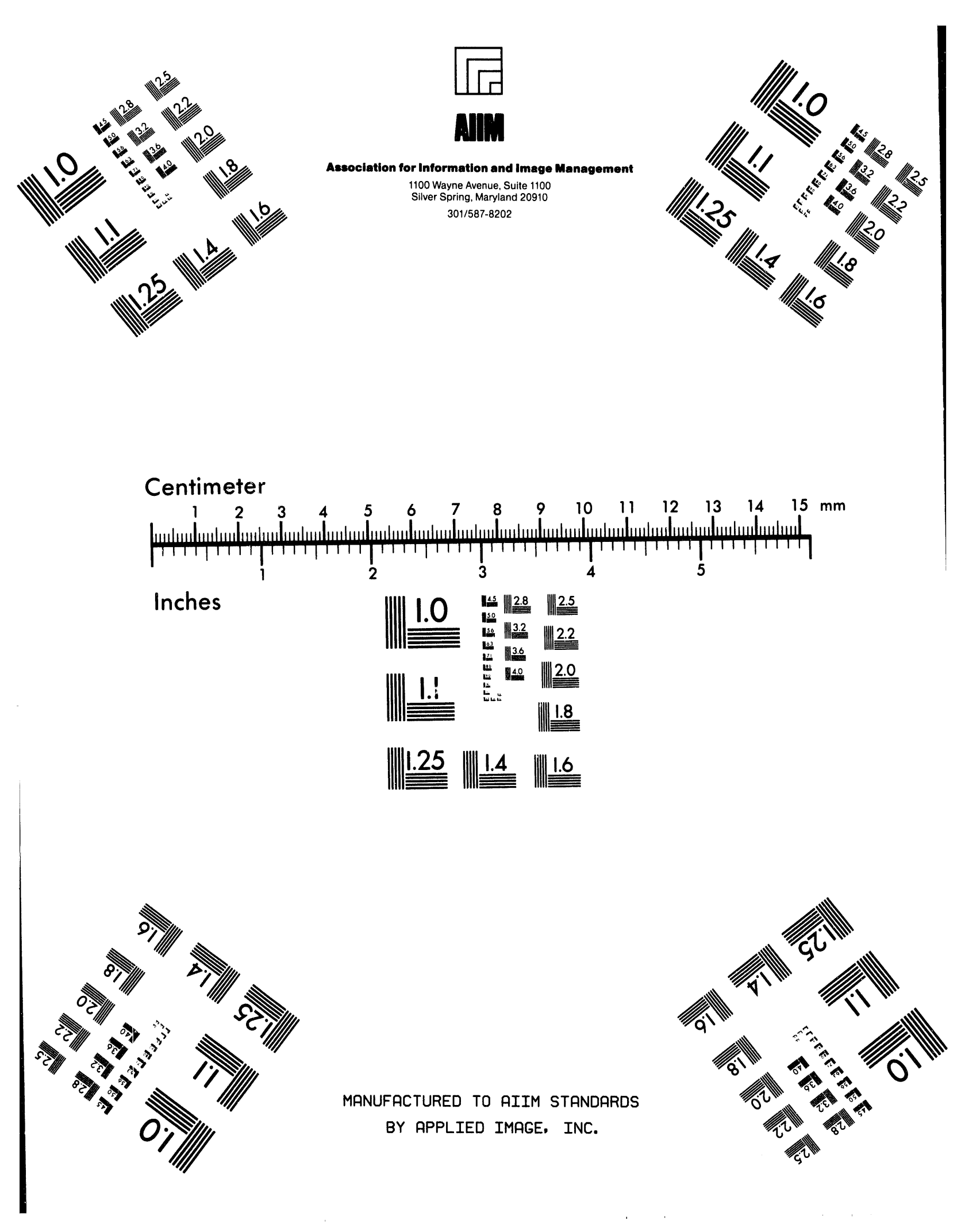
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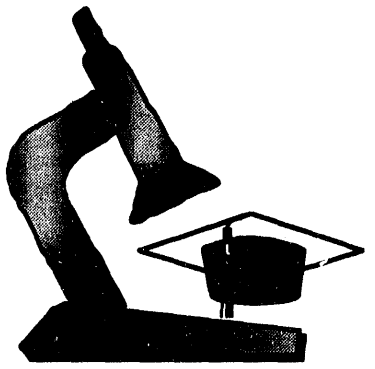
U.S. Department of Energy
Office of Environmental Restoration
and Waste Management
Office of Technology Development

ENVIRONMENTAL EDUCATION AND DEVELOPMENT DIVISION (EM-522)



Fiscal Year 1993

ANNUAL REPORT

Office of Technology Integration and Environmental Education and Development

MASTER

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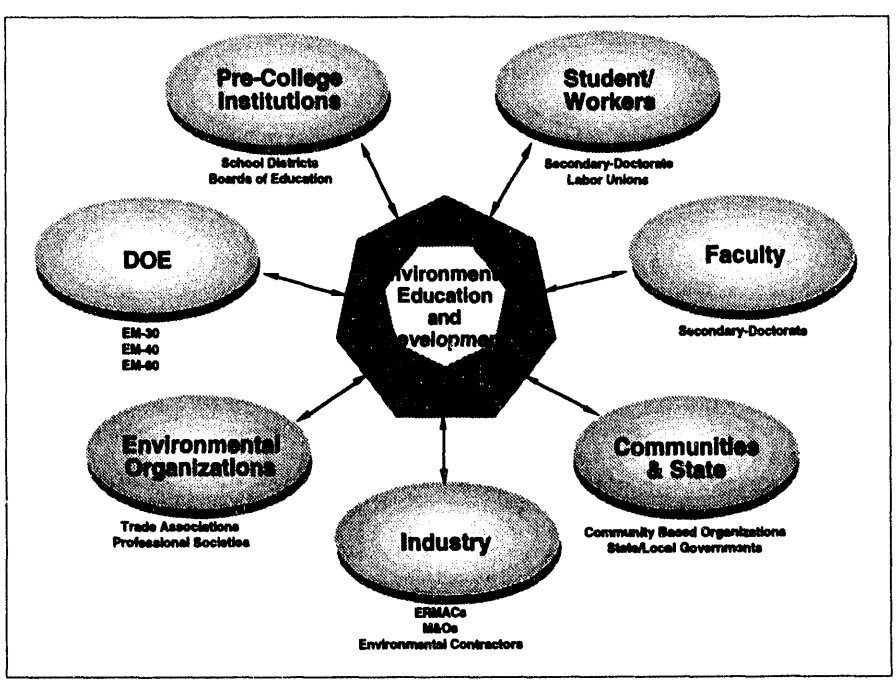
The Environmental Education and Development Division (EM-522) is one of three divisions within the Office of Technology Integration and Environmental Education and Development (EM-52) in Environmental Restoration and Waste Management's (EM's) Office of Technology Development (EM-50).

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 capabilities 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 underrepresented groups, to meet the demands entailed by EM's goal.

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, the Office of Technology Development (EM-50) has the specific mission of ensuring 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 EM 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 underrepresented groups as they will constitute a greater proportion of the emerging workforce. EM,therefore, needs programs and approaches that are successful and innovative in reaching demographically and culturally diverse populations.

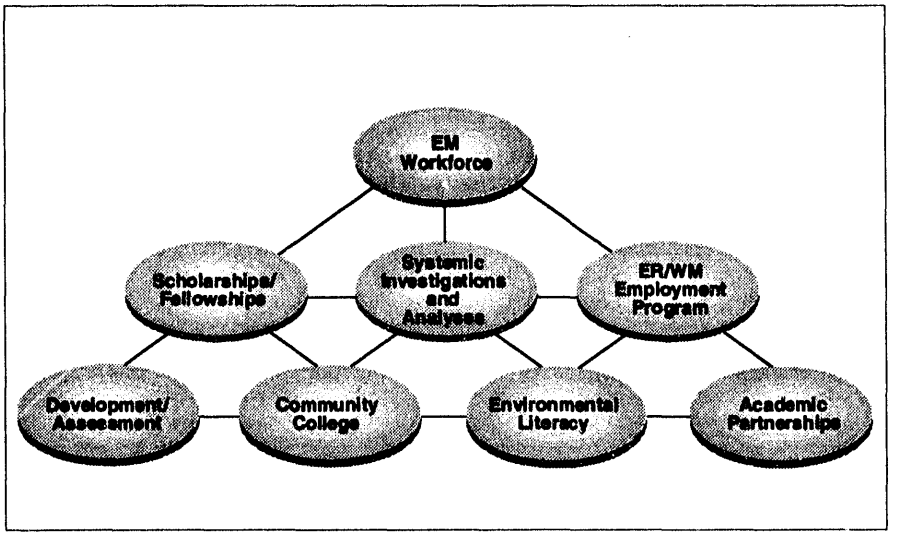


EM-522 Customer Base

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 education and training 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) authorizes the Secretary of Energy to establish a program for 20 scholarships and 20 fellowships to enable individuals to qualify for employment in DOE's EM program.



EM-522 Program EM Workforce Pyramid: Interrelated programs are designed to supply and maintain a workforce trained in EM technology and management skills.

The EM's training authority is derived from the Occupational Safety and Health Act (OSHA) of 1970 (PL 91-596), as well as the Environmental Protection Agency Regulations on Personnel Training (40 CFR 264.16), the Environmental Protection Agency Regulations on Permit Applications (40 CFR 270.14), and the Hazardous Waste Standard (29 CFR 1910.120).

In addition to legislated initiatives, federal regulations, and mission statements, EM's education and training programs are supported by the Secretary of Energy through Secretarial Notices and DOE Orders. 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 training mission is accomplished through DOE Order-4310.1B (Training), DOE Order-5480.18A (Accreditation of Performance-Based Training for Category A Reactors and Nuclear Facilities), and DOE Order-5480.20 (Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities).

Goals

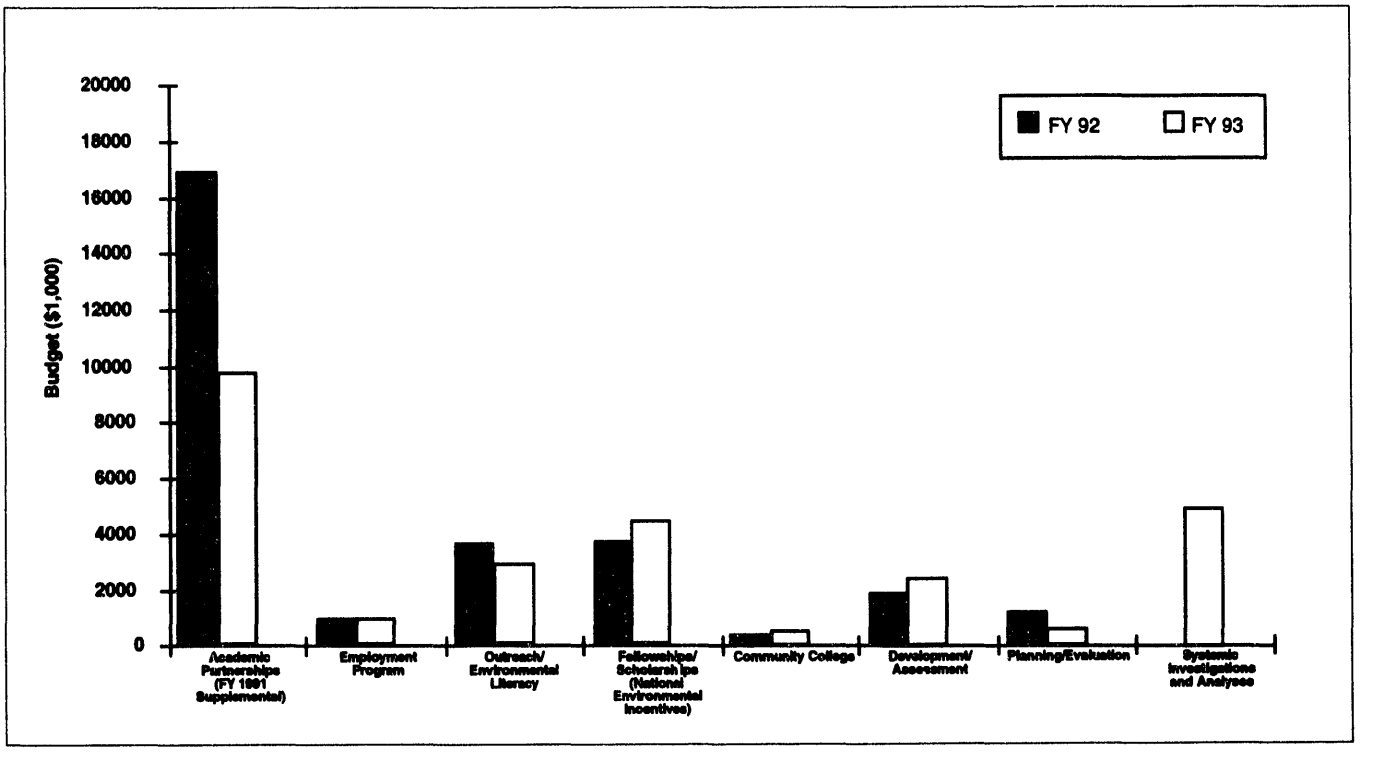
EM-522 has immediate and intermediate goals for meeting EM's 30-year goal. The most immediate goal is to assess the EM workforce for current and near-term demands for people appropriately trained and educated to achieve EM's mission. EM-522 must then take actions to create an adequate manpower supply.

FY 1993 Activities

PROGRAM REVIEWS. EM-522 participated in the EM-52 Mid-Year Program Review on April 6-7, 1993 at the Holiday Inn Crowne Plaza in Rockville, Maryland. EM-522 also held Mid-Year Sub-Program Reviews and Working Sessions for the Scholarships/ Fellowship Program (May 6-7, 1993 in Washington, DC), for K-12 Outreach/ Environmental Literacy Program (May 26-28, 1993 in Lakewood, Colorado), and for the Academic Partnerships Program (June 15-16, 1993 in Rockville, Maryland). The Program Reviews provided DOE Headquarters and Field Offices, as well as Principal Investigators, with the opportunity to fully interact, exchange information, make contacts, and understand the directions of EM-522's programs within the framework of DOE's mission and needs.

RETREATS. EM-522 Headquarters Staff and Contractors participated in an Education Retreat on January 12-13, 1993 at the Stouffer Harborplace Hotel in Baltimore, Maryland. The purpose of the retreat was to focus on team building, understand expectations for 1993 programs, identify goals/accomplishments for 1994, and clarify roles and responsibilities of federal personnel and support contractors.

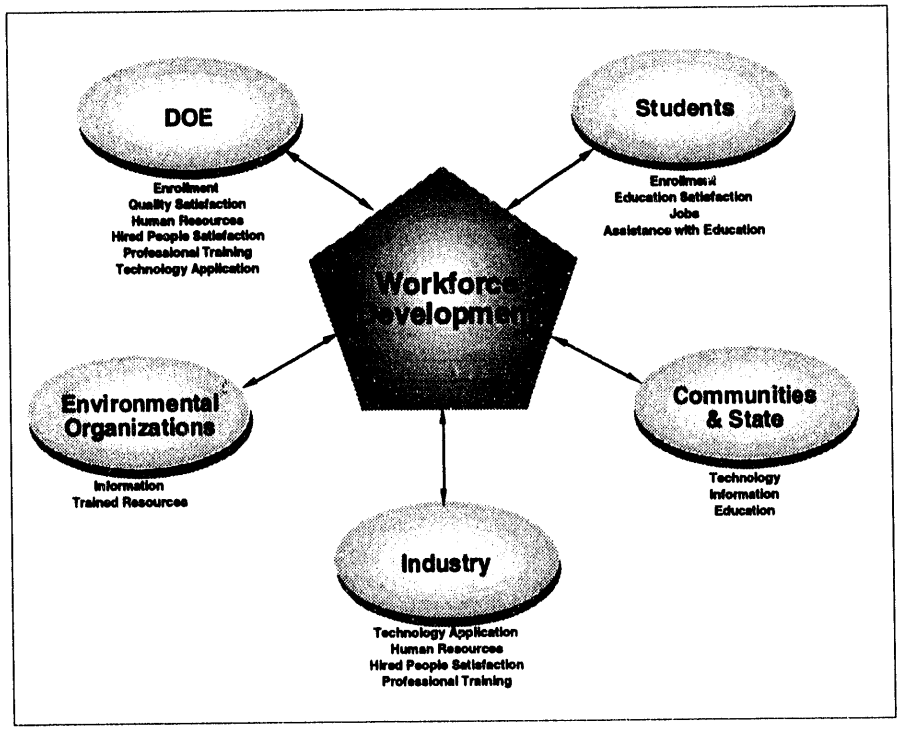
A DOE/EM-52 Field/Headquarters Retreat was held on April 8, 1993 at the Holiday Inn Crowne Plaza in Rockville, MD following the EM-52 Mid-Year Program Review. The purpose of the retreat was to determine and agree on the role of the Field Offices, to provide an opportunity for Field Office input for FY 1995 programs, and to create new ideas for providing more realistic information on workforce needs.



