Northwest **Power** and **Conservation** Council

November 7, 2017

MEMORANDUM

TO: **Council Members**

FROM: **Jeff Allen**

SUBJECT: **Idaho Sockeye Update**

BACKGROUND:

Presenter: Paul Kline and Dr. Jesse Truhenski, IDFG

Summary: Paul Kline, Assistant Chief of Fisheries and Dr. Jesse Trushenski, Fish Health Program Supervisor for the Idaho Department of Fish and Game will review efforts to date to expand the production of Snake River Sockeye Salmon to more effectively address recovery objectives. Mr. Kline and Dr. Trushenski will review the "start-up" of the new Springfield Hatchery in Eastern Idaho and the ramp-up of smolt production at the new facility to meet design capacity guidelines. Smolt out-migration survival information will also be reviewed along with a discussion of strategies to employ to maximize the success of this growing program.

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

UPDATE

SNAKE RIVER SOCKEYE SALMON PROGRAM EXPANSION

NORTHWEST POWER AND CONSERVATION COUNCIL
FISH COMMITTEE MEETING – NOVEMBER 14, 2017
COEUR D'ALENE, ID

Paul Kline
Jesse Trushenski
IDAHO DEPARTMENT OF FISH AND GAME

OUTLINE

Program expansion

Expected outcomes (from expansion)

