

LiveRoof Maintenance Protocol

The LiveRoof Maintenance Protocol is simple and takes you through the year season by season. It is based upon sound horticulture and lean processes, and is designed to protect owner investment with minimal investment of time.

Documentation

Always record each maintenance event. By keeping records (in spreadsheet format), you will learn the particular nuances of caring for your LiveRoof[®].

Name of Person	Date	Activity	Observations
		If soil test, which lab, what test, and what were the results?	
		If fertilizer, record type and amount applied per 1000 sf	
		Time needed for bi-weekly weed walk and drain inspection.	
		If irrigation, duration and weather conditions?	

PLEASE NOTE: The following recommendations are for LiveRoof[®] systems planted with low-growing, drought tolerant succulents. Deep & Maxx systems planted with traditional landscape perennials & ornamental grasses typically have different maintenance requirements and increased irrigation needs. Consult your LiveRoof[®] Grower for maintenance recommendations for these types of plants.



Spring Maintenance

Spring Maintenance begins with an ANNUAL SOIL TEST **2-3 weeks before the spring “growth flush”**.

The spring “growth flush” varies with locale. It is the time when plants “wake up” and grow very fast. This typically coincides with “spring flowers” such as Forsythia, Daffodils, and Wisteria. In Tennessee, for example, it occurs around mid March, while in Minnesota it begins around mid April.

EARLY TO MID MARCH (adjust earlier or later for local climate)

PERFORM ANNUAL SOIL TEST – To Check Fertility and pH.

LiveRoof soils are formulated for sustainable nutrient content, but heavy rainstorms and snowmelt can leach nutrients and deplete fertility. Soil testing is best conducted during late winter which leaves time to apply fertilizer, if needed, before the spring growth flush, the time when plants most require adequate nutrition.

To test soil, gather a two cup sample by digging soil out in small quantities (using a large spoon) from at least 15-20 separate places throughout the roof. Place these small samples (“sub-samples”) in a labeled, sealed, plastic bag, or test kit from your desired testing lab. LiveRoof, LLC recommends the following laboratories and test procedures.

A&L Great Lakes Labs, Fort Wayne, IN

Tests: S2R, S3 & SNO3 with recommendations, appx \$35.00

A&L Analytical Labs, Memphis, TN

Tests: S3M, Soluble Salts, Nitrate-Nitrogen with recommendations, appx \$25.00

A&L Eastern Labs, Richmond, VA

Tests: S23, Nitrate-Nitrogen with recommendations, appx \$30.00

A&L Western Labs, Modesto, CA & Portland, OR

Tests: S3C with recommendations, appx \$35.00

A&L Canada, London, ON

Complete S1B + S7 with recommendations, appx. \$35.00 CDN + HST (13%)

Pennsylvania State University, University Park, PA

Saturated paste, pH, salts, nutrients plus percent solids & organic matter, appx. \$54

Soil test submission forms are available on LiveRoof.com Follow tab: System Specifications to tab: Installation and Maintenance Guides.

MARCH

Begin Bi-Weekly “Weed Walk” and Continue until late Fall

Weeds are opportunists, and some weeds actually grow during winter. Therefore, you will probably have a few weeds waiting for you in spring. Once your roof is thawed out it is time to walk your roof and pull any and all weeds, no matter how small—every two weeks. Doing this is efficient, and the reason for the two week interval is that by pulling weeds when they are tiny, you keep them from maturing and creating seed, which in turn just creates more weeds.

If you weed every two weeks, you Weed Smart, not hard, and actually minimize the time needed for weeding. In fact, you can maintain an acre sized LiveRoof in just 20 minutes every two weeks, using this method. That's a total of only 8 hours per year in areas of temperate climate!

On the other hand, if you neglect your bi-weekly weed walk, weeds can become plentiful and time consuming to remove.

EARLY APRIL

Apply Fertilizer (if needed)

Upon receipt of your soil test results from the lab, interpret the information and determine the need, if any, for fertilization. Pay attention to the various nutrient levels; such as Nitrogen (N or NO₃-N), Potassium (K), Phosphorus (P). For each of these, the soil report will indicate if there is a Low (L), Moderate (M), or High (H) amount of that nutrient in the soil. The most important of these, in terms of plant vigor, is Nitrogen. If your soil contains less than a Moderate (M) amount of nitrogen, the plants may thin out and create areas of exposed soil. Therefore, if the Nitrogen level is Low, it may be advisable to apply supplemental fertilizer..

