



An Educational Partnership Program with Minority Serving Institutions: A Framework for Producing Minority Scientists in NOAA-Related Disciplines

Larry Robinson, Jacqueline Rousseau, Delicia Mapp, Vernon Morris & Meka Laster

To cite this article: Larry Robinson, Jacqueline Rousseau, Delicia Mapp, Vernon Morris & Meka Laster (2007) An Educational Partnership Program with Minority Serving Institutions: A Framework for Producing Minority Scientists in NOAA-Related Disciplines, *Journal of Geoscience Education*, 55:6, 486-492, DOI: [10.5408/1089-9995-55.6.486](https://doi.org/10.5408/1089-9995-55.6.486)

To link to this article: <https://doi.org/10.5408/1089-9995-55.6.486>



Published online: 31 Jan 2018.



Submit your article to this journal [↗](#)



Article views: 16



View related articles [↗](#)



Citing articles: 5 View citing articles [↗](#)

An Educational Partnership Program with Minority Serving Institutions: A Framework for Producing Minority Scientists in NOAA-Related Disciplines

Larry Robinson	NOAA Environmental Cooperative Science Center, Environmental Sciences Institute, Florida A&M University, Tallahassee, FL 32307, Larry.Robinson@fam.u.edu
Jacqueline Rousseau	Office of Education, Educational Partnership Program, National Oceanic and Atmospheric Administration, Silver Spring, MD 20910, Jacqueline.J.Rousseau@noaa.gov
Delicia Mapp	Office of Education, Educational Partnership Program, National Oceanic and Atmospheric Administration, Silver Spring, MD 20910, Delicia.C.Mapp@noaa.gov
Vernon Morris	NOAA Center for Atmospheric Sciences, Howard University, Washington, DC 20059, vmorris@howard.edu
Meka Laster	Office of Education, Educational Partnership Program, National Oceanic and Atmospheric Administration, Silver Spring, MD 20910, Meka.Laster@noaa.gov

ABSTRACT

An effective partnership with Minority Serving Institutions (MSI) has been established with the U.S. Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA). Building on a commitment to increase research collaboration with MSIs, a collaborative program developed by NOAA and its MSI partners has led to a significant increase in the education and graduation of students from underrepresented communities in science, technology, engineering and mathematics (STEM) that support NOAA's mission. NOAA's Educational Partnership Program (EPP) with Minority Serving Institutions (MSI) was established in 2001 with a primary goal to increase individuals trained in STEM fields from which NOAA may select its future workforce. The program uses the National Science Foundation (NSF) data and internally developed performance metrics to illustrate a measurable impact on national statistics. To date, over 900 undergraduate and graduate students have benefited directly from educational and research experiences through the EPP and over 340 secondary (middle school and high school) students have participated in EPP activities designed to encourage students to pursue degrees in STEM fields. The EPP framework demonstrates that an effective partnership, with best practices, and concrete examples of success is available as a template for institutions and agencies working to replicate these successes.

2.5% of science and engineering doctorates awarded during the period 1987-1991. This value increased to only 2.8% between 1992 and 1996. (National Science Foundation, 1999).

A similar trend is found among doctoral scientists and engineers employed in colleges and universities between 1985 and 1995 (NSF/SRS, 1995). These statistics, coupled with a strong desire to make significant improvement in these data, a commitment to diversify the workforce and the need to prepare a succession plan to address the aging workforce led to the next step. The U.S. Department of Commerce, National Oceanic and Atmospheric Administration and a consortium of 10 historically black colleges and universities (HBCUs) collaborated to establish the foundation and framework for NOAA's Educational Partnership Program with Minority Serving Institutions (EPP/MSI) described below. For the purpose of this program, NOAA uses the U.S. Department of Education's definition of MSI.

