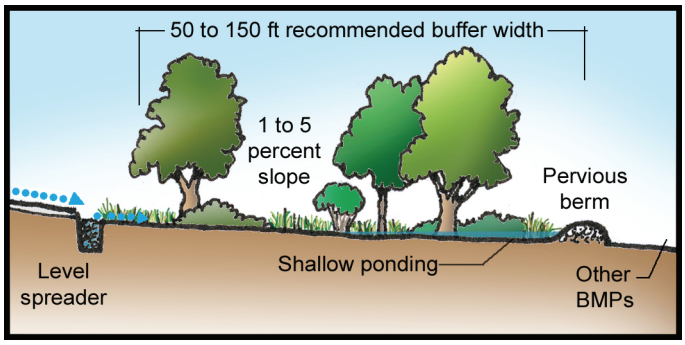


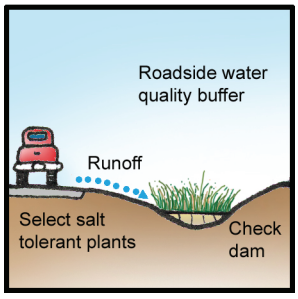
1.16 Urban runoff and roadsides

Buffers for urban runoff can be effective for trapping sediment but are generally less effective for dissolved pollutants. Buffers may be ineffective for urban stormwater where high runoff volume converges on and is channeled through the buffer. Buffers need to be designed to prevent flows from inundating or bypassing the buffer.

Key design considerations

- Buffers are best suited for low to moderate density areas (less than 20 percent impervious cover).
- Flow length into a buffer should be less than 150 feet for pervious surfaces and less than 75 feet for impervious surfaces.
- A level spreader can be used to disperse concentrated flow along the width of the buffer.
- Other best management practices should be used with buffers including low impact development that minimizes impervious cover.

Vegetated roadside buffers can be used to improve water quality by filtering runoff. Use check dams to slow water movement and increase retention time. Select salt tolerant plants where road salt is used.



1.16 References

Bäckström, M.; Viklander, M.; Malmqvist, P.A. 2006. Transport of stormwater pollutants through a roadside grassed swale. Urban Water Journal. 3: 55-67.

Ball, J.E.; Jenks, R.; Aubourg, D. 1998. An assessment of the availability of pollutant constituents on road surfaces. The Science of the Total Environment. 209: 243-254.

Bannerman, R.T.; Owens, D.W.; Dodds, R.B.; Hornewer, N.J. 1993. Sources of pollutants in Wisconsin stormwater. Water Science and Technology. 28(3-5): 241-259.

Barrett, M.; Lantin, A.; Austrheim-Smith, S. 2004. Stormwater pollutant removal in roadside vegetated buffer strips. Transportation Research Record. 1890: 129-140.

Barrett, M.E.; Walsh, P.M.; Malina, J.F., Jr.; Charbeneau, R.J. 1998. Performance of vegetative controls for treating highway runoff. Journal of Environmental Engineering. 124: 1121-1128.

Booth, D.B.; Hartey, D.; Jackson, R. 2002. Forest cover, impervious-surface area, and the mitigation of stormwater impacts. Journal of the American Water Resources Association. 38: 835-845.

Clar, M.L.; Barfield, B.J.; O'Connor, T.P. 2004. Stormwater best management practice design guide volume 2 vegetative biofilters. EPA/600/R-04/121A. Washington, DC: U.S. Environmental Protection Agency. http://www.epa.gov/nrmrl/pubs/600r04121/600r04121asect2.pdf [Date accessed: October 18, 2007].

Claytor, R.A.; Schueler, T.R. 1996. Design of stormwater filtering systems. Ellicott City, MD: Center for Watershed Protection. http://www.mckenziewaterquality.org/documents/stormwater_filtration_system_design.pdf [Date accessed: October 18, 2007].

Clinton, B.D.; Vose, J.M. 2006. Variation in stream water quality in an urban headwater stream in the southern Appalachians. Water, Air, and Soil Pollution. 169: 331-353.

Cooper, C.M.; Moore, M.T.; Bennett, E.R. [and others]. 2004. Innovative uses of vegetated drainage ditches for reducing agricultural runoff. Water Science and Technology 49(3):117-123.

Deletic, A. 1998. The first flush load f urban surface runoff. Water Research. 32: 2462-2470.

Deletic, A.; Fletcher, T.D. 2006. Performance of grass filters used for stormwater treatment – a field and modeling study. Journal of Hydrology. 317: 261-275.

Forman, R.T.T.; Alexander, L.E. 1998. Roads and their major ecological effects. Annual Review of Ecological Systems. 29: 207-231.

Good, J.C. 1993. Roof runoff as a diffuse source of metals and aquatic toxicity in storm water. Water Science and Technology. 28(3-5): 317-321.

