The Ecology and Organismal/Evolutionary Biology Program at Old Dominion University

Prepared and Approved by The Department of Biological Sciences

March 2009

**Mission:** To prepare undergraduate and graduate students for careers in ecology and organismal/evolutionary biology and seek new knowledge through research.

**Vision:** To be one of the premier programs in the country in ecological and organismal/evolutionary biology education and research.

**Goals:**
1. Hire and retain high quality faculty in the fundamental areas required of the discipline.
2. Recruit high quality undergraduate and graduate students.
3. Seek funding for research from a diversity of sources.
4. Build and maintain a solid resource base for the program, including space, field station alliances, and graduate student financial assistance.

The intent of this document is to provide (1) an understanding of what the discipline of ecology and evolutionary/organismal biology encompasses and its relevance to current national and global issues, the job market, funding opportunities, educational needs, and the prominence and vision of the profession, (2) the background of excellence in ecology and evolutionary/organismal biology at Old Dominion University, (3) an overview of the current state of the program at ODU, and (4) a summary of future needs and recommended actions. The impetus for this effort springs from the critical need for long-range, visionary planning for the program.
The Ecology and Organismal/Evolutionary Biology Program at Old Dominion University

Executive Summary:
Ecology is a widely recognized, cohesive, vibrant discipline with many sub-disciplines and is one of the most integrative of the sciences. The fundamental elements of ecology are distinct and integral to solving national and global problems and to educating professionals who will develop and implement those solutions. Like ecology, evolutionary biology is broad and highly synthetic, and provides the foundation for virtually all of the biological sciences. Organismal biology is an equally synthetic science and a primary vehicle for understanding the complex interplay between evolution and the environment. Several government agencies have well-established directives to fund basic and applied research in the ecological sciences. These include the Environmental Protection Agency (EPA), the Department of Energy (DOE), National Oceanic and Atmospheric Administration (NOAA), the World Bank Global Environment Fund (GEF) and the National Science Foundation (NSF). Surveys of ODU undergraduate biology students demonstrate the continued need for a robust ecological/evolutionary sciences program. After their second or third year, 60% of the ODU biology undergraduate majors are in the organismal biology/ecological sciences tract.

In the 1970's and 1980's, a diverse ecological faculty was assembled in the Department of Biological Sciences at Old Dominion University as a result of strategic planning, and the Ecological Sciences Ph.D. Program was established. The primary strengths of the program include active, productive faculty; high quality, professionally involved students; strong, internationally recognized, well-funded research programs; and excellence in marine ecology, botany and evolutionary biology. The Ecological Sciences faculty has been successful at garnering research funds, often leading the College of Sciences in grant funding while also shouldering one of the highest undergraduate and graduate teaching loads in the College. With many of our faculty members leaving or retiring and with severe limitations in institutional support, one of the university's strongest programs has declined. The fundamental areas of ecology and evolutionary/organismal biology must be taught and represented in our research programs to maintain the level of excellence expected in this program.

Recommendations:

Faculty and staffing issues:

- The Department, College and upper administration must clearly identify resources (start up cost funds, space, etc.) prior to recruiting high quality faculty. The College goal of attracting top tier faculty is not possible without these resources.

- Hire faculty in the most critical, fundamental areas where there presently are gaps as resources become available. Currently, the most critical positions are 1) community or landscape ecologist with strong quantitative or GIS skills, 2) quantitative ecologist
specializing in higher vertebrates (mammalogy, ornithology), and 3) invertebrate ecologist/evolutionary biologist with strong molecular or quantitative skills.

- Later hires should focus on additional critical areas vacated by retirements or departures.

- Hire an ecology technician and at least one lab coordinator for the introductory biology courses as resources become available.

- Pursue additional large, collaborative research proposals with colleagues at ODU and other institutions.

- Continue seeking funding from the major funding agencies such as NSF.

- Pursue smaller grants from foundations or personal service contracts. These sources can be valuable and involve less red tape than bigger grants from NSF.

