

CHAPTER 7-3

GARDENING: PRIVATE MOSS GARDENS

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CHAPTER 7-3

GARDENING: PRIVATE MOSS GARDENS



Figure 1. This is a large private moss garden in Nagoya, Japan, using boulders to add interest. Photo by Janice Glime.

Private Gardens

Private gardens are gaining popularity in the USA (Dunn 2008; Martin 2008; Cullina 2009). You know moss gardens are coming of age when an article appears in the *New York Times* (see Tortorella 2014). Garden journals give advice on establishment and care of moss gardens. But what works in one part of the world may not work in another, and that is true within countries as well. Watering instructions and species choice must be in tune with local climate, light, available bryophytes, and competing species.

In Japan, even tiny spaces a meter wide by three meters long are used for a garden. It may be a vegetable garden, but often it is a moss garden with a few tracheophyte highlights (Figure 1). Such private gardens give their owners a sense of space and tranquility (Figure 2). Mosses are particularly enjoyed because they miniaturize the landscape and give a feeling of looking into the distance (Figure 3-Figure 9). Cushions of *Leucobryum* (Figure 10) can resemble distant mountains. *Polytrichum* (Figure 11) can simulate a forest. *Hypnum imponens* (Figure 12), a common "sheet moss" sold for decorative purposes, is used to "fill nooks and crannies" (Cullina

2008). Small mosses in the foreground provide the open fields. Pebbles become boulders.



Figure 2. This peaceful scene is a private moss garden in Kyoto, Japan. Photo by Janice Glime.



Figure 3. This lamp adds interest in a private moss garden at a home near Nagoya, Japan. Photo by Janice Glime.



Figure 4. These rocks form a path through *Polytrichum* in a private moss garden in Nagoya, Japan. Picture by Janice Glime.



Figure 5. Fukushima-san sweeping his private moss garden in Nagoya, Japan. Photo by Janice Glime.



Figure 6. This path leads through *Polytrichum* in a private garden in Nagoya, Japan. Photo by Janice Glime.



Figure 7. *Entodon* and *Polytrichum* grow in a private moss garden in Nagoya, Japan. Typically, the *Polytrichum* will outgrow the pleurocarpous mosses such as *Entodon*. Photo by Janice Glime.



Figure 8. This portion of a private moss garden in Nagoya, Japan, has texture created by different species of mosses. Photo by Janice Glime.



Figure 9. This private moss garden in Nagoya, Japan, has a dry "stream" and bridge. Photo by Janice Glime.



Figure 10. *Leucobryum glaucum* growing naturally around a tree at Coopers Rock, West Virginia, USA. Species of *Leucobryum* are used to simulate mountains in moss gardens. Photo by Janice Glime.



Figure 11. *Polytrichum piliferum* showing white leaf tips. Species of *Polytrichum* are used to simulate mountains in moss gardens. Photo by David Holyoak, with permission.



Figure 12. *Hypnum imponens*, a common species in private gardens, available as sheet moss. Photo by Janice Glime.

Smith *et al.* (2010) summarized the role of residential gardens in preserving biodiversity in urban areas. But bryophytes are typically neglected in such studies. In their studies of 61 domestic gardens in Sheffield, UK, they found 67 bryophyte taxa and 77 lichen taxa. The individual gardens supported growth of 3 to 24 bryophyte species each, with a mean richness of 11.3 species. Of these, 14 species occurred in lawns. About one quarter of the species occurred in only one garden. Only 10% of the species occurred in more than half the gardens. The richness of species correlated with garden area (correlated with substrate richness) and altitude. Species present in 20 or more of the 61 gardens were *Amblystegium serpens* (Figure 13; 31 spp), *Barbula convoluta* (Figure 14; 30 spp), *Barbula unguiculata* (Figure 63; 22), *Brachythecium rutabulum* (Figure 15; 55 spp), *Bryum argenteum* (Figure 16; 21 spp), *Ceratodon purpureus* (Figure 45-Figure 46; 42 spp), *Didymodon insulanus* (Figure 17; 27 spp), *Funaria hygrometrica* (Figure 18; 23 spp), *Kindbergia praelonga* (Figure 19; 56 spp), *Ptychostomum capillare* (Figure 20; 37 spp), *Rhynchostegium confertum* (Figure 21; 32 spp), *Rhytidiadelphus squarrosus* (Figure 22; 23 spp), and *Tortula muralis* (Figure 23; 35 spp).



Figure 13. *Amblystegium serpens*, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo by Michael Lüth, with permission.



Figure 14. *Barbula convoluta*, a species that occurred in more than 30% of the gardens studied in Sheffield, UK. Photo by Ivanov, with permission.



Figure 17. *Didymodon insulanus*, a species that occurred in more than 30% of the gardens studied in Sheffield, UK. Photo by David T. Holyoak, with permission.



Figure 15. *Brachythecium rutabulum* capsule, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo by Wesley, with permission from BBS webmaster.



Figure 18. *Funaria hygrometrica*, a species that occurred in more than 30% of the gardens studied in Sheffield, UK. Photo by Michael Lüth, with permission.



Figure 16. *Bryum argenteum*, a species that occurred in more than 30% of the gardens studied in Sheffield, UK. Photo by Michael Lüth, with permission.



Figure 19. *Kindbergia praelonga*, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo by Michael Lüth, with permission.



Figure 20. *Ptychostomum capillare* with capsules, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo by through Creative Commons.



Figure 21. *Rhynchostegium confertum* with capsules, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo by Michael Lüth, with permission.



Figure 22. *Rhytidiadelphus squarrosus*, a species that occurred in more than 30% of the gardens studied in Sheffield, UK. This species often occurs in lawns in Europe. Photo by Michael Lüth, with permission.



