



***Reviving the Little Red Fish:
An Update on Kokanee Conservation***

for the

Friends of the Issaquah Salmon Hatchery

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Photo: Bill Priest, King County

Focus

- *What is a kokanee?*
- *How did kokanee population health get this bad?*
- *What are our kokanee recovery goals?*
- *What's most important to do now?*



Species

- *Non-anadromous variant of Sockeye salmon*
- *Entire life cycle occurs in freshwater lakes*
- *Kokanee ↔ Sockeye*



PHOTO – ROGER TABOR

Distribution

- *North Pacific*
- *6 native populations in WA: Lakes Sammamish, Whatcom, Ozette, Chain, Chilliwack, and Osoyoos*



PHOTO – ROGER TABOR

Juvenile and Subadult Fish

- *Incubation usually 3-5 months*
- *Fry at emergence: 20-30 mm; 1 g*
- *Rapid emigration to lake environment*
- *Primarily feed on zooplankton*



PHOTO – ROGER TABOR

Adult Fish

- *Typically return in 3-4 years to spawn*
- *High fidelity to natal stream*
- *Adults: 280-400 mm; 200-540 g*
- *600-1,200 eggs per female*



PHOTO – ROGER TABOR

Lake Washington Basin (Historic) Runs

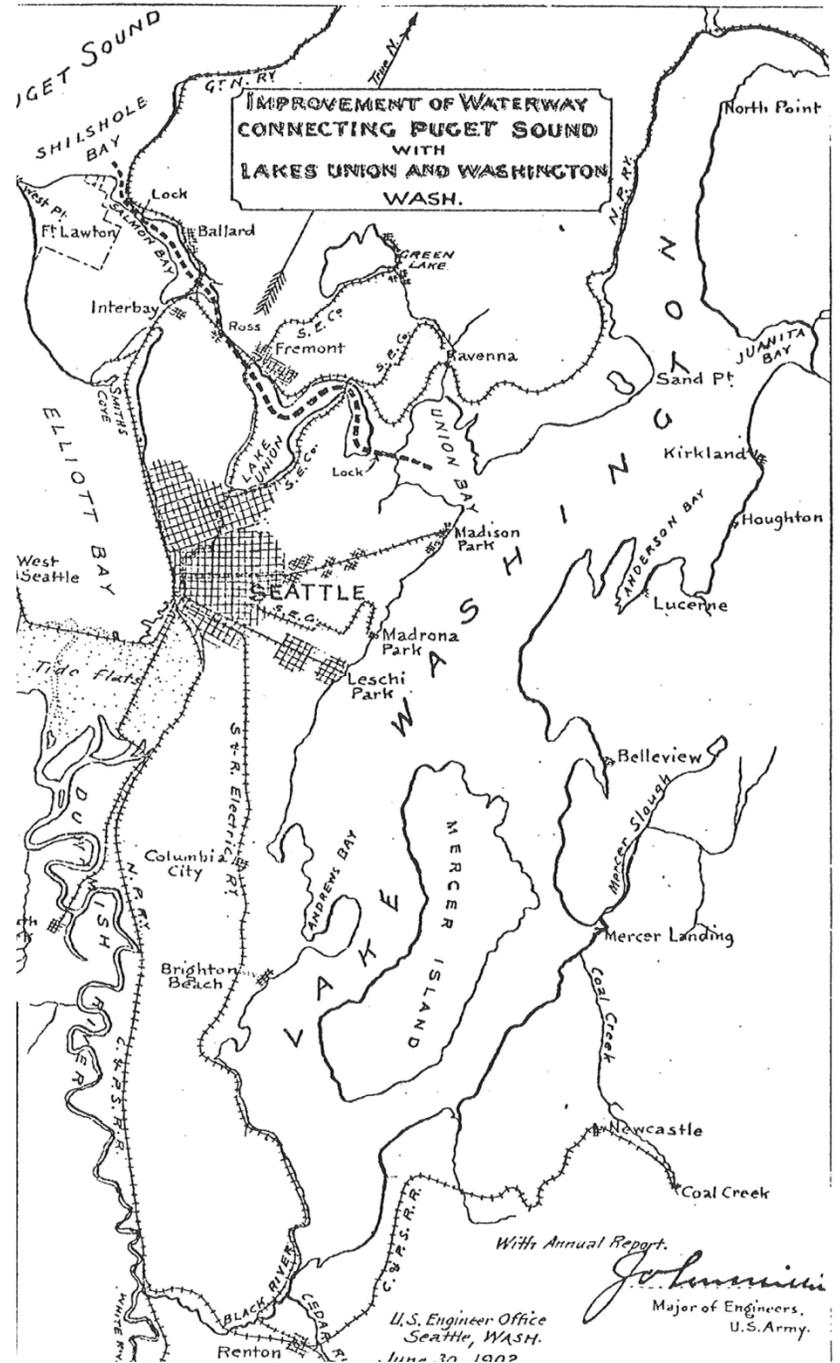
- *“Early Run” (Lake Sammamish)*
- *“Middle Run” (Lake Washington)*
- *“Late Run” (Lake Sammamish)*



PHOTO – ROGER TABOR

STATUS: Prior to 1916

- Ship Canal in operation in 1916 (@9 foot lake level drop)
- All 3 kokanee runs important food and recreational resources.
- Other native species: bull trout, cutthroat trout, rainbow trout, northern pikeminnow
- Sockeye, Chinook and Coho salmon?
- Bass



STATUS: Ship Canal through 60s

- *(Whatcom Lake) kokanee introduction (~35 million fry)*
- *Bear Creek kokanee supplementation*
- *(Baker Lake) Sockeye introduction and supplementation*
- *(Green River) Chinook introduction and supplementation*
- *Coho supplementation*
- *Mysis, perch, ↑ nutrient loading, urbanization*