The overarching goal of the EPP is to increase the number of students from underrepresented communities who take coursework and graduate with degrees in STEM fields that directly support NOAA's mission. At The U.S. Department of Commerce, NOAA is committed to ensuring that its workforce is diverse and that the next generation of scientists is given the opportunity to contribute to the services provided by NOAA. As part of its succession planning efforts, NOAA supports EPP's programs to build capacity at MSI's that have programs with track records of training and graduating students in STEM sciences, to ensure that there is a cadre of well trained scientists from which the agency may select its scientists and leaders to meet its workforce needs.

INTRODUCTION

During the past ten years, issues associated with the number of underrepresented minorities in science, technology, engineering and mathematics (STEM) have been at the center of numerous discussions, studies and programs. These efforts have been conducted in good faith and in some cases have led to positive outcomes (American Council on Education, 2006). However, the baseline in the late 1990s offered considerable opportunity for improvement. For example, some growth in the number of racial/ethnic minorities with science and engineering doctorates occurred between 1987 and 1996, but with the exception of Asians, this growth was marginal at best. African Americans held

BACKGROUND

In 1997, the leaders of eight HBCUs received invitations from former DOC Undersecretary for Oceans and Atmosphere, Dr. D. James Baker, to meet at NOAA's headquarters in Washington, DC to discuss the development of an educational partnership program "designed to promote and increase the number of professionals in oceanic, atmospheric and environmental sciences among minorities and under-represented communities." The Undersecretary's letter acknowledged that NOAA scientists and staff along with

representatives from these HBCUs and others have already initiated collaborative efforts that would be discussed in more detail at a meeting held at the U.S. Department of Commerce on December 17, 1997.

The December meeting hosted by Department of Commerce Deputy Secretary Robert L. Mallet and Dr. Baker was attended by representatives from nine HBCUs and resulted in the formation of NOAA's HBCU Consortium. This relationship was formalized in 1998 with the signing of a Joint Project Agreement (JPA) between DOC, NOAA and the HBCU Consortium. The JPA reiterated the parties' "mutual interest in enhancing education and training opportunities in South Africa", but also stated that the parties "have a mutual interest in increasing the capacity of HBCU Consortium members to educate and train U.S. students in the oceanic, atmospheric and environmental sciences, ... to help assure that qualified persons from the full spectrum of U.S. academic institutions are available to meet the future needs of U.S. industry, academia and government." After a series of discussions, the Consortium and DOC/NOAA agreed to primarily focus their attention on building education and research capacity among member institutions in the United States and to add remote sensing technology to the previously established science areas.

It should be noted that although this paper focuses on the accomplishments of the Educational Partnership Program with Minority Serving Institutions, several longstanding activities by NOAA staff strongly committed to diversifying NOAA's workforce contributed to bringing to the forefront the need to develop and support programs of this nature. Most notable among these collaborative efforts were the "Expanding Opportunities Conferences" (EOC) initiated in 1995 and held in 1999, 2001 and 2003. These conferences sponsored by NOAA and organized jointly with MSIs and others concerned with diversity in NOAA related sciences, defined issues and proposed strategies for their resolution. In fact, the need for a new approach to address the under representation of minorities in NOAA related sciences is reflected in the following statement from the 1999 conference proceedings: "As minority under representation in these fields is a complex and pervasive issue, a simplistic approach to increasing the numbers of minorities in the occupational and educational sectors will not work." (EOC, 1999). Later in 1999, NOAA's Science Advisory Board (SAB) established September 25, 1997, voted unanimously to recommend that diversity should be included among eight themes that "should be woven into all NOAA science program efforts." (NOAA, 1999).

COMPONENTS OF THE EDUCATIONAL PARTNERSHIP PROGRAM

NOAA's EPP/MSI is comprised of four program components. Each of these program components is administered through competitive processes. The program components are: the Undergraduate Scholarship Program (USP); the Graduate Sciences Program (GSP); the Environmental Entrepreneurship Program (EEP); and the Cooperative Science Centers (CSCs). This paper will provide a description of the components discuss best practices, highlight the significant activities and accomplishments of the Cooperative Science Centers (CSC's), and provide other outcomes realized during the past five years.