**Graduate student issues:**

- Increase institutional graduate student support in the form of additional GTA’s, Dominion Scholarships (complete financial packages), and tuition waivers. Regardless of the number of GRA’s created by faculty grants, institutional support is critical for the stability of our graduate programs. Also provide a comprehensive health care plan for graduate students with all or a significant portion of the premium included in the financial support packages.

- Develop and fund a graduate student recruiting program.

**Other resource issues:**

- The Department, College and upper administration must resolve current space issues and secure necessary space for the current faculty.

- The Department, College and upper administration must identify space prior to hiring new faculty.

- Reinvest in equipment critical to the ecological and evolutionary biology program (e.g., field vehicles and vessels).

- Reevaluate current space usage on a regular basis and reallocate if justified. Renovate space that is currently underutilized and allocate to more critical purposes.

- Renovate MGB labs, which are 28 years old and substandard by modern criteria.

- Continue to build endowments within the department.
• Identify and actively seek formal alliances with appropriate field stations (e.g. the Anheuser Busch Coastal Research Center, The Nature Conservancy (TNC) reserves, and the VIMS Wachapreague Lab). Marine labs are in particular demand. Seek conservation easement contracts for land with specific ecological features of benefit to the education and research goals of the program.
I. Relevance of ecology and evolutionary/organismal biology as a discipline and the need for fundamentally strong programs:

A. Overview:

Ecology is a widely recognized, cohesive, vibrant discipline with many associated sub-disciplines and is one of the most integrative of the sciences. There is substantial overlap with chemistry, mathematics, geology and soil science, climatology, and many other fields. However, the fundamental elements of the discipline of ecology are distinct and integral to solving national and global problems and to education of professionals who will develop and implement solutions. Society faces a daunting array of ecological problems. Funding for research in these areas is growing. Meeting national interests requires citizens who are aware of environmental issues and practicing scientists with the skills to tackle environmental problems. The discipline of ecology addresses many critical societal needs. Like ecology, evolutionary biology is broad and highly synthetic, and provides the foundation for virtually all of the biological sciences. Most biologists subscribe to Theodore Dobzhansky’s admonition that “[N]othing in biology makes sense except in the light of evolution” (Dobzhansky, T. 1964. American Zoologist, 4:443-452). Despite its fundamental role in the practice of biology at every scale, public misunderstanding of evolutionary biology is notorious and has prompted remedial action from many organizations, including the National Academy of Sciences (National Academy of Sciences and Institute of Medicine. 2008. Science, Evolution, and Creationism. Washington, D.C.: The National Academies Press). Organismal biology is an equally synthetic science and a primary vehicle for understanding the complex interplay between evolution and the environment. The discipline deals with the biology of organisms (animals, plants, and microbes) as complex and highly integrated systems, with biologists seeking to understand how evolutionary and ecological forces shape the form and function of living beings. The public knows the discipline for its practitioners, such as botanists, ichthyologists, and ornithologists, who study specific groups of organisms. It is no coincidence that one of the three primary disciplinary divisions of the National Science Foundation’s Directorate for Biological Sciences is Integrative Organismal Systems.

B. Global and national societal needs:

A report on the ecological challenges of the 21st Century in the e-Bulletin of the International Association for Ecology (INTECOL) identifies ecology as a broad discipline that is placing increased emphasis on large scale phenomena related to the needs of society and research that has a strategic or utilitarian motivation (J. Grace, 2008, INTECOL e-Bulletin 2(3)). The report indicates that the top challenges of this century are to: (1) address the big questions through fundamental research on populations and ecosystems; (2) define a new ecology that has the important concepts and tools that ecologists of the 21st Century need;
and (3) train applied ecologists who will become general practitioners of the discipline.

