

Title:

Root Rot studies of fir species in New York Christmas trees production

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Abstract:

Fraser fir is considered a premium tree and is favored by many NY Christmas tree growers, unfortunately it often suffers from root rot and sudden death. Over the past few years our work looked at three components of the problem in order to develop solutions for growers. 1) The susceptibility of different varieties of fir: in our field study we found that Turkish fir was the most resistant to root rot. 2) The species of *Phytophthora* most commonly associated with the decayed root systems: *Phytophthora cactorum* and *P. cryptogea* were consistently isolated. 3.) Relationship of soil characteristics with tree death at four NY farms: this data was collected in fall of 2012 and analysis is being concluded in the first quarter of 2013. This report is a review of the third component which took place in 2013.

Background and Justification:

Christmas tree farming is a multi-million dollar industry in temperate regions of the U.S.; providing fresh-cut trees for decoration and live specimens for transplant. New York State is seventh in the U.S. for Christmas tree producers (844 farms) and total trees harvested (348,043 trees) – an estimated farm gate and consumer retail value of \$8.8 and \$14.2 million, respectively. Among the Christmas tree species grown, Fraser fir (*Abies fraseri*) has become popular and is now considered a premium tree for consumers and Christmas tree growers in New York State. Unfortunately tree death through a rapid decline has also become common on Fraser fir on many NY tree farms. The areas of greatest tree death appear to be associated with low lying portions of fields and *Phytophthora* infections.

Procedures:

The site analysis project began in the fall of 2012 and looked at soil drainage characteristics to determine if criteria could be established in order to determine if a site is suitable for growing Fraser fir.

The from the soil characteristics were collected at four farms experiencing Fraser fir tree loss due to root rot.

They were:

- Farm # 1 Phelps, NY
- Farm # 2 Springwater, NY
- Farm # 3 Sparta, NY
- Farm # 4 Scottsville, NY

Data was collected at four growers' Fraser fir fields in November and December of 2012.

Measurements were made on water drainage ability in minutes per inch of soil with percolation tests. Two were in healthy sites and two were in sites in the same field where trees were declining and dying. Post hole diggers were surface sterilized prior to moving to each new site. For percolation tests four tests were conducted per farm. Standard percolation test procedures were followed with 6" holes dug to a depth of 12 inches and coarse gravel was placed at the bottom prior to filling with water. The holes were filled with water to pre-saturate the sides for one hour prior to running the tests.

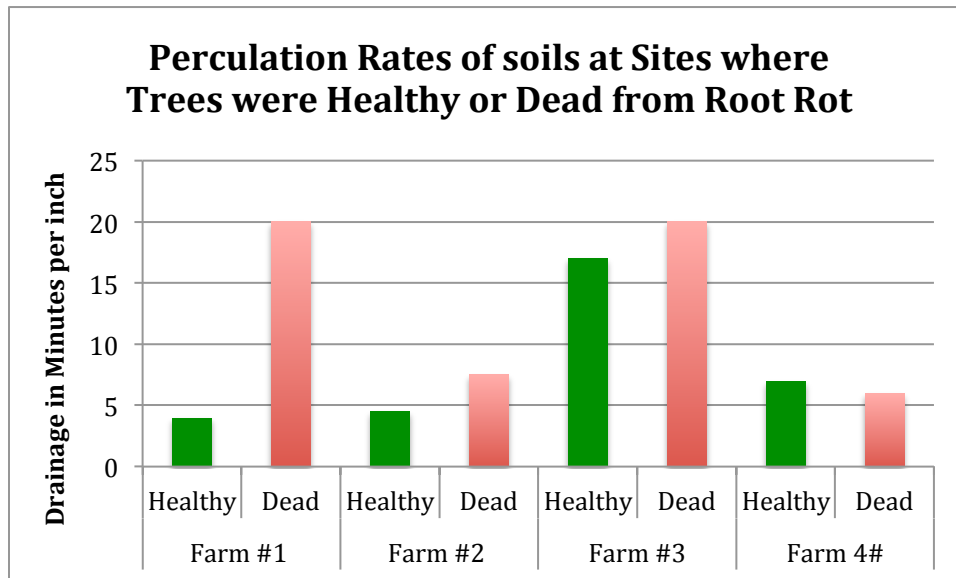
Penetrometer readings were also conducted at good and bad areas of each field. A total of 10 separate readings were taken from each healthy or declining site. An average of those readings was used for comparison between sites on each farm.

