

PBDEs, PCBs, and Mercury Presence in the Columbia Basin

Paul Lumley, CRITFC Executive Director LCEP 2014 Science to Policy Summit June 13, 2014

# Four Tribes' Ceded Lands

Combined, the land comprising this ceded area is:

- > 66,591 square miles
- > More than 25% of the entire Columbia Basin
- > 55% of the rivers and streams that are still accessible to salmon
- > Includes almost all of the salmon habitat above **Bonneville Dam**











# Ensuring Tribal Fish Consumption is Protected



"...the right of taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary buildings for curing them: together with the privilege of hunting, gathering roots and berries...."

—1855 Treaty with the Yakima

### Contaminated Fish were Not Part of the Deal!







Columbia River Inter-Tribal Fish Commission

# A fish consumption survey was completed by CRITFC/EPA in 1994



"The rates of tribal members consumption across gender, age groups, persons who live on versus off-reservation, fish consumers only, seasons, nursing mothers, fishers, and non-fishers range from 6 to 11 times higher than the national estimate used by USEPA."

(CRITFC, 1994)



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#### Columbia River's contaminated 'resident' fish dangerous, say Oregon health authorities

Print



Chinook salmon in the Columbia River, such as these seen at Cascade Locks, are still considered safe to eat. But Oregon health authorities have issued an alert warning people against eating so-called resident fish caught in a 150-mile long stretch of the Columbia above Bonneville Dam. (Jamle Francis/The Oregonian/2012)

By Lynne Terry | Iterry@oregonian.com Email the author | Follow on Twitter on September 23, 2013 at 4:39 PM, updated September 24, 2013 at 8:55 AM

Fish that live year-round just above Bonneville Dam are so chock-full of contaminants that health authorities on Monday advised the public not to eat them at all.

They also urged the public to limit the consumption of so-called resident fish in a 150mile stretch upstream from Bonneville Dam.



Don't Miss: Oil In The Northwest Coal In The Northwest Voices of Coal Waypoints Blog Warning: Some Columbia River Fish Not Safe To Eat Sept. 23, 2013 | Northwest News Network



The Columbia River. | credit: Amelia Templeton | rollover image for more

New advisories from health officials in Washington and Oregon was some fish in the Columbia River aren't safe to eat.

The warnings do not apply to ocean-going fish like salmon and stee

#### Mid-Columbia Advisory Area Consume no more than ONE MEAL PER WEEK of resident fish caught between Ruckel Creek and McNary Dam. PCB Hg Little White Big White Salmon Salmon McNa Klickitat John Day Hood Umatilla The Da

John Day

September 23, 2013



POWERING OregonLive.com

#### TUESDAY, SEPTEMBER 24, 2013

#### **Bonneville Dam toxic** Fish living near

Resident fish are contaminated with PCBs and mercury, but migratory fish are OK

By LYNNE TERRY

n Monday adv

ANNA KING

\$1.00

the consumption of so-called resi-dent fish in a 150-mile stretch up-stream from Bonneville Dam. The advisory does not affect migra-tory fish, such as salmon, steelhead, American shad and lamprey. But it does include sturgeon and walleye, two species popular with tribes. Fish that live year-round just above Bonneville Dam are so chock-full of contaminants that health authorities ed the public not to They also urged the public to limit

said David Farrer, Oregon's public Tests were done on Columbia River fish collected in August 2011, under the auspices of the U.S. Army Corps of Engineers. The Oregon Health Authority got the results this past May and then performed exten-sive analysis. The results were surprising. The threshold for a health advisory for polychiorinated biphenyls, or PCBs, is 0.047 parts per million. The tests turned up 183 parts per million. That's higher than I've ever seen." health toxicologis

By comparison, tests on carp in the Willamette River around Port-land harbor, another contaminated site, turned up 5 parts per million In the Columbia River, small-

mouth bass were tested near the Bonneville Dam. They were col-lected between the dam and Ruckle EISH. Page 43

