

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



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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

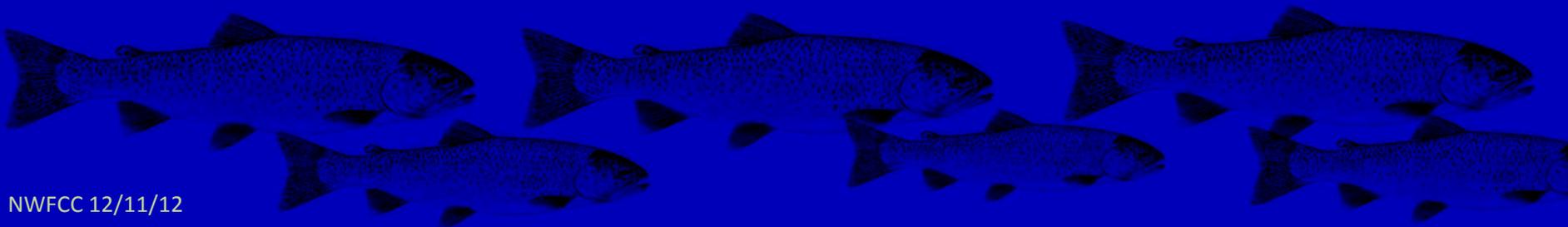


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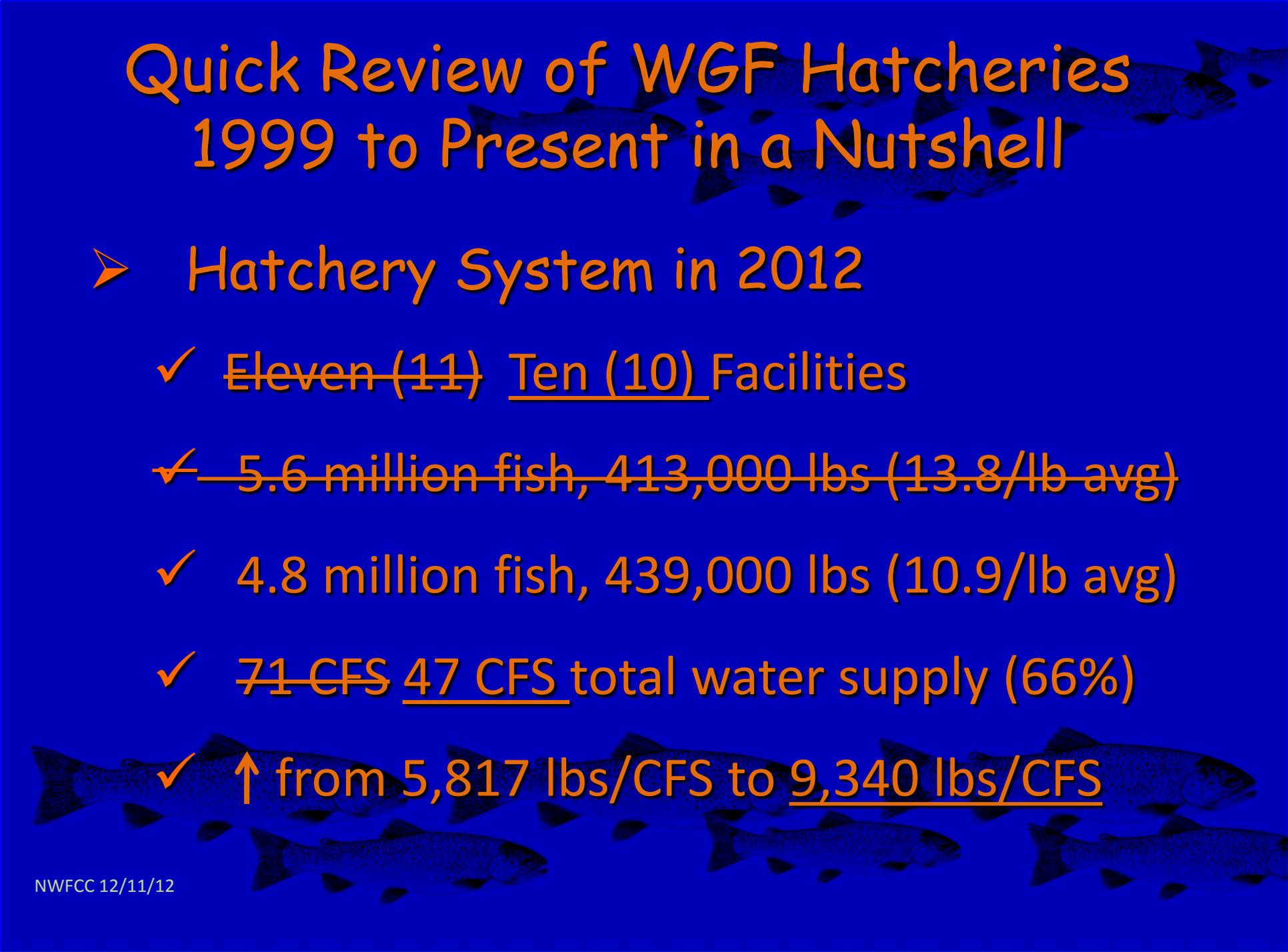
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✓ ↑ from 5,817 lbs/CFS to 9,340 lbs/CFS

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:

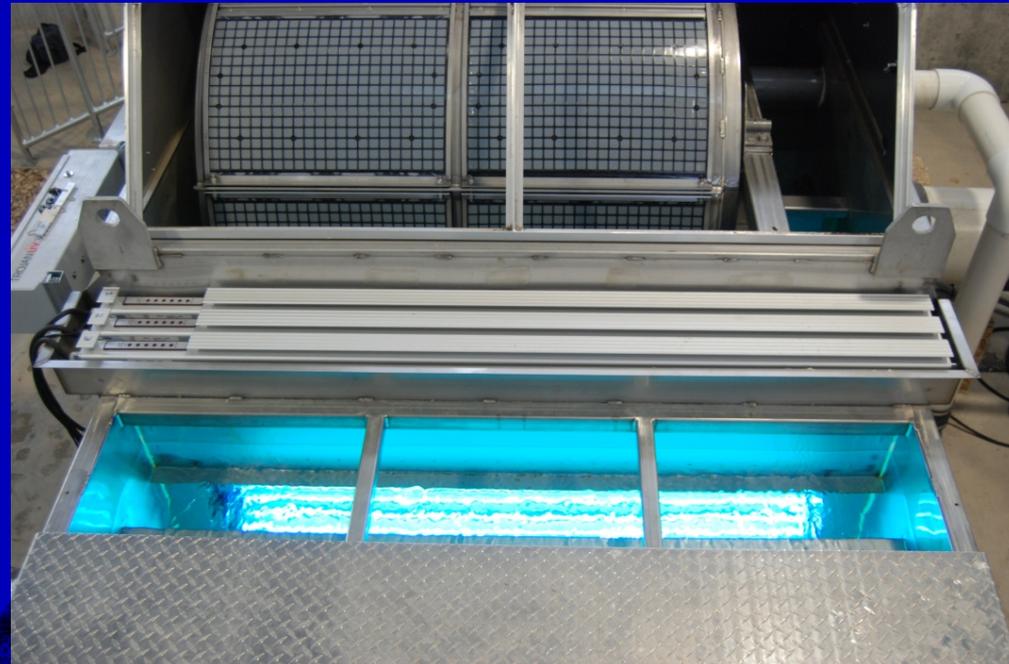
- ✓ Improve water quality of sources (7)



