

## *Characteristics of Streams and the Impact on Biota*

An analysis where biota reflect full support show they are located in watersheds with healthy, forested riparian zones that include wetlands. Riparian areas are transitional areas between terrestrial and aquatic ecosystems that are vital to watershed health. In watersheds with agricultural use or anthropogenic disturbance such as industrial, commercial, and residential development, the riparian zone provides a buffering between the stream and the area of disturbance. These buffers demonstrate that they help to preserve the stream channels and habitat in their natural condition.

It is important to understand the importance of forested canopies and riparian buffers to preserve and maintain stream ecological integrity. As discussed in Giller and Malmqvist (2001)<sup>1</sup>, forested buffers have substantial and positive influences on stream ecology. The overlying canopy, moderates water temperature by providing shade to protect against solar radiation and high daytime air temperatures. Additionally, the cooler waters enhance oxygen carrying capacity in the water column which is especially critical in trout waters and limits primary production thereby limiting the impact of excessive nutrient inputs. A healthy riparian zone reduces stormwater runoff and pollutants such as nutrients, toxics and pesticides from sources in the watershed before they enter the stream. Forested buffers stabilize the streambank reducing erosion and siltation while the exposed root systems within the stream provide hiding places for fish. The leaf and woody debris become an important source of nutrients and carbon to the aquatic system. The leaf litter and woody debris that accumulate on the stream bottom provide a diverse range of habitat for invertebrates and fish as well as refuge from stream flow. Additionally, the buildup of woody material can form debris dams influencing flow patterns, causing the formation of pools and eddies thereby enhancing habitat diversity within the stream channel.

An analysis of how land use impacts the aquatic ecosystem was completed by observing the land use in riparian zones, defined as 300-foot buffers around the streams, as well as, land use in the whole AU. For the assessment, the extent of land use in the AUs and their riparian zones was calculated for “developed” land use defined as urban, suburban, and agricultural land use; “undeveloped” land use which includes forest, wetlands, and the waterways; and impervious surface. Numerous studies have shown that of all of the land use indicators, impervious surface is the most predictive and reliable indicator for biological integrity<sup>2</sup>. The studies reveal that where impervious surface exceeds 10% of watershed land use biological degradation occurs.

When examining impervious surface in riparian zones, the riparian buffer exhibits very high sensitivity to land use changes in the watershed. Where impervious surface exceeds 10% in the riparian zone, the biological communities display extensive degradation with 90% of the biological communities impaired. Without a buffer to reduce the effects of stressors within the watershed, the biological communities are inundated and unable

---

<sup>1</sup> Giller P., and Malmqvist B., 2001. *The Biology of Streams and Rivers*. Oxford University Press. Pp. 33, 37-38.

<sup>2</sup> Booth, D.B. and L. Reinelt. 1993. Consequences of urbanization on aquatic systems - measured effects, degradation thresholds, and corrective strategies. *Proceedings of the Watershed '93*

Klein, R.D. 1979. Urbanization and stream quality impairment. *Water Resources Bulletin* 15: 948-963.

Schueler, T.R. 1994. The importance of imperviousness. *Watershed Protection Techniques* 1(3): 100- 111.

Steedman, R.J. 1988. Modification and assessment of an index of biotic integrity to quantify stream quality in southern Ontario. *Canadian Journal of Fisheries and Aquatic Sciences* 45: 492-501.

to recover. Development in the riparian zone degrades the benefits from a healthy ecosystem by intensifying storm water flow, destabilizes streambanks, increases levels of sedimentation and other nonpoint pollutants, rises water temperatures, damages stream habitat, reduces infiltration into the soil, as well as increases the frequency and intensity of flooding and low stream flows.

New Jersey's water quality protection programs guard against further degradation of the State's waters in part through protection of riparian buffers. These protections include the SWQS antidegradation policies that provide special riparian protection to Category One (C1) waters based on their exceptional ecological significance, exceptional water supply, exceptional recreation and exceptional fisheries to protect and maintain their water quality, aesthetic value, and ecological integrity<sup>3</sup>. These waters are afforded 300-foot development buffers under the Flood Hazard Area Control Act (N.J.A.C. 7:13) and along with the Stormwater Management Act rule (N.J.A.C. 7:8) regulate certain activities proposed within or impacting riparian zones to help maintain the water quality functions of the buffers.

Additional information on these rules and associated programs are available on the Department's web site at <http://www.nj.gov/dep/landuse> and <http://www.nj.gov/dep/stormwater>.

---

<sup>3</sup> NJDEP. *New Jersey Surface Water Quality Standards Antidegradation Designations Fact Sheet*. NJDEP. July 2017. Available at <https://www.state.nj.us/dep/wms/bears/docs/swqsfactsheet2-antideg.pdf>