- When applying fertilizer to green roofs, it is important to be sensitive of runoff potential. Ask yourself, where is the runoff water going, and what might it affect (e.g., fish, frogs, etc.)? In all cases, it is imperative to use a “Slow Release” fertilizer rather than a conventional fertilizer to minimize nutrient runoff. Slow release fertilizers are coated with a waxy or resinous covering that allows the fertilizer to release into the soil over time, rather than all at once. Such fertilizers are more readily absorbed by the plants, and therefore are less likely to contaminate runoff water.
- Always choose a high quality slow release granular fertilizer—available at your local garden center. Good brands are Osmocote® and Nutricote®, but there are others. High quality fertilizers are designated “Coated Slow Release Fertilizer”, and the label will typically indicate something to the effect of “provides 4 to 6 months of continuous feeding”. Some high quality “turf-grade” fertilizers may work well on the green roof, but they too must indicate “slow release”, and must contain NO Herbicides or other Pesticides.
- Fertilization is best conducted during the spring, with a single annual application.. Spring is the correct time because the plants are actively growing and not under drought stress.
- All fertilizers will be labeled with three numbers, which indicate the % by weight of Nitrogen (N), Phosphorus (P), and Potassium (K), in the fertilizer. Common formulations are 18-6-12 or 14-14-14, but there are many others. In some communities, Phosphorus-containing fertilizers are prohibited due to the potential for creating algae growth in waterways. If in doubt, check with your local cooperative extension agency (csrees.usda.gov/Extension/).
- A Rotary Spreader (push type or belly-crank type) can be used to ensure that fertilizer is applied evenly.

In all cases, fertilizer should be applied in accord with manufacturer’s recommendations, and evaluated by the applicator for runoff potential in accord with site specifics. The greater the runoff potential, the lower should be the application rate. Applicator assumes all risks associated with fertilizer application.

pH: Another important part of your soil analysis is the pH. pH is an indication of the acidity or alkalinity of the soil. Plants have a preferred pH range for optimal utilization of nutrients, and in the case of most green roof plants, this range is 6.0 to 8.0. Below 6.0 is too acid, and above 8.0 is too alkaline. If your soil pH is below 6.0, consult your soil testing lab for recommendations to increase alkalinity. Typically, this means adding lime. And, if the soil is above 8.0, it can be made more acid with elemental sulphur or an application of acidifying fertilizer. Since LiveRoof soils are formulated to buffer against pH changes, the need to adjust pH is relatively uncommon.

Mowing (if desired)

Mowing is sometimes conducted in order to tidy up the roof after winter. Persistent dried seed heads can detract from the aesthetic qualities of the green roof. And, in some cases they are so thick as to shade the foliage. If this occurs, you may choose to mow the green roof and the time to do this is early April (adjust accordingly to precede spring growth flush).

If you choose to mow your green roof, set the mower blade just above the foliage. The idea is to mow the dried seed heads, but avoid cutting the foliage. Do not bag the clippings, instead blow them into the vegetated portion of the roof so that they can decompose and nourish the soil.

When mowing, BE SAFE. Use protective equipment, including harnesses if needed, and make sure that the roof is free of frost or other slipping hazards.

Deep and Maxx Systems: The Deep and Maxx systems are often populated with perennials and grasses. In addition to the maintenance outlined above, any non evergreen perennials should be trimmed down at this time of year to tidy them up. Vegetable plants should be removed and the soil raked smooth and any weeds removed before replanting.

APRIL TO JUNE

Continue Your Bi-Weekly “Weed Walk”

This will only take a few minutes. In fact, it’s like a walk through a meadow, and it’s easy. Simply pull any and all weeds, before they have a chance to flower and set seed. You might only fill up your hand with tiny weeds, but this is what prevents the development of a “seed bank” within your green roof. And, it is what keeps your total maintenance time to a minimum.

Note: It is especially important that no woody plant ever be allowed to establish in a green roof system. Woody plants have extensive root systems that can damage roofing membranes.

Other things to check for when taking your Weed Walk:

DISPLACED SOIL: Nesting birds can displace soil. Any displaced soil should immediately be replaced.

DRAIN INSPECTION: Roof drains should be inspected every two weeks and any debris, pebbles, or leaves should be removed to keep drains flowing freely.

DEBRIS REMOVAL: With each visit, debris that has blown in should immediately be removed as it may lodge on top of the plants and impair their growth.

PEST CONTROL: Occasionally pest insects such as aphids may show up and bother the plant material, and while not commonplace, fungal problems like mildew occasionally affect green roof plants. LiveRoof® LLC suggests that most pest problems are the result of an imbalance in the relationship of the pest organism and its natural biological controls (beneficial insects like ladybugs and lacewings). Typically pests and fungal infirmities (like blight or mildew) are triggered by unusual weather events that cause the pest to multiply faster than it’s biological control. In time, the biological control usually catches up and most pest and disease issues tend to be temporary in nature.

On the other hand, if you detect persistent pest problems, LiveRoof suggests the use of organic and natural biological control agents instead of conventional pesticides. Conventional pesticides may runoff into sensitive areas and might also damage roofing membranes. Consult a professional prior to applying any biocontrol or pest or disease fighting agent.

