GREEN ROOF MAINTENANCE GUIDE

Performing routine, preventative maintenance is essential to keeping your green roof healthy. All maintenance should be performed by trained and qualified personnel and using horticultural and safety best practices. Working on elevated structures may require safety training and specialized, protective equipment. Please consult applicable safety regulations and building codes. This installation guide outlines the basic tasks associated with ongoing green roof plant care and maintenance.

Seasonal plant care and green roof maintenance is outlined below for traditional 'extensive' (nominal 4" depth) green roofs. Green roofs involving 'semi-intensive' (6") and 'intensive' (8") modules (aka "roof gardens"), typically incorporate larger and more diverse plantings like ornamental grasses and herbaceous perennials. The associated care and maintenance for these applications is generally more frequent and similar to ground-level landscaping.

MAINTENANCE ACTIVITIES AND SCHEDULE

The type of maintenance activities required for a green roof will depend on the plantings and regional climate. The seasonal guidelines noted below are typical for 'extensive' green roofs planted with low-growing, drought-tolerant sedum and succulents in most moderate climates (Zones 3-7) with 30-50 inches per year of precipitation. Basic green roof maintenance involves watering, weeding, and plant care. Proactive maintenance will always be best.

Watering Green roof systems are typically designed using hardy, drought-resistant varieties that can thrive in a harsh roof top environment. Extensive green roofs typically don't require built-in irrigation systems in most regions. However, during periods of prolonged drought, the extensive green roof should be watered to sustain plant health. As a general rule, if natural precipitation is < 0.5-inch in a 10-15 day period during the growing season, watering may be needed or plants may become dormant or fail. Prolonged temperatures above 85 degrees F and/or very windy locations may need to be watered sooner. Supplemental irrigation should include the application of approximately 1 inch of water once per week until more moderate precipitation patterns resume. In arid climates (including Southern CA, Southwest U.S., High Plains and Mountain states and central TX) as well as the Southeast U.S. and Gulf Coast regions, permanent irrigation systems are recommended for all green roof systems.

Weeding The green roof should be visually inspected and spot-weeded every 2-4 weeks during the growing season. It is important to remove weeds before they flower and set seed to minimize future efforts. Like any garden, preventative, regular weeding has the best results with the least total effort. In most climates, for green roofs < 5,000 sf, weeding will require about 10 to 20 man-hours per year. While weeding, it is a good idea to inspect the roof drains and insure that water not utilized by the green roof can drain freely off the roof.

Plant Care Green roof plant care has two primary components – fertilizing and trimming. Fertilizing should be conducted at least annually in spring for the first 3-5 years after installation, and then on a reduced schedule if soil testing and plant performance suggest it is advisable. Late summer or early fall fertilizing may also be suggested depending on the plant mix and region, but is

generally not necessary. Avoid feeding during the hottest/driest parts of the year or late in the season when plants should be entering a dormant or less active phase. Nutrients should be added with granular, slow-release fertilizer (minimum 3 months) with a target N-P-K ratio of 18-6-12. Alternatively, a generic 10-10-10 slow-release general landscaping fertilizer can be used and is often available at garden and home centers. We recommend Harrells, Osmocote®, and Nutricote® products. Where an organic fertilizer is preferred, Plant Tone (Espoma), or Earthworks Replenish are also effective. Apply fertilizers in accordance with the manufacturer's recommendations and instructions on the container. Soil tests are recommended every year or every other year, with target values the same as for general landscaping.

Every two to three years, trim the green roof to encourage additional leaf development at the plant crown and to spread regenerative cuttings across the system during the spring season. A string trimmer or even a lawn mower set at the maximum height with a mulching blade can be used. Everybody likes a haircut, and so do your plants!

During each green roof maintenance event (or monthly) it is advisable to monitor plant health. These observations may adjust the timing or needs for other maintenance tasks. An overview about green roof maintenance in each season and general sequencing about plant care seasonal is illustrated below.

