

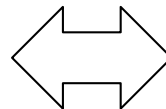
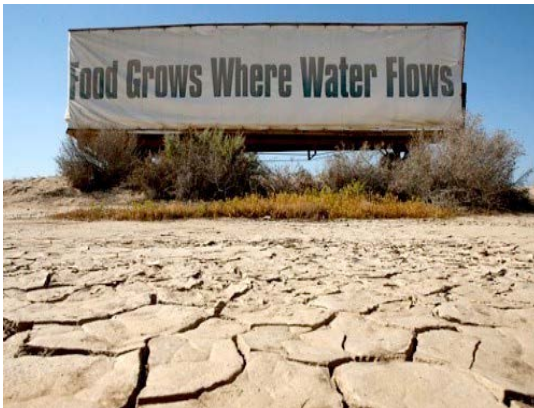
From Rain Tanks to Catchments: Use of Low-Impact Development to Address Hydrologic Symptoms of the Urban Stream Syndrome

Stanley B. Grant, Asal Askarizadeh, Megan A. Rippy
Civil and Environmental Engineering
University of California, Irvine

Water Resource Sustainability Issues on Tropical Islands

December 2, 2015

California, USA



SE Australia

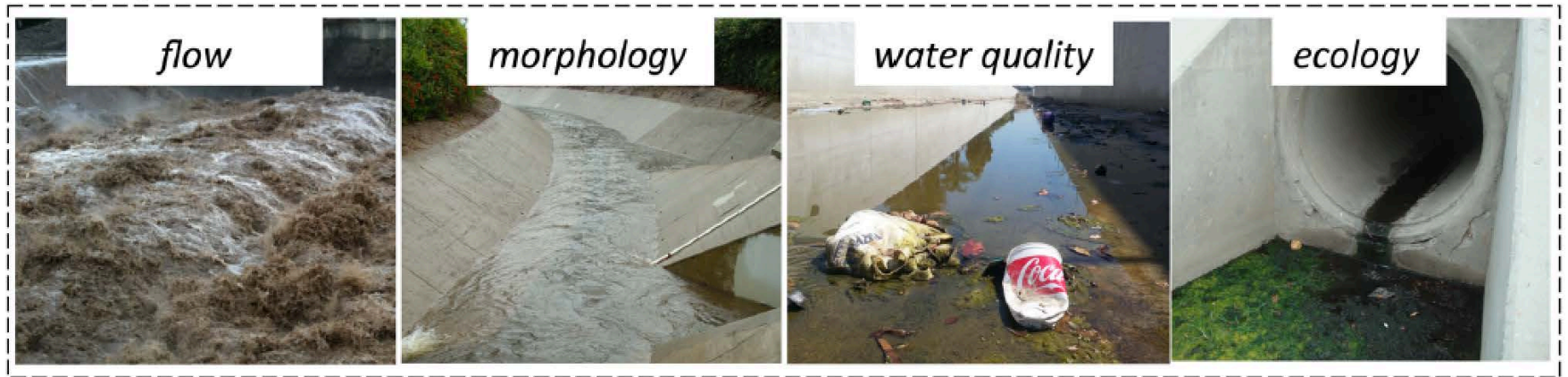


UCI Water PIRE: “Low Energy Options for Making Water from Wastewater”