The Brookings Institution identified “energy and environmental security” as the number one challenge in their list of the top ten global economic challenges (W. McKibbin and P. Wilcoxen, Brookings Institute web site, February 2007). The report states “energy and environmental security have emerged as the primary issues on the global agenda for 2007. Consensus has recently been forged on the potential for long-term economic, national security and societal damage from insecure energy supplies and environmental catastrophe, as well as the intense need for technological advances that can provide low-polluting and secure energy sources. Yet despite growing global momentum, there is still little agreement on the best set of actions required to reduce global dependency on fossil fuels and greenhouse gas emissions. Con founding the international policy challenge is the disproportionate impact of high oil prices and global warming across nations, insulating some countries from immediate concern while forcing others to press for more rapid change.”

The Copenhagen Consensus Project’s list of the world’s top ten issues requiring solutions includes climate change, malnutrition and hunger, and sanitation and water. The United Nations has identified pollution, deforestation, loss of rain forests, loss of wetlands, population growth, loss of biodiversity, and energy sources among their top ten global environmental issues. Finding solutions to all of these issues requires the understanding and application of ecological and evolutionary principles.

Recent forums clearly indicate a national and global resolve to address issues that require ecologists with sound fundamental training. For example, a September 2008 briefing in Washington focused on climate change solutions (“Responding to Climate Change: A Role for Ecosystems: Science Briefing for Policy Makers”). One of the keynote presenters, Patrick Megonigal, is a graduate of our program. The forum announcement stated that “a growing number of reports show that climate change will impact human health, economic and national security, and agricultural and natural resource management. In response, scientists and policymakers are urgently considering how to regulate carbon emissions and mitigate the effects of climate change. Legislation has been introduced to implement cap and trade systems and carbon taxes, and to promote carbon sequestration. Informed policy decisions require that policymakers understand the potential role of ecosystems in mitigating the problems caused by carbon emissions.”

As with ecology, there is a strong public need to understand the principles underlying evolutionary and organismal biology. A potent example is the evolution of drug resistance in pathogenic microbes, a phenomenon that falls as much within the purview of basic evolutionary biology as molecular biology. The study of emerging infectious diseases, such as West Nile Virus, is as ecological and organismal in nature as it is medical.
C. Funding:

Several government agencies have well-established directives to fund basic and applied research in the ecological sciences. These include the Environmental Protection Agency (EPA), the Department of Energy (DOE), NOAA, the World Bank Global Environment Fund (GEF) and the National Science Foundation (NSF). These agencies have long-term commitments to supporting ecological research as evidenced by core programs dedicated to ecological disciplines. For example, NSF’s Division of Environmental Biology includes programs in ecology, ecosystems, population biology, evolutionary processes, systematic biology, and biodiversity. The Division of Integrative Organismal Systems includes programs in anatomy, physiology, neurobiology, behavior, and development.

Indeed, ODU’s ecological sciences doctoral program spans the scope of the NSF’s Division of Integrative Organismal Systems and Division of Environmental Biology, two of the three primary research divisions within the Directorate for Biological Sciences. The Division of Molecular and Cellular Biology overlaps the work performed by some of our more highly integrative faculty. Evolutionary biology infuses all three Divisions, as it does all aspects of biology.

D. Job market:

The job market fluctuates for most fields but remains relatively robust in the ecological disciplines. This is largely due to the national and international demand in academia, government agencies, environmental consulting firms, and non-government organizations (NGOs) for educators, researchers and practicing professionals in ecological areas.

E. Education:

Surveys of ODU undergraduate biology students reveal a continued need for a robust ecological/evolutionary science program. After their second or third year at ODU, 30% of the biology undergraduate majors were in the pre-professional health science tract, 60% in the organismal biology/ecological sciences tract, and 9% in the secondary school teaching tract. Those trends are echoed in our transfer students (50 – 70 students/yr), 52% of whom indicated an interest in ecological sciences, 36% professional health science, and the rest undecided.

F. Professional organizations and societal outreach:

Numerous well recognized professional societies serve the ecological community and provide assistance and outreach to society at large. These vibrant, proactive societies are a reflection of the contributions and the professionalism of ecologists. The Ecological Society of America, the premier ecological society in
the world, publishes *Ecology*, the leading journal in the field, holds large annual meetings, and provides responsive, progressive societal services through such efforts as the Ecological Sustainability Science Initiative and the Strategies for Ecology Education, Development, and Sustainability (SEEDS) program.