- The Undergraduate Scholarship Program is designed to increase the number of students who undertake course work and graduate with degrees in specific scientific areas or fields integral to NOAA's mission. Approximately 15 rising juniors, who have matriculated in the natural and/or physical science fields are selected annually. In their first year, students participate in a 10-week orientation program at NOAA headquarters where they rotate through NOAA Line and Program Offices to learn about programmatic and research objectives as well as potential career opportunities within NOAA. In the second year, students complete a 10-week field internship during which they are involved in research and technical operations at designated NOAA line offices.
- The Graduate Sciences Program is designed specifically to recruit, hire and provide graduate level training to qualified women and minority candidates in NOAA-related sciences. Individuals are trained in a pre-determined course of study to meet the specificity of NOAA's scientific occupations. Mentorships are established between students and NOAA scientists to ensure the student's research is a collaborative effort and is relevant to NOAA's mission.
- The Environmental Entrepreneurship Program's objective is to increase the number of students proficient in environmental business enterprises. The program facilitates linkages between MSIs, NOAA and the private sector. NOAA's Environmental Entrepreneurship Program supports student training and experiential learning opportunities for the purpose of stimulating job-creation, business development and revitalizing and sustaining local communities.
- The Cooperative Science Centers' (CSC) objectives are to educate and graduate students in NOAA-related sciences, to conduct research in support of NOAA's mission, and to build capacity within the collaborating institutions. Four Cooperative Science Centers (CSCs) were established in 2001 through a national competition. These centers are partnered with four of NOAA's Line Offices. The Centers are: City College of the City University of New York, partnered with the National Environmental Satellite, Data, and Information Service; Florida A&M University, partnered with the National Ocean Service; Howard University, partnered with the National Weather Service; and, the University of Maryland Eastern Shore, partnered with the National Marine Fisheries Service. While these Science Centers are designated at four principal institutions, there are 17 MSI partners among the four Centers.

BEST PRACTICES

During the planning stage and in the five years since its establishment, NOAA's Educational Partnership Program with Minority Serving Institutions has been able to identify "Best Practices," which have led to meeting key milestones towards the program's overall goal. The goal is to increase the number of graduates from underrepresented groups properly educated in areas that support NOAA's mission. The following is a collection of brief descriptions of these best practices that illustrates how NOAA and its academic partners have supported the program's objectives:

Collaborative Planning and Program Design - The planning of this new program was unique in that it was conducted in a true spirit of collaboration between NOAA and the HBCU Consortium, which is novel among education partnerships between the Federal sector and the MSI community. In other words the approach to this initiative could not be characterized by the cliché: "we're the government and we come to fix your problem." The program design benefited from the involvement of top administrators from NOAA, DOC and the HBCU consortium and just as importantly, scientists and faculty (subject matter experts), NOAA line offices and HBCU academic programs who would have ultimate responsibility for recruitment and education of student participants. This involvement occurred early in program conception and remained throughout program implementation. Both the HBCU Consortium and NOAA acknowledged that in order to achieve desired goals, a well-planned program along with the necessary funding were crucial to the success of this new initiative. During the three years following the meeting in 1997, DOC/NOAA officials met regularly with Consortium members to identify strategic priorities, capabilities and gaps needing to be addressed. The EPP's program components presented above were derived from the HBCU Consortium and NOAA sessions, input from EOC participants and proceedings, NOAA's SAB, NOAA's MSI Council and others interested in developing this new program. Whereas identifying the issues and developing the elements of a program were indeed critical steps, prior to this initiative there had been no significant component in NOAA's core budget to provide sizeable and long-term financial support needed to implement a NOAA-wide program of this scale. Consortium members and DOC/NOAA officials worked collaboratively to seek approval for the new funds for this education program targeted at MSIs.

