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# Reducing bacterial contamination of waterways

Use of best management practices is the key strategy for dairy producers.

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Nationally, the U.S. Environmental Protection Agency (EPA) has identified 41,173 impaired waters for not having met water quality standards. The top three causes of impairment are pathogens, metals (other than mercury), and nutrients. Frequently, livestock are targetedby EPA as a potential cause for both pathogens and nutrients in these watersheds. The following table shows the number of impaired waters during 2011 in the top 10 milk producing states.

| milk rank | state | number of impaired waters |
|---|---|---|
| 1 | California | 691 |
| 2 | Wisconsin | 593 |
| 3 | Idaho | 915 |
| 4 | New York | 528 |
| 5 | Pennsylvania | 6,957 |
| 6 | Texas | 719 |
| 7 | Minnesota | 1,144 |
| 8 | Michigan | 2,352 |
| 9 | New Mexico | 196 |
| 10 | Washington | 2,420 |

Water is a finite resource that can be significantly impaired by pollution from a variety of sources across the landscape. The source of bacteria in streams can originate from wildlife, pets, domestic animals or humans. No one person, industry, or activity is to blame, but the agricultural sector often is singled out as a major contributor. Although many think this claim is unjust, the agricultural sector can choose to regulate itself through stewardship and conservation practices, rather than having solutions determined by those who may not understand the industry.

Livestock producers must carefully consider any measures they can take to minimize watershed pollution and reduce the potential for regulation. Pollution in water bodies has led to governmental regulations in the Bosque River watershed in Texas, the Vermillion River watershed in Illinois, the Fourth Creek watershed in North Carolina, the Chesapeake Bay watershed in Delaware and many others across the country.

## Best management practices

In an effort to aid livestock producers in their efforts to minimize their industries' contributions to the bacterial load found in streams, the Texas A&M AgriLife Extension Service created the Lone Star Healthy Streams program. As part of that effort, producers are encouraged to implement best management practices (BMPs) to reduce bacterial contamination in runoff for beef cattle, dairy cattle, horses, feral hogs and poultry.

No matter where dairy producers reside, implementing voluntary conservation practices enables the industry to do its part to improve water quality. For grazing and confined dairies, BMPs can be broken down into five categories: pasture management, runoff management, riparian area protection and management, manure management and mortality management.

**Pasture Management.** The primary goal of BMPs for pasture is to maintain adequate vegetative cover on the ground to improve forage production, reduce soil erosion and enhance water conservation and protection. In addition, BMPs for vegetation can also help improve animal performance and enhance the long-term sustainability of dairy cattle production systems.

Heavy grazing pressure and high stocking rates decrease the vigor and persistence of forage plants on pastures. If cattle remove more than 50 percent of the aboveground biomass, photosynthesis is slowed, which in turn reduces root development and the amount of moisture and soil nutrients that may be taken up for plant production. The long-term results of this situation are reductions in plant vigor, density and productivity; increases in bare ground; and less-desirable or undesirable plant species, i.e. weeds. This change ultimately leads to a degradation of pasture conditions.

If stocking rate is not reduced, pasture carrying capacity will be diminished, animal performance will decrease, and the potential for profit be limited. Input costs associated with the enterprise – for increased herbicides and winter feeding, for instance – will rise, making a bad situation worse.

Pasture BMPs also include changes in the way cattle are managed and grazed. Very high stocking densities for short durations, as seen in rotational or intensive grazing management, fall into this category. When properly done, rotational grazing management insures the vigor, density and productivity of the pasture by moving animals frequently so that enough plant biomass remains for the plant to continue to thrive.

**Runoff Management.** Runoff BMPs help control the amount of water moving across the landscape. These are vital to minimizing bacterial contamination of surface water bodies and keeping watersheds healthy. When the flow of water across the landscape decreases, fewer pollutants are picked up and deposited into the water body itself.

When pastures are properly managed as described previously, the perennial ground cover

increases the amount of precipitation captured on site and decreases the amount that is lost as runoff. When pastures are overused, undesirable plant species tend to move in. These generally do not provide the type of ground cover necessary to reduce runoff and increase infiltration. As a result, much of the precipitation is lost from the site, thereby reducing forage production and minimizing recharge of underground aquifers. In clayey soils, the soil becomes compacted, which can lead to further reductions in infiltration rates and increases in overland flow.

Other common BMPs to help manage runoff include filter strips (NRCS Code 393), building location and roof runoff structures/rainwater harvesting (NRCS Codes 558 and 636), and grassed waterways. On dairies, it is particularly important to control not only water flow, but leachate that originates from silage piles and other storage. Recently, USDA-Natural Resources Conservation Service has begun additional efforts in this area, which should be a resource for producers looking to improve leachate management.

**Riparian Area Management.** Riparian areas are environmentally sensitive areas along streams and rivers that require special protection from grazing cattle. To protect them, adopt BMPs that control the amount of time animals spend in and near riparian areas. These practices range from strategies for modifying animal behavior to total exclusion from the riparian area. Locate salt and mineral supplement stations away from these areas to minimize the time animals congregate in the area. In addition, chose sites away from riparian areas for heavy use purposes such as supplemental feeding.

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Other riparian area BMPs include: shade structures (NRCS Code 717), watering facility (NRCS Code 614), exclusionary fencing (NRCS Code 382), and access control (NRCS Code 472). Exclusionary fencing that totally eliminates cattle access to streams may not be feasible, but if an alternative water source away from the stream can be provided, cattle may find it more convenient to use it rather than drinking from a stream.

