

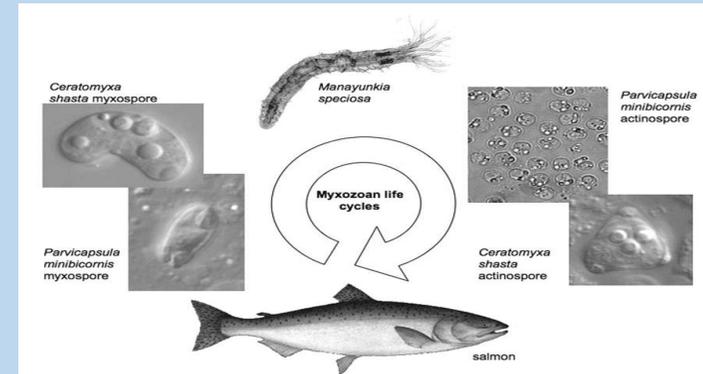
# Factors Contributing to Decline of Klamath Fall Chinook and Actions of Yurok Tribe to Minimize Future Risks

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Poor Ocean Conditions



High Juvenile Disease Rates



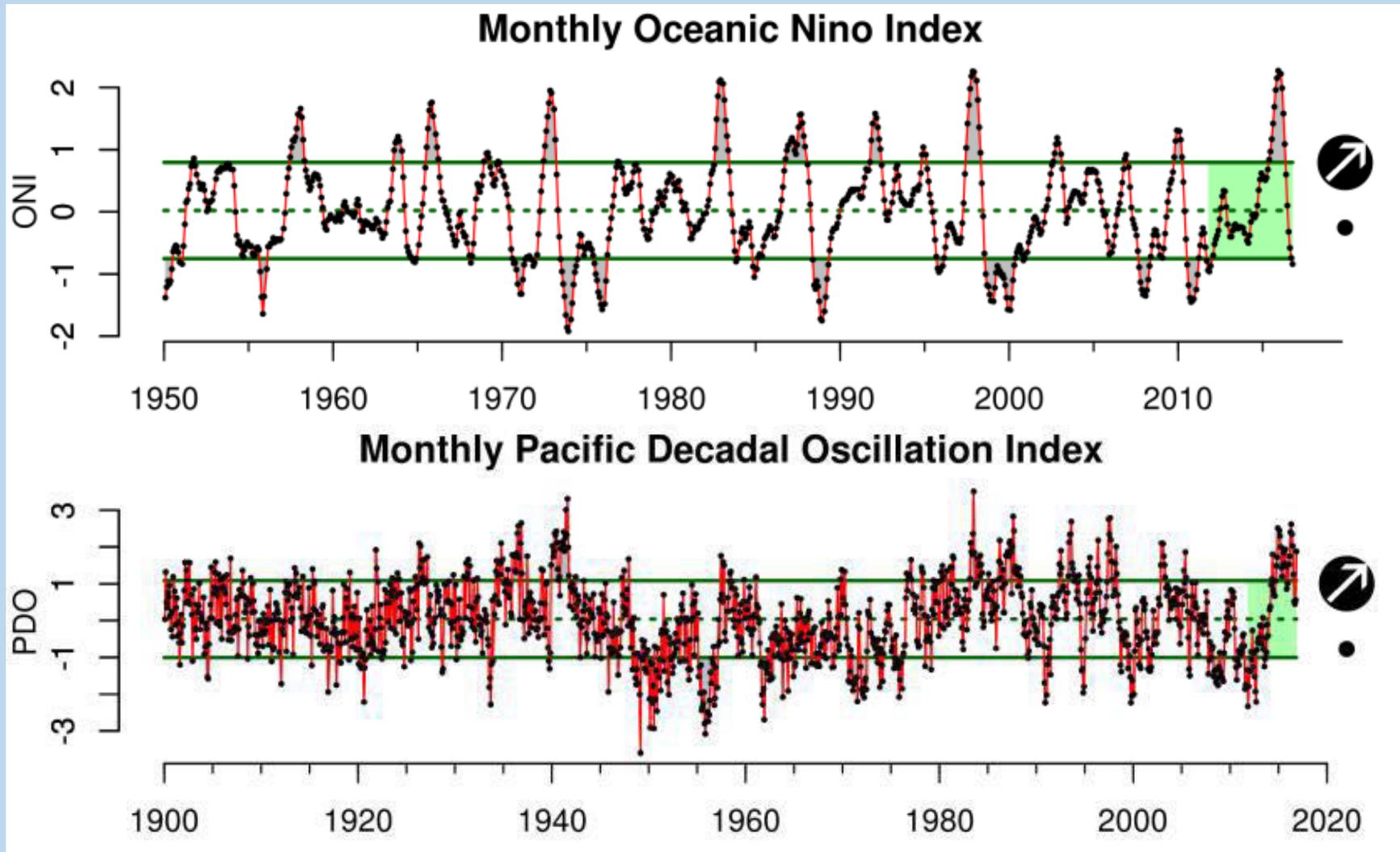
Dams



Lack of Peak Flows



# Poor Ocean Conditions when 2013 and 2014 Cohorts Entered the Ocean



Graphs from: *State of the California Current report for 2016*, by the California Current Ecosystem Assessment Team

