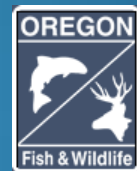
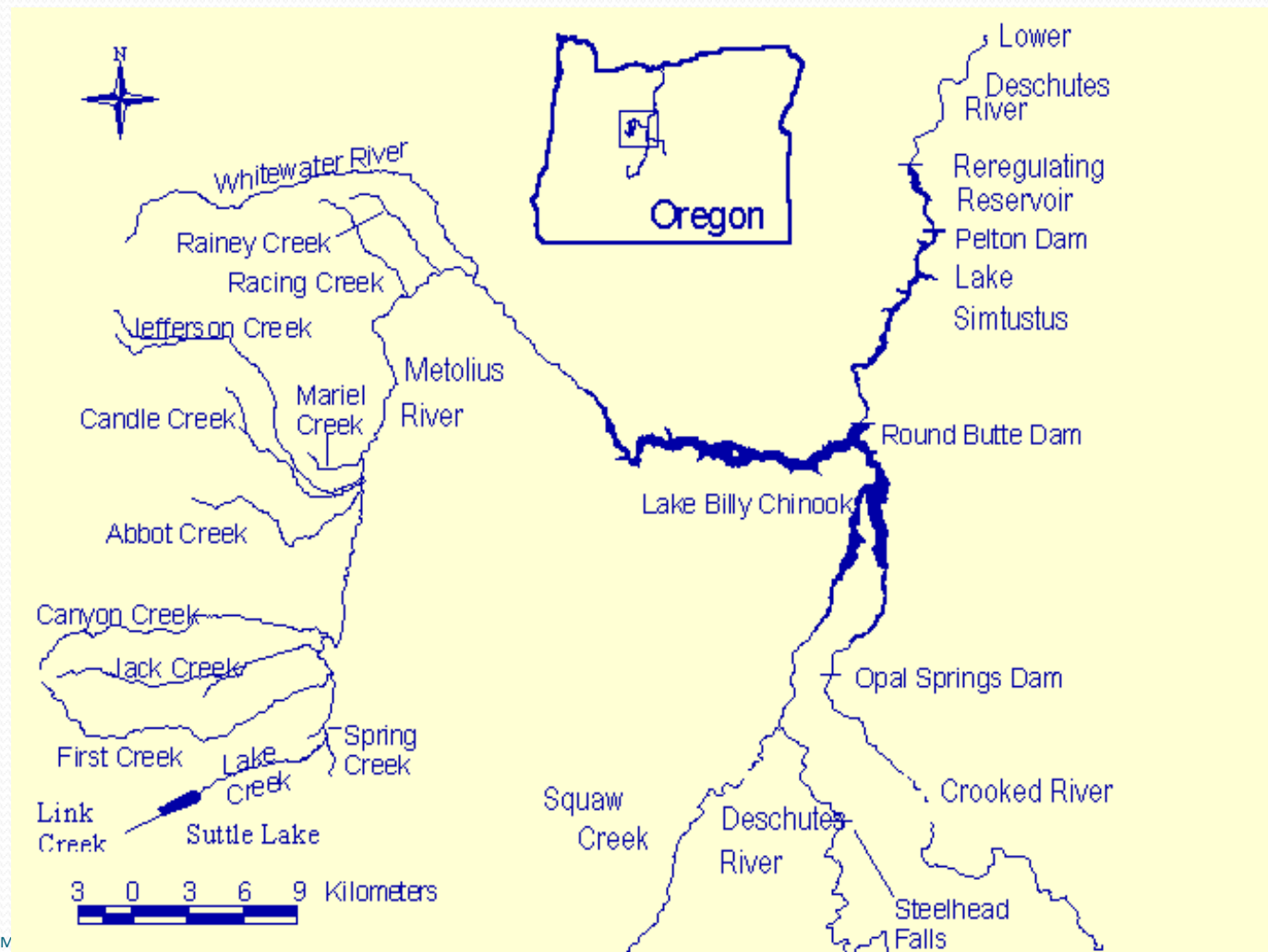


