

Citizen Scientists Struggle to Save Sword Ferns

Earth911

When scientists pursue research that requires massive amounts of field data, especially collected over a large geographic area — think of Audubon’s annual bird count and [monarch butterfly](#) migration monitoring — they often call on [citizen scientists](#).

But when a volunteer group of park stewards in Seattle discovered that native sword ferns were mysteriously dying, they turned the narrative around, driving the scientific process, developing experiments, and even finding funding for more rigorous tests.

Sword Ferns

The evergreen western sword fern (*Polystichum munitum*) is one of the most abundant species in its native habitat. But that habitat is mostly limited to the Pacific coast from Southeastern Alaska to Southern California. Because the plants have little economic value, their biology has not been closely studied.

“These plants are charismatic in a lot of ways,” says Tim Billo, a lecturer at the University of Washington. Sword ferns dominate the understory of Pacific Northwest forests, where they help prevent erosion. They comprise a major part of the winter diet for [mountain beavers](#), a small, burrowing rodent endemic to the lowland forests of the Northwest. “An individual fern lives basically forever, just adding to their rhizome every year. The ones in Seward Park could be as old as the oldest trees there — between 300 and 500 years old. Imagine if all of the oldest trees started dying,” says Billo.

The Question

That’s what happened to sword ferns in Seward Park in 2013. That fall, Catherine Alexander [noticed](#) that many of the sword ferns in the Seattle park didn’t look healthy, and alerted the volunteer group [Friends of Seward Park](#).

The next spring, many of the ferns failed to grow. Today, the dead-fern zone covers 20 acres.

The volunteers have learned of [other dead zones](#) around the Puget Sound region. Although it quickly became obvious that the ferns were suffering a die-off much like the one affecting the region’s [starfish](#), the question remained: What was causing it?



A healthy western sword fern (*Polystichum munitum*). Image: Adobe Stock

The Response

The citizen scientists aggressively pursued the question. They scrutinized weather data to see if the die-off correlated to climatic factors like dry weather. “Moisture could be a contributor among possibly many factors, but not a primary cause,” says Billo. “There has not really been a drought the last five years, and there’s patchy distribution of the die-off.”

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They hired a soil scientist to test for pathogens, “We’ve ruled out phytophthora,” says Billo of a type of mold common in damp regions. They also tried to recreate the die-off by planting healthy ferns in soil from affected areas. A new [strategic plan](#) commissioned by Seattle Parks and Recreation reports 17 research efforts.

“One of the most tantalizing results we found,” says volunteer park steward Paul Shannon, “suggests that the die-off may be transmitted through water.” Shannon is referring to a home experiment in which he placed affected fronds and healthy fronds together in water-filled beer bottles and the healthy fronds died.

The Next Level

By early 2019, the volunteers still had no diagnosis and were beginning to feel they had reached the limits of amateur science. Then, in May, Shannon pitched their project to the Seattle chapter of 100 Women Who Care and [won a grant](#) of \$7,750 to fund their research.

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Their goals: Figure out the mechanism of the die-off. Pin down the extent of the die-off. Describe the symptoms of the die-off to differentiate between die-off and a dead fern.

In terms of figuring out the mechanism, Shannon says there are two plans. “One will be redoing that [beer bottle] experiment properly.” Plant pathologist Marianne Elliott will continue to look at water transmission in the greenhouses at Washington State University’s Puyallup Research and Extension Center; a graduate student from Reed College will do some of the same analysis. Some of the grant money will go to paying a University of British Columbia graduate student to sequence DNA from affected plant tissues, looking for the presence of bacterial or fungal infection.

Billo is also working with undergraduate volunteers, who may be able to receive a small stipend out of the grant, to monitor die-off sites. They will use a protocol for quantitatively describing each site, which will enable better diagnosis and comparison among sites.

Work Continues

Meanwhile, consultants for the city are testing the sword fern’s drought and stress responses.

A recent college grad is building a [website](#) that will consolidate the information available so far. And local volunteers continue to do what they can, documenting the progress of the die-off, propagating new plants, attempting to replant in the dead zone — whatever they have the time and skill to do.

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Although the city is taking action and the grant has improved its resources, the quest to understand what’s causing sword ferns to die is still largely in the hands of citizen scientists.

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