# Extremely High *C. shasta* Disease Rates when Juvenile Chinook Emigrated in 2014 and 2015

Year	% Positive <i>C. shasta</i> from QPCR
2006	34
2007	31
2008	49
2009	45
2010	17
2011	17
2012	30
2013	46
<b><u>2014</u></b>	<b><u>81</u></b>
<b><u>2015</u></b>	<b><u>91</u></b>
2016	48
Mean	44

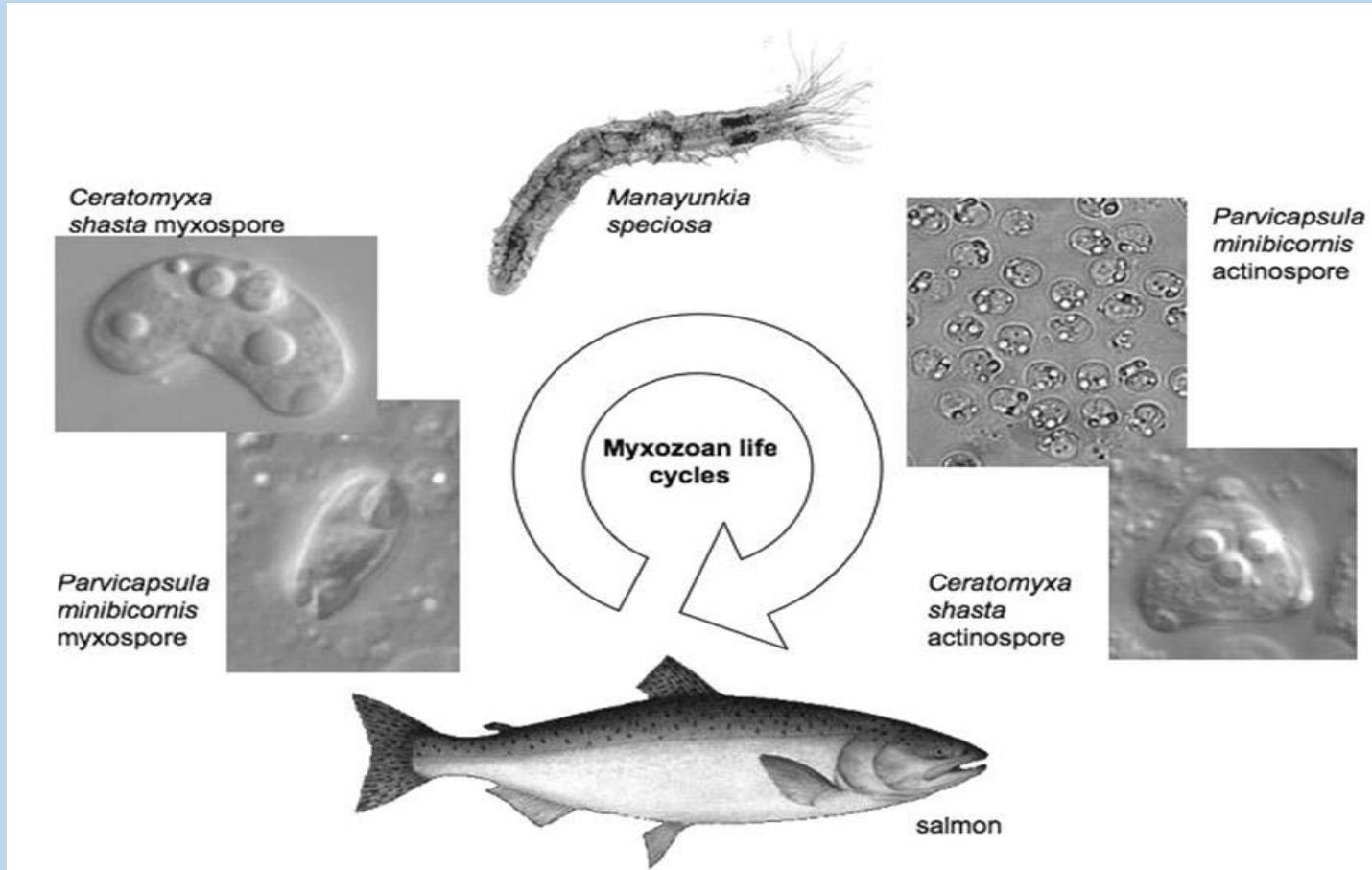
→ This cohort's age-4 projection is the lowest on record

