

<p><b>LAKELAND CENTRAL SCHOOL DISTRICT 1086 EAST MAIN STREET SHRUB OAK, NY 10588</b></p>	<p><b>1. ENVIRONMENTAL BENEFITS OF GREEN ROOFS</b></p> <p>Green roofs are layers of living vegetation installed on the top of buildings. They assist in managing stormwater by retaining and filtering rainwater through the plant's soil and root uptake zone. The water retained on the roof is cooler and reduces cooling and heating costs of the building and surrounding areas. For small rainfall events, little or no runoff will occur, and most of the precipitation will return to the atmosphere through evaporation and transpiration. In addition to stormwater benefits, it has been reported, green roofs can extend the life of roofs two to three times, because the plants and soil reduce the roof membrane from being exposed to ultraviolet radiation and cold weather effects. There are many factors to consider in constructing a green roof, however, the most important design consideration, for both new buildings and rehabilitation, is the load-bearing capacity of the roof. The load-bearing capacity will determine the type of vegetative cover.</p>
<p><b>MS4PY10 STORMWATER PROGRAM</b></p>	
<p><b>FACT SHEET #2 SEPTEMBER 2019</b></p>	
<p><b>THE ENVIRONMENTAL BENEFITS OF GREEN ROOFS</b></p>	
<p><b>FOR MORE INFORMATION, CONTACT YOUR STORMWATER COORDINATOR:</b></p> <p><b>GEORGE PRINE AT: 914-245-1700 OR AT gprine@lakelandschools.org</b></p>	<p><b>2. TYPES OF GREEN ROOFS</b></p> <p>Although popular in Europe, green roofs are a relatively new technology in the U.S. Green roofs, depending on the depth, type of vegetative cover and function include:</p> <ul style="list-style-type: none"> <li>• <b>Extensive Green Roofs</b></li> <li>• <b>Intensive Green Roofs</b></li> <li>• <b>Modular Green Roof Systems</b></li> <li>• <b>Built-In-Place Green Roof Systems</b></li> </ul>

### 3. EXTENSIVE GREEN ROOFS

Key features of extensive green roofs are:

- **Low Load Bearing:** These roofs are usually contain 3 to 5 inches of soil and load the roof with 13 to 30 pounds per square foot of roof area
- **Residential Roofs and Retrofits:** Because of their low load bearing requirements, they are ideal for existing low-sloped residential roofs and retrofits
- **Low Maintenance:** They are low maintenance
- **Shallow Growing Medium:** They have shallow soils and other growing media that are well-suited for low growing plants such as sedum and other succulent plants
- **No Irrigation:** They are not usually irrigated
- **Least Cost:** They are the least expensive green roof type

### 4. INTENSIVE GREEN ROOFS

Key features of intensive green roofs are:

- **High Load Bearing:** These roofs are usually 6 to 12 inches of soil and load the roof with 80 to 150 pounds per square foot of roof area
- **Commercial Use:** Because of their high load bearing requirements, they are ideal for new buildings and existing large commercial buildings with flat roofs
- **Rooftop Gardens:** Because of their high load bearing capacity, intensive green roofs can accommodate diverse plants and trees
- **Irrigation:** Intensive green roofs require a permanent irrigation system
- **High Cost:** Intensive green roofs are most labor-intensive and costly to install and maintain

### 5. MODULAR GREEN ROOF SYSTEMS

Modular green roof technologies are primarily used for extensive green roof systems. They are popular in the U.S. due to their ease of installation, simple design and flexibility. Key features of extensive modular green roofs are:

- **Plastic Modules:** These roofs are made up of individual plastic modular, two foot square interlocking containers. They are loaded with a drainage system, a growing medium and vegetation prior to placement
- **Lightweight:** They are the lightest load of all green roof systems, weighing 15 to 50 pounds per square foot when fully saturated. Soil contains sand, gravel and peat and are typically at depths of 1 to 6 inches
- **Ease of Installation:** Because the modules are pre-planted, they can be placed at any time of the year and can be removed for quick repair or rotated for seasonal effect
- **Existing Roofs:** Because of their light weight, the modules can be placed on existing roofs with flat or slightly pitched roofs

### 6. BUILT-IN-PLACE GREEN ROOF SYSTEMS

Built-In-Place green roof systems are more complex and require detail engineering design, because of their high load bearing capacity. Key features of intensive built-in-place green roofs are:

- **Design Preparation:** Designs must be planned and approved before construction can start, because of the high roof loading requirements
- **Weight Load:** The weight load is heavier than a modular system. A typical load is 40 to 200 pounds per square foot and may require the roof to include structural support
- **Roofing Components:** Roofing components typically include: a roof structural support, roofing drains, a vapor control layer, thermal insulation, a media support panel, water-proof repellent membrane, a drainage layer for the plant medium, a filter membrane and finally the growing medium that is soil based with a depth of 8-24 inches of soil

## 7. BENEFITS OF GREEN ROOFS

Green roofs provide numerous benefits:

- **Stormwater Management:** Green roofs intercept 15% to 90% of the rooftop runoff, depending on the roof size, type of growing medium and plant cover. They assist in managing stormwater by retaining and filtering rainwater through the plant's soil and root uptake zone.
- **Heat Absorption:** Green roofs absorb heat and lower ambient temperature. The water retained on the roof is cooler and reduces cooling and heating costs of the building and surrounding areas
- **Energy Conservation:** green roofs insulate the building, reducing both heating and cooling costs
- **Air Quality Improvements:** Photosynthesis, through plants and trees on the roof, reduce

the negative impact of carbon dioxide and produce oxygen. Plants also aid in filtering airborne pollutants

- **Roof Life Extension:** Green roofs extend the life of a conventional roof two to three times, because the plants and soil reduce the roof membrane from being exposed to ultraviolet radiation and cold weather effects
- **Green Rooftop Crops:** Herbs and vegetables can be grown on rooftop garden, depending on sun exposure, wind, temperature and soil medium
- **Natural Benefits:** Plants grown on a green roof can also be used as a food supply for birds and insects

## 8. MAINTENACE REQUIREMENTS

Once a green roof is established, maintenance requirements are minimal and include inspection of the roof membrane and drainage flow paths. Water will be required until the plants are well established, and some weeding may be necessary. Plant watering is accomplished through drip irrigation. Excess stormwater runoff, not absorbed during heavy rainfall events, may be directed to rain barrels, or discharged to the nearest storm drain system.

**SOURCES:** The information in this fact sheet was extracted from various EPA and green roof publications.