

## **College of Natural Resources Strategic Plan Update 2006-2012**

### **1. Vision and Mission Statements**

The College is the only comprehensive education, research, and outreach program in natural resources in the Commonwealth. Specific departments and programs in the College are considered among the best nationally by many measures. Our vision is to build upon these existing strengths to become an innovative international leader in environmental and natural resource science, creating and sharing the knowledge needed for sustainable management of our resources for this and future generations. Our specific objectives are to: (i) produce well-trained professionals capable of optimally balancing conservation, management, and utilization of environmental and natural resources in the context of the unprecedented ecological, political, and economic challenges of the 21<sup>st</sup> century; (ii) provide relevant, timely, and cost-effective research on critical issues involving conservation, management, policy, and sustainable utilization of environmental and natural resources; and (iii) provide information needed by practicing professionals and the general citizenry of the Commonwealth, nation, and the world to improve the quality of their lives and the environment as well as promote economic growth. The College's programs are directly woven into the social, environmental, economic, and political fabric of the Commonwealth.

The central theme surrounding the goals and objectives of the College is conservation, sustainable management, and utilization of natural resources. Within this context, the research and outreach efforts of the College during the period from 2006 to 2012 will be couched in four overarching multi-disciplinary areas: (i) ecological and social sustainability of natural resource management, (ii) food, nutrition, and health issues, (iii) efficient and equitable utilization and conservation of renewable natural materials, and (iv) applications of geospatial analysis, including Geographic Information Systems and remote sensing. To further energize efforts in these areas, special initiatives will be undertaken over the next 6 years to expand our research program by strengthening our efforts in water resources, wildlife disease vectors, biosecure aquaculture, ecotoxicology, marine resource management, remote sensing, and biotechnology / biomaterials. Our research spans the three most promising future growth areas of the U.S. economy as identified by the U.S. Department of Labor—geospatial analysis, nanotechnology, and biotechnology. On the outreach side, additional funding will be sought to support the activities of the Sloan Forest Industries Center in order to fully realize the potential of the Center to influence economic viability in the forest-based industries of the Commonwealth and nation. And a new cooperative effort will be developed within the Commonwealth that will lead to the formation of an externally funded institute focused on human-wildlife conflict resolution both locally and internationally. Efforts in Cooperative Extension will continue our award-winning programs for loggers and land owners, be at the forefront of the emerging trend to use geospatial technologies to enhance extension, and lead the initiation of a new cooperative outreach effort to train Master Naturalists.

Academically, we will continue our commitment to excellence in pedagogy by refining our undergraduate program to include an appropriate formal capstone experience for every student. Additionally, we will explore the development of an innovative next-generation undergraduate major in meteorology, initiate the first interdisciplinary doctoral program in Geospatial and Environmental Analysis in the United States, and expand our new programs in environmental education. Enrollment in our National Capital Region professional degree program will be expanded, an innovative externally funded postdoctoral program to train future faculty will be developed, and the degree offerings will be more tightly focused by discontinuing the National Capital Region M.F. program.

We will continue to diversify our faculty and staff in all hiring actions as an important step in the further diversification of our student body. To enhance the standing of the College as a recognized leader in environmental and natural resources education, research, and outreach we will aggressively continue to nominate deserving faculty and staff members for national and international awards and recognitions. Likewise, we will work vigorously to increase gifts to the College endowment. All of the above actions will help us to contribute to the overall advancement of university, college, department and program rankings while at the same time helping us to serve better the various natural resource constituencies within the Commonwealth, nation, and the world.

## **2. Learning -- Undergraduate Academic Plans**

The college will expand its efforts to provide a high quality undergraduate education in all of its majors and will continue to evolve and refine both the quality of teaching and the utilization of innovative approaches that improve learning and the learning environment. Regular SAF and FPS program accreditation reviews will be used to guide the evolution of the curriculum in the forestry and wood science programs. Degree programs without regular review requirements for professional accreditation will be evaluated internally on a 5-year rotation and at 10-year intervals through the CSREES Review process. All programs will include a process for the regular collection of learning outcomes data and its evaluation. Our approach to outcomes assessment will be guided in part by the requirements of specialized professional program accreditation guidelines.

