Experimental design

The study was conducted in three watersheds ranging in size from 1.4 to 4.4 ha established during 1989-1997 at the University of Missouri, Memorial Research Center, University of Missouri, Columbia, MO 65201. Each of the three watersheds was divided into five main land use positions: toe slope (E1), summit (E2), contour (E3), back slope (E4), and foot slope (E5). The toe slope (E1) is the area where rainfall is captured before it reaches the collecting system and is therefore the area with the highest water content. The summit (E2) is the area with the lowest water content. The contour (E3) is the area where rainfall is distributed evenly across the landscape. The back slope (E4) is the area where rainfall is collected from the toe slope and summit areas. The foot slope (E5) is the area where rainfall is collected from the toe slope, summit, and contour areas.

MATERIALS AND METHODS

Soil microbial activities were measured in the vegetative contour buffer can be mainly attributed to the increased nutrient availability provided by the vegetative cover. Microbial activities within top 25 cm soils were significantly higher in both grass strip and agroforestry treatments. The less pronounced trends in microbial activities at the landscape-scale suggests that heterogeneity of the topographical features may play a significant role in controlling microbial activities at the landscape-scale.

**CONCLUSIONS**

- Contour vegetative buffers implemented along the landscape showed significantly degraded herbicides by enhanced microbial activities compared to the original control treatment. This treatment was more important to enhance microbial activities than landscape practice for these small-scale systems.

- The incorporation of wood chips in the contour buffer system may reduce potential herbicide loss. Such practice could further enhance the potential for degrading herbicides in the riparian zone. Furthermore, it is critical to target and regulate the contour buffer and management so that water quality and nutrient transport to downstream receiving waters can be achieved.

- Microbial parameters widely used for assessment of soil quality, e.g., dehydrogenase and glucosidase activities, may not be useful for evaluating the overall bioremediation potential of various vegetative buffer designs.

**ABSTRACT**

The efficiency of vegetative buffer strips is important for reducing herbicide leaching to surface waters. A buffer strip design should buffer herbicides released into surface run-off and subsequent leaching to surface water bodies and sediments. Experimental studies were arranged in a split-plot design with three treatments and a factorial combination of three land use positions (E1, E2, E3), and herbicide treatments with five landscape positions (contour, shoulder slope, back slope, head slope, and toe slope). Land use treatments included: control, grass buffer strip, and agroforestry buffer strip (Figure 1). Each of the three watersheds was divided into five main land use positions: toe slope (E1), summit (E2), contour (E3), back slope (E4), and foot slope (E5). The toe slope (E1) is the area where rainfall is captured before it reaches the collecting system and is therefore the area with the highest water content. The summit (E2) is the area with the lowest water content. The contour (E3) is the area where rainfall is distributed evenly across the landscape. The back slope (E4) is the area where rainfall is collected from the toe slope, summit, and contour areas. The foot slope (E5) is the area where rainfall is collected from the toe slope, summit, and contour areas.

**RESULTS AND DISCUSSIONS**

- Enhanced microbial enzyme activities measured in the vegetative contour buffer can be mainly attributed to the increased nutrient availability provided by the vegetative cover. Microbial activities within top 25 cm soils were significantly higher in both grass strip and agroforestry treatments. The less pronounced trends in microbial activities at the landscape-scale suggests that heterogeneity of the topographical features may play a significant role in controlling microbial activities at the landscape-scale.

- **CONCLUSIONS**

  - Contour vegetative buffers implemented along the landscape showed significantly degraded herbicides by enhanced microbial activities compared to the original control treatment. This treatment was more important to enhance microbial activities than landscape practice for these small-scale systems.

  - The incorporation of wood chips in the contour buffer system may reduce potential herbicide loss. Such practice could further enhance the potential for degrading herbicides in the riparian zone. Furthermore, it is critical to target and regulate the contour buffer and management so that water quality and nutrient transport to downstream receiving waters can be achieved.

  - Microbial parameters widely used for assessment of soil quality, e.g., dehydrogenase and glucosidase activities, may not be useful for evaluating the overall bioremediation potential of various vegetative buffer designs.