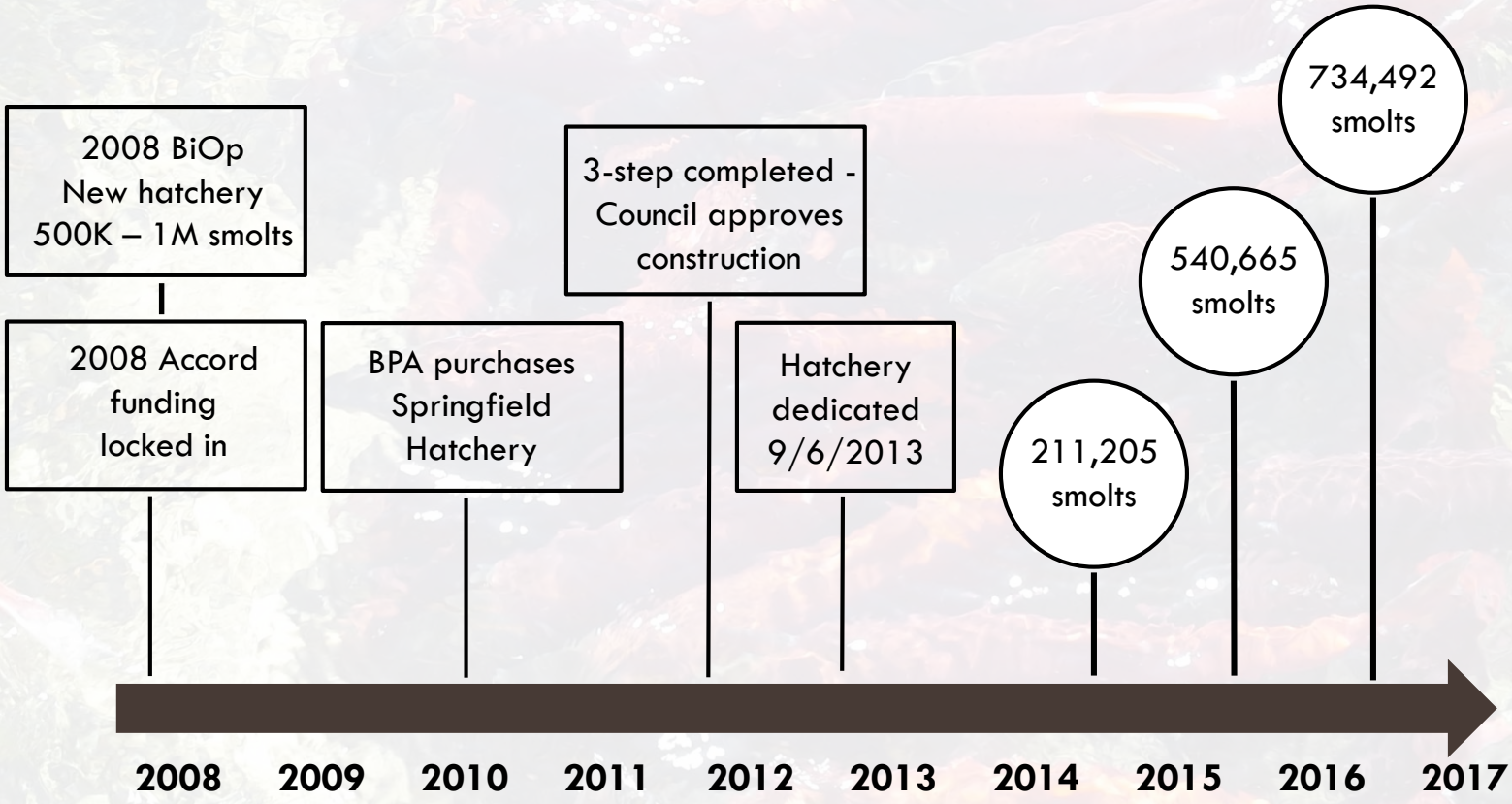
New hatchery start-up

Smolt release evaluations

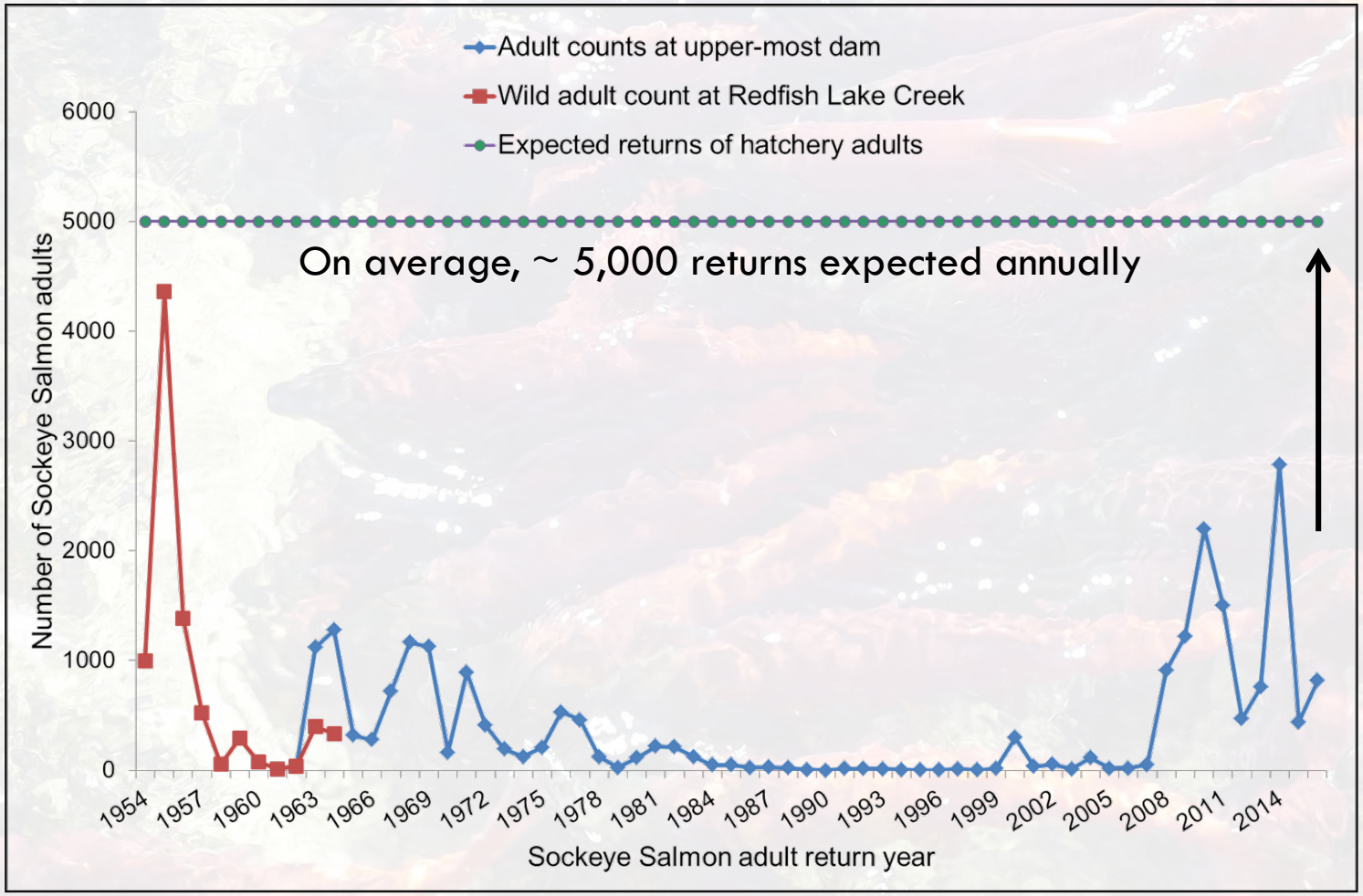
Challenges (identifying and solving)