While a capstone experience has been the norm in the forestry, fisheries, and wildlife majors for a number of years, we will in this planning period define and develop a menu of appropriate capstone experiences for each of our majors, one of which will be an opportunity for an undergraduate research experience. Where extra costs to the student are involved, we will be mindful of these expenses and will seek external assistance to provide scholarships or stipends. For example, the Wood Science and Forest Products Department will experiment with the introduction of a 'manufacturing enterprise institute' in the curriculum. This experience will be an integrated business-like environment for students, conceptually including all aspects and stages of running a modern wood manufacturing business. It is envisioned that other programs on campus

will be invited to participate, including marketing, management, industrial design, architecture, and industrial systems engineering.

The Department of Geography plans to establish a nationally recognized major in meteorology that will attract highly-qualified students from throughout the United States. This major will leverage existing strengths within the Department of Geography and elsewhere in the College to provide innovative undergraduate training consistent with the emerging paradigm in meteorology that places increasing emphasis on geospatial analysis and climatology in education and forecasting. To enhance the major, we will establish collaborative relations with the National Weather Service (NWS) in Blacksburg to provide educational and internship opportunities for meteorology majors. The NWS fully support the establishment of the major within the Department of Geography and is eager for it to proceed. Given the opportunities available with the NWS and the extensive and growing external funding available for meteorology (average annual external funding per FTE nationally of \$450,000), we envision expanding significantly undergraduate research experiences for the majors in collaboration with the new faculty in meteorology. We are confident that the program will be able to attract 100 majors within a few years. Moreover, the VT Air Force ROTC has indicated its strong support for the new major, noting that meteorology skills are in great demand in the Air Force and that the meteorology major will help it attract more highly qualified students, including winners of meteorology scholarships available from the Air Force who are forced to attend universities outside of Virginia. In addition, the courses in the meteorology major will help students in other departments, such as Geosciences (for example, in their Geosciences education track). Lastly, the major will allow us to recruit productive and visionary researchers who will not only provide an innovative undergraduate program in meteorology but also participate in and strengthen the CNR-wide doctoral program in Geospatial and Environmental Analysis.

The Virginia Tech Aquaculture Center is the focal point in the state and region for developing and testing aquaculture systems for use in commercial aquaculture, conservation aquaculture, and research. Building on these existing strengths, the Department of Fisheries and Wildlife Sciences will develop a new undergraduate option in Aquaculture to serve the growing need for trained professionals in this area.

The Department of Forestry is committed to maintaining its traditionally strong programs in natural resource management while expanding and strengthening newer programs in environmental resource management, urban forestry, and natural resource conservation. A particular emphasis will be placed on further development of the relatively new environmental education and urban forestry options.

During the current planning period efforts will be made to increase overall undergraduate enrollment in the college to approximately 600 students. A three-pronged approach will be used. First, the creation of the previously mentioned meteorology major and aquaculture option, combined with the continued growth of interest in geospatial training, will attract a significant number of additional students directly to the College. We also expect increased interest and continued growth in our environmental education

options. Second, articulation agreements will be developed with community colleges to facilitate movement of community college students to all options in the College. And third, a more aggressive effort will be undertaken to recruit students from the University Studies pool. We will also undertake an extensive make-over of our College and departmental webpages to make them more effective in attracting students. In the context of an increasingly globalized economy and environment, we need to strive to engage all of our students in courses and study abroad opportunities to expand international perspectives. And finally, we will increase our level of contact with high school guidance counselors to keep them fully informed about opportunities and available educational options for students interested in natural resources. To support all of these efforts we will seek to add to our scholarship endowments as a part of the current university capital campaign and will seek to increase the number of out of state students and under represented groups through increases in both the number and amount of scholarship offers.

