

## Reintroduction of Salmon into their Historic Habitats (Two-Part Session)

A Concurrent Session at the 35<sup>th</sup> Annual Salmonid Restoration Conference held in Davis, CA from March 29 – April 1, 2017.

# + Session Overview

- Session Coordinators:

- Curtis Knight, CalTrout
- Rob Lusardi, Ph.D., CalTrout/UC Davis

Climate change, aging water infrastructure, successive years of drought, and increasing demand for water resources has precipitated strong declines in salmonids throughout California. Compounding this, longitudinal and lateral disconnections from historical spawning and rearing habitat has triggered a loss of salmonid life history diversity, making species less resilient to change. As a result, reintroductions of salmonids to historical habitat has occurred or is proposed as a recovery strategy. Dam removal, trap and haul above high head dams, reintroduction of captive bred animals, and improving lateral connectivity to historical floodplain habitat are proposed methods to improve salmonid life history diversity, abundance, population redundancy and, ultimately, resilience to change. We seek abstracts that examine the methods, science, and policy implications of salmonid reintroductions to historical habitat.

# + Presentations

Part 3 of Afternoon session

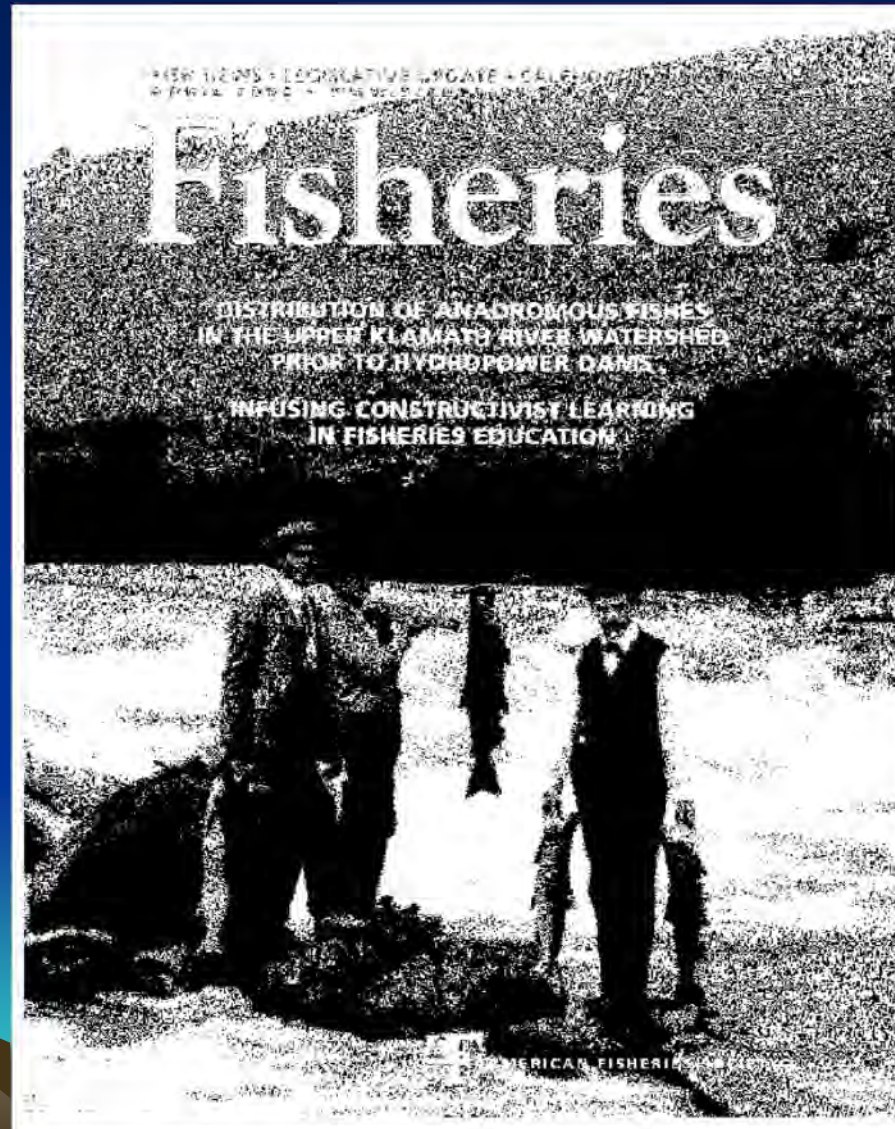
*(Slide 4) The Persistence and Characteristics of Chinook Salmon Migrations to the Upper Klamath River Prior to Exclusion by Dams*  
John Hamilton, US Fish and Wildlife Service

# Presentation for Salmonid Restoration Federation

4/1/17

John Hamilton  
USFWS, Yreka CA

# Background – April 2005

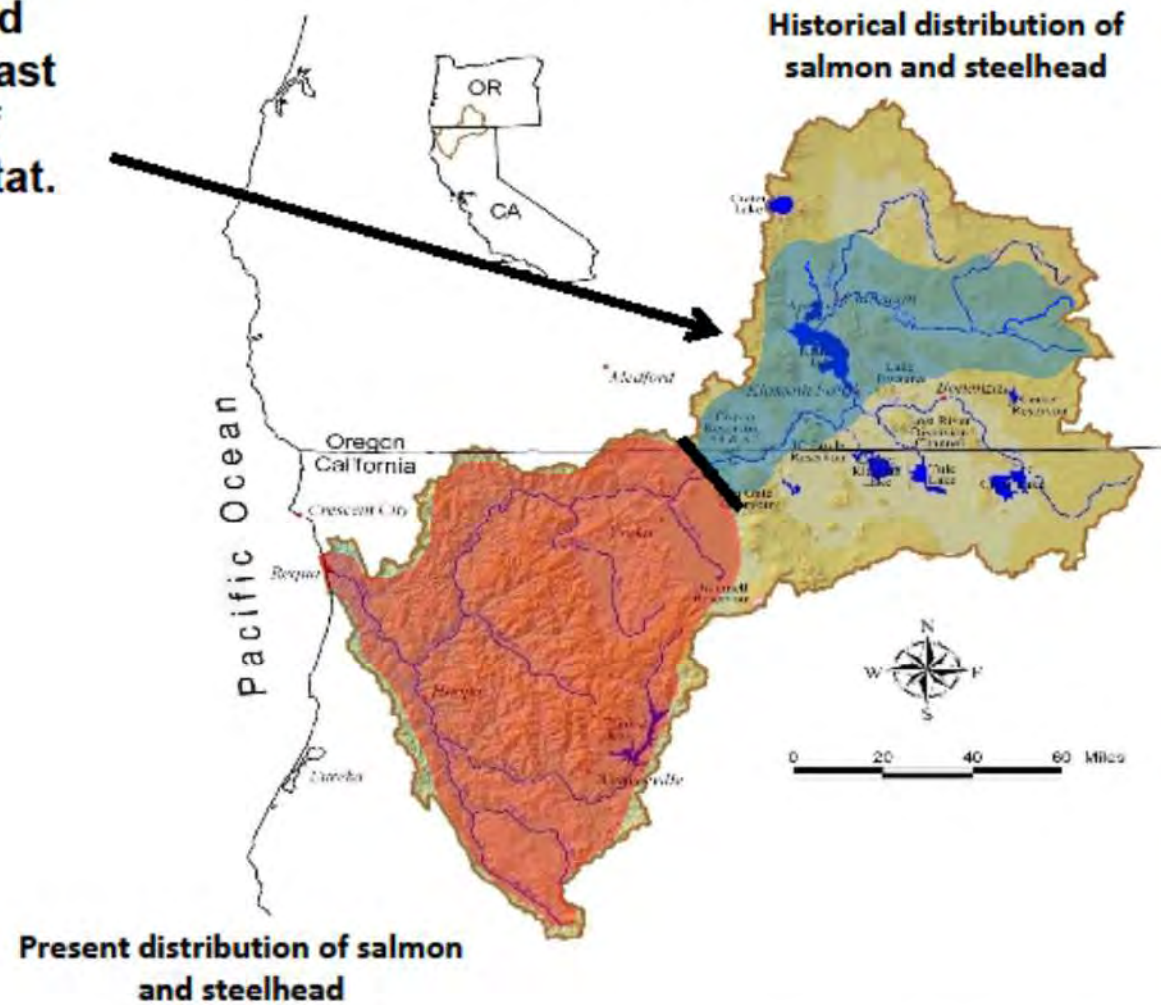


# Administrative Law Judge TTH Finding (2006):

- Chinook salmon (both spring and fall-run) were abundant in the tributaries of Upper Klamath Lake, including Jenny, Fall, and Shovel Creeks, as well as the Wood, Sprague, and Williamson rivers. (*NMFS/FWS-Issue 2A*)

**Provides Salmon  
and Steelhead  
access to at least  
420 miles of  
historical habitat.**

## Klamath River Basin



Compiled by M. Swenson, US-OR Klamath Basin Area Office, 2009.

# Since 2005/2006

- We found extensive new information on Chinook salmon
- Some of new info has conflicted the Record on historical migrations upstream from IGD and needed scrutiny
- An updated synthesis of all info provides a better understanding of historical Chinook salmon migrations



# The Persistence and Characteristics of Chinook Salmon Migrations to the Upper Klamath River Prior to Exclusion by Dams

John Hamilton, Yreka FWR

Dennis Rondorf, USGS

William Tinniswood, ODFW

Ryan Leary, Klamath Tribe

Tim Mayer, FWS

Charleen Gavette, NMFS

Lynne Casal, USGS

# Important New Sources since 2005/2006: Digitized Historical Newspaper Collections

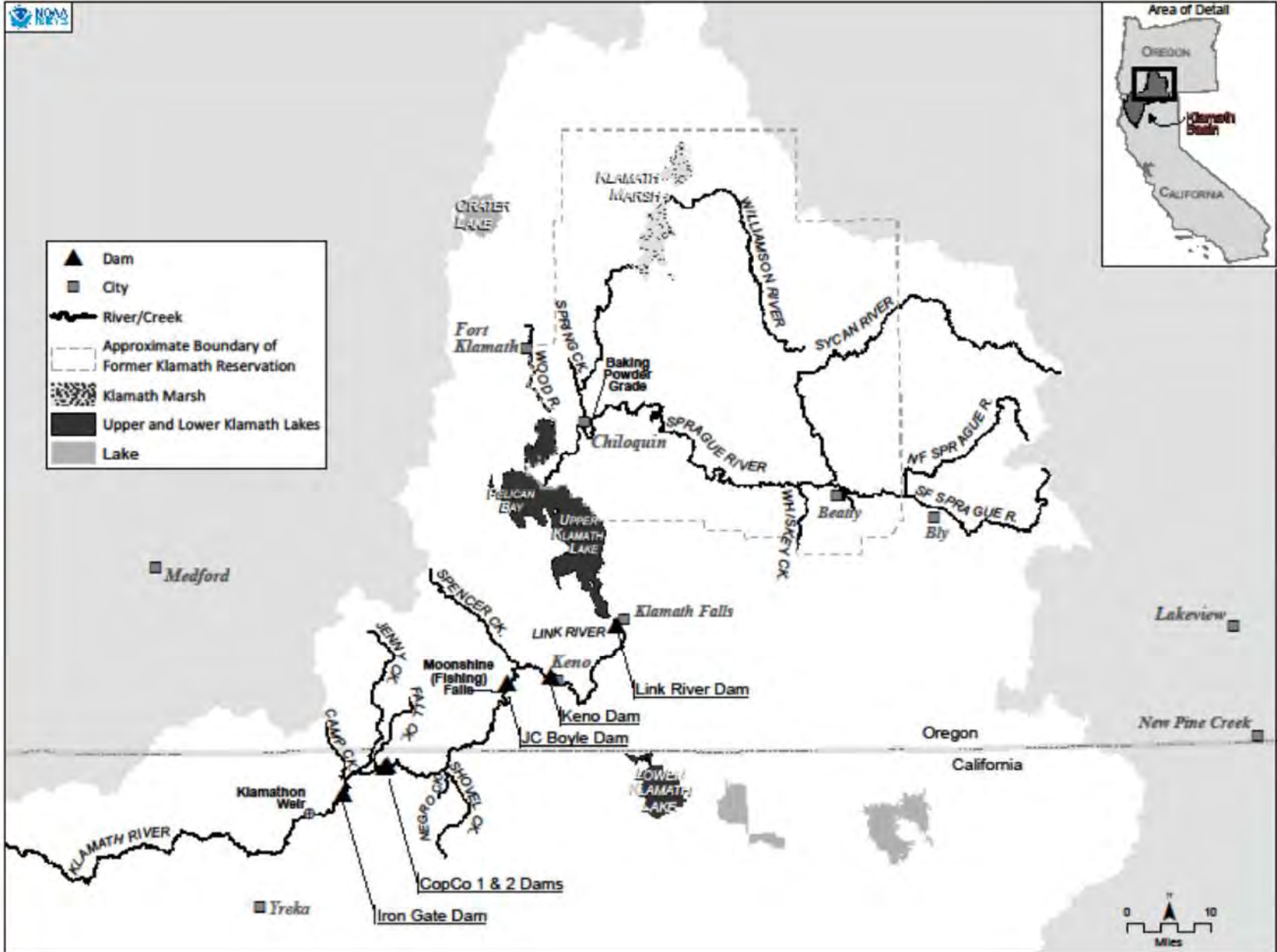
- California State Library – California Digital Newspaper Collection
- University of Oregon Library – Historic Oregon Newspaper Collection

# New Information vs. Conventional Wisdom

- Spatial Extent of Chinook Salmon Migrations in Upper Basin?
- Abundance?
- Upper Basin migrations disappeared by the 1890's (Hume in Snyder 1931)? Extirpated before 1900 (Moyle 2002)?
- Migration blocked in 1917 or 1918?
- Migrations only in Fall and Spring?