**Manure Management.** Manure BMPs minimize pathogens through proper storage, handling, recycling and disposal of the nutrients excreted by a cow each day. For each 1,000 pounds of bodyweight in the lactating cow herd, approximately 80 pounds of manure per day is produced, or 12 to 14 tons each year. Thus, for each 100 cows in a Holstein herd weighing an average of 1,400 pounds per cow, between 5.5 and 6 tons of manure are produced per day, or 1,700 to 2,000 tons per year. Some of the common BMPs include: retention control structures, land application of nutrients, soil testing as part of the nutrient management plan, and composting.

**Mortality Management.** Animal mortality must be managed to protect the health of people, animals and the environment, so it is important to know your options and plan ahead. Disposing of carcasses properly reduces odors, bacterial contamination and the spread of disease. Mortality management provides the following benefits:

- Reduces pollution of groundwater and surface water.
- Minimizes odors from improperly handled carcasses.
- Reduces damage to crops and forages.
- Decreases risk of diseases spreading to animals feeding on the carcass.
- Provides contingencies for normal and catastrophic mortality events.

Large numbers of animals can die from a disease epidemic or natural disaster, but these events are rare. Thus, focus on the normal, day-to-day deaths from illness or injury that every operation must deal with on a routine basis. Several methods discussed may be applicable to the management of large-scale mortalities if scaled appropriately and conducted under the guidance and supervision of pertinent state and environmental agencies. Work with local emergency management agencies either individually or as a producer group to develop contingency plans for if and when catastrophic events occur.

Acceptable ways for managing mortality include rendering, composting, incineration, sanitary landfills and burial. Specific rules and availability vary from state-to-state, thus some of these practices may be more appropriate than others depending upon local constraints. Always remember that on-farm disposal of dead animals should be done in a manner that protects public health and safety, does not create a nuisance, minimizes the spread of disease and prevents harm to water quality. In addition, proper disposal should be completed as quickly as possible.

## Free help is available

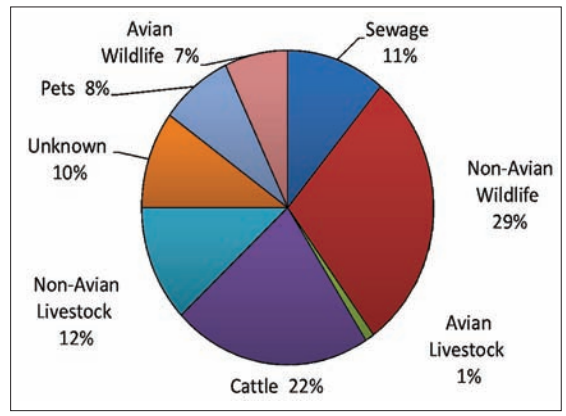
Many agencies offer free consultations on issues faced by dairy producers regarding BMPs to minimize bacterial contamination of streams, or on creating specific plans to implement that will protect the environment from bacteria and nutrients. These agencies also routinely conduct free seminars and short courses on current information and management practices in agriculture. Here in Texas, for example, these agencies include local Soil and Water Conservation Districts, the Texas State Soil and Water Conservation Board, and the Texas AgriLife Extension Service. Most of these agencies have counterparts in the other states and nationally, the USDA-Natural Resources Conservation Service (NRCS) is available. All of these agencies strive to help landowners and managers improve and protect their soil, water, and other natural resources.

In addition, financial assistance is available to implement some of these practices through the following programs from the Natural Resources Conservation Service (NRCS): Environmental Quality Incentives Program (EQIP); Wildlife Habitat Incentives Program (WHIP); Grassland Reserve Program/Wetland Reserve Program; and the Conservation Security Program. The USDA Farm Service Agency (FSA) can also be involved through the Conservation Reserve Program, Conservation Reserve Enhancement Program, and Source Water Protection Program.

## How do we measure progress?

One potential method is the use of bacterial source tracking. By using this method studies have been done in certain watersheds to try to pinpoint specific sources of bacteria. In this process investigators try to match a microbe from a polluted site and an animal source to suggest the origin of fecal pollution.

At present, bacterial source tracking can reliably determine if fecal bacteria are from human or animal sources. If the bacteria are from animal sources, bacterial source tracking can also tell if the animals are livestock or wildlife. The procedures are being fine-tuned so that what type of livestock and what type of wildlife can be determined as well.




The problem is that bacterial source tracking is very expensive and its reliability has been called into question. For example, if samples are collected immediately under a bridge where wild birds roost, the percent that is attributable to avian wildlife may be inflated. Although the site may have been convenient due to its accessibility, the numbers don't reflect the watershed. Thus, it is critical that sites be carefully chosen. Another issue is that so far investigations do not differentiate between bacteria that comes fromdairy and beef cattle. If the money is available it is a good place to start, however. The data can provide a baseline for future comparisons once BMPs have been implemented.

One example of a bacterial source tracking study comes from the Peach Creek Watershed, near Gonzales, TX. As illustrated in the figure above, 29 percent of bacteria came from non-avian wildlife (animals like skunks, raccoons, armadillos, etc.) and 22 percent came from cattle. Note that human sewage contributed 11 percent and pets 8 percent at this particular location.

### Conclusion:

If not handled properly, livestock can contribute bacteria to water bodies and cause contamination of waterways. However, best management practices do exist to help prevent bacterial contamination of water resources. Know your options and decide which practices to implement for your individual situation. Improving our BMPs in the areas of pasture management, runoff management, riparian area protection and management, manure management, and mortality management can minimize dairies' impact on the environment.

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