2007 INTERNAL REVIEW OF ENVIRONMENT AND NATURAL RESOURCES PORTFOLIO: STRATEGIC GOAL 6

I. Background

Strategic Goal 6 used to be Strategic Goal 5 which comprised two objectives: 5.1 Forests, and Rangeland and 5.2: Soil, Air, and Water. These two objectives served the basis upon which two external reviews were conducted in FY2005 and two internal reviews in 2006. Its evolution into Strategic Goal 6 in 2007 divided the portfolio into 4 objectives: Clean, Abundant Water and Clean Healthy Air; Soil Quality and Productive Working Lands; Forests and Rangelands; and Wildlife Habitat. A new strategic plan developed by the Natural Resources and Environment (NRE) unit concluded that Strategic Goal 6 would be better served if it were treated as one portfolio rather than subdividing it into 4 distinct portfolios. The unit presented its arguments to the Director of the Office of Planning and Accountability and upon further discussions, reached an agreement to proceed with Strategic Goal 6 as one portfolio. Given this new configuration, all subsequent internal reviews of Strategic Goal 6 will be made as a single Environment and Natural Resources Portfolio.

This document was completed in September 2007 as the internal review of Environment and Natural Resources Portfolio. It contains program updates to the portfolio, responses to the comments from the 2005 external panel review and changes to criteria scores with accompanying justifications. For this report, the portfolio reviews the entire Environment and Natural Resources Portfolio in a single document in order to integrate all the activities that cut across the knowledge areas of the portfolio. The nature of this portfolio is such that issues are best addressed in an interdisciplinary manner bringing into focus the interactivity of the soil, air and water resources, to forest, rangeland and grassland and the crosscutting elements among them. These include invasive species, global change, land use, economics and pollution. In order to better show the impacts and significance of the work conducted under this portfolio, it is necessary for all activities to be presented as a whole under the strategic goal and not as the individual objectives 6.1 to 6.4 as outlined in the CSREES Strategic Plan for 2007-2012. The portfolio has also undertaken a major initiative, called the Environment and Natural Resources (ENR) Enterprise, which is a new business strategy for all knowledge areas and programs under this portfolio. It cuts across boundaries and shares resources and capabilities to better address the complex issues facing the nation's natural resource base and the environment. This document is a result of the efforts of the National Program Leaders from the Natural Resources and Environment Unit in collaboration with CSREES Office of Planning and Accountability. The NRE unit reevaluated the scoring and based on the consistency of the scores, used the average from the previous scores as the new baseline.

> The following knowledge areas (KAs) are included in the Environment and Natural Resources Portfolio: Protect and Enhance the Nation's Natural Resource Base and Environment.
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> - 101: Appraisal of Soil Resources
> - 102: Soil, Plant, Water, Nutrient Relationships

- 103: Management of Saline and Sodic Soils and Salinity
- 104: Protect Soil from Harmful Effects of Natural Elements
- 111: Conservation and Efficient Use of Water
- 112: Watershed Protection and Management
- 121: Management of Range Resources
- 122: Management and Control of forest and range fires
- 123: Management and sustainability of Forest Resources
- 124: Urban Forestry
- 125: Agroforestry
- 135: Aquatic and Terrestrial
- 136: Conservation of Biological Diversity
- 131: Alternative Uses of Land
- 132: Weather and Climate
- 133: Pollution Prevention and Mitigation
- 141: Air Resource Conservation and Management
- 403: Waste Disposal, Recycling and Reuse
- 405: Drainage and Irrigation Systems and Facilities
- 605: Natural Resource and Environmental Economics

- **Portfolio reviews:**

February 1-3, 2005 (external panel review for Strategic Objective 5.2, now Strategic Objectives 6.1 and 6.2)

February 15-17, 2005 (external panel review for Strategic Objective 5.1, now Strategic Objective 6.3 and 6.4)

August 2006 (internal Agency review for Strategic objectives 5.1 and 5.2)

September 2007 (internal Agency review for Environment and Natural Resources Portfolio, formerly Strategic Goal 5)

- **Portfolio scores:**

Under Strategic Goal 5, Objectives 5.1 and 5.2 received an overall score of 77 and 81, respectively from the 2005 external Portfolio Expert Panel Review panels. Table 1.1 below shows the breakdown of scores for different questions and criteria. For consistency in presentation, comparison and evaluation of a single portfolio document for Strategic Goal 6, the scores from the 2005 Portfolio Review Expert Panel (PREP) were averaged to produce a single score of 79 for the whole portfolio in 2005. The same was done to produce a single score of 83 for the internal portfolio review for Strategic Goal 5 in 2006. These are the integrated scores for comparison to the 2007 internal review of Environment and Natural Resources Portfolio, which is the new designation of the old Strategic Goal 5.

Table 1.1: Summary of scores of external and internal reviews

Criteria	Purpose	2005 Score External	2006 Score Internal	2007 Score Internal
Relevance				
1. Scope	Describe what the portfolio can provide in terms of coverage of work with the available funds	3	3	3
2. Focus	Demonstrate portfolio ability to remain focused on issues, topics and critical needs of the nation	2.5	2.5	2.5
3. Emerging Issues	Identify contemporary and/or emerging issues that are consistent and relevant to the portfolio and its mission	2.5	2.5	2.5
4. Integration	Demonstrate functional integration of CSREES research, extension and education efforts in the portfolio.	2	2	2
5. Multi-disciplinary	Demonstrate multidisciplinary balance of the portfolio in solving scientific problems	2	2.5	2.5
Quality				
1. Significance	Demonstrate generation of significant findings in the portfolio	2	2.5	2.5
2. Stakeholder	Demonstrate stakeholder/constituent input to the portfolio	2	2	2
3. Alignment	Demonstrate portfolio alignment with current state of science-based knowledge and previous work	2	2.5	2.5
4. Methodology	Demonstrate use of appropriate and/or cutting edge methods and techniques for funded projects	2.5	2.5	2.5
Performance				
1. Productivity	Demonstrate the ability of CSREES to create and provide services through funding, directing, managing and partnering with its stakeholders	2.5	2.5	2.5
2. Comprehensiveness	Demonstrate comprehensiveness of portfolio in terms of areas of work, outputs and outcomes	2	2	2
3. Timeliness	Demonstrate the extent to which funded activities were completed within the funding time frame	2.5	2.5	2.5
4. Agency guidance	Demonstrate strength of CSREES program leadership and management relating to the portfolio program management.	2.5	3	3
5. Accountability	Demonstrate the extent to which funded projects of the portfolio have been completed with thoroughness, clarity, timeliness, adequacy and usefulness	2	2	2
Overall score		**79**	**83**	**83**

- **A brief summary of the PREP report with the panel's specific recommendations:**

The panel found that the people of CSREES in the Natural Resources and Environment Unit make a significant difference and add considerable value to the work of both the agency and the partnership. The evidence presented in this portfolio reflects hard work and indicates high levels of productivity. There is evidence of increasing emphasis on integration and that CSREES staffs are becoming more creative and determined about planning and reporting as forms of accountability.

The panel recommends continued effort in establishing new partnerships. Many opportunities exist for programming on critical issues, expanding urban track issues and the issue of wildlife-urban interface. National needs can often be met by working in international collaborations and contexts in addition to federal agency collaborations.

The panel suggests that the partnership continue to expand interactions with stakeholders and to include emerging stakeholders and communities in underrepresented and urban areas. It is as important for planning processes to identify new stakeholders and partners as it is for the process to identify emerging issues and priorities. Interaction with all federal agencies across states and within program areas are important to attain the synergistic effect of integrated funding on levels of research, education and extension productivity.

There is a need to standardize and expand the documentation and evaluation metrics across program areas and increase the archiving and accessibility of research project data (in the Current Research Information System (CRIS) and other systems). This is necessary in order to permit meta-analysis of the data.