II. History of excellence at ODU:

During the late 1970's and the early 1980's, a diverse ecological faculty was assembled in the Department of Biological Sciences at Old Dominion University as a result of strategic planning over the previous decade. Proposals were submitted to the State Council of Higher Education in Virginia (SCHEV), and the Ecological Sciences Ph.D. Program was approved to begin in the fall of 1982.

The primary strengths of the program include an active, productive faculty; high quality, professionally involved students; strong, internationally recognized, well funded research programs; success of our graduates in employment and contributions since finishing the program; an excellent location with respect to natural coastal ecosystems as well as environmentally impacted urban systems; and excellence in marine ecology, botany and evolutionary biology. Most of our graduates have quickly found employment in academia or federal, state, and local environmental management positions. A few examples include:

Charles Acosta is on the faculty at Northern Kentucky University, funded by the World Wildlife Fund, and continues to conduct research and train students in Belize, his home country;

Hayden Mattingly is a faculty member at Tennessee Tech and is funded to work on endangered stream darters, a group of native fishes;

Don Behringer is on the faculty at the University of Florida, has published in *Nature* and other prominent journals, and has acquired a half million dollars in competitive extramural funding in his first year at UF;

Jason Schratwieser is Director of Research and Outreach for the International Game Fish Association;

Patrick Megonigal is a Senior Scientist at the Smithsonian Environmental Research Center and the recipient of many grants and honors;

Christine Conn is the Director of the Strategic Land Planning Office for a Sustainable Future for the Maryland Department of Natural Resources;

Daniel Stover is the Field Director of the North America Regional Climate Center for Earthwatch Institute;

Stefan Koenemann is a professor in the Institute for Animal Ecology and Cell Biology in Hannover, Germany;
Chad Cross is on the faculty of the University of Nevada, Las Vegas, where he founded the program in epidemiology and biostatistics in the Department of Environmental and Occupational Health;

Deborah Hutchinson is a faculty member at Coastal Carolina University and has published in the Proceedings of the National Academy of Sciences.

The Ecological Sciences faculty has been successful at garnering research funds, often leading the College of Sciences in grant funding while also shouldering one of the highest undergraduate and graduate teaching loads in the College. For the past three decades or more, the Department of Biological Sciences has been the #1 or #2 most productive research department in the College of Sciences, a distinction due largely to the efforts of the Ecological Sciences faculty.

The primary goal of the program is to train ecologists to conceptualize studies of environmental problems with a sound foundation based on fundamental ecological principles and to apply their acquired skills in the private sector, governmental agencies, and academic institutions. The program provides broad training in the ecological sciences and modern analytical techniques. Broad training, in this context, means that students receive training in the general theoretical principles of ecology and in the application of these principles to a variety of ecosystems, including terrestrial, aquatic and marine.

A major focus of the Ecological Sciences program has been application of ecological knowledge. There is a need for ecological scientists with applied experiences. Human pressures on the environment will continue to demand appropriate expertise to address management and solutions at the international, national, and regional levels. The quality and reputation of the research programs maintained by our faculty are ensuring that our graduates are well recognized as experts in their respective sub-disciplines and are often sought on that basis alone.

III. Current state of program and anticipated vacancies:

The research and educational capacity of the university is becoming diminished in ecological and aquatic sciences. Scientific reputations take decades to build and it would be unwise to lose our strength in this area of science.

