Regulatory Science: Riparian Zones and Buffers (Newsletter)*

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Ecologists have determined that landscape edges -- boundaries separating one type from another -- have higher biological diversity and productivity than do the areas on either side of them. These transition zones are important to animals: mammals, birds, reptiles, insects, and fish. In terrestrial ecosystems edges are found between woodlands and grasslands and between forests and meadows. In aquatic ecosystems the edges are stream and river banks and pond and lake shores; the edges separating aquatic and terrestrial ecosystems are called riparian zones.

Environmental regulations often require riparian buffer zones to prevent undesired materials or chemicals from migrating into the water, and too often regulators face pressure to stipulate a one-size-fits-all width to the buffer. This makes no more sense than having a single speed limit for all streets and roads from residential areas in cities and towns to county, state, and federal highways.

Riparian buffers have been a concern for several decades in the Intermountain West, Great Basin, and Pacific Northwest. The initial focus was on declining populations of anadromous and resident salmon and trout; since then the quality of potable water supplies has been added. Water temperature; overland and vadose zone runoff of plant nutrients (nitrogen and phosphorus) and agrichemicals from crop lands and CAFOs; and livestock grazing have been concerns of regulators and environmental groups. While agriculture is a primary focus, mining and energy production and transmission are also closely monitored. Riparian buffers are control mechanisms for preventing nonpoint source pollution of receiving water bodies.

Geomorphic, hydrologic, hydraulic, and biotic characteristics vary greatly among drainage basins (watersheds) and along a stream network from headwaters to outlet. Buffer zone size needs to be based on these factors and on what functions the zones are to perform. Preventing sediments from eroding directly into a headwater stream channel after logging of the adjacent slopes requires different riparian buffers than does retaining overland flow from flat farmland so that plant nutrients are retained by terrestrial vegetation.

Steepness of upland slopes, soil characteristics and depth, and land cover all affect surface and ground water hydrology (flow directions). Channel steepness affects the hydraulics (flow velocity and discharge). Channel aspect (compass direction), width, and gradient affect whether vegetation shading will lower water temperatures. Sediment characteristics and fish use of a designated reach of stream should also influence the design and size of riparian buffer zones.

A riparian buffer zone is an environmental management tool and, like all tools, must be carefully selected to be the most appropriate to successfully achieve the desired outcome.

While mandating a fixed riparian buffer width for all stream channels in a state makes regulatory enforcement easier it does not resolve the fish and water quality issues of concern. Designing, maintaining, and restoring riparian buffer zones so they work as intended while accommodating the agricultural, mining, or energy operation in the uplands with minimal interference requires applying science to the specific location, just as there are many different speed limits on city streets and on county, state, and federal roads. Done correctly everyone benefits.

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