

OREGON STATE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

# OREGON'S

## AGRICULTURAL PROGRESS

### LIFE AT THE TOP

also

Seed money

Beetle banks

Global pollution

Whale detectives

Native pollinators





# Greening THE CONCRETE JUNGLE

BY AIMEE BROWN



*The living, breathing roof atop the Portland Building is a hard-working landscape 17 stories above the city's streets. Where some people see air vents and pigeon roosts, OSU horticulturists see a new frontier for creating landscapes that help absorb storm water, reduce city heat, and soften the hard edge of the concrete jungle.*

Portlandia greets visitors to the Portland Building with a giant outstretched hand. The symbol of Portland, Oregon, the copper sculpture (second only to the Statue of Liberty in size) is what most people notice about the downtown headquarters of the city's government. But inside the building, at the top of 17 flights of stairs, the Portland Building opens onto a rooftop meadow of living plants and one of Oregon State University's latest agricultural experiments.

In this urban environment colored in hues of steel gray and asphalt black, the rooftop offers a patch of rich color and texture, a living quilt of gold, red, and green plants, some in bloom and buzzing with insects. It is not a rooftop garden with potted palms and banana plants as I had imagined, but it is definitely a growing, thriving rooftop meadow in the middle of a major metropolis.

Looking across the city from this vantage point, I see an environment filled with impermeable surfaces—roads, buildings, and parking lots—that separate the falling rain from the spongy ground. Western Oregon's

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heavy winter rains can't penetrate these hard surfaces. As a result, storm water runs off roads and sidewalks, overflowing treatment facilities and sweeping pollution into rivers and on downstream. Portland is investing \$1.4 billion in its Big Pipe project to keep most of the city's sewage and storm water from overflowing into the Willamette River. The green roof I'm standing on will help reduce run-off and bring some green back into the urban landscape.

"Storm water management is a primary reason that many city governments are interested in green roofs," said Erin Shroll, the lead researcher on OSU's Green Roof Technology project. "But there is a host of other benefits associated with the roofs, ranging from better building insulation to reductions in the urban heat island and increases in wildlife habitat."

There are 12,500 acres of rooftop in the city of Portland, according to Tom Liptan, an environmental specialist with the city's Bureau of Environmental Services, who has pioneered green roofs in Portland. He estimates

*"Each part of the city, and to a degree each part of each roof, has its own microclimate and a variety of conditions that must be considered before planting."*

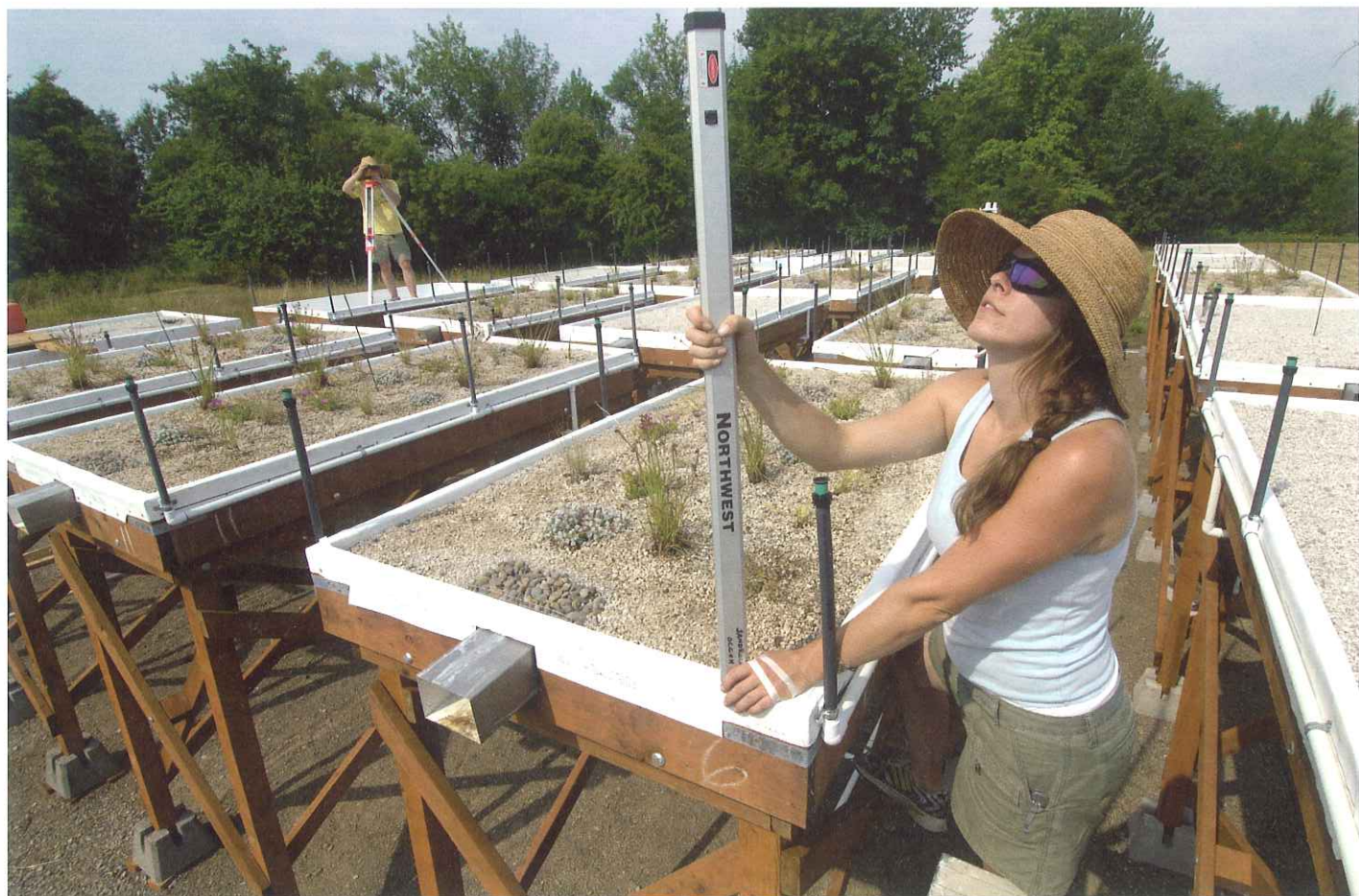
that just a few, about 25 acres, are planted as green roofs, either as old-fashioned roof gardens or as what he calls eco-roofs, specially designed with a lightweight growing medium, an assortment of rock-garden plants and other vegetation, and an underlying waterproof membrane.

