

# Results After Two Seasons Of Sampling With The Portable Floating Fish Collector on Cougar Reservoir

**Todd Pierce**

Fisheries Biologist

U.S. Army Corps of Engineer- Portland District

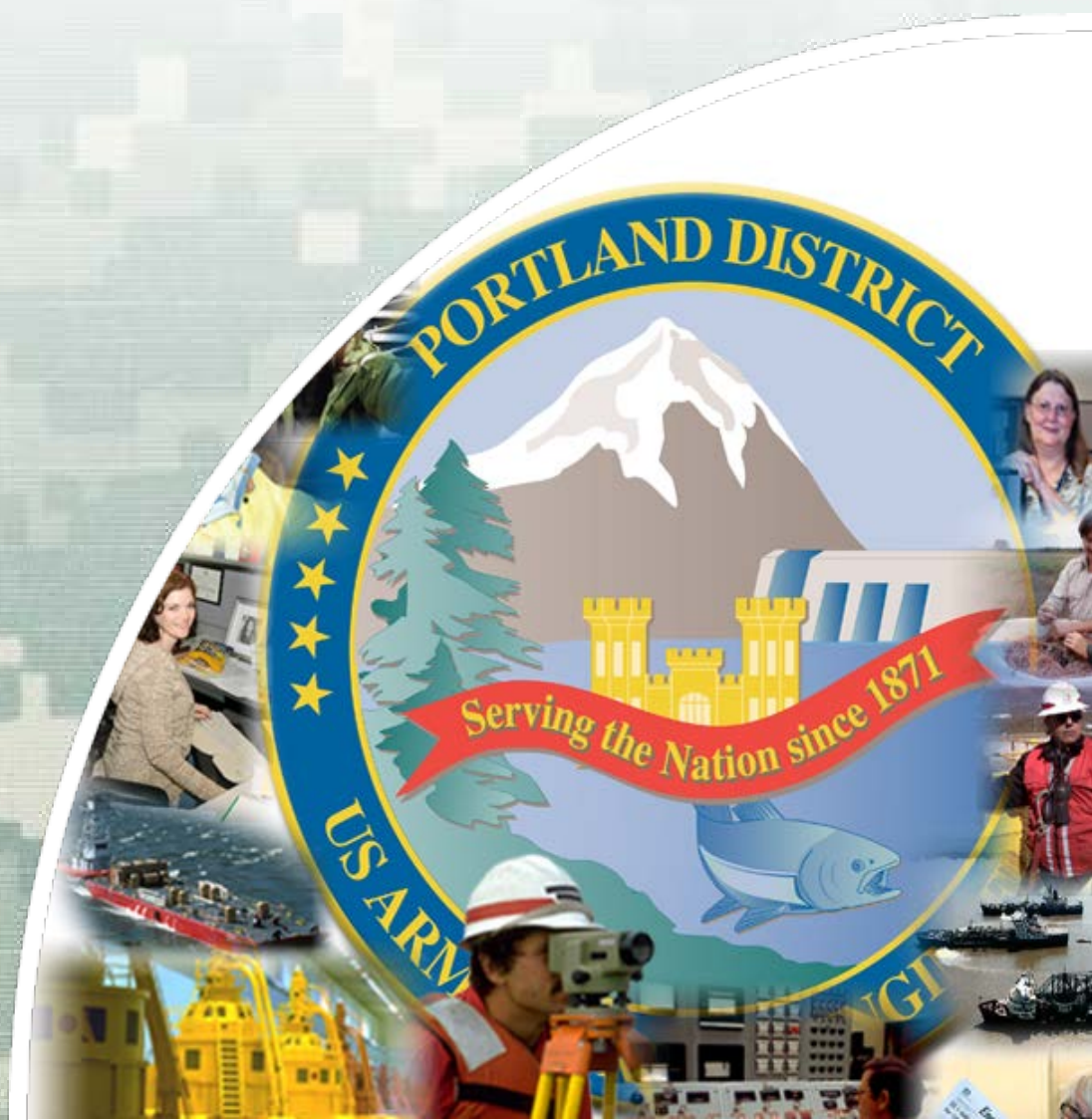
Willamette Basin Fisheries Review

Corvallis, OR

Feb. 8, 2016

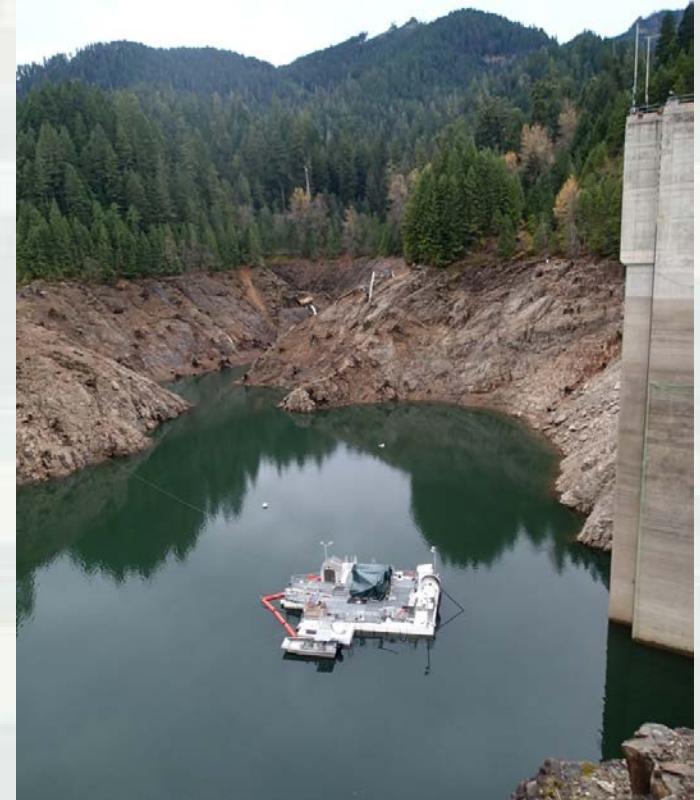


US Army Corps of Engineers  
**BUILDING STRONG**



# Overview

- Purpose
- PFFC 101
- Season 1 & Trap Mods.
- Season 2
- Season 1 & 2 Comparisons
