

Annual report to
FLORICULTURE NURSERY RESEARCH INITIATIVE
and
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
for the period of
APRIL 2009 TO MAY 2010

PROJECT

Conventional and alternative soilless substrate component physiochemical properties for the Pacific Northwest United States and subsequent effect on containerized ornamental crop growth and quality.

PRINCIPLE INVESTIGATORS:

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SYNOPSIS

Situation: The effect of soilless substrate components on the physiochemical properties of the container system is poorly understood in the Pacific Northwest. Little research or information has historically been available for growers to make informed decisions when engineering soilless substrates with desired physical properties such as air space and water holding capacity or chemical properties such as pH, cation exchange capacity, anion exchange capacity, and electrical conductivity. Furthermore, we continue to investigate the interaction of culture practices, specifically fertility and irrigation, with multi-component soilless substrates.

Recently, the slump in the housing market and increased interest in energy generation from renewable resources such as woody biomass have resulted in a variable bark supply for container nurseries in the Willamette Valley. Due to the reduced supply, the price of bark has been unstable and shown an overall increase during the last two years. Many nurseries continue to report difficulty finding consistent bark in needed quantities at historical prices. Oregon Association of Nurseries, growers and allied suppliers in the Northwest have identified a need for alternative substrates as a top priority.

Program Effort: Numerous workshops and presentations to increase stakeholders' fundamental understanding of the hydrology and chemistry associated with soilless substrates have been conducted. In addition, research on individual substrate components and their effect on Douglas Fir bark based soilless substrates, to determine nutrient contribution, effect on pH, water availability, and their overall effect on crop growth and water use efficiency have been completed or underway. Research is ongoing to determine the effect of substrate amendments dolomite and lime on substrate pH over time. Furthermore, we are currently investigating the effect of fertilizer application technique on crop response and environmental impact.

In an effort to find multi-faceted solution to the bark shortage, we have begun to screen numerous, readily available products that show promise as an alternative soilless substrate and occur within a 200 mile radius of the Oregon nursery epic center (northern Willamette valley). These may include but are not be limited to: Douglas fir logging slash, whole-tree hybrid poplar, whole-tree ponderosa pine, culled shade trees, culled or disposed Christmas trees, rye grass seed straw, and bamboo.

Results and Impacts: Increased understanding of soilless substrates by growers is changing practices throughout the Pacific Northwest nursery industry. Growers have begun to use coir as a replacement for peat. Many growers are altering mixes to contain less pumice and peat, therefore reducing cost. In addition, growers are beginning to realize that many traditional substrates are no longer suitable for current management practices and may actually reduce crop growth through poor physical properties or increased disease incidence. Lastly, growers have begun to rethink the current amendment described as 'starter packages' that contain water-soluble fertilizer lime, micronutrients and many unproven materials. Growers have begun to move towards a simple approach of adding urea-formaldehyde, lime or micronutrients. All findings will be crafted into extension publications that will be widely disseminated throughout the Pacific Northwest.

INSTITUTIONAL COOPERATORS:

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INDUSTRY COOPERATORS

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STUDENT INVOLVMENT

Graduate

R. Costello, MS, Crop and Soil Science, OSU, 2009 to present
M. Zazirska, MS, Crop and Soil Science, OSU, 2007 to 2009

Undergraduate

B. Moore, student intern, summer 2009, Clackamas Community College, OR
J. Kowalski, student intern, summer 2009, University of Puget Sound, WA.
J. Klick, student intern, winter 2009, University of Illinois, IL.

PUBLICATIONS

Owen, J.S., Jr. J.E. Altland, M. Zazirska-Gabriel. 20___. Change in aged and fresh Douglas fir bark physical properties over 12-months. HortScience. *In Preparation.*

Zazirska, M., J.S. Owen, Jr., and J.E. Altland. 20___. Comparison of methodology to determine particle size distribution of Douglas fir bark based soilless substrate and its use to predict on moisture characteristic curves. HortScience. *In Preparation.*

Altland, J.E., J.S. Owen, Jr., and W.C. Fonteno. 20___. Use of Columns to Determine Moisture Characteristic Curves at Low Tensions for Soilless Substrates. HortScience. *Submitted*

Boyer, C., J.S. Owen, Jr. and J.E. Altland. 20___. Finding the balance: Calcined clay rate effects in pine bark substrates. Proc. Southern Nursery Assoc. Res. Conf. *In Press*

Altland, J.E., J.S. Owen, Jr., M. Zazirska-Gabriel. 20___. Influence of Pumice and Plant Roots on Substrate Physical Properties Over Time. Acta Hort. *In Press*

Zazirska, M., J.E. Altland, and J.S. Owen, Jr. 2009. Effect of peat moss and pumice on Douglas fir bark based soilless substrate physical and hydraulic properties. HortScience. 44: 874-878.

White, S., J. Owen, and C. Wilson. 2009. Green Nursery Production Practices Part 1: Value Added Container Amendments. The SC Nurserymen. January/February. P. 27.

ABSTRACTS

Owen, J.S., Jr., J. Altland, C. Scagel, H. Stoven, D. Horneck and J. Frantz. 2009. Quantifying winter discharge of controlled release fertilizers to determine environmental impact and plant uptake. HortScience 44:1064

Owen, J.S., Jr., H. Stoven, J. Kowalski, and K. Phillips. 2009. Assessment of struvite containing controlled release fertilizer as a source of phosphorus for containerized ornamental crops. HortScience 44:1131-1132

PRESENTATIONS

Octoberfest, The Greener Green: Sustainability in Nursery Systems, October, NWREC, OSU, Aurora, OR.

OSU Nursery Research and Extension Field Day, September, NWREC, OSU, Aurora,

Annual Oregon Shade Tree Growers Meeting, October, NWREC, OSU, Aurora, OR.

DOLLARS LEVERAGED - \$32,751

Owen, Jr., J.S., H.M Stoven, and L.I. Santamaria. 2009. Physical, chemical, and biological characterization of culled shade tree wood for use in Ornamental Nursery Production. J. Frank Schmidt Family Charitable Foundation - \$6,220.

Owen, Jr., J.S., H.M Stoven, J.E. Altland and L.I. Santamaria. 2009. Screening alternative soilless substrate components for containerized crop production in the Pacific Northwest. Oregon Department of Agriculture - \$26,531.

GRANTS NOT-AWARDED

Developing an economically feasible forest by-product alternative substrate for use in production. Agricultural Research Foundation - \$100,000

Comparing fertilizer application techniques in containerized crop production to compare performance and nutrient use efficiency Oregon Department of Agriculture - \$25,594.

Screening alternative soilless substrate components for containerized crop production in the Pacific Northwest. Oregon Department of Agriculture - \$37,993.

Sustainable nursery and greenhouse growing substrates produced from regional biomass. 2009-2012. USDA-NIFA Specialty Crop Research Initiative. \$3,932,957

Utilization of culled shade-trees to increase nursery economic and environmental Sustainability. Oregon Department of Agriculture - \$12,283.