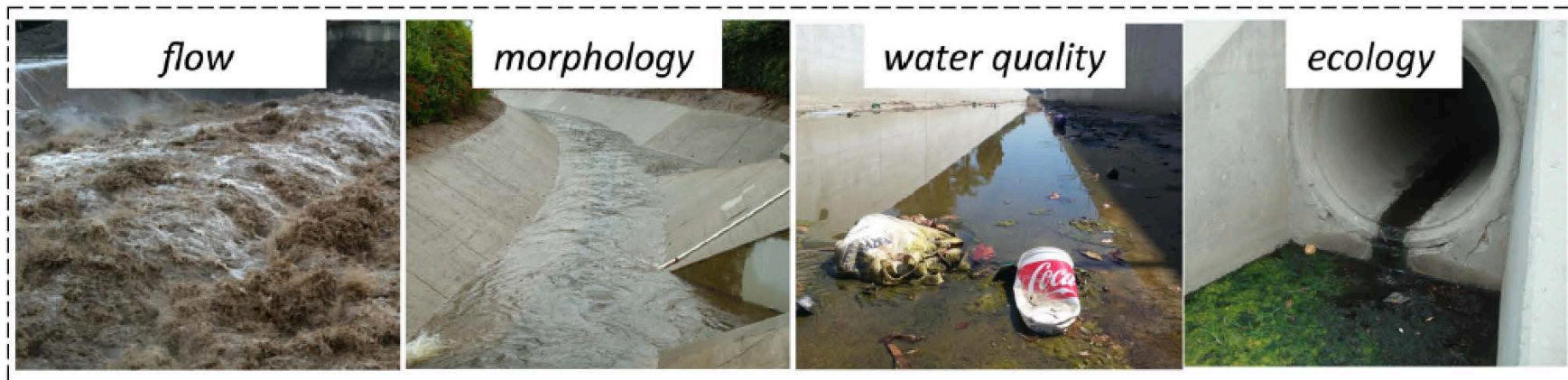


<http://water-pire.uci.edu/>

The Urban Stream Syndrome



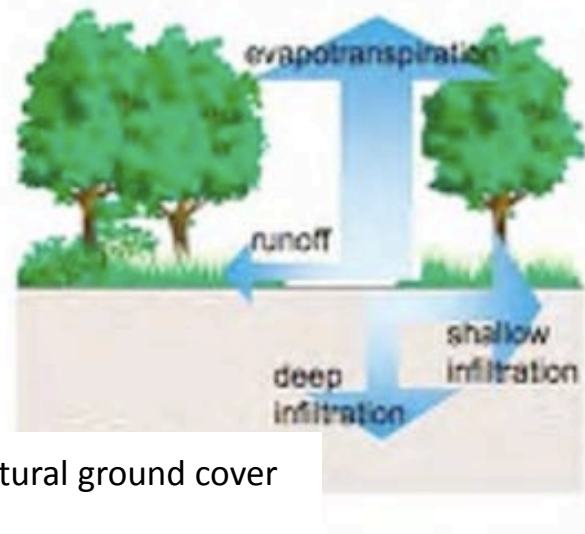
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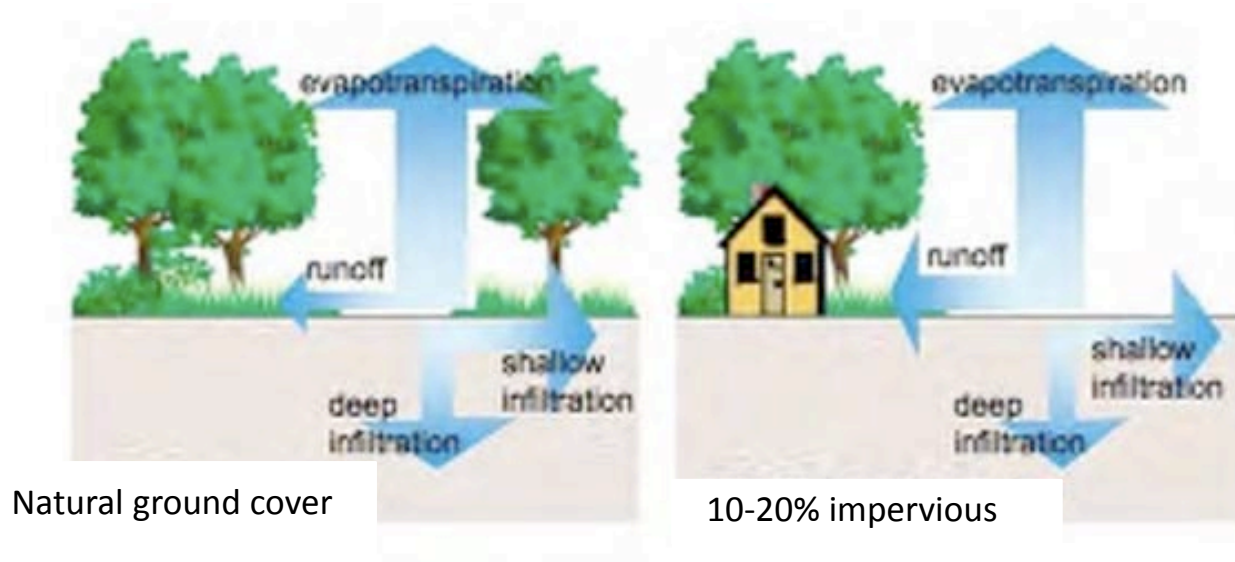
3 Asal Askarizadeh,[†] Megan A. Rippy,[†] Tim D. Fletcher,[‡] David L. Feldman,[§] Jian Peng,[⊗] Peter Bowler,[#]
4 Andrew S. Mehring,^{||} Brandon K. Winfrey,[⊥] Jasper A. Vrugt,[†] Amir AghaKouchak,[†] Sunny C. Jiang,[†]
5 Brett F. Sanders,[†] Lisa A. Levin,^{||} Scott Taylor,[∇] and Stanley B. Grant^{*,†,○,¶}