- Lessons Learned
- Future Design Ideas



# Purpose

- Cost effective, semi-portable research prototype that will help inform operations and biological performance of future full-scale permanent downstream passage structures at Willamette Valley Projects



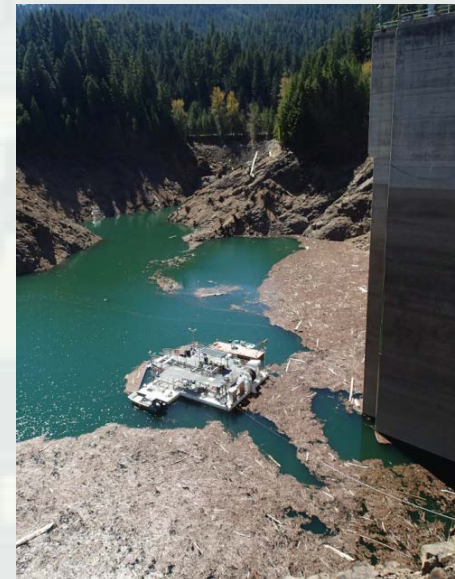
# PFFC 101

- Power supply
- Water pumps
- Mooring system
- Collection area
- Staff (Bio's/ TC's)



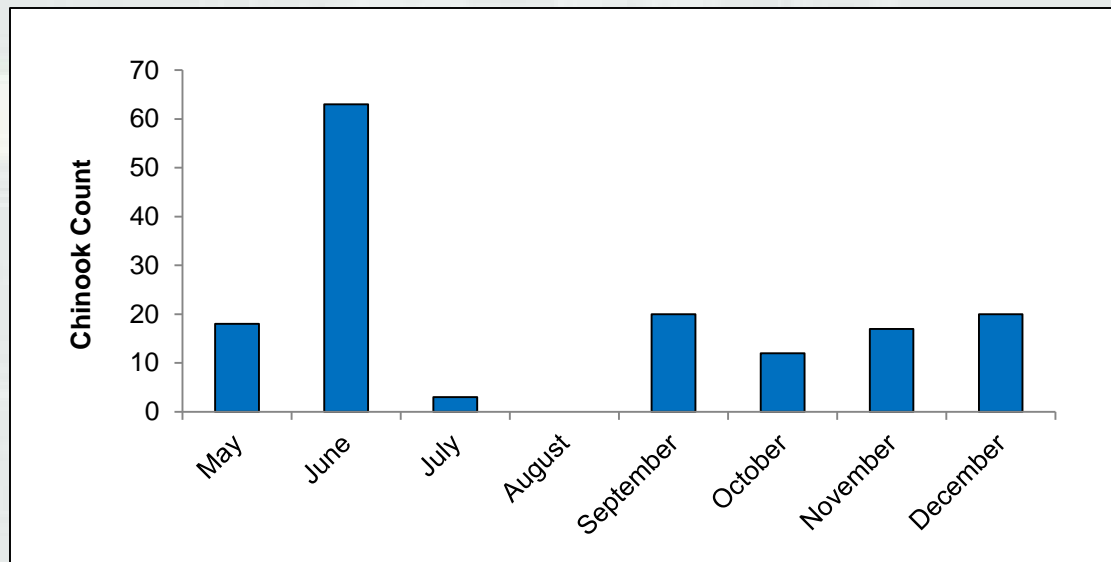
# Season 1 (2014): May 27<sup>th</sup>- Dec. 16<sup>th</sup>

