

# Dworshak NFH and IHNV Update



Guppy Blair  
USFWS Idaho FHC



# Recent publication in collaboration with USGS, Western Fisheries Research Center

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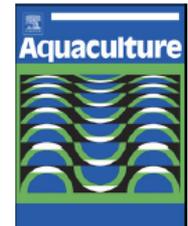


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## Successful mitigation of viral disease based on a delayed exposure rearing strategy at a large-scale steelhead trout conservation hatchery



Rachel Breyta<sup>a,b,\*</sup>, Corie Samson<sup>c</sup>, Marilyn Blair<sup>c</sup>, Allison Black<sup>a,d</sup>, Gael Kurath<sup>a</sup>

<sup>a</sup> U.S. Geological Survey, Western Fisheries Research Center, 6505 NE 65th St., Seattle, WA 98115, United States

<sup>b</sup> School of Aquatic and Fishery Sciences, University of Washington, Box 355020, Seattle, WA 98195-5020, United States

<sup>c</sup> US Fish and Wildlife Service, Idaho Fish Health Center, 276 Dworshak Complex Drive, Orofino, ID 83544, United States

<sup>d</sup> Institute for Public Health Genetics, University of Washington, Box 353410; Raitt Hall, Seattle, WA 98195-3410, United States

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### ABSTRACT

In 2009, the largest steelhead trout conservation hatchery in the state of Idaho, Dworshak National Fish Hatchery (NFH), lost over 50% of the juvenile steelhead trout (*Oncorhynchus mykiss*) population being reared for release. The causative agent of this high mortality was the viral pathogen infectious hematopoietic necrosis virus

# Dworshak National Fish Hatchery

- Located at the confluence of the North Fork and mainstem of the Clearwater River
- Constructed to mitigate for loss of B-Run steelhead in North Fork Clearwater River and its tributaries as a result of the construction and operation of the Dworshak Dam
- Co-managed by USFWS and Nez Perce Tribe with 2005 Snake River Basin Adjudication Settlement Agreement.



# Dworshak NFH Background

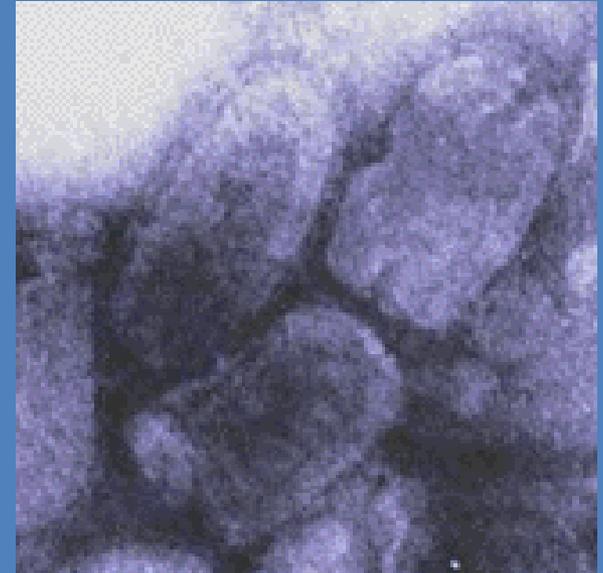
- 2.1 million steelhead
- Originally built with river water supply only.
- 3 reuse systems: 2 with 25 BPs each and 1 with 34 BPs
- 1992 reservoir water to incubation & nursery in conjunction with the construction of the Clearwater SFH





# IHNV

- Infectious Hematopoietic Necrosis Virus
- First reported in U.S. in WA, OR 1950s, endemic NW USA
- Steelhead, RBT more susceptible to disease
- RNA Rhabdovirus (bullet shaped), replicates in cytoplasm of infected cell



