

Agroclimate Science Portfolio Strategic Plan 2014 Progress and Implementation Report

Point of Contact: Michael A. Bowers, Acting Division Director

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Introduction

NIFA's Agroclimatology program has created and maintained a diverse, yet focused, portfolio addressing climate variability and change in agriculture and natural resources systems, with a mix of natural and social sciences, mathematics, and engineering which has led towards developing a better understanding of Earth-system processes; creating sophisticated predictive models; supporting advances in data management and sharing; and is working to build an expert scientific workforce to address climate related issues in agriculture. A growing set of accomplishments have far-reaching and significant impacts on the advancement and application of global and climate change knowledge. For example, through the use of seasonal climate forecasts, which are now significantly more accurate and have longer lead times, farmers and ranchers now have critical and timely information for crop and livestock management. The NIFA Agroclimate portfolio is a major contributor to solutions of this societal challenge through its vision and mission:

Vision: Farmers, foresters, ranchers, land owners, resource managers, consumers, businesses, policymakers, and Federal agencies empowered with science-based knowledge to adapt to climate variability and change by managing the risks, challenges, and opportunities in the agricultural sectors, and mitigate impacts by reducing emissions of atmospheric greenhouse gases and enhancing carbon sequestration.

Mission: Support transformational discovery, learning and outreach programs that advance the development and delivery of agricultural science and optimize sustainable management, production, utilization and consumption of goods and services from working lands under a variable and changing climate.

History of the Program

Fiscal year (FY) 2010 was the first year that AFRI solicited competitive grant applications for climate change under a challenge area. Seven programs solicited applications in FY 2010 addressing various areas of climate change; Climate Mitigation and Adaptation in Agriculture; Impacts of Climate Change on Animal Health and Production; National Cereal Germplasm Phenotyping; Regional Approaches to Climate Change; Regional Approaches to Climate Change: Planning; and two Interagency Climate Change programs. No solicitation was published in FY 2011. In FY 2012 only two AFRI programs, Regional Approaches to Climate Change and an Integrated Approaches to Climate Mitigation and Adaptation in Agriculture and one interagency program were solicited for. In FY 2013, only one AFRI program, Climate Mitigation and Adaptation in Agriculture, and one interagency program were solicited for. There was no new climate projects awarded in FY 2014. Currently, there are 90+ AFRI projects summing to more than \$160 million in the portfolio (see appendix A), and the CRIS systems lists 1,961 projects (competitive and capacity) of which 1,531 comprise climate change adaptation and 1,132 comprise climate change mitigation.

NIFA's Climate Portfolio contributes significantly to the mission of USDA to provide leadership on agriculture production, natural resources management, food security, food safety, and climate-related issues, based on sound public policy, the best available science, and efficient management. Its goal is to develop sustainable agriculture and forestry based strategies for:

1. Adaptation – Maximize resiliency and reduce the impact of climate variability and change on the stability and productivity of agriculture and forest agroecosystems, and of natural resources and the environment under changing climates by providing producers and decision makers with new and sustainable management methods and technologies.
2. Mitigation – Reduce atmospheric greenhouse gas emissions in agricultural and forestry production systems and optimize carbon sequestration potential in agriculture and forest working lands by providing producers and decision makers with new and sustainable management methods and technologies which can also contribute to the emerging economic opportunities of a carbon-based market system.
3. Climate Science Education and Extension – Increase the number of agriculture scientists, educators and extension professionals in the workforce with the skills and knowledge to address societal issues and improve the understanding of climate variability and change, its impacts, and options for sustainable food production and environmental stewardship.

Knowledge Areas

Climate Change affects almost all aspects of our life; from the environment to human health and nutrition, to production agriculture, forestry and range. Hence, climate change touches on almost all of the NIFA knowledge areas; however the ones listed below are most directly connected to the portfolio.

TOPIC I. NATURAL RESOURCES AND ENVIRONMENT

SOIL

- 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

WATER

- 111. Conservation and Efficient Use of Water
- 112. Watershed Protection and Management

FOREST AND RANGE RESOURCES

- 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

NATURAL RESOURCES, GENERAL

- 131. Alternative Uses of Land
- 132. Weather and Climate
- 133. Pollution Prevention and Mitigation
- 134. Outdoor Recreation
- 135. Aquatic and Terrestrial Wildlife
- 136. Conservation of Biological Diversity

AIR

- 141. Air Resource Protection and Management

TOPIC II. PLANTS AND THEIR SYSTEMS

PLANT PRODUCTION

- 201. Plant Genome, Genetics, and Genetic Mechanisms
- 202. Plant Genetic Resources
- 203. Plant Biological Efficiency and Abiotic Stresses Affecting Plants

- 204. Plant Product Quality and Utility (Pre-harvest)
- 205. Plant Management Systems
- 206. Basic Plant Biology

PLANT PROTECTION

- 211. Insects, Mites, and Other Arthropods Affecting Plants
- 212. Pathogens and Nematodes Affecting Plants
- 213. Weeds Affecting Plants
- 214. Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215. Biological Control of Pests Affecting Plants
- 216. Integrated Pest Management Systems

TOPIC III. ANIMALS AND THEIR SYSTEMS

ANIMAL PRODUCTION

- 301. Reproductive Performance of Animals
- 302. Nutrient Utilization in Animals
- 303. Genetic Improvement of Animals
- 304. Animal Genome
- 305. Animal Physiological Processes
- 306. Environmental Stress in Animals
- 307. Animal Management Systems
- 308. Improved Animal Products (Before Harvest)

ANIMAL PROTECTION

- 311. Animal Diseases
- 312. External Parasites and Pests of Animals
- 313. Internal Parasites in Animals
- 314. Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

TOPIC IV. AGRICULTURAL, NATURAL RESOURCE, AND BIOLOGICAL ENGINEERING

- 401. Structures, Facilities, and General Purpose Farm Supplies
- 402. Engineering Systems and Equipment
- 404. Instrumentation and Control Systems
- 405. Drainage and Irrigation Systems and Facilities

TOPIC V. FOOD AND NON-FOOD PRODUCTS: DEVELOPMENT, PROCESSING, QUALITY, AND DELIVERY

FOOD

- 503. Quality Maintenance in Storing and Marketing Food Products

NON-FOOD

- 511. New and Improved Non-Food Products and Processes
- 512. Quality Maintenance in Storing and Marketing Non-Food Products

TOPIC VI. ECONOMICS, MARKETS, AND POLICY

- 601. Economics of Agricultural Production and Farm Management
- 603. Market Economics
- 605. Natural Resource and Environmental Economics
- 606. International Trade and Development
- 608. Community Resource Planning and Development
- 609. Economic Theory and Methods
- 610. Domestic Policy Analysis
- 611. Foreign Policy and Programs

TOPIC VII. HUMAN NUTRITION, FOOD SAFETY, AND HUMAN HEALTH AND WELL-BEING

HUMAN NUTRITION

- 701. Nutrient Composition of Food
- 704. Nutrition and Hunger in the Population

FOOD SAFETY

- 711. Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712. Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

HUMAN HEALTH

- 721. Insects and Other Pests Affecting Humans
- 722. Zoonotic Diseases and Parasites Affecting Humans
- 723. Hazards to Human Health and Safety

TOPIC VIII. FAMILIES, YOUTH, AND COMMUNITIES

- 803. Sociological and Technological Change Affecting Individuals, Families, and Communities
- 804. Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805. Community Institutions, Health, and Social Services

Portfolio-level highlights for FY2014

The climate change team continues to work on a contributed book entitled “Agriculture and Natural Resources Science for Climate Variability and Change: Transformational Advancements in Research, Education and Extension” that has been accepted by Springer-Verlag Publishing Company. This contributed volume will illustrate the National Institute of Food and Agriculture’s (NIFA) unique approach in combining research, education and extension in addressing agricultural and forest-based climate change mitigation and adaptation. This volume of NIFA funded projects will have five sections that mirror the tracks in the Climate Change Portfolio including: 1) Carbon, Nitrogen, Energy and Water Footprints in Agriculture Production: Changing Practices and Opportunities; 2) Scientific Inputs to Managing Natural Resources and the Environment Under a Changing Climate: Modeling and Decision Making; 3) Genomics and Breeding for Enhanced Climate Adaptation and Mitigation: New Knowledge and Knowledge Transfer; 4) National and International Partnerships for Climate Science Applications in Agriculture and Forestry: Bridging Sectoral Requirements; and 5) Translating climate science into actionable knowledge: The role of social sciences. Each section will feature a community-authored “state of the science” chapter followed by case studies and exemplars. The book will end with a synthesis chapter that identifies scientific gaps and opportunities.

Climate Change Portfolio Tracks

The Climate Change Portfolio is organized into five tracks with five to eight goals under each. The following sample accomplishments are listed by track and goal (note: this is not a comprehensive list, but is illustrative of the types of projects supported).