Securing Adequate Funding - For three years between FY 1997 and FY 2000, DOC/NOAA submitted requests for funding through the formal Federal agency budgeting process to support this new NOAA HBCU initiative while Consortium members (now 10 strong in 1998) embarked upon an extensive lobbying campaign. After three consecutive NOAA budget submissions, the request to establish the Educational Partnership Program with Minority Serving Institutions was eventually funded in FY 2000. NOAA published a request for proposals in the Federal Register in April 2001 announcing the availability of \$15M to support its new Educational Partnership Program. The designation of new funds as opposed to attempting to operate on "discretionary" program budgets within NOAA or competing with other existing budget priorities created realistic opportunities for program development and implementation. The support of DOC/NOAA senior management through the formal budgetary process sent a clear message that NOAA was committed to the success of this new investment of federal resources.

Sustained Investment - EPP recognizes that improving the representation of minorities in NOAA-related sciences benefits from sustained financial investment. Initially, NOAA made a three-year budget commitment to all funding recipients, eventually extending the funding by two years. As part of the NOAA commitment to sustained funding, EPP has become mainstreamed into the NOAA long-term education program planning

and budget process and, as such, the program now includes a five-year funding commitment to the CSCs. NOAA considers the initial funding for the Cooperative Science Centers as the seed monies similar to the core funding invested in other NOAA institutes and centers.

Partnerships led and impacts realized mostly by MSIs - EPP supports institutions with strong track records for recruitment and matriculation of minorities in the NOAA-related sciences. All principal institutions funded through EPP must be MSIs. While majority institutions are allowed to participate in cooperative science centers, the CSC lead must be an MSI. In addition, no more than 20% of awarded funds may be provided to a majority institution.

NOAA Leadership Commitment to Support EPP - As a demonstration of commitment to support the EPP, an MSI Council, comprised of NOAA Deputy Assistant Administrators was established to make recommendations on EPP programs and to guide the development and implementation of NOAA policy as it relates to expansion of activities within the MSI community. Academic partners routinely meet with NOAA leadership to provide updates on program activities, receive feedback and jointly determine future strategies.

Dedicated Program Administrative and Scientific Support - NOAA has committed 7 full-time employees to provide programmatic and administrative support to EPP and its participants. In addition to administrative support, each Cooperative Science Center has two scientific liaisons who are high level NOAA scientists and administrators whose responsibilities are to provide guidance and create or facilitate collaboration between NOAA scientists and academic partners. The MSIs also have dedicated staff assigned to implement the program. Each CSC has a Director and a Distinguished Scientist who are charged with managing the research of the Center and who serves as the principal points of contact with NOAA scientists.

Cooperative Agreements Verses Grants - All financial agreements disbursed under EPP are cooperative agreements and not grants. This funding mechanism requires collaboration on programs developed at MSIs that utilize the scientific and technical expertise at NOAA and build upon existing graduate and undergraduate program successes at MSIs. As a result, both partners have made a commitment to develop programs that are mutually beneficial in both the education and research arenas.

Collaboration with NOAA Scientists - All EPP education and research projects are collaborative activities between NOAA and its MSI partners. These partnerships may be direct faculty and scientist involvement in research of mutual interest including experiments using NOAA facilities or resources. Research must be transferable to operations and NOAA strongly encourages scientists to support training of students, at all levels, in their research projects. To the extent possible, NOAA scientists participate on Ph.D. candidates' committees providing scientific guidance as do other members. All students participating in EPP programs are assigned a mentor to guide them through course offerings and to encourage students to pursue

graduate education. In addition, EPP supports the exchange of faculty and staff between NOAA and MSIs to foster partnerships and enhance learning experiences by all participants.

Dedicated Direct Student Support - Both the Environmental Entrepreneurship Program and the Cooperative Science Centers have a non-negotiable program requirement that a minimum of 30% of its total funding is allocated to direct student support. Direct student support includes, but is not limited to, tuition, assistantships, travel, conference participation fees and research support.

Education and Outreach - EPP requires education and outreach to be integral components of all program activities. Education and outreach are also used for student recruitment into CSC education programs to expand the minority pipeline. The EPP recognizes the need to establish a pipeline to maintain the early successes of this program; therefore all four centers have an outreach and K-12 program that engages students in some aspect of NOAA science.

