



# Seeds

Strategies for Ecology Education,  
Development and Sustainability



The First Six Years • 1996-2002

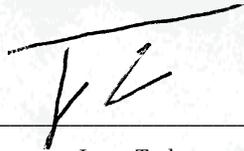
This report summarizes and celebrates the successes and lessons learned during the first six years of the SEEDS Program 1996-2002, funded by The Andrew W. Mellon Foundation. We look forward to watching SEEDS grow, as the program builds on these past achievements and sets new goals.



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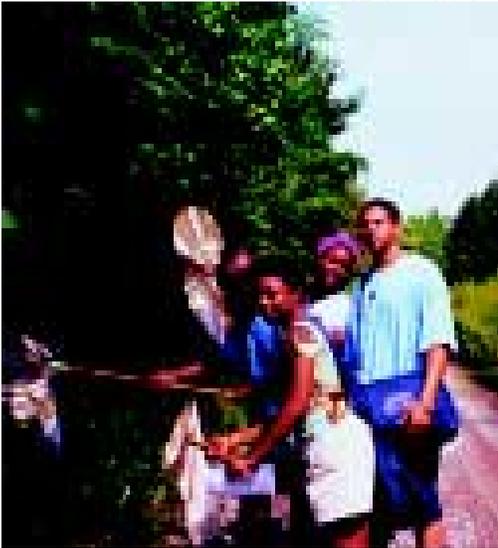
# Seeds: Plant Them Nurture Them Watch Them Grow

## Seeds

Seeds: Small packages containing all the genetic information needed to develop into an entire plant. When the timing is right, and the conditions for successful germination are present, a seed can be transformed into a brightly flowering plant or a towering tree.

SEEDS: Strategies for Ecology Education, Development and Sustainability. A small but sustaining package containing all the components needed to grow a new, more diverse generation of ecology professionals. Since 1996, leaders from the United Negro College Fund, the Ecological Society of America, and the Institute of Ecosystem Studies have worked together to create the proper environment in which African American and other minority students can be encouraged to study — and excel in — the field of ecology.





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*“I know as one person I cannot plant an entire forest, decontaminate an entire lake or get an entire nation to begin recycling. However, I can be a SEED which will grow and reproduce others like me.”*

— SEEDS student

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## SEEDS OF CHANGE:

### Taking Root and Beginning to Grow

SEEDS Participants .....	Inside Back Cover
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# PLANT THEM . . . The History of SEEDS

*“It is essential, from a justice and fairness standpoint, that no one be excluded from the field of ecology because of racism, prejudice, or discrimination, no matter how subtle it might be. Instead, all students should have a chance to explore this wonderful and important career path. But ecology must diversify for more than reasons of social justice; only when the full breadth of the American family is engaged in deciding what are important ecological problems and are able to bring their full, rich brilliance to bear on solving these problems, will ecology be up to the task that faces it. That the leadership of the ESA recognized this fact, when it made diversifying the field a key goal in advancing the science of ecology, is one of SEEDS greatest accomplishments in its first half decade.”*

—Alan Berkowitz, Head of Education, IES

## SOWING THE SEEDS OF DIVERSITY

In 1996, leaders from the Ecological Society of America (ESA), the United Negro College Fund (UNCF), the Institute of Ecosystem Studies (IES), and other organizations offering research experiences to minority students, met under the auspices of The Andrew W. Mellon Foundation in New York City to discuss how to grow a more diverse and robust field of ecology. A common concern emerged: that opportunities in ecology programs for advanced undergraduates from underrepresented groups were going unfilled due to a lack of suitable applicants. This did not bode well for the future diversification of ecology, already identified as a major concern by the ESA, whose membership in 1992 was a mere 0.3% African American.

In ecology, the groups agreed, there are several barriers to overcome in order to create a healthy and diverse field. Many minority students, particularly those who live in urban areas, have limited opportunities to experience the natural world or to meet and interact with professional ecologists. And, because few minority scientists teach or conduct research in the ecological sciences, minority undergraduates are at an additional disadvantage when looking for role models or for academic and career counseling, even if they are interested in pursuing an ecology degree.



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*“The diversification of the scientific community is a profound opportunity for science... [It] is a major source of richness... to the scientific process.*

— Steward T.A. Pickett, former Vice President for Science, ESA

*“SEEDS, by targeting minority students, makes them aware of the great need for their representation in many policy-making decisions that involve ecological and environmental issues.”*

— SEEDS student

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When trying to identify the best methods to recruit more minorities into ecology, leaders from the United Negro College Fund pointed out that America's Historically Black Colleges and Universities (HBCUs) play a critical role in educating and producing black science and engineering bachelor's degree recipients. As important, students completing their undergraduate education at HBCUs are much more likely to attend graduate school and to complete doctoral degrees in science and engineering.

Unfortunately, ecology has not been well represented in courses or degree programs at Historically Black Colleges and Universities, so many African American students are simply unaware of ecology as a field of study or as a career. As a result, for those with an interest in science in general, and biology in particular, the obvious academic and career path has routinely led to the health sciences where courses, undergraduate research programs, academic majors, community support, and role models are all well established.

## SEEDS TAKES ROOT

Dan Durret, Director of the United Negro College Fund's Department of Environmental Education Programs, and Alan Berkowitz, then Vice-President of the Ecological Society of America for Education and Human Resources, and the Head of Education at the Institute of Ecosystem Studies, agreed to work together to establish a new program to meet these needs, which they called Strategies for Ecology Education, Development and Sustainability, or SEEDS. Their goal was simple: *to recruit more African American undergraduate students into ecology.*



The foundation for the partnership was the belief that if ecology could be introduced as a degree option in UNCF colleges, and more courses and other learning opportunities could be made available to students *early in their undergraduate career*, then more African American undergraduates would seek advanced study and work opportunities in ecology. In the long run, the nation would begin to see more African American ecologists in research and in education, and as leaders nationwide.

