



Lawn Moss: Friend or Foe?

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Introduction

There are thousands of species of moss worldwide. These very simple plants lack the typical leaf, shoot, root, and seed-forming systems of most higher plants; however, they are some of the hardiest living organisms on the planet (figure 1). Lawn moss can reproduce sexually (spores, etc.) or asexually (breaking off into smaller pieces that divide and multiply), and their numbers can increase rapidly under the right conditions. They are tolerant of extremely low mowing, so regular clipping of the grass will not remove them. It would seem that these plants would not offer much resistance to our efforts to manage or control them, but as Mother Nature often shows, their simplicity in design and function correlates well with their ability to colonize and persist in some of the most inhospitable growing conditions around your property: sidewalks, driveways, and yes – the lawn.



Figure 1. Silvery thread moss (*Byrum argenteum*) is one of the most common turf competitors in the landscape in either high- or low-maintenance situations.

Why Mosses Occur

It is important to understand that mosses occur when some underlying condition allows them to out compete turfgrasses and other plants. These conditions most frequently are some combination of:

1. poorly drained, persistently wet soils.
2. acidic soil conditions.
3. medium to dense shade.
4. repeated “scalping” of turf on uneven terrain.
5. compacted soils.

Steps You Can Take to Reduce the Competition From Moss

If the problems that are limiting the turf or other plant growth are not corrected, any moss elimination or control efforts will be futile. First, identify which of the above factors are likely contributing to the occurrence of the moss (figure 2). What is your soil pH? If you do not know, then a soil test is recommended. For the steps on how to conduct a meaningful soil test and interpret the results, visit the [Virginia Tech Soil Testing Lab webpage](http://www.soiltest.vt.edu) at www.soiltest.vt.edu. You can learn more about soil testing in Soil Testing for the Lawn and Landscape Soil Sampling for the Home Gardener (see References). A soil test is simple to perform and very affordable for the amount of information you will receive regarding lime and nutrient requirements.

Next, is the site poorly drained? If so, install drainage or regrade the area to promote water removal. Mosses thrive in these conditions, whereas all turfgrasses struggle.

The third factor that likely is limiting the turf is lack of sunlight. Many species of moss are tolerant of dense shade and prefer moist soil in the shaded areas.

Removing trees from the lawn would fix the shade problem but this practice is almost never acceptable to the average homeowner. However, simply pruning trees to remove lower limbs or thin the canopy fosters much improvement of turfgrass growing conditions. Any arborist would concede that tree pruning usually promotes healthy trees, so pruning benefits both trees and lawn.



Figure 2. The moss is overtaking the turf in this very poorly drained soil on a heavily shaded site.

If moss occurs in sunny spots, mower “scalp” may be the culprit. Wide mower decks reduce time on the mower but may contribute to scalping on uneven slopes. Scalping severely weakens turfgrass and allows moss to thrive. Smooth the uneven places in the lawn by topdressing with soil, regrade the area, or use a smaller mower in uneven areas.

Compacted soils also give moss a competitive advantage. Use a core aeration machine to alleviate compaction and improve turfgrass growing conditions. You can rent such machines or hire a professional to aerate the lawn for you.

Alternatives in Moss Control/Suppression

Physically removing moss with a rake is one way to get rid of moss, but it is essentially impossible to get every single piece of this very simple but durable organism. Remember there are plenty of spores already in the soil or that are being moved in by wind or water. Remove all vegetative material that you possibly can, scratch the soil, and reseed with a turfgrass that best fits the site. For information on the best grasses available for lawns in Virginia be sure to check the annually updated Virginia Turfgrass Variety Recommendations List on the [Virginia Cooperative Extension website](http://www.ext.vt.edu) (www.ext.vt.edu).

