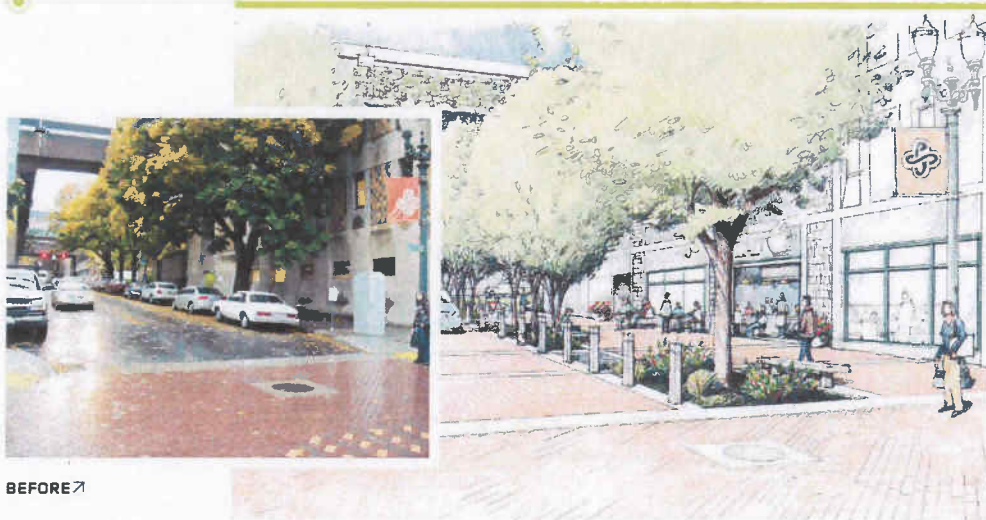


STREETS THAT DRINK

PORTLAND'S STORMWATER DESIGNS ARE GROWING EVER SMARTER.

BY LISA OWENS VIANI

◀ AFTER



BEFORE ▶

ABOVE

Kevin Robert Perry, ASLA, transformed the Southwest Park to Southwest Broadway block of the Portland State University campus from an autocentric street to a pedestrian plaza with stormwater planters that blend in seamlessly.

IMAGE CREDITS

Courtesy Nevue Ngan Associates

Walking through downtown Portland, Oregon, with its dense street tree canopy, ecoroofs, green walls, and short blocks bustling with pedestrians, bicyclists, and businesses, with light rail clanging in the background, it is easy to feel like you are in Ernest Callenbach's *Ecotopia*—or at least on a different, more advanced planet. The streets and their edges are a key piece of this picture. Throughout the city, sidewalks and streets are rapidly being turned into green streets that incorporate stormwater planters, curb extensions, and swales, using soil and plants to filter and

treat urban stormwater runoff before it flows into the city's often-overwhelmed combined stormwater/sewer system or directly into the Willamette River. While the scale of Portland's progress is astonishing enough—it now has 850 green stormwater facilities in the ground—its landscape architects are busy designing ever-more-innovative green streets. Kevin Robert Perry, ASLA, with Nevue Ngan Associates, has come up with a design—the Southwest Montgomery Green Street Plan—for a nine-block green stormwater spine that would ultimately connect the city's West Hills with

the river to the east. Two of the blocks, completed in the past two years, present a possible template for a new and improved generation of stormwater treatment facilities and a more "advanced" type of green street (see "Five Shades of Green Streets," page 34).

Perry's goal is the seamless integration of stormwater retrofits into a busy urban scene within the confines of buildings and rights-of-way; he also wants to move away, wherever possible, from the deeper "bathtub" look of some of the city's earlier stormwater planters and curb extensions. "Since the first green street project in 2003 on Northeast Siskiyou Street [in a residential suburb; see "Infiltrating Portland," *LAM*, August 2005], we've been moving into more and more complex urban systems," says Perry, who formerly worked for the city of Portland's Bureau of Environmental Services. "We're now able to strategically put in these systems. They're not just plants growing in the bottom of a deep hole but are more aesthetic, functioning in all respects and defining the space—that's what we're trying to achieve." David Goodyke, also of Nevue Ngan, adds, "We don't want them to look like pits anymore; there's got to be a balance between how much water you hold and treat versus designing for pedestrians."

Somewhere along the line there was an evolution in design thought that may have gone too far, says Perry. Over the years, in an effort to hold and filter more stormwater longer before it either goes back into the combined storm drain/sewer system or infiltrates the ground, project engineers began designing stormwater planters as deep as two feet, contributing to the look of



ABOVE

With flow-through stormwater planters and other green streets treatments, the nine-block Southwest Montgomery Stormwater Spine will connect Portland's hills to the west with the Willamette River to the east.

