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University of Arkansas, United States Department of Agriculture, and County Governments Cooperating

on the bayou

BAYOU BARTHOLOMEW WATER QUALITY PROJECT

in this issue

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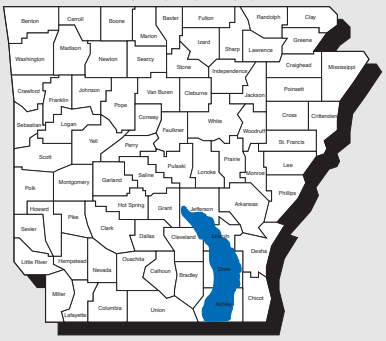
"TMDL" *What Is It?*

by Mike Daniels

Nonpoint source pollution refers to contaminants, such as sediment, plant nutrients and pesticides, that are transported from the landscape to streams and lakes in runoff water from storm events. Nationally, agriculture is considered by EPA to be the leading source of nonpoint source pollution. One strategy taken by EPA in addressing nonpoint source pollution is the "Total Maximum Daily Load," or TMDL approach. Under the authority of the Clean Water Act (1987: Section 303d), individual states are required to implement the TMDL approach in the following manner:

1. States develop a list of impaired water bodies that do not meet their intended uses.
2. States prioritize this list for TMDL Development.
3. States develop TMDL for these priority watersheds by:
   a. quantifying pollutant levels through monitoring,
   b. establishing the maximum pollutant load that a waterbody can receive and
   c. identify sources and allocate pollutant loadings among sources.
4. Reduce pollutant loads through voluntary or regulatory measures to meet the TMDL.

Bayou Bartholomew Watershed



– 359 miles long
– 997,000 acres

States have come under increasing pressure from EPA to implement the TMDL approach due to several lawsuits against EPA. For example, EPA was sued by a coalition of environmental groups in Arkansas. The suit was settled out-of-court with the consent decree being that the State of Arkansas would take a more aggressive timeline in completing TMDL implementation and that the number of stream miles slated for TMDL would triple.

Bayou Bartholomew is one of the top priority watersheds in Arkansas for TMDL implementation. The out-of-court settlement requires that the Arkansas Department of Environmental Quality implement TMDL by January 15, 2002. The following is a summary of the water quality conditions of Bayou Bartholomew taken from the Arkansas Department of Environmental Quality's (ADEQ) 2000 Water Quality Inventory Report:

The waters within Bayou Bartholomew and its tributaries have been designated as suitable for the propagation of fish/wildlife, primary and secondary contact

recreation and public, industrial and agricultural water supplies. The bayou contains a total of 359.4 stream miles, of which 330.5 are being assessed using monitoring data. Water quality is impacted in much of the bayou by nonpoint source pollution generated by row crop agriculture. Silt loads and turbidity are consistently very high, thus causing degradation to the aquatic life contained in many parts of the bayou. Bayou Bartholomew also recorded the highest level of the pesticide metolachlor of any station sampled in the reporting period. The entire stretch of Bayou Bartholomew has been assessed as not meeting the aquatic life uses due to siltation and turbidity.

Voluntary approaches to reducing sediment loading will most likely be tried first. However, if voluntary approaches do not achieve the TMDL, more lawsuits may ensue which could lead to regulatory approaches being implemented. ■

Riparian Forest *Buffers*

— Rex Roberg

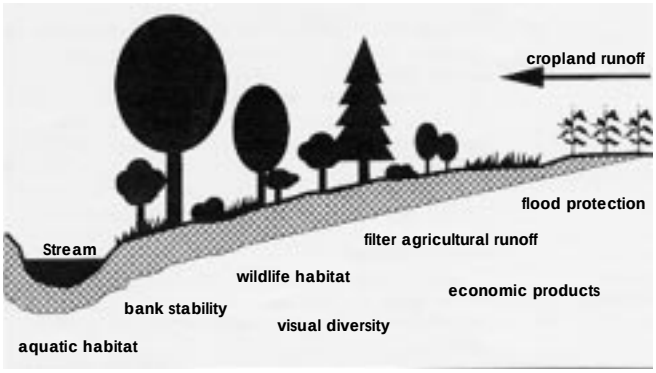
Riparian forest buffers are permanent areas of trees, shrubs, or other vegetation adjacent to streams. They filter runoff, removing nutrients and sediments, protect the shoreline from erosion, moderate flood damage and provide food and habitats for living resources.

