

**HARBOR BRANCH**

FLORIDA ATLANTIC UNIVERSITY

# Pompano Culture in Recirculating Aquaculture Systems

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Funding Thanks to



**Paul S. Wills**

CDFA 11.417: Wills - Final Steps Toward  
Commercialization of Pompano Aquaculture  
NA18OAR4170345

*Ocean Science for a Better World*

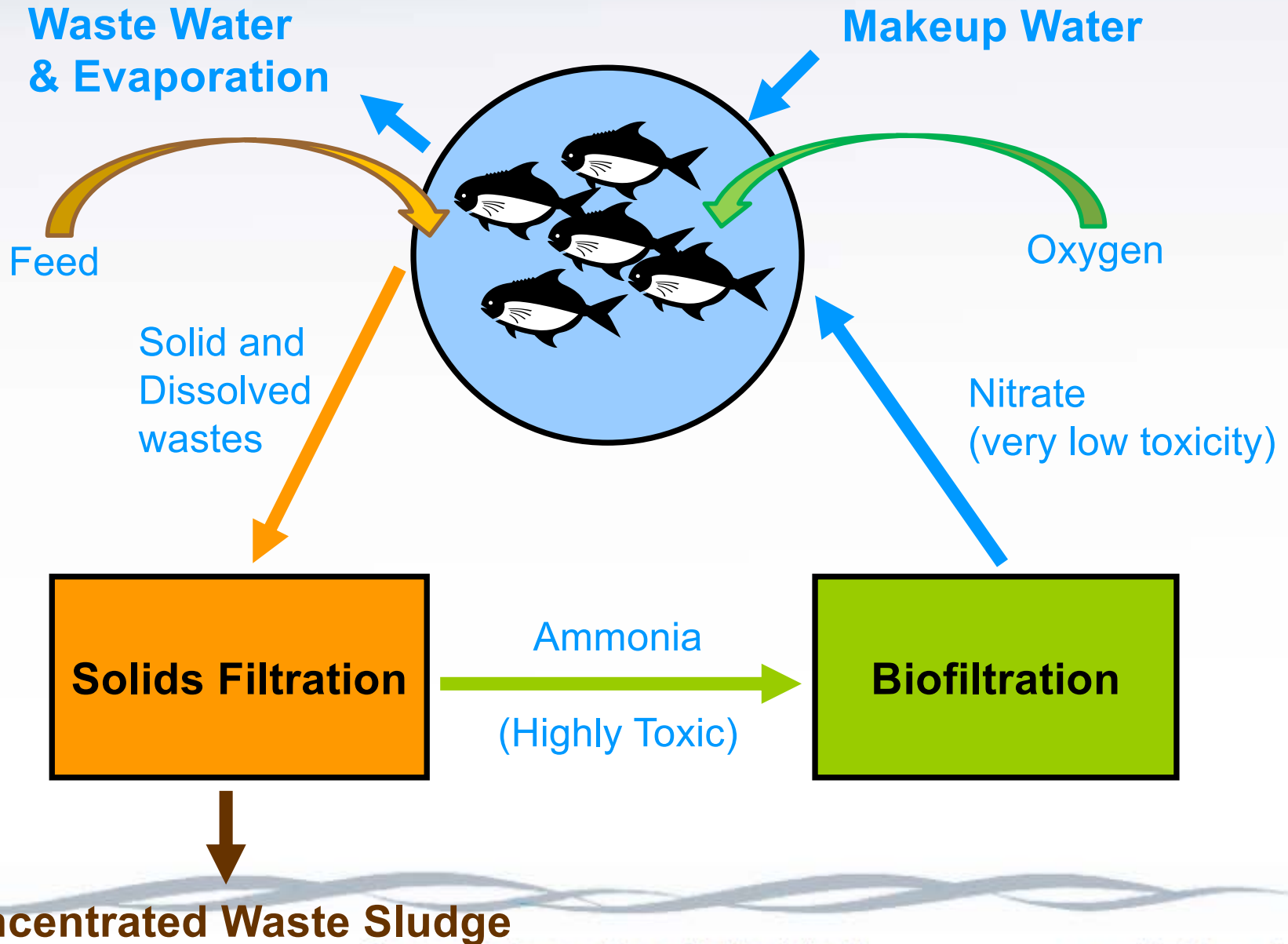
[www.hboi.fau.edu](http://www.hboi.fau.edu)

# Recirculating Aquaculture Systems (RAS)

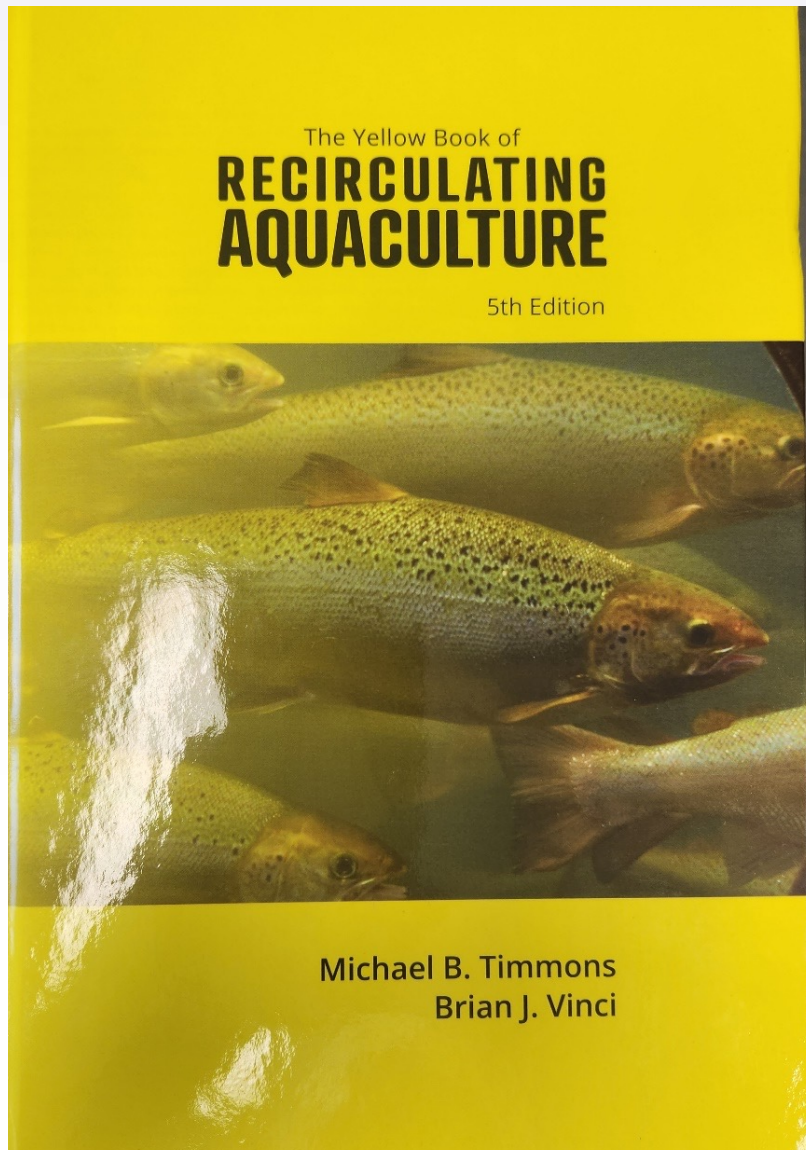
- Year round growing season
- Reduced water consumption
- Reduced effluent discharge
- Intensive production
- Enhanced biosecurity
- Increased food safety
- Containment of escapees
- Environmental Sustainability



# Basic RAS Design



# Advanced RAS design and Operation



“The Yellow Book”

New 5<sup>th</sup> edition

Available on Amazon \$99

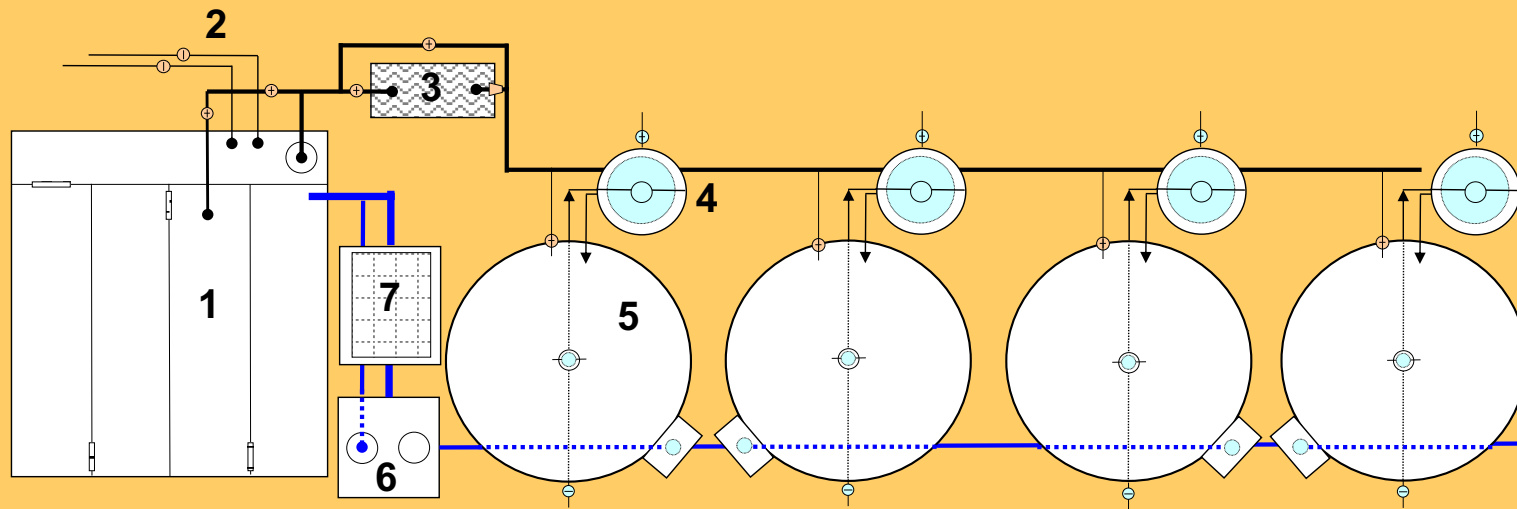
Search “ISBN 0971264694”

# Basis of the Commercial System Design

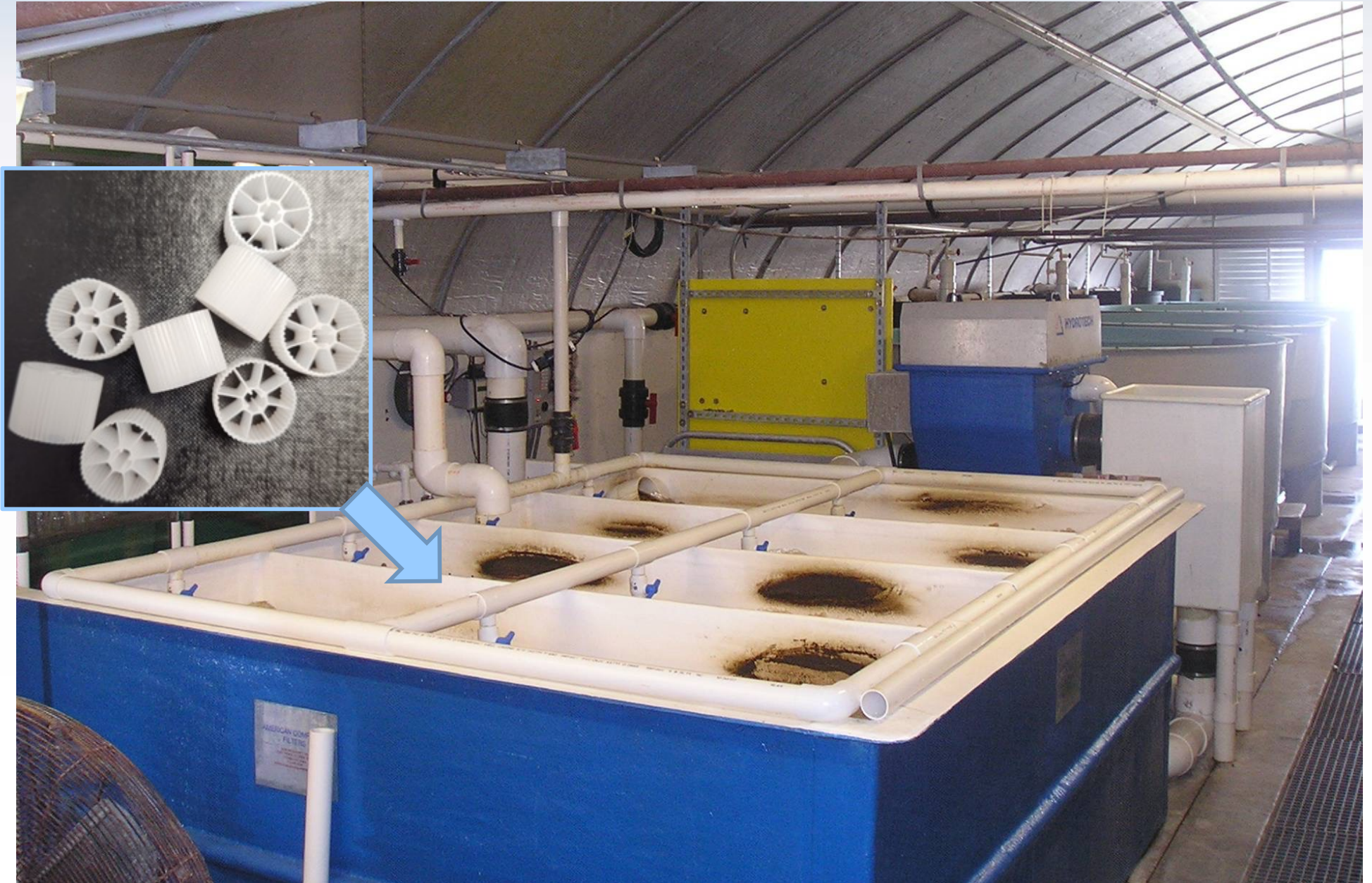
- Scaled up version of tested design developed jointly for USDA-ARS project and FL-FWCC marine hatchery program FMFEI
- System Operated so far with:
  - Red Drum up to  $>90 \text{ Kg/m}^3$   $\rightarrow$  (~1% BWD feed rate)
  - Florida Pompano  $\sim 40 \text{ Kg/m}^3$
  - Cobia  $\sim 45 \text{ Kg/m}^3$