Overview: Elements of the Program

Development

The Department of Energy (DOE) has made a commitment to bring its facilities into compliance with regulations and to restore the environment of sites under its control by the year 2019. Responsibility for accomplishing this goal is vested with the Office of Environmental Restoration and Waste Management (EM). Concerns regarding the availability of workers with the necessary technical skills and the prospect of retraining workers from other programs within DOE or other industries are addressed by several EM organizations including the Division of Environmental Education and Development (EM-522). EM-522 addresses these concerns under two main program elements: development and assessment. The goal of workforce development and assessment is to promote the development, retention, training, and retraining of the EM workforce for full implementation of the EM mission.



Workforce Development Customer Base

The focus of the Development program element is to ensure skilled EM workers. The goal of this program element is to provide information and follow-up workforce planning processes to identify current and/or evolving needs of the EM workforce. In FY 1993 there were four functions of the Development program element: 1) to support workforce planning efforts, focusing on sites to provide the human resources supportive of EM activities; 2) to develop projects that engage educational communities and public/private organizations in joint efforts to authenticate EM worker skills; 3) to recommend and develop interventions to promote the hiring and career development of women and minorities in the EM workforce to ensure diversity and quality; and 4) to participate in and support efforts to coordinate workforce development with the Department of Defense, the Environmental Protection Agency, the Department of the Interior, state governments, and industry.

WORKFORCE STUDY COMPARISONS

In FY 1993, the first function of the Development element, workforce planning efforts, centered around a report on workforce study comparisons. This report, "WorkforcePlanning for DOE/EM: Assessing Workforce Demand and Supply", examined five studies that provide a bank of data to facilitate EM's planning. However, these data are not directly comparable because the sponsoring organizations had different concerns, missions, and options available to them. The workforce studies varied considerably in terms of the occupations they studied, the time frames they

examined, and the questions each was to answer.

The studies examined in the report were:

- DOE-EM Roadmaps Human Resource Projections sponsored by DOE-EM-14,
- Environmental Restoration and Waste Management Manpower Needs Assessment Study (MNAS; Holmes, Lewis, Hunt, and Finn, 1992) sponsored by DOE-EM-522,
- Educational Needs and Employment Trends of Environmental Hazardous Materials Technicians and Related Workers (EHM Tech; Hudis, Garland, Matlof, and Vork, 1992) co-sponsored by the Department of Education Office of Vocational and Adult Education and the DOE Office of Contractor Human Resources,
- Hanford Site 30-year planning exercise (Hanford 30-year), and
- Environmental Restoration and Waste Management: An Occupational Assessment for the Oak Ridge Area (ORAU).

[redacted]

The report, "Workforce Planning for DOE/EM: Assessing Workforce Demand and Supply", was completed in FY 1993. The study addressed several workforce concerns. First, various workforce projections relevant to EM occupations were compared to determine common findings and to resolve inconsistencies. Second, case studies, interviews, and published data were used to examine the potential availability of workers for these occupations due to occupational mobility rates and training/retraining options. Third, demand and supply factors were integrated in a framework useful for structuring workforce analyses. The analyses demonstrated that: (1) workforce skills are not anticipated to change due to the mission transition; (2) science, engineering, and technician occupations tend to be mobile within and across occupational categories; and, (3) experience and on-the-job training are more crucial than education to the issues of worker supply.

TRADE - EM SIG

The Training Resources and Data Exchange (TRADE) Environmental Management Special Interest Group (EM SIG) meets the requirements of the second Development function. The purpose of the EM SIG is to focus on the environmental training needs and resources of the DOE system in order to improve DOE environmental management programs by emphasizing excellence rather than compliance only and to encourage reliance on training as a tool to improve performance. The EM SIG facilitates the identification of compliance, competence, and excellence levels of DOE training efforts. It assists in the integration of environmental training with complementary requirements. The EM SIG produces training products to meet DOE system needs for today and tomorrow by ensuring that the products will be:

- technologically sound,
- technically correct,
- cost-effective,
- recognized as meeting the need of corporate and contractor management, and
- complementary to DOE initiatives.

[redacted]

The Environmental Management Special Interest Group (EM SIG) held its annual Spring Workshop on May 13-14, 1993 in Augusta, Georgia. The plenary session of the workshop, "The Changing DOE Complex: Tools for Transition in the 90's," featured two speakers, Jim

Landers, DP-51, and Larry Ferris, EG&G Rocky Flats, technical advisor to Leanne Smith, EM-64. Both presentations focused on mission transition issues related to the implementation of Section 3161 of the National Defense Authorization Act of FY 1993, bringing the perspectives of both DP and EM to light.

The EM SIG held a strategic planning meeting in Gaithersburg, Maryland on August 11, 1993. Participants attending the meeting represented the general SIG membership, the SIG steering committee, and DOE Program Offices EM-10, 40, 50, EH-20, and PR-15. The purpose of the meeting was to examine the validity of the mission of the SIG in light of the changing nature of the DOE Complex, and to develop a three year strategic plan.

During FY 1993, the EM SIG updated its products. Because environmental management is an area heavily influenced by laws and regulations that have special vocabularies, the EM SIG deemed a training reference manual to be a valuable first product to be updated every year. The manual contains:

- a glossary of environmental management terms,
- a regulatory baseline of personnel training requirements in federal regulations and DOE Orders, and
- a matrix for identifying necessary training for workers whose tasks have environmental implications.

The Instructional Resources for Environmental Laws and Regulations, a six volume set of training resource materials covering the major environmental laws, was updated by the EM SIG in FY 1993. Also, the EM SIG members at Hanford and Oak Ridge developed and piloted the Reciprocity Training Program and a site/facility access program, sharing their work with other interested EM SIG members.

HAZWOPER (Hazardous Waste Operator) issues and concerns crosscut many TRADE SIGs. In FY 1993, the EM SIG organized a HAZWOPER taskforce, whose membership included three other SIGs: Emergency Management Information, Industrial Hygiene, Radiation Protection, and Occupational Safety. The taskforce met as needed by conference call to discuss HAZWOPER issues and to share solutions to problems. The taskforce produced a matrix of HAZWOPER issues and concerns for EM-40's consideration in the development of the new HAZWOPER order.

ENVIRONMENTAL WORKFORCE STUDY

The Environmental Workforce Study is under the third function of the Development program element. EM's Office of Technology Integration and Environmental Education and Development (EM-52) has a long term strategy to assess EM's current workforce knowledge, skills, and abilities (KSA) requirements. In support of this strategy, it was determined that the DOE, its supporting education and training groups, as well as the environmental industry would benefit from additional data on projected EM workforce needs.

A preliminary survey was directed by the Executive Committee of the National Congress for the Advancement of Minorities in the Environmental Professions (NationalCongress) to be conducted to identify prospective environmental industry workforce requirements (new hires) and their supporting academic degree prerequisites. The data was intended to enhance the National Congress planning and policy processes.

This study, conducted by Basic Technologies International (BTI) in April 1992, reported a suggested trend towards

a greater demand for higher degrees in the year 2003, with the largest increase expected in the Ph.D. category. The trend suggested that demand for new hires with only a Bachelor's degree will shrink significantly over the same period. The survey included eight responding corporations with a total employee workforce of 96,339 employees. Industry identified more environment-oriented occupational specialties over the next ten years than the scope of science and engineering programs presently offered by U.S. academic institutions.

Data in the June 1992 study, "Environmental Restoration and Waste Management Manpower Needs Assessment Study" (MNAS; Holmes, Lewis, Hunt, and Finn, 1992) sponsored by DOE-EM-522, suggested that the skills mix needed to accomplish the DOE's environmental restoration and waste management (ERWM) mission will not differ markedly from the ones presently in existence within the DOE complex. The study also suggested that staffing and retention difficulties are due less to a lack of supply and more to organizational and institutional barriers.

[redacted]

DOE Staff and EM contractor human resources personnel from Hanford, Washington, Rocky Flats, Colorado, and Headquarters met June 24-25, 1993 in Seattle, Washington at a Focus Group A meeting to review and finalize the draft of the Education, Training, and Professional Development(ETPD) Profile Data Collection Tool, one key component of the multi-phased study. The data collection tool will be used to develop an accurate profile of the education, training, and professional development of the DOE/Contractor workforce at selected DOE sites: Hanford - Richland, Washington and Rocky Flats - Golden, Colorado. Participants at the Focus Group A meeting also refined and critiqued the data collection methodology and quality control mechanisms, and refined and critiqued the data analysis plan and report format.

FFEII - ATS

The Environmental Protection Agency and the Departments of Energy, Defense, and Interior are involved in a process, the Federal Facility Environmental Improvement Initiative (FFEII), to identify and overcome the barriers that inhibit a speedy realization of EM goals in the cleanup of Federal Facilities. The Accelerated Training Subgroup (ATS), one of four subgroups in the Environmental Restoration Workgroup of the FFEII, is co-chaired by DOE/EM-52 and EPA. The ATS is an example of the fourth function of the Development program element.

[redacted]

The ATS met quarterly in FY 1993 (November, March, May, August) to exchange ideas among the member agencies and to inform participants of the major environmental training developments in their agencies. Agenda items included detailed briefings on each agency's environmental education and training programs and on collective electronic training data bases and bulletin boards.

The central effort of the ATS in FY 1993 was the creation of an electronic bulletin board system to list the environmental training resources of potential interest to all agencies. The base for the system is CLU-IN, theEPA's Cleanup Information Bulletin Board. A Special Interest Group (SIG) was formed with representation from the training community of each agency to compile a listing of pertinent training information. In accordance with EPA procedures, the information base is open to the public through subscription, thereby increasing its utility as a mechanism to enhance the flow of training information. The need to

duplicate the information in the public sector is minimized because the training resources are available to a much wider audience of users, thus capitalizing on the effort already paid for by tax dollars.

Assessment

The focus of the Assessment program element is to identify skills and training needed by the EM workforce. The goal of this program element is to identify the skills needed by EM workers to perform current and future jobs, and to identify the training necessary to provide those skills. In FY 1993, there were two Assessment program functions: (1) to support data gathering and analysis functions by conducting workforce needs assessments; and (2) to establish baseline data on education, training, and professional development.

TRAINING NEEDS ANALYSIS

One of EM's priorities is to develop training programs that address the skills and knowledge needs to accomplish the EM mission. This priority addresses the changing DOE mission, 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. 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 programmaticareas to have the knowledge and skills to function effectively.

In support of the mission of EM's Office of Technology Development, EM-522 establishes programs to ensure that the number and skills mix of employees are adequate for the level and scope of DOE's waste management and cleanup activities. Toward this end, EM-522 has completed an initial EM workforce analysis to identify current and expected staffing needs in selected occupations. The analysis will facilitate the development of policy decisions related to ensuring an adequate supply of personnel to accomplish EM's mission. Based on the findings of this and related studies conducted by EM, an analysis of the training needs of current and projected staff was planned to ensure that training programs for current staff, new hires, and staff transitioned from other programmatic areas impart the knowledge and skills these employees need to function effectively. This training needs analysis was conducted by the Oak Ridge Institute for Science and Education (ORISE).

FY 1993 ACCOMPLISHMENTS

Documents describing problems and issues relevant to the EM mission were selected from recommendations of DOE and contractor personnel, including ORISE personnel who conduct related analyses for other DOE offices. Documents analyzed for this study included reports from DOE Tiger Teams, the General Accounting Office, and the Office of Technology Assessment, as well as internal DOE and contractor studies and periodicals, such as the Operating Experience Weekly Summaries.

In FY 1993, approximately 5200 problems were identified in over 150 documents and entered into a database. These problems were sorted into three areas: those issues that involved training practices and administration issues; those that involved problems with thecontent of training programs or lack of training programs; and, those that were regulatory noncompliance training issues.

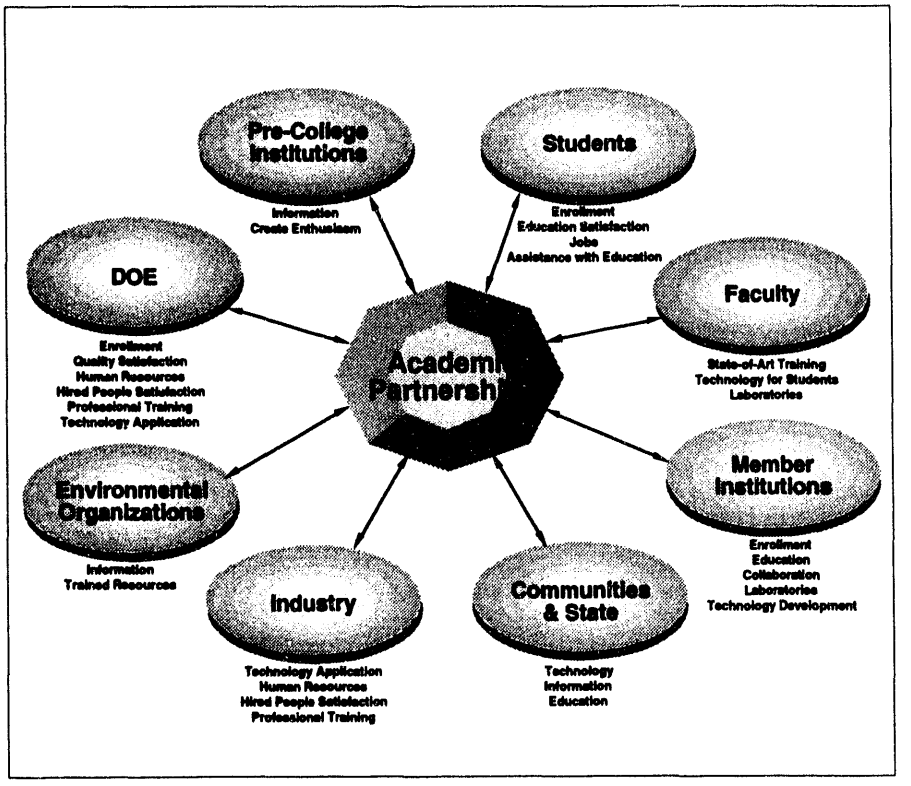
In the training practice area, the majority of issues identified were in training programs (35%), followed by

performance-based training (29%), and training administration/organization (26%). The problems and issues in training programs were lack of formality, cross training, general employee training (GET), job-specific training, lessons learned, on-the-job training, retraining/ remedial training, and subcontractor/ visitor/vendor training. The key tenets of performance-based training most often found lacking included: analysis, training design and development (training plans, lesson plans, performance objectives, and materials/equipment), and training evaluation (examinations and drills and exercises). In the area of training administration/organization, problems and issues included: centralization, definition, policy and procedures, updating, training resources, and training program oversight.

Of the training content issues identified, the majority involved safety and health (45%), followed by environment (21%). The problems and issues of safety and health included: confined space, electrical safety, lockout/tagout, fire protection, laboratory safely, personal protection, toxic and hazardous chemicals, construction safety, radiation protection, and transportation. The problems and issues focused on environmental restoration and compliance included: waste management, environmental data collection, waste minimization, emergency response, and environmental technologies.

In terms of the regulatory noncompliance training issues, reviewers identified broad deficiencies in training programs that arose from inadequate understanding or application of regulatory requirements. Of the training practice issues identified, the majority of theregulations cited were DOE Orders (62%) followed by other federal regulations (35%). Of the training content issues identified, the majority of the regulations cited were other federal regulations (59%) followed by DOE Orders (34%).

Academic Partnerships 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:

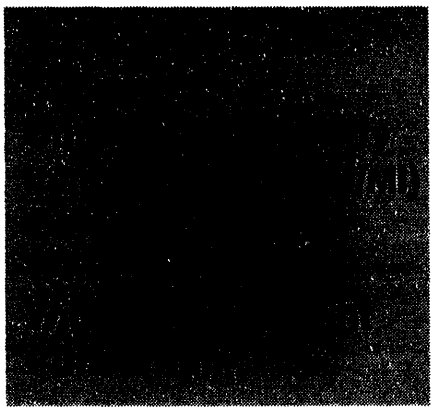


Academic Partnerships: Customer Base

"... 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.

EM 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 five comprehensive Academic Partnerships through cooperative agreements: 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); the Partnership for Environmental Technology Education (PETE); and the University of Tennessee (UT). The partnerships participate in research, curriculum development, technology transfer, faculty and teacher development/recruitment, and student recruitment.



