



McCloud River Redband Trout Program

Rescue, Spawn, and Return



Mount Shasta Hatchery



Photo courtesy of M. Dege

Beau Jones
Fish Hatchery Technician
Ca. Dept. of Fish & Wildlife



McCloud River Redband Trout Program Rescue, Spawn, Return

- About Mt Shasta Hatchery
- Rescue, Spawn 2015 & 2016 and spawning matrix
- Broodstock why and how
- Conservation efforts, return of originals
- Introduction of F1A
- Return to the McCloud River



Mt. Shasta Hatchery

- Mt. Shasta Hatchery is located along the I5 corridor in Northern California
- Approximately 1 hour south of the Oregon Border
- Oldest operating hatchery west of the Mississippi River
- Started operation in 1888
- Spring Fed with an average water temperature in the lows 40's
- Major Broodstock Facility (Approximately 30 million eggs/year)



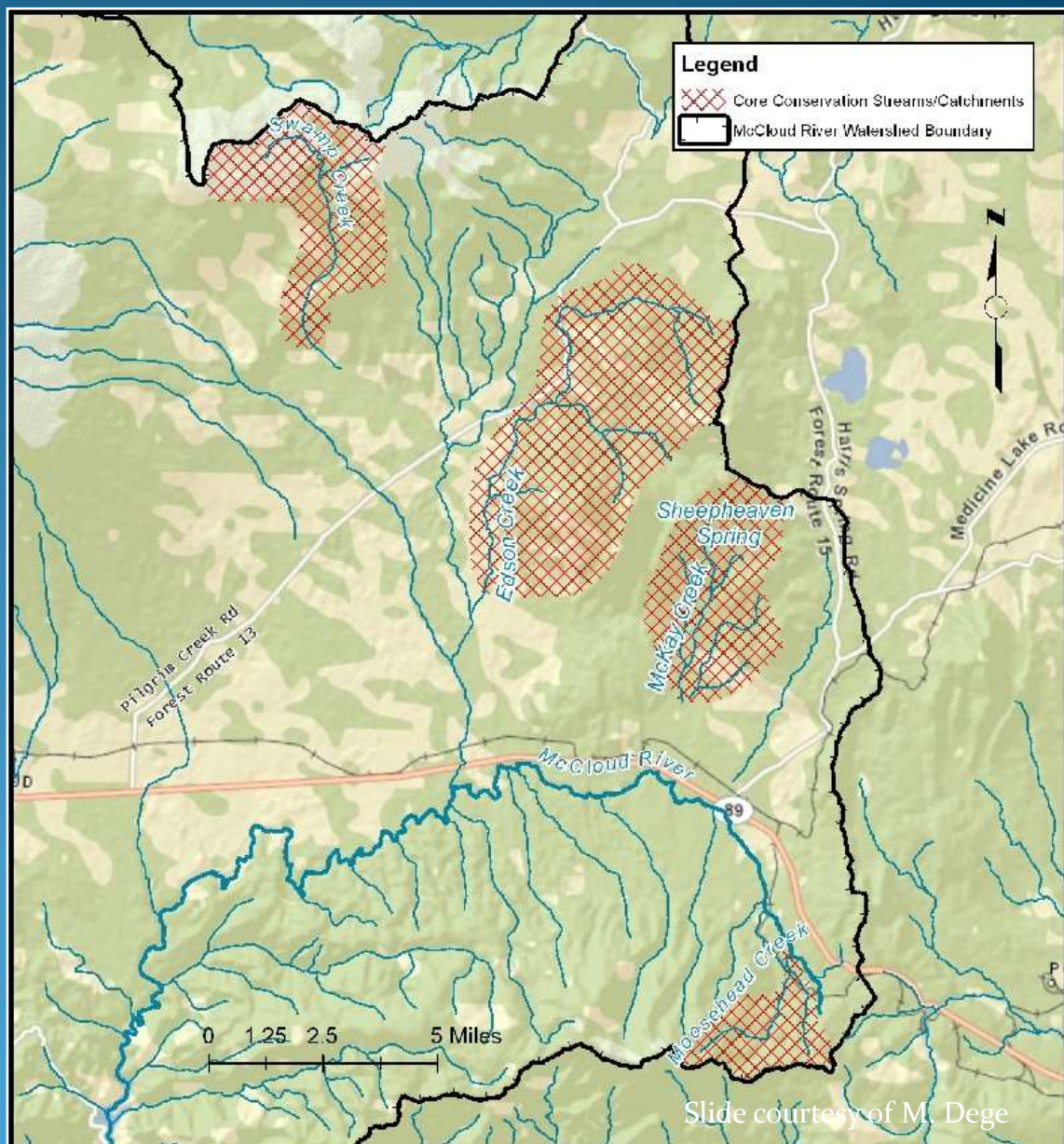


Upper McCloud Watershed

