

## ***AGRICULTURE***

Farm and ranch operations have played an important role in the Plum Creek Watershed (Figures 6.10 and 6.11). Although urbanization has drastically changed upstream reaches of the landscape, much of the watershed remains dominated by agricultural land use, particularly in those parts of Caldwell County not affected by the growth of Lockhart. Production of various classes of livestock, as well as row and forage crops is significant.



Figure 6.10. Orchard in southern Caldwell County. Crop production remains a common activity in the watershed.

## **Livestock**

Plum Creek Watershed residents have long relied on livestock production for food and income. Land use analysis indicated that rangeland and pasture make up more than half of the land use in the watershed. Most of this area is devoted to grazing by domestic animals, including sheep, goats, horses, and cattle.



Figure 6.11. Cattle graze in western central Caldwell County.

Sheep and Goats

While overall numbers in the watershed are not large, goats and sheep are often found in high concentrations in areas where they are present. The waste from these animals represents a source of both bacteria and nutrients. Proper grazing management is necessary to reduce the loss of plant cover, which can increase runoff and erosion of topsoil. In addition, direct access to riparian areas and streams increases potential contributions of both pollutants.

The USDA National Agricultural Statistics Service estimated that there were 1,100 sheep and goats in the Plum Creek Watershed in 2002. Although these numbers most certainly change among and even within years, the overall trend has been stable in the last several years. As a result, the Agricultural Nonpoint Source work group determined to use the 2002 estimate in the SELECT analysis. Results of the analysis indicate that these animals are most likely located primarily in the northern reaches of Plum Creek, on and near the base of the Edwards Plateau (Figure 6.12).

