Watershed Planning for Green Infrastructure Implementation through the GreenPlan-IT Toolkit

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The benefits for greening the urban landscape through Green Infrastructure (GI) are numerous, including water-quality improvements derived from filtering runoff pollution, reduction of urban flooding risks, and increased groundwater recharge. Other benefits include traffic calming effects, improvement of the bike/pedestrian environment, improved connectivity of green spaces (and habitats for birds and wildlife), as well as beautification of neighborhoods and increased property values. But how do we ensure that GI placement is optimized to yield the water-quality and flow reduction outcomes called for within the NPDES permits?

GreenPlan-IT is a planning level tool that is designed to support the cost-effective selection and placement of GI in urban watersheds. The GreenPlan-IT toolkit is comprised of three tools: (a) a GIS-based Site Locator Tool to map and rank potential GI sites; (b) a Modeling Tool to determine baseline conditions and project runoff and pollutant load reduction from GI scenarios; and (c) an Optimization Tool that uses cost-benefit analysis to identify the best GI installation scenario within a watershed for achieving flow/load reduction goals. Tool outputs are used by municipalities to develop watershed master plans to guide future GI implementation toward addressing water quality and quantity targets.

GreenPlan-IT is a product of the Green Plan Bay Area project, a collaborative effort between San Francisco Estuary Partnership (SFEP), San Francisco Estuary Institute (SFEI) and Bay Area municipalities. New enhancements for the GreenPlan-IT toolkit will be developed through new US EPA Water Quality Improvement funding that will facilitate broader implementation among Bay Area municipalities.

Keywords: stormwater, low-impact development, green infrastructure, load reduction, GIS, municipal planning

Poster Topic: Runoff Infrastructure

Rain Gardens in Richmond: A Low-cost, Community Driven Solution for Stormwater Filtration

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In Richmond, a grassroots approach is creating a system of rain gardens along the Richmond Greenway providing solutions to non-point pollution and stormwater drainage issues while positively engaging community members.

Railroad development in Richmond began in 1895, and industrialization expanded from there, bringing pavement and pollution to the city. As a result, this area contributes some of the highest levels of non-point pollution flowing into the Bay. The Richmond Greenway is a walking and biking path, built several years ago as part of the Rails to Trails Initiative. However, the Greenway faces drainage issues leading to polluted stormwater accumulating where city streets intersect with the path. Richmond's financial limitations have previously been seen as inhibiting solutions to these environmental problems as there is a perception that expensive and sophisticated engineering solutions are required to solve these challenges.

This poster shows how The Watershed Project, a small non-profit, found a low-cost, grassroots solution to this large-scale drainage problem, using a network of rain gardens along the Richmond Greenway. Through collaborations with partnering organizations, hiring and mentoring local youth known as the Green Collar Corps, and the help of many volunteers, we have built a system of five rain gardens and bioswales along the Greenway, with several more planned. This project is a model for communities facing similar problems around the Bay Area.

The rain gardens and bioswales alleviate flooding and eliminate post-storm ponding through "slow, it spread it, sink in" designs: slowing down the water, spreading it, and allowing it to infiltrate into the soils where it is filtered by microbes. Other benefits include improved water quality in the Bay, adding much needed green spaces around the mostly paved City of Richmond, and an engaged local community dedicated to beautifying the city and protecting green spaces.

Keywords: Richmond, stormwater, rain garden, bioswale, community partnership, low cost solution

Poster Topic: Runoff Infrastructure

Performance of a Bioswale on Urban Runoff Management

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Bioswales have proved to be an effective best management practice (BMP) to control runoff. Most bioswale evaluation studies have been conducted a few years following construction, perhaps underestimating the pollutant control value of mature trees because their crowns and root systems were not fully developed. This study evaluates the effectiveness of a bioswale eight years after construction in Davis, California. The bioswale was installed in 2007 and measured 9 m x 1 m x 1 m (LxWxD). Engineered soil (80% native lava rock and 20% loam soil by volume) replaced the native Yolo loam soil. Four Red Tip Photinia (*Photinia ×fraseri Dress*) trees and two Blueberry Muffin Hawthorn (*Rhaphiolepis umbellata (Thunb.) Makino*) shrubs were planted in the bioswale. Runoff flowed into the bioswale from an adjacent 171 m^2 panel of turf grass. An identically sized control plot consisting of non-disturbed native soil was located immediately adjacent to the treatment plot. The same plants were planted in the control site. Surface runoff, pollutant loading, and woody plant growth were measured. Compared to the control, the treatment reduced N, P, and TOC loading by 99.4%, 99.7%, and 99.6%, respectively. These reductions were primarily due to a reduction of surface runoff by 99.4%. After eight years, plant growth was not significantly different, perhaps because the native Yolo loam is a very productive agricultural soil. The superior performance of the bioswale for reducing pollutants demonstrates the importance of additional long-term monitoring and the potential for large-scale application as an effective urban runoff control measure.

Keywords: bioswale, engineered soil, urban runoff, water quality

Poster Topic: Runoff Infrastructure