Copepod-induced morbidity of spring Chinook Smolts in the Upper Deschutes River

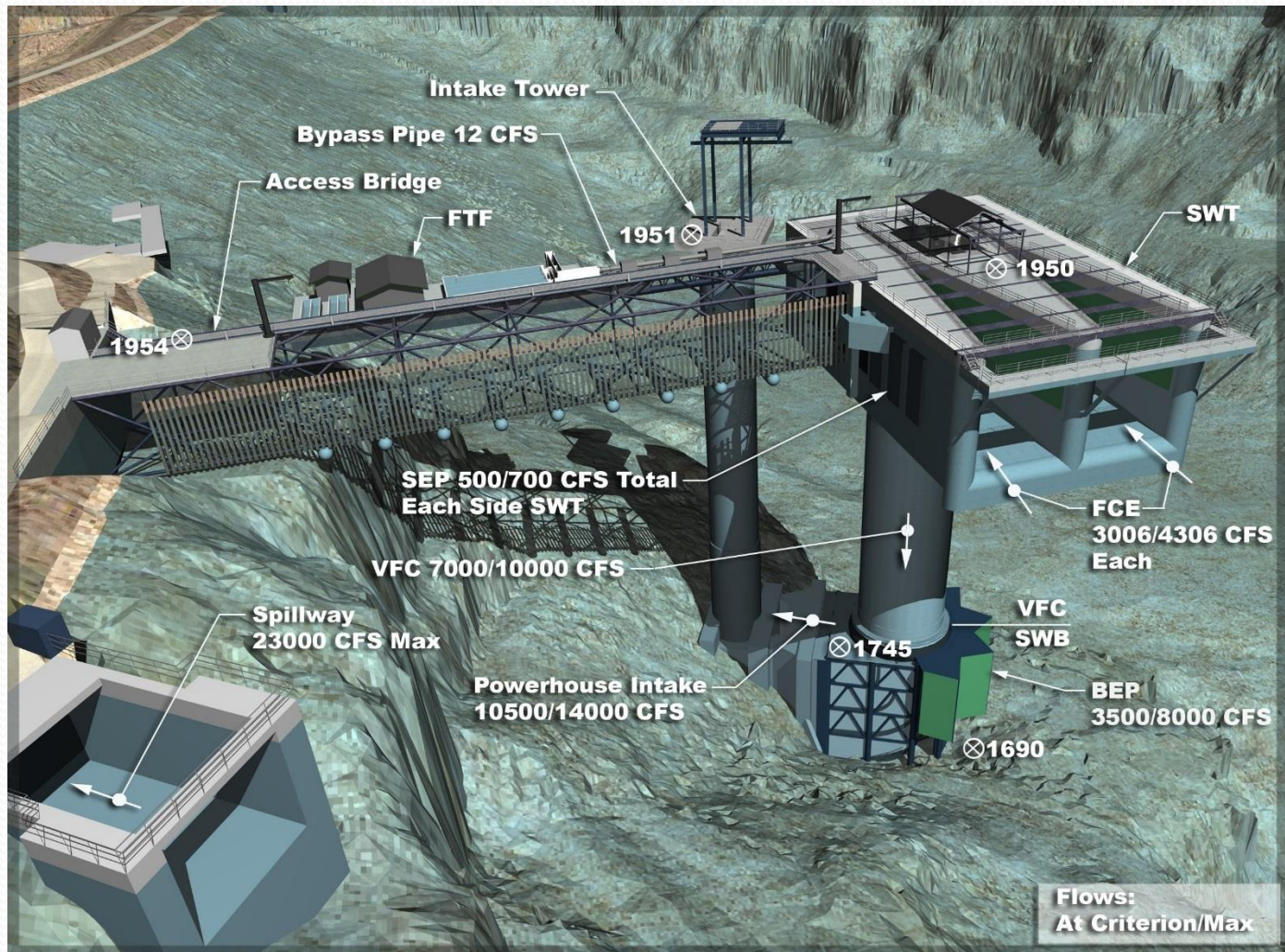
Implications for Reintroduction Success

Richard Stocking
ODFW – Fish Health Services
Madras, Oregon





Fish Transfer Facility (FTF)