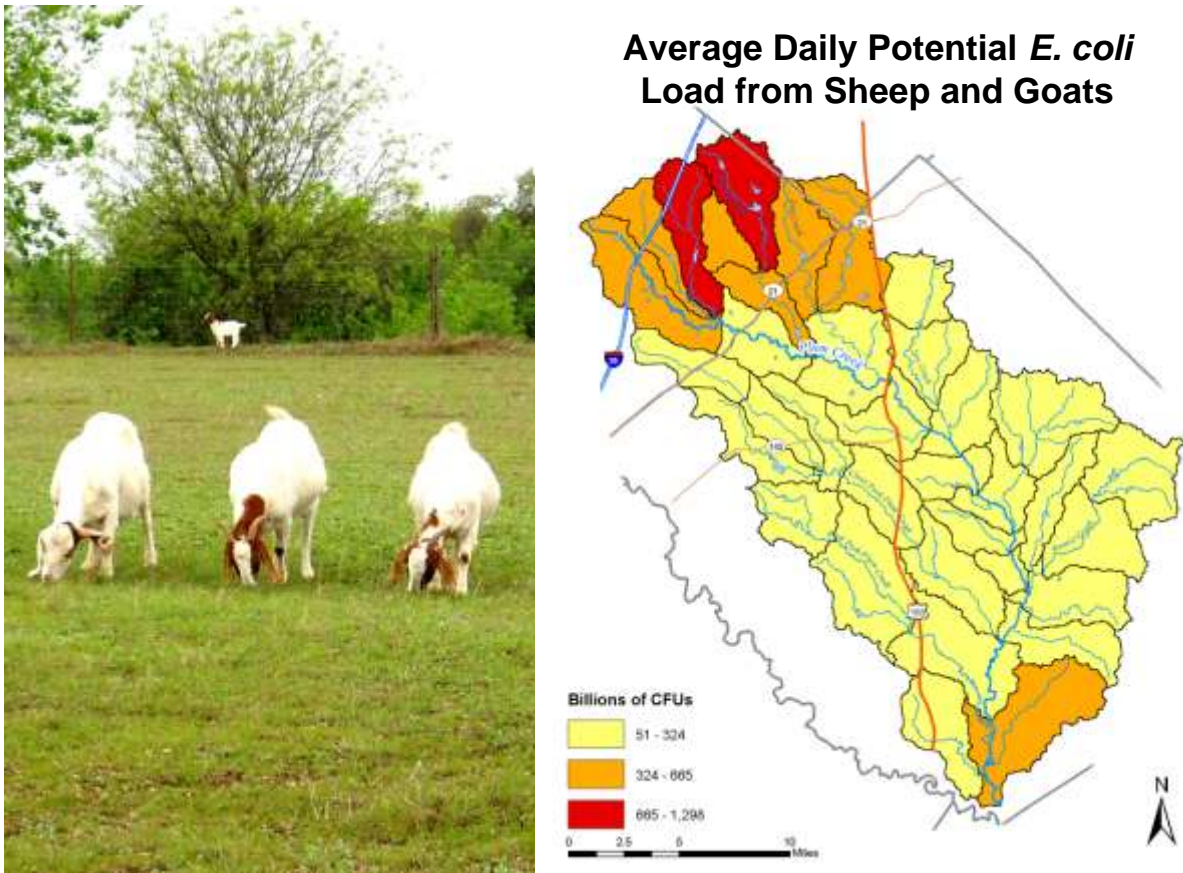


Figure 6.12. Sheep and goat production occur throughout the Plum Creek Watershed but are mostly concentrated in the northern area.

Horses

Horses are grazed in the Plum Creek Watershed, though at much lower densities than other livestock. Most horse owners in the watershed have small numbers of animals, as compared to other types of livestock operations. Nevertheless, the waste from these animals has the potential to contribute both bacteria and nutrients, particularly if pastures or confinement areas are located near drainage areas or the animals are allowed direct access to stream and riparian zones. The Agricultural Nonpoint Source work group recommended utilizing the Texas Agricultural Statistics Service county estimates for 2002 in the SELECT analysis. From the portion of Caldwell, Hays, and Travis Counties lying in the watershed, there are approximately 900 horses in the watershed. Based on land use and census data, these animals are likely more dispersed across undeveloped areas of the entire watershed as opposed to being concentrated in only a few subwatersheds (Figure 6.13).

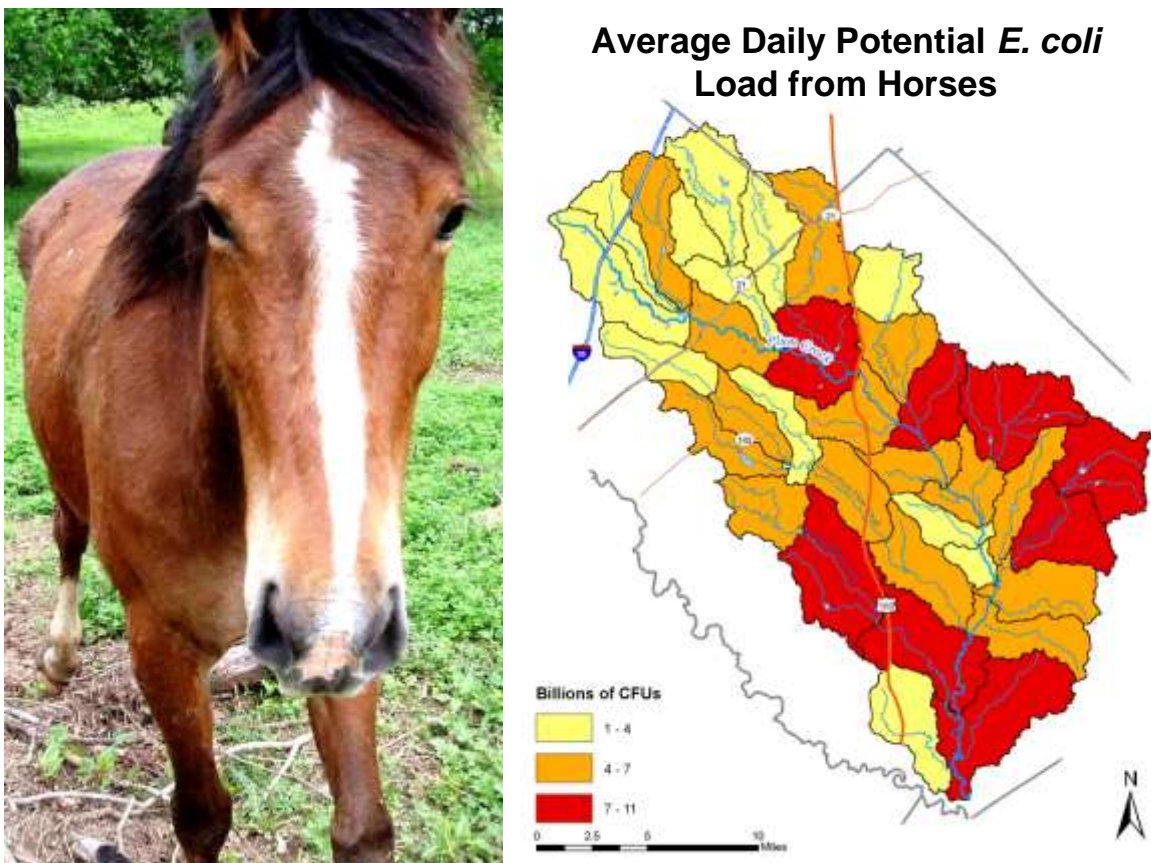


Figure 6.13. Horses are not found in numbers as high as other livestock in the watershed but are scattered throughout pastures and rangelands in southern portions of the watershed.