The panel recommends training on the logic model for agency employees and external and internal partners. Instead of just evaluating past performance, the panel also suggests developing strategic plans for each problem area and increasing stakeholder contributions by including panel members and other stakeholders in the development and review of CSREES strategic plans at the portfolio level.

Finally, the panel suggests increasing the documentation of outcomes. Formative evaluations to document program implementation successes and challenges should be performed. The panel acknowledges how important NPLs have been over the years. It also recognizes the dilemma of getting data at the national level to present a national picture. In developing goals, outcomes, and measures, CSREES should consider how it adds value and the unique role it plays.

II. CSREES response to PREP recommendations that cross all portfolios

In response to directives from the Office of Management and Budget (OMB) of the President, CSREES implemented the PREP process to systematically review its progress in achieving its mission. Since this process began in 2003, fourteen expert review panels have been convened and each has published a report offering recommendations and guidance. These external reviews occur on a rolling five-year basis. In the four off years an internal panel is assembled to examine

how well CSREES is addressing the expert panel's recommendations. These internal reports are crafted to specifically address the issues raised for a particular portfolio; however, despite the fact that the expert reports were all written independent of one another on portfolios comprised of very different subject matter, several themes common to the set of review reports have emerged. This set of issues has repeatedly been identified by expert panels and requires an agency-wide response. The agency has taken a series of steps to effectively respond to those overarching issues.

Issue 1: Getting Credit When Credit is Due

For the most part panelists were complimentary when examples showing partnerships and leveraging of funds were used. However, panelists saw a strong need for CSREES to better assert itself and its name into the reporting process. Panelists believed that principal investigators who conduct the research, education and extension activities funded by CSREES often do not highlight the contributions made by CSREES. Multiple panel reports suggested CSREES better monitor reports of its funding and ensure that the agency is properly credited. Many panelists were unaware of the breadth of CSREES activities and believe their lack of knowledge is partly a result of CSREES not receiving credit in publications and other material made possible by CSREES funding.

Issue 1: Agency Response:

To address the issue of lack of credit being given to CSREES for funded projects, the Agency implemented several efforts likely to improve this situation starting in 2005.

First it developed a standard paragraph about CSREES's work and funding that project managers can easily insert into documents, papers and other material funded in part or entirely by CSREES.

Second, the Agency is in the process of implementing the "One Solution" concept. One Solution will allow for the better integration, reporting and publication of CSREES material on the web. In addition, the new Plan of Work (POW), featured a logic model framework, that became operational in June 2006. The logic model framework is discussed in more detail below. Because of the new POW requirements and the POW training conducted by the Office of Planning and Accountability (also described in more detail below), it will be simpler for state and local partners to line up the work they are doing with agency expenditures. This in turn will make it easier for project managers to cite CSREES contributions when appropriate.

Issue 2: Partnership with Universities

Panelists felt that the concept of partnership was not being adequately presented. Panelists saw a need for more detail to be made available. Questions revolving around long-term planning between the entities were common as were ones that asked how the CSREES mission and goals were being supported through its partnership with universities and vice versa.

Issue 2: Agency Response:

CSREES has taken several steps to strengthen its relationship with university partners. First, to the extent possible, implementing partners will be attending the CSREES strategic development exercise which is intended to help partners and CSREES fully align what is done at the local level. Second, CSREES has realigned the state assignments for its National Program Leaders

(NPLs). Each state is now assigned to one specific NPL. By reducing the number of states on which any individual NPL is asked to concentrate and assigning and training NPLs for this duty, better communication between state and NPLs should occur. Finally, several trainings that focused on the POW were conducted by CSREES in geographic regions throughout the country. A major goal of this training was to better communicate CSREES goals to state leaders which will facilitate better planning between the universities and CSREES.

Issue 3: National Program Leaders

Without exception the portfolio review panels were complimentary of the work being done by NPLs. They believe NPLs have significant responsibility, are experts in the field and do a difficult job admirably. Understanding the specific job functions of NPLs was something that helped panelists in the review process. Panelists did however mention that often times there are gaps in the assignments given to NPLs. Those gaps leave holes in programmatic coverage.

Issue 3: Agency Response:

CSREES values the substantive expertise that NPLs bring to the Agency and therefore requires all NPLs to be experts in their respective fields. Given the budget constraints often times faced by the agency, the agency has not always been able to fund needed positions and had to prioritize its hiring for open positions. In addition, because of the level of expertise CSREES requires of its NPLs, quick hires are not always possible. Often, CSREES is unable to meet the salary demands of those it wishes to hire. It is essential that position gaps not only be filled but that they are filled with the most qualified candidate.

Operating under these constraints and given inevitable staff turnover, gaps will always remain. However, establishing and drawing together multidisciplinary teams required to complete the portfolio reviews has allowed the Agency to identify gaps in program knowledge and ensure that these needs are addressed in a timely fashion. To the extent that specific gaps are mentioned by the expert panels, the urgency to fill them is heightened.

Issue 4: Integration

Lack of integration has been highlighted throughout the panel reviews. While review panelists certainly noted in their reports where they observed instances of integration, almost without fail panel reports sought more documentation in this regard.

Issue 4: Agency Response:

Complex problems require creative and integrated approaches that cut across disciplines and knowledge areas. CSREES has recognized the need for these approaches and has undertaken steps to remedy this situation. CSREES has recently mandated that up to twenty percent of all National Research Initiative (NRI) funds be put aside specifically for integrated projects. These projects cut across functions as well as disciplines and ensure that future Agency work will be better integrated. Finally, integration is advanced through the portfolio process which requires cooperation across units and programmatic areas.

Issue 5: Extension

While most panels seemed satisfied at the level of discussion that focused on research, the same does not hold true for extension. There was a call for more detail and more outcome examples

based upon extension activities. There was a consistent request for more detail regarding not just the activities undertaken by extension but documentation of specific results these activities achieved.

Issue 5: Agency Response:
Outcomes that come about as a result of extension are, by the very nature of the work, more difficult to document than the outcomes of a research project. CSREES has recently shuffled its strategy of assigning NPLs to serve as liaisons for states. In the past, one NPL might serve as a liaison to several states or a region comprised of states. Each state will be assigned a specific NPL and no NPL will serve as the lead representative to more than one state. This will ensure more attention is paid to extension activities.

In addition CSREES also has been in discussion with partners and they have pledged to do their best to address this issue. The new POW will make extension-based results and reporting a priority. Placing heavy emphasis on logic models by CSREES will have the effect of necessitating the inclusion of extension activities into the state's POWs. This, in turn, will require more reporting on extension activities and allow for improved documentation of extension impact.

Issue 6: Program Evaluation
Panelists were complimentary in that they saw the creation of the Office of Planning and Accountability and portfolio reviews as being the first steps towards more encompassing program evaluation work; however, they emphasized the need to see outcomes and often stated that the scores they gave were partially the result of their own personal experiences rather than specific program outcomes documented in the portfolios. In other words, they know first hand that CSREES is having an impact but would like to see more systematic and comprehensive documentation of this impact in the reports.

Issue 6: Agency Response:
The effective management of programs is at the heart of the work conducted at CSREES and program evaluation is an essential component of effective management. In 2003 the PREP process and subsequent internal reviews were implemented. Over the past three years fourteen portfolios have been reviewed by expert panel members and each year this process improves. NPLs are now familiar with the process and the staff of the Planning and Accountability unit has implemented a systematic process for pulling together the material required for these reports.

Simply managing the process more effectively is not sufficient for raising the level of program evaluations being done on CSREES funded projects to the highest standard. Good program evaluation is a process that requires constant attention by all stakeholders and the agency has focused on building the skill sets of stakeholders in the area of program evaluation. The Office of Planning and Accountability has conducted training in the area of evaluation for both NPLs and for staff working at Land-Grant universities. This training is available electronically and the Office of Planning and Accountability will be working with NPLs to deliver training to those in the field.

