

DJIA 34991.90 0.35% ▲

Nasdaq 14701.17 0.01% ▼

U.S. 10 Yr -0/32 Yield 1.363% ▼

Crude Oil 73.72 1.13% ▼

Euro 1.1868 0.08% ▼

# THE WALL STREET JOURNAL.

Brent Lawrence ▼

CORONAVIRUS BRIEFING

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U.S.

## Heat Wave Hit Northwest Businesses From Christmas Trees and Doughnuts to Fish

Farms and stores in Oregon and Washington are still recovering and assessing the damage from last month's record-high temperatures

# Climate Change Vulnerability Assessments for LSRCP Hatchery Programs

Doug Peterson

USFWS, Abernathy Fish Technology Center

[doug\\_peterson@fws.gov](mailto:doug_peterson@fws.gov)

Rod Engle

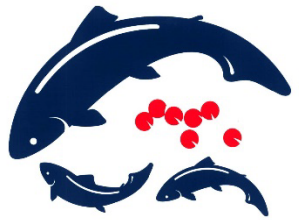
USFWS, LSRCP Office

[rod\\_engle@fws.gov](mailto:rod_engle@fws.gov)

December 14, 2022

Lower Snake River Compensation Plan Chinook Symposium

Boise, ID



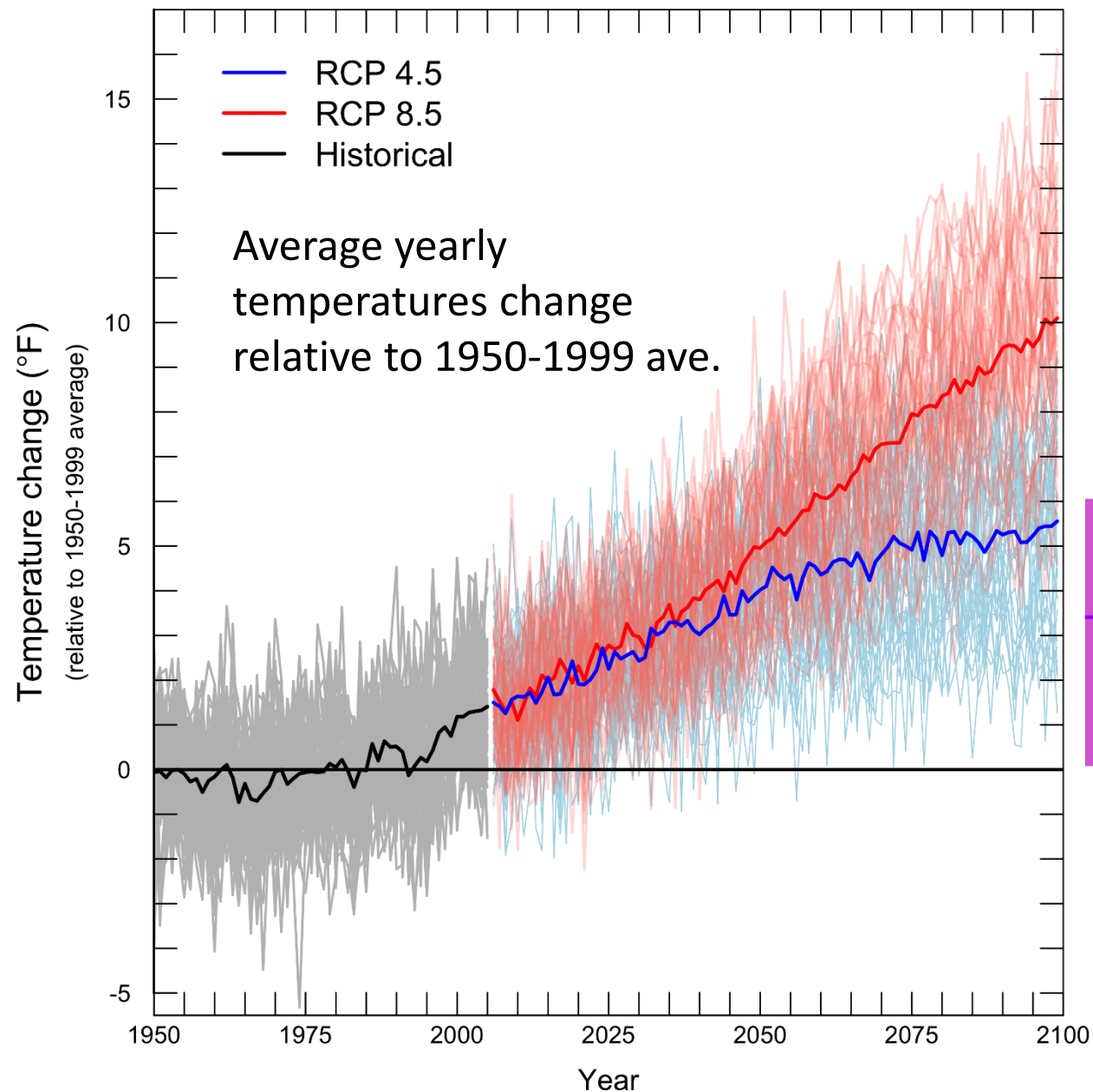
LOWER SNAKE RIVER  
COMPENSATION PLAN  
*Hatchery Program*



# Outline

- Climate change and hatcheries
- Development of assessment (CCVA) framework
- Implementation with FWS hatcheries
  - Examples
  - Lessons Learned
- LSRCF perspective & pilot programs
- Assessment approach & progress

# Climate change



Warming now  
and  
in the future

Figure source: Climate Impacts Group, based on climate projections used in the IPCC 2013 report.