Research studies show that buffers are effective. Reasonably sized, properly developed and managed riparian buffers are estimated to filter nearly 70 percent to almost 100 percent of nutrients and sediment and to protect the streams from runoff.

A good riparian forest buffer is flexible to suit the land, but the model is a three-zone buffer system. The inner core zone closest to the water is undisturbed forest, and mature trees generally are not removed from this zone. It extends upland from the stream's edge, stabilizing the streambank and providing habitat for aquatic organisms. The tree roots reduce soil erosion, and keep sediment and any nutrients bound to it out of the water.

The second zone immediately after the mature trees, is managed forest. It protects water quality by removing, transforming or storing nutrients, sediments and other pollutants. Trees in this zone need to be harvested so that there will be vigorous tree growth. As they grow, these trees remove nutrients while they also provide food and shelter for hundreds of wildlife species.

The third zone back from the water after the managed forest, contains grass filter strips or other control measures to slow runoff. The strips filter sediment and related chemicals and allow water to infiltrate the ground. Grass filter strips protect the wooded areas and set the stage so the riparian forest buffer can perform at its peak. Zone 3 spreads out the water flow and prevents adjacent land-use runoff from eroding channels through the buffer.



Benefits that a riparian buffer can provide.

Even with the buffer at the stream, when the land adjacent to the riparian buffer is used for pasture, livestock need to be kept out of the riparian zone as much as practical; and when it is used for cropland, sediment, fertilizer and pesticides need to be carefully managed.

Riparian forest buffers are a common-sense way for you to protect your most valuable asset, your land; and demonstrate your personal commitment to conservation. What's more, the continuous Conservation Reserve Program (CRP) sign-up makes the use of conservation buffers economically attractive. You can sign up any day at your local U.S. Department of Agriculture (USDA) Service Center without having to make a competitive offer as required during the general CRP sign-up. Your offer will be automatically accepted if all eligibility requirements are met.

Other federal, state, and local government programs also can help with the cost of implementing buffer practices. These include the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), Wetlands Reserve Program (WRP) and Stewardship Incentive Program (SIP). ■

Best Management *Practices* for Pond *Aquaculture*

— Nathan Stone

Arkansas has about 50,000 acres of aquaculture ponds, half of which are devoted to catfish production.

Fish farming is highly beneficial to the Arkansas economy and is generally environmentally responsible. For example, catfish grow-out ponds are drained every 5 to 10 years. Once a pond is filled, water is added only to compensate for evaporation and seepage. Natural processes within ponds assimilate fish wastes and purify the water. Nevertheless, awareness of cumulative environmental impacts possible from many small sources has encouraged fish farmers to adopt management practices to minimize any possible environmental impact from their farms.

Aquaculture scientists in the southern region have worked with producers to develop Best Management Practices for pond aquaculture. The following list is adapted from Tucker, et al., 2000 and Boyd, et al., 2000:

- Operate foodfish grow-out ponds for multiple years without draining.
- Maintain storage capacity in ponds and capture rainfall to reduce water use.
- Minimize water exchange.

University of Arkansas at Pine Bluff catfish pond.