IMAGE CREDITS

Courtesy Nevue Ngan Associates

FIVE SHADES OF GREEN STREETS

- **LEVEL 1**
Introducing as many landscape plantings as possible to the streetscape and minimizing impervious areas. Some runoff from the sidewalks may be managed in planted areas.
- **LEVEL 2**
Adding street trees to achieve a significant canopy.
- **LEVEL 3**
Actively managing stormwater on the street—fully managing street, sidewalk, and driveway runoff using a landscape system.
- **LEVEL 4**
Emphasizing alternative transportation (biking, walking) and having those components be part of the green street.
- **LEVEL 5**
Integrating building, site, and street frontage for stormwater management, treating runoff from both public and private land.

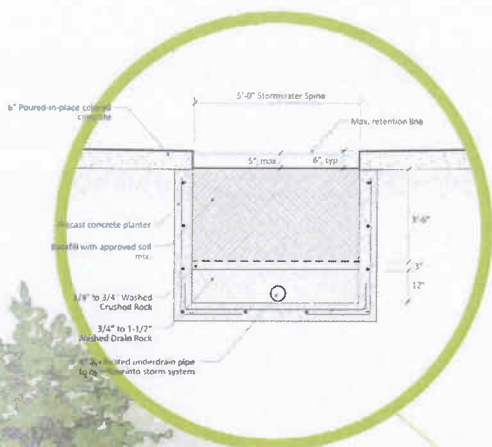
plants growing down in a pit—and to the perception that they are unsafe for pedestrians. “Northeast Siskiyou was only about six inches deep,” he says, referring to that first innovative project.

Tom Liptan, FASLA, now heads up the city’s ecoroof work with the Bureau of

perception that worries him even if the possibility is unlikely.

In the first block of the spine completed in 2009—Southwest Park Avenue to Southwest Broadway, which runs through the Portland State University campus—Perry dealt with both aes-

facilities such as pipes and conduits that needed to be protected. The planters hold four feet of soil—which some of the stormwater will percolate down into—but Perry’s goal was to have the water fill the planters to no more than six inches during heavy flows, with just a few inches of freeboard. “Many green streets might have a design depth of ponding water of six inches, but they are also engineered to have 12 inches or more of freeboard space above the design depth.” It is that total depth—18 inches and sometimes more—that Perry is questioning both the look and function of. “This makes the stormwater facility much deeper than it needs to be. They don’t have to be so deep. I’m not a big believer in freeboard,” says



BELOW

The design for the spine between Southwest Broadway and Southwest 6th Avenue takes advantage of a drop in grade from east to west with a small plaza midblock and shallow downslope stormwater planters that accept sheet flow

IMAGE CREDITS

Courtesy Nevue Ngan Associates

Environmental Services and initiated many of the first green streets projects. He concurs with Perry but explains the reasoning behind the deeper facilities. “In southeast Portland, for example, we’re trying to get as much infiltration as we can, to get off the combined sewer/stormwater system. The engineers are trying to get a certain volume of water off the system, to get a certain amount of cubic feet per street per neighborhood.” Yet Liptan says the deeper planters have caused some Portland residents to worry that they could trip and fall into them—a

thetic concerns and people’s fear of falling in by designing the planters to have less freeboard, or extra space above the highest level the water is designed to reach, which resulted in a shallower look and alleviated the need for building protective curbs around them. A second innovation is that the planters allow stormwater to flow through them, almost like a stream, and move downhill into a subsequent part of the stormwater spine, rather than completely infiltrate the ground. Perry explains that this decision was made because there were underground

Perry. The Southwest Montgomery stormwater spine plan calls for capturing the flow-through stormwater when one of the downstream blocks of the spine is completed and then reusing the water in a university building and for irrigation. That block will house the Oregon Sustainability Center, a “living high-rise” to be developed by Gerding Edlen Development.

Another innovation is the way the stormwater gets into the stormwater spine: It flows across a gentle cross slope and downhill into the planters. “A major



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ABOVE

Most of Portland's stormwater retrofits have been designed to be deep, to hold and treat large volumes of stormwater runoff. Newer, shallower designs can achieve the same result but may require a larger footprint.

IMAGE CREDITS

Courtesy Nevue Ngan Associates

change is not using curb cuts," explains Perry. "I've seen lots of green streets that have failed to get stormwater into them; this way the water flows, unencumbered, into the planters."

The Southwest Park to Southwest Broadway block is now used exclusively by pedestrians and bicyclists; delivery zones were moved to an adjoining street. In addition to the spine of stormwater planters, smaller planters were installed at the bases of the support columns for a sky bridge that connects the buildings above the plaza. New benches and bicycle racks were put in, and curb extensions were added downstream on Southwest Broadway to capture additional runoff from the street. The stormwater spine was planted with a mix of natives and non-natives, says Perry. "We chose plants for harsh conditions—able to handle flood and drought—and we wanted everything to be evergreen for year-round interest. We've got diverse textures, so there's more interface with the runoff to slow it down."