Urban Stream Syndrome



Natural ground cover

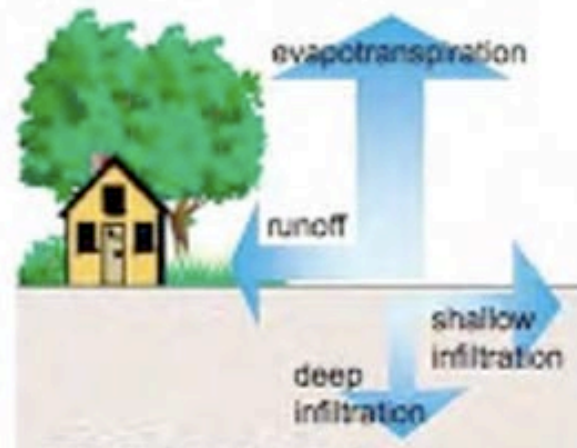
Urban Stream Syndrome



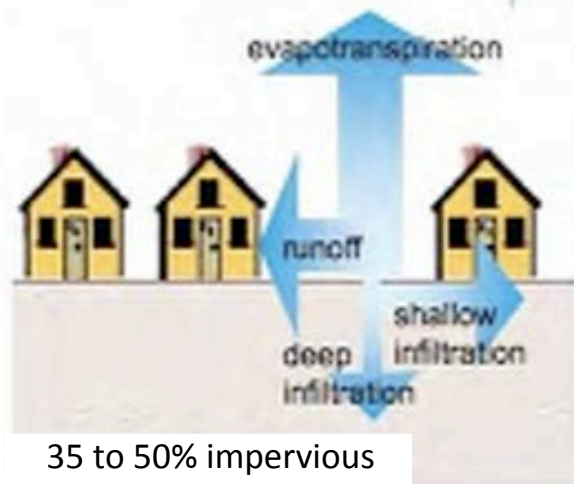
Urban Stream Syndrome



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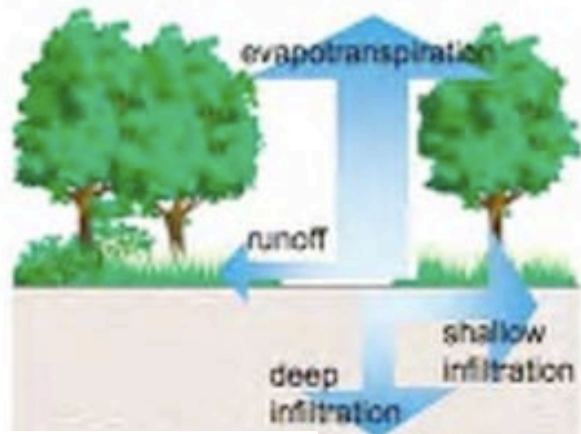