# New Records Since 2005/2006

Reach	2005 Publication	New Info Since 2005
Upstream from IGD	17	>100
Link River and Upstream (Klamath Upper Basin)	12	65



What do Anecdotal Accounts  
Suggest about Abundance of  
Historical Runs of Chinook  
Salmon Upstream from IGD?



## Anecdotal Accounts of Abundance Range from Thousands to Millions

- *“..thousands of salmon are beating their lives out in an attempt to scale the falls [Moonshine Falls]. A fish ladder could be built ...”* Portland Sunday Oregonian April 10, 1910
- *“...There are millions of the fish [salmon] below the falls near Keno....”* Klamath Evening Herald, September 24, 1908

# Historical Abundance Upstream from IGD

Year	Accounts: Non Occurrence	Accounts: Not Abundant	Accounts: Abundant
Pre-1910	NA	3	>41
Post -1910	?	?	?



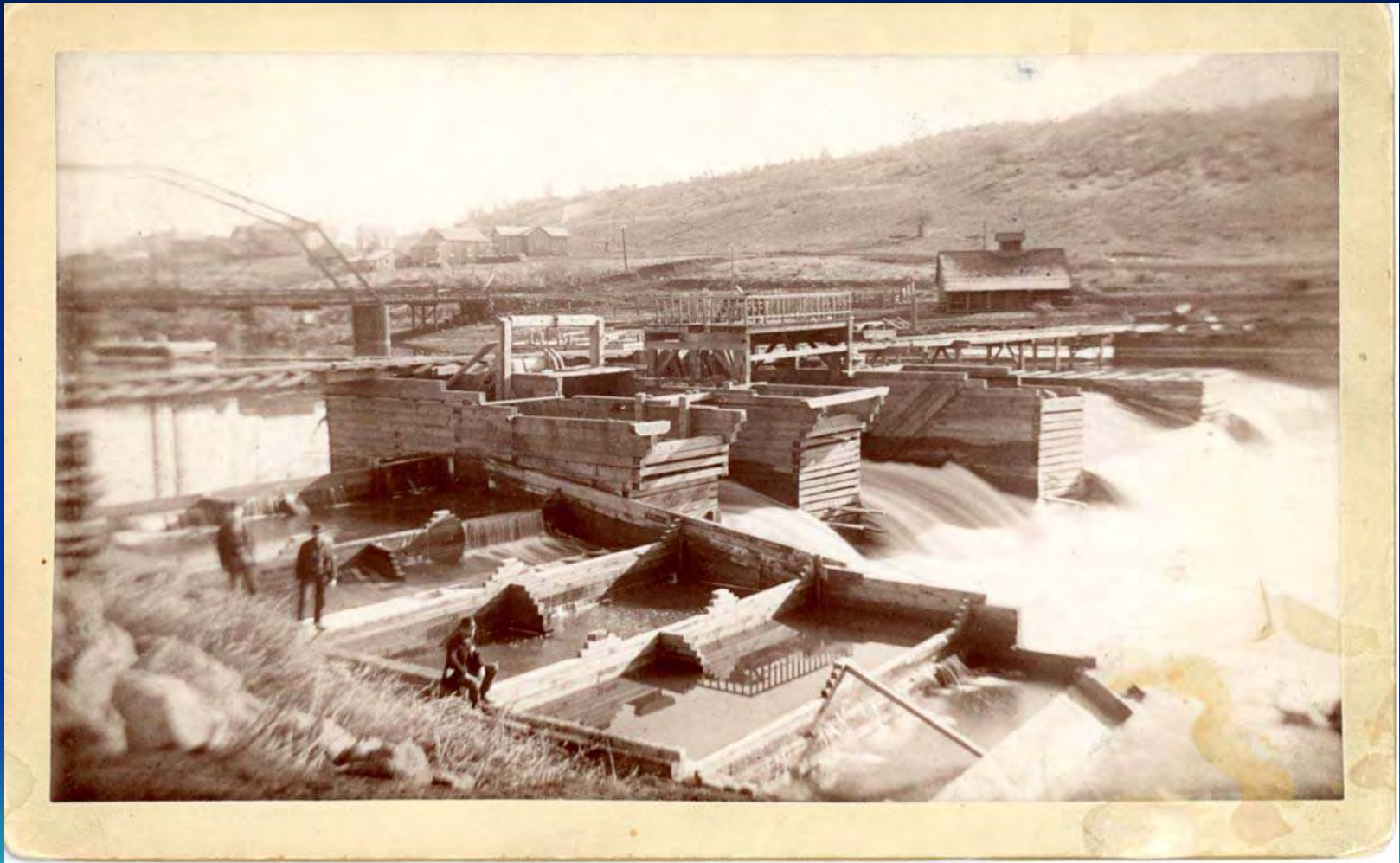
# Klamathon Migration Blockage

- 1889 Klamathon, CA Mill Dam
- Blocked upstream migration
- Many salmon trying to pass upstream were illegally trapped and sold

# Klamathon Migration Blockage

- In 1889 the Klamathon Dam became a Regional issue:
  - OR Governor insisted that “*measures be taken to stop the lawless acts and to have a fishway constructed that will allow the millions of salmon to pass up this important river, as this is the season they must go up to spawn*” (Sacramento Daily Union, September 25, 1889)
  - CA Governor appointed a Siskiyou County Fish Commissioner & instructed the Sheriff to lend every assistance possible; fishing violators were arrested
  - First precedent for Klamath River fish ladder; immediately constructed by the Company