The EM partnership with the HBCU/MI Consortium was initially funded in September 1990 to increase the ERWM content in the existing curricula and to encourage participation by minority and educationallydisadvantaged students in the DOE weapons complex cleanup. 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**. To increase the amount, access and quality of mathematics and science education and information dissemination in minority communities.
- **Undergraduate education and post-secondary training**. 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**. 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&M University - Kingsville
- Texas Southern University
- Tuskegee University
- University of Texas - El Paso
- Xavier University

The HBCU/MI Consortium organized and sponsored the First Forum on Undergraduate Research Experiences of Minority Undergraduate Science, Mathematics, and Engineering Students and a Workshop on Graduate School Opportunities held in Atlanta, Georgia in October 1992. With over 600 individuals

in attendance, 338 students and 170 faculty from 46 Historically Black Colleges and Universities and Minority Institutions participated in the forum. All EMCOM students and approximately 100 other students from HBCU/MIs presented posters on research projects conducted during the summer of 1992 or during the 1991-92 academic year. Other sponsors of the forum and Workshop included the Massachusetts Institute of Technology, the U.S. Department of Energy, and the U.S. Environmental Protection Agency.

In February 1993, the HBCU/MI Consortium, in partnership with several private environmental corporations, convened the 1993 National Congress for the Advancement of Minorities in the Environmental Professions in Washington, DC. The purpose of the Congress was to present a leadership model for developing partnerships between education, industry, and government in the education and training of underrepresented minorities in the sciences, research, and technology. The Secretary of Energy, Hazel O'Leary, addressed the National Congress as the keynote speaker.

The second HBCU/MI Curriculum Development Workshop was held in June 1993 in Atlanta, Georgia. Workshop activities included group, panel, and focus group discussions on topics such as communications, curriculum modules in environmental sciencesimplemented by the Consortium members, the integration of computer technology in curriculum development, implementation of environmental training programs, and specific discipline-based curriculum models in the areas of chemistry, biology, and toxicology, and environmental education modules developed for pre-college education.

In September 1993, on behalf of the HBCU/MI Consortium, representatives from Clark Atlanta University and Howard University presented exhibits of the Consortium's technology progress to a Congressional audience in Washington, DC. The exhibits on display represented DOE EM grantees from all regions of the country and were tied together by the theme: "innovative technologies solving national problems".

In FY 1993, seventy-nine students, 11 teachers, and 9 faculty members participated in the Environmental Management Precollege Analytical Chemistry (EMPAC) program at five HBCU/MI consortium sites: Clark Atlanta University, Hampton University, Jackson State University, Souther University, and Texas A&M University at Kingsville.

Alabama A&M University, Clark Atlanta University, and Central State University collaborated to write, program and evaluate four modules for the Integrated Comprehensive Institutional Support System (ICISS): Algebra I and II, Calculus, and Environmental Science. The ICISS uses digital interface technology to combine hypertext, audio tracks, videos, and still photography to form electronic lecture notes. The notes allow an instructor to interact with the students, thus enhancing the learning environment. The instructors can test more frequently and can instantly know, through computer graded quizzes and record keeping, what concepts the students have or have not learned. The students can query the system as often as they desire to review lecture notes, or retake exams. One hundred and seventeen institutions nationwide currently use the ICISS as part of their instruction.

HBCU/MI member, New Mexico Highlands University (NMHU), implemented the newly developed

Environmental Science BS and MS Programs for the 1993-94 academic year. At the end of FY 1993, NMHU had approximately 67 declared Environmental Science majors.

A Professor of Chemistry and Environmental Sciences from Northern Arizona University (NAU) worked three months in the Environmental Chemistry Group at Los Alamos National Laboratory (LANL) evaluating analytical methods used in the chemical analysis of soil at water samples. While at LANL, the professor coordinated a laboratory-wide program for minority summer students, focusing on career opportunities in environmental fields and post graduate education. This appointment was through the EMCOM Program.

Four NAU students participated as EMCOM scholars at national laboratories: three undergraduates at LANL and a biology graduate student at NREL.

The Four Corners Intertribal Center for Science and Mathematics, with support from the Department of Education, Department of Energy PREP Program, the National Science Foundation, and the HBCU/MI Consortium, implemented a science training program for 40 high school students and 8 teachers. Most of the students were Native Americans, seven teachers were minorities, three of which were Native Americans. The teachers participated in six weeks of research training, complemented by seminars in curriculum development. Students participated in five weeks of research training. Both teachers and students worked with scientists at Northern Arizona University. A scientific conference was held at NAU to conclude the program with all students presenting papers on their research. Follow-up activities for both students and teachers will be held during the 1993-94 academic year.

A faculty member from the Engineering and Technology department at NAU worked with scientists, other engineers, and AWU students to define, design, and engineer the facilities required to conduct a large scale drawdown and infiltration test. The large scale drawdown and infiltration test to be conducted during the summer of 1994 is intended to provide information about hydraulic bulk properties of the 6-0 foot unsaturated vadose zone which separates nuclear waste storage facilities from the Snake River Plane Aquifer. The massive experiment being planned will augment, calibrate, and verify both the analytical techniques and simulation techniques also being used to study the problem.

SCUREF, a consortium of five research universities in South Carolina, conducts programmatic research for DOE through a subcontract with the Westinghouse Savannah River Company (WSRC). SCUREF also conducts research, education, and technology transfer activities through a cooperative agreement with the DOE-Savannah River (DOE-SR) Operations Office. The cooperative agreement, funded primarily by EM-522, provides funding for precollege, undergraduate, and graduate education initiatives, research in support of EM activities, and technology transfer initiatives, with a focus on environmental restoration and waste management (ERWM). The education outreach program is designed to increase the number of scientists, engineers, and technicians prepared for careers in ERWM, as well as to attract and encourage educationally disadvantaged students to

careers in science and technology. In FY 1993, the first year of the agreement through DOE-SR, 24 cooperative agreement programs were funded.

The following institutions are members of SCUREF:

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

In FY 1993, working partnerships between the Medical University of South Carolina (MUSC) and regional historically Black colleges and universities (HBCUs) were established to allow undergraduates from the HBCUs to participate in internships, research experiences, and course work in environmental sciences at MUSC.

"Technology Today", a television program that concentrates on technology transfer and was prepared as the focus of a SCUREF task, was broadcast on the South Carolina Educational Television on December 8, 1992. By popular demand the program was rebroadcast on December 12. The program features the Savannah River Technology Center (SRTC)-developed *in situ* remediation technology using horizontal wells, and the SRS Defense Waste Processing Facility (DWPF) waste glass process. "Technology Today" is a series highlighting inventions and technologies developed through DOE laboratories such as SRTC, Sandia National Laboratories, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Brookhaven National Laboratory, and Pacific Northwest Laboratory. The program is narrated by former CNN news correspondent Charles Crawford.

SCUREF's Video Algebra program was presented to the South Carolina Council of Teachers of Mathematics on November 20, 1992. Over 100 teachers from across the state attended the meeting. The Video Algebra program is designed to motivate students and enhance classroom instruction. The videos can be used in the classroom to help teachers, and they can be kept in the library for students to use on an individual basis. The videos also use "real world" demonstrations to help students understand challenging material. This is accomplished by creating a set for the demonstration or by actually going "on location" to the Savannah River Site or otherindustries. Clemson University, the University of South Carolina-Aiken, and the University of South Carolina-Columbia are participating in this project.

In FY 1993, SCUREF developed a series of interactive video discs that incorporate images from "Technology Today," a video previously sponsored by DOE and broadcast on South Carolina Public Television. Using images of actual EM research projects conducted at DOE sites, the video discs are designed to capture the students' interest in careers in environmental sciences. The video is digitized using QuickTime technology and incorporated into a database that allows students to choose among various themes to explore various careers.

During the 1993 summer, SCUREF offered an earth science/computer technology institute for elementary and middle school teachers to learn to use interactive video disc/computer technology in teaching earth sciences. Twenty teachers participated in the five-week summer institute. The fifth week of the institute was a summer camp for students where the course participants could demonstrate their training.

SCUREF held a summer and school year "Early Intervention Program" for rural and minority sixth and seventh graders. The program involved hands-on ERWM research projects, college preparatory course work in math and science, college admission workshops for parents, and a mentorship program with successful high school, college, and professional mentors. Approximately 150 students participated in the FY 1993 program.

As an offshoot of the SCUREF Task, "Improved Computational Methods for Groundwater Modeling", a four-hour class titled "Introduction to Groundwater Hydrology" was taught to 32 Westinghouse Savannah River Corporation professionals who had a wide variety of scientific and engineering backgrounds. The goal of the class was to provide an overview of the basic principles of groundwater flow and hydrogeology and to relate these principles to environmental issues at the Savannah River Site.

A Clemson University Professor and two of his graduate students participated in the Savannah River Site (SRS) Technical Day in February 1993. Technical Day is an annual event that showcases SRS technologies and research programs. The Clemson team showcased one of the largest SCUREF projects, "Establishment of a Well Field for Geohydrology." This project involved taking an SRS well field formerly proposed for waste burial and turning it into an outdoor laboratory where geohydrology students and professionals could learn the latest techniques for groundwater monitoring.

SCUREF provided scholarships in ERWM related areas through the cooperative agreement to undergraduate rural and minority students, to graduate teachers in science, and to middle school teachers pursuing graduate science education. Graduate support for ERWM-related theses were provided in support of mission needs at the Savannah River Site.

WERC, funded by EM since 1990, works in cooperation with the Los Alamos National Laboratory and Sandia National Laboratory. WERC's mission to expand the nation's capability to address waste management issues by providing resources for the management of all types of waste. WERC accomplishes its goals in four areas:

Education and training. Consortium education includes environmental management degree programs in engineering, the sciences, and all related waste management fields for associates, bachelor's, master's and Ph.D. candidates, as well as continuing education programs and short courses for environmental remediation and waste management professionals.

Technology development. Students, faculty, and professionals from Consortium institutions, the national laboratories, and industry collaborate on research projects involving all environmental media. The project selection process emphasizes conversion to DOE and industrial site demonstration.

Technology transfer. Technology transfer is accomplished through several methods, including: collaboration between consortium members, government and industry waste management agencies; conference presentations; refereed journals; environmental site demonstrations; environmental laboratories; and industrial partners.

Special programs and outreach. These programs provide environmental remediation and waste management education and services to students from pre-college, community college, and universities, federal, local, and state governments, and professions in the fields of waste management.

The following institutions are members of WERC:

- New Mexico State University - Las Cruces
- University of New Mexico - Albuquerque
- New Mexico Institute of Mining Technology - Socorro
- Navajo Community College - Shiprock

FY 1993 ACCOMPLISHMENTS

WERC co-sponsored and helped to organize the Waste Management '93 Conference in Tucson, Arizona on February 28 to March 4, 1993. More than 2,000 national and international professionals participated in theConference. WERC presented information on the Carlsbad Environmental Monitoring and Research Center, the Environmental Fellows Program, the nationally awarded Videoconference Series, the Industrial Affiliates program and the WERC Education Programs. Other sponsors of the Conference included Analytical Development Corp., BNFL Inc., Brown & Root Environmental, Carpenter Technology, Chem-Nuclear Systems, Dames & Moore, and SM Stoller Corp.

During the week of April 18, 1993, WERC organized and sponsored the "WERC for the Future Week" at NMSU in Las Cruces, New Mexico. More than 375 students, faculty, government and industry professionals attended the week-long activities that included the 3rd Annual Environmental Design Contest for Universities and Community Colleges, the 3rd Annual WERC Technology Transfer Conference featuring researchers and student from the Historically Black Colleges and Universities/Minority Institutions Consortium (HBCU/MI), the WERC Industrial Affiliate Board Meeting, the WERC Executive Board Meeting, and Exhibits by industry and government.

At the WERC 3rd Annual Environmental Design Contest, held April 20 - 23, 1993 at NMSU in Las Cruces, 20 university and college teams from across the United States and 1 team from Mexico participated, with Purdue University emerging as the winner. The 1993 contest problem featured a realistic printed wiring board manufacturing waste remediation and minimization problem. Sponsors of the contest included DOE, Babcock and Wilcox, CH2M Hill, Chemical Waste Management, Waste Management Inc., SM Stoller, and Phelps Dodge Mining.

In June 1993, the Navajo Community College-Shiprock (NCC) awarded two scholarships for the new Johnson & Johnson/WERC Environmental Scholars program. Thescholarship program is open to Native American students with excellent academic records and an interest in pursuing careers in Earth and Environmental Sciences. Candidates must be entering their freshman year of study at NCC. The Scholars receive a $5,000 scholarship and special benefits such as tutoring and summer internships.

The University of Texas at El Paso became the 58th institution to carry WERC-ITV telecourses in FY 1993. Through the 1993 Fall semester, more that 300 students have received the courses each semester.

In August 1993, twenty-three teachers and 28 students (over 50% minority representation) from high schools across New Mexico and West Texas participated in the WERC Summer Institute '93. DOE, WERC and industrial

researchers conducted seminars on the clean-up of water in industrial and public sectors. Participants were divided into teams and competed for the best solutions based on laboratory tests.

WERC co-sponsored the WIPP Educational Transportation Outreach program in Las Cruces in January 1993. Presentations were given at NMSU and area high schools during the two-day visit. The transportation system that will be used for the WIPP project washighlighted in the presentations. More than 1,300 visitors viewed the TRUPACT II display. Media from El Paso and Las Cruces provided news coverage of the events.

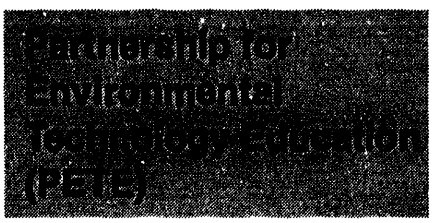
During the 1993 Fall semester, 663 students enrolled in WERC education programs. Fifty percent of the students in the program are from underrepresented populations or women. By the end of FY 1993, WERC graduates total 118, and they have entered the workforce or are pursuing advanced environmental degrees. The WERC Education programs include a new Master's Degree in Environmental Engineering that was approved in Summer 1993 by the New Mexico Commission on Higher Education.

WERC shortcourses and ITV technology transfer training programs reached 500 professionals during 1993. Courses were conducted on the Safe Drinking Water Act, Bioremediation of TNT Wastes by Higher Plants, Adsorption of Organic Molecules from Aqueous Solution on Surface Modified Zeolites, Bioreclamation of Oil-field Produced Waters, the Nature of Groundwater Flow and Transport and its Relationship to Microbiology, Emergency Response to Hazardous Spills, and a special course on new environmental technologies that was conducted for the New Mexico Environment Department. This course will help expedite remediation technologies to sites in the field.

In September 1993, WERC presented results of new WERC research technologies to Congress in Washington, DC. WERC was one of 36 DOE-EM participants invited to display results in House and Senate Office buildings.

The WERC Soil-Water-Air-Testing Laboratory (SWAT) environmental laboratory was awarded a contract in September 1993 to test drinking water from New Mexico municipalities. The testing program was a result of the Federal Safe Drinking Water Act.

In July 1993, WERC, in collaboration with DOE and Sandia National Laboratories, assisted in the first DOE High School Honors Program at Sandia National Laboratories. The top high school senior students from the United States and foreign countries participated in the two-week seminar. Technical training support from WERC included an environmental remediation design contest.



PETE was initially funded by DOE in April 1991. Originally, it 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 environmental 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. The national PETE program will then consist of six semi-independent regional partnerships.

Rapid progress was made in FY 1993 towardthe establishment of a national PETE program. Incorporation of the national non-profit organization is targeted for January 1994. Kickoff meetings for the northeast and southeast regions were held in February and March 1993, respectively. These meetings resulted in the establishment of working groups, or interim steering committees, to develop bylaws and program plans. North Central PETE was formally established in March 1993 at a meeting in Chicago, Illinois. The bylaws were adopted and steering committee officers were elected at the meeting. In April 1993, a meeting to kickoff planning for South Central PETE was held in Denver, Colorado.

Northwest PETE held its first resource instructor conference in May 1993 at Pasco, Washington. During the conference, PETE participants observed some of the latest remediation technology on a tour of the Hanford reservation. Regional conferences were also held in August and September 1993 in the north-central, northeast, and southeast regions.

