

Urban Runoff as a Drinking Water Source: Protecting Public Health with Distributed Treatment



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E-Learning Webinar Climate & Health

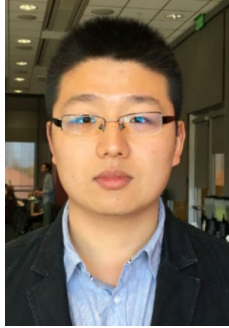
NIES Superfund Research Program

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The Stormwater Team



Joe Charbonnet



Yanghua Duan



Greg LeFevre



Richard G. Luthy



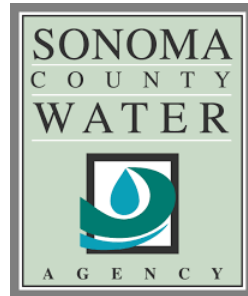
Marc Teixidó Planes



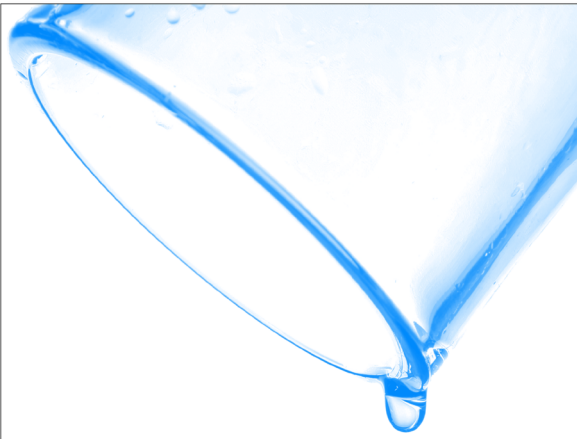
Jessica Ray



Stephanie Spahr





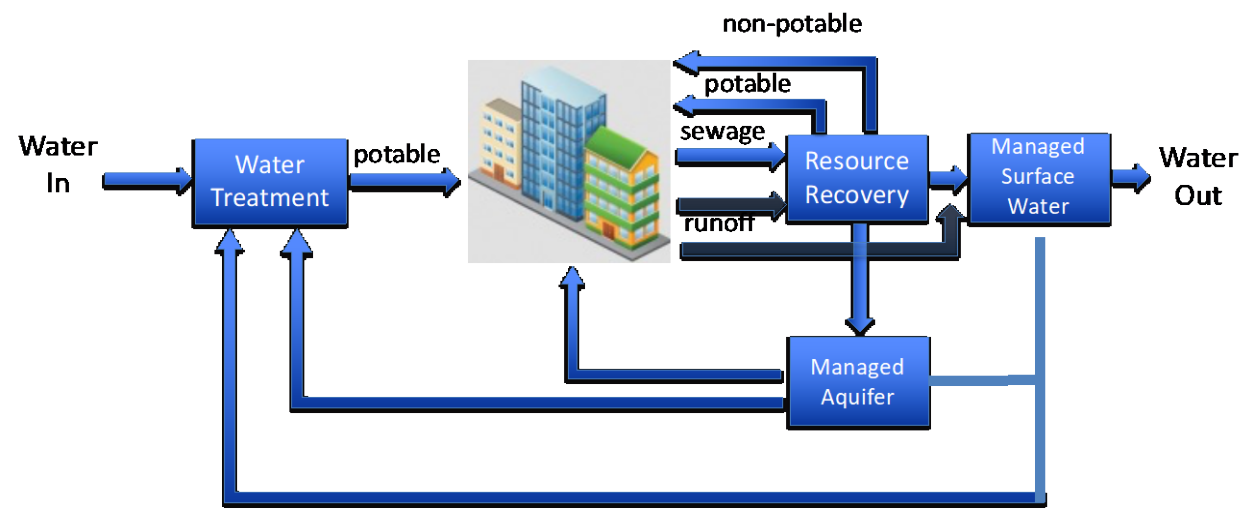


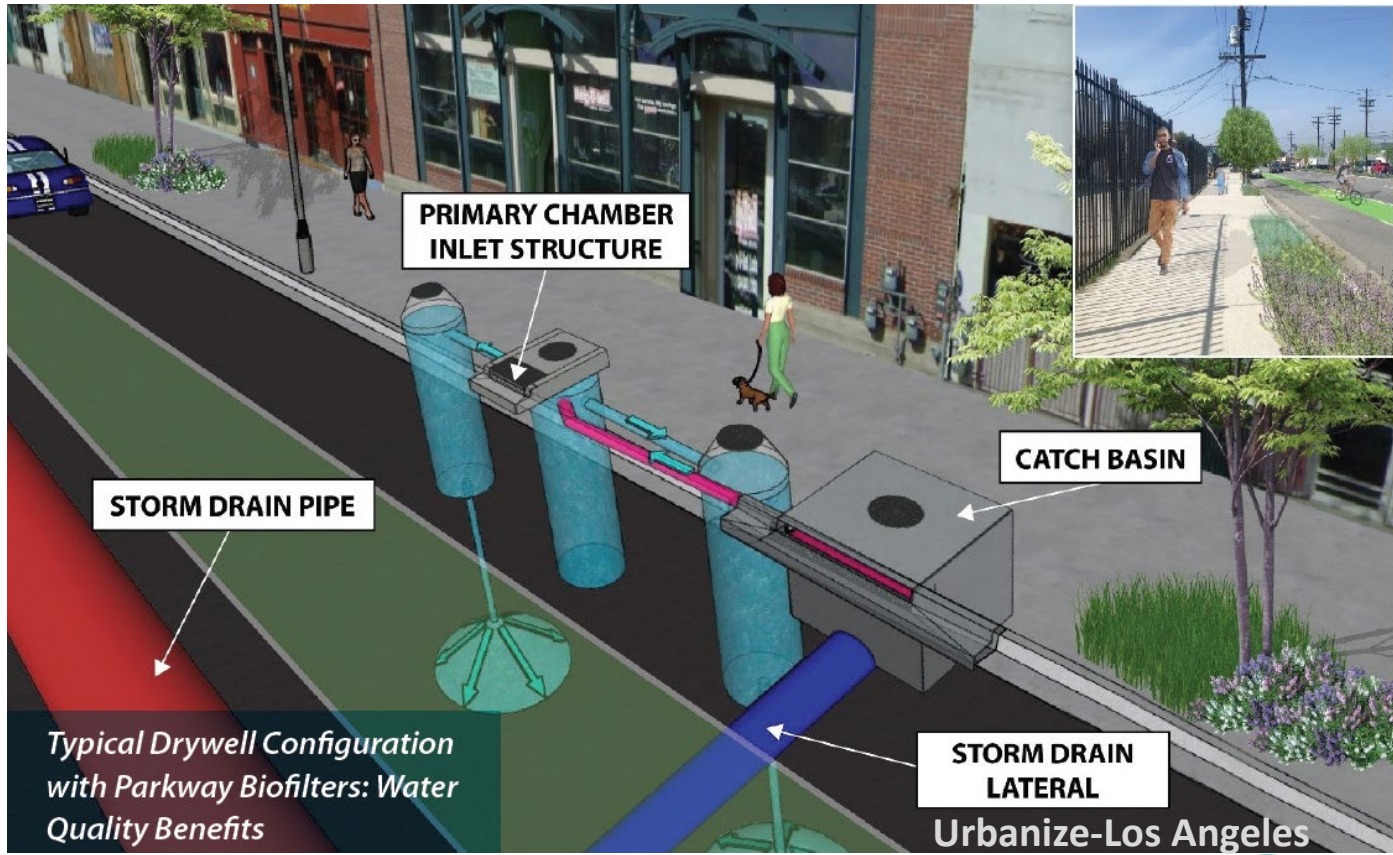
Water 4.0

The Past, Present, and Future of
The World's Most Vital Resource

David Sedlak

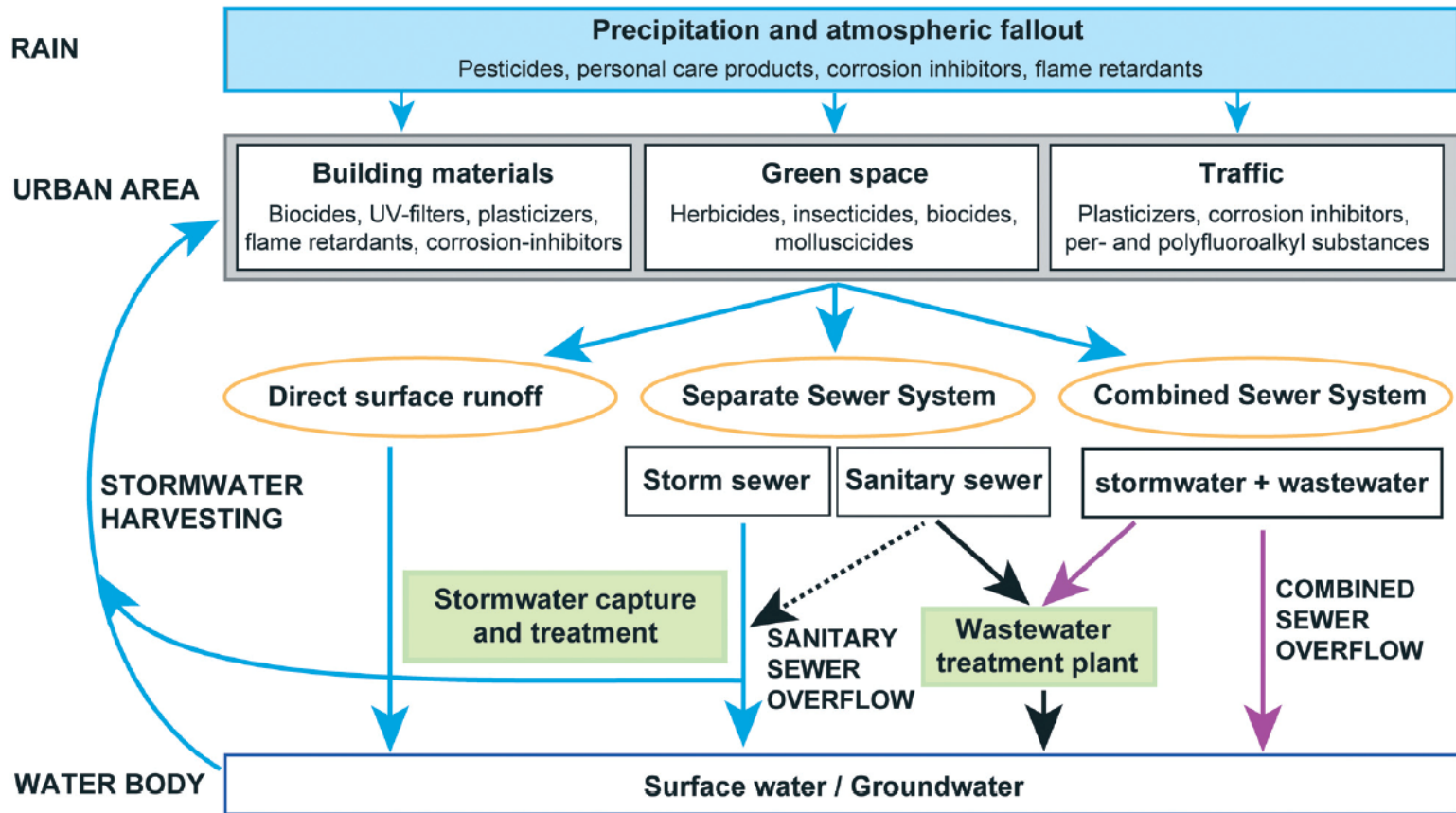
- Water 1.0: Centralized Supply
- Water 2.0: Drinking Water Treatment
- Water 3.0: Wastewater Treatment
- Water 4.0: Reuse, Stormwater, Desalination, etc.