The Office of Planning and Accountability is working more closely with individual programs to ensure successful evaluations are developed, implemented and the data analyzed. Senior leadership at CSREES has begun to embrace program evaluation and over the coming years CSREES expects to see state leaders and project directors more effectively report on the outcomes of their programs as they begin to implement more rigorous program evaluation. The new POW system ensures data needed for good program evaluation will be available in the future.

Issue 7: Logic Models

Panelists were consistently impressed with the logic models and the range of their potential applications. They expressed the desire to see the logic model process used by all projects funded by CSREES and hoped not only would NPLs continue to use them in their work but, also, that those conducting the research and implementing extension activities would begin to incorporate them into their work plans.

Issue 7: Agency Response:

Logic models have become a staple of the work being done at CSREES and the Agency has been proactive in promoting the use of logic models to its state partners. Two recent initiatives highlight this. First, in 2005, the POW reporting system into which states submit descriptions of their accomplishments was completely revamped. The new reporting system now closely matches the logic models being used in portfolio reports. Beginning in fiscal year 2007, states will be required to enter all of the following components of a standard logic model. These components include describing the following:

- Program Situation
- Program Assumption
- Program Long Term Goals
- Program Inputs which include both monetary and staffing
- Program Output which include such things as patents
- Short Term Outcome Goals
- Medium Term Outcome Goals
- Long Term Outcome Goals
- External Factors
- Target Audience

The system is now operational and states were required to begin using it by June of 2006. By requiring the inclusion of the data components listed above states are in essence, creating a logic model that CSREES believes will help improve both program management and outcome reporting. Please note a sample logic model has been included in Appendix A.

The second recent initiative by CSREES regarding logic models concerns a set of training sessions conducted by Planning and Accountability staff. In October and November of 2005 four separate training sessions were held in Monterrey, California, Lincoln, Nebraska, Washington D.C. and Charleston, South Carolina. More than 200 people representing land-grant universities attended these sessions where they were given training in logic model creation, program planning, and evaluation. In addition, two training sessions were provided to NPLs in December

2005 and January 2006 to further familiarize them with the logic model process. Ultimately it is hoped these representatives will pass on to others in the Land-Grant system what they learned about logic models thus creating a network of individuals utilizing the same general approach to strategic planning. These materials also have been made available to the public on the CSREES website.

The logic model for Strategic Goal 6 portfolio is presented in the appendix of this document. The new logic model format indicates outcomes as Knowledge, Actions and Conditions rather than the short-, mid- and long-term outcomes in previously used logic models. The logic model was prepared by National Program Leaders of the Natural Resources and Environment Unit and by staff members of the CSREES Office of Planning and Accountability.

III. National Program Leader's response to Portfolio Review Expert Panel Recommendations regarding Environment and Natural Resources Portfolio (reviewed as Strategic Goal 5 in 2005)

The Natural Resources and Environment (NRE) Unit of CSREES is responsible for the implementation of Environment and Natural Resources Portfolio under the CSREES Strategic Plan for 2007-2012 (formerly Strategic Goal 5 in the CSREES Strategic Plan 2004-2007). The unit realized even before the portfolio review that a better approach was needed to address its function of "Protecting and Enhancing the Nation's Natural Resource Base and Environment". This function goes beyond the National Program Leaders (NPLs) of the NRE Unit and involves all NPLs whose programs' interests are related to many environmental and natural resources issues and to their having personal interest, skills, knowledge and experience in the area. A formal collaborative effort, cutting across boundaries has begun. It makes it easier to work within the administrative boundaries of the agency in ways that enhance CSREES's effectiveness in dealing with its mission to serve the public and its partners.

This collaborative effort, called the Environment and Natural Resources (ENR) Enterprise, will use research, education, and extension programs to improve the management of natural resources in working lands and expand economic growth in the rural and urban, and ex-urban communities dependent upon these natural resources. The goal of the Environment and Natural Resources (ENR) Enterprise is to support research, education, and extension programs that optimize the production of agricultural goods and services while protecting the environment. Achieving the "ENR" strategy requires an understanding that couples human and natural systems. This new strategy will enable people to be better informed in their personal and professional endeavors about working lands and ecosystems.

This internal review document is part of the agency-wide initiative to bring together all the primary and secondary knowledge areas of Strategic Goal 6 to focus all resources to solve complex issues. As stated earlier, the specific objectives under this revised strategic goal are better addressed in this integrated manner compared to evaluating the components separately. The National Program Leaders responsible for this portfolio identified the following set of issues that were specifically raised within the portfolio review of Strategic Goal 5, now Strategic Goal 6 (Environment and Natural Resources Portfolio), and prepared the following set of responses.

Relevance

1. Scope: Describe what the portfolio can provide in terms of coverage of work with the available funds

2005 Panel Recommendation: Reallocate resources from terminated programs to emerging programs.

Portfolio Response:
Actions taken in FY2007:

The ECOP Forestry Task Force published an RREA strategic plan for FY 2005-2009 in April 2005. The plan was a direct outcome of a strategic planning effort that involved nearly 100 people from more than 45 land grant universities. The plan is unique in that it provides focused, strategic direction for a formula-funded program that heretofore was conducted across a very large range of issues with little focus.

New NRI research projects under the CSREES Global Change and Climate Program are developed in collaboration with NASA and other US federal agencies on the terrestrial carbon cycle. This program was initiated in 2004 and since then twelve projects have been funded directly by CSREES and twenty agriculture related projects were funded by collaborating federal agencies. Projects focus on emerging programs that identify the size, variability, and potential future changes to reservoirs and fluxes of carbon within the agricultural and forest ecosystems and provide the scientific underpinning for evaluating options to manage carbon sources and sinks. These projects contribute to the US Climate Change Science Program and the US Global Change Research Program. New collaborations for funded projects were made in 2007 with the US Environmental Protection Agency and NASA. The Global Change and Climate Program anticipates funding four projects from each collaboration and an equivalent number from the collaborating agency.

Actions taken in FY2006:

The Renewal Resources Extension Act (RREA) program, through the National Focus Funds has awarded grants to address the issue of forest fragmentation, parcelization and conversion. This represents an expansion beyond typical programs, issues and audiences that heretofore comprised the RREA program conducted by 72 institutions. This is an emerging issue for the nation's private forest lands and is one that requires attention by locally elected and appointed officials who make land use decisions. This is a reallocation of funds from a program with a traditional focus to an issue of contemporary importance.

Several National Programs Leaders with natural resources and environmental portfolios are engaged in the strategic planning and resource allocation under various CSREES competitive programs such as the National Research Initiative (NRI).

2. Focus: Demonstrate portfolio ability to remain focused on issues, topics and critical needs of the nation.

2005 Panel Recommendation: Balance national needs and regional priorities.

Portfolio Response:
Actions taken in FY2007:

The ENR Enterprise is establishing a business strategy to address long-term priorities that cut across programs and disciplines. The concept of working lands has been developed as part of the vision to address issues of the portfolio of national and regional levels.

The 1890 Capacity Building Program currently covers several Strategic Goal 6 Knowledge Areas, especially in the areas of soil, air and water. National Program Leaders of this portfolio were involved in the review process of applications for funding in 2007. In this cycle twelve research projects were funded totaling $6 million and thirty teaching projects were funded totaling the same amount. The projects are aimed at strengthening the institutional capacity of the 1890 institutions to improve their research and teaching capabilities.

The Extension Committee on Organization and Policy (ECOP) Forestry Task Force along with portfolio NPLs provided strategic guidance for the Renewable Resources Extension Act (RREA) program by reviewing current issues that necessitate an education approach, how the funds are allocated, and making recommendations for investments in projects of nationwide importance via the National Focus Funds.