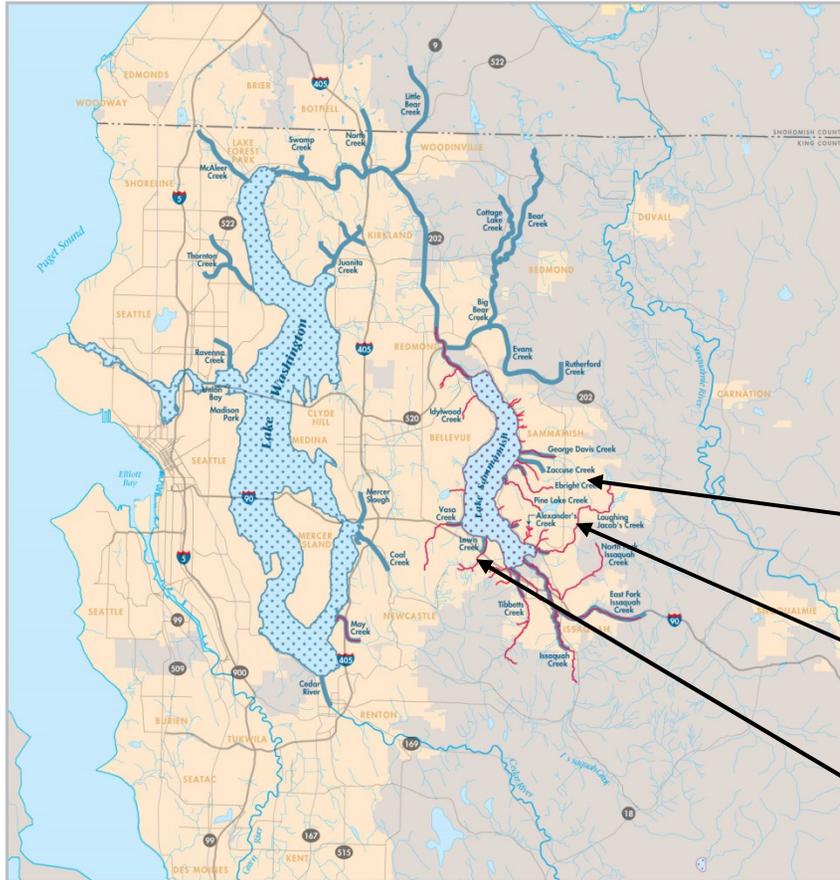


STATUS: 70s – early 90s

- *↓ nutrient loading; ↓ kokanee numbers*
- *Changing predator-prey dynamics*
- *Hatchery operations include kokanee removal*
- *More (Whatcom Lake) kokanee introductions (~3.5 million fry) 1976-1979*
- *Intermittent DFW and KC monitoring begins*
- *“Early Run” collapses in 1983*
- *Recreational kokanee fishery closed in 1986 (still closed)*



Kokanee Distribution – Historic and Current



Key Current Spawning Areas
 These creeks have consistently supported spawning since 1996. Other areas, including for example the lakeshore and Pine Lake, Tibbetts, and Vasa Creeks, are also known to periodically support spawning.

Ebright Creek

Laughing Jacobs Creek

Lewis Creek

HISTORIC AND CURRENT KOKANEE DISTRIBUTION in the Lake Washington Basin

- Historic Kokanee Distribution in Stream or River
- Historic Kokanee Distribution in Lake
- Current Kokanee Distribution in Stream or River
- Current Kokanee Distribution in Lake
- Road
- River/Stream
- Lake
- Incorporated Area
- Unincorporated King County