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









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NWFCC 12/11/12



Maximizing Water Available



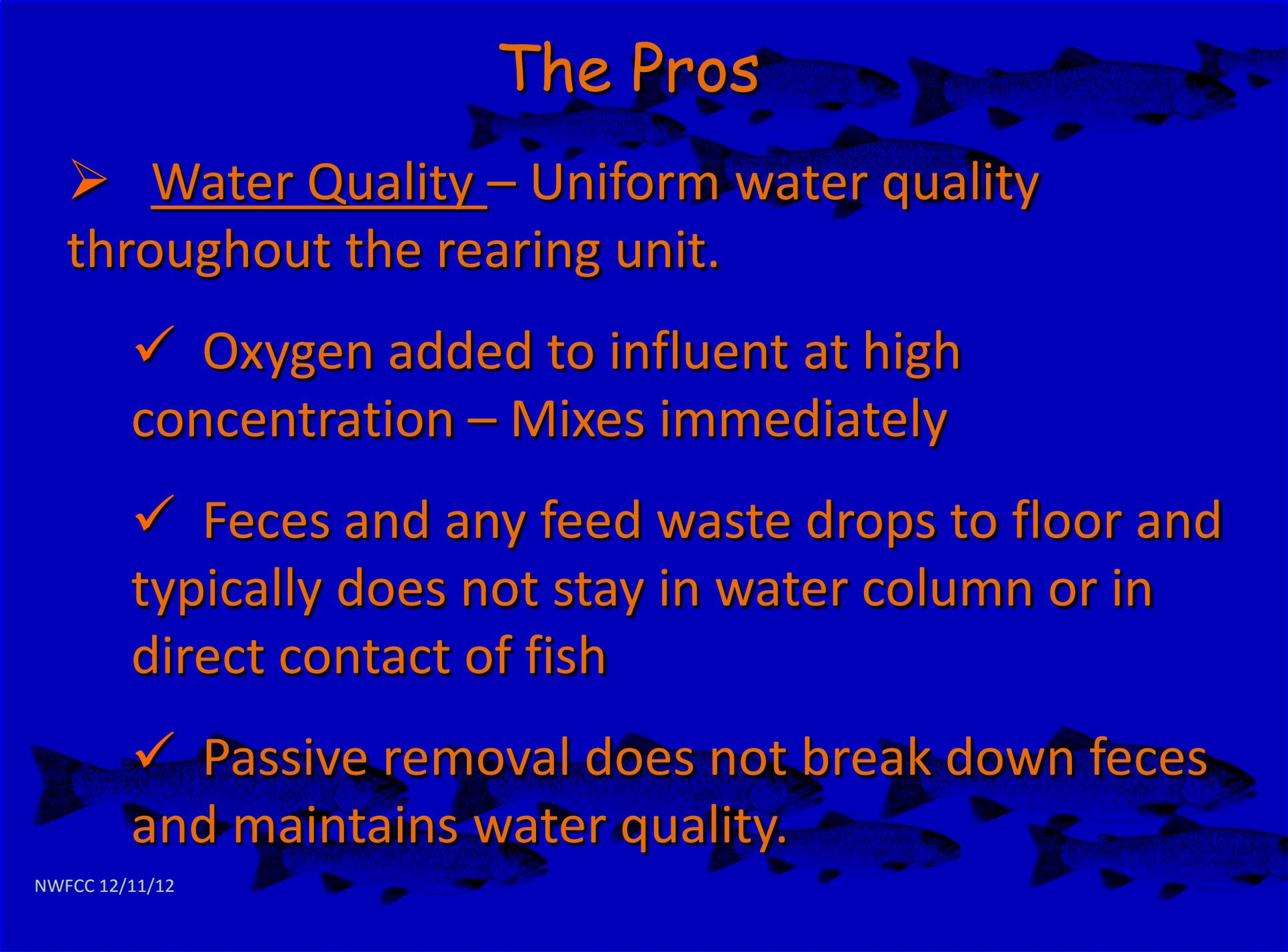
- Speas – 12.5 CFS
 - ✓ 2004 – 2008 = 80,200 lbs average
 - ✓ 2011 = 226,000 lbs
- Dubois – averages 30,000 lbs
 - ✓ Pre-construction = 1,600 gpm
 - ✓ Post-construction = 420 gpm