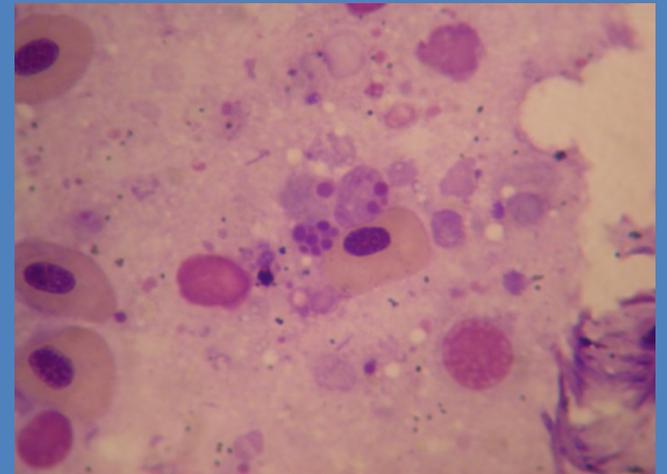
# IHN Signs

Exophthalmia, anemia, pale gills, darkening, hemorrhage



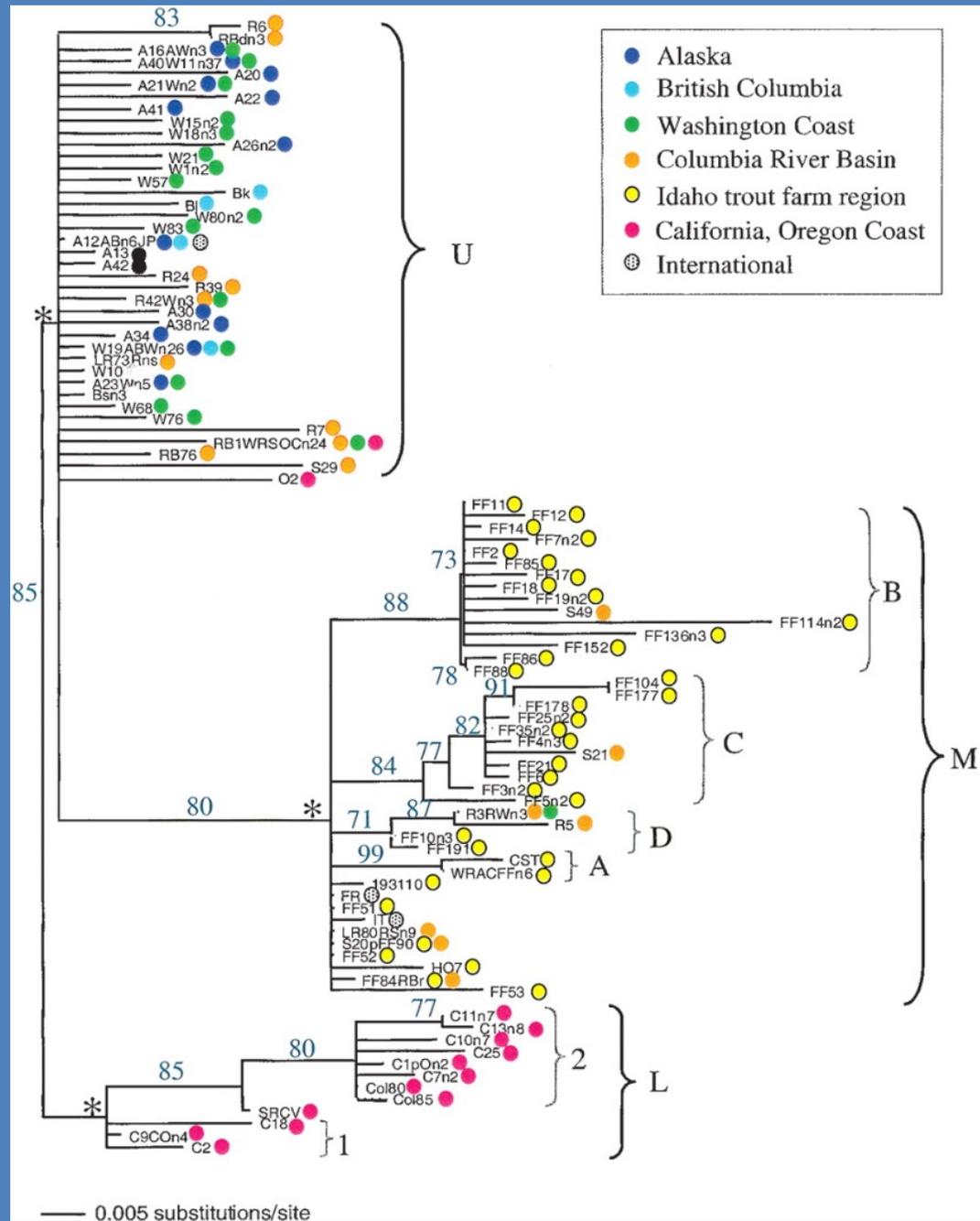
# IHNV continued

- Necrosis kidney, spleen (blood forming)
- Vertically transmitted on outside of egg, can disinfect eggs to break cycle.
- Horizontally transmitted, by adults or juveniles
- Detection: Cell culture, histology, PCR.