***Outcome Measures and Benchmarks:*** Course ratings; local, regional and national teaching awards; number of new capstone experiences developed; development of new programs in meteorology and aquaculture; number of undergraduate students; number of articulation agreements; new website developed; number of high school counselor contacts; placement rates of graduates; salary ranges; and other employer based feedback. ***Resource Requirements/Sources:*** Development of the meteorology major will require new funds for positions and operations from the University level. Other changes will utilize existing or reprogrammed funds within the departments and college.

### 3. Learning -- Graduate Academic Plans

The graduate programs in the College will continue to provide high quality curricula addressing both the theoretical and applied aspects of natural resource disciplines. Our goal is to grow our on-campus program by 60 doctoral students and our National Capital Region professional degree program by 20 for a total enrollment of 111 M.S., 101 Ph.D. and 70 professional degree (M.N.R.) students by 1012.

One of the ways we will increase our doctoral student numbers will be through the development of two interdisciplinary doctoral programs that will reach across the College and beyond. The first will combine cutting-edge training in the theory and application of geospatial science with environmental analysis to address a broad range of contemporary natural resource and environmental issues. In order to take full advantage of this opportunity, this expansion will require that we move forward with the hiring of two new faculty in remote sensing applications. Expansion of the CNR faculty in this area was previously vetted and approved by the coordinating Council for Engineering, Physical Sciences, and Information Technology. The second will build on an existing strength and seek to move Virginia Tech into a position of national leadership through an expanded graduate education program in the area of biomaterials development and commercialization. Similarly, existing strengths within the College will be utilized to evolve new research efforts that will expand graduate education in biotechnology and

aquaculture and lead to the development of a new graduate education program in ecotoxicology. Funds to expand the geospatial and biomaterials programs will be provided by the Provost. Start-up costs will be shared and largely derived from research overhead and endowment earnings.

Our National Capital Region M.N.R. program will be used to develop a unique post-doctoral training experience to prepare future faculty by providing a mentored teaching experience. We will also develop a graduate certificate and College web presence in human dimensions of natural resources in order to attract and recognize graduate students who address the social dimensions of natural resource issues.

More emphasis will be placed on pedagogical approaches that facilitate rapid publication in peer-reviewed journals and provide doctoral students with opportunities to gain training and experience in teaching. Moreover, these exciting new programs will help to increase diversity by attracting additional international students and by providing an attractive vehicle with which to recruit minority students from within the United States. Paralleling these efforts will be an increased emphasis on having a strong web-presence for our graduate education and research efforts.

***Outcome Measures and Benchmarks:*** *number of Masters, Doctorate, and Professional Degree students enrolled; number of new interdisciplinary graduate degree programs developed; number of peer-reviewed journal papers published within one year of graduate degree completion; increase in racial and gender diversity of graduate students; graduate website revised.* ***Resource Requirements/Sources:*** *Expansion in the geospatial area will require new funds for positions and operations from the University level. Funding for the biomaterials initiative has already been approved. Other changes will be funded internally through existing funds and reprogramming at the department and college level.*

#### **4. Discovery**

Several new or strengthened research initiatives will be developed or expanded during the period from 2006 to 2012. The Virginia Tech Aquaculture Center will expand capabilities to support research on aquaculture technologies by faculty across the University. The College will assume the lead role at Virginia Tech in aquaculture and seek to double the Aquaculture Virginia allocation from USDA. An International Initiative for Sustainable and Biosecure Aquafarming will be developed to foster academic and industrial collaborations and to establish new seafood manufacturing businesses.

