

# Project GREEN

2015 Legislative Summary

WIND  AGRICULTURE  
LAND surface erosion bacteria **PLANTS** cover crops Vegetation **HABITAT**  
PRODUCTION nutrient uptake

**microbes** organic matter NITROGEN **FOOD** **FARMLAND** remediation sustainability  
CLAY TEXTURE salinity **Earth** vegetables  
TECHNOLOGY **FERTILITY** filtration SILT analysis HORIZONS

**RAINFALL** replenish **CARBON CYCLE** **HEALTHY** ROCK  
Critical POPULATION contaminants  
particles STRUCTURE Water storage food security PURIFICATION  
SUBSOIL **SOIL** SAND MINERALS management practices NATURAL RESOURCE climate change rhizosphere  
PEST MANAGEMENT Microbiology DNA Sequencing

# MESSAGE FROM THE COORDINATOR



DOUG BUHLER

With the United Nations designating 2015 the “International Year of Soils,” increased attention has been brought globally to challenges surrounding food, energy and the environment. Since 1997, Project GREEN (Generating Research and Extension to meet Economic and Environmental Needs) has been confronting these issues and their impacts on plant agriculture.

In 2014-15, \$1.2 million was awarded for 40 new research and outreach projects, while 31 other projects received continued funding of \$975,100. Important research was conducted on issues such as plant diseases, soil health and the efficient use of natural resources — work that is vital to achieving our mission of protecting the environment and food safety while responding to industry needs.

I’m excited to share our findings with you, and this year we’ve taken a new approach to our legislative summary. Providing an easily navigable experience for stakeholders is our highest priority. While this summary provides a glimpse of the innovative research performed by our world-class faculty, the full report can be viewed at [agbioresearch.msu.edu/PG2015](http://agbioresearch.msu.edu/PG2015).



2015  
International  
Year of Soils

Here you will find the report broken into sections, making it simple to find the information you’re looking for quickly. The components of our traditional report that you’re accustomed to seeing will still be available, including financial information, competitive grant summaries, academic infrastructure reports and a list of grants awarded for 2015.

Project GREEN values your input. Please provide feedback on this year’s report, helping us learn the best ways to convey our research findings. Feel free to share your thoughts by sending an email to [info@agbioresearch.com](mailto:info@agbioresearch.com) or by calling 517-355-0123.

On behalf of the team at Project GREEN, MSU AgBioResearch, MSU Extension, the Michigan Department of Agriculture and Rural Development, and our 39 partner organizations, thank you for your interest in our work. I hope you are as intrigued and enlightened by this year’s research as I am.

Sincerely,

Doug Buhler  
Program Coordinator, Project GREEN  
Director, MSU AgBioResearch  
Senior Associate Dean for Research,  
College of Agriculture and Natural Resources

### DIRECTORS’ ACTION TEAM

The Directors’ Action Team is the decision-making body that establishes goals and strategic action plans for Project GREEN.

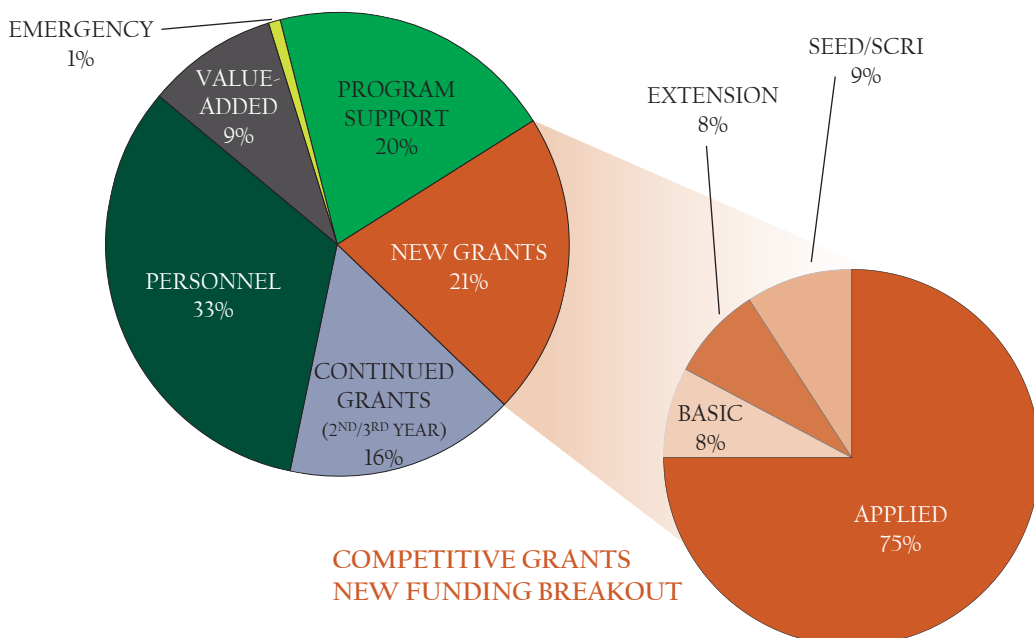
**DOUG BUHLER**  
MSU AgBioResearch

**RAY HAMMERSCHMIDT**  
MSU Extension

**VANCE BAIRD**  
MSU Department of Horticulture

**JAMIE CLOVER ADAMS**  
**GORDON WENK**  
**ROBIN ROSENBAUM**  
Michigan Department of Agriculture  
and Rural Development

