

A. COVER PAGE

Name of state: South Dakota

Cooperative agreement number: NCC5-588

Effective dates: September 1, 2001 through August 31, 2004

Project Title:

“The Use of Remote Sensing for Monitoring, Prediction, and Management of Hydrologic, Agricultural, and Ecological Processes in the Northern Great Plains”

Director information:

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Interim Director

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* effective May 1, 2004

Signature and date

Edward F. Duke, Interim Director

Date

South Dakota Space Grant Consortium and NASA EPSCoR Program

June 1, 2004

B. PROGRESS REPORT

Components of the South Dakota Cooperative Agreement

The South Dakota NASA EPSCoR Program has the following components:

1. Core Funding for Research Infrastructure Development
2. Two Research Projects:
 - “Leaf Area Index for Fire Chronosequences of the Black Hills and Southern Siberia: A Comparative Study”
 - “Cross-Calibration of Landsat and IKONOS Sensors for Use in Precision Agriculture”

State Program Changes

Effective May 1, 2004, Dr. Sherry Farwell resigned as Director of the South Dakota NASA EPSCoR Program and South Dakota Space Grant Consortium. Dr. Farwell begins his new position as Director of the National Science Foundation EPSCoR Office in July 2004. Dr. Edward Duke currently serves as Interim Director of the NASA EPSCoR and SD Space Grant Consortium, and Mr. Tom Durkin continues in his role as Deputy Director of both programs.

State Program Summary

Scope of program. The South Dakota NASA EPSCoR Program was initiated in September 2001. The state program consists of the core grant and two research projects designed to enhance NASA-related research in earth system science and to develop the State’s infrastructure for research and technology-based economic development. Two unifying themes underlie all components of the state program, namely: a) Establish quantitative links between geospatial information technologies and fundamental climatic and ecosystem processes in the Northern Great Plains; and b) Develop and use coupled modeling tools, which can be initialized by data from combined satellite and surface measurements, to provide reliable predictions and management guidance for hydrologic, agricultural, and ecological systems of the region. In accordance with these research themes, the state program is aligned with NASA’s Earth Science Enterprise, and the principal NASA Field Centers involved are Goddard Space Flight Center and Stennis Space Center. The U.S. Geological Survey’s EROS Data Center, in Sioux Falls, SD, is also a key partner in the state program, because of its role as the Land Processes Distributed Active Archive Center (LP DAAC) for NASA's Earth Observing System.

Summary of progress of state program toward achieving the goals and objectives as stated in original proposal. South Dakota’s EPSCoR 2000 proposal articulated six fundamental goals for the NASA EPSCoR program; these goals and a summary of progress toward achieving each goal are listed below:

1. *Establish and strengthen linkages with NASA Centers, researchers, and EROS Data Center.*

The state program has provided funding for 22 trips for NASA-related planning, which involved 34 state investigators; major collaborations have been established with Goddard Space Flight Center and Stennis Space Center, along with additional interactions with the Jet Propulsion Laboratory, Ames Research Center, and NASA Headquarters; seven follow-on

proposals have been submitted for funding through NASA (including subcontracts); five undergraduate students (all Native American) have been accepted into NASA internships or other research activities; and ties between state researchers and EROS Data Center have been strengthened through planning meetings, Program Initiation Grants and other collaborative research projects, coauthored publications, and through representation on the Technical Advisory Committee.

2. *Promote participation of the State's major research institutions, agencies, and businesses.*

Under the state's NASA EPSCoR program, two of the state's major research institutions, South Dakota School of Mines and Technology (SDSM&T) and South Dakota State University (SDSU), have developed extensive collaboration with Augustana College, Oglala Lakota College, and Sinte Gleska University, and with the State's Department of Agriculture and Department of Environment and Natural Resources. Ten major industrial partners have interacted with the research teams, and dozens of additional contacts have been facilitated through forestry and agricultural cooperatives, users workshops, guideline papers, and internet-based dissemination.

