Understory Forest Monitoring:

A Guide for Small Forest Managers

With funding provided by

WEST MULTNOMAH
Soil & Water Conservation District

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BEFORE: A dense monoculture of invasive periwinkle (Vinca species).

AFTER: A diverse mix of native vegetation beginning to establish. It will mature into a lush forest floor of native wildflowers.

Managing a healthy forest is not just about having healthy trees.

Foresters, scientists, and private woodland owners have an interest in what is growing on the forest floor. A healthy understory can offer:

- Flowers for native pollinators
- Food for wildlife
- Resiliency against invasion by forest weeds
- Organic material to build healthier soil
- Stable soil that doesn't erode into nearby streams
- Beautiful views while recreating in the forest

Just like taking inventory of the forest, measuring tree diameters and spacing, it is also important to monitor the changes over time on the forest floor.

Herbaceous forest plants tend to reach their peak bloom and cover in mid to late spring (mid-May to mid-June in western Oregon). It's best to monitor forest understory consistently at this time of year.

There are dozens of ways to monitor the understory plants in a forest. Two effective methods are described here.

Point intercept method

This method is performed by laying out a straight line transect in the forest and documenting what is growing on the forest floor at one-foot increments along the transect.

West Multnomah Soil & Water Conservation District often sets up multiple transects that are 33' in length giving us 33 data points per transect.

The data gathered from the plots can be used to find the average cover of different vegetation types in your forest. Longer or shorter transects can be utilized as required.

This method was adopted by partners of the Greater Forest Park Conservation Initiative (GFPCI) in Portland, Oregon and is described in detail on pages 3-6 in the Vegetation Module of the Unified Monitoring Protocol found on the GFPCI web page.

Simplified step-by-step methods:

1. Choose random points within the project area at a rate of at least one point per two acres.
2. Navigate to a point and mark the starting point with a high-visibility monument such as a wooden post that is painted and/or flagged with bright colors so it will be visible and easy to locate in future years.
3. Label each starting point with a unique transect name, and mark the point with a GPS if possible.
4. Run a measuring tape for 33 feet along the forest floor, always going in a consistent direction, such as North. Use two posts and clips at either end of the transect to hold the tape about 3 feet above the ground. Mark the end of the transect with a whisker or pin flag.
5. Use a 4-foot long ¼-inch diameter steel rod as a sampling rod. Hold the sampling rod at each foot along the transect so that it hangs directly down, and lower it to the ground.
6. List each plant species that the sampling rod hits, and tally the number of times each species is hit along the 33 feet of transect sampled. For points with no plants, tally the number of times the rod hit bare soil or organic matter – duff, twigs, or logs. Every foot interval where the sampling rod touches a plant species counts as a 'hit'.
7. Repeat steps 2 – 6 for each random point.
8. Getting information out of the data: Divide the number of times each species is hit by the total number of hits possible (33 in this case) and then multiply by 100. This shows the percent cover of each species in that transect.

   For example, if sword fern is hit 16 times out of 33 readings, the forest has about 50% ground cover of sword fern. It's possible to get over 100% cover of all the species combined if several species are hit at each foot. This scenario indicates a forest with multiple layers of thriving understory species.

Pros:

- Longer transects help track a larger area of the forest floor, and increase the chance of capturing variability.
- Estimating percent cover can be inaccurate and allow bias. The point intercept method reduces the potential for bias when measurements are taken accurately at the designated interval (i.e. one reading for every foot increment along the transect).
- Once set up, this method is relatively quick and easy to repeat. We recommend this method for the family forest owner.

Cons:

- Laying out a transect can be time consuming.
- There are some supplies needed, including the sampling rod.
- There's a chance that a plant exists adjacent to or along the transect, but can be missed at any of the 1-foot increments. Make a note of species along the transect that don't get sampled.

Fixed radius plot method

This method was developed by the Understory Seed Increase Project (USIP) Partnership in Portland, Oregon.

It is performed by creating a circle plot with a radius of 5.5 feet. All the plant species observed within the plot that cover a significant amount of area (> 5%) are recorded, and the percentage of the plot covered by each species is estimated.

Smaller square subplots can be used within the circular plot to get a detailed count of plants per square foot if this level of detail is desired, such as when monitoring the success of a recent seeding.

Getting an average between several plots will provide a good overall sense of the state of a forest stand's understory.

Simplified step-by-step methods:

1. Select at least 2 plot locations within the project area that are relatively clear of shrubs and are good candidates for forest seeding. Mark the center of each plot with a whisker flag or other high-visibility durable monument. Label each plot with a unique plot name, and mark the point with a GPS if possible.

2. Using a compass, measuring tape, and pin flags, mark the perimeter of the plot 5.5 feet out from the center at each of the cardinal directions (N, E, S, W).

3. Take photos of each plot at each monitoring event, always facing the same direction from the same location.

4. It is optional to record influential environmental factors for each plot such as canopy cover, percent evergreen vs. deciduous tree canopy, slope, aspect, and soil characteristics.

5. List all plant species that cover 5% or more in the plot (and any amount of a particular species, such as those that are being seeded). Estimate the percent of the plot covered by each species as seen from directly above. It helps to determine what different percent areas look like to compare with the cover of the plants observed. For reference, within a full 95 ft^2 plot, 1% cover = ~1 ft^2 (1 ft x 1 ft); 5% cover = 4.75 ft^2 (2.2 ft x 2.2 ft); 25% cover = 23.75 ft^2 (5 ft x 5 ft).

6. If a detailed inventory of plant density per square foot is desired, use smaller square subplots (0.25 m) placed half way between the center and each pin flag. Count all the individuals of every plant species found in the subplot at each cardinal direction.

7. Getting information out of the data: Find the average of the number of plants (for subplots) and the percent cover (for plots) for each species of interest to get a sense of how well that species is establishing and filling in throughout the project area.

Pros:

- This method better tracks very small changes in the plant community. In a small area, everything can be tracked.

Cons:

- The set-up of these plots is meticulous and can take a bit of time.

- When tracking percent cover, there is a risk of estimating poorly.

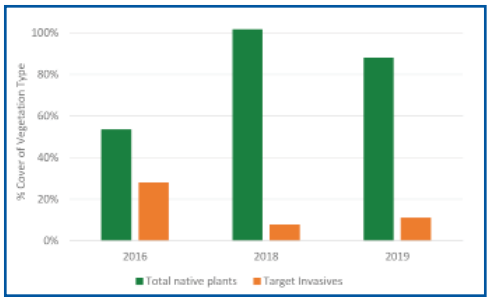
Summary pros and cons

Pros:

Many woodland managers are treating invasive species in their forests and it can feel like a never ending battle. Monitoring forest understory over the years can offer encouragement as invasive species cover decreases and native species begin to flourish.

It would be useful to gain some understanding of potential invasive weeds in the region. Catching an aggressive invasive weed when it first arrives can be one of the best methods of controlling it before it spreads throughout the forest.

Change in forest understory cover over four years using point intercept



Information gathered at a forest site in the Abbey Creek Watershed, Multnomah County, Oregon.

Cons:

Plant identification can be difficult, especially in the spring when plants are very small. Learning which plants are common to the area can be rewarding and helpful in the exercise of monitoring. It isn't critical to identify every plant.

Thank you to our partners who showed leadership in creating these monitoring protocols: Forest Park Conservancy, Clean Water Services, Metro, Portland Bureau of Environmental Services.

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