65 miles north of Redding,
CA

~20 miles east of MSH

Small isolated spring
streams



Slide courtesy of M. Dege



13/14 Driest Water Year on Record in CA

Winters of 11/12, 12/13, 13/14, 14/15- all warm and dry

Effects on hatchery salmonids and wild fish survival

- Fish rescues of McCloud River Redband trout from
 - Edson Creek
 - Swamp Creek
 - Moosehead Creek



Photo's courtesy of Dr. M. Clifford, M. Dege, S. Plemons



Water Conditions become so adverse a decision had to be made.



Photo's courtesy of M. Dege, S. Plemons



Spawn 2015 & 2016

- Fish were isolated in their streams do to drought. In an effort to make genetics more diverse we cross breed their streams and separated into paired family groups



Moosehead
Creek Female



Edson Creek
Male

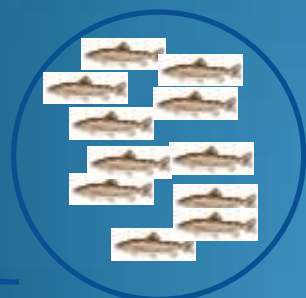
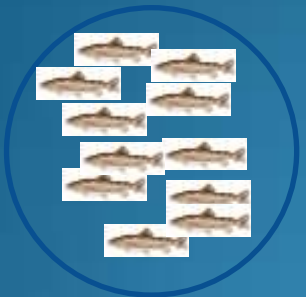
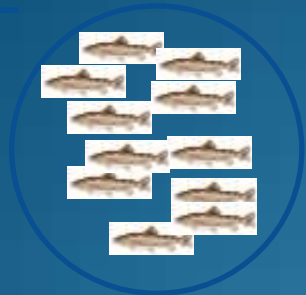