# Late 1889 - Company Constructed a Fish Ladder



# Klamathon Fish Ladder

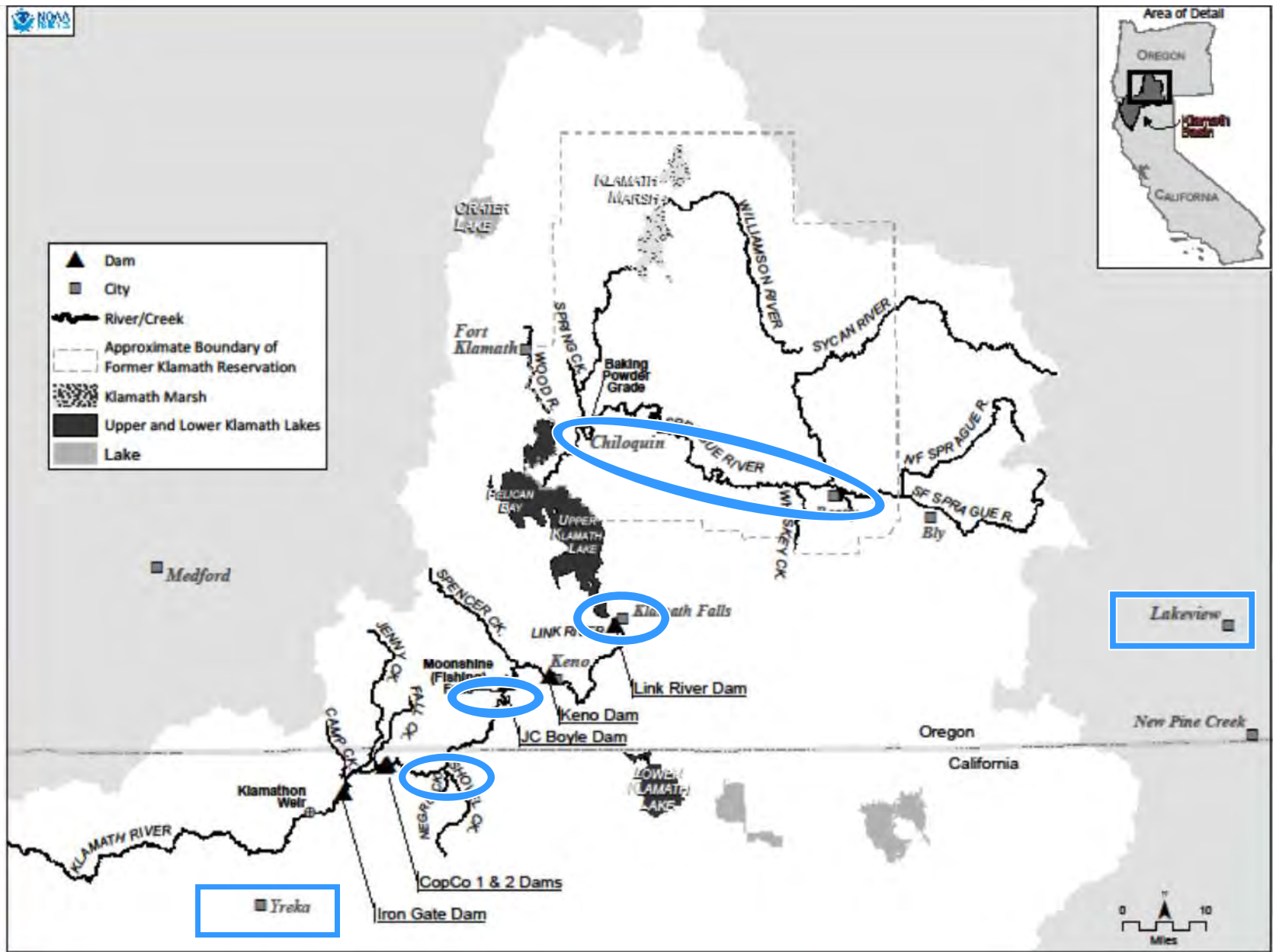
- 1890's - Klamathon fish ladder intermittently impaired, but did not block migration
- 1902 – Klamathon and dam destroyed by fire
- Post 1902 – No impairment; two of largest anecdotal estimates of salmon runs were in 1908 and 1910

# Upper Klamath River Harvest and Fishing Locations



# Small Scale Commercial Harvest

- Four Locations
  - Shovel Creek, CA
  - Moonshine Falls, OR
  - Link River, OR
  - Sprague River, OR



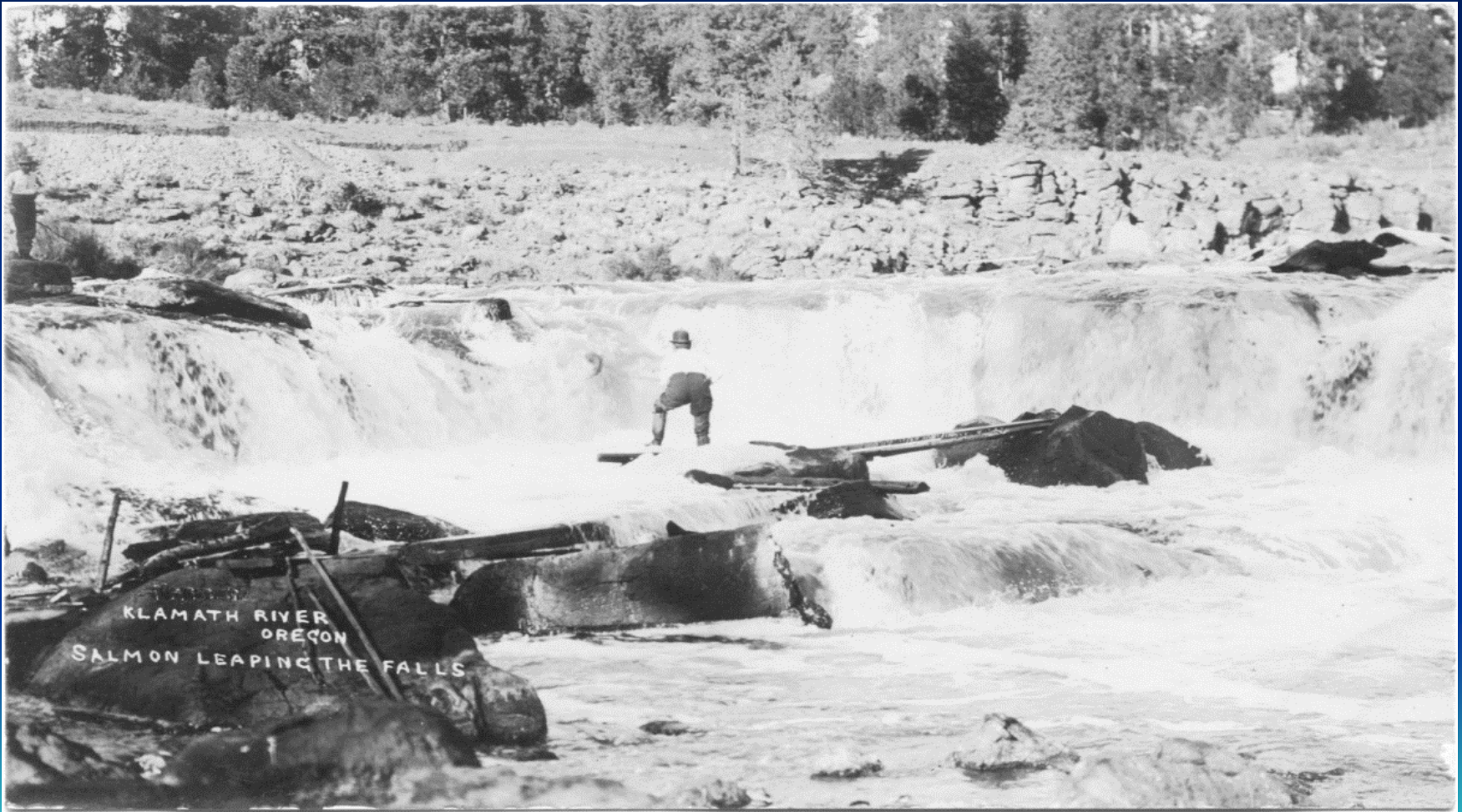
# Shovel Creek: 1902



"MY BEST DAY'S CATCH."