Next steps

PROGRAM EXPANSION



EXPECTED OUTCOMES



NEW HATCHERY START-UP

Springfield Hatchery

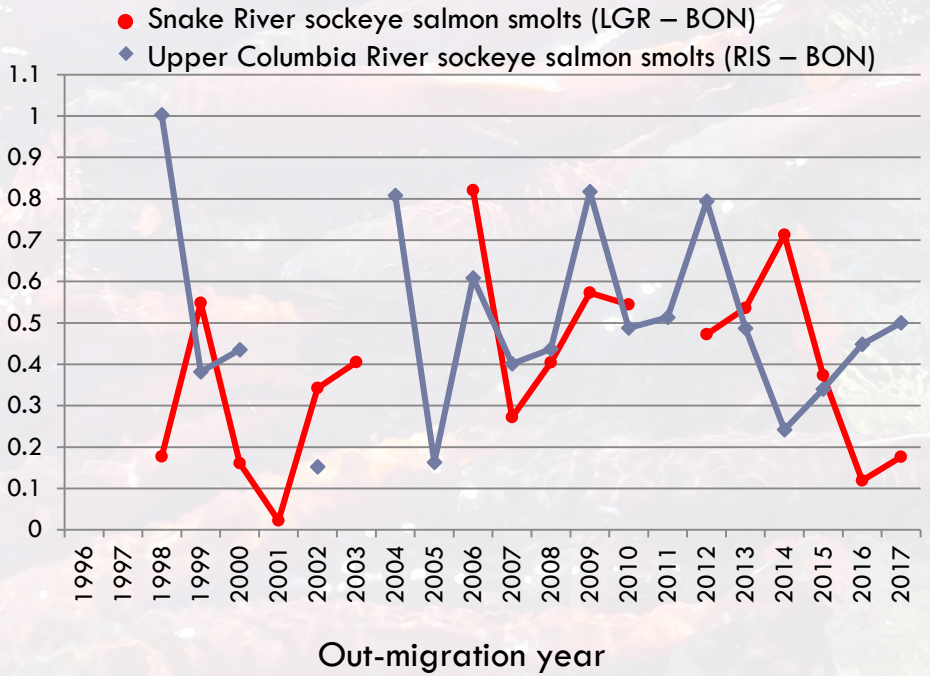
NEW HATCHERY START-UP

- ✓ Incubation and rearing systems
- ✓ In-hatchery survival

NEW HATCHERY START-UP

- ✓ Pre-release condition of fish

SMOLT RELEASE EVALUATIONS



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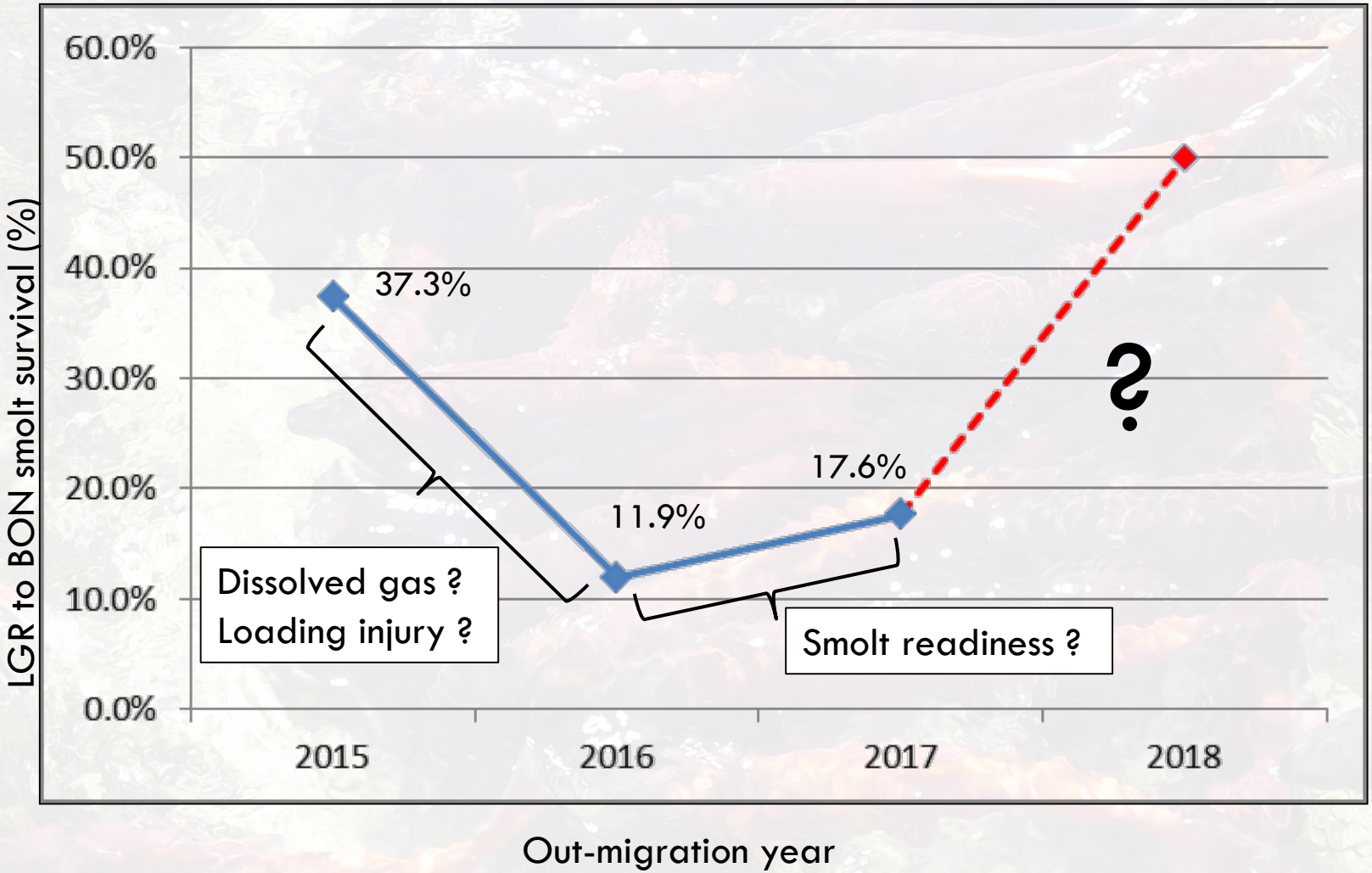


CAUSE FOR CONCERN

2015 Releases (BY13)

- 1st releases of smolts from Springfield Fish Hatchery
- 211K+ smolts released
- 3K+ mortalities observed by 2nd day of releases
- Fish in poor condition, showed signs of gas bubble trauma

MORTALITY RELATED TO GAS SUPERSATURATION, FAULTY AERATOR?

2016 Releases (BY14)

- Gas supersaturation issues addressed
- 540K+ smolts released
- Post-release mortality estimated at 8K+
- Fish showed overt descaling, signs of blunt force trauma

MORTALITY RELATED TO PUMPING TRAUMA, (DE)SMOLTIFICATION?

SMOLTIFICATION IN FISH

Parr

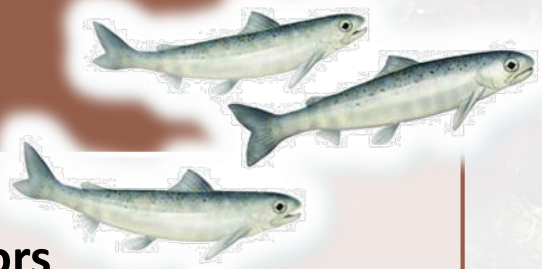
Osmotic gradient favors water absorption and ion loss for fish

Fish do not drink

Active uptake of Na and Cl by gill tissue, other ions in gut

Glomerular filtration rate is high, kidney produces copious and dilute urine

Smolt



Osmotic gradient favors water loss and ion accumulation for fish

Fish drinks continuously

Active export of Na and Cl by gill tissue, other ions via urine

Glomerular filtration rate is reduce, kidney produces scant, concentrated urine

STRESS RESPONSE IN FISH

Chemical Stressors

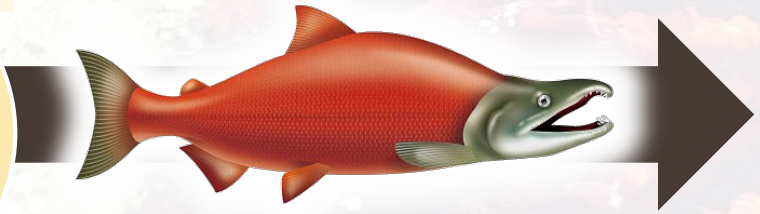
- Low dissolved O_2
- High CO_2
- Toxic materials