With many of our faculty members leaving or retiring and their replacements being delayed, one of the university's strongest programs has declined. By mid-year 2008-2009, 31% (5 of 16) of the faculty positions fundamental to the ecology program are vacant. Most noteworthy are the community ecologist position, still unfilled after 3 yrs, an invertebrate biologist position vacated by retirement in December 2008, a mammalian ecologist, our herpetologist/conservation biologist on leave to NSF, and a gap left by a fisheries biologist who transferred to OEAS several years ago. In addition, 54% of the existing ecology faculty (6 of 11) are full professors, and 46% (5 of 11) of the existing ecology faculty are over 60 years of age; only one is younger than 40. In addition to current vacancies, the ecological sciences faculty is dominated by individuals eligible for retirement in the next 5 years, and as a result we will have several new vacancies in the next few years.
The ecology and organismal/evolutionary biology faculty serve a disproportionate number of our majors (54-60%). The number of those majors increased from 591 in the fall of 2004 to 788 in the fall of 2008. Only 9 upper-level ecology courses are being offered spring semester 2009, and only three of those have a lab or field component. There is a maximum of 34-40 seats available in those labs. The chief departmental advisor relates that students are desperate for ecology lab electives.

Biology and the ecological sciences in particular are not disciplines in which burgeoning enrollments can be handled by the same instructors teaching more students in larger classes. Students in biological sciences must have laboratory and field courses to acquire the skills and knowledge necessary for either post-baccalaureate employment or graduate programs. As a practical matter, they also need such courses to satisfy their degree and meet University accreditation requirements. Students currently must complete 16 credit hours of electives to include 3 lab/field courses. However, we have limited laboratories in which we can teach, few field vehicles and vessels (all in poor repair) for field-based classes, and a shrinking supply budget for upper level laboratory-intensive and field-based courses. A paucity of suitable courses on the organismal/ ecology/evolution side erodes the attractiveness and effectiveness of our program because students cannot enroll in the courses they need to satisfy their requirements. We simply do not have enough upper division courses to meet student needs. The situation is already critical and will only become worse with unfilled positions and upcoming retirements. We have thus far bridged these gaps by either not offering courses or by employing temporary adjunct instructors. However, employing many temporary non-research faculty members to cover our undergraduate teaching needs is not what students expect when they choose to enroll at a research institution, nor do these temporary staff members train graduate students or generate research funding.

Instructional problems in the program can be summarized in three major points.

(1) The diversity of undergraduate elective course offerings is declining, and the availability of existing courses is increasingly unpredictable. Mammalogy, ornithology, community ecology, vertebrate zoology, animal behavior, and conservation biology are among the courses any biology department in a university of our size and stature should be able to offer regularly; we cannot. Even when courses are available, the unpredictability of their offering due to a shrinking faculty makes it difficult for our students to complete the required curriculum. (2) The quality and consistency of our core courses (Ecology and Evolution) are in jeopardy as faculty numbers decline. We've been fortunate in being able to assign excellent instructors to these courses, but assignments must often be made at the last minute. The problem is not that we lack faculty capable of teaching the courses. Rather, we have too few faculty members to teach the essential courses. Moreover, with declining faculty numbers and increasing enrollments, class sizes in the core courses are increasing steadily; the majority of sections now enroll well over 100 students each. This poses a problem for undergraduate success for a number of reasons, not the least of which is the inherent difficulty of teaching an increasingly quantitative curriculum in the large lecture setting. (3) Reducing the number of faculty at a time when enrollments are growing steadily will erode one of our undergraduate program's greatest strengths -- the ability of undergraduates to develop one-on-one relationships with faculty mentors. One of our program's biggest selling points, speaking to a concern voiced by many of the parents and students, is that it combines the benefits
provided at a large research university with the advantages of a smaller school. One way this is manifested is in the accessibility of faculty to undergraduates and the consequent ability for students to develop strong one-on-one relationships with faculty mentors who are recognized experts in their fields. This accessibility is largely due to the research faculty teaching the labs in the advanced courses.

