

Commission Briefing: Washington State Sockeye Salmon

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Aaron Dufault

Pink, Chum, Sockeye Salmon

Specialist

Fish Program



Outline

Sockeye biology

 General Life History, Distribution, Survival

Comparison of Major Sockeye Stocks

 Fraser River

 Snake River

 Lake Washington

 Baker Lake

 Lake Wenatchee

 Lake Osoyoos/Okanogan R.

Conclusion

 Stock Summary

 Increasing Opportunity

Sockeye Life History

- Primary Western North American Distribution



Augerot et al. 2005

General Life History

Lake Rearing

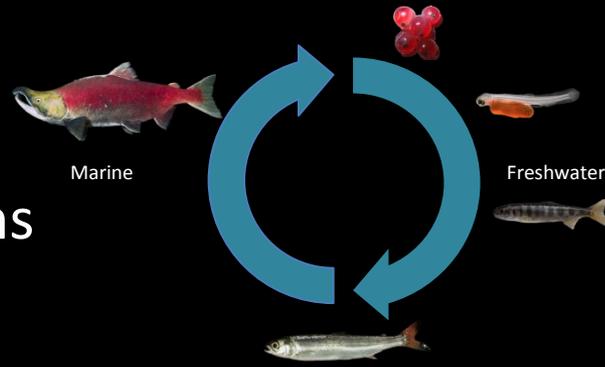
- Migrate to lake immediately upon emergence
- Smallest fry among pink, chum, coho, & chinook (~1 in)
- Increase in size before migrating to marine environment
 - 1 to 2 years
- Return as age 3-5 fish –
 - 1-4 years in ocean



Survival

Marine

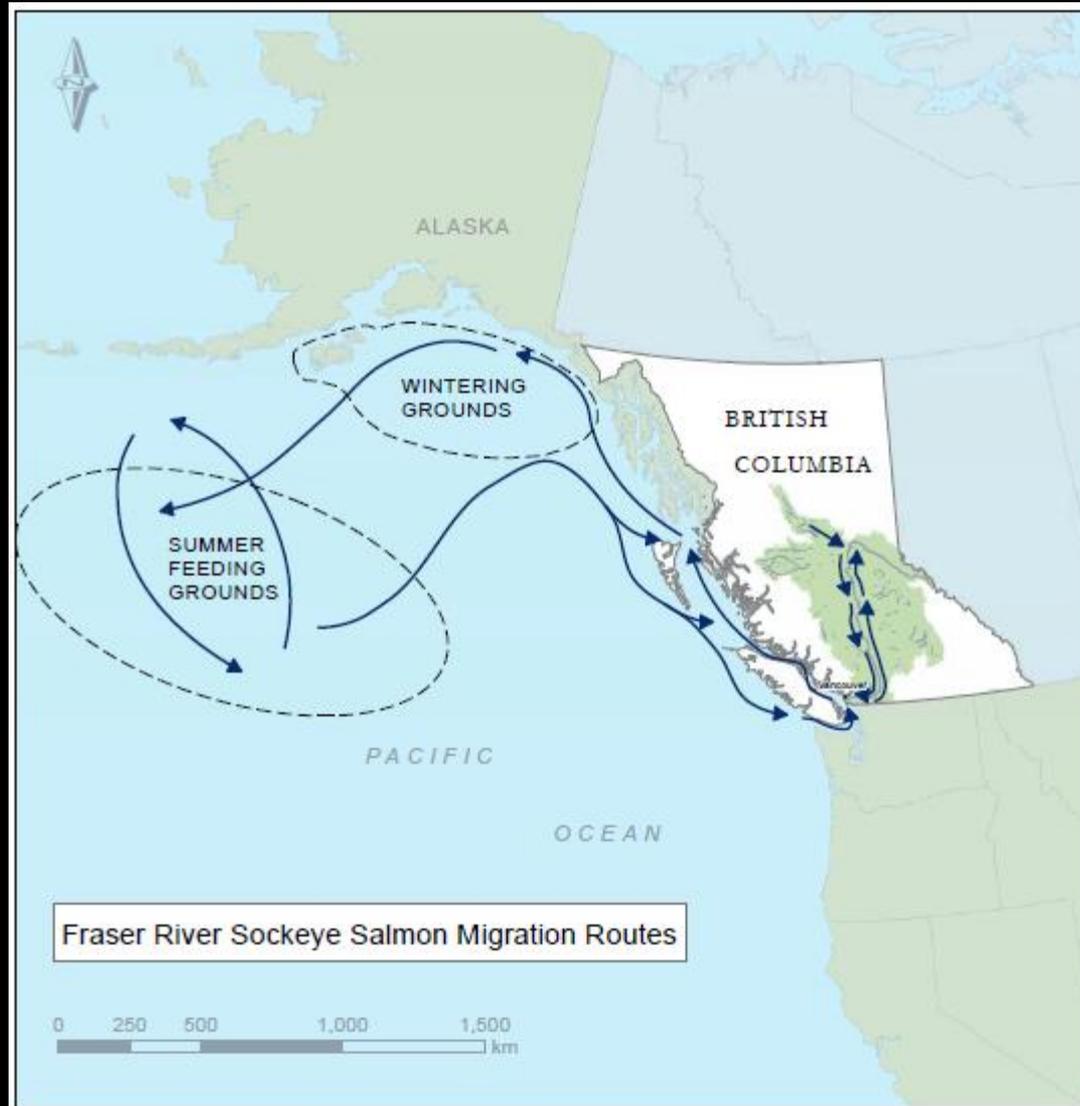
- Environmental
 - Ocean conditions
- Biological
 - Predation
 - Food Availability



Freshwater

- Environmental
 - Flooding events/drought
 - Temperature
 - Sedimentation
 - Eutrophication
- Biological
 - Predation
 - Disease
 - Food availability
- Dam fish passage

Ocean Migration

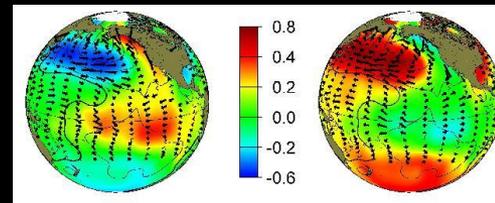


Regional Sockeye Stocks



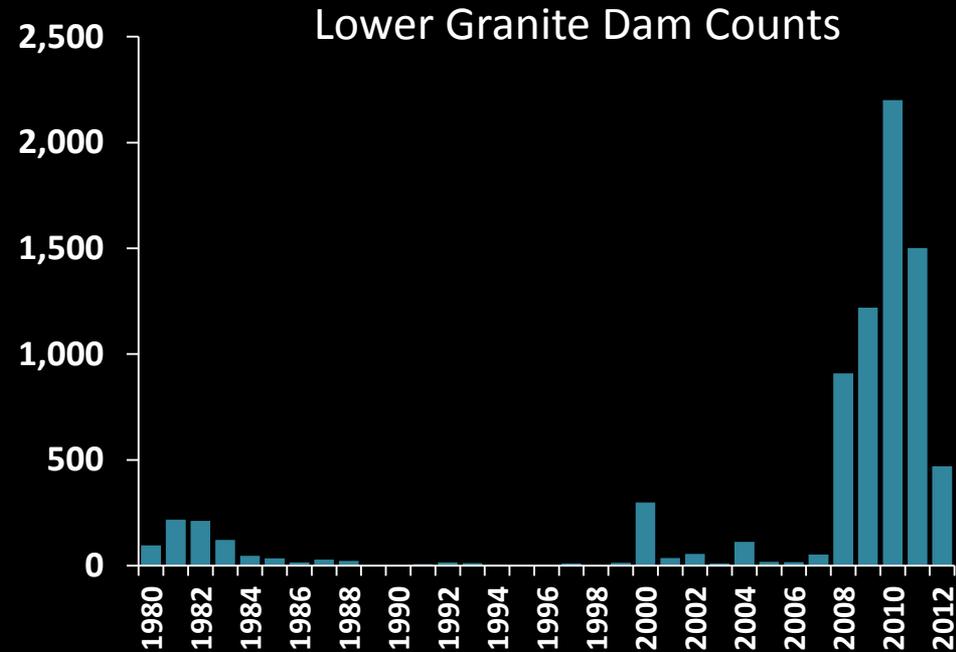
Regional Trends

- Peterman and Dorner 2012 – Decreasing productivity of southern sockeye stocks since 2000 (in some cases since 1990's)
 - Using data 1950 - 2008
- Causes of decline?
 - Peterman 2010 – decline in smolt-to-adult life stage
 - Ocean conditions?
 - Food availability