There are no easy chemical solutions to moss, but there are some compounds that will reduce moss populations with repeated use. There are numerous compounds that suppress moss by acting as desiccants. Products containing salts of fatty acids can be used for nonselective control of moss. These chemicals will burn turfgrass so minimize contact with grass blades. The control will be temporary as moss will reinvade treated sites if favorable conditions for moss development exist. Ground limestone (levels of 75 to 100 pounds per 1000 sq ft) and hydrated lime (2 to 3 pounds per 1000 sq ft) are readily available and inexpensive, but these desiccants warrant caution if the moss is growing in a mixed stand with turfgrass; the desiccants will almost certainly damage the turfgrass.

Other compounds specifically marketed for moss control include ferrous sulfate (commonly called iron sulfate), ferrous ammonium sulfate, and copper sulfate. There are numerous products in particular that contain ferrous sulfate, and this treatment has shown suppression on moss at high label use rates, but typically the result is a slight burn to the moss and then rapid moss recovery. These products may be found at your local hardware or department store and will specifically mention moss control on the label. You also might recognize these materials as some of the lawn and landscape industry’s earliest fungicides. The iron and copper-based materials can be toxic to new turfgrass establishments, so they often must be deactivated by a lime application that counteracts the effects of the metals applied. These desiccants are ideally used winter through spring when the chances for damaging the existing turf are reduced. Carefully follow label directions in order to maximize product effectiveness and turf safety.

Internet searches for “moss control” often link testimonials to the use of liquid dish detergent and baking soda. It is likely that these products will injure moss (but not necessarily control it), but since these are not registered pesticides for moss control, they can not be recommended.

From a synthetic pesticide perspective, it is common for homeowners to attempt moss control with glyphosate, likely our most widely used non-selective herbicide for lawn and landscape use. However, glyphosate does not work on most mosses. The herbicide active ingredient carfentrazone is the best chemical control product labeled for moss control in home lawns when applied by licensed lawn and landscape professionals. This product is only labeled for use by professional applicators.

Virginia Tech Turfgrass Weed Specialist and Professor Shawn Askew recommends this approach for best results:

1. Have the area treated with carfentrazone at the recommended spot treatment rate on the label
2. Moss will turn brown within 4 days.
3. Once moss reaches peak injury, use a vertical mower, garden rake, string trimmer, or some means to aggressively dislodge the moss from soil.
4. Rake or blow the moss debris away from the infected area and deposit in an area where moss would not be an issue, or bag and discard.
5. Seed the area with desirable turfgrass (consider shade-tolerant species such as fine fescue, but this will depend on the lawn grass currently managed). Note: the ideal times to seed cool-season turfgrasses are in late summer to mid-fall and early-mid spring; mid-spring through early summer for warm-season grasses.
6. Fertilize the area to meet turfgrass needs and use the ferrous sulfate-type compounds as both fertilizer and moss-control treatments for the young turfgrass.
7. If any remaining moss starts to recover, treat again with carfentrazone after about 2 weeks since germination. Carfentrazone will be safe to use over young, developing grass seedlings if seed has been planted.
8. This entire practice may be needed twice annually to achieve near eradication of moss. The more turfgrass cover you can obtain, the less moss you will have.
9. If environmental conditions are not changed to favor turf (remove trees, trim some tree limbs to improve light penetration, soil test, alleviate soil compaction, more water, less water, etc.) then moss will begin to return in the next season and some level of routine maintenance will be needed to keep it out.

Moss Gardens

Why work against Mother Nature? Chances are if the conditions are right for moss to grow, significant renovation may be required to get turfgrass to thrive in the same area, with no guarantees.

Mosses are often regarded as pests that need to be removed from the lawn. However, mosses have both

ecological and aesthetic value. A good bio-indicator of air and water pollution, these hardy, yet delicate, plants only thrive in areas that exhibit good air and water quality. They are also one of the first plants to respond to acid rain; the decline in mosses (and other related plants, such as lichens) indicate a negative change in the environment. Moss acts as a great erosion control and helps retain moisture and nutrients in the soil.

Aesthetically, mosses add a natural beauty to the lawn and garden setting, typically filling in void spaces of soil where little else will grow (figure 3). Mosses can brighten up a shady corner of your property as they are at their greenest in low light, unlike most turfgrasses which need full sun to thrive. Moss may be the ideal plant under large, shady trees – providing low-maintenance year-round greenery. Mosses do well with most shade-loving shrubs and deciduous trees (especially oak, ash, maple, and tulip poplar) but may not hold up as well under conifers.

