Ecosystem Services in the Croton Watershed: Nature's Contributions to Human Health & Environment

Soils are natural filters which remove pathogens and pollutants as water seeps through them.

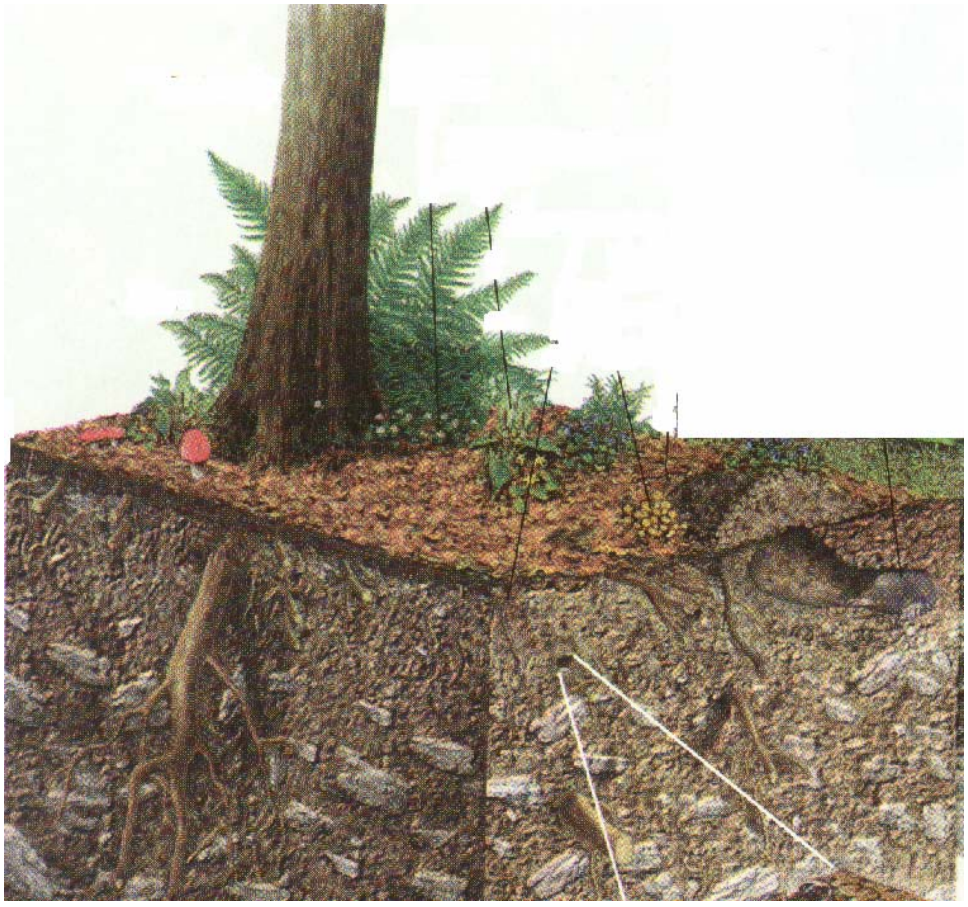

Figure adapted from: Living in the Environment, 10th ed. GT Miller, Jr. Wadsworth Publishing, 1998.

Natural systems clean air and water, remove and destroy pathogens, and turn wastes into resources, protecting our health while supporting further ecological development. Nature can and does literally work for us, especially where we respect her capacities by making sure that what we build does not destroy what nature creates.

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Paving the Way to Problems

Runoff from the roadway is moving the soil down slope off the road shoulder and into the forest. A simple planted terrace would reverse this process.

Westchester County, photo by E. Mattfeldt.

Human dwellings, commercial developments, parking lots, and infrastructure are impervious to water, turning rainfall into runoff, with negative, sometimes disastrous effects down slope. Walk around a housing development, along a roadway, or by a lawn on a sloping hillside, and chances are that you will see erosion rills, gravelly scars in the soil, where water takes a short cut downhill to the stream, lake or reservoir below.

This erosion gully carries turbidity and pollutants from the roadway right into the NYC drinking water supply.

The slope in such instances is too much for the permeability of the soils in the area, so water flows downhill rather than into the soil. In general, though, since soils in Westchester, Putnam, and Dutchess Counties are relative permeable, runoff can be captured by forested areas, meadows, and wet areas, and ultimately, the water table.

Scaling Buffers to Protect Biodiversity and the Quality of Life

The water holding (and biogeochemical filtration) capacity of the landscape needs to be made substantially larger than inputs from upslope areas. In technical terms, engineering practices must scale the components of terraces, meadows and restored forest to incorporate water into soils and groundwater.[2] This will increase the Hydroperiod or water holding capacity, the volume of water which can be held per acre of natural landscape. While filtration capacity, i.e., how much pollutant a given plant, microbial, or geochemical surface can remove, is much more complicated, a large number of wetlands have documented treatment capacities in terms of removal of suspended solids, pathogens, phosphate, and nitrogen, as well as other ecosystem services.

Figure from:The Natural History of plants tr. By Oliver. Blackie & Sons,Ltd.,1896.

Buffers around upslope infrastructure are necessary to protect and enhance down slope biodiversity. Biogeochemically active soils, like those pictures above, protect human health, water quality, and the quality of life.