As part of Portland's efforts to promote sustainable development, city leaders are encouraging the use of green roofs as a lightweight, low maintenance, vegetated alternative to conventional rooftop materials on both residential and commercial buildings. There are now more than 80 green roofs within the city, and more are being planned. But up until now, little has been done to determine what plants are best suited for roof-top use in the wet-winter, dry-summer climate of Portland.

Planting green roofs is more than blanketing a roof with sedums and succulents and hoping for the best, according to David Sandrock, a researcher in OSU's Department of Horticulture. "The science behind creating a successful green roof is still in its infancy," he said. "This is a brand new landscape where nothing is truly native. There's a lot to learn and a lot to explore."

To help explore this new frontier, OSU joined into a partnership with Liptan and the city of Portland to study the green roof on top of the Portland Building in the heart of the city's downtown area.

"Each part of the city, and to a degree each part of each roof, has its own microclimate and a variety of conditions that must be considered before planting," said Shroll. She and Sandrock are examining what plants will



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Researchers Erin Shroll (front) and David Sandrock are monitoring an array of experimental green roofs at OSU's new Center for Urban Horticulture.





be most successful on rooftops across the Northwest.

To learn more about rooftop microclimates and the plants that could thrive in each, Shroll and Sandrock are leading a green roof research program at the newly developed Oak Creek Center for Urban Horticulture on the southwest side of the OSU campus in Corvallis. There they built 24 raised test plots, each planted with a mixture of six different plants native to the Willamette Valley and two non-native plant varieties. The plots represent *extensive* roofs, that is, green roofs with two to six inches of growing medium and not intended for foot traffic. These green-carpeted roofs are in contrast to *intensive* rooftop gardens, what people generally imagine when they first hear about roof-top plantings, with patios and gardens that can be used as outdoor living spaces.