10-20% impervious

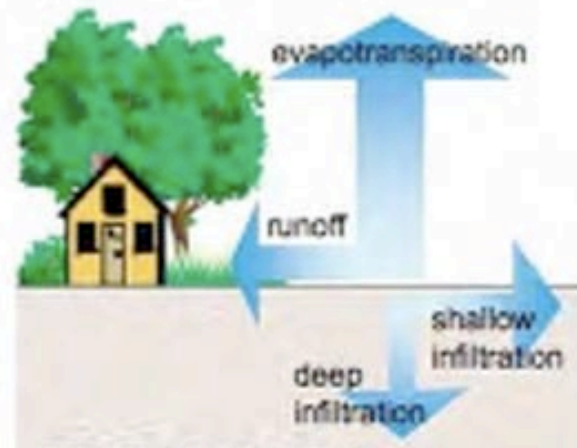


35 to 50% impervious

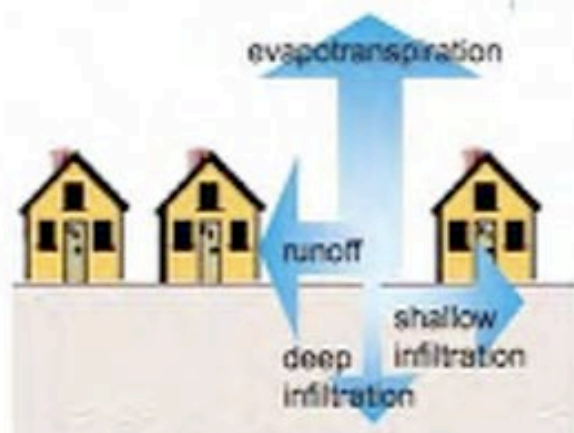
Urban Stream Syndrome



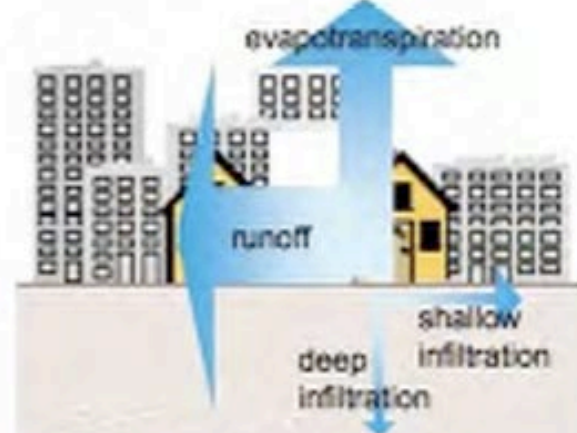
Natural ground cover



10-20% impervious



35 to 50% impervious



75 to 100% impervious

Increased Imperviousness alters stream hydrology in two ways*

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- During wet weather, water is delivered directly to the stream as overland flow (i.e., runoff). Overland flow is rare in natural catchments.

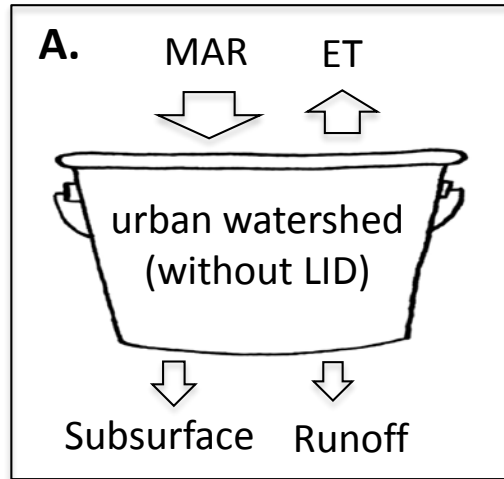
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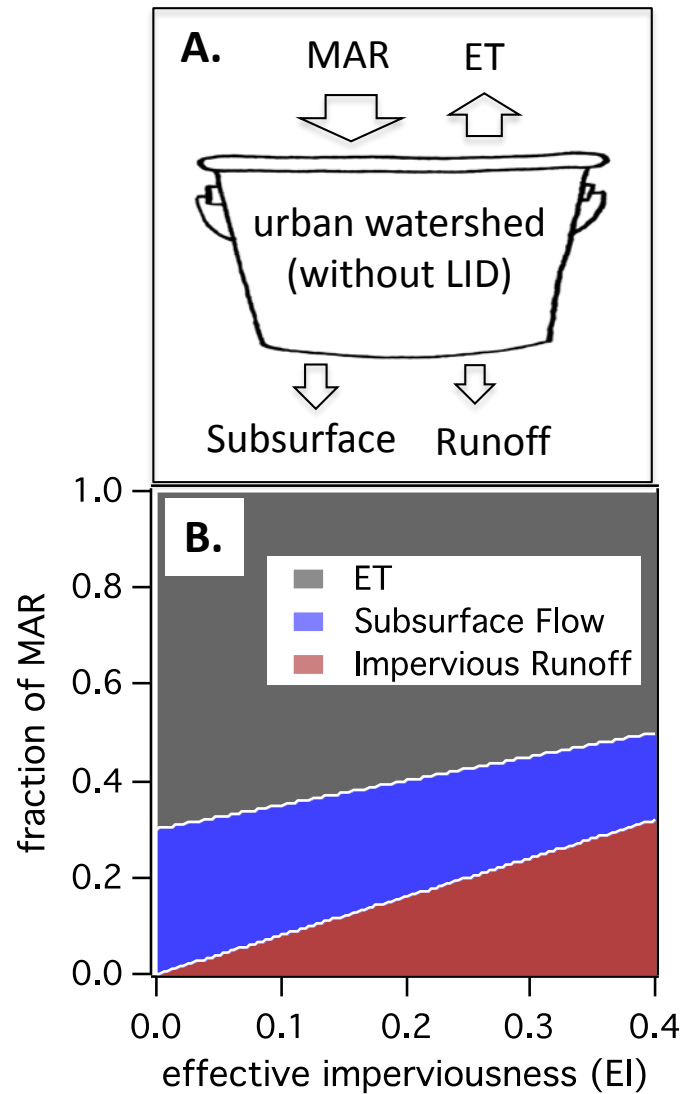
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- During dry weather, stream baseflow is reduced because impervious surfaces prevent infiltration and resupply of the shallow groundwater
- These two changes are a primary cause of the so-called “urban stream syndrome”

