UNIVERSITY OF KENTUCKY College of Agriculture, Food and Environment

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Plant Pathology Fact Sheet PPFS-OR-W-04

"Wet Feet" of Ornamentals

Nicole Ward Gauthier
Extension Plant Pathologist

Tracey Parriman
Extension Horticulture Agent

Brad Lee
Extension Water Quality Specialist

Introduction

"Wet feet" is the common term for a condition that affects plant species intolerant of wet growing conditions. This problem occurs when soils become saturated with water, which, in turn, displaces available oxygen. Roots require oxygen to function; when oxygen is deficient, roots suffocate. Once root damage occurs, plants decline and may eventually die. While "wet feet" is an abiotic disorder and is not caused by infectious organisms, declining root health and wet soil conditions can inhibit the ability of some plants to thrive. This also provides ideal conditions for many root and collar rot water mold pathogens, such as *Phytophthora* and *Pythium*.

Possible Causes

Some of the reasons for excess soil moisture include:

- Soil is high in clay content and poorly drained.
- Topsoil has been completely removed or subsoil has been spread out over topsoil (e.g., subdivision or new home construction sites).

FIGURE 1. LOW-LYING AREAS MAY HOLD SURFACE WATER AFTER EXCESSIVE IRRIGATION OR HEAVY RAIN.
FIGURE 2. PERSISTENT PUDDLING OR SATURATED CONDITIONS CAN RESULT IN ALGAL GROWTH.

Figure 3. Root damage from wet conditions can cause "drought" symptoms due to reduced uptake of water and nutrients.
Figure 4. Damaged roots reduce availability of water and nutrients, causing dieback.

- Water drains into plantings from nearby impervious surfaces (e.g. paved roadways, driveways, or patios).
- Low areas in the landscape result in water puddling after heavy or persistent rain (Figure 1).
- Plants are frequently overwatered.

Identification of "Wet Feet"

Obvious indicators of "wet feet" are the presence of wet, soggy soils or puddles on the soil surface after heavy rains. Algae or moss growing on soil surfaces is also indicative of wet sites (Figure 2).

Sensitive plant species affected by "wet feet" may gradually decline over several months or years. Symptoms can include:

- Wilting, yellowing, and/or browning foliage (Figure 3)
- Twig or branch dieback (Figure 4)
- Browning and death of deeper roots, while roots close to the surface appear healthy.

Similar above-ground symptoms can occur as a result of other factors such as drought or disease. Thus, knowledge of the growing site, drainage, and irrigation practices is helpful in diagnosing "wet feet."

Management

In many cases, it is not possible to reverse plant decline due to "wet feet." The following management tools are suggested for preventing this condition from occurring.

Determine & Manage Soil Drainage Issues

Internal soil drainage must be appropriate for the specific plants being considered for installation. Most species require aerated soils (sufficient air in the soil) at least as deep as their root systems extend. The majority of annuals and perennials, for example, have root systems that reach only shovel-depth. Shrubs can root much deeper, while trees root deeper still.

- Prior to planting, examine soil color to determine whether soil is saturated for a significant period of time (Figure 5).

1) Dig an observation hole:

- A minimum depth of 18 inches for annual, perennial, and shallow-rooted shrubs, or
- A minimum depth of 40 inches if preparing to plant trees and large shrubs, or
- Until gray colors are observed.

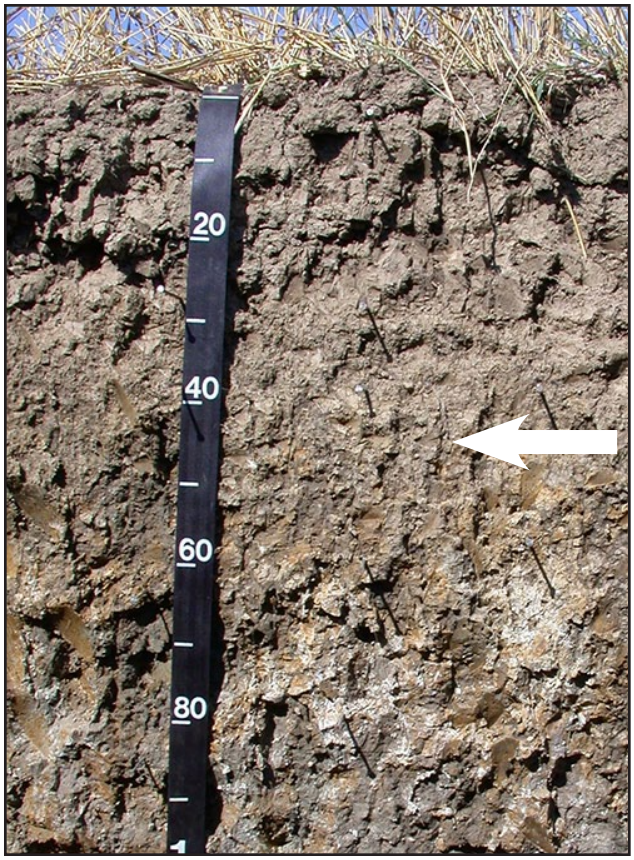

Figure 5. Soil color that is gray or gray-mottled is indicative of prolonged saturation. Soil in this photo, with depth measured in centimeters (cm), shows gray mottling beginning around 45 cm (about 9½ inches); gray colors become more prominent as depth increases.