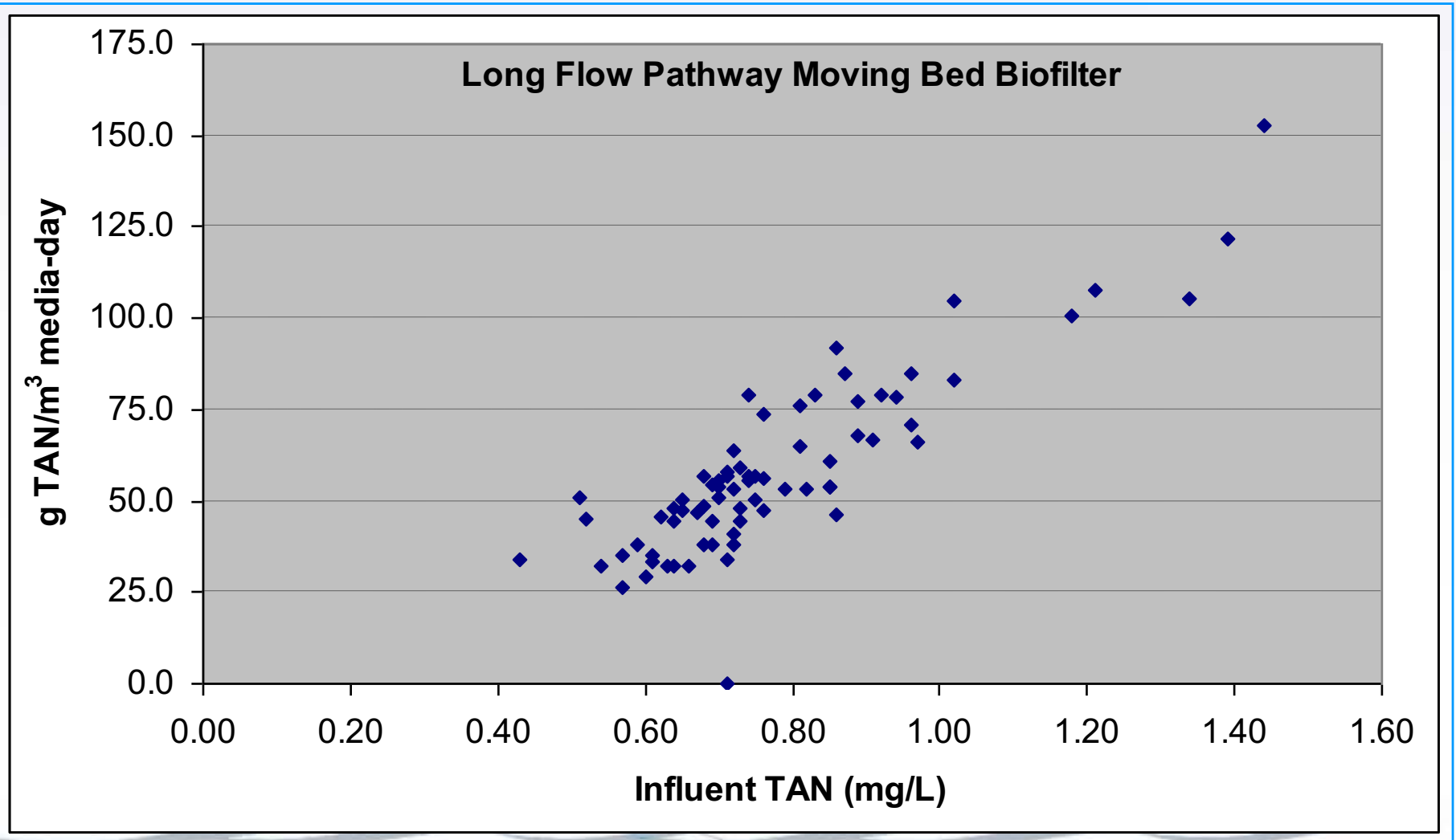
# LOW HEAD GROWOUT SYSTEM



1. Long flow pathway moving bed reactor with cross flow oxygenator, float valves, and propeller pump; 2. Incoming salt and freshwater lines with float valves and water meters; 3. UV sterilizer; 4. Torrus filters with 13ft<sup>3</sup> of MB3 floating plastic media; 5. Ten-foot diameter tanks w/ center sump and sidebox drain; 6. Diverter box; and 7. 60 micron drum filter.