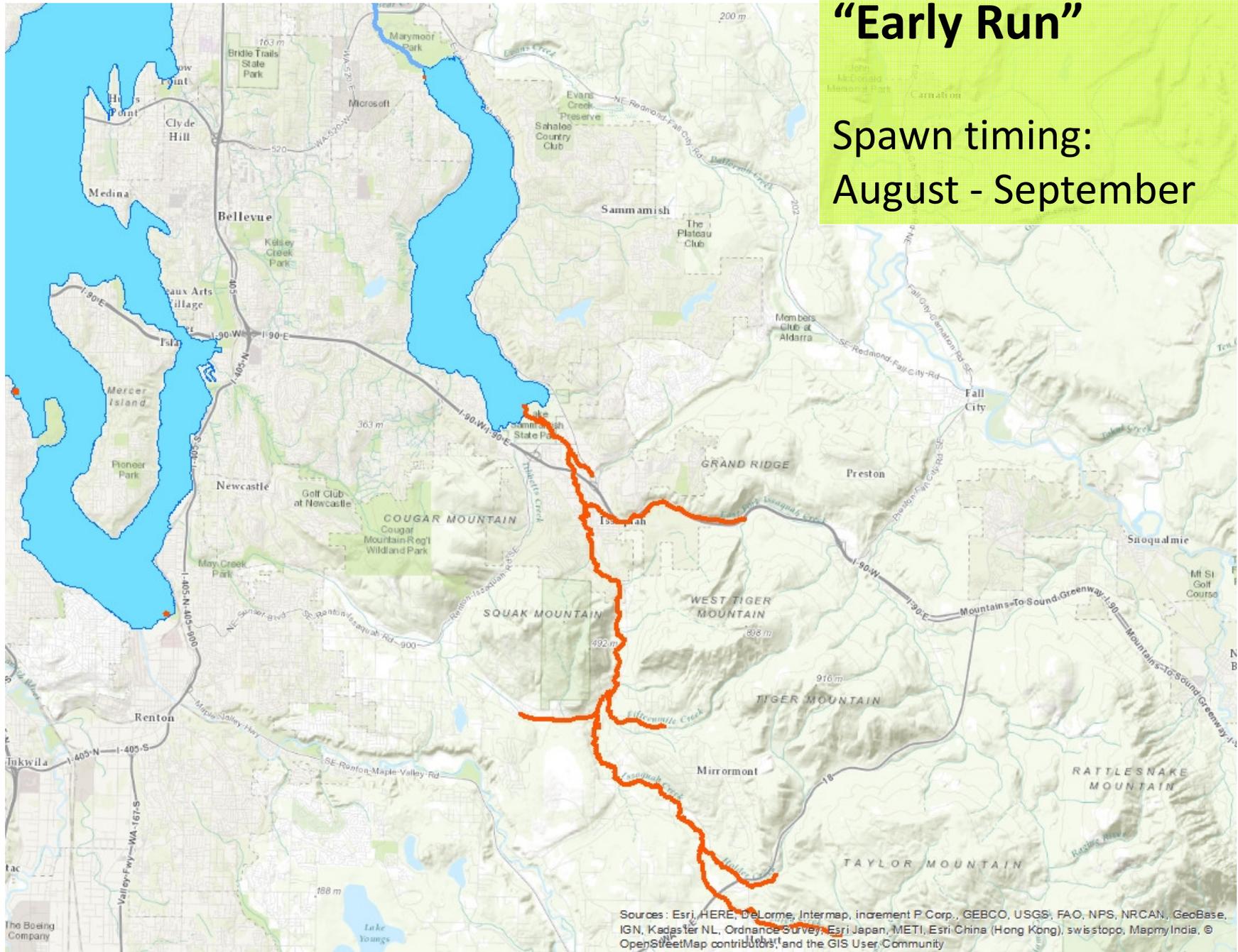


Sources: Current Status of Kokanee from Lake Sammamish Kokanee Blueprint Report, Sept. 2014; Historic Status of Kokanee in the Lake Washington Basin, March 2000.



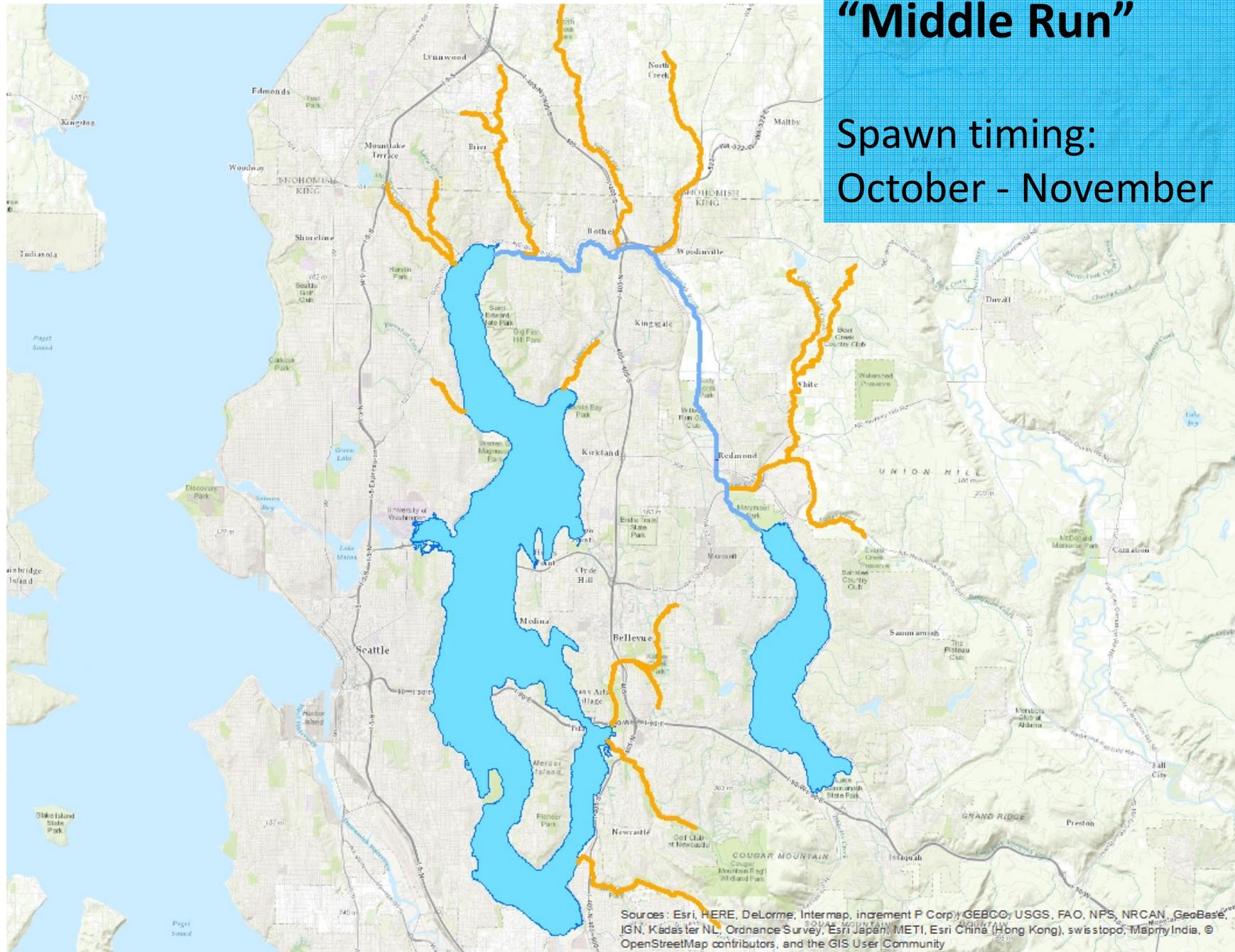
“Early Run”