# Moonshine Falls: 1910



# Salmon Fishing, Link River: (about 1907)





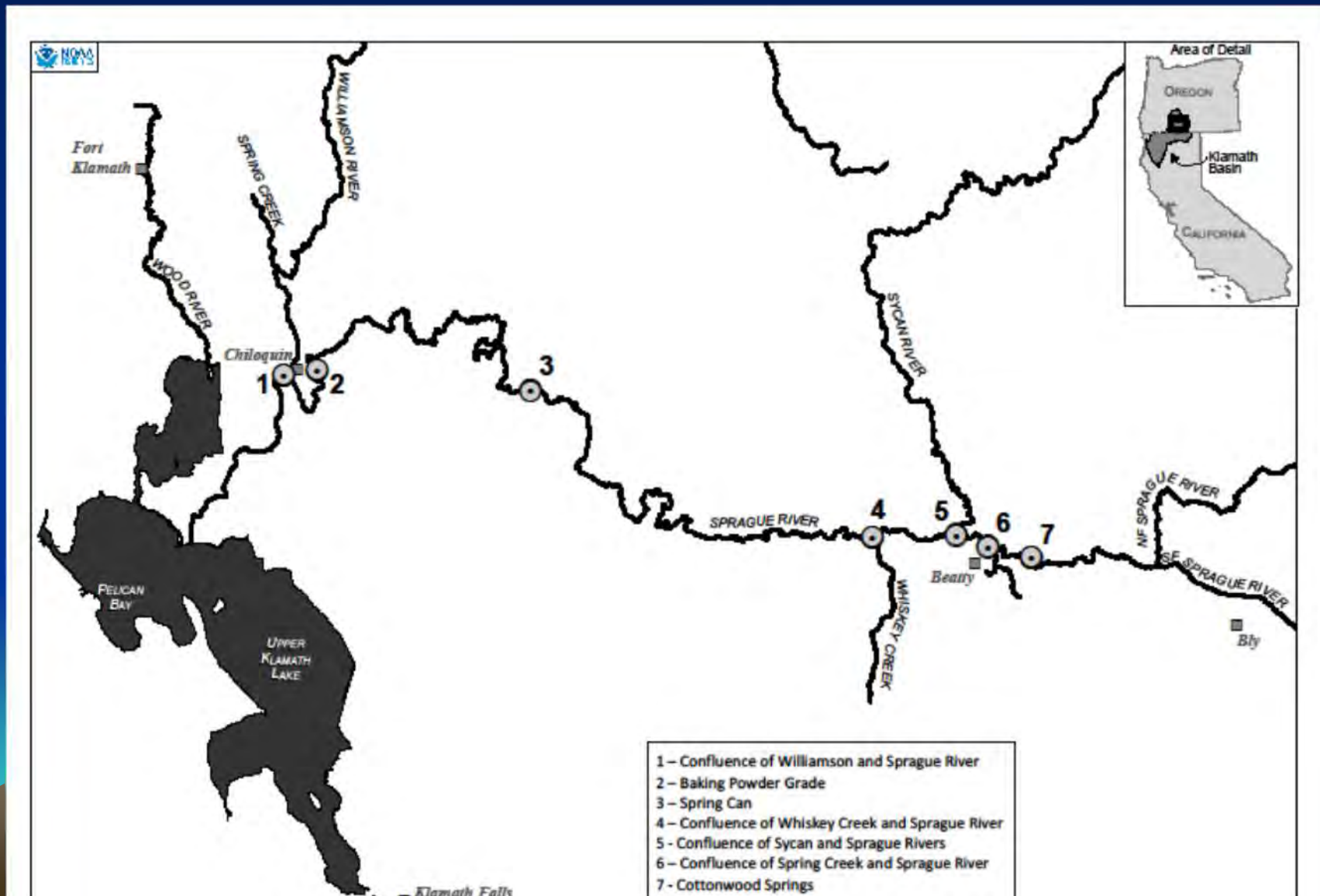
***Gentlemen display their catch while salmon fishing on the rapids of Link River, 1891.***

# Sprague River: 1904



INDIANS AT HOME, KLAMATH RESERVATION, OREGON

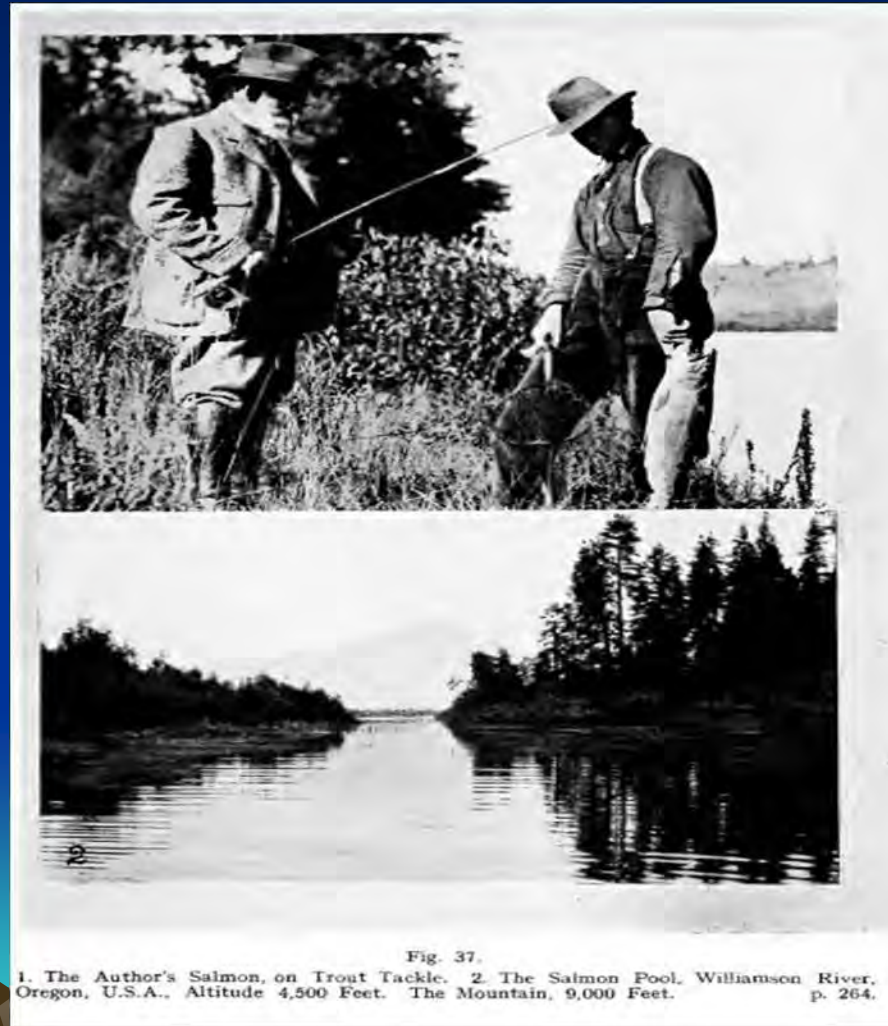
# “Indian Salmon Fishing Holes on the Sprague River” (Courtright 1941)



