

REARING CONTAINERS





to know the following:

- What are the principle elements of a salmon rearing container?
- List various types of containers: shapes, materials, and why you would use one or the other
- How to maintain them and why that's important



List some elements of a rearing container: (or – if you were a fish, what would you want to live in?)



Compare shapes/sizes

- Rectangular: various lengths, widths, depths
- Round – perfectly round, oblong, various diameters, depths
- Why so many choices?



Rearing Containers Designs

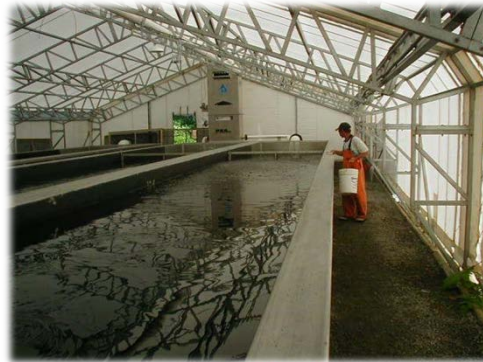
- Elements of design common to all styles of rearing containers.
 - Recirc, reuse, or single pass?
 - Flow patterns
 - Water source – screened/treated?
 - Various materials
 - Easily drained (sounds simple!)
 - No seepage
 - Screened outlet with a method to manipulate the water level



Elements of Design cont.

- Being able to section off a rearing container

- Culturist access



- Predators!



- Size of container relative to life stage



- Head and tail screens
- Separator screens
- Access all sides for feeding and cleaning
- Predator protection
- Single pass, flow through design

↑
Easily drained for
cleaning

Rectangular containers:

- Advantages
 - Young fish feed better
 - You can see what's going on
 - Isolation of lots is easier
 - Space efficiency
 - Mortality is easily noticed and removed
- Disadvantages
 - Can be labor intensive
 - Flow dynamics can be bad
 - 1:10 rule
 - Anything else?



Capilano Rearing Trough

- Rounded bottom
- Various lengths
- Various materials



Fiberglass Start Troughs

- Shallow (< 1' depth)
- Easy to maintain
- Good for small fish
- Not good for large numbers
- Coho, sockeye, chinook



Raceways

- Raceways are the most common container used in the Northwest for the production of salmon and trout.
- Rectangular in shape and usually no deeper than 4' of water.
- Size can be specific to site or production goal.
- Commonly constructed of aluminum, sheet metal, fiberglass and concrete.
- Water level is controlled by a combination of dam boards and a standpipe for drainage.
- Designs tend to be narrow to facilitate fish handling.
- Should be built without common walls for disease control

○ Advantages

- Good flow characteristics, depending on design
- Easily cleaned (again, depending on design)
- Convenient fish handling, intermediate screens can be incorporated into design
- Fish are readily visible
- Efficient use of space

○ Disadvantages

- If designed properly there are few drawbacks to the common raceway provided they are properly sized with good inlet, outlet, screen level control design.
- They are difficult to cover for photo period control
- Not as conveniently cleaned as circulars or SeaBags.

Aluminum Raceways



Shaded



Fort Richardson



Concrete Raceways



More rectangular cont



Why might you choose one material over the other?