Figure 23. *Tortula muralis* and water drops in Dunblane Scotland, a species that occurred in more than 50% of the gardens studied in Sheffield, UK. Photo courtesy of Peggy Edwards.

Making Your Garden

Private moss gardens are common in Japan (Pullar 1966/1967; Inoue 1980), but elsewhere they are rare. In Chatsworth, Great Britain, there is a moss and lichen garden of 33 moss and 4 liverwort species, including such common taxa as *Dicranella heteromalla* (Figure 24-Figure 25), *Dicranum scoparium* (Figure 26), *Hylocomium splendens* (Figure 27), *Neckera crispa* (Figure 28), *Plagiomnium undulatum* (Figure 29), *Polytrichum commune* (Figure 30), *P. piliferum* (Figure 31-Figure 32), *Rhizomnium punctatum* (Figure 33-Figure 34), and *Thamnobryum alopecurum* (Figure 35) (Ando 1972). And where else but at the home of a poet – we find cushions of *Polytrichum commune* adorning the gardens of Poet Laureate W. Wordsworth.



Figure 24. *Dicranella heteromalla* on soil bank, a common species in this habitat. Photo by Janice Glime.



Figure 25. *Dicranella heteromalla* with capsules, showing the hair-like leaves. Photo by Michael Lüth, with permission.



Figure 28. *Neckera crispa*, a common species in Europe, where it is used in moss gardens. Photo by Michael Lüth, with permission.



Figure 26. *Dicranum scoparium*, a common species that is used in moss gardens in Europe and the USA. Photo by Janice Glime.



Figure 29. *Plagiomnium undulatum*, a common species in Europe, where it is used in moss gardens. Photo by Michael Lüth, with permission.



Figure 27. *Hylocomium splendens*, a common northern moss used in European and American moss gardens. Photo by Michael Lüth, with permission.



Figure 30. *Polytrichum commune*, a common species that is used in moss gardens in Europe and the USA. Photo by David Holyoak, with permission.



Figure 31. *Polytrichum piliferum* antheridial splash cups. These add color to moss gardens in the spring. Photo by Janice Glime.



Figure 32. *Polytrichum piliferum* with calyptrae, demonstrating colorful calyptrae in late summer. Photo through GNU Free Documentation License.



Figure 33. *Rhizomnium punctatum* exhibiting its typical growth form on a rock wall; compare to the soil form in Figure 34. Photo by Michael Lüth, with permission.



Figure 34. *Rhizomnium punctatum* exhibiting its growth form on soil. This species is common and often used in moss gardens in Europe. Photo by Michael Lüth, with permission.



Figure 35. *Thamnobryum alopecurum* with capsules, a common species that is used in moss gardens in Europe. Photo by Michael Lüth, with permission.

In the Netherlands, a Japanese garden at the estate of Clingendael has become a moss garden. It sports several locally rare species [the leafy liverworts *Odontoschisma denudatum* (Figure 36) and *Plagiochila asplenoides* (Figure 37)] among its 57 taxa. Schoenmakers (1985) speculates that several of the species that are restricted to paths are the inadvertent contributions of visitors.

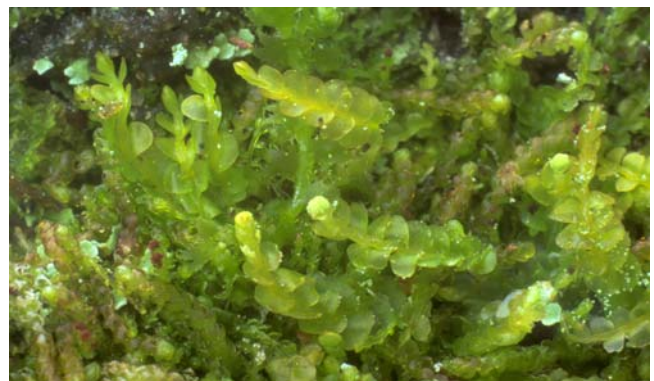


Figure 36. *Odontoschisma denudatum*, one of 57 taxa in a moss garden in The Netherlands. Photo by Jan-Peter Frahm, with permission.



Figure 37. *Plagiochila asplenioides*, one of 57 taxa in a moss garden in The Netherlands. Photo by Michael Lüth, with permission.



Figure 38. *Atrichum altecristatum*, a rapid invader of newly opened forest edges and a suitable moss garden species. Photo courtesy of Eric Schneider.

Mossery

In the 19th Century, a number of British and Americans joined the fad of moss collecting (Wikipedia 2017). This interest led to the establishment of mosseries in a number of both British and American gardens. Mosseries are typically made with slatted wood, with a flat roof. They are open to the north, permitting the entrance of light while maintaining shade. Moss samples were installed in the cracks between the wooden slats. Regular moistening of the entire structure helped to maintain growth.

Garden Variety

In the United States, mosses are being used as a means of exploring new garden themes (Massie 1996). A number of web sites give instructions for planting moss gardens, often supplying pictures of very small ones to the large ones of Japan. Even in the highly settled New Jersey, one anthropologist maintains an entire acre of moss (Whiteside 1987). And the prestigious journal *Horticulture* sports one article titled "Even a rolling stone could get some moss here" (Atkinson 1990).

