

2012
Annual Report

for

Multistate Research Project NC-1186
Water Management and Quality for
Ornamental Crop Production and Health

Submitted on behalf of

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to

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on

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Summary

Twenty-eight attendees from twenty-one institutions (Appendix I) met for the 2012 NC-1186 multistate research project annual meeting in Columbus, OH (Appendix II). The meeting was held in conjunction with activities being conducted by the Ohio Floriculture Association (OFA), American Nursery Landscape Association (ANLA) and Horticultural Research Institute (HRI). Furthermore, the meeting was coordinated with a planning meeting for the USDA SCRI planning grant entitled 'Containment, Remediation, and Recycling of Irrigation Water for Sustainable Ornamental Crop Production' that was initiated at the 2010 NC1186 meeting. Attendees were comprised of EPA staff, USDA staff, industry, and faculty, students, and staff from seventeen academic institutions that represented four national regions including central, mid-west, mid-atlantic and southeastern United States. The meeting began with a tour led by Drs. Struve and Altland. Tour stops included a progressive greenhouse operation (Timbuk Farms), nursery operation (Deckers Nursery), and The Ohio State University research farm. The following day Dr. White led the grant development workshop for the SCRI planning grant followed by industry listening session on water issues. Bridget Behe (faculty) presented her current research on consumer marketing use eye-track software. The remainder of the day was utilized by NC1186 participants to discuss potential collaborative research and Extension activities. In the evening participants attended the HRI research reception.

The next day, the formal annual meeting began (Appendix III). Each university and government agency provided a 5 to 10 minute oral station report that included their current activities within the five interrelated areas relevant to this project: 1. source water management and quality, 2. irrigation management, 3. runoff water management and quality, 4. substrate and nutrition management, and 5. pathogens and crop health management. Each oral presentation echoed the 1 to 2-page station report submitted by each state. Each state provided a separate update on the status of water (quality, quantity and regulation) in their region. Graduate students and post-doctoral researchers were also given the opportunity to present their research to peers (Appendix II) via a 15-minute PowerPoint presentation. Jongyun Kim (post-doctoral student) presented his findings on use of sensor networks to monitor and control irrigation in ornamental crop production. John Majsztrik (post-doctoral student) presented early findings of the national survey focused on water issues facing ornamental producers. New business included discussion of website, national survey, future meetings and dissemination of current research or water needs via popular express as a form of outreach. The formal meeting was adjourned on time.

The following day(s), participants attended the OFA Short Course or departed the meeting. Also, other business related to future group meetings and agreed upon goals were addressed (Appendix III).

Accomplishments:

Water resource and management survey of ornamental plant producers was initiated in 2011. In 2012 the survey was disseminated nationwide. Early analysis of data with a small sample size revealed nursery and greenhouse industry trends and assisted in defining stakeholder needs. The survey will be completed in winter of 2012. Data from the survey will be further analyzed in the winter of 2012 and spring of 2013. Results from the survey will be utilized by the NC1186 research project as a baseline defining trends in industry behavior and cultural practices. Furthermore, results will be used to provide insight for ornamental water research and Extension programs nationwide to ensure stakeholder needs are being addressed.

Participants in the NC1186 research group intend to release a four-part series of publications called the "State of Water" to a national trade journal, to educate specialty crop producers about current water issues, use patterns, and practices to more efficiently manage water.

Impact Statements:

Rutgers University researchers secured funding to initiate the 3-year project titled "The Upper Cohansey River Watershed Stormwater Management Implementation Project" that includes a significant portion of funds for a "mini-grant" program to subsidize grower implementation of management practices and structures, with the remainder devoted to education of area nursery growers to improve water quality in the upper Cohansey River, specifically through the reduction of phosphorus, total suspended solids, and fecal coliform bacteria.

Auburn University researchers have begun to quantify the level of salt tolerance for landscape and green-roof crops when using reclaimed water (grey water) as an alternative water source reducing the demand for potable water.

Researchers from the Universities of Georgia and Maryland collaborated in the development and deployed wireless nodes, both with powered devices (nR5) and non-powered latching solenoids (nR5-DC), to monitor and control irrigation events at greenhouse and nursery operations throughout the United States, resulting in decreased water use, decreased crop production time, and decreased crop loss.