- Distance from tower: 75'- 222'
- Trap inflows (treatment schedule)
  - ▶ low 64 cfs/ high 109 cfs
- Avoidance once inside trap
- Occupying depths below trap (> 8')
- Mortality
  - ▶ stressors of handling/ transport
    - warm collection/ cold release
  - ▶ excessive debris



# Season 1 (2014): Continued

- Chinook catch (n= 157)
  - ▶ fry & yearlings in spring
  - ▶ sub-yearlings & yearlings in fall/ winter
  - ▶ non-existent in summer (July 3<sup>rd</sup>- September 2<sup>nd</sup>)
    - warm epilimnion (24.4 C at surface)



# Challenges- Hydraulics

## ■ Problem:

- ▶ PFFC is 1' too low = high bypass flow

## ■ Solution:

- ▶ Ramped weir- decreases bypass flow
- ▶ Flume- dewateres and improves fish safety



Ramp

Weir

Dewatering flume



Hopper



# Trap Modifications

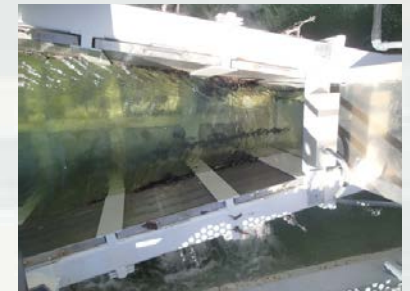
- Shutdown for contractor (AAC)
  - ▶ Dec. 2014- Mar. 2015
- Corrections
  - ▶ FCM raise
  - ▶ porosity controls/ adjustment
  - ▶ new hopper crane
  - ▶ anchor relocation
  - ▶ debris boom





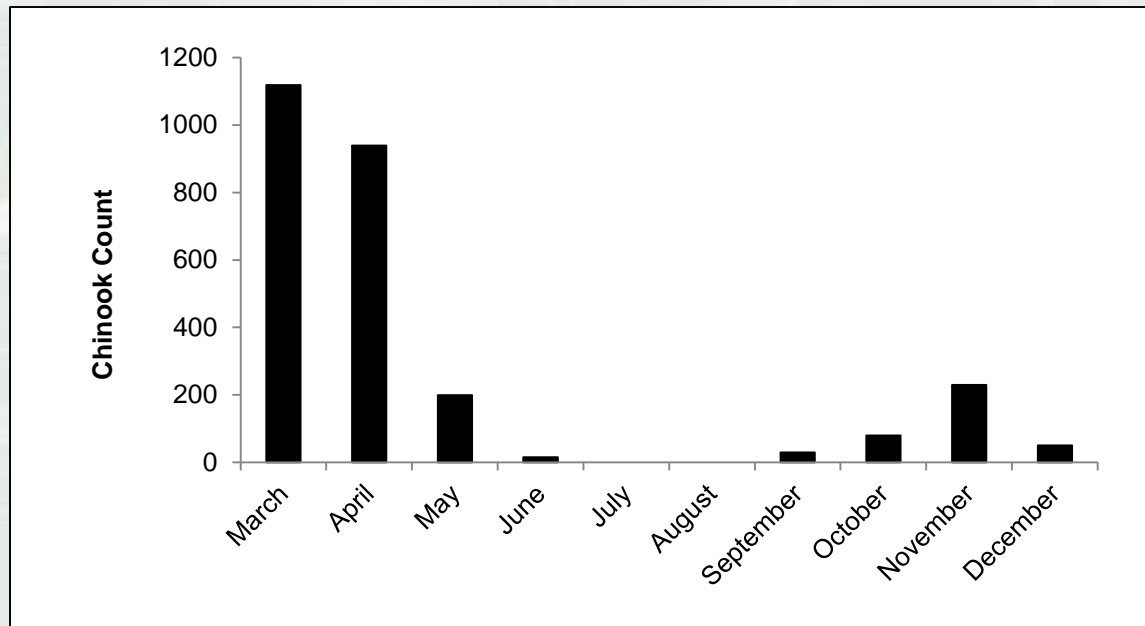
# Season 2 (2015): Mar. 2<sup>nd</sup>- Dec. 31<sup>st</sup>

