



# 2004 Campus Research Programs



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

Agricultural and Biological Engineering (ABE) links the engineering sciences to the life sciences to produce food, feed, fiber and other products from renewable bio-resources. It also aims to enhance the productivity of agricultural and biological systems while protecting the environment and conserving and replenishing our natural resources. Florida's agricultural industry is one of the largest and most diverse in the nation, and requires a broad, interdisciplinary research approach if it is to continue to prosper as the population swells and natural resources become more limited. Over 30 faculty members, located both on the UF campus in Gainesville and at several UF-IFAS Research and Education Centers throughout Florida, participate as members of interdisciplinary teams working with state, national and international agricultural, water management and environmental protection agencies, as well as the UF-IFAS Space Agricultural and Biotechnology Research and Education (SABRE) Center located at NASA's Kennedy Space Center and the NASA Environmental Systems Commercial Space Technology Center (ESCST) located at UF in Gainesville.

The department's research program includes the following four main areas.

**Bioprocess and Food Engineering** includes post-harvest engineering for seafood, fruits and vegetables; process microbiology; heat and mass transfer in biological systems; thermal processing of food, packaging technology, space biotechnology and recycling systems. Current research includes a study on the International Space Station of the effects of light and gravity on plant form. The model plant *Arabidopsis* will be used to study how plants grow towards or away from light in various gravitational accelerations and the roles of the photoreceptors in both the gravity and light induced responses. These fundamental studies will help in the development of procedures for growing plants on the moon or mars where gravity is reduced. Plants will play a vital role in human space exploration for food supplies, atmospheric purification, waste treatment, and psychological benefits.

**Information Systems** research is directed towards electronic communication technology, with special emphasis on safety and energy; mathematical modeling over a broad range of plant and animal systems; knowledge-based decision support systems, weather information, climate change analysis and remote sensing. Current

research includes integration of dynamic crop models with hydrology models for analyzing and optimizing the management practices relative to crop production and water quality associated with nutrient leaching. Research is also being conducted to link crop models with climate forecasts to better understand climate-related risks to production and how to reduce economic risk to producers.

Agricultural Production Engineering includes machine systems analysis and design, robotics, aquacultural production systems, safety, design and analysis of agricultural structures and their environment, systems automation and management. Research projects are focusing on using machine vision, image processing and pattern classification technologies to develop an automatic system for early detection of diseases in citrus groves, and the development of a robotic system for harvesting citrus including the potential development of new tree architectures and grove management practices for optimizing the robotic workspace. Progress continues on development of the Robotic Greenhouse Sprayer, which can autonomously navigate through a greenhouse applying chemicals at uniform application rates, to address producer concerns over worker safety, environmental impacts, and economic cost associated with manual application of pesticides and fungicides.

**Land and Water Resources Engineering** encompasses design and analysis of irrigation and drainage systems, developing methodologies to predict and reduce non-point pollution from agricultural watersheds, analysis and modeling of surface and groundwater hydrology, as well as water reuse and waste management. Current research includes the use of sensor-based control of irrigation to increase the efficiency of residential and commercial irrigation, resulting in a decrease in total water usage in Florida. Irrigation currently accounts for 50% to 70% of an average household's total water usage. The sensor-based system would deliver enough water to meet landscape needs, but prevent irrigation from occurring if adequate moisture is detected in the soil.

RESEARCH HIGHLIGHTS

**PHOSPHORUS SENSING IN THE LAKE OKEECHOBEE DRAINAGE BASIN**  
**BY DR. WONSUK “DANIEL” LEE**

**SIGNIFICANCE:** Lake Okeechobee is a large, multifunctional lake located at the center of the Kissimmee-Okeechobee-Everglades aquatic ecosystem. The lake provides regional flood protection, water supply for agricultural, urban and natural areas, and is a critical habitat for fish, birds and other wildlife, including the federally endangered Everglades Snail Kite. The 1997 Lake Okeechobee Surface Water Improvement and Management (SWIM) Plan found that excessive phosphorus loading is one of the most serious problems facing the lake. Frequent algal blooms, detrimental changes in biological communities, and impaired use of the water resources are among the documented adverse effects of excessive phosphorus loading. Concentrations of total phosphorus in the lake water are more than two-fold higher than the goal of 40 parts per billion (ppb), which is the concentration identified by the Florida Department of Environmental Protection (FDEP) to prevent an imbalance to the lake flora and fauna.

Lake Okeechobee is listed under section 303(d) of the Clean Water Act as a Florida impaired water body limited primarily by phosphorus, and is the first water body in Florida for which a TMDL is being established. Recently, the Florida Department of Environmental Protection (FDEP) began rulemaking to set the Total Maximum Daily Load (TMDL) at 140 metric tons/year of phosphorus into the lake in order to achieve the 40 ppb goal for in-lake P concentrations. However, over the last 5 years annual P loads from the lake watershed have averaged 584 metric tons, well above the recommended TMDL. Runoff from dairies and cow-calf operations is considered to be the primary source of external phosphorus loading to the Lake Okeechobee.

**RATIONALE:** Currently phosphorus concentrations in soil and vegetation samples obtained from throughout the watershed are measured using standard laboratory analysis procedures, which are very time consuming, costly and labor intensive. We propose to develop a novel technique for cost-effective P detection in soils and vegetation using reflectance spectroscopy. If successful, this technique will greatly decrease the time and labor requirement for monitoring P-levels in terrestrial ecosystems and will provide real-time sensing ability for identifying problem areas (“hot-spots”).

**Impact:** The proposed P-sensing system will facilitate the inexpensive and timely identification of “hot-spots” throughout the Lake Okeechobee drainage basin. The identification of “hot-spots” could then be used to better assess the effectiveness of best management practices or remediation alternatives for reducing P loads to the Lake Okeechobee. In order to apply the results in a large scale area, hyperspectral images (Figure 1) were obtained using a Queen Air Twin engine aircraft modified for sensor operation with a hyperspectral imaging system (AISA+, Specim, Spectral Imaging Ltd.) in conjunction with a GPS/INS unit and data acquisition system for representative sites in the Lake Okeechobee drainage basin. Image radiance measurement was converted to reflectance by measuring and correlating the water and lime rock hyperspectral ground reflectance data to image data. Spectral angle mapper classification and spectral feature fitting was used for P analysis in images. Spectral libraries from both ground and

image data were prepared and used for spectral analysis.

The sensing system in conjunction with a Differential Global Positioning System (DGPS) can be used to produce P concentration map of target area in the Lake Okeechobee drainage basin (Figure 2). The proposed P sensing system measures the reflectance of soil sample, determines the location with a DGPS receiver, and looks for the soil signature in database related to that location, and finally calculates P concentration using the technique developed by Bogrekci and Lee in 2004.

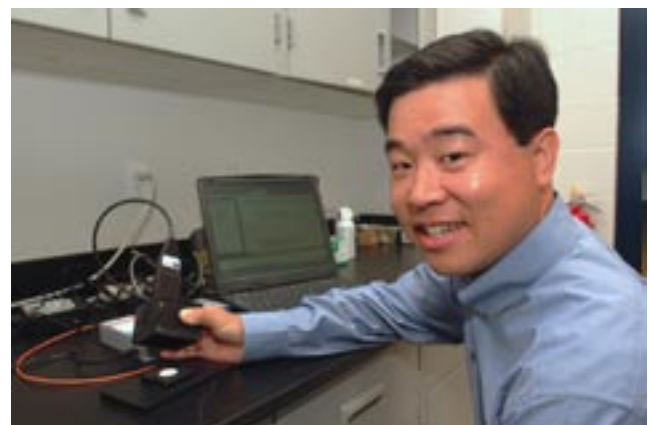
Two spectral measurement sensor systems were specified and designed. Using VIS-NIR spectroscopy for the determination of P concentration is limited in terms of sensitivity and accuracy with an RMSE of 17% to produce a commercial sensor. Therefore, two different methods were used to measure P concentrations using infrared properties of soil samples. These two systems are currently being assembled and after laboratory calibration, sensors will be recalibrated in field conditions and tested for evaluation by selecting high and low P concentration sites.

**COLLABORATORS:** Agricultural and Biological Engineering Department: Ismail Bogrekci, Tom Burks, and Jack Jordan. Mechanical and Aerospace Engineering Department: John Schueller. Agronomy Department: Johannes Scholberg. Soil and Water Science Department: Rao Mylavarapu and John White.

Figure 1. Hyperspectral image and spectral signature of vegetation (left bottom corner) in a dairy farm in the Lake Okeechobee drainage basin.

Figure 2. Actual (left) and predicted (right) Mehlich1 P concentration for soil in a dairy farm in the Lake Okeechobee drainage basin.

*Daniel Wonsuk Lee*



# AGRICULTURAL & BIOLOGICAL ENGINEERING

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Howard W. Beck	Prof.	Information Technology	10	30	60
Ismail Borgecki	Postdoc Assoc.	Precision Agriculture, Instrumentation, Sensor Design, Signal and Image Processing	0	100	0
Ray A. Bucklin	Prof.	Farm Structures and Waste Management	30	70	0
Thomas F. Burks	Asst. Prof.	Robotics and Machine Systems Analysis	40	60	0
Kenneth L. Campbell	Prof.	Water Quality, Surface Water Hydrology	25	75	0
Khe V. Chau	Prof.	Post Harvest Technology, Food Processing	40	60	0
Melanie J. Corell	Asst. Prof.	Biological Eng.	40	60	0
Michael D. Dukes	Asst. Prof.	Irrigation and Water Resources Management	40	60	0
Jonathan Earle	Assoc. Prof. and Assist. Dean	Engineering Ag & Wastewater Mgmt.	0	0	0
John-Pierre Emond	Visiting Prof.	Packaging, Food Distribution and Transport	60	40	0
Clyde Fraisse	Asst. Ext. Sci.	Reducing Climate and Weather Risks in Agriculture and Natural Resource Management	0	30	70
Byron T. French	Assoc. Prof.	Power and Machinery	80	0	20
Wendy D. Graham	Prof. and Chair	Water Quality, Groundwater Hydrology	5	65	30
Dorota Z. Haman	Prof.	Irrigation and Water Resources Management	20	20	60
Michael Hannan	Postdoc Assoc.	Mautine Vision and Robotics Development for Citrus harvesting	0	100	0
Keither Ingram	Asst. Res. Sci.	Reducing Climate and Weather Risks in Agriculture and Natural Resource Management	0	75	25
Shrikant S. Jagtap	Asst. In	Crop Modeling	0	100	0
Jimmy W. Jones	Dist. Prof.	Plant Modeling and Systems Analysis	20	80	0
Pierce H. Jones	Prof. and Asst. Program Director	Energy Extension	0	0	100
Jonathan D. Jordan	Asst. In	Remote Sensing	0	100	0
Jasmeet Judge	Asst. Prof.	Remote Sensing	30	70	0
James D. Leary	Lecturer	Energy, Environmental Control of Structures	90	10	0
Won Suk Lee	Asst. Prof.	Precision Agriculture	30	70	0
Carol J. Lehtola	Assoc. Prof.	Safety	20	0	80
Craig Ri. Miller	Assistant In	Energy Extension	0	0	100
John W. Mishoe	Prof.	Crop Modeling Instrumentation Systems	60	40	0
Raphael Munoz-Carpena	Asst. Prof.	Hydrology	0	40	60
Roger A. Nordstedt	Prof.	Waste Management	50	0	50
Allen R. Overman	Prof.	Water Management and Pollution Control	20	80	0
Wendell A. Porter	Asst. Res. Sci.	Energy and Electric Systems Analysis	0	75	25
Kathleen C. Ruppert	Assistant Extension Scientist	Energy Extension	0	0	100
John K. Schueller	Affiliate Prof.	Agricultural Machines, Precision Agriculture	0	100	0
Glen H. Smerage	Assoc. Prof.	Biological and Ecological Systems	15	85	0
Michael T. Talbot	Assoc. Prof.	Grain Drying and Energy Analysis	10	20	70
Arthur A. Teixeira	Prof.	Food Engineering	40	60	0
Allen Turner	Lecturer	Sensor Technology, Precision Agriculture, Robotics	70	30	0
Bruce A. Welt	Asst. Prof.	Packaging and Irradiation	80	20	0
Fedro Zazueta	Dir. of OIR	Irrigation and Information Technology	0	0	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
ABE-03793	Jones, J.W.	Development and Use of Crop Models for Selected Florida Crops
ABE-03814	Graham, W.D.	Determination of Indicators of Ecological Change
ABE-03824	Bucklin, R.A., Jones, P.H.	Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine and Dairy Facilities
ABE-03874	Teixeira, A.A., Smerage, G.H.	Improvement of Thermal and Alternative Processes for Foods
ABE-03973	Chau, K.V., Talbot, M.T.	Heat and Mass Transfer in Biological Systems
ABE-04004	Lee, W.S., Pierce, F.J., Schueller, J.K., Jordan, J.D., Burks, T.F., Whitney, J.D., Salyani, M., Schumann, A.W., Davenport, J.R., Stevens, R.G., Seavert, C.F., Righetti, T.L.	Maintaining the Competitiveness of Tree Fruit Production Through Precision Agriculture
ABE-04015	Nordstedt, R.A.	Animal Manure and Waster Utilization, Treatment and Nuisance Avoidance for a Sustainable Agriculture
ABE-04016	Munoz-Carpena, R., Campbell, K.L., Graham, W.D., Dukes, M.D.	Development and Evaluation of TMDL Planning and Assessment Tools and Processes
ABE-04036	Dukes, M.D., Simonne, E.H., Haman, D.Z.	Reducing Water Needs and Environmental Impact of Vegetable/Turf Production Using Improved Irrigation Scheduling and Irrigation Systems
ABE-04085	Graham, W.D., Campbell, K.L., Shukla, S., Reddy, K.R., Clark, M.W., Jawitz, J.W., Graetz, D.A., O'Connor, G.A., Nair, V., Grunwald, D., Hodges, A., Chambliss, C.	Hydrologic and Biogeochemical Processes Regulating Phosphorus Retention in the Lake Okeechobee Drainage Basin
ABE-04237	Judge, J., Graham, W.D., Jones, J.W.	Microwave Remote Sensing in Hydrology

## PUBLICATIONS

**Albrigo, L., H. Beck, L. Timmer and E. Stover.** 2004. Development and Testing of a Recommendation System to Schedule Copper Sprays for Citrus Disease Control. *J. ASTM Intl.*

**Albrigo, L., J. Valiente and H. Beck.** 2004. A flowering Expert System for the Decision Information System for Citrus. *Acta Horticultura.*

**Baum, M., M. Dukes and G. Miller.** 2004. Analysis of Residential Irrigation Distribution Uniformity. *Journal of Irrigation and Drainage Engineering.*

**Berger, K., M. Knoelke and B. Welt.** 2004. Influence of Sample Structure and Instrument Settings on Hot Tack Measurements of Thin Sealant Films. *Journal of Plastic Film & Sheeting.* 20(1):55-63.

**Bray, D. and R. Bucklin.** 2004. Latest in Tunnel Barns for Cow Comfort. *UF Animal Science.*

**Correll, M. and J. Kiss.** 2004. The Roles of Phytochromes in Elongation and Gravitropism of Roots. *Plant and Cell Physiology.*

**Correll, M., R. Edelmann, R. Hangarter, J. Mullen and J. Kiss.** 2004. Ground-based Studies of Tropisms in Hardware Developed for the European Modular Cultivation System (EMCS). *Advances in Space Research.* 1:234.

**Dukes, M. and R. Evans.** 2004. Riparian Ecosystem Management Model: Hydrology and Sensitivity Under a Narrow Single Vegetation Riparian Buffer in the Middle Coastal Plain. 46(6):1567-1579.

**Dukes, M., R. Evans, J. Gilliam and S. Kunickis.** 2004. Effect of Riparian Buffer Width and Vegetation Type on Shallow Groundwater Quality in the Middle Coastal Plain of North Carolina. *Transactions ASAE.* 45(2):327-336.

**Duryea, M., J. Mishoe, F. Altpeter, E. Hoffmann and A. Wright.** 2004. Nanotechnology Task Force. IFAS Dean's Office: Gainesville, FL.

**Emond, J. and J. Brecht.** 2004. Development of Quality Curves for Highbush Blueberries as a Function of the Storage Temperature. *Food Products Press.*

**Fidler, M., J. Capece and K. Campbell.** 2004. Optimization of Best Management Practices for Beef Cattle Ranching in the Lake Okeechobee Basin: 2003 Final Data Report to Florida Department of Agriculture and Consumer Services. Agricultural and Biological Engineering Department, University of Florida: Gainesville, FL.

**Garvin, M., K. Tarvin, L. Stark, G. Woolfenden, J. Fitzpatrick and J. Day.** 2004. Arboviral Infection of Two Species of Wild Jays (*Aves: Corvidae*): Evidence for Population Impacts. *Journal of Medical Entomology.* 41:215-225.

**Haman, D.** 2004. CAD and Management Software for Irrigation Systems. Institute of Food and Agricultural Sciences.

**Haman, D.** 2004. Computer Aided Microirrigation. Round-Table Conference on Microirrigation, ICID.

**Haman, D.** 2004. Efficiency and Uniformity of Microirrigation System. Proceedings of Tomato Workshop and Field Day.

**Haman, D.** 2004. Injecting Chemicals into Microirrigation Systems: Using Plasticulture Technology for the Intensive Production of Vegetable Crops. An American Society for Horticultural Sciences Seminar: Lexington, Kentucky.

**Haman, D.** 2004. Irrigated Acreage-Florida. In: 1999 Irrigation Survey. *Irrigation Journal.* 50(1):19.

**Haman, D.** 2004. Irrigation 101. *American Nurseryman.* 192(7):90-93.

**Haman, D.** 2004. Irrigation Methods and Pointers for Watermelon Production in Florida. Proc. of the 1986 Watermelon Institute. Institute of Food and Agricultural Sciences, Veg. Crops Department.

**Haman, D.** 2004. Methods and Equipment for Injecting Chemicals into Microirrigation Systems. Proceedings of the Third Annual Microirrigation Workshop and Mini-Trade Show.

**Haman, D.** 2004. Microirrigation for Grapes in Florida. Institute of Food and Agricultural Sciences.

**Haman, D.** 2004. Proc. of International Fertigation Symposium.

**Haman, D.** 2004. Proper Filtration: Key to Microirrigation Performance. *Irrigation Business and Technology - Voice of IA The Irrigation Association.* 1997:3.

# PUBLICATIONS

- Haman, D.** 2004. Pumps, Displacement. In: Encyclopedia of Water Science. pp. 759-763.
- Haman, D.** 2004. Soil-plant-water Relationships. The Florida Irrigation Society 6th Annual Show and Technical Conference Magazine. pp. 2.
- Haman, D. and F. Zazueta.** 2004. Efficiency and Uniformity of a Microirrigation System. Citrus and Vegetable Magazine. pp. 3.
- Haman, D. and G. Burgess.** 2004. Theoretical Development for Measuring the Elastic Properties of Spherical Cuticular Membranes. Transactions of the ASAE. 29(5):1470-1476.
- Haman, D. and G. Hochmuth.** 2004. Tensiometer Control and Fertigation of Micro-irrigated Tomatoes. American Society of Agricultural Engineers Winter Meeting.
- Haman, D. and G. Merva.** 2004. Influence of Selected Ions and Cuticular Waxes on Elastic Properties of Tomato Cuticle. International Agrophysics. 1:289-300.
- Haman, D. and L. Salgado.** 2004. Microirrigation for Fruit Production in Chile. Microirrigation for a Changing World: Conserving Resources/Preserving the Environment. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D. and M. Joyner.** 2004. Polymer Conditioners for Florida Soils. Crop Science Society of Florida.
- Haman, D. and P. Lyrene.** 2004. Blueberry Response to Irrigation and Ground Cover. Proc. Fla. State Hort. Soc.
- Haman, D. and P. Lyrene.** 2004. Use of Tensiometers for Blueberry Irrigation Scheduling. Proc. Fla. State Hort. Soc.
- Haman, D. and S. Irmak.** 2004. Continuous Water Content Measurements with Time-domain Reflectometry on Sandy Soils. Soil and Crop Sci. Soc. of Fla. Proc.
- Haman, D. and S. Irmak.** 2004. Evaluation of Five Methods for Estimating Class A Pan Evaporation in a Humid Climate. HortTechnology. 13(3):500-508.
- Haman, D. and S. Irmak.** 2004. Performance of the Watermark Granular Matrix Sensor in Sandy Soils. ASAE Paper No. 00-2037. American Society of Agricultural Engineers.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems Part 1: Measuring Operation Pressures. Ornamental Outlook. pp. 18-19.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Application Rates. Ornamental Outlook. pp. 32-36.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Uniformity of Water Application in Sprinkler Systems. Ornamental Outlook. 6:2.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Uniformity of Water Application of Microirrigation Systems. Ornamental Outlook.
- Haman, D. and T. Yeager.** 2004. Irrigation System Selection for Container Nurseries. Ornamental Outlook. pp. 18-21.
- Haman, D. and T. Yeager.** 2004. Stop Seeing Spots – Tips for Eliminating Foliar Deposits and Stains Caused by Irrigation Water. Ornamental Outlook.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Filters Serve Key Role in Trickle Systems. Citrus & Vegetable Magazine. pp. 4.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Florida Irrigated Acreage. In: 1992 Irrigation Survey. Irrigation Journal. 43(1):22-52.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Irrigated Acreage-Florida. In: 1997 Irrigation Survey. Irrigation Journal. 48:1.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Irrigated Acreage-Florida. In: 1998 Irrigation Survey. Irrigation Journal. 49:1.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Potential Impact of Improper Irrigation System Design. The Florida Irrigation Society 4th Annual Trade Show and Technical Conference Magazine.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. The Impact of Improper Irrigation System Design. Irrigation News, the Irrigation Association. May.
- Haman, D., A. Smajstrla and F. Zazueta.** 2004. Water Quality Problems of Microirrigation in Florida. Round-Table Conference on Microirrigation, ICID. 1:49-58.
- Haman, D., B. Boman, G. Knox, S. Lacascio, T. Obreza, L. Parsons, F. Rhoads and T. Yeager.** 2004. Status and Growth of Microirrigation in Florida. Microirrigation for a Changing World: Conserving Resources/Preserving the Environment. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D., C. Brooks, T. Yeager and R. Beeson, Jr.** 2004. Square Funnel Containers for Nursery Production. SNA Proceedings.
- Haman, D., E. Simonne and M. Dukes.** 2004. Vegetable Production Guide for Florida. Chapter 8: Principles and Practices for Irrigation Management. pp. 31-35.
- Haman, D., F. Zazueta and A. Smajstrla.** 2004. Computer Aided Design of Landscape Irrigation Systems. Applied Agriculture Research. pp. 280-284.
- Haman, D., F. Zazueta and A. Smajstrla.** 2004. Computer Aided Design of Turf Irrigation Systems. Proc. Fla. State Hort. Soc.
- Haman, D., G. Clark, C. Stanley, D. Maynard, G. Hochmuth and E. Hanlon.** 2004. Water and Fertilizer Management of Microirrigated Fresh Market Tomatoes. Transactions of the ASAE. 34(2):429-435.
- Haman, D., H. Helikson and C. Baird.** 2004. Photovoltaic-powered Water Pumping for Irrigation. American Society of Agricultural Engineers, Florida Section Meeting.
- Haman, D., J. Jeznach and E. Pierzgaliski.** 2004. Development of Microirrigation in Poland. In: Microirrigation for a Changing World: Conserving Resources/Preserving the Environment. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D., J. Mishoe and S. Thomson.** 2004. A Knowledge-based Irrigation Advisor Using Moisture Sensors and Crop Simulation. Proceedings of the Third International Conference on Computers in Ag. Extension Programs.
- Haman, D., K. Campbell and D. Graetz.** 2004. Lysimeter Study of Microirrigation and Fertigation of tomatoes. Soil and Crop Sci. Soc. of Florida Proceedings.
- Haman, D., K. Campbell, K. Stone and D. Graetz.** 2004. Nitrogen Movement Under Microirrigation. American Society of Agricultural Engineers Summer Meeting.
- Haman, D., L. Couto and G. Hochmuth.** 2004. Nitrogen and Irrigation Management for Squash Production in North Florida. Proc Fla. State Hort. Soc..
- Haman, D., M. Palacios, A. Del-Nero, A. Pardo and N. Pavon.** 2004. Banana Production Irrigated with Treated Effluent in Canary Islands. Transactions of ASAE. 43(2):309-314.
- Haman, D., M. Register and R. Stamps.** 2004. Cold Protection of Leatherleaf Fern in Florida. American Society of Agricultural Engineers, Florida Section Meeting.
- Haman, D., M. Youngblood and R. Curry.** 2004. Effect of Climate Change on Irrigation Needs in the Southeast. ASAE.
- Haman, D., P. Kirpich and S. Styles.** 2004. Problems of Irrigation in Developing Countries. Journal of Irrigation and Drainage Engineering. 1:38358.
- Haman, D., P. Lyrene and R. Pritchard.** 2004. Response of Young Blueberry Plants to Irrigation in Florida. HortScience. 32(7):1194-1196.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Evapotranspiration and Crop Coefficients for Young Blueberries in Florida. Applied Engineering in Agriculture. 13(2):209-216.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Response of Young Blueberry Plants to Microirrigation in Florida. In: Microirrigation for a Changing World: Conserving Resources/Preserving the Environment. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Water Use and Irrigation Scheduling of Young Blueberries. Proc. Fla. State Hort. Soc.
- Haman, D., S. Irmak and R. Bastug.** 2004. Determination of Crop Water Stress Index for Irrigation Timing and Yield Estimation of Corn. Agron. J. 92:1221-1227.
- Haman, D., S. Irmak and T. Yeager.** 2004. Container Production Innovations. American Nurseryman. pp. 54-56.
- Haman, D., S. Irmak and T. Yeager.** 2004. Irrigation Water Use Efficiency of Multi-pot Box System. Journal of Environmental Hort. 19(1):38452.
- Haman, D., S. Irmak, A. Irmak, J. Jones, T. Yeager and K. Campbell.** 2004. A New Irrigation-plant Production System for Water Conservation in Ornamental Nurseries: Quantification and Evaluation of Irrigation, Runoff, Plant Biomass, and Irrigation Efficiencies. Applied Engineering in Agriculture. 19(6):651-655.
- Haman, D., S. Thomson and J. Mishoe.** 2004. Knowledge System to Adjust Soil-water Parameters of the Pnutgro Crop Model. ASAE.

# PUBLICATIONS

- Haman, D., T. Yeager and S. Irmak.** 2004. Multi-pot Box System for Increased Efficiency of Irrigation in Ornamental Plant Production. Irrigation Association Technical Conference Proceedings.
- Haman, D., T. Yeager, R. Beeson Jr. and G. Knox.** 2004. Multiple Pot Box for Container Plant Production. *Journal of Environmental Horticulture*. 16(1):60-63.
- Haman, D., T. Yeager, S. Irmak and C. Larsen.** 2004. Container Plant Production in Multiple Pot Box. SNA Research Conference.
- Haman, D., T. Yeager, S. Irmak, R. Beeson, Jr. and G. Knox.** 2004. Multipot Box and Funneled Containers in Container Nursery Production. *Proc. Fla. State Hort. Soc.*
- Hochmuth, R., E. Simonne, G. Hochmuth, M. Dukes and D. Studstill.** 2004. Field Testing of Possible Nitrogen Fertilizer Best Management Practices for Watermelon Grown on Sandy Soils.
- Irmak, S., D. Haman, A. Irmak, J. Jones, K. Campbell and T. Crisman.** 2004. Measurement and Analyses of Growth and Stress Parameters of *Viburnum Odoratissimum* (Ker-gawl) Grown in a Multi-pot Box System. *HortScience*. 39(6):1445-1455.
- Irmak, S., M. Dukes and J. Jacobs.** 2004. Using Modified Bellani Plate Evapotranspiration Gages to Estimate Short Canopy Reference Evapotranspiration.
- Jackson, Jr., J. and C. Fraisse.** 2004. *Weather and Climate in Florida*. University of Florida: Gainesville, FL.
- Lehtola, C., C. Brown and J. Nelson.** 2004. NASD: The National Agricultural Safety Database - An Important Tool for Safety Programming. *Journal of Extension*.
- Mendoza, T., B. Welt, W. Otwell, H. Kristinsson and M. Balaban.** 2004. Kinetic Parameter Estimation of Time-temperature Integrators Intended for Use with Packaged Fresh Seafood. *Journal of Food Science*. 69(3):FMS90-FMS96.
- Munoz-Carpena, R., M. Dukes, L. Miller, Y. Li and W. Klassen.** 2004. Design and Field Evaluation of a New Interface for Soil Moisture-based Irrigation Control. 2004 ASAE Annual International Meeting, Ottawa, Canada.
- Naab, J., P. Singh, K. Boote, J. Jones and K. Marfo.** 2004. Using the CROPGRO-Peanut Model to Quantify Yield Gaps of Peanut in the Guinean Savanna Zone of Ghana. *Agronomy Journal*. 96:1231-1242.
- Pedersen, P., K. Boote, J. Jones and J. Lauer.** 2004. Modifying the CROPGRO-Soybean Model to Improve Predictions for the Upper Midwest. *Agronomy Journal*. 96:556-564.
- Sau, F., K. Boote, W. Bostick, J. Jones and M. Minguez.** 2004. Testing and Improving Evapotranspiration and Soil Water Balance of the DSSAT Crop Models. *Agronomy Journal*. 96:1243-1257.
- Simonne, E., M. Dukes and D. Haman.** 2004. Principles and Practices for Irrigation Management. *Vegetable Production Guide for Florida*. pp. 33-39.
- Sims, R. and K. Campbell.** 2004. Performance Evaluation of the Field Hydrologic and Nutrient Transport Model (FHANTM 2.0) on Beef Pastures at Buck Island Ranch, Florida: Final Model Report to Florida Department of Agriculture and Consumer Services. Agricultural and Biological Engineering Department, University of Florida: Gainesville, FL.
- Towler, M., Y. Kim, M. Correll, B. Wyslouliz and P. Weathers.** 2004. Design, Development, and Applications of Mist Bioreactors. *Plant Tissue Culture Engineering*.

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Beck, H.W.	Cooperative Agreement Implementation Plan for the Environmental Systems Commercial Space Tech Center (Es Cstc): Amendment 1	NASA	56,100
Beck, H.W.	Creation of a National Training Program for First Detectors in Agricultural Homeland Security: Curriculum Cataloging	North Carolina State Univ.	61,434
Bucklin, R.A.	Plant and Environmental Interactions in a Mars Greenhouse	NASA	24,000
Burks, T.F.	The Automated Citrus Harvester Program	Dept of Citrus	100,000
Campbell, K.L.	Pasture Water Management for Reduced Phosphorus Loading in the Lake Okeechobee Watershed	Dept of Agricul & Consumer Ser.	104,612
Chynoweth, D.P.	NASA Environmental Systems Commercial Space Technology Center at the UF	NASA	44
Dukes, M.D.	Evaluation of Soil Moisture Based On-demand Irrigation Controllers	Water Management Districts	220,862
Emond, J.	Optimization of RFID in the Produce Supply Chain	Tanimura & Antle	30,870
Emond, J.	RFID in Produce	Fresh Express	30,870
Graham, W.D.	Demonstration of Water Quality Best Management Practices For Beef Cattle Ranching in the Lake Okeechobee Basin	Dept. of Environmental Protection	1,348,233
Haman, D.Z.	Demonstration of Ebb and Flow Water Application System for Outdoor Containerized Plant Production in Florida (DACS Match)	Dept. of Environmental Protection	38,000
Haman, D.Z.	Demonstration of Multipot Boxes for Container Nursery Production	Dept. of Environmental Protection	50,485



## AGRICULTURAL & BIOLOGICAL ENGINEERING

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Jagtap, S.S.	Decision Support System for Agricultural Applications of Climate Forecast in West Africa	U.S. Dept. of Commerce	125,141
Jagtap, S.S.	Strengthening Agricultural Rsearch Capacity to Generate Technologies in Nigeria's Dry Belt	Intl. Start Secretariat	10,270
Jones, J.W.	Spatial Data & Scaling Methods F/assessment of Agricultural Impacts of Climate: Managing Multiple Sources of Uncertainty	National Center for Atmospheric Res.	90,576
Jones, J.W.	Measuring and Assessing Soil Carbon Sequestration by Agricultural Systems in Developing Countries	Univ. of Hawaii	219,434
Jones, J.W.	Agricultural Application of Climate Information System for Agriculture and Water Resource Management in the SE USA	Univ. of Miami	224,995
Jones, J.W.	Risk Reduction for Specialty Crops in the Southeastern USA	U.S. Dept. of Agriculture	499,969
Jones, J.W.	Decision Support System for Reducing Agricultural Risks Caused by Climate Variability	Florida State University	354,476
Jones, J.W.	Measuring and Assessing Soil Carbon Sequestration by Agricultural Systems in Developing Countries	Univ. of Hawaii	290,053
Jones, J.W.	Agricultural Application of Climate Information System for Agriculture and Water Resource Management in the Southeastern USA	Univ. of Miami	225,000
Jones, J.W.	Tools for Assessing Integrated Crop-Livestock Farm Householdeconomic Risks	U.S. Dept. of Agriculture	15,000
Jones, J.W.	Integrated Crop Management Information System under Current and Future Climate Conditions	U.S. Dept. of Agriculture	16,240
Jones, J.W.	Decision Support System for Reducing Agricultural Risks Caused by Climate Variability	Florida State University	620,000
Jones, J.W.	Improving Economic Efficiency and Reducing Environmental Impact in the US Sugarcane Industry Thr a Systems-Based Approach	U.S. Dept. of Agriculture	100,000
Jones, J.W.	Integration and Verification of Water Quality and Crop Yieldmodels for BMP Planning	Dept. of Agricul. & Consumer Ser.	405,527
Jordan, J.D.	Baseline Mapping via Remote Sensing for Monitoring the Biocontrol of Schinus Terebinthifolius Raddi in Florida	Dept. of Environmental Protection	24,879
Judge, J.	Linking Changes in Dynamic Vegetation to Passive Microwave Remote Sensing	NASA	24,000
Judge, J.	Improved Estimation of Evapotranspiration and Recharge Through Assimilation of Microwave Observations	NASA	83,772
Lee, W.S.	Development of a Reflectance Spectroscopic P-sensor for Terrestrial and Aquatic Ecosystems in the Lake Okeechobee...	Dept. of Agricul. & Consumer Ser.	399,300
Lee, W.S.	Citrus Yield Mapping System Using Machine Vision	Dept. of Agricul. & Consumer Ser.	35,000
Lehtola, L.J.	Expansion & Maintenance of National Agricultural Safety Database (NASD)	East Carolina University	37,367
Price, D.	IPA for Donald R. Price with National Science Foundation	National Science Foundation	177,398
Royce, F.S.	Economic, Social and Enviromental Sustainability of Cuban Agricultural Cooperativies	Social Science Research Council	2,900
Teixeira, A.A.	Processing of Sugar Beet Tailings	Am Crystal Sugar	12,300
Teixeira, A.A.	IPPD/Therman Sandwich Wrap and Optimum Work Flow	Firehouse Restaurant	15,000
Welt, B.A.	In-case Filling of Flower Vases	Saint Rose Miami	300



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The *vision* of the Department of Agricultural Education and Communication is to lead in developing and strengthening educators, communicators, and leaders to meet society's challenges in agriculture and natural resources. The mission of the department is to serve society through the land-grant mission of teaching, research, and extension in agriculture and natural resources by enhancing leadership in communities and organizations, education in formal and nonformal settings, and communication of ideas and issues. The four programmatic dimensions of the department include education, communication, leadership, and extension within an agriculture and natural resources context.

Primary constituent groups include school-based agriscience teachers, extension educators who conduct educational programs through the Florida Cooperative Extension Service, professional agricultural communicators, and specialists in agribusiness, community, and governmental agencies who serve in leadership, education, and/or communication/public relations capacities. The applied nature of research in the department suggests a strong connection between faculty-led research projects and practice in these professional arenas.

Current research projects may be grouped into the areas of critical and creative thinking, media relations, distance education

strategies and technologies, teaching and learning strategies and methods, youth leadership development, educator preparation and professional development, leadership and change, and program evaluation. Research priorities reflect state, regional, and national needs and emerge from periodic discussions with key stakeholder groups. The following studies illustrate the types of projects currently under investigation as a part of our complementary to those supported by the Florida Experiment Station: Grassroots Leadership in the Florida Farm Bureau, Media Relations Knowledge and Skills of Agricultural Scientists, Motivation and Attrition in Distance Education Courses, Content Analysis of Biotechnology Coverage in the News Media, Effects of Inquiry-Based Teaching Methods in Laboratory Settings, The Influence on Family and Community on Student Achievement, Evaluation of a Food Science Curriculum Based Upon Good Agricultural Practices, Community Viability and Leadership, the Role of Extension in the Adoption of Technologies by Beef Producers, Leadership and Life Skill Development of College of Agriculture Students, and Challenges in Teaching Agriculture in Urban Settings.

RESEARCH HIGHLIGHTS

**THE INFLUENCE OF LEARNING STYLE ON COGNITIVE PROCESS SKILL DEVELOPMENT**

BY JIM DYER

**SIGNIFICANCE:** Helping students to become successful learners is a goal of virtually every educator. Whereas many people view academic success through achievement scores, those who hire college graduates tend to take a more fundamental approach to success and view it as the ability of students to think critically and solve problems in a multitude of situations.

In almost every list of teaching objectives it is possible to find statements affirming the intention of teachers to develop in their students the ability to gather and process information efficiently and accurately. However, teaching faculty share a common goal: To develop in students those complex mental operations (cognitive abilities) that promote success in the classroom and in their personal lives. The capacity to inquire, analyze, think critically, and solve problems is central to our concept of a successful education. However, in spite of our repeated affirmation of the importance of teaching students to learn by thinking for themselves, the processes involved in addressing individual differences in students are some of the least emphasized activities in classroom instruction. As a result, students often enroll in classes and major in subject areas where they are likely to experience little success.

Students are much different today than they were before a majority of today's faculty began their teaching careers. While not surprising, both educators and the general public sometimes take this phenomenon for granted. Whereas educating the masses was once a straightforward understanding that those who know, teach, and those who do not know, learn; the process of teaching and learning seems to have evolved into a more complicated process.

Faculty and students learn differently. Entering college freshmen tend to exhibit learning styles that are concrete, active patterns. Faculty, on the other hand, tend to reflect a preferred learning pattern in the abstract, reflective realm. This divergence in learning styles becomes more complex when other factors such as critical thinking and problem solving skills are introduced to the mix. Unfortunately, research that recognizes and addresses the learning differences and needs of individual students is still in its adolescent stage. As such, there is much that we do not know about how students perceive and process information – and then use that information to think through the solution of a problem. Expert-novice research leads us to believe that thinking patterns can be changed; however, that change may only be a reflection that those who did not develop problem solving skills failed to become experts. If we are to be successful in increasing the ability of all students to think critically and solve problems, a broader understanding of how to connect with students of all learning styles must be attained.

**RATIONALE:** Whereas faculty members are generally abstract reflective learners who favor teaching in a style that is thoughtful, introspective, scholarly, and promotes learning for its inherent value, students often need structure in their learning processes. Some learning styles are more dependent upon this teacher-intervention than others. It is postulated that these students are most effective at learning when active learning processes are in place that cause students to critically think and solve problems.

Cognitive or learning style is defined as the way each person perceives, sorts, absorbs, processes, and retains information. Critical thinking has been defined as true higher order thinking that allows a person to ask appropriate questions in order to gauge a reflective, responsible, and reasonable response to a given situation. As such, students are neither born with the ability to think critically, nor do they acquire it naturally as they go through life. Rather, it is a process whereby the skill of thinking is one that must be taught. Cognitive process skills are those specific and macro thinking skills that are involved in the perception and processing of information through higher order thinking and problem solving skills. They include such processes as analyzing, decision making, critical thinking, problem solving, and evaluation. However, not all students (nor instructors) perceive and process information in the same way. This complicates the instructional process and forces instructors to use a myriad of teaching strategies, methods, and techniques to develop these skills in students. The question remains, however, as to which (if any) of these strategies, methods, and/or techniques assist the learner in developing problem solving skills. Likewise, the influence of individual learning styles upon this process is not known. The purpose of this research is to identify those variables that influence cognitive process skill (CPS) development. Secondary purposes include determining the role of cognitive (learning) styles in CPS development and identifying educational strategies that enhance CPS development across educational areas of interest and learning styles.

**IMPACT:** The major impact of this project lies in enhancing the ability of students to think critically and solve problems. In doing so, learners should be able to better utilize instruction, thereby maximizing learning for all students and providing the agricultural industry with better-prepared personnel.

Specifically, an evaluation instrument is being developed in this project whereby instructors may evaluate their courses and instructional strategies to determine the level of problem solving/critical thinking being taught in a course. Administrators and faculty alike will be able to identify courses that are producing desired changes in cognitive process skills.

*Jim Dyer*



## RESEARCH HIGHLIGHTS

Another impact to colleges should be the improved identification and retention of students who are likely to be successful in attaining a degree. Each year colleges of agriculture and natural resources nationwide spend millions of dollars educating students who later change their minds about a career in agriculture and drop out of educational programs, often negating the investment that the college and university has made in those students.

If students' proclivity toward using cognitive process skills is mismatched with the CPS level required by their respective area of study, remedial courses may be prescribed or the student may be counseled to consider another major where they are more likely to experience success at an early point in their academic career.

**COLLABORATORS:** None (individual project)

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Edward W. Osborne	Chair and Prof.	Teaching Methods/Agriscience Instruction	65	5	30
Larry R. Arrington	Dean	Extension			
Cheri Brodner	Infor. Coord./Pub. Serv.	Extension	0	0	100
Hannah S. Carter	Lecturer	Leadership	20	20	60
Jimmy G. Cheek	Dean	Academic Programs			
James E. Dyer	Asst. Prof.	Teaching/Learning Strategies	70	30	0
Marta M. Hartmann	Lecturer	Multicultural Education	70	0	30
Tracy A. Irani	Asst. Prof.	Consumer Perceptions/Communications Technology	70	30	0
Glenn D. Israel	Prof.	Evaluation Methods	10	20	70
Mark J. Kistler	Asst. Prof.	Extension Education	50	0	50
Howard W. Ladewig	Prof.	Adoption/Diffusion of Agricultural Technology	20	0	80
Brian E. Myers	Asst. Prof.	Education Strategies	60	20	20
Lacy Park	Coord/Acad Support Service	Academic Programs	50	0	0
Nick T. Place	Assoc. Prof.	Extension Education/Professional Development	60	0	40
Rick W. Rudd	Assoc. Prof.	Leadership/Critical Thinking	55	25	20
Ricky W. Telg	Assoc. Prof.	Media Relations/Distance Education	80	0	20
Bryan Terry	Coord./Statistical Research	Extension	0	0	100
Pete Vergot	Assoc. Prof. and Dist. Ext. Dir.	Extension	0	0	100
Shannon Washburn	Asst. Prof.	Educational Strategies/Youth Development	60	0	40

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
AEC-03879	Irani, T.A.	Factors Influencing Public Perceptions of Agricultural Biotechnology: Developing a Model to Predict Consumer Acceptance of GMO Foods
AEC-03957	Israel, G.D.	The Influence of Social Capital on Education and Technology Transfer Outcomes
AEC-04048	Dyer, J.E.	The Influence of Learning Styles in Cognitive Process Skill Development
AEC-04082	Israel G.D.	The Influence of Family, School and Community Social Capital on Early Childhood Educational Outcomes of Rural Youth
AEC-04193	Israel, G.D.	Reduction of Error in Rural and Agricultural Surveys

## PUBLICATIONS

**Beaulieu, L. and G. Israel.** 2004. It's More than Just Schools: How Families and Communities Promote Student Achievement. The Role of Education: Promoting the Economic and Social Vitality of Rural America. pp. 44-55.

**Colvin, J., S. Frazee, J. Smith and M. Kistler.** 2004. Perceptions of Secondary Principals in Texas Concerning Leadership Skills Attained Through Membership and Participation in the FFA Program. *Journal of Southern Agricultural Education Research*. 54(1):244-255.

**Grantham, S. and T. Irani.** 2004. Watching Your Language: Translating Science Based Research for Public Consumption. *Journal of Applied Communications*. 88(1):43-51.

**Gregg, A. and T. Irani.** 2004. Use of Information Technology by County Extension Agents of the Florida Cooperative Extension Service. *Journal of Extension*.

**Irani, T. and R. Telg.** 2004. Personality Type and its Relationship to Distance Education Students' Course Perceptions and Performance. *Quarterly Review of Distance Education*. 4(4):445-455.

**Israel, G.** 2004. Enhancing the Rural South's Quality of Life: Leveraging Development Through Educational Institutions. *Southern Rural Sociology*. 20(1).

**Israel, G. and L. Beaulieu.** 2004. Investing in Communities: Social Capital's Role in Keeping Youth in School. *Journal of the Community Development Society*. 34(2):35-57.

**Israel, G. and L. Beaulieu.** 2004. Laying the Foundation for Employment: The Role of Social Capital in Educational Achievement. *The Review of Regional Studies*. 34(3).

**Kistler, M. and G. Briers.** 2004. Change in Knowledge and Practices as a Result of Adults' Participation in the Texas A&M Ranch to Rail Program. *Journal of Southern Agricultural Education Research*. 53(1):227-238.

**Larsen, W. and R. Mills.** 2004. Just another test. *Test of Journal Trade*.

**Lundy, L. and T. Irani.** 2004. Framing Biotechnology: A Comparison of U.S. and British Newspapers. *Journal of Applied Communications*. 8(2):41-49.

**Lundy, L., T. Irani, R. Turner, S. Percival and B. Mcpherson.** 2004. GNC University: A Case Study in Partnering Business and Education Through Distance Learning. *Journal of Applied Communications*. 88(2):51-60.

**Myers, B.** 2004. Incorporating Science, Math, and Reading into the Agriculture Classroom: The Role of the Laboratory. *The Agricultural Education Magazine*.

**Myers, B.** 2004. Where Have All the Ag Teachers Gone? *The Agricultural Education Magazine*. 72(5).

**Myers, B. and J. Dyer.** 2004. A Comparison of the Attitudes and Perceptions of University Faculty and Administrators Toward Advising Undergraduate and Graduate Students and Student Organizations. American Association for Agricultural Education Annual Meeting.

**Myers, B. and J. Dyer.** 2004. Advising Components, Roles, and Perceived Level of Competence of University Faculty. *Journal of Southern Agricultural Education Research*. 53(1):258-271.

**Myers, B. and J. Dyer.** 2004. Advising Components, Roles, and Perceived Level of Competence of University Faculty. Southern Region - American Association for Agricultural Education Annual Meeting.

**Myers, B. and J. Dyer.** 2004. Agriculture Teacher Education Programs: A Synthesis of the Literature. *Journal of Agricultural Education*. 45(3):44-52.

**Myers, B. and J. Dyer.** 2004. Effects of Investigative Laboratory Instruction on Student Content Knowledge and Science Process Skill Achievement Across Learning Styles. Southern Region - American Association for Agricultural Education Annual Meeting.

**Myers, B. and J. Dyer.** 2004. Making Science Applicable: The Need for a Modern Agricultural Education Curriculum. *The Agricultural Education Magazine*. 74(5):24-25.

**Myers, B. and J. Dyer.** 2004. Perceptions, Value, and Preparation of University Faculty and Administrators Toward Advising Undergraduate and Graduate Students and Student Organizations. American Association for Agricultural Education Annual Meeting.

**Myers, B. and J. Dyer.** 2004. The Influence of Student Learning Style on Critical Thinking Skills. Southern Region - American Association for Agricultural Education Annual Meeting.

**Myers, B. and L. Jones.** 2004. Successful Field Trips: A Three-step Approach. *The Agricultural Education Magazine*. 76(4):26-27.

**Myers, B. and T. Roberts.** 2004. Conducting a Professional Development Workshop Using Experiential Learning. *NACTA Journal*. 48(2):27-32.

**Myers, B., J. Dyer and L. Breja.** 2004. Recruitment Strategies and Activities Used by Agriculture Teachers. American Association for Agricultural Education Annual Meeting. 44(4):94-105.

**Myers, B., J. Dyer and L. Breja.** 2004. Solutions to Recruitment Issues of High School Agricultural Education Programs. Southern Region - American Association for Agricultural Education Annual Meeting.

**Myers, B., J. Dyer and S. Washburn.** 2004. Problems Facing Beginning Agriculture Teachers. *Journal of Agricultural Education*.

**Myers, B., S. Washburn and J. Dyer.** 2004. Assessing Agriculture Teachers' Capacity for Teaching Science Integrated Process Skills. *Journal of Southern Agricultural Education Research*.

**Osborne, E.** 2004. A Model for the Study of Reading in School-based Agricultural Education. American Association for Agricultural Education Annual Meeting.

**Osborne, E.** 2004. Process and Product Variables for the Study of Reading in Secondary Agriscience. American Association for Agricultural Education Annual Meeting.

**Osborne, E., S. Washburn and J. Dyer.** 2004. Space Odyssey: 2004 - Space Agriculture in the Classroom 7th Grade Curriculum.

# PUBLICATIONS

**Ricketts-Grage, K., N. Place and J. Ricketts.** 2004. Exploring Cooperation between Secondary Agricultural Educators and Livestock Extension Agents: A Case Study. *Journal of Extension*.

**Roberts, G., T. Irani, L. Lundy and R. Telg.** 2004. Practices in Student Evaluation of Distance Education Courses among Land Grant Institutions. *Journal of Agricultural Education*. 45(3):1-10.

**Roberts, G., T. Irani, L. Lundy and R. Telg.** 2004. The Development of an Instrument to Evaluate Distance Education Courses Using Student Attitudes. *The American Journal of Distance Education*. 45(3):1-10.

**Smith, J., M. Kistler, K. Williams, W. Edmiston and M. Baker.** 2004. Relationships between Selected Demographic Characteristics and the Quality of Life of Adolescents in a Rural West Texas Community. *Journal of Agricultural Education*. 45(4):71-81.

**Terry, B. and G. Israel.** 2004. Agent Performance and Customer Satisfaction. *Journal of Extension*. 42(6).

**Warner, W. and S. Washburn.** 2004. Building Community and Administrative Support Through Professionalism. *The Agricultural Education Magazine*. 76(5):38511

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Isreal, G.D.	The Influence of Family, School and Community Social Capital on Early Childhood Educational Outcomes of Rural Youth	U.S. Dept. of Agriculture	103,000





### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The mission of the Agronomy Department is to discover, develop, evaluate and disseminate knowledge and information necessary to support the agronomic-related industries of the State and nation, and to promote and enhance the production and utilization of agronomic commodities and the management of pest plant species for the benefit of society.

The Agronomy Department's research mission is accomplished through state-wide programs conducted by faculty members located on the Gainesville campus throughout a network of UF/IFAS Research and Education Centers across the State. Research programs of the Department are programmatically organized into the following four areas:

**GENETICS PROGRAM AREA:** The strength of the Genetics Program Area has been in traditional, applied breeding programs to develop improved cultivars of forages, legumes, sugarcane and small grains. Forage and field crop scientists in the Department have released crop cultivars since 1988. Molecular biology programs are now making significant contributions to the more traditional forage, peanut, and sugarcane breeding programs.

**MANAGEMENT AND NUTRITION PROGRAM AREA:** National and international strengths in this program include forage evaluation, management, and utilization; diversified row crop and forage management; conservation tillage, multiple-cropping systems; utilization of urban and agricultural wastes as nutrient sources for crop production; and alternative crop plants. Emphasis has recently been placed on environmental impacts of forage production practices. Management recommendations have been developed that facilitate increased efficiency of nutrient cycling in grazed pastures and use of

dairy wastes for production of forage crops while minimizing environmental impacts. For field crops, an important strength has been the presence of a highly diversified crop management team that possesses expertise in cultivation practices of numerous crop plants including peanut, cotton, tobacco, corn, small grains, soybean, sugarcane and rice.

**WEED SCIENCE PROGRAM AREA:** Weed scientists in the Department have developed, evaluated and implemented weed management strategies for terrestrial and aquatic weeds in temperate, subtropical and tropical environments. Current strengths include biology, molecular genetics, and physiology of weed species; aquatic and invasive plant research and management; weed management strategies for southeastern cropping systems; weed/crop interference mechanisms; computer decision modeling; wetland mitigation; and pasture, rangeland and noncrop weed management systems.

**PHYSIOLOGY AND ECOLOGY PROGRAM AREA:** Traditional strengths have been documenting and understanding the physiology of crops at the leaf, whole plant and crop canopy levels, particularly in response to global climate change factors and other environmental factors, and development of computer simulations of crop growth, development, and yield. Significant contributions include documenting crop responses to rising carbon dioxide and climate change factors and development of crop simulation growth models for grain legumes that incorporate physiological mechanisms and allow assessment of hypothetical responses to climate change, crop management and genetic improvement.

## RESEARCH HIGHLIGHTS

## PEANUT GENOMICS

BY MARIA GALLO-MEAGHER

**SIGNIFICANCE:** Cultivated peanut, also known as groundnut (*Arachis hypogaea* L.), is grown on 25.5 million hectares between latitudes 40° N and 40° S with a total global production of 35 million tons. It is both a major food crop and one of the top oilseed crops produced in the world. Peanut offers numerous human health benefits. Peanut seed is high in oil (40%-55%), but it contains mostly unsaturated fat, which has been shown to lower LDL-cholesterol levels in the blood. Additionally, genetic mutants have been discovered that contain a very high proportion of desirable mono-unsaturated fatty acids. All of these “high oleic” varieties which were developed by the University of Florida have about 80% oleic (18:1) fatty acid content with approximately 2%-4% linoleic and 4%-6% palmitic (16:0) fatty acids in the oil of the seed. These seed, and products produced from them, have greatly improved shelf-life in addition to their health benefits, as compared to other peanut varieties with “normal” oil chemistry. Peanut also contains resveratrol which leads to improved cardiovascular health, as well as fiber that reduces the risk of certain types of cancer, and controls blood sugar levels. In addition, peanut also is a good source of folic acid which helps prevent neural tube defects; and contains nearly half of the 13 essential vitamins and 35 percent of the essential minerals. Because of its high nutritional value, the peanut is being widely investigated as a key food source for astronauts during extended space missions.

However, peanut can also be allergenic to a subset of the population. Over 600,000 American children have a peanut allergy and the number affected appears to be growing. Peanut allergic individuals may experience symptoms ranging from mild urticaria, facial swelling, and abdominal cramps to hypertension with anaphylactic shock. While children outgrow other allergies, an allergy to peanuts is considered life-long in most cases.

**RATIONALE:** Genomics is the study of the total hereditary material (the genome or complete DNA sequence) of an organism (structural genomics), the transcription of genes into RNA (transcriptomics), the translation of RNA into proteins (proteomics), and the synthesis of metabolic compounds (metabolomics). Furthermore, to fully understand the function of genes, comparative genomics involves comparing the genomes of two or more organisms for the purpose of identifying conserved functional sequences.

Genomics accelerates the discovery of improved traits such as higher yield, disease and pest resistance, tolerance to plant stresses

such as drought, and value-added traits such as increased nutritional value. Genomics provides essential tools to fully understand the molecular and metabolic basis of the synthesis of crucial compounds, to manipulate their content in various organs, and to better manipulate interactions between the plant’s genetic makeup and its environment. It also facilitates the introduction of these traits into new crop varieties.

Unlike other major crops, few basic tools utilized in genomics are available for peanut. To date, peanut represents, at the molecular level, an under-explored section of the large and diverse legume family. As an early and essential component of a peanut genomics toolkit, cDNA libraries and expressed sequence tag (EST) resources that sample gene expression during peanut reproductive development from major organs including flowers, pegs, and seed, are in development. The data gathered will be instrumental in peanut gene discovery and utilization.

**IMPACT:** Peanut has been designated by the US Legume Genome Initiative as one of four focal legumes (along with soybean, common bean, and alfalfa) for which more molecular tools and basic knowledge are needed in order to benefit the legume and plant scientific communities. Peanut genomics will enhance links with the current genomics efforts underway in the model legume *Medicago trunculata*, as well as *Arabidopsis* and other botanical models. Therefore, new information about the peanut genome will significantly contribute to and advance our understanding of the function, structure, and evolution of legume genomes. The practical outcome will be advancement in peanut improvement including future peanut varieties that keep farmers competitive with higher yields and more desirable protein and oil content, and reduced allergenicity.

**COLLABORATORS:** William G. Farmerie, UF/ICBR, Robert J. Ferl, UF/IFAS, Daniel W. Gorbet, UF/IFAS, Andrew Patterson, University of Georgia, Barry Tillman, UF/IFAS.

Dr. Maria Gallo-Meagher



# AGRONOMY

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Jerry M. Bennett	Chair and Prof.	Crop Physiology	20	50	30
Fredy Altpeter	Asst. Prof.	Molecular Genetics and Breeding	30	70	0
Kenneth J. Boote	Prof.	Crop Physiology	20	80	0
Carrol G. Chambliss	Assoc. Prof.	Forage Crop Management	5	20	75
Jason A. Ferrell	Asst. Prof.	Weed Science	0	35	65
Frederick M. Fishel	Assoc. Prof.	Weed Science	20	0	80
Alison M. Fox	Assoc. Prof.	Weed Ecology	30	50	20
Raymond N. Gallaher	Prof.	Multiple Cropping Systems	20	80	0
Maria Gallo-Meagher	Assoc. Prof.	Molecular Genetics and Breeding	30	70	0
William T. Haller	Prof.	Aquatic Plant Management	20	80	0
Joe C. Joyce	Assoc. Exec. VP/Prof.	Aquatic Plant Management			
Kenneth A. Langeland	Prof.	Aquatic Plant Management	5	15	80
Kevin Kenworthy	Asst. Prof.	Genetics and Breeding	30	70	0
Gregory E. MacDonald	Asst. Prof.	Weed Science	30	70	0
Kenneth H. Quesenberry	Prof.	Genetics and Breeding	30	70	0
Johannes M. Scholberg	Asst. Prof.	Crop Ecology and Management	30	70	0
Aziz Shiralipoor	Assoc. Scientist	Crop Physiology	0	100	0
Thomas A. Sinclair	Visiting Prof.	Crop Physiology	10	55	0
Lynn E. Sollenberger	Prof.	Forage Crop Management	40	60	0
Randall K. Stocker	Dir. and Prof.	Weed Ecology	0	50	50
Lori Unruh-Snyder	Lecturer	Crop Management	100	0	0
Elmo B. Whitty	Prof.	Field Crop Management	0	40	60
David Wofford	Prof.	Genetics and Breeding	65	35	0
E.T. York, Jr.	Distinguished Service Prof.	Plant Breeding			

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
AGR-03621	Bennett, J.M.	Drought Tolerance of N <sub>2</sub> Fixation in Relationship to Yield, Genetic Diversity, and Germplasm Development
AGR-03726	Chambliss, C.G., Sollenberger, L.E.	Evaluation of Forage Germplasm and Forage Management Practices
AGR-03854	Quesenberry, K.	Selection and Adaptation of Grass and Legume Species for Forage Production in the Southern Coastal Plain and Peninsular Florida
AGR-03905	MacDonald, G.E., Tredaway, J.A.	Manipulation of Vegetative Reproduction as a Means of Perennial Weed Management
AGR-03983	Gallaher, R.N.	Conservation Tillage Multiple Cropping Management Strategies for Greater Sustainability
AGR-04013	Scholberg, J.M., Burr, K.L., Ferguson, J.J., McSorley, R.	Integrative Use of Perennial Peanut for Cost-Effective Weed Control in Organic Citrus.
AGR-04035	Scholberg, J.M.	Improved Use of Crop Nutrient Interception Capacity for Groundwater Protection
AGR-04039	Sollenberger, L.E., Graetz, D.A. Chambliss, C.G., Scholber, J.M.	Verification of Interim BMP's for Nitrogen Fertilization of Hayfields within the Suwannee River Water Management District
AGR-04065	Gallaher, R.N., McSorley, R., Wang, K.H., McGovern, R.J., Kokalis-Burelle, N.	Effects of Management Practices on Pests, Pathogens, and Beneficials in Soil Ecosystems
AGR-04070	Fox, A.M., Stocker, R.K., Langeland, K.A.	Assessment of the Growth, Dispersal, and Impacts of Invasive, Non-native Plants in Florida's Natural Areas
AGR-04076	Altpeter, F.	Dissection of Trait Components and Molecular Improvement of Grasses through Genetic Engineering
AGR-04083	Wofford, D.S., Quesenberry, K.H.	Genetic Improvement of Forage Grass and Legume Species
AGR-4092	Scholberg, J.M., Beck, H.W., Boote, K.J., Obreza, T.A., Dukes, M.D., Hutchinson, C.M.	Improved Resource management for Profitable and Environmentally Sound Integrated Cropping Systems
AGR-04133-Q	Quesenberry, K.H., Williams, M.J.	Genetic Diversity and Domestication of Forage Legumes for the Subtropics and Tropics
AGR-04133-A	Altpeter, F., Valencia, E., Blount, A.R.	Molecular Improvement of Physiological Traits Defining Environmental Adaptation of Tropical Forage Grass Production
AGR-04152	Haller, W.T.	Evaluation of New Herbicides for Aquatic and Wetland Weed Control
AGR-04155	Whitty, E.B.	Peanut Breeding and Genetics
AGR-04159	Quesenberry, K.H., Prine, G.M.	Plant Genetic Resources Conservation and Utilization
AGR-04165	MacDonald, G.E.	Development of Sustainable Peanut Production Technologies for Amerindian Villages in the Rupununi Region of Guyana

## PUBLICATIONS

Allen, L., K. Heimburg, R. Bill, J. Bartholic and K. Boote. 2004. Remotely Sensed Temperatures and Evapotranspiration of Heterogenous Grass and Citrus Tree-canopy Surfaces. *Soil Crop Sci. Soc. Florida Proc.* 63:38372.

Altpeter, F. and A. Hopkins. 2004. Molecular Breeding of Forage and Turf.

Altpeter, F. and J. Popelka. 2004. Generation of Transgenic Rye (*Secale cereale* L.) Plants with Single and Defined T-DNA Inserts, Following Agrobacterium-mediated Gene Transfer. *Transgenic Crops of the World*. pp. 79-88.

Altpeter, F., J. Popelka and H. Wieser. 2004. Stable Expression of 1Dx5 and 1Dy10 High-Molecular Weight Glutenin Subunit Genes in Transgenic Rye, Drastically Increases the Polymeric Glutelin Fraction in Rye Flour. *Plant Molecular Biology*. 54:783-792.

Altpeter, F., Y. Fang, J. Xu and X. Ma. 2004. Comparison of Transgene Expression Stability after Agrobacterium-mediated or Biolistic Gene Transfer into Perennial Ryegrass (*Lolium perenne* L.). *Molecular Breeding of Forage and Turf*. pp. 255-260.

Auld, D., S. Pinkerton, E. Boroda, K. Lombard, C. Murphy, K. Kenworthy, W. Becker, R. Rolfe and V. Ghetie. 2004. Registration of TTU-LRC Castor Germplasm with Reduced Levels of Ricin and Rca120. *Crop Science*. 43:746-747.

Duryea, M., J. Mishoe, F. Altpeter, E. Hoffmann and A. Wright. 2004. Nanotechnology Task Force. IFAS Dean's Office: Gainesville, FL.

Ferrell, J. and W. Vencill. 2004. Impact of Adjuvant and Nozzle Type on Cotton Injury from Post-directed Applications of Flumioxazin. *Cotton Science*. 7:242-247.

Ferrell, J. and W. Vencill. 2004. Recovery of Flumioxazin in Soil and Water Using Gas Chromatography and Mass Spectrometry. *AOAC International*. 87:56-59.

Ferrell, J. and W. Witt. 2004. Comparison of Glyphosate with Other Herbicides for Weed Control in Corn (*Zea Mays*): Efficacy and Economics. *Weed Tehcnology*. 16:701-706.

Ferrell, J., H. Earl and W. Vencill. 2004. Duration of Yellow Nutsede Competitiveness After Treatment with Various Herbicides. *Weed Science*. 52:24-27.

Ferrell, J., H. Earl and W. Vencill. 2004. The Effect of Selected Herbicides on CO<sub>2</sub> Assimilation, Chlorophyll Fluorescence and Stomatal Conductance of Johnsongrass (*Sorghum halepense*). *Weed Science*. 51:28-31.

Ferrell, J., H. Earl, W. Vencill, M. Van Iersel and M. Czarnota. 2004. Effects of Three Herbicides on Whole Plant Carbon Fixation and Water Use by Yellow Nutsedge. *Weed Science*. 52:213-216.

Ferrell, J., T. Murphy and W. Vencill. 2004. Effects of Postemergence Herbicides on Centipedegrass Seed Production. *Weed Technology*. 17:871-875.

