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The Space Between

Lying at the edge of land and water, riparian habitats play a crucial role in the ecosystem

By Peter H. Taylor

Plip…plop. A raindrop hits a farmer's field on a hillside in New Brunswick, seeps into the ground, and begins a downhill journey toward a brook. Pesticides and fertilizers in the soil dissolve and hitch a ride along the way. As it nears the stream, however, the water percolates through a natural habitat called a riparian zone, which acts as a filter and removes the chemicals. The water is clean when it enters the brook, en route to the Gulf of Maine.

Thousands of streams flow into more than 60 rivers that meander to the Gulf. This drainage network spans 69,115 square miles [176,699 square kilometers] and carries some 250 billion gallons to the sea each year. Riparian areas are the transition zone where land meets water along rivers, streams, lakes, ponds and estuaries. In northeastern North America, natural riparian areas are usually forested. Riparian zones play a vital role in the ecosystem as they filter the water, provide homes for animals and plants and control flooding.

A report from the National Academy of Sciences in the United States identifies protection and restoration of riparian areas as a national priority. In Canada, the issue is equally pressing. Riparian areas often suffer tremendous impacts from forestry, agriculture and urbanization. According to the NAS report, loss of these vital habitats in some places exceeds 90 percent. Around the Gulf of Maine, where the presence of Europeans extends back 400 years, a long history of human population growth and resource use has resulted in widespread destruction and degradation of riparian zones. These changes can have severe consequences for aquatic and coastal ecosystems. Today environmental managers, conservation planners and scientists are implementing numerous initiatives to sustain riparian habitats, but they say many advances are needed to close gaps in scientific understanding and effective management.

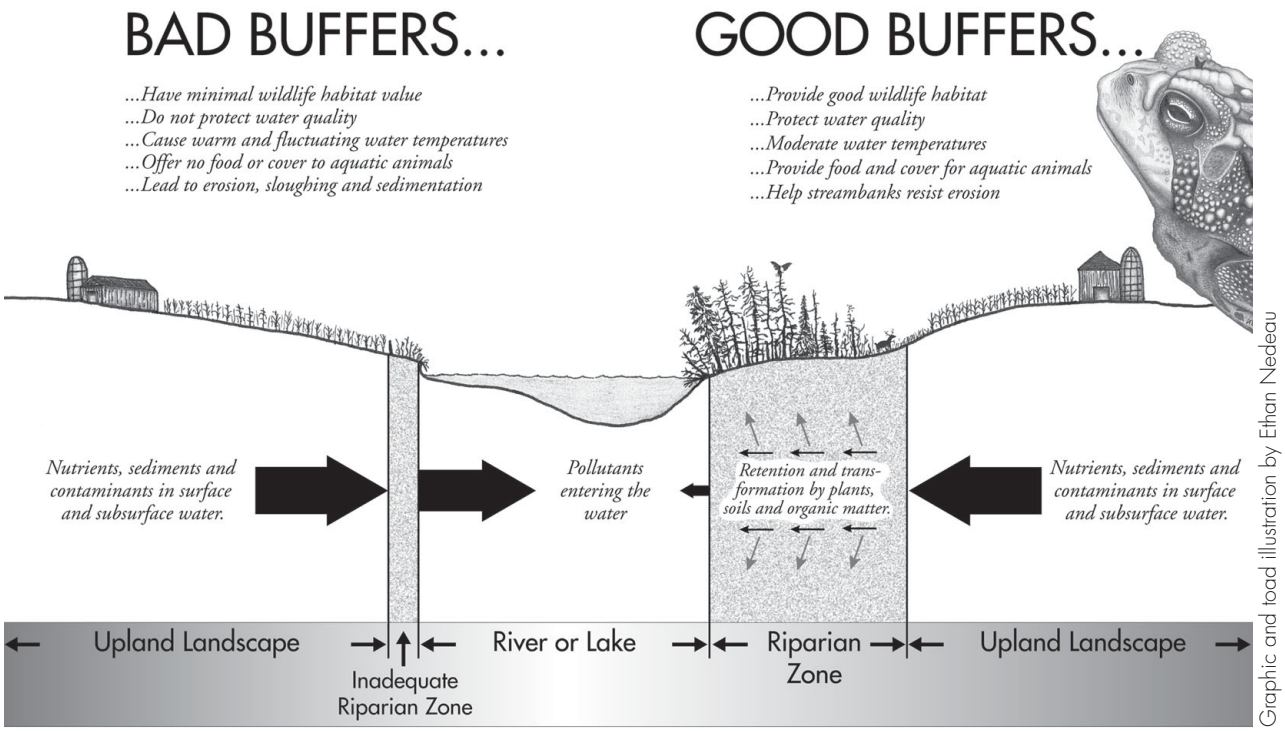
"Current regulatory mechanisms are probably not totally sufficient, and other solutions are required," said Jed Wright, a watershed protection specialist at the U.S. Fish and Wildlife Service's Gulf of Maine Coastal Program. Traditionally, laws and scientific studies have focused solely on the role of riparian zones in protecting water quality. Indeed, these habitats can be quite effective as natural purifiers that remove pesticides, nutrients, petroleum products and other contaminants before they enter a stream or other water body. The vegetation also helps prevent erosion of sediments and stabilizes water temperature for salmon, brook trout and other creatures that require cool conditions.