Researchers from the Universities of Oregon and Virginia Tech, in cooperation with industry stakeholders, have deployed a commercially viable wireless mesh networks at nurseries in the Northwestern and Mid-Atlantic US to allow nursery producers to monitor the substrate water status via mobile devices resulting in greater communication across management, increased understanding of the impact cultural practices and better comprehend resource utilization and

management.

Researchers from North Carolina State University, in cooperation with personnel from the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) and the North Carolina Nursery and Landscape Association (NCNLA), have monitored source water quality used for irrigation in over 100 nurseries across North Carolina. These nurseries will serve as a cadre of participants that will be sampled longitudinally every 5 years to monitor changes in water quality.

Researchers from North Carolina State University cooperated with the North Carolina Nursery and Landscape Association (NCNLA) and initiated a program to integrate various cover crop combinations into field production of nursery stock to improve soil physical properties, decrease the amount of mowing, and decrease first year fertility costs by introducing alternative forms of nitrogen into production.

Kansas State University researchers have begun to identify alternative, drought tolerant conifer species for Kansas and the lower great plain landscapes.

Kansas State University researchers have also identified ideal irrigation frequency and water application volumes for production of herbaceous perennials in alternative substrates comprised of Eastern Redcedar (*Juniperus virginiana*).

Michigan State University researchers are investigating water conservation practices and subsequent impacts on reducing nutrient losses in runoff. They are irrigating plants based on plant daily water use (DWU), potentially decreasing water use between 20-80% and runoff or leachate by 38-59%, depending on plant species and irrigation treatment.

Michigan State University researchers are investigating the use of organic fertilizers as a replacement for conventional controlled release fertilizer in pot-in-pot containerized production of woody ornamental crops, potentially reducing energy consumption for conventional fertilizers utilized in ornamental crop production.

Researchers at Purdue University are developing new approaches for assessing N loss using various management practices, to determine N movement in the container and to determine the effects of media temperature and moisture content on loss of N by a) N leaching, and b) gaseous N loss via volatilization and denitrification through stable isotope analysis in effort to increase nitrogen use efficiency of crops.

University of Tennessee held a workshop in McMinnville, TN to educate growers on proper calibration and use of air assisted sprayers, to limit pesticide residue on non-target surfaces and ultimately to limit release into in nursery runoff. They utilized water sensitive paper and specialized scanning software to illustrate when surfaces were over-sprayed and how to adjust nozzles based on canopy characteristics. Ninety-seven percent of program participants (54 participants representing 2,470 acres) stated they would reduce inefficient pesticide applications as a result of

attending this program, an estimated saving of approximately \$308 per acre.

Researchers at Texas A&M AgriLife Research hypothesize that the identification of optimum cation (Ca-K-Mg) ratios will enhance the productivity and quality of greenhouse roses while minimizing fertilizer use and their pollution potential.

Preliminary results from a study at Texas A&M AgriLife Research indicate that broadleaf mistletoe infection on native tree species used in ornamental landscapes and parks are significantly affecting the water economy of the trees and surrounding landscapes throughout the year, even in the winter when the trees are dormant. Companion studies are evaluating the frequency and intensity of mistletoe-infested trees in urban and suburban-rural settings.

Clemson University researchers collaborated with researchers from University of California-Davis and Cooperative Extension, University of Maryland, Michigan State University, University of Florida, Texas A&M University, and Virginia Tech to survey and conduct round-table listening sessions with growers throughout the USA. Survey and listening session results are being used to formulate a nationally collaborative grant proposal that addressed research and extension needs explicitly expressed by stakeholder participants.

Clemson University researchers also developed a novel screening method that facilitate screening of aquatic plant species for susceptibility to plant pathogens. These results will be applied to “design” adaptive management practices to limit *Phytophthora* species introduction into the environment or reintroduction into nursery production areas. This research will help protect the environment and facilitate water recycling practices.