3. *Develop the State's scientific talent and infrastructure for enhanced competitiveness in research, development, and technology-based economic development.*

SD NASA EPSCoR participants include 24 faculty or post-doctoral associates, 25 graduate students, and 28 undergraduates. Team members have obtained over \$1.5 million in new grants to support the NASA EPSCoR theme with over \$5.7 million currently pending (\$1.3 million of this total is from NASA or NASA subcontracts). Team members have obtained \$46,000 in major research equipment, authored 27 peer-reviewed publications and 161 additional publications or presentations, and participated in a variety of economic development initiatives including SBIR grants, regional economic development alliances, assistance to user groups in the forestry and agriculture industries, and 10 major industry partnerships, some of which involve potential commercialization opportunities.

4. *Encourage greater participation by underrepresented groups, especially Native Americans.*

The composition of the research team includes 36% women and 5% Native Americans. The SD NASA EPSCoR program and the SD Space Grant Consortium have played a leading role in the State's efforts to increase the number of Native American students in SMET fields. The success of these efforts is indicated by the following achievements: a) a record number of Native American students received engineering degrees from SDSM&T in 2003, b) SDSM&T awarded its first Ph.D. to a Native American in 2004, and c) five Native American undergraduates have or will participate in internships or research projects at NASA Centers. SD Space Grant Consortium initiated two new Workforce Development programs in 2004 to continue to build on these accomplishments.

5. *Build greater public and political support for science, mathematics, engineering, and technology.*

NASA EPSCoR and other federal infrastructure programs have been a critical factor in obtaining public and political support for SMET education and research in South Dakota. These collective efforts culminated in October 2003, with the Governor's *Research 2010*

initiative, which signified an unprecedented reordering of the State's priorities with respect to basic research and technology-based economic development.

6. *Communicate the benefits of current and future NASA programs to the progress and development of South Dakota, the Northern Great Plains, and the Nation.*

Through effective coordination with the SD Space Grant Consortium and its network of 34 affiliate organizations, SD NASA EPSCoR showcases NASA's contributions to science and technology by means of formal and informal science partnerships that extend across the state and the region. These include the Western Research Alliance, the Upper Midwest Aerospace Consortium, the annual South Dakota Space Days, and a variety of forestry and agriculture cooperatives and natural resource management groups.

Continuation Plan. Under the continuation plan outlined in Section C, the state program will maintain the same fundamental themes and will continue to support the current research projects during the final two years of the Cooperative Agreement. Increased emphasis, however, will be placed on promoting the transition to sustainability and on aligning the current projects with existing and emerging state and regional research centers, including components of the NSF EPSCoR program and the State's Research 2010 Centers. The Core Grant will also foster new research collaborations by awarding additional Program Initiation Grants and funding NASA-related travel opportunities. The SD NASA EPSCoR program will continue its close interaction with the SD Space Grant Consortium with the goal of encouraging broader participation by all SD citizens in SMET education and communicating to the public the importance of NASA-related research to the prosperity of South Dakota and the region.

B. PROGRESS REPORT (CONTINUED)

1. Research success of individual Core Grant investigators during the period of the cooperative agreement as measured by:

- a. **list of articles accepted by or published in refereed journals:** None related directly to activities of the Core Grant
- b. **list of talks, presentations or abstracts at professional meetings:** None related directly to activities of the Core Grant
- c. **list of patents (pending and awarded):** None
- d. **list of follow-on grant proposals submitted and funded (including NASA awards):**

Two faculty received support directly from the Core Grant: Sherry Farwell, Director, and Edward Duke, Faculty Advisor for Remote Sensing. These faculty were involved in several new initiatives that overlap with the themes of the NASA EPSCoR program, but which also address broader aspects of state infrastructure development. In addition, nine research teams received funding from the Core Grant in the form of Program Initiation Grants.