The Pros



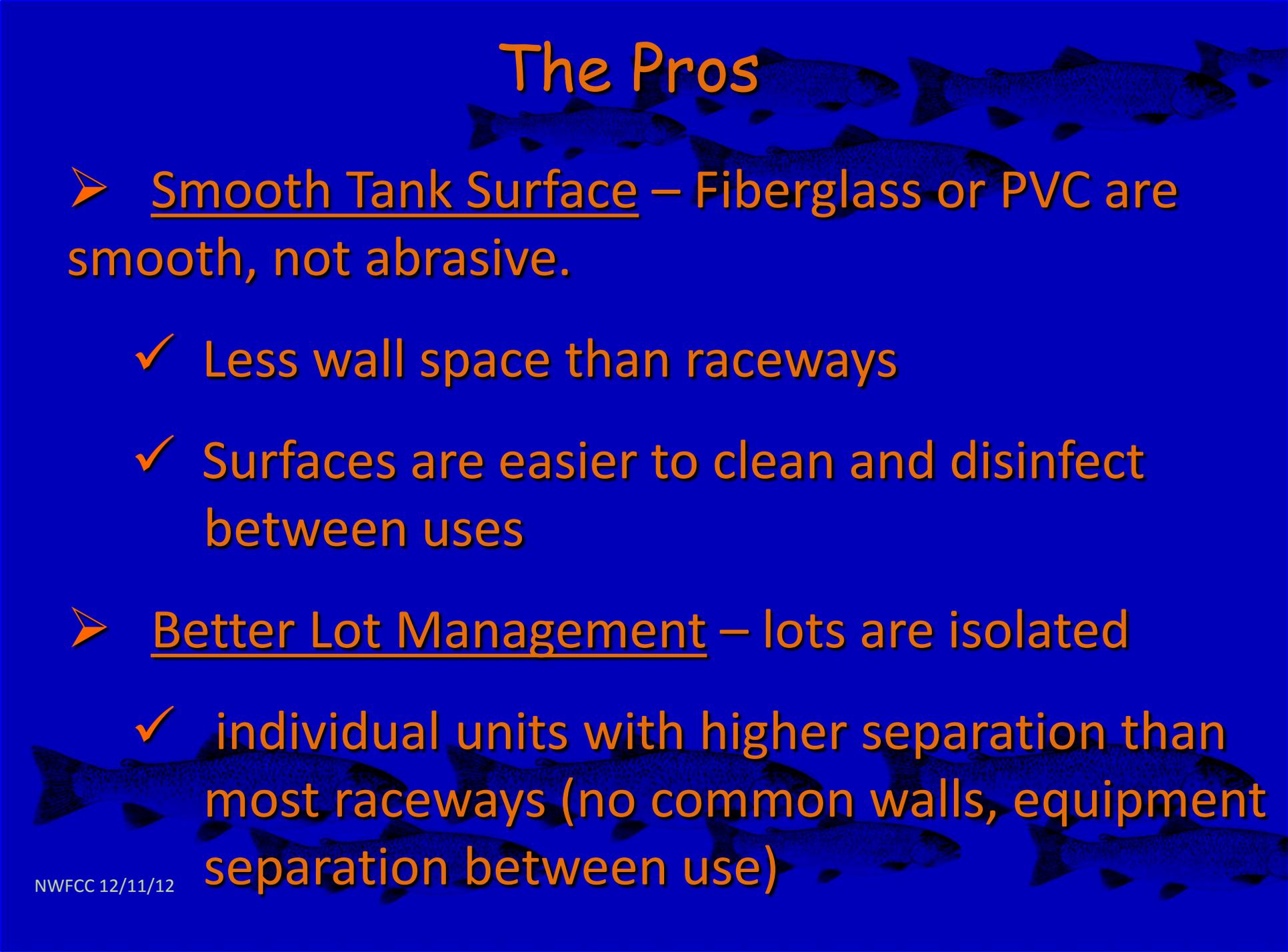
- Self Cleaning – only pull sumps twice a day.
 - ✓ No vacuuming or brushing required (covered units)
 - ✓ Cleaning labor greatly reduced
 - ✓ Moves solids out quickly
 - ✓ Controls TSS easily
 - ✓ Fish are not exposed to waste as much as raceways
- 

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)