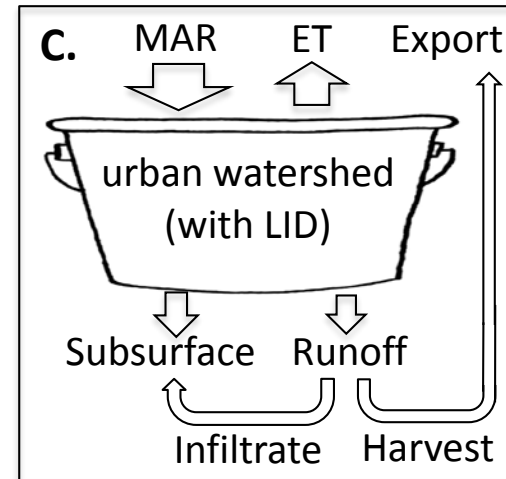
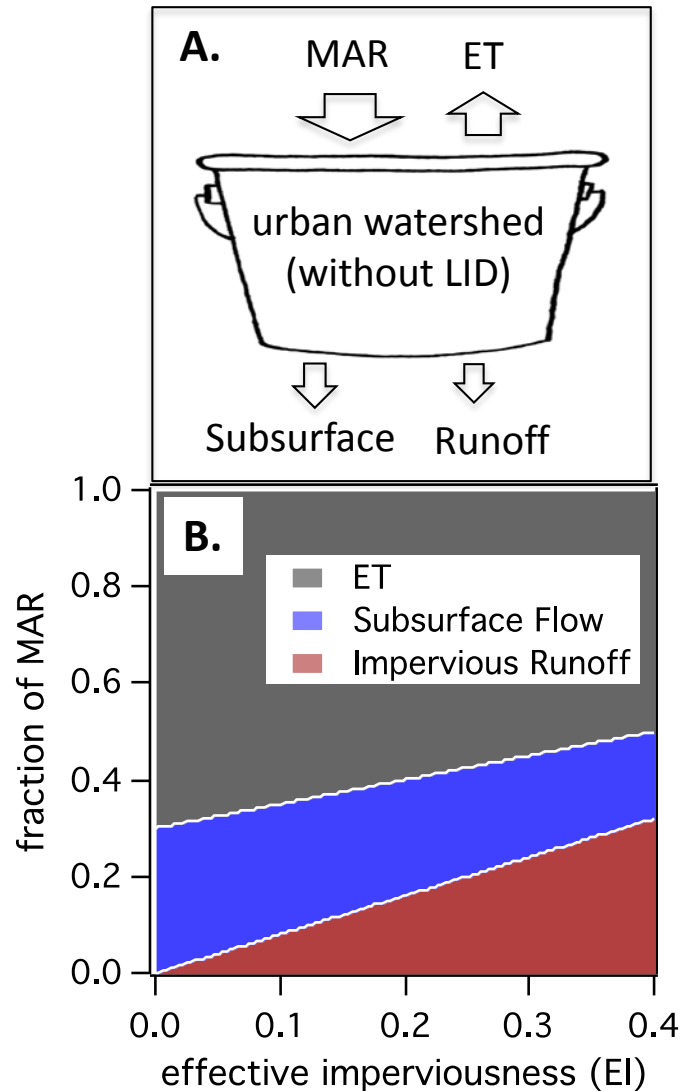
Annual Catchment Water Balance