With a generous grant from The Andrew W. Mellon Foundation, the three organizations set out to develop strategies to nurture ecology at HBCUs, by supporting faculty with an interest in introducing or strengthening ecology studies on their campuses, developing innovative and engaging courses and other learning opportunities, and exposing students to ecology and the environment throughout their undergraduate career.

# FERTILE GROUND FOR SEEDS TEAMS

The SEEDS partners decided early on that the best way to encourage the growth of new ecologists is to first encourage faculty at Historically Black Colleges and Universities to develop more ecology courses and programs at their schools. Faculty who are interested in developing field experiences or new courses, or who want to develop ecology lab sequences to support biology and other related courses, need both encouragement and support. SEEDS helps provide this support through faculty exchanges and visits to other campuses, professional development workshops, and introducing faculty to other scientists who were willing to visit their campus to enhance the school's curriculum, while bringing the excitement of ecology and ecological research to faculty and students alike.

Students with the potential to grow into the next generation of ecologists also need to have their strengths and interests nurtured from the beginning. Support might include developing recruitment events or ecology clubs, where students can interact with faculty and other SEEDS students, or, it might include providing stipends and other support to enable students to participate in academic, field, or research activities, as well as travel to state and national scientific meetings.

When discussing potential programs to support students, faculty, and their campuses, it was recognized that each HBCU campus is unique, with different academic emphases and differing needs. Thus, the best program would be one where each school developed its own, individualized courses, recruitment efforts, and other learning opportunities to fit within its institutional mission.

To initiate the process, each school assembled a SEEDS Team suited to their needs and resources – usually 2-4 faculty members and, in many cases, a handful of dedicated students – to plan and carry out their work. Some SEEDS Teams also included an ESA partner from a nearby institution who provided complementary perspectives, expertise, and resources. And in the fall of 1996, SEEDS developed a competitive mini-grants program. These small grants were awarded for support of students, faculty, and/or programs designed to develop stronger, more robust ecology programs at HBCU campuses.



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*“Most students come to Lemoyne-Owen College wanting to enter the medical field. SEEDS has helped broaden career opportunities for students, exposing them to the field of ecology.”*

— Dr. M Iqbal Shafi, Biology Department Chair, Lemoyne-Owen College

*“At my school ... everybody wants to be a doctor. So here I am, wanting to be something like a wildlife biologist... I felt kind of alone, until I got into SEEDS and found out there were more people who had the same interests as me.”*

— SEEDS student

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# NURTURE THEM . . . SEEDS Strategies



## SEEDING THE FIELD

Introductory biology and environmental science courses are how students are most often introduced to the principles of ecology. Whenever possible, participating SEEDS colleges have been encouraged to revise existing courses to include more ecology, and to introduce new courses in ecology and the environment so that all undergraduates have an opportunity to be introduced to — and share the excitement of — the science of nature and the nature of science.

Since 1996, when the first SEEDS Teams were formed and there were only a handful of ecology or related courses on participating campuses, the number of courses has increased tremendously. Each school now has a strong ecology component in their introductory biology sequence, and most have new ecology and environmental science courses that did not exist before.

In addition, many campuses are introducing field studies and undergraduate

## THE SEEDS PARTNERS

### **Ecological Society of America (ESA)**

The Ecological Society of America is a non-partisan, nonprofit organization of scientists founded in 1915 to promote ecological science by improving communication among ecologists; raise the public's level of awareness of the importance of ecological science; increase the resources available for the conduct of ecological science; and ensure the appropriate use of ecological science in environmental decision making by enhancing communication between the ecological community and policy-makers. With over 8000 members, it is the largest professional association of ecologists in the world and publishes some of the field's leading scientific journals.

Through its education program, ESA seeks to increase the diversity of ecology-related professions, to improve the quality of ecology education at all levels, and to engage the public in a dialogue on ecological issues. Recognizing the vital link between diversity of perspectives and the quality of the scientific enterprise, ESA leaders identified as a key goal the need to “increase the diversity of ecologists, including representation of cultural, ethnic, gender, intellectual and disciplinary perspectives, and persons with disabilities.”

### **United Negro College Fund (UNCF)**

The United Negro College Fund, or UNCF, is the nation's oldest and most successful minority higher education assistance organization. UNCF has been and continues to be firmly committed to the business of making higher education available and accessible to deserving minority students.

Since its founding in 1944, UNCF has worked to enhance the quality of education for students by providing

research into their biology and ecology curriculum. For example, at Alcorn State University, in Alcorn State, Mississippi, students have participated in a water quality and hazardous substance research project. Their research was submitted to a scholarly journal and presented as a poster session at the ESA annual meeting. At Rust College, in Holly Springs, Mississippi, a new course in environmental studies introduces students to terrestrial, aquatic, and contemporary urban environmental issues, and includes water and soil quality sampling and other research and field study techniques.



Three colleges have even introduced a new focus in ecology on their campuses: in 1998, Tuskegee University established an ecology minor; in 1999, Alcorn State University established an ecology/environmental science minor; and in 2000, Florida Memorial College established an environmental studies major and an ecology minor.

These new courses and avenues of study provide exciting opportunities for students to learn about and pursue undergraduate and graduate careers in ecology and related fields.

financial assistance to deserving students, raising operating funds for our 39 member Historically Black College and Universities, and increasing access to technology for students and faculty at HBCUs. UNCF administers more than 450 scholarship, fellowship and special programs, such as SEEDS, for students and faculty attending or teaching at member colleges and universities, other HBCUs, and majority institutions throughout the country. Since 1944, UNCF has raised more than \$1.8 billion and more than 300,000 students have earned college degrees as a result of UNCF's assistance. Currently, 60,000 students are supported by UNCF's scholarships, internships and fellowships.

### **Institute of Ecosystem Studies (IES)**

Founded in 1983, the Institute of Ecosystem Studies is an independent research and education center with more than 150 employees. Located in the Hudson Valley of New York State, the Institute creates knowledge through scientific research and synthesis, disseminates ecological understanding through teaching, writing, and exhibits, and applies knowledge by participating in decision-making regarding the ecological management of natural resources and promoting a broader awareness about the importance of ecological relationships to human welfare. Its education program advances the theory and practice of ecology education, fostering ecological literacy—an understanding of and ability to use the ideas and methods of ecological science for oneself—in youth, teachers, young scientists, professionals, decision makers and the general public. Work with undergraduate students and faculty focuses on infusing ecological research into teaching and learning, and on recruiting, training and sustaining a diverse ecological workforce.

## Howard University: When Seeds Blossom and Flower

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*“There is no ‘magic bullet,’ no singular solution to the question of how to engage people from under-represented groups in a currently homogeneous field like ecology. Career decisions are made at many points in each person’s life, with many factors at work. Likewise, each individual responds to a slightly different drummer. It is our job to provide support and opportunities in as many places and ways as we can.”*

—Alan Berkowitz, Head of Education, IES

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Established in 1868, the College of Arts and Sciences is Howard University’s oldest and, with an enrollment of approximately three thousand students, its largest academic unit. In addition to offering twenty-one degree programs to its students, the college provides instruction in core courses to all undergraduate students in the university. The Department of Biology has the largest enrollment of undergraduate majors in the College of Arts and Sciences. Before SEEDS, most of the courses focusing on the environment had been in engineering and the physical sciences, particularly chemistry, with an environmental sciences minor as an option within the Department of Engineering. Most students who pursued this track studied water and air quality assessment and remediation. Now, students have 40 ecology-related courses to choose from at Howard.

Through the SEEDS program, Howard introduced a multi-disciplinary environmental studies course to address a recognized need for a course that would focus on ecological and environmental issues. The course provides the

## New Teaching Techniques, Curriculum, and Courses of Study

### **Florida Memorial college: A Wetlands Classroom in its Own Backyard**

At Florida Memorial College, both biology majors and non-majors alike have had opportunities to learn about ecology, but until SEEDS, there was no opportunity for students with a serious interest in ecology to pursue their interests in depth. To better serve these students, an innovative new summer course has been developed for upper division students who have completed at least one course in Cell and Molecular Biology. “Ecology of Tropical Wetlands” introduces the role of different organisms in the ecological web, using the ecology of South Florida as the focus of study. The course emphasizes the importance of scientific inquiry including data collection and analysis, and teaches students how to communicate results for a variety of audiences.

In addition, the course includes field trips to the Everglades, Fern Forest, Fairchild Tropical Garden, Big Cypress Preserve, and to recycling and waste treatment facilities. Several guest speakers from these and other agencies visit the classroom over the course of the summer to speak directly to students about the ecology of local wetlands, and their agency’s role in preserving and protecting the region’s fragile ecosystems. Students leave the class with a greater appreciation of how the ecology of the region has changed over time, and a better understanding of the personal and professional roles they can play in the region’s restoration and maintenance.

### **Tuskegee University: The Science of Inquiry**

In 1993, Tuskegee established a program in environmental science, with a major available to students with an interest in waste management, water quality and toxicology, or in environmental management, law and economics. In addition, students can earn a B.S. in forestry and wildlife, with courses available to support all interested in ecology and environmental Biology. With SEEDS support, Tuskegee built upon this foundation by introducing a greater ecological focus in its “General Soil Science” course and by developing a new course, “Environmental Science II.” In addition, Environmental Science majors can now pursue a science option with an emphasis on ecology.

In the freshman-level course, “Environmental Biology,” faculty have introduced active learning modules, problem-

necessary background and training to enable students to 1) understand the complexity of the environment; 2) accept responsibility for the environmental consequences of their personal actions; and 3) develop a foundation of a personal environmental ethic. The two-semester course uses a case study approach, with six or seven cases introduced each semester. Students examine the scientific, social, policy and cultural implications of each case study. In the first semester, students focus on individual and local issues, and learn how these affect the lives we live at home and in school. The second semester focuses on community and global issues. During both semesters, as part of a required service component, students work on and off campus on conservation and watershed issues.

The environmental studies course and a complementary Environmental Society have become mainstays of ecological education at Howard University, with faculty presenting results of their program at faculty development workshops and with administrators investing in the long-term support of the programs. Howard University has also enhanced the SEEDS project by organizing faculty development programs where faculty can learn more about inquiry-based learning, developing students' critical thinking, and integrating outcomes assessment into their courses.



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*“SEEDS is a great program to become involved with because it gives you a chance to grasp opportunities and network your way to pursuing your career ideas.”*

— SEEDS student

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based learning, and group exercises building on their SEEDS experience. This course, which is required of all biology and environmental science majors, had been taught as a large lecture class with multiple lab sections. With SEEDS support, the lab sections were also upgraded with computer-based exercises, and with the scheduling of field trips. Since many students take this course as first-semester freshmen, it sets the tone for how they expect to learn biology in college. Having opportunities to *do* science, rather than to simply listen to lectures, has helped increase both student retention and performance, and has increased student interest in ecology.

### **Oakwood College: Learning from Real World Problems**

Oakwood College is located on an 1100-acre farm, with mountainous, forested, and wetland areas. While ecology had been taught as an upper division course for juniors and seniors before the SEEDS program, the real world importance of ecology was driven home to students and faculty when the college was cited by the Environmental Protection Agency (EPA) for disturbing the ecosystem of their wetlands and was ordered to restore the affected area. SEEDS students were enlisted to study the site and to meet with experts, who visited campus to help develop a plan for restoring and preserving the area. Students got hands-on opportunities to be involved with several aspects of site cleanup, from planning to implementation, and learned how restoration activities can help meet EPA and other regulations. In effect, students discovered for themselves the impact humans have on the environment.

