

FEATURED NEWS

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A Holistic Approach to Boxwood

by Andrea Filippone of F2 Environmental Design and AJF Design, President of American Boxwood Society

My career has had many twists and turns but they all tie together somehow in giving me the ability to see boxwood from so many vantage points – as an architect, a landscape designer, a nurseryman, a soil designer, an installer and a maintenance



provider. My husband, Eric T Fleisher, and I run the firm F2 Environmental Design that specializes in environmental restoration. We have been approaching boxwood organically, and sustainably for over 25 years. Our focus with boxwood is good drainage, appropriate soil structure and an efficient nutrient cycling system, based on a balanced biological bio mass (<http://f2environmentaldesign.com/>).

I travelled to Macedonia on a boxwood exploration trip with Tomasz Anisko of Longwood Garden. Our goal was to retrace Edgar Anderson's trip and locate the Vardar Valley plant. Although we never actually found the mother plant, we did observe the boxwood growing beautifully on the limestone hillsides in harsh conditions with temperatures ranging from -10 to 110 degrees. The key is good drainage and the appropriate soil biology.

Often boxwood will thrive when they are left alone in the shade, under a tree that has never been fertilized or irrigated. That makes you wonder – are we over irrigating and fertilizing this plant? – the answer is a resounding YES!

Understanding boxwood's native environment and growth habit is important in managing the plant. We look closely at the various foliage and growth habits of the different cultivars. We also closely study the root growth habits of the different cultivars. Some are dense, and some more sparse. This informs how we may choose different management approaches to different plants in relation to their habit.

DELIVERABLES

(May to August 2022)

Research

- 10 Research articles
- 12 Presentations

Extension & Outreach

- 2 Workshops/symposia
- 2 Webinars/virtual meetings
- 7 Extension presentations
- 6 Extension publications
- 238 Samples diagnosed
- 66 Email/phone inquiries answered
- 3,219 People reached with articles/news

Education

- 5 Postdoctoral associates
- 2 Graduate students
- 2 Summer interns

Publicity

- 2 Interviews/reports



We must focus more on best management practices.

1. Build a soil with the proper structural characteristics in terms of water infiltration and air flow. Through the use of appropriate compost and/or biological infusions, we encourage a balanced ratio of bacterial to fungal biomass, and a healthy predatory population, encouraging an efficient natural nutrient cycling system.
2. Through proper pruning practices, encourage air circulation and sunlight through the plant
3. Utilize an adaptive strategic approach to irrigation. Less is more.
4. Choose the right cultivar for the right application and placement. Consider disease tolerant cultivars.
5. No use of fertilizers or chemicals.
6. Mulch will reduce the splash back of the fungal spores on the ground by over 90%. So, mulch but not too much because one needs to maintain the air circulation under the plant as

well. If you have to prune up at the base of the plant to do this – then that needs to be done.

7. Use fungicides only if you have a conclusive diagnosis of boxwood blight. If needed utilize these chemicals strategically and with the greatest of care. This will ensure greater effectiveness, and less detrimental effect on the surrounding soil and plant environment.

As the new president of the American Boxwood Society (ABS), I would like to reach out to more parts of the United States and encourage more individuals to be part of our organization. Increased membership will help ABS get the word out about managing boxwood properly, avoiding boxwood blight, and the boxwood tree moth. We have a duty to do this but we need to recruit volunteers from different sectors of the USA who would be interested in



participating in fun boxwood events and research projects. Please join <https://boxwoodsociety.org/>. Our goal is to show everyone the beauty of boxwood in all its forms!

FEATURED RESEARCH

Boxwood Blight in Oregon Can Be More Severe at Cool Temperatures by Jerry Weiland

We evaluated how Oregon isolates of the boxwood blight pathogen respond to temperature. Initially, we grew 15 isolates on potato dextrose agar (PDA) and malt extract agar (MEA) at six temperatures ranging from 41 to 86°F (5 to 30°C). These isolates were collected from four nurseries and represented five different genotypes known to occur in the state. Our isolates grew as expected on PDA, where the best temperature for growth was 77°F, and matches what has been reported previously. However, our isolates grew better at cooler temperatures (59-68°F) when they were grown on MEA. These results show that the temperature responses of the boxwood blight pathogen depend upon the substrate that it is being grown on. In order to determine what this means in terms of disease, we

sprayed spores onto plants of Green Velvet (a more susceptible cultivar) and Winter Gem (a more resistant cultivar) and then placed them into a moist chamber (closed plastic bin) to ensure that infection occurred. We then moved the plants into growth chambers at either 59 or 77°F. We chose 59°F as a representative temperature for Oregon in the spring and fall during the rainy season. We chose 77°F, because this is what previous research had shown was the optimal temperature for this pathogen to cause disease. At 77°F, Winter Gem responded to infection as expected and developed very mild symptoms of disease (less than 5% of canopy affected) compared to Green Velvet (15-45% of canopy affected). However, at 59°F, disease increased significantly on both cultivars to the point that Winter Gem developed just as much severe blight as Green Velvet.