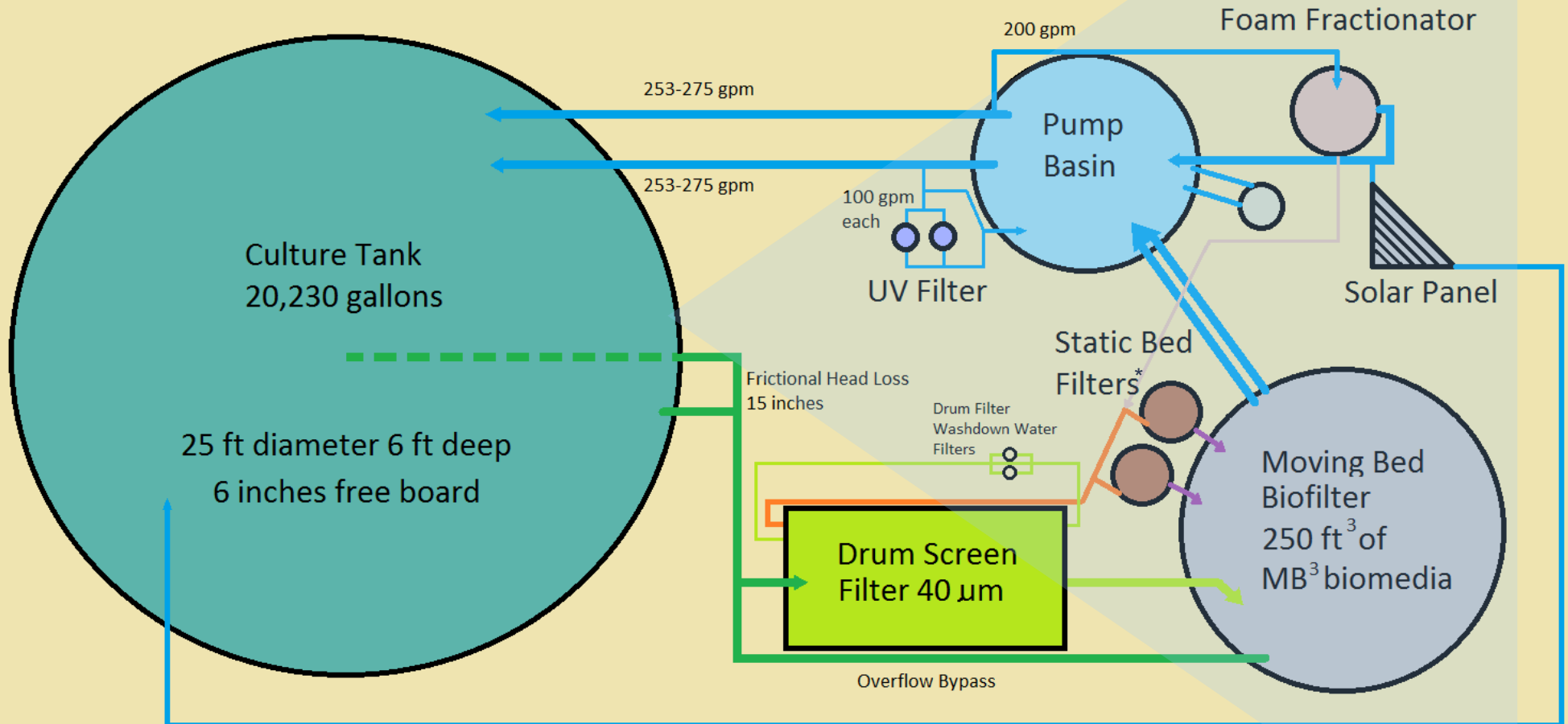


# BIOFILTER VOLUMETRIC NITRIFICATION RATES





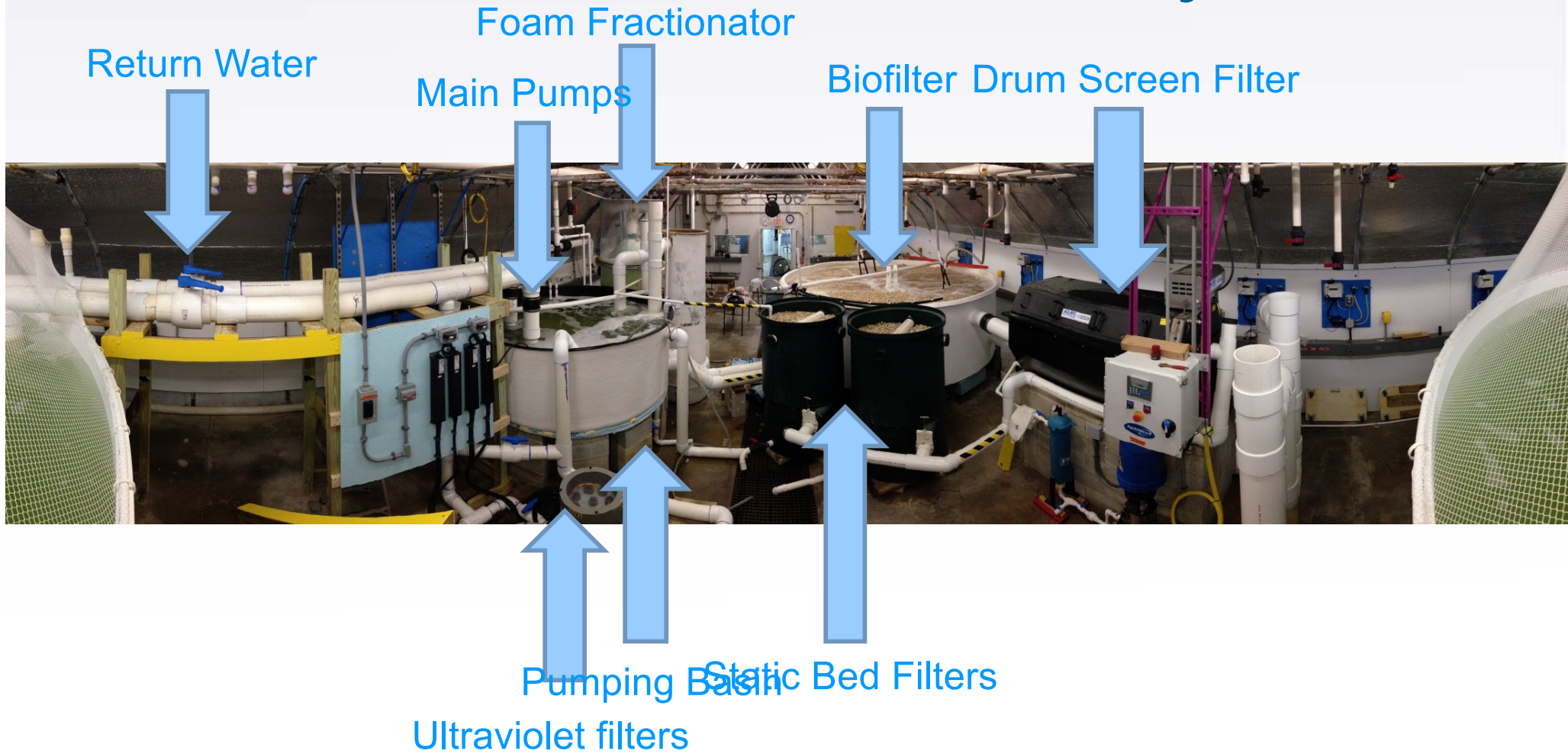
# Commercial System Design



Not to scale

\* Static Bed filters each contain 8 ft<sup>3</sup> of MB<sup>3</sup> biomedica

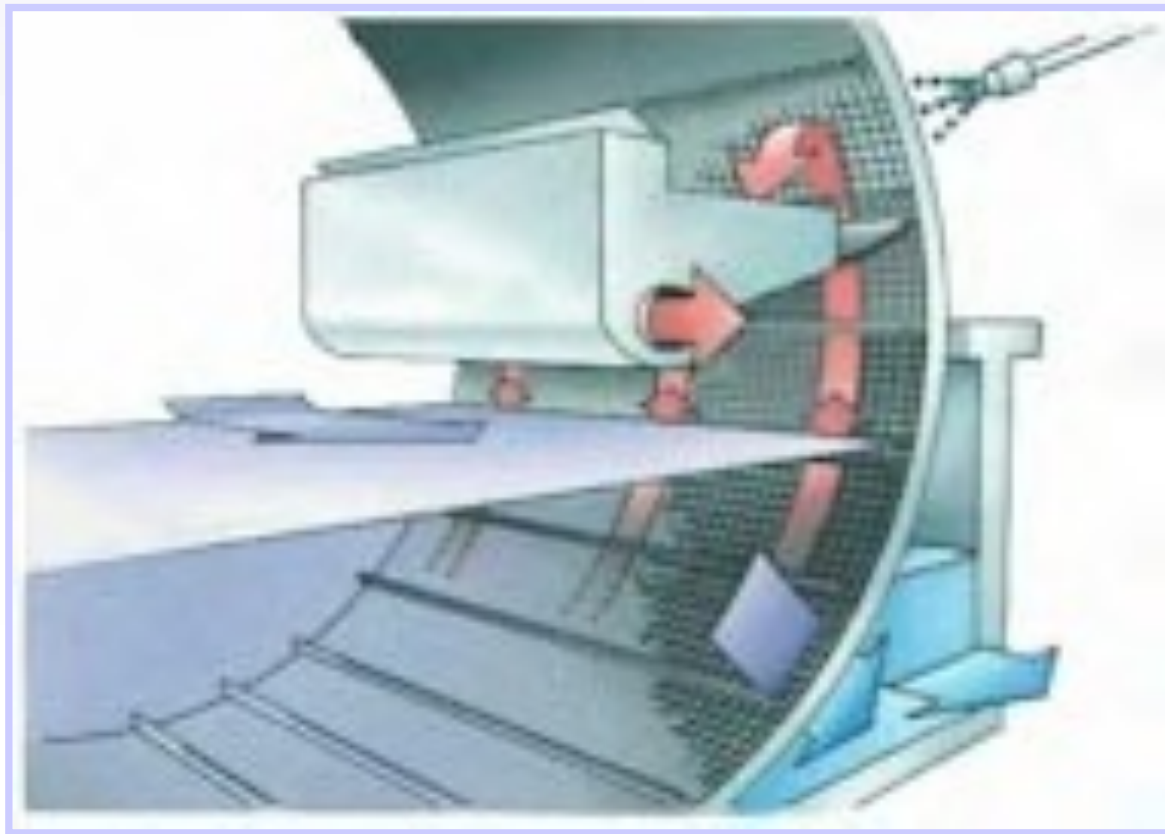
# Panorama of Filtration System



# Drum Screen Filter (60um)



# Microscreen Cleaning Process



# Waste Water Recapture

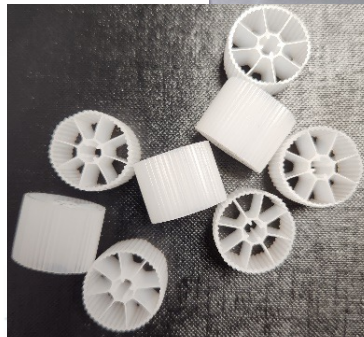
- We used a Static Bed Filter to separate solids from Drum Screen Filter Waste stream
