ONE HORSE OR A HUNDRED

Equine Program

WO 1020 (No. 3 in Series)

MSUE Equine AoE Team

3 Manure and Water Don't Mix

By Jane Herbert, MSUE District Water Quality Agent

What's the big deal about horse manure? Why are our neighbors so concerned about the manure from our horses getting into surface waters and groundwater? There are several reasons why *manure and water don't mix.*

Because they spend so much time around it, horse owners may not consider that horse manure contains pollutants and, under the right circumstances, can pose a threat to humans and the environment. A source of nutrients such as nitrogen and phosphorus, horse manure may also contain pathogens (including *E. coli*) that can be hazardous to human health. When manure is not managed properly, these contaminants can make their way into our water and cause problems.

Groundwater: Most rural Michiganians get their drinking water from groundwater wells. Light-textured soils make these drinking water supplies vulnerable to contaminant leaching. Excess nitrogen (nitrogen not used by plants) enters groundwater as *nitrates*, which have been linked to health problems in infants and the elderly. Horse manure that is piled up and left indefinitely or spread too heavily can leach nitrates to drinking water. Additionally, manure that washes overland and comes into contact with drinking water wells (Figure 1) can leach down around well casings, transporting both nitrates and pathogens to groundwater.

Surface water: The flip side of the groundwater issue is manure entering surface waterways, including lakes, streams, ponds, drains, ditches and wetlands. Horse access to waterways should be controlled to prevent damage to stream banks and shorelines. Hoof traffic compacts the soil, disturbs vegetation, and increases erosion and runoff. Restricting access also reduces the opportunity for "direct deposit events" (Figure 2).

The primary concerns about manure runoff are phosphorus loading, dissolved oxygen (DO) levels and increases in biochemical oxygen demand (BOD). We'll explore these one at a time.

Figure 1. Horse lot within the 50-foot recommended isolation distance from well.

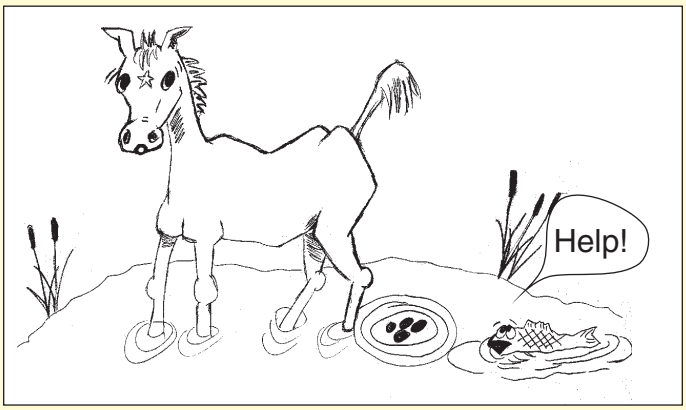

Figure 2. A direct deposit event.

MICHIGAN STATE UNIVERSITY EXTENSION

One horse or a hundred

- **Phosphorus** — This naturally occurring element is the limiting factor for aquatic plant growth. That means that, in healthy aquatic ecosystems, this natural plant food is present in very small amounts, limiting plant and algae growth. When excess phosphorus enters the system, it can quickly cause overgrowth. This can lead to nuisance plant communities that reduce the recreational and aesthetic value of the waterway and put stress on aquatic ecosystems (see below). The main sources of phosphorus loading from horse operations are manure runoff and soil erosion. Phosphorus chemically binds to soil particles — when soil moves, so does phosphorus.
- **Dissolved oxygen** — Fish and other aquatic critters need certain levels of dissolved oxygen (DO) in the water to breathe. Some fish, such as trout and salmon, require higher DO levels than others, such as carp and catfish. During the day, aquatic plants and algae undergo photosynthesis and generate dissolved oxygen. Problems start at night, when these same plants undergo respiration and take up oxygen, lowering DO levels. Nuisance plant and algae overgrowth can create major fluctuations in DO, stressing and even killing fish (Figure 3).

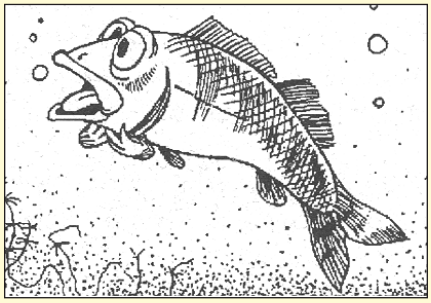

Figure 3. Fish stress due to reduced DO levels.
(Image source: Michigan Department of Environmental Quality)

- **Biochemical oxygen demand** — Naturally occurring aerobic bacteria act as waterway scavengers, constantly breaking down waste and organic matter in the water. But when a large and sudden amount of organic matter enters surface water, it can cause sharp increases in biochemical oxygen demand. This means that when manure, bedding and/or horse feed enter a pond, lake or stream, these scavenger bacteria multiply very rapidly to clean up the mess. Their need, or demand, for oxygen also increases rapidly, and suddenly the bacteria are competing with fish for oxygen. If the bacteria win, the result can be a quick and extensive fish kill.

By now, you may be saying, "OK! Enough with the science lesson! How do I know if I'm doing a good job managing my horse manure? If I'm not, what kinds of changes should I make?"

Stay tuned to the *One Horse or a Hundred* series. Future articles will contain useful information on managing horse manure to protect the environment *and* keep your neighbors happy.

For more information and materials online, visit these Web sites:
www.emdc.msue.msu.edu
www.msue.msu.edu/aoe/equine/