

FWF Strategic Plan (2009-2014)

Vision

We will be recognized nationally and internationally as a premier university research, teaching and outreach department focusing on the natural resource disciplines. As the flagship natural resource program in Tennessee, we will be known for our leadership, and our ability to address the needs of the state, the region and beyond.

Mission

The mission of the Department of Forestry, Wildlife and Fisheries (FWF) is to advance the science and sustainable management of natural resources to promote their health, utilization, and appreciation in Tennessee, the region and beyond through programs in teaching, research and extension.

Driving Forces

“Change” is the one word that best characterizes the natural resources of Tennessee and the surrounding region, now and into the foreseeable future. Many underlying factors are driving this change. The faculty in the Department of Forestry, Wildlife and Fisheries must address these factors as they develop a strategy for the future. The major factors to consider include changes in population, climate, invasive species, production emphasis, and ownership.

Several trends in population demographics for the state and region are evident. In general, the population is aging as the “baby boom generation” approaches retirement. There is also a national movement of population away from rural areas into more urban environments. Overall, the state of Tennessee is experiencing an increase in population due to an influx of retirees, of recreationists who desire second homes, and immigrants from other states (and other countries) seeking a higher quality of life and the amenities afforded by our natural resources. Associated with population increases is increased development and a concomitant loss of wild and agricultural lands due to development. Approximately 80,000 acres per year are lost to development, greatly impacting wildlife and forest resources. This trend is expected to continue as the state population is predicted to increase by 20% over the next 20 years.

These human demographic changes are also interacting with climate- and habitat-induced changes in the distribution of wildlife that can spread disease to people and domestic animals (e.g., the recent spread of rabid raccoons into eastern Tennessee, and accelerating rates of wildlife-hosted tick-borne disease across the state). Continuation of these trends will likely lead to resource demands that will stress the state's forests and wildlife, and emphasize the interaction (both positive and negative) of humans with our state's natural resources.

Another factor that brings change and potentially more stress is climate change. Expected warming of the region may result in the decline of some species (both plant and animal) and to the influx of others more suited to warmer climates. The recent regional drought highlights the potential negative consequences and added stress that can be linked to changes in the region's climate. In addition, regional human influences may have an additive effect on the stress brought

about from climate change. Projected population growth may lead to increased nitrogen/sulfate deposition, air quality issues, and impacts on the water table as well as soil and water chemistry. As a result, there is a need to adapt our science and education activities to encompass natural and human-induced fluctuations in temperature, water quality and quantity, and related threats to the health of our ecosystems.

A third major factor, the significant impact of invasive species, is also linked to population and climate change. As our growing population leads to an increased use of our resources by both tourists and native Tennesseans, invasive plant and animal species are inadvertently spread. Changing transportation infrastructure and increased world commerce also lead to greater potential movement of plants, insects and diseases throughout the region. A plethora of exotic forest pests including hemlock and balsam wooly adelgids, butternut canker, beech bark disease, and dogwood anthracnose, continue to devastate native host species. Zebra mussels, first found in the Tennessee River in 1991, now can be found throughout its length. Fire ants continue their slow but steady spread northward, and pests such as the gypsy moth, emerald ash borer, and sudden oak death loom as future threats to our hardwood forests. The Tennessee Exotic Plant Council lists 29 plant species as serious threats, including Japanese knotweed, kudzu, mimosa, Japanese stilt grass, tree of heaven, Johnson grass and Japanese honeysuckle, all of which displace native plant species and potentially inhibit natural and artificial forest regeneration. Gradual warming of Tennessee's climate will allow even more pests (exotic and native) to move into the region from more southern ecosystems. Scientists and educators will be faced with the new challenges posed by these invaders.

Yet another factor that potentially threatens the health of the state and regional ecosystems is change in land ownership due to two major trends: (1) aging of the population, and (2) divestiture of land by traditional forest industries. As our population continues to age, landowners will pass on their estates on to heirs who may have weaker ties to the land (especially if they live in more urban communities), and less interest in conserving and managing the lands they inherit. Another traditional forest landowner, forest industry, has all but completed total divestiture of their lands because of changes in tax code that made it more economically sensible to create and sell land to financial institutions such as timberland investment management organizations (TIMOs), real estate investment trusts (REITs), and limited liability and master limited partnerships. The objectives of these new land owning organizations may not coincide with previous management activities and methodologies. Both major factors, population aging, and land divestiture, will continue to increase the fragmentation of the land base that supports our forests and wildlife, leading to new and varied stresses on processes and species that normally depend on contiguous vegetation over large geographic areas.

One final factor affecting the structure and function of our forested ecosystems is a change in emphasis on the commodities produced from these lands. For example, a "commodity" receiving increased emphasis is recreation. Tennessee's natural resources are the basis of much of the tourism industry in the state. Increasing fragmentation and development, coupled with increasing demands for recreation, will place additional stress on the natural resources of the state, remove land from the overall base, and affect the use of adjacent land due to changes in visual values. We need to better understand the importance of the recreation and tourism sector

and its interaction with competing interests for the state's natural resources.

Another prominent example of a commodity that has moved to the forefront of our resource management strategy, due to increases in energy costs and a desire to reduce dependency on foreign oil, is the production of biofuels and biobased products from cellulosic feed stocks such as switchgrass and woody biomass from our forests. Increased acreage in switchgrass will have significant implications for wildlife populations. Increased use of timber resources for biomass will also affect plant and animal species, as well as the markets for traditional wood products. Rather than wait until such changes have occurred to determine appropriate forest and wildlife management strategies, proactive work is needed if we are to help promote sustainable use of our valuable natural resources.

Recent global events have also substantially increased emphasis on domestic fossil fuel exploration and production. Recent increases in the price of coal have resulted in new surface mines and re-mining of many former mine sites in Tennessee and the region. Reforestation research and improved techniques are needed to expedite the recovery of native hardwood ecosystems and amenities on these sites after mining and mine soil reclamation. Re-mined sites provide significant opportunities to improve tree growth, native diversity, and suitability for wildlife over levels of success achieved for these forest attributes with earlier revegetation techniques.