F₁A





Individual families groups



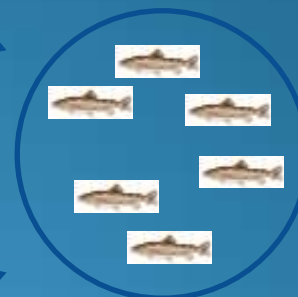
To production



Edson-Swamp rescues



➤ Spawning matrix we used for first spawn of F₁A



Should get a male and female from each sib group 50% of the time

Eg Edson-Swamp crosses



Spawning

- 4/2/15 First Spawn
 - 3 Females Spawned
 - Approx. 225 total eggs were taken





Spawning Continued

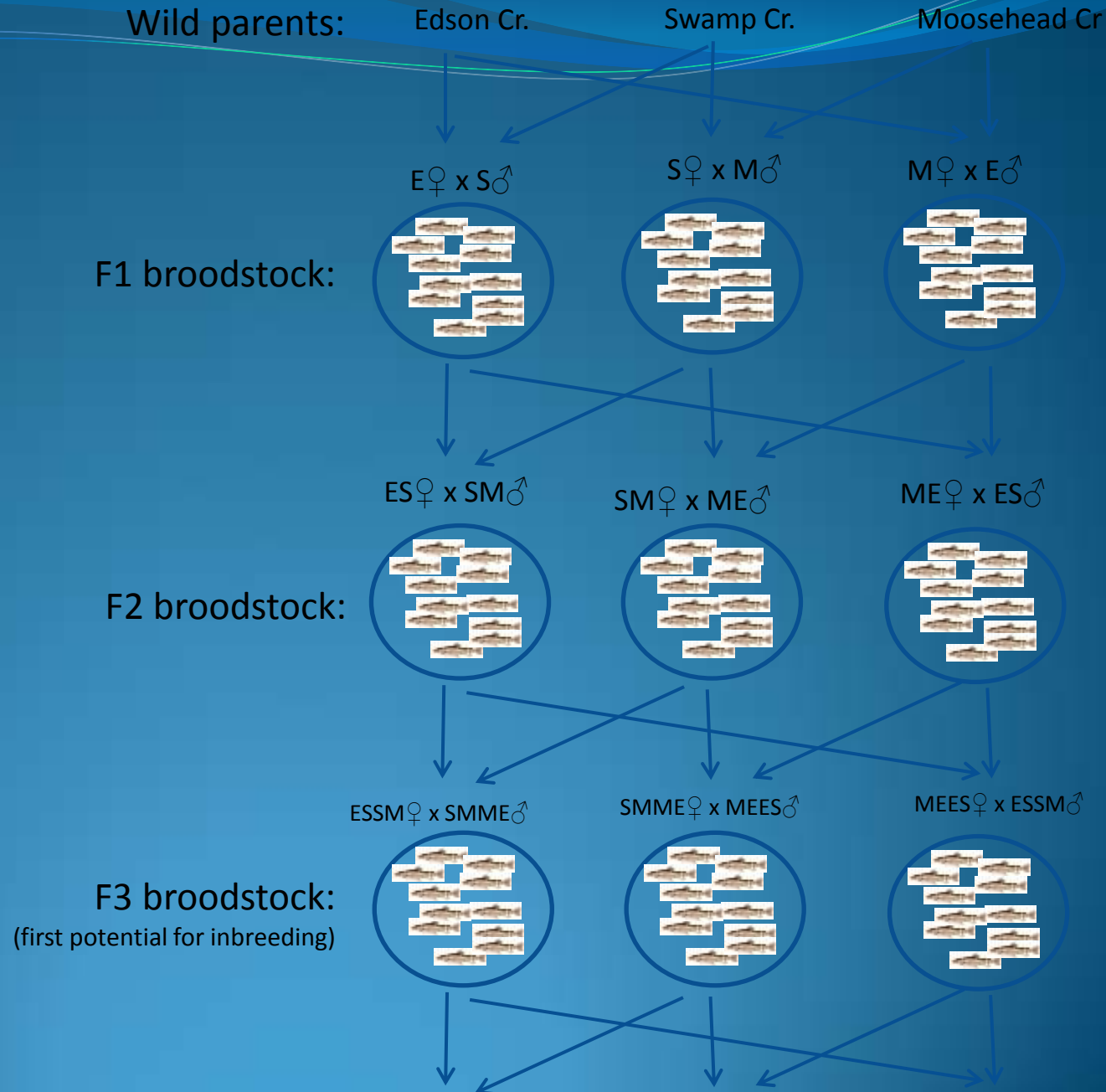
- Spawning concluded in June 2015
- By July 2015 approximately 4500 good eggs were set out to hatch





Spawning Matrix

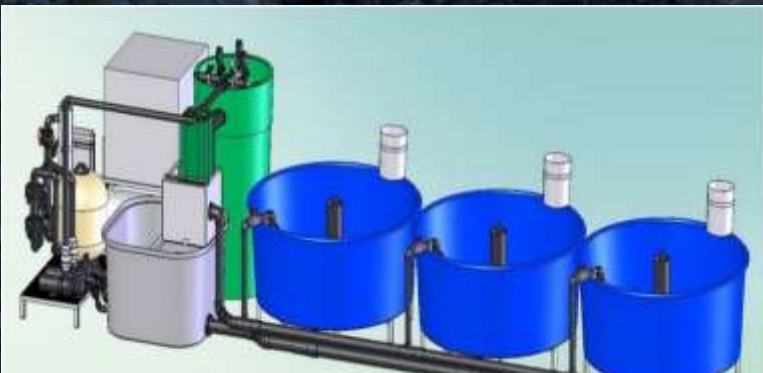
- This how a rotational spawn would look for the three different groups over three generations