The PETE summer internship program had 13 participants during summer 1993. The program is designed to develop and enhance community college environmental sciences/ hazardous waste programs by providing the instructors with the opportunity to acquire experience in occupations that are relevant to the courses taught by them. It also serves to provide professional development opportunities to the environmental science/hazardous waste faculty at community colleges. The internships help to develop ties between the community colleges and DOE, DoD, EPA, and NASA laboratories, state regulatory agencies and private industry. The 13 interns participated in R&D programs, remediation projects and waste operations at 10 sites: DOE Nevada Operations/Test Site; Lawrence Berkeley Lab; U.S. Navy/San Bruno Command; Dept. of Toxic Substances Control; Environmental Monitoring SystemsLab; Jet Propulsion Lab; Lawrence Livermore National Lab; Sandia National Laboratories (California and New Mexico); and, Air Resources Board, Sacramento.

The development of Western PETE community college network of forty colleges was completed in FY 1993 with the addition of 8 new start colleges.

Western PETE held two Resource Instructor Conferences in FY 1993. The first conference, held in February 1993 at Long Beach, California, centered around the theme "Present current DoD planning for base closures and general down sizing and the role of community colleges in support of the DoD and DOE ERWM programs". The second conference, held in July 1993 at Salt Lake City, Utah, focused on programs and materials with an emphasis on pollution prevention.

PETE supported the planning and development of the California Environmental Enterprise (CEE). The CEE, a distributed function of the American Network for Environment and Trade, is being established as a dynamic

technology-services network of private industry, national laboratories, state and local government, regulatory agencies, universities and environmental organizations that work together to provide economic and rehabilitative reuse of environmentally-impaired property. PETE provides training and retraining services in support of CEE projects.

In March 1993, a presentation on PETE was delivered at the Control Ambiental Expo '93 in Mexico City at the request of the co-sponsor, Institute of the Americas. There is interest in Mexico in establishing a International Institute for Environmental Technology and Management as a nationwide public-private partnership modeled after PETE. Eventually, up to 50 university and vocational institute campuses would beorganized into an environmental education and training network, serving all 30 Mexican states and tied directly to PETE.

In FY 1993, PETE completed the initial planning for a 2+2+2 program in the Four Corners region which includes five tribal college campuses, high schools and Northern Arizona University. The 2+2+2 program allows middle and high school students to enter pathways that lead to community college or university programs in environmental sciences. The pathways necessarily include options for two-year environmental technician degrees, as well as access to environmental sciences and engineering curricula and baccalaureate programs either in four-year institutions or as transfer students from the community colleges.

The Cooperative Agreement with the University of Tennessee (UT) and Martin Marietta Energy Systems (MMES) is primarily a joint educational program in environmental restoration and waste management (ERWM) that focuses educational resources to examine key technical disciplinary decisions facing DOE, as well as their impact on state, regional, national, and international policy in ERWM. A second objective of the program is to build a sound ERWM educational infrastructure near Oak Ridge that will directly benefit the environmental and technology transfer missions of DOE Oak Ridge Field Office, MMES, and other Oak Ridge contractors. Activities include: joint policy studies on key ERWM issues, joint technical studies on key ERWM issues, expedited curriculum development, more credit courses and new short courses taught in Oak Ridge, accelerated minority recruitment, and planning for an expanded academic partnership with DOE and other educational institutions.

In FY 1993, the University of Tennessee established a Master of Science course in Environmental Engineering at Oak Ridge. The course concentrates on environmental restoration and waste management (ERWM) issues. Approximately 100 employees in Oak Ridge have enrolled in this degree program.

UT held a one-day workshop on stakeholder involvement in land use decisions in Knoxville, Tennessee in June 1993. A report on the workshop, entitled "Stakeholder Involvement: Open Processes for Reaching Decisions about the Future Uses of Contaminated Sites," was issued.

Ten graduate students from UT were involved in on-going ERWM research at the Oak Ridge Reservation in association with Martin Marietta Energy Systems, Inc. staff.

In July 1993, approximately 50 individuals, representing industry, DOE, and other federal agencies and regulators from across the nation attended a two-day workshop at UT in Knoxville, Tennessee on radioactive scrap metal recycling. A report of the workshop, entitled "Establishing Cleanup Standards for Radioactive Scrap Metal," was issued.

During FY 1993, UT held a monthly forum on ERWM issues in Oak Ridge, Tennessee. Presentations were made by ERWM leaders. Students involved with the technical and policy studies of the UT Cooperative Agreement attended, as well as professionals from the private sector, government, and academia.

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 and research of environmental science. Therefore, EM-522 provides financial incentives to undergraduate and graduate students, as well as to the faculty, to identify and support candidates who are drawn from the nations spectrum of population to enter professions supporting EM's mission. Through such financial incentives, EM hopes 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 objectives of EM's Scholarships/ Fellowships Program are: 1) to support students (including technicians) in EM-related disciplines; 2) to enhance participation of under-represented groups to 30% of the total supported by EM; 3) to provide for a practical experience (at Labs or other sites) for all students; and 4) to support junior faculty for collaborative mission-related research and development in support of Technology Development (EM-50). These four objectives form the basis for the four program elements: Stipends, Tuition/Fees, Faculty Support, and Practical Work Experience.

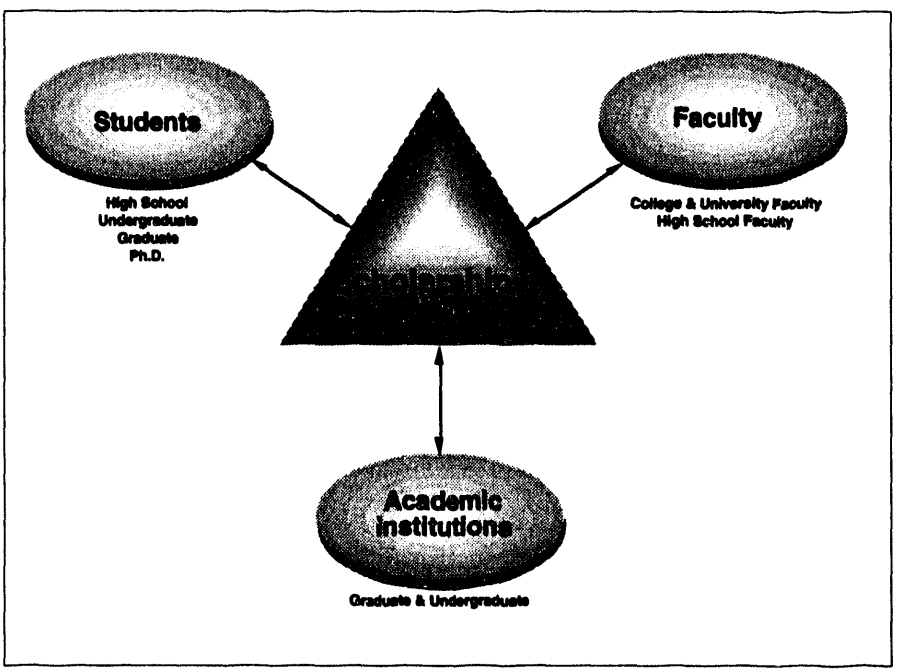
OAK RIDGE INSTITUTE FOR SCIENCE EDUCATION (ORISE)

ORISE, a consortium of colleges and universities, administers DOE's ERWM Scholarship Program, ERWM Fellowship Program, the ERWM Junior Faculty Award Program, and the ERWM Undergraduate and Graduate Employment Program.

Environmental Restoration & Waste Management Scholarship Program. The ERWM Scholarship Program encourages talented students to pursue either associate's or bachelor's degrees in disciplines supportive of DOE's EM mission.

Environmental Restoration & Waste Management Fellowship Program. The Fellowship Program supports 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. ERWM 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 ERWM Junior



National Environmental Incentives: Scholarships/Fellowships

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 ERWM 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 degree. 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 practical work experience in the field.

ENVIRONMENTAL MANAGEMENT PARTNERSHIPS IN EDUCATION, RESEARCH, AND TECHNOLOGY

Through DOE/EM sponsorship, the Associated Western Universities (AWU) administers the EMCORE, EMCOM, and EMPAC programs.

Environmental Management Career Opportunities Research Experience (EMCORE) Scholarships and Fellowships. The long-term purpose of EMCORE is to attract a large number of new ERWM 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 ERWM problems; 2) build curricula and academic research programs in ERWM; 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-

	Student Stipends	Tuition and Fees	Faculty Support	Practical Work Experience	Student Research Assistance	Faculty Research Support	Summer Academic Enrichment	High School Teacher Support
EMCORE	X	X	X	X	X			
EMCOM	X	X	X	X	X			
EMPAC			X	X			X	
STAR	X		X	X			X	X
VANDERBILT	X	X		X				
ERWM FELLOWS	X	X		X				
ERWM SCHOLARS	X	X		X				
JUNIOR FACULTY			X	X	X	X		

Scholarships/Fellowships: Matrix of Program Elements and Projects

reviewed journals as well as present their work at professional meetings.

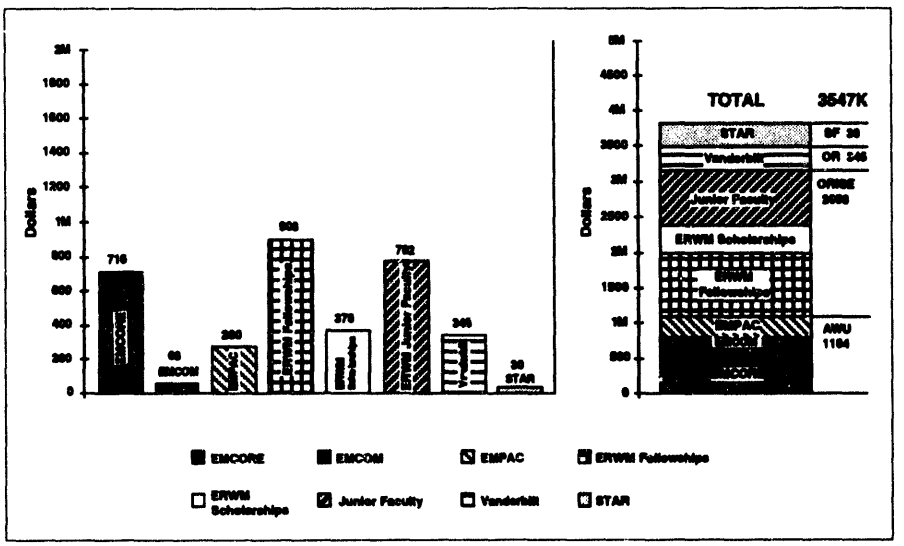
Environmental Management Career Opportunities for Minorities (EMCOM). The EMCOM program provides Undergraduate Scholarships, Graduate Fellowships, and Faculty Fellowships for fulltime undergraduate students, graduate students, and faculty, respectively, at member institutions of the HBCU/MI Environmental Technology and 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 ERWM, their record of mentoring, the apparent benefit to the applicant and to the applicant's home institution, and the compatibility of the applicant's ERWM-related research interests with those of the host facility. Preference in the Faculty Fellowship Awards is generally given to applications from faculty/student teams.

Environmental Management Precollege Analytical Chemistry (EMPAC). The ultimate goal of the EMPAC program is to motivate High School students to pursue careers in environmental science and engineering. It provides the students with the opportunity to participate in and receive credit for an intense college-level science experience in analytical chemistry with environmental emphasis. The program provides stipends and allowances for Faculty Site Coordinators/Instructors (up to $7,000 per month), High School Chemistry Teachers as laboratory instructors ($2,200 per month), and High School Students ($50 per week), as well as for the hosting institutions in the form of tuition and fees, course expenses, etc.

HISTORICALLY BLACK COLLEGES AND UNIVERSITIES/MINORITIES INSTITUTIONS CONSORTIUM (HBCU/MI)

Scholarships/Fellowships - HBCU/MI. The HBCU/MI Consortium sponsors two scholarship/fellowship programs for precollege and university students, as well as numerous institutional opportunities. The Environmental Management Career Opportunities for Minorities (EMCOM) and Environmental Management Precollege Analytical Chemistry (EMPAC) programs are administered through Associated Western Universities, and represent 51% of the consortium's annual budget for scholarships and fellowships.

Each member institution in the HBCU/MI Consortium provides campus specific scholarship or fellowship opportunities. These programs include: Research and Professional Development for Faculty; Research Initiation and Course Development for Faculty and Students; and, Support Activities, such as travel to professional meetings. Approximately 110 faculty members and 215 students participate in research activities on the campuses. Several



Scholarships/Fellowships Program (by Project)

thousand students, teachers, and faculty members are affected by recruitment and retention programs that are leveraged with HBCU/MI Consortium funds.

SOUTH CAROLINA UNIVERSITIES RESEARCH AND EDUCATION FOUNDATION (SCUREF)

SCUREF/Westinghouse Scholarship. This scholarship provides funding for students majoring in science or engineering who have interest in waste management or environmental engineering careers. It encourages females and members of underrepresented groups to major in science or engineering fields related to ERWM. Although there is no legal requirement for the scholarship recipient to pursue employment in one of these areas upon graduation, the recipients are encouraged to seriously consider such employment. The scholarship includes a stipend of $5000 per year. The stipend is renewable for 2 additional years provided the eligibility requirements are met. Scholarship recipients must also enroll in a 3 semester hour environmental course for each year of scholarship funding.

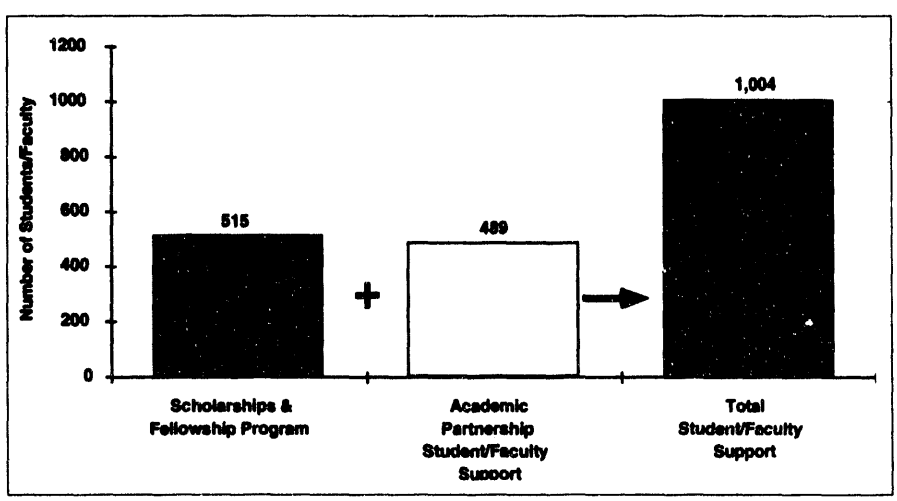
Masters in Science or Math Education. This program is designed to improve the quality of education in rural and depressed areas. The scholarship recipients are selected from teachers in rural or depressed areas. Each scholarship recipient receives $12,500 over 2 academic years and 3 summers. After completion of the program, the recipients must teach for 4 years in a rural or depressed area.

B.S. in Science or Math Education. This scholarship program is designed to increase the supply of qualified science and math teachers in rural or depressed areas. The scholarship recipients, selected from the freshman class, receive $5,000 per year for 3 years. The students must agree to teach in rural or depressed area for 4 years after completion of the program.

WASTE MANAGEMENT EDUCATION AND RESEARCH CONSORTIUM (WERC)

WERC Undergraduate Fellowship Program. Fellowships are available to students interested in pursuing an Environmental Remediation/Waste Management related degree. The fellowship requires students to work hand-in-hand with researchers developing new technologies in the ERWM field. Undergraduate fellowships range form $500 to $1,500 for qualified students. Two hundred students in WERC programs have been awarded fellowships in this program.

Johnson & Johnson/WERC Environmental Scholars Program. The Navajo Community College -Shiprock (NCC) awards two scholarships each year for the Johnson & Johnson/WERC Environmental Scholars program. The scholarship program is open to Native American high school seniors with excellent academic records and an interest in pursuing careers in Earth or Environmental Sciences. Candidates must be entering their freshman year of study at NCC. The Scholars receive a $5,000 scholarship and special benefits such as tutoring and summer internships.



Total Student/Faculty Support

ENVIRONMENTAL MANAGEMENT ASSOCIATE PROGRAM (EMAP)

The EMAP, renamed as the Environmental Training Program to provide a more structured and focused emphasis on the two trainees being developed (Environmental Management Trainee and Environmental Technology Trainee) provides the opportunity for environmental on-the-job training and development for recent graduates in environmental management disciplines. Trainees, placed with sponsoring organizations for environmental training, gain experience in applied environmental management that broadens their academic skills and knowledge. The Hazardous Waste Remedial Actions Program (HAZWRAP) within Martin Marietta Energy Systems, Inc. provides day-to-day coordination of these activities.