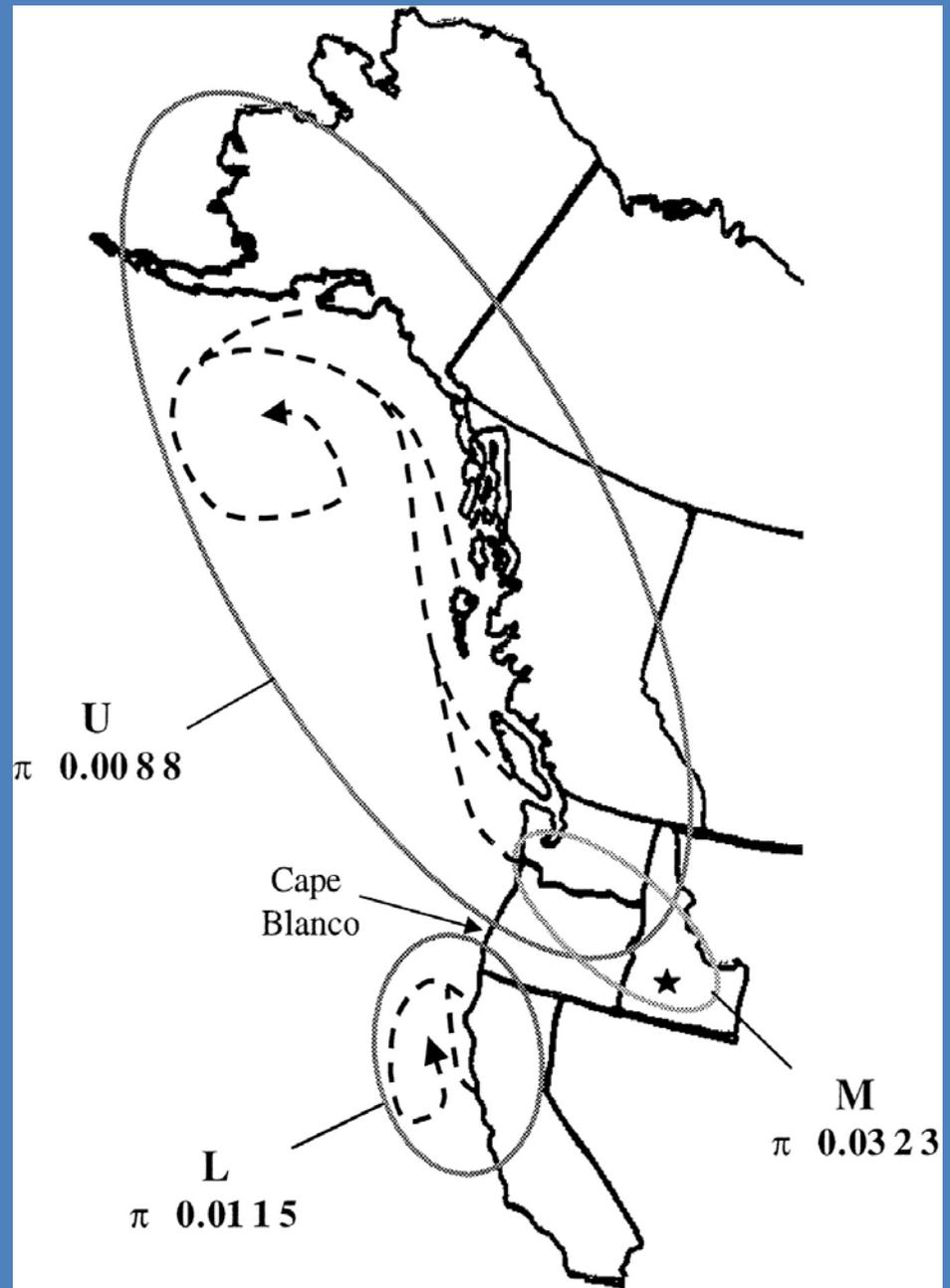
# WFRC: Epidemiology

North American  
IHNV isolates are  
grouped based on  
genetic sequences



# Epidemiology

3 major genogroups:  
U, M, L clades



# Genogroups

- M clade: primarily steelhead and rainbow trout in WA, OR, ID
- U clade: primarily sockeye in AK, BC, WA, OR, ID, but also in Columbia R. Chinook and steelhead
- L clade: primarily Chinook of S. OR and N. CA

# Dworshak IHNV Background

- Historically cyclical problems
- Highest acute mortality usually with earliest egg takes in late May and early June at 2-3 weeks post ponding out of nursery
- Size at ponding: 80-90 fpp
- Loading: 30,000 per pond
- Very limited genotyping historically, U or M clade



# Dworshak NFH 2009

- Very high mortalities in steelhead juveniles. Lost about half of production.
- First outbreak June 20, 2009
- Genotype M 139



# Dworshak NFH 2010

- Reservoir water to system 1
- March 2010 new engineer Jack Christiansen
- IDF&G Clearwater Hatchery extra flow seasonally
- Higher loadings than previous years at 75-130,000 per pond when first ponded.
- First takes not put out onto river water until July 22 at a size of 28 fpp





Photo from above 24" Reservoir Line. The 10" tee on left supplies Incubation.





20" Steel Pipe  
Welded to 24"  
Reservoir  
Pipeline for  
delivery of  
reservoir water  
to System 1.

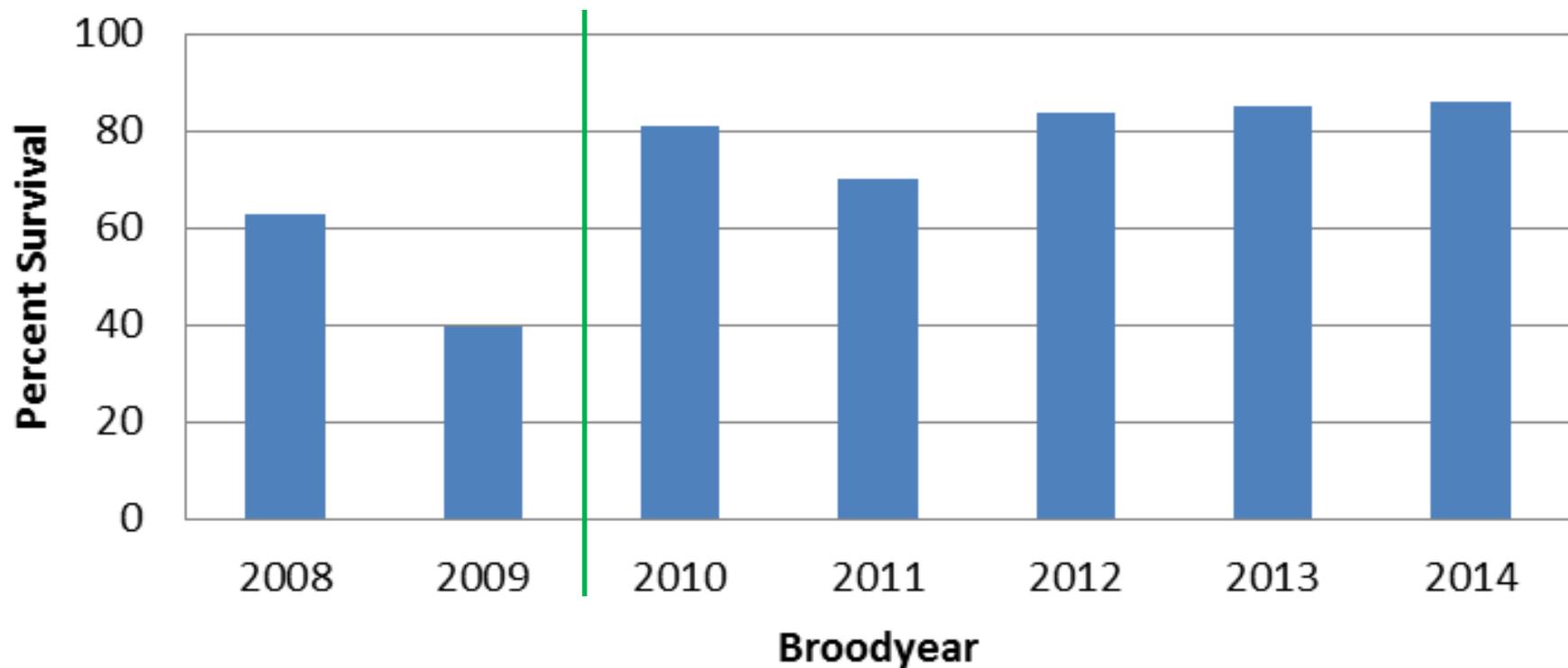
Valve that was installed on welded pipe addition to allow 'hot tap' procedure to connect System 1 to 24" reservoir line without shutting down Nursery or Incubation water supplies.