All of the significant factors mentioned above (population change, climate, invasive species, shifts in ownership, and changes in product emphasis) will likely lead to increased stress on our environment. Cutting across several factors is the influence of globalization. While current economic conditions are dampening the effects somewhat, the impacts of globalization are becoming increasingly evident. Sawmills are converting to facilities to ship containerized logs to Asia, international tourism is increasing, and international competition is affecting the forest industry in the state. These factors and the influence of globalization will necessitate new approaches to wise management and conservation. Ultimately, the health of our forests, streams, and wildlife, and the communities that depend on them will depend on the research and education efforts of scientists and educators like those in the Department of Forestry, Wildlife and Fisheries. It is our responsibility to plan to meet these needs in the future. This strategic plan for the Department has been developed with such factors firmly in mind.

Inherent Strengths:

We are located at a geographic juncture of five major physiographic provinces, which positions us particularly well to conduct research relevant to species and systems native to the Coastal Plain, Highland Rim, Cumberland Mountains, Cumberland Plateau, Ridge and Valley, and Appalachians. The diversity of physiographic regions, landforms, and species within our state also enhances our ability to expose our students to the species and management of systems ranging from bottomland hardwoods to Appalachian spruce-fir forests.

Several faculty have developed strong international affiliations (e.g., Austria, Canada, China, Czech Republic, France, Mexico, Slovenia, Thailand, etc.) that lead to opportunities for collaborative research, teaching and outreach on a wide variety of disciplinary areas.

The breadth of disciplines represented within the department is very wide. Most other units at peer institutions are aggregated into separate departments of forestry, wildlife & fisheries, and forest products within a college or school.

Research, teaching and Extension activities are focused on hardwood ecosystems. Our strongest competitors (peers we aspire to equal or surpass) are more focused on pine and mixed ecosystems, giving us a niche that we can exploit.

Research Programs

Strengths of Our General Research Program

Organization into “centers” provides a potential mechanism to both focus research efforts, and to draw together cooperating scientists across disciplines and departmental/unit lines, including scientists outside of UT. Centers can also help promote recognition of research efforts by topic area.

The department contains a very wide range of disciplinary experts. Most other peer departments have been homogenized within a larger unit, e.g., a *department* of forest products, or forestry, or wildlife and fisheries within a college of natural resources.

FWF extramural grant and contract funding (research and Extension) consistently surpasses that garnered by the other six departments within UTIA.

Currently, there is a mixture of applied and basic research efforts department-wide.

The demographics of the faculty are a source of stability in research programs. Although the number of full professors is large relative to associate and assistant professors, only a minority are nearing retirement.

The research environment within UTIA encourages cooperation across departments and other units.

The 10 Research and Education Centers distributed across the state are a valuable resource for field research activities.

The proximity of large tracts of public land (e.g., Great Smoky Mountains National Park, Cherokee National Forest, Tennessee’s state forests, state parks, and Wildlife Management Areas), and public waters (many of the State’s major reservoirs, over 700 miles of trout streams, and an abundance of cool and warm water rivers and streams) allows for long- and short-term research activities through cooperation with federal and state agencies.

Proximity to Oak Ridge National Laboratory provides unique opportunities for collaboration on energy, materials science, nanotechnology, high performance computing, and environmental research.

We are the host institution for the Southeast Regional Sun Grant Center, and have direct ties with the UT Office of Bioenergy Programs.

Personnel from government agencies (e.g., US Forest Service, TDF, USGS, National Park Service) stationed on, or near, campus facilitates cooperative studies. For example, we are the host institution for the SA-CESU (Scientists from USDA Forest Service, USDI National Park Service, and U.S. Geological Survey are stationed within department), and the host institute for

the Southern Appalachian Field Laboratory of USGS.

Faculty have developed strong research relationships with industrial and NGO partners.

Research Areas

The characterization of current research activities can be seen as a continuum that has *long-term signature areas* at one end, followed by *established* and *developing* research areas, and ending with potential *research opportunities* at the other. Although a research area may appear in one of these discrete categories below, there is no attempt to indicate whether the area falls at the upper or lower end of that category – i.e., the order of appearance in each list is simply alphabetical and has no intentional significance.

Long Term “Signature” Areas

Over the years the department has become well known for several research areas that have shaped the way we are perceived by peers and constituents. These “signature” areas have contributed directly to our national, and sometimes international, reputation for excellence in research. Other established and emerging research areas exist within the department, and could be elevated to “signature” areas in the future, but the following are what we believe we are known for at present:

- Avian Ecology and Conservation
- Carnivore Ecology
- Conservation Fisheries
- Hardwood Management
- Primary Wood Processing (e.g., drying)
- Quail Research at Ames Plantation
- Tree Improvement
- Wood Composite Manufacturing and Characterizations

As departmental priorities evolve, some of the signature areas may be maintained, while others may fade through changes in staffing and resource allocation.

Established Research Programs

In addition to the “signature areas” identified above, the department also has developed well-established research programs in:

- Aquatic Organism Stress Physiology
- Forest Economics
- Habitat Modeling
- Human Dimensions
- Mycobacterium & Johne’s Disease
- Native Grasslands Ecology and Management

Natural Resources Policy
NIR use for non-destructive, fast characterization of wood products
Process Analytics/Statistical Process Control
Ungulate Ecology and Management
Upland Ecology and Habitat Management
Wetland Ecology and Habitat Management
Wildlife Habitat Modeling

Again, research activity in these areas may be strengthened, potentially leading to accomplishments that will elevate them to signature areas, or be reduced as departmental and individual scientist priorities and funding opportunities evolve.

Developing Research Programs

Several research areas have been identified within the department as being in the establishment phase. Typically, these are areas that have been recognized as scientifically significant, and in which faculty members have been successful in garnering extramural support. Continued success with grants and contracts in these areas and/or allocation of additional state funds, could lead to an established or, eventually, a signature program.

Advanced materials
Amphibian Disease Ecology
Bioenergy
Ecosystem Services
Forest Restoration
Landscape Ecology
Nano-technology
Wildlife Health

Opportunities

The following areas have been identified as having significant opportunity for increased research activity in the future:

Aquaculture
Bio-products
Biofuels Sustainability
Climate Change
Wildlife Disease Modeling
Disturbance Ecology
Fire Ecology and Management
Forest Soils/Hydrology
Invasive Species Ecology and Management
Resources Sampling
Spatial Technology/Analysis
Urban/Community Forestry

Watershed Management
Wildlife Damage Ecology and Management
Wildlife Disease Diagnostics
Wood Protection/Preservation

Strategic Research Directions for the Department

Upon consideration of external driving forces, current research activities, and foreseeable opportunities, the following five strategic research directions have been identified for the department: bio-based products, disturbance-related ecology and land management, native grassland ecology and management, wildlife health, and human dimensions and institutions of natural resource management.