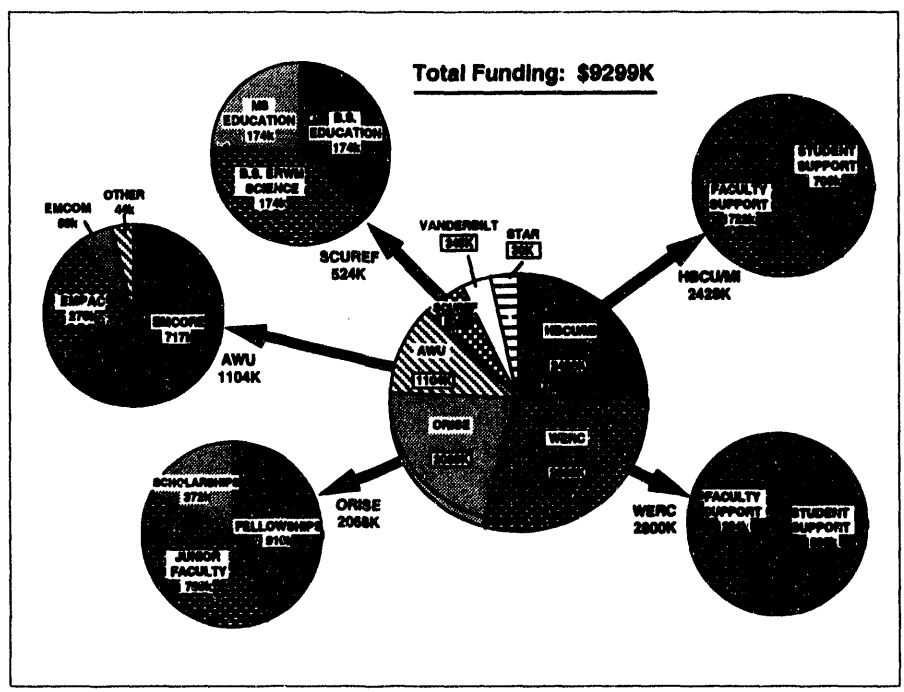
In FY 1993, the ERWM Fellowship program supported 45 students. Eleven fellows completed their appointments during the year. In September 1993, 14 new awardees began the program, together with 12 renewing fellows and 8 fellows who received an extension. Five universities were approved for program participation. With this addition, there are now participating 39 universities that have developed interdisciplinary academic programs at both the M.S. and Ph.D. levels with research and technology development related to the clean-up of DOE facilities.

During 1993, nine fellows completed their practicum assignments at five DOE sites. The sites included: Argonne National Laboratory (2), Idaho National Laboratory (2), Lawrence Livermore National Laboratory (2), Sandia National Laboratory (2), and Rocky Flats Office (1).

The Vanderbilt University Internship Program supported six new scholarships and four renewal awards in FY 1993.

For the 1993-1994 academic year, 20 undergraduate scholarships were awarded. These awards will make up 12 student/faculty teams, four of which will work at LANL, two at INEL, and one each at MSE, ORNL, WIPP, and PNL.

The ERWM Scholarship Program supported 18 students in FY 1993. Eight scholars participated in their practicum assignments in the summer of 1993 at the following DOE facilities: Oak Ridge National Laboratory (3), Los Alamos National Laboratory (2), Waste Isolation Pilot Project (1), Savannah River Technology Center (1), and Morgantown Energy Technology Center (1).



Breakdown of Entire Scholarship/Fellowship Support

Faculty Support

The ER/WM Junior Faculty Award Program selected six new award recipients in the 1993 fiscal year from 80 applications that were received, processed and merit reviewed based on earlier program announcements. In addition, six renewal applications were merit reviewed and approved for a second award. The twelve 1993 awardees will continue their collaborative research with Oak Ridge National Lab (4), Pacific Northwest Lab (3), Westinghouse Hanford Company (1), Savannah River Technology Center (1), Idaho National Engineering Lab (1), Sandia National Lab (1), and the Rocky Flats site (1). The 12 awardees are supporting 41 students in various research assistance roles. Collectively, the 12 awardee institutions have contributed over $450,000 in cost sharing related to DOE specific ERWM research. A survey completed in 1993 of the 1990 awardees indicated that all were profoundly influenced by the DOE ERWM Junior Faculty Award Program. Many of the previous awardees are continuing their research or activities in the direction of DOE ERWM needs or in direct collaboration with DOE sponsored research. Many students who served as research assistants for these awardees are pursuingERWM related careers or advanced degrees. Many advances in ERWM related curriculum, courses and centers of excellence at awardee institutions have emerged from the program.

Practical Work Experience

In FY 1993, the Associated Western Universities (AWU) made awards through the EMCORE Program to 34 undergraduate students and 16 faculty fellows for the 10-week summer research experience at DOE facilities. Seven teams were assigned to Los Alamos National Lab (LANL), four teams to Idaho Engineering Laboratory (INEL), and one team each to MSE, RESL, Pacific Northwest Lab (PNL), Sandia National Lab (SNL), Oak Ridge National Lab (ORNL), and the Waste Isolation Pilot Plant (WIPP). Sixty-one DOE or DOE contractor scientists participated during the summer as host scientists and immediate research supervisors. At least 10 laboratory administrators made the program run smoothly.

AWU made FY 1993 awards in the EMCORE Program to 12 graduate students. Student practicum assignments were as follows: four students at LANL, three at SNL, two at PNL, and one each at NREL, INEL, and HAZWRAP.

In the Vanderbilt Intern Practicums, four students were placed at the following DOE sites: Bechtel National, Westinghouse Savannah River Company, Westinghouse Hanford Company, and Argonne National Lab.

In the 1993 EMCOM Program, 67 students (51 undergraduate and 16 graduate) and 17 faculty members representing all seventeen HBCU/MI member institutions formed research teams and conducted summer research at 18 DOE facilities. Twenty students graduated from the EMCOM program this year.

RESTORATION AND WASTE MANAGEMENT EMPLOYMENT PROGRAM

The Environmental Restoration and Waste Management Employment Program (ERWM-EP), also known as the ERWM Employment Program, was established during FY 1992. The establishment of the program was authorized 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. To achieve this goal, the program supports 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 is expected to offer 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 are required to work one year in EM for every year of educational support provided to them.

The FY 1992 Report to Congress entitled "Scholarship and Fellowship Program for Environmental Restoration & Waste Management" was issued in March 1993.

In June 1993, ERWM-EP students, who were scheduled to complete their education program within the year, attended a meeting in Washington, DC to learn about the process of employment with the federal government. These were the first students to become candidates for employment with EM through the program.

The first ERWM-EP student to complete the ERWM-EP requirements became a federal EM employee in October 1993.

The first phase of the Employment Tracking System (ETS) database was completed in FY 1993. The ETS was designed to provide EM with a central data repository containing information about program participants totrack employment, identify trends in placement, and link practical work experience with employment.

After discussions and input from program offices and the General Counsel, a decision was made to modify the process for bringing new candidates into the ERWM-EP. The revised process will address issues such as methodology for participant selection, federal hiring and placement processes, and the FTE ceiling limitations within EM.

The first Practical Work Experience (PWE) assignments were completed during FY 1993. Nine undergraduate scholars and seven graduate fellows participated in required PWE assignments at DOE Headquarters, Operation Offices, or National Laboratories.

Two minority students began ERWM-EP Fellowship appointments in January 1993.

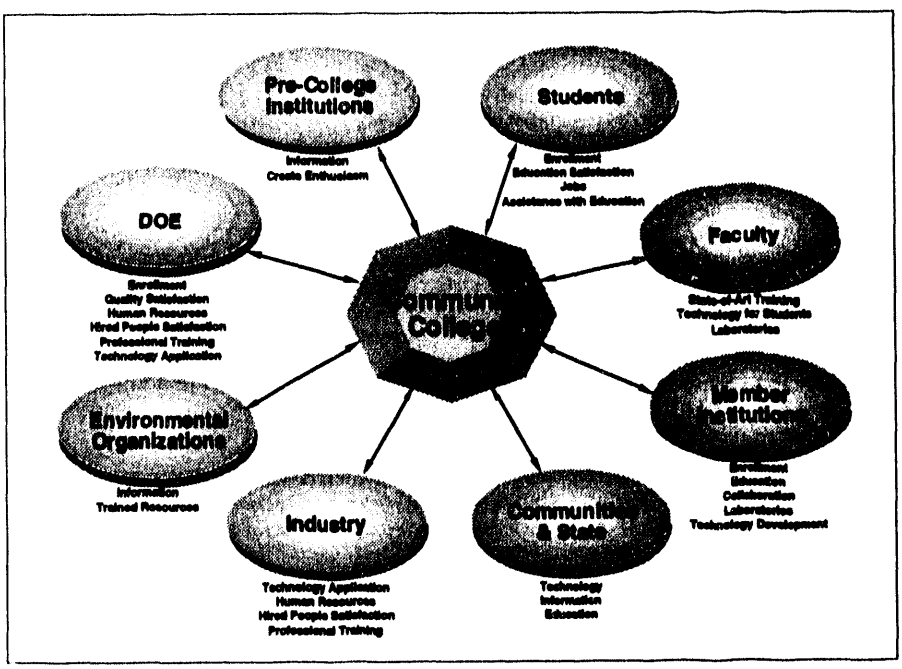
Six graduate fellows began their Master's thesis research during FY 1993. All research supported EM's environmental restoration mission.

With approximately 1200 community, technical and junior colleges in the United States with an estimated population of 5 to 6 million students, such 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 represent the easy access, low cost alternative for the current workforce to return for continuing technical training or retraining for new career directions. 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.

The Community College Program performs a key service for DOE Field Offices by providing essential technical training to meet the specific needs of each local site. In addition, these institutions aid DOE with worker retraining, regulatory training, and other ERWM related classes. EM-522 identified four Community College program elements for FY 1993: Two-year Technical Associate Degree Development; Faculty Network and Curricula Database; Student Internship at DOE National Laboratories; and Articulation Initiatives with Four-year Institutions.

During FY 1993, EM-522 began a transitioning of the Community College program to merge with Scholarships/ Fellowships (National Environmental Incentives) and Academic Partnerships. This restructuring is intended to give greater emphasis to programs that are designed to "bridge" students from high school into post-secondary education and from community colleges into articulation at four-year colleges and universities. Such restructuring will also expand cooperative efforts between the existing academic partnerships and the two-year community colleges.

The Two-Year Technical Associate Degree Development program element assists DOE Field Offices and National Labs in meeting their needs for technicians by working with local community colleges to develop specialized two-year degree programs in environmental restoration and waste management.



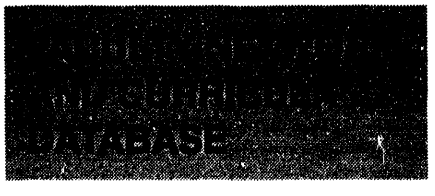
Community College: Customer Base

Programmatic functions of the Technical Degree Development element include:

- Determining regional DOE workforce technician needs;
- Developing site-specific technician curriculum;
- Producing trained graduates for site clean-up mission;
- Designing programs for quick implementation and results.

In FY 1993, five colleges participated in Technical Degree Development:

- Cincinnati Technical College in Cincinnati, Ohio developed an Environmental Engineering Associate Degree;
- The Community College of Southern Nevada in Henderson, Nevada developed an Environmental Restoration Technology Associate Degree;
- Mesa State College in Grand Junction, Colorado developed an Environmental Restoration Technology Associate Degree;
- Wilbur Wright College in Chicago, Illinois began development of an Environmental Waste Management Associate Degree.



Networks have been organized to facilitate the sharing of environmental science curricula, information exchange and problem solving to aid the EM-affiliated community colleges across the country. A database is currently in operation that contains each member school's technician curricula, student profiles and other relevant data.

Programmatic functions of the networking and databases element include:

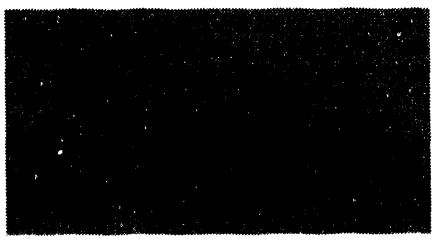
- Facilitating and accelerating the development of DOE/community college partnerships;
- Increasing accessibility of curricula content;
- Providing a forum to learn from successes and mistakes of others.

An example of a successful networking program is the Community College Network (C^2NET) which is supported by an award from the Grand Junction Project Office. C^2NET has 15 member colleges, all of which are located at or near a DOE site. C^2NET activities facilitate and accelerate the development of DOE/community college partnerships which are primarily concerned with developing a work force to meet DOE's 30-year environmental restoration goals. To support these partnerships, C^2NET provides a network for the affiliated colleges to share environmental science curricula, to share information, and to solve problems.

In FY 1993, C^2NET sponsored two meetings in support of its function to aid member community colleges through curriculum development and information exchange. The C^2NET spring working meeting was held in Albuquerque, New Mexico on April 29 - 30, 1993. The meeting's primary participants were representatives of the 15 member colleges that are in proximity to DOE facilities. The agenda dealt with intercollege curriculum consistency, site-specific DOE/college memoranda of understanding, and setting the agenda for the summer C^2NET Annual Meeting held in Grand Junction in August 1993. The annual C^2NET meeting, held in July 1993 in Grand Junction, Colorado, had a dual

focus. First, employee retraining was discussed in terms of DOE remediation work, and the second topic was a continuation of the curriculum consistency efforts with an emphasis on articulation between community colleges and four-year programs.

C^2NET was presented as a resource at the Northwest Partnership in Environmental Technology Education (PETE) Conference in Pasco, Washington on May 22, 1993.



This program element targets underrepresented minority students with career interests in math, science, engineering, and environmental restoration and waste management. It includes university level science and math courses, summer work experience at a DOE National Laboratory, and other technology transfer mechanisms.

Programmatic functions of the student internships element include:

- Providing underrepresented students access to DOE National Laboratories;
- Developing mechanisms for student technology transfer;
- Encouraging students to explore environmental science for post-secondary study school level;
- Increasing minority graduates with science degrees.

The Summer and Transfer Achievement Readiness Program (STAR) has been a key student internship program. STAR mainly works with underrepresented minority students with career interests in math, science, engineering, and environmental restoration and waste management. The program includes university level science and math courses, summer work experience at a DOE National Laboratory, and components that encourage students to explore environmental sciences at the high school level. STAR is an innovative partnership that includes Houston Community College, the Bronx College in New York, Contra Costa College in California, and the University of California at Berkeley, Lawrence Berkeley Lab and Lawrence Livermore National Lab.

Houston Community College successfully completed all planned STAR summer activities in FY 1993. Twenty community college students from New York, Texas and California attended intensive math and environmental science courses at the University of California Berkeley for seven weeks. These students also interned at Lawrence Livermore National Laboratory where they participated in environmental research related to the courses. In addition, the STAR partners conducted summer mini-camps for 240 high school students who were taught environmental science.

STAR outreach activities for the year were concluded during Summer 1993. More than 3,000 high school students and their parents were exposed to environmental issues and environmental science as a career.

In FY 1993, ten STAR students transferred to four-year educational institutions. This represents a 100 percent transfer rate to date. Sixty new scholarships were awarded to freshmen, and ten new scholarships to juniors who are pursuing environmental science careers.

ARTICULATION INITIATIVES WITH FOUR-YEAR INSTITUTIONS

This program element seeks to develop course work articulation agreements between two and four-year academic institutions in an effort to create a bridge for students to transfer completed course work for credit. This activity is intended to encourage continued post-secondary education.