# Climate change

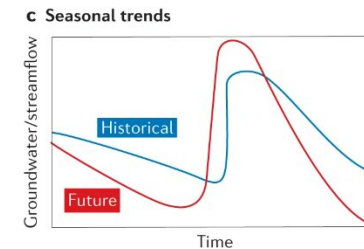
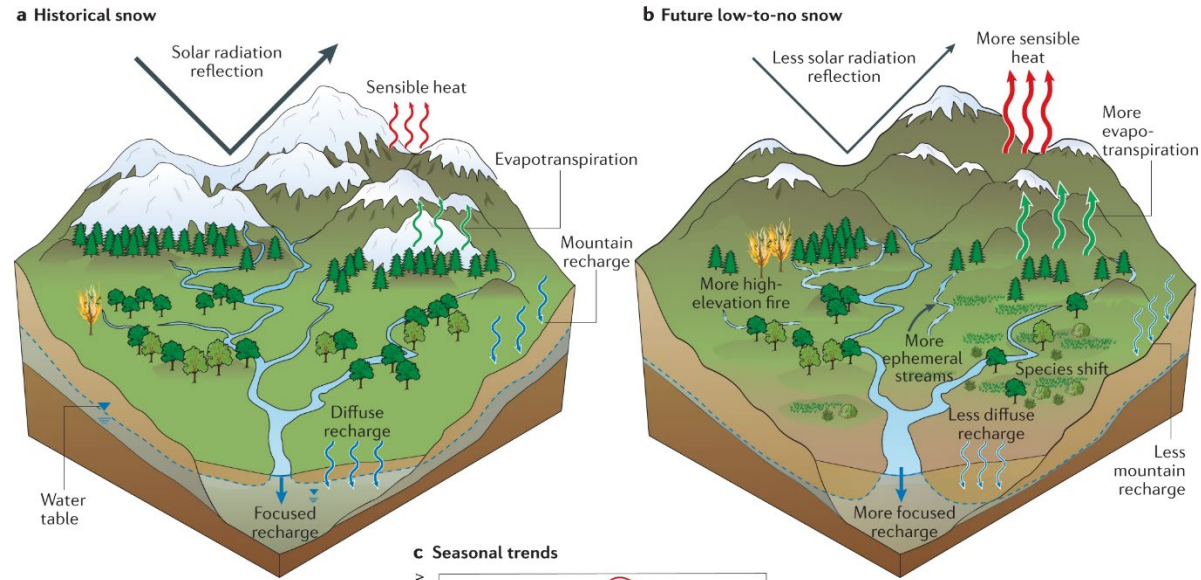
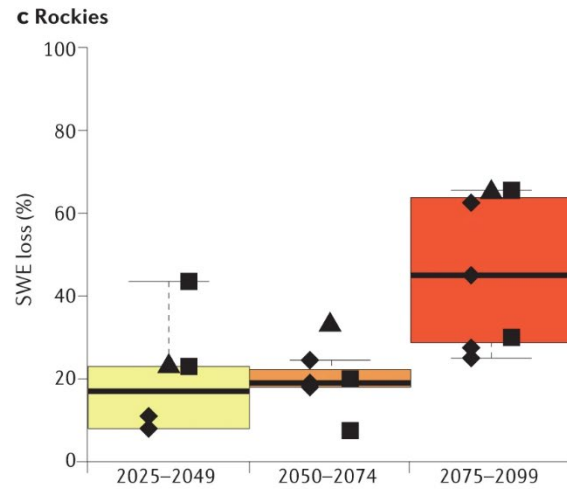
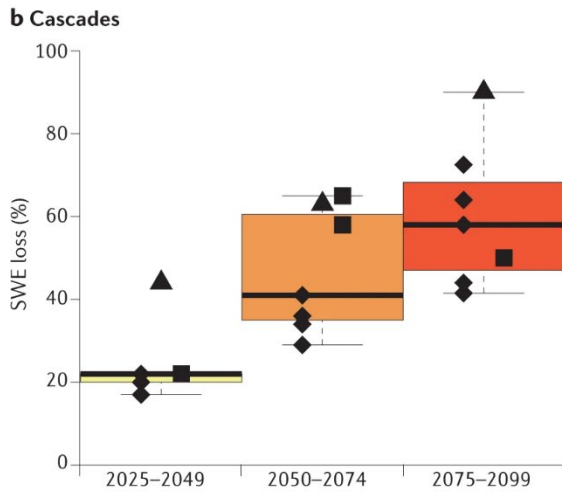
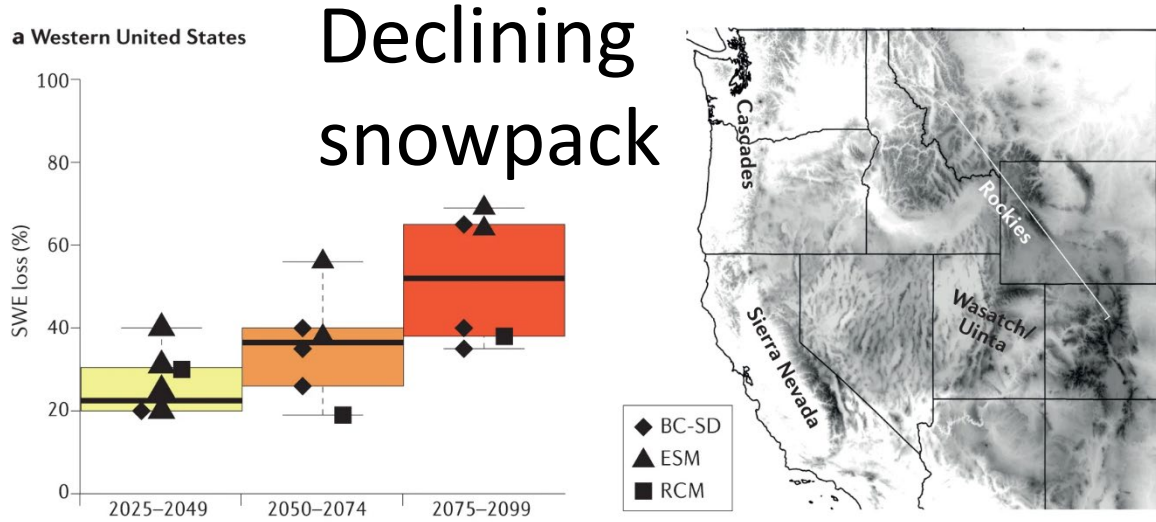
Review Article | Published: 26 October 2021

## A low-to-no snow future and its impacts on water resources in the western United States

Erica R. Siirila-Woodburn , Alan M. Rhoades, Benjamin J. Hatchett, Laurie S. Huning, Julia Szinai, Christina Tague, Peter S. Nico, Daniel R. Feldman, Andrew D. Jones, William D. Collins & Laurna Kaatz

*Nature Reviews Earth & Environment* 2, 800–819 (2021) | [Cite this article](#)