- Distance from tower: 42'- 111'
- Trap inflows (treatment schedule)
  - ▶ low 72 cfs/ high 122 cfs
- Avoidance once inside trap
- Occupying depths below trap (> 8')
- Mortality
  - ▶ stressors of handling/ transport
    - warm collection/ cold release
  - ▶ isolated debris events
  - ▶ high parasite (copepod) load



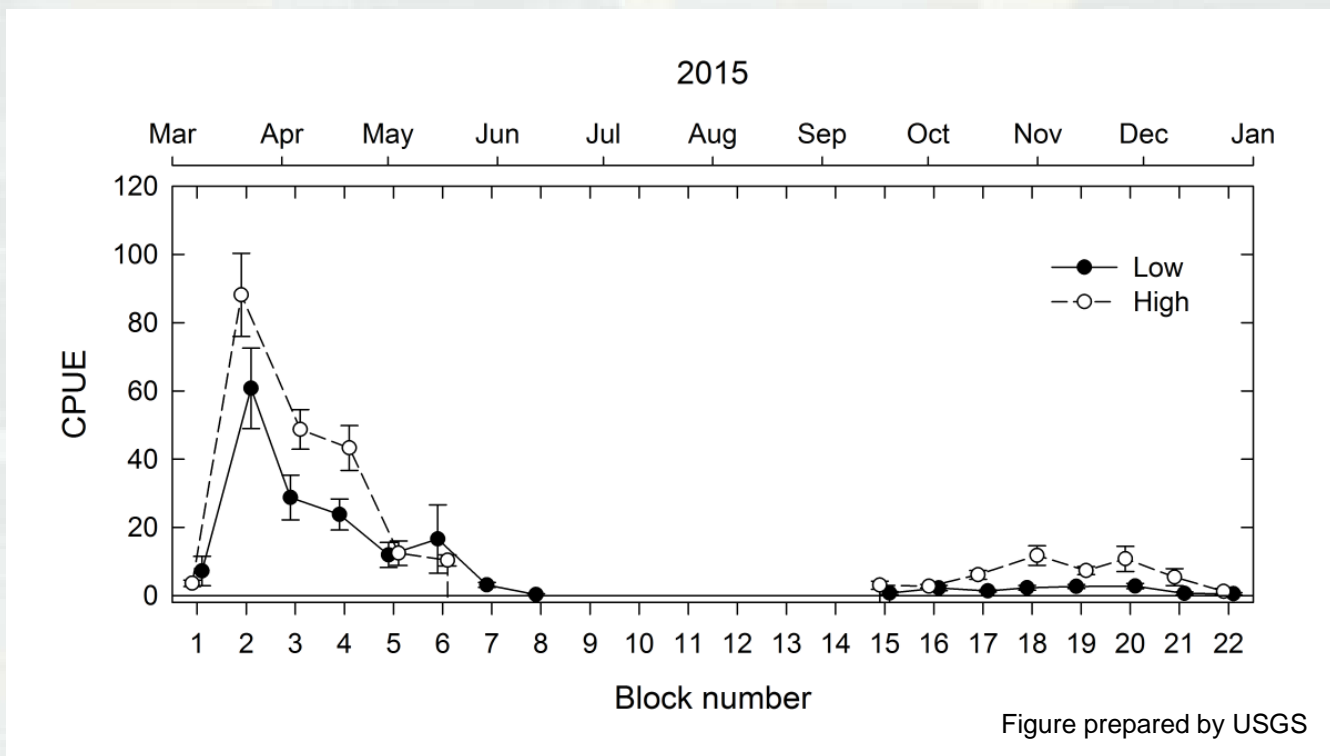
# Season 2 (2015): Continued

- Chinook catch (n= 2,661)
  - ▶ fry and yearlings caught in spring
  - ▶ tapers off in early summer
  - ▶ sub-yearlings, yearlings, and unknown caught in fall/ winter