Proposals submitted by SD NASA EPSCoR Core Grant Staff

Dr. Sherry Farwell, Director of SD NASA EPSCoR through April 30, 2004, submitted the following infrastructure-building proposal that is related, directly or indirectly, to NASA EPSCoR objectives:

“Planning Grant to Obtain Baseline Information for the Proposed HNUSL (Homestake National Underground Science Laboratory),” National Science Foundation (Division of Physics), \$230,000, (proposal withdrawn, being revised for resubmission by new Homestake Laboratory Conversion Project)

(Dr. Farwell, in collaboration with physicists, biologists, and earth scientists from across the Nation, spearheaded the State’s effort to gain NSF approval for this major facility. Though the ultimate decision regarding the proposal is still pending, the establishment of the proposed national underground laboratory would constitute the single most important event in South Dakota history with respect to science, technology, and economic development. Already, everyone in South Dakota knows about “neutrinos” and “dark matter.” To support the State’s efforts, the Governor established a State Science and Technology Authority and the Homestake Laboratory Conversion Project, and the Legislature appropriated \$24.3 million to help fund the transition.)

Dr. Edward Duke, Faculty Advisor on Remote Sensing, and Interim Director of SD NASA EPSCoR effective May 1, 2004, submitted the following infrastructure-building proposals that are related, directly or indirectly, to NASA EPSCoR objectives:

“Sustained Economic Growth of the Oglala Lakota Nation through Development of the Technological Infrastructure,” National Science Foundation (HRD, Tribal Colleges and Universities Program) (Subaward -- Prime Oglala Lakota College), 10/1/01 – 10/31/06, \$67,948 (funded)

Nelson Research Grant (SDSM&T), “Geochemical Inventory of Missouri River Tributaries in South Dakota,” 7/01/03 – 6/30/04, \$5000 (funded)

“Tatanka-Zitkala-Peji” (Bison-Birds-Grass), U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service 1994 Research Grant Program (Subaward - Prime Oglala Lakota College), 10/1/04 – 9/30/06, \$15,000 (pending)

Program Initiation Grants funded by NASA EPSCoR Core Grant

“Development of an Instrumentation System for Real Time Irradiance Reference Monitoring and Scattering Detection” (SDSU PIs are Dr. L. Leigh and Dr. D. Aaron, funded for \$9,748)

“Large Scale Models of Sugarbeet Quality from Multi-Spectral Satellite Imagery” (SDSU PI is Dr. D. Humberg, funded for \$5,200)

“The Effects of Fire Suppression and Fire on Soil Organic Carbon in Newton Hills State Park and in the Black Hills” (Augustana College PI is Dr. S. Matzner, funded for \$9,980)

“Heritage and Future: Transitioning from AVHRR to MODIS” (Augustana College PIs are Dr. D. Swets and Dr. B. Reed, funded for \$8,824)

“Determining the Global Importance of Biogenic MBO Emissions through Measurements and Models Driven by Remotely Sensed Data from the Terra Satellite” (SDSM&T PI is Dr. B. Baker, funded for \$9,800)

“Use of Remote Sensing to Monitor Impacts of Land Use and Seasonal Land Cover Changes on Missouri River Water Chemistry and Sediment Loads” (SDSM&T PI is Dr. E. Duke, funded for \$10,000)

“Collaborative Research: Investigating the Role of Prairie Wetlands on the Northern Great Plains Pre-Storm Environment” (SDSM&T/SDSU/National Weather Service PIs are Dr. W. Capehart, Mr. D. Todey, Dr. K. Harding, funded for \$19,938)

“The Use of LiDAR Remote Sensing to Determine Avian Diversity” (SDSM&T PI is Dr. K. Vierling, funded for \$10,000)

“Development of Hydrazine/Nitrogen Dioxide Fiber Optic Sensor” (SDSU PI is Dr. A. Andrawis, funded for \$15,062)

e. improvements in state research and development infrastructure

Through its two main research projects and its Program Initiation Grants, SD NASA EPSCoR has provided approximately \$46,000 for the purchase or development of major new research equipment. The following are examples of equipment that enhances the capability of the State's researchers to establish quantitative relationships between remotely sensed measurements and physical and biophysical parameters at the Earth's surface:

- Automated Sun Radiometer (ASR). This sun-tracking radiometer measures the intensity of direct sunlight at 10 different wavelengths. Based on these measurements researchers can extract information on atmospheric constituents such as water vapor, ozone, and aerosols. Once these parameters are known for a given area and day, it is possible to correct satellite imagery for atmospheric distortion in radiometric intensity. This unit was constructed by the University of Arizona's remote sensing group for use by SDSU's Cross-Calibration and Precision Agriculture NASA EPSCoR project. (total cost \$26,000)
- Real Time Reference Monitor (RTRM). The RTRM is a hyperspectral field instrument that continually monitors and records all downwelling radiation (both direct and diffuse components). The system includes an on-site weather station. This unit was conceived, designed and constructed by an SDSU graduate student under a NASA EPSCoR Program Initiation Grant. (total cost \$15,000)
- LiCor LAI-2000. The LAI-2000 was purchased to obtain effective Leaf Area Index for ground truth measures of LAI. (total cost \$5,000)
- In addition, Dr. Donald Deering of NASA Goddard donated a 30-meter trailer-mounted pneumatic boom for spectral measurements of vegetation canopies to Dr. Vierling's Leaf Area Index NASA EPSCoR project. (estimated value \$15,000)

2. Systemic change as evidenced by:

a. reordered State and/or institutional priorities (limit: 1/2 page)

In October 2003, Governor M. Michael Rounds unveiled his *2010 Initiative* for improving South Dakota's economic growth and quality of life. Goal Three of the five-goal plan asserts that South Dakota will "Become a recognized leader in research and technology development by 2010." This proclamation signified an unprecedented reordering of the State's priorities with respect to basic research and technology-based economic development. Although many factors contributed to the dramatic improvement in the climate for research in the State over the past three years, substantial credit belongs to the national EPSCoR programs (primarily NASA and NSF) and, specifically, to participants in the NASA EPSCoR program. While Director of SD NASA EPSCoR, Dr. Sherry Farwell was instrumental in developing proposals to NSF that resulted in the selection of the Homestake mine as the preferred site for a National Deep Underground Science and Engineering Laboratory. Subsequently, the State of South Dakota secured an agreement with the mine's owner, Barrick Gold Corporation, to accept ownership of the property, and the State established a Science and Technology Authority to manage the facility and to work with the scientific community nationally to secure final funding for the laboratory. As another example, Dr. Patrick Zimmerman, a participating scientist in the SD NASA EPSCoR program, successfully lobbied former Governor William Janklow to support

basic research in carbon cycle science, biospheric carbon sequestration, and development of a certification protocol for carbon emission reduction credits. This program, entitled “C-Lock,” represented a milestone in establishing a connection between basic and applied science and state priorities and policies.

b. increased financial commitment from the State, industry, and participating institutions (limit: 1/2 page)

To facilitate the establishment of the Deep Underground Science and Engineering Laboratory, the legislature authorized \$24.3 million to create the State Science and Technology Authority and fund the Homestake Laboratory Conversion Project. To implement the Governor’s *2010 Initiative*, the legislature authorized \$3 million to fund between two and four interdisciplinary research centers for a period of five years. Four of the 11 finalists on the list of proposed centers involve current NASA EPSCoR researchers; these four centers are: “The South Dakota Sustainable Energy Institute,” “The Center for Applied Research in Biogeosciences,” “The Center for the Research, Development, and Commercialization of Advanced Information Systems for Agriculture, Disaster Mitigation, and Homeland Security,” and “The Institute for Belowground Biocomplexity.” In addition, two of the three projects funded as small grants for exploratory research by the SD NSF EPSCoR Center for Biocomplexity Studies involve NASA EPSCoR investigators; these are: “Modeling Climate-Wetland Interactions in the Northern Great Plains” and “Quantification and Scaling-up of the Coupled Biogeochemical Cycles of Carbon and Water in Grassland Ecosystems of South Dakota.”

3. Examples of successful transfer of technology to the private sector (limit: 1/2 page).

Each of the two SD NASA EPSCoR research teams is actively pursuing technology transfer opportunities. These include development of forestry applications of LiDAR technology (SBIR Phase Zero, Horizons, Inc., Lamp-Rynearson Associates); satellite and aircraft remote sensing products for precision agriculture, as well as development of unmanned aerial vehicles (UAVs) (Raven Industries, Skyhawk Sensing); radiometric calibrations and verification of spatial resolution for QuickBird satellite (DigitalGlobe); decision support and resource management systems for precision agriculture and other markets (Resource21, a division of Boeing Company, Ag20/20, a NASA Stennis and USDA collaboration for commercialization of remote sensing, and Raytheon); numerous site-specific management guidelines and workshops for agricultural producers (Potash and Phosphate Institute, SD Soybean Research and Promotion Council, United Soybean Board, SD Corn Utilization Council); and several collaborations with SAIC Technologies at EROS Data Center.

Also, while Director of SD NASA EPSCoR, Dr. Sherry Farwell was instrumental in establishing the Western Research Alliance (WRA), a forum for individuals and organizations dedicated to promoting technology-based economic development in western South Dakota. WRA accomplishments include creation of an Angel Investor Group, increased SBIR/STTR activity in the region, hosting the national SBIR meeting (2001), a proposal to establish a Technology Park in Rapid City, and organizing day-long meetings on subjects such as Geospatial Information Technology, Materials Science and Research, and Biotechnology and Biomedical Engineering. One such meeting stimulated development of a Center for Nanoscience and Technology centered at SDSM&T, which has been responsible for the

generation of several major proposals including a new NSF EPSCoR initiative, a State Research 2010 Center, and a multi-state NSF consortium for nanoscience and engineering.

4. Extent to which collaborations with State agencies, industry, research and academic institutions, and with NASA have been developed (limit: 1/2 page)

Twenty-two collaborative trips were taken by 34 different South Dakota researchers from September 2001 (the start date of SD's NASA EPSCoR Program) to the present. These 22 trips were to NASA Centers, NASA-related activities and conferences, and other locations to meet with NASA personnel to build upon research projects initiated under EPSCoR funding. The following NASA Centers were visited: Goddard Space Flight Center (3 trips), Jet Propulsion Laboratory (3 trips), and Stennis Space Center. Other noteworthy destinations were to the USGS EROS Data Center in Sioux Falls, SD, where faculty and student researchers collaborated with EROS scientists on SD's NASA EPSCoR research projects.

Nine Program Initiation Grants (PIGs) at a total funding of \$90,000 were awarded to researchers at SDSM&T, SDSU, and Augustana College. A six-member Steering Committee (two from each institution) selected these projects based on their potential to develop into major new collaborations both within the State and with NASA. Details on these awards are provided in Sec. 1d (follow-on grant proposals).

NASA EPSCoR participants played a central role in the creation of a new Geographic Information Science Center of Excellence. The center, approved by the Board of Regents in May 2004, will expand educational and research opportunities at SDSU and the EROS Data Center.

NASA EPSCoR participants are actively collaborating with faculty and students at Oglala Lakota College on the Pine Ridge Reservation and Sinte Gleska University on the Rosebud Resrevation to increase the use of geospatial technology and remote sensing. These activities involve coordination with several major programs including the NASA Earth Science REASoN program (SGU), the NSF Tribal Colleges and Universities Program (OLC), the SD Space Grant Consortium Workforce Development program, and the multi-state Native Connections program.

