Stress Management at Every Stop

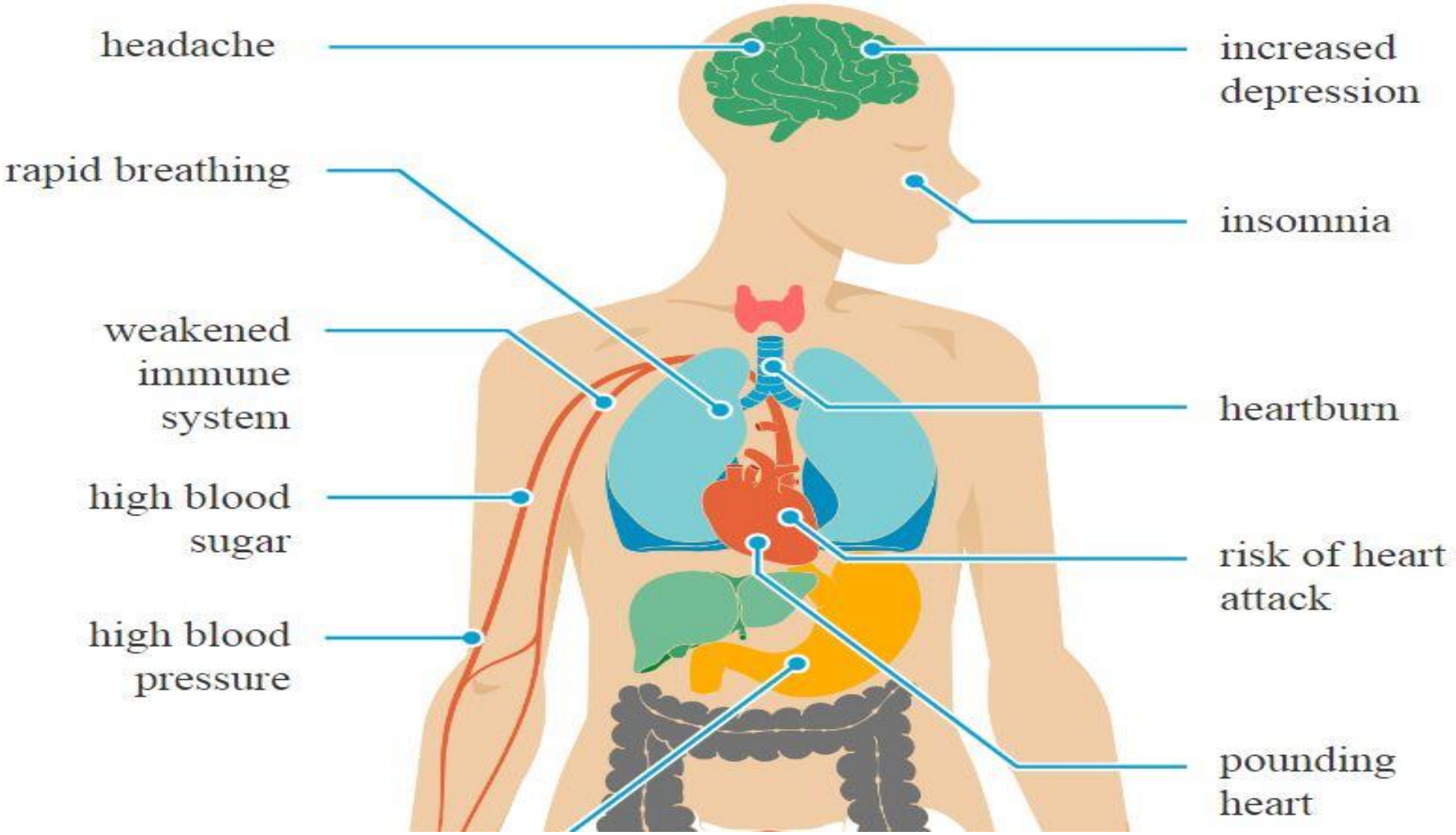
Matthew A. Smith
Extension Aquaculture Specialist
Madison County Extension
smith.11460@osu.edu

CFAES

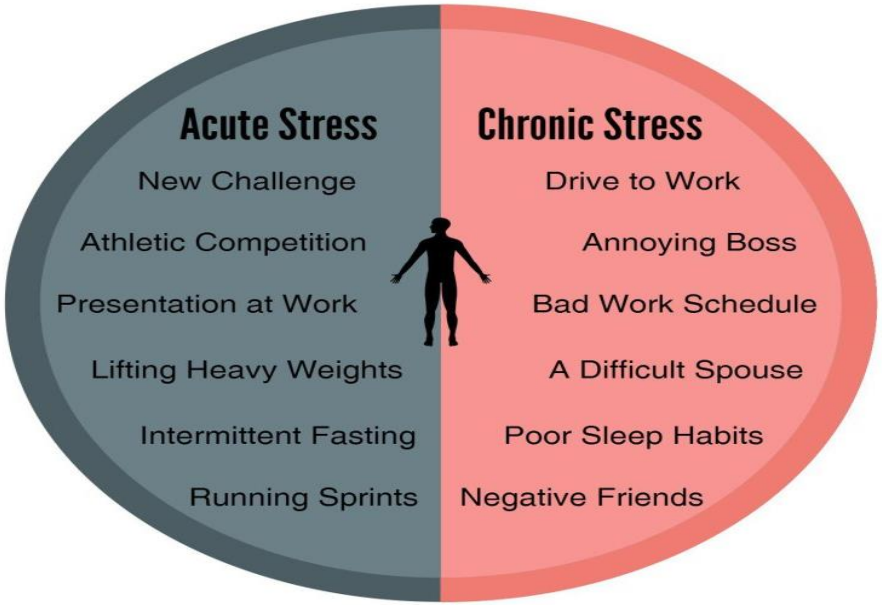
THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