Bio-based products – includes energy, chemicals, composites and solid wood products from cellulosic sources. Although much of this effort is focused on the bioenergy component at present, the initiative cuts across land management (forest and grassland), policy and socio-economics, wildlife management and ecology, and watershed management projects.

Justification

Investigations into the efficient production of bioenergy have moved to the forefront of our resource management strategy due to increases in energy costs and a desire to reduce dependency on foreign oil. Included in this strategic focus area is the production of both biofuels and bio-based products from cellulosic feed stocks such as switchgrass and woody biomass from our forests. Increased acreage in switchgrass will have significant implications for wildlife populations. Increased use of timber resources for biomass will also affect plant and animal species, as well as the markets for traditional wood products. Communities dependent on natural resources for jobs and tax revenues will also be affected, depending on the success of statewide and region-wide efforts to convert cellulosic feedstocks into marketable products. Rather than wait until such changes have occurred to determine appropriate forest and wildlife management strategies, as well as appropriate socio-economic policies, proactive work is needed if we are to help promote sustainable use of our valuable natural resources.

Strengths, Weaknesses, Opportunities and Threats

The strengths of the department that support this effort are the personnel and resources within the Forest Products Laboratory and their close ties to the Office of Bioenergy Programs, as well as the Southeastern Regional Sun Grant Center. We also have a wide range of personnel outside of the Forest Products Center with the expertise necessary to cover several of the related issues pertaining to grassland management, forest ecology, wildlife management, economics, and policy. Finally, our scientists have developed strong national and international collaborations that will help us leverage our expertise in specialized subdisciplines. Our weaknesses relate to both personnel and facilities. There are disciplinary gaps in the expertise of our current faculty, even within the Forest

Products Center. We lack scientists in cellulosic chemistry, landscape ecology, watershed management, and spatial modeling. The department also lacks depth in key areas for this, or any other, initiative. We compete for funding resources against other units across the country that are several scientists deep in any given disciplinary area. Even at our current staffing level, we are at (or above) capacity in terms of office and laboratory space. What space we do have is spread among many locations, hindering cross-disciplinary collaborations. Given the current funding support of bioenergy-related research at both the state and national levels, and the expected demand for education in this area (undergraduate, graduate, and Extension), we have a tremendous opportunity to establish ourselves as one of the leading programs for comprehensive research, teaching and Extension programs in bio-based products. The threats to realizing this success are the current economic downturn (limiting the availability of resources to sustain and expand our efforts), and our heavy reliance on extramural funding to support our current personnel with technicians, graduate students and operating funds.

Disturbance-related ecology and land management – includes “traditional” disturbances of our natural ecosystems such as timber harvesting, storms, wildfires, and endemic insects and diseases, plus sources of disturbance related to the changes we see in our state and region. These disturbances include the introduction of exotic invasive species, and land conversion.

Justification

Much of the “change” described in the Driving Forces section of this plan manifests through one or more types of disturbances to existing landscapes. In addition to longstanding sources of disturbance, we recognize that other sources of “disturbance” are also leading to changes in our forests and grasslands, changes that must be addressed if we are to continue to serve the needs of our constituents. Exotic invasive species, both plant and animal, are crowding out native varieties. Exotic insects and disease pests such as the hemlock woolly adelgid have caused devastation in native populations of eastern hemlocks, and threats from other potential pests such as the emerald ash borer, sudden oak death, and the gypsy moth could be just as severe in the future. Land conversion is another type of disturbance, one that includes changes in crops (e.g., to feed stocks for biofuels), fragmentation due to ownership changes, and general population growth that is also leading to increased urbanization (and suburbanization). Energy concerns have led to increased interest and activity in the extraction of non-renewable resources, such as coal and natural gas, which can also disturb the environment. Finally, climate change is an issue that will conceivably affect, directly or indirectly, all of the other disturbances just mentioned. These disturbances ultimately lead to questions regarding the best practices for land management and conservation. We are committed to seeking answers to these questions through our local, regional, national, and international research activities, to transmitting these answers to the public via our Extension activities, and to infusing our courses with the new knowledge we gain to better prepare our graduates for their careers in natural resource management and conservation.

Strengths, Weaknesses, Opportunities and Threats

One of our major strengths in pursuing this strategic initiative is also one of our weaknesses. Within the department we have the advantage of an extremely broad range of disciplinary expertise with which we can address the variety of disturbances that affect our natural resources. However, we have no depth of faculty expertise in any given area. We also have gaps in expertise in several key areas (e.g., landscape ecology, watershed management, and spatial modeling). We currently have excellent relationships with personnel in other UT departments, other state agencies and NGOs, promoting collaborative opportunities that can offset some of the lack of scientific depth within the department. Our departmental Extension professionals also provide us with direct connections to the network of county agents and the county forestry associations, giving us the ability to implement research-based solutions and provide advice to alleviate the effects of disturbances, or to help prevent their occurrence.

Several specific areas that represent opportunities related to this initiative include: disturbance ecology, invasive species ecology and management, climate change, fire ecology and management, and urban/community forestry. These areas have implications for all three components of our land grant mission and can be tailored to the specific needs of our state and region. Threats to the success of this initiative center on the relatively small size of our department. Typically, we find ourselves competing for resources and students with other university programs in our region that are Colleges or Schools (at least three times our size), rather than departments. Although we have been very successful in the past, our overall capacity is limited by our faculty numbers and our facilities. We also suffer from our faculty, staff and graduate students being dispersed among numerous locations on campus, making management and collaboration difficult and inefficient.

Native grasslands ecology and management – Native grasslands, once a significant component of Eastern landscapes, have been reduced more than any other ecosystem in North America. These grasslands included extensive prairies, pine and oak savannahs, oak woodlands, and cedar glades, each with especially adapted flora and fauna. Today, approximately 51 million acres of pasture and hay lands (with mostly non-native grass species) occur in the Mid-South alone, a very significant component of non-forested cover within the region. Grasslands also occur on reclaimed surface mines, military training areas, and as small but important features within row crop dominated landscapes (e.g., grassed waterways, field buffers, and filter strips).

