

Auburn University and USDA/Natural Resources
Conservation Service

Alabama Aquaculture
Best Management Practice (BMP)

Managing Ponds to Improve Quality of Draining Effluent

BMP No. 10



Definition

Water released from ponds that are partially or completely drained has greater concentrations of nutrients, organic matter, and suspended solids than overflow from ponds following storms. The majority of food fish ponds are partially drained at 5- to 6-year intervals with complete draining after 15 to 20 years. However, some ponds are drained each year such as: most fry and fingerling ponds and food fish ponds that are not seinable. Concentrations of most water quality variables are highest in the final 20 to 25% of water released when ponds are completely drained. Thus, particular attention should be given to techniques for enhancing the quality of pond draining effluent and especially the final effluent from ponds.

Explanation

Ponds normally overflow after heavy rains when large amounts of runoff enter ponds. The pond serves as a settling basin, so coarse suspended solids entering in runoff have opportunity to settle. Overflow is most common in winter and early spring when pond waters do not have high concentrations of nutrients and organic matter. Thus, water quality is usually quite good when

overflow occurs, and overflow also occurs when stream flow is high.

Pond draining may be done at anytime during the year. In late spring, summer, and early fall, pond waters contain higher concentrations of nutrients and organic matter than in winter and early spring.

When draining ponds from a bottom release, there will be a surge of water when the valve is first opened, and the water entering the pipe from near the pond bottom will contain suspended organic matter and soil particles. Discharge initially will be highly turbid, but it will clear as loose particles are removed from the pond bottom around the pipe intake. This problem has been avoided when draining research ponds at Auburn University because the ponds are fitted with swivel-type drains that take in water from the surface and can be lowered to completely drain the pond. However, catfish pond drains usually have the discharge pipe inlet at the pond bottom.

When ponds are completely drained for fish harvest, water quality is much better in the first 75% to 80% of effluent than in the last 20% to 25% of effluent (Figure 1).

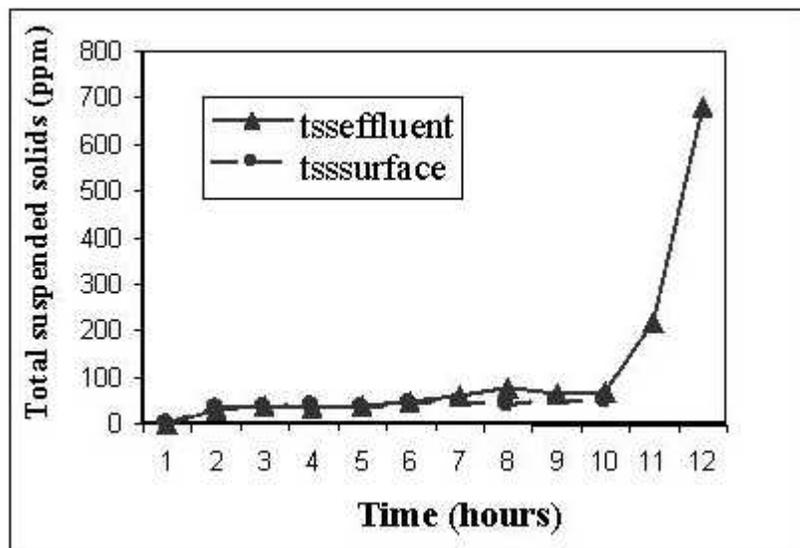
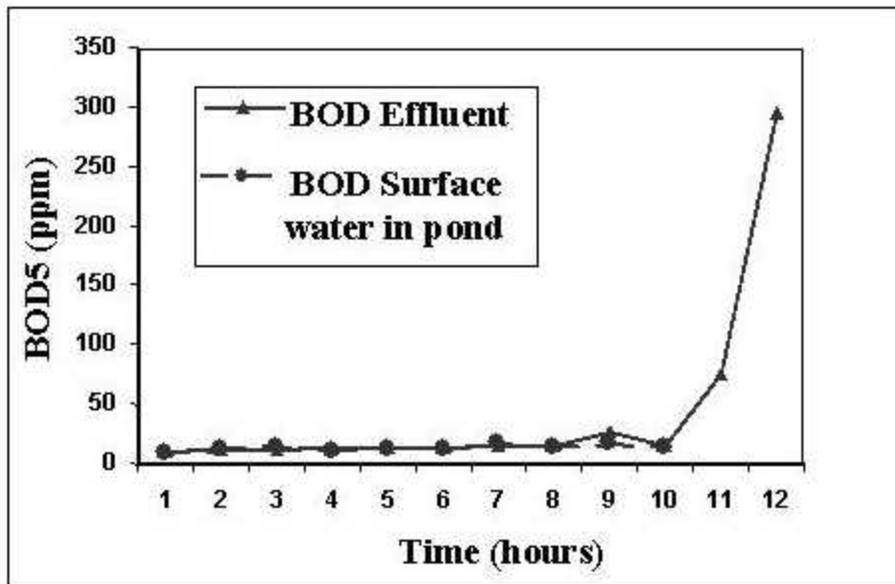


Figure 1. Differences in water quality.

