

SYNTHESIS OF BEST AVAILABLE SCIENCE:

**Temperature and Dissolved Oxygen Conditions
in the Lake Washington Ship Canal
and Impacts on Salmon**



Lake Washington Ship Canal: Temperature and Dissolved Oxygen Science Synthesis & Roundtable

Lauren Urgenson

WRIA 8 Technical Coordinator

Cedar River Council Meeting¹

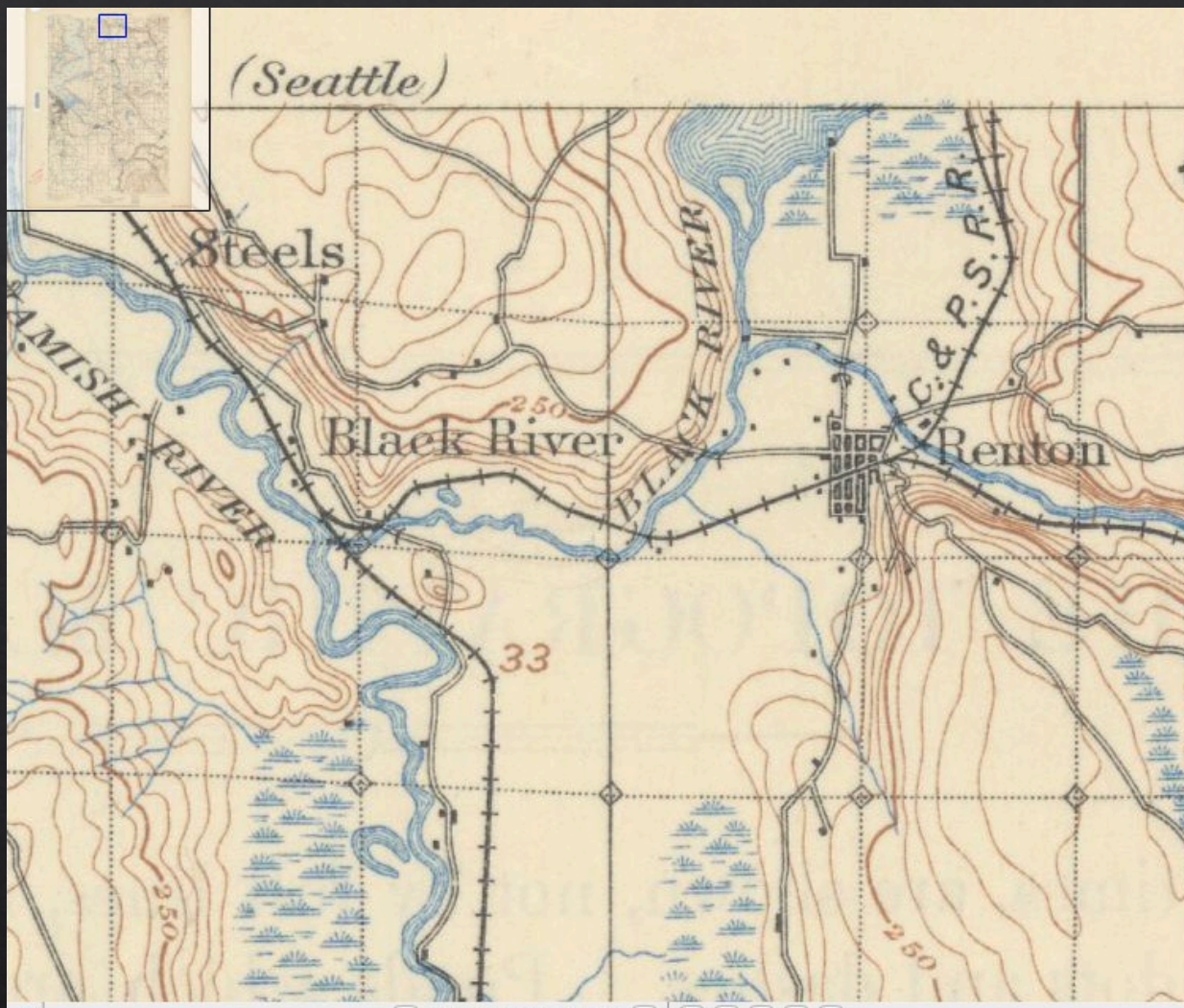
September 28, 2021

March 2021



King County
Science and