Justification

In recent years, a number of opportunities to incorporate native grasses into various management systems have been proposed. These include silvopastures, wildlife habitat, traditional forage production for hay and pasture, soil conservation, and surface mine reclamation. More recently, use of native grasses as biofuels feedstock has received a great deal of attention. In order to improve deployment of native grasses and to ensure

optimum ecological benefits are realized, better information on ecology and management is needed.

Strengths, Weaknesses, Opportunities and Threats

Three organizational components within the department represent the strengths that support this initiative. The Center for Native Grasslands Management (CNGM), the first of its kind east of the Great Plains, operates within FWF. We are also the headquarters for the newly organized Eastern Native Grasslands Alliance (ENGA), an “organization of organizations” that share an interest in issues related to the management of native grasslands for wildlife, ecosystem restoration, biofuels, etc. During 2008 we also learned that we were successful in our bid to host the Northern Bobwhite Conservation Initiative (NBCI), a national effort supported by nearly 30 state wildlife agencies to work toward the restoration of steadily declining northern bobwhite quail populations throughout their native range. We also have a range of faculty expertise that will allow us to address many of the scientific and management concerns related to this strategic direction, including (but not limited to) such issues as: the suitability of native grasses for biofuels (both economically and chemically); the potential to manage native grassland communities for wildlife species; and the establishment or restoration of sustainable oak savannahs.

The opportunity presented by the current co-location of the CNGM, ENGA and NBCI entities is that we could very quickly establish a national reputation as the foremost program on the ecology and management of native grasslands. Our current weaknesses include a lack of personnel, facilities and operating support to carry out much of the research and Extension activities required to accomplish the goals of the CNGM and NBCI. However, we have recently been notified that we have been designated as a “Keystone Initiative” by the National Fish and Wildlife Foundation, and as such, we are likely to receive a large grant (potentially \$7.5 million over 10 years) to provide support for personnel and operating. Assuming this grant is awarded as expected, the remaining “threat” to this overall initiative will be the ability to find space to house the additional personnel (4-5 people) that the grant will support.

Wildlife health – Wildlife Health research, and the related field of Conservation Medicine, are academic areas that are growing rapidly in importance. This growth is being driven in part by concern about zoonotic diseases — cross-species diseases that travel to humans from other animals — as well as diseases that travel from wildlife to livestock and thereby threaten our agricultural production systems. The recent outbreak of the H1N1 virus also serves to illustrate that such disease-related concerns are global in scale, and research will benefit greatly from strong national and international collaborations.

Justification

Given the increasing stress being placed on our ecosystems, there are growing health threats to valued wildlife populations themselves. Such issues require not only fundamental research into wildlife disease ecology and diagnosis, but also application of research findings in ways that provide practical assistance for resource managers, policy-makers, and landowners. These problems must be addressed using a team approach that involves wildlife biologists, entomologists, veterinarians, animal production managers, public health specialists, epidemiologists and scientists in numerous other disciplines.

Strengths, Weaknesses, Opportunities and Threats

One of the strengths of the FWF wildlife health program is the close collaboration between faculty across sub-disciplines within the department, and across disciplines outside of the department (e.g., with colleagues in UT CVM, the University of Georgia, Michigan State University, ORNL, etc.). We have close ties to the new NIMBioS initiative (One FWF faculty member is an Assistant Director) which promises to bring further opportunities for collaborative efforts. Finally, we have had significant success related to extramural funding in general, and specifically relating to work on infectious disease diagnostics. Given the growing interest in infectious disease research, there is a tremendous opportunity to secure competitive funding from a very wide range of federal granting programs and agencies, including NSF, AFRI, NIH, CDC, DoD, and DHS.

The weaknesses we face in our wildlife health program are similar to those in other areas, namely a lack of depth in any given discipline, and gaps in coverage of sub-disciplines such as wildlife toxicology, wildlife disease modeling, and wildlife pathology. Collaboration with scientists outside of FWF can alleviate some of these weaknesses, and we also have an opportunity for an additional faculty position related to animal infectious disease modeling through the NIMBioS program. The main threat to the ongoing success of the wildlife health program is potential loss of two positions, one faculty (non tenure-track) and one research associate. Both positions were converted to soft funding in 2007 and have been self-supporting through several grants since then. Both positions are critical to the functioning of the program.

Human dimensions and institutions of natural resource management – includes the traditional disciplines of natural resource policy, economics, and sociology, and the emerging fields of ecosystem services markets, climate change policy, and natural resource sustainability.

Justification

Natural resource issues are complex, dynamic, and multi-dimensional. Citizens, institutions, and lawmakers need timely and comprehensive information, and innovative mechanisms for working together. Further, land managers and planners need policy improvements that recognize our interconnections, nurture ecological and human adaptation, and foster natural resource sustainability. Our economic, social, and political

systems -- as well as our natural environment -- have grown so interconnected that change and interactions are continuous. Changes are being driven by population growth, technological advances, and market globalization. This has produced a shared-power world whereby individuals, groups, and institutions struggle to influence their future. This struggle is increasingly being felt at rural landscape levels, as we mitigate and adapt natural resource management to constant perturbations like climate change, increasingly fragmented landscapes, and growing landowner diversity.

Tennessee's forests are primarily privately owned and the future of these lands is in the hands of the owners and the institutions influencing them. These institutions include markets, government agencies, and the civic sector (examples being forest certification programs, advocacy and user groups, and others promoting policy and institutional changes). Yet, we have insufficient knowledge about how our human and ecological systems interact and adapt to each other regarding such things as landowner decisions, policy development at the state or local level, and public attitudes. The human and political dimensions of these issues will be critical in determining the future of the state's natural ecosystems. These issues must be examined from a multi-disciplinary perspective to identify the interactions between the various institutions, landowners, and ecosystems.

Strengths, Weaknesses, Opportunities and Threats

The Department possesses a number of strengths to explore the human dimensions of natural resources. Two units, the Natural Resource Policy Center and the Human Dimensions Research Laboratory, are housed principally in the Department and involve a number of departmental faculty, staff, and graduate students. These centers also have been very successful in acquiring external funds and have strong ties with partners inside and beyond the University including Pennsylvania State University, EPA, The Nature Conservancy, TWRA and two centers at the University of Tennessee: Baker Center for Public Policy and Water Resources Research Center.