Cattle

Like other animals, urine and feces from cattle represent sources of both nutrients and bacteria. These pollutants can be transported to streams during runoff events following rainfall. The potential for impact increases where animals are grazed or confined near streams or drainage areas, or when they are permitted direct access to stream and riparian corridors.

The Agricultural Nonpoint Source work group utilized the 2002 Texas Agricultural Statistics Service estimate for cattle in Hays and Caldwell Counties in the SELECT analysis. Although periodic dry weather conditions have resulted in significant fluctuations in animal numbers in the watershed, average total head estimates have remained relatively constant over the last several years. Based on the portions of Caldwell and Hays Counties within the Plum Creek Watershed, there are an estimated 33,000 cattle in the watershed. There are no concentrated cattle feeding operations, such as feedlots or dairies, in the watershed. Most animals are grazed on pasture and rangelands in both upland and bottomland areas. The SELECT analysis indicated that cattle are most likely distributed primarily in the eastern and southern portions of the Plum Creek Watershed (Figure 6.14), outside of areas that have experienced significant urbanization.

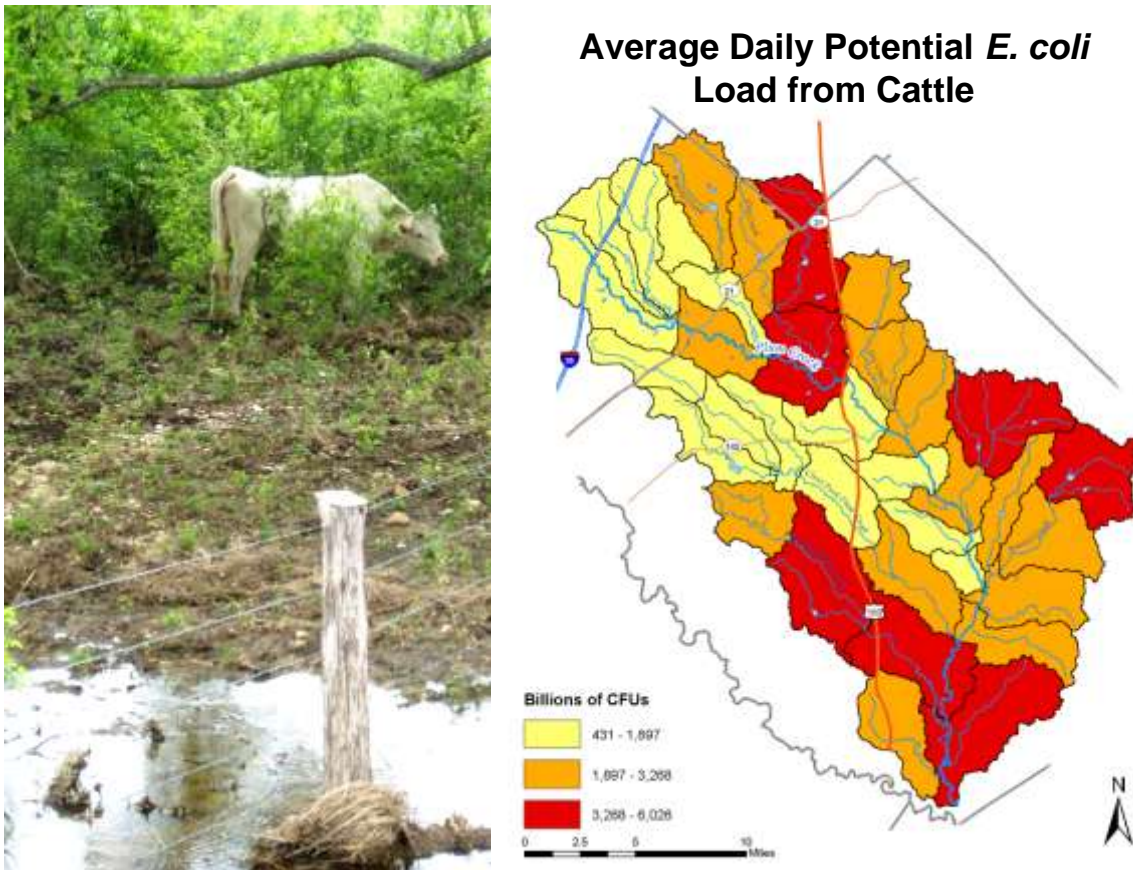


Figure 6.14. Beef cattle represent the primary class of livestock in the watershed and are common throughout rural areas on a variety of land use types. Estimated numbers and potential *E. coli* contributions are highest in southern and eastern areas of the watershed.