Technical Support Section





<https://geologywriter.com/>

Black River, Seattle, ca 1899 (MOHAI 6465).jpg



1885



1983



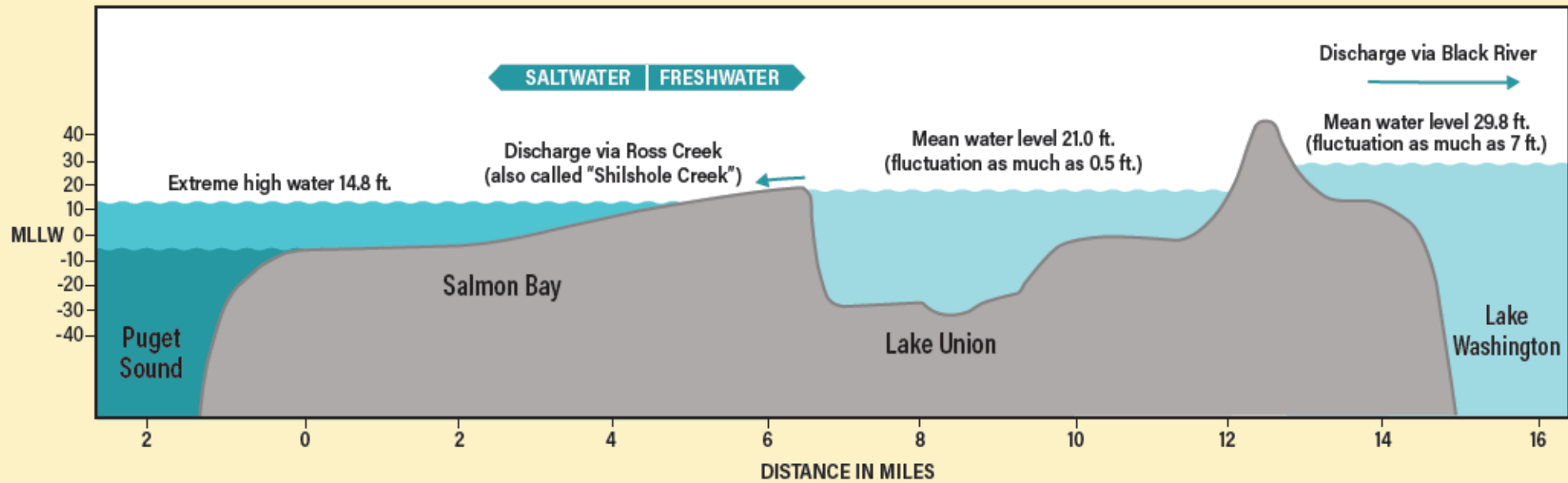
1913



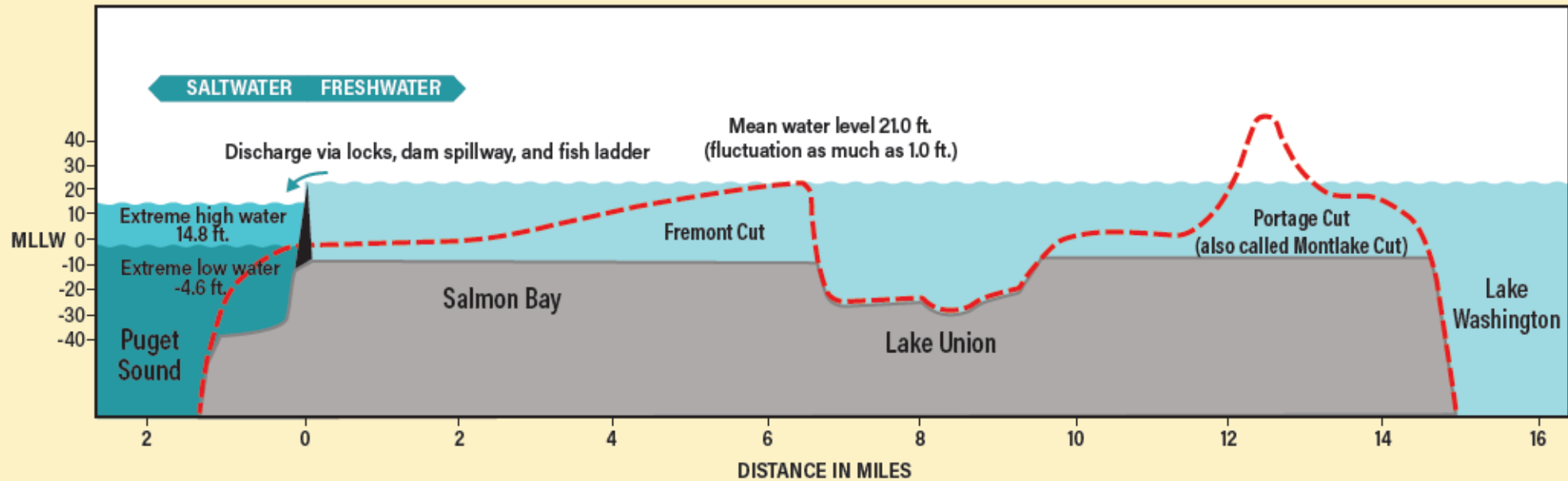
1916

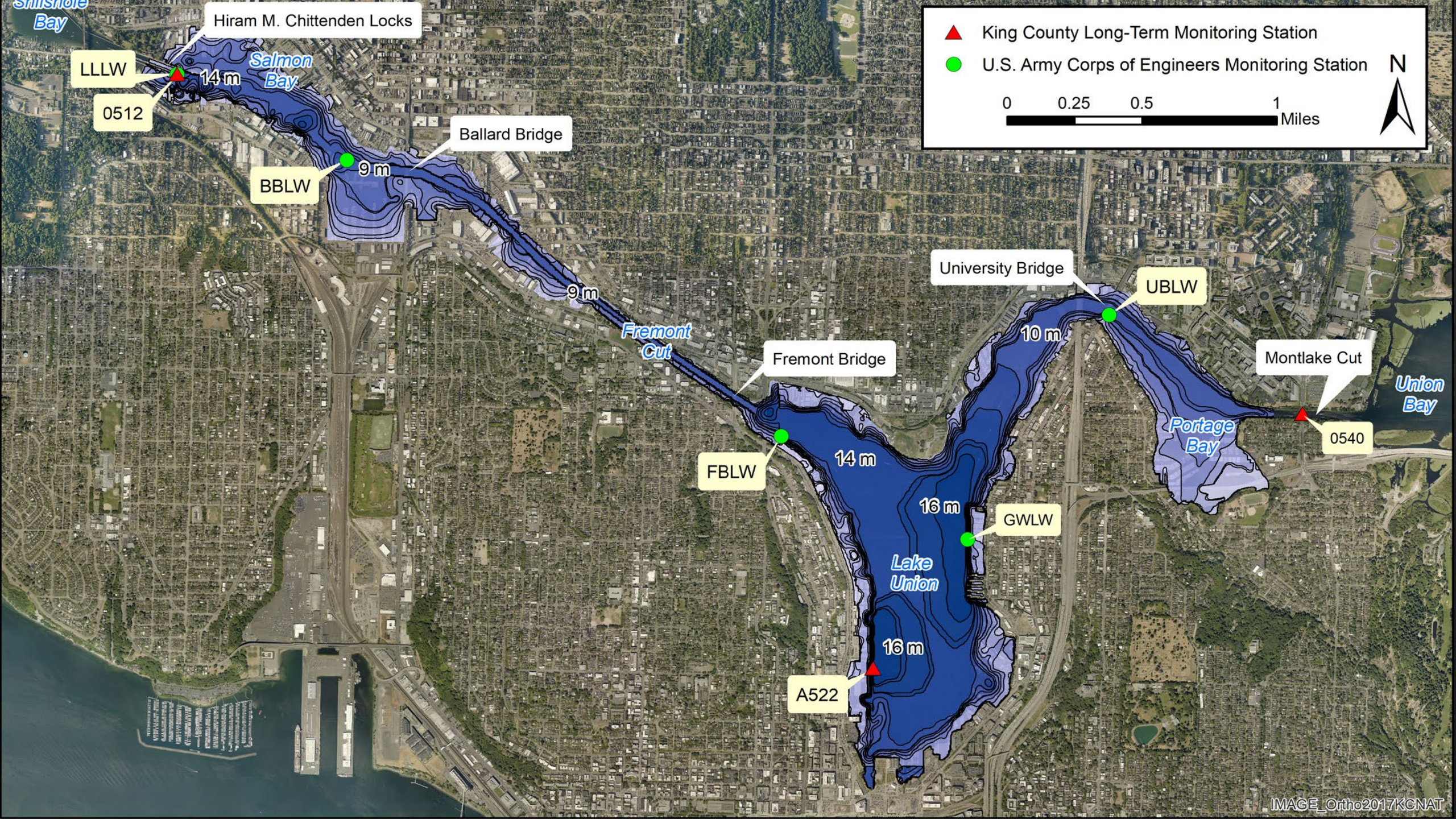


HISTORICAL (PRE-CANAL) CONDITIONS



PRESENT DAY CONDITIONS





Hiram M. Chittenden Locks

LLLW

0512

14 m

Salmon Bay

BBLW

9 m

Ballard Bridge

9 m

