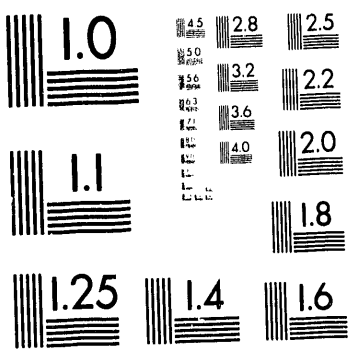
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DOE/EM-0105P

U.S. Department of Energy
Office of Environmental Restoration
and Waste Management
Office of Technology Development

DIVISION OF ENVIRONMENTAL EDUCATION AND DEVELOPMENT

Fiscal Year 1992 ANNUAL REPORT

OFFICE OF TECHNOLOGY INTEGRATION AND ENVIRONMENTAL EDUCATION AND DEVELOPMENT

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I. OVERVIEW

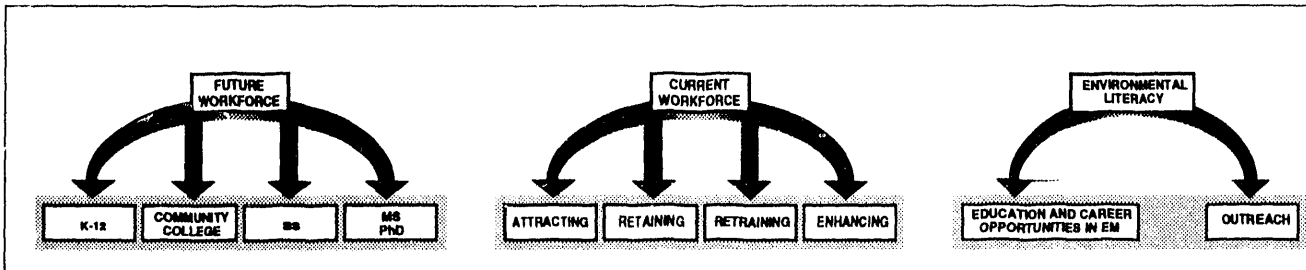
The Environmental Education and Development Division (EM-522) is one of three divisions within the Office of Technology Integration and Environmental Education and Development (EM-52) in EM's Office of Technology Development (EM-50).

The primary design criterion for EM-522 education activities is directly related to meeting EM's goal of environmental compliance on an accelerated basis and cleanup of the 1989 inventory of inactive sites and facilities by the year 2019. Therefore, EM-522's efforts are directed specifically toward stimulating knowledge and capability to achieve the goals of EM while contributing to DOE's overall goal of increasing scientific, mathematical, and technical literacy and competency.

The primary implementation criterion for EM-522 education activities involves a focus on programs that have both immediate and long-range leveraging effects on infrastructure. Specifically, this focus includes programs that yield short-term results (one to five years), as well as those that yield long-term results, i.e., they will move towards sustaining themselves after five years to ensure a steady supply of people, including women and minorities, to meet the demands entailed by EM's goal.

Mission

While the general EM mission is to bring all DOE operating facilities into compliance with applicable environmental laws and regulations and to clean up the 1989 inventory of contaminated inactive sites and facilities by the year 2019, EM-50 has the specific mission to ensure that reliable and acceptable technologies are available for implementation at DOE sites and that a technically trained workforce is available to complete EM's mission. In support of the overall mission, the Environmental Education and Development Division's mission is to ensure that the current workforce has the skills, knowledge, and training (retain and retrain the current generation) and that an appropriately educated workforce will be available (attract and train the next generation) to conduct future EM activities. While the workforce demographics are changing, EM will need to rely more on women and minorities as they will constitute a greater proportion of the emerging workforce. EM, therefore, needs programs and approaches that are successful and innovative in reaching a demographically and culturally diverse population.



In order to complete the scenario, EM must also have as its education mission that it teach the agency itself how to be a place where people want to be employed in an intrinsically and extrinsically meaningful and rewarding job.

Authority

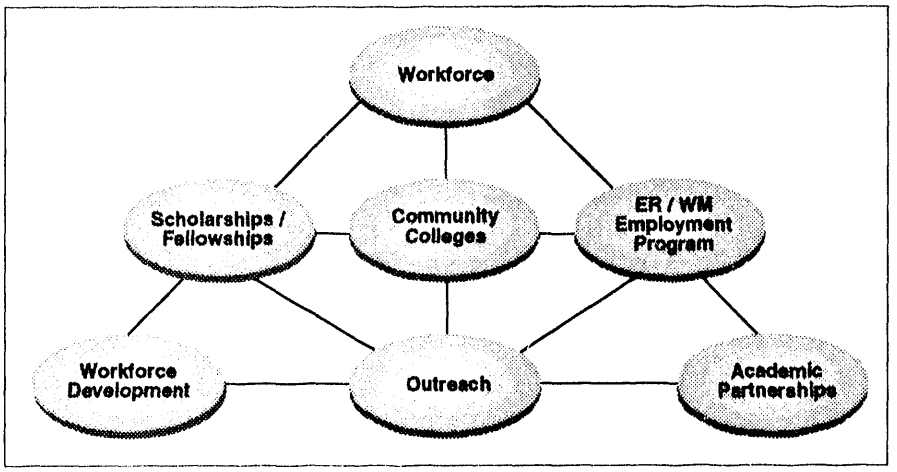
Congress has legislated several statutes to authorize educational programs at DOE. The Department of Energy Science Education Enhancement Act of 1990 (PL 101-510) encourages continuing support of Departmental efforts to aid science, mathematics, and engineering education, especially through DOE's National Laboratories. The National Environmental Education Act of 1990 (PL 101-619) set as U.S. policy the establishment and support of a program of education on the environment. The National Defense Authorization Act for Fiscal Years 1992 and 1993 (PL 102-190) mandates that the Secretary of Energy establish a program for 20 scholarships and 20 fellowships to enable individuals to qualify for employment in DOE's EM program.

In addition to legislated initiatives and mission statements, the establishment of EM's educational programs are supported by the Secretary of Energy through certain Secretarial Notices. In SEN-23-90, the Secretary determined that the Department "shall use, to the extent practical and available, its resources to help strengthen science and mathematics education in the U.S." In SEN-21-90, the Secretary committed the Department to recruit, train, and develop within DOE the technical and managerial talent needed to operate the DOE complex.

The Department of Energy has been an active member of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) which was formed to develop and coordinate Federal budget strategies for improving education in science and mathematics. FCCSET has recognized the need for a partnership with State and local governments, educators and parents, business and industry, professional associations and community-based organizations in order to achieve a goal that by the year 2000, U.S. students would be first in the world in science and mathematics achievement.

Goals

EM-522 has immediate and intermediate goals for meeting EM's 30-year goal. The most immediate goal is to assess the EM workforce for current and near-term demands for people appropriately trained and educated to achieve EM's mission. EM-522 must then take actions to create an adequate manpower supply.



EM-522 Program

EM Educational Accomplishments

During FY 1992, EM-522 took the following steps towards accomplishing

EM's goals through Workforce Development, Academic Partnerships, Scholarships/Fellowships, ERWM Employment program, Community Colleges, and Outreach Programs.

- Continued support of academic partnerships with university consortia to provide a comprehensive strategy of curriculum development and enhancement
- Completed the establishment of the Western States Academic Partnership for Environmental Technology Education.
- Established focused faculty and student incentives to build academic programs in environmental restoration and waste management
- Established selective pre-college and educational outreach activities in environmental science and environmental literacy
- Established technology transfer initiatives related to the environmental industry through partnerships
- Initiated the Environmental Restoration and Waste Management Graduate and Undergraduate Employment Program and selected the first 18 participants
- Supported over 250 faculty and students in two-year and four-year post-secondary institutions that offer approved EM-related programs through a nationwide scholarship and fellowship program
- Provided students with practicum and research assignments at national laboratories and other DOE facilities engaged in ER&WM activities
- Completed the initial development and implementation of a DOE complex-wide training needs analysis model
- Initiated the development and preliminary implementation of a formal program evaluation strategy for all environmental education and development activities

II. WORKFORCE DEVELOPMENT

The existence of EM-50, generally, and EM-522, specifically, is predicated on a projected shortfall in appropriately trained and educated human resources. The 43,000 personnel involved in environmental restoration and waste management at the end of 1992 are projected to increase to approximately 56,000 by the year 2007. Therefore, manpower is the basis for the existence of EM's education and development program. The overall objective of EM-522's Workforce Development Program is to leverage existing educational and human resources and organizational infrastructure to provide innovative solutions for the EM manpower problems. Workforce development is the training and/or retraining of the current workforce to accomplish the EM mission. Programs to develop workforce capabilities focus on two areas: 1) recruiting new employees and retaining current ones, and 2) developing employees through training and educational opportunities, both to enhance performance in current jobs and to prepare them for new positions necessary to carry out the EM mission. DOE's major concern is its changing mission from weapons production to environmental restoration and waste management, along with the requirement that DOE retain and retrain its existing workforce.

EM-522 recognizes that timely progress in Environmental Restoration and Waste Management activities requires a skilled and knowledgeable workforce at all levels in the Federal and contractor organizations. These organizations include DOE program offices, DOE field offices, M&O contractors at sites undergoing restoration and cleanup, and technical support and construction contractors employed directly by DOE or by the M&O contractor.

Although DOE field and program offices vary relatively little in their structure and culture, contractor organizations at the national laboratories and field sites exhibit great diversity. This variation arises from their missions and functions as well as their policies, procedures, and internal structures for managing, hiring, labor relations, employee development, and training. Overlying these corporate and organizational patterns are site-to-site differences in labor supply and demand and other demographic and economic factors. The sum of these differences accounts for the great diversity among the DOE workforce. The strategy behind the EM-522 Workforce Development Program acknowledges this diversity, its organizational components, and its implications for programs designed to meet the EM manpower needs in both the short and the long term.

The Manpower Assessment Action Plan was initiated by EM early in 1991 and put into effect by summer 1991. The subsequent DOE-wide assessment of cleanup manpower needs revealed that the technology and regulatory issues related to EM activities are sufficiently complex that special education and training programs are necessary to ensure an adequate supply of properly trained people.