The National Integrated Water Quality Program (NIWQP) continued to address national and regional needs to complement the locally-defined needs addressed by research funded through the Hatch Act Program. In 2007, CSREES through the NIWQP, in cooperation with the Natural Resources Conservation Service, held a grant competition to fund a project that would provide a synthesis of lessons learned from the Conservation Effects Assessment Project (CEAP) Competitive Grants Program. This synthesis will explore similarities and differences among watershed scale projects attempting to determine the link between implementation of conservation practices and water quality.

Actions taken in FY2006:

All portfolio programs, such as the National Integrated Water Quality Program, have established a set of priorities for integrated research, education, and extension projects. These priorities change approximately every three years to reflect current priorities within the water resources program and the water research, education, and extension, community. Twelve projects were funded through this program covering areas such as the development of fact sheets to educate real estate professionals to developing new techniques to disinfect drinking water.

All National Research Initiative programs handled by NRE NPLs have 5 to 10 year goals that are mentioned in the annual Request for Applications. The goals are developed and reviewed through a program development team that is focused on environment and natural resources

issues. Logic models are used extensively in the strategic planning process and incorporate stakeholder information from various forums. National Program Leaders play an active role in acquiring stakeholders input through review panels, society meetings, federal agency counterparts and scientific steering groups.

3. Emerging Issues: Identify contemporary and/or emerging issues that are consistent and relevant to the portfolio and its mission

2005 Panel Recommendation: Identify emerging issues by identifying "emerging stakeholders".

Portfolio Response:

Actions taken in FY2007:

Several new collaborations with SERD have been established. Two of the eight FY 2006 Targeted Expertise Shortage Areas (TESA) were Natural Resources and Environment areas, particularly in forest ecosystem health and restoration; and Agricultural Systems and Natural Resources Engineering, especially in wood and fiber engineering. This collaboration addresses emerging stakeholders in these areas who are involved with education and capacity building in addition to the traditional science stakeholders.

Supported by RREA funding, the Sustainable Management of Rangeland Resources team has developed and filmed spots on over 120 topics. RREA helps to fund the development and delivery of rangeland monitoring workshops in Wyoming including four Range College 101 and 301 workshops with curricula which includes, general range education, assessment and monitoring, rangeland grazing management, rangeland manipulation, water quality and hydrology, and irrigated pasture topics. The objective of these efforts is to expand cooperative monitoring programs between public land management agencies and livestock grazing on federal lands with over 644 producers and agency personnel participating annually.

Actions taken in FY2006:

A majority Air Quality stakeholder is the USDA Agricultural Air Quality Task Force that provides national needs. The total CSREES air quality portfolio (formula, special grants and competitive) has given presentations to the taskforce. The NRI Air Quality Program emphasis areas that are closely aligned to the task force recommendations. Eleven projects with a total cost of $5 million were funded during this time covering areas such as physical, chemical and biological characterization of particulate matter from livestock buildings to gaseous productions from swine waste storage.

4. Integration: Demonstrate functional integration of CSREES research, extension and education efforts in the portfolio.

2005 Panel Recommendation: Better integrate research, education and extension into projects and programs

Portfolio Response:

Actions taken in FY2007:

The Water Quality Program had been successful in program integration through its partnerships. For example, through the Rutgers Cooperative Extension-Water Resources Program (WRP), the portfolio oversees 11 watershed research projects in New Jersey; the majority of which are sponsored by a State or Federal grant. As part of the Regional Water Coordination Program's Watershed Management Priority Area, the RCE-WRP has enhanced these efforts by directing extension programming and educational (graduate and undergraduate) efforts into these same watersheds. The same is true in New York, where watershed research projects have been enhanced by providing training to targeted stakeholder groups. In the Virgin Islands, new curriculum and student research activities have been designed around an existing watershed study. This synergistic effort of integrating research, education and extension projects within a watershed has the best potential for truly making a difference in the quality of life of the residents in that watershed.

The NIWQP continued to fund watershed projects that integrate research, education, and extension activities within a single project. Each watershed project is required to have interrelated research, education, and extension objectives. These integrated watershed projects include stakeholder participation in design and implementation of research and extension components of the project. Students are actively engaged in the project through training and new curriculum development. Since 2005, 20 integrated watershed projects have been funded through the NIWQP and 13 integrated research and extension projects have been funded through the CEAP grants program.

Actions taken in FY2006:

The NRI air quality program is fully integrated. All proposals submitted to this program integrated research with education or extension. An integrated extension and education proposals was funded for a national workshop on agricultural air quality. Eleven projects with a total cost of $5 million were funded during this time covering areas such as physical, chemical and biological characterization of particulate matter from livestock buildings to gaseous productions from swine waste storage.

The Biology of Weedy and Invasive Species in Agroecosystems committed at least a third of its annual budget to integrated research, education and extension projects. Out of 17 projects with a total budget of $4.6 million, 4 projects were integrated.

5. Multidisciplinary: Demonstrate multidisciplinary balance of the portfolio in solving scientific problems.

2005 Panel Recommendation: Increase integration of social and policy science into projects.

Portfolio Response:

Actions taken in FY2007:

The Global Change and Climate program has conducted joint solicitations with other federal agencies emphasizing societal impacts of land-use and land-cover change and management strategies for carbon mitigation. A total of three projects from each of the above topic areas were funded and were highly multidisciplinary in nature.

Using the concept of working lands, the environment and natural resources (ENR) enterprise will integrate agricultural, natural and human components. Working lands explicitly includes humans as an integral part of the system, not something apart from it. The ability to study, design, manage, evaluate and understand such hybrid systems requires an integrated, long-term, and interdisciplinary examination of biogeochemistry, energy transformations, biological processes and socio-economic relationships. Viewing agriculture as part of an ecological system as well as a human dominated socio-economic system produces a broad range of performance criteria including ecological goods and services, sustainability, food security, economic viability, resource conservation, social equity, as well as increased production. The ENR vision will be used in the planning of future competitive research focus areas for all portfolio programs.

Actions taken in FY2006:

The Integrated Water Quality Program included social and economic sciences in two program areas – Conservation Effects Assessment Project and the Integrated Water Quality Program. These priority areas for research, education, and extension were aimed at improving understanding of social and economic factors affecting behavior change among water users.

The portfolio has subscribed to the use of “agroecology” as an overarching theme in the NRI to integrate agricultural, natural and human components. Viewing agriculture as part of an ecological system as well as a human dominated sociological and economic system produces a broad range of performance criteria, including ecological goods and services, sustainability, food security, economic viability, resources conservation, social equity as well as increased production.

Quality

1. Significance: Demonstrate generation of significant findings in the portfolio.

2005 Panel Recommendation: Establish metrics to evaluate productivity and impacts from formula, competitive and appropriated funding.

Portfolio Response:

Actions taken in FY2007:

The air quality program has been holding annual all investigator meetings to document progress on project objectives and held an international workshop to set science baselines for agricultural emissions and known practices that reduce or mitigate emissions. The latest workshop published a 1300 page proceeding of the scientific presentations.

Metrics for portfolio knowledge areas continue to be defined to better address outputs and outcomes. These metrics are part of the ENR vision and strategic plan to develop trans-disciplinary research programs that integrate with education and extension components. Monthly seminars are held presenting various ENR subject areas to better define metrics for impacts. In addition, National Research Council studies have also been used to define the ENR metrics. These metric are expected to be implemented in 2009.

Actions taken in FY2006:

A considerable set of program impacts was developed through the Integrated Water Quality Program Impacts Report. This report includes research, education, and extension impacts and outcomes. The CSREES-NRCS CEAP Competitive Grants Program has funded 13 watershed-scale integrated (research and outreach) projects that evaluate the effects of conservation practices on water resources. This program focuses on understanding how the suite of conservation practices, the timing of these activities, and the spatial distribution of these practices throughout a watershed influence their effectiveness for achieving locally defined water quality goals.