  - Concentrates solids prior to discharge
  - Recaptures significant component of water used for wash down of drum screen
  - Each contains 8 Ft<sup>3</sup> MB<sup>3</sup> Media



# Moving Bed Biofilter (450 ft<sup>3</sup> MB<sup>3</sup> Biomedia)



Aeration Keeps Bed Fluidized





Minimum Dose Desired

30,000  $\mu\text{W sec/cm}^2$

The two units delivering

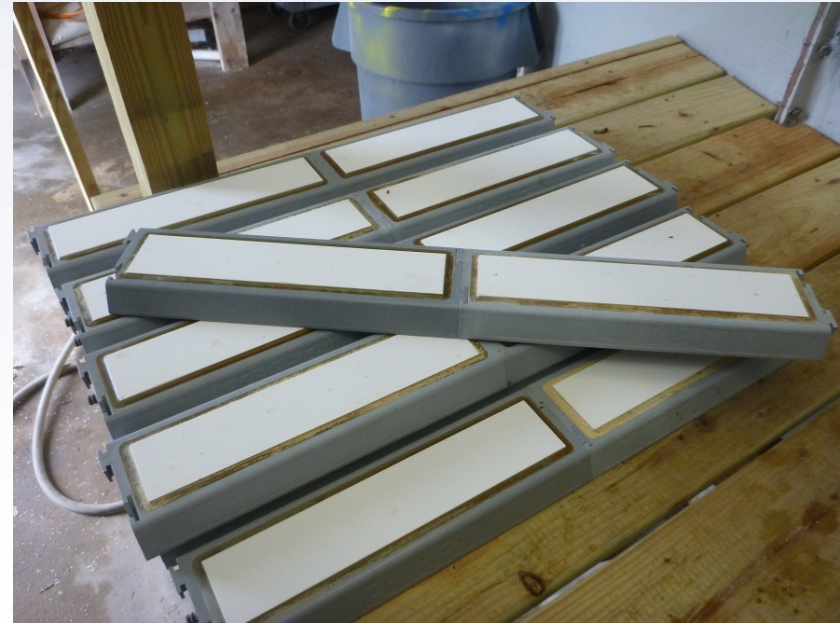
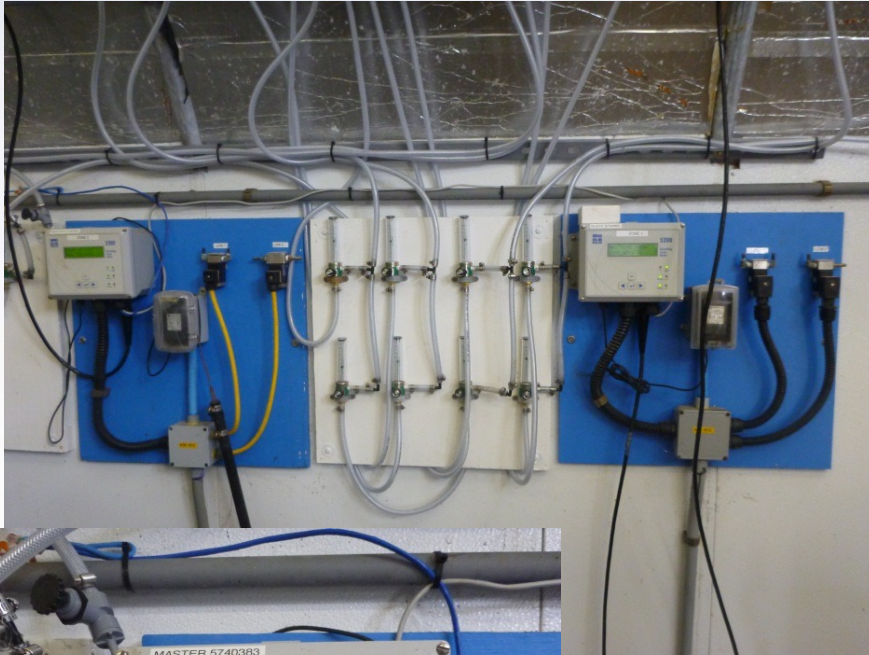
$\sim 150,000 \mu\text{W sec/cm}^2$