Performance Measures and Metrics - Performance measures were established at the initial program development stage and are used to determine program metrics in a manner that is consistent with a NOAA-wide emphasis on accountability. Examples of program performance measures include: students trained and graduated in sciences that directly support NOAA's mission; collaborative research activities undertaken and completed between MSI partners and NOAA; leveraged funds; and publication of peer reviewed papers.

Monitoring - NOAA has established a Student Tracker Database that identifies every student trained with EPP funds as well as students who have benefited directly from the establishment of the Cooperative Science Centers. The database is structured to monitor funds spent on each student and to track the progress, graduation dates and employment of students funded by EPP. EPP also requires semi-annual performance reports which are reviewed by EPP staff and technical monitors. Review comments are provided to recipients to enhance the program activities.

Advisory Committees - Oversight scientific and management committees and advisory boards have been established to provide program guidance and opportunities for collaboration. Committees and councils consist of representatives from NOAA, other federal agencies, academic partners and the private sector. At a minimum, meetings are held annually.

Program Evaluations - In an attempt to determine the successes and challenges of its programs, EPP conducts extensive evaluations of its program activities every three years. Review panels consisting of NOAA staff and external scientists from the academic community evaluate the full spectrum of program activities, including student recruitment and training, research, program administration and capacity building. Recommendations and findings resulting from the evaluations are provided to the academic institutions and NOAA scientific partners to guide program adjustments and revisions.

Alignment and Integration into Mainstream NOAA - As this program was conceived it was important that its success be based on its ability to support NOAA's strategic priorities. NOAA has worked to integrate activities of the Cooperative Science Centers into the major program goals of the agency, similar to the type of activities that are common to NOAA's majority academic partners. The EPP CSCs have become mainstream partners within their respective NOAA Line Offices and participate in planning and research activities with other NOAA funded institutes and centers.

Implementation of Selected Best Practices in the Cooperative Science Centers - During the past five years the NOAA established Cooperative Science Centers received approximately seventy percent of program EPP funding. Consequently, many of the program's successes are derived from the implementation of best practices among these four consortia totaling 21 universities. Although all of the best practices noted above have had positive impacts on the CSCs, the outcomes of a select group of best practices are expanded upon in the section that follows.

Collaboration with NOAA Scientists - The NOAA Center for Atmospheric Sciences at Howard University (NCAS) has developed data that are being provided to the National Weather Service (NWS) National Center for Environmental Prediction for verification of their regional ozone forecasts. NCAS has developed a center-wide network of observational facilities for studying weather and climate processes and providing practical student training. The Beltsville Atmospheric Measurements Program (BAMP) developed under NCAS includes a 104-acre measurement facility in Beltsville, MD where NCAS and NOAA scientists collaborate on a variety of field campaigns, instrument calibrations and evaluation and student training activities. NCAS scientists and students conduct ozone sonde measurements at the Beltsville site capturing several cases of moderate to severe ozone pollution. In addition, wind velocity, wind direction and virtual potential temperature up to 4 km are recorded by wind profilers located at Beltsville and these data are transmitted in real time to both the NOAA Forecast Systems Laboratory Cooperative Agency Profiler network and to NWS forecasters.

NCAS scientists also participate in extensive collaborations integrating the use of NOAA facilities and networks. One example is the research expeditions aboard the NOAA vessel Ronald H. Brown conducted in spring 2004 and summer 2006 in collaboration with NESDIS, NWS, and AOML scientists. These experiments provide: critical data for NWS surface and upper air analyses in regions of sparse observations, satellite and model validation and evaluation opportunities for weather forecasting, and a unique environment to train students. The focus of these cruises has been on characterization of long-range transport of aerosols and their impact on climate and weather systems, air quality, and physical oceanography over the tropical Atlantic.