2. Stakeholder input: Demonstrate stakeholder/constituent input to the portfolio.

2005 Panel Recommendation: Expand stakeholder community to include under-served and urban populations.

Portfolio Response:

Actions taken in FY2007:

Two new multi-state projects were established in the Northeast US to address Urban Forestry and Wood utilization. Another new multi-state project was established in the North Central US to address agroforestry issues in that region. Another new multi-state project in the North Carolina Region will focus on the ecological footprint of animal production systems.

The Global Change and Climate Program adopted the US Climate Change Science Strategic Plan which undertakes periodic consultation with a broad community of stakeholders in formulating its activities and in the development of synthesis and assessment products for a growing agricultural community, including those in rural areas as well as managed forests.

Actions taken in FY2006:

The Water Quality Program has focused its efforts to address the needs of urban populations through its Agriculture Water Security Initiative. A workshop was held where participants representing six key areas of water resource management identified how USDA can improve and charted a potential course for research, education, and economics within the six areas to increase water availability for agriculture, human consumption, and economic growth.

Underserved or underrepresented audiences also were a special focus of the Integrated Water Quality Program. Through this focused effort, grants were awarded to a Tribal Community College (Salish Kootenai) and a historically black university (Tennessee State) to facilitate increased capacity among scientists and educators at these institutions. The ultimate goal of these awards was to improve efforts to reach under-served audiences among minority and Native American agricultural producers.

3. Alignment: Demonstrate portfolio alignment with current state of science-based knowledge and previous work.

2005 Panel Recommendation: Establish strategic planning that addresses emerging issues and align with other USDA efforts and other federal agencies.

Portfolio Response:

Actions taken in FY2007:

Agency education programs have aligned the disciplines targeted for funding with the strategic plans of the ENR enterprise. For example, the 1890 Capacity Building Grants and the National Needs Fellows Programs focused on Soil, Air, Water, Forestry and related Natural Resources disciplines

The Global Change and Climate Program has aligned its objectives to match those of the US National Climate Change Implementation Plan and continues to support emerging issues relevant to agriculture in collaboration with other US federal agencies.

CSREES National Program Leaders for the Water Program were part of a team of federal agencies that developed “A STRATEGY FOR FEDERAL SCIENCE AND TECHNOLOGY TO SUPPORT WATER AVAILABILITY AND QUALITY IN THE UNITED STATES”. This report outlines a strategy for federally funded research and education activities to address water resources issues in the United States. The CSREES Water Program currently focuses on critical water issues identified in the strategy including: detection of pathogens, human dimensions of water resource management, and expanding water availability through new technologies.

Investigators funded through the NRI Water and Watersheds program meet during the CSREES National Water Conference where national, regional, and watershed scale projects discuss research, education, and extension program outcomes and impacts on water resources. The

conference provides a forum for improving alignment of research (NRI) with integrated (NIWQP) activities in the CSREES Water Program.

The National Water Program, through the Committee for Shared Leadership for Water Quality, is sponsoring a meeting in Reno, NV in 2008 where Regional Water Quality Coordination Projects will meet with water-focused Multi-State Committees funded through the Hatch Act. This meeting will begin the alignment of formula-funded research with projects funded through competitive grants of the NIWQP.

Actions taken in FY2006:

The Conservation Effects Assessment Project competitive grants program was jointly managed by CSREES and NRCS. Discussion with NRCS is underway to explore reallocation of the resources committed to this effort.

The Global Change and Climate Program has consistently collaborated with other federal agencies in preparing joint solicitation under a competitive grant process, which addresses critical needs identified by the US Climate Change Science Program. These areas include land use and land cover change, the global carbon cycle and ecosystem dynamics.

Through the principal efforts of James Dobrowolski (USDA-CSREES-NRE), Evert Byington (USDA-ARS) and Ralph Crawford (USDA-FS-Research) communication and coordination across government occurs each month around the subjects of rangeland, grasslands, and pastures. Called the Interagency Working Group for Grazing Lands, national program leaders from at least four cabinet-level departments (Agriculture, Defense, EPA, Interior) meet to improve cooperation and efficiency, identify potential resource leveraging opportunities, identify resources for multidisciplinary teams, provide suggestions for long-term efforts at landscape scales, and continue to promote standardization of monitoring and assessment practices.

4. Methodology: Demonstrate use of appropriate and/or cutting edge methods and techniques for funded projects.

2005 Panel Recommendation: Implementation of on-line formats and interactive teaching methods as appropriate for target audiences for delivery of educational and research projects.

Portfolio Response:

Actions taken in FY2007:

Supported by RREA funding, University of Wyoming Extension produced “Wyoming’s Natural Resources”, a series of seventy-second TV spots which air twice weekly on statewide commercial television reaching an estimated 30,000 homes. The Sustainable Management of Rangeland Resources team has developed and filmed spots on over 120 topics. The segments have been complied on a DVD, available through UW CES offices. Viewers gain a better understanding and awareness of natural resources issues and how they impact the total state

eXtension continues to develop new communities of practice and communities of interest to facilitate the integration of research, education and extension activities throughout the agency. A total of twenty-one communities of practice have been established and are currently working to support their respective communities of interest.

Actions taken in FY2006:

eXtension tools and mechanisms have been developed to address the national need for an electronic-based system of extension tools for delivery of educational and research products to the stakeholder community.

Performance

1. Portfolio Productivity: Demonstrate the ability of CSREES to create and provide services through funding, directing, managing and partnering with its stakeholders

2005 Panel Recommendation: Demonstrate how projects meet objectives for research, education and extension.

Portfolio Response:

Actions taken in FY2007:

Funded projects under the National Research Initiative undergo post-award reviews for to evaluate how projects met their objectives under the mission goals of the agency. An annual retreat for competitive programs is held to evaluate progress and discuss mechanisms for reporting and evaluation of on-going projects.

Under the Renewable Resources Extension Act, funded projects must follow guidelines for reporting on indicators developed for this purpose and to include a report on the composition of their audiences and stakeholders.

The CSREES Water Program is reviewing each Regional Water Quality Coordination Project on a recurring three year cycle. Three projects are reviewed each year by a panel of experts from the national program and regional water experts. The reviews focus on accomplishments and impacts of the Regional Water Quality Coordination Projects and make recommendations for future program development, evaluation, and funding.

Actions taken in FY2006:

The portfolio NPLs worked closely with the Office of Planning and Accountability to ensure successful evaluations of program are developed and implemented. Several portfolio NPLs act as state liaisons and review State Plans of Work which provide a mechanism for evaluating how projects meet their objectives for research, education and extension.

2. Portfolio Comprehensiveness: Demonstrate comprehensiveness of portfolio in terms of areas of work, outputs and outcomes.

2005 Panel Recommendation: More leadership by NPLs in facilitating strategic planning and resource allocation.

Response:

Actions taken in FY2007:

National Program Leaders evaluate formula funded projects as part of the overall program portfolio and has resulted in a change in attitude towards the used of these types of funds to achieve program objectives through strategic planning and resource allocation of the portfolio.

Natural Resources and Environment knowledge areas are now reported as a single portfolio which allows better strategic planning and resource allocation and gives opportunities for improved leadership in collaborative efforts.

Actions taken in FY2006:

The ECOP Forestry Task Force along with portfolio NPLs provided strategic guidance for the RREA program by reviewing current issues that necessitate an education approach, how funds are allocated and making recommendations for investments in projects of nation wide importance via the National Focus funds.

3. Portfolio Timeliness: Demonstrate the extent to which funded activities were completed within the funding time frame

2005 Panel Recommendation: Increased frequency and quality of reporting at the national and state levels.

Portfolio Response:

Actions taken in FY2007:

Air Quality and Water Quality Assessment reports are made to allow for stakeholder input from all sectors. The reports are submitted to the National Academies of Science for their review and input. Review by the Academies give further credibility to federal partners such as EPA.

Global change and climate related projects are reported through national data bases established through the various interagency working groups and are reviewed by federal program officers assisted by scientific steering committees.