According to the Action Plan, DOE must:

(1) implement integrated workforce planning at each site to address local needs while providing national level data to DOE Headquarters;
(2) develop a common taxonomy of occupations based on skills and capabilities rather than on administrative or compensation-based factors;
(3) assess local workforce resources for recruiting and retention; and

(4) develop and implement a training and education tracking system to assess the extent to which DOE investments in these programs have yielded qualified individuals who actually accept positions within the DOE complex.

Thus, the purpose for conducting manpower assessments is to provide data to EM management for planning its education and development program, prioritizing initiatives, and evaluating effectiveness.

Plans and programs are being established to train employees who may be affected by the changing missions of the DOE complex. EM is committed to attempt to use employees now in the DOE system who can qualify for environmental restoration and waste management work before hiring from the outside. Many employees are expected to come from those affected by cutbacks in nuclear weapons research and production. Coordinated long-range EM-wide planning through the use of roadmaps will be key to assessing and providing adequate human resources, a cohesive and well-justified capital assets expenditure program, and sufficient facilities and analytical laboratories in the appropriate locations.

Manpower Needs Assessment Study

EM has assessed the current and near-term demand for and the national supply of personnel trained and educated to achieve DOE environmental compliance and cleanup goals. The Manpower Needs Assessment Study was conducted by Pacific Northwest Laboratory (PNL), with support from Oak Ridge Institute for Science Education (ORISE) and Associated Western Universities (AWU), to assess the supply and demand for scientific, engineering, and technical occupations relevant to DOE-EM. The study involved the examination of budget projections and interviews of program/project and human resource managers throughout the DOE complex. The managers have predicted a 45% increase over the 1991 base figures over the five-year period covered by the 1993-1997 Five-Year Plan. Budget driven figures have projected 49% and 87% increases for constrained and unconstrained budget scenarios, respectively.

FY 1992 ACCOMPLISHMENTS

The Manpower Needs Assessment Study of the environmental work force was completed in June 1992. The purpose of the assessment was to validate existing educational programs and to establish a baseline for future programs, especially those that address long leadtime skills. The results of the study underscored the need for the current educational programs, as well as the need for DOE to support pre-college math and science education as "vital" for long term goals, to be involved in college level programs related to DOE cleanup requirements at an early stage, and to focus on two- and four-year college programs for the high demand, low supply occupations. The report identified the lack of a common occupational classification scheme as a primary obstacle to assessing the workforce readiness of the DOE complex.

In April 1992, AWU completed a report entitled "Education Programs and Related Agreements between DOE EM-Designated Sites and the Education Community" as an annex to the Manpower Needs Assessment Study. The information provided in the report on education programs indicates a direct effect on Manpower Development. By fully utilizing education programs in a pipeline sense (connecting programs in a logical progression from precollege to professional levels within DOE), more people could be brought into the EM

community. Heightened interaction between academe, National Laboratories, and EM-designated sites, would bring together the flow of ideas and research (academe) and technology development (labs) and with technology validation and use (DOE technical staff). Therefore, National Laboratories could bridge academe and EM's field efforts through the interface of EM education programs.

The University of Tennessee completed a draft report on ER&WM manpower needs in the Oak Ridge area. The draft report was built on the methodology developed in the PNL 1992 national study. A Masters of Science option was established by the University of Tennessee in the Oak Ridge area specifically to address the need to upgrade and/or retrain science and engineering personnel to meet the environmental engineering needs of DOE ORO. More than 100 students have already been admitted into the program. The numbers are expected to reach 200 to 250 students within the year.

Human Resources Loading of Roadmaps

As a result of the Manpower Needs Assessment Study, EM has recognized that a common taxonomy of occupations would facilitate planning, make the various needs for people across the complex more understandable, permit a more efficient and equitable investment of training and education dollars, and enhance coordination between DOE and its contractors. The goal is to develop a system that cross-references the various job categories used across the complex to a common set of categories.

Roadmaps highlight obstacles to program success at the installation and project levels because they are based on "bottom up" planning at the installation or project level and focus principally on issues that hinder progress and the strategies for resolving them. Since an estimate of human resource requirements (Federal and contractor) needed to support EM programs for the projected cleanup period (through 2019) is required for credible program planning, the human resource projections should be based on site roadmap desired activities diagrams.

FY 1992 ACCOMPLISHMENTS

A Common Occupational Classification System was completed in September 1992. This system provides a common taxonomy for reporting human resource data across the DOE complex to allow the cross-referencing of job titles and, by extension, the set of knowledge, skills, and abilities associated with each position and job title. The system reduced, by over half, the number of job titles and their descriptions to 88 common ones within nine families (engineers, scientists, technical, management, professional, administrative, crafts, operators, and laborers). The Common Occupational Classification System was used by four sites selected to fast-track human resource projection development: Hanford, Rocky Flats Plant, Fernald Environmental Management Project, and Idaho National Engineering Laboratory.

Training Needs Analysis

With the mission of DOE evolving, the transfer of formerly defense-related sites to EM, and a Secretarial directive to retain and retrain the displaced workforce to meet EM's mission when feasible, it has become an EM priority to develop training programs that address the skills and knowledge needs to accomplish the EM mission. Analysis of training needs of current and projected staff for DOE and its contractors provides information that is needed to develop comprehensive training programs in environmental

restoration and waste management for current staff, new hires, and staff transitioned from other programmatic areas have the knowledge and skills to function effectively.

FY 1992 ACCOMPLISHMENTS

An assessment of the training needs of current and projected staff was started in August 1992. Existing data from completed training needs assessments and workforce planning studies were collected and analyzed. The Training Needs Assessment has over 110 entries in an annotated bibliography with an associated problem analysis that analyzes the problem, cause, result, and remedy for each bibliographic entry.

EM Training Coordination

One of the components of the human resources mission is to coordinate complex-wide training programs for the appropriate technical training of the environmental workforce. EM-522 does not specifically conduct training programs. EM-522 participates in the mechanisms that have been established to coordinate the training efforts across the DOE complex for both Federal and contractor employees. This maximizes the application of DOE's limited resources and minimizes management and training redundancies.

FY 1992 ACCOMPLISHMENTS

As an EM-52 initiative, a planning and coordination group met in August 1992 to work out details and responsibilities for training among the various offices within EM. A draft charter was crafted for review and approval by senior management.

Throughout FY 1992, EM-522 support was maintained for the Training Resources and Data Exchange (TRADE). This valuable organization, run by the Oak Ridge Institute for Science and Education (ORISE), facilitates the flow of useful training and development information among over 2000 trainers and training managers DOE-wide, both Federal and contractor.

Also, during FY 1992, interagency coordination was maintained among the Departments of Defense, Interior, and Energy and the EPA on common environmental training issues through a standing committee of the Federal Facility Environmental Improvement Initiative (FFEII), the Accelerated Training Subgroup (ATS).

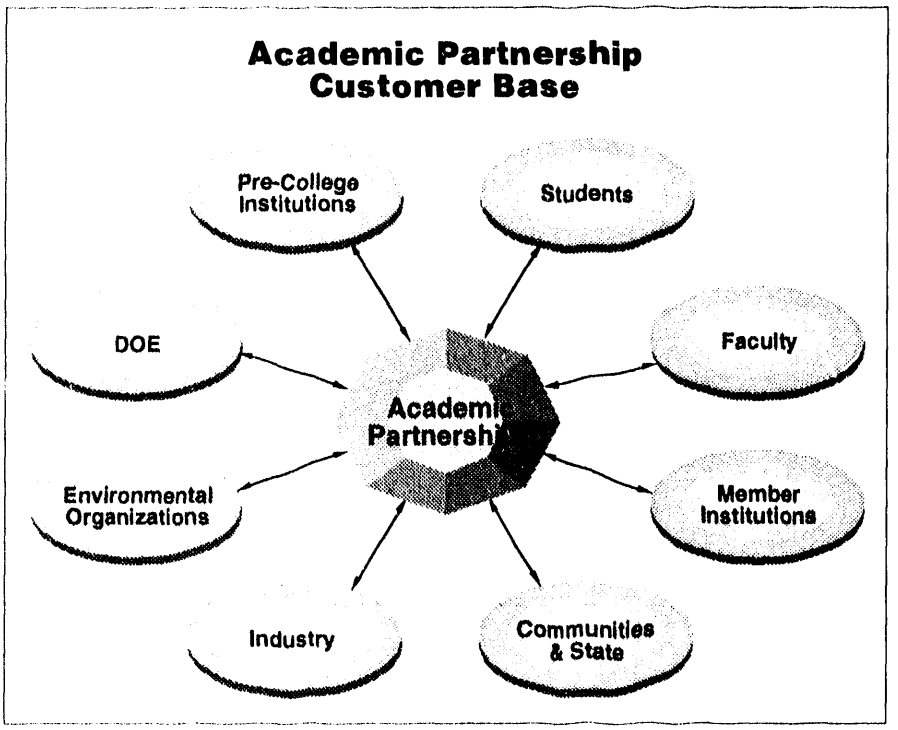
A significant initiative of the Western Governors' Association (WGA) was to join in partnership with the Federal Departments of Defense, Interior, and Energy, as well as the Environmental Protection Agency to develop common solutions to the training problems posed by the cleanup of Federal, state and private facilities and sites. As part of this effort, planning for parallel workforce development began in May 1992, and a combined Federal report on Workforce Planning was in final draft at the end of the fiscal year. It laid out the different needs and approaches of the Federal agencies for the workforce. As the dialogue with states and the affected stakeholders progresses in FY 1993 and beyond, this document will serve as a baseline for discussion.

III. ACADEMIC PARTNERSHIPS

Academic Partnerships are designed for the short term (three to five years) payoff. They are established to be an efficient way to get EM curricula integrated within a multitude of institutions nationwide. The Notice of Program Interest, published in the April 17, 1990 Federal Register, described the Academic Partnership program as a major pilot component for achieving EM's education mission: " ... innovative Academic Partnerships aimed at increasing the number of scientists, engineers, and other professionals, especially technicians, educated in relevant technical and non-technical disciplines to resolve the Nation's environmental restoration and waste management challenges. The objectives of this program are to infuse an environmental restoration and waste management focus into existing curricula and to increase the participation of minority and educationally disadvantaged students. DOE's interest includes: Faculty development/recruitment; enhancement of inter- and multi-disciplinary educational approaches; student recruitment and career counseling, principally with minority and educationally disadvantaged students; internships; linkages with middle schools, high schools, and 2-year academic institutions, and private sector."

