

# Use of RAS Technology in Serial Re-Use Fish Culture - Why?



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December 11, 2012



# Use of RAS Technology in Serial Re-Use Fish Culture - Why?



- Quick Review of the WGF System and why we changed.
- Overview of technology and its impact
- Overview of the Pros and Cons of using RAS technology



# Quick Review of WGF Hatcheries Past and Present



- Overall, Wyoming is an arid state
- Closed water systems are limited
- Traditionally, several hatcheries partially supplied by surface water sources
- Dirt ponds were also a mainstay

# Quick Review of WGF Hatcheries Past and Present



## ➤ Hatchery System in 1999

- ✓ Eleven (11) Facilities
- ✓ 5.6 million fish, 413,000 lbs (13.8/lb avg)
- ✓ 71 CFS total water supply

# It All Changed in 2000

- Parasite in Wyoming waters since 1986
- Spread across the state through time
  - ✓ Dubois first hatchery infected - May 2000
  - ✓ Wigwam Rearing Station 2003
  - ✓ Story Hatchery 2004
  - ✓ Ten Sleep Hatchery 2010
  - ✓ Wigwam Rearing Station 2010



## Whirling Disease



# Quick Review of WGF Hatcheries 1999 to Present in a Nutshell

- Hatchery System in 2012
  - ✓ ~~Eleven (11)~~ Ten (10) Facilities



# Quick Review of WGF Hatcheries 1999 to Present in a Nutshell



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# Quick Review of WGF Hatcheries 1999 to Present in a Nutshell

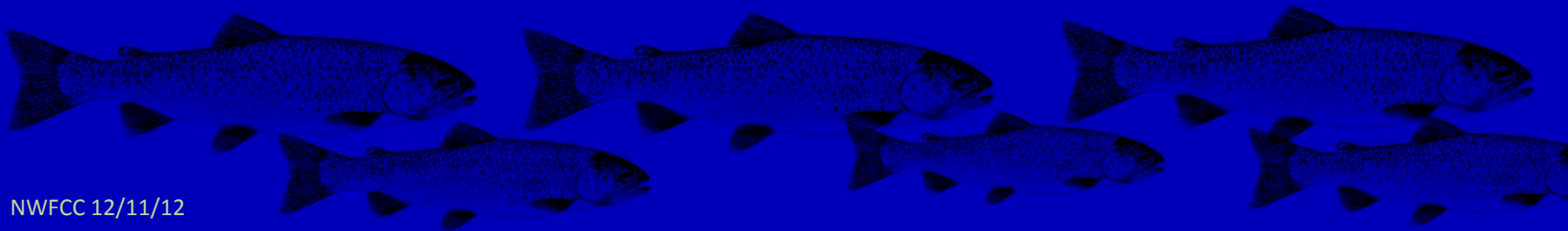


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✓ ~~5.6 million fish, 413,000 lbs (13.8/lb avg)~~

✓ 4.8 million fish, 439,000 lbs (10.9/lb avg)





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✓ ~~71 CFS~~ 47 CFS total water supply (66%)