IV. Current and future needs:

A. Faculty/courses:

Without the fundamental areas of ecology and evolutionary/organismal biology represented in our curriculum and research programs (as they have been in the past), our ecology program will decline. We must have sufficient strength in full-time, tenure-track faculty numbers to preserve the Ecological Sciences Program that historically has been strong and in great demand by our students. Faculty hires must also be structured with an eye toward keeping our core courses staffed with individuals who bring appropriate expertise to each course. If the core courses are to both introduce students to the foundational ideas in the major subdisciplines of ecology and to show how those foundational ideas are being applied to current research issues (i.e., why they are current, vibrant, and important subdisciplines), we need faculty who are more than just minimally qualified to teach them. At the same time, our hiring strategy should also take into account the dilemma posed by asking research faculty to teach large (i.e., sections with more than 50 students) lecture classes: the increasing time demands of such courses will inevitably affect research productivity.

We are currently discussing plans to increase the relevance of the program curriculum by revamping current undergraduate and graduate (Masters degree only) tracks and establishing new ones. Within these tracks, we will emphasize courses that impart specific skills necessary for practitioners of ecology and evolutionary/organismal biology and that provide a foundational knowledge base for professionals in the field. The proposed tracks are a manifestation of the directions in which the disciplines of ecology/evolutionary biology are moving; thus, we can better serve our students at the Bachelor’s and Master’s level. Enrollment in a specific track will not be mandatory; students may elect to pursue a broader curriculum that is customized for their individual goals or encompasses elements of several tracks. Underlying the foundational courses are the organismal courses that train students in particular taxonomic groups. Subspecialties based on taxonomic groups are essential in some areas of ecology and evolutionary biology. Several of the foundational courses combine skills and a particular taxonomic group. Faculty positions can similarly combine foundational disciplines, skills and taxonomic specialties.

**Currently proposed tracks:** marine biology, wetland ecology, systematics/biodiversity, conservation biology
Associated foundational skills: molecular techniques, taxonomy/systematics, quantitative ecology/biometry, GIS, policy, writing

Foundational courses and expertise required for the ecology program:

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<tr>
<th>Introductory Ecology</th>
<th>Speciation/systematics</th>
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<tr>
<td>Evolution</td>
<td>Molecular systematics</td>
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<tr>
<td>Population ecology/genetics</td>
<td>Physiological ecology</td>
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<tr>
<td>Community ecology</td>
<td>Marine ecology</td>
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<td>Ecosystem ecology</td>
<td>Developmental biology</td>
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<tr>
<td>Landscape ecology</td>
<td>Behavioral ecology</td>
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<tr>
<td>Conservation biology</td>
<td>Biometry/quantitative ecology</td>
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Organismal courses and areas of expertise required for ecology program:

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<tr>
<th>Invertebrate Zoology</th>
<th>Ornithology</th>
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<tr>
<td>Mammalogy</td>
<td>Non-vascular plants</td>
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<tr>
<td>Entomology</td>
<td>Plant systematics</td>
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<tr>
<td>Ichthyology</td>
<td>Microbial ecology</td>
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<tr>
<td>Plant Ecology</td>
<td>Herpetology</td>
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Immediate (current) faculty needs:

- Community or landscape ecologist with strong quantitative or GIS skills
- Quantitative ecologist specializing in higher vertebrates (mammalogy, ornithology)
- Invertebrate ecologist/evolutionary biologist with strong molecular or quantitative skills.
- Marine phycologist

Anticipated future needs (next 5-10 years):

- Ecosystem ecologist/biogeochemist
- Plant ecologist
- Marine ecologist
- Conservation biologist

In addition to faculty, we also need at least one, if not two, lab coordinators to take the large load of lab development, preparation, and coordination off the faculty, who could then more effectively address the upper level course needs. With that kind of support, we will be better able to attract a research faculty member to teach the majors introductory course.
B. Research/funding:

The program’s faculty, in addition to continuing to seek and obtain funding from the primary agencies, such as NSF, needs to develop collaborative research efforts within the ODU community and with colleagues at other institutions. We must continue to build our endowments for scholarships, endowed chairs, and visiting scientist programs. Regardless of extramural support, however, critical needs must be met by Commonwealth support, including (1) an ecology staff technician, (2) regular replacement of field vehicles and vessels, and (3) increased financial support (more stipends) and health insurance for graduate students.

