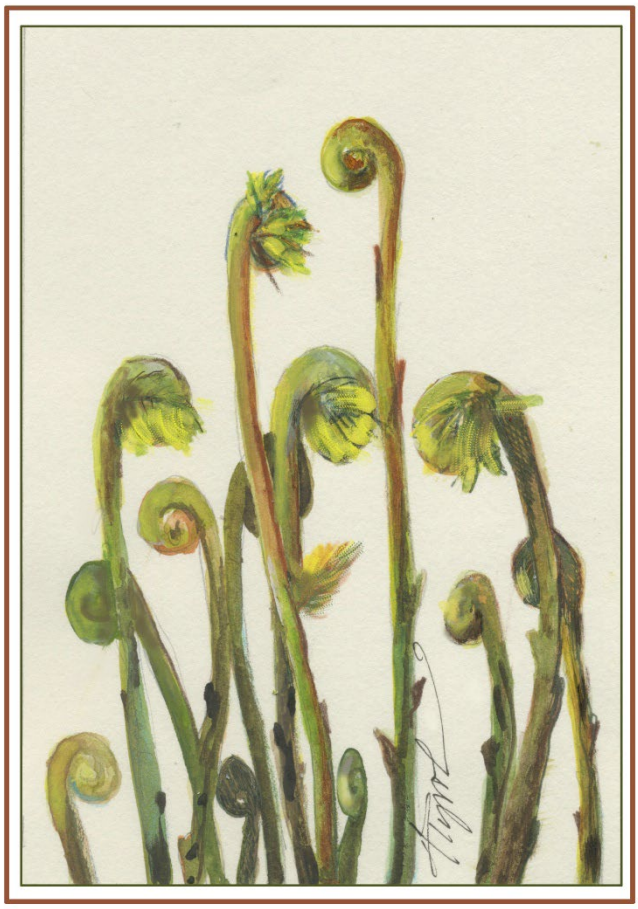
The Outside Story

The World According to Ferns

By Catherine Schmitt



Ferns have grown on Earth for longer than trees and flowers, and existed well before *Homo sapiens*. In our region, the oldest lineage, emerging 200 million years ago, is the royal fern family (*Osmundaceae*), including royal, cinnamon, and interrupted ferns.

Named for the fertile, spore-producing pinnae that "interrupt" the rest of the leafy frond, *Osmunda claytonia* illustrates the many qualities ferns have evolved after so much time on this planet: tough spores that drift on the wind and can remain viable for decades; a separate, tiny reproductive form, called a gametophyte, tolerant of drought and flood; a special light receptor that enables photosynthesis in the shadiest environments.

When an asteroid slammed into Earth 65 million years ago, sending clouds of iridium-laced dust into the sky, it was these adaptations that helped ferns survive, while 75 percent of living things, including the non-flying dinosaurs, went extinct. Ferns were the first plants to leaf out on the devasted ground. For at least 1,000 years following the impact, ferns flourished.

Geologists, paleontologists, and botanists have considered this fern spore "spike" evidence of ferns' capacity to adapt to severe disturbance and thrive in the wake of disasters. Recently, however, a group of researchers has advocated for a wider perspective that includes the many positive interactions ferns have with other species.

Through the many climatic and other changes since the asteroid impact, ferns evolved and diversified, and now include more than ten thousand species. Bracken fern emerged six million years ago and is now one of the most common plants across the globe, in part because it can grow on disturbed, dry, and low-nutrient soils, spread quickly, and persist over large areas. Its foliage contains a chemical that repels would-be foragers.

These traits have given bracken fern a contemporary reputation as coarse, poisonous, and invasive, especially among those who would prefer to see trees growing in their place, or more palatable forage for livestock. Other fern species are similarly repudiated for their tendency to form a dense canopy and thick litter that inhibits other plants from taking root.

Ecologist Lauren Azevedo-Schmidt sees ferns as more than just successful pioneers. A member of a team of NASA-funded researchers studying the post-asteroid impact fern spore spike, Azevedo-Schmidt is part of a growing movement among ecologists to think beyond the individualistic, competition-based models of nature that have dominated scientific discourse since Darwin.

“Something can be seen through the human gaze as being ‘detrimental’ to an ecosystem, and still be important for other environmental processes,” she said. “We don’t give ferns enough credit for how dynamic they really are.”

For example, interrupted fern can produce a chemical that inhibits growth of red oak, but a fern makes less of this chemical in the presence of fungi such as slippery jack mushrooms. One conventional perspective is that the fungi help the trees outcompete the ferns. The alternative proposed by Azevedo-Schmidt is that ferns *facilitate* the development of the forest, adding nutrients, holding moisture, building soil, taking cues from the fungi that the ground is ready for more red oak.

As the ecosystem diversifies, the ferns adjust. Ferns can sink rhizomes into raw earth inhospitable to seed plants, and quickly ramp up photosynthesis, beginning a process of re-greening. As they grow, ferns provide food and shelter for insects (more than 100 species in the case of bracken fern, including sawflies, aphids, ants, and bracken borer moth caterpillars) and provide nesting material for palm warblers, white-throated sparrows, and golden-crowned kinglets. Fern litter absorbs moisture, insulates the ground, and contains nitrogen, according to botanist Robbin Moran in his book “A Natural History of Ferns.” As generations of ferns produce an accumulation of organic matter and nutrients, holding in moisture where their connected roots stabilize the ground, they create conditions for other plants and more complex ecosystems to establish.

Ferns have a lot to show for their tenure on this planet. We sense something of this when we appreciate their ancient beauty, from the marvelous spiral of their unfurling fiddleheads to the delicate divisions of their leafy fronds. There, in the shade beneath the trees, or on some parched and sunlit ground, what seems like a persistent weed in human timescales may very well be doing the patient work of ecosystem recovery and resilience.

Catherine Schmitt is a science writer and author of “The President’s Salmon: Restoring the King of Fish and its Home Waters.” Illustration by Adelaide Murphy Tyrol. The Outside Story *is assigned and edited by* Northern Woodlands *magazine and sponsored by the Wellborn Ecology Fund of New Hampshire Charitable Foundation: nhcf.org.*

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