The key to EM-522's reaching its long-term goal is in planning and implementing needs-driven education and development initiatives. Academic partnerships represent a cross-cutting mechanism for linking and focusing the commitment and resources of government, private industry, and the professional and academic communities in a common effort to efficiently accomplish the collaborative initiative of a massive national cleanup problem.

DOE funds Partnerships up to five years to institutionalize the curricula and other environmentally focused activities. Thereafter, the Partnerships are expected to become self-sufficient. To date, EM has established four comprehensive Academic Partnerships: Historically Black Colleges and Universities/Minority Institutions Environmental Technologies and Waste Management Consortium (HBCU/MI); South Carolina Universities Research and Education Foundation (SCUREF); Waste-management Education and Research Consortium (WERC); and the Western States Regional Partnership for Environmental Technology Education (PETE). The established Partnerships share commonality in curriculum development, faculty and teacher development/ recruitment, student recruitment, and career counseling.



Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) Environmental Technologies and Waste Management Consortium

The HBCU/MI Consortium partnership with DOE was formed/funded in September 1990 to increase the ER/WM content in the existing curricula and to encourage participation by minority and educationally disadvantaged students. The HBCU/MI Consortium was formed to respond to national research and development, policy formulation, and minority needs in hazardous materials management, environmental restoration, environmental health, and waste management. The Consortium's activities are directed to accomplish goals in four major areas:

- Minority outreach and pre-college education. Goal: To increase the amount, access and quality of mathematics and science education and information dissemination in minority communities.

- Undergraduate education and post-secondary training. Goal: To increase the number of qualified minority professionals available to teach and work in environmental sciences and engineering.

- Graduate and post-graduate education and research. Goal: To develop nationally recognized capabilities in environmental research, education and technology transfer within the Consortium for providing graduate research, education and support to minority students at Master's and Ph.D. levels in those sciences that support the environmental, and non-hazardous, hazardous and radioactive waste handling industries.

- Technology transfer. To effect technology transfers among HBCU/MIs, the environmental and waste management industries, and federal and state governments.

The following institutions are members of the HBCU/MI Consortium:

- Alabama A&M University
- Clark Atlanta University
- Florida A&M University
- Florida International University
- Hampton University
- Howard University
- Jackson State University
- New Mexico Highlands University
- North Carolina A&T State University
- Northern Arizona University
- Prairie View A&M University
- Southern University, Baton Rouge
- Texas A&I University
- Texas Southern University
- Tuskegee University
- University of Texas, El Paso
- Xavier University

FY 1992 ACCOMPLISHMENTS

During FY 1992, thirteen member institutions of the HBCU/MI Consortium (Alabama A&M, Clark Atlanta, Florida A&M, Florida International, Howard, New Mexico Highlands, Prairie View A&M, Southern University, Texas A&I, Texas Southern, Tuskegee, UTEP, Xavier) developed undergraduate minors or options in the environmental area by infusing the contents into the existing curricula. Three member institutions developed graduate programs:

- ► Jackson State University - Ph.D. program in Environmental Science;
- ► Hampton University - Ph.D. program in Nuclear Physics;
- ► Texas A&I University - graduate courses in Environmental Engineering.

Clark Atlanta University is in the planning stages of developing Masters and Ph.D. programs in Environmental Health Sciences & Toxicology.

The HBCU/MI Consortium completed a comprehensive laboratory training program for Egyptian officials in Cairo. The training program included instrumentation, air quality, wet chemistry, bacteriology, data management, and quality assurance.

Three member institutions gave support to faculty who provided advanced environmental training to the Tabbin Institute of Metallurgical Studies in El Tabbin, Egypt.

In FY 1992, the HBCU/MI Consortium used cooperative agreement funds to provide partial support for the Associated Western Universities' Environmental Management Precollege Analytical Chemistry (EMPAC) and Environmental Management Career Opportunities for Minorities (EMCOM) programs. These programs are also funded by DOE/EM Headquarters through the Idaho Field Office.

In FY 1992, the summer EMPAC Programs were conducted at 10 sites, 5 of which were HBCU/MI Consortium institutions (Clark Atlanta U., Hampton U., Jackson State U., Southern U., and Texas A&I U.). High school teachers and university faculty provided significant mentoring to high school students. A course was given in college level analytical chemistry and focussed on environmental methodology. Students in the EMPAC program scored slightly better than average on the American Chemical Society standardized test for college-level analytical chemistry.

EMCOM awarded undergraduate scholarships to 44 students (34 HBCU/MI funded) and graduate fellowships to 11 students (7 HBCU/MI funded). In the EMCOM practicum program during the summer of 1992, 18 HBCU/MIs, 13 DOE sites, and 14 HBCU-supported faculty mentors for the undergraduate and graduate students participated in the program. EMCOM practicums were awarded to 34 undergraduate students who were placed with 12 faculty mentors and to 5 new graduate students placed with 5 faculty mentors. Six graduate students continued from a previous practicum. The undergraduate and graduate students and 14 faculty members were placed at AMES, BNL, INEL, ITRI, LANL, LBL, LLNL, NIPER, NREL, ORNL, PNL, SNLA, and SRL for the summer research practicums. In this program, the students receive support throughout the year.

The HBCU/MI sponsored the pilot HBCU/MI Consortium Regional Environmental Technology Transfer Forum in Oak Ridge, Tennessee in July 1992. The goal of the Forum was to assist in empowering minorities with technology business opportunities through technology transfer activities.

In FY 1992, the HBCU/MI Consortium entered into partnership with select members of the public and private sectors of the environmental industry to develop a mutually acceptable and beneficial strategy for promoting national environmental career awareness activities, educational and training, contracting and employment opportunities within African American, Hispanic, and American Indian communities. Four subcommittees within the Consortium contributed their efforts to enable the consortium to "market" its capabilities and interests to industry through the 1993 National Congress for the Advancement of Minorities in the Environmental Professions during February 1993 in Washington, DC. The 1993 National Congress is the initial session of a series of biennial gatherings that will include education, industry, and government leaders.

South Carolina Universities Research and Education Foundation (SCUREF)

SCUREF formed a DOE partnership through the Westinghouse Savannah River Corporation (WSRC) in 1990. The scope of the program is to develop education and training initiatives, research and development of ER/WM, and technology transfer with a focus towards the needs at the Savannah River Site.

SCUREF has a two-part education and training initiative. The first part is designed to increase the number of scientists, engineers, and technicians who will be prepared for careers in EM fields. This part also includes working with the State's 16 technical schools to create associate degree programs in ER&WM. The second part is an innovative outreach program designed to attract and encourage educationally disadvantaged students to careers in science and technology. The outreach program targets South Carolina middle and secondary school students and teachers.

The following institutions are members of the SCUREF Consortium:

- University of South Carolina, Columbia
- University of South Carolina, Aiken
- Clemson University
- Medical University of South Carolina
- South Carolina State University

FY 1992 ACCOMPLISHMENTS

SCUREF made awards through 3 scholarship programs for the school year beginning in Fall 1992. The three scholarship programs are designed to aid South Carolina math and science education and to increase students' interest in professions related to the ER/WM mission of the Savannah River Site. All three scholarships are targeted toward women and underrepresented groups. There are currently 12 students in the WSRC/SCUREF Scholarship for Environmental Restoration and Waste Management. This scholarship, designed to increase the number of female and minority ER/WM scientists and engineers, is awarded for a three-year period to college freshmen or sophomores who are majoring in an ER/WM related field and who will take one ER/WM related course per term. The Scholarship Program for Improvement of Secondary School Science and Math Teaching, designed to increase teacher proficiency in rural or inner city areas, was awarded for an 18 month period to 8 qualified secondary school teachers in South Carolina for Interdisciplinary Masters of Arts (IMA) degrees. The scholarship recipients must be willing to return to teaching in rural or depressed areas. The Scholarship Program for Increasing the Supply of Qualified Secondary School Science and Math Teachers was awarded for a three-year period to 9 qualified high school students who will major in secondary math or science education at a SCUREF institution. These scholarship recipients must be willing to teach in rural or depressed areas.

SCUREF and WSRC personnel successfully completed the Transuranic Waste Drum Study in July 1992. Reliable methods were developed to measure the amount of water in drums and to determine the mechanics of water transport into the drums. The effects of water on the storage medium in the drums were documented in the study. The methods developed in the study provide a generic solution that could possibly affect 40,000 drums per year across the DOE complex. There is a potential savings of approximately $100 per drum if the recommended wicking and sealing processes are adapted at the sites. These processes would extend the life of the drums by reducing corrosion, thereby decreasing the hazardous potential of the drums.

Clemson University conducted a summer field camp for undergraduate and graduate students from SCUREF institutions at the Field Geohydrology Experimental Site on the Savannah River Site. The experimental site is an outdoor laboratory for geohydrology experimentation. It was developed from a well field at a site formerly proposed for waste burial but never used for that purpose. Students and professional geohydrologists use the well field to conduct experiments that will improve the methodology for groundwater sampling, thus aiding in the cleanup or prevention of contamination. The Field Camp consisted of three phases: 1) studying sedimentary rocks, 2) conducting pump tests at the well field, and 3) classroom instruction on groundwater remediation techniques and geochemical analytical methods.

In conjunction with the field camp efforts, Clemson University developed a master's degree program in hydrogeology. Six courses were offered in the new degree program with 53 students enrolling in the initial courses. One student is expected to graduate with a master's degree in May 1993. Two more students are expected to graduate between August and December 1993. Clemson University also developed short courses for registered geologists in South Carolina. In September 1992, Clemson conducted a hydrogeology symposium for which eight hours of continuing education credit were allowed for registered professional geologists toward the requirements of the South Carolina State Board of Registration for Geologists.