In the process, the area has been developed as an Outdoor Ecological Laboratory for both the “General Ecology,” and “General Biology” courses, which have introduced research components as part of their course of study. In addition, a boardwalk has been constructed so that students can walk out to the wetlands, signs and markers have been posted to identify different ecosystems, and a nature trail has been constructed through the forested areas to allow students to spend more time in the out of doors. SEEDS students have also been involved in a health-related research project in a neighboring town testing DDT-contaminated ponds and portions of the Tennessee River.

Results of this and other student research have been presented at the ESA annual meeting and, because of this new interest, Oakwood College has approved a new course in environmental science.

# A CROSS-FERTILIZATION OF IDEAS



The SEEDS partners believe that both science and the nation will be stronger if we make a long-term commitment to increasing the role of minorities within the field of ecology. This commitment is necessary at all levels of the educational enterprise, but it cannot happen without the support and participation of biology and ecology faculty. Faculty are key influences for student choices and success. Faculty outside the field of ecology also need opportunities to learn more about the field, so that they can advise and encourage students with an interest in ecology, and so that faculty can expand their own professional development as biologists, chemists, soil scientists, and engineers.

To meet this growing need to nurture faculty at all levels, the SEEDS program has developed and supported a number of diverse faculty development programs. Over the last six years, more than 50 faculty members at the participating campuses have participated in the program. Activities include workshops at participating campuses, programs and opportunities for exchange with other scientists at the ESA annual meeting and at IES, support for field supplies and research

## Faculty Development Workshops

SEEDS sponsors faculty development workshops to encourage faculty from participating SEEDS campuses to share:

- effective methods for recruiting more talented students into the field of ecology, including how to develop programs that transform a student's appreciation for the local environment into a love of science and research;
- frameworks for developing new courses, starting with defining the goals and objectives of the course and then developing assessments and teaching strategies for achieving those goals;
- innovative teaching and learning strategies for improving existing courses and for introducing new and challenging concepts, like ecosystem ecology, into those courses;
- ideas for integrating ecology, student research, and field experiences into new and existing biology courses;
- methods for teaching core ecology concepts to make them more accessible for students of diverse backgrounds, such as inquiry-based investigations and problem- or case-based teaching;
- practical plans for teaching about ecosystems as diverse as the human/urban environment and aquatic/wetland ecosystem; and
- lessons learned about how to more effectively assess and document their courses and the overall program's success.

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*“The workshop was great. We accomplished much toward enhancing our curriculum in a short time.”*

— SEEDS faculty

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*“The best part of the workshop was sharing ideas and learning from other SEEDS faculty who face some of the same challenges that I do.”*

— SEEDS faculty

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equipment, and funds for faculty research and study.

As a result of participating in these annual workshops and other SEEDS faculty development programs, HBCU faculty have increased their own knowledge of ecology and improved their teaching to incorporate more student-centered learning and authentic assessments into their courses. Equally as important, participating faculty members at SEEDS schools have grown into a close and supporting network with a common goal: the recruitment and retention of more African American and other minority students in ecology-related fields.

Since 1997, SEEDS has also helped more than 30 HBCU faculty, many of whom have not had such opportunities in the past, attend ESA meetings. The faculty network with each other and with scientists from across the discipline of ecology, enhancing their careers as researchers, teachers and mentors. In addition, they learn about cutting-edge research and teaching techniques, and participate in the vibrant community of ecologists.



## SEEDS Elements of Ecology Teaching Excellence

(from Faculty Development Workshop, Paine College, Augusta, GA, March 2001)

- 1) Student-centered and student-active learning.
- 2) Inquiry-based teaching, building on students' questions.
- 3) Constructivist teaching, building on their prior conceptions and helping students actively construct and revise their understandings.
- 4) Uses and develops students' critical thinking skills.
- 5) Guided by authentic assessment of identified learning objectives.
- 6) Learning in real contexts and through real problems.
- 7) Gaining direct knowledge of, and comfort in, local environments.
- 8) Addresses diverse learners and learning styles.
- 9) Builds on the most current thinking in ecology, emphasizing the most important big ideas and frameworks.
- 10) Engages student interest and builds a positive attitude towards the field of ecology.

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*“We value the SEEDS program because the training that faculty receive from the annual faculty development workshops is a direct benefit to our school.”*

— Dr. Barbara Frankle, Dean of Faculty/  
Academic Dean, Lemoyne-Owen College

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## TENDING THE SEEDLINGS



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*“The SEEDS program at Tuskegee University sponsored a trip to the Dauphin Island Sea Lab. This was a prime opportunity to venture off into the realm of marine biology, and at the same time we were exposed to expertise, and a chance for an internship. Being out in the Bay not only exposed me [to] many different organisms, but I learned about the factors that control weather patterns, and how the increase in farm land and their fertilizers are having a devastating effect on the Gulf Coast. All of this information came from one trip that in turn broadened my horizon.”*

— SEEDS student

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Students need experiences in the field – interacting with other students and scientists beyond their own institution, and learning in and about ecosystems other than those nearby – in order to fully understand and get excited by ecology. They also need these experiences if they are to take a leadership role in enhancing ecology teaching and recruitment on their campuses – a hallmark of the work of many SEEDS Teams. Finally, they need to have opportunities simply to be exposed to and immersed in ecology and the environment in safe, socially supportive, fun and comfortable settings. To meet these needs, SEEDS strategies have included ways of building student leaders – bringing students to professional society meetings, providing field trip opportunities and developing ecology clubs and associated activities on each SEEDS campus.

For example, SEEDS provides support for students to travel to the annual meetings of the Ecological Society of America and other professional societies, where they can attend sessions and are invited to make poster presentations on their program as well as on SEEDS-related research. At ESA, where most students choose to attend, they have opportunities to participate in scientific field trips and workshops, career workshops, and SEEDS planning sessions. SEEDS students, often working with their faculty SEEDS Team members, have co-hosted special events such as environmental justice symposiums and workshops on diversity.