✓ ↑ from 5,817 lbs/CFS to 9,340 lbs/CFS

# So What Changed???

1. Funding available = + \$29,000,000
2. Construction focused on:
  - ✓ Water source protection (6 hatcheries)





# So What Changed???

## 2..Construction focused on:

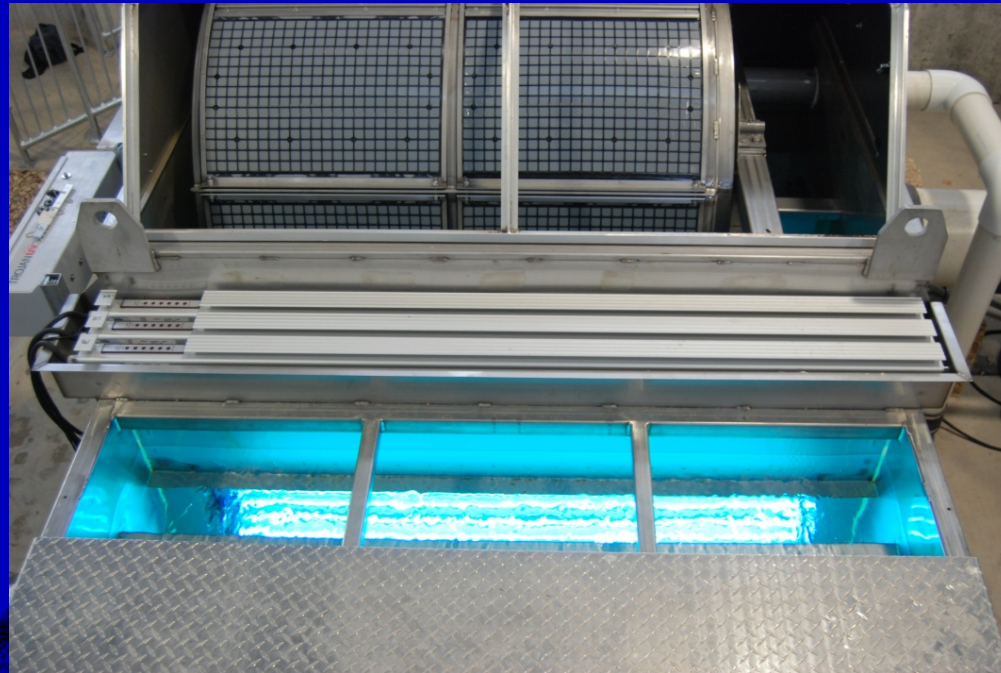
- ✓ Improve water quality of sources (7)



# So What Changed???

## 2..Construction focused on:

- ✓ Improve water quality of sources (3)





# So What Changed???

## 2. Construction focused on:

- ✓ Protect rearing units (5 hatcheries)





# So What Changed???

## 2. Construction focused on:

- ✓ Rearing environment improvement



















NWFCC 12/11/12



# Maximizing Water Available



## ➤ Speas – 12.5 CFS

✓ 2004 – 2008 = 80,200 lbs average

✓ 2011 = 226,000 lbs

## ➤ Dubois – averages 30,000 lbs


✓ Pre-construction = 1,600 gpm

✓ Post-construction = 420 gpm



# The Pros

A group of five realistic-looking fish, possibly salmon or trout, swimming towards the right. They are positioned above the title 'The Pros'.

- Self Cleaning – only pull sumps twice a day.
    - ✓ No vacuuming or brushing required (covered units)
    - ✓ Cleaning labor greatly reduced
    - ✓ Moves solids out quickly
    - ✓ Controls TSS easily
    - ✓ Fish are not exposed to waste as much as raceways
- 
- A group of five realistic-looking fish, possibly salmon or trout, swimming towards the right. They are positioned below the list of pros.

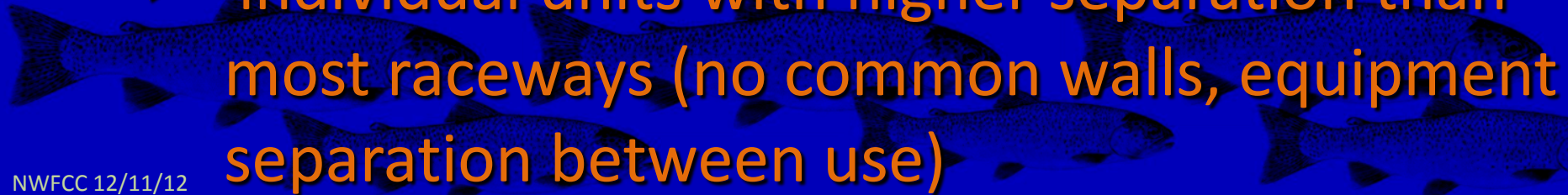
# The Pros



- Water Quality – Uniform water quality throughout the rearing unit.
  - ✓ Oxygen added to influent at high concentration – Mixes immediately
  - ✓ Feces and any feed waste drops to floor and typically does not stay in water column or in direct contact of fish
  - ✓ Passive removal does not break down feces and maintains water quality.