The first Savannah River Site Distinguished Scientist, Dr. Frank Parker, began his second year, in the Fall 1992, with the faculty at Clemson University in the Environmental Systems Engineering Department of the College of Engineering. Dr. Parker, a leading international expert in the field of radioactive and hazardous waste management, is part of an effort to bring eminent world class ER/WM scientists to South Carolina and the Savannah River Site. Through this program, scientists provide technical expertise and role model leadership in research and graduate level education in the areas of waste management and environmental restoration.

A compilation of white papers produced by South Carolina educators, "SCUREF Science and Mathematics Initiative White Papers", was published in December 1991 and will be used by the South Carolina Governor's Task Force. SCUREF developed a set of videotapes that provide details on the proposed pilot programs discussed in the white papers. These videotapes are to be used for broadcasting through Instructional Television Fixed Services (ITFS) to South Carolina teachers in workshops during in-service training programs.

Waste-management Education and Research Consortium (WERC)

The WERC partnership, funded by DOE in 1990, works in cooperation with the Los Alamos National Laboratory and Sandia National Laboratory. The mission of WERC is centered on the management and reduction of hazardous and radioactive wastes. WERC is committed (1) to addressing public and private sector problems that are associated with the management of radioactive, hazardous, and mixed wastes, and (2) to producing professionals to deal with those problems. WERC accomplishes this goal by linking and synthesizing three distinct but related activities:

- education and training
- research and development
- technology transfer.

The following institutions are members of the WERC Consortium:

- New Mexico State University
- University of New Mexico
- New Mexico Institute of Mining Technology
- Navajo Community College

FY 1992 ACCOMPLISHMENTS

During FY 1992, WERC institutions established the following EM-related programs:

- ► Master of Science in Environmental Engineering at New Mexico State University;
- ► Associate Degree Program at New Mexico State University at Carlsbad
- ► Associate Degree in Solid Waste Management Technology for Native Americans at Navajo Community College
- ► 16 courses per year in Engineering, Math, Computer Science, and Management on the interactive TV system.

The EM-related undergraduate, graduate, and associate degree programs established in previous years were continued in 1992 with over 500 students in the programs. Thirty students completed their degree program in 1992.

WERC established the Environmental Fellows Program (EFP) in September 1992. The long range mission of the EFP is to expand the world's capability to address issues associated with the management of hazardous, radioactive and solid wastes by establishing a worldwide community of highly qualified administrators and scientists in the field of environmental management. There are four major components to the program's mission of training emerging leaders from government and industry: (1) An educational program for selected emerging leaders at the graduate and/or post-doctoral levels; (2) Seminars and conferences involving world-wide experts and visiting faculty; (3) Applications of technology to find solutions to world-wide environmental problems; and (4) An optional work experience program for the fellows at national laboratories for a short period following their educational program. These components will be implemented through the following activities:

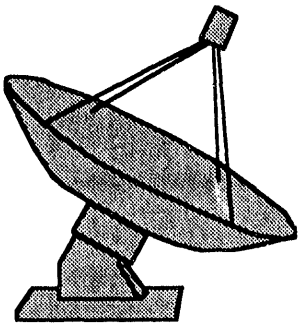
- ► an International Fellows Training Program beginning in August 1993;
- ► a Student Exchange Graduate Program to begin in January 1993;
- ► a Monthly International Colloquium series; and
- ► an International Conference on Environmental Management in June 1994.

In June 1992, twenty visiting ministers from seven European countries (Belgium, France, Great Britain, Luxembourg, Netherlands, and Spain) visited Washington D.C., Las Cruces, NM, and the WIPP site at Carlsbad, NM to gain a better understanding of environmental educational opportunities that would be available through the WERC International Fellows Program.

WERC received two awards during the fiscal year, one for its overall performance and one for its Teleconference Series:

- Outstanding Engineering Achievement Award from the National Society of Professional Engineers, and
- Best Distance Learning Program for Higher Education Award from the TeleCon XII Conference.

WERC and several private companies sponsored the 2nd annual National Environmental Design Contest at New Mexico State University in Las Cruces, NM in April 1992. The Contest involved student teams from across the U.S., and one from Mexico, competing with demonstrations of processes and equipment



to solve a soil pollution problem. The competition was created to challenge students to seek creative solutions to specified real-life environmental problems. The Design Contest was conducted in conjunction with the Technology Development Conference where results from WERC's technology development research were presented to industry and government.

In Fall 1991, the Navajo Dryland Environments Laboratory, an educational facility, was established at the Navajo Community College Shiprock Campus (Shiprock, NM) to provide Native American students with the opportunity for practical ER/WM training experiences. The projects included activities such as monitoring groundwater contaminants in abandoned uranium mines near Shiprock and waste disposal in arid climates.

Western States Regional Partnership for Environmental Technology Education (PETE)

PETE, initially funded by DOE in April 1991, was established as a regional program in five western states (Arizona, California, Hawaii, Nevada, and Utah) to link the technical resources of the Department of Energy, Department of Defense, EPA, and NASA Laboratories, federal and state agencies, private industry, and professional societies with participating community colleges. The overall goal of this program is to significantly enhance the number of graduates emerging from the education pipeline in disciplines related to nvironmental science, engineering and management, with an emphasis on technicians. This effort will assist in the development and presentation of curricula for training Environmental-Hazardous Materials Technicians and will encourage more transfer students to pursue studies in environmental science, engineering and management at four-year institutions. The PETE methodology is currently being extended nationally in order to assure maximum beneficial impact. Five other regional partnerships are forming in the Southeast, North Central, Northwest, Northeast, and South Central.

FY 1992 ACCOMPLISHMENTS

In FY 1992, PETE held two semi-annual Resource Instructor Conferences that provide a regular forum for information exchange and mutual support among participating community colleges and the other regional partners. The first FY 1992 conference, held in February 1992 in Las Vegas, NV, focused on the issue of private sector demand for Environmental-Hazardous Materials Technicians and the pros and cons of developing national certification standards. The second conference, held in July 1992 in San Diego, CA, had as its primary theme the development and implementation of high school or community outreach programs (2+2+2/ Tech Prep).

PETE assisted in the initiation of Environmental-Hazardous Materials Programs in the State of Nevada at the Community College of Southern Nevada in Las Vegas. In the 1992 Fall Semester, 245 students were enrolled in the program at that Community College. PETE provided

direct assistance to eight other new start colleges in 1992 through training for instructors or support for curricular materials and supplies. There are currently 33 actively participating colleges in the PETE Regional network.

PETE initiated the Summer Internship Program in FY 1992. Instructors from eight community colleges (Navajo Community College, Cosumnes River College, Santa Rosa Junior College, Honolulu Community College, Southwestern College, City College of San Francisco, L.A. Trade-Technical College) were placed at DOE (LLNL, LBL, SNLL) and EPA Laboratories and at the Nevada Test Site for 8-10 week assignments.

IV. SCHOLARSHIPS/FELLOWSHIPS

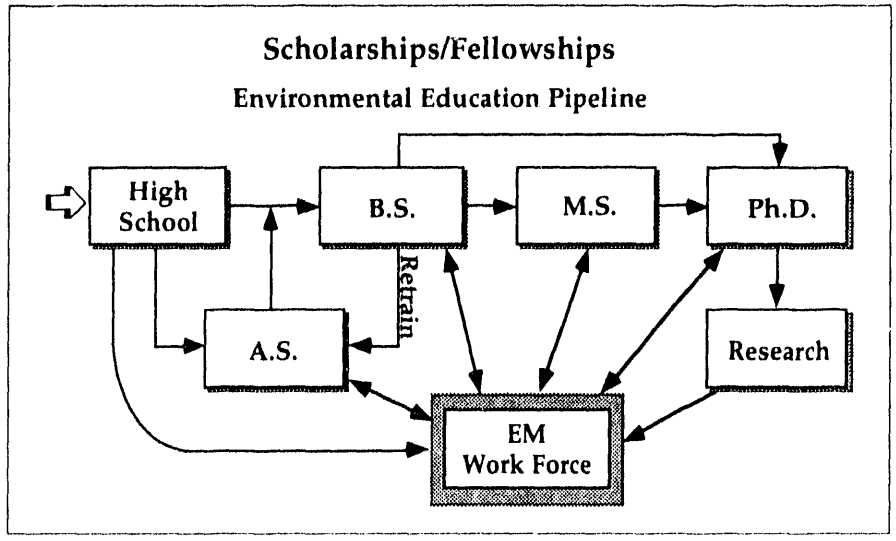
EM recognizes that it is not enough to motivate students, teachers or schools in the K-12 area only through curriculum activities to maximize the study of environmental science. Therefore, EM-522 provides financial incentives to undergraduate and graduate students, as well as to the faculty who serve as role models for young people. The purpose of such financial incentives is to motivate outstanding graduate and undergraduate students to pursue research and degrees that will help DOE achieve its human resource and research goals in the EM mission.

The EM Scholarship/Fellowship Program is designed to increase the pool of talented scientists and engineers with bachelors and graduate degrees supporting the EM mission. The National EM Scholarship Program is designed to encourage talented students to pursue either associate or bachelors degrees in disciplines supporting the EM mission through careers as scientists, engineers, and technicians. The Junior Faculty Award Program is structured to support research projects on EM topics and to attract the most promising students toward research and professional careers related to the EM mission. Practicum and research assignments at National Laboratories are directed towards current relevant environmental topics and provide hands-on state-of-the-art ER/WM expertise that is needed in EM's current and future workforce.

Oak Ridge Institute for Science Education (ORISE)

ORISE, a consortium of colleges and universities, administers DOE's ER&WM Scholarship Program, ER&WM Fellowship Program, and the ER&WM Junior Faculty Award Program.

Environmental Restoration & Waste Management Scholarship Program. The ER&WM Scholarship Program is designed to encourage talented students to pursue either associate's or bachelor's degrees in disciplines supportive of DOE's EM mission. In FY 1992, the program was changed to grant scholarship awards only to students attending two-year institutions. The B.S. level component of the program was transferred to the new ERWM Employment Program.



Environmental Restoration & Waste Management Fellowship Program. The Fellowship Program is designed to support highly capable students interested in pursuing graduate study in an academic discipline related to the management of low/high-level radioactive wastes, hazardous wastes, and environmental protection and restoration in a DOE-designated university program. ER&WM Graduate Fellows are required to spend a minimum of three months at a

DOE laboratory. The practicum is a critical and highly successful part of the fellowship program and, in many cases, has stimulated the fellows' interest in continued involvement in DOE/EM research activities after graduation.