Physical Stressors

- Handling
- Forced swimming
- Temperature

Perceived Stressors

- Predator presence
- Startling stimuli
- Unfamiliar setting



Primary Response

Secondary Response

Tertiary Response

Stressor Perception

Hormonal Axes Engaged

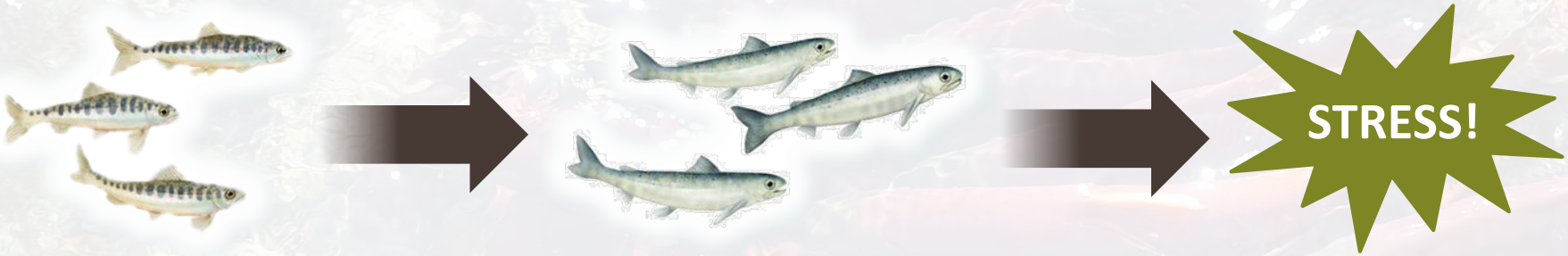
Metabolic changes to support fight/flight

Physiological consequences of energy mobilization

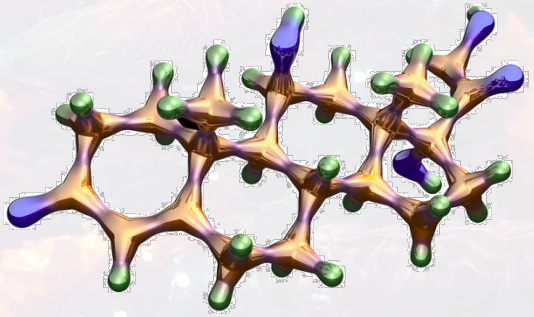
Major functional & behavioral changes

Altered fitness

SMOLTS ENCOUNTER MULTIPLE STRESSORS



Stress and smoltification share physiological mediators and influence many of the same processes

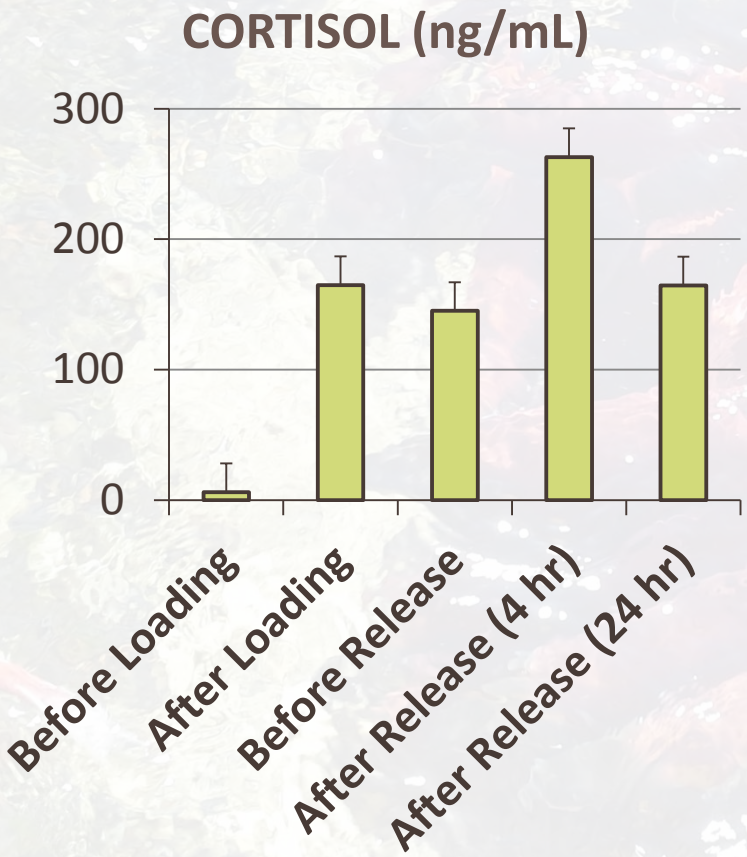


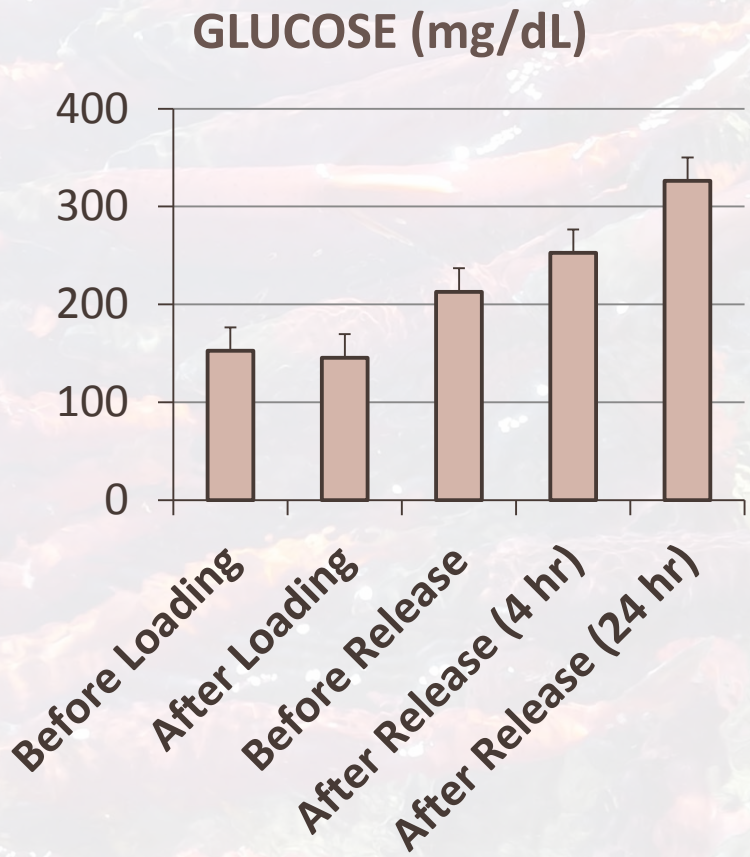
Smoltification coincides with another stressor—transportation and release

EXPERIMENTAL DESIGN

Sample Collection	Replication	Parameters to be Measured
Jan-Feb, monthly	20-25 fish per sampling point	Length & weight
Mar-release, twice monthly	Two raceways	Smolt index
Before and after loading, transportation, and release	Progeny of Eagle broodstock and Manchester broodstock	Observations
Natural-origin fish		HSI & lipid levels
		Physiological measures of stress and smoltification

BLOOD CHEMISTRY BEFORE & AFTER TRANSPORT





RESULTS SUGGEST ANOTHER STRESSOR IS AFFECTING FISH POST-RELEASE

WATER CHEMISTRY—THE SMOKING GUN?