In spite of the presence of moss gardens in the United States at least as early as the 1930's (at Cutting Estate, Great River, Long Island, N.Y.; Grout 1931), few suppliers provide a selection of mosses. Atkinson (1990) complained that when inquiring of the editor of a horticulture magazine where one could obtain mosses for gardens he was referred to Carolina Biological Supply! Nevertheless, more recently a quick search on the web revealed several sources for *Atrichum* (Figure 38), *Callicladium* (Figure 39), *Dicranum scoparium* (Figure 26), *Campylopus* (Figure 40), *Hypnum imponens* (Figure 12), *Thuidium delicatulum* (Figure 41), *Leucobryum* (Figure 10), *Climacium dendroides* (Figure 42), *Dicranella heteromalla* (Figure 24-Figure 25), and *Plagiomnium cuspidatum* (Figure 43). One site sold sheet moss that had been cleaned, spread on a backing, glued down, and dyed green! No, thank you! Another source offers a complete garden, including 400 sq feet of moss, for \$US 399.99.



Figure 39. *Callicladium haldanianum*, a shade-loving moss available for purchase for moss gardens in the USA. Photo by Janice Glime.



Figure 40. *Campylopus pilifer*; the genus *Campylopus* can be purchased in the USA for use in moss gardens. Photo by Michael Lüth, with permission.



Figure 41. *Thuidium delicatulum*, a moss that does well in American moss gardens. Photo by Janice Glime.



Figure 42. *Climacium dendroides*, a moss often used in American moss gardens. Photo by Janice Glime.



Figure 43. *Plagiomnium cuspidatum*, a common species in American moss gardens, often as a volunteer. Photo by Janice Glime.

Seasons

To maintain variations in color through the growing season, one needs to pay attention to the phenological

changes among the mosses, just as in planting a flower garden. This can provide highlights in different places as the garden changes through the growing season.

Mosses have life cycles that change their appearance. Spring is a typical season for the production of antheridial splash cups. In some species these are reddish (Figure 31); in others, especially splash platforms, they are green, but look like green flowers (Figure 44). Others have colorful setae (Figure 45, Figure 47) and capsules (Figure 46-Figure 48), and these can appear throughout the summer and autumn, depending on the species.



Figure 44. *Rhizomnium punctatum* males showing splash platforms that look like green flowers. Photo by Michael Lüth, with permission.



Figure 45. *Ceratodon purpureus* showing red-tipped setae in early spring. Photo by Hermann Schachner, through Creative Commons.



Figure 46. *Ceratodon purpureus*, showing red capsules in early summer. Photo by Michael Lüth, with permission.



Figure 47. Moss with ice on capsules, showing colorful setae even in early winter. Photo by J. Paul Moore, with permission.



Figure 48. *Pottia lanceolata* with contrasting capsule color. Photo by Michael Lüth, with permission.

Water Gardens

Many bryophytes like a damp habitat (Figure 49). And some of these habitats are very poor in nutrients. Hence, the bryophytes are naturals for water gardens (Figure 50- Figure 51) (Freiland 2017).

Among the many aquatic species, one of the best for a garden is *Philonotis fontana* (Figure 52). It has a fresh, pale green color and tolerates partial submersion or soggy ground.

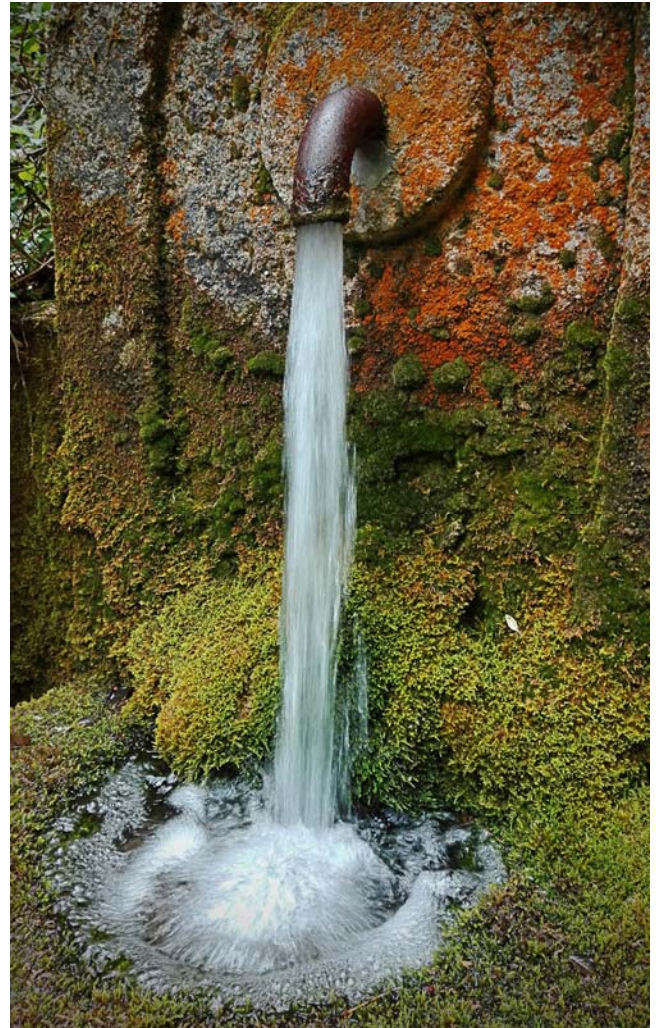


Figure 49. Water garden and moss where a pipe has been repurposed for creating a garden. Photo from pxhere, through Creative Commons.



Figure 50. Water garden with mosses and waterfall. Photo by David Spain, with permission.

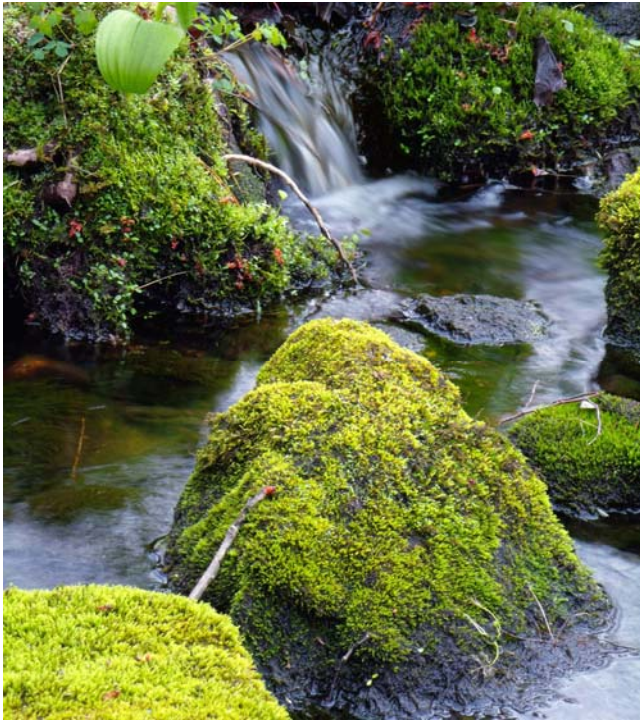


Figure 51. Water garden with mosses on rocks. Photo from pxhere, through Creative Commons.



Figure 52. *Philonotis fontana* with capsules, a suitable moss for water gardens. Photo by Michael Lüth, with permission.

Bog Garden

Gardeners such as Case (1994) have found *Sphagnum* (Figure 53) bog gardens to be a viable alternative in the Great Lakes area, avoiding high maintenance problems of woodland species unsuited for residential living. These require special conditions devoid of limestone rock and chlorine.

The RaisingRarities website <<http://raisingrarities.com/bog-garden/>> provides instructions for preparing a bog garden. The pond is excavated and a pond liner is used to cover the shape (Figure 54). It can have a pool attached, as in the diagram, but will require a shallow section for the bog (Figure 55). The lining at the lip of the bog area keeps sand from entering the deeper pool and should go up the bog side of the stones and under them (Figure 56). The bog shelf should be filled 2.5-5 cm deep with pure silica sand. Plant *Sphagnum* (Figure 53) on the bog shelf and fill the entire shelf with it. Pitcher plants and sundews can be added for

interest, planted among the *Sphagnum*. Collect rainwater and use it to keep the pond and bog at a constant level.



Figure 53. Colorful *Sphagnum* that could be used in a bog garden. Photo by Janice Glime.

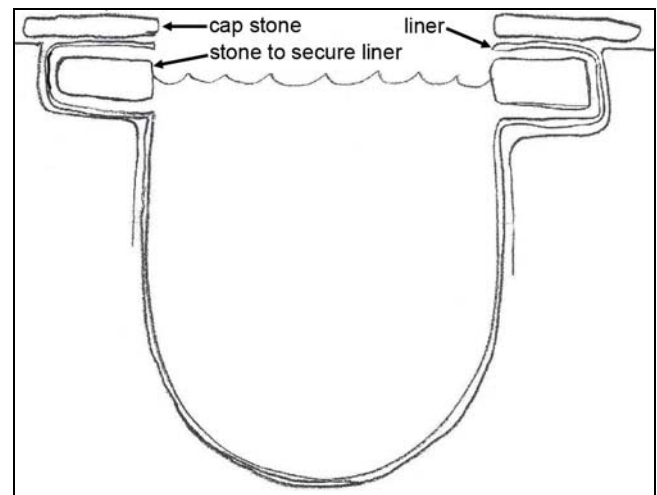


Figure 54. Bog basin and liner in cross section. Redrawn from RaisingRarities.

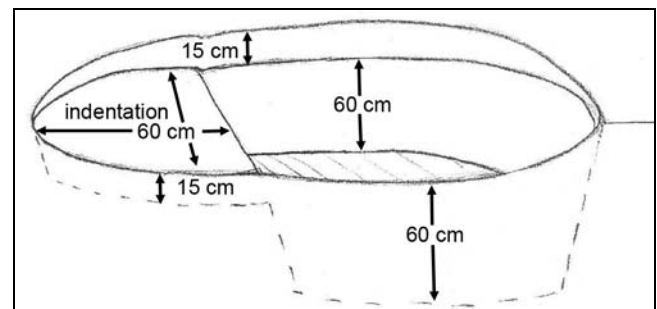


Figure 55. Bog basin and liner showing important dimensions. Redrawn from RaisingRarities.

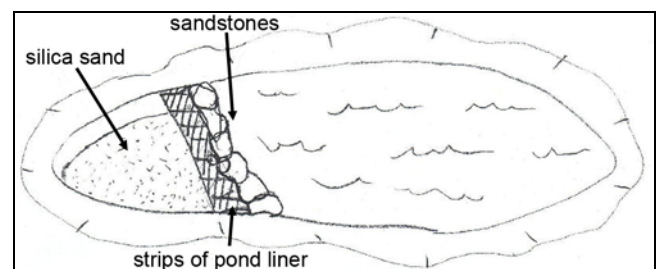


Figure 56. Bog basin shape showing retaining rocks. *Sphagnum* will be located on top of the sand. Redrawn from RaisingRarities.

My Personal Garden

For my own moss garden, I managed to rescue *Marchantia polymorpha* (Figure 57; with gemmae cups) that was being overtaken by lawn grass on the university campus. It started as a small clump, but one day only a few weeks later I found tiny grey-green specks all over my bare soil (I was just starting the garden). On closer inspection, I found these to be germinating gemmae – the liverwort had spread all over the bare surface and was invading my dying *Leucobryum* (Figure 10) cushion as well. By the second year, I had several forests of archegoniophores (Figure 58), but it seems I didn't get any males.