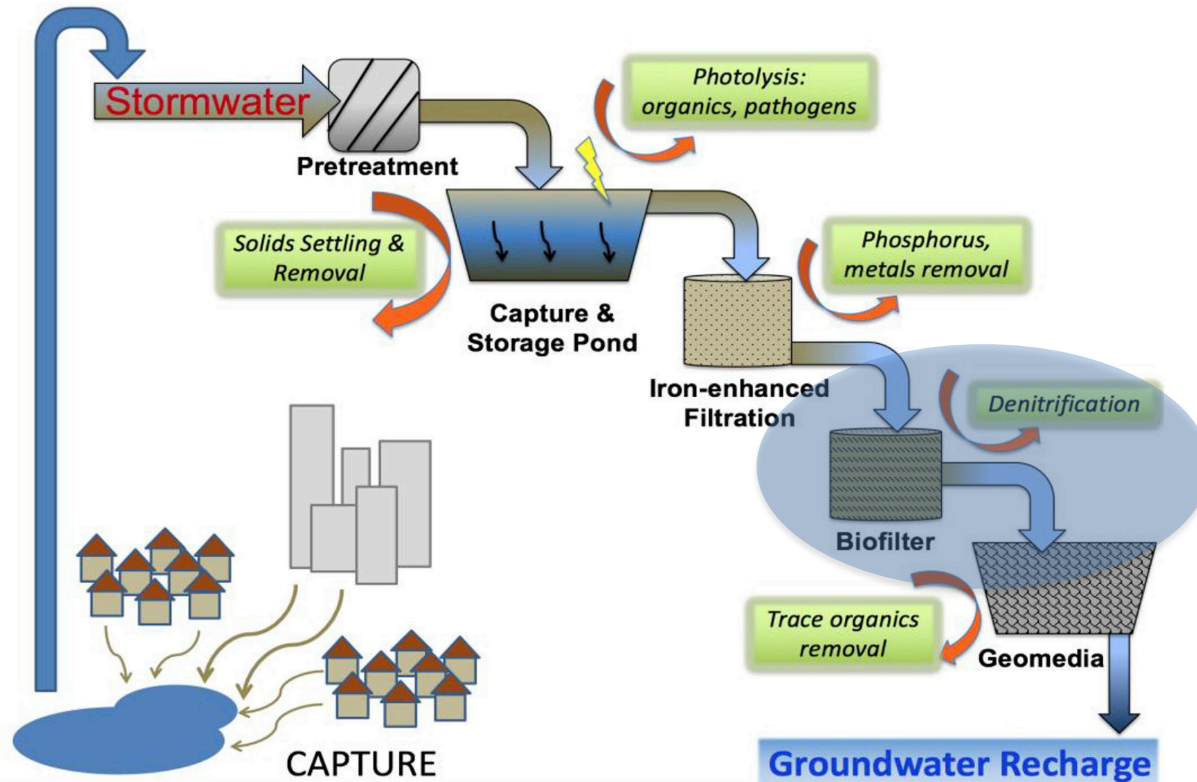
Typical Drywell Configuration with Parkway Biofilters: Water Quality Benefits