The ESA annual meeting has proven to be an important opportunity for students to learn how ecologists work and share ideas, and to participate in a scientific meeting. Upon arrival at the meeting, students are paired with a mentor who discusses academic and career goals with them, helps them decide on which sessions to attend, introduces them to other scientists, and joins them at social events. Mentors are recruited from active ESA members, and include professional ecologists, faculty, graduate students, and even former SEEDS students.

## Ecology Clubs: Cultivating an Interest in Ecology

Ecology Clubs serve as a social center for students, nurturing an interest in the science of ecology while introducing them to various ecological issues and avenues of study. Depending on the campus, ecology clubs arrange environmental meetings, support Earth Day celebrations, host field trips, and organize recycling and other “green” activities on campus, where students can develop an early interest in the environment. With some nurturing and opportunities for study, this initial interest can be transformed into a greater appreciation of the science of ecology. Many Ecology Clubs include members who take responsibility for student recruitment into ecology, and members serve as role models in the practice of environmental sustainability and stewardship on campus.

When the SEEDS program began, only two schools had ecology clubs, with about 45 students participating. By the end of 2001, each of the 10 SEEDS schools had clubs and it was estimated that close to 200 students were active. Some campuses use connections they have with research universities and facilities to bring in prominent ecologists to deliver talks and visit with students. For example at Tuskegee University, faculty and researchers from Duke University, the University of Georgia, Auburn University, and Dauphin Island Sea Lab have led seminars and met with students to give them a better idea about career opportunities. Field trips to research facilities and state parks provide another opportunity for students to not only have more in-depth field experiences, but to also see the full range of career possibilities in ecology.

Hampton University's ecology interest group has, among other things, tackled local environmental justice and human health/environment issues. Their panel discussion, "West Nile Virus and Mosquitoes: To Spray or Not to Spray," that drew over 60 Hampton students and local community members, and the Green Careers Videoconference are two examples of their highly successful on-campus activities.

LeMoyne-Owen College's Ecology Club has organized a campus cleanup day, a fieldtrip to the Mississippi River, and a campus-wide essay contest. The club has also purchased computer programs for interactive simulations on species diversity and ozone depletion. They hold a weekend academy seminar series where community activists and guest speakers are invited.

Paine College has two ecology-related clubs: EARTH (Environmental Advocates Recycling to Help Save Our College) and the Paine College Ecology Club. Activities have included a campus cleanup, a recycling campaign for America Recycles Day, and a SEEDS booth at an Earth Day celebration. They recruit students through special video shows in the dining hall and in membership drives at campus poetry reading nights.

## Bethune-Cookman College: Turning the Tide of Apathy

Although ecology was officially part of the curriculum at Bethune-Cookman College, not one student had enrolled in the course in over ten years, according to Dr. Mike John, Associate Professor of Biology. There was, in his words, "total apathy," when it came to the subject. No one knew about careers or other opportunities in ecology because, as he explained, students were simply not interested. Students believed that questions of the environment in general were "white issues," and therefore did not affect them.

The SEEDS program has helped turn that apathy around, according to Dr. John. Starting with the goal of stimulating an interest in ecology, Dr. John and his colleagues introduced a number of SEEDS activities that have met with remarkable success in a very short period of time.



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*“SEEDS is a program that has greatly benefited me as a participant. It has given me academic, financial, and employment support that has directed me to the field of environmental policy. Without SEEDS involvement in my undergraduate experience, the experiences and opportunities that I have been exposed to would be nonexistent.”*

— SEEDS student

*“The opportunity to take part in a scientific meeting alone was more than gratifying.”*

— SEEDS student

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*“To design a curriculum in ecology we were forced to remove the mind-set of apathy brought on by years of minority disenfranchisement from the environmental movement and replace it with the ecological awareness that would make our students see the necessity of taking ecology in the first place.”*

— Dr. Mike John,  
Bethune-Cookman College

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First and foremost, ecology has been introduced into the general biology course, which is required of all Bethune-Cookman College students. This means that all students — more than 400 each year — are exposed to the basics of ecology as part of their general education.

In addition, Dr. John has introduced problem-based learning into his laboratory sessions, and has worked with students on innovative studies of environmental contamination that directly affects Bethune-Cookman students, their families, and their communities. For example, Dr. John has organized field studies in makeshift playgrounds in local neighborhoods and at nearby rivers

and streams to test for environmental pollutants. These trips have proven to be important learning experiences for students, as students learn the precise methodology of scientific measurement and replication, and are then given opportunities to write up and present their results to their peers and at national meetings.

When students detected traces of mercury in areas popularly used for fishing, the campus saw an immediate surge of interest in ecology. As a result, Dr. John’s new summer course, Ecology, in which field testing of local sites plays an important role, was an immediate success, attracting more students than any other course taught in science or math during the first two summer sessions.

Equally important, by participating in field studies and other SEEDS-related events, students discover that contamination of their environment may in fact be detrimental to their health. It’s like a wake-up call to action and involvement, Dr. John noted, and has resulted in a surge of interest in ecology on campus. In fact, some of his earliest SEEDS students are now pursuing graduate degrees in ecology, with two students already pursuing ecology-related careers.

## ESA Environmental Justice Workshops, Symposia, and Discussions

### **2002 meeting, Tucson, AZ**

*Workshop:* “Global Climate Change & Environmental Justice Education” (Organizers: Jablonski & Cole).

*Symposium:* “Ecological Restoration and Environmental Justice: Empowering Communities” (Organizers: Jablonski & Rodriguez).

### **2001 meeting, Madison WI**

*Workshop:* “Teaching and Learning through Ecological Thinking In and About Urban Ecosystems,” sponsored by ESA’s Education Section (Organizers: Berkowitz & Mappin)

*Evening Session:* “Environmental Justice and Ecology Education,” sponsored by ESA’s Education and Human Resources Committee (Organizers: Jablonski, Grant, Middendorf, & Nilon)

# ENVIRONMENTAL JUSTICE

Environmental justice is the fair treatment of peoples of all races, cultures, and income with respect to the development, implementation and enforcement of environmental laws, regulations, programs and policies.