Figure 57. My moss garden initially had a small patch of *Marchantia polymorpha*, about 10 cm in diameter. Within a month, it spread by gemmae, extending about a half meter in each direction. Photo by Michael Lüth, with permission.



Figure 58. The second year these *Marchantia* plants produced archegoniophores in abundance. After a few years, I had to remove some of the *Marchantia* to provide space for mosses. Photo by Janice Glime.

Added to that were *Fissidens* (Figure 59), *Brachythecium* (Figure 60), *Climacium dendroides* (Figure 42), *Dicranum scoparium* (Figure 26)), *Leucobryum glaucum* (Figure 10), *Plagiomnium cuspidatum* (Figure 43), *Polytrichum juniperinum* (Figure 61), *Rhytidiadelphus triquetris* (Figure 62), *Barbula* (Figure 63), *Thuidium delicatulum* (Figure 41), and *Ceratodon purpureus* (Figure 45-Figure 46) that I was able to collect locally, mostly in places where they were doomed to be overgrown or destroyed by traffic. Of these, *Fissidens*, *Plagiomnium cuspidatum*, and *Thuidium delicatulum* (Figure 41) were the most successful.



Figure 59. *Fissidens taxifolius* with capsules; some species of *Fissidens* grow easily in moss gardens in North America. Photo by Keith Bowman, with permission.



Figure 60. *Brachythecium salebrosum*, a species that can occur in large mats usable for moss gardens. Photo by Michael Lüth, with permission.



Figure 61. *Polytrichum juniperinum* with capsules in moss garden in Michigan, USA. Photo by Janice Glime.



Figure 62. *Rhytidiadelphus triquetrus*, a species that often grows well in moss gardens in North America. Photo by Janice Glime.



Figure 63. *Barbula unguiculata*, a hardy species that adds a contrasting color in the moss garden, preferring a sunny site. Photo by Michael Lüth, with permission.

The *Leucobryum glaucum* (Figure 10) was a gift from a friend, and it fared well the first year. It looked bad when winter ended and stains of tannic acid from leaf litter discolored it. It survived, but not well, so the next year I made sure it was not covered with litter for the winter, but it did not make it. I replaced it with a really nice hummock of *L. glaucum*. This time I put it on a bed of pine needles, a substrate it often has in nature. But it wasn't long before the chipmunks decided that made a nice entrance to their tunnel.

Some night-active animal also tore up all the *Dicranum scoparium* (Figure 26) and *Thuidium delicatulum* (Figure 41) the first night, and once dismembered from their normal growth habit, both failed to thrive. However, later introductions have survived winter and both have produced new growth, so there is hope. Some rodent decided that the *Thuidium* patch was the best place to enter its underground passage, but I seem to have thwarted that hole by stepping on it and filling it in. Alas, now there is a hole in the *Polytrichum* patch.

Most of the *Polytrichum juniperinum* (Figure 61) is doing fine (Figure 64). It is only the large patch that didn't have good structural integrity that looks like a fallen forest. But even there a few die-hards are putting up new shoots.



Figure 64. My personal moss garden, when it was about three years old, in Houghton, Michigan, USA. Photo by Janice Glime.

The real winners [*Marchantia* (Figure 57-Figure 58) aside] are *Fissidens* (Figure 59) and *Plagiomnium cuspidatum* (Figure 43), with the latter looking a luscious bright green. To my surprise, the *Rhytidiadelphus triquetrus* (Figure 62) did well, whereas *Hylocomium splendens* (Figure 27) didn't like its transplant at all. One patch of *Climacium dendroides* (Figure 42) had mostly brown plants with a few new green shoots arising, but the second patch eventually sprang to life, producing a solid cushion of plants of a most vital green. The old, weedy *Ceratodon purpureus* (Figure 45) seems not to like my gardens much and disappears rather rapidly.

A new patch of the liverwort *Conocephalum conicum* (Figure 65) seems to be doing well. It, and *Fissidens* (Figure 59), also fared well in my indoor garden. That is, they fared well until the birds ate the *Conocephalum*. I found it with triangular cuts around the edge. Each day it grew smaller until it disappeared. The *Fissidens* diminished and ultimately disappeared after the box turtle died. Apparently the turtle had been an effective dispersal agent for both species because they kept appearing in new places until after the turtle died.



Figure 65. *Conocephalum conicum*, a rock and soil dweller that adds interesting texture to a moss garden. Photo by Robert Klips, with permission.

I attribute my success, after several failures, to the installation of a sprinkling system. It comes on about 4 am for 20 minutes each night. (We usually don't get much rain in spring or summer.) That makes it hydrated and ready to

take advantage of the cool morning sun. It seems to have made all the difference.

I have learned that leaf litter apparently creates more problems than just deprivation of light during the growing season. The tannic acid seems detrimental to several species, because even when I remove the litter the day the snow retreats from its surface, the mosses that were covered with it seem to have suffered. When I removed most of the leaves before winter, the mosses seemed to fare much better.

Mountain Moss Enterprises

The Mountain Moss Enterprises is located near Revard, North Carolina, USA, and is owned by Annie Martin. Known as Mossin' Annie, this entrepreneur has dedicated her life to rescuing bryophytes that are in the path of destruction due to construction or other human activities. These mosses she either plants in one of her many projects, both public and private, or in her own garden where she cares for them until they meet their destiny in a moss garden somewhere.

One of the frequent sources of her bryophytes is from overgrown blacktop. This seemingly unlikely habitat can be a good source for large patches of bryophytes that come in large sheets. Others come from roofs where the owners are convinced they are harmful.