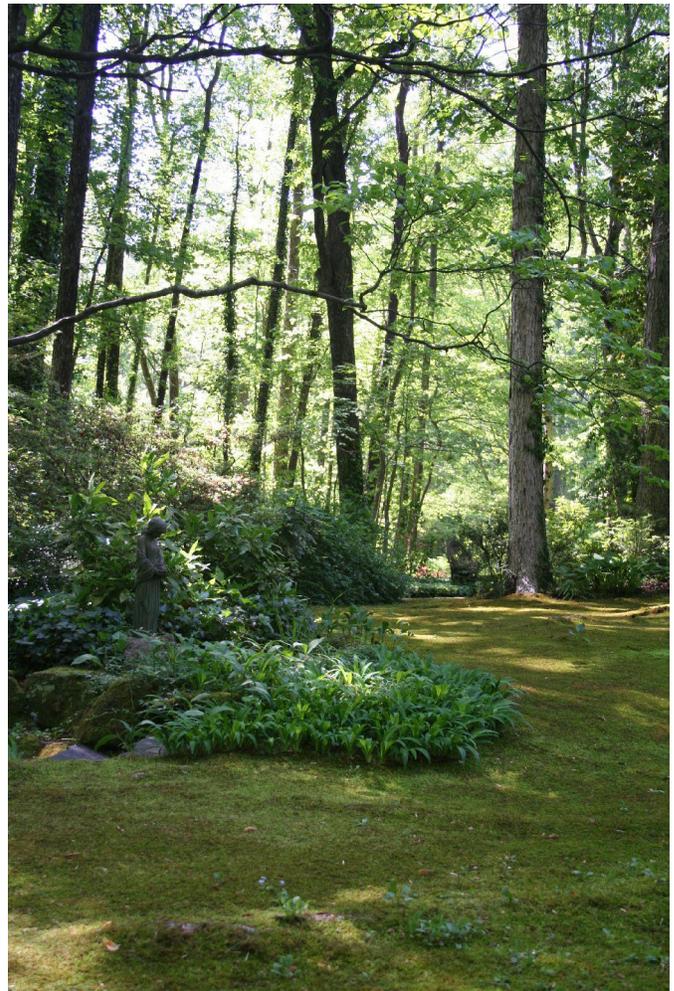


Figure 3. This is a moss lawn in a densely shaded landscape at the Eden Woods garden of Norie Burnet in Richmond, Virginia.

Growing Moss

Mosses are usually found in deep forests, in areas of little light and high moisture content. For that reason, lawns of moss are best suited to properties that are slightly or deeply wooded. Some mosses will thrive in full sun when adequate humidity is present, but most require the moisture and low light that wooded lots provide.

If moss is already growing on your property, you're off to a good start. Its presence indicates that environmental conditions are favorable for moss to grow and that little or no site preparation is necessary. For a weak lawn with moss present, simply remove the grass by hand or chemically and let the moss take over. Glyphosate containing herbicides (such as Roundup) can kill off the grass but rarely damage moss. Keep the area free of debris such as leaves, twigs, and acorns and the moss will do the rest. This method is by far the easiest and least frustrating in establishing a moss lawn; naturally occurring mosses need far less TLC than do those transplanted by gardeners. Naturally occurring mosses can thrive with no supplemental irrigation or soil amendments.

Site Preparation

If you'd like to establish moss in a currently moss-free location, a little more prep work is needed. Weed to remove any existing plants and rake to remove twigs, leaves and other debris. Rake the area smooth and tamp the soil slightly. Conduct a soil test to determine the pH of this soil; mosses prefer a pH around 5.5 (somewhat acidic). If your soil's pH is higher you can lower it with the addition of skimmed milk powder, powdered sulfur, or rhododendron fertilizer according to soil test results. Be sure to lightly water in any powdered amendments.