## Hydrologic alterations



# Climate change (and hatcheries...)

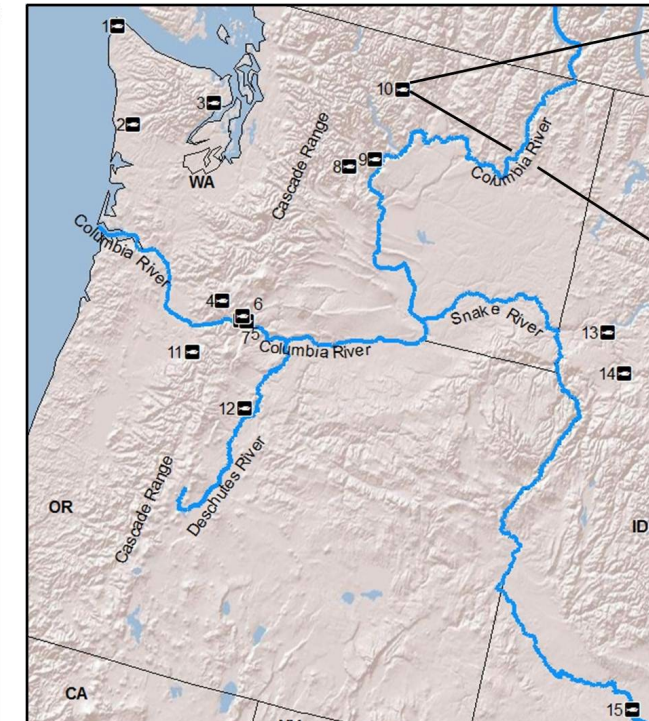
## REVIEW

### Potential effects of global climate change on National Fish Hatchery operations in the Pacific Northwest, USA

Kyle C. Hanson\*, Kenneth G. Ostrand

2011. Aquaculture Environment Interactions 1:175-186

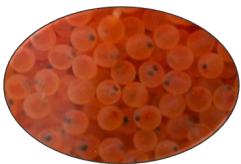
NFH facility	Increasing air temperature	Decreasing rainfall	Increasing rainfall	Seawater intrusion	Altered hydrological cycle
<b>Idaho</b>					
Dworshak	X	Spring	Fall, winter		X
Hagerman	X	Spring, summer	Fall		X
Kooskia	X	Spring	Fall, winter		X
<b>Oregon</b>					
Eagle Creek	X				X
Warm Springs	X	Winter, summer	Fall		X
<b>Washington</b>					
Carson	X	Winter, summer	Fall		X
Entiat	X	Winter, summer	Fall		X
Leavenworth NFH Complex	X	Winter, summer	Fall		X
Little White Salmon	X	Winter, summer	Fall		X
Makah	X	X		X	X
Quilcene	X	X		X	
Quinault	X	X			
Spring Creek	X	Winter, summer	Fall		X
Willard	X	Winter, summer	Fall		X
Winthrop	X				



# Climate change vulnerability assessments (CCVA) for NFH

*OBJECTIVE: Provide a framework to quantitatively analyze climate effects to help adapt hatchery infrastructure and programs to future conditions*

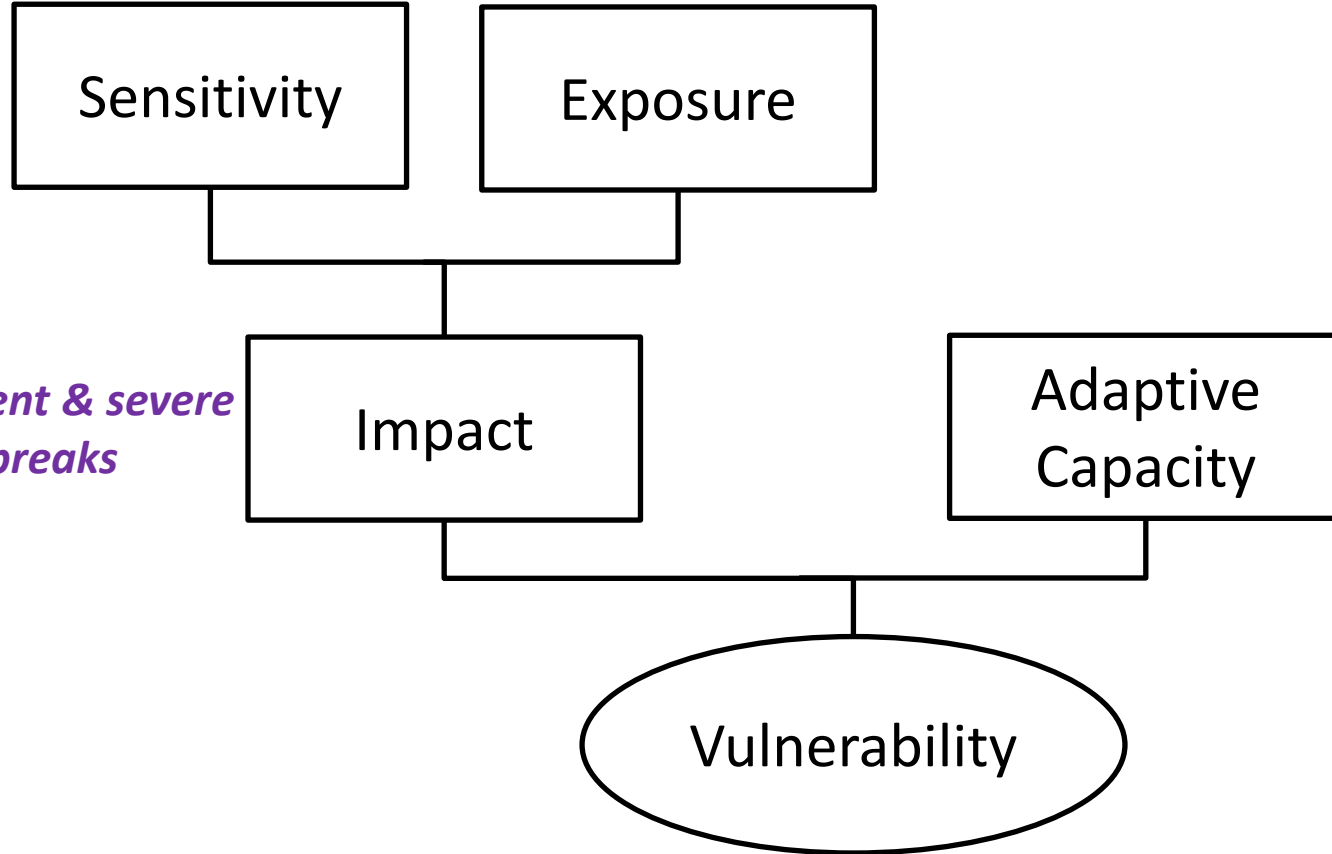
- Hatchery managers & biologists: set practical priorities to cope with future conditions
- Senior leadership and program managers: compare across programs and hatcheries using a consistent methodology
- Primary focus on the facility\*



