

**NASA/Minority University Research and Education Program (MUREP)  
Tribal Colleges & Universities Project (TCUP)  
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NASA Goddard Space Flight Center**

**FY2013 Annual Report**

**PROJECT DESCRIPTION**

NASA's **Tribal Colleges and Universities Project (TCUP)** is an activity element within the Minority University Research and Education Project (MUREP). MUREP enhances the research, academic, and technology capabilities of Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), and other Minority Serving Institutions (MSIs). Multiyear grants awarded to MSIs assist faculty and students in research pertinent to NASA missions.

TCUP is a science, technology, engineering and mathematics (STEM) educational grant and mentoring program that specifically targets TCUs as well as supporting American Indian and Alaska Native (AI/AN) students. The overall goal of the project is to expand opportunities for the nation's STEM workforce through capacity building, infrastructure development, research and engineering experience, outreach, and information exchange.

NASA's goals for TCUs are to enhance their technical expertise; increase the participation of underrepresented and underserved students in science, technology, engineering and mathematics (STEM) disciplines; and to provide opportunities to participate in NASA-related education and research projects. The NASA TCUP is guided by Executive Order 13592: "Improving American Indian and Alaska Native Educational Opportunities and Strengthening Tribal Colleges and Universities." NASA is highly committed to ensuring the broadest participation of TCUs in the Agency's research and education programs as well as its overall mission.

This past year represents the final year of a 3-year NASA announcement of opportunity released in the summer of 2010 by the NASA Office of Education, MUREP. While the TCUP effort is comprised predominately of three cooperative agreements totaling approximately \$1.1M annually, the overall NASA investment in TCUs for FY2013 was \$2.7M<sup>1</sup>. The TCUP activities contribute over 40% of the agency's support to TCUs.

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<sup>1</sup> FY2013 data is reflected as final, while the FY2014 data is still being added and is therefore preliminary at this time.

TCUP consists of three primary elements:

- 1) NASA TCUP “externship” opportunities or Research Experiences for Undergraduates (REUs), which provide NASA expertise and training in research, engineering, and education opportunities to Tribal College and University faculty and students out in Indian country – bringing NASA to the TCUs;
- 2) NASA TCUP Center Summer Research Experience (SRE) internships which provide NASA Center expertise, experiences, and mentoring; and
- (3) A tribal college engineering internship program to participate in a NASA flight mission and enhance TCU engineering training.

### **PROJECT GOALS**

The goals of TCUP are to utilize NASA’s unique contributions in collaboration with tribal colleges and universities and tribal-serving institutions to improve the overall quality of the Nation’s STEM education.

To achieve these goals, TCUP seeks to:

1. Focus the Agency’s attention on identifying and removing barriers to TCU participation in NASA programs that support STEM education and achievement toward future workforce potential by providing NASA Research Experiences for TCU faculty and undergraduates out in Indian Country at tribal colleges or at NASA Centers.
2. Expand outreach activities to attract and retain students in STEM and to increase the interactions between TCUs and NASA, with particular attention paid to activities designed to increase TCU familiarity with the Agency. Strengthen collaboration between NASA and tribal colleges to improve high quality NASA education and research opportunities at the 36 Tribal Colleges.
3. Enhance TCU STEM infrastructure and help engage TCU students in NASA’s missions, such as through development of local climate change research programs with faculty and students at TCUs or engineering flight mission internships which actively involve students in the engineering and implementation of NASA flight missions.

TCUP achieves these goals through the following efforts:

**Faculty and Research Support:** TCUP provides NASA competency-building education and research opportunities for faculty through the Summer Research Experience Internship/Externship Programs as well as the AIAN CCWG program. Faculty received training in science, engineering, GIS and remote sensing at NASA Centers as well as during training sessions out in tribal colleges and universities that prepared them to conduct earth surface

dynamics research activities locally. Through these facets of TCUP, faculty members had the opportunity to not only engage with NASA personnel, but also shared ideas and present research in a collegial environment.

**Student Support & Student Involvement Higher Education:** TCUP provides NASA competency-building education and research opportunities to individuals to develop qualified undergraduate students who are prepared for employment in STEM disciplines at NASA, industry, & higher education. This support is provided through both the Academic Year Research Experience for Undergrads (REU) as well as the Summer REU. There were 52 TCU students that had the opportunity to engage in authentic NASA-related, mission-based R&D activities through the 2013 Summer Research Internship/Externship Programs in which students carry out NASA-related scientific projects in cooperation with NASA/science or engineering mentors at a Tribal College or NASA center.