Urbanize-Los Angeles



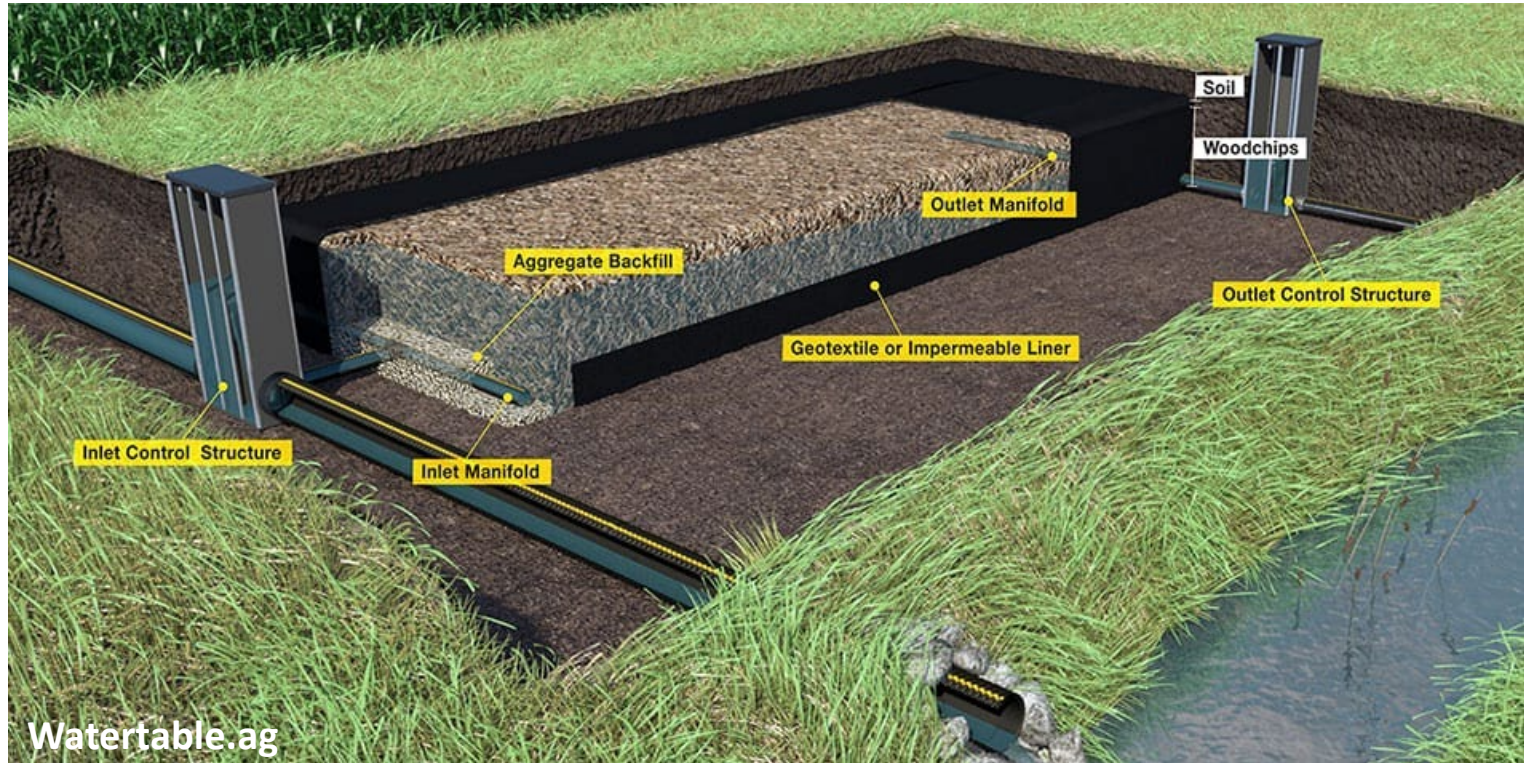
Spahr et al. (2020)

Capture, Treat, and Recharge

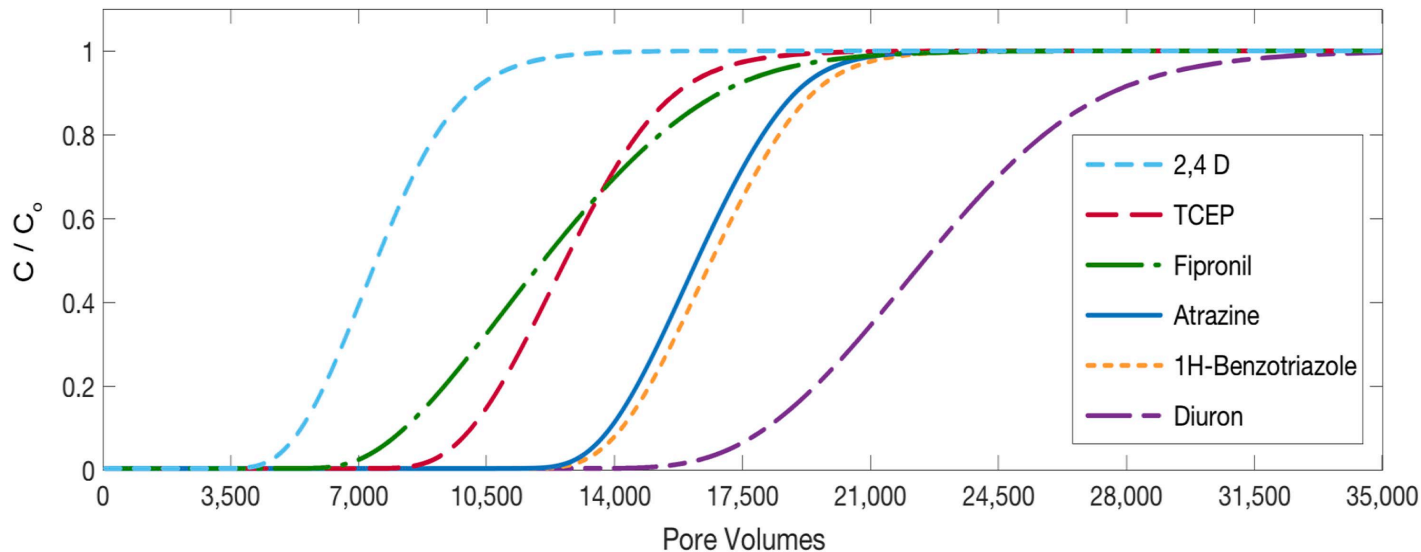


Ashoori et al. (2019)