Track 1. Agroecosystem production and resource management

Goal: Reduce energy, nitrogen, carbon and water footprints in agriculture production systems

Sample Accomplishment. The Regional Approaches to Climate Change in the Pacific Northwest (REACCH) is a coordinated agricultural project is working to improve the long-term profitability of cereal production systems in the Pacific Northwest and increase management options for producers that sequester soil carbon. Milestones achieved: Redesigning and adding content to the project website; Posting online course for graduate students; Holding the second annual teacher workshop; Presenting project triptych to NIFA and the USDA leadership; Publishing 3 issues of the OutREACCH and the year 3 annual report; Completing 12 more of the 40 project milestones; improved data portal access and data tools; uploading over 100 datasets; continuing data collection on diverse experiments; Processing producer surveys. Workforce development: Adoption of high school curricula or modules to incorporate climate change and agriculture into the region's classrooms. The project supports 28 summer interns, and a total of 34 different graduate students/postdocs. Outcomes: Fourfold increase in the adoption and effective use of precision agriculture equipment leading to increased nitrogen use efficiency and reduced N₂O emissions from wheat production areas of the study region. Increases of 50% in acreage planted using soil and soil carbon conserving methods (direct seeding or reduced tillage). Doubling of acreage planted to rotations that include legumes, reducing requirements for applied nitrogen, with concomitant reductions in N₂O emissions. Impact: Reduced vulnerability of cereal production systems of the region to climate related losses in productivity as a result of use of decision support tools developed by this project.

Sample Accomplishment. A project out of Cornell entitled, New Tools and Incentives for Carbon, Nitrogen, and Greenhouse Gas Accounting and Management in Corn Cropping Systems, now in its fourth year, seeks to provide small- to large-scale corn growers with low-cost soil C assessment and greenhouse (GHG) accounting tools, and provide policymakers with an evaluation of the current and long-term costs and benefits of various policy incentives for this sector of the agricultural economy. Milestones achieved: The Adapt-N tool will be available online to corn growers in 26 states for and includes new output data on greenhouse gas emissions including N₂O. Interest in Adapt-N includes both agricultural industry and

environmental protection groups. Workforce development: The project involves three graduate students and four undergraduates. Outcomes: The Climate Team developed capacity to produce downscaled climate projections from a set of GCMs driven by the IPCC's four Representative Concentration Pathways (RCPs). These are being used to drive DayCent and PNM crop-soil biogeochemical models, the outputs of which are being linked to economic performance and mitigation policy efficacy at nationally integrated scales. Collectively, soil C assessment results indicate that tillage has a greater impact on soil organic C in the top 30 cm than crop rotation or residue removal. Potential Impacts: Increased carbon sequestration would decrease greenhouse gases mitigating climate change.

Sample Accomplishment. USDA-funded Water Sustainability and Climate (WSC), a joint program with NSF, has increased understanding of how stream flow and groundwater pumping interact. A focus of analysis by the research team (from the University of Nebraska, University of Illinois, Resources for the Future, Desert Research Institute, and NOAA-NMFS) has been the potential use for trading of groundwater pumping rights as an innovative management tool that can simultaneously increase profits for farmers that irrigate with groundwater and increase stream flows and related ecosystem services. A major study area for the research has been the Platte River Basin in Nebraska, where the Ogallala Aquifer provides groundwater for intensive agricultural production and the hydrologically-connected Platte River provides habitat for several endangered bird and fish species, including the whooping crane. As a result of WSC research activities, a woman-owned business (Mammoth Trading) was started in 2014. The company developed the first water market in the world to apply algorithmic clearing methods. The first successful trades in the market were completed in July 2014, decreasing the impacts of groundwater pumping on surface water while providing economic benefits to the farmers participating. It is anticipated that trading of groundwater pumping rights will become an increasingly important policy and risk management tool for farmers that can sustain groundwater supplies and ecosystem services during future droughts, both in the High Plains region and elsewhere.

Goal: Develop and implement new nitrogen fertilizer recommendations that optimize yield while reducing greenhouse gas emissions

Sample Accomplishment. Site-specific climate friendly farming is a NIFA funded project that seeks to develop an improved biophysical model that captures the landscape-scale, spatio-temporal variability of N₂O emissions and related processes under different management regimes. The project is now in its fourth year. Milestones achieved: There was a major focus on integrating project experimental data into the cropping systems model in order to run site-specific simulations under different climate and economic scenarios. The CropSyst Microbasin model was applied to a small area instrumented with a flux tower (CO₂, H₂O, and N₂O) and

automated chambers (CO₂ and N₂O), with the purpose of evaluating integrated soil water, nitrogen and carbon budgets under conventional and no-tillage management. Measure fluxes of greenhouse gases from agriculture source to atmosphere. Workforce development: Presentations were made at various university seminars. Results have been disseminated to industry through presentations at grower and other industry meetings. Presentations were also made at local high schools to educate students on climate change and agricultural issue. Outcomes: By working with four growers over the last three years, there has been a great exchange of information and knowledge of challenges associated with developing site-specific prescription maps. Growers have willingly applied fertilizer in long test strips to aid in assessing spatial variability in crop response to nitrogen fertilizer. Growers/researchers are gaining a deeper understanding of the role of climate, topography, and soils on the hydrologic variability within a field and are gaining confidence in the ability for remote sensing technology (e.g., RapidEye Imagery) to capture much of this variability.

Goal: Develop process based models for greenhouse gas generation

Sample Accomplishment. Through participation in the AgMIP (Agricultural Model Intercomparison and Improvement Project), the climate change portfolio is developing an improved understanding differences between alternative land use models used to evaluate climate change impacts and climate change mitigation strategies. Milestones achieved: As part of the NIFA climate change Project Directors AgMIP held a workshop on January 10, 2014 entitled "Harmonizing Agricultural Data and Models: AgMIP-USDA Workshop". Outcome: A web-based utilization of data for evaluating and improving agricultural models and using them for analyses of climate change impacts, adaptation strategies, and potential food security issues. Impact: More robust models will allow better forecasting of climate change impacts on production systems

Goal: Improve agricultural and forest sector inputs to climate change models

Sample Accomplishment. A project out of the University of Alabama in Huntsville is assessing whether agricultural food, fiber and bio-fuel production can be sustained in the U.S. through a migration of production back to the Southeastern U.S. under an irrigation assisted rain-fed agricultural system. Milestones achieved: The project team continues to make presentations to farmer's groups, legislators, water resources managers, etc. The project was highlighted in Alabama Farmer's Federation Neighbors Magazine and in the Huntsville R&D magazine. An editorial appeared in the Montgomery Advertiser concerning the project as well as in Southeast Farm Press. Workforce development: The project supports two undergraduates, three graduate students and one-post doctoral position. One graduate student at the University of Georgia (sub to Washington State University) is finishing his thesis on the microeconomic impact of irrigation and presented his work at a water resources conference in

the fall of 2013. Outcomes: Data from four weather stations in each county (a total of twelve sites) spanning the years 1950 through 1999 were used to simulate corn production with and without irrigation. The output from those simulations were then used to examine how farm income and water use would change with the adoption of irrigation under a variety of economic and weather conditions. Impact: Migration of production back to the Southeast, if sustainable, would be an adaptation strategy to climate change and provide additional capacity for long-term food, fuel and fiber security.

Goal: Identify new production practices that increase soil carbon while reducing GHG emissions

Sample Accomplishment. The NIFA Sustainable Corn Coordinated Agriculture Project is collecting data on crop production, pests, and carbon, nitrogen, and water footprints at 35 sites in 8 states. Milestones achieved: In-depth interviews with 165 project farmers in 9 Corn Belt states focused on challenges associated with management of agricultural systems under increasingly variable weather conditions. Biophysical (climate, yield, etc.) models were enhanced in combination with data sets acquired through collaborations with external partners and enables model testing and fine-tuning. Workforce development: A total of 29 undergraduate students, 36 graduate students, 8 postdoctoral researchers, and 17 research staff are members of this team. Outcomes: Certain management practices, such as no-tillage and cover crops, can increase soil carbon, yet the amount of time to substantially increase carbon depends on factors such as soil type, temperature and other environmental factors. Applying nitrogen at a variable rate, utilizing nitrogen sensing equipment, results in a reduction in nitrogen fertilizer use, nitrous oxide emissions, and soil nitrate leaching. Impact: Identify and develop crop management practices that can contribute to the mitigation and adaptation of sustainable corn productions systems to climate change.

Sample Accomplishment. The Pine Integrated Network: Education, Mitigation, and Adaptation Project (PINEMAP), Coordinated Agricultural Project, has established 120 replicated active field experiments for monitoring of carbon and nutrient dynamics and four replicated, new manipulative experiments located on the edges of the loblolly pine range that will simulate drought by excluding rainfall to determine changes and reactions of tree growth, soil and water processes, and carbon uptake and emissions. The PINEMAP Extension program has conducted four webinars involving 315 forestry consultants and state forestry agency personnel. The PINEMAP Climate Change Workshop Series for 1890 Land Grant Universities has so far conducted two workshops on the southern pine forest and climate change involving 55 educators from extension and natural resource agencies. To date, PINEMAP research results and information has been disseminated to the Western Gulf Silvicultural Technology Exchange, reaching 72 silviculturalists who manage 5 million acres of pine forests. Workforce

development: The PINEMAP Undergraduate Fellowship Program, resulted in 17 completed Fellowships, 161 presentations, 14 schools visited where 69 teachers and 3,689 students were reached. A total of 41 graduate students from 9 southeastern universities are being trained.

Outcomes: To better manage forests to increase carbon sequestration; increase the efficiency of nitrogen and other fertilizer inputs and adapt forest management approaches and plant improved tree varieties to increase forest resilience and sustainability under variable climates.

Impact: The creation of healthy climate resilient forests that sequester carbon.

Track 2: Genomics and breeding

Goal: Translate genomics research and resulting technologies to the agricultural and forestry production sector.

Sample Accomplishment. The USDA NIFA Triticeae (Barley & Wheat) Coordinated Agricultural Project (TCAP) is applying the latest genomic technology to variety development, improving traits associated with disease resistance, water and nitrogen use efficiency (WUE & NUE), and low temperature tolerance, to mitigate the impact of climate change on production.