Environmental Restoration & Waste Management Junior Faculty Award Program. The ER/WM Junior Faculty Award Program is designed to increase the number of university faculty members and students who conduct educational development, technology development, and applied research in the ER/WM area. The program is directed towards full-time, regular, non-tenured faculty in tenure-track positions who are within six years of having obtained a PhD. Awards are available for a two-year period, but second year renewals are determined by first year performance. The awardees are required to collaborate with a DOE facility and to develop mission-related research proposals in technical areas that complement ongoing education and research or respond to identified research needs. This also improves the possibility of obtaining third year funding directly from the DOE facility.

Vanderbilt University Internship Program in Radioactive Waste Management

This internship program consists of two years of academic studies and a summer practicum for undergraduate and graduate students. Six new candidates are selected each year. Course studies follow traditional disciplines with added courses in radioactive waste management, hazardous waste management, nuclear physics, and radiation measurements. Graduate students take a course in risk management and have the option to take the environmental law course in the law school. At the end of the first of the two years, interns are assigned to a DOE-owned contractor-operated facility or to a DOE prime contractor to get first-hand experience in the field.

Associated Western Universities (AWU) Scholarships and Fellowships

Through DOE/EM sponsorship, AWU administers the EMCORE, EMCOM, and EMPAC programs. (The EMCOM and EMPAC Program FY 1992 accomplishments are discussed in Section III, Academic Partnerships.)

Environmental Management Career Opportunities Research Experience (EMCORE) Scholarships and Fellowships. The long-term purpose of EMCORE is to attract a large number of new ER/WM scientists and engineers to careers with DOE, its laboratories, and its facilities. EMCORE is designed to accomplish this goal through implementing three objectives: 1) increase the number and ethnic diversity of scientists and engineers working on DOE's ER/WM problems; 2) build curricula and academic research programs in ER/WM; and 3) build active, long-term R&D collaborations between DOE and academe. The EMCORE Undergraduate Scholars begin their award with an appointment to a DOE laboratory or facility for a summer practicum. The Summer Scholars then compete at the end of the summer to receive an academic year award. Academic year scholarships provide students with support for on-campus study and continuation of the summer research in collaboration with their Host Scientist/Engineer. Graduate Fellowships provide full-year support for on-campus study and research, and for research on site at a DOE facility. Fellows are generally encouraged to do most of their thesis/dissertation research on site.

All participants are expected to publish the results of their research in peer-reviewed journals as well as present their work at professional meetings.

Environmental Management Career Opportunities for Minorities (EMCOM). The EMCOM program provides Undergraduate Scholarships, Graduate Fellowships, and Faculty Fellowships for fulltime undergraduate students, graduate students, and faculty, respectively, at member institutions of the Environmental Technology Waste Management Consortium.

Selection of undergraduate scholars and graduate fellows is competitive within each member institution and is based on the students' academic program and performance, their career plan, and faculty recommendations. Faculty Fellowship selection is based on the individual's professional qualifications in a discipline pertinent to the needs of ER/WM, their record of mentoring, the apparent benefit to the applicant and to the applicant's home institution, and the compatibility of the applicant's ER/WM-related research interests with those of the host facility. Preference in the Faculty Fellowship Awards is generally given to applications from faculty/student teams.

National Hispanic Scholarship Fund (NHSF)

The National Hispanic Scholarship Fund Scholarship Program was established in 1990 to provide scholarships to Hispanic-American community college and four-year college students who pursue academic majors relevant to Environmental Restoration and Waste Management. The program's two major goals are to encourage Hispanic students to enter professions relating to environmental restoration and waste management and to encourage Hispanic community college students to transfer to four-year programs relating to environmental restoration and waste management. Students are selected for the scholarship on the basis of background and interest in the environmental sciences. First year Scholarship recipients are encouraged to reapply for additional years.

FY 1992 ACCOMPLISHMENTS

Scholarship and Fellowship accomplishments are grouped by the local DOE Field Office implementing the programs.

Albuquerque:

UNDERGRADUATE PROGRAMS:

- **National Hispanic Scholarship Fund (NHSF) Program.** In FY 1992, NHSF awarded scholarships to 38 community college and four-year students. In this total, each of the 24 community college students received a $2000 scholarship and each of the 14 four-year students received a $3000 scholarship. Of the 14 recipients, six had transferred to the four-year program from a community college. The students are majoring in chemical, mechanical, electrical, civil, environmental, industrial, general, and bioengineering, as well as, geology, biochemistry, ecology, environmental science, chemistry, mathematics, and computer science.

Idaho:

UNDERGRADUATE PROGRAMS:

- **Environmental Management Career Opportunities Research Experience (EMCORE) Program.** In FY 1992, the Associated Western Universities made awards in the EMCORE Program to 10 student/faculty

teams, comprised of 28 undergraduate scholarships and 10 faculty fellowships, for the 10-week summer research experience. Four student/faculty teams were assigned to Los Alamos National Laboratory, three teams to Idaho National Engineering Laboratory, and one team each to MSE, Pacific Northwest Laboratory, and Waste Isolation Pilot Plant. LANL wholly funded one of the undergraduate summer scholarships and asked three EMCORE students to stay as LANL employees for the remainder of the summer. INEL funded three EMCORE student extension and invited one EMCORE faculty member to return the summer 1993 on an INEL-funded EMCORE Fellowship. In addition to the awardees, 44 DOE or DOE Contractor scientists participated during the summer 1992 as host scientists and immediate and immediate research supervisors. At least 10 laboratory administrators helped to run the program smoothly.

For the 1992-1993 academic year, 15 undergraduate scholarships were awarded to make up 9 student/faculty teams. Four student/faculty teams will be assigned to LANL, two teams to INEL, and one team each to MSE, PNL, and WIPP.

GRADUATE PROGRAMS:

- **Environmental Management Career Opportunities Research Experience (EMCORE) Program.** In FY 1992, funding was provided for six graduate fellowships. Four of the awards were made in FY 1991 and two in FY 1992, but all six graduate awardees began their appointments during FY 1992. (The graduate program has two recruiting periods, August 1 and November 1, and two corresponding appointment start dates, November 1 and January 1.) Two awardees were assigned to Sandia National Laboratory (AL), two to PNL, and one each to MSE and INEL for their practicums. Three graduate fellows completed their lab practicums.

Oak Ridge:

UNDERGRADUATE PROGRAMS:

- **Vanderbilt University Internship Program in Radioactive Waste Management.** The Vanderbilt University Intern Program, also known as the Radioactive Waste Intern Program, supported 12 students (6 new and 6 continued) in FY 1992. In the Vanderbilt Intern Practicums, seven students were placed at 6 DOE sites (2 at Bechtel National, one each at Westinghouse Hanford Company, Westinghouse Savannah River Company, Sandia National Laboratory, Chem Nuclear Geotech, Haliburton-NUS) during the summer of 1992.

- **Environmental Restoration & Waste Management Scholarship Program.** The ER/WM Scholarship program supported 30 scholars, 15 of which were new awards and 15 were renewals. In the summer 1992, fifteen students completed the associated Practicums in the scholarship program.

GRADUATE PROGRAMS:

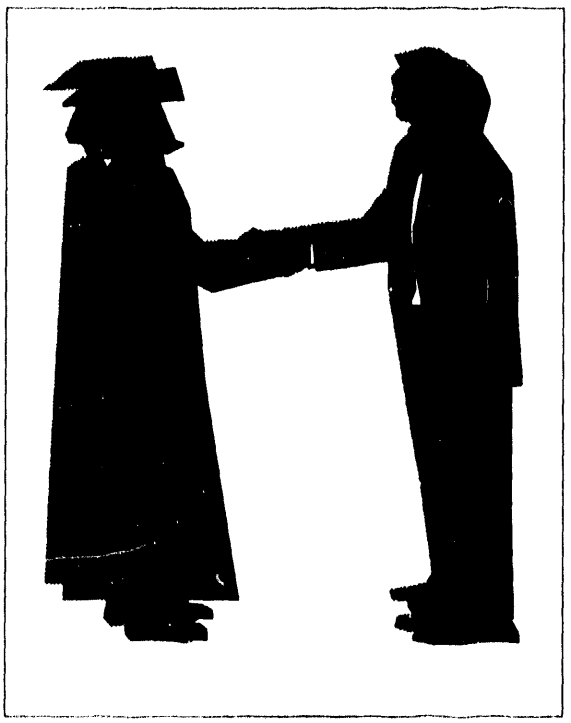
- **Environmental Restoration & Waste Management Fellowship Program.** The ER/WM Fellowship program supported 30 Fellows (4 new awards and 26 renewals). Four Fellows completed the associated practicums in the summer of 1992.

FACULTY DEVELOPMENT:

- **ER/WM Distinguished Junior Faculty Award Program.** Six new

awardees were selected in FY 1991 for FY 1992 and are collaborating with Oak Ridge National Laboratory (3), Pacific Northwest Laboratory (2), and Westinghouse Hanford Company. The previous six awardees from FY 1991 were renewed for FY 1992, and continued their collaboration with Oak Ridge National Laboratory (3), Argonne National Laboratory, Los Alamos National Laboratory, and Idaho National Laboratory.

V. ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT EMPLOYMENT PROGRAM



The Environmental Restoration and Waste Management Undergraduate and Graduate Employment Program (ERWM-EP), also known as the ERWM Employment Program, was established during FY 1992. The establishment of the program was mandated by Congress through the National Defense Authorization Act for Fiscal Years 1992 and 1993 (PL 102-190). The goal of the ERWM-EP is to provide EM with highly talented and appropriately trained individuals in the management of hazardous, radioactive, and mixed wastes and in environmental restoration. The program will achieve its goal by supporting highly talented students in graduate and undergraduate study related to the mission goals of EM. During a summer of their academic program, the participants are assigned to a 3-month practical work experience where they have the opportunity to gain practical, state-of-the-art, on-site experience at either a DOE facility, field office or headquarters to receive on-the-job training and development. They make a commitment to environmental management through their educational pursuits and to DOE through their participation in the program. EM guarantees employment in environmental restoration and waste management positions at DOE facilities after the graduate fellows and undergraduate scholars have completed their academic degree program. The participants of the ERWM-EP must work one year in EM for every year of educational support provided to them.