## FINANCE AND OPERATIONS



# COMPETITIVE GRANT SUMMARIES

Competitive grants are the foundation of Project GREEN. Michigan State University, the Michigan Department of Agriculture and Rural Development, and Michigan plant commodity organizations work together to ensure that Project GREEN research aligns with industry priorities and scientists respond to the changing needs of plant agriculture in Michigan.

## Enhanced profitability for Michigan fruit and vegetable growers...when insecticide sprays can be safely withheld

JAMES MILLER

Awarded: \$40,000  
Leveraged: \$300,000

Insect pests such as codling moth (CM) in apple are a constant threat to Michigan fruit production and drain its profitability. But unwarranted sprays negate the positive effects of natural enemies and decrease an insecticide's lifespan by speeding the development of resistance. In theory, growers knowing the maximal number of pest individuals possibly present in an amount of crop can predict the maximal percent of infestation and make an evidence-based decision on whether to spray insecticides. Until recently, pest management science had not discovered a way to measure the absolute density of pests in a manner that was quick, practical or reliable. GREEN supported research that validated procedures for translating pest numbers into accurate estimates. These findings elevate the science of spray decisions and are directly transferrable to a wide range of pests across fruit, vegetable, field, forestry and ornamental crops.

## Monitoring for Brown Marmorated Stinkbug and Other Potential Invasive Pests

LARRY GUT

Awarded: \$68,070  
Leveraged: \$138,000

Invasive species have become increasingly problematic for North American fruit crop industries. The brown marmorated stinkbug (BMSB) is currently the best documented and greatest threat to the Michigan apple and peach industries. It also can be problematic in cherry. BMSB adults were detected in six Michigan counties in 2011 and two additional counties in 2012. The U.S. Department of Agriculture considers Michigan a region of high suitability for other potential invasive pests of apple and peach, as well. Project GREEN researchers developed monitoring programs and educational resources to provide timely and vital information to Michigan's stone fruit growers. Their findings have played an important role in helping Michigan fruit growers maintain their current integrated pest management programs and avoid tens of millions of dollars in damage by this pest.

## Long-term Management of Multiple-resistant Palmer Amaranth in Michigan Field Crops

CHRISTY SPRAGUE

Awarded: \$39,050  
Leveraged: \$20,643

Multiple-resistant Palmer amaranth (MR-PA), the greatest weed threat to field crop production, was recently confirmed in Michigan. MR-PA has been economically devastating to southern U.S. row crop farmers, and initial research indicates that it has been extremely difficult to manage in Michigan. Extended emergence patterns, a rapid growth rate and prolific seed production, combined with the propensity to develop resistance to multiple herbicide site-of-action groups, make this weed difficult to manage. To prevent a dramatic increase of this devastating weed in Michigan, long-term management strategies need to be implemented. MSU researchers used Project GREEN funds to better understand how this non-native, detrimental weed has adapted to Michigan's climate and cropping systems. Their research has provided information to growers on how to reduce MR-PA infestations through crop rotation and management strategies.

## Development of Genetic Stocks for Cucumber Fruit Resistance to *Phytophthora capsici*

REBECCA GRUMET

Awarded: \$58,500  
Leveraged: \$75,000

Each year, the pickling cucumber industry prioritizes its greatest production problems. For the past 10 years, downy mildew and *Phytophthora capsici* (P. capsici) have rated Nos. 1 and 2. The annual estimated costs of these diseases are \$3 million spent on fungicide sprays and an additional \$2 million of lost production. There is a great need for the development of disease-resistant cucumber varieties that will provide economic and environmental benefits. With the support of Project GREEN, MSU researchers have taken the first step in supplying Michigan growers with such a solution. They have identified three cucumber accessions as possible sources of resistance to fruit infection by P. capsici, and carried out screening and development of a true-breeding line for subsequent breeding efforts.