Fish will take care of themselves if you limit stress…

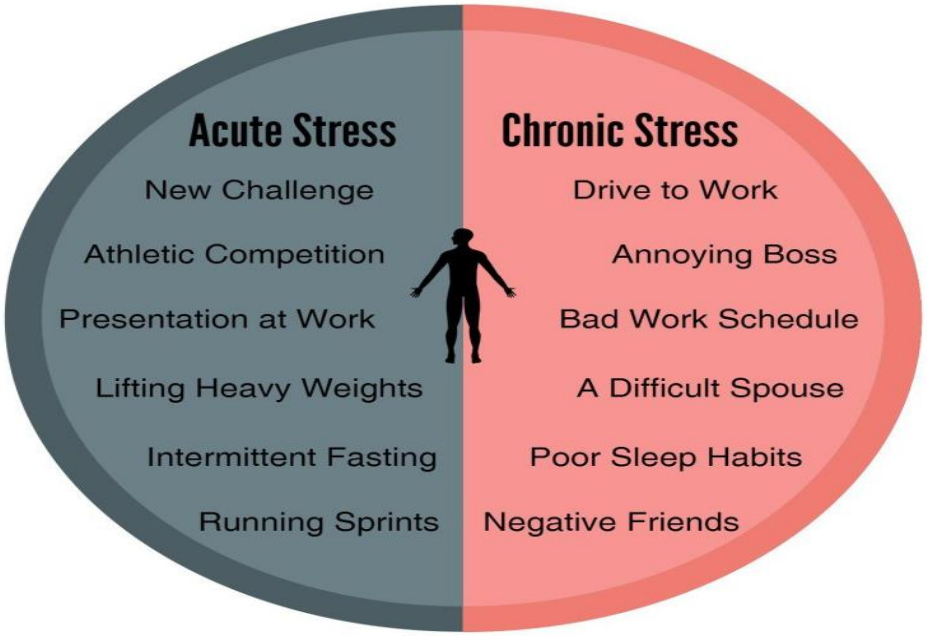
Stress in humans



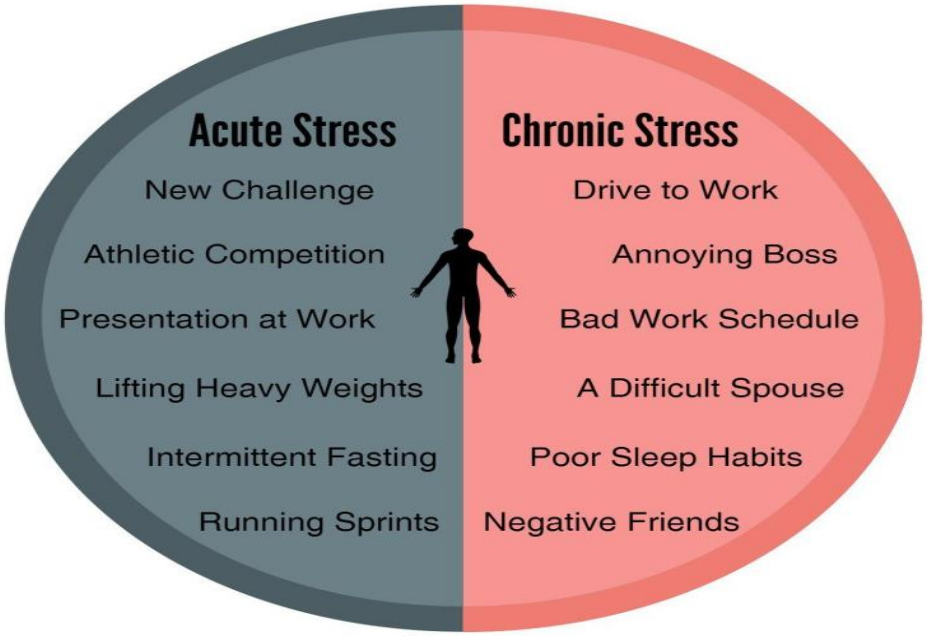
Stress in humans | **Acute** vs. Chronic



Stress in humans | Acute vs. **Chronic**



Stress in humans | Oftentimes a combination!