**Targeted Institution Research and Academic Infrastructure:** in FY2013 the funded TCUP activities continued to support scientific research and academic support at partner institutions.

**Course Development:** N/A

### **PROJECT ACCOMPLISHMENTS**

TCUP seeks to contribute to the Agency's efforts in broadening participation of underrepresented groups in STEM. This accomplished through attracting and retention of tribal college students. TCUP programs provide mentoring support, academic development and enhancements, social and professional networks and have helped students to complete undergraduate degrees.

These accomplishments are reflected in the following highlights:

1. NASA TCUP provided support for two workshops of the American Indian Alaska Native Climate Change Working Group. The meetings afford TCU students and faculty the opportunity to participate in professional meetings and present posters of their research. The fall 2012 meeting was held in Anchorage, AK with over **88 participants**. Among the participants were 14 TCU students and 5 faculty (low participation due to the location and associated travel costs). Great discussions centered on climate change and comparing/contrasting Western and Native science. The spring 2013 meeting was held at the National Weather Service Training Center in Norman, OK and was hosted by the University of Oklahoma. More than **96 persons** participated, of which 10 students and 6 faculty were from TCUs.
2. The 2013 NASA REU summer externship program involved **21 students** from **10 TCUs**: Blackfeet Community College, College of Menominee Nation, Dine College, Haskell Indian Nations University, Navajo Technical College, Salish Kootenai College, Sinte Gleska University, Southwestern Indian Polytechnic Institute (SIPI), Tohono O'dham Community College, and White Earth Tribal and Community College

Sample student projects from the NASA REU included:

**Blackfoot Community College**, “Using Remote Sensing to Identify Quaking Aspen on the Rocky Mountain Front.”

**College of Menominee Nation**, “The Deforestation of the Toledo District in Southern Belize (The Mayan Homelands.”

**Dine College**, “Navajo Nations First Aquaponics Dome.”

**Haskell Indian Nations University**, “Characteristics of the Colorado River: Riparian Bank Stability.”

**Navajo Technical College**, “Where the Sun Shines and the Wind Blows: Renewable Energy for the Navajo Nation in New Mexico.”

**Salish Kootenai College**, “The Effects of Sea Level Rise and Urbanization(SLRU) on Culturally Significant Resources Located Along the Oregon West Coast and Upper Columbia River”,

**Sinte Gleska University**, “Effects of Greenness (Productive) Trends on a Bison Range Unit.”

**Southwestern Indian Polytechnic Institute (SIPI)**, “Biophysical Classification of Water Availability in the Rio Grande, North of Albuquerque, NM.”

**Tohono O'dham Community College**, “Flash Flood Hazards in Sells, Arizona.”

**White Earth Tribal and Community College**, “Development of a Wild Rice Permit System for the White Earth Nation.”

3. NASA Field Centers worked with students on a variety of projects under the 2013 TCUP NASA-AIHEC SRE Center internship program. This provided all 19 participants valuable exposure to the realities of working with NASA and other scientists and engineers at tribal college training sessions.

Sample summer internship activities at a NASA Field Center included:

- Johnson Space Center, 3 students, Salish Kootenai College, “Unity Game Engine” and “Space Systems Modeling and Simulation.” and “Wireless Sensor Network Technology Development.”
- Marshall Space Flight Center, 2 students, Fond du Lac Tribal and Community College, “Environmental Modeling and Research Experience (EMARE) program.”
- Kennedy Space Center, 4 students, Institute of American Indian Arts, “Modeling and Simulation: Exploring educational applications of NASA 3D simulation system.”
- Ames Research Center, 9 students, Northwest Indian College, Turtle Mountain Community College, Navajo Technical College, Haskell Indian Nations University, Southwestern Indian Polytechnic Institute, Chief Dull Knife College, “Native American Research Project pilot project focusing on engineering-based problem solving” and “Rotorcraft Aeromechanics Research XXIII.” and “Drilling and Retrieving Sediment from Mars.” And “Quantitative Analysis of Beta-Lactam Antibiotics by Iodometric Assay.”
- Goddard Space Flight Center (GSFC), 3 students, Salish Kootenai College, Northwest Indian College, Navajo Technical College, “Hydrological Modeling for Climate Adaptation Internship.” and “Inventory Portal and Wiki Templates.”