# General components of a Vulnerability Assessment

*Thermally sensitive species;  
Disease outbreaks at high temps*

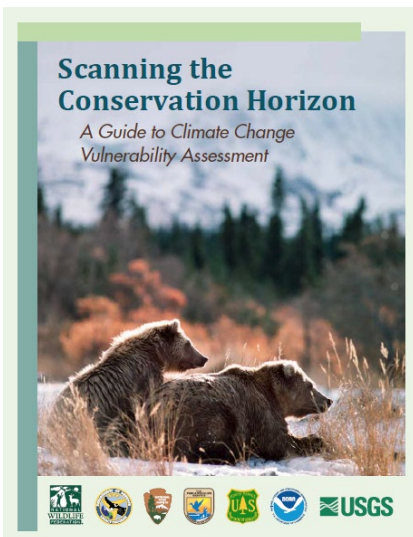
*Water temperatures  
predicted to increase*



*More frequent & severe  
disease outbreaks*

*Medicinal treatments  
& water chillers*

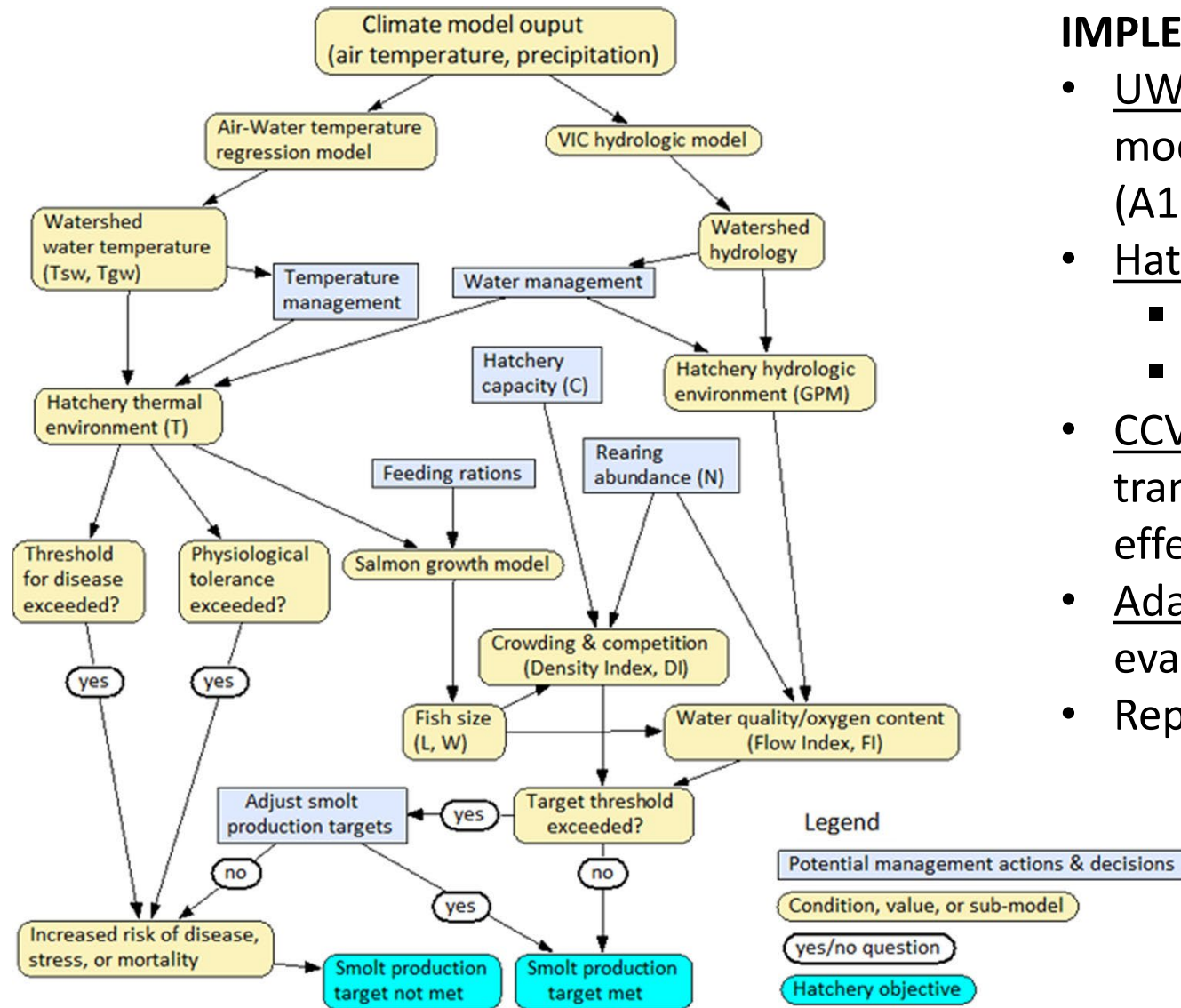
*Project occasional disease outbreaks at hatchery*