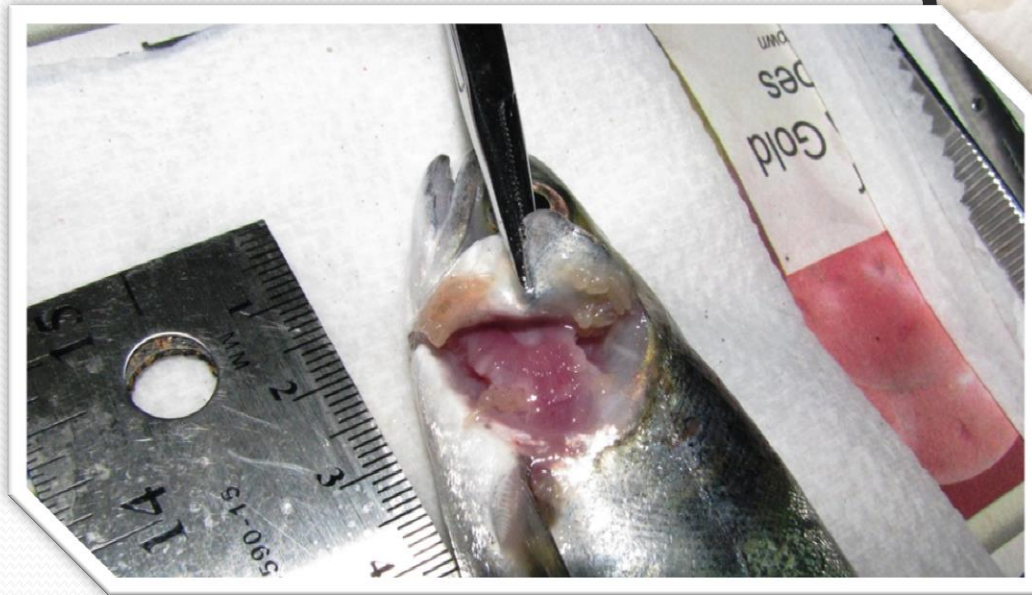
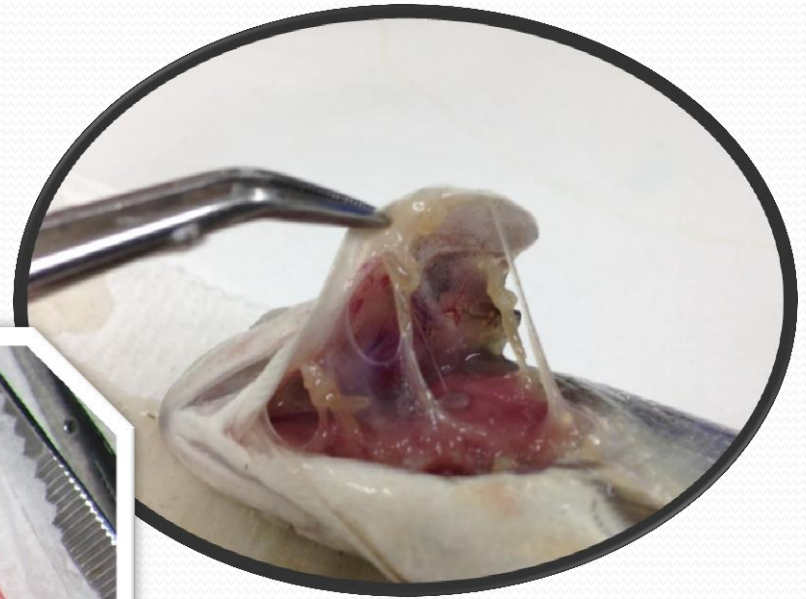
Reintroduction Issues

- Summer steelhead (StS) and spring Chinook (ChS) smolts out-planted as fry (200 – 400k) beginning 2008 – 2009. Very limited hatchery smolt program.
- Downstream passage of smolts began in 2009 – 2010.
- Capture of StS smolts at the FTF was very low (3 – 8k) but the estimated SAR's were promising (~0.8 – 1.8%).
- Capture of ChS smolts at the FTF was relatively higher (10 – 25k) but the estimated SAR's were far below expectations (generally <0.02%).
- Are there any disease concerns that might shed some light on the difference?
- Two parasites of concern: *C. shasta* and freshwater copepods.

Copepod Infection Severity Index

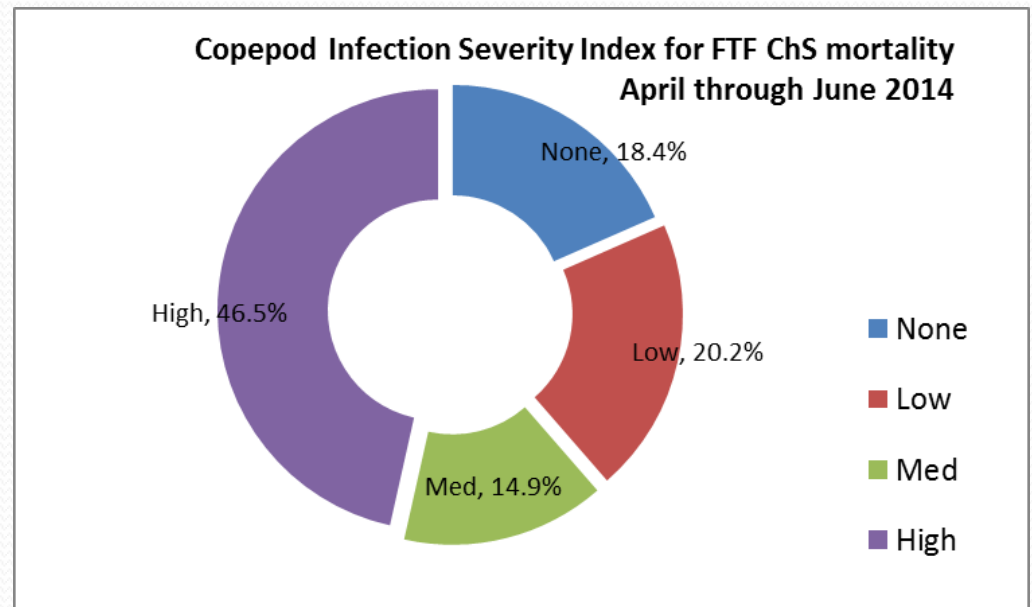
- (0) **None**: no grossly visible copepods.
- (1) **Low**: One or two visible copepods. No visible tissue damage. No gill damage.
- (2) **Medium**: Three to four copepods with no open lesions or gill erosion.
- (3) **High**: Five or more copepods and/or open lesions associated with copepods including erosion of gill tissue.