Snake River

- ESA listed in 1991
- Intense captive broodstock program
- Brought back from brink of extinction
 - From single digit returns

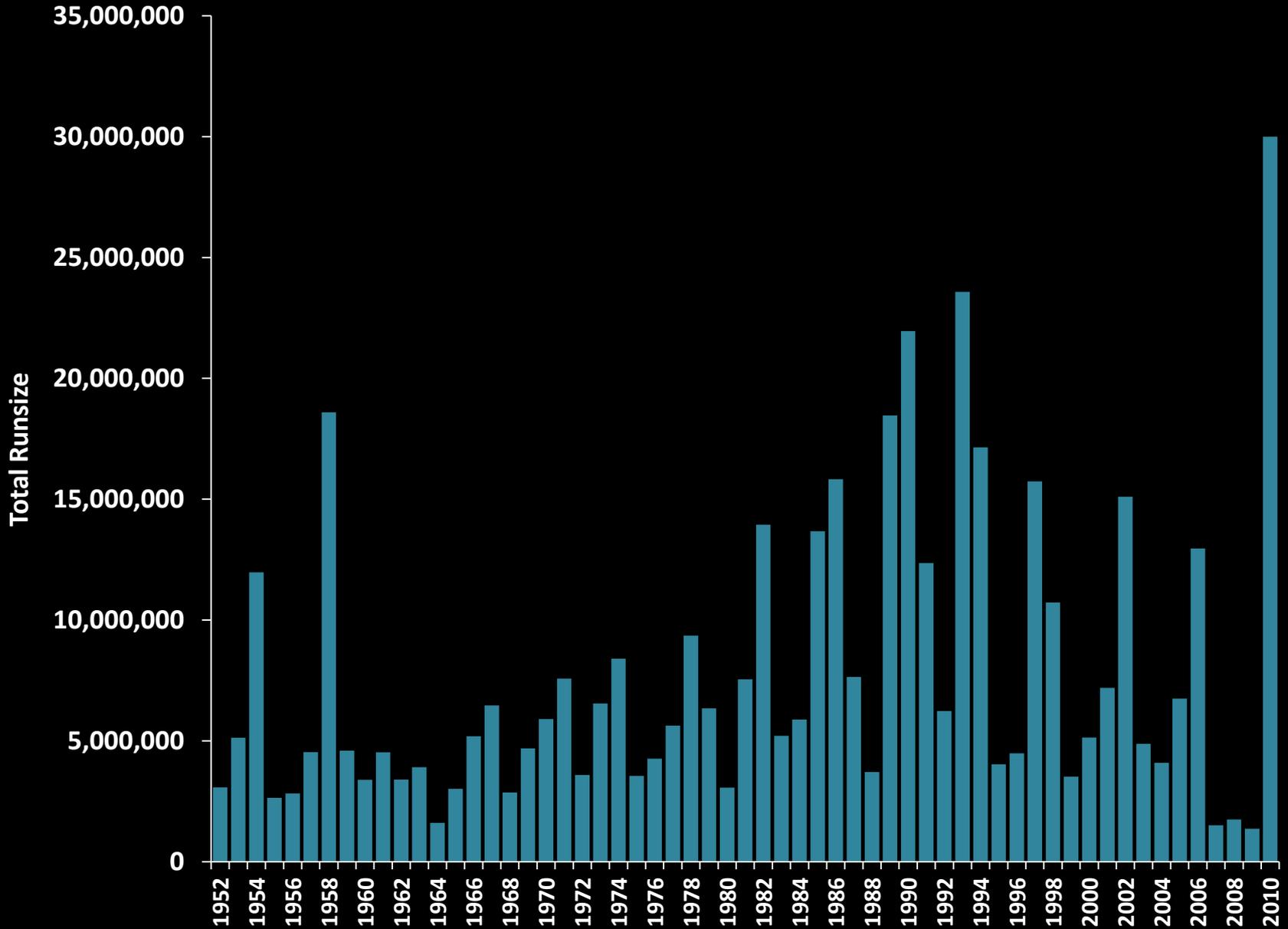


Fraser River



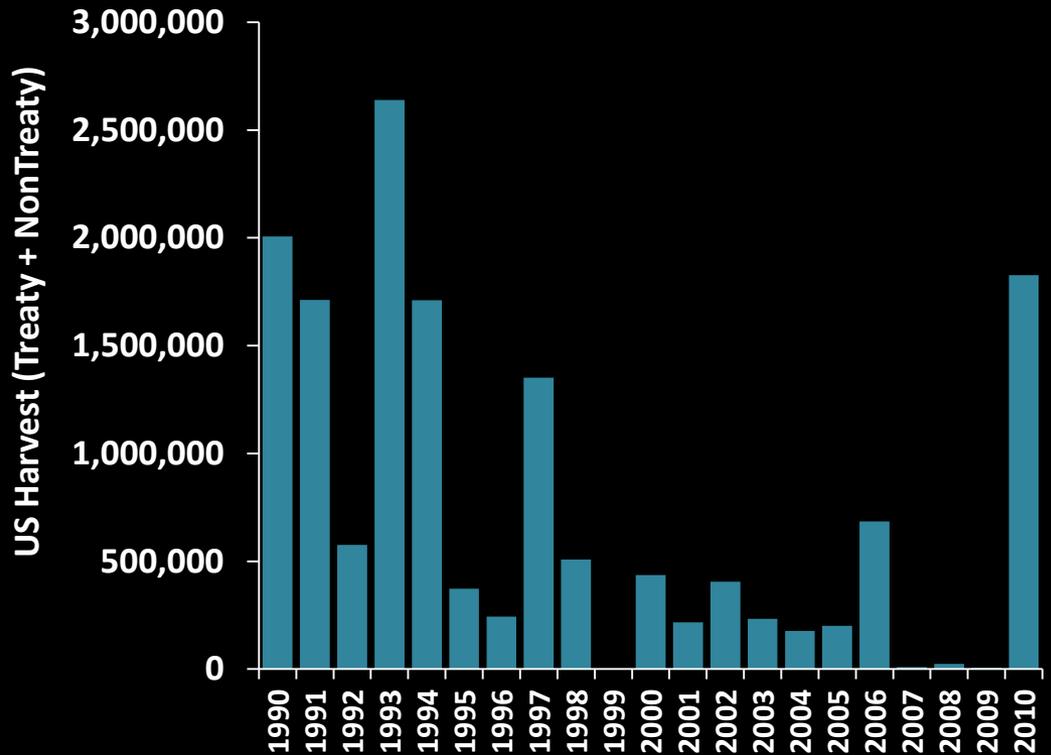
James Skitt Matthews, 1890

Fraser River – Runsize



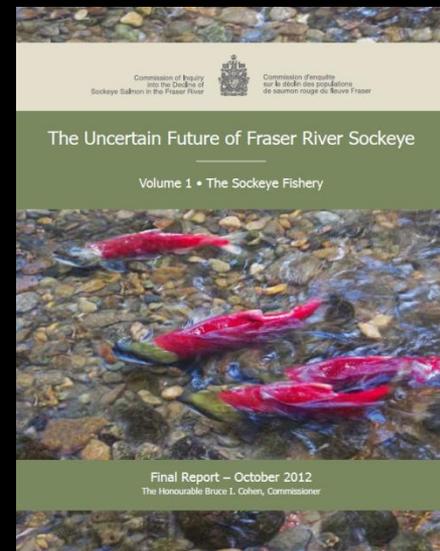
Fraser River – Fisheries

- Management – natural
- Commission Policy – commercial priority
- Average US catch - 730k (Treaty+NonTreaty)
- ~\$5.3 million ex-vessel value (2000-2011)



Fraser River

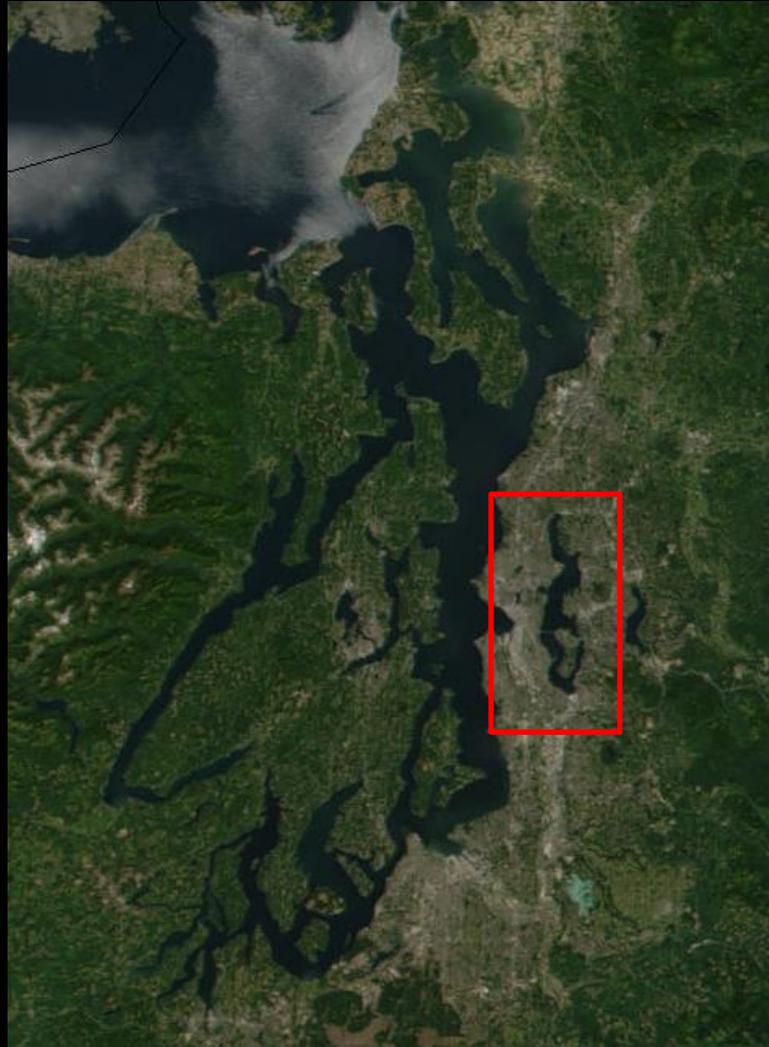
- 2008 – Decreased Fraser sockeye productivity spurred “Cohen Commission”