# PUBLICATIONS

- Ferrell, J., T. Murphy and W. Vencill.** 2004. Tolerance of Winter-installed Tall Fescue and Hybrid Bermudagrass Sod to Herbicides. *Weed Technology*. 17:521-525.
- Ferrell, J., T. Murphy, L. Burpee and W. Vencill.** 2004. Effect of Brown Patch Control on Preemergence Herbicide Efficacy in Tall Fescue. *Weed Technology*. 17:747-750.
- Ferrell, J., W. Vencill and T. Grey.** 2004. Flumioxazin Soil Persistence and Mineralization in Laboratory Experiments. *J. Agric. Food Chem.* 51:4719-4721.
- Ferrell, J., W. Vencill and W. Witt.** 2004. Sulfentrazone Absorption by Plant Roots Increases as Soil or Solution pH Decreases. *Weed Science*. 51:826-830.
- Fox, A.** 2004. Escape-exotic Species Compendium of Activities to Protect the Ecosystem and Zebra Mussel Mania Curriculum Guide. *Applied Environmental Education and Communication*. 3(1):58-61.
- Fox, A. and D. Gordon.** 2004. Criteria for Listing Invasive Plants. *Weed Technology*. 18:1309-1313.
- Gorbet, D., H. Wood, M. Gomillion and E. Whitty.** 2004. Florida Peanut Variety Trials.
- Gwata, E., D. Wofford and K. Boote.** 2004. Genetics of Promiscuous Nodulation in Soybean: Nodule Dry Weight and Leaf Color Score. *Journal of Heredity*. 95:154-157.
- Gwata, E., D. Wofford, K. Boote and H. Mushoriwa.** 2004. Determination of Effective Nodulation in Early Juvenile Soybean Plants for Genetic and Biotechnology Studies. *African J. of Biotechnol.* 2(11):417-420.
- Hanna, W. and L. Sollenberger.** 2004. Tropical and Subtropical Grasses. Forages: The Science of Grassland Agriculture.
- Hanna, W., C. Chaparro, B. Mathews, J. Burns, L. Sollenberger and J. Carpenter.** 2004. Perennial Pennisetums. Warm-Season (C4) Grasses. pp. 503-535.
- Hernandez G.A., L. Sollenberger, D. McDonald, G. Ruegsegger, R. Kalmbacher and P. Mislevy.** 2004. Nitrogen Fertilization and Stocking Rate Affect Stargrass Pasture and Cattle Performance. *Crop Science*. 44:1348-1354.
- Johnson, P., K. Kenworthy, D. Auld and T. Riordan.** 2004. Distribution of Buffalograss Polyploid Variation in the Southern Great Plains. *Crop Science*. 41:909-913.
- Kenworthy, K., D. Auld and C. McKenney.** 2004. Systematic Collection of Buffalograss from the Lower Great Plains and Evaluation for Phenotypic and Physiological Parameters. *American Society of Agronomy National Meetings*.
- Kenworthy, K., D. Auld, C. McKenney and B. Lauterbach.** 2004. The Effect of Longitude and Latitude on Dormancy of Native Accessions of Buffalograss. *American Society of Agronomy National Meetings*.
- Kenworthy, K., D. Auld, D. Wester, R. Durham and C. McKenney.** 2004. Evaluation of Buffalograss Germplasm for Induction of Fall Dormancy and Spring Green-up. *Journal of Turfgrass Management*. 3:23-42.
- Koschnick, T., W. Haller and A. Fox.** 2004. Turf and Ornamental Plant Tolerances to Endothal in Irrigation Water II. Turf species. *HortTechnology*.
- Langeland, K.** 2004. What You Said: Survey Results from Restricted Use Pesticide Applicators Concerning Continuing Education Needs and Preferences. *Aquatics*. 26(4):14-21.
- Langeland, K. and J. Hutchinson.** 2004. Notes from the Lygodium Research Review. *Wildland Weeds*. pp. 38511.
- Langeland, K., T. Fucigna, A. Ferriter, D. Leslie, J. Burney, R. Penfield and D. Gordon.** 2004. Old World Climbing Fern: An Increasing Problem in Central Florida. *Florida Cattleman and Livestock Journal*. 74:74-80.
- MacDonald, G.** 2004. Cogongrass (*Imperata cylindrica*) - Biology, Ecology and Management. *Critical Reviews in Plant Sciences*. 23(5):367-380.
- MacDonald, G. and M. Barron.** 2004. Cogongrass Management Utilizing Integrated Revegetation Strategies - Annual Report.
- MacDonald, G., R. Kemerait, E. Williams, S. Brown, G. Harris, R. Gilbert, J. LaGra and C. Lye.** 2004. Establishment of Peanut Research Field Trials in Communities in the Rupununi. Final Report - Crop Year 2003.
- Main, C., J. Ducar, E. Whitty and G. MacDonald.** 2004. Weed Management in Southeastern Peanut with Diclosulam and Flumioxazin. *Weed Technology*.
- Maurer, M., D. Auld, C. Murphy, C. McKenney, P. Johnson and K. Kenworthy.** 2004. Evaluation of Twenty-six Buffalograss Cultivars and Accessions for Use as Turfgrass on the High Plains of West Texas. *Texas Journal of Agriculture and Natural Resources*. 14:24-36.
- Moore, K., K. Boote and M. Sanderson.** 2004. Physiology and Developmental Morphology. Warm Season C4 Grasses. *American Society of Agronomy*: Madison, WI. pp. 179-216.
- Moser, L., B. Burson and L. Sollenberger.** 2004. Warm-season C4 Grasses. *American Society of Agronomy*: Madison, WI.
- Naab, J., P. Singh, K. Boote, J. Jones and K. Marfo.** 2004. Using the CROPGRO-peanut Model to Quantify Yield Gaps of Peanut in the Guinean Savanna Zone of Ghana. *Agronomy Journal*. 96:1231-1242.
- Newman, Y. and L. Sollenberger.** 2004. Grazing Management and N Fertilization Effects on Competition between Vaseygrass and Limpograss. *Crop Science*.
- Pedersen, P., K. Boote, J. Jones and J. Lauer.** 2004. Modifying the CROPGRO-soybean Model to Improve Predictions for the Upper Midwest. *Agronomy Journal*. 96:556-564.
- Prasad, P., K. Boote, J. Vu and L. Allen.** 2004. The Carbohydrate Metabolism Enzymes Sucrose-P Synthase and ADG-pyrophosphorylase in Phaseolus Bean Leaves are Up-regulated at Elevated Growth Carbon Dioxide and Temperature. *Critical Reviews in Plant Sciences*. 166:1565-1573.
- Quesenberry, K.** 2004. Evaluation of Cultivars and New Germplasm of Rhizoma Perennial Peanut. Proceeding of the 2004 North Florida Perennial Peanut Field Day. pp. 1-2.
- Quesenberry, K., L. Sollenberger and Y. Newman.** 2004. Limpograss. Warm-season (C4) Grasses. pp. 809-832.
- Real, D., M. Rizza, K. Quesenberry and M. Echenique.** 2004. Reproductive and Molecular Evidence for Alloamy in *Lotononis Bainesii* Baker. *Crop Science*. 44:394-400.
- Reis, R., Y. Newman, L. Sollenberger, A. Hernandez Garay and L. Premazzi.** 2004. Cool-season Management Affects Subsequent Performance of Tifton 85 Bermudagrass. Proceedings of the 2004 Forage and Grassland Conference. pp. 308-312.
- Rizza, M., D. Real, K. Quesenberry and E. Albertini.** 2004. Plant Reproductive System Determination Under Field Conditions Based on Ccodominant Markers. *Journal of Genetic and Breeding*. 58:47-54.
- Santos, B., J. Dusky, W. Stall and D. Shilling.** 2004. Influence of Method of Phosphorus Application on Smooth Pigweed (*Amaranthus hybridus*) and Common Purslane (*Portulaca oleraceae*) Interference in Lettuce. *Weed Science*. 52(5):797-801.
- Santos, B., J. Dusky, W. Stall, D. Shilling and J. Gilreath.** 2004. Phosphorus Absorption in Lettuce, Smooth Pigweed (*Amaranthus hybridus*), and Common Purslane (*Portulaca oleraceae*) Mixtures. *Weed Science*. 52(3):389-394.
- Santos, B., J. Dusky, W. Stall, J. Gilreath and D. Shilling.** 2004. Mechanisms of Interference of Smooth Pigweed (*Amaranthus hybridus*) and Common Purslane (*Portulaca oleraceae*) on Lettuce as Influenced by Phosphorus Fertility. *Weed Science*. 52:78-82.
- Sau, E., K. Boote, W. Bostick, J. Jones and M. Minguez.** 2004. Testing and Improving Evapotranspiration and Soil Water Balance of the DSSAT Crop Models. *Agronomy Journal*. 96:1243-1257.
- Sollenberger, L.** 2004. Plant-herbivore Interactions. Forages: The Science of Grassland Agriculture.
- Sollenberger, L. and Y. Newman.** 2004. Grazing Management. Forages: The Science of Grassland Agriculture.
- Sollenberger, L., R. Reis, L. Nussio, C. Chambliss and W. Kunkle.** 2004. Forage Conservation. Warm-season (C4) Grasses. pp. 355-387.
- Spires, J., K. Kenworthy and R. Rhykerd.** 2004. Emergence and Height of Plants Seeded in Crude Oil Contaminated Soil. *Texas Journal of Agriculture and Natural Resources*. 14:37-46.
- Spires, J., K. Kenworthy and R. Rhykerd.** 2004. Root and Shoot Biomass of Plants Seeded in Crude Oil Contaminated Soil. *Texas Journal of Agriculture and Natural Resources*. 14:117-124.
- Teuton, T., B. Brecke, J. Unruh, G. MacDonald, G. Miller and J. Ducar.** 2004. Factors Affecting Seed Germination Tropical Signalgrass (*Urochloa subquadrifera*). *Weed Science*. 52:376-381.
- Teuton, T., C. Main, G. MacDonald, J. Ducar and B. Brecke.** 2004. Green Peanut Tolerance to Preemergence and Postemergence Herbicides. *Weed Technology*. 18:719-722.
- Unruh Snyder, L. and G. Fick.** 2004. Correcting Measurements of Pasture Forage Mass by Vacuuming the Stubble. 94:860-863.
- Wang, K., R. McGovern, R. McSorley and R. Gallaher.** 2004. Cowpea Cover Crop and Solarization for Managing Root-knot and Other Plant-parasitic Nematodes in Herb and Vegetable Crops. *Soil Crop Sci. Soc. Florida Proc.* 63:99-104.

# PUBLICATIONS

Wang, K., R. McSorley and R. Gallaher. 2004. Effect of *Crotalaria Juncea* Amendment on Squash Infected with *Meloidogyne Incognita*. *Journal of Nematology*. 36:290-296.

Wang, K., R. McSorley and R. Gallaher. 2004. Host Status and Amendment Effects of Cowpea on *Meloidogyne Incognita* in Vegetable Cropping Systems. *Nematropica*. 33(2):215-224.

Wang, K., R. McSorley and R. Gallaher. 2004. Relationship of Soil Management History and Nutrient Status to Nematode Community Structure. *Nematropica*. 34:83-95.

Wang, K., R. McSorley and R. Gallaher. 2004. Relationships of Nematode Communities and Soil Nutrients in Cultivated Soils. *Soil Crop Sci. Soc. Florida Proceedings*. 63:105-113.

Wang, K., R. McSorley, A. Marshall and R. Gallaher. 2004. Nematode Community Changes Associated with Decomposition of *Crotalaria Juncea* Amendment in Litterbags. *Applied Soil Ecology*. 27:31-45.

Zhang, L., M. Yang, X. Wang, B. Larkins, M. Gallo-Meagher and R. Wu. 2004. A Model for Estimating Joint Maternal-offspring Effects on Seed Development in Autogamous Plants. *Genomics*. 19:262-269.

Zhao, W., J. Zhu, M. Gallo-Meagher and R. Wu. 2004. A Unified Statistical Model for Functional Mapping of Environment-dependent Genetic Expression and Genotype by Environment Interactions for Ontogenetic Development. *Genetics*. 168:1751-1762.

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Altpeter, F.	Molecular Improvement of Physiological Traits Defining Environmental Adaption of Tropical Forage Grass Production	U.S. Dept. of Agriculture	95,118
Altpeter, F.	Development and Comparison of Alternative Strategies to Control Dispersal of Transgenic Bahiagrass into Natural	U.S. Dept. of Agriculture	350,000
Altpeter, F.	Characterizing the Ryegrass Drought Stress Regulon (Industry Match to CPBR)	Vialactia Biosciences	20,000
Altpeter, F.	Characterizing the Ryegrass Drought Stress Regulon	Consort. for Plant Biotech Res.	141,000
Altpeter, F.	Molecular Improvement of an Environmentally Friendly Turfgrass	Consort. for Plant Biotech Res.	52,022
Bennett, J.M.	Drought Tolerance of Nitrogen Fixation in Soybean Plant Introductions and Breeding Lines in Florida	U.S. Dept. of Agriculture	99,280
Bennett, J.M.	Drought Tolerant of Nitrogen Fixation in Soybean Plant Introductions and Breeding Lines in Florida: Amendment #5	U.S. Dept. of Agriculture	14,960
Bennett, J.M.	Research Support for Sarah Cathey - Graduate Assistantship	Jones Ecological Research Ctr.	18,680
Bennett, J.M.	Drought Stress Tolerance in Florida	U.S. Dept. of Agriculture	57,340
Bennett, J.M.	Research Projects in Florida Peanut Production	Dept. of Agricul. & Consumer Ser.	116,000
Bennett, J.M.	Research Projects in Florida Soybean Production	Dept. of Agricul. & Consumer Ser.	5,467
Bennett, J.M.	Research Projects in Florida Tobacco Production Tobacco Check-off Funds	Dept. of Agricul. & Consumer Ser.	11,500
Bennett, J.M.	Modeling of Soybean Yields	Inst. for Technology Dev.	15,000
Boote, K.J.	Simulation of Peanut Cropping Systems to Improve Production Efficiency and Enhance Natural Resource Management	Univ. of Georgia	300,000
Boote, K.J.	Testing and Improving a Perennial Forage Model for Predicting Forage Production, N Uptake, N Leaching and ...	U.S. Dept. of Agriculture	96,934
Gallaher, R.N.	Management of Viral and Fungal Diseases and Insect Pests of Peanut Affecting Yield, Quality and Net Returns Under...	Univ. of Georgia	2,000
Gallo-Meagher, M.	Molecular Improvement for Insect Resistance in Turf and Forage Grasses	U.S. Dept. of Agriculture	100,000
Haller, W.T.	Evaluation of New Herbicides for Hydrilla Control	Dept. of Environmental Protect.	21,051
Haller, W.T.	UF Cooperative Aquatic Plant Education Program	Dept. of Environmental Protect.	25,000
Haller, W.T.	Assessment of Aquatic & Invasive Plant Management Methodologies (2005)	Water Management Districts	40,000
Kenworthy, K.E.	Ryegrass Variety Trials	Miscellaneous Donors	4,450
Langeland, K.A.	Technology Transfer Component of the Areawide Program for <i>Melaleuca Quinquenervia</i>	U.S. Dept. of Agriculture	220,406
Langeland, K.A.	Cumberland Island Non-Native Plant Survey	U.S. Dept. of the Interior	32,370
Langeland, K.A.	Improving Herbicide Effectiveness for <i>Lygodium Microphyllum</i> Control	Dept. of Environmental Protect.	24,352
Langeland, K.A.	Treatment Effectiveness for <i>Lygodium</i> on A.R.M. Loxahatchee National Wildlife Refuge	U.S. Dept. of the Interior	100,000
Langeland, K.A.	Evaluation of Target and Non-target Effects of Herbicide Application	Water Management Districts	25,000
MacDonald, G.E.	Development of Sustainable Peanut Production Technologies for Amerindian Villages in the Rupununi Region of Guyana	Univ. of Georgia	144,395

## AGRONOMY

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
MacDonald, G.E.	Native Plant Restoration Following Cogongrass Control on Reclaimed Mining Areas	Fl. Inst. of Phosphate Research	25,725
MacDonald, G.E.	Soil Moisture and Herbicide Uptake and Translocation Study for Torpedograss ( <i>Panicum Repens</i> ) Rfp# C-13416	Water Management Districts	40,000
Netherland, M.D.	Evaluation of a Potential New Aquatic Herbicide (Sp-1019) for Control of Fluridone-Tolerant Hydrilla	Dept. of Environmental Protect.	30,000
Prine, G.M.	Ryegrass Variety Trials-Miscellaneous Donors	Miscellaneous Donors	18,049
Quesenberry, K.H.	Genetic Diversity and Domestication of Forage Legumes	U.S. Dept. of Agriculture	100,000
Ramey, V.A.	Production and Printing of Invasive Plant ID Fold Out Cards Task Assignment Under Master Agreement SI849	Dept. of Environmental Protect.	36,483
Ramey, V.A.	Maintenance & Expansion of the APIRS Online Database, the Flupland Invasive Plants Library/FL Aquatic Plants (2004-05)	Dept. of Environmental Protect.	50,000
Ramey, V.A.	Maintenance and Expansion of Dep/IFAS Aquatic Plant Management Web Site and Development of Education..04-05	Dept. of Environmental Protect.	40,000
Scholberg, J.M.	Integrative Use of Perennial Peanut for Cost Effective Weed Control in Organic Citrus	U.S. Dept. of Agriculture	162,601
Scholberg, J.M.	A System Approach for Improved Integration of Green Manure in Commercial Vegetable Production Systems	Univ. of Georgia	171,800
Scholberg, J.M.	Implementation and Evaluation of a Web-Based Nutrient Management Plan Support (Numaps) System for Florida Crops	Dept. of Environmental Protect.	299,889
Scholberg, J.M.	Crop Phytoremediation of Phosphorus-enriched Soils in the Lake Okeechobee Region	Dept. of Agricul. & Consumer Ser.	419,580
Scholberg, J.M.	Improved Use of Crop Nutrient Interception Capacity for Groundwater Protection	Dept. of Agricul. & Consumer Ser.	14,700
Scholberg, J.M.	Develop Irrigation Systems/practices for Reducing Nitrogen Leaching for Vegetable Crops	Dept. of Agricul. & Consumer Ser.	166,619
Shiralipour, A.	Year 2-Solid and Hazardous Waste Management Training and Other Resource Conservation & Recovery Act Related Activies	Dept. of Environmental Protect.	60,000
Sollenberger, L.E.	Management to Minimize Nutrient Loss and Enhance Recycling in Grazed Grasslands	U.S. Dept. of Agriculture	30,000
Sollenberger, L.E.	Determinants of Nutrient Pools and Fluxes in Grazed Grasslands	U.S. Dept. of Agriculture	99,428
Stocker, R.K.	The Nature Conservancy's Natural Areas Training Academy	Fl. Fish & Wildlife Consvr. Comm.	25,000
Stocker, R.K.	Aquatic Plant Management Graduate Assistantship	Aquatic Ecosys. & Restorn. Found.	20,000
Stocker, R.K.	Impacts of Invasive Non-Native Agricultural Plants in the US Virgin Islands Natural Areas	U.S. Dept. of Agriculture	55,517





**2004 Annual Research Report**  
*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

The primary mission of the statewide Animal Sciences program is to assist the livestock industries of Florida to achieve efficient production by contributing to the solution of livestock production problems through research, resident instruction and extension programs. This mission is accomplished through the cooperative efforts of the faculties of the Department of Animal Sciences, the Range Cattle Research and Education Center (Ona), the North Florida Research and Education Center (Marianna), the Subtropical Agricultural Research Station, USDA-ARS (Brooksville) and the sixty-seven county extension facilities. One integral part of the accomplishment of this mission is the cooperation and support of people in the livestock industries. In addition, personnel from a number of campus departments cooperate with Animal Sciences faculty members in program support. The Department of Animal Sciences balanced research program ranges from basic research in molecular biology and cloning to applied livestock production research conducted at cooperator farms. Some research areas of major focus include, improving bovine embryo survival, improving the efficiency of dairy and beef production, improving the skeletal development of the horse through improved nutrition, improving reproductive efficiency of the horse, developing systems for utilizing by-products

and waste materials in animal production and developing new or improved meat and poultry products. These major focus areas are addressed through research in reproductive physiology, nutrition, animal breeding and genetics, molecular biology, meat and poultry products and livestock management systems. The Department of Animal Sciences maintains several research and teaching farms in the Gainesville area where the animal resources to support the programs are housed. These include a swine teaching and research farm and facilities that house sheep, horses and some cattle for short term research projects on the University of Florida Campus. The department has four off-campus farms in the Gainesville area. An 1100 acre dairy farm with 600 cows plus replacement heifers provides resources for the dairy research program. Beef cattle research facilities include 1200 and 1600 acre beef farms designed to support individual animal as well as large group research. The Horse Research Center near Ocala is the site that supports the majority of the equine research conducted by the department. Research conducted at privately owned horse, dairy and beef farms with cooperating farm owners is vital to the department's total research effort and is an extension of the department's research resources.

## RESEARCH HIGHLIGHTS

**THE POTENTIAL USE OF THE SLICK HAIR GENE TO HEAT STRESS AND INCREASE PRODUCTIVITY OF DAIRY CATTLE IN WARM CLIMATES**

**SIGNIFICANCE:** Heat stress is responsible for large declines in pregnancy rates and lowered milk production of dairy cattle during hot months throughout much of the United States as well as in the Caribbean region. Since the summer depression in fertility is greater for high-producing cows than for low-producing cows, the continual improvement in milk yield per cow that has occurred over time and is expected to continue to increase in the future means that problems of heat stress which are already severe, likely will be exacerbated in the future. Despite its importance, there are few effective strategies for reducing the effects of heat stress. The major strategy, modifying the environment using shade, sprinklers, fans, etc., is capital-intensive, not particularly effective, and is of limited use for many small and medium-sized dairies with limited opportunity for capital investment and also is not useful for alternative production systems such as grazing dairies. There is thus a compelling need to develop alternative approaches for reducing the summer decline in fertility and milk production.

**RATIONALE:** One alternative approach would be to produce dairy cattle that are genetically more resistant to heat stress. This can be done by crosses of Holsteins to *Bos indicus* (Brahman or, more likely, milking zebu breeds). This approach effectively produces heat tolerant cattle but the cost in terms of reduced milk production and other issues makes this idea unfeasible for Florida dairies. Another approach is through the use of a major dominant gene (the *Slick hair* gene) that has recently been identified in *Bos taurus* cattle. The effect of the *Slick hair* gene is to produce a hair coat that is very short, glossy and has the tactile feeling of a recently clipped animal. Previous studies have shown that slick-haired Senepol beef cattle (a *Bos taurus* breed developed on St. Croix, U.S. Virgin Islands) are equal in heat tolerance to Brahman cattle and that slick-haired Senepol F<sub>1</sub> crossbreds with temperate breeds such as the Hereford or Angus show heat tolerance very comparable to those of Brahman and Brahman crossbreds. Observations on the hair coat types of progeny of Senepol X Angus and Senepol X Hereford F<sub>1</sub> dams mated to temperate breed sires indicated that they were segregating into two categories, one group with very short, sleek, hair coats like those of purebred Senepol and their F<sub>1</sub> crossbreds and one group whose hair coats were not distinguishable from those of temperate breed cattle. It was also observed that occasionally Senepol calves were also born with hair coats like those of temperate cattle. This, coupled with the fact that the Senepol breeders were able to quickly establish a uniform, short sleek hair coat within their breed on the vast majority of the animals, supported the idea that a single, major gene was responsible for the very short, sleek (Slick) hair coats of Senepol and other tropically adapted breeds of *Bos taurus* cattle such as the Carora of Venezuela and the milking Criollo breeds of Central and South America. The discovery of slick-haired Holstein cattle in Puerto Rico that likely were upgraded from Criollo cattle for over 30 years also supported the concept of a major gene was responsible for this type of hair coat. In more recent years we have observed the expected ratios of 50% slick to 50% normal-haired progeny when animals heterozygous for the *Slick hair* gene are mated to normal-haired animals.

**IMPACT:** We have demonstrated that a short, sleek hair coat in cattle is associated with increased heat tolerance and that such a hair coat can be produced by the action of a single gene, the *Slick hair* gene, which is dominant in mode of inheritance. We have also observed that *Bos taurus* cattle with this gene and the type of hair that it imparts to them are able to maintain rectal temperatures under heat stress that are approximately 0.5° C lower than those of genetically similar cattle with normal hair. This difference in rectal temperature is similar to that observed elsewhere between *Bos indicus* and unadapted *Bos taurus* cattle. This superior thermoregulatory ability appears to be the result of the fact that the slick coat facilitates convective and conductive heat loss and minimizes absorption of heat by solar radiation. Since the *Slick hair* gene is dominant, it is easy to incorporate it into Holstein or other breeds of dairy cattle through an upgrading procedure (successive crosses of the Holstein after an initial cross with a Senepol along with selection each generation for those possessing slick hair). Once highly upgraded (87.5% or greater) slick-haired Holstein cattle are produced, they can be mated together to produce a percentage of their progeny that are homozygous for the *Slick hair* gene. Previously homozygous black Simmental and Limousin cattle have been developed using these same techniques through the incorporation of the black gene into these, originally red, breeds. The salient advantage of the availability of homozygous slick sires is that such bulls can be mated to normal-haired cows and all the progeny would be expected to be slick-haired.

An important question that remains to be answered regarding the *Slick hair* gene is to determine what is the impact of the greater heat tolerance (as measured by lowered rectal temperatures) of

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## RESEARCH HIGHLIGHTS

slick-haired cows on fertility and milk production. We have already demonstrated that young, slick-haired 87.5% Holstein bulls graze more during the hotter periods of the day and have lower respiration rates while maintaining lower body temperatures. If this same effect is expressed in lactating females, it could have important consequences on their productivity and fertility. It is likely that the ability to maintain lower temperatures without increasing respiration rates will encourage greater feed consumption and more productive use of this extra feed in terms of increased milk production. Also, it has been shown that very early bovine embryos cannot survive a uterine temperature above 41 ° C, a temperature often measured in Florida dairy cows under heat stress. We hope that effect of the *Slick hair* gene will be sufficient to lower uterine temperatures enough to allow the survival of the embryos and thus to increase pregnancy rates during the summer months in Florida which can be as low as 10%.

Very limited data from a grazing dairy in Puerto Rico demonstrated a 25% advantage in milk yield for slick-haired Holstein cows over their normal-haired contemporaries. Apparently slick-haired cows were willing to graze for additional hours during the day due to their increased heat tolerance and, therefore, were able to produce at a higher level. In a much larger study in Venezuela, it has been observed that under mild heat stress (i.e., rectal temperatures < 40° C) in a near desert environment), Holstein x Carora crossbred cows (75% Holstein) with slick hair were able to conceive again about 21 days sooner than did cows of the same breed composition but with normal hair. This was in spite of the fact that these same slick-haired cows milked about 1000 kg more milk than did their normal-haired siblings. These data provide

encouragement that beneficial effects of the *Slick hair* gene will be of economic importance under the more severe heat stress characteristic of much of the southern United States and the Caribbean region.

Future Research: While we have a growing quantity of data indicating a considerable advantage in productivity of slick-haired animals as compared to their normal-haired contemporaries in Puerto Rico and Venezuela, we have not yet demonstrated a similar advantage in Florida. A study is currently underway to compare the impact of the *Slick hair* gene on milk yield, fertility and health traits in 87.5 % Holstein cows at the Dairy Research Unit and in south Florida at the McArthur Farms Dairy. This study will replicate one underway in several cooperating dairies in Puerto Rico.

Also, studies are continuing in collaboration with researchers from USDA-ARS (STARS) at Brooksville to identify the genomic location of the *Slick hair* gene and/or genetic markers for the gene. A marker would be very useful in the identification of Holstein cattle that are homozygous for the *Slick hair* gene.

**COLLABORATORS:** We have collaborated with researchers from the Subtropical Agricultural Research Station (STARS), Brooksville, Florida on the study of the *Slick hair* gene since the initial studies of the Senepol breed there. We also have had a long relationship in the study of this gene and heat tolerance in general with faculty of the University of Puerto Rico at Mayaguez. The TSTAR program of the USDA has been instrumental in its support of this research here in Florida as well as the cooperative studies in Puerto Rico. Funding from the IFAFS program of USDA also was critical in several aspects of this research.

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## ANIMAL SCIENCE

### FACULTY & STAFF

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Joel V. Yelich	Assoc. Prof.	Animal Reproductive Physiology, Beef	60	40	0

### RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
ANS-03532	Harms, R.H., Sloan, D.R., Wilson, H.R.	Amino Acid Requirements of Commercial Laying Hens and Broiler Breeder Hens
ANS-03695	Kunkle, W.E., Bates, D.B., Reiling, B.A.	Use of Molasses-Based Mixtures in Cow-Calf Production Systems
ANS-03792	McDowell, L.R.	Mineral and Vitamin Supplementation of Ruminants
ANS-03818	Elzo, M.A., Johnson, D.D., Kunkle, W.E.	Improvement of Beef Cattle in Multibreed Populations: Phase III
ANS-03821	Yelich, J.V.	Synchronization of Estrus in Cattle of Bos Indicus Breeding
ANS-03833	Williams, S.K.	The Poultry Food System: A Farm to Table Model
ANS-03859	Head, H.H., Bachman, K.C.	Use of bST, Shortening the Dry Period, and Prepartum Feeding of Anionic Salts to Improve Milk Production and Health of Dairy Cows
ANS-03912	Hansen, P.J., Staples, C.R.	Enhancing Production and Reproductive Performance of Heat-Stressed Dairy Cattle
ANS-03956	Sharp, D.C.	Luteinizing Hormone (LH) Synthesis and Secretion Regulation in Horses
ANS-03980	Moore, K.	Improving Efficiencies of In-Vitro Embryo Production Technologies in Cattle
ANS-04001	Hansen, P.J., de Vries, A., Staples, C.R., Olson, T.A., Drost, M., Thatcher, W.W., Willard, S.T., Whisnant, C.S., Misztal, I., Rutledge, J.J., Edwards, J.L., Chase, C.C.	Improving Fertility of Heat-Stressed Dairy Cattle
ANS-04003-F	Fields, M.J.	Effect of Oxytocin on the Uterine Oxytocine Prostanoid System in the Peri-Implantation Cow
ANS-04058	Hall, M.B., Nair, V.D., Harris, W.G., Graetz, D.A.	Manure-derived Components and Their Influence on Long-term Phosphorous Stability in Soils
ANS-04063	Hansen, P.J.	Apoptosis and Stress in Preimplantation Embryos
ANS-04080-A	Adesogan, A.T., Staples, C.R., Valencia, E., Sollenberger, L.E.	Improving Forage Quality and Livestock Productivity with Exogenous Fibrolytic Enzymes
ANS-04080-H	Hall, M.B., Adesogan, A., Riquelme, E.	Assessing Digestibility of Cell Wall Crude Protein in Tropically Grown Forages for Improved Livestock Production
ANS-04080-O	Olson, T.A., Moore, K., Pantoja, J.	Evaluation and Utilization of the Slick Hair Gene in Florida and Caribbean Dairies
ANS-04089	De Vries, A.	Management Systems to Improve the Economic and Environmental Sustainability of Dairy Enterprises
ANS-04111	Ott, E.A.	Influence of Nutrition and Management on Skeletal Development of Growing Horses
ANS-04144	Williams, S.K.	Production Systems to Improve the Efficiency and Profitability of Small and Economically Disadvantaged Livestock Family Farms

# PUBLICATIONS

- Adesogan, A. and M. Salawu.** 2004. Effect of Applying Formic Acid or Lactobacillus Buchneri Inoculants with or without Homofermentative Lactic Acid Bacteria on the Fermentation Characteristics and Aerobic Stability of Intercropped Pea-wheat Silages and Whole Crop Wheat or Pea Silages. *Journal of the Science of Food and Agriculture.* 84:983-992.
- Adesogan, A., M. Salawu, S. Williams and R. Dewhurst.** 2004. Reducing Concentrate Requirements and Improving Milk and Microbial Protein Yield in Dairy Cows by Replacing Grass Silage with Pea-wheat Intercrop Silages. *Journal of Dairy Science.* 87:3398-3406.
- Adesogan, A., N. Krueger, D. Dean, M. Salawu and C. Staples.** 2004. Effect of Treating Bermudagrass with an Inoculant, Molasses and a Mixture of These Additives on Silage Fermentation and Aerobic Stability. *Journal of Dairy Science.*
- Adesogan, A., N. Krueger, D. Dean, M. Salawu and C. Staples.** 2004. The Influence of Treatment with Dual Purpose Inoculants or Soluble Carbohydrates on the Fermentation and Aerobic Stability of Bermudagrass. *Journal of Dairy Science.* 87:3407-3416.
- Bachman, K.** 2004. Dry Period Length: How Short is Long Enough. National Mastitis Council.
- Badinga, L., A. Lowe and C. Staples.** 2004. Production and Metabolic Responses of Periparturient Holstein Cows to Dietary Conjugated Linoleic Acid and Trans-octadecenoic acids. *Journal of Dairy Science.* 87:158-168.
- Block, J. and P. Hansen.** 2004. Towards an Embryocentric World: The Current and Potential Uses of Embryo Technologies in Dairy Production. *Reproduction Fertility and Development.* 16:38366.
- Bray, D. and R. Bucklin.** 2004. Latest in Tunnel Barns for Cow Comfort. *UF Animal Science.*
- Bridges, G., G. Portillo, J. de Araujo, W. Thatcher and J. Yelich.** 2004. Efficacy of Either a Single or Split Treatment of PGF After a 14 D Melengestrol Acetate Treatment to Synchronize estrus and Induce Luteolysis in Bos Indicus x Bos Taurus Heifers. *Theriogenology.*
- Buford, M., C. Calkins, D. Johnson and B. Gwartney.** 2004. Cow Muscle Profiling: A Comparison of Chemical and Physical Properties of 21 Muscles from Beef and Dairy Cows. *Beef Cattle Report.* pp. 89-91.
- Chapman, C., L. Chapman, L. Naughton-Treves and L. McDowell.** 2004. Predicting Folivore Abundances: Validation of a Nutritional Model. *Predicting Folivore Abundances: Validation of a Nutritional Model.* 62:55-69.
- de Araujo, J., G. Bridges, G. Portillo and J. Yelich.** 2004. The Effect GnRH vs. No-GnRH at the Initiation of a 7 Day CIDR Synchronization Treatment on AI Pregnancy Rates in Postpartum Lactating Angus and Bos Indicus x Bos Taurus Cows.
- de Araujo, J., M. Ausitn, B. Austin and J. Yelich.** 2004. Comparison of Two CIDR Synchronization and AI Treatments in Postpartum Lactating. University of Florida, Gainesville, Florida.
- Dean, D., A. Adesogan and N. Krueger.** 2004. The Effect of Treatment of Two Warm Season Grass Hays with Commercial Fibrolytic Enzymes or Ammonia on Nutritive Value. University of Florida: Gainesville, Florida.
- DeVries, A.** 2004. Trends in Reproductive Performance in Dairy Cows: What Do the Numbers Tell Us. Florida Reproduction Road Show.
- DeVries, A. and C. Risco.** 2004. Pregnancy Rates in Natural Service and Artificially Inseminated Dairy Herds. PDHGA Southeast Regional Meeting.
- DeVries, A. and C. Risco.** 2004. Pregnancy Rates in Natural Service and Artificially Inseminated dairy herds. West Florida Dairy Conference.
- DeVries, A., R. Giesy, L. Ely, B. Broadus, C. Vann and B. Butler.** 2004. DBAP 2003: What We Have Learned About Your Business. Florida Dairy Business Conference.
- DeVries, A., W. Thatcher and J. van Leeuwen.** 2004. Economic Importance of Improved Reproductive Performance. Florida Reproduction Road Show.
- Ealy, A., S. Wagner, A. Shiels, N. Whitley, D. Keisling, S. Johnson and G. Barbato.** 2004. Identification of Interferon-tau Isoforms Expressed by the Pre-implantation Goat (*Capra hircus*) Conceptus. *Domestic Animal Endocrinology.* 27:39-49.
- Elzo, M.** 2004. KU-Kamphangsae Dairy Herd: Preliminary Ideas for a Research-Development Study: USA.
- Elzo, M.** 2004. Preliminary Ideas for the Analysis of a Dual-purpose Multibreed Cattle Population in Mexico: University of Florida.
- Elzo, M. and A. de los Reyes Borjas.** 2004. Perspectives for Multibreed Genetic Evaluation of Cattle in Brazil. *Ciencia Animal Brasileira.* 5:171-185.
- Elzo, M., D. Johnson, J. Wasdin and J. Jones.** 2004. Protocol for Beef Cattle Multibreed Genetic Research Programs at the University of Florida (with Summary Protocols of Other Research Areas)(VERSION 2.0): University of Florida.
- Fields, M. and M. Shemesh.** 2004. Extragonadal Receptors in the Reproductive Tract of Domestic Animals. *Journal of the Community Development Society.* 71:1412-1418.
- Giesy, R., A. DeVries and A. Wilkie.** 2004. Advantages and Disadvantages of Using Manure Digesters to Generate Electricity on Florida Dairy Farms. Florida Dairy Business Conference.
- Giesy, R., A. DeVries and A. Wilkie.** 2004. Review of the Economics of Manure Systems that Generate Electricity on Dairy Farms. Florida Dairy Business Conference.
- Hansen, P.** 2004. Frontiers in Reproductive Immunology - Forum Introduction. *Reproductive Biology and Endocrinology.* 1:115.
- Hansen, P.** 2004. Physiological and Cellular Adaptations of Zebu Cattle to Thermal Stress. *Animal Reproduction Science.* 82-83:349-360.
- Hersom, M.** 2004. Principles of Supplementing the Grazing Beef Cow. Department of Animal Sciences, University of Florida.
- Hersom, M., C. Krehbiel and G. Horn.** 2004. Effect of Live Weight Gain of Steers during Winter Grazing: II. Visceral Organ Mass, Cellularity, and Oxygen Consumption in Cattle during High-Grain Feeding. *Journal of Animal Science.* 82:184-197.
- Hersom, M., G. Horn, C. Krehbiel and W. Phillips.** 2004. Effect of Live Weight Gain of Steers During Winter Grazing: I. Subsequent Feedlot Performance, Carcass Characteristics and Body Composition in Beef Steers. *Journal of Animal Science.* 82:262-272.
- Hersom, M., R. Wettemann, C. Krehbiel, G. Horn and D. Keisler.** 2004. Effect of Live Weight Gain of Steers During Winter Grazing: III. Blood Metabolites and Hormones during Feedlot Finishing. *Journal of Animal Science.* 82:2059-2068.
- Houser, T., J. Sebranek, B. Thacker, T. Baas, D. Nilubol, E. Thacker and F. Kruse.** 2004. Effectiveness of Transdermal, Needle-free Injections for Reducing Pork Carcass Defects. *Meat Science.* 68:329-332.
- Houser, T., J. Sebranek, W. Maisonet, J. Cordray, B. Wiegand, D. Ahn and E. Lee.** 2004. The Effects of Irradiation at 1.6 kGy on Quality Characteristics of Commercially Produced Ham and Pork Frankfurters Over Extended Storage. *Journal of Food Science.*
- Houser, T., J. Sebranek, W. Maisonet, J. Cordray, D. Ahn and P. Dixon.** 2004. Irradiation-induced Cured Ham Color Fading and Regeneration. *Journal of Food Sciences.*
- Jousan, F. and P. Hansen.** 2004. Insulin-like Growth Factor-I as a Survival Factor for the Bovine Preimplantation Embryo Exposed to Heat Shock. *Biology of Reproduction.* 71:1665-1670.
- Kamaruddin, M., T. Kroetsch, P. Basrur, P. Hansen and W. King.** 2004. Immunolocalization of Heat Shock Protein 70 in Bovine Spermatazoa *Andrologia.* 36:327-344.
- Keene, B., K. Knowlton, M. McGilliard, L. Lawrence, S. Nickils-Richardson, J. Wilson, A. Rutledge, L. McDowell and M. van Amburgh.** 2004. Measures of Bone Mineral Content in Mature Dairy Cows. *Measures of Bone Mineral Content in Mature Dairy Cows.* 87:3816-3825.
- Koonawootrittriron, S., M. Elzo, P. Sapanarat, C. Chaimongkol, T. Sainui, K. Nithichai, T. Tongprapi and T. Talukmun.** 2004. D.P.O. Sire & Dam Summary 2003. Kasetsart University: Thailand.
- Koonawootrittriron, S., M. Elzo, P. Sapanarat, S. Tumwasorn, T. Tongprapi, C. Chaimongkol and K. Nithichai.** 2004. A Case Study on Phenotypic and Genetic Trends for First Lactation Productions of a Multibreed Dairy Population in Thailand. Kasetsart University.
- McDowell, L.** 2004. Faculty Achievement Report, Report of Accomplishments. Faculty Achievement Report, Report of Accomplishments.
- McDowell, L.** 2004. Mike Hidioglou, 1922-2003: A Brief Biography. 82:1258.
- McDowell, L.** 2004. Mineral and Vitamin Supplementation for Ruminants. Mineral and Vitamin Supplementation for Ruminants.
- McDowell, L.** 2004. Mineral Nutrition in Hot Climates/Heat Stress. pp. 196-214.
- McDowell, L.** 2004. Potential Impacts of Amendments Used to Reduce Dairy Manure P Runoff.
- McDowell, L.** 2004. Re-evaluation of the Essentiality of the Vitamins. pp. 37-67. 2004. Selenium Supplementation for Ruminants.

# PUBLICATIONS

- McDowell, L.** 2004. Toxicity from Water Treatment Residuals on Mineral Status from Grazing Ruminants.
- McDowell, L., F. Fuentes and N. Wilkinson.** 2004. Barium Selenate Supplementation of a Crossbred Cattle Herd in Puerto Rico. 2:693-695.
- McGlothen, J., G. Lester, P. Hansen, L. Pablo and D. Hawkins.** 2004. Alterations in Uterine Contractility in Mares with Experimentally Induced Placentitis. *Reproduction*. 127:57-76.
- Mink, B., C. Calkins, D. Johnson, A. Stelzleni and B. Gwartney.** 2004. Properties of Cow and Beef Muscles: Benchmarking the Differences and Similarities. International Congress of Meat Science and Technology. 50:38356.
- Myer, R., J. Brendemuhl, F. Leak and J. Hess.** 2004. Evaluation of a Rendered Poultry Mortality-soybean Meal Product as a Supplemental Source for Pig Diets. *Journal of Animal Science*. 82:1071-1078.
- O'Connor, C., L. Lawrence, A. St. Lawrence, K. Janicki, L. Warren and S. Hayes.** 2004. The Effect of Dietary Fish Oil Supplementation on Exercising Horses. *Journal of Animal Science*. 82:2978-2984.
- Olson, T.** 2004. Førsteintrykket av den norske storfekjøttproduksjonen. *Kjøttfeavl*. 3:38447.
- Page, J., X. Wang, L. Sordillo and S. Johnson.** 2004. MEK1 Signaling Through P38 Leads to Transcriptional Inactivation of E47 and Repression of Skeletal Myogenesis. *Journal of Biological Chemistry*. 279:30966-30972.
- Peterson, T., L. McDowell, R. McMahon, N. Wilkinson, O. Rosendo, W. Seymour, P. Henry and J. Shearer.** 2004. Balance and Serum Concentration of Biotin in Sheep Fed Alfalfa Meal Based Diets with Increasing Level of Concentrate. 82:1165-1169.
- Portillo, G., E. Hiers, C. Barthle, M. Shaw and J. Yelich.** 2004. Response to a Prostaglandin Injection on Either Day 6 or 7 of the Estrous Cycle in Angus and Brahman x Angus heifers. *Theriogenology*.
- Portillo, G., J. de Araujo, G. Bridges, M. Shaw, N. Schrick, W. Thatcher and J. Yelich.** 2004. Secretory Patterns of LH in Response to a GnRH Treatment Administered on Day 6 of the Estrous Cycles in Angus and Brahman X Angus Heifers. *Journal of Animal Science*.
- Riley, D. and T. Olson.** 2004. Genetic and Nongenetic Influences on Vigor at Birth and Preweaning Mortality of Purebred and High Percentage Brahman Calves. *Journal of Animal Science*. 82:1581-1588.
- Riley, D. and T. Olson.** 2004. Maternal and Reproductive Performance of Brahman X Angus, Senepol X Angus, and Tuli X Angus Cows in the Subtropics. *Journal of Animal Science*. 82:2764-2772.
- Rivera, R., G. Dahlgren, L. deCastroPaula, R. Kennedy and P. Hansen.** 2004. Actions of Thermal Stress in Two-cell Bovine Embryos: Oxygen Metabolism, Glutathione and ATP Content, and the Time-course of Development. *Reproduction*.
- Rivera, R., K. Kelley, G. Erdos and P. Hansen.** 2004. Reorganization of Microtubules and Microfilaments by Thermal Stress in Two-cell Bovine Embryos. *Reproduction*. 70:1852-1862.
- Rosendo, O., C. Staples, L. McDowell, R. McMahon, F. Martin, L. Badinga, J. Shearer, W. Seymour and N. Wilkinson.** 2004. Biotin Supplementation Effects on Peripartum Performance and Metabolites of Holstein Cows. 87:2535-2545.
- Roth, Z. and P. Hansen.** 2004. Involvement of Apoptosis in Disruption of Oocyte Competence by Heat Shock in Cattle. *Biology of Reproduction*. 71:1898-1906.
- Roth, Z. and P. Hansen.** 2004. Sphingosine 1-phosphate Protects Bovine Oocytes from Heat Shock during Maturation. *Biology of Reproduction*.
- Selberg, K., C. Staples, D. Luchini and L. Badinga.** 2004. Dietary Trans-octadecenoic Acids Upregulate the Liver Gene Encoding Peroxisome Proliferator-activated Receptor Alpha in Transition Dairy Cows. *Journal of Dairy Research*.
- Sollenberger, L., R. Reis, L. Nussio, C. Chambliss and W. Kunkle.** 2004. Forage Conservation. Warm-season (C4) Grasses. pp. 355-387.
- Soto, P., R. Natzke and P. Hansen.** 2004. Mastitis and Fertility in Cattle - Possible Involvement of Inflammation or Immune Activation in Embryonic Mortality. *American Journal of Reproductive Immunology*. 51:294-304.
- Streicher, K., I. Mullarky, Y. Cao, S. Johnson and L. Sordillo.** 2004. Thioredoxin Reductase Regulates Angiogenesis by Increasing Endothelial Cell-derived Vascular Endothelial Growth Factor. *Nutrition & Cancer*. 50:221-231.
- Talbot, N., T. Caperna, A. Powell, W. Garrett and A. Ealy.** 2004. Isolation and Characterization of a Bovine Trophoblast Cell Line Derived from a Parthenogenetic Blastocyst. *Molecular Reproduction and Development*. 69:164-173.
- Veazey, W., K. Anusavice and K. Moore.** 2004. Mammalian Cell Delivery via Aerosol Deposition. *Journal of Biomedical Materials Research Part B: Applied Biomaterials*. pp. 334-338.
- Wang, X., S. Thomson, J. Starkey, J. Page, A. Ealy and S. Johnson.** 2004. Transforming Growth Factor Beta-1 (TGF-1) is Up-regulated by Activated RAF in Skeletal Myoblasts but does not Contribute to the Differentiation-defective Phenotype. *Journal of Biological Chemistry*. 279:2528-2534.
- Warren, L.** 2004. Feeding the Breeding Herd. University of Florida.
- Warren, L.** 2004. Managing Horse Manure by Composting. Marionpoliteia.
- Warren, L.** 2004. Recent Advances in Equine Nutrition. Washington State University.
- Webb, D. and A. DeVries.** 2004. Trends in Reproductive Performance for Southeast DHIA Herds. Southeast Dairy Management Conference.
- White, C., F. Lopez and L. McDowell.** 2004. Effects of Virginiamycin and Fat on Utilization of Grain Sorghum Diets by Swine. 3:74-80.
- Yegani, M., A. Nilipour, G. Butcher, R. Miles, Jr and B. Sanei.** 2004. Biosecurity is the Ultimate Approach to Survival. *World Poultry*. 20(7):30-31.
- Yegani, M., H. Raoof, A. Nilipour, G. Butcher and R. Miles, Jr.** 2004. Frequent Health Hazards that Threaten Poultry Workers. *World Poultry*. 20(4):22-25.

## ANIMAL SCIENCE

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Adesogan, A.T.	Improving Forage Quality and Livestock Productivity with Exogenous Fibrolytic Enzymes	U.S. Dept. of Agriculture	124,058
Fields, M.J.	Effects of Oxytocin on the Uterine Oxytocin Prostanoid System in the Peri-Implantation Cow	U.S. Dept. of Agriculture	28,000
Hall, M.B.	Assessing Digestibility of Cell Wall Crude Protein in Tropically Grown Forages for Improved Livestock Production	U.S. Dept. of Agriculture	56,700
Hall, M.B.	Services Agreement: Animal Nutrition	Walt Disney World Company	50,050
Hansen, P.J.	Apoptosis and Stress in Preimplantation Embryos	U.S. Dept. of Agriculture	270,000
Hansen, P.J.	Embryo Transfer as a Tool for Improving Fertility of Heat Stressed Dairy Cattle	Bard (U.S.-Israel Ag. R&D Fund)	53,000
Johnson, D.	Feeding and Aging Effects on Cow Beef	FL Beef Council	39,750
Johnson, S.E.	Phosphoregulatory Events Controlling Myogenesis	U.S. Dept. of Agriculture	224,224
Johnson, S.E.	Repression of Skeletal Myogenesis	Natl. Institutes of Health	272,802
Moore, K.A.	Restoration of Lost Bone Mass After Ovariectomy	Natl. Institutes of Health	89,974
Olson, T.A.	Evaluation and Utilization of the Slick Hair Gene in Florida and Caribbean Dairies	U.S. Dept. of Agriculture	35,000
Ott, E.A.	Composting Horse Manure	Dept. of Agricul. & Consumer Ser.	120,000
Sand, R.S.	Production Practices to Improve the Efficiency and Profitability of Small and Economically Disadvantaged Livestock Families	Florida A&M University	53,704
Thatcher, W.W.	Epidemiology of Lameness in Dairy Cows	U.S. Dept. of Agriculture	19,444
Williams, S.K.	Production Systems to Improve the Efficiency and Profitability of Small and Economically Disadvantaged Family Farms	Florida A&M University	102,222
Yelich, J.V.	Progestogen Based Estrous Synchronization Programs in Bos Indicus X Bos Taurus Cattle	U.S. Dept. of Agriculture	72,700





### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The Department of Entomology and Nematology maintains tripartite priorities consistent with the mandate given to full-service land-grant universities and associated experiment stations: research, extension, and instruction. This Department is unusual in that about 35 of its 60 faculty are not located on the main campus; rather, they are located at 10 Research and Education Centers distributed through the state. This provides an exceptional opportunity to address the diverse needs of the state and for students to work in diverse ecological and crop production systems.

Entomology and Nematology offers an undergraduate program leading to a B.S., and graduate programs leading to M.S. (thesis), M.S. (nonthesis) and Ph.D. in entomology and nematology. The Department is one of the largest entomology programs nation-wide, and one of only a few that offer comprehensive training in Nematology. Besides providing a full complement of regular and special topics courses needed for degree candidates, the Department offers, at the undergraduate level, service courses in basic entomology for a wide range of disciplines. Further, departmental faculty offer courses that are credited to the Liberal Arts and Sciences undergraduate honors and general education requirements. The Department also participates in a new professional degree program, the Doctor of Plant Medicine

Entomology and Nematology faculty and staff garner over \$1 million in extramural and donation support annually for pursuit of

a wide range of research, instruction, and extension activities. These sources of funding support about 100 graduate students pursuing M.S. and/or Ph.D. degrees. About 30% of all graduate students are international. This, plus significant collaborative international research and education efforts, give the department a strong international dimension in addition to its domestic mandate.

Molecular, whole organism, and population ecology studies are included in the range of supported research within Entomology and Nematology. The USDA, National Science Foundation, various agrochemical industries, and the State of Florida are among the donors sponsoring departmental research, extension, and instruction programs.

The major areas of emphasis include:

- Basic Sciences (Behavioral Ecology, Toxicology, Physiology, and Systematics).
- Biological Control
- Integrated Pest Management
- Medical, Veterinary and Urban Entomology
- Nematology
- Pathology, Genetics and Biotechnology

For more information, visit the Web site at <http://entnemdept.ufl.edu>

John Capinera, Chairman

## RESEARCH HIGHLIGHTS

## NEMATODE MANAGEMENT ON GOLF COURSES

**SIGNIFICANCE:** The golf industry in Florida generates an estimated 4.4 billion in annual revenue and employs 73,000 people. Key to the success of a golf course is an attractive and healthy turfgrass playing surface. Plant-parasitic nematodes are recognized by golf course superintendents in Florida as one of the major limitations to growing healthy turfgrasses in our state. A survey of 196 fairways and 193 putting greens on 62 golf courses throughout Florida found potentially damaging numbers of plant-parasitic nematodes on 87% of the courses surveyed. The most important nematode species was sting nematode (*Belonolaimus longicaudatus*), which was found at damaging numbers on 60% of Florida golf courses. Feeding by this nematode causes reduction of the turf root-system, greatly impairing the ability of the turf to extract water and nutrients from the soil, and causing wilting, declining, and dying of the turf. There also are negative environmental impacts that occur as secondary results of sting nematode damage. These include increased irrigation frequency, increased potential for nitrogen to leech into groundwater, and increased herbicide use.

The most commonly used nematicide, fenamiphos (Nemacur, Bayer CropScience), will no longer be manufactured after May of 2007. This has created a critical need to develop new control strategies for sting nematode, and other plant-parasitic nematodes, on golf course turf. Our research has focused on the identification and implementation of such strategies.

**RESEARCH AND IMPACTS:** The nematicidal soil fumigant 1,3-dichloropropene (1,3-D) has been used for pre-plant control of plant-parasitic nematodes on food and fiber crops for many years. Because of the tolerance of bermudagrass to 1,3-D, and the relative susceptibility of sting nematode, we investigated its potential as a post-plant nematicide for use on golf courses. The biggest challenge was to find a way to apply 1,3-D in an acceptable manner. Because it is a fumigant, 1,3-D must be delivered into the soil profile below where the bulk of the nematode populations occur, it then moves upward through the soil profile as a gas, killing the nematodes upon contact. Using tractor-mounted slit-injection equipment to inject 1,3-D 5 to 6 inches deep in the soil was found to be an acceptable application method on golf course fairways. However, the same application equipment was not suited for putting green applications. We studied several methods for applying 1,3-D to putting greens before finding a method that worked well and was practical. In 2004, the first commercial applications of 1,3-D to putting greens were made with the prototype unit. At

this time additional units are being manufactured. 1,3-D is now labeled for nematode control on turfgrasses in Florida, Georgia, North and South Carolina, and Alabama. Last year more than 20% of the golf courses in Florida were treated with 1,3-D.

While 1,3-D works well for sting nematode, it is not equally effective against some of the other plant-parasitic nematodes affecting turfgrasses. It cannot be used in some regions of Florida based on soil type, cannot be used within 100 ft. of buildings, and there is a 10 acre minimum for application. Therefore, we have investigated numerous botanical products and biological controls for their potential to suppress plant-parasitic nematodes on turfgrasses. Mustard bran derived from oriental mustard (*Brassica juncea*) releases the nematicide allyl-isothiocyanate (AITC) upon contact with water. The dry material can be added topically to turf and the AITC can be moved into the ground during irrigation. Numerous field experiments conducted over a four-year period evaluated the effectiveness of mustard bran for management of lance (*Hoplolaimus galeatus*) and sting nematodes on turfgrasses. Multiple formulations, rates, and application methods were evaluated on several grass species. Unformulated mustard bran was bulky, caused phytotoxicity, and was difficult to apply. However, improved formulations caused no phytotoxicity, were easier to apply, and reduced population densities of both lance and sting nematodes in soil. Visual improvement of turf often was pronounced, especially in sites where lance nematode was the primary nematode problem. Results of these studies indicate that formulated mustard bran could be an acceptable alternative to fenamiphos for certain turfgrass situations. This material is currently under review by the EPA for labeling as a biopesticide.

**FUTURE:** We continue our efforts to identify methods for nematode control on turfgrasses that are effective and fit with IPM strategies. This year we will work with new formulations of mustard bran in an effort to improve the consistency of its results. We also will be working with several other botanicals, as well as nematode-parasitic microorganisms. By the time that Nemacur is no longer manufactured we should have several new weapons in our arsenal to manage nematode problems on golf course turf.

Billy Crow



## ENTOMOLOGY & NEMATOLOGY

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
John L. Capinera	Chair and Prof.	Pest Management Ecology	10	50	40
Carl S. Barfield	Prof.	Pest Management	100	0	0
Drion G. Boucias	Prof.	Insect Pathology	10	90	0
Marc Branham	Asst. Prof.	Systematics	70	30	0
Eileen A. Buss	Asst. Prof.	Ornamental Plants & Turf	5	25	70
Paul M. Choate	Lecturer	Insect Behavior Instruction	60	10	30
William T. Crow	Asst. Prof.	Nematology	5	25	70
James P. Cuda	Asst. Prof.	Biological Weed Control	5	65	30
Donald W. Dickson	Prof.	Nematology	20	70	10
Thomas R. Fasulo	Assoc. In	Software Development	0	10	90
John L. Foltz	Assoc. Prof.	Forest Insects	10	70	20
John H. Frank	Prof.	Biological Control	20	60	20
Daniel E. Hahn	Asst. Prof.	Insect Physiology	30	70	0
Harlan G. Hall	Assoc. Prof.	Honey Bee Genetics	10	90	0
Donald W. Hall	Prof.	Medical Entomology	70	30	0
Amanda C. Hodges	Asst. Ext. Sci.	Detection and Diagnostics	0	0	100
Marjorie A. Hoy	Eminent Scholar	Biological Control	10	80	10
Philip G. Koehler	Prof.	Urban Entomology	25	20	55
Pauline O. Lawrence	Prof.	Physiology and Biochemistry	20	80	0
Norman C. Leppla	Prof. & Program Director	Biocontrol and Ecology	5	50	45
Oscar E. Liburd	Asst. Prof.	Small Fruits and Vegetables	10	50	40
James E. Maruniakl	Assoc. Prof.	Insect Pathology	20	80	0
Heather J. McAuslane	Assoc. Prof.	Plant Resistance	20	80	0
Robert T. McSorley	Prof.	Nematology	20	80	0
Julio C. Medal	Research Assoc.	Biological Control	0	100	0
Faith M. Oi	Asst. Extension Scientist	Urban Entomology - Termites	35	15	0
Michael A. Scharf	Asst. Res. Sci.	Insect Toxicology	0	100	0
Frank J. Slansky	Prof.	Nutritional Ecology	20	80	0
Jerry L. Stimac	Prof.	Population Ecology	20	80	0
Susan E. Webb	Assoc. Prof.	Virus-Vector Studies, Vegetables	5	25	70
Simon S. Yu	Prof.	Insect Toxicology	10	90	0

**RESEARCH PROJECTS**

PROJECT NO.	AUTHOR	TITLE
ENY-03507	Lawrence, P.O.	Interactions Between a Parasitic Wasp and its Insect Host
ENY-03703	Dickson, D.W.	Role of Adhesin Epitopes on Attachment of Pasteuria Endospores to Phytopathogenic Nematodes
ENY-03803	McAuslane, H.J.	Plant Breeding, Genetics and Cultivar Development for St. Augustine Grass and Other Turf Species
ENY-03824	Butler, J.F.	Systems for Controlling Air Pollutant Emissions and Indoor Environments of Poultry, Swine, and Dairy Facilities
ENY-03845	Koehler, P.G., Oi, F.M., Fasulo, T.R., Brenner, D., Williams, D.F., Patterson, R.S.	Household Pest Management
ENY-03867	Cuda, J.P., Medal, J.C., Pearlstine, L.G.	Classical Biological Control of Brazilian Peppertree, Schinus Terebinthifolius (Anacardiaceae), in Florida
ENY-03924	Boucias, D.G., Adams, B., Maruniak, J.E.	Development, Evaluation, and Safety of Entomopathogens for Control of Arthropod Pests
ENY-03934	Frank, J.H., Cuda, J.P., Hoy, M.A., Leppla, N.C., Capinera, J.L., Hall, D.W.	Biological Control of Arthropod Pests and Weeds
ENY-03942	Yu, S.S.	Toxicology of Agriculturally Important Insect Pests of Florida
ENY-03961	Hall, H.G., Wu, R.	Selection of Honey Bees for Suppressed Reproduction of the Parasitic Varroa Mite and mapping of the Quantitative Trait Loci(QTL) Involved
ENY-03963	Cuda, J.P., Medal, J.C.	Screening of Potential Biological Control Agents for Tropical Soda Apple
ENY-03994	Hall, H.G., Wu, R.	OTL Involved in Suppression of Varroa Mite Reproduction on Honey Bees
ENY-04003	Leppla, N.C., Pantoja, A., Frank, J.H.	Release and Evaluate an Exotic Nematode for Mole Cricket Control in Puerto Rico
ENY-04008	Dickson, D.W., Ou, L., Locascio, S., Noling, J., Roberts, P., Bryant, H.	Multi-tactic Approach to pest Management for Methyl Bromide Dependent Crops in Florida
ENY-04011	Adams, B.J.	A Comparative Analysis of Plant and Insect Parasitic Nematodes: A Novel Approach to Controlling Insect Pests and Plant Pathogens
ENY-04012-L	Liburd, O.E., Nuessly, D.J., Schuster, D.J., Funderburk, J.E., Stansly, P.A., Leibee, G.L., Webb, S.E.	Biology and Management of Arthropod Pests of Vegetables
ENY-04012-W	Webb, S.E., Nuessly, G.S., Schuster, D.J., Funderburk, J.E., Stansly, P.A., Leibee, G.L., Liburd, O.E.	Biology and Management of Arthropod Pests of Vegetables
ENY-04025	McAuslane, H.J., Liburd, O.E.	Chemical Ecology and Management of Insect Pests of Blueberry, Vaccinium spp., in Florida
ENY-04030	Butler, J.F.	Sources, Dispersal and Management of Stable Flies on Grazing Beef and Dairy
ENY-04080-A	Adams, B.J., Vargas, R.	Leveraging Taxonomic Expertise in Existing Research Programs for Control of Mole Crickets (Scapteriscus spp.)
ENY-04080-F	Frank, J.H.	Controlling Mexican Bromeliad Weevil
ENY-04080-L	Liburd, O.E.	Utilization of Living Mulches to Suppress Cucurbit Pests
ENY-04096	Crow, W.T., Giblin-Davis, R.M.	Biology Damage Potential, and Management of Plant-parasitic Nematodes on Turfgrasses and Ornamental Plants
ENY-04097	Buss, E.A.,	Management Strategies for Arthropod Pests of Turfgrass and Ornamental Plants.
ENY-04133-D	Dickson, D.W.	Identification, Distribution, and Biology of Meloidogyne Mayagensis, Other Meloidogyne spp., in Florida Agriculture
ENY-04133-M	McAuslane, H.J., Nuessly, G.S., Nagata, R.T.	Developing Multi-species Insect Resistance in Romaine Lettuce
ENY-04137	Leppla, N.C., Larson, B.C.	Incorporating Alternative, Multi-tactic IPM into the Crop Planning Process of Florida Vegetable Growers
ENY-04190	Stimac, J.L.	Insect and Manure Management: Impact on Nuisance Factors and Food Safety
ENY-04221	Hoy, M.A.	Integration of Chemical and Biological Control of Citrus Leafminers in Young Groves
ENY-04222	Leppla, N.C. Frank, J.H., Vicente, N.E.	Integrated Management of Pest Mole Crickets in Puerto Rico and Florida

# PUBLICATIONS

- Barbara, K. and E. Buss.** 2004. Integration of Insect Parasitic Nematodes (Nematoda: Steinernematidae) with Insecticides for Control of Pest Mole Crickets (Orthoptera: Gryllotalpidae: Scapteriscus spp.). *Journal of Economic Entomology*.
- Barbara, K. and E. Buss.** 2004. Survival and Infectivity of *Steinernema Scapterisci* (Nematoda:Steinernematidae) After Contact with Soil Drench Solutions. *Florida Entomologist*. 87(3):300-305.
- Barbara, K., E. Buss and J. Dunford.** 2004. Nematodes for Hire: Economical Ways and Greener Days Using Integrated Pest Management. *Florida Turf Digest*. 21(5):14,15,18,20.
- Boucias, D. and V. Blaeske.** 2004. Influence of *Helicosporidium* sp. (Chlorophyta: Trebouxiophyceae) Infection of Development and Survival of Three Noctuid Species. *Environmental Entomology*. 33(1):54-61.
- Buss, E.** 2004. False Oleander Scale Control, 2003. *Arthropod Management Tests*.
- Buss, E.** 2004. Gall Wasps (Hymenoptera: Cynipidae). *Encyclopedia of Entomology*.
- Buss, E.** 2004. New Host Record for *Euphoria Sepulcralis* F. (Coleoptera: Scarabaeidae). *The Coleopterists Bulletin*. 58(3):328.
- Buss, E., K. Barbara, J. Congdon and J. Turner.** 2004. Timing of White Grub Management, 2003. *Arthropod Management Tests*.
- Buss, E., K. Barbara, J. Congdon, J. Turner and P. Ruppert.** 2004. Red Imported Fire Ant Control, 2003. *Arthropod Management Tests*. 29:G2.
- Buss, E., P. Ruppert and L. Wood.** 2004. Aphid Control with Alternative Insecticides, 2003. *Arthropod Management Tests*.
- Capinera, J.** 2004. Vegetable Pests and Their Management. *Encyclopedia of Entomology*. pp. 2434-2488.
- Capinera, J., R. Scott and T. Walker.** 2004. *Field Guide to the Grasshoppers, Katydid, and Crickets of the United States*. Cornell University Press: Ithaca, New York.
- Cave, R., J. Frank, B. Larson and M. Owen.** 2004. Exploration for Parasitoids of Bromeliad Weevils in Mesoamerica. *Journal of the Bromeliad Society*. 53(6):243-249, 261-265.
- Chen, J., H. McAuslane, R. Carle and S. Webb.** 2004. Effects of *Bemisia argentifolii* (Homoptera: Aleyrodidae) Infestation and Squash Silverleaf Disorder on Zucchini Yield and Quality. *Journal of Economic Entomology*. 97:2083-2094.
- Choate, P. and J. Frank.** 2004. Collecting and Preserving Insects. *Encyclopedia of Entomology*. 577-583.
- Congdon, J. and E. Buss.** 2004. Southern Chinch Bug Control, 2002. *Arthropod Management Tests*.
- Crow, W.** 2004. Alternatives to NemaCur. *The Florida Green*. Summer(2004):52-54.
- Crow, W. and J. Welch.** 2004. Root Reductions of St. Augustine Grass (*Stenotaphrum Secundatum*) and Hybrid Bermuda Grass (*Cynodon Dactylon* x *C. Transvaalensis*) Induced by *Trichodorus Obtusus* and *Paratrichodorus Minor*. *Nematropica*. 34:31-37.
- Frank, D. and O. Liburd.** 2004. Comparison of Living and Synthetic Mulches in Zucchini. *Citrus and Vegetable Magazine*.
- Frank, J.** 2004. *Belonuchus Agilis*, a Fourth Species of this Genus (Coleoptera: Staphylinidae) Reported from Florida. *Florida Entomologist*. 87:92-92.
- Frank, J.** 2004. Biographies: John Abbott, Jean Louis Rodolphe Agassiz, Ulisse Aldrovandi, Charles Paul Alexander, Herbert George Andrewartha, Ross Harold Arnett, Jean-Guillaume Audinet-Serville, Jean-Victor Audouin, and 142 others. *Encyclopedia of Entomology*. 1:1290.
- Frank, J.** 2004. Book Review: Emden, H. Van, Service. M.W. *Pest and Vector Control*. *Florida Entomologist*. 87:419-420.
- Frank, J.** 2004. Book Review: Lenteren, J.C. *Quality Control and Production of Biological Control Agents*. *Florida Entomologist*. 87:100-101.
- Frank, J.** 2004. Book Review: Patterson, G. *The Mosquito Wars. A History of Mosquito Control in Florida*. *Florida Entomologist*. 87:417-418.
- Frank, J.** 2004. Common (Vernacular) Names of Insects. *Encyclopedia of Entomology*. pp. 587-589.
- Frank, J.** 2004. Phytotelmata. *Encyclopedia of Entomology*. pp. 1717-1720.
- Frank, J.** 2004. Pronunciation of Scientific Names and Terms. *Encyclopedia of Entomology*. pp. 1832-1834.
- Frank, J.** 2004. Scientific Names and Other Words from Latin and Greek. *Encyclopedia of Entomology*. pp. 1970-1972.
- Frank, J. and M. Thomas.** 2004. Rove Beetles (Coleoptera: Staphylinidae). *Encyclopedia of Entomology*. pp. 1922-1927.
- Frank, J. and P. Stansly.** 2004. Eumicrota and Phanerota (Coleoptera: Staphylinidae: Aleocharinae) Attacking Litigated Mushrooms in Florida. *Florida Entomologist*. 87:237-240.
- Frank, J., N. Leppla and N. Vicente.** 2004. Mole Crickets to the South. *Florida Turf Digest*. 21(4):20-22.
- Frank, J., S. Sreenivasan, P. Benschhoff, M. Deyrup, G. Edwards, S. Halbert, A. Hamon, M. Lowman, E. Mockford, R. Scheffrahn, G. Steck, M. Thomas, T. Walker and W. Welbourn.** 2004. Invertebrate Animals Extracted from Native *Tillandsia Bromeliads* in Sarasota County, Florida. *Florida Entomologist*. 87:176-185.
- Hall, D.** 2004. Entomology at the Land Grant University: Perspectives from the Texas A&M University Department Centenary.
- Hansen, E., J. Funderburk, S. Reitz, S. Ramachandran, J. Eger and H. McAuslane.** 2004. Within-plant Distribution of *Frankliniella* Species (Thysanoptera: Thripidae) and *Orius insidiosus* (Heteroptera: Anthorcoridae) in Field Pepper. *Environmental Entomology*. 32:1035-1044.
- Hixson, A. and W. Crow.** 2004. First Report of Plant-parasitic Nematodes on Seashore Paspalum. *Plant Disease*. 88:680.
- Hochmuth, G., D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. *Celery Production in Florida*. *Vegetable Production Handbook for Florida*.
- Hodges, A., C. Harmon and L. Osborne.** 2004. The Grower's Role in Protecting the U.S. from Exotic Pest Invasions. *Society of American Florists*.
- Hodges, G. and A. Hodges.** 2004. New Invasive Species of Mealybugs, *Palmicultor Lumpurensis* and *Chaetococcus Bambusae* (Hemiptera: Coccoidea: Pseudococcidae) on Bamboo in Florida. *Florida Entomologist*. 87:396-397.
- Hoy, M.** 2004. Acaricides or Miticides. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Amber Insects: DNA Preserved. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Augmentative Biological Control. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Behavior of Insects: Genetic Analysis by Crossing and Selection. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Behavior: Molecular Genetic Analyses. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Classical Biological Control. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Fossil Record of Insects. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Four-legged Mites (Eriophyoidea or Tetrapodili). *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Genetic Modification of *Drosophila* by P Elements. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Genomes of Insects. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Meiotic Drive in Insects. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Natural Enemies Important in Biological Control. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Pesticide Resistance Management. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Sex Ratio Modification by Cytoplasmic Agents. *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Soil Mites (Acari: Oribatida and others). *Encyclopedia of Entomology*.
- Hoy, M.** 2004. Symbionts of Insects. *Encyclopedia of Entomology*. pp. 2160-2168.
- Hoy, M.** 2004. Transgenic Arthropods for Pest Management Programs. *Encyclopedia of Entomology*.
- Hoy, M. and C. Jessey.** 2004. *Ageniaspis Citricola* (Hymenoptera: Encyrtidae) Established in Bermuda. *Florida Entomologist*. 87:229-230.
- Hutchinson, C., E. Simonne, G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. *Potato Production in Florida*. *Vegetable Production Guide for Florida*. pp. 259-268.
- Jeyaprakash, A. and M. Hoy.** 2004. Multiple Displacement Amplification in Combination with High-fidelity PCR Improves Detection of Bacteria from Single Females or Eggs of *Metaseiulus Occidentalis* (Nesbitt) (Acari: Phytoseiidae). *Journal of Invertebrate Pathology*. 86:111-116.
- Leppla, N.** 2004. *Encyclopedia of Pest Management*.
- Leppla, N. and B. Larson.** 2004. New Tomato and Pepper Extension Resources. *Citrus & Vegetable Magazine*. 68:18-20.
- Leppla, N. and B. Larson.** 2004. Quality Control Methods for the Production of Natural Enemies. *Encyclopedia of Pest Management*.

# PUBLICATIONS

- Leppla, N., J. Frank, N. Vicente and A. Pantoja.** 2004. A Commercial Nematode for Mole Cricket Control. Proceedings of the Caribbean Food Crops Society.
- Liburd, O.** 2004. A New Lure for Baiting Apple Maggot Traps. MSU CAT Alert. 15(14):1-2.
- Liburd, O.** 2004. Blueberry Maggot Management. Annual Report of the Secretary of the State Horticultural Society of Michigan. pp. 144-145.
- Liburd, O.** 2004. Cold Wintry Conditions Impacted Thrips Abundance in Florida Blueberries during 2003. Berry/Vegetable Times. 3:3.
- Liburd, O.** 2004. Identification of Host Volatile Compounds for Monitoring Blueberry Maggot Fly. Small Fruits Review. 3:307-312.
- Liburd, O.** 2004. Integrated Pest Management Strategies for Controlling Insecticide Resistance in Armyworms (Lepidoptera: Noctuidae). Proceedings of the 8th Annual Conference and Career Fair. pp. 64.
- Liburd, O.** 2004. Monitoring Apple Maggot in Michigan. Gerber Integrated Pest Management Newsletter. 9:8.
- Liburd, O.** 2004. Monitoring for Blueberry Maggot Fly. MSU CAT Alert. 15(11):1-2.
- Liburd, O.** 2004. Monitoring Fruit Flies in Michigan. MSU CAT Alert. 16(13):4.
- Liburd, O.** 2004. Protecting High-value Fruit from Key Rhagoletis Species. USDA CSREES National IPM Program. pp. 13.
- Liburd, O.** 2004. The Effectiveness of Various Insecticides to Control Blueberry Gall Midge. Berry/Vegetable Times. 4:38387.
- Liburd, O.** 2004. Trapping for Blueberry Maggot Fly. MSU CAT Alert. 14(8):1-2.
- Liburd, O. and D. Frank.** 2004. A Review of Synthetic and Living Mulches for Control of Homopteran Pests (aphids and whiteflies) and Diseases in Vegetables. Nematode and Insect Borne Disease and Their Management. pp. 20.
- Liburd, O. and E. Finn.** 2004. Blueberry Gall Midge: A Key Pest of Blueberries in the Southeast. Fruit Growers News. 40:18-19.
- Liburd, O. and E. Finn.** 2004. Blueberry Insect Pests Up-date. Florida Blueberry Growers Association. pp. 3.
- Liburd, O. and E. Finn.** 2004. Comparison of Methods for Detecting Blueberry Gall. Florida Blueberry Growers Association. pp. 4.
- Liburd, O. and E. Finn.** 2004. Effect of Overwintering Conditions on the Emergence of *Diachasma Alloeum* Reared from the Puparia of Blueberry Maggot. Proceedings of the International Symposium on Biological Control of Arthropods. pp. 14-18.
- Liburd, O. and E. Finn.** 2004. Evaluating Techniques for Detecting Blueberry Gall Midge in Southern Highbush and Rabbiteye Blueberry Plantings. Dixie Blueberry News. 1:38355.
- Liburd, O. and E. Finn.** 2004. Evaluation of Conventional and Reduced-risk Insecticides for Control of Flower Thrips in Blueberries. Berry/Vegetable Times. 3:38354.
- Liburd, O. and E. Finn.** 2004. The Status of Blueberry Gall Midge in the Southeastern. EDIS, ENY 825. pp. 2.
- Liburd, O. and E. Sarzynski.** 2004. Effect of Trap Height and Within-planting Location on Captures of Cranberry Fruitworm (Lepidoptera: Pyralidae) in Highbush Blueberries. Agricultural and Forest Entomology. 6:199-204.
- Liburd, O. and G. Seferina.** 2004. Grape Root Borer: Life Stages and IPM Strategies in Florida. Fact Sheet SP 330. pp. 2.
- Liburd, O. and G. Seferina.** 2004. Insect Pest of Grapes in the Southeastern United States. UF/IFAS, Pest Alert. pp. 2.
- Liburd, O. and G. Thornton.** 2004. Time to Monitor for Black Cherry Fruit Flies. MSU CAT Alert. 15(9):1-2.
- Liburd, O. and K. Pettit.** 2004. Tarnished Plant Bug: A Key Pest of Fruit and Vegetable Growers. Fruit Growers News. 40:36-37.
- Liburd, O. and L. Stelinski.** 2004. Apple Maggot Fly and Its Sibling Species: Physiological and Environmental Status. MSU CAT Alert. 14(15):3-4.
- Liburd, O. and L. Stelinski.** 2004. Seasonal Abundance of Cherry Fruit Flies in Northwest Michigan. MSU CAT Alert. 14(18):5-6.
- Liburd, O., E. Finn, K. Pettit and J. Wise.** 2004. Response of Blueberry Maggot Fly (Diptera: Tephritidae) to Imidacloprid-treated Spheres and Selected Classes of Insecticides. Canadian Entomologist. 135:427-438.
- Liburd, O., E. Sarzynski and G. Krewer.** 2004. Results of Gall Midge Control Experiments in Bacon Co. and Recommendations for Control. Proceedings of the Southeastern Regional Fruit and Vegetable Conference. pp. 5.
- Liburd, O., G. Seferina and D. Dinkins.** 2004. Suppression of Two Spotted Spider Mites. Berry/Vegetable Times. 3:38415.
- Liburd, O., G. Seferina and S. Weihman.** 2004. Insect Pests of Grapes in Florida. EDIS, ENY 713. pp. 4.
- Liburd, O., J. Funderburk and S. Olson.** 2004. Effects of Biological and Chemical Insecticides on Marketable Yields of Tomatoes. Journal of Applied Entomology. 124:19-25.
- Liburd, O., L. Gut, L. Stelinski, M. Whalon, M. McGuire, J. Wise and R. Prokopy.** 2004. Mortality of Rhagoletis Species Encountering Pesticide-treated Spheres (Diptera: Tephritidae). Journal of Economic Entomology. 92:1151-1156.
- Liburd, O., R. Casagrande and S. Alm.** 2004. Evaluation of Various Color Hydromulches and Weed Fabric on Broccoli Insect Populations. Journal of Economic Entomology. 91:256-262.
- Liburd, O., S. Alm and R. Casagrande.** 2004. Effect of Trap Color, Bait, Shape, and Orientation in Attraction of Blueberry Maggot Flies (Diptera: Tephritidae). Journal of Economic Entomology. 91:243-249.
- Liburd, O., S. Alm and R. Casagrande.** 2004. Susceptibility of Highbush Blueberry Cultivars to Larval Infestation (Diptera: Tephritidae). Journal of Economic Entomology. 27:817-821.
- Liburd, O., S. Polavarapu, S. Alm and R. Casagrande.** 2004. Effect of Trap Size, Age and Positions on Captures of Blueberry Maggot Flies (Diptera: Tephritidae). Journal of Economic Entomology. 93:1452-1458.
- Liburd, O., T. Holler and A. Moses.** 2004. Toxicity of Imidacloprid-treated Spheres to Caribbean Fruit Fly, *Anastrepha suspensa* (Loew)(Diptera: Tephritidae) and Its Parasitoid *Diachasmimorpha longicaudata* (Ashmead)(Hymenoptera: Braconidae) in the Laboratory. Journal of Economic Entomology. 97:525-529.
- Lobinske, R., J. Stimac and A. Ali.** 2004. A Spatially Explicit Computer Model for Immature Distributions of *Glyptotendipes paripes* (Diptera: Chironomidae) in Central Lakes. Hydrobiologia. 519:19-27.
- Luc, J. and W. Crow.** 2004. Nematode and Nitrogen Management. Golf Course Management. 72(8):97-100.
- Luc, J. and W. Crow.** 2004. Sting Nematode: Not a Steward of the Environment. Golf Course Management. 72(9):86-88.
- Magalhaes, B. and D. Boucias.** 2004. The Effects of Drying on the Survival of *Metarhizium Anisopliae* var. *Acridum* Driver & Milner Conidiospores. J. Orthoptera Res. 13(1):155-159.
- Maynard, D., G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Lettuce, Endive, Escarole Production in Florida. Vegetable Production Handbook for Florida.
- McAuslane, H. and H. Alborn.** 2004. Factors Influencing Systemic Induction of Terpenoid Aldehydes in Cotton Plants. Journal of Chemical Ecology.
- McAuslane, H., J. Chen, R. Carle and J. Schmalstig.** 2004. Influence of *Bemisia argentifolii* (Homoptera: Aleyrodidae) Infestation and Squash Silverleaf Disorder on Zucchini Seedling Growth. Journal of Economic Entomology. 97:1096-1105.
- McSorley, R.** 2004. Agroecology. Encyclopedia of Entomology.
- McSorley, R. and J. Frederick.** 2004. Effect of Extraction Method on Perceived Composition of the Soil Nematode Community. Applied Soil Ecology. 27:55-63.
- McSorley, R. and L. Duncan.** 2004. Population Dynamics. pp. 469-492. Nematology Advances and Perspectives.
- McSorley, R., D. Amalin and J. Pena.** 2004. Development of Three Sac Spiders Occurring on Lime Orchards at Homestead, Florida. Proc. Fla. State Hort. Soc. 116:44-46.
- Medal, J.** 2004. Perspectives on Biological Control of Invasive Plants in Latin-America. CSIRO-Entomology.
- Medal, J. and H. Norambuena.** 2004. Proceeding of the II Latin-American Short-course on Biological Control of Weeds. University of Florida-IFAS.
- Medal, J., D. Ohashi, D. Gandolfo, F. McKay and J. Cuda.** 2004. Risk Assessment of *Gratiana boliviana* (Chrysomelidae), a Potential Biocontrol Agent of Tropical Soda Apple, *Solanum viarum* (Solanaceae) in the USA. CSIRO-Entomology.
- Minno, M., J. Butler and D. Hall.** 2004. Florida Butterflies and their Host Plants. University Press of Florida: Gainesville, FL.
- Mizell, III, R. and D. Boucias.** 2004. Mycopathogens and their Exotoxins Infecting the Glassy-winged Sharpshooter Survey, Evaluation and Storage. California Department of Food and Agriculture.

# PUBLICATIONS

- Nigg, H., S. Simpson and J. Knapp Jr.** 2004. The Caribbean Fruit-fly Free Zone Programme in Florida, U. S. A. pp. 179-182.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Onion, Leek, and Chive Production in Florida. Vegetable Production Handbook for Florida.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor, S. Smith and E. Simonne.** 2004. Tomato Production in Florida. Vegetable Production Guide for Florida. pp. 301-316.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cole Crop Production in Florida. Vegetable Production Guide for Florida. pp. 131-163.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cucurbit Production in Florida. Vegetable Production Handbook for Florida. pp. 169-197.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Pepper Production in Florida. Vegetable Production Guide for Florida. pp. 247-258.
- Olson, S., E. Simonne, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Legume Production in Florida. Vegetable Production Handbook for Florida. pp. 207-217.
- Pedra, J., M. Scharf, L. McIntyre and B. Pittendrigh.** 2004. Genome-wide Transcription Profile of Field and Laboratory-selected DDT-resistant *Drosophila*. Proceedings of the National Academy of Sciences USA. 101(18):7034-7039.
- Persad, A. and M. Hoy.** 2004. High-fidelity PCR Assay Discriminates between Immature *Lipolexus oregmae* and *Lysiphlebus testaceipes* (Hymenoptera: Aphididae) within Their Aphid Hosts. Florida Entomologist. 87:18-24.
- Persad, A. and M. Hoy.** 2004. Manipulation of Female Parasitoid Age Enhances Laboratory Culture of *Lysiphlebus testaceipes* (Hymenoptera: Aphididae) Reared on *Toxoptera citricida* (Homoptera: Aphididae). Florida Entomologist. 86:429-436.
- Rangasamy, M., H. McAuslane, R. Cherry and R. Nagata.** 2004. Mechanism of Resistance in St. Augustinegrass to Southern Chinch Bug (*Blissus insularis*). Journal of Economic Entomology.
- Rondon, S., O. Liburd, J. Price, R. Francis and D. Cantliffe.** 2004. Commercial Availability of Predators. EDIS, UF/IFAS. pp. 6.
- Sarzynski, E. and O. Liburd.** 2004. Techniques for Monitoring Cranberry Tipworm (Diptera: Cecidomyiidae) in Rabbit-eye and Southern Highbush Blueberries. Journal of Economic Entomology. 96:1821-1827.
- Scharf, M., C. Ratliff and G. Bennett.** 2004. Impacts of Residual Insecticide Barriers on Perimeter-invading Ants, with Particular Reference to the Odorless House Ant, *Tapinoma sessile* Say. Journal of Economic Entomology. 97(2):601-605.
- Scharf, M., D. Wu-Scharf, B. Pittendrigh and G. Bennett.** 2004. Catalytic Activity and Expression of Two Flavin-containing Monooxygenases from *D. melanogaster*. Archives of Insect Biochemistry and Physiology. 57:28-39.
- Siegfried, B., L. Meinke, S. Parimi, M. Scharf, T. Nowatzki, X. Zhou and L. Chandler.** 2004. Monitoring Western Corn Rootworm Susceptibility to Carbaryl and Cucurbitacin Baits in the Areawide Management Pilot Program. Journal of Economic Entomology. 97(5):1726-1733.
- Simonne, E., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, S. Smith and T. Taylor.** 2004. Eggplant Production in Florida. Vegetable Production Guide for Florida. pp. 199-206.
- Simonne, E., D. Maynard, G. Hochmuth, M. Lamberts, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Sweetpotato Production in Florida. Vegetable Production Guide for Florida. pp. 293-299.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Okra Production in Florida. Vegetable Production Guide for Florida. pp. 229-233.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Sweet Corn Production in Florida. Vegetable Production Guide for Florida. pp. 285-292.
- Stelinski, L. and O. Liburd.** 2004. Attraction of Apple Maggot Flies (Diptera: Tephritidae) to Synthetic Fruit Volatile Compounds and Food Attractants in Michigan Apple Orchards. Great Lakes Entomologist. 35:37-45.
- Stelinski, L. and O. Liburd.** 2004. Behavioral Evidence for Host Fidelity Among Populations of the Parasitic Wasp *Diachasma alloeum*: Parasitoids Tracking the Sympatric Speciation of Their *Rhagoletis* Fly Hosts. Naturwissenschaften. pp. 5.
- Stelinski, L. and O. Liburd.** 2004. Evaluation of Various Deployment Strategies of Imidacloprid-treated Spheres in Highbush Blueberries for Control of *Rhagoletis mendax* Curran (Diptera: Tephritidae). Journal of Economic Entomology. 94:905-910.
- Stelinski, L., O. Liburd, S. Wright, R. Prokopy, R. Behle and M. McGuire.** 2004. Comparison of Neonicotinoid Insecticides for Use with Biodegradable and Wooden Spheres for Control of Key *Rhagoletis* Species (Diptera: Tephritidae). Journal of Economic Entomology. 94:1142-1150.
- Tartar, A. and D. Boucias.** 2004. A Pilot-scale Expressed Sequence Tag Analysis of *Beauveria bassiana* Gene Expression Reveals a Tripeptidyl Peptidase that is Differentially Expressed in Vivo. Mycopathologia. 158:201-209.
- Tartar, A. and D. Boucias.** 2004. Analysis of the Nuclear and Plastid Genomes of the Non-photosynthetic, Pathogenic Green Algae *Helicosporidium* sp. Microbiology Letters. pp. 233:153-157.
- Thornton, G. and O. Liburd.** 2004. The Season for Cherry Fruit Flies in Northwest Michigan. The Fruit Growers News. 38:36-38.
- Wang, C., M. Scharf and G. Bennett.** 2004. Behavioral and Physiological Resistance of the German Cockroach to Gel Baits. Journal of Economic Entomology. 97(6):2073-2078.
- Wang, K., R. McGovern, R. McSorley and R. Gallaheer.** 2004. Cowpea Cover Crop and Solarization for Managing Root-knot and Other Plant-parasitic Nematodes in Herb and Vegetable Crops. Soil Crop Sci. Soc. Florida Proc. 63:99-104.
- Wang, K., R. McSorley and R. Gallaheer.** 2004. Effect of *Crotalaria Juncea* Amendment on Squash Infected with *Meloidogyne Incognita*. Journal of Nematology. 36:290-296.
- Wang, K., R. McSorley and R. Gallaheer.** 2004. Host Status and Amendment Effects of Cowpea on *Meloidogyne Incognita* in Vegetable Cropping Systems. Nematropica. 33(2):215-224.
- Wang, K., R. McSorley and R. Gallaheer.** 2004. Relationship of Soil Management History and Nutrient Status to Nematode Community Structure. Nematropica. 34:83-95.
- Wang, K., R. McSorley and R. Gallaheer.** 2004. Relationships of Nematode Communities and Soil Nutrients in Cultivated Soils. Soil Crop Sci. Soc. Florida Proceedings. 63:105-113.
- Wang, K., R. McSorley, A. Marshall and R. Gallaheer.** 2004. Nematode Community Changes Associated with Decomposition of *Crotalaria Juncea* Amendment in Litterbags. Applied Soil Ecology. 27:31-45.
- Wattanalai, R., D. Boucias and A. Tartar.** 2004. Chitinase Gene of the Dimorphic Mycopathogen, *Nomuraea rileyi*. J Invertebr. Pathol. 85:54-57.
- White, J. and O. Liburd.** 2004. Effects of Soil Moisture and Temperature on Reproduction and Development of Two Spotted Spider Mites *Tetranychus urticae* Koch (Acari: Tetranychidae) in Strawberries. Journal of Economic Entomology.
- Wise, J., L. Gut, R. Isaacs and O. Liburd.** 2004. New Insecticide Chemistries: How to Effectively Measure Pest Management Performance. Proceedings Michigan State Horticultural Society. pp. 3.
- Wise, J., L. Gut, R. Isaacs, A. Schilder and O. Liburd.** 2004. Insecticide/Fungicide Evaluation Studies. Dept. of Entomology. pp. 75.
- Wise, J., O. Liburd and L. Gut.** 2004. Performance of Selective Insecticides for Apple Maggot Control. MSU CAT Alert, Extension Bulletin. 16(14):1.
- Wise, J., R. Isaacs and O. Liburd.** 2004. Control of Blueberry Maggot, 2001. Arthropod Management Tests. 27:3.
- Yu, S.** 2004. Induction of Detoxification Enzymes by Triazine Herbicides in the Fall Armyworm, *Spodoptera frugiperda* (J.E. Smith). Pesticide Biochemistry and Physiology. 80:113-122.
- Zappala, L. and M. Hoy.** 2004. Reproductive Strategies and Parasitization Behavior of *Ageniaspis citricola*, a Parasitoid of the Citrus Leafminer *Phyllocnistis citrella*. Entomologia Experimentalis et Applicata. 113:135-143.
- Zhang, W., H. McAuslane and D. Schuster.** 2004. Repellency of Ginger Oil to *Bemisia argentifolii* (Homoptera: Aleyrodidae) on Tomato. Journal of Economic Entomology. 97:1310-1318.

## ENTOMOLOGY & NEMATOLOGY

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Adams, B.J.	Trait Deterioration in Entomopathogen Nematodes	U.S. Dept of Agriculture	26,500
Boucias, D.G.	Mechanisms for Biosynthesis, Release & Detection of Volatile Chemicals in Plant Insect Interactions	U.S. Dept of Agriculture	175,000
Boucias, D.G.	Reu Supplement: Cell Structure and Biology of Heliosporidium A Unique Group of Invertebrate Pathogens	National Science Foundation	18,000
Boucias, D.G.	Cell Structure and Biology of Heliosporidium a Unique Group of Invertebrate Pathogens	National Science Foundation	73,000
Boucias, D.G.	Manipulation of Hirsutella as a Biological Control of Glassywinged Sharpshooter, Homalodisca Coagulata	State of California	54,950
Buss, E.A.	Evaluation of Integrated Pest Management Practices in Urban Turfgrass	Environmental Protection Agcy.	67,072
Buss, E.A.	Optimizing Alternative Pest Management for Turfgrass in the Southeast	Univ. of Georgia	35,340
Butler, J.F.	Development of Formulation for Timed Applications to Suppressant Repellent and Attractant for Use in Timed Applic	Intermatic	50,000
Capinera, J.L.	IPA for Dr. G. White	U.S. Dept. of Defense	143,221
Crow, W.T.	Alternatives to Organophosphate Pesticides on Turf	Golf Course Supers Assn.	31,240
Crow, W.T.	Timing of Nematicide Applications on Turf Based on Soil	Golf Course Supers Assn.	21,000
Cuda, J.P.	Biological Control of the Invasive Strawberry Guava for Caribfly Suppression	U.S. Dept. of Agriculture	24,977
Cuda, J.P.	SI849 Task: Classical Biological Control of Brazilian Peppertree, Schinus Terebinthifolius (Anacardiaceae), in Florida	Dept. of Environmental Protect.	25,339
Dickson, D.W.	Optimization of Metam Sodium Application Methods for Maximum efficacy and Minimum Volatilization Losses	Texas A&M University	18,012
Dickson, D.W.	Distribution, Biology & Etiology of Meloidogyne Mayaguensis a New Root-knot Nematode Threat to Florida	U.S. Dept. of Agriculture	99,760
Foltz, J.L.	Changes to Bark Beetle Populations as a Consequence of Fuel Reduction Treatments in Florida Flatwoods Ecosystems-phase 2	U.S. Dept. of Agriculture	16,500
Frank, J.H.	Biological Control of Metamasius Callizona for the Conservation of Bromeliad Communities in Florida State Parks	Dept. of Environmental Protect.	47,657
Frank, J.H.	Controlling Mexican Bromeliid Weevil	U.S. Dept. of Agriculture	35,000
Hall, H.G.	Improvement of DNA Delivery for Gene Transfer in Economically Important Insect	U.S. Dept. of Agriculture	540,050
Hoy, M.A.	Classical Biological Control of the Brown Citrus APHID in Florida	U.S. Dept. of Agriculture	35,000
Hoy, M.A.	Integration of Chemical and Biological Control of the Citrus Leaf Miner in Young Groves	U.S. Dept. of Agriculture	96,830
Koehler, P.G.	Cellulose Inhibitors of Termites	Procter & Gamble Company	190,000
Koehler, P.G.	Evaluation of New Technologies for Protection of Military Personnel From Filth and Biting Flies	U.S. Army	243,182
Larson, B.C.	Enhancing Distance Education in Integrated Pest Management	U.S. Dept. of Agriculture	73,376
Lawrence, P.O.	Reu-Interactions of an Entomopoxvirus, its Parasitic Wasp & Their Insect Host: Viral Morphogenesis and Gene Expression	National Science Foundation	18,750
Lawrence, P.O.	A Research Supplement: An Entomopoxvirus of Diachasmimorpha Krausii is a Possible Homolog of DIEPV	National Science Foundation	24,658
Leppla, N.C.	Incorporating Alternative, Multi-Tactic IPM into the Crop Planning Process of Florida Vegetable Growers	U.S. Dept. of Agriculture	49,959



## ENTOMOLOGY & NEMATOLOGY

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Leppla, N.C.	Handheld Acoustic System to Detect Insects in Nursery Container Crops	U.S. Dept. of Agriculture	20,000
Leppla, N.C.	Release and Evaluate an Exotic Nematode for Mole Cricket Control in Puerto Rico	U.S. Dept. of Agriculture	22,550
Leppla, N.C.	Efficacy of Sulfuryl Flouride as Methyl Bromide Alternative in Processing Mills	U.S. Dept. of the Interior	20,000
Leppla, N.C.	Florida and Offshore Biological Control Initiatives in Miami	U.S. Dept. of Agriculture	115,000
Leppla, N.C.	Integrated Management of Pest Mole Crickets in Puerto Rico and Florida	U.S. Dept. of Agriculture	99,992
Liburd, O.E.	An Integrated Approach for Reducing Pesticide Risks in Commercial Strawberry Production	Environmental Protection Agcy.	75,834
Liburd, O.E.	Utilization of Living and Synthetic Mulches to Suppress Cucurlibit Pests	U.S. Dept. of Agriculture	29,697
McAuslane, H.J.	Developing Multi-species Insect Resistance in Romaine Lettuce	U.S. Dept. of Agriculture	65,299
McSorley, R.T.	Management of Root-Knot Nematodes in Field Production of Floral and Ornamental Crops	U.S. Dept. of Agriculture	21,950
McSorley, R.T.	Population Dynamics and Interactions of Soil Microorganisms	U.S. Dept. of Agriculture	18,000
McSorley, R.T.	Management of Root-Knot Nematodes in Field Production of Floral and Ornamental Crops	U.S. Dept. of Agriculture	21,950
McSorley, R.T.	Sustainable Agricultural Practices for Management of Plant-Parasitic Nematodes on Tropical Crops	Univ. of Puerto Rico	9,000
McSorley, R.T.	Management of Root-Knot Nematodes in Field Production of Floral and Ornamental Crops	U.S. Dept. of Agriculture	22,500
Rutledge, C.R.	IPM for Mosquito Control: Program Development Training and Educational Materials	U.S. Dept. of Agriculture	44,625
Webb, S.E.	Management of Insects on Potatoes with a New Insecticide USA-03-816	Dupont Company	6,000



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The Department of Environmental Horticulture is committed to developing and communicating scientifically based research and information on the enhancement of interior and exterior living environments through the use of ornamental plant material and turfgrasses. Environmental Horticulture plays a dominant role in Florida's agricultural economy with the production, sales and maintenance of ornamental plants (woody plants, floricultural crops, foliage plants, bedding plants, and cut foliage) exceeding \$9.9 billion per year. Turfgrass production and maintenance, an integral part of Florida's tourism industry, adds another \$7 billion to state economy while golf courses contribute \$5 billion to the economy of Florida. Environmental Horticulture faculty, located in Gainesville and at Research and Education Centers from Jay to Homestead, are addressing the following research areas:

**WATER MANAGEMENT AND PLANT NUTRITION** – Identify, develop and disseminate environmentally and economically sound technologies that will increase production and utilization efficiencies as well as protect or improve environmental quality. Research is providing significant results leading to water conservation in nurseries, landscapes and on golf courses. New research will address the water and fertilizer requirements of turfgrasses and landscape plants.

**LANDSCAPE CONSERVATION AND ECOLOGY** – Florida, by virtue of its size, diversity, geographic location and multiple climatic zones provides unique opportunities for modeling a sustainable horticultural industry in subtropical and tropical regions throughout the world. The components of the success of this model are development of appropriate propagation and production techniques and introduction of new plants to the industry. Research to develop micropropagation techniques has led to rapid availability of sea oats and wetland plants for beach and landscape restoration. An additional component, invasive plant evaluation, is being addressed for existing plants and new plant introductions.

**BIOTECHNOLOGY, PLANT BREEDING AND NEW CROP DEVELOPMENT** – We are striving to develop horticultural characteristics, disease and host/plant resistance through classical genetics and molecular techniques, allowing us to create marketable products for consumers. Today, the floral biotechnology program is among the leading programs nationally and internationally.

**PLANT PRODUCTION MANAGEMENT** - An important source of sound research-based information to the professional horticultural industry, the scientific community and the consumer/student. This program is viewed as a leader in crop production and physiology information and will set an example for the industry in environmentally safe practices.

**CONSUMER HORTICULTURE-PEOPLE, PLANTS AND THE ENVIRONMENT** - Communicate environmentally sound landscape and gardening practices to the citizens of Florida in order to sustain the natural beauty and protect the natural resources of Florida, and to promote quality of life for residents and tourists.

**POSTHARVEST/POST PRODUCTION** - Address the needs of the foliage and floriculture market chain. Currently the best interior evaluation facilities in the US are located within this department, and it is the only program nationally addressing whole plant longevity on a broad scale. Major emphasis is placed on research to improve the performance of fresh cut flowers for the consumer.

**LANDSCAPE AND TURFGRASS MANAGEMENT** - Develop and provide research based principles and practices to government agencies, landscape professionals, golf course superintendents, sod producers and consumers that will ensure the successful establishment of landscape plants and turfgrass without polluting the environment or wasting resources. These projects range from the proper use of fertilizer in the landscape to the fate of pesticides on golf courses.

The Environmental Horticulture Program addresses the use of ornamental plants and turfgrasses for home and commercial landscapes and for beautification in the home and office. Today, teaching, research and extension programs blend current day recommendations with the need to maintain and enhance our environment and preserve our natural resources. Florida faces many challenges in the future with efficient water use and prevention of runoff, production of a broad range of plant material for distribution world-wide and the need for highly qualified individuals to fill critical industry jobs. The faculty and staff in Environmental Horticulture are poised to meet these challenges with sound scientific research that is recognized throughout the world.

## RESEARCH HIGHLIGHTS

**BEST MANAGEMENT PRACTICES FOR CONTAINER PLANT NURSERIES**

BY THOMAS H. YEAGER

**SIGNIFICANCE:** Nationally, agriculture has been the subject of public scrutiny regarding environmental issues. In central Florida, producers of ferns cut for their green foliage and producers of citrus fruit have been scrutinized for causing elevated nitrate nitrogen concentrations in ground water. In Okeechobee County, the dairy industry has been mandated to minimize phosphorus runoff into Lake Okeechobee and ultimately the Everglades, while the nursery industry in Broward County has been subjected recently to potential mandates to reduce phosphorus runoff into canals. Broward County and the South Florida Water Management District are required by government mandates to reduce the phosphorus concentration in canals that discharge to the Everglades. Thus, water quality issues and in particular surface water quality issues are rapidly coming to the forefront of public attention and will impact nursery operations.

**RATIONALE:** Best Management Practices (BMPs) provide a standardized terminology for nurseries and other agricultural businesses, trade associations, and governmental agencies to use when communicating about environmentally conscious production practices. These practices must be research-based, readily adaptable, and have minimal economic burden. Development of these practices for the container nursery industry has been progressing for several years thanks to support from the nursery industry, private companies, Horticultural Research Institute, Water Management Districts, Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Services, USDA-ARS, UF, and various associations and endowments. Research has involved a team approach with faculty from UF's Research and Education Centers, USDA-ARS, and other disciplines such as Agricultural and Biological Engineering, Food and Resource Economics, and Soil and Water Science. Current research encompasses development of fertilization application

techniques for maximizing nutrient absorption by plants and minimizing nutrient runoff from production areas into ground and surface waters. Fertilization and irrigation BMP recommendations developed through research will be tested for commercial adaptability in Broward County. To accomplish this, UF personnel will demonstrate BMPs at several commercial nursery sites. Nursery operators will evaluate the effectiveness of BMPs at these demonstration sites so that technology transfer and implementation of BMPs will be enhanced.

**IMPACT:** This past year, members of the Florida Nursery, Growers and Landscape Association as well as other plant producers representing Broward, Dade, and Palm Beach counties were convened along with representatives from governmental agencies, associations, and educational institutions. The goal of these meetings was to establish priority BMPs that were currently being used or could be readily adopted to either minimize or reduce offsite nutrient movement into the canals. This process evolved into a draft document titled *South Florida Container Nursery BMP Guide* (<http://floridaagwaterpolicy.com>). Once adopted by statutory rule, producers implementing BMPs and keeping appropriate records are exempt from costs associated with the clean up of ground and surface water contaminated with phosphorus or other constituents, and these producers are presumed to be in compliance with state water quality standards. Research conducted at UF and other collaborating universities is pivotal in guiding the rule development process because research-based information determines the "best" practices that become specified by the rule.

**THE FUTURE:** In the future, nursery businesses will spend more time than in the past accounting for production activities and communicating positive environmental benefits of their management practices. BMPs provide the nurseries a common format for accountability and communication. Being a part of the accountability process during development is very important for nurseries. But it is equally important for us to ensure that research-based information forms the backbone of BMPs.

Tom Yeager



## ENVIRONMENTAL HORTICULTURE

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Terrill A. Nell	Chair and Prof.	Floriculture	25	55	20
James E. Barrett	Prof.	Floriculture	30	70	0
David G. Clark	Assoc. Prof.	Floriculture/Biotechnology	30	70	0
Bijan Dehgan	Prof.	Taxonomy	70	30	0
Edward F. Gilman	Prof.	Arboriculture/Landscaping	5	45	50
Charles L. Guy	Prof.	Biotechnology	30	70	0
Lisa A. Hall	Crd. Academic Programs	Education/Recruitment	100	0	0
Michael E. Kane	Prof.	Tissue Culture	30	70	0
Dennis B. McConnell	Prof.	Foliage	70	30	0
Grady L. Miller	Assoc. Prof.	Turfgrass	60	40	0
Richard K. Schoelhorn	Assoc. Prof.	Floriculture	30	0	70
Laurie E. Trenholm	Asst. Prof.	Turfgrass/Urban Horticulture	5	45	50
Tom Wichman	Extension Agent II	Master Gardener Program	0	0	100
Thomas H. Yeager	Prof.	Woody Ornamentals	5	25	70

### RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
ENH-03791	Nell, T.A.	Postproduction Evaluation of Foliage Plants, Potted Flowering Plants and Fresh Cut Flowers for Interior Use
ENH-03914	Grabosky, J.C., Gilman, E.F.	Landscape Tree Establishment and Protection in the Development and Maintenance of Urban Environments
ENH-03922	Trenholm, L.E., Unruh, J.B.	Best Management Practices for Residential and Commercial Landscape Turfgrasses in Florida
ENH-04003	Dehgan, B., Guy, C.L.	Reproductive Biology and Invasive Potential of Lantana Camara Cultivars
ENH-04033	Miller, G.L.	Improve Turfgrass Management as Related to Environmental Parameters
ENH-04046	Clark, D.G.	Molecular Genetics of Floriculture Crops
ENH-04054	Guy, C.L.	Maltose as a Chloroplast Emergency Compatible Solute in Response to Acute Temperature Shock
ENH-04069	Emino, E.R., Schoellhorn, R.K.	Cultural Systems for Specialty Cut Flowers and Other New Ornamental Crops for Florida

# PUBLICATIONS

- Baum, M., M. Dukes and G. Miller.** 2004. Analysis of Residential Irrigation Distribution Uniformity. *Journal of Irrigation and Drainage Engineering*.
- Beeson Jr., R., R. Beeson Jr., M. Arnold, T. Bilderback, B. Bolusky, S. Chandler, H. Gramling, J. Lea-Cox, J. Harris, P. Klinger, H. Mathers, J. Ruter and T. Yeager.** 2004. Strategic Vision of Container Nursery Irrigation in the Next Ten Years. *Journal of Environmental Horticulture*. 22(2):113-115.
- Beeson Jr., R., T. Yeager and J. Kahoun.** 2004. Irrigation Volumes and Tree Growth of *Quercus Virginiana* in Porous Bottom Containers and #25 Pot-in-pot. *Southern Nursery Association*. pp. 537.
- Chen, J., D. McConnell and R. Henny.** 2004. Light Induced Coordinative Changes in Leaf Variegation between Mother Plants and Daughter Plantlets of *Chlorophytum Comosum* 'Vittatum'. 659:453-459.
- Clark, D., C. Dervinis, J. Barrett, H. Klee and J. Jones.** 2004. Drought-induced Leaf Senescence and Horticultural Performance of Transgenic P-SAG12-IPT *Petunias*. *J Am Soc Hort Sci*. 129:93-99.
- Clevenger, D., J. Barrett, H. Klee and D. Clark.** 2004. Factors Affecting Seed Production in Transgenic Ethylene-insensitive *Petunias*. *J Am Soc Hort Sci*. 129:401-406.
- Gilman, E. and R. Black.** 2004. *Landscape Plants of the Gulf and Atlantic Coasts*. University Press of Florida: Gainesville, FL.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems Part 1: Measuring Operation Pressures. *Ornamental Outlook*. pp. 18-19.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Application Rates. *Ornamental Outlook*. pp. 32-36.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Uniformity of Water Application in Sprinkler Systems. *Ornamental Outlook*. 6:2.
- Haman, D. and T. Yeager.** 2004. Field Evaluation of Container Nursery Irrigation Systems: Measuring Uniformity of Water Application of Microirrigation Systems. *Ornamental Outlook*.
- Haman, D. and T. Yeager.** 2004. Irrigation System Selection for Container Nurseries. *Ornamental Outlook*. pp. 18-21.
- Haman, D. and T. Yeager.** 2004. Stop Seeing Spots – Tips for Eliminating Foliar Deposits and Stains Caused by Irrigation Water. *Ornamental Outlook*.
- Haman, D., B. Boman, G. Knox, S. Lacascio, T. Obreza, L. Parsons, F. Rhoads and T. Yeager.** 2004. Status and Growth of Microirrigation in Florida. *Microirrigation for a Changing World: Conserving Resources/Preserving the Environment*. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D., C. Brooks, T. Yeager and R. Beeson, Jr.** 2004. Square Funnel Containers for Nursery Production. *SNA Proceedings*.
- Haman, D., S. Irmak and T. Yeager.** 2004. Container Production Innovations. *American Nurseryman*. October:54-56.
- Haman, D., S. Irmak and T. Yeager.** 2004. Irrigation Water Use Efficiency of Multi-pot Box System. *Journal of Environmental Hort*. 19(1):384-52.
- Haman, D., S. Irmak, A. Irmak, J. Jones, T. Yeager and K. Campbell.** 2004. A New Irrigation-plant Production System for Water Conservation in Ornamental Nurseries: Quantification and Evaluation of Irrigation, Runoff, Plant Biomass, and Irrigation Efficiencies. *Applied Engineering in Agriculture*. 19(6):651-655.
- Haman, D., T. Yeager and S. Irmak.** 2004. Multi-pot Box System for Increased Efficiency of Irrigation in Ornamental Plant Production. *Irrigation Association Technical Conference Proceedings*.
- Haman, D., T. Yeager, R. Beeson Jr and G. Knox.** 2004. Multiple Pot Box for Container Plant Production. *Journal of Environmental Horticulture*. 16(1):60-63.
- Haman, D., T. Yeager, S. Irmak and C. Larsen.** 2004. Container Plant Production in Multiple Pot Box. *SNA Research Conference*.
- Haman, D., T. Yeager, S. Irmak, R. Beeson, Jr and G. Knox.** 2004. Multipot Box and Funneled Containers in Container Nursery Production. *Proc. Fla. State Hort. Soc.*
- Kelly, R., R. Schoellhorn, Z. Deng and B. Harbaugh.** 2004. University of Florida's Best. GPN - Greenhouse Product News. 14(5).
- Klee, H. and D. Clark.** 2004. *Ethylene Signal Transduction in Fruits and Flowers*. Plant hormones: Biosynthesis, Signal Transduction, Action. Kluwer Academic Publishers: Dordrecht, The Netherlands. pp. 369-390.
- McCarty, B., C. Wells, G. Miller and G. Landry Jr.** 2004. Plant Growth and Development. *Best Golf Course Management Practices*. Prentice Hall: Upper Saddle River, NJ. pp. 59-94.
- McCarty, B., J. Weinbrecht, J. Toler and G. Miller.** 2004. St. Augustinegrass Response to Plant Growth Retardants. 44:1323-1329.
- McConnell, D. and J. Chen.** 2004. The Right Light Levels for Foliage. 13(12):20-21.
- Miller, G.** 2004. Analysis of Soccer Field Surface Hardness. 661:287-294.
- Miller, G. and B. McCarty.** 2004. *Best Golf Course Management Practices*. Prentice Hall: Upper Saddle River, NJ.
- Miller, L., T. Yeager and C. Larsen.** 2004. Monitoring Phosphorus and Nitrate Nitrogen in Above Ground Porous Container. *SNA Research Conference*.
- Norcini, J., B. Dehgan, S. Kabat, J. Aldrich and F. Martin.** 2004. Wildflower Ecotype Research in Florida. 4th Annual Native Seed Quality Conference.
- Shibuya, K., K. Barry, J. Ciardi, H. Loucas, B. Underwood, S. Nourizadeh, J. Ecker, H. Klee and D. Clark.** 2004. The Central Role of PhEIN2 in Ethylene Responses Throughout Plant Development in *Petunia*. *Plant Physiol*. 136:2900-2912.
- Simkin, A., B. Underwood, M. Aldridge, H. Loucas, K. Shibuya, E. Schmelz, D. Clark and H. Klee.** 2004. Circadian Regulation of the PhCCD1 Carotenoid Dioxygenase Controls Emission of Beta-ionone, a Fragrance Volatile of *Petunia* Flowers. *Plant Physiol*. 136:3504-3514.
- Snowden, K., A. Simkin, B. Janssen, K. Templeton, H. Loucas, D. Clark and H. Klee.** 2004. The Dad1/PhCCD8 Gene Affects Branch Production and has a Role in Leaf Senescence, Root Growth and Flower Development. *The Plant Cell*.
- Stiles, C., G. Miller and R. McGovern.** 2004. The Doctor of Plant Medicine Takes Root in UF IFAS. *Florida Turf Digest*. 21(5):22-24.
- Teuton, T., B. Brecke, J. Unruh, G. MacDonald, G. Miller and J. Ducar.** 2004. Factors Affecting Seed Germination Tropical Signalgrass (*Urochloa subquadriflora*). *Weed Science*. 52:376-381.
- Thetford, M., B. Ballard, J. Raymer, J. Gibson and R. Schoellhorn.** 2004. The Milton Gardens: A History and Future of Teaching, Research and Display. *Southern Nursery Association Research Conference*. 49:422-425.
- Trenholm, L. and J. Unruh.** 2004. *Florida Lawn Handbook*. University Press of Florida: Gainesville.

## ENVIRONMENTAL HORTICULTURE

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Cantliffe, D.J.	Enhanced Product Quality and Productivity of Vegetables Through Sustainable Prot	U.S. Dept. of Agriculture	37,563
Clark, D.G.	Gene Function Analysis in Transgenic Petunias	Gloeckner Fdtn., Fred C.	10,000
Clark, D.G.	Floriculture Genomics - Basic Tools for Crop Improvement Through Biotechnology	Am. Floral Endowment	26,000
Dehgan, B.	Reproductive Biology & Invasive Potential of Lantana Camera Cultivars	U.S. Dept. of Agriculture	19,300
Gilfman, E.F.	Developing Weed-based Tree Selector Software for Florida	Dept of Agricul & Consumer Ser	19,200
Guy, C.L.	Royalty Returns	UF Research Foundation	131
Guy, C.L.	Maltose as a Chloroplast Emergency Compatible Solute in Response to Acute Temperature Shock	U.S. Dept. of Agriculture	125,000
Kane, M.E.	Application of Micropropagation Technology for Storage & Production of FL Native Wildflower Ecotypes Used for Seed...	FL WildFlower Advisory Council	10,130
Kelly-Begazo, C.A.	Western Panhandle FloridaYards and Neighborhoods Program	Dept. of Environmental Protect.	89,119
Kelly-Begazo, C.A.	Continued Expansion & Sustainability of the FL Yards & Neighborhoods (Builder Developer Pilot Project)	Dept. of Environmental Protect.	138,654
Knox, G.W.	Continued Expansion & Sustainability of the FL Yards and Neighborhoods Program to Protect Water Quality From Nonpoint	Dept. of Environmental Protect.	412,265
Larson, B.C.	Western Panhandle Florida Yards and Neighborhoods Program	Dept. of Environmental Protect.	85,049
Larson, B.C.	Lake Okeechobee Region FYN Expansion and Enhancement Project	Dept. of Environmental Protect.	52,920
Larson, B.C.	Continued Expansion & Substainability of the FL Yards & Neighborhoods Prog to Protect Water Quality From Stormwarter Runoff	Dept of Environmental Protect	130,848
Miller, G.L.	On-Site Testing of Grasses for Overseeing of Bermudagrass Fairways 2004-2005	Natl. Turfgrass Federation	16,000
Nell, T.A.	Florial Initiation, Crop Culture & Psotproduction Longevity of Poinsettias	Paul Ecke Poinsettias Inc.	112,500
Nell, T.A.	Cleanliness and Care: Providing Practical Solutions to Increase Fresh Flower Longevity	Am Floral Endowment	39,000
Nell, T.A.	Flowering Plant Longevity	Am Floral Endowment	19,500
Trenholm, L.E.	Best Management Practices for Florida's Green Industries: Educational Program	Dept. of Environmental Protect.	114,867
Trenholm, L.E.	Warm Season Turfgrass and Rates and Irrigation	Dept. of Environmental Protect.	700,000
Yeager, T.H.	Determination of Runoff Quality and Quantity of Container-Grown Plant Production	U.S. Dept. of Agriculture	43,875
Yeager, T.H.	Reclaimed Water for Irrigation of Container Grow Plants	Water Management Districts	89,000
Yeager, T.H.	Wick Irrigation System for Small Foliage Plants	Natl. Foliage Foundation	10,000
Yeager, T.H.	BMP Development and Education for Southeast Florida Nursery Operators	Dept. of Agricul. & Consumer Ser.	23,625
Yeager, T.H.	Evaluation of Controlled Released Fertilizers	Haifa Nutritech	8,500
Yeager, T.H.	Development of E-learning Resource for Water and Nutrient Management and Conservation, for Nursery and Greenhouse Ind.	Univ. of Maryland	36,000





**2004 Annual Research Report**

*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

The mission of the Department of Family, Youth and Community Sciences is to enhance lifelong learning and the personal, social, economic, and environmental well-being of diverse individuals, families, and communities through state-of-the-art extension, research, and teaching programs.

The Mission includes the following key elements:

- To apply research-based information through innovative outreach programs.
- To extend the frontiers of knowledge through research and other scholarly endeavors.
- To build student competencies for successful careers in human and community development.
- To enhance the professional development of individuals through continuing professional education.

A major strength of the department is the diversity of disciplines that operate in collaborative and complementary ways to address issues of importance to individuals, families, and communities. This diversity allows human development to be considered from a broad perspective, giving consideration to the key contextual setting in which people are embedded. These contextual factors include families, neighborhoods, schools, communities, and extra-community linkages. These elements form the conceptual foundation for the research, teaching, and outreach activities of the unit.

Some faculty focus their research on youth development issues such as crime and violence prevention in public schools. This

research has led to the development of a safe school survey and school climate survey model for Florida schools, an analysis of school crime and violence data quality systems, longitudinal studies on trends of youth crime and violence, and research on youth risk prevention program effectiveness. Other youth development research has focused on investigating partnerships that adults and youth form, for the purpose of addressing the goals of a local organization, community, or government entity. Florida youth and adults expand and learn leadership skills through partnerships that promote community volunteerism, more specifically, engagement in civic governance. The research examines the knowledge, attitudes and skills of youth and adults regarding willingness to be involved in partnerships and how they apply leadership skills in partnerships for community governance. Other faculty focus their research in the area of food safety and quality in order to provide consumers with credible, science-based research information on emerging technologies, storage, and handling of food in relation to food safety and quality. This research contributes to a safer food supply and better handling by consumers, thereby enhancing the quality of life for individuals, families, and communities.

The research programs prepare graduate and undergraduate students for fulfilling careers in human services, community development, and family and youth professions through the broad-based social science degree. The scope of the Department of Family, Youth and Community Sciences reflects an integrated approach to understanding the linkages between individuals, families, and communities, and the environments in which they function.

RESEARCH HIGHLIGHTS

**SCHOOL CRIME AND VIOLENCE AND PREVENTION PROGRAM EVALUATION RESEARCH**

The Department of Family, Youth and Community Sciences engages actively in research that is designed to study the impacts of various community systems on the development of youth. These projects emphasize the examination of the interaction of children, youth, peers, and families with these major systems, including schools, neighborhoods, communities, and law enforcement, courts and referral agencies. Projects also explore the impact of specific programs on youth with a focus on identifying whether or not these programs are effective and have an impact. This effort has the goal of improving our understanding of the characteristics of environments, children, families, and programs that optimize the healthy development of the nation's youth.

Dr. Rose Barnett has recently completed several studies that have examined the effectiveness of prevention programs to reduce youth crime and violence in schools and communities in the major urban area of Palm Beach County, the fourteenth largest school district in the United States and the location of a major school shooting in the United States. A longitudinal research-based evaluation study was recently completed on the first eight years of the Palm Beach County Youth Court, a program established by the Palm Beach County School District School Police Department for juvenile first offenders. The goal of this program is to keep youth from having a criminal record and from potentially becoming repeat offenders. The evaluation study examined the effectiveness of the court processing, the changing trends in patterns of youth crime and violence, and locations of these crimes. It explored the use of sanctions for these offenses and the impact of significant people on the youth participating in the study. The Palm Beach County Youth Court program provides four benefits to their local community: accountability, timeliness, cost savings, and community cohesion. Research being conducted this year on the effectiveness on the youth court will continue to explore the relationships between the key participants as well as examine risk and protective factors related to these changing trends.

Another project led by Dr. Barnett examined the effects of *Aggressors, Victims and Bystanders*, a program developed by Dr. Ron Slaby (Harvard University) and implemented in Palm Beach County middle schools by the School Police Department. This is a conflict resolution program curriculum that is designed to provide bystanders – which includes most individuals within a school

community – with the combination of problem-solving skills and supported help-seeking strategies they need to take positive steps to prevent violence. This study examined the effectiveness of this program in order to determine its full impact in terms of reducing youth crime and violence, as well as building positive steps and skills to increase youth preparedness in conflict situations.

It was determined that the program did have impact, particularly in the areas of improving how students handle conflict and violence in the school environment in the following specific areas: how choices and actions can prevent conflicts from escalating into fights; how attitudes and beliefs regarding conflict and violence and habits of thought affect the way they deal with conflict; ways to stay calm and think clearly during heated conflict; ways to address and incorporate different points of view and define problems in ways that relieve conduct; and how language can be an important tool in alleviating conflict and preventing fights.

Dr. Rose Barnett



**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Nayda I. Torres	Chair and Prof.	Family and Consumer Economics	0	0	100
Rosemary V. Barnett	Asst. Prof.	Youth Development and Public Policy	65	35	0
Eboni Baugh	Lecturer		100		0
Linda B. Bobroff	Prof.	Foods and Nutrition	5	0	95
Elizabeth B. Bolton	Prof.	Community Development	15	0	85
Mark Brennan	Asst. Prof.	Community Development	50	0	50
Gerald R. Culen	Assoc. Prof. and Acting Program Director	Youth Development	0	0	100
Kate Fogarty	Asst. Prof.	Youth Development	40	0	60
Lisa A. Guion	Asst. Prof.	Program Planning and Evaluation	30	0	70
Mary N. Harrison	Prof.	Consumer Education	0	0	100
Joy C. Jordan	Assoc. Prof.	Youth Development	0	0	100
Marilyn K. Lesmeister	Asst. Prof.	4-H Volunteer Development	0	35	65
Heidi J. Liss	Provisional Asst. Scientist	Rural Behavior/Violence Prevention			
Marilyn N. Norman	Assoc. Prof.	Youth Development			100
Amarat H. Simonne	Asst. Prof.	Food Safety and Quality	0	35	65
Suzanna D. Smith	Assoc. Prof.	Human Development	80	20	0
Michael S. Spranger	Prof. and Asst. Dean				100
Marilyn E. Swisher	Asst. Program Director & Assoc. Prof.	Sustainable Agriculture	50	0	50
Josephine Turner	Prof.	Family and Consumer Economics	30	0	70
Glenda L. Warren	Assoc. Prof.	Nutrition-EFNEP	0	0	100
Carolyn S. Wilken	Assoc. Prof.	Family Life	70	0	30

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
FYC-03782	Evans, G.D.	Early Childhood Interventions for Violence Prevention in Florida
FYC-03923	Barnett, R.V.	Evaluation Research in the Area of Youth Development and Youth Crime and Violence in Public Schools
FYC-03960	Simonne, A.H.	Enhancing Food Safety and Quality Through Technologies and Consumer Research
FYC-04080	Simonne, A.H., Marshall, M. R.	Consumer Preference and Phytonutrient Contents of Specialty Tomatoes and Tropical Fruits in the Caribbean Region

## PUBLICATIONS

**Beaulieu, L. and G. Israel.** 2004. It's More Than Just Schools: How Families and Communities Promote Student Achievement. The Role of Education: Promoting the Economic and Social Vitality of Rural America. Southern Rural Development Center: Mississippi State, MS. pp. 44-55.

**Beaulieu, L., R. Gibbs and G. Israel.** 2004. The Role of Education: Promoting the Economic and Social Vitality of Rural America. Southern Rural Development Center: Mississippi State, MS.

**Bobroff, L.** 2004. Dietary Guidelines. Nutrition and Well-Being A to Z. MacMillan Reference USA: Detroit. pp. 153-154.

**Bobroff, L.** 2004. Dietary Reference Intakes. Nutrition and Well-Being A to Z. MacMillan Reference USA: Detroit.

**Bobroff, L.** 2004 Food Guide Pyramid. Nutrition and Well-Being A to Z. Macmillan Reference USA: Detroit. pp. 225-228.

**Bobroff, L.** 2004. Nutrition and Diet. Optimal Aging Manual - Your Guide from Experts in Medicine, Law, and Finance. Optimal Aging LLC: Sarasota, Florida. pp. 636-648.

**Bobroff, L.** 2004. Recommended Dietary Allowances. Nutrition and Well-Being A to Z. MacMillan Reference USA: Detroit.

**Bobroff, L.** 2004. The Pathway: Follow the Road to Health and Happiness. Journal of Nutrition Education and Behavior. pp. 36.

**Brennan, M.** 2004. Global Challenges of Parks and Protective Area Management. International Symposium on Society and Resource Management.

**Brennan, M. and A. Luloff.** 2004. Concern about Air Quality and Awareness of Ground level Ozone in the Delaware Valley: Summary of the 2004 Telephone Survey Results. Delaware Valley Regional Planning Commission (DVRPC): Philadelphia, PA.

**Brennan, M., A. Luloff and J. Finley.** 2004. "Building Sustainable Communities in Forested Regions." Society and Natural Resources.

**Brennan, M., A. Luloff and J. Finley.** 2004. Hunter Movements: A Comparison of Hunter Behaviors and Opinions During Two Pennsylvania Hunting Seasons. The Pennsylvania State University, Human Dimensions Unit: University Park, Pennsylvania.

**Giunion, L., A. Simonne and J. Easton.** 2004. Youth Perspectives on Food Safety. 42(1):8.

**Israel, G. and L. Beaulieu.** 2004. Investing in Communities: Social Capital's Role in Keeping Youth in School. Journal of the Community Development Society. 34(2):35-57.

**Israel, G. and L. Beaulieu.** 2004. Laying the Foundation for Employment: The Role of Social Capital in Educational Achievement. The Review of Regional Studies. 34(3).

**Luloff, A., J. Bridger and M. Brennan.** 2004. "Building Sustainable Communities". Biodiversity: Addressing a Global Issue Locally. The Environmental Law Institute: University Park, PA.

**Luloff, A., J. Bridger and M. Brennan.** 2004. The Economic Impact of Tourism in Adams County: The Influence of Gettysburg National Military Park and the Eisenhower National Historic Site. Global Challenges of Parks and Protective Area Management. International Symposium on Society and Resource Management.

**Simonne, A., A. Nille, K. Evans and M. Marshall Jr.** 2004. Ethnic Food Safety Trends in the United States Based on CDC Foodborne Illness Data. 24(8):590-604.

**Simonne, A., E. Simonne, D. Studstill, S. Stapleton, W. Davis, R. Hochmuth and M. Taylor.** 2004. Assessing the Eating Quality of Muskmelon Varieties Using Sensory Evaluation. 116:360-363.

**GRANTS & CONTRACTS**

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Bobroff, L.B.	Evaluation of an Extension-based Diabetes Education Program in Various Geographic Regions of Florida	Dept. of Health	40,655
Culen, G.R.	4-H Youth Development Program	Fl. 4-H Foundation	23,000
Ferrer, M.	Florida after School Enrichment Project	U.S. Dept. of Agriculture	122,000
Harrison, M.N.	Understanding Lead-based Paint Regulations	Univ of Georgia	34,289
Harrison, M.N.	Keeping Children Safe-children's Environmental Health Program	Univ of Georgia	9,000
Jordan, J.C.	Youth Curriculum Development	Fl. 4-H Foundation	7,500
Norman, M.N.	4-H Camp Ocala Support	Fl. 4-H Foundation	16,857
Norman, M.N.	4-H Camping Program Cherry Lake	Fl. 4-H Foundation	55,418
Norman, M.N.	4-H Camp Business Manager Support	Fl. 4-H Foundation	33,551
Norman, M.N.	4-H Cloverleaf Camping Program	Fl. 4-H Foundation	55,865
Norman, M.N.	4-H Timpoochee Camping Program	Fl. 4-H Foundation	10,801
Norman, M.N.	4-H Youth Development Program	Fl. 4-H Foundation	19,860
Simonne, A.	Consumer Preference and Phytonutrient Contents of Speciality Tomatoes and Tropical Fruits in the Caribbean Region	U.S. Dept. of Agriculture	32,454
Swisher, M.E.	Sustainable Agriculture Training Plan 2003-04	Univ. of Georgia	10,000
Swisher, M.E.	State Training Plan 2004-2005	Univ. of Georgia	10,000
Torres, N.I.	Cyfar Conference Facilities and Registration Coordination	U.S. Dept. of Agriculture	120,879
Torres, N.I.	Cooperative Support Agreement	U.S. Dept. of Agriculture	40,000
Torres, N.I.	Family Nutrition Program	Dept. of Children & Families	2,113,404



**2004 Annual Research Report**  
*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

The mission of the Department of Fisheries and Aquatic Sciences (FAS) has two major components: (1) To achieve greater understanding of the physical, chemical, and biological features of aquatic systems through research, education, and public outreach, and (2) To foster the informed management and husbandry of aquatic resources.

The Department is organized into four programmatic areas that encompass the strengths of our Department and how our capabilities best meet current and future challenges facing Florida.

The four programmatic areas are:

- Aquaculture
- Aquatic animal health
- Conservation and management of aquatic environments
- Sustainable fisheries

The goals of the four programs are strongly interconnected by shared concerns and opportunities, such as the integrity and sustainability of water resources.

**Aquaculture** is the fastest growing sector of agriculture in Florida, the United States, and the world. Its importance is marked, primarily, because aquatic organisms (e.g., fish) are diverse and among the most efficient animals known to convert food into protein for human consumption. World fisheries landings have leveled-off at approximately 100 million tons. Most of the stocks are considered fully exploited or overexploited. Aquaculture will be one of the major means to make up for limited fisheries stocks during this century and beyond.

**Aquatic animal health** is a truly interdisciplinary program well established at the University of Florida that involves faculty, staff and students from the Department of Fisheries and Aquatic Sciences, The College of Veterinary Medicine, and The Whitney Laboratory. This program focuses on, 1) disease diagnosis & health management, 2) assessment of the effects of toxic algal blooms & environmental contaminants, and 3) an intensive educational program in aquatic animal health through the Graduate School and Extension Programs.

**Conservation and management** of aquatic environments is a response to the serious challenges facing Florida due to the explosive growth of human development. This program focuses on 1) achieving an objective and comprehensive understanding of the structure and function of ecosystems, 2) providing critical information needed for the development of management approaches that ensure the integrity and sustainability of critical natural resources and 3) generating the human resources needed to meet the management challenges of the future through education and extension programs.

**Sustainable fisheries** serve Florida's recreational and commercial fisheries, which together represent an economic value unmatched by fisheries of any other state in the nation. The program focuses on 1) the effects of habitat quality on fish population abundance, 2) population modeling and stock assessment, 3) essential fish habitat & ecological forecasting, and 4) public outreach for sustainable fisheries.

## RESEARCH HIGHLIGHTS

## BIVALVE ECOLOGY AND PHYSIOLOGY

Bivalves are probably most familiar as pretty shells found on beaches or on plates in seafood restaurants. Many might be surprised to learn, however, that bivalves play important roles in the economy and ecology of Florida. For example, clam farming is an important agribusiness in the state. The culture of hard clams (*Mercenaria mercenaria*), a relatively new agricultural industry in Florida, represents the fastest growing segment of the state's aquaculture industry; between 1989 and 1999 revenue from farm-raised hard clams increased fifteen-fold. Today, approximately 400 active shellfish growers farm over 1800 acres of sovereign submerged state lands off nine coastal counties, producing a crop worth \$18.2 million with an economic impact of about \$55 million (2001). While the hard clam aquaculture industry of Florida is a dramatic success story, each year clam farmers face the risk of catastrophic crop loss associated with climatic, environmental and biological factors. In addition, the high-density nature of many aquaculture technologies presents new and unique challenges for the industry. To maintain its impressive growth and to meet increasing national and global demand for aquaculture products, the Florida hard clam industry must increase survival, growth, and yield while consistently producing a high quality crop.

Florida also faces the challenge of potential economic and ecological impacts resulting from the introduction of invasive species. The number of new invasions by marine organisms has more than quadrupled in the last 100 years. While the study of marine invasions in the United States has typically focused on Pacific states and the Northeast, the recent invasion of Tampa Bay by the green mussel, *Perna viridis*, reveals that the Gulf of Mexico is also vulnerable to biological invasions. Bivalves have many qualities that make them successful invaders and the impacts of bivalve invaders range from apparently innocuous to clearly harmful, both ecologically and economically.

Shirley Baker's research program in Fisheries and Aquatic Sciences (FAS) focuses on the physiology and ecology of marine, estuarine and freshwater invertebrates. Her current program specializes in cultured, invasive and native bivalve populations. One of Dr. Baker's long-term research goals is to enhance the sustainable development of open-water clam farming. She is also interested in the consequences of biological invasions and anthropogenic disturbances on the ecology and physiology of invertebrates. Her methods bridge and integrate several levels of research; from comparative physiology and biochemistry at the level of the organism, to remote sensing at the level of the ecosystem.

The CLAMMRS project (Clam Lease Assessment, Management and Modeling using Remote Sensing), on which Dr. Baker is lead PI, is one such study that spans several disciplines. This project is addressing the needs of the hard clam aquaculture industry through a series of interrelated research and extension activities. In association with the Florida Department of Agriculture and Consumer Services, Division of Aquaculture, water quality and weather monitoring stations have been installed at ten clam aquaculture lease areas around the state. In addition to creating a water quality data base to document events associated with crop loss, the CLAMMRS team, including Dr. Ed Philips (FAS), Dr. Clay Montague (Environmental Engineering Sciences), Dr. Debra Murie

(FAS), Leslie Sturmer (Shellfish Aquaculture Extension Program), Dr. Derk Bergquist (former FAS postdoctoral associate) and FAS graduate students Carla Beals, Erin Bledsoe, and Jon Fajans, is also determining the impact of food resource availability and quality on clam productivity, filling gaps in knowledge of Florida clam physiology and response to stressors, and developing a computer simulation model of Florida clam production. A better understanding of clams, their environment, and the human dimensions of clam farming will increase production, farm efficiency and profitability and thereby enhance the sustainable development of open-water clam farming in Florida.

Recently, the need for a hardier clam strain has become evident as clam culturists in south Florida report below average survivals or total losses during the hot summers. While strain development through basic breeding is a long and costly process, a quicker method to capitalize on genetics is through triploid induction. Dr. Baker and colleagues Drs. John Scarpa (Harbor Branch Oceanographic Institute), Chuck Adams (Food and Resource Economics), and Leslie Sturmer are examining the hypothesis that triploid clams will exhibit reduced gamete production and increased body mass that will contribute to higher survival during the summer stressors of heat, reduced dissolved oxygen, and reduced food availability found in the subtropical waters of Florida. Graduate student, Elise Hoover, is comparing the responses of diploid and triploid clams subjected to laboratory stress challenges. Dr. Baker is also determining the physiological mechanism by which triploidy may improve field survival. This project provides information concerning the commercial value of triploid hard clams for increased stress resistance in Florida.

In addition to her focus on hard clams, Dr. Baker also maintains an emphasis on invasive bivalve species and the green mussel, *Perna viridis*, in particular. The green mussel, native to the Persian Gulf and the Philippines, has been introduced throughout the Indo-Pacific, appeared in the Caribbean in 1989 and, by 1999, had invaded Florida. Dr. Baker and her FAS colleagues Drs. Patrick Baker and Ed Philips and graduate student Jon Fajans, have tracked the spread of this mussel since that time. *P. viridis* initially

Shirley Baker





## RESEARCH HIGHLIGHTS

spread south from its point of origin in Tampa Bay with prevailing currents and in 2002 it invaded northeast Florida. Prior invasion patterns and laboratory tolerance trials conducted in Baker's lab suggest that cold temperatures will limit northward range expansion to the Gulf of Mexico and the southeastern United States. Their studies also indicate that *P. viridis* out-competes the native and ecologically important eastern oyster, *Crassostrea virginica*. This project provides resource and industry managers with predictions concerning the spread and severity of green mussel invasions, as well as environmental impacts upon ecosystems. It also identifies areas of concern and future research needs regarding this and similar species.

**PRIMARY COLLABORATORS:** Drs. Patrick Baker, Tom Frazer, Debra Murie, and Ed Philips (FAS), Dr. Chuck Adams (Food and Resource Economics), Drs. Derk Bergquist and David Julian (Department of Zoology), Kal Knickerbocker and Sherman Wilhelm (Florida Department of Agriculture and Consumer Services), Dr. Clay Montague (Department of Environmental Engineering Sciences), Dr. John Scarpa (Harbor Branch Oceanographic Institute), Leslie Sturmer (Shellfish Aquaculture Extension Program), Dr. Anita Wright (Department of Food Science and Human Nutrition), and many FAS graduate students and biologists. Funding has been provided by USDA, EPA, and Florida Sea Grant.