# Recreational Fishing: 1910

- “*Thousands of salmon enter the Klamath River [in Oregon] ...The Klamath County Rod and Gun Club desires a special provision lifting the protection from salmon to permit Klamath people to get at least some benefit from the large salmon runs here during the Fall and Spring months. Now no one is allowed to fish other than with hook and line, and as salmon will not bite a hook this law gives people here absolutely no benefit from the millions of salmon in these waters.*” Portland Morning Oregonian, December 10, 1910

# Game Fishes of the World by C.F. Holder (1913) – salmon caught in Williamson River



# When did Migrations Cease and Why?

- Three Perspectives:
  - A. Historical Record
  - B. Fish Passage Hydraulics
  - C. BOF (1916) report summarizing their weir operation



# Awareness of Migration

## Blockage - Klamath Falls *Evening Herald*

Front Page Headlines:

- *“Inspect the Klamath Dam - Officials will Investigate Salmon Shortage”* - October 28, 1913.
- *“Indians Oppose Salmon **Racks at Hatcheries [Klamathon Weir]** - Future Supply in Serious Danger”* - November 3, 1913.
- *“May Ask U.S. to See that River is Kept Clear: Is Shutting off Indians Salmon Supply”* October 23, 1914.

# Conclusion of Investigation into Migration Blockage

- “*NO SALMON BELOW DAM: Hatchery [BOF Klamathon Weir] responsible for salmon shortage felt here*” C.M. Ramsby and A.J. Sprague - *Klamath Evening Herald*, October 30, 1914.

# Remember Klamathon?

- Now Important for a second reason
- 1910 - in anticipation of Copco 1 Dam, U.S. Bureau of Commercial Fisheries (BOF) constructed a weir and began egg take at Klamathon



FIG. 41. The rocks at **Kinnathin**, between which the returning grills were trapped. Photograph by E. A. McGregor.

# In 1910 Did BOF Weir Block Migration??

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## Examples - Post 1910 Accounts of Abundance Upstream from Klamathon

- 1911: “..one of the Klamath Indians, last week came over from the Reservation [*to Lakeview, Oregon*] bringing with him a large load of salmon which were *caught in the Sprague River*. It is needless to say that he found a ready sale for the fish.” Lakeview, OR Lake County Examiner (October 19)
- 1912: “Salmon are *running in fine style in the Klamath and Link Rivers* .....None have been taken with hook and line as yet, although a number of fishermen have been whipping Link River for them.” Portland Morning Oregonian (September 9)

# U.S. Bureau of Commercial Fisheries Report (1916) on Klamathon Weir Operation:

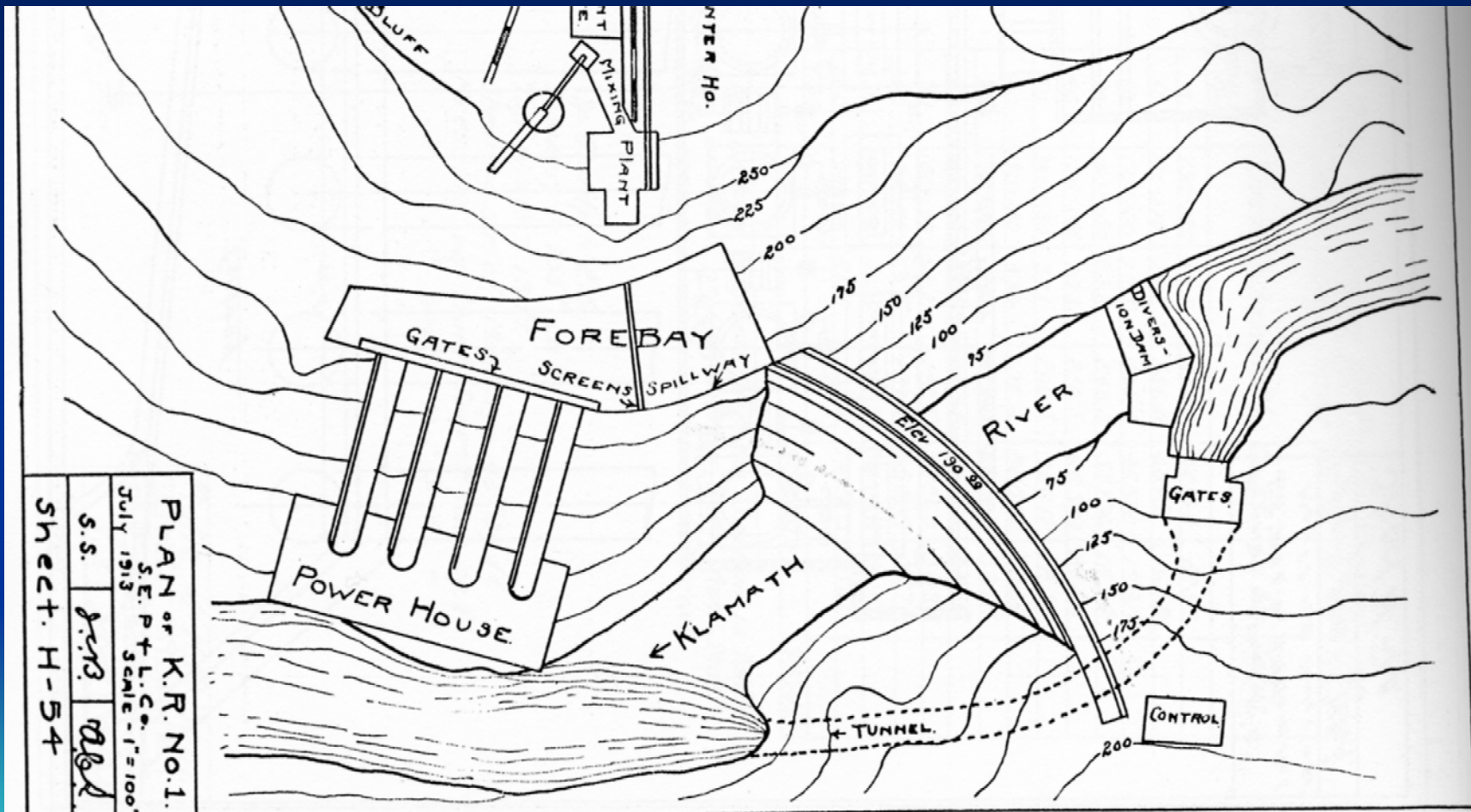
- *“The racks are put in place in September and removed in December of each year.”*
- *‘All the spring-run salmon are permitted to run upstream beyond the station. The racks are not in place until after the run is passed by and in the upper part of the river.’*

If Migrations did not stop in 1910, when did they cease?

