

ASLA Green Roof Monitoring Results

Energy Savings:

- Engineering analysis showed that the green roof created a 10 percent reduction in building energy use during winter months and negligible difference in the summer.
- Further analysis showed that ASLA should show a two to three percent savings in the summer and identified the cause of this deficit: over-cooling of the building. Following the engineer's guidance, ASLA will change cooling of the building and will follow up with further monitoring.

Water Retention:

- From July, 2007 to May, 2007 the green roof retained nearly 75 percent of the total rainfall (29 inches). This kept 27,512.4 gallons out of the city sewer system.
- The roof typically retained 100 percent of a one-inch rainfall.
- The heaviest rainfall during the monitored period was March 16, 20'07. A total of 2.48 inches of rain fell during the 24-hour period with the roof retaining 51 percent, the equivalent of 1.3 inches of rain.
- The roof retained more water during the growing season. In Sept 2006 – the heaviest month of rainfall—the roof retained 79.5 percent of 5.56 inches of rain. In November 2006, the roof retained 58.9 percent of 4.35 inches that fell during the month as the plants were dormant.

Water Quality:

- The green roof did not add any nitrogen to the runoff. Because of the amount of water retained, the roof provided a significant reduction in the amount of nitrogen introduced back into the watershed.
- Typical of “young” green roofs, the analysis showed higher amounts of some other nutrients such as phosphorus, as well as heavy metals in the runoff—all below EPA standards and below levels expected from street runoff. Based on other green roof research, nutrient levels are expected to decrease in a few years. The heavy metals may be coming from the roof materials or from settled particulate matter/pollutants.
- It is important to note that this study did not look at runoff from a conventional roof compared to the green roof runoff—and the results would be expected to look different. Water quality testing will be repeated in two years to see how the results change over time with a goal of comparing the green roof runoff to conventional roof runoff.

Temperature Differences:

- The green roof has been as much as 32 degrees cooler than conventional black roofs on neighboring buildings.
- Temperature differences are greatest on the hottest days.
- Temperatures on the ASLA roof differ by area—areas with thicker growth and better coverage are cooler. The coolest is the stairwell roof, followed by the plantings under the grate. The hottest area is the south terrace, which has the most exposed gravel/growing medium.
- Temperature differences are a result of both shading (i.e., the plants preventing the roof surface from absorbing sunlight and reflecting it as heat energy) and the plants' evapotranspiration.
- Temperature differences should increase over time in all areas on the roof as the plantings mature and fill in.

Plant Performance:

- Plant growth has varied dramatically by location.
- Different plant species were planted in different areas based on soil depths and expected heat, light, and water conditions. As part of the experimental nature of the roof, the planting palette was particularly broad and included both commonly used green roof plants and species not typically used on green roofs.
- All of the plantings under the grating are highly successful, showing excellent growth and coverage.
- On the extensive portion of the roof, hardy species of Sedum (Sedum album, Sedum reflexum, Sedum spurium, and Sedum sexangulare) performed well over other Sedum species (Sedum lanceolatum and Sedum stenopetalatum). Delosperma nubigenum (Ice Plant) did well in many areas but not well in the north terrace.
- Growth was slowest on the south mound (four and a half inches of growing medium) and on the south terrace (three inches) where initial planting coverage was thinnest and where the hottest temperatures were recorded. Some of the experimental plants used in these areas did not grow well.
- On the intensive portion, Rhus copallina (Flame Sumac), Rhus aromatica (Smooth Sumac), Campsis radicans (Trumpet Vine), and Rosa Carolina (Pasture Rose) were successful while Ceonanthus americanus (New Jersey Tea) struggled.
- The original plant palette on the north mound (six inches of growing medium) was a mix of succulents and hardy drought-tolerant native perennials and grasses. Overall growth on this mound has been good, though ASLA is considering some additional planting of succulents to compensate for the die-back of perennials in the hot, dry weather.
- Overall, grasses performed very well, especially Eragrostis spectabilis (Purple Lovegrass).
- Additional perennials that performed well included Allium ceruum (Nodding Onion), Coreopsis verticillata (Thread Leaved Tick Seed), Asclepia tuberosa (Butterfly Milkweed). However, Rudbeckia hirta (Black-eyed Susans) struggled.