Redband Broodstock

- We are establishing a broodstock for more diverse genetics, conservation, commitment to Cogsdill Bill, and to the angler
- Brood selects were chosen by hatchery personnel based off of family groups and brood numbers given by genetisis Jeff Rodzen. Broodstock were put into a RAS and separated into three tanks depending on their cross and family group





Production & Broodstock RAS Units

Making room



Original 500 gallon tanks



New 2355 gallon Tanks





Return of the Originals

- Fall of 2016 333 of the original rescued fish were returned to Edson, Swamp, and Moosehead creeks





Introduction of F1A

- Fall of 2016 the F1A redband was planted into Moosehead, Swamp, and Trout creeks
- Total F1A 1247 Fish
- All fish were physically marked and pit tagged





Return To The McCloud River

- Twenty of the original redbands that were ten inches or longer were unable to go back to there original creeks
- August 2017 the twenty originals were put into the upper McCloud River

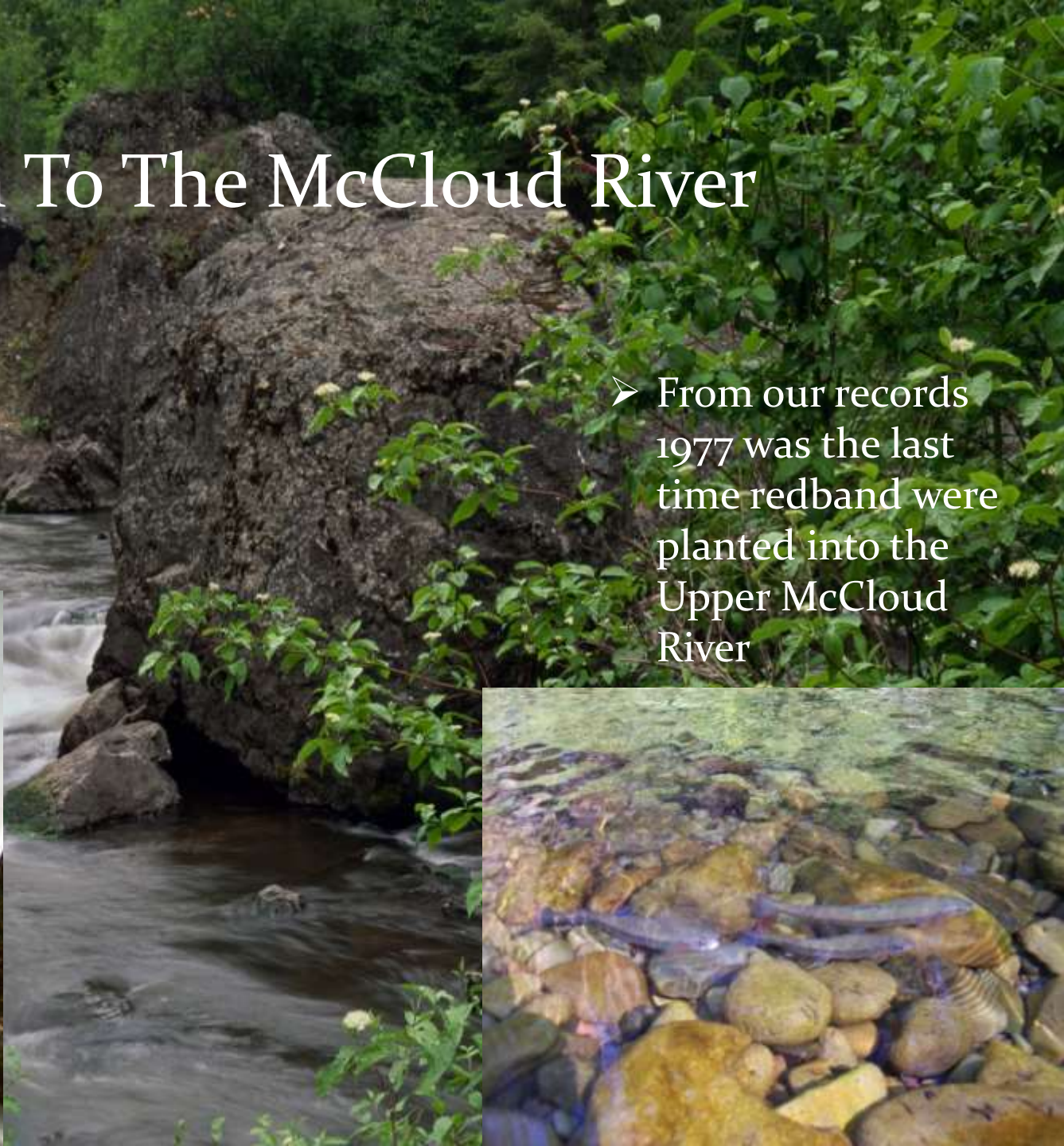




Return To The McCloud River

➤ On September first
264 F1A were
introduced into the
Upper McCloud
River

➤ From our records
1977 was the last
time redband were
planted into the
Upper McCloud
River





Conclusion

CDFW Wild Trout

CDFW Pathology

CDFW Mt Shasta Hatchery

CDFW Fisheries Branch

CDFW Geneticist

Any Questions



The Rescue

- A decision was made to relocate the redbands to MSH
- What are the risks of moving fish from the wild to a hatchery?
 - Recirculating Aquaculture Systems (RAS)
- Do we have time to install the RAS and prepare them for fish?
 - Where do we put them?
 - Electrical
 - Establishing the RAS bio filters