Milestones Achieved: TCAP - associated plant breeding program efforts have greatly impacted the barley and wheat growers and industry by releasing more than 70 improved varieties and germplasm for farmers and consumers. Workforce development: TCAP is and has trained more than 40 PhD students in traditional and modern plant breeding and a new and more diverse generation is being attracted to plant breeding. Develop varieties and breeds that maximize carbon sequestration and can adapt to current and future climate conditions. Scientific knowledge created: TCAP has produced more than 100 scientific publications during the first three years of the project which includes several articles in high impact journals: Nature, Science, PNAS, Genome Biology, Genetics, and PLoS Genetics. Develop transgenic approaches for enhanced adaptation to biotic and abiotic stress in many different environments.

Outcomes: A web-based plant breeding training network has been successfully implemented. With the limited number of public breeding programs releasing finished varieties, the wheat and barley public breeding programs provide the most fertile training opportunities for graduate and undergraduate students interested in plant breeding. These actions are providing the continuity required for sustainable cereal breeding activities in the U.S. while filling the need for highly trained field breeders for the private sector.

Track 3: Human and economic dimension

Goal: Evolution in producer decision-making to incorporate awareness of climate impacts

Sample Accomplishment. Under the interagency program on Water Sustainability and Climate Program, one project seeks to improve the resilience and profitability of farms in the North Central Region amid variable climate change, through the development of dissemination of decision support tools, resource materials, and training. Milestones achieved: During this reporting period Midwestern corn farmers, public and private sector agricultural advisors (including Extension educators), climate and social science researchers were involved in the project. Estimated meeting and conference attendance included 2000 Website page views, 9,003 Unique website visitors, and 2,203 E-Newsletter listserv members. During this reporting period U2U decision support tools and research was made available on a website and presentations were made at 31 agricultural and scientific meetings in addition to holding 11 focus groups with farmers and agricultural advisors. Twenty-one book chapters, journal articles, and Extension articles were published along with several project fact sheets and four editions of the U2U Quarterly E-Newsletter. In collaboration with the USDA-funded CSCAP project (SustainableCorn.org) the project launched AgriClimate Connection, an interactive blog where farmers and scientists across the Corn Belt can learn about and discuss cutting-edge farm management strategies, weather and climate conditions, and more. Impact: Weather and climate patterns are a driving force behind the success or failure of cropping systems. With U.S. corn and soybean production accounting for 37% of global supplies and contributing over \$50 billion annually to the national economy, the ability to successfully produce crops under more variable climate conditions is critical for food security and rural livelihoods. Farmers can benefit from incorporating climate information into their farm management planning, but the actual use of such information remains limited. The U2U project strives to enhance the usability and up-take of climate information for farmers and their advisors, and bolster Extension's capacity to address agro-climate issues across the Corn Belt. Long-term, these efforts will lead to more profitable agricultural systems across the Corn Belt and greater resilience to a changing climate. Understand the importance of changing demographics and social networks as drivers affecting soil carbon management.

Track 4: Formal and non-formal Education

Goal: Supply graduates to meet the climate change workforce demands

Sample Accomplishment. The AFRI piece of the Climate Change Portfolio supported 59 undergraduate and 63 graduate students in fiscal year 2013 and 2014.

Track 5: Extension and Outreach

Goal: Supply the public with critical climate change information

Sample Accomplishment. One study out of Washington State University is working on the sustainability and integrity of water resources and ecosystems in the Columbia River Basin which are threatened by dwindling supplies, growing demand from multiple uses, increased mobilization phosphorous and nitrogen, algae blooms, and reduced biodiversity. Climate change will exacerbate the pressures on water resources and ecosystems. The goal of this program was to understanding of how these biophysical and social systems co-evolve to promote the sustainability of water. The team is using stakeholder input and engagement to develop models on water sustainability and climate change in the region. To date, the team held 12 small meetings and one large meeting with stakeholders from 21 organizations in the Spokane River Basin. These meetings documented stakeholder interests and concerns about water availability, quality and equity. The team developed a collaborative hydrologic model for the basin with significant stakeholder input which is currently being improved and tested. Additionally two new datasets on water use have been developed. The first was detailed how property rights over water were defined in relation to consumptive use, diversion quantities, transfers, and third party effects, which vary by state. The second dataset constructed is a record of water rights adjudications in Washington which have not occurred evenly across the state. Overall, the team is starting to discover scientifically valuable linkages and feedbacks in the highly sensitive systems of the Columbia River Basin.

Goal: Develop appropriate outreach materials and practices to landowners, businesses, agencies and other members of the public.

Sample Accomplishment. USDA NIFA has been working to connect the USDA Climate Hubs with Cooperative Extension. Through the NIFA Climate Hub Working Group, The Office of the Director, and Communications, we reached out to our Cooperative Extension partners to ensure that they were aware of this valuable resource. The NIFA Climate Hub Working Group wrote three white papers that provide the Hub leaders with contact information for relevant USDA NIFA National Program Leaders (NPLs) and Listservs of Cooperative Extension System Specialists and Educators. The papers educate Hub Leaders about the NIFA Connections and

Partnerships for that would be relevant to the USDA Regional Climate Hubs. Many of the NPLs have been connecting related national Extension initiatives, such as Eden and the Rural Development Centers, with the Hubs so that these unique entities can leverage their respective resources. Eric Norland represents USDA-NIFA on the USDA Hubs Executive Council. USDA NIFA helped the REE Hubs team draft and release the RFP for the Hubs. Rachel Melnick has also been working with the Hub executive council for one year. She received the applications, organized the peer review panel, and worked with the Hub leaders and the communications unit on the roll out of the Hubs. She has been serving a 20% detail to the NPL of the Hubs as a Natural Resource Specialist to provide essential programmatic support for the Hubs.

Goal: Broaden societal impacts by engaging public-private partnerships with industry, grower associations, and private foundations

Sample Accomplishment. The Climate and Corn-based Cropping Systems Coordinated Agricultural Project (CSCAP) is a partnership among 11 institutions creating new science and educational opportunities. Team members seek to increase resilience and adaptability of Midwest agriculture to more volatile weather patterns by identifying farmer practices and policies that increase sustainability, while meeting crop demand. The effectiveness of any adaptation or mitigation action in Corn Belt agriculture depends on the degree to which the region's farmers are willing and able to act. A primary objective of this project is to conduct social science research that assesses farmer understanding of climate change and attitudes toward adaptive and mitigated practices and strategies. Milestones achieved: Toward that end, a survey of 5000 farmers from 22 watersheds in 11 Corn Belt states was conducted in February 2012. The survey was conducted in partnership with the Useful to Usable (U2U) project (www.AgClimate4U.org), another USDA-funded climate and agriculture project. The watersheds that were surveyed account for more than half of all US corn and soybean production. Farmers selected for the survey were those who grew corn and who had more than \$100,000 in gross farm income in 2011; these larger-scale farmers cultivate approximately 80 percent of the farmland in the region. Outcomes: The farmer survey data have been compiled in a "statistical atlas" that contains tables and maps that show the geographical distribution of survey results across the Corn Belt. Data presented include: Beliefs about climate change; Attitudes toward potential climate change adaptation and mitigation actions; Concerns about climate-related threats to farm operations; Perceived capacity to deal with the predicted impacts of climate change; and recent experience with extreme weather events. Weather maps that were developed using data from National Weather Service Cooperative Observer weather stations from across the region are also presented. The maps show differences over time in extreme precipitation, drought, and heat stress by watershed. The maps and tables are resources that extension educators, agricultural advisors, and other agricultural stakeholders across the region can use to help increase understanding of farmer perspectives in their local areas. Impact:

Knowledge of farmer beliefs and concerns about climate change, attitudes toward adaptive and mitigative strategies and practices, and decision support needs to inform the development of tools and practices will lead to long-term sustainability of crop production systems.

Revised Project Timeline of Climate Change Portfolio Activities

	2014	2015	2016	2017	2018
Prepare a Climate Change Strategic Plan for NIFA that builds on the President's Climate Action Plan		X	X	X	X
Expand National Program Leadership Areas to Address Climate Change Issues	<u>X</u>	X	X	X	X
Perform Continuous Assessment of Existing Projects to Identify Gaps	<u>X</u>	X	X	X	X
Initiate a Strategic National Plan for Adapting to Climate Change		X	X	X	X
Establish a Core Set of Climate Change Priorities that are included in other NIFA Portfolios	<u>X</u>	X	X	X	X
Establish an External Advisory Panel on Climate Change and Agriculture			X	X	X
Organize and Produce Syntheses Products based on the Climate Change Portfolio	<u>X</u>	X	X	X	X
Develop Interagency Collaborations for Climate Science	<u>X</u>	X	X	X	X
Help Design and Implement Climate Change Communities of Practice with eXtension		X	X	X	X
Produce a Strategic Communication and Marketing Plan for NIFA Activities Focusing on Climate Change			X	X	X
Recruit an Academic Fellow to Work on NIFA's Climate Change Portfolio	<u>X</u>	X	X	X	X
Collaborate with NOAA Sea-Grant for Climate Extension	<u>X</u>	X	X		
Produce Agricultural Workforce Development Plan in climate change science	X	X			
<u>X</u> indicates activities underway or completed					

Climate Change Project Director Meeting Agenda

Monday, January 6- Thursday, January 9, 2014

University of Florida, Gainesville, FL

The Agriculture and Food Research Initiative (AFRI) Agriculture and Natural Resources Science for Climate Variability and Change Challenge area focuses on the mitigation and adaptation to climate variability and change. The challenge area supports activities that reduce greenhouse gas emissions, increase carbon sequestration in agriculture forest production systems, and prepare the nation's agriculture and forests to adapt to variable climates. The long-term outcome for this program is to reduce the use of energy, nitrogen fertilizer, and water by ten percent and increase carbon sequestration by fifteen percent through resilient agriculture and forest production systems.