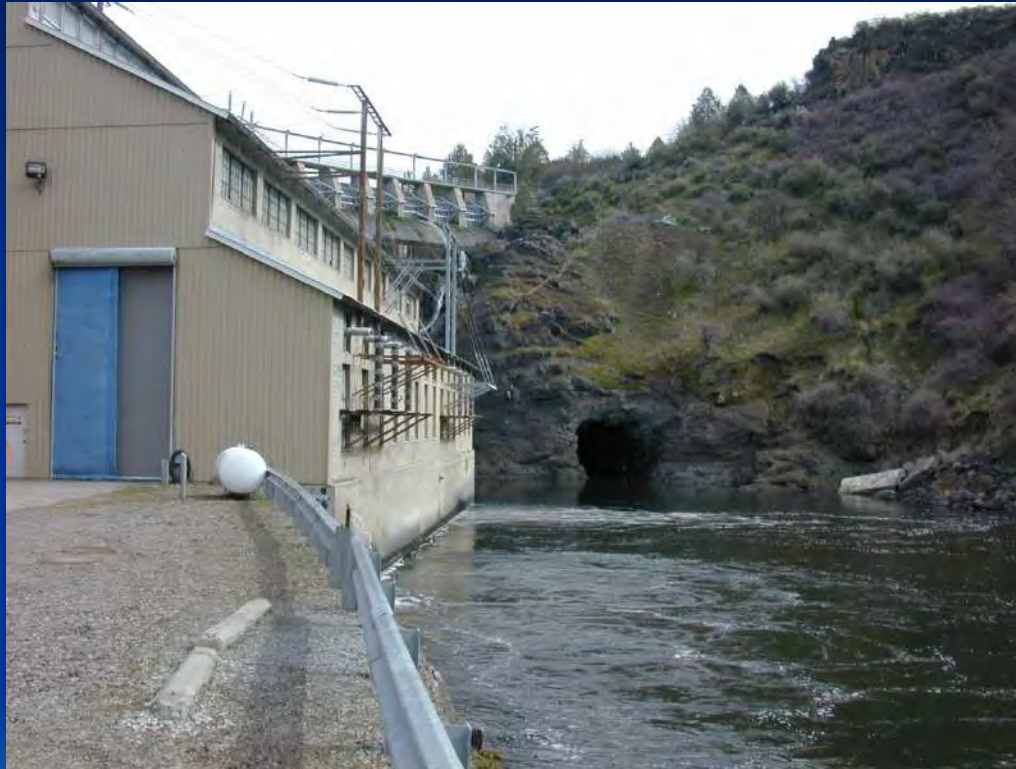


# Fish Passage Hydraulic Calculations

# Copco 1 Diversion Tunnel Plan: 1910



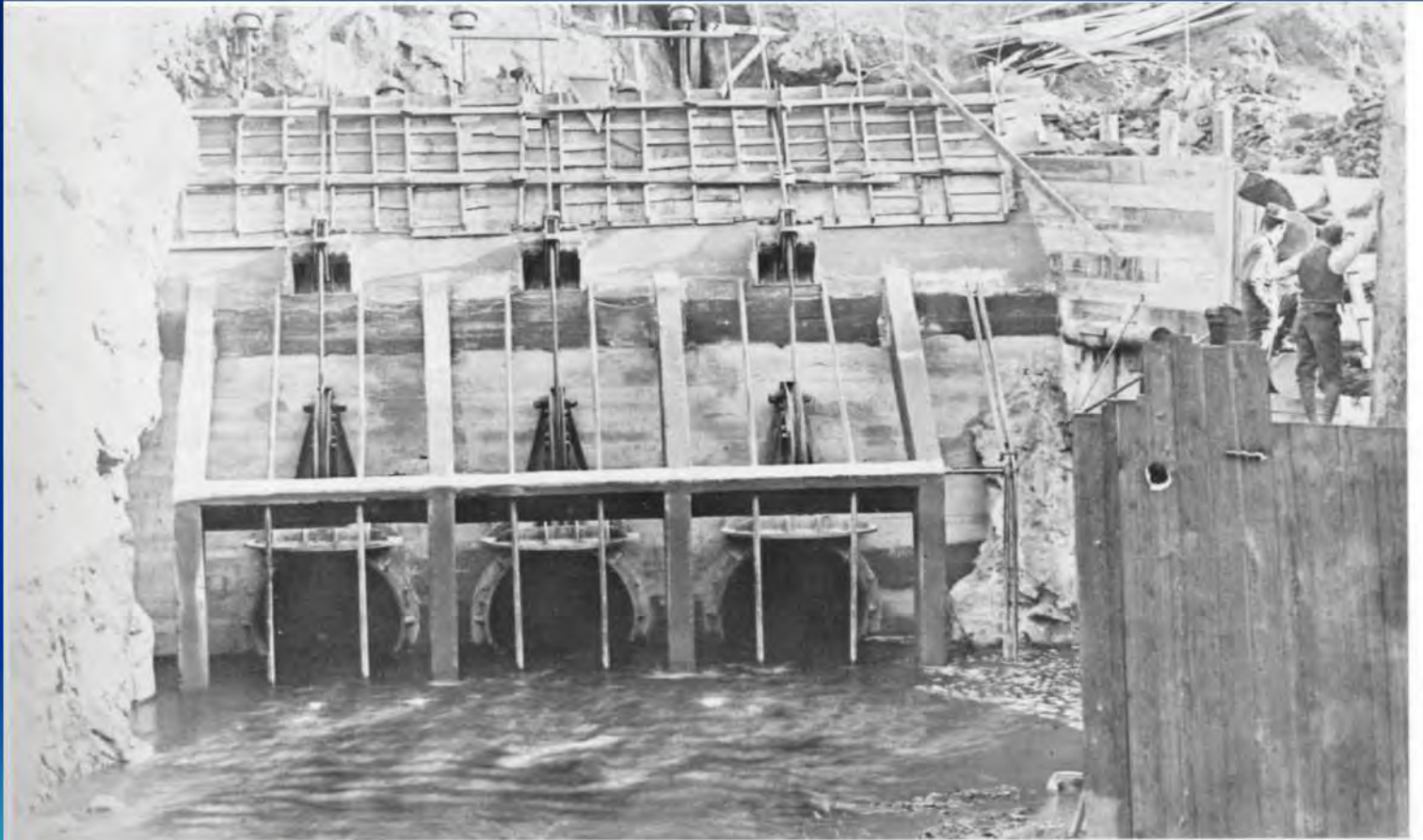
# Copco 1 Diversion Tunnel



# Copco 1 Diversion Tunnel 1911



# Copco 1 Diversion Tunnel Headgates October 12, 1912



First water turned through Copco No. 1 diversion tunnel. October 12, 1912.