Spawn timing:
August - September



“Middle Run”

Spawn timing:
October - November



“Late Run”

Spawn timing:
November - January



Kokanee Diversity

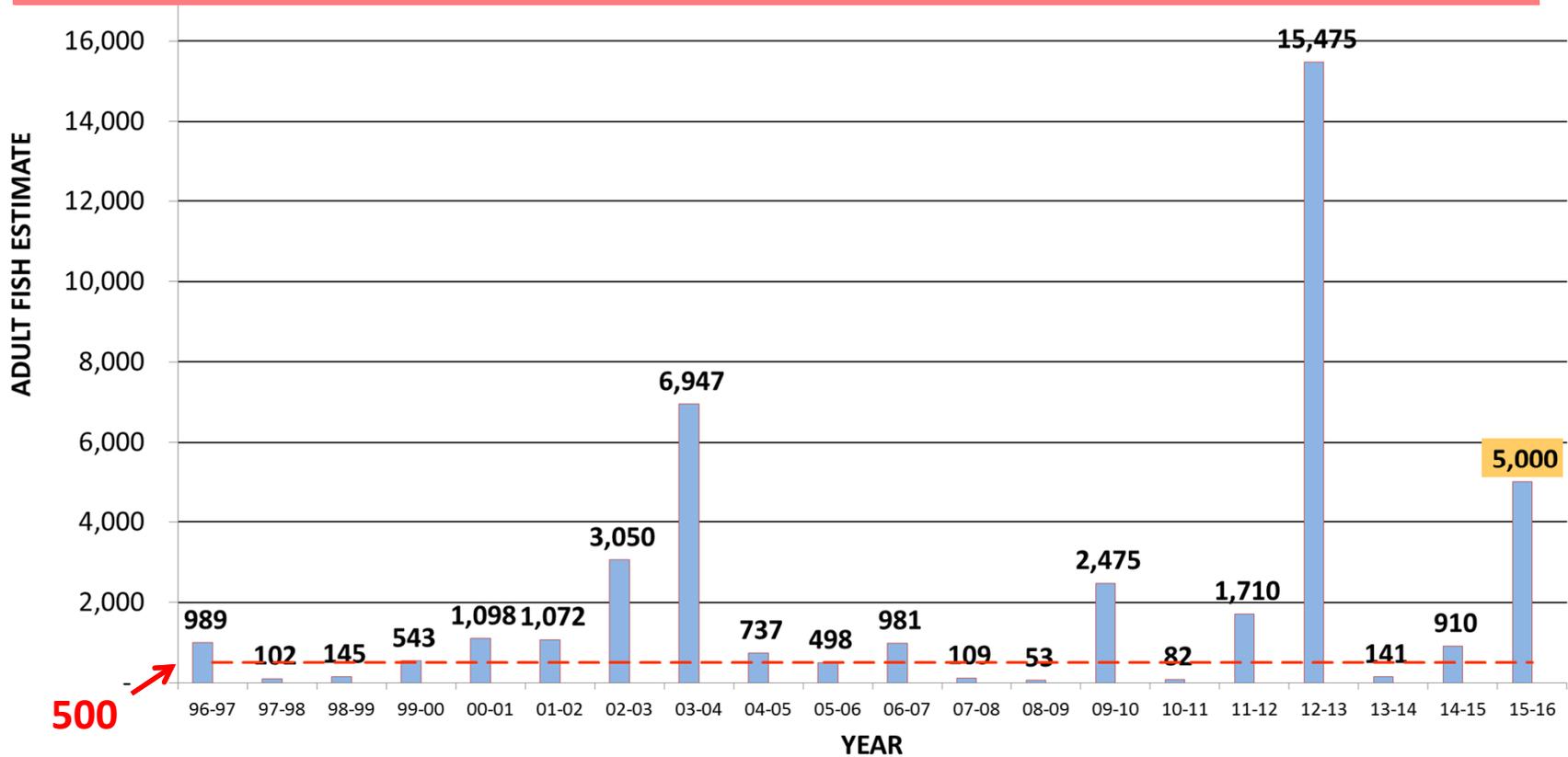
- *Early Run – August to October run timing; Issaquah Creek focused* **EXTIRPATED**
- *Middle Run – September to November run timing; Lake Washington and Salm River tribs* **?, LIKELY EXTIRPATED**
- *Late Run – November to January run timing; Lake Sammamish tribs except Issaquah(?)* **LOW NUMBERS**
- *Shoreline spawners* **UNKNOWN, LIKELY LOW NUMBERS**



Abundance

Annual escapement estimate for Ebright, Lewis, and Laughing Jacob creeks assuming a 7-day stream life (includes fish taken into hatchery program).

Historic return levels in the tens of thousands...



What Happened?

15,475
spawners
in 2012-
2013...

... produced
only...