Fremont Cut

Fremont Bridge

FBLW

14 m

16 m

Lake Union

16 m

A522

GWLW

University Bridge

10 m

UBLW

Portage Bay

Montlake Cut

0540

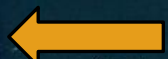
Union Bay

King County Long-Term Monitoring Station

U.S. Army Corps of Engineers Monitoring Station

0 0.25 0.5 1 Miles



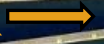


Puget Sound

Large Lock



Small Lock



Saltwater Drain Intake



Lake Washington

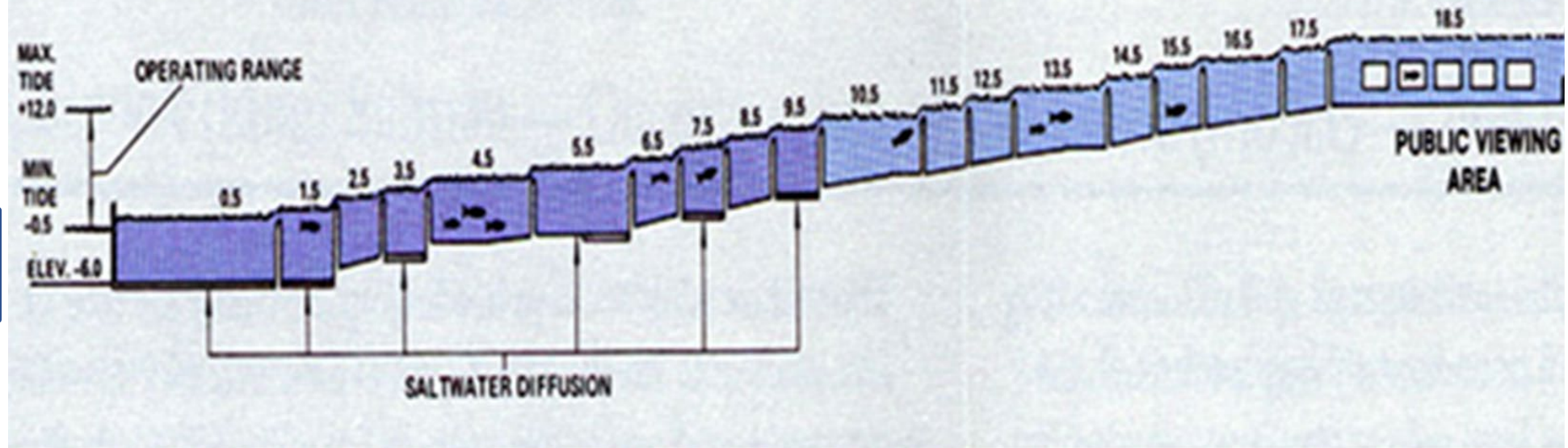
Smolt Flumes



Fish Ladder



THE FISH LADDER IN PROFILE



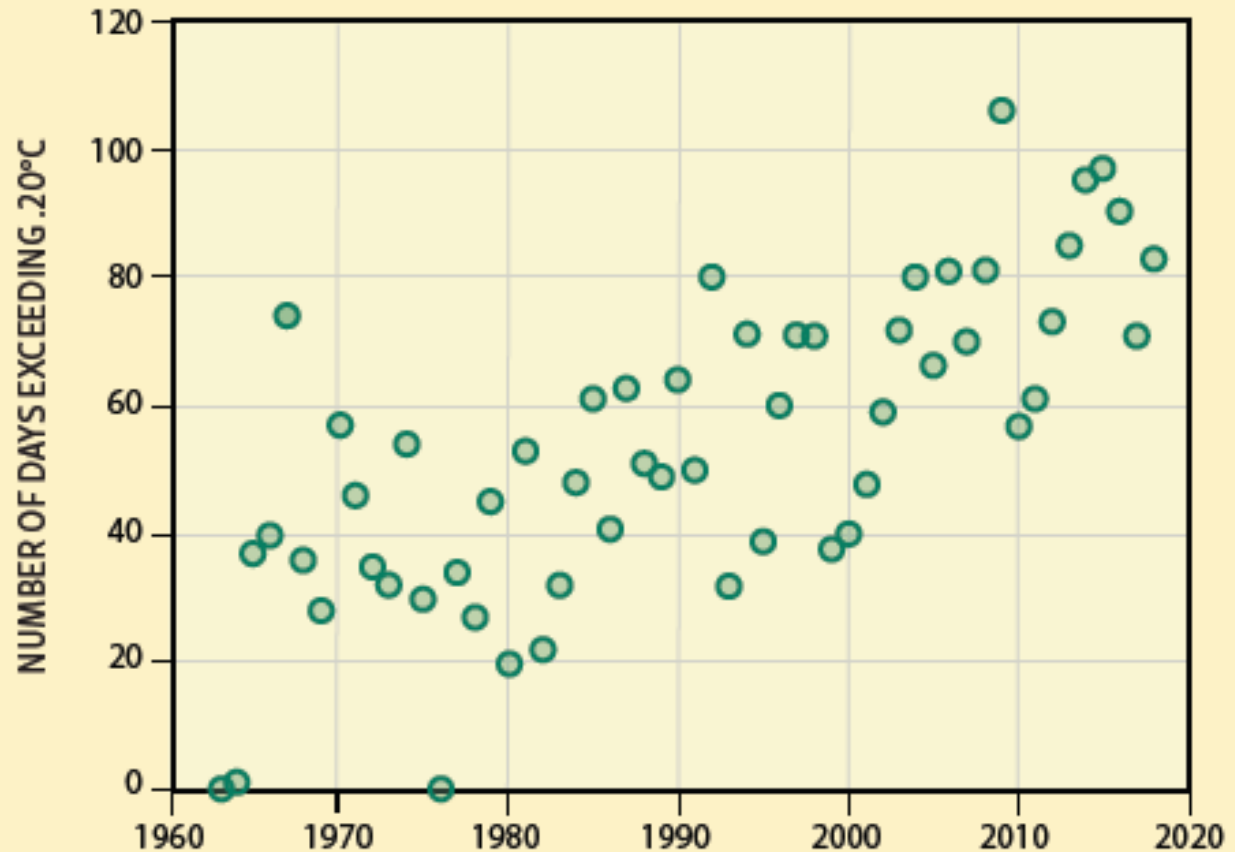
←
Puget Sound

Avg. 15.1°C
(59.2 °F)

Avg. 21.6°C
(70.9 °F)

*Lake
Washington*
→

Increasing Surface Water Temperatures, Lake Washington



Data provided by C. DeGasperi, King County Department of Natural Resources and Parks. Adapted from Goetz and Quinn (2019).