 - Goal to determine cause of decline
- Next year largest return in 100 years (30+ million sockeye)
- Cohen Commission Findings
 - Numerous local and regional stressors
 - Management not cause of decline
 - Identified life stages with knowledge gaps



Lake Washington

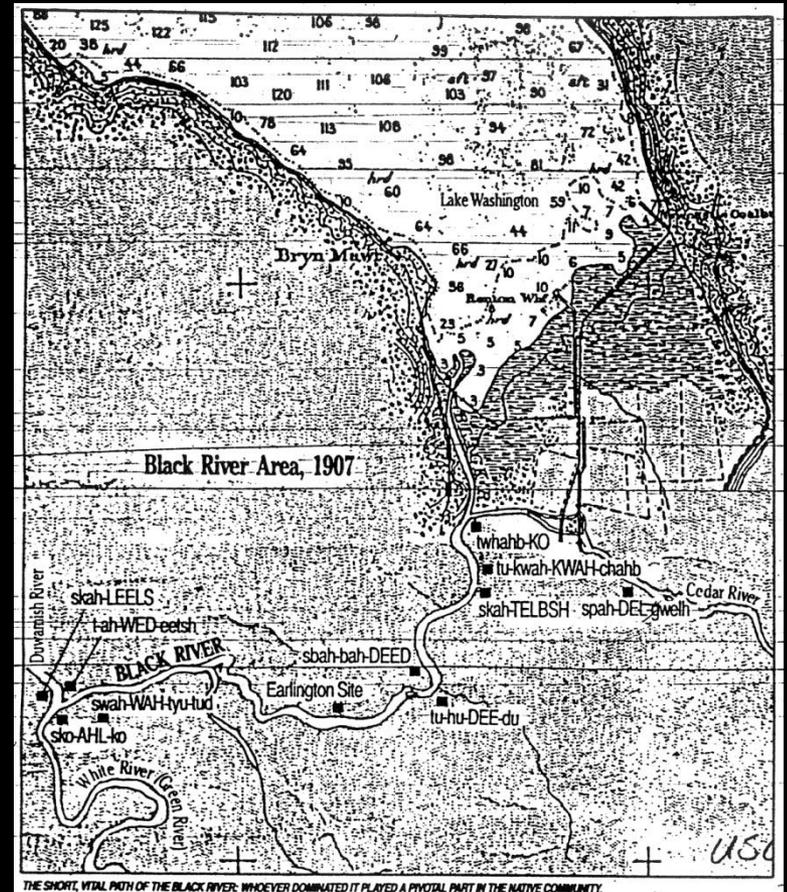


Lake Washington



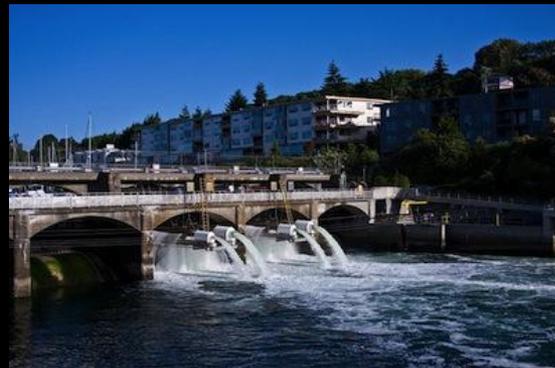
Lake Washington - History

- WDF introduced Sockeye from Baker from 1934-1944
- Construction of Ballard locks 1916 – lake dropped 8.8ft
 - Diversion of Cedar into lake
- Locks/ship canal became only lake outlet
- Suitable for lake rearing