# Tank Cover

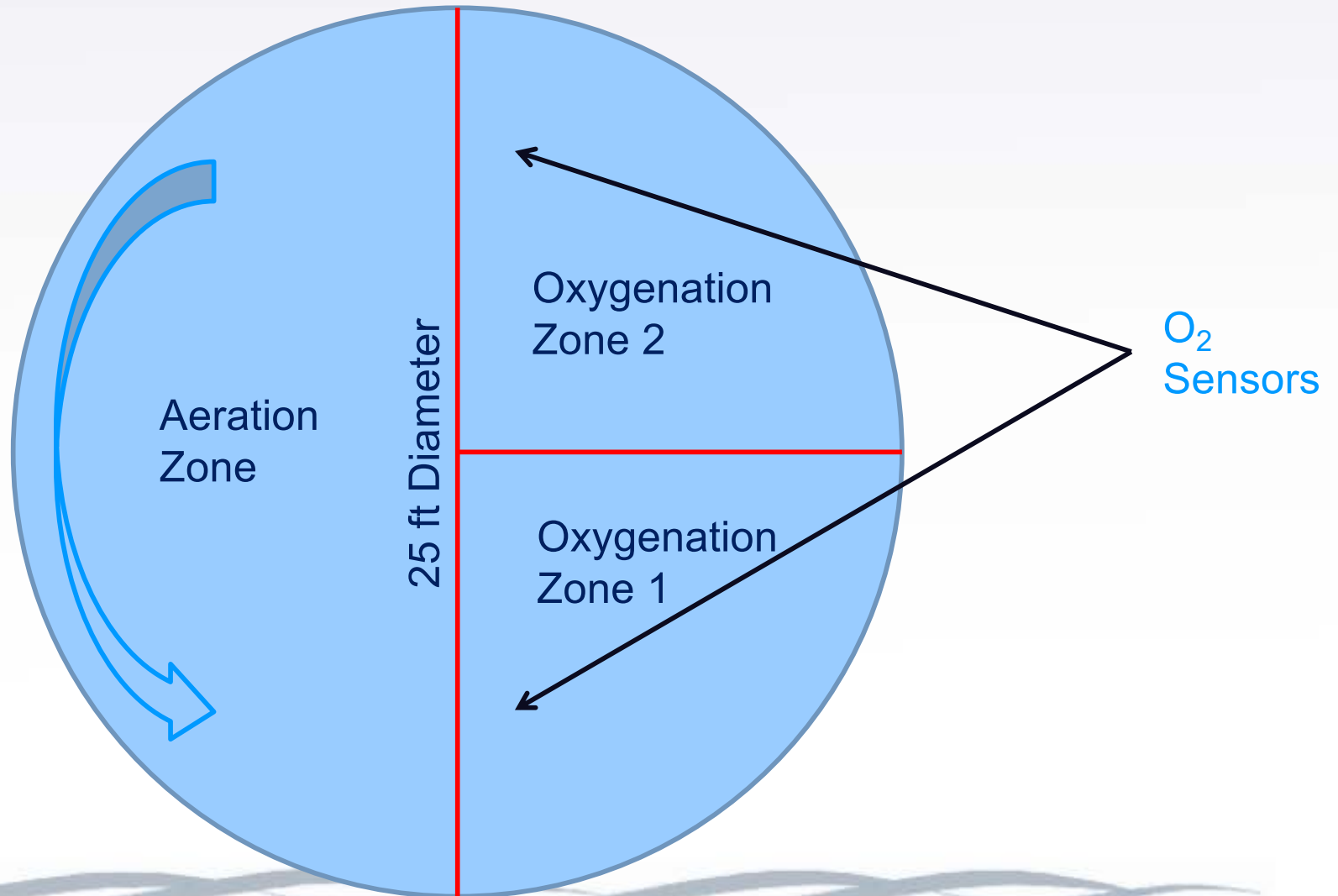




# Aeration and Oxygenation



# Aeration and Oxygenation



# Backup Systems

- Systems designed to combat “Murphys Law”
  - “If anything can go wrong it will”
- Therefore managers must:
  - Anticipate
  - Plan
  - Train
  - Respond
    - (an automatic system that “cries wolf” can derail this necessary task)

# Backup Systems

- Generators
- Automatic oxygen system
- Alarm Systems

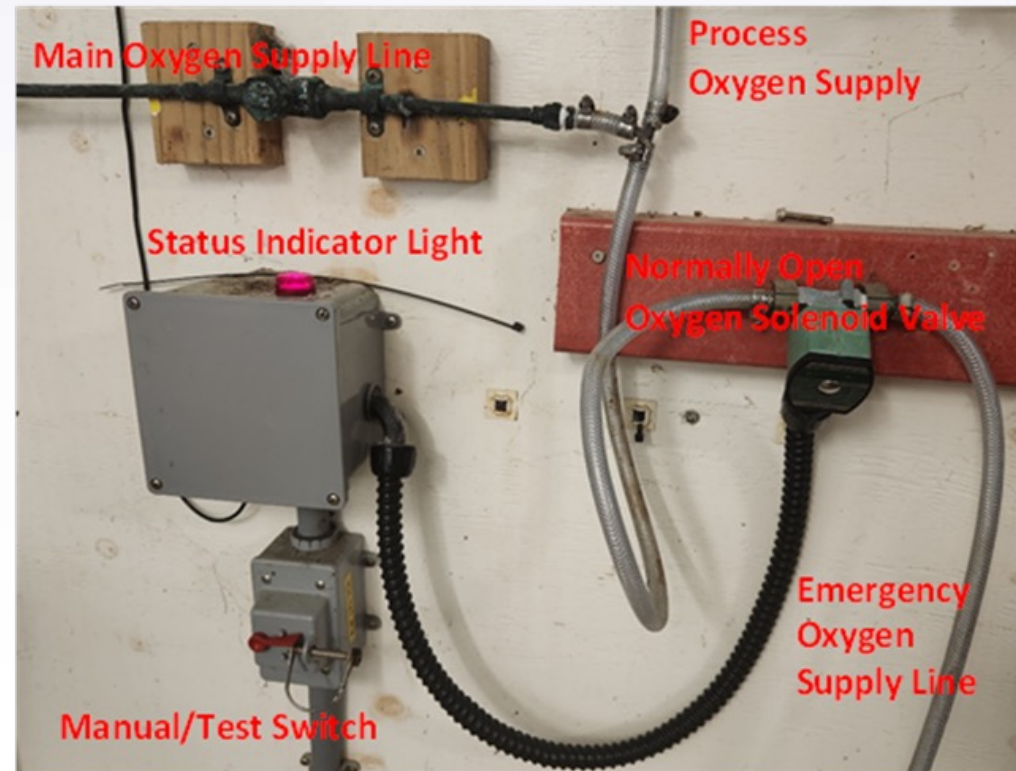
# Generators

- Must have disconnect switch and meet other local requirements



# Automatic Oxygen System

- Opens oxygen flow to tanks regardless of monitoring systems or other backup systems when power lost
- Must use Normally Open Solenoid Valves for failsafe system
  - Normally open → closed when power on; open when power off