2) Examine soil color; if it is:

- Bright red or brown below the topsoil, soil is well-drained and there should not be any issues with "wet feet."
- Gray or mottled and mixed with the brown soil matrix located between the 18-inch and 40-inch depths, the soil is moderately well-drained.
- Gray within 18 inches of the soil surface, soil is saturated for significant periods of time (2 weeks or more) during the growing season. If this is the case, select plant species that can tolerate wet conditions.

▪ Prior to planting, amend compacted soils with organic matter to improve drainage. Incorporate organic matter into soil at least 12 inches deep. This will only improve the drainage of compacted soils. Adding organic matter to soils that are not compacted will not improve soil drainage.

▪ Annuals, perennials, shrubs, and small trees can be planted in raised beds. However, depending upon the height of the raised bed and the depth of plant roots, it may still be advisable to use species that are tolerant of periodic wet conditions.

Manage Excess Water

▪ Reroute downspouts so that rainwater does not drain near trees or shrubs. Drain extenders, which allow water to flow beyond and away from foundation plantings, may be installed.

▪ Subsurface drainage systems (such as French drains) may help divert excess water to an offsite location. These systems can be more expensive than those that divert surface water, but they are often highly effective.

▪ Construct a rain garden (Figure 6) to manage storm water runoff and to alleviate issues with flooding. For more information about rain garden construction, refer to Additional Resources, below.

Figure 6. Rain gardens are strategically placed in low areas to help manage surface water.

Select Appropriate Plant Material

▪ Avoid planting sensitive species in poorly drained sites. Refer to Table 1 for a partial listing of woody plants intolerant of wet sites.

▪ Replace sensitive plants with those tolerant of wet conditions. Refer to Table 2.

Table 1. Partial listing of woody plants readily damaged by wet growing sites.

Common name	Botanical name
Beech, American	*Fagus grandifolia*
Blueberry	*Vaccinium* sp.
Cherry	*Prunus* sp.
Crabapple	*Malus* sp.
Dogwood, flowering	*Cornus florida*
Eastern red cedar	*Juniperus*
Holly, American	*Ilex opac*
Maple, sugar	*Acer saccharum*
Pine, eastern white	*Pinus strubus*
Redbud	*Cercis canadensis*
Spruce, blue	*Picea pungens*
Spruce, Norway	*Picea abies*
Taxus (yew)	*Taxus* sp.

Table 2. Partial listing of woody plants that can tolerate wet growing sites.

Common name	Botanical name
Arborvitae	*Thuja occidentalis*
Arrowwood	*Viburnum dentatum*
Ash, green	*Fraxinus pennsylvanica*
Birch, river	*Betula nigra*
Buttonbush	*Cephalanthus occidentalis*
Dogwood, red osier	*Cornus sericea*
Juneberry	*Amelanchier arborea*
Larch, American	*Larix laricina*
Maple, red	*Acer rubrum*
Oak, willow	*Quercus phellos*
Sweetgum	*Liquidamber styraciflua*
Sycamore	*Platanus occidentalis*
Willows	*Salix* sp.

Additional Resources

Improving the Productivity of Landscapes with Little or no Topsoil (AGR-203)
http://www2.ca.uky.edu/agc/pubs/agr/agr203/agr203.pdf

Residential Rain Gardens: Design, Construction, and Maintenance (HENV-205)
http://www2.ca.uky.edu/agc/pubs/HENV/HENV205/HENV205.pdf

Stress and Decline in Woody Plants (ID-50)
http://www2.ca.uky.edu/agc/pubs/id/id50/id50.pdf

Transplant Shock: Disease or Cultural Problem? (PPFS-OR-W-19)
http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-19.pdf

What's Wrong with My Taxus? (ID-52)
http://www.ca.uky.edu/agc/pubs/ID/ID52/ID52.pdf

When White Pines Turn Brown (PPFS-OR-W-22)
http://www2.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-22.pdf

November 2015

Acknowledgement
The authors thank Paul Vincelli, UK Extension Plant Pathologist, for his review of this publication.

Photos: Julie Beale (figure 1), Nicole Ward Gauthier (figure 3), Cheryl Kaiser (figure 4), and Brad Lee (figure 5), University of Kentucky; Matthew Chappell, University of Georgia, Bugwood.org (figure 2); and David Hymel, Rain Dog Designs, Gig Harbor, WA (figure 6)