Education and Outreach - The Center for Remote Sensing Technology (CREST) at the City College of the City University of New York was designated to provide education and training and to conduct research consistent with NOAA's environmental assessment,

Year	Academic Institution Conferring Doctorate	African Americans	Hispanic Americans
2001	Indiana University at Bloomington	0	1
	University of North Carolina at Chapel Hill	1	1
	University of Texas Hlth Sci Ctr at Houston	1	0
	Washington State University	0	1
	Total	2	3
2002	Unvierstiy of California, Berkley	0	1
	University of North Carolina at Chapel Hill	0	1
	Total	0	2
2003	Jackson State University	3	0
	University of California, Irvine	0	1
	University of Illinois at Urbana-Champaign	0	1
	University of Nevada, Las Vegas	1	0
	Total	4	2
2004	Drexel University	1	1
	Jackson State University	4	0
	Rutgers, the State University of NJ, New Brunswick	0	1
	University of California, Los Angeles	1	0
	Total	6	2

Table 1. National Science Foundation Survey of Earned Doctorates, African and Hispanic American, environmental sciences conferred doctorate statistics, 2004.

prediction and stewardship missions. With the establishment of CREST, the City College expanded its Environmental and Earth System Engineering/Science courses. The program is designed to address the particularly acute stresses in urban ecosystems that accommodate the increasing population. The urgency of environmental issues in urban environments is important for the City College of the City University of New York. The university which is geared to training scientists and engineers able to respond to the increase in demand for experts in this field and to understand and respond to the interactions and impacts of human activities on earth systems. The Environmental and Earth System Engineering program will be the first such program in the New York State public university system (State University of New York and City University of New York). Through EPP funds, CREST has developed a new BS/BE degree that is a combined engineering and science approach using remote sensing technology to study earth systems.

Advisory Committees - The Living Marine Resources Cooperative Science Center (LMRCSC) has established a Technical Advisory Board (TAB) to review and make funding recommendations for all research conducted at the Center. The TAB consists of NOAA and academic senior fisheries scientists. The TAB was established to support the research component of the LMRCSC and to review and provide recommendations on the Center's science plan and research. The on-going and future research projects at the Center are intended to meet the mission of NOAA Fisheries. In addition, the LMRCSC designed its program to allocate a fixed percentage of its budget to support research activities annually. The process allows for faculty to submit proposals, often in partnership with NOAA Fisheries scientists, to the TAB for technical review and funding consideration. This unique approach to research funding allows for the LMRCSC to set fixed timeframes to conduct and

complete research and to align and adjust its research activities to respond to emerging living marine resource challenges. The TAB and NOAA scientists' involvement also ensures that the LMRCSC has a strong linkage with NOAA's mission. A total of 24 projects are on-going at the Center, 12 of which were funded through the TAB review process in 2005.

Alignment and Integration into Mainstream NOAA - In 2005, the Environmental Cooperative Science Center (ECSC) along with its NOAA advisory board jointly developed a strategic plan for the Center. The group determined that the primary scientific goals of ECSC are to understand the coupling of human and ecological systems, advance the science of stress ecology across coastal ecosystems, and assess societal environmental values and goals. The ECSC emphasizes the same environmental stressors that presently are the focus of NOAA's National Centers for Coastal Ocean Science (NCCOS), specifically stressors associated with: a) climate change (including changes in precipitation, sea-level, temperature, and coastal storms, leading to such stressors as changes in salinity, sedimentation and erosion); b) extreme natural events, such as harmful algal blooms; c) pollution, such as heavy metal toxicity, fecal coliform and viral diseases and nutrient enrichment; d) invasive species, such as Phragmites, Chinese tallow and cogon grass; and e) land and resource use, such as water management issues, oyster management issues and coastal development issues. By working largely through collaboration with National Estuarine Research Reserve (NERR) partners, these research and educational activities are conducted in the context of real-world problems; thus, the ECSC is working to develop methodologies and tools for understanding and managing coastal ecosystems through addressing specific management issues currently confronting NERR and other coastal systems. Through this integration of theoretical/conceptual framework development with