Springfield Hatchery

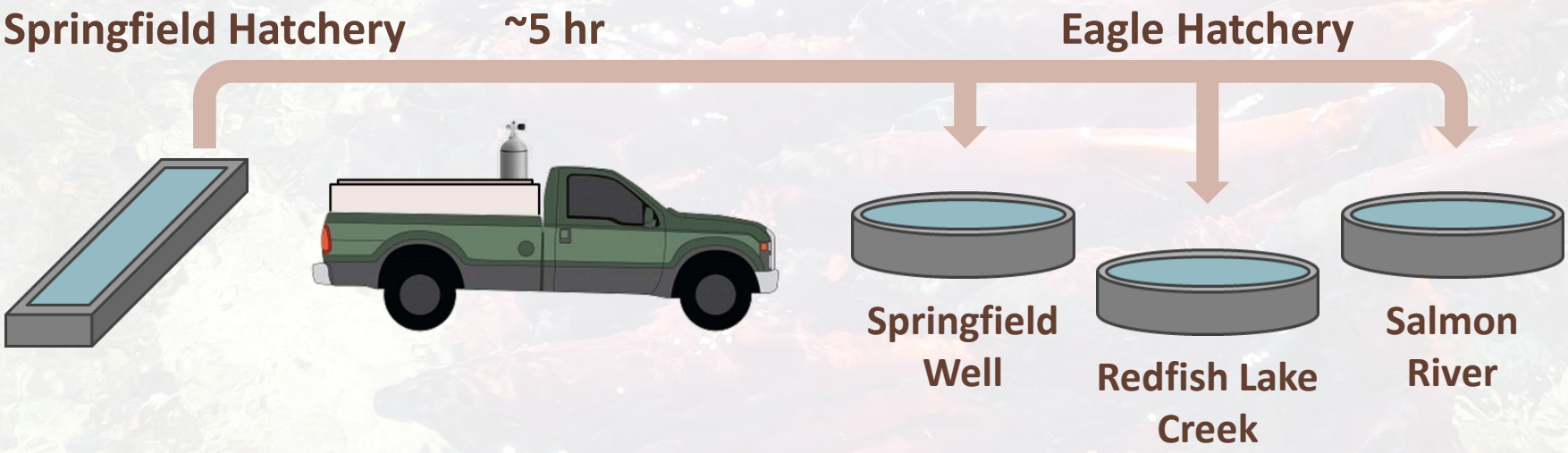
- Alkalinity = 194-202 mg/L
- Hardness = 234-248
- pH = 7.70-7.75

Redfish Lake Creek

- Alkalinity = 1-8 mg/L
- Hardness = 11-12 mg/L
- pH = 7.41-7.72

DRAMATIC DIFFERENCES IN WATER CHEMISTRY PROFILE LIKELY ANOTHER SOURCE OF PHYSIOLOGICAL STRESS

PRESMOLT EXPERIMENTATION—PHASE 1



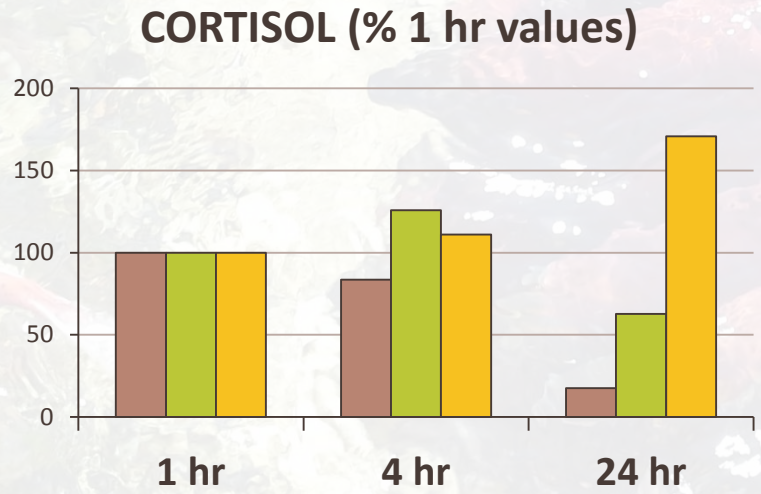
SAMPLE BLOOD CHEMISTRY BEFORE AND AFTER TRANSPORT AND RELEASE TO DIFFERENT WATER SOURCES

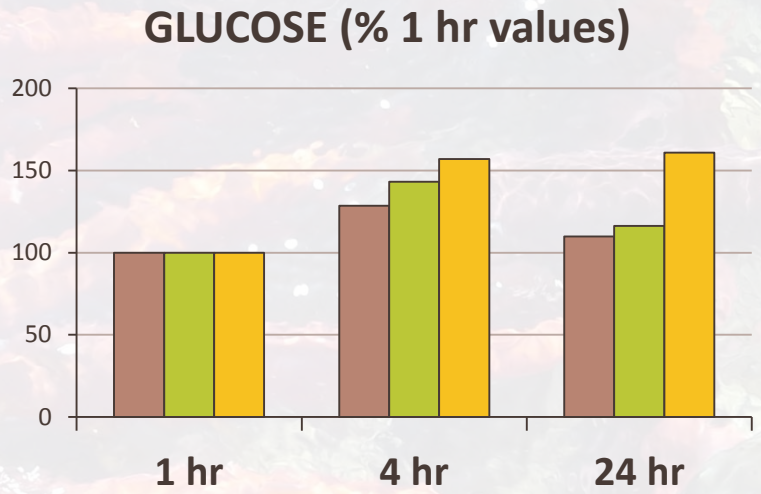
VERIFY DIFFERENCES IN WATER CHEMISTRY ARE CAUSE OF DIFFERENTIAL STRESS RESPONSES AND SURVIVAL