C. Graduate student support:

The faculty will continue to seek GRA support for graduate students in their grants; however, base institutional support for GTA’s is essential for attracting and retaining a stable core of graduate students and for attracting high quality faculty. We also need more tuition waivers and affordable health insurance to be competitive in recruitment of graduate students. Most top-tier research universities provide such support; we do not.

D. Space:

Space issues are difficult to solve but must be addressed in order to attract and retain high quality faculty. We also need general areas for undergraduate research (or at least undergraduate lab/field internships working on existing projects with faculty members in new or renovated modern labs). Some institutions have formal programs through which undergraduates can rotate through selected research labs as part of their early training.

E. Field station alliances:

The university needs to forge formal alliances with field stations and acquire access to properties with specific ecological features that enhance educational and research opportunities for our students and faculty. There is a demand for opportunities to conduct field studies in diverse, ecologically attractive locations for course credit. We currently own and manage the Blackwater Ecologic Preserve, an invaluable educational and research resource, and we are a member of the Organization of Biological Field Stations. However, we must expand these efforts and resources to be competitive with many other institutions.
V. Proposed actions:

A. Faculty and staff hires:

1. The Department, College and Upper Administration must clearly identify resources (start up cost funds, space, etc.) prior to recruiting high quality faculty. The College goal of attracting top-tier faculty will not be possible without these resources.

2. Hire faculty in the most critical, fundamental areas where there presently are gaps as resources become available. Currently, the most critical positions are community or landscape ecologist with strong quantitative or GIS skills, quantitative ecologist specializing in higher vertebrates (mammalogy, ornithology), and invertebrate ecologist/evolutionary biologist with strong molecular or quantitative skills.

Currently, the range of start-up packages for assistant professors in equipment-intensive areas of ecology and evolutionary/organismal biology is $350,000 to $400,000. In modeling and less equipment intensive areas, the range is $150,000 - $250,000.

3. Hires after that should focus on additional critical areas vacated by retirements or departures.

4. Hire an ecology technician and at least one lab coordinator for the introductory biology courses as resources become available.

B. External funding:

1. Pursue additional large, collaborative research proposals with colleagues at ODU and other institutions.

2. Continue to seek funding from the major funding agencies such as NSF.

3. Pursue smaller grants from foundations or personal service contracts. These sources can be valuable and involve less red tape than bigger grants from NSF.

4. Continue to build endowments within the department.

C. Graduate student support:

1. Increase institutional graduate student support in the form of additional GTA’s, Dominion Scholarships (complete financial packages), and tuition waivers. Regardless of the number of GRA’s created by faculty grants, institutional support is critical for the stability of our graduate programs.
Also provide a comprehensive health care plan for graduate students with all or a significant portion of the premium included the financial support packages.

2. Develop and fund a graduate student recruiting program.

D. Space:

1. The Department, College and upper administration must resolve current space issues and secure necessary space for the current faculty.

2. The Department, College and upper administration must plan ahead with regard to space and identify space prior to hiring new faculty.

3. Reinvest in equipment critical to the ecological and evolutionary biology program (e.g., field vehicles and vessels).

4. Reevaluate current space usage on a regular basis and reallocate if justified.

5. Renovate space that is currently underutilized and allocate to more critical purposes. With appropriate renovations, new lab and office space can be created in the museum (MGB 307) and MGB 347. Other such rooms should be identified and considered for renovation and/or reassignment. We also need renovation to improve our existing labs (both research and teaching) to bring them up to modern standards. We need additional and improved storage facilities for our teaching collections, such as renovated space in vacated areas in MGB. They are absolutely central to an organismal biology program.

E. Field station alliances:

1. Identify and actively seek formal alliances with appropriate field stations (e.g. the Anheuser Busch Coastal Research Center, The Nature Conservancy (TNC) reserves, and the VIMS Wachapreague Lab). Marine labs are in particular demand. Most research universities have such arrangements and/or labs of their own. Seek conservation easement contracts for land with specific ecological features of benefit to the education and research goals of the program. These areas should have high ecological value of interest to the program and university.