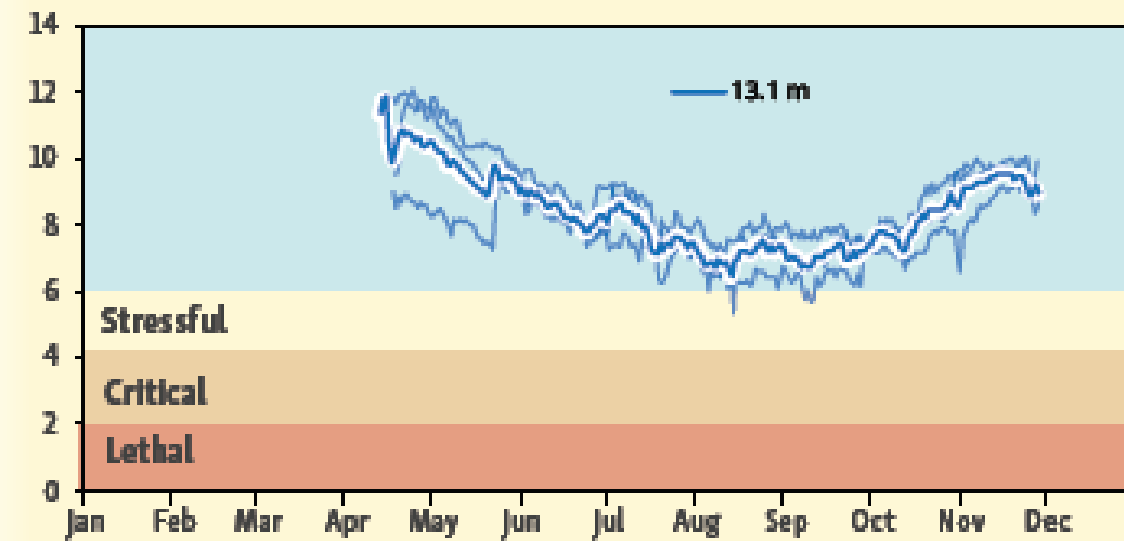
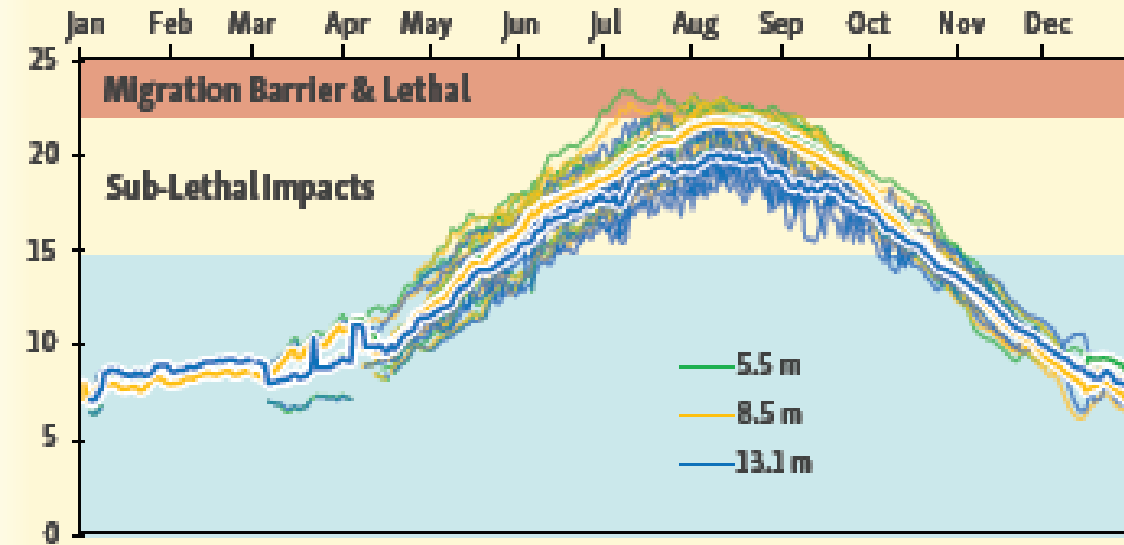
ADULT CHINOOK	10-20 Days	~0.6 Day		
---------------	------------	----------	--	--

JUVENILE CHINOOK	Hours to Weeks	< 24 Hours	1-2 Days to 2 Weeks	< 24 Hours	< 24 Hrs
------------------	----------------	------------	---------------------	------------	----------



Travel Times

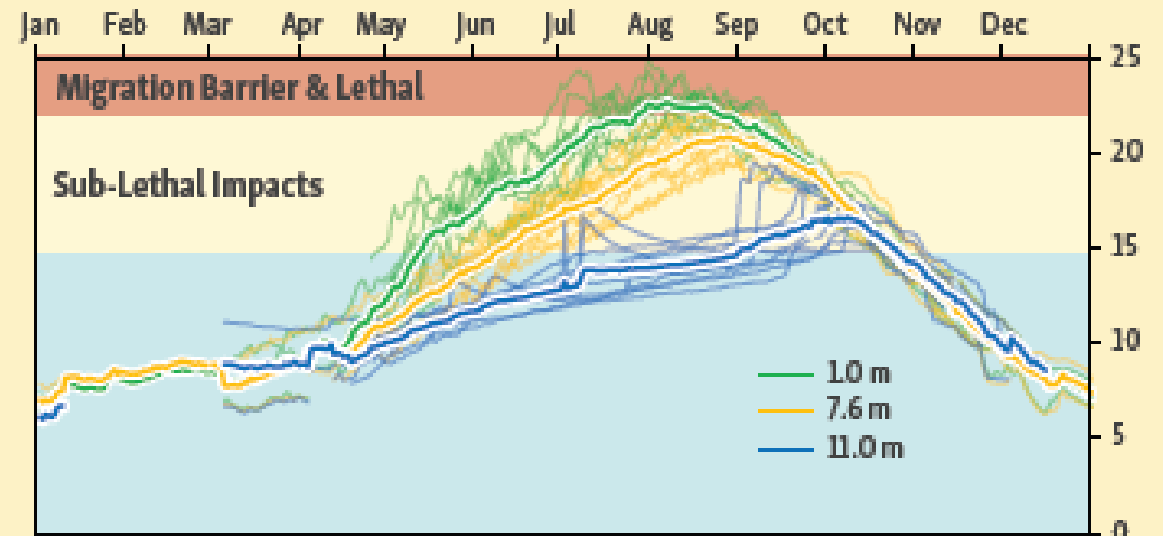
LARGE LOCKS (LLLW)