# Copco 1 Diversion Tunnel Flow Velocity

- Diversion Tunnel = 108 m long, 4.9 x 5.5 m xsection
- Slope 2.0%; Manning's  $n = 0.05$
- Minimum average daily flow = 42.5 m<sup>3</sup>/sec
- Velocity thru tunnel = 3.3 m/sec
- Chinook salmon max swimming distance @ 3.3 m/sec flow = 51 m vs 108 m long tunnel

# When Did Migrations Cease and Why?

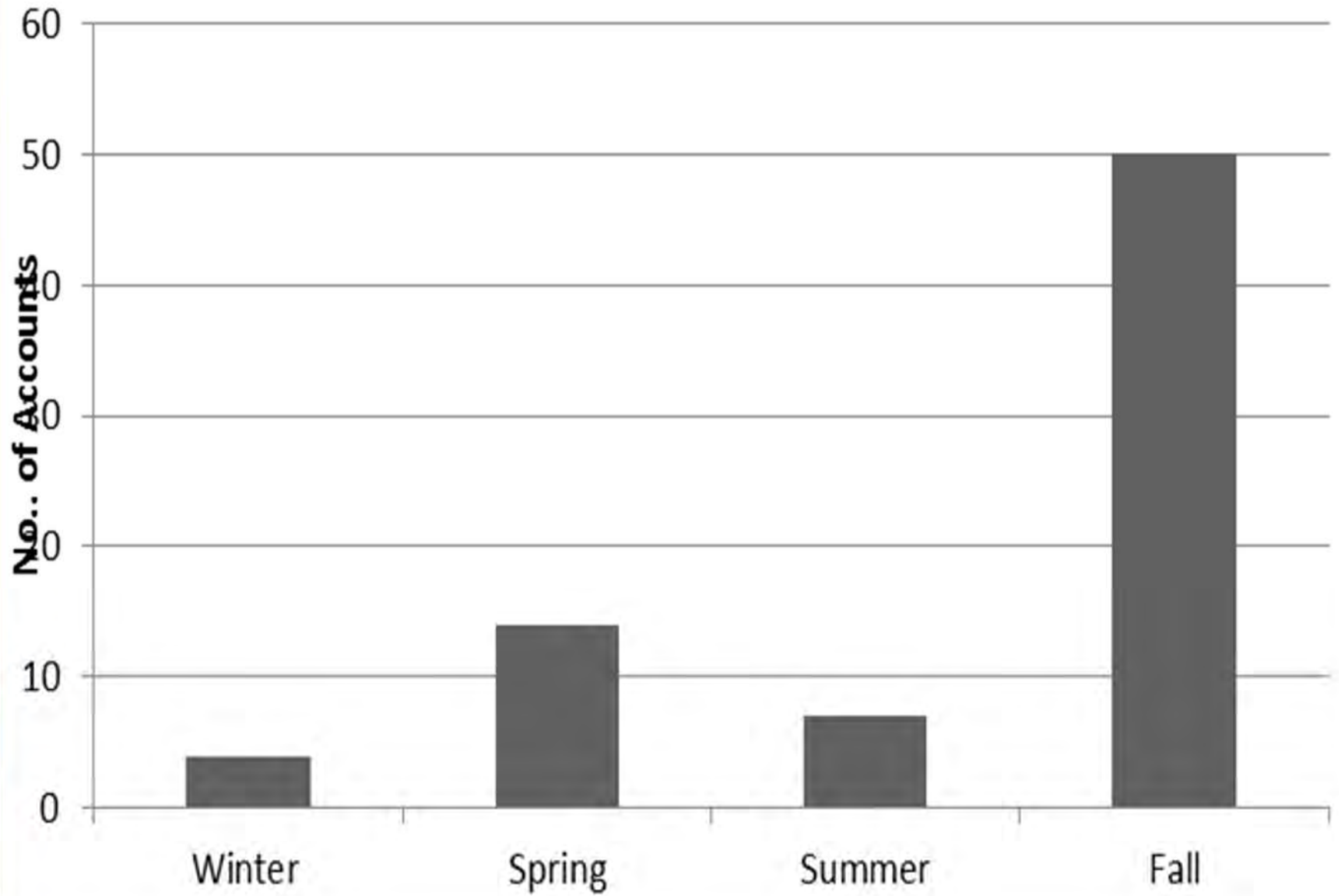
- Actual date of blockage – about October 12, 1912:
  - Historical Record
  - Fish Passage Hydraulics
  - BOF Report on weir operation

# Confounding Factors

- Salmon that passed Copco 1 prior to blockage were observed upstream later in 1912
- Impacts were not apparent to all until fall of 1913

# When were the Seasonal Migrations Upstream from IGD?





# Seasonal Occurrence

- The record suggests that migrations were seasonally diverse and associated with various life histories
- Fall observations not necessarily salmon that entered Klamath Upper Basin in that season

# Summary

- There was overwhelming support for conclusions that Chinook salmon historically migrated upstream of Link River and into tributaries of Upper Klamath Lake
- New information confirms the importance of runs to early settlers and Indians. We found accounts of robust in-river Tribal and recreational fisheries upstream from IGD
- Reports of abundant runs far outnumbered reports of non abundance

## Summary (Cont.)

- We identified four general fishing areas that included small scale commercial harvest, with harvest continuing in the upstream-most local at least through 1911
- Chinook salmon migrations were seasonally diverse and likely supported various life histories
- The greatest focus of adult Chinook salmon observations was in the Sprague River in the fall



## Summary (Cont.)

- Despite other threats and accounts to the contrary, migrations persisted in the Klamath Upper Basin through the fall of 1912, when they were blocked by early construction of Copco 1 Dam
- As managers of the Klamath River consider monitoring, restoration, and reintroduction of Chinook salmon runs, they will likely look to the historical record for guidance. This summary will provide a background for planning

# QUESTIONS?



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