FORCE & RESISTANCE

Ruin, Recovery in the Mississippi Watershed

By G. Tracy Mehan III

My vocabulary is not adequate to describe my shock at the destruction observed. There was the dissection and destruction of level river terrace land by gullies…sheet erosion of the sloping to rolling fields made conspicuous by rilling; stream bank cutting, the filling of bridges with sediment…and the burying of roads near the foot of bluffs.

—Otto R. Zeasman, agronomist at the University of Wisconsin Extension Service (1922)

The settlers coming into the Hill Country of southwestern Wisconsin in the early 19th century were overwhelmed by the beauty and fecundity of the landscape. Stanley W. Trimble describes it as "a sort of rural paradise, an Arcadia in America" in his monumental history of environmental devastation and renewal, *Historical Agriculture and Soil Erosion in the Upper Mississippi Valley Hill Country*. Here natives of New England and northern Europe found beautiful valleys with cold, clear, flowing springs with ample brook trout outside the front door of their farm houses. Prairie soils were rich and fertile. All was well for six or seven decades.

Things began to change for the worse. The springs eventually dried up but then filled with raging waters with even a moderate rainstorm, bringing with it "torrents of mud, sand, and boulders, all threatening your house and farmstead. Of course, the brook trout are long gone."

On larger streams and in the floodplain, floodwaters destroyed crops and fences, undermining the fertility of the fields, swamping pastures, decreasing farm income, and often driving farmers off their land.

Roadways and railroad lines were closed, often ripped away or buried. Bridges were demolished, along with telephone and power lines. This damage to infrastructure strained modest county budgets. "In a real sense," writes UCLA professor Trimble, "the landscape was truly out of control."

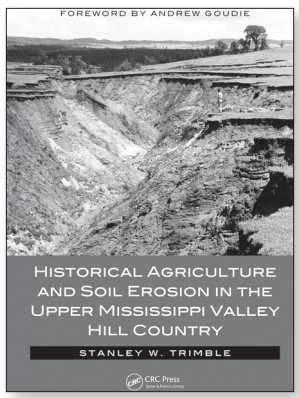
The village of Freeburg, Minnesota, Houston County, or rather the remains of it, were once perched on Crooked Creek, a direct tributary of the Mississippi River. Originally, it was located on a high terrace about 25 feet above the flood plain in the mid-1880s. By 1929 an average of 15 feet of sediment covered the floodplain, which would suggest that the village was only about 10 feet higher. Only three or four buildings remain of this disappearing village. The "most well-known example of a buried village" was Beaver, Minnesota, where sedimentation in its valley and increased flood discharges resulted in its being flooded 27 times in 1938 alone.

The Upper Mississippi River Hill Country, termed the Northern Mississippi Valley Loess Hills by the U.S. Department of Agriculture, covers, not just the Driftless Area of Wisconsin, but also an area from Hastings, Minnesota, downriver past Dubuque, Iowa, "One of the most beautiful landscapes in the world," according to Trimble, a judgment with which this reviewer, a son of the Midwest, concurs.

The watershed also includes Jo Daviess and Carroll Counties in Illinois, the latter containing the old lead mining town of Galena, one of the places U.S. Grant once called home. It is "an island of hilly country, largely unglaciated, surrounded by a sea of gently rolling landscape, all glaciated." The disaster which manifested itself in the early 20th century was "on the scale of huge hurricane, a tsunami, or an earthquake — but instead of one huge event, it occurred in increasingly severe increments — a disaster in slow motion."

Trimble, while not flinching from telling this "sad and often tragic story," also wants to relate a story of the "fall and recovery of paradise," which is an "almost miraculous and mostly happy story." This is a book of solid science but also the best kind of environmental history describing the interaction of human beings with their landscapes.

Trimble brings to this narrative 39 years of field work in this and other regions of the United States and draws on 80 years of data in the process. While reading his description of the arduous field work to survey and re-survey floodplains, terraces, slopes, and soil movement, usually in the hot, humid, buggy summer, often up to his waist in water most of the day, I gave thanks



Historical Agriculture and Soil Erosion in the Upper Mississippi Valley Hill Country, by Stanley W. Trimble. CRC Press Taylor & Francis Group; 242 pages; $89.95.

for my law degree and recalled former Senator Bob Dole's line on why he ran for vice president with Gerald Ford in 1976: "Well, it's indoor work and there's no heavy lifting."

A remarkable feature of this definitive study is the ample archival photographs showing, before and after, the decimated landscapes, moonscapes really, and their restoration, say, through contour farming and the cessation of grazing on hillsides and slopes and their subsequent re-vegetation. These shots, along with Trimble's generous quotations of journals and other eyewitness accounts, give a depth and granularity to the story which enlivens his narrative.

Stanley Trimble also provides a basic introduction, along with a marvelous glossary, which will allow the non-specialist to understand and appreciate the nature of the problem and the ultimate solution pioneered by committed scientists at the USDA and various universities. Forces such as rainfall and gravity act upon the landscape. They face resistance from the strength of soil or rock or vegetation, with its extensive root system, which can also protect the soil from raindrops, slow the flow of water, allow for more infiltration, and enhance it with organic material. Thus, "If resistance is as great as the force, no change takes place," notes Trimble. "But when the force is greater than the resistance, earth material will be moved and geomorphic work will be done."

Scientists and conservationists use the Universal Soil Erosion Equation as a model to simplify and predict the mass of soil eroded from a field in tons per acre year. If R is erosive power of rainfall, K is the susceptibility of soil to erosion, S and L refer to the declivity and length of slopes (the most important factors in the Hill Country), C vegetative cover, and P conservation practices (e.g., strip cropping, contour farming), the equation for annual losses is rendered thus:

$$\text{Erosion} = R \times K \times S \times L \times C \times P$$

As the settlers cleared the forests and broke the prairies with the plow, rainfalls, more intense than they had experienced back East or in Europe, began to work on the soils over the decades. The original soil was of high quality, and little erosion occurred in the early years. Crop yields remained high. The myth of "inexhaustible" prairie soils soon developed. Add to this the practice of grazing of animals on steep slopes and things did not go well. By the 20th century, human beings had destroyed the natural hydrological regime, which impacted both soils and surface and groundwater.

Humans were responsible for the degradation; they also spurred the recovery

In the Coon Creek Basin in Wisconsin, floodplain accretion in the 1930s exceeded 12,000 tons per year for every square mile of drainage area, for a vertical accretion rate of 15.24 centimeters per year. The "primeval" rate was about 0.03 centimeter per year. Yet, according to Trimble, soil conservation measures did, ultimately, stop the aggradation of the historic floodplain. Indeed, "The Village of Coon Valley was literally saved by soil conservation!"

Trimble draws many conclusions from his expertise and experience, which are applicable for beyond the Mississippi Valley. Of paramount importance, "And perhaps the most obvious conclusion of this study is that while humans were responsible for the environmental degradation of the Hill Country, they were also responsible for the almost miraculous recovery of the region."

"This most certainly is not the wanton destruction of landscape and persistent if not worsening soil erosion crisis sometimes reported over the past three decades or so, often even in scholarly journals," states Trimble.

The Hill Country story is not an exception. The Southern Piedmont is showing improvement through reversion of cropland to forests. Why grow corn in Georgia with yields of 50–75 bushels per acre when yields in Wisconsin, Iowa, Minnesota, and Illinois may be more than 200 bushels per acre? American agricultural productivity increased almost 2 percent per year over the 20th century. While land area for agriculture decreased by 10 percent during 1947–2007, productivity increased by 150 percent.

Of course, this presents new challenges, such as nutrient overenrichment. But the point is that human beings are capable of adapting to and solving problems resulting from their use of natural resources. This is a process of continuous improvement, to import a term from the quality management movement.

Another important conclusion Trimble draws is that well-designed programs, such as USDA's conservation and outreach efforts, can help enlighten citizens and ameliorate environmental problems. The United States, says Trimble, "Has led the world in soil conservation technology, and administration, and this continues, as epitomized by the Hill Country."

G. Tracy Mehan III is a principal with The Cadmus Group, Inc., an environmental consulting firm based in Arlington, Virginia, and an adjunct professor at George Mason University School of Law. He may be contacted at tracy.mehan@cadmusgroup.com.