→ This cohort's Age-3 projection is the 2<sup>nd</sup> lowest on record

Data from:

True K., Voss A., Foott J.S. 2016. *Myxosporean Parasite (Ceratanova shasta and Parvicapsuls minibicornus) Prevalence of Infection in Klamath River Basin Juvenile Chinook Salmon, March – August 2016*. Anderson, CA: US Fish and Wildlife Service. California- Nevada Fish Health Center.

# Life Cycle of *Ceratanova shasta*



Polychaete worms  
(*Manayunkia speciosa*)

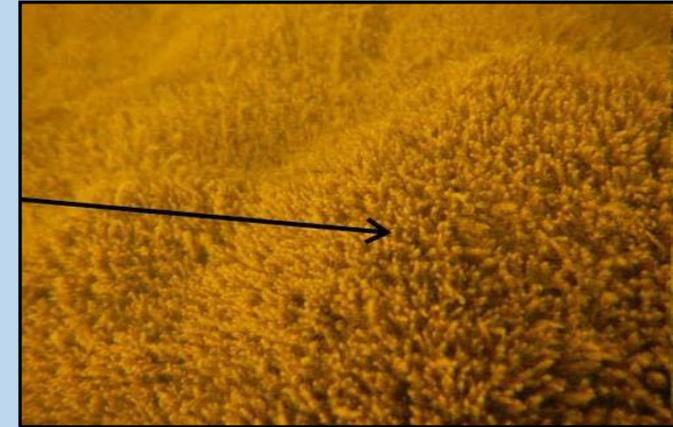
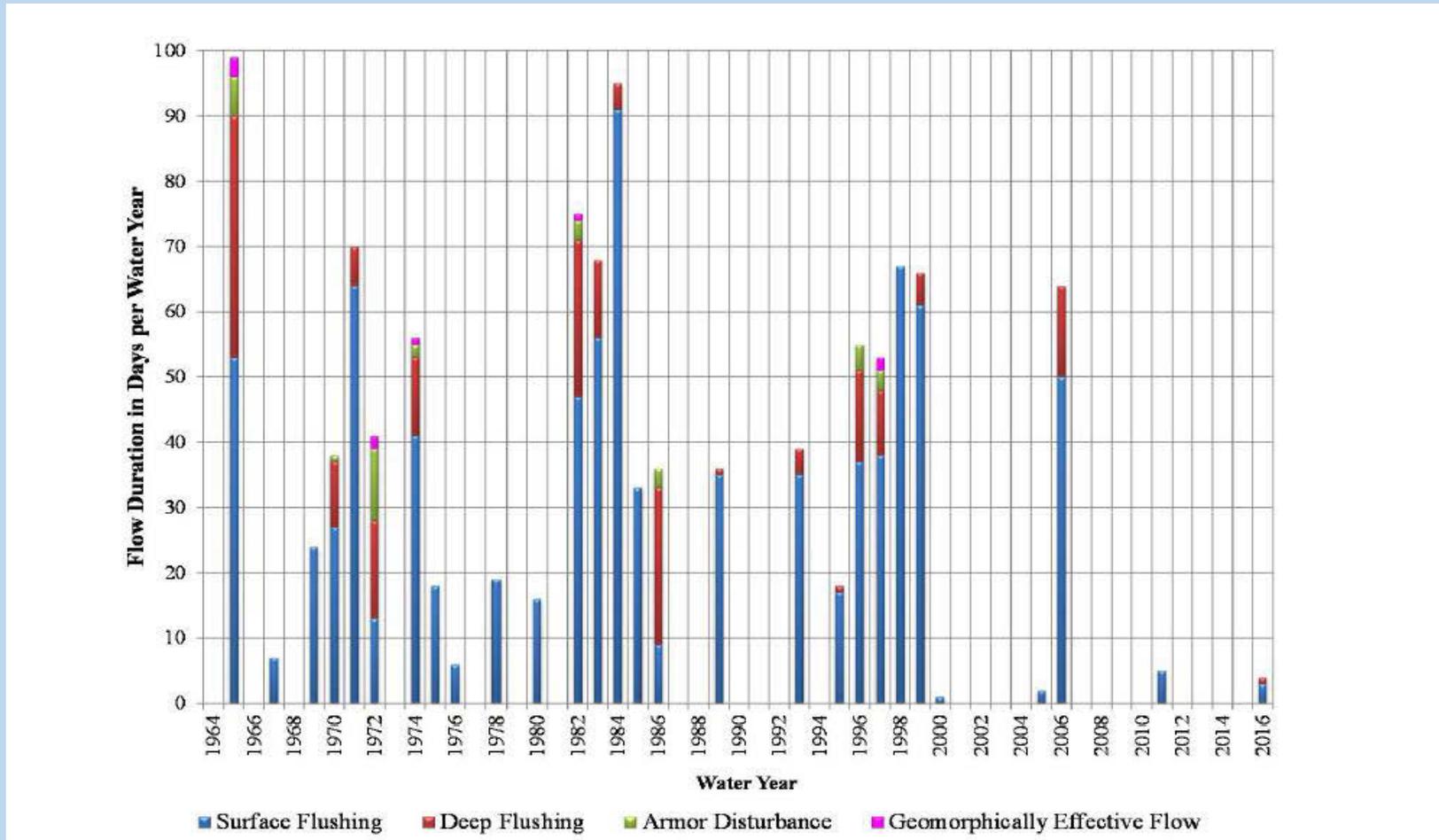