Once the site is prepped, you have two choices: sit back and wait for the moss to come to you, or find moss suitable for your location and transplant. Again, those mosses which are naturally sown have a far better success rate and require less care than those transplanted. You may be rewarded with an instant carpet by transplanting mosses, but this carpet will require more attention to keep it lush. Also, rhizoids ('roots' of mosses) and the edges of transplanted moss sods can dry and die out if proper care and handling are not given during transport. On the other hand, if moss spores are allowed to settle in on their own, those mosses that are best suited for your landscape's conditions will take hold.

Choosing Mosses for Transplant

If you choose to transplant, take a good look at your landscape and make note of the site's conditions. You'll have a greater chance of success if the transplanted moss comes from a very similar environment to where it is being planted. For instance, if your landscape conditions include moist, organic-rich soil with deep shade, collect moss growing under similar conditions. Note also that mosses grow in soil as well as on rocks and logs. Transplant to the same environment from which you harvested: those harvested from rocks will grow best on rocks, not in soil; those harvested from soil will grow best in soil of similar conditions, not rocks or logs.

Some mosses can withstand a good amount of foot traffic while others do not perform well as carpets. Again, take cues from the environment to determine if the mosses you have found would act as a carpet in your landscape; if it is spreading in nature, chances are it will do the same in your landscape under suitable growing conditions. Fern moss is one that does perform well as a moss carpet (and accounts for 90 percent of the moss in the landscape pictured in this publication). Fern moss grows aggressively to cover bare areas and knits together well, creating a "rug." It is spongy to the touch and has the texture of small fern fronds. When dormant from February to April, fern moss sports an olive green hue but is otherwise emerald green, even in dreary winters.

It is important to note that it is extremely difficult to correctly identify species of moss, sometimes even for the experts. While we do know that individual species prefer certain environments, without proper identification, listing those attributes here would not be of much help. For successful transplanting it is therefore more important to note the environmental conditions in which the moss is growing and match those conditions, rather than to identify the species in a field guide.

How to Transplant

Use a spade or a knife with a long sturdy blade to dig out sods of moss. Make sure each sod piece is at least the size of an outstretched hand; any smaller than this and the sod is more susceptible to drying out and dying. Take up all the soil necessary to keep all rhizoids intact. It may take a few tries to determine the depth of soil you need to dig for the particular species of moss you are transplanting. You also want to have some soil intact below the rhizoids to keep them from drying out. Press the pieces of sod in place to make good contact with the soil and water thoroughly. To minimize erosion, cover the area where you dug the moss from with leaf debris; new moss will move in and likely cover the area within a year or two.

Transplanted mosses usually need watering, even into the winter months during the first year of establishment. You should water transplanted moss any time that the ground's surface dries out.

To make a little moss go a bit further, consider spacing the moss sods at spaced intervals. Over time the sods will grow together to form one continuous patch of green.

Once the moss is established there is little else to do besides keep the area tidy as you did throughout the establishment process. Remember to be patient as it may take several growing seasons for moss to fill in an area; your patience will be rewarded with a year-round carpet of green. Once established, avoid regular traffic on moss by using walkways, stepping-stones, or obstructions in the landscape to divert foot traffic (figure 4). Walking over moss occasionally does not pose a problem but regular traffic should be discouraged. Remember to be patient as it may take several growing seasons to get a lush carpet of moss to fill in an area.



Figure 4. Stepping stones in Norie Burnet's gardens in Richmond not only look great, but they minimize traffic problems on the tender carpet of moss in the landscape.

Summary

Whether your intent is to control moss or perhaps grow it as a lawn, it is clear that the environment and site characteristics will ultimately dictate your success. No chemical controls are absolute in their ability to selectively eradicate moss from the landscape. Similarly, if you desire to establish and grow moss in the landscape, there are specific requirements for soil, moisture, light, and limited traffic that must be met. As this publication shows, moss can be considered either a major competitive weed problem in a typical grassy lawn or a wonderful alternative to turfgrass in shaded landscapes.

Acknowledgments

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References

The following referenced materials are available online or through local Extension offices.

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