

# Sword Fern Soil Sample Collection Guide



Forest Health Watch Community Science

Summer 2024 Version

<https://foresthealth.org>

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## Introduction

The purpose of this document is to provide guidance for collecting soils under western sword fern plants to be tested in the Forest Health Watch program. This document is a working draft. Please send any feedback or questions to [foresthealthwatch@gmail.com](mailto:foresthealthwatch@gmail.com) or contact us at <https://foresthealth.org/>.

## Microbes and sword fern roots study

Community scientists are needed to collect soils to survey the microbes associated with the roots of healthy and unhealthy sword fern plants. The aim is to identify primary microbes associated with plant health. Soil samples will be baited (see below) for the presence of oomycete species.

## Steps to Participate

1. Acquire sampling materials
2. Collect soil samples, fern, and site data
3. Add observation of plants to [Sword Fern Health Watch iNaturalist project](#)
4. Store samples
5. Submit samples for testing
6. Stay tuned or follow up about testing

The screenshot shows the iNaturalist project page for 'Sword Fern Health Watch'. The page features a main image of a sword fern with a red 'ADD OBSERVATIONS' button. Below the image is a 'Stats' section with a table of totals and most observed species.

Totals	Most Observations	Most Species	Most Observed Species
15 Observations	noah133 (12 observations)	figgywiggums (1 species)	Western Sword Fern (15 observations)
1 Species	figgywiggums (0 observations)	noah133 (1 species)	
2 People			

The page also includes a map of the project location in Washington state, a list of 5 members, and options for adding observations, exporting data, and viewing usage stats.

## Materials Needed

- Hand Trowel or Shovel
  - Use a tool that is easy to clean and avoid tools with areas that soil can accumulate and be difficult to remove
- Rag to remove soap from shovel after sterilization.
- Zip-top bags (1 gallon or less)
- Mobile device to add iNaturalist observations
- Materials to remove residual soil and sterilize shovel between samples.
  - Any of the following methods or supplies are suitable:
    - Bucket with scrub brush and soapy water (our favorite)
      - Note: We recommend using biodegradable soap
    - Disinfectant wipes
      - Note: Bleach wipes are okay, but be diligent to remove bleach before collecting next sample
    - Disinfectant spray
      - Surface cleaners are generally effective at sterilizing the surface but be vigilant to remove all soil particles.

	
Cleaning a hand shovel - Soil water, scrub brush, shovel	Samples collected in the field - Shovel, zip-top sample bags, GPS, bucket with soap water and scrub brush

## Data Collection

Please add observations of the ferns sampled to the iNaturalist project so we have the needed information (coordinates, fern health, etc.). Descriptions about the site and ferns will be helpful for understanding the factors affecting fern health. Questions in the iNaturalist project are described below. Any additional information can be shared in the 'notes' section of the observation.

## Adding Observations to iNaturalist

Create an account on [iNaturalist.org](https://www.inaturalist.org)

- Join the [Sword Fern Health Watch](#) project
- Take a soil sample, record data, capture 4 photos.
- Add an observation of ferns via mobile app or internet browser
- Tag [Sword Fern Health Watch project](#) in the observation
- Answer required project questions about the observation
- Share the observation!

### **Tip!**

We suggest downloading the iNaturalist app, creating an account, and joining the project before going out into the field. The iNaturalist app will work without wifi, but only if you are already signed in and a member of the project.

### iNaturalist Observations

Please add one observation to the iNaturalist project for each sample you collect. Each observation can have 4 photos so please include photos of the overall site, the individual fern, and any signs or symptoms of fern health issues.

### Overall Plant Health Condition

Each fern will be rated for general health conditions (good, fair, poor, or dead). Do your best to estimate the fern's health condition.

### Plant Symptoms

The information below is presented to help you identify symptoms and other factors more confidently.

**Healthy**



**Browning Fronds**







**Wilting Fronds**



**Collapse of Some Fronds**



Collapse of All Fronds	Absence of New Growth (when other nearby plants have new growth)
	
Dead	Other (Describe in Notes)
	

### Dieback Percent

Estimate the percentage of the fern that is unhealthy or dying. To estimate dieback, visualize the fern if full and in a percentage, determine what percentage (e.g. 50%) of the fern is unhealthy. If in a group of people, comparing dieback estimates can help everyone become more comfortable with estimating.

**In the notes section of the observation, write the sample number and the percent dieback for each plant you sampled under.**

### Percentage of Ferns Affected Within Site (Percentage)

- Estimate the percentage of ferns within eyesight that are unhealthy or dying.

### Regeneration Present

- Not sure
- Yes, there are new plants
- No, there are not new plants
- Other (describe in notes)

### Soil Sample Collected

- Not sure
- Sample Collected
- Sample Submitted to Lab Already
- Other

### Soil Sample Number

Please add an identifier here to link the iNaturalist observation with the soil sample you collect (e.g. JMH-SF-001 for your initials, sword fern, and the number).