A meeting of the Project Directors (PDs) from projects funded in 2010 and later was held in Gainesville, FL on January 6-9, 2014. Dr. Ramaswamy provided opening remarks virtually to kick-off the meeting. Panel sessions focused on the five sections of the contributed book entitled "Agriculture and Natural Resources Science for Climate Variability and Change: Transformational Advancements in Research, Education and Extension". In all, there were a total of 127 participants representing 64 different projects.

Climate Change PD Meeting Agenda

Monday, January 6, 5:30-7:30 PM Century B	Evening Reception (prefunction area)	Graduate Student Poster Session (will leave posters up depending on the number of boards)
Tuesday, January 7, 7:30-8:30	Breakfast Buffet (Break Pavilion)	
Tuesday, January 7,		Posters set up to feature individual projects. Posters Remain up Tuesday-Thursday
8:30-8:45	Plenary Session (Century A)	NIFA Welcome and Meeting Overview- view of the CC portfolio and the underlying basis for it
8:45-9:00		Dr. Ramaswamy Remarks
9:00 – 10:15	Panel Discussion -1-5 and breakout (Century A) These panel discussions will focus on the five sections of the book in a panel format; there will be three panelists in each with each giving a five minute presentation related to the topic and then each will lead a breakout session charged with addressing the state of the science and future directions in that area.	Carbon, Nitrogen, Energy and Water Footprints in Agriculture Production: Changing Practices and Opportunities This session focuses on the role of research, education, and extension in reducing carbon, nitrogen, and water footprints through improved fertilizer, fuel, and pesticide use efficiency, increased sequestration of soil carbon, and reduced greenhouse gas (GHG). Breakout Leaders: Sharon Doty, David Brown, Clyde Fraisse
10:15-10:45	Break	
10:45- 12:00	Panel Discussion -2 and	Scientific Inputs to Managing Natural Resources and the

	breakout. These panel discussions will focus on the five sections of the book in a panel format; there will be three panelists in each with each giving a five minute presentation related to the topic and then each will lead a breakout session charged with addressing the state of the science and future directions in that area	Environment Under a Changing Climate: Observations to Models to Decisions. This session includes the development of next-generation Earth System Models that include coupled and interactive representations of ecosystems, agricultural working lands, and forests, to produce comprehensive, reliable global and regional predictions of decadal climate variability and change through advanced understanding of the coupled interactive physical, chemical, biological, and human processes that drive the climate system. Effectively translate model results and associated uncertainties into the scientific basis for well-informed human adaptation to and management decisions for climate change. Breakout Leaders: Jennifer Adams, Dick McNider, Chad Kruger
12:00-1:00	Lunch	Clyde Fraisee stakeholder panel
1:00-2:15	Panel Discussion -3 and breakout	Genomics and Breeding for Enhanced Climate Adaptation and Mitigation: New Knowledge and Knowledge Transfer. This session will bring genomics - based breeding to application by providing the science to validate genetic associations and directing cooperatives that will apply the technology in operational programs. These projects combine the drivers behind the science, the immediate target of extension, and establish the platform for delivering education and more distributed extension materials. Breakout Leaders: Carl Schmidt, Curt Hannah, Randall Wisser
2:15-2:45	Break	
2:45-4:00	Panel Discussion – 4 and breakout. These panel discussions will focus on the five sections of the book in a panel format; there will be three panelists in each with each giving a five minute presentation related to the topic and then each will lead a breakout session charged with addressing the state of the science and future directions in that area	National and International Partnerships for Climate Science: Applications in Agriculture and Forestry: Bridging Sectoral Requirements This session focuses on broad and active partnerships that are required to both mitigate and adapt to climate change. Breakout Leaders: Lois Wright Morton, Sanford Eigenbrode, Sarah Rothenberg
4:00-5:00	Plenary Session	Readout from Breakout Sessions 1-4 and discussion
5:00	adjourn	
Wednesday January 8, 8:30-5:00	Field trip with box lunches & chartered buses	Drs. Martin, Hannah, Nagoshi, Fraisee
Thursday, January 9 7:30-8:30	Breakfast	
8:00-11:00	Open Space Discussion	Project Director identified topics of interest (n=3), one

		which will be data management
11:00- 12:00		Readout from breakout sessions and discussion
12:00-1:00	Lunch	Jim Jones on AgMIP and SECC
1:00-2:15	Panel Discussion -5 and breakout. These panel discussions will focus on the five sections of the book in a panel format; there will be three panelists in each with each giving a five minute presentation related to the topic and then each will lead a breakout session charged with addressing the state of the science and future directions in that area	Translating climate science into actionable knowledge: The role of social sciences. This session focuses on the role of social sciences in integrating with biological and physical sciences to develop or enhance innovative strategies for managing natural resources or adopting technologies under climate variability and change conditions. This session calls for papers to present behavioral, economic, institutional, or social concept and methodologies that lead to providing end users practical and achievable knowledge and information for long-term decision making. Breakout Leaders: Linda Prokopy, Virginia Matzek, Wendy-Lin Bartels, Nick Brozovic
2:15-2:45		Readout from panel discussion 5
2:45-3:15	Break	
3:15-4:30	Breakout groups	PDs meet in one group to discuss nuts and bolts issues (annual reporting, project extension beyond 5 yrs, project management, team science, reporting outcomes) and graduate students meet to discuss what works and doesn't work in transdisciplinary projects
4:30-5:00	Readout	Recap and notes from graduate student breakout group
5:00	adjourn	

Earth Systems Modeling (EaSM) Principle Investigator Meeting

Monday, January 27- Wednesday, January 29, 2014

Washington, DC

The EaSM funding opportunity enables interagency cooperation on one of the most pressing problems of the millennium: climate change and how it is likely to affect our world. It allows the partner agencies -- National Science Foundation (NSF), Department of Energy, and USDA NIFA -- to combine resources to identify and fund the most meritorious and highest-impact projects that support their respective missions, while avoiding duplication of effort and fostering collaboration between agencies and the investigators they support. A meeting of the project directors (PDs) from the first two rounds of EaSM funding was held in Washington DC on January 27-29, 2014. The goal of the meeting was to stimulate ongoing research collaboration amongst appropriate EaSM projects, with the goal of optimizing the overall success of EaSM research and applications. Success means achieving two related legacies: (i) Foster the development of science teams conducting interdisciplinary research in Earth system sciences; (ii) Significantly improve the US capability to develop and apply Earth System Models. Large projects from the EaSM1 program provided keynote talks, while projects from the second round of funding participating in lightning presentations. There were several poster sessions highlighting the projects' research. The meeting also hosted a panel on Communicating Climate Science with Dr. Bill Collins, Senior Scientist and Climate Sciences Department Head at the Lawrence Berkeley National Laboratory, Ms. Cheryl Dybas, National Science Foundation Science Communication Officer for Environmental Research and Dr. Louis Wright Morton, Professor, Department of Sociology at Iowa State University and PD for USDA NIFA's Sustainable Corn CAP.

EaSM Meeting Agenda

Monday January 27th

8:30-9:15 am	Welcome Remarks from DOE, NSF, and USDA Officials DOE – Dr. Sharlene Weatherwax, Associate Director of Science for Biological and Environmental Research, Dept. of Energy NSF – Dr. Michael Morgan, Director of the Division of Atmospheric and Geospace Science, National Science Foundation USDA–NIFA - Meryl Broussard, Deputy Director for Agriculture and Natural Resources.
9:15 – 9:30 am	Meeting organizers discuss the meeting goals and walk-through the agenda
9:30 – 10:15 am	PLENARY – EaSM1 -Auditorium
9:30-9:50 am	Simulations of Anthropogenic Climate Change Using a Multi-Scale Modeling Framework David Randall, Colorado State University

9:50:-10:10 am	Developing a Next-Generation Approach to Regional Climate Prediction at High Resolution. Greg Holland, UCAR
10:10 - 10:30 pm	Improved Regional and Decadal Predictions of the Carbon Cycle. Presented by Dan Ward, Cornell University
10:30-11:00 am	NETWORKING/COFFEE BREAK
11:00 – Noon	PLENARY: EaSM1 Agriculture -Auditorium
11:00-11:20 am	Understanding Biogeochemical Cycling in the Context of Climate Variability Using a Regional Earth System Modeling Framework. Serena Chung, Washington State University
11:20 – 11:40 am	Predictability and Prediction of Decadal Climate and its Societal Impacts in the Missouri River Basin: A Regional Study Integrating Earth System, Hydrologic, Agricultural, Economic and Land Use Model. Vikram Mehta, CSRES
11:40 –12:00 am	Migration of Agricultural Production Back to the Southeast as a Climate Change Adaptation Strategy. Dick McNider U of Alabama, Huntsville
12:00 – 1:30 pm	LUNCH – on your own
1:30 – 2:30 pm	Lightning Presentations – Two Concurrent Sessions
	Lightning Presentations: Agriculture - Auditorium A
1:30 – 1:35 pm	Intro to Session – Nancy Cavallaro
1:35 - 1:40 pm	Multi-Model Regional Simulation of Climate Change Impacts on Agriculture and Ecosystems in the Southwestern United States. Menas Kafatos, Chapman University
1:40-1:45 pm	Forest Die-off, Climate Change, and Human Intervention in Western North America. Phil Mote, Oregon State University
1:45-1:50 pm	Multi-scale climate information for agricultural planning in southeastern South America for coming decades. Lisa Goddard, Columbia University
1:50-1:55 pm	Attribution of changes in precipitation intensity over the central United States. Raymond Arritt, Iowa State University
1:55-2:00 pm	Optimizing Future Crop Yield Projections using Weighted Multi-Model Ensemble Approaches: A New Framework for an Integrated Climate. DW Shin, Florida State University
2:00-2:05 pm	Integration of decadal climate predictions, ecological models and human decision-making models to support climate-resilient agriculture in the Argentine Pampas. Guillermo Podesta, University of Miami
	Lightning Presentations: Human Populations -Auditorium B
1:30 – 1:35 pm	Intro to Session

