Auburn University and USDA-Natural Resources Conservation Service

Alabama Aquaculture
Best Management Practice (BMP)

Reducing Storm Runoff into Ponds

BMP No. 1

Definition

Storm runoff or overland flow is the water that flows over the land surface following rainfall events. Watershed ponds receive storm runoff, and sometimes, small streams or springs may flow into them. The amount of runoff entering ponds depends upon the size and characteristics of their watersheds. The volume of effluent from ponds in response to heavy rains depends largely upon the watershed area to pond surface ratio (WP ratio).

Explanation

Catfish farming in Alabama is conducted primarily in watershed ponds located in the Blackland Prairie region of Alabama. Soils in this region are high in clay content, and this results in high runoff volumes after storm events. Watershed ponds are filled by runoff that occurs mostly in the winter and spring as illustrated in Figure 1.

The recommended maximum WP ratio for watershed ponds in the Blackland Prairie region of Alabama usually is 10:1, but some ponds may have a much larger ratio. Ponds located in the Coastal Plain region of Alabama may need 30 acres or more of land to contribute runoff for each surface acre of ponded water. Watersheds also may have small ephemeral or permanent streams or springs that also contribute inflow to ponds. Enough watershed area to supply water to fill ponds during the winter and spring is desirable. However, if WP ratios are larger than necessary, excessive flow through ponds could cause erosion of pond outlet structures and increases total suspended solids concentration in effluents. Water flowing through ponds also flushes out products added to ponds to enhance water quality and fish production, e.g. fertilizer, lime, and salt, and lowers alkalinity. If phytoplankton abundance and nutrient concentrations are high in ponds at time of overflow, pollutant loads to streams may increase. Alabama Department of Environmental Management (ADEM) rules require that discharges of pollutants be prevented or reduced to the maximum extent practical to ensure instream water quality. Thus, excessive overflow from watershed ponds should be avoided.

There are several ways to minimize the overflow from watershed ponds. If possible during pond design, the water area should be adjusted for watershed area so that the WP ratio does not result in excessive runoff. Where existing ponds have an excessively large watershed area, a part of the stream, spring, or overland flow may be routed around ponds or another pond may be constructed on the watershed to increase storage volume. Changes in vegetative cover may be implemented to intercept more water and lessen overland flow.

Reduction in Storm Overflow

Practices

The following practices are suggested to reduce storm runoff into ponds:

- *New watershed ponds in the Blackland Prairie region of Alabama should be designed to have a WP ratio of 10:1 or less.*
- *Use diversions and grade stabilization structures to divert excess runoff around ponds, or it may be possible to build an additional pond to increase storage on the watershed.*
- *Maintain good vegetative cover on all parts of watersheds, and where feasible, replace short or sparse vegetation with taller and denser vegetation.*

Implementation notes

The watershed drainage area is a vital element in new pond design. In Blackland Prairie locations, the pond area usually should be about 10% of watershed area. If enough pond area to provide a WP ratio of 10:1 is not feasible, then methods for routing runoff around ponds should be considered.

In the case of existing ponds with excessive watershed area, construction of another pond or wetland on the watershed may be possible. This will lessen the WP ratio and increase water storage on the watershed (See Figure 2).

Diversions also are useful for controlling water on watersheds. A diversion is a channel constructed across the slope with a supporting ridge on the lower side.

A drawing illustrating the use of a diversion to divert overland flow around ponds is shown in Figure 3. A grade stabilization structure will be necessary to control the runoff water safely to the drainage way below the pond. USDA-NRCS can provide information on proper diversion and grade stabilization structure design and construction. In some cases, extending pipes through embankment type diversions to allow a portion of the runoff to enter ponds may be necessary.

Small steams or drainage from upstream dams may be partially or completely diverted from ponds by ditches. Pipes or other structures also may be installed in ditches to allow a portion of the flow to enter ponds.

Storm runoff from watersheds is greater where the land is bare or covered with short grass. Bare soil is highly undesirable on watersheds for catfish ponds because it erodes and results in highly turbid runoff (See BMP No. 3). Many watersheds of catfish ponds in Alabama are covered by short grass. Converting short or sparse vegetation to taller and denser vegetation can reduce the runoff volume from these watersheds. Of course, this application usually would require that the pond owner to own most or all of the watershed.

References

USDA-NRCS Alabama Conservation Practice Standards:
Code 362 – Diversion
Code 410 – Grade Stabilization Structures

Yoo, K. H. and C. E. Boyd. 1994. Hydrology and Water Supply for Pond Aquaculture. Chapman and Hall, New York, New York.

Evans, J. O. and J. H. Patric. 1983. Harvest trees, reap water. J. Soil and Water Conservation 38:390-392.