5. Evidence of how EPSCoR activities have furthered State priorities (limit: 1/2 page).

In the Governor's *2010 Initiative*, described above (Sec. 2a), Goal Four proposes to "Improve cooperative efforts with Native American Tribes." Six of the Nation's 35 Tribal Colleges are located in South Dakota and all are formally affiliated with the SD Space Grant Consortium; in addition, Mike Collins of Oglala Lakota College and James Rattling Leaf of Sinte Gleska University serve as members of the NASA EPSCoR Technical Advisory Committee. SDSM&T currently has a record number (84) American Indian students pursuing engineering and science degrees and, in Spring 2003, SDSM&T awarded the highest number of engineering B.S. degrees to American Indian students of any institution nationwide. An additional milestone was attained in 2004 with the awarding of the first Ph.D. degree to an American Indian; T.Bull Bennett was also the recipient of a NASA Earth System Science Graduate Fellowship for his research on "Analysis of Large Ungulate Grazing Impacts on Short-grass Prairie Using Satellite Derived and Ground-based Multispectral Radiometry." Five Native American undergraduates are current or recent participants in internships or research projects at NASA Centers. SD NASA EPSCoR and the SD Space Grant Consortium also work closely with the NASA Honors Program and the NSF

Bridges to Success Program, which support summer programs for American Indian high school and Tribal College students. Continuing to increase participation of American Indians in SMET fields is the focus of the new SD Space Grant Consortium NASA Workforce Development Program, the new multi-state Native Connections program, and a new proposal in preparation for NSF's Alliances for Graduate Education and the Professoriate.

6. Discussion of interaction between and cooperation with State Space Grant program (limit: 1/2 page).

The South Dakota Space Grant Consortium was established in March 1991 and currently includes 34 members and affiliates. The SD Space Grant Consortium and the NASA EPSCoR program work closely to promote research and education in earth system science, to expand collaboration between the universities and EROS Data Center, and to strengthen partnerships with the State's six Tribal Colleges. The NASA EPSCoR Technical Advisory Committee includes representation from all four SD Space Grant Consortium members and from five of its industrial and educational affiliates. In addition to initiatives to engage American Indian students in SMET fields, the SD Space Grant Consortium also supported four "Women in Science" conferences in March 2004 that reached 730 high school girls in four South Dakota cities. The conferences introduced the girls to the spectrum of opportunities in science and math related careers and encouraged them to maintain their academic studies for eventual careers in those fields.

Each year the SD Space Grant Consortium organizes Space Days, a two-day event held at different cities around South Dakota. Up to 4500 students, teachers, and members of the public attend these events to see NASA exhibits (e.g., ISS traveling exhibit), hear presentations by astronauts, and participate in hands-on science demonstrations. Plans are underway for Space Days 2005 to be coordinated by the State's Tribal Colleges and to be held in conjunction with the Black Hills Pow Wow, an event that draws up to 14,000 attendees to Rapid City from around the region and across the U.S.

7. Personnel information – numbers, gender distribution, and ethnic distribution of faculty, post-docs, graduate and undergraduate students.

	Core Grant Administration	Core Grant Student Fellowships	Program Initiation Grants funded by Core*	Total
Faculty	2		9	10**
Staff	3			3
Post-doc				0
Ph.D.		3		3
M.S.		6	2	8
B.S.		4	1	6
Male	3	9	9	21
Female	2	4	3	9
White	5	9	11	25
Black				0
Asian		1	1	2
American Indian		3		3

* Preliminary compilation—final reports pending.