@5,000
spawners
in 2015-
2016

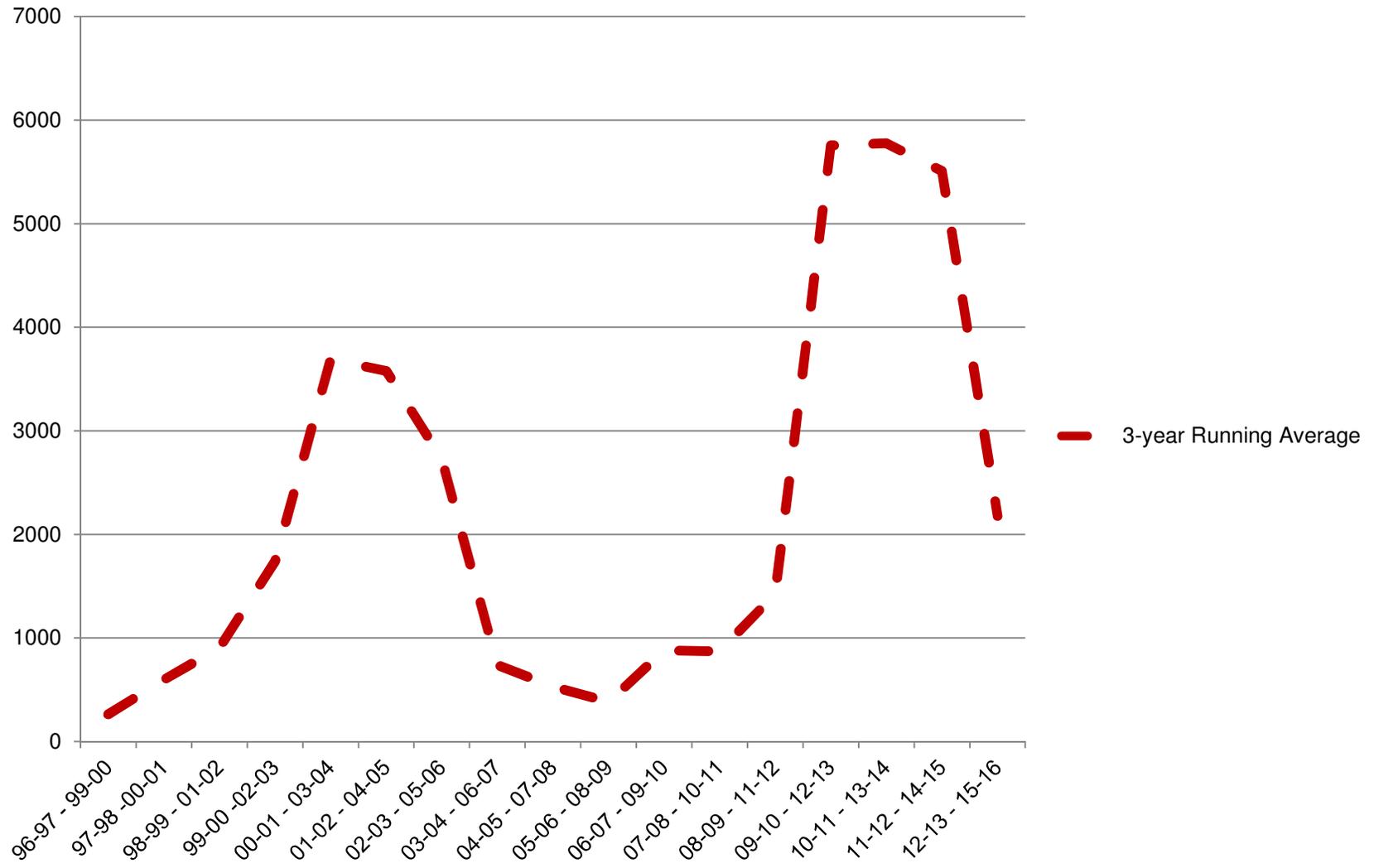
Why?

- Not enough spawning area
- Poor lake conditions, e.g., temperature or food
- Predation (human or wildlife)
- ???



Abundance

3-year Running Average Escapement



Population Status

Where do they live? More places is better...

Early-mid 1990s: Lake Washington and Sammamish, and many creeks draining to them

Today: Lake Sammamish and only three creeks draining to it

How diverse are they? More diversity is better...

Early run:
extinct

Middle run:
extinct(?)

Late run:
present but
near extinct

How many are there?

More fish is better...

+/- 20,000



Early-mid
1990s

+/- 2,000



Average
for 1996-
2015



Population Status Recap

- *Abundance: @10-20% of historic levels on average, at best*
- *Distribution: spawning primarily in only three creeks*
- *Diversity: two of three unique runs likely extirpated*
- *Productivity: unknown*
- *Still NOT legal to catch and keep kokanee on Lake Sammamish!*



Potential/Suspected Factors Contributing to Decline

- *Replumbing of Lake Washington affecting access to habitats*
- *Hatchery operations – removing kokanee, timing of releases*
- *Land use/stormwater impacts – impervious surface contributing to high flows in late fall/winter, low flows in early fall*
- *Predation – coho on fry, cutthroat/others on later stages*
- *Fishing – intentional or unintentional due to poor species identification by anglers*
- *Culverts and barriers preventing access to spawning areas*
- *Lake temperature and dissolved oxygen levels*

Better fish and habitat data would increase certainty!



Lake Sammamish Watershed Land Cover - 1936



Lake Sammamish Watershed Land Cover - 2009



Habitat Trends – Lake Sammamish Subbasins

From 2011 WRIA 8 Land Cover Change Analysis

Subbasin	%age forest cover change 1991-2006	acres forest loss 1991-2006
North Fork Issaquah	-30.1	547
East Fork Issaquah	-3.6	188
Middle Issaquah	-3.5	109
Fifteenmile	-1.5	41
Lower Issaquah	-0.9	41
Upper Issaquah	2.8	-200
East Lake Sammamish	-18.9	922
Tibbetts	-6.7	173
McDonald	-1	20
	Total	1841





Kokanee Recovery and Conservation Goal

“Prevent the extinction and improve the health of the native kokanee population such that it is viable and self-sustaining, and then supports fishery opportunities”



Kokanee Work Group Active Partners

- ***Watershed residents***
- ***King County***
- ***City of Sammamish***
- ***City of Issaquah***
- ***City of Bellevue***
- ***City of Redmond***
- ***Friends of Issaquah Salmon Hatchery***
- ***Washington Department of Fish and Wildlife***
- ***US Fish and Wildlife Service***
- ***Friends of Lake Sammamish State Park***
- ***Snoqualmie Tribe***
- ***Trout Unlimited (national and local)***
- ***Washington State Parks***
- ***Save Lake Sammamish***
- ***Friends of Pine Lake***
- ***Darigold***

