

## **APHIS-PPQ Plant Biosecurity Curriculum (PBC)**

The Plant Protection and Quarantine (PPQ) unit within APHIS is developing a Plant Biosecurity Curriculum as an important education, outreach, and recruitment program, and seeks cooperators from the National Plant Board. Typically, academic programs are strong in science but do not include coursework involving issues/ challenges related to regulatory activities in plant health and biosecurity. In addition, students have limited knowledge of the scientific and career opportunities that are available in regulatory agencies. By implementing the course information associated with the PPQ Plant Biosecurity Curriculum (developed by Subject Matter Experts within PPQ), universities will be able to offer new programs to their students with less investment and more factual information than if the programs were developed without PPQ support. Course coordinators (academic instructors) at universities will assist students in their efforts to obtain future employment with state and federal regulatory agencies.

The objectives of a PBC for PPQ are:

1. Develop a foundation for plant protection/biosecurity and regulatory studies at several levels of education (K-12, College and Graduate Programs).
2. Assemble information regarding plant protection activities not explained elsewhere and advance an understanding of State and Federal Regulations and Roles and Responsibilities in Agricultural Biosecurity.
3. Promote awareness of the dangers posed by invasive exotic weeds, plant pathogens, and other plant pests.
4. Promote knowledge about career opportunities available in plant protection and provide hands-on experience through internship opportunities.

### **Universities currently involved with PBC**

The vision of the PBC is to educate students in the areas of biology of plant pests and diseases, management of invasive pests, diseases, and weeds, survey and detection techniques, identification technology, risk assessment, and domestic and international regulations.

**North Carolina State University.** PPQ has developed an upper-level undergraduate/graduate course, “Challenges in Plant Resource Protection,” that provides training on regulatory aspects of plant protection using real-world case studies and issues, and develops hands-on problem-solving abilities in risk analysis and risk management. This course is flexibly delivered to the University of Florida and Florida A&M University. In addition, CPHST has developed a course in “Fundamentals of Risk Analysis.”

A minor in Plant Biosecurity and Regulatory Science at NCSU consists of existing introductory undergraduate courses in Entomology, Plant Pathology and Weed Science, combined with the PPQ “Challenges” and “Fundamentals” courses, and a Senior Seminar Project. (Website: <http://cipm.ncsu.edu/aphiscourse/index.cfm>)

**University of Florida.** The “Challenges” course is incorporated into UF’s “Doctor of Plant Medicine” program. A number of students from this program have worked with PPQ as interns, and several permanent employees have been hired from the DPM program.

**Florida A&M University.** PPQ has worked with FAMU to develop a Center of Excellence in Biological Control. PPQ and FAMU are developing a minor in Regulatory Plant Science similar to the minor being developed at NCSU. This minor also combines the “Challenges” and “Fundamentals” classes with existing FAMU courses. Some students have worked as interns with PPQ.

**University of Maryland.** Plant Health Programs has worked with UM to establish a seminar series in “Exploring Plant Protection, Health, and Quarantine Issues” that is being offered for the second time in Fall 2008. A 3-credit course providing an overview of PPQ operations will be offered in Spring 2009. These courses will form the basis for a minor in the future. In 2007, PHP hired 12 UM students through an intern program.

**Michigan State University.** CPHST personnel have been involved in teaching an Internet-based course titled “International Plant Protection Convention.” This course is international in content and instruction, and is designed for anyone interested in global plant health and its relationship to international trade. This course is part of a series of food law courses comprising an International Food Law Certificate Program.

### **New Program Development**

In the last several months, PPQ has communicated with several universities regarding the potential expansion of the Plant Biosecurity Curriculum. As a result, several new programs are under development.

**Rutgers University.** Rutgers has identified a faculty member that will coordinate their curriculum and is in the process of developing a Certificate program in Plant Biosecurity and Protection of Natural Resources. The program will combine existing classes in entomology, plant pathology, and plant science with the NCSU course “Fundamentals of Risk Analysis” and a newly developed overview course emphasizing diagnostic methods.

**University of Maryland, Eastern Shore.** UMES will participate remotely in the two biosecurity courses offered at the University of Maryland, College Park. UMES is an 1890 Land-Grant Institution.

**New Mexico State University.** NMSU is very interested in this program and is currently reviewing Plant Biosecurity Curriculum lecture materials to determine how this could be integrated with their existing programs. NMSU is an 1862 Land Grant, a Hispanic Serving Institution, and has a significant number of Native American students.

**North Carolina A&T University.** The Plant Biosecurity Curriculum was presented to the Dean of Agriculture in June 2008. He was very interested in the initiative and will present this information to the college faculty in September. NC A&T is an 1890 Land-Grant Institution.

**University of Georgia.** UGA has independently developed an Agrosecurity Certificate Program that has some overlapping goals with the Plant Biosecurity Curriculum. The coordinator of this program is interested in incorporating some Plant Biosecurity modules or case studies into their existing classes.

**University of Puerto Rico, Mayagüez.** The Plant Biosecurity Curriculum was presented to the administration in the Dept. of Crop Protection in August 2008. UPRM is interested in the program and PPQ will continue to work with them in the coming months. This is an 1862 Land Grant and also a Hispanic Serving Institution.

### **Benefits and Results**

- Plant Biosecurity Curriculum courses have been implemented at 5 universities. Six additional universities are developing a program or considering development.
- By working with institutions with significant minority student populations, PPQ is actively working to promote the agency's civil rights goals.
- The curriculum and the internships will serve to train students in PPQ operations and will serve as an excellent recruitment tool.
- State agencies involved in plant protection activities and the National Plant Board have the opportunity to participate in the PBC by contributing course content or guest lectures.

### **For additional information contact:**

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## **Plant Biosecurity Curriculum Proposed Module Topics**

As the curriculum is expanded to new institutions, each institution can specifically design a curriculum that fits with their strengths and current course offerings. This outline identifies key elements of plant biosecurity as a series of modules. Each module can be developed by Subject Matter Experts into a lecture, a section of a course, or into an entire course, upon request of the partner institutions. The courses can be combined with existing courses to develop a Minor or Certificate, depending upon institutional capacity and interest. This information can also be shared among institutions.

### **1. Introduction to Plant Protection and Quarantine**

A short module for the beginning of each course.

Definition of Plant Biosecurity.

The purpose, goals, and importance of PPQ.

Historical overview.

Organization of PPQ and relation to APHIS, USDA, and other government agencies.

Role of State and other Federal agencies.

Role of Department of Homeland Security-Customs and Border Control

Current Plant Biosecurity Issues in U.S.

### **2. Legislation and Organizations that Support Plant Protection and Quarantine Activities**

#### **A. Legislative framework and standards**

International: International Plant Protection Convention (IPPC), Food and Agriculture Organization (FAO), World Trade Organization (WTO),  
Sanitary

and Phytosanitary Measures (SPS) Agreement, etc.

Domestic: Quarantine-37 (plant propagative materials), Quarantine-56 (fruits and vegetables), Plant Protection Act, Agricultural Bioterrorism Protection Act, Code of Federal Regulations, Federal Register, State legislative authorities

#### **B. Organizations and Programs**

International Cooperation and Global Safeguarding

National Plant Protection Organizations

Regional Plant Protection Organizations (e.g. North American PPO)

Federal and State Agencies

National Plant Board, National Association of State Depts. of Agriculture

### 3. The Safeguarding Continuum and Trade

#### A. Pre-border

- International cooperation and communication
- Facilitating trade vs. preventing entry of invasive pests on commodities
- Trade agreement requirements
- Risk assessment and risk management
- Pre-clearance programs for agricultural products
- Phytosanitary measures
- Solid Wood Packing Material/ISPM 15
- Offshore mitigation activities (e.g. Caribbean Safeguarding Initiative)
- Export certification

#### B. Border

- Roles of border personnel
- Permits
- Inspections
- Certifications
- Commodity treatments as a result of Port of Entry pest detection
- Quarantines
- Smuggling, interdiction, and trade compliance
- Investigative and Enforcement Services
- Select agents

#### C. Post-border

- Emergency response programs
- Eradication and control activities
- Plant pest programs
- Pest surveillance
- Domestic trade and quarantines
- Roles of state and federal personnel

#### Example of Subject Matter Experts contributing to module development Domestic program case studies

Module topic	Federal Subject Matter Expert	State Subject Matter Expert
Fruit flies	Mike Hennessey	
Citrus Greening and Citrus Canker	Pat Gomes	
Plum Pox Virus	Don Albright	
Asian longhorned beetle	Christine Markham	
Glassy winged sharpshooter	Beth Stone-Smith	
Emerald ash borer	Phil Bell	

#### **4. Tools and Methods for Plant Protection and Safeguarding**

##### **A. Surveillance methods and technologies**

- Survey design and sampling methods
- Detection, monitoring, and delimiting surveys
- Spatial analysis technologies (GIS)
- Cooperative Agricultural Pest Survey Program
- Pest databases
- Public awareness

##### **B. Identification and diagnostic methods and technologies**

- Tools and methods for insect, disease, and weed identification
- Diagnostic laboratories
- Microscopy
- Lucid and dichotomous keys
- PCR/Nucleic acid analysis- standard, real time, and quantitative methods
- Immunoassay methods- ELISA, microplate and lateral flow methods
- Microarray technology

##### **B. Disease, Pest, and Weed Management and Eradication**

- Integrated Pest Management
- Chemical controls
- Biological control
- Pheromones and other semiochemicals
- Sterile insect technique
- Containment and areawide management strategies
- Pest Free Areas, Areas of Low Pest Prevalence

#### **5. Risk Analysis**

- Promoting trade while safeguarding agricultural resources
- International, legal, and regulatory framework
- Pest Risk Analysis
- The role of economics in risk analysis
- Risk Assessment concepts and methodologies
- Data sources: Agricultural Quarantine Inspection Monitoring, Agricultural Quarantine Activity System, Global Pest and Disease Database, Offshore Pest Information System, etc.
- Risk Management and Risk Communication

## **6. Biology and Taxonomy of Exotic Species**

### **A. Organism biology**

- Taxonomy, identification, and diagnosis
- Growth, development, life cycle, and plant interactions
- Invertebrate pests
- Plant diseases
- Weeds

### **B. Ecosystems and diversity**

- Invasion biology
- Entry and establishment
- Factors that influence survival, movement and dispersal
- Epidemiology of diseases

## **7. Education, Outreach, and Careers in the Biosecurity Continuum**

- Communities as stakeholders: international, national, state, industry, public
- Consultation with stakeholders and impact on policy development
- Social aspects of biosecurity: public relations, communication, education
- Impacts of environmental and conservation organizations
- Careers in biosecurity: federal, state, and private industry