

Coastal North Carolina Aquaculture Effluent Challenges

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- Physical
Barriers to water movement.
- Human
Public perception.
- Technical
Hurdles to meeting regulatory standards.

Coastal Effluents : Physical Challenges

- Flat topography of coastal area means low water velocity in receiving streams.
- Water movement mostly driven by wind instead of tides.

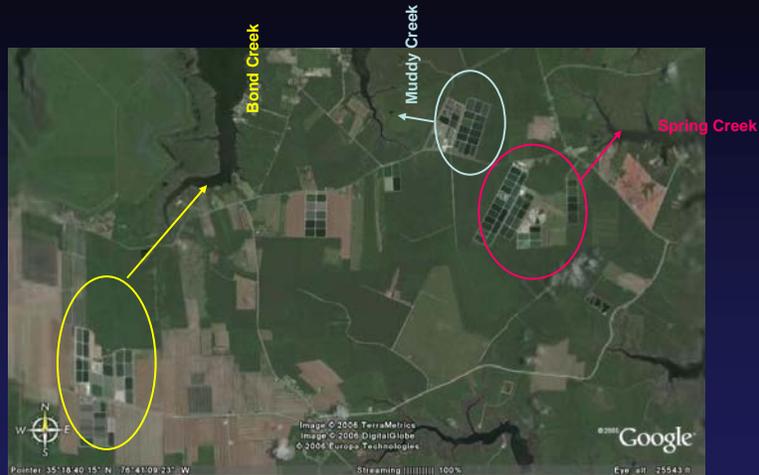


Coastal Effluents: Human Challenges

- Demographics of coastal areas changing
- Closer proximity to general population
 - Increased scrutiny by public
 - Visual properties of effluent water are cause of concern to public
 - Pond effluents are visible and traceable.



Mixed agriculture and residential property



Coastal Effluents: Technical Challenges General NPDES Permit

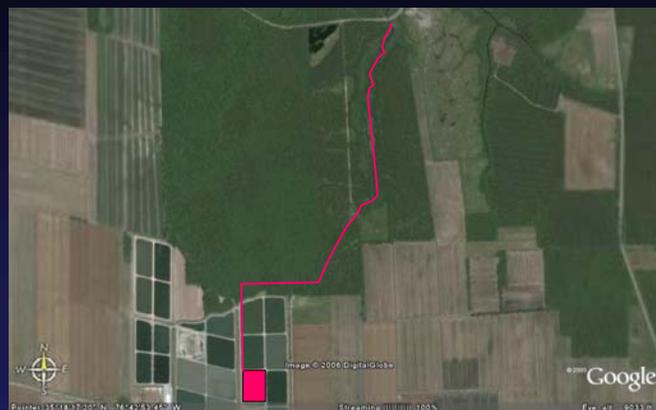
- National Pollution Discharge Elimination System
- General permit statewide for aquaculture
- Allows discharge for facilities with less than 100,000 lbs production and 30 days effluents per year.
- Individual permits for facilities that exceed these levels are issued at discretion of Regional Director of Division of Water Quality.
- State standards can exceed federal standards.

Coastal Effluents: Technical Challenges

- Chlorophyll-a of effluents cannot exceed 40 $\mu\text{g/L}$
- For Low Flow waters (USGS designation) cannot discharge waters with measurable oxygen demand (BOD).

Based on past research, most pond effluents will not meet these standards.

Coastal Effluents: Technical Challenges Rhodamine Dye Tracer Study



Funded by North Carolina Sea Grant

Rhodamine Dye Tracer Study



Culvert

Comparison of Rhodamine Dye Studies Conducted on Three Coastal Creeks

Creek	Rate of travel (ft/hr)	Dilution entering creek (%)	Location of 50% dilution	Location of 100% dilution	Wind direction/speed
A	265.8	50.0	Culvert	820.6 ft from culvert	W 10-15
B	329.5	66.7	Upstream of culvert	175.7 ft from culvert	NNW 5-10
C	205.4	21.3	613.4 ft from culvert	1674.2 ft from culvert	SSW ~5

Coastal Effluents: Technical Challenges

Rhodamine dye study conclusions:

Less mixing and dilution of effluents than anticipated.

Discharge of effluents causes plug flow in receiving streams.

Little dilution in farm ditches.

Depending on location, effluents take a long time to reach open areas (important for record-keeping).

A Case Study: Hybrid Striped Bass Effluents

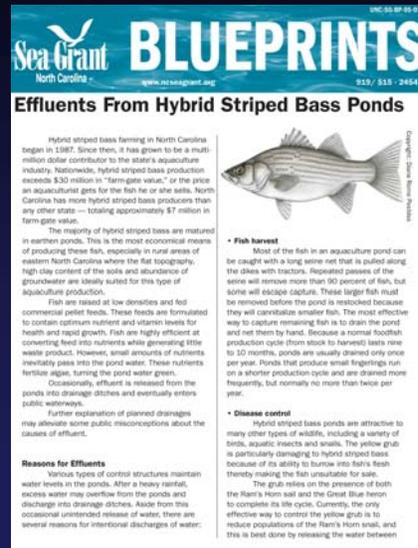
Recent situation based on public complaints.

- NPDES permits
 - All affected producers have applied
- On-going meetings
 - Producers, NCSU, NCCES, NCDA&CS, DSWC, and DWQ)
- Continuation of monitoring
 - Producers provided funding
 - Matched by NCSU (Extension and Research Services).



Human Challenges: Public Awareness

- Provide information to concerned groups



- **RMP - Reducing effluent volume and improving quality of draining effluent**

Established by Four HSB farms:

- Maintain water levels 2-4" below top of standpipe.
- After a two week waiting period, apply an approved herbicide if necessary to kill remaining algae
- Avoid discharge when harvesting fish
- Investigate new technology and innovative methods for reducing concentrations of suspended solids in draining effluent.

HSB Effluents

- Receiving streams are designated as Low Flow streams
 - Producers presented RMP to NC DWQ
 - Identify strategies to:
 - Significantly limit effluents from farms (stocking densities and feeding rates)
 - Zero-discharge from farms (ultimate goal)
- CURRENT OBJECTIVES FOR 2007 FRG PROPOSAL**
- Water reuse within farm (pumping infrastructure and water control structures)
 - Repeated production within each pond (channel catfish model)

HSB Effluents- Challenges

- Zero discharge not currently practiced in HSB industry
- Limited research about effects on production (parasites)
- No economic estimates of effects on income
- Requires changes in stocking and feeding rates (must be phased in as currently stocked ponds are harvested)



Coastal Effluents: Summary of Challenges

- Physical challenges limit ability to discharge water.
- Human challenges complex and ongoing.
- Technical challenges largely identified.
- Producers acutely aware of complaints and are being responsive.
- Changes to pond management must be phased in, so process will take time.