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Appendix I – NC1186 2012 Attendees

Adam Newby	Ohio State University, graduate student
Amy Fulcher	University of Tennessee, NC1186 secretary moving to vice-chair
Anthony LeBude	North Carolina State University
Bill Bauerle	Colorado State University
Bridget Behe	Michigan State
Charlie Hall	Texas A&M
Cheryl Boyer	Kansas State University
Dan Hitchcock	Clemson University
Dan Struve	Ohio State University
Eugene Blythe	Mississippi State University
Frank Henning	Environmental Protection Agency- CSREES Liaison, Region IV
Genhua Niu	Texas A&M University, elected NC1186 secretary
James Altland	USDA-ARS, Wooster, OH
Jim Owen	Virginia Tech, current NC1186 chair moving to past-chair
John Lea-Cox	University of Maryland, NC1186 past-chair
John Majsztrik	University of Maryland, post-doctorate researcher
Jongyun Kim	University of Maryland, post-doctorate researcher
Marc Teffeu	American Nursery and Landscape Association
Matthew Chappell	University of Georgia
Michael Mickelbart	Purdue
Paul Fisher	University of Florida
Rosa Raudales	University of Florida, graduate student
Sarah White	Clemson University, NC1186 vice- chair moving to chair
Tom Fernandez	Michigan State University
Tyler Hoskins	Virginia Tech, graduate student
Vickie Wang	Michigan State University
Win Dunwell	University of Kentucky
Yan Chen	Louisiana State University

Appendix II – NC1186 Water Management and Quality for Ornamental Crop Production and Health Meeting Schedule

Thursday, July 12 - Academic and Industry participants arrive and check in
Springhill Suites, Columbus Ohio
SPRINGHILL SUITES COLUMBUS OSU
1421 Olentangy River Rd
Columbus, OH 43212

Friday, July 13 - all day pre-tour of Ohio nurseries / greenhouses. In the evening we will grill out at the Struve's.

8 am: Depart Hotel

9 am: Timbuk Farms (<http://www.timbuk.com/>)

11 am to 1 pm: lunch and travel to Deckers Nursery

1 pm: Deckers Nursery (<http://www.deckersnursery.com/>)

3 pm: OSU facilities overview and tour

6:00 pm: Grill Out at Dr. Struve's House

8:30 pm: Return to hotel

Saturday, July 14 – At Columbus, OH convention center, rm E162 AB (Shuttle provided by Springhill Suites)

8 am to 11 am: SCRI Contain - Grant Development Workshop

12 pm to 2 pm: SCRI Contain Industry Panel Discussion at convention center

2 pm to 5 pm: Discussions among multi-state participants regarding future opportunities (grants, projects, Extension or outreach collaborations)

6 pm to 8:30 pm: HRI will co-host a summer reception with the American Nursery & Landscape Association (ANLA) on Saturday, July 14, 2012 from 6:00 to 8:30 pm at the Hyatt Regency Columbus (Franklin Ballroom - CD on the Second Level).

Sunday, July 15 - At Columbus, OH convention center, room E162 AB (Shuttle provided by Springhill Suites)

9 am to 5 pm - NC1186 Annual Meeting Agenda

- Introductions
- Comments from administrative and industry advisors
- Concise oral station reports (5 min each, one per institution)
- Student presentations (12 min with 3 min for questions)
- Current regulation and issues by region
- Lunch (no host)
- Old Business
 - Subject reviews for publication
 - Website
 - Survey
 - CRIS reports
- New Business
 - Officer nominations for Secretary
 - Popular press article
 - Grant opportunities reports
 - Recruiting new members
 - Next meeting time and location
 - Mid-term review 2013
 - Renewal 2014
 - Australia 2014
 - Other new business

Evening – OFA annual reception at Howlett Hall at annual trial gardens (reception pending) Dinner as a group or on your own in Columbus, OH (no host)

Monday, July 16- At Columbus, OH convention center (Shuttle provided by Springhill Suites)

Attend OFA Short Course or depart meeting

<http://www.ofa.org/shortcourseinfo.aspx>

Also note there will be an OSU Open house of the OSU annual trials, with buses leaving and returning to the Convention Center.