Grass, C.M.; Angle, J.S.; Welterlen, M.S. 1990. Nutrient and sediment losses from turfgrass. Journal of Environmental Quality. 19: 663-668.

Groffman, P.M.; Crawford, M.K. 2003. Denitrification potential in urban riparian zones. Journal of Environmental Quality. 32:.1144-1149.

Han, J.; Wu, J.S.; Allan, C. 2005. Suspended sediment removal by vegetative filter strip treating highway runoff. Journal of Environmental Science and Health. 40: 1637-1649.

Hatt, B.E.; Fletcher, T.D.; Walsh, C.J.; Taylor, S.L. 2004. The influence of urban density and drainage infrastructure on the concentrations and loads of pollutants in the small streams. Environmental Management. 34: 112-124.

Haycock, N.E.; Muscutt, A.D. 1995. Landscape management strategies for the control of diffuse pollution. Landscape and Urban Planning. 31: 313-321.

Hipp, B.; Alexander, S.; Knowles, T. 1993. Use of resource-efficient plants to reduce nitrogen, phosphorus, and pesticide runoff in residential and commercial landscapes. Water Science and Technology. 28(3-5): 205-213.

Hoffman, E.J.; Latimer, J.S.; Hunt, C.D. [and others]. 1985. Stormwater runoff from highways. Water, Air, and Soil Pollution. 25: 349-364.

Isabelle, P.S.; Fooks, L.J.; Keddy, P.A.; Wilson, S.D. 1987. Effects of roadside snowmelt on wetland vegetation: an experimental study. Journal of Environmental Management. 25: 57-60.

Jensen, M.B. 2004. Hydrological conditions for contaminant leaching through highway swales. Water, Air, and Soil Pollution. 158: 169-180.

Latimer, J.S.; Hoffman, E.J.; Hoffman, G. [and others]. 1990. Sources of petroleum hydrocarbons in urban runoff. Water, Air, and Soil Pollution. 52: 1-21.

Mackenzie, M.J.; Hunter, J.V. 1979. Sources and fates of aromatic compounds in urban stormwater runoff. Environmental Science and Technology. 13: 179-183.

Matteo, M.; Randhir, T.; Bloniarz, D. 2006. Watershed-scale impacts of forest buffers on water quality and runoff in urbanizing environment. Journal of Water Resources Planning and Management. 132: 144-152.

MPCA. 2000. Protecting water quality in urban areas. St. Paul, MN: Minnesota Pollution Control Agency (MPCA). http://www.pca.state.mn.us/water/pubs/sw-bmpmanual.html [Date accessed: October 18, 2007].

Moorhead, D.L.; Davis, W.S.; Wolf, C.F. 1998. Coliform densities in urban waters of West Texas. Journal of Environmental Health. 60: 14-18.

Muthukrishnan, S.; Madge, B.; Selvakumar, A. [and others]. 2004. The use of best management practices in urban watersheds. EPA/600/R-04/184. Cincinnati, OH: U.S. Environmental Protection Agency. 271 p. http://www.epa.gov/nrmrl/pubs/600r04184/600r04184.pdf [Date accessed: October 18, 2007].

Oberts, G.L. 1986. Pollutants associated with sand and salt applied to roads in Minnesota. Water Resources Bulletin. 22: 479-483.

Roy, A.H.; Freeman, M.C.; Freeman, B.J.; [and others]. 2006. Importance of riparian forest in urban catchments contingent on sediment and hydrologic regimes. Environmental Management. 37: 523-539.

Sansalone, J.; Koran, J.; Smithson, J.; Buchberger, G. 1998. Physical characteristics of urban roadway solids transported during rain events. Journal of Environmental Engineering. 127: 427-440.

Steinke, K.; Stier, J.C.; Kussow, W.R.; Thompson, A. 2007. Prairie and turf buffer strips for controlling runoff from paved surfaces. Journal of Environmental Quality. 36: 426-439.

Whipple, W., Jr.; Hunter, J.V. 1977. Nonpoint sources and planning for water pollution control. Journal of the Water Pollution Control Federation. 49: 15-23.

Wu, J.; Mersie, W.; Atalay, A.; Seybold, C.A. 2003. Copper retention from runoff by switchgrass and tall fescue filter strips. Journal of Soil and Water Conservation. 58: 67-72.

Yu, S.L.; Stanford, R.L. 2004. VDOT Manual of Practice for Planning Stormwater Management. Federal Highway Administration, FHWA/VTRC 05-CR5. Charlottesville, VA: Virginia Transportation Research Council. 135 p. http://www.virginiadot.org/vtrc/main/online_reports/pdf/05-cr5.pdf [Date accessed: October 18, 2007].