Embracing the Dynamics of Seasonal Change

The Garden in December is a most welcome escape from the commotion of the Holidays. With winter's chill about to descend and festive evergreens decorating nearly every store, most gardeners also resort to evergreens for adding colorful décor to their December gardens. Many years back I attended a talk by the landscape architect Wolfgang Ohme (1930-2011) who looked at the winter landscape – not as a mass of frosted 'dead' stems – but as a dried floral arrangement featuring golds, tans and dark browns with evergreens accents. Every time I see the spore bearing stems of Sensitive Fern in winter, I think back to that talk and realize how progressive Wolfgang was in his design philosophies!

Sensitive Fern, botanically known as *Onoclea sensibilis* is an all-too little used fern, pictured above in early August. Growing from Manitoba south through Colorado and Texas and east to Florida and Quebec, it is also native to far Eastern Russia, Eastern China, parts of Japan and Korea! It is a member of its own family, the Onocleaceae, which it shares with 3 other genera. Probably its most notable family member for most gardeners being the Ostrich Fern or *Matteuccia struthiopteris*. The genus and species of Sensitive Fern were named and described in 1753 by the Swedish botanist and physician Carl Linnaeus (1707-1778). The genus refers to the fertile, spore producing fronds and comes from the Greek *Onos* meaning vessel and *Kleio* or *Kleiein* for 'to close'. The species name is from the Latin for sensitive and refers to how the foliage is highly sensitive to frost and droughts.

Ferns are a rather ancient group of plants with some species dating back to nearly 300 million years ago (MYA). While not that old, fossil remains of *Onoclea* dating back 55-65 MYA have been found in association with those of Dawn Redwood (*Metasequoia glyptostroboides*) in Alberta Canada. These fossils of *Onoclea* appear virtually identical to the species of today! Fern foliage is technically referred to as fronds and consists of two general types: trophophylls and sporophylls. The trophophylls are the finely cut fronds that one typically associates with ferns and their function is purely for photo-

synthesis. By contrast, the primary function of the sporophylls is to form and release the reproductive spores, although they are often photosynthetic and can appear virtually identical to their purely photosynthetic 'cousins'. However, this is not always the case and for Sensitive Fern they appear dramatically different.

All sporophylls produce and release dust sized spores from structures called sori. Much like seeds, they are intended to move the offspring to potentially new and beneficial habitats. The differences between spores and seeds are manifold, but two major differences are the number of chromosomes and how they 'grow'. A seed is a diploid organism with two sets of chromosomes. The spore is a haploid organism, with only one set of chromosomes. A seed could be considered as a small plant in a shell, with a primitive root, shoot and leaves contained within that simply needs moisture combined with the proper temperatures to grow. By contrast, when fern spores land in the proper environment, they start to divide and produce a small haploid and green plantlet called a prothalus. This prothalus develops sperm producing structures called antheridia and female ovum yielding structures called archegonium. In the presence of moisture, the sperm swim to the ovum, resulting in a new fern. This explains why ferns often grow in moist environments. The image above right shows the initial fronds of a fern stretching upwards from the smaller prothallus attached to the rock.

For Sensitive Fern, the trophophylls are produced early in spring from a horizontal stem or rhizome and are noticeably coarser than most ferns. The fronds are light to dark green in color with an overall ovate or egg shape, whereby the wider base tapers to a point at the tip (as seen in the initial image). Each frond has a central stem or rachis from which extend 6-8 pairs of leaflets or pinnae. The pinnae are ¾-1" wide and are widely spaced at the base of the frond, becoming merged into one structure near the tip. The wavy margins of the pinnae are somewhat toothlike or dentate and if studied closely, each individual 'tooth' called a pinnule has its own vascular system that originates from the central midrib (as pictured above). The central stem or rachis also has a leafy growth on either side, giving it a winged appearance (also seen in the image above). These fronds can grow from 1' to over 3' tall in locations where the competition is taller. Typical to most ferns, the Trophophylls

first appear as a tightly coiled structure, often called a fiddlehead for its resemblance to the coiled head of many stringed instruments (pictured above right). It is also called a crosier, due to its resemblance to the head of a Bishops staff! Unlike most ferns, fiddleheads of *Onoclea* display a very showy, bright red central rachis during early spring, as seen above and in a mass planting at Longwood Gardens at left! The red color marks the presence of Anthocyanins which aid in protecting the leaf during those cool and frosty nights of early spring. The newly emerging pinnae also bear a red margin and an overall red cast. Although the base of the leaf rachis – technically called a stipe – often retains a red hue, the balance of the rachis and pinnae become green with the ensuing warmer temperatures of spring. Come the first subfreezing evening of fall, the frosted fronds collapse to the ground.

By contrast, the sporophylls do not appear until late May. Like their photosynthetic kin, they also expand through the unfurling of a fiddlehead-like structure, yet their pinnae are far more narrow with a strong vertical orientation, as seen above in August and at left after maturing. These fronds only reach 10-18" tall by ¾" wide. As the sporophylls unfurl, the small bead-like structures of the sori can be seen along either side of the central stem of the pinnae. The sori initially form on the individual pinnules which, in turn roll inward 'to close'

around the ‘vessel’ of the sori. The result is these bead-like structures that was also the inspiration behind the name of the genus. In part, this also explains why each pinnule has its own vascular system! The sori ultimately expand to nearly ⅛” in diameter and when mature, they turn dark brown to nearly black and persist throughout the winter as seen above left in January. Come spring, the sori split open and the green spores are finally released. The sporophylls often persist for upwards of a year and the image of the split sori above right was taken the following November!

It is these nearly black fertile fronds of Sensitive Fern that I enjoy throughout December and the winter months to come! Although ferns are often considered to be shade dwellers, *Onoclea* is very much at home in sun providing the soil remains moist. At Willowwood Arboretum, as in my backyard the plants thrive in a moist meadow and their aggressive rhizomatous root system allows them to readily compete with various forbs and grasses. In fact, their aggressive tendencies can become a bit of a nuisance in smaller gardens, although they remain a very endearing groundcover! In one meadow at Willowwood Arboretum, the plants annually spread outward and have created a nearly perfect circle as seen above in mid-May! Plants are hardy in zones 4-9 and are tolerant of varying soil pH from acid to neutral.

The plants mix well with a number of herbaceous companions and in New Jersey are naturally seen growing with Joe Pye Weed (*Eutrochium purpureum*) and NY Ironweed (*Vernonia noveboracensis*). If you are looking for a grassy textured companion, consider the Tussock Sedge (*Carex stricta*) which thrives in wet or boggy conditions. If a shrubby companion is of need for winter interest, the sporophylls provide an attractive foundation for the red winter stems of Virginia Sweetspire (*Itea virginica*) and Red-Osier Dogwoods (*Cornus sericea*). You may also wish to consider the orange-red stems of Coral Bark Willow (*Salix alba* ‘Britzensis’) as seen in the closing image below, or with various evergreens. If you are looking for inspiration on a possible combination with a tree, consider those ancient fossil remains from Alberta Canada from where it was found growing in combination with the Dawn Redwood (*Metasequoia glyptostroboides*). Of course, it goes without saying that their winter appearance is bolstered with a dusting of snow!

As gardeners, we do not always consider the colors from frosted stems and foliage as a highlight of winter interest. Thinking back to Wolfgang’s presentation, he emphasized how gardens which appear nearly the same year-round can appear static and dull. *Onoclea* adds bold summer texture, the depth of dark winter color and the dynamic of seasonal change, allowing the plant to

sustain the interest of our garden throughout the year, especially during these colder months of winter! Season's Greetings to All and the Very Best in the Year to Come!

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