EXPERIMENT CONDUCTED 5-7 OCTOBER 2017

PRESMOLT EXPERIMENTATION—PHASE 1

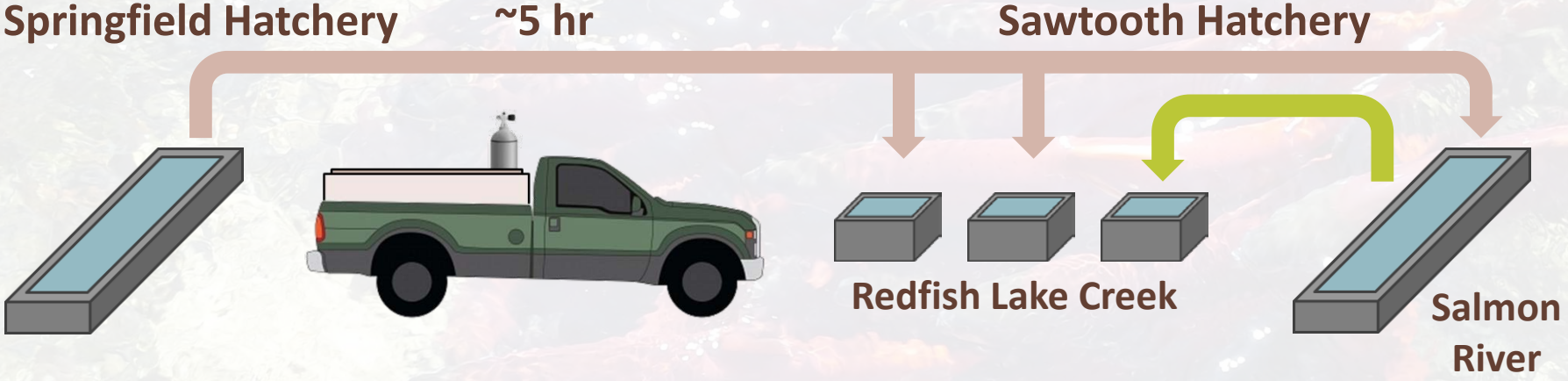
SPRINGFIELD WELL	SALMON RIVER	REDFISH LAKE CREEK
• Alkalinity = 188 mg/L • Hardness = 232 mg/L • pH = 8.18	• Alkalinity = 66 mg/L • Hardness = 68 mg/L • pH = 7.94	• Alkalinity = 17 mg/L • Hardness = 11 mg/L • pH = 7.33

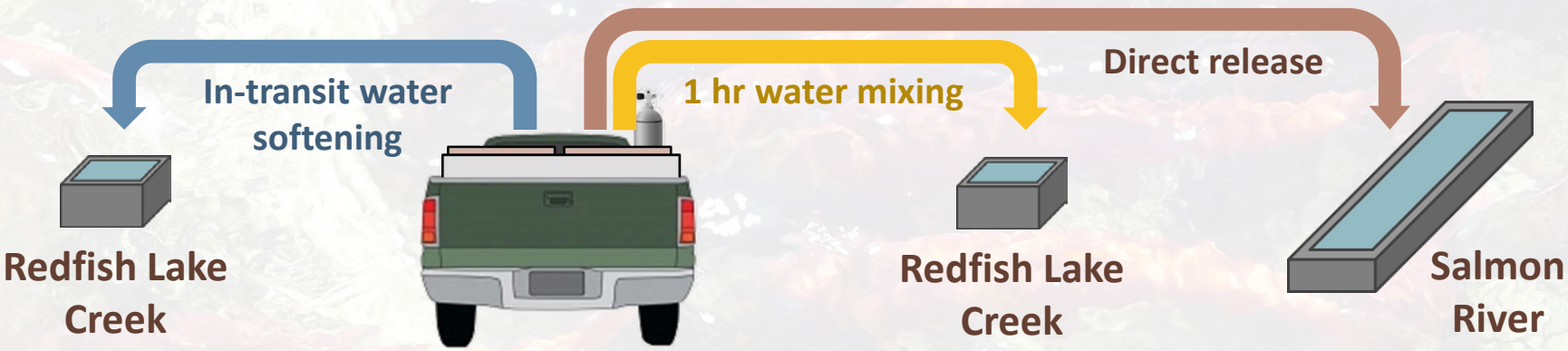




RESULTS SUPPORT WORKING HYPOTHESIS RELATED TO WATER CHEMISTRY

PRESMOLT EXPERIMENTATION—PHASE 2





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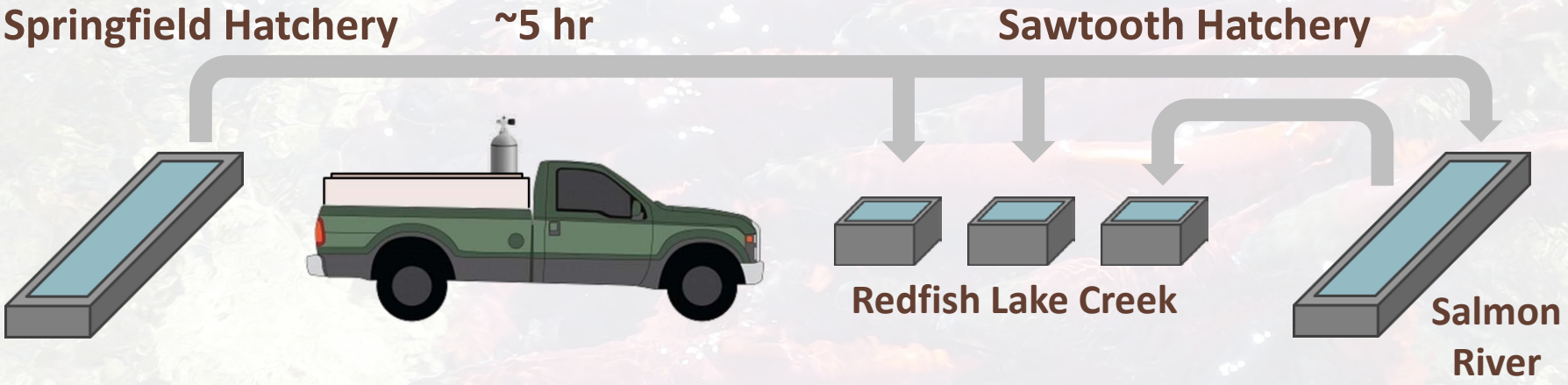

