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PROTECT STREAMBANKS WITH TREES

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Streambank erosion is a natural adjustment process of rivers, but lateral bank movement can be controlled. Retaining the natural woodlands along our streams and rivers will protect the banks. Lowland sites are often the best areas for growing cultivated crops as well as forest products. Cropping right up to the bank is tempting because of the high yields, but one good-sized flood can cause untold damage with a great loss of land for future production.

Variation of stream discharge appears to occur in about 15- to 20-year cycles. The flood of 1993 (500 year) was of historic proportions, but a similar flow occurred in the early 1950's. Stream flow in central Kansas was 4.5 times the historical yearly averages (Figure 1). Because of this variation, streambank losses usually are not recognized until a major high-water event happens.

This study was undertaken to evaluate the influence of natural woodland vegetation on lateral streambank erosion/deposition following the 1993 flood.

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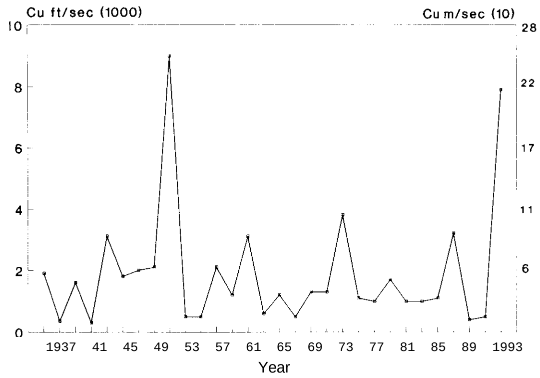

Figure 1. Historical mean discharge of the Kansas River at the beginning point of the study area.

Procedures

Study Area. The study area was in the Kansas River Basin, which covers about 60,000 sq miles in three states. The specific zone of study was a 40-mile portion near Manhattan, Kansas (Figure 2). The woody vegetation along the river consists of many tree species, including cottonwood *(Populus deltoides)*, silver maple *(Acer saccharinum)*, willow species *(Salix* sp.), hackberry *(Celtis occidentalis)*, sycamore *(Platanus occidentalis)*, and elm species *(Ulmus sp.)*

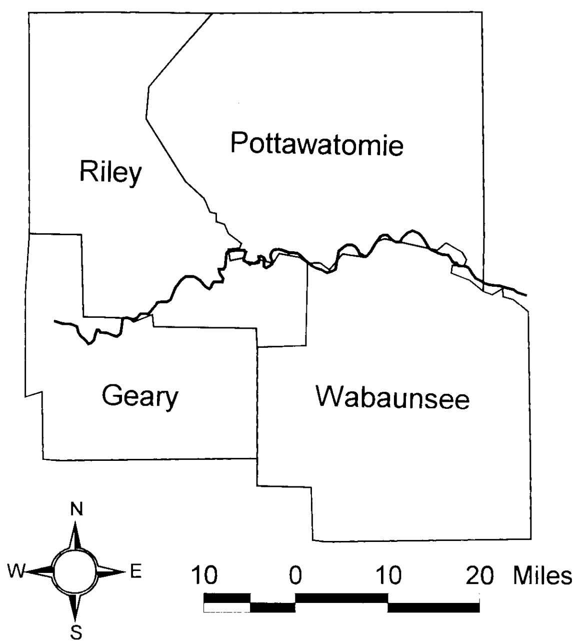

Figure 2. Diagram of the river study area.

Tools of Investigation. Aerial photographic images were chosen to compare pre- and postflood streambanks (slides were taken in December 1992 and December 1993), using easily identified features such as riparian vegetation and streambank edge. Local offices of the Consolidated Farm Service Agency provided slide images of the study area.

Data Collection Process. Photocopies of the slides were transferred with a CalCompl digitizing tablet into a LandCADDI R12 computer-aided drawing (CAD) program file. The photocopies were calibrated to previously digitized, USGS, 7.5 minute, topographical, quadrangle maps to enable accurate scaling and analysis of the images. Only features useful in calibrating slide images, such as roads, railroad tracks, and mile section lines, were digitized from the quadrangle maps.