SEASONAL GREEN ROOF MAINTENANCE – MOST U.S. REGIONS

Plant Type	Spring	Summer	Fall
Sedums	Fertilize (April) Weed (May) Trim* (optional – May)	Weed (every 2-4 weeks) Watering (during droughts)	Weed (October)
Perennials	Trim* (March-Apr) Fertilizer (April) Replant* (if necessary)	Weed (every 2 weeks) Activate irrigation system	Weed (October) Replant* (if necessary) Winterize irrigation
Ornamental Grasses	Trim* (March-April) Fertilizer (April) Replant* (if necessary)	Weed (every 2 weeks) Set Watering Schedule (or use irrigation system)	Weed (October) Replant* (if necessary) Winterize irrigation

Trimming of grasses and perennials should be conducted early spring before new growth appears, or late fall, depending on the specific plant variety. Sedum trimming should be conducted during active growth in spring. Replanting in spring or fall will also be determined by the specific plant variety.

SPRING SEASON

- Conduct routine inspections and spot weeding (2-3 week intervals) to prevent flowering and reseed.
- If soil testing suggests it is required, or in the absence of a soil test, apply slow release fertilizer.
- Monitor plant health and replace any plants, as necessary, taking note of any areas impacted by rooftop microclimates (shady spots, exhaust vents, drip edges, intense reflected light, etc.) where replanting may not be successful, and alternate plantings or an alternate approach (i.e., decorative stone) may be necessary.
- Do not apply herbicides or pre-emergent weed control without first consulting a horticulturalist or your GreenGrid representative.

SUMMER SEASON

- Conduct routine inspections and spot weeding (2-3 week intervals) to prevent flowering and reseed.
- Establish the irrigation schedule for permanently irrigated systems.
- Water non-irrigated systems during prolonged drought as noted above, applying 1" of water once per week. Heat waves, sustained wind and solar glare conditions (from reflective glass) may warrant more frequent watering of 2-3 times per week.
- Monitor plant health and for microclimate effects.
- Address pests if needed using organic, essential-oils based products, if possible. Apply preventative and/or curative fungicides if necessary, particularly in hot, humid climates in the Southeast U.S. and Gulf Coast.

FALL SEASON

- Conduct routine inspections and spot weeding (3-4 week intervals).
- Monitor plant health and replant as needed.
- Be cautious if you need to apply fertilizer during the early fall season as it may affect plant hardiness during the winter months. If it is absolutely necessary, we suggest diluting the application rate by 50-75%.
- If the irrigation system is permanent, drain and winterize in cold regions by October 15th.
- Plants will become dormant as colder temperatures persist in northern climates. In warmer climates, plants may go dormant or semi-dormant and weeds will continue, so remain vigilant by periodically weeding.

OTHER CONSIDERATIONS

- For intensive green roofs and garden-style settings, plant maintenance and care is more frequent and generally consistent with the requirements of ground-level landscaping. A horticulturalist or landscape professional can assist or make recommendations for your specific garden-roof installation.
- Restorative maintenance on green roofs that have not been well maintained should be under the guidance of a GreenGrid representative or landscape professional. Restoration may include combination slow release and foliar (liquid) feeding, replanting or application of plant cuttings, temporary irrigation, etc.
- Modules installed with less than full coverage, planted on site, or not fully rooted on delivery due to schedule demands will require a short period of additional maintenance on the roof, which may include additional watering and weeding in particular. As the plants mature, and less of the media is exposed, the frequency of maintenance will decrease.

DOCUMENTATION

Maintenance activities should be recorded to document the type of activities completed, resources used and timing for future events. ***Routine submission of maintenance documentation is required to maintain plant warranty.***

The maintenance log and photos should record the following:

- Person conducting maintenance, date and time. Time required for maintenance tasks.
- Type of cutting, trimming or other plant care provided.
- Soil testing results, fertilizer type/brand and application rate, if applicable.
- Notations or photos about plant stress, watering rates, drought periods, and plant replacement(s).
- Photos of all green roof areas, with close up photos of any problem spots.