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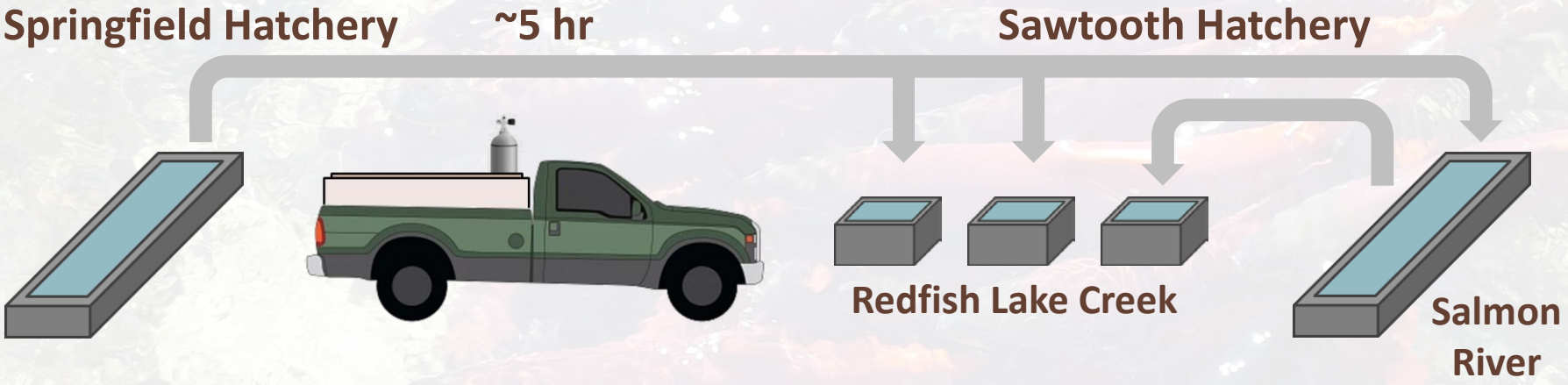


SAMPLE BLOOD CHEMISTRY BEFORE AND AFTER TRANSPORT AND RELEASE TO DIFFERENT WATER SOURCES

UNDERSTAND THE MAGNITUDE AND TIMING OF STRESS RESPONSE RELEATED TO DIFFERENT RELEASE STRATEGIES

EXPERIMENT CONDUCTED 24-26 OCTOBER 2017

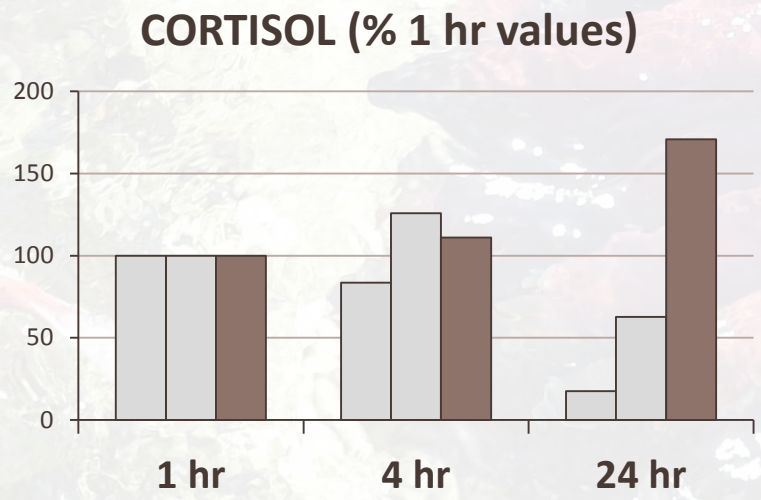
PRESMOLT EXPERIMENTATION—PHASE 2

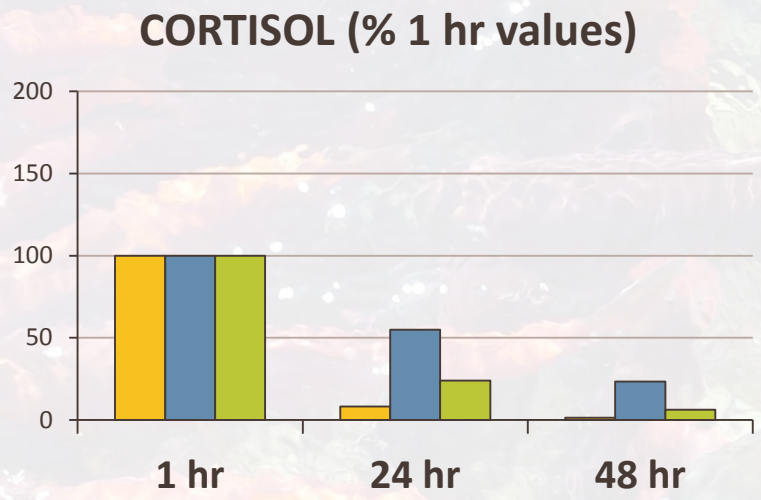
DIRECT RELEASE SPRINGFIELD TO RFLC

SPRINGFIELD TO RFLC WITH WATER MIXING

SPRINGFIELD TO RFLC WITH WATER SOFTENING

DIRECT RELEASE SALMON RIVER TO RFLC





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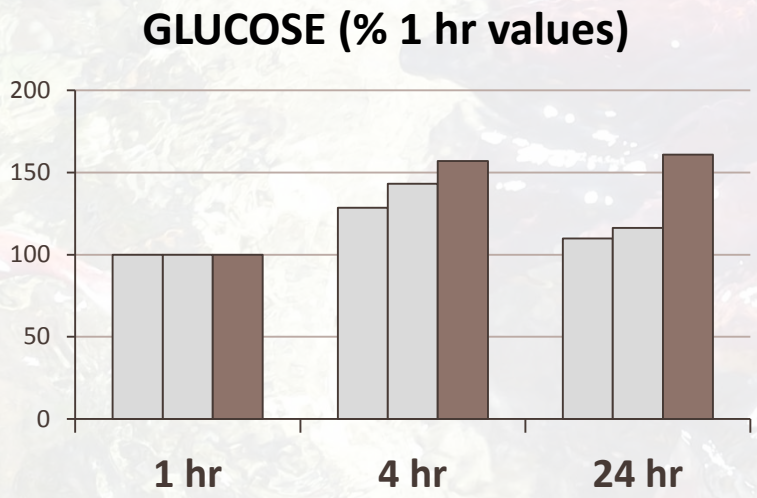