# PFFC CPUE (Block Design)

- High flow catch greater than low flow



# Bull Trout



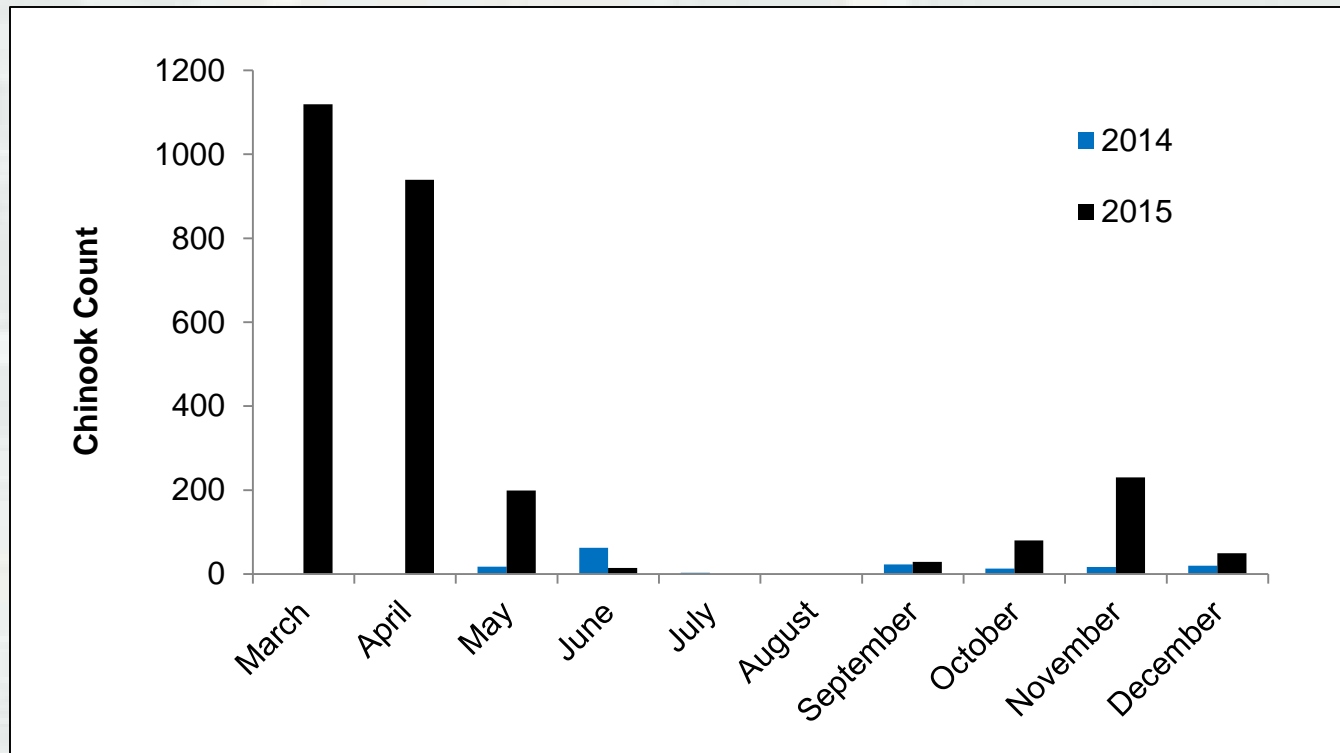
Bull Trout	Inflow	1st Detection	2nd Detection	Collection Date	Release Site	Age
1	high	3/19/2015	-	3/19/2015	reservoir	adult
2	low	3/25/2015	3/25/2015	-	-	adult
3	low/ high	4/28/2015	9/29/2015	-	-	adult
4	low	11/2/2015	-	11/3/2015	below dam	adult
5	high	-	-	11/23/2015	below dam	adult
6	low	-	-	12/5/2015	below dam	adult
7	high	-	-	2/2/2016	-	sub-adult