	BS	MA	MS	JD	PhD	Total
Cooperative Remote Sensing Science and Technology Center	43	0	24	0	3	70
Environmental Cooperative Science Center	28	0	20	1	10	59
Living Marine Resources Cooperative Science Center	57	1	11	0	2	71
NOAA Center for Atmospheric Sciences	23	0	19	0	7	49
TOTAL STUDENTS	151	1	74	1	22	249
TOTAL MINORITY STUDENTS	91	0	40	1	21	153

Table 2. National Oceanic and Atmospheric Administration educational partnership program graduated student statistics.

assessments of practical problems of concern to environmental decision-makers, ECSC can provide scientific support to NOAA while at the same time providing the educational environment to develop a new, diverse generation of environmental scientists, trained in the interdisciplinary approaches essential to addressing the next generation of coastal environmental problems. (ECSC, 2005).

Noticeable Program Successes - EPP partners include 21 universities with science programs of which 17 are MSIs. Over 900 students affiliated with these universities are the recipients of direct EPP support. EPP has developed a pipeline that educates and graduates underrepresented minorities in NOAA-related sciences. Tables 2 and 3 below summarize the student output during the past five years.

Student Output - According to data published by the National Science Foundation (NSF) between fiscal years 2001 and 2004 (National Science Foundation, 2004 and National Science Foundation/SRS survey), a total of 9 Ph.D. degrees in Atmospheric Sciences were awarded nationally to African Americans. All degrees conferred during this time period were awarded by majority institutions and none of the awarding institutions conferred more than one degree to an African American for any given year. In May 2006, Howard University, the NCAS lead institution, made an unprecedented impact on national statistics by awarding 3 Ph.D. degrees in Atmospheric Science to African Americans. An additional 12 African American Atmospheric Scientists are in the pipeline with graduation dates expected within the next two years.

A total of 21 Ph.D. degrees in Environmental Sciences were awarded to African and Hispanic Americans between fiscal years 2001 and 2004 according to NSF national statistics summarized in Table 1.

Scholarly Activities - In addition to student output, EPP expects program participants to engage in research that can be published in peer reviewed journals. Among the four Cooperative Science Centers, EPP funded investigators have generated 223 publications since 2001. Additionally, EPP encourages and promotes student participation in scholarly activities including the publication of research in peer reviewed publications. To date CSC students supported through EPP have successfully published 45 papers in national and international journals.

Eight PhDs were awarded in Environmental Science by Florida A&M University, the lead ECSC institution and two doctorate degrees in Environmental Science

were awarded by Jackson State University, an ECSC partner institution. As with the Atmospheric Sciences graduates at Howard University, when comparing the number of PhDs in Environmental Sciences awarded to African Americans at ECSC against NSF statistics, the impact of the graduates supported through EPP becomes evident. A total of 21 PhD degrees in Environmental Science were awarded to African and Hispanic Americans between fiscal years 2001 and 2004 according to NSF. Jackson State University (an ECSC partner) was the only institution to award more than one Environmental Science doctorate degree to African Americans in a single year. Based upon the number of students in the EPP pipeline shown below in Table 3, this trend of increasing the number of minority students completing doctorate degrees in Environmental Sciences is expected to continue through this NOAA sponsored program.

Scholarly Activities - In addition to student output, EPP expects program participants to engage in research that can be published in peer reviewed journals. Among the four Cooperative Science Centers, EPP funded investigators have generated 223 publications since 2001. Additionally, EPP encourages and promotes student participation in scholarly activities including the publication of research in peer reviewed publications. To date CSC students supported through EPP have successfully published 45 papers in national and international journals.

NOAA Workforce Impacts - As of May 2006, NOAA's Educational Partnership Program Graduate Science Program (GSP) has hired 24 career conditional students who are either pursuing or have completed master or doctorate degree programs. Each of these 24 students is assigned to a NOAA Line Office. A total of 4 GSP students are assigned to the National Ocean Service (NOS); 3 to the Office of Oceanic and Atmospheric Research (OAR); 4 to the National Weather Service (NWS); 6 to the National Marine Fisheries Service (NMFS); and 7 to the National Environmental Satellite, Data, and Information Service (NESDIS). The significance of these numbers is apparent when noting that between October 2000 and September 2005, a total of 60 minorities were hired by NOAA to fill science occupations. NOAA EPP has measurably impacted the NOAA science workforce by creating a pipeline of 22 trained minority hires who constitute more than one third (37%) of the NOAA minority science hires between 2000 and 2005.