- Provide adequate aeration and circulation of pond water.
- Position aerators to minimize erosion of pond bottoms and levees.
- When discharging water, draw from the surface waters, which are of higher quality than the bottom layer.
- Avoid discharging water during final seining.
- Allow solids to settle before discharging the final volume of water from a pond.
- When possible, reuse water that is drained from ponds.
- To capture water in emptied ponds, raise the standpipe (or shut the valve) during the winter months.
- Construct new pond levees to meet or exceed NRCS/ Cooperative Extension recommendations.
- Establish and maintain grass cover on pond levees.
- Make sure ditches are large enough to handle the flow of water from draining ponds with minimal erosion. Allow vegetation to grow in drainage ditches to prevent erosion and to trap solids. Where possible, construct check dams in farm ditches to allow solids to settle.
- Lift pond standpipe (or shut valve) when renovating inside earthwork to capture solids. Unlike compacted pond bottoms, disturbed soils are easily eroded.
- Use sediment from inside the pond to repair pond levees rather than disposing of it outside of ponds.
- Extend the ends of drainpipes beyond the toes of the levees, to prevent levee erosion.
- Use high quality feeds and efficient feeding practices. Avoid feeding more than the fish will eat.
- Use reasonable stocking and feeding rates to avoid water quality problems from excessive plankton blooms.
- Use approved chemicals only, and follow label requirements. The label is the law. Store salt so that is not washed into streams by rainfall.

Follow all Arkansas Game and Fish Commission regulations with respect to exotic species. ■

Gulf of Mexico *Hypoxia Update*

According to Webster, "hypoxia" is a deficiency in the amount of oxygen reaching bodily tissue.

When used in context with water quality, "hypoxia" means a deficiency of dissolved oxygen beyond that acceptable for normal aquatic life. In the Gulf of Mexico, off the shore of Louisiana, there is a large hypoxic zone that forms in mid spring and lasts into fall. This zone varies in size from around 4,000 square miles up to around 9,000 square miles. At times, the dissolved oxygen gets so low that aquatic life migrates out of the region, hence the term "Dead Zone" is often used. The size of the hypoxic zone seems to be directly related to the load of nutrients (fertilizer) carried by the Mississippi River.

The White House's Center for Environment and Natural Resources (CENR) recently released the draft of the Integrated Assessment report concerning the Hypoxic Zone in the Gulf, as required in section 604(a) of Public Law 105-383. The assessment covers six topics:

1. Characterization of hypoxia (in the Gulf of Mexico).
2. Ecological and economic consequences of hypoxia.
3. Flux and sources of nutrients in the Mississippi-Atchafalya River Basin.
4. Effects of reducing nutrient loads to surface waters within the Mississippi River Basin and Gulf of Mexico.
5. Reducing nutrient loads, especially nitrate-nitrogen, to surface water, groundwater and the Gulf of Mexico.
6. Evaluation of economic costs and benefits of methods for reducing nutrient loads to the Gulf of Mexico.

According to the report, hypoxia does occur naturally in the Gulf, but human activities in the last century have greatly increased the size and severity of the hypoxic zone. The change in size in the zone corresponds to three major changes in the drainage basin: (1) channelization of the river for flood control and navigation; (2) alterations in the landscape that removed much of the "buffer" for runoff into the Mississippi; and (3) a dramatic increase in fertilizer nitrogen input into the Mississippi River basin. The nutrient loading appears to have stabilized since around 1980. If the nutrient load to the Gulf is not changed, we can expect the hypoxic zone to reform at its current size of about 4,000 to 9,000 square miles each summer. Returning the zone to conditions similar to those at the start of the 20th century will require a 40 percent reduction in nitrogen flux out of the Mississippi River system. If the nation wants to achieve this reduction, it will require a combination of nutrient input reductions and restoration of significant areas of wetland and riparian buffers.

The Integrated Assessment may be obtained from the National Oceanic and Atmospheric Administration's web site, http://www.nos.noaa.gov/Products/products.html. ■

The hypoxic zone forms in mid spring and lasts into fall.

