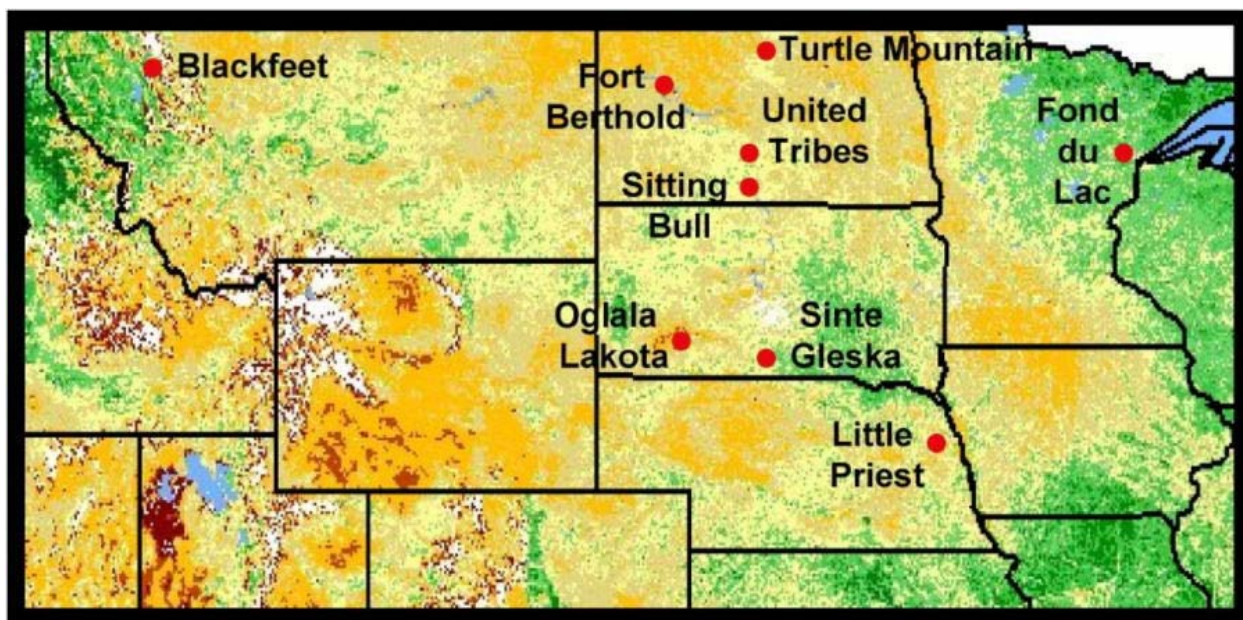


TRibal Earth Science and Technology Education (TRESTE) Project
(An Innovative Approach to Integrate Earth Science Data and Research into Curricula at Tribal Colleges and Universities)

Year Two Progress Report
1 July 2006 – 30 June 2007



TRESTE Partner TCU Locations

“...partnering with TCU faculty to inspire undergraduate students into Earth System Science and NASA-related careers”

From
**Universities Space Research Association
and Sinte Gleska University**

Awarded in Response to

Strengthening Undergraduate Institutional Capacity in
Earth System Science and Applications
Category of the NASA Research Announcement NN-H-04-Z-YO-006-N
“Inspiring the Next Generation of Earth Explorers: Integrated Solutions for K-16 and Informal Education”

1.0 Summary of Activities

Year 2 continued with curriculum enhancement and development integrating Problem-based Learning (PBL) and Earth System Science (ESS) concepts. Case studies incorporating physical science topics were introduced and developed into “teaching boxes”, and faculty career development was reinforced with ESRI training and a case study exercise using AEROCam data. Specific course enhancements and development at each Tribal College and University (TCU) as a result of TRibal Earth Science and Technology Education (TRESTE) are listed in Table 1.

TRESTE's nine TCU are Blackfeet Community College (BCC), Fond du Lac Tribal and Community College (FdLTCC), Fort Berthold Community College (FBCC), Little Priest Tribal College (LPTC), Oglala Lakota College (OLC), Sinte Gleska University (SGU), Sitting Bull College (SBC), Turtle Mountain Community College (TMCC) and United Tribes Technical College (UTTC).