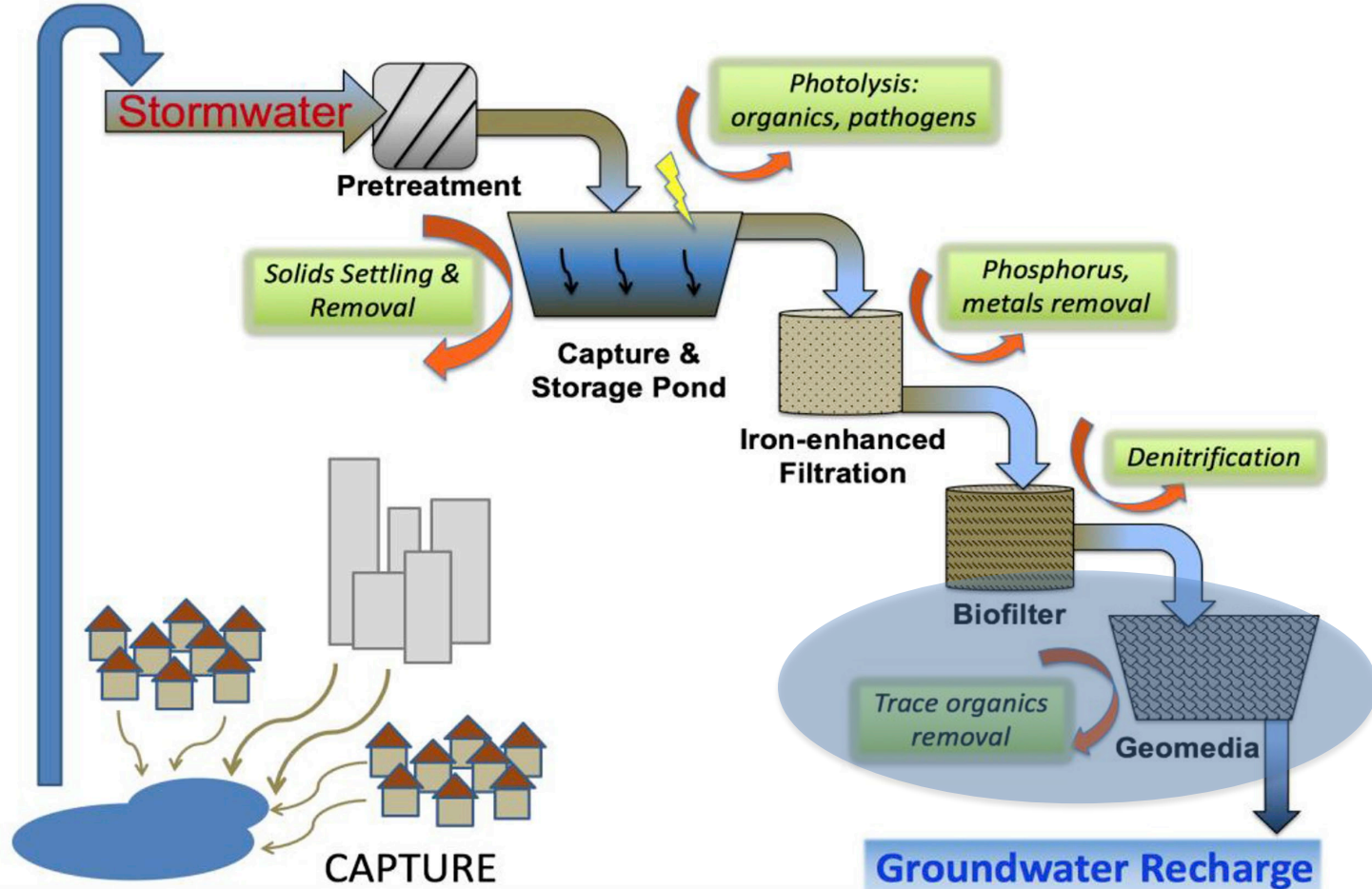
Woodchip Biofilter



Biochar-Amended Woodchip Biofilter



Ashoori et al. (2019)