Glick et al. 2011



# CCVA Framework for Pacific Northwest NFH



## IMPLEMENTATION

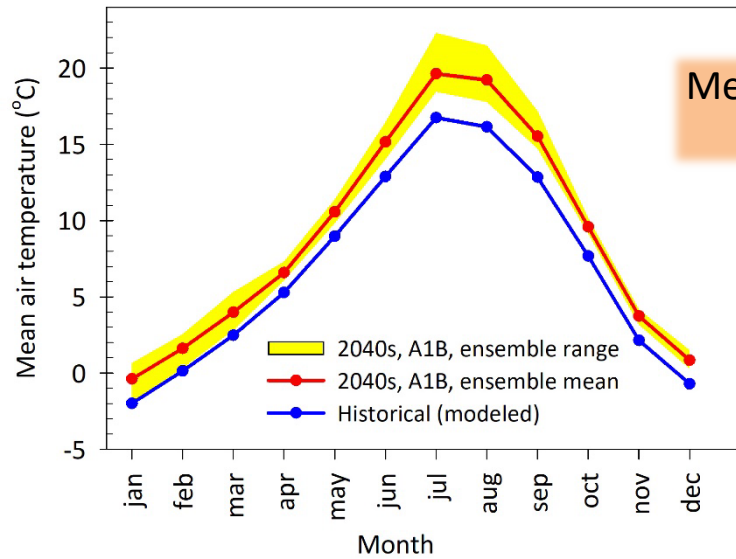
- UW Climate Impacts Group: Downscaled climate model output from 10 model ensemble from AR4 (A1B, 2040s); routed flow from VIC model
- Hatchery data from facilities and biologists
  - Operational information
  - Water usage for all sources
- CCVA team biologists: Data integration; QA/QC; translate changes in water temps & availability to effects on hatchery rearing programs
- Adaptation Planning meeting with hatchery staff, evaluation team, co-managers, stakeholders
- Reporting

$$\text{Flow Index} = \frac{N \times \text{mean weight}}{\text{Mean length} \times \text{inflow}}$$

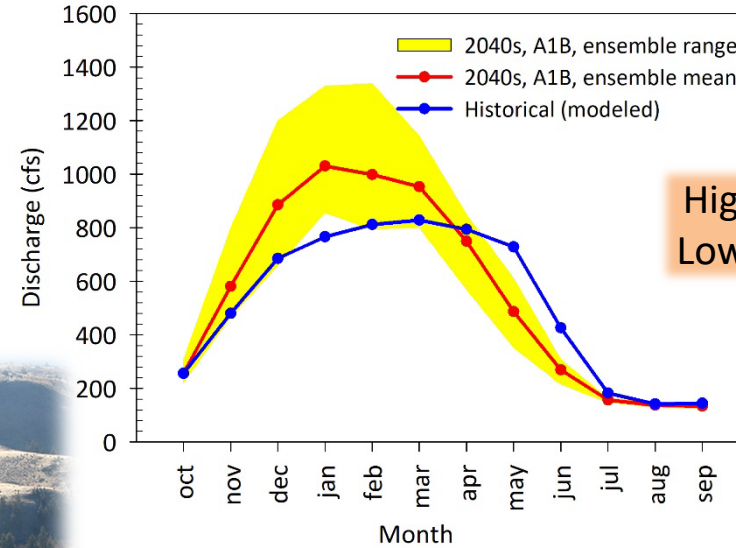
$$\text{Density Index} = \frac{N \times \text{mean weight}}{\text{Mean length} \times \text{capacity}}$$

# Spring Chinook at Warm Springs NFH (NE Oregon)

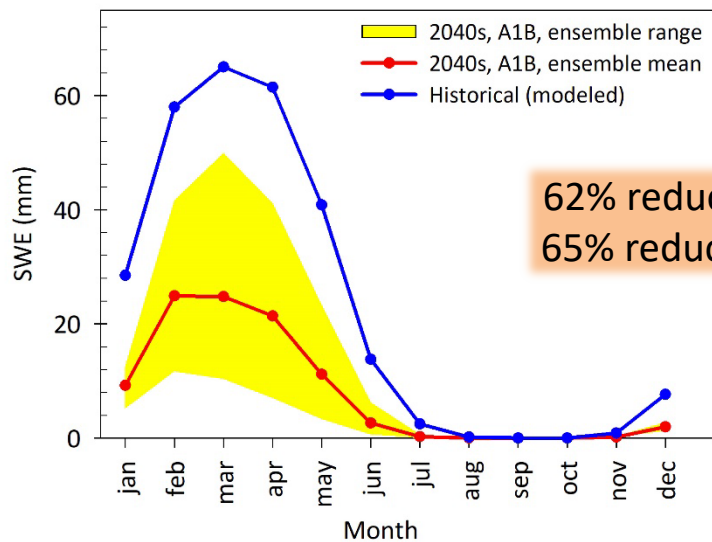
Warm Springs River drainage area air temperature



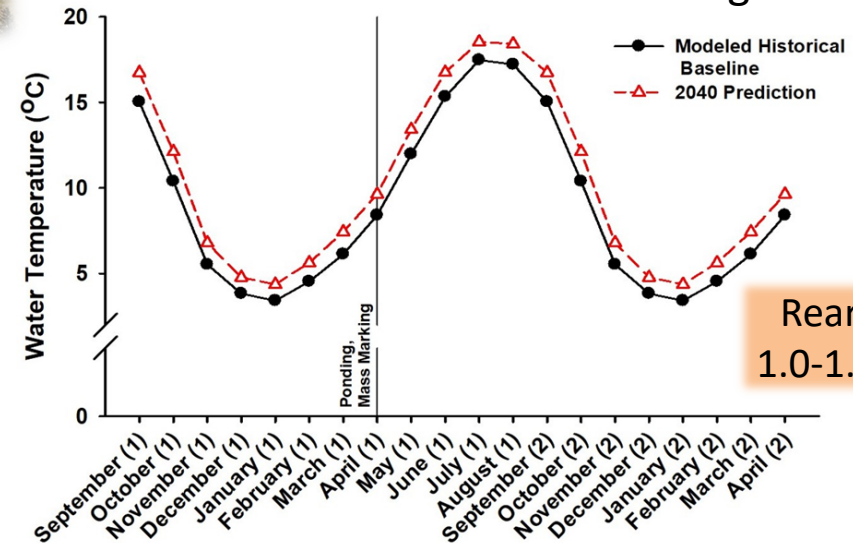
Warm Springs River near Warm Springs NFH