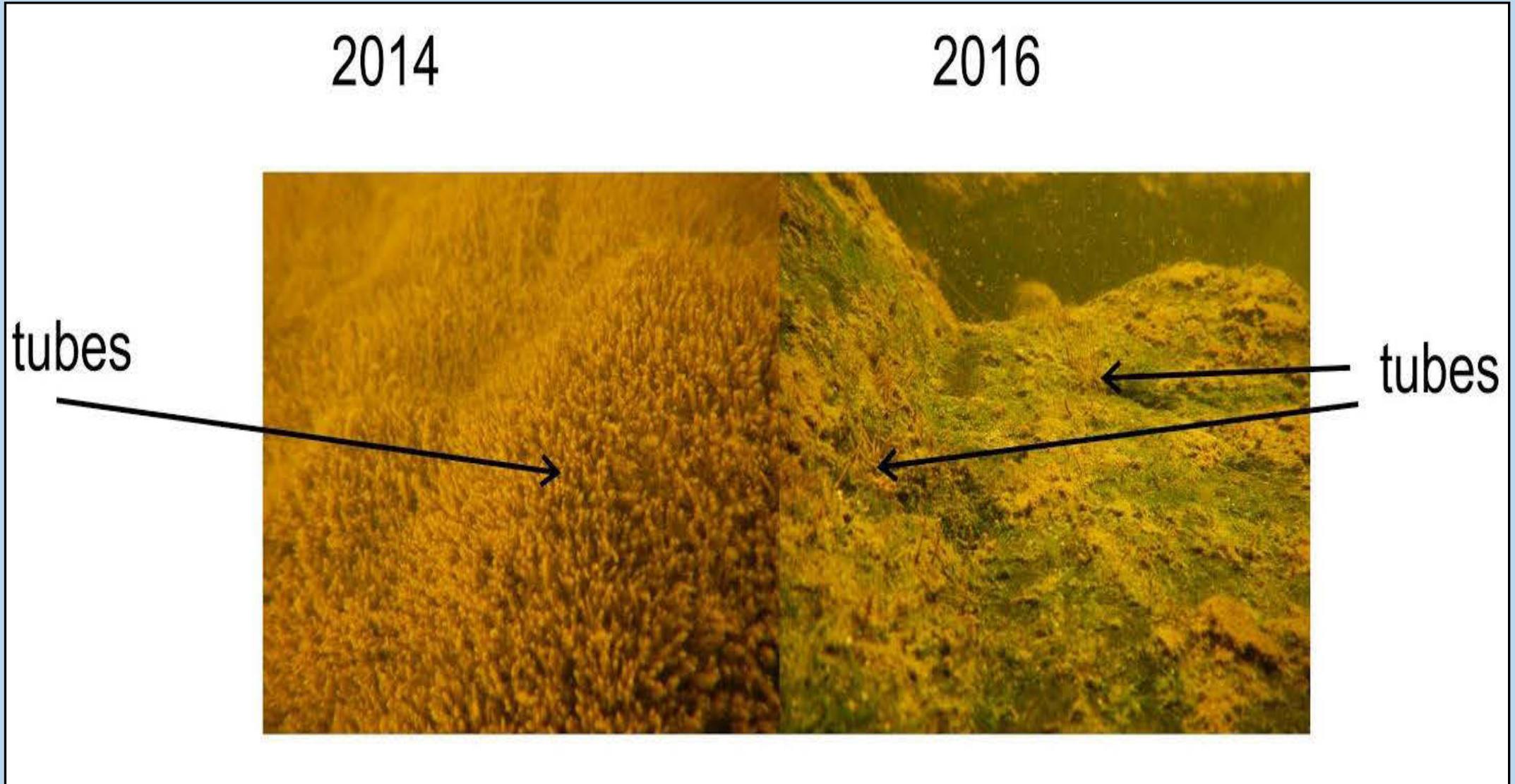
Figure. The life cycle of *Ceratanova shasta* and *Parvicapsula minibicornis*. *Manayunkia speciosa* is a small freshwater polychaete worm (3-5 mm in length) and intermediate host of both parasites. (Figure and photo from USFWS, Arcata Fish and Wildlife Office).