Dinner as a group on your own in Columbus, OH (no host)

Tuesday, July 17

Academic and Industry participants depart

Introductions

Introductions

Industry report - Marc Teffeau, ANLA

- Industry is stable, glut in inventory is moving on, even some shortages. Major cuts by growers led to some current shortages. Smaller becoming more niche-oriented and big getting bigger, no major turnaround for 7-10 yrs. because of market demographics, not the economy.
- Eight million fewer consumers in Gen X and Y.
- Gen x and y have big educational debt and are not marrying or establishing their own households.
- Not going to be the growth industry it was since the 70's, which depended on baby boomers.
- Color, new plants are driving the market. Product differentiation is one way to differentiate and increase competitiveness.
- Some branding programs are looking at how they can position themselves
- Global warming:
 - Warns of make sustainability claims of production or practices they can't substantiate. That's why funding Bob Schuzke & Auburn to ensure claims of sustainability are backed by research.
- The anticipated 30-40% increase on price for "Green" isn't happening.
- Discussion - 7 yr. average life of urban tree. Are drought & storms good for plant sales? Replacement plants?

- Farm Bill
 - Research titles are stable or up because research is not controversial.
 - Senate bill is out there. House bill passed.
 - Boehner doesn't support the bill.
 - SCRI, Block grants – stable funding.
 - Senate Bill.
 - We have specialty crops farm Bill Alliance.
 - 2 issues pushed through – match & how decision making was made – more industry oversight.

- IR-4 isn't in Farm Bill. Separate.
 - In President's Budget – move to consolidate IR4 & regional IPM centers - a serious industry issue.
 - IR-4 is not IPM. Very disingenuous of NIFA to try to merge them.

- HRI - Over last few years become more systematic.
 - No longer funding plant breeding – not accountable enough. Branded program bring plants to industry & IP stays at state.
 - They'll look at working with National arboretum on long-term research. National arboretum will add resistance to biotic abiotic stress. Then color aesthetics added.
 - Looking at using a RFP rather than broad, open application.
 - Got rid of <5K category.
 - Grant \$ are driven by how investments are doing.
 - \$215,000 this year.
 - They want IP ownership – they treat projects with IP potential differently now than in the past. Looking at return on investment.

- EPA may have regulatory authority of pesticide applications over water rather than FIFRA.

- ANLA & OFA merger occurred this year
 - Government relations office in DC still.
 - Management clinic shifted to Nashville, TN.
 - HRI - separate management than ANLA as is a different type of non profit entity and oversight of various non-profit types is different.
 - Floriculture funding
 - American Floral Endowment
 - Fred C. Gloeckner Fund
 - HRI (ANLA) will not to take nursery funding to fund greenhouse work.

- When the deadline approaches for SCRI grants – many researchers ask HRI/ANLA for a letter of support., but ANLA needs to provide input along the way and be involved in the development and have a voice in how the project develops.

- National Issues Task Force (NITF) committee of ASHS.
 - Republican staffers had as much support for agriculture research as democrats.
 - House Ag Farm Bill markup.
 - There will be a farm bill this year both sides see it's the only way to show they can accomplish something.

- SCRI:
 - 25 mil FY13
 - 30 mil FY14 & FY15
 - 65mil FY16
 - 50 FY17
 - SCRI is now a permanent part of USDA budget.

- OREI – funding is likely discontinued in next Farm Bill.

- AFRL – 700 million has been allocated.
- USDA folks matching with their federal salary now possible.
- Good that SCRI didn't get rolled into AFRI .
- ASHS = Spec. Crops ~400 crops.
- 50% of crop farm gate value.
- The majority of people we are serving have 400 acres.

Station reports

Cheryl Boyer – Kansas

- New member

Amy Wright – Alabama

- reclaimed water from campus hand washing stations.

Amy Fulcher - Tennessee

- UT – hiring TN – good spring, few losses. Fruit producers are doing well. Booming!
- Dissolved Oxygen levels in irrigation water – enhanced growth & interest in in part of IPM to prevent root rot pathogens.
- SCRI – bio containers & DWU & on-demand-based system & looking at ability to water use with/o increasing production time. Sensor placement.
- SCRI – Intelligent spray –plant growth regulators and pruning effect on plant architecture & how they affect volume of water used for optimum spray coverage.
- iBooks Sarah White and I have some experience now – Not volunteering Sarah - but may be able to answer questions. Ditto smart phone app.
- Comment: 1-2 out of 10 growers are having alkalinity issues.

