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Conventional and amended bioretention soil media for targeted pollutant treatment: A critical review to guide the state of the practice

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ABSTRACT

Bioretention systems are widely used green infrastructure elements that utilize engineered bioretention soil media (BSM) for stormwater capture and treatment. Conventional bioretention soil media, which typically consists of sand, sandy loam, loamy sand or topsoil amended with compost, has limited capacity to remove and may leach some stormwater pollutants. Alternative engineered amendments, both organic and inorganic, have been tested to supplement BSM. Yet, municipalities and regulatory agencies have been slow to adopt these alternative amendments into their design specifications, partly because of a lack of clear guidance on how to select the right amendment to treat a target stormwater contaminant under highly variable climatic conditions. This article aims to provide that guidance by: (1) summarizing the current design BSM specifications adopted by jurisdictions worldwide, (2) comparing the performance of conventional and amended BSM, (3) highlighting advantages and limitations of BSM amendments, and (4) identifying challenges for implementing amendments in field conditions. The analysis not only informs the research community of the barriers faced by stormwater managers in implementing BSM amendments but also provides guidelines for their adoption by interested agencies to comply with existing regulations and meet design needs. This feedback loop could catalyze further innovation in the development of sustainable stormwater treatment technologies.

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