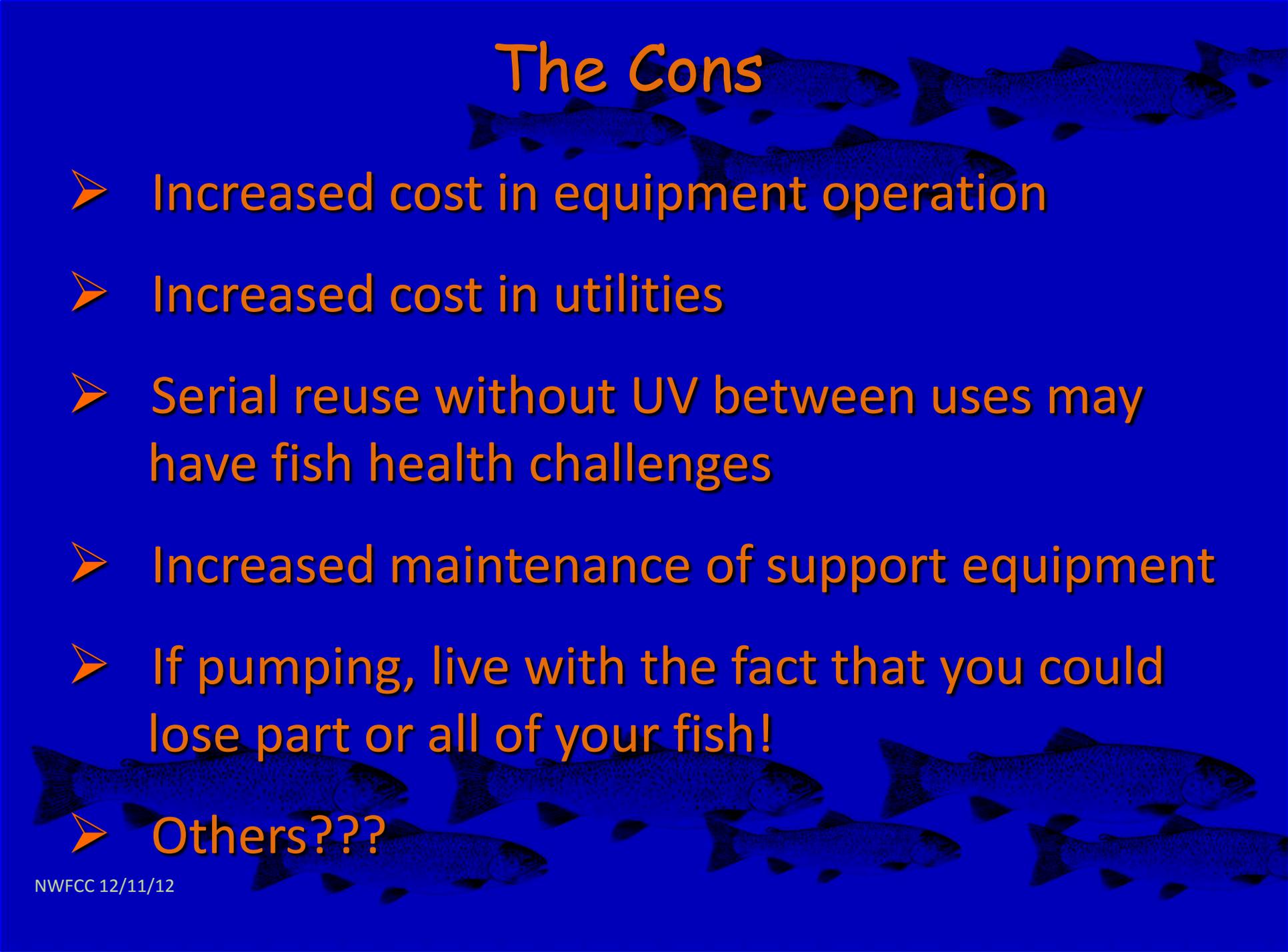
- ✓ If static bath, oxygen can be used effectively.
 - ✓ If water source is lost, units can be maintained for much longer than raceways with oxygen introduction and level management.
 - ✓ If recirculation is available, unit setup can management reuse water quality very effectively.
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The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