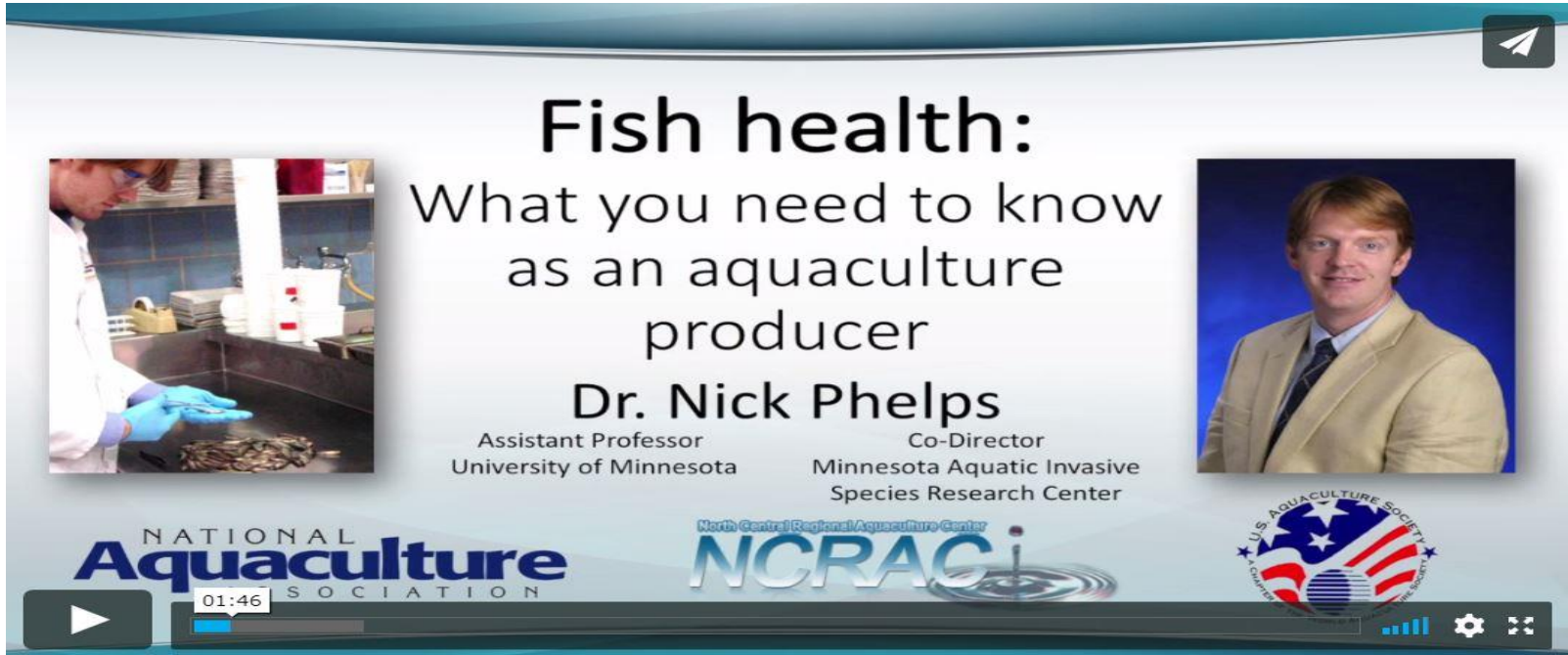


Harvest
(e.g. crowding)

Design
(e.g. too strong water flow)

Timeline of events

- Start by doing your homework – only goes so far but is necessary
- Just by reading/talking to Extension you can learn more about what stresses a fish
- Depending on the species, you may only have one shot per year so keep them happy!



Timeline of events

- You will hear this several times today…

  “An ounce of prevention is worth a pound of cure”

- Take your time at every step so that your investments pay off

Timeline of events

- Superior genetics/species – some species are more tolerant/susceptible to certain stressers/diseases
- Understand some species need more care (i.e. better water quality, less turbidity, less handling)

Timeline of events

- Know your supplier if you're not growing your own – know that they haven't spent weeks on a transport truck before coming to you
- Let the supplier know as early as possible how many/what you need to help ensure high quality!

Timeline of events

- Properly acclimate your fish!
- WQ of current water and destination/quarantine water
- How different are the parameters?
- In bags? – float in destination/quarantine water until temperatures are almost the same, open bags and exchange water slowly
- In a hauling truck? Can't float but still check parameters and slowly acclimate
- Salted?