Typical Pathology



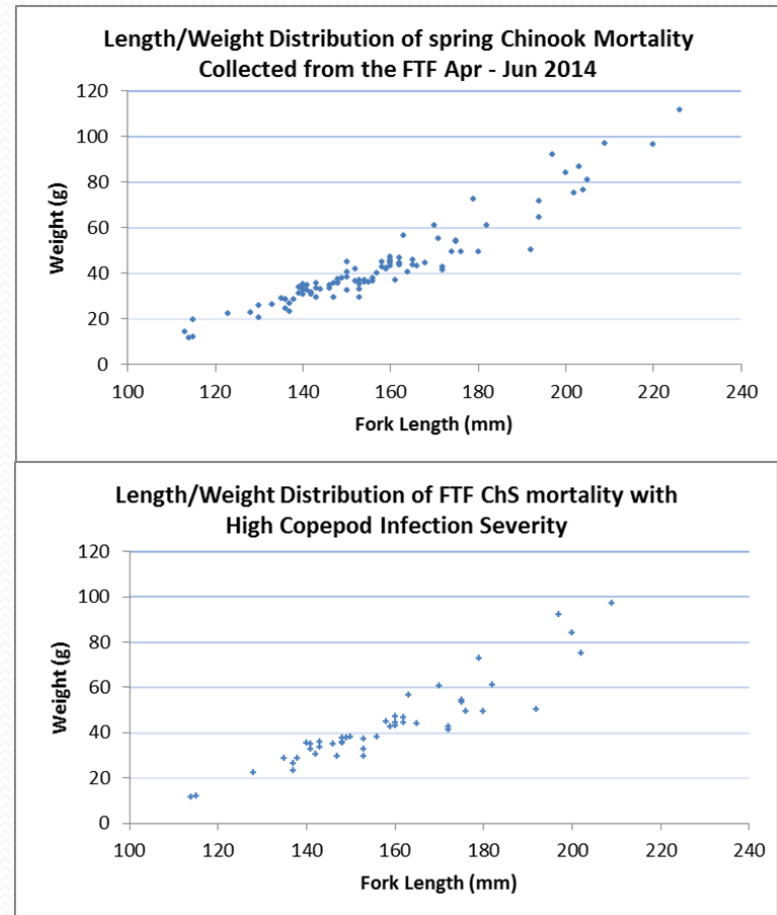
FTF Mortality: ChS Smolts

- 114 mortality examined late April through mid June
- ~32% of loss was LM marked.
- ~ 46% of loss was level 3 with open/infected lesions due to copepods.



FTF Mortality: ChS Smolts

- First graph shows L/W distribution of all mortality.
- Second graph shows only level 3 infections.
- ~30% of level 3 infections are LM marked: all May-June.
- No indications of a L/W bias for copepod infection severity.



History

- Health examinations of spring Chinook smolts (dead and live) sampled at the FTF.
 - 50 -80% of mortality with open lesions due to copepods.
 - 15 – 30% of randomly selected live spring Chinook smolts with open lesions due to copepods.
- Suggested that copepods could be a significant cause of post-release mortality.
- Why are copepods an issue for spring Chinook smolts?

Location! Location! Location!



