

### V(A). Planned Program (Summary)

#### Program # 3

##### 1. Name of the Planned Program

Global Food Security and Hunger - Strategic Research for the Management of Invasive Pest Species

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
135	Aquatic and Terrestrial Wildlife				20%
211	Insects, Mites, and Other Arthropods Affecting Plants				30%
215	Biological Control of Pests Affecting Plants				30%
216	Integrated Pest Management Systems				20%
	<b>Total</b>				100%

### V(C). Planned Program (Inputs)

#### 1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
<b>Plan</b>	0.0	0.0	0.0	4.0
<b>Actual Paid</b>	0.0	0.0	0.0	2.5
<b>Actual Volunteer</b>	0.0	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
0	0	0	265730
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	132865
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

**Expert information systems:** Lucid software will be used to develop and deploy electronic identification tools and resources for selected taxa and commodities. **Offshore research:** We will conduct offshore research on selected high risk species to generate data on biology, ecology, and control.

**Invasive Patterns:** Together with empirical data generated from the offshore research, we will utilize existing databases on interceptions and establishments to test various hypotheses about invasions.

**Benefits and risks of biological control agents:** We will work with cooperators to assess the benefits and risks of fungal and arthropod biological control agents. A database containing data on host range of different natural enemy taxa will be developed. **Onshore research:** We will conduct research to develop ecologically based strategies for the management of invasive insect pests and weeds that have become established in Florida.

### 2. Brief description of the target audience

The target audience include: federal and state biosecurity agencies, small-scale farmers, extension workers, and biological control scientists/entomologists.

### 3. How was eXtension used?

eXtension was not used in this program

## V(E). Planned Program (Outputs)

### 1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	200	150	75	100

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

#### Patent Applications Submitted

Year: 2014

Actual: 1

#### Patents listed

### 3. Publications (Standard General Output Measure)

#### Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	5	7

## V(F). State Defined Outputs

### Output Target

#### Output #1

##### Output Measure

- Electronic identification keys/tools/resources developed.

Year	Actual
2014	1

#### Output #2

##### Output Measure

- Knowledge generated on specific target pests and used for the development of contingency plans.

Year	Actual
2014	21

#### Output #3

##### Output Measure

- Analyses conducted on key issues regarding safety and specific target biological control agents studied to determine safety.

Year	Actual
2014	5

#### Output #4

##### Output Measure

- Target biological control agents introduced and established against specific insect pest or weed targets.

Year	Actual
2014	2

#### Output #5

##### Output Measure

- Undergraduate and graduate students trained through mentorship and involvement in research programs.

Year	Actual
2014	16

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Digital identification keys/tools/resources for the identification of invasive species utilized.
2	More effective strategies for the identification, prevention or management of invasive species.
3	Integrated pest management approaches adopted by farmers leading to greater profitability.
4	The introduction and spread of IAS minimized.
5	More effective management of aquatic weeds in first order springs.
6	Trade between the US and partners is safer through implementation of strategies to mitigate the introduction of invasive insect pests and weeds.
7	Well trained undergraduates and graduates contribute to the effective management of native and non-native pests

## **Outcome #1**

### **1. Outcome Measures**

Digital identification keys/tools/resources for the identification of invasive species utilized.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	21

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Florida faces a disproportionate risk from invasive pests which are a major threat to agriculture and the environment. Farmers, the general public, ornamental industry, and various state and federal agencies involved in efforts to mitigate the threats of invasive pests are concerned with these threats.

#### **What has been done**

#### **Results**

{ This is the first comprehensive survey ever on mealybug. We found at least 21 mealybugs reported. With a few exceptions, all the species collected are native or relatively common in the Neotropical region, but according to Williams and Granara de Willink (1992), *Dysmicoccus neobrevipes* might not be native to the Neotropics. In this survey, *Saccharicoccus sacchari* (Cockerell) which was collected only a few times and only from sugarcane, but this species was cited by Perez-Gelabert (2008) on a record for the Dominican Republic, found on the another grass, *Paspalum maximum*.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

## **Outcome #2**

### **1. Outcome Measures**

More effective strategies for the identification, prevention or management of invasive species.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	3

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The work on offshore pests is aimed at safeguarding US Agriculture, farmers, food and ornamental growers, the nursery industry and government agencies.

#### **What has been done**

The effectiveness of risk communication activities for entomophagous biological control agents were compiled. Data on classical and fortuitous biological control were collected for use to populate existing or new databases. These data allow the testing on hypothesis relating to safety issues.

#### **Results**

Offshore research on seven high risk species (Planococcus lilacinus, Rhyncophorus ferrugineus, Rhyncophorus cruentatus and Rhyncophorus palmarum, Oxycarenum hyalinipennis, Tuta absoluta, and Anastrepha grandis) was carried out or initiated in Trinidad, Dominican Republic, Curacao and Aruba, Kenya, and Panama with a view to generate data on biology, ecology, surveillance and control. These pests are listed as high priority threats by USDA APHIS. Research activities were conducted in collaboration with several international partners.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

### **Outcome #3**

#### **1. Outcome Measures**

Integrated pest management approaches adopted by farmers leading to greater profitability.

#### **2. Associated Institution Types**

- 1890 Research

#### **3a. Outcome Type:**

Change in Action Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	1

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

North Florida and specially, Leon, Jefferson, Wakulla, and Gadsden counties

##### **What has been done**

{ Extension and teaching project to enhance the capacity of urban agriculture in North Florida by supporting the adoption of best management practices in Leon, Jefferson, Wakulla, and Gadsden counties

##### **Results**

1) the development of, integrated pest management, and transitional organic vegetable production, and 2 develop student led projects on various aspects of urban vegetable production; 3) to carryout comprehensive survey and analyses of farming practices in Leon, Jefferson, Wakulla, and Gadsden counties, 4) development and demonstration of training plots, 5) provide basic technical support and training to clientele and students in areas such as soil testing, soil & bed preparation, crop and cultivar selection, irrigation practices, identification and diagnostics of pest and beneficial species, pest management, conservation of beneficial species, economic analysis

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

**Outcome #4**

**1. Outcome Measures**

The introduction and spread of IAS minimized.

**2. Associated Institution Types**

- 1890 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2014	2

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

{US produceur, organic farmers and beekeepers

**What has been done**

Several field trials were conducted to provide pratical and step by step procedure to control pests of honey bees

**Results**

Field data indicated that not only did dry spores (6% water content) of *Metarhizium anisopliae* control mite populations in both organic and conventional beekeeping, but it also controlled small hive beetle populations. For satisfactory control of both pests, treatments should be initiated at the same time. The mites are treated with patties twice at an interval of 30 days, and the treatment for SHB is applied once as a 5-lb soil treatment in a metal pan placed under the bottom boards.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants

## **Outcome #5**

### **1. Outcome Measures**

More effective management of aquatic weeds in first order springs.

### **2. Associated Institution Types**

- 1890 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2014	1

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Fshermen and general public (who use the aquatic resources for recreation), water users, boaters, kayakers, swimmers, park visitors, water resource managers and private industry such as bottled waterenterprises.

#### **What has been done**

(a) inventory introduced and native herbivores feeding on Hydrilla at Wakulla Springs and Wacissa Springs concentrating on aquatic weevils and flies; (b) established of populations of *C. lebetis* at selected springs in the Wacissa Springs group and Wakulla Springs; (c) evaluated the effects of temperature, nitrates, phosphates and sulphates on the performance of potential biological control candidates; and (d) documented the economic importance of removing Hydrilla verticillata from Wakulla Springs and Wacissa Springs and the rivers they feed in north Florida

#### **Results**

Biological control of Hydrilla verticillata. A survey of the upper 1.5 miles of the river of the Wacissa Springs Group was conducted. A descriptive scale of 0-3 was used with 0 indicating Hydrilla undetected and 3 completely choked. Survey results of the Wacissa River indicated varying levels of Hydrilla infestations. Thus, for mitigation purpose, cultures of Hydrilla were established in the laboratory from Wacissa Big Blue Spring, Wacissa #2 and Garner Spring. The Hydrilla tip mining midge, *Cricotopus lebetis* were reared in the laboratory for release into Wacissa River to assess its effectiveness in controlling Hydrilla.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
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135 Aquatic and Terrestrial Wildlife  
216 Integrated Pest Management Systems

**Outcome #6**

**1. Outcome Measures**

Trade between the US and partners is safer through implementation of strategies to mitigate the introduction of invasive insect pests and weeds.

Not Reporting on this Outcome Measure

**Outcome #7**

**1. Outcome Measures**

Well trained undergraduates and graduates contribute to the effective management of native and non-native pests

**2. Associated Institution Types**

- 1890 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2014	13

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Public and US Education system

**What has been done**

Train undergraduate and graduate students

**Results**

3 undergraduate students and 13 graduate students received their degree

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
135	Aquatic and Terrestrial Wildlife
211	Insects, Mites, and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

#### **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 Programmatic Challenges

##### **Brief Explanation**

Government regulations regarding globalization of trade and transport has multiplied concerns of introduction of invasive species. This threat has increased as trade has grown and so have the complexities of trade especially in agricultural products. Increase in temperature improves the

#### **V(I). Planned Program (Evaluation Studies)**

##### **Evaluation Results**

The overall implementation of the research program in the Center for Biological Control was evaluated by the Center Advisory Council in December 04, 2013 and found to be progressing satisfactorily.

##### **Key Items of Evaluation**

n/a