### Optional iNaturalist Questions

<p>Site Type (Optional)</p> <ul style="list-style-type: none"> <li>• Not sure</li> <li>• Urban</li> <li>• Suburban</li> <li>• Rural</li> <li>• Other</li> </ul>	<p>Site/ Area Disturbance (Optional)</p> <ul style="list-style-type: none"> <li>• Not sure</li> <li>• Heavy- a lot of development</li> <li>• Medium- moderately used</li> <li>• Low- fairly natural, not much development</li> <li>• None-natural Forest, far from development</li> <li>• Other</li> </ul>
<p>Site Hydrology (Optional)</p> <ul style="list-style-type: none"> <li>• Upland/well drained</li> <li>• Seasonally Flooded area</li> <li>• Wetland, Lots of water</li> <li>• Other</li> </ul>	<p>Site Location Description (Optional)</p> <ul style="list-style-type: none"> <li>• Not sure</li> <li>• Urban yard/open park grounds</li> <li>• Roadside</li> <li>• Forest Edge</li> <li>• Inside a forest canopy</li> <li>• Other</li> </ul>
<p>Slope Position (Optional)</p> <ul style="list-style-type: none"> <li>• Not sure</li> <li>• Area is flat</li> <li>• Summit of hill or mountain</li> <li>• Top of slope</li> <li>• Middle of Slope</li> <li>• Lower Slope</li> <li>• Floodplain or valley bottom</li> <li>• Riverbank</li> <li>• Other (Describe in Notes)</li> </ul>	



## Sample Collection

- Locate the fern you're interested in sampling
- Remove litter and duff layers (leaves and decaying plant material) on top of soil before collecting
- We want to avoid most of saprophytic microbes that help decay dead plant material
- Collect samples from 3-4 spots around a fern - stay within 1 meter from the base of the fern
  - Dig up to 10cm deep into the soil.
  - Collect about 500 grams (1 liter) of fine soil particles and small roots
  - Keep small roots in soil sample
  - Mix samples into a single sample bag (one sample bag per fern)



- Sterilize sampling equipment before collecting next sample
  - Remove soil particles and sterilize shovels using the methods and supplies listed in the Materials Needed section above.
  - We recommend carrying a small bucket containing a liter of soapy water and a scrub brush.
  - Try your best to remove all residual soil particles from the shovel.
  - Wipe soap residue off shovel using rag or by following below method.
  - Stick shovel into the soil a few times (not in exact spot to collect sample) to remove soap residue when you arrive at the next fern you want to sample.
- Label the sample bag. Be sure to include the following information on the sample bag:
  - Sword Fern
  - Your Name
  - Date
  - Sample Number
  - Site Location Name
  - Sword Fern Health Description



## Sample Storage

Community scientists can store soil samples before submitting the samples to the lab in order to build a collection that can be submitted together.

### Best practices for sample storage:

- Keep in a cool dry area that best mimics the temperatures of the natural environment they were collected from.
  - Do not let the soils get too hot (ie in a car) or too cold. Please do not store the samples in the fridge.
- Keep the zip-tops open to allow moisture exchange.
  - We would rather the soils dry out than trap moisture for molds to grow

## Submitting Samples

Send or deliver the samples to Joey Hulbert ([hulbe@wsu.edu](mailto:hulbe@wsu.edu)) at the WSU Puyallup Research and Extension Center. Samples can be placed in a cardboard box and sent via ground or any other standard method. We have also received samples in old ice-cream containers and paper bags. Please feel free to email Joey with any questions.

Click [here](#) for the lab location on Google Maps.

Send samples to:

- ATTN: Joey Hulbert / Fig Dewitz
- WSU Puyallup Research & Extension Center
- 2606 West Pioneer
- Puyallup, WA, 98371-4998 USA

## What to expect from the Lab

Sample processing can take a while depending on lab capacity. A lot of time and funding is required to identify microbes in soil. Feel free to email Joey, Fig or the team at [foresthealthwatch@gmail.com](mailto:foresthealthwatch@gmail.com) about the status of your submitted sample.

### Sample processing:

The Forest Health Watch program generally uses about half of the submitted sample to test for the presence of *Phytophthora* first (see below). *Phytophthora* are a group of microbes notorious for causing many tree diseases, including Port-Orford cedar root disease and sudden oak death.

The other half of the sample is saved for DNA extraction to more broadly identify the community of microbes (beneficial and antagonistic species) present in the soil. More funding is generally needed to complete this second step.

### *Phytophthora* testing

*Phytophthora* can be isolated from soil because they produce swimming spores. Our lab tests for *Phytophthora* by flooding the soil samples with water, floating leaves on top of the water as bait for *Phytophthora* spores, and then growing *Phytophthora* from infected plant material on petri-plates.



## Scheduling a Group Hike

Collecting soil samples can be a fun way to add purpose to hikes and other forms of recreation. It is also a great reason to organize an educational hike or plan an activity with a group. Please contact us if you're interested in organizing an educational hike to sample an area with a group.

## Complimentary iNaturalist Projects

[Sword Fern Health Watch · iNaturalist](#) - The purpose of this project is to collect observations of healthy and unhealthy western sword ferns.

[Western Sword Fern Decline in the Pacific Northwest](#) - Project collecting observations about unhealthy sword ferns in the Pacific Northwest

[Western Redcedar Dieback Map](#) - Regional project collecting observations of healthy and unhealthy western redcedar trees.

[Bigleaf Maple Health Watch](#) - Regional project collecting observations about healthy and unhealthy bigleaf maple trees.

[Western Hemlock Health Watch](#) - Regional project collecting observations about healthy and unhealthy western hemlock trees.