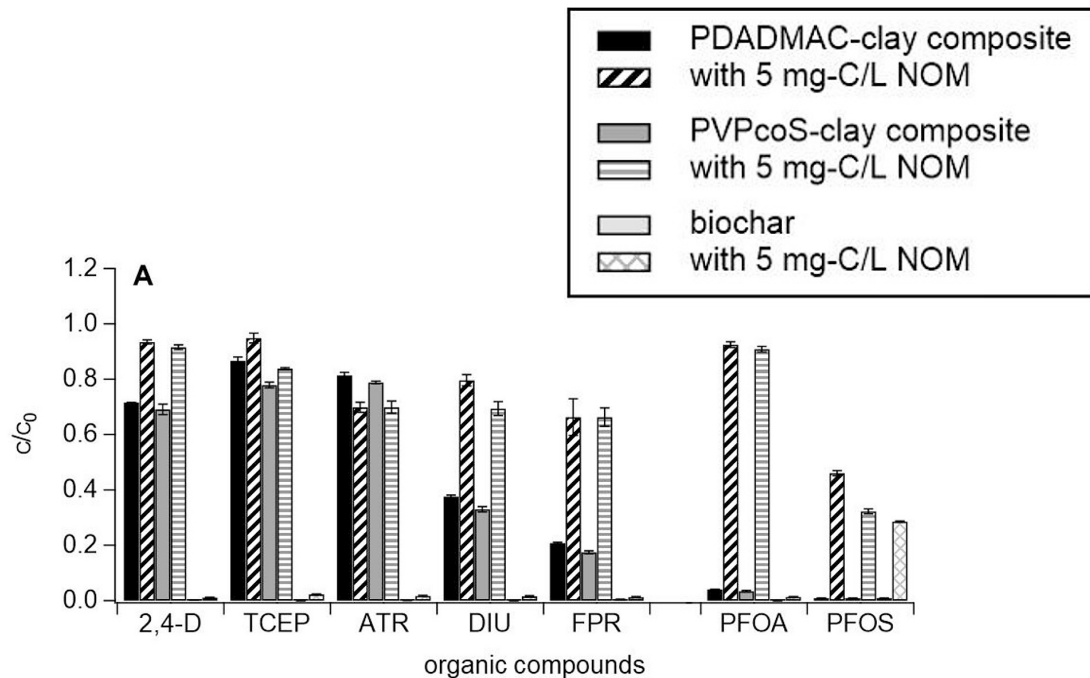


Geomedia for Contaminant Removal

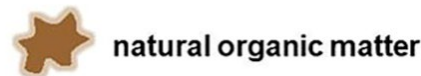
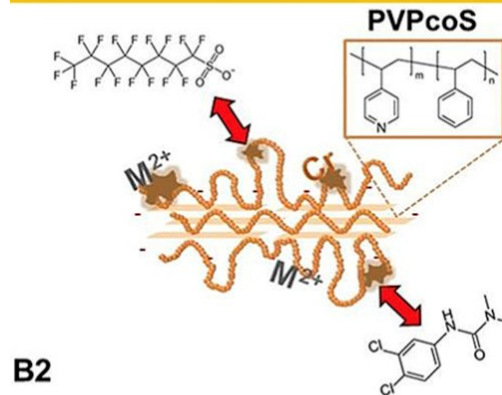
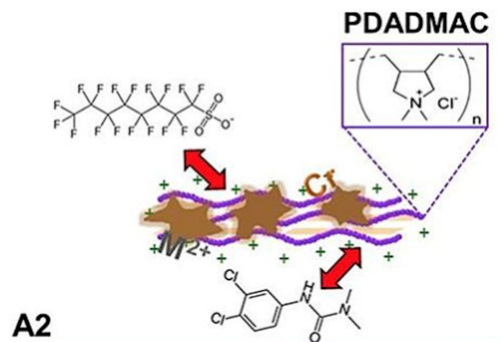
Issues of concern:

- Competition (e.g., NOM, Ca^{2+})
- Biotransformation
- Clogging
- Regeneration/disposal

Competition from Natural Organic Matter



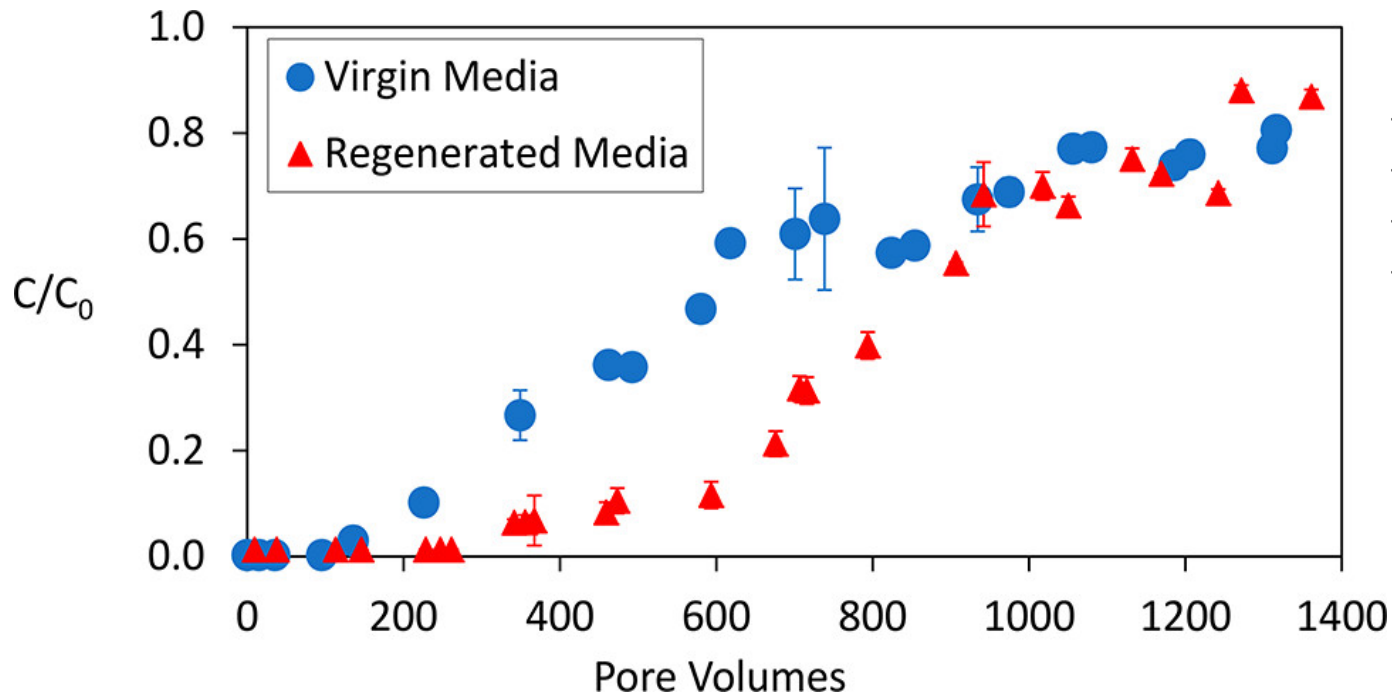
Ray et al. (2019)