# Alarm System



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# Nursery System



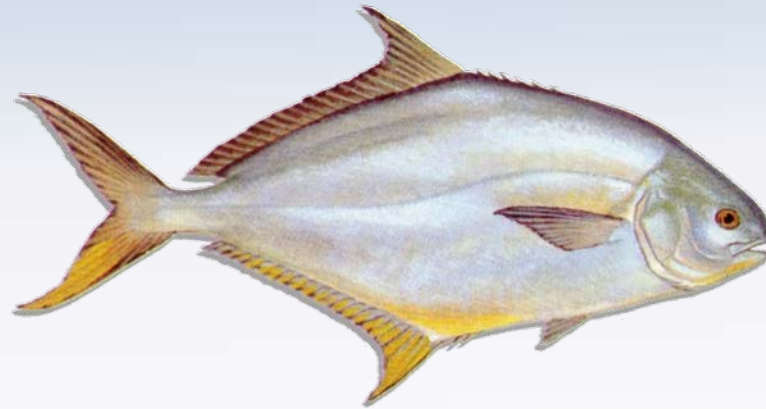


# Larviculture System



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# Broodstock Conditioning and Spawning System USDA-ARS/HBOI-FAU Design



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# Broodstock Profile

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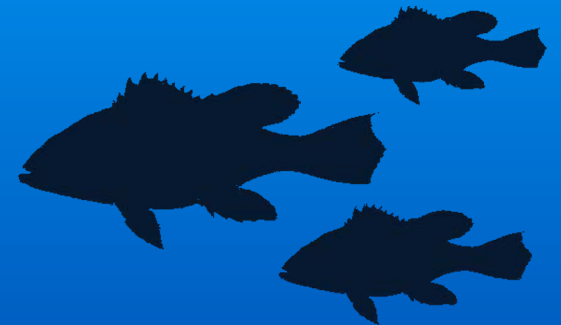
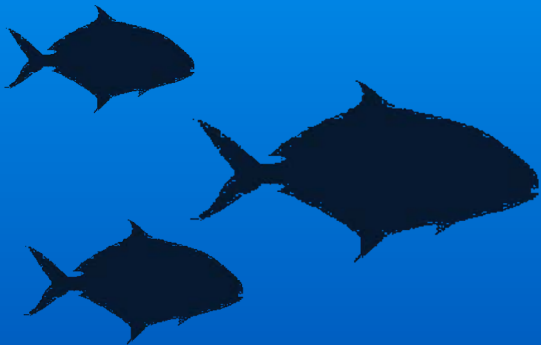
## Florida Pompano

Weight: 0.7 – 2.3 kg

Mature age: 1- 3 yrs

Temp: 18 – 30 C

Salinity: 5 – 36 ppt





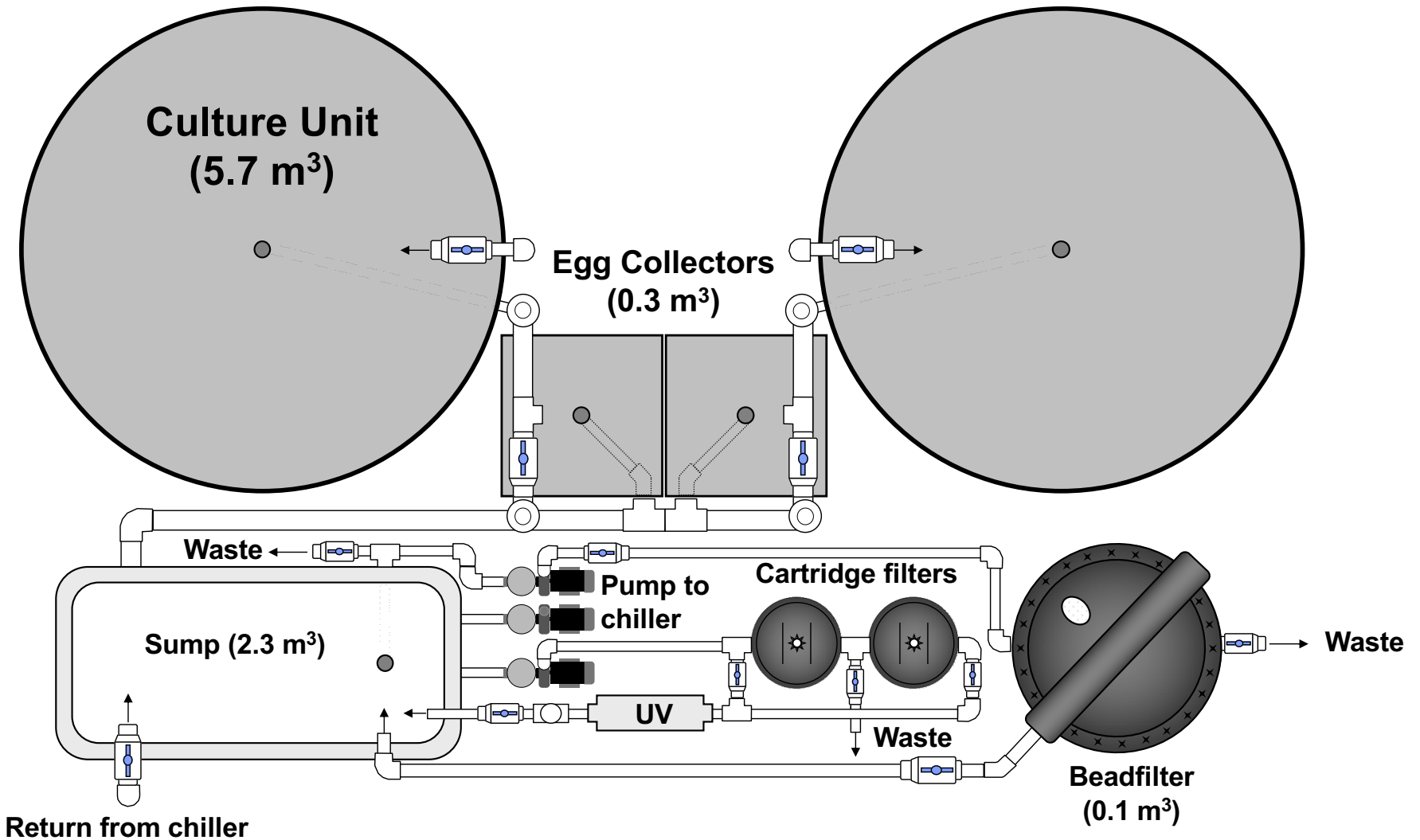
# Water Quality Management Parameters

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Parameter	Target Level
Temperature	16 - 30 C
pH	7.6 - 8.2
Dissolved oxygen	$\geq 5$ mg/L
Alkalinity	$\geq 200$ mg/L
Ammonia	$\leq 1$ mg/L
Nitrite	$\leq 2$ mg/L
Total dissolved solids	$\leq 5$ mg/L