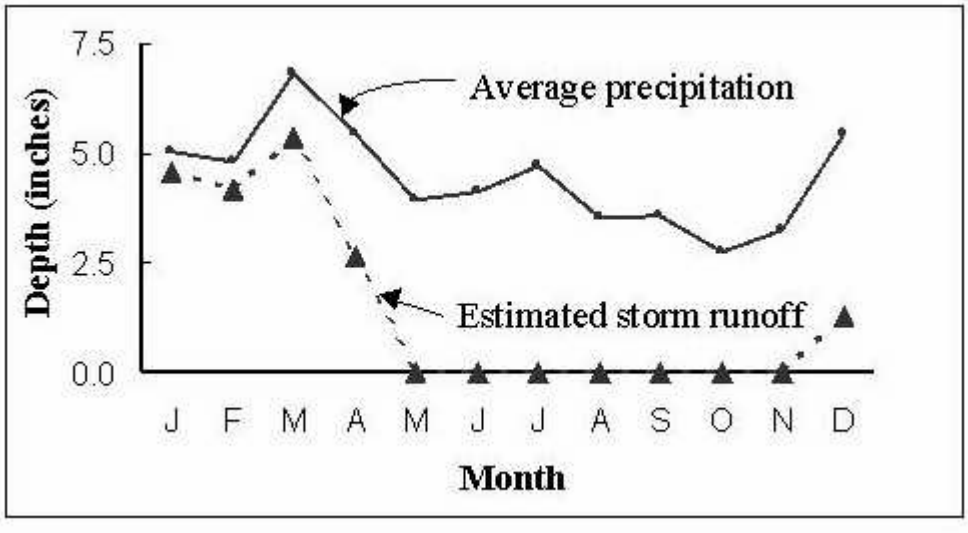

Figure 1. Distribution by month of normal precipitation at Demopolis, Alabama, and estimates of monthly runoff.

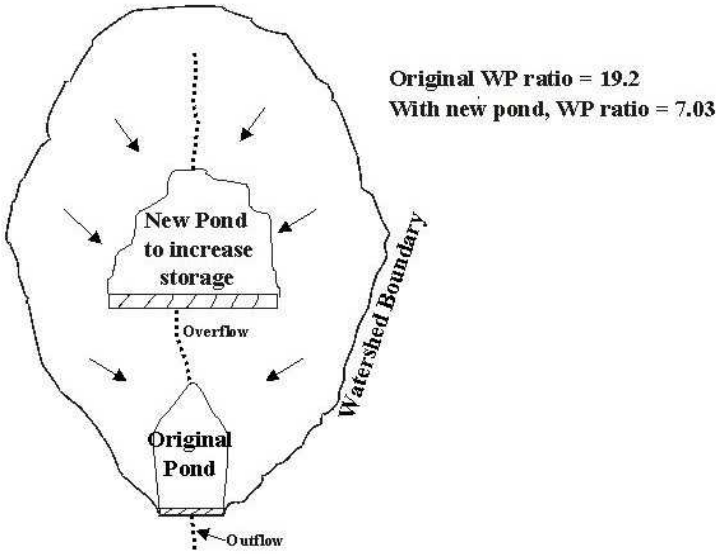

Figure 2. Illustration of the installation of another pond to increase storage on a watershed.

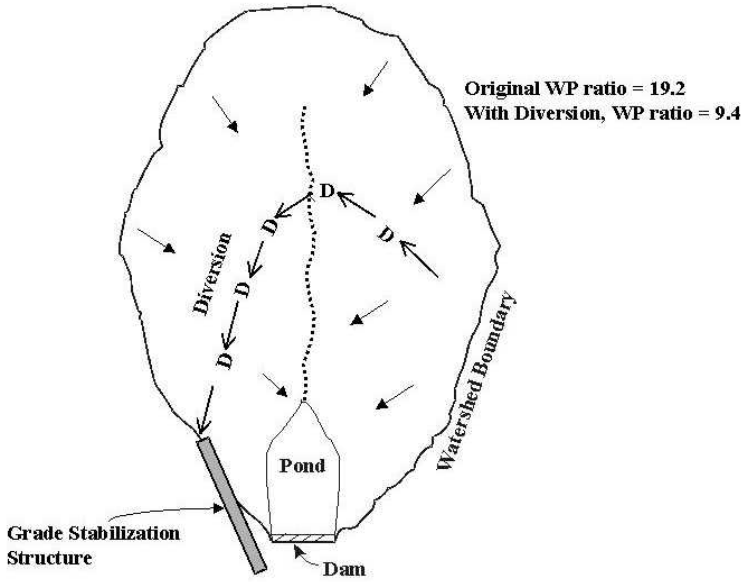

Figure 3. Illustration of the use of a diversion to reduce the amount of overland flow entering a pond from its watershed.