Martin lives in an area of the Appalachians that receives 150-200 cm rainfall per year (Tortorella 2014). Nevertheless, she waters her moss gardens three times each day. She claims that with 3-4 minutes of supplemental water per day the mosses will grow year-round in "nearly any temperature." (I can't imagine that watering when they are under snow is helpful. It would most likely create ice that could actually dry them out more.)

Mosses can dry out or freeze, and easily survive, green up when once again getting wet, but during that dry period they don't look nice. This ability to dry makes them easy to ship, so the distance to a moss supplier is not a real problem. But obtaining mosses from elsewhere does present ecological problems. In addition to the raping of the landscape by some moss collectors, it introduces non-native species.

Martin makes a variety of designs in her gardens, sometimes using differences in colors of leaves to create designs (Figure 66). In other cases, she may use colorful lichens (Figure 67) or furniture to create highlights (Figure 68).



Figure 66. Moss garden at Mountain Moss Enterprises, Pisgah Forest, North Carolina, USA, August 2009. Photo by Annie Martin.



Figure 67. MountainMoss Enterprises moss arrangement with red cap lichens, *Cladonia* sp. Photo courtesy of Annie Martin.



Figure 68. Mossin' Annie garden in snow, showing the green of the mosses, even in winter. Photo courtesy of Annie Martin.

Annie Martin (pers. comm. 31 January 2010) received a grant to explore the cultivation of mosses as a cash crop to replace declining tobacco farms. This study involved a partnership of NC Cooperative Extension, Rural Advancement foundation International-USA, and the NC Tobacco Trust Fund Commission which provided the funding. Martin was able to explore various propagation techniques.

Martin points out that moss cultivation requires far less time, labor, and equipment for both maintenance and harvesting compared to tobacco farming. Start-up money is likewise far less for establishing mosses. Maintenance costs are limited to labor and watering, requiring no chemicals, no fertilizers, no pesticides, and no herbicides. This eliminates the pollution of groundwater that is typical of agriculture. On the other hand, the mosses in the Southeast can be harvested any time of year, with their productivity measured in square feet.

Moss and Stone Gardens

David Spain is the owner of Moss and Stone Gardens in Raleigh, North Carolina, USA (Tortorella 2014). Spain presented moss gardening on the Martha Stewart Show, reporting that "she was a big moss fanatic." Spain recounts his early attempts to grow mosses, bemoaning the lack of teachers or sources appropriate for the area. One of these early attempts, following online advice, was to make a mix of mosses in a blender with buttermilk. This slurry was

painted onto rocks or soil. Instead of a moss garden, he got a mold garden. His garden designs tend to mimic nature (Figure 96-Figure 98).



Figure 69. *Thuidium delicatulum* in Moss and Stone Garden, showing a fern highlight and a small stream with a stone bridge. Photo from Moss and Stone Garden, with permission from David Spain.

Dale Sievert's Garden

Dale Sievert is a landscape gardener in Wisconsin. He became enamored with mosses and now his property is adorned with 60 species of bryophytes. Some of these species arrived by themselves. Among the more common ones in the garden are *Bryum caespitium* (a widespread species; Figure 70), *Thuidium delicatulum* (a species that spreads rapidly; Figure 71), *Rhodobryum ontariense* (an interesting species that resembles miniature palm trees; Figure 72), *Plagiomnium cuspidatum* (a species that commonly volunteers; Figure 73), *Leucobryum glaucum* (a cushion moss that prefers acidic soil; Figure 75), and *Anomodon rostratus* (a very common species locally and in his garden; Figure 87).



Figure 70. *Bryum caespitium* forming intriguing hummocks among the rocks. Photo courtesy of Dale Sievert.



Figure 71. *Thuidium delicatulum*, a moss that spreads easily and usually survives well in the Sievert and other gardens. Photo courtesy of Dale Sievert.



Figure 72. *Rhodobryum ontariense*, a moss shaped like a palm tree that adds interest to any garden. Photo courtesy of Dale Sievert.



Figure 73. *Plagiomnium cuspidatum* in snow. This is a common volunteer in Dale Sievert's garden and in mine, where it doesn't mind being buried in snow. Photo courtesy of Dale Sievert.

Sometimes Sievert lets the mosses determine their own successional pathway. As is typical, pleurocarpous mosses often overrun the acrocarpous mosses (Figure 74). But acrocarpous mosses can invade tight acrocarpous moss cushions as well, as is a common event in which *Polytrichum* invades a *Leucobryum* cushion (Figure 75). A series of pictures demonstrates some of the changes through time, 2011-2015 (Figure 76-Figure 78).



Figure 74. Nature has her own ideas about what belongs where. Here *Atrichum* is being invaded by pleurocarpous mosses. Photo courtesy of Dale Sievert.



Figure 77. Moss and cat statues in 2013 showing thick mat and capsules. Photo courtesy of Dale Sievert.



Figure 75. *Leucobryum glaucum* with invading *Polytrichum*. Photo courtesy of Dale Sievert.



Figure 78. Moss and cat statues in 2015. The original moss has been replaced with *Thuidium delicatulum* dominating the scene. Photo courtesy of Dale Sievert.



Figure 76. Moss and cat statues in 2011 showing well-established but still thin mat of mosses. Photo courtesy of Dale Sievert.