Ecological Engineering: Natural Solutions to Problems of Human Development

Ecological engineering methods can greatly increase the water catchment volume of an area with terraces made from materials as simple as soil, hay bales or compost, or as structurally stable as pinned timbers, gravel catchments, gabions, and other low cost means for increasing the resistance to the overland water flow. Plantings help keep soils from moving down slope, turning potential erosion and runoff from highways, parking lots, mining operations, and housing developments into clean water sources. [3] This allows woodlands and wetlands to incorporate surface flow, and eliminate runoff while Biogeochemically filtering stormwater through plants, microbes, and soil surfaces. A potentially negative input becomes a positive addition to groundwater, increasing ecological productivity, biodiversity, and preserving or increasing the value of adjacent properties.

Adding Value to Real Estate by Conserving & Creating Diversity in the Landscape

Nearness to great cities, cultural events, and centers of learning and employment confers advantages on Westchester, Putnam, & Dutchess Counties compared to many areas in the country. But add the rural quality of life contributed by the landscape, and the rest of the country jams relatively few areas comparable to the Croton Watershed. Much as the setting adds value to a gem, the diversity of forests, meadows, and wetlands increase the selling price and net worth of private homes and condominiums, businesses, corporate headquarters, villages and towns. A number of studies to date have noted how conserving natural features in residential developments add profits to these enterprises. Retrospectively, we can expect that creating habitat and conserving forest communities, meadows, wetlands and water features can also increase local real estate value, improving water quality at the same time, by filtering out pollutants, and capturing runoff from nearby infrastructure.

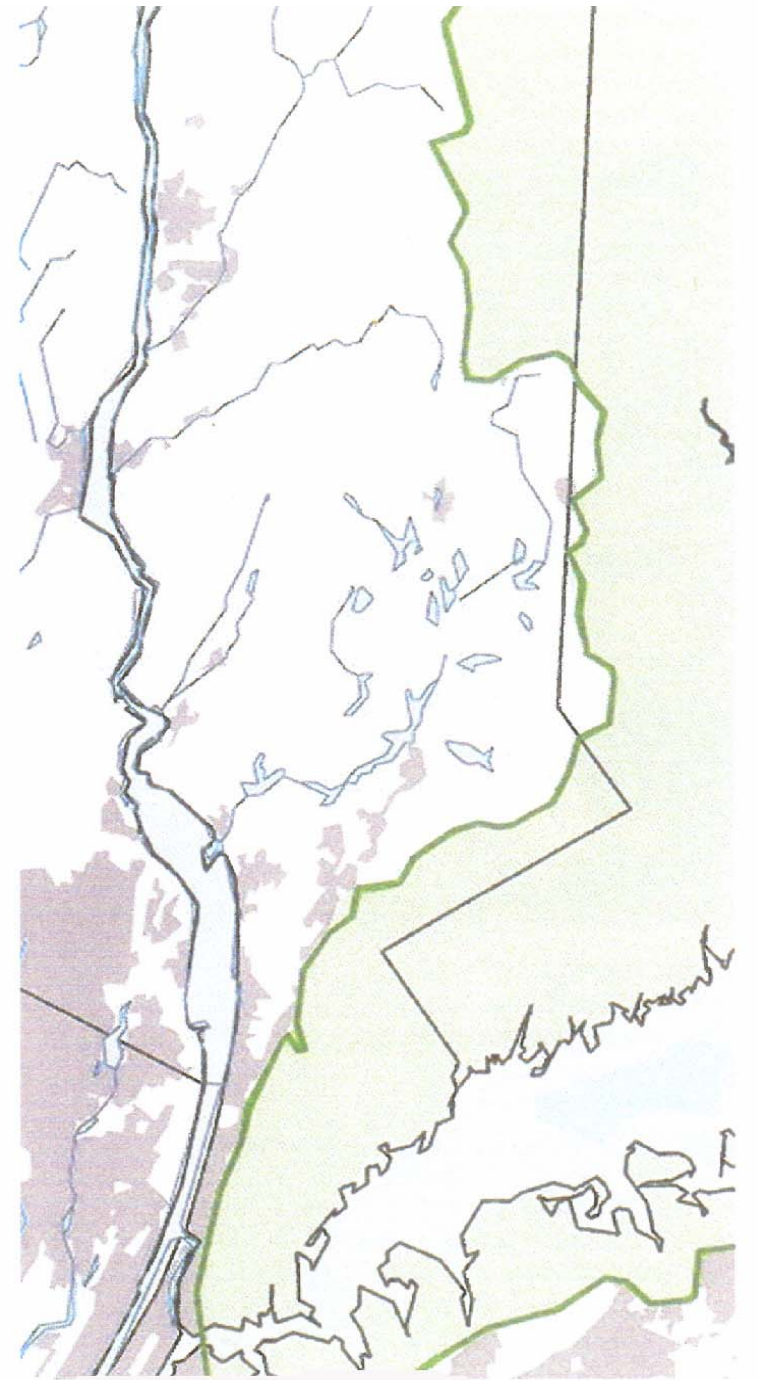

Figure adapted from: Significant Habitats & Habitat of the NY Bight Watershed, US Fish & Wildlife Service, 1997.

[1] Wood, Tim, F.H. Bormann and G.K. Voight ,1984, Phosphorus cycling in a northern hardwood forest: biological and chemical control Science 223, p.391

[2] Bevan, KJ. 1984. Infiltration into a class of vertically non-uniform soils. Hydrological Sci. J. 29 (4) 425-434

[3] Richardson, Curtis J, 1985, Mechanisms controlling phosphorus retention capacity in freshwater wetlands Science 228:1424-1428.