# Total Chinook Catch

- Season 1 (May- Dec. 2014)
  - ▶ Chinook salmon= 157
- Season 2 (Mar.- end of year)
  - ▶ Chinook salmon= 2,661



# Collection Efficiencies

- 2014 PFFC collected/ detected and/or passed interrogator
  - ▶ 46.2% efficiency (6 of 13)
    - 3 fish (not-collected): 2-3 separate detections on multiple days on different dates
- 2015 PFFC collected/ detected and/or passed interrogator
  - ▶ 75% efficiency (12 of 16)
    - 2 collected after Nov. 11<sup>th</sup> (CGJ PIT reader questionable)
    - 75% of collected and not collect detections occurred on high flow setting
- 2015 USGS Surrogate JSATS and/or PIT release groups collection efficiency
  - ▶ March- 4 of 503= 0.80%
  - ▶ June- 2 of 505= 0.40%
  - ▶ September- 0 of 489= 0.00%
  - ▶ September- November= 6 of 532= 1.13%



# 1<sup>st</sup> vs. 2<sup>nd</sup> Season Trap Ops/ Catch

## 2014

- 46.2% trap entry eff. (6 of 13)
- Velocities incorrect
  - ▶ high bypass flow/ ramped weir
- Pumps (85% max)- less inflow
- Debris boom- none/ temp.
- Fish escaping hopper
- ~150' from Intake Tower
- Ops began late (May 27<sup>th</sup>)
  - ▶ low catch
  - ▶ mortality (water temp.)

## 2015

- 76.5% trap entry eff. (12 of 16)
- Velocities mostly correct
  - adj. bypass/ no weir
- Pumps (95% max)- higher inflow
- Debris boom w/ 18" screens
- Less fish escaping hopper
- ~60' from Intake Tower
- Ops began early (March 2<sup>nd</sup>)
  - higher catch
  - mortality (water temp./ copepod)



# Lessons Learned- Trap and Fish

- Debris management
- Keep trap components/ design simple- oil over water?, remote tending
- Staffing- all trades
- Adjustable ballast- fine tune bypass flow
- Mortality issues- seasonal (copepod #'s, trend by month), tempering
- Peak catch of salmon in spring (fry)/ winter (subyearlings)/ summer (zero)
- Fish occupy outflow from trap (false attraction)
- Catch independent of temperature control operations
- High trap inflow catches more fish than low flow- we are shorting ourselves operating at low flow
- Avoidance issues- false attraction, milling behavior, incoming water velocities, look of trap?, capture point (PIT antenna), predator occupancy, noise, small entrance for given large volume of cul-de-sac





# Future Design Ideas

- Higher inflows (pump or gravity  $>$  or  $=$  tower)
- Recirculation of false attraction to attract upstream oriented fish
- Provide much longer entrance to deter non-committers
- Deter predators near trap/ deter Chinook near tower
- Make trap look more natural (color, contours, rocks, decoys, etc.)
- Design mainly to spring and winter dam ops (peak passage)
- Incorporate designs to trick salmon entering the cul-de-sac (1<sup>st</sup> time)
  - ▶ Inflow to attract at entrance/ outflow to attract jumpers
  - ▶ Gradual guidance into a curved/ circular collection facility
- Pre-dam structure
- Change trap orientation (rotate on axis)



# Acknowledgments



- Portland District Office
  - ▶ Sean Askelson, Brandt Bannister, Chris Budai, Ian Chane, Jared Edwards, Scott Fielding, Kristy Fortuny, Dave Griffith, Dave Hamernik, Jeff Hicks, Kathryn Newhouse, Ribha Patel, William Roberts, Mary Karen Scullion, Jeff Sedey, Ryan Souders, Kathryn Tackley, Tina Teed, Elizabeth Wells, Budget Staff, and others
- Lookout Point Office
  - ▶ Aquatic Stewardship Crew (Greg Taylor and others), Budget, Electricians (Wayne/ Darrell), Operators (Desk/ Rovers), GM and PM crews, Supply, Tech Section, Timekeepers
- USGS (Beeman and others)
- ODFW (Zymonas/ Hogansen, Monzyk/ Romer and others)
- OSU (Carl Schreck, Crystal Herron, FPGL, Sarah Bjork, Craig Banner)
- Federal/ State Take Permits (NOAA, ODFW)



# Questions?