Gill Erosion



Typical Pathology

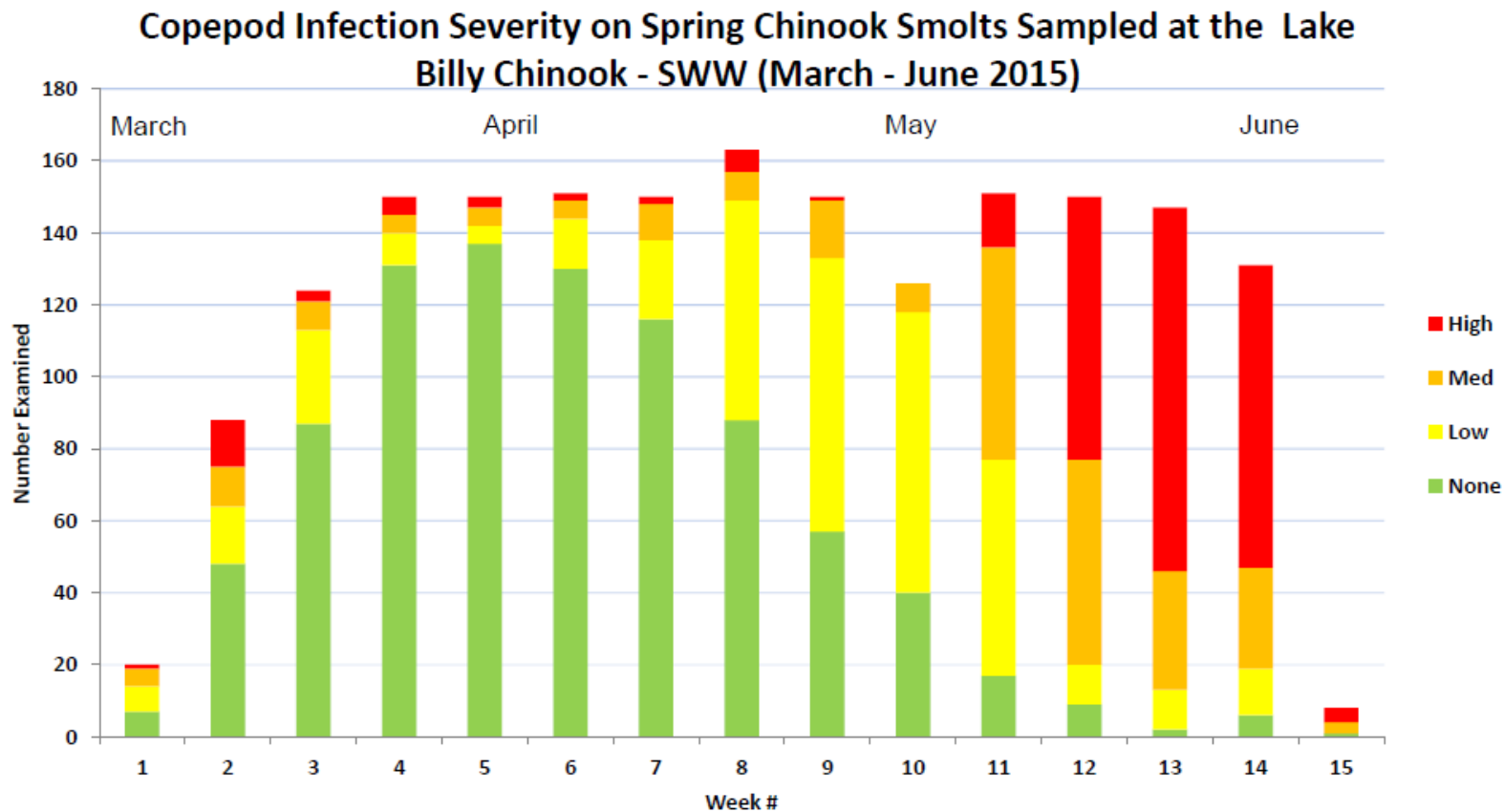
Open lesions at attachment site



Copepod Study 2015

- A semi-quantitative approach to estimating the contribution of copepods to post-release mortality.
- Examine up to $n = 150$ ChS smolts captured at the FTF each week beginning in March and ending in June.
- Each randomly selected “live” fish was sedated with ms222, assigned at C.I. value from 0 – 3 and then released downstream.
- ChS with lesions not due to copepods were noted.
- Assuming that level 3 infected ChS will **NOT** survive to an ocean phase.
- Assuming that level 2 infected ChS have a fitness level less than level 1 but greater than level 3.

Copepod Study 2015



Copepod Study 2015

- FTF passed ~15k ChS smolts below the Pelton Round Butte Projects with the peak(s) occurring mid-April.
- Fish Health examined 1,860 ChS smolts
- LM clip to RM clip ratio's were very similar between the sample and the census (FTF). Approximately 70% of ChS sampled were LM clip (*Wizard Falls released 50k mid-March into various tributaries*).
- Confident that the sample is representative.
- Data suggests that up to 30% (if including level 2) of the post-release ChS smolts will not survive to an ocean phase due to copepods alone.
- Data analysis in progress

Questions???