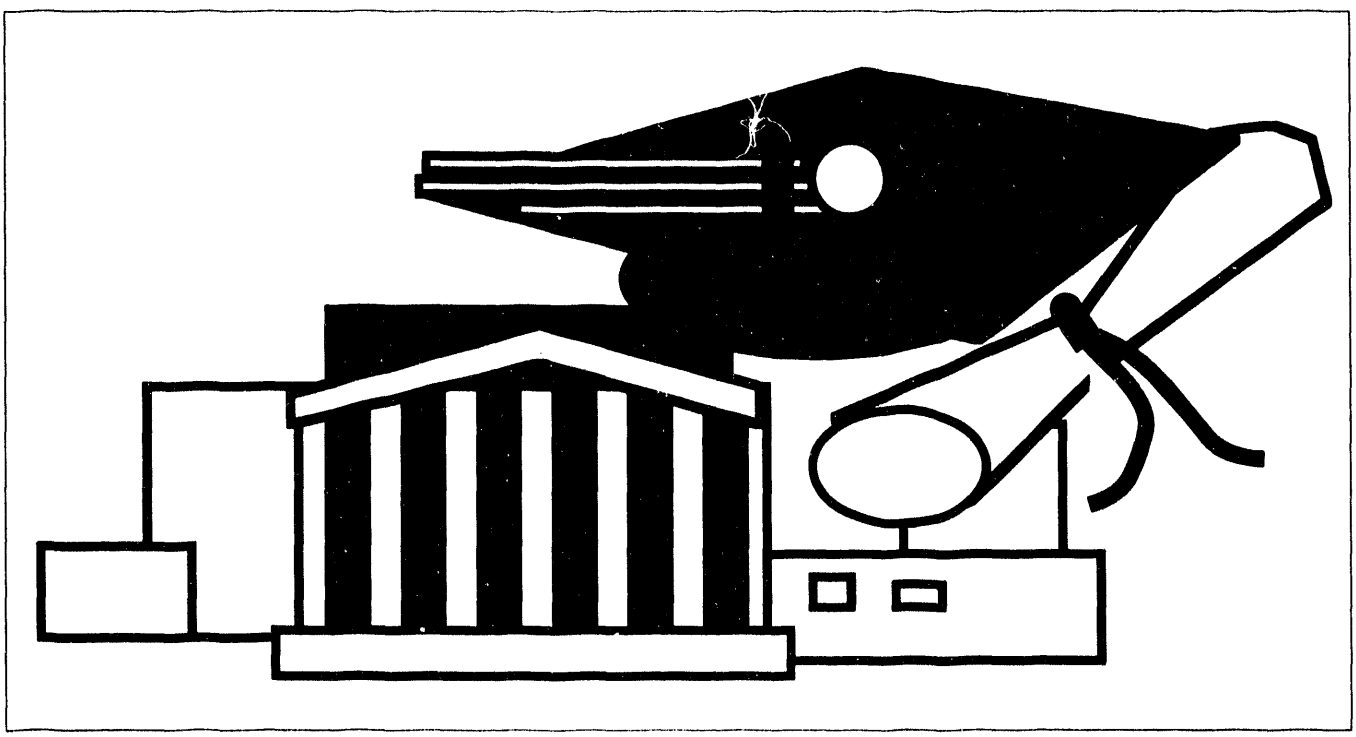
Programmatic functions of articulation initiatives include:

- Creating academic partnerships between regional colleges and universities;
- Allowing course credits to transfer from one academic institution to another;
- Encouraging continued post-secondary education.

Cincinnati Technical College began in FY 1993 to develop formal arrangements for articulation of students into four year programs at Ohio State University, Miami of Ohio University, Cincinnati College, Findlay College, and universities in Northern Kentucky.

Columbia Basin College began to pursue articulation arrangements with universities and colleges in Washington State in FY 1993.

The Community College of Southern Nevada formed a partnership with the University of Nevada, at the Las Vegas and Reno campuses, to formalize course credit transfer policies.

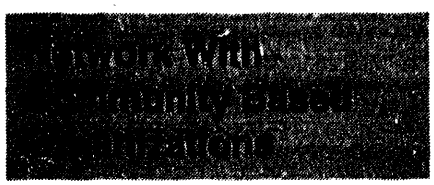


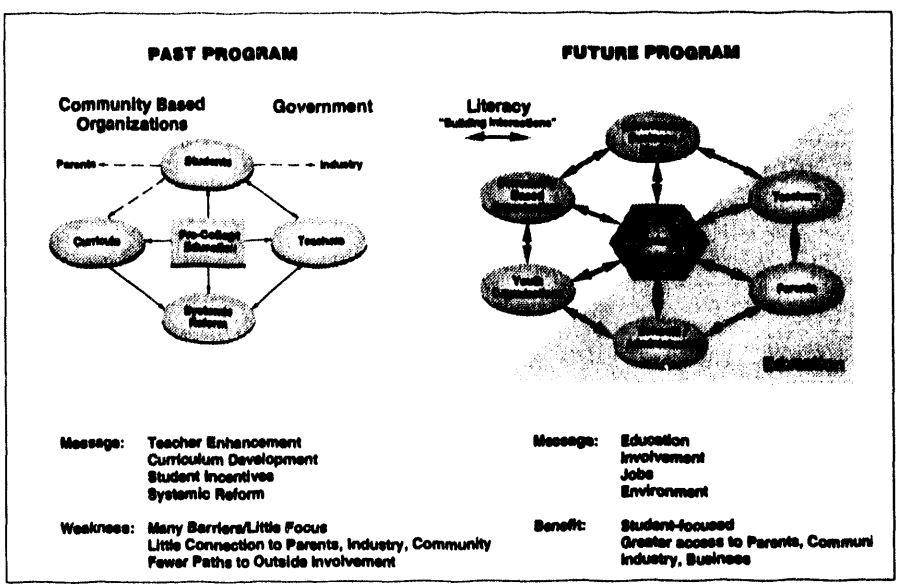
Until Fiscal Year 1993, the EM Environmental Education Program was in the "start-up" mode and incorporated environmentally modified versions of successful programs operated elsewhere and a variety of experimental precollege outreach programs. Increasingly scarce resources required careful fine-tuning for selection of programs to add or to continue. In FY 93, EM-522's primary focus began to shift from precollege outreach activities that were based on the CEHR FCCSET committee recommendations (Teacher Enhancement, Student Incentives, Curriculum Development, Systemic Reform) to the broader sphere of environmental literacy. The scope of the Environmental Literacy program now targets DOE site needs and the DOE-EM mission. The goals of Environmental Literacy programs are to increase public knowledge of environmental issues and to make all aware of opportunities to pursue environmental education and careers. EM believes that the DOE needs environmentally literate citizens who are familiar with EM education and career opportunities in addition to the basic principles of radioactivity, risk management and risk communications, waste management, and other science and environmental issues.

In order to achieve these goals, the FY 93 Environmental Literacy programs were focused into the following areas: 1) promotion of ERWM education and career opportunities; 2) development and dissemination of literacy materials; 3) involvement of students, adults and the public directly in ERWM technology/ process development and activities; 4) networking and coordination with Community-Based Organizations (CBOs) with participation of diverse populations; and 5) evaluation of plans and activities.

Environmental literacy outreach activities promote ERWM education and career opportunities designed to attract workers to environmental fields. These activities include the development of exhibits and publicity materials for the EM roadshow and other expositions and participation in promotional activities such as public service announcements. The activities promote the development of literacy materials which specifically inform students, teachers, parents, and the public about environmental issues and ERWM activities that complement existing environmental science curricula. Environmental literacy activities involve EM-522 working with existing CBOs to gain greater participation, credibility, and public awareness of ERWM activities in culturally and demographically diverse populations.

ALBUQUERQUE:

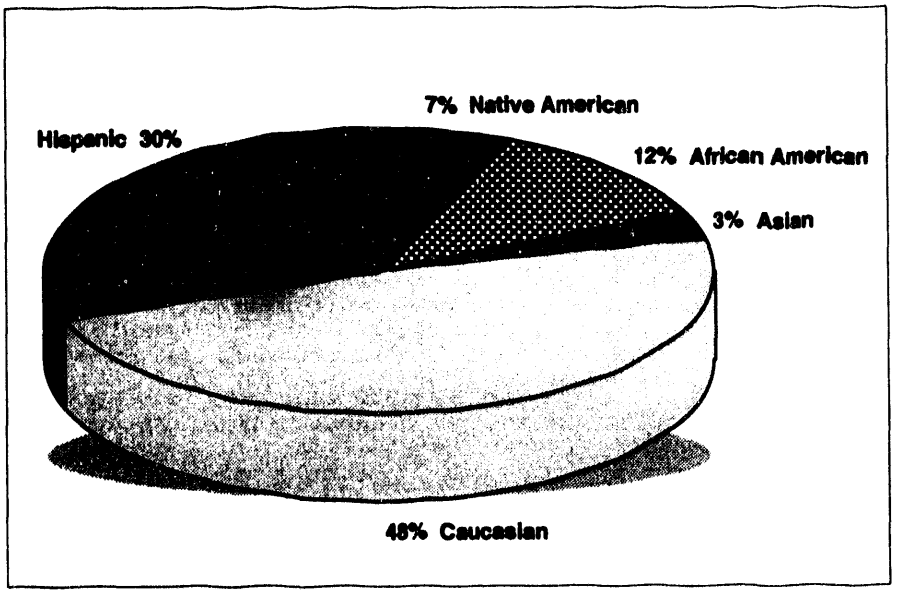




Outreach: Environmental Literacy

Direct Funding to New Mexico School Districts. This project is an integrated team effort involving representatives from the DOE, the New Mexico State Department of Education, Sandia National Laboratories and the Waste-management Education Research Consortium. The purpose of the project is to encourage economically disadvantagedstudents to pursue careers in the environmental sciences by enhancing education in science and mathematics. Participants are involved with teacher training, hands-on science and mathematics learning tools, and field trips.

In FY 1993, there were 226 teachers and 8,500 students trained through DOE/EM outreach programs with direct funding to New Mexico School Districts. During the year, 20 legislators participated in the program, while 25 parent workshops were held. Because of this program, math and science scores in the state improved by about 6 percent in 1993. As a result, this DOE program is being used as a model for other state-funded math and science programs. Many believe that it is the grass roots approach by DOE that has made this program a success.



EM Outreach/Literacy: Audience Characterization

Students Watching Over Our Planet Earth (SWOOPE). SWOOPE, an innovative, hands-on environmental science project forteachers and students in grades K-12, has the ultimate goal of inspiring students to continue in the science education pipeline while at the same time raising the general level of scientific literacy in the family and community.

Activities in FY 1993 included the development of a commercialization plan to expand the application of Swoope to a national market.

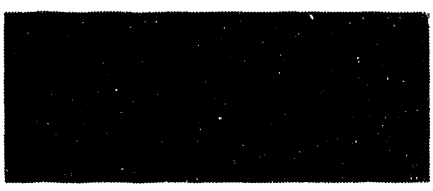
CHICAGO:

Environmental Education Outreach for Minorities. This project seeks to inject portions of the community college environmental curriculum into high schools. Courses on the fundamentals of environmental science and environmental issues are offered to students from inner city and suburban high schools on Fridays at community colleges. In addition, students can attend mini-lectures and tours at Brookhaven National Laboratory during spring break, as well as apply for summer work experience at the Laboratory.

Argonne Summer Institute for Teachers. Argonne National Laboratory works with teachers from suburban and

urban school systems in the Chicago area in Summer Curriculum Institutes. The teachers are exposed to practicing scientists and engineers working in the field of environmental restoration, waste management, and hazardous waste transportation. Teachers survey and collect environmental materials for use in the classroom. The teachers also develop a large number of classroom and field activities for use in urban areas with minority students.

A teacher's inservice workshop entitled "Beyond Recycling...The Next Step" was held on March 6, 1993 and repeated on March 20, 1993. There were only 80 positions available for the 150 applications received for the inservice sessions. The workshop was led by twelve teachers who participated in the Environmental Restoration summer institutes over the previous three years. The teachers gave presentations on the various classroom materials and outdoor activities that they had developed. The Teams Urging Responsible, Feasible Environmental Restoration (TURFER) activity packet was presented at the teacher's inservice sessions. The activity packet contained a comprehensive program that teaches students environmental field skills. Environmental Restoration/Waste Management Career Packets which provide realistic information about careers in ERWM fields were also presented.

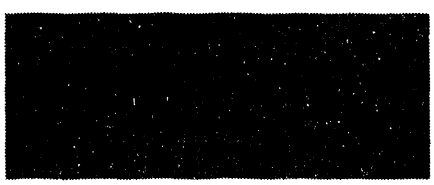


Problem Solving Through Innovative Thinking. This program brings awareness of today's exciting scientific challenges to high school students who go to the Iowa State University campus for an intense 3-4 week course in problem solving. The students are challenged with complex, multidisciplinary problems related to environmental remediation. Students participating in this program are selected solely on academic merit. They are accompanied by two high school teachers from Iowa inner city schools.

In FY 1993, the Ames program attracted 22 high-ability Iowa high school students and two Iowa high school teachers to the Iowa State University campus in Ames for a 23-day program in mathematics and environmental science. The teachers and students had an opportunity to meet Ames Laboratory scientists who spoke about their scientific careers. The group also toured the scientific laboratories. The students were given pre-and post-test in environmental science. They showed positive growth during the summer. The program also received many responses from parents and teachers on the positive experiences of the students.

FERNALD:

With the support of EM-50 the total education effort at Fernald reached over 2,000 teachers and almost 26,000 students.



Super Science Saturday. High school students with an interest in scientific careers attend intense hands-on demonstrations of science related to Fernald environmental activities that are presented by FEMP volunteers. These students present similar hands-on demonstrations at Terrific Science Carnivals at elementary schools in their school districts.

In FY 1993, the program provided hands-on, open-minded science to eight teachers and 40 students.

Partners for Terrific Science. Teachers in a five-State region work with private industry and university personnel to develop teaching modules in a science field. DOE sponsors teachers to attend sessions in their home districts and encourages the development of modules based on environmental restoration. The modules are dispersed to teachers through a series of workshops and through teacher representatives within school districts.

By August of 1993, this program was in 23 states and one DOD school. Eleven high school teachers and 15 fifth grade teachersparticipated, exposing 425 students to enhanced hands-on science activities. Hands-on classroom experiences on remediation were created for use in the classroom by teachers.

Chemical Education for Public Understanding (CEPUP). This Lawrence Hall of Science program was sponsored by DOE-Fernald and other local companies through Cincinnati Technical College. The objective was to provide educational experiences for middle school teachers to focus on chemicals and their interaction with people and the environment, as well as to promote the use of scientific principles, processes, and evidence in public decision-making. Since March 1992, over 220 teachers have participated, affecting 125 students per year. Students use hands-on experiences to make decisions which the general public faces each day. These materials directly correlate to clean-up decisions and remediation techniques in use at Fernald.

In FY 1993, eighty teachers participated in CEPUP, potentially affecting 9,756 students, through their increased knowledge.

Inner City Land Lab/Cincinnati Zoo Program. As an extension of an existing project with the Cincinnati Public Schools, this project is aimed at stimulating and directing the interest of disadvantaged and minority students to mathematics and the life/environmental sciences, with the long-term goal of increasing the number of people entering careers in the technical fields. The project includes teacher development, hands-on science in the classroom, and field trips. Three programs have been initiated with the Cincinnati Zoo and Botanical Garden: the Junior Environmentalists, Land-lab at Rockdale School, and New Explorers.

The Junior Environmentalists, a program forminority students grades 4th through 6th, meets weekly at the zoo for after-school activities. The program also included a monthly overnight trip and a 10-day field expedition each summer. Since the inception of the program 25 years ago, more than 50% of the graduates have entered science-related careers.

The Land-lab at Rockdale School program involves students, parents, and community leaders assisting in developing and maintaining a land-lab based at the school. The program includes teacher development programs, field trips, and hands-on science activities both at the lab and in the classroom.

New Explorers programs emphasize environmental science with the zoo to reach a wide variety of teachers and students in the tri-state area. The programs have received major national and

international recognition and awards for their outstanding education programs. These programs reach out to 125,000 students each year. In FY 1993, twenty-six teachers and 1368 students participated in this program.

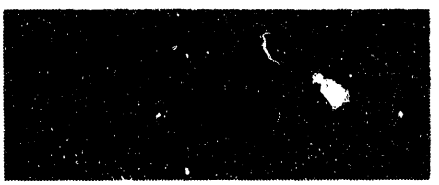
Science, Technology, Environment and Me (STEM CAMP). The Fernald Environmental Management Project (FEMP) participates in hands-on demonstrations related to Fernald environmental issues for students in grades 5-8 to capture their interest in science and mathematics.

In FY 1993, sixty middle school students attended the camps and participated in hands-on, open-minded environmental science activities. Scholarships were provided to underrepresented groups to attend the camps.

Teachers at Federal Facilities. Middle and high school teachers from local school districts are employed at Federal facilities for eight weeks to evaluate DOE educational projects for applicability to the region.

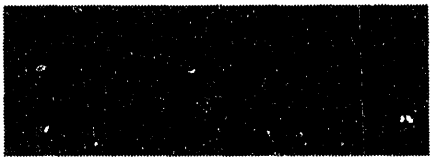
In FY 1993, six teachers were selected to work in the laboratory at the Fernald Facility. Two teachers were involved in remediation activities and two were involved in laboratory safety. Two teachers were also selected to attend TEEM Sessions in Idaho with the purpose of importing the program to the Cincinnati region. Through the teachers, this program potentially impacted 750 students.