1:35 - 1:40 pm	Use of Climate Information in International Negotiation for Adaptation Resources. Michela Biasutti, Columbia University
1:40-1:45 pm	Assessing decadal climate change impacts on urban populations in the Southwestern USA. PI –Benjamin Ruddell, Arizona State University
1:45-1:50 pm	Advanced Climate and Regional Model Validation for Societal Applications. Lawrence Buja, UCAR
1:50-1:55 pm	Mechanisms, Predictability, Prediction, and Regional and Societal Impacts of Decadal Climate Variability. Gokhan Danabasoglu, UCAR
1:55-2:00 pm	Linking Human and Earth System Models to Assess Regional Impacts and Adaptation in Urban Systems and their Hinterlands . Brian O’Neill UCAR
2:00-2:05 pm	A Pilot Project on Interactive Land Use and Climate Predictions. Guiling Wang, University of Connecticut
2:15-3:00 pm	Lightning Presentations – Two Concurrent Sessions
	Lightning Presentations: Extreme Events -Auditorium A
2:15-2:20 pm	Intro to Session
2:20 - 2:25 pm	New Approaches for Understanding the Statistics of Daily Weather Extremes in a Changing Climate. Prashant Sardeshmukh, CU Boulder
2:25 - 2:30 pm	Decadal predictability of extreme events: Impact of a model error representation and numerical resolution. Gennady Samorodnitsky, Cornell University
2:30- 2:35 pm	Advancing extreme value analysis of high impact climate and weather events. Dan Cooley, Colorado State University
2:35 - 2:40 pm	Assessing High-Impact Weather Response to Climate Variability and Change Utilizing Extreme Value Theory. Greg Holland, NCAR
2:40 - 2:45 pm	Wildfires and regional climate variability - Mechanisms, modeling, and prediction. Yuhang Wang, Georgia Tech
2:45 - 2:50 pm	Quantifying and Conveying the Risk of Prolonged Drought in Coming Decades. Bette Otto-Bliesner, NCAR
	Lightning Presentations: Reanalyses and Hydroclimate -Auditorium B
2:15-2:20 pm	Intro to Session
2:20 - 2:25 pm	Developing and Implementing Ocean-Atmosphere Reanalyses for Climate Applications (OARCA). Gil Compo University of Colorado Boulder and Ben Giese, Texas A&M

	University
2:25 - 2:30 pm	The Dynamic Watershed and Coastal Ocean: Predicting Their Biogeochemical Linkages and Variability over Decadal Time Scales. - Powell, UC Berkeley
2:30- 2:35 pm	Atmosphere-Ocean Coupling Causing Ice Shelf Melt in Antarctica (ACCIMA). David Holland, New York University
2:35 - 2:40 pm	Topographic Control of the Gulf Stream. Gokhan Danabasoglu, UCAR
2:40 - 2:45 pm	Decadal prediction and stochastic simulation of hydroclimate over monsoonal Asia. Andrew Robertson, Columbia University
2:45 - 2:50 pm	Linking near term future changes in weather and hydroclimate in western North America to adaptation for ecosystem and water management. Richard Seager, Columbia University
3:00-4:00 pm	Poster viewing Training Room 6 , coffee break and networking
4:00 – 5:30 pm	PLENARY – EaSM1, Regional and Global Earth System Models -Auditorium Intro to Session, and Moderated by Renu Joseph
4:00-4:20 pm	Improving Decadal Prediction of Arctic Climate Variability and Change Using a Regional Arctic System Model (RASM). Wieslaw Maslowski, Naval Postgraduate School
4:20 – 4:40 am	Climate-to-humans: A study of urbanized coastal environments, their economics and vulnerability to climate change. Enrique Curchitser, Rutgers University
4:40 – 5:00 pm	MOBY: Modeling Ocean Variability and Biogeochemical Cycles. William Large NCAR and Dennis McGillicuddy WHOI
5:00 – 5:20 pm	Regional Earth System Model of the Northeast Corridor: Analyzing 21st Century Climate and Environment. Charles Vörösmarty, CUNY City College

Tuesday January 28th

8:30 – 8:45 am	Plenary – Morning Announcements
	PLENARY: EaSM 1 - Auditorium
8:45 - 9:05 am	Climate Mitigation and Earth System Management from Local to Global Scale: Modeling Technology-Driven Futures. Yang Zhang, North Carolina State University
9:05 - 9:25 am	Multiscale Modeling of Aerosol Indirect Effects on Decadal Timescales. Lynn Russell, University of California San Diego
9:25 - 9:45 am	Understanding Coupling between Biogeochemical Cycling and Climate Change in Northern Ecosystems: Historical Analysis and future projections with the GFDL Earth System Model. Elena Shevliakova, Princeton University

9:45 - 10:05 am	Informing Climate-Related Decisions with Earth Systems Models. Rob Lempert, RAND Corp.
10:05 - 10:30 am	NETWORKING/COFFEE BREAK
10:30 - 11:30 am	<p>PLENARY: Communicating Climate Science Panel.</p> <p>Bill Collins, Senior Scientist and Climate Sciences Department Head, Lawrence Berkeley National Laboratory and Professor in Residence, Dept of Earth and Planetary Science, UC Berkeley</p> <p>Cheryl Dybas, National Science Foundation, Science Communication Officer for Environmental Research</p> <p>Louis Wright Morton, Professor, Department of Sociology, Iowa State University</p>
11:30-12:00 pm	Lightning Presentations – Two Concurrent Sessions
	Aerosols, Clouds, and Climate -Auditorium A
11:30 - 11:35 am	Intro to Session
11:35 - 11:40 am	Quantifying the Uncertainties of Aerosol Indirect Effects and Impacts on Decadal-Scale Climate Variability in NCAR CAM5 and CESM1. Yi Deng, Georgia Tech
11:40 - 11:45 am	Simulating Aerosol Indirect Effects with Improved Aerosol-Cloud-Precipitation Representations in a coupled regional climate model. Yang Zhang North Carolina State University
11:45 - 11:50 am	Chemistry and Climate over Asia: Understanding the Impact of Changing Climate and Emissions on Atmospheric Composition. Mary Barth -NCAR
11:50 - 11:55 am	Arctic Climate Response to Decadal Changes in Radiative Forcing from Aerosols and Ozone. Presented by Loretta Mickley, Harvard University
11:55 - 12:00 pm	Direct Statistical Approaches to Large-Scale Dynamics, Low Cloud Dynamics, and their Interaction. Farid Ait Chaalal, Caltech/Brown University
	Statistical Analysis -Auditorium B
11:30 - 11:35 am	Predictability of the carbon-climate system on seasonal to decadal time scales. Inez Fung, University of California Berkeley
11:35 - 11:40 am	An Informed Guide to Climate Data Sets with Relevance to Earth System Model

	Evaluation. David Schneider, NCAR
11:40 - 11:45 am	Climate Sensitivity, Stochastic Models and GCM-EaSM Optimization. Mickael Chekroun, University of California Los Angeles
11:45 - 11:50 am	Assessing and Improving the Scale Dependence of Ecosystem Processes in Earth System Models. Danica Lombardozi, UCAR
11:50 - 11:55 am	Stochastic Simulation and Decadal Prediction of Large-Scale Climate. Dmitri Kondrashov, University of California Los Angeles
11:55 am - 12:00 pm	Ecosystem Impacts of Variability and Extreme Events in the Arctic. David Lawrence, NCAR
12:00 pm - 12:05 pm	Improved Cold Region Hydrology Process Representation as a Cornerstone of Arctic Biogeochemical Modeling. David Lawrence, NCAR
12:00-1:30 pm	LUNCH – on your own
1:30 – 3:00 pm	Breakout sessions - Auditorium A, Auditorium B, and Training Room 6/or 10
	<u>Aerosol-Climate Interaction</u> Moderated by - Steven Ghan, Pacific Northwest National Lab
	<u>Human Dimensions and Decision Making/Policy</u> Moderated by - Bill Gutowski, Iowa State University
	<u>Energy and Climate Change</u> Moderated by - Vatsal Bhatt, Brookhaven National Laboratory
3:00 – 4:00 pm	<u>Poster viewing Training Room 6</u>, coffee break and networking
4:00 - 4:45 pm	Report from Breakout (15mins each) -Auditorium
4:45 – 5:30 pm	Plenary discussion -Auditorium

Wednesday January 29th

8:15 – 8:30 am	Plenary – Morning Announcements -Auditorium
8:30 AM – 9:00 am	Plenary: The Science of Team Science –Auditorium Team Science Member

