Growing Ferns from Spores by William Cullina

Raising ferns from spores is surprisingly easy if you obtain clean, viable spores and sow them in a sterilized potting mix enclosed in a plastic bag or similar container. The following step by step guide will take you through spore collection, sowing and care of your young hardy ferns.

With a few exceptions, fern spores ripen in covered structures on the underside of some or all of the fronds. Species in the genus *Osmunda* as well as ostrich and sensitive fern produce modified leaves or leaflets that harbor the spores.

Athyrium filix-femina (lady fern)
Ripe spores emerging from sori

Osmunda claytoniana (interrupted fern)
ripe spores are in fertile leaflets

Matteuccia struthiopteris (ostrich fern)
"feathers" (fertile fronds) with spores

Each species ripens at a particular time in the season. Interrupted fern is the first in early May while climbing fern (*Lygodium palmatum*) doesn't ripen until late November. Spores turn from white or green to brown or black when mature, so check the fronds and watch for darkening spore capsules (sori). As the spores are about to drop, the sorus splits open and peals back, revealing tiny globes full of spore. This is the time to harvest the frond. It requires a bit of diligence to catch some ferns at the right time, though others like the *Diplazium pycnocarpon* (glade fern) pictured to the left ripen over three or more weeks, making timing easier.

Clip the frond and bring it indoors immediately if possible. If you are on a hike or travelling, place it in a plastic bag and keep it in the refrigerator until you get home - it should stay in good shape for up to a week under refrigeration. Find a room that is quiet and free of drafts and place the frond spore side down on a sheet of waxed or white paper and leave it to dry overnight. When you lift the frond off the next day, you should see a brown spore print on the paper. If the print is very faint or non-existent, you were either too early or too late so try again.


Glade fern fronds on paper.


The next day with fronds removed and a nice spore print visible.

The clean spore from these two fronds with a penny for comparison: this pile contains roughly 10 million spores!

Store the clean spore in a waxed or paper envelope in the refrigerator until you need it. With the exception of the Osmundas and a few other more primitive ferns which need to be sown right away, spore will stay viable like this for several years.


Store spores the refrigerator

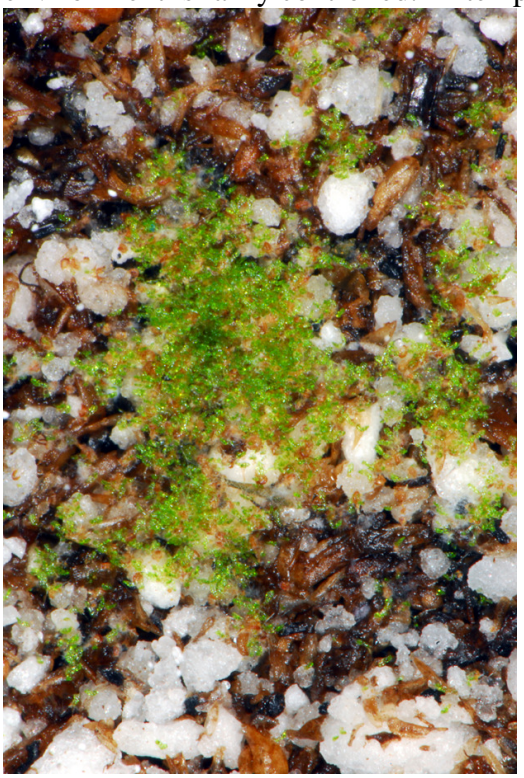

A packet of wood fern spore (*Dryopteris marginalis*) from the NEWFS seed catalog is enough for 1 pot

The nice thing about fern spores is that they will sprout at any time of the year. All they need is a warm, sunny window and a humid, protected spot free from pathogens and competitors like mosses and liverworts. They are very easy to germinate indoors even during the winter when few other natives can be grown effectively. I prefer to sow them in late February as the lengthening days and strengthening sun gets them going more quickly than if I sow them in December or January. Buy a bag of good seed starting medium and fill a 3 to 4 inch diameter plastic pot to the top (use a new pot or thoroughly scrub used ones with a 10% bleach solution and rinse them well). Then, use the bottom of another pot to gently but firmly tamp the mix down and water it thoroughly so it is well-dampened all the way through. Now, place the pot in a microwave for 2 minutes and then plunge a meat thermometer into the center. If the temperature climbs 150° F, put the pot in a gallon-sized Ziplock back and seal it up. If the temperature is less than 150° (the point at which most pathogens are killed), give it another minute or two. Every microwave is different, but after a few pots you will get a feel for the proper time with your particular unit. Let the pot cool down for an hour in the bag then open it up and quickly tap the spore over the surface. You don't need much spore for a 4 inch pot. An amount equivalent to the head of a kitchen match should suffice. If you sow it too thickly, the young ferns become dangerously crowded very quickly.


The spore will settle on the surface and absorb water from the mix, so just seal the bag back up and place it on a sunny windowsill (in summer an east-facing window is best to avoid overheating, though in winter a south-facing window yields the best results).

A spore is simply a single cell that begins dividing and growing as soon as it absorbs moisture. It does not take long before you will notice a film of green appearing on the surface of the potting mix. What you are seeing are a host of tiny gametophytes – small, moss-like creatures that are the means by which ferns accomplish sexual recombination. Once a gametophyte is large enough and conditions are right (the air is damp and there is some water present on its surface), it releases mobile sperm that swim through the film of water in search of pockets of eggs to fertilize. Once fertilized, these

eggs grow into what we think of as the fern. This type of reproduction is more sensitive to environmental conditions than that of seed plants, which is accomplished within the flower and ovary. This is way ferns do so well in a sealed plastic bag where the environment is fairly controlled. A temperature between 65-75° F is best.



Lady fern gametophytes 11 days after sowing.

Lady fern gametophytes 21 days after sowing.

Lady fern gametophytes 42 days after sowing.

Detail of *Blechnum spicant* (deer fern) gametophyte.

Lady fern gametophytes 93 days old with first sporophytes (young ferns) visible center right (the round-leaved fern center left is a *Pellaea atropurpurea* (purple cliff brake) that got as a spore in during cleaning).

If no young ferns are evident among the gametophytes after 12 weeks, try watering the pot with dilute liquid fertilizer (1/4 the recommended rate for houseplants).

Often this spurs sperm release and fertilization. Leave the ferns in the bag until the young ferns (sporophytes) are 1-2 inches tall. As long as things were sterile from the start and you collected and cleaned the spore correctly to minimize contamination, the little ferns can grow in the bag for up to a year if necessary though you will want to give them additional fertilizer at the same rate once a month.

Once they are large enough to handle, gently tease apart the mass of small ferns into small clumps of 2 or 3. In the image below, maidenhair sporlings can be seen growing from the gametophytes that gave them life. The gametophytes begin to wither as they are shaded out by the larger sporophytes. At this stage the plants have a few shallow roots that cling to the potting mix so it is easier to tuck the clumps into either their own individual pot or into a larger pot or tray at 2 inch spacing. For best results, sterilize the new pots as before and zip the transplants back up in a bag, a plastic deli container, a clear dome or cover made for propagation, a terrarium, or some other means to keep them humid. After two weeks you can crack the cover to let drier air in and begin to acclimate them to ambient conditions. Under ideal conditions you can go from spore to garden-sized transplants in 9 months, so if you start in late winter you will have plants ready to set into the garden in the fall or the following spring. To the right is a 10 month old polypody fern (*Polypodium virginianum*) grown to size in a plug cell (a type of propagation tray). This species prefers to grow on mossy rocks, and a 2 inch plug like this is easier to tuck into moss than a larger pot. Small transplants like this one should be held over until spring to avoid the danger of frost heaving that may afflict them during their first winter if planted in the fall.

(all images by William Cullina with the exception of *Lady fern gametophytes with first sporophytes* © Catherine McDonough