IDAHO:



Teaching Hazardous Waste and Nuclear Topics (TNT). Teaching Hazardous Waste and Nuclear Topics (TNT) is an outreach project offered jointly by the INEL and the American Nuclear Society (ANS). INEL scientists provide information to elementary and secondary school teachers on the fundamentals of nuclear practices and processes in the modern DOE facility. Workshops are conducted over a period of two Saturdays; the first workshop day consists of classroom lectures, demonstrations, and discussion. The second day includes a tour of the INEL Radioactive Waste Management Complex. Teachers return to their classrooms with information, hands-on experiences, and an activity manual to augment their curriculum materials.

Since the beginning of the program, TNT has provided a broad understanding of hazardous materials and nuclear topics for approximately 1,000 Intermountain Region teachers at all grade Levels. In FY 1993, 118 teachers participated in five TNT workshops.



Students Investigating Today's Environment (SITE). Students Investigating Today's Environment (SITE) is a waterquality testing program sponsored by EM-50 and conducted throughout Idaho since 1991. Students and teachers from 18 districts and over 20 schools throughout Idaho participated in the 1993 project conducting environmental testing and monitoring of the Snake River. The data collected was used as input for a database, analyzed, compiled, and shared among participating schools and sponsors of other student environmental monitoring projects. SITE has many partners joining the INEL to provide funding, facilities, materials, and staffing, as well as significant project diversity.

In FY 1993, FARNET, an association of national networks, selected SITE as the best creative use of Internet to improve research and education in Idaho.

Nationally, SITE has taken the lead among similar projects in several areas: published manuals, interactive networking, institute of higher learning-supported 800 numbers allowing affordable access to precollege users, and analysis support through state agencies and the INEL.

Teachers Exploring Environmental Management (TEEM). TEEM, previously known as the Waste Management Technologies Symposium, is an environmental program for secondary science teachers addressing the environmental and safety issues surrounding the handling, storage, and disposal of chemicals in school laboratories. Two sessions were conducted focusing on chemical safety issues, and waste minimization through microscale chemistry.

In FY 1993, TEEM participants completed a chemical inventory, forming alliances with community emergency action resources, presenting concerns to teachers and administrators.

TEEM was endorsed by the Idaho Education Association and the Idaho Division ofEnvironmental Quality.

TEEM (hazardous chemical) was transferred to DOE-Fernald.

On March 6, 1993, the second TEEM Evaluation and Planning meeting was held in Idaho Falls, ID for the 1992 TEEM participants. Notable actions completed by TEEM include: relocating and/or redesigning chemical storage rooms; obtaining operable ventilation systems; making presentations to school boards (open to media coverage); and contacting hazardous chemical disposal companies to bid disposal of unwanted chemicals. The teachers wanted to see more progress more rapidly and are setting new goals for this purpose.

Teachers Teaching Teachers (T^3). T^3 is a week-long, hands-on chemistry and physics workshop designed to allay the elementary school teachers' fears of teaching science. The program has a unique workshop approach where secondary teachers guide elementary teachers in hands-on physics and chemistry activities. The interactive format and lab experiments were developed by secondary teachers and reviewed by Idaho National Engineering Laboratory scientists. The experiments augment existing upper elementary physical science curricula and text books.

A presentation describing T^3 was made to the Pocatello School District Curriculum Planning Committee in March 1993. The INEL Office of Academic Programs had been requested to demonstrate the program in contrast to the other science programs conducted in District 25. A flood of phone calls to the District Office produced numerous requests for additional presentations for entire school faculties. There were also requests from individual teachers to participate in the summer workshop. The response was much greater than the District had anticipated. They are now very positive about offering an INELprogram that they had declined for the past three years.

In FY 1993, the program was technically transferred to University of Wyoming, Lewis-Clark State College (LCSC), Albertson College of Idaho, Casper Community College, and DOE research Facility at Rocky Flats, Colorado.

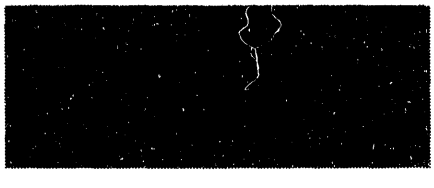
T^3 participants gave presentations at Idaho Science Teachers Association (ISTA) & National Science Teachers Association Conventions. At the 1993 ISTA Convention, the ISTA President-Elect stated "T^3 is the finest science program Idaho has going."

Kids Choice Science Camps. Supported by EM-50 since 1990, these summer science camps in the Intermountain West promote a hands-on, environmental theme with INEL or community science professionals involved with the instruction. Since 1990, Kids' Choice Science Camps have included: the Eastern Idaho Technical College Summer Science Camps, the Idaho Summer Science Camp, Odyssey of the Mind, Invention Convention, Minerals Education Program for Youth Scholars, the Progressive Summer Science Camps for underrepresented populations, and several community science camps conducted throughout Idaho. The project meets its primary objective by assisting small, rural communities, without science museums or discovery centers to provide science opportunities outside of the classroom.

In FY 1993, Eastern Idaho Technical College offered over 20 one-week math, science, computer, environmental, and bilingual summer camps that were leveraged by six school districts and others.

A one-week camp was offered in Homedale, Idaho, with a population of 2,078. The community views the camp as providing the difference in science achievement in their community.

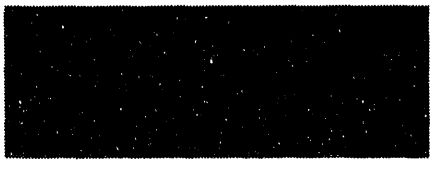
NEVADA:



Science and Technology Education Program (STEP). The projects supported under STEP focus on methods and activities to increase the work force needed for environmental restoration and waste management of DOE facilities, including the Nevada Test Site. The objective of the program is to improve, increase, and develop general public, student, and institutional interest in environmental sciences, engineering, and technology.

In FY 1993, DOE/NV and the Clark County District continued to receive requests for videotapes about the Garside Junior High School Technology Program. This program was started with seed funding from DOE/NV's STEP funding from EM-52 in 1991. The district and DOE/NV have distributed several hundred videotapes to schools all over the nation wanting to know more about the technology classroom program. The DOE/NV, Office of External Affairs assumed responsibility for distributing the tapes. No STEP funds were used in FY 1993 for this purpose. The technology program is a good example of the use of ERWM funding for "start-up" costs, as well as how a school district managed to use DOE funding as a catalyst for a district-wide junior high school technology classroom program. An important factor of this program is that funds are directly distributed to the recipients.

Two noncompetitive financial assistance grants were awarded to the Community College of Southern Nevada (CCSN) and the Environmental Studies Cooperative Education Center at the University of Nevada, Las Vegas (UNLV) in FY 1993.



University of Nevada, Las Vegas Environmental Studies Project (ESP) Curriculum Development. The degree program has a distinctly different approach from that of traditional studies. Rather than train individuals for niches in specific professional fields, the mission of this program is to train individuals to develop values to measure themselves as well as the ecosystems.

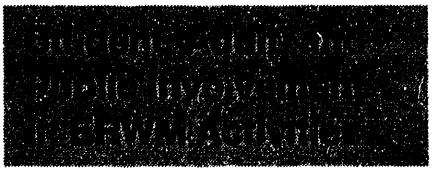
The program is interdisciplinary and is designed to prepare students for entry level positions in a variety of fields, including but not limited to: environmental policy and planning, environmental education, natural resource management, pollution control, conservation, lobbying environmental communications, etc. The program focuses on the development of in-depth knowledge in a specialization for interconnection with other applied disciplines such as public policy, economics, sociology, ecology, and engineering.

In FY 1993, a Hazardous Materials Study Center was developed. The center focuses on the technical issues that are present at the Nevada Test Site.

OAK RIDGE:

Kindergarten Through Sixth Grade Science Awareness. Ecological and physical science projects are developed by the American Museum of Science and Oak Ridge National Laboratory for presentation at rural and inner-city elementary school classrooms.

The American Museum of Science and Energy's outreach program, with support from EM-52, presented 300 sessions to 7,157 students and teachers, in a seventeen county region located within a 90 mile radius of OakRidge, Tennessee. Information on this program was presented at the Association of Science-Technology Centers (ASTC) Annual Conference.



Teacher Summer Research in Environmental Management. Pre-college teachers who serve educationally disadvantaged and underrepresented minority students from the Appalachian region participate in this project. The teachers hold eight-week summer appointments doing individual research projects at ORNL or CRESO. They also spend four hours per week in workshops designed to explore innovative ways to effectively communicate the nature of scientific inquiry to students and other teachers.

Three teachers completed their eight-week research assignments at Oak Ridge National Laboratory in FY 1993. Three additional teachers completed their eight-week research assignments at Clinch River Environmental Studies Organization (CRESO).

A workshop, relating to radiological sciences and waste management, was held in September 1993. This one-day program, sponsored in partnership with Oak Ridge National Lab, the American Nuclear Society, Oak Ridge Institute of Science Education, Knox County schools, and the University of Tennessee, provided 180 teachers with information and hands-on experiences for use in the classroom.

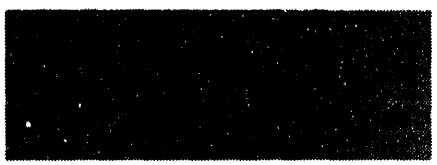
Clinch River Environmental Studies Organization (CRESO). Student-teacher teams from three high schools collect baseline environmental data over a 130 acre site that incorporates a former solid waste landfill. One goal is to build a cumulative, site-specific database to support a broadly based project of K-12 environmental education and student research.

Precollege Educational Outreach/ SEED. The MathQuest Summer Camps provide an opportunity for sixth and seventh graders to experience how mathematics is involved in the environmental restoration and waste management in their everyday world, as well as how important it will be to their future careers. To ensure maximum relevance, instruction is planned around activities that impact the target age group.

Curriculum modules have been developed for computers, water quality, stream flow, ecology, ozone, and others. The curriculum is designed and taught by qualified personnel with experience in teaching math and science to the target age group. The camps are based on academic campuses, but activities reach into the community to local businesses, the federal laboratory system, and institutions of higher learning, thus providing the participants with a broad spectrum of experiences.

ERWM MathQuest Summer Camps, held in the Chattanooga and Knoxville areas, were highly successful in providing 72 sixth and seventh grade campers opportunities to learn how math is needed in everyday activities involving environmental management. Experiences at the five-day residential camps included hands-on activities involving stream studies, ozone production, community solid waste management, composting, automobile emissions, recycling, reforestation, electricity production, business and industrial environmental management.

RICHLAND:

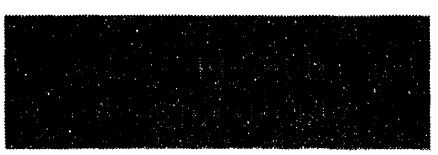


Native American Employment Program (NAEP). NAEP has aggressive and innovative outreach activities that are designedto address the diverse needs of Native Americans through recognition of their unique culture. The program also provides the Native Americans with educational and technical assistance and employment at the Hanford Site.

In FY 1993, NAEP conducted career workshops at reservation schools on the Yakima, Nez Perce and Umatilla Reservations. Presentations to students focus on opportunities in engineering and science. Students receive information on the environmental restoration mission at Hanford and on the technical workforce needs. NAEP employees were role models and spokespersons during the outreach program. The NAEP identified twelve Native American students as candidates for summer employment. As of June 1993, five students were working on site within their assigned technical groups. The remaining students were at various stages of the employment process.

The NAEP worked with the American Indian Science and Engineering Society (AISES) to plan the AISES Annual National Conference to be held in Spokane, Washington on November 11 - 14, 1993. "Restoring the Earth" is the conference theme which fits well with Hanford's environmental restoration mission.

Assistant Secretary Grumbly visited the Hanford site on August 11 - 13, 1993. He was presented with a written summary of the NAEP. During meetings with the Assistant Secretary, local tribes applauded the accomplishments of the NAEP. The NAEP exhibit "Native Americans Restoring the Environment", which highlights employees employed through the program, was included as part of a Hanford Science Center's (HSC) display on Indians. An objective of the display was to create an appropriate focal point in association with Assistant Secretary Grumbly's meetings at HSC with the Indian tribes.



OPTIONS in Science, Engineering, and Technology. The OPTIONS program, initiated by DOE through the Pacific Northwest Laboratory (PNL), was undertaken to motivate multi-cultural and

non-traditional students to remain in the science, engineering, and technical pipeline from early grades through graduate school.

In May 1993, twelve $1500 awards were given to participants in the OPTIONS project. There were six two-year awards and six one-year awards. The scholarships were applied by Columbia Basin Community College (CBC) to the costs of tuition, fees, and books for each awardee. This established a two-year program at CBC where students receive support while pursuing their technical studies. Students receiving the DOE/PNL awards were selected by CBC and PNL representatives.

In June 1993, approximately 650 sixth, seventh, and eighth grade students and teachers at Harriet Tubman Middle School in Portland, Oregon participated in activities designed to expose students to live science. Sixth graders attended a meet-a-scientist session with Bonneville Power Administration and PNL scientists. Hands-on workshop experiences in geology, old growth forests, fresh water ecology, ethnobotony, and salmon/Native American culture were reserved for the seventh graders. Eighth graders made a trip to the Bonneville Dam and Fish Hatchery.

Yakima Valley & Tri-Cities Mathematics, Engineering, Science Achievement (MESA) Ninth Grade Transition Project. The MESA project, for schools in the Yakima Valley and Tri-Cities area, is designed to develop activities that support ninth grade academics, provide mentors,expand job opportunities for students, expand the role model network and facilitate student entrance into the pipeline to higher education. It is structured to emphasize environmental applications of the course material.

Stars, Bugs, Molecules, and You. A course offered by the Institute for Science and Society for "home-bound" K-12 teachers, Stars, Bugs, Molecules, and You is designed to provide a survey of the scientific disciplines and a review of societal issues that are affected by science and technology. The course is structured to excite and motivate teachers, who have little or no science background, in order to motivate students to learn science.

ROCKY FLATS:

Exhibitions and Educational Exhibits. RFO was invited to display their exhibit (used at school career and science fairs, and general educational expos) at the United Nations Environmental Youth Forum in Boulder, Colorado on May 20-21, 1993.] In FY 1993, the FY 1992 groundwater exhibit was expanded to be more interactive through involvement with the Denver Children's Museum Earthlab and Weather Center.[The expansion included three-dimensional models for students to use to simulate groundwater movement, contaminant pathways, and cleanup technologies.]

Starguiders, a pilot program where Rocky Flats professionals work with Arapahoe House alcohol and drug rehabilitation centers at inner-city middle schools on a prevention program, was implemented in FY 1993. TheRocky Flat plant professionals focus on teaching

about the environment and are involved in several events to increase participation of underrepresented groups in math and science.

Rocky Flats began coordinating a DOE-wide technology education showcase for display at the 1994 International Technology Education Association Conference.

Rocky Flats began development of an environmental restoration model with a focus on risk assessment.

Expanding Your Horizon. A one-day workshop provides information and encouragement to young women in grades 6-9 to pursue science, mathematics, and engineering course work and careers. Women professionals employed in non-traditional fields serve as role models and points of contact for the young women.

On March 6, 1993, the Rocky Flats Office co-sponsored the Expanding Your Horizons Conference for inner-city girls at Metropolitan State College in Denver, Colorado. Five hundred 6 to 9th grade girls attended the workshops. Approximately 25 science and math oriented workshops were offered. Women Scientist from Rocky Flats participated as role model for the attendees.

Center for Applied Technology. The Rocky Flats Environmental Literacy/ Outreach Program works with three school districts on their Technology Education Centers. Grants are provided to the School districts to purchase equipment. The purpose of the project is to teach students the underlying systems involved in technology, with a focus on environmental technology.

In February 1993, the RFO awarded a grantfor $119,412 to Jefferson County Arvada West Articulation to support an exploratory, hands-on technology program for K-12. This unique program takes the concept of a technology lab found in many middle schools and expands it throughout ten elementary and middle schools that feed into Arvada West High School. Once students get to Arvada West, they have an opportunity to study environmental technologies taught in an interdisciplinary manner.

Mentorship Program. DOE employees work with area schools to help teachers and students further their science and math education. The focus is placed on activities that challenge students by providing them with an opportunity to explore ERWM-related topics through hands-on activities under the guidance of experienced DOE science and engineering professionals.

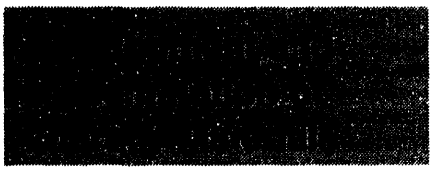
In FY 1993, Rocky Flats participated in a Teacher/Business exchange facilitated by the Boulder Chamber of Commerce. For example, scientists from Rocky Flats visited Casey Middle School to experience school life first-hand. They participated in a school day observing classroom dynamics, class context, equipment needs, and dedicated professionals. In exchange, teachers from the Casey Middle School visited Rocky Flats to experience a scientist's workday first-hand. The teachers participated in a tour of the Rocky Flats facility and visited five scientists in their respective offices observing current projects, equipment, and dedicated professionals. The educators were interested not only in the academic requirements for scientists, but also in traits required by industry such as communication skills, team work, and the ability to work independently.

