What Causes Pine Needle Blight in Northern Nevada Landscapes?

A Guideline for Nursery/Landscape Professionals and Homeowners

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Introduction

Pine trees often show symptoms of stress or disease by discoloration and/or dropping of their needles. This is often called "pine needle blight". In northern Nevada cases of pine needle blight appear to be increasing particularly on some species of pine. Since 2001, the plant pathology laboratory of the Nevada Department of Agriculture has analyzed pine blight samples submitted by home owners and nursery and landscape professionals. Some of the troubled trees have been assessed on site with the aid of laboratory analysis. A comprehensive investigation of pine needle blight syndrome was conducted in 2004. During past seven years, a variety of factors have been identified to be the cause of pine needle blight in northern Nevada Landscapes. This fact sheet is to help clients understand the causes and to provide general guidelines on how to diagnose possible causes of the problem.

Causes

"Needle blight" is a general term to describe sudden or severe death of pine needles. The dieback usually starts at the tip of the needle and may be brown, red, or gray in color (Figure 1). There are three main causes of needle blight: infectious disease pathogens; environmental stresses; and the secondary effects of insect or disease infestation occurring elsewhere in the same tree. The first type of needle blight is caused by fungal pathogens. These pathogens attack needles directly, and cause discoloration and death of needle tissue. The second type of needle blight is caused by environmental stresses, such as high levels of soil salt, cold wind, hot dry wind, and drought. The third type is generally considered as a secondary symptom of other diseases or damages. For example, bark beetle damage or bark canker diseases cause severe needle blight as a result of damage caused to twigs, branches or trunk. Because of the diversity of causes, a pine tree showing needle blight must be assessed carefully to understand the real cause.

Figure 1. Death of needle tips (green arrow indicated) of a pine tree that has been under environmental stresses. The necrosis starts from the tip of the needle and progresses to the lower part of the needles. In severe conditions, the entire needle turns to brown (© Nevada Department of Agriculture).

Infectious needle blight diseases: A number of fungal pathogens infect needles

and cause needle blight. These types of diseases are not common in northern Nevada, although they may occur in certain cases or isolated locations. In the case of fungal infection, the presence of fungal fruiting bodies appearing as elliptical or elongated black dots on infected needles, is very diagnostic. Fungal infections are characterized by being progressive diseases that generally become more severe with time and may spread between trees. To determine if the needle blight is caused by a fungus, symptomatic needles should be collected and submitted to a qualified laboratory for examination and testing. Unless a fungus is identified to be the cause, spraying of a fungicide will not be helpful to treat general needle blight symptoms.

Poor maintenance and environmental stresses: For younger trees or newly transplanted ones, improper transplanting and poor soil conditions are the primary causes of the needle blight. For established trees prolonged drought and lack of adequate nutrients are common causes of needle blight. Root confinement caused by adjacent hardscaping or compacted soils can also cause needle blight. Another important factor causing needle blight is salt in the soil. In certain locations, salt levels in the soil may reach toxic levels; certain species of pine may be susceptible to even low levels of salt.

Diseases or injuries to trunk or root system: Needle blight can be symptomatic of disease or insect infestations in another part of the tree. For example, trunk or branch damage by insects disrupts normal water flow inside the tree and therefore cause needle scorch or browning, a symptom similar to that caused by lack of soil moisture. In a similar way, bark canker diseases also cause needle blight. Unlike insect damage, which may cause needle blight throughout the tree, bark canker on certain branches may cause needle blight only on those branches with cankers. Root rot is another condition associated with needle blight, which is often overlooked. Many root rot problems are linked to overwatering or poor soil drainage.

Figure 2. *A pine tree showing severe needle blight that needs to be assessed systemically instead of just examining needles. The green arrow indicates that trunk should be examined to see if any insect infestation or canker disease is present (© Nevada Department of Agriculture).*

Pre-sampling Examination

There are many factors that cause needle blight either directly or indirectly. Systemically examining an entire tree is essential when evaluating the cause of needle blight. When needles start to lose their normal green color, the **first step** is to see if any fungal fruiting bodies (tiny black dots) are present on the infected or dead needles. The **second step** is to check if the tree is supplied with enough water. Restore water supply if irrigation systems is damaged, or adjust the amount of irrigation the tree receives if over/under watering is suspected. The **third step** is to check trunk and branches for any insect holes, gummy masses caused by insects feeding under the bark (Fig.2), discoloration of bark (indication of a canker disease), oozing sap, mechanical damage, or trunk girdling by wood peckers (Fig. 3). Check for possible

misapplication of herbicides. Following these three steps, one can 1) make a preliminary diagnosis and begin to fix the problem, 2) know where on the tree the problem occurs, and 3) decide what tissue should be sampled for further laboratory analysis.

Sampling and Submission

Samples must be taken from areas of the diseased pine tree that have the best chance of gathering identifiable stages of the pathogen or organism. A correct sample from a pine tree should include discolored needles, twigs, and small branches. Using a hand lens, inspect the needles and collect any needles with small black dots. If bark canker and oozing are present take samples of inner bark tissue, under or near the canker, which show necrotic areas. Collect and place in a vial of alcohol any insect specimen you find that may be associated with the damage. The samples should be packed in a new sealable plastic bag to which a plant diagnostic form has been attached. Plant disease diagnostic forms can be downloaded from the Nevada Department of Agriculture website at: (http://agri.nv.gov/PLANT_PATHOLOGY/SPECIMENS_FOR_DIAGNOSIS_OF_PLANT_DISEASES_DISORDERS.pdf). To assist diagnosis, photographs can be attached or directly emailed to shwang@agri.state.nv.us. Maintain samples on ice or at 4^{o}C (39 ^{o}F) before shipping (ship samples collected on Friday the following Monday).

To prevent spread of infectious diseases, tools used for sampling, such as pruning shears, loppers, saws, corer, etc, must be disinfected for at least five minutes with 70% alcohol, household bleach containing approximately 5.25% sodium hypochlorite, or an equivalent disinfectant.

Submit samples by overnight mail to:
Plant Pathology Laboratory
Nevada Department of Agriculture
350 Capitol Hill Avenue
Reno, NV 89502
(775) 688-1180 x 275

Figure 3. *Sapsuckers attacked a scotch pine (Pinus sylvestris) causing severe damage of the bark. Xylem tissue, which functions to transport water and nutrients from root to canopy, was injured by rows of holes spaced closely together (green arrow). The tree showed severe needle blight (© Nevada Department of Agriculture).*

Management

Management strategies of pine needle blight vary depending on the cause. Needle blight caused by fungal infection can be treated with a fungicide, but the disease should be positively diagnosed by a qualified laboratory or a plant pathologist to avoid the unnecessary expense of a fungicide application. Maintenance-related needle blight can be fixed by improving cultural practices. Proper maintenance, including appropriate irrigation, boosts tree growth vigor and tolerance to environmental stresses. Complete failure of a pine tree can be caused by bark beetles or girdling canker pathogens. Therefore it is essential to protect the integrity of the trunk and major branches from damage caused by poor pruning practices or other mechanical wounds that would attract those organisms.