Green Velvet (left to right): Healthy and diseased plant at 77°F. Healthy and diseased plant at 59°F



Winter Gem (left to right): Healthy and diseased plant at 77°F. Healthy and diseased plant at 59°F

In other words, the more resistant cultivar became susceptible to boxwood blight at the cooler temperature. Our research confirms observations by several Oregon growers, who have indicated that some of the more resistant *B. microphylla* cultivars can develop just as much disease as susceptible cultivars. Four growers also had symptoms of boxwood blight develop this spring (mid-March through June), when our weather was cooler and wetter than average.



Heavily infected Winter Gem at a nursery. Exterior canopy looks healthy (left) while interior has extensive leaf spots, stem lesions, and defoliation (right)

These findings have important implications for boxwood blight resistance breeding programs and for calibrating boxwood blight infection risk models, which may need to be adjusted to include temperatures cooler than 77°F.

Upcoming International Boxwood Seminar



How do weather and climate impact boxwood blight? A modeling approach to aiding in boxwood disease management

September 7, 1:00 p.m. Eastern

Dr. Len Coop, Associate Professor, Oregon State University, Corvallis, Oregon (USA).

[Click to Register](#)

Diagnostic Hint by Margery Daughtrey

Buxus microphylla var. *japonica* ‘Winter Gem’ with symptoms of boxwood blight were found by a horticultural inspector this summer at a nursery on Long Island; the plants had recently been received from out-of-state. Leaf spots, shoot cankers and defoliation made the plants conspicuous to the inspector. Two of our helpful advisory committee members verified from photographs that the plant had the right appearance to be ‘Winter Gem’, which has been rated as one of the most resistant cultivars in numerous trials. Even cultivars which have shown superior resistance are susceptible when the environment is conducive to infection and disease development. Don’t dismiss the possibility that a cultivar with a great reputation has boxwood blight: it might! Resistance is not immunity. Incubate the plant material and use your microscope to check for the distinctive sporulation.



Sporulation of *Cps* from a shoot canker on Winter Gem boxwood

EXTENSION HIGHLIGHT

BBIG Scientists Join Forces on Boxwood Blight Awareness and Mitigation at Cultivate '22

Cultivate is the biggest and most attended annual meeting in the U.S. horticulture industry. As part of the Cultivate '22 held in Ohio on July 16-20, 2022, the Boxwood Blight Insight Group scientists, Luisa Santamaria and Jay Pscheidt from Oregon State University, Jerry Weiland from USDA ARS in Corvallis, OR, and Fulya Baysal-Gurel from Tennessee State University spoke to attendees on the latest research and innovations about boxwood blight scouting and mitigation. Click this link (<https://www.nurserymag.com/article/cultivate-boxwood-blight/>) to learn more.



BBIG Team Spotlights at PlantHealth2022 in Pittsburgh by Chuan Hong

The American Phytopathological Society (APS) Annual Meeting was held in Pittsburgh, PA



from August 6 to 10. Specifically, The BBIG proposed symposium – **Epidemiology, Detection and Management of an Evasive Disease – Boxwood Blight**, co-sponsored by APS’ seven subject committees, was well attended and received, bringing first responders, arborists, extension and research communities up to date through informative presentations and productive follow-up discussion. Thanks to five speakers – Nina Shishkoff, Jerry Weiland, Xiao Yang, and James LaMondia (BBIG team members) and Len Coop, a collaborator at Oregon State University, and to the moderator (Fulya Baysal-

Gurel) and the organizers – the BBIG leadership team. Seven posters further spotlighted the BBIG project in the areas of pathogen detection and diagnostics, blight epidemiology, biological control, boxwood microbiome, and project outreach as exemplified by the BBIG International Boxwood Seminars. More details are at <https://twitter.com/boxwoodhealth>.

PROJECT MEETING BRIEF

Three Project Leaders and the Project Manager met monthly on June 12, July 11 and August 11, 2022, discussing project progress, planning project-wide activities, and preparing this issue of the BBIG Newsletter.