### Other Livestock

There is one concentrated animal feeding operation in the southeastern portion of the Plum Creek Watershed. Harwood Farm is located in the Copperas Creek drainage northeast of Luling (Figure 6.15). This facility is an egg laying operation with approximately 1 million chickens and is managed by Cal-Maine Foods, Inc. under a general permit with the TCEQ through the TPDES. As part of the permit, the facility must operate according to a nutrient management plan filed with the TCEQ. Flush water used in production is retained on site, and solids are removed from the facility every 2 months. Currently, the facility does not apply manure on site. However, a portion of liquid waste is offered to landowners for application as fertilizer on nearby pasturelands.



Figure 6.15. Harwood Farm in the eastern portion of the watershed.

### **Row Crops**

Row crops do not typically represent a significant source of bacteria to a watershed but may have the potential to contribute high levels of nutrients. Fertilizers used in crop production can be carried downstream in runoff generated by rainfall events and irrigation. This overland flow can potentially allow high concentrations of nutrients to reach a stream and affect water quality if effective management practices are not used.

Areas in the western and central part of the Plum Creek Watershed along the Clear Fork drainage are largely devoted to production of row crops, including corn, sorghum, wheat, and cotton. Some row crop production still occurs in Hays County, but this is slowly declining as agricultural land undergoes development. In the 2006 assessment, nutrient concerns for orthophosphorus and total phosphorus existed from near State Highway 21 to 2.5 miles upstream of the confluence of Clear Fork Plum Creek with the mainstem of Plum Creek. As previously mentioned, the stream was also listed as having nitrate concerns for the entire length of the segment to the San Marcos River. Nutrients from crop production, among other sources, may contribute to high levels of these nutrients.

## **WILDLIFE**

In many watersheds across the country, *E. coli* input from wildlife contributes a large portion of the total stream bacteria load. Wildlife also can be a significant source of nutrients. This is particularly true where populations of riparian animals (raccoon, beaver, and waterfowl) are high. In some cases, bacteria from wildlife alone cause violations of water quality standards.

An assessment of watersheds within central Texas by the TCEQ included examination of bacteria sources in Peach Creek, a watershed adjacent to Plum Creek. Non-avian wildlife (wildlife other than birds) was responsible for almost 30% of the bacteria loading in that watershed (Di Giovanni and Casarez 2006). The non-avian wildlife component includes animals such as raccoons, coyotes, deer, and other mammals. However, information on the abundance and contribution of most animal species is very limited. It is hoped that future studies will shed light on the impacts different species have on water quality in different habitats. In some watersheds, large lakes or reservoirs attract large populations of waterfowl, which can contribute to bacteria loads. However, there are no large reservoirs to attract permanent waterfowl populations in the Plum Creek Watershed and no known large bird colonies in the area contributing to bacteria loads.

### **Deer**

Due to their numbers, white-tailed deer are a significant potential contributor to wildlife bacteria loads in some portions of central Texas. In addition, urine and feces from deer also contribute to nutrient loading. While deer densities are particularly high in areas of the Edwards Plateau to the north and west, much of the potential deer habitat near the Plum Creek headwaters has experienced rapid urban development, and southern portions of the watershed are less suitable for deer habitat. This lack of habitat results in low deer populations in the Plum Creek Watershed. Until recently, TPWD conducted deer surveys in this region, but the predominant habitat type yielded such low counts that resources were shifted elsewhere in the state. The Water Quality and Habitat work group used current density data derived from a 2005 TPWD study (Lockwood 2005) for individual resource management units to estimate that there are approximately 2,000 deer in the Plum Creek Watershed. Because most of these animals are located in the rural and more heavily wooded southern portions of the watershed, the SELECT analysis indicates that these areas have the greatest potential for contributions of bacteria and nutrients by deer (Figure 6.16).