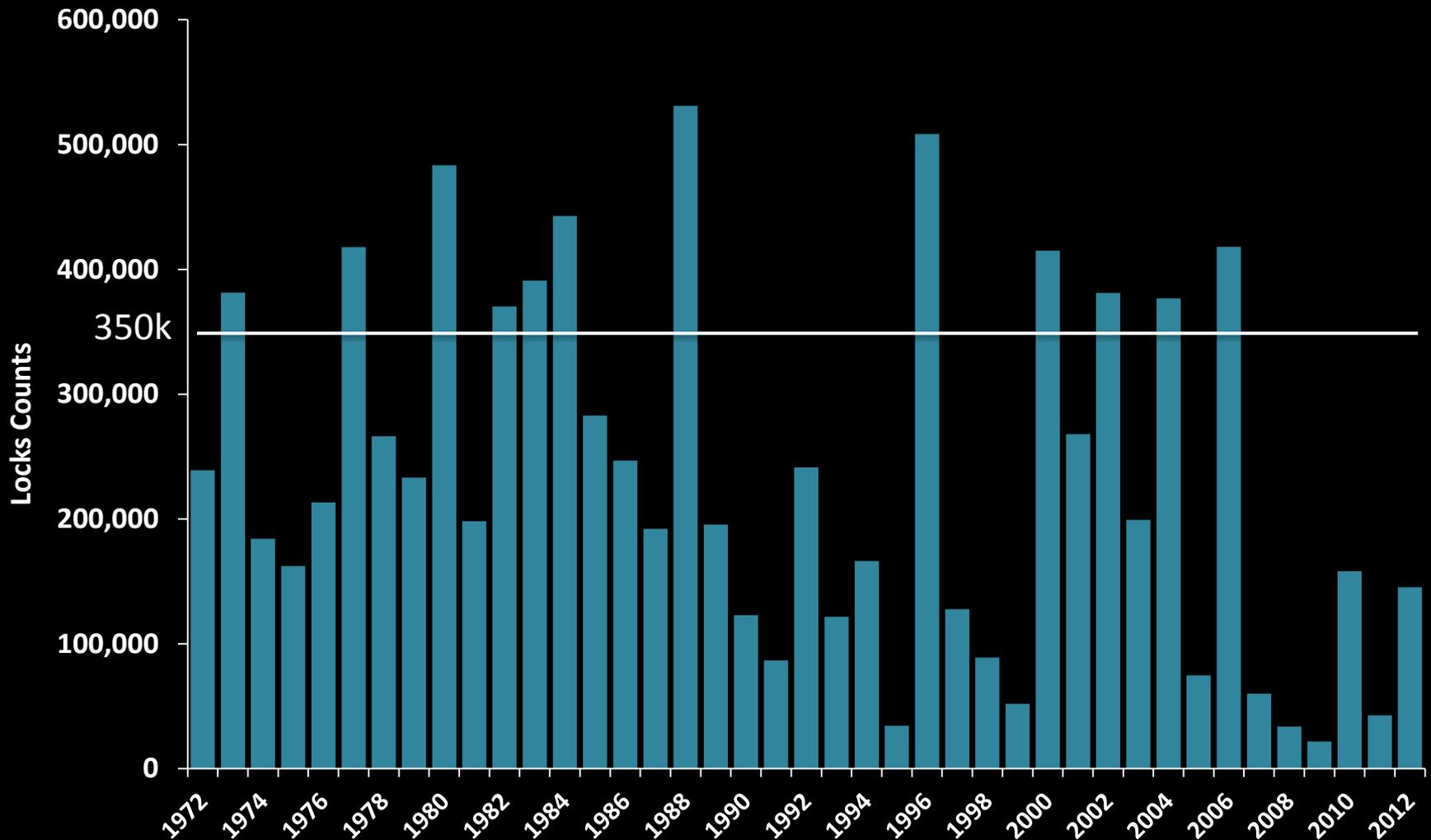


Lake Washington – History Cont.

- By 1960 ~25,000 fish returning
- Escapements increased through 60's
- First fisheries in 70's
- Spawning primarily in Cedar River
 - Bear Cr.



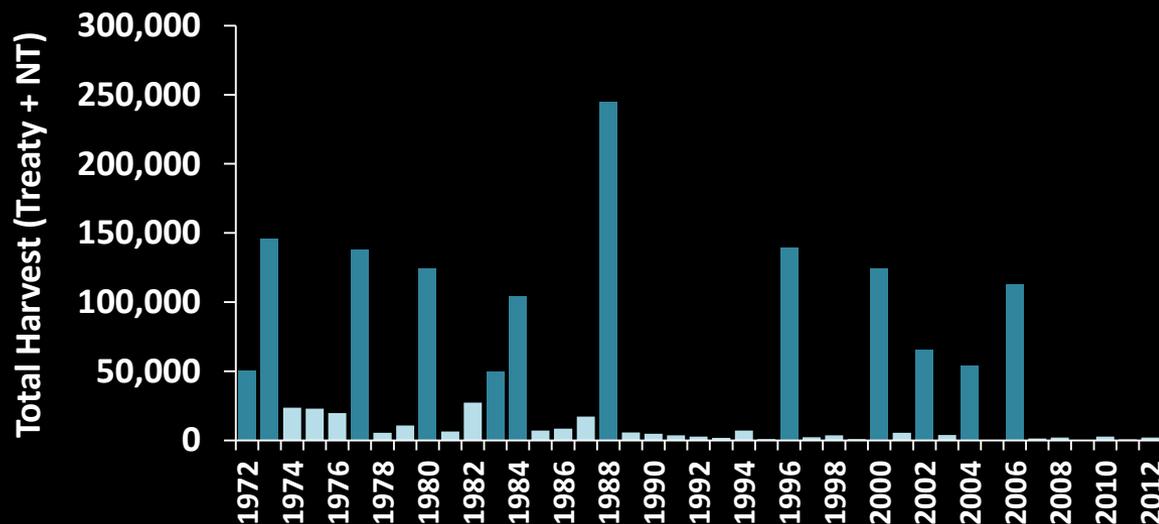
Lake Washington Locks Counts



- 350k escapement goal – surplus over 350k at locks is harvestable

Lake Washington – Fisheries

- Management – mixed stock
- Commission Policy – recreational priority, commercial > 200k share
- 1972-2012 – fisheries 29% of the time (last fishery in 2006) – 22% since 1990
- Average harvest – 111,000 (State + Treaty)
- 2006 Recreational Fishery – estimated \$3.7 million



Improvements

- Interim Cedar River Hatchery – 1991
 - 17 million egg-take capacity
- Improved Cedar River Hatchery – 2011
 - 34 million egg-take capacity
- Water quality improved
- Comanagers reassessing management framework