"You can have a stream where the watershed is highly urbanized, for example, and if it still has an intact riparian area it's likely to be in much better shape than streams that don't," said Jeff Dennis, a biologist for the Maine Department of Environmental Protection.

Regulations typically prescribe that a riparian strip be left in place as a buffer zone along shorelines where development, timber harvest or agriculture occurs. Numerous studies have investigated the minimum riparian width needed to maintain water quality. That distance ranges from less than 50 feet to more than 300 feet, depending on such local conditions as steepness of the slope and type of soil. Consequently, the laws, which vary between jurisdictions, usually specify minimum buffer width, amount of trees remaining and other requirements.

Increasingly, scientists and managers are moving beyond the traditional emphasis on water quality. "It goes well beyond the issue of water quality," Wright said, "because riparian buffer zones are also significant habitat for wildlife." Riparian areas host a greater variety and number of birds than other habitats, for example, and the luxuriant vegetation provides animals with shelter and food. Riparian buffer zones also can offer travel corridors for moose, bear and other animals in an otherwise fragmented landscape.

Studies show, however, that buffer zones may need to be wider to sustain wildlife. "If you want to accommodate songbirds, which are especially sensitive animals, you might need a buffer that's 100 meters [330 feet] wide," said Bob Bancroft, a riparian management consultant based in Nova Scotia. Many songbirds are vulnerable to parasitism by cowbirds, which thrive along the edges of woodlands. If a riparian buffer zone is wide enough, it can provide adequate protection from the cowbirds. To retain more species such as herons, scarlet tanagers and American redstarts, studies suggest a buffer width of 660 feet [201 meters].



Recently, a Nature Conservancy project on a 185,000-acre [740,000-hectare] tract along the St. John River in northern Maine adopted an innovative, comprehensive approach that aims to incorporate these additional considerations in riparian management. The St. John is the largest river in the Gulf of Maine watershed and hosts rare plants such as Furbish's lousewort, a member of the snapdragon family.

"We're taking the simple standard buffer and seeing how we can apply it more smartly to the land to really protect the whole system, not just one species or water quality," said Josh Royte, a conservation planner for TNC.

The core of the plan is a necklace of riparian buffer zones along streams and the main river. Buffers up to 250 feet wide [76 meters], where no tree cutting will occur, form the 'chain' of the necklace. Located at intervals along the waterway are larger 'beads' of buffer zone—circular, no-cut areas of 300 to 600 acres [120 to 240 hectares]. The Conservancy designed these expanded areas to help support wildlife such as mating groups of pine martens. The project also intends to safeguard sites where groundwater flows into the river, because these areas are essential habitat for rare plants. Although the Nature Conservancy's design is remarkably comprehensive, Royte noted that even this plan might not account adequately for some potential problems, such as changes in flow caused by climate change.

Such a broad view of riparian management is not yet common. While many general scientific principles are well understood, tailoring them to particular sites can be a formidable challenge. Often this can require extensive – and expensive – fieldwork. In the future, this dilemma might be resolved in part by the development of advanced mathematical techniques that use existing data about terrain and geology to understand water flow and ecological conditions.

While scientific progress is important, an equally pressing challenge lies in translating existing scientific knowledge into successful management. At present, legislation and enforcement fall well short of protecting riparian zones. In many cases, regulations call for narrow buffers that may scarcely support water quality or habitat. Moreover, exemptions included in the laws sometimes allow for development and other harmful land use practices, depending on the circumstances. Even when laws might protect riparian zones adequately, enforcement may be difficult.

As a result, there is an immediate need to upgrade the legislative framework for riparian management. This might include developing incentives for riparian protection or mechanisms that transfer some of the societal costs to developers and others that degrade riparian habitats. As an alternate strategy, some non-government organizations purchase land or acquire the development rights along waterways to protect riparian zones and aquatic habitats.

Riparian habitats are not only the transition zone between terrestrial and aquatic ecosystems, but these rich environments also stand squarely at the intersection of ecology, economics and policy. At a fundamental level, improving awareness and education about riparian zones could fuel better management.

"Effective management," Jed Wright said, "requires a good combination of science and judgment."

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