Department of

Entomology

Periodic Program Review

Submitted March 2011

Self Study

Self Study Report **December 22, 2009**
Department of Entomology
University of Kentucky

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I. Organization of Self-study Document

This document presents an overview of the Department of Entomology. It includes our mission statement and a description of the Department's activities that address goals and values in the University of Kentucky Strategic Plan for 2009-14 (http://www.uky.edu/Provost/ strategic_planning/plan.htm).
The Department activities also address several goals of the (2009-2014) Strategic Plan for College of Agriculture at the University of Kentucky.

Members of the review team:

Scott Shearer, Chair, Biosystems and Agricultural Engineering

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The Committee will add one or more student representatives at a later date.

This self-study document is organized to provide a basis for the review team's assessment of the quality of:

1. Degree programs and student learning
2. Extension programs
3. Research programs and benchmark comparisons
4. Faculty/staff and unit productivity
5. Recruitment and retention of a diverse faculty, staff and student body
6. Management and adherence to policies and collegial environment
7. Planning, evaluation, and resources that maximize program effectiveness relative to allocation.

II. Introduction to the Department of Entomology

The members of the Department of Entomology are committed to providing high quality programs. We recognize that we must continually look for new opportunities and adjust current programs to enhance our ability to meet the changing needs of society. Our strengths are in graduate education, research, teaching, and extension. Faculty are actively involved in a number of undergraduate degree programs, including Agricultural Biotechnology (ABT), Sustainable Agriculture, and an individualized program in Entomology within the BS program in Agriculture. Faculty teach undergraduate courses that are required for several majors within the College of Agriculture (e.g., Forestry, Horticulture, and Plant and Soil Sciences) and Arts and Sciences (Biology). Each semester for the past 15 years the Department has taught a course (ENT 110) that fulfills a natural sciences requirement in the current University Studies Program (USP) at the University of Kentucky. Faculty in Entomology are dedicated instructors who take pride in their graduate and undergraduate teaching responsibilities.

Within the Department, we strive for a creative synergy between fundamental and applied entomological research, developing long-term solutions to entomological problems, while providing answers that address immediate short-term problems. We have a strong integration of research and extension efforts that enhances our visibility and effectiveness. We also integrate the graduate education program with our research and extension strengths. The Department's approach to the MRLS (mare reproductive loss syndrome) crisis in Kentucky (2000-03) and our response to the more recent world-wide outbreak of bed bugs demonstrate how we respond to critical needs within the Commonwealth of Kentucky, the nation, and world.

A. Mission for the Department of Entomology

Our mission is to improve the quality of human life and protect our environment through a better understanding of insects and related arthropods. We conduct fundamental and applied research on insects, deliver information through education and outreach activities, educate graduate and undergraduate students, develop and provide resources for agricultural and pest management professionals, implement integrative and effective systems for insect pest management, and enhance science education and public appreciation of human-insect interactions.

B. Addressing the goals and values of the University of Kentucky

The Department of Entomology supports the mission and goals outlined in the University of Kentucky 2009-2014 Strategic Plan (http://www.uky.edu/Provost/strategic_planning/). Specifically, the Department of Entomology supports the following goals and objectives in the 2009-14 Strategic Plan.

Goal 1: Prepare Students for Leading Roles in an Innovative-driven Economy and Global Society

Objective 1.4 Increase the number and quality of graduates at all levels to enhance the reputation of the University and address the critical needs of the Commonwealth and United States.

Strategy 1.4.3 Provide training opportunities for graduate and professional students to serve the needs of the Commonwealth and beyond

Strategy 1.4.4 Develop and implement new programs and strategies to increase student enrollment and diversity, including…..pipeline initiatives with middle and high school-students and their teachers.

Metric 1-9. Increase master's degrees awarded per academic year to 1,450.

Metric 1-10. Increase research and professional doctoral degrees awarded per academic year to 780.

Goal 2: Promote research and creative work to increase the intellectual, social, and economic capital of Kentucky and the world beyond its borders

Objective 2.1 Increase research and scholarly productivity

Strategy 2.1.3 Grow traditional sources of extramural research support and identify and cultivate new sources.

Objective 2.2 Expand research capacity

Objective 2.3 Enhance the impact and public awareness of the University's research and scholarship on the knowledge based economy of Kentucky and the nation

Strategy 2.3.4 Integrate research and teaching more fully by increasing research opportunities for students at all levels.

Metric 2-1. Increase total annual research expenditures, as reported to the National Science Foundation in science and engineering fields, to $430 million.

Metric 2-2. Increase the five-year total for journal publications to 10,000.

Metric 2-3. Increase the five-year total for citations to 65,000.

Metric 2-4. Increase total annual invention disclosures, licenses and options executed, and startups based on new licenses to 132.

Metric 2-5. Increase total annual national and international recognition awards for research excellence.

Goal 3: Develop the Human and Physical resources of the university to achieve the institution's top 20 goals

Objective 3.1 Recruit faculty and professional staff with high potential for success at a top 20 level research university

Objective 3.2 Enhance the success, retention, and advancement of all cadres of faculty and professional staff engaged in the varied missions of the University.

Metric 3-7. Renovate or modernize 200,000 square feet of classroom, research, and student support space, as prioritized by a needs analysis.

Goal 4: Promote Diversity and Inclusion

Metric 4-1. Ensure that all educational and administrative units implement strategies to achieve inclusive excellence.

Metric 4-2. Increase the proportion of students from diverse ethnic groups and other underserved populations.

Goal 5: Improve the Quality of Life of Kentuckians through Engagement, Outreach, and Service

Metric 5-1. Increase the number of faculty and staff reporting outreach and engagement activities on the Engagement Measurement Instrument (EMI) to 1,000.

Metric 5-2. Increase outreach, service, and engagement contacts made with individuals in providing university knowledge and expertise to improve lives and benefit communities.

The Department of Entomology supports the mission and vision of the University of Kentucky and embraces the core values of the University.

Mission of the University of Kentucky

The University of Kentucky is a public, land grant university dedicated to improving people's lives through excellence in education, research and creative work, service, and health care. As Kentucky's flagship institution, the University plays a critical leadership role by promoting diversity, inclusion, economic development, and human well-being.

Vision

The University of Kentucky will be one of the nation's 20 best public research universities.

Values

The University of Kentucky is guided by its core values:

- Integrity
- Excellence
- Mutual Respect and Human Dignity
- Diversity and Inclusion
- Academic Freedom
- Shared Governance
- Work-life Sensitivity
- Civic Engagement
- Social Responsibility

C. Addressing the Goals of the College of Agriculture outlined in "The Land-grant Vision: College of Agriculture Strategic Plan 2009-2014".

The Department of Entomology will make significant contributions to the following college goals and key indicators for the College of Agriculture.

Goal 1

Prepare Students for Leadership in an Innovation-Driven Economy and Global Society

Key Indicators for the College:

Increase the number of graduate degrees awarded by an average of 5% per year.

Goal 2

Promote Research and Creative Work to Increase the Intellectual, Social and Economic Capital of Kentucky and the World Beyond its Borders

Key Indicators for the College

1. Increased the annual total of external awards to $35M or above.
2. Increased federal competitive grant awards from 33 to 40 percent of the College's extramural funding portfolio.
3. Increased the average number of refereed journal publications by 5% per year.
4. Increase the cumulative number of patents awarded by an average of 5 per year.

Goal 3

Develop the Human and Physical Resources of the College to Achieve Top 20 Stature

Key Indicators, by 2014 the College will have:

1. At least three listings in the top 10 or top quartile according to Academic

Analytic's Faculty Productivity Index.
2. Increased its total endowment to $120M.
3. Sustained a Top 20 national ranking as indicated by NSF-reported research expenditures.
5. Renovated or modernized 50,000 sq. ft. of College classroom, research, and student space.

Goal 4

Promote Diversity and Inclusion

Key Indicators, by 2014 the College will have:

1. Increased the percentages of graduate students, professional staff, and faculty from under-represented groups by 10 % in each group.
2. Increased the percentage of female faculty to 30%.

Goal 5

Improve the Quality of Life for Kentuckians through Extension, Outreach and Service

Key Indicators, by 2014 the College will have:

1. Increased grantsmanship in Extension or Integrated Projects as evidenced by numbers of proposals submitted and funded.
2. Sustained Extension contacts at or above 6 million.

D. Vision and Goals for the Department of Entomology

Goals:

We strive to be among the strongest research, extension, and graduate education programs in Entomology in the nation.

Within the Department we maintain a high quality program by:

Establishing a creative environment that fosters productive faculty, staff, and students

Developing high impact extension and research programs that address the needs of the citizens of Kentucky, the nation, and the world

Recruiting and training outstanding graduate students who are highly competitive for quality professional positions.

Maintaining a balance between applied and fundamental research programs

Striving for an extramural funding base of competitive federal grants

Supporting high publication productivity in respected peer-reviewed journals

Mentoring quality graduate students and post-doctoral scholars

Members of the Department foster a creative environment for scholarly activities. Our scholarly focus is driven by the pursuit of fundamental knowledge and an applied mission to deliver new technologies and knowledge. The Department provides the intellectual environment for new discoveries and the application of knowledge to improve the quality of life. We adapt to new opportunities and challenges as they arise, e.g., novel insect-vertebrate interactions, new invasive species, or the planting of insect resistant transgenic crops. The influence of our activities extends beyond the University of Kentucky, through our teaching, outreach, and the strengths of our graduate students.

The Department of Entomology, through its extension programs, fosters the adoption of Integrated Pest Management and sustainable agricultural practices while promoting the wise stewardship of the commonwealth's natural resources. We ambitiously pursue an extramural funding base that includes competitive federal grants, and we seek funding for the formation of endowed chairs and graduate student fellowships.

Interdepartmental Activities of the Department of Entomology

The involvement of Entomology faculty as instructors and advisors in the undergraduate Agricultural Biotechnology program is an example of our involvement in interdepartmental teaching programs. In addition, Dr Bruce Webb served as the Director for ABT between 2006 and 2009. Members of the faculty have been actively involved in the annual Center for Ecology, Evolution and Behavior (CEEB) Research Symposium at the University of Kentucky. The role of entomology faculty in teaching courses that contribute to a number of majors is highlighted in Section III. Faculty also provide leadership for programs in integrated pest management, pesticide safety education, IR-4 programs for minor use crops, and the Kentucky Forest Health Task Force.

III. Degree Programs Within the Department of Entomology

Undergraduate Education

The Department of Entomology offers a major in Entomology as an individualized program within the Bachelor of Science in Agriculture (http://www.ca.uky.edu/students/welcome/entomology.asp) and an undergraduate minor in Entomology. The requirements for the minor in Entomology are described at: (http://www.uky.edu/Registrar/Major-Sheets/minorsCurrent/agr/ent.pdf).

Insect Biology (ENT 110) currently fulfills a natural sciences requirement for the University Studies Program (USP) at the University of Kentucky. General Entomology (ENT/BIO 300) fulfills a requirement for the Biology major as well as a natural sciences requirement for the USP. In addition, our faculty offer courses that serve students from several undergraduate programs including Plant and Soil Sciences, Forestry, Horticulture, Animal Science, and Natural Resources and Conservation. Several faculty members of the Department of Entomology actively participate as instructors and advisors in the Bachelor of Science in Agricultural Biotechnology (ABT) program (http://www.ca.uky.edu/students/welcome/ag_biotechnology.asp) and an Entomology faculty member taught genetics (BIO 304) in alternate years through Fall 2008. Faculty also mentor undergraduate students through independent study projects and research experiences.

Student Credit Hours and Course Evaluations for faculty in the Department of Entomology

For the academic years 2003-04 through 2008-09, the average number of student credit hours for courses listed as Entomology (ENT) was 1,044 ± 58 per academic year (Table 1). The student credit hours resulting from ENT 110 (Insect Biology) represents an average of 46 % (±3) of the total student credit hours in Entomology for the academic years 2003 to 2009. The total contact hours do not include ABT, Biology courses and Gen 100 sections taught by Entomology faculty or students enrolled in ENT courses that are co-listed with Biology and Forestry. For example, Chuck Fox taught Biology/ENT 304 (Genetics) in 2004 (N=165), 2006 (N=182), and 2008 (N=162). Reddy Palli taught ABT 460 (Introduction to Molecular Genetics) in 2007 (N=31) and 2009 (N=25) and James Harwood taught ABT 301 (Writings and Presentations in the Life Sciences) (N=14) in 2009. John Obrycki taught a section of Gen 100 in 2006 (N=25) and co-taught a section in 2008 (N=25). Additionally, these summarized student contact hours do not reflect the added faculty time working with students in laboratory sections of several entomology courses (e.g., ENT 300, ENT 320, ENT 402).

Table 1. Student credit hours (SCH) in the Department of Entomology; 2003-2009. Student credit hours for the Department of Entomology (ENT) by semester, course level, and academic year. Data from UK Institutional Resource, Planning and Effectiveness webpage (www.uky.edu/IRPE/students/hours/total/ag)

Semester	Course Level	03-04	04-05	05-06	06-07	07-08	08-09
Fall							
	100-299	225	225	225	225	234	237
	300-499	177	150	171	165	117	153
	500-599	64	44	68	64	33	56
	600-799	122	93	127	83	131	132
	Fall Totals	588	512	591	537	515	578
Spring							
	100-299	243	237	240	240	243	240
	300-499	47	67	69	89	48	59
	500-599	42	39	54	33	-	39
	600-799	163	154	168	119	161	124
	Spring Totals	495	497	531	481	452	462
Summer 8-week							
	300-499	3	3	-	-	3	-
	600-799	9	-	5	1	-	-
	Summer Totals	12	3	5	1	3	0
Semester Totals							
	100-299	468	462	465	465	477	477
	300-499	227	220	240	254	168	212

	500-599	106	83	122	97	33	95
	600-799	294	247	300	203	292	256
	Course Level Totals	1,095	1,012	1,127	1,019	970	1,040

Faculty in the Department take pride in their teaching and are dedicated to this aspect of their profession. This dedication is reflected in the results of student/course evaluations for entomology (Table 2). With few exceptions, the semester averages for value of course (item # 20) and quality of teaching (Item # 21) in undergraduate and graduate courses in entomology are consistently between 3.0 and 4.0 (good to excellent). Several courses and instructors are consistently evaluated above 3.5.