FY 1992 ACCOMPLISHMENTS

Several significant developments occurred during the first year of the program. EM conducted an ERWM-EP planning workshop and developed the program description, student/university applications, a practical work experience booklet, and a program marketing brochure.

The highlight of the activities was the selection of the first group of participants (18 academically talented graduate and undergraduate students from 13 universities) who will provide a cornerstone for the future. These student appointments became effective on September 1, 1992. Two additional awards were to be made in January 1993 to bring the total to 20 students (mandated by Congress) at 15 universities. The program p lan calls for the selection of 20 new graduate fellows and 20 new undergraduate scholars for FY 1993.

The initial eighteen ERWM-EP participants met in Oak Ridge, TN in August 1992 for the first Annual ERWM-EP Orientation Workshop. The purpose of the workshop is to provide the ERWM-EP participants with information about DOE's Environmental Restoration and Waste Management program activities and to introduce them to the federal system and the DOE management and operating network. During the orientation workshop, DOE management reaffirmed the strategy and commitment of Admiral James D. Watkins to the importance of the environmental activities at each of the DOE sites.

VI. COMMUNITY COLLEGES

Community Colleges are being recognized as the "heartland" of the education pipeline. There are approximately 1200 community, technical and junior colleges in the United States with an estimated population of 5-6 million students. These institutions are significant, nationwide resources that should play a key role in an EM education program. The community colleges represent a key transition point for millions of students (particularly minority students) between high school and four-year institutions. They also increasingly represent the easy access, low cost alternative for the current workforce to return for continuing vocational training or retraining for new career directions. The community colleges form the backbone for technician training and education programs near each DOE site. Their standing in the local communities, their familiarity with the issues at each site, and their flexibility in offering programs make them ideal vehicles to enhance the professional education and training of the workforce.

It is, therefore, the mission of the Community Colleges Program (1) to retrain and upgrade the skills of current DOE employees; (2) to use their unique ability to attract and train the next generation of technicians at or near the sites where their skills are needed; (3) to act as a bridge between high schools and four-year institutions; and (4) to provide women and minorities with the opportunity of a local post-secondary education.

FY 1992 ACCOMPLISHMENTS

Community College project accomplishments are grouped by the local DOE Field Office implementing the activities.

Albuquerque:

CURRICULUM DEVELOPMENT:

- **Mesa State College**. The Mesa State College project involved curriculum development. In FY 1992, they continued support of an Associate of Applied Science (A.A.S.) program in Environmental Restoration Technology. Funding was provided for faculty and adjunct professor salaries. Five students were graduated in the first class (May 1992) of the program. Three of the graduates were hired by the Grand Junction Project Office. Since many students in this program are part-time, they will graduate at a later date.

- **Community College Network (C^2Net)**. C^2NET is a project on Transfer of Curriculum Development for Environmental Education Degree Programs. In FY 1992, C^2NET held a Community College Network Meeting where community college representatives were able to interact with DOE program personnel, to learn about DOE's training and education programs, and to exchange experiences in environmental curriculum development with one another.

Idaho:

CURRICULUM DEVELOPMENT:

- **Eastern Idaho Technical College**. In FY 1992, Eastern Idaho continued support of the Hazardous Material Technician Associate Degree Program by providing program equipment purchases,

training materials and lab supplies, and professional development for the faculty.

Richland:

CURRICULUM DEVELOPMENT:

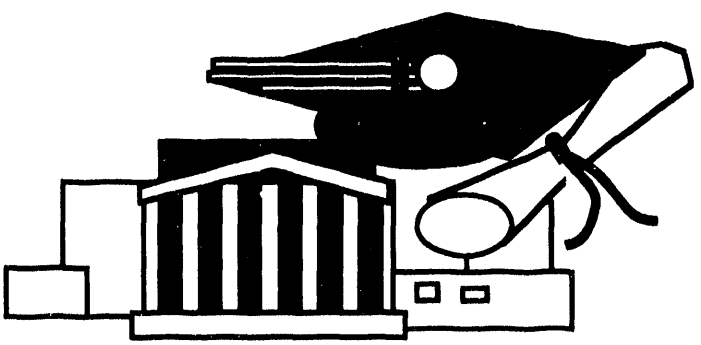
- **Columbia Basin College (CBC).** CBC in a partnership with DOE-RL., Dept of Education, and the Hanford contractors developed a comprehensive Associate of Applied Science degree program in Environmental Hazardous Materials Technology (AAS EHMMT). This program is designed to enable students to function as entry level environmental hazardous materials technicians and to provide the students with special nuclear training relevant to the DOE-RL Environmental Restoration of the Hanford project. In FY 1992, CBC implemented the first three quarters of the AAS EHMMT program and awarded Waste Management program scholarships. Seventeen students were graduated from the program. CBC also developed retraining and in-service training components to the Environmental hazardous Materials program and has offered a total of 23 workshops. In addition to the degree program activities, CBC was key in the development of PETE Southwest and PETE Northwest and also provided leadership for the PETE national network.

San Francisco:

STUDENT SUPPORT:

- **Summer and Transfer Achievement Readiness Program (STAR).** Project STAR, a nationwide community college partnership, focuses on increasing the bridging function of community colleges between high schools and 4 year undergraduate programs. STAR has an impact on students, teachers, parents, and curricula. In FY 1992, twenty community college students attended the summer program which included academic and research experiences in environmental restoration and waste management at the University of California at Berkeley and Lawrence Livermore National Laboratory. There is a 100 % transfer rate in Project STAR of community college students to 4-year institution. There is also a 100 % retention rate of students participating in the Project STAR summer activities.

In FY 1992, Project STAR assisted 2 consortium members (D-Q University and Contra Costa College) in enriching their ERWM curricula and assisted one community college in developing an ERWM curriculum.

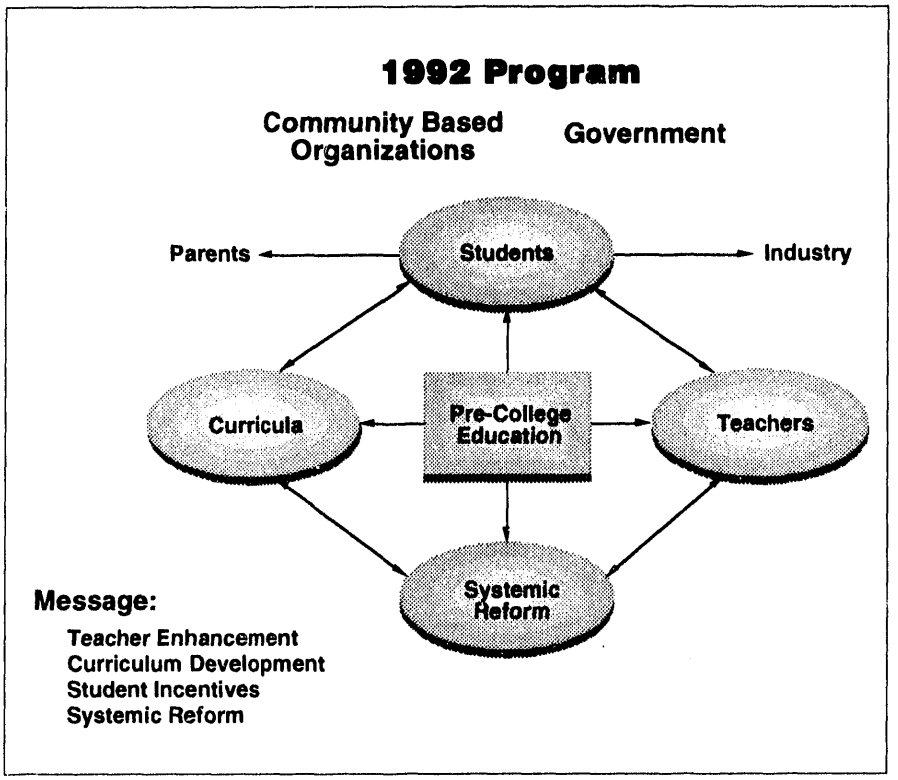


VII. OUTREACH

The major goal of the Outreach Program is to effectively plan and implement activities that will evolve into a "good infection" in the U.S. precollege educational system, thereby winning students' interest, enhancing teachers' knowledge and abilities, and persuading State policy-makers to institutionalize environmental education for all young people, especially minorities and women who are becoming a larger and larger component of the American workforce. The Outreach programs act as a direct means for enhancing both content and skills that can have immediate payoffs in the classroom. They provide an opportunity for intervention in the educational system through leveraging local funds for teacher improvement and for upgrading teacher skills to teach science with a focus on environmental and waste topics. The programs introduce students to new experiences and furnish a means for students, particularly disadvantaged, to become active in mathematics and science.

The Federal Coordinating Council for Science, Engineering, and Technology (FCCSET) was formed by the White House Office of Science and Technology Policy to develop and coordinate Federal budget strategies for improving education in science and mathematics. The publication of FCCSET's Committee on Education and Human Resources' (CEHR) *By the Year 2000: First in the World* was a landmark achievement, displaying the FY 1992 Federal strategy and budget for mathematics, science and engineering education across government agencies. In this document, CEHR, chaired by the Secretary of Energy, made precollege education and teacher enhancement the first priority. The CEHR strategy at the precollege level is structured around four program elements: teacher preparation and enhancement, curriculum reform, organizational reform, and student incentives and opportunities.

As an active member of CEHR/ FCCSET, DOE-EM structured its FY 1992 pre-college outreach activities according to the FCCSET Precollege Program Elements.



Teacher Enhancement: EM-522 projects for K-12 teachers provide instruction in content and methodology for teaching environmental science and mathematics, provide stipends, travel expenses, and teaching materials to teachers to improve their instruction capability, and allow teachers to write and pilot curricula that improve teaching and learning.

Student Incentives: These EM-522 projects involve student camps, field trips, and classroom activities that give students an opportunity to better understand the need for mathematics and environmental science and their role in today's environment.