SUMMARY

	BS	MA	MS	JD	PhD	Total
Cooperative Remote Sensing Science and Technology Center	66	0	36	0	38	140
Environmental Cooperative Science Center	30	1	18	1	12	62
Living Marine Resources Cooperative Science Center	53	0	18	0	9	80
NOAA Center for Atmospheric Sciences	63	0	12	0	15	90
TOTAL STUDENTS	212	1	84	1	74	372
TOTAL MINORITY STUDENTS	186	0	65	0	58	309

Table 3. National Oceanic and Atmospheric Administration educational partnership program student pipeline statistics.

In the five years since its inception in 2001, the NOAA Educational Partnership Program with Minority Serving Institutions and its academic partners have made significant contributions to building capacity at minority serving institutions. This capacity building has resulted in educating and graduating students in science, technology and mathematics fields that support NOAA's mission which is "to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet the Nation's economic, social, and environmental needs".

With an understanding of performance measures and metrics as a program requirement, EPP established a student tracking mechanism that has resulted in a database that contains student data and information against which EPP determines the number of students who receive funds and who eventually graduate with degrees in NOAA mission sciences. The program compares its accomplishments against data from the National Science Foundation to assess the program's success in increasing the total number of underrepresented students graduating with science and engineering doctorates and the impacts these students have on the national education statistics.

EPP's overarching goal is to increase the number of individuals educated and who graduate in STEM fields and enter the national workforce. The five-year partnership with NOAA EPP and 17 MSIs has resulted in the training of over 900 students and, more importantly, the graduating of over 240 students in STEM fields. NOAA EPP has measurably impacted the NOAA workforce by channeling 22 minority program participants into five NOAA line offices. Furthermore, the 22 hires constitute 37% of the NOAA minority science hires between 2000 and 2005.

The EPP framework demonstrates that an effective mechanism can be achieved for producing minority graduates in STEM related disciplines. Commitment on the behalf of the agency and its academic partners is a key component of a successful program. This along with other EPP best practices described above can be used as a template for agencies and institutions working to replicate these early successes.

ACKNOWLEDGEMENTS

The authors of this paper wish to acknowledge DOC and NOAA leadership and the members of the NOAA MSI Council for their continued support in providing the scientific and technical support that allows the EPP

program components to function effectively. In addition, the authors acknowledge the Center Directors and their Program Managers at each NOAA EPP Cooperative Science Center who provided the data and information used to make the case for the success of EPP. NOAA workforce data provided by Mr. Tillman Peck of the NOAA Office of Civil Rights were invaluable in defining the impact EPP graduates have had on changing the diversity of the NOAA workforce.

REFERENCES

- Environmental Cooperative Science Center, 2005, Strategic Plan.
- Expanding Opportunities in Oceanic and Atmospheric Sciences: A Conference to Strengthen Linkages between HBMSCUs, NOAA and Graduate Studies in Marine and Atmospheric Fields, March 19-31, 1999, Proceedings, University of Maryland Eastern Shore (UMES), Princess Anne, Maryland
- National Oceanic and Atmospheric Administration Civil Rights Office, May 2006, Internal Communication.
- NOAA, 1999 REFERENCE MISSING
- National Science Foundation, 1995, Academic Employment of Doctoral Scientists, NSF/SRS, Characteristics of Doctoral Scientists and Engineers in the United States.
- National Science Foundation/Science and Engineering Doctorate Awards, 2004.
- National Science Foundation/SRS, Survey of Earned Doctorates, Science and Engineering Doctorates Awarded to U.S. Citizens and non-U.S. Citizens on Permanent Visas.