PESIDENT FISH under advis

Fish ad





# Fishery Resources are Central to Tribal Culture



# 2011 Future of Our Salmon: A Vision of Restoration in the Columbia River Basin

- Attended by over 250 tribal leaders, federal and state fisheries managers, scientists, non-tribal fishers and members of the public.
- A Key Concern: Salmon recovery is challenged by toxic contamination in the Columbia River
- Follow-up: 2012 Toxics Reduction Workshop



CRITFC 2011 Future of Our Salmon conference: Executive Panel



### June 2012 Toxics Reduction Strategic Planning Session

### Short and Intermediate:

### > Enhance existing effective programs

- Regional pesticide stewardship
- Increase stormwater source control
- Take back programs drugs and herbicides
- Legislate market incentives
- Increase Supply and Demand for Safer Alternatives
  - Reduce priority chemicals in products
  - Increase green chemical alternatives

### Long Term / Policy Change:

> Advocate for a fully funded Columbia River Restoration Act

- Support Toxics Substances Control Act (TSCA) Reform
  - Support a precautionary principle approach
  - No preemption of state authority

Support research on effects/toxicity of emerging contaminants on biota & human health Columbia River Inter-Tribal Fish Commission



EPA 910-R-02-006

COLUMBIA RIVER BASIN FISH CONTAMINANT SURVEY 1996-1998

U.S. Environmental Protection Agency Region 10 Seattle, Washington 98101



### 2002 EPA/CRITFC Fish Contaminant Study

Fish taken from 24 Tribal fishing sites in Columbia River Basin - 1996 - 1997

- Anadromous: Fall/spring chinook, steelhead trout, smelt and Pacific lamprey
- Resident: rainbow trout, mountain whitefish, white sturgeon, walleye, large scale sucker, bridgelip sucker

92 pollutants detected in fish:

- PCBs, dioxins, furans, arsenic, mercury; and
- DDE, a breakdown product of DDT

### **2009 State of the River Report for Toxics**

A summary of current information about four of the most widespread toxic contaminants found in the Columbia River Basin

- Mercury: a cause of fish consumption advisories
- DDT and its breakdown products: banned but persistent
- PCBs: banned but persistent
- PBDE flame retardants: EPA does not currently regulate





Percentages of juvenile chinook salmon samples from different reaches of the Lower Columbia River with PBDE or PCB concentration above estimated toxicity thresholds\*



Concentrations of PCBs and PBDEs in a number of juvenile fall chinook salmon from the Lower Columbia River are higher enough to potentially affect their health and survival

\*Data from Lower Columbia River Ecosystem Monitoring Project

### PCBs in juvenile chinook salmon<sup>1</sup>



Concentrations of PCBs in significant percentages of juvenile salmon samples from the Portland area and reaches F, E, and D are above the 2400 ng/g lipid effect threshold associated with multiple adverse effects in juvenile salmonids.<sup>2</sup>

<sup>1</sup>Data were collected by NOAA Fisheries, as part of the Lower Columbia River Ecosystem Monitoring Project.

<sup>2</sup>Meador et al. 2002. Aquat. Conserv. 12:493-516.

**NOAA Slides** 

### PBDEs in juvenile chinook salmon<sup>1</sup>



Sum PBDEs (ng/g lipid)

<sup>1</sup>Data were collected by NOAA Fisheries, as part of the Lower Columbia River Ecosystem Monitoring Project.

<sup>2</sup>Arkoosh et al. 2010 Aquat. Tox 98:51-59; Arkoosh et al. 2013. Report to EPA.