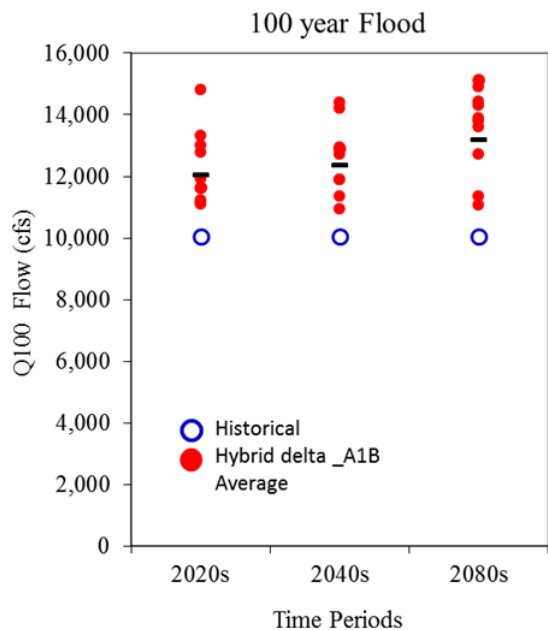
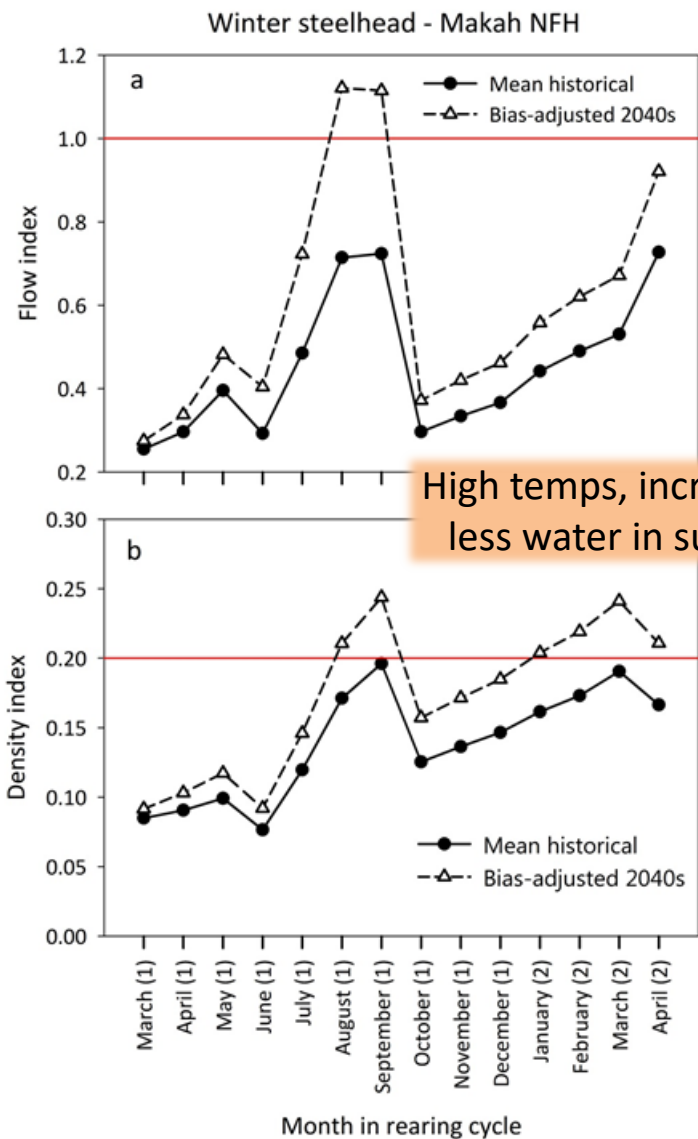
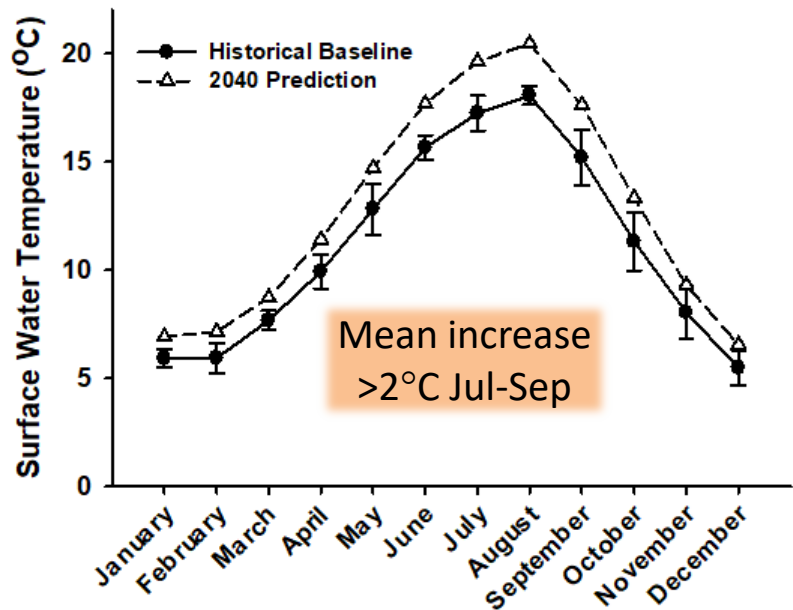
Warm Springs River drainage area Snow Water Equivalent (SWE)



Juvenile Chinook salmon rearing



# Winter steelhead at Makah NFH (Olympic Peninsula, WA)



# Lessons learned so far from NFH experience

- 1. Sensitivity and overall vulnerability of programs vary by geography and species**
  - Steelhead at Makah NFH may be impossible
  - Summer Chinook salmon, Entiat NFH may be ok with moderate mitigation measures
- 2. Process & meeting did lead to re-consideration of current practices**