All Project Directors and their associates met on August 17, 2022, discussing boxwood-related research and extension progress. Dr. Jerry Weiland presented a seminar on differential cultivar performances under prevailing cool temperatures in Oregon and the implications on sustainable boxwood blight management.

NEW ROLES AND PROMOTION



Christine Stone recently joined the BBIG team at the USDA-ARS Foreign Disease & Weed Science Unit on the Fort Detrick U.S. Army base in Maryland, where she has worked for more than 20 years as a support scientist. Christine holds a M.S. degree in plant pathology from Michigan State University and a B.S. in biology/ecology from Juniata College. Christine’s scientific career at USDA-ARS is distinguished by her many contributions to our understanding of soybean rust disease, including the development of molecular diagnostic assays, gene expression studies of pathogen infection structure formation, and soybean germplasm screens, primarily conducted within high security BSL3 plant pathogen containment facilities. In her new role at USDA-ARS, Christine will be leading research on the boxwood blight pathogens in the lab of BBIG Co-Director Jo Anne Crouch. Christine

can be reached by email at Christine.stone@usda.gov.

Congratulations to Casey, BBIG Advisory Panel member

Dr. Casey Sclar, Advisory Panel member, recently joined the Pennsylvania State University as the H.O. Smith Endowed Director of the Arboretum at Penn State. He has a doctorate in entomology from Colorado State University and a bachelor of science degree in ornamental horticulture from California Polytechnic State University, San Luis Obispo. Prior to Penn State, he led the American Public Gardens Association for 10 years after working in IPM for Longwood Gardens for over 15 years. His disciplinary expertise, data-driven administrative leadership and extraordinary benchmarking insights from engagement with over 600 public gardens throughout the U.S.A. and beyond have been tremendous assets for this project. Casey is more excited to connect people, plants and partnership with his passion for the art, science and business of horticulture to continue his support for this project.



Happy Retirement to Martha, BBIG Advisory Panel Member



Martha Sleeper has worked in the nursery industry in Oregon since 1990, first with her small nursery where she sold plants at a local Saturday market. After that she started working in retail garden centers, at several independent garden centers including at a wholesale nursery business specializing in Japanese Maples and other unique plants. In 2005, she began working at Hines Horticulture in Forest Grove, Oregon where she took on the challenges of being a “plant issue detective”. This led to a career of learning about plant diseases, insects, weed issues, irrigation and all the aspects of plant health.

In 2014 she became the Fields Operations manager for Hines where she was responsible for the growing and maintenance of all plant material except propagation. This position stretched her, but it allowed her to bring her knowledge of plant health and consumer expectations to generate quality products for the markets. In 2017, she became the Plant Health Manager and became responsible for pest control, irrigation, and regulatory issues. Martha started participating as a BBIG AP in 2020 and has been an incredible resource for the industry perspective of the initiative in blight management. Martha retired from this position on June 30 and passed the torch to Laura Gladwin.

Her next adventure will be to work together with her husband on their small farm in the foothills of western Oregon where they raise heritage hogs, pasture raised poultry and eggs, heirloom cider apples and honey from their 17 beehives. She is also looking forward to spending more time being “Grandma” to her 1 ½ year old grandson. Martha encourages the team to continue to work for practical solutions to boxwood blight (BWB) management in nurseries and landscapes, and to grow the educational programs for nursery workers. Martha told us, “Please continue to reach out to Laura with possibilities of collaboration in the future. As you know, Everde Growers is a significant grower of Buxus in Oregon, and BWB management is very important to the nursery”.

BBIG Welcomes Its Youngest Advisory Panel Member

Laura Gladwin is the Plant Health Manager, Everde Growers, Forest Grove, Oregon. With Martha’s retirement, she has accepted to serve on the BBIG Advisory Panel. Laura is coming with

rich background and experience in industry, academia, and international agriculture.

She grew up in a forest and always adored plants. While she was studying Botany at Oregon State University, she started her career in a retail nursery. Steadfastly dedicated to science, she completed her degree in Botany, while working in horticulture. Laura worked for a solar panel manufacturer and Intel, before returning to school to study for a Master's degree in Ethnobotany at University of Kent in Canterbury, England. She had always been fascinated by the way people used plants, and dreamed of a summer internship at Kew Gardens. She did her Master's research work in Morocco and landed a summer internship at the Kew Gardens working in the herbarium. She stayed abroad for another two years, volunteering at a botanical garden in Yucatan, Mexico, and even started her doctorate studies in Mexico. However, the pandemic brought a swift stop to her doctorate studies and she returned to the US. While living abroad, she realized that horticulture meant more to her than she ever recognized and wanted to come back to the industry. She has now been in the nursery industry for over a decade, working in both retail and wholesale operations. Laura is passionate about plants and she looks forward to a lifetime of learning and discovery.