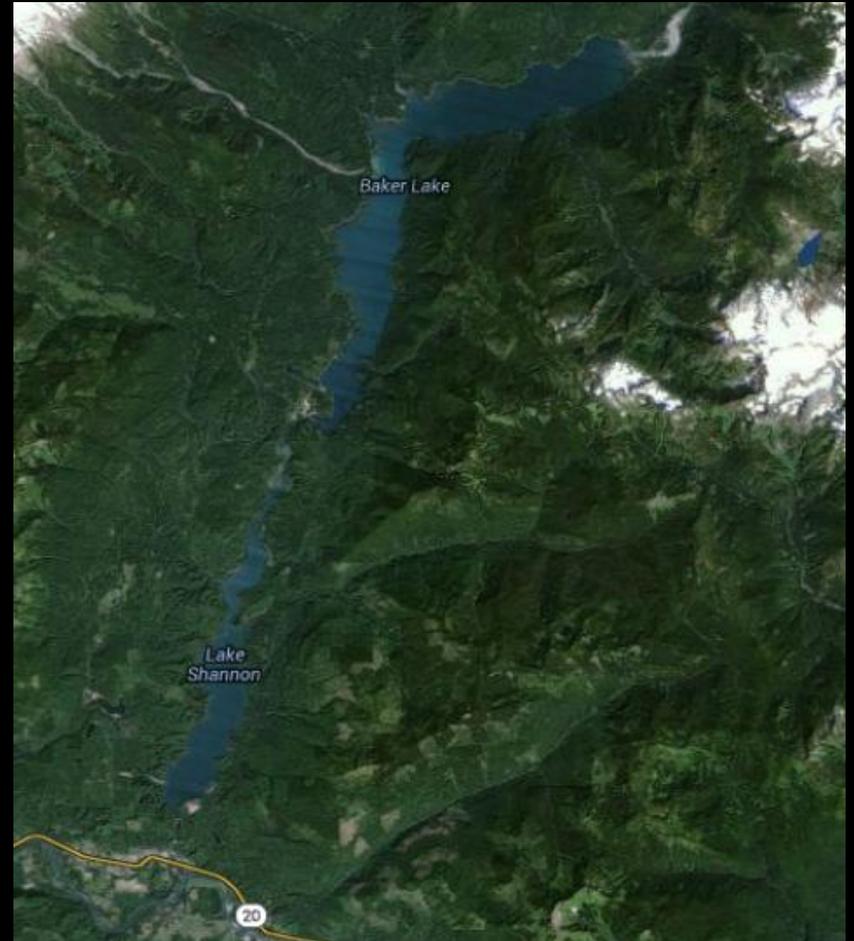
Challenges

- Lake productivity – McPherson and Woody 2009
- Urban development
- Locks counts – ground-truthing
- In-lake survival estimates

Baker Lake

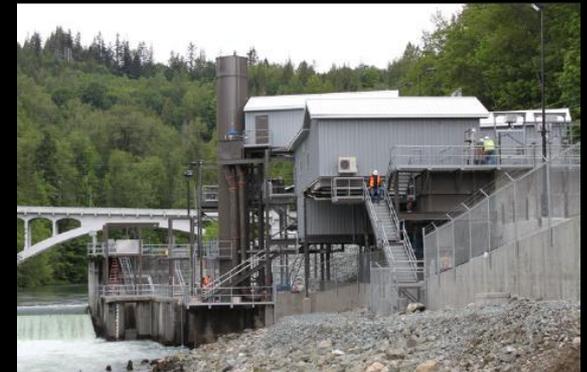


Baker Lake

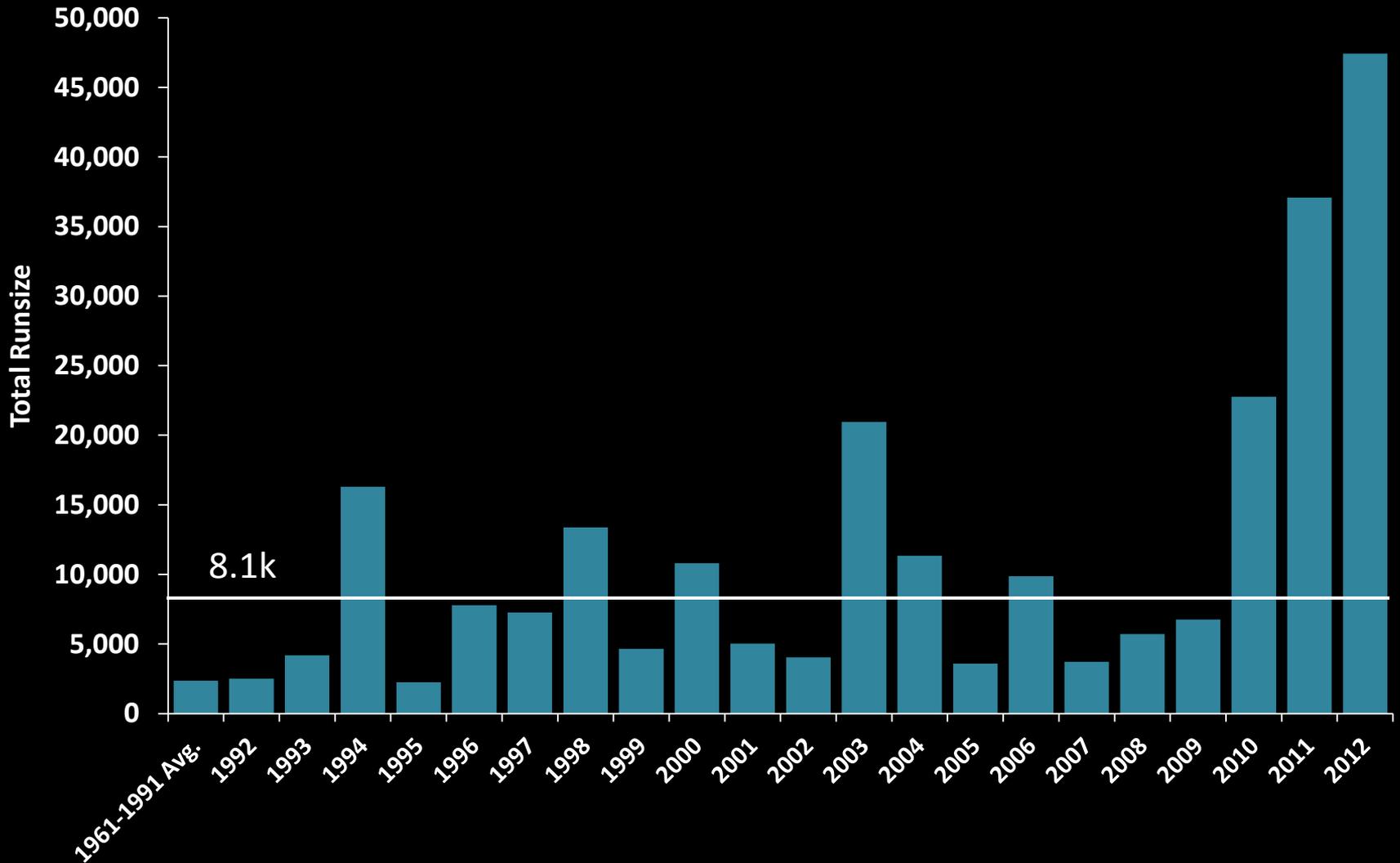


Baker Lake History

- Native Baker River sockeye run blocked by Lower Baker Dam in 1925 – ladder for fish passage
 - Lake Shannon
- Upper Baker Dam (1959) – enlarging Baker lake
 - Blocked upstream fish passage
- Human transport of adults/smolts from lake to Baker river
- Hatchery dependent run – artificial spawning beaches – low levels of natural spawning in Baker Lake/River