# The Pros



- Smooth Tank Surface – Fiberglass or PVC are smooth, not abrasive.
    - ✓ Less wall space than raceways
    - ✓ Surfaces are easier to clean and disinfect between uses
  - Better Lot Management – lots are isolated
    - ✓ individual units with higher separation than most raceways (no common walls, equipment separation between use)
- 



# The Pros



- Footprint – Less footprint required for rearing volume.
- ✓ Entire parameter of unit accessible
- Rearing Conditions
  - ✓ Can set rotational speed proportional to fish length
  - ✓ Fish easily distribute throughout the tank and water column, no unutilized space like raceways.

# The Pros



## ➤ Fish Condition

- ✓ Fins erosion has been noted less
- ✓ Fish coloration is not as dark as raceways
- ✓ CV measurements are typically lower values
- ✓ Fish are “firmer” and typically a “trimmer” condition factor
- ✓ Can adjust velocity to improve fitness



# The Pros



## ➤ Feeding

- ✓ Easier to get feed to the entire lot
- ✓ Depth and flow spreads the feed out and stays in the column longer
- ✓ Fish spread out to feed throughout the unit.



# The Pros



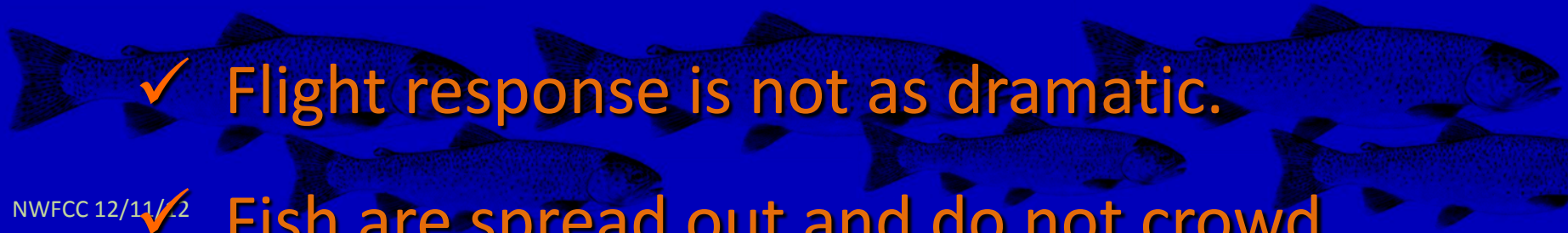
- Sampling & Harvesting
  - ✓ Elevated tank improves access
  - ✓ Do not have to get in tank to crowd
  - ✓ Can use bag seine to easily crowd to sample or collect for harvest.
  - ✓ Require less bending over to load or net fish, saves on staff's backs.



# The Pros




## ➤ Stress Management/Health

- ✓ No brushing units, not stressing the fish or exposing them to waste
  - ✓ Wasted feed and feces are removed with limited exposure to fish
  - ✓ Workers do not need to get into the rearing unit.
  - ✓ Flight response is not as dramatic.
  - ✓ Fish are spread out and do not crowd
- 

# The Pros



## ➤ Stress Management/Health (Continued)

- ✓ Velocity management improves health and fish condition.
  - ✓ Less surface area for predator interaction (if not under a building)
  - ✓ If treatments are required, unit can be easily isolated and effluent controlled.
  - ✓ Chemical treatments distribute evenly
  - ✓ Feed treatments uniformly distributed
- 



# The Pros




## ➤ Stress Management/Health (Continued)

- ✓ If static bath, oxygen can be used effectively.
- ✓ If water source is lost, units can be maintained for much longer than raceways with oxygen introduction and level management.
- ✓ If recirculation is available, unit setup can management reuse water quality very effectively.

# The Cons



- Adjusting the Swirl or Radial Separators
    - ✓ Can be difficult to set balance when flows are adjusted
  - Units require elevation (32" average) for raised access.
  - Units are efficient when oxygen enhancement is available.
  - Reuse requires a minimum of 24" between uses for oxygen and spray bars
- 



# The Cons



- Increased cost in equipment operation
- Increased cost in utilities
- Serial reuse without UV between uses may have fish health challenges
- Increased maintenance of support equipment
- If pumping, live with the fact that you could lose part or all of your fish!
- Others???



Questions????

