Article 33

Technical Note #109 from Watershed Protection Techniques 3(2)

The Impact of Stormwater on Puget Sound Wetlands

Watershed managers have frequently questioned whether natural wetlands should be used for stormwater treatment. At the same time, wetland regulators have wondered whether upstream development and stormwater runoff might have a negative impact on the quality of natural wetlands. Until recently, these questions were largely theoretical, since very little research had been conducted on the influence of stormwater on wetlands. However, a series of recent research studies from the Pacific Northwest has shed new light on this topic.

A consortium of agencies and universities undertook an intensive eight-year study to investigate the consequences of watershed development and stormwater runoff on freshwater palustrine wetlands in the Puget Sound lowlands ecoregion. The consortium, formally known as the Puget Sound Wetlands and Stormwater Management Research Program (PSWSRP), evaluated how five major structural components of wetlands— hydrology, water quality, soils, plants, and animals— responded to watershed urbanization. Palustrine wetlands were selected because they have historically been altered more than other wetland types in the Puget Sound lowland ecoregion. Palustrine wetlands are freshwater systems that are in headwater areas or isolated from other water bodies and typically contain a mix of open water and other vegetation zones.

The 19 palustrine wetlands studied were relatively small (ranging from 1.5 to 31 acres in surface area) and had contributing watersheds that ranged from 87 to 886 acres in area. The wetland plant communities at the study sites were quite diverse. About 26% of the study wetlands classified as scrub-shrub wetlands, 16% were forested wetlands, 13% were emergent and 5% were bogs or fens. The remaining 40% of wetlands studied were a mix of more than one of these wetland community types.

The study wetlands differed sharply in the amount of development that had occurred in their contributing watersheds, as defined by the indicator of total impervious cover. The wetlands were roughly split according to whether they were largely undeveloped (less than 4% impervious cover), moderately developed (four to 20%) and highly developed (more than 20%). The largely undeveloped wetlands were used as a reference to define the "best attainable" conditions for wetlands within the ecoregion. It should be noted that some of the wetlands experienced rapid growth during the eight years of study, while others remained relatively stable. A detailed summary of the study design and sampling methods used to investigate the wetlands can be found in Azous and Horner (1997).

Hydrology

Wetland hydrology is often described in terms of its hydroperiod: the pattern of fluctuating water levels due to the complex interaction of flow, topography, soils, geology, and groundwater conditions in the wetlands. One of the key characteristics of the undeveloped reference wetlands was that they had relatively

Table 1: Key Factors that Influence Water Level Fluctuation (WLF) in Puget Sound Wetlands

Factor	Range	Mean WLF (feet)	No. of Observations
Forest Cover	No forest cover More than 15% cover	1.15 0.45	97 224
Impervious Cover	less than 3.5% 3.6 to 20% 22 to 55%	0.32 0.53 1.43	105 143 73
Outlet Constriction	low or moderate high	0.44 1.02	198 123
Wetland to Watershed Area Ratio	less than 5 percent more than 5 percent	0.91 0.39	169 152