THE USE OF SALT TO TRANSPORT OR HANDLE FISH

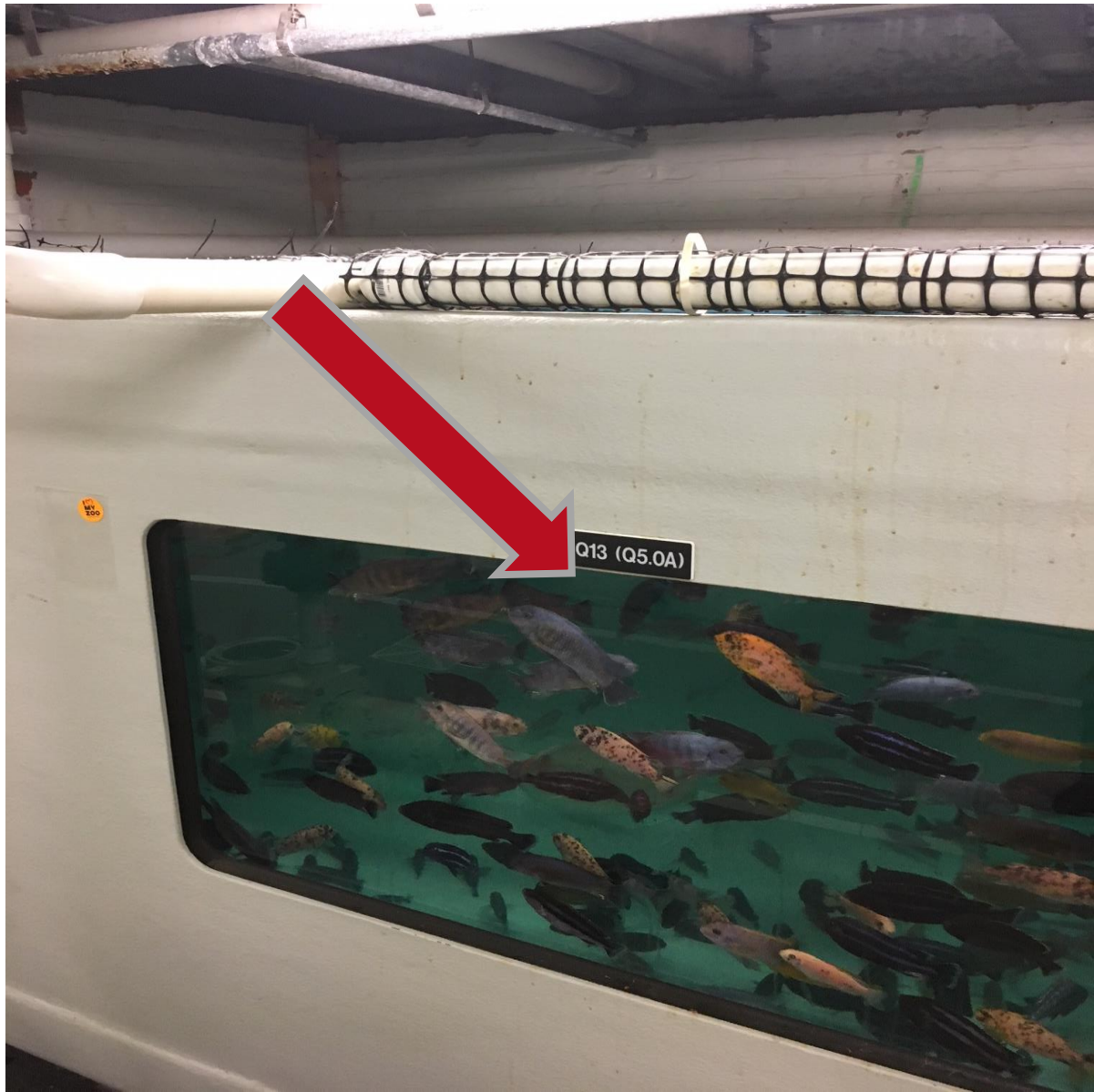
Timeline of events

Quarantine – protect your investment

7 days if possible

Know what you should be worried about with your species

- Crank the temp up?



Timeline of events

- Once fish are stocked, proper feeding and water remediation is key
- There's an obvious balance…
  - Feed as much as they will eat so the product is off of your farm and in the market (which limits risk in some ways and improves cash flow!)*
  - Limit overfeeding to manage your water. System dependent but we all know feeding more than our filtration (whether it be ponds, RAS, or aquaponics) can handle is a recipe for disaster
  - Multiple feeds p/day can limit filtration burden and improve digestion of nutrients
  - *If the market wants it ASAP and year-round

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Timeline | once stocked – temperature

- Humans are homeotherms
  - We self-regulate at ~ 98.6 F
- Fish are poikilotherms
  - Poikilo = irregular/varied
- Means that body temperature is determined by temperature of the environment (i.e. water temp)
- Species specific
  - Warm water, cool water, cold water
  - Tilapia, yellow perch, salmon