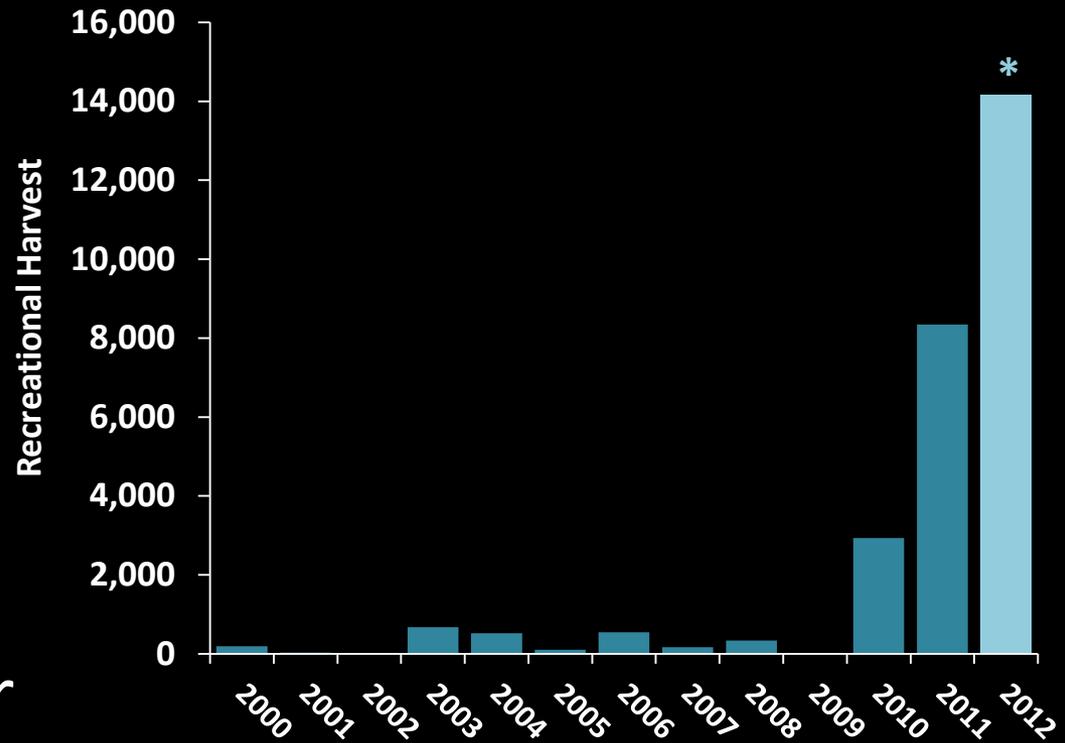


Baker Lake – Runsize



Baker Lake – Fisheries

- Management – predominately hatchery stock
- Commission Policy – recreational priority
- Baker Lake fishery opened in 2010
- 2012 first Skagit River fishery
- Avg. harvest ~7000
– 2010-12
- ~\$746k avg. economic value (2010-11)



Improvements

- 2008 floating surface collector increased smolt capture efficiency – “Gulper”
- Updated fish hatchery in 2010 – capacity 11 million fry (1.7 million 1970’s to 2009) – Artificial Spawning beaches
- Updated Baker trap – better fish handling

Challenges

- Lake rearing capacity for smolts
- Which fish contribute to smolt production
- Data needs for management