Project outcomes in Year 2 also included project-developed course materials, Web resources, and a completed set of Faculty Evaluation Expectations by which faculty were expected to be evaluated against and project metrics developed.

The 2nd Annual Workshop was held at Blackfeet Community College in Browning, MT, 6-9 June 2007. The ESS topic was Forest and Grassland Fire and Smoke and their impact of energy budgets. Each partner TCU presented a summary of their activities for the year. The workshop presentation can be found on the TRESTE web page, <http://space.hsv.usra.edu/TRESTE/07workshop.html>. In addition, ERSI provided additional GIS training and a case study using the University of North Dakota's Airborne Environmental Research Observational Camera (AEROCam) data was presented.

TRESTE PI's and faculty engaged in outreach activities that were varied and reached audiences both within and outside of the Tribal community. Activities and forums such as the *Joint NASA/NSF Research and Education Opportunities Conference for Higher Education Principal Investigators, Faculty, and Partners*, the *NativeView Tribal College Forum VI*, and an environmental science curriculum workshop for pre-service and in-service teachers were among those supported by TRESTE. Faculty outreach activities are described on Table 2.

Communications continued to be a significant component in the success of the project. Monthly telecons were held, and regular email network established to update faculty on training opportunities, opportunities to participate in TCU-related projects, and available data sources. Another major factor in connecting participants was the 2nd Annual Workshop which brought everyone together for updates, highlights, and face-to-face interactions.

Administratively this year, the project lost Jason Kennedy, the PI at Fond du Lac Tribal and Community College. However, Jason worked diligently to help find his replacement. The project was fortunate to have Jay Sandal, Biology Faculty, and Elizabeth Sedgewick, GIS/ Geography Faculty as replacements.

As the project moves into Year 3, faculty are working to involve more students, begin teaching new courses planned, complete case studies, and present work at conferences. Collectively the TRESTE group will be looking at avenues and collaboration to disseminate developed materials, and sustainability plans to continue and expand upon the initiatives started.

Lastly, roadblocks to be addressed and recommendations for project improvement in Year 3 were solicited from faculty. These issues and ideas in addition to comments on the benefits of the project are shared in Table 3.

		study TES 095: Peer Tutor & TRM 201: Native People & Environmental Issues	
<i>Incorporate Geospatial Data & Technology in Existing Core Science Courses</i>			
<ul style="list-style-type: none"> Geospatial Datasets used in Curriculum 	<p>FBCC</p> <p>OLC</p> <p>SGU</p> <p>TMCC</p>	<p>Incorporate NOAA precipitation data in research methods class</p> <p>Added lectures on precipitation data acquisition & analysis</p> <p>Used Tribal GIS Database to enhance GIS projects studying roads, ownership, land use</p> <p>SDView: satellite data & LandSat data – used to identify greenness of range land & prairies</p> <p>DOQ – used to identify Lakota historical sites, tourism sites, etc.</p> <p>DLG (rivers, roads...) – used to support ecological studies</p> <p>Census Data – used for diabetes outreach</p> <p>Reservation data from different sources</p> <p>River flow data sets – used to illustrate effects of drought on prairie ecosystem.</p> <p>NASA data sets related to the solar system objects – used for viewing & analysis in Integrated Science II</p> <p>Used satellite imagery in lectures & labs for radon residence mapping, reflectivity & emissivity</p> <p>MODIS, LandSat data in three curriculum modules</p>	15
<ul style="list-style-type: none"> Geospatial Datasets in Planned Curriculum 	BCC	Remote sensing information on Chief Mountain to be used	
<ul style="list-style-type: none"> Geospatial Technology in Existing Curriculum 	BCC	Used GPS receivers to map cultural significant sites on Blackfeet reservation used in Cultural Geography courses	