- 4. NASA inducted 3 tribal college students into the 2013 NASA Student Ambassadors Virtual Community. Their selection is part of the agency's effort to engage undergraduate and graduate students in science, engineering, mathematics and technology, or STEM, research and interactive opportunities. Students were nominated by NASA mentors and managers primarily as a result of their summer research experiences as part of the NASA TCUP. This fourth group of student ambassadors, known as Cohort V, included interns from 3 different TCUs, representing Arizona, New Mexico and South Dakota. Members of this virtual community will interact with NASA personnel, share information, make vital professional connections, collaborate with peers, represent NASA in a variety of venues in addition to helping inspire and engage future interns.

5. Nine undergraduate tribal college students worked as student research interns on BisonSat, all from Salish Kootenai College, building and testing the flight unit in preparation for delivery to the launch provider in June 2014. Four SKC faculty members mentored these students and led this research. In addition, a NASA EONS proposal that includes a student-designed reduced gravity experiment was submitted. Four students gave oral presentations and/or presented posters at the 2013 NASA Montana Space Grant Student Research Symposium: Robert Davis (“BisonSat Overview”), Judy Hudgins (“Mars Science Lab's Curiosity Rover: A Day in the Life of Flight Operations as MAHLI, MARDI, Mastcam Payload Downlink Lead”), Noel Stewart (“Uplink Commanding of the NASA Mars Science Laboratory Curiosity Rover's Mastcam, MAHLI, and MARDI Cameras”), and Ryan Young (“Search Coil Magnetometer for Aurora Detection”, a project funded by the NASA Montana Space Grant Consortium that Ryan completed in addition to his BisonSat work).

### **OTHER TCU-RELATED ACTIVITIES**

- *November 1-3, 2012, Anchorage, AK.* NASA supported the 34<sup>th</sup> Annual American Indian Science and Engineering Society (AISES) National Conference. NASA supported the conference by sending a team to provide recruitment support at the Career Fair.
- *April 25-27, 2013, Milwaukee, WI.* Kennedy Space Center (KSC), in conjunction with the College of Menominee Nation, built upon partnering activities grown out of the WSGC Student Satellite Program and the Tribal College Rocketry Consortium. A total of 56 students (nine teams), representing seven tribes were recruited for this event (in its third year). The AISES teams were from the University of Minnesota-Twin Cities, Northwest Indian College (WA), University of California-Los Angeles (UCLA), and the University of Wisconsin-Stout. Tribal teams were from the College of Menominee Nation (WI), Leech Lake Tribal College (MN), Northwest Indian College (WA), Haskell Indian Nations University (KS), and Fond du Lac Tribal and Community College (MN), were recruited to participate in a *First Nations Rocket Competition*. The purpose of the competition is to provide science and engineering students of every experience level with the skills needed to successfully build and launch a model rocket with “inflight auto-stability”. The overall winning Tribal team was Rocky Rocket from Northwest Indian College in WA, who also sponsored the winning, AISES team, A-Rocket.

**PROJECT CONTRIBUTIONS TO ANNUAL PERFORMANCE GOAL (APG) MEASURES**

**APG 5.1.2.1: ED-12-1: Achieve 40% participation of underserved and underrepresented (in race and/or ethnicity) students in NASA higher education projects.**

TCUP targets recruitment and retention of underrepresented and underserved students, including women and girls, and persons with disabilities into the STEM fields. Based on the nature of the TCUP activity and its focus on students and faculty attending tribal colleges and university, NASA TCUP exceeded the 40% goal with 100% participation of underserved and underrepresented students in FY2013.

With respect to Ethnicity and Race, all participants in the NASA TCUP self-identified as *Not Hispanic or Latino* (100%) and *American Indian, Alaskan Native, or Native Hawaiian/Pacific Islander* (100%).

**APG 5.1.2.1: ED-12-2: Achieve 45% participation of women in NASA higher education projects.**

FY2013<sup>2</sup>: Female – 37%      Male – 63%

While TCUP did not meet this goal, there was a 12% increase over the female participation in FY2012

**APG 6.1.1.1: ED-12-3, APG 6.1.1.1: ED-12-5 and APG 6.1.2.2: ED-12-6**

The following APGs focus on elementary and secondary education.  
N/A in FY2013

**IMPROVEMENTS MADE DURING THE PAST YEAR**

- N/A

**PROJECT PARTNERS**

The following partners were instrumental in project execution: The American Indian/Alaska Native Climate Change Working Group (AI/AN CCWG), American Indian Higher Education Consortium (AIHEC), American Indian Science and Engineering Society (AISES), Kiksapa Consulting LLC, National Center for Atmospheric Research (NCAR), Salish Kootenai College, the University Corporation for Atmospheric Research (UCAR), and the United States Geological Survey (USGS).

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<sup>2</sup> Only represents reported data by participant