## The Soil Health Initiative: Crop Rotations for Enhancing Soil Health, Plant Health and Disease Management in Potato Production

WILLIAM KIRK

Awarded: \$72,500  
Leveraged: \$150,000

Michigan ranks seventh in national potato production but is plagued by many soil-borne diseases that are not well controlled. Soil-borne disease complexes are recognized as the cause, but soil ecology is not adequately understood and disease management has been inconsistent. MSU researchers used Project GREEN funding to expand the knowledge of pathogenic interactions in soil, providing a foundation on which to build biologically based management strategies and sustainable disease management practices. These insights will increase profit, reduce costly inputs and taxing environmental effects, and reduce potato yield loss due to soil-borne diseases. It also increases the understanding of strategies to enhance soil and plant health for improved soil-borne disease control.





## REPORTS AND SUMMARIES

### Delivering Tools to Floriculture Producers to Combat a New Downy Mildew

MARY HAUSBECK

Awarded: \$80,000  
Leveraged: \$236,798

Impatiens bedding plant production in the United States has steadily declined because of battles with downy mildew (DM). The industry was valued at \$62.9 million in 2014, approximately half of the 2010 industry (\$112 million). DM, an emerging and widespread disease caused by the water mold pathogen *Plasmopara obducens*, rapidly deflowers, defoliates and kills impatiens, which cannot be cured once they are infected. Recent reports of oospores, which allow the pathogen to overwinter and persist long-term in landscape beds, have raised concerns that DM could become an even more persistent problem. MSU researchers used Project GREEN funds to better understand the biology of this new downy mildew pathogen and to develop management strategies that support continued production of this valuable bedding plant. They found that manipulating environmental conditions in the greenhouse limits downy mildew and that fungicides applied in the greenhouse can extend protection to impatiens for months in the landscape.

### Producing Greenhouse and Nursery Plants that are Safe for Pollinators in the Yard and Garden

DAVID SMITLEY

Awarded: \$30,000  
Leveraged: \$96,317

In 2013 and early 2014, protests, publications, press releases and advertisements targeted retail stores and garden centers as selling flowers, trees and shrubs that were toxic to bees. Staged protests at selected garden centers of a large retail chain demanded that the stores remove neonicotinoid insecticides from their shelves and not sell plants treated with neonicotinoid insecticides. Michigan is ranked third in the nation in floriculture, with an annual wholesale value of \$402.7 million, so if Michigan growers lose large contracts with retailers, it would have a negative effect on Michigan's economy. Project GREEN supported a complete review of scientific literature, which indicated that greenhouse and nursery plants sold at garden centers have little impact on managed colonies of honeybees. Communication made as a direct result of this project had an important effect on the neonicotinoid and bees crisis; sale volumes actually increased in spring of 2014 compared with previous years, and no loss of sales that could be attributed to the misperception that garden center flowers are toxic.

For a complete list of competitive grant summaries and 2016 awarded grants, visit [agbioresearch.msu.edu/PG2015](http://agbioresearch.msu.edu/PG2015).

## ACADEMIC INFRASTRUCTURE REPORTS

### THE DEPARTMENT OF PLANT, SOIL AND MICROBIAL SCIENCES

Funds from Project GREEN that flow through this department are primarily used to support infrastructure needs at several MSU research sites and facilities. This year, the department installed an underground irrigation system on the east side of the Plant Pathology Farm, thereby providing reliable irrigation to all 35 acres of its fruit, vegetable and field crop research area. Researchers who utilized the MSU Agronomy Farm or any of the Plant Pathology Farm buildings, equipment and land could successfully lead projects because of the highly functional working conditions there.

Additionally, operating funds for MSU Extension specialists have allowed faculty members in the department to be more responsive to the needs of Michigan growers and commodity groups through research, extension and education. They've been equipped with direct links to producers, enabling them to respond quickly to their questions, concerns and research needs.



## PROGRAM SUMMARIES

### MSU LAND MANAGEMENT OFFICE

The MSU Land Management Office invests Project GREEN funds in key areas that help keep MSU AgBioResearch centers operating at full capacity. Most often, farm managers use Project GREEN infrastructure dollars to fund new equipment and skilled labor positions. In 2014-15, Project GREEN dollars bridged operating budget gaps at three of the 14 MSU AgBioResearch plant-based research centers, enabling the purchase and repair of equipment as well as the maintenance of several buildings.

Numerous research center projects also benefited from Project GREEN dollars, including:

- Potato variety testing to identify new commercial lines.
- Colorado potato beetle management recommendations.
- Protecting long-term soil quality.
- Evaluation of advanced potato germplasm for commercial traits.
- Diploid potato breeding.

For a complete list of academic infrastructure reports and program summaries, visit [agbioresearch.msu.edu/PG2015](http://agbioresearch.msu.edu/PG2015).

# IMPROVING OUR UNDERSTANDING OF SOIL



Kurt Steinke (left) and his graduate student Christopher Bauer count tillers in winter wheat plants.

For nearly two decades, Project GREEN has been influencing the plant agriculture industry through innovative and transformative research. But a truly significant impact would be impossible without dedicated researchers pushing the boundaries of the field.

Kurt Steinke, an assistant professor of soil fertility and nutrient management at Michigan State University, has been the beneficiary of Project GREEN funding since joining the Department of Plant, Soil and Microbial Sciences in 2011. His first Project GREEN initiative focused on improving the ecological efficiency of sugarbeet production. Sugarbeets are a specialty crop without as heavy of a research focus as larger-acreage cash crops.

Steinke found that while genetics and yields of the crop have changed dramatically over the past 10 to 15 years, nutrient recommendations have not. It used to be common that sugarbeets would follow dry beans in the field. Now they may routinely follow corn and wheat, two higher-density crops that produce greater biomass and more carbon, which affects the soil's composition. By improving and updating nutrient recommendations, growers

continue to see increases in yield and efficiency of fertilizer applications.

With the assistance of Project GREEN funding in 2013, 2014 and 2015, Steinke has completed two additional projects. Since the early 1980s, atmospheric sulfate deposition has dropped nearly 75 percent due to pollution control measures. This has decreased the freely available sulfates from the atmosphere. Steinke and his team sought to determine the relationship between sulfur and nitrogen use efficiency in corn production.

"We found that adding sulfur helped nitrogen use efficiency, agronomic efficiency and corn yield but only at extremely low nitrogen rates and where organic matter levels were less than 2.8 percent," Steinke said. "If growers were below the MSU recommendation for nitrogen, they saw a response to sulfur. If they were above, we did not see a response."

In a second project, Steinke studied soil health by testing whether management practices impacted the biomass and diversity of soil microbial communities. Soybeans were preceded by three cover crop scenarios: no crop, oilseed radish (a rooting crop) and hairy vetch (a

leguminous crop). Various organic and inorganic fertilizers were applied to all three, and samples were taken for DNA sequencing tests.

"The biggest question is, do we need to grow two crops to harvest one?" Steinke said. "The first crop is the soil microbial community, and the second is the cash crop of interest. Microbes rule the world. They dictate nutrient cycling. They mineralize nutrients. So if we have a healthy microbial community, does that translate into our crops having better access to a nutrient pool?"

Data analysis continues, and while preliminary findings indicate that management has a definite impact on microbial communities, there are several changes in the biomass that are out of growers' control.

Steinke was awarded just over \$130,000 for research on the two projects but was able to leverage more than \$250,000, a tribute to the relevance of his work.

"Not many states have a program similar to Project GREEN," Steinke said. "I know a couple of other states are looking at the Project GREEN model. The diversity of crop production in Michigan really plays a role in the program's importance, and we're fortunate to conduct research that helps growers well beyond our state."

**"The diversity of crop production in Michigan really plays a role in the program's importance."**

- Kurt Steinke, MSU AgBioResearch scientist



Project GREEN - Michigan State University  
Justin S. Morrill Hall of Agriculture  
446 West Circle Drive, Room 109  
East Lansing, MI 48824-1039  
[agbioresearch.msu.edu](http://agbioresearch.msu.edu)

## RECOGNIZING INDUSTRY PARTNERS

Project GREEN activities are aided by organizations that identify critical agricultural issues. Without these valuable partners, Project GREEN would not be possible.

- Celery Research Inc.
- Corn Marketing Program of Michigan and the Michigan Corn Growers' Association
- Great Lakes Canola Association
- Growing U.P. Agricultural Association
- Hop Growers of Michigan
- Michigan Apple Committee
- Michigan Asparagus Research Inc.
- Michigan Bean Commission and Michigan Bean Shippers' Association
- Michigan Blueberry Advisory Council
- Michigan Carrot Committee
- Michigan Cherry Committee
- Michigan Christmas Tree Association
- Michigan Commercial Beekeepers Association
- Michigan Cranberry Council
- Michigan Crop Improvement Association
- Michigan Farm Bureau
- Michigan Floriculture Growers Council
- Michigan Grape and Wine Industry Council
- Michigan Grape Society
- Michigan Hay and Grazing Council
- Michigan Integrated Food and Farming Systems
- Michigan Nursery and Landscape Association
- Michigan Onion Committee
- Michigan Organic Food and Farm Alliance
- Michigan Peach Sponsors
- Michigan Potato Industry Commission
- Michigan Sod Growers Association
- Michigan Soybean Promotion Committee
- Michigan State Horticultural Society
- Michigan State Millers' Association
- Michigan Tree Fruit Commission
- Michigan Turfgrass Foundation
- Michigan Vegetable Council
- Michigan Wheat Program
- Midwest Nut Producers
- National Grape Cooperative
- Pickle Seed Research Fund
- Sugarbeet Advancement Committee
- Western Michigan Greenhouse Association

