GREEN STREETS, CLEANER STORMWATER: A PRIMER

CUTTING THE CURBS

The quiet city of El Cerrito is loudly leading the way in the East Bay in tackling and treating the grime and grease and other pollutants that race off its streets into the storm drains—and eventually San Francisco Bay—when it rains. In two block-long stretches of San Pablo Avenue (one at Eureka; the other at Madison), the city cut the curbs to allow stormwater from the street to flow into several large planters. By slowing and holding onto the stormwater, the planters encourage pollutants in the water to drop out and be filtered by the microbes in the soil and plant roots. The plants themselves take up excess nutrients in the stormwater. Projects like these are sometimes called "green streets."

The El Cerrito planters were built below grade so that polluted water running off of the street and sidewalk will flow into them and be filtered before going into the storm drain system and the Bay. Photo by Lisa Owens Viani.

WHAT ARE GREEN STREETS AND HOW DO THEY WORK?

Green streets are streets where plants and soil are a visible part of the storm drain and gutter system. Designed to tie into the existing street and storm drain system, these green streets projects retain and filter stormwater while they beautify the street. A variety of green streets facilities—**stormwater planters, rain gardens, curb extensions** or **bulb-outs, bioswales,** and **vegetated swales**—are now being used by cities to treat pollutants in stormwater. All of these landscape features work by slowing the water down and either allowing it to infiltrate into the ground or to flow through slowly before it goes back into the storm drain system. The purpose is to hold onto the stormwater longer than in a traditional curb-and-gutter system so that pollutants can be filtered out. Whether stormwater **infiltrates** or **flows through** the landscape feature depends on the location and the goal of the project—and practical issues such as whether or not there are facilities, pipes, or conduit located beneath the surface.

Green streets are designed by engineers, who calculate the volume of water they want to treat. No matter what their size, green streets facilities all use the simple principle of letting plants and soil "do the work" to treat pollution. The city of Portland, Oregon and others have found that using plants and soil to treat stormwater can be less expensive than building and maintaining pipes and other "hard" structures. An added benefit of using soil and plants is that, unlike pipes and concrete, they offer habitat for birds, butterflies, and bees.

Plants like these in a Portland stormwater planter help catch and slow runoff while providing habitat for pollinators and birds. Photo by Lisa Owens Viani.

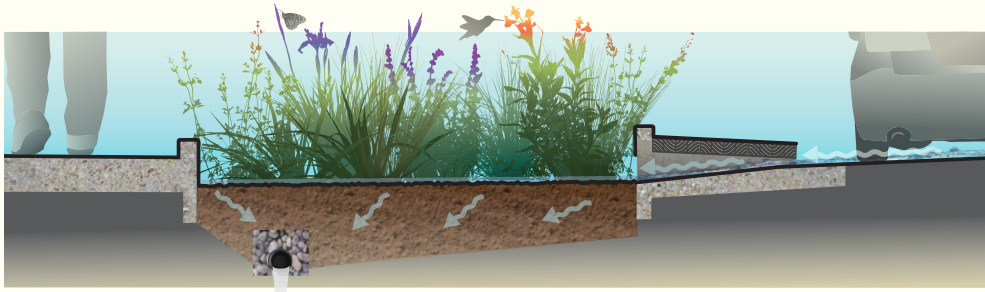


Illustration courtesy of Gates & Associates.

"The City was excited to build this project—a project that could help demonstrate the potential for treating runoff from our streets and roads while at the same time providing an aesthetic improvement to our urban streetscape. It's also exciting to see the interest this project is generating from all kinds of other parties such as Caltrans, clean water organizations, regulatory entities, and private consulting firms." –Jerry Bradshaw, Public Works Director, City of El Cerrito

Curb extensions aka **bulb-outs** (below) are often used on wide streets, and can help slow traffic, in addition to greening up a concrete- and asphalt-heavy landscape.

Stormwater from the street flows into this curb extension in San Bruno.

Rain gardens are often used in residential areas, at schools, or at city halls and other government offices, where there is usually room for bigger stormwater treatment facilities; the one below was built at El Cerrito's City Hall and takes runoff from the building's roof.

A rain garden at El Cerrito City Hall is planted with sedges, vine maples, and other natives.

A small residential rain garden in the city of Portland. Photo courtesy of Portland Sustainable Stormwater Division.

Brisbane built this rain garden at its City Hall. This photo (and the curb extension photo above left) courtesy of the San Mateo Countywide Water Pollution Prevention Program.

Bioswales are long, fairly shallow depressions in the earth that often use a curved or sinuous form to slow water, and are planted with native or non-native grasses and other vegetation. Like the other green streets facilities, bioswales treat stormwater from adjacent parking lots or roads. The one below filters runoff from a parking lot. Research from Portland, Oregon indicates that swales planted with native species filter more pollutants than swales planted with turf.

This bioswale filters runoff from the adjacent parking lot. Photo courtesy Kevin Robert Perry.