With the exception of the Natural Resource Policy Center, no entity exists at UT that specifically addresses the human dimension aspects of natural resource policy issues. Coupled with the growing interest in issues related to human-natural resource interactions such as biodiversity, climate change, and development pressures, we have a tremendous opportunity to develop a regional or national program in human dimensions of natural resources. Unfortunately, like other programs in the department, our primary weakness is that we lack the necessary depth to adequately cover all aspects of current and emerging issues. Even more importantly, we lack the necessary breadth to adequately deliver needed teaching, outreach, and research products. To address the issues noted in the justification above, this critical programmatic area must be strengthened, both in support and professional staffing, and in operational funding.

Staffing Priorities

The direction of research activities within the department will be determined in large part by the disciplinary background and interests of the faculty that are hired. Departmental operating resources can be used to promote research in a designated high priority area, but without qualified and willing faculty in that area, such resources will not be effective. When existing faculty positions become vacant, or opportunities for new positions arise, departmental priorities will be reflected by the decision to recruit from a particular discipline. This decision will be influenced by the research opportunities expected for existing programs, or the desire to expand our departmental research activities into new areas.

The following disciplinary areas, presented within the strategic research directions, have been identified as having high priority for new faculty lines that may become available within the department:

Biobased Products

- Analytical Chemistry
- Chemical Engineering
- Process Engineering

Disturbance-Related Ecology and Land Management

- Forest Soils/Hydrology
- Fire Ecology and Management
- Landscape Ecology
- Quantitative Ecology
- Spatial Analysis/Modeling
- Urban/Community Forestry
- Watershed Management
- Wildlife Damage Management

Native Grasslands Ecology and Management

- Fire Ecology and Management
- Landscape Ecology
- Quantitative Ecology
- Spatial Analysis/Modeling
- Watershed Management

Wildlife Health

- Spatial Analysis/Modeling
- Wildlife Disease Diagnostics (Eda)
- Wildlife Pathology (joint w/CVM?)

Human Dimensions and Institutions of Natural Resource Management

- Water Policy
- Biodiversity/Ecosystem Services

Based simply on the appearance within two or more initiatives, the highest priority new positions are Spatial Analysis/Modeling (3 initiatives), followed by Fire Ecology and Management, Landscape Ecology, Quantitative Ecology, and Watershed Management (2 initiatives).

The following support personnel are also needed to provide assistance to existing research activities (in order of priority):

Wildlife Health Lab Manager
Web Maintenance and Design
Instrument Technician/Research Associate (TFPC)
Spatial Analysis Research Associate
Research/Teaching assistant at MS level to assist with applied statistics
GIS Research Associate
Center for Native Grassland Management Research Associate

Resource Needs

Salary and benefits, office space, and operating support for faculty/staff identified above

Office space for current graduate students, post docs, etc.

Lab space for faculty and staff

Storage space for equipment, boats, etc.

GRA stipends (at minimum, restore \$110,000 cut; raise base rate for hard-funded stipends)

Vehicles to support field research programs

Implementation

1. Objective – secure existing faculty positions when or if they become vacant

Action – review positions of faculty that are retirement-eligible, plan future of each position, develop position request support material for each

Timeline - fall 2009, continuous evaluation and revisions as faculty become retirement-eligible, or as priorities change (revisit each summer at minimum).

2. Objective – compete successfully for new faculty positions when opportunity arises

Action – develop position request support material for high priority faculty positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

3. Objective – compete successfully for new research staff positions when opportunity arises

Action – develop position request support material for high priority staff positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

4. Objective – secure development funds for endowed faculty positions

Action – work with UTIA Development Office personnel to engage existing donors and seek new donors through initiatives such as the *Volunteer Forest*

Timeline – obtain commitment for position by 2012

5. Objective – provide adequate space to store small vehicles (ATVs, boats, etc.) and equipment

Action – work with AgResearch to construct new storage structure

Timeline – complete during fall of 2009

6. Objective – replace lost GRA funds

Action – develop GRA request support material linked to strategic research initiatives

Timeline – fall 2009 for FY11, and each subsequent fall for the following fiscal year in preparation for budget requests during the spring.

7. Objective – secure development funds for endowed graduate fellowship positions

Action– work with UTIA Development Office personnel to engage existing donors and seek new donors through initiatives such as the *Volunteer Forest*, link to research areas of interest to donor.

Timeline – obtain commitment for at least one fellowship by 2012

Academic Programs

Strengths

We have a diverse, comprehensive (forestry, wildlife, fisheries, forest products) department that provides many opportunities for multi-disciplinary instruction.

We emphasize applied, field-based, hands-on experiences, not only in field camp courses, but in many other forestry, wildlife, and fisheries courses.

We emphasize the use of technology by providing the students with state of the industry software. Students also are introduced to field use of high-end GPS technology and other technologically advanced measurement tools. Technology also enhances student-faculty interactions in a number of courses.

We are one of a dwindling number of programs that maintains a strong emphasis on traditional applied management skills and techniques of forestry, wildlife, and fisheries, while also considering multiple values and including emerging principles in the management of entire ecosystems. Applied management courses taught in blocks and called “field camps” are part of our teaching program.

Students receive one-on-one interaction with faculty in all courses, rather than interacting solely with teaching assistants or post-docs.

Students interact individually with faculty during academic advising, and faculty are involved in student clubs and extra-academic activities.

We currently offer two minors (one in Forestry, and one in Wildlife and Fisheries Science) to students in other majors. This allows us to educate students outside of our department in critical concepts related to natural resource science and management. This can be a pathway for non-majors into our graduate program.

Having National Park Service, USGS, and U.S. Forest Service personnel on campus or nearby provides multiple opportunities for undergraduate instruction, new graduate courses, student internships, and other forms of temporary student employment.

Formal internship programs, as well as practicums, provide students with the opportunity for professional work experience in summers for credit.

Unlike most programs in the southeastern region, we focus on hardwood ecosystems rather than pine or mixed forest types.

The diversity of ecosystem types within proximity to campus provides an advantage to our program as we endeavor to expose students to a range of resource issues. The nearness of a variety of public lands (WMAs, GSMNP, National Forests, State Forests) presents numerous

opportunities for outdoor instruction.

Graduates in the Wildlife & Fisheries major are certifiable by TWS. Graduates in the Forestry major are eligible, because of the accreditation of the forestry program, for SAF certification.