Self-contained (Drought Safe Haven) Recirculating Aquaculture Systems (RAS)





- In late June (2014) the first RAS arrived at MSH and construction begin
 - 6 hatchery troughs and 1 deep tank were removed





- Additional electrical had to be installed to accommodate pumps, UV, and chiller
- Construction took approximately 2 days to complete





- On Day 2 water was added to the system
- Feeding of the Bio-Filters started





- By Mid July (2014) the RAS was ready for fish but not without setbacks
 - Pipes became clogged with fish feed
 - Filters clogged from over feeding systems
 - Tanks over flowing
 - Drains not properly draining
- But with a lot of trial and error the RAS were ready for fish





The Rescue's

- 8/28/14, 128 Redband trout rescued from Edson Creek
- 8/29/14, 98 Redband trout rescued from Edson Creek
- 9/2/14, 517 Redband trout rescued from Swamp Creek
- 9/17/14, 269 Redband trout rescued from Moosehead Creek
- A total of 1,012 McCloud River Redband trout were rescued and moved to MSH
 - In route predation was observed
 - Cages were constructed to segregate fish by size





Added Precaution

- Upon arrival redbands were treated with a 6 hour bath of Oxytetracycline @ 100 ppm
 - Based on Pathology Recommendations
 - Treatment was conducted in 400 gallon tank on fish planting truck
 - Pathology approved fish before transfer
- Once the fish had been treated and placed in the RAS they were given a 3 day bath of formalin at 140 ppm for 1 hour
 - Formalin does not kill nitrifying bacteria



How do we Rear Wild Trout?

- Concerns of rearing wild trout
 - Large variation in size
 - Feeding wild fish
 - Insects to commercial diets





How do we rear wild trout?