Once the base maps were digitized, streambank edges from the 1992 and 1993 slide images of the Kansas River were digitized. Notes as to land-cover condition were made within the drawing as needed. Then a river centerline was interpolated within the CAD drawing using the 1992 streambanks as a guide. The centerline served as a reference for river position and demarcation and land-cover classification.

Data collection points were established at regular 500-foot intervals along the centerline in the study area. At these points, land cover was classified using the 1992 aerial photographs as references. Erosion and deposition amounts were estimated by measuring the perpendicular distance from the 1992 streambank to the 1993 streambank at data collection points.

Land-cover vegetative types in the 100-ft zone next to the 1992 streambank were categorized as: forest land, cropland, grassland, or single tree-row. A forested streambank is one on which the dominant land-cover type (>51%) is woody vegetation. A cropland or grassland streambank is one on which the dominant land-cover type is either agricultural crops or grass. Finally, a single tree-row streambank is one on which a single row of trees exists adjacent to a nonforest land-cover type.

Vegetation data were collected for both the left and right side streambanks at every data collection point and inserted into the CAD program. Data from each side of the river were pooled.

Results and Discussion

Data were collected from a total of 204 (103 right side and 101 left side) streambank points. These data points were classified as follows: 96 points as forest land, 37 as cropland, 47 as grassland, and 24 as single-tree row. Thus, 59% of the banks were tree lined.

About 62% of the banks had sandy soils, and 38% had loamy soils. The streams generally were of two types, meandering (63%) and relatively shallow and braided (37%). Many of the streambanks were entrenched.

Land-cover vegetation significantly (1% level) affected the amount of erosion of the lateral streambank (Figure 3). Both forest and the single tree-row vegetation types collected soil, with mean depositions of 10 ft and 4 ft, respectively, which were not significantly different, whereas grassland lost an average of 78 ft, and cropland lost an average of 150 ft. The surface acreage of the lost land was considered for each mile of stream erosion: 9.4 acres for grassland and 18.2 acres for cultivated land. The latter is equivalent to about 1/4 section of land for every 10 miles of stream distance in this study.

These results showed that woody vegetation is highly effective in protecting streambanks. Water movement is slowed by the standing trees, thus reducing the energy available for erosion and allowing deposition of suspended materials. Greater rooting depth, larger and stronger roots, and perhaps greater rooting density also stabilize the soil mantle.

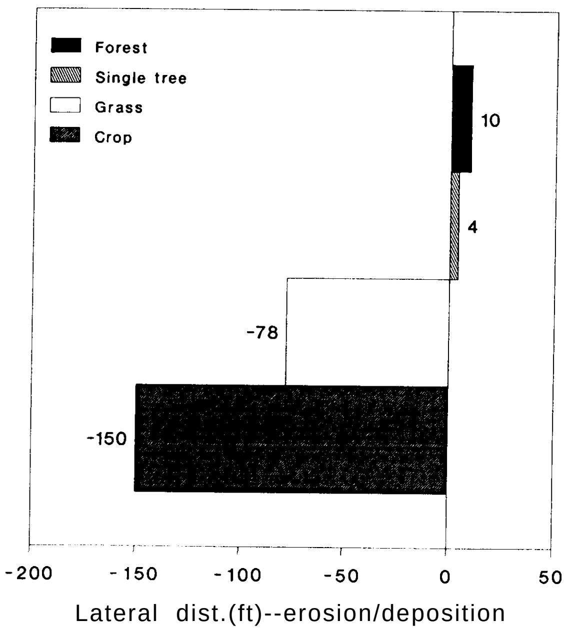

Figure 3. Lateral movement of streambank by land-cover type.

Conclusions

Trees have a highly beneficial effect in protecting streambanks against erosion during large floods. Tree cover reduced the extent of streambank erosion caused by the extreme flood of 1993 on the Kansas River. Forested areas on both sides of the river sustained less erosion than those reaches that had no woody vegetation cover. Natural stands of timber are best left standing to protect the riparian ecosystem, affording greater bank stability and water quality and reducing downstream sedimentation (Figure 4). Cultivating land next to the stream bank should be avoided because of the large acreage loss during high water events, which occur frequently in central Kansas.

Figure 4. Natural woody vegetation should be left to protect streambanks.