Table 2. Teacher and Course Evaluation Results for Department of Entomology; Fall 2003 – Spring 2009.
Semester averages (SD) for questions 20 (overall value of course) and 21 (overall quality of teaching); Scale 1 to 4 (poor to excellent). Source: University of Kentucky Institutional Research: (http://www.uky.edu/IR/tce.html)

Year Semester	Question 20	Question 21
	Value of Course	Quality of Teaching
2003 Fall	3.5 (.6)	3.6 (.6)
2004 Spring	3.5 (.6)	3.7 (.5)
Fall	3.5 (.7)	3.6 (.6)
2005 Spring	3.5 (.7)	3.6 (.7)
Fall	3.5 (.6)	3.6 (.6)
2006 Spring	3.6 (.6)	3.7 (.6)
Fall	3.2 (.9)	3.4 (.8)
2007 Spring	3.5 (.7)	3.7 (.6)
Fall	3.4 (.7)	3.6 (.7)
2008 Spring	3.2 (.8)	3.5 (.7)
Fall	3.5 (.7)	3.7 (.6)
2009 Spring	3.5 (.6)	3.7 (.5)

Graduate Education

The Department of Entomology offers graduate work leading to the Master of Science (Plan A -- Thesis and Plan B -- Non-thesis) and the Doctor of Philosophy degrees. The graduate student handbook is updated as needed and is available on the Department's website (http://www.ca.uky.edu/entomology/dept/gradprogram.asp). Individual graduate programs are planned by students in consultation with their advisor, and advisory committee, and the Director of Graduate Studies. Study and research are available in various areas of entomology including applied entomology, araneology, behavior,

biochemistry, biological control, ecology, genetics, plant resistance, insect biology, medical and veterinary entomology, molecular biology, physiology, systematics, and taxonomy. The discipline of entomology, similar to all agricultural and biological sciences, has evolved significantly during the past two decades and continues to undergo rapid changes. To increase flexibility in the core curricula, the PhD and MS core curricula are the responsibility of the graduate faculty in Entomology, which represents a change from prior responsibility at the Graduate School level.

Admission Requirements

Admission to the Graduate program in Entomology is based on the recommendation of the Entomology Graduate Program Committee. Minimum admission requirements include an overall undergraduate grade point average of 3.0 and an overall graduate grade point average of 3.25. Applicants whose native language is English must score at least 1050 on the combined verbal and quantitative portions of the Graduate Record Examination (GRE) general test. Those whose native language is not English must have a Test of English as a Foreign Language (TOEFL) with a minimum score of 79 on the TOEFL-iBT. A minimum overall band score of 6.5 on the International English Language Testing System (IELTS) may be used in lieu of a TOEFL score. They must also have a score of 550 or above, on the quantitative portion of the GRE. The Program requires three letters of recommendation. Meeting the minimum requirements does not guarantee admission. These minimal requirements may be waived in exceptional cases if sufficient additional evidence is presented regarding the ability of the student to do graduate work. Admission to the Graduate Program in Entomology does NOT automatically guarantee financial assistance to the student.

Degree Requirements

During their first year of graduate studies, M.S. (Plan A) and Ph.D. students are required to prepare a formal written research proposal encompassing a thorough literature review, clear statement of objectives, and materials and methods of the project. A research proposal seminar will be presented to the Department upon completion of the written research proposal. An exit seminar, usually presented during the last semester of the student's tenure, is required for M.S. (plans A and B) and Ph.D. students. August graduates will present their seminar in the preceding spring. M.S. students using the Plan B option will be required to provide a detailed outline of their practicum to their Advisory Committee. The practicum must be a minimum of 3 credit hours (maximum of 6 credit hours) and may consist of library research, special problems, internships, etc., as agreed upon by the student and major professor, and approved by the Advisory Committee. M.S. and Ph.D. students will be required to post a formal notification of scheduled examinations on the notice board in the main departmental office two weeks prior to the examination date.

All M.S. and Ph.D. students must satisfy the following core course requirements:

1. An undergraduate course in general entomology. Students who have not had such a course must take ENT 300.
2. STA 570 Basic Statistical Analysis
3. Each M.S. student must take two semesters of ENT 770, Entomological Seminar, (or approved equivalent seminars) and Ph.D. candidates must take four semesters of approved seminars.
4. Ph.D. and M.S. candidates using the Plan A option must take a minimum of one course from two of the following core areas. M.S. candidates using the Plan B option must take a minimum of one course from all three core areas.

Core Area 1: Insect Behavior, Ecology, Evolution and Systematics.

ENT 564 Insect Taxonomy
ENT 568 Insect Behavior
ENT 607 Advanced Evolution
ENT 625 Insect-Plant Relationships
ENT 660 Immature Insects
ENT 665 Insect Ecology
ENT 667 Invasive Species Biology

Core Area 2: Insect Molecular Biology, Physiology and Genetics.

ENT 635 Insect Physiology
ENT 636 Insect Molecular Biology

Core Area 3: Pest Management and Applied Ecology.

ENT 530 Integrated Pest Management
ENT 561 Insects Affecting Human and Animal Health
ENT 574 Advanced Applied Entomology
ENT 680 Biological Control

In all cases, an equivalent graduate level course from another institution is acceptable upon approval of the Advisory Committee. Such approval will not decrease the minimum number of credits required, but simply will permit the student to take other courses.

For a complete list of Entomology courses see:
http://www.ca.uky.edu/entomology/dept/courses.asp

Detailed information on the graduate program in Entomology can be found at:
http://www.research.uky.edu/gs/bulletin/bullinfo.shtml

Graduate students in Entomology pursue research M.S. or Ph.D. degrees in one of three broad areas of emphasis:

Insect Molecular Biology, Physiology and Genetics

Insect Behavior, Ecology, and Evolution
Insect Pest Management and Applied Ecology

Insect Molecular Biology, Physiology and Genetics

This area trains students to use insects as model systems to understand the general principles of molecular biology, physiology, and genetics.
Areas of strength

* Molecular Virology
* Genetic Engineering of Insect Pathogens
* Insect Immunity
* Insect/Bacterial Symbioses
* Physiological Basis of Chemical Communication
* Molecular/Biochemical Insect Parasitology
* Biochemistry of Insect-Plant Interactions
* Mendelian and Quantitative Genetics

Faculty in this area:
Stephen L. Dobson, Charles W. Fox, Kenneth F. Haynes, S. Reddy Palli, Bruce A. Webb, Jennifer A. White, Xuguo Zhou

Insect Behavior, Ecology, Evolution, and Systematics

Students use insects to understand general principles of biology. This program provides preparation for a competitive position in academics or industry, wherever a strong foundation in basic biology is required.
Areas of Strength

* Chemical and acoustic communication
* Community ecology and food-web studies
* Evolutionary and behavioral genetics
* Mating behavior
* Modeling
* Predator/prey interactions
* Insect/plant interactions
* Insect/vertebrate interactions
* Systematics

Faculty in this area:
Robert J. Barney, Grayson C. Brown, Stephen L. Dobson, Charles W. Fox, James D. Harwood, Kenneth F. Haynes, John J. Obrycki, S. Reddy Palli, Daniel A. Potter, Lynne K. Rieske-Kinney, John D. Sedlacek, Michael J. Sharkey, Bruce Webb, Thomas Webster, Jennifer A. White, and Kenneth V. Yeargan

Pest Management and Applied Ecology

Students are prepared for careers in agricultural, urban, horticultural, or forest pest management. The program provides preparation for a competitive position in academics, government agencies, extension or industry.

Areas of strength
* Integrated pest management
* Host (plant or animal)/insect interactions
* Enhancement of biological control
* Host resistance
* Extension and technology transfer
* Urban entomology
* Conserving Biodiversity

Faculty in this area:
Robert J. Barney, Ric T. Bessin, Grayson C. Brown, Stephen L. Dobson, Douglas W. Johnson, James D. Harwood, Kenneth F. Haynes, John J. Obrycki, S. R. Palli, Daniel A. Potter, Michael F. Potter, Lynne K. Rieske-Kinney, John D. Sedlacek, Michael J. Sharkey, Lee H. Townsend, Thomas Webster, Jennifer A. White, Kenneth V. Yeargan, and Xuguo Zhou

Departmental Facilities

Modern computer, microscope, video, chromatographic and molecular equipment, along with laboratory and greenhouse facilities, are available to support graduate and undergraduate student research projects. A broad array of equipment is available to complement studies in molecular biology and physiology, including**:** real time PCR, a cell culture facility, GC-MS, Capillary Electrophoresis, SEM, Confocal and Photo-microscopes, scintillation counters, ultracentrifuges, and DNA sequencers. The University has an advanced genomics technology center and proteomics and micro-array facilities that are available for use. In addition, faculty and students at the University have access to thousands of acres of forests, grassland, and farmland for research sites.

Assessment of Graduate Education

The University of Kentucky graduate program in entomology is one of the healthiest in the country. When divided by tenure-track faculty, the number of graduate students and post-docs in the Department (Table 3) reflects a very productive graduate program (averaging over 2 (students/post-docs) / faculty / year).

In 2007 and 2008, 110 and 137 PhD degrees in Entomology were awarded in the United States. This represents an average of 3.5 PhD degrees / year / institution for 35 programs reported in the annual Council of Entomological Department Administrators survey. During the past 6 years, the Department of Entomology at the University of Kentucky has awarded an average of 4.5 PhD degrees per year (Table 3). Data are not available nationally for Masters degrees awarded, but the graduate program in

Entomology at the University of Kentucky averaged 5 MS degrees in Entomology per year from 2003 to 2009.

Table 3. Enrollment and Degrees Awarded - Department of Entomology; 2003-2009

Enrollment						
	2003/4	2004/5	2005/6	2006/7	2007/8	2009
Master of Science	14	14	8	11	12	8
Doctorate	16	23	25	23	27	20
Post-Doctorate	7	7	7	11	8	12
TOTAL	37	44	40	45	47	40
Degrees Awarded By Year						
	2003/4	2004/5	2005/6	2006/7	2007/8	2009
Master of Science	3	11	4	5	1	6
Doctorate	3	2	4	4	4	10
Total	6	13	8	9	5	16

In 2009, all full-time graduate students in the Department of Entomology were supported by graduate research assistantships or fellowships from a variety of funding sources. Seventeen students (61%) were supported by grant funds. Seven students (25 %) were supported by federal funds, either Hatch or multi-state projects and four students (14 %) were supported by Fellowships.

One quantitative measure used to assess the quality of a graduate program is the GRE scores of students enrolled in a graduate program. From 2003 to 2008, the average combined GRE (verbal, quantitative, analytic) scores for students enrolled in the graduate program in Entomology increased from 1588 to 1766 (Table 4). The GRE scores for students enrolled in the graduate program in Entomology compare favorably to the average GRE scores for students enrolled in all graduate programs in the College of Agriculture (Table 4). In 2009, the average GRE writing score for students enrolled in Entomology was 4.31 compared to a College of Agriculture average of 3.86.

Table 4. Sum of GRE scores for students enrolled in the Graduate Program in Entomology; 2003-2008. GRE data for enrolled graduate students in Entomology and in the College of Agriculture from:
http://www.research.uky.edu/gs/GraduateSchoolReports/GREReport/GREReport.html

Year	Number of Students Enrolled in ENT	Average Total GRE for Entomology Students	Average Total GRE (College of Ag)
2003	26	1588	1604
2004	30	1639	1609
2005	27	1670	1653
2006	27	1675	1630
2007	35	1721	1610
2008	35	1766	1630

The exceptional productivity of graduate students in the Entomology program may be partially attributed to the careful mentoring provided by the faculty (Tables 5A and 5B). In the Graduate Student Productivity Report for 2005 (Graduate School Reports Website), the Department of Entomology was considered one of the top 10 graduate programs at the University of Kentucky, based on total numbers of graduate student publications and presentations. The Graduate School has not updated this graduate student productivity report for 2006-08.

Table 5A. Productivity of Graduate Students in the Department of Entomology as measured by publications and presentations (2003-05).
Relative productivity of Entomology graduate students compared to all graduate students in the College of Agriculture. [Data are from the Graduate School report:
http://www.research.uky.edu/gs/GraduateSchoolReports/GraduateStudentProductivity/GraduateStudentProductivity97-05.pdf

Year	Entomology Students' Publications/ Presentations	Percentage of College of Ag Publications/ Presentations
2003	69	22 %
2004	59	19 %
2005	58	24 %

Table 5B. Summary of Entomology Graduate Student Productivity, 1997-2008.

Numbers of refereed publications and presentations at regional, national, or international meetings on which at least one Entomology graduate student was an author. These data were compiled by Dr. Ken Yeargan, DGS for Entomology 2002-09.

Calendar year	# Publications	# Presentations
1997	19	28
1998	8	21
1999	12	42
2000	18	27
2001	19	25
2002	21	49
2003	24	45
2004	19	40
2005	23	35
2006	25	47
2007	20	35
2008	22	60

IV. Departmental Web Resources

The Department of Entomology maintains several distinct web resources on multiple servers, including Extension Entomology Programs, Integrated Pest Management Programs, and the Kentucky Critter Files. Our web page not only serves as our primary interface within and outside the department, these web resources significantly enhance our extension, research and graduate education activities within the Department. These resources are all linked through our main departmental website, located at http://www.ca.uky.edu/entomology/entomology.php.

Main Departmental Website. From 2003 to Apr 2007, our departmental website was housed on the main campus servers at www.uky.edu. During each of those 52 months, our site was among the top twenty sites (measured by total number of hits) of all sites hosted by www.uky.edu, and in 40 of those months our site was within the top 10 most active sites. In May 2007, our site was redesigned and moved to the College of Agriculture servers at www.ca.uky.edu. Since the College of Agriculture began tracking usage of our web site (at http://www.ca.uky.edu/internal/reports/) in May 2007, at least 2 pages from our site have appeared each month in the top 10 of their monthly list of most popular sites (based on number of hits). In 23 of those 30 months, 5 or more of our pages have been in the top 10 most active sites for the College of Agriculture.

During the 2007 redesign of our website, Mr. Blake Newton built Google Analytics into the site. This software package allowed us to gather more detailed statistics about the use

of our site than ever before. For instance, from Oct 31, 2008 – Oct 31, 2009, our site received 2,078,456 pageviews from over 200 countries and all 50 states. The most-visited page during that period was ef636.asp (Bed Bugs), with 176,258 views. We regularly use these statistics as a guide for improvements to our website. In particular, we used Google Analytics to determine our most-visited pages when we created a selection of Spanish-translations of insect factsheets in 2007-08. We are also able to measure and compare the impact of our site over time. For instance, comparing the period of Oct 31, 2008 to Oct 31, 2009 with the same period the previous year, visits to our site by Kentuckians increased 7.8%.

The main departmental website contains basic departmental information such as personnel, contact information, and application materials for prospective students. However, our metrics indicate that our collection of 230 ENTfacts are by far the most-visited content. ENTfacts are online factsheets (available in both HTML and PDF formats) that provide topic-specific information and recommendations for Kentucky agricultural professionals, gardeners, homeowners, consumers, and others who are impacted by insects and arthropods. Between Oct 31, 2008 and Oct 31, 2009, each of the top 50 most-visited pages within our site were ENTfacts. During that same period, total visits to ENTfacts accounted for 1,859,279 of 2,078,456 total pageviews (90%) within our website.

Many of our ENTfacts are also highly-ranked by search-engines. For instance, a search for "bed bugs" on www.google.com shows our page as the 3rd highest-ranked entry. The summary below shows Google rankings for our top-five most visited pages during Oct 31, 2008 – Oct 31, 2009 (as searched on Nov 16, 2009):

Page	**Content/search terms**	**Google rank**
ef636.asp	bed bugs	3
ef611.asp	carpenter bees	1
ef604.asp	termite control	1
ef621.asp	fruit flies	1
Ef603.asp	carpenter ants	2

Websites have been established to provide specific information on the status and distribution of invasive arthropods in the Commonwealth, including the emerald ash borer and hemlock woolly adelgid.

Kentucky Critter Files.

The Kentucky Critter Files (located at http://www.uky.edu/Ag/CritterFiles/casefile/casefile.htm) is an on-line field guide to the insects, spiders, and other arthropods that are most-commonly encountered by Kentucky youth and 4-Hers. Since Jan 2007, when we built Google Analytics into the site, the Kentucky Critter Files has received over 2,169,759 pageviews. From Oct 31 2008 – Oct 31 2009, the site has received 668,789 pageviews. Many of the Critter Files pages are

highly-ranked by Google. The summary below shows Google rankings for five of the most-visited Critter Files entries during Oct 31 2008 – Oct 31 2009 (as searched on Nov 16 2009):

Page	Content/search terms	Google rank
wolf.htm	wolf spiders	6
pisaurid.htm	fishing spiders	3
cobweb.htm	cobweb spiders	3
assassin.htm	assassin bugs	2
Funnel.htm	funnel weaver spider	1

V. Research Programs

Highlights of programs within the Department of Entomology

Entomology faculty respond to the needs of the citizens of Kentucky. These highly visible research programs are a critical aspect of the mission of the Department of Entomology.

Natural Resources

Behavioral and ecological questions in forest ecosystems are addressed in the context of herbivore-plant relations, feeding guild interactions, and interactions among plant stressors. How disturbance forces directly and indirectly impact arthropod abundance, herbivory and herbivore success, and forest community dynamics are evaluated, as are evaluating species' invasability from a suborganismal to community/ landscape level. Current research emphasis focusing on the highly invasive hemlock woolly adelgid, which is threatening the sustainability of eastern Kentucky's hemlock forests, and a globally invasive gall wasp, which impacts nut production and threatens the feasibility of forest restoration efforts (Rieske-Kinney).

Community Entomology (urban, recreational, home and garden)

Agricultural Entomology -- Sustainable IPM

Fundamental / Translational Research

A developing research program seeks to understand mechanisms of foraging by generalist predators and identify their role in biological control. Through the integration of molecular techniques, behavioral studies and field experiments, members in this laboratory delineate trophic connectivity and measure the intensity of specific predator-prey interactions. Understanding those forces that regulate the abundance of these important natural enemies can ultimately provide information that discerns the role of prey biodiversity and habitat management on predation dynamics. (Harwood)

A variety of post-genomics technologies including RNA interference, microarray,

quantitative real-time PCR and a model insect pest, the red flour beetle, *Tribolium castaneum* were used to study the function of gene products that play key roles in hormonal regulation of development, reproduction and insecticide resistance. These studies identified nuclear receptors, transcription factors; G-protein coupled receptors, and P450s that are essential for insect development, reproduction and survival. Experiments are in progress to develop methods including screening for small molecule blockers and feeding RNA interference to block the function of the identified gene products in pest insects. (Palli)

Endosymbiont ecology - Bacterial endosymbionts are common among insects, and affect many aspects of the ecology, evolution and behavior of their hosts. Our laboratory focuses on host-symbiont interactions within introduced arthropods, to understand the relevance of symbionts for both pest invasiveness and biological control. (White)

The invasive mosquito *Aedes albopictus* (the Asian tiger mosquito) is a significant biting pest throughout much of the United States, including Kentucky. A better understanding of *Ae. albopictus* behavior will allow the development of improved methods to control this mosquito. A component of this program is utilizing novel insect marking technologies to track their dispersal, population size and survivorship. (Dobson)

A developing research program is combining the power of genomic, proteomic, and bioinformatic research tools with the biological disciplines of toxicology, physiology, and sociobiology to address biological questions with practical implications. Specifically, the directions of this research program will fall into two areas, sociogenomics and metagenomics. Eusocial Hymenopterans (ants, bees, and wasps) are a poster child for sociogenomic studies, whereas eusocial Dictyopterans (wood-feeding termites and cockroaches) are often delegated to "the other eusocial insects" recieving minimal attention. The goal for this program is to inventory and functional characterize genes/gene networks/pathways/genetic tools that orchestra the complex social life of Dictyopterans at the molecular level. Additionally, several cellulase-producing insect model systems are under consideration for metagenomic sequencing. The goals for the metagenomic projects are to i) inventory novel lignocellulase encoding genes, ii) identify "core" lignocellulases critical for biomass enzymatic pretreatments, and iii) develop biofuel/industrial potential. This fundamental research program is tied to technology transfer to improve insect pest management. (Zhou)

Insect behavior and chemical ecology – This program investigates fundamental questions concerning how insects communicate using chemical signals. We have a long-term interest in the evolution of multi-component pheromones in moths, with a focus on a model species, *Trichoplusia ni.* More recently, we have developed a new focus on the bed bug, *Cimex lectularius.* Studies of this species include identifying chemical signals mediating aggregation, determining the geographic distribution of resistance to insecticides, and exploring mechanisms of host-finding behavior. (Haynes)

VI. Extension Programs

Present Status

The Department of Entomology has five Extension Entomology Faculty and two extension specialists. One Extension Entomologist and an Integrated Pest Management Specialist, both with 100% extension appointments, are assigned to the Research and Education Center (REC) in Princeton, KY. Academically and administratively they report to the Department of Entomology on the Lexington campus. The five Extension entomologists routinely collaborate on educational programs and research projects. In addition, research faculty and their graduate students are often involved in cooperative work with the Extension entomologists

Leadership responsibilities for specific areas are generally divided as follows.

UK-Entomology Extension Group

Dr. John Obrycki, Chairman of Entomology
Administration
State Entomologist
Mr. Joe Collins, Senior Nursery Inspector
Mr. Carl Harper, Senior Nursery Inspector

Dr. Lee Townsend, Extension Coordinator
Pesticide Safety Education (PSE = PAT)
Medical /Veterinary
Shade trees, ornamentals, forest, including invasive species – EAB, HWA
Forages
Tobacco
Biocontrol - thistle

Dr. Doug Johnson (Only Off Campus Entomologist)
Integrated Pest Management (IPM)
Pest Management Centers (PMC)
Small Grains
Soybeans
Grain Sorghum
Stored Grain

Dr. Ric Bessin

Minor Use Pesticide Clearance Program (IR-4)
Corn
Fruits / Nuts
Vegetables
Sustainable Agriculture

Dr. Mike Potter

Structural Pest Control
Home Owner Pest Control
Turf & Ornamental
Medical

Dr. Jen White

Greenhouse Pest Management

Dr. Janet Lensing

Cooperative Agricultural Pest Survey (CAPS)
Introduced / Exotic Pests

Patty Lucas (MS) IPM Specialist

Blake Newton (MS) , PSE, Youth

Darlene Thorpe, Staff Assistant

In addition to commodity research/education efforts, extension entomology specialists provide leadership for four major federal programs: Integrated Pest Management, Pesticide Safety Education, Minor Use Pesticide Clearance Program and the Pest Management Centers. Also, the department operates an Insect Identification and Recommendation Laboratories in Lexington and Princeton, as a service to all Kentucky clients.

There is a critical need to balance the responsibilities for Extension education with the increasing demands of research to answer clienteles' questions. Applied research is needed to supply information for educational programs and the time needed for this work and to obtain extramural funds to support it, continue to increase.

Integrated Pest Management (IPM)
Integrated Pest Management encourages the balanced use of cultural, biological and chemical measures that are most appropriate to a particular situation in light of economic, social, and environmental factors. County extension agents, producers of agricultural and horticultural crops, and persons who recommend, sell or apply agricultural chemicals need to have a working knowledge of IPM concepts and processes. Additionally, it is important that non-Ag consumers of Ag products understand and value the benefits of IPM to food safety and the environment and that Ag producers/businesses understand that the ultimate consumer of Ag products places a value on the environmental effects of production as well as the product.

Historically extension IPM programs have been supported by Smith/Lever 3(d) formula funds. These funds served as the seed support around which working groups were

developed. These working groups sought other funding to operate their programs. At the end of federal fiscal year 2008 these funds became fully competitive. UK-IPM was successful in obtaining FY09 funding at a slightly higher rate than what the formula would have provided. At this writing we are preparing an application for a three-year IPM project for Kentucky.

From its very inception Integrated Pest Management (IPM) in Kentucky (KY) has been taught and demonstrated in its very broadest since. UK-IPM is currently active in all field crops, vegetable and fruit crops, ornamental crops, and Master Gardner Programs. Additionally, there are special efforts in pest diagnosis and identification.

County Level Programs - These programs are conceived, planed and implemented at the county level. Though they often do involve state level people, the flow of ideas is from local community out to the state. Three examples of these county level programs are:

Improving vegetable insect pest and beneficial identification for homeowners (Daviess Co.)

Combating Organophosphate resistant codling moth and Oriental fruit moth in commercial apple orchards (Graves, Warren, and Larue Counties).

Private applicator training programs on DVD, along with other training materials are developed and delivered to each county. They are used by county extension agents for ag and natural resources to train approximately 3,000 applicators each year

Resident Instruction – Individuals working with IPM concepts cooperate in a number of formal classes. The instructors of the class listed below have long been associated with IPM programs in Kentucky. Additionally, they rely on experts from various departments to fulfill a portion of their class schedule, thus continuing the team approach.

PLS-490C Certified Crop Advising. Dr. Larry Grabau (Agronomy, Production Res/Inst) deals with the art and science of professional crop management consulting.

ENT-530 Integrated Pest Management taught by Dr. Grayson Brown (Entomology) deals directly with the basic concepts and functions of IPM programs.

PLS 531 Plant Pest Management is being taught by Dr. J.D. Green, a weed scientist in the Department of Plant and Soil Science. This offering focuses directly on the "field experience" segment of IPM.

ENT-630 Advanced Applied Entomology taught by Dr. Grayson Brown (Entomology). This class will deal with more advanced and complex IPM concepts.

SAG 101 - Introduction to Sustainable Agriculture. Dr. Krista Jacobsen. Will incorporate IPM principals.

PLS /SAG 386, Plant Production Systems. Drs. Krista Jacobsen & Mark Williams, will incorporate IPM principals

The following are examples of the impact of IPM programs:

Commercial Production of Ornamental Plants
Growers stated that they are realizing an increase in plant quality leading to higher returns due to adoption of IPM techniques. Growers averaged an increase of approx. $2300 due to information gained, such as the ability to identify insects and diseases, spraying for borers at the appropriate time, preserving beneficial insects, and tracking water and substrate pH and fertilizer, both of which can predispose a plant to insect and disease problems when at non-optimal levels. With 79 grower-participants this means an economic value of $179,000 for the state of Kentucky. One central Kentucky grower stated that his nursery will save $1500 from information on one pest alone, the shoot boring caterpillar.

Commercial Vegetable Demonstration, Daviess Co. KY
One grower indicated that by reducing his sprays 15% - 20% he was able to eliminate 2 sprays over 116 acres. The elimination of two sprays over the growing season resulted in a savings of $20/acre, which totaled $2,320 over the total 116 acres.

Plant Disease Diagnostic
A client survey indicated that the diagnostic responses and information they received favorably impacted the pest management decisions they made. An estimated 650,000 acres of soybean were NOT sprayed with a fungicide as a direct result of soybean rust surveillance and disease diagnostic activities associated with this project. This has tremendous environmental and economic implications for Kentucky.

Fertility Success
Results have shown that improved nitrogen management techniques can increase overall nitrogen use efficiency by approximately 20%, leaving less N for environmental contamination and reducing the number of trips over the field. In addition, improved N management resulted in approximately $30 per acre of additional income for the producer as a result of increased yield.

Insect Trapping
Surveys of Kentucky Certified Crop Advisors found that they use insect pest flight data to make scouting decisions that resulted in information that was used to make control decisions. Additionally, the information alerted them to problems they would otherwise have missed. Using the information saved consultants on average 2.5 hours for each event. A survey of active KY Crop Advisors found 24 percent of those responding indicating they used the trap data during the 2008 season to help them make a decision not to spray a crop resulting in 20,875 acres of field crops not being sprayed with an insecticide. Also, during 2008 fifteen counties in Kentucky confirmed damages caused by armyworms. In those counties, 3,700 acres were checked as a result of the issued

warnings. The warnings saved approximately 64,000 bushels of corn, 150 tons of pasture and 7,275 bushels of wheat or approximately $389,000.

Teaching Growers to Use Refuges with Bt Corn
Insect management in field corn has undergone one of the most rapid and dramatic changes in recent agricultural history. Producers have moved from a threshold-based pest management system using broad-spectrum insecticides, to a preventive system of Bt corn and seed treatments for insect control. Because all of the corn seed is now treated with a single class of insecticide and Bt corn represents the majority of our acreage, resistance management is now a heightened concern. A recent survey of corn producers at regional meetings indicated that as many as 40% of our growers may not be using refuges of adequate size to effectively manage resistance. Resistance management is explained to growers at state, regional, and county-based educational programs.

A County based vegetable programs
Scouting-based vegetable insect and disease management programs have been used the past two seasons in Lincoln and Casey Counties to aid vegetable producers at a local auction increase produce quality and yield while keeping pesticide applications and costs to a minimum. It is estimated that this has saved growers at least $50 per acre.

IPM Web Pages
The IPM program maintains web pages at: http://www.uky.edu/Agriculture/IPM/ipm.htm These pages in conjunction with other areas of expertise provide an open gateway to interested individuals. The increase in "hits" as a measure of use over the years is one way to gauge the effects of these pages. The site serves as a portal to pest management information that resides on many other servers, serving many allied programs. In years past we have received ca. 250,000 hits per year. Recently our ability to measure use has changed, and we can no longer evaluate the number of individual "hits" However, we do know that more than 450 unique individuals (read addresses) are accessing this site. Starting on July 27, 2009 Google Analytics was added to the IPM web site to allow for more current tracking and site usage information. Using Google Analytics, we identified the visits to the IPM web site from July – November 2009 as originating from 34 different states and 36 countries.

4H/Youth Education Programs

YOUTH EVENTS The Entomology Department creates displays and gives presentations at youth events across the state. Mr. Blake Newton, an extension specialist in the Department, coordinates this active youth education program. Since 2003, we have made more than 14,000 contacts at museums, schools, science festivals, and other venues. Annual events include the Raven Run night Insect Walk and Bugs-All-Day at the Lexington Explorium, each of which attract about 200 attendees each year.

COMMUNITY-BASED SCIENCE PROJECTS Starting in 2005, the Department began working closely with the Tracy Farmer Institute on a series of year-long community-based science (CBS) projects. So far, these grant-funded (USDA and NSF) projects have

engaged over 500 K-12 students from six Kentucky counties in long-term studies of a variety of entomological topics, including Mare Reproductive Loss Syndrome and Invasive Species.

TRAINING OPPORTUNITIES Several training opportunities have been provided for Kentucky 4H Agents and K-12 teachers by the Department of Entomology and the availability of these opportunities is increasing. 4-H Entomology in-service training sessions were offered to agents in 2004, 2007, and 2008. Since 2005, K-12 teachers enrolled in the CBS projects (above) attend a week-long workshop each summer. In 2004, we created Braille and low-vision insect-study guides for K-12 teachers, and workshops were conducted in support of these materials in 2005. Scheduled for 2010 are three water-investigation workshops for Kentucky 4-H agents.

Insect Identification Lab

Identification of arthropods (approx. 700/year) submitted by county extension agents, specialists, private individuals and businesses is an important part of the extension entomology program. The lab participates in the Southern Plant Diagnostic Network, a web-based approach to problem diagnosis that contributes data to national bioterrorism and national security efforts. The insect identification lab also cooperates closely with the Plant Disease and Diagnostic Lab, Livestock Disease Diagnostic Center, UK Medical Center, and county health departments.

VII. Regulatory Programs

The Office of the State Entomologist is responsible for the licensing of businesses and individuals that buy, sell, ship, or distribute nursery stock for commercial or monetary gain in Kentucky. This includes, but is not limited to, nurseries, garden centers and landscapers. We conduct annual inspections of nurseries and assist nursery owner/managers with their pest problems. 895 nursery dealers were licensed in 2009; 396 nurseries were licensed in fiscal year 2009-2010.

Members of the State Entomologist Office also handle Phytosanitary Certificate Applications for individuals who ship any plant or plant products out of Kentucky. This includes international movement of plants and plant products and domestic shipments within the United States.

The vast majority of State Entomologists in the United States are associated with state governmental Departments of Agriculture. However, Kentucky statutes state that the chair of the Department of Entomology of the Agricultural Experiment Station at the University of Kentucky shall be the State Entomologist.

Personnel in the Office of the State Entomologist

Dr. John Obrycki, State Entomologist
Mr. Joe Collins, Senior Nursery Inspector
Mr. Carl Harper, Senior Nursery Inspector

Dr. Janet Lensing, Cooperative Agricultural Pest Survey (CAPS) Coordinator
Mr. J.D. Loan, Insect Survey Coordinator (Eastern Kentucky)
Ms. Katie Kittrel, Nursery Inspector (Western Kentucky)

Selected Examples of Pest Surveys conducted in Kentucky

See http://www.ca.uky.edu/caps/ for a complete list of pest surveys conducted in Kentucky through the federal-state partnership CAPS program.

Gypsy Moth – several thousand traps are used to sample for male gypsy moths every year in a wide area of Kentucky.

Numbers of moths captured in each county are shown in parentheses after the county name.

2005

- **Number of Traps Set:** 8830
- **Number of Moths Captured:** 46
- **Number of Positive Counties:** 12
- **Positive Counties:** Bath (1), Boyd (1), Campbell (29), Fayette (3), Greenup (4), Harrison (1), Henry (1), Kenton (2), Lawrence (1), Lewis (1), Lincoln (1), Trimble (1)

2006

- **Number of Traps Set:** 7734
- **Number of Moths Captured:** 130
- **Number of Positive Counties:** 20
- **Positive Counties:** Adair (1), Boone (8), Bourbon (1), Boyd (2), Bracken (8), Campbell (61), Carter (1), Fayette (2), Gallatin (2), Grant (3), Greenup (8), Harrison (1), Jefferson (1), Kenton (11), Lawrence (1), Lewis (2), Mason (1), Owen (2), Pendleton (13), Scott (1)

2007

- **Number of Traps Set:** 6630
- **Number of Moths Captured:** 212
- **Number of Positive Counties:** 34
- **Positive Counties:** Anderson (1), Bath (3), Boone (5), Boyd (6), Bracken (3), Campbell (35), Carroll (1), Carter (14), Clark (3), Fayette (6), Fleming (1), Floyd (10), Franklin (6), Grant (2), Greenup (2), Harrison (2), Henry (1), Jefferson (1), Johnson (11), Kenton (1), Lawrence (28), Lewis (6), Martin (16), Mason (3), Nicholas (1), Oldham (2), Owen (3), Pike (20), Robertson (2), Rowan (1), Scott (3), Shelby (2), Wayne (2), Woodford (1)

2008

- **Number of Traps Set:** 5373
- **Number of Moths Captured:** 181
- **Number of Positive Counties:** 22
- **Positive Counties:** Boone (2), Boyd (8), Bracken (4), Campbell (116), Carter (1), Clark (1), Fayette (3), Fleming (1), Floyd (2), Greenup (6), Harrison (1),

Jessamine (1), Johnson (2), Kenton (12), Lawrence (3), Lewis (1), Martin (1), Mason (1), Owen (1), Pendleton (8), Pike (4), Scott (2)

Pine shoot beetle surveys: 2005 – 2008

Since the introduction and subsequent establishment of *Tomicus piniperda*, the pine shoot beetle, in states immediately north of Kentucky there are concerns about the possibility that the pine shoot beetle has spread into Kentucky. The risk from nursery stock received from infested northern states creates a threat of introduction into Kentucky. Lindgren funnel traps baited with alpha-pinene (A-pinene) lure have been used in these surveys. Traps were set in tree farms, roadside areas, forested areas, and commercial nurseries along the Ohio River and were checked once every two weeks.

2005

- **Number of Traps Set:** 31
- **Number of Beetles Captured:** 0
- **Number of Counties Included in the Survey:** 14
- **Counties Surveyed:** Boone, Boyd, Bracken, Campbell, Carroll, Gallatin, Greenup, Henry, Kenton, Lewis, Mason, Oldham, Pendleton, Trimble

2006

- **Number of Traps Set:** 36
- **Number of Beetles Captured:** 0
- **Number of Counties Included in the Survey:** 18
- **Counties Surveyed:** Boone, Boyd, Bracken, Caldwell, Calloway, Campbell, Carroll, Gallatin, Greenup, Henry, Kenton, Lewis, Marshall, Mason, Oldham, Pendleton, Trimble, Trigg

2007

- **Number of Traps Set:** 34
- **Number of Beetles Captured:** 0
- **Number of Counties Included in the Survey:** 18
- **Counties Surveyed:** Boone, Boyd, Bracken, Caldwell, Calloway, Campbell, Carroll, Gallatin, Greenup, Henry, Kenton, Lewis, Marshall, Mason, Oldham, Pendleton, Trigg, Trimble

2008

- **Number of Traps Set:** 34
- **Number of Beetles Captured:** 0
- **Number of Counties Included in the Survey:** 18
- **Counties Surveyed:** Boone, Boyd, Bracken, Caldwell, Calloway, Campbell, Carroll, Gallatin, Greenup, Henry, Kenton, Lewis, Marshall, Mason, Oldham, Pendleton, Trigg, Trimble

Emerald Ash Borer

Ash trees are a major component of the landscape in Kentucky, so the emerald ash borer is of particular concern both because of the prevalence of ash trees in urban and

suburban areas and because lumber and wood products are among Kentucky's top export products. In 2008 and 2009, Kentucky participated in a national Emerald Ash Borer survey using a newly-developed baited purple trap system. These traps were placed primarily in the northern part of the state but also in locations considered to be higher risk areas for the emerald ash borer, for example, campgrounds, state and national parks, and sawmills. The emerald ash borer was found in Kentucky in March 2009. A quarantine was established in north-central Kentucky to limit the spread of the emerald ash borer within Kentucky (http://pest.ca.uky.edu/EXT/EAB/welcome.html).

2008
Number of Traps Set: 3065
Number of Beetles Captured: 0
Number of Counties Surveyed: 54

2009
Number of traps set: 5626
Number of Beetles captured: 200
Number of Counties Surveyed: 54

VIII. Productivity of Entomology Department

Extension Productivity

The Department has published over 230 Entomology fact sheets and lesson plans over the past 5 years. These valuable sources of information are disseminated at meetings and workshops throughout Kentucky, and are available electronically on the Department's website. Extension and research faculty also publish many articles in leading industry trade journals with international circulation. They are routinely interviewed by news organizations throughout Kentucky, and such national news outlets as The New York Times, Washington Post, U.S. News & World Report, and National Public Radio.

Newsletter
Kentucky Pest News Newsletter is a joint venture among plant pathologists, entomologists, and weed scientists in the College of Agriculture with occasional contributions from some other specialists. Extension entomologists and staff provide articles for the newsletter.

Pesticide Safety Education
Extension entomology specialists and staff provide leadership for this program, provide training manuals and meetings and maintain a website which provides on-line manuals and schedules of approved training and testing opportunities. Currently there are about 33,000 certified private applicators in Kentucky. 3,414 private applicators were trained and certified during the past year in 509 county-based training sessions. There are about 14,000 certified commercial and non-commercial applicators and operators in Kentucky. Entomology specialists provide initial and continuing education in an average of 12

meetings a year across the state. A Pesticide Safety Education web site has been established at http://pest.ca.uky.edu/PSEP/welcome.html

A recent example of the impact of the pesticide safety education program comes from the city of Owensboro. The Department of Entomology provided a local program in the area that was attended by approximately 100 individuals. The city of Owensboro had 13 employees participate in the free training program. Compared to training costs through some of the other providers and programs, at a cost of $90 per person, this program provided at least $1,170 of training to the employees of the city of Owensboro.

Extension Clientele served

Each year the extension group provides thousands of consultations with householders, growers, businesses, institutions and state agencies about pest problems, pesticide issues, bites, stings, product contamination and pest-related litigation.

Householders (advice to thousands per year)
Kentucky Pest Control Industry
KY Housing Authorities
KY Food Processing & Pharmaceutical Industries
KY Health Departments and Health Care Industry
KY Public Schools
KY Parks & Recreation
KY Wood Products Industry
KY Correctional Facilities
KY Department of Agriculture
KY Office of the Attorney General

Some specific KY clientele served in the past 5 years, most in the form of on-site pest management inspections and advice included:
Ashland Oil, GTE, General Electric, LexMark, Hitachi USA, Armour, Algood & Kroger Foods, Great Harvest Bread Company, KY History Center, KY Transportation Cabinet, Fayette County Attorney's Building, Shakertown, Ronald McDonald House, UK & Humana Hospitals, Maker's Mark, Amazon.com.

Highlights of Extension Programs and Activities

Kentucky Pest Control Short Course

The conference, organized and hosted by our extension group, is recognized as one of the finest training events of its kind in the country. In fall 2009, over 420 individuals from Kentucky and more than a dozen surrounding states attended the meeting in Lexington, which also received national trade industry coverage by *Pest Control* and *Pest Control Technology* magazines.

Major Extension Programs of the Department

Kentucky Pest Management Center

Gypsy Moth Program
USDA Crop Profiles and Pest Management Strategic Plans
PSEP (Pesticide Safety Education Program)
IPM (Integrated Pest Management)
CAPS Program (Cooperative Agricultural Pest Survey)
School Visits; classroom presentations

Research Productivity (Data from Ag Expt Station Summaries)

Between 2003 and 2008, members of the Department of Entomology maintained an excellent record of productivity (Table 6), which is among the highest departmental productivity rates for the College of Agriculture.

Table 6. Publications by members of the Department of Entomology; 2003-2008. Data from Annual Reports of the Kentucky Agricultural Experiment Station

Year	Books	Book Chapters	Journal Articles	Other Research Pubs	Avg. Number of Publications/ tenure track faculty	Avg. Number of Publications / research FTE
2003/04	0	4	36	4	2.8 (N=16)	3.4 (N=13)
2004/05	0	6	40	11	3.6 (N=16)	5.7 (N=10)
2005/06	1	2	40	3	2.9 (N=16)	4.8 (N=9.5)
2006/07	2	4	48	13	3.9 (N=17)	6.3 (N=10.6)
2007/08	1	2	40	3	2.7 (N=17)	4.2 (N=11)

From 2003 to 2009, Entomology faculty, students, post-docs and staff published 4 manuscripts in high profile journals, e.g., Science, and the Proceedings of the National Academy of Sciences, USA and published in a wide range of high impact journals, e.g., American Naturalist, Animal Behaviour, Archives of Insect Biochemistry and Physiology, Journal of Molecular Entomology, Molecular Ecology, Biological Control, Ecology, Environmental Entomology, Evolution, Gene, Genetics, Insect Biochemistry and Molecular Biology, Journal of Economic Entomology, Oecologia, Oikos, and Virology. In addition, one Entomology faculty member and recent graduate student were recognized as experts in their sub-disciplines by receiving an invitation to write a review article for the Annual Review of Entomology, which has the highest impact factor of all Entomological journals.

Between 2003/04 and 2007/08, Entomology faculty have generated over $17 million in grant funding, averaging $ 318,488 per Research FTE per year. Federal competitive grant sources included NSF, USDA/NRI, NIH, EPA, and USDA/BARD (Binational Agricultural and Research Development).

Table 7. Sponsored Project Awards for the Department of Entomology received through the University of Kentucky Research Foundation; FY 1999-2003

FY	TOTAL GRANT FUNDING ($)	AVG PER RESEARCH FTE	% FEDERAL COMP. GRANT DOLLARS	INDIRECT COSTS GENERATED ($)
2003/04	2,312,460	$ 177,882	77 %	298,770
2004/05	2,451,126	$ 245,113	57 %	214,372
2005/06	1,986,164	$ 208,850	54 %	308,244
2006/07	2,505,347	$ 236,782	72 %	302,586
2007/08	7,925,776	$ 723,815	16 %	429,214

From FY 2003/04 to 2007/08, the percentage of awards to the Department from federal competitive sources ranged from 16 to 77 % (Avg = 55 %). The relatively low percentage in 2007/08 (16%) is due to the large Gates Foundation Award to Stephen Dobson, which was not included in the College of Agriculture dataset as a competitive federal award. For the period FY 2003 to 2008, the Department of Entomology generated over $1.5 million in Indirect Costs from grant-awarding agencies for the University of Kentucky. Over the past 5 years, there has been a significant increase in the indirect costs generated by the faculty in the Department of Entomology.

Another indicator of the productivity of the entomology faculty and their influence and contributions to science is based on the number of citations of their publications as summarized by the Web of Science. Between 2001 and November 2009, publications by the faculty in Entomology have been cited 15,673 times. There has been a general increase in the annual number of citations for the faculty in Entomology. This increase is expected for the senior faculty, but our newly hired faculty members have also contributed to this increase in citations. Additionally, even though our extension faculty do not have formal research responsibilities, they continue to publish in referred journals and their scientific contributions add to the departmental citations.

Year	2001	2002	2003	2004	2005	2006	2007	2008	11/2009
Citations	742	796	950	966	1243	1293	1362	1554	1528

Benchmark Comparisons

There are Departments of Entomology at 13 of the benchmark institutions used by the University of Kentucky (Table 8). Each of these 13 universities is a Land Grant Institution. Only tenured or tenure track faculty listed on the departments' websites are included in table 8 (data collected in December 2009). Nine of the 13 Departments of Entomology at our benchmark institutions are larger than the Department of Entomology at the University of Kentucky (11 if jointly appointed faculty are included in the total for the University of Arizona and the affiliates are included for the University of Illinois). Despite our relatively small size, the Department of Entomology at the University of Kentucky has been ranked as a top 10 (upper 25 %) graduate program in Entomology (among all Entomology programs) during the past three years in the Academic Analytics Ratings of graduate programs in the United States. Relative to the Departments of Entomology at our 13 peer institutions, the Department of Entomology at the University of Kentucky ranked ahead of 8 programs and below 5 programs in the most recent Academic Analytics summary for 2008.

Table 8. Number of faculty in Departments of Entomology at thirteen of the University of Kentucky's benchmark institutions.

Institution	**Number of faculty in Department of Entomology**
Michigan State University	29
North Carolina State University	32
Ohio State University	28
Pennsylvania State University	26
Purdue University	27
Texas A&M University	50 (on and off main campus faculty)
University of Arizona	15 plus 7 joint appointments
University of Florida Entomology and Nematology	36 (Gainesville faculty, which (includes nematologists)
University of Georgia	35 (three locations)
University of Kentucky	**17**
University of Illinois	11 plus 17 affiliates
University of Maryland - College Park	21
University of Minnesota - Twin Cities	17
University of Wisconsin - Madison	14

IX. Diversity of faculty, staff, and students

The members of the Department of Entomology are committed to building on the strengths of a diverse group of faculty, staff and students. Of the 28 students currently

enrolled in our graduate program (2009-10), 14 are female (50%) and 4 (14 %) are international students. The Department of Entomology also has a focus on training Kentucky students; 6 (21 %) of our graduate students are from Kentucky. The staff in the Department is balanced between males and females. The diversity of the faculty in the department has increased due to our recent hires, who added to the number of women and international citizens in the Department.

X. Fostering a professional and creative environment

All members of the Department work towards creating a professional and creative environment. Examples of the types of activities within the Department include:

Support student attendance at professional meetings
Proposal and Exit Seminars by Graduate Students
Encouragement to publish results while a graduate student
Encouragement to present results at professional meetings

XI. Efforts to maximize program effectiveness

During the past 6 years several new initiatives have been established in the Department of Entomology to enhance effectiveness of our programs. Examples include a graduate student publication scholarship program designed to encourage students to publish their studies in a timely manner. The Clarke-Knapp Endowment Fund has been established to support graduate student travel to scientific meetings to present research results. A Distinguished Alumni Lecture Series has been established to invite successful alumni of the Department of Entomology to present a seminar and meet with current graduate students. This program not only highlights our successful graduates from the Department, it also highlights the faculty mentors within the Department. The Bobby Pass Research Professorship was established in the Department in 2008. This endowed Professorship is currently held by Daniel Potter, Full Professor in the Department of Entomology. An Urban Entomology Graduate Fellowship was established in 2005 to attract an outstanding PhD student to our graduate program. The current recipient of this Fellowship, Alvaro Romero, will graduate in December 2009 and we are advertising for a new student to fill this Fellowship. In 2007 and 2009, two groups of graduate students and faculty have made field trips to the monarch butterfly overwintering sites in Mexico.

XII. Goals and plans for the Department of Entomology

Plans for the Department of Entomology

The Plan for the Department of Entomology is to continue to foster a dynamic, synergistic, creative environment for research, teaching, and extension. Within the Department there exists a very healthy collegial environment for graduate student training, research and extension. We embrace new technologies and discover new knowledge to follow our intellectual pursuits and address societal issues. Our new discoveries will be applied in mission-oriented programs through technology transfer

activities. Our new knowledge and information will be transferred to students and the public through progressive programs and through our integrated programs in research, teaching and extension. The Department will develop a new strategic plan by March 2010.

It has been a long-term goal of the Department of Entomology to be brought together in one building. Progress has been made to consolidate the department, and most faculty, staff and students are now located on the second and third floors of the Agricultural Science Center North and in a section of the seed house in the greenhouse complex. However, three research programs remain in the Dimock Building. Despite the splintering effects of two locations for departmental personnel, we have maintained a strong esprit de corps and highly productive programs. The current situation is not ideal, thus, a long-term goal for the Department of Entomology is to be housed in a modern facility similar to new Plant Sciences Building.

Appendix 1

A. Strategic Plan 2004 – 2006 Department of Entomology University of Kentucky

Introduction to the Department

The Department of Entomology maintains high quality programs. However, we recognize that we must continually look for new opportunities and adjust current programs to enhance our ability to meet the changing needs of society. Our strengths are in graduate education, research, teaching, and extension. Faculty are actively involved in a number of undergraduate degree programs, including an individualized program in Entomology within the BS in Agriculture, and we teach undergraduate courses, which are components of several undergraduate majors.

Within the Department, we strive for balance between fundamental and applied entomological research, developing long-term solutions to entomological problems, while addressing problems in the shorter term. We have a strong integration of research and extension efforts to enhance our visibility and effectiveness. The Department's approach to the MRLS (mare reproductive loss syndrome) crisis demonstrates how we respond to critical needs within the commonwealth of Kentucky.

Mission for the Department of Entomology

Our mission is to improve the quality of human life and protect our environment through a better understanding of insects and related arthropods. We conduct fundamental and applied research on insects, educate graduate and undergraduate students, implement integrative and effective systems for insect pest management, and enhance science education and public appreciation of human-insect interactions.

Vision and Goals for the Department of Entomology

We strive to be among the strongest research, extension, and graduate education programs in Entomology in the nation.

Within the Department we maintain high quality programs by:

* Establishing a creative environment that fosters productive faculty, staff, and students

* Developing high impact extension and research programs that address the needs of the citizens of Kentucky, the nation, and the world
* Recruiting and training outstanding graduate students who are highly competitive for quality professional positions.
* Maintaining a balance between applied and fundamental research programs
* Striving for an extramural funding base of competitive federal grants
* Supporting high publication productivity in respected peer-reviewed journals
* Creating and fostering quality graduate and post-doctoral training programs

All members of the Department foster a creative environment for scholarly activities. Our scholarly focus is driven by the pursuit of fundamental knowledge and an applied mission to deliver new technologies and knowledge. The Department provides the intellectual basis for new discoveries and the application of knowledge to improve the quality of life. We adapt to new opportunities and challenges as they arise, e.g., novel insect-vertebrate interactions, new invasive species, or the planting of insect resistant transgenic crops. The influence of our activities extends beyond the University, through our teaching, outreach, and the strengths of our graduate students. The Department of Entomology, through its extension programs, fosters the adoption of Integrated Pest Management and sustainable agricultural practices while promoting the wise stewardship of the commonwealth's natural resources. We ambitiously pursue an extramural funding base that includes competitive federal grants, and we seek funding for the formation of endowed chairs and graduate student fellowships.

The Department of Entomology addresses the goals in the University of Kentucky 2003-2006 Strategic Plan and the College of Agriculture Strategic Pan 2004-2006.

Goa1 1. Reach for National Prominence

Objective: The Department of Entomology will be one of the nation's best graduate programs in Entomology

Key Indicators:

By 2006, the Department of Entomology will

(1) be considered among the top 20 Entomology programs in the country, based upon the ranking by the National Research Council.

(2) continue to place our graduates in significant professional positions in industry,academia, and federal and stare agencies.

Goal II. Attract and Graduate Outstanding Students

Objectives: The Department will continue to provide undergraduate education in entomology and the agricultural and biological sciences.

The Department will continue to provide undergraduate research experiences.

Key Indicators:

By 2006, the Department will:

(1) increase our undergraduate student contact hours and advising by 5 %.

(2) maintain our active participation in undergraduate research opportunities.

(3) maintain a diverse offering of undergraduate courses

Goal III. Attract, Develop and Retain a Distinguished Faculty

Objective: Maintain a creative environment for faculty to pursue their ideas.

Key Indicators

By 2006, the Department will

(1) add two faculty members in targeted areas of opportunity
(2) provide nationally competitive salaries and program support to attract and retain the highest quality faculty

Goal IV. Discover, Share and Apply New Knowledge

Objectives:

The Department will maintain its high level of productivity and external grant funding. The Department will develop nationally recognized fellowships to attract highly qualified doctoral students.

The Department will develop programs to encourage graduate students to make presentations at scientific meetings and publish results of their research in a timely manner.

Key Indicators

By 2006, The Department of Entomology will

(a) maintain our current level of funding and strive to maintain over 50 % of external grant funding yearly from federal competitive sources.

(b) continue to enhance our PhD program with a goal of graduating five PhD students each year.

(c) increase our current number of doctoral students and postdoctoral scholars by 5%.

(d) maintain our Top 10 status at the University of Kentucky for graduate student productivity as measured by graduate student presentations and publications.

Goal V. Nurture Diversity of Thought, Culture, Gender and Ethnicity

Objectives:

The Department will strengthen our collaborative relationships with Kentucky State University.

The Department will create an open and supportive environment that encourages diversity within the Department.

Key Indicators: By 2006, the Department will

(1) increase the number of L.T. Johnson Fellows from 2 to 3.

(2) foster and support a diverse environment within our research, teaching, and extension programs.

Goal VI. Elevate the Quality of Life for Kentuckians

Objectives:

The Department of Entomology will focus on issues that affect the quality of life within the Commonwealth of Kentucky, the nation, and the world.

The Department will integrate our research and extension programs to address needs within the state.

The Department will deliver programs that promote the adoption of sound agricultural management practices and conservation of natural resources.

Key Indicators: By 2006, the Department will

(1) increase the number of entomology fact sheets available on the department's website

(2) enhance the understanding and appreciation of insects by the citizens of Kentucky
(3) increase the ability of urban and agricultural cliental to effectively manage insect pests

Appendix 1B.

Department of Entomology Implementation Plan based on recommendations of the 2003 Review Committee.

***Source of Recommendation (E = External Review Committee recommendation)**

****** **Accept Recommendation (A=Accept)**

Departmental responses to recommendations summarized in last column of table.

Facilities available to the department for all its missions should be improved.	* E	** A	Improve facilities in the Dept of Entomology	Develop plans for systematic improvement of facilities for all missions of the department. Discuss plans with the Dean to identify funding.	Labs for new faculty upgraded; lab renovations in Animal Path completed; Sci II underway
Consideration of the addition of faculty to the department is warranted. The faculty and chair should develop a plan that establishes priorities for these positions.	E	A	To increase the size of the faculty in targeted priority areas.	Develop position descriptions that focus on targeted emerging priority areas. Provide College of Agriculture administration with rationale for these positions.	Three new faculty hired; 1 in 2007 and 2 in 2008.
The department consider a focus on hiring assistant professors in future faculty searches.	E	A	To increase the number of Assistant Professors in the Dept by hiring high quality, well trained individuals.	Develop a rationale in the Department for hiring assistant professors to add to the expertise of the faculty.	Three new Assistant Professors on the Entomology Faculty; 1 in 2007 and 2 in 2008
The quality of teaching space, classrooms and laboratories, available to the department is inadequate.	E	A	Improve the quality of teaching facilities within the department	Develop a priority list of teaching improvements with estimated costs. Work with the College of Agriculture administration to address items on this list.	Requested improvements in N-12; upgraded teaching microscopes in 2009

The department should continue or increase its involvement in the Agricultural Biotechnology Program.	E	A	The department will continue active participation in the ABT program.	Encourage Entomology faculty to participate and assume leadership roles in the Ag. Biotechnology program.	Bruce Webb served as Director of ABT from 2006-09; Several faculty involved in teaching and advising
The department should become involved in developing programs in sustainable agriculture, equine sciences, public health, and a possible School of Natural Resources.	E	A	The dept will explore opportunities to enhance its participation in these developing programs	The department will assess its role in these developing interdepartmental programs and prioritize contributions that can be made to each of these programs.	Ric Bessin is playing a role in the Sustainable Ag Program.
The department should explore means of providing graduate students with expanded opportunities for meaningful teaching experiences.	E	A	All graduate students seeking meaningful teaching experiences will be provided opportunities to participate in departmental teaching programs	Survey the graduate students to determine the types of experiences that would meet their needs. Develop several options and opportunities to enhance graduate student teaching experiences.	Overview of teaching opportunities included in the new graduate student orientation. All students who seek a meaningful teaching experience are provided opportunities
The graduate student handbook should be posted on the departmental web site and a formal graduate student orientation be instituted.	E	A	Maintain a current version of the graduate student handbook on the departmental website and establish an orientation program for incoming students.	Post a PDF version of the graduate student handbook on the departmental website. Offer a 1/2-day orientation session for incoming graduate students.	The graduate student handbook is maintained on the departmental website and updated as needed.
The department should consider creating opportunities for professional training of post-doctoral associates.	E	A	Provide high quality, creative experiences for post-	Survey post-docs in the Department to determine their needs. Develop a program based upon survey results.	This is an ongoing activity; but little has been accomplished

			doctoral associates in the Department		
The department should examine its graduate course distribution and scheduling.	E	A	Provide offerings of graduate courses that minimize scheduling conflicts.	Examine scheduling of graduate courses in the Department	The faculty are reviewing our graduate courses in 2009-10
Graduate research at Princeton would be greatly facilitated by housing on the station.	E	A	Provide adequate housing options for graduate students who are conducting research at the Princeton Research and Education Center.	Develop a proposal to create graduate student housing at Princeton. Present plan to College of Agriculture administration.	Thanks to Nancy Cox and Doug Johnson – housing is now available for graduate students conducting research at Princeton
Individual issues of research staff quality and productivity need to be addressed.	E	A	Maintain a positive work environment that supports staff productivity.	Work with individual faculty and staff to foster productivity.	Ongoing
The department should consider the allocation of salaries for field research support personnel.	E	A	Provide support for faculty conducting field research within the Department.	Discuss needs with faculty conducting field research. Based upon discussions develop a proposal to provide needed research support.	Proposal submitted to the Dean in 2009; unlikely to be funded in current budget cycle
The department should consider addition of extension faculty and/or extension associates.	E	A	This would be a component of the objective: To increase the size of the faculty in targeted priority areas.	Develop position descriptions that focus on targeted areas of entomology. Provide College of Agriculture administration with rationale for these positions.	Proposal submitted to Dean in 2009; unlikely to be funded in current budget cycle
The department should plan for the future handling of the areas of PAT, IPM, and Pesticide	E	A	Meet the expectations of these federal	The extension faculty will discuss appropriate means to address these federal programs in Kentucky.	Ongoing

Impact Assessment.			programs given reduced federal support provided to them.		
The department should consider creating stable positions (not grant funded) in the areas of insect diagnostics and youth-4H entomology.	E	A	Continue to provide timely identification of insect specimens submitted to the diagnostic lab and high quality programs in youth - 4H entomology.	Discuss with extension faculty the needs in these areas. Develop a plan to address these needs	Ongoing; but current budget limitations do not provide flexibility for funding these positions
There is a need for additional technical support for applied research conducted by extension faculty.	E	A	Provide support for faculty conducting field research.	Discuss needs with faculty conducting field research. Based upon discussions develop a proposal to provide needed research support.	Proposal submitted to Dean in 2009
The department should explore ways to encourage extension faculty to teach and to reward them for this effort.	E	A	All Extension faculty are encouraged to participate in the teaching program.	Extension faculty regularly contribute in a variety of ways to the teaching program in the department.	Extension faculty are teaching courses and these efforts are recognized in the Dept.
The department chair should continue his efforts to develop a shared leadership style with the faculty and staff.	E	A	Foster a culture of shared governance within the department.	Continue to involve the faculty and staff in departmental committees and activities.	Ongoing
Consideration should be given for a formal process to encourage nominations of staff for recognition in the college and the university.	E	A	Recognize staff members who have are making significant contributions to the dept, college and university.	Request that the Awards Committee inform staff of recognition awards and solicit appropriate nominations.	Nominations have been submitted for staff awards

The staff would be interested in offering items for consideration at faculty meetings and to have access to the departmental meeting minutes.	E	A	Provide means for staff members to contribute to faculty meetings and have access to minutes of dept meetings.	Designate one staff member to request items from the staff for consideration at faculty meetings. Minutes of faculty meetings are available in the main office.	Ongoing; several staff members are invited to each faculty meeting.

Appendix 2A Current Graduate Students and Post-docs in the Department of Entomology (Fall 2009)

Ph.D. Program CURRENT GRADUATE STUDENTS Fall 2009/Spring 2010

Last Name	First Name	Major Advisor
Adkins	Josh	Rieske-Kinney
Andrews	Elizabeth	Dobson
Bixby	Andrea	Potter, D.
Boring	Andy	Sharkey
Colvin*	Sarah	Yeargan
Crain	Philip	Dobson
Deacutis	Juliane	Webb
Dodd	Luke	Rieske-Kinney
Goodman	Mark	Haynes
Hammons	Derrick	Potter, D.
Keathley	Craig	Potter, D.
Kowles	Katelyn	Harwood
Leavengood	John	Sharkey
Mains	Jimmy	Dobson
Mallis	Rachael	Rieske-Kinney
Peterson	Julie	Harwood
Redmond*	Carl	Potter, D.
Romero	Alvaro	Haynes / Potter, M.
Spelman	Michael	Webb
Suh	Eunho	Dobson
Wigginton*	John	Palli
Welch	Kelton	Harwood
Wulff	Jason	White

M.S. Program CURRENT GRADUATE STUDENTS Fall 2009/Spring 2010

Last Name	First Name	Major Advisor
Brady*	Cristina	White
Clark	Josh	Rieske-Kinney
Condra	Jennie	Potter, D.
Eskelson	Michael	Harwood
Hagan	Carla	Potter, D.
Johansen	Kacie	Sharkey
Larson	Jonathon	Potter, D.
Minter*	Logan	Brown
Vanek	Sarah	Potter, D.
Thomas	Anna	Harwood

VISITING GRADUATE STUDENTS Fall 2009/ Spring 2010

Last Name	First Name	Major Advisor	Country
Li	Xiangrui	Zhou	China
Li	Zhen	Zhou	China
Norlie	Norliemy	Sharkey	Thailand
Opatovsky	Itai	Harwood	Israel (BARD Fellow)
Shi	Jing	Zhou	China

- Indicates part-time student

Post-doctoral Researchers Fall 2009 / Spring 2010

Last Name	First Name	Mentor
Chapman	Eric	Harwood
Chandrasekar	Raman	Palli
Huang	Yuxin	Dobson
Kajita	Yukie	Haynes/Obrycki
Li	Yiping	Palli
Peel	Bethany	Dobson
O'Connor	Linda	Dobson
Romero	Susan	Harwood
Sheng	Zhentao	Palli
Sui	Yipeng	Palli
Venard	Claire	Dobson
Zhu	Fang	Palli

B.S. Program CURRENT UNDERGRADUATE STUDENTS Fall 2009

Last Name	First Name	Major Advisor
Allen	Sean	un assigned
Barger	Rachel	Haynes
Coy	R. Murphey	Fox
Gibson	Kenneth	Haynes
Hamilton	Brooke	Fox

UNDERGRADUATE STUDENTS CONDUCTING RESEARCH PROJECTS Fall 2009

Adams	Mark	Harwood

Appendix 2B

MS and PhD Graduates and Post-doctoral Researchers 2004-2009
Department of Entomology

MS Graduates	Year	Current Position
Ayayee, Paul (Rieske-Kinney)	2009	PhD Program Pennsylvania State University
Bale, Katie (Webb)	2004	
Brannon, Sonja (Yeargan)	2004	PhD Program University of Georgia
Choate, Beth (Rieske-Kinney)	2005	PhD Program University of Maine
Decker, Kimberly (Yeargan)	2007	
Dickey, Stephanie (Webb)	2004	
DiLuna, Francis (Dahlman)	2004	
Fisher, J.Ray (Sharkey)	2009	PhD Program University of Arkansas

Friley, Karen (Bessin)	2004	Kentucky State University
George, Justine (Potter, D.)	2007	PhD Program Penn State University
Hassell, Rebekah (Haynes)	2009	High School Teacher Nashville, Tennessee
Joseph, Andrew (Bessin)	2009	State Apiarist Des Moines, Iowa
Kellogg, Shelly (Rieske-Kinney)	2004	USDA Dept of Homeland Security
Land, Aerin (Rieske-Kinney)	2006	US National Park Service Everglades National Park, Homestead, FL
Lutz, Martha (Plan B) (Haynes)	2007	Instructor Blue Grass Technical Community College
Maier, Reid (Potter, D.)	2005	
Margam, Venu (Palli)	2004	Post-doc Researcher Purdue University
Prater, Callie (Potter, D.)	2005	PhD Program North Carolina State University
Russell, Kathleen (Bessin)	2007	Laboratory/Field Technician Plant and Soil Sciences Department University of Kentucky
Saenz, Virna (Townsend)	2006	PhD Program North Carolina State University
Seagraves, Bonny (Potter, D.)	2006	South Dakota State University Cooperative Extension Service Brookings, South Dakota
Seltmann, Katja (Sharkey)	2004	Research Assistant and Programmer North Carolina State University
Schwrtzberg, Ezra	2004	PhD Program

(Brown)		Pennsylvania State University
Sun, Zhiyuan (Palli)	2009	PhD Program University of Illinois, Chicago
Trout, Rebecca (Brown)	2006	PhD Program University of Arkansas
Wilkins, Tonja (Sedlacek)	2004	USDA-ARS Post-doc Researcher Yakima Research Lab, Washington

PhD Graduates	**Year**	**Current Position**
Amarillo-Suarez, Angela (Fox)	2006	Assistant Professor of Ecología y Territorio Directora Carrera de Ecología Pontificia Universidad Javeriana
Bai, Hua (Palli)	2009	Post-Doc Researcher Brown University
Bitra, Kavita (Palli)	2009	Post-Doc Researcher University of Georgia
Brelsfoard, Corey (Dobson)	2009	Post-Doc Researcher Yale University
Coleman, Tom W. (Rieske-Kinney)	2006	Entomologist, USDA Forest Service Forest Health Protection San Bernadino National Forest
Cooper, Rodney (Rieske-Kinney)	2007	USDA-ARS Research Entomologist Shafter, California
Gill, Torrence (Webb)	2007	Post-Doc Researcher Pennsylvania State University Department of Entomology
Hladilek, Erin (Wise/Arthur/Obrycki)	2009	Seeking employment
Hubbard, Jamee (Potter, D.)	2004	Assistant Professor University of Wisconsin -
Khoo, Cynthia (Dobson)	2007	Post-Doc Researcher Colorado State University

Kroemer, Jeremy (Webb)	2006	USDA-ARS Post-Doc Researcher Ames, Iowa
Lensing, Janet (Wise)	2006	Coop. Agricul. Pest Survey Coordinator University of Kentucky
Moser, Susan (Obrycki)	2009	USDA-ARS Post-Doc Researcher Ames, Iowa
Nusawardani, Tyasning (Webb)	2009	Post-Doc Researcher Iowa State University
Pitz, Kevin (Sharkey)	2006	Assistant Professor University of Tennessee, Martin
Quinton, Scott (Brown)	2005	
Rattanadechakul, Walaikorn (Webb)	2004	
Sarmiento-Monroy, Carlos (Sharkey)	2006	Assistant Professor National University of Bogota, Colombia
Seagraves, Micheal (Yeargan)	2006	USDA-ARS Post-Doc Researcher Brookings, South Dakota
Stillwell, R. Craig (Fox)	2007	NIH-PERT Post-Doc Researcher University of Arizona
Wilkins Fisher, Tonja (Webb)	2009	USDA-ARS Post-doc Researcher Yakima, Washington
Xi, Zhiyong (Dobson)	2005	Assistant Professor Michigan State University
Zhang, Zhaolin (Palli)	2009	Post-Doc Researcher Northwestern University

Appendix 2C **DEPARTMENT OF ENTOMOLOGY STAFF** **Fall 2009**

NAME	TITLE	PROGRAM
Antonik, Melanie	Sr. Lab. Tech.	Rieske-Kinney
Brady, Cristina	Sr. Lab. Tech	White
Colvin, Sarah	Sr. Lab. Tech.	Yeargan
Clevinger, Celeste	Program Coor II	Dobson
Clutts, Stephanie	Sr. Lab. Tech.	Sharkey
Collins, Joe	Sr. Nursery Inspector	State Entomol
Draper-Burnett, Hannah	Information Tech.	Chair
Fath-Goodin, Angelika	Research Scientist II	Webb
Fleming, Esther	Sr. Lab. Tech.	Webb
Garrity, Katie	Temp. Tech. ParaProf.	Dobson
Harper, Carl	Sr. Nursery Inspector	State Entomol
Ison, O. Gwyn	Admin. Services. Assist.	Main Office
Kesheimer, Adam	Staff Support Associate	Main Office
Kittrell, Katie	Nursery Inspector (West KY)	Collins
Lensing, Janet	CAPS Coor.(Nursery Inspec)	Harper
Loan, J.D.	Nursery Inspector (East.KY)	Harper
Lucas, Patty	Extension Specialist	Johnson
Martinez, Natalia	Research Analyst	Dobson
McHone, Kelly	Admin. Supp. Assoc. I	Main Office
Minter, Logan	Sr. Lab. Tech.	Brown
Newton, Blake	Extension Specialist	Townsend
Ramaseshadri, Partha	Research Scientist	Palli
Redmond, Carl	Research Analyst	D. Potter
Stamper, Shelby	Research Analyst	Haynes
Thorpe, Darlene	Staff Support Associate	Main Office
Wallin, Bill	Sr. Lab Tech	Fox
Wigginton, John	Sr. Lab Tech	Palli
Yu, Dicky	Research Analyst	Sharkey

Appendix 2D. List of Faculty in the Department of Entomology (Fall 2009)

Name (Rank) Responsibility Areas of expertise

Barney, R.J. (Adjunct Assistant Professor) Research
Stored-product entomology; Pest Management; Ecology and population sampling of predaceous arthropods.

Bessin, R.T. (Professor) Extension
Field and specialty IPM Extension programs, Biotech education and Master Gardener training

Brown, G.C. (Professor) Research and Teaching
Computer simulation of insect populations; Mathematical and theoretical ecology; Systems analysis in IPM.

Dahlman, D.L. (Professor Emeritus).

Dobson, S.L. (Professor) Research and Teaching
Medical/Veterinary Entomology, Evolution and Molecular Genetics; Potential of symbiotic bacteria as a means to modify natural insect populations.

Fox, C.W. (Professor) Research and Teaching
Population genetics; evolutionary ecology; behavioral ecology.

Freytag, P.H. (Professor Emeritus).

Harwood, J.D. (Assistant Professor) Research and Teaching
Arthropod ecology; molecular ecology; biological control; food web ecology

Haynes, K.F. (Professor) Research and Teaching
Insect behavior; Chemical ecology; Chemical signals mediating host-finding and mating behavior.

Johnson, D.W. (Professor) Extension
Pest Management and Extension programs related to the biology and control of insects important to field crops.

Knapp, F.W. (Professor Emeritus).

Obrycki, J.J. (Professor) Department Chair and Research
Biological control, Ecology of insect predators.

Palli, S.R. (Professor) Research and Teaching

Insect physiology, molecular biology, endocrinology and applied biotechnology.

Potter, D.A. (Professor) Research and Teaching
Behavior, ecology and control of arthropods attacking woody plants and turf; Insect-plant interactions; Urban landscape IPM.

Potter, M.F. (Professor) Extension
Pest Management and Extension programs related to urban and industrial pest control, and horticultural and medical entomology.

Rieske-Kinney, L.K. (Professor) Research and Teaching
Forest entomology; interactions between forest arthropods and forest regeneration, restoration, and sustainability; ecology and biology of forest insects; herbivore/plant relations.

Rodriguez, J.G. (Professor Emeritus).

Sedlacek, J.D. (Adjunct Assistant Professor) Research
Stored-product insect ecology; Stored-grain pest management, particularly biological control.

Sharkey, M.J. (Professor) Research and Teaching
Insect systematics; systematics of parasitic wasps.

Townsend, L.H. (Professor) Extension and Teaching
Extension programs related to the management of insect pests of tobacco, forages, and livestock.

Webb, B.A. (Professor) Research and Teaching
Molecular virology and development.

White, J.A. (Assistant Professor) Research and Extension
Interspecific interactions; behavioral ecology; biological control; endosymbionts

Yeargan, K.V. (Professor) Research and Teaching
Ecology of insects and spiders; Soybean and forage IPM; Biological control.

Zhou, X. (Assistant Professor) Research and Teaching
Insect integrative genomics

Appendix 3. Graduate Student, Staff, and Faculty Awards and Recognition 2004-09

2009

Graduate Students

Mark Adams, B.S. Student Competition Presentation Award, NCB-ESA
Josh Adkins, Presidential Prize, National ESA Meeting
Elizabeth Andrews, Jobbins Scholarship
Elizabeth Andrews, Presidential Prize, National ESA Meeting
Andrea Bixby, O.J. Noer Research Foundation Grant
Cristina Brady, Presidential Prize, National ESA Meeting
Sarah Colvin, M.S. Student Competition Presentation Award, NCB-ESA
Sarah Colvin, Presidential Prize, National ESA Meeting
Luke Dodd, Graduate Student Scholarship Award, NCB-ESA
Luke Dodd, Dissertation Year Fellowship, UK
Mark Goodman, Presidential Prize, National ESA Meeting
Derrick Hammons, Outstanding PhD Student Award, Gamma Sigma Delta, COA
Craig Keathley, Presidential Prize, National ESA Meeting
Logan Minter, M.S. Student Competition Presentation Award, NCB-ESA
Julie Peterson, PhD Student Competition Presentation Award, NCB-ESA
Julie Peterson: Kentucky Women in Agriculture Research Fellowship
Julie Peterson: Karri Casner Environmental Science Fellowship
Sarah Vanek, M.S. Student Competition Presentation Award, NCB-ESA
Kelton Welch: American Arachnological Society Graduate Research Grant

Faculty

Grayson Brown, Vice President Elect, ESA
James Harwood, Early Career Innovation Award, ESA
James Harwood, President, International Branch, ESA
Reddy Palli, Vice President, Integrative Physiological and Molecular Insect Systems Section, ESA
Reddy Palli, University Research Professor, UK
Reddy Palli, Bobby Pass Excellence in Grantsmanship Award, COA
John Obrycki, President, NCB-ESA
Michael Sharkey, President Elect, International Society of Hymenopterists

2008

Graduate Students

Ayayee, Paul. 2nd place oral presentation at Ohio Valley Entomological Association Indianapolis, IN. October 2008.
Hua Bai, President's Prize 1st Place, Student Oral Presentation, National ESA meeting
Hua Bai, Dissertation Year Fellowship, UK
Juliane Deacutis, President's Prize 1st Place Student Display Presentation, National ESA meeting

Tonja Fisher, President's Prize 1st Place, Student Oral Presentation, National ESA meeting
Mark Goodman, Kentucky Opportunity Graduate School Fellowship, UK
Derrick Hammons, USDA Sustainable Agriculture Research and Education Graduate Student Research Grant
Derrick Hammons, American Wine Society Tennessee Chapter Scholarship in Honor of Dr. Robert Kryter, American Wine Society Educational Foundation
Derrick Hammons, American Society for Enology and Viticulture National Scholarship
Julie Peterson, President's Prize 1st Place, Student Oral Presentation, National ESA meeting
Julie Peterson, First Place, PhD Student Competition Presentation, NCB-ESA
Alvaro Romero, President's Prize 2nd Place Student Display Presentation, National ESA meeting
Alvaro Romero, Pi Chi Omega Scholarship; The National Pest Control Fraternity
Alvaro Romero, National Conference of Urban Entomology PhD Award
Anna Thomas: Kentucky Science of Natural History Student Research Grant

Staff

Darlene Thorpe, Outstanding Staff Award, COA

Faculty

Stephen Dobson, Bobby Pass Excellence in Grantsmanship Award, COA
Reddy Palli, Thomas Poe Cooper Distinguished Research Award, COA, UK
Daniel Potter, Fellow, ESA
Daniel Potter, Bobby C. Pass Research Professorship, UK
Daniel Potter, Professional Landcare Network National Leadership Award

2007

Graduate Students

Rodney Cooper, Dissertation Year Fellowship, UK
Juliane Deacutis, Graduate School Fellowship, UK
Michael Eskelson, President's Prize 1st Place, Student Display Presentation, National ESA meeting
Derrick Hammons, Eastern Wine Industry Student Scholarship, American Society for Enology and Viticulture Eastern Section,
Cynthia Khoo, President's Prize 1st Place, Student Oral Presentation, National ESA meeting
Susan Moser, President's Prize, 2nd Place, Student Oral Presentation, National ESA meeting
Julie Peterson, President's Prize 2nd Place Student Display Presentation, National ESA meeting
Alvaro Romero, Jeffrey P. LaFage Graduate Student Research Award, Entomological Foundation, National ESA meeting
Barb Sharanowski, President's Prize 1st Place, Student Oral Presentation, National ESA meeting
Barb Sharanowski, Dissertation Year Fellowship, UK
Craig Stillwell, Outstanding PhD Student Award, Gamma Sigma Delta, COA

Faculty
Lee Townsend, Outstanding Specialist Award, Kentucky Association of Agricultural Agents
Ken Yeargan, Fellow, ESA

2006
Graduate Students
Bekah Hassell, Kentucky Opportunity Graduate School Fellowship, UK
Tonja Fisher, Lyman T. Johnson Fellowship, UK
Torrence Gill, Lyman T. Johnson Fellowship, UK
Derrick Hammons, Kentucky Farm Bureau Louis F. Ison Memorial Scholarship
Cynthia Khoo, Dissertation Year Fellowship, UK
Aerin Land, Allen-Abrahamson Graduate Student Award, 2006 North American Forest Insect Work Conference, First Place for MS Poster Competition.
Janet Lensing, Outstanding PhD Student Award, Gamma Sigma Delta, COA
Alvaro Romero, Young Scientist of the Year Finalist, Bayer Environmental Science
Faculty
Stephen Dobson, Prestigious Paper Award, COA
Daniel Potter, Distinguished Achievement Award in Horticultural Entomology, ESA

2005
Graduate Students
Tonja Fisher, Lyman T. Johnson Fellowship, UK
Torrence Gill, Lyman T. Fellowship, UK
Erin Hladilek, Center for Ecology, Evolution & Behavior Fellowship, UK
Jeremy Kroemer, Dissertation Year Fellowship, UK
Aerin, Land, M.S. Student Paper Award, Ohio Valley Entomological Association, First Place for oral presentations.
Alvaro Romero, Urban Entomology Graduate Research Fellowship 2005-09

2004
Graduate Students
Tom Coleman, Ph.D. Student Paper Award, Ohio Valley Entomological Association, Third Place for oral presentations.
Tonja Fisher, Lyman T. Johnson Fellowship, UK
Torrence Gill, Lyman T. Fellowship, UK
Shelly Kellogg, M.S. Student Paper Award, Ohio Valley Entomological Association, First Place for oral presentations.
Callie Prater, National Watson Turfgrass Research Fellowship, U.S. Golf Association
Michael Rogers, J.H. Comstock Outstanding Graduate Student Award, ESA
Faculty
Lynne Rieske-Kinney, Faculty Futures Award
Bruce Webb, University Research Professor, UK

NCB-ESA North Central Branch of Entomological Society of America
ESA Entomological Society of America

UK University of Kentucky
COA College of Agriculture

Review Report

University of Kentucky
College of Agriculture
Department of Entomology Periodic Review
January 24, 2011
Final Report

Review Process

Consistent with the University of Kentucky's Administrative Regulations, on December 22, 2009, Dean M. Scott Smith appointed and charged a Periodic Review Committee to conduct an evaluation of the Department of Entomology. Members of the review committee were: Dr. Scott A. Shearer, Chair (Biosystems and Agricultural Engineering), Dr. Reddy Palli (Entomology), Dr. Ric Bessin (Entomology), Dr. Lynne Rieske-Kinney (Entomology), Dr. Teri Lear (Veterinary Science), Dr. Mark Williams (Horticulture), and Mr. Blake Newton (Entomology).

The committee was supplied with documents from the Department of Entomology including *Self-Study Report, Department of Entomology, Dec. 22, 2009*; *Current Entomology Faculty Vitae;* and *2008 Feedback on Entomology Specialists by County Agents*.

Non-departmental committee members only were present for all meetings to ensure an open dialog. The committee met and interviewed all faculty, staff and graduate students using the following process: Faculty members were interviewed on an individual basis by groupings: 1) insect molecular biology, physiology, and genetics; 2) insect behavior, ecology, evolution, and systematics; and 3) pest management and applied ecology (30 min. each). Technical, clerical and professional staff members were interviewed in small groups: 1) office and IT, 2) technicians, 3) postdoctoral scholars and 4) specialists (1 hr. each). Graduate students and undergraduate students enrolled in individualized studies programs were invited for a group interview (1 hr.). And to conclude the interview process the members of the Review Committee met with the program Chair (1 hr.) The committee also surveyed the Directors of Undergraduate Studies from undergraduate programs in the College who rely on Entomology course offerings to meet degree requirements. Representative of various clientele groups were surveyed to assess the quality of outreach services provided by the Department. Surveys for both groups are appended to this report.

The Periodic Review Committee presents our findings in the following report with summary bullet recommendations highlighting areas in need of immediate attention. The Committee would be pleased to meet with the Dean and his Administrative Staff should additional information be required.

General Comments

In general the Department of Entomology is characterized as "very productive and continuing to move in the right direction." On the positive side there were three very talented faculty hires during the past two years. The Department continues to meet clientele needs with the current range and mix of faculty talents. Most faculty, staff and students characterize the work atmosphere as very positive, collegial and supportive. The new faculty members feel comfortable and well supported. More established faculty members are willing to share resources for the overall benefit of the program.

Tremendous value is realized from the balance between teaching, research and extension efforts. The department is progressing well in molecular and genomics research areas which represent a new direction for the program with regard to technical expertise. The applied research programs continue to address important areas of concern to the state and constituent base. However, some faculty members question whether the land grant mission is rigorously understood by all faculty members. The ability of the department to meet clientele needs might be skewed with a continued transition to basic research to the exclusion of the more applied research components of the program.

It was recognized that several existing faculty members are nearing completion of extremely successful careers. Concerns were voiced regarding the potential hiring freezes under the current budget constraints and the resulting inability to replace faculty members as they retire. The department has made good progress with regard to diversity although this remains a future concern. New leadership has created new opportunities to resolve longstanding conflicts although some faculty meetings can be rancorous. For the most part disagreements are professional, not personal. These differences are focused on programmatic direction which is a healthy discussion for any academic unit. Several individuals are very passionate about their positions. A recurring theme in faculty discussions remains the balance between basic and applied research programs.

The remainder of this report provides a summary of concerns brought to light as a result of a review of the documents supplied, interviews within and outside of Entomology and a survey of external clientele. In some cases the information conveyed represents minority views. In other instances the issues are more widely recognized. At the conclusion of this report a section entitled “Review Committee Recommendations” was provided in an attempt to distinguish between minority and widely held concerns.

Leadership

Esprit décor is now higher at the Department of Entomology than for similar programs at peer institutions. Dr. Obrycki continually promotes interaction within the Department and is always positive and upbeat about opportunities to move the program forward. There is good faculty/graduate student interaction and seminar attendance is excellent. Dr. Obrycki has developed an Advisory Committee consisting of four senior faculty members serving in rotation. The Advisory Committee provides input to the faculty annual performance reviews, a process that seems to be working well. All of the staff agreed that Dr. Obrycki is accessible, genuine and further that he acknowledges and responds to concerns in a timely manner. Dr. Obrycki is held in high regard for his continual focus and attention to pointing out the accomplishments of faculty, staff and students. Faculty meetings are productive with focus on moving things forward.

Faculty

Given past hiring practices and the current budget concerns, the program has reached a point where faculty staffing includes 14 full professors and three new assistant professors. The current distribution of faculty is a result of a significant influx of faculty members in 1978 and 1979. To the credit of the program, many of these faculty members have chosen to remain at the University of Kentucky. Several retirements are anticipated within the next five to seven years, and many of the retirements will come from applied areas. The distribution of basic versus applied researchers has been a primary strength of the Department and is perceived by many to be a good balance. Existing strife between biology and molecular faculty members appears to have diminished. More face-to-face meetings may prove useful

for enhancing interactions. Diverse faculty skills sets will help foster collaboration, and the applied component will remain important to fulfilling the land grant mission of the College.

Some concern was voiced by two faculty members regarding Wethington Awards, suggesting the current structure is creating a two-tier faculty. It was felt that faculty with equally productive programs should receive similar compensation. Some faculty feel there has not been enough discussion and communication between the administration and faculty on the future of programs with this type of reward structure.

The entomology faculty is well positioned to take advantage of the expertise of several adjuncts. Given the existing appointments, faculty members are urged to more actively engage adjuncts in their graduate education and research programs. With the recent shift in focus at Kentucky State University (KSU), there may be new opportunities for engagement with these adjuncts. KSU faculty members are continually invited to campus to present seminars. Opportunities may also exist to partner with a faculty member at Eastern Kentucky University who works with honey bees.

Support and Technical Staff

With the recent shift by upper administration to push an increasing number of accountability and business procedures to the departmental level, insufficient office staff are available to accomplish all necessary functions. A disconnect exists between the faculty and staff in terms of responsibilities. Faculty need to better understand and adhere to university policies and guidelines regarding travel and ProCard use. Perhaps these concerns are receiving elevated attention because of the upcoming audit of Departmental finances. Office staff must resolve employment related problems for student workers hired by laboratory technicians without the timely initiation of the requisite paperwork. Most of these problems can be easily resolved by simply improving the lines of communication between faculty and staff.

With regard to interaction between the academic unit and other parts of the university, the administrative staff is confronted with Cost Accounting Standard (CAS) items, cost share problems, poorly defined budget transfers, and the lack of appropriate training to handle these problems. This situation can be improved through enhanced communication between Sponsored Projects Accounting (SPA), the College Business Office, and the academic unit. For example, budget transfers at the College level should include detailed explanations. SPA should engage more with faculty to help them understand post award budget management. For example, when PIs are unable to meet cost share obligations, or if cost accounting standards are violated, these items are charged against departmental counts. A suggestion for changes to academic unit business practices includes cross-training to accommodate specific business practices at peak times or during vacation and other leave periods. Staff noted the many in-service and training opportunities for professional advancement. A business process manual has been developed and the staff is provided with equipment upgrades as the budget allows.

The work atmosphere is characterized by laboratory staff as open, friendly, and relaxed with many noting the latitude to go about their activities without direct supervision. Most staff members are professional and take initiative. Off-campus employees state there is good communication with main campus and they do not feel left out. Faculty members seem appreciative of staff efforts and this satisfaction is reflected in annual performance reviews. Many faculty members go out of their way to express appreciation. College wide, staff salaries are perceived as the lowest common denominator and

salary levels for technicians seem out of line. It is increasingly difficult to attract and retain quality technicians.

Dr. Obrycki serves as the state entomologist and as such his relationship with the regulatory staff is essential to meeting the state mandate. He has created an atmosphere within the regulatory branch of the program that integrates well with other departmental functions. The regulatory staff members feel appreciated. Opportunities for career advancement are somewhat limited although the recent creation of new positions offers some opportunities.

Most technical staff members indicate the attention to worker safety, training, and routine laboratory safety procedures are appropriate. Areas of concern voiced staff members include: 1) worker safety for those who set insect traps along roadsides – this issue is being addressed through training and via the addition of several devices to warn motorists and improve visibility; and 2) safety of those employees who share office suites – outer suite doors should remain closed and locked outside of normal business hours to protect those working after hours. Occupational and Safety and Health inspections keep the focus on safety. Aside from some of the paperwork requirements being delayed, little in the way of safety infractions were noted during inspections. Staff members recognize that some laboratories are more dangerous than others. Access to personal protective equipment (PPE) is good and safety training is available and encouraged. Training for shipping of hazardous materials could be improved. Hazardous materials are delivered directly to shippers to avoid internal policies.

Research Programs

Future research directions in Entomology may be affected by recent changes in national competitive grants programs with the reduction in fundamental research opportunities. The National Institute for Food and Agriculture's (NIFA) shift to larger programs with multi-team investigators will require entomologists to find new areas of opportunity. This shift may require faculty to look at funding mechanisms from less traditional sources such as the National Institutes of Health (NIH).

Entomology differs from other agricultural disciplines when defining and responding to clientele needs. Research in this discipline often focuses on controlling insect infestations or the spread of insect borne diseases. Much of the historical work has been motivated by problems brought to light through extension. Now, faculty members are attempting to convince the NIH that the bed bug epidemic must be addressed since many chemical controls are ineffective. Alternative chemicals are slow acting requiring weeks to affect control. Management of this pest presents a growing concern and challenge for the profession.

Recent UK initiatives that hold promise for entomology researchers may include: 1) the environmental and sustainability initiative, and 2) domestic and international medical problems. An institutional interface between the Colleges of Medicine and Agriculture may prove to be advantageous for generating solutions for managing emerging global diseases. Some faculty members recognize most interdisciplinary initiatives are self-initiating. However, it might prove useful if future initiatives are driven by the administration.

Extension and Regulatory Programs

Extension faculty continue to be responsive to clientele needs and are willing to work with cooperating units on solutions to contemporary problems. For example, the Mare Reproductive Loss Syndrome

(MRLS) problem was identified and faculty members were able to initiate a research program that generated results quickly. Similarly, three new stink bug pests have attacked kudzu and soybeans, and the globalization of trade is increasing this problem. While these are two examples of the ability of the program to identify problems and marshal resources to affect changes, these problems seem to occur with greater frequency.

Extension programming space is tight and the need for additional storage and work areas appears well justified. Off-site training requires significant quantities of materials to be packed and transported. Peak training periods present problems with current staffing levels. Dr. Obrycki continues to provide additional support staff to help with the situation.

The Clientele Survey was e-mailed to representative groups including commodity organizations, private applicators and government agencies. Response to the survey was extremely positive and complimentary of the Entomology program and their outreach efforts. Several of the respondents considered UK's program to be one of the best in the nation. All of the respondents noted the professionalism of faculty and staff along with the prompt manner in which they responded to requests. One of the respondents noted how the talents of specific faculty members were brought to bear on problems of importance to Kentucky residents, such as the evolving bed bug problem. One of the commodity groups suggested that interaction might be enhanced by adding information links between the respective web sites. One of the respondents was unaware of the periodic newsletter (Kentucky Pest News) and how to access extension publications. The Department may want to consider how to better publicize, distribute and/or improve the accessibility of these materials.

Educational Programs

A critical mass of graduate students appears to be a significant factor contributing to the vibrant and dynamic learning environment reported by many research assistants. They value the challenging academic environment and the opportunity to work side by side with talented and highly regarded faculty members. Advanced degree recipients appear to be landing good jobs. Unfortunately, resources to support graduate education continue to decline. The decline in resources coincides with increasing tuition costs thereby compounding the problem. In an effort to improve productivity to meet the demands of grants and contracts, many faculty prefer to employ postdoctoral scholars. This practice comes at the expense of reduced graduate student numbers.

Entomology course instructors have high, but reasonable, expectations of graduate student performance. However, some faculty remark that "graduate students are being trained in a program that was developed 30 years ago." Questions that came to light during the review included the following: 1) How can the program achieve a balance between breadth and depth? 2) Should there be a common core of courses? 3) What is the appropriate balance between applied and molecular coursework? In some cases faculty were critical of peers who put too much of their own flavor and background into a course. Some faculty felt the graduate program would benefit from strengthening of applied course offerings. Yet others felt strongly about the need to reorganize existing offerings. A faculty dialog is beginning to evolve concerning the reorganization of core courses. Some faculty members argue that some graduate students appear to sacrifice program breadth as they focus on coursework specific to their thesis topic. This focus occurs to the exclusion of acquiring more applied entomology skills from multiple courses. A possible solution may be the development of a board survey course at the graduate level.

When discussing the curriculum with the graduate students, Ph.D. students indicated course offerings were somewhat limited. Others commented on residency requirements that discourage additional coursework after the qualifying exam. Many Ph.D. students commented on the "Preparing Future Faculty" program and the difficulty they have working the required 12 credits into their programs of study. In the more applied areas the normal programs of study require completion of a M.S. degree before entry in to the Ph.D. program. Direct admission into the Ph.D. program after completion of a B.S. degree is becoming more prevalent. Unfortunately, the students noted there was no mechanism or system for screening candidates prior to direct admission.

Graduate students are presented with numerous opportunities to engage in resident instruction and extension activities. Ample opportunities exist to teach laboratories and sections of various courses. Many students desire greater classroom responsibilities. Some faculty members commented on the need to revise the Student Evaluations of Teaching and to insure this feedback is provided to graduate teaching assistants. It was also noted that many students are utilized to deliver extension programming and to teach short courses.

At the undergraduate level some faculty members note considerable overlap in course content. The 300 level (and below) courses provide survey style information and are well received by students. Most faculty members have an undergraduate course they prefer to teach. Course demand should drive offerings and comments regarding the need for a critical evaluation and optimization of course offerings may be necessary in the near future. Several faculty members point to opportunities and challenges presented by the new General Education requirements. The Sustainable Agriculture program is driving an increase in demand for particular courses and the Agricultural Biotechnology program is seeing increased faculty involvement to foster the undergraduate research experience.

Response to the survey instrument given to the DUSs of Animal and Food Sciences, Biotechnology, Equine Sciences, Forestry, Horticulture, Natural Resources and Environmental Science, Plant and Soil Sciences, and the Sustainable Agriculture program were extremely complimentary of the both the variety of Entomology course offerings and the quality of instruction. All DUSs reported students were challenged by the undergraduate course offerings and held the Entomology faculty in high regard. Two suggestions were advanced regarding the format and frequency of course offerings. One DUS suggested ENT 340 be expanded to a 3 credit-hour course thereby allowing students to meet the Specialty Support requirement of their program, but further noting this was a minor concern. Another DUS noted that by offering ENT 530 during alternate years, some students were placed at a disadvantage. This DUS also recognized that low course enrollment may make annual offerings impractical.

Facilities and Equipment

Faculty members remain concerned about the division created by housing the program in two locations. Perhaps those most affected are graduate students housed in Animal Pathology as they are somewhat isolated from faculty and graduate students in Agricultural Science Center – North. Research space remains marginally acceptable when compared with programmatic needs. In general the quantity of space is adequate although the quality falls short of minimal requirements in several cases. Labs are getting older and there is little in the way of options and resources for renovating these spaces. Quality laboratory space in the Animal Pathology building remains a major concern, as these laboratories are damp, dirty and not well organized. Faculty members are struggling with base electrical load limitations. Leaking sinks have been reported to Physical Plant Division (PPD) on multiple occasions with little or no response.

Recent faculty hires were left with the impression that renovations would be well underway before arrival on campus. Renovation difficulties were identified at the PPD level. Several fume hoods in key laboratories are either inoperable or have insufficient draw for safe operation. Dr. Obrycki and COA Administration have indicated their willingness to pay for the HVAC system upgrades. The College and PPD appear to be at a stalemate. This issue is now beginning to impact faculty progress and the ability to meet granting agency contractual obligations. It is recommended that HVAC system ductwork be cleaned to eliminate particulate contaminates released into laboratory space. Climate control in these spaces affects the scope and accuracy of work. Poor ambient temperature control in the laboratory forces the use of growth chambers thereby limiting the number of colonies that can be maintained.

For the condition of other facilities the following points are noted: 1) while the greenhouses have been upgraded and are in good shape, a priority area of concern is continuity of greenhouse operation and management with the retirement of Mr. Tommy Sutton ; 2) there is a need to maintain North Farm plots as these capabilities remain essential to the future of the program; two tractors were purchased to meet these needs while reducing dependence on the North Farm crew; 3) several faculty members recognize a need for additional graduate student housing at the Princeton Research and Education Center; housing to accommodate up to five entomology students during the summer months should be sufficient; and 4) the Insect Museum has grown to a collection that includes over 700,000 specimens requiring significant faculty and staff time commitment as undergraduates use the museum for learning; no budgeted staff are directly assigned to manage this collection; and 5) access to reliable internet connectivity is a problem for many (faculty, staff and graduate students) housed in the Animal Pathology Building.

Review Committee Recommendations

It is the consensus of the Review Committee that the Department of Entomology is making excellent progress towards meeting its defined mission. The general atmosphere in the Department is positive and the leadership is characterized as excellent. There is good interaction between faculty and students and the faculty place high values on the contributions of the technical and administrative staff. Research productivity is excellent and prospects for continued progress are good. The Review Committee provides the following recommendations to further strengthen the program as well as resolve existing concerns voiced by faculty, staff and students.

Program Recommendations

1. The Department should continue the development of a faculty staffing and hiring plan that takes into account approaching retirements, the ability of the program to meet the needs of its students and constituents, and the evolution of the department to ever changing research needs of the clientele of the future.

2. The Department should consider a review of criteria for direct admission into the Ph.D. program for students holding B.S. degrees only. To the extent it is warranted, more formalized guidelines would be helpful for establishing some minimal level of student performance as opposed to leaving this entirely to the discretion of individual faculty members.

3. The Department should redouble their efforts to review and revise the core curriculum for

graduate students. The protracted discussion may be limiting options and opportunities for some graduate students.

Facility Recommendations

1. College and Departmental administrations must move immediately to review the safety of all laboratory fume hoods and repair or replace those that are not functioning at safe levels. Further, it is recognized that some of the hood problem may be tied to HVAC systems design and operation practices. The status quo of continual reporting of hood related problems and lack of attention by PPD must be investigated and resolved.

2. Internet connectivity concerns voiced by faculty and graduate students housed in the Animal Pathology Building should be investigated immediately. Warranted corrective actions should be implemented as soon as possible.

3. College and Departmental administrations should meet with PPD to resolve differences over HVAC maintenances issues (e.g. ductwork cleanliness and ambient temperature control in laboratories) compromising the ability of Entomology faculty, staff and students to fulfill research grant and contractual obligations.

4. College and Department administrations should review the policy of locking exterior, office and laboratory doors to ensure the security of employees and students working after hours (evenings and weekends) and to reduce the incidences of theft at all times. Other means of limiting access to these areas (i.e., control keypad, card readers, etc.) should be investigated as a long term solution.

Appendix A
Survey Instrument for Clientele Base

Dear UK Entomology Clientele:

The performance of each Department at the University of Kentucky is reviewed every six years. Currently, the Department of Entomology is undergoing periodic review. The purpose of this review is to assess the accomplishments of the Department and to improve the quality and effectiveness of the unit and its programs.

As a representative of a clientele group who receives information and support from the Department of Entomology, I would appreciate your input into this review. Below are four general questions about the Department. Please respond to these questions via this e-mail message. Feel free to discuss this matter with, and to get input from, other members of your organization. ***Please respond by Wednesday, December 1, 2010.***

1) How does the UK Department of Entomology provide effective research/extension information to meet your pest management needs and those of your industry?

2) Evaluate the quality and professionalism of the programs in the UK Department of Entomology.

3) What are other ways in which the UK Department of Entomology could meet the future needs of your industry?

4) What types of pest management/pesticide safety information and support (workshops, short courses, training programs, etc.) have you or your industry received through the UK Department of Entomology or Extension service?

5) Please indicate if you find information from the following sources useful, practical, and easy to understand (check all that apply).

Kentucky Pest News	___Useful	___Practical	___Understandable	___Don't Use
Entomology Publications	___Useful	___Practical	___Understandable	___Don't Use
Pesticide Recommendations	___Useful	___Practical	___Understandable	___Don't Use
Applicator Training Materials	___Useful	___Practical	___Understandable	___Don't Use
Training Meetings and Conferences	___Useful	___Practical	___Understandable	___Don't Use
Pesticide Training Web Site	___Useful	___Practical	___Understandable	___Don't Use
UK IPM Web Site	___Useful	___Practical	___Understandable	___Don't Use
UK Entomology Web Site	___Useful	___Practical	___Understandable	___Don't Use

If you have not used any of these materials, please explain.

Please respond by ***Wednesday, December 1, 2010.*** Your response will remain confidential and only summarizes will be provided in the Review Report. Thank you in assisting us to provide effective extension, research, and educational programs to meet the needs of Kentuckians!

Appendix B
Survey Instrument for Relevant DUS

Dear DUS:

A committee consisting of Reddy Palli, Ric Bessin, Lynne Rieske-Kinney, Teri Lear, Mark Williams, Blake Newton and myself as Chair was charged with the responsibility of conducting a periodic program review of Entomology. We are nearing the completion of this effort and recognize that we need additional input from the Directors of Undergraduate Studies of curriculums that rely on Entomology undergraduate course offerings to meet degree requirements. Given the recent weather related delays and bonus holidays I thought the best approach to obtain input would be through a brief survey. In the event there are larger issues or areas of concern, the Review Committee would be happy to meet with you in person.

We ask that you please complete and return the survey below to initiate this dialog. Our intent is to provide a summary of all responses to this survey in the report. We will ensure the responses are void of names and will attribute them in general to the Directors of Undergraduate Studies in the COA. On behalf of the Review Committee I would like to thank you in advance for responding to this survey. Please let me know if you have any questions or concerns.

1. Considering the current undergraduate courses offered by Entomology, are the needs of students in your degree program(s) being met? If not, please explain (topics not addressed, or topics not addressed in sufficient depth or depth) and be specific regarding course numbers and titles.

2. Are Entomology classes offered on a recurring basis and with a sufficient number of seats to ensure your students are able to meet degrees requirements in a timely fashion? If not, please explain and be specific regarding course numbers and titles.

3. Are there additional courses that may be needed to complement existing course offerings at the undergraduate level? If not, please describe what course or courses should be added in support of your program along with a brief description of content.

4. Considering the existing course offerings, are the formats (lecture, lab, and/or recitation) appropriate to meet the needs of your students? If not, please explain and be specific regarding course numbers and titles.

5. Are there other concerns the Review Committee should consider as we bring closure to the report and/or do we need to meet in person to discuss your concerns?

Program Review Implementation Plan

UK Program Review Implementation Plan

*This **required** form is described as Appendix A in AR II-I.0.6.*

College/Unit: Entomology **Date: March 22, 2011**

Recommendation/ Suggestion	Source I/E/H*	Accept/ Reject**	Unit Response (resulting goal or objective)	Actions (including needed resources)	Time Line
1. The Department should continue the development of a faculty staffing and hiring plan that takes into account approaching retirements, the ability of the program to meet the needs of its students and constituents, and the evolution of the department to ever changing research needs of the clientele of the future.	E	A	Develop a plan to address faculty hiring based on the needs of the department and the clientele served by the department.	Discussions at faculty meetings have been initiated to address future needs for faculty hires	ongoing
The Department should consider a review of criteria for direct admission into the Ph.D. program for students holding B.S. degrees only. To the extent it is warranted, more formalized guidelines would be helpful for establishing some minimal level of student performance as opposed to leaving this entirely to the discretion of individual faculty members.	E	A	Clarify policies for admission into PhD program in Entomology.	Policy regarding PhD admissions was discussed at March faculty meeting. A slight modification of text on our website will be made to address students entering PhD program directly with a BS degree.	May 2011
The Department should redouble their efforts to review and revise the core curriculum for graduate students	E	A	Undertake a critical review of the graduate curriculum	Started discussion at faculty meetings to evaluate the needs for a major revision of the graduate curriculum.	Dec 2011

1. College and Departmental administrations must move immediately to review the safety of all laboratory fume hoods and repair or replace those that are not functioning at safe levels. Further, it is recognized that some of the hood problem may be tied to HVAC systems design and operation practices. The status quo of continual reporting of hood related problems and lack of attention by PPD must be investigated and resolved.	E	A	**Provide safe environment within labs**	Lab renovations have been started in Ag Science North to address problems with fume hoods.	Ongoing
Internet connectivity concerns voiced by faculty and graduate students housed in the Animal Pathology Building should be investigated immediately.	E	A	Provide reliable internet connectivity for faculty, staff and students housed in Animal Pathology Building	Contacted UK IT office to resolve these problems. Internet connectivity is now established for faculty and students.	March 2011
2. College and Departmental administrations should meet with PPD to resolve differences over HVAC maintenances issues (e.g. ductwork cleanliness and ambient temperature control in laboratories) compromising the ability of Entomology faculty, staff and students to fulfill research grant and contractual obligations.	E	A	Provide adequate heating and cooling for laboratories in Ag Science North.	Several labs are being renovated in Ag Science North to address these issues involving heating and cooling of the second and third floor labs and offices.	Ongoing
3. College and Department administrations should review the policy of locking exterior, office and laboratory doors to ensure	E	A	Provide a safe and secure environment for members of the Entomology Department.	Install keypad lock for computer lab on third floor of Ag Science North. Modify locks on main office doors to enhance building security.	Ongoing

the security of employees and students working after hours (evenings and weekends) and to reduce the incidences of theft at all times. Other means of limiting access to these areas (i.e., control keypad, card readers, etc.) should be investigated as a long term solution.					

* **Source of Recommendation (I = Internal recommendation; E = External Review Committee recommendation; H = Unit Head recommendation)**

** **Accept/Reject Recommendation (A=Accept; R=Reject)**

Unit Head Signature: John J. Angelis **Unit Head Supervisor Signature:** _____ **Date:** _____

March 22, 2011