Teachers Teaching Teachers (T^3). T^3 is a week-long, hands-on chemistry and physics workshop designed to

enhance elementary school teachers' science teaching. The program has a unique workshop approachwhere secondary teachers guide elementary teachers in hands-on physics and chemistry activities. The interactive format and lab experiments were developed by secondary teachers and reviewed by Idaho National Engineering Laboratory scientists. The experiments augment existing upper elementary physical science curricula and text books. The Rocky Flats Facility imported T^3 into Colorado from Idaho in 1993. The secondary teachers have a modified Colorado presentation to align with state science standards.

In FY 1993, the T^3 workshop involved 20 teachers and had an impact on approximately 1,000 students. The workshop was conducted in the Denver Public School District where 70% of the students are minorities.

SAN FRANCISCO (OAKLAND):



Environmental Restoration and Waste Management (ERWM) Curriculum Development/Training Minorities in Early Childhood Education. This project, developed around the use of bilingual bicultural training materials, is a cooperative effort to develop and institutionalize science activity-oriented curricula for minority elementary school students.

The National Hispanic University (NHU) completed the Bilingual Environmental Science Training (BEST) curriculum for grades K-4 in FY 1993. The University presented a three-day Summer Teacher Institute Workshop on its grades 3 and 4 BEST Program in 1993.

NHU conducted two Community Based Environmental Literacy Workshops in 1993. The topic for the workshops was "1,001 Ways to Save the Planet and Pollutions in Your Backyard."

American Indians Young Scholars (AIYS). The AIYS Project is a cooperative effort, implemented by D-Q University, that is designed to stimulate Native American students' desire to gain knowledge in science and math. The program includes lab research activities, field trips, hands-on experiments, guest lecture presentations, group science projects, and career and college motivational seminars.

During the summer of 1993, D-Q University conducted a three week summer bridge program for 25 American Indian students. The tribes represented in the program were the Aleutian, Apache, Blackfoot, Brunca, Cayuga, Cherokee, Chumash, Eskimo, Kickapoo, Navajo, Paiute, Pomo, Yuki, and other tribes. The project's activities were held at D-Q University and focused on academic hands-on research experiences. There was emphasis on math and science as applied to environmental restoration and waste management issues. Academic support was given to D-Q University by the University of California-Davis and Stanford University. Follow up activities will include students attending year round Saturday Academies located throughout the state of California, as well as students being recruited to attend D-Q University to pursue careers in the environmental sciences.

The Idaho Field Office was assigned the lead responsibility for the coordination and development of a comprehensive evaluation strategy for EM-522 activities. The Idaho Field Office is working with the Technical Evaluation Support Team (TEST) to develop an overall comprehensive evaluation strategy draft to be implemented in FY 94. A major effort will be to build upon current evaluation efforts and to avoid unnecessary duplication by using proven methods to improve both the formative and summative evaluation information efforts.

The evaluation process 1) identifies the objectives, strategies, and standards according to best research practice in education to successfully accomplish the stated goals; 2) designs a formative evaluation process for program development according to stated goals and a summative evaluation process to document the impact of the program and projects; 3) implements these evaluation processes in the Environmental Education and Development Division (EM-522); and, 4) provides documentation of outcomes of the EM-522 environmental education support projects.

Project Evaluation. The depth and scope of the project level activities depend on the individual project and its funding level. Project level formative evaluation activities are the responsibility of project personnel. These evaluation activities are conducted by in-house personnel, local external evaluation consultants, and any other available source. Technical assistance is available for projects conducting their own evaluations. Typical support includes instruments for evaluation (or assistance with their development), a review of project evaluation plans, potential evaluation questions, review of instrument design, and other project assistance necessary for effective evaluations.

Program Evaluation. Program evaluation activities are conducted by teams of experts and are coordinated by EM.

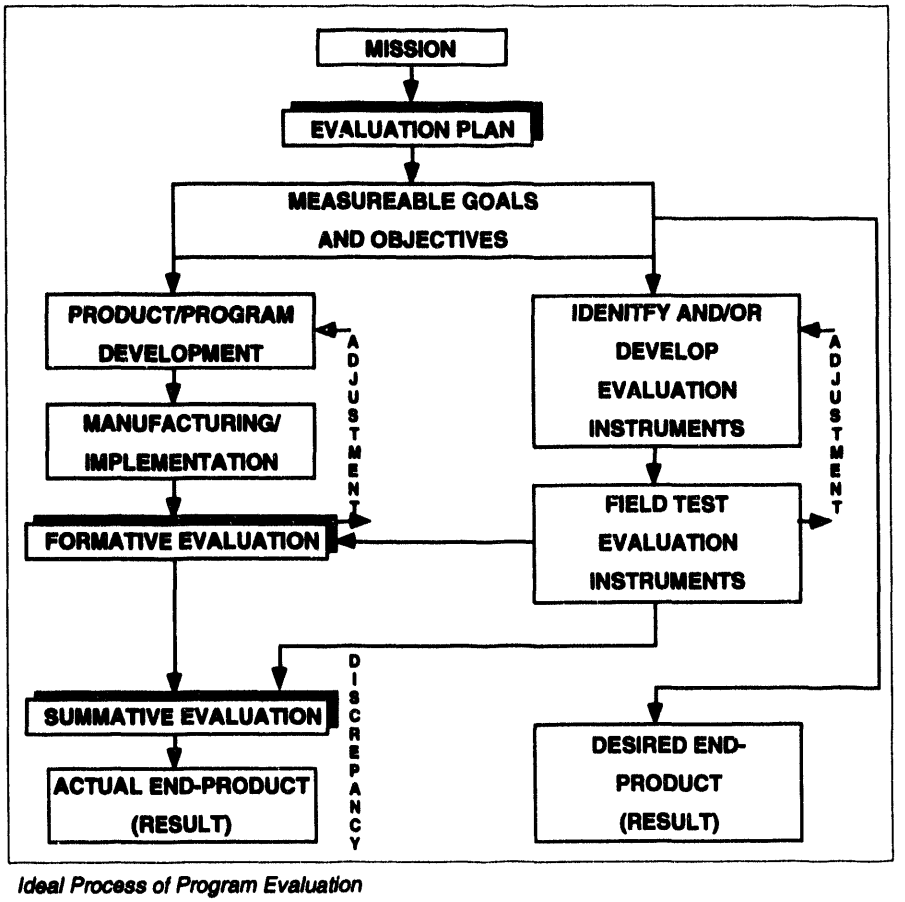
Peer Panel Review. The purpose of the peer panel review activity is to provide a systematic assessment of program coverage and delivery and to provide rapid and continuous feedback about EM-52 projects. The objectives of the peer panel review process are:

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;
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.

All EM projects are tracked with respect to documentation, budgets and progress toward milestones. EM-522's Program Tracking System (PTS) is an important formal reporting system in which all project managers are required to submit both fiscal and activity milestone information. While the PTS cannot produce the data of a rigorous evaluation, it can be a very valuable tool for project personnel as well as EM policy-makers. The monitoring activity is the responsibility of the Program Coordinating Office (PCO). This monitoring activity focuses not only on universal information, but on the collection of performance data as well.



Ideal Process of Program Evaluation

Technical Assistance is provided by external program evaluation consultants as specific needs are identified. Special assistance will be provided on technical issues likely to be problematic across all EM-522 program types. Some categories likely to require special assistance are: implementation of evaluation plans, instrument development, question development, target population issues, and internal evaluation. Within EM, there are programs and projects with similar goals and directions. Instruments will be developed for use in evaluating such programs and projects.

The purpose of formative evaluation is to improve EM-522 projects which are still developing. Formative evaluation feeds information to project staff, who can make changes as needed. The evaluation strategy provides for a good balance between program operation (formative evaluation activities) and program effectiveness (summative evaluation activities). Technical assistance and collaboration will be used to strengthen the quality and amount of evaluation information collected.

Summative evaluation can be considered as the consumer's protector. It takes an independent look at the project and asks whether it is any good; what is the quality of the products, the effectiveness of the interventions, the short term outcome and long term impact produced, positive and negative side effects, transportability and utility in other

settings, critical competitors (i.e., alternatives that achieve the same ends only better, cheaper, or with fewer negative side effects. Good formative evaluations also address many of these same questions; in some instances the best formative evaluation is an anticipatory summative evaluation. In summative evaluation, these questions are not addressed in order to improve the project, but to render decisions about continuation, termination and dissemination. Summative evaluations are conducted by external evaluators according to an identified need.

In FY 1993, EM-52 conducted two separate peer panel reviews on educational activities.

Students Watching Over Our Planet Earth (SWOOPE). A peer review of the SWOOPE program was conducted October 21-23, 1992 at the Sandia National Laboratories in Albuquerque, New Mexico by a panel of four professionals. The panel conducted a management review of the developmental process, materials produced, and impact of the SWOOPE program. The panel performed the monitoring review to advise DOE/EM-522 Headquarters on possible next steps for the program. The findings of the review panel were divided into five major headings: Materials, Cultural Diversity, Evaluation, Cost, and Dissemination. The primary focus of the review panel was on the instructional materials produced by the SWOOPE program.

The Peer Review Panel presented their findings in the Peer Panel Report for the SWOOPE program in December 1992. Los Alamos National Laboratory, on behalf of SWOOPE, responded to the findings and recommendations in a February 1993 report. The Technical Evaluation and Support Team (TEST) reviewed and analyzed documents pertaining to SWOOPE to provide an unbiased evaluation of SWOOPE's response to the Peer Panel Review Report. TEST recommended that EM-52 order an external summative evaluation of the SWOOPE program.

EM Scholarships and Fellowships. A panel of four professionals served as evaluators at the Scholarship and Fellowship Program Review held May 6-7, 1993 in Washington, DC. This review process was more for informational purposes across programs, with evaluation being a secondary issue. The objectives of the panel were: (1) to review and comment on the goals of the individual programs as they relate to EM's mission goals; (2) to provide critical feedback to DOE Headquarters about the current status of Scholarship/Fellowship programs; (3) to make a pre-assessment or evaluability assessment of the type of evaluation activities that are now in place and how the evaluation process can be improved; and (4) to provide perceptions on the program strengths, as well as recommendations for improving programs. Therefore, part of the review was to assess the probable impact of the scholarship and fellowship programs as they were presented at the review in terms of the likely effect they would have on the number of well-trained workers in the field, and in particularly, on increasing the number of newly trained workers from the underrepresented groups.

Hazardous Materials in Aquatic Environments of the Mississippi River Basin. This is a broad research and education program aimed at elucidating the nature and magnitude of toxic materials that contaminate aquatic environments of the Mississippi River Basin, the complex interactions that occur during the transport of such contaminants, the actual and potential impact on ecological systems and human health, and the mechanisms through which these impacts might be remedied and the contaminated environment restored. This program, executed by Tulane and Xavier Universities, addresses research, development, and education problems associated with aquatic systems, which are representative of those faced by the U.S. Department of Energy (DOE). These include identifying available information to characterize the systems in the Mississippi River basin and comparable aquatic environments, identifying sources of potential pollution affecting the aquatic system, and mechanisms and technologies for restoring contaminated environments. The program utilizes a total system approach to pollution prevention and abatement considering the sources and natural environmental factors in the ecosystem.

Tulane and Xavier Universities work closely with Oak Ridge National Laboratories (ORNL) to develop and maintain a long term relationship that will encourage interaction and collaborations among the investigators at all of the institutions.

A student internship program was established for summer 1993. Four students (2 from Tulane and 2 from Xavier) went to ORNL in June for a 10 week program. One student worked on an engineering project to determine the deterioration rate of concrete blocks that surround containers of low level radiation waste. The other students worked on the Walker Branch climatic change project, a long-term experiment that involves the collection and redistribution of rainfall from one section of the site to another to compare the variances in vegetation and soils between the two sites and a control site. Plans are being made to expand the internship program to support 8 students in summer 1994.

A Chemistry professor from Xavier University -and an Engineering professor from Tulane University spent 5 weeks during summer 1993 at ORNL working with ORNL researchers to explore mutual research interests and discuss future collaborations. In September 1993,three staff members from the Environmental Sciences Division at ORNL visited Tulane and Xavier Universities to share the experience of ORNL in dealing with the use of biological markers (biomarkers) in ecological risk and to present two seminars, one on risk assessment and one on mechanisms to utilize the strategy for incorporating markers data into a risk assessment. The ORNL researchers also met with several ERWM project investigators.

In FY 1993, the Coordinated Instrumentation Facility (CIF) sponsored 3 seminars on Environmental Sample Preparation Techniques. These seminars were designed to educate the investigators on the use of microwave digestion systems for sample preparation and on the use of Inductively Coupled Plasma and Atomic Absorption Spectroscopy for Analyses.

Tulane/Xavier project administrators participated in OTD's "New Technologies and Program Exhibition" at the Rayburn House Office Building and at the Hart Senate OfficeBuilding in September 1993.

The following research and education projects were initially funded under this research grant.

COLLABORATIVE CLUSTER PROJECTS

Biological Fate and Transport of Toxic and Hazardous Materials.

- Biomarkers Subcluster
- Ecology Subcluster
- Exposure Subcluster

Assessment of Mechanisms of Metal-Induced Reproductive Toxicity in Aquatic Species as a Biomarker of Exposure.

Bioremediation of Selected Contaminants in Aquatic Environments of the Mississippi River Basin.

Pore-Level Flow, Transport, Agglomeration and Reaction Kinetics of Microorganisms Investigators.

Natural and Active Chemical Remediation of Toxic and Radioactive Metals in Aquatic Environments.

- Metal Ion Up-take on Selective Ion Exchange Membranes
- The Adsorption-Desorption of Metals at the Fresh-Salt Water Interface Subcluster
- Metal-Ion Sequestering Resins and Polymers Subcluster

Expert Geographical Information System (GIS) for Assessing Hazardous Materials in Aquatic Environments.

EDUCATION

Enhancement of Environmental Education at Tulane and Xavier Universities.

- Curriculum Development
- Environmental Programs Office and Staff
- ERWM Scholars Program at Xavier

INITIATION PROJECTS

Heavy Metal Immobilization in Mineral Phases.

A Pilot Study of the Applicability of Polarography to Exposure and Bioremediation Problems in Aquatic Systems.

An Interactive Hypermedia Model of Risk Communication About Hazardous Waste Remediation for Scientists, Administrators, and Students.

Bioenvironmental Analytical Support Services.

Evaluation of the Carcinogenic, Reproductive and Developmental Effects of Mixtures of Contaminants on the Medaka Fish (Oryzias latipes).

The Removal of Phenolics and Aromatic Amines from Aqueous Streams through Enzymatic Polymerization in the Presence of Surfactants.

Genetically Engineered Micro-organisms: Aromatic Hydrocarbon Biodegradation Genes from Rhodococcus.

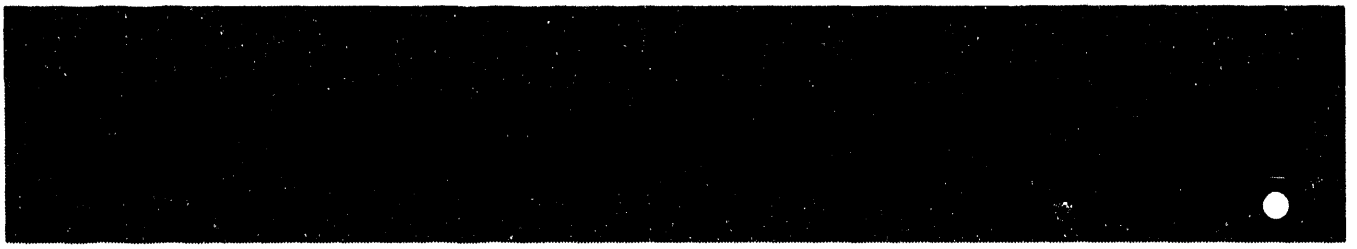
Lazer Ablation/Ionization Studies Related to the Removal of Nuclear Materials from Metal Surfaces.

Asymmetric PVDF Pervaporation Membranes for the Removal of Organic Contaminants from Waste Water.

Initiation of Collaborative Research Between the Tulane/Xavier CBR and the Institute of Radioecological Problems of the Academy of Sciences of Belarus in Minsk, Belarus.

Risk, Stress, and Restructuring in the U.S. Petrochemical Industry: A Case Study from Louisiana.

Synthesis of New Resins for the Absorption of Actinide Ions.



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