Ecotoxicology is a relatively new area with tremendous potential. Novel herbicides, pesticides, and residual human wastes are creating unforeseen problems throughout the world. We will develop a state-of-the-art laboratory and outdoor mesocosm facility to facilitate new research on the impact of environmental toxicants on the physiology, nutrition, endocrinology, and embryology of wild animals. This effort meshes closely with the complements and current IBPHS initiative in infectious diseases

as well as certain areas of human health and nutrition. Similarly, the College plans to partner with the College of Engineering to explore the development of a major research project in northern Virginia focused on the impacts of urbanization on water quality and quantity as a part of the ICTAS water initiatives. It is also possible that this effort would have ties to a proposed “third institute” that is to explore issues relating to social and individual transformation.

The College is already the university leader in geospatial analysis. Given that research opportunities are expanding exponentially in this field, the College needs to strengthen its faculty resources in remote sensing as previously mentioned, to have the necessary expertise to more effectively compete for large external grants in geospatial analysis.

Both the College and University have already committed significant resources to expanding our efforts in biomaterials and biotechnology as a part of the ICTAS initiative. We will continue to build on these investments through cooperative efforts with faculty in Agriculture and Life Sciences, Engineering, and the Virginia Bioinformatics Institute to expand further our research efforts in plant molecular genetics, propagation, energy, and biobased materials. These efforts will include both research on new materials and their application using our facilities and faculty at both Blacksburg and at the Institute for Advanced Learning and Research in Danville. Commercialization of new materials and products will be aggressively pursued through Virginia Tech Intellectual Properties. The Sustainable Engineered Materials Institute, with current federal support for leading edge research, is a foundation from which to engage the broader materials community on the campus and foster development of new products from renewable natural resources.

The College will place greater emphasis on faculty, staff, and graduate students publishing high quality research in nationally and internationally recognized top-tier, peer-reviewed journals in the signature research areas of the College. This activity is essential to sustaining our goal of increasing sponsored funding by at least 10% each year. Also in order to sustain this growth, it is essential in the near term that resources be invested in refurbishing existing research space as well as acquiring leased space. Longer term, the goal is to develop sufficient funding from state and private sources to support the creation on campus of at least 30 thousand assignable square feet of classroom, specialized teaching, computation, and research space.

Future hires will be focused on strengthening research in geospatial analysis, meteorology, biogeography, international dimensions of resource use, wildlife disease, watershed management, forest hydrology, and biomaterials. Research will be both expanded and enhanced by the coordinating council-approved cluster hire in remote sensing and by recruiting faculty for the meteorology program; both will also strengthen the doctoral program in geospatial and environmental analysis and increase the procurement of external funding in new areas. We will continue to build on existing cooperative relationships with industry to increase research funding as well as aggressively pursue support from traditional sources such as NRI and NSF as well as new efforts directed at NIH. These new programs and program enhancements will make

Virginia Tech much more competitive for large external grants and facilitate the application of advanced technology to societal needs.

***Outcome Measures and Benchmarks:*** *Number of research grants and contracts in new priority program areas; new contracts and grants for the Sloan Center; number of faculty hired in priority program areas; number of team-based grants in excess of \$1M.*

***Resource Requirements/Sources:*** *Expansion in the geospatial area will require new funds for positions and operations from the University level. Funding for the biomaterials initiative has already been approved. Other changes will be funded internally through existing funds and reprogramming at the department and college level.*

## **5. Engagement and International Programs**

A central mission of the College is to serve the needs of the Commonwealth through various forms of outreach. In the College we have organized outreach under five programmatic themes as follows: (i) industrial and cooperative extension programs, (ii) economic development programs, (iii) youth and teacher education programs, (iv) continuing and professional education programs, and (v) international development programs. Some faculty in the College have formal outreach positions, e.g. extension specialists and associates; however, most engagement programs are conducted by regular teaching and research faculty.

