A Systems Approach to Plant Disease Management

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Systems Approach to Disease Management

- Looks at production path
- High risk, vulnerable points of production are identified—"Critical Control Points"
- CCP’s are where pathogens may be introduced
Critical Control Points

- Receiving area
- Propagation area
- Container storage areas
- Substrate piles/storage areas
- Irrigation sources
- Cull piles
The Oregon Association of Nurseries has published the "Safe Procurement and Production Manual," a 106-page guide to producing healthy nursery stock by using a systems approach. A new revised version is available online now as a PDF download, at no cost. A print version is available from the OAN office, 503-682-5089 or 888-283-7219.

When it comes to preventing the introduction and spread of plant pests and pathogens, a proactive approach that intelligently targets areas of highest risk is better than reacting to things as they happen. This easy-to-follow book helps growers evaluate their own nursery operations. It contains best practices that are proven to be effective at reducing risks from plant pests and pathogens. Different chapters of the book address the various components of plant production, from propagation to final shipment.

» Download the Safe Procurement and Production Manual(PDF).
» Download treatment options for waterborne pathogens in nursery and greenhouse irrigation systems here
How can you tell if a disease is noteworthy?

- If it has its own website.
Ornamental diseases are game changers when:

- Cause widespread damage or death
- Likelihood of infection is ever present
- Negative publicity leads to decreased sales
- Pathogen is exotic and/or invasive
- Pathogen is long lived in soil, media, water
- Regulated by state and federal agencies
- Leads to increased cost of production
Let’s look at some game changers

- Phytophthora ramorum (Sudden oak death, Ramorum blight)
Phytophthora ramorum

- Sudden oak death on West Coast, coastal live oak
- Pathogen of over 100 plant species
- Ramorum blight – Rhododendron, Viburnum, Camellia, Kalmia
- Increased regulations, quarantines, stop sales
- Contamination of soil and water
- Spawned “Systems Approach Management”
- New Phytophthora species are being identified
Documented Spread of P. ramorum

Symptoms of *Phytophthora ramorum* diseases
Ramorum Blight

A. Under moist conditions, sporangia develop on infected leaves.

B. Sporangia land on leaves and buds, releasing zoospores which encyst, germinate, and infect.

C. Although primarily an aerial pathogen, P. ramorum zoospores, sporangia and chlamydospores can initiate root infections on some plants. Infected roots lack symptoms but can lead to stem and leaf infections.

D. It is presumed that inoculum in leafy debris is responsible for new infections and long-term survival of the pathogen.

1. Infected plant material is introduced into the nursery through the plant trade. Nursery plants can also become infected from adjacent infected forest.

2. Sporangia produced on infected plants or plant debris are transported via water splash or air currents to uninfected plants.

Parke and Lucas, APS Net
Let’s look at some game changers

- *Phytophthora ramorum* (Sudden oak death, Ramorum blight)
- Boxwood Blight
Boxwood Blight

- Calonectria pseudonaviculata
- First found in 2011 in the U.S.
- BoxwoodBlight.org clearinghouse
- Research – Kelly Ivors, Cal Poly
- All cultivars susceptible to some degree
- Fungicides for prevention only
- In AL and FL in 2015
Do you know the symptoms of boxwood blight?
Leaf spots are diagnostic
Boxwood Blight Stem Lesions
Bundles of spores
Save or Sacrifice?
After two cover Sprays/fungicide
Boxwood Blight after Two Fungicide cover Sprays
Some Boxwood Varieties Show Tolerance to Blight

A recent report from the North Carolina State University Cooperative Extension showed considerable variability in the susceptibility of Boxwoods (Buxus spp.) to Boxwood Blight (Cylindrocladium pseudonaviculatum). The researchers evaluated twenty-four varieties and
Other Boxwood Diseases

- Volutella blight
- Boxwood canker
- Phytophthora root rot
Volutella blight/boxwood
Boxwood canker/ Sept 2014
Black stem of boxwood caused by *Colletotrichum theobromicola*
Let’s look at some game changers

- Phytophthora ramorum (Sudden oak death, Ramorum blight)
- Boxwood Blight
- Rose Rosette
Rose Rosette Virus

- Vectored by an eriophyid mite
- Widely reported on multiflora rose since 1970’s
- Particularly on shrub roses
- Symptoms show up 2-3 yrs after planting
- Death can occur within 2-3 yrs of infection
- No curative treatment
- USDA funds 5 yr research project, 2015
Rose Rosette, a virus disease
Rose Rosette in a mass planting of Knockout Rose
Rose Rosette Research
Reduce Risk
Receiving and Shipping

• Sharpen diagnostic skills
• Inspect incoming and outgoing plants
• Work cooperative with state regulatory and Extension personnel
• Protect your reputation by following all shipping regulations
Reduce Risk
Propagation

- Limit access
- Propagate on site or buy local liners
- Grow stock plants or source cuttings locally
- Cuttings from diseased free plants only
- Propagate in raised beds or on benches to eliminate soil contamination
- Pay attention to detail/sanitation practices
Raised propagation beds prevent soil contamination
Hosta ‘August Moon’
Foliar nematodes are spread by propagating infected plants; also, by splash dispersal during irrigation or rain events. Discard infested plants.
Foliar nematode emerging from leaf tissue
Phytophthora or Fusarium are capable of causing crown rot of liriope.
Reduce Risk
Production Areas

- Avoid species/cultivars not resistant to common diseases
- Avoid fields with known soil-borne pathogen problems
- Use new containers stored on concrete pads
- Ground pads should be contoured, covered with fabric or gravel
- Muddy containers could indicate root rot issues
- Limit visitors
- Clean vehicles and implements
Entomosporium leaf spot

Indian Hawthorn
Scab/Crabapple

- Common on older crabapple cultivars
- Causes premature leaf drop
- Symptoms may be found on leaves and fruit
- Also found on apple and pyracantha
Store media on concrete pad to prevent contamination by pathogens
Dirty pots = Dead Roots?
Phytophthora root rot
Phytophthora root rot

Phytophthora is a “water mold”
Reduce Risk
Water Management

- How do you manage irrigation?
- Too much, too little or ill-timed can lead to issues
- Check water quality
- Assay for plant pathogens
- Drip irrigation on plants susceptible to foliar diseases
Phytophthora

- Oomycete, not considered a fungus
- More closely related to brown algae
- Reproduces rapidly in water
- Easily moved in irrigation water
- Dead roots lead to dead plants
Water inflow should be as far as possible from pumping station
Drip irrigation to keep foliage dry and minimize foliar diseases
Reduce Risk
Integrated Pest Management

- Train and designate at least one person as a scout
- Post images of your top ten disease/pest issues
- Outbreaks should be mapped and reported
- Send employees to educational meetings
- Use social media to stay engaged
Reduce Risk
Relationship w gov/educ

• Build a relationship of trust with regulatory, extension, university employees

• Be a mentor to young employees

• Suggest workshops, seminars, publications, outreach that would benefit nursery industry

• Interact with policy makers, univ administrators; let them know the nursery industry is as deserving of research and outreach as any other agricultural commodity

• Be active in local and regional nursery organizations
Real. Life. Solutions.

Programs in agriculture and natural resources, 4-H youth development, family and consumer sciences, and resource development. University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating. UT Extension provides equal opportunities in programs and employment.