– Bob Morgan, P.E.
ASWCC

Winter *Water* Management *Reduces Costs* for Rice Farmers

Winter-flooded rice fields provide critical habitat for migrating and wintering water birds. Rice acreage and production are increasing in the Mississippi Alluvial Valley (MAV) despite static or declining trends in southwest Louisiana and the Texas Gulf Coast. While managing lands for wildlife is important, management practices that improve the rice grower's "bottom line" are more readily adopted.

To help clarify the link between water bird and field management, we conducted a study during winter-spring 1995-96 and 1996-97. Our objective was to evaluate the potential of rice field flooding in winter to reduce residual rice straw and weeds, thus benefitting spring field preparation for rice or soybeans in the MAV.

Turning Rice Straw Into Soil

In the MAV, there are about 5 tons per acre of rice straw left after harvest. Because rice straw has high silica content and contains little nitrogen relative to carbon, it resists both physical breakdown and biological decay. The straw must be decomposed and amended to soils by spring to facilitate planting.

A combination of fall disking and flooding until March 1 reduced rice straw 68 percent by spring planting. Reduction of straw by fall disking alone was the same as flooding until March 1 alone (53-54 percent), suggesting that disking and late flooding may have similar effects on straw reduction. Although the combination of treatments reduced straw the most, the substitution of late winter flooding for fall disking would save rice growers more than $14 per acre.

Control of Winter Weeds

A mild winter climate with plenty of rainfall makes the MAV a perfect place for growth of early-season broadleaf weeds and grasses. Known as winter weeds, pest plants such as bluegrass, buttercup and sourdock are controlled with tillage or herbicides before spring planting. Holding water until March 1 reduced winter weeds by 78 percent when compared to fields not flooded in winter. The substitution of late winter flooding for spring disking would save rice growers more than $8.50 per acre. The substitution of late winter flooding for an aerial application of a spring "burn down" herbicide would save more than $13 per acre.

Winter-flooded rice fields provide critical habitat for migrating and wintering water birds.

Winter Flooding, Waterfowl and Red Rice

Red rice is the MAV's number one production challenge, adversely affecting both crop yield and quality. Waterfowl are known to help control red rice by consuming seeds in flooded fields. Waterfowl may not eat all red rice from infested fields; however, seeds eaten cannot germinate the following year. Conversely, waterfowl have been implicated as vectors of red rice. This claim is unsubstantiated. Past research has shown no viable red rice seed pass through digestive systems of waterfowl.

Although no winter rice field-management practice offered complete control of red rice, no-till methods and shallow flooding maximized the chance for red-rice sprouting in fall and waterfowl consumption in winter. Rice growers should not bury seed with heavy tillage only to preserve the red rice seed bank for future years.

In summary, winter-water management showed potential to provide critical habitat for migrating and wintering water birds in concert with cost-effective rice-soybean production in the MAV, a region where both commodities continue to increase in planted acres and production.

– Scott W. Manley,
Ducks Unlimited, Inc.
– Richard M. Kaminski,
MSU

no-till tips

Cotton Production

Field Section
– Same as for conventional tillage.
– Control erosion using waterways, rows on contour and filter strips.
– Subsoil if tillage pan exist and/or extreme traffic has occurred.
– Avoid land with heavy infestations of perennial grasses and vines.

Vegetative Cover
– Cover crops may be needed if crop residue is inadequate.
– Small grains, especially wheat, are preferred.
– Excessive growth can interfere with planting, emergence and growth.
– Do not plant until cover crop and weeds are dead.

Planting Equipment
– Use conservation tillage or no-till planting equipment.
  • Heavy duty down pressure springs.
  • Tool bar weight brackets.
  • Double-disc or offset double-disc openers.
  • Heavy-duty press wheels.
– Plant 4 to 5 mph.
– Use coulters if the planter does not have double-disc openers.

Planting
– Soil temperature 68°F for three consecutive days with a favorable five day forecast.
– Planting may be delayed if crop or residue is dense.
– Plant seed 1/4 to 1/2 inch deep.
– Good closure of seed furrow can help ensure a better stand.
– Plant stands may be reduced – plant 1/2 to 1 seed per foot more than conventional.

