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Standard Paper

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**Coho salmon spawner mortality in western US urban watersheds: bioinfiltration prevents lethal storm water impacts**

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Summary

1. Adult coho salmon *O ncorhynchus kisutch*return each autumn to freshwater spawning habitats throughout western N orth A merica. The migration coincides with increasing seasonal rainfall, which in turn increases storm water run‐off, particularly in urban watersheds with extensive impervious land cover. Previous field assessments in urban stream networks have shown that adult coho are dying prematurely at high rates (>50%). Despite significant management concerns for the long‐term conservation of threatened wild coho populations, a causal role for toxic run‐off in the mortality syndrome has not been demonstrated.
2. We exposed otherwise healthy coho spawners to: (i) artificial storm water containing mixtures of metals and petroleum hydrocarbons, at or above concentrations previously measured in urban run‐off; (ii) undiluted storm water collected from a high traffic volume urban arterial road (i.e. highway run‐off); and (iii) highway run‐off that was first pre‐treated via bioinfiltration through experimental soil columns to remove pollutants.
3. We find that mixtures of metals and petroleum hydrocarbons – conventional toxic constituents in urban storm water – are not sufficient to cause the spawner mortality syndrome. By contrast, untreated highway run‐off collected during nine distinct storm events was universally lethal to adult coho relative to unexposed controls. Lastly, the mortality syndrome was prevented when highway run‐off was pretreated by soil infiltration, a conventional green storm water infrastructure technology.
4. Our results are the first direct evidence that: (i) toxic run‐off is killing adult coho in urban watersheds, and (ii) inexpensive mitigation measures can improve water quality and promote salmon survival.
5. *Synthesis and applications*. Coho salmon, an iconic species with exceptional economic and cultural significance, are an ecological sentinel for the harmful effects of untreated urban run‐off. Wild coho populations cannot withstand the high rates of mortality that are now regularly occurring in urban spawning habitats. Green storm water infrastructure or similar pollution prevention methods should be incorporated to the maximal extent practicable, at the watershed scale, for all future development and redevelopment projects, particularly those involving transportation infrastructure.