



Best Management Practices for Boxwood Blight in Virginia Nurseries

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Introduction

First observed in Virginia in 2011, Boxwood blight (*Calonectria pseudonaviculata*) is a serious fungal disease of boxwoods. Nurseries can prevent introduction by purchasing clean stock, routinely scouting for symptoms, and following cultural guidelines. This document has been prepared to guide nursery operators on the best practices for avoiding or managing boxwood blight in their operations.

If boxwood blight is not known to be present in the nursery:

1. Avoid introduction.

Propagate host plants, including *Buxus*, *Pachysandra*, and *Sarcococca* species, locally wherever possible to avoid accidental blight introduction from incoming plant material.

- Take cuttings from disease-free mother plants.
 - Mother plants should be located away from loading and unloading zones, cull piles, and high traffic areas. Limit access to essential staff.
 - Avoid treating mother plants with fungicides, so symptoms are not suppressed.
 - Inspect mother plants for boxwood blight symptoms before cuttings are taken.

Taking extra precautions when purchasing plant material is absolutely necessary.

- Buy from licensed nurseries and request a phytosanitary certificate from vendors, or a copy of their Boxwood Blight Cleanliness Program Agreement. Virginia Nurseries enrolled in the Boxwood Blight Cleanliness Program are

detailed at the [Virginia Department of Agriculture and Consumer Services](http://www.vdacs.virginia.gov/) website.

- Inspect all newly purchased plant material upon receipt. If a shipment displays boxwood blight symptoms, report the problem immediately to the [Virginia Department of Agriculture and Consumer Services](http://www.vdacs.virginia.gov/) at 804-371-5086.
- Create a holding area for all incoming boxwood and other host plant materials (Fig. 1).

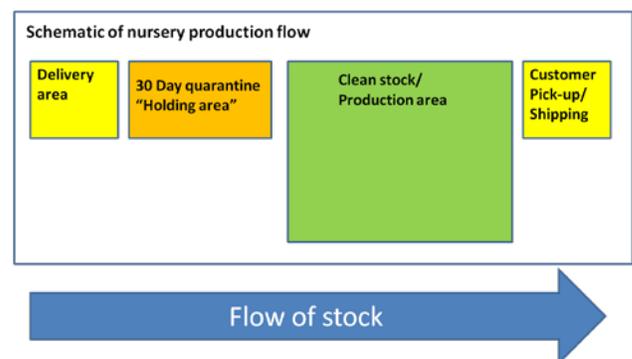


Figure 1. Schematic showing flow of nursery stock. Plants should be held for a 30-day quarantine period before releasing into production areas of nurseries (graphic courtesy of Norm Dart, Virginia Department of Agriculture and Consumer Services).

- Holding area must be at least 10 feet from other blocks of plants, preferably farther. Alternatively, a physical barrier such as an enclosed greenhouse can be used. The holding area should not be uphill from the production area to avoid potential contamination and spread through runoff.
- Locate the holding area on concrete, asphalt, or weed mat over gravel to facilitate the cleaning of fallen leaf and potting mix debris.
- Accurately label all incoming plant stocks and arrange them by supplier.

- Hold all incoming plant material and new cuttings for 30 days and regularly have trained staff inspect them for boxwood blight symptoms (Fig. 2), especially when temperatures are between 64 and 77° F with high relative humidity and rain events.

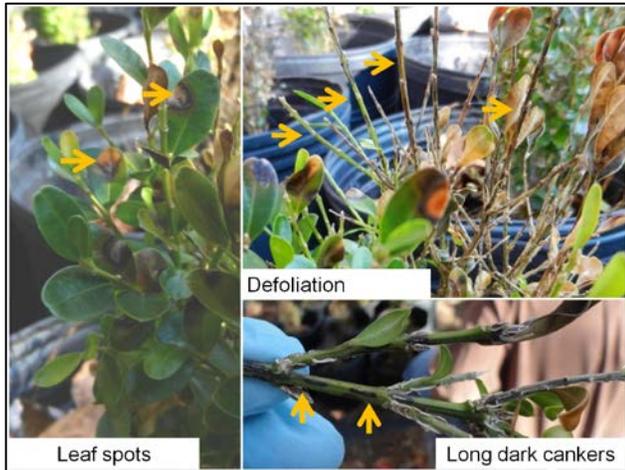


Figure 2. Symptoms of boxwood blight include leaf spots and blotches, defoliation, and black stem cankers. Symptoms often start low in the canopy or from the interior of the plant (photo by Norm Dart, Virginia Department of Agriculture and Consumer Services).

- Suspend use of all fungicides during the holding period.
- Remove plant debris by vacuuming, sweeping, or raking on a regular basis. Debris can be burned or deposited in a municipal landfill but should not be composted.

Avoid unintentional introduction of this disease from large equipment rentals or contract labor.

- Avoid bringing in plant diggers or large equipment that may have recently been in contact with infected boxwood plants or used at sites where boxwood blight has been found.
- If you must bring in large equipment:
 - Check to make sure that the equipment has not been used in areas where boxwood blight has been found.
 - Have the equipment cleaned and sanitized before it enters the nursery property.
- Require contract work crew to clean and sanitize all vehicles, footwear, and work clothes before they enter nursery property.

- Contractor vehicles should be washed and be visibly free of mud and plant debris before they enter nursery property.
- Contractor vehicles should not be allowed to drive directly into boxwood production areas.
- Consider supplying Tyvek™ boot covers and overalls, as well as disposable rubber or nitrile gloves to work crews. Require work crews to put on protective gear before entering boxwood propagation and production areas.

Customer returns and traffic management

- Do not allow plants to return to the nursery after they have left nursery property.
- Require customers and drivers to clean their trucks and trailers before arriving at pickup zones. Do not allow customers and drivers to sweep their trucks or trailers or unload any debris once they have arrived at the nursery property.
- Do not allow customer vehicles into the production areas of the nursery.

Shipping and receiving

- Locate loading and unloading zones on a surface that can be easily swept and cleaned between shipments.
- Sweep or vacuum and sanitize trailers between loads. Brooms and other tools from the shipping/receiving area should only be used in the shipping/receiving area.

2. Cultural practices

Sanitation

- Minimize host plant debris accumulation by regularly cleaning the surface area around the plants, as well as fallen leaves inside the pot (Fig. 3).
 - Plant and soil debris should be bagged then incinerated or buried. The debris should not be composted.
 - Residual plant debris that is too small to be raked or vacuumed can be burned on-site with an agricultural flamer.



Fig. 3. Store plants on easy-to-clean surfaces such as weed mat over well-drained gravel (photo by Norm Dart, Virginia Department of Agriculture and Consumer Services).

- Sanitize tools as frequently as practical when working with boxwood. Shears, clippers, and other cutting implements should be sanitized before starting a new block, vendor, or variety. After each use, tools such as shears, pruners, shovels, and rakes should be completely rinsed, dried, and sanitized following label instructions. Please refer to the [Virginia Boxwood Blight Task Force](#) website for a list of effective sanitizers.
- Boots should be cleaned and sanitized between hoop houses or larger production blocks and at the end of the workday. Alternatively, Tyvek™ boot covers or other similar products should be changed between production units (Fig. 4).



Fig. 4. Clean and sanitize boots between hoop houses and production fields (photo by Norm Dart), Virginia Department of Agriculture and Consumer Services.

- After every crop production cycle, remove all crop debris and sanitize all propagation mist beds, cutting benches, machines, and tools.
- Only use new or sanitized pots/flats that have been thoroughly cleaned of soil and plant debris. Do not reuse potting mix previously used in host plant production.

Water management

- Use drip irrigation wherever possible. When overhead irrigation must be used, water plants in the morning to minimize the leaf wetness period (Fig. 5).



Figure 5. Use drip irrigation to reduce the leaf wetness period whenever possible (photo by Norm Dart, Virginia Department of Agriculture and Consumer Services).

- Minimize water runoff such that it does not run from one host plant production area into another.
- Minimize standing water in host plant blocks.
- Avoid handling, repotting, or shearing plants when they are wet.

3. Inventory, stocking, storage, and displays

Select and grow boxwood cultivars that are resistant (or tolerant) to boxwood blight. No boxwood cultivar is known to be immune to boxwood blight; only partial resistance is available. Refer to the [Virginia Boxwood Blight Task Force](#) website for a list of more resistant cultivars.

Do not store or display boxwood on soil surfaces where boxwood blight was detected. All newly received boxwood should be stored and displayed in a disease-free area of the nursery and preferably over concrete, asphalt, or weed mat over gravel.

Avoid keeping root-bound, unkempt, or unsold plants in production areas for unnecessary periods of time. Manage weeds in pots and hoop houses to increase air circulation in the lower crown.

Store and display all future boxwood inventories in an area of the nursery where customers will not have to walk through. Keep a minimum of six-inch spacing between plants.

4. Scouting

Scout all host plants (*Buxus*, *Pachysandra*, and *Sarcococca* species) in the nursery on a weekly basis (Fig. 6).



Figure 6. Scout host plants frequently, especially when conditions are favorable for disease (photo by Norm Dart, Virginia Department of Agriculture and Consumer Services).

- This includes ‘feral’ plants that may have established themselves in natural areas of the nursery. These plants may act as a reservoir for the disease.

In case that boxwood blight-symptoms are observed, report immediately to the [Virginia Department of Agriculture and Consumer Services](http://www.virginiaagriculture.com) at 804-371-5086.

Restrict access and do not sell symptomatic boxwood until they have been examined and cleared by the Virginia Department of Agriculture and Consumer Services.

5. Incorporate a preventative scheduled spray routine for production/saleable stock.

Apply a preventative fungicide to healthy stock when temperatures are between 41 and 86° F and rainfall is expected. The optimum temperature for disease development is 75° F.

- Sign up and customize a weekly Boxwood Blight infection risk forecast at uspest.org/push.

Make sure to achieve thorough coverage of the plant, including the interior and lower crown.

A list of registered fungicides for management of boxwood blight can be found on the [Virginia Boxwood Blight Task Force website](http://www.virginiaagriculture.com/boxwood-blight-task-force).

6. Recordkeeping

Maintain records of the following for a minimum of 12 months:

- Incoming host plants, including quantity and source(s)
- Location of holding area(s) for incoming host plants
- Shipping records (dates, quantity, plants shipped, destinations)
- Inspection records
- Personnel training (dates, attendees, subject matter, trainer)

7. Training

Educate and train appropriate personnel to:

- Understand the potential impacts of accidental introduction and spreading this disease and the importance of following quarantine protocols when handling diseased plants in infested areas.
- Recognize and report signs and symptoms of boxwood blight.
- Understand the pathogen’s life cycle and biology.

Develop site-specific sanitation protocols and best management practices in addition to those outlined in this document.

Training sessions should be provided at least once each year.

Refer to the [Virginia Boxwood Blight Task Force website](http://www.virginiaagriculture.com/boxwood-blight-task-force) for pictures of symptoms and best

management practices. Contact your local [Virginia Cooperative Extension](#) office for information on training opportunities on boxwood blight.

If Boxwood Blight is found in the nursery:

Contain and eradicate the pathogen.

Symptomatic plants should be reported immediately to the Virginia Department of Agriculture and Consumer Services at 804-371-5086.

Remove any symptomatic plants and/or potentially infested soil/potting media from blocks or areas where the pathogen is detected. Scout for symptoms on other plants within a positive block or hoop house to ensure all infected plants are detected and removed.

- Destroy all infected plants and associated debris by burning, burying, or depositing in a municipal landfill or incinerator. Do not compost debris.
 - Bag plants on-site before transporting.
 - If plants are too big to bag, burn or bury them on-site or transport using a covered trailer.
- Remove fallen leaf and plant debris from blocks or areas where the pathogen is detected.
 - Rake, vacuum, or sweep plant debris and collect in bags. Destroy the debris by burying, burning, or bringing to an approved landfill or incinerator.
 - Residual debris can be burned with an agricultural flamer.
- Thoroughly clean and sanitize all hoop houses, tools, trailers, and equipment involved with the plant destruction at the end of each use, as outlined in the cultural/sanitation section.

Place healthy-appearing plants that were within 10 feet of an infected plant under quarantine for six months until released for sale by the Virginia Department of Agriculture and Consumer Services.

- Clearly mark the quarantine area and restrict access to essential personnel.
- Suspend use of all fungicides during the quarantine period.
- Monitor plants for symptoms on a weekly basis.
- If additional infected plants are detected while in quarantine, remove them immediately. Plants

within 10 feet of them should be placed in quarantine and the six-month holding period reset.

- If no additional plants are found infected during weekly scouting and laboratory testing of symptomatic tissue for six consecutive months under the quarantine period, plants may be released for sale.

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