Undergraduate Curriculum Concerns and Issues

1. Student involvement in the major should begin upon entering our program, and continue throughout their academic career.
2. Mastery of course topics should proceed in a logical manner throughout the curriculum.
3. Training related to habitat management is needed throughout the curriculum for both majors.
4. The focus in both majors has traditionally been commodity-oriented. Increased emphasis on ecosystem services produced from the land base may require a shift in topics throughout the curriculum.
5. There are too few opportunities in the curricula for students to practice synthesizing biological factors and management practices. Students would benefit from developing the ability to predict hypothetically how systems will react to various treatments and system changes, and what types of systems will develop and how they will grow given biotic and abiotic site factors.
6. There is currently no formal mechanism to monitor employer needs (i.e., knowledge and skills) and expectations for our graduates. It is important for us to continually address such needs and expectations within our academic program.
7. Spatial technology skills are becoming necessary to many of the jobs our students will enter into after graduation, but mastery of such skills is not necessarily a part of our current programs.
8. Student involvement in existing opportunities outside of the classroom is low (e.g., honors, undergraduate research, study abroad and exchange programs, and internships).
9. A large proportion of our undergraduate majors are transfer students from Tennessee community colleges. Such students can have a difficult time making sure that the courses they take will transfer successfully into our undergraduate programs.

New Degree Program and Course Recommendations

A review of our current degree programs revealed several opportunities for expanding our offerings; however, all would require additional teaching faculty resources.

Undergraduate

Minor in Bio-Products (Forest Products) – One of the difficulties faced by faculty in the forest products area is attracting a steady pool of candidates for Master’s degrees without having an undergraduate major in forest products. Instead of creating an entirely new major, an alternative may be to develop several courses that, together, could serve as a minor. Students completing the minor would then be potential candidates for graduate programs.

Urban/Community Forestry Concentration – As the urban (and suburban) forest interface continues to grow, we expect there to be related increase in the demand for foresters that can manage the associated natural resources. A new concentration in Urban/Community Forestry under the existing forestry major is seen as a cost effective way to meet such demands in the near term. A significant enrollment in such a concentration would be an indicator of the need to eventually develop a separate major.

Recreation (Outdoor or Wildland) major – Given the expected increase in demand for outdoor recreation opportunities, especially in east Tennessee, there may be a need for a separate major in Recreation.

New courses – Our current curricula would benefit from several new courses, covering important topics in more depth than is feasible within our existing suite of courses. These courses would likely begin as electives, but could eventually become required in one or both of our majors. Highest priority new courses are: forest soils, hydrology/water quality, forest engineering, fire ecology and management, and grassland ecology and management.

Graduate

MS in Bio-Products – Several of the current Master’s students being supervised and supported by faculty in the forest products area are actually enrolled in the graduate degree programs of other departments on campus (e.g., chemical engineering, statistics, etc.). One of the greatest hurdles in attracting Master’s students is that we do not have a specialized MS degree for them. A new MS degree in Bio-products is seen as the solution to this issue. The name “Bio-Products” is seen as a better marketing label the more traditional “forest products” or “wood science” alternatives.

Bio-Products concentration within Natural Resource PhD – A recognizable concentration name matching the new MS degree program in the forest products area would aid marketing and recruitment of doctoral students.

New Course – Many of our graduate students have indicated in their exit interviews that they would have found a natural resource-specific quantitative

methods course very valuable to their program. Such a course is common in other university natural resource graduate programs.

Two additional general concerns for departmental graduate programs are the need for standardization of expectations, and the broader availability of graduate course offerings.

Enrollment Planning

There is a concern within the department that our undergraduate enrollment is not matched by our departmental support (FTEs and operating funds). At the same time, there has been pressure to increase enrollment to help justify requests for additional resources. Effective enrollment planning is only possible when faculty and teaching support resources are linked with the number of students (undergraduate and graduate) enrolled in departmental programs. An analysis has been completed to determine target enrollments for both graduate and undergraduate degree programs (Appendix A). This analysis will be updated periodically as we move toward a better balance of enrollment and resources. At the same time, we are committed to increase the quality and diversity of the students that are enrolled in departmental programs.

Staffing priorities

The direction of teaching activities within the department will be determined in large part by the disciplinary background and interests of the faculty that are hired. Departmental operating resources can be used to promote teaching in a designated high priority area, but without qualified and willing faculty in that area, such resources will not be effective. When existing faculty positions become vacant, or opportunities for new positions arise, departmental priorities will be reflected by the decision to recruit from a particular discipline. This decision will be influenced by accreditation and certification requirements, as well as the desire to expand our departmental teaching activities into new areas.

Current Faculty Positions – Current teaching positions should be maintained and better supported. Teaching workloads do not match formal teaching appointments; several 100% Extension and Research faculty are teaching courses on a regular basis (e.g., Silviculture, Planning and Management, Wood Identification, Wildlife Health, etc.). In general, these teaching assignments have been made to fill subject matter needs and to help offset the loads of faculty that do have formal teaching appointments.

New Faculty Positions - The following disciplinary areas, reflecting the recommendations for new courses and curricula within the department, have been identified as having high priority for new faculty lines that may become available within the department:

- Fire Ecology
- Forest Engineering
- Forest Soils/hydrology
- Green Engineering (partial teaching appointment)

Urban/Community Forestry
Watershed Management
Wildlife Management/Science (general position to help reduce teaching loads if enrollment in Wildlife & Fisheries major does not decrease)
Wildland Recreation

Several of these new position areas coincide with those determined to be of high priority within departmental strategic research directions. Based on this correspondence, the highest priority areas for new teaching faculty would be Fire Ecology and Watershed management (both appear in two of the four strategic research directions), followed by Forest Soils/Hydrology and Urban/Community Forestry (both appearing in one of the four strategic research directions).

New Staff Positions – The most pressing need for new staff in the teaching programs is in the area of web site maintenance, to help improve recruiting efforts and provide current students (and faculty) with better access to teaching-related materials and activities. This staff need coincides with one of the high priority research staff needs.

Resource needs

Salary and benefits for faculty and staff identified above

Travel and operating to support fall camps

Travel support for undergraduates and graduates attending/presenting papers or posters at conferences or participating in competitions (e.g., conclave, quiz bowl, etc.)