** Duke included in both Administration and Program Initiation Grant columns.

8. Names, titles, and affiliations of Technical Advisory Committee members.

Sherry Farwell
 Dean of Graduate Education and Sponsored Programs, SDSM&T
 Director of South Dakota Space Grant Consortium and South Dakota NASA EPSCoR
 (through April 30, 2004)

Edward Duke
 Professor of Geology, SDSM&T
 Interim Director of South Dakota Space Grant Consortium and South Dakota NASA
 EPSCoR (effective May 1, 2004)

James Rattling Leaf
 Land and Natural Resource Developer
 Director of Sicangu Policy Institute, Sinte Gleska University

Ron Woodburn
 South Dakota Bureau of Information and Telecommunications

Larry Diedrich
 SD State Senator
 Diedrich Bros. Farms, Elkton, SD

Mike Collins
Professor of Science and Mathematics, Oglala Lakota College

Gregg Johnson
Science Department Manager, SAIC/USGS EROS Data Center, Sioux Falls, SD

Dan Swets
Chair, Department of Computer Science, Augustana College
Associate Director South Dakota Space Grant Consortium

Kevin Dalsted
Director, Engineering Resource Center, SDSU
Associate Director South Dakota Space Grant Consortium

Don Lefevre
CEO, Cynetics Corp., Rapid City, SD

J. Foster Sawyer
Hydrology Specialist, South Dakota Department of Environment and Natural Resources

Daniel Hoyer
Hydrologist, RE/SPEC, Inc., Rapid City, SD

9. Schedule of meetings of Technical Advisory Committee.

A day-long meeting of the Technical Advisory Committee was held July 31, 2003, in Rapid City, SD, to assess progress during the first two years of the Cooperative Agreement. The second meeting of the TAC has been delayed until late summer 2004, because of the departure of Sherry Farwell as Director of SD NASA EPSCoR. The agenda for that meeting will focus on sustainability of the current research projects and transition to a new research theme in anticipation of a possible second round of NASA EPSCoR proposals in two years.

C. REQUEST FOR CONTINUATION

1. Two-year program plan and budget.

The plan outlined here for the final two years of the SD NASA EPSCoR program maintains the unifying theme of the original proposal, namely, to support multidisciplinary, multi-institution teams that integrate remote sensing and surface measurements in order to monitor, model, manage, and predict behavior of ecosystems of Northern Great Plains. In order to address these fundamental research themes, we propose to continue the three components of the state program at the same funding levels as in the first three years. These components are:

1. Core Funding for Research Infrastructure Development (administered by E. Duke at SDSM&T)
2. “Leaf Area Index for Fire Chronosequences of the Black Hills and Southern Siberia: A Comparative Study” (L. Vierling, PI, SDSM&T)
3. “Cross-Calibration of Landsat and IKONOS Sensors for Use in Precision Agriculture” (D. Helder and D.E. Clay, PIs, SDSU)

The goals of the overall program remain the same as those outlined on pages 2-3 of the summary section, but, in the final two years of the Cooperative Agreement, there will be added emphasis on completing the transition of currently funded research projects to self-sufficiency and on developing a new group of meritorious projects for possible NASA EPSCoR competition in two years. Within that overall framework, the role of the Core Grant will be the following:

- Provide administrative support, travel funds, and programmatic guidance to the two research teams that will assist them in accomplishing their research objectives, securing long-term funding, and completing the transition to self-sufficiency
- Identify and cultivate new research areas and teams for potential proposals to the next cycle of NASA EPSCoR (2006), for other NASA funding opportunities, or for funding through other agencies
- Continue to encourage participation of American Indian students in SMET fields and NASA-related research
- Promote alignment and integration of current and next generation SD NASA EPSCoR projects with evolving statewide programs funded by NSF EPSCoR, DOE, USDA, and the Governor’s Research 2010 Centers
- Coordinate participation of SD researchers in regional NASA collaborations such as the Upper Midwest Aerospace Consortium and the Native Connections Consortium
- Enhance public awareness of NASA research and technology development in cooperation with the SD Space Grant Consortium
- Increase interaction of SD EPSCoR participants with state and federal government agencies and with the private sector, and continually reassess long-range strategic plans under the guidance of the Technical Advisory Committee and Steering Committee

2. Metrics to be used for tracking and evaluating program progress.

Metrics of progress toward the goals outline above will include the following:

- Number of SD investigators who travel to NASA Headquarters or NASA Centers or to other NASA-related events
- Number of NASA scientists, engineers, and administrators who visit SD to interact with investigators involved in the NASA EPSCoR program
- Number of follow-on proposals generated from research activities of the Core Grant, Program Initiation Grants, or the two main research projects
- Number of new research awards in SD from NASA and other federal agencies where the funded projects are related to the theme of the SD NASA EPSCoR program
- Number of SD university graduates in M.S. and Ph.D. programs whose research is related to the theme of the SD NASA EPSCoR program
- Number of publications and presentations based on research activities of the Core Grant, Program Initiation Grants, and the two main research projects
- Number of Native Americans and women who become engaged in projects supported by the SD NASA EPSCoR and SD Space Grant Consortium programs
- Number of NASA EPSCoR researchers who become funded through the new Research 2010 Centers, NSF EPSCoR projects, or other statewide programs
- Number of SD EPSCoR researchers participating in regional or national coalitions or serving on NASA review panels
- Number of media reports or informal science contacts related to SD NASA EPSCoR research
- Number of non-university individuals who become directly or indirectly involved in the SD NASA EPSCoR program as end users of geospatial data and products generated by the research
- Number of meetings of the SD NASA EPSCoR Technical Advisory Committee and Steering Committee

3. Milestones and timetables for achievement of specific objectives during the award period.

Milestones for implementing the continuation plan and a proposed timetable are summarized in the chart below. At least three meetings of the Technical Advisory Committee (TAC) will be convened to review progress of current programs, to develop priorities for SD NASA EPSCoR activities following the final two years of the current Cooperative Agreement, to build political support within the State for NASA-related research and development, and to generate improved strategies for technology transfer and commercialization.

Throughout the two-year extension period, the Core Grant will seek to build alliances between NASA EPSCoR and established and emerging state programs for basic and applied research. Key opportunities for such synergy exist with the NSF EPSCoR Center for Biocomplexity Studies, the South Dakota Carbon Sequestration Project and its evolving regional and national partnerships, and four of the proposed South Dakota 2010 Research Centers, specifically “The South Dakota Sustainable Energy Institute,” “The Center for Applied Research in Biogeosciences,” “The Center for the Research, Development, and Commercialization of

Advanced Information Systems for Agriculture, Disaster Mitigation, and Homeland Security,” and “The Institute for Belowground Biocomplexity.” Additional opportunities for expanding NASA EPSCoR research projects are developing through current and pending research on carbon sequestration (DOE, NASA) and a variety of USDA programs. The number of emerging state research programs with links to current NASA EPSCoR research is a testimony to the success of NASA EPSCoR and its impact on state priorities. More importantly, these emerging research centers represent tangible progress toward long-term sustainability of the research initiated under NASA EPSCoR.

Solicitation of approximately five Program Initiation Grants each year will foster development of new NASA-related research projects, and these will help to determine the future direction of SD NASA EPSCoR in the period beyond the current Cooperative Agreement.

Starting in the middle of 2005, the Steering Committee and Technical Advisory Committee will begin a 16-month process of reassessing the overall SD NASA EPSCoR theme and goals, identifying meritorious research teams to lead the next cycle of NASA EPSCoR research, and drafting a new state proposal for NASA EPSCoR support after the current Cooperative Agreement. This process will be closely coordinated with the EPSCoR Office at NASA Headquarters as well as with NASA scientists at the applicable Field Centers.

Timetable for Major Core Grant Activities in Years 4-5.

Sep-04	Jan-05	May-05	Sep-05	Jan-06	May-06
TAC meeting		TAC meeting		TAC meeting	
Increase interaction with SD 2010 Research Centers and NSF Center for Biocomplexity Studies					
Solicit Program Initiation Grants			Solicit Program Initiation Grants		
Develop new research areas for next EPSCoR competition					
Select new research areas for next EPSCoR competition					
Submit proposals for next EPSCoR funding cycle					