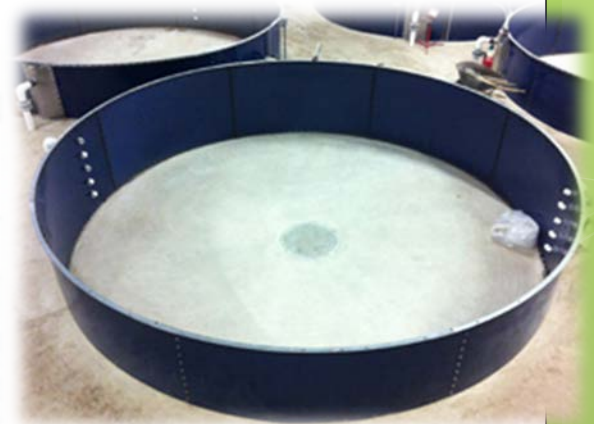
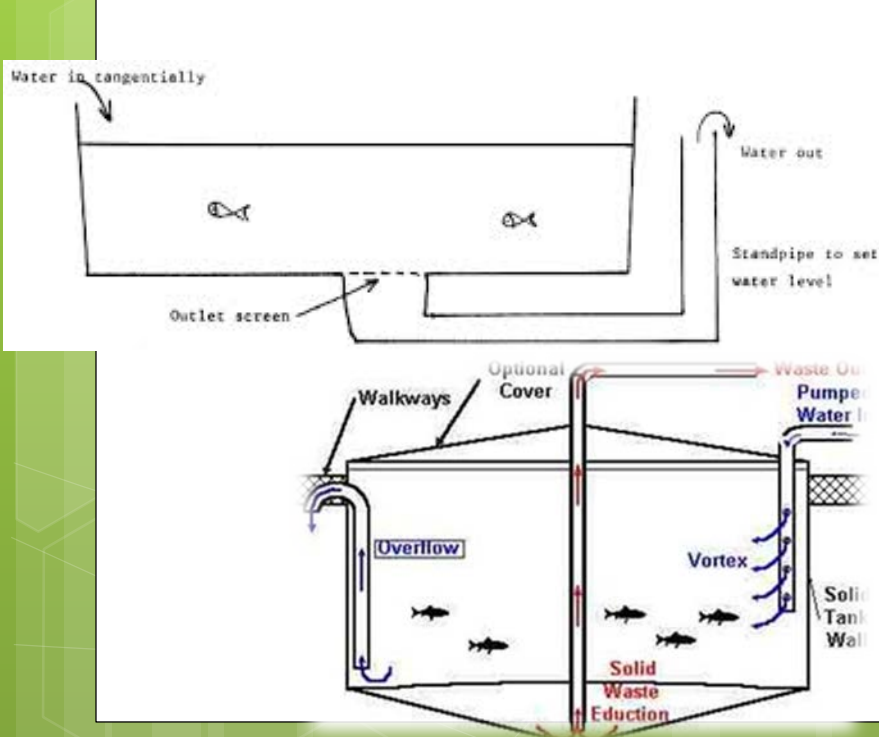
Earthen Ponds

- Can be constructed of a variety of materials but generally for use with trout and salmonids. Typically are gravel or hypalon-lined.
- Never seen one in Alaska but commonly used in Canada and the Northwest.
- Designed with controlled influent plumbing and effluent structure.
- Advantages
 - Cheap and easy to build
 - Can accommodate the lay of the land
 - Offer a more natural habitat for fish, sometimes providing natural food as well
- Disadvantages
 - Difficult to clean
 - Disease control and treatment is difficult
 - Tough to predator proof
 - Poor design for fish handling
 - Bank vegetation has to be controlled



Circular Ponds

- Circular ponds are usually no larger than about 30' in diameter and 4' deep with a slightly sloped bottom that aids in cleaning and removal of morts.
- Flow is introduced along the side of tank and allowed to splash in creating a circular flow and some aeration.
- Drains are located in the center of the bottom.
- Water level is adjusted with a standpipe or angled over discharge pipe.



Circular Ponds

○ Advantages

- Mostly self-cleaning
- Good flow characteristics
- Good feed distribution
- Fish distribute themselves well / exercise

○ Disadvantages

- Inefficient use of space
- Crowding/capture of fish
- Hard to section off
- Access to center screen is hard in large diameter containers





Here again, various shapes, sizes and materials



Salmon farm in B.C. Some of the larger circulars I've seen



Sea Bags/Lensing Units

- These containers are essentially freshwater raceways floating in saltwater.
- FW introduced at surface displaces the SW
- Bags “inflate”
- A recovery tube attached to the bag allows for mort removal and cleaning of the bag is accomplished without using a brush.
- Uneaten feed will exit the bag through the perforated holes.
- Do you remember why these might be used instead of more conventional containers?



Lensing Bags

○ Advantages

- A very big plus in SE Alaska, the bags do not require an upland site.
- A very clean rearing container, excess feed, feces and mortals are easily removed.
- Excellent flow characteristics
- Produce a healthier smolt than traditional rearing containers.

○ Disadvantages

- Very expensive, fabric used in the bag has a much shorter useful life than fiberglass, concrete or metal.
- Cumbersome to remove fish for release or transfer
- Fish are not easily visible depending on the size of bag and water quality.
- Not a good container for starting small fish, fish should be larger than 3-4 grams.



What's wrong with living in filth?



Maintaining a Clean Rearing Environment

- It is important to keep containers clean because:

Maintaining a Clean Rearing Environment

- It is important to keep containers clean because:
 - Reduce the amount of particulates in the water, minimizing gill irritants.
 - Remove fecal matter and uneaten feed.
 - Less organic material in a raceway will make chemical treatments more effective. Organic material may bind with some drugs being used for treatment and make it less effective.
 - Outlet screens remain clean longer.
 - Removal of dead or dying fish daily will reduce the spread of disease.