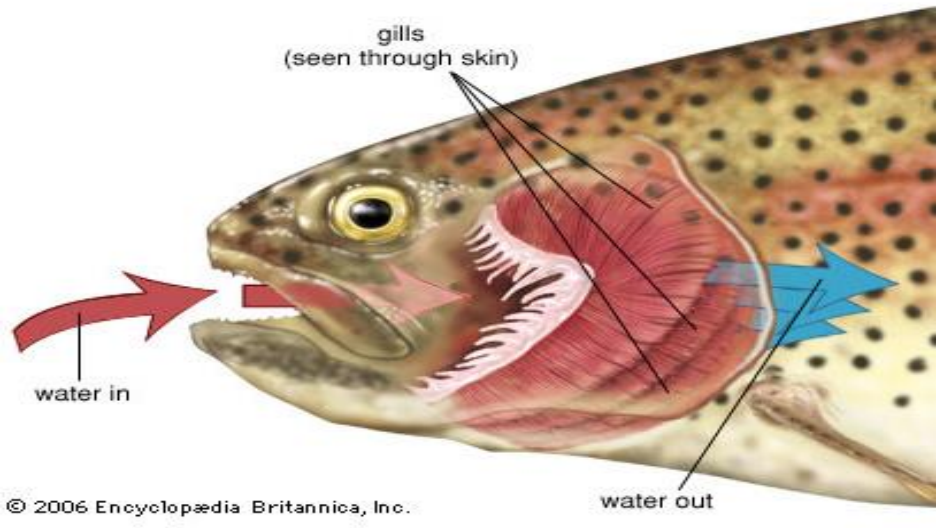
Timeline | once stocked – temperature

- Tilapia as an example
  - Too hot? Spend all of their energy covering "cost to survive" – maintenance ration too great; will not grow/ stress
  - Too cold? Metabolism is so low that they stop eating or eat very little. Maintenance ration low; will not grow much
  - Within range? Will grow okay and be healthy/less stressed
  - Optimal temp? Growth often 3-10 x greater than tolerable
  - Die outdoors overwinter in many Midwest states
  - Limit stress at every step to promote good growth