In addition, soil samples were pulled from all sites and were analyzed for water retention, physical properties, nutrient, pH, organic matter and soil health characteristics. These measurements and samples were collected from both portions of fields where Fraser fir was showing healthy growth and at locations where Fraser firs have died due to root rot. GPS location and elevation measurements were collected for all the sampling sites.

Results and Discussion:

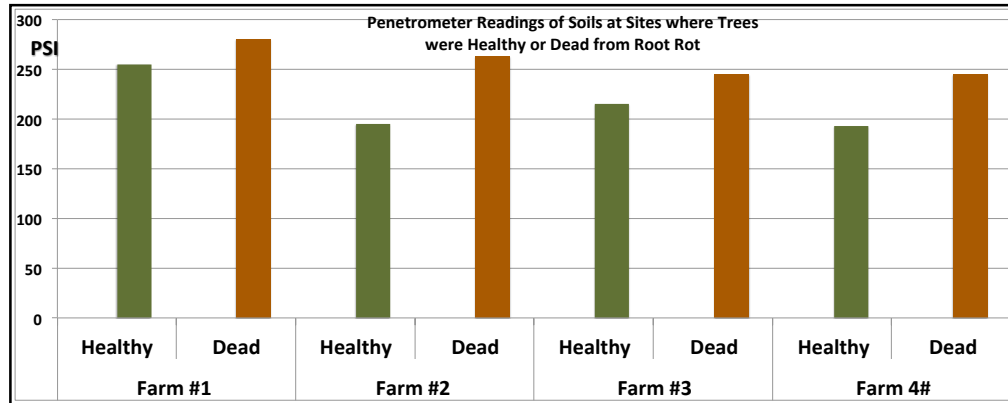
Percolation Tests

Drainage was measured in minutes per inch (The higher the value the longer it took for water to drain into the soil.)



Penetrometer Tests

The penetrometer provides a measurement of soil compaction in the field. It measures the soils resistance in pounds per square inch to the insertion of a probe.



In three of the four farms evaluated penetrometer readings indicated that the soil was more compacted at the site on the farm where the trees were declining or dead. On farm #4 the grower reported that soil in the dead area was fill and there may be a problem with a perched water table in that location.

Although there was a consistent trend of increased compaction in the dead areas of the field on the other three location on the farm the compaction at these farms there was not consistent critical level of compaction that would indicate a problem. (As with the percolation tests a level that was healthy at one location was higher than a problem dead area in another field.)

Elevation

Measure of distance, in feet, above sea level.

Farm #1		Farm #2		Farm #3		Farm 4#	
Healthy	Dead	Healthy	Dead	Healthy	Dead	Healthy	Dead
703	693	1888	1885	1897	1892	598	588

As observations on affected farms often indicates, the numbers consistently showed that the problem areas on each of these farms were in the lower portions of the field and the healthy areas were higher. This is not a surprise, as an increased level of soil water would be expected in the lower portions of the field and saturated soils correspond with root rot and tree death. Due to the complexity of field soil drainage cases can be observed where fir decline and death occurs at higher elevations of fields.

A total of 184 readings from the four farms and analyzed in this study. These included soil macro and micro nutrient levels, pH, physical characteristics and drainage characteristics. No consistent markers were found across the sites that could be used as a

predictive rule to use across the state. The information indicates that it is useful for growers to pay attention to their soil compaction, drainage and elevations within their farm to help determine appropriate sites for Fraser fir.

The results of this soil/site study will be presented to growers at their upcoming grower meetings.

Keywords:

Pest: Root Rot, Phytophthora

Setting: nursery, Christmas trees

Management Technique: monitoring, research & education