



# CAES

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## **BEST MANAGEMENT PRACTICES FOR BOXWOOD BLIGHT FOR CONNECTICUT - FOR COMMERCIAL, PUBLIC, AND RESIDENTIAL LANDSCAPES - Version 4.0\*\***

\*\*These are subject to revision based on the availability of new information (revised February 2023).

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### **MANAGING BOXWOOD BLIGHT IN THE LANDSCAPE**

Observations of naturally occurring *Calonectria pseudonaviculata* infections of pachysandra in the landscape in 2012 significantly changed possible approaches to managing this pathogen on properties where both hosts are present. Management guidelines based on the host plant affected are provided for boxwood, pachysandra, and the presence of both boxwood and pachysandra. When both hosts are present on a property that is diagnosed with boxwood blight, it will be very difficult to effectively control or manage this disease and keep both of the hosts in the landscape. Once the fungus is present, regardless of the host, the known biology of this pathogen suggests that it will likely persist and serve as a continual source of inoculum for that property and for any neighboring properties with boxwood or pachysandra. It is not known if this fungus can be successfully eradicated once it is present in the landscape. Please bear in mind that this is a new disease for North America, so published scientific studies on boxwood blight are relatively few, as is information concerning management.

These management practices are based on what is known about the biology, dispersal, and survival characteristics of this plant pathogen, which will be modified as new information is available. In addition, the epidemics that occurred in 2011 and 2018, the wettest and second-wettest years in the last 30 years, demonstrated two things: First, that it is much more difficult to control boxwood blight after the disease has gotten started than preventatively and second, the distribution of disease suggests that low levels of disease were already present in locations that were not recognized until weather conditions were very conducive, leading to severe disease outbreaks. The management guidelines are outlined for protection of properties not currently known to have boxwood blight versus those with confirmed disease present. Note that undetected levels of disease may be present on any property, especially if weather has been dry and unfavorable for disease development.

## **IF BOXWOOD BLIGHT HAS NOT BEEN DETECTED OR CONFIRMED:**

### **A. EXCLUSION OF THE PATHOGEN**

1. Start with pathogen-free material by purchasing from reputable suppliers or nurseries that are licensed and/or certified according to all applicable phytosanitary laws and regulations.
  - i. Carefully inspect plants for symptoms at the time of purchase or when received from supplier. Personnel should be trained to detect boxwood blight.
  - ii. All symptomatic plants should be immediately isolated and samples from any symptomatic/suspicious plants should be sent to The Connecticut Agricultural Experiment Station (CAES) for testing: <https://portal.ct.gov/CAES-PDIO>
  - iii. Request a history of fungicide treatments with each shipment, if available (fungicide name, application rate, and time).
2. IF THERE ARE NO ESTABLISHED BOXWOOD PLANTINGS ON THE PROPERTY: Newly purchased plants can be installed at time of purchase. However, it is advisable to wait for at least four weeks to make certain the plants are pathogen-free prior to planting. Note: Boxwood blight develops under extended wet and warm conditions. Holding plants under dry conditions when the pathogen will not spread and disease will not develop will not ensure that plants do not have some low level of undetected disease.
3. IF THERE ARE ESTABLISHED BOXWOOD PLANTINGS ON THE PROPERTY: Newly purchased plants should be isolated from existing boxwood plantings for at least four weeks, but preferably for longer. Note: Boxwood blight develops under extended wet and warm conditions. Holding plants under dry conditions when the pathogen will not spread and disease will not develop will not ensure that plants do not have some low level of undetected disease.
  - i. Keep plants labeled to be able to track the vendor source, if purchased from more than one supplier.
  - ii. Physically separate material by source—avoid co-mingling of plant material, if purchased from different vendor sources.
  - iii. Holding area should have a surface that can be easily cleaned of plant debris.

- iv. All plant debris should be removed on a regular basis by vacuuming, sweeping, or raking and properly disposed (e.g., bagged for municipal trash, buried). This should NOT be composted.
- v. Suspend the use of fungicides on new plants during the holding period.
- vi. Monitor sanitation practices of anyone entering or working in the holding area.
  - a) The most effective product for sanitizing is 70% alcohol (Isopropyl or ethanol). Conidia are killed on contact when wet and microsclerotia are killed with exposure (continuously wet) within 4 minutes. Other products (at label rates) kill conidia only and include: phenolics (e.g., Lysol concentrate); 1:10 dilution of household bleach (10% Clorox); hydrogen dioxide (e.g., ZeroTol, Oxidate); and hydrogen peroxide, peroxyacetic acid, and octanoic acid (e.g., X-3). Personal protective equipment may be necessary when handling some sanitizers.
  - b) Products for sanitizing boots, shoes, and clothing in the field include alcohols or over-the-counter sprays (e.g., Lysol disinfectant spray).
- vii. Any boxwood with suspicious symptoms should be sent to CAES for diagnosis and testing as previously described.
- viii. IF NO SYMPTOMS DEVELOP DURING THE HOLDING PERIOD, the risk of introducing boxwood blight into an established planting is reduced, so the plants can be installed. Fungicide application prior to planting would further reduce risk.
- ix. Follow steps below for water management, sanitation, inspection, fungicide application and record-keeping.

### **IF BOXWOOD BLIGHT IS SUSPECTED OR HAS BEEN CONFIRMED:**

As soon as boxwood blight is suspected on boxwood and/or pachysandra, samples should be brought or sent to the Plant Disease Information Office of CAES in New Haven or the Valley Laboratory Diagnostic Office in Windsor for identification and confirmation.

Once the disease has been confirmed by CAES, as follows are available options.

#### **Option 1. Total Removal**

1. Remove all boxwood and/or pachysandra from the property and double-bag for disposal in municipal trash. Alternative: plants can be buried on the property. If buried, at least 1 foot of soil should be placed over buried plants.
2. Plants should NOT be composted.
3. Replant with plants not in the Buxaceae (e.g., not boxwood, pachysandra, or sarcococca). Consult landscaper, landscape designer, or landscape architect for assistance with plant selection.
4. If a property owner elects to replant with a member of the Buxaceae (e.g., boxwood, pachysandra, or sarcococca), they need to be aware that there is a continual risk of re-infection from local or unidentified sources of the boxwood blight fungus. Mulching will assist in covering microsclerotia and reduce splash dispersal.

## Option 2. Selective Removal

1. Remove all symptomatic boxwood and/or pachysandra plants and all adjacent, non-symptomatic boxwood and/or Pachysandra within 10 feet of symptomatic plants on the property.
  - i. Double-bag plants for disposal in municipal trash, if permitted. Alternative: plants can be buried on the property. If buried, at least 1 foot of soil should be placed over buried plants.
  - ii. Plants should NOT be composted.
2. Remove all organic matter and plant debris by vacuuming, sweeping, or raking for proper disposal (e.g., bagged for municipal trash, buried). This should NOT be composted.
3. After the removal of leaf debris, there is still a risk that microsclerotia may have been incorporated into the soil, therefore, placing mulch on the soil and pruning out the lower canopy and branches to avoid contact or close proximity to soil and mulch would be helpful to reduce the possibility of spores splashing up into the plant canopy.
4. Replanting with boxwood (or other plants in the Buxaceae) is not suggested, since the removal protocol cannot guarantee that all sources of the fungus have been eliminated from the vicinity. If planting must be done, choose from varieties with lower susceptibility to boxwood blight (<https://portal.ct.gov/CAES-boxwood-blight-susceptibility>). Be aware that plants are more likely to be exposed to the pathogen and effective fungicide programs would likely be required.
5. Sanitize all tools and equipment after use.
  - i. The most effective product for sanitizing is 70% alcohol (Isopropyl or ethanol). Conidia are killed on contact when wet and microsclerotia are killed with exposure (continuously wet) within 4 minutes. Other products (at label rates) kill conidia only and include: phenolics (e.g., Lysol concentrate); 1:10 dilution of household bleach (10% Clorox); hydrogen dioxide (e.g., ZeroTol, Oxidate); and hydrogen peroxide, peroxyacetic acid, and octanoic acid (e.g., X-3). Personal protective equipment may be necessary when handling some sanitizers.
  - ii. Products for sanitizing boots, shoes, and clothing in the field include alcohols or over-the-counter sprays (e.g., Lysol disinfectant spray).
6. FOR ALL REMAINING, NON-SYMPTOMATIC BOXWOOD OR PACHYSANDRA ON PROPERTY:
  - i. Inspect for symptoms on a weekly basis for at least several months (preferably one year) after infected plants are removed.
  - ii. Any boxwood and/or Pachysandra with suspicious symptoms should be sent to CAES for diagnosis and testing as previously described.
  - iii. Avoid overhead watering or working with plants when they are wet, as water is important for the spread and development of boxwood blight.
  - iv. Non-symptomatic plants can be sprayed with registered fungicides, at the **discretion** of the property owner.
    - a) Research on fungicide efficacy is ongoing in the U.S. This information, in combination with research from other countries that have been dealing with this disease for many years, can be used in