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Karl E. Havens	Chair & Prof.	Plankton Ecology Limnology	30	50	20
Micheal S. Allen	Assoc. Prof.	Freshwater Fisheries Ecology	20	80	0
Roger Bachman	Research Prof.	Limnology	0	100	0
Patrick K. Baker	Research Asst. Prof.	Invertebrate zoology & malacology	0	100	0
Shirley M. Baker	Asst. Prof.	Ecological Physiology	20	80	0
Daniel E. Canfield, Jr.	Prof.	Limnology	20	80	0
Frank A. Chapman	Assoc. Prof.	Fisheries and Reprod. Biology	20	60	20
Charles E. Cichra	Prof.	Fish Ecology and Management	40	0	60
Ruth Francis-Floyd	Joint Prof.	Fish Health Management	30	20	50
Thomas K. Frazer	Assoc. Prof.	Marine Ecology	20	80	0
Charles A. Jacoby	Asst. Prof.	Coastal Estuarine Ecology, Water Quality, Habitat Quality	5	25	70
William J. Lindberg	Assoc. Prof.	Marine Fisheries Ecology	20	60	20
Debra J. Murie	Asst. Prof.	Fisheries Ecologist	20	80	0
Denise Petty	Asst. Prof. Vet. Med.	Aquatic Animal Health	20	20	60
Edward J. Philips	Prof.	Algal Physiology and Ecology	20	80	0
William Seaman, Jr.	Prof.	Marine fisheries	0	0	100
Leslie Sturmer	Multi-County Aquaculture Extension Faculty	Aquaculture	0	0	100
Robert Swett	Asst. Prof.	Waterway Management, Coastal Planning	0	0	100
Craig A. Watson	Coord. Res. Prog.	Tropical Aquaculture	0	40	60
Roy P. Yanong	Assoc. Prof.	Fish Medicine	5	20	75

RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
FAS-03902	Baker, S. M., Philips, E.J., Montague, C., Sturmer, L.N., Wilhelm, R.S.	CLAMMRS: Clam Lease Assessment, Monitoring, and Modeling using Remote Sensing.
FAS-03953	Allen, M.S., Canfield, J.E., Cichra, C.E., Philips, E.J., Frazer, T.K.	Fisheries, Aquatic Ecology and Limnology of Florida's Freshwater Ecosystems
FAS-03955	Watson, C.A., Lindberg, W.J., Yanong, R.P., Lane, M., Canfield, D.E. Baldwin, J.D.	Tropical Aquaculture, Florida
FAS-03978	Jacoby, C.A., Lindberg, W.J., Baker, S.M., Baker, P.K., Chapman, F.A., Frazer, T.K., Murie, D.J., Parkyn, D.C., Philips, E.J.	Management and Ecology of Florida's Coastal Marine Ecosystems
FAS-04007	Chapman, F.A., Baker, S.M., Baker, P.K., Bowen, B.R., Cichra, C.E., Francis-Floyd, R.T., Murie, D.J., Parkyn, D.C., Philips, E.J., Watson, C.A., Yanong, R.P.	The Science of Aquaculture: The Biology, Husbandry, and Utilization of Aquatic Organisms
FAS-04042	Lindberg, W.J., Watson, C.A., Yanong, R.P.	Tropical Aquaculture Research, Florida, 2002
FAS-04045	Lindberg, W.J., Baker, S.M., Philips, E.J., Sturmer, L.N., Degner, R.L., Otwell W.S., Wright, A.C., Rodrick, G.E., Baker, P.K., Francis-Floyd, R.T., Yanong, R.P., Adams, C.M.	Aquaculture, Florida Research Project
FAS-04123	Watson, C.A., Lindberg, W.J.	Tropical Aquaculture Florida, 2003
FAS-04205	Watson, C.A., Hill, J.E.	Tropical Aquaculture Florida, 2004

PUBLICATIONS

**Baker, P.** 2004. *The Mollusks: A Guide to Their Study, Collection, and Preservation.* Academy of Natural Sciences. Philadelphia, PA.

**Baker, S. and D. Padilla.** 2004. *New Frontiers in Functional Morphology of Mollusks: A Tribute to Drs. Vera Fretter and Ruth Turner.* 18:121-128.

**Baker, S., P. Baker, D. Heuberger and L. Sturmer.** 2004. *Short-term Effects of Rapid Salinity Reduction on Seed Clams.* *Journal of Shellfish Research.*

**Bergquist, D., S. Baker and D. Julian.** 2004. *Toxic Sulfide Concentrations in the Sediments and Water Column of the Suwannee River Estuary and its Influence on Hard Clam Survival.* Florida Sea Grant College Program.

**Greenawalt, J., T. Frazer, S. Keller and C. Jacoby.** 2004. *Abundance and Sizes of Bay Scallops in Heterogeneous Habitats Along the Gulf Coast of Florida.* *Gulf of Mexico Science.* (1):74-84.

**Hale, J., T. Frazer, D. Tomasko and M. Hall.** 2004. *Changes in the Distribution of Seagrass Species Along Florida's Central Gulf Coast - Iverson and Bittaker Revisited.* *Estuaries.* 27(1):36-43.

**Hartman, K., R. Yanong, R. Francis-Floyd, A. Riggs and D. Petty.** 2004. *Spring Viremia of Carp (SVC) and Koi Herpes Virus (KHV) Emerging Diseases of Koi: Workshop Summary and FAQs. Pondkeeper: The Trade Resource for Aquatic Plant Nurseries, Ornamental Fish Hatcheries, Landscape Installers, & Retailers.* pp. 40-43.

**Hauxwell, J., C. Osenberg and T. Frazer.** 2004. *Conflicting Management Goals: Manatees and Invasive Competitors Inhibit Restoration of a Native Macrophyte.* *Ecological Applications.* 14(2):571-586.

**Hauxwell, J., T. Frazer and C. Osenberg.** 2004. *Grazing by Manatees Excludes Both New and Established Wild Celery Transplants: Implications for Restoration in Kings Bay, FL, USA.* *Journal of Aquatic Plant Management.* 42:49-53.

**Havens, K.** 2004. *Is There a Common Language Regarding the Trophic State of Lakes?* *LakeLine.* 24:33-36.

**Havens, K. and G. Nurnberg.** 2004. *The Phosphorus-chlorophyll Relationship in Lakes: Potential Influences of Color and Mixing Regime.* *Lake and Reservoir Management.* 20:188-196.

**Havens, K., B. Sharfstein, M. Brady, T. East, M. Harwell, R. Maki and A. Rodusky.** 2004. *Recovery of Submerged Plants from High Water Stress in a Large Subtropical Lake in Florida, USA.* *Aquatic Botany.* 78:67-82.

**Hoyer, M., S. Notestein, T. Frazer and D. Canfield Jr.** 2004. *Bird Density and Species Richness on Five Florida Coastal Rivers, with Comparisons to Florida Freshwater Lakes.* *Hydrobiologia.*

**Hoyer, M., T. Frazer, S. Notestein and D. Canfield Jr.** 2004. *Vegetative Characteristics of Three Low-lying Florida Coastal Rivers in Relation to Flow, Light, Salinity and Nutrients.* *Hydrobiologia.* 528:31-43.

**Kirkendale, L., T. Lee, P. Baker and D. O'Foighil.** 2004. *Oysters of the Conch Republic (Florida Keys): A Molecular Phylogenetic Study of Parahyotissa Mcgintyi, Teskyostrea Weberi, and Ostrea Equestris.* *Malacologia.* 46:309-326.

**Mallison, C. and C. Cichra.** 2004. *Accuracy of Angler-reported Harvest in Roving Creel Surveys.* *North American Journal of Fisheries Management.* 24:880-889.

**Moline, M., H. Claustre, T. Frazer, O. Schofield and M. Vernet.** 2004. *Alteration of the Food Web along the Antarctic Peninsula in Response to a Regional Warming Trend.* *Global Change Biology.* pp. 38360.

**Yanong, R.** 2004. *Common Fungal Diseases in Fish.* *Proceedings, North American Veterinary Conference.*

**Yanong, R.** 2004. *From Dog-paddling to Swimming with the Fishes: Post-DVM Educational Opportunities in Fish Medicine.* *Proceedings, Expanding Private Practitioner Opportunities in Fish Medicine, Special Session: 35th Annual Conference, International Association for Aquatic Animal Medicine.* pp. 62-69.

**Yanong, R. and D. Petty.** 2004. *Attack of the Killer Eyelids! The Weird World of Ciliates.* *Buntbarsche Bulletin: Journal of the American Cichlid Association.* 221:38361.

**Yanong, R., E. Curtis, R. Simmons, V. Bhattaram, M. Gopalakrishnan, N. Ketabi, N. Nagaraj and H. Derendorf.** 2004. *Pharmacokinetic Studies of Florfenicol in Koi (Cyprinus carpio) and Three-spot Gourami (Trichogaster trichopterus) after Oral and Intramuscular.* *Journal of Aquatic Animal Health.*

**Yanong, R., R. Russo, E. Curtis, R. Francis-Floyd, R. Klinger, I. Berzins, K. Kelley and S. Poynton.** 2004. *Cryptobia iubilans Infection in Juvenile Discus (Symphysodon aequifasciata): Four Case Reports, Pathology, and Treatment Trials.* *Journal of the American Veterinary Medical Association.* 224(10):1644-1650.

## FISHERIES & AQUATIC SCIENCES

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Allen, M.S.	Important Microhabitats for Spotted Sunfish in the Anclote Manatee R1	Water Management Districts	80,000
Allen, M.S.	Hatching Duration, Growth and Survival of Age Largemouth Bass Along a Lattitudinal Gradient of Florida Lakes	Fl. Fish & Wildlife Consvr. Comm.	54,850
Baker, P.K.	Genetic Analysis of Hard Clam ( <i>Mercenaria Mercenaria</i> ) Performance in Commercial Culture	U.S. Dept. of Agriculture	142,897
Baker, P.K.	An Invertebrate Survey for Desoto National Memorial	U.S. Dept. of the Interior	23,814
Baker, S.M.	Diversification for Hard Clam Aquaculture Industry Through Investigation of Blood Ark, anadara Ovalis, & Ponderous Ark...	U.S. Dept. of Agriculture	81,052
Baker, S.M.	Clammers (Clam Lease Assessment, Management, and Modeling Using Remote Sensing): Alligator Harbor Aquaculture Use Area	U.S. Dept. of Agriculture	50,683
Baker, S.M.	Improving Stress Resistance of Cultured Hard Clams: Tripolid Production	Harbor Branch Ocean Inst.	19,000
Canfield Jr., D.E.	Evaluation of Lake Tohopekaliga Habitat Enhancement Project	Fl. Fish & Wildlife Consvr. Comm.	370,940
Canfield Jr., D.E.	Florida Lakewatch	Dept. of Environmental Protect.	450,000
Canfield Jr., D.E.	Restoration of the Economic Vitality of Lake Griffin's Largemouth Bass Fishery: a Research/Demonstration Project	Lake County	68,907
Canfield Jr., D.E.	Florida Lakewatch: Lake County	Lake County	109,000
Canfield Jr., D.E.	Lake User Survey	Water Management Districts	60,000
Canfield Jr., D.E.	Lake Vegetation and Light Penetration	Water Management Districts	40,000
Cichra, C.	Natural Resource Values Assessments: Investigation of the Effects of Water Level Fluctuation on Centrarchid ....	Fl. Fish & Wildlife Consvr. Comm.	54,600
Dunsmore, L.E.	Application of Landscape Ecology Principles to the Design and Management of Marine Protected Areas in Coral Reef Ecosy	Am. Assn. for Advance of Science	39,000
Frazer, T.K.	Project Coast	Water Management Districts	465,000
Frazer, T.K.	Kings Bay Vegetation Evaluation and Monitoring Program	Water Management Districts	50,000
Lindberg, W.J.	Tropical Aquaculture Florida 2003	U.S. Dept. of Agriculture	222,892
Lindberg, W.J.	Habitat Selection and the Performance of Gag Grouper Across a Range of Hard Bottom Habitat in the Nestern Gulf of Mexico	U.S. Dept. of Commerce	95,218
Murie, D.J.	Age and Growth of Yellow Fullhead and Two Introduced Catfishes from South Florida	U.S. Dept. of the Interior	29,945
Philips, E.J.	Coastal Eutrophication and the Productivity of Clams and Oysters	U.S. Dept. of Agriculture	435,000
Philips, E.J.	Implementation of Eadin: Expert Assistance and Distance Indentification Network	U.S. Dept. of Agriculture	70,000
Philips, E.J.	Integration of Clams into Wastewater Treatment:a Dairy Model	U.S. Dept. of Agriculture	50,937
Philips, E.J.	Gtmnerr Water Quality Monitoring	Dept. of Environmental Protect.	35,645
Philips, E.J.	Silver Springs Retrospective Ecosystem Study: Phase Ii	Water Management Districts	33,500
Stocker, R.K.	Tropical Aquaculture Florida, 2004	U.S. Dept. of Agriculture	198,727
Watson, C.A.	Tropical Aquaculture Laboratory Support 2004	Dept. of Agriculture & Consumer Ser.	121,260
Watson, C.A.	Aquatic Product Review and Label Development	Hartz Mountain Corp	50,000
Yanong, R.P.	Use of 17-alpha Methyltestosterone (Mt) for Expression of Male Secondary Sexual Characteristics in Ornamental Fish	U.S. Dept. of Agriculture	73,058



**2004 Annual Research Report**

*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

The general goal of Food and Resource Economics research is to provide knowledge needed to guide decisions in the production, marketing, distribution, and consumption of food, fiber, and marine products and the development and more efficient use of natural, human and capital resources.

**FOOD AND AGRICULTURE:** Florida ranks as a major agricultural state and often leads the nation in the production of a wide variety of agricultural commodities. Before reaching the consumer, each product moves through a unique marketing channel often involving grading, processing, packaging, transporting, international trade, wholesaling and retailing. The provision of inputs and services to the agricultural sector also involves significant economic activity. Agricultural businesses must cope with increased regulatory pressure, shifting consumer preferences regarding food safety and environmental protection as well as dealing with emerging opportunities through biotechnology. Agribusiness, farm management and production economics, marketing, international trade and competition, and consumer economics are among the subject matter sub-areas contributing.

**NATURAL RESOURCES AND ENVIRONMENT:** Florida's population growth and associated pressures on land, water, and natural systems

pose difficult policy choices for public officials. Environmental and resource problems and policies affect agriculture and Florida's rural communities. The need for research increases as the competition between agricultural and nonagricultural users of land and water intensifies. These conflicting issues are clearly part of the management challenge in commercial agriculture. Natural resource and environmental economics, including marine economics, are the primary subject matter sub-areas contributing.

**ECONOMIC DEVELOPMENT:** Economic development generally refers to targeted programs designed to enable people to raise overall per capita incomes or to improve circumstances for specific disadvantaged populations. The emphasis of the program thrust is the enhancement of people's capacity to acquire and manage resources effectively. Economic transitions underway in rural Florida result in pockets of economic disadvantage. Public and private managers must cope with the costs of economic change and must be able to influence both the pattern and pace of growth. Insights are sometimes obtained from problem-solving work in other counties that may be applicable in Florida. Rural economic development, international development, economic impact analysis, and agricultural labor subject matter sub-areas contribute.

## RESEARCH HIGHLIGHTS

**ETHICAL ANALYSIS SUPPLEMENTS POLICY ANALYSIS  
REGARDING FOOD SAFETY AND AGRICULTURAL BIOTECHNOLOGY**

In the late twentieth century, systematic thinking about values and norms associated with the food system – farming, resource management, food processing, distribution, trade, and consumption – has come to be referred to as *agricultural ethics*. Agricultural ethics incorporates elements of disciplinary philosophical ethical analysis with concerns about particular “issue areas” that arise in connection with the food system. Agricultural ethics has grown from the work of a handful of philosophically trained individuals in U.S. land-grant institutions to a large, worldwide collection of academics, scholars, farmers, policymakers, and activists, thinking and writing about these issues.

Over the past several years there has been considerable public discussion and policy analysis of issues such as changes in farm structure, treatment of agricultural animals, food safety; the environmental impacts of particular farming/resource management practices, international trade concerns, food security, and of course food and agricultural biotechnology. Ethics or ethical analysis is one of a number of disciplinary tools that can be used to enhance discussion of policy issues relating to food, agriculture, and the environment. Indeed, all of the agricultural sciences have had something to contribute. The work of this researcher, however, has focused primarily on ethics regarding policy. Two examples of this research are summarized here: 1) Food Safety, and 2) Agricultural Biotechnology.

Food safety is an ethical issue in part because, in the modern food production-transportation-processing-wholesaling-retailing chain, foods can be exposed to chemicals or microbial pathogens, or simply can be mishandled. Consumers on their own may not be able to tell whether the foods they purchase and eat will put them at risk for sickness or disease or even allergic reactions. Under what is known as a “rights approach” to ethical analysis – the primary ethical responsibility people have is to respect each others’ rights – food safety takes on particular significance because the rights approach demands that people not be placed at risk against their will. The complexity and lack of transparency of the food production system implies that government agencies such as the Environmental Protection Agency, the U.S. Food and Drug Administration, and public health departments have an important role in protecting rights. One way they do this is by attempting to ensure that food is safe. One problem is that determining “safety” is not so simple: “safe” implies a value judgment that potential hazards have been adequately analyzed and that any remaining risks are “acceptable.” Some people question whether those responsible for ensuring safety really operate under a “protect rights” regime, or whether an alternative ethical approach, the so-called “utilitarian” (greatest social net value) approach is employed. Under a utilitarian regime, judgments about “relative safety” can sometimes inadvertently place certain individuals at risk (e.g., those with unique allergies).

In light of occasional food scares and lapses in the regulatory system, questions have to be raised about the appropriateness and thoroughness of many scientific risk analyses and assessments of safety. In general, calls for stricter evaluations of certain chemicals and genetically engineered foods, more inspections of process-

ing plants and grocery stores, and thorough product labeling all reflect the ethical demand that consumers be protected from exposure to (real and perceived) risks associated with foods, i.e., have their rights protected. Even the increasing demand for so-called “Country of Origin” labels may have some basis in peoples’ concerns about whether foods imported from nations with less stringent environmental regulations are safe to eat.

Labels for food products containing material from genetically modified (GM) crops have also been the subject of consumer scrutiny and some policy discussion. Interestingly, the development of recombinant DNA techniques for transforming agricultural plants and animals, as well as for food processing and animal drugs, has been the focus of controversy for more than 20 years. The debate reached one peak within the United States in connection with the approval process for bovine somatotropin within the dairy industry, only to resurface again in connection with European and Japanese consumer rejection of transgenic maize and soy. The highly visible political controversy over biotechnology has made the debate a prominent place for the consideration of virtually every ethical concern associated with food and agriculture. Indeed, agricultural biotechnology is debated in terms of food safety and consumer consent, the broader environmental effects of its use in crop and livestock production, its impact on the structure of agriculture, and its potential to address problems of hunger on a global basis, and, of course, its place in the global market.

Each of these issues might be raised with respect to many technologies that affect production practices in the food system. It is accurate to say that many of the real issues have little to do with the use of transgenic technology. Yet such a statement also is misleading by virtue of the way that biotechnology has come to symbolize the broad pattern of technological change within the food system for the broader public. The controversy over biotechnology thus is ethically significant because it signals a current of dissatisfaction within a subset of the public regarding general social and technological trends in the food system, and because it illustrates the frustration that segment of the population feels over its inability to influence policy. Here, biotechnology also connects with the general issue of consumer trust in science.

*Jeff Burkhardt*



## RESEARCH HIGHLIGHTS

Beyond these issues of power over the food system and consumer confidence in the judgment of experts and powerful actors, there are issues that are unique to the use of biotechnology. One concerns the quasi-religious question of whether these technologies are so intrusive with respect to life processes that they amount to a form of disrespect for humanity's proper relationship to nature, a form of "playing God." Here, agricultural biotechnology is viewed as but one component of a revolution in biology that includes the possibilities of human cloning and genetic engineering. An outgrowth of this concern can take the form of whether people have the right to base dietary choices on the basis of religious and quasi-religious beliefs. If a person believes that so-called biotech foods are impure on religious or philosophical rather than scientific grounds, is it ethical for the food industry to place that person in a position in which it becomes impossible to make dietary choices on the basis of these beliefs?

The debate over agricultural biotechnology also has occurred at the same time that U.S. research agencies such as the National Institutes of Health and the National Science Foundation have urged greater attention to research ethics. Within many domains of science, research ethics has focused primarily on human subjects and informed consent, and secondarily on the use of animals as research subjects. The first concern has not much affected agricultural researchers, whereas the second has been experienced in terms of the growing importance of Institutional Animal Care and Use Committees (IACUCs) in the review of agricultural research. Even more recently, discussion of the role of ethics in policy regarding agricultural biotechnology research and development was a major part of the work of the U.S. Secretary of Agriculture's "Advisory Committee on Agricultural Biotechnology" (ACAB), on which Dr. Burkhardt served from 1999-2001.

Research ethics also is coming to be seen in terms of the broader steering and control over the research agenda and the

proper role of self-interested actors (such as corporations) in supporting public-sector scientific research. In agricultural research, these ethical issues concern the appropriate way that food consumers, citizens, and other food system outsiders should have their values reflected in the development of agricultural production practices, especially as these are affected by new technology. One view holds that markets provide adequate opportunity for citizens to "vote with their pocketbooks," whereas another holds that the power of actors such as farm organizations, input suppliers, food companies, and government regulatory agencies limits the extent to which market choices truly can reflect the values of the broader public. The issues also can be articulated in terms of the public's confidence and trust of these actors. If self-seeking economic actors can conspire in ways that limit which foods are available and at what price, why should the public accept the claim that biotechnology (or, indeed, any technology) serves the public's interest in a safe, secure, and environmentally sound food system?

Responses to specific ethical problems, such as the public's trust in agricultural science or the broader environmental place of agriculture, may require significant organizational responses. These responses may include opportunities for broader public participation in policy decisions, or more effective outreach programs to elicit a wide range of citizens' perspectives. The specificity of the problem in question will determine the nature of response that is most appropriate. Ethics alone will not indicate what is needed. The emphasis here is on the need for agricultural institutions to develop a base of expertise in signaling the nature and importance of ethical concerns, with the expectation that this will lead to more effective decision making in the future. This, indeed, is the focus of the recently released Issue Paper from the Council on Agricultural Science and Technology (CAST), "Agricultural Ethics," for which this Dr. Burkhardt served as Task Force Chair and Lead Author. See [http://www.cast-science.org/cast/src/cast\\_top.htm](http://www.cast-science.org/cast/src/cast_top.htm)

## FOOD & RESOURCE ECONOMICS

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Thomas H. Spreen	Chairman and Prof.	Quantitative Methods, Citrus Economics	25	50	25
Charles M. Adams	Prof.	Marine Economics	0	0	100
Richard P. Beilock	Prof.	Marketing Transportation	30	70	0
Robert J. Burkhardt	Prof.	Philosophy and Ethics in Agriculture	40	40	20
Roy R. Carriker	Prof.	Natural Resource and Environmental Economics	30	0	70
Henry M. Cothran	Assoc. In	Budget Analysis, Community Development	20	0	80
Carlton G. Davis	Distinguished Service Prof.	International Economics	10	90	0
Robert L. Degner	Prof. and Program Director	Market Research Center	0	60	40
Evan Drummond	Assoc. Director & Prof.	Senior Assoc. Dir. Of Honors Program	100	0	0
Robert D. Emerson	Prof.	Econometrics, Agricultural Labor	40	60	0
Gary F. Fairchild	Prof.	Marketing & Trade	80	20	0
Alan W. Hodges	Asst. In.	Horticultural Economic, Impact Analysis	0	30	70
Lisa A. House	Assoc. Prof.	Agribusiness Management	60	40	0
Clyde F. Kiker	Prof.	Natural Resources/Environmental Economics	50	50	0
Richard L. Kilmer	Prof.	Agrcultural Marketing	30	70	0
Sherry L. Larkin	Asst. Prof.	Natural Resource and Environmental Economics	30	70	0
Donna J. Lee	Assoc. Prof.	Natural Resource Economics	40	60	0
Burl F. Long	Prof.	Natural Resource Economics - Public Policy	80	0	20
Charles B. Moss	Prof.	Agribusiness Finance and Quantitative Methods	30	70	0
David Mulkey	Prof.	Regional Economics	5	30	65
Michael T. Olexa	Prof.	Agricultural Law	60	0	40
Mikael Sandberg	Lecturer	Agricultural Economics	100	0	0
Andrew Schmitz	Eminent Scholar	Marketing and Trade	30	70	0
James L. Seale, Jr.	Prof.	International Agricultural Trade, Finance and Policy	30	70	0
James A. Sterns	Asst. Prof.	Agribusiness Mnagement	60	40	0
Timothy G. Taylor	Prof.	International Economics and Agribusiness	60	40	0
Peter J. Van Blokland	Prof.	Agribusiness Finance	40	0	60
John J. Van Sickle	Prof.	Agricultural Marketing & Trade	20	10	70
Ronald W. Ward	Prof.	Agricultural Marketing	30	70	0
Richard N. Weldon	Assoc. Prof.	Agribusiness Finance	70	30	0
Allen F. Wysocki	Assoc. Prof.	Food Distribution and Marketing	70	0	30



**RESEARCH PROJECTS**

PROJECT NO.	AUTHOR	TITLE
FRE-03701	Beilock, R.P.	Agricultural and Food Product Logistics: Implications for Florida and the U.S. in a World Market
FRE-03825	Hodges, A.W.	Technical and Economical Efficiencies of Producing, Marketing, and Managing Environmental Plants
FRE-03863	Larkin, S.L.	The Efficiency of Alternative Natural Resource and Environmental Policies and Practices
FRE-03890	Burkhardt, R.J.	Agriculture and Natural Resource Ethics
FRE-04005	House, L.A., Degner, R.L.	Consumer Attitudes and Preferences Regarding Florida Agricultural Products
FRE-04080	VanSickle, J.J., Evans, E.A., Knapp, J.L., Alamo-Gonzalez, C.	Technical Barriers to Trade (TBT): Economic and Trade Impacts of Regulations to Control Invasive Pests
FRE-04090	Davis, C.G.,	Caribbean Basin Countries Agricultural Sector Adjustment Challenges Under Emerging Trade Liberalizations and Integration Regimes
FRE-04118	Hodges, A.W., Mulkey, W.D.	Economic, Environmental and Fiscal Impact Analysis of Agriculture, Natural Resources and Amenity-based Services in Florida.
FRE-04145	VanSickle, J.J.	Economics of Managing Invasive Species in Tropical and Sub-tropical Areas of the US Caribbean Basin
FRE-04146	Spreen, T.H., Muraro, R.P., Roka, F.M.	Economic Analysis of the Florida Citrus Industry Competing in a Global Market
FRE-04147	Taylor, T.G., Fairchild, G.F.	Trade and Economic Growth in the Caribbean
FRE-04163	Moss, C.B., Schmitz, A.	Impact Analysis and Decision Strategies for Agricultural Research
FRE-04167	Sterns, J.A.	The Marketing of Differentiated Agricultural and Food Products
FRE-04178	Weldon, R.N.	Improving Risk Management Tools to Enhance the Competitiveness of Florida Crop and Livestock Producers
FRE-04191	Seale Jr., J.L.	Impacts of Trade and Domestic Policies on the Competitiveness and Performance of Southern Agriculture
FRE-04192	Larkin, S.	Marketing, Trade, and Management of Fisheries and Aquaculture Resources
FRE-04246	Emerson, R.D., Iwai, N., Roka, F.M., Vansickle, J.J.	Assessing Agricultural Labor Risk for Specialty Crops

# PUBLICATIONS

- Adams, C., A. Hodges, L. Sturmer and D. Mulkey.** 2004. The Economic Impact of the Florida Cultured Hard Clam Industry. *Journal of Applied Aquaculture*. pp. 85-100.
- Adams, D., R. Kilmer, C. Moss and A. Schmitz.** 2004. Valuing Catastrophic Losses for Perennial Agricultural Crops: Citrus as a Model. *Proceedings of the Florida State Horticultural Society*.
- Blank, S., K. Erickson, C. Moss and R. Nehring.** 2004. Agricultural Profits and Farm Households. *American Journal of Agricultural Economics*. 86(5):1299-307.
- Broek, L., J. Haydu, E. Neves and A. Hodges.** 2004. Production, Marketing and Distribution of Cut Flowers in the United States and Brazil. pp. 38371.
- Duval, J., J. Price, G. Hochmuth, W. Stall, T. Kucharek, S. Olson, T. Taylor, S. Smith and E. Simonne.** 2004. Strawberry Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Erickson, K., C. Moss and A. Mishra.** 2004. Rates of Return in the Farm and Non-Farm Sectors: How Do They Compare? *Journal of Agricultural and Applied Economics*. 36(3):789-95.
- Feleke, S., R. Kilmer and C. Gladwin.** 2004. Determinants of Food Security in Southern Ethiopia at the Household Level. *Agricultural Economics*.
- Green, A., A. Hermansen-Baez, A. Hodges, W. Smith, D. Rockwood and J. Stricker.** 2004. Multidisciplinary Academic Demonstration of a Biomass Alliance with Natural Gas. In: *Proc. International Conference on Engineering Education*.
- Hodges, A. and J. Haydu.** 2004. An Internet-based System for Financial Benchmark Analysis of Wholesale Nursery Operations. 49:71-74.
- Hutchinson, C., E. Simonne, G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Potato Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 259-268.
- Kilmer, R.** 2004. The Southern Agricultural Economics Association's Declining Membership. *Journal of Agricultural and Applied Economics*. 36(2):265-275.
- Larkin, S. and C. Adams.** 2004. The Marine Life Fishery in Florida, 1990-1998. *Marine Fisheries Review*. 65(1):38717.
- Larkin, S. and G. Sylvia.** 2004. Generating Enhanced Fishery Rents by Internalizing Product Quality Characteristics. *Environmental and Resource Economics*. 28(1):101-122.
- Larkin, S., R. Roberts, B. English, J. Larson, R. Cochran, M. Marra and S. Martin.** 2004. Factors Affecting Observed Environmental Benefits from Precision Farming in the Southeastern United States. University of Florida. Gainesville, FL.
- Larkin, S., W. Keithly, C. Adams and R. Kazmierczak Jr.** 2004. Buyback Programs for Capacity Reduction in the U.S. Atlantic Shark Fishery. *Journal of Agricultural and Applied Economics*. 36(2):317-332.
- Lowe, G., C. Davis and R. Kilmer.** 2004. United States Trade Flows for Selected Categories of Speciality Crops. *International Agricultural Trade and Policy Center*: Gainesville, Florida.
- Mishra, A., C. Moss and K. Erickson.** 2004. Valuing Farmland with Multiple Quasi-Fixed Inputs. *Applied Economics*. 36(15):1655-69.
- Moss, C. and A. Schmitz.** 2004. Delineating the Relevant U.S. Sweetener Markets. *Journal of Agricultural & Food Industrial Organization*. 2(1):Article 1.
- Moss, C., T. Schmitz and A. Schmitz.** 2004. The Brave New World: Imperfect Information, Segregation Costs, and Genetically Modified Organisms. *Agrarwirtschaft*. 53(8):303-8.
- Napasintuwong, O. and R. Emerson.** 2004. Labor Substitutability in Labor Intensive Agriculture and Technological Change in the Presence of Foreign Labor. *AgEcon Search*: [http://agecon.lib.umn.edu/cgi-bin/pdf\\_view.pl?paperid=14330&ftype=.pdf](http://agecon.lib.umn.edu/cgi-bin/pdf_view.pl?paperid=14330&ftype=.pdf).
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor, S. Smith and E. Simonne.** 2004. Tomato Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 301-316.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cole Crop Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 131-163.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cucurbit Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 169-197.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Pepper Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 247-258.
- Olson, S., E. Simonne, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Legume Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 207-217.
- Polopolus, L., M. Olexa, F. Roka and C. Fountain.** 2004. Field Sanitation and Drinking Water Regulations. *Citrus and Vegetable Magazine*.
- Prasertsri, P. and R. Kilmer.** 2004. Scheduling and Routing Milk from Farm to Processors by a Cooperative. *Journal of Agribusiness*. 22(2):93-106.
- Rahmani, M., A. Hodges and C. Kiker.** 2004. Compost Users' Attitudes toward Compost Application in Florida. *Compost Science and Utilization*. pp. 55-60.
- Roberts, R., B. English, J. Larson, R. Cochran, S. Larkin, M. Marra and S. Martin.** 2004. Economics of Precision Farming 2003 Summary Report. University of Florida: Gainesville, FL.
- Roberts, R., B. English, J. Larson, R. Cochran, S. Larkin, M. Marra and S. Martin.** 2004. Factors Influencing Southeastern Cotton Farmers to Adopt Precision Soil Sampling Technology Sooner than Later. University of Florida: Gainesville, FL.
- Roberts, R., B. English, J. Larson, R. Cochran, S. Larkin, M. Marra and S. Martin.** 2004. Precision Farming Technology Adoption, Perceptions of Environmental Benefits, and Whole-Farm Costs for Southeastern Cotton Farmers. University of Florida: Gainesville, FL.
- Roberts, R., B. English, J. Larson, R. Cochran, W. Goodman, S. Larkin, M. Marra, S. Martin and W. Shurley.** 2004. Adoption of Site-Specific Information and Variable Rate Technologies in Cotton Precision Farming. *Journal of Agricultural and Applied Economics*. 36(1):143-158.
- Schmitz, T., C. Moss and A. Schmitz.** 2004. Reduced Demand Due to StarLink Corn: A Structural Change Model. *Journal of Agricultural & Food Industrial Organization*. 2(2).
- Simonne, E., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, S. Smith and T. Taylor.** 2004. Eggplant Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 109-116.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Sweet Corn Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 285-292.
- Stainback, G., J. Alavalapati, R. Shrestha, S. Larkin and G. Wong.** 2004. Improving Environmental Quality in South Florida Through Silvopasture: An Economic Approach. *Journal of Agricultural and Applied Economics*. 36(2):481-489.
- Testuri, C., R. Kilmer, T. Spreen and X. Zhang.** 2004. Class I Price Differentials for the Southeastern United States: Methodology and Empirical Results. *Florida Agricultural Experiment Station Research Bulletin*. pp. 401.
- Zhang, J., J. Alavalapati, R. Shrestha and A. Hodges.** 2004. Economic Impacts of Closing National Forests for Commercial Timber Production in Florida and Liberty County. *Journal of Forest Economics*.

**GRANTS & CONTRACTS**

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Adams, C.M.	Assessing the Fair Market Value of Commercial Shark Vessels in the Gulf of Mexico and Atlantic Regions	Gulf & S. Atlantic Fish Dev. Fd.	30,413
Cumming, G.S.	Sustainability and Land Use in the Caribbean Region	U.S. Dept. of Agriculture	100,000
Degner, R.L.	Market Enhancement for Small Diameter Timber in Florida	Dept. of Agricul. & Consumer Ser.	31,185
Emerson, R.D.	Assessing Agricultural Labor Risk for Specialty Crops	U.S. Dept. of Agriculture	730,319
Fairchild, G.F.	Cross-border Curricular Programs in International Environmental and Agribusiness Management	Univ. of Maine	50,450
House, L.A.	Measures of Consumer Acceptance of and Willingness to Pay for Genetically Modified Foods in the U.S. and the E.U.	Mississippi State University	71,667
House, L.A.	Analysis of Goat Meat Consumption in Florida	Fort Valley State University	13,875
Larkin, S.L.	Economic Effects of Habs on Coastal Communities and Shellfish Culture in Florida	Environmental Protection Agcy.	91,959
Miller, D.L.	Santa Rosa Beach Mouse Use of a Hurricane Fragmented Landscape	U.S. Dept. of the Interior	22,000
Monroe, M.C.	Partnership and Outreach Case Studies	U.S. Dept. of the Interior	24,705
Olexa, M.T.	Update Water Quality and Water Quantity Related Publications in English and Spanish	Dept. of Agricul. & Consumer Ser.	17,126
Seale Jr., J.L.	Estimating Import & Export Demand for Specialty Crops	U.S. Dept. of Agriculture	52,500
Seale Jr., J.L.	Structural Changes in Food Demand in Developing Countries & Its Implications for U.S. Trade and Global Security	U.S. Dept. of Agriculture	40,000
Spreen, T.H.	Marketing Florida Citrus Products-doc Contract# 04-14	Dept. of Citrus	27,500
Vansickle, J.J.	Florida Agricultural Competiveness and Trade	Dept. of Agricul. & Consumer Ser.	1,000,000
Vansickle, J.J.	Economics of Managing Invasive Species in Tropical Areas of the United States of America	U.S. Dept. of Agriculture	290,901



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The Food Science and Human Nutrition department is dedicated to quality research, teaching, extension, and service programs in the broad and diverse areas of food science, human nutrition, and dietetics. We have faculty both on campus and at the Citrus Research and Education Center, and several faculty members participate in the Center for Nutritional Sciences, an interdisciplinary program encouraging comprehensive training and research in the science of nutrition. Members of the faculty also participate in programs in other departments in IFAS and across the University of Florida, other universities, and government agencies. Members of the faculty are well recognized nationally and internationally, as evidenced by the recent election of a faculty member to the National Academy of Sciences. The faculty has also been very successful in generating grants from federal, state, and industry sources, and grant expenditures last year totaled over \$2 million.

The department's research programs can be divided into two broad categories: food science and human nutrition. Research in the area of food science addresses problems and opportunities important to the food industry in Florida and throughout the world. Research projects involve many of the commodities important in Florida, including seafood and aquaculture products, citrus, fresh

fruits and vegetables, and dairy products. Research areas include food safety and microbiology issues, food processing and new method development, quality and sensory aspects of foods, and composition and chemistry of foods. Research in the area of human nutrition addresses basic and applied aspects of human nutrition in efforts to improve the health and wellness of Floridians and the world population, and includes studies on gene regulation, immunity, and women's health. Research areas include the function and biochemistry of micronutrients, the role of water-soluble vitamins in the health of various populations, the effects of phytochemicals and nutrient supplements on health, and the development of education programs for improved nutrition and health.

The department publishes in many national and international journals, including several popular publications. Research programs in the department offer many opportunities for the training of graduate and undergraduate students, and faculty with appointments in the Cooperative Extension Service effectively share research findings with clientele in Florida and around the world. For more information on the Food Science and Human Nutrition department, please contact Charles Sims or visit our Web site: [FSHN.IFAS.UFL.EDU](http://FSHN.IFAS.UFL.EDU)

## RESEARCH HIGHLIGHTS

**FUNCTIONAL PROTEIN INGREDIENTS FROM FISH  
PROCESSING BYPRODUCTS**  
BY DR. HORDUR G. KRISTINSSON

The global demand for aquatic foods is rapidly growing and never before has the world seen as much wild and cultured fish harvested. It is estimated that the world harvest now exceeds 130 million metric tons and that seafood contributes more than 15 percent of all animal protein consumed globally by humans. The problem is that an unnecessarily large amount of fish species and byproducts from seafood processing are not used for human consumption. For example, typically 60 percent to 70 percent of the weight of a fish is unutilized after primary processing. By-catch in fisheries is also a major problem. For example, it is no uncommon to see 5 lbs of by-catch for each 1 lbs of shrimp harvested. Much of these underutilized materials are very difficult or uneconomical to process into products for human consumption and are therefore typically used as animal feed or converted into fertilizer. A sizable part of this material ends up with no use at all, and is simply discarded. At the same time this is taking place many common fish stocks are declining and it is predicted that the demand for high quality protein from aquatic foods will exceed the supply in the near future. Even though aquaculture is believed to supply more fish than traditional fisheries in the future, it is highly unlikely that the demand for quality protein will be met. To address this growing problem new methods have to be developed to be able to economically utilize the vast amount of underutilized species of the oceans and the processing by-products from conventional species. Researchers have for many decades been working on this problem but most developments have been met with many challenges, with most attempts failing due to economics or poor quality of the final products. This global problem has direct consequences to Florida, since it is one of the major fisheries, processing and seafood import states in the US along with having seafood consumption well above the US average.

To address the above problem we have along with our collaborators developed a novel process where proteins of excellent functionality and stability can be economically and efficiently extracted from underutilized fish species and byproducts. This process is based on homogenizing the fish raw material in water and selectively solubilizing the muscle proteins at either a specific very low or high pH where viscosity is below a certain critical level. The soluble proteins are then separated from unwanted components in the raw material (e.g., membrane lipids, fat, connective tissue, bones, scales, skin etc.) by high speed centrifugation. The proteins are then collected through filters and recovered by isoelectric precipitation, yielding an almost lipid free protein isolate. We have investigated many different warm-water species of commercial importance to Florida and the Caribbean basin along with a range of cold water species of commercially importance to the US. Our work can be roughly divided into four categories: (1) Investigating ways to obtain optimal extraction of functional fish proteins, (2) Investigating and improving the stability of the extracted proteins, (3) Investigating the functionality of the extracted proteins and researching the molecular properties behind different functionalities, and (4) Modifying/improving the functionality of the extracted proteins by altering protein structure.

Detailed optimization work on a variety of species has shown us that each species requires a special set of conditions to optimally extract and recover functional proteins, and we are investigating the mechanisms behind this. Using this new process we are able to reach close to 90 percent protein recovery for certain species from our starting raw material, which is well above that of other processes that have been developed. More importantly, we have found that the extracted proteins have exceptional stability and functionality when compared with other conventional processes used to recover proteins. Color, microbial and oxidative stability is outstanding for the proteins extracted using high pH, which is important if they are to find use as food or food ingredients. Proteins extracted at low pH are however susceptible to lipid oxidation and we are working on ways to effectively retard the oxidation. The extracted proteins are also found to have superior functional properties compared to fish proteins extracted by other means, and thus can be used effectively as functional ingredients in several seafood based systems. The extracted proteins have significantly better gel-forming abilities compared to proteins extracted by conventional means. We have found that the high pH extraction process positively modifies the structure of the proteins which explains their improved functionality. One of the most significant recent discoveries we have made with the isolated proteins is that they have exceptionally good water-binding properties and can be incorporated into seafood muscle based systems to effectively prevent water-loss and improve quality. The control of water in muscle food products is of enormous importance to the fish industry, and is primarily done with the aid of phosphates and salt. These pure extracted fish proteins are able to economically substitute phosphates, giving the processor not only seafood products with exceptional water binding and quality but also a better label and at the same time gives the processors the capability to utilize their byproducts. By systematically manipulating the conditions the proteins are extracted at, we have been able to not only influence what proteins are extracted but also induce different structural alterations in the muscle proteins. This has

*Hordur Kristinsson*



## RESEARCH HIGHLIGHTS

enabled us to modify and even further improve the functionality of the extracted proteins. We have also recently started to use enzyme technology to hydrolyze the extracted proteins to make fish protein hydrolysates of variable peptide makeup, depending on the enzyme used and reaction conditions. We have found that some of these peptides have high bioactivity and may find use as bioactive functional ingredient in nutraceutical food applications or as ingredients to stabilize foods against lipid oxidation.

This work is expected to lead to better utilization of seafood byproducts and increase the availability of quality protein from aquatic resources. This research is also expected lead to the commercial development of fish proteins as economical and competitive ingredients for a variety of seafood product applications. Currently this protein extraction technology is being tested on a commercial scale and is expected to improve the bottom line of seafood processors and make them more competitive on not only

a local but global scale. This process is therefore expected to have a significant economic as well as environmental contribution to US fisheries.

**GRADUATE STUDENTS: (conducting research on fish protein utilization and functionality)** Bergros Ingadottir, Matthew Davenport, Holly Petty, Ann Theodore, Stefan Crynen, Margret Geirsdottir (University of Iceland), Dr. Yong Liang (post-doc)

**COLLABORATORS:** Dr. Herbert O. Hultin, Department of Food Science, University of Massachusetts, Amherst, MA. Dr. Tyre Lanier, Department of Food Science, North Carolina State University, Raleigh, NC. Dr. Ingrid Undeland, Department of Chemistry and Bioscience, Chalmers University of Technology, Gothenburg, Sweden. Dr. Sjöfn Sigurgísladóttir, Dr. Ragnar Thorsteinsson, Margret Geirsdottir, Icelandic Fisheries Laboratories/University of Iceland, Reykjavik, Iceland.

**FUNDING:** USDA-NRI program, USDA-TSTAR Program

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Charles A. Sims	Prof. and Chair	Food Quality	60	30	10
Douglas L. Archer	Prof.	Food Safety	20	40	40
Lynn B. Bailey	Prof.	Human Nutrition	50	50	0
Murat O. Balaban	Prof.	Food Engineering and Process	50	50	0
Raymond K. Blanchard	Asst. In	Nutritional Biochemistry	0	100	0
Peggy L. Borum	Prof.	Human Nutrition	40	60	0
Ross D. Brown, Jr.	Assoc. Prof.	Biochemistry	30	70	0
Ann K. Casella	Lecturer	Dietetics Education, Nutrition Screening	70	0	0
Robert J. Cousins	Eminent Scholar & Acting Program Director	Nutritional Biochemistry	20	80	0
Thomas W. Dean	Asst. Extension Scientist	Pesticide Information	0	0	100
Jesse F. Gregory, III	Prof.	Food Chemistry	30	70	0
Gail P. Kauwell	Assoc. Prof.	Nutrition and Dietetics	70	30	0
Hordur G. Kristinsson	Asst. Prof.	Seafood Chemistry	50	50	0
Mitchell D. Knutson	Asst. Prof.	Nutritional Biochemistry	25	75	0
Robin J. Langkamp-Henken	Assoc. Prof.	Nutrition and Dietetics	50	50	0
Maurice R. Marshall, Jr.	Prof.	Seafood Chemistry/Biochemistry	50	50	0
Pamela S. McMahon	Lecturer	Dietetics and Nutrition	100	0	0
Charles W. Meister	Scientist	Pesticide Research	0	100	0
Mark A. Mossler	Asst. In	Pesticide Information	0	0	100
Olaf N. Nesheim	Prof.	Pesticide Information	0	0	100
Walter S. Otwell	Prof.	Seafood Technology	0	0	100
Susan S. Percival	Prof.	Nutrition and Immunity	30	70	0
Gail C. Rampersaud	Asst. In	Nutrition Research and Education	0	50	50
Gary E. Rodrick	Prof.	Food Microbiology	50	50	0
Ronald H. Schmidt	Prof.	Dairy Technology	20	40	40
Keith R. Schneider	Asst. Prof.	Food Safety	10	15	75

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Harry S. Sitren	Prof.	Nutritional Biochemistry	50	50	0
Stephen T. Talcott	Asst. Prof.	Fruit and Vegetable Biochemistry	50	50	0
R. Elaine Turner	Assoc. Prof.	Nutritional Science	80	0	20
Susan W. Williams	Assoc. In.	Pesticide Information	0	0	100
Anita C. Wright	Asst. Prof.	Food Microbiology	50	50	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
FOS-02287	Cousins, R.J.	Zinc Metabolism and Function in Animal Systems
FOS-03764	Sims, C.A.	Strawberry Cultivar Development
FOS-03806	Percival, S.S.	Immunomodulation by Dietary Factors
FOS-03840	McMahon, R.J.	Biotin Metabolism in a Rat Model of Sepsis
FOS-03846	Talcott, S.T.	Postharvest Quality and Safety in Fresh-cut Vegetables and Fruits
FOS-03910	Talcott, S.T.	Phytochemical and Quality Assessment of Fresh and Processed Fruits and Vegetables
FOS-03921	Wright, A.C.	Phase Variation and Expression of Capsular Polysaccharide in <i>Vibrio Vulnificus</i>
FOS-03972	Sitren, H.S.	Conditionally Essential Nutrients in Enteral and Parenteral Nutrition
FOS-03995	Gregory, J.F., Bailey, L.B., Stacpoole, P.W.	Genetic Effects on Folate-Dependent One-Carbon Metabolism
FOS-04003-M	Marshall, M.R., Balaban, M.O., Simonne, A.H., Talcott, S.T., Mach, A.S.	High Hydrostatic Pressure to Improve Quality and Safety of Seafood from Tropical/Subtropical Regions
FOS-04003-T	Talcott, S.T., Percival, S.S.	Adding Value to Tropical Fruit: Techniques to Increase Bioactive Phytochemicals
FOS-04021	Archer, D.L., Schneider, K.R., Goodrich, R.M., Parish, M.E., Sargent, S.A., Brecht, J.F., Bartz, J.A.	Improving the Safety of Fresh Fruits and Vegetables
FOS-04041	Otwell, W.S., Rodrick, G.E., Schneider, K.R., Balaban, M.O., Wright, A.C., Kristinsson, H.G., Mahan, W.T., Adams, C.M.	Advancing the Capacity of PHT for Processing Safe Oysters in Florida
FOS-04055	Langkamp-Henken, B.	Nutrition, Immune Function, and Clinical Outcome
FOS-04067	Balaban, M.O., Teixeira, A.A.	High Pressure Dependence of Compressibility, Density, and Viscosity of Model Food Systems
FOS-04068	Kristinsson, H.G., Balaban, M.O., Otwell, W.S., Marshall, M.R.	Assessing the Use of Carbon Monoxide and Filtered Smoke on the Safety and Quality of Seafood Products
FOS-04080-B	Balaban, M.O., Marchall, M.R.	High Pressure Carbon Dioxide Processing of Tropical and Subtropical Fruit Juices
FOS-04080-K	Kristinsson, H.G.	Production of High-value Functional Protein Isolates from Underutilized Tropical and Subtropical Fish Species and Byproducts
FOS-04080-P	Percival, S.S., Talcott, S.T.	Enhancing Bioactive Phytochemicals in Fresh and Processed Guava ( <i>Psidium Guajava</i> )
FOS-04088	Percival, S.S., Talcott, S.T.	Health Benefits of Red Muscadine Wine
FOS-04098	Kauwell, G.P., Bailey, L.B.	Optimizing Health with Folate and Related Nutrients Throughout the Lifespan
FOS-04113	Otwell, W.S., Rodrick, G.E., Schneider, K.R., Balaban, M.O., Wright, A.C., Kristinsson, H.G., Mahan, W.T., Adams, C.M.	Oyster Post Harvest Treatments (PHT) for Processing in Florida
FOS-04120	Marshall, M.R., Thompson, N.P., Meister, C.W., Yoh, J.W., Fernando, S.Y.	Southern Region Program to Clear Pest Control Agents for Minor Uses
FOS-04143	Kristinsson, H.G.	Tailoring the Physical and Functional Properties of Muscle Proteins by Different Acid and Alkali Unfolding and Refolding Strategies
FOS-04182	Marshall M.R., Meister, C.W., Yoh, J.W., Fernando, S.Y.	Southern Region Program to Clear Pest Control Agents for Minor Use
FOS-04195	Otwell, W.S., Rodrick, G.E., Schneider, K.R., Balaban, M.O., Wright, A.C., Kristinsson, H.G.	Implementing Post Harvest Treatments in Commerce of Florida Oysters



# PUBLICATIONS

- Antoine, F., C. Wei, W. Otwell, C. Sims, R. Littell, A. Hogle and M. Marshall Jr.** 2004. Chemical Analysis and Sensory Evaluation of Mahi-mahi (*Coryphaena hippurus*) During Chilled Storage. 67(10):2255-2262.
- Bailey, L.** 2004. Folate and Vitamin B12 Recommended Intakes and Status in the United States. *Nutrition Reviews*. 62:S14-S21.
- Basset, G., E. Quinlivan, S. Ravel, F. Rebeille, B. Nichols, K. Shinozaki, M. Seki, L. Adams-Phillips, J. Giovannoni, J. Gregory III and A. Hanson.** 2004. Folate Synthesis in Plants: The p-Aminobenzoate Branch is Nitiated by a Bifunctional PabA-PabB Protein that is Targeted to Plastids. *Annual Review of Nutrition*. 101:1496-1501.
- Basset, G., S. Ravel, E. Quinlivan, R. White, J. Giovannoni, F. Rebeille, B. Nichols, K. Shinozaki, M. Seki, J. Gregory III and A. Hanson.** 2004. Folate Synthesis in Plants: The Last Step of the P-Aminobenzoate Branch is Catalyzed by a Plastidial Aminodeoxychorismate Lyase. *Plant J*. 40:453-461.
- Brecht, J., M. Saltveit, S. Talcott, K. Schneider and K. Felkey.** 2004. Fresh-cut Vegetables and Fruits. 30:185-251.
- Chung, H., J. Hong, M. Kim, M. Marshall Jr, Y. Jeong and S. Han.** 2004. Detection of Irradiated Ostrich Meat by DNA Comet Assay and Radiation-induced Hydrocarbons. 69(5):399-403.
- Clark, J., L. Howard and S. Talcott.** 2004. Antioxidant Activity of Blackberry Genotypes. 585:475-479.
- Davis, S., E. Quinlivan, K. Shelnut, D. Maneval, H. Ghandour, A. Capdevila, B. Coats, C. Wagner, J. Selhub, L. Bailey, J. Shuster and J. Gregory III.** 2004. Effects of the MTHFR 677C-T Polymorphism and Dietary Folate Restriction on Plasma One Carbon Metabolites and Red Blood Cell Folate Concentrations and Distribution in Women. *Journal of Nutrition*.
- Davis, S., E. Quinlivan, K. Shelnut, H. Ghandour, A. Capdevila, B. Coats, C. Wagner, B. Shane, J. Selhub, L. Bailey and J. Gregory III.** 2004. Homocysteine Synthesis is Elevated but Total Remethylation is Unchanged by the Methylenetetrahydrofolate Reductase 677C->T Polymorphism and by Dietary Folate Restriction in Young Women. *Journal of Nutrition*.
- Del Pozo-Insfran, D., C. Hernandez-Brenes and S. Talcott.** 2004. Phytochemical Composition and Pigment Stability of Açai (*Euterpe oleracea* Mart.). 52:1539-1545.
- Duryea, M., J. Mishoe, F. Altpeter, E. Hoffmann and A. Wright.** 2004. Nanotechnology Task Force. IFAS Dean's Office: Gainesville, FL.
- Fanning, A., B. Langkamp-Henken and R. Henken.** 2004. Dietary Arginine Supplementation does not Increase Body Weight or Leg Muscle Protein Concentration. *Journal of Undergraduate Research*.
- Gregory III, J.** 2004. Vitamins. *Fennema's Food Chemistry*, 4th Ed.
- Gregory III, J., E. Quinlivan and S. Davis.** 2004. Integrating the Issues of Folate Bioavailability, Intake and Metabolism in the Era of Fortification. *Trends in Food Science and Technology*.
- Gregory, III, J.** 2004. *Fennema's Food Chemistry*, 4th Ed.
- Gregory, III, J.** 2004. *Modern Nutrition in Health and Disease*, 9th Ed. (M. Shils ed.).
- Howard, L., S. Talcott, C. Hernandez-Brenes and B. Villalon.** 2004. Changes in Phytochemical and Antioxidant Activity of Selected Pepper Cultivars (*Capsicum* sp.) as influenced by Maturity. 48:1713-1720.
- Hudgens, J., B. Langkamp-Henken and R. Henken.** 2004. The Mini Nutritional Assessment as an Assessment Tool for Elders in Long-term Care. *Nutrition in Clinical Practice*. 19:463-470.
- Hudgens, J., B. Langkamp-Henken, J. Stechmiller, K. Herrlinger-Garcia, C. Nieves Jr. and R. Henken.** 2004. Immune Function is Impaired with a Mini Nutritional Assessment Score Indicative of Malnutrition in Nursing Home Elders with Pressure Ulcers. *Journal of Parenteral and Enteral Nutrition*. 28:416-422.
- Hultin, H., H. Kristinsson and T. Lanier.** 2004. Process for Recovery of Functional Proteins by pH Shifts. *Surimi and Surimi Seafood*. 80-100. Marcel Dekker.
- Kauwell, G.** 2004. *Issues and Choices in Clinical Nutrition*. Lippincott, Williams & Wilkens: New York, NY.
- Kauwell, G.** 2004. *Nutrition, Genetics and Genomic Health Care. Issues and Choices in Clinical Nutrition*. Lippincott, Williams & Wilkens: New York, NY.
- Kelleher, S., Y. Feng, H. Kristinsson, H. Hultin and D. McClements.** 2004. Functional Fish Protein Isolates Prepared Using Low Ionic Strength, Acid Solubilization/Precipitation. More --Efficient Utilization of Fish and Fisheries Products. Elsevier Science. pp. 407-414.
- Klaus, S., A. Wegkamp , W. Sybesma, J. Hugenholtz, J. Gregory III and A. Hanson.** 2004. A Nudix Enzyme Removes Pyrophosphate from Dihydroneopterin Triphosphate in the Folate Synthesis Pathway of Bacteria and Plants. *J Biol Chem*.
- Kristinsson, H.** 2004. Improvements of Water Uptake and Retention in Muscle Products by Manipulation of pH and Ionic Strength. *Feed Info News Service Scientific Reviews*. 1:38358.
- Kristinsson, H.** 2004. Lipids in Seafood. *Seafood Biochemistry and Seafood Processing*. Blackwell Publishing. pp. 1-12.
- Kristinsson, H.** 2004. The Production, Properties and Utilization of Fish Protein Hydrolysates. *Food Biotechnology*. Marcel Dekker. pp. 1-22
- Kristinsson, H. and H. Hultin.** 2004. Changes in Trout Hemoglobin Conformations and Solubility after Exposure to Acid and Alkali pH. *J. Agric. Food Chem*. 52:3633-3643.
- Kristinsson, H. and H. Hultin.** 2004. The Effect of Acid and Alkali Unfolding and Subsequent Refolding on the Pro-oxidative Activity of Trout Hemoglobin. *Journal of Agricultural and Food Chemistry*. 52:5482-5490.
- Langkamp-Henken, B. and R. Henken.** 2004. Invited Book Review: Nutrition and Immune Function Series: *Frontiers in Nutritional Science*, No. 1 PC Calder, CJ Field, HS Gill (eds.). *Nutrition in Clinical Practice*. 19:311.
- Langkamp-Henken, B., B. Bender, E. Gardner, K. Herrlinger-Garcia, M. Kelley, D. Murasko, J. Schaller, D. Thomas, S. Wood and R. Henken.** 2004. Nutritional Formula Enhanced Immune Function and Reduced Days of Upper Respiratory Tract Infection Symptoms in Seniors. *Journal of the American Geriatric Society*. 52:38423.
- Lee III, G., B. Langkamp-Henken and R. Henken.** 2004. Arginine Supplementation and Lung Neutrophil Accumulation Following Lipopolysaccharide Treatment. *Journal of Undergraduate Research*.
- Lee, J. and S. Talcott.** 2004. Fruit Maturity and Juice Extraction Influences Ellagic Acid Derivatives and Other Antioxidant Polyphenolics in Muscadine Grapes. 52:361-366.
- Liuzzi, J. and R. Cousins.** 2004. Mammalian Zinc Transporters. *Annual Review of Nutrition*. 24:151-172.
- Liuzzi, J., J. Bobo, L. Lichten and R. Cousins.** 2004. Responsive Transporter Genes Within the Murine Intestinal-pancreatic Axis form a Basis of Zinc Homeostasis. *Proceedings of the National Academy of Sciences USA*. 101:14355-14360.
- Lundy, L., T. Irani, R. Turner, S. Percival and B. Mcpherson.** 2004. GNC University: A Case Study in Partnering Business and Education Through Distance Learning. *Journal of Applied Communications*. 88(2):51-60.
- Mackey, A., R. McMahon, J. Townsend and J. Gregory III.** 2004. Uptake, Hydrolysis, and Metabolism of Pyridoxine-5'-D-Glucoside in Caco-2 Cells. *Journal of Nutrition*. 134:842-846.
- Mackey, A., S. Davis and J. Gregory III.** 2004. Vitamin B-6. *Modern Nutrition in Health and Disease*, 9th Ed. (M. Shils ed.).
- Mendoza, T., B. Welt, W. Otwell, H. Kristinsson and M. Balaban.** 2004. Kinetic Parameter Estimation of Time-temperature Integrators Intended for Use with Packaged Fresh Seafood. *Journal of Food Science*. 69(3):FMS90-FMS96.
- Momol, T., M. Balaban, F. Korel, A. Odabasi, E. Momol, G. Folkes and J. Jones.** 2004. Discrimination of Plant Pathogenic Bacteria Using an Electronic Nose. *Plant Health Progress*.
- Oliveira, A., S. O'Keefe, M. Balaban, C. Sims and K. Portier.** 2004. Influence of Commercial Diets on Quality Aspects of Cultured Gulf of Mexico Sturgeon (*Ancipenser oxyrinchus desotoi*). *Journal of Food Science*. 69(7):S278-S284.
- Peterson, T., L. McDowell, R. McMahon, N. Wilkinson, O. Rosendo, W. Seymour, P. Henry and J. Shearer.** 2004. Balance and Serum Concentration of Biotin in Sheep Fed Alfalfa Meal Based Diets with Increasing Level of Concentrate. 82:1165-1169.
- Quinlivan, E. and J. Gregory III.** 2004. Folic Acid and the Prevention of Neural-tube Defects. *New England Journal of Medicine*. 350:2209-2211.
- Quinlivan, E., S. Davis, K. Shelnut, H. Ghandour, G. Henderson, B. Shane, J. Selhub, L. Bailey and J. Gregory III.** 2004. Methylenetetrahydrofolate Reductase 677 C->T Polymorphism and Folate Status Affect One-carbon Incorporation into Human DNA Deoxynucleosides. *Journal of Nutrition*.

# PUBLICATIONS

Riad, G., J. Brecht and S. Talcott. 2004. Browning of Fresh-cut Sweet Corn Kernels after Cooking is Prevented by Controlled Atmosphere Storage. 628:387-394.

Rosendo, O., C. Staples, L. McDowell, R. McMahon, F. Martin, L. Badinga, J. Shearer, W. Seymour and N. Wilkinson. 2004. Biotin Supplementation Effects on Peripartum Performance and Metabolites of Holstein Cows. 87:2535-2545.

Scheer, J., A. Mackey and J. Gregory III. 2004. Activity of Hepatic Cytosolic and Mitochondrial Forms of Serine Hydroxymethyltransferase and Hepatic Glycine Concentration Parallel Vitamin B-6 Intake in Rats. Journal of Nutrition. 135:233-238.

Schulbach, K., R. Rouseff and C. Sims. 2004. Changes in Volatile Sulfur Compounds in Strawberry Puree During Heating. Journal of Food Science. 69(4): FCT268-FCT272.

Schulbach, K., R. Rouseff and C. Sims. 2004. Relating Descriptive Sensory Analysis to Gas Chromatography/ Olfactometry Ratings of Fresh Strawberries Using Partial Least Squares Regression. Journal of Food Science. 69(7):S273-S277.

Shelnutt, K., G. Kauwell, D. Maneval, J. Gregory III, D. Theriaque, A. Browdy and L. Bailey. 2004. Folate Status Response to Controlled Folate Intake Is Affected by the Methylenetetrahydrofolate Reductase 677CT Polymorphism in Young Women. Journal of Nutrition. 133:4107-4111.

Shelnutt, K., G. Kauwell, J. Gregory III, D. Maneval, E. Quinlivan, D. Theriaque, G. Henderson and L. Bailey. 2004. Methylenetetrahydrofolate reductase 677C->T Polymorphism Affects DNA Methylation in Response to Controlled Folate Intake in Young Women. Journal of Nutritional Biochemistry. 15:554-560.

Shelnutt, K., G. Kauwell, J. Gregory III, D. Maneval, E. Quinlivan, D. Theriaque, G. Henderson and L. Bailey. 2004. Methylenetetrahydrofolate Reductase 677C->T Polymorphism Affects DNA Methylation in Response to Controlled Folate Intake in Young Women. Journal of Nutritional Biochemistry. 15:554-560.

Simonne, A., A. Nille, K. Evans and M. Marshall Jr. 2004. Ethnic Food Safety Trends in the United States Based on CDC Foodborne Illness Data. 24(8):590-604.

Talcott, S., L. Howard and C. Hernandez-Brenes. 2004. Antioxidant Changes and Sensory Properties of Carrot Puree Processed with and without Periderm Tissue. 48:1315-1321.

Turner, R. 2004. Beverages and Obesity: Is there a Connection?. International Society of Beverage Technologists.

Undeland, I., H. Kristinsson and H. Hultin. 2004. Hemoglobin-mediated Oxidation of Washed Minced Cod Muscle Phospholipids: Effect of pH and Hemoglobin Source. Journal of Agricultural and Food Chemistry. 52:4444-4451.

Vaughn, J., L. Bailey, K. Shelnutt, K. von-Castel Dunwoody, D. Maneval, S. Davis, E. Quinlivan, J. Gregory III, D. Theriaque and G. Kauwell. 2004. Methionine Synthase Reductase 66A->G Polymorphism is Associated with Increased Plasma Homocysteine Concentration when Combined with the Homozygous Methylenetetrahydrofolate Reductase 677C->T Variant. Journal of Nutrition. 134:2985-2990.

Wright, A., L. Sturmer and W. Otwell. 2004. Temperature Acclimation (tempering) of Hard Clams does not Promote Growth of Vibrio vulnificus. Journal of Shellfish Research.

Wright, A., P. Finglas, J. Dainty, C. Wolfe, D. Hart, D. Wright and J. Gregory III. 2004. Differential Kinetic Behavior and Distribution for Pteroylglutamic Acid and Reduced Folate: A Revised Hypothesis of the Primary Site of Pteroylglutamate Metabolism in Humans. Journal of Nutrition.

Yoruk, R., S. Yoruk, M. Balaban and M. Marshall Jr. 2004. Machine Vision Analysis of Antibrowning Protency for Oxalic Acid: A Comparative Investigation on Banana and Apple. 69(6):281-289.

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Balaban, M.O.	High Pressure Dependence of Compressibility, Density, and Viscosity of Model Food Systems	U.S. Dept. of Agriculture	119,688
Balaban, M.O.	High Pressure Carbon Dioxide Processing of Tropical and Subtropical Fruit Juices	U.S. Dept. of Agriculture	46,779
Borum, P.L.	Carnitine Studies	Miscellaneous Donors	1,100
Borum, P.L.	Improving Nutritional Status of Young People with HIV/Aids (Buddy Books)	Dept. of Legal Affairs	40,000
Gregory III, J.F.	Genetic Effects on Folate-dependent One-carbon Metabolism	National Institutes of Health	217,181
Henken, R.J.	Hill's Pet Products	Hill's Pet Nutrition Inc.	10,260
Kauwell, G.P.	Optimizing Health with Citrus Nutrients Throughout the Life Span Collaborative Position with the Florida Dept of Citrus	Dept. of Citrus	86,450
Kristinsson, H.G.	Assessing the Use of Carbon Monoxide and Filtered Smoke on the Safety and Quality of Seafood Products	U.S. Dept. of Agriculture	422,874
Kristinsson, H.G.	Tailoring the Physical & Functional Properties of Mescle Proteins by Different Acid & Alkai Unfolding & Refolding ...	U.S. Dept. of Agriculture	110,000
Kristinsson, H.G.	Production of High-value Functional Protein Isolates from Underutilized Tropical	U.S. Dept. of Agriculture	35,314
Kristinsson, H.G.	Acid & Alkali Unfolding and Refolding Strategies to Improve the Foaming Properties of Egg White Proteins	Am. Egg Board	15,900
Marshall Jr., M.R.	Southern Region Program to Clear Pest Control Agents for Minor Uses	U S Dept of Agriculture	2,951,124
Marshall Jr., M.R.	Biopesticide Research	Rutgers State University	133,200
Marshall Jr., M.R.	IR-4 Applied Research USDA	Rutgers State University	24,000

## FOOD SCIENCE & HUMAN NURITION

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Marshall Jr., M.R.	IR-4 Applied Research Industry	Rutgers State University	47,723
Marshall Jr., M.R.	Food & Environmental Safety	Rutgers State University	57,600
Marshall Jr., M.R.	A National Agricultural Program: Clearance of Chemicals & Biologics for Minor or Special Uses/Pesticides	Rutgers State University	153,500
Mossler, M.A.	Integrated Pest Management Center Network, Crop Profiles, and Special Projects for Florida - Proposal	North Carolina State Univ.	32,255
Mossler, M.A.	Integrated Pest Management Center Network Puerto Rico	North Carolina State Univ.	4,821
Neheim, O.N.	Southern Region Pest Management Center	U.S. Dept. of Agriculture	1,270,880
Neheim, O.N.	Examination Services for Restricted Use Applicators	Dept. of Agricul. & Consumer Ser.	50,000
Neheim, O.N.	Preparation, Coordination and Implementation of Pesticide Applicator Training and Examinations for Florida	Dept. of Agricul. & Consumer Ser.	24,000
Otwell, W.S.	Advancing the Capacity of Post Harvest Treatments (Pht) for Processing Safe Oysters in Florida	U.S. Dept. of Agriculture	374,145
Otwell, W.S.	Impact of Temperature Acclimation on Vibrio Vulnificus Content for Florida Farm-raised Clams During Summer Harvest	U.S. Dept. of Agriculture	17,000
Otwell, W.S.	Oyster Post Harvest Treatments (Pht) for Processing in Florida	U.S. Dept. of Agriculture	417,923
Otwell, W.S.	Conducting Shipboard Studies Focused on the Conditions of Harvested and Handling...Scombrototoxin Formation	Food and Drug Administration	90,000
Otwell, W.S.	Product Characterization to Advance the Use of Post-harvest Treatments for Raw Oysters	Interstate Shellfish Sani. Conf.	75,000
Otwell, W.S.	Implementing Post Harvest Treatments in Commerce of Florida Oysters	U.S. Dept. of Agriculture	373,310
Percival, S.S.	Health Benefits of Red Wine	Dept. of Agricul. & Consumer Ser.	10,000
Percival, S.S.	Characterization of a Fruit & Vegetable Juice Concentrate on Human Immune Function	National Safety Associates	76,590
Schneide, K.R.	Fresh Produce Food Safety Training Program and Curriculum Development	North Carolina State Univ.	45,649
Sims, C.A.	Sensory Evaluation of Fruits and Vegetables	Syngenta	25,000
Talcott, S.T.	Health Benefits of Red Muscadine Wine	U.S. Dept. of Agriculture	134,827
Talcott, S.T.	Adding Value to Tropical Fruit: Techniques to Increase Bioactive Phytochemicals	U.S. Dept. of Agriculture	35,900
Talcott, S.T.	Functional Properties of Improved Natural Pigments	U.S. Dept. of Agriculture	15,000
Talcott, S.T.	Polyphenolic Recovery System to Develop Functional Food Ingredients	Dept. of Agricul. & Consumer Ser.	12,000
Wright, A.C.	Phase Variation and Expression of Capsular Polysaccharide in Vibrio Vulnificus	U.S. Dept. of Agriculture	260,000
Wright, A.C.	Improved Methods for Molecular Detection of Vibrio Vulnificus R/lr-q-26a	U.S. Dept. of Commerce	128,700
Wright, A.C.	Regulation of Capsular Polysaccharide and Virulence in Vibrio Vulnificus - R/l4-q-27	U.S. Dept. of Commerce	49,958



**2004 Annual Research Report**

*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

**SITUATION:** Forests cover one-third of the world's land area and provide a range of goods and services including timber and non-timber products, clean water, wildlife habitat, carbon sequestration, microclimate amelioration, recreation and biodiversity. Demand for these goods and services is increasing; yet, the area of forests to meet these needs is decreasing. For example, in Florida the forested area per capita has dropped from four acres per person in 1960 to one acre per person today. Each year, 40,000 acres of forested land are being lost in Florida, mostly to urbanization. In some locations, urban sprawl is causing fragmentation of forests, reducing their ecological value. Further, timberland ownership patterns and land-owner objectives are changing rapidly in response to changes in tax, legal and economic issues.

With all of the challenges facing the world's forests, it is imperative that we embrace and foster all types of forests to provide, in total, the complete range of ecological, economic and social goods and services. For example: (1) Native forests and protected areas conserve inherent species' richness and genetic diversity; (2) Second-growth working forests provide jobs, homes and products; (3) High-yield plantation forests help meet demand for timber and paper products; and (4) Urban forests and those on the wildland-urban-interface ameliorate microclimate and provide recreational,

aesthetic and psychological benefits; and (5) Agroforests, which combine trees and agriculture, provide multiple benefits to the land-owner and can mitigate environmental impacts.

**RESEARCH RESPONSE:** The School conducts research that generates new knowledge to meet society's needs for sustainable management and conservation of forests and related resources at the state, regional, national and international levels. Four focus areas are: (1) Forest systems biology from the molecular to landscape scales; (2) Human dimensions broadly defined to include social sciences, economics, recreation (photograph), management, utilization and policy related to forest resources; (3) Agroforestry and tropical forestry spanning diverse settings such as silvopastures in Florida, home gardens in Africa and working forests in the Amazon; and (4) Urban forestry and the wildland-urban interface with programs aiming to enhance existing urban forests and mitigate the effects of urban sprawl into rural forests.

Our goal in all of these research areas is to address complex, real-world problems affecting the world's forest resources. Due to the complexity, most research projects are multidisciplinary efforts involving collaborative efforts of School scientists with those of other universities, private companies and research organizations.

## RESEARCH HIGHLIGHTS

**CSTAF, CENTER FOR SUBTROPICAL AGROFORESTRY: UNDERSTANDING THE ENVIRONMENTAL AND ECONOMIC BENEFITS OF INTEGRATED LAND-USE SYSTEMS.**

**SIGNIFICANCE:** Agroecosystems, especially small-scale production systems in the southeastern United States, are challenged as never before with natural resource management problems. According to USDA Census of Agriculture (2002), 88 percent of farms in Florida are considered small farms (annual sales less than \$250,000), 84 percent of which are individually or family owned; but they constitute 56 percent of total agricultural income in the state. Similarly, out of the 6.6 million hectares (16.3 million acres) of forestlands in Florida, 52 percent are non-industrial private lands. Clearly, small farms and timber operations are significant drivers of the state's economy. These small-scale operations are under increasing pressures – if not threats – caused by various changes. The increasing impact of a rapidly urbanizing landscape on the wildland-urban interface creates significant changes in ecosystem characteristics such as increased fire danger, changes in water drainage patterns leading to soil erosion and flooding, and fragmentation of wildlife habitat. Agricultural non-point source pollution is a significant cause of stream and lake contamination and prevents attainment of water quality goals in the Clean Water Act. The problem of phosphorus (P) loss from soil is a major concern in fertilized agricultural and forestry enterprises, particularly in coarse-textured, poorly drained soils of the southeast, where drainage water ultimately mixes with surface water. The potential for P loss from fertilized pastures resulting in water quality degradation is a particularly serious issue. Faced with these consequences of rapid land-use changes, the small-farm community of the Southeast is under pressure to adopt land management practices that are economically and ecologically sustainable. Integrated systems such as agroforestry that provide economic advantages of diversified production as well as ecological benefits of mixed systems seem appropriate in this scenario.

**RATIONALE:** Today there is a growing body of knowledge on agroforestry and an increasing awareness about its potential as a land management approach throughout the world. Agroforestry research in the School of Forest Resources and Conservation got a boost with the establishment of the Center for Subtropical Agroforestry (CSTAF) in 2001 from a four-year \$3.92 million USDA/CSREES/IFAFS grant (<http://cstaf.ifas.ufl.edu>). The Center is a multi-disciplinary, multi-institutional entity for undertaking research, extension, and education in agroforestry.

**IMPACT:** A comprehensive CSTAF “white paper” has established the scope and role of agroforestry in the region (<http://cstaf.ifas.ufl.edu/whitepaper.htm>). Silvopasture – the integration of trees with forage and livestock – is the most prevalent form of agroforestry in the region. Available information suggests that silvopasture is an ecologically sustainable and environmentally desirable approach to mitigating the problem of nutrient pollution resulting from beef-cattle pastures. For example, silvopasture can minimize nutrient losses from the soil (because of enhanced nutrient uptake by tree and crop roots from varying soil depths compared with more localized and shallow rooting depths of a monoculture), and thus enhance water quality. Also, in locations where the water table is high and the likelihood of losing nutrients via surface and

subsurface drainage is greater, the lowering of the water table by trees could result in less nutrient loss via surface and subsurface drainage. Research is still under way and more evidence is needed to fully support these hypotheses.

Carbon sequestration and wildlife habitat improvement are two other major ecosystem services of agroforestry systems. These benefits are public goods. Ranchers and other landowners have very little motivation to consider these services in their production decisions, unless these services are internalized through compensation policies. Internalizing the externalities implies that ranchers would pay for the negative social costs of phosphorus runoff and would receive payments for the positive social benefits of carbon sequestration. In doing so, silvopasture could become financially competitive and environmentally sustainable relative to traditional cattle ranching. Currently we do not have adequate information on this important issue from different ecoregions.

Other CSTAF results include development of the Southeastern Agroforestry Decision Support System, a web-based tool that will assist in planning and tree/shrub selection, with data for 12 Florida counties; quantification of tree-crop interactions in alley cropping systems of loblolly pine, longleaf pine, and pecan, with cotton as the understory species; estimation of tree survival, wood yields, commercial value of 13 year-old south-Florida slash pine, cattle and goat production, and forage yield in a silvopastoral system in Central Florida; and possible use of agroforestry techniques such as organic and conventional till alley-cropping for improving the economic viability of organic farming.

These and other aspects of agroforestry research, development, and education worldwide were highlighted and the awareness about them enhanced during the 1<sup>st</sup> World Congress of Agroforestry organized by UF/IFAS in June-July 2004 in Orlando, Florida (<http://conference.ifas.ufl.edu/wca/>). A declaration adopted by more than 500 delegates from 82 countries who participated in the congress underscored the role of agroforestry in land management and environmental sustainability and called for “increased investments to support research, technology development, and extension to improve the integration of agroforestry with broader natural resource and watershed management efforts.”

*P. K. Nair*



## SCHOOL OF FOREST RESOURCES & CONSERVATION

### RESEARCH HIGHLIGHTS

**COLLABORATORS:** CSTAF is a multi-institutional, multidisciplinary center for undertaking research, education, and extension in agroforestry. Its activities include research, extension, and education projects that are carried out in collaboration with 40

researchers from UF/IFAS (Gainesville, Ona, and Milton), Florida A&M University, Auburn University, University of Georgia, and the University of the Virgin Islands.

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Timothy L. White	Direct or and Prof.	Quantitive Forest Genetics	20	60	20
Janaki R. Alavalapati	Assoc. Prof.	Natural Resource Policy/Administration	40	60	0
Loukas G. Arvanitis	Prof. Emeritus	Biometrics	0	0	0
Michael E. Bannister	Research Asst. Prof.	Agroforestry	0	100	0
Grenville Barnes	Assoc. Prof.	Land Tenure/Cadastral Property Systems	100	0	0
George M. Blakeslee, Jr.	Prof. and Assoc. Director	Forest Health	80	0	20
Douglas R. Carter	Assoc. Prof.	Economics/Management	50	50	0
Wendell P. Cropper, Jr.	Asst. Prof.	Biological Process Modeling	30	70	0
John M. Davis	Assoc. Prof.	Forest Biotechnology	20	80	0
Bon A. Dewitt	Assoc. Prof.	Photogrammetry/Digital Mapping	100	0	0
Mary L. Duryea	Asst. Dean and Prof.	Reforestation and Urban Forestry	0	100 (adm)	0
David W. Gibosn	Assoc. Prof.	Geomatics	100	0	0
Dudley A. Huber	Assoc. In	Forest Genetics	0	100	0
Eric J. Jokela	Prof.	Silviculture	40	60	0
Karen A. Kainer	Asst. Prof.	Tropical Forestry	30	70	0
Matias Kirst	Asst. Prof.	Quantitative Genetics	30	70	0
Alan J. Long	Assoc. Prof.	Forest Operations and Environ. Regulations	60	0	40
Timothy A. Martin	Asst. Prof.	Tree Physiology	30	70	0
Martha C. Monroe	Assoc. Prof.	Natural Resources Education	30	20	50
Ramachandran P.K. Nair	Distinguished Prof.	Agroforestry	40	60	0
Gary F. Peter	Assoc. Prof.	Plant Genomics	20	80	0
Donald L. Rockwood	Prof.	Forest Tree Improvement	30	70	0
Robert A. Schmidt	Prof. Emeritus	Forest Pathology	0	0	0
Scot E. Smith	Assoc. Prof.	Remote Sensing/GIS	100	0	0
Wayne H. Smith	Prof. Emeritus	Forest Soils & Ecology/Biomass	0	0	0
Gregory Starr, Jr.	Res. Asst. Scientist	Ecophysiology	0	100	0
Christina L. Staudhammer	Asst. Prof.	Biometrics	30	70	0
Taylor V. Stein	Assoc. Prof.	Ecotourism/Recreation	60	40	0
Sarah W. Workman	Vis. Asst. Prof.	Agroforestry	0	25	0
Daniel J. Zarin	Assoc. Prof.	Tropical Forestry	30	70	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
FOR-00008	White, T.L.,	Administration of McIntire-Stennis Funds and Projects
FOR-03781	Stein, T.V.	Understanding the Benefits of Nature-based Tourism and Recreation in Florida
FOR-03789	Alavalapati, J.R.	Analysis of Forest and Natural Resource Policy Issues
FOR-03812	Nair, R.P.	Development and Evaluation of Integrated Agroforestry Systems
FOR-03900	Nair, R.P., Alavalapati, J.R., Long, A.J., Bannister, M.E., Workman, S.W.	Establishing a Center for Subtropical Agroforestry
FOR-03944	Zarin, D.J.	Ecology and Management of Tropical Forests
FOR-03974	Smith, W.H., Duryea, M.L., Long, A.J.	Wildland Urban Interface: Risk Mitigation and Technology Transfer
FOR-04080	Bannister, M.E., Workman, S.W., Palada, M.C., Ellis, E.A.	Tree-crop Diversity and Enterprise Development Through Agroforestry: A Participatory Survey and GIS-based Analysis in the Virgin Islands
FOR-04093	Davis, J.M.	Molecular Biology of Forest Trees
FOR-04095	White, T.L., Jokela, E.J., Martin, T.A., Cropper, W.P.	Forest Productivity, Health and Sustainability
FOR-04107	Rockwood, D.	A Cooperative Multicultural Scholars Program in Natural Resources and Forestry between Florida A&M University and the University of Florida
FOR-04116	Davis, J.M., White, T.L., Martin, T.A.	Allele Discovery for Genes Controlling Economic Traits in Loblolly Pine
FOR-04121	Carter, D.R., Alavalapati, J.R.	Socio-economic Impacts of Forest Land Ownership and Management Patterns at the Regional Level
FOR-04168	Rockwood, D.L., Carter, D.R., Peter, G.F.	Fast Growing Forest Tree Management Systems for Florida and Similar Areas
FOR-04172	Huber, D.A.	Quantitative Genetics and Tree Improvement of Southern Pines
FOR-04177	Kainer, K.A.	Ecology and Community-based Management of Neotropical Forests

## PUBLICATIONS

**Adegbi, H.G., N.B. Comerford, E.J. Jokela and N.F. Barros.** 2004. Root Development of Young Fast Growing Loblolly Pine in Spodosols of the Lower Coastal Plain. *Soil Science Society America Journal*. 68:596-604.

**Alavalapati, J.R.R. and D.R. Carter (eds.).** 2004. Competitiveness of Southern Forest Products Markets in a Global Economy: Trends and Predictions. Proceedings of the Southern Forest Economics Workshop, March 14-16, 2004, St. Augustine, Florida. 303 pp.

**Alavalapati, J.R.R. and E. Mercer.** 2004. Valuing Agroforestry Systems: Methods and Applications, Kluwer Academic Press, Dordrecht, The Netherlands. 314 pp.

**Alavalapati, J.R.R. and D.J. Zarin.** 2004. Tropical Working Forests – for What and for Whom? Pages 279-289 In: D.J. Zarin, J.R.R. Alavalapati, F.E. Putz and M. Schmink (eds.). Working Forests in the Neotropics: Conservation through Sustainable Management? Columbia University Press: New York.

**Alavalapati, J.R.R., E. Mercer and J. Montambault.** 2004. Agroforestry Systems and Valuation Methodologies: An Overview. Pages 31-38 In: J.R.R. Alavalapati and E. Mercer (eds.). Valuing Agroforestry Systems: Methods and Applications. Kluwer Academic Publishers, Dordrecht, The Netherlands.

**Alavalapati, J.R.R., R.K. Shrestha, A. Stainback and J.R. Matta.** 2004. Agroforestry Development: An Environmental Economic Perspective. Pages 299-310 In: P.K.R. Nair, M.R. Rao and L.E. Buck (eds.). New Vistas in Agroforestry. A Compendium for the 1st World Congress of Agroforestry. Kluwer Academic Publishers, Dordrecht, The Netherlands.

**Albertin, A. and P.K.R. Nair.** 2004. Farmers' Perspectives on the Role of Shade Trees in Coffee Production Systems: An Assessment from the Nicoya Peninsula, Costa Rica. *Human Ecology*. 32:443-463.

**Allen, S., S. Jose, P.K.R. Nair, B. Brecke, P. Nkedi-Kizza and C. Ramsey.** 2004. Safety Net Role of Tree Roots: Evidence from a Pecan (*Carya illinoensis* K. Koch)-Cotton (*Gossypium hirsutum* L.) Alley Cropping System in the Southern United States. *Forest Ecology and Management*. 192:395-407.

**Ankersen, T. and G. Barnes.** 2004. Inside the Polygon: Emerging Community Tenure Systems and Forest Resource Extraction. Pages 156-177 In: D. J. Zarin, J. R. R. Alavalapati, F. E. Putz and M. Schmink (eds.). Working Forests in the Neotropics: Conservation through Sustainable Management? Columbia University Press: New York.

**Athman, J. and M. Monroe.** 2004. Motivating Students Through Environment-based Education. *Legacy*. 15(4):42-44.

**Athman, J. and M. Monroe.** 2004. The Effects of Environment-based Education on Students' Achievement Motivation. *Journal of Interpretation Research*. 9(1):9-25.

**Becker, B.N., D.L. Rockwood, L.Q. Ma, J.G. Isebrands, R.B. Hall, N. Brown, C. Lin and R. Lange.** 2004. Poplar, Eucalypt, and Willow Genotypes for PCE, TCE, Toluene, and Arsenic Dendroremediation Systems. Page 351 In: Book of Abstracts, 1st World Congress of Agroforestry. June 27-July 2, 2004. Orlando, FL.

**Behm, A.L., M.L. Duryea, A.J. Long and W.C. Zipperer.** 2004. Flammability of Native Understory Species in Pine Flatwood and Hardwood Hammock Ecosystems and Implications for the Wildland-Urban Interface. *International Journal of Wildland Fire*. 13(3):355-365.

**Biber, P.D., M.A. Harwell and W.P. Cropper, Jr.** 2004. Modeling the Dynamics of Three Functional Groups of Macroalgae in Tropical Seagrass Habitats. *Ecological Modelling*. 175:25-54.

**Bryant, D.M., M.J. Ducey, J.C. Innes, T.D. Lee, R.T. Eckert and D.J. Zarin.** 2004. Forest Community Analysis and the Point-centered Quarter Method. *Plant Ecology*. 175:193-203.

**Clark, J.K. and T.V. Stein.** 2004. Applying the Nominal Group Technique to Recreation Planning on Public Natural Areas. *Journal of Park and Recreation Administration*. 22(1):1-22.

**Coelho, R.F.R., D.J. Zarin, I.S. Miranda and J.M. Tucker.** 2004. Análise Florística e Estrutural de Uma Floresta em Diferentes Estágios Sucessionais no Município de Castanhal, Pará [Floristic and Structural Analysis of Different Stages of Successional Forest in the Municipality of Castanhal, Pará]. *Acta Amazonica*. 33:563-582.



# PUBLICATIONS

- Coelho, R.F.R., D.J. Zarin, I.S. Miranda and J.M. Tucker.** 2004. Ingresso e Mortalidade de Uma Floresta em Diferentes Estágios Sucessionais no Município de Castanhal, Pará [Recruitment and Mortality of Different Stages of Successional Forest in the Municipality of Castanhal, Pará]. *Acta Amazonica*. 33:619-630.
- Cogdill, R.P., L. Schimleck, P.D. Jones, G.F. Peter, R.F. Daniels and A. Clark, III.** 2004. Estimation of the Physical Wood Properties of Pinus Taeda L. Radial Strips Using Least Squares Support Vector Machines. *Journal of Near Infrared Spectroscopy*. 12(4):263-270.
- Cooke, J.E.K., A.M. Morse and J.M. Davis.** 2004. *Forestry*. Pages 881-904 In: P. Christou and H. Klee (eds.). *Handbook of Plant Biotechnology*. John Wiley & Sons, West Sussex, UK.
- Cropper, W.P., Jr.** 2004. Forest Dynamics and Disturbance Regimes. Studies from Temperate Evergreen-deciduous Forests. (book review) *Agricultural and Forest Meteorology*. 123:237.
- Cropper, W.P., Jr. and P.J. Anderson.** 2004. Population Dynamics of a Tropical Palm: Use of a Genetic Algorithm for Inverse Parameter Estimation. *Ecological Modelling*. 177:119-127.
- Cumming, G., G. Barnes, S. Perz, M. Schmink, K. Sieving, J. Southworth, M. Binford, R. Holt, C. Stickler and T. Van Holt.** 2004. An Exploratory Framework for the Empirical Measurement of Resilience. *Ecosystems*.
- Dickens, E.D., J.P. Barnett, W.G. Hubbard and E.J. Jokela (eds.).** 2004. *Slash Pine: Still Growing and Growing!* Proc. of the Slash Pine Symposium. USDA Forest Service Gen. Tech. Report SRS 76. 145 pp.
- Drew, W.M., J.R.R. Alavalapati and P.K.R. Nair.** 2004. Determining Agroforestry Profitability Using the Policy Analysis Matrix: A Case Study from Pohnpei, Federated States of Micronesia. Pages 59-78 In: J. R. R. Alavalapati and E. Mercer (eds.). *Valuing Agroforestry Systems: Methods and Applications*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Egertsdotter, U., L. van Zyl, J. MacKay, G.F. Peter, M. Kirst, R. Whetten and R. Sederoff.** 2004. Variation in the Expression Profiles of 350 Genes During Wood Formation in Loblolly Pine. *Plant Biology*. 6(6):654-663.
- Ernst, J. and M.C. Monroe.** 2004. The Effects of Environment-based Education on Students' Critical Thinking Skills and Disposition Toward Critical Thinking. *Environmental Education Research*. 10(4):507-522.
- Ersoz, E.S., S. Gonzalez-Martinez, G. Gill, G. Brown, A. Morse, T. White, J. Davis and D.B. Neale.** 2004. SNP Discovery in Candidate Genes Conferring Resistance to Pitch Canker and Fusiform Rust in Loblolly Pine. Page 306 In: *Plant and Animal Genome Conference*, January 10-14, San Diego, CA.
- Fox, T.R., E.J. Jokela and H.L. Allen.** 2004. The Evolution of Pine Plantation Silviculture in the Southern United States. Pages 63-82 In: M. Rauscher and K. Johnsen (eds.). *History of Forest Science in the Southern United States*. USDA Forest Service Gen. Tech. Rep. 75.
- Gagnon, J.L., E.J. Jokela, W.K. Moser and D.A. Huber.** 2004. Characteristics of Gaps and Natural Regeneration in Mature Longleaf Pine Flatwoods Ecosystems. *Forest Ecology and Management*. 187:373-380.
- Gezan, S.A., D.A. Huber and T.L. White.** 2004. Design and Analysis of Experiments in Forestry: Incorporating Spatial Variation. Pages 28-31 In: 2004 IEG Meeting: Advancing Regeneration Technologies for the Deployment of Elite Southern Pine Germplasm. June 22-24, Jekyll Island, GA.
- Green, A., A. Hermansen-Baez, A. Hodges, W. Smith, D. Rockwood and J. Stricker.** 2004. Multidisciplinary Academic Demonstration of a Biomass Alliance with Natural Gas. In: *Proc. International Conference on Engineering Education*.
- Hermansen, A., W. Smith, A. Long, C. Randall, A. Behm and D. Doran.** 2004. Fire in the Wildland-Urban Interface in the USA South. Pages 319-334 In: *Forestry Serving Urbanized Societies, IUFRO Conference*, Copenhagen, Denmark, 2002.
- Hodges, A., D. Mulkey, J.R.R. Alavalapati, D.R. Carter and C. Kiker.** 2004. Economic Impacts of the Forest Industry in Florida, A Final Report to the Florida Forestry Association. 47 pp.
- Hodges, A., D. Mulkey, J.R.R. Alavalapati, D.R. Carter and C. Kiker.** 2004. Executive Summary: Economic Impacts of the Forest Products Industry in Florida. *Florida Forests*. (Fall) Vol. 8(3):12-15.
- Irlandi, E.A., B.A. Orlando and W.P. Cropper, Jr.** 2004. Short-term Effects of Nutrient Addition on Growth and Biomass of *Thalassia Testudinum* in Biscayne Bay, FL. *Florida Scientist*. 67:18-26.
- Isebrands, J., D. Rockwood, R. Hall, A. Lindner, A. Pacheco, N. Brown and R. Lange.** 2004. Phytoremediation of a Perchloroethylene Contaminated Site in LaSalle, Illinois with Populus Clones – A Field Evaluation. *Proc. AEES Conference*. June 4, 2004, Fayetteville, AR.
- Jawdy, S.S., S.P. DiFazio, U.C. Kalluri, J.M. Davis, A.M. Morse, C. Dervinis, K.E. Smith and G.A. Tuskan.** 2004. Using SSH and RCA to Identify Auxin-responsive Transcripts in Populus. Page 26 In: 12th New Phytologist Symposium, Functional Genomics of Environmental Adaptation in Populus. October 10-13, Gatlinburg, TN.
- Jokela, E.J.** 2004. Nutrient Management of Southern Pines. Pages 27-35 In: E.D. Dickens, J.P. Barnett, W.G. Hubbard and E.J. Jokela (eds.). *Slash Pine: Still Growing and Growing!* Proc. of the Slash Pine Symposium. USDA Forest Service Gen. Tech. Report SRS-76.
- Jokela, E.J. and P.M. Dougherty (eds.).** 2004. Long-term Production Dynamics of Loblolly Pine Stands in the Southern United States. A Special Issue of *Forest Ecology and Management*. Vol. 192:1-130.
- Jokela, E.J. and P.M. Dougherty.** 2004. Long-term Production Dynamics of Loblolly Pine Stand in the Southern United States. *Forest Ecology and Management*. 192:1-2.
- Jokela, E.J., P.M. Dougherty and T.A. Martin.** 2004. Production Dynamics of Intensively Managed Loblolly Pine Stands in the Southern United States: A Synthesis of Seven Long-term Experiments. *Forest Ecology and Management*. 192:117-130.
- Kaya, B. and P.K.R. Nair.** 2004. Dynamics of Particulate Organic Matter Following Biomass Addition from Fallow-improvement Species in Southern Mali. *Agroforestry Systems*. 60:267-276.
- Kirst, M., A. Myburg, and R. Sederoff.** 2004. Genetic Mapping in Forest Trees: Markers, Linkage Analysis and Genomics. Pages 105-141 In: J. K. Setlow (ed.). *Genetic Engineering, Principles and Methods* (v. 26). Kluwer Academic/Plenum Publishers.
- Kirst, M., A. Myburg, M.E. Kirst, J. Scott, J. and R. Sederoff.** 2004. Quantitative Analysis of Transcript Variation on Microarrays Reveals Coordinated Downregulation of Lignin Gene Transcripts Associated with Two Quantitative Trait Loci for Growth in a Eucalyptus Hybrid Backcross. *Plant Physiology*. 135:2368-2378.
- Kumar, B.M. and P.K.R. Nair.** 2004. The Enigma of Tropical Homegardens. *Agroforestry Systems*. 61 & 62:135-154.
- Lawrence, S.D., C. Dervinis and J.M. Davis.** 2004. Cytokinin and Wound Signal Interaction Reduces Weight of Gypsy Moth Larvae Feeding on Poplar. Page 497 In: 2004 American Society of Plant Biologists Meeting, July 24-28, Lake Buena Vista, FL.
- Lindner, A., A. Pacheco, D. Rockwood, J. Isebrands and R. Brigmon.** 2004. Phytoremediation of TCE at Two Superfund Sites: Assessing Methanotroph Activity in the Rhizosphere. SBRP Annual Meeting, November 3-4, 2004, Seattle, WA.
- Long, A.J., 14 others.** 2004. Prescribed Fire and Slash Pine. Pages 66-78 In: E.D. Dickens, J.P. Barnett, W.G. Hubbard and E.J. Jokela (eds.). *Slash Pine: Still Growing and Growing!* Proceedings of the Slash Pine Symposium, Gen. Tech. Rep. SRS-76. Asheville, NC: USDA, Forest Service, Southern Research Station. 145 pp.
- Lu, P. and T.L. White.** 2004. Determining Test and Block Numbers in Consideration of Progeny Testing Quality and Cost: An Example of Half-Sib Families with RCB Design and Single-Tree Plots. *Forest Genetics*. 11(1):29-44.
- Maness, T.C., R.A. Kozak and C.L. Staudhammer.** 2004. Reliability Testing of Statistical Process Control Procedures for Manufacturing with Multiple Sources of Variation. *Wood and Fiber Science*. 36(3):443-458.
- Martin, T.A. and E.J. Jokela.** 2004. Developmental Patterns and Nutrition Impact Radiation Use Efficiency Components in Southern Pine Stands. *Ecological Applications*. 14:1839-1854.
- Martin, T.A. and E.J. Jokela.** 2004. Stand Development and Production Dynamics of Loblolly Pine Growing on Spodosols in North-central Florida USA. *Forest Ecology and Management*. 192:39-58.
- Masozera, M. and J.R.R. Alavalapati.** 2004. Forest Dependency and its Implications for Protected Areas Management: A Case Study from the Nyungwe Forest Reserve, Rwanda. *Scandinavian Journal of Forest Research*. 19(4):85-92.
- McGarvey, R.C., T.A. Martin and T.L. White.** 2004. Integrating Within-crown Variation in Net Photosynthesis in Loblolly and Slash Pine Families. *Tree Physiology*. 24:1209-1220.
- McGarvey, R.C., T.A. Martin and T.L. White.** 2004. Leaf- and Crown-level Net Photosynthesis in Loblolly and Slash Pine Families. *Forest Biology Research Cooperative Report #26*. 22 pp.
- Mercer, D.E. and J.R.R. Alavalapati.** 2004. Summary and Future Directions. Pages 303-310 In: J. R. R. Alavalapati and E. Mercer (eds.). *Valuing Agroforestry Systems: Methods and Applications*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Monroe, M.C. and K.C. Nelson.** 2004. The Value of Assessing Public Perceptions: Wildland Fire and Defensible Space. *Applied Environmental Education and Communication*. 3:109-117.

# PUBLICATIONS

- Montagnini, F. and P.K.R. Nair.** 2004. Carbon Sequestration: An Under-exploited Environmental Benefit of Agroforestry Systems. *Agroforestry Systems*. 61 & 62:281-298.
- Morse, A.M., J.E.K. Cooke and J.M. Davis.** 2004. Functional Genomics in Forest Trees. Pages 3-18 In: S. Kumar and M. Fladung (eds.). *Molecular Genetics and Breeding of Forest Trees*. The Haworth Press, Inc., Binghamton, NY.
- Morse, A.M., C.D. Nelson, S.F. Covert, A.G. Holliday, K.E. Smith and J.M. Davis.** 2004. Pine Genes Regulated by the Necrotrophic Pathogen *Fusarium circinatum*. *Theoretical and Applied Genetics*. 109: 922-932.
- Murray G. and M.E. Bannister.** 2004. Peasants, Agroforesters, and Anthropologists: A 20-year Venture in Income-generating Trees and Hedgerows in Haiti. *Agroforestry Systems*. 61:383-397.
- Nair, P.K.R., M.R. Rao and L.E. Buck (eds.).** 2004. *New Vistas in Agroforestry. A Compendium for the 1st World Congress of Agroforestry, Florida, USA, 2004*. Kluwer, The Netherlands. 475 pp.
- Neale, D.B., J.M. Davis, T.L. White, T.A. Martin, J.F.D. Dean, S.F. Covert, L.H. Pratt and M-M. Cordonnier-Pratt.** 2004. Genomics to Breeding in Loblolly Pine. Page 34 In: 2004 IEG Meeting: Advancing Regeneration Technologies for the Deployment of Elite Southern Pine Germplasm. June 22-24, Jekyll Island, GA.
- Nelson, K., M.C. Monroe, J. Johnson and A. Bowers.** 2004. Living with Fire: A Comparison of Homeowner Assessment of Landscape Values and Defensible Space in Minnesota and Florida USA. *International Journal of Wildland Fire*. 13:413-425.
- Nowak, J. and A. Long.** 2004. Slash Pine in Integrated Timber, Forage, and Livestock Silvopastoral Systems. Pages 98-104 In: E. D. Dickens, J. P. Barnett, W. G. Hubbard and E. J. Jokela (eds.). *Slash Pine: Still Growing and Growing!* Proceedings of the Slash Pine Symposium, Gen. Tech. Rep. SRS-76. Asheville, NC: USDA, Forest Service, Southern Research Station. 145 pp.
- Onokpise, O., D. Worthen, D. Rockwood and T. Willis.** 2004. Proceedings of the Symposium on Celebrating Minority Professionals in Forestry and Natural Resources Conservation. Volume II: Annotated Version. Forestry and Natural Resources Conservation, DAS, CESTA, FAMU: Tallahassee, FL.
- Osoorio, L.F., T.L. White, D.A. Huber and G.L. Powell.** 2004. Breeding Strategy and Vegetative Propagation of *Eucalyptus grandis* at Smurfit Cartón de Colombia. Page 10 In: 2004 IEG Meeting: Advancing Regeneration Technologies for the Deployment of Elite Southern Pine Germplasm. June 22-24, Jekyll Island, GA.
- Pennisi, L.A., S.M. Holland and T.V. Stein.** 2004. Achieving Bat Conservation through Tourism. *Journal of Ecotourism*. 3(3):195-207.
- Peter, G.F. and D.B. Neale.** 2004. Molecular Basis for the Evolution of Xylem Lignification. *Current Opinions in Plant Biology*. 7:737-742.
- Peter, G.F., J. Fernandez, D.E. White, C. Courchene and G.A. Baum.** 2004. Impact of Forest Biotechnology on the Economics of Corrugated Box Production. TAPPI Fall Technical Conference, TAPPI Press. CD-ROM.
- Peter, G.F., D.E. White, N. Sicarelli, R. de la Torre and D. Newman.** 2004. Commercialization of Forest Biotechnology Targets for Enhanced Global Competitiveness of the US Pulp and Paper Industry. TAPPI Paper Summit Spring Technical and International Environmental Conference, TAPPI Press. CD-ROM.
- Pierskalla, C.D., M.E. Lee, T.V. Stein, D.H. Anderson and R. Nickerson.** 2004. Understanding Relationships Among Recreation Opportunities: A Meta-Analysis of Nine Studies. *Leisure Sciences*. 26:1-18.
- Pitre, F.E., M. Ouellet, M. Davis, J.M. Davis, J.J. Mackay and J.E.K. Cooke.** 2004. Nitrogen Availability Affects Wood Formation in Poplar. Page 46 In: 12th New Phytologist Symposium, Functional Genomics of Environmental Adaptation in Populus. October 10-13, Gatlinburg, TN.
- Puri, S. and P.K.R. Nair.** 2004. Agroforestry Research for Development in India: 25 Years of Experiences of a National Program. *Agroforestry Systems*. 61 & 62:437-452.
- Ramirez, G., C. Dervinis, A.M. Morse, S.P. Difazio and J.M. Davis.** 2004. Characterization of the Poplar Cytokinin Response Regulator Gene Family. Page 50 In: 12th New Phytologist Symposium, Functional Genomics of Environmental Adaptation in Populus. October 10-13, Gatlinburg, TN.
- Rockwood, D.L., C.V. Naidu, D.R. Carter, M. Rahmani, T. Spriggs, C. Lin, G.R. Alker, J.G. Isebrands and S.A. Segrest.** 2004. Short-rotation Woody Crops and Phytoremediation: Opportunities for Agroforestry? Pages 51-63 In: P. K. R. Nair, M. R. Rao and L. E. Buck (eds.). *New Vistas in Agroforestry. A Compendium for the 1st World Congress of Agroforestry, 2004*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Sanborn, A., A. Belcher, R. Albritton and T. Stein.** 2004. Florida National Science Trail Visitor Assessment: 2003-2004 Annual Report. Gainesville, FL. School of Forest Resources and Conservation, University of Florida.
- Schimleck, L., P.D. Jones, G.F. Peter, R.F. Daniels and A. Clark, III.** 2004. Nondestructive Estimation of Tracheid Length from Sections of Radial Wood Strips by Near Infrared Spectroscopy. *Holzforchung*. 58:375-381.
- Schmidt, R.A.** 2004. Major Disease Issues with Slash Pine Management. Pages 87-90 In: E. D. Dickens, J.P. Barnett, W.G. Hubbard and E.J. Jokela (eds.). *Slash Pine: Still Growing and Growing!* Proc. of the Slash Pine Symposium. USDA Forest Service Gen. Tech. Report SRS-76.
- Segrest, S., D. Rockwood, D. Carter, W. Smith, A. Green and J. Stricker.** 2004. Short Rotation Woody Crops for Cofiring in Central Florida. In: Proc. 29th International Technical Conference on Coal Utilization & Fuel Systems. April 18-22, 2004, Clearwater, FL. Coal Technology Association CD, ISBN No. 0-932066-29-54, Paper 12.
- Shepard, J.P., H. Abd-El Monsef and L.G. Arvanitis.** 2004. Relationships Between National Wetlands Inventory Maps and Hydrophytic Vegetation in Florida. *Wetlands Ecology and Management*. 12:409-418.
- Shrestha, R.K. and J.R.R. Alavalapati.** 2004. Effect of Ranchland Attributes on Recreational Hunting in Florida: A Hedonic Price Analysis. *Journal of Agricultural and Applied Economics*. 36(3):763-772.
- Shrestha, R.K. and J.R.R. Alavalapati.** 2004. Estimating Ranchers' Cost of Agroforestry Adoption: A Contingent Valuation Approach. Pages 183-199 In: J.R.R. Alavalapati and E. Mercer (eds.). *Valuing Agroforestry Systems: Methods and Applications*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Shrestha, R.K. and J.R.R. Alavalapati.** 2004. Valuing Environmental Benefits of Silvopasture Practice: A Case Study of the Lake Okechobee Watershed in Florida. *Ecological Economics*. 49:349-359.
- Shrestha, R.K., J.R.R. Alavalapati and R.S. Kalmbacher.** 2004. Exploring the Potential for Silvopasture Adoption in South-Central Florida: An Application of SWOT-AHP Method. *Agricultural Systems*. 81:185-199.
- Stainback, G. and J. Alavalapati.** 2004. Modeling Catastrophic Risk in Economic Analysis of Forest Carbon Sequestration. *Natural Resource Modeling*. 17(3):299-317.
- Stainback, G.A. and J.R.R. Alavalapati.** 2004. Restoring Longleaf Pine Through Silvopasture Practices: An Economic Analysis. *Forest Policy and Economics*. 6 (3-4):371-378.
- Stainback, G., J. Alavalapati, R. Shrestha, S. Larkin and G. Wong.** 2004. Improving Environmental Quality in South Florida through Silvopasture: An Economic Approach. *Journal of Agricultural and Applied Economics*. 36(2):481-489.
- Tamang, B., M. Langholtz, B. Becker, S. Segrest, D. Rockwood, S. Richardson and J. Stricker.** 2004. Fast Growing Tree Bridge Crops for Ecological Restoration of Phosphate Mined Lands. First National Conference on Ecosystem Restoration. December 6-10, 2004, Lake Buena Vista, Florida.
- Thangata, P.H., J.R.R. Alavalapati and P.E. Hildebrand.** 2004. Metamodeling Agroforestry Adoption: Assessing Factors Influencing Adoption of Improved Fallows in Southern Africa Using an Integrated Linear Programming and Econometric Model. Pages 219-236 In: J. R. R. Alavalapati, and E. Mercer (eds.). *Valuing Agroforestry Systems: Methods and Applications*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Timko, T. and J.R.R. Alavalapati.** 2004. Economic Impact of Adopting Silvopasture in Florida: A CGE analysis. Pages 294-303 In: Proceedings of the Southern Forest Economics Workers Annual Conference, March 14-16, 2004, St. Augustine, Florida.
- Vasconcelos, S.S., D.J. Zarin, M. Capanu, R. Littell, E. A. Davidson, F.Y. Ishida, E.B. Santos, M.M. Araújo, D.V. Aragão, L.G.T. Rangel-Vasconcelos, F.A. Oliveira, W.H. McDowell and C.J.R. Carvalho.** 2004. Moisture and Substrate Availability Constrain Soil Trace Gas Fluxes in an Eastern Amazonian Regrowth Forest. *Global Biogeochemical Cycles* 18, GB2009, doi:10.1029/2003GB002210.
- Vergara, R, T.L. White, D.A. Huber, B.D. Shiver and D.L. Rockwood.** 2004. Estimated Realized Gains for First-generation Slash Pine (*Pinus elliottii* var. *elliottii*) Tree Improvement in the Southeastern United States. *Canadian Journal of Forest Research*. 34:2587-2600.
- Wanvestraut, R., S. Jose, P.K.R. Nair and B.J. Brecke.** 2004. Competition for Water in a Pecan-Cotton Alley Cropping System in the Southern United States. *Agroforestry Systems*. 60:167-179.
- White, D.E., G.F. Peter and M.A. Evans.** 2004. A Cross-industry Systems Assessment of Future Printing and Papermaking Industry Trends. *GTAF World Technology Forecast*. 16:66-69.

# PUBLICATIONS

**White, T.L.** 2004. Breeding Theory and Genetic Testing. Pages 1551-1561 In: J. Burley, J. Evans and J. A. Youngquist (eds.). Encyclopedia of Forest Sciences. Elsevier Ltd, Pub. Oxford, UK. Vol. 4.

**White, T.L. and T.D. Byram.** 2004. Slash Pine Tree Improvement. Pages 7-19 In: E.D. Dickens, J.P. Barnett, W.G. Hubbard and E.J. Jokela (eds.). Slash Pine: Still Growing and Growing! Proceedings of the Slash Pine Symposium, Jekyll Island, GA, April 23-25, 2002. USDA Gen. Tech. Rep. SRS-76. Asheville, NC: US Dept of Agriculture, Forest Service, Southern Research Station.

**White, T.L. and M. Carson.** 2004. Breeding Programs of Conifers. Pages 61-85 In: C. Walter and M.J. Carson (eds.). Plantation Forest Biotechnology for the 21<sup>st</sup> Century. Research Signpost, Kerala, India.

**Wullschleger, S., S. Segrest, D. Rockwood and C. Garten.** 2004. Enhancing Soil Carbon Sequestration on Phosphate Mine Lands in Florida by Planting Short-rotation Bioenergy Crops. Third Annual Conference on Carbon Sequestration. Washington, DC.

**Yates, G., D. DeGraw and T. Stein.** 2004. Scenic Highway Corridor Group Leaders' Perceptions of the Florida Scenic Highway Program Process. Gainesville, FL. School of Forest Resources and Conservation, University of Florida.

**Zarin, D.J.** 2004. Neotropical Working Forests: Concepts and Realities. Pages 1-12 In: D.J. Zarin, J.R.R. Alavalapati, F.E. Putz and M. Schmink (eds.). Working Forests in the Neotropics: Conservation through Sustainable Management? Columbia University Press: New York.

**Zarin, D.J., J.R.R. Alavalapati, F.E. Putz and M. Schmink (eds.).** 2004. Working Forests in the Neotropics: Conservation through Sustainable Management? Columbia University Press: New York. 437 pp.

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Alavalapati, J.R.	Identification and Assessment of Conservation Compatible Practices on Private Forestlands	Natl. Sci. for Sus. Forestry	99,249
Bannister, M.E.	Developing Agroforestry and Natural Resource Distance Education: Meeting the Needs of the Changing Southeastern US	U.S. Dept. of Agriculture	241,928
Bannister, M.E.	Tree-crop Diversity and Enterprise Development Through Agroforestry: a Participatory Survey and Gis-based Analysis	U.S. Dept. of Agriculture	115,841
Carter, D.R.	Rapid Assessment of Timber Market Conditions and Trends in the Southeastern United States	U.S. Dept. of Agriculture	15,000
Davis, J.M.	Allele Discovery for Genes Controlling Economic Traits in Loblolly Pine	Univ. of California	863,363
Davis, J.M.	Genome-enabled Discovery of Carbon Sequestration Genes in Poplar	U.S. Dept. of Energy	239,876
Davis, J.M.	Genome-enabled Discovery of Carbon Sequestration Genes in Poplar	Battelle	199,494
Davis, J.M.	Genetic Screening of Resin Traits Linked to Spb Resistance	U.S. Dept. of Agriculture	65,843
Duryea, M.L.	Turfgrass Research	Fl. Turf-grass Association	42,680
Jokela, E.J.	Indisciplinary Program in Natural Resource Management: Integrated Analysis of Forested Watersheds	U.S. Dept. of Agriculture	99,814
Jokela, E.J.	Spatial Modeling of Nitrogen Emissions from Poultry Operation and Their Influence on Pitch Canker in Pinus Elliottii	Dept. of Agricul. & Consumer Ser.	24,898
Jose, S.	Restoration Ecology of Longleaf Pine Ecosystems: Developing an Interdisciplinary Distance Education Course	U.S. Dept. of Agriculture	164,936
Long, A.J.	Fire Risk Ratings and Mitigation Options for Southern Landowners	U.S. Dept. of Agriculture	51,000
Long, A.J.	Research Synthesis for a Hypertext Encyclopedia of Southern Fire Science Information	U.S. Dept. of Agriculture	40,000
Long, A.J.	Cooperative Wood Testing Program	Fl. Forestry Association	20,000
Long, A.J.	Florida Forest Stewardship Program	Dept. of Agricul. & Consumer Ser.	63,878
Martin, T.A.	Comparing Pine Families Using Large-scale Methods: Agenda 2020, Part 3	U.S. Dept. of Agriculture	40,000
Martin, T.A.	Improving Nfdrs by Understanding Understory Dynamics of Fuel-loading and Fuel Moisture in Southeastern U.S. Coastal Plai	U.S. Dept. of Agriculture	40,000
Martin, T.A.	Secondary Xylem Form and Function: Linkages among Wood Quality, Growth and Tree Water Relations: Year 2	U.S. Dept. of Agriculture	46,000
Martin, T.A.	Forest Productivity, Health and Sustainability	Fl. Forestry Association	245,900
Martin, T.A.	Dynamics of Carbon, water, and Energy Fluxes for Pine Ecosystems in Florida: Recovery from Perturbation and Variation Acro	Univ. of Alabama	216,733
Monroe, M.C.	Community Partnerships Landscape Level Strategies to Reduce the Risk and Loss from Catastrophic Fire	U.S. Dept. of Agriculture	117,000
Monroe, M.C.	Developing Resource Managers Skills for Wildland Urban Interface Challenges	U.S. Dept. of Agriculture	161,000
Monroe, M.C.	Florida Plt Fire Education Program	Am. Forestry Foundation	5,000

## SCHOOL OF FOREST RESOURCES & CONSERVATION

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Monroe, M.C.	Expanding Our Research: Project Learning Tree Ee Centers	Fl. Ag. in the Classroom Inc.	13,500
Nair, R.P.	Training of Icfre (India) Forestry Professionals	Indian Coun. of Forest Res. & Ed.	56,000
Nair, R.P.	Support to the First World Congress of Agroforestry, 2004	U.S. Dept. of Agriculture	10,000
Nair, R.P.	Establishing a Center for Subtropical Agroforestry	U.S. Dept. of Agriculture	3,913,984
Nair, R.P.	Agroforestry: Sustainable Land Use Patterns in the Tropics	U.S. Dept. of Agriculture	15,000
Rockwood, D.L.	Eucalyptus Energywood Plantation - 2000	Common Purpose Institute	2,400
Rockwood, D.L.	A Cooperative Multicultural Scholars Program in Natural Resources & Forestry Between Floridda A&M Univ. & Univ. of Florida	U.S. Dept. of Agriculture	60,000
Rockwood, D.L.	Sumter County Compost for Forest Crops	Sumter County	25,000
Rockwood, D.L.	Florida Center for Solid and Hazard Waste Management - Sponsored Research	Dept. of Environmental Protect.	8,000
Rockwood, D.L.	Collaborative Research: Florida Interdisciplinary Center For Environmental Sound Solutions Summer Program for High School	National Science Foundation	10,913
Smith, W.H.	Cooperative Wood Testing Program	Fl. Forestry Association	32,000
Stein, T.V.	Wo # 37 - Big Bend Scenic Byway Study	Dept. of Transportation	179,550
Stein, T.V.	Developing a Plan for Jackson County Sustainable Tourism Development	Jackson County	13,000
Stein, T.V.	Five Year Florida National Scenic Trail User Assessment	U.S. Dept. of Agriculture	30,000
White, T.L.	Forest Productivity, Health and Sustainability	Fl. Forestry Association	269,000
White, T.L.	Cooperative Genetics Research Program	Fl. Forestry Association	105,000
White, T.L.	Forest Productivity, Health and Sustainability	Fl. Forestry Association	226,000
White, T.L.	Project Learning Tree	Fl. Forestry Association	10,000
White, T.L.	Amendment to Dacs/dof - IFAS/SFRC Memorandum of Understanding: Urban Forestry Position	Dept. of Agricul. & Consumer Ser.	10,000
White, T.L.	Cooperative Genetics Research Programs	Fl. Forestry Association	99,000
White, T.L.	Enhancing Resarch and Technology Transfer Efforts of the Southern Center for Wildland-urban Interface Research and in	U.S. Dept. of Agriculture	10,000
Workman, S.W.	Mycorrhizal Validation and Characterization for Reforestation Efforts in Western Nicaragua	U.S. Dept. of Agriculture	15,000
Zarin, D.J.	Experimental Manipulation of Nutrient and Moisture Availability in Young Secondary Forests in Eastern Amazonia	Andrew W. Mellon Foundation	470,000
Zarin, D.J.	Caribbean Dry Forest Restoration	U.S. Dept. of Agriculture	50,000
Zarin, D.J.	Igert: Working Forest in the Tropics	National Science Foundation	641,607
Zarin, D.J.	Impacts of Throughfall Reduction on Understory Trees in an Amazonian Forest	Woods Hole Research Center	11,610

**2004 Annual Research Report**

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The University of Florida Herbarium is an integral unit in the Department of Natural History of the Florida Museum of Natural History. Personnel and students from various University of Florida departments work and conduct research collaboratively in the herbarium. There are 7 faculty and staff, 10 graduate students and 2 research associates housed in the herbarium. In addition 5 undergraduate students are employed part-time as specimen preparators and 6 volunteers actively work with our programs. An additional 11 faculty and staff and 6 graduate students from closely affiliated departments regularly utilize herbarium facilities. Herbarium staff manages the day-to-day operations in support of faculty, staff, student, visitor and inter-institutional activities. The Institute of Food and Agricultural Sciences provides financial support for these operations.

Plants are essential resources, providing food, medicine, shelter, oils, dyes and a myriad of other products. Herbarium programs, in parallel with the overall function of the Florida Museum of Natural History, strive to provide a structure for communicating about and understanding the natural world. The herbarium's mission has four areas of focus: plant collections acquisition and care, research based on the collections, education, and public service. Our activities are dedicated to understanding, preserving and interpreting biological diversity.

**COLLECTIONS ACQUISITION AND CARE:** The herbarium collection consists of nearly 500,000 specimens and is growing by around 3,000 specimens per year. Specimens are acquired through fieldwork, exchange from other institutions, the plant identification service and gifts. Each specimen requires individual preparation prior to being added to the collection. Data from each specimen is entered into the computerized catalog that is available on the web for searching at: <http://www.flmnh.ufl.edu/herbarium/cat/>. High-resolution, zoomable images of selected specimens are also provided. Inter-institutional specimen loans are shipped and received to facilitate plant monographic studies, revisionary studies and flora projects by researchers at the University of Florida and other Florida, national and international herbaria. 5665 specimens were processed in 141 loan transactions during the year 2004.

**COLLECTIONS-BASED RESEARCH:** The research emphasis of the herbarium is plant systematics and floristics. Major research projects in 2004 have been in molecular and morphological systematics of Orchidaceae, Euphorbiaceae, Apocynaceae, Melastomataceae, and Polygalaceae. Researchers are working on the floras of Florida and the New World tropics. The herbarium collection and library also serve as a resource for research in the fields of agronomy, anthropology, conservation, ecology, entomology, forestry, landscape architecture, plant pathology, environmental horticulture, soil science, wildlife ecology and zoology.

**EDUCATION:** Class tours introduce students to the resources and services available at the herbarium. Techniques for specimen preservation and herbarium management are taught. The herbarium web site provides information and links on specimens, collections, plant collecting, herbarium practice and legal issues.

**PUBLIC SERVICE:** The principal public service activity of the herbarium is provided through the Plant Identification and Information Service. Researchers and the network of Cooperative Extension Service agents submit requests for identification and information. Proper plant identification is crucial for plant care, weed control, research, and for an understanding of potential hazards (toxicity). The staff of the herbarium assists in providing such types of information as scientific names and authors for cultivated plants, weeds, and native species, their common names, range, specific locations, dates of flowering, and possible human and animal toxicity.

Researchers, students and the general public also have access to the herbarium's non-circulating reference library. The literature in this collection contains descriptions, illustrations, photographs, geographical ranges and keys for differentiating species of plants, as well as information regarding Latin plant names (nomenclature), plant collectors and economic botany. The herbarium staff provides assistance to visitors in the use and understanding of the library subject matter. The herbarium library catalog is available through the State University System of Florida library catalog and on the web at: <http://www.flmnh.ufl.edu/herbarium/lib/>.

## RESEARCH HIGHLIGHTS

### FLORISTIC INVENTORY OF KANAPAHA BOTANICAL GARDENS

The Floristic Inventory of Kanapaha Botanical Gardens was initiated in early 2002 by the University of Florida Herbarium, Florida Museum of Natural History, University of Florida Libraries Digital Library Center, Florida Center for Library Automation, and Kanapaha Botanical Gardens. The goal of the project is to document the native, naturalized, and cultivated vascular plants growing at the gardens.

Kanapaha Botanical Gardens (KBG) is a 62-acre display facility, along the southern margin of Lake Kanapaha in Gainesville, Florida, developed and maintained by the North Florida Botanical Society, Inc., a private nonprofit organization. Don Goodman, Director of KBG, began development of the site in 1978, and it was formally opened to the public in October 1986. The garden derives its name from its proximity to Lake Kanapaha. The word Kanapaha is formed from the Timucua Indian words for "palmetto leaf" and "house" and taken together refer to the Indians' thatched dwellings formerly on the western shore of Lake Kanapaha.

Kanapaha Botanical Gardens is comprised of collections of cultivated plants bordering calcareous woodlands, prairies and a fluctuating lake. The garden includes an impressive display of bamboos, herb garden, colorful hummingbird and butterfly gardens, palm hammock, succulent plant rock garden and water garden developed in collaboration with Gainesville Regional Utilities to provide a public demonstration of reclaimed water use. Visitors are particularly drawn to "signature plants" such as a premier stand of wong chuk bamboo, Asian snake arums and, during the warmer months, the giant hybrid Victoria water lilies. Summer is the most colorful season when the hummingbird and butterfly gardens and vinery are at their peak. Azaleas, camellias, ornamental cherries and Japanese magnolias are also enjoyed in the spring as harbingers of the Spring Garden Festival in late March.

S. Barry Davis, an Herbarium staff member and coordinator for this project, is preparing and identifying specimens of preserved, pressed plants for each species found. Sets are being deposited at the University of Florida Herbarium and at the Kanapaha Botanical Gardens. Additional specimens will be prepared for distribution to experts when assistance or verification of identifications is needed. All specimen data and images are accessible at the University of Florida Herbarium web site.

A crew of staff and volunteers are working on aspects of this project. Don Goodman and the KGB staff facilitate access to the gardens and help locate particular plants. Kent Perkins, Herbarium Collection Manager, manages specimen accessions and the herbarium's web site. Kathy Davis, Pat Carlisle, Rebecca Bennett and other herbarium technicians prepare specimens for the collections. Kathy Davis and the Digital Library Center staff produce digital images of the specimens. Marybeth Rinzler, KGB Facilities Coordinator, is working on public outreach projects.

Representative specimens of each species found growing in the garden are preserved in flat, dry sections. Specimens are placed in folded newspapers between blotters and cardboards in a plant press that is put on an electric drier with good airflow and low humidity. Data on the plant's size, habit, distinguishing features, habitat and locality, including GPS coordinates, are recorded for labels. The collections are identified using available literature and by comparison with collections in the University of Florida Herbarium. Specimens are preserved by affixing them with an accompanying label to a sheet of heavy, archival paper.

The specimens collected serve as vouchers and may be examined by researchers to verify the identity of the plants named in

the study. Duplicate vouchers may be distributed as gifts for determination to experts, who are the most knowledgeable in the plant group. Vouchers are important because changes in plant classification result in shifts in species alignments, groupings and identifications. Voucher specimens help cross-reference these changes to previous research and may be utilized in future research.

An inventory of the KBG flora will empower its staff to make plant selections to enhance the diversity of the garden. The specimens serve as an historic record of the species and varieties being grown with dates of flowering and fruiting. Other useful information such as plant health and survival can be determined through the specimen data. Knowledge of the documented occurrence and spread of invasive or weedy plants may help eradication efforts.

The public will benefit through improved garden signage with correct plant names. For many people from school children to senior citizens, a setting such as KBG is their first opportunity to see plants in natural settings and at natural stages of life; other institutions display live plants only when they are flowering. Proper identification at all stages of growth is only possible because identification has been made and documented.

Web pages and databases developed in this project provide plant scientific names, common names, searchable label data, and high-resolution specimen images. These materials can be used for scientific and educational purposes by a broad consumer cross-section, including, homeowners, horticulturalists, ecologists, and other persons interested in plant recognition and identification.

In the past three years over 1000 plants have been pressed, most in duplicate and some in triplicate where expert identification is needed. Six hundred twenty species and cultivars have been identified, mounted, imaged and are now available on the herbarium's Web site.

The comprehensive species list will be presented in a checklist of plant families, still under development. This checklist will be co-authored by Dr. Walter S. Judd and published in a scientific journal as the final report for the project.

**WEB SITES:** Floristic Inventory of Kanapaha Botanical Gardens: <http://www.flmnh.ufl.edu/herbarium/kanap/> • Kanapaha Botanical Gardens: <http://www.kanapaha.org/>

*S. Barry Davis*



**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY
Norris H. Williams	Keeper of the Herbarium, Curator	Systematics and Evolution of Orchidaceae
Kent D. Perkins	Collection Manager	Museum Collection Management and Computerization; Endangered Species
S. Barry Davis	Extension Botanist	Plant Identification and Information Service; Asteraceae; Florida Flora
Robert L. Dressler	Research Associate	Systematics and Pollination Biology of Orchidaceae
Marc S. Frank	Assistant Collection Manager	Horticulture and Horticultural Systematics
Dana Griffin, III	Emeritus Faculty, Dept. of Botany	Bryophytes; Lichens; Plant Geography
Walter S. Judd	Professor Department of Botany	Vascular Plant Systematics; Florida and West Indian Floras; Generic Flora of the Southeastern United States Project
Gertrude Lindler	Program Assistant	Herbarium Accounting and Record Management; Library Acquisitions and Cataloguing and Management
W. Mark Whitten	Research Scientist	Systematics and Pollination Biology of Orchidaceae

**RESEARCH PROJECT**

PROJECT NO.	AUTHOR	TITLE
HRB-04170	Williams, Norris H., Perkins, Kent	Computerization and Digitization of the University of Florida Herbarium

**SELECTED PROJECTS BY FACULTY, STAFF AND ASSOCIATED RESEARCHERS:**

Brown, Paul Martin	Wild Orchids of North America, North of Mexico
Davis, S. Barry, Perkins Kent D.	Floristic Inventory of Kanapaha Botanical Gardens
Dressler, Robert L.	Flora Mesoamericana: Orchidaceae Family Treatment
Huck, Robin B.	Taxonomic Revision of <i>Dicerandra linearifolia</i> (Lamiaceae)
Judd, Walter S.	Flora of the Greater Antilles: Ericaceae and Melastomataceae Family Treatments; Generic Flora of the Southeastern United States: Many Family Treatments; Melastomataceae Family Generic Level Systematics; A Revision of <i>Miconia</i> Sect. <i>Chaenopleura</i> (Melastomataceae) in the West Indies
Whitten, W. Mark	Molecular and Morphological Systematics of Stanhopeinae (Orchidaceae)
Williams, Norris H.	Molecular and Morphological Systematics of the Subtribe Oncidiinae (Orchidaceae); Revision of <i>Tolumnia</i> (Orchidaceae)

**SELECTED PROJECTS BY GRADUATE STUDENTS:**

Abbott, J. Richard	Flora of Devil's Hammock, Levy County, Florida; Flora of Snipe Island, Taylor County, Florida; A Taxonomic Revision of <i>Badiera</i> (Polygalaceae) in Conjunction with a Phylogenetic Analysis of the Polygaleae (Polygalaceae), Ph.D. Dissertation
Blanco, Mario	A Monograph of the Genus <i>Lockhartia</i> (Orchidaceae: Oncidiinae), Ph.D. Dissertation; Studies of Central and Southern American <i>Aristolochia</i> (Aristolochiaceae)
Carlswald, Barbara	Molecular Systematics of Leafless Vandeeae (Orchidaceae), Ph.D. Dissertation
Corogin, Paul	Flora of Tiger Creek Preserve, Polk County, Florida, M.S. Thesis
Edwards, Christine	The Phylogenetics of a Clade of Southeastern U.S. Endemics in the Mentheae (Lamiaceae), Ph.D. Dissertation
Endara, Lorena	Systematics of the Pleurothallidinae (Orchidaceae), Ph.D. Dissertation

## RESEARCH PROJECTS

AUTHOR	TITLE
Gulledge, Kimberly	The Systematics, Biogeography, and Population Structure of the Genus <i>Lechea</i> (Cistaceae), Ph.D. Dissertation
Heaney, Michael	Anatomy and Systematics of <i>Polystachya</i> (Orchidaceae)
Ionta, Gretchen	Molecular Phylogeny of the Genus <i>Rhexia</i> (Melastomataceae); Phylogeny and Generic Circumscription of the Subfamily Periplocoideae (Apocynaceae), Ph.D. Dissertation
Jacono, Colette	Introduced <i>Marsilea</i> Species in the Southern United States
Neubig, Kurt	Molecular Systematics of <i>Dichaea</i> (Orchidaceae), M.S. Thesis
Notis, Christine	Phylogeny of the Subfamily Kilmeyeroideae (Clusiaceae), M.S. Thesis
Penneys, Darin	Morphological and Molecular Cladistic Analysis of the Blakeeae (Melastomataceae), Ph.D. Dissertation
Porter-Utley, Kristen	Taxonomic Revision of <i>Passiflora</i> section <i>Cieca</i> (Passifloraceae), Ph.D. Dissertation

## PUBLICATIONS

**Abbott, J.R. and B.S. Carlswald.** 2004. Noteworthy Collections: Florida. *Castanea* 69(4): 324-327.

**Brown, P.M.** 2004. Understanding *Platanthera chapmanii* (Orchidaceae), its Origins and Hybrids. *Sida* 21(2): 853-859.

**Carlswald, B.S.** 2004. Molecular Systematics and Anatomy of Vandaeae (Orchidaceae): The Evolution of Monopodial Leaflessness. Ph.D. Dissertation. University of Florida, Gainesville, FL. xvii, 301 p.

**Darst, M. and A.K. Gholson.** 2004. Noteworthy Collections: Florida. *Castanea* 69(4):328.

**Dressler, R.L.** 2004. The *Sobralia undatocarinata* Complex: Where Have They Been Hiding? Orchids: The Magazine of the American Orchid Society. 73(10):774-778.

**Dressler, R.L.** 2004. Validation of Four *Malaxis* Species (Orchidaceae). *Lankesteriana* 4(1):97.

**Dressler, R.L. and S. Dalström.** 2004. A Synopsis of *Cischweinfia* (Orchidaceae). *Selbyana* 25(1):1-10.

**Dressler, R.L., W.M. Whitten and N.H. Williams.** 2004. Phylogenetic Relationships of *Scaphyglottis* and Related Genera (Laeliinae: Orchidaceae) Based on nrDNA ITS Sequence Data. *Brittonia* 56(1):58-66.

**Guerrero, A., W.S. Judd and A.B. Morris.** 2004. A New Species of *Illicium* Subsection *Parviflora* (Illiciaceae) from the Massif de la Hotte, Haiti. *Brittonia* 56(4):346-352.

**Judd, W.S. and D.S. Penneys.** 2004. Taxonomic Studies in the Miconieae (Melastomataceae). VIII. A Revision of the Species of the *Miconia desportesii* Complex on Hispaniola. *Rhodora* 106(926):124-147.

**Judd, W.S. and R.G. Olmstead.** 2004. A Survey of Tricolpate (eudicot) Phylogenetic Relationships. *American Journal of Botany* 91:1627-1644.

**Judd, W.S., D.S. Penneys, and J.D. Skee, Jr.** 2004. Rediscovery of *Ossaea alleotricha*, an Endemic of the High-elevation Massif de la Hotte, Haiti, and its Transfer to *Miconia* (Melastomataceae: Miconieae). *Brittonia* 56(2):159-165.

**Kabat, C.A., S.M. Kabat, and W.S. Judd.** 2004. An Inventory of the Vascular Flora of Morningside Nature Center, Alachua County, Florida. *Rhodora* 106(927):226-252.

**Michelangeli, F.A., D.S. Penneys, J. Giza, D. Soltis, M.H. Hils & J.D. Skee, Jr.** 2004. A Preliminary Phylogeny of the Tribe Miconieae (Melastomataceae) Based on nrITS Sequence Sata and its Implications on Inflorescence Position. *Taxon* 53(2):279-290.

**Notis, C.** 2004. Phylogeny and Character Evolution of Kilmeyeroideae (Clusiaceae) Based on Molecular and Morphological Data. M.S. Thesis, University of Florida, Gainesville, FL. xi, 116 p.

**Penneys, D.S. and W.S. Judd.** 2004. Two New Species of *Charianthus* (Melastomataceae: Miconieae) from the Lesser Antilles. *Brittonia* 56(2):151-158.

**Stern, W.L., W.S. Judd and B.S. Carlswald.** 2004. Systematic and Comparative Anatomy of Maxillarieae (Orchidaceae), Sans Oncidiinae. *Botanical Journal of the Linnean Society* 144:251-274.

**Whitten, W.M.** 2004. Review of Native Ecuadorian Orchids. Volume IV by Calaway H. Dodson. *Orchids: The Magazine of the American Orchid Society* 73(2):142.

**Zomlefer, W.B., D.E. Giannasi, W.S. Judd, L.M. Kruse and K.A. Bettinger.** 2004. A Floristic Survey of Fort Matanzas National Monument, St. Johns County, Florida. *Sida* 21(2):1081-1106.



**GRANTS & CONTRACTS**

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Soltis, D.E., Judd, W.S., Manchester, S.R., Soltis, P.S.	AToL: Collaborative Research: Resolving the Trunk of the Angiosperm Tree and Twelve of its Thorniest Branches	National Science Foundation	\$403,433
Williams, N.H., Dressler, R.L.	General Support for Orchid Research	South Florida Orchid Society	\$1,800
Williams, N.H.	Molecular and Morphological Systematics of the Subtribe Oncidiinae (Orchidaceae)	National Science Foundation	\$25,000
Williams, N.H.	Systematics of Maxillariinae: Generic Delimitation, Pollinator Rewards and Pollination.	National Science Foundation	\$300,000
Williams, N.H.	What is Oncidium? Phylogenetics as a Prelude to a Revised Classification of Oncidium and Related Genera	American Orchid Society Fund	\$10,802



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The Horticultural Sciences Department, a unit of the Institute of Food and Agricultural Sciences, University of Florida, has statewide responsibilities for undergraduate and graduate instruction and for Cooperative Extension activities. Research responsibilities are shared with faculty assigned to several Agricultural Research and Education Centers and Agricultural Research Centers. Statewide research is coordinated, and overall research planning is the responsibility of the Chair of the Horticultural Sciences Department. Cooperative research with faculty from other on- and off-campus units is essential to serve the complex Florida fruit and vegetable industry and to develop an extensive fruit and vegetable crops information base.

Any organization whose primary interest is in fruit and/or vegetable crops can exist only as a part of agriculture – the only fundamental or primary occupation. Without plant life there could be no agriculture, and the systematic production and utilization of a major group of plants – a keystone of agriculture. The purpose of the Horticultural Sciences Department is to develop, evaluate, assemble, maintain, and disseminate the knowledge necessary to ensure that this keystone remains strong, dynamic, relevant and intact. The size and diversity of the domestic industry and the world-wide importance of fruits and vegetables in human nutrition and economic development emphasize the need for consolidation of resources to accomplish this purpose into a single department. The Horticultural Sciences Department assumes this role of coordinating the search for and application of special knowledge from many disciplines.

**GOALS:** Goals of the department must be consistent with the basic role of agriculture, reflect the needs of a changing world environment, and represent an enduring quality. The goals of the Horticultural Sciences Department are:

**1. TEACHING** - To develop undergraduate students with a scientific understanding of fruit and vegetable production, handling,

storage and marketing. To develop graduate students who have the basic scientific knowledge to teach effectively, do significant research and to consult with the industry. To make a continuous concerted effort to attract and maintain qualified teachers for all of the undergraduate and graduate (Horticultural Sciences) programs and to take positive measures to recruit and train the best possible students at both levels for their future careers in industry, business, research, or extension.

- 2. RESEARCH** - To solve immediate technical problems facing the fruit and vegetable industries. To develop new information, materials and techniques to increase the efficiency of production, harvest and postharvest handling. To develop basic information on the genetics, growth, development and senescence of these crops through a continuous reservoir of research in breeding and genetics, biotechnology and molecular biology, biochemistry, and physiology that is at the forefront of knowledge applicable immediately or in the future.
- 3. EXTENSION** - To develop and disseminate recommendations to the commercial fruit and vegetable industry based on research results. To develop and disseminate recommendations to home gardeners and youth organizations.
- 4. INTERNATIONAL PROGRAMS** - Through the Office of International Programs, to assist in disseminating knowledge of technology to developing countries, aiding in solving problems in their industries, and teaching their students.

The Horticultural Sciences Department in Gainesville has developed various centers of excellence in several research disciplines that include molecular and cellular biology, breeding and genetics, physiology, postharvest physiology, and culture and management. Details of programs under each of these areas, as well as Faculty involved are available on our Web site at <http://www.hos.ufl.edu/>.

## RESEARCH HIGHLIGHTS

## IDENTIFICATION OF GENES CONTROLLING TOMATO FLAVOR

Research efforts initiated in the laboratory of Harry Klee in the Horticultural Sciences Department, IFAS/UF, are helping to develop tools that may lead to a better tasting tomato. Using the modern molecular techniques commonly referred to as genomics and metabolomics, the first genes involved in synthesis of compounds that contribute to overall flavor have been identified.

Generally, most consumers feel that the flavor of fresh supermarket tomatoes does not approach that of home-grown varieties. In recent years, many of the breeding companies have begun to appreciate that flavor is an important trait and varieties with better flavor may give them a marketing edge. The problem is that “flavor” is a highly complex trait regulated by literally hundreds of genes. Thus, one does not simply go out and identify a tomato with great taste. Tomato flavor consists of a complex interaction between sugars, acids and a set of 20 or more volatile compounds. While breeders have paid attention to the sugars and acids, the volatile compounds have been largely ignored. Yet these are the molecules that give tomato its distinct flavor and aroma. Despite their recognized importance, very little is known about their synthesis and the genes that regulate their accumulation.

The Klee lab initiated the molecular aspects of this project as part of a collaboration with Jay Scott, the tomato breeder in Horticultural Sciences, and Elizabeth Baldwin a USDA researcher in Winter Haven. This early work was made possible by an endowment from the Dickman family, noted for their long involvement in the Florida tomato industry. More recently the project has expanded into a major collaborative effort to catalogue the genes involved in synthesis and accumulation of the twenty most important volatiles. The approaches have involved the latest molecular biology techniques as well as more traditional biochemical techniques. The Klee lab has established a collaboration with Jim Giovannoni in the USDA/ARS laboratory at Cornell University to catalogue expression of over 10,000 genes expressed during tomato fruit ripening. Together, the UF and USDA groups are cataloguing the patterns of gene expression, correlating these patterns with the accumulation of the various volatile compounds and building computer databases to uncover the genes regulating their synthesis. Already, 14 genetic loci affecting various volatile compounds have been identified and the first two genes in pathways for synthesis of volatiles have been isolated.

In collaboration with Don McCarty, also in Horticultural Sciences, the Klee lab has also been using more directed approaches to gene identification. These two groups have identified a family of genes that break down the carotenoid compounds lycopene and beta-carotene to release several important volatiles. These carotenoid-derived volatiles are very important contributors to flavor having fruity/floral properties (Simkin et al. The tomato *CCD1* (*CAROTENOID CLEAVAGE DIOXGENASE 1*)) genes contribute to the formation of the flavor volatiles  $\beta$ -ionone, pseudoionone and geranylacetone. *Plant J.* 40: 882–892). In the course of characterizing these genes, they also uncovered evidence for a new

class of carotenoid-derived plant hormones. The as yet unidentified hormone controls the ability of the plant to make branches. This exciting and unexpected result points the way toward future manipulation of plant architecture (Booker et al., *MAX3/CCD7* is a carotenoid cleavage dioxygenase required for synthesis of a novel plant signaling molecule. *Current Biol.* 14: 1232-1238)

Work being conducted in parallel with David Clark in Environmental Horticulture indicates that many of these same flavor volatiles are also important constituents of aroma in many ornamental species such as petunia and rose (Simkin et al. Circadian regulation of the *PhCCD1* carotenoid dioxygenase controls emission of  $\beta$ -ionone, a fragrance volatile of petunia flowers. *Plant Physiol.* 136: 3504-3514). For example, the major constituent of rose flavor is a compound called 2-phenylethanol. In selecting for larger, more colorful flowers over the years, the natural rose scent has been lost from many of the commercial varieties. With the isolation of the genes encoding 2-phenylethanol synthesis, it should now be possible via biotechnology to replace the lost scent, giving added value to the product.

It is clear that there is strong support for this research in both the public and private sector. To understand the complexities of tomato flavor has required a multilab interdisciplinary effort. The work has been funded by a grant from the National Science Foundation Plant Genome program as well as several of the major tomato seed companies. In the near future, it is hoped that this work will assist breeders by providing tools for them to select higher levels of the desirable volatile compounds and lower levels of the undesirable volatiles. In the longer term, as the many genes controlling their synthesis are isolated, it should be possible to create transgenic designer fruits that have improved flavor that will hold up to postharvest storage and shipping as well as flowers with improved scent. For example, it should be possible to produce beautiful, long-lived roses that actually smell the way a rose should smell. Many of the chemicals targeted by this program also contribute to the flavor of other fruits and vegetables. Thus, it can be expected that this work will provide a foundation for quality improvement in many crops important for Florida agriculture.

Harry Klee



## HORTICULTURAL SCIENCES

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Daniel J. Cantliffe	Chair and Prof.	Seed Physiology	20	80	0
Mark J. Bassett	Prof.	Common bean genetics/snap bean breeding	10	90	0
Jeffrey K. Brecht	Prof.	Postharvest Physiology	10	60	30
Jose X. Chaparro	Asst. Prof.	Breeding and Genetics	30	70	0
Carlene A. Chase	Asst. Prof.	Weed Physiology	20	80	0
Christine D. Chase	Assoc. Prof.	Molecular Biology	20	80	0
Kenneth C. Cline	Prof.	Cell Biology, Biochemistry	10	90	0
Rebecca L. Darnell	Prof. and Assoc. Chair	Physiology and Biochemistry	50	50	0
Frederick S. Davies	Prof.	Environmental Physiology of Citrus	30	70	0
Thomas R. Dreschel	Assoc. Scientist	Molecular Biology	0	100	0
James J. Ferguson	Prof.	Commercial Citrus Production	10	20	70
Robert J. Ferl	Prof. and Asst. Program Director	Biological Sciences	20	80	0
Kevin M. Folta	Asst. Prof.	Genetics, Molecular Biology	20	80	0
Larkin C. Hannah	Prof.	Molecular Biology of Maize	20	80	0
Andrew D. Hanson	Eminent Scholar	Metabolic Engineering	10	90	0
Donald J. Huber	Prof.	Fruit Ripening	30	70	0
Chad M. Hutchinson	Asst. Prof.	Alternative Vegetable Crops	0	60	40
Eileeen A. Kabella	Asst. Prof.	Cucurbit Breeding and Genetics	30	70	0
Harry J. Klee	Eminent Scholar	Molecular Biology	20	80	0
Karen E. Koch	Prof.	Molecular Biology	20	80	0
Paul M. Lyrene	Prof.	Blueberry Breeding	20	80	0
Donald R. McCarty	Prof.	Molecular Genetics	10	90	0
Gloria A. Moore	Prof.	Citrus Genetics	10	90	0
Annalisa Paul	Asst. In	Biological Sciences	0	100	0
Balasubramani Rathinasabapathi	Asst. Prof.	Plant Physiology	50	50	0
Sanja Roje	Asst. In	Metabolic Engineering	0	100	0
Steven A. Sargent	Prof.	Postharvest Technology	10	20	70
Paul C. Selnke	Asst. In	Biological Sciences	0	100	0
Andrew M. Settles	Assistant Professor	Plant Molecular Biology	20	80	0
Eric H. Simone	Asst. Prof.	Vegetable Production	0	20	80
William M. Stall	Prof. and Asst. Chair	Weed Science	5	20	75
Denise M. Tieman	Asst. In	Molecular Biology	0	100	0
Carlos E. Vallejos	Assoc. Prof.	Genetics, Molecular Biology & Physiology	10	90	0
Jeffrey G. Williamson	Prof.	Deciduous Fruit Industry	5	15	80

**RESEARCH PROJECTS**

PROJECT NO.	AUTHOR	TITLE
HOS-03793	Martsof, J.D.	Development and Use of Crop Models for Selected Florida Crops
HOS-03795	Chase, C.D.	Nuclear Genes Regulating Mitochondrial Biogenesis and Function in a Maize Model System
HOS-03822	Bassett, M.J.	Development of Snap Bean Varieties and Genetic Investigations in Common Bean
HOS-03832	Locascio, S.J., Simonne, E.H.	Microirrigation Technologies for Protection of Natural Resources of Natural Resources and Optimum Production
HOS-03846	Brecht, J.K., Huber, D.J., Sargent, S.A.	Postharvest Quality and Safety in Fresh-cut Vegetables and Fruits
HOS-03862	Cline, K.C.	Targeting and Assembly of Thylakoid Membrane Proteins
HOS-03865	Hutchinson, C.M.	Improving Soil and Nutrient Management Practices in Florida to Minimize Environmental Impacts
HOS-03880	Hannah, L.C.	Intron Enhanced Gene Expression in Maize
HOS-03907	Ferl, R. J., Sehnke, P.C.	The Arabidopsis GF 14/14 3-3 Family: Structure and Function
HOS-03920	Lyrene, P. M., Sherman, W.B.	Breeding, Genetics, and Ecology of Florida Blueberries
HOS-03939	Chase, C.A., Rathinasabapathi, B., Stall, W.M.	Improving Weed Management in Horticultural Crops: Biological, Physiological, and Biochemical Approaches.
HOS-03940	Ferl, R.J., Paul, A.L.	Transgenic Plant Biomonitoring of Spaceflight Exposure
HOS-03988	McCarty, D.R., Koch, K.E., Hannah, L.C., Settles, A.M.	Functional Genomics of Endosperm Development in Maize
HOS-03996	Sherman, W.B., Lyrene, P.M.	Deciduous and Subtropical Fruit Crops Cultivar Development
HOS-04003-D	Darnell, R.L., Williamson, J.G., Brunner, B.B., Taylor, T.G.	Environmentally Sound Off-season Production of Raspberry in the Tropics and Subtropics
HOS-04003-S	Sargent, S.A., Brecht, J.K., Huber, D.J., Bartz, J.A., Sims, C.A.	Extending Postharvest Quality of Specialty Tomatoes in the Caribbean Region
HOS-04013	Ferguson, J.J., McSorley, R.T., Scholberg, J., Buhr, K.T.	Integrative Use of Perennial Peanut for Cost-effective Weed Control in Organic Citrus
HOS-04024	Hanson, A.D.	Folate Synthesis, Catabolism, and Engineering in Plants
HOS-04031	Rathinasabapathi, B.	Development of Plant Pathogens as Bioherbicides for Weed Control
HOS-04080	Cantliffe, D.J., Osborne, L.S.	Enhanced Product Quality and Productivity of Vegetables Through Sustainable Protected Agriculture Utilizing Reduced Pesticides
HOS-04080	Vallejos, C.E., Jones, J.B., Stall, R.E.	Identification, Characterization, and Molecular Tagging of a Gene for Resistance to All Tomato Races of Xanthomonas
HOS-04084	Simonne, E.H.	Vegetable Variety Evaluation in Florida
HOS-04108	Hutchinson, C.M.	Development of New Potato Clones for Improved Pest Resistance, Marketability and Sustainability in the Eastern United States
HOS-04109	Klee, H.J.	Functional Genomic Analysis of Fruit Flavor and Nutrition
HOS-04133-H	Huber, D.J., Bartz, J.A.	Shelf Life Extension of Intact and Fresh Cut Tropical Fruit with 1-methylcyclopropene
HOS-04133-K	Klee, H.J., Cantliffe, D.J., Sargent, S.A.	Galia Melon: A New High Quality Shipping Melon for Florida Producers
HOS-04139	Moore, G.A.	Resistance to Citrus Tristeza Virus via Gene Silencing and Plant Resistance Genes
HOS-04160	Davies, F.S., Schaffer, B.A., Crane, J.H., Munoz-Carpena, R., Li, Y.C.	Environmental Physiology and Management of Subtropical and Tropical Fruit Crops in Florida
HOS-04166	Folta, K.M.	Characterization of Light-Sensing Pathways in Plants
HOS-04174	Koch, K.E.	Regulation of Photosynthetic Processes
HOS-04186	Folta, K.M.	Development of Molecular Tools for Improvement of Octoploid Strawberry
HOS-04243	Cantliffe, D.J.	Environmental and Genetic Determinants of Seed Quality and Performance

# PUBLICATIONS

- Basset, G., E. Quinlivan, S. Ravel, F. Rebeille, B. Nichols, K. Shinozaki, M. Seki, L. Adams-Phillips, J. Giovannoni, J. Gregory III and A. Hanson.** 2004. Folate Synthesis in Plants: the P-Aminobenzoate Branch is Initiated by a Bifunctional PabA-PabB Protein that is Targeted to Plastids. *Annual Review of Nutrition*. 101:1496-1501.
- Basset, G., S. Ravel, E. Quinlivan, R. White, J. Giovannoni, F. Rebeille, B. Nichols, K. Shinozaki, M. Seki, J. Gregory III and A. Hanson.** 2004. Folate Synthesis in Plants: The Last Step of the P-aminobenzoate Branch is Catalyzed by a Plastidial Aminodeoxychorismate Lyase. *Plant J.* 40:453-461.
- Booker, J., M. Aldridge, S. Wills, D. McCarty, H. Klee and O. Leyser.** 2004. MAX3/CCD7 is a Carotenoid Cleavage Dioxygenase Required for Synthesis of a Novel Plant Signaling Molecule. *Current Biology*. 14:1232-1238.
- Brecht, J., M. Ritenour and S. Sargent.** 2004. Advances in Temperature Monitoring Management. *American Vegetable Grower*. August:36.
- Brecht, J., M. Saltveit, S. Talcott, K. Schneider and K. Felkey.** 2004. Fresh Cut Vegetables and Fruits. *Fresh Cut Vegetables and Fruits*. 30:185-251.
- Chase, C. and S. Gabay-Laughnan.** 2004. Cytoplasmic Male Sterility and Fertility Restoration by Nuclear Genes. *Molecular Biology and Biotechnology of Plant Organelles*. Springer. pp. 593-622
- Clark, D., C. Dervinis, J. Barrett, H. Klee and J. Jones.** 2004. Drought-Induced Leaf Senescence and Horticultural Performance of Transgenic P-SAG12-IPT Petunias. *J Am Soc Hort Sci*. 129:93-99.
- Clevenger, D., J. Barrett, H. Klee and D. Clark.** 2004. Factors Affecting Seed Production in Transgenic Ethylene-Insensitive Petunias. *J Am Soc Hort Sci*. 129:401-406.
- Coaker, G., T. Meulia, E. Kabelka, A. Jones and D. Francis.** 2004. A QTL Controlling Stem Morphology and Vascular Development in *Lycopersicon Esculentum* x *L. hirsutum* (Solanaceae) Crosses is Located on Chromosome 2. 89(12):1859-1866.
- Daniell, H. and C. Chase.** 2004. Introduction to the Molecular Biology and Biotechnology of Plant Organelles. *Molecular Biology and Biotechnology of Plant Organelles*. Springer.
- Daniell, H. and C. Chase.** 2004. Molecular Biology and Biotechnology of Plant Organelles. Springer.
- Darnell, R., J. Williamson and H. Alvarado.** 2004. Off-season Raspberry Production in a Subtropical Climate. *Acta Hort*. 659:67-71.
- Duval, J., J. Price, G. Hochmuth, W. Stall, T. Kucharek, S. Olson, T. Taylor, S. Smith and E. Simonne.** 2004. Strawberry Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Emond, J. and J. Brecht.** 2004. Development of Quality Curves for Highbush Blueberries as a Function of the Storage Temperature. *Food Products Press*.
- Ergun, M. and D. Huber.** 2004. Suppression of Ethylene Perception Extends Shelf-life and Quality of 'Sunrise Solo' Papaya Fruit at Both Pre-ripe and Ripe Stages of Development. 69:184-192.
- Ezz, T., M. Ritenour and J. Brecht.** 2004. Hot Water and Elevated CO<sub>2</sub> Effects on Proline and Other Compositional Changes in Relation to Post-harvest Chilling Injury of 'Marsh' Grapefruit. *J. Amer. Soc. Hort. Sci.* 129(4):576-582.
- Ferguson, J. and M. Gal.** 2004. A Method to Screen Weed-Suppressing Allelochemicals in Florida Biomass. *Proceedings of the Florida State Horticultural Society*.
- Francis, D., E. Kabelka, J. Bell and B. Franchino.** 2004. Resistance to Bacterial Canker of Tomato in *Lycopersicon hirsutum* LA407 and Inbred Backcross Progeny Derived from Crosses to Cultivated Tomato (*L. esculentum*). 85:1171-1176.
- Gabay-Laughnan, S., C. Chase, V. Ortega and L. Zhao.** 2004. Molecular-Genetic Characterization of CMS-S Restorer-of-Fertility Alleles Identified in Mexican Maize and Teosinte. *Genetics*. 166:959-970.
- Gilreath, P. and W. Stall.** 2004. *Proceedings Florida Tomato Institute*. Citrus and Vegetable Magazine and Vance Publishers.
- Goyer, A., T. Johnson, L. Olsen, E. Collakova, Y. Shachar-Hill, D. Rhodes and A. Hanson.** 2004. Characterization and Metabolic Function of a Peroxisomal Sarcosine and Pipecolate Oxidase from Arabidopsis. *J Biol Chem*. 279:16947-16953.
- Goyer, A., V. Illarionova, S. Roje, M. Fischer, A. Bacher and A. Hanson.** 2004. Folate Biosynthesis in Higher Plants: cDNA Cloning, Heterologous Expression, and Characterization of Dihydroneopterin Aldolases. *Plant Physiol*. 135:103-111.
- Grumet, R., E. Kabelka, S. McQueen, T. Wai and R. Humphrey.** 2004. Characterization of Sources of Resistance to the Watermelon Strain of Papaya Ringspot Virus in Cucumber: Allelism and Co-segregation with Other Potyvirus Resistances. 101:463-472.
- Haman, D. and P. Lyrene.** 2004. Blueberry Response to Irrigation and Ground Cover. *Proc. Fla. State Hort. Soc.*
- Haman, D. and P. Lyrene.** 2004. Use of Tensiometers for Blueberry Irrigation Scheduling. *Proc. Fla. State Hort. Soc.*
- Haman, D., P. Lyrene and R. Pritchard.** 2004. Response of Young Blueberry Plants to Irrigation in Florida. *HortScience*. 32(7):1194-1196.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Evapotranspiration and Crop Coefficients for Young Blueberries in Florida. *Applied Engineering in Agriculture*. 13(2):209-216.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Response of Young Blueberry Plants to Microirrigation in Florida. *Microirrigation for a Changing World: Conserving Resources/Preserving the Environment*. Proceedings of the Fifth International Microirrigation Congress. ASAE.
- Haman, D., R. Pritchard and P. Lyrene.** 2004. Water Use and Irrigation Scheduling of Young Blueberries. *Proc. Fla. State Hort. Soc.*
- Hochmuth, G., D. Maynard, C. Vavrina, W. Stall and T. Kucharek.** 2004. Beet Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 115-116.
- Hochmuth, G., D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Celery Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Hochmuth, R., A. Weiss, E. Simonne and W. Laughlin.** 2004. Using a Polymer Coating on Plastic Mulch to Reduce Permeability to Soil Fumigant. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Hochmuth, R., E. Simonne, G. Hochmuth, M. Dukes and D. Studstill.** 2004. Field Testing of Possible Nitrogen Fertilizer Best Management Practices for Watermelon Grown on Sandy Soils.
- Hochmuth, R., J. Fletcher, M. Sweat, D. Dinkins, A. Tyree, C. Vann, W. Thomas, D. Goode, Jr, C. Starling, J. Breman, J. Jones, E. Simonne and G. Hochmuth.** 2004. Suwannee Valley Water and Nutrient Management Demonstrations.
- Hochmuth, R., L. Davis, W. Laughlin, E. Simonne and R. Sprengel.** 2004. Developing a Production System for Growing Organic Herbs Using Soilless Culture in a Greenhouse. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Hochmuth, R., L. Davis, W. Laughlin, E. Simonne, S. Sargent and A. Berry.** 2004. Evaluation of Twelve Beit-alpha Cucumber Varieties and Two Growing Systems. *Acta Hort*. 659:461-466.
- Hochmuth, R., L. Davis, W. Laughlin, E. Simonne, S. Sargent and A. Berry.** 2004. Evaluation of Twelve Greenhouse Beit-Alpha Cucumber Varieties and Two Growing Systems During 2002-2003 Winter Season in Florida. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Hochmuth, R., L. Davis, W. Laughlin, S. Sargent, A. Berry and E. Simonne.** 2004. The Effect of Abscisic Acid (VBC-30025) on the Acceleration of Ripening of Bell Pepper. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Hochmuth, R., L. Davis, W. Laughlin, S. Sargent, A. Berry and E. Simonne.** 2004. The Effect of Abscisic Acid on the Acceleration of Ripening of Bell Pepper. *North Florida REC - Suwannee Valley*: North Florida REC - Suwannee Valley.
- Hochmuth, R., W. Laughlin and E. Simonne.** 2004. Poblano Pepper Cultivar Evaluation for North Florida in the Spring of 2004. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Hochmuth, R., W. Laughlin and E. Simonne.** 2004. The Effect of Bokashi (a fermented microbial amendment) on the Production and Quality of Cucumber. *North Florida REC - Suwannee Valley*: <http://nfrec.ifas.ufl.edu>.
- Hochmuth, R., W. Laughlin, S. Kerr, L. Davis, E. Simonne, W. Stall, A. Weiss, J. Nance and J. Mirusso.** 2004. Effect of Various Soil Fumigant, Mulch Type, and Herbicide Treatments on Pepper Plant Stand and Control of Nutsedge and Nematodes. *North Florida REC - Suwannee Valley*: <http://nfrec-sv.ifas.ufl.edu>.
- Huber, D., J. Jeong and M. Ritenour.** 2004. The Power of 1: Use of 1-Methylcyclopropene (1-MCP) may Enhance Shelf Life and Quality Retention for Tomatoes and Avocados. *Florida Grower*. April:14.
- Hutchinson, C., D. Gergela and J. White.** 2004. Pumpkin Large Jack-o-Lantern Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:41.
- Hutchinson, C., D. Gergela and J. White.** 2004. Pumpkin Miniature Variety Trial Results - Apopka. *Vegetable Variety Trial Results in Florida for 2003*. S-396.

# PUBLICATIONS

- Hutchinson, C., D. Gergela and J. White.** 2004. Pumpkin Small-Sized Variety Trial Results - Hastings. Vegetable Variety Trial Results in Florida for 2003. S-396:37.
- Hutchinson, C., D. Gergela and J. White.** 2004. Pumpkins Medium Jack-o-Lantern Variety Trial Results - Hastings. Vegetable Variety Trial Results in Florida for 2003. S-396:38.
- Hutchinson, C., E. Simonne, G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Potato Production in Florida. Vegetable Production Guide for Florida. Vance Publishing: Lenexa, KS. pp. 259-268.
- Hutchinson, C., R. Hochmuth and K. Haynes.** 2004. Yield of Potatoes Grown in a Soilless Perlite Production System.
- Jeong, J. and D. Huber.** 2004. Suppression of Avocado (*Persea americana* Mill.) Fruit Softening, and Changes Incell Wall Matrix Polysaccharides and Enzyme Activities: Differential Responses to 1-MCP and Delayed Ethylene Application. 129:752-759.
- Jeong, J., J. Brecht, D. Huber and S. Sargent.** 2004. 1-methylcyclopropene (1-MCP) for Extending Shelf-life and Maintaining Quality of Fresh-cut Tomato. 39:1359-1362.
- Jovичиc, E., D. Cantliffe and P. Stoffella.** 2004. Fruit Yield and Quality of Greenhouse Grown Bell Pepper as Influenced by Density, Container, and Trellis System. HortTechnology. 14:507-513.
- Jovичиc, E., D. Cantliffe, L. Osborne and P. Stoffella.** 2004. Mite Population and Damage Caused by Broad Mites (*Polyphagotarsonemus latus* (Banks) Infesting Bell Pepper (*Capsicum annuum* L.) at Different Seedling Developmental Stages. Proceedings of the Seventh International Symposium on Protected Culture in a Mid-Winter Climate, International Society for Horticulture Science. pp. 339-344.
- Kabelka, E. and R. Grumet.** 2004. Inheritance of Resistance to the Moroccan Watermelon Mosaic Virus in the Cucumber Line TMG-1 and Cosegregation with Zucchini Yellow Mosaic Virus Resistance. 95:237-242.
- Kabelka, E., B. Diers, W. Fehr, A. LeRoy, I. Baianu, T. You, D. Neece and R. Nelson.** 2004. Putative Alleles for Increased Yield from Soybean Plant Introductions. Putative Alleles for Increased Yield from Soybean Plant Introductions. 44:784-791.
- Kabelka, E., B. Franchino and D. Francis.** 2004. Two Loci from *Lycopersicon hirsutum* LA407 Confer Resistance to Strains of *Clavibacter Michiganensis* Subsp. *Michiganensis*. 92(5):504-510.
- Kabelka, E., W. Yang and D. Francis.** 2004. Improved Tomato Fruit Color within an Inbred Backcross Line Derived from *Lycopersicon esculentum* and *L. Hirsutum* Involves the Interaction of Loci. 129(2):250-257.
- Kabelka, E., Z. Ullah and R. Grumet.** 2004. Multiple Alleles for Zucchini Yellow Mosaic Virus Resistance at the Zym Locus in Cucumber. 95:997-1004.
- Karakurt, Y. and D. Huber.** 2004. Ethylene-induced Gene Expression, Enzyme Activities, and Water Soaking in Immature and Ripe Watermelon (*Citrullus lanatus*) Fruit. Ethylene-induced Gene Expression, Enzyme Activities, and Water Soaking in Immature and Ripe Watermelon (*Citrullus lanatus*) Fruit. 161:381-388.
- Karrupiah, K., M. Ritenour, M. Burton, J. Brecht and T. McCollum.** 2004. Short-duration, Hot Water Treatment for the Control of Chilling Injury and Post-harvest Decay in Citrus. Proc. Fla. State Hort. Society. pp. 117.
- Klaus, S., A. Wegkamp, W. Sybesma, J. Hugenholtz, J. Gregory III and A. Hanson.** 2004. A Nudix Enzyme Removes Pyrophosphate from Dihydroneopterin Triphosphate in the Folate Synthesis Pathway of Bacteria and Plants. J Biol Chem.
- Klee, H.** 2004. Ethylene Signal Transduction. Moving Beyond Arabidopsis. Plant Physiol. 135:660-667.
- Klee, H. and D. Clark.** 2004. Ethylene Signal Transduction in Fruits and Flowers. Plant Hormones: Biosynthesis, Signal Transduction, Action!. Kluwer Academic Publishers: Dordrecht: The Netherlands. pp. 369-390.
- Klee, H. and P. Davies.** 2004. Plant Hormones: Biosynthesis, Signal Transduction, Action!. Kluwer Academic Publishers: Dordrecht: The Netherlands.
- Krewer, G., D. Nesmith, J. Williamson, B. Maust and B. Mullinix.** 2004. Ethephon for Bloom Delay of Rabbiteye and Southern Highbush Blueberries. Small Fruits Review.
- Lyrene, P.** 2004. Early Ripening Rabbiteye Blueberries. Proceedings of 2004 Southeastern Blueberry Conference. pp. 113-116.
- Lyrene, P.** 2004. Effect of Weather on Pollination of Southern Highbush Blueberries. Proceedings Southeastern Blueberry Conference. pp. 119-124.
- Lyrene, P.** 2004. Performance de las Nuevas Variedades de Arandanos del Tipo Southern Highbush de Florida. Infoberry. Nov/Dec:38671.
- Lyrene, P. and J. Williamson.** 2004. Blueberry Fruit Set as Related to Relative Humidity in North-central Florida in Spring 2003. Proceedings of the Florida State Horticultural Society. 116:21-24.
- Lyrene, P. and P. Lyrene.** 2004. Flowering and Leafing of Low-chill Blueberries in Florida. Small Fruits Review. 3:375-379.
- Mao, L. and D. Huber.** 2004. Induction of Water-soaking Deterioration in Watermelon Fruit by Ethylene. 30:284-290.
- Mao, L., Y. Karakurt and D. Huber.** 2004. Incidence of Water-soaking and Phospholipid Catabolism in Ripe Watermelon (*Citrullus lanatus*) Fruit: Induction by Ethylene and Prophylactic Effects of 1-Methylcyclopropene. pp. 33.
- Maynard, D., G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Lettuce, Endive, Escarole Production in Florida. Vegetable Production Handbook for Florida. VancePublishing Corporation: Lenexa, KS.
- McCollum, T., P. Stoffella, C. Powell, D. Cantliffe and S. Hanif-Khan.** 2004. Effects of Silverleaf Whitefly Feeding on Tomato Fruit Ripening. Postharvest Biology and Technology. 31:183-190.
- Morales-Payan, J. and W. Stall.** 2004. Effects of Aminolevulinic Acid and Acetylthioproline on Weed-free and Weed-infested St. Augustine Turfgrass. Proc. Fla. State Hort. Soc. pp. 117.
- Morales-Payan, J. and W. Stall.** 2004. Papaya (*Carica papaya*) Transplant Growth is Affected by Trichoderma-based Stimulator. Proc. Fla. State Hort. Soc. pp. 117.
- Morales-Payan, J. and W. Stall.** 2004. Passion Fruit (*Passiflora edulis*) Transplant Production is Affected by Selected Biostimulants. Proc. Fla. State Hort. Soc. pp. 117.
- Moussatche, P. and H. Klee.** 2004. Autophosphorylation Activity of the Arabidopsis Ethylene Receptor Multigene Family. J Biol Chem. 279:48734-48741.
- Olson, S. and E. Simonne.** 2004. Vegetable Production Handbook for Florida. Vance Publishing Corporation: Lenexa, KS.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Onion, Leek, and Chive Production in Florida. Vegetable Production Handbook for Florida. Vance Publishing Corporation: Lenexa, KS.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor, S. Smith and E. Simonne.** 2004. Tomato Production in Florida. Vegetable Production Guide for Florida. Vance Publishing: Lenexa, KS. pp. 301-316.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cole Crop Production in Florida. Vegetable Production Guide for Florida. Vance Publishing: Lenexa, KS. pp. 131-316.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Cucurbit Production in Florida. Vegetable Production Handbook for Florida. Vance Publishing Corporation: Lenexa, KS. pp. 169-197.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Pepper Production in Florida. Vegetable Production Guide for Florida. Vance Publishing: Lenexa, KS. pp. 247-258.
- Olson, S., E. Simonne, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Legume Production in Florida. Vegetable Production Handbook for Florida. Vance Publishing Corporation: Lenexa, KS. pp. 207-217.
- Riad, G., J. Brecht and S. Talcott.** 2004. Browning of Fresh-cut Sweet Corn Kernels after Cooking is Prevented by Controlled Atmosphere Storage. 628:387-394.
- Ritenour, M., K. Karrupiah, R. Pelosi, M. Burton, J. Brecht and E. Baldwin.** 2004. Response of Florida Grapefruit to Short-duration Heat Treatments Using Vapor Heat or Hot Water Dips. Proc. Fla. State Hort. Society. 116:405-409.
- Ritenour, M., S. Sargent and J. Brecht.** 2004. Reducing Water Loss From Fresh Vegetables. American Vegetable Grower. Feb:54.
- Rondon, S., O. Liburd, J. Price, R. Francis and D. Cantliffe.** 2004. Commercial Availability of Predators. EDIS, UF/IFAS. pp. 6.
- Rouse, R. and W. Sherman.** 2004. UF Sun Peach. J. Amer. Pomological Soc.. 58(2):108-110.
- Santos, B., J. Dusky, W. Stall and D. Shilling.** 2004. Influence of Method of Phosphorous application on Smooth Pigweed (*Amaranthus hybridus*) and Common Purslane (*Portulaca oleraceae*) Interference in Lettuce. Weed Science. 52(5):797-801.



# PUBLICATIONS

- Santos, B., J. Dusky, W. Stall and J. Gilreath.** 2004. Effect of Phosphorus Fertilization on Common Lambsquarters (*Chenopodium album*) Duration of Interference in Lettuce (*Lactuca sativa*). *Weed Technology*. 18:152-156.
- Santos, B., J. Dusky, W. Stall and J. Gilreath.** 2004. Effect of Phosphorus Fertilization on the Area of Influence of Common Lambsquarters (*Chenopodium album*) in Lettuce. 18:258 - 262.
- Santos, B., J. Dusky, W. Stall and J. Gilreath.** 2004. Influence of Common Lambsquarter (*Chenopodium album*) Densities and Phosphorus Fertilization on Lettuce. *Crop Protections*. 23:173-176.
- Santos, B., J. Dusky, W. Stall, D. Shilling and J. Gilreath.** 2004. Phosphorus Absorption in Lettuce, Smooth Pigweed (*Amaranthus hybridus*), and Common Purslane (*Portulaca oleraceae*) Mixtures. *Weed Science*. 52(3):389-394.
- Santos, B., J. Dusky, W. Stall, J. Gilreath and D. Shilling.** 2004. Mechanisms of Interference of Smooth Pigweed (*Amaranthus hybridus*) and Common Purslane (*Portulaca oleraceae*) on Lettuce as Influenced by Phosphorus Fertility. *Weed Science*. 52:78-82.
- Sargent, S., M. Ritenour and J. Brecht.** 2004. The Use of Ethylene Gas. *American Vegetable Grower*. May:41.
- Shibuya, K., K. Barry, J. Ciardi, H. Loucas, B. Underwood, S. Nourizadeh, J. Ecker, H. Klee and D. Clark.** 2004. The Central Role of PhEIN2 in Ethylene Responses throughout Plant Development in *Petunia*. *Plant Physiol*. 136:2900-2912.
- Simkin, A., B. Underwood, M. Auldridge, H. Loucas, K. Shibuya, E. Schmelz, D. Clark and H. Klee.** 2004. Circadian Regulation of the PhCCD1 Carotenoid Dioxygenase Controls Emission of Beta-ionone, a Fragrance Volatile of *Petunia* Flowers. *Plant Physiol*. 136:3504-3514.
- Simkin, A., S. Schwartz, M. Auldridge, M. Taylor and H. Klee.** 2004. The Tomato CCD1 Genes contribute to the Formation of the Flavor Volatiles Beta-ionone, Pseudoionone and Geranylacetone. *Plant J*. 40:882-892.
- Simonne, A., E. Simonne, D. Studstill, S. Stapleton, W. Davis, R. Hochmuth and M. Taylor.** 2004. Assessing the Eating Quality of Muskmelon Varieties Using Sensory Evaluation. 116:360-363.
- Simonne, E.** 2004. Drip Irrigation Management for Tomato. *Florida Tomato Institute Proceedings*.
- Simonne, E.** 2004. Fertility Management for Bell Pepper Grown with Plasticulture. *Proceedings Mid-Atlantic Fruit Vegetable Convention*. 1:56-58.
- Simonne, E.** 2004. How do you Determine the N and K Status of Your Tomatoes, Peppers, and Eggplants? Fresh Petiole Sap Testing. *Proceedings Empire State Fruit and Vegetable Expo*. 2:94-96.
- Simonne, E.** 2004. Principles of Nutrient and Water Management to Optimize Tomato, Pepper, and Eggplant Production. *Proceedings Empire State Fruit and Vegetable Expo*. 2:100-103.
- Simonne, E.** 2004. Water Management for Tomato. *Florida Tomato Institute Proceedings*. pp. 51-54.
- Simonne, E. and G. Hochmuth.** 2004. Double Cropping Vegetables Grown with Plasticulture in the BMP era. *Citrus and Vegetable Magazine*. June:N7-N8.
- Simonne, E. and G. Hochmuth.** 2004. Fertilizer and Nutrient Management for Tomato. *Florida Tomato Institute Proceedings*. pp. 55-60.
- Simonne, E. and S. Olson.** 2004. Vegetable Production Guide for Florida. *Vance Publishing: Lenexa, KS*.
- Simonne, E., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, S. Smith and T. Taylor.** 2004. Eggplant Production in Florida. *Vegetable Production Guide for Florida*. *Vance Publishing: Lenexa, KS*. pp. 106-116.
- Simonne, E., D. Maynard, G. Hochmuth, M. Lamberts, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Sweet Potato Production in Florida. *Vegetable Production Guide for Florida*. *Vance Publishing: Lenexa, KS*. pp. 293-299.
- Simonne, E., D. Studstill, R. Hochmuth and J. Jones.** 2004. On-farm Demonstration of Soil Water Movement in Vegetables Grown with Plasticulture.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb.** 2004. Okra Production in Florida. *Vegetable Production Guide for Florida*. *Vance Publishing: Lenexa, KS*. pp. 229-233.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith.** 2004. Sweet Corn Production in Florida. *Vegetable Production Guide for Florida*. *Vance Publishing: Lenexa, KS*. pp. 285-292.
- Simonne, E., M. Dukes and D. Haman.** 2004. Principles and Practices for Irrigation Management. *Vegetable Production Guide for Florida*. *Vance Publishing: Lenexa, KS*. pp. 33-39.
- Simonne, E., R. Hochmuth, D. Studstill and S. Kerr.** 2004. Pumpkin Strip Variety Trial Results - Live Oak.
- Snowden, K., A. Simkin, B. Janssen, K. Templeton, H. Loucas, D. Clark and H. Klee.** 2004. The Dad1/PhCCD8 Gene Affects Branch Production and has a Role in Leaf Senescence, Root Growth and Flower Development. *The Plant Cell*.
- Spann, T., J. Williamson and R. Darnell.** 2004. Photoperiod and Temperature Effects on Growth and Carbohydrate Storage in Southern Highbush Blueberry Interspecific Hybrid. *Journal of the American Society for Horticultural Science*. 129:294-298.
- Stall, W. and J. Gilreath.** 2004. Weed Control in Tomato. *Proc. Fla. Tom. Inst*. 521:61-65.
- Villalta, A. and S. Sargent.** 2004. Response of Beit-Alpha Cucumbers (*Cucumis sativa*) to Continuous Ethylene Exposure.
- Wai, T., J. Staub, E. Kabelka and R. Grumet.** 2004. Linkage Analysis of Potyvirus Resistance Alleles in Cucumber. 88(6):454-458.
- White, J. and C. Hutchinson.** 2004. Gourd Variety Trial Results - Apopka. *Vegetable Variety Trial Results in Florida for 2003*. S-396:6.
- White, J. and C. Hutchinson.** 2004. Potato Chipping Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:30-31.
- White, J. and C. Hutchinson.** 2004. Potato Early-line Chip Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:27-29.
- White, J. and C. Hutchinson.** 2004. Potato Early-line Fresh Market Variety Trial Results - Hastings. *Vegetable Variety Trials in Florida for 2003*. S-396.
- White, J. and C. Hutchinson.** 2004. Potato NE 1014 Regional Project Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396.
- White, J. and C. Hutchinson.** 2004. Potato Red and Purple-skinned Fresh Market Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:16-18.
- White, J. and C. Hutchinson.** 2004. Potato Russet-skinned Fresh Market Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:19-20.
- White, J. and C. Hutchinson.** 2004. Potato Snack Food Association Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:32-33.
- White, J. and C. Hutchinson.** 2004. Potato Statewide Red-skinned Variety Trial Results - Hastings. *Vegetable Variety Trials in Florida for 2003*. S-396:9.
- White, J. and C. Hutchinson.** 2004. Potato White-skinned Fresh Market Variety Trial Results - Hastings. *Vegetable Variety Trial Results in Florida for 2003*. S-396:14-15.
- White, J. and C. Hutchinson.** 2004. Pumpkin Variety Trial Results - Apopka. *Vegetable Variety Trial Results in Florida for 2003*. S-396:34-36.
- White, J. and C. Hutchinson.** 2004. Winter Squash Variety Trial Results - Apopka. *Vegetable Variety Trial Results in Florida for 2003*. S-396:43.
- White, J., C. Hutchinson, C. Lippi, E. Redden and T. Donovan.** 2004. Potato Statewide Red-Skinned Variety Trial Results - Bunnell. *Vegetable Variety Trial Results in Florida for 2003*. S-396:8.
- White, J., C. Hutchinson, T. Olczyk and E. McAvoy.** 2004. Potato Statewide Red-skinned Variety Trial Results - South. *Vegetable Variety Trials in Florida for 2003*. S-396.
- Williamson, J., P. Lyrene and E. Miller.** 2004. Early and Mid-fall Deloiation Reduces Flower Bud Number and Yield of Southern Highbush Blueberry. *Proceedings of the Florida State Horticultural Society*. 116:25-27.
- Yang, W., X. Bai, E. Kabelka, C. Eaton, S. Kamoun, E. van der Knaap and D. Francis.** 2004. Discovery of Single Nucleotide Polymorphisms in *Lycopersicon Esculentum* by Computer Aided Analysis of Expressed Sequence Tags. 14:21-34.

## HORTICULTURAL SCIENCES

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Brecht, J.K.	Produce Safety and Biosecurity - a Multi-state Research, Education and Extension Initiative	Univ. of Georgia	74,872
Brecht, J.K.	Systems Approach to Identifying Critical Handling Steps and Cost-effective Technologies to Maintain Quality of Fresh	U.S. Dept. of Agriculture	100,000
Cantliffe, D.J.	Integrated Application of Beneficial Insects for Reduced Insecticide Use on Strawberry	U.S. Dept. of Agriculture	157,900
Chaparro, J.X.	Genetic Maps of Sweet and Trifoliolate Orange	Univ. of California	21,000
Darnell, R.L.	Environmentally Sound Off-season Production of Raspberry in the Tropics & Subtropics	U.S. Dept. of Agriculture	35,400
Ferl, R.J.	Plant Space Biology Segment Tdi	NASA	230,940
Folta, K.M.	Green Light Sensing, Integration and Response During Photo-Morphogenesis	National Science Foundation	111,174
Hannah, L.C.	Royalty Returns	UF Research Foundation	6,987
Hansen, G.R.	Feed Efficiency in Cattle	U.S. Dept. of Agriculture	207,085
Hanson, A.D.	Transport of Folates and Their Precursors in Plants	Natl. Institutes of Health	145,500
Hanson, A.D.	Collaborative Research: Assigning Gene Function in the Arabidopsis One-carbon Metabolism Network	National Science Foundation	69,779
Hanson, A.D.	Biosynthesis, Recycling, and Functions of Plant Pteridines	U.S. Dept. of Agriculture	200,000
Huber, D.J.	Shelf Life Extension of Intact and Fresh Cut Tropical Fruit with 1-methylcyclopropene	U.S. Dept. of Agriculture	61,905
Hutchinson, C.M.	Utilization of Legumes in Crop Rotation Programs to Reduce Nitrate Leaching from Potato Production into Sensitive Florid	Dept. of Environmental Protect.	299,875
Hutchinson, C.M.	Potato Breeding and Variety Development to Enhance Pest Resistance and Marketing Opportunities in the Eastern U.S.	Univ. of Maine	20,000
Hutchinson, C.M.	Crop Yield, Sap/tissue Analysis for the Controlled Release Fertilizer Field Demonstration Study in the Tri-county	Water Management Districts	37,275
Hutchinson, C.M.	Effects of Fertilizer Types and Fertilization Practices on Potato Production and Nitrogen Release to Surface Waters	Water Management Districts	64,236
Klee, H.J.	Functional Genomic Analysis of Fruit Flavor and Nutrition Pathways	National Science Foundation	1,159,280
Klee, H.J.	'Galia' Melon: a New High Quality Shipping Melon for Florida Producers	U.S. Dept. of Agriculture	100,000
Klee, H.J.	Reu Supplement: functional Genomic Analysis of Fruit Flavor and Nutrition Pathways	National Science Foundation	24,000
Koch, K.E.	Identification and Characterization of Cell Wall Mutants In Maize and Arabidopsis Using Novel Spectroscopies	Purdue University	301,024
McCarty, D.R.	Genetic Analysis of Abscisic Acid Biosynthesis	U.S. Dept. of Energy	218,898
McCarty, D.R.	Functional Analysis of B3 Domain Transcription Factors	National Science Foundation	130,000
McCarty, D.R.	Functional Genomics of Endosperm Development in Maize	National Science Foundation	909,748
Moore, G.A.	Characterization of Antimicrobial Genes and Testing of Their Effectiveness in Transgenic Citrus for Resistance to Citrus	U.S. Dept. of Agriculture	418,935
Moore, G.A.	Resistance to Citrus Tristeza Virus via Gene Silencing and Plant Resistance Genes	U.S. Dept. of Agriculture	116,267
Rondon, S.I.	An Integrated Approach for Reducing Pesticide Risks in Commercial Strawberry Production	Environmental Protection Agcy.	34,166
Rondon, S.I.	Reduced Dependence on Pesticides: Integrating Pest Mgt Tools	North Carolina State Univ.	36,000
Sargent, S.A.	Extending Postharvest Quality of Specialty Tomatoes in the Caribbean Region	U.S. Dept. of Agriculture	35,000

**GRANTS & CONTRACTS**

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Sargent, S.A.	Extending Postharvest Quality to Increase the Competitiveness of Exotic Tropical Fruits and Greenhouse-grown Vegetables	U.S. Dept. of Agriculture	100,000
Scott, J.W.	Identification and Introgression of Silverleaf Whitefly (Bemisia Argentifoli) Resistance Genes from Lycopersicon....	U.S. Dept. of Agriculture	70,000
Simonne, E.H.	Field Testing of Possible Bmps for Vegetables Grown in the Caribbean Bassin	U.S. Dept. of Agriculture	100,000
Simonne, E.H.	Update of UF/IFAS Nitrogen Fertilization and Management Recommendations for Fresh Tomato Production in Florida in the ...	Dept. of Agricul. & Consumer Ser.	93,666
Simonne, E.H.	Field Screening of Sweet Potato Germplasm	Clemson University	5,500
Stall, W.M.	Effects of Nematodes and Weed Interactions on Plant Interference	U.S. Dept. of Agriculture	10,000
Vallegos, C.E.	Identification, Characterization and Molecular Tagging of a Gene for Resistance to All Tomato Races of Xabthomonas	U.S. Dept. of Agriculture	125,688



### 2004 Annual Research Report

*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

The research mission of the Department of Microbiology and Cell Sciences is the pursuit of fundamental research regarding basic life processes. Some of the results of the research have immediate applications while other findings may not be reduced to application for some time. Whatever the case, fundamental research is the foundation upon which all applied applications are built. The Florida Agricultural Experiment Station is somewhat unique in that a basic research unit is a part of its organization. This provides an advantage to applied researchers in IFAS because close linkages and collaborations are possible within this structure, and it greatly enhances information and technology transfer, and the time required for application of basic information is greatly shortened. The research faculty has been quite successful in obtaining extramural funding for project support. At the end of 2004, there was approximately \$5,500,000 of active grants and contracts in place. Although these projects primarily involve faculty members of the Department of Microbiology and Cell Sciences, there are also collaborations with researchers in the College of Veterinary Medicine, the Center for Particle Science and Technology, Horticultural Sciences, Entomology and Nematology, Soil and Water Sciences, and Chemistry at the University of Florida. And there are linkages with Michigan State University, Oakland University, and the University of North Texas.

The Department has a major teaching component, and the breadth of the curriculum has influenced the expertise of the research faculty; most faculty members are engaged in both research and teaching. Departmental research is concentrated mainly into one of two areas; microbial biochemistry and immunology. However, some faculty members do not fit into either of these categories. A major area of research deals with production of fuel alcohol and other useful chemicals from biomass using genetically modified microorganisms. Six researchers conduct research in some aspect of host-resistance to microbial disease. There are other important projects that affect bovine brucellosis (Bang's disease of cattle), food safety, and environmental impact of viruses and bacteria.

The research accomplishments of the Department are disseminated largely by publication in refereed national and international journals. Communication via conferences, scientific meetings, and seminars is also an effective means of sharing our research accomplishments with peers, and other interested parties. The accomplishments of the research program benefit the citizens of Florida, and they also have national and worldwide effects.

## RESEARCH HIGHLIGHTS

**REPLACING PETROLEUM WITH FUEL ETHANOL AND CHEMICALS MADE FROM CROP RESIDUES**

**SIGNIFICANCE:** Over 3 billion gallons of ethanol are currently made from corn starch in the U.S., approximately 2 percent of total U.S. automotive fuel. In gasoline blends, ethanol serves as a fuel extender, an oxygenate to improve air quality, and to increase the octane rating. Over 55 percent of the petroleum needed each year is imported, an amount roughly equivalent to that used as automotive fuel and the single largest item in our national trade imbalance. By utilizing existing technology developed in part at UF-IFAS, it should be possible to replace up to 20 percent of the imported petroleum with renewable fuels and chemicals made from municipal and agricultural biomass residues.

Technology is currently available to convert the carbohydrate polymers in woody biomass (cellulose and hemicellulose) into sugar syrups that can be fermented to ethanol and other chemicals as replacements for imported petroleum. This conversion to sugars involves both cooking with dilute acids and treatment with microbial enzymes. Early studies at UF developed the first biocatalysts that can efficiently convert all of the different sugars in woody biomass into fuel ethanol, and more recently developed additional biocatalysts that produce a variety of single chemicals as products. These new processes are projected to be competitive with petroleum and have been licensed for commercialization. Pilot plants are currently operating in Jennings, LA and Tokyo, Japan. The first large scale biomass to ethanol plant (over 20 million gallons per year) is projected to begin operation in 2007.

**RATIONALE:** By the end of 2005, U.S. production of fuel ethanol from corn starch is projected to exceed 4 billion gallons per year. Technology developed at UF can be used produce an equal amount of fuel ethanol from the inedible corn stems, leaves and cobs. In combination with other undervalued agricultural materials (beet pulp, rice hulls, sugar cane bagasse, peanut hulls, orange pulp, forest residues, etc.) and woody waste (construction waste, residential green waste) now buried in landfills, it should be possible to replace up to 20 percent of the imported petroleum with renewable products such as ethanol, biodegradable plastics, and solvents.

Research at UF-IFAS is currently focusing on improvements in the biocatalysts and processes that can reduce the capital and operating costs of manufacturing renewable chemicals. Cost areas of current focus include developing novel biocatalysts that

function optimally under more extreme conditions (acid environment, elevated temperatures) than yeast currently used for ethanol production from starch. Additional studies are investigating the enzymatic mechanisms and genes concerned with the depolymerization of carbohydrates in biomass into soluble sugars by natural organisms, and including some of these traits in biocatalyst that produce ethanol, lactic acid, and other chemicals.

With industry collaboration, additional research is optimizing aspects of chemical processing to facilitate the most efficient biological fermentation, to minimize the cost of nutrients, and to identify market uses for co-products from biorefineries using woody biomass.

**IMPACT:** The development of new manufacturing in the U.S. to produce fuel ethanol from woody biomass waste will provide new employment, stimulate the economy, reduce our dependence on foreign imported oil, improve air quality, and reduce the problem of solid waste disposal. Additional products such as biodegradable plastics and solvents can also be produced from woody biomass as alternatives to petroleum-based products.

**COLLABORATORS:** This work is being carried out at the University of Florida by a collaborative group of faculty including Dr. Julie Maupin-Furlow, Dr. James F. Preston, Dr. K. T. Shanmugam, Dr. Shengde Zhou, and Dr. Greg W. Luli (Vice President for Research, B.C. International, Dedham, MA). Support for this research is provided by funding from the Department of Agriculture, Department of Energy, Department of Defense, Biotechnology Research and Development Corporation, Consortium for Plant Biotechnology Research, and by B.C. International LLC.

*Lonnie Ingram*



**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Eric W. Triplett	Chair and Prof.				
Phillip M. Achey	Prof. and Acting Program Director	Radiation Biology	100	0	0
Henry C. Aldrich	Prof.	Biological Ultrastructure	50	50	0
Abdolkarim Asghari	Lecturer	Microbiology Lab Instructor	100	0	0
Thomas A. Bobik	Asst. Prof.	Bacterial Genetics	50	50	0
Marian L. Buszko	Assoc. In	Microbiology and MNR	50	50	0
Eva Czamecka	Asst. In	Plant Molecular Biology	0	100	0
Francis C. Davis, Jr.	Assoc. Prof.	Biochem. of Development	70	30	0
Samuel R. Farrah	Prof.	Environmental Microbiology	50	50	0
William B. Gurley	Prof.	Plant Molecular Biology	40	60	0
Jeri J. Houle	Asst. In	Immunology	0	100	0
Lonnie O. Ingram	Distinguished Prof.	Microbiology	15	85	0
Howard M. Johnson	Graduate Research Prof.	Immunology of Lyphokines	15	85	0
Nematollah Keyhani	Asst. Prof.	Bacterial Pathogens	50	50	0
Peter E. Kima	Asst. Prof.	Parasitology	60	40	0
Julie A. Maupin	Assoc. Prof.	Bacterial Physiology	50	50	0
Louise L. Munro	Asst. In	Microbiology Lab Instructor	100	0	0
James F. Preston, III	Prof.	Biological Control, Biomass Degradation	50	50	0
Madeline Rasche	Asst. Prof.	Microbial Protein Biochemistry	50	50	0
Keelnatham T. Shanmugam	Prof.	Bacterial Physiology	50	50	0
Prem S. Subramaniam	Res. Asst. Prof.	Biochemistry	0	100	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
MCS-03691	Maupin, J.A.	Proteasomes in the Archaea
MCS-03703	Preston, J.F.	Role of Adhesin Epitopes on Attachment of <i>Pasteuria</i> Endospores to Phytopathogenic Nematodes
MCS-03798	Preston, J.F.	Biologically Based IPM Systems for Management of Plant-Parasitic Nematodes
MCS-03802	Rasche, M.E.	Biochemistry and Physiology of Methane-producing Microorganisms
MCS-03861	Davis, F.C.	Genetic Engineering of <i>Zymomonas Mobilis</i> for Fuel Ethanol Production
MCS-03979	Ingram, L.O.	Engineering Bacteria for Fuel Ethanol Production
MCS-04000	Gurley, B.W., Gabriel, D.W.	The Signal Transduction Pathway Elicited by Citrus Canker Disease
MCS-04026	Shanmugam, K.T., Ingram, L.O., Maupin-Furlow, J.A., Preston, J.F., Aldrich, H.C.	Biocatalysts for Biomass Conversion to Fuels and Chemicals
MCS-04073	Ingram, L.O., Gurley, W.B., Bobik, T.A., Keyhani, N.O., Jin, S.	Sentinel Plants Utilizing Bacterial Two-Component Signaling Systems
MCS-04080	Preston, J.F., Dickson, D.W., Shanmugam, K.T., Giblin-Davis, R.M.	The Genome of <i>Pasteuria Penetrans</i> : A Blueprint for Developing <i>Pasteuria</i> spp. for the Biocontrol of Plant-parasitic Nematodes
MCS-04105	Farrah, S.R.	Surface Modification for Advancing Separation Processes and Environmental Protection
MCS-04131	Shanmugam, K.T., Davis, F.C., Ingram, L.O., Maupin-Furlow, J.A., Preston, J.F., Aldrich, H.C.	The Science and Engineering for a Biobased Industry and Economy
MCS-04164	Nicholson, W.L.	Resistance of Sporeforming Soil Bacteria to UV Radiation
MCS-04184	Triplett, E.W., Graham, L.E., Kratz, T.K., Armstrong, D.E., Carpenter, S.R.	A Microbial Observatory for the North Temperate Lakes Long Term Ecological Research Site
MCS-04194	Kima, P.E.	Assessment of <i>Leishmania</i> Antigen Presentation by Infected Cells

## PUBLICATIONS

**Bobik, T.A. and M.E. Rasche.** 2004. Purification and Partial Characterization of the *Pyrococcus horikoshii* Methylmalonyl-CoA Epimerase. *Applied Microbiology and Biotechnology*. 63:682-685.

**Bonner, C.A., R.A. Jensen, J.E. Gander and N.O. Keyhani.** 2004. A Core Catalytic Domain of the TyrA Protein Family: Arogenate Dehydrogenase from *Synechocystis*. *Biochemical Journal*. 382:279-291.

**Caccamo, M.A., C.S., Malone, and M.E. Rasche.** 2004. Biochemical Characterization of Dihydropyrimidinase Reductase, A Tetrahydropyrimidinase Biosynthesis Enzyme in *Methylobacterium extorquens* AM1. *J. Bacteriol.* 186:2068-2073.

**Casey, T.B., K.T. Shanmugam, L.P. Yomano and L.O. Ingram.** 2004. Engineering *Escherichia Coli* for Efficient Conversion of Glucose to Pyruvate. *Annual Review of Nutrition*. 101(8):2235-2240.

**Czarnecka-Verner, E., S. Pan, T. Salem and W.B. Gurley.** 2004. Plant Class B HSFs Inhibit Transcription and Exhibit Affinity for TFIB and TBP. *Plant Mol Biol.* 56(1):57-75.

**Davis, J., S. Farrah and A. Wilkie.** 2004. Bacterial Indicator Decimation in Flushed Dairy Manure Wastewater by Ambient Temperature Fixed-film anaerobic Digestion. *Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability*, Proceedings of the 10th World Congress. pp. 1734-1736.

**Duryea, M., J. Mishoe, F. Altpeter, E. Hoffmann and A. Wright.** 2004. Nanotechnology Task Force. IFAS Dean's Office: Gainesville, FL.

**Graham, J.M., A.D. Kent, G.H. Lauster, A.C. Yannarell and E.W. Triplett.** 2004. Seasonal Dynamics of Phytoplankton and Protozoan Communities in a Northern Temperate Humic Lake: Diversity in a Dinoflagellate Dominated System. *Microbial Ecology*. 48:528-540.

**Grosjean, H., V. de Crecy-Lagard and G. R. Bjork.** 2004. Aminoacylation of the Anticodon Stem by a tRNA-Synthetase Paralog: Relic of an Ancient Code? *Trends in Biochemical Sciences*. 29(10):519-22.

**Hasona, A., Y. Kim, F. G. Healy, L.O. Ingram and K.T. Shanmugam.** 2004. Pyruvate Formate Lyase and Acetate Kinase are Essential for Anaerobic Growth of *Escherichia Coli* on Xylose. *J. Bacteriol.* 186(22):7593-7600.

**Hendrickson, T.L.H., V. de Crecy-Lagard and P. Schimmel.** (2004). Incorporation of non Natural Amino Acids into Proteins. *Annu. Rev. Biochem.* 73:147-176.

**Iniguez, A.L., E.A. Robleto, A.D. Kent, and E.W. Triplett.** 2004. Significant Yield Increase in *Phaseolus vulgaris* Obtained by Inoculation with a Trifolitoxin-producing, Hup+ Strain of *Rhizobium leguminosarum* bv. Phaseoli. *Crop Management* (Online Only: <http://www.plantmanagementnetwork.org/pub/cm/review/2004/yield/>, 5 pages).

**Iniguez, A.L., Y. Dong and E.W. Triplett.** 2004. Nitrogen Fixation in Wheat Provided by *Klebsiella Pneumoniae*. *Molecular Plant-Microbe Interactions*. 17:1078-1085.

**Johnson, C.L., M.L. Buszko, M.L. and T.A. Bobik.** 2004. Purification and Initial Characterization of the *Salmonella Enterica* PduO ATP:Cob(I)alamin Adenosyltransferase. *J. Bacteriol.* 186(23):7881-7.

**Johnson, H.M. and P.S. Subramaniam.** 2004. The IFNAR1 Subunit of the Type I IFN Receptor Complex Contains a Functional Nuclear Localization Sequence. *FEBS Letter.* 578(3):207-210.



# PUBLICATIONS

- Johnson, H.M., M.G. Mujtaba, M.R. Ellis, L.O. Flowers, S.M.I. Haider and P.S. Subramaniam.** 2004. Characterization of a Peptide Inhibitor of JAK2 that Mimics SOCS-1 Function. *Journal of Immunology*. 172(12):7510-7518.
- Johnson, H.M., P.S. Subramaniam, S. Olsnes and D.A. Jans.** 2004. Trafficking and Signaling Pathways of Nuclear Localizing Protein Ligands and their Receptors. *Bioessays*. 26(9):993-1004.
- Johnson, H.M., P.S. Subramaniam, L.O. Flowers and S.M. Haider.** 2004. Signal Transduction Mechanism of a Peptide Mimetic of IFN Gamma. *Biochemistry*. 43(18):5445-5454.
- Kaczowka, S.J., C.J. Reuter, L.A. Talarico and J.A. Maupin-Furrow.** 2004. Recombinant Production of *Zymomonas mobilis* Pyruvate Decarboxylase in the Haloarchaeon *Haloferax volcanii*. *Archaea* 1(5).
- Kent, A.D., S.E. Jones, A.C. Yannarell, J.M. Graham, G.H. Lauster, T.K. Kratz and E.W. Triplett.** 2004. Annual Patterns in Bacterioplankton Community Variability in Humic Lake. *Microbial Ecology*. 48:550-560.
- Kima, P.E. and M.E. Rasche.** 2004. Sex Determination Using the Polymerase Chain Reaction. *Biochem. And Molecular Biology Educ.* 32:115-119.
- Kirkland, B.H., E. Cho and N.O. Keyhani.** 2004. Differential Susceptibility of *Amblyomma Maculatum* and *Amblyomma americanum* (Acari:Ixodidae) to the Entomopathogenic Fungi *Beauveria Bassiana* and *Metarhizium anisopliae*. *Biological Control*. 31:414-421.
- Kirkland, B.H., G.S. Westwood and N.O. Keyhani.** 2004. Pathogenicity of Entomopathogenic Fungi *Beauveria bassiana* and *Metarhizium anisopliae* to Ixodidae Tick Species *Dermacentor variabilis*, *Rhipicephalus sanguineus*, and *Ixodes scapularis*. *Journal of Medical Entomology*. 41:705-711.
- Lauderdale, C.V., H.C. Aldrich, A.S. Lindder.** 2004. Isolation and Characterization of a Bacterium Capable of Removing Taste- and Odor-causing 2-Methylisoborneol from Water. *Water Res.* 38(19):4135-42.
- Lawit, S.J. and Czarnecka-Verner.** 2004. Interplay of Eukaryotic General Transcription Factors in Regulation of Transcription In: *Recent Research Developments in Biochemistry* 5, Ed.: S. G. Pandalai, Research Signpost. pp. 173-206.
- Link, L., J. Sawyer, K. Venkateswaran, and W.L. Nicholson.** 2004. Extreme Spore UV Resistance of *Bacillus pumilus* Isolates Obtained from an Ultra-clean Spacecraft Assembly Facility. *Microb. Ecol.* 47:159-163.
- Maughan, H. and W.L. Nicholson.** 2004. Stochastic Processes Influence Stationary-phase Decisions in *Bacillus subtilis*. *J. Bacteriol.* 186:2212-2214.
- Maughan, H.B. Galeano and W.L. Nicholson.** 2004. Novel rpoB Mutations Conferring Rifampicin Resistance on *Bacillus subtilis*: Global Effects on Growth, Competence, Sporulation and Germination. *J. Bacteriol.* 186:2481-2486.
- Maupin-Furrow, J.A., M.A. Gil, I.M. Karadzic, P.A. Kirkland and C.J. Reuter.** 2004. Proteasomes: Perspectives from the Archaea. *Front Biosci.* 9:1743-1758.
- Metzgar, D., J. Bacher, V. Pezo, J. Reader, V. Doring, P. Schimmel, P. Marliere and V. De crecy-Lagard.** 2004. Acinetobacter so. ADP1: An Optimal Model Organism for Genetic Analysis and Genome Engineering. *Nucleic Acids Research*. 32(19):5780-90.
- Nicholson, W.L.** 2004. Extreme Spore UV Resistance of *Bacillus pumilus* Isolates Obtained from an Ultra-clean Spacecraft Assembly Facility. *Microbial Ecology*. 47:159-163.
- Nicholson, W.L.** 2004. Novel rpoB Mutations Conferring Rifampicin Resistance on *Bacillus subtilis*: Global Effects on Growth, Competence, Sporulation, and Germination. *Journal of Bacteriology*. 186:2481-2486.
- Nicholson, W.L.** 2004. Stochastic Processes Influence Stationary-phase Decisions in *Bacillus subtilis*. *Microbial Ecology*. 186:2212-2214.
- Nicholson, W.** 2004. Ubiquity, Longevity, and Ecological Roles of *Bacillus* Spores. *Bacterial Spore Formers: Probiotics and Emerging Applications*. Horizon Bioscience: Norfolk, U.K. pp. 1-15.
- Patel, M., M. Ou, L.O. Ingram and K.T. Shanmugan.** 2004. Fermentation of Sugarcane Bagasse Hydrolysate to L(+) Lactic Acid by a Thermotolerant Acidophilic *Bacillus* sp.. *Biotechnology Letters*. 26:865-868.
- Pezo, V., D. Metzgar, T.L.H. Hendrickson, W.F. Waas, S. Hazebrouck, V. Doring, P. Marliere, P. Schimmel and V. de Crecy-Lagard.** 2004. An Artificially Ambiguous Genetic Code that Confers a Yield Advantage. *Proceedings of the National Academy of Sciences USA*. 101(2):8593-7.
- Rasche, M.E.** 2004. Outcomes of a Research-driven Laboratory and Literature Course Designed to Enhance Undergraduate Contributions to Original Research. *Biochem. and Molecular Biology Educ.* 32:101-107.
- Rasche, M.E., S.A. Wyles and M. Rosenzvaig.** 2004. Characterization of Two Methanopterin Biosynthesis Mutants of *Methylobacterium extorquens* by use of a Tetrahydromethanopterin Bioassay. *Journal of Bacteriology*. 186:1565-1570.
- Reuter, C.J., S.J. Kaczowka and J.A. Maupin-Furrow.** 2004. Differential Regulation of PanA and Pan B Proteasome-activating Nucleotidase and 20S Proteasome Proteins of the Haloarchaeon *Haloferax volcanii*. *J. Bacteriol.* 186:7763-7772.
- Reuter, C.J. and J.A. Maupin-Furrow.** 2004. Analysis of Proteasome-dependent Proteolysis in *Haloferax volcanii* Cells Using Short-lived Green Fluorescent Proteins. *Appl. Envir. Microbiol.* 70:7530-7538.
- Reader, J., D. Metzgar, P. Schimmel and V. de Crecy-Lagard.** 2004. Identification of Four Genes Necessary for Biosynthesis of the Modified Nucleoside Queuosine. *Journal of Biological Chemistry*. 279(8):6280-5.
- Self, W.T., A. Hasona and K.T. Shanmugan.** 2004. Expression and Regulation of a Silent Operon, *Hyf*, Coding for Hgrogenase 4 Isoenzyme in *Escherichia coli*. *J. Bacteriol.* Jan. 186(2):580-7.
- Shukla, V.B., S. Zhou, L. P. Yomano, K.T. Shanmugan, J.F. Preston and L.O. Ingram.** 2004. Production of D(-)-Lactate from Sucrose and Molasses. *Biotechnology Letters*. 26:689-693.
- Underwood, S.A., M.L. Buszko, K.T. Shanmugan and L.O. Ingram.** 2004. Lack of Protective Osmolytes Limits Final Cell Density and Volumetric Productivity of Ethanologenic *Escherichia Coli* KO11 During Xylose Fermentation. *Appl. & Environ. Microbiology*. 70(5):2734-2740.
- Wang, X., J.F. Preston III and T. Romeo.** 2004. The pgaABCD Locus of *Escherichia coli* Promotes the Synthesis of a Polysaccharide Adhesin Required for Biofilm Formation. *J. Bacteriol.* 86(9):2724-34.
- Xie, G., C.A. Bonner, N.O. Keyhani and R.A. Jensen.** 2004. Phylogenetic Evidence for the Lateral Gene Transfer of Several Whole-pathway and Partial-pathway TRP Operons in Bacteria. *BMC Biology*. 2:15.
- Yannarell, A. and E. Triplett.** 2004. Within and Between-lake Variability in the Composition of Bacterioplankton Communities: Investigations at Multiple Spatial Scales. *Applied and Environmental Microbiology*. 70:214-223.

## MICROBIOLOGY & CELL SCIENCE

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
De Crecy-Legard, V.	Elimination of Canonical Amino Acids from <i>Escherichia Coli</i> by Experimental Evolution	National Science Foundation	83,308
Farrah, S.R.	Surface Modification for Advancing Separation Processes and Environmental Protection	National Science Foundation	25,000
Farrah, S.R.	Advanced Separation Processes	National Science Foundation	14,999
Farrah, S.R.	Fellowship for Shannon McQuaig	Biological Consult Ser. of N. Fl.	12,500
Farrah, S.R.	Virus Monitoring of Effluents from Joint Facility	Orange County	29,550
Ingram, L.O.	Sentinel Plants Utilizing Two-component Signaling Pathways	U.S. Dept. of Defense	684,759
Ingram, L.O.	Acid-tolerant Bacterial Biocatalysts	Biotechnology Res. & Dev. Corp.	400,000
Ingram, L.O.	Sentinel Plants Utilizing Bacterial Two-component Signaling Pathways	Colorado State University	90,543
Ingram, L.O.	Ethanol-tolerant Biocatalysts for Fuel Ethanol Production	U.S. Dept. of Energy	200,000
Keyhani, N.	Comparative Analysis of in Vivo and in Vitro Transcripts (ESTS) of <i>Beauveria Bassiana</i>	National Science Foundation	173,179
Nicholson, W.L.	Interplanetary Transfer of Endolithic Bacteria in Impact Ejecta	NASA	34,408
Preston III, J.F.	The Genome of <i>Pasteuria Penetrans</i> : a Blueprint for Developing Biocontrol of Plant-Parasitic Nematodes	U.S. Dept. of Agriculture	41,598
Preston III, J.F.	Biofilm Formation and Dispersal Mechanisms	Emory University	36,375
Preston III, J.F.	Bacterial Conversion of Hemicellulose to Ethanol	Consort for Plant Biotech. Res.	139,973
Rasche, M.E.	Methanopterin Biosynthesis in Archaea and Methylophilic Bacteria	National Science Foundation	309,248
Shanmugam, K.T.	Engineering Thermotolerant Biocatalysts for Biomass Conversion Products	U.S. Dept. of Energy	589,801
Triplett, E.	Genome Sequencing of a Nitrogen-fixing Bacterial Endophyte	Inst. for Genomic Research	146,711

### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The Plant Pathology Department at the University of Florida addresses the diseases that affect an incredible diversity of crops throughout the state of Florida, and worldwide. The diseases, climates, and soil types, constitute a fascinating “laboratory” in which to work and provide unprecedented opportunities for research in Plant Pathology. Our department, which was founded over 50 years ago, has a rich tradition and a long history of excellence in teaching, research, and extension within the state, throughout the nation, and abroad. Our students, faculty, postdoctoral associates, and staff are currently involved in all aspect of plant pathology, ranging from biological control, epidemiology, and ecology to molecular genetics of host-parasite interactions. The research and extension activities of our faculty are supported financially by many national and international granting agencies, industry groups, and growers. Our department is the coordinating institution of the Southern Plant Diagnostic Network (SPDN; <http://spdn.ifas.ufl.edu>) formed after 9-11, to improve our diagnostic capabilities and networking of clinic data for improved pest detection on a national level.

The University of Florida’s Institute of Food and Agricultural Science has a total of 37 faculty, 14 of whom are located in Gainesville and the remainder in 8 Research and Education Centers located strategically throughout the state from Homestead in the extreme south to Quincy in the Florida’s northwestern panhandle. Thus, prospective students have unprecedented opportunities to work with a wide variety of crops ranging from exotic palms, sugarcane, and tropical root crops, fruit and ornamentals to more familiar ones such as tomatoes, strawberries, citrus, pecans, grapes, and turf. Such diversity has important international implications, especially in the tropics, and thus, many of our graduate students are from abroad. In December 2003, we had 28 graduate students, 13 of whom are U.S. citizens and the remainder from the countries of Brazil, Chile, Costa Rica, Hungary, Kuwait, Morocco, Oman, Peru, Philippines, South Africa, Surinam, Turkey, and Venezuela. The University of Florida also has an unusually active undergraduate program, with about 18 students currently majoring in Plant Pathology. This makes our undergraduate Plant Pathology program one of the largest in the country

In addition to the crop diversity and international character of our department, we also have a good blend of applied and basic activity

in our research and extension programs. Some of our graduates have opted to orient their programs towards applied disease control, many of whom now have lucrative careers in industry, academia, and government service. Likewise, our basic molecular programs are very strong, and getting even stronger as new faculty members are added. Graduates working in these areas, too, have already established themselves in the private sector and academia. Our teaching program is also highly effective, both at the graduate and undergraduate levels. We offer a wide variety of courses, including those oriented towards lower division undergraduates with enrollment sizes of 300 or more towards highly specialized graduate courses with much smaller class sizes.

In addition to the crop diversity and international character of our department, we also have a blend of applied and basic activities in our research and extension programs. Some of our graduates have opted to orient their programs towards applied disease control, many of whom now have lucrative careers in industry, academia, and government service. Likewise, our basic molecular programs are very strong, and getting stronger as new faculty members are added. Graduates working in these areas, too, have already established themselves in the private sector and academia. Our teaching program is also highly effective, both at the graduate and undergraduate levels. We offer a wide variety of courses, including those oriented towards lower division undergraduates with enrollment sizes of 900 or more, to highly specialized graduate courses with much smaller class sizes. Our undergraduate Plant Pathology program is one of the largest in the U.S. We also have a new research position at NASA on pathobiology of organisms under extreme environments (i.e., Mars). This program is a joint effort between NASA and our college of agriculture, the Institute of Food and Agricultural Sciences (IFAS). Our department also participates actively in two interdisciplinary programs; the Plant Molecular Cell Biology (PMCB) and the Doctor of Plant Medicine (DPM) programs. Please see our Web site for links to these exciting programs (<http://plantpath.ifas.ufl.edu>). We are optimistic about the future of our department, and hope you enjoy our Web site.

## RESEARCH HIGHLIGHTS

**ENGINEERING RESISTANCE TO TOMATO YELLOW LEAF CURL VIRUS AND OTHER BEGOMOVIRUSES IN TOMATO TO REDUCE PRODUCTION COSTS AND PESTICIDE USE**

The primary goal of my research program is to minimize losses to Florida crops caused by begomoviruses. Begomoviruses are transmitted by whiteflies and cause yield losses in several economically important crops. As of 2005, more than 10 species of begomoviruses have been found in Florida. The tomato industry has been the focus of most of this research program, because tomato has been significantly impacted by several begomoviruses in the last 10 years. The viruses of most importance to Florida tomato production are *Tomato mottle virus* (ToMoV) and *Tomato yellow leaf curl virus* (TYLCV). TYLCV has been the most important virus to infect tomato in Florida since 1997.

TYLCV is a plant virus that can infect many plants but is best known for its negative impact on tomato production. Symptoms of TYLCV in tomatoes appear two to three weeks after infection and include severe stunting, marked reduction in leaf size, upward cupping and yellowing of leaf margins, mottling, and high rates of flower loss. TYLCV is able to spread rapidly from plant to plant, cause high incidences of infected plants, and eliminate yields in tomato. Despite the use of multiple management tactics TYLCV regularly causes economically significant losses in tomato. The impact of TYLCV on tomato production has been well documented in Mediterranean and Caribbean countries where it has been responsible for country-wide crop failures. Although TYLCV is known as a major pathogen of tomato, it can also infect several vegetable, ornamental and weed plant species. TYLCV has caused crop failures in bean production in Spain.

TYLCV is only one of three begomoviruses that can infect tomato in Florida. In 1990 ToMoV appeared and caused economic losses (\$125 million in the 1990-91 production season) for several years. My research program identified TYLCV in Florida in 1997 and a third begomovirus, *Sida golden mosaic Florida virus* (SiGMFV), in a tomato field near Citra, FL in 2002. We determined that ToMoV and SiGMFV came from weeds and appear to be native to Florida while TYLCV was introduced from outside the state. It is highly probable that other begomoviruses will appear in Florida in the future. One that we are watching for is *Potato yellow mosaic virus* (PYMV), which can induce symptoms similar to those of ToMoV but can infect potatoes and peppers as well.

Successful management of TYLCV is difficult. It requires significant changes in production practices, pest management practices, and yield expectations. Currently Florida growers must rely on insecticides to reduce whitefly populations and cultural practices to reduce reservoirs of TYLCV. Insecticides with different modes of actions are used in rotation, with the timing of applications based on the recommendations of pest management advisors. When whitefly populations are high, insecticides must be applied more than once a week. Cultural practices such as sanitation, timing of crops, location of crops, and removal of infected plants are used. In contrast, the use of virus-resistant cultivars would be a long term solution that would be more effective, reduce dependence on chemicals, and consequently lower production cost.

The results from my research program on the diversity and biology of begomoviruses in the Western Hemisphere indicated

that Florida growers needed cultivars resistant to a wide range of begomoviruses (broad-spectrum resistance). This would provide them with the ability to produce tomatoes in the presence of ToMoV, TYLCV, and other begomoviruses that might appear in the future. This production would be possible without the current strong reliance on insecticides. Studies in Israel demonstrated that plants with tolerance to TYLCV, could still act as reservoirs for TYLCV for susceptible cultivars and crops. In order to be most effective cultivars would have to have broad-spectrum and high levels of resistance to begomoviruses. We anticipate that such resistant cultivars would become the cornerstone of begomovirus management programs in tomato production.

All resistance genes in use today are derived from a wild species of *Lycopersicon*. The best known resistance relies on multiple genes with complex inheritances. Such resistances are expensive and time consuming to move into new cultivars. My research program addressed the need for improved resistance by developing a source based on a single dominant gene that provides a level of resistance that resembles immunity. This was accomplished by exploiting a

Jane Polston



**RESEARCH HIGHLIGHTS**

natural host defense system called gene silencing. Gene silencing is a mechanism that all cells use to destroy foreign nucleic acid. Since viruses are made of nucleic acid (plus a little protein) this mechanism can be stimulated to give plants the ability to target and destroy a virus. This is done by inserting (transforming) one of the ToMoV genes into the tomato genome. We used the ToMoV *Rep* (Replicase-associated protein) gene that is essential for virus replication. After inoculation with ToMoV, transformed plants showed no evidence of ToMoV replication. We found that a single copy of the ToMoV *Rep* gene in a tomato cell generated resistance that was stable through five generations. Yields of transformed plants were found to be equivalent to the untransformed plants in the absence of ToMoV and greatly superior to untransformed plants in the presence of ToMoV. This resistance to ToMoV is controlled by a single dominantly inherited gene. This means that this trait can be moved into new horticultural backgrounds quickly and easily unlike other resistance genes.

A similar approach was used to produce high levels of resistance to TYLCV in tomato. Several different modifications of the TYLCV *Rep* gene were transformed into tomato genomes and tested for their ability to confer resistance to TYLCV. Any one

of three modified *Rep* genes were shown to generate high levels of resistance to TYLCV. These plants had normal horticultural phenotypes and were essentially immune to TYLCV; that is they showed no symptoms of infection, and no virus could be detected in inoculated plants. These plants proved to be resistant to the Israeli isolate of TYLCV and one of the modified genes showed broad-spectrum resistance to one other begomovirus.

Virus resistant cultivars can significantly reduce costs and insecticide use in tomato crop production. Genetically engineered virus resistance provides the highest levels of resistance known in tomato and this resistance can easily be moved into new cultivars. Currently, the main barrier to the use of genetically engineered resistance is the cost of licensing. When these costs are reduced, these genes for resistance to ToMoV and TYLCV can be rapidly moved into horticulturally superior inbred lines and made available to Florida growers.

**COLLABORATORS:** E. Hiebert (Professor Emeritus), M. Lapidot, Volcani Ctr. Israel

Support for this research came in part from the Florida Tomato Committee, IFAS Dean for Research Office, Univ. of Florida, USDA-T/STAR, and USDA-CSREES Critical Issues Program.

# PLANT PATHOLOGY

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Gail C. Wisler	Chair and Prof.	Virology	10	80	10
Jerry A. Bartz	Assoc. Prof.	Postharvest Disease	20	80	0
Raghavan Charudattan	Prof.	Biological Control of Weeds	20	80	0
Prem S. Chourey	Prof. Adj.	Molecular Genetics			
Lawrence Datnoff	Prof.	Fungal Plant Pathogens, Silicon Nutrition	80	20	0
Dean W. Gabriel	Prof.	Bacterial/Plant Interactions	20	80	0
Phil Harmon	Asst. Prof.	Ornamentals, Turf and Small Fruit Pathology	0	40	60
Jeffrey B. Jones	Prof.	Bacterial Plant Pathogens	10	90	0
James W. Kimbrough	Prof.	Mycology	50	30	20
Thomas A. Kucharek	Prof.	Field Crops and Vegetable Dis.	0	40	60
Jane E. Polston	Prof.	Virology	80	20	0
Daryl R. Pring	Prof. Adj.	Molecular Genetics			
Jeffrey A. Rollins	Asst. Prof.	Fungal Molecular Biology	20	80	0
Wen-Yuan Song	Asst. Prof.	Molecular Genetics of Disease Resistance	20	80	0
Carol M. Stiles	Asst. Prof.	Fungal Plant Pathogens	70	30	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
PLP-03496	Stall, R.E.	Polyphasic Analysis of Zanthomonads Associated with Horticultural Crop Plants in Florida
PLP-03613	Weingartner, D.P.	Biology and Management of Nematodes Affecting Agronomic and Horticultural Crops
PLP-03846	Bartz, J.A.	Postharvest Quality and Safety in Fresh-Cut Vegetables and Fruits
PLP-03925	Charudattan, R., Datnoff, L.E.	Biological Control of Soilborne Plant Pathogens for Sustainable Agriculture
PLP-03932	Song, W.Y.	Signal Pathways-mediated by the Rice Receptor-like Kinase XA21
PLP-03934	Charudattan, R.	Biological Control of Arthropod Pests and Weeds
PLP-04000-G	Gabriel, D.W.	The Signal Transduction Pathway in Citrus Elicited by Citrus Canker Disease
PLP-04000-J	Jones, J.B., Stall, R.E., Sun, X.	Pathogen Specificity in Xanthomonas Pathogenic on Citrus and use of Bacteriophages for Citrus Canker Control
PLP-04003-B	Bartz, J., Sargent, S., Brecht, J., Huber, D., Sims, C.	Extending Postharvest Quality of Specialty Tomatoes in the Caribbean Region
PLP-04031	Charudattan, R.	Development of Plant Pathogens as Bioherbicides for Weed Control
PLP-04050	Jones, J.B., Momol, T.M., Olson, S.M., Pradhanang, P., Scott, J.W., Miller, S.A.	Integrated Management of Bacterial Diseases on Tomato
PLP-04062	Rollins, J.A.	Mechanisms of Broad Host Range Pathogenicity in Sclerotinia sclerotiorum
PLP-04065	McGovern, R.J., McSorley, R., Wang, K.H., Gallaher, R.N., Kokalis-Burrelle, N.	Effects of Management Practices on Pest, Pathogens and Beneficials in Soil Ecosystems
PLP-04080	Charudattan, R.	Development of a Bioherbicide System to Management Invasive Weedy Grasses in Crops and Natural Areas
PLP-04112	Polston, J.E.	Identification, Characterization and Management of Plant Viruses in Florida and the Western Hemisphere
PLP-04175	Wisler, G.C.	Regional Plant Diagnostic Center Laboratory
PLP-04232	Schuerger, A.C.	Extraterrestrial Biology: Can Terrestrial Microorganisms and Plants Germinate, Grow, Replicate, and Adapt to the Martian Environment

# PUBLICATIONS

- Anith, K., T. Momol, J. Kloepfer, J. Marois, S. Olson and J. Jones. 2004. Efficacy of Plant Growth-promoting Rhizobacteria, Acibenzolar-S-methyl, and Soil Amendment for Integrated Management of Bacterial Wilt on Tomato. *Plant Disease*. 88:669-673.
- Chandramohan, S., J. Shine, M. Duchrow, E. Roskopf and R. Charudattan. 2004. A Bioherbicide System to Manage Guinea Grass (*Panicum maximum* Jacq.) in Sugarcane in Florida. *Sugar Cane International*. 22(2):28-30.
- Charudattan, R. 2004. Biological Control of Weeds. *Impact*. 21(1):19-20.
- Charudattan, R. 2004. Tropical Soda Apple. *Impact*. 20(2):12.
- Clark, D., C. Dervinis, J. Barrett, H. Klee and J. Jones. 2004. Drought-induced Leaf Senescence and Horticultural Performance of Transgenic P-SAG12-IPT *Petunias*. *J Am Soc Hort Sci*. 129:93-99.
- Datnoff, L., W. Elmer and D. Huber. 2004. Mineral Nutrition and Plant Disease. *American Phytopathological Society*: St. Paul, MN.
- Ding, X., G. Cory and W. Song. 2004. A High-throughput System to Verify Candidate Interactors from Yeast Two-hybrid Screening Using Rolling Circle Amplification. *Analytical Biochemistry*. 331:195-197.
- Duval, J., J. Price, G. Hochmuth, W. Stall, T. Kucharek, S. Olson, T. Taylor, S. Smith and E. Simonne. 2004. Strawberry Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Elliott, M., T. Broschat, J. Uchida and G. Simone. 2004. Compendium of Ornamental Palm Diseases and Disorders. *APS Press*: St. Paul, Minn.
- Guven, K., J. Jones, T. Momol and E. Dickstein. 2004. Phenotypic and Genetic Diversity Among *Pseudomonas Syringae* pv. *Phaseolica*. *J. Phytopathology*. 152:658-666.
- Harmon, P. and C. Harmon. 2004. Camellias and Sudden Oak Death: A New Threat to Your Landscape? *The Camellia Journal*. Sept-Nov: 38354.
- Harmon, P. and R. Latin. 2004. Winter Survival of the Perennial Ryegrass Pathogen *Magnaporthe Oryzae* in North Central Indiana. *Plant Disease*.
- Hochmuth, G., D. Maynard, C. Vavrina, W. Stall and T. Kucharek. 2004. Beet Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 115-116.
- Hochmuth, G., D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb. 2004. Celery Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Hodges, A., C. Harmon and L. Osborne. 2004. The Grower's Role in Protecting the U.S. from Exotic Pest Invasions. *Society of American Florists*.
- Hutchinson, C., E. Simonne, G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Potato Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 259-268.
- Jones, J., J. Cubero, T. Gottwald, J. Graham Jr, W. Dixon, T. Schubert, P. Chaloux, V. Stromberg, G. Lacy and B. Sutton. 2004. Detection and Characterization of a New Strain of Citrus Canker Bacteria from Key/Mexican Lime and Alemow in South Florida. 88:1179-1188.
- Kimbrough, J. 2004. Shell and Systemic Hyalohyphomycosis in Fly River Turtles Caused by *Paecilomyces lilacinus*. pp. 34.
- Latin, R. and P. Harmon. 2004. Managing Gray Leaf Spot in the Midwest. *Golf Course Management*. 72(10):89-92.
- Maynard, D., G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb. 2004. Lettuce, Endive, Escarole Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Momol, T. and J. Jones. 2004. Proceedings of the First International Symposium on Tomato Diseases - *Acta Horticulturae*. International Society for Horticultural Sciences (ISHS).
- Momol, T., B. Lockhart, H. Dankers and S. Adkins. 2004. Canna Yellow Mottle Virus Detected in Canna in Florida. *Plant Health Progress*.
- Momol, T., M. Balaban, F. Korel, A. Odabasi, E. Momol, G. Folkes and J. Jones. 2004. Discrimination of Plant Pathogenic Bacteria using an Electronic Nose. *Plant Health Progress*.
- Momol, T., P. Ji, K. Pernezy, R. McGovern and S. Olson. 2004. Tomato Soilborne Diseases and Florida Plant Diagnostic Network (FPDN). *Proceedings Florida Tomato Institute*. pp. 521.
- Nodzon, L. and W. Song. 2004. Yeast Two-hybrid Technology. *Encyclopedia of Plant and Crop Science*. Marcel Dekker, Inc.: New York. pp. 1302-1304.
- Nodzon, L., W. Xu, Y. Wang, L. Pi, P. Chakraborty and W. Song. 2004. The Ubiquitin Ligase Xbat-32 Regulates Lateral Root Development in Arabidopsis. *The Plant Journal*. 40:996-1006.
- Obadovic, A., J. Jones, T. Momol, B. Balogh and S. Olson. 2004. Management of Tomato Bacterial Spot in the Field by Foliar Applications of Bacteriophages and SAR Inducers. *Plant Disease*.
- Obadovic, A., J. Jones, T. Momol, S. Olson, L. Jackson, B. Balogh and K. Guven. 2004. Integration of Biological Control Agents and Systemic Acquired Resistance Inducers Against Bacterial Spot on Tomato. *Plant Disease*.
- Obadovic, A., O. Mavridis, K. Rudolph, J. Jones, G. Minsavage and J. Wang. 2004. Characterization and PCR-based Typing of *Xanthomonas Campestris* pv. *Vesicatoria* Pepper and Tomato Pathogen in Serbia. 110:285-292.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek and S. Webb. 2004. Onion, Leek, and Chive Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS.
- Olson, S., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor, S. Smith and E. Simonne. 2004. Tomato Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 301-316.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Cole Crop Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 131-163.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Cucurbit Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 169-197.
- Olson, S., E. Simonne, D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Pepper Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 247-258.
- Olson, S., E. Simonne, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Legume Production in Florida. *Vegetable Production Handbook for Florida*. Vance Publishing Corporation: Lenexa, KS. pp. 207-217.
- Roberts, P., T. Kucharek, P. Gilreath, H. Yonce, J. Jones and G. McAvoy. 2004. Update on Diseases of Tomato. *Citrus & Vegetable Magazine*.
- Rodrigues, F.A., L. Datnoff, N. Benhamou, J. Jones and R. Belanger. 2004. Ultrastructural, Cytochemical and Biochemical Aspects of Silicon-mediated Rice Blast Resistance.
- Roskopf, E., C. Yandoc and R. Charudattan. 2004. Genus-specific Host Range of *Phomopsis amaranthicola* (Sphaeropsidales), a Bioherbicide Agent for *Amaranthus* spp. *Biocontrol Science and Technology*.
- Scott, J., S. Olson, J. Bartz, D. Maynard and P. Stoffella. 2004. Fla. 7964 Hybrid Tomato Resistant to Tomato Spotted Wilt Virus. *Rep. Tomato Genet. Coop* 54:51.
- Simonne, E., D. Maynard, G. Hochmuth, C. Vavrina, W. Stall, T. Kucharek, S. Webb, S. Smith and T. Taylor. 2004. Eggplant Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 199-206.
- Simonne, E., D. Maynard, G. Hochmuth, M. Lamberts, C. Vavrina, W. Stall, T. Kucharek and S. Webb. 2004. Sweetpotato Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 293-299.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek and S. Webb. 2004. Okra Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 229-233.
- Simonne, E., G. Hochmuth, D. Maynard, C. Vavrina, W. Stall, T. Kucharek, S. Webb, T. Taylor and S. Smith. 2004. Sweet Corn Production in Florida. *Vegetable Production Guide for Florida*. Vance Publishing: Lenexa, KS. pp. 285-292.
- Stiles, C., G. Miller and R. McGovern. 2004. The Doctor of Plant Medicine Takes Root in UF IFAS. *Florida Turf Digest*. 21(5):22-24.
- Wang, K., R. McGovern, R. McSorley and R. Gallaher. 2004. Cowpea Cover Crop and Solarization for Managing Root-knot and Other Plant-parasitic Nematodes in Herb and Vegetable Crops. *Soil Crop Sci. Soc. Florida Proc*. 63:99-104.
- Wyss, G., R. Charudattan, E. Roskopf and R. Littell. 2004. Effects of Selected Pesticides and Adjuvants on Germination and Vegetative Growth of *Phomopsis Amaranthicola*, a Biocontrol Agent for *Amaranthus* spp. *Weed Research*. 44:469-482.

## PLANT PATHOLOGY

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Charudattan, R.	Biological Control of Imperata Cylindrica in West Africa Using Fungal Pathogen	Intl. Inst. of Tropical Agricul.	123,000
Charudattan, R.	Large-scale Field Trials Using Alternaria Destruens for Control of Dodder (Cuccuta Pentagon) in the Cover Crop.....	U.S. Dept. of Agriculture	22,000
Charudattan, R.	Field Evaluaton Studies of Dacylaria Higginsii as a Component in an Integrated Approach to Pest Management	U.S. Dept. of Agriculture	20,000
Charudattan, R.	Development of a Bioherbicide System to Manage Invasive Weedy Grasses in Crops and Natural Areas	U.S. Dept. of Agriculture	59,920
Datnoff, L.E.	Ecology, Pathogenicity and Management of Bipolaris and Curvularia Fungal Species Assoc with Decline of Ultradwarf	Golf Course Supers Assn	30,000
Gabriel, D.W.	Towards a Dna Microarray Chip for Early & Rapid Detectin of Multiple Quarantined Pathogens	U.S. Dept. of Agriculture	385,958
Gabriel, D.W.	Complementation Vector with Increased Stability in Xylella	Univ. of California	67,936
Jones, J.B.	Identification of Bacteria by Fatty Acid Profiles	Multiple Sources	15,525
Jones, J.B.	The Effect of Chromosomal Transfer and Mutational Analysis on Pathogen Specificity in Strains of Xanthomonas Pathogenic	U.S. Dept. of Agriculture	386,328
Jones, J.B.	Biological Control by Deployment of Bacteriocin Producing and Weakly Pathogenic Strains	U.S. Dept. of Agriculture	100,000
Koenig, R.L.	What Service Providers must Know about Organic Rules and Regulations	Univ. of Georgia	133,762
McGovern, R.J.	Management of Tropical Fruit Fly Species Pink Hibiscus Mealybug and Other Invasive Pests	U.S. Dept. of Agriculture	15,050
McGovern, R.J.	Integrated Management of Fusarium in Florists' Crops	Am. Floral Endowment	17,000
Moml, T.M.	Management of Bacterial Spot and Bacterial Wilt on Fresh Market Tomatoes in the Caribbean	U.S. Dept. of Agriculture	99,174
Polston, J.E.	Developing Multiple Viral Resistance in Tomato to Tropical Plant Viruses	U.S. Dept. of Agriculture	40,000
Polston, J.E.	Developing Rapid, Regulatory and Market Acceptable Transformation Protocols for Vegetable Crops	U.S. Dept. of Agriculture	100,000
Rollins, J.A.	Application of Genomic Technology to the Analysis of Gene Expression in Sclerotinia	U.S. Dept. of Agriculture	70,800
Rollins, J.A.	Regulation of Apothecial Morphogenesis in Sclerotinia Sclerotiorum	U.S. Dept. of Agriculture	200,000
Song, W.	Transformation of Citrus with Xanthomonas Resistance Genes for the Control of Citrus Canker	U.S. Dept. of Agriculture	279,452
Song, W.	Protein Interaction Map for Rice Kinases	Univ. of Nebraska	297,898
Wisler, G.C.	Regional Plant Diagnostic Center Laboratory	U.S. Dept. of Agriculture	1,667,067
Wisler, G.C.	Molecular Studies on Sugar Utilization in Maize and Sorghum	U.S. Dept. of Agriculture	45,000
Wisler, G.C.	Npdn Regional Center Plant Diagnostics Facility: Supplemental Soybean Rust Diagnosis	Cornell University	72,000



### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

Soil and water are among the most important of all natural resources. Maintaining soil and water quality is essential to sustainable agricultural productivity and protection and conservation of natural resources. The interdisciplinary nature of Soil and Water Science Department (SWSD) programs provides students and faculty an opportunity to conduct basic and applied research at multiple (molecular to landscape) scales to solve environmental problems and protect and manage land and water resources. The SWSD is organized as an academic unit within the University of Florida's Institute of Food and Agricultural Sciences (UF/IFAS). Responsibilities of this unit include academic programs, research, extension education, and scientific/professional/community service. Our teaching, research, and extension/outreach programs are conducted in a wide range of ecosystems including: agricultural lands, forested lands, rangelands, urban lands, wetlands, and shallow lakes and estuaries. The Department consists of faculty, staff, and students on campus, plus faculty located at various UF/IFAS Research and Education Centers statewide who are tenure-acruing in Soil and Water Science.

The SWSD programs are designed to meet the changing needs of our clientele at state, national and international levels. The SWSD's programs are focused in five thrust areas:

- **MANAGEMENT OF NUTRIENTS, PESTICIDES, AND WASTES:** Soil-water-plant relationships; rhizosphere processes; fate and transport; waste management (animal wastes, biosolids, and composts); turfgrass fertility; hydrology; and groundwater quality

- **REMEDIATION OF CONTAMINATED SOILS, WATERS, AND AQUIFERS:** Fate and transport; bio/phytoremediation; molecular microbial ecology; hydrology; and groundwater quality
- **SOIL QUALITY AND ECOLOGICAL INDICATORS:** Soil morphological indicators; chemical contributors and indicators; microbial contributors and indicators; and ecosystem restoration
- **SOIL-LANDSCAPE ANALYSIS:** Soil genesis and classification; pedologic processes; landscape hydrology; soil and water chemical processes; soil and water microbial processes; and risk assessment
- **WETLANDS AND AQUATIC SYSTEMS:** Hydric soils; wetland delineation; wetland ecology; soil-water-plant relationships; hydrology; molecular microbial ecology; biogeochemistry; restoration of wetlands and lakes; and surface water quality

The SWSD extension faculty translate current, relevant soil and water science knowledge into user-friendly formats for Florida residents, visitors, industry, business, governmental agencies and county agents. These emphasize the SWSD's five thrust areas and 10 of the Florida cooperative Extension Service's State Major Programs (SMPs). The SWSD faculty's basic and applied research supports extension efforts by addressing current and anticipated land, soil, and water resource uses and potential environmental problems.

For more information, visit our Web site at: <http://soils.ifas.ufl.edu>.

*K. Ramesh Reddy, Chairman*

## RESEARCH HIGHLIGHTS

## ENVIRONMENTAL HYDROLOGY RESEARCH

BY J.W. JAWITZ

**SIGNIFICANCE:** There is expanding demand for freshwater resources to provide drinking water for the growing population and irrigation water for agriculture, with simultaneous pressure to prevent pollution and leave enough water for natural ecosystem functions. These combined pressures define the need for sustainable water resource management. Protection and management of water resources requires the assessment of ecosystem degradation resulting from human activities, and the implementation of measures for the reduction and amelioration of current impacts.

Groundwater resources throughout the United States are currently threatened by uncontrolled releases of anthropogenic contaminants such as petroleum hydrocarbons and chlorinated solvents. The National Research Council in 1997 estimated that there were an estimated 300,000 to 400,000 contaminated sites in the U.S. with cleanup costs as high as \$500 billion to \$1 trillion. Surficial aquifers throughout Florida are threatened by chemical spills, pesticide leaching, landfills, and leaking underground storage tanks.

Thousands of U.S. lakes and reservoirs, covering several million acres of water surface, have become degraded by excess nutrient loading to the extent that some type of activity is necessary to make them more usable as resources and ecosystems. Adverse effects from excess nutrient loading are manifested across multiple scales, from the eutrophication of small lakes, to the development of a hypoxic zone in the Gulf of Mexico resulting from discharges from the Mississippi River basin. Between 1994 and 2001, Florida taxpayers invested \$60 million in efforts to reduce nutrient inflows from the Everglades Agricultural Area to the Everglades. The Comprehensive Everglades Restoration Plan (CERP), in compliance with the Everglades Protection Act of 1991, comprises a suite of restoration and nutrient reduction projects that span 35 years with an estimated cost of \$7.8 billion dollars.

**RATIONALE:** Remediation of contaminated soils, waters and aquifers is one of the key research thrust areas in the Soil and Water Science Department. Within this thrust area we emphasize assessing and remediating human impacts on hydrologic ecosystems. Hydrologic systems of particular interest include groundwater resources that are threatened by uncontrolled releases of anthropogenic contaminants such as petroleum hydrocarbons and chlorinated solvents, and surface water bodies such as rivers, lakes, and wetlands whose ecological integrity has been compromised by excess nutrient loading.

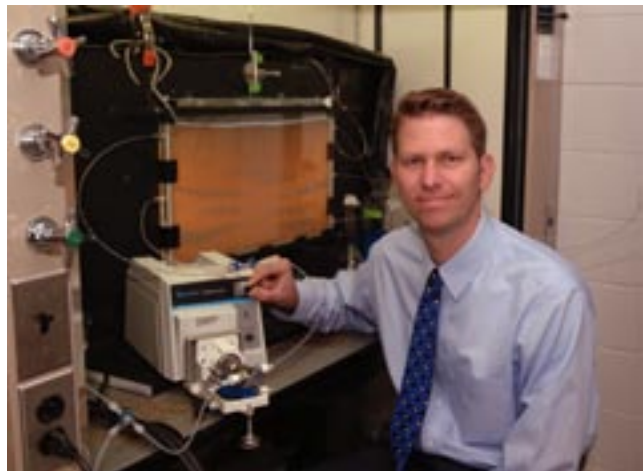
**IMPACT:** *Groundwater contamination.* Our group has participated in several field-scale studies demonstrating the clean-up of aquifers contaminated by oils and other carcinogens such as trichloroethylene. In most of these studies, more than 70 percent of the contaminants were removed from the subsurface by remedial technologies. However, the benefit of partial clean-up of contaminated sites has been a contentious issue in both the scientific and regulatory communities. Our recent laboratory and mathematical modeling studies have extended these field results by analyzing the risk reduction accrued by partial removal of contaminants from aquifers. We have demonstrated that the contaminant elution dynamics are controlled by the combined effects of spatial

heterogeneities in the aquifer hydrodynamic properties and the contaminant location. Our laboratory, modeling, and field results indicate that the degree of spatial variability found at real field sites will lead to measurable risk reductions with even moderate reductions in the amount of contaminant mass present. It is hoped that these results will stimulate the further implementation of remedial technologies at contaminated sites.

*Wetland restoration.* Our research group has developed a mathematical model to describe the coupled effects of both hydrologic and biogeochemical processes in wetlands systems. This model was used to predict phosphorus mobility in the northern Everglades, where over the past several decades, agricultural drainage waters discharged into the northern Everglades have been enriched in phosphorus (P) relative to the historic rainfall-driven inputs. Phosphorus enrichment has occurred in natural soils, and the open water sloughs have become colonized by monospecific stands of cattails. While methods of reducing total P concentrations in the discharge water have been actively pursued, the effects of low-P water moving over the enriched soils have not been fully addressed. Model results suggest that if the proposed input concentration limit of 10 ppb total P is met, the soil-P will be released such that the impacted region will expand spatially. Although P movement through the marsh is slow due to biological sequestration, eventually all of the load over the past several decades will become mobilized through diffusion into the low-P water column. The release of soil P is expected to result in water column concentrations of greater than 10 ppb for over 100 years after inflow targets are met. These results have implications for resource managers who may consider restoration alternatives such as physically isolating the impacted region to retain the accrued P in the soil.

**COLLABORATORS:** This research program has involved a diverse group of scientists from the following academic departments and organizations: Soil and Water Science (K. Ramesh Reddy), Agricultural and Biological Engineering (Wendy Graham, Kenneth Campbell, Rafael Munoz-Carpena), Environmental Engineering

Dr. James Jawitz



## SOIL & WATER SCIENCE

### RESEARCH HIGHLIGHTS

Sciences (Michael D. Annable, William R. Wise), Civil, Coastal, and Oceanographic Engineering (Kirk Hatfield), Materials Science and Engineering (Brent P. Gila), Louisiana State University (John R. White) Clemson University (Ronald Falta), South Florida

Water Management District (Jana Majer-Newman, Eric Flaig), US Geological Survey (Christian Langevin), and US Environmental Protection Agency (A. Lynn Wood, Carl Enfield).

### FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
K. Ramesh Reddy	Chair and Graduate Research Prof.	Wetland Biogeochemistry/Water Quality	30	60	10
Mark Clark	Asst. Prof.	Wetland Ecology/ Water Quality	0	30	70
Mary E. Collins	Prof.	Environmental Pedology	75	25	0
Nicholas B. Comerford	Prof.	Forest Soils	30	70	0
Donald A. Graetz	Prof.	Environmental Chemistry	40	60	0
Sabine Grunwald	Asst. Prof.	Land Resources	40	60	0
Willie G. Harris, Jr.	Prof.	Soil Genesis and Mineralogy	30	70	0
James Jawitz	Asst. Prof.	Soil Physics/Hydrology	30	70	0
Lena Q. Ma	Assoc. Prof.	Trace Metal Biogeochemistry	30	70	0
Sambasiva R. Mylavarapu	Asst. Prof.	Soil Nutrient Management	5	25	70
Vimala D. Nair	Research Asst. Prof.	Environmental Chemistry	0	100	0
Peter Nkedi-Kizza	Prof.	Soil Physics/Hydrology	20	80	0
Tom Obreza	Prof.	Nutrient Management	0	30	70
George A. O' Connor	Prof.	Soil Chemistry	20	80	0
Andrew V. Ogram	Assoc. Prof.	Microbial Ecology and Molecular Biology	30	70	0
Li-Tse Ou	Scientist	Microbiology - Bioremediation	0	100	0
Hugh L. Popenoe	Prof.	Soil Chemistry, Tropical Soils	25	75	0
Roy D. Rhue	Prof.	Soil Physical Chemistry	30	70	0
Jerry B. Sartain	Prof.	Soil Fertility, Turf Nutrient Management	30	60	10
James O. Sickman	Asst. Prof.	Biogeochemistry	30	70	0
John R. White	Research Asst. Prof.	Wetland Biogeochemistry	25	75	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
SWS-03805	Nkedi-Kizza, P.	Predicting the Fate and Transport of Organic Pesticides in Soils with Emphasis on Calcareous Soils of South Florida
SWS-03920	Collins, M.E.	Pedological Research in Florida
SWS-03834	O'Connor, G.A.	Chemistry and Bioavailability of Waste Constituents in Soils
SWS-03865	Mylavarapu, R.S.	Improving Soil and Nutrient Management Practices in Florida to Minimize Environmental Impacts
SWS-03897	Sylvia, D.M.	Soil Microbial Taxonomic and Functional Diversity as Affected by Land Use and Management
SWS-03898	Harris, W.G., Nair, V.D., Rhue, R.D., Graetz, D.A., Kidder, G., Mylavarapu, S.R.	Management Practices in Florida to Minimize Environment Impact
SWS-03900	Nair, V.D., Graetz, D.A.	Environmental Impacts of Agroforestry Systems
SWS-03917	Jawitz, J.W., Ogram, A.V., Ou, L.T., Hornsby, A.G.	Reducing the Potential for Environmental Contamination by Pesticides and Other Organic Chemicals
SWS-03919	Ou, L.T., Ogram, A.V.	Mechanisms and Mitigation of Agrochemical Impacts on Human and Environmental Health
SWS-04015	Wilkie, A.C.	Animal Manure and Waste Utilization, Treatment and Nuisance Avoidance for a Sustainable Agriculture
SWS-04016	Jawitz, J.W.	Development and Evaluation of TMDL Planning and Assessment Tools and Processes
SWS-04020	Jawitz, J.W.	Assessment and Remediation of Anthropogenic Impacts to Hydrologic Ecosystems
SWS-04027	Clark, M.W., Reddy, K.R., DeBusk, W.F., Harris, W.G.	Environmental Feedback Mechanisms Influencing Sediment Accretion and Vegetative Community Development in Shark River Slough
SWS-04043	Ma, L.Q.	Remediation of Soils Contaminated With Trace Metals
SWS-04056	Grunwald, S., Graetz, D.A., Comerford, N.B., Clark, M.W., Reddy, K.R., Graham, W., Annable, M., Wise, W., Shatar, T., Bishop, T.A.	GIS-Based Spatial Modeling Applied to Land Resource Management
SWS-04058	Harris, W.G., Nair, V.D., Graetz, D.A., Hall, M.D.	Manure-Derived Components and Their Influence on Long-Term Phosphorus Stability in Soils
SWS-04061	Grunwald, S., Graetz, D.A., Comerford, N.B., Brown, R.B., Clark, M.W.	Geo-Temporal Estimation and Visualization of Nitrogen in a Mixed-Use Watershed
SWS-04071	Jawitz, J.W., White, J.R., Annable, M.D., Hatfield, K.	In-Situ Quantification of Surface Water and Groundwater Nutrient Fluxes from Agricultural Watersheds
SWS-04085	Reddy, K.R., Graham, W.D., Campbell, K.L., Clark, M.W., Chambliss, C.G., Graetz, D.A., Jawitz, J.W., Hodges, A.W., O'Connor, G.A., Nair, V.D., Shukla, S., Grunwald, S.	Hydrologic and Biogeochemical Processes Regulating Phosphorus Retention in the Lake Okeechobee Drainage Basin

# PUBLICATIONS

- Allen, S., S. Jose, R. Nair, B. Brecke, P. Nkedi-Kizza and C. Ramsey. 2004. Safety Net Role of Tree Roots: Evidence from a Pecan (*Carya illinoensis* K. Koch)-Cotton (*Gossypium hirsutum* L.) Alley Cropping System in the Southern United States. *Forest Ecology and Management*. 192:395-407.
- Becker, B., D. Rockwood, L. Ma, J. Isebrands, R. Hall, N. Brown, C. Lin and R. Lange. 2004. Poplar, Eucalypt, and Willow Genotypes for PCE, TCE, Toluene, and Arsenic Dendroremediation Systems. In: *Proceedings 1st World Congress of Agroforestry 2004*.
- Brandt, R., H. Elliott and G. O'Connor. 2004. Water Extractable P in Biosolids: Implications for Land-based Recycling. *Water Environment Research*. 76:121-129.
- Brunland, G., S. Grunwald, T. Osborne and K. Reddy. 2004. Geostatistical Analyses of Soil Properties in Water Conservation Area 3, South Florida. pp. 28.
- Chauhan, A., A. Ogram and K. Reddy. 2004. Syntrophic-Methanogenic Associations Along a Nutrient Gradient in the Florida Everglades. *Applied Environ*. 70:3475-3484.
- Comerford, N. and N. Barros. 2004. Phosphorus Nutrition of Forest Trees. *Phosphorus: Agriculture and the Environment*.
- Corstanje, R. and K. Reddy. 2004. Response of Biogeochemical Indicators to a Drawdown and Subsequent Reflood. *Journal of Environmental Quality*. 33:2357-2366.
- Corstanje, R., S. Grunwald, T. Osborne and K. Reddy. 2004. Characterization of the Spatial Distribution and Uncertainty of Soil Properties in Water Conservation Area 1, South Florida.
- Cropper Jr, W. and N. Comerford. 2004. Optimizing Simulated Fertilizer Additions Using a Genetic Algorithm with a Nutrient Uptake Model. *Ecological Applications*.
- Davis, J., S. Farrah and A. Wilkie. 2004. Bacterial Indicator Decimation in Flushed Dairy Manure Wastewater by Ambient Temperature Fixed-film Anaerobic Digestion. *Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability, Proceedings of the 10th World Congress*. pp. 1734-1736.
- Delaune, R. and K. Reddy. 2004. Soil Chemistry and Mineralogy: Redox Potential. *Encyclopedia of Soils in the Environment*. pp. 366-371.
- Fares, A., L. Parsons, T. Obreza and K. Morgan. 2004. Spatial and Temporal Plant Water Use and Rain Inputs as Affected by Citrus Canopy and Microsprinkler Irrigation System. *Irrigation Association*.
- Giesy, R., A. DeVries and A. Wilkie. 2004. Advantages and Disadvantages of using Manure Digesters to Generate Electricity on Florida Dairy Farms. *Florida Dairy Business Conference*.
- Giesy, R., A. DeVries and A. Wilkie. 2004. Review of the Economics of Manure Systems that Generate Electricity on Dairy Farms. *Florida Dairy Business Conference*.
- Grunwald, S. 2004. Environmental Soil-Landscape Modeling. *Environmental Soil-Landscape Modeling*.
- Grunwald, S. and K. Reddy. 2004. Why Understanding Spatial Variability Matters in Biogeochemistry. *Geological Society of America (GSA)*.
- Grunwald, S. and S. Lamsal. 2004. Emerging Geographic Information Technologies and Soil Information Systems. *CRC Press*. pp. 26.
- Grunwald, S., K. Reddy and W. Debusk. 2004. Spatial Variability, Distribution, and Uncertainty Assessment of Soil Phosphorus in a South Florida Wetland. 15:811-815.
- Haman, D., B. Boman, G. Knox, S. Lacascio, T. Obreza, L. Parsons, F. Rhoads and T. Yeager. 2004. Status and Growth of Microirrigation in Florida. *Microirrigation for a Changing World: Conserving Resources/Preserving the Environment. Proceedings of the Fifth International Microirrigation Congress. ASAE*.
- Haman, D., K. Campbell and D. Graetz. 2004. Lysimeter Study of Micro-irrigation and Fertigation of Tomatoes. *Soil and Crop Sci. Soc. of Florida Proceedings*.
- Haman, D., K. Campbell, K. Stone and D. Graetz. 2004. Nitrogen Movement under Micro-irrigation. *American Society of Agricultural Engineers Summer Meeting*.
- Hanselman, T., D. Graetz and A. Wilkie. 2004. Comparison of Three Enzyme Immunoassays for measuring 17 $\beta$ -Estradiol in Flushed Dairy Manure Wastewater. *Journal of Environmental Quality*. 33(5):1919-1923.
- Hoyos, N. and N. Comerford. 2004. Land Use and Landscape Effects on Aggregate Stability and Total Carbon of Andisols from the Colombian Andes. *Geoderma*.
- Inglett, P., K. Reddy and P. McCormick. 2004. Periphyton Tissue Chemistry and Nitrogenase Activity in a Nutrient Impacted Everglades Ecosystem. *Biogeochemistry*. 67:213-233.
- Inglett, P., K. Reddy and R. Corstanje. 2004. Anaerobic Soils. *Encyclopedia of Soils in the Environment*. Academic Press. pp. 71-78.
- Kabenji, N., R. Rhue and S. Daroub. 2004. A Novel Technique for Measuring Surface Charge and Determining Points of Zero Charge using Flow Adsorption Calorimetry. *Soil Science*.
- Lamsal, S., S. Grunwald. 2004. Regional Hybrid Geospatial Modeling of Soil Nitrate-Nitrogen in the Santa Fe River Watershed. pp. 25.
- Leader, J., K. Reddy and A. Wilkie. 2004. Optimization of Low-cost Phosphorus Removal from Wastewater Using Co-treatments with Constructed Wetlands. *9th International Conference on Wetland Systems for Water Pollution Control, Avignon (France), September 26-30*. pp. 683-691.
- Li, Y., G. Zinati, H. Bryant and S. Mylavarapu. 2004. Distribution and Fractionation of Phosphorus, Cadmium, Nickel, and Lead in Calcareous Soils Amended with Composts. *J. Environ. Sci. Health*. B39 (1):209-223.
- Lopez-Zamora, I. and N. Comerford. 2004. Below Ground Competitive Strategies: The Root of the Melaleuca Problem in the South Florida Flatwoods. *Wildland Weeds*. pp. 21-24.
- Makris, K., H. El-Shall, W. Harris Jr., G. O'Connor and T. Obreza. 2004. Intraparticle P Diffusion in a Drinking Water Residual at Room Temperature. *Journal of Colloid and Interface Science*. 277:417-423.
- Makris, K., W. Harris Jr, G. O'Connor and T. Obreza. 2004. Phosphorus Immobilization in Micropores of Drinking-water Treatment Residuals: Implications for Long-term Stability. *Environmental Science and Technology*. 38:6590-6596.
- Malecki, L., J. White and K. Reddy. 2004. Nitrogen and Phosphorus Flux Rates from Sediments in a Southeastern US River Estuary. *Journal of Environmental Quality*. 33:1545-1555.
- McKee, K., S. Grunwald and M. Clark. 2004. Characterization of Soil Phosphorus in Historically Isolated Wetlands.
- Nair, R., M. Bannister, V. Nair, J. Alavalapati, E. Ellis, S. Jose and A. Long. 2004. Silvopasture in Southeastern United States: More Than Just a New Name for an Old Practice. *CAB International*.
- Nair, V. and R. Kalmbacher. 2004. Silvopasture as an Approach to Reducing Nutrient Loading of Surface Water from Farms. *CAB International*.
- O'Connor, G., D. Sarkar, S. Brinton, H. Elliott and F. Martin. 2004. Phytoavailability of Biosolids-P. *Journal Environmental Quality*. 33:703-712.
- O'Connor, G., H. Elliott, N. Basta, R. Bastian, G. Pierzynski, R. Sims and J. Smith Jr. 2004. Sustainable Land Application: An Overview. *Journal Environmental Quality*. pp. 34.
- Prenger, J. and K. Reddy. 2004. Microbial Enzyme Activities in a Freshwater Marsh after Cessation of Nutrient Loading. *Soil Science Society of America Journal*. 68:1796-1804.
- Qi, C. and S. Grunwald. 2004. GIS-based Hydrologic Modeling in the Sandusky Watershed. 48(1):169-180.
- Rivero, R., S. Grunwald, K. Reddy and T. Osborne. 2004. Characterization of the Spatial Distribution and Variability of Physico-Chemical Soil Properties in Water Conservation Area 2A in South Florida.
- Sabesan, A., S. Grunwald and M. Binford. 2004. Land Cover Trajectories in a Mixed-use Watershed.
- Sooknah, R. and A. Wilkie. 2004. Evaluating Floating Aquatic Macrophytes in Improving the Water Quality of Anaerobically Digested Flushed Dairy Manure Wastewater. *Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability, Proceedings of the 10th World Congress*. pp. 2170-2173.
- Sooknah, R. and A. Wilkie. 2004. Nutrient Removal by Floating Aquatic Macrophytes Cultured in Anaerobically Digested Flushed Dairy Manure Wastewater. *Ecological Engineering*. 22(1):27-42.
- Sotomayor, D., G. Martinez, O. Santana, S. Mylavarapu and J. Guzman. 2004. Phosphorus Soil Tests for Environmental Assessment in Sub-tropical Soils. *Communications in Soil Science and Plant Analysis*. 35:1485-1503.
- Steinman, A., A. Rediske and K. Reddy. 2004. The Importance of Internal Phosphorus Loading in Spring Lake, Michigan. *Journal of Environmental Quality*. 33:2040-2048.

# PUBLICATIONS

Tischler, M., M. Collins, S. Grunwald and M. Binford. 2004. The Integration of Ground-Penetrating Radar, Geographic Information Systems, and Global Positioning Systems for 3-D Soil Modeling.

VanGriensven, A., T. Meixner, S. Grunwald, T. Bishop, M. diLuzio and R. Srinivasan. 2004. A Global Sensitivity Analysis Tool for the Parameters of Multi-Variable Catchment Models

Westhead, E., C. Pizarro, W. Mulbry and A. Wilkie. 2004. Recycling of Manure Nutrients: Treatment of Anaerobically Digested Dairy Manure with Freshwater Algae. Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability, Proceedings of the 10th World Congress. pp. 1785.

White, J., K. Reddy and M. Moustafa. 2004. Influence of Hydrologic Regime and Vegetation on Phosphorus Retention in Everglades Stormwater Treatment Area Wetlands. Hydrologic Processes. 18:343-355.

Wilkie, A. 2004. 9th International Conference on Wetland Systems for Water Pollution Control, Avignon (France), September 26-30. International Water Association.

Wilkie, A. 2004. Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability, Proceedings of the 10th World Congress. International Water Association.

Wilkie, A. 2004. Anaerobic Digestion 2004 – Anaerobic Bioconversion for Sustainability, Proceedings of the 10th World Congress. International Water Association.

Wilkie, A., H. Castro, K. Cubinski, J. Owens and S. Yan. 2004. Fixed-film Anaerobic Digestion of Flushed Dairy Manure after Primary Treatment: Wastewater Production and Characterisation. Biosystems Engineering. 89(4):457-471.

Wilkie, A., P. Smith and F. Bordeaux. 2004. An Economical Bioreactor for Evaluating Biogas Potential of Particulate Biomass. Bioresource Technology. 92(1):103-109.

Zekri, M. and T. Obreza. 2004. Growing a Healthy Tree. Proper Foliar Nutrition is Vital in Producing Quality Crops. Florida Grower. 97(8):12-14.

Zekri, M. and T. Obreza. 2004. Macronutrient Deficiencies in Citrus: Calcium, Magnesium, and Sulfur. Citrus & Vegetable Magazine. 68(12):8-9.

Zekri, M. and T. Obreza. 2004. Plant Nutrients for Citrus Trees. Citrus & Vegetable Magazine. 68(10):17-20.

## GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Clark, M.W.	Task Order - T5000 01 049 - Spatial Variability and Modeling of Soil Accretion in Shark River Slough	U.S. Dept. of Agriculture	398,968
Collins, M.E.	Ground Penetrating Radar Services (UF Entities)	Multiple Sponsors	4,235
Collins, M.E.	Methodology to Determine the Attributes of Subaqueous Soils as Related to Existing and Potential Submerged Aquatic .....	Dept. of Transportation	208,580
Comerford, N.B.	Forest & Wetland Resource Management:an Education Consortium-targeting Tropical and Temperate Ecosystems	U.S. Dept. of Education	59,965
Graetz, D.A.	Evaluating Effectiveness of Best Management Practices (BMPs)for Animal Waste and Fertilizer Management to Reduce Nutrien	Dept. of Environmental Protect.	1,060,574
Grunwald, S.	Geo-temporal Estimation and Visualization of Nitrogen in a Mixed-use Watershed	U.S. Dept. of Agriculture	645,000
Harris Jr., W.G.	Chemical and Textural Analysis of Florida Soils	Multiple Sponsors	7,510
Harris Jr., W.G.	Manure-derived Components and Their Influence on Long-term Phosphorus Stability in Soils	U.S. Dept. of Agriculture	286,903
Jawitz, J.W.	Insitu Quanification of Surface Water & Groundwater Nutrientfluxes from Agricultural Watersheds	U.S. Dept. of Agriculture	64,733
Jawitz, J.W.	Impacts of Dnapi Source Zone Treatment	Environmental Protection Agcy.	172,029
Ma, L.Q.	Collaborative Research: Understanding and Enhancement of Arsenic Hyperaccumulation by a Fern	National Science Foundation	130,595
Ma, L.Q.	Phyto-restoration of Arsenic Polluted Soil Ecosystems in Thetropics and Subtropics	U.S. Dept. of Agriculture	44,728
Mylavarapu, S.R.	Training for Comprehensive Nutrient Management Planning for Third Party Vendors	Dept. of Agricul. & Consumer Ser.	452,638
Nkedi-Kizza, P.	Evaluation & Application of Hydrolic Model in South Florida	U.S. Dept. of Agriculture	75,000
Nkedi-Kizza, P.	Evaluation and Application of the UUDA's Everglades Agro-Hydrology Model	U.S. Dept. of Agriculture	37,500
Nkedi-Kizza, P.	Sorption and Transformation of Pesticides in Carbonatic Soils from Florida and Puerto Rico	U.S. Dept. of Agriculture	99,279
Obreza, T.A.	Southern Region Watershed Resources Management	Texas A&M University	70,000
O'Connor, G.A.	Land Application of Residuals and Manure in the Lake Okeechobee Watershed:p Considerations	Environmental Protection Agcy.	100,000
O'Connor, G.A.	Characterizing the Forms,solubilities,bioavailability and Mineralization Rates of Phosphorus in Biosolids, commercial..	Water Environment Res. Fdtn.	300,000
Ogram, A.V.	Linkages Between Microbial Community Composition, Function and Revegetation in the Hole in the Donut	U.S. Dept. of the Interior	296,305

## SOIL & WATER SCIENCE

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Ogram, A.V.	Lindages Between Microbial Diversity and Processes Along Nutrient Gradients in Wetlands	National Science Foundation	163,170
Ou, L.	Improving Dispersion and Decreasing Emissions of Preplant Soil Fumigants	U.S. Dept. of Agriculture	20,000
Reddy, K.R.	Phosphorus Retention and Storage by Isolated and Constructed Wetlands in the Lake Okeechobee Basin	Dept. of Agricul. & Consumer Ser.	724,286
Reddy, K.R.	Everglades Soil Mapping	Water Management Districts	300,000
Reddy, K.R.	Developing an Improved Understanding of Phosphorus (P) Cycling in Wetland Ecosystems	U.S. Dept. of Agriculture	30,000
Reddy, K.R.	Phosphorus Retention and Storage by Isolated and Constructed Wetlands in the Lake Okeechobee Basin	Dept. of Agricul. & Consumer Ser.	814,159
Reddy, K.R.	Aggregation as an Indicator of Disturbance and Recovery in Sandy Soils	U.S. Army	24,892
Reddy, K.R.	Influence of Water Levels on Subsidence of Upper St Johns River Basin Organic Soils	Water Management Districts	65,000
Reddy, K.R.	Characterization of Long-term Phosphorus Burial in Wetlands and Lakes for the Upper Saint Johns River Basin	Water Management Districts	3,000
Sartain, J.B.	Evaluation of Evergreen Product	Diamond V Mills	24,750
Sylvia, D.M.	Mycorrhizal Inoculum and Assessment	Multiple Sources	1,030
Turner, B.L.	Phosphorus Sequestration in Wetlands: Composition and Stability Fo Soil Organic Phosphorus	U.S. Dept. of Agriculture	298,000





### 2004 Annual Research Report

*for the* FLORIDA AGRICULTURAL EXPERIMENT STATION

Research in agriculture, food and natural resources in Florida is increasingly complex, and requires state-of-the-art research designs and data analysis methods. The Department of Statistics in IFAS participates in study design and data analysis needed for research programs to produce competitive, effective and efficient research. Statistics faculty and staff hold approximately 1000 collaborative sessions each year with faculty, staff and graduate students from other IFAS units. In addition to general statistical consulting, faculty and students in IFAS Statistics work to develop new designs and data analysis methods to meet needs of IFAS research.

The IFAS Department of Statistics also manages an undergraduate degree program in Statistics, and engages in the teaching program coordinated with the Department of Statistics in the College of Liberal Arts and Sciences. This includes teaching the applied statistics courses typically taken by College of Agricultural and Life Sciences students and other areas of the university. In addition, statistical

training seminars and workshops are presented to IFAS personnel as part of an in-service training program.

**Statistical research in the department is of two types, collaborative and statistical methodological.**

Collaborative research involves working closely with other IFAS faculty on projects that require significant statistical input. These include long-term environmental impact studies, agricultural ecosystem research, studies to examine process and storage on product quality, artificial reef assessment, animal and human nutrition, food safety, remote sensing, and crop fertilization studies.

IFAS Statistics faculty members are engaged in statistical methodological research in the area of statistical genetics, random effect models, analysis of repeated measures, and spatial models. These all have immediate applications in food, agricultural, and natural resource research.

## RESEARCH HIGHLIGHTS

The research of my group centers on the development of any statistical methodologies aimed at bringing together cutting-edge knowledge across a broad spectrum of theoretical biology (including genetics, development, ecology, physiology and evolution) and biomedicine. We are particularly interested in the use of systems biology approaches to derive genetic models, statistical methods and computational algorithms for detecting and mapping specific genetic loci that affect complex traits in any organism. By seeking for an elegant unification of powerful statistical methods with biological, cytological or molecular foundations behind quantitative inheritances, our theoretical work provides an organizing framework for understanding the coherent behavior of a whole biological system from the integration and coordination of its parts.

**FUNCTIONAL MAPPING: TOWARDS HIGH-DIMENSIONAL BIOLOGY:** Many complex traits inherently undergo remarked developmental changes during ontogeny. Traditional mapping approaches that analyze phenotypic data measured at a single point are too simple to take into account such a high-dimensional biological issue. We have developed a general framework, called functional mapping, in which the foundation is established for mapping quantitative trait loci (QTL) that underlie variation in a complex trait of dynamic feature. Functional mapping provides a useful quantitative and testable framework for assessing the interplay between gene action, development, sex, genetic background and environment.

**FUNCTIONAL MAPPING: SIMPLICITY FROM COMPLEXITY:** Functional mapping incorporates fundamental principles behind biological processes or networks that are bridged with mathematical functions into a QTL mapping framework. Thus, instead of estimating the genetic effects, variances and covariances among all points within a particular biological network, functional mapping estimates mathematical parameters that determine shape and function of this network. This statistical treatment largely simplifies the complexity of a developmental process. We have implemented a number of parametric (such as autoregressive, transform-both-side and structured antedependence models) and nonparametric approaches to model the structure of variance-covariance matrix among different but related points.

**FUNCTIONAL MAPPING: BIOMEDICAL IMPLICATIONS:** Although functional mapping was originally proposed for growth analysis, it has been extended to attack many different biomedical problems. Several successful examples include genetic mapping of drug response, HIV dynamics, tumor growth, circadian rhythms, gene expression dynamics and programmed cell death (apoptosis). We anticipate that the integration between functional mapping and biomedical processes will open a novel avenue for functional studies for complex diseases and drug response in the postgenomic era.

**JOINT INTERVAL AND LINKAGE DISEQUILIBRIUM MAPPING:** The non-random association between different genes, termed linkage disequilibrium (LD), provides a powerful tool for high-resolution mapping of QTL underlying complex traits. This LD-based mapping approach can be made more efficient when it is coupled with interval mapping characterizing the genetic distance between markers and QTL. We provide a closed-form solution for joint estimation of quantitative genetic parameters describing QTL

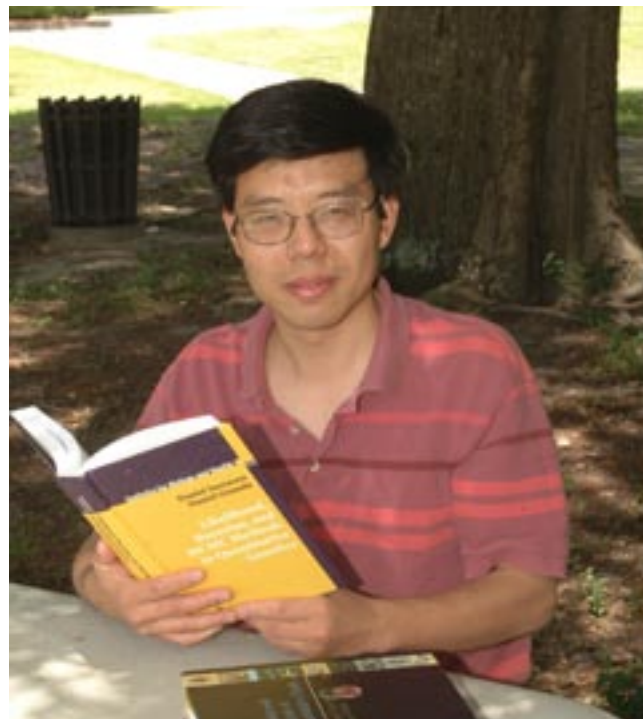
effects, QTL position, residual variances, and population genetic parameters describing allele frequencies and QTL-marker LD.

**SEQUENCING COMPLEX TRAITS WITH HAPMAP:** Determining the patterns of DNA sequence variation in the human genome is a useful first step towards identifying the genetic basis of a common disease. A haplotype map, or HapMap, aimed at describing these variation patterns across the entire genome has been recently developed by the International HapMap Consortium. We have derived a novel statistical model for directly characterizing specific sequence variants that are responsible for disease risk based on the haplotype structure provided by HapMap.

**POLYPLOID MAPPING:** Polyploids are extremely important in agriculture and have been thought to play a central role in evolution and speciation of higher plants. The genetic mapping of polyploids is one of the most difficult tasks in statistical genetic research. Some uniqueness of polyploids, such as preferential chromosomal pairing and double reduction, makes their genetic analyses qualitatively different from those of diploids. Unlike the traditional classification (allo- and autopolyploids), We used Peloquin's (1961) idea to sort polyploids into bivalent and multivalent polyploids based on the pairing patterns of homologous chromosomes during meiosis. We have constructed a host of statistical models for linkage analysis, map construction and QTL mapping separately for bivalent and multivalent polyploids.

**MAPPING SEED DEVELOPMENT:** Coordinated expression of maternal, embryo and endosperm tissues is required for proper seed development. The coordination among these three issues

*Dr. Rongling Wu*



## RESEARCH HIGHLIGHTS

is controlled by the interactions between multiple genes derived from the maternal, embryo and endosperm genomes. We have developed a series of statistical models for estimating epistatic effects among QTL derived from the maternal, embryo and endosperm genomes. Our models have power to map imprinted loci that trigger parent-of-origin specific control over gene expression during seed development. Collaborating with Dr. Brian Larkins at the University of Arizona and Dr. Chunhai Shi and Dr. Jun Zhu at Zhejiang University, we have successfully identified interacting QTL from the maternal, embryo and endosperm genomes that

regulate endosperm-specific traits in maize and rice. By integrating QTL mapping within the context of seed development, we are among the first to provide insightful ideas for the understanding of the genetic architecture of seed quality traits.

**STATISTICAL ALGORITHMS:** We derived a closed-form of the EM algorithm for estimating linkage analysis between any kind of marker systems, fully vs. partially informative, or codominant vs. dominant. This more efficient EM algorithm has been extended for linkage disequilibrium mapping and joint interval and linkage disequilibrium mapping.

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
George Casella	Chair and Prof.	Monte Carlo Methods			
Mary Christman	Assoc. Prof.	Environmental Statistics	50	50	0
Ramon C. Littell	Prof. & Assoc. Chair	Linear Models	10	90	0
Kenneth M. Portier	Assoc. Prof.	Environmental Statistics	25	75	0
Rongling Wu	Asst. Prof.	Genetics	10	90	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
STA-03776	Portier, K.M., Littell, R.C., Casella, G., Roberts, S.M.	Statistical Issues in Assessing Risks to Natural Resources
STA-04003	Littell, R.C.	Improved Statistical Methods for On-Farm Research
STA-04064	Wu, R., Littell, R.C., Casella, G.	Theoretical Genomics: Statistical Models and Applications

## PUBLICATIONS

Antoine, F., C. Wei, W. Otwell, C. Sims, R. Littell, A. Hogle and M. Marshall Jr. 2004. Chemical Analysis and Sensory Evaluation of Mahi-mahi (*Coryphaena hippurus*) during Chilled Storage. 67(10):2255-2262.

Kalmbacher, R., J. Norcini, T. Chakravarthy, I. Ezenwa and F. Martin. 2004. Tissue-cultured Creeping Bluestem for Restoration of Phosphate-mined Lands. *Native Plants Journal*. pp. 81-90.

Kalmbacher, R., J. Norcini, T. Pittman, S. Pfaff and F. Martin. 2004. Wiregrass Grown on Florida Flatwood and Sandhill Sites. *Native Plants Journal*. pp. 123-130.

Littell, R. and R. D'Agostino. 2004. Tutorials in Biostatistics.

Mislevy, P., F. Martin and J. Miles. 2004. Biomass Accumulation and Forage Nut Frequency of Tropical Grass. *Soil and Crop Science Society of Florida Proc.* 62:61-66.

Norcini, J., B. Dehgan, S. Kabat, J. Aldrich and F. Martin. 2004. Wildflower Ecotype Research in Florida. 4th Annual Native Seed Quality Conference.

Norcini, J., J. Aldrich and F. Martin. 2004. Harvest Season influences Fertilizer Effects on Seed Production of Lanceleaf Coreopsis. *Journal of Environmental Horticulture*. 22:229-233.

O'Connor, G., D. Sarkar, S. Brinton, H. Elliott and F. Martin. 2004. Phytoavailability of Biosolids-P. *Journal Environmental Quality*. 33:703-712.

Oliveira, A., S. O'Keefe, M. Balaban, C. Sims and K. Portier. 2004. Influence of Commercial Diets on Quality Aspects of Cultured Gulf of Mexico Sturgeon (*Ancipenser oxyrinchus desotoi*). *Journal of Food Science*. 69(7):S278-S284.

Rosendo, O., C. Staples, L. McDowell, R. McMahon, F. Martin, L. Badinga, J. Shearer, W. Seymour and N. Wilkinson. 2004. Biotin Supplementation Effects on Peripartum Performance and Metabolites of Holstein Cows. 87:2535-2545.

Vasconcelos, S., D. Zarin, M. Capanu, R. Littell, E. Davidson, F. Ishida, E. Santos, M. Araujo, D. Aragao, L. Rangel-Vasconcelos, F. Oliveira, W. McDowell and C. Carvalho. 2004. Moisture and Substrate Availability Constrain Soil Trace Gas Fluxes in an Eastern Amazonian Regrowth Forest. *Global Biogeochemical Cycles*. 18:10.

Wyss, G., R. Charudattan, E. Roskopf and R. Littell. 2004. Effects of Selected Pesticides and Adjuvants on Germination and Vegetative Growth of *Phomopsis amaranthicola*, a Biocontrol Agent for *Amaranthus* spp. *Weed Research*. 44:469-482.

Zhang, L., M. Yang, X. Wang, B. Larkins, M. Gallo-Meagher and R. Wu. 2004. A Model for Estimating Joint Maternal-offspring Effects on Seed Development in Autogamous Plants. *Genomics*. 19:262-269.

Zhao, W., J. Zhu, M. Gallo-Meagher and R. Wu. 2004. A Unified Statistical Model for Functional Mapping of Environment-dependent Genetic Expression and Genotype by Environment Interactions for Ontogenetic Development. *Genetics*. 168:1751-1762.



**2004 Annual Research Report**

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The College of Veterinary Medicine at the University of Florida, the state's only veterinary college, offers comprehensive service to the public through a fourfold mission – teaching, research, extension, and patient care. Following graduation of its first class in 1980, the college has built on the University's reputation for excellence and is consistently ranked in the top 10 of all U.S. veterinary colleges by US News and World Reports.

The College is unique in that it is administered jointly by IFAS and the Health Sciences Center, with the Dean of Veterinary Medicine answering to both the Vice President for Agriculture and the Vice President for Health Affairs. Over half of College faculty hold both IFAS and Health Sciences Center faculty appointments. The College is home to four departments, each of which includes IFAS faculty.

- The Department of Large Animal Clinical Sciences is responsible for teaching, clinical service and research involving diseases of livestock, poultry and fish. Major programs include animal reproduction, food animal production medicine, equine colic and equine performance medicine.
- The Department of Pathobiology is responsible for teaching, clinical service and research involving pathology, molecular biology, microbiology and parasitology of animal diseases. Major programs include tick borne diseases, EPM in horses, the AIDS viruses of animals, and mycoplasmal diseases. The depart-

ment also hosts the College's Comparative Clinical Immunology Program.

- The Department of Physiological Sciences is responsible for teaching, clinical service and research involving basic physiology and toxicology. Major programs include environmental toxicology, forensic toxicology, the neurosciences, and respiratory and cardiac physiology.
- The Department of Small Animal Clinical Sciences is primarily responsible for teaching, clinical service, and research involving diseases of pets and zoo animals, but some work is done with livestock, primarily in the field of ophthalmology.

In addition to the above four departments, the College also is host to the Center for Environmental and Human Toxicology. Included within this center are the Analytical Core Toxicology Laboratory, the Aquatic Toxicology Facility and the University of Florida Racing Laboratory. The Racing Laboratory, one of only five such internationally certified laboratories in the U.S., is responsible for conducting drug screens on all horses and greyhounds raced at tracks throughout Florida.

The College also hosts the University's Marine Mammal Program jointly with the Whitney Laboratory. This interdisciplinary program supports research and training in the care of marine mammals with emphasis on manatees.

## RESEARCH HIGHLIGHTS

## NUTRITIONAL MANAGEMENT OF CAPTIVE REEF FISHES

**SITUATION:** The production of freshwater ornamental fish for the aquarium trade is the largest component of Florida's aquaculture industry. In contrast, the trade in ornamental marine fish involves mostly wild caught species with only a few species grown in captivity. Significant collection of some species occurs in the Florida Keys and the Caribbean, but most are collected in the Pacific and Indian. The ability to culture more species of ornamental marine fish would decrease the industry's reliance on harvest of wild populations.

There are several obstacles to the development of a cultured marine ornamental fish industry comparable to Florida's freshwater industry. These include captive spawning and larval rearing of marine reef fish, adequate life support, nutritional management, and disease prevention and treatment. Florida is uniquely situated to address these obstacles because of the infrastructure already in place to support the freshwater component of the industry, including the University of Florida's Tropical Aquaculture Laboratory, the strong support of Florida Sea Grant, and coastal collections that occur in our waters.

**RATIONALE:** Nutritional management is among the most important of the factors limiting marine fish husbandry at this time and is a necessary precursor to successful aquaculture. Life support systems have improved dramatically over the past 10 to 20 years and now are rarely a limitation to maintaining healthy captive populations of reef fish. Quarantine and health management protocols also have improved significantly over the past 10 years. Nutritional management has changed from feeding simple cut fish to offering a variety of fresh vegetables and special diets, but most nutritional changes have been the result of the empirical work of experienced aquarists with almost no scientifically rigorous controlled studies being done. An informal survey of 18 oceanaria conducted in the late 1990s indicated that herbivorous reef fish did not thrive as well as carnivorous species and were prone to non-specific health problems that may have a nutritional component. The most important of these was Head and Lateral Line Erosion Syndrome (HLLES), a slowly progressive condition that begins with the loss of epithelium around the face, progresses along the lateral line, and eventually results in debilitation and death.

Florida Sea Grant began supporting research in the captive nutritional management of herbivorous reef fish in 1998. Atlantic surgeonfish collected in the Florida Keys have been used as a model for a much larger group of reef fish that are popular as aquarium pets and display animals. Initially, field work was conducted in the Florida Keys where the natural feeding habits and food choices of three species of Atlantic surgeonfish (the blue tang, the ocean surgeonfish, and the doctor fish) were documented. A follow-up pilot study was conducted at The Whitney

Laboratory with wild caught fish of the same three species. The health status and growth rates of fish were measured for fish fed three different diets, an algal diet and two commercial diets (one flake and one premium pellet). The pilot study showed that these fish could be maintained under laboratory conditions and could be fed a pelleted diet with reasonable success. This creates the opportunity to manipulate specific nutrients in the diet.

In 2000 a cooperative research program was established with Walt Disney World Animal Programs to evaluate HLLES using ocean surgeonfish from the Florida Keys as the model species. The University of Florida component of the project is to evaluate suspected nutritional contributors to the condition, while the Disney research team (under the Direction of Dr. Andy Stamper, research veterinarian, The Living Seas) is to evaluate environmental contributors. Preliminary results of these collaborations will be presented at the International Association for Aquatic Animal Medicine meeting in May 2005.

**IMPACT:** This research has resulted in an improved understanding of the natural history of Atlantic surgeonfish and the captive husbandry of these species. As results from the University of Florida and Walt Disney World collaboration are made available, we expect to see significant changes in the captive management of these popular fish groups. We are cautiously optimistic that this work will result in a significant decrease in the occurrence of HLLES in captive reef fish. Improved animal husbandry, including an appreciation of the environmental and nutritional needs of these fish, is an essential step to closing the life cycle and being able to culture more species of reef fish, decreasing the industry's reliance on harvest of wild populations. By virtue of already having in place the infrastructure for the large-scale commercial rearing and shipping of ornamental freshwater fish, Florida is well-situated to benefit economically from this research by expanding its fledgling commercial ornamental marine aquaculture industry.

**COLLABORATORS:** Ruth Francis-Floyd, DVM, MS, Chris Tilgman, M.S., Ilze Berzins, DVM, Ph.D., Scott Terrell, DVM, DACVP, Denise Petty, DVM, and Lara Croft, DVM.

*Ruth Francis Floyd*



**COLLEGE OF VETERINARY MEDICINE**

**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION	GRANT
<b>ADMINISTRATION</b>						
Joeseeph DiPietro	Prof. and Dean	Parasitology	1	0	0	0
Charles Courtney, III	Prof. and Assoc. Dean	Parasitology	2	13	0	0
Ronald Gronwall	Prof. and Ex Assoc. Dean	Physiology	1	0	0	0
James Thompson	Prof. and Assoc. Dean	Small Animal Medicine	16	0	0	0
<b>LARGE ANIMAL CLINICAL SCIENCES</b>						
Eleanor Green	Prof. and Chair	Equine Medicine	1	0	10	0
Louis Archbald	Prof. and Assoc. Chair	Reproduction	83	10	0	0
Murray Brown	Prof.	Equine Surgery	83	16	0	0
Gary Butcher	Prof.	Poultry	16	16	68	0
Shauna Cantwell	Clin. Asst. Prof.	Anesthesiology	90	10	0	
Patrick Colahan	Assoc. Prof.	Equine Surgery	73	27	0	0
G. Arthur Donovan	Assoc. Prof.	Dairy	71	8	0	0
Maarten Drost	Prof.	Reproduction	90	10	0	0
Ruth Francis-Floyd	Prof.	Aquatic Animal Health	30	17	50	50
Steeve Giguere	Asst. Prof.	Equine Medicine	80	20	0	0
Gregory Haines	Lecturer	Equine Surgery	100	0	0	0
Jorge Hernandez	Asst. Prof.	Epidemiology	55	45	0	0
Dawn Loesch	Lecturer	Large Animal Surgery	93	7	0	0
Mau reen Long	Asst. Prof.	Equine Medicine	85	15	0	25
Robert MacKay	Assoc. Prof.	Equine Medicine	67	33	0	1
Margo Macpherson	Asst. Prof.	Reproduction	59	11	0	0
Alfred Merritt, II	Prof	Equine medicine	27	63	0	95
Pedro Melendez	Lecturer	Dairy	90	10	0	0
Luisito Pablo	Assoc. Prof.	Anesthesiology	90	10	0	0
Malgorzata Pozor	Lecturer	Theriogenology	88	5	0	0
D. Owen Rae	Assoc. Prof.	Beef	87	13	0	0
Eddie Richey	Prof.	Beef Extension	4	0	67	0
Carlos Risco	Assoc. Prof.	Dairy	90	10	0	0
Allen Riggs	Lecturer	Aquatic Animal Health	100	0	0	100
Sheilah Robertson	Assoc. Prof.	Anesthesiology	82	18	0	0
Christine Sanchez	Asst. Prof.	Equine	67	6	0	0
Jan Shearer	Assoc. Prof.	Dairy Extension	5	13	82	0
Mats HenrikTrodsson	Prof.	Theriogenology	83	17	0	0
Alexander Valverde	Asst. Prof.	Anesthesiology	85	15	0	0
Huisheng Xie	Lecturer	Acupuncture	68	17	0	0
Dana Zimmer	Asst. Prof.	Equine	7	25	58	0
<b>PATHOBIOLOGY</b>						
John Dame	Prof. and Chair	Molecular Biology	1.33	30	0	1
Basima Al-Khedery	Asst. Sci.	Molecular Parasitology	0	70	0	0
David Allred	Assoc. Prof.	Molecular Biology	22	78	0	10

**COLLEGE OF VETERINARY MEDICINE**

**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION	GRANT
Anthony Barbet	Prof. and Chair	Molecular Biology	4	96	0	25
Dan Brown	Asst. Sci.	Infectious Diseases	0	38	0	38
Mary Brown	Prof.	Microbiology	30	70	0	42
Claus Buergelt	Prof.	Pathology	16	84	0	0
Michael Burrige	Prof.	Epidemiology	1	99	0	0
William Castleman	Prof.	Pathology	50	50	0	50
Carol Detrisac	Clin. Asst. Prof.	Pathology	65	35	0	35
Donald Forrester	Prof.	Wildlife Diseases	20	80	0	0
Jack Gaskin	Assoc. Prof.	Microbiology	42	58	0	0
E. Paul Gibbs	Prof.	Virology	47	53	0	8
Pamela Ginn	Assoc. Prof.	Pathology	75	10	0	0
Ellis Greiner	Prof.	Parasitology	56	44	0	0
Suman Mahan	Assoc. Prof.	Molecular Biology	0	100	0	100
Ayalew Mergia	Assoc. Prof.	Molecular Biology	17	83	0	20
Paul Nicoletti	Prof.	Microbiology	51	24	0	0
Leticia Reyes	Asst. Sci.	Lab Animal Diseases	0	100	0	100
Carlos Romero	Scientist	Molecular Biology	0	100	0	100
Marilyn Spalding	Aso Sci	Wildlife Diseases	0.33	50	0	50
James Sweat	Asst. In	Aquatic Animal Health	0	100	0	100
Scott Terrell	Clin. Instructor	Wildlife Pathology	12	43	0	0
Barbara Torres	Assoc. Sci.	Infectious Dis.	0	100	0	100
John Troutman	Clin. Instructor	Pathology	100	0	0	0
Elizabeth Uhl	Asst. Prof.	Pathology	50	50	0	0
Lori Wendland	Asst. Sci.	Microbiology	0	100	0	100
Janet Yamamoto	Prof.	Virology	19	81	0	10
<b>PHYSIOLOGICAL SCIENCES</b>						
John Harvey	Prof. and Chair	Clinical Pathology	40	11	0	0
Arthur Alleman	Asst. Prof.	Clinical Pathology	66	34	0	0
Kevin Anderson	Assoc. Prof.	Neuroscience	20	32	0	22
David Barber	Asst. Prof.	Toxicology	23	77	0	0
Donald Bolser	Asst. Prof.	RespiratoryPhysiology	25	75	0	68
Paul Davenport	Prof.	RespiratoryPhysiology	33	66	0	44
Evan Gallagher	Asst. Prof.	Toxicology	24	76	0	54
Timothy Gross	Assoc Scic	Toxicology	0	9	0	9
Linda Hayward	Asst. Prof.	Cardiovascular Physiology	23	77	0	47
Urszula Iwaniec	Asst. Sci.	Bone Biology	0	100	0	0
Robert Jamest	Asst. Sci.	Physiological Sciences	0	10	0	10
Richard Johnson	Prof.	Neuroscience	18	88	0	54
Iskande Larkin	Res. Assoc.	Marine Mammals	30	70	0	50
Hugo Ochoa-Acuna	Asst. In.	Toxicology	0	85	0	85
Rose Raskin	Assoc. Prof.	Clinical Pathology	82	18	0	0



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**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION	GRANT
Roger Reep	Assoc. Prof.	Neuroscience	38	62	0	0
Stephen Roberts	Prof.	Toxicology	25	75	0	0
Maria Sepulveda	Asst. Sci.	Toxicology	0	100	0	100
Ian Tebbett	Prof.	Toxicology	18.33	5	0	100
Floyd Thompson	Assoc. Prof.	Neuroscience	26	68	0	38
Thomas Vickroy	Prof.	Pharmacology	24	76	0	20
Alistair Webb	Prof.	Anesthesiology	19	47	24	32
Thomas Wronski	Prof.	Bone Physiology	25	75	0	20
<b>SMALL ANIMAL CLINICAL SCIENCES</b>						
Colin Burrows	Prof. and Chair	Gastroenterology	15	5	0	0
Christopher Adin	Asst. Prof.	Small Animal Surgery	71	29	0	0
Darcy Adin	Clin. Lecturer	Small Animal Medicine	45	0	0	0
Susan Anderson	Clin. Asst. Prof.	Small Animal Medicine	96	4	0	0
Diedrich Beusse	Clin. Prof.	Marine Mammals	51	49	0	0
Margaret Blaik	Asst. Prof.	Small Animal Medicine	85	15	0	0
Dennnis Brooks	Prof.	Ophthalmology	75	25	0	0
Paul Cardeilhac	Prof.	Aquatic Animal Health	17	83	0	0
Cheryl Chrisman	Prof.	Neurology	90	10	0	0
Roger Clemmons	Assoc. Prof.	Neurology	76	24	0	0
Kirsten Cooke	Clin. Prof.	Small Animal Medicine	88	11	0	25
Cynda Crawford	Asst. Sci.	Small Animal Medicine	2	98	0	98
Gary Ellison	Prof.	Small Animal Surgery	59	41	0	0
James Farese	Asst. Prof.	Small Animal Surgery	76	24	0	0
Kirk Gelatt	Disting. Prog.	Ophthalmology	83	17	0	0
John Graham	Asst. Prof.	Radiology	87	13	0	0
Darryl Heard	Assoc. Prof.	Zoo and Wildlife Medicine	93	7	0	0
Richard Hill	Asst. Prof.	Nutrition	70	30	0	50
Natalie Isaza	Clin. Asst. Prof	Small Animal Medicine	100	0	0	0
Ramiro Isaza	Asst. Prof.	Zoo and Wildlife Medicine	70	30	0	30
Elliot Jacobson	Prof.	Zoo and Wildlife Medicine	49	51	0	0
Gail Kunkle	Prof.	Dermatology	66	34	0	0
Julie Levy	Asst. Prof.	Small Animal Medicine	48	52	0	0
Daniel Lewis	Prof.	Small Animal Surgery	64	36	0	0
Diane Lewis	Clin. Prof.	Dermatology	20	0	0	0
Rosanna Marsella	Asst. Prof.	Dermatology	75	25	0	0
Rowan Milner	Asst. Prof.	Small Animal Medicine	80	20	0	0
Takayoshi Miyabayashi	Assoc. Prof.	Radiology	88	12	0	0
Gregory Roberts	Asst. Prof.	Anesthesia	100	0	0	0
Don Samuelson	Prof.	Visual Sciences	42	58	0	0
Michael Schaer	Prof.	Small Animal Medicine	96	4	0	0
Margaret Thompson	Asst. Prof.	Radiology	85	15	0	0

## RESEARCH PROJECTS

PROJECT NO.	AUTHOR	TITLE
VME-03777	Spalding, M.G., Forrester, D.J.	Surveillance for Diseases of Wildlife Which are Transmissible to Livestock and Poultry in Florida
VME-03843	Allred, D.R.	Genetic Basis for Antigenic Variation in Babesia Bovis
VME-03868	Forrester, D.J., Spalding, M.G.	Surveillance for Parasites and Diseases
VME-03876	Burridge, M.J.	Control of Ticks, and Tickborne Diseases Threatening Animal and Public Health in Florida
VME-03877	Cardeilhac, P.T.	Organochlorine Pesticides in Alligator Egg Yolks and Their Association with Fertility of Alligator Populations on Florida Lakes.
VME-03878	Rae, D.O.	Raising the Calf Crop in Florida Beef Cattle
VME-03887	Courtney, C.H., DiPietro, J.	Rational Control of Equine Helminthiasis in Florida
VME-03895	Macpherson, M.L., Blanchard, T., Hernandez, J., Loomis, P., Varner, D.	The Insulin-like Growth Factor System and Stallion Infertility
VME-03971	MacKay, R.	Pathophysiology, Diagnosis, Treatment, and Prevention of Equine Protozoal Myeloencephalitis (EPM) and Endotoxemia of Horses
VME-04023	Brooks, D.E., Ollivier, F.J., Sapp, H.	Detection of Proteinase Inhibitors in Equine Amniotic Membrane for Development of Therapeutic Agent for Ulcerative Keratitis
VME-04129	Brown, M.P.	Pharmacokinetics of Antimicrobial Agents in Large Animals
VME-04169	Brown, M.P.	Biomarkers of Equine Joint Disease
VME-04215	Burridge, M. J., Sonenshine, D.E.	Development of a Pheromone Based Decoy Technology for Control of Cayenne Ticks ( <i>Amblyomma cajennense</i> ) in Trinidad
VME-04239	Melendez, P., Urdaz-Rodriguez, J.H., Donovan, G.A.	Epidemiology of Infectious and Non-Infectious Diseases in Dairy Cattle in Puerto Rico

## PUBLICATIONS

DeVries, A. and C. Risco. 2004. Pregnancy Rates in Natural Service and Artificially Inseminated Dairy Herds. PDHGA Southeast Regional Meeting.

DeVries, A. and C. Risco. 2004. Pregnancy Rates in Natural Service and Artificially Inseminated Dairy Herds. West Florida Dairy Conference.

Hartman, K., R. Yanong, R. Francis-Floyd, A. Riggs and D. Petty. 2004. Spring Viremia of Carp (SVC) and Koi Herpes Virus (KHV) Emerging Diseases of Koi: Workshop Summary and FAQs. Pondkeeper: The Trade Resource for Aquatic Plant Nurseries, Ornamental Fish Hatcheries, Landscape Installers, & Retailers. pp. 40-43.

Peterson, T., L. McDowell, R. McMahon, N. Wilkinson, O. Rosendo, W. Seymour, P. Henry and J. Shearer. 2004. Balance and Serum Concentration of Biotin in Sheep Fed Alfalfa Meal Based Diets with Increasing Level of Concentrate. 82:1165-1169.

Rivera, R., K. Kelley, G. Erdos and P. Hansen. 2004. Reorganization of Microtubules and Microfilaments by Thermal Stress in Two-cell Bovine Embryos. Reproduction. 70:1852-1862.

Rosendo, O., C. Staples, L. McDowell, R. McMahon, F. Martin, L. Badinga, J. Shearer, W. Seymour and N. Wilkinson. 2004. Biotin Supplementation Effects on Peripartum Performance and Metabolites of Holstein Cows. 87:2535-2545.

Yanong, R. and D. Petty. 2004. Attack of the Killer Eyelids! The Weird World of Ciliates. Buntbarsche Bulletin: Journal of the American Cichlid Association. 221:38361.

Yanong, R., R. Russo, E. Curtis, R. Francis-Floyd, R. Klinger, I. Berzins, K. Kelley and S. Poynton. 2004. Cryptobia Lubilans Infection in Juvenile Discus (*Symphysodon aequifasciata*): Four Case Reports, Pathology, and Treatment Trials. Journal of the American Veterinary Medical Association. 224(10):1644-1650.

Yegani, M., A. Nilipour, G. Butcher, R. Miles, Jr and B. Sanei. 2004. Biosecurity is the Ultimate Approach to Survival. World Poultry. 20(7):30-31.

Yegani, M., H. Raouf, A. Nilipour, G. Butcher and R. Miles, Jr. 2004. Frequent Health Hazards that Threaten Poultry Workers. World Poultry. 20(4):22-25.

**COLLEGE OF VETERINARY MEDICINE**

**GRANTS & CONTRACTS**

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Adin, C.A.	Use of a Percutaneously Controlled Hydraulic Occluder in The treatment of Canine Intrahepatic Shunts	Morris Animal Foundation	15,878
Allan, S.A.	Novel Strategies for Lyme Disease Prevention	Ctrs. for Disease Control & Pre.	88,976
Alleman, A.R.	Endothelial Cell Invasion in Cattle Infected with Anaplasma Marginale	U.S. Dept. of Agriculture	210,000
Allred, D.R.	Mechanisms Controlling Babesial Antigenic Variation	Natl. Institutes of Health	290,167
Allred, D.R.	Combinatorial Genetics Strategy for Immunization Against Parasite Component Function Despite Antigenic Variation	U.S. Dept. of Agriculture	240,000
Barber, D.S.	Kinetic and Biochemical Assessment of Depleted Uranium Neurotoxicity	Virginia Polytechnic Inst.	178,803
Barbet, A.F.	Molecular Mechanisms of Msp2 Variation in Rickettsiae	Natl. Institutes of Health	414,460
Beusse, D.O.	Training in the Care of Marine Mammals	Fl. Fish & Wildlife Consv. Comm.	15,485
Bolser, D.C.	Regulation of the Cough Reflex	Natl. Institutes of Health	304,190
Brooks, D.E.	Drug Studies in Glaucomatous Monkeys	Alcon Research Ltd.	200,000
Brooks, D.E.	Naturally Occurring Glaucoma in the Rhesus Monkey	Ciba Vision	522
Brown, M.	Changes in Chondroitin Sulfate, Keratan Sulfate, and Aggrecan Core Protein in Serum, Synovial Fluid, and Cartilage in Respon	USA Equestrian Inc.	20,000
Brown, M.	Pari-Mutuel Wagering Funded Research and Development Program	Dept. of Business & Prof. Regul.	45,000
Brown, M.B.	Infectious Disease Diagnostic: Culture, PCR & Serology	Multiple Sponsors	75,605
Brown, M.B.	Infectious Disease Diagnostics: Culture, PCR & Serology (Federal)	U.S. Dept. of the Interior	13,205
Brown, M.B.	Minority Supplement - Recurrent Urinary Tract Infection in Women	Natl. Institutes of Health	98,217
Brown, M.B.	Recurrent Urinary Tract Infection in Women	Natl. Institutes of Health	394,588
Brown, M.B.	Regulatory T Cell Responses Against Mycoplasma Bovis in Calves	Univ. of North Texas	48,960
Brown, M.B.	Upper Respiratory Tract Disease & Environmentally-Threatened Gopher Tortoises	National Science Foundation	349,932
Burridge, M.J.	Commercialization of Innovative and Sustainable Technologies for Control of Ticks and Heartwater in Domestic and Wild Animals	Intl. Development Coop. Agency	793,000
Burrows, C.F.	Dog Owners and Breeders Symposium	Am. Kennel Club	4,000
Burrows, C.F.	Graham/Gilma Fellowship	UF Foundation	27,344
Burrows, C.F.	Research in Degerneative Mycopathy	UF Foundation	2,500
Burrows, C.F.	Research in Dermatology	UF Foundation	4,000
Burrows, C.F.	Troneck Endowment Fund	UF Foundation	24,900
Burrows, C.F.	Waltham Professorship in Small Animal Nutrition	Waltham Ctr. for Pet Nutrition	45,822
Cardeilhac, P.T.	Alligator Disease Research	State of Louisiana	16,000
Cardeilhac, P.T.	Development and Economic Feasibility of Commercial Feeds Specifically Designed for Rescued Manatees	Fl. Fish & Wildlife Consv. Comm.	25,000
Cardeilhac, P.T.	A Pelleted Feed for the High-Volume Production of Large Mouth Bass Fingerlings Free of Pale-Liver Syndrome	Fl. Fish & Wildlife Consv. Comm.	23,000
Colahan, P.T.	Pharmacokinetic & Clearance Study	Dept. of Business & Prof. Regul.	300,000
Courtney, C.H.	Research Experience for Veterinary Medical Students	Natl. Institutes of Health	97,380
Courtney, C.H.	Summer Research Experience at the University of Florida for Veterinary Medical Students	Merck & Company Inc.	19,800
Courtney, C.H.	Training in the Care of Marine Mammals	Fl. Fish & Wildlife Consv. Comm.	2,420,000
Courtney, C.H.	Interceptor Guarantee Program Testing (Heartworm Diagnostic Screening)	Novartis - United States	3,100
Courtney, C.H.	Heartgard 30 Guarantee Program Testing (Tissue Only)	Multiple Sponsors	4,500

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FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Courtney, C.H.	Animal Health and Disease Program of Research Fy 2002-2003	U.S. Dept. of Agriculture	20,264
Courtney, C.H.	Pari-Mutuel Wagering Funded Research and Development Program	Dept. of Business & Prof. Regul.	300,000
Crawford, P.C.	Diagnostic Testing for Survey of West Nile Virus in Domesticcanids and Felids in Alachua County	Dept. of Health	36,000
Crawford, P.C.	Identification, Characterization, and Prevention of Canine Acute Respiratory Syndrome (Cars) in Racing Greyhound in Fl	Dept. of Business & Prof. Regul.	100,000
Dame, J.B.	Species-Specific Diagnosis of Human Malaria	Flow Incorporated	77,108
Davenport, P.W.	Respiratory Sensation in Normal and Asthmatic Children	Natl. Institutes of Health	173,183.30
Davenport, P.W.	P03601 Influence of Codeine on Capsaicin Induced Cough in the Human: Eval of Novel Measures of Antitussive Efficacy	Schering-Plough Corp	131,187
Davenport, P.W.	Respiratory Muscle Training in Ventilator Dependent Patients	Natl. Institutes of Health	28,136
Davidson M.K.	Diagnostic Support Laboratory	Fl. Fish & Wildlife Consvr. Comm.	5,000
Francis-Floyd, R.	Aquatic Medical Education Programs	Fl. Fish & Wildlife Consvr. Comm.	65,621
Francis-Floyd, R.	Dermatology Study at Homosassa Springs	Fl. Fish & Wildlife Consvr. Comm.	3,000
Gallagher, E.P.	Health Effects of Chlorinated Compounds: Aquatic Toxicology Core D	Natl. Institutes of Health	161,528
Gaskin, J.M.	Impact of Largemouth Bass Iridovirus on Florida Fisheries	Wildlife Foundation of Florida	33,200
Gaskin, J.M.	Canine Pyoderma Research	Multiple Sources	2,730
Giguere, S.	In Vivo-Induced Antigens of Rhodococcus Equi As Targets for Vaccine Development	Morris Animal Foundation	52,708
Giguere, S.	Pharmacokinetics of Cefpodoxime in Foals and the Effect of Age on Drug Absorption	Morris Animal Foundation	7,493
Giguere, S.	Azithromycin and Clarithromycin for the Treatment of Rhodococcus Equi Infections in Foals	Morris Animal Foundation	7,268
Green, E.M.	Island Whirl Colic Research	UF Foundation	11,600
Greiner, E.C.	An Illusrated Dey to the Parasites of Marine Mammals in Florida Waters	Fl. Fish & Wildlife Consvr. Comm.	9,875
Greiner, E.C.	Literature Review of Horsetapeworm Prevalence in North America	Merial Ltd. (USA)	2,500
Greiner, E.C.	Parasite Control and Diagnosis of Domestic and Companion Animal Species	Multiple Companies	4,810
Greiner, E.C.	Parasites Prevalence in Monk Parakeets: Myiopsitta Monarchus	Pandion Systems	18,743
Gross, T.	Evaluation of Papermill Effluent Effects in Eastern Mosquitofish (Gambusia Holbrook)	Natl. Coun. Air & Stream Improve.	65,000
Gross, T.	Health Effects of Chlorinated Compounds: Chlorinated Pesticides and Fepvelopmental Morality of Wildlife. Project 2	Natl. Institutes of Health	291,006
Gross, T.	Microcosm and Mesocosm Evaluation of the Bioaccumulation of Chlorinated Pesticides in the North Shore Restoration Area A	Water Management Districts	80,000
Harvey, J.W.	In Vitro Manatee Blood Studies	Fl. Fish & Wildlife Consvr. Comm.	50,000
Harvey, J.W.	Optimization of Aspartamine Aminotrnstferase(Ast) and Alaine Aminotransfease(Alt)Methodologies for Diagnosis in Manatees	Fl. Fish & Wildlife Consvr. Comm.	3,750
Hayward, L.F.	Contributions of the Parabrachial Nucleus & Gaba-A Receptorsto the Development and Maintenance of Hypertension	Am. Heart Association - Fl.	60,000
Heard, D.J.	Iron Storage Disease in Captive Egyptian Fruit Bats	Lubee Foundation	4,500
Hill, R.C.	The Effect of High Dietary Fat on Muscle Glycogen Utilization and Performance in Racing Greyhounds	Dept. of Business & Prof. Regul.	75,000
Jacobson, E.R.	Infectious Disease Diagnostics: Culture, PCR and Serology	U.S. Dept. of the Interior	5,250
Jacobson, E.R.	Isolation and Characterization of a Poxvirus in North American Pinnipeds	Fl. Fish & Wildlife Consvr. Comm.	12,750
Jacobson, E.R.	Isolation and Characterization of a Poxvirus in North American Pinnipeds	U.S. Dept. of Commerce	38,181

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FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Jacobson, E.R.	Miscellaneous Donors	Miscellaneous Donors	7,375
Jacobson, E.R.	Seriological Survey of Snakes in Zoological Collections for Exposure to Ophidian Paramyxo Virus	Multiple Sources	11,415
Jacobson, E.R.	Survey of Reptiles for Infectious Diseases	Multiple Sources	1,900
Johnson, R.D.	Differential Expression of Acid-Sensing Subunits in Sensory Neurons of Rat Drg	UF Medical Guild	500
Johnson, R.D.	Capsaicin Insensitive Nociceptors of the Drg	Natl. Institutes of Health	108,967
Kollias-Baker, C.	Determination of a Reporting Level for Procaine	Racing Med. & Testing Consort.	59,122
Kollias-Baker, C.	Detection of Nonpermitted Agents Administered by Intra-Articular Injection in Horses	Dept. of Business & Prof. Regul.	20,000
Levy, J.K.	Evaluation of Zona Pellucida Antigens Suitable for Immunotracerption of Cats (Felis Catus) by a Single...	Dalhousie University	5,000
Levy, J.K.	Fiv Vaccination: Effects of Fiv Diagnostic Testing	Texas A&M University	26,080
Levy, J.K.	Evaluation of Zona Pellucida Antigens Suitable for Immunotracerption of Cats	Petsmart Charities	91,268
Levy, J.K.	Gnrh Immunotracerption of Cats	Merck & Company Inc.	3,750
Lewis, D.D.	Pari-Mutuel Wagering Funded Research and Development Program	Dept. of Business & Prof. Regul.	5,510.20
Long, M.T.	Diagnostic Testing and Survey of West Nile Virus Suspect Ani Mals	Dept. of Agricul. & Consumer Ser.	60,000
Long, M.T.	Epidemiology of Epidemic and Endemic Cycles of West Nile Virus in Florida	U.S. Dept. of Agriculture	100,000
Long, M.T.	Pharmacokinetics and Bioavailability of Two Different Formulations of Flunixin in Foals, Yearlings, and Adult Horses	Dept. of Business & Prof. Regul.	25,438
Long, M.T.	The Use of a Competitive-Inhibition Linked Immunosorbent Assay to Detect West Nile Virus in Sea Mammals	Fl. Fish & Wildlife Consv. Comm.	20,000
Long, M.T.	West Nile Virus/Live Yellow Fever Virus Vector Vaccination: Immunogenicity Testing, Safety, and Reversion to Virulence	Intervet International, B.V.	369,262
Macpherson, M.L.	Pari-Mutuel Wagering Funded Research and Development Program	Dept. of Business & Prof. Regul.	78,428
Marsella, R.	Summer Research Experience at the University of Florida for Veterinary Medical Students	Merck & Company Inc.	3,750
Meeus, P.F.	Mechanisms of Antigenic Variation of Anaplasma Marginale in Different Environments	Natl. Institutes of Health	117,804
Meeus, P.F.	Canine Heartworm Testing	Multiple Sponsors	1,250
Mergia, A.	Foamy Virus Vector for Immunodeficiency Virus Therapy	Natl. Institutes of Health	104,647
Mergia, A.	Functional Analysis of Fiv Orf-A	Natl. Institutes of Health	253,750
Merritt, A.M.	Effect of a High Fat Versus a High Carbohydrate Meal on Equine Gastric Accomodation, Emptying and Contents Ph	Dept. of Business & Prof. Regul.	28,515
Milner, R.J.	Summer Research Experience at the University of Florida for Veterinary Medical Students	Merck & Company Inc.	3,750
Rae, D.O.	Detection and Eradication of Mycobacterium Paratuberculosis (John's Disease) in Beef Cattle: a Demonstration Project.	U.S. Dept. of Agriculture	30,580
Randell, S.C.	The Pharmacokinetics of Ondansetron in Cats After Intravenous Oral and Rectal Administration	Merck & Company Inc.	3,750
Reep, R.L.	Florida Marine Mammal Health Conference	Fl. Fish & Wildlife Consv. Comm.	10,000
Reep, R.L.	Induced Axon Sprouting and Functional Recovery from Hemi- Patial Neglect Following Experimental Infarct in the Rat	Merck & Company Inc.	3,750
Reep, R.L.	Role of Dorsocentral Striatum in Neglect and Recovery	Northern Illinois University	2,999
Reep, R.L.	Sensory Evoked Potential Studies in Manatees	Fl. Fish & Wildlife Consv Comm	12,500
Reep, R.L.	Skeletal Biomechanics of the Florida Manatee	Fl. Fish & Wildlife Consv Comm	3,750
Reep, R.L.	Training in the Care of Marine Mammals	Fl. Fish & Wildlife Consv Comm	24,288

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FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Risco, C.A.	Rapid Somatic Cell Count in Cow's Milk	Serim Research Corp.	1,000
Roberts, S.M.	Assessment of Arsenic Bioavailability From Soils in Cynomolgus Monkeys	Exponent Environmental Group	33,930
Roberts, S.M.	Consulting Services to Revise Human Health-Based Surface Water Quality Criteria As Listed in Ch 62-302, Fl Admin Code	Dept. of Environmental Protect	20,000
Roberts, S.M.	Dermal Penetration of Nanoscale High Energetic Materials	U.S. Air Force	15,000
Roberts, S.M.	Health Effects of Chlorinated Compounds/Autoimmune Toxicity of Chlorinated Compounds:Project 5	Natl. Institutes of Health	191,463
Roberts, S.M.	Human Health and Ecological Risk Assessment	Dept. of Environmental Protect.	25,200
Roberts, S.M.	Outreach Core - Health Effects of Chlorinated Compounds	Natl. Institutes of Health	57,800
Roberts, S.M.	Prevention of Chemotherapy-Induced Hair Loss	Univ. of Miami	111,774
Roberts, S.M.	Toxicology Support Services-Hw492	Dept. of Environmental Protect	214,000
Roberts, S.M.	Training Core - Health Effects of Chlorinated Compounds	Natl. Institutes of Health	147,103
Romero, C.H.	Isolation and Molecular Identification of Viruses Infecting Cetaceans Stranded Along Florida's Coasts	Harbor Branch Ocean Inst.	99,910
Romero, C.H.	Isolation & Molecular & Serological Characterization of Viruses Infecting Marine Mammals Stranded Along Florida's...	Fl. Fish & Wildlife Consvr. Comm.	25,000
Romero, C.H.	Enhancement of Animal Health Preparedness for Dealing with Bioterrorism	University of South Florida	249,961
Romero, C.H.	Training in the Care of Marine Mammals	Fl. Fish & Wildlife Consvr. Comm.	35,000
Romero, C.H.	Marine Mammal Microbiology Diagnostic & Support Laboratory	Fl. Fish & Wildlife Consvr. Comm.	35,000
Samuelson, D.A.	Histology of Marine Mammals of Florida	Fl. Fish & Wildlife Consvr. Comm.	25,000
Samuelson, D.A.	Glutamine Synthetase and Intestinal Epithelium	Natl. Institutes of Health	7,340
Samuelson, D.A.	Corneal Neovascularization and its Impact on Visual Functionin Florida Manatees	Fl. Fish & Wildlife Consvr Comm	15,000
Sepulveda, M.S.	An Evaluation of the Role of Thiamine Deficiency and Organochlorine Pesticides on Alligator Embryo Mortality On..	Lake County	50,875
Shearer, J.K.	Preparation of Educational Materials for the Humane Euthanasia of Cattle	Mcarthur Farms Inc.	7,000
Spalding, M.G.	Veterinary Services and Research Related to Wildlife Disease	Fl. Fish & Wildlife Consvr. Comm.	45,163
Spalding, M.G.	Whooping Crane Research	Natl. Fish & Wildlife Fdtn.	11,880
Sweat, J.M.	Brevetoxin Induced Pulmonary Pathogenesis in the Florida Manatee Trichechus Manatus	Fl. Fish & Wildlife Consvr Comm	76,983
Szabo, N.J.	Health Effects of Chlorinated Compounds Analytical Core: Core A	Natl. Institutes of Health	60,690
Vickroy, T.W.	Pari-Mutuel Wagering Funded Research and Development Program	Dept. of Business & Prof. Regul.	12,726
Webb, A.I.	Minor Use Animal Drug Program: Southern Region	U.S. Dept. of Agriculture	136,980
Webb, A.I.	Food Animal Residue Avoidance Databank, Farad	U.S Dept. of Agriculture	152,602
Wronski, T.J.	Restoration of Lost Bone Mass After Ovariectomy	Natl. Institutes of Health	233,858
Wronski, T.J.	Aging and Bone Responsiveness to Space Flight: Preflight Study	N. California Inst. for Res. & Ed.	5,277
Xie, H.	Response of Horses to Acupuncture Treatment for Enteric Diseases and Colic	Frick Foundation, Helen Clay	1,500
Yamamoto, J.K.	Clinical Transmission Study: Performance Evaluation of An Fiv Vaccine Under Natural Exposure Challenge	Fort Dodge Laboratories	27,159
Yamamoto, J.K.	Miscellaneous Donors	Miscellaneous Donors	207,000
Yamamoto, J.K.	Protective Cmi Mechanisms of a Dual-Subtype Fiv Vaccine	Natl. Institutes of Health	362,500

### 2004 Annual Research Report

for the FLORIDA AGRICULTURAL EXPERIMENT STATION

The premier value of Florida's wildlife and their habitats centers on their integral role in maintaining the functioning of the state's ecosystems, providing a healthy environment for all living organisms, including humans. A second value stems from the recreational uses and associated economic revenues. A 2001 survey by the U.S. Fish and Wildlife Service reported that individuals in Florida spent \$1.6 billion on wildlife viewing activities and \$400 million on hunting.

The increasing human population is the single most important factor placing the state's wildlife and other natural resources at risk. Associated with human growth are the loss or conversion of natural and agricultural habitats to urban and suburban development, the loss of species due to land use changes and habitat fragmentation, and an increase in introduced or invasive species. Many of the problems facing Florida are not unique. They are mirrored throughout the Latin American tropics, and countries throughout the region turn to UF/IFAS for the expertise to solve their problems.

The mission of the Department of Wildlife Ecology and Conservation is to foster education, expand knowledge, and reward scholarship, using multi-disciplinary approaches, for the purpose of

understanding, managing, and conserving biological resources. The primary goal of our teaching, research, and extension programs is to develop and communicate the knowledge necessary for enhancing the conservation and management of wildlife and their habitats for the greatest aesthetic, ecological, economic, and recreational values.

The expertise of the 18 state-line Ph.D. faculty in the Department is complemented by three federally supported Ph.D. faculty in the Florida Fish and Wildlife Cooperative Research Unit and five additional grant-supported research faculty and postdoctoral scholars. These scientists garner substantial extramural support for their research from diverse sources, including state, federal, and non-governmental agencies. Seventeen additional faculty members from other UF departments and outside agencies hold affiliate or courtesy faculty status and participate in the Department's teaching, research and extension programs. In addition to providing information to governmental and non-governmental agencies involved with the management and conservation of wildlife, these 40 wildlife scientists and over 70 graduate students publish widely in national and international scientific journals. For more information, visit the Wildlife Ecology and Conservation Web site at <http://www.wed.ufl.edu/>.

## RESEARCH HIGHLIGHTS

**DISTURBANCE ECOLOGY AND RESTORATION OF NATURAL COMMUNITIES IN MANAGED LANDSCAPES**

**SIGNIFICANCE:** Coastal dunes and beaches comprise between 2800 to 4800 km of seashore in the five Gulf States, Georgia and Puerto Rico. Coastal landscapes are under increasing pressure from rapidly growing development (industrial and residential) and use (recreational and military). Beach dunes along the gulf and east coasts and associated barrier islands have been fragmented by increasing residential and commercial development leaving smaller, isolated areas of beach dunes. These dunes are barriers that protect infrastructure from the damaging effects of high tides, storm surges, and waves and provide critical habitat for wildlife species. As these landscapes become more fragmented, additional natural and anthropogenic disturbances have an increasing impact on the plant and animals dependant on these linked habitats. Hurricanes, which have recently increased in frequency in Florida, further fragment remaining dunes and impact wildlife species. These storms erode the shoreline, flatten beach dunes and uproot vegetation. The recovery of the vegetation following hurricanes aids dune building, island stabilization, and it provides food and shelter for wildlife. Because beach mice rely on dune habitats, they are particularly vulnerable to further fragmentation of dunes and vegetation loss. Of the five subspecies present in Florida and Alabama, only one is not listed as federally endangered or threatened. For beach mice, dunes and associated vegetation provides cover from predators, a stable microenvironment, nesting material, a more stable substrate and food resources. Because plant recolonization following storms may be slow, beach mice habitat may remain suboptimal for years following a severe hurricane. In addition to high demand for coastal species use in dune restoration and stabilization projects, demand is increasing for transplants to address the needs of developers, home owners, municipalities, nurserymen and landscapers as development accelerates near coastal areas.

**RATIONALE:** Restoration techniques including those that lead to rapid dune building and stabilization and provide for the needs of wildlife species are needed. For successful restoration a multi-disciplinary approach is often required. To address a wide range of questions University of Florida faculty Dr. Mack Thetford, (environmental horticulture), Dr. Lyn Branch (Wildlife Ecology and Management) and I along with our graduate and undergraduate students collaborate using the approaches of horticulture, wildlife behavior, landscape ecology and plant community ecology to direct restoration efforts. This research began 10 years ago because of the needs and opportunities provided by the passage of Hurricanes Opal and Erin in the fall of 1995 over Santa Rosa Island Florida. Hurricane Opals 12- to 15-foot tidal surge created multiple (> 10) over wash sites on Santa Rosa Island, where large dunes 10 to 30 ft in height were removed and adjacent remnant dunes were damaged. Tropical activity has continued to impact this island with several smaller tropical storms affecting the island in the intervening years. Most recently, in 2004, Hurricane Ivan's storm surge, which was equal to or greater than Hurricane Opal, again over washed Santa Rosa Island.

For several years after Opal, Dr. Mack Thetford, biological scientist Lisa Yager and I evaluated the impacts of different configu-

ration and types of sand fence on the speed of sand accumulation. We also explored when and where to plant the most commonly used foredune beach species, sea oats and bitter panicum, and how quickly beach mice were present in these restoration sites. Because of the large number of plantings required to restore areas impacted by tidal surge, watering of vegetation following planting is not practical. Determining survival of plants planted at times of the year where watering may not be necessary was one of the primary objective of this project. Also, perils of rapid sand accumulation using sand fencing in combination with plantings was discovered and new planting and fence designs were developed and tested to successfully facilitate rapid sand accumulation and stabilization with beach plants. The project resulted in 6000 ft of beach with new dunes. Created dunes were approximately 6 ft tall and 75 ft wide.

Incorporating information gained from observing and quantifying the resilience of the vegetation after storms is important to develop strategies for restoration based on natural processes. Following Opal large quantities of sea oat were uprooted. Sea oats consist of both above ground and below ground stems or rhizomes. Buds on rhizomes are capable of producing new sea oat plants. The above and below ground stems (rhizomes) were separated by the storm surge and uprooted rhizomes were deposited as wrack on the beach strand, in trees and on the road. Because segments of severed rhizomes will root and develop above ground stems, these uprooted rhizomes represented a potential propagule source for beach revegetation. The availability and cost of nursery-grown transplants for large-scale restoration projects can be limiting. Biological scientist Lisa Yager, Amy Compton and Mica Schneider, Dr. Thetford and I developed a series of experiments to determine the viability of the rhizomes after exposure to the desiccating effects of salt water and wind, and potential techniques for treating and planting the rhizomes for revegetation. This series of experiments lead to recommendation for the use of this technique for beach restoration.

In addition to plants used commonly for dune building, a diversity of plants are used by beach mice as food and cover. Also, remaining dune fragments damaged by tropical storms can

*Debbie Miller*





**RESEARCH HIGHLIGHTS**

be strengthened by planting a variety of beach plants including shrubs and forbs. However, the availability of these plants for restoration and strategies for increasing transplant success are lacking. Graduate students Kathryn Smith and Josiah Raymer and undergraduate students Perrin Penniman, Mica Schneider and Jennifer Dupree set out to develop propagation, production (i.e. container size and volume) and out planting protocols for several underutilized beach plants. Once these protocols were established, field experiments were used to determine where best to use the plants in the disturbed beach landscape. Recommendations based on this work are also available for use post Ivan. Recently, graduate student Josiah Raymer has begun work to look at increasing the richness of beach plantings and determine the effects of these multiple species planting on sand accumulation and plant survival and growth.

Restoration efforts to meet beach mice needs can only be developed with increased information on beach mice use of the habitat patches found in beach landscapes. Graduate students Kathryn Smith and Alex Pries, under the guidance of Dr. Lyn Branch, investigated the use of this hurricane fragmented beach landscape by the Santa Rosa Beach mice. The documented presence of beach mice in a variety of habitats including frontal dunes, dry swales and scrub dunes underscores the need to develop restoration strategies that address the entire beach landscape. Alex and Dr. Branch are testing the hypothesis that landscape structure influences the distribution of beach mice on this barrier island and are examining how Hurricane Ivan has changed occupancy patterns in both scrub and frontal dune habitat types. Brittany Bird, again under the guidance of Dr. Branch, investigated the impact of arti-

ficial lighting and plant cover on beach mice foraging behavior.

**IMPACT:** Beach dunes provide habitat for wildlife and protect infrastructure from moderate tropical storm over wash. Without beach dunes, storm surge over washes islands damaging roads, buildings and ecosystems further inland. This research program resulted in recommendations for fence orientation and planting that have been used in recent restoration efforts. Many coastal residents and land managers have become aware of this information through research reports and extension programs including 4H, home owner meetings, development and placement of a demonstration site and informational kiosks. Local nurseries now offer for sale many of the beach plant species for which propagation, production and out planting protocols were developed as part of this research program. Natural resource managers throughout the Gulf and Atlantic coast continue to solicit information and apply recommendations developed through this research program. Beach mice populations are important indicators of the integrity of our beach landscape. The decline of beach mouse populations reflects the loss of functionality of our dune systems and foretells of possible consequences for other wildlife dependant on coastal habitats. Results of beach mouse work have altered the view of the importance of various components of the beach landscape and will alter efforts to manage beach mice and the landscape on which they depend.

**COLLABORATORS:** US Fish and Wildlife Service, US Department of Defense, US Park Service, Florida Fish and Wildlife Conservation Commission, Santa Rosa County Board of County Commissioners, Florida Seagrass Extension, Dr. Mack Thetford, Dr. Lyn Branch.

# WILDLIFE ECOLOGY & CONSERVATION

## FACULTY & STAFF

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Nat B. Frazer	Chair and Prof.	Conservation Biology, Herpetofaunal Ecology	40	30	30
Michael L. Avery	Courtesy Assoc. Prof.	Avian Ecology			
Richard Bodmer	Courtesy Asst. Prof.	Tropical Conservation			
Lyn C. Branch	Prof.	Behavioral Eco., Latin American Conservation	40	60	0
Emilio M. Bruna	Asst. Prof.	Latin American Studies	40	60	0
Raymond R. Carthy	Courtesy Asst. Prof.	Wetlands Ecology			
Thomas A. Contreas	Courtesy Asst. Prof.	Landscape Ecology			
Graeme S. Cumming	Asst. Prof.	Landscape Ecology	40	60	0
Kenneth Dodd, Jr.	Courtesy Assoc. Prof.	Herpetofaunal Ecology, Conservation Bio./USGS			
Donald Forrester	Affiliate Prof. Emeritus	Wildlife Parasitology & Diseases, College of Vet. Med.			
Lawrence R. Franz, Jr.	Assoc. Scientist	Herpetofaunal Ecology	12	56	32 (public service)
Peter C. Frederick	Research Assoc. Prof.	Wetlands Ecology, Avian Behavior	0	100	0
Bill Giuliano	Asst. Prof.	Wildlife Biology & Management	60	0	40
Lawrence Harris, Jr.	Emeritus Prof.	Landscape Ecology			
Mark E. Hostetler	Asst. Prof.	Extension Wildlife Specialist	0	20	80
Stephen R. Humphrey	Dean and Curator	Wildlife Community Ecology			
Susan K. Jacobson	Prof.	Natural Resources Education, Tropical Conservation	40	60	0
Steve A. Johnson	Asst. Prof.	Urban Wildlife	60	0	40
Wiley M. Kitchens	Courtesy Assoc. Prof.	Wetland Systems			
Thomas H. Kunz	Courtesy Prof.	Bat Research-Lubee Foundation			
Lynn W. Lefebvre	Courtesy Asst. Prof.	Marine Mammal Ecology			
Ronald F. Labisky	Prof. Emeritus	Wildlife Population Ecology & Conservation			
Martin B. Main	Associate Prof.	Behavioral Ecology and Conservation			
Frank J. Mazzotti	Associate Prof.	Wildlife & Growth Management			
Gary K. Meffe	Courtesy Professor	Editor, Conservation Biology	0	100	0
Kenneth Meyer	Courtesy Assoc. Prof.	Avian Research & Conservation Inst.			
Deborah L. Miller	Assoc. Prof.	Plant Ecology, Wetland Ecology	60	30	10
Michael P. Moulton	Assoc. Prof.	Community Ecology, Introduced Species	70	30	0
John J. Mullahey	Prof.	Ruminant Nutrient & Range Management			
Max A. Nickerson	Prof. Affiliate	Herpetology	24	38	38 (public service)
James D. Nichols	Courtesy Assoc. Prof.	Wildlife Population Ecology and Biometrics			
Madan K. Oi	Asst. Prof.	Population Ecology	60	40	0
Leonard Pearlstine	Scientist	Spatial Analysis			
Henry F. Percival	Courtesy Assoc. Prof.	Wetlands Wildlife Ecology			
Kenneth Rice	Courtesy Asst. Prof.	Wildlife Biologist USGS			
Scott Robinson	Affiliate Professor	Ordway Eminent Scholar of Ecosystem Conservation Natural History			

**FACULTY & STAFF**

FACULTY	TITLE	SPECIALTY	TEACHING	RESEARCH	EXTENSION
Perran J. Ross	Assoc. Scientist	Zoology-Liaison between FFWCC & Stakeholders	0	0	85
Joseph M. Schaefer	Prof. & Dist. Director	Ecosystem Conservation in Urbanizing Landscapes			
Kathryn E. Sieving	Assoc Prof. and Prog Director	Avian Ecology	70	30	0
Lora L. Smith	Courtesy Asst. Prof.	Herpetology			
Melvin E. Sunquist	Assoc Prof. and Prog Director	Carnivorous Mammal, Mammalian Ecology and Behavior	60	40	0
George W. Tanner	Assoc. Chair & Prof.	Range Ecology and Habitat Management	40	60	0
John B. Thorbjarnsarson	Courtesy Prof.	Conservation Zoologist/Wildlife Conservation Society			
Anton D. Tucker	Courtesy Assoc. Prof.	Mote Marine Laboratory			
Patricia A. Werner	Prof. Emeritus	Population and Community Ecology			

**RESEARCH PROJECTS**

PROJECT NO.	AUTHOR	TITLE
WEC-03790	Branch, L.C.	Dynamics and Interactions of Patchily – Distributed Species
WEC-03844	Sieving, K.E.	Ecology and Conservation of Forest Birds
WEC-03941	Oli, M.K.	Modeling the Dynamics and Regulation of Vertebrate Populations
WEC-04017	Cumming, G.S.	Understanding and Managing Complex Interactions, Dispersal and Cross-scale Dynamics for the Sustainable Use of Natural Resources
WEC-04049	Moulton, M.P.	Ecology and Management of Non-indigenous Vetebrates
WEC-04094	Bruna, E.M.	Plant-animal Interaction and Plant Population Dynamics in Human-modified Landscapes
WEC-04133	Cumming, G.S., Baban, S.M.	Sustainability and Land Use in the Caribbean Region
WEC-04156	Sunquist, M.E.	Ecology and Conservation of Mammalian Carnivores

# PUBLICATIONS

- Bennett, E., G. Cumming and G. Peterson.** 2004. A Systems Models Approach to Determining Resilience Surrogates for Case Studies. *Ecosystems*.
- Cumming, G.** 2004. On the Relevance of Abundance and Spatial Pattern for Interpretations of Host-Parasite Association Data. *Bulletin of Entomological Research*. 94:401-409.
- Cumming, G.** 2004. The Impacts of Low-Head Dams on Fish Species Richness in Wisconsin, USA. *Ecological Applications*. 14:1495-1506.
- Cumming, G. and J. Collier.** 2004. Change and Identity in Complex Systems. *Ecology and Society*.
- Cumming, G., G. Barnes, S. Perz, M. Schmink, K. Sieving, J. Southworth, M. Binford, R. Holt, C. Stickler and T. Van Holt.** 2004. An Exploratory Framework for the Empirical Measurement of Resilience. *Ecosystems*.
- Cumming, G., J. Alcamo, O. Sala, R. Swart, E. Bennett and M. Zurek.** 2004. Are Existing Global Scenarios Consistent with Ecological Feedbacks? *Ecosystems*.
- Getz, L., M. Oli, J. Hofmann and B. McGuire.** 2004. Factors Influencing Home Range Indices of Two Species of Sympatric Voles. *Journal of Mammalogy*.
- Getz, L., M. Oli, J. Hofmann and B. McGuire.** 2004. Population Dynamics of Northern Short-Tailed Shrew, *Blarina brevicauda*: Insights From a 25-Year Study. *Canadian Journal of Zoology*.
- Giuliano, W.** 2004. A Simulated Insect Diet as a Water Source for Quail: Effects on Body Mass and Reproduction. *Comparative Biochemistry and Physiology*. 111A:299-32.
- Giuliano, W.** 2004. Avian Response to Warm-season Grass Use in Pasture and Hayfield Management. *Biological Conservation*. 106:383-61.
- Giuliano, W.** 2004. Comparative Reproductive and Physiological Responses of Northern Bobwhite and Scaled Quail to Water Deprivation. *Comparative Biochemistry and Physiology*. 119A:781-786.
- Giuliano, W.** 2004. Effect of Border-edge Cuts on Bird Communities in Farm Woodlots of Southwestern Pennsylvania. *Journal of Wildlife Management*. 62:1430-1437.
- Giuliano, W.** 2004. Effect of Streambank Fencing on Herpetofauna in Pasture Stream Zones. *Wildlife Society Bulletin*. 30:361-369.
- Giuliano, W.** 2004. Effects of Forest Structure on the Distribution of Southern Flying Squirrels in Urban Parks. *Urban Ecosystems*. 7:55-64.
- Giuliano, W.** 2004. Effects of Red Imported Fire Ants on Northern Bobwhite Chicks. *Journal of Wildlife Management*. 60:309-313.
- Giuliano, W.** 2004. Effects of Short-term Grazing Exclusion on Riparian Small Mammal Communities. *Journal of Range Management*. 57:346-350.
- Giuliano, W.** 2004. Fall Food Habits and Reproductive Condition of Fishers, *Martes pennanti*, in Vermont. *Canadian Field-naturalist*. 115:52-56.
- Giuliano, W.** 2004. Forest Structure in Urban Parks: Effects on Eastern Chipmunk Distribution. *Northeast Wildlife*. 56:49-56.
- Giuliano, W.** 2004. Helping Shrub and Edge Birds. *Pennsylvania Game News*. 70(5):23-24.
- Giuliano, W.** 2004. Influence of Rainfall on Northern Bobwhite and Scaled Quail Abundance and Breeding Success. *Texas Journal of Science*. 51:231-240.
- Giuliano, W.** 2004. Integrating Wildlife Management and Agriculture: Conserving Biodiversity Through Long-term partnerships. *Conservation of Biological Diversity: A Key to the Restoration of the Chesapeake Bay Ecosystem and Beyond*. pp. 48-51.
- Giuliano, W.** 2004. Lepidoptera-habitat Relationships in Urban Parks. *Urban Ecosystems*.
- Giuliano, W.** 2004. Physiological Responses of Northern Bobwhite (*Colinus virginianus*) to Chronic Water Deprivation. *Physiological Zoology*. 68:262-276.
- Giuliano, W.** 2004. Prey Selection in Relation to Sexual Dimorphism of Fishers (*Martes pennanti*) in New Hampshire. *Journal of Mammalogy*. 70:639-641.
- Giuliano, W.** 2004. Quail and Rain: What's the Relationship?. *Quail III: National Quail Symposium*. 3:64-68.
- Giuliano, W.** 2004. Reduced Predation of Artificial Nests in Border-edge Cuts on Woodlots. *Journal of Wildlife Management*. 65:351-355.
- Giuliano, W.** 2004. Relationships Among Habitat, Cover, and Eastern Cottontails in Kentucky. *Transactions of the Kentucky Academy of Science*. 58:383-55.
- Giuliano, W.** 2004. Reproductive Responses of Adult Female Northern Bobwhite and Scaled Quail to Nutritional Stress. *Journal of Wildlife Management*. 60:302-309.
- Giuliano, W.** 2004. Response of Birds to Grazing of Riparian Zones. *Journal of Wildlife Management*. *Journal of Wildlife Management*. 64:976-982.
- Giuliano, W.** 2004. Seasonal Changes in Abundance of Kentucky Cottontails. *Transactions of the Kentucky Academy of Science*. 54:22-27.
- Giuliano, W.** 2004. Seasonal Changes in Body Measurements and Organ Masses of the Eastern Cottontail (*Sylvilagus floridanus*) in Kentucky. *Transactions of the Kentucky Academy of Science*. 52:119-123.
- Giuliano, W.** 2004. Significance of Tall Fescue in the Diet of the Eastern Cottontail. *Prairie Naturalist*. 26:53-60.
- Giuliano, W.** 2004. Survival and Movements of Orphaned White-tailed Deer Fawns in Texas. *Journal of Wildlife Management*. 63:570-574.
- Heath, J. and P. Frederick.** 2004. Relationships Among Mercury Concentrations, Hormones, and Nesting Effort of White Ibises. *The Auk*.
- Jacobson, S.** 2004. Biological Conservation through Education.
- Jacobson, S.** 2004. Multidisciplinary Research and Education on Neotropical Working Forests. *Association for Tropical Biology and Conservation Conference*.
- Jacobson, S.** 2004. People and Parrots: Collaborative Planning and Environmental Outreach for Abaco National Park. *Abaco Science Alliance Conference*.
- Jacobson, S.** 2004. Understanding, Measuring and Breaking Down Barriers to Implementation of an Adaptive Management Program: The FWC Objective-based Vegetation Management Approach in Florida. *Final Report for USGS State Partnership Program and FL Fish and Wildlife Conservation Commission*.
- Jacobson, S.** 2004. Understanding, Measuring, and Overcoming Barriers to the Implementation of an Adaptive Land Management Program in Florida. *Society for Conservation Biology Conference*.
- Kareiva, P., M. Manson, J. Geoghegan, R. Dickinson, P. Kabat, J. Foley, R. Defries, M. Rosegrant, C. Ringler, V. Wolters, H. Pereira, O. Sala, D. Lodge, G. Cumming, A. Dobson, J. Alder, M. Xenopoulos, D. Van Vuuren, E. Bennett, A. Parma, M. Pascual, J. Agard, C. Butler and P. Wilkinson.** 2004. Chapter 4: State of the Art in Describing Future Changes in Ecosystem Services. *Millennium Ecosystem Assessment Volume 2: Scenarios Assessment*. Island Press.
- Lovell, D., W. Whitworth, J. Choate, S. Bissell, M. Moulton and J. Hoffman.** 2004. Geographic Relationships of Pocket Gophers in Southeastern Colorado. *Transactions of the Nebraska Academy of Sciences*. 29:45-55.
- Oli, M.** 2004. Fast-slow Continuum and Mammalian Life-history Patterns: An Empirical Evaluation. *Basic and Applied Ecology*. 5:449-463.
- Oli, M. and K. Armitage.** 2004. Yellow-bellied Marm: Ot Population Dynamics: Demographic Mechanisms of Growth and Decline. *Ecology*. 85:2446-2455.
- Ozgul, A., L. Getz and M. Oli.** 2004. Demography of Fluctuating Populations: Temporal and Phase-related Changes in Vital Rates of Prairie Voles, *Microtus ochrogaster*. *Journal of Animal Ecology*. 73:201-215.
- Rodriguez, J., J. Agard, T. Beard, E. Bennett, S. Cork, G. Cumming, D. Deane, A. Dobson, D. Lodge, M. Mutale, G. Nelson, G. Peterson and T. Ribeiro.** 2004. Chapter 11: Tradeoffs Among Ecosystem Services. *Millennium Ecosystem Assessment Volume 2: Scenarios Assessment*. Island Press.
- Sunquist, M. and K. Kawanishi.** 2004. Conservation Status of Tigers in a Primary Rainforest of Peninsular Malaysia. *Biological Conservation*. 120:329-344.
- Sunquist, M., D. Thornton and M. Main.** 2004. Ecological Separation Within Newly Sympatric Populations of Coyotes and Bobcats in South-central Florida. *Journal of Mammalogy*. 85:973-982.
- Sunquist, M., S. Luo, J. Kim, W. Johnson, J. van der Walt, J. Martenson, N. Yuhki, D. Miquelle, O. Uphyrkina, J. Goodrich, H. Quigley, R. Tilson, G. Brady, P. Martelli, V. Subramaniam, C. McDougal, S. Hean, S. Huang, W. Pan, U. Karanth, J. Smith and S. O'Brien.** 2004. Phylogeography and Genetic Ancestry of Tigers (*Panthera tigris*). *Public Library of Science Biology*. 2:2275-2293.
- Villarreal, D., M. Machicote, L. Branch, J. Martinez and A. Gopar.** 2004. Habitat Patch Size and Local Distribution of Burrowing Owls (*Athene cunicularia*). *Ornitologia Neotropical*. *Ornitologia Neotropical*.

## WILDLIFE ECOLOGY & CONSERVATION

### GRANTS & CONTRACTS

FACULTY	TITLE	SOURCE OF FUNDS	AMOUNT
Bruna III, E.M.	Research Starter Grant: the Effect of Habitat Fragmentation on Ant-plant Mutualisms	National Science Foundation	50,000
Cumming, G.S.	David H. Smith Conservation Research Fellowship	Nature Conservancy	17,354
Cumming, G.S.	Bat Inventories at Southeast Coastal Protected Area	U.S. Dept. of the Interior	85,000
Cumming, G.S.	Bat Inventories at SE Coastal Protected Area - Amendment #1 to Task #J2114 03 0007 - No: H5000 01 0473 (UF)	U.S. Dept. of the Interior	45,957
Frederick, P.C.	Effects of Environmental Mercury Exposure on Development & Reproduction in White Ibises	Dept. of Environmental Protect.	182,814
Hostetler, M.E.	Farming and Conservation Easement: A Win-Win Partnership	Univ. of Georgia	10,000
Johnson, S.A.	Excluding Anurars from Agricultural Fields in South Florida	Veg Pro	36,904
Kitchens, W.M.	Continued Vegetation Mnitoring of the Savannah River Tidally Influenced Marshes	U.S. Dept. of the Interior	81,222
Kitchens, W.M.	A Proposal to Document Flora & Faunal Succession Following Alternative Habitat Restoration Techniques in Large Central F	Fl. Fish & Wildlife Consvr Comm	75,000
Meffe, G.K.	Conservation Biology Editorial Office	Soc. for Conservation Biology	79,014
Oli, M.K.	URTD & Environmentally Threatened Gopher Tortoises	National Science Foundation	116,384
Percival, H.F.	Factors Affecting the Population Dynamics of Northern Bobwhites (Colinus Virginus)& Their Harvest on the Babcock	Fl. Fish & Wildlife Consvr. Comm.	75,245
Percival, H.F.	Graduate Research in Fish and Wildlife Management	Fl. Fish & Wildlife Consvr. Comm.	40,000
Percival, H.F.	American Alligator Distribution, Size, and Hole Occupancy and American Crocodile Juvenile Growth & Survival	U.S. Dept. of the Interior	167,203
Percival, H.F.	Development of Unmanned Aerial Vehicles for Assessment of Wildlife Population and Habitats: Phase 2	U.S. Dept. of the Interior	18,400
Ross, J.P.	Facilitation Leadership Initiative	Fl. Fish & Wildlife Consvr. Comm.	289,851
Sieving, K.E.	Minority Postdoctoral Research Fellowship for FY 2003 Host Institutional Allowance	National Science Foundation	10,000
Sieving, K.E.	Changes to Bird, Small Mammal, and Herpetofaunal Populations as a Consequence of Fuel Reduction Treatments in FL Flatwood	U.S. Dept. of Agriculture	61,250
Tanner, G.W.	Amphibians Using Isolated Ephemeral Ponds in FL Longleaf Pine Uplands: Population and Metapopulation Dynamics	U.S. Dept. of Agriculture	27,188
Tanner, G.W.	Florida Grasshopper Sparrow Habitat Assessment	U.S. Dept. of Defense	57,750