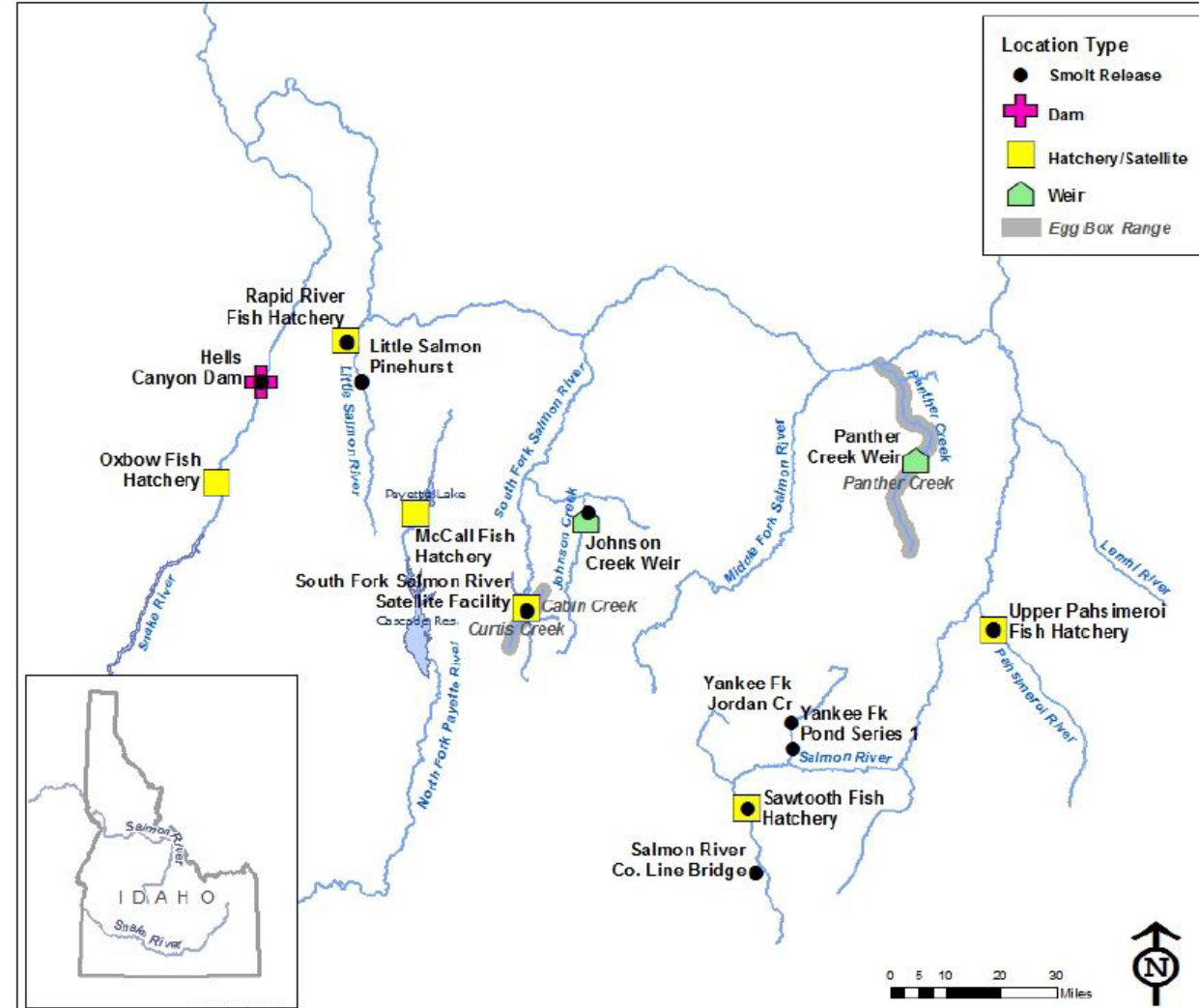
**E.g., consider change to chum salmon at Makah and reconsider PRAS building**
- 3. Standardized evaluation was challenging - every facility had unique infrastructure and operations**
  - Translating changes in surface water to water available to hatcheries
  - Groundwater & blending of water sources
- 4. Sometimes, hatchery data was difficult to obtain**
  - Variability in record keeping
  - Staff turnover

# LSRCP Perspective

- Climate change impacts occurring now and will continue into the future with LSRCP programs (spring/summer Chinook, fall Chinook, steelhead).
- Need a useful, quantitative tool to address and identify needs of the programs/facilities.
- Each facility/program in LSRCP will likely be evaluated
  - Sawtooth, McCall Chinook programs (proximity, overlap with co-managers).
  - Discussion with cooperators on next programs....Tucannon River Chinook/steelhead, Snake River Fall Chinook (Irrigon, Lyons Ferry, FCAP), NE Oregon spring/summer Chinook.
- USFWS, co-manager staff (M&E/O&M) participation and co-manager involvement in the process.
  - Statement of Works, Cooperative Agreements
  - Data requests, participating/reviewing/responding to modeling, developing actions/options, infrastructure needs, engaging partners.

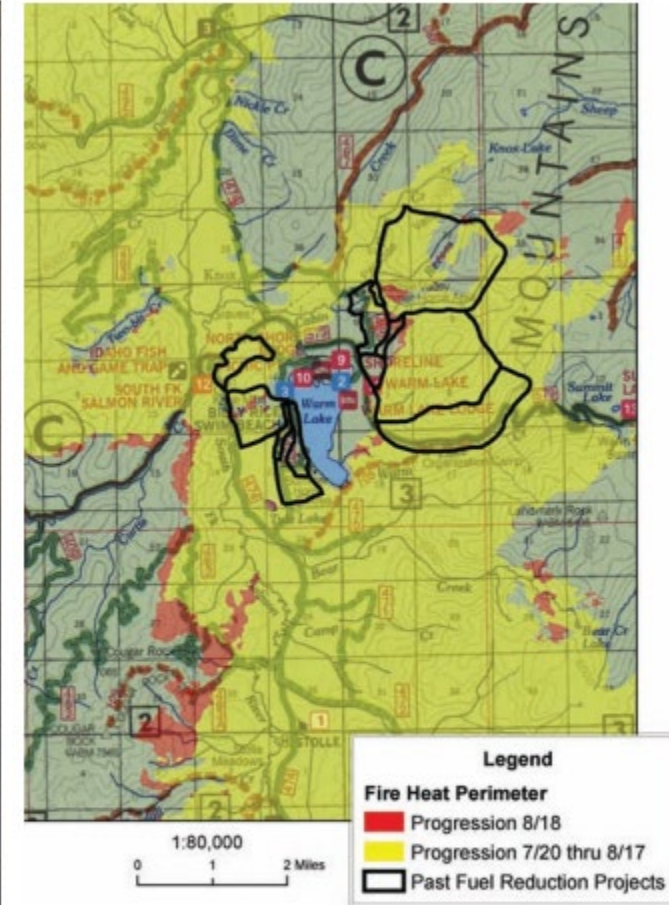
# McCall Hatchery – South Fork Salmon River Summer Chinook

- Consistently high performing program in LSRCP.
  - ESA-listed, integrated program.
  - 8,000 adult goal, 0.80 SAR target
  - 0.5 SAR, 0.8 SAS BY2007-2016
- Adult collection and juvenile release at South Fork Salmon River
  - Weir, adult holding ponds, spawning activities, HOR/NOR management
  - Water source is SFSR
- Rearing at McCall Hatchery
  - Incubation, rearing only
  - Water source is Payette Lake



# McCall Hatchery – South Fork Salmon River Summer Chinook

2007 Cascade complex fires (Graham et al. 2009 – USFS, Rocky Mountain Research Stat.)



**Figure 35.** By August 18, the Monumental and North Fork Fires, while burning near Warm Lake, burned through or approached over 5,000 acres (outlined) that were treated to influence both fire behavior and burn severity.