Post-Doctoral Research Associate Position Available, Frederick, MD

Host-pathogen interactions of a newly introduced plant pathogen through the lens of evolutionary genomics and transcriptomics. A major challenge for developing long-term control options for boxwood blight is that we know very little about how the two fungal species that cause the disease establish infection and overcome the host's immune response. This post-doctoral research appointment will: (1) leverage transcriptomics, comparative genomics and fluorescent imaging to characterize host-pathogen interactions by different species and genotypes of the boxwood blight fungi; and



(2) determine whether there is a correlation in disease severity between pathogen genotype and the host genotype/resistance phenotype. Post-doctoral; two-year appointment. Position is in the lab of Dr. Jo Anne Crouch, USDA-ARS, Frederick, MD. For full details, see <https://tinyurl.com/3besxnrr> or inquire with Christine.Stone@usda.gov. Please mention in the subject of your email "Postdoctoral opportunity – boxwood blight".

RECENT PUBLICATIONS

Aiello, D., Guarnaccia, V., Vitale, A., LeBlanc, N., Shishoff, N., and Polizzi, G. 2022. Impact of *Calonectria* Disease on Ornamental Horticulture: Diagnosis and Control Strategies. *Plant Disease* <https://apsjournals.apsnet.org/doi/epdf/10.1094/PDIS-11-21-2610-FE>

Barker, B.S., Coop, L., and Hong, C. 2022. Potential Distribution of Invasive Boxwood Blight Pathogen (*Calonectria pseudonaviculata*) as Predicted by Process-Based and Correlative Models. *Biology* 11, 849 (open access at <https://www.mdpi.com/2079-7737/11/6/849/pdf>)

Brand, T., Beltz, H., Ehsen, B., Adhikari, U., Daughtrey, M. L., Luster, D. G., Kong, P., and Hong, C. X. 2022. Multi-year field plantings evaluating boxwood cultivars for susceptibility to the blight

pathogens (*Calonectria* spp.) in Northern Germany. Plant Disease published online as First Look at <https://doi.org/10.1094/PDIS-05-22-1102-RE>

Dhakal, K., Bika, R., Ghimire, B., Parajuli, M., Neupane, S., Neupane, K., Addesso, K.M., and Baysal-Gurel, F. 2022. Arthropod and Disease Management in Boxwood Production. Journal of Integrated Pest Management 13(1): 18 (open access at <https://doi.org/10.1093/jipm/pmac013>)

Kodati, S., Allan-Perkins, E., Cowles, R.S., and LaMondia, J. 2022. The effect of temperature, leaf wetness period, and cultivar susceptibility on boxwood blight disease development and sporulation. Plant Disease, published online as First Look at <https://apsjournals.apsnet.org/doi/10.1094/PDIS-05-22-1022-RE>

Kodati S., Cowles R., and LaMondia, J. 2022. Survival of conidia of the boxwood blight pathogen *Calonectria pseudonaviculata* under different relative humidity condition. Plant Health Progress. <https://apsjournals.apsnet.org/doi/10.1094/PHP-12-21-0142-RS>

Li, X. P., Kong, P., Daughtrey, M. L., Kosta, K., Schirmer, S., Howle, M., Likins, M., and Hong, C. X. 2022. Characterization of the soil bacterial community in selected boxwood gardens across the United States. Microorganisms 10, 1514 at <https://doi.org/10.3390/microorganisms10081514>

Rogers, L.W., Koehler, A.M., Crouch, J. A., Cubeta, M.A. and LeBlanc, N.R. 2022. Comparative genomic analysis reveals contraction of gene families with putative roles in pathogenesis in the fungal boxwood pathogens *Calonectria henricotiae* and *C. pseudonaviculata*. BMC Ecology and Evolution 22:79 (open access at <https://doi.org/10.1186/s12862-022-02035-4>)

Weiland, J.E., Ohkura, M., Scagel, C.F., Davis, E.A., and Beck, B.R. 2022. Cool temperatures favor growth of Oregon isolates of *Calonectria pseudonaviculata* and increase severity of boxwood blight on two *Buxus* cultivars. Plant Disease. <https://apsjournals.apsnet.org/doi/10.1094/PDIS-04-22-0769-RE>

PROJECT DIRECTORS AND MANAGERS

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