Scholarship endowments to support the recruitment of high quality undergraduates

Endowment for graduate student fellowships.

Resources to support student computer needs related to classroom expectations.

Implementation

Curriculum

1. Objective – Insure that students are involved in their major from the beginning of their academic career.

Action – The forestry major has a mechanism, *FOR 100 Forests and Forestry in American Society*, to introduce students to their chosen career area during their first semester. A similar course is needed for the wildlife and fisheries science major. Both majors should maintain at least one required FWF, FOR, or WFS course per semester.

Timeline – make adjustments by end of 2009-2010 academic year.

2. Objective – Improve the logical flow of course topics to make sure that necessary plant and animal identification and biological preparation courses are scheduled before the management-oriented courses that require such information to be effective.

Action – shift both camps to fall semester, senior year and adjust prerequisite courses accordingly

Timeline – implement shift starting fall semester, 2010

3. Objective – provide students in both majors with appropriate exposure to habitat management.

Action – Infuse additional training in habitat management throughout the curriculum for both majors.

Timeline – complete by fall semester, 2010

4. Objective – Provide students with resource management training consistent with expected changes in ownership objectives

Action -- Explore a change in focus from commodity-oriented management to a broader perspective emphasizing ecosystem services.

Timeline – complete assessment by end of fall semester, 2009

5. Objective – Provide opportunities, and raise expectations, for students to synthesize important concepts throughout the curriculum, rather than focusing exclusively on the capstone course as the mechanism for such synthesis.

Action – Identify (and document) synthesis opportunities in existing courses, and add these to the courses' expectations.

Timeline – complete by end of academic year 2009-2010

6. Objective – Monitor employer needs (i.e., knowledge and skills) and expectations for graduates of our programs.

Action – develop and implement employer survey

Timeline – complete survey by end of 2010

7. Objective – Increase the use of spatial technology across the curricula of both majors.

Action – Create opportunities for learning and use of spatial technology in existing courses.

Timeline – continuous

8. Objective – Increase student involvement in opportunities outside of the classroom such as honors, undergraduate research, study abroad and exchange programs, and internships.

Action – involve students that have participated in these programs in classroom discussions and presentations.

Timeline – continuous

Action – explore the possibility of requiring professional experience as part of the undergraduate degree program(s)

Timeline – complete review and make decision by end of spring semester, 2010.

9. Objective – Make it easier for transfer students to make the transition to our undergraduate programs.

Action – Develop specific transfer guides for students transferring to FWF undergraduate majors from Tennessee community colleges.

Timeline – complete by end of fall semester 2009

10. Objective – Create interest and understanding among existing UT undergraduates of the potential for graduate research programs (especially at the MS level) in forest products disciplines.

Action – develop courses and seek approval for a minor in Bio-Products (Forest Products)

Timeline – end of spring semester, 2010

11. Objective – Meet the perceived demand for forestry graduates that are capable of managing urban/community forests.

Action – seek approval for an Urban/Community Forestry concentration within the existing forestry major using relevant courses that already exist, and develop new courses if needed.

Timeline – complete proposal by end of fall semester, 2009

12. Objective – Explore the feasibility of creating a new Recreation major.

Action – Develop a plan for the major including expected costs (faculty FTEs and operating), expected demand, and proposed curriculum.

Timeline – draft by January, 2010

13. Objective – attract and retain Master’s students to forest products/wood science-related disciplines.

Action – develop and submit a proposal for a new master’s program in “bio-products”

Timeline – complete proposal by end of spring semester, 2010; submit as soon as feasible thereafter.

14. Objective – Fill gaps in current undergraduate and graduate course offerings

Action – Analyze specific course needs, create new courses as faculty resources become available

Timeline – complete analysis of needed courses by end of summer, 2009

15. Objective – Achieve departmental consensus on the expectations for graduate education

Action – Discuss and draft departmental guidelines for research and course work expectations tied to degree program (i.e., MS vs. PhD) and major.

Timeline – hold discussions during summer/fall, 2009; complete draft by end of fall semester, 2009.

Enrollment Planning

1. Objective – Ensure that faculty and teaching support resources are linked with enrolment in departmental programs.

Action – Update peer program analysis (Appendix A) to provide reasonable target enrollments given current resources.

Timeline – update by end of fall semester, 2009

2. Objective – Effectively recruit the numbers of high quality students to meet the targets established for departmental programs.

Action – Determine the most effective system of content and delivery mechanisms to attract undergraduate students to FWF majors through the southern regional recruiting consortium activities (e.g., focus groups, recruiting surveys, etc.)

Timeline – complete initial survey by end of fall semester, 2009

Action – Concentrate recruiting efforts and resources on activities most likely to provide success in recruiting for numbers, student quality, and diversity.

Timeline – begin efforts, tied to results of survey, spring 2010

Staffing

1. Objective – secure existing faculty positions when or if they become vacant

Action – review positions of faculty that are retirement-eligible, plan future of each position, develop position request support material for each

Timeline - fall 2009, continuous evaluation and revisions as faculty become retirement-eligible, or as priorities change (revisit annually).

2. Objective – compete successfully for new faculty positions when opportunity arises

Action – develop position request support material for high priority faculty positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

3. Objective – compete successfully for new teaching staff positions when opportunity arises

Action – develop position request support material for high priority staff positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

4. Objective – secure development funds for endowed faculty positions

Action – work with UTIA Development Office personnel to engage existing donors and seek new donors through initiatives such as the *Volunteer Forest*.

Timeline – obtain commitment for position by 2012

Resources

1. Objective – Increase university support for FWF teaching programs.

Action – develop support material for restoration of GTA funds and operating funds lost to current budget cuts. Link to strategic teaching initiatives.

Timeline – fall 2009 for FY11, and each subsequent fall for the following fiscal year in preparation for budget requests during the spring.

2. Objective – Increase private support for FWF teaching programs.

Action – Seek endowments for scholarships, student learning enhancement (travel and operating), and fellowships.

Timeline – continuous (set \$ targets by fall 2009)

Extension Programs

Strengths

The county Extension network is very well managed in Tennessee. Unlike some states, the system has been maintained at the single county level, rather than asking agents to cover multi-county regions.

Relationships with other state agencies and NGOs are excellent, promoting collaboration with such partners as the Tennessee Wildlife Resources Agency, the Tennessee Forestry Association, the Tennessee Division of Forestry, and the Natural Resource Conservation Service.