Photo: Roger Tabor, USFWS



Focus for Action

- *Prevent extinction*
- *Preserve existing remnant population diversity and abundance*
- *Protect the (3) main spawning aggregations*
- *Restore access to, and create new, spawning area*
- *Improve habitat conditions*
- *Reintroduce fish to functional habitat*
- *Expand action area to broader Lake Washington watershed e.g., Sammamish River tributaries*



Priority Action: Supplementation

- *Primary funder is US Fish and Wildlife Service, with contributions from WDFW and King County*
- *Scoped to run for twelve years of production, through 2021*
- *2007-2009, not enough spawners - 2009-2010 was first year of production*
- *Seven consecutive years of production*
- *Have tested stream-specific systems to reduce straying*
- *All fish marked for monitoring*



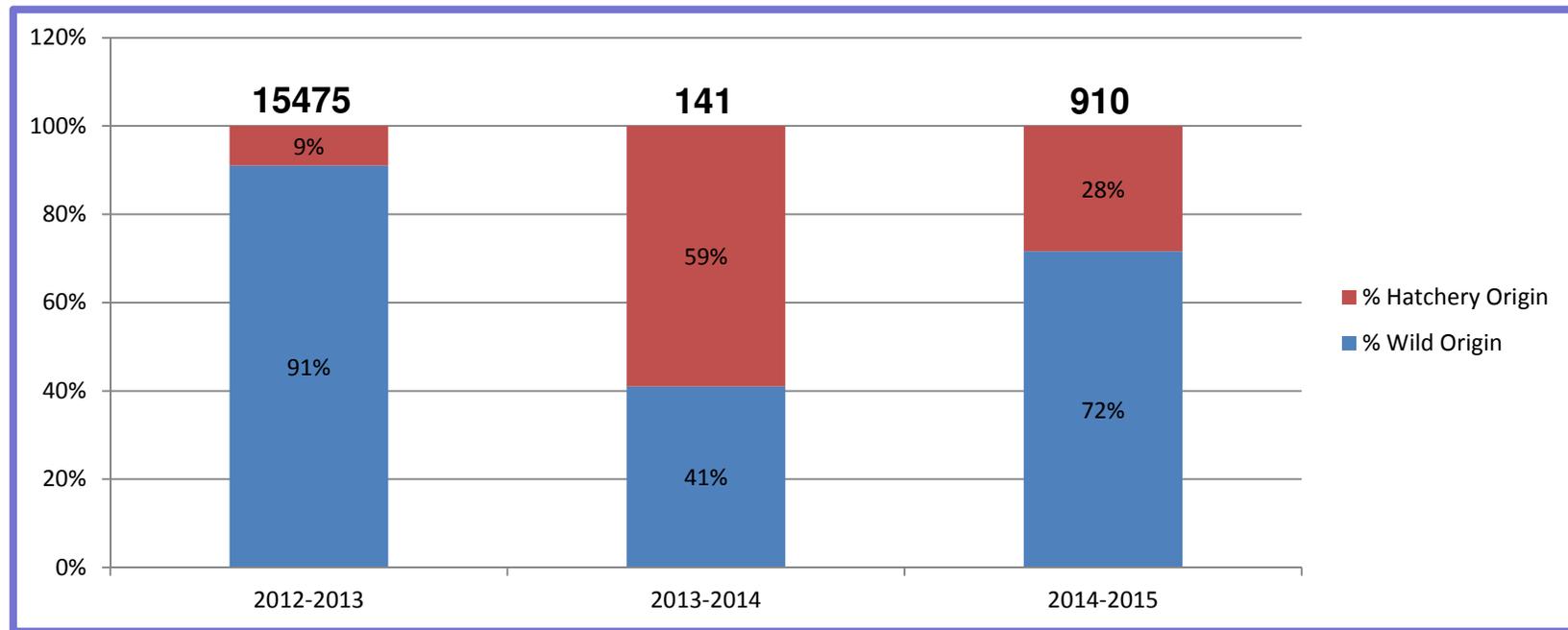


10,000 fry per bucket
50,000 fry per key stream





Origin of Recent Returns



- *fish from the hatchery program are returning to spawn*
- *in smaller return years the hatchery-origin return is a larger proportion*
- *in larger return years the hatchery-origin return is a smaller proportion*
- *a trend of large/growing hatchery-origin return could indicate a growing habitat problem, i.e., hatchery spawning is consistently more effective than wild*



Priority Action: Habitat Restoration

- *Ensure enough habitat quality and quantity when supplementation program ends*
- *Seven of eleven near term kokanee/chinook restoration projects are done or underway*
- *“Kokanee Blueprint” identifies the next wave of key habitat projects*
- *New Trout Unlimited position will increase pace*

Before



After (2012)



Priority Action: Habitat Protection

- *Heavily reliant on work by jurisdictions to implement effective regulatory programs:*
 - *Stormwater programs*
 - *Critical Areas Ordinances*
 - *Shoreline Master Programs*
- *Developing incentive/non-regulatory approaches in jurisdictions:*
 - *TDRs*
 - *Acquisition*



Priority Action: Public Engagement

- *Increase awareness of kokanee and their decline*
- *Encourage action now to prevent further degradation*
- *Build constituency to sustain long term efforts*



Priority Action: Public Engagement

- *Salmon Adventure geocaching at Salmon Days*
- *Kokanee Cam 2015*
- *Kokanee Quest geocaching*
- *Annual Kokanee Celebration (April 22, 2016)*
- *Project volunteer opportunities with cities, Mountains to Sound Greenway*
- *Urban Wildlife Refuge Partnership...*



