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Pipers Creek: Salmon Habitat Restoration in the Pacific Northwest

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Conventional stream restoration practice often assumes that bank and instream restoration will not be successful until excessive stormwater flows are first controlled upstream. However, construction of stormwater retrofits may be too expensive or infeasible. In a large watershed, it may take many years to implement all planned retrofits. Can instream habitat improvements ever be implemented before stormwater flows are controlled? Experience in Pipers Creek suggests it may be possible, using relatively simple techniques, to maintain or even improve fish populations in advance of stormwater retrofitting in a salmon stream, thus restoring the stream from the bottom up (see Table 1 for the restoration "prescription").

Pipers Creek is a small stream that winds 1.5 miles along a downtown Seattle park (Figure 1). The 1,920 acre watershed is more than 50% impervious. The creek runs through a wooded ravine surrounded by high-density (averaging 10 housing units per acre) residential and commercial development. Storm flows can reach 300 cfs with about a five-year storm. Base flows are a mere 1.5 cfs. Small urban streams like Pipers Creek once provided important freshwater habitat for coho salmon, cutthroat trout, and steelheads.

Table 1: The Pipers Creek "Prescription"

Location: Seattle, WA
Watershed size: 1,920 acres
Degree of Imperviousness: > 50percent

Restoration Step	Application in Pipers Creek
Control Urban Hydrologic Regime	■ Erosion control projects ■ Source control BMP ■ Educational programs ■ Within pipe detention
Remove Urban Pollutants	■ No retrofits
Restore Instream Habitat Structure	■ Create pools/riffles ■ Confine and deepen low flow channels ■ Provide structural complexity
Stabilize Channel Morphology	■ Restore tight meander pattern ■ Stabilize channel to accommodate bankfull discharge
Replace / Augment Riparian Cover	■ Provide instream overhead cover ■ Revegetate streambanks
Protect Critical Stream Substrates	
Recolonize Stream Community	

Previous Restoration Efforts

The Pipers Creek Watershed Action Plan, developed in 1990, identified public education, regulatory, operating and maintenance, public works, and monitoring projects to restore and enhance the creek. The identified projects included restoration of stream habitat. An earlier effort to prevent stream erosion and trap sediments involved constructing fourteen boulder control structures (large stacked boulders with two- to three-foot wide notches extending from the creek bottom to the structure's top—see Figure 2). Even with the structures, the creek still showed severe degradation due to uncontrolled stormwater flows. For example:

- Many of the boulder control structures had failed as boulders shifted or as the notches became plugged with sediment. Several structures with notches greater than two feet wide were not trapping any sediment at all.
- The stream bottom was covered with fine grained silts.
- Low flow channels within the stream became braided, and the stream channel had lost most of its meanders.
- Very low diversity of flora and fauna was reported, with few taxa of aquatic insects present. However, Pipers Creek still had some crayfish and cutthroat trout present.

Bottom-up Restoration Approach

Therefore, a second restoration strategy was undertaken. The concept was to reconstruct elements of instream habitat and reinforce them to withstand high flows. Thus, during periods of low flow, the stream would return to the reconstructed flow pattern and continue to provide habitat. The goals were to do the following: