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**Background**

The Washington State University Center for Sustaining Agriculture and Natural Resources (CSANR) entered into this agreement with the U.S. Environmental Protection Agency (EPA) Region 10 for the purpose of identifying, evaluating, and demonstrating alternative pest management methods and strategies to replace chemical controls lost due to factors including the emergence of pest resistance and the implementation of the 1996 Food Quality Protection Act (FQPA). An outcome of this process will be an improvement in the working relationships among private and public institutions, communities, and individuals concerned about the future of agriculture and the natural resources upon which we all depend. By decreasing dependence on single pest management strategies and supporting diverse cropping systems and integrated pest management strategies, we ultimately increase the resilience of farming systems and improve the utility and cost effectiveness of all pest management strategies.

**Criteria for Project Selection**

Due to the number of minor crops grown in Washington and the variety of pest pressures growers face, there was no shortage of potential projects for the funds allocated. Projects were rated using the following principles:

1. High potential for positive impact but unlikely to be supported by private sector development due to commercial disincentives.
2. Community-based, grower-supported approaches in education, application, and research.
3. Integration of pest management strategies across all elements of the farm system.
4. Existing but underutilized technology that is demonstrable to practitioners.
5. Incorporation of natural processes such as pest-predator relationships, nutrient cycles, and nitrogen fixation into the production process.
6. Reduction of off-farm inputs having the greatest potential for environmental harm or human health effects.
7. Maximizing productive use of biological and genetic potential of crops or animal species.
8. Education of pesticide applicators on integrated pest management (IPM) and alternatives to chemical control.
9. Improving match between cropping system patterns and land utilized.
10. Supporting improved farm management (resource conservation and sound financial management).
11. Providing measurable outcomes.
12. Matching funds, personnel, or in-kind resources to leverage available resources.
13. Potential for transferable results to other geographic locations.

A call for proposals was issued in Winter 2001. Submitted proposals were jointly reviewed and ranked by the EPA Project Officer and the Washington State University (WSU) IPM Coordinator using the criteria listed above. Those projects demonstrating the most potential for eliciting positive change in Pacific Northwest pest management strategies over the next five to ten years were selected.
Funding Distribution by Project

<table>
<thead>
<tr>
<th>Project Leader</th>
<th>Project Title</th>
<th>Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foss, Carrie</td>
<td>WSU IPM certification program</td>
<td>$7,612.50</td>
</tr>
<tr>
<td>Masters, Chuck</td>
<td>Duff removal project</td>
<td>$7,612.50</td>
</tr>
<tr>
<td>Hadwiger, Lee</td>
<td>An evaluation of two chemical fungicides for potatoes</td>
<td>$7,612.50</td>
</tr>
<tr>
<td>Patten, Kim</td>
<td>Efficacy, fate, and persistence of Arsenal (imazapyr) for control of two diverse aquatic weeds: an emergent estuary grass (Smooth Cordgrass, Spartina alterniflora), and a submersed emergent dicot (Parrotfeather milfoil, Myriophyllum aquaticum).</td>
<td>$7,612.50</td>
</tr>
<tr>
<td>Jones, Vincent</td>
<td>Development of software for palm hand-held computers to improve the implementation of IPM in deciduous fruits</td>
<td>$3,560.00</td>
</tr>
<tr>
<td>Brunner, Jay</td>
<td>Survey of IPM practices in Washington tree fruits</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Miles, Carol</td>
<td>Cover crops for weed control in vegetable production systems</td>
<td>$8,500.00</td>
</tr>
<tr>
<td>Daniels, Catherine</td>
<td>Proposal for enhanced IPM education</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>Williams, Marty</td>
<td>Integration of chemical and biocontrol for suppression of volunteer potatoes.</td>
<td>$5,140.00</td>
</tr>
<tr>
<td>Granatstein, David</td>
<td>Cultivating Biological Connections – Northwest Symposium on Organic and Biologically Intensive Farming: Advances in Research and Education</td>
<td>$1,647.00</td>
</tr>
</tbody>
</table>

Total $63,297.00

Summary of Results

Short individual project reports are located in the Appendix. In-depth project reports have been developed into feature articles for the Agrichemical and Environmental News newsletter, a WSU monthly publication dealing with agrichemicals and their effects on human health and the environment. These articles will be published during the spring quarter of 2003. This report is also on the Center for Sustaining Agriculture and Natural Resources (CSANR) Web page at

An overall summary of the funded projects with respect to the thirteen criteria for project selection follows. The ten projects funded (Foss, Masters, Hadwiger, Patten, Jones, Brunner, Miles, Daniels, Williams, and Granatstein) each satisfied criteria 1, 11, 12, and 13, i.e., positive impact, measurable outcomes, leveraged resources (match of funding, in-kind support, etc.), and transferability to geographic locations other than the study site.

While all projects were designed to serve a significant grower base, those most clearly able to demonstrate criterion 2, community based grower support, were from Jones,
Brunner, Masters, Miles, Williams, Granatstein, and Patten. The Masters project came directly from the affected grower base.

Of the ten projects, six were most focused on criterion 3, identifying (Patten, Miles, and Williams), evaluating (Brunner), or demonstrating (Jones and Granatstein) integrated approaches.

Two projects, those by Masters and Jones, used very innovative approaches to identify and incorporate existing but underutilized technologies for addressing pest management techniques, thereby fulfilling criterion 4. Masters’ approach was to modify a turf sweeper for forest seed orchard use and Jones’ approach was to design software to tie easily transportable palm-held computers into pesticide decision-making databases.

Both Williams and Jones addressed criterion 5, the utilization of natural processes for enhancement of IPM, but in very different ways. Williams’ approach was in elucidating pest weakness and thus control, while Jones’ approach was to bring existing information on natural processes (natural enemies’ susceptibility to chemicals) directly to those making on-the-ground decisions in orchard spray programs.

With respect to criterion 6, each of the ten projects had a goal of reducing unnecessary chemical use. These reductions were approached in a variety of ways, however, ranging from increasing applicator knowledge to foster thoughtful decisions (Foss, Jones, Brunner and Daniels), to identifying more selective pesticides (Patten) or more environmentally benign ones (Hadwiger), to decreasing pest pressures through natural competition (Miles and Williams) or physical removal (Masters).

Incorporating plant health as a pest management approach, thereby addressing criterion 7, was the focus of two projects. Hadwiger’s project focused on the health of the crop while Williams’ project examined the mechanism for the declining health of the weed pest.

While the ultimate intent of all research projects is to transfer the information to growers in the most expedient way, three of the projects (Granatstein, Foss, and Daniels) exclusively focused on criterion 8, using workshops, seminars, and media (printed and Web-based) to accomplish this goal.

None of the funded projects focused specifically on criterion 9, improving match between cropping system and the subject land.

Criterion 10 was addressed by Patten, Hadwiger, and Williams. Resource conservation, particularly water quality and aquatic habitat, was a demonstrated outcome of the Patten research, and both the Hadwiger and Williams projects provided possible economic benefits to the grower through reduced pesticide inputs.

Four of the project outcomes are immediately identifiable as the projects have now been concluded (Foss, Jones, Brunner, Daniels). Final outcomes for the other projects, funded at earlier stages of research, will not become completely evident until research is complete (Patten, Masters, Hadwiger, Miles, and Williams). In all cases, research results are very promising and the mandates for the funding under discussion were met.
Of particular interest is the Brunner project, which measured grower behaviors (chemical choices and use patterns) across an 11-year time span during which strong efforts were made by WSU research and extension agents to educate growers and field personnel on emerging IPM practices in tree fruits. This survey will greatly assist educators in identifying the need for and disseminating specific IPM information, as well as provide current information to regulatory agencies about the common chemical use patterns in orchard systems.
The Washington State University IPM Certification Program project was initiated to provide landscape and turf managers with the knowledge they needed to implement successful IPM programs. Landscape and turf professionals need to understand the cultural requirements of the plants being grown and the biology of the pest problems. We sought to develop a program that would provide them with this base of knowledge as well as teach them how to develop a site survey and IPM plan, improve plant health through cultural strategies, monitor pest population, maintain records, and determine when pesticide use is appropriate in an integrated approach.

During the project period, teams of entomologists, pathologists, and weed scientists developed curriculum for landscape and turf professionals with research-based information on managing plant problems using an integrated approach. Cultural practices, biological controls, and utilization of pest-resistant varieties of common landscape and turf pests were outlined, with an emphasis on minimizing environmental and human health effects. Our team developed instructional tools including electronic presentations and fact sheets.

The IPM Certification Program courses and workshops were conducted through the WSU Pesticide Education Recertification programs. Each of approximately 3,000 landscape and turf professionals attended six hours of this specialized IPM training at twelve western Washington locations during 2001-2002.

Program attendees received an IPM notebook containing fact sheets and six credits toward a WSU IPM certificate. WSU IPM Certification was obtained by completing 30 hours of IPM training offered through WSU Cooperative Extension. The 30 hours included a minimum of twelve hours of hands-on IPM workshops. Seven hundred forty-three licensed pesticide applicators registered for the WSU IPM Certification credits and seventeen participants completed their WSU IPM Certification requirements during the project period.

A subsample of the WSU IPM Certification program participants were surveyed to determine if they adopted the IPM practices taught in the workshops and recertification courses. Survey responses showed that 81% planned to adopt an integrated approach to managing pest problems in turf and landscape areas and 12% reported that they already practiced IPM. Ninety-seven percent of those surveyed also reported that the training increased their diagnostic skills for identifying pest problems in turf and landscape areas. The expected outcomes of improved diagnostic skills and the adoption of IPM strategies are decreased pesticide use and improved plant problem management.
The goal of our project was controlling the cone gall midge, a pest of Douglas-fir, by managing duff (organic litter) in a Douglas-fir seed orchard.

Douglas-fir seed damage by the cone gall midge is an important cause of reduced seed yield in Douglas-fir seed orchards. Midge infestations have destroyed up to 80% of the seed in some instances. The industry relies strongly on genetically improved seed, the production of which is labor- and cost-intensive. Because each and every tree in a seed orchard is expensive to produce, insect damage can result in significant economic loss. Pesticides have been used to control the midge, but the Food Quality Protection Act has already made some of these chemical choices unavailable.

A non-chemical option to control this pest seems feasible. Orchard duff is the overwintering habitat of the cone gall midge. By removing the habitat, it is likely we can reduce midge populations. The funding we secured from EPA and others is being used to modify a turf sweeper to enable removal of orchard duff.

Modification of a Tuff Vac 5000 for the purpose of duff removal is being completed by the United States Forest Service Equipment Development Center in Missoula, Montana, under the direction of Keith Windell. The modifications are currently in progress and nearing completion. Modifications include offsetting the hitch and chute, rotating the chute, extending the frame and rear axle, designing and fabricating a bin and dumping mechanism, and purchasing a self-dumping trailer, including fabrication of the trailer sides. Upon completion and testing, the equipment will be used in an operational trial scheduled for October 2003.
**Phytophthora infestans** is a serious fungal pest in potato, causing the disease known as potato late blight. Currently infections are held in check with 10 to 12 weekly fungicide applications on potato foliage. This pathogen can also follow the potatoes to storage, bringing the date of these preventative treatments ever closer to the edible stage of the product. The goal of our project was to evaluate alternative chemical fungicides for potatoes and identify a product that could greatly reduce the break-even costs to growers without creating environmental concern.

My laboratory had the opportunity to combine preparations of two natural chemicals that have a potential to induce natural disease resistance in plants. One is a copper compound with antimicrobial properties, the exact chemical composition of which is presently proprietary. The second compound is chitosan, which is approved for human consumption. Both compounds have cleared EPA for use in agriculture.

The major findings of this study are that

1. the chitosan/copper compound treatment provides a level of protection against late blight that is comparable to commercially available fungicides;
2. the concentration of this chitosan/copper treatment is from 40- to 100-fold less than the level of copper found in the fungicide Kocide; and
3. due to low ingredient cost and low application rate necessary to achieve efficacy, this new treatment will substantially reduce the costs of late blight control.

The next step is to provide documentation towards making this treatment available commercially. This will be accomplished by obtaining data for additional seasons at Monroe, where the conditions are optimal for infection and the potato is confronting multiple strains of the pathogen, and continuing pathological assays under controlled conditions for additional information on treatment retention, treatment intervals, and optimal fungicidal procedures. Results indicating the continued success of this copper/chitosan treatment will provide the motivation for the manufacturers of the individual components to proceed toward the expensive process of marketing the combination treatment.

I have set the stage for the commercial phase of this project by disclosing the treatment to the WSU Foundation, initiating the process of clearing this treatment through the EPA, and holding preliminary discussions with two manufacturers who have expressed an interest in patenting and marketing the treatment.
The objectives of this study were to determine the fate and persistence of imazapyr applied in an estuary, evaluate its efficacy for control of parrotfeather milfoil (\textit{Myriophyllum aquaticum}), and evaluate its efficacy for control of smooth cordgrass (\textit{Spartina alterniflora}).

Fate and persistence were studied via a series of both water and sediment samples at a variety of distances and time intervals. Imazapyr was found to decay extremely rapidly in both in water and sediment, reaching near-zero concentration at the application site after 40 and 400 hours, respectively. Samples taken in water also showed a rapid decrease in concentration at a short distance from the spray zone. (Water collected just 6 or 60 m outside the spray zone at the first incoming tide had an imazapyr concentration equivalent to water collected at the immediate edge of the spray zone at the seventh tide.) We also compared the imazapyr concentration in areas with and without a Spartina canopy, and found that the presence of the herbaceous growth caused a five-fold decrease in the amount of imazapyr initially reaching the sediment.

We found that imazapyr provided excellent control of parrotfeather milfoil. Control achieved with imazapyr was slightly (though not statistically) better than that achieved with glyphosate in a comparative test. We plan to conduct further testing in the summer of 2003 to better distinguish between the two chemical treatments.

In examining efficacy on Spartina, we again compared imazapyr to glyphosate, using a crop-oil concentrate with imazapyr and a non-ionic surfactant with glyphosate. Efficacy evaluation was based on a visual rating of percent control and stem density compared to an untreated check 9 to 14 months after treatment. As with parrotfeather, we found imazapyr to be more effective than glyphosate for Spartina. Effective rates for imazapyr were one tenth those of glyphosate. Spartina control was also more consistent with imazapyr than with glyphosate. Imazapyr required a shorter drying time and was more effective across the range of estuary conditions than glyphosate.

We also examined ecosystem effects of imazapyr. From an aquatic toxicity profile, the data compared favorably to other herbicides (fluazifop-P and haloxyfop-ethoxyethyl) used for Spartina control elsewhere in the world. From an ecosystem management perspective any effect of imazapyr on nontarget plants would be insignificant.
The goal of our program was to take advantage of the unique opportunity afforded by the current state of hand-held computing by developing software that would assist growers, field personnel, and consultants in making complex pest management decisions in the field.

IPM programs are typically more complex than simple, pesticide-based management systems. Unfortunately, this complexity means that almost by nature, practitioners end up making decisions with inadequate or out-of-date information. In deciduous fruits, the impact of FQPA on organophosphate insecticide (OP) use and the shift toward mating disruption of our key pests has exacerbated this situation. For example, mating disruption increases the role of natural enemies, but it also increases the diversity of pests encountered because broad-spectrum OPs are no longer providing ancillary suppression of secondary and rare pests. Adding further to the complexity of the situation, many consultants are unfamiliar with some of the aspects of the newer pesticides, such as their effects on natural enemies, timing for optimal efficiency, and relative efficacy.

While education and educational materials (bulletins, Web sites, presentations) are key factors in helping growers deal with the increasing complexity of newer IPM systems, we felt that the current state of hand-held computing offered a unique opportunity for influencing IPM programs. The computers are inexpensive ($150-$500), have relatively powerful software packages (including relational databases), connect and backup easily to desktop computers, and are small and light enough to fit in a shirt pocket for field use.

We have used the Palm OS platform to develop a relational database based on the current crop recommendations in the Crop Protection Guide for Tree Fruits in Eastern Washington (Washington State University publication EB0419). The database ties together pesticide recommendations and rates for the different pests, relative efficacy of the materials (when known), and the effects of the pesticides on natural enemies. In addition, it lists any precautions, restrictions on re-entry, pre-harvest intervals, and pesticide use patterns. These data are searchable and can be updated by linking to the WSU Tree Fruit Research and Extension Center Website, where complete documentation is also available.

For the 2002 season, we provided the insecticide and disease recommendations for apple, pear, cherry, peaches and nectarines, and apricot. The databases were available for Palm OS computers, and for Windows (using Microsoft Access and Filemaker Pro) and Macintosh (using Filemaker Pro) operating systems.
Our project sought to document the pest control practices among Washington State tree fruit growers across an eleven-year span of time between 1989 and 2000. Objectives included documenting how practices changed over time and quantifying the current state of pest control within the grower group surveyed.

The data collected and analyzed included timing, application method, spray volume, percent of acreage treated, and types of chemicals applied (which ones and at what rates). Our survey methodology attempted to anticipate reporting difficulties including chemistries that are used for more than one purpose. We gathered usage data on thirty-two insecticides/miticides, twenty-one fungicides, eleven plant growth regulators, seven supplemental nutrients, and fifteen herbicides.

Obviously, treatment availability affected usage across this eleven-year period. Most notable among the insecticides were the loss of Ethyl parathion, Methyl parathion, Phosphamidon, Propargite, Systox, Ryania, and Trithion and restrictions on Azinphosmethyl. Newer, “safer” chemicals including abamectin, azadirachtin, diatomaceous earth, fish oil, kaolin, spinosad, and tebufenozide showed expected increases.

A comparison of fungicide usage reflected the fact that Metiram and Oxythioquinox had become unavailable in 2000, but had been replaced by kresoxim-methyl (Sovran), Oxytetracycline, Propiconazole, Thiram, Trifloxystrobin, and Triflumizole (Procure). Use of Captan, copper, mancozeb, myclobutanil, Ziram, and sulfur increased in 2000, while use of fenarimol, lime sulfur, and triadimefon decreased.

Plant growth regulators (PGRs) are used by tree fruit growers for a variety of reasons, the most common being chemical thinning. Our report explains the various uses for the PGRs as well as quantifying them. The most pronounced change for a PGR was an increase in Carbaryl use from 96,000 lb in 1989 to 279,000 lb in 2000.

The 2000 crop season saw a reduction in the use of most of the available herbicides, except for glyphosate and oxyfluorfen. An increased use of these chemicals may be a reflection of the loss or reduced reliance on the other chemicals listed.

Regarding issues of topical interest, our surveys also revealed that the average last spray date for apple growers was greater than three weeks before harvest and that, while mating disruption is prevalent, more than half of the practitioners use their pheromone dispensers at half the recommended per-acre density.
Our project compared efficacies of weed control in vegetable crops achieved by the planting of cover crops. The eventual objective of this research is to offer growers an effective non-chemical weed control alternative that requires less labor, time, and fossil fuel resources than mechanical control.

In our study we overseeded winter cover crops in demonstration plots of edamame (vegetable soybeans) and dry beans, then measured the subsequent weed stand and weed weight. In 2001, we tested five cover crops: black medic, cereal rye plus Austrian winter pea, crimson clover, annual rye grass, and Sudan grass.

All cover crops resulted in lower weed weight than the control plots, but the differences were not statistically significant. In the fall, weed weight was lowest in the crimson clover treatment, but by late winter it was lowest in the annual rye treatment. It was highest in the cereal rye plus winter pea mix. All cover crop treatments resulted in a significant decrease in the number of weeds compared to the control treatment. The control and Sudan grass treatments had the greatest diversity of weed species while annual rye had the lowest weed species diversity. Annual rye also achieved the greatest biomass of the cover crops.

We concluded that weed suppression due to cover crops is likely a function of both numbers of cover crop plants and cover crop biomass. In general, we found that Sudan grass and annual rye grew too vigorously for this overseeding system while medic was not vigorous enough. Annual rye was difficult to control in the following year, coming back as a weed. From our observations, the cereal rye and crimson clover performed well in the overseeding system.

Winter cover crops can reduce weed growth in a subsequent vegetable crop and the crops’ growth can be optimized if they are sown in the summer into a standing vegetable crop. Timing of winter cover crop overseeding is critical; it should be late enough that there is no or little competition between the cover crop and the vegetable crop, yet early enough that the cover crop becomes established before winter.

We are continuing our study with modifications suggested by the first year’s results. Due to an infestation of halo blight (*Pseudomonas syringae*) in our dry beans, we adjusted our cover crop treatments so that we could investigate potential control options of this soilborne disease as well as weeds. We added brown mustard and Caliente mustard, and removed the winter pea addition to cereal rye. We also increased the seeding density of cereal rye threefold. In 2003, the plots will be planted with a single variety of halo blight-susceptible dry beans and we will evaluate weed and disease pressure in each plot.
Appendix of Individual Project Reports
Report: 8 of 10
Leader: Catherine Daniels, WSU
Project: Enhanced IPM Education

Our project sought to increase end-user exposure to current integrated pest management (IPM) research information by forming a partnership between the Alternative Pest Management Strategies for Integrated Pest Management (a.k.a. IPM Mini-Grants) program and the Washington State Pest Management Resource Service (WSPRS, formerly Washington State University’s Pesticide Information Center). The purpose of this collaboration was to promote grower understanding and implementation of IPM practices by exposing them to cogent reports of IPM programs relevant to Washington production systems.

A gamut of agricultural issues affect producers within Washington State and the Pacific Northwest. Pest management decisions require input on not only pest pressures but also on human and environmental exposure potential to agrichemicals used in pest management. A need for education and information dissemination exists in several areas, particularly, appropriate use of IPM techniques.

The Agrichemical and Environmental News (AENews) is a widely read monthly newsletter featuring reports and original analyses on agrichemicals and their effects on humans and the environment. It is an effective vehicle for educating Washington agricultural producers. Past issues of AENews have featured articles on IPM, but the need exists for more information, particularly on current projects in Washington State that promote understanding of IPM principles and applications.

Grant funds were used to support a writer/editor who was responsible for editing and formatting the reports, using standard publication practices, into a form suitable for publication. All project reports were summarized and collated into a final summary report and submitted to the funding agency in December 2002; in addition, the project reports have been edited into article format for publication in AENews. The articles have been entered into the regular newsletter publication schedule and are slated to appear in early spring 2003. In addition to the standard HTML format for the newsletter, articles have also been converted to PDF format in order to facilitate printing and further dissemination at professional meetings.
The purpose of this work was to combine chemical and biological control methodologies toward suppression of volunteer potatoes, then to evaluate this approach. While chemical and biological control are basic components of integrated weed management, few studies identify the extent to which herbicide-induced stress and arthropod herbivory reduce weed fitness.

When potato plants appear unintentionally outside their intended rotation in a cropping system, they become weeds with respect to the intended crop. Our model study system involved volunteer potato (the weed), Colorado potato beetle (the biocontrol agent), and sub-lethal doses of fluroxypyr (the chemical agent).

Herbicide dose-response bioassays were conducted both with and without arthropods feeding on the weeds. Logistic model parameter estimates for leaf area and shoot biomass indicated larval herbivory improved suppression of volunteer potato with fluroxypyr herbicide. Further, we found that less herbicide was needed when beetles fed on the weed than when they did not; biologically effective doses of the herbicide were in fact 60 to 80% lower in the presence of the feeding beetles.

In the field, we found that weed fitness was significantly reduced with fluroxypyr or when beetles were allowed to defoliate the weed. When beetles were present, volunteer potato leaf area was reduced 47%, shoot biomass was reduced 21%, and tuber biomass was reduced 20%, compared to the situation when no beetles were present.

Our conclusion was that integrated weed management systems targeting volunteer potato could be more effective when the Colorado potato beetle defoliates escaped weeds.
The *Northwest Symposium on Organic and Biologically Intensive Agriculture* was held in Yakima, Washington on November 8 2002. The Symposium was organized and sponsored by the Washington State University Center for Sustaining Agriculture and Natural Resources, Oregon State University, Tilth Producers and Oregon Tilth. About 230 people attended the symposium and over half the participants were growers, a quarter were researchers and extension agents, and a quarter were industry and agency representatives. Presentations were made by leading researchers, educators and growers on topics that included seeds, pest management, soil health and systems evaluation. Presentation included an overview of farming systems studies by John Reganold, an introduction to a small-farm system by Henning Schemsdorf, wheat breeding for organic systems and perennial wheat development by Steve Jones, farmers screening the USDA germplasm collection by JJ Haapla, tools for farmers to accurately predict soil nitrogen by Chris Koopmans, and weed suppressive soils by Matt Leibermann. The Symposium included 50 posters that highlighted sustainable, organic and biologically intensive production, research and education in the region. The event was a great success and a highlight was the tremendous amount of interaction that occurred between poster authors and growers. The Symposium Proceedings are available from the CSANR web site, [http://csanr.wsu.edu/](http://csanr.wsu.edu/)