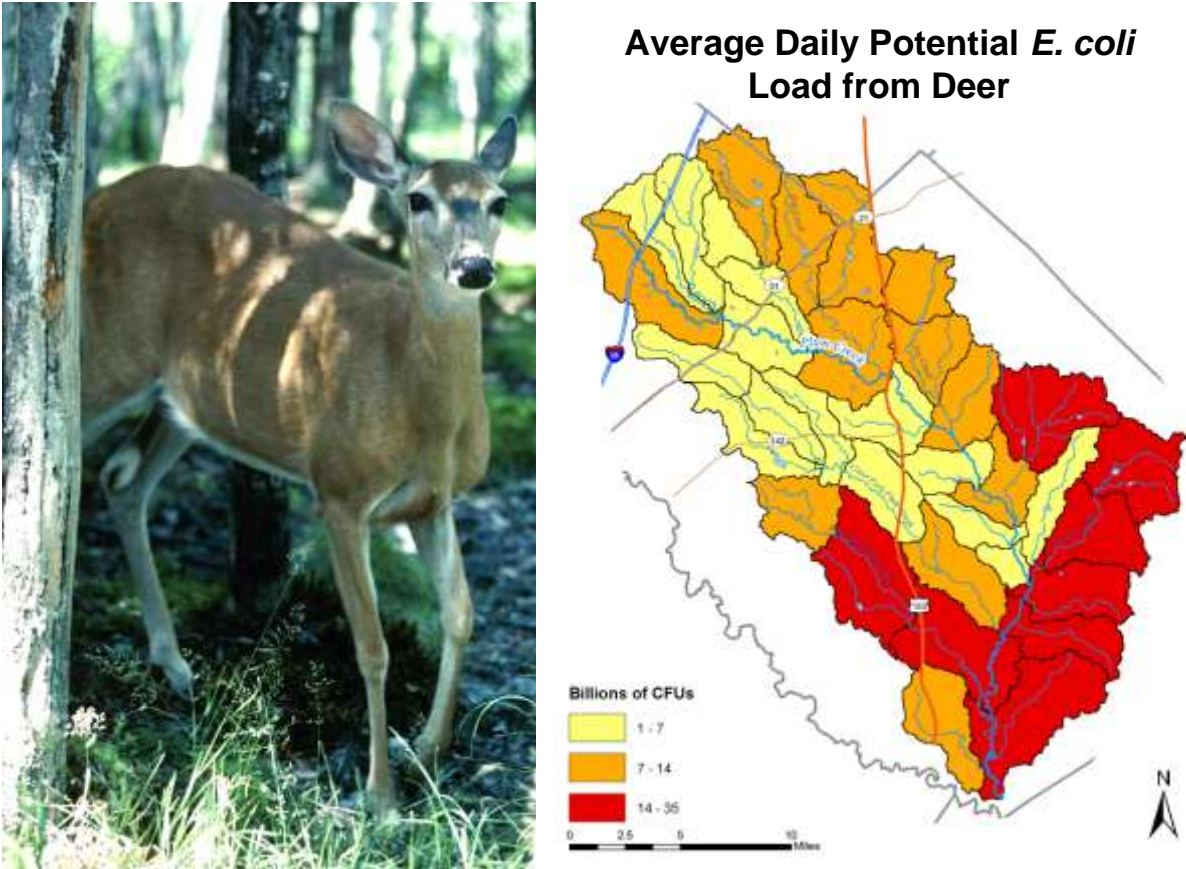


Figure 6.16. White-tailed deer densities and potential *E. coli* loads are highest in rural areas with ideal habitat, including abundant vegetation and water sources. Photo courtesy of © 2007 JupiterImages Corporation.

## Feral Hogs

In many watersheds across the state and much of the southern United States, feral hogs are a growing concern. A high rate of reproduction and preference for secluded habitats along streams make high numbers of hogs concentrated in small riparian areas a potential threat to water quality. In addition, extensive rooting activities of groups of feral hogs can cause extreme erosion and soil loss, and herbivory of planted crops can cause significant economic impacts in areas with high numbers of animals. Hogs are often quite secretive, and little solid data exists on their abundance and distribution, which is compounded by their high rate of reproduction and tendency to move in groups along waterways over large areas of a watershed in search of food.