New Opportunity – Urban Wildlife Refuge Partnership



- *New US Department of Interior initiative*
- *Program goal: Engage urban communities in wildlife conservation in partnership with the Service.*
- *“Create an urban refuge initiative that defines excellence in our existing urban refuges, establishes the framework for creating new urban refuge partnerships and implements a refuge presence in 10 demographically and geographically varied cities across America by 2015.”*



New Opportunity – Urban Wildlife Refuge Partnership

- *Lake Sammamish is one of first in the nation, chosen in 2013*
- *The Kokanee Work Group is the local host entity*
- *Will help build community and regional stewardship of the resource*
- *Builds on and augments our capacity to engage key constituents*
- *Does not add regulatory requirements or involve federal acquisition of land*



New Opportunity – Urban Wildlife Refuge Partnership

- *Interpretive Plan provides a range of ideas for actions*
- *Initial funding supported the*
 - *Interpretive Plan*
 - *Kokanee Cam*
 - *Kokanee Quest*
 - *Curriculum development*
 - *State Park signage*



Results of Action?

tripling Ebright Creek spawning area via Pereyra culvert

+ supplementation program

+ hatchery coho release delay

+ angler education

(+ ???)

change in population trajectory?

+ restored access to and habitat in Zaccuse Creek

+ restored run in Issaquah Creek

+ effective land use and stormwater management (in & out of UGA)

+ growing community support

consistently productive population?



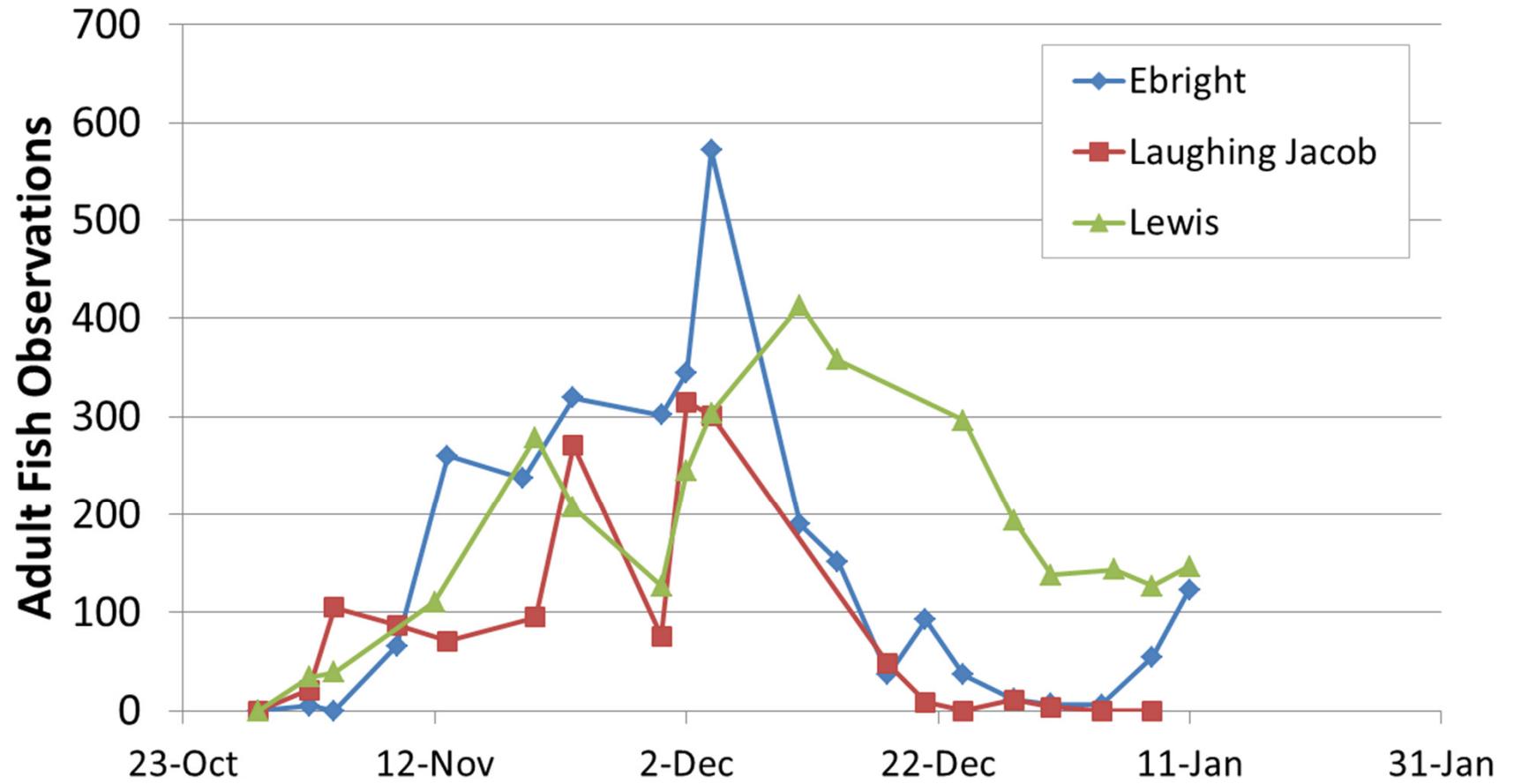


Questions?