**Geomorphic Flows in the Klamath River have been Minimal since 2000 Relative to Period from 1964 – 1999,  
(resulting in stable polychaete worm habitat)**



**Figure. Duration of sediment mobilization flows in days per Water Year in the Klamath River below Iron Gate Dam for Water Years 1964-2016 (taken from Arcata USFWS Technical Memo regarding Geomorphic Flows).**

**Comparison of polychaete colonies on a specific rock in 2014 (drought) relative to 2016 (following a deep flushing flow of 11, 250 cfs).**



# What Yurok Tribe (and others) have done to Minimize Future Juvenile Disease Problems from Lack of Flow

- Successfully litigated against Bureau of Reclamation and NMFS for failure to reconsult after high disease levels of 2014 and 2015 exceeded Incidental Take Statement threshold within 2013 Biological Opinion for SONCC coho salmon.
  - Until formal reconsultation is complete, the court awarded:
    - Surface flushing flows of at least 6,000 cfs every year until the dams are decommissioned.
    - Deep flushing flows of approximately 11,250 cfs every other year if hydrology allows.
    - 50,000 acre ft. of additional water to be available each spring if disease criteria warrant the provision of dilution flows

# Klamath River Dams Contribute to *C. shasta*

- Reservoirs frequently experience toxic algae blooms
  - Algae cells settle on river bottom providing food for polychaete worms
- Dams interrupt sediment budget
  - Results in armoring of substrate = less sediment mobilization = prime polychaete habitat



# Four Klamath River Dams Scheduled for Removal in 2020

- Amended Klamath Hydroelectric Agreement to remove dams was signed in April 2016
- Application has been filed with FERC to transfer ownership from PacifiCorps to the Klamath River Renewal Corporation (the entity whose sole purpose is to oversee dam removal)
- Application has been filed with FERC to decommission and remove the dams from the river