9:00 – 10:30 am	Breakout sessions
	<u>Interdisciplinary Team Science</u> Moderated by - Mary Ann Rozum, USDA NIFA
	<u>Extreme Events</u> Moderated by - Yuhan Wang, Georgia Tech
	<u>Statistical Analysis</u> Moderated by -Dan Cooley, Colorado State University
	<u>Uncertainties related to ecosystem response to climate changes</u> Moderated by - Guiling Wang, University of Connecticut
10:30 – 11:00 am	NETWORKING/COFFEE BREAK
11:00-11:45 pm	Report from Breakout (15mins each) -Auditorium
11:45 - 12:15 pm	General Discussion -Auditorium Rapporteur's summary Program Director's comments

Water Sustainability and Climate (WSC) Principle Investigator Meeting

Wednesday, January 29- Friday, January 31, 2014

Washington, DC

The WSC Program is a joint program between USDA NIFA and the NSF Directorates for Geosciences, Engineering and Social, Behavioral & Economic Sciences. The goal of the program is to enhance the understanding and predict the interactions between the water system and land use changes (including agriculture, managed forest and rangeland systems), the built environment, ecosystem function and services and climate change/variability through place-based research and integrative models. A meeting of the project directors (PDs) from the first two rounds of WSC funded was held in Washington DC on January 29-31, 2014. The meeting started off with a keynote address from Peter Colohan, Assistant Director of the White House's Office of Science and Technology Policy, Division of Environment & Energy. Dr. Ramaswamy and the Deputy Assistant Directors from all NSF Directorates greeted the PDs. Representatives from each project discussed how the project progress and outcomes. There was also a lot of opportunity for networking between the PDs. At the end of the meetings, there was a discussion of the PDs had a discussion about shared experiences, outcomes, and results. This discussion lead to a large group of our PDs, lead my USDA NIFA grantee Mazdak Arabi to submit a proposal to NSF's Research Coordination Networks Program which will support groups of investigators to communicate and coordinate their research, training and educational activities across disciplinary, organizational, geographic and international boundaries.

WSC Meeting Agenda

January 29 Wednesday pm					
Time	Speaker	Affiliation	Talk Title	Proposal Title	Category
1:00 - 1:40	Peter Colohan Assistant Director	Environmental Information OSTP	Invited		
1:40 - 1:45	Marge Cavanaugh Deputy Assistant Director	NSF/GEO	Greetings		
1:45 - 1:50	Fae Korsmo Acting Deputy Assistant Director	NSF/SBE	Greetings		
1:50 - 1:55	Kesh Narayanan Deputy Assistant	NSF/ENG	Greetings		

	Director				
1:55 - 2:10	Sonny Ramaswamy Director	USDA/NIFA	Greetings		
2:10 - 2:30	Cheryl Dybas Public Affairs Officer	NSF/OLPA	Greetings		
2:30-3:00	Jonathan Gilligan Heather Barnes	Vanderbilt University	Agricultural Decision Making and Adaptation to Precipitation Trends in Sri Lanka	Climate, Drought, and Agricultural Adaptations: An Investigation of Vulnerabilities and Responses to Water Stress Among Paddy Farmers in Sri Lanka	2010/2
3:00-3:30	Steve Froelking	Boston University	Crops, Climate, Canals and the Cryosphere in Asia - Changing Water Resources around the Earth's Third Pole	Collaborative Research: WSC-Category 3: Crops, climate, canals, and the cryosphere in Asia - changing water resources around the Earth's third pole	2010/3
3:30-3:45			coffee break		
3:45-4:15	Brozovic, Nicholas	University of Illinois Urbana-Champaign	Challenges and opportunities for resilient groundwater management	WSC-Category 1: Development of an Integrated Economic-Hydrologic-Ecologic Framework for Resilient Surface Water-Groundwater Management	2012/1
4:15-4:45	Michalak, Anna	Stanford University	WSC-Category 2: Extreme events impacts on water quality in the Great Lakes: Prediction and management of nutrient loading in a changing climate	WSC-Category 2: Extreme events impacts on water quality in the Great Lakes: Prediction and management of nutrient loading in a changing climate	2010/2

4:45-5:30			breakout group discussions		
January 30 Thursday am					
8:00--8:30			breakout group report		
8:30-9:00	Cailin Orr	Washington State University	Columbia River Basin: Linking interdisciplinary earth system modeling with collaborative stakeholder modeling	WSC-Category 3: Watershed Integrated System Dynamics Modeling (WISDM): Feedbacks among biogeochemical simulations, stakeholder perceptions, and behavior	2012/3
10:00-10:30	Haggerty, Roy	Oregon State University	Collaborative Research WSC Category 2: Anticipating water scarcity and informing integrative water system response in the Pacific Northwest	Collaborative Research WSC Category 2: Anticipating water scarcity and informing integrative water system response in the Pacific Northwest	2010/2
10:30-10:45			coffee break		
10:45-11:15	Hyndman, David	Michigan State University	Using Coupled Landscape, Atmosphere, and Socioeconomic Systems Models to Examine Water Sustainability across the High Plains Aquifer Region	Collaborative Research: WSC-Category 3- Toward Sustainability of the High Plains Aquifer Region: Coupled Landscape, Atmosphere, and Socioeconomic Systems (CLASS)	2010/3
11:15-11:45	Meixner, Thomas	University of Arizona	Climate, Population and Land Use Impacts in the Value of Ecosystem Services in Semi-arid River Basins	Collaborative Research: WSC-Category 3 - Climate and Population Change and Thresholds of Peak Ecological Water: Integrated	2012/3

				Synthesis for Dryland Rivers	
11:45-12:15	Foufoula-Georgiou, Efi	University of Minnesota-Twin Cities	Climate and human dynamics as amplifiers of natural change: developing new macro-scale frameworks to assess vulnerability and resilience	WSC-Category 2, Collaborative: Climate and human dynamics as amplifiers of natural change: a framework for vulnerability assessment and mitigation planning	2010/2
12:15-1:30			lunch on your own		
January 30 Thursday pm					
1:30-2:00	Molotch, Noah	University of Colorado at Boulder	Snowmelt partitioning under variable climate and land cover: implications for trans-basin diversions in the Colorado Front Range	WSC Category 3, Collaborative Research: Snowpack and Ecosystem Dynamics: The Sustainability of Inter-basin Water Transfers under a Changing Climate	2012/3
2:00-2:30	Maxwell, Reed; Stuart	Colorado School of Mines	Towards understanding hydrology and water quality impacts from the mountain pine beetle infestation in the Rocky Mountain west	WSC-CATEGORY 2 COLLABORATIVE: Water quality and supply impacts from climate-induced insect tree mortality and resource management in the Rocky Mountain West	2010/2
2:30-3:00	Harmon, Thomas	University of California - Merced	Propagating Climate-Driven Changes in Hydrologic Processes and Ecosystem Functions across Extreme Biophysical and Anthropogenic Gradients	WSC Category 3: Propogating Climate-Driven Changes in Hydrologic Processes and Ecosystem Functions across Extreme Biophysical and Anthropogenic Gradients	2012/3

3:30-3:45			coffee break		
3:45-4:15	Sukop, Michael	Florida International University	The South Florida WSC Project One Year On	WSC-Category 2 Collaborative: Robust decision-making for South Florida water resources by ecosystem service valuation, hydro-economic optimization, and conflict resolution modeling	2010/1 2012/2
4:15-4:45	Arumugam, Sankarasubraman	North Carolina State University	Water Sustainability under Near-term Climate Change: A Cross-Regional Analysis Incorporating Socio-Ecological Feedbacks and Adaptations	WSC- Category 3: Collaborative Research:Water Sustainability under Near-term Climate Change : A cross-regional analysis incorporating socio-ecological feedbacks and adaptations	2012/3
4:45-5:15	Georgescu, Matei Hanemann, Michael	Arizona State University	Category 3: Sustainable Large-Scale Deployment of Perennial Biomass Energy Crops	Category 3: Sustainable Large-Scale Deployment of Perennial Biomass Energy Crops	2012/3
5:15-6:30			breakout group discussions		
January 31 Friday am					
8:00-9:00			breakout group report		
9:00-9:30	Kucharik, Christopher	University of Wisconsin-Madison	Forward Thinking for the Yahara Watershed: A Framework to Assess the Future Impacts of Climate Change, Land Use, and Urbanization on Ecosystem Services	WSC Category-2: Climate Change, Shifting Land Use, and Urbanization in a Midwestern Agricultural Landscape: Challenges for Water Quality and Quantity	2010/2

9:30-10:00	Arabi, Mazdak	Colorado State University	Scalable and Accessible Data and Modeling Infrastructure for Assessing Hydrologic Impacts of Land Use and Climate Change	WSC-Category 3: Assessing Water Management Tradeoffs and Targets under Climatic and Land Use Uncertainty	2012/3
10:00-10:15			coffee break		
10:15-10:45	Welty, Claire; Elie Bou-Zeid	U of MD Baltimore County/ Princeton	Regional Climate Variability and Patterns of Urban Development - Impacts on the Urban Water Cycle and Nutrient Export	Collaborative Research, WSC-Category 2: Regional Climate Variability and Patterns of Urban Development - Impacts on the Urban Water Cycle and Nutrient Export	2010/2
10:45-11:15	Pincetle, Stephanie Dianne Pataki	University of California-Los Angeles	The Complex Architecture of Water Management in Los Angeles County: Water Contractors, Wholesalers, Retailers and Groundwater Basins.	WSC-Category 3: Collaborative: The role of local water resources in the water sustainability of Los Angeles	2012/3
11:15-1:00			wrap up and reports		