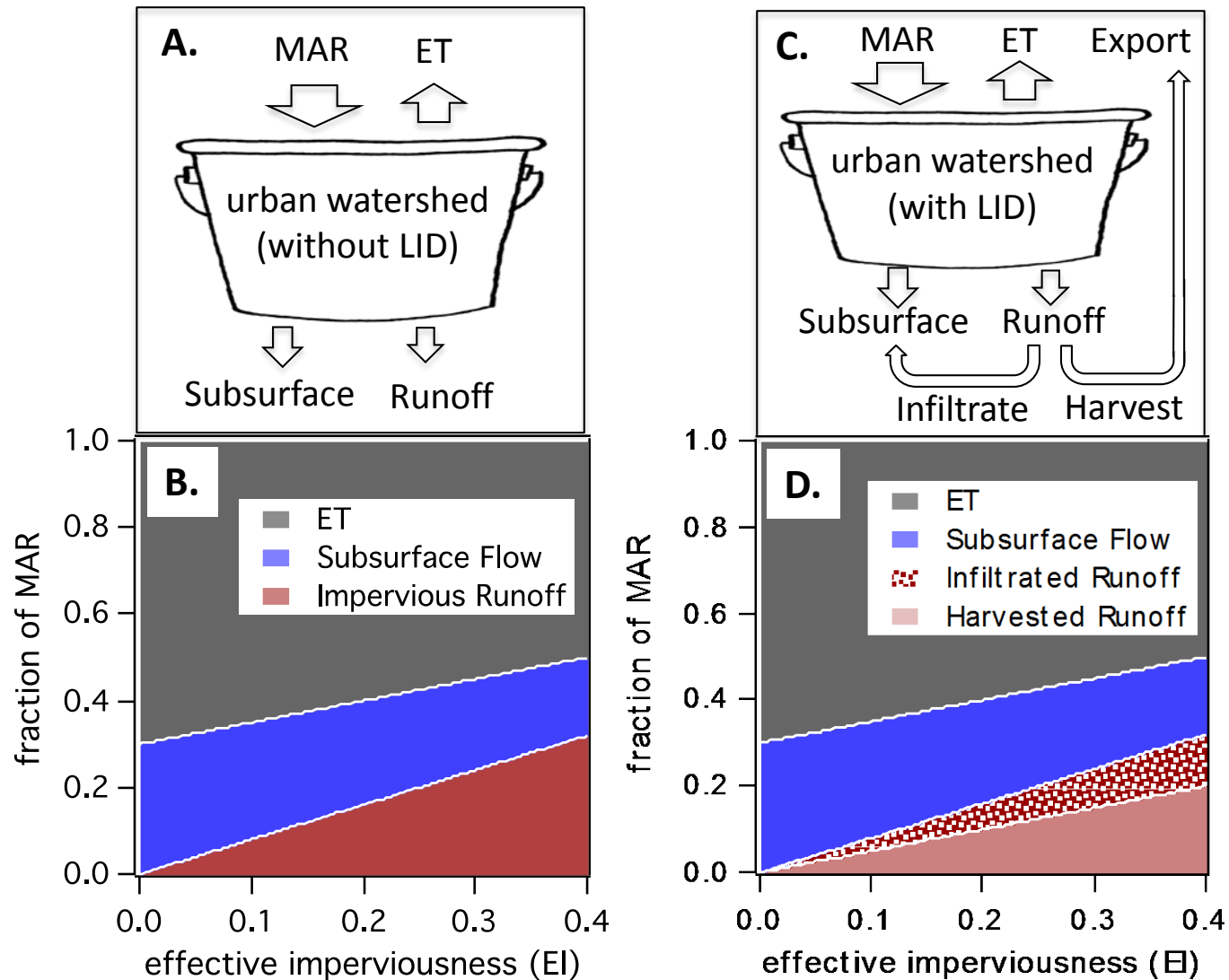
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Annual Catchment Water Balance



Q: What is the best mix of distributed LID for a Specific Catchment?

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A: Depends on your end goal!

Say the goal is to restore pre-urban
stream hydrology, then* ...

*Walsh,C.J.; Fletcher, T.D.; Burns, M.J. (2012) “Urban Stormwater Runoff: A New Class of Environmental Flow Problem”, *PLoS ONE* 7(9):e45814