conjunction with other management strategies previously outlined, especially when weather is favorable for disease. When there is a risk of boxwood blight occurring, fungicide applications need to be used on a regular preventive schedule. Because of the tight nature of the boxwood canopy, thorough coverage with fungicides is difficult. However, all parts of the plant need to be covered, so any sprays should be applied until run-off. The most current information concerning fungicide efficacy and use in the management of blight is posted at: <https://portal.ct.gov/CAES-boxwood-blight-fungicides> Please note: research at CAES is ongoing to determine the most effective fungicides for CT and the U.S.

- v. Monitor sanitation practices of anyone working with boxwood on the property. All tools and equipment need to be sanitized frequently—between individual plants, beds, and plantings.
    - a) The most effective product for sanitizing is 70% alcohol (Isopropyl or ethanol). Conidia are killed on contact when wet and microsclerotia are killed with exposure (continuously wet) within 4 minutes. Other products (at label rates) kill conidia only and include: phenolics (e.g., Lysol concentrate); 1:10 dilution of household bleach (10% Clorox); hydrogen dioxide (e.g., ZeroTol, Oxidate); and hydrogen peroxide, peroxyacetic acid, and octanoic acid (e.g., X-3). Personal protective equipment may be necessary when handling some sanitizers.
    - b) Products for sanitizing boots, shoes, and clothing in the field include alcohols or over-the-counter sprays (e.g., Lysol disinfectant spray).
  - vi. Monitor activities of pets, children, or others in order to minimize the potential for movement and spread of the sticky fungal spores.
7. Keep accurate records.
- i. Locations of symptomatic plants;
  - ii. Source and date of original plantings (if known);
  - iii. Locations of remaining boxwood plantings on the property;
  - iv. Mortality due to any cause;
  - v. All fungicide applications (date and rate of product).

## **B. WATER MANAGEMENT**

1. Water is very important for the spread and development of boxwood blight. Avoid overhead watering or working with plants when they are wet from rain, irrigation or dew. This includes pruning, moving or even walking through wet plants.
2. Recent research has demonstrated that spores spread under dry conditions can survive for days and still germinate when wet conditions return. This will require additional sanitation and/or fungicide management.
3. Avoid or minimize accumulation of standing water in boxwood plantings.