# Results

- No IHNV detected during the first year in 2010 and for following years, for those ponded initially on reservoir water until mixed with river
- For these fish, positive detection of IHNV was delayed by about 3-3 1/2 months, genotypes were all U clade

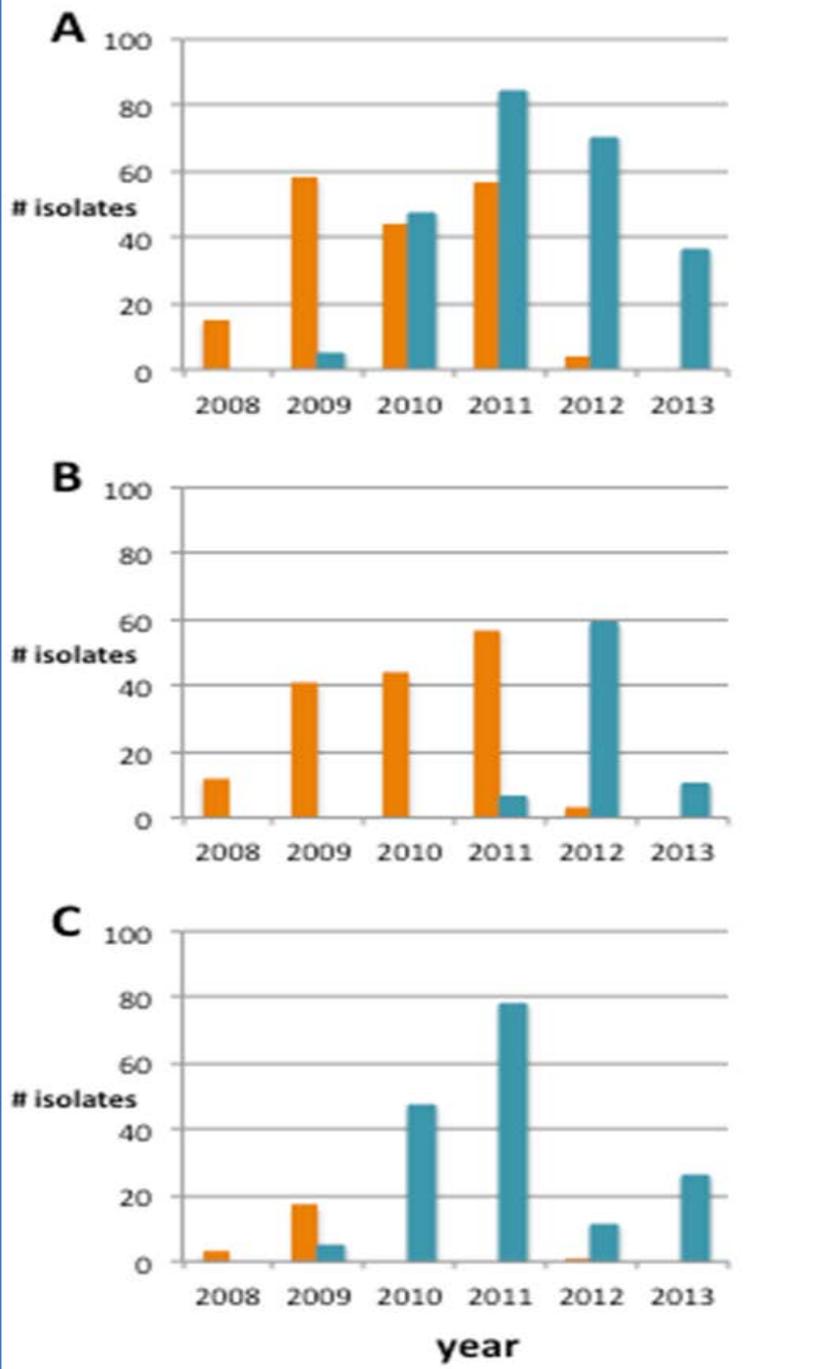
## Eyed Egg to Smolt % Survival for Summer Steelhead



# Adult Genotyping

- 2009 results indicated adult steelhead in Clearwater River were most likely source of IHNV in steelhead juveniles (M139)
- 2010 results indicated that adult spring Chinook were most likely source with delayed exposure and detections at lower, chronic mortality (U clade)
- Shift in all subsequent years in IHNV types in all adult fish from M to U groups





Proportion of U and M viruses in steelhead and Chinook salmon adults from 2008 -2013.