Actions taken in FY2006:

The Agricultural Air Quality Workshop brought together all the CSREES funded research, in addition to other federal, state and privately funded agricultural research to develop assessment reports on agricultural emissions and control technologies that reduce emissions.

Multi-state and competitively funded projects under the portfolio have mandatory meetings of principal investigators with the managing National Program Leader to provide a means for reporting of project outcomes and impacts.

4. Agency Guidance: Demonstrate strength of CSREES program leadership and management relating to the portfolio program management.

2005 Panel Recommendation: Address needs for staffing levels for better allocation of time to leadership for program development and less to program management and maintenance.

Response:

Actions taken in FY2007:

Dr. Robert Williamson joined the NRE unit as a shared faculty with North Carolina A&T University to handle fisheries and wildlife.

Dr. Maureen McDonough joined the NRE units as an IPA from Michigan State University as a forest sociologist.

Mr. Bruce Mertz was hired as the program specialist for invasive species, watersheds and sustainability.

Mr. Dewell Paez was hired as the program specialist for global change, air quality and soils.

Actions taken in FY2006:

Dr. James Dobrowolski joined the NRE unit as the National Program Leader for Rangelands, Grasslands and Ecosystems.

Dr. Joanne Throwe joined the NRE unit a shared faculty with the University of Maryland to handle water and ecosystems.

Dr. Daniel Cassidy was hired as the program specialist for forest resources and biology.

5. Portfolio Accountability: Demonstrate the extent to which funded projects of the portfolio have been completed with thoroughness, clarity, timeliness, adequacy and usefulness

2005 Panel Recommendation: Focus on performance indicators, outcomes and impacts.

Response:

Actions taken in FY2007:

The ENR concept has adopted the new logic model format that focuses on knowledge, actions and condition as outcomes, rather than short, medium and long-term outcomes for planning purposes. Using the ENR concept and vision, metrics are being defined to be applied consistently across the knowledge areas to better address outputs and outcomes. Additionally, considerable efforts are deployed to include documentation of the use of stakeholder input in the development of scientific areas of focus, inclusion of social and economic sciences to improve impacts, and educational partnerships that will benefit from research applications.

Under the Renewable Resources Extension Act, funded projects must follow guidelines for reporting on indicators developed for this purpose and to include a report on the composition of their audiences and stakeholders. These include the use of a reporting template that every RREA institution must use, impacts should be based on state reports, recognition of funding sources, and requiring multiple institutions to file a single report.

Actions taken in FY2006:

A considerable set of program impacts was developed through the Integrated Water Quality Impacts Report. This report includes research, education and extension impacts and outcomes. For example, the Non-point Education for Municipal Official (NEMO) project is a national effort to use of geographic information system and remote sensing technology as educational tools in its promotion of land use planning rather than mechanical devices as the primary weapon against water pollution.

The RREA strategic plan includes specific short, intermediate and long term performance measures for each of the strategic issues. A workshop was conducted to develop specific indicators for each measure. Examples of indicators include identification of the specific needs and issues of a diverse audience (short-term), adoption of new rangeland and forest technologies (medium-term) and improved health and sustainability of forests and rangeland (long-term).

Future Directions

1. Issue: Develop the ENR enterprise to integrate disciplines and programmatic strengths.

   Strategies:

   - The ENR enterprise is developing its strategic plan to integrate across scientific disciplines and integrate researcher education and extension activities throughout the knowledge areas.
   - Use of "working lands" as an overarching theme in the NRI and in ENR to integrate agricultural, natural and human components. Viewing agriculture as part of an ecological system as well as a human dominated socio-economic system produces a broad range of performance criteria including ecological goods and services, sustainability, food security, economic viability, resource conservation, social equity, as well as increased production.

2. Issue: Eliminate barriers to integrating research, education and extension.

   Strategies

   - The National Integrated Water Quality Program has established a set of priorities for integrated research, education, and extension projects. These priorities change approximately every three years to reflect current priorities within the water resources program and the water research, education, and extension, community.
   - The ENR enterprise is also focused on integrating research, education and extension by developing an organizational logic model that will be used by National Program Leaders to fund integrated projects under various funding mechanisms.

3. Issue: Implement programs, on-line formats and interactive teaching methods as appropriate for delivery of products to target audiences.

   Strategies:

   - eXtension will address the national need for an electronic-based system of extension tools for delivery of educational and research products to the stakeholder community.
   - NRE unit National Program Leaders are making use of interactive internet based communication systems to conduct business with partners and stakeholders.

IV. Updates of the self-assessment paper

1. Budget

The budget for this portfolio has remained steady over the past years and reflects the overall budget of CSREES (Table 4.1). There was a significant increase in the total CSREES funding for 2005 and most individual programs in 2005 were generally funded at the same level or with slight increases. There was a major increase in NRI funds for the portfolio which contributed to half of the total increase in the portfolio's funds. Industry and non-federal grants also increased in 2005 (Table 4.2). All knowledge areas under the portfolio have generally been steady over the past years with changes in specific areas of interest reflecting increase in certain parts of the portfolio while drawing from other programs (Table 4.3). This also reflects the operational aspect of the general portfolio which follows programs rather than specific knowledge areas which overlap between and among programs. Knowledge Area 136 (Conservation of Biological Diversity) although presented in this portfolio was not used as a classification until 2005 and projects under this KA were previously included in other KA's in the portfolio. KA 141 (Air Resource Conservation and Management) is also a new knowledge area which was initiated in late 2004 and funds reported under this code will be reflected in 2006. This KA is presented to show that the portfolio continues to grow by adding knowledge areas and is making progress in addressing important environmental issues.

Table 4.1: CSREES Research Funding for Environment and Natural Resources Portfolio **by Source during 2000-2005**

Funding Source	Fiscal Year *(in thousands)*						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**Grand Total**
Hatch	28,797	29,036	27,174	27,394	27,094	28,571	**168,066**
McIntire-Stennis	15,326	15,142	14,706	14,806	14,889	15,539	**90,408**
Evans Allen	5,339	5,365	5,090	4,020	3,989	4,856	**28,659**
Animal Health	26	6	4	22	21	43	**122**
Special Grants	7,934	8,068	12,555	16,209	13,395	17,092	**75,253**
NRI Grants	6,672	18,426	14,865	18,836	12,152	25,883	**96,834**
SBIR Grants	1,520	2,820	3,332	3,146	3,775	3,501	**18,094**
Other CSREES	32,901	43,830	20,348	23,725	27,303	26,998	**175,105**
Total CSREES	**98,515**	**122,693**	**98,074**	**108,158**	**102,618**	**122,483**	**652,541**

Table 4.2: Funding from All Sources for Environment and Natural Resources Portfolio **during 2000-2005**

Sources of Funding	Fiscal Year *(in thousands)*						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**Grand Total**
CSREES	98,514	122,695	98,073	108,151	102,616	122,484	**652,533**
Other USDA	12,124	13,224	18,257	25,898	29,500	44,198	**143,201**
Other Federal	81,450	93,463	147,936	87,550	96,523	126,896	**633,818**
State Appropriations	257,158	256,780	270,022	197,299	198,754	258,812	**1,438,825**
Private or Self Generated	22,369	24,572	22,174	17,198	18,261	32,089	**136,663**
Industry Grants and Agreements	11,752	14,499	19,232	34,609	32,405	37,346	**149,843**
Other non-federal	27,721	25,983	29,689	39,749	45,398	74,164	**242,704**
Grand Total	**511,088**	**551,216**	**605,383**	**510,454**	**523,457**	**695,989**	**3,397,587**

Table 4.3: CSREES Funding for Environment and Natural Resources Portfolio **by Knowledge Area during 2000-2005**