Temp: Lower lethal | 52 F
Stop feeding | 63 F
Optimal | 85 - 88 F

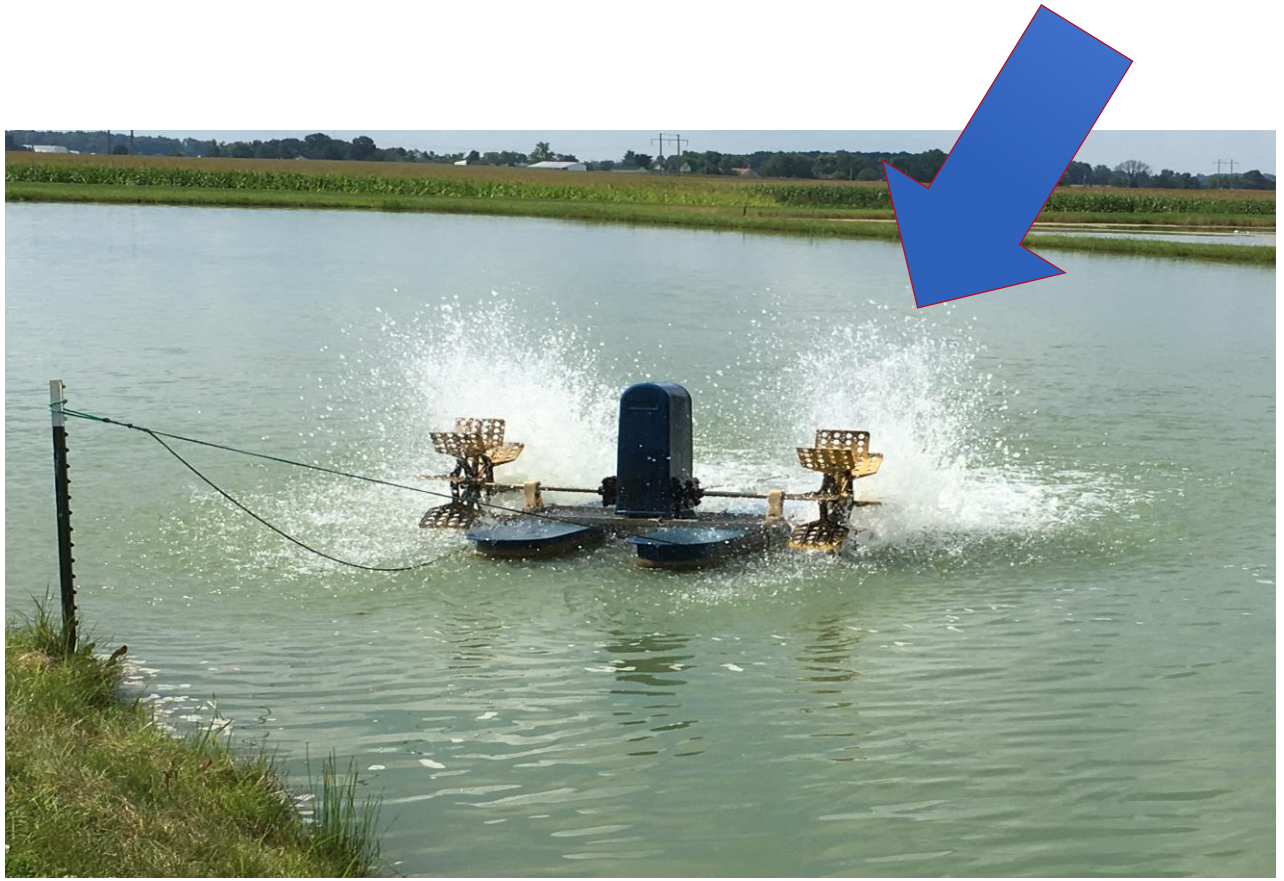
Timeline | once stocked – oxygen

- ✓ Oxygen necessary to survive
- ✓ Fish, plants, bacteria, uneaten feed, fish waste – all use up oxygen
- ✓ Microscopic plants produce oxygen when the sun is out – how?
- ✓ Beneficial organic decomposition occurs because of aerobic processes
- ✓ > 5 mg/L for bacteria, plants, and fish
- ✓ Check DO all over the system



Oxygen saturation

°F	mg/L
32	14.6
41	12.8
50	11.3
59	10.0
68	9.0
77	8.2
86	7.5
95	6.9



Timeline | once stocked - pH

- ✓ How acidic or basic something is
- ✓ Low = acidic | High = basic
- ✓ Need to consider the fish, plants, and bacteria
- ✓ Each have their own ranges and optimum growth
- ✓ Large pH swings = fish stress | plant stress
- ✓ pH determines amount of ammonia in harmful form
- ✓ Limit pH swings with higher alkalinity; buffer

Timeline | once stocked – TAN

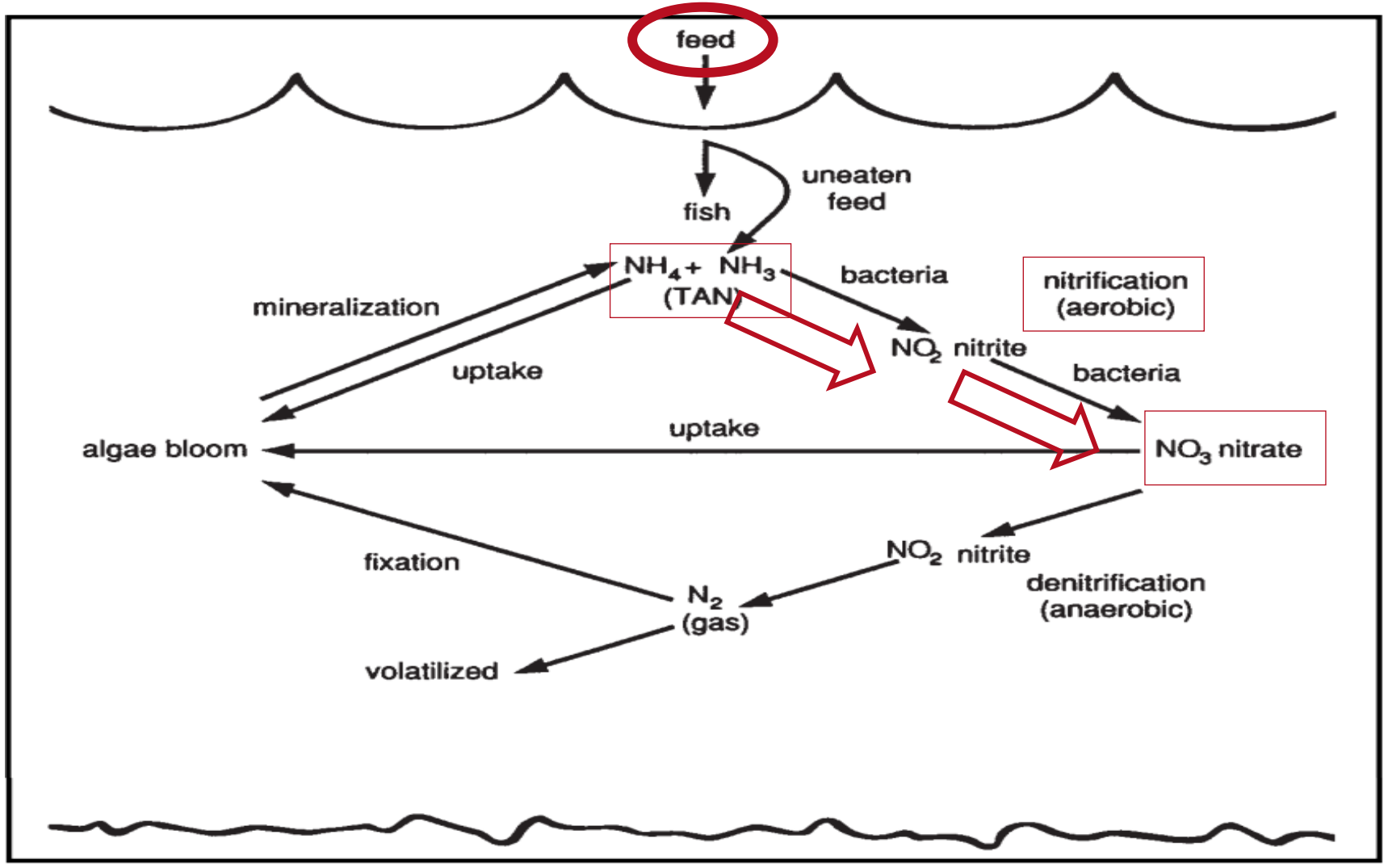


Figure 1. Nitrogen cycle in a fish pond.