Sievert has a number of special features to highlight the various areas of his garden. A bamboo fountain pours into a small pool surrounded by mosses (Figure 79). A bird bath is adorned by colorful rocks and moss-covered rocks (Figure 80). As in many gardens, including my own, a Japanese lantern adds interest (Figure 81). Small to large boulders can add diversity to the scene and may add their own beauty (Figure 82-Figure 83). Stumps provide flat platforms for miniature gardens (Figure 84-Figure 85) or depressions that have their own interest and are great bryophyte substrates (Figure 86). Statuary peers at the visitors or poses playfully among mosses (Figure 85-Figure 86). Ferns provide changes in texture (Figure 87). Pools can attract frogs (Figure 88).



Figure 79. Bamboo fountain in mossy garden, creating a refreshing pool that raises the humidity for the nearby mosses. Photo courtesy of Dale Sievert.



Figure 82. Rocks and a bit of wood enhance this scene with mostly *Anomodon rostratus*, a common moss in Dale Sievert's garden. Photo courtesy of Dale Sievert.



Figure 80. Birdbath garden in Dale Sievert's moss garden. Photo courtesy of Dale Sievert.



Figure 83. *Thuidium delicatulum* and rocks in Dale Sievert's moss garden. Photo courtesy of Dale Sievert.

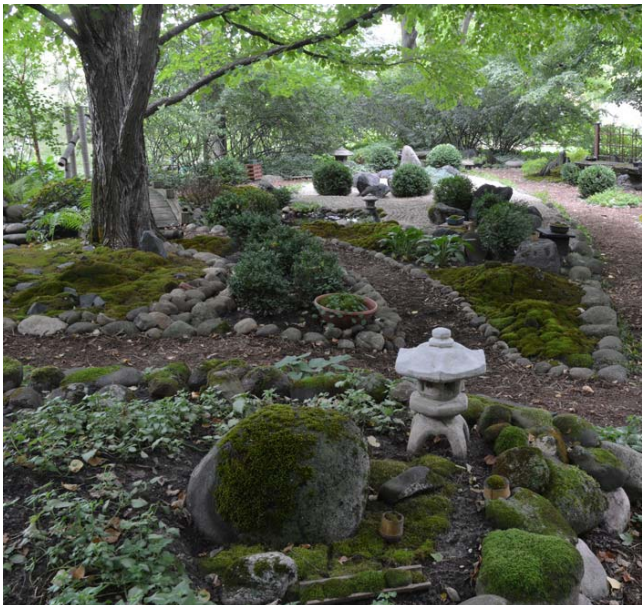


Figure 81. Dale Sievert's moss garden, adorned by a Japanese lamp. Photo courtesy of Dale Sievert.



Figure 84. Here a miniature garden grows on a stump in Dale Sievert's moss garden. Photo courtesy of Dale Sievert.



Figure 85. Statuary can add interest or even bring a laugh. Here *Anomodon rostratus* grows with bunnies on a stump. Photo courtesy of Dale Sievert.



Figure 86. Raccoon statues in tree stump bring a smile in the moss garden. Photo courtesy of Dale Sievert.



Figure 87. Even a fern can provide a highlight, seen here hovering over *Anomodon rostratus*. Photo courtesy of Dale Sievert.



Figure 88. Pools can provide habitat and a welcome drink for wildlife. Here the Green Frog *Rana clamitans* sits on a mossy rock. Photo courtesy of Dale Sievert.

Fungi (Figure 89-Figure 90) are willing participants in Dale Sievert's garden. The mosses help to keep the soil moist longer, permitting the fungal threads to thrive. In the right conditions, the fruiting bodies emerge, adding color to the garden.



Figure 89. The pore fungus *Boletus* sp. and moss. Photo courtesy of Dale Sievert.



Figure 90. *Coprinus* with the moss *Anomodon rostratus*. Photo courtesy of Dale Sievert.

Dale has been fortunate to have some of his mosses exhibit prolific "fruiting." The setae and capsules often add brilliant colors to the landscape.



Figure 91. *Ceratodon purpureus* with numerous red setae. Later red capsules will develop. Photo courtesy of Dale Sievert.



Figure 94. *Plagiomnium cuspidatum* with capsules, adding a fresh shade of green to the scene. Photo courtesy of Dale Sievert.



Figure 92. *Amblystegium varium* with capsules, a colorful addition in a rock garden. Photo courtesy of Dale Sievert.



Figure 93. This patch of mixed mosses will soon have capsules to change the color scheme. Photo courtesy of Dale Sievert.



Figure 95. In the Japanese garden portion, a pool, moss, rocks, and raked sand give the feel of a Japanese garden. Photo courtesy of Dale Sievert.

New Methods in Moss Gardening

Rick Smith (2009) has written one of the North American guides to moss gardening, *New Methods in Moss Gardening*. Smith provides his personal experiences around the world where he has created moss gardens or been a consultant. He provides instructions for growing twelve of the most common mosses, accompanied by pictures (Figure 96-Figure 98).



Figure 96. Moss garden designed by Rick Smith. Photo courtesy of Rick Smith.



Figure 97. Moss garden designed by Rick Smith at Illinois Central College. Note the *Polytrichum* in the foreground. Photo by Rick Smith, with permission.



Figure 98. Moss garden designed by Rick Smith. Photo courtesy of Rick Smith.

Indoor Moss Garden

As my aging body prevents me from maintaining my outdoor moss garden, I am now attempting an indoor moss garden. So far, I am able to do the required bending, but at least once planted it is essentially maintenance-free – no weeds! I was pleased to have a supplier who rescues the bryophytes she sells by removing them from roofs or construction sites where they are slated for destruction, then cultivates them. Several other suppliers state that they grow their own mosses. I avoid the "grab bags" after trying one and concluding they were ravaged from the forest.

My previous attempts at introducing mosses inside were unsuccessful, with the town's water quality being incompatible despite a filter on the garden room watering system. I was successful with *Conocephalum* cf. *salebrosum*. And it also appeared that my turtle was successful in dispersing it.