Knowledge Areas	Fiscal Year *(in thousands)*						
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**Grand Total**
101- Appraisal of Soil Resources	3,248	5,741	4,605	4,544	3,444	4,469	**26,051**
102- Soil, Plant, Water, Nutrient Relationships	13,887	22,402	15,816	17,076	12,521	17,192	**98,894**
103- Management of Saline and Sodic Soils and Salinity	514	909	464	333	286	486	**2,992**
104- Protect Soil from Harmful Effects of Natural Elements	929	2110	1,887	1,085	1,271	1,881	**9,163**
111- Conservation and Efficient Use of Water	2,384	3,238	6,280	8,746	7,842	7,830	**36,320**
112- Watershed Protection and	12,305	18,221	14,624	12,654	15,177	15,170	**88,151**
121- Management of Range Resources	3,766	6,039	2,384	3,376	3,402	3,650	**22,617**
122- Management and Control of Forest and Range Fires	527	2515	957	1450	2,149	2,774	**10,372**
123- Management and Sustainability of Forest Resources	16,691	15,005	12,187	16,679	13,109	16,588	**90,259**
124- Urban Forestry	525	861	1056	889	937	1053	**5,321**
125- Agroforestry	4978	968	1598	1,796	1,842	2,515	**13,697**
131- Alternative Uses of Land	1328	5,929	1,385	2,825	1,145	3,268	**15,880**
132- Weather and Climate	1,514	1,956	1,509	4,250	5,566	5,371	**20,166**
133- Pollution Prevention and Mitigation	16,999	19,655	16,904	15,047	16,480	19,571	**104,656**
135- Aquatic and Terrestrial Life	6,893	6,850	5,325	6,019	5,024	5,602	**35,713**
136- Conservation of Biological Diversity	0	0	0	0	0	15	**15**
141- Air Resource Conservation and Management	0	0	0	0	0	0	**0**
403- Waste Disposal, Recycling and Reuse	5,635	4,445	5,226	4,498	6,197	7,339	**33,340**
405- Drainage and Irrigation Systems and Facilities	907	1295	874	1144	1,715	1,105	**7,040**
605- Natural Resource and Environmental Economics	5,514	4,843	5,006	5,741	4,510	6,605	**32,219**
Grand Total	**98,544**	**122,982**	**98,087**	**108,152**	**102,617**	**122,484**	**652,866**

2. Challenges and opportunities

The challenge for the Environmental and Natural Resources Enterprise is to increase knowledge necessary to mitigate or adapt to the potential magnitude of environmental changes and their feedbacks in agricultural, forestry and rangeland ecosystems to help society respond effectively. Research, educational and extension activities for this initiative would focus on the complexity of changes in ecosystem processes and their frequency and intensity, particularly those that have significant consequences for society. These activities will enable society to better protect its natural resources and environment for societal needs. The national program leaders from the NRE unit and other natural resources and environment programs within CSREES are identifying research topics in support of an ENR working plan and will develop a common strategy to be implemented across various programs. The concept of working lands, as an organizing theme for the ENR Enterprise, can be applied at a range of spatial scales including the field, family, the farm level enterprise, the landscape, watershed, institutional or community scale within agricultural, rangeland, forested, or community systems. Viewing agriculture as part of an ecological system as well as a human dominated socio-economic system requires a broad range of performance criteria and produces among others, ecological goods and services, sustainability, food security, economic viability, resource conservation, social equity, as well as increased production.

Successful research education and extension activities for the ENR Enterprise requires collaboration from within CSRESS, USDA and across other federal agencies but more so from the partnerships with the Land Grant Universities. This is necessary to address the scientifically important and socially relevant issues facing the nation. This is also important in meeting Strategic Goal 6 of CSREES' strategic plan in an integrated and holistic manner and over time will address all the issues raised in the Program Assessment Rating tool (PART) review.

3. **Success stories**:

Several CSREES funded projects have resulted in the development and improvement of methods for measuring soil moisture. In one project, a ground penetrating radar device was successfully used to map soil moisture down to a 1 cm^2 grid to varying depths in a commercial vineyard. This project has made a significant impact on the quality of wine grapes because of its dependence on slight water stress. This new technology has the potential to increase both yield and quality, factors often inversely related in wine making. Other projects are extending the range of *in situ* sensors such as Time Domain Reflectometry thermal dielectric response to measure plant available water. These projects improve our understanding of basic relationships between various soil properties, available water and water retention in situ to improve our ability to manage spatially variable soils and water resources efficiently and profitably. The projects were initially funded through the Hatch formula funds and were followed by competitive funds through the National Research Initiative.

A Hatch Multi-state project was focused on assessing the impact of agricultural technologies and practices on crop yields, water quality, and profitability. Analyses of 15 proposed irrigation district rehabilitation projects in the Lower Rio Grande Valley found that 49,392 acre feet of

water could be conserved each year. Costs of saving water ranged from $16 to $119 per acre foot. Savings ranged from $800 thousand to $5.9 million based on the potential cost of saved water. These studies are providing conceptually correct and empirically accurate estimates of the economic value of water and the information necessary to obtain funding for South Texas irrigation district rehabilitation projects. These studies are essential for resource owners and decision makers to make informed choices in water and rehabilitation projects.

Agriculture is the primary source of ammonia emissions to the atmosphere in the US. Once in the atmosphere, ammonia can be converted to fine particulate matter, a criteria pollutant, or deposited by either wet or dry deposition to water bodies leading to water pollution. An NRI funded study evaluated the effect of feeding reduced crude protein diets on air emissions from swine and broiler chickens. Emission data were developed from these studies for both common feeding practices in the industry and for diets that employ mitigation strategies focused on source reduction of air emissions. The impact was a 40 to 50 percent reduction in ammonia emissions with no negative performance effects in either species. The combination of these two animal studies demonstrates that animal performance can be maintained when reduced protein feeding strategies are implemented. Adoption of such source reduction strategies will allow for emission reduction targets to be reached.

Renewable Resources Extension Act funds to New Mexico have been used to demonstrate control methods for noxious and invasive weeds and brush species on native rangeland. RREA funding has also augmented investigative efforts in examining the effects of forestry practices and prescribed fire on wildlife habitat. RREA monies are leveraged with approximately $600,000 of state, county and private funds. RREA appropriations have allowed the Cooperative Extension Service at New Mexico State University to conduct best management practices demonstrations in controlling toxic, noxious and invasive species on private and public rangelands, farmland, and public highway rights-of-way in 32 of the 33 counties in the state, develop and conduct extensive resource monitoring along riparian restoration corridors associated with salt cedar control on the Rio Grande, Pecos, and Canadian river drainages, and conduct resource monitoring workshops for land owners in six counties in northeastern New Mexico accounting for more than one-half million acres of rangeland.

To increase the practice of sustainable environmental stewardship on grazing lands, a science-based rangeland management program was established to educate landowners for better resource management decisions. The program recognizes that the economic sustainability of farms and ranches is essential to conserve the natural environment, open space, and historical heritage. Thus, the program also incorporates education in knowledge and skills of business operations. This program has certified 5 ranchers as “Undaunted Land Stewards,” encompassing more than one million acres. Another 50 ranchers are currently progressing toward certification. In addition, this program has helped preserve 11 historical sites on private lands where visitor access to historical interpretation helps convey the educational message about ranching, livestock grazing, and land stewardship on working lands. Feature articles about this program have appeared in both the New York Times and the Seattle Post-Intelligencer.

Plants are carried to new areas by the wind, animals, and humans. Unfortunately when a plant is introduced to a new area, it often grows unchecked by its natural predators or environmental conditions. Under CSREES-NRI funding, researchers at the University of Connecticut investigated the invasive and potentially invasive plant species in New England. Their work focused on early detection strategies and developing models to predict the occurrence and spread of invasive plants across a region. The researchers are tackled this difficult task by enlisting the help of volunteers through a newly developed program called the Invasive Plant Atlas of New England (IPANE). To date, this project has trained over 400 volunteers to identify 100 invasive plant species. Each volunteer is assigned a parcel of land and must record the habit and extent of the invasive plant species in the area. This information is used to create maps of invasive plant distribution and develop models that could predict the potential distribution of invasive species in the region. The project plans to stay ahead of new invasions and control established invasive species to prevent loss of diversity in natural native habitats. With its science-driven programs and use of volunteers, IPANE is being looked at as an ideal model for early detection networks in this country.