SRAC463

Timeline of events

- Treat aquatic weeds at the correct time of year
- Limit heavy die offs by correct timing, dosage, and percentage applied at once
- Identify species

Timeline of events

Predation by birds, otters, snakes, turtles, humans, etc. - Very stressful on fish

- Flight response – fountain effect or flash expansion requires a lot of energy
- Some cover to reduce bird predation; limiting stress. Economical?
- Aluminum stringers

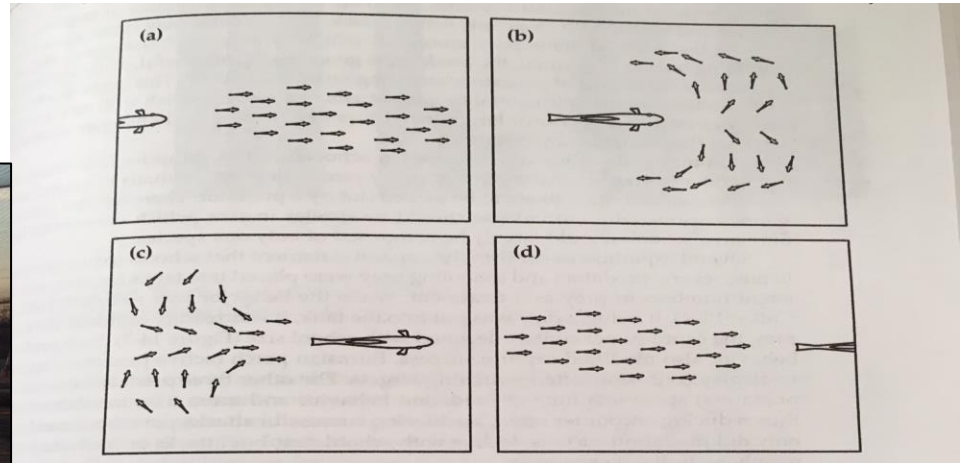


Figure 14-5. *Fountain effect of herring to a barracuda approach from the rear of the school. Redrawn from Partridge (1982).*

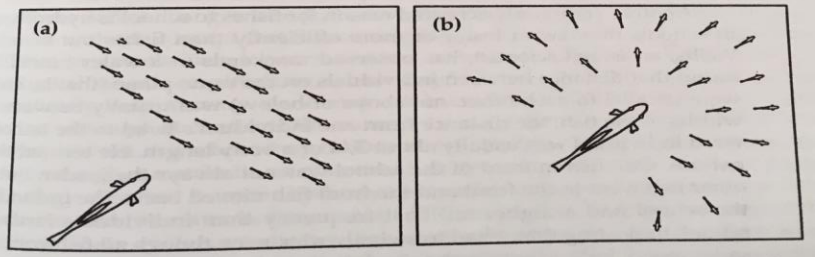


Figure 14-6. *Flash expansion of herring to a barracuda attack from the side of the school. Redrawn from Partridge (1982).*

Timeline of events – feeding during growout

2.2 lbs Feed

0.4 – 0.9 lb
Alkalinity

0.6 – 2.2 lbs
Oxygen

0.8 – 3.0 lbs
Carbon Dioxide

0.6 – 1.1 lbs
Waste Solids

0.05 – 0.12 lb
TAN (NH_3 + NH_4)

Timeline of events

- If you sample….
- As few as possible to get adequate average (length/weight preferable)
- Many don’t bother but that also may mean your feeding rates are off due to unknowns (death rate, average sizes, etc.)
- Sample only when temperature is right and avoid sampling broodstock ponds as spawning season approaches

Timeline of events

Limiting while promoting

- Limit stress during growout by…
  - Limiting handling
  - Limiting overfeeding
  - Limiting water quality problems
  - Limiting surprises
- Promoting growth during growout by…
  - Promoting good growth through properly designed systems/adequate good bacteria and biosecurity practices
  - Promoting a fish's immune system/barriers to infection
  - Promoting good understanding of proper feeding practices
  - Promoting good record keeping to limit surprises

Timeline of events

When harvesting…

- Take fish off feed few days in advance
- If indoors can move to purging tanks
- Taking off feed allows the fish to purge themselves of waste

  – better flavor if eaten and allows for better water quality if being hauled

Timeline of events

When harvesting…

- Have the equipment necessary for harvesting ready a day or two in advance – Disinfect your gear
- Don’t transport gear to other farms without disinfection
- Salt, nets, buckets, baskets, ice, treated water

Regulations

Business is Ever Changing

- What can we do?
  - Have bio-security protocols in place
  - Disinfect after ALL deliveries, NO exceptions
  - All deliveries to our hatchery must have required testing
  - Shortcuts are not worth it

