

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Engagement

- Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	5%		3%	
131	Alternative Uses of Land	5%		3%	
132	Weather and Climate	5%		2%	
133	Pollution Prevention and Mitigation	5%		3%	
211	Insects, Mites, and Other Arthropods Affecting Plants	5%		2%	
216	Integrated Pest Management Systems	5%		3%	
402	Engineering Systems and Equipment	5%		3%	
403	Waste Disposal, Recycling, and Reuse	5%		3%	
602	Business Management, Finance, and Taxation	12%		6%	
605	Natural Resource and Environmental Economics	5%		3%	
606	International Trade and Development Economics	3%		9%	
608	Community Resource Planning and Development	12%		10%	
610	Domestic Policy Analysis	5%		2%	
721	Insects and Other Pests Affecting Humans	3%		6%	
722	Zoonotic Diseases and Parasites Affecting Humans	5%		3%	
723	Hazards to Human Health and Safety	2%		6%	
724	Healthy Lifestyle	5%		2%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	2%		6%	
805	Community Institutions and Social Services	3%		9%	
903	Communication, Education, and Information Delivery	3%		16%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

Actual Paid	1.6	0.0	0.5	0.0
Actual Volunteer	0.1	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
224757	0	64919	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
266105	0	944926	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
155145	0	628934	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The College of Agricultural Sciences is committed to fostering advances toward solving some of the world's most pressing problems. To do so, our faculty extensively collaborate with colleagues and partners from around the world. We foster a welcoming climate for international students, scholars, and visitors in which the free flow of information and ideas leads to solutions for the challenges we face as a global population.

Efforts in sustainable intensification of global agriculture are aimed at building the self-reliance of farmers in developing countries. Researchers are engaged in promoting international cooperation in insect chemical ecology; predicting the demand growth for animal products in Brazil, Russia, India, Indonesia, and China, the world's most rapidly developing countries; and investigating approaches for disease control in cacao to help growers globally to have a more sustainable and environmentally friendly crop.

Understanding the transmission cycles of diseases combined with the effects of environmental degradation or change sparked investigations into how population growth combined with ecosystem change have increased human schistosomiasis around Lake Malawi in Africa and the use of fine-scale climate model projections to predict malaria at local levels in East Africa under expected climate change.

Penn State research and extension activities are advancing the role of women in agriculture and increasing opportunities for civic engagement by international youth, underserved populations, and women. Global programs with social impacts use sports and recreation to build peace and youth leadership. We are also working to increase opportunities for civic engagement with underserved populations and women.

2. Brief description of the target audience

Agricultural Producers/Farmers/Landowners
 Agriculture Services/Businesses
 Nonprofit Associations/Organizations

- Business/Industry
- Community Groups
- Education
- General Public
- Government Personnel
- Human Service Providers
- Military
- Non-Governmental Organizations
- Nonprofit Associations/Organizations
- Policy Makers
- Special Populations (at-risk and underserved audiences)
- Students/Youth
- Volunteers/Extension Leaders

3. How was eXtension used?

Penn State Cooperative Extension supports faculty and staff use of eXtension and promotes communities of practice as a way of broadening sources of information and outreach. Penn State Cooperative Extension supports the professional development offered through eXtension.org.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1817	29135	853	144

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2014
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	3	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of participants in extension education classes and workshops.

Year	Actual
2014	3749

Output #2

Output Measure

- Number of technology disclosures involving college faculty, staff, extension educators, or students.

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Finding that a new strain of Schistosoma haematobium has developed in Lake Malawi following the decline of snail-eating fishes in the lake's shallows.
2	Number of countries that sought out the Penn State Marcellus Education Team as an objective educational leader in shale gas issues and research.
3	International symposium held and formal international declaration made in support of the effects sport and recreation can have on youth leadership, peace building, empowering women, and social inclusion.
4	Use of fine-scale climate model projections to predict malaria at local levels in East Africa under expected climate change.
5	International short course in insect chemical ecology offered.

Outcome #1

1. Outcome Measures

Finding that a new strain of *Schistosoma haematobium* has developed in Lake Malawi following the decline of snail-eating fishes in the lake's shallows.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Schistosomiasis, a debilitating disease caused by parasitic flatworms, affects about 250 million people. The flatworms burrow into people's skin in freshwater, then mate within the intestines. Eggs are carried in human excrement back to the lake, where they hatch and live in a snail host. Urogenital schistosomiasis was formerly transmitted in Lake Malawi, Africa, only in swamps and backwaters. But infection rates along the lakeshore have increased, sometimes reaching 94% of schoolchildren.

What has been done

The researchers studied interactions among snail-eating cichlid fishes; the density of the intermediate host of the parasite, a small, freshwater snail (*Bullinus nyassanus*); and the prevalence of human infection with *S. haematobium* in Lake Malawi.

Results

The researchers found that the increased human infection rate was correlated with a decline in a snail-eating fish caused by overfishing and other ecological changes. The human population on the shoreline has doubled in the last 30 years, bringing increased sediment and nutrients into the shallow waters of the lake. The researchers believe that a strain of *S. haematobium* transported to the lake by tourists from another part of Africa interbred with the native Lake Malawi strain of *S. haematobium* to produce a strain of the parasite that can colonize both the original host snail and its close relative. This relative lives in the shallows and open waters of the lake, rather than in the swamps and backwaters, resulting in the higher human infection rates. This evolving situation affects transmission of urogenital schistosomiasis in local and tourist populations along the lakeshore. The work was published in the journal *EcoHealth*.

4. Associated Knowledge Areas

KA Code	Knowledge Area
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #2

1. Outcome Measures

Number of countries that sought out the Penn State Marcellus Education Team as an objective educational leader in shale gas issues and research.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Marcellus Education Team teaches landowners, community and government leaders, and businesses about financial, environmental, economic, and legal issues and impacts of Marcellus shale and natural gas drilling. They are recognized as national and international leaders able to provide an unbiased introduction to the opportunities and issues surrounding shale gas development.

What has been done

Last year the team delivered about 200 programs in 21 counties in Pennsylvania, 10 states, and 10 countries and reached more than 28,000 participants.

Results

The team has met with representatives of countries such as Brazil, Ukraine, Lithuania, South Africa, and Algeria, and worked with the U.S. State Department, the U.S. Department of Interior, and the Pennsylvania Department of Community and Economic Development, to discuss the economic and societal implications and social license of developing a shale gas resource. They have also met with representatives of the World Bank and international businesses. The team has partnered with state representatives to provide pipeline outreach to constituents.

Because of their collaborative efforts, more than \$110,000 in new natural gas programming support was committed in the past year.

The team also helped develop a new smartphone gas royalty and well decline curve app that provides information to lessors about wise lease management, all based on actual Pennsylvania shale gas well data. More than 1,400 sessions have been opened from more than 20 countries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
606	International Trade and Development Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis
723	Hazards to Human Health and Safety
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #3

1. Outcome Measures

International symposium held and formal international declaration made in support of the effects sport and recreation can have on youth leadership, peace building, empowering women, and social inclusion.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Half of the world's population is aged 25 or less, and about 85% of all youth live in less developed countries. Nearly half the world's population resides in rural areas, and 38% of the world's population depends on agriculture for livelihood. These statistics particularly apply in Africa and the Global South. There is a pressing need--for international security, stability, and regional capacity building--for innovative strategies to engage youth.

What has been done

This project seeks to create worldwide opportunities for youth to improve their lives and communities. It focuses on youth personal development, building capacity in their communities, and activism in social justice and equality. This project works on a range of international collaborations in evidence-based research and innovative educational programs. In August 2014 the UNESCO Croke Park Symposium on Youth Civic Engagement and Leadership through Sport and Recreation was held in Ireland.

Results

The symposium, leveraged by appropriated funds, explored the positive effects sport and recreation can have on youth and their communities. The symposium resulted in significant policy initiatives and a major formal declaration on using sports and recreation as mechanisms for youth development worldwide. The Croke Park Declaration was presented to the UN, UNESCO, and UNICEF as a platform for them to build global programming and policy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions and Social Services

Outcome #4

1. Outcome Measures

Use of fine-scale climate model projections to predict malaria at local levels in East Africa under expected climate change.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Malaria mosquitoes are cold-blooded--their body temperature matches the temperature of their direct surroundings. The ability of mosquitoes to transmit malaria is strongly influenced by environmental temperature. People are interested in how expected climate change will affect global malaria trends, but they are most interested in what may happen in their own town or village. The use of new fine-scale climate model projections helps to answer that question.

What has been done

Scientists examined how future climate warming might affect the potential for mosquitoes to transmit malaria. The researchers compared malaria transmission at four sites in Kenya that differed in altitude and prevailing environmental temperature. The team applied a statistical technique to conventional, coarse-scale climate models to better predict malaria transmission potential at local levels.

Results

This is one of the first studies to attempt to explore how climate change might affect conditions at the local level. Malaria predictions using global climate model simulation results don't necessarily indicate what may happen at a specific location. What is likely to happen in one location can be very different from another location just 50 miles down the road. To really understand the impact of climate change on malaria dynamics, a higher-resolution approach is needed. Fine-scale climate model projections suggest the possibility that population centers in cool, highland regions of East Africa could be more vulnerable to malaria than previously thought, while population centers in hot, lowland areas could be less vulnerable. Fine-scale predictions of malaria risk will be better tailored to the needs of local communities and can improve local adaptation and mitigation strategies. The research was published in the journal *Climatic Change*.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
721	Insects and Other Pests Affecting Humans

Outcome #5

1. Outcome Measures

International short course in insect chemical ecology offered.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Gathering as an international group allows young scientists to make professional connections they can use for the rest of their careers. They practice presenting their research and their professional selves. Entomologists can learn about similar plant-pest interactions in other parts of the world, and may even find the beginnings of a solution to a local problem in a predatory insect that could be safely introduced for biological control.

What has been done

As part of a research project on chemical ecology of interactions among plants, insects, and microorganisms, a 2-week international short course in insect chemical ecology was offered. This highly successful course rotates yearly amongst the Swedish Agricultural University, the Max Planck Institute for Chemical Ecology, and Penn State.

Results

Participants were 42 students from 14 countries: Brazil, Botswana, China, Nigeria, Kenya, Sweden, Belgium, Italy, France, Germany, India, French Guiana, Japan, Canada, and the U.S. The 22 guest lecturers were all recognized international experts in their subdiscipline. Each student presented a poster and a short lecture on his or her research. Subject matter covered included sensory biology and evolution; insects and pathogens; applied uses of pheromones and other semiochemicals; semiochemical discovery, isolation, identification, and synthesis; plant-insect interactions; pollination ecology; and the evolution of odor-mediated behavior. During a field trip, the group learned about the latest research underway at the Penn State Fruit Research and Extension Center in Biglerville.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Extramural Funding)

Brief Explanation

Natural Disasters

- Natural disasters allow the rapid spread of diseases and can damage equipment, such as drinking water treatment systems, that is essential for public health.

Economy

- The global economy influences political instability, and lack of opportunity can incite radical groups, disempower women and minorities, and discourage peace-building activities.

Government Regulations

- U.S. and foreign government regulations can influence the feasibility and necessity of various work.

Changes in Appropriations, Public Policy Changes, Competing Public Priorities, and Competing Programmatic Challenges

- Changes in appropriations, public policy changes, competing public priorities, and competing programmatic challenges can influence the amount of foreign aid available.

Extramural Funding

- Some of our programs are affected by extramural funding, either by adding resources to promote them or by shaping the content of the product.
- Extramural funding has allowed some teams to conduct practical applied research projects that include integrated extension/educational components.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The generation of outcomes from existing programs and the development of new programs require improved evaluation that identifies pre- and post- responses to information and monitoring for long-term behavioral changes that result in improved outcomes. More statewide extension programs are using retrospective evaluation to gather information about the number of participants who actually put into practice lessons learned through

extension programs. Measuring costs averted or profit increased can show powerful, tangible benefits of our programming--the type of feedback that keeps people coming back for more information. Customer satisfaction and needs assessment instruments (Salesforce and Atlas) are scheduled to be implemented in fall 2015 to provide feedback on the quality and value of our programs.

Key Items of Evaluation

See highlights of state-defined outcomes in this planned program.