NOAA Slides

# **Toxic Effects of PCBs and PBDEs in fish**

- Changes in thyroid function
- Reduced disease resistance
- Impaired growth and metabolism
- Reproductive and developmental toxicity



# Results from Lower Columbia River Juvenile salmon monitoring

- PCBs are a continuing problem and PBDEs are an emerging problem in the Lower Columbia
- They are present in the food chain, including invertebrate prey of juvenile salmon
- They are bioaccumulating in endangered juvenile salmon
- Concentrations highest for juvenile fall chinook that spend the longest time rearing/feeding in the Lower River

# Results from Lower Columbia River Juvenile salmon monitoring

- Lipid loss as fish migrate downstream could exacerbate toxic effects
- The Lower Willamette and the Lower Columbia (Portland and Vancouver) appear to be important sources of PCB and PBDE exposure for juvenile salmon
- Additional exposure concerns in the Upper Columbia and Snake River
- Health risks to salmon from current exposures are uncertain, but concentrations in some fish samples are comparable to levels causing toxic effects in lab studies



### **Mercury in Columbia River fish**



From EPA. 2009. Columbia River Basin: State of the River Report for Toxics

Most fish consumption advisories in the Columbia Basin are due to mercury

EPA's human health mercury guideline for fish consumption is 0.3 ppm

The estimated threshold for toxic effects of mercury in fish is 0.2 ppm.<sup>1</sup>

All fish with mercury levels above the EPA guideline for protection of human health (0.3 ppm) have concentrations that also put fish health at risk

USGS reports concentrations > 0.2 ppm in bass and northern pikeminnow from multiple sites in the Lower Columbia and Willamette Rivers.<sup>2</sup>

<sup>1</sup>Beckvar et al. 2005. Environ. Tox. Chem 24:2904-2105 <sup>2</sup>Hinck et al. 2004. USGS Report 2004-5154

# Lamprey and Sturgeon

- Pacific lamprey and white
  sturgeon are particularly
  vulnerable to bioaccumulation of
  toxics
- Many contaminants do not have
  benchmarks for the level of
  concern to key species
- The role of contamination in reduced reproduction and/or rearing success of white sturgeon in impounded areas is unknown











CRITFC-USGS Study Contaminants in Larval Lamprey in the Columbia River Basin

### Elena Nilsen, Whitney Temple, and Brian McIlraith

Andrew Wildbill, CTWS Matt Fox, CTWS Aaron Jackson, CTUIR Ralph Lampman, Yakama Nation Patrick Luke, Yakama Nation Lance Wyss, OSU Gabe Sheoships, CRITFC/OSU Dianne Barton, CRITFC Bob Heinith, CRITFC





# **Key Lamprey Findings**

- Largest contaminant dataset on pre-adult Pacific lampreys in Northwestern USA
- Contaminants bioaccumulated and were widespread in tissues and sediment
- Pesticides, mercury, flame retardants accumulated during larval stage
- Concentrations exceeded guidance levels indicating potential threat to lamprey health







# Basin-wide State Water Quality Standards are Tightening

- October 2011: EPA approved Oregon's surface water quality standards that used a fish consumption rate of 175 grams/day
- January 2013: EPA disapproved Oregon's freshwater aquatic life criteria for 3 pollutants
- > 2012–2014: Washington Department of Ecology is in the process of revising surface water quality standards to reflect regional fish consumption rates
- May 2012: EPA disapproved Idaho's request to use a fish consumption rate of 17.5 g/d and funds a 2014 statewide tribal fish consumption survey



# Water Quality Determines Fish Quality

- States set allowable pollution levels
- Based on fish consumption and risk level





Federal Support for Toxics Reduction is Needed for the Columbia River

- The Columbia was designated a "Large Aquatic Ecosystem" in 2006 by EPA
- The Columbia River Restoration Act (CRRA) was introduced in Oregon legislators in 2010, but not enacted
- "Recent release of fish consumption advisories is a strong indicator that the Columbia River needs comprehensive toxics reduction, clean up and monitoring"
   Debrah Marriott, LCEP Executive Director, September 2013

The CRRA needs strong and persistent regional support!!!



"The tribes believe that the long-term solution to this problem isn't keeping people from eating contaminated fish, it's keeping fish from being contaminated in the first place." — Joel Moffett, CRITFC Chairman, 2013



