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Researchers Challenge Water-Flow Model

By [CORNELIA DEAN](#)

Decades ago, when geologists were developing ideas about how water typically flows across land, many of them studied the streams of the Mid-Atlantic States, concluding that they naturally move in ribbonlike channels cut through silty banks. In the years since, ecologists and conservationists have used this model in efforts to restore streams damaged by urbanization.

Now, though, researchers at Franklin and Marshall College are challenging it. They say the streams studied by their geological predecessors were not “natural archetypes” but rather the artifacts of 18th- and 19th-century dam building and deforestation.

The scientists, Robert C. Walter and Dorothy J. Merritts, report their findings on Friday in the journal *Science*.

In a commentary on the work, David R. Montgomery of the [University of Washington](#), said it did not challenge the earlier geologists’ “fundamental insights” into the interplay of water and sediment. But, Mr. Montgomery said, “in light of the new findings, what constitutes a natural channel form requires re-examination.”

The researchers examined historical records and maps, geochemical data, aerial photographs and other imagery from river systems in Pennsylvania and Maryland. They discovered that beginning in the 1700s, European settlers built tens of thousands of dams, with perhaps almost 18,000 or more in Pennsylvania alone.

In a telephone interview, Dr. Merritts described a typical scenario. Settlers build a dam across a valley to power a grist mill, and a pond forms behind the dam, inundating the original valley wetland. Meanwhile, the settlers clear hillsides for farming, sending vast quantities of eroded silt washing into the pond.

Years go by. The valley bottom fills with sediment trapped behind the dam. By 1900 or so the dam is long out of use and eventually fails. Water begins to flow freely through the valley again. But now, instead of reverting to branching channels moving over and through extensive valley wetlands, the stream cuts a sharp path through accumulated sediment. This is the kind of stream that earlier researchers thought was natural.

“This early work was excellent,” Dr. Merritts said, “but it was done unknowingly in breached millponds.”

She said she and Dr. Walters believed their work had important implications for stream restoration. For one thing, she said, evidence so far suggests that removing the overlay of sediment may encourage streams to return to a truly natural state. But also, she added, restoration “requires much more consideration of what we are trying to restore, and what might actually be a sustainable approach.”

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