Extension professionals within FWF receive planning input directly from their clientele, as well as feedback from county agents and area specialists. As a result, they are able to provide service and education that is very relevant to the needs of the public being served.

A wide range of expertise exists within the department to address the needs of state clientele. All Extension professionals are also involved to varying degrees in research and teaching activities.

The existence of a network of County Forestry Associations provides opportunities to engage landowners interested in natural resource issues.

Program Priorities

The priorities of the Extension program all relate to meeting the needs of clients in the public and private sectors of Tennessee. In general, this often means addressing sustainability, profitability, and the environment.

Specific areas of priority include:

- Biofuels
- Deer management
- Fisheries
- Grasslands
- Hardwoods
- Invasive species
- Recreational landowners
- Wildlife Damage

Opportunities

There are two new general areas of opportunity for the FWF Extension program: providing continuing education to professionals (beyond the in-service training of agents), and engaging a new audience beyond the traditional agriculture clientele.

A proposal has been developed to require the registration of professional foresters practicing in Tennessee. One component of the registration requirement is the annual completion of continuing forestry education. The responsibility for providing such education will likely be assumed by Extension faculty within FWF. Other opportunities for continuing education exist for government employees (e.g., US Forest Service), and industry professionals that seek to increase their knowledge, or refresh their understanding of important concepts.

Given the changes in land ownership in Tennessee, as well as the increasing urbanization of the state, there is a need to reach out to people who have not previously benefited from traditional Agricultural Extension activities. Determining what these needs are will be the first step in providing for the needs of this new sector.

Staffing Priorities

Faculty and Professional Staff

- Biofuels (tied to Forest Products)
- Fisheries
- Forestry (Middle Tennessee)
- Grasslands (Ext. Associate)
- Wildlife (West Tennessee)
- Wildlife (youth)

Staff

- Computer/Internet (web site and distance learning)
- Statistics/Spatial technology
- Grants/Contracts

Resource Needs

- Office and lab space for faculty identified above
- Salary and benefits for staff identified above
- Storage space for equipment

Implementation

1. Objective – meet the continuing education needs of forestry professionals if/when registration becomes a state requirement to practice forestry in Tennessee.

Action – develop series of continuing forestry education programs for professional foresters.

Timeline – (dependent on passage of registration requirements)
2. Objective – meet the continuing education needs of professionals in natural resource

agencies as well as in industry, (in state, regionally and nationally).

Action – seek new opportunities to provide continuing education to resource professionals analogous to the current training programs in Silviculture (USDA Forest Service) and Statistical Process Control (industry).

Timeline – continuous

3. Objective – determine the needs for outreach among non-traditional clientele

Action – develop and conduct a survey of the (mostly) urban population of Tennessee to provide information on outreach needs related to natural resources.

Timeline – 1 to 2 year project, depending on funding

4. Objective – compete successfully for new faculty positions when opportunity arises

Action – develop position request support material for high priority faculty positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

5. Objective – compete successfully for new staff positions when opportunity arises

Action – develop position request support material for high priority staff positions

Timeline – fall 2009, continuous evaluation and revisions as priorities change (revisit annually)

General Departmental Considerations

Beyond the specific staffing and resource needs addressed above for research, teaching and Extension, there are three general issues that should be addressed for the future development of the department. These issues relate to the overall functioning of the department, but one issue is “structural,” one is “programmatic,” and the last is “virtual.” Yet, the resolution of each issue will have a profound effect on how the department functions and is perceived by others.

The “structural” issue involves the scattered physical locations of FWF faculty and staff. At last count, FWF personnel occupied space in eight locations on the UTIA campus. The consolidation of FWF personnel into a single new building has been, and remains, a high priority. Joint planning with the U.S. Forest Service to build two new buildings (one for USFS personnel, and one for FWF) has progressed, but has slowed due to fiscal uncertainty at both the state and federal level. There is also the shorter term possibility of consolidating personnel through relocation as renovation plans for Ellington Plant Sciences Building progress. While this is a less than ideal solution to the problem, it may be the most feasible action in the short-to-medium term.

The “programmatic” issue centers on the departmental fisheries component. With the retirement of our longtime fisheries Extension Specialist, we were left with two faculty members in this departmental program area, with a total effort of one FTE in research and one in teaching. This presents two problems. Until we are able to replace our extension position, we are faced with an inability to support County Agents. Currently, the stop-gap solution has been to designate three county agents (one per region) with fisheries responsibilities to help meet the public’s need for the routine problems involving Tennessee’s 100,000+ farm ponds. The second concern is that with only two tenure-track faculty, we struggle to support a research and teaching program in fisheries. Therefore, in addition to filling the vacant Extension Specialist position, we also need to acquire a new faculty position, most likely in the area of conservation fisheries to enhance our strength in this discipline.

The “virtual” issue revolves around the name of the department. The current name does not reflect the personnel and activities of a large portion of faculty and staff, namely those involved in the area of forest products. The Tennessee Forest Products Center has grown to include seven faculty members – approximately the same as those in forestry (8), and wildlife & fisheries (9) – yet the name of the department excludes their discipline. A name change to “The Department of Forestry, Wildlife, Fisheries and Forest Products,” while accurate, may be overly cumbersome. The other alternative would be to change to a name that is more general such as “The Department of Natural Resources.” A long term goal, if we are successful in growing our department significantly through the hiring of more faculty FTEs, is to seek consideration for the designation of “School” within the College. At that time, a new name – e.g., the “School of Natural Resources” would serve to enhance and promote public (and institutional) perception of our role within the Institute of Agriculture.

Implementation

1. Objective – construct a new FWF building
Action – secure state and or federal funds to support planning and construction
Timeline – begin construction by 2014
2. Objective – revitalize the fisheries program
Action – draft a short- and long-term strategy for the fisheries program
Timeline – complete draft by May, 2010
3. Objective – resolve the discrepancy between the name of the department and the makeup of its personnel and programs.
Action – continue to seek input from stakeholders
Timeline – resolve by January, 2010
4. Objective – become the School of Natural Resources
Action – grow the department’s programs (faculty, staff and resources) to justify new designation (similar Schools of Natural Resources, or Forest Resources, range in size from 10 to 57 faculty, with an average of 37)
Timeline – become School by 2015 (to coincide with dedication of new building)