Though density and distribution data are scarce, studies in comparable habitats indicate hogs typically occur in various bottomland habitats at densities of nearly 30 hogs/mile<sup>2</sup> (Tate 1984 and Hone 1990). Particularly in periods of low flow and drought, hogs will congregate around water sources to drink and wallow and in the process deposit a portion of their waste directly in the stream. As a result, feral hogs can contribute both bacteria and nutrients as a nonpoint source and also through direct deposition, depending on their location and stream conditions.

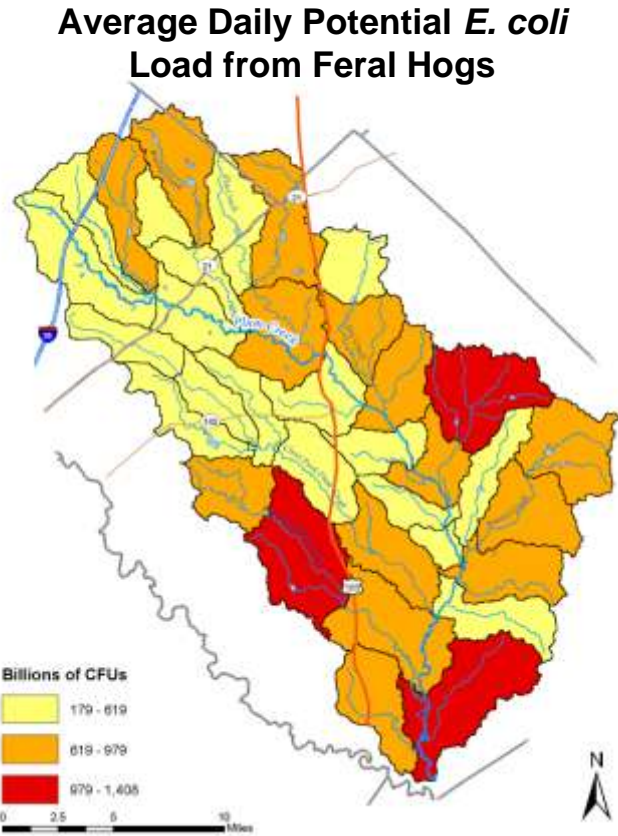


Figure 6.17. Feral hogs are concentrated in areas with perennial water sources and dense vegetation types, and numbers appear to be increasing in the Plum Creek Watershed. Photo courtesy of USDA-NRCS.

As with all other animals, urine and feces from feral hogs contribute to potential loadings of both bacteria and nutrients in the watershed. Landowner observations and general road surveys indicate significant hog activity in the watershed, particularly along Plum Creek and its tributaries. However, because no specific data exist for Plum Creek, the Water Quality and Habitat work group estimated hog numbers using the average of the reported range, or approximately 12 hogs/mile<sup>2</sup>. Based on this estimate, there are as many as 5,000 feral hogs in the Plum Creek Watershed. Because hogs tend to prefer riparian corridors, their distribution was focused in those areas by limiting the land use to zones in closer proximity to creeks and water impoundments for the SELECT analysis. As a result, analysis indicates that while feral hogs are located throughout the watershed, the primary areas of potential impact are in central and southern portions of the Plum Creek Watershed which have numerous water sources and large areas of undeveloped land (Figure 6.17).



## ***OIL AND GAS PRODUCTION***

Production of natural gas and petroleum continues in the Plum Creek Watershed. While some cases of hydrocarbon and saltwater release have been reported in the past, there are currently no known pollution problems associated with these activities (GBRA and UGRA 2003). However, continued monitoring for leakage of brine and other waste products is warranted, as the potential exists for some small-scale contamination by old and abandoned wells in the area. Though oil activities were not assessed in SELECT since these wells do not contribute to the *E. coli* load, they may be a source of nitrogen compounds, salts, and hydrocarbons (petroleum byproducts).

## ***OTHER ISSUES***

Though not regulated as a water quality **pollutant**, trash and solid waste are major problems in portions of the watershed (Figure 6.19). Home appliances, large quantities of old tires, and other items are found at many stream crossings, particularly along less frequently used rural roads. Smaller pieces of trash are swept downstream, and even large objects can be moved during floods. This is a significant issue in some areas, where much of the stream channel is filled with debris. Accumulation of trash can alter streamflow, adding to flood concerns, and contributing to further pollution of the stream. In areas where illegal dumping is a problem, a great deal of effort is necessary to clean up existing trash and prevent further dumping. Sites with trash often receive additional dumping when there appear to be no consequences or control measures in place.



Figure 6.19. Debris at a stream crossing in Caldwell County. Trash is a major issue along stream crossings in rural areas of the watershed.