My new adventure in the indoor moss garden is still quite young, but I do have some success stories. My first introduction was again *Conocephalum* cf. *salebrosum* (Figure 99-Figure 104), and it has been highly successful. The *Conocephalum* cf. *salebrosum* is doing especially well at the base of the waterfall and the stream margins (Figure 99-Figure 101). My *Marchantia polymorpha* got dried out, but it is trying to come back, perhaps from gemmae.



Figure 99. Newly planted *Conocephalum salebrosum* along stream, with some bare fake rock at edge. on 16 December 2022. Photo by Janice Glime.



Figure 100. *Conocephalum salebrosum* growing successfully at the very moist base of the waterfall on 19 February 2023. The green rock and its surrounding liverworts can be seen at the middle left of Figure 99 from two months earlier. Photo by Janice Glime.



Figure 101. *Conocephalum salebrosum* growing on wet soil beside the stream in the garden room, 16 December 2022. Photo by Janice Glime.



Figure 102. *Conocephalum salebrosum* invading soil on the rock, extending by fragments from the clump above in Figure 101, two months after being planted. Photo by Janice Glime.



Figure 103. *Conocephalum salebrosum* colonizing a ledge in the garden room waterfall. Photo by Janice Glime.



Figure 104. *Conocephalum salebrosum* showing the bright green of new branches on the thallus after two months in the garden room. Photo by Janice Glime.

My next adventure was a small patch of *Thuidium delicatulum* (Figure 105). To my surprise, this was also quite successful (Figure 106). Both of these bryophytes have produced new branches and have a wonderful, fresh color.



Figure 105. *Thuidium delicatulum* in garden room on 19 Feb 2023. Photo by Janice Glime.



Figure 106. *Thuidium delicatulum* in garden room on 19 Feb 2023; it was planted ~25 November 2022. Photo by Janice Glime.

Two other bryophytes seem to be doing very well – *Rhytidiadelphus squarrosus* and *Rhytidiadelphus triquetrus*. I wasn't surprised at the latter because it had also been successful in my outdoor garden. *Leucobryum glaucum* is surviving, appears healthy, but so far no expansion. Of course it is winter here, so the room is cool, but not freezing. It gets watered at least 3 times a week and has a small, two-meter high waterfall to maintain moisture.



Figure 107. *Rhytidiadelphus squarrosus* in garden room 19 Feb 2023 after nearly three months. Photo by Janice Glime.



Figure 108. *Rhytidiadelphus triquetrus* in garden room 19 Feb 2023 after nearly three months there. Photo by Janice Glime.



Figure 109. *Leucobryum glaucum* in garden room 19 Feb 2023 after ~3 months. The color is darker than normal and many apical pieces are scattered loose on it. Photo by Janice Glime.

Sun-loving mosses usually die within the same growing season. Likewise, xerophytes don't do well in the high level of moisture.

After 45 years, there are at last volunteers in the garden. These are mostly on pumice that I put there just for that purpose. The mosses are thin and I don't recognize them, but they are healthy.



Figure 110. Volunteer moss on pumice beside the garden room waterfall – after more than 40 years of opportunity! Photo by Janice Glime.

Harvesting Ban

In 2006, a moratorium was declared on moss harvesting in the national forests around Asheville, North Carolina, USA (Tortorella 2014). This ban was based on a study of the moss trade. Local collectors would sell sheet moss for as little as \$.50 per pound to members of the floral trade. But stripping a log of all its moss requires 20 years for a new crop, despite all the local rainfall. Gary Kauffman, an ecologist and researcher on the study, determined that if a third of the moss was left on the log, the mosses would grow back in ten years. One of the dangers of collecting the mosses is what fishermen call "bycatch." Unintended species come along with the desired ones, and some of these are rare and endangered. Including these bycatch species, studies indicate that more than 70 species are harvested in the Appalachian moss industry.

Because of these conservation concerns, it is best to do as Annie Martin has done – rescue mosses and liverworts that are scheduled for destruction. In many of these locations, the moss "invaders" are hardy species and ones likely to survive in a garden.

Summary

Private moss gardens tend to serve the same purpose as the larger moss gardens. Rocks, pebble paths, lamps, and other items add interest, and the limited color gives them a peaceful appeal. Outside of Japan, fewer moss gardens exist, in part because the climate is often not suitable. Another difference seems to be the love of color in other parts of the world.

Mosseries are an older form of growing mosses. The moss gardens themselves have a wide variety, using artistic designs, Japanese styles, natural styles, and mixed with flowering plants. They vary by season, changing colors when producing reproductive structures and between wet and dry states. Water gardens require different species, but running water can add sound to the landscape. Bog gardens can be used to grow insectivorous plants and other bog plants.

Worldwide, mosses such as *Polytrichum* and *Leucobryum* seem to be popular choices for these gardens. Species like *Thuidium delicatulum*, *Fissidens* sp., and *Plagiomnium cuspidatum* spread easily and may overtake acrocarpous mosses nearby. *Plagiomnium cuspidatum* can often arrive by itself.

Conocephalum salebrosum, *Thuidium delicatulum*, *Rhytidiadelphus triquetrus*, and *R. squarrosus* do well in indoor gardens.

Harvesting mosses should only be done on your own property or other private property where you have permission. The best way to get plants is to rescue them where they are scheduled for destruction.

Acknowledgments

I appreciate the email discussions with Nancy Church, Annie Martin, Rick Smith, and David Spain. Most recently, I spent an afternoon discussing mosses and moss gardening with Dale Sievert, leading me to include additional topics in an attempt to answer his questions.

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