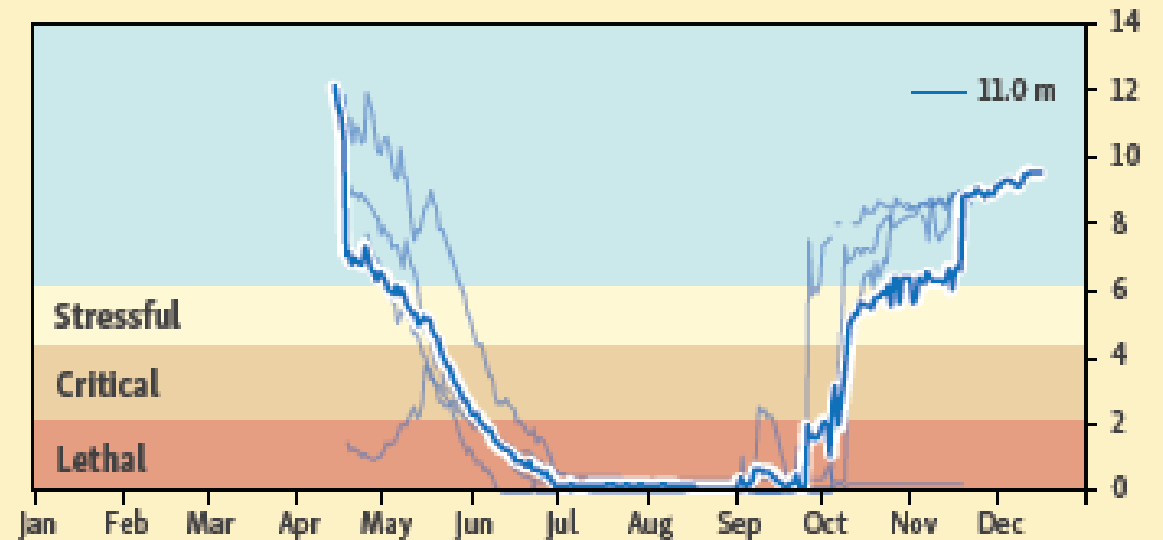
GAS WORKS PARKS (GWLW)



TEMPERATURE °C



DISSOLVED OXYGEN (MG/L)