Curriculum Development: EM-522 projects provide for experiential projects and hands-on materials in environmental science, developed to compliment existing curricula and to address the cultural needs of underrepresented groups. Environmental science curricula across the country have had an impact on 5,500 teachers and over 150,000 students.
Organizational and Systemic Reform: These projects work toward redefinition and redesign of environmental science education. They involved greater participation from parents and communities in the educational setting in efforts to increase the support and success of the projects.

FY 1992 ACCOMPLISHMENTS

Outreach project accomplishments are grouped by the local DOE Field Office implementing the activities.

Albuquerque:

STUDENT INCENTIVES:

- In August 1992, thirty-two college and university students across the nation presented their technical research papers at Spectrum '92, a Nuclear and Hazardous Waste Management International Topical Meeting, in Boise, ID. All students are engaged in environmental studies at their respective schools. The technical papers were products of research done in DOE/EM funded environmental education programs, which included: the American Indian Higher Education Consortium; the Associated Western Universities; the Historically Black Colleges and Universities/Minority Institutions Hazardous Waste Materials and Waste Management Consortium; the National Hispanic Scholarship Fund; South Carolina Universities Research Education Foundation; the Summer Enhancement Achievement Readiness Program; and the Waste-Management Education and Research Constortium. Each student was awarded a $750 scholarship. The students were honored at a reception where awards for the best poster and best presentation were given.

- In the SWOOPE Radiation and Radon Unit, students measured concentrations in their homes and provided the data to the New Mexico Institute of Mining and Technology. The information will be used in a study by the New Mexico Environment Division at the Institute.

TEACHER ENHANCEMENTS:

- Students Watching Over Our Planet Earth (SWOOPE) activities included the establishment of an EPA/DOE SWOOPE joint pilot effort in Washington, D.C. Twelve teachers (elementary through high school - 10 being from the inner-city) participated in the three-day workshop that piloted the Water Quality Unit.

COMMUNITY OUTREACH:

- DOE-AL's project manager for the educational outreach program received several awards, including the New Mexico Distinguished Public Service Award, for his innovative activities in promoting environmental science and math in 10 rural New Mexico school districts. He has developed successful techniques for involving the parents, teachers, and leaders from the local community, as well as the news media, governor's office, and congressional representatives to play a stronger role in supporting math and environmental science education. His efforts have reached 432 teachers and 10,821 students in 45 schools.

Chicago:

STUDENT INCENTIVES:

- Under the Argonne ER/WM Educational Outreach programs, 19 schools were given small grants to purchase testing materials for environmental monitoring. These materials were integrated into the classrooms. Several schools began collecting data on streams in the Chicago area in collaboration with other organizations.

- Also in the Argonne area, a student/teacher organization called TURFERS (Teens/Teachers Urging Responsible Feasible Environmental Restoration) was created. A "TURFER" day was organized to carry out an environmental assessment and characterization at a site. This exercise integrated math, environmental science, writing and problem solving into a field trip.

- Argonne created a teacher's guide of ER/WM field trips and activities in the Chicago area. The sites listed in the guide included landfills, recycling centers, water treatment plants, incinerators, and other processing facilities. An accompanying video tape of the sites was included with the teacher's guide.

- Ames Laboratory administers the Problem Solving Through Innovative Thinking program. In FY 1992, twenty gifted and talented mid-Iowa school students and two Iowa high school teachers went to Iowa State University for a residential 4-week program in mathematics and environmental science. The Mathematics group studied iteration and recursion, graph theory, applied probability, and math/ecology interface. The Environmental group studied plant response to the environment, environmental issues, water quality, and habitat fragmentation.

- The Brookhaven National Laboratory (BNL) established linkages with Bronx and Suffolk County Community Colleges to offer a course in the fundamentals of environmental science for high school students. Bronx Community College (BCC) draws from a pool of students (99.9% minority) from six Bronx high schools participating in BCC's Liberty Partnership Program. The faculty were trained at BNL where they developed a syllabus for basic and advanced subject material. The environmental science course is currently being offered in BCC's "Fridays at the College" program.

- DOE signed an MOU with the National College Athletic Association, Fall 1991, to modify the National Youth Sports Program to include a math/science component. "Hands-on" math/science pilot programs were conducted at 16 sites which were selected from 31 proposals. During 1992, 6,963 students, mostly identified through the summer program via outreach programs in the school and community-sponsored youth groups, participated in the math/science program. All projects were required to plan and implement 10 hours of instructional activities with an emphasis on environmental sciences and with explicit attention to balancing information with skills building. The program is staffed by college/university instructors, elementary/secondary teachers, undergraduate students, and parents.

Fernald:

STUDENT INCENTIVES:

- Fernald Environmental Management Project (FEMP) personnel from Environmental Monitoring provided hands-on experiences for high school seniors as part of the "Super Science

Saturday" program. The experiences were based on sampling techniques in a hazardous environment. FEMP also directed one day of activities for the "Science, Technology, Environment and Me" Camp. The camp included 120 students.

TEACHER ENHANCEMENTS:

- In FY 1992 under the Partners for Terrific Science program, FEMP sponsored four regional teachers to participate in Industrial Application Workshops, hosted three summer teacher interns at the FEMP, and participated in several of the student components of their multi-faceted program. The program is designed to combine the talents of industrial scientists, engineers, and chemical educators to improve science education.

- In FY 1992, under the Chemical Education for Public Understanding Program (CEPUP) (a diverse educational program that highlights the societal issues related to chemical usage), lead teachers, representing the Cincinnati Public Schools, the Archdiocese of Cincinnati, regional suburban schools, and regional private schools initiated a program for conducting in-service training for teachers from the tri-state area (Ohio, Kentucky and West Virginia). The in-service trainings on "Investigating Groundwater" and "Solutions and Pollutions" are funded by local industries, FEMP and the U.S. EPA. The program has reached a total of 280 teachers from over 200 schools in the tri-state region.

Idaho:

STUDENT INCENTIVES:

- The Madison School District of Rexburg, ID and four partners (Madison Memorial Hospital, Upper River Valley Medical Society, and the Idaho National Engineering Laboratory) conducted four science camps for approximately 100 sixth and seventh grade students.

- The 1992 Budding Scientist Pilot Program included students from 13 Idaho high schools. As a class, the science students took water samples for nine different water quality tests and compared their results with those from other schools throughout Idaho.

- A Regional Science Bowl, a cooperative effort to motivate and reward students excelling in science and mathematics and sponsored by DOE and Cray Research Foundation, was held at Seneca Valley High School in Germantown, MD. As winners of the Regional Science Bowl, a Rockville High School team represented the state of Maryland at DOE's National Science Bowl in April 1992, where they competed against winners of 29 other regional science bowl held at various DOE research facilities. The Rockville, MD team was extraordinary because they won the regional science bowl without the aid and direction of a coach. Their motivation and desire to learn spurred them on to victory.

TEACHER ENHANCEMENTS:

- "Teachers Teaching Teachers" (T3) is a physical science workshop taught by secondary teachers to their elementary school (grades 4 through 6) peers. In FY 1992, they developed a curriculum consisting of 130 hands-on experiments and a box of accompanying lab equipment. All participants received the curriculum and lab box. Since the project has been so successful in Idaho, it was also implemented in Colorado and is currently under consideration for implementation in other states.

COMMUNITY OUTREACH:

- Native American students on the half million acre Fort Hall Indian Reservation in Idaho participated in the Fort Hall Summer Science Camp. They worked with a hydrologist and an attorney and began an ongoing water quality program to supply data from the reservation to several local, state, and Federal agencies.

Nevada:

STUDENT INCENTIVES:

- Under the Science and Technology Education Program (STEP), EM-522 funded the development of a technology lab. The lab is designed to provide students with hands-on experience and exposure to physical science, biotechnology, and information and communications technology. In FY 1992, the lab hosted 1,048 visitors from over 20 different states, including Alaska. As an outgrowth of this lab and others like it, AB 103 was passed in the state legislature and was signed into law by the governor in Nevada. The law makes technology education mandatory for all seventh and eighth grade students in the state of Nevada.

Oak Ridge:

STUDENT INCENTIVES:

- In support of the K-6 Science Awareness project, personnel from the American Museum of Science and Energy and from the Oak Ridge National Laboratory visited over 300 classrooms at schools within a 90-mile radius of Oak Ridge, Tennessee. Museum staff work in conjunction with ORNL to develop and present the programs, which were based in the ecological and physical sciences. The science programs were directed toward classes with 25 to 30 students in rural and inner-city schools.

- Ten student/teacher teams from three high schools were appointed to the Clinch River Environmental Studies Organization (CRESCO) in FY 1992. The teams began gathering baseline data for use in the development of a 130-acre site (including a former landfill) into a long-term wildlife sanctuary and environmental study center. The ten initial projects included: measurements of reptile abundance and diversity; use of amphibian eggs as an indicator of water quality; surveys of small mammals, herbaceous flowering plants, ferns and woody plants, bird and butterfly censuses; collection of pond life and snails; and civil, geological, and soil surveys.

- Twenty high school juniors and seniors were appointed for a 10-week summer term under the Summer Educational Experience for the Disadvantaged (SEED) project. They participated in "hands-on" study experiences at ORNL in the research divisions. Besides conducting independent research projects under the guidance of staff mentors, the students attended a weekly career/education seminar and prepared formal research reports for review by their advisors.

TEACHER ENHANCEMENTS:

- Eight junior and senior high school teachers received appointments under the Teacher Summer Research in Environmental Management Project to engage in ongoing environmental research at ORNL. While at the lab for eight weeks, the teachers collaborated with senior scientists on projects that specifically related to environmental restoration and waste management. The appointees were all teachers of educationally disadvantaged and under-represented students from the Appalachian regions.

Richland:

STUDENT INCENTIVES:

- In the OPTIONS Pipeline Support/ Magnet Awards and Internships program, twelve awards were given to nontraditional, multicultural students, predominantly Native Americans, attending Columbia Basin College. The students are studying science or technical topics in preparation for careers in environmental restoration and waste management fields. Based on satisfactory progress, the awards will be extended from year to year. During Summer 1992, six of the twelve were placed in paid summer internships at the Pacific Northwest Laboratories.