One sign of just how successfully the stormwater spine has been integrated into the scene is how little attention it seems to get. Pedestrians walk by and

cross the planters on unobtrusive metal grates, students sit on benches in front of them, and bicyclists park their bikes next to them—all without seeming to notice anything unusual. This first block is also close to Portland State's Epler Hall stormwater planter system (which reuses the stormwater in the building) and the green streets stormwater planters on Southwest 12th Street (also designed by Perry), so that by now, stormwater facilities are nothing new to the students or Portland residents.

The second block of the Southwest Montgomery stormwater spine, completed in March 2010, stretches from Southwest Sixth to Southwest Fifth. Here, the spine was retrofitted into a plaza that acts as a major thoroughfare between Portland State University campus buildings for locals, students, and tourists. Three stormwater planters were added here, including one that cascades down a series of planted "steps" integrated into the plaza's staircase and collects runoff from the stairs. A trench drain under the sidewalk collects stormwater from Southwest Sixth Street and from adjacent sidewalks and the plaza and conveys it into a large planter on the east side of the plaza. Here, too, the planters retain stormwater to a

depth of four to six inches. They were planted primarily with aspens, which tolerate harsh conditions, are native to Oregon, and colonize with shallow roots, so they should not grow too deep into the planters, says Perry. A small green wall three to four feet tall will be installed along the planter that was tucked in next to an existing fountain.

Funding for the two completed blocks came from Portland State University, the city's Bureau of Environmental Services, and the Portland Development Commission, for a total cost of \$642,440, which includes 1,800 square feet of stormwater planters, new pavement in the plazas, some new landscape plantings in addition to those in the stormwater planters, and the to-be-installed green wall. All partners seem thrilled with the project so far—and on board for future projects. Emily Hauth, project manager with the city's Bureau of Environmental Services, says, "By trying to get as many green streets projects in the ground as possible, we're anticipating the development coming to Portland in the next 20 years and trying to reduce that 'first flush' [of stormwater] into the river. Everyone's embraced it—the landscape architecture community, academics, the city, the citizens."

The design concepts used in the first two blocks will be applied to the other blocks of the spine and are already being discussed in planning green streets in more challenging locations. One potential case will be a 30-block stretch of Southeast Division Street, a typical curb and gutter road, 36 feet wide, running through both residential and commercial neighborhoods. "The public definitely has some concerns about some of the deep green streets projects they've seen," Perry says. "The



BEFORE 71



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ABOVE
Nevue Ngan cut into the steps in this plaza on the Portland State University campus to capture runoff from an uphill street and the plaza's pavement

IMAGE CREDITS
Courtesy Nevue Ngan Associates

tradeoff [in making the stormwater facilities shallower] is that the footprint might have to be a little larger. There are several design ideas on the table right now, including curb extensions with curb cuts, but we are also strongly advocating a curbless street as well. It's a big proposition to make for a street that carries the volume of traffic that it does." Perry says bollards could be used in lieu of curbs in some spots to protect people and planted areas from cars. Liptan supports the idea of curbless streets, but points out that it would be prohibitively expensive to go back and make all streets curbless unless the street is already being upgraded with sidewalks and other improvements, as was done on Seattle's SEA (Street Edge Alternatives) Street and on the Logus Road Green Street in Milwaukie, Oregon (also designed by Perry). "We would never have 850 projects in the ground if we had removed all of the curbs. We've had to retrofit within the curb and gutter system." But, he adds, "We need to remain open to new ideas and learn as we go." For cities

that want to get more green streets in the ground—or just get started—Liptan and Perry recommend being opportunistic and seizing the chance to create green streets facilities whenever street improvements have to be made.

Retrofitting old urban streets to green streets is tricky but presents a "renaissance in landscape architecture almost back to Olmstedian days," Perry says. "Our role as landscape architects is that of problem solver. These green infrastructure projects in the urban environment are not just about water but about people, transportation, and retrofitting—changing the way the landscape has been developed in an unsustainable way and moving toward reversing the mistakes of auto-based design." Although Perry believes it's best not to "overthink and overdesign" green streets projects, he admits it can be complicated to retrofit the existing auto-oriented infrastructure, making grades work out and dealing with minutiae. Another challenge of green streets for landscape architects and

designers that Goodyke identifies is coordinating with the contractors installing the projects. "There's still a learning curve in building these things and a level of precision involved that many contractors are not used to," he says.

Perry has developed a framework for green streets design that he refers to as "multiple shades of green" (see "Five Shades of Green Streets," page 34). The completed Southwest Montgomery Green Street blocks, he says, are the first examples he knows of that are true "level 5" green streets. Moving forward, Perry says, he'd like to see even more plants used in green streets projects. "We don't call them 'green streets' for nothing. There's a trend toward more engineered, too formulaic, sparsely planted projects with too much rock. The plants themselves can act as energy dissipaters." The bottom line, he says, is that simpler is better when designing green streets, despite their complexities. ●

LISA OWENS VIANI IS A WRITER IN THE BAY AREA AND A FREQUENT CONTRIBUTOR TO *LANDSCAPE ARCHITECTURE MAGAZINE*.

Project Credits

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