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2015/2016 Adult Fish Return Timing



PRIMARY KNOWLEDGE GAPS:

- Quantity and quality of stream habitat
- Lake phytoplankton and zooplankton
- Year-class productivity and abundance
- Recruitment from supplementation program
- Spatial distribution



- ❖ *How many fish can lake support (each age class)?*
- ❖ *Is stream habitat or lake habitat limiting?*

Contact:

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KING COUNTY TECHNICAL LEAD:

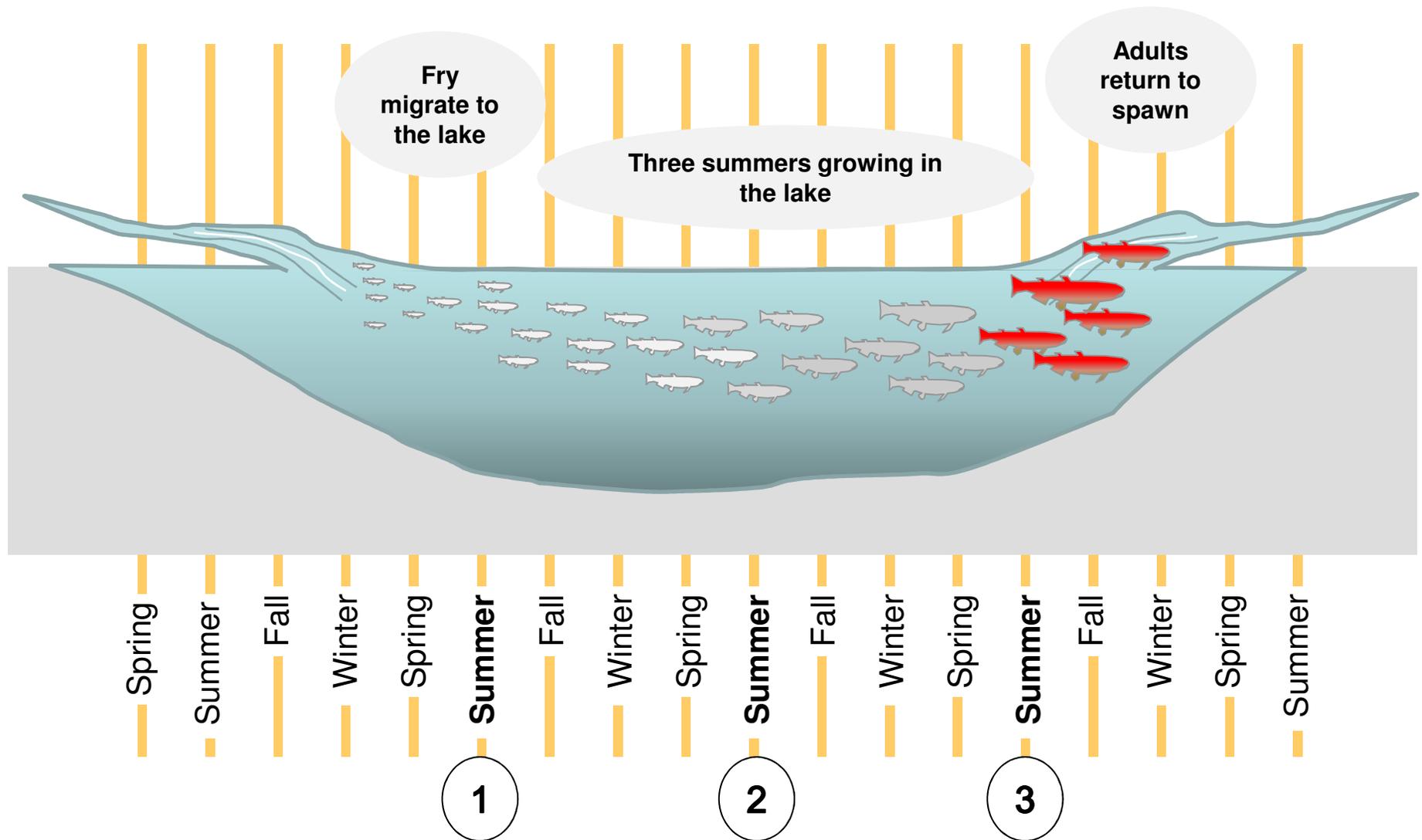
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PHOTO - HANS BERGE

Kokanee Biology

>90% of our kokanee currently follow this life history...



Kokanee Work Group Active Partners

Conservation
Educational/Outreach
Sportsman
Landowners

- Save Lake Sammamish
- Friends of Issaquah Salmon Hatchery
- Friends of Pine Lake
- Mountains to Sound Greenway
- Trout Unlimited
- Friends of Lake Sammamish Park
- Mid-Sound Partnership
- Numerous private landowners

Tribal Government

- Snoqualmie Tribe

Local Government

- City of Issaquah
- City of Sammamish
- City of Redmond
- City of Bellevue
- King County

State and Federal
Government

- WA State Parks
- WA Department of Fish and Wildlife
- US Fish and Wildlife Service

LAKE WASHINGTON BASIN (HISTORIC) RUNS –

- “Early Run” (Lake Sammamish) ✘
- “Middle Run” (Lake Washington) ?
- “Late Run” (Lake Sammamish) ✔



PHOTO – ROGER TABOR

Kokanee Biology

- *smaller form of sockeye salmon*
- *life cycle is three or four years*
- *lives in natal streams for only a few months after hatching*
- *does not go to the ocean – rears in Lake Sammamish*
- *Lake Sammamish kokanee are genetically unique*



STATUS: Early 90s – early 00s

- *KC starts monitoring program in 1992*
- *Genetics analysis of “Middle” and “Late” runs*
- *Supplementation plan to rescue “Early Run” developed 2001*
- *“Early Run” determined extinct in 2003*

STATUS: Early 00s - today

- *Kokanee Work Group formed in 2007*
 - *“Prevent the extinction and improve the health of native kokanee population such that it is viable and self-sustaining, and then supports fishery opportunities.”*
- *Supplementation plan to rescue “Late Run” developed 2007*
- *Hans Berge thesis 2009*
- *KWG habitat project Blueprint 2014*