Lake Wenatchee



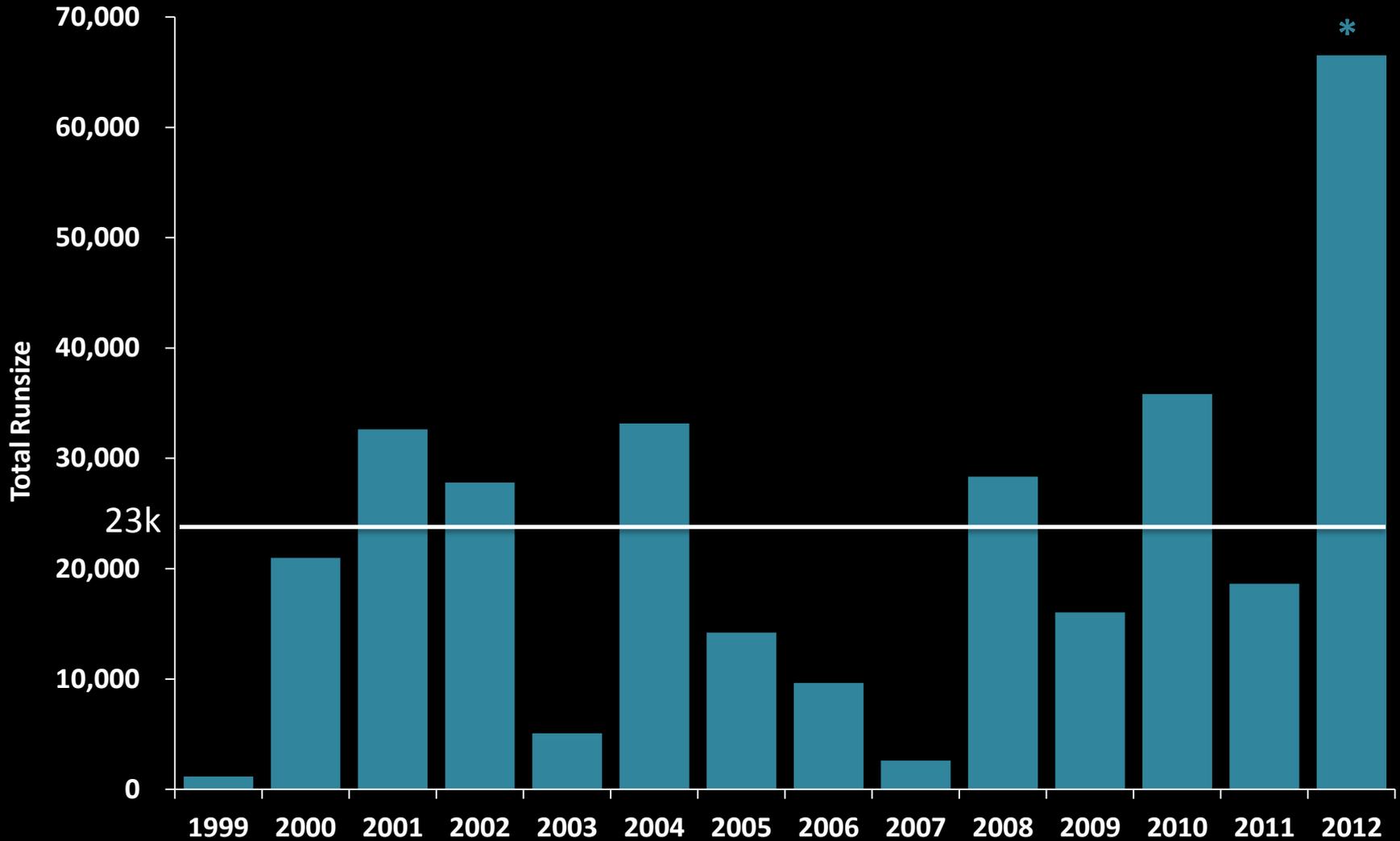
Lake Wenatchee



Lake Wenatchee – History

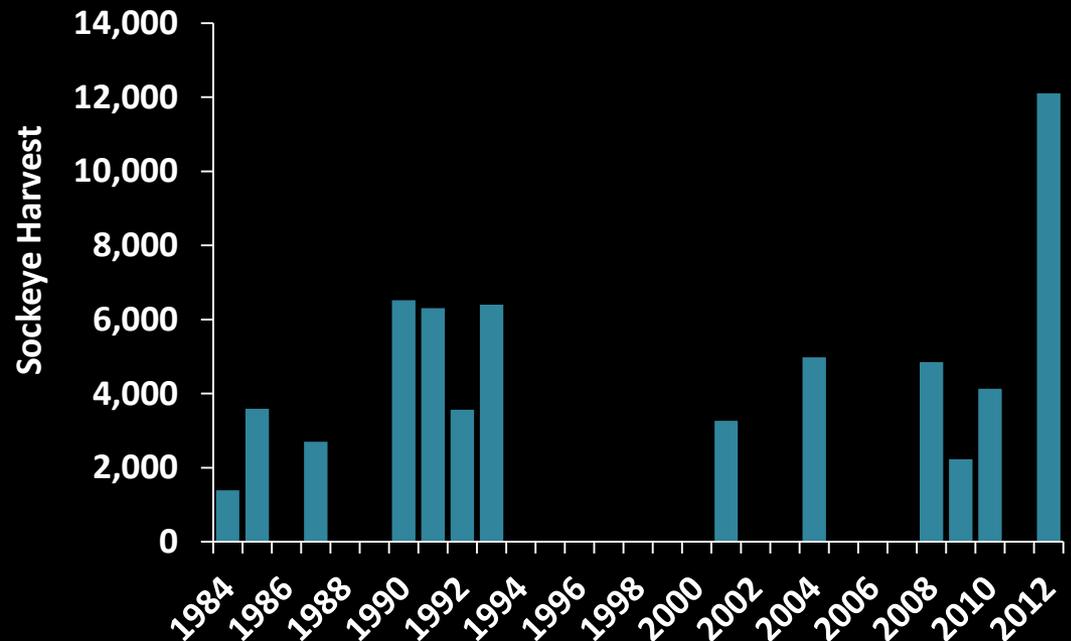
- Native run with introductions of Quinault River and Grand Coulee fish (1939-1943)
- 1909 Tumwater Dam built on Wenatchee R.
 - Closed 1956
- 1998 – Tumwater dam counts start
- Spawning – Little Wenatchee, White, Napeequa rivers.

Lake Wenatchee – Tumwater Dam Counts



Lake Wenatchee – Fisheries

- Management – natural stock
- Commission Policy- recreational
- On avg. fishery every 2 years (~46%)
- Avg. harvest ~ 4800 sockeye/year
- ~\$173,000 avg. economic value (04,08,09 fisheries)



Changes to Management

- Lake Wenatchee Hatchery – historically produced 200k fry
 - Poor returns
 - Cut to 100k -> phased out
 - Now entirely natural spawning

Challenges

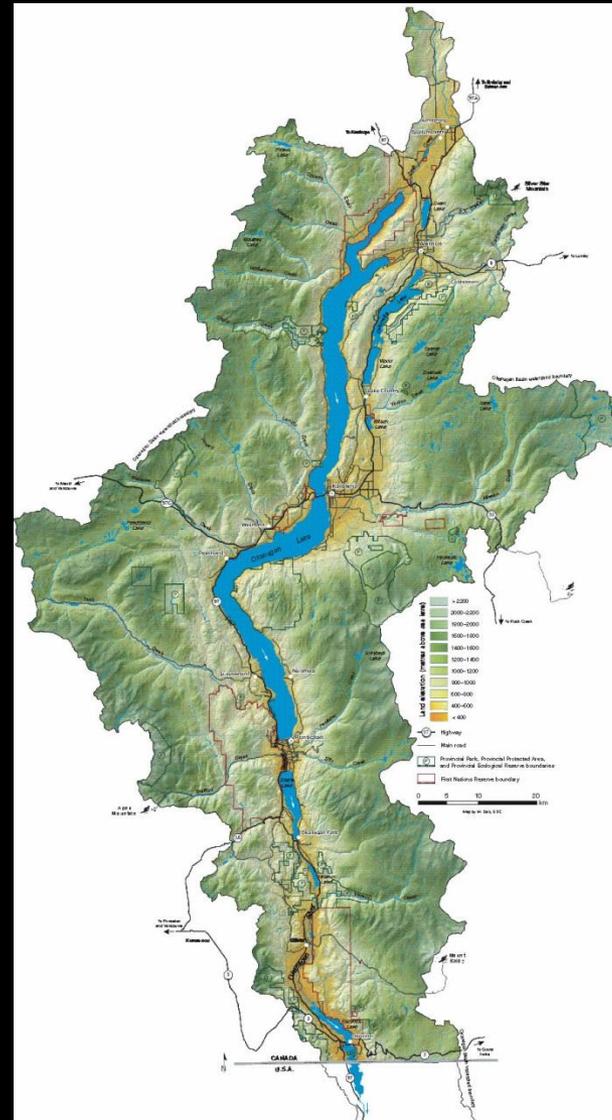
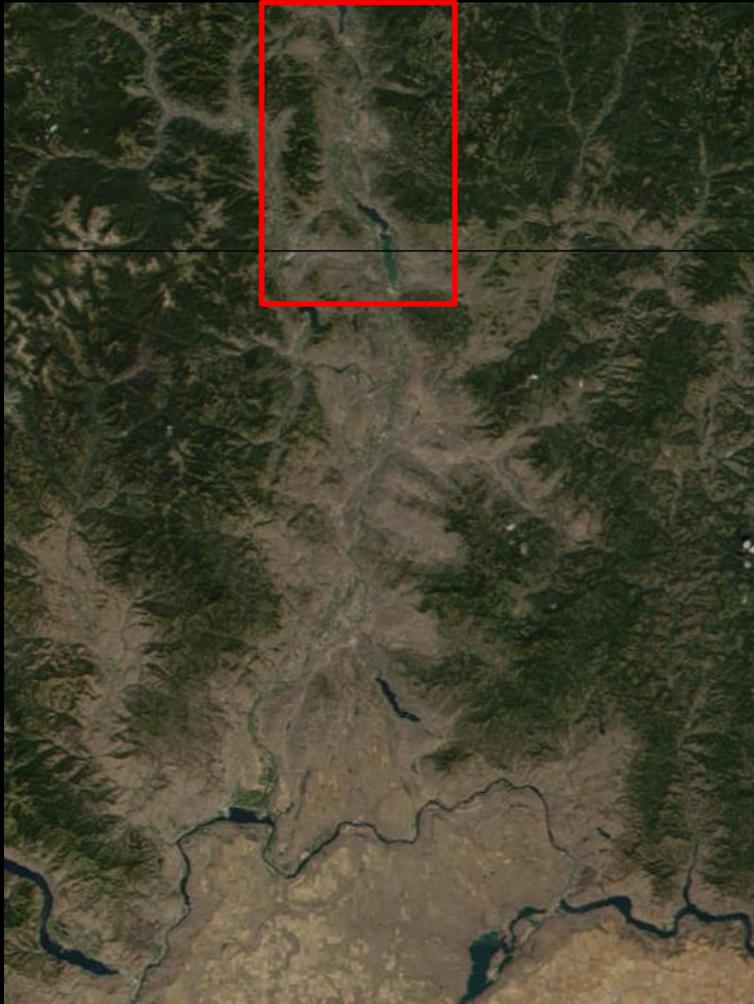
- Confined spawning habitat
- Prespawn mortality
- Passage through Columbia River dams
- Mainstem Management/Tribal Impacts