Currently used wood adhesives are predominately derived from non-renewable petrochemicals and may contain hazardous formaldehyde. Oregon State University has successfully developed an environmentally friendly wood adhesive from soybean flour. The adhesive is currently used in the commercial production of interiorly used plywood panels. One of the adhesives has been successfully commercialized for production of plywood and particleboard in a number of plants. The emission of volatile organic compounds and hazardous air pollutants in each plant has been reduced by 90% by replacing the urea-formaldehyde resin with this new alternative adhesive. It is estimated that plywood plants adopting this technology consumed about 26,000,000 lbs of soy flour in 2006 and that particleboard plants will consume additional 15,000,000 lbs of soy flour per year after its full conversion.

Increasing dependency on fossil power is true in the forest products industry both in the field (harvest) and in the mill (product conversion). The University of Georgia, using Langdale Industries Inc. as the experimental site, examined the efficacy of economically chipping unmerchantable forest understory and logging slash for biomass conversion to fuel for co-generation facilities. Chipping unmerchantable understory and logging slash did not negatively impact round wood production, but provided a source of chips to the mill below average market prices for fuel chips. The energy balance for these chips had a ratio of 44:1 delivered to the mill, one of the best ratios for any feedstock. Using mill residues and these fuel chips, Langdale's OSB mill is now fossil-fuel independent.

As systemic problems of declining environmental quality due to impacts of modern intensive row-crop agriculture continue to escalate from local to regional scales in the Midwestern U.S., there is a need to integrate more holistic, integrated and ecologically-based approaches to producing food, fiber, and fuel while sustaining communities and economies. Iowa State University research is demonstrating that diverse perennial vegetation (native prairie plantings, encroached and restored oak savannas) provide important ecological functions related to the uptake and cycling of water, nutrients, and carbon, and that their incorporation into annual cropping systems can reduce losses of key resources and enhance overall sustainability of agricultural landscapes. These results are providing a scientific basis for strategically

incorporating perennial plants into agricultural systems to achieve multiple environmental and societal benefits, thereby serving as a guideline for developing more effective agricultural policies that take into account the ecosystem services afforded by diverse, perennial-based agroecosystems.

Newly funded Global Change and Climate research projects through the CSREES National Research Initiative cut across various program elements of the US Climate Change Science Program. A new research project has integrated the effects of land use change on invasive plant species distribution into an invasive plant atlas for the mid-southern US. The project quantifies the relationships of weed distribution and spread with land use and the use that information directly in educating agriculture stakeholder, natural resource managers, and other interested parties on potential human-induced opportunities for invasive species spread. This project addresses objectives of the land use/land cover change and ecosystem program areas. Another cross cutting project has been funded to assess the effects of land cover and land use change on carbon stocks in the Southern US, giving special attention to translating site-specific carbon pools to landscape scales. This project investigated soil carbon in dependence of land use, land cover, hydrology, topography and other landscape facts. The work addresses issues common to the Land Use/Land Cover Change and the Global Carbon Cycle research elements. It also addresses USDA's priority research areas including spatially-explicit soil carbon modeling.

4. Performance measures

A. Measure Description: Cumulative number of ecological-economic models developed and used for management of invasive species.

Measure Term: Long-term

Measure Type: Outcome

Explanation of Measure Development and use of comprehensive interdisciplinary (ecological and economic) models critical to the assessment of management strategies related to priority invasive species on forest and range lands. No such integrated models currently exist, making it difficult to conduct meaningful cost-benefit analyses of either the threats of invasive species, or of the efficacy of prevention and mediation actions. It is anticipated that model development will occur in stages over four to five years.

Measure timeframe	Target	Actual Development:
2004	Baseline	0
2005	1	0
2006	1	1
2007	2	
2008	3	
2009	5	
2010	7	

B. Measure Description: Assessment and Control Technologies for Agricultural Emissions
Measure Term: Long-term
Measure Type: Outcome

Explanation of Measure Number of assessments of priority and high consequence agriculture-related particulate, odor, and gaseous emissions control technologies for cost effective management approaches for regulators, commercial firms, and livestock and crop producers of varying scope and scale developed and used.

Measure Time Frame	Target	Actual Development
2004	Revised Baseline	3
2005	5	5
2006	7	7
2007	8	
2008	10	
2009	12	
2010	14	

V. 2007 score changes for Strategic Goal 6: Environment and Natural Resources Portfolio

After evaluating all the updated information of the portfolio, the national program leaders have determined that no changes to the newly integrated score are warranted at this time. Significant advances in many areas have been made but at this point their impacts have not yet been realized. Integrating the separate objectives into a single portfolio is an achievement in itself. The averaged score from the integration serves a new benchmark for the portfolio. It is the intent of the national program leaders to use this new benchmark as the starting point for future evaluations. The average score serves as a base for the new portfolio, taking into consideration all components of the portfolio together for the first time. As a starting point, this approach puts heavy emphasis on planning and implementing that provides a strong foundation for evaluation. This further emphasizes the need to assess the portfolio in its entirety. In addition, the transition from Strategic Goal 5 into Strategic Goal 6 highlights a significant change and the way in which the ENR Enterprise serves a solid foundation for more components and integrated approach to program development in the natural resources and the environment. The new score appropriately reflects this new starting point for the portfolio.

VI. Summary

There has been significant progress in terms of strategic planning and implementation of the Environmental and Natural Resources (ENR) enterprise that will result in more measurable and significant outcomes and impacts in the years to come. The National Program Leaders have been in the process of planning the overall integration of ENR into the portfolio and it will soon be implemented across the agency to achieve its goals. The ENR enterprise will employ four integrative strategies that will guide its National Program Leaders in establishing priorities, identifying opportunities, and designing new programs and activities.

1. Develop Intellectual Capacity

The ENR enterprise will invest in projects that enhance individual and collective capacity to discover, learn, create, and identify problems and formulate solutions with respect to the principles and needs of our partners and stakeholders. This strategy will develop a competitive agricultural workforce. In all of ENR's research programs, developing new knowledge will incorporate educating and mentoring students, and informing the public through outreach.

2. Integrate Research, Education and Extension

The ENR Enterprise will invest in activities that integrate research, education and extension, and, particularly those that develop reward through effective integration at all levels. Programs will also ensure that findings and methods of research are quickly and effectively communicated in a broader context and to a larger audience. This strategy is vital to accomplish the new direction of the new strategic goals.

3. Promote Partnership

The ENR enterprise will promote collaboration and partnerships between disciplines and institutions and among academe, industry and government to enable strong linkages and movement of research, education and extension among various key stakeholders both in the public and private sectors. Such strong interactions and relationships will strengthen ENR partnership and optimize the impact of research, education and extension on the economy and on society.

4. Incorporation of Community Developed Strategic Plans

The strategic plan developed by the Renewable Resources Extension Act (RREA) Strategic Plan has provided and excellent model of community-based thinking that addresses issues of environment and natural resources sustainability. In the case of RREA plan, the nation's forests and rangeland resources are focus areas where strategic imperatives are addressed to cover issues such as a diverse audience, stewardship, land conversion and others. Similar plans have been developer or are in the process of development for air, soil and water resources. The global change and climate program is based on the US Climate Change Science Program strategic and implementation plans over broad sectors such as carbon cycling. The ENR enterprise will provide an overall philosophy and linkage to these community developed strategic plans and will be a significant contribution to the portfolio. The ENR vision will also be the guiding philosophy for the development of future community-based efforts to address current and future portfolio issues.