- High Profile fish
 - A lot of pressure to succeed
- Information acquired from Gila and Bull trout efforts
- All three creeks in one system
 - System can handle the biomass
 - Creek to cages
- Treat them with special care, but the same as any other trout
 - Daily Care: Feeding/Cleaning/Monitoring
 - Weekly tank cleanings
 - Weekly Ammonia monitoring





Additional Systems

- We did encounter some early loss of Young of the Year
 - Some did not take well to commercial diets
 - Introduced Krill and Brine Shrimp
 - Fish were growing and needed additional room
 - minimize stress
 - spawning soon
- In late January 2015, 2 additional RAS were brought to MSH
 - 12 additional hatchery troughs were removed to accommodate
 - Same procedures of installation and establishing bio-filter
 - On 2/23/15 fish from each creek were re-inventoried into the new systems
 - Cages were removed and each round tank had a size group



Re-Inventory into new systems

2/23/2015

Re-inventory numbers were as follows:

- Edson Creek: 186
- Swamp Creek: 422
- Moosehead Creek: 233
- Total Fish: 841 (17% loss)





Rearing McCloud River Redband trout

- Everything went smooth for the next two months
 - Slight modifications to the systems
 - Feeding/Cleaning/General Fish Care
- Monthly meeting discussing fish disposition
 - To Spawn or Not to Spawn?
 - Fish Health
 - Develop broodstock
 - Can we even pull it off?



Spawning Continued

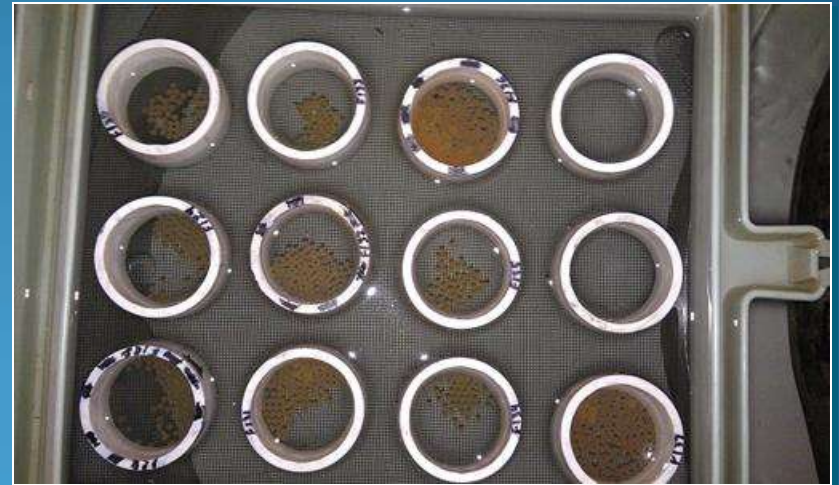
- Cross breed genetically distinct streams
- Adult genetic collections on all spawned fish
- Mark all spawned fish (physical and PIT)
- True 1:1 pairings (one male with one female)
- Equal representation among the rescued streams
 - Edson-Moosehead – 11 family groups (27.5%)
 - Edson-Swamp – 16 Family groups (40%)
 - Moosehead-Swamp – 13 Family Groups (32.5%)





Spawning Continued

- 4/2/15 to 6/11/15
 - 6 different spawning's
 - 42 family groups
 - Approximately 5,500 eggs were taken





- These videos are of the first family group starting to hatch
- This took place approx. 52 days post fertilization
- Eggs were set out in egg baskets to hatch
- Inflowing water was set around 5 gpm
- Baskets were lifted and troughs were cleaned daily
- As the eggs hatched the sac fry would fall through the bottom of the baskets coming to rest in the troughs
- Approximately 30 days after the fish would hatch they would begin to look for food





Egg Updates

- In October 2015 visual counts estimated (1,500)
 - Initial goal was 1000 fish
 - More genetically diverse
 - Readily eating commercial diets
 - All family groups kept separate