Several campuses have recognized the role Historically Black Colleges and Universities can and should play in promoting environmental sustainability and environmental justice in minority communities. For example, at Rust College, leaders are enlisting the help of students, faculty, and the community to transform the campus into the first sustainable college in Mississippi. At Paine College, new programs in environmental justice education and environmental sustainability have enhanced existing ecology courses available at the college. And at Howard University, faculty have introduced environmental justice into their courses through the use of case studies, which are reinforced by fieldtrips to a local solid waste landfill adjacent to a minority community.

SEEDS students often point to the important role environmental justice can play in making ecology more meaningful to students and piquing their interest in ecology. By focusing on a problem relevant to students and by highlighting broader issues, SEEDS faculty and students can then “work backwards” to introduce ecological principles.

By exposing undergraduates, through SEEDS-sponsored fieldtrips and other outreach programs, to the issues affecting environmental sustainability and equity, campuses are educating a new generation of ecologists and environmentalists, who can in turn become leaders and advocates for environmental equity in their own communities.

The topic of environmental justice, absent from the meetings of the ESA before SEEDS, now is now regularly represented in papers, symposia and workshops. Indeed, SEEDS faculty and leaders have played a key role in bringing this new dimension to the way in which ecology – as exemplified in ESA’s programs – is practiced.



*Evening Session:* “Diversifying the Field of Ecology: In What Ways Does the Field Need to Change?” (Organizers: Berkowitz & Jurgensen-Armstrong)

## **2000 meeting, Snowbird, UT**

Symposium: “The Role of Ecology in Environmental Justice” (Organizers: Nilon, & the Education Section and EHR Committee)

*Evening Session:* “Environmental Justice Workshop” (Organizer: Middendorf)

## **1999 meeting, Spokane, WA**

*Discussion:* “What Can the Ecological Society of America Contribute to Environmental Justice?” (Organizers: Middendorf, Gonzalez, Pouyat, & Berkowitz)

## **1998 meeting, Baltimore, MD**

*Field Trip:* “Undergraduate Ecology Education Field Trip” (Organizers/sponsors: SEEDS and the Baltimore LTER, emphasizing urban ecology and inquiry teaching)



# WATCH THEM GROW . . .

## Celebrating our Results



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*“Somehow, we must break the vicious cycle of under-representation resulting in an absence of mentors and a narrowness of topics that begets more under-representation. This must be replaced with immediate efforts to identify diverse role models and mentors, and to jump-start the broadening of the topics addressed in the field, both to help make the field more welcoming, and to begin reaping the benefits we anticipate in the long-run from diversification of the ecological community.”*

—Alan Berkowitz, Head of Education, IES

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## PROFILE of 2002 SEEDS SCHOOLS

### **Alcorn State University, Lorman, Mississippi**

Alcorn State University was founded on the site originally occupied by Oakland College, a school for whites established before the Civil War by the Presbyterian Church. When the college did not reopen at the end of the war, the property was sold to the state of Mississippi and renamed Alcorn University in honor of James L. Alcorn in 1871, then governor of Mississippi. At first the school was exclusively for black males but in 1895 women were admitted. Today, the university’s original 225 acres of land have grown into a 1,700-acre state-of-the-art campus, and women outnumber men at the university. Approximately 94% of Alcorn’s 2900 students are African Americans.

### **Bethune Cookman College, Daytona Beach, Florida**

Bethune-Cookman College was founded in 1904 by Dr. Mary McLeod Bethune as a small, private, liberal arts college with ties to the United Methodist Church. Today, the co-educational, residential college offers both Bachelor of Arts and Bachelor of Science degrees in 39 major areas. Ninety-three percent of the campus’ approximate 2335 students are African Americans.

# SEEDS SCHOOLS

America's Historically Black Colleges and Universities play an important role in the science and engineering education of minority students. African American students completing their undergraduate education at HBCUs are more likely than those from other schools to attend graduate school and to complete doctoral degrees in science and engineering. HBCUs also account for a substantial share of black science and engineering graduate students, enrolling 27 percent of all African Americans who graduate in biology. HBCUs have also proven to be an important seed-bed for the SEEDS program.

Since its start in 1996, when the first Ecology Recruitment Teams were established at five Historically Black Colleges and Universities, the SEEDS project doubled in size to include ten campuses. The number of ecology or related courses offered at SEEDS campuses increased from a handful of courses to a much richer selection of introductory and advanced offerings. SEEDS schools have developed new courses, new options to major or minor in ecology and environmental science, new computer-based ecology activities, and new opportunities to participate in fieldwork and field study opportunities.

For example, every summer, Hampton's SEEDS Team now offers freshmen a week-long adventure in ecology in their Eco-Camp program. Participants explore marine, freshwater and terrestrial ecosystems near campus to learn about different research techniques used to address a wide range of interesting problems. The highlight of the 2001 Eco-Camp was when students helped band and release a sea turtle at the Virginia Institute of Marine Science.

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*“In general, HBCUs have served as the principal conduit for the education of African Americans. This is especially the case for scientists and engineers; without these institutions, their number would be negligible... Recent research and scholarship reaffirms the quality of educational life for African Americans at HBCUs and further documents the crucial productivity these colleges show in both their efficiency and their proficiency in many key fields, notably, the sciences and technical fields.”*

— William Trent and John Hill,  
in *Who Will Do Science* (1994)

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## **Florida Memorial College, Miami, Florida**

Florida Memorial College is one of the oldest academic centers in Florida. The private, coeducational, baccalaureate degree-granting college has its origins in the Florida Baptist Institute, founded in 1879 in Live Oak, and in the Florida Baptist Academy, founded in 1892 in Jacksonville. These two institutions merged in 1941 to form the Florida Normal and Industrial Memorial Institute in St. Augustine, Florida. The institution became a four-year college in 1945. Today, the college enrolls approximately 1700 students, about 90 of whom major in Biology each year.