# McCall Hatchery – South Fork Salmon River Summer Chinook

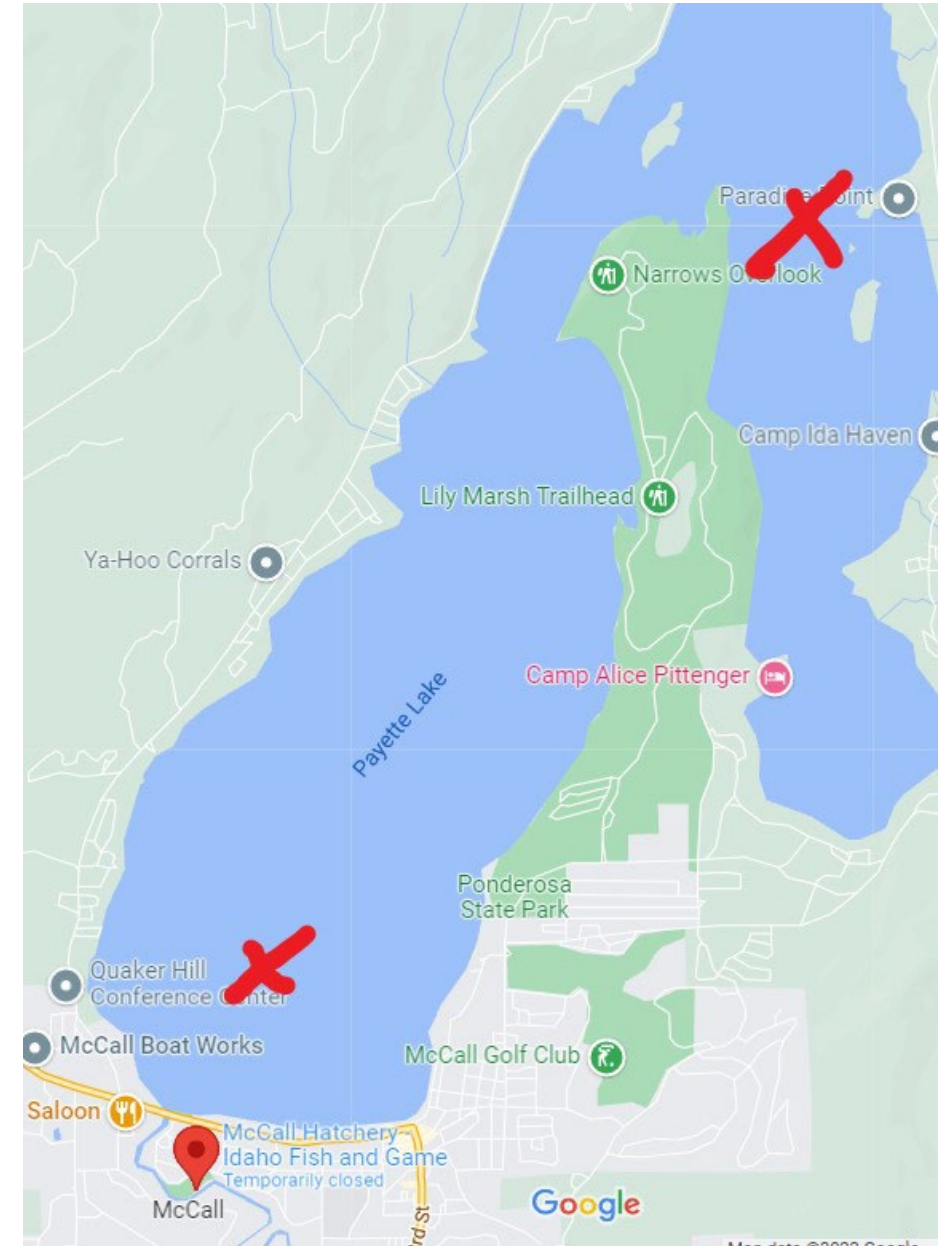
- South Fork Salmon River
  - Ridge to river exposed, canopy gone
  - Decreasing snowpack
  - Debris, runoff events, flash flooding
  - 2014 brood die off from flash flood event
  - 2017 Log jam/debris at intake
  - Ich/Furunculosis increased
  - 2015, 2021, 2022 holding conditions on-site inhospitable
    - 2021-2022 Rapid River (IPC) adult holding.
- Broodstock holding pond construction at McCall Hatchery (2022), spawning shed, shade structure – \$1.6 – 1.9M total cost.





# McCall Hatchery – South Fork Salmon River Summer Chinook

- McCall Hatchery
  - Water source Payette Lake
  - Two intakes into lake (200m), thermal mixing possible
    - Surface – 7 feet - warmer water (winter)
    - Deep – 50 feet - colder water (summer)
  - Payette Lake has potential for warming, shifting thermocline.
    - Stratification/temperature
    - Algal blooms
    - Upper Payette River temperature impacts
  - Modeling effort, partners and interested parties?
    - City of McCall, USFS, Idaho DEQ
  - Monitoring is present, strategic planning and development of options from CCVA.



# LSRCP progress

1. Working team Doug, Rod, John Erhardt (USFWS Idaho Fish & Wildlife Conservation Office), and Kathleen Hemeon (Abernathy) collaborate with evaluation and operations staff
2. Rearing, temperature, and water use data received from Sawtooth and McCall hatcheries
3. Team trying to determine climate datasets to use for pilot programs and other LSRCP facilities
4. Working through the “unique” aspects of pilot programs



LOWER SNAKE RIVER  
COMPENSATION PLAN  
*Hatchery Program*