Conservation Efforts

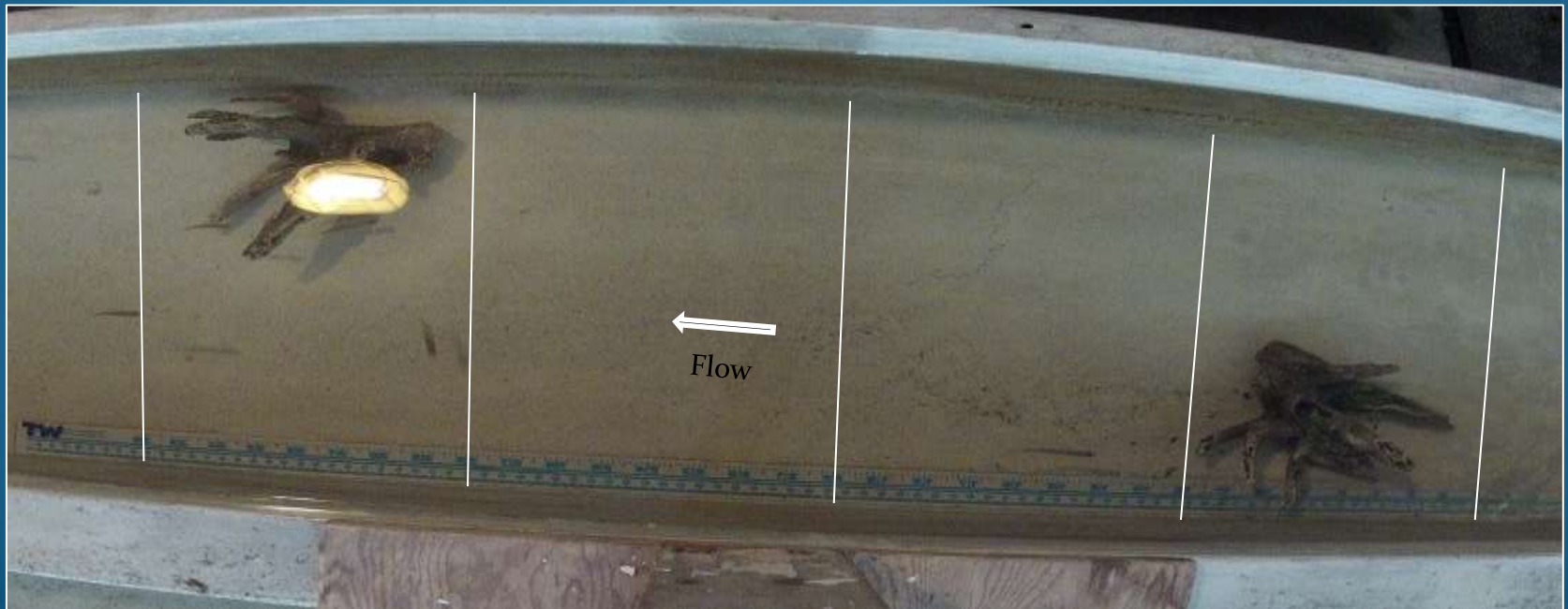
1. Artificial/Natural Habitat
2. Feed delivery (natural terrestrial insects, processed food, and krill)
3. Water-flow velocity (varying trough flow velocity)
4. Water temperature (2013-15 McCloud stream data)
5. Photoperiod (2015 McCloud area natural photo period)