Biofilms and Clogging

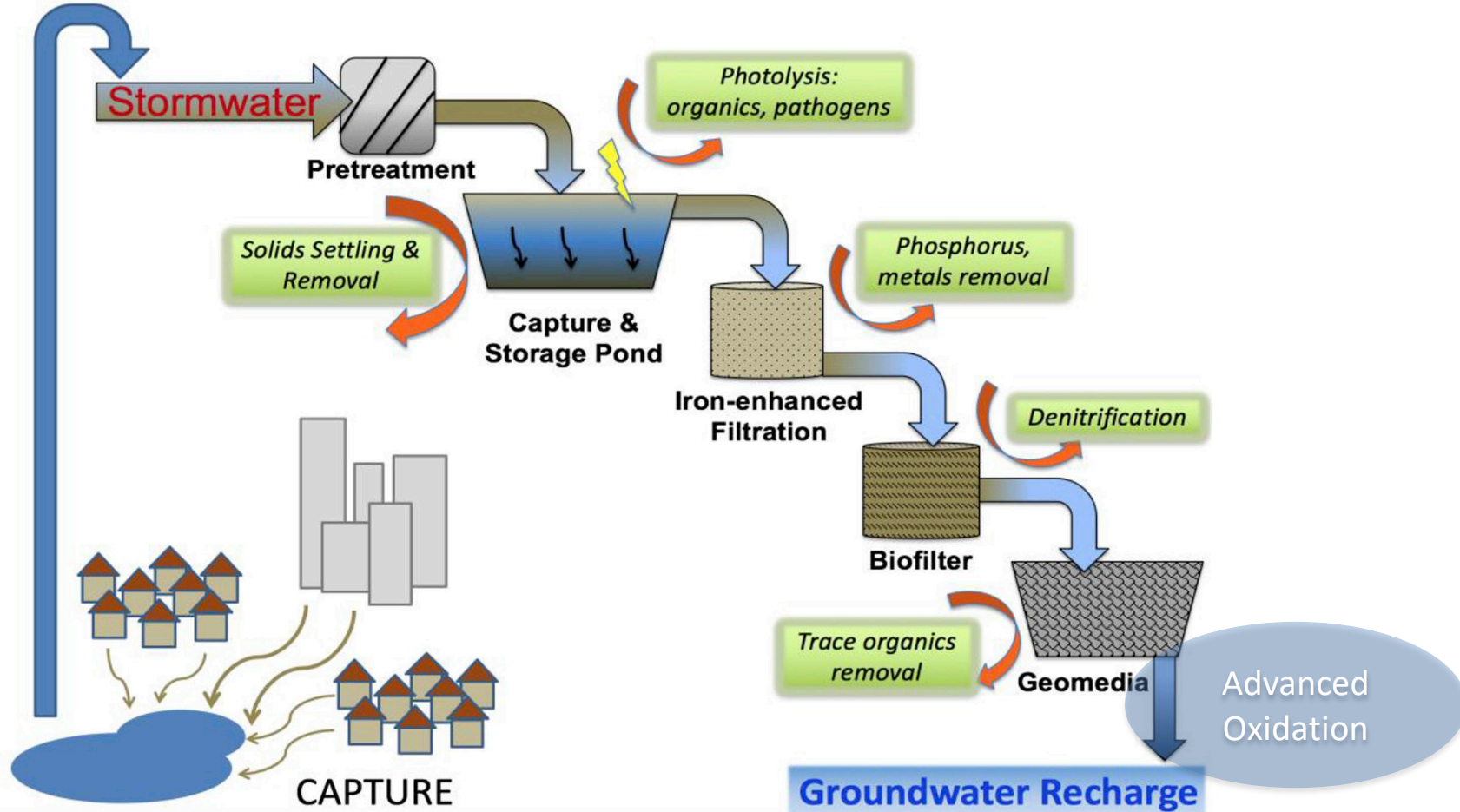


Geomedia Regeneration

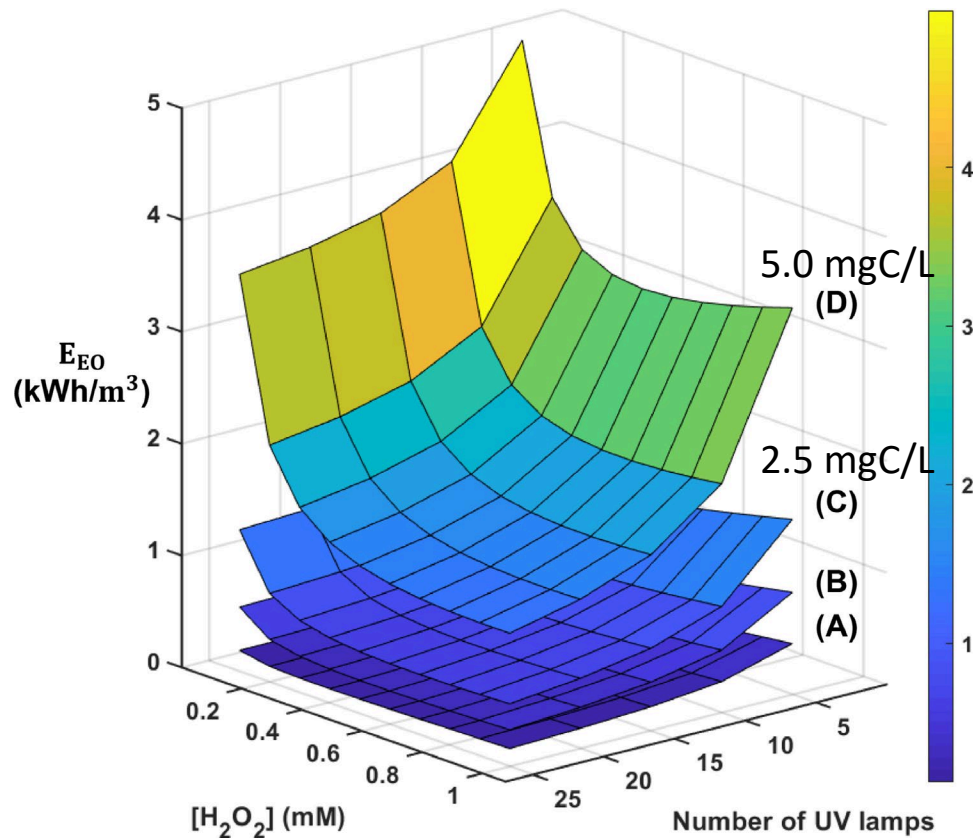
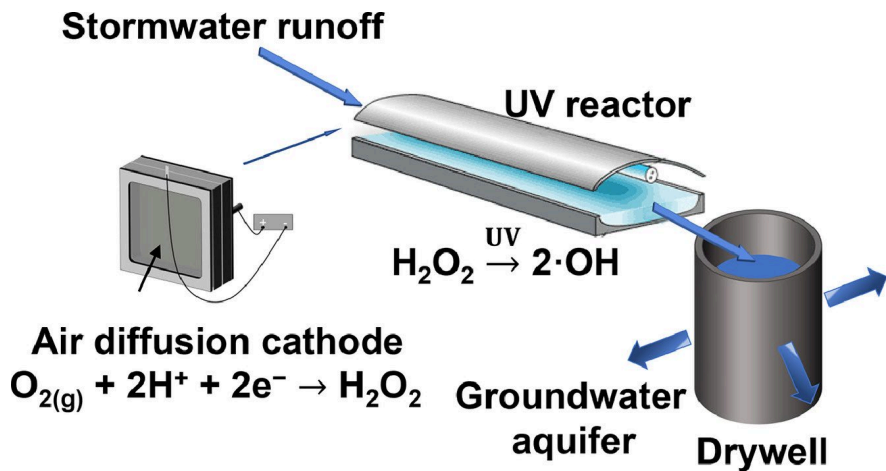


- Mn-oxide coated sand
- oxidizes phenols (BPA)
- fails after several years
- activity restored with HOCl

Charbonnet et al. (2021)



Modular Advanced Oxidation Process



Final Thoughts

- Stormwater recharge is becoming more popular as a means of breaking the reliance of cities on imported water.

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- Distributed recharge systems require source control and low-maintenance treatment systems to minimize risks from chemical contaminants.
- Technologies developed for hazardous waste site remediation (e.g., permeable reactive barriers, sorbents, AOPs) are useful in these efforts.

References

Ashoori N., Teixido M., Spahr S., LeFevre G.H., Sedlak D.L. and Luthy R.G. (2019) Evaluation of pilot-scale biochar-amended woodchip bioreactors to remove nitrate, metals, and trace organic contaminants from urban stormwater runoff. *Water Research*, 154: 1-11. doi: 10.1016/j.watres.2019.01.040

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Spahr S., Teixido M., Sedlak D.L. and Luthy R.G. (2020) Hydrophilic trace organic contaminants in urban stormwater: occurrence, toxicological relevance, and the need to enhance green stormwater infrastructure. *Env. Sci.-Water Res. & Technol.* 6:15-44. doi: 10.1039/c9ew00674e