	FBCC	Added computerized labs on earthquake activities, severe storms & tornado histories to Earth Science class	
		Used Chemical Analysis of tributaries to compare water quality	18
		Used Aerial Photography to enhance GIS applications	
	FdLTCC	GEOG 1010: Physical Geography – introduced GIS concepts & reviewed GIS case study on Physical Geography/Earth System Science relevance, examined MODIS satellite imagery maps	9
		GEOG 1054: Intro to GPS – used GPS receivers purchased through TRESTE for lab exercise	3
		GEOG 1056: Data Acquisition in GIS – added new lab using GIS analysis to examine drought in Missouri River	4
		BIOL 2050: Principles of Ecology – students used GPS receivers to examine, identify & assess old growth white pines	
	LPTC	INFO 2100: Computer Literacy – amended to introduce lesson on GPS systems	32
		BIOS 2000/ENVR 2000: Prairie Restoration & Management – amended to include GIS/GPS mapping using ArcGIS	
		BIO 1600: Conservation Biology – amended to include lab using GPS	
	OLC	GIS 213: Intro to GIS – introduced 3D flight animation	21
		Used Windows Movie Maker, ArcView, 3D Analyst, Internet GIS – to teach basic ideas of GIS & encourage GIS use in everyday life	
	SGU	Used Google Earth to better understand topography of land	
	UTTC	GEO 125: Fundamentals of GIS, GPS & Remote Sensing – incorporated	

		<p>additional Remote Sensing material</p> <p>Injury Prevention Major Computer Information Tech Major -- integrated GEO 125</p>	
<ul style="list-style-type: none"> Geospatial Technology in Curriculum Developed 	FBCC	<p>GEO 125: Intro to GIS/GPS/RS</p> <p>CTL 900: Integration of GIS/GPS/RS & NASA ERC</p>	
<ul style="list-style-type: none"> Geospatial Technology Planned Curriculum 	<p>FdLTCC</p> <p>LPTC</p> <p>UTTC</p>	<p>Environmental Applications of Geography course – case study using GIS & Remote Sensing principles to investigate watershed assessment, droughts, sustainable development & alternative energy</p> <p>New GIT (Geospatial Information Technology) program</p> <p>Integrate GIT component in Intro to GIS & Intro to Remote Sensing and Mapping Software</p> <p>PBL & Remote Sensing applications in: TES 101: Intro to Action Research TES 150: Research II TES 200: Research III TES 250: Capstone Research/Internship IV</p> <p>Intermediate level geospatial technology applications course</p>	
Faculty Development			
<ul style="list-style-type: none"> PBL Benefits 	<p>FBCC</p> <p>LPTC</p> <p>OLC</p> <p>UTTC</p>	<p>Additional methodology to incorporate & improve student learning</p> <p>INFO 1600: Intro to Programming - augmented with PBL concepts</p> <p>INFO 1650: Computer Organization - amended to include more PBL topics/concepts</p> <p>Applied PBL to everyday issues for student final project – e.g., fires on reservation</p> <p>Increased use in science classes</p> <p>Provided for more cooperative learning & case study experiences similar to what graduates will encounter in the</p>	

		workplace	
<ul style="list-style-type: none"> GIS Skills Acquired 	FBCC LPTC OLC	Intro to ArcView 9.0 ArcGIS techniques & applications Download & process satellite data for use in ArcGIS map Remote Sensing & refreshing GIS skills Data Georeferencing	
<ul style="list-style-type: none"> New Data Acquisition Skills 	FBCC FdLTCC LPTC OLC TMCC UTTC	Intro to MODIS data and NASA Data Gateway NOAA precipitation monthly data for trends NOAA severe storms data for trends MODIS from Data Gateway, convert MODIS files using MODIS Reprojection Tool (MRT) Acquired & processed MODIS data Used EOS Gateway, Glovis, Google Earth, LpDAAC & Terra Server to locate & download data & maps Utilized state websites to locate & download shape files for county boundaries, road, rivers... Geological Survey Data EOS Gateway & Earth Science Website AEROCam images Ability to access ESS data from various sources & to manipulate it & produce complex relationship displays	
<ul style="list-style-type: none"> Weather Instruments Used 	BCC FBCC	Monitored monthly precipitation in wetland & used students to gather data & create charts for comparison from year to year Recorded precipitation & wind data	

	OLC	Rain gauge used for hydrology class & thermometers used to measure outside temp for bird studies	
	SGU	Students used sling psychrometer & barometer for data gathering in Integrated Science Classes. Infrared thermal gun used in soils lab	
	TMCC	Used instruments for radon parameter study, data to be used for GIS mapping	
<ul style="list-style-type: none"> ▪ Weather Instruments Use Planned 	LPTC	Planned for Fall 2007	
	UTTC	Weather station to be used in Introductory Meteorology course	