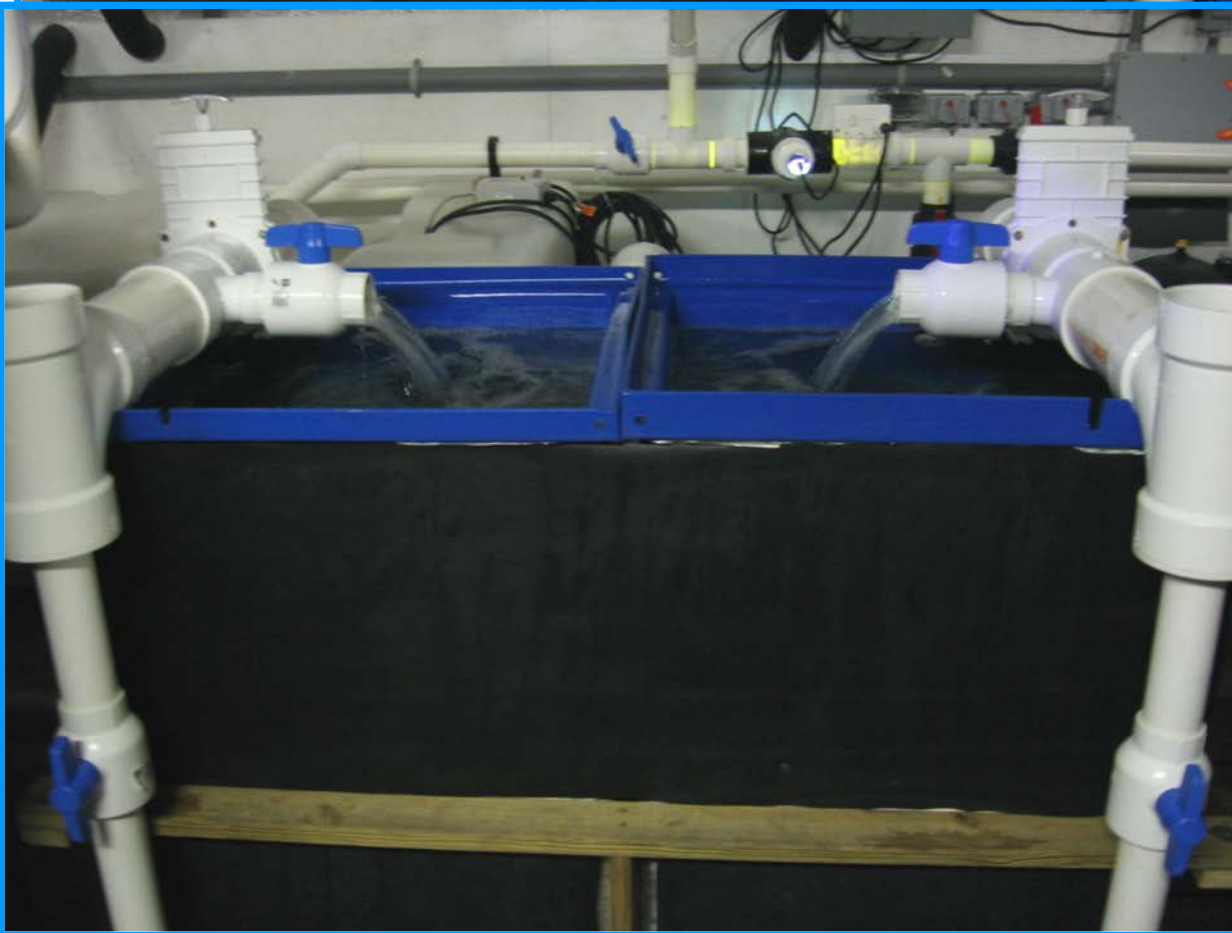
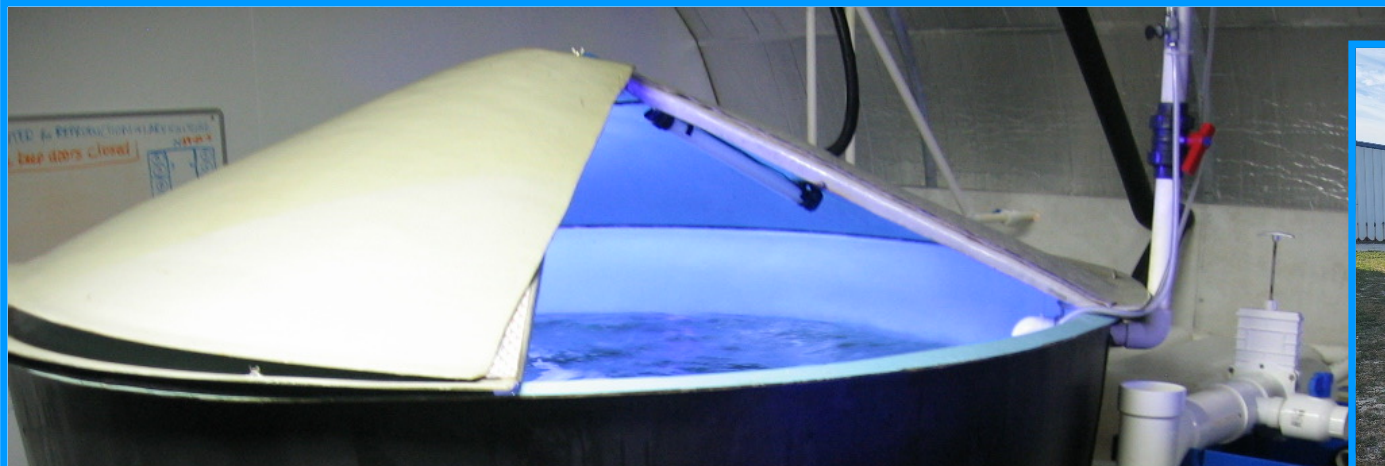
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# Broodstock Conditioning System





Oce



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Falcon Heavy: USSF-67 Jan 15, 2023