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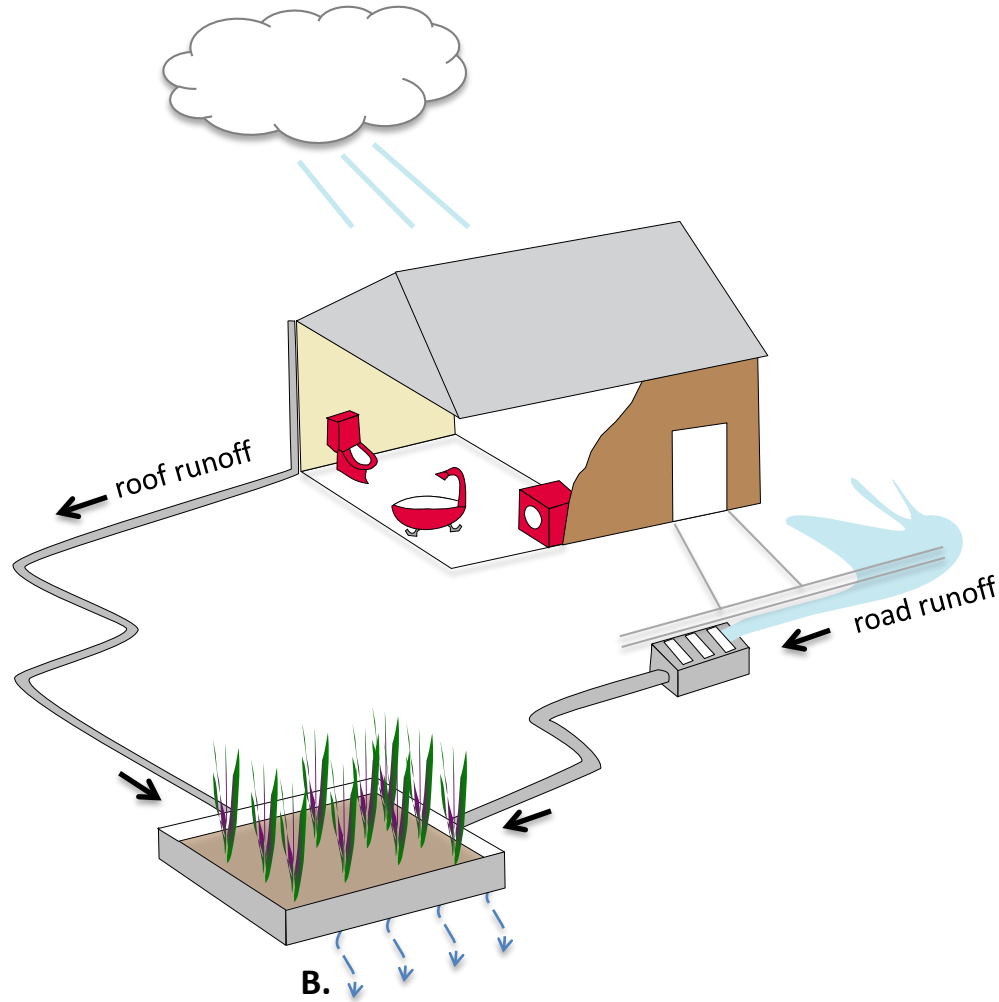
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- A portion of the captured stormwater should be **infiltrated** to restore shallow groundwater and baseflow in the stream
- The rest should be **harvested**; i.e., used for any purpose that keeps it out of the stream

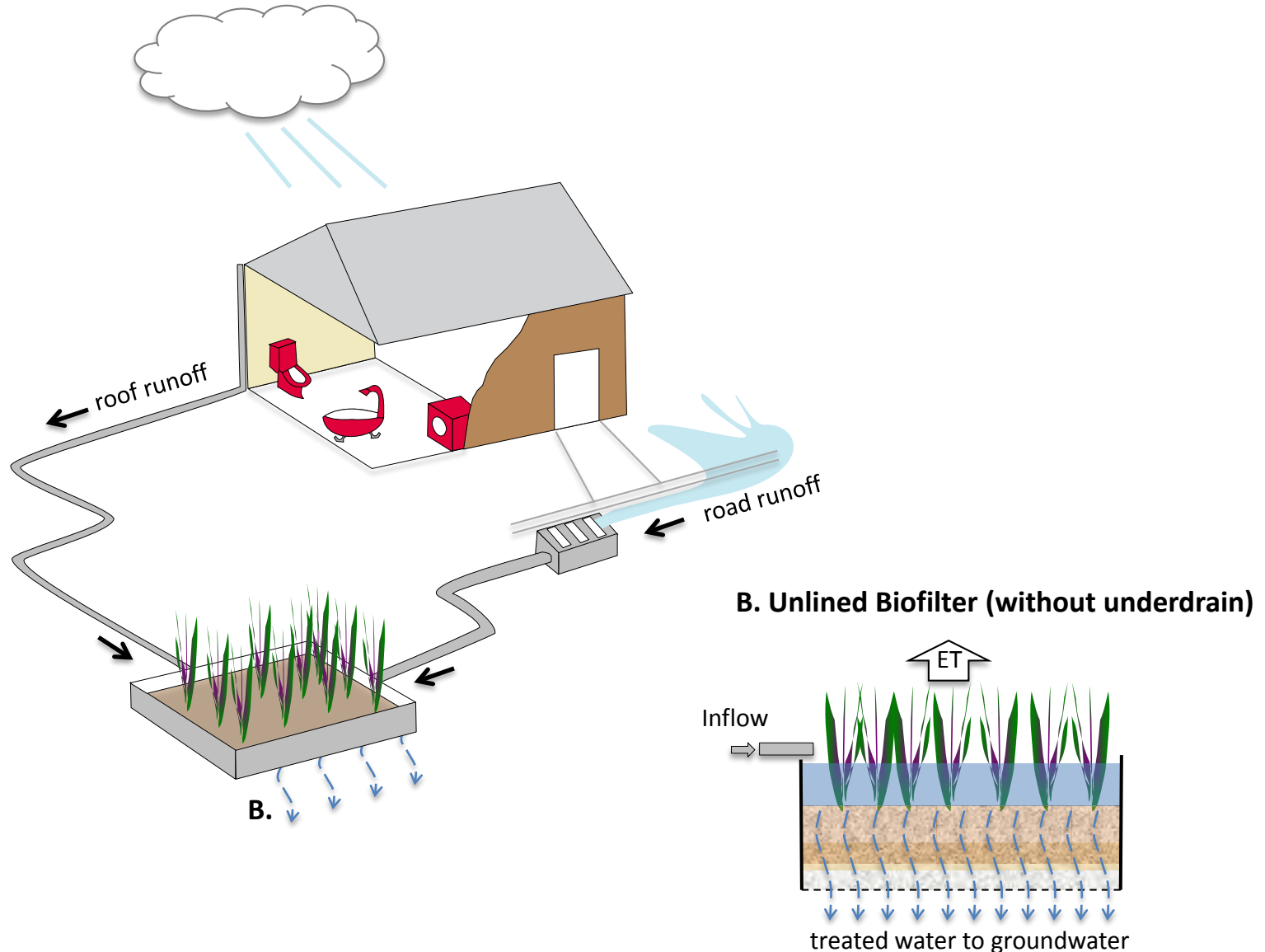
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Stormwater Infiltration Technologies