## **Hampton University, Hampton, Virginia**

Hampton University was founded in 1868 during the days of Reconstruction as Hampton Normal and Agricultural Institute to prepare African-American men and women to lead and teach their newly freed people. In 1878, Hampton established a formal education program for Native Americans, beginning the Institute's lasting commitment to serving a multicultural population. Hampton's historic Native American education program spanned more than forty years, with the last student graduating in 1923. The college currently enrolls more than 5200 undergraduates (87% of whom are African American). At Hampton, students can study ecology in both its Department of Biological Sciences and in the Department of Marine and Environmental Sciences.



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*“My professors were really passionate about ecology... I think they were the key to my success...”*

— SEEDS student

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This was one of the many opportunities they had to meet scientists and to experience different places where scientists work.

SEEDS has also had a growing impact on HBCU faculty. Approximately 30 faculty members have been involved with SEEDS programs or as members of SEEDS teams, with a number of additional faculty at each participating school indirectly involved, either by participating in field trips, collaborating on courses, or helping set up faculty workshops. As a result of their participation in these and other SEEDS faculty development programs, faculty have added problem-based learning strategies at three campuses, enhanced inquiry-based learning at five campuses, included- new computer-based ecology activities in three schools, and have introduced or enhanced fieldwork and fieldtrip opportunities at all participating campuses.

## SEEDS Students

Ultimately, it is the SEEDS impact on students that will have a lasting impact in the field. And once again, the numbers are impressive.

Starting in 1997 with five students, the program now has impacted approximately 150 students through direct sponsorship and other activities, and over 300 additional students each year who participate in recruitment activities, Earth Day celebrations, campus cleanups, talks by visiting scientists, and other SEEDS-sponsored events. The number of students taking

### **Howard University, Washington, DC**

Howard University is the largest HBCU, with approximately 6000 undergraduates and 4000 graduate students. The College of Arts and Sciences is the largest college in the university, with more than 2000 undergraduates enrolled each year. The Biology Department’s 600 majors makes it the largest college. Howard has developed an Environmental Studies major and minor with support in part from the SEEDS program.

### **LeMoyne-Owen College, Memphis, Tennessee**

LeMoyne-Owen College was established in the fall of 1968 when LeMoyne College, a hundred-year-old institution formed by the American Missionary Association, and Owen Junior College, a junior college founded by the Tennessee Baptist Missionary and Educational Convention, merged. Today, the community-based college has a predominantly African American student population of 1200, mostly from the Memphis area.

### **Oakwood College, Huntsville, Alabama**

Oakwood College was founded in 1896 by the Seventh-day Adventist Church for the expressed purpose of educating freed slaves. Located on a 1100-acre farm, with nature trails and a newly established outdoor laboratory, the current student population is approximately 1767, of which 79 percent are African Americans. More than 350 of Oakwood College’s students are enrolled in the natural sciences.

### **Paine College, Augusta, Georgia**

Ecology has long been part of Paine’s curriculum in the Biology Department, with General Ecology required by

ecology or related courses each year at SEEDS schools has also increased dramatically.

SEEDS has substantially increased the involvement of students in research, field studies, and summer internships, up from only three students in 1997 to 108 students in 2001. For example, the number of students conducting ecology-related research in faculty labs has grown from none in 1997 to 68 in 2001. Off-campus research has also increased from six students participating in 1997, to 27 in 2001.

SEEDS also enables between 20 and 35 students each year to attend scientific meetings, mostly the Ecological Society of America's annual meetings.



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*“To truly understand nature you must look at all the components that surround it. What does each animal do for its surroundings, and what do the surroundings do for each animal? This question can be answered through ecology. Knowing an organism’s habitat is fundamental in understanding that organism. These are the reasons I would like to enter the ecology field.”*

— SEEDS student

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all biology majors. The campus supports three programs which complement the SEEDS program (Building Environmental Justice Collaborations, Building Environmental Sustainability, and Paine Environmental Justice Education and Research). In the Fall of 1997, an interdisciplinary course, Environmental Studies Seminar, was added to the curriculum. More than half of Paine College students are first generation college students.

### **Rust College, Holly Springs, Mississippi**

Rust College was established in 1866 by the Freedman’s Aid Society of the Methodist Episcopal Church. The founders were missionaries from the North who opened a school in Asbury Methodist Episcopal Church, where Moses Adams, a local Negro preacher was pastor. The school accepted adults of all ages, as well as children, for instruction in elementary subjects. A year later the first building on the present campus was erected. Rust is a four-year liberal arts college and the second oldest private college in Mississippi. It is also one of the five remaining HBCUs founded before 1867. It now enrolls approximately 850 students, with more than half coming from low-income families from North Mississippi.

### **Tuskegee University, Tuskegee, Alabama**

The Tuskegee Normal School opened on July 4, 1881, when Booker T. Washington was hired as its first teacher. In 1882, Dr. Washington contracted to buy a 100-acre abandoned plantation, which became the nucleus of Tuskegee’s present campus. Starting with 30 students, today Tuskegee University enrolls approximately 2680 undergraduate students and 400 graduate students. The university is a member of the Marine Environmental Sciences Consortium, an association of 22 Alabama colleges and universities that operates the Dauphin Island Sea Lab.



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*“Because environmental problems are not going away, my personal goal in SEEDS is to make people aware of the many education and job opportunities available. With more people showing an interest [in] the environment, we can definitely make a difference.”*

— SEEDS student

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Interestingly, the number of students attending scientific meetings with sources of funding *other than* SEEDS has increased from three students in 1997 to approximately 28 in 2001. It is believed that the rise is in large part due to the stimulation of students’ and faculty interests in ecology because of the SEEDS program.