"The old way of managing stormwater was to put it in a pipe and forget about it. That approach doesn't recognize that stormwater can be an asset when it's integrated into building and site design." –Tom Liptan, City of Portland, Sustainable Stormwater Division

Eco-roofs and **green walls** are two additional, innovative and attractive ways of treating stormwater. **Eco-roofs** are roofs on top of which a layer of plastic has first been installed (to prevent water damage), and then a shallow layer of soil and plants added. When rain falls on a traditional hard roof, it often races off into gutters and into the storm drain system—and San Francisco Bay. When rain falls on an eco-roof, it is slowed, absorbed, and filtered.

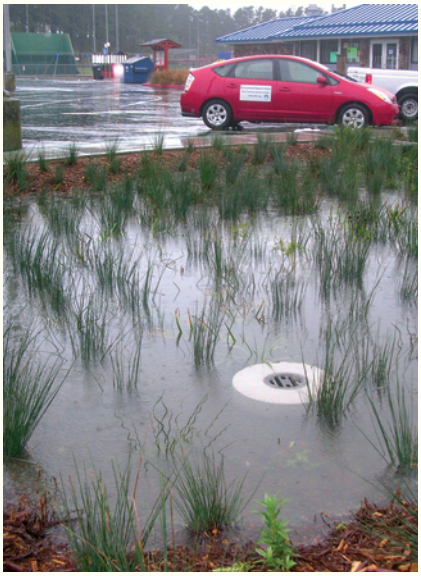
One of Portland, Oregon's many eco-roofs, blooming with sedum. Photo courtesy of Tom Liptan.

Green walls also filter water that sheets off of roofs before it can make its way to the street. Both eco-roofs and green walls can provide habitat for birds and pollinators. Birds have begun nesting on some eco-roofs in Portland, Oregon.

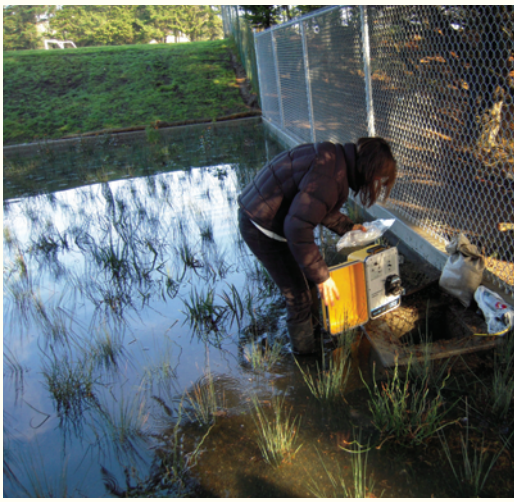
Green walls like this one at a motel in Portland, Oregon can slow and filter runoff from roofs. Photo by Lisa Owens Viani.

THE SCIENCE OF GREEN STREETS

The San Francisco Estuary Institute (SFEI) recently found that a rain garden installed next to a parking lot in Daly City, California reduced PCBs and mercury in the runoff by 40 percent, and pollutants from motor oil, diesel, and asphalt called PAHs, as well as heavy metals, including zinc, copper, lead, and nickel, by over 80 percent. Most of this pollution comes from cars and other vehicles. In El Cerrito, scientists are testing for copper, mercury, PCBs, pesticides, and other contaminants.



This rain garden in Daly City treats polluted water from an adjacent parking lot. Photo above and below by SFEI.



SFEI scientists study how much pollution the Daly City rain garden filters.

RETHINKING OUR STREETS

All of these landscape features—sometimes called "LID" (for **low impact development**) or **"green infrastructure"**—can be used in both urban and in residential settings, beautifying streets, calming traffic, and offering habitat.

Kevin Robert Perry, of Nevue Ngan, author of the award-winning *San Mateo County Sustainable Green Streets and Parking Lots Design Guidebook*, which can be downloaded at www.flowstobay.org, says green streets can start as simply as planting street trees—and be as advanced as curbless streets, where stormwater simply sheetflows into green streets treatment devices. "We need to go back and reverse our auto-oriented infrastructure and rethink our streets," says Perry.

Photo courtesy of Kevin Robert Perry.

Hear podcast interviews on these topics at www.sfestuary.org/podcast/

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In downtown Portland, a planter adds greenery to the streetscape while treating stormwater. Photo by Lisa Owens Viani.

This residential street in Milwaukie, Oregon has no curbs, just a concrete border. Polluted runoff sheets off the road into the planter where it is filtered. Photo courtesy of Kevin Robert Perry.

"Retrofitting green streets is not just about managing stormwater but is equally about creating streets that promote biking, walking, and transit and doing it in a way that makes our communities far more aesthetic and livable. Retrofitting streets for livability is probably one of the most important aspects in creating healthy and vibrant communities, because streets, good or bad, often define the character of our neighborhoods. In retrofitting neighborhoods with green streets, we have the opportunity to transform a neighborhood's character and do it in such a way that also helps the environment at multiple levels." –Kevin Robert Perry, Nevue Ngan