May – September 2009 - 2019

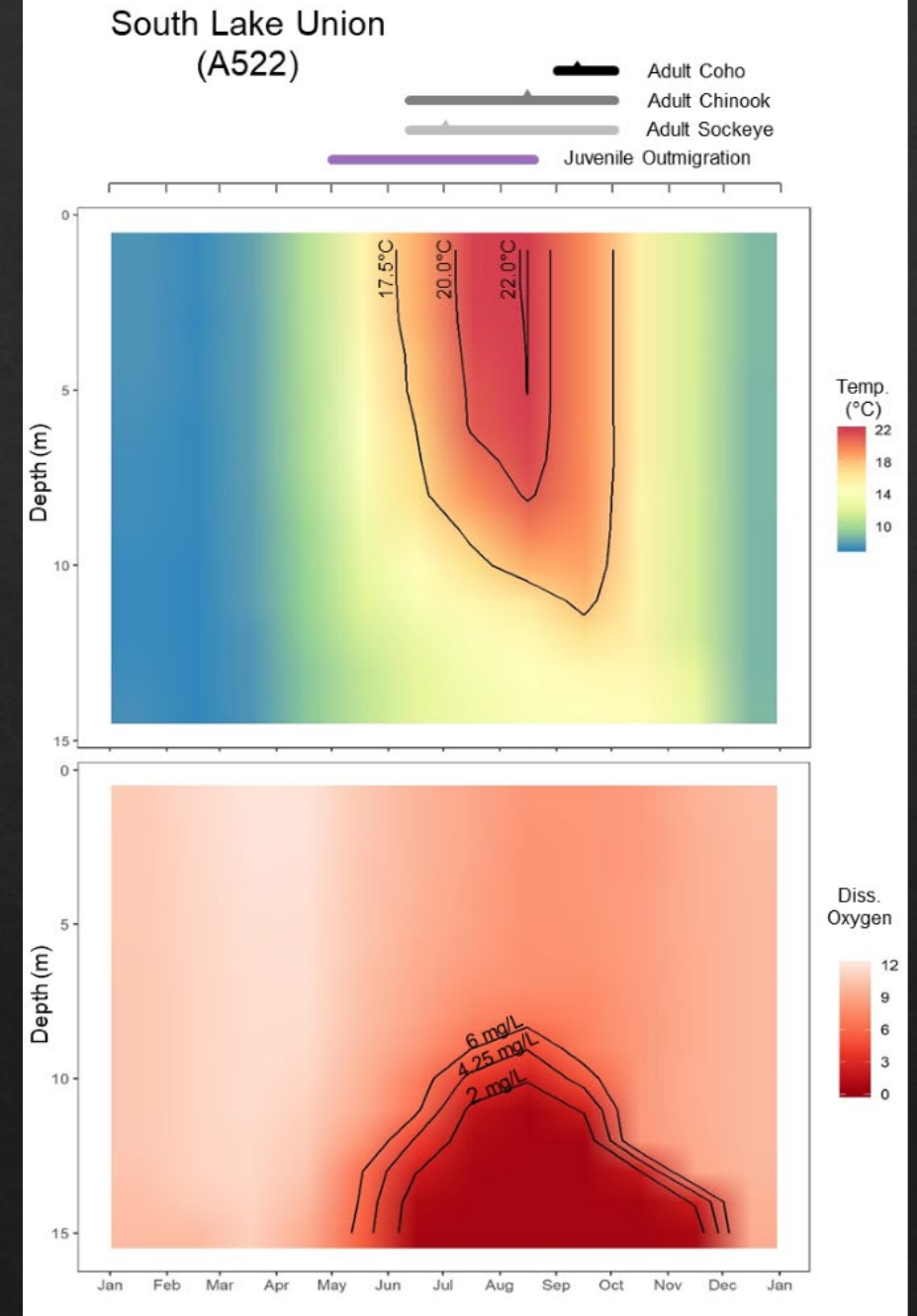
Threshold

15°C Sub-Lethal	87 - 92%
-----------------	----------

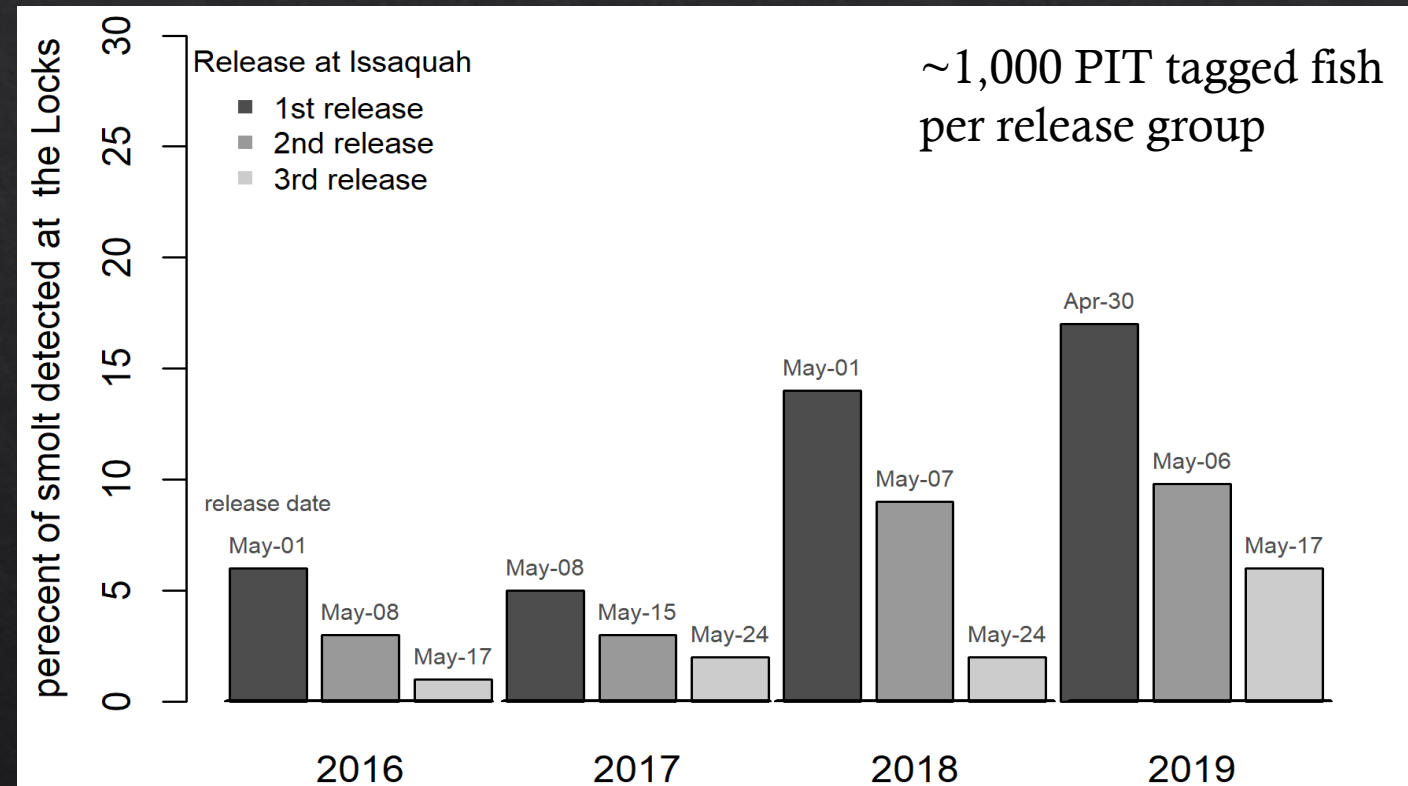
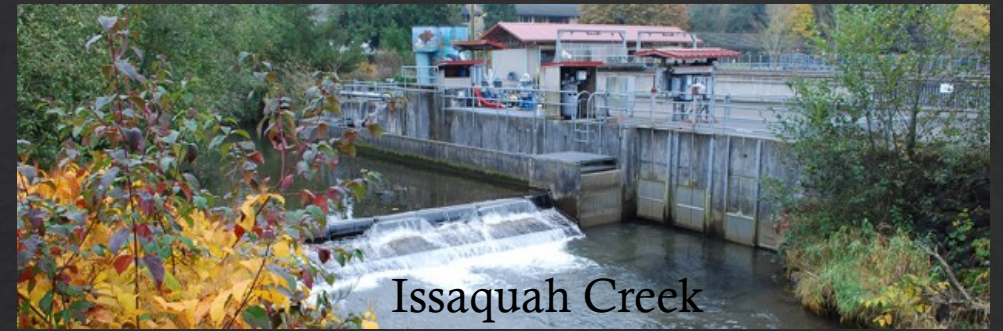
22°C Migration Barrier/Lethal	12 – 24%
-------------------------------	----------