Before SEEDS, no students at participating campuses had either a major, minor or concentration in ecology. In 2001, approximately 36 students have an ecology focus in their undergraduate career.

Before SEEDS, no students opted at participating schools to pursue an ecology-related career or postgraduate degree. As of 2001, 21 students were employed in ecology

careers and 28 were in ecology-related graduate programs at schools such as North Carolina State University, Cornell University, Tuskegee University, and Loyola Marymount University.. Examples of careers pursued by SEEDS students upon graduation include Environmental Justice Specialist with the US Department of Energy (DOE), Research Assistant at Tuskegee University, Research Specialist at Emory University, Dolphin Trainer and Assistant Education Coordinator at Blue Lagoon Island, and Environmental Protection Specialist for the US Environmental Protection Agency (EPA). Other students are employed by the US Forest Service and the Ministry of the Environment in the Bahamas.

## SEEDS Contributions to the ESA Community

Since 1997, SEEDS students and faculty have contributed posters, papers, and other sessions at the Ecological Society of America’s Annual Meetings. At the 2000 ESA meeting, for example, students and faculty participated in the following events:

### EDUCATION POSTER SESSIONS:

- HAYES, JACK. Paine College, Augusta, GA 30901, USA. The Campus Ecosystem: Temperatures.
- HILEMAN, D.R., R.O. ANKUMAH, K.C. DAY\*, J.S. HISHAW\*, I.N. MOORE\*, L.B. PREVOST\*, Y.B. QADIM ASIL\*, AND C.O. WILLIAMS\*. Tuskegee University, Tuskegee, AL, 36088, USA. Increasing Minority Involvement in Ecology: The SEEDS program at Tuskegee University.
- MIDDENDORF, GEORGE, MURIEL POSTON, AND MARY MCKENNA. Howard University, Washington DC, 20059, USA. The Development of Environmental and Ecological Programs at Howard University.
- ONWERE, C.\*, P.P. TADI-UPPALA, J. DAVID\*, AND M. BYFIELD\*. Oakwood College, Huntsville, AL 35896, USA. Impact of Outdoor-Ecological Education on Students at Oakwood College.

### SCIENCE POSTER SESSIONS:

- ACHOLONU, ALEX D.W., KETIA SHUMAKER\*, YOLANDA GRANT\*, GAYLE CULLEY\*, KETURAH MORRIS\*.

## SEEDING THE FIELD

Diversifying the field of ecology is a two-way street, reaping benefits for ecology while also helping nurture even more success in recruiting and retaining people from diverse backgrounds. These are long-term processes, yet SEEDS has achieved a great deal even in its infancy. The ESA already is more diverse as a result of SEEDS: its annual meetings cover a broader array of topics (e.g., Environmental Justice), a more diverse group of ecologists are serving as mentors, authors, committee members and presenters, and the Society's education programs are expanding to reach out to even more minority students. The UNCF is championing programs in the environment among its HBCU constituency, building on the foundation and expertise SEEDS has provided. And IES has forged strong relationships between its scientists and students and faculty at the SEEDS institutions, while also launching a new research effort to understand the complex factors involved in students' career decisions and achievements.



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*“It only takes one person to start a trend.  
Let's start one with improving our environmental conditions.”*

- SEEDS student

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Alcorn State University, Lorman, MS, 39096, USA. Water quality studies on the Big Sunflower River and the Yazoo River, Mississippi.

- LEONARD, C.N., A.F. HOLLAND, C.A. BARANS and D. GILLET. Tuskegee University, Tuskegee, AL, 36088, USA, and South Carolina Department of Natural Resources, Charleston, SC, 29422, USA. The tolerance of a marine oligochaete to low levels of dissolved oxygen.

- MCKENNA, M.A., J. ABRAHAM, T. COLLINS. Howard University, Washington DC, 20059, USA. Edaphic factors in succession: Interactions between *Bidens polylepis* and *Oenothera biennis*

- WILLIAMS, C.O.\*, E. RHODEN\*. Tuskegee University, Tuskegee Institute, AL, 36088, USA. Rooting of Eastern gamagrass.

### SYMPOSIA:

- NILON, C., B. GRANT, G. MIDDENDORF and S. ORTEGA. The Role of Ecology in Environmental Justice.

### WORKSHOPS:

- MIDDENDORF, George, Department of Biology, Howard University, Washington, DC; B. GRANT, Department of Biology, Widener University; L. JABLONSKI, University of Dayton; Charles NILON, Dept. of Fisheries and Wildlife Sciences, University of Missouri-Columbia. Environmental Justice Workshop

\*SEEDS students

# SEEDS OF CHANGE . . .

## Taking Root and Beginning To Grow

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*“More and more, ecology is being called upon to work with and embrace the social sciences, the human dimension of ecosystems. How can we do this when our ranks are overwhelmingly dominated by people from just one segment of the American family? We need the fullest of palettes to paint a vivid and compelling environmental future for our land and people. This is, perhaps, the greatest challenge facing ecology today.”*

—Alan Berkowitz, Head of Education, IES

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The nation needs more teachers, researchers, faculty members, and practitioners involved in the field of ecology. We also need a citizenry with skills and motivation to address ecological questions. These teachers, scientists, faculty members, researchers, and amateur ecologists need to better represent the nation’s population if, as citizens, we are going to successfully frame the social and environmental agenda, solve the nation’s environmental problems, support communities, and integrate the knowledge and wonder of the natural world in the day-to-day lives of all Americans.

To this end, with support from the Andrew W. Mellon Foundation, the Ecological Society of America is building on the successes of the past six years of collaboration with the United Negro College Fund and the Institute of Ecosystem Studies. ESA is continuing to work with UNCF while implementing new programs to begin collaborations with Tribal Colleges and Hispanic Serving Institutions. SEEDS will continