# COLLEGE OF AGRICULTURE & NATURAL RESOURCES

## MASTER PLAN: A VISION AND ROADMAP FOR THE NEXT 25 YEARS

2013

# Table of Contents

## College of Agriculture and Natural Resources Master Plan

## I. EXECUTIVE SUMMARY

The College of Agriculture and Natural Resources (CANR) envisions itself as an exceptional contributor to solving the grand challenge of feeding the world while protecting the earth's natural resources. With a commitment to continuous quality improvement, CANR embarked on the development of a *Master Plan* to enable the College to prepare its graduates to address the world's grand challenges in agriculture and natural resources 25 years into the future. The *Master Plan* is a flexible, "living document," from which we will derive specific action plans. It also includes individual unit plans with performance measures, against which we will measure progress. The *Master Plan* results from a year-long discussion with members of CANR's Advisory Board, administrative leadership team, students, faculty, staff, alumni, legislators, and other external stakeholders.

A comprehensive examination of CANR's external and internal strengths, weaknesses, opportunities, and threats has provided the opportunity to advance the College in the areas of teaching, advising and curriculum; research and discovery; Cooperative Extension; infrastructure; and budgetary principles for implementing the vision. The *Master Plan* not only defines the mission, vision and values of the College, but articulates several goals within each area of endeavor that will lead to significant impact on the challenges faced in agriculture and natural resources. To contribute exceptionally to the grand challenge of sustaining agriculture and natural resources into the future, CANR must achieve the following major goals:

Selective Excellence

- *Achieve selective excellence in areas that define and guide us, are relevant to our stakeholders, and complement the work of our partner institutions*. While we strive for excellence in everything that we do, we do not endeavor to do everything that relates to agriculture and natural resources. The College has achieved selective excellence in several areas, including: 4-H and youth development; avian biosciences; ecology; food safety; genetics and genomics; integrated pest management; natural resource economics, experimental economics and policy; public horticulture; soil and water quality, nutrient management, irrigation; wildlife conservation; and pre-veterinary medicine. To remain relevant to future stakeholders and students, the College must develop excellence in the areas of: mitigation and adaptation of agriculture, ecosystems and the environment to climate change; data analytics and statistics; legal and regulatory policy; sustainable landscapes and ecosystems; urban agriculture; "One Health," integrating plant, animal, ecosystem and human health.

Teaching, Advising and Curriculum:

- *Grow and diversify enrollment.* With nearly two career opportunities for every graduate, we must close the gap between the societal demand for agriculture and natural resource professionals and the supply of graduates in these fields. In an increasingly diverse world, the demographics of our student body must change to take full advantage of the diversity present in our society that can provide better solutions to the world's grand challenges.
- *Broaden and improve student learning outcomes*. Preparing the next generation of leaders in agriculture and natural resources will require new approaches to curriculum and teaching, including streamlined, flexible curricula; the creation of "T-shaped" students with emphasis on professional skill development; as well as an emphasis on innovative approaches, interdisciplinary, and discovery learning opportunities. We must fully develop and communicate the value proposition of a CANR education in terms of the outcomes, competencies, and agency in our graduates.
- *Greater teaching collaboration across and outside of the college.* We will enrich curricula and courses by leveraging expertise across campus, in Cooperative Extension, and at partner institutions such as USDA, EPA, DNREC, DDA, and other universities.

Research and Discovery

- *Ensure that future research is more selective in scope, more collaborative and interdisciplinary in nature, more relevant to stakeholders, and more competent for limited funding*. To that end, our unique strengths in research will fall into the headings of 1) genetics and genomics; 2) mitigation of and adaptation to climate change; 3) a "one health" approach to animal, plant, human and ecosystems; 4) sustainable food systems, landscapes and ecosystems; and 5) the human dimensions of agriculture and natural resources.
- *Build a more robust research infrastructure*. We must reexamine how we utilize our resources, both human and physical, in the execution of the research mission. We envision a future that is more flexible and collaborative, and utilizes resources more efficiently to achieve greater impact. We will leverage our existing partnerships and seek new ones to achieve this goal.

Cooperative Extension and Outreach

- *Establish UD Cooperative Extension as a premier broker of unbiased, research-based, evidence-informed information across the state and nation*. We will support unique strengths in 1) profitable and competitive agriculture; 2) environmental protection and natural resource conservations; 3) farm, small business, and family resource management; 4) food safety and security, nutrition and health; and 5) youth STEM development, and volunteer leadership.
- *Statewide focus and integrated structure*. In a relatively small and homogenous state, we expect to market and deliver 80% of our current county-based programs statewide by 2018. As UD seeks the Carnegie "engaged university" designation, we will lead efforts to integrate Extension across appropriate UD colleges.
- *Create and implement a sustainable funding model*. A more diversified portfolio of funding sources with less reliance on federal capacity funds is achievable and will be pursued. Three major new sources of revenue include tuition, cost recovery and gifts.
- *Enhance scholarship and leadership, and stress programmatic impact*. Extension professionals will enhance their scholarly contributions to research and outreach, and we will shift our focus in evaluation from activities to impact for a minimum of one statewide program each year. We will strengthen the program leader role to include responsibilities for grants and contracts, partner and agency linkages and cross-college integration.
- *Utilize technology in educational delivery.* A growing proportion of our stakeholders desire access to information 24/7 and wish to receive programming in an entirely digital or hybrid format. We will optimize current digital initiatives, enhance web presence, and market to new audiences through social media.
- *Develop a strategy for meeting the population needs in Wilmington.* As the state's largest and most diverse population center, we will align Extension programs with the needs of Wilmington residents.

Infrastructure

- *Secure a renovation of Worrilow Hall as the College's major research laboratory space.* Alternatively, construct one new building with more open-concept, flexible spaces that can accommodate a variety of uses and people.
- *Build attractive, welcoming, flexible and functional spaces.* Whether classroom, lab, lobby or office, we must create desirable workspaces and project a positive image as renovations are undertaken. We must be especially conscious of designs that anticipate changing needs.
- *Create a fair, transparent space allocation system.* In 2013, the CANR Space Committee was created to provide a college-wide, shared governance mechanism for space allocation.

Budgetary Principles for Implementing the Vision

- *Maximize transparency in budgeting, and reduce risk by diversifying the funding portfolio.* Fund allocation within the College should be as transparent and predictable as possible; a detailed annual report will be published beginning in FY14. New revenue sources including, but not limited to, royalties, fees, and online learning can compensate for expected cuts in federal capacity funds, state funds, and certain grant programs.
- *Implement more aggressive cost recovery, and reduce costs by enhanced efficiency.* In 2013, the College developed a Cost Recovery Committee to advise the dean's office on new strategies and policies for achieving financial sustainability. This shared governance mechanism will examine cost recovery strategies for teaching, research and Extension programs, and also look at opportunities for additional revenue generation. Likewise, we value efficiency and return on investment, and therefore will seek ways of reducing costs without sacrificing quality of service.
- *Create a surplus for unforeseen circumstances and reinvestment*. The College should endeavor to set aside 1-2% of its annual budget for unforeseen circumstances each year, reinvesting these funds in mission-critical areas at the year's end if such circumstances do not arise. At least 50% of any budget surplus should be dedicated to facility upgrades and maintenance annually for the foreseeable future.
- *Centralize salaries and space, create clear priorities for allocation.* In FY13, salary and space were centralized, and in the future will be allocated together according to college-level priorities, not simply historical levels of allocation.

## II. MISSION, VISION, VALUES

a) **Mission**: Fundamentally, the mission of the College of Agriculture and Natural Resources is synonymous with the Land Grant mission - the generation, translation and dissemination of knowledge in the public interest. Agriculture and natural resource issues affect everyone, every day, thus we play an exemplary role in fulfilling the Land Grant mission of the University of Delaware.

b) **Vision**: We envision a college that contributes exceptionally to the overall mission of Land Grant colleges of agriculture and related sciences in areas of unique strength that define and guide us, are relevant to our stakeholders, and have impact on Delaware, the region and the world.

c) **Values**:

i. *Diversity*. We believe that fostering diversity of backgrounds, views and values among our ranks leads to better graduates, better research, and better service for our stakeholders.

ii. *Efficiency and return on investment*. We will run an efficient and fruitful enterprise that returns more to those who pay tuition, taxes and endow us with gifts and grants than they generously provide on our behalf.

iii. *Impact*. We will measure our success by the impact we have on students, stakeholders and society. Outcomes are more important than activities.

iv. *Quality*. We will define ourselves by the quality of what we do, not the quantity of what we've done.

v. *Relevance*. We will generate, translate and disseminate objective, data-driven information that ultimately enriches the lives of the public we serve. Everyone eats, and everything is dependent on our natural resources, and we are committed to solving problems of local and global relevance within these areas.

vi. *Selective Excellence*. We value excellence in all that we do, but do not endeavor to do everything. We will build on our unique strengths or create them anew in areas where we have or can achieve excellent outcomes, and allow other areas to be supported by our partners.

vii. *Service*. As an integral component of a major research university, our work is performed to serve students, stakeholders, industries and agencies exceptionally well.

viii. *Sustainability*. We will not only generate and translate but will practice sustainable agriculture and sustainable use of the earth's precious natural resources. We will lead by example.

## III. OUR VISION OF THE FUTURE

The pace of change in agricultural production accelerates with each passing generation, hence the need for strategic change within Land Grant universities. We celebrated the 150th anniversary of the Morrill Act in 2012, which created Land Grant universities and colleges like ours, and we reflected on all of the changes, positive and negative, during that time. The first 150 years of the implementation of the Morrill Act saw many successes, and also introduced some of the challenges we currently face. Now that we approach the close of 2013, we ponder what the next 150 years will bring, but we believe that the fundamentals will remain unchanged for the foreseeable future – teaching, research, and outreach in the public interest. The first green revolution was about creating better crop varieties and animal breeds, mechanization, and inputs such as fertilizers, pesticides and vaccines. The second green revolution will again involve genetics and high-tech mechanization, but will seek to reduce or optimize chemical inputs to minimize environmental impact, reduce costs, protect our arable lands for future production and improve public perception. In any case, we will need better decision making tools – rapid access to reliable information will be required to reach yield goals and feed 9-10 billion people by 2050 (Evans, 1998).

The same rapid pace of change applies to natural resources and the environment. In fact, the predicted changes in mean climate and climate variability may manifest relatively large departures from normal in the coming decades. Natural resource managers will need better data on what is happening and when, and predictive ability will be imperative. Since agriculture is also dependent on the earth's natural resource base, changes in climate and the environment will affect agricultural productivity and food quality, just as agricultural practices affect the environment in terms of soil, air and water quality. The college enjoys expertise in both agriculture and natural resource disciplines and is therefore uniquely poised to make important contributions to our collective future. In the next 25 years, we must provide solutions for solving one of the world's grand challenges – providing a safe, affordable, nutritious food supply for a growing population while minimizing the footprint of agriculture.

Delaware is a state with a diverse and economically important agricultural industry and a richness of natural resources (Awokuse et al., 2010). For decades, the College has contributed to the state's agricultural enterprise and to the conservation of its natural resources, and will continue to be relevant to Delaware for decades to come. While the specific contributions we make will change over time, the impact of our work on the state, region and world will only grow. This *Master Plan* will serve as a vision and roadmap for the future of the College. Our vision of the future is conditioned by the following trends (Table 1).

**Table 1. Global trends that condition the future of the College (various sources; CANR administrative retreat June 20, 2013)**

| Things that will increase | Things that will decrease |
|---|---|
| **Global Trends** | |
| World Population (2-3 billion by 2050) and associated population stresses on food production and the environment | Natural resources, pristine areas, wildlife habitat |
| Increased population in urban and suburban areas | Stagnant or declining population in rural areas |
| Mean global temperature, sea level and climate variability | Historic climates for agriculture and ecosystems |
| Life expectancy, aging population; amount of tax dollars to support elderly | Discretionary spending for the working population; government funding of agriculture and natural resource science and education |

| | |
|---|---|
| Availability of knowledge | Ease with which the "right" knowledge can be found and applied to a specific problem |
| News and information via the Internet, social media; digital communication | News, information and communication from TV, radio and print sources |
| Degree of economic development in developing countries | The degree of dominance that the US exerts on the world economy |
| Health care costs; obesity and nutrition-related illnesses, recognition of the benefits of a health-conscious lifestyle | Ignorance of preventative medicine; intolerance for self-inflicted health problems; shift away from certain types of food |
| "Clean and green" industries, marketing approaches, products and services | Purchasing decisions based solely on price and quality; consumers will care more about how/where things are produced and the indirect consequences |
| Cost of food, food scarcity | Food availability in areas of need |
| Biofuels, alternative energy, energy efficiency | Fossil fuel use (decrease after 2050?) |
| Sensors and satellites for real-time environmental monitoring | Empirical sampling, data gaps, need for interpolation and assumptions |
| Urban agriculture, local food production | Percentage of population involved in large-scale food production |
| Precision agriculture, biocontrol, adaptive and prescriptive approaches; associated farm input costs | Calendar-based cultural practices, broad spectrum pesticide use, applicability of methods developed in other regions |
| Government regulation of agricultural production and environmental issues | Time and resources available for workplace needs other than government compliance |
| Invasive species, new diseases and pests of animals, plants, and humans | Pesticide and antibiotic efficacy |
| Genetic yield potential and yield of most crops | Availability of arable land and tolerance for low-yield approaches to agriculture |
| Applications of genetics and genomics in animal and plant improvement | Diversity of genetic background in major crop plants, animal breeds; traditional landrace varieties in cultivation |
| Appetite for meat and dairy products in the developing world | Land available for crops other than feed and forage |
| Robotics – milking, mechanical harvest, postharvest & processing, etc. | Hand labor in production and processing |
| Irrigated acres, irrigation efficiency, drought tolerance of crops | Availability of water for irrigation due to competition with urban and environmental uses |
| **Things that will increase** | **Things that will decrease** |
| **Higher Education Trends** | |
| Students interested in life sciences and environmental sciences | Students interested in traditional agricultural disciplines |
| Societal need for graduates of agriculture & natural resource colleges | Tolerance by employers for graduates that lack basic professional skills such as communication, critical thinking, accountability, etc. |
| Cost of higher education, student loan debt | Access to traditional higher education by low income families; willingness to tolerate tuition increases |
| The percentage of underrepresented minorities and non-traditional students in college | Percentage of traditional-aged, white suburban students in college |

| | |
|---|---|
| High quality online and blended learning | Lecturing, particularly large lecture hall approaches |
| Data analytics, "Big data" researchers and practitioners | Demand for graduates that lack good quantitative skills in agriculture and natural resources |
| e-advising, learning analytics, and tools for student self-assessment and tracking | The need for routine advising |
| Competency-based and prior-learning credits, dual enrollment in high schools, alternative forms of credentialing | The need for certain "Gen Ed" and introductory level courses; the practice of all coursework being obtained from one entity |
| Open educational resources, MOOCs, other online resources | Traditional textbooks and lab manuals |
| Digital media centers, information commons areas, group learning, problem-based learning environments | Traditional classrooms |
| Emphasis on graduate education at research universities | Attention and resources directed toward traditional undergraduate education |
| Lifelong education and programs to aid transitions to second, third, or fourth careers | Programs that prepare graduates for one specific career |
| Interdisciplinary teams to address major issues in research, teaching and outreach | Single investigator research and extension programs, single instructor courses |
| Experiential learning, internships, work experience, co-op programs, special problems and research; all to promote career readiness | The need for extensive training and orientation programs as employers on-board graduates to new positions |

## IV. UNIQUE STRENGTHS, PARTNERSHIPS, RESOURCES AND ATTRIBUTES OF CANR

A unique strength is an area of selective excellence to which we devote resources such as positions, infrastructure, and funding. The College is currently known for several unique strengths as outlined below. (Table 2) A main objective of the *Master Plan* is to position the college to have a set of unique strengths relevant to the world's grand challenges 25 years into the future, and we must begin the planning now to develop new strengths and to enhance and maintain existing strengths.

**Table 2. Current and future unique strengths of the College.**

| Current strengths | Future strengths we will need |
|---|---|
| • 4-H and youth development<br>• Avian biosciences and disease<br>• Ecosystem sciences and biodiversity<br>• Experimental economics<br>• Food safety<br>• Genetics and genomics<br>• Integrated pest management<br>• Natural resource economics and policy<br>• Public horticulture<br>• Soil and water quality, nutrient management, irrigation<br>• Wildlife and habitat conservation/restoration<br>• Pre-veterinary medicine and animal biology | • Climate science – mitigation and adaptation in agriculture, ecosystems and environment<br>• Quantitative sciences: data analytics, predictive modeling, statistics related to large data sets<br>• Legal and regulatory policy<br>• Sustainable landscapes and ecosystems<br>• Urban agriculture<br>• Integration of plant, animal and ecosystem health expertise with human health – a "one health" initiative |

a) Partnerships. We enjoy a richness of partner institutions within two hours of the Newark campus. The following serve as examples (Table 3), but the list is far from inclusive of all partnerships:

**Table 3. Current and future partnerships needed to leverage resources and achieve selective excellence in College programs.**

| Current partnerships | Future partnerships needed to support unique strengths |
|---|---|
| • Botanic gardens: Longwood, Winterthur, Chanticleer, Mt Cuba, National Arboretum, Morris Arboretum, Scott Arboretum/ Swarthmore<br>• State, Federal, private agencies/resources: Delaware Department of Agriculture, Delaware Natural Resources and Environmental Control, Delaware Nature Society, Delaware Center for Horticulture, Delmarva Poultry Industry, Tri-State Bird Rescue, Bombay Hook National Wildlife Refuge, Chesapeake Bay Foundation, major US museums (DC, NY, PHL), US Fish & Wildlife Service, Maryland Wildlife & Heritage Service, USDA-APHIS and USDA-ARS station in Wyndmoor, PA, USDA's Beneficial Insect Research Unit located on the Newark Farm<br>• Agricultural industry headquarters, research facilities: DuPont, Poultry companies such as Perdue, Produce Marketing Association, Merck Animal Health<br>• Allied Universities: Four Land Grants (Delaware State, University of Maryland-Eastern Shore, University of Maryland-College Park, Rutgers), formal partnerships with three; bovine and equine research partners with the University of Pennsylvania Veterinary School and New Bolton farm<br>• International: China Agricultural University, Universidade Federal Lavras, Brazil | • Stronger, more plentiful and different industry partners to support research and Extension programs as federal capacity funds likely decline<br>• Stronger relationships and collaborations with EPA and similar organizations focused on environmental issues relevant to the College<br>• A broader range of global partner universities with faculty expertise complementary to ours<br>• Industry and agency partners that can support internships and work experiences for a larger number of students<br>• Stronger relationships between the governing bodies of the three Delaware counties and Cooperative Extension to support programs that directly affect their constituents<br>• Stronger links to high schools and community colleges to encourage enrollment or transfer into our undergraduate programs<br>• Partnership with firms that can provide services to help utilize technology in teaching and outreach<br>• International partners that provide opportunities in all mission areas across a range of unique strengths |

Partnerships help leverage resources and accomplish our mission, increase the diversity of thought among our people, and expand our capabilities. In the future, we must explore additional partnerships as collaborative, interdisciplinary approaches will be needed for solving problems and educating students well. Technology will allow us to extend partnership arrangements beyond the mid-Atlantic region in the future, and we must be looking beyond our immediate horizon to find logical affiliations nationally and internationally. While we cannot name the specific partnerships that we will enjoy 25 years from now, the types of partners needed are listed in Table 3.

b) Resources. Current resources that facilitate our mission and future resources needed to maintain or enhance our mission are listed in Table 4.

**Table 4. Current and future resources for the College.**

| Current resources | Future resources needed to support unique strengths |
|---|---|
| • The Newark farm, or "350-acre outdoor classroom," is located next to the buildings we occupy. More than just a farm, it contains woodlands, wetlands, streams, grasslands, and other natural habitat, and performs ecosystem services for the University of Delaware.<br>• The CC Allen Lab is the only Biosafety level-3 facility at the University of Delaware. It is used for poultry disease research.<br>• The Carvel Research and Education Center lies in the heart of the agricultural industry and sensitive environmental areas of the state. It complements rather than duplicates the Newark farm and provides the main point of outreach and interchange between the college and its stakeholders.<br>• The Lasher Lab in Georgetown, which provides disease surveillance, as well as avian health research and outreach to the poultry industry.<br>• Warrington Irrigation Research Farm, near Georgetown, consists of 95 acres of agricultural land and 41 acres of woodland.<br>• The University of Delaware Botanic Gardens surround the buildings of the Newark campus, and provide teaching and outreach opportunities for stakeholders.<br>• The New Castle and Kent County Extension offices provide additional space for research, extension and teaching programs. | • New research lab facilities will be needed to replace those in Worrilow Hall that have or will soon exceed their useful lifetime.<br>• Funding will need to be obtained through philanthropy, grants, contracts, and in-kind services to sustain our farms as operating expenses and maintenance escalate.<br>• Endowments will be needed to support key faculty, professionals, and new/upgraded facilities that underpin our unique strengths.<br>• Renovations to Townsend Hall, the CC Allen Lab, Lasher Lab and the Carvel Center will be required toward the end of the 25 year period under consideration. Ideally, the renovations would be made over time to maintain optimal use of the facilities and avoid large disruptions of work and capital required to perform the renovations.<br>• Access will be needed to facilities and resources off-site such as Penn Farm, DuPont Stine-Haskell, Longwood Gardens, and Delaware Nature Society in lieu of expanding or duplicating resources on campus. |

Attributes. Several attributes make the College unique among colleges at UD or compared to other colleges of agriculture and related sciences in the region. We must continue to exploit and market these attributes to present our value proposition to external clientele, including prospective students and their families, colleagues at other institutions and across campus, government officials and the general public that we serve.

- CANR has expertise in biological, physical, and social sciences and can thus address the human dimensions of problems, as well as the underpinning science.
- Extension engages us with our stakeholders, deliberately aligns us with the core values of UD, and provides a strong sense of relevance and value to Delawareans.
- CANR provides a small college feel within the context of a larger research university. We must preserve this attribute as we grow enrollment in the College.

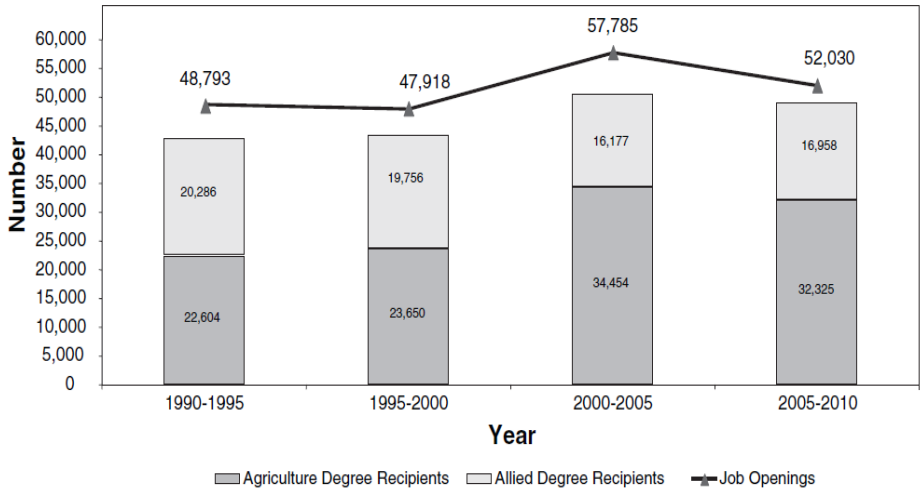
- World-class faculty in many disciplines are approachable and accessible to students, stakeholders, industry and communities. We must upgrade our facilities and grow our reputation in select areas to attract the finest new hires to replace retiring faculty.
- CANR is located in the heart of the east coast megalopolis, and its 350-acre Newark farm is largely within the city limits. This provides excellent opportunities for urban agriculture and studying the urban-agriculture interface. Similarly, it provides an appropriate context for studying natural resource issues in a human dominated landscape. It also facilitates close relationships with a number of partners (e.g., Table 3). The juxtaposition of urban, agricultural, and natural land use types will only intensify in our region over the next 25 years.
- CANR enjoys unusually strong relationships with state and federal legislators and regional agencies in part due to the small size of Delaware relative to other states, but largely through our relevance to key sectors of the state's economy. We must work diligently to maintain these relationships as the population grows and legislators are faced with new challenges in the future.
- CANR students enjoy strong placement upon graduation. The USDA has documented two jobs for every graduate of a college like ours (Goecker et al., 2010), lower post-graduation rates of unemployment compared to most majors (Carnevale & Cheah, 2013), and strong placement in graduate and professional schools. These trends have been apparent since the 1990s and will likely continue well into the future.

## V. TEACHING, ADVISING AND CURRICULUM

a) Current status and likely future

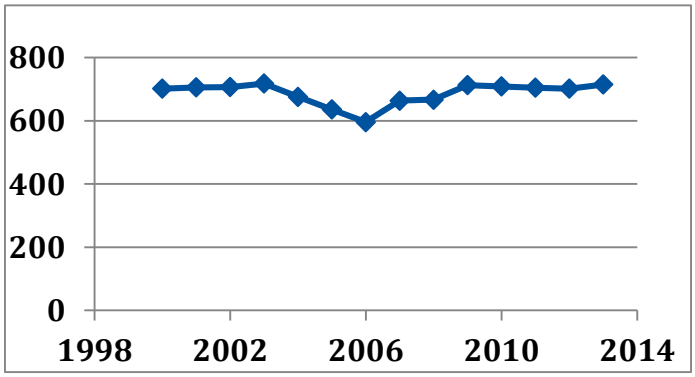
Among the seven colleges at the University of Delaware, CANR is known for its applied curricula, approachable professors, hands-on coursework, quality advisement, small class size, high rates of job placement upon graduation, and vast outdoor teaching resources located right on the main campus. Additionally, we have a satellite campus in Georgetown that could play a larger role in the teaching mission. Students appreciate the "small school feel within a larger research institution" that is often touted in our recruitment literature. The overall picture is positive, except that the relatively low enrollment does not address the societal need for graduates in the agriculture and natural resource disciplines, and also creates vulnerabilities relative to the University's budget process (see section IX). Nationwide, there are approximately *two employment opportunities for every graduate of a college like CANR*, a trend that has been in existence since before 1990 and will likely continue well in to the future (Figure 1).

**Figure 1. Projected average annual employment opportunities and available graduates in agricultural and natural resource fields of study, United States, 1990-2010. Source: US Dept of Labor Monthly Labor Review, February 2004, and National Center for Education Statistics Completion Reports.**



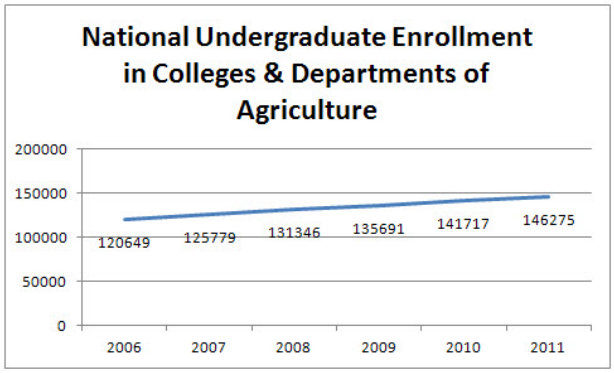

In 2013, CANR enrolled about 4.5% of the students at UD and taught 3.5% of the Student Credit Hours (SCH) at the undergraduate level. The College supports 18 majors with about 31 FTE currently devoted to teaching; each FTE produces 546 SCH/year.

**Figure 2. Unduplicated undergraduate headcount enrollment trend in CANR, 2000 through 2013.**

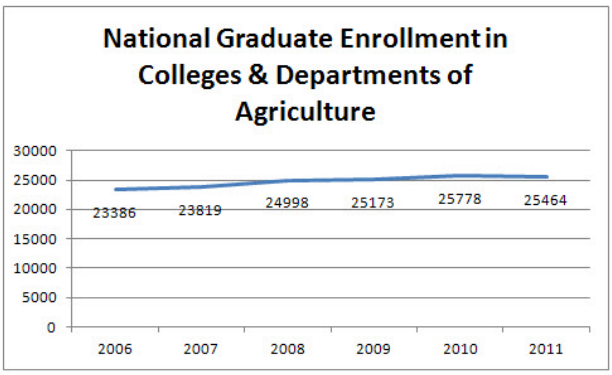



Undergraduate enrollment has varied over the last decade, but there is no overall trend during that time period (Figure 2). Enrollment rose to 715 undergraduate students in Fall 2013, the highest in a decade. This relatively flat enrollment trend is in contrast to most colleges of agriculture and related sciences in the nation, who have experienced, on average, about a 20% increase in undergraduate enrollment in

recent years (FAEIS, 2013; Figure 3). This makes CANR the second smallest college at UD in terms of undergraduate enrollment, which highlights one of its vulnerabilities.




source: Food & Agricultural Education Information System (FAEIS)




source: Food & Agricultural Education Information System

**Figure 3. Nationwide enrollment trends in colleges of agriculture and related sciences at the undergraduate (top) and graduate (bottom) levels. The overall enrollment trend for the period 2004-2011 is +21% at the undergraduate level (FAEIS database, 2013).**

At the graduate level, CANR averages just over two students per faculty member, on par with the best agricultural and natural resource research institutions in the country. In the five years preceding this document (to 2008), CANR averaged about 175 graduate students, about 5% of the total UD enrollment, with no apparent trend up or down. The breakdown of Fall 2012 enrollment (total=188 students) is shown in Figure 4. In contrast to strong upward trends in undergraduate enrollment, graduate enrollment in colleges of agriculture and related sciences nationwide has been largely constant in recent years, similar to CANR (Figure 3). Many qualified applicants are turned away each year due to a lack of funding for stipends and/or tuition waivers.

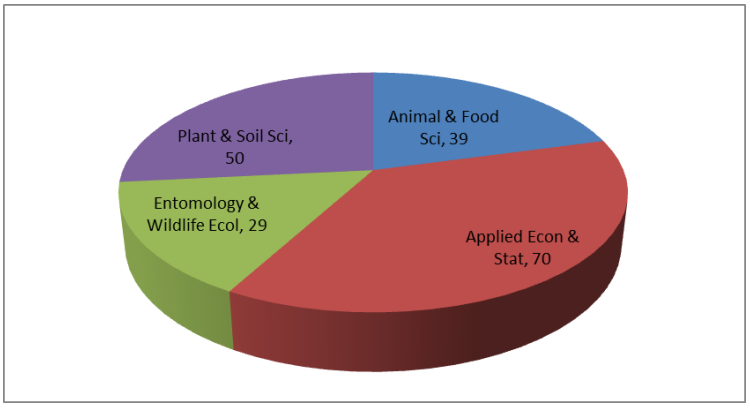



**Figure 4. Unduplicated headcount enrollment of graduate students by department, Fall 2012.**

Higher education has experienced a number of changes in recent years, and has received much criticism as student loan debt has topped credit card debt in the USA, and tuition/fees have increased at twice the rate of inflation in the last 30 years (Hauptman, 2013). Massive open online courses (MOOCs), for-profit universities, dual enrollment, online education, alternative credentialing (e.g., badges), and the flipped classroom represent just some of the "disruptive innovations" that challenge the *status quo*. Still, most public universities, including UD, continue with a traditional lecture-based, classroom instruction model that has persisted for centuries. The growth rate of enrollment in online and hybrid (part live, part online) classes and programs has been five- to ten-fold that of traditional face-to-face education for several years (Allen and Seaman, 2013). Recent research suggests that the learning outcomes are as good as or better in online and hybrid delivered courses than those in traditional face-to-face courses (US Dept of Education, 2009).

While the future of teaching and learning at public land grant institutions is uncertain, the trend away from traditional face-to-face instruction and curricula will likely continue, and we must therefore endeavor to fundamentally change our curricula and pedagogy to remain relevant and effective. Employers of college graduates have stressed the need for greater attention to a general set of professional skills, such as critical thinking, problem solving, accountability, and effective teamwork (Hart Research Associates, 2013). This suggests that the pendulum needs to swing back from the highly technical, content-rich curricula of the past several decades toward a more general, broadly applicable, rounded education. This will be a challenging and significant departure from the norm, as our teaching styles and course structures are deeply rooted in our culture. The following are goals that will guide our efforts in teaching and learning for the next 25 years:

b) Goals

i. *Grow and diversify enrollment in select areas at the undergraduate and graduate levels.* In late 2012, the dean announced a goal of increasing undergraduate enrollment 15% by 2015, or the "15 by 15" plan. This would add about 100 undergraduate students to the College and was motivated by the societal need for graduates in agriculture and natural resource disciplines. While this goal is attainable with greater effort toward recruiting, longer term we must endeavor to do more to close the gap between the number of career opportunities and the number of graduates. In particular, there is strong enough demand to double the number of graduates in the following fields:

1. *Food science and technology, food safety*
2. *Marketing, sales and management of agricultural and natural resource products and services*
3. *Statistics, biostatistics and quantitative biology and economics*
4. *Environmental and natural resource sciences, including climate science, conservation, regulatory policy, and alternative energy*
5. *Genetics, breeding, and biotechnology*
6. *Sustainable agriculture (broad-based)*

We should endeavor to reach national averages for numbers of graduates in all of our majors by 2025 (as documented in the IPEDS and FAEIS databases), and make the curricular changes today that will allow us to attract and retain more undergraduates. Equally important will be reaching national averages for diversity in our student body, again assessed through national databases. At the same time, we must be mindful not to diminish the quality of instruction as enrollment grows to target levels.

At the graduate level, our enrollment could easily grow by 15% or more if more funding were available. Space availability would not constrain growth of ~15%, but beyond this level, new spaces for graduate offices and research laboratories would likely be needed. As graduate education aligns largely with research capabilities, select programs for growth will reflect the unique strengths in research and discovery listed in section VI. More specific areas for growth include:

1. *Professional Master's degree programs*. Non-thesis MS degrees and graduate certificates have become more popular as students seek to distinguish themselves from others in a competitive workplace. The best example is the non-thesis MS program in Statistics, which has doubled in enrollment in about five years, and has more growth potential.

2. *PhD program in Applied Economics*. Only one of four departments in the college lacks a PhD program – Applied Economics and Statistics. A recent external program review identified the need to develop such a program for the department to improve its rankings and produce highly skilled economists for this growing sector of agriculture and natural resources.
3. *A genetics and genomics undergraduate/graduate program*. An integrated approach to education in this vital area includes MS and PhD degrees, as well as a pipeline for recruiting from BS and 4+1 BS/MS programs.
4. *A series of 4+1 programs in select fields*. In a 4+1 program, students can obtain a BS and a Master's degree in five years, saving a significant amount of money and time compared to the traditional route of a 4-year BS followed by a 2-year Master's degree. One example would pair a number of undergraduate BS degrees with an MA in Agricultural Education, allowing a path to teacher certification for CANR students who wish to pursue middle and high school teaching careers.

From a budgetary perspective, the College can afford to grow graduate enrollment to a "break-even" level. Currently, 80-85% of the funds awarded to the College for graduate tuition are immediately expended on graduate tuition waivers. The net tuition revenue to the College (~$900,000 projected in FY14) is further eroded by payment of ~$3300/student in allocated expenses. The result is a 6% net revenue projected to the College for FY14, thus we are currently near the break-even point. The net tuition revenue predominantly comes from self-paying students, and to a lesser extent, from students whose tuition and allocated costs are written into grants and contracts or provided by the UD Graduate Office. Clearly, more self-funded students are needed, faculty should be incentivized to include more funding for graduate students in grants and contracts, and development opportunities should be sought that will support graduate studentships.

ii. *Reach students in other colleges through service courses, minors, internships, and extracurricular activities*. While only a small proportion of the undergraduate students at UD will take a major within CANR, every student should know something about food and natural resource issues in order to be better informed of how their food choices and personal behavior affects agriculture and the environment. Service courses and minors should be designed to permit entry of students from diverse disciplines, but should be rigorous, meaningful experiences. Clubs should attract students of all backgrounds, and events such as *Ag Day* and *Evening in the Garden* should be structured to attract non-majors to our part of the campus. Internships, special projects and undergraduate research opportunities should also be open to non-majors who wish to expand their horizons.
iii. *Student outcomes: Create "T-shaped" students.* In recent years, employers have been vocal about the types of skills and attributes they need in college graduates. The concept of "T-shaped" students has been discussed extensively at IBM regarding the development of a better IT workforce, but has nearly universal relevance across disciplines (Donofrio et al., 2009). Figure 5 illustrates the T-shaped student concept. Basically, employers of our graduates believe that we need to broaden the top of the T by using different pedagogical methods, requiring internships/work experiences, and making the curriculum more interdisciplinary. To remain relevant to society, higher education needs to embrace this approach. CANR should revise

its curricula and teaching methods with the goal of producing workplace-ready graduates that can solve problems requiring interdisciplinary approaches. More specifically, the learning outcomes of our teaching programs should include the attributes listed across the top of the T, and we should develop appropriate metrics to assess these learning outcomes prior to graduation.

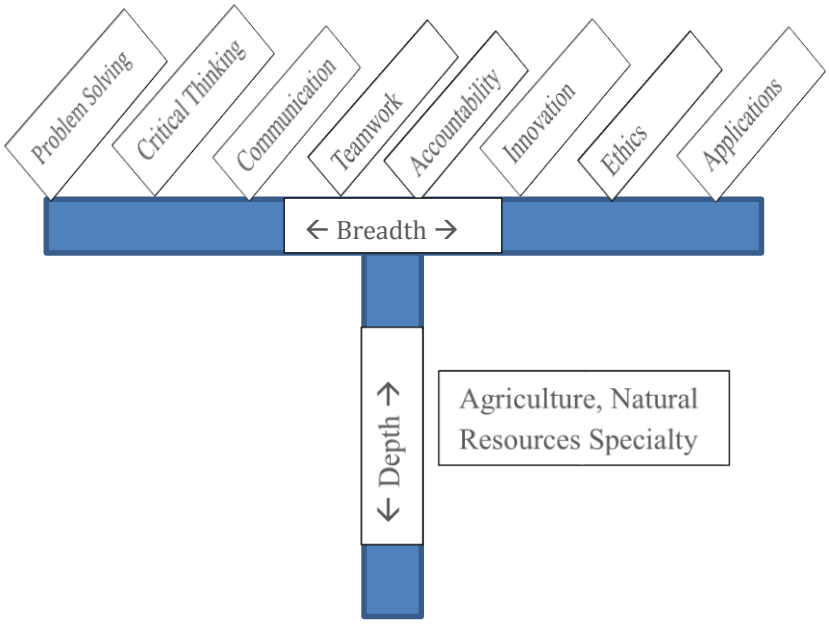



**Figure 5. An illustration of the "T-shaped Student," as envisioned by College leadership and informed by employer surveys.**

iv. *Innovation & discovery learning*. Critics like Mark Twain have argued that lecture is a process of transferring the instructor's notes to the student's notebooks without going through the minds of either party. In reality, lectures can be stimulating and effective teaching tools in many situations, but overreliance on this or any single form of pedagogy has limitations for student learning. The College is known for its commitments to experiential learning, study abroad, hands-on and, to a lesser extent, problem-based and online learning. Innovative approaches, if embraced strongly, not only improve learning outcomes but *can help to distinguish CANR from similar colleges in the region, and make us a student's top choice for enrollment in agriculture and natural resource disciplines.* As strongly as UD has distinguished itself in study abroad, we should endeavor to distinguish CANR as the college of choice for students seeking discovery learning and other innovations in teaching and learning. Every curriculum in CANR should incorporate opportunities for innovation and discovery learning in every semester.

v. *Streamlined, flexible curricula.* During the fall of 2012, Stamats, Inc., a higher education marketing firm, consulted with CANR on 1) the effectiveness of the web site for recruiting students and 2) the viability of various undergraduate majors based on national and regional benchmarking. The main conclusions were that 1) the College's website was relatively ineffective for student recruitment and could be improved, and 2) undergraduate curricula could be streamlined into fewer, broader majors with concentrations or options within them. The College should

reduce the number of highly specialized, low enrollment programs in favor of broader, more flexible, better enrolled majors. Ideally, ~2 majors per department (with concentrations in subdisciplines) should be sufficient to produce graduates across a range of career tracks. Majors will be regularly evaluated for enrollment and output of graduates, and those with enrollment below threshold for three years running should be merged or eliminated following review.

vi. *Online and hybrid delivery.* National trends, peer-reviewed research, and student preference all strongly suggest that the College should continue to develop online modules, courses and programs to remain relevant to our current students and attract new, place-bound students to our College. *Quality must not be sacrificed for reduced cost or efficiency as we grow online offerings.* Fortunately, research on teaching and learning suggests that the quality of instruction can be maintained or even enhanced using technology (US Dept of Education, 2009). Greater support will be needed to assist instructors as they develop online materials and this will require an investment by the College in instructional design and technology. The College should set a goal of 30% of its teaching online by 2020. The 30% figure represents the proportion of all college students in the USA (in 2010-2011) who have taken at least one course online; this figure grows annually. Also, 30% is the threshold amount of online delivery that classifies a course or program as blended or hybrid learning (Allen and Seaman, 2013). Thus, 30% is a minimal figure relative to higher education trends in the USA.

vii. *Teaching expectations and assessment.* In research, we evaluate faculty based on the entirety of their programs – publications, grants, presentations, graduate and undergraduate involvement, professional development and other items that constitute a whole. However, in teaching, faculty are generally evaluated for the number of courses/credits they teach and student evaluation scores in those courses. This approach ignores the importance of advisement, peer assessment, contributions to curriculum enhancement, professional and technical development, grantsmanship, and scholarly contributions to teaching and learning. In short, we should expect faculty with teaching appointments to develop strong teaching *programs*, just as we expect a programmatic approach to research and extension efforts, and change our assessment metrics and policies to properly evaluate *programs*, not just courses. The details of assessment may vary among disciplines, but at the very least, the College should institute some form of peer assessment of teaching based on long-standing guidelines and research in this area (Johnson and Ryan, 2000).

viii. *Broaden the outcomes for graduate students.* Graduate education represents the nexus between research and teaching, and consequently, much emphasis is placed on developing a skill set leading to success as a principal investigator. Less emphasis has been placed on developing teaching skills, despite evidence that shows that graduate students who teach during their programs actually have better research outcomes (Feldon et al. 2011). Even less emphasis is placed on development of outreach and translation skills that would be useful for students headed for careers in Extension. Graduate students need to be "T-shaped" (see goal *iii* above) just as much as do undergraduates, hence we need to broaden our graduate programs to include professional skills and also to provide meaningful teaching and/or Extension experiences. Skill development can be easily assessed during comprehensive exams and thesis defenses. Utilizing Extension and teaching

faculty/staff in graduate curricula and on committees would broaden the student experience in ways beneficial to students and also to the reputation of the departments from which they graduate.

ix. *Greater involvement and collaboration across and outside of the College.* As we build relevant, innovative and interdisciplinary curricula and courses, we should leverage all resources that can be brought to bear on teaching. This includes team teaching within and across departments, the involvement of Extension professionals and specialists in teaching, and leveraging our partner institutions such as USDA, EPA, DNREC, DDA, and sister institutions. Even today, technology allows guest teaching from colleagues around the world. Within the College, Extension personnel are underutilized in formal teaching and can bring a wealth of practical, up-to-the-minute knowledge to our students. Spreading our teaching FTE across a greater number of people enhances the depth and diversity of our teaching programs.

a) Current status and likely future

The College has been traditionally strong in research relative to its size. For example, although CANR is the 2nd smallest college at UD in faculty number, it ranks 3rd in grant proposal submissions and 3rd in total research expenditures. We currently have six named chairs and three AAAS Fellows, thus ~10% of our research faculty have achieved significant distinction in their fields, a testament to the quality of the overall faculty of the College. We have achieved selective excellence in fields such as genetics and genomics, soil and water sciences, conservation biology and natural resource economics, and our faculty are frequently invited to speak at national and international conferences. Many of our current research strengths, resources and partnerships are articulated above in section IV.

The College currently has about 40 FTE devoted to research, about half of the total number of faculty FTE in the College. Total research expenditures for the past two fiscal years have averaged ~$16 million/year, or about $400,000/year per FTE in research. Major sources of support are depicted in Figure 6.

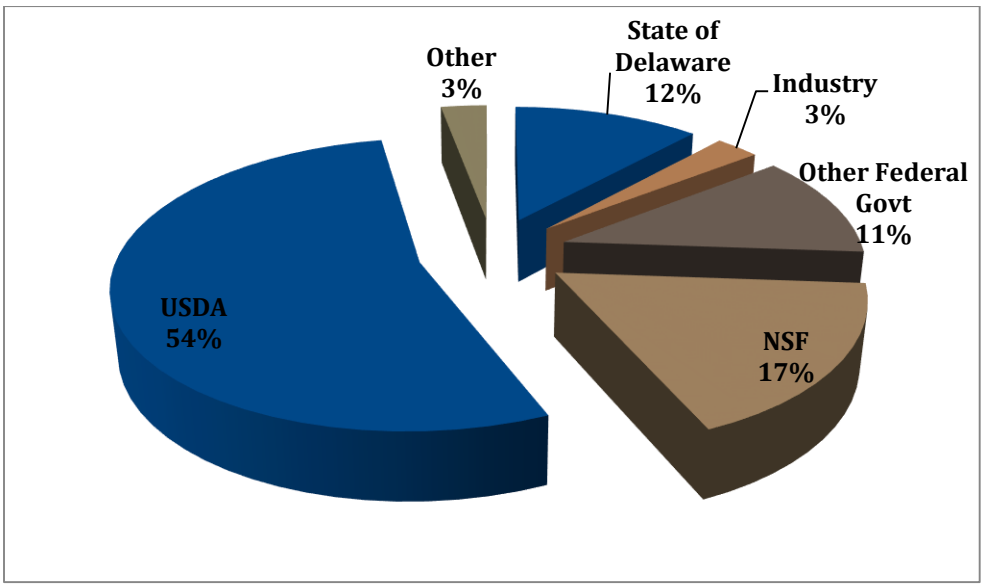



**Figure 6. FY2013 sources of sponsored research funding for CANR. Total grants and contracts were approximately $16 million for FY2013.**

The nature of research is becoming more collaborative and interdisciplinary, and will likely continue on this track for the coming decades. There must be a balance between shorter term applied research, which is important to remaining relevant to current stakeholders, and longer term fundamental research that lays the groundwork for new products and services that cannot be envisioned at present. Each investigator will experience increasing pressure to articulate the value of their research to society as those who fund our programs, including the average taxpayer, scrutinize investments in university research more closely. The expense of conducting research – whether applied or fundamental - will continue to escalate, as will the competition for available funds, requiring a diversification of the funding portfolio depicted in Figure 6 (National Research Council, 2012). Only the very best research ideas will attract funding in the future, underscoring the need to build selective excellence in the research conducted in the College. Efficiencies can be captured as investigators who work in teams can share equipment, space and human capital – we have an excellent example

of this approach in the Delaware Biotechnology Institute and should seek to replicate this model. Overall, the future of our research depends on being more selective in scope, more collaborative and interdisciplinary in nature, more relevant to stakeholders, and more competitive for limited funding.

b) Unique research strengths of the College

After considerable reflection and planning, we have defined our research strengths based not only on what we do today, but what we endeavor to do in the future. The areas of selective excellence that we will maintain or build are:

i. Genetics & genomics for plant, animal, and ecosystem improvement. The College has considerable expertise in genetics, genomics, and molecular biology, and several faculty in this area have achieved international renown for their research. The future of agriculture and natural resources depends on continued research investment in this field as solutions to many of the world's grand challenges will involve genetics and allied disciplines.
ii. Sustainable food systems, landscapes and ecosystems. Sustaining our food system is foundational to our College's mission and requires an interdisciplinary approach, involving almost all of our faculty as well as those from outside of the College. To be sustainable, agriculture must be 1) profitable for the producer; 2) affordable, safe and nutritious for the consumer; and 3) respectful of the environment. Without any one of the three, the system fails. Beyond food, our research has, and will continue to focus on sustainable landscape design and management, and sustaining the world's ecosystems by conserving natural resources and enhancing biodiversity and resiliency. The Delmarva region provides an excellent setting in which to study sustainability since it is a relatively populous, environmentally sensitive region of the country.
iii. "One Health" initiative – animals, plants, humans, ecosystems. Traditionally, the health of the earth's inhabitants has been studied and practiced in relative isolation; animal health by veterinarians and animal scientists, plant health by plant pathologists and physiologists, human health by medical scientists, and ecosystem health by ecologists. In recent years, science is beginning to uncover the interconnections among various organisms and between organisms and their environments. For decades, our College has been strong in animal and plant health research, and more recently we have developed strength in ecosystem health. We are beginning to address human health through our work in food science, nutrition and safety, and we're reaching out to the College of Health Sciences and other partners on these topics. It stands to reason that fundamental knowledge of health in one set of organisms might be applied to other organisms. Our College will endeavor to expand the frontiers of the health of plants and animals and find new links to humans and ecosystems through partnerships.
iv. Climate change – impacts, mitigation and adaptation. One of the greatest challenges facing agriculture and the environment is climate change. Even without further warming, enhanced variability in climate can reduce the sustainability of food production and ecosystem function. Our research increasingly contains themes of climate change and variability, but the future will require us to be more intentional with research in mitigation and adaptation solutions for our stakeholders.

v. Human dimensions of food, agriculture and natural resources. Some would say that if we just applied what we knew already, we could solve many of the grand challenges in agriculture and natural resources. While our science has produced several possible solutions for enhanced food production and natural resource conservation, changing behavior in people is quite often the barrier to implementation and ultimately, positive change. Some solutions are simply viewed as uneconomical, misaligned with current government policy and regulation, or too risky to be implemented. We must focus on the human dimensions of our problems or we will be less impactful and relevant to the public we serve. One of our departments – Applied Economics and Statistics – is invaluable in this respect, bringing expertise to our remaining departments on the human dimensions of problems we need to solve.

c) Goals

i. *Achieve excellence in areas of unique strength*. Fundamentally, world class programs are built on quality human capital. We must recruit and retain the best – and most diverse - faculty and staff available, and continuously ask ourselves if we're hiring the best person or simply the best person in the applicant pool. We must be more aggressive and intentional about hiring and be aware that every job announcement that we release speaks volumes about who we are and where we're going. Presented with the choice, we must opt for fewer, high quality hires rather than a larger number of average hires if we are to achieve selective excellence in any given field. While the number of research FTEs will likely remain the same or decrease slightly, the prominence of our faculty, their programs, and our College will increase, as will its diversity. Quality can and should be measured by regular benchmarking of faculty output, impact, and recognition against our aspirational peer institutions. Diversifying faculty ranks will be challenging as it has been previously, and we will need to market our positions in appropriate outlets to ensure a diverse applicant pool in every search.

ii. *Support research with excellent facilities and core support units.* Attracting and retaining the best faculty and staff requires that we compete with other excellent institutions for top candidates. The support that candidates receive in terms of startup packages, work environment, and help from support units will play a major role in choice of institution, so we must invest in physical facilities and support personnel to achieve excellence. More detail on physical facilities is provided below in section VIII, and individual support unit plans were crafted in response to the needs and goals of programmatic units of the College (Section X.b). While the College and the departments shoulder the responsibility for making good hires and getting them started, in turn, each researcher must build and maintain a sustainable funding stream that contributes not only to their research output, but to the College's research support infrastructure.

iii. *Promote interdisciplinary approaches to research and collaborate with partners outside the College.* The world's grand challenges require solutions that derive from teams of researchers working across disciplinary boundaries. As listed above in Section IV.a, we enjoy a richness of partnerships with public and private entities that, when leveraged, result in greater impact for our stakeholders than we alone can produce. As an example, in September 2013, we partnered with universities in the region to hold the first Delmarva Land Grant Summit in Dover. Six Land Grant

colleges of agriculture and related sciences came together to focus on issues of importance to the Delmarva region, and pledged to develop seed grant funding to support collaborative research (to be launched in 2014). Seed grant funding illustrates our commitment to working together and is designed to lead to larger, collaborative awards in future years.

## VII. COOPERATIVE EXTENSION

a) Current status and likely future

All colleges at UD engage with the community in select areas and thus align themselves with one of the University's strategic milestones, "The Engaged University" (*The Path to Prominence,* University of Delaware, 2008). However, CANR differs from other colleges in that it is *deliberately structured* for engagement with the public through Cooperative Extension, and its outreach mission is thus substantially larger, more impactful, and more central to our identity. Cooperative Extension celebrates its 100th anniversary in 2014 and as we celebrate the accomplishments of the last century, we must look ahead to the next century and change accordingly to maintain our impact and relevance to society.

UD Cooperative Extension follows a more-or-less traditional model in that it is a federal-state-county partnership (though the county funding levels are low compared to other states) and most of the personnel are "county agents," termed "professionals" in Delaware. Programs are focused into three main areas of Agriculture and Natural Resources, 4-H Youth Development and Family and Consumer Sciences. Importantly, we partner with the state's other land grant university, Delaware State University, to deliver science-based information to the public. We also have strong ties to other mid-Atlantic and northeastern universities on matters of regional importance, and Extension is generally more engaged across state lines than are the research and teaching missions.

The College employs a total of 59 FTE in Cooperative Extension, 22 as professionals located largely in county offices, 27 as specialists integrated into the four departments or one of the county offices, and 10 FTE in support. Currently, there are 23.9 professional FTE's in Agriculture & Natural Resources, 15.2 professional FTE's in 4-H Youth Development, and 4.9 professional FTE's in Family and Consumer Sciences (FCS) (Figure 7). Additionally, there are seven paraprofessionals in Family and Consumer Sciences providing nutrition education through federal grant programs such as Expanded Food and Nutrition Education Program (EFNEP), and Supplemental Nutrition Assistance Program )SNAP-Ed.). The 4-H program is the most strongly leveraged on grant funds, though significant percentages of funding of the two other programs are sourced from grants.

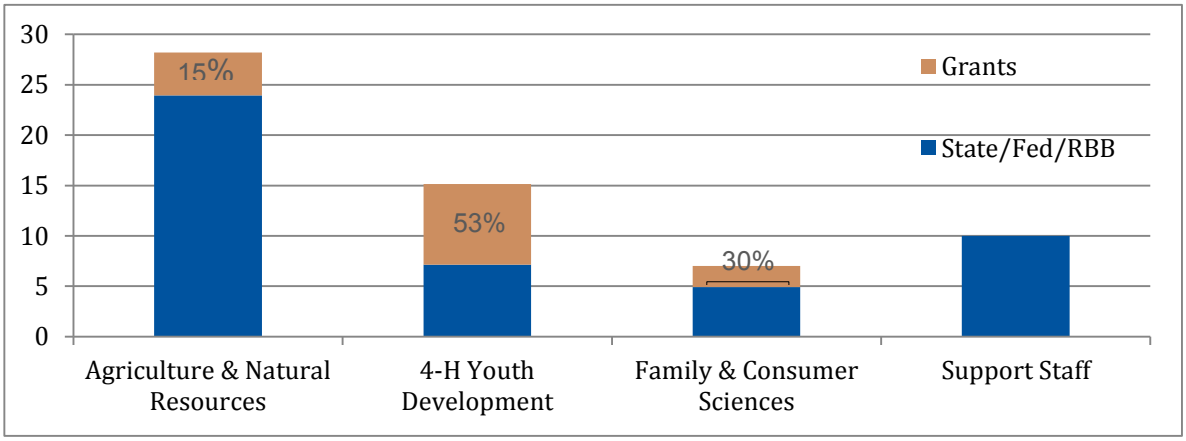



**Figure 7. Cooperative Extension: FTE by program type and funding source**

We envision UD Cooperative Extension being recognized across the state and nation as a premier broker of unbiased, research-based, evidence-informed information. Extension professionals have been, and will continue to be, recognized as the "go to" source for outreach at the University of Delaware. In fact, we believe that all colleges at UD can utilize and contribute to the Extension network, and that it can serve as a model and mentor for enhanced engagement efforts at UD.

We also envision even greater collaboration across county lines, with Delaware State and other regional institutions, as well as with Delaware Sea Grant, and USDA, EPA and other federal entities. To achieve this vision change will be required on several levels. We have redefined our unique strengths and goals accordingly.

b). Extension Unique Strengths, or Plan of Work

Upon considerable reflection and advice from stakeholders, the following Plan of Work has been developed to take UD Cooperative Extension into its second century. Our programs and activities focus the majority of our resources in these primary areas.

i. *Profitable and competitive agriculture*. Extension has and will continue to be strong in applied research and translation around best management practices. Producing food for an increasing population, while minimizing the footprint of agriculture, requires the implementation of science-based, best management practices.
ii. *Protect and enhance the environment and conserve natural resources.* Climate variability and change will require mitigation and adaptation strategies for agriculturists and natural resource managers. Examples include irrigation management, disaster preparedness, enhancing soil and water quality, reducing off-site transport of nitrogen and phosphorous, pesticide education, planned landscapes, precision agriculture, energy efficiency, conservation practices, and integrated pest management.
iii. *Farm, small business and family resource management*. Across all audiences there is an increasing need for financial literacy, from the newly minted college graduate to the largest agricultural enterprises. Topics extended through this program include budgeting, credit, debt and risk management, recordkeeping, cash flow, estate planning, insurance literacy, business management, as well as marketing and human resource management. Our strength in applied economics must be extended to the public to have positive impacts on society and the regional economy.
iv. *Food safety and security, nutrition and health. The overall goal of these programs is to increase the number of Delawareans who are healthy at every stage of life. This requires a socio-ecological approach that encompasses healthy and safe food choices and healthy and safe environments. Specific programs include topics of human nutrition, diet, health literacy, prevention education and an integration of health with the environment and agriculture systems. This also aligns with the 4-H national mission as "health" is one of the four H's in 4-H. Food*-borne illness extracts a considerable toll on the economy and health of individuals, and as agriculture diversifies and becomes more complex, safe food handling practices for producers, processors, and consumers will require Extension support. The increasing number of urban farms and gardens, local food entrepreneurs and value-added foods that are being created will require a considerable education effort to ensure food safety and foster this sector of the agricultural economy.

v. *Youth STEM education, volunteer and leadership development. Nationally, 4-H has established a bold goal of engaging one million new young people in science programs by 2013. This can be viewed as an early intervention in creating the pipeline of students who will study STEM disciplines at the University of Delaware and other US institutions. Delaware youth participation in 4-H is the highest in the country on a percentage basis; projects and events include animal husbandry and veterinary medicine, the environment, agriculture, plants, engineering, robotics and technology. Judging contests in science include dairy, equine, horticulture, livestock, poultry, wildlife habitat, and wood science. Recent results from a Tuft's University study of the long-term outcomes of 4-H participation show that 4-H youth were 1) 2.1 times more likely to be engaged with their communities, 2) 1.7 times more likely to be engaged* in school and 1.5 times more likely to report high academic competence, 3) 1.6 times more likely to report healthy habits and 2.4 times as likely to delay sexual intercourse, and 4) 1.6 times as likely to participate in STEM programs in Grade 11 of high school, compared to non 4-H youth (Lerner et al. 2011). This underscores the need to continue 4-H Extension programming for Delaware's future.

vi. Beyond youth development, Cooperative Extension also engages in personal leadership development for individuals and the training of volunteers for Extension program delivery. *Currently, there are over 3,000 volunteers in Delaware Cooperative Extension*, including Master Gardeners, Master Food educators and 4-H leaders. A continued focus on personal leadership development for youth and adults provides peer-to-peer education, which is a highly effective tool for addressing behavior change

c) Goals

i. *Statewide focus and structure*. Across the nation, Extension has been traditionally county-based, but more recently states have adopted regional and statewide delivery models. Since Delaware is relatively small and homogenous, most outreach needs are not county-specific, and switching to a statewide model presents greater efficiency and effectiveness of limited resources. We expect to market and deliver 80% of our current county-based programs statewide by 2018.

ii. *Create and implement a sustainable funding model*. Federal capacity funds have been vital to Cooperative Extension nationwide, but levels of funding have not increased at the same rates as costs. The same is true for state funding. Competitive funding is available to Extension personnel, but like capacity funds, the future is uncertain. A more diversified portfolio of funding sources with less reliance on federal capacity funds is achievable and will be pursued (Figure 8). Three major new sources include tuition, cost recovery and gifts. Growth in these areas should reduce dependence on federal capacity and RBB funds in Extension.

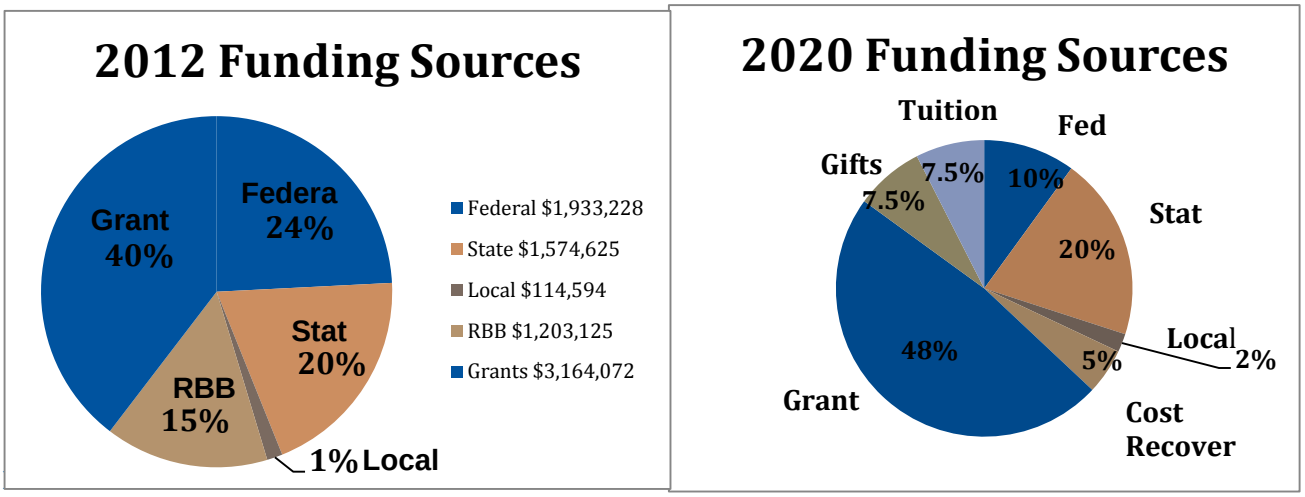



**Figure 8. Current sources of revenue for Cooperative Extension (FY12) and projected future sources/distributions to the year 2020.**

iii. *Stress programmatic impact through evaluation and enhance scholarship*. If relevant, science-based information is extended well, we should be able to measure positive change in agriculture, environment, and society as the result of our efforts. Impact evaluation is necessary to secure funding in a competitive environment and enhances the scholarly work of the organization. We will shift our focus in evaluation from activities to impact for a minimum of one statewide program each year.

iv. *Integration of Cooperative Extension across UD colleges and within CANR departments*. Integration of faculty in colleges outside of CANR with Cooperative Extension represents an outstanding opportunity to enhance outreach at UD. This goal is timely as UD is seeking the Carnegie "Engaged University" classification during FY14. The best opportunities appear to be in the Colleges of Education and Human Development, Health Sciences, and Earth, Ocean and Environment, as well as the School of Public Policy and Administration in Arts and Sciences. Within the College, we envision a greater integration of Extension personnel within departments, and that the scholarship of outreach and engagement would be considered on the same level as the scholarship of research and teaching.

v. *Enhance program leadership*. Current program leaders have split roles in educational programming and in program leadership. We must strengthen the program leader role to include responsibilities including leadership for grants and contracts, partner and agency linkages and cross-college integration. The goal is to move from part-time to full-time program leadership with the above responsibilities incorporated. By 2016, we will increase program leadership by 1 FTE (primarily through ag and natural resources and 4-H youth development). By 2020, we will increase programmatic leadership by one additional FTE.

*vi.* *Utilize technology in educational delivery.* A growing proportion of our stakeholders desire access to information 24/7 and wish to receive programming in an entirely digital or hybrid learning format (part online, part live). To accomplish this goal, we will optimize *Ask an Expert* (a nationwide Extension initiative to link clients to experts digitally), enhance web presence including You Tube, conduct online certificate courses and workshops, and market to new audiences through social media. We will strive to achieve 100% of educators providing at least one educational program by distance technology by 2020.

vii. *Develop a strategy for meeting the population needs in Wilmington.* As a major population center for the state, a comprehensive review of Extension educational program priorities as they align with the needs of Wilmington will be explored. There is also a need to assess other University and partner resources that are available for this targeted population and develop a University strategy for an educational presence in Wilmington that is cohesive and impactful. An Extension strategy for meaningful engagement in Wilmington will be developed with a needs assessment completed in 2014. Programmatic and staffing recommendations will be completed for 2015 with the goal of an overall 10% increase in programs targeted to the Wilmington area by 2018.

a) Current status and likely future

The college currently occupies over 360,000 gross square feet of built space spread across the three counties as shown in Figure 9. The vast majority of the square footage resides on the main campus in Newark, and a breakdown of the Newark campus by function is provided in Figure 10. In addition to physical space, the College operates two 350-acre farms, one on the Newark campus and the Thurman Adams farm in Georgetown.

**Figure 9. Gross square feet of all physical facilities statewide in CANR.**

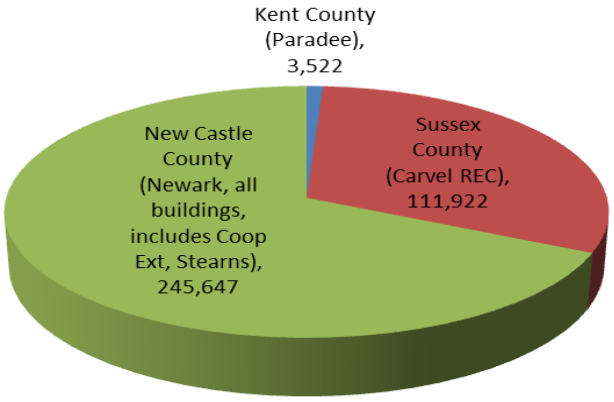
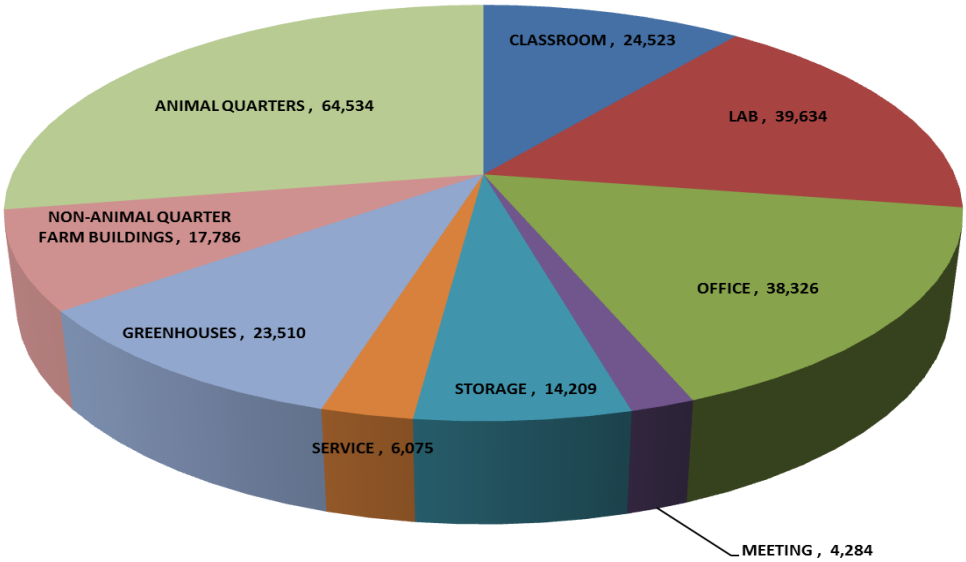



**Figure 10. Breakdown of space on the Newark campus by function, CANR.**




It is interesting to note in Figure 10 that we have more square footage devoted to animals than faculty and staff ("office") and students ("classroom") combined, reflective of the size and scope of our farms. This highlights the distinct nature of CANR relative to other colleges at UD, and illustrates one reason why our cost of delivery of research, teaching and Extension programs is higher than most other campus units. Importantly, much of the

space on our farms is *not maintained by the central facilities unit* on campus, so our College bears much higher operating and maintenance costs than others, and must have its own contingency plan in the event of a disaster.

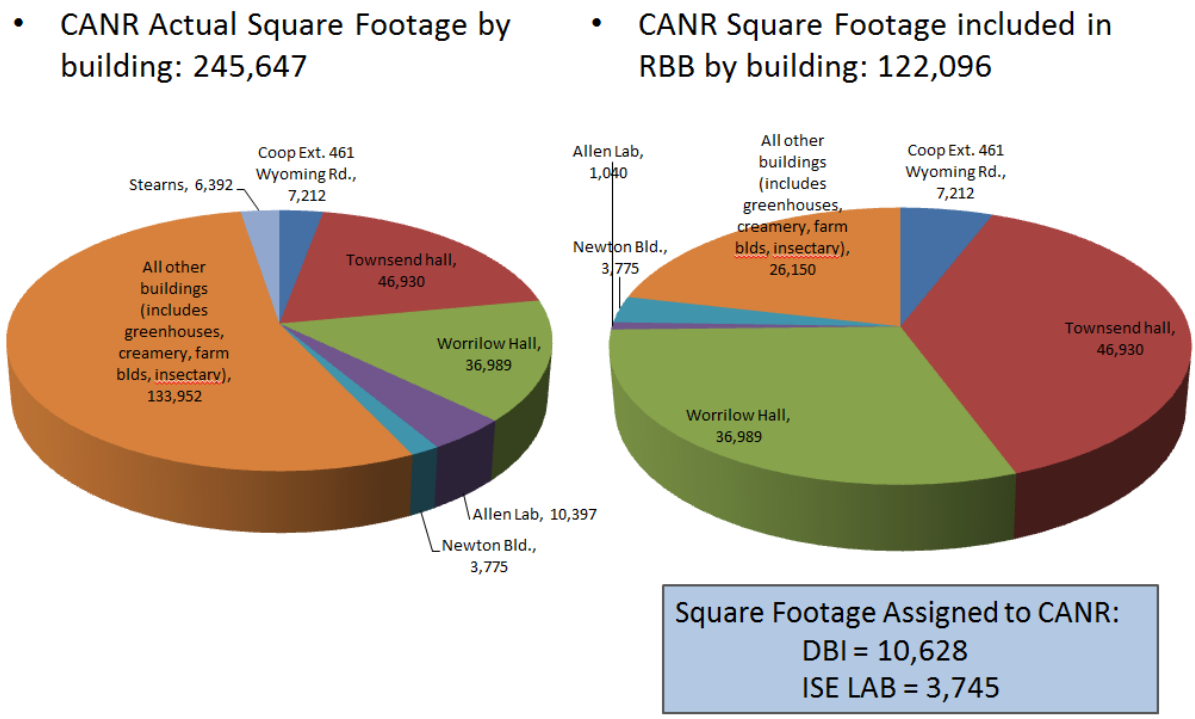



**Figure 11. Actual square footage, by building, on the Newark campus (left) compared to the amount of space in the same buildings that is maintained by central campus facilities (right). Just about half of the Newark campus building space is maintained solely by the College.**

Most buildings in the College are in acceptable condition, although like all Land Grant Universities, we have our share of deferred maintenance issues (Kadamus, 2013). In Georgetown, The Carvel Center is the newest building (completed in 2005) and represents the best quality workspace in the entire College. The Lasher Lab, where poultry disease diagnostics are performed at the Carvel Center campus, has exceeded its useful life, but thanks to a ~$3 million grant from the state, it will be completely renovated during 2014-15. The old "Substation" building on the south side of County Seat Highway in Georgetown has not been heavily used since the Carvel Center was competed, but could be better utilized if renovated. In Newark, Townsend Hall was built in the 1950s, but recently renovated and is in fairly good condition overall. The CC Allen lab, a relatively new biosafety level-3 facility, must undergo constant maintenance to remain cleared for select agent research and is in excellent condition. Numerous buildings on the Newark Farm range from excellent condition (dairy) to condemned (old farm home). The Fischer Greenhouses are in very good condition and are in no immediate need of expansion, as relatively little of our research and teaching is conducted there.

There is a strong consensus that Worrilow Hall, which houses the majority of research laboratory space and several teaching labs, has exceeded its useful life and hinders the progress of the College more than any other facility. Fundamental problems exist with air quality, temperature control, water quality, lighting, flooring, fire suppression, emergency backup power, and casework and cabinetry in most of the research labs. The teaching labs remain in acceptable condition, but are not constructed to universal accessibility standards,

limiting the full participation of some students. A complete renovation is estimated to exceed $20 million, much of which will have to come from private fundraising according to current policies.

Although second in importance behind human capital, space is nonetheless critical to the future success of the College. The quality of the work space is directly associated with the quality of research, teaching and Extension work that is accomplished, and absolutely critical for attracting (and retaining) top notch faculty, staff and students to the College. This must improve in the case of Worrilow Hall in the near term.

It is difficult to anticipate future space needs, but current trends in construction (i.e., the ISE lab, completed in 2013) seem to favor more open-concept, flexible spaces that can accommodate a variety of uses and investigators. We would consider ourselves fortunate to experience one major renovation or the construction of one new building during the 25 year timeline considered in this document. Given this infrequency of renewal and the uncertainty of needs in the future, we must plan new spaces to be as flexible and multi-functional as possible.

b) Goals

i. *Replace or completely renovate Worrilow Hall.* In the 25 year timeline considered in this document, renovation of Worrilow Hall must come soon, ideally in the next five years. Toward the end of the 25 year period, we must prepare for renovations of Townsend, CC Allen, farm buildings and the Carvel Center as these facilities will have exceeded 30 years since being constructed or last renovated. It is likely that a new building will be needed within 25 years that will house research labs, particularly if Worrilow Hall renovations are partial or temporary. An architectural firm has been secured as of October 2013 to develop a plan for Worrilow's renovation, which will address safety and functional issues, and provide designs for more flexible, shared lab spaces and common spaces for maximal efficiency and effectiveness.

ii. *Outdoor spaces*. We must develop a plan for the Newark Farm and areas adjacent to our buildings, including the University of Delaware Botanic Gardens and ecological wetlands and woodlands, to preserve these resources for future generations of faculty, staff and students. The farm is valuable to all mission areas of the College, and extremely important to attracting prospective students and faculty. This plan must align with the University's Master Plan, which is also being developed during 2013-2014. Similarly, The Thurman Adams, Jr Research farm in Georgetown must have a long-range plan since most of its arable land is currently being utilized.

iii. *Classrooms.* The quantity of space available for teaching is more than adequate for our enrollment at present. Data obtained from the UD registrar shows that none of our classrooms or teaching laboratories are utilized more than 50% of the available periods during the day, and seat utilization is 54% or less in all but one of our teaching spaces. However, with one exception, all classrooms were designed for lecture, with fixed seating facing a lectern. To facilitate new approaches to teaching and learning, we will need attractive, flexible, technology-capable classrooms that are more conducive to conferring desired learning outcomes. With innovations such as blended and online learning, along with availability of classrooms on the central part of campus, we may need even less space devoted to classrooms in the future. Clearly, our focus should be on improving the *quality* of classroom space, not the quantity, and in the near term we should endeavor to pilot a new classroom concept by renovating an existing classroom. Ideas can be gleaned from designs used in the ISE Lab and in Gore Hall.

iv. *Attractive, welcoming, functional common spaces.* The College is fortunate to have the Townsend Commons: a large, open, flexible use space that students and others find

attractive. Due to current parking and bus route configurations, most people enter the back of Townsend Hall through the Commons. As long as this is the case, we should be mindful that the first impression of the College occurs in the Townsend Commons, and develop a plan to make the space even more inviting and functional. One possibility is to develop it along the lines of the University of Pennsylvania Weigle Information Commons (http://wic.library.upenn.edu/newtowic.html). Entering Townsend primarily through its back doors may change as the STAR campus is developed, since the UD Master Plan calls for opening the view of Townsend Hall to College Ave and STAR (http://www.udel.edu/star/downloads/Master_Plan_Vol1_11-02-11.pdf). Townsend lobby and Commons are contiguous spaces, so the plan should include changes to both spaces to make visitors feel welcomed, informed and comfortable.

v. *Create a fair, transparent space allocation system.* In early 2013, the CANR Space Committee was created to provide a College-wide, shared governance mechanism for space allocation. The committee is advisory to the dean, and includes representation from all five programmatic units. They vet all requests for significant changes in space allocation. Space vacated through retirements or discontinuation of programs returns to the College pool for reallocation. Top priority for space allocation will be reserved for new hires, and new hires will not be made unless there is adequate space available to foster success.

a) Revenue and expenditures: Current status and likely future

At the time of writing the Master Plan, the University of Delaware is in the fourth year of transition from a block or historical budget model to one based on Responsibility Center Management (RCM), termed Responsibility Based Budgeting (RBB) at UD. In RBB, revenues generated through tuition dollars, state appropriations, and other sources are aggregated centrally, and then distributed to colleges after withholding funds for certain priorities of the central administration (e.g., new facilities, subvention, athletics). The seven colleges at UD then receive a share of the remaining revenue based on the amount of teaching and sponsored research that they contribute to the overall University totals. The colleges are "taxed" for central services such as the admissions office, registrar, physical plant, library, etc., according to defined algorithms, and must operate on the net amount of revenue after taxes. This decentralized approach to university budgeting began at the University of Pennsylvania in the 1970s and has spread to a number of institutions nationwide. It presents opportunities and challenges, which will be outlined in the next section.

Today, the CANR budget is approximately $67 million dollars per year. Fiscal year 2012 (FY12) was the last full year of budget data available prior to development of the *Master Plan*. Total revenues and expenditures for FY12 are presented in Figures 12 and 13, respectively.

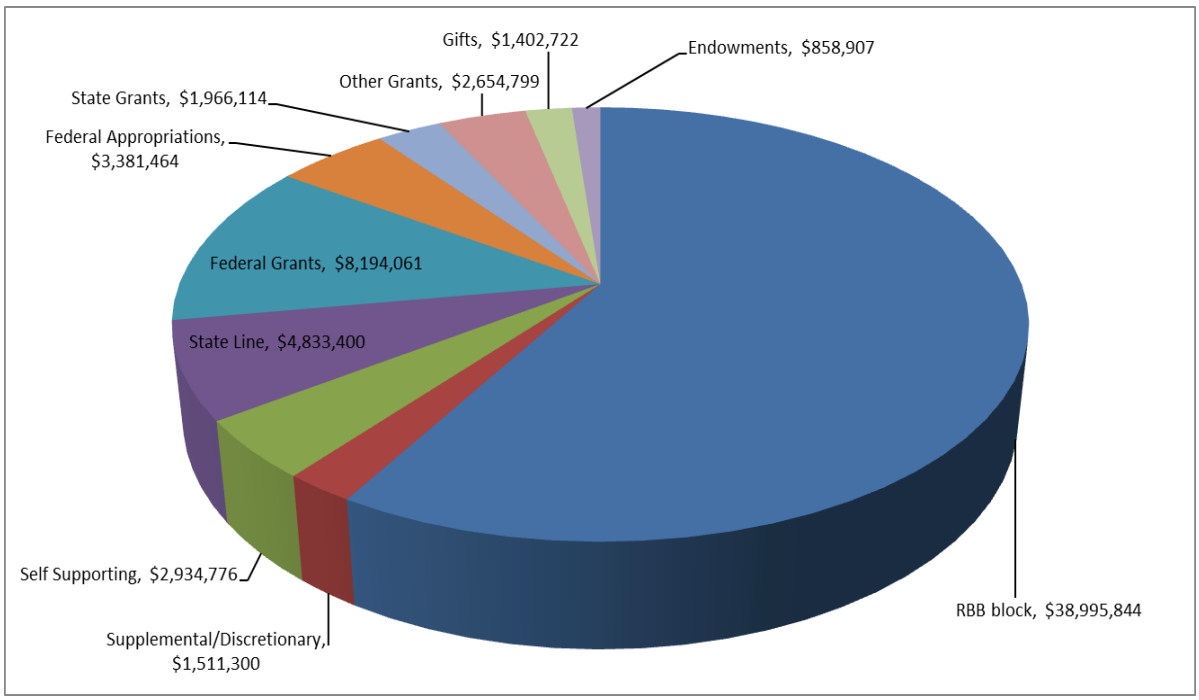



**Figure 12. Revenue, by category, FY12 (ending June 2012). "Supplemental/Discretionary" should be labeled "Carryforward" to better reflect it as a source from previous years.**

While the future of funding in any of the categories in Figure 12 is uncertain, we can hypothesize which are likely to grow, and which are likely to shrink based on long-term trends.

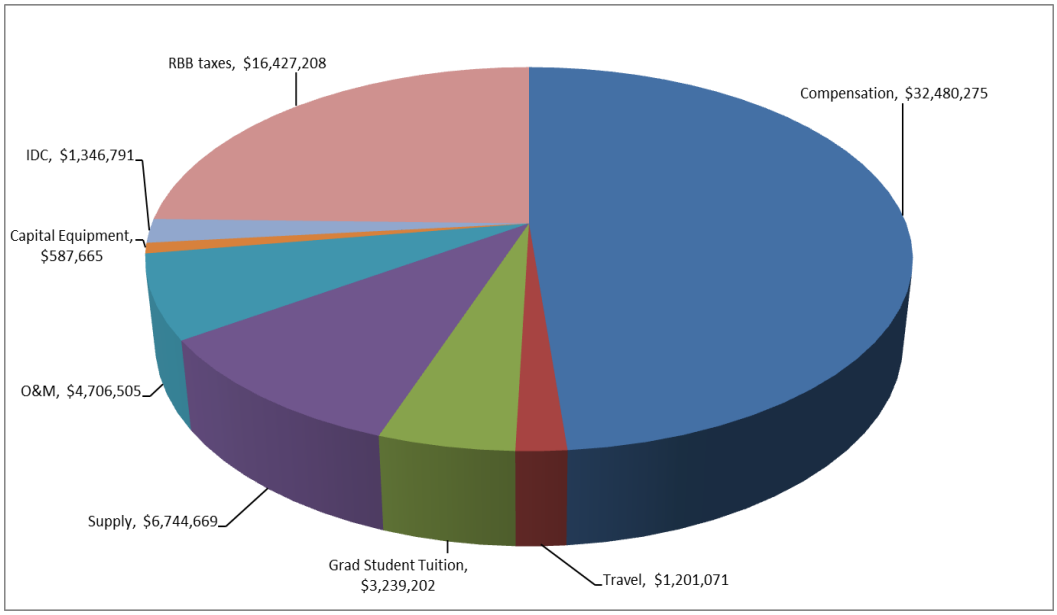



**Figure 13. Expenses, by category, FY12 (ending June 2012). Total expenditures matched revenues at ~$67 million.**

RBB Block: The RBB Block is derived from the overall RBB pool at UD, and constitutes the largest single source of income to the College. The revenues available to distribute to colleges from RBB are comprised largely of tuition dollars and state appropriations, with minor amounts from endowments and other sources. While the overall RBB pool has been increasing in recent years, the ability to grow this by increasing tuition, which contributes ~¾ of the funds, is limited since tuition increases are unpopular with students/parents and UD has increased its tuition greatly in recent years. The 17% that the state contributes to the overall RBB pool is also not likely to increase; in fact, budget planning for FY14-17 includes a 2% reduction/yr assumption. Financial aid, which comes off the top of the overall RBB pool, has been increasing rapidly in recent years and is now the largest off-the-top expense taken before revenues are allocated to colleges. *While the overall RBB pool may not increase, the amount allocated to CANR could increase if we increase credit hour production, the number of students in our majors, our research expenditures, or all of the above*. As mentioned in the section on teaching and curriculum, our goal is to increase the number of graduates to meet some of the industry demand in agriculture and natural resources and also to educate non-majors on agricultural and natural resource issues through service courses. If we grow enrollment, the revenue from the RBB block should increase in a transparent and fairly predictable manner.

Grants. Grant revenue from all sources – state, federal, industry, and other – has been increasing in recent years and likely will increase into the future. Faculty and staff have done an excellent job in garnering funds from a variety of sources, and each new hire is evaluated for the ability to attract sustainable levels of external funding. Even as cuts in federal competitive grant funding may occur, the proportion of the CANR budget attributable to grants should increase into the future by a few percent per year through increased focus on industry and philanthropy as funding sources (National Research Council, 2012).

Federal Appropriations. Over $3.3 million per year is awarded to CANR in federal capacity funds, predominantly Hatch funds to support the Delaware Experiment Station and Smith-Lever funds to support Extension. Small amounts of McIntire-Stennis and Animal Health funds are also received. In FY13, sequestration reduced these appropriations by about 7.6%, or $250,000, and the Continuing Resolution passed in October 2013 by Congress embeds another round of sequestration and similar cuts for FY14. Given the great uncertainty in federal funding

across a number of programs in the future, we *presume that federal capacity funds will decrease with time*, probably by amounts similar to sequestration-triggered levels every few years. This is less of an issue with research funding as there are other sources of revenue available, but presents a major issue for the sustainability of Extension. More has been said on this topic in the Extension section, and a major goal for Extension is to reduce the dependency on federal capacity funds.

State Line. The state of Delaware provides a 1:1 match for the federal capacity funds the College receives, and, thankfully, it goes beyond this annually and funds other items of importance to the state such as poultry disease research and surveillance, biotechnology, and the Carvel Center. As of July 2013, the state has restored the 15% cut that CANR experienced in 2011, so the total revenue from the state is currently $5.2 million/yr. At the University level, we use a 2% reduction annually to forecast the state's contribution, and although the current year brought good news to the College, it is wise to assume a 2% annual reduction as we plan future College budgets. Funding required to sustain Medicaid, K-12 education and other state programs has increased and will likely continue to reduce the capacity of the state to fund higher education (Rich, 2013).

Gifts and endowments. Our alumni and friends have been generous to the College in the past and, although highly variable from year-to-year, gift and endowment income is increasing. Currently gifts and endowments represent about 3% of our budget, a reasonable long-term goal would be to realize about 5% of the overall budget in gifts and endowment revenue.

Self-supporting units. Our soil, plant and animal diagnostic labs, the DNA sequencing center and the UD Creamery currently operate near cost-neutrality. As self-supporting units, they must do so, and their budgets will be monitored annually to ensure cost neutrality. The UD Creamery has been quite successful, and the potential exists for a small amount of its revenue above costs to be used to support the dairy at the Newark Farm. Surpluses from other self-supporting units are unlikely, but would be returned to support the research mission if available. The College should evaluate the potential for new, entrepreneurial self-supporting units with the goal of providing services that generate net revenue back to the College.

Supplemental/discretionary. These funds are derived largely from Indirect Cost recovery on grants (IDC) and are carried forward from year to year in anticipation of significant expenses such as space renovation and startup costs. Currently, the term is a misnomer as all of the funds in this category must be applied to resolve the College's structural deficit of over $1 million/yr and provide startup funding for new hires. The goal is to resolve the structural deficit and apply much of the funds in this category to deferred maintenance issues throughout the College and special initiatives such as seed grants.

Compensation. About half of all CANR expenditures are for salary and benefits for its 250+ personnel. Salary raises are set in a collective bargaining process at UD. Even through the great recession, UD faculty and staff received raises, thus we anticipate that salaries will increase by 1-4% annually into the future. Health care and other benefits are also increasing precipitously, and we project a 6% annual increase in health care benefits alone. Much of any increased revenue to the College will inevitably be used to fund increased compensation. As retirements occur, we will recoup dollars in salary savings, which can then be used to cover increased salaries and benefits for existing employees. Without new sources of income, the size of the College, in terms of number of personnel, will decrease over the long term.

RBB Taxes. About ¼ of our expenditures go to support central services at UD. Since much of the budget in any given support unit is in compensation, we expect that RBB taxes will increase into the future, though currently, energy efficiency upgrades and other cost-cutting measures have slowed the rate of increase in UD support unit budgets.

Supplies, capital equipment. Supplies and new equipment expenditures total just over 10% of expenditures, much of which are incorporated into grants. Any increases to this category would likely be offset by increased grant revenue.

O&M. CANR experiences extensive operations and maintenance costs due to our two 350-acre farms and other facilities that we maintain ourselves; i.e., the operation and maintenance of significant resources assigned to the College are above and beyond what RBB taxes cover. *Expenditures in this category may rise faster than any other category*, as the College currently has extensive deferred maintenance issues in Worrilow Hall and on farms.

Grad Student Tuition. Almost all of our graduate students receive a waiver of tuition, termed a "tuition scholarship." To be competitive for the best students, we must not only waive tuition but also provide a stipend to our students. Taken together, the cost to the College is currently $45,000-50,000/year per student. In RBB, CANR receives credit for all tuition billed to students, then is charged the amount of tuition waived. This expense not only increases as our graduate numbers grow, but also increases each time tuition is raised at UD. As of 2013, we are near cost-neutrality on the total graduate student enterprise, as a small percentage of self-paying students basically subsidize the allocated costs of the students provided with stipends and waivers. Thus, we must grow the proportion of self-paying students in our graduate programs to remain cost-neutral into the future, and/or charge tuition to grants.

IDC. The University returns 96% of indirect costs from grants (IDC) to the College, and currently 28% is distributed to the units; this 28% pass through is shown as an expense in Figure 13. The IDC returned to departments is the primary source of supplemental funding for chairs to use on items such as start-up costs for new hires, lab renovations, etc. This category will increase modestly in the future as grant funding increases.

Travel. Most travel expenses are charged to grants and supplemental accounts, and although this may increase in the future, revenue streams will increase accordingly to support travel needs of faculty, Extension professionals and administration.

b) Opportunities and challenges of RBB, implications for the CANR budget

i. *Mission first, budget second*. The RBB model tends to create competition among colleges for what appears to be a finite pool of resources; some would argue that this is healthy competition, while others argue that it creates unwarranted tension among colleges that should be working together. An extreme example of bad RBB behavior would be teaching, say "English for Agriculture majors," when it really is not within our mission to do so, yet it would yield significant revenue to the College. *We must not let the budget drive the mission of the College or the University*. Having said that, resources are finite and therefore we need to set priorities, fund the top priorities first, and look to partners to conduct or collaborate on lower priority programs.
ii. *Every program does not have to pay for itself*. RBB requires each college to live within its budget and make responsible choices about programs it can support. However, it does not require each department, program or activity to be revenue neutral. Subvention is the term used in RBB for subsidizing colleges that don't generate enough RBB revenue to support themselves. Subvention is necessary to account for the differential cost of program delivery among different colleges. CANR is currently on the receiving end of subvention, as enrollment in our majors and courses is insufficient to meet the high cost of delivering our field and laboratory oriented programs. Just as other colleges subvent CANR, on a smaller

scale some programs within the College subvent others. An example would be the revenue from high enrollment majors and courses being used to subvent one of several low-enrollment majors whose graduates are important to society and should be maintained. In sum, RBB allows us to do a limited amount of *pro bono* work in the College as long as the work is high priority and we identify a source of subsidy.

iii. *RBB aligns well with CANR, but there are vulnerabilities.* The implementation of RBB at UD is unique in that 25% of the revenues available for distribution to colleges are allocated based on sponsored research, and 75% are allocated based on teaching workload. Implementations of RBB at most other universities do not include this "research incentive." As CANR is a strong research College, ranking third in research expenditures among seven colleges, we benefit from this allocation model. If the RBB model would change in such a way as to reduce the research incentive (and/or subvention), the College would be vulnerable to a relatively large budget cut. This underscores the need for broadening the portfolio of revenue streams to the College in the event of such changes in RBB. Reductions in the research incentive and in subvention have been discussed by the provost, the deans and the Faculty Senate during FY13, i.e., our vulnerabilities are real, not just perceived.

c) Goals

i. *Maximize transparency & predictability.* The College's budget allocations to various units should be transparent. One of the advantages of UD's RBB budget model is transparency across colleges, so the same principle should be extended across units within the College. An annual report will be published with unit-level detail and made available to all beginning in FY14. Unfortunately, the RBB model will never allow for a completely accurate prediction of a future budget as there are too many uncertainties in model inputs. An example is the ratio of in-state to out-of-state students; the students pay very different amounts of tuition, but we do not know this ratio with sufficient certainty in any given year until the incoming class is finalized, close to the time budgets are allocated. Despite this challenge, the College can provide tools for units to run "what if" scenarios and continually update estimates of inputs to assist in budget planning.

*ii.* *Minimize vulnerability to cuts by diversifying the portfolio and targeting revenue streams for growth.* Referring back to Figure 12, new revenue sources including, but not limited to, royalties from intellectual property, revenues from fee-based programs, and online learning could compensate for expected cuts in federal capacity funds, state funds, and certain grant programs. The College must endeavor to secure and grow such new sources of revenue to sustain itself and have the opportunity to undertake new programs and ventures. In addition, the College should seek to grow existing revenue streams, particularly the RBB block through greater teaching activity, gifts/endowments through greater development work, and competitive grant funds through building unique strengths in areas of selective excellence.

*iii.* *Reduce long-term costs by enhanced efficiency.* We value efficiency and return on investment, and therefore should seek to reduce costs by all means possible without sacrificing the quality of service we provide. Examples include, but are not limited to, reduced utility expense through energy upgrades, optimizing space

utilization through renovation and elimination of unneeded items, and seeking arrangements to share or outsource costly functions.

iv. *Create a surplus for unforeseen circumstances and reinvestment*. The College should endeavor to set aside 1-2% of its annual budget for unforeseen circumstances each year, reinvesting these funds in mission-critical areas at the year's end if such circumstances do not arise.

*v.* *Continually reinvest in facilities and avoid deferred maintenance.* We must keep our physical resources in optimal condition to attract and retain the best faculty and staff, and to optimize the efficiency of our work. Significant deferred maintenance issues are apparent on many campuses nationwide (Kadamus, 2013), and our College is no exception. Small, periodic expenditures on maintenance are preferable to infrequent, large expenditures to keep facilities in optimal condition. At least 50% of any budget surplus should be dedicated to facilities upgrades and maintenance annually for the foreseeable future.

*vi.* *Centralize salaries and space, create clear priorities for allocation.* As the University switched from block to RBB budgeting, the concept of "faculty lines" or "staff lines" disappeared. Under RBB, there are no lines *per se*, only dollars available for investment in various resources, human or physical. Faculty, professionals and staff require space in which to work, thus if salaries are centralized, space should be centralized as well. It makes little sense to allocate dollars to a unit for a faculty/staff hire without also allocating space to support the hire. Therefore, in FY13 salary and space were centralized, and in the future will be allocated together according to College-level priorities, not simply historical levels of allocation. With each new hire or investment in physical space, the following questions will be asked in order to prioritize allocations to units:

1. Is the position vital to building or maintaining selective excellence in an area of unique strength?
2. What type and how much space are required to ensure success of the new position without compromising the success of others?
3. Will the position/space allocation generate revenue (directly or indirectly) for the College? If not, how will the allocation be subsidized?

*vii.* *Achieve greater cost recovery from grants, contracts, fees and gifts.* The College has not been recovering the full cost of certain activities it performs. This is particularly true for certain research and extension programs, but also for teaching some cost-intensive courses. Not recovering the full cost of programs has clear benefits to individuals – IDC rates below negotiated levels, receiving services free of charge or at discount, providing services to stakeholders at no cost. However, the benefits are outweighed by the opportunity costs associated with subsidizing these activities at the College level. Deferred maintenance and upgrades of facilities and equipment are perhaps the best examples of opportunities missed due to funds being diverted to cover the full cost of program delivery. Moving forward, we must increase the percentage of cost recovery sought for projects and/or prioritize certain programs for subsidy. This will allow us to achieve goals *ii* and *iv* more easily. In 2013, the College developed a Cost Recovery Committee to advise the dean's office on new strategies and policies for achieving financial sustainability. This shared governance mechanism will examine cost recovery strategies for

teaching, research and Extension programs, and also look at opportunities for additional revenue generation such as new products from the Creamery or new services from our diagnostic labs.

## X. DEPARTMENT OF ANIMAL AND FOOD SCIENCES

**Introduction and Overview**

The Department of Animal and Food Sciences (ANFS) integrates research, teaching and outreach in the disciplines of food and animal sciences. The department's undergraduate students receive a multidiscipline-based experience that combines hands-on and virtual learning environments to provide a solid science background. The undergraduate curriculum prepares students for a variety of options upon graduation including veterinary school and other graduate programs, research, and immediate job opportunities. In addition to the undergraduate experience, the Department's graduate program has expanded and is sought after by students pursuing further studies in food and animal science. The student population is diverse, recognizes the importance of life-long learning, has obtained critical thinking skills, and is passionate about the integration of food and animal sciences. The students are supported by a faculty that is recognized globally for their commitment to excellence in the integration of animal and food sciences, developing innovative solutions, and to collaboration across disciplines and University settings. The faculty is diverse, collaborative, and embraces a systems approach to research and learning. The students and faculty have access to stat-of-the-art lab space and discovery learning opportunities. Our goal is that other universities and industry acknowledge the Department as a center of excellence in animal and food sciences. We will measure this goal through federal and industry grants, collaborations, undergraduate and graduate student enrollment, as well as through the careers and graduate programs that our students attend post-graduation.

For future planning, the dean should consider determining a target for undergraduate and graduate enrollments for the College longer term, beyond 2015 and the shorter term goal of increasing enrollment by 15%. For example, it may be feasible for CANR to grow to 1,000 or more undergraduates in the next 25 years. Different scenarios should then be explored and a plan developed to accommodate targeted departmental teaching growth that takes into consideration strategic resources (faculty, staff and space-farm, wet labs, lecture rooms, on-line program development). The dean's plan will address new faculty hires, space needs, etc. The plan must consider preserving high quality teaching and academic advisement if enrollments are to grow in departments with current high enrollments. Maintaining program quality is as important as increasing enrollments.

**Unique Strengths of the Department**

- Undergraduate Programs

  Academically-rigorous undergraduate programs providing opportunities for hands-on training, research, internships and study abroad. Majors in Pre-veterinary Medicine and Animal Biosciences, Animal and Food Sciences, and Food Science. Minor in Equine Science currently under development will complement current minors in Animal Science and Food Science.

  We are particularly known for our PVAB program, which is enhanced by hands-on learning and the on-farm activities; however, we do not anticipate that this program will grow past the current size. We are increasingly becoming known for our FOSC program, which will continue to grow over the next 5 years in undergraduate enrollment.

- Research and Graduate Programs

  Integrative systems biology programs intersecting impacts of environment/climate, animal management, host genetics and nutrition, on animal behavior and welfare, productivity, physiology, pathology and microbiology. Multidisciplinary training of MS and PhD students contribute to diverse areas in science and engineering.

Unique research strengths with graduate student training that will continue to grow over the next 5 years include Avian Health, Ruminant Microbiology and Silage Fermentation, and Microbial Food Safety.

- Extension/Outreach Programs

  Poultry health and production. Seek practical solutions to sustain poultry production by applying translational research findings to the areas of energy, environment and animal health, welfare, and productivity. This is an area of historical importance for the state and for the department and will continue to grow.

  Food safety and nutrition. Evaluate the impact of agricultural production practices on food safety and the development of mitigation strategies to reduce food borne diseases. SNAP-Ed programs are currently supported by ANFS faculty.

  Large animal nutrition and health. Improve utilization of feed and forages. Prevent lameness and loss of productivity.

**Our Vision for the Future**

ANFS is an adaptive unit dedicated to maintaining relevancy in animal science and food science for Delaware and the world. We strive to integrate our scientific expertise into a more robust coordinated program of scholarly activities and productivity across scientific disciplines (nutrition, physiology, genetics, pathology, animal management and welfare) and emphasis areas (food, dairy, equine, poultry). We seek to expand our faculty and their interests to important subject matter areas at the interface of animal and food sciences, namely human nutrition and physiology and zoonotic diseases.

Goals:

Faculty Hires. We will develop an interdisciplinary research, teaching and outreach program focusing on areas such as obesity and inflammatory diseases of the intestinal tract of humans and animals. Faculty will be needed in animal and human nutrition, food science (food quality and safety), and infectious diseases. Research areas focusing on obesity and inflammation will focus on basic approaches to defining the microbiome of the intestinal tract in models/systems (monogastrics or ruminants) and impacts on food animal growth/meat quality, health and human microbial food safety. In particular we would like to see research at the interface of human nutrition and health using animal models that will use physiology and microbiology directed towards human health in the food science arena. Research will define effects of genetic and environmental factors, including applications in the use of pre/probiotics, vaccines, and other alternatives to antibiotics and anticoccidials. Appropriate faculty hire(s) will seek joint appointments in other departments, such as in Behavioral Health and Human Nutrition, College of Health Sciences. Seek funding from NIH, NSF, and Gates Foundation, in addition to USDA and industry. Invite potential applicants/hires to participate in the ANFS Graduate Seminar Series as early as Fall 2013 to gauge their "fit" and interest for our positions and benefit from their perspectives.

Investigate the feasibility of developing a National Avian Biosciences Center (NABC). Objective is to develop industry-university-government (USDA) partnership committed to addressing short-and long-term needs of commercial and small stakeholder poultry producers and the allied industries that support them in the U.S. The NABC would do as follows: 1) Prioritize and coordinate research and outreach of poultry sciences at Land Grant universities and USDA ARS facilities; 2) Support teaching of poultry sciences at Land Grant universities by providing internships and other educational opportunities for students interested in the field; and 3) Seek to develop sustainable funding from USDA, poultry and allied industry and non-profits and foundations.

Partnerships. Explore the feasibility of developing a partnership with one or more multi-national animal biologics (vaccine) companies to characterize infectious disease agents of domestic animal species worldwide. Efforts initially will focus on poultry pathogens using established departmental expertise and industry contacts, but could be expanded to other domestic species. Will enhance our understanding of pathogens in the U.S. and worldwide via their discovery and characterization. May provide revenues via discovery of novel/new vaccine candidates. Partner(s) will enhance ANFS scientific expertise via collaborations with company scientists.

Explore the feasibility of developing a produce research facility to be located on the STAR campus that would work in collaboration with government, and industry on state, national, and international levels. Initial discussions with the Produce Marketing Association and the DDA have been well-received. The primary goal of the facility will be to house equipment for testing and use of pathogenic microorganisms in the development of mitigation strategies and novel treatments and technologies.

Teaching. Evaluate feasibility of expanding ANFS teaching and outreach in food (dairy) science to include new courses for students and new UDairy Creamery products such as fluid milk, cheese and yogurt. Efforts will enhance recruitment of high school applicants into the Food Science major, and enhance employment opportunities for graduates. Will provide opportunities for offering certificate programs to the public.

Expand enrollment in current ANFS courses to non-ANFS, non-CANR majors/audiences on high interest topics that fulfill University breadth requirements. Targeted courses include ANFS 101- Animals, Science and Society & ANFS 102-Food for Thought. In addition, ANFS faculty will develop new undergraduate course offerings and perhaps programs for face to face and on-line delivery, as appropriate, in other high interest courses such as companion animal science, molecular gastronomy, animal-human bond, etc. Some courses may be offered in Winter Session and geared to broader audiences and taught at the 100 or 200 levels.

Develop a unique, rigorous equine science minor. In December 2012, ANFS received a very generous donation from Suzanne and Stuart Grant in support of an equine studies minor. The development of the minor is underway and will be available to students in Fall 2014. The minor will attract new students to ANFS and CANR and will provide a basis for the possible development of additional equine-focused courses.

Advisory Committee. Develop ANFS industry advisory group with representation from animal & food producers and allied industry companies (diagnostics, pharma/vaccine, pre/probiotics, etc.). Advisory group will convey the educational training requirements for their future employees, provide opportunities for research and outreach collaborations. Seek paid and unpaid student internships. Host annual meeting showcasing department's research, teaching and outreach capabilities, as applicable.

**What we will leave behind to achieve the goals**

- Given the current strength in ANFS and its critical role in CANR, we plan on achieving future goals via replacement/retirement of faculty. After analyzing the programs and their strengths, we feel that additional resources are warranted to support the PVAB and to grow the Food Science undergraduate program. Through UNIDEL funding we may seek additional resources. We are also evaluating the possibility of a FOSC on-line master's program.
- Short term, ANFS is planning one hire. We would like to have at least one additional line to make a cluster hire; we will speak with the College of Health Sciences as mentioned above in the development of unique research areas integrating animal and food science with nutrition.

Longer term, ANFS will likely have four and possibly as many as eight faculty retirements in the next 5-10 years. Changes may occur in the areas of silage fermentation due to the retirement of the sole faculty member; however, the areas of dairy research may branch into other aspects of immunology and nutrition. Strengths in avian heath and food safety will continue despite retirements.

**Stakeholder input**

In July 2013, the Department distributed via e-mail and regular mail a questionnaire surveying undergraduate and graduate student alumni. The survey results are included at the end of this section.

**Curricular revision**

ANFS offers three majors: Pre-veterinary Medicine and Animal Bioscience (PVMAB), Animal and Food Science (ANFS), and Food Science (FOSC) (accredited by IFT). ANFS faculty will review the Stamats report with particular attention to the concern expressed about the Animal and Food Science major. We will better define/describe the major so undergraduate program applicants have a clearer understanding of its goals, curricular options, and employment opportunities. The Animal and Food Science major is very important as it offers undergraduates other subject matter options and greater flexibility not provided by the PVMAB or FOSC major curricula.

**Staffing Plan**

- Livestock/equine professional or staff level employee on the Webb Farm- a need for many years. An essential need as Equine Science minor evolves and more students enroll in it.
- Food science professional to work in the areas of product development, sensory analysis and to interface with food industries.
- Teaching program professional to assess ANFS learning goals. This effort, initiated by the provost at the University several years ago, has stopped but should be rekindled.
- Research technicians-coordinate sharing of technicians among faculty, where appropriate.
- Veterinarians will continue to be important members of the ANFS faculty in their areas of expertise in teaching, research, and outreach and the relevance they bring to maintaining a vibrant pre-veterinary medicine program.

**Space Utilization Plan and Facility Needs**

ANFS has not developed a comprehensive specific space utilization plan. We will take under consideration the plan for Worrilow Hall developed by the Department of Plant and Soil Sciences that we received on March 22, 2013. Please note below a specific short term need for ANFS Faculty office space.

Our efforts thus far have concentrated on overall facility needs on the CANR campuses in Newark and Georgetown.

- A renovation of the 33 year-old Worrilow (WOR) Hall, its laboratories and garage is of the highest priority for CANR and UD. Essential to keep UD CANR at the cutting edge of research and teaching for Delaware agriculture, and to maintain a skilled workforce. Renovation is equally important for recruiting new faculty, as well as new undergraduate and graduate students. WOR Hall has not undergone a renovation since it was built in 1980. The HVAC system does not meet standards for performing research and other systems (electrical emergency power) are also woefully inadequate. Renovation plan should take into consideration flexibility shared labs by multiple faculty using similar technologies. Labs should be designed so that they may be repurposed as needed. Underutilized space (animal rooms - see “ANFS specific need” below, and garage) must be reallocated as per the CANR Master Plan; e.g. need based on teaching and research. Develop strategy to seek support for renovation.

- Identify food safety research space in WOR Hall devoted to studies of food-borne pathogens. Food pathogen research is currently performed in Townsend (TNS) Hall but this is not desirable for safety reasons and does not facilitate optimal research collaboration.

- Build new lecture/lab facility to address greater ANFS, CANR, and UD teaching needs on the South and Star Campuses. The new facility could be an addition to Worrilow Hall or a separate structure on the CANR or Star campus.
  - Laboratory classrooms
    - Wet-laboratory classrooms-anatomy, physiology, microbiology, etc.
    - Food science test kitchen and sensory lab (OA Newton building usage and renovation efforts are being considered)
  - Active learning/discussion/PBL classrooms
    - A classroom on the Webb Farm for ANFS capstone courses and Extension functions
- Newark Farm –The Farm is recognized by ANFS and other units to be a critical resource that is valued not only by the current stewards, but by the community and the state. CANR should seek special status of the farm that could protect it in perpetuity as an open green space or other appropriate type protected space in Newark as long as it does not limit our own plans for growth.
  - *Develop a 25-year plan in conjunction with farm superintendent and staff and the departments. ANFS in coordination with the existing CANR Livestock Committee will provide input on animal needs for teaching, research and extension outreach. ANFS anticipates needing to maintain livestock and poultry and will make specific recommendations based on our Master Plan. Teaching priorities and needs for animals will continue although the numbers and perhaps species may change.
  - Broiler chicken house on the Newark Farm should be updated to meet our needs for the near future in Newark. Longer term (5-10 years), the facility will need to be re-evaluated and probably replaced. Seek support from industry or former donor.
  - Additional Newark Farm needs pertaining to ANFS will be provided in future drafts of this document.
- Georgetown (Carvel) Campus and the Thurman Adams Agricultural Research Farm. ANFS faculty will work with Director Mark Isaacs and others to provide input into the future opportunities and use of the farm. The farm is essential to research, graduate education, and Extension efforts in Delaware and the region.
  - *Renovation of the Lasher Lab. ANFS, CANR, UD central administration, the Delaware Dept. of Agriculture, and the State are currently in discussions to address funding for the renovation. The 45 year-old laboratory, a biosafety level (BSL) 2 facility, suffers from major system deficiencies that require frequent and costly repairs to its outdated HVAC, electrical, plumbing, and refrigeration systems. These deficiencies have the potential to negatively impact the highly sensitive diagnostic technologies the broiler companies depend on to certify domestic and exported chicken to be free of avian influenza and other poultry and potential human pathogens. Of additional concern is the lack of a BSL-3 room with shower-in shower-out facilities for testing avian influenza specimens that may have potential human health significance. The Lasher Lab plays a critical role in addressing the serious and diverse disease problems faced by the region's $3.2 billion poultry industry. It is the only poultry diagnostic laboratory in Delaware.
  - Build two commercial-type broiler chicken houses on the Thurman Adams Agricultural Research Farm. The full-size (60' x 600'), tunnel-ventilated houses will be designed with specialized instrumentation to address and perform research in the areas of poultry production, welfare, environment and health. To help offset the cost of construction, the

houses will generate revenue, via a contract with an integrator. Funding for construction from broiler/allied industries will also be pursued. The facilities will provide research and Extension outreach opportunities as few other universities have tunnel ventilated paired houses. Having a UD-owned facility is important because broiler companies are reluctant to perform certain research studies (e.g. environmental testing) using contract growers' houses because of the possible negative impacts on production. This proposal would be for the near term (2-5 years).

  - Additional Georgetown Farm needs pertaining to ANFS will be provided in future drafts of this document.

- Explore the feasibility of attracting a companion animal veterinary practice (contacting VCA (www.vcahospitals.com) or similar veterinary practices) to the STAR campus where Pre- Veterinary and Animal Biosciences undergraduate majors could intern. Staff veterinarians will be sought to teach appropriate courses such as introduction to veterinary companion animal medicine.
- *ANFS Current Need. Identify office space on the north end of the ground floor of TNS Hall for current and future ANFS faculty hires. With the inclusion of two former BREG faculty in ANFS, only one of the two faculty can currently be accommodated on the ground floor. Our goal is to have the remaining faculty member's office relocated from the 2nd to the ground floor. We propose to 1) relocate the current ANFS graduate student office area (Room 045 TNS) to a renovated Room 126 WOR (current animal room), and 2) re-configure the current graduate student area into ANFS offices to house current faculty and future hires.

**Needs in terms of services from support units such as Information Technology (IT), Communications, farm and facilities, etc.**

- To meet increasing general IT needs and informatics needs for research, it is vital that we retain a systems administrator with these abilities and skills:
  - Install and maintain Unix or Linux based servers
  - Maintain the security of the servers
  - Maintain distributed backups of all data
  - Ability to install and maintain a database system
  - Familiarity with the computational needs of our research community
  - Advise users regarding computer purchases
  - Install software packages and trouble-shoot failed installations
- The farm and farm staff at Newark and Georgetown are essential to our goals. In Newark, we have had serious concerns for some time regarding the lack of farm staffing. We believe a minimum of two additional staff are needed to reach "normal" staffing levels; one at the Webb farm-livestock/equine specialist, and one on the main farm-crops specialist. Some of our current farm staff are overworked now, and we plan on expanding programs for teaching (equine minor) and research. ANFS faculty strongly recommend using S. Hallock DuPont endowment to support staff hires and other needs of our farm given that the original intent of this gift was to support livestock teaching and research. We also recognize that other cost recovery tools may be necessary.

**Areas or initiatives in which we should seek to obtain funds, including endowed chairs, awards, scholarships, etc.**

- Seek funds for undergraduate research scholarships, especially for summer sessions.
- Seek endowed chair positions to enhance stature of department and its faculty. Will free-up funds to make other faculty hires.

Department of Animal and Food Sciences

# 2013 Graduate Alumni Survey

**INTRODUCTION**

In order to assess the success of graduate students, the Graduate Committee of the Department of Animal and Food Sciences conducted an alumni survey in the summer of 2013 to see how our former graduate students were doing and how they feel about their experiences and their major. A combination of a mail survey and an internet option were used. The emphasis was on graduate students who graduated over the past 15 years, between 1997 and 2012. We received information back from 35 graduate students in that time frame for a 44.9% adjusted response rate (based on the list given and adjusted for bad addresses).

This survey has some similarities to the Graduate Exit Survey that some of you were asked to complete at the end of your degree work in the Animal and Food Sciences Department, but also includes your experiences in finding a job, follow---up graduate position, or post---doctoral position and some aspects about what you are doing currently. You will not need to search past records for answering the survey – a reasonable "guestimate" will be fine. This survey should take about 12 minutes to complete.

Thank you for your help in assessing our graduate program. Graduate degree majors included in this survey are MS and PhD in Animal Science, Food Science and Animal and Food Sciences.

If you prefer, you can take this survey online at: http://ag.udel.edu/gradanfs

UNIVERSITY OF DELAWARE | College of Agriculture & Natural Resources

1. **Let's start with understanding some of the factors that led you to choose the Department of Animal and Food Sciences at the University of Delaware. For each factor, please indicate if it was a Strong Factor, a Moderate Factor, or Not a Factor in your decision to come to the University of Delaware.** (Circle your response)

| | | Strong Factor | Moderate Factor | Not a Factor |
|---|---|---|---|---|
| A | Quality of graduate education at UD | 37.5% | **53.1%** | 9.4% |
| B | Location of the University | **62.5%** | 21.9% | 15.6% |
| C | Reputation of a particular graduate program | 25.0% | **59.4%** | 15.6% |
| D | Scientific reputation of particular faculty | 37.5% | **46.9%** | 15.6% |
| E | Reputation of UD in general | 43.8% | **50.0%** | 6.2% |
| F | Atmosphere on campus | 38.7% | **41.9%** | 19.4% |
| G | Friends/colleagues attending ANFS or UD | 25.0% | 12.5% | **62.5%** |
| H | Recruitment experience with ANFS faculty | 37.5% | 21.9% | **40.6%** |
| I | Information presented at a Graduate Fair | 0.0% | 7.1% | **92.9%** |
| J | Other (please explain) | | | |

2. **What was your degree and major?** (circle all that apply)

| Major Area | M.S. | Ph.D. |
|---|---|---|
| Animal Science | 58.8% | 14.7% |
| Food Science | 20.6% | |
| Animal and Food Science | 0.0% | 8.8% |

3. **Did you participate in any UD certificate programs?**
3.3% YES

**If Yes, please list the certificate program(s):**

4. **In retrospect, would you choose the same degree program again?**

72.4% Yes

5. **Now we would like to ask about your ratings of specific aspects of your graduate school experience, the coursework, faculty, your adviser, facilities and other aspect ; of graduate school life. For each question, please indicate your choi ce by circling if you feel your experience was Excellent, Good, F ir or Poor. If the question does not apply, please leave it blank.**

| | | EXCELLENT | GOOD | FAIR | POOR |
|---|---|---|---|---|---|
| a | Availability of my advisor | **57.1%** | 17.9 | 10.7 | 14.3 |
| b | Willingness of my advisor to help | **53.6%** | 21.4 | 7.1 | 17.9 |
| c | Relevance of coursework to my graduate program | **50.0%** | 35.7 | 14.3 | 0.0 |
| d | Overall fairness in grading in my courses for my major | **46.4%** | **46.4** | 3.6 | 3.6 |
| e | Relevance of courses in preparing me for employment and/or acceptance into another advanced degree program | **42.9%** | 28.6 | 21.4 | 7.1 |
| f | Overall competence of my advisor | **60.7%** | 10.7 | 14.3 | 14.3 |
| g | Overall competence of graduate instructors | 39.3% | **53.6** | 7.1 | 0.0 |
| h | Timeframe to degree completion | **46.4%** | 35.7 | 7.1 | 10.7 |
| i | Interaction opportunities with other graduate students | 39.3% | **46.4** | 10.7 | 3.6 |
| j | Housing options on or nearby campus | 33.3% | **41.7** | 20.8 | 4.2 |
| k | Reasonably priced healthcare options provided | 29.2% | **33.3** | 29.2 | 8.3 |

**Do you have any other comments about your graduate experiences in the Animal and Food Sciences Department or UD, in general?**

**EMPLOYMENT EXPERIENCES** Next, we would like to shift to your experiences in the job market following graduation. In terms of employment, please exclude any part---time or temporary work that you might have done immediately after graduation and focus on what you consider your first professional position.

6. **How long after graduation did it take you to find your first job?**

**Months** Median = 1 ; Q1 = 0 ; Q3 = 8.25 ; Mean = 11.05 ; Std = 19.6

7. **Did you begin searching for a job before graduation?**

**64.3% YES**

**If Yes, how long before graduation did you begin actively looking for a job?_____Months** Median = 3.5 Mean = 7.4

8. **How helpful was each of the following resources in assisting you in finding your first job after earning your advanced degree at UD?** (Please indicate by circling if it was Very Helpful, Helpful, Somewhat Helpful, or Not Helpful. If it does not apply, please leave it blank.)

| | | VERY HELPFUL | HELPFUL | SOMEWHAT HELPFUL | NOT HELPFUL |
|---|---|---|---|---|---|
| a | Faculty/Advisor | 32.0% | 12.0% | 8.0% | **48.0%** |
| b | Friends and family | **30.4%** | 17.4% | 21.7% | **30.4%** |
| c | UD Career Services | 4.3% | 8.7% | 21.7% | **65.2%** |
| d | Career Fairs at UD | 0.0% | 0.0% | 9.0% | **91.0%** |
| e | The CANR Academic Programs Office | 4.5% | 0.0% | 13.6% | **81.8%** |
| f | An internship | 10.0% | 5.0% | 5.0% | **80.0%** |
| g | Other (please describe) | 14.3% | 0.0% | 0.0% | **85.7%** |

9. **How would you classify your first job after graduation?** (Check one)

| | | | |
|---|---|---|---|
| 39.3% | Private business or industry | 0.0% | Self---employed |
| 3.6% | Non---profit | 28.6% | Academia |
| 21.4% | Government | 7.1% | Other |

**10. Was your first job after your advanced degree at UD directly related to your degree?**

DEFINITELY 55.6% SOMEWHAT 22.2% NO 22.2%

If somewhat or not, please explain _____

**11. What was your first professional job (after your advanced degree)?**

Title: _____

Responsibilities: _____

Years at this job: Median = 2.5 Mean = 3.77

**12. What is your current job?**

Title: _____

Responsibilities: _____

_____

Years at this job: Median = 3 Mean = 5.4

**13. Please indicate your starting salary and present annual salary.**

| Salary Range | Starting Salary | Present Salary |
|---|---|---|
| Under $30,000 | **33.3%** | 11.1% |
| $30,001 to $40,000 | 18.5% | 0.0% |
| $40,001 to $50,000 | 14.8% | 7.4% |
| $50,001 to $60,000 | 14.8% | 7.4% |
| $60,001 to $70,000 | 7.4% | 3.7% |
| $70,001 to $80,000 | 11.1% | 7.4% |
| $80,001 to $90,000 | 0.0% | 7.4% |
| $90,001 to $100,000 | 0.0% | 14.8% |
| $100,001 to $120,000 | 0.0% | **22.2%** |
| $120,001 to $140,000 | 0.0% | 11.1% |
| $140,001 to $200,000 | 0.0% | 0.0% |
| Over $200,000 | 0.0% | 7.4% |

**Starting: Mean = $42,777 Median = $34,999**

**Current: Mean = $90,739 Median = $94,999**

**14. In terms of your current position, how satisfied are you with the following aspects of your job?**

| | | VERY SATISFIED | SATISFIED | UNSATISFIED | VERY UNSATISFIED |
|---|---|---|---|---|---|
| a. | Salary | 34.6% | **46.1%** | 11.5% | 7.7% |
| b. | Opportunity for Advancement | 30.8% | **57.7%** | 7.7% | 3.8% |
| c. | Professional Responsibilities | **50.0%** | 38.5% | 11.5% | 0.0% |
| d. | Location | **50.0%** | 38.5% | 7.7% | 3.8% |
| e. | Benefits | **50.0%** | 38.5% | 3.8% | 7.7% |
| f. | Personal Growth | 42.3% | **50.0%** | 7.7% | 0.0% |

**15. Based on your career, are there subjects or topics that you would recommend for future students?**

| Subject | Reason Why |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

**16. Was writing a thesis or dissertation as part of your degree an essential learning experience?**

**100.0%** YES

**If No, can you explain?** _____

_____

**17. The University of Delaware has asked departments to assess how effectively they are preparing students for critical education goals. The following statements reflect the primary goals of the Department of Animal and Food Sciences. For each one please indicate if you Strongly Agree, Agree, Disagree, or Strongly Disagree if your major effectively prepared you for these goals.**

| | | STRONGLY AGREE | AGREE | DISAGREE | STRONGLY DISAGREE |
|---|---|---|---|---|---|
| a | My graduate degree prepared me to apply major concepts, theoretical principles, and research findings to the solution of problems | 42.9% | **50.0%** | 0.0% | 7.1% |
| b | My graduate degree prepared me to employ appropriate research methodologies to collect, analyze and interpret data | 42.9% | **50.0%** | 0.00% | 7.1% |
| c | My graduate degree prepared me to use computers for data analysis and presentation | 32.1% | **39.3%** | 17.9% | 10.7% |
| d | My graduate degree prepared me to work effectively in teams | 32.1% | **46.4%** | 10.7% | 10.7% |
| e | My graduate degree prepared me to present written and oral reports of technical information | 35.7% | **53.6%** | 3.6% | 7.1% |

## PARTICIPANT BACKGROUND INFORMATION

**18. What year did you graduate from UD?** Median = 2001

**19. What was your cumulative GPA at graduation?**
Mean = 3.59 Median = 3.6 Std = .3

**20. How would your describe your race or ethnicity?**

| | |
|---|---|
| Non---Hispanic, Caucasian | 78.6% |
| African or African---American | 0.0% |
| Hispanic/Latino | 7.1% |
| Asian (Japan/China/Southeast Asia) | 3.6% |
| Asian (India/Pakistan/Bangladesh) | 7.1% |
| Middle Eastern | 0.0% |
| Prefer not to say | 3.6% |

**21. In what year were you born?** Median = 1972

**If you have any other comments, please list them below.**

Thank you for responding!

Please return your completed survey in the enclosed envelope.
If you have any additional questions or comments, please contact:

**Dr. Jack Gelb**
302---831---2524
jgelb@udel.edu

Department of Animal and Food Sciences

# 2013 Undergraduate Alumni Survey

## INTRODUCTION

The Department of Animal and Food Sciences (ANFS) conducted an alumni survey in the summer of 2013 to see how our graduates are doing and how they feel about their experiences and their major. A combination of a mail survey and an internet option were used. The emphasis was on majors who graduated over the past 15 years, between 1997 and 2012. We received information back from 224 undergraduate majors in that time frame for a 28.9% response rate. Information from this survey effort is being used to improve our programs and help future students understand the experiences of our graduates.

The following are the questions and the percentage responses to each question. Percentages that are bolded represent the modal category. For some questions, summary statistics are given, such as the mean, median or standard deviation.

Undergraduate majors included in this survey are:

- Animal Science (including pre---veterinary medicine)
- Food Science

UNIVERSITY OF DELAWARE | College of Agriculture & Natural Resources

1. **Let's start with understanding some of the factors that led you to choose the Department of Animal and Food Sciences at the University of Delaware. For each factor, please indicate if it was a Strong Factor, a Moderate Factor, or Not a Factor in your decision to come to the department.** (Circle your response)

| | | Strong Factor | Moderate Factor | Not a Factor |
|---|---|---|---|---|
| a | Quality of the academic program | **64.7%** | 30.8% | 4.4% |
| b | Opportunity to participate in undergraduate research | 16.5% | 33.9% | **49.6%** |
| c | Hands---on experience in laboratory courses | **70.5%** | 24.6% | 4.9% |
| d | Hands---on experience on the farm with food---animals | **72.3%** | 15.6% | 12.1% |
| e | Recruitment experience with ANFS faculty | 22.8% | 27.2% | **50.0%** |
| f | Small college atmosphere | **39.5%** | 36.8% | 23.8% |
| g | Other (please explain) | | | |

2. **What was your major in the ANFS Department?** (check all that apply)

   84.0% Animal Science (including pre---veterinary medicine)

   16.0% Food Science

3. **In retrospect, would you choose the same major again?** 79.0% Yes

   **If no, why?** _____

4. **Did you have a minor(s) in the University?** 58.0% Yes

**5. What was your most rewarding experience in your major?**

**6. In retrospect, what do you wish you had learned more about?**

**7. Now we would like to talk about your ratings on aspects of your experience within the ANFS department on courses, the faculty, your advisor, and the facilities. For each question please indicate by circling if you feel your experience was Excellent, Good, Fair or Poor. If the question does not apply, please leave it blank.**

| | | EXCELLENT | GOOD | FAIR | POOR |
|---|---|---|---|---|---|
| a | Availability of my advisor or major professor | **60.0%** | 29.1 | 7.6 | 3.1 |
| b | Willingness of my advisor or major professor to help | **60.7%** | 25.9 | 10.7 | 2.7 |
| c | Quality of curricular advising in the major | **41.8%** | 40.9 | 15.0 | 2.3 |
| d | Quality of career advising in the major | 20.5% | 34.5 | **35.5** | 9.5 |
| e | Relevance of courses in preparing me for employment | 29.6% | **46.6** | 19.3 | 4.5 |
| f | Overall fairness in grading in my courses for my major | **51.3%** | 43.3 | 5.4 | 0.0 |
| g | Quality of instruction in courses in my major | **58.0%** | 37.1 | 4.5 | .4 |
| h | Quality of instruction in courses outside my major | 34.4% | **55.8** | 9.4 | .4 |
| i | Opportunities for interaction with faculty in the major | **61.4%** | 30.9 | 6.7 | .8 |
| j | Availability of professional activities or clubs in the major | **54.8%** | 36.5 | 7.8 | .9 |
| k | Helpfulness of office staff | 42.3% | **52.7** | 4.5 | .5 |
| l | Availability of courses for my major | 40.3% | **47.5** | 11.3 | .9 |

**Question 7. Continued**

| | | EXCELLENT | GOOD | FAIR | POOR |
|---|---|---|---|---|---|
| m | Availability of internship experiences for the major | 17.4% | **43.0** | 31.4 | 8.2 |
| n | Opportunities for hands---on learning experiences like those in the capstone/production courses | **59.6%** | 28.4 | 10.6 | 1.4 |
| o | Classroom facilities | 38.4% | **50.9** | 9.4 | 1.3 |
| p | Clarity of degree requirements in the major | 58.5% | 36.6 | 4.9 | 0.0 |
| q | Overall professional competence of departmental faculty | **60.7%** | 37.5 | 1.8 | 0.0 |
| r | Attitude of departmental faculty towards students | **62.9%** | 29.5 | 7.1 | .4 |
| s | Quality of my initial contacts with the Department | **54.5%** | 40.5 | 5.0 | 0.0 |
| t | Opportunities for students to participate in research | **43.5%** | 39.6 | 13.5 | 3.4 |
| u | Farm facilities | **59.9%** | 35.4 | 4.7 | 0.0 |

**Do you have any other comments about your experiences in the Animal and Food Science Department?**

**EMPLOYMENT EXPERIENCES** Next, we would like to shift to your experiences in the job market following graduation. In terms of employment, please exclude any part---time or temporary work that you might have done immediately after graduation and focus on what you consider your first professional position.

**8. How long did it take you to find your first job?**

**Median: 2 Months**
**Quartile 1: 0 Months**
**Quartile 3: 5 Months**

**9. Did you begin searching for a job before graduation?**

61.6% YES

**If Yes, how long before graduation did you begin actively looking for a job? Median: 4 Months**

**10. In terms of your first job after graduating from UD, how helpful were each of the following in assisting you to find a job?** (Please indicate by circling if it was Very Helpful, Helpful, Somewhat Helpful, or Not Helpful. If it does not apply, please leave it blank.)

| | | VERY HELPFUL | HELPFUL | SOMEWHAT HELPFUL | NOT HELPFUL |
|---|---|---|---|---|---|
| a | Faculty | 20.0% | 22.3% | 23.4% | **34.3%** |
| b | Friends and family | 25.7% | **32.1%** | 22.5% | 19.8% |
| c | UD Career Services | 6.5% | 16.5% | 25.9% | **51.2%** |
| d | Career Fairs at UD | 8.3% | 11.9% | 25.6% | **54.2%** |
| e | ANFS Careers Class | 3.2% | 10.9% | 26.3% | **59.6%** |
| f | The CANR Academic Programs Office | 3.9% | 11.9% | 21.2% | **62.9%** |
| g | An internship | 29.0% | 16.7% | 13.6% | **40.7%** |
| h | Other (please describe) | | | | |

**If you had an internship, list the sponsoring company/organization.**

---

**11. Was your first job directly related to your major?**

**55.2%** DEFINITELY 29.5% SOMEWHAT 15.2% NO

Please explain _____

**12. What was your first professional job?**

Title: _____

Responsibilities: _____

Years at this job: **Mean: 2.5 years**

**13. What is your current job?**

Title: _____

Responsibilities: _____

Years at this job: **Mean: 3.3 years**

**14. Please indicate your starting salary and present annual salary**

| Salary Range | Starting Salary | Present Salary |
|---|---|---|
| Under $30,000 | **40.0%** | **20.4%** |
| $30,001 to $40,000 | 25.4% | 10.4% |
| $40,001 to $50,000 | 12.2% | 12.4% |
| $50,001 to $60,000 | 8.8% | 10.4% |
| $60,001 to $70,000 | 5.4% | 7.5% |
| $70,001 to $80,000 | 5.4% | 10.9% |
| $80,001 to $90,000 | 1.5% | 7.0% |
| $90,001 to $100,000 | 1.5% | 8.0% |
| $100,001 to $120,000 | 0.0% | 5.5% |
| $120,001 to $140,000 | 0.0% | 3.5% |
| $140,001 to $160,000 | 0.0% | 1.0% |
| Over $160,000 | 0.0% | 2.0% |
| **Mean** | **$39,341** | **$63,208** |
| **Median** | **$34,999** | **$54,999** |
| **Standard Deviation** | **$17,126** | **$34580** |

**15. In terms of your current position, how satisfied are you with the following aspects of your job?**

| | | VERY SATISFIED | SATISFIED | UNSATISFIED | VERY UNSATISFIED |
|---|---|---|---|---|---|
| a | Salary | 24.4% | **47.2%** | 23.4% | 5.1% |
| b | Opportunity for Advancement | 31.2% | **46.7%** | 17.6% | 4.5% |
| c | Professional Responsibilities | **47.8%** | 44.3% | 6.9% | 1.0% |
| d | Location | **47.8%** | 45.3% | 6.5% | .5% |
| e | Benefits | **44.9%** | 40.3% | 10.2% | 4.6% |
| f | Personal Growth | **49.7%** | 38.2% | 10.6% | 1.5% |

**16. Based on your career, are there courses or experiences that you would recommend for future students?**

**Courses/Experiences** **Reason Why**

_____ _____

_____ _____

**17. The University of Delaware has asked departments to assess how effectively they are preparing students for critical education goals. The following statements reflect the primary goals of the Department of Animal and Food Sciences. For each one please indicate if you Strongly Agree, Agree, Disagree, or Strongly Disagree if your major effectively prepared you for these goals.**

| | STRONGLY AGREE | AGREE | DISAGREE | STRONGLY DISAGREE |
|---|---|---|---|---|
| a My major prepared me to apply major concepts, theoretical principles and research findings to the solution of problems. | 39.5% | **57.8%** | 2.2% | 0.4% |
| b My major prepared me to employ appropriate research methodologies to collect, analyze and interpret data. | 40.1% | **49.1%** | 10.8% | 0.0% |
| c My major prepared me to work effectively in teams. | **51.1%** | 43.0% | 5.8% | 0.0% |
| d My major prepared me to present written and oral reports of technical information. | 42.9% | **43.3%** | 12.9% | .9% |
| e My major prepared me for admission to a graduate or veterinary program. | **51.2%** | 37.4% | 9.9% | 1.5% |

**BACKGROUND INFORMATION**

**18. What year did you graduate from UD?** **Median : 2005**

**19. What was your cumulative GPA at graduation?** **Mean : 3.35**
**Median : 3.40**
**Std Dev : 0.37**

**20. Did you go on for an additional advanced degree?**

68.8% YES

**If Yes, what degree(s) did you receive (circle all that apply)**

| | | |
|---|---|---|
| MS | 33.4% | YES OR IN PROGRESS |
| PhD | 10.3% | YES OR IN PROGRESS |
| DVM/VMD | 24.5% | YES OR IN PROGRESS |
| MD | .4% | YES OR IN PROGRESS |
| Other | 8.9% | YES OR IN PROGRESS |

Numbers above based on the total respondents, not just those that answered yes for additional degree

**What graduate school or schools did you attend?** _____

_____

**21. What is your gender?**

11.2% Male
88.8% Female

**22. In what year were you born?** **Median: 1983**

**If you have any other comments, please list them below.**

Thank you for responding!

Please fold the completed survey and return it in the enclosed stamped envelope.
If you have any additional questions or comments, please contact:

**Dr. Jack Gelb**
302---831---2524
jgelb@udel.edu

# XI. APPLIED ECONOMICS AND STATISTICS

**Introduction and overview**

The Department of Applied Economics and Statistics (APEC) recently completed a comprehensive Academic Program Review (APR) in February 2013, which involved an internal self-assessment of our programs and external input from various stakeholders and a panel of academic experts from outside institutions. The overall conclusions from the APR are that APEC faculty and staff have worked very hard in recent years to make significant improvements to our programs and processes. These changes have resulted in phenomenal growth in high quality output in our teaching, scholarship and outreach activities. For example, we have experienced significant increase in our number of majors and enrollment in our courses and have seen a dramatic growth in research output and growth in contracts and grants. According to our 2013 APR panel report: "The Committee's overall assessment is that (Applied Economics and Statistics) has a strong M.S. program in both the AREC and STAT areas … Relative to peer departments, job placement prospects for both AREC and STAT students are excellent and with competitive starting salaries."

Using our recent APR process and findings as a starting point, we are approaching the "CANR Master Plan Process" as an opportunity to further develop a clearer and more specific vision of what we want to become as a department in the next two decades and why we believe these are reasonable goals to pursue.

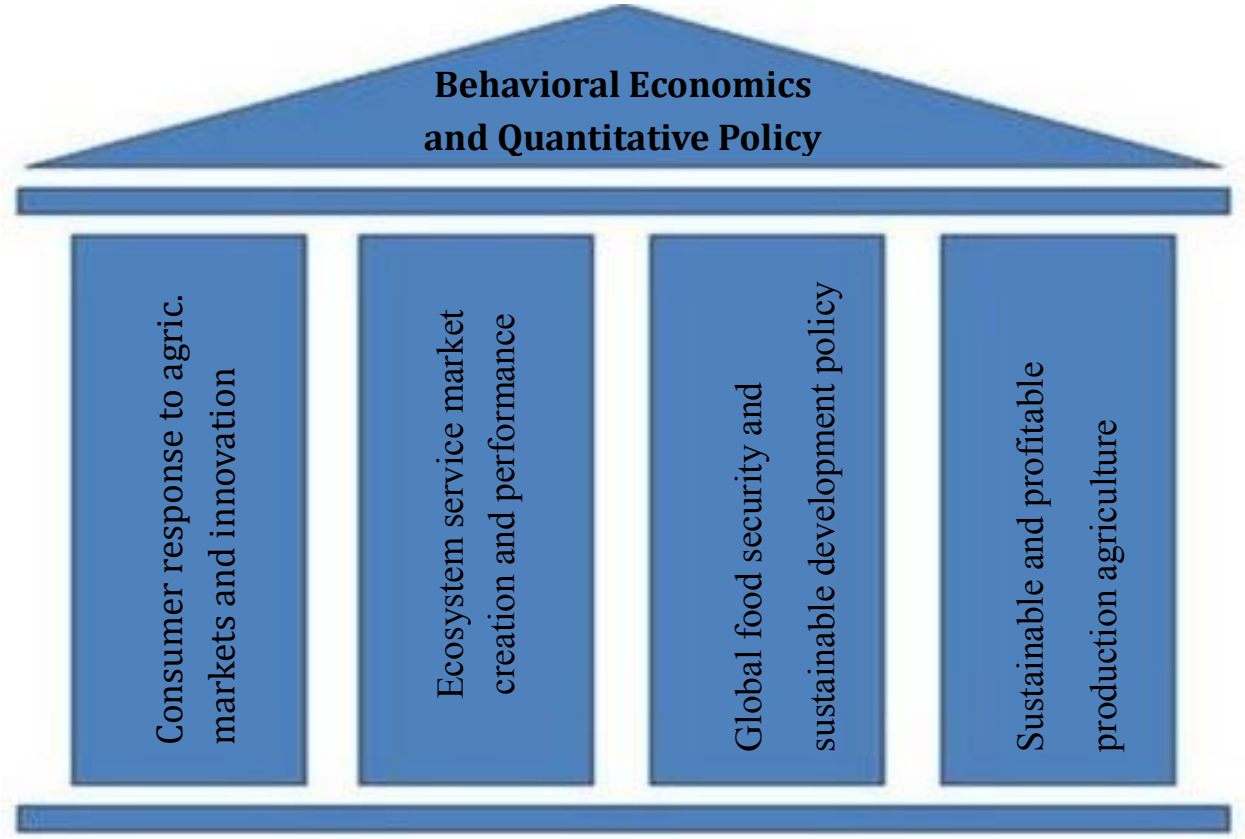
**Unique strengths of the department**

APEC is uniquely positioned to become an academic leader in the blending of scholarship and teaching in the two disciplines of applied economics and statistics because of the composition of our department's faculty and academic programs. Each of the areas of excellence we have chosen to pursue will include a holistic integration of research, teaching and outreach/Extension. The identified areas of strengths stated below will guide future activities of the department. We identified two unique strengths with each one supported by four pillars. Each pillar represents a unique application or expression in support of the area of excellence.

a) An applied economics program with strong emphasis on behavioral economics and quantitative policy analysis using state-of-the-art tools (e.g., experimental economics and applied econometrics).

   We will emphasize stronger integration within the department with the applied statistics program. This area of excellence will have four pillars that integrate current and future faculty and staff expertise. The four pillars are:

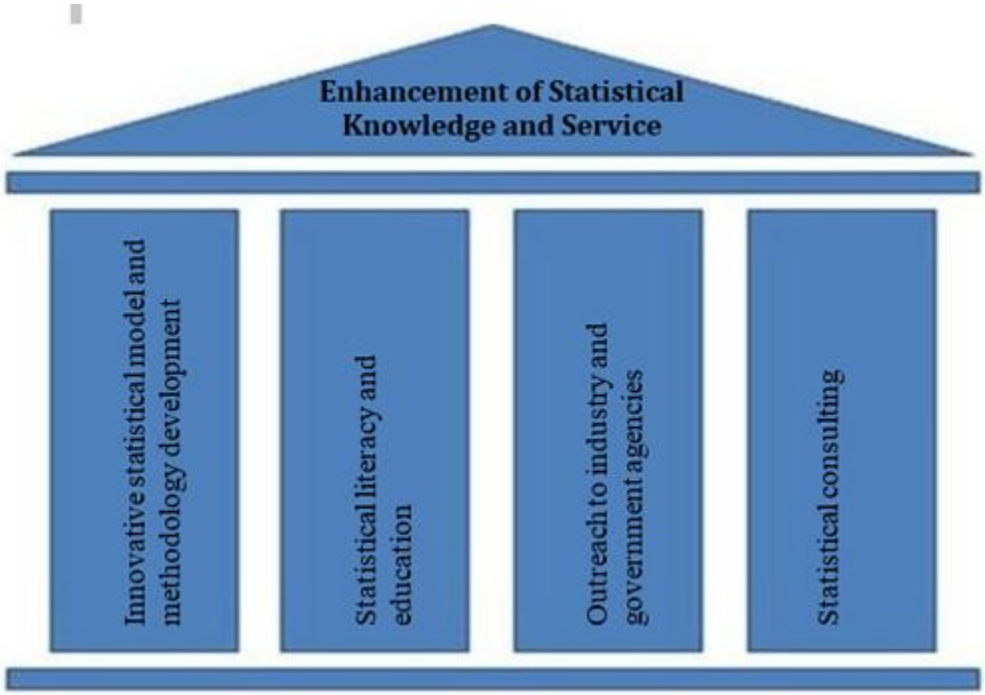
   - Consumer response to agricultural markets and innovation
     - Focuses on analyzing the economics of consumer behavior in local and global food markets and related public policy issues in a global food system
   - Ecosystem service market creation and performance
     - Emphasizes the efficient and sustainable provision of ecosystem services from nature and working lands
   - Global food security and sustainable development policy
   - Sustaining profitable production agriculture in the face of suburbanization pressure




b) An applied statistics program that is a national leader in providing statistical knowledge and service to address real world problems locally and nationally.

We will emphasize stronger integration within the department with the applied economics program. This area of excellence will have four pillars that integrate current and future faculty and staff expertise. The four pillars are:

- Innovative statistical model development
- Statistical literacy and education on campus and the region
    - Training in statistical theory and analytical methodology with applications to economics and the sciences (biological, social sciences, etc.)
    - Training the next generation of statisticians at the undergraduate and graduate levels, as well as teaching non-majors to use statistics as a tool in their fields
- Connection and outreach to private industry and government agencies
    - Outreach via internships, seminars, and workshops
- Statistical consulting expertise and service (via the StatLab)
    - Potential areas of strength: biostatistics, bioinformatics, econometrics, geostatistics, and big data analysis, experimental design, financial analytics, etc.




**Our vision for the future**

The mission and goals of our department are to provide quality education to undergraduate and graduate students, foster the free exchange of ideas, and engage in scholarly and outreach activities that generate new knowledge capital that could yield accurate information for making important decisions in the public and private sectors of our society. APEC has a strong record and tradition of productive programs and personnel who are engaged in innovative teaching, cutting-edge social science research, and public service in a wide variety of professional areas.

*Long-term goals* (25 years out):

- Double the current number (four) of research active faculty to support growth in scholarship
    - Applied economics: increase by adding 4 new hires
    - Statistics: increase by adding 4 new hires
    - Rationale: support growth in scholarly activities, grantsmanship, teaching and mentoring graduate students in MS and future PhD programs
- Transform each of the three retirements in Extension positions to tenure track faculty (joint focus on applied research and Extension).
- Obtain three endowed chair positions to support very productive faculty, attract new faculty, and enhance our department's reputation.
- Develop nationally respected PhD programs. Based on 2013 APR recommendation, the initial PhD program will be in "Applied Economics" and then in "Statistics."
- Build significantly larger capacity for generating extramural funding to support large multidisciplinary and policy-relevant research.
- Increase variety of courses available and modes of instruction at the undergrad and graduate levels.
- Develop a statistics program with a national reputation comparable to some of the top statistics departments in the U.S. that have embraced a more multidisciplinary focus in their research and teaching.
- Adopt a smaller scale model of the successful statistics programs at North Carolina State University (NCSU) and Iowa State University (ISU). For example, Iowa State Univ. describes their statistics programs as follows:

- "The department has areas of strength in biological statistics and bioinformatics, engineering statistics, survey statistics, computational statistics, statistical graphics, Bayesian statistics, theoretical statistics, statistics education, and spatial and environmental statistics..."
- Our goal is to develop a more collaborative partnership in statistical modeling and applications with other units at UD. Although APEC does not currently have the number of faculty and staff to duplicate what NCSU and ISU do, we could still develop a more focused mini-version of some of the programs they currently have that are relevant to our own needs and aspirations.

**What we will leave behind to achieve the goals**

In recent years, we deliberated about this issue in response to previous APR recommendations and have made the following strategic decisions about what to leave behind:

- We discontinued the Operations Research graduate program in 2012.
- AGED program and corresponding resources have been moved out of our department.
- One faculty position (Pat Barber) was left unfilled since 2011 retirement.
- Review curriculum to eliminate redundant courses.
- Discontinue small enrollment courses that are not deemed necessary for our undergraduate and graduate majors.

**Stakeholder input**

Stakeholder inputs were obtained from three sources: APEC alumni, current students, and national experts in our profession (2013 APR panel of five academics). We conducted a comprehensive survey of our alumni (undergraduate and graduate) who are now professionals in various fields (business, government agencies, academia, etc.) and asked for their feedback regarding the quality of our programs and suggestions for improvements. Below is a summary of their responses.

Undergraduate Students:

A total of 351 undergraduate alumni from 1995 to 2010 served as the population for this study. We had a 31.1 percent overall response rate. Here are several key points from the survey:

- Two-fifths (40%) of our students decided upon an APEC major before entering the University.
- Most of our undergraduates (58%) found their "first job" in the private sector.
- More than one half (52%) of our graduates started at salaries between $30,001 and $40,000. The average current salary now is $63,350, which is consistent with the national average for similar disciplinary graduates. In a 2011 report by researchers at Georgetown University's Center on Education and the Workforce, using the U.S. Census Bureau's American Community Survey, the median income at the 25% (75%) percentile for agricultural economics (and agribusiness) graduates are $39,000 ($92,000). The full report can be downloaded at the Georgetown site: http://cew.georgetown.edu/whatsitworth/.
- The students indicated that we do a very good job in availability of the advisor, willingness of the advisor to help, opportunities for interaction with faculty, and the attitude of the faculty toward students; "excellent" ratings over 50% were secured. In addition, the department rated well in fairness of grading, quality of instruction, availability of courses, clarity of degree requirements, and quality of initial contacts with the department; combined "good" and "excellent" ratings were received.

Furthermore, our 2013 APR external reviewers had interviews with current APEC students and received valuable feedback. In their report, they stated the following:

*"Undergraduate students and alumni expressed a high level of satisfaction with the level of personal attention and advising the department offers, the breadth of course plans and options that are offered, career opportunities, and preparation for graduate school. Students in each major found programs tailored to their interests and opportunities to build skills inside and outside their courses. The FABM, ERE, and NRM majors also expressed a strong identification with being part of the College."*

Graduate Students:

In a recent Alumni Survey of graduate students over the past 15 years, former graduate students identified financial support (73.9%), contacts with the department (63.8%), personal recommendations (60.9%), and course offerings (53.6%) as strong factors in choosing the department as a place to undertake graduate study. Students gave high "excellent" ratings for their advisor's help (72.1%), opportunities for interaction with faculty (65.7%), advisor availability (64.7%), professional competence of faculty (61.8%), and attitude of faculty (61.8%). Lower marks were given to graduate room/office facilities, and post-graduation career advising, although ratings of "excellent" and "good" combined for these areas were still well over 67 percent. The mean starting salary over a 15-year period was nearly $55,000, and the current salary of graduate alumni was nearly $84,000.

Career/Job Placement: The graduates were asked about their first job placement. Virtually all of our students find their first job within a few months of graduating. The data and statistical tools taught in all of our degrees have become very valuable in the job market. For those who went on to Ph.D. programs, most received funding in the form of fellowships, research and teaching assistants. The two companies that employed the most of our graduates were JPMorgan Chase and Bank Of America. Other companies reflect a diverse set of firms including Dupont, Barclay's, Exelon Power Team, Cardinal Health, Education Testing Service, and Lucent Technologies, to name a few. In recent years, educational institutions that have admitted and funded our past MS degree graduates for Ph.D. degrees include: Cornell University, University of North Carolina – Chapel Hill, Texas A&M, North Carolina State University, UPenn, UC-Davis, and the University of Florida.

**Curricular revision**

In the past five years, we have made a variety of revisions to each of our majors. However, in response to a recent Stamats report and the recommendations in our 2013 APR panel report, we plan to revisit each of our majors and revise the course requirements, where necessary. For example, in our 2013 APR report the review team observes, "The two applied economics undergraduate majors do not currently have a common core of courses that train all students as applied economists. This would be accomplished, and the program strengthened, by having the Food and Agribusiness Marketing and Management (FABM) and Environmental and Resource Economics (ERE) take the same common core of calculus, introductory and intermediate microeconomics, and statistics/quantitative courses." These are two very important majors in our department that deserve closer review for possible improvements.

**Staffing plan**

Currently unfilled and imminent retirements – (Rank and Date of retirement is in parenthesis):

1. Teaching/Research Faculty (Assoc. Prof.) - Applied Econ/AgED (December 2011)
2. Teaching/Research Faculty (Assoc. Prof.) - Applied Econ/OR (December 2012)
3. Extension/Research Faculty - Applied Econ/Extension Specialist (Jan. 2013)
4. Extension/Research Faculty (Full Prof.) - Applied Econ/Extension (Jan. 2014)
5. Teaching/Research Faculty (Full Prof.) - Statistics (May 2013)

6. Teaching/Research Faculty (Full Prof.) - Statistics (December 2013)
7. Teaching/Research Faculty (Assistant Prof.) - Statistics (May 2014)
8. Teaching/Research Faculty (Assoc. Prof.) - Statistics (May 2015)

Based on recommendations of the 2013 APR panel report, we request the following positions:

- *Applied Economics:* In addition to current staffing, our department needs to hire:
  - 2-4 new tenure track faculty to support the establishment of a Ph.D. program.
  - 2 tenure track faculty (research and extension). This will be done in consultation with the director of cooperative extension.
- Statistics: Immediate hire of 3-5 tenure track positions to replace pending retirements with at least one at the associate professor or higher.

Administrative Staffing: While APEC has grown in size and responsibilities over the past two decades, resources for administrative staff support remained constant. Our entire department has only two administrative staff support (assistant to the chair and staff assistant for Graduate Programs), but CANR only provides full salary for one of the positions and 75% for the other. We request that:

- CANR should cover the full salary for both administrative support staff members
- Based on the 2013 APR panel recommendation, CANR should approve the hiring of one additional support staff to assist with the management of grants and accounting. Responsibilities would include assistance with grants submission and post-grant administration on the financial and compliance sides.

**Space utilization and facility needs**

- Faculty/Staff offices
  - We have just enough space for offices, but have no room for additional growth.
- Center for Applied and Experimental Economics
  - There is need for larger and more functional space. (Update: renovation is underway)
- Graduate Student offices
  - We have a large number of graduate students, but have very limited space for the students. Currently, only funded students (about 65% of total) have office space.
- Post-doc and visiting professor offices
  - We need dedicated office spaces for post-docs and visiting faculty.
- Townsend Hall (TNS) class room teaching spaces
  - TNS has limited classroom space for computer lab instruction (e.g., GIS courses).

**Needs from support units**

- Need better designed and easier to navigate websites to attract prospective students (and potential faculty/staff) to our department.
- Need more timely and effective technical assistance for web development and maintenance, computers, software, and support for research.
- There is an urgent need for a major overhaul and redesign of our departmental webpages across the college.
- The centralized administration of technical and web development support has been inadequate and quite limited in meeting our departmental needs. For example, we have been asking for help in revising the structure and content of our department websites for almost two years and have yet to get the type of assistance we need.
- The allocation of more resources to web design/maintenance and general IT may be needed to complement the role filled by one single web designer in CANR.

- Faculty and staff members of APEC would like to have more access to making basic updates to the content of our departmental website.

**Development needs**

- New faculty hires
- Endowed chair positions
- Center for Experimental and Applied Economics
- Undergraduate and graduate research scholarships
- Funded undergraduate summer internship programs
- Scholarships for undergrads involved in experiential learning (e.g., NAMA club, conference travels, etc.)

**Foundational steps to be taken in 2014**

- Curricular Revision and consolidation of some undergrad majors:
    - Subcommittee to review.
- Ph.D. program in Applied Economics: Subcommittee to explore feasibility.
- Relocation of the Center for Experimental and Applied Economics and the renovation of the previous ag. library space.
- Faculty Searches: Obtain CANR dean's approval to set up search committees.

## XII. ENTOMOLOGY AND WILDLIFE ECOLOGY

**Introduction and overview**

The mission of the Department of Entomology and Wildlife Ecology is "to conduct basic and applied research on entomological and wildlife conservation issues that addresses society's problems, improves management practices that are compatible with environmental stewardship, and advances biological and ecological knowledge; to educate undergraduate and graduate students to become professionals and citizens capable of solving problems and disseminating information; and to assist the public in matters related to insects, wildlife and other forms of biodiversity."

Research and teaching in the department encompasses the study of invertebrate and vertebrate animals at the organismic level with topics including but not limited to: insect and wildlife ecology, patterns in animal diversity and abundance, population processes and demographics, interactions with plants, the environment and humans, and long-term management and conservation. The department also addresses ways to mitigate negative impacts of insects and wildlife and on humans, while maintaining or restoring biodiversity and ecosystem integrity, particularly in ecosystems heavily managed for the human enterprise. The department's Extension mission is to educate the public about the importance of coexisting with insects and wildlife, as well as to help them apply research results through Extension programs in integrated pest management, including the safe and effective use of pesticides and other pest management techniques.

**Unique strengths of the department**

1) Wildlife Ecology and Conservation with expertise in human-wildlife conflicts, ecological monitoring, habitat management and restoration, migration ecology, wildlife ecology, and wildlife population management.

2) Conservation Biology with expertise in aeroecology, biodiversity, climate change, energy development (i.e., wind energy), and invasive species.

3) Entomology with expertise in agricultural entomology, apiculture, biocontrol, integrated pest management, and pollination ecology.

**Distinctive attributes of the department**

1) Our focus is on wild animals: Our department is the only group on campus focused on the ecology and conservation of terrestrial organisms in natural environments. Our unique combination of faculty expertise in vertebrates, invertebrates, and plants allows us to investigate multitrophic interactions, a powerful approach to conservation issues.

2) The interaction between Entomology and Wildlife Conservation: Students in both majors benefit by exposure to the other discipline. Our Wildlife majors are more employable than their competitors because of their knowledge of insects, and our Entomology majors have a broader awareness of biodiversity and the interactions of insects and vertebrates. Ours is the only department in the country to offer this synergistic combination of majors.

3) Our location: We are located within the heart of the Northeast urban crescent (D.C. to Boston) and adjacent to the largest tidal wetlands in the world. Wildlife, entomological, and ecological issues faced by 20% of the U.S. population occur locally.

4) The proximity of research and teaching field sites: The University farm, ecology woods, Webb Farm woods, Iron Hill Park, Fair Hill Natural Resource Management Area, and White Clay Creek State Park are all within a

mile of Townsend hall and allow us to expose students to field research in ways that most other universities cannot.

We are perfectly positioned for convenient collaborations with world class research institutions such as the Patuxent Wildlife Research Center, Smithsonian Migratory Bird Center, the American Museum of Natural History, the Baltimore NSF LTER program and others. We are also positioned to address the impact of sea level rise on the salt marsh ecosystem and migratory waterfowl.

Our department depends heavily on external collaborations, particularly for our research programs. We are always seeking new opportunities for collaborations and will continue to do so in the future. We have a large established network of like-minded institutions and scientists. Our adjunct faculty are associated with the Delaware Museum of Natural History, the USDA Beneficial Insects Introduction lab, Philadelphia Academy of Natural Sciences, CANR's department of Animal and Food Sciences, Stroud Water Research Center, Northeast Grassland Bird Working Group, DuPont Co, The Smithsonian Migratory Bird Center, USDA Forest Service, and the National Park Service. Many of our adjuncts collaborate on research projects with our faculty. We have externally funded projects with NSF; USDA NIFA; State Wildlife agencies in Pennsylvania, Delaware, Maryland, and New Jersey; US Fish and Wildlife Service; USGS; USDA APHIS Wildlife Services; USDA NRCS; USDA Forest Service; DuPont Co.; Panthera; and Wildlife Conservation Society.

Active collaborations include:

*Greg Shriver:* US Fish and Wildlife Service, National Park Service Inventory and Monitoring Program, University of Maine and the University of Connecticut along with the State of Maine, Delaware Department of Natural Resources and Environmental Control, and Maryland/DC Audubon; Delaware State for turbine project; UD EOE and USDA Forest Service for the FRAME project.

*Douglas Tallamy:* Smithsonian Migratory Bird Center; University of Maryland; Beneficial Insect Research lab; USDA National Integrated Water Quality program with PLSC and FREC

*Jake Bowman:* Delaware Division of Fish and Wildlife, Maryland Wildlife and Heritage Service, The Nature Conservancy, Ducks Unlimited, USDA/APHIS Wildlife Services, and US Fish and Wildlife Service.

*Debby Delaney:* N.C. State; Cornell University; Penn State; Virginia Tech; West Virginia University; and State Beekeeping Associations

*Judy Hough-Goldstein:* USDA Forest Service; N.J. Dept of Ag

*Jeff Buler:* Delaware State; UD EOE, USGS, USDA NRCS

*Chuck Mason:* DuPont Co.

*Kyle McCarthy:* Panthera; Wildlife Conservation Society

*Joanne Whalen:* University of Maryland

*Chris Williams:* Ducks Unlimited; New Jersey Division of Fish and Wildlife

*Charles Bartlett:* North Carolina Museum of Natural Sciences; American Museum of Natural History.

Summary: We are pleased with the niche we fill within UD and the greater academic community in the mid-Atlantic area but we can meet even more needs by expanding our programs. We believe that with our current department structure (an even balance between entomology and wildlife), we will be well-positioned to meet the changing conservation and wildlife/entomological needs of the state and region in the coming decades. We are already addressing the conservation of biodiversity, wildlife species management, the pest control needs in agriculture,

invasive species, climate change and sea level rise, restoration ecology, pollination challenges, forest fragmentation, and integrating modern farming practices with conservation needs. All of these issues will intensify over the coming decades and we may need to expand our programs in these areas to meet these demands.

**Our vision of the future**

We do not plan to change the proportion of our faculty specializing in Wildlife and Entomology, but with the recent addition of two faculty members from the Department of Bioresources Engineering will have the opportunity to focus in new areas as these faculty members retire. Specifically, we would benefit from a faculty member who specializes in disease/toxicology/physiology in terrestrial organisms. Each year new diseases (e.g., avian influenza, chronic wasting disease) and toxins (e.g., mercury) are emerging issues that threaten not only our ecosystems but also the wildlife that inhabit them, including humans. This type of faculty specialty would benefit both the entomology and wildlife research programs. Our future hires need to be sufficiently diverse in the research area to benefit from the ever changing challenges to resource conservation (e.g., climate change, energy development).

As existing entomology faculty retire, we will carefully consider whether replacing them with their current areas of expertise (behavioral ecologist/insect ecologist for Tallamy; agricultural entomologist for Mason; biocontrol entomologist for Hough-Goldstein) is warranted. Areas such as agricultural entomology and biological control of invasive insects are areas of interest to our diverse stakeholder groups. We will reevaluate the future faculty hires and direction of the department after each hire.

**What we will leave behind to achieve the goals**

1) We can terminate our Plant Protection major with agreement by PLSC;

2) We are willing to lose the Ecology and Organismal Biology concentration within the Environmental Science major;

3) As recommended by the APR review committee, we are ready to dissolve the Center for Managed Ecosystems as a formal entity;

4) Our Extension personnel can become more focused with thin staff if they give up the certified crop Advisor program, pest recommendation guides, and insect trapping programs.

**Stakeholder input (forthcoming)**

**Curricular revision**

**a) undergraduate**

We make minor revisions and adjustments to our curriculum every semester to keep our offerings current and attractive. The requirements and policies have been updated periodically to implement the several changes made in our program offerings and to facilitate consistency in administering certain aspects of our programs. For example, at the graduate level we added the section for M.S. students who plan to continue in the Ph.D. program as more of our M.S. students requested reclassification to begin their doctoral studies. 'Our course requirements have changed as the Wildlife Ecology side of our graduate programs have grown and matured. For example, in 2000 we required ENWC 614, Insect Ecology, for our graduate degrees. This course has evolved into 814, Advanced Ecology, to accommodate more graduate level topics and to cover a broader range of upper level ecology of animals and plants. We have also strengthened or added offerings in Herpetology, Ornithology, Population Ecology, Wildlife Research Techniques, Conservation Biology, Wildlife Habitat Management, Wildlife Policy and Administration, Landscape Ecology, and Advanced Spatial Modeling to better accommodate the graduate programs not only in Wildlife Ecology, but also in Entomology.

In recent years, we have conducted a major revision of the Wildlife curriculum three times to keep pace with national trends and ensure that our graduates meet certification requirements of the Wildlife Society. Such a revision, however, is overdue for our Entomology major.

We have expanded our undergraduate course enrollment in Wildlife Conservation substantially in the last few years and believe we can continue to expand, at least modestly, in the future with the courses we now have in place. We are currently working to distinguish our Wildlife Conservation major and Ecology major from the Environmental Science "themes" being proposed by EOE to minimize confusion among students about how these majors differ. Our Ecology major is new and is still in the five year trial period. We hope to see more growth in the Ecology major and we will discontinue the major if it remains small after the five year probationary period. One way to possibly increase enrollment in the Ecology Major would be for ENWE to teach the University's introductory ecology course (now taught as BISC 302), but only with additional faculty and TA support.

A significant proportion of our majors transfer into the department after matriculating at UD. They do this because they were unaware of our programs when they were considering UD. We hope to reverse this trend by improved marketing approaches.

We offer the strongest and most diverse study abroad programs in the College. They are popular courses that routinely fill with 1/3 of the student applicants. We would like to meet the study abroad needs of more students but cannot expand without additional faculty to spread the effort required for effective study abroad courses. We are considering new on campus winter session options but we will proceed with these cautiously because of the high teaching loads our research faculty already carry. Tallamy is offering a new course entitled "Humans and Nature" that targets non-majors. He hopes to get it approved to satisfy University science and breadth requirements so that it can expand in enrollment quickly.

Measurable Milestone

1) In five years we will have increased our Entomology and Ecology majors to 30-40 students each or we will fold them into an umbrella major.

Action Item:

1) Review and revise Entomology Curriculum in 2014

2) Survey transfer students to determine how we can better market our majors to prospective students

**b) Graduate programs**

The overarching goal of our graduate program is to offer quality training in Entomology and Wildlife Ecology and Conservation with a focus on population management, restoration, and conservation. We emphasize taxonomic skills at all trophic levels; this sets our program apart from most others. The Department offers graduate programs leading to the Master of Science (M.S.) in Entomology, M.S. in Wildlife Ecology, and the Doctorate of Philosophy (Ph.D.) in Entomology and Wildlife Ecology and typically trains 30 students at any given time. We are pleased with this size because it currently matches employment demands and we do not have any challenges attracting excellent graduate students. Presently, we are turning away ¾ of our graduate applicants because of lack of supporting funds.

The M.S. in Entomology has been offered since 1949. During this time, the department built a strong reputation in the nation as a feeder for Ph.D. programs. The M.S. in Wildlife Ecology was added in 2004 and the Ph.D. degree program received provisional status effective September 1, 1999. It received permanent status in 2008.

There have been 69 degrees granted from our graduate program over the past 10 years (6 Ph.D. and 63 M.S.) with 49 of those students graduating since our last 5-year review. Currently, we have 34 graduate students (10 Wildlife Ph.D., 2 Entomology Ph.D., 9 Wildlife M.S., 8 Entomology M.S.). Twenty-six of these students are on full-time funding through a research assistantship, teaching assistantship, or fellowship.

Nearly all of our graduates have gained employment within the field or have transitioned to advanced degree programs. Among the 63 Master's graduates, 16 have gone on to pursue a doctoral program.

The new Ph.D. program seems to have improved the number and quality of applications to our graduate program. While it is possible to go directly to the Ph.D. program, we require that students complete the M.S. degree before being admitted or reclassified into the doctoral degree program in Entomology and Wildlife Ecology. Students already matriculated in the M.S. Program in Entomology or Wildlife Ecology who plan to pursue the doctoral degree may request reclassification to the Ph.D. program as a pre-candidate in lieu of reapplying for graduate study.

We recognize that our Ph.D. graduate curriculum could provide more courses at the 800 level. We will continue to address this need in the coming years. Of particular importance is a course in biometrics and experimental design. We have sought such a course from the statistics group for decades but the need remains. Our APR review identified this area as a top priority for curriculum additions.

We are concerned that four potential budget threats could act together to downsize our graduate program. The most serious threat would be a reversal of UD's long-standing policy of waiving graduate tuition when grants cover a stipend. We are skeptical about administration suggestions to shift graduate support to grants. Many of our granting agencies (e.g. state agencies or smaller federal grants) simply will not absorb these costs. Second is the erosion of Hatch assistantships. If Hatch budgets disappear in the coming years, so will support for five graduate students. Third, we are concerned about the increasing overhead rate required by non-State of Delaware agencies, which is currently 41%. We have already received criticism from one granting agency that this rate may over-price their ability to fund our proposals. We are similarly concerned that continuous University mandated raises in graduate stipends and overhead will make us less competitive with state and federal natural resources agencies that fund so much of our wildlife research. Wildlife graduate programs across the country offer lower stipends than biology or engineering programs. We will make every effort to funnel RBB monies toward graduate student support rather than S-contracts, but our graduate program will shrink considerably if we lose tuition remission, Hatch assistantships, have to charge higher overhead rates, and graduate stipends continue to increase.

We are seeking creative approaches to funding graduate work but funding remains our biggest challenge in the near term. One approach could be to direct substantial gifts to the department toward graduate assistantships. Collaborations with groups such as The Mt. Cuba Center, The Garden Club of America, US Forest Service Philadelphia Field Station, and the USDA Natural Resource Conservation Service, could also generate support for graduate students that we have not taken advantage of in the past.

Action Items:

1) Strengthen graduate course offerings to provide more depth and specialty options for Ph.D. as well as Master's students.

2) Explore nontraditional sources of graduate funding (i.e. other federal agencies, NGOs and private donors)

3) Create an in-house course in biometrics and experimental design

**Staffing Plan**

Of our 10 faculty, 8 are full-time tenure track lines and two (Charles Bartlett and Kyle McCarthy) are on non-tenure track lines. With the addition of Jeff Buler and Kyle McCarthy, our wildlife program is now supported by five faculty members and matches our five faculty lines in entomology. We recently received two additional faculty lines (1 tenure and 1 non-tenure track) when Bioresources Engineering department was dissolved. These lines will offer us an opportunity to focus in new areas as these faculty retire.

The Extension program in our department consists of two full-time Extension specialists (Joanne Whalen; IPM and Ag Program leader, and Brian Kunkel; ornamentals IPM), an Extension agent (Bill Cissell; IPM) and Debbie Delaney, who carries a 25% Extension appointment in apiculture. Susan King's position as pesticide coordinator was eliminated in 2009. Joanne Whalen has also served as Ag Program leader for the state since 2010.

Three of the five entomology faculty in our department are nearing the end of their careers, as is Joanne Whalen, the cornerstone in Delaware's entomology Extension program for the past 32 years. How these people will be replaced will determine the future direction of the department.

Action Item:

1) Determine the areas of focus for upcoming new hires

Currently, we get by with 1.5 secretaries. This is a loss of 0.5 secretaries even though our department is now larger and more productive than at any time in its history. We recently added an administrative assistant. This person took over the grant administration, human resources, budgeting, web maintenance, etc. that was handled centrally by the College. As more responsibilities are transferred to the departments, additional staffing should be added also.

We hope to continue to integrate Extension into our faculty with future hires. Currently, our only faculty member with a formal Extension appointment is Debbie Delaney. When Joanne Whalen retires, we hope to add her replacement to our faculty ranks.

**Space Utilization and facility needs**

Teaching space. All of our lab courses have space issues. Our teaching lab (Townsend 012) has limited bench space and microscope availability. Expanding class size is not an option without expanding sections offered. We can accommodate this expansion in our introductory courses using TAs as lab instructors, but labs of our advanced taxonomy courses are taught by faculty rather than graduate students simply because of the required level of expertise. Therefore, adding sections for these courses will substantially increases class time commitment for some of our key research faculty. We as a department and the college as a whole need a facility that accommodates larger lab sections. This might be met through renovations in Worrilow, use of the conference room in the girl scouts building or some other innovative approach.

Offices and research labs. Currently, all of our faculty and Extension personnel have their own offices. We are fortunate in that most of our wildlife faculty do not require standard wet labs. We do need to maintain a shared molecular lab that is well used and maintained. It has become more cost efficient to send samples for particular analyses (mercury, genomic analyses, radio isotopes, etc.) to specialized labs rather than do them ourselves. If we do expand entomology and wildlife faculty positions we will need to add lab space for those new positions. Our graduate students have adequate office space. It does not look like we will be expanding our graduate program so this condition should hold well into the future.

Facilities.

1) Permanent storage for field equipment including radar equipment and boats is a long-term storage need. Our woodlot shed was destroyed by a tree fall years ago. In addition to our garage space in Worrilow we also need a 40x60' pole barn, to address these needs.

2) The Insect Reference Collection (Museum) has been restricted by serious space constraints for two decades. The working conditions within this important resource are appalling and are an embarrassment when visiting scientists come to use the facility. We have submitted specs for what would constitute adequate space to the CANR Space Committee.

**Needs from support units**

*Maintain farm services*

Both the University farm and the woodlot represent essential teaching and research facilities for faculty, as well as important sites for undergraduate research. For logistical reasons, nearly all of our impressive undergraduate research projects are conducted within these facilities. In addition to traditional research plots, the farm has wetlands, warm season grasslands, riparian corridors, and forest fragments that are used as habitat by a great diversity of birds, mammals, and insects. The presence of the woodlot enables field-based teaching exercises such as squirrel mark-recapture and vegetative analyses that would otherwise be impossible. Moreover, the UD ecology woods is a classic example of urban forest fragmentation and provides an excellent research site for studies examining conservation in such sites. It has been listed as one of Delaware's Natural Areas worthy of protection by the Delaware Nature Society. Nevertheless, both the UD ecology woods and the Newark farm itself are under constant threat from competing interests such as athletics. Vigilance must be maintained to prevent the loss of this crucial training and research site.

*IT needs*

1) The loss of our computer replacement program has been problematic and we would like to see the return of this program.
2) Several faculty would benefit from planned up-grades to our long-distance conferencing capabilities. This will help facilitate graduate committee meetings, extension programs, teaching efforts down state.

3) We would all benefit from better access (i.e. faster and greater capacity) to data storage, archiving, and file sharing on the CANR network.

4) Establishment of an FTP server to permanently store and deliver existing and future scientific software and/or datasets produced from sponsored research projects.

5) The availability of and instruction in how to use current web-based design tools. For example, instruction in how to use Wordpress, Dreamweaver, or other web design programs, how to create applications, how to track web traffic for evaluation purposes, etc. would relieve IT over the long run. Departmental websites would require a trained webmaster for maintenance; perhaps our new Administrative Assistant? We have several that need maintaining and periodic updating (e.g., Biological Control, FRAME, MAAREC, Planthoppers).

Our three undergraduate majors are not marketed well on the college web site or on our own web site. Many incoming freshman declare majors in Biology, Animal Science, or Environmental Science (or do not declare majors at all) when what they really want is Wildlife Conservation. With suggestions from the STAMATs evaluation, we hope to identify majors while they are still in high school. We have contracted the services of Tom Ilvento to help survey alumni. We also plan to survey incoming freshman, High School juniors, current majors, and transfer students to help

us identify better marketing approaches for our programs. We will use the results of these surveys to determine what catch phrases will attract more students to consider our programs.

# XIII. PLANT AND SOIL SCIENCES

**Introduction and overview**

The aim of teaching, research, and extension in the Department of Plant & Soil Sciences department is to enhance the quality and sustainability of our agricultural, natural and managed landscapes on a scale that ranges from the molecule to the mountain, providing students the preparation needed for success in the sciences, horticultural and agronomic industries. In pursuit of these aims, we will:

- Perform basic and applied research about plants, soils, water, microbes, and their interactions at the level of the molecule and cell, organism and population.
- Integrate basic, translational, and applied research to improve growth, development, and adaptation of plants in varied and changing environments.
- Understand nutrient and trace-element cycling in natural and anthropogenically-impacted environments.
- Educate our stakeholders about the discoveries we make via publications, outreach and extension.

We offer an interdisciplinary program that integrates people, plants, soils and water. This includes understanding and designing sustainable, healthy ecosystems in natural, urban and managed landscapes. We aim to offer focused, rigorous training that requires critical thinking, problem solving, and a translation of knowledge and education to application. The success of our graduates will be measured in their impact in meeting future challenges to agriculture, landscapes, and ecosystems.

Our aim is to define the goals for our department and set the priorities to achieve those goals. The end product will be an improved and enlarged undergraduate program, better-integrated graduate training, and development of novel, externally-funded research activities to advance plant and soil sciences and to achieve international recognition for our work. All of these aims will be enhanced through our interactions with our stakeholders via education, extension and outreach activities.

**Unique strengths of the department**

Our unique strengths that allow us to fulfill this vision are:

- A strong, integrated faculty with outstanding international reputations in (1) plant biology, (2) soil chemistry and environmental science, (3) landscape horticulture.
- A concentration of research on the interface between plants, microbes, and soils, and on the mechanisms which mediate their interactions.
- Remarkable breadth in our work that spans basic to applied research, and translates many of those findings to the field, while training students, stakeholders, and scientists.

**Our vision of the future**

The current state of the PLSC undergraduate program and our majors is that we have had a relatively low number of undergraduate majors for many years, with our largest cohort in the Landscape Design & Horticulture programs. There are nearly as many graduate students in our department as undergraduate students. The low undergraduates-to-faculty ratio facilitates one-on-one interactions that are a hallmark of our department, although this would be negatively impacted if we were required to eliminate some of our low-enrollment courses. However, the number of undergraduates is too low, resulting in cancellation of some courses, and this number is below a level that may be sustainable. So while keeping these close interactions with the students, we would like to:

- See growth in the number of undergraduate majors to a healthier level, aiming for approximately 100 undergraduates in our department (versus 40-50 today).
- Teach exciting undergraduate and graduate level courses that are attractive to our majors as well as non-majors.
- Continue to provide a high level of mentoring and advising.
- Increase the credit-contact hours of our faculty.
- Increase the use of active learning processes in our courses.
- Enhance employment opportunities for the students via more internship and training opportunities.
- Improve our utilization of online teaching by offering a small number of additional, online courses to broaden our engagement with students and providing easier access to course materials.

The current state of the PLSC research program is that our department has had a steady increase in grant submissions, funding, and publications over the last five years. We seek to build on this success over the long term by reinforcing and building on this success through support of research-active faculty and the staff that contribute to this success. This research productivity depends on robust graduate programs, and thus there is some independency with the goal to build that program.

**What we will leave behind to achieve the goals**

The primary thing that we anticipate leaving behind is the antiquated view of working in isolation within our department. Over many years, our department has been evolving towards multidisciplinary programs, evident in the numerous faculty members with joint appointments, cross-listed courses, and the cross-campus location of the facilities at which our faculty are located. Our teaching programs will benefit from reduced barriers across departments as we'll be able to attract a broader range of students. Likewise, our research and graduate education programs will be greatly enhanced by projects and grants that span the university. All aspects of our departmental efforts will be enriched by greater engagement in our community and local or regional businesses.

Beyond this, we are planning to make changes to our majors (described below) that will "leave behind" aspects of our current academic programs.

**Stakeholder input**

The clearest group of stakeholders is our alumni, who have experienced our teaching and research programs, and then gone on to work at businesses, in the government, non-profits, academic or other institutions. We are currently awaiting the results of survey.

**Curricular revision**

We have several proposed changes to our undergraduate majors, grouped into three major areas – the first two are our current majors, while the third is a proposed new major.

<u>Plant-related majors currently include the following:</u>

- Landscape Horticulture and Design. Enrollment is 25 in 2013.
- Plant Science. Enrollment is 26 in 2013.
- Plant Protection. This major is shared with ENWC. Enrollment is 2 in 2013.

In the long-term, we envision consolidation of these majors into a smaller set of majors with concentrations, perhaps consolidating these majors across departments within the college to create interdepartmental majors.

We are also actively discussing the development of a Bachelor of Landscape Architecture (B.L.A.) degree program, which for accreditation purposes may need to be a stand-alone major. If this proves successful, it could serve to launch a Master of Landscape Architecture degree at some point in the future.

Thus, in the near term, our plan for the plant-related majors is to offer two majors, one focused on landscape design (retaining that successful program and its emphasis on design), and one that integrates soil and environmental science into our plant science major, with concentrations that focus on basic sciences in these areas.

The long-term target for undergraduate enrollment is to grow to more than 100 undergraduates within the next five to ten years, while keeping in mind that some of the students who would be interested in the current majors might end up in the Genetics & Genomics major described below.

Another current major to reconfigure is Environmental Soil Science.

The future of this major is an area of active discussion by the faculty, as the enrollment is just 2 students in 2013. The challenge is that we have a number of highly acclaimed faculty members, including many junior faculty members who are interested to grow the program, yet most of their work is in the larger "environmental" area which is largely occupied by other colleges at UD. The courses we offer in this area count towards the concentration in Environmental Soil Science, within the Environmental Science major, but none are part of the required core of classes for that major, or any of the other nine concentrations within that major.

As mentioned above, the option that the faculty have been discussing is consolidating the Environmental Soil Science, Plant Horticulture, and Landscape Design majors into a single major (as yet untitled). This new major would have a common core of classes required of all students plus three tracks for specialization, tentatively entitled: 1. Agricultural Sciences (agronomy), 2. Ecosystems Sciences (Soils, Ecology issues). 3. Plant Sciences/Biology. The Agricultural Sciences track would focus on producing graduates interested in agronomic education and crop management with a sustainability focus. The Ecosystem Science track would essentially replace the current Environmental Soil Science major and produce graduates interested in natural resource sciences and management, ecosystem restoration, environmental consulting, government scientific organizations, or may lead to enrollment in graduate school. And the Plant Biology concentration would focus on basic plant sciences including horticulture, plant propagation, molecular biology, etc. This proposed change would reduce the number of majors in the department, have a title that is more attractive to incoming students, and will provide courses, both existing and new, that will bring together the existing strengths among our faculty and increase university-wide enrollment in PLSC courses.

The long-term target for our Environmental Soil Science program is for growth, but this is likely to be achieved via integration with other majors, in the near term.

We propose a new major: Genetics & Genomics.

We envision the creation of an interdepartmental degree program that leverages the expertise of faculty across CANR that work in the area of genetics and genomics, a field with clear, long-term relevance to agriculture and natural resources management. Major objectives are to: [1] offer a contemporary degree program with expansive job opportunities for graduates; [2] provide more flexible degree options for students with multiple inlets and outlets; a key feature being a contiguous BS/MS program; [3] capitalize on common threads in research and extension activities among CANR faculty. Such a program would benefit a number of faculty members in our department, so it is to our benefit to develop and grow such a program.

The target for undergraduate enrollment in this new Genetics & Genomics program is to make this a large program, hopefully exceeding our other two large majors which currently have ~30 students each. In other words, we envision this program as an opportunity that could support significant growth.

The current state of the PLSC graduate program and our fields of study is that the total number of graduate students in our department is relatively strong, with nearly as many graduate students as undergraduates. This is because we have many faculty with well-funded research programs that support their students. Plus, the Longwood Graduate Program has independent funding for graduate students. However, because we have a single graduate program, our graduate students share few courses, and enrollment in some courses is weak, perhaps because we have almost no

course requirements. Addressing this problem will require greater enrollment of our students across a broader range of our course offerings – a change that is currently underway as a result of the hiring of new faculty that are committed to making such a change.

Proposed changes to our graduate concentration areas:

*Area of emphasis: Landscape Horticulture and Design*

The Longwood Graduate Program (LGP) is highly successful, but enrollment is limited because for financial reasons and the time it takes the faculty adviser to successfully mentor a cohort of students. We anticipate little growth in the LGP program. Ultimately, however, growth in this area could come in large part from a master's degree program in landscape architecture (M.L.A.) which would have a unique strength (relative to other MLA programs) due to our department's strong expertise in plants and public gardens. The development of this program would depend on the successful development of the undergraduate BLA major discussed above.

We also would like to grow research programs in the area of horticulture, which could include breeding and development of ornamentals, fruits or vegetables; a faculty member with expertise in breeding of ornamentals would fit very well with the Genetics & Genomics program described elsewhere. And the new faculty position in Urban Forestry should be involved in growing this program in new directions that will support horticulture.

*Area of emphasis: Plant Biology*

The development of the new undergraduate major in Genetics & Genomics ("G&G") would provide excellent benefits for the graduate program in plant biology, which includes most of our faculty working in the area of molecular biology. We envision that the G&G program would include a number of large classes that would require teaching assistants (TAs). With these TAs, we could bring in a cohort of graduate students that could rotate among labs, comprising a more typical graduate program. In addition, the G&G program would offer a 4+1 program, whereby students could receive an M.S. degree with one additional year of school after their undergraduate degree. This would be a non-thesis, course-based offering, which would help to grow class sizes at the graduate level, and it would bring in graduate tuition. We would also like to require a set of core classes for these students, which could be taught as short modules, and could include practical methods courses - which would require a graduate teaching lab.

*Areas of emphasis: Environmental Soil Sciences and Management*

The merging and refocusing of the undergraduate Environmental Soil Science and Plant Horticulture, and Landscape Design majors into a single major entitled Sustainable Landscapes and Ecosystems with specialization tracks would have impacts on graduate students in the soil sciences. Because the new major would have a focus on ecosystems-scale science this would encourage development or enhancement of coursework focused on environmental systems. This emphasis would also highlight the ecosystem-sciences research areas of the faculty. Students are aware of the serious global environmental issues we face; thus, we foresee the undergraduate major driving a shift and an increase in the quality and size of the pool of graduate students applying to the graduate program, while maintaining our current strengths in Environmental Soil Sciences and Management. Other developments outside but affiliated with the department will enhance this perception. Examples include the new university-wide graduate program in Water Science & Policy; the Delaware Environmental Institute; the Delaware Water Resource Center; and the Interdisciplinary Science and Engineering building. It is hoped that the new undergraduate major will attract students to the department and the subsequent addition of TA positions beyond the one position affiliated with the Introduction to Soil Science course. Lastly, the department will encourage research-active soils and water faculty to offer their graduate students mentorship experience by hosting the best and brightest undergraduates in research experiences within their laboratories. Increasingly, employers are looking for the 'above & beyond' coursework experiences that research internships can provide to undergraduates. We believe that such opportunities are a 'win-win' for the undergraduate intern, the graduate student, and the hosting faculty member.

**Staffing Plan**

To accomplish our goals in the area of undergraduate curriculum, we will need to:

- Support our landscape design and ultimately BLA program via hiring of faculty and instructors to help grow the program.
- TA lines to assist with anticipated larger class sizes.
- Teaching lab manager, if we're going to develop labs for these classes.
- Hire a recruiter for department (perhaps a recent graduate; not necessarily full time).

To accomplish our goals in the area of graduate curriculum, we will need to:

- Development of the position of a graduate coordinator into a more clearly defined and recognized administrative, mentoring, and advising position could benefit our research-oriented graduate programs (plant biology and environmental soil sciences).

To accomplish our goals in the area of growth in research we will need to strengthen and retain our faculty. The department has significant strengths in both soil chemistry and plant biology. In both cases, these should be maintained and strengthened with additional hiring in complementary areas. Success in graduate education programs will also contribute to the attainment of this goal, through improvements to both recruitment and retention of faculty. In addition, we will need continual enhancements to grant administration, as the importance of administrative staff cannot be overstated. The submission of proposals and financial/administrative accounting of existing awards can be challenging, particularly for researchers who are often more focused on their academic questions that are the reason grants are awards are made. Thus we should hire, train, promote and reward the staff that can facilitate these processes.

**Space Utilization and facility needs**

To accomplish our goals in the area of undergraduate curriculum, we will need to:

- Dramatically improve and modernize our teaching space to provide classrooms and teaching labs for cutting-edge educational opportunities. In the context of the Genetics and Genomics major, this would require substantial updates and new equipment, as well as computer labs for bioinformatics work in the classes.
- Upgrade teaching facilities (the greenhouse rooms) with modern IT equipment and create better spaces for learning (problem-based learning environments).

To accomplish our goals in the area of graduate curriculum, we will need to:

- Offices for the expanded graduate student enrollment that we envision.
- A graduate teaching lab for methods-based courses in plant molecular biology.
- Improved, modernized laboratory space that will put students in different labs in close proximity, and will include desks in the lab or very close to the labs for graduate students will facilitate their work and help with recruiting.
- In the longer term, we will need to invest to improve and maintain the quality of our greenhouses, and growth chambers and field spaces to facilitate teaching of plant courses and the research performed by our graduate students, particularly if we are to strengthen horticulture, soils, and plant biology as we would like.
- Workshop facilities - Faculty need access to workshop facilities where faculty and students can fabricate and assemble instrumentation for field studies. This is a major need for plant, soil and water faculty who have programs that extend beyond the traditional laboratory. Such space is currently available in the college in our farmhouse facilities.

To accomplish our goals to enhance our research productivity, a high priority is improved research facilities. High-grade research facilities contribute in innumerable ways, including recruitment and retention of faculty, staff and graduate students, including facilitating high quality research and interactions among researchers, providing safe working conditions, providing flexibility in research activities as technologies develop and change. Given the poor state of Worrilow Hall, our department has taken a piecemeal approach of making the best of this low-grade facility, and seeking better space as it became available (e.g. DBI & ISE, and it was hoped, the Girl Scout Building). Unfortunately, faculty that remain in Worrilow Hall have research space that is of poor quality, which may affect the quality of research from these labs. This has and will result in a department that is increasingly fragmented, with faculty that don't well understand their colleagues' research programs, don't know their lab members, etc. The worst case scenario is that in their absence, faculty become alienated from the department. The best remedy is to bring faculty back together, but some are reluctant to give up the interdisciplinary space that they have come to appreciate (like at DBI). Thus, this should be retained by developing space that reunites PLSC faculty while pulling in colleagues from other departments and colleges – putting everyone closer together.

Thus we can envision the following steps to improve our research programs:

- Consolidation of PLSC faculty laboratories in one, modern, research building to mitigate the increasing decentralization that has occurred in pursuit of top-tier research space and to accommodate the space required for new hires in the department, particularly for laboratory space and post-doc/student office space which is currently not sufficient for existing faculty.
- Work together with other departments and colleges to ensure that this is also interdisciplinary space, thus replicating the strengths of DBI & ISE facilities.
- Maintenance and expansion of plant growth facilities. Our growth chambers and greenhouses are adequate at the moment, but may require expansion depending on the needs and productivity of our faculty.
- Workshop facilities - Faculty need access to workshop facilities where faculty and students can fabricate and assemble instrumentation for field monitoring. This is a major need for soil and water faculty who have monitoring programs that extend beyond the traditional laboratory. Such space is currently available in the college in our farmhouse facilities (currently under Bioresources Engineering).

**Needs from support units**

To accomplish our goals in the area of undergraduate curriculum, we will need to:

- Improve our IT technology for teaching genomics, bioinformatics, and distance learning, including improved desktop and laptop computers in faculty offices.
- Provide incentives for developing and teaching "recruiting courses."

To accomplish our goals in the area of graduate curriculum, we will need to:

- Vehicles/trucks for field sampling; workshop needs. Many of our research and extension faculty have field activities where faculty and students have to routinely collect samples from field sites near and far from the UD campus. While the department has two trucks (one just recently acquired from Bioresources Engineering) these vehicles are limited and not in the best of conditions. Future resources need to be allocated to purchase/provide new or used vehicles to faculty.

**Foundational Steps to be taken in 2014**

To address our aim of improving our undergraduate curriculum, we have several strategies:

- Recruit a larger number of incoming students into our programs.
- Make our programs and courses relevant and interesting to a greater number of students.
- Promote our majors, career opportunities, and courses to students.
- Promote the availability of research or internship opportunities for our best undergraduates.
- Promote our students and graduates for industry and government jobs.
- Consider online teaching methods for their utility and impact.

Thus, our activities to accomplish our goals in the area of undergraduate curriculum development include:

- Select titles for our majors and courses that reflect their content and offer options more attractive options to incoming students.
- Better advertise our majors and course offerings to prospective and current students.
- Teach more "recruiting" courses that engage undeclared students or students from other majors in exciting topics within plant and soil sciences. (i.e. a Farm-to-Table course that includes growing organically, popular foods, food preparation and presentation; Sustainable Landscaping course that includes rationale for sustainability and methods for incorporating sustainable concepts such as rain gardens, green roofs, meadows, reforestation, native plants in residential and public landscapes, etc.)
- Evaluate all current courses and eliminate or revamp those that no longer meet our goals.
- Provide research, training, and internship opportunities to our students.
- Implement an active learning pedagogy in more of our classes.

To address our aim of improving our graduate curriculum, we have several strategies:

- Increase participation in interdisciplinary graduate programs.
- Expand opportunities for training scientific staff/workforce for industry, non-profit and academia.
- Build a graduate component to the proposed Genetics & Genomics program that would include development of a 4+1 B.A.-M.S. program
- Expand teaching opportunities for graduate students, in part via TAing of the Genetics & Genomics courses.
- Increase graduate funding through training grants.
- Increase graduate enrollment in the Soils program through recruitment from our new undergraduate major.

Thus, our activities to accomplish our goals in the area of graduate curriculum development include:

- Identify and/or develop core classes for each of the emphasis areas in our graduate program.
- Increase graduate student participation in our own grad-level courses.
- We could potentially partner with other institutions, domestically or internationally, to develop these programs, co-teach courses via remote connections to expand our offerings and having larger groups of students.

To address our aim of improving our research programs, we have several strategies:

- Reunite research-focused faculty and their laboratories in one, modern, research building, while maintaining the interdisciplinary strengths of DBI & ISE facilities.
- Closely integrate extension staff and faculty into research.
- Hire in complementary areas to build on existing strengths.
- Work with our neighboring institutions to coordinate research, minimize overlap or duplication, and support common goals.

- Encourage faculty to pursue extramural funding from new and non-traditional sources including international groups, industry, commodity groups or foundations, private investors, and philanthropic organizations.

Thus, our activities to accomplish our goals to strengthen and grow our research programs include:

- Support and strengthen research programs of current faculty to retain the excellent research programs that are expensive and difficult to build.
- Strategic hiring to complement existing strengths in plant biology, plant-microbe interactions, environmental soil science, soil chemistry, and water science.

# MASTER PLAN: NEWARK FARM SUPPORT UNIT

## XIV. NEWARK FARM

**Mission**

To provide the services necessary to be successful in the areas of Teaching, Research and Extension/Outreach. Provide a forward thought process to enable the Newark Farm the ability to remain pertinent in the three mission areas. Institute a whole Farm ecosystem that all three areas listed above can benefit from, working together to remain successful as an Institution and for the greater good of the nearby community.

**Services provided**

The Newark Farm provides many services applicable towards the three mission areas.

Teaching:

1) Diversified land base indicated by departmental curriculum.

2) Facilities and animals for required curriculum.

3) Equipment for hands on instruction.

4) Instruction for classes provided by Professional and Salaried Staff.

- Limitations of services for teaching are labor, professional expertise and spatial needs

Research:

1) Typically all aspects and means to carry out on-farm projects in the form of land, equipment, labor, and technical guidance.

2) Allocation of materials and equipment when needed and possible

- Limitations are precision equipment (various generations thereof), irrigation, and spatial

Extension/Outreach:

1) Equipment, facilities and land base

2) Some professional expertise as it pertains to subject matter

- Limitations include precision equipment for planting plots, irrigation, land base for long term projects, and continued labor for large scale/long term projects.

**Budgetary Needs**

1) The Farm's operating budget has varied year to year depending on emergency needs and possible equipment upgrades. This is different than the proposed system of a fixed annual budget that includes funding for emergencies and upgrades.

2) Many aspects seem to be a grey area as to the Farm's responsibility to budget for items and services; hopefully these can become more clear. The College needs to develop a policy regarding what unfunded activities should be absorbed into the farm budget.

3) A cost center could be used to recoup expenses that do not fall within the defined farm budget.

**Staffing Plan**

1) Consideration to Farm staffing will depend primarily upon the direction the College will take in the next 5 years

2) Wholesale changes could reflect the attitude and new path the College may take, and therefore a restructuring would be needed and maybe a shifting of positions towards other areas

3) Reduction in Farm staff via unfilled positions are having a detrimental effect on morale and productivity

4) Areas that Farm staff are relied on that may not fit squarely within a person's job description or scope would need to be addressed.

**Outsourcing and Collaboration**

1) Areas for outsourcing and collaboration for the Farm are somewhat limited but possible

2) Outsourcing certain management aspects seem to be cost prohibitive but, if kept within the scope of our land base, could be acceptable

3) Outsourcing of specialized facets would be helpful when equipment and knowledge base is limited

4) Collaboration would be valuable with outside institutions and agencies to complete either common goals or accept specialized guidance

5) Utilization of other institutions in collaborative efforts would need to be reciprocal in nature or come at a cost

**Foundational steps to be taken in 2014**

1) Departmental desires and plans evaluated to determine steps necessary for success

2) Farm model for future discussed and determined if possible within the scope of departmental needs

3) Steps initiated to start whole farm plan and meshing of departmental philosophies

4) Staffing changes or restructuring to carry out long term Farm plan

## XV. FISCHER GREENHOUSE AND GROWTH CHAMBER COMPLEX

**Mission**

The Fischer Greenhouse Complex and Growth Chamber Facility provide the primary greenhouse space available to faculty, professionals, staff and students. The professionally managed facilities are dedicated to the acquisition and dissemination of knowledge thru research, teaching and outreach activities, extension demonstrations, departmental functions and sponsored student organizations.

**Services provided**

**a) Greenhouses**

All plant material within the greenhouse is maintained by greenhouse staff unless instructed not to by users of the bench space.

Maintenance of greenhouse plant material consists of daily watering, weekly fertilization with 21-5-20 fertilizer at 200 ppm N, and application of insecticides if an infestation is detected. Persons who have plant material within a greenhouse can request that fertilizer and/or insecticides not be used.

The greenhouse manager and supervisor routinely scout greenhouse space in an effort to identify the presence of insect activity in an effort to keep the level of infestation to a minimum. If an infestation is detected appropriate chemicals are applied to only the infested material rather than "blanket spray" everything in the greenhouse. This technique is used in an attempt to lower the amount of chemicals introduced into the environment as well as lessen exposure to the applicator as well as all persons using greenhouse space.

Whenever possible the use of biological insecticide is used in an attempt to reduce the amount of toxic chemicals introduced into the environment.

Greenhouse bench space is provided for growing plant material that is related to educational and research projects being conducted under the supervision of a faculty member or by a sponsored student organization.

Location of assigned bench space is determined both by the environmental conditions required for the crop or the type of plant material being grown.

Specific zones within the greenhouses are reserved for growth of transgenic plant material, as required by law, and for plant material inoculated with pathogens.

Greenhouse staff will assist users of the facility with proper disposal of plant material when no longer needed. Any biohazards are properly boxed for pick up by Occupational Health and Safety Department.

Growth medium and containers and miscellaneous supplies are provided for all users of the greenhouses regardless if the plants being grown are for teaching, research or outreach purposes. Funding for all greenhouse materials comes directly from CANR.

**b) Growth chambers**

The Fischer Growth Chamber Facility is primarily used for research purposes. U of D faculty, students, graduate students and researchers from DBI make up the users of the facility.

All plant material within the growth chamber complex is maintained by the researchers in charge of the project. Greenhouse staff is not responsible for maintaining research plant material within a growth chamber in any way.

Replacement light bulbs and ballasts, as well as routine maintenance of air and water lines within each chamber are conducted by greenhouse staff.

Greenhouse staff will assist users of the growth chambers with setting the environmental conditions within each chamber.

Greenhouse staff will monitor all growth chambers on a daily basis to ensure each unit is operating at the set conditions, and make any adjustment necessary to bring conditions back to the required range if necessary.

Greenhouse staff will assist users of the facility with proper disposal of plant material at the conclusion of a project.

**Budgetary Needs**

Currently the operating budget for the greenhouse and growth chamber facility complex is funded solely by CANR. Supplies used from greenhouse inventory are used for both teaching, research and outreach needs. As all departments within CANR utilize the greenhouse facility to some extent it was determined in 2010 that the cost of materials used in the growth facility complex on a routine basis be funded by CANR rather than try to divide the costs between each department.

Future consideration should be given to the possibility of charging researchers for supplies used from greenhouse inventory. Currently all supplies taken from greenhouse inventory for use at the DBI facility are charged back to the individual lab that used the supplies on a quarterly basis. This policy could be put into effect for researchers working within the Fischer complex that use supplies from greenhouse inventory.

Supplies used for teaching and educational purposes are more easily accurately budgeted for as they occur on a regular basis dependant on the number of courses offered during a semester. Supplies used for research purposes vary greatly over the course of a year and as a result are difficult to accurately budget for. Consideration for greenhouse supplies needed for a project (growth medium, containers) could be added into the total funding needs when a research project is in the planning phase. Greenhouse supplies used by researchers can be tracked by the greenhouse manager and then charged to a purpose code to reimburse CANR for the cost of the actual materials used. The tracking of supplies might be a tedious task but it would insure that expenses remain within budgeted levels. Supplies used for educational purposes should continue to be funded by CANR as they are used by students paying tuition for the privilege to enroll in courses that require use of the greenhouse and related supplies.

**Staffing Plan**

Current greenhouse staff consists of the Growth Facilities Manager, the Greenhouse Supervisor, and one part time miscellaneous wage employee. Weekend watering is covered by two students that alternate weekends. If there is a conflict with students covering a weekend the Growth Facilities Manager or the Greenhouse Supervisor cover the watering responsibilities for that weekend.

The current amount of staff is sufficient, and should remain sufficient, to operate the existing greenhouses into the future. If the current greenhouse facilities are expanded the possibility of adding an additional miscellaneous wage employee should be considered.

**Outsourcing and Collaboration**

Our current greenhouse facilities are sufficient to handle the current space demands for educational and research purposes. Space demand reaches 100% during the months of February, March, April, and May. Occupancy is close to 60% the remaining months of the year. The possibility of developing courses or outreach programs that would involve use of greenhouse space during current periods of under usage could be considered in an attempt to get maximum usage of the greenhouse facility year round.

**Foundational steps to be taken in 2014**

### a) Greenhouses

In an attempt to keep all environmental systems in working order we currently maintain an ongoing three year plan to budget for potential capital improvements and repairs to the greenhouse complex. Input from the Greenhouse Advisory Committee, made up of a faculty member from each of the departments within CANR, is used to determine any potential future needs or changes they would like to see happen within the greenhouse. By continuing to involve all possible users of the greenhouse facilities in planning decisions helps to assure the future needs for all departments within CANR are taken into consideration. Time periods longer than 3 years can be considered for large scale budgeting purposes.

Currently repair or replacement of all existing fans, motors, valves, lights, pumps and other mechanical systems is completed by U of D union shops at no additional cost to CANR. If this policy were to change at any time in the future additional budgeting for such repairs will need to be considered.

The Priva greenhouse environmental computer that operates all the mechanical systems within Fischer greenhouse was recently upgraded in 2013. This upgrade was necessary as the previous operating system was 13 years old, becoming unreliable and obsolete. This upgrade will enable Fischer greenhouse to operate efficiently far into the future. The new system will be monitored daily to ensure all systems are adjusting properly to the new operating software. This recent upgrade in 2013 eliminates the need for any capital improvements in 2014 as far as the greenhouse facilities are concerned.

The South greenhouses were completely refurbished in 2007, with all new modern environmental control systems. All systems will continue to be monitored daily in an attempt to keep everything operating at peak efficiency.

Greenhouse staff will continue to do annual preventative cleaning and lubrication of all greenhouse mechanical systems (vents, vent motors, shade cloth motors, pad wall pads) in an effort to reduce the potential for unexpected costs as a result of mechanical breakdown of environmental control systems.

Currently all landscaping and teaching equipment used jointly by greenhouse and UDBG staff is stored within two 12" X 24" sheds. Both sheds have leaking roofs and wood rot issues that need to be addressed. The roof of one of the sheds was covered in plastic in 2011 as a temporary fix to slow deterioration of the structure. To allow for future expansion of storage needs replacement of the two existing sheds with one larger pole barn structure could be considered. Putting up one larger structure cans actually be more cost effective than replacing both sheds with new ones the same size.

### b) Growth chambers

The cost of maintaining all growth chambers in proper working order and supplying replacement light bulbs and ballasts currently comes out of the operating budget of the greenhouse and growth chamber facility. Routine maintenance of the chambers is conducted by greenhouse staff whenever possible. Occasionally professional help is called upon if the issue is of a particular technical variety. The possibility of purchasing a maintenance plan from an outside contractor, such as Namco Cascade Inc., that would cover annual maintenance and any necessary replacement parts could be considered. We currently have opted not to have a maintenance plan due to the high cost involved. Spreading the cost of a maintenance plan amongst the users of the growth chamber facility could be a possible consideration to make such a plan more cost effective. Users of growth chambers that are most concerned about possible down time if a unit requires a replacement part are most likely to support this idea.

To avoid potential scheduling conflicts with growth chamber users we need to develop a system by which individual researchers can view the upcoming research projects of other labs in order to better schedule use of the limited amount of growth chamber space. A web site could be developed by U of D IT for such a purpose.

The particular experiment or plant material being grown in a chamber can determine if several researchers can share a chamber or if they require their own unit. This sometimes results in a chamber being only partially occupied for the duration of an experiment. Future emphasis should be on sharing space whenever possible in order to use existing growth chamber space efficiently.

Generally all 9 of the growth chamber units in Fischer are occupied with research projects and there are several potential users waiting a turn for space. Our facility has space and existing infrastructure to accommodate another growth chamber unit. Consideration should be given to the possibility of adding another unit to handle any future increase in demand for growth chamber space.

## XVI. ACADEMIC PROGRAMS AND STUDENT SERVICES

**Mission**

The Office of Academic Programs and Student Services Office manages the effective delivery of all undergraduate recruitment and academic advising functions and student support services in the College of Agriculture and Natural Resources.

**Services provided**

1) ***Academic Advisement and Support***
   - Coordinate and support academic advisement to all new and current students
   - Maintain students' academic records; manage degree progress; certify graduates
   - Interpret and administer UD academic policy to students, faculty, advisors, and staff
   - Advise students in the ANR interdisciplinary major (Approximately 80-100 students per year)
   - Meet students experiencing academic difficulty
   - Monitor students involved in personal/family crisis, verify documentation, notify instructors of absence from class
   - Approve course substitutions and waivers to academic program requirements, authorize change of grades, major and other requests
   - Make student referrals and encourage participation in on-campus resources
   - Assist students in ways to ensure their personal and academic success
   - Respond and resolve undergraduate student and parental concerns and complaints
   - Monitor internal applications, admissions, course scheduling
   - Make recommendations for changes in academic policy
   - Assist and consult with CANR Courses and Curriculum Committee
   - Evaluate and approve CANR readmission applications
   - Work daily with students and faculty through in-person, telephone, and written and electronic correspondence
   - Dean's List, probation, dismissals, and retention mailings

2) ***College Promotion and Undergraduate Recruitment***
   - Coordinate all undergraduate recruitment activities including over 100 customized prospective student visits per year, Exploration Days, mailings, emails, and calls to prospective and admitted students
   - Revise all recruitment brochures and handouts, Admissions Curriculum Guides.
   - Oversee and direct the Ag Ambassador Program
   - Manage the undergraduate prospective and current student portion of the CANR website
   - Maintain the Talk of Townsend", our online undergraduate student blog
   - Assist with the development of "major" videos and student noteworthy news articles

3) ***Special Event/Program Management***
   - CANR Convocation
   - CANR New Student Orientation
   - The ANR major which is CANR's interdisciplinary major
   - CANR "U-Can-Do-It" program for students on academic probation

**Services not provided**

- Graduate Student Support: Although we currently make revisions to the graduate portions of the catalog, we are responsible for serving the undergraduate student population only. Since graduate students have the same academic and personal needs as undergraduate students and there isn't an "Academic Programs" type office in the college, we recommend adding a graduate services coordinator position. Most graduate faculty coordinators are NOT comfortable providing these services or referrals.

**Budgetary needs**

- CANR Communications to produce new website, publications, and social media campaigns for unit to use with prospective and current students.
- CANR Communications and Facilities staff to make improvements to common areas, TNS lobby, messaging on bulletin boards, etc.

**Staffing plan**

Increase staff by at least two professional members in the next 1-2 years. Growth of staff should correlate with planned growth (15% increase by 2015) of the student body and student services offered. With two additional staff members, the current Academic Programs and Student Services Office would be in a much better place to deliver proactive versus reactive advisement and support.

- Internships & Career Counseling - One of the things that prospective and current students ask about most often is how our college supports and connects students to internships and career opportunities. These proposed new positions would work closely with our academic departments and UD's Career Services Center, promoting internships, seeking, finding, and creating new opportunities for students, meeting and building relationships with employers, and assisting outside companies in building internship opportunities for our students. Essentially, these positions would be responsible for doing whatever it took to make it easier for our students to get connected and to get a head start on the internship and career-seeking process which is important in working with today's college student.
- Assessment of our Advisement and Academic Services - One of the ways to know if we are doing well in the eyes of our students is to assess them on a regular basis to ensure that we as a college are providing the academic and advising services that we've promised and that students have come to expect. These proposed new positions could be responsible for developing a Student Satisfaction Exit Survey in addition to other surveys during the academic year and would benefit our office and college in learning what we're doing right and where we need to improve (i.e. advisement models we practice, support we provide, advisor training that we offer, etc.).
- Retention – Responsible for initiating and developing ways to retain our students (including traditional, transfer, and international) especially our first-year student population who are most vulnerable and have the most challenging time making connections (i.e. welcome postcard, routine majors meetings, birthday cards, study nights, study skills and time management workshops).
- Advisement - With an increase in our ANR major population and potentially the addition of all Agricultural Education advising for the college in the not so distant future, dividing this group of advisees among 2-3 staff members instead of just 1 would benefit the students and provide them with more support and personal attention. In addition, UD's International numbers are continuing to increase and for those students coming through special CANR and UD articulation agreements, having an individual to work with this special population is essential to their success. These staff members can also initiate work with recruiting transfer students and advise other majors in the college if we were to move towards the hybrid advising model mentioned in this report.

**Outsourcing and Collaboration**

- Ag Day – This event does not have anything to do with the mission of this unit and will be outsourced.
- South Campus Classroom Scheduling- Recommend Registrar's Office in collaboration with a support staff member in each department oversee this process.
- Scholarship Coordination – Process would benefit from collaboration with CANR Development Director, CANR Financial Manager, and departmental designees.
- Catalog Revisions – Currently all revisions from all CANR units are submitted and coded. Departmental support staff can be training to revise their departmental sections.

**Foundational steps to be taken in 2014**

A. Office In General

- Name Change - Change to "Office of Undergraduate Student Services" or "Office of Undergraduate Student Support Services" to reflect true mission of unit.
- In less than 1 year, become more proactive versus reactive advising office by providing more programming for current students.
- In less than 10 years, serve as an institutional, regional, and national model for recruitment, advisement, and the retention of students by becoming active leaders in our national advising organization. (NACADA)

B. Undergraduate Recruitment

- Revise current recruitment timeline - to better utilize resources and possible overlapping of efforts with the CANR Communications staff, and Admissions.
- Faculty Involvement – Discuss with departments, ways to promote increased and improved participation and have faculty take more ownership over the recruitment process. How can we get away from the, "someone else is taking care of that" attitude?
- Departments must provide value propositions - Each major should have at least 3 value propositions for unit to use with messaging to prospective students.
- Facilities - College commitment to provide a more welcoming atmosphere for families entering CANR facilities. In addition, it would benefit us by having more space for prospective families to meet faculty and current students that is separate from the advising office for current students (i.e. waiting room, presentation room)
- Vehicle for CANR Tours - Vehicle for Ag Ambassadors to use for tours rather than using visiting family vehicles.

C. Academic Advising

- New Advisement Model - Investigate instituting a hybrid academic advising model whereby students would be advised by professional advisors in their FR and SO years and faculty mentors in their JR and SR years.
- Develop assessment process for future advising practices
- Establish advising awards for faculty and staff around the college to promote and reward good advising practices
- Develop automated graduation clearance process so that more focus can be placed on advising
- Develop additional non-traditional advising modes of communication to students (i.e. YouTube Advising Videos, Student blogs)
- Revise ANR interdisciplinary major to make more academically rigorous and to have a more focused theme (i.e. sustainability; agricultural communication)

D. Student Retention and Success

- Investigate Career Services liaison having office hours in TNS Hall
- Coordinate satellite tutoring services by Academic Enrichment Center offered in TNS
- Establish more intrusive advising and programming by intensively following-up with students
- Assess the current U-Can-Do-It program for students on academic probation
- Establish Big Brother/Big Sister type program where seniors are paired with new students to provide transitional support.

E. Technology

- Work with CANR IT to develop or support an online appointment management system for prospective and current students for scheduling visits and advising appointments AND a client relationship management system to track interactions and automate responses with prospective students.

## XVII. COMMUNICATIONS

**Communications Mission:**

All communication efforts are directed to the primary target audiences of the University of Delaware's College of Agriculture & Natural Resources, in order to increase enrollment and create, strengthen and/or retain constituent support. Communication efforts are equally dedicated to conveying the institution's impact on the community, state, nation, and world to external and internal publics.

**CANR Vision Statement:**

The College of Agriculture & Natural Resources envisions itself as an exceptional contributor to solving the grand challenge of feeding the world while protecting the earth's natural resources.

**Resources:**

CANR's Communications Office provides support services for faculty, staff, students and partners of the College through the work of a web developer, feature writer, part-time photographer, off-site/part-time graphic designer, and a communications manager. The support services provided by the team include: website design and maintenance, social media coordination and support, professional feature writing for UDaily, special event planning/organization and support, photography and videography, product development, and special projects coordination.

The size and scope of the office has not kept pace with the demands of a College that continues to grow its enrollment and aspires to increase its regional and national profile. The overall goals of the Master Plan necessitate a communications structure that is strategic and proactive in its ability to enhance the College's visibility, strengthen relationships with College constituents, position the College competitively, and reinforce the University's brand through the College's image. The office should then serve its CANR client base by pro-actively developing and managing strategic public relations, media relations, integrated marketing (including online tactics), and publication efforts.

An increase in the professional expertise of the team and the expansion of professional labor is needed to effectively meet communication objectives, reach existing and expanding target audiences, and provide a more efficient structure to deliver communication services. A proposed split with CANR's IT helpdesk arm would provide an opportunity to establish a more focused communications office; web development would be retained within the Communications Office.

The following professional additions would strengthen the effectiveness of CANR's communication activities, enhance the office's skill sets and ensure that the College's core messages are consistently being imparted on external and internal fronts:

- Special Events Coordinator/Administrative Assistant (Full-Time for 2014) to plan and implement major CANR events that draw increasingly large audiences (i.e., Ag Day, Evening in the Garden, Worrilow Award Ceremony, legislative-related events, etc.), as well as provide administrative support to the Communications Office. [*Possible cost-share opportunity w/Cooperative Extension, which the director is in agreement with*.]

- Publications Specialist (Full-Time for 2014) to assist in writing marketing copy for brochures, recruitment materials, proposed new electronic newsletter, proposed new annual report; assist in editing all copy before/after design; work with part-time graphic designer and University Printing; coordinate production schedules; and work with vendors for marketing products.

- Cooperative Extension Communications Liaison (Part-Time for 2015) to assist in working with designated Cooperative Extension contacts to identify regular opportunities for visibility, and identify and implement new opportunities for incorporating social media into communication efforts.

The Office of Communications Marketing (OCM), the University's main communications organ, has recently undergone a reorganization that is designed to be more strategic and goal-oriented, as opposed to reactive and responsive to disparate requests across campus. With an emphasis on proactive planning and a focus on external communications that will position UD as a world-class research institution, OCM will now rely on college communicators housed at the seven colleges to funnel all requests made to its main office. In addition, OCM has activated the communication managers at the various colleges as press officers who will engage in selective media pitching in order to help secure broader news coverage; press officers will be able to pitch news stories to select reporters in consultation and collaboration with OCM.

A strengthened CANR communications unit can help OCM expand public awareness of the University by promoting messages that, at the same time, advance the goals outlined in the College's Master Plan.

A strategic communications action plan follows that has been themed according to needs identified in the Master Plan that relate to visibility, recruitment, advocacy, and relationships.

CANR Communications Office Action Plan

**Strategic Initiative I – Visibility**

CANR's Communications Office will develop a communications program to raise local, regional and national awareness of CANR's strengths in cutting-edge research, compelling work of faculty and Cooperative Extension, as well as exceptional efforts of students to help solve the world's challenge of sustaining agriculture and natural resources into the future.

*Goal One: Create a system for regularly securing news story ideas about CANR faculty, research and students; faculty experts on current national trends/issues; topics for social media campaigns; and marketing initiatives.*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Establish a CANR Communications Committee, chaired by the communications manager and comprised of representatives from each of the four academic departments, Undergraduate Services, and Cooperative Extension, to discuss on a monthly basis regular news story ideas, trend/research topics (i.e., STEM projects for K-12), world events tied to specific CANR faculty expert analysis, social media campaigns, value propositions from each department, and CANR marketing initiatives. Each month, the committee will also review topics scheduled for faculty workshops and presentations. It will also discuss ways to convey compelling research in layman's terms that create relevance/immediate significance for general publics. | 2014 | Increase local, regional and national print and electronic feature stories | Communications Manager |

**Strategic Initiative – Visibility continued**

*Goal Two: Actively pitch the local, regional and national print/electronic news media with an array of targeted stories, leads and visual resources to increase positive coverage of CANR.*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Collaborate with OCM to secure strategic news coverage:<br>• Submit 1 national story idea each quarter to OCM that it can pitch nationally (March, June, September & December)<br>• Pitch 1 story per month to trade journals and inform OCM of the nature of the pitch at the end of every month<br>• Identify 3 underutilized faculty experts who are working on current/timely research or have expertise in a current trend topic. Arrange media training w/OCM for possible media usage.<br>• Secure opportunities for experts to be quoted.<br>• Look for 3+1 stories = energy, environment & health | 2014 - | Increase local, regional and national print and electronic features | Communications Manager & Communications Specialist |
| Build strong, professional relationships with regional media. OCM to arrange personal visits with reporters to introduce CANR communications manager to features reporter at *The Newark Journal*, and reporters at WDDE-FM (NPR affiliate in Dover) & WBOC-TV 16 | 2014 - | CANR faculty & Extension staff are positioned as viable expert sources for the media. | Communications Manager |

**Strategic Initiative – Visibility continued**

*Goal Two continued*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Work with OCM to help organize a Southern Delaware media tour for President Harker & Dean Rieger | Spring 2014 | UD is positioned as a university leader in agriculture & natural resources | Communications Manager |

*Goal Three: Utilize news service mechanisms to increase local, regional and national coverage*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Utilize tools designed to monitor journalists who are searching for expert sources (i.e., mymediainfo.com, MeltWater, etc.) | 2014 - | CANR faculty & Cooperative Extension staff are positioned as viable expert sources for the media. | Communications Manager |

**Strategic Initiative – Visibility continued**

*Goal Four: Implement proactive strategies to promote CANR at all times*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Be ahead of the story by staying abreast of critical issues and subsequent developments that may be of interest to key reporters. Ensure a clear line of communication with OCM and disseminate facts quickly. | 2014 - | Messaging is on-point | Communications Manager |
| Write talking points for consistency of message for administrators. | 2014- | Messaging is on-point | Communications Manager |

**Strategic Initiative – Visibility continued**

*Goal Five: Utilize comprehensive online tactics to promote and market CANR in a way that elevates the College's academic reputation; promotes its distinctive qualities, including Cooperative Extension; and highlights the quality of faculty, Extension staff, research, academic programs, and undergraduate & graduate students.*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Create a new CANR website, complete with a new domain/new web server, that engages prospective students, is easy to navigate, ranks better on search engines, provides information about faculty and research, gives information about jobs to students, provides a redesigned template for departmental webpages, etc. Designated categories: Future Students, Current Students, Alumni, Faculty & Staff, Extension, Research, Give Back, UDairy Creamery, News, Events, & Get Social | January/ early February 2014 | Attracts prospective students; easier to navigate; increases traffic & ranks better on search engines | Web Developer |
| Schedule and rotate primary photos on a two-week cycle | 2014 - | Audiences remain engaged | Web Developer & Photographer |
| Establish web links to and from local information sources:<br>• High School Web Sites<br>• Pertinent Agriculture/Natural Resource Web Sites in DE | March & April 2014 | Maintain connection to important sites | Web Developer |
| Train four (4) designated department web content managers to update department content regularly | February – March 2014 | Department pages are up-to-date and consistent | Web Developer |

**Strategic Initiative – Visibility continued**

*Goal V continued*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Establish a faculty/staff social media task force that will:<br>• Develop a strategic social media plan/calendar for CANR & Extension<br>• Develop best practice guidelines for social media use & online sharing; promote w/faculty and staff<br>• Expand expertise by training staff in the use of key social media platforms | 2014 | Connect with existing and new target audiences | Communications Team, including Extension Communications Specialist<br>eXtension Fellow Michele Walfred via grant |
| Establish designated Cooperative Extension communication contacts in Lawn & Garden, Family & Consumer Sciences, Agriculture & Natural Resources, and 4-H Youth Development. Communication contacts will be trained to help develop web/social media content on a monthly basis, and then push out content/messaging. | 2014 | Increase visibility of Cooperative Extension content | Web Developer & Extension Communications Specialist |
| Target social-media savvy faculty to encourage their students to engage in CANR posts and social media campaigns by offering extra credit | 2014 | Engage CANR students & encourage others to "come over the bridge" | Communications Team, including Extension Communications Specialist |

**Strategic Initiative – Visibility continued**

*Goal V continued*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Collaborate with OCM on purchasing an account with Hootsuite Enterprise that will enable all of CANR's social media accounts to be linked & accessed from one location. | 2014 | Efficiency will be achieved by being able to use one platform to maintain, analyze and push content. | Web Developer & Extension Communications Specialist |
| Utilize Storify to collect media from across the web on a particular event/topic and tell its entire story via the most relevant social media posts. | April 2014 | Efficiency will be achieved by allowing the user to track all aspects of a story in one location. | Web Developer & Extension Communications Specialist |
| Implement Phase II of the website redesign (cosmetic only): Cooperative Extension. Designated categories: Kent County, New Castle County, Sussex County & Carvel Research Center | June – August 2014 | A web presence is created that is married to CANR's web design/ encourages social media engagement | Web Developer & Extension Communications Specialist |

**Strategic Initiative II – Recruitment**

*Goal One: Develop primary print and electronic recruitment materials to support outreach efforts, target prospective student audiences, and help increase enrollment & retention.*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Feature 2-minute videos on the web of CANR classes in action, faculty and students working on visually-stimulating research projects, STEM initiatives, dynamic events, etc. Schedule a series of 4 videos each semester. | April 2014 | Prospective students see CANR as an exciting place to be | Communications Team |
| Produce an engaging undergraduate viewbook that targets prospective students and their parents.<br>• Create an online version, which features digital page-turning, following print production.<br>• Create a corresponding poster for guidance counselors' offices. | End of July/Early August 2014 | Prospective under-graduate students envision themselves at CANR & apply. Book demystifies "Ag" stereotype. | Communications Manager & Communications Specialist |
| Produce an engaging graduate viewbook that targets prospective graduate students and highlights research work performed at CANR.<br>• Create an online version, which features digital page-turning, following print production. | End of July/Early August 2015 | Prospective graduate students see the compelling research work performed & apply. | *Publications Specialist & Communications Manager |

**Strategic Initiative II - Recruitment continued**

*Goal one continued*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Produce departmental e-newsletter templates that are in sync with CANR's website and UD brand identities, so departments can write and distribute quick updates in their areas once each year to prospective undergraduate students. Departments would write the content and the Communications Office would provide final edits. Departments would also distribute the e-newsletter. | Distribution will be determined by the best time in the recruitment cycle | Prospective undergrad students see the compelling work being done by CANR faculty & students. | *Publications Specialist & Web Developer |
| Redesign and update content for existing two-sided program fliers for recruitment visits. Ensure design is in sync with CANR's website and UD brand identities. | January 2015 | Detailed program information is provided | *Publications Specialist & Part-Time Graphic Designer |
| Design two (2) Cooperative Extension templates, in keeping with the new marketing materials, for the recruitment of program participants and master volunteers (electronic & hard copy) | January 2015 | Detailed program information is provided | *Publications Specialist & Part-Time Graphic Designer |

**Strategic Initiative III – Advocacy**

CANR will effectively articulate the College's connection to the needs of Delaware and its citizens. The College will educate the public about CANR students served and generate a steady stream of general visibility to set the social, political and economic climate that will support policy reform.

*Goal One: Increase legislators' awareness of the need to support CANR*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Establish an annual legislative breakfast for elected officials prior to the General Assembly where the dean presents the state of CANR & its needs; two students discuss how CANR has impacted their lives significantly; and a recipient of Extension services discusses the value of the services received. Theme the breakfast and remarks each year around an identified CANR need (i.e., secure renovation of Worrilow Hall). Invite students, faculty, key administrators & alumni to sit at breakfast tables with legislators and engage them w/ their individual stories. | 2015 | Legislators connect with constituents & learn more about CANR's critical needs | Communications Manager |
| Schedule a special Legislative CANR day where a group of students visit the offices of key elected officials to discuss the value of their CANR experiences and the need for continued support. | 2015 - | Voting constituents persuade legislators to support CANR | Communications Manager & Government Relations |
| The dean will meet one-on-one with key legislators in August/September to discuss CANR trends for the year, where newly enrolled CANR students are coming from, Extension highlights, and provide an update on CANR as well as where support will be needed. | 2014 - | Legislators' awareness about the needs of UD/CANR are increased | Communications Manager & Government Relations |

**Strategic Initiative III – Advocacy continued**

*Goal Two: Engage Legislators on a Regular Basis*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Create a consistent flow of information promoting key events/great news by Tweeting, posting on FaceBook, e-mailing links to any major media placements, etc. | 2014 - | Legislators become more connected to CANR | Communications Manager |
| Upon their graduation, identified CANR alumni write their respective legislators about their experiences, jobs that have resulted, and advocate for the continued financial support of CANR. | 2014 | Voting constituents persuade legislators to support CANR's need for funding | Communications Manager & Director of Development/ Alumni |
| Invite legislators regularly to key events where they will have visibility with their constituents (i.e., Ag Day, Evening in the Garden, Extension Offices/Field Days, Research Trials, etc.) | 2014 | Legislators become more connected to CANR | Communications Manager & Dean's Office |

**Strategic Initiative IV – Relationships**

CANR will strengthen its relationships with constituents in the Delaware community and develop more strategic relationships across sectors to enhance the College's image.

*Goal One: Engage and inform key constituents regularly about the dynamic work performed at CANR; target advisory board members, alumni, prospective donors, critical members of the agricultural and natural resource community in Southern Delaware, existing & future business partners, elected officials, etc.*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Repackage select UDaily features on the compelling work of faculty, students and Extension staff, & produce a brief e-newsletter to email to primary groups of stakeholders three times each year. In addition to 4 or 5 feature stories, the e-newsletter would feature a short letter from the dean and lots of photos. | 2015-<br>September<br>February<br>June | Stake-holders feel connected to CANR and are apprised of important occurrences on a regular basis. | Communications Manager & *Publications Specialist |
| Produce a themed annual report that includes a message from the dean, highlights the year, features financials, highlights a report of gifts, details progress on the journey of the Master Plan, etc. | January 2014 | Stake-holders are assured of the direction of the College & feel vested | *Publications Specialist |

**Strategic Initiative IV – Relationships continued**

*Goal Two: Utilize major events to strengthen connection to constituents*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Capitalize on events by inviting and courting targeted groups of stakeholders:<br>• AG Day --- Invite UD Board of Trustees & CANR Advisory board members to lunch on the grounds.<br>• Evening in the Garden --- Invite prospective donors, alumni & parents of Ag Ambassadors.<br>• Worrilow Award Ceremony --- Invite members of the business community who may have immediate ties to the award winners.<br>• Lasher Lab Renovation Ribbon Cutting Ceremony --- Invite elected officials, donors & prospective donors, members of the business community, key alumni & parents | 2014 activity dates | Strengthen existing relation-ships | Administrative support designated for each event |

*Goal Three: Engage local business and community groups*

| Action Items | Timeline | Anticipated Outcomes | Lead |
|---|---|---|---|
| Secure invitations for the dean to speak with local ag and business groups about the work being done at CANR, and CANR's commitment to the Delaware community. Make sure the important work of Cooperative Extension is conveyed. | 2014- | Increase presence in the local community & establish new partnerships | Communications Manager |

**Conclusion**

The proposed strategic communications plan is designed to help increase the overall awareness of the College on regional and national levels, as well as to aid its increase in enrollment and create, strengthen and/or retain constituent support. The plan's suggested communication efforts highlight CANR's distinctive qualities, particularly the compelling research that is conducted by seasoned faculty, as well as its overall goal to be an exceptional contributor to solving the grand challenge of feeding the world while protecting the earth's natural resources.

To effectively communicate and market CANR to a variety of target audiences, the Communications Office, in concert with OCM, must use a variety of strategies and consistent messaging. As mentioned previously, the overall goals of the Master Plan necessitate a communications structure that is strategic and proactive in its ability to enhance the College's visibility, strengthen relationships with College constituents, position the College competitively, and reinforce the University's brand through the College's image. The professional addition of a special events coordinator/administrative assistant, publications specialist, and Cooperative Extension communications liaison would strengthen the effectiveness of CANR's communication activities, enhance the office's skill sets and ensure that the College's core messages are consistently being imparted on external and internal fronts.

The Communications Office is aligned fully with CANR's Master Plan and the members of its team are enthusiastic about future possibilities.

**Appendix 1; Items from programmatic units**

The items below are specifically pulled from the draft Programmatic Unit Plans (Departments and Cooperative Extension). Some units specifically mention communications items, while others simply infer it. It will be important in the finalization of the master plan to put some more concrete text around the needs of the programmatic units.

**ANIMAL AND FOOD SCIENCES**

Communications is inferred throughout the plan, with no specific items or mention.

**APPLIED ECONOMICS AND STATISTICS**

Communications and Information Technology (combined)

- Students' first impression of an academic department is determined by their view of the website. It is crucial to have a current and informative website for recruitment and dissemination of important information.
- Most notably we are lacking in technical assistance for web development and maintenance, computers, software, and support for research. We have been doing the best possible with what is currently provided by the college.
- There is an urgent need for a major overhaul and redesign of our departmental webpages across the college.
- The centralized administration of technical and web development support has been inadequate and quite limited in meeting our departmental needs. For example, we have been asking for help in revising the structure and content of our department websites for almost two years and have yet to get the type of assistance we need.
- The allocation of more resources to web design/maintenance and general IT may be needed to complement the role filled by one single web designer in CANR.
- Faculty and staff members of APEC would like to have more access to making basic updates to the content of our departmental website.

**COOPERATIVE EXTENSION**

**Goal: Enhanced Educational delivery through facilities and distance technology enhancements.** Maintaining sustainability of extension also requires preparing for the next generation of learners and their desired methods of learning. A hybrid of distance technologies involving synchronous and asynchronous methods along with traditional face-to-face methods is needed. (Support Units-IT and Communications)

Recommendations Short Term:

- Continue development of eXtension resources including Ask and Expert (roll out July 2013) and online course content.
- Continued development of web capacity for marketing and content.

**Goal: Communications Enhancements. Cooperative Extension is heavily dependent upon the communications unit and IT for assistance in the development, marketing and delivery of education programs as well as for the informing multiple forms of stakeholders about the outcomes and accomplishments of the program such as federal and state legislators, related industry, state and local agencies, other land grant universities and the constituents themselves. A unified statewide message is needed. (Support Units-Communications and IT)**

Recommendations Short Term:

- Incorporation of National Branding into UD Cooperative Extension Brand and use broadly to establish name brand recognition.
- Initial "Ask an Expert" as part of Extension web presence and linkage to national Land Grant eXtension System
- Further develop web presence including YouTube, on line courses and certificate programs.
- Key message points of plan of work translated into a public piece
- Establishment and institutionalize social media efforts
- Communication strategy related to strategic initiatives in this plan (i.e. move to more statewide work, rationale for cost recovery and assistance in communicating the transition, areas of programmatic expertise.

Recommendations Long Term:

- Establishment of regular communications with federal and state legislators, related industry, state and local agencies and constituents about Extension outcomes and accomplishments.
- Incorporation of new communication technologies as they develop.

**ENTOMOLOGY AND WILDLIFE ECOLOGY**

- The availability of and instruction in how to use current web-based design tools. For example, instruction in how to use WordPress, Dreamweaver, or other web design programs, how to create applications, how to track web traffic for evaluation purposes, etc.
- Most of our faculty would benefit from increased technical support for our websites. We have several that need maintaining and updating (e.g., Biological Control, FRAME, MARUS, Planthoppers).

**PLANT AND SOIL SCIENCES**

Communications and Information Technology (blended among areas in the plan)

1. Grow and enhance undergraduate education

- Recruit a larger number of incoming students into our programs.
- Make our programs relevant and interesting to a greater number of students.
- Promote our majors, career opportunities, and courses to students.
- Promote the availability of research or internship opportunities for our best undergraduates.
- Promote our students and graduates for industry and government jobs.

## XVIII. INFORMATION TECHNOLOGY

**Services provided**

### a) Desktop, hardware and software support

Staffing: Yohannes Tesfaye

- Provide recommendations and support for the purchase of new PC and Mac computers
- Provide repair and troubleshooting support for existing machines
- Provide software recommendations for faculty and professional staff and purchase as needed
- Refresh computers/machines as needed
- Transfer files and applications from old computers to new computers

### b) Computer lab oversight & classroom technology

Staffing: Yohannes Tesfaye

- During computer lab hours, provide printing services for posters sized maximum 42" by 54".
- Maintain and provide support for the following:
    - Teaching Lab, 007 TNS
    - GIS/AutoCAD Lab, 006 TNS
    - Computer Lab, 004 TNS
- Support classroom technology for CANR scheduled teaching spaces and centrally scheduled (TNS 132, 009, 002) as needed and in conjunction with University Media Services.

### c) Distance technology

Staffing: Yohannes Tesfaye

- Provide software and hardware support for Adobe Connect and Polycom/ITV/H323 systems
- Work with Director of Extension and county Extension directors to maintain distance technology support and new installations of technology throughout county Extension offices

### d) Server and email support

Staffing: Greg Keane, Yohannes Tesfaye

- Manage the overall security and function of the computing environment and infrastructure
- Manage email (College hosted Microsoft Exchange)
- Manage U Drive (file storage)
- Provide guidance and support for computer back ups
- Maintain an inventory of all CANR Mac users and ensure backup of all machines
- Maintain an inventory of all server systems and plan for needs associated with all
- Assist the CANR web developer with the maintenance and management of web server needs
- Provide server support for faculty research needs

**e) IT solutions**

Staffing: Greg Keane, Yohannes Tesfaye

CANR IT is often called upon to provide customized recommendations to faculty and staff for IT solutions for research, teaching and extension projects, which may be a blend of the aforementioned areas.

- **Services NOT provided**

CANR IT is limited in staffing and resources but has the support of Central IT. For the most part, separate from high performance computing, CANR IT can provide the basic services provided by Central IT, just not at an advanced level. UD central IT provides: Academic Technology Services, Client Support and Services, Management Information Systems, Network and Systems Services, University Media Services, Web Development.

**Budgetary Needs**

The CANR IT budget was combined with the Communications budget for FY13. We recommend separating the budget in order to maintain an accurate separation and allocation of funds.

An estimated $15-21K will be needed annual to maintain central services for fileshare and active directory. The existing IT budget has been sufficient for routine supplies but has not allowed for any new projects, innovation, or training. These items will be essential to the growth of college IT support.

**Staffing Plan**

As it exists now, CANR IT staff are adequate to address computing needs of Townsend Hall with some support for County Cooperative Extension Offices. However, the staffing plan should consider that if the foundational steps for FY14 are taken (see below) that this should allow CANR IT staff to be able to provide more customized IT solutions for college faculty, staff, professionals and students.

Separate IT team leadership will be essential to the continued success of the IT unit. This can either happen through the hire or appointment of an IT manager, or a new hire in educational technology, which would have leadership duties as well.

**Outsourcing and Collaboration**

As noted in the sections that follow Central IT can provide significant support to CANR in the short and long term IT needs of the college.

**Foundational steps to be taken in 2014**

CANR Information Technology reviewed the draft Programmatic Unit (departments and Cooperative Extension) and has provided these overarching action items based on those plans. Appendix One provides the detailed items provided specifically from each programmatic unit plan.

In general, CANR IT must move from a completely reactive unit to a more proactive unit, and a source for providing IT guidance and solutions that evolve beyond desktop support.

- CANR will work with UD Information Technology to centralize basic, core services (email, file share, etc.) in order for CANR's IT professionals to provide customized service and IT solutions to its faculty and professionals. CANR IT must continue to assess its services so as not to duplicate existing services already offered.
- CANR must define the core services that are provided by CANR IT and those for which Central IT is responsible. CANR must change its climate to one of abidance by the structure that supports IT (trouble

ticket system, help line, deadlines, providing support for appropriate tasks, etc.) and as such IT professionals must hold users accountable for said items.

- CANR must maintain an accurate inventory of the IT services, hardware and software for which it is responsible.
- CCIT will look to UD's Academic Technology Services to support the implementation of advances in teaching technology tools, primarily in the area of distance technology. Advances in teaching with technology will allow CANR to recruit and train students.
- CANR IT must take advantage of professional development opportunities to stay abreast of cutting edge advances. This includes both internal UD and external opportunities.
- CANR IT should be consulted in the grant writing process as much as other support units, especially as many funding agencies are now looking for advanced solutions for "broader impacts" and solutions for data management plans. Traditionally this consultation has been an afterthought and in order for CANR to be even more successful in securing grants, PIs might seek the expertise of CCIT professionals in these areas.
- Due to the strong research mission of the college, it will be essential to the continual success of faculty members for CANR Information Technology to provide customized research computing and database support.
- Maintaining sustainability of extension and teaching programs also requires preparing for the next generation of learners and their desired methods of learning. A hybrid of distance technologies involving synchronous and asynchronous methods along with traditional face-to-face methods is needed. CANR Information Technology must be suited to provide customized guidance to faculty members for the development of these courses and support for their implementation. CANR must devote facilities and resources to make these teaching technologies possible and encouraged.

1) Centralize CANR Email on the UD Microsoft Exchange Server.
2) Virtualize CANR web servers as existing hardware needs replacing.
3) Move to Central file storage (NTFS) and active directory (AD) services. Faculty servers will be evaluated on a case-by-case basis for movement into Chapel Street Computing Center, Delaware Biotechnology Institute's Data Center, or remain in TNS 102A. This will involve CANR using Central Active Directory.
4) Evaluate CANR Computer Teaching Facilities for renovations and/or migration to Central Scheduling (Registrar's Office).
5) Reinstate the Computer Desktop Refreshment Program.
6) Renovate the Townsend Hall Commons into an Information Commons.
7) Provide a solution for IT team leadership either through the hiring of an IT manager or through a combination of an existing position at IT (i.e. DBI).
8) CANR will evaluate college and campus solutions for GIS licensing and computer laboratories.

**Appendix 1. Items from programmatic units**

The items below are specifically pulled from the draft Programmatic Unit Plans (Departments and Cooperative Extension). Information Technology is specifically called out in all of the programmatic plans; however, communications is often inferred due to support with web development. It will be important in the finalization of the master plan to put some more concrete text around the needs of the programmatic units.

**ANIMAL AND FOOD SCIENCES**

*Information Technology*

To meet increasing general IT needs and informatics needs for research, it is vital that we retain a systems administrator with these abilities and skills:

- Install and maintain Unix or Linux based servers
- Maintain the security of the servers
- Maintain distributed backups of all data
- Ability to install and maintain a database system
- Familiarity with the computational needs of our research community
- Advise users regarding computer purchases
- Install software packages and trouble-shooting failed installations

**APPLIED ECONOMICS AND STATISTICS**

*Communications and Information Technology (combined)*

- Students' first impression of an academic department is determined by their view of the website. It is crucial to have a current and informative website for recruitment and dissemination of important information.
- Most notably we are lacking in technical assistance for web development and maintenance, computers, software, and support for research. We have been doing the best possible with what is currently provided by the college.
- There is an urgent need for a major overhaul and redesign of our departmental webpages across the college.
- The centralized administration of technical and web development support has been inadequate and quite limited in meeting our departmental needs. For example, we have been asking for help in revising the structure and content of our department websites for almost two years and have yet to get the type of assistance we need.
- The allocation of more resources to web design/maintenance and general IT may be needed to complement the role filled by one single web designer in CANR.
- Faculty and staff members of APEC would like to have more access to making basic updates to the content of our departmental website.

**COOPERATIVE EXTENSION**

*Goal: Enhanced Educational delivery through facilities and distance technology enhancements.* Maintaining sustainability of extension also requires preparing for the next generation of learners and their desired methods of learning. A hybrid of distance technologies involving synchronous and asynchronous methods along with traditional face-to-face methods is needed. (Support Units-IT and Communications)

*Recommendations Short Term:*

Foster the statewide programmatic efforts through distance technologies that provide for efficient time and travel of faculty, agents and specialists.
Distance Education expertise and support for course development (both credit, certificate and non-credit courses) utilizing distance course development (Moodle or other capacity.)

Technical support for computer file sharing, calendar sharing, mail, survey and evaluation tools and data storage, and new planning and reporting system.

Cutting edge technology and a technology plan for each office location that is part of a master plan, including the appropriate investment strategy for equipment (lease verses own).

*Goal: Communications Enhancements. Cooperative Extension is heavily dependent upon the communications unit and IT for assistance in the development, marketing and delivery of education programs as well as for the informing multiple forms of stakeholders about the outcomes and accomplishments of the program such as federal and state legislators, related industry, state and local agencies, other land grant universities and the constituents themselves. A unified statewide message is needed. (Support Units-Communications and IT)*

*Recommendations Long Term:*

*Push technology that provides educational information on time needed basis.*

**ENTOMOLOGY AND WILDLIFE ECOLOGY**

*Information Technology*

1) The loss of our computer replacement program has been problematic and we would like to see the return of this program.

2) Several faculty would benefit from an up-graded long-distance conferencing system; perhaps in our conference room. This will help facilitate graduate committee meetings, extension programs, teaching efforts down state.

3) We would all benefit from better access (i.e. faster and greater capacity) to data storage, archiving, and file sharing on the CANR network.

4) Establishment of an FTP server to permanently store and deliver existing and future scientific software and/or datasets produced from sponsored research projects.

5) The availability of and instruction in how to use current web-based design tools. For example, instruction in how to use Wordpress, Dreamweaver, or other web design programs, how to create applications, how to track web traffic for evaluation purposes, etc.

6) Most of our faculty would benefit from increased technical support for our websites. We have several that need maintaining and updating (e.g., Biological Control, FRAME, MARUS , Planthoppers).

**PLANT AND SOIL SCIENCES**

*Communications and Information Technology (blended among areas in the plan)*

1. Grow and enhance undergraduate education

- Consider online teaching methods for their utility and impact.
- We anticipate needing improved IT technology for teaching genomics, bioinformatics, distance learning, including improved desktop and laptop computers in faculty offices.
- **Other items inferred include the increased support overall for IT research needs (large data needs, research computing, database support, etc.).*

## IX. FACILITIES

**Mission**

Overall, College facilities exist to meet the wide range of teaching, research, and extension activities prioritized by CANR. For this college, that includes office, classroom, and lab space, as well as unique creamery, greenhouse, farm, and field units. Also, we utilize the landscape for these fundamental activities working both separately and in combination on agriculture, the environment, ecology, and horticulture. The desire to provide the best, most up-to-date facilities is constantly being balanced with budgetary constraints.

**Services provided**

1) Manage the planning, implementation, and budgets of all major facilities and capital projects for the College.

2) Monitor and initiate requests for routine maintenance and renovations of all CANR facilities.

3) Participate in general activities including committees, College activities, and University initiatives as well as tracking information including facilities spending and space surveys.

*Generally, the Admin Facilities Manager handles maintenance and renovation projects that are (1) interdepartmental or (2) supported by the Dean with funding or coordination for larger or more complicated projects. Departments typically handle maintenance and minor renovation within their own labs and offices. Likewise, unit leaders take the lead on their facilities, coordinating with the facilities manager and providing updates as needed. This includes the farm superintendent, greenhouse manager, creamery manager, Carvel REC director, and remote Extension office managers (461 Wyoming, Paradee).*

**Budgetary needs**

In the past, the facilities budget started with base funding intended for routine maintenance and minor renovations. That account code was added to when larger projects were authorized. If this is to change so that the Facilities manager receives a finite annual budget that will be managed to accommodate multi-year maintenance planning, figuring out what this budget should be will take time. In FY12, about $40,000 was spent on projects above basic maintenance, often as cost sharing with departments. Basic maintenance is about a third that much. Major construction projects require development of their own budget as we commit to them.

Catching up with deferred maintenance is also a consideration. A plan to improve facilities, especially on the farm will take time to develop and the cost for doing so will be significant.

As the potential for collectivizing facilities is considered, (i.e. storage areas, conference rooms, grad offices, open-use lab facilities), the increased need for Admin maintenance funding and oversight should be considered. Agreements will need to be reached on how maintenance costs will be shared between the budgets of facilities, other units, and the departments.

**Staffing Plan**

The work I could use part-time help with would be best done by someone who will consistently be available, so that time is saved after training. Also, having a non-student would be helpful because students have a hard time holding their own interacting with faculty or other maintenance staff. Consequently, except for fairly easy “paperwork” type tasks that can be done occasionally by office staff, I’m not able to distribute tasks.

**Outsourcing and Collaboration**

1) I will be moving departmental space surveys to the respective administrative offices.

2) I'm moving nutrient management to Mike Popovich for Newark, Vic Greene and Cory Whaley for downstate, and turf nutrient management to Mike Loftus.

**Foundational steps to be taken in 2014**

1) Work with the Dean to develop a plan for renovating or replacing Worrilow.

2) Work with the Dean and Departments toward renovating and constructing facilities that are identified in department/Admin master plans and prioritized.

3) Develop an overall plan to improve maintenance of farm structures and roads.

4) Develop/implement a system to address disposal of unused equipment and supplies.

5) Develop/implement a plan to identify all storage spaces and formally assign them to avoid dumping grounds.

6) Continue to work on removing buildings that the College fully maintains from RBB Algorithm 12.

7) Work closely with the CANR Space Committee to meet the needs of departments.

**Appendix 1. Items from programmatic units**

The following two pages identify ways that I can contribute to implementing the facilities component of departmental plans. For the most part, my action items listed above are not mentioned by the departments, with the exception of addressing Worrilow.

Glaringly, whether this results from the master planning instructions or whether it reflects actual departmental mindset, departments did not strongly address a vision for how the landscape should be maintained or improved to meet their missions to any great degree. ANFS does recognize the need for adequate farm staffing (I strongly agree) but, otherwise, the land itself was not considered. Our land provides infrastructure, fields, water systems, and a wide range of habitats and gardens that are fundamental to departmental missions. All of these have a cost to them, the same as equipment, buildings, and people. Why is there no vision for the future of this landscape?

<u>Faculty and Staff Office Space</u>

Office space will primarily be addressed within the space committee. A rolling list of available space will be maintained that can be utilized as additional staff and faculty are hired. Several offices can be made available by limiting faculty to a single office in DBI or ISE. Using office space more efficiently would still not meet the desired increases identified by departments, especially APEC who would like to double in size over 25 years. The closest opportunity for that much office space would be to accept 501 S. College. (Recall, the great cost associated with renovation was for removing loadbearing walls to create larger open spaces. Leaving the building configured as offices would require minimal expense, provided Facilities is tasked with paying for basic infrastructure improvement.) Taking over 501 S. College would also provide a valuable large meeting/lecture space for all departments. Alternatively, converting Worrilow to office and classroom space would work.

<u>Graduate Student Office Space</u>

Graduate student space falls within the purview of the Space Committee. Space is not provided consistently across departments. Initial discussion within the Space Committee is that the College should work toward providing a desk for every grad student in all departments and that there should be minimum standards for graduate office space across all departments that meet basic UD safety and ADA occupancy standards. Some inter-departmental sharing may be desirable with care toward clustering researchers using similar technologies or research topics. There are few

available spaces for additional graduate students within our current footprint without repurposing existing spaces such as conference rooms or possibly 057 Townsend when the economics lab moves. Taking over 501 S. College or converting Worrilow could provide grad student space. PLSC needs should be addressed with some farmhouse renovation once Jin and Sparks students move to ISE.

Research Facilities

A strong consensus is that Worrilow does not meet current research needs. Per Krawchuk, the building should only be renovated for less infrastructurally intensive uses like office or teaching space. A new building is needed that allows for lab systems similar to ISE or DBI in Newark. Likewise, Lasher lab may need to be repurposed and a new building constructed. Lasher's BSL-2 lab needs renovation or replacement and a new BSL-3 lab is needed. New buildings will be discussed collectively below.

Classrooms

Several departments expressed the need for more and larger lab classes to allow expanded enrollment. One possibility is to combine the two large adjacent lab classes in Worrilow. No additional space is available within our current footprint and would have to be addressed while planning a new lab building and renovation of Worrilow. There may be ability to improve two remaining lab classes in Worrilow and the one in Townsend.

ANFS has identified the need for a test kitchen and sensory lab to expand food science teaching. This could be accommodated in the Newton building with considerable renovation (and removal of animal research from the building).

ANFS has also identified the need for a PBL classroom on the Webb farm. The only space available is the small recently renovated student room in the sheep barn. Alternatively, if space can be carved out, a room could be built in the arena.

General classroom space cannot be increased within the current footprint but existing classrooms could be renovated to accommodate multiple teaching styles. Some would require main campus cooperation.

Storage

ENWE would like a 40 x 60 pole barn on the farm for large equipment storage. This is not strictly needed if they can keep half of 124 Worrilow once cleared. They also have space in the Entomology building, in farm buildings, and in the S. greenhouse. What they would gain, however is replacement of the Ecology Woods field building and that has merit. We have a design and budget. Funding is required.

Extension needs storage in Paradee. This likely requires acquisition of additional space either within Paradee or at a remote storage facility. Some improvements might be gained by renovation of existing storage spaces.

Other

Insect Reference Collection Museum- While the space is not ideal, perhaps 056/057 Townsend could be renovated for this purpose. Once a location is identified, renovation needs are not complicated.

Economics Lab/Center – Project under way.

New Buildings

New buildings require funding which requires design and cost estimating. Under consideration are two lab buildings (Worrilow replacement and perhaps Lasher), two commercial poultry houses, a 40 x 60 storage building, and eventual replacement of the Newark broiler house. Once prioritized, we can work with FP&C to generate designs and budgets that can be used for fundraising and planning.

Storage needs are ever expanding. To a significant extent, current needs can be met by purging old equipment and supplies, and careful allocation of existing space.

## XX. CENTRAL BUSINESS SERVICES

**Mission**

The College of Agriculture and Natural Resources is a Land-Grant Institution, Research Experiment Station, and State Cooperative Extension Service as created by the Morrill, Hatch, and Smith-Lever Acts, respectively. As a land grant college, Agricultural Sciences receives federal formula funds for research and extension which contribute to annual funding in excess of $60 million. The College of Agriculture and Natural Resources is the only college at the university that receives federal formula funds. Federal formula funds require stringent and complex reporting, one of the factors that makes the College of Agriculture and Natural Resources funding the most complex at the university. The college also receives extramural support from the state, counties, industries and foundations.

**Services provided**

The college has a central business office that provides accurate and consistent reports for the federal government and general services to all four academic departments, two experiment stations and three county offices. Although decentralization to departments has occurred and is encouraged, the central business office provides oversight of all college budgeting, reconciles accounts, coordinates pre-award and post-award grants processing and administers personnel matters.

**a) Business services**

The Central Business Office of CANR currently reviews and monitors financial activity on over 1,000 separate purposes ranging from RBB (block), Allocated, Self-Supporting, State lines, Federal Appropriations, Federal Grants, Gifts, State Grants, other grants, gifts, endowments, and agency funds.

The university fiscal year covers July through June activity and the year-end close is an extended period covering multiple closes during July for 4-6 weeks duration. This covers all non-federal purposes. The federal fiscal year covers October through September and this close occurs annually during October.

Ensure proper coding of all transactions based on detailed account designation.

All fiscal transactions are subject to internal and external audits. Internal audits are completed on an annual basis during August of each year. Federal audits have been completed in recent years.

Processes all revenue received from self-supporting purposes including cash, checks and credit card transactions according to set UD policies. Works closely with UD Cashiers and Gifts Processing units to assure proper receipt of funds received centrally through billing/accounts receivable process.

Coordinates grants processing for the college, with responsibilities for both pre-award and post-award functions.

Assists Project Directors/Investigators to prepare, submit and maintain contracts and grants; reviews grant application instructions to ensure a timely and accurate submission; prepares budgets; provides follow-up information; resolves problems and addresses issues; prepares request for budget revisions and no-cost extensions; oversees award closeout.

Verifies the accuracy of financial records as they pertain to receipts, expenditures, and related transactions to maintain effective stewardship of sponsor's funds; monitors documentation of grant expenditures and cost share to ensure consistency with grant requirements and compliance with applicable laws and regulations and to maximize use of available funds.

Meets with departmental administrators and Project Directors/Investigators to provide expertise and leadership on contracts and grant processing and administration; develops and implements methods of communicating necessary

information to faculty and staff and provides training to assure compliance with federal and University policy; supervises employees engaged in accounting for grant funds.

Maintains budgets for federal appropriations including Hatch, Hatch Multistate, Smith Lever, Animal Health, McIntire-Stennis; runs monthly reports to monitor expense and cost share balances; prepares financial information for the USDA/NIFA Plan of Work report and the AD-419 report; completes the Animal Health and Disease Program of Research and the McIntire-Stennis Program of Research; works directly with staff and the Research Office to close-out federal appropriations.

Manages all federal Experiment Station Projects (Hatch, Hatch Multistate, Animal Health, McIntire-Stennis); Reviews projects annually to advise faculty of terminating projects; works directly with faculty to establish new or renewal projects. Submits forms through the National Information Management and Support System (NIMSS) and USDA/NIFA (REEport) for approval. Reviews and submits all progress/termination reports through REEport.

Maintains knowledge of applicable laws, policies, procedures, etc. necessary to comply with Federal, State, and University regulations concerning contracts and grants. Reviews and/or approves all webforms containing any CANR purpose; this amounts to hundreds of transactions on a daily basis.

Attends meetings and workshops at department, college and university levels. Represents the college at USDA conferences at regional and national level.

Participates and/or assists in special projects.

**b). Human Resources**

Maintains confidential personnel files on all benefited positions including faculty, exempt and non-exempt personnel. Also maintain separate confidential personnel files related to evaluations and medical.

Actively participates in recruitment process of faculty, exempt and non-exempt positions. Strive to maintain a diverse search committee and obtain a diverse applicant pool.

Provides departments with annual Employee Merit distribution (May) spreadsheets, and enter information into central electronic system for deans approval balancing with designated pool allocations.

Processes all contract promotions (requires update to position and job employment data); process all graduate student renewals.

Provides guidance to departments on matters relating to personnel issues.

Processes all terminations and maintain terminated employee files for one year until the files are transferred to central Human Resources for retention purposes.

All personnel webforms are date sensitive and must be submitted prior to mandated deadlines in order to avoid missed pays or overpayments.

Human Resources information is subject to audit; provided documentation required by a USDA HR audit of all Extension and Research funded personnel in 2010.

Maintains effort through LAM for all personnel except those assigned to Animal and Food Sciences. Effort subject to change based on grant funding changes.

**Budgetary Needs**

The CANR Central Business office is currently providing these services with a small staff of 4 professionals and 3 dedicated miscellaneous wage personnel.

**Staffing Plan**

Recommend increasing staff to reduce current stress level.

HR and fiscal responsibilities need to be separated into 2 positions that work closely together.

UD Central Administration needs to provide additional tools and training for PeopleSoft.

During FY14, two positions will become vacant due to retirements; immediate hiring of these positions will be critical.

File maintenance for all APEC and ENTO purposes will be transferred and maintained by these units.

**Outsourcing and Collaboration**

If responsibilities from the CBO are outsourced to individual units additional manpower within the units will be necessary. College staff is overextended with their current workload.

**Foundational steps to be taken in 2014**

Hire a new Chief Budget Officer to provide leadership for Business Services.


## XXI. ELBERT N. AND ANN V. CARVEL RESEARCH AND EDUCATION CENTER

Facility overview

What began in 1941, as the University of Delaware's College of Agriculture and Natural Resources southern agricultural experimental "substation" has evolved into an influential, multi-faceted complex that has been vital in supporting Delaware's 8 billion dollar agricultural industry. The Carvel facility's 26,000 square feet of offices, labs, meeting, and classroom space is surrounded by 347 acres used for agricultural research (Thurman Adams Jr. Agricultural Research Farm), and the adjacent Lasher Laboratory, a world-class poultry research and diagnostic laboratory. The Jones-Hamilton Environmental Poultry Research house is also a critical facility in evaluating litter management and air quality areas.

**Jones Hamilton Environmental Poultry Research House**

In addition, the Warrington Research Farm (130 Acres) located in Harbeson, Delaware serves as a primary irrigation research facility focusing on center pivot (66 acres) and sub-surface (18 acres) irrigation technologies.

**Warrington Irrigation Research Farm**

The Carvel Research and Education Center (CREC) is also home to Sussex County Cooperative Extension, whose agents, specialists, staff, and volunteers deliver university-based knowledge to a diverse group, continuing the strong tradition of serving the citizens of Delaware and the region. The former office and meeting complex (10,728 square feet) located south east of CREC now referred to as the REC Annex, serves as supplemental meeting and storage space and is the office of Delmarva Poultry Industries (DPI).

Funding for CREC staff (50), operations, and support comes from federal (Hatch and Smith Lever funds), State, County, and extramural funds. State funds have been instrumental in expanding staff, facility construction, renovations, research equipment and operations, totaling over 15 million dollars since 1991. In addition, County funds since 1991 totaling over 2.5 million dollars have been invaluable in supporting research and extension programs.

With the arrival of Dean Mark Rieger in 2012, the College of Agriculture and Natural Resources initiated the development of a College Master Plan in 2013. The CREC staff was charged with thinking about the future. How will the experiment station, our facility, and staff change in fifteen to twenty-five years (2028-2038) to meet the challenges facing agriculture and our Delaware residents? What will be the priorities for our research, diagnostic, and extension programs? This document provides a brief summary of future trends in Sussex County, programmatic opportunities, facility support and direction, and challenges in meeting these goals. The following information is a summary extracted from Carvel personnel and clientele in response to five questions proposed by the CREC Director:

- Existing/new research and extension personnel needs
- Existing/new facility and capital improvement needs
- Overall facility and research equipment needs
- What role does our facility and staff play in student recruitment and teaching
- Innovative strategies to address limited resources and program expansion

**Unique Strengths of the CREC**

The CREC has a long history (72 years) of providing valuable support to the citizens of Delaware and the region, through outstanding applied research and extension programs. The relatively new Carvel building (2006) provides a "state of the art" facility for office, meeting, and teaching space. The design and layout of the building has significantly enhanced the communications and program coordination among staff and volunteers. The Thurman Adams Jr. agricultural research farm provides researchers from main campus, as well as Georgetown, the opportunity to conduct studies throughout the State that directly impact Delaware farmers. This research farm is noted by many in the agricultural industry as one of the most well equipped and operated farms not only in the region, but on the East coast.

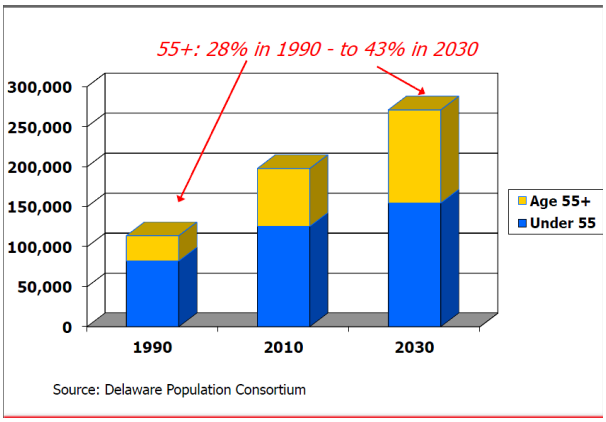
**Thurman Adams Jr. Agricultural Research Farm**

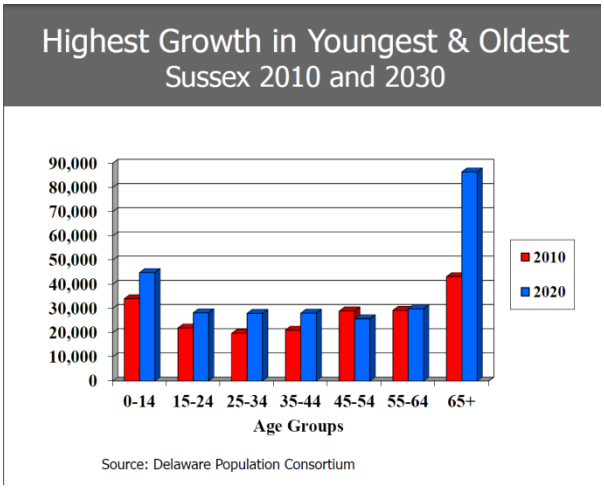
**Our vision of the future**

**a) Sussex Demographics**

- In the past twenty years, Sussex (population) has grown rapidly. The growth trend is expected to continue although at a slightly slower rate. The growth rate will be influenced by the possible rebound in the real estate sector.
- 68,000 residents not in the labor force. (A large pool)
- Largest increase in population will come From persons age 65+.
    - Demand for healthcare services and the need for jobs in the field.
- Need to attract and retain younger workers to replace "Baby-Boomers" during the next few years.
    - Extend careers and introduce encore careers to our senior population.
- Retention of existing businesses and attraction of new ones depends on qualified work force

*(From the summary slide by Ed Simon from the Sussex Conference Demographic Overview)*



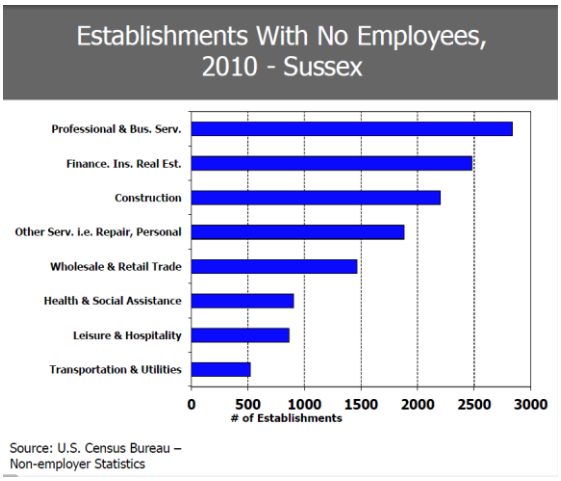

**b) technology**

Broadband access will continue to improve with significant change seen in 5 years. Last mile access will be wireless for rural users. There continues to be challenges for some Sussex citizens for access to reliable and functional internet capability. Once addressed, the use of the web will become the backbone of information for clientele. In addition, the use of Precision Ag technologies in all aspects of crop production continues to expand.

**c) Environmental regulation**

Due to Sussex County's location within significant watersheds of national importance, (Chesapeake Bay, Inland Bays and Delaware Bay) water resource management, climate change and regulatory issues remain front and center. Maintaining a productive and profitable agricultural industry in conjunction with environmental quality will be paramount for the States 8 billion industry. This will require a continued strong commitment to research and extension efforts in the areas of nutrient management, irrigation, pest management, and livestock production.

### d) Economic and community development




There are twenty-five towns in Sussex with significant infrastructure and revenue challenges. There will be a demand for expertise in managing this ever-changing landscape.

Sussex will remain an economy of small business anchoring a significant service and retail tourism market. A recent study states Delaware's coastal economy is valued at $6 billion dollars. If you couple this with the $8 billion dollar agriculture economy, you understand Sussex County economic engines.

Community resiliency will expand from our coastal communities to our rural communities. Through issue-based forums, town halls, informal discussions, and in-depth research and analysis, our Extension programs work side by side with communities on both short and long term issues that will affect economic and community prosperity.

### e). Education

K-12 will see an increased scrutiny on the disparity of resources between eastern and western Sussex County. There is an expectation of elevated education in the math, science, and engineering curriculum. New charter schools will be in place, expanding school choice options for Sussex residents. Student populations will continue to increase, with a significant increase in the Hispanic population.

Delaware Technical and Community College will continue as a significant County resource. Their 2 year Ag degree with unique concentrations continues to attract Sussex students. An opportunity may exist for our College to expand course offerings and degree concentrations as it pertains to the University of Delaware's Associate Arts degree program. This will allow transfer students the opportunity to get exposed to agriculture curriculum and possibly aid the College in recruitment of students from southern Delaware.

### e) Programmatic opportunities

*"Continue to do what we are doing only better and more efficiently"*

**Agriculture & Horticulture**

- **IPM/Weed Science**- insects, weeds, and diseases are complex and difficult issues and will continue to be challenging with different combinations of seed traits and herbicides, and the management of resistant species.
- **Irrigation**-irrigation and water usage will become even more important in the future for Sussex County and the State. Focuson improved water management (efficiency and conservation), and enhancing crop production and nutrient management will be critical.
- **Nutrient Management**- environmental issues are going to become even more contentious and litigious. Farmers, homeowners, and the landscape and greens industriescontinue to look to UD for help and guidance.
- **Variety and fertility trials**-research on new varieties, production methods, and enhancing efficient fertilizer plant use are important areas of emphasis.
- **Organics**- will continue to grow as a popular trend with a limited audience. Organic commodity prices are a minimum of 25% over conventional grain prices. However, current research is demonstrating significant challenges in this area, particularly as it relates to labor and yield.

- **Master Gardener Program**- continues to expand each year.Sussex County Master Gardeners volunteered a total of 6,189,25 hours (average of 80 hours per Master gardener) in 2012 for educational efforts in the following areas: Demonstration gardens, public service, mass media, educational presentations, community projects, exhibits and displays. Hours given by volunteers saved Delaware Cooperative Extension $116,172.22 ($18.77 professional rate). Interest continues to increase for information regarding "victory gardens" and backyard food production for home consumption.

  Sussex County Master Gardeners are people who enjoy gardening, have gardening experience, want to learn more about gardening and have a desire to help others in their community.

  Their volunteer contribution provides a significant economic and environmental service to the local community. In alternate years, Carvel serves as a joint training location for both Kent and Sussex County Master Gardeners.The Demonstration Garden, located directly behind Carvel is the site for self-directed tours and is an open-air classroom for a wide variety of residential horticulture topics. This garden serves host to workshop topics ranging from pruning, composting, hypertufa, starting a vegetable garden, weed and plant ID, encouraging songbirds and butterflies and much more! In recent years Master Gardeners have gained recognition for their efforts in emphasizing Accessible Gardens. Their Garden Smart/Garden Easy presentations encourage those with physical disabilities to continue to enjoy gardening. In addition, the award-winning puppet show, The Adventures of Peter Rabbit in Farmer McGregor's Garden travels to schools and special events across the state - wherever young children and their parents, may gather. The educational show features garden pests, pollinators, and making healthy food choices.
- **Wildlife Conservation/demonstration area**- public interest in this field may demand more attention. Designated area in Georgetown includes the woodlot and small field plantings.
- **Locally raised livestock**- interest continues to grow in grass-fed/pasture raised, locally produced beef, lamb, and poultry.
- **Poultry production and disease management-** emphasis has greatly increased with informational transfer of applied research for all aspects of poultry production. Primary areas include litter management, ventilation and air quality, overall house management with technology (controllers), bio-security, energy (see below), and manure management. Lasher laboratory is the front line for poultry disease surveillance and diagnostics.
- **Energy**- research in this area has primarily focused on energy savings for poultry production. Emphasis is ventilation, solar, LED lighting, and potential for alternative uses of manure for energy and enhanced nutrient recovery.
- **Vegetables**- research in this area has dramatically increased with the new Vegetable and Fruit Extension Specialist in Georgetown. Emphasis continues in lima bean breeding and production, vine crops, and sweet corn. Additional research includes specialty fruit and Cole crops. Food safety and handling has become of critical importance to fresh markets, processing plants, and home owners.
- **Horticulture**- commercial horticulture continues to increase in Sussex. The landscape and greens industry along with homeowners are major areas of emphasis along with business management and marketing.
- **Farm financial and business management-** unique programs like "Annie's Project" work with farm and agriculture industry wives on business management and touch the importance of family business transitioning (Estate planning).
- **Farm, home, and work place safety**- this program continues to provide outreach to diverse audiences, with emphasis on farm equipment and shop safety, grain handling, protective equipment, and Agrability. Disaster preparedness has also become paramount for Sussex County and the State, especially within the coastal communities.

**4-H Youth leadership and development**

4-H has a long and proud agricultural tradition, but in its 100+ year history, has also focused on important life skills, citizenship, leadership, healthy lifestyles, the arts, science and technology, and engineering.4-H is really youth in action. The county 4-H Extension agents, with the help of dedicated adult volunteer leadership in all parts of the county and state, make it possible for every boy and girl - regardless of race, creed, economic or cultural background - to take part in 4-H activities. 4-H members learn about science and scientific methods. They explore careers and obtain valuable life skills, such as public speaking and demonstrations, which are critical in today's workforce. Sussex County 4-H'ers have the opportunity to explore, in depth, many 4-H project curricula; the principles of agriculture production and management, family and consumer science, animal science, healthy lifestyles, creative and communication arts and much more. 4-H is unique. Through a variety of outreach modes; traditional clubs, afterschool, in- school initiatives, day and overnight camping, 4-H delivers diverse and flexible education through experiential learning. Sussex County youth involved in 4-H plan and put their ideas into action. It is little wonder that it is one of the largest youth programs in the world.

For the 2012-2013 year Sussex County 4-H has 414 members comprising 20 traditional clubs, four Afterschool clubs and five specialty clubs attended to by 90 dedicated adult volunteers. Like any educator in Delaware, 4-H is proud that our family of volunteer educators are screened with background checks and enthusiastically attend trainings and forums throughout the year to enhance an already vibrant leadership force that is committed to the 4-H motto to "make the best, better."

**Family & Consumer Sciences**

Now more than ever, the disciplines and programs under the umbrella of Family and Consumer Sciences (FCS) contribute relevant and much needed information to individuals and families. As people struggle with balancing budgets, becoming better consumers, worrying about the quality of their family childcare, improve nutrition, reduce obesity, remaining productive as they mature and having the ability to purchase, prepare and consume food safely, FCS Extension agents are providing their constituents with practical use for the latest research and technology. Programs like the Master Food Educators are critical in meeting these demands. This volunteer workforce helps FCS agents' staff educational displays, assist or conduct workshops, present nutrition, food safety and wellness curricula to schools and other public groups.

FCS agents and the outreach professionals from EFNEP are committed to help individuals choose healthy food selections and lead a physically active lifestyle. EFNEP nutrition assistance in particular, outreach to low-income families where nutrition resources are most needed, and are a key component of the 4-H Day Camp experience emphasizing healthy eating choices. While a balanced diet of fruits, grains, vegetables, dairy and protein are always emphasized, knowing that the good foods are grown and prepared safely is of vital importance. FCS professionals offer continuous workshops to the commercial and smaller growers who produce the food we eat. It starts at the farm and extends to the table. FCS staff work with Ag agents in teaching our produce growers how to handle food safely through education such as Good Agricultural Practices (GAPs) and Good Handling Practices (GHPs). In addition, food safety programs such as the nationally recognized ServSafe and local short course DineSafe, train the chefs, cooks, waiting staff and anyone who handles food, how to serve it safely.

In cooperation with the State of Delaware Division of Childcare Licensing, FCS staff provides quality, extensive training sessions for those working directly with children to enhance their skills and maintain their licensing.

**Staffing plan**

**Space utilization and facility needs**


**Lasher Lab Mission**: To support the poultry industry and maintain its economic viability through poultry disease diagnosis and applied poultry research.

This lab represents the first line of defense against poultry diseases on the Delmarva Peninsula. Diagnostic services provided at Lasher include necropsy and clinical diagnosis, bacteriology, serology, and mycology using molecular diagnostic testing. Virology and histopathology specimens collected at Lasher lab are sent to Newark (Allen Lab) for further testing. As a NALHN approved laboratory, Lasher lab routinely performs surveillance for avian influenza and exotic Newcastle disease as well. In addition, there is close cooperation and collaboration with State Department of Agriculture laboratories in both Delaware and Maryland and along with numerous commercial labs in the two state areas. This keeps all parties abreast of current poultry diseases and related production problems at all levels from the breeder flocks through the processing plants.

The role of Lasher Laboratory as the premier poultry diagnostic laboratory in the Delmarva region is secure. There is a long-term steady demand for diagnostic services and research that support poultry health and food safety (see table below).

## UD Poultry Health System

| Activity Category | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Lab Accessions | 2704 | 3914 | 5940 | 9640 | 7844 | 8456 | 8617 | 8450 | 8606 | 7110 |
| Necropsy cases (flocks) | 296 | 620 | 987 | 1000 | 1095 | 1390 | 1114 | 815 | 823 | 1103 |
| Routine Avian Influenza Tests | 0 | 1224 | 1621 | 4332 | 3879 | 3699 | 3718 | 3701 | 3233 | 3926 |
| Breeder ELISA | 1303 | 2439 | 2874 | 1969 | 1869 | 1689 | 2013 | 1494 | 1833 | 2053 |
| Food Safety Pathogens Testing | 176 | 0 | 0 | 259 | 599 | 1195 | 2085 | 2292 | 2601 | 462 |
| IBD Progeny Challenge Testing (1K=1000 birds) | 13 K | 8K | 20K | 16 K | 13K | 13K | 14K | 7K | 6K | 12K |

The UD Poultry Health System and its ongoing commitment to poultry disease diagnostics and surveillance is well-recognized by the Delmarva poultry companies and growers. Its functions directly support the vital export market for broiler meat products. Lasher Lab is staffed by only five full-time technicians and one veterinarian. Diagnostic virology and histopathology support is provided in Newark by faculty and staff at the C. C. Allen Lab and Worrilow Hall. Primary funding provided through State Line "Poultry Diagnostic Lab".
*Accession numbers with asterisks above represent the "new normal" (post-2004 avian influenza event) level of accessions received by the lab.

Applied research projects in collaboration with the poultry industry, faculty, and allied poultry industry in adapting new technologies, and helping develop best management practices are in place. Among these are:

- Beta-testing new diagnostic PCR commercial kits for Salmonella, Campylobacter, a respiratory viral disease screening panel, which includes a rapid, multiplex-PCR screening for common Infectious Bronchitis subtypes.
- Evaluating the performance of different commercial brands of ELISA and PCR tests for the detection of a number of common poultry diseases.
- Evaluating the effects of on-demand application of poultry litter treatment application in broilers.
- Evaluating the effect of in-house composting and an adapted propane torch flow-through kiln-dryer on poultry disease pathogen inactivation and broiler performance.
- Evaluating various methods of Infectious Bronchitis vaccine application to determine the most optimal mode of administration.
- Evaluating various coccidiosis vaccines for infectivity and shedding patterns.
- Developing disease models for Gangrenous Dermatitis and Necrotic Enteritis, and evaluating the influence of various feed additives on both diseases.
- Surveillance of respiratory diseases and the detection of novel or emerging and/or re-emerging Infectious Bronchitis viruses.
- Discovery of novel variant strains of Infectious Bursal Disease.
- Field Disease Investigations: Developed an integrative model (disease surveillance, environmental evaluation, feed testing) for identifying predisposing factors and major contributors to disease and poor performance.


Distance learning Classroom. Carvel's state of the art telecommunication classroom is designed to deliver the best in acoustics and HD imagery to provide students, faculty, and staff distant learning opportunities. This classroom has also been recently upgraded to accommodate Adobe Connect conferencing as well. The classroom provides Carvel staff opportunities to teach courses to main campus in Newark, and allow for expanded meeting capability saving valuable time and travel resources. Course offerings have included vegetable crops, weed science, and Agriculture education. In addition, this classroom provides opportunities for agriculture industry meetings not only within Delaware but globally as well.

**Old REC office complex (REC Annex)**

- Roof replaced on main building
- Re-locate plant science lab currently in Lasher to old weed science building (needs new heating and AC system)
- Replacement of tables and chairs for meeting rooms
- Water treatment system for old REC and shed will need to be replaced
- Renovate/upgrade
- Possible alternative - REC ANNEX, remodeled, might serve as a 4-H Center. The meeting room could be enlarged, modernized and possibly rented out when 4-H is not using the space, as an income generator. 4-H has an entrepreneurial curriculum – this could be managed by interns and agent oversight for the benefit of all programming, not just 4-H - in the same way creamery interns run the UDairy. Meeting space and break out rooms rented to community and private functions – modeled along the lines of the Virden Center – are very much in demand in this area. Given the high dollar that DTCC fetches for its facility rentals, this could be self-sustaining. A bit of a pipe dream, but there is a very big community need for meeting space, and this

location might fill that need. Downside is this would require additional maintenance and custodial staff and would elevate operating costs for Carvel.

- Remove old vegetable research trailer

**Carvel building**

- Stairwell treads
- Chiller, etc. – pumps and motors will require repairs or replacement
- Roof repair (leak free guaranteed)
- Upgrade in generator capacity

**Poultry houses and research buildings**

- All roofs will need painting and repairs
- State-of-the-art poultry research houses (commercial scale) for true trial comparisons

**Lasher Lab – Total Renovation**

- Backup generator
- Poultry research/necropsy – needs to be updated (hatchery included in this); bathroom would be nice
- Re-grade/repave road via necropsy

**Farms (Thurman Adams Jr., Dill, and Warrington)**

- Replace aging ag research infrastructure (irrigation technology & pivots, add auto steer, yield monitoring)
- Purchase the 5+ acres where home and buildings are at Dill farm and move/demolish existing structure
- Expand/renovate the farm shop
- Expand equipment storage shed (critical for keeping specialized research equipment out of weather)
- Paint room/booth (for farm equipment)
- Experimental Station Road will need to be repaved/gated
- Liquid fertilizer handling facility for safety purposes
- Walk-in coolers on farm and lab for plant science

**General**

- Parking lots will need to be resurfaced/sealed
- Septic systems will need repairs or replacement
- Grove – take proper steps to ensure health and longevity
- Forest land – continue to manage for harvest
- Clear out debris piles
- Purchase or rent more land adjacent to us

- Storage will always be a huge issue (currently old REC serves this capacity well)
- Improve field drainage/grading issues
- Outside showers
- Classroom space
- Possibility of using solar/wind for energy
- Continue to update fitness facility for Carvel staff
- Demolish old buildings that are becoming eye sores and a drain on resources
- Housing for visiting scientists, grad students, etc.
- Blinking light in front of building (turn lane?)
- Maintain ITV capabilities, however need Townsend Hall to partner with complementary equipment and facilities. Have a state of the art room at Carvel and just a poor make do room (007) in Townsend Hall
- Sub-zero commercial or wide freezer
- New refrigerator/ice machine – kitchen
- iPads for staff
- Upgraded phone system
- Replace all copiers
- Motor pool (fleet of vans for use – agents, 4-H, poultry, etc.)
- Updated lab equipment for Lasher and plant science (molecular) including growth chambers

**Farm**

- Fabrication/project development shop
- Land level many of the fields on the farm.
- Continue critical technical support of the farm crew.
- Equipment for vegetable production, particularly effective cultivators for 30-inch rows as well as new 6-row monosem
- 6-row corn planter
- Welder/plasma cutter
- Continue to upgrade research plot combines
- Small plot harvester/sheller for limas/peas
- Corn stalk cutter
- Rear loading lowboy trailer
- New truck tractor

- New Kruger trailer for top kick truck
- Backhoe
- New sprayer for weed science
- Continue to upgrade tractors
- New computers in farm shop
- RTK Auto steer
- Truck with lift gate
- Zone and vertical tillage equipment
- Advanced irrigation system/equipment
- Mini escavator
- 2 new gator ATVs
- Climate control seed storage
- New irrigation for demo garden & grove
- Vegetable processing research area
- High tunnels/nursery/shade house
- Update computers
- Small plot research combine

**Poultry Research**

- Access to freezer facilities outside of Lasher Lab
- Establish a poultry emission-testing lab (15 x 15 or larger) to provide evaluation services for the industries that are of interests in evaluating their products on emission control, bird production performance and health.
- Upgrade the environmental house with variable speed 24"fan, scales, controller for actuated attic vent. Update controller software. Add to CT controller feed & bird scales or update present system to advanced controls and internet access.
- Demolish the old large broiler barn that is no longer used and build one or two new broiler houses for broiler environmental and emission research and demonstration, such as tunnel ventilation, attic vent, and different lighting systems.
- Poultry truck and bobcat
- New incubators
- Research pens for poultry

**Foundational steps to be taken in 2014**

- Staff flexibility-Staff personnel may need to stop being focused upon past job roles and be willing to work with other groups if needed. Staff may be asked to embrace new roles.
- Coordination of field projects to make sure they meet overarching goals – can't do everything when an idea hits someone. Do we have a threshold criteria or set of goals and objectives that projects should meet? Such as; is there money, land for this project? Is the project worthwhile, or can it be justified? Should we be doing this particular project?
- More on-farm research using GPS/ GIS systems similar to the way Bob Nielsen at Purdue has spoken of at CCA meetings. Would require Precision Ag support.
    - Cost is minimal, and farmers increasingly have all the equipment necessary.
    - Benefit is that by combining many fields and farms, greater data can be gathered. On-farm research using cooperators teamed with UD agronomy team of experts.
- Increase our visibility: How to connect with non-ag here at the REC (is it beneficial that people come to REC and see what we have versus collaborating with other groups at events away from the REC?) This can be a double edge sword as far as demands on Carvel.
- In seeking outside funding we could continue to promote the story about why the research farm is important and what happens here
    - Maintain a list of all of the projects being done on the research farm and required a report of some kind to be submitted on the project.
    - Farm manager could use to show the value of the farm. Many of us who do work on the farm already prepare reports on what we do; it would be a matter of getting someone to compile them in one location e.g. a limited access web-based resource that could include links to reports and publications that are already exist. Preliminary data that is not ready for publication for clients to access could be summarized by the researcher and the report would only be accessible internally. ALSO, as we are going to be implementing a new planning and reporting system there could be a built in check-box to designate, projects and educational events that use REC facilities.
- Full use of technology and distance learning
- Volunteers for research programs (USDA Beltsville has extensive volunteer programs to help with plot maintenance, harvest, etc.). This can present issues in liability and quality control.
- On-line courses to juniors and seniors for college credits – more like Academic Challenge – charge AP/college credits that would generate income to support RBB model.
- Grain storage – work the market. Are costs and risks associated with this and is there enough grain to warrant this cost?
- Any ways to maximize income with chicken houses?
- Major clean-up; salvage metal/old machinery; bring in some money
- Farm market and winery (could use student interns similar to creamery); sell on-farm products, vegetables, honey, etc. (or could have community farm market as well); health concerns

- Donate or sell crops we haven't been selling to local businesses – "buy local." Problem if sell then we compete with local producers which could cause bad blood.
- Continue to maximize commodity sales; does pose challenges since some crops are destructed due to research protocol.
- Volunteers work toward providing programmatic support/teaching classes
- Communication Management Systems (social media)
    - Mailing lists for notification of meetings, etc. How to manage
    - Snail mail
    - E-mail
    - Twitter
    - Texting
    - Facebook

## XXII. UNIVERSITY OF DELAWARE BOTANIC GARDENS

The major role of the UDBG is as an outdoor laboratory for the university community. Currently, there are more than 35 undergraduate courses, approximately 10 courses from outside CANR, using the gardens. The UDBG's mission is to contribute to an understanding of the changing relations between plants and people through education, research, and community outreach so as to instill an appreciation of plants in the landscape and the natural environment.

**Master Plan for Garden**

- **Plant collections**
    - Maintain and improve overall collection pertinent to educational needs.
    - Improve interpretation with signage in the garden, information on the web and printed brochures for distribution.
    - Improve collection records and plant labeling in the garden
    - Develop a NAPCC collections beginning with *Styrax*.
    - Purchase and develop BG Map web application for teaching use
    - Expand garden area for collections
    - Naming opportunities for individual Gardens in UDBG to generate endowment

- **Gardens**
    - Install a series of frequently rotating, small scale idea gardens
    - Edible plant garden
    - Expand color trials
    - Establish additional ecological niche gardens and expand upon existing gardens.
    - Incorporate the riparian corridor and warm season meadow as part of the UDBG.
    - Install trails, boardwalks, overlooks in naturalistic areas
    - Expand space for conifer collection and small flowering trees

- **Marketing**
    - Increase the number and diversity of courses supported through collaborations with faculty, particularly in other colleges
    - Establish additional collaborative projects such as those with Art and Fashion Design.
    - Market UDBG to broad audience with informational content and sponsored activities in the garden.
    - Supplement UD courses with additional website content such as plant information and interactive maps.

- **Summer internships**
  - Improve the diversity and educational value of the student's experience
  - Fund 3-5 summer internships annually, endow at $125,000 each.
  - Fund 2 yearlong internships annually, endow at $650,000 each.

- **Graduate education**
  - Establish MS plant curation program, two students alternating years.
  - Develop external funding for the program

- **Programing**
  - Endowed speaker series ($75,000 each) to fund two nationally recognized speakers annually.
  - Increased short course offering to generate regional recognition and generate additional income.
  - Provide seasonal themed walks of gardens and natural areas for educational, marketing and fundraising purposes.
  - Develop Garden as a regional point of interest for garden clubs and groups with horticultural interest.
  - Host industry programs, field days to build cooperative and collaborative relationships.
  - Cosponsor regional programs

**Needs to accomplish goals**

- **Equipment**
  - Construct pole building to replace current sheds and protect equipment stored outside
  - Replace tractor and loader
  - Replace current utility work vehicle and add second vehicle
  - Install frost free hydrants in Native garden

- **Funding**
  - Spring Plant Sale
    - Sale nets about $40,000, stable over last 3 years
    - Patrons donations raise about $25,000
    - Educational opportunities generated for students via the sale.
  - Fall Sale
    - Sale nets about $12,000
    - Opportunities to increase income substantially
    - Need a fixed date, conflicts with football tailgating
  - Friends dues
    - Generates about $20,000 annually
    - Continue to build membership
    - Build stronger relationships with key donors
  - CANR
    - Currently supports the UDBG with $40,000 annually
  - Need to increase funding through revenue generation, gifts, and endowments

- **Staffing**
  - UDBG operates with fewer staff than other university gardens
  - Increase professional staff
    - Add maintenance staff, minimum one full time person
    - Increase professional staff from part time to full time

## APPENDIX A - MASTER PLANNING PROCESS

The process of developing the CANR *Master Plan* took place during the 2013 calendar year. The following is a list of significant steps in the process that led to the document. In addition to the key dates listed, the Master Plan was discussed in the monthly in CANR Administrative team meetings with unit leaders more-or-less continuously throughout the first half of 2013.

December 7, 2012. *Master Plan* announced at the CANR Fall Faculty meeting by Dean Rieger.

January, 2013. Programmatic and support unit leaders charged with developing unit-level plans.

February 8, 2013. Agriculture and Family & Consumer Sciences Team Meeting on plan.

February 17-19, 2013. APEC Academic Program Review, input from external review team.

February 29, 2013. Extension Administrative Leadership Team, discussion of plan.

March 10-12, 2013. ENWE APR, input from external review team.

March 26, 2013. *Master Plan* Town Hall I: Curriculum.

April – June, 2013. Unit-level plans submitted to Dean and revised.

April 22, 2013. *Master Plan* Town Hall II; Space.

May 1, 2013. *Master Plan* outline, current status of College shared with CANR Advisory Board.

May 28, 2013. *Master Plan* Town Hall III: Research and Extension.

June 13, 2013. College of Health Sciences, discussion of Master Plan and opportunities with CANR.

June 20, 2013. CANR Administrative Team Retreat to discuss College's future.

August 1, 2013. New Castle County Extension meeting, discussion with Extension Director.

August 7, 2013. Extension Ornamental Horticulture, team meeting and discussion.

August 19, 2013. Sussex County Extension, discussion with Extension Director

September-October, 2013. Unit-level plans - second and third revisions submitted, finalized.

September 9, 2013. Kent County Extension, discussions with Extension Director.

September 17, 2013. *Master Plan* Draft shared with Provost Domenico Grasso.

September 30, 2013. Extension 4-H Team, meeting and discussion.

September 30 – October 2, 2013. ANFS APR, input from external review team.

October 28, 2013. *Master Plan* Draft released to the College for vetting.

November 15, 2013. Deadline for comments and revisions to the *Master Plan* from College.

November 26, 2013. *Master Plan* Draft revised and distributed to CANR Advisory Board.

December 17, 2013. CANR Advisory Board meeting to finalize CANR *Master Plan*.

February 23-25, 2014. PLSC APR, input from external review team.

## APPENDIX B – EXTERNAL STAKEHOLDER INPUT

In addition to the specific events below, Dean Rieger visited each member of the CANR Advisory Board during the summer of 2013, and made over 50 visits with major and prospective donors where the *Master Plan* was discussed.

February 12, 2013. Extension Poultry Advisory Committee survey/focus group, Georgetown, DE.

February 17-19, 2013. APEC Academic Program Review, input from external review team.

March 10-12, 2013. ENWE APR, input from external review team.

April 2, 2013. Delaware Soybean Board, discussions with Extension Director.

April 15, 2013. Kent County Extension Advisory Committee, discussions with Extension Director.

May 1, 2013. *Master Plan* outline, current status of College shared with CANR Advisory Board.

May 6, 2013. New Castle County Farm Bureau, discussions with Extension Director.

September 30 – October 2, 2013. ANFS APR, input from external review team.

October 1, 2013. ANFS stakeholder dinner hosted by Dean Rieger; in conjunction with ANFS departmental review.

December 17, 2013. CANR Advisory Board meeting devoted to vetting of *Master Plan*.

February 23-25, 2014. PLSC APR, input from external review team (to be incorporated).

## LITERATURE CITED


Allen, E. and J. Seaman. 2013. Changing course: ten years of tracking online education. Sloan-C report. http://babson.qualtrics.com/SE/?SID=SV_4SjGnHcStH5g9G5

Awokuse, T.O., T.W. Ilvento and Z. Johnston. 2010. The impact of agriculture on Delaware's economy. College of Agriculture and natural Resources, University of Delaware. http://ag.udel.edu/deagimpact/index.html

Carnevale, A.P. and B. Cheah. 2013. Hard times: College majors, unemployment and earnings. Georgetown Public Policy Institute, Center on Education and the Workforce. 20 pages.

Donofrio, N., Spohrer, J., Zadeh, H.S. and Demirkan, H. "Evolution of Medical Education and Practice: Research Driven T-Shaped Professionals," under review, 2nd International Conference on The Human Side of Service Engineering, Krakow, Poland, July 19-23, 2014: and invited for special issue of Informs-Service Science, under review.

Evans, L.T. 1998. Feeding the ten billion: plants and population growth (P. 196). Cambridge University Press, UK.

FAEIS - The USDA's Food and Agricultural Education Information System. Accessed April 2013. http://www.faeis.ahnrit.vt.edu/

Feldon, D.F., J. Peugh, B.E. Timmerman, M.A. Maher, M. Hurst, D. Strickland, J.A. Gilmore and C. Stiegelmeyer. 2011. Graduate students' teaching experiences improve their methodological research skills. Science 333:1037-1039.

Goecker, A.D., P.G. Smith, E. Smith, and R. Goetz. 2010. Employment opportunities for college graduates in food, renewable energy, and the environment. United States, 2010-2015. www.csrees.usda.gov/nea/education/part/education_part_employment.html.

Hart Research Associates. 2013. It takes more than a major: Employer priorities for college learning and student success. Whitepaper, April 10, 2013. http://www.aacu.org/leap/documents/2013_EmployerSurvey.pdf

Hauptman, A.M. 2013. 10 Dubious claims about higher ed decline. Inside Higher Ed., June 2013.： http://www.insidehighered.com/views/2013/06/20/challenging-10-claims-about-higher-educations-decline-essay#ixzz2XJoadzED

Johnson, T.D. and K.E. Ryan. 2000. A comprehensive approach to the evaluation of college teaching. New directions for teaching and learning 2000(83):109-123.

Kadamus, J. 2013. The state of facilities in higher education: benchmarks, best practices, and trends. Sightlines LLC, Guilford, CT.

Lerner, R.M. et al. 2011. The positive development of youth: Report of the findings from the first seven years of the 4-H study of positive youth development. National 4-H Council, Chevy Chase, MD.

National Research Council, Committee on Research Universities. 2012. Research Universities and the future of America: Ten breakthrough actions vital to our nation's prosperity and security (Summary). National Academies Press, Washington, DC.

Rich, D. 2013. Public affairs programs and the changing political economy of higher education. J. Public Affairs Ed. 19:263-283.

US Department of Education, Office of Planning, Evaluation and Policy Development. 2009. Evaluation of evidence-based practices in online learning: a meta-analysis and review of online learning studies. Washington, DC.