Fish rearing container basics:

- containers should be cleaned as needed
- Mortalities should be removed daily (or as needed).
- Clean outlet screens – or else!
- Disinfect equipment between raceways. (what would you use for this?)
- Disinfect containers once fish are out of it. Steam or sun-drying is preferable



Cleaning Methods

- There are two primary methods of manually keeping containers clean:
 - Vacuuming
 - Brushing
- Clean as needed!
- You can potentially do more harm than good. How is that so?

Vacuuming

- Need to either create a siphon or pump
- Where is the “stuff” going to go?
- How do you keep from sucking up fish?



Some raceways may have an area at the tail section to allow solids to settle out

The problem is – where does that stuff go?

This is a state facility in the midwest – most lower 48 hatcheries discharge into river systems →



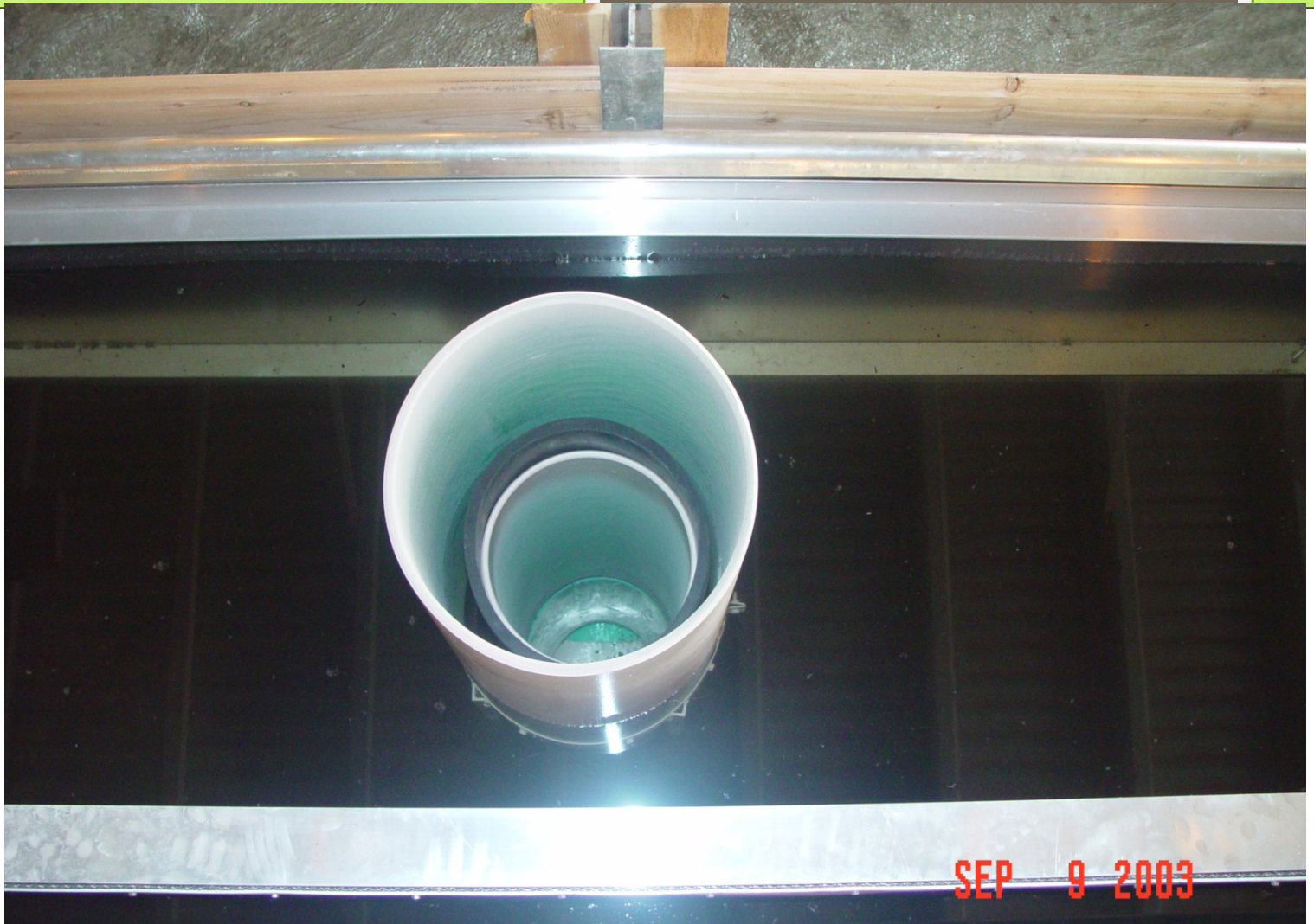
Effluent Standards

- Effluent Limitations for Discharge of Hatchery Waste from Raceways
 - Effluent sampling is conducted May – October during peak rearing months.
 - pH (range) 6.5 – 8.5
 - Settleable Solids
 - Total suspended solids
 - Monthly avg. not to exceed 5.0 mg/l
 - Daily max. not to exceed 15 mg/l
- Effluent monitoring is especially critical when discharged into a stream/river system



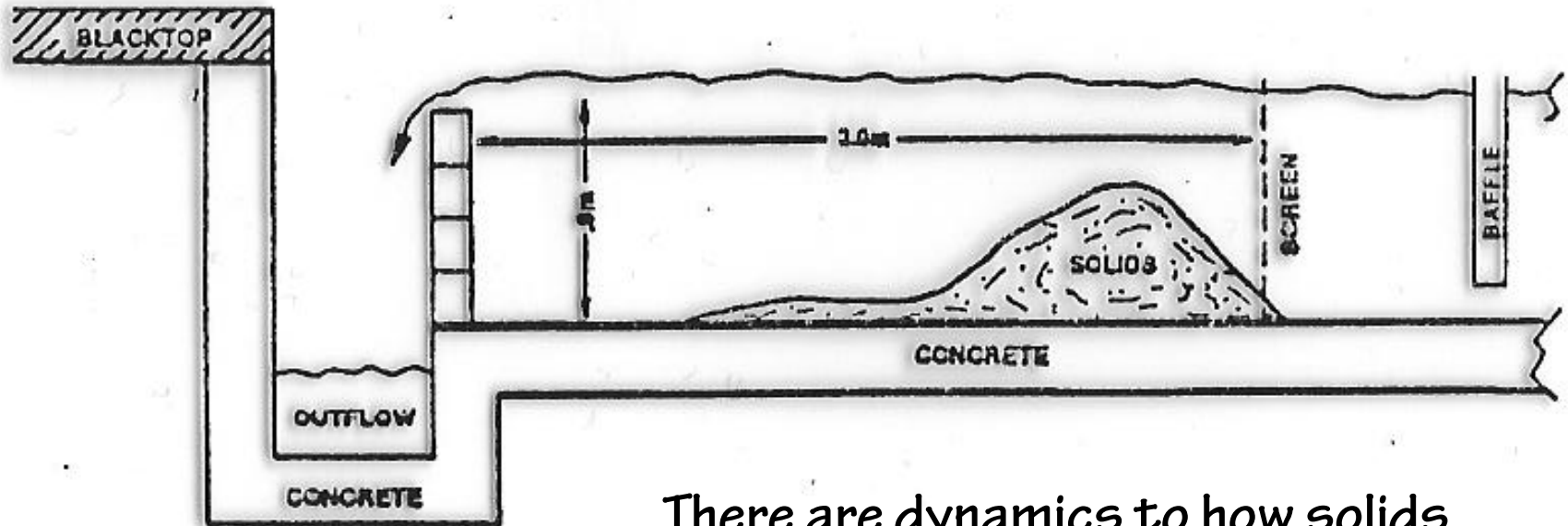
Here there is a pipe within a pipe. You are looking at the outer pipe. Better photo on next slide.

Standpipe cover, allows effluent to be pulled from the bottom



Looking straight down at the standpipe. The outer pipe allows effluent to be pulled from the bottom while the inner pipe leads to the drain.

Solids Settling Characteristics in Raceways



There are dynamics to how solids settle out in a raceway – knowing how this works can greatly reduce labor and keep container much cleaner

- Advantages of vacuuming
 - Doesn't stir up debris
 - Is physically easier than brushing
- Disadvantages
 - Sucking up fish!
 - Time consuming
 - Breaking impellers
 - If using a gas engine the equipment is noisy
 - Difficult to disinfect equipment between tanks



Brushing

- Starting at the head end, the bottom is brushed as you work a section at a time toward the tail end.
- During brushing it is necessary to intermittently draw down the water level to create a flushing/drain down action to force suspended debris to the tail end of the raceway and through the screens.
- Watch the tail screen!
- You want this to be pretty fast – don't want fish wallowing in poo for very long!





The broom that flies underwater

It is the shape that makes the broom dive to the bottom for the cleaning pressure that is needed for an exceptional cleaning job.

The Warren Water Broom has been a mainstay in the hatchery business for over three decades. It is an extreme pond cleaning device that has stood the test of time and durability over the long haul. It is milled from UHMW plastic and has replacement bristles. Overall it is a broom made to be sanitized easily and used for many years.

24" Warren Water Broom **\$49.50**

36" Warren Water Broom **\$72.50**

24" Lightning Broom **\$52.50**



- Advantages of brushing:

- Fairly quick method
- Brushes are cheap and easily replaced.
- If done gently, works well with small fish.

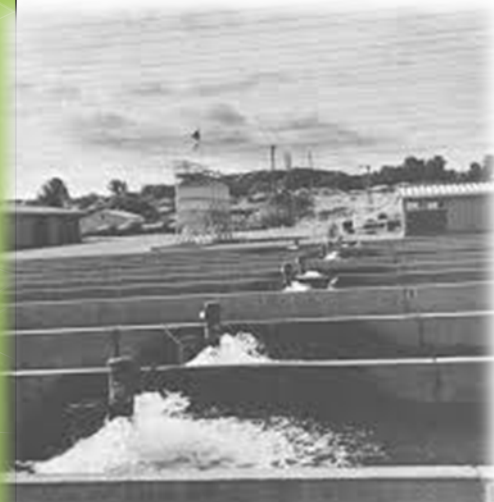
- Disadvantages

- Does not clean as effectively as vacuuming.
- Labor intensive, physically demanding.
- If you are not patient this methods stirs up a lot of feces and debris which can do a lot of damage to fish



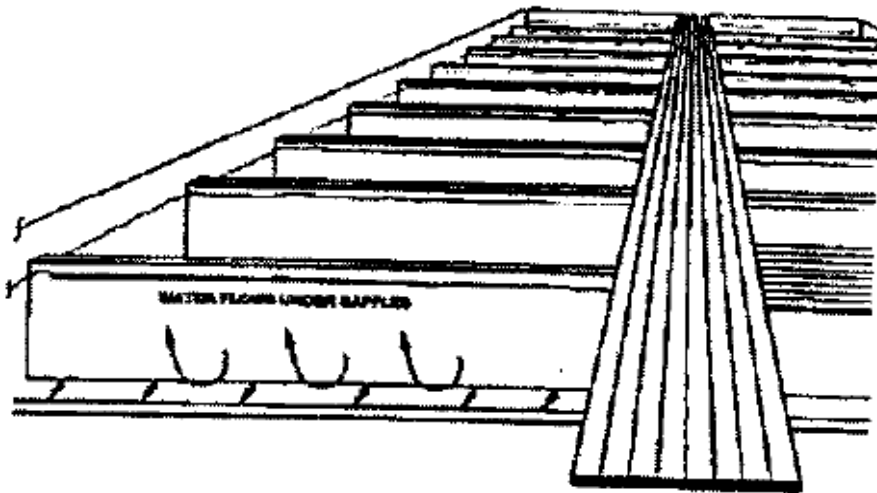
Other methods of cleaning:

- Baffles: travelling and stationary
- Adjust densities and placement of fish
- Self-cleaning design
- Mechanically influence the flow
- Put a bunch of sturgeon in the container!



Fixed baffles in raceways create high flow at certain points and move material downstream 24/7.

Figure 6. Raceway equipped with baffles.



Traveling Baffle



http://www.vmgindustries.com/raceway_main.html

Baffled Raceway



Predators



STUPID PEOPLE

Sometimes they come labelled

Predator Control



- Mort picking in saltwater pens
- River otters are a real problem here





Bird covers
are
essential



Indoor
rearing

Bears



- Going after broodstock
- Feed rooms
- Rearing ponds
- On-site housing

Electric fences, tasers, rubber bullets, noise making devices

Alarms and Potential Problems

- Hi and Low water level alarms
- Intrusion alarms
- Flow Alarm
- Pressure Alarms – Mercury Switch
- Phone dialers



*A few site visits to show
diversity of containers and
layout*

Bonneville Hatchery – rearing and adult holding







Bonneville Hatchery – near
Portland

Captive broodstock
program







Willamette and Leaburg hatcheries - Oregon





Trail Lakes – indoor rearing





Trail Lake – start tanks and outdoor rearing



Gunnuck Creek – Kake





New Sawmill Ck hatchery - Sitka