Photo's courtesy of M. Dege



Artificial/Natural Habitat





Artificial/Natural Habitat



Photo's courtesy of M. Dege



Feeding





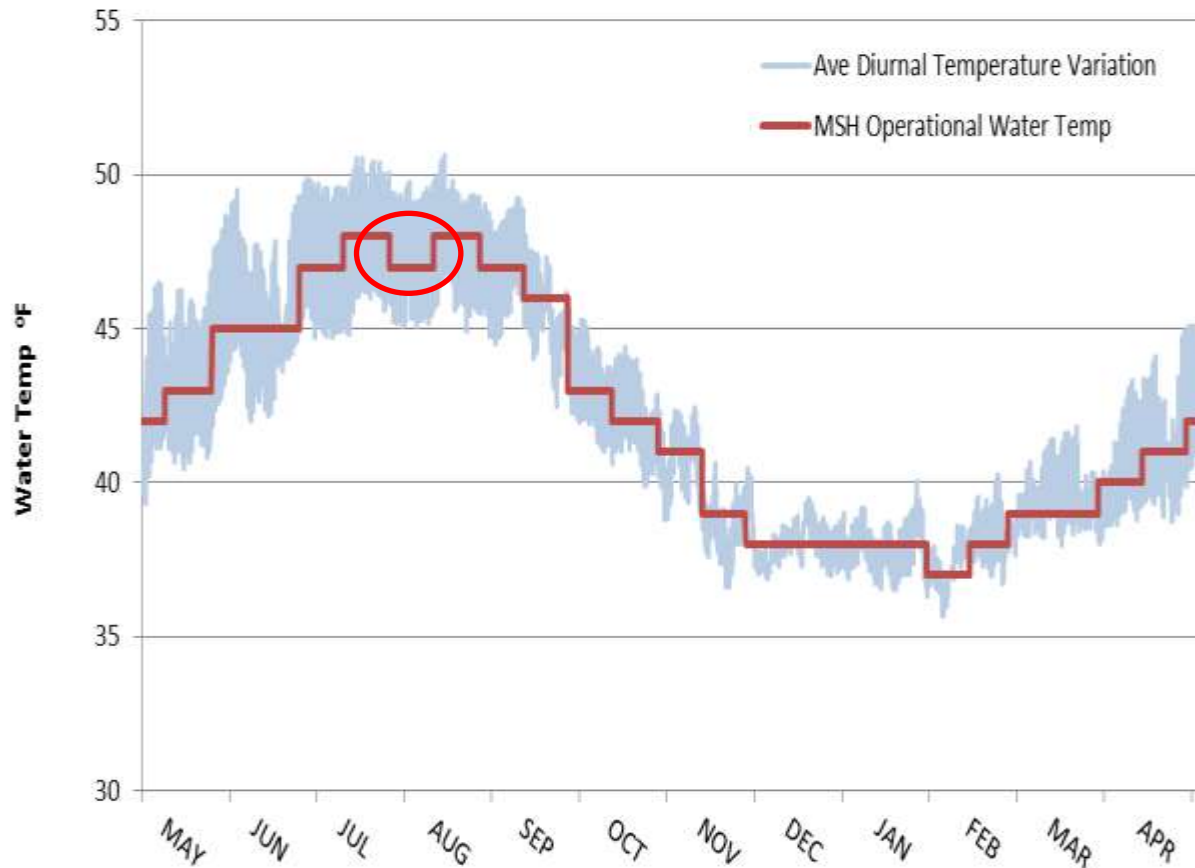
Feeding

- Rescued Adults being reared in RAS are fed using mechanical feeders @ 0.5% biomass.
- Feed is being broadcasted to Young of the Year .





Water Temperatures



Water Temperature	
Jan (1-15)	38
Jan (16-31)	38
Feb (1-15)	37
Feb (16-28)	38
Mar (1-15)	39
Mar (16-31)	39
Apr (1-15)	40
Apr (16-30)	41
May (1-15)	42
May (16-31)	43
Jun (1-15)	45
Jun (16-30)	45
Jul (1-15)	47
Jul (16-31)	48
Aug (1-15)	47
Aug (16-31)	48
Sep (1-15)	47
Sep (16-30)	46
Oct (1-15)	43
Oct (16-31)	42
Nov (1-15)	41
Nov (16-30)	39
Dec (1-15)	38
Dec (16-31)	38



Moving Forward

- Conservation efforts will continue
 - Continue trying to follow water temperature profile
 - Water flow velocity trials (1-42 gpm trough limitations)
 - Photoperiod is still a work in progress





What Now?

- Continued discussions on redbands reared at MSH
- Develop broodstock with redband progeny
 - Utilize as Heritage trout?
- Will fish stay at MSH?
 - Weather dependent
 - Stock back into streams





Questions?