Table 2: Outreach Conducted

TCUs	Types of Activity	Activity Topics	Audiences	No. of Participants
BCC	Presentation	Cultural site map	Undergrad students in Cultural Geography class	10
	Presentation	Using cultural site map information in curriculum & compliance with Montana's Indian Education for All Act	4-6 grade teachers in local school district	
	Workshop	BCC student demo on use of GPS to map cultural sites on the Marias River at the Annual Bear River Massacre Commemoration	Members of the Blackfeet Confederacy, Heart Butte Public School, & Blackfeet Immersion schools	
FdLTCC	GIS Day on Campus	Geocaching activity	Students in GIS Club, students, faculty & staff	50
FBCC	Workshop	Instruction on ArcGIS 9.0, ArcMap, GEO Explorers, databases	FBCC staff, faculty, students Federal & Tribal authorities	14
	Workshop	Overview of hardware, operating systems, & applications for	6-12 teachers on Ft Berthold reservation	15

		GIS/GPS/RS into curricula. NASA educators resources		
LPTC	Workshop	Intro to Geospatial Technologies	Tribal Leaders & faculty from neighboring TCU	7
OLC	AIHEC Workshop	GIS/GPS	TCU faculty, students, other reservation community members	9
	GIS Class at SGU	Google Earth, GPS, ArcView, 3D extension	Undergrad/grad students	10
	Pine Ridge Chamber & Lakota Express Workshop	Online GIS & showed how spatial technology can help tribal economy	Undergrad/grad students	10
SGU	Faculty Tutorial	PBL Strategies	SGU faculty	1
	PBL Module	PBL Concepts	Grad student	8
	Curriculum Workshop	ENVR Science Curriculum Material	Pre-service & In-service K-12 Teachers	15
UTTC	PowerPoint presentation	“Geospatial Technology: What is it and How can it help me?”	UTTC faculty & staff, & advisory board	8
	“Nakotas on the Prairie” Science Camp Exercise	GPS treasure hunt & navigating waypoints & mapping fire hydrant locations	4 th - 8 th students	25
	Presentation, demo, & hands on exercise at Summer Teacher Institute	Field sampling techniques for water & soils using GPS, aerial photo imagaery, digital thermometer, etc.	Pre-service & in-service K-12 teachers	18
Planned				
TMCC	Workshop Training	Basic GIS Skills	High School Teachers	

Table 3: Project Feedback

<ul style="list-style-type: none"> Networking with TRESTE Colleagues 		<p>Shared GEO 125 between FBCC & UTTC</p> <p>Increasing & promoting teaching across curium</p> <p>Promoting & generating higher degree of interest in STEM courses, especially in ENVR & Computer Science</p> <p>Worked with project group to create teaching box for GIS/GPS tutorials</p> <p>Shared teaching box materials, case studies, & PBL exercises.</p>
<ul style="list-style-type: none"> Roadblocks 		<p>Insufficient time</p> <p>Time needed to obtain training in geospatial technology for integration in courses</p>
<ul style="list-style-type: none"> Recommendations 		<p>More assistance with access of local relevant data</p> <p>Offering 2-3 courses on GPS unit use</p> <p>Hands on workshop on GPS/GIS system – how to input points in GPS units to create maps</p> <p>Face-to-face meeting twice a year</p> <p>Offer consulting services to help other TCU faculty develop teaching materials</p> <p>Schedule meetings involving TCUs at AIHEC & NativeView</p> <p>More training in using Website tools</p> <p>More college administrators involved</p> <p>Enhance resources provided – e.g., Davis or comparable</p>

		integrated electronic weather station with software
<ul style="list-style-type: none"> Benefit of TRESTE to College & Faculty 		<p>Exposure to NASA resources & networking with NASA personnel & other TCUs</p> <p>Other project TCU faculty with background in ESS and/or GPS/GIS as resources</p> <p>Increased interest in development & implementation of GIS/GIT curriculum & program of study</p> <p>Personal Development Improved Curricula</p> <p>How GIS, satellite imagery relate to physical science & possibilities of incorporating remote sensing into instruction</p> <p>Cross communication with like-minded instructors, access & training on resources</p>

2.0 Project Presentations

- NativeView 2006 Tribal College Forum V - **Maury Estes**; 7-8 September 2006, Bismarck, ND. Served on "Building on Geospatial Collaborations: Example of Tribal College Initiatives" panel and presented poster.
- Joint NASA/NSF Research and Education Opportunities Conference for Higher Education Principal Investigators, Faculty, and Partners, Chantilly, VA, February 22-24, 2007.
Session on Research and Education Outreach
 NASA's Roundtables:
 Hashima Hasan, Science Mission Directorate
Donald Perkey, Tribal Earth Science & Technology Education Program (TRESTE)
 Erin Peters, Exploration Systems Mission Directorate
 Tony Springer, Aeronautics Research Mission Directorate
 Deana Nunley and Flint Wild, Podcasting in Higher Education: Tips, Trends, and Demonstrations
 Mabel Jones Matthews, Kofi Bota and Ben Oni, Database Demonstrations: NASA Competency Mapping Project and Science and Technology Information System
 Walter Hill and Other Directors of NASA University Research Centers
 Maria Thompson, Associate Vice President, Research Administration, Tennessee State University
 An 8.5x14 trifold TRESTE brochure distributed at this meeting is available at:
http://space.hsv.usra.edu/TRESTE/reports_and_presentations.html
- 2nd Annual Workshop, Blackfeet Community College, Browning, MT. June 7-9 2007

3.0 Project-Provided Resources

Web Resources – List is representative and not inclusive

- **Earth System Science Web Resources**
http://space.hsv.usra.edu/TRESTE/web_resources_ess.html
 - Earth Observatory
The purpose of NASA's Earth Observatory is to provide a freely-accessible publication on the internet where the public can obtain new satellite imagery and scientific information about our home planet. The focus is on Earth's climate and environmental change. <http://earthobservatory.nasa.gov/>
 - Earth scientists around the world use NASA satellite imagery to better understand the causes and effects of natural hazards. The goal in sharing these images is to help people visualize where and when natural hazards occur, and to help mitigate their effects. All images in this section are freely available to the public for re-use or re-publication (please use credits as indicated for each image).
<http://earthobservatory.nasa.gov/NaturalHazards/>

- **Problem-Based Learning Web Resources -**
http://space.hsv.usra.edu/TRESTE/web_resources_pbl.html
 - National Center for Case Study Teaching in Science
PBL frequently included as one form of case studies which are stories with an educational message. This web page describes materials provided by the National Center for Case Study Teaching in Science located at the University of Buffalo.
 - Illinois Mathematics and Science Academy Problem-Based Learning site
 - High School Teachers' PBL Earth System Science Course site
Materials for a Problem-Based Learning based Earth System Science course for High School teachers.

- **NASA LandSat Web Resources**

http://space.hsv.usra.edu/TRESTE/web_resources_landstat.html

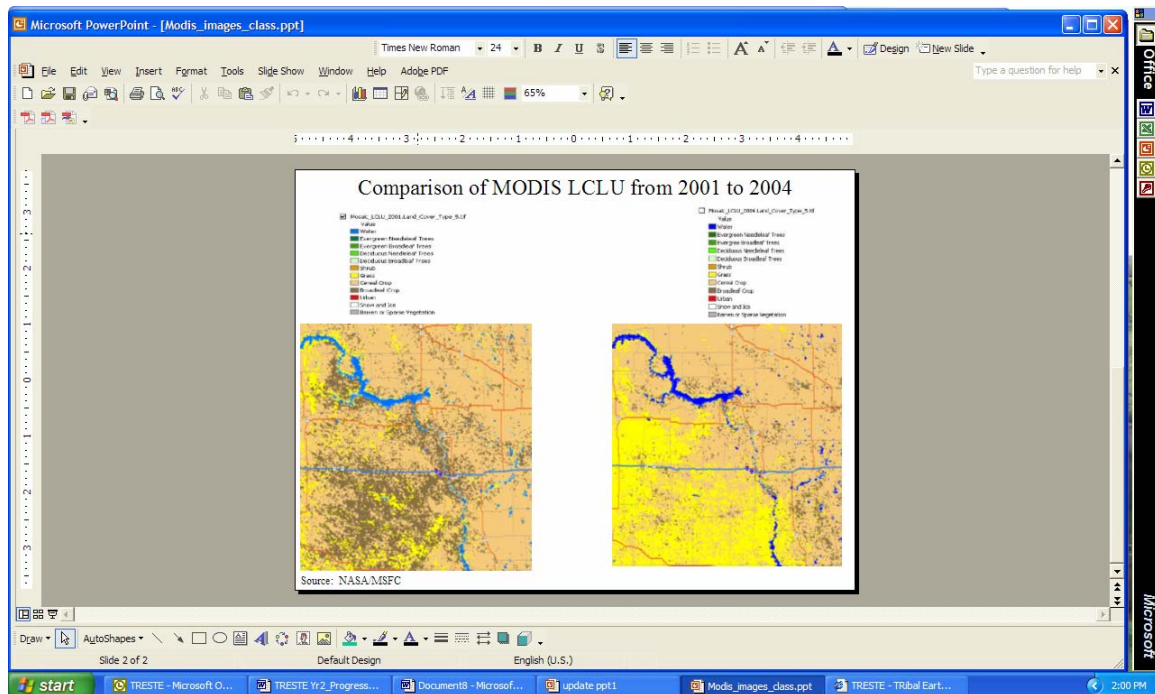
The screenshot shows a web browser window with the following details:

- Browser Title:** TRESTE - Tribal Earth Science & Technology Education Program - Microsoft Internet Explorer
- Address Bar:** http://space.hsv.usra.edu/TRESTE/web_resources_landstat.html
- Page Content:**
 - Navigation Menu (Left):** Leadership Team, Partner Schools, Collaborating Organizations, Goal and Objectives, Teaching Resources, Web Resources, Needs Workshop, '06 Annual Workshop, Reports and Presentations, Home.
 - Main Content:**
 - Section:** NASA Landsat Web Resources
 - Text:** Below are two web that provide Landsat materials.
 - Links:**
 - <http://landsat.gsfc.nasa.gov/>
 - <http://landsat.gsfc.nasa.gov/education/>
 - Image:** A small photograph showing several people sitting at computer workstations in a classroom or lab setting.

- **Teaching Resources** - http://space.hsv.usra.edu/TRESTE/teaching_resources.html
 - '06 Annual Workshop Case Study - [Energy Budget and Landscape Changes Resulting from Drought](#)
 - Tutorials provided by Sylvio Mannel (Ogala Lakota College) - [Introduction to GPS units, GIS and the internet, Google Earth and ArcGIS](#)

Other Resources Provided

- NCAR COMET module about Microwave Remote Sensing. These modules are not designed for students but for NOAA weather forecasters. However, you might find it interesting. You might think about using the intro part. It does provide some insight into how different wavelengths "see" different things.
- "Start With a Story: The Case Study Method of Teaching College Science. This book about case study teaching of college science contains strategies, tips, examples, ideas, and resources for using case studies. The collection examines every aspect of the case study method: the case for cases; what makes a good case and how to write different types; using case studies for team learning and in large classes; and assessing and evaluating the case study process.
- "How to set up a GIS program at a tribal college", Mannel and Winkelman, 2005, <http://gis.esri.com/library/userconf/proc05/papers/pap1616.pdf>
- The "Earth Observatory" article below shows a perfect example of the effect of soil moisture on surface temperature, i.e., the effects of the Bowen ratio on the sun's radiation that we discussed in our annual meeting case study. http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=17486
- AEROCam system data acquisition project – collaboration with Doug Olsen, Project Manager, Center for People and the Environment, University of North Dakota, ND.
- Soil moisture vs. temperature maps created using MODIS data and ArcGIS



Examples of Communicated Notices

- Adding native place names to the National Map and GNIS - <http://gis.cdatribe-nsn.gov/NativeNames/>

- Free data sources

<http://datagateway.nrcs.usda.gov> – great first stop (provides DOQs, landcover type and many other data categories)

<http://www.geodata.gov> - federal, state and local geographic data

<http://seamless.usgs.gov> – many data formats

<http://ned.usgs.gov> – national elevation data set

<http://soildatamart.nrcs.usda.gov> - soil survey

<http://www.sdgs.usd.edu/register/index.html> - State Geological Surveys like South Dakota Geological Survey (SDGS) provide layers of DOQs, topo maps, and Digital Line Graphs, such as roads and water.

- iGETT Institute - a one- to two-week institute where participants learn remote sensing technology and integration with GIS and create a Learning Unit that can be shared by other colleges