

Auburn University and USDA/Natural
Resources Conservation Service

Alabama Aquaculture
Best Management Practice (BMP)

Settling Basins and Wetlands

BMP No. 6



Definition

Properly designed settling basins retain water long enough for coarse suspended solids to settle. Water discharging from settling basins will be lower in suspended solids concentrations and concentrations of total nitrogen, total phosphorus, and biochemical oxygen demand than water entering them. Settling basins also provide the opportunity for pH adjustment.

Constructed wetlands are shallow water basins with dense stands of emergent aquatic vegetation. Wetlands act as settling basins and biological filters, can reduce turbidity, and they can be used as water treatment systems.

Explanation

Catfish ponds already act as settling basins because water remains in them under relatively quiescent conditions for long periods of time. Overflow usually occurs only in winter and spring after heavy rains. Storm overflow and the initial 75% to 80% of water drained to completely empty a pond cannot be treated effectively by sedimentation, because the suspended matter consists of very small clay particles and phytoplankton cells. Also, the volume of storm overflow and initial draining effluent is large and the size of a settling basin or wetland required for treating effluents can be substantial. The final 20% to 25% of effluent when a pond is completely drained would require a smaller settling basin or wetland than needed for storm overflow and initial draining effluent. Many catfish farms in Alabama extend to property lines or to streams and no space is

available for constructing settling basins or wetlands. However, there are some farms where settling basins or wetlands could be used. Although initial construction costs can be substantial, settling basins or wetlands provide an alternative to holding the last 20% to 25% of water in a pond after fish harvest to allow time for sedimentation before final discharge (See BMP No. 9).

Research has shown that settling basins are as effective as wetlands for treating pond effluent. Settling basins are much simpler to construct and operate than wetlands. Nevertheless, constructed wetlands provide habitat for many species of animals and are attractive. There has been considerable effort by some to promote wetlands for treating aquaculture effluents, and a few farmers may want to use them.

Use of settling basins and constructed wetlands

Practices

- *Settling basins are an alternative method for improving the quality of final draining effluent from catfish ponds. Settling basins are suggested where space is available and construction costs are manageable.*
- *Where possible, the water level in an adjacent pond can be lowered to accept pumped effluent from the pond being drained, thereby functioning as a settling basin.*
- *Constructed wetlands may be used as an alternative to settling basins.*

Implementation notes

On most catfish farms only one pond is drained at a time, and only one or two ponds are drained each year. A single settling basin can be used for all ponds on a single watershed. The volume of this settling basin should be about 37.5% of the volume of the largest pond in order to provide retention time for sedimentation. For example, if the largest pond in the watershed has an area of 10 acres and an average depth of 5 feet, the settling basin volume would be 18.75 acre-feet. For a 5-foot deep settling basin the area would be 3.75 acres. The settling basin should be constructed so as to exclude any outside drainage area to the extent possible. There must be a system to convey water from all ponds on the watershed to the settling basin. The settling basin should have grass cover on its embankments to prevent erosion (See BMP No. 3). Water should overflow from the surface of the settling basin when it is in use. A minimum hydraulic retention time (HRT) of 8 hours is suggested, but a HRT of 24 hours or longer will provide better treatment. When sediment accumulation begins to encroach on the HRT volume, the sediment should be removed and properly disposed of. The principle features of a settling basin are illustrated in Figure 1.

Inflow to the structure should be controlled so that the hydraulic retention time is not reduced in the settling basin thereby increasing outflow turbidity.

Some fish farms in Alabama could discharge effluent into natural wetlands. However, direct

discharge into natural wetlands is not recommended as a best management practice. Wetlands are unique and ecologically-valuable habitat, and they could be harmed by sedimentation or excessive nutrient inputs. Of course, it might be possible to discharge effluent from a settling basin through a natural wetland to provide polishing of an already acceptable effluent. This would be a "site-specific" practice that should only be considered after consultation with local Natural Resources Conservation Service (NRCS) specialists.

References

- Boyd, C. E. 1995. Bottom Soils, Sediment and Pond Aquaculture. Chapman and Hall, New York, New York.
- Schwartz, M. F. and C. E. Boyd. 1995. Constructed wetlands for treatment of channel catfish pond effluents. *Progressive Fish Culturist* 57:255-266.
- Boyd, C. E., J. Queiroz, J. Lee, M. Rowan, G. N. Whitis, and A. Gross. 2000. Environmental assessment of channel catfish, *Ictalurus punctatus*, farming in Alabama. *Journal of the World Aquaculture Society* 31(4):511-544.
- Boyd, C. E. and J. Queiroz. 2001. Feasibility of retention structures, settling basins, and best management practices in effluent regulation for Alabama channel catfish farming. *Reviews in Fisheries Science* 9(2):43-67.

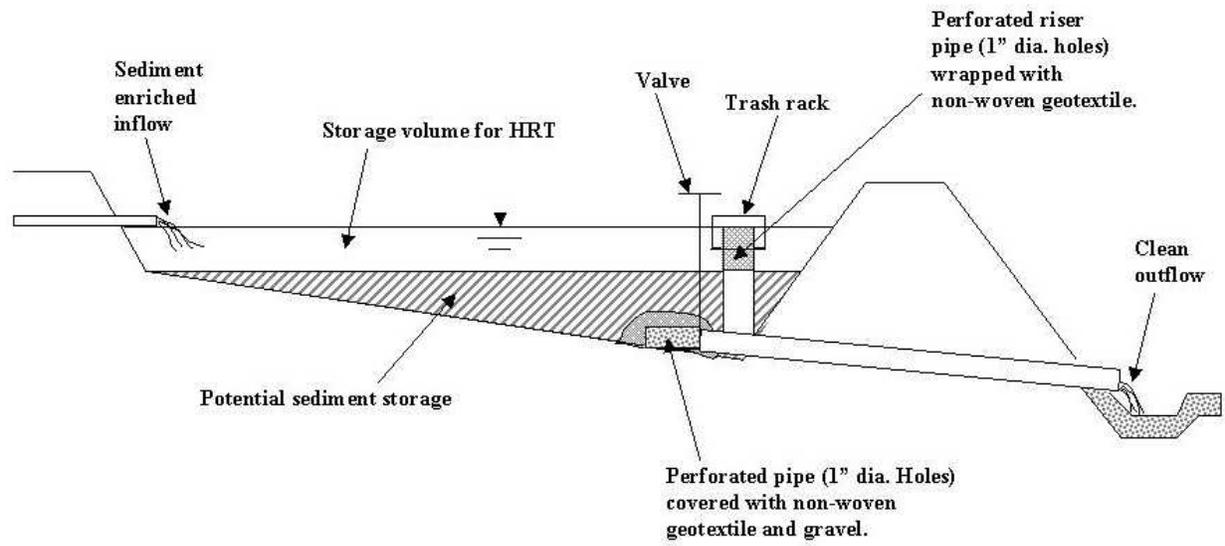


Figure 1. Principle features of a settling basin.



Auburn University is an equal opportunity educational institution.

"The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer."