



THE
Fern
RENAISSANCE

By Mike Freedman and Jennifer Possley

Have you noticed? Fairchild is experiencing a fern renaissance. Partnering with Miami-Dade County, the South Florida Conservation Team and Fairchild's horticulture staff are establishing conservation collections of Miami's imperiled ferns at Fairchild in locations such as the Isabel Foster Fern Glade, the conservatory, the sunken garden, the Whitman Pavilion and the gatehouse.



Endangered *Thelypteris reticulata* in the Isabel J. Foster Fern glade. These were grown at Fairchild from locally collected spores.
Photo by Jennifer Possley.

The motivation behind this collaborative effort is an unhappy fact: Nearly three-quarters of Miami's native fern species are extirpated, extinct or imperiled. By maintaining healthy collections of many rare South Florida ferns, Fairchild helps ensure that these rare species will remain part of our botanical heritage.

While much of our native fern propagation is done by the Cincinnati Zoo & Botanical Garden's Carl H. Lindner Jr. Family Center for Conservation and Research of Endangered Wildlife, we are increasingly propagating ferns from spores here at Fairchild. If you, too, are enchanted by ferns, you may want to try your hand at growing them by following the steps outlined below. Just remember that it is illegal to collect spores (or any plant material) from any preserve without the proper permits. However, you can easily obtain spores from your own yard or from ferns purchased at a nursery.

Growing Ferns at Home

Finding spores

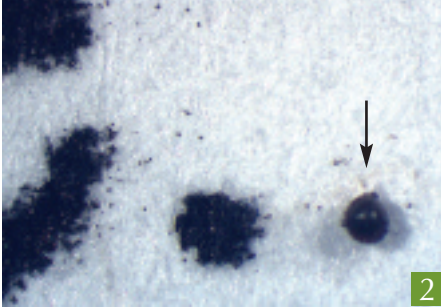
It is important to realize that fern spores—or its reproductive body—are tiny. In fact, a single spore cannot be seen by the unaided eye. Spores are contained in cases called sporangia, (Photo 1) each of which usually holds 64 spores. For a real-world comparison, one sporangium is more or less the same size as the period at the end of this sentence. (Photo 2)

One of the many enchanting things about ferns is the variety of ways in which they bear their sporangia. Fern sporangia can be found singly or in clusters on the underside of fronds (the name given to fern leaves). They can be in lines or squiggles. Sometimes the leaf margin will cover them or they'll be under a thin film of tissue forming an umbrella-like covering. They can cover the back of a frond and be hidden under a mat of hairs. They can even be on a specialized lobe or frond that bears no resemblance to the sterile fronds. Fern spores come in many colors, depending on the species. Though individual spores are invisible, their colors can be seen through the walls of their sporangia, making ripe sporangia appear black, orange or other colors.

2 Collecting spores

There is more than one way to collect spores for planting. For the home gardener who wants a few—rather than millions—of ferns, a teaspoon and a piece of paper (Photo 3) will be sufficient for collecting material. This method requires fronds whose sporangia have already launched most of their spores. (Photo 4) Even these “empty” sporangia will have a few spores clinging to them. To collect this spore-bearing material, hold the frond with one hand while using a spoon to lightly scrape the fuzzy, empty sporangia with the other hand. In your third hand, hold an appropriate spore-catching receptacle (jar, envelope, sheet of paper, etc.), to catch anything that falls. (Yes, it's awkward enough that you might want to spore hunt with a partner.) Be sure to scrape *lightly* with the spoon to avoid releasing any plant juices. The resulting dust-like scrapings are what you'll use for growing.

An alternative to the spoon method is to make a spore print. This method requires a frond covered with ripe sporangia (Photo 5). A 10x magnification (or higher) lens is useful to identify ripeness. Look for very dark sporangia, perhaps with some light brown mixed in. Once you have an appropriate frond in hand, place it face down onto a piece of white paper as quickly as possible. An air-conditioned room without drafts is ideal for spore release, which can start just a few minutes after harvest, though the process may take several hours. Left undisturbed, the frond will leave a spore pattern on the paper that mirrors the shape of the frond. At this point, caution needs to be exercised because you've now collected millions of spores—you'll need only a tiny fraction of them. As a side benefit, this method can also produce stunningly beautiful art.