Weed Control
– Kill vegetation prior to planting.
– May require two burndowns.
  • First, at least two prior to planting.
  • Second, can be applied at planting.
– Identify weeds in seedling stage.
– See Roundup Ultra and Gramoxone Extra labels for rates on specific weeds.

Fertilizer and Lime
– Soil test same as conventional.
– Adjustment for cover crop may be necessary.

– Dr. Bill Robertson
Extension Agronomist-Cotton

Doublecrop Soybean Production

Dealing With Wheat Residue
– Consider using short-statured wheat varieties.
– Cut wheat just below the heads to minimize straw residue for better planting.
– Uniform straw distribution can ensure better planting.
– Waiting till the dew is off can ensure that the straw is more brittle and easier to plant through.

Using the Right Planter
– Planters with fluted, bubble, ripple or smooth coulters will help with seed-to-soil contact.
– Planting at a slight angle (20 degrees) to the wheat can help with seed-to-soil contact.
– Planters with heavy cast-iron press wheels placed in a vee usually provide the best seed cover.
– Weight or proper spring tension on the press wheels may be required for firming the soil around the seed.
– Planters with 450-600 lbs of weight per row unit may be necessary to ensure proper seed depth.

Controlling Weeds
– Use of proper burndown herbicides and proper rates at spray pressures of 50 to 60 psi are encouraged for thorough weed coverage.
– Gramoxone Extra and Roundup D-Pak are two effective burndown herbicides available to the no-till producer.
– Timely postemergence herbicide applications can help reduce weed pressure in a no-till production system.

Other Management Considerations
– Use high yielding varieties.
– Adequate soil moisture is necessary for good yields
– Extension computer programs such as "SOYVA" and "Irrigation Scheduling" can be helpful in variety selection and water management.
– Research suggests that after June 15, growers should plant at row spacings of 19 inches and less.
– Increased seeding rates of 15 percent and seed treatments often help to ensure better stands.

– Dr. Lanny Ashlock,
Extension Agronomist-Soybeans
– Bill Kinkaid
Assistant Extension Specialist-Natural Resources

Additional information concerning no-till production can be obtained at **www.aragriculture.org**

on the bayou
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Conserving Water at Home

— Bill Kinkaid

Household water conservation not only saves water, it saves energy too.

HOUSEHOLD AREA	TIPS
The bathroom is the one place where the most savings in water can be made.	
Toilets	There are two basic ways to cut down on water usage at the toilet. First, do not use the toilet for things it was not meant for, such as: flushing tissue paper, gum wrappers, cigarette butts, diapers and anything else that was intended for the waste basket. Secondly, reduce the amount of water you use per flush. This can be done by placing a plastic bottle or two (filled with water) in the tank. This displaces water and cuts down on the amount you have to use to flush; however, do not displace too much water causing you to have to double flush. Reduced capacity bowls also help to save water.
Showers	Most showers pour out between 5 and 10 gallons of water per minute. Water can be saved by simply taking less time in the shower or filling the tub with less water if you are bathing.
Shaving and Tooth Brushing	Do not leave the water running while shaving or brushing your teeth, simply run just as much as you need while brushing, or fill the sink with just enough water while shaving.
While the bathroom is where a majority of water is wasted, the kitchen, laundry and faucet are also substantial contributors to water wasting.	
Kitchen	When washing dishes in a dishwasher, make sure that you have a full load of dishes. Are you the dishwasher in your household? If yes, then remember that a sink full of wash water and one of rinse water will do the job just fine. You do not have to leave the water running to wash dishes.
Laundry	Most washing machines use 40 gallons of water or more each time they run, so save up for a full load of clothes each time you wash.
Faucet	Slow drips out of a faucet can add up to15 or 20 gallons of water a day, while a 1/16-inch faucet leak can waste as much as 100 gallons a day.

Adapted from the American Water Works Association.

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