## C. SANITATION

1. Remove leaf debris by raking or vacuuming. Debris should be bagged for municipal waste. It should NOT be composted. Mulching will assist in covering microsclerotia and reduce splash dispersal.
2. Monitor plant debris in run-off water. Divert from other boxwood plantings.
3. Routine operations to maintain the boxwood planting (e.g., planting, pruning, grooming) should include sanitation practices. A suggested protocol is outlined as follows:
  - i. Pruning to remove branches and leaves from the lower part of the plant would increase air flow, reduce water splash of soil to leaves, and increase fungicide coverage.
  - ii. Pruning should not occur if plants are wet or if there is high humidity, especially after extended wet periods. However, spores can survive dry periods for at least 9 days and germinate when moistened. Sanitation and/or fungicide use is especially important.
  - iii. Fungicide programs prior to pruning can include DMI fungicides (FRAC group 3) which inhibit sporulation. Optional: The day before pruning is scheduled, plants can be thoroughly sprayed with ZeroTol. Immediately after pruning is done, the planting can be sprayed again with ZeroTol or fungicides with curative action can be applied.
  - iv. Any routine fungicide programs can resume after pruning, as applicable.
  - v. Tools and equipment should be sanitized when moving between different boxwood plantings on a property or between properties.
    - a) The most effective product for sanitizing is 70% alcohol (Isopropyl or ethanol). Conidia are killed on contact when wet and microsclerotia are killed with exposure (continuously wet) within 4 minutes. Other products (at label rates) kill conidia only and include: phenolics (e.g., Lysol concentrate); 1:10 dilution of household bleach (10% Clorox); hydrogen dioxide (e.g., ZeroTol, Oxidate); and hydrogen peroxide, peroxyacetic acid, and octanoic acid (e.g., X-3). Personal protective equipment may be necessary when handling some sanitizers.
    - b) Products for sanitizing boots, shoes, and clothing in the field include alcohols or over-the-counter sprays (e.g., Lysol disinfectant spray).
4. Work in plantings with suspect potentially infected plants last—after completing work with healthy plants.
  - i. Wearing of protective gear can be helpful.
5. If a planting or property known to have boxwood blight has been visited, wash and sanitize shoes, tools, equipment, and vehicles that may have become contaminated before traveling to other properties.
  - i. Use of protective gear can be helpful.
6. Train all personnel and home and property owners to avoid movement through plantings with infected or exposed and potentially infected plants and to regularly sanitize clothing and equipment as part of standard operating procedures.



## **D. INSPECTION**

1. Inspect all boxwood plantings throughout the growing season by trained personnel.
  - i. If boxwood blight symptoms are detected, immediately send samples from all symptomatic plants to The Connecticut Agricultural Experiment Station (CAES) for testing.
  - ii. Infected plant material should NOT be composted.
  - iii. If you observe suspicious symptoms on boxwood, it is important to have the disease accurately identified by a specialist (state inspector or CAES plant pathologist).
2. Routinely monitor and inspect all incoming boxwood material, when applicable.
3. Routinely inspect boxwood in the landscape on the growing grounds or surrounding area for boxwood blight.

## **E. FUNGICIDE MANAGEMENT**

1. Fungicides for boxwood blight management should be used preventatively whenever possible in conjunction with cultural controls and scouting. Combinations of systemic and protectant fungicides in different FRAC classes with different modes of action are desirable both for increased efficacy and for fungicide resistance management. We have observed that propiconazole, benzovindiflupyr and fluxapyroxad have some curative activity within 48 hours after infection and that fungicides in FRAC group 3 inhibit can sporulation. Managing to prevent disease using fungicides as a part of best management practices is our best approach. Current fungicide information is available at <https://portal.ct.gov/CAES-boxwood-blight-fungicides>

## **F. RECORD KEEPING/TRACEABILITY**

1. Keep accurate, detailed records of:
  - i. Source of boxwood and planting date;
  - ii. Map location of boxwood plantings in the landscape;
  - iii. Mortality due to any cause;
  - iv. All pesticide/fertilizer applications;

## **G. TRAINING**

1. Educate and train personnel as well as home and property owners to recognize boxwood blight.
  - i. Early detection is critical.
2. Train personnel and home and property owners in BMPs, including sanitation.

## **III. OTHER HELPFUL INFORMATION**

As new science-based information becomes available, it will be posted on the Boxwood Blight page of the Experiment Station's website: <https://portal.ct.gov/CAES-PDIO>

Additional guidelines and information on boxwood blight can be found at that location.

Another source of useful information can be found at the AmericanHort Knowledge Center: <https://www.boxwoodhealth.org/>

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