Deep and Maxx Systems: Unless populated with Sedums and other succulent plants, the Deep and Maxx systems will likely require regular watering to keep the plants from wilting and dying. This will vary with exposure and plant material, and should be provided by a competent gardener or horticulturist as needed to maintain plant health.

Summertime Maintenance

JUNE TO SEPTEMBER

Continue Your Bi-Weekly “Weed Walk”

Even during summer, your biweekly weed walk will only take a few minutes. It’s easy. Just pull any and all weeds before they flower and set seed. This is the secret to optimizing your green roof and keeping your maintenance costs and time to a minimum.

Irrigation

In northern North America, irrigation may not be needed to keep your LiveRoof® alive during most summers provided it is the Standard 4 ¼” deep system populated with Sedums, but prolonged hot dry weather can result in plant thinning or death.

In warmer climates, regular irrigation will probably be required. Regardless of climate, LiveRoof® recommends irrigation (in a manner practical and efficient for the scale of the installation) as a “temporary” management tool during PROLONGED HOT DRY WEATHER.

PROLONGED HOT DRY WEATHER is generally defined as periods of 75 degree weather, with less than 1 inch of rainfall per month. This “ballpark” time period will likely be less if the temperatures are hotter, or on sloping roofs and roofs exposed to persistent winds or reflected sunlight. Such conditions can dry out the soil and cause the plants to go dormant, or in extreme cases, to dry up and die.

During prolonged hot dry weather or when plants become drought stressed, irrigation should be applied, temporarily, to re-wet the soil to the point of saturation. This will keep plants from going dormant, keep them plump and healthy so they can cover the soil effectively, and optimize their appearance. It also enhances the evaporative cooling effect of the green roof.

There are no absolutes when it comes to drought stress and irrigation. Check the plants for wilting, especially in the afternoon. If the plants are wilting, it is time to irrigate.

For the LiveRoof® Lite system, expect to irrigate more frequently, perhaps every 2 or 3 weeks during hot, dry weather.

Likewise, the Deep (6”) and Maxx 8” and 12” systems often require very frequent irrigation if populated with native or conventional (non-succulent) perennials.

Thoroughly irrigating, as indicated above, will pay off significantly. Not only will the plants be healthier and fuller, bringing reduced maintenance costs, but the actual cost of irrigation is minimal compared to the energy savings derived from enhancing the evaporative cooling of the green roof.

In areas of shade, less irrigation will be required.

Deep and Maxx Systems: Unless populated with Sedums and other succulent plants, the Deep and Maxx systems will likely require regular watering to keep the plants from wilting and dying. This will vary with exposure and plant material, and should be provided by a competent gardener or horticulturist as needed to maintain plant health.



Fall Maintenance

OCTOBER TO NOVEMBER

Continue Your Bi-Weekly “Weed Walk”

Many weeds germinate and grow during fall and you should continue your bi-weekly weed walk until it gets very cold, perhaps a few weeks before snowfall in northern climates (but stay off the roof if there is frost or ice). Some weeds are capable of reproducing during winter, even under the snow, so you will want to have the roof “weed-free” going into winter.

In addition

- Never fertilize during fall. It may stimulate tender growth and compromise the cold hardiness of the plant material.
- Rake up any fallen and matted tree leaves. These can smother the green roof plants.
- Be sure the drains are free-flowing and not impaired by fallen leaves. Impaired drainage can damage the roof and damage or kill the plants.

Deep and Maxx Systems: The Deep and Maxx systems will likely contain vegetable, perennial, and grass species. During fall, these plants may be trimmed and tidied up for winter, or in the case of vegetable plants, they may be removed altogether. One consideration may be wind erosion, and this may favor leaving the vegetable plants intact, then removing and replanting them during spring.

Winter Maintenance

DECEMBER TO FEBRUARY

In Northern Temperate Regions: Across the northern temperate region of North America, the plants will be dormant and the soil will usually be frozen during the winter season. This is the time to stay off the roof as it may be slippery and dangerous. There is nothing to be done during the winter except perhaps snow removal from rooftop walkways--if roof ingress and egress is required.

- Should you have to shovel pathways on your roof during winter, avoid using salt and other deicing chemicals. They will kill the plants and damage the pavers. Instead, use sand or cat litter as an anti-slip agent.
- Consider the use of heat strips with pavers, provided they can be applied without damage to roofing membranes.
- Also, avoid piling all the snow in one place. Instead disperse it evenly over the green roof plantings. Excess snow can potentially damage the plant material by insulating the plants and keeping them too warm, thereby triggering fungal diseases.

In Warm Climate Regions: In areas of warm climate, the plants will likely be dormant or semi-dormant during the winter, but the weeds will not be. Therefore, you must follow the same “Weed Walk” protocol as described under the heading Spring Maintenance

- **Precaution:** Even in areas of warm climate, it is possible to have ice and frost. Avoid being on the roof when there is ice or frost.





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