Active Funded NIFA Climate Change Projects (2010 to Present)

Proposal Number	Proposal Title	Program Name	CRIS Number	PD's Name	PD'S Institution	Total Award Amount
2010-03359	Legume adoption practices in western central United States: economic and environmental benefits in face of increased climatic variability	Climate Change: Regional Approaches to Climate Change: Planning	223332	M. Anowarul Islam	University of Wyoming	50000
2010-03361	Sustainable Reduction of Greenhouse Gas Emissions from Northeast Dairy Farms	Climate Change: Regional Approaches to Climate Change: Planning	223753	Albert J Heber	Purdue University	50000
2010-03362	Climate-Rangeland Connections: Building a Knowledge Center of Best Practices for Climate Change Mitigation and Adaptation on SW Rangelands	Climate Change: Regional Approaches to Climate Change: Planning	223383	Mitchel McClaran	Arizona Board of Regents, University of Arizona	50000
2010-03364	Sustaining Rangelands in the Southern Great Plains in the 21st Century: Adapting to and Mitigating for Climate Change	Climate Change: Regional Approaches to Climate Change: Planning	223450	Bradford Wilcox	Texas A&M University	50000
2010-03365	Greenhouse Gas Emissions And Nitrogen Cycling From Beef Production Systems: Effect Of Climate, Season, Production System, Diet, And Managemen	Climate Change: Regional Approaches to Climate Change: Planning	223699	Galen E Erickson	Board of Regents, Univ of Nebraska, Univ of Nebraska-Lincoln	50000
2010-03368	Toward A Tall Fescue Cap: A Model Forage System For The Carbon Economy And Changing Climate	Climate Change: Regional Approaches to Climate Change: Planning	223799	Charles P. West	University of Arkansas, Fayetteville	50000
2010-03371	Building a solution-oriented team for a rangeland coordinated agricultural project	Climate Change: Regional Approaches to Climate Change: Planning	223536	Richard Conant	Colorado State University	50000

2010-03373	Western conifer forest systems: Strategies for climate change adaptation and mitigation	Climate Change: Regional Approaches to Climate Change: Planning	223451	Glenn Thomas Howe	Oregon State University	50000
2010-03379	Assessment of whole farm sustainability and mitigation of emissions from dairy production systems in the arid west	Climate Change: Regional Approaches to Climate Change: Planning	223358	Ermias Kebreab	Regents of the University of California	50000
2010-03387	Planning Grant: A Regional Approach to Climate Change Planning for Dairy and Beef Production Systems	Climate Change: Regional Approaches to Climate Change: Planning	223320	Wendy Powers	Michigan State University	50000
2010-04228	Adapting kernel metabolism to enhance cereal yield under adverse conditions	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224539	Larkin C Hannah	University of Florida Board of Trustees	1999998
2010-04233	Adapting Chicken Production to Climate Change Through Breeding	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224429	Carl J Schmidt	University Of Delaware	831200
2010-04236	New Tools and Incentives for Carbon, Nitrogen, and Greenhouse Gas Accounting and Management in Corn Cropping Systems	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224437	David Wolfe	Cornell University	892402
2010-04237	Predictive Modeling and Mitigation of the Effects of Climate Change on the Infestation Patterns of a Migratory Crop Pest Insect.	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224523	Rodney N Nagoshi	USDA-ARS, CMAVE	654665
2010-04246	Analysis of clinal variation in maize: implementation of an experimental framework for studying crop adaptation	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224463	Randy J. Wisser	University of Delaware	1749707
2010-04251	Climate Variability to Climate Change: Extension Challenges and Opportunities in	Climate Change: Climate Change Mitigation and Adaptation in	224428	Clyde William Fraise	University of Florida Board of Trustees	1871769

	the Southeast USA	Agriculture				
2010-04256	Useful to Usable U2U Transforming Climate Variability and Change Information for Cereal Crop Producers	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224375	Linda Prokopy	Purdue University	1000000
2010-04261	National Facilitation of Extension Programming in Climate Change Mitigation and Adaptation for Animal Agriculture	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224785	Richard R Stowell	Board of Regents, Univ of Nebraska, Univ of Nebraska-Lincoln	867952
2010-04265	Site-Specific Climate Friendly Farming	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224618	David J. Brown	Washington State University	1990559
2010-04267	Rice culture in the Sacramento-San Joaquin Delta to mitigate past agricultural impacts, improve water quality and sequester carbon	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224583	William Horwath	Regents of the University of California	999925
2010-04269	Integrated Resource Management Tool to Mitigate the Carbon Footprint of Swine Produced in the U.S.	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224705	Gregory J. Thoma	University of Arkansas	1990964
2010-04299	Hydraulic Controls on Carbon Cycling and Water Exchange Rates of Southern Conifers	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224509	Gabriel Katul	Duke University	415647
2010-04321	Precision Zonal Management Systems for Resilient Cereal Yields and Ecosystem Services Under Variable Climates	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	224585	Nicholas Jordan	Regents of the University of Minnesota	1662428
2010-04348	Improving barley and wheat germplasm for changing environments	Climate Change: National Cereal Germplasm Phenotyping	224328	Jorge Dubcovsky	The Regents of the University of California	5000000
2010-04362	The physiological impact of heat stress on pig metabolism and performance	Climate Change: Impacts of Climate Change on Animal Health and	224192	Lance Baumgard	Iowa State University of Science and	1000000

		Production			Technology	
2010-04400	Climate Change, Mitigation, and Adaptation in Corn Based Cropping Systems	Climate Change: Regional Approaches to Climate Change	224740	Lois Wright Morton	Iowa State University of Science and Technology	8000000
2010-04401	PNW Regional Approaches to Climate Change	Climate Change: Regional Approaches to Climate Change	224850	Sanford Daniel Eigenbrode	Regents of the University of Idaho	8000000
2010-04434	Integrating Research, Education, and Extension for Enhancing Southern Pine Climate Change Mitigation and Adaptation	Climate Change: Regional Approaches to Climate Change	224777	Timothy A Martin	University of Florida	4000000
2011-00827	Multi-Model Regional Simulation of Climate Change Impacts on Agriculture and Ecosystems in the Southwestern United	Interagency Climate Change	224892	Menas Kafatos	Chapman University	848000
2011-00828	Optimizing Future Crop Yield Projections Using Weighted Multi-Model Ensemble Approaches	Interagency Climate Change	224712	Dong-Wook Shin	Florida State University	789000
2011-00829	Conversion of Farm Fields to Wetlands: How Do Created Wetlands Affect Global Warming Potential?	Interagency Climate Change NASA	225368	Amy J. Burgin	University of Nebraska, Lincoln	454545
2011-00830	Carbon dynamics in management intensive grazing dairy systems	Interagency Climate Change NASA	224737	AARON THOMPSON	University of Georgia	560117
2011-00831	Carbon Management on Public Lands in the Intermountain West: Multi-scale Analysis of Carbon Stock Responses to Human and Natural Disturbance	Interagency Climate Change NASA	224790	Jason Neff	University of Colorado at Boulder	361113
2011-00832	Carbon Dynamics and Forest Management: effects of land use, climate change, and natural disturbances	Interagency Climate Change NASA	224745	Aaron Weiskittel	University of Maine	597383

	in Northeastern Forests					
2011-00835	Understanding Coupling between Biogeochemical Cycling and Climate Change in Northern Ecosystems: Historical Analysis and future projections	Interagency Climate Change	225191	Stephen W Pacala	The Trustees of Princeton University	900000
2011-00836	Predictability and Prediction of Decadal Climate and Societal Impacts in the Missouri River Basin: A Regional Study Integrating Earth	Interagency Climate Change	224816	Vikram Mehta	The Center for Research on the Changing Earth System (CRCES)	1534000
2011-00837	Development of a Coupled Socioeconomic-Technology Model of Future Emissions to Support Climate Mitigation and Earth System Management	Interagency Climate Change	224779	David George Streets	UChicago Argonne LLC	700000
2011-01033	Biofuel Cropping Systems for Feedstock Production and Greenhouse Gas Mitigation	Interagency Climate Change NASA	225050	Michael L Thompson	Iowa State University	726510
2011-01034	Forecasting Carbon Storage of Eastern Forests: Can American Chestnut Restoration Improve Storage Potential in an Uncertain Future?	Interagency Climate Change NASA	225038	Douglass Jacobs	Purdue University	681743
2011-01036	Integrated, Observation-Based Carbon Monitoring for Wooded Ecosystems in Washington, Oregon, and California	Interagency Climate Change NASA	224951	Robert Kennedy	Oregon State University	770842
2011-01177	Understanding Biogeochemical Cycling in the Context of Climate Variability Using a Regional Earth System Modeling Framework	Interagency Climate Change	224991	Jennifer Adam	Washington State University	3052996