Cool Water Refuge

13 – 92%

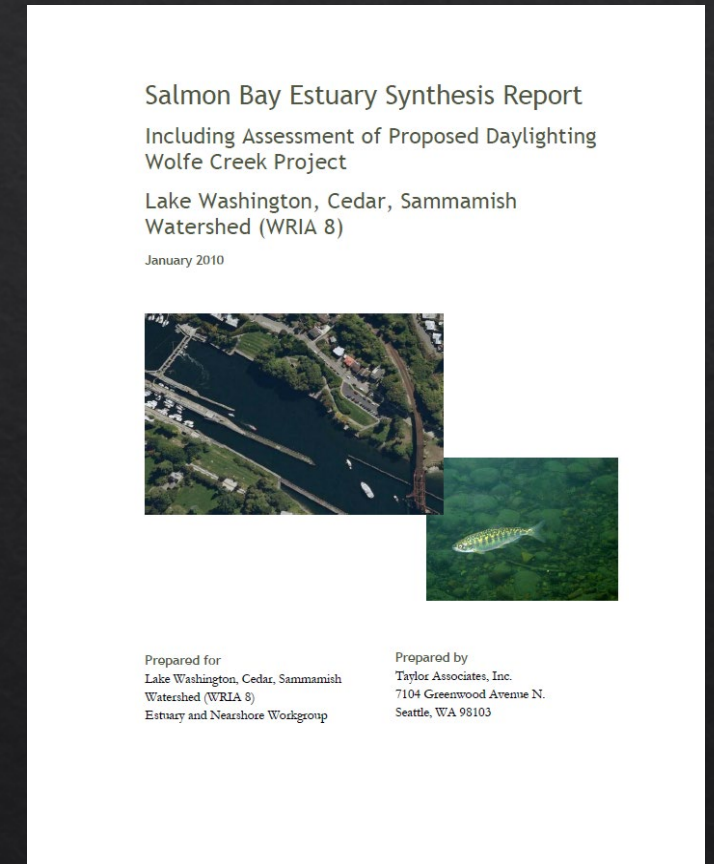
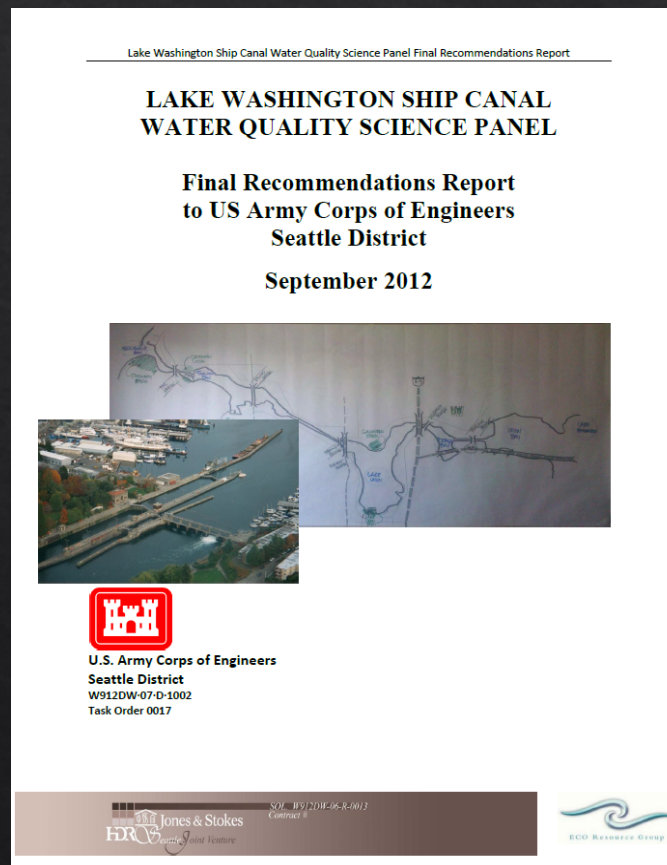
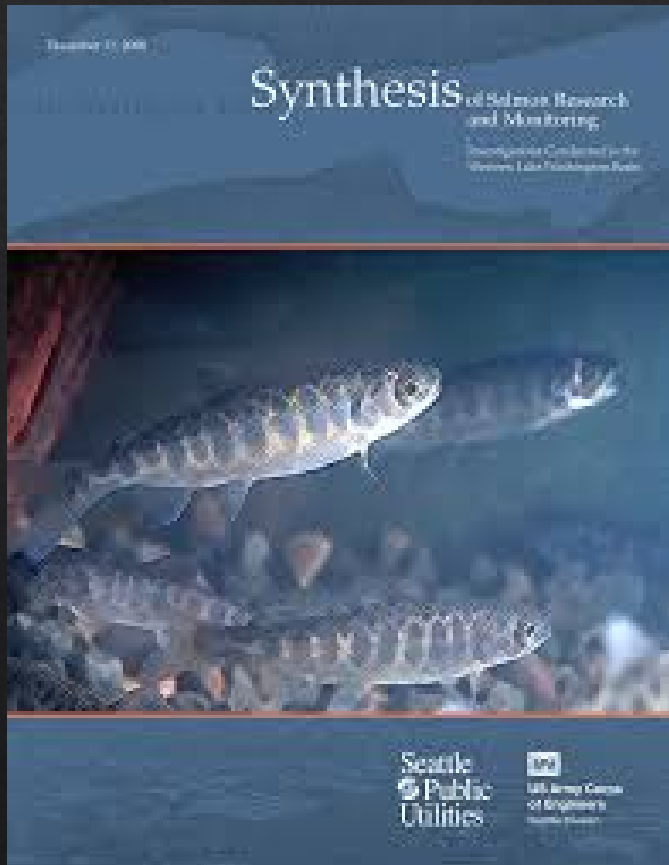


Direct & Indirect Effects



Juvenile Chinook released ~May 1st were detected at the Ballard Locks 2.6 to 7.3x greater compared to those released 3 weeks later.

Build On What We've Learned





Lake Washington Ship Canal Salmon Roundtable

Shared
Understanding
of the Problem



Pool Expertise to
ID & Advance
Solutions



Advocate for
Implementation
& Monitoring

Summer 2021 – Winter 2022





LWSC Roundtable

on Salmon and Water Quality

Technical

Steering and Strategy

Coordinators

- WRIA 8
- LLTK

**Information, Input, and
Advocacy**

Timeline



Summer – Fall 2021

Working Group Meetings

Fall – Winter 2021

Workshops

Winter 2022

Summary Write-Up

Winter 2022

Approval and Next Steps

Thank You

Funding Provided by:

- King County WaterWorks
- WRIA 8 Salmon Recovery Council

Special Thanks to:

- Authors/contributors to synthesis
 - Roundtable participants
 - YOU
-

