Performance of a Stormwater Pond/Wetland System in Colorado

Urbonas and his colleagues recently investigated the pollutant removal performance of a large stormwater pond/wetland system located in Aurora, Colorado. The unique runoff treatment system is illustrated in Figure 1. Runoff enters a large wet pond that provided a total of 0.3 watershed-inches of runoff treatment (0.1 inches of permanent pool, plus 0.2 inches of extended detention — approximately 20 hours for most storm events). Runoff then exits the pond over a soil/cement spillway and enters a series of six cascading wetlands cells.

Wetland cells were located in a flat and broad channel, and were formed by a soil/cement drop structure installed across the channel. Water velocity was designed to be less than three feet per second (fps) during major floods, and less than 0.3 fps during smaller storm events. The wetland consisted primarily of cattail and bulrush species. Average contact time in the 3.8 acre wetland area was about two hours during smaller storms. The wetland cells comprised about 0.7% of total watershed area.

The Shop Creek watershed draining to the system was 550 acres in size and almost exclusively composed of detached single family homes. Watershed imperviousness averaged 40%, although only 75% of the impervious surfaces were hydraulically connected. Shop Creek is located in the high plains and foothills of the Rockies mountains east of Denver.

Thirty-six storm events were sampled over a three year period in a cooperative effort of the Cherry Basin Water Quality Authority and the Denver Urban Drainage and Flood Control District. Monitoring was confined to the growing season (May to September) in the semi-arid area. In addition, a limited number of baseflow samples were taken along the wet pond and wetland system to characterize water quality dynamics during dry weather periods.

The monitoring revealed that the pond/wetland system was reasonably effective at removing many pollutants during storm events (Table 1). For example, about half of the total and dissolved phosphorus load was removed as it passed through the pond, with the majority occurring in the pond rather than the wetland. Likewise, about 72% of suspended sediment was removed by the system, even with a slight export from the wetland component. Removal of total zinc and copper approached 60% for the system. Chemical oxygen demand (COD) was reduced by 56%.

The performance of the pond/wetland system in removing nitrogen, however, was mediocre, due in
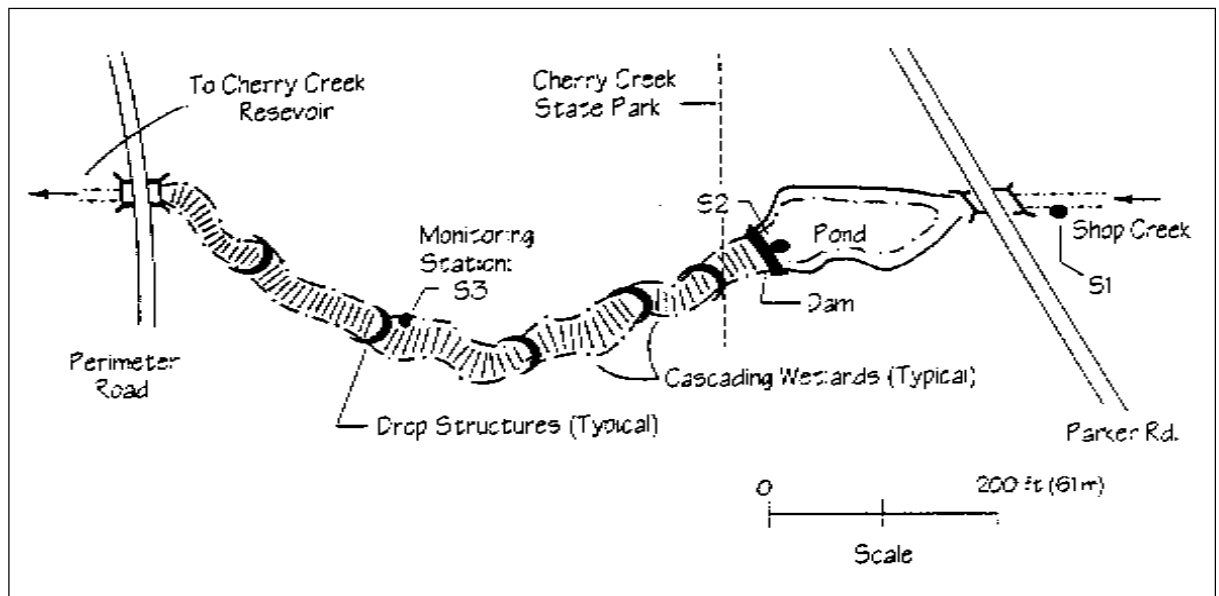
Figure 1: Arrangement of the Pond-Wetland System on Shop Creek (Urbonas *et al.*, 1994)