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Contents

Up on the Rooftop Sedums Grow.....	1
A Rose is a <i>Rosa</i>	4
Book Review.....	5
Grub Control.....	5
Invasive Plant Watch— Garlic Mustard.....	6
Garlic Mustard Lasagna....	6
What to do with your Easter Lily and Other Spring Gift Plants.....	7
MSU Landscape Alert: What to do about the Emerald Ash Borer.....	8
Garden Walk.....	9
Spotlight on Native Plants— The Nan Weston Nature Preserve at Sharon Hollow.....	10
Notes from Karen.....	12
Looking for Volunteers....	12
The Aqua Thumb.....	12
MGAA Field Trip to Frederik Meijer Gardens & Sculpture Park.....	13
Hotline.....	14
Volunteer Opportunities...	14
Team Updates.....	14
Calendar Of Events.....	15
Alumni Association News.....	15

Up On The Rooftop Sedums Grow Malletts Creek Library Green Roof Filters and Absorbs Storm Water

By Monica Milla (*MG 2004*)

The new Malletts Creek Branch of the Ann Arbor District Library has turned a lot of heads. Its sustainable design incorporates solar heating, natural daylighting, convection cooling, naturally captured and filtered storm water, and native plants and grasses. But not everything groundbreaking about the site is actually on the ground — in fact, one of its most innovative features is the roof. A green roof, to be exact.

A Green What?

Green roofs, sometimes also called vegetative roofs, are built on top of buildings and are generally planted with vegetation that requires minimal maintenance and watering. As development replaces land with buildings and parking lots, the amount of impervious surfaces grows. The idea of green roofs is to replace the green space that was lost with the new construction. Green roofs are similar to rooftop gardens except they are not maintained and they are neither ornamental nor recreational. Green roofs are practical and beneficial to the building and surrounding site.

Green roofs slow and clean storm water runoff, which otherwise can exacerbate flooding and increase erosion. Green roofs absorb storm water and release it slowly over several hours. They can re-



Gregory Scott of Ground EFX applies the growth medium to the Malletts Creek Library Branch on October

tain 60 to 100 percent of the storm water they receive. In addition, they last longer than standard roofs because they're protected from ultraviolet radiation and extreme temperature fluctuations. Green roofs also provide insulation to the building. In winter the roof stays warmer than the ground, thus warming the building, and in summer the plants cool the roof and divert heat from the building.

Green roofs are a relatively new concept in North America. The idea was developed in Germany in the early 1990s. Today, about 12 percent of all German flat roofs are green roofs, and the industry is growing 10 to 15 percent a year. Green roofs are also popular in the Netherlands and England, and they're starting to catch on in North America,

(Continued on page 2)

(Continued from page 1)



Workers plant various varieties of sedum on the northeast side of the roof on October 28, 2003. Plants are spaced 12 inches on center to cover the 13,000-square-foot roof.

too. Green roofs can be found on the city halls of Chicago, Toronto, and Atlanta, and on corporate buildings such as the Heinz 57 Center in Pittsburgh.

The Malletts Creek Library roof, which was installed in October 2003, is the second green roof in Michigan. The first was created last summer on Ford's new Rouge assembly plant in Dearborn. At 10.6 acres, this is the largest green roof in the U.S. Also in state, MSU's vegetative green roof program evaluates plant species, propagation, and establishment methods; substrates, water and nutrient requirements; and water quality and quantity of runoff. Numerous experiments are being conducted on 48 simulated roof platforms at the Horticulture Teaching and Research Center.

How Green Roofs Are Made

Green roofs are constructed in layers on top of the roof. The number of layers depends on the type and root depth of the plants selected, the slope of the roof, and the materials used in the layers. Layers can include, from the top down to the roof, the following: a filter fabric to hold the plants in place, the growth media and the plants, a drainage layer, a root barrier, an insulation layer, and a waterproofing layer. Sometimes more than one function is combined in a single layer.

The filter fabric holds the soil in place and prevents small soil particles from entering and clogging the drainage layer underneath. Generally, growth media is a mix of about two-thirds inorganic material (such as expanded slate or crushed clay) and one-third organic material (humus and topsoil). This mixture provides essential drainage, soil air capacity, and organic nutrients.

The drainage layer carries away excess water and makes an extremely stable and pressure-resistant sub-base. A root barrier prevents deep roots (in the case of trees, for example) from damaging the roof. The insulation layer is optional and prevents water stored in the green roof system from extracting heat in the winter or cool air in the summer. The waterproofing layer is critical and ensures that water doesn't seep into the roof.

The Malletts Creek Roof

The 13,000-square-foot roof is irrigated and watered only by natural rainfall. It is planted with many varieties of sedum and one type of allium, located every 12 inches on center:

- *Sedum album murale* – Also called white stonecrop, this semi-creeping plant features white flowers with dark dots in late summer.
- *Sedum sexangulare* – Also known as tasteless stonecrop, this upright plant features yellowish-green foliage and small yellow flowers in fall.
- *Sedum kamtschaticum* – Also called Russian or orange stonecrop, this mounding plant has orangey-yellow flowers in summer.
- *Sedum spurium* 'John Creech' – This variety is named after the former director of the U.S. National Arboretum. It is low growing with scalloped green leaves and pink flowers in the fall.
- *Sedum floriferum* 'Weihenstephaner Gold' – Also called Kamschatka stonecrop, this trailing sedum grows to about six inches. Its beautiful yellow flowers bloom in summer.
- *Sedum hybridum* 'Immergrunchen' – This sedum is popular on European roof gardens. It has yellow flowers and dark maroon foliage in winter.
- *Allium schoenoprasum* – This medium-height variety of chives is mounded with fuchsia flowers.