Lake Osoyoos/Okanogan River



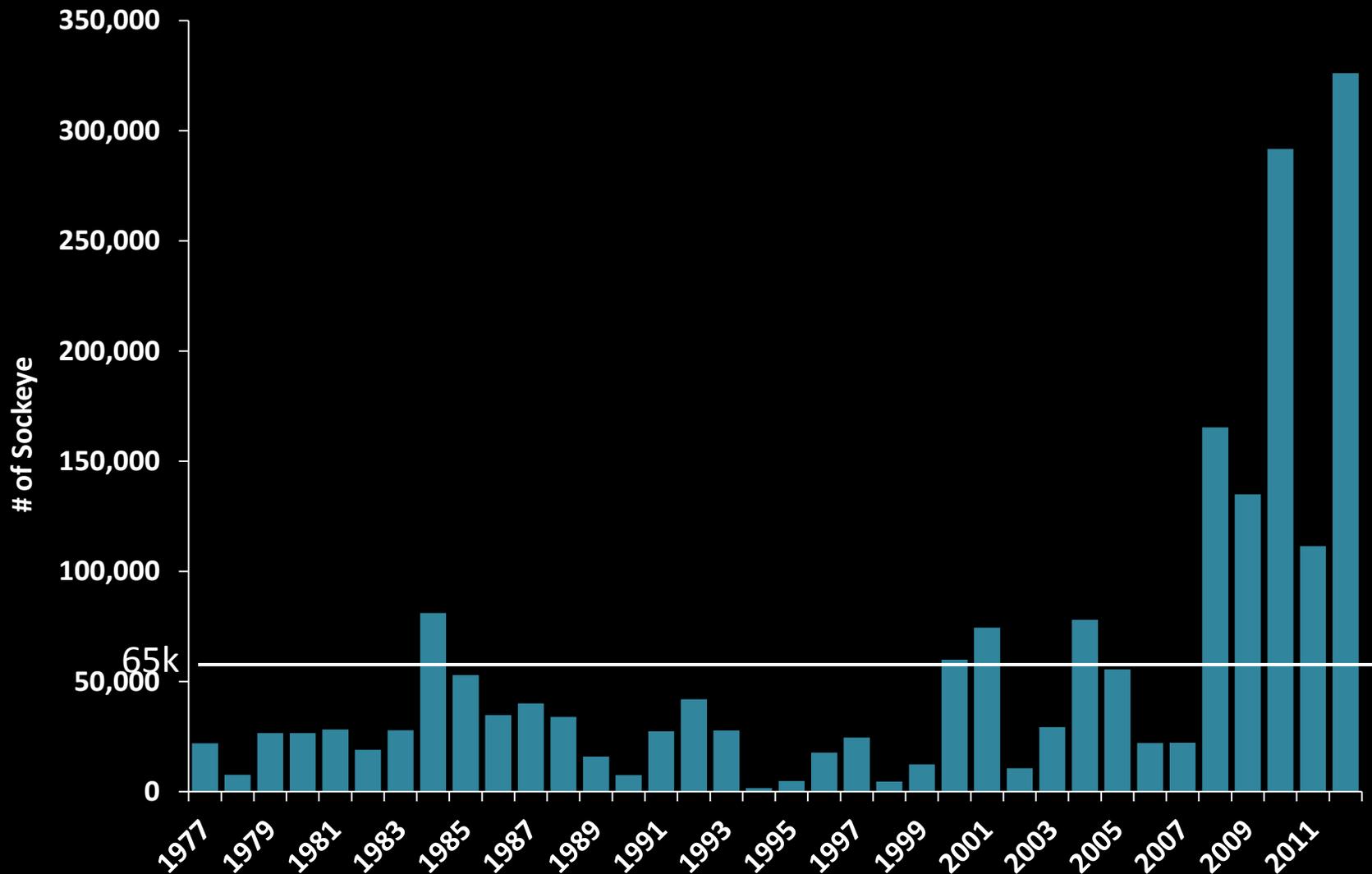
Okanogan/Lake Osoyoos



Okanogan - History

- Water quality improvements
 - Infrastructure (sewer)
 - Decreased nutrients into lake – Previously eutrophic
- Reintroduction/Habitat restoration efforts
 - Water quality improvement to Lake Osoyoos
 - Skaha Lake – removal of irrigation dam
 - Introduced sockeye into Skaha Lake
 - Modifications to McIntyre dam – fish access to Okanogan River above Osoyoos

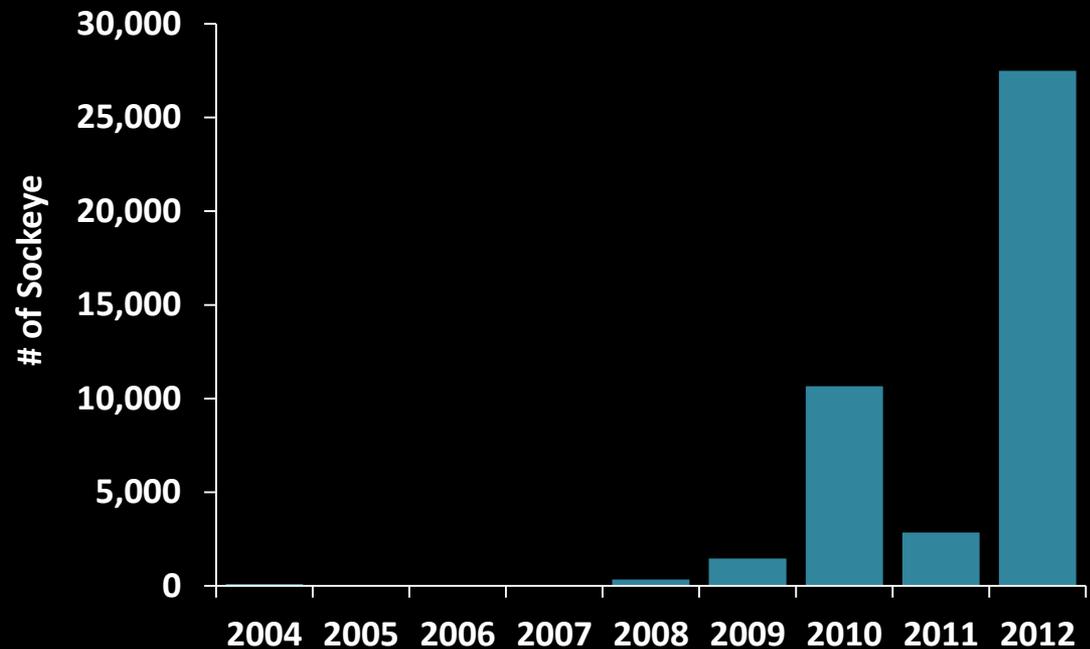
Okanogan - Runsize



- Comprises bulk of Columbia sockeye run currently

Okanogan - Fisheries

- Management – mixed stock
- Commission Policy– recreational priority
- US Fisheries occur in Columbia R. mainstem
- Recent fishery – Avg. harvest ~8600
- \$725,000 avg. economic value (2010-12)



Improvements

- New Hatchery in Penticton to be finished in 2014
 - 8 million egg take capacity
 - Supply sockeye to Skaha, Osoyoos and Okanogan

Challenges

- Columbia river dams
 - 10 dams to get to Osoyoos
- Access to Skaha Lake and Okanogan Lake
- High water temperature- prespawn mortality

Stock Summary

Snake River

- Captive broodstock success

Fraser

- High runsizes – commercial importance
- Cohen commission

Lake Washington

- Introduced run – urban lake
- Uncertain lake smolt capacity

Baker

- Hatchery dependent run
- Increased recreational opportunity

Stock Summary Cont.

Wenatchee

- Limited spawning habitat
- Most consistent fishery over last 20 years

Okanogan

- Bulk of Columbia return
- Spawning/lake rearing in Canada
- Habitat/water quality improvements

Increasing Opportunity

- Fraser
 - Develop marine recreational techniques
- Baker Lake
 - Lake Shannon Rearing
- Okanogan/Osoyoos
 - Support Canadian enhancement efforts
 - Develop new fishing techniques and areas
- Lake Washington
 - Reassess management framework
 - Continue studies to determine optimum hatchery practices
- Lake Wenatchee
 - Restore spawning habitat

Acknowledgements

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- Kyle Adicks
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Total Recreational Harvest