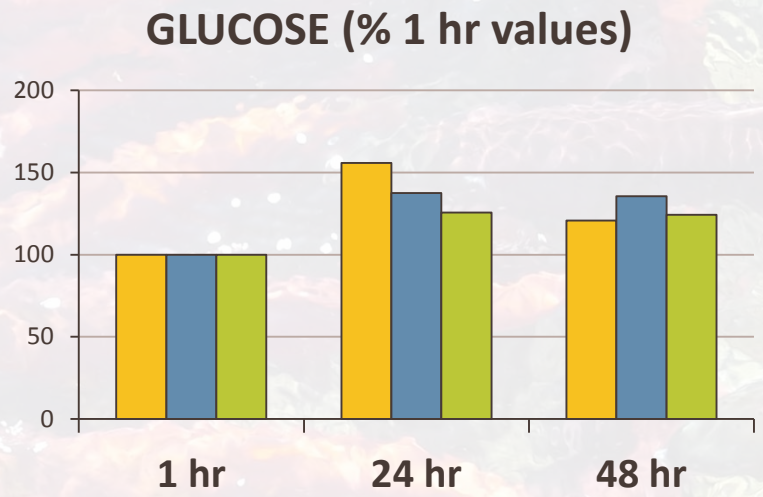

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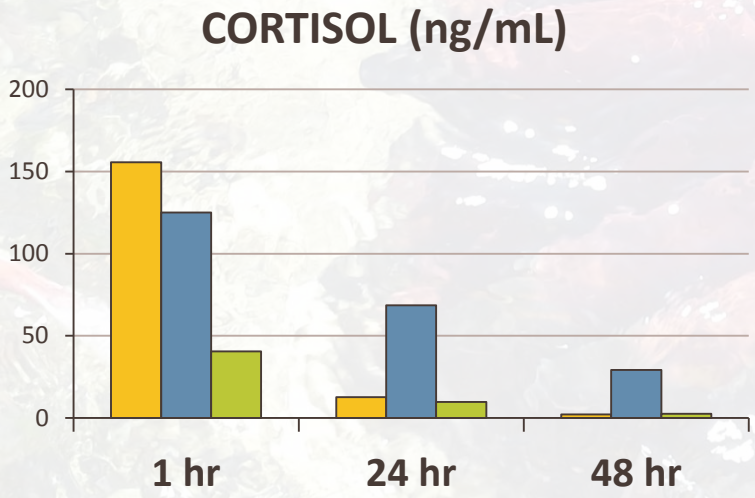

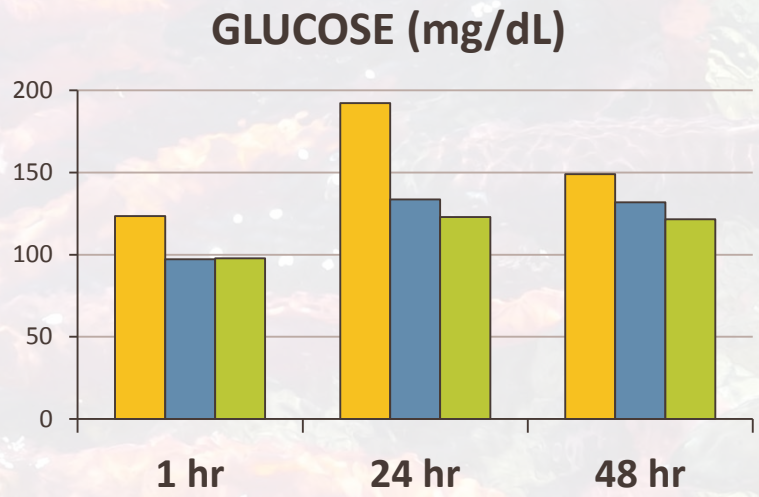

WHAT WE'VE LEARNED SO FAR

Smolts face a number of stressors during transport and after release

- Handling and loading, in-transit conditions, temperature changes, transition to natural environment
- Stress is magnified by the physiological strain of smoltification

Water chemistry appears to be a significant contributor to reduced survival of Springfield-reared smolts

Water mixing and/or softening hold promise, but short-term holding at Sawtooth Hatchery and acclimation to Salmon River water seems to be the most effective strategy to address water chemistry differences between Springfield Hatchery and Redfish Lake Creek

- Additional experimentation planned for Spring 2018

ADAPTIVE MANAGEMENT ACTIONS FOR BY16

~237K presmolts released to Redfish Lake after 1-2 weeks of acclimation at Sawtooth Hatchery **(October 2017)**

~332K smolts released to Redfish Lake Creek after acclimation at Sawtooth Hatchery **(April/May 2018)**

~285K smolts released to Salmon River after acclimation at Sawtooth Hatchery **(April/May 2018)**

~47K smolts released directly to Redfish Lake Creek, without acclimation at Sawtooth Hatchery **(April/May 2018)**

ADAPTIVE MANAGEMENT ACTIONS FOR BY17

Total smolt production target reduced to ~750K **(September 2017)**

Additional 450 adults from NOAA captive broodstock released to Redfish Lake **(September 2017)**

~300K smolts to be reared at Sawtooth Hatchery
(November 2017—April/May 2019)

~450K smolts to be reared at Springfield Hatchery
(November 2017—April/May 2019)

Release strategy to be determined based on additional experimentation and results of BY16 smolt releases

BY18 AND BEYOND

Future proposals for rearing and releasing Sockeye Salmon will depend on the relative success of strategies implemented for BY16 and BY17

Any changes will involve a number of logistical and administrative hurdles that will need to be cleared

- Transport truck and driver availability for dual transport events
- Biosecurity risks associated with fish movement and/or water mixing
- Utilization of LSCRP facility for acclimation or rearing
- Others?

Fully understanding the problem—and we think we are getting close—puts the solution within reach

Questions? Please ask!