Presentation OAA Conference

Timeline of events

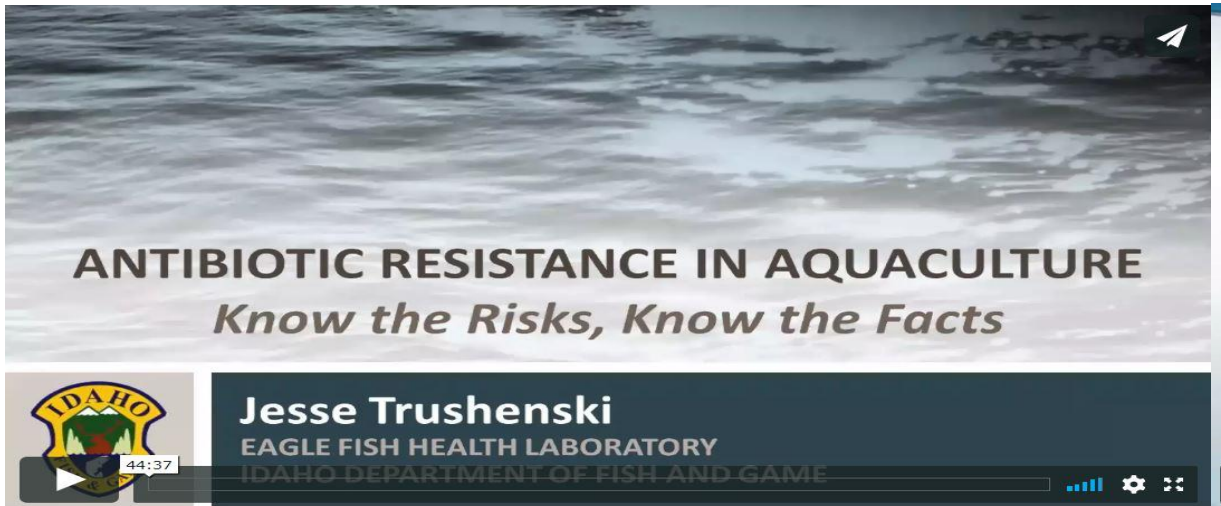
When transporting…

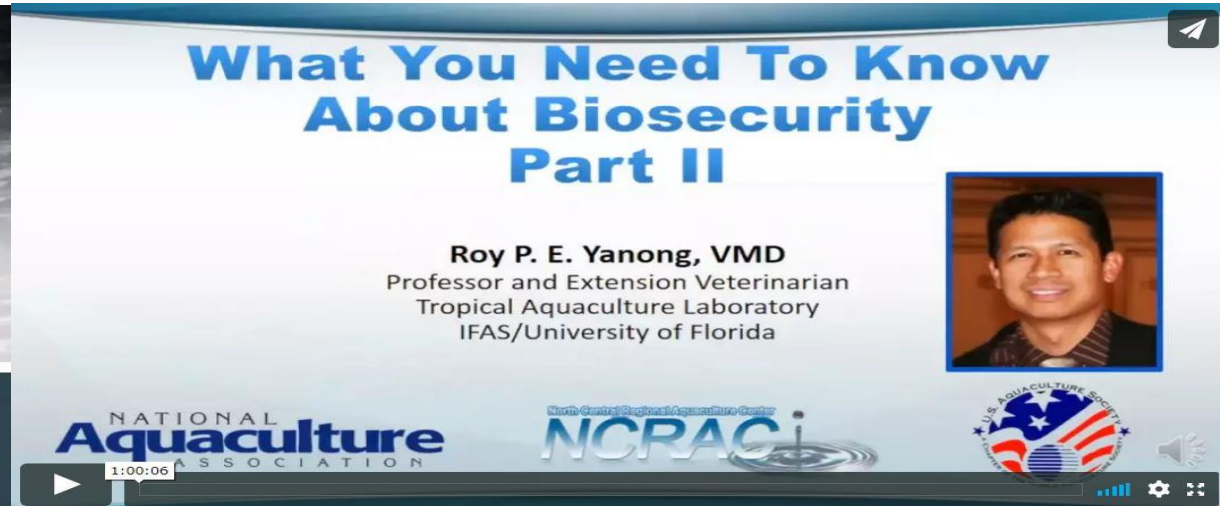
- As mentioned, purge/take off feed
- Liquid oxygen if decent trip and lot of weight/fish, chill water, well water on long hauls
- Ammonia eater & chloramine treatment if long hauls

  and water exchanged common
- Correct time for transporting?
- Everything is geared towards limiting stress & prevention

Final thoughts…

- We are all here, including the Associations, to help
- Whether you've been in business for 5 days or 30 years, there's always room for improvement
- Read up and stay current
- Plenty of NCRAC/USAS/NAA webinars out there now on biosecurity and fish health
- A rising tide lifts all boats





Questions?

Matthew A. Smith
OSU South Centers
smith.11460@osu.edu
740.289.2071 ext 121