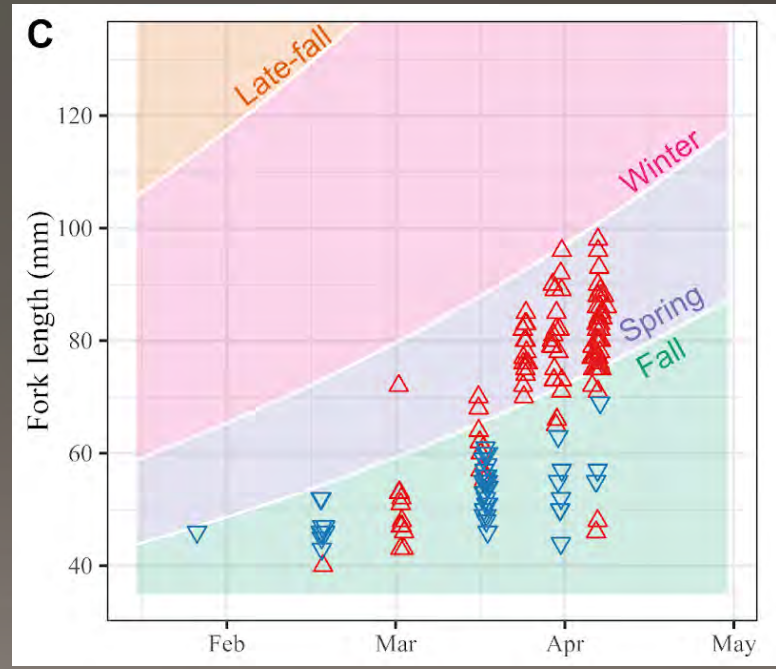


Wild vs cage fish growth comparison

- Cage (black) and wild (purple) fish in a Butte Sink wetland had similar growth trajectory
- Salmon caught in Butte Creek (red triangles) started small but were almost winter-run size by April vs salmon in Sacramento River (blue triangle) never reached spring size

➢ Butte Creek can produce large size juvenile by April but not the lower Sacramento River





Conclusion

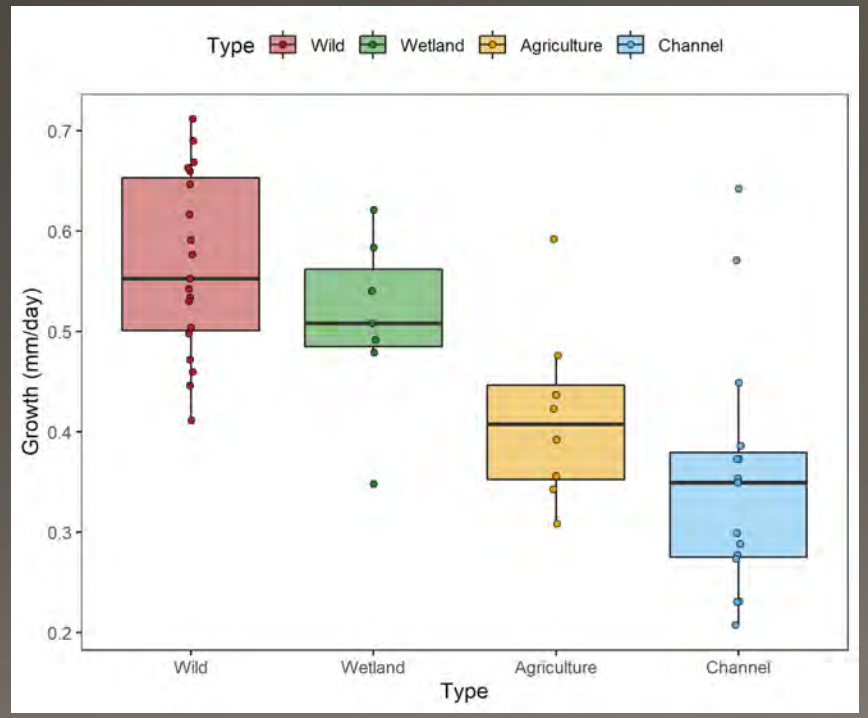
- Different patterns of water quality, food resources, and juvenile Chinook Salmon growth observed between channel and off-channel habitats in all years. However, the signal was more distinct in the dry years due to larger differences in water residence time in off-channel habitats compared to the 2019 homogenized conditions.

- Butte Sink wetland benefits were observed for Butte Creek chinook even in critically dry years. Benefits also observed through downstream food subsidies in the Butte Creek channel.

- The Butte Sink and Sutter Bypass off-channel habitats provide high quality rearing conditions for all runs (including endangered winter-run) of Chinook, as well as steelhead coming from the Sacramento River, if they can access those habitats through weir overtopping events.

2022 Sampling & Analysis

- Zoop and water sampling along the Butte Sink and Sutter Bypass
- Wild fish sampling in Butte Sink (~11 juvenile salmons)
- Comparison of wild vs caged juvenile fish growth (otolith microchemistry) :
  19 wild, 30 caged fish from 2019



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- Movement and floodplain habitat use of Butte Creek spring-run Chinook Salmon from Phoenix cohort (otoliths and eyeballs isotope analysis)

Project deliverables

- Cordoleani F., Holmes E.J., Bell-Tilcock M.B., Johnson R.C., Jeffres C.A. (2022). Variability in foodscapes and fish growth across a habitat mosaic: Implications for management and ecosystem restoration. Ecological Indicators. 136(8):108681.

- Cordoleani F., Holmes E.J., Bell-Tilcock M.B., Johnson R.C., Jeffres C.A. (2022). Evaluating the role(s) of the Butte sink and Sutter Bypass for Butte Creek spring-run Chinook Salmon and other Central Valley juvenile salmonid populations – a three-year study comparison. CVPIA Report. DOI: 10.13140/RG.2.2.32217.60005

- https://floracordo.shinyapps.io/ShinySutter/

Questions?

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CVPIA SIT Meeting April 13, 2022

New Business

New Business Topics

- Mike Beakes: introduced idea of developing standardized monitoring plans through a SIT subgroup – continue discussion at next SIT meeting

SIT Meetings

Second Wednesdays, 10am to 12pm

Next Meeting: May 11, 2022

All meetings are listed on
http://cvpia.scienceintegrationteam.com/meetings/