During 2006 – 2012 we will continue to build our Cooperative Extension Programs by strengthening our capacity and focusing on branded and issue-based programs. Specifically, we will improve our national award-winning *Virginia Forest Landowner Education Program* by increasing educational services in emerging areas such as land fragmentation, invasive species, water quality, wildland fire, land protection, and wildland-urban interface issues. We will toward the creation of a research and extension center that better serves the needs of the 400,000 forest owners in the state, and takes advantage of synergies with other state and federal agencies and non-governmental organizations. We will also move toward growing and institutionalizing two soft-money-funded and highly successful programs: the *Virginia SHARP Logger Program* and the *Virginia Geospatial Extension Program*. We will seek hard-money support for the coordinators of these two valuable programs, and increase the level of soft-money operational support. The CNR is planning to develop a new Extension Demonstration Area focused on conservation of natural resources, at the former Catawba Dairy Farm west of Roanoke. This cooperative venture will receive much attention during 2006 – 2012. This new facility will provide an outstanding resource for the College's teaching, research, and extension programs, and will result in stronger ties with partner organizations. The CNR will foster new partnerships with community focused on natural resource conservation and development issues, e.g. the Grayson County Land Care Group. The CNR will provide land protection and natural resource conservation efforts to support community development efforts as well. During 2006 – 2012 the CNR will conduct a strategic planning process for our Extension programs, and specifically look at administrative and resource issues to insure our Extension resources are effectively used to foster the highest quality and most productive programs possible.

The College will continue its support of university economic development issues, including full participation in the university Southside Initiative and other initiatives as they develop. The College will continue to work with the Department of Horticulture to assist with the development of a high-value nursery and tree crop industry for Southside Virginia. Working with the offices of the Secretary of Agriculture and Forestry, the Secretary of Commerce and Trade, and building on existing Extension programs in forest products and the newly established Sloan Forest Industries Center; the College will take a leadership role in the development of new programming and an initiative in manufacturing systems to better support and lead the Virginia forest products manufacturing industry into global competitiveness. The College, working through the Virginia Water Resources Center, will undertake follow up programs to the Governor's 2004 Summit on Water.

The College will continue to build the award-winning Wood Magic Program, which brings science-based programming to 4<sup>th</sup> grade students and teachers in accordance with the Virginia Standards of Learning. Also, we will expand our natural resource education web pages, continue to offer educational programs for K-12 teachers across the Commonwealth, and continue participation with the Governors School for Agriculture and Natural Resources. Activities associated with *Virginia View* will be expanded to increase public accessibility to and application of digital satellite imagery. Additionally, the College will take the lead role in developing and implementing a new *Master Naturalist Program*, with cooperative funding from five state agencies.

The College will grow its portfolio of both open enrollment and contract continuing education courses offered to government agencies, private industry, non-government organizations, and the general public. Targeted areas include unit load design, packaging science, non-timber forest products, natural resources leadership, timber harvesting, and forest nutrition. New web-based courses will be developed in cooperation with the U.S. Forest Service within the Distance Education Consortium.

The College will also grow its portfolio of international development and research projects, and encourage more faculty and graduate students to engage in these projects. We will strengthen our relationships with the Office of International Research, Education and Development and help implement the University's international strategic plan. The College will be a participant in developing programs for the Caribbean Center for Education and Research in the Dominican Republic, increasing our activities at the Los Cuevas Research Center in Belize, and through a joint cooperative program with CALS, Vet Med, and the Universidad Austral de Chile, provide graduate training for future Chilean faculty and encourage Virginia Tech faculty and students to participate in programs at Austral. We will also participate in the exploration of the formation of a Virginia Tech center in Asia. The College will expand both the quantity and quality of study-abroad courses for students and will seek additional scholarship support to assist more students to gain international study opportunities.

***Outcome Measure and Benchmarks:*** Master Naturalist program initiated and functional; number of activities that utilize the facilities at Punta Cana; number of student and faculty participating in exchanges with Universidad Austral; number of professional development courses offered at the VT Asia Center; increase in the number of students enrolled in international study programs; number of students using College educational webpages. ***Resource Requirements/Sources:*** Conversion of two soft money Extension positions will require new funds from Extension at the University level. Other changes will be funded internally with existing funds and reprogramming at the department and college level.