The roof features four copper-clad skylights and slopes at between 9.5 and 11.8 degrees away from the skylights. The roof uses a 2.5-inch, two-layer system, the Roofmeadow® Type II Aromatic Garden. Dan Mooney, an architect with Luckenbach/Ziegelman, says, "The green roof consists of a lightweight growth medium layer spread over a synthetic sheet drain, which in turn sits on a waterproofing membrane to protect the roof. The roof itself is reinforced so it can support the weight of possible future plantings." The maximum wet weight of the system is 15 pounds per square foot. Also, a photodegradable wind blanket that will break down over time was laid on top of the soil layer to protect the growth media from wind damage over the winter.

The roof garden is not made for frequent foot traffic, but pavers around the edges of the roof make the area accessible for maintenance and cleaning. Joe Vinic of Tom's Landscape and Nursery in Troy, explains that the roof is on a two-year maintenance schedule. He says, "During the first two years, we will pull weeds until the plants fill out. After that time, the roof will be virtually maintenance free."

The roof also slows rainwater. In a typical building, rain rushes from the roof into gutters and from the gutters into the

(Continued on page 3)

(Continued from page 2)

stream at full speed. In heavy rains, the flow can be heavy and quick, which erodes creek beds. At the Malletts Creek branch, “Downspouts send water over the longest path possible, which gives it time and space to be slowed down, cooled, and cleaned by plant material as well as absorbed by the soil,” says Shannan Gibb-Randall, an associate at InSite Design Studio.

Malletts Creek Ground Landscaping

In addition to the roof plants, the Malletts Creek site will be landscaped starting this spring. Mooney says, “It will have minimal lawn, with 65 percent of site being native plantings.” Gibb-Randall adds, “The site will incorporate native vegetation, with deep-rooted structures up to 18 feet deep, to minimize watering requirements.”

Native plants attract native birds and beneficial insects, and are well suited to the hot and cold extremes of our seasons. They don’t require fertilizer and can survive dry spells. For example, tall native grasses will be planted along the back edge of the property, which require trimming only once a year. They will significantly reduce the amount of mowing and provide a habitat for wildlife.

The Malletts Creek Branch site naturally captures and filters storm water that falls on impervious surfaces, such as sidewalks and the parking lot. Sarah Faik of InSite Design Studio explains, “Parking lot water is some of dirtiest water, containing oil, grease, sediment, and heavy metals. It’s important to deal with it before it flows in water bodies. Contaminants reduce oxygen in the water and it turns murky.” Josie Parker, director of the Ann Arbor District Library, says, “We worked with the City of Ann Arbor, the Huron River Watershed Council, and the Washtenaw County Drain Commissioner to make sure the Malletts Creek Library Branch site would help mitigate erosion and clean the water entering the creek.”

Water filtering is accomplished through bioswales that have been placed adjacent to the parking area. Storm water is directed to the bioswales through grading and shallow “troughs” that run through the parking lot. The bioswales are shallow vegetated zones that capture and cleanse the water before it soaks into the ground. Bioswales help decrease overland water flow and act as a stormwater detention facility that allows suspended solids to settle. Plants in the bioswales filter particulates and pollutants as runoff passes slowly and evenly through the channel. The pollutants are then incorporated into the soil where they may be immobilized and/or decomposed by plants and microbes. Unlike traditional storm water management systems, which rely heavily on expensive underground pipe systems, this natural approach to storm water management takes advantage of the ability of native plant materials and soils to clean, slow, and store water.

The troughs and bioswales look natural in the site and are

easily visible in and near the parking areas. The library’s goal for the site is to “teach, by example, responsible coexistence with the natural environment.” This design helps make people aware of runoff and how it is handled.

The Malletts Creek Library Branch was designed by Luckenbach|Ziegelman Architects PLLC of Ann Arbor. InSite Design Studio, also of Ann Arbor, served as the landscape architects and Skanska USA Building, Inc., of Farmington Hills, served as construction manager. The green roof project was managed by Roofscapes, Inc., of Philadelphia.

Resources for Green Roofs

For more information on green roofs, check out the following:

- General information – www.greenroofs.com/Greenroofs101
- Malletts Creek Library Branch features – [www.aadl.org/stories/storyReader\\$94](http://www.aadl.org/stories/storyReader$94)
- Ford’s Rouge assembly plant green roof – www.bdcmag.com/newstrends/FORDROOF.asp
- MSU’s green roof research program – www.hrt.msu.edu/greenroof



Finished rows of plants are set to grow on the northwest side of the roof.



Plugs, in 72-cell trays, wait to be planted on the southeast side of the roof.

All photographs in this article are by Monica Milla