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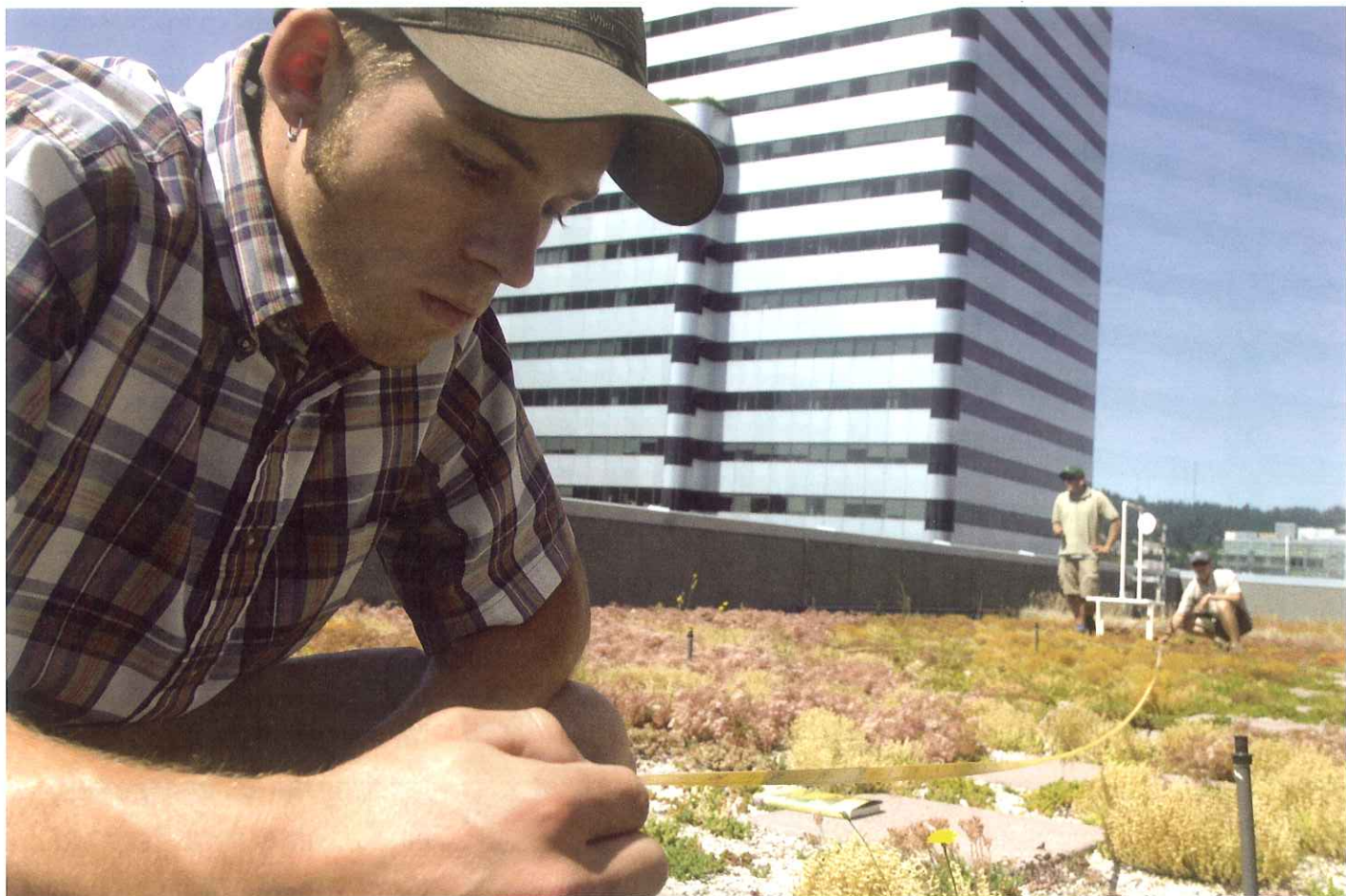
Extensive roofs are usually within the normal load-bearing capacity for commercial buildings and do not require additional structural reinforcement before installation. However, said Shroll, approval from a structural engineer should be the first step in designing any green roof. In contrast, *intensive* roofs tend to have deeper soils to support a wider variety of plants and may require structural modifications to be considered safe.

"But as far as storm water management, extensive green roofs are the workhorses," said Sandrock, who leads OSU's program in landscape design. "In our test plots, it's all about reducing run-off and the overflow of winter rains. Keeping the plants alive through the dry summer is part of the cycle."

Green roofs aren't always green. The bright assortment of sedums and other rock-garden plants attract pollinating insects to the top of the city (left) as researchers monitor the growth of each kind of plant (above).







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OSU horticulture student Corey Petersen and colleagues monitor the microclimates across plots of experimental plantings on the Portland Building rooftop.



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Data loggers arrayed above the plants automatically record air temperature and light every 30 minutes. Additional sensors buried beneath the soil measure how the plants and substrate affect the temperature of the roof below.

The idea of watering extensive roofs is new to the green roof industry, and it is generally unnecessary in places where summer rain is abundant. The researchers fitted their plots with an ir-

rigation system that drips the minimum water necessary to carry the plants through the dry season and ensure they are ready for rapid uptake of moisture when the winter rains begin to fall.

In order to use less water for irrigation, Shroll and Sandrock collect and store rainwater that drips from the conventional roofs at the Urban Horticulture Center during winter. They've also created a bioswale on the property to help absorb and filter run-off from the Center's buildings before it enters nearby Oak Creek.

Back at the Portland Building, Tom Liptan points out honey bees patrolling the rooftop plants. Where are they coming from? How did they find their way here? Where are they going?

"I mentioned them to the mayor, and he suggested that we put a beehive up here," Liptan said.

Green roofs are opening new territory for cities and homeowners alike. "Putting in a green roof begins to address the 'What can I do?' stumbling block that many people face when thinking about sustainability issues," said Sandrock. "It helps people understand that by doing something relatively small, each individual can have a big impact on the health and sustainability of their communities." **OAP**