James Altland - Ohio

- Nutrient release from CRF
 - Oscillating
 - → 40 C doesn't make that much of difference.
- Biochar – moderates the release of the fertilizer – peak isn't as high & it is wider but ultimately same amount of N is released.
 - The source of the biochar makes a difference in what nutrients the char has. A lot of P in biochar.
 - It's charcoal intended for ag., not the grill.
- The gases that some of the pyrolysis are captured for biofuel.
- Farm gate ↓ 20%.
- Only best operations are left.

Matt Chappell - Georgia

- Water replacing PGR's – hydrangeas.
- Fertilizer leaching at various volumetric water contents (VWCs) & N rates.
- Differences on VWC and phenotype response.
- On farm trials of precision irrigation system.
- Nursery affected by fracking for gas:
 - Was pH 7 to 9.5 after fracking & sodium off of the charts.
 - 187 ppm Na >100 x normal level (or 1000 x).
 - Nurseries are 3 miles from fracking.
 - Marine biology lab analyzed hydrocarbons & phenols, bicarbonates were very low. Calcium went to 1 ppm.

Frank Henning - EPA

- Requiring infiltration of storm water is a focus. An 85 or 95% storm event 1" – 1.5" rain event.
- How instream flow is regulated.

Bill Bauerle - Colorado

- Water costs:
- \$500 A/ft.
- \$1500 A/ft. in CA
- All water flows out of CO.
- Jim Klep only other person in nursery/water == his position avail. In ~ 3 yrs.

Mike Mikelbart - Indiana

- Kyle Daniel 100% nursery landscape extension.
- Jennifer Dennis & Roberto Lopez.
- Nitrogen gas loss from containers.
- M1 - Never bounced back from last recession. Ind. Consolidation occurred earlier.
- Bert: Organic to CRF.
 - No growth differences
 - Not much leaching for either fertilizers
 - Need to look at economics of it.

Sarah White – South Carolina

- SC growers moved a lot of plants in the spring.
- Regulations- have to report if withdrawal water.
- Pathogen remediation, developed novel infection method for evaluating plant susceptibility to pathogens.

Jim Owen - Virginia

- Industry doing well this spring.
- Drought has hurt them.
- Water centric institution.
- Impaired waters – levels above what they should be.
 - Chesapeake Bay dominates 2/3 of state.
 - In 2025 water availability may become a major issue for VA.
- Ping Kong - CO₂ in water can help pH issues & pathogen issues.
 - Linking retention pond mgt. with plant cultural practices -> optimizing them to pond management.
- If growers use phosphorus from wastewater as a fertilizer source, can they get nutrient credits for removing from water?

Water Concerns Discussion

- Texas
 - Need more info before can report.
- Ohio
 - Lake Erie surrounding countries: fertilizer can't have P (rule is for home owners only).
- Kentucky
 - Water is crisis management.
- Mississippi
 - Lots of discussion of consumer water use.
 - Has been water rich historically. Lake Ponchartrain has foundation.
- Colorado
 - All water is in reservoirs & farmers own them.
 - Farmers will lease their water rights for a year to Denver.
- Indiana
 - Advocacy groups are starting to show interest.
 - Effort to ban phosphorus application to home (lawns) was shot down. Leaf litter has really high Phosphorus!
- Florida
 - Looked at numerical nutrient criteria and that is being pushed in SE region.
 - FL is most P rich soil except HI. 40%/ of world's P comes from FL.

- Chesapeake Bay
 - How will Pennsylvania comply with TMDL? PA is responsible for 30% of reductions that need to take place to meet TMDL.
 - Impervious tax in DC now and coming to MD. Just passed law all urban fertilizer applications are reported by landscapers (not homeowner). Fertilizer with phosphorus are not supposed to be in stores unless starter fertilizer with low phosphorus levels.
 - Incentives: Green roofs count as an impervious surface reduction.
 - Bay Ag Nutrient Committee
 - Save the Bay magazine Spring 2012
 - What it costs for 1 nitrogen credit?
 - \$30 – 50
- Maryland – Regulation passed in early 2000 to mid 2000's.
 - St. Laurence Sea Pact.
 - County by County homeowner restrictions.
 - Landscapers base fertilization regimen on soil test results.
 - Alkalinity >200 ppm.
 -
- Tennessee
 - Have lots of water – little perceived need to conserve water.
 - Not all high quality.
 - High alkalinity.
- South Carolina
 - Extension service is trying to educate people on water conservation practices to limit contamination of agricultural runoff.
- Virginia
 - Water quality variable.
 - 2007 is fresh on one's mind – they built 2nd ponds.
 - Boxwood Blight & Phytophthora are driving irrigation practices.
 - 95% containment is required by Phase II reg. but it isn't defined.
 - Have nutrients management plans that must be in place to fertilize.
 - Certified nutrient planner must write the plan. Not nurseries at this time.
- Massachusetts has TMDL for impervious area.

- Use of Sensor Networks.
 - Decrease disease losses 50% with sensor networks: Gardenia (potential for disease reduction for *Rhododendron* & *Pieris*).
 - Decrease in production time is really savings.
 - Gardenias – no flood treatment.
 - 2.40/ft.2 ↑ in profit
 - 5.90/ft 2 150/ ↑ in profits
 - 14 mo. to 10 mo. Prod. time
 - 3 gal 36 mo. to 22 months
 - A tiny bit of stress bends the growth curve.
 - Snapdragons: Less “grassiness” and lateral branching with their irrigation regime.
 - Winter ↑ WUE
 - ~ 27.8/. VWC
 - NR5 monitoring
 - 4-6 times/day quality was better w/sensor
 - 1-4/day great quality
 - Badger 1 gal resolution \$110.00
 - Netafim flow meter every gallon is a click

New Business

- 2014 will be renewal so the new secretary will need to shepherd that process. John Lea-Cox – “Could be team effort.”
 - Amy nominated Genhua Niu as new secretary.
 - Altland 2nd
 - No additional nominations.
 - Unanimous vote affirming Genhua Niu as new secretary.
- Must have meetings in separate Federal Fiscal Year.
 - ASHS 22 – 25 July in Palm Desert, CA
 - SNA 5 – 7th Aug.
 - Have next mtg. before ASHS in Palm Desert.
 - Yan & Don M. may have H₂O treatment contacts
 - One-day nursery tour on the 2nd day of meeting, drive south toward Palm Desert, 1 day of meeting on drive south.
 - Executive committee will determine exact location, dates, & agenda and send email to NC1186 list-serve.
- Tentative NC1186 meeting in association with International Horticulture Congress in 2014-Brisbane – because Australia has novel management techniques for nurseries that are water limited, their knowledge could be very useful to US growers.

- Doug Buehler. stated in email:
 - Your station resort is important for midterm review as are meeting the group's objectives.
- Jim Owen will submit the report within 30 days to NIMMS.
- Jim Owen broached the idea of writing a series of 4 articles for NMPro and GMPro – “The State of Water” topics could include:
 - National outlook on water issues
 - Imbedded costs of water (Dewayne Ingram)
 - Alternative water sources
 - Water saving irrigation technologies
 - Water treatment options

Old Business

- Julie's survey – we decided not to do, at least temporarily
- Subject review refereed publications proposed at first meeting.
 - Tabled as an objective of the group- not enough interest or follow-through.
- Website – moving server to droople – website should be completed sometime this fall < hortwater.org>.
- John Lea-Cox, Sarah White, & Amy Fulcher will work together to insert content.
- Survey NC1186 adopted last year – move to change survey to a more simplistic survey that we can get higher response rates to – that will more reflect the heartbeat of water use by our stakeholders.
 - Questions like:
 - Do you treat your water?
 - Do you use solenoids?
 - How much water do you pump?
 - Short, concise, 2 - 5 minutes to complete
 - Table implementation until 2013 meeting so that survey fatigue is not excessive.
 - Select 10 questions from current SCRI (MINDS & Contain) survey.
 - Potential for incentives to increase participation and completion of survey.
 - Have survey ready for IRB approval by next years NC1186 meeting in CA.
 - Perhaps (if possible) link to Dr. Hall's economic survey so we can draw additional conclusions.
 - perhaps our top 3 questions into Dr. Hall et al.'s survey
 - next year is census year.
 - Survey should be short & iPad compatible.

Meeting Adjourns