TEACHER ENHANCEMENTS:

- In FY 1992, six workshops for middle school teachers were conducted under the OPTIONS in Science, Engineering, and Technology program. The workshops are designed to prepare the teachers to teach content and skills that are essential as a foundation to the science, engineering, and technology that are required for participation in environmental restoration and waste management. The workshops focused on two topics: 1) environmental sciences and engineering, and 2) materials science and technology. This program was a continuation of FY 1991 OPTIONS.

COMMUNITY OUTREACH:

- In October 1991, Admiral Watkins made a commitment to provide educational assistance to tribal schools and to initiate a pilot adult education/training program leading to meaningful employment opportunities at Hanford. In response to Admiral Watkins' commitment, eleven Native Americans were hired in FY 1992 through the Native American Employee Training Program. An employment workshop for the Nez Perce Tribe was successfully completed. A number of employment applications were submitted at the workshop for review. Of two Yakima candidates who were interviewed, one was selected for a drafting training program specifically developed for the Native American Program.

Rocky Flats:

STUDENT INCENTIVES:

- In FY 1992 in the Rocky Flats area, an Environmental Club, honors Chemistry students, teachers, and a Denver-area high school spent six weeks reviewing and evaluating DOE's 737-page ER/WM Five Year Plan for FY 1993-1997. The comments were sent to DOE Headquarters and used in the creation of the Student Version of the DOE ER/WM Five-Year Plan for FY 1994-1998 by DOE summer interns. The document review process included several briefings by Rocky Flats scientists and a tour of the Rocky Flats Plant.

- Rocky Flats funded two technology center grants to open Technology Education Laboratories at Adams County District 50 and Adams County District 12. These Laboratories, in conjunction with school districts and area corporations, provide centers for students to learn the concepts underlying technological systems in a setting fostering self-motivation and potential career opportunities. The Adams 50 laboratory, a pilot program to redesign a vocational education woodworking lab into a modern exploratory technology center, opened in April 1992 and has impacted about 700 middle

school students and 5 teachers. The laboratory at Adams District 12, in the second phase of a program begun in 1991-1992, allows high school students at the Bollman Occupation Center to explore technology occupations, such as environmental science and energy laboratories.

- Rocky Flats was a major sponsor for the "Expand Your Horizons Conference" held in October 1991 in Denver, CO. Approximately 280 students and 56 adults attended the one-day event. The purpose of the conference is to encourage sixth through ninth grade girl students to pursue careers in math and environmental science. Seventy-seven student and adult workshop presentations were given, including several by Rocky Flats personnel.

- In FY 1992, Rocky Flats supported two minority sponsored career expositions. "The Annual Career Information Expo" was sponsored by the Colorado Society of Hispanic Professional Engineers and Scientists (CSHPES). One hundred and thirty students participated in the CSHPES expo. "Expanding Your Visions" was sponsored by Metropolitan State College in Denver, CO and was targeted for young African-American males. Seven hundred students (grades six to twelve) attended the "Expanding Your Visions" expo.

TEACHER ENHANCEMENT:

- In late FY 1992, 30 teachers participated in the Denver Earth Sciences Project in the Four-Corners area of Colorado/Utah. Rocky Flats funded the groundwater kits that were used to train the teachers on teaching groundwater curriculum. The teachers also received kits with experiments to take home.

San Francisco:

STUDENT INCENTIVES:

- The National Hispanic University (NHU) completed the first term (K through grade 6) science workshops. The workshops delivered hands-on science experiments to enhance the learning of science as it relates to the environment. The experiments were developed for a bilingual classroom environment. NHU has finalized the curricula for grades 3 and 4. The University has also institutionalized the curricula that were developed by offering four new courses at its Department of Education. One such course is entitled "Developing Concepts in Bilingual Environmental Science Education." The University is continuing the development of curricula for grades 1 through 6. The parents continue to grow in their enthusiasm and involvement in the program.

- The American Indians Young Scholars (AIYS) Program, a cooperative effort funded by DOE and implemented by D-Q University, has an overall retention rate of 98 % for students in the program. In FY 1992, D-Q University developed and completed ERWM materials for the AIYS project and disseminated the materials to the American Indian Education Centers. D-Q University provided technical assistance to the Saturday Academics to deliver workshops in learning skills development, local community waste management and disposal practices, and tribal policies related to environmental issues. The Saturday Science Academy Program, which emphasized environmental science and math concepts, was regularly attended by 75 students from six of the Education Centers.

- Also in Summer 1992, 29 Native American students in grades 9-12 attended the Environmental Science Camp at D-Q University. The Summer Program includes the Mentoring, Tutoring, and Internship Program which offers tutoring n Environmental Restoration and Waste Management-related subjects as well as mentorship and internship programs.

Savannah River:

STUDENT INCENTIVES:

- Approximately 30 minority students attended the second six-week Math Excellence Workshop. The students had been accepted engineering or science students, but they lacked the math skills required for successful college work. They were also given the regular course Mathematics 105, which includes algebra and trigonometry, for college credit. A math workshop/tutorial was also included in the course. The success of the course was demonstrated by the success of the students in completing Math 105 during the summer period with scores that were significantly higher than their peers who did not attend the Math Excellence Workshop.

TEACHER ENHANCEMENTS:

- Members of an ER/WM sponsored course "Earth Science for Elementary Teachers" received two of eight National Science Teachers Association national awards in multi-media instruction. The course, held at the University of South Carolina at Aiken, included instruction in interactive multi-media techniques as well as material on basic earth science.

VIII. EVALUATION

Evaluation activities provide the documentation needed to determine the appropriate management and direction of programs required to meet EM's resource needs for the current and future workforce development. More specifically, EM-522's evaluation activities are carried out with the purpose of (1) identifying successful projects; (2) determining why successful projects work; (3) identifying actions to allow for continuous improvement; and (4) developing data for use in overall program optimization.

EM-52 is developing a comprehensive evaluation strategy to monitor and frequently assess the effectiveness of both programs and individual projects by internal and external experts. The major goals of EM-522's evaluation strategy are to (1) provide information on how to best structure project evaluation activities; (2) provide assistance on how to accomplish the technical requirements of an evaluation; (3) achieve a high quality of EED program evaluation while containing costs; and, (4) foster coordination and collaboration among those involved in DOE evaluation. These goals will be implemented at three different levels: element, project, and program.

The program assessment technique currently in place is an external program review panel.

EM-52 Peer Panel Review

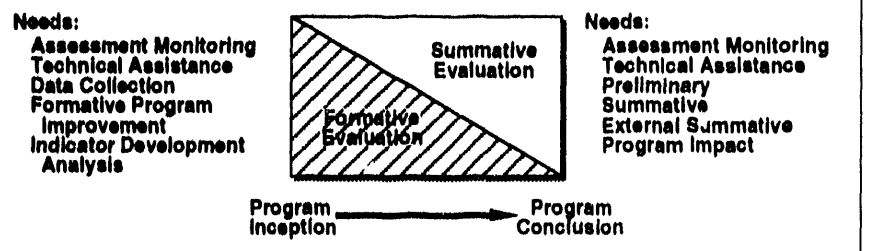
The purpose of the peer panel review activity is to provide a systematic assessment of program coverage and delivery and to provide rapid and continuous feedback about EM-52 projects. The objectives of the peer panel review process are:

1) To provide adequate program monitoring to determine the extent that EM-52 programs are being implemented as intended;

2) To determine the extent in which a given program is reaching the appropriate target population;

3) To estimate the effectiveness and benefits of these programs;

4) To provide a cost-effective approach that will provide Headquarters with important feedback about their programs from experts that have no connection to these programs;



Evaluation Activities During the Life of the Program

5) To obtain immediate recommendations on how the various programs can be improved; and

6) To provide the necessary follow-up on the panel's recommendations and take the appropriate action steps to improve the programs and the overall evaluation activities.

The recommendations provided by the panel are used by program managers and Headquarters staff to improve their EM-52 programs, to increase overall coordination of programs, and to strengthen the overall evaluation function. Although EM-52 may not accept all panel

recommendations, they are required to respond in a memo of record to all recommendations and issues that are identified by the panel.

FY 1992 ACCOMPLISHMENTS

In FY 1992, EM-52 conducted two separate peer panel reviews on educational activities.

- **Pre-College (K-12 Outreach) Programs.** In May 1992, a three-member panel reviewed selected Pre-College K-12 Outreach programs. The purpose of the review was to obtain general observations and recommendations concerning project quality, focus, cost, and evaluation for use in project improvement and planning. The panel categorized the projects as teacher enhancement projects, student enhancement projects, and minority projects.

  In summary, the panel was impressed with the overall commitment and quality of the educational projects. Their recommendations were aimed at improving the design and implementation of the projects, the effectiveness of DOE coordination of the projects, and evaluative evidence of project impact.

- **Academic Partnership Programs.** In June 1992, a review of the three academic partnership programs (SCUREF, HBCU/MI, and WERC) by a three-member panel was organized and conducted by the Environmental Education and Development Division of DOE's Albuquerque Operations Office. None of the reviewers had direct connections with either DOE or the universities and colleges in the DOE partnerships.

The programs within the Academic Partnerships were categorized by the populations reached and the types of activities conducted. The population-based programs were categorized as pipeline, current workforce, and environmental literacy. The activity type-based programs were categorized as: 1) faculty development, post-secondary education and training; 2) outreach; 3) recruitment/retention; and, 4) technology transfer. Since the Partnerships develop their own priorities for the categories, the review panel based its evaluation of the programs on the quality of the activities in each area.

The panel concluded that DOE's efforts to develop human resources and a knowledge base for ER/WM activities are laudable and that such efforts should be continued and expanded. They praised DOE's efforts to enhance minority and underrepresented participation in the ER/WM field and recommended that the efforts be expanded through the use of models developed at other Federal agencies, such as NIH, NSF, and NASA. The panel also concluded that DOE's educational programs could provide models to other Federal agencies to (1) promote post-secondary education in areas of defined national need and (2) enhance participation by minority and underrepresented groups by documenting and transferring their experiences in these programs.

Twelve recommendations were made specifically for the SCUREF Program. Nine recommendations were given for the HBCU/MI Program and nine for WERC. The panel also provided three recommendations for the overall program.

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