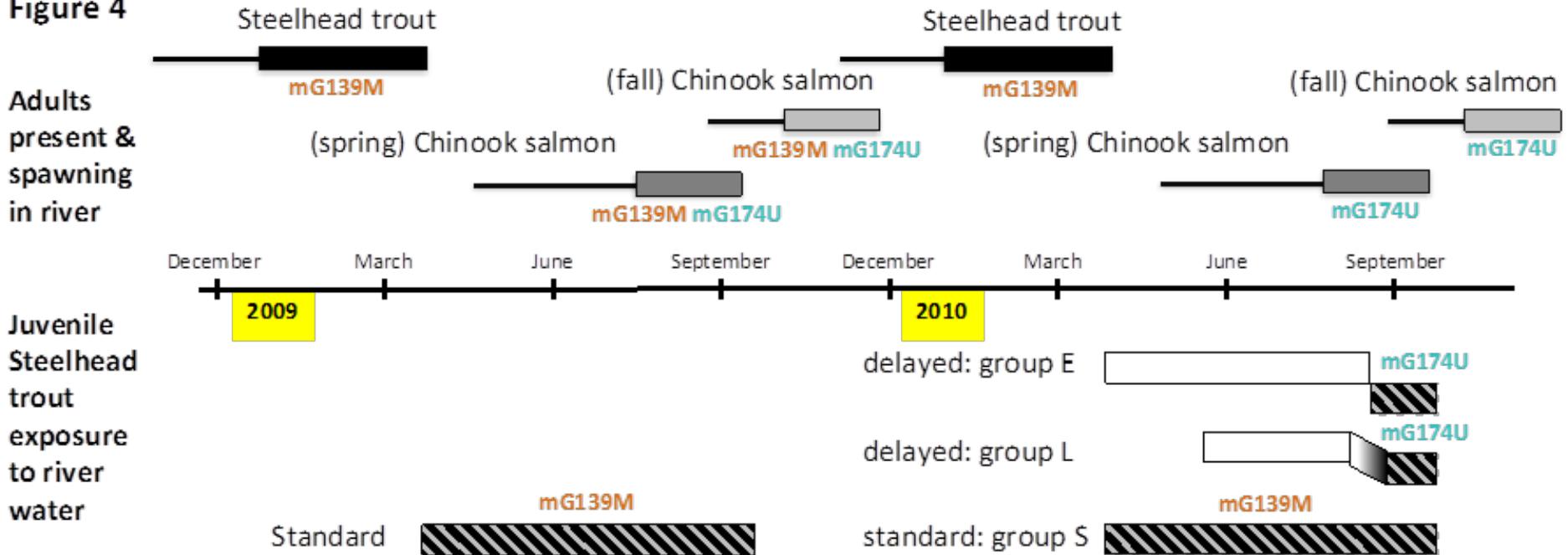
M139 and variants in orange or U174 and variants in blue

A: Adult Chinook and steelhead combined

B: Steelhead only

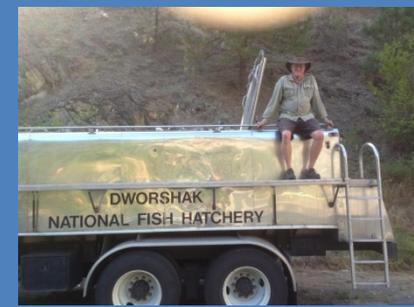
C: Chinook salmon only

Figure 4



Timing of adults and dominant IHNV types as compared to juveniles in 2009 and 2010

# Take Home messages



- Plumbing mod was successful to dramatically reduce IHNV mortalities in steelhead juveniles at Dworshak
- Plumbing mod changed IHNV at Dworshak from the STT lethal M clade to the STT less-lethal U clade, more common in SCS
- IHNV in Dworshak production fish is most likely attributed to adult STT & SCS congregating near the North Fork intake
- As long as the Dworshak water source is from the river where IHNV is prevalent in both STT and SCS adults, we risk IHN losses. Not a long term fix
- There is potential that we may see increased IHN disease and mortality in SCS in the future

# Any questions?

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