2011-01666	Type 2- Collaborative Research - Migration of Agricultural Production Back to the Southeast as a Climate Change	Interagency Climate Change	224953	Richard McNider	The University of Alabama in Huntsville	2176080
2011-02981	Carbon Management on Public Lands in the Intermountain West: Projected Impacts and Decision Support Tools	Interagency Climate Change NASA	225940	Jason Neff	University of Colorado at Boulder	260203
2011-03007	The Role of Soil Oxygen in Controlling Greenhouse Gas Emissions in a Constructed Agricultural Wetland	Interagency Climate Change NASA	225765	Amy J. Burgin	University of Nebraska, Lincoln	194342
2012-00453	Development of a Coupled Socioeconomic-Technology Model of Future Emissions to Support Climate Mitigation and Earth System Management	Interagency Climate Change	227822	David George Streets	The University of Chicago	700000
2012-00855	Integrated Cropping System Approaches to Simultaneously Limiting Nitrous Oxide and Ammonia Emissions	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	230939	Tony Vyn	Purdue University	749939
2012-00857	Drought-induced Mortality of Trees: Ecosystem Changes Under Climate Change	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	230021	Robert Bradley Jackson	Duke University	749759
2012-00863	Dietary intervention and microbial community analysis towards methane mitigation	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229903	Samodha C. Fernando	Board of Regents, Univ of Nebraska, Univ of Nebraska-Lincoln	749941
2012-00877	Fresno State Student Development Program to Address Climate Challenges in Agriculture.	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	231053	Alam Hasson	California State University, Fresno	216349

2012-00878	Optimizing legume management to reduce GHG emissions and increase resilience	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	230518	M. Todd Walter	Cornell University	659819
2012-00881	US Dairy Adoption of Anaerobic Digestion Systems Integrating Multiple Emerging Clean Technologies: Climate, Environmental and Economic Impact	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	230080	Craig Frear	Washington State University	749920
2012-00882	Riparian forests as ecological and economic buffers to climate vulnerability in flood-prone agricultural systems	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229933	Virginia Matzek	President and Board of Trustees of Santa Clara College	146106
2012-00928	The Effect of Aerobic and/or Intermittently Flooded Rice Cultivation on AQP Transcription Levels and the Nutritional Quality of Rice Grain	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229936	Sarah Rothenberg	University of South Carolina	149994
2012-00931	The use of fungal and diazotrophic endophytes as a means for climate change mitigation and adaptation in agroecosystems	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229904	Sharon L Doty	University of Washington	750000
2012-00932	Enhancing Greenhouse Gas Mitigation And Economic Viability Of Anaerobic Digestion Systems: Algal Carbon Sequestration And Bioplastics Production	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229956	Kevin Feris	Boise State University	681143
2012-00937	Seed Grant - Microbial Analyses to Better Target Integrated Efforts for Methane Biofiltration in Livestock Systems	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229950	Jonathan Schilling	Regents of the University of Minnesota	150000
2012-00939	Farmer adaptation to climate-induced yield changes and market impacts	Integrated Approaches to Climate Adaptation and Mitigation in	229985	Wyatt Thompson	University of Missouri	746352

		Agroecosystems, AFRI				
2012-00967	Reducing Greenhouse Gas Emissions through Anaerobic Digestion of Wastes from Regionally Important Agriculture	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229906	Lide Chen	Regents of the University of Idaho	149998
2012-00974	Projecting Climate Change Mitigation And Adaptation In Fire-Prone Forests Under Future Climate Change	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229865	Matthew D Hurteau	PENNSYLVANIA STATE UNIVERSITY-UNIV PARK	749335
2012-00978	Integrating Climate Science into Forest Management Decision-Making using a Collaborative Network Approach	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	229917	Robert Scheller	Portland State University	716698
2012-01011	Defining and Implementing Agricultural Management Practices to Mitigate and Adapt to Climate Change	Integrated Approaches to Climate Adaptation and Mitigation in Agroecosystems, AFRI	230549	William Horwath	Regents of the University of California	744669
2012-01085	Climate Change Mitigation and Adaptation in Dairy Production Systems of the Great Lakes Region	Climate Change: Regional Approaches to Climate Change	232153	Matthew D Ruark	The Board of Regents of the University of Wisconsin System	1999086
2012-02355	Resilience and vulnerability of beef cattle production in the Southern Great Plains under changing climate, land use and markets	Climate Change: Regional Approaches to Climate Change	232896	David Engle	Oklahoma State University	1999413
2012-03307	Development of an Integrated Economic-Hydrologic-Ecologic Framework for Resilient Surface Water-Groundwater Management	Interagency Climate Change	229743	Nicholas Brozovic	Board of Trustees of the University of Illinois	147260
2012-03335	WSC-Category 3: Assessing Water Management Tradeoffs and Targets	Interagency Climate Change	229710	Mazdak Arabi	Colorado State University	1500000

	under Climatic and Land Use Uncertainty					
2012-03368	Snowpack and Ecosystem Dynamics: The Sustainability of Inter-basin Water Transfers under a Changing Climate	Interagency Climate Change	229822	Noah Molotch	The Regents of the University of Colorado	1405098
2012-03369	Collaborative: Climate and Human Dynamics as Amplifiers of Natural Change: A Framework for Vulnerability Assessment and Mitigation Planning	Interagency Climate Change	229836	Sergey Rabotyagov	University of Washington	326620
2012-03452	Watershed Integrated System Dynamics Modeling (WISDM): Feedbacks among biogeochemical simulations, stakeholder perceptions, and behavior	Interagency Climate Change	230079	Cailin Huyck Orr	Washington State University	1495640
2012-03455	WSC-Category 2 Collaborative: Robust decision-making for south Florida water resources by ecosystem service valuation and modeling	Interagency Climate Change	230152	Julie Harrington	Florida State University	125382
2013-00582	EaSM2 collaborative research: Wildfires and regional climate variability - Mechanisms, modeling, and prediction	Interagency Climate Change	232299	Yongqiang Liu	USDA Forest Service	203456
2013-00601	Collaborative Project: Attribution of changes in precipitation intensity over the central United States	Interagency Climate Change	232542	Raymond W Arritt	Iowa State University of Science and Technology	1000000
2013-00628	EaSM2 Forest Die-off, Climate Change, and Human Intervention in Western North America	Interagency Climate Change	233153	Philip W Mote	Oregon State University	4000000
2013-04148	Key uncertainties in the global carbon	Climate Change: Climate Change	1000067	Matthew Charles	University of Colorado	20000

	cycle:Perspectives across terrestrial and ocean ecosystems	Mitigation and Adaptation in Agriculture		Long	n for Atmospheric Research	
2013-04149	Effect of Climate Change on Multitrophic Interactions among Solitary Pollinator bees, Bee Parasites, and Crops	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1001796	Yong-Lak Park	West Virginia University	150000
2013-04178	Climate Change Adaptation in Working Landscapes of the Intermountain Northwest	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002277	Joel N. Hartter	University of Colorado, Boulder	900000
2013-04181	Strengthening Farm Operator Capacity for Strategic Management of Cropping System Adaptation to Climate Change	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002246	Robert D Weaver	The Pennsylvania State University	750000
2013-04193	Adaptation of Agroecosystems to Climate Change at the Edge of the US Cornbelt-Assessing Different Drivers in a Network of Infrastructure	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002171	David A Hennessy	Iowa State University of Science and Technology	550000
2013-04207	Nat'l Extension Climate Science Initiative	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002191	Michael Kroenke	Regents of the University of Minnesota	25000
2013-04215	Influence of Thermal Challenge on Turkey Muscle Development and Meat Quality	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1001935	Gale Strasburg	Michigan State University	975000
2013-04241	Characterization of genomic signatures for rice crop resilience in response to climate change in the U.S.	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002720	Susan R McCouch	Cornell University	600000
2013-04244	Development Of Dietary Interventions To Mitigate Climate-Induced Alterations Of Rainbow Trout (Oncorhynchus mykiss) Gut Microbial Population	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1001872	Carl James Yeoman	Montana State University	800000

2013-04246	Beef cattle selection and management for adaptation to drought	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1001884	Megan M Rolf	Oklahoma State University	100000
2013-04249	Selection for strains of <i>Saccharomyces cerevisiae</i> with enhanced Ochratoxin-A detoxification capabilities	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002281	Aaron Welch	Florida International University	250000
2013-06128	Understanding the Causes of the 2012 US Drought	Climate Change: Climate Change Mitigation and Adaptation in Agriculture	1002524	Philip W Mote	Oregon State University	50004
2014-01442	Quantifying Greenhouse Gas Mitigation Effectiveness through the GRA Croplands Greenhouse Gas Network (MAGGnet)	Interagency Climate Change NASA	1002685	MARK ANTHONY LIEBIG	USDA, AGRICULTURAL RESEARCH SERVICE	100000
2014-01637	Manipulating Grass-Fungal Endophyte Symbioses to Reduce Greenhouse Gas Emissions and Increase Soil Carbon Sequestration in Grasslands	Interagency Climate Change NASA	1002949	Rebecca Lynne McCulley	University of Kentucky	100000
2014-01837	Global network for the development and maintenance of nutrition-related strategies for mitigation of methane and nitrous oxide emissions	Interagency Climate Change NASA	1003050	Alexander Nikolov Hristov	PENNSYLVANIA STATE UNIVERSITY-UNIV PARK	100000
2014-02114	Enhancing both soil carbon sequestration and fertility while reducing soil greenhouse gas emissions through designer biochar application	Interagency Climate Change NASA	1003011	Jeffrey Michael Novak	USDA/ARS	110000
2014-02309	COMET-Global: Whole-farm GHG Estimation and Environmental Diagnostics Platform	Interagency Climate Change NASA	1003302	Keith Paustian	Colorado State University	100000

2014-04488	Soil Organic Carbon Interactions with Organic Matter Additions: Mechanisms and Models	Interagency Climate Change NASA	1003449	Johannes Lehmann	Cornell University	620000
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