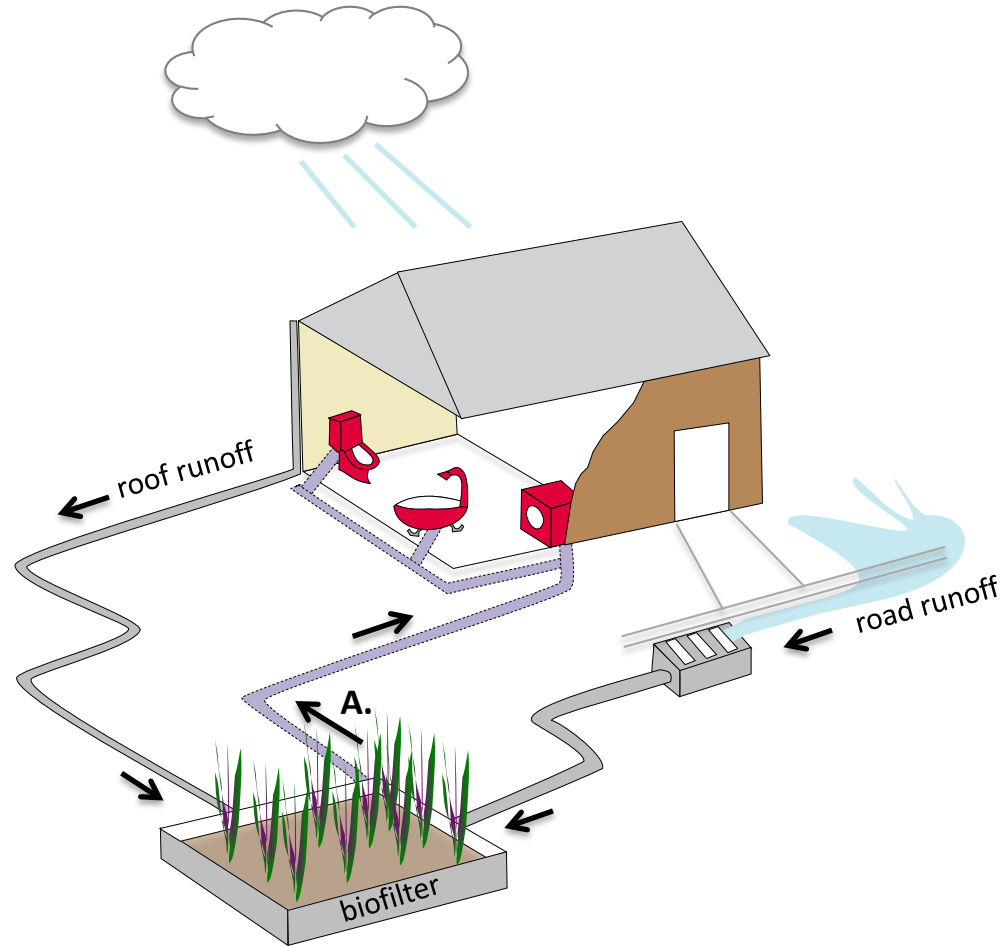
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Stormwater Infiltration Technologies



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Stormwater Harvesting Technologies



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