This results because fish activity and harvest operations suspend particles of soil and organic matter from the bottom. In some studies at Auburn University, drains were closed after about 75% to 80% of water had been discharged from ponds and fish removed by seining. The suspended solids were allowed to settle after fish were removed, and the water was discharged slowly to prevent sediment resuspension. This effected a large reduction in the pollution load (Table 1).

Table 1. Average concentrations of selected water quality variables in the final water (approximately 20% of pond volume) discharged from ponds after channel catfish were harvested by seining.				
Discharge schedule	Total Suspended Solids (mg/L)	Total Kjeldahl nitrogen (mg/L)	Total phosphorus (mg/L)	Biochemical oxygen demand (mg/L)
Immediately after seining	370	11.9	0.97	30.1
1 day after seining	408	12.2	0.52	19.2
2 days after seining	16	3.1	0.30	12.4

Improvement of draining effluent quality

Practices

- *Where possible, construct seinable ponds that do not have to be drained for harvest.*
- *Design new ponds with structures that allow ponds to be drained near the surface instead of from the bottom. Where practical, alter drain structures for surface discharge when old ponds are drained for harvest and renovation.*
- *Maximize periods between partial or complete draining by managing ponds to prevent erosion of earthwork and to maintain good water quality.*
- *Where possible, avoid discharge when harvesting fish. When ponds must be drained completely, it is recommended that the final 20% to 25% of pond volume discharged into a settling basin or held for 2 or 3 days to minimize suspended solids and then discharged slowly.*
- *Producers are encouraged to investigate new technology and innovative methods for reducing concentrations of suspended solids in draining effluent.*

Implementation notes

When ponds are drained for fish harvest, water levels should be lowered to 20% or 25% of full volume, drains should be closed and fish harvested by seining. Once fish have been removed, the water should be allowed to stand until suspended solids have settled. This will normally take only 2 or 3 days. The water should then be released slowly to prevent resuspension of solids. It is recommended that the valve only be opened to ¼ its maximum capacity during final draining, the valve should be closed at the beginning of rainfall and not reopened until water has cleared.

Some catfish farms have space for settling basins to treat effluents (See BMP No. 6). Where effluents can be introduced into settling basins, there is no reason to hold the last 20% to 25% of water for sedimentation following fish removal.

On farms where several ponds are located in close proximity, it might be possible to transfer water from the pond being drained for harvest to adjacent ponds for reuse. Once harvest is complete, water could be pumped back to the harvested pond. Of course, additional pumping costs would be incurred.

An example of a “swivel-type” drainpipe is illustrated in Figure 2. Another possibility is to install a second drain valve on the pond standpipe at the seineable depth elevation. This allows only the better quality water to be discharged and doesn't require the owner to close the valve to prevent total pond drainage.

References

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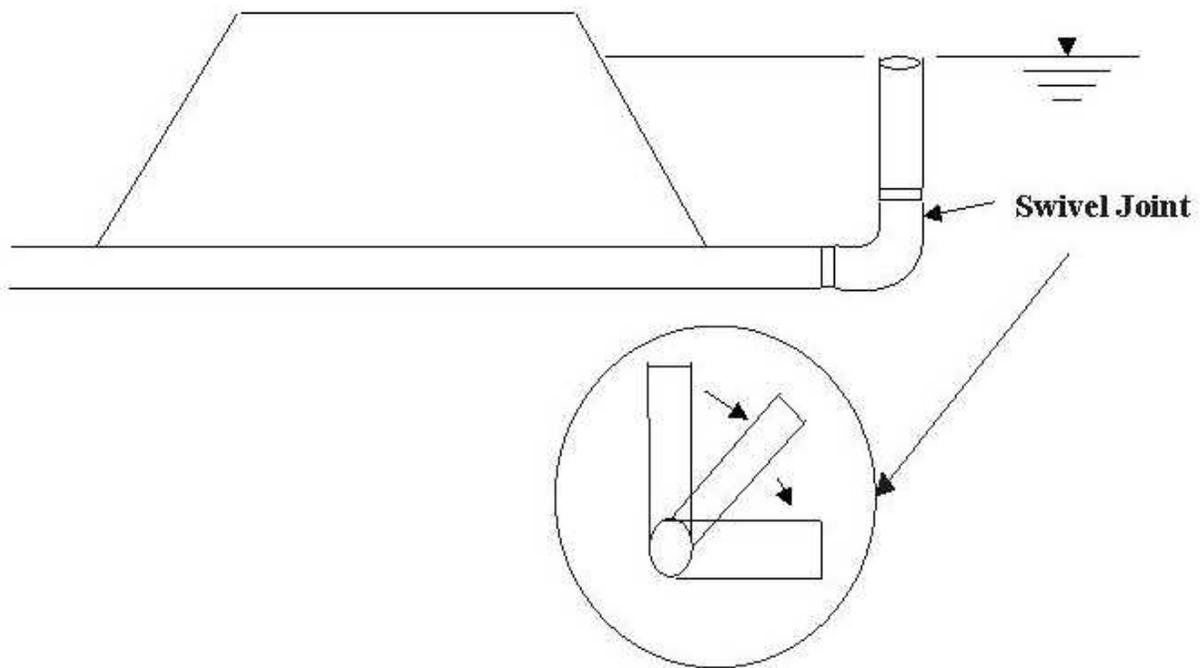


Figure 2. Swivel connection used to maintain appropriate level.



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