1. The sporangia are clearly visible in this microphotograph of Florida's endangered *Thelypteris sclerophylla*. Dark brown sporangia are ripe; green ones are still developing. Photo by Hank Poor

2. This close-up photograph of the end of a sentence shows a period (left) next to a single fern sporangium (right, with arrow). Photo by Mike Freedman

3. Mike Freedman demonstrates the teaspoon method of collecting spores from over-ripe sporangia on *Asplenium nidus*. Photo by Jennifer Possley/FTBG

4. The sporangia on the back of this (non-native) *Blechnum brasiliense* frond are old. When viewed without magnification (top image), they have a somewhat shaggy appearance. Under magnification (bottom image), one can see that the shaggy appearance is actually persistent annuli (singular: annulus)—a worm-like line of cells along a sporangium that contracts as it dries, explosively launching spores from their sporangia. Photos by Hank Poor

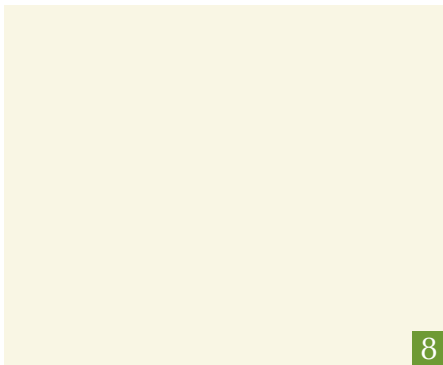
5. A spore print of the endangered native Florida tree fern, *Ctenitis sloanei*. Photo by Jennifer Possley/FTBG



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7



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6. A wide variety of containers could serve as spore germinating chambers. If yours doesn't have a lid, cellophane and a rubber band work perfectly well.

Photo by Jennifer Possley/FTBG

7. Two young individuals of the endangered native fern *Asplenium verecundum*. The gametophyte on the left has been fertilized and is now a sporophyte, as evidenced by the emerging fronds. The gametophyte on the right does not yet have fronds and remains as a small heart-shaped blob of tissue.

Photo by Jennifer Possley/FTBG

8. Rare Miami-Dade County ferns acclimating in Fairchild's nursery using the plastic bag method.

Photo by Jennifer Possley/FTBG

3 Preparing the container

To grow ferns from your spores you'll need a clear container with a top that seals well. Anything from a baby food jar (Photo 6) covered with cellophane to an aquarium with a lid will suffice. For the growing medium, we recommend a mixture of one-third each of peat moss, perlite and vermiculite. However, you may also use potting soil, agar, clay, kitty litter, plain peat, sphagnum, stones or sand.

If your container is not microwave-proof, sterilize it in dilute bleach solution and rinse it well before adding growth medium. Ideally, the medium will also be sterilized. Here's an easy method that we use: In a microwavable container, spoon in moistened perlite in a 1/2-inch deep layer. On top of this, add a 1/4-inch layer of the moistened one-thirds mixture described above. Microwave for two minutes, cover and let cool. Just before sowing your spores, add water to a corner until it reaches the top of the perlite layer.

4 Sowing spores

Now you are ready to sow your spores. Keep in mind that sowing lightly is best.

If you used the spoon method, then a pile of sporangia large enough to fill the inside of this "o" will be sufficient to grow dozens of ferns in a 2-by-2-inch container! Use a knife or a small paintbrush to transfer a tiny amount of the spores you collected onto a piece of paper such as a 3-by-5-inch index card. Tilting, tapping, moving the paper back and forth, 6 inches above the container, distribute the spores evenly on the surface of the medium.

If, however, you used the spore print method, then you will have an excess of pure spores and will need to sow even less material. Onto a card use the same volume of spores as above (enough to fill the inside of an "o"). This time, though, hold the card vertical and tap it once, lightly, over a trash can to discard the excess spores. You will sow only those spores that stick to the card. Tilt and tap the card to distribute the remaining spores across the card's surface. Then, tilt, tap and move the paper back and forth 6 inches above the container to distribute the spores evenly on the surface of the medium. If the spores are fresh and conditions are right, they will all grow, and quickly become overcrowded. Erring on the stingy side is best.

When you are finished sowing spores, cover the container and place it in a location with bright, indirect light (windowsills or a surface under fluorescent lights work well).

5 Growing spores

Now the hard work is done and you're ready for the fun part—growing. To avoid stress from changes in the direction of light, mark one side of the container and try to keep that side in the same position whenever you move the container to check your ferns. Avoid removing the lid except to add water as needed. Start looking for green after one month. The first material you see will be gametophytes, the tiny, sexual phase of a fern's life (Photo 7). Be patient—it may be four to six weeks before you see gametophytes and you can expect to wait at least four months until these 1/4-inch wide, heart-shaped plants produce their first fronds.

In a while, you will have a container full of small young ferns, known as "sporophytes." When they reach the top of the lid, you will need to transplant them to a pot full of soil. However, this change of venue can be very shocking for a fern. We recommend watering the fern well and putting the pot in a sealed plastic bag, out of direct sunlight (Photo 8). After one week, make a 1-inch hole in the bag. Add one hole per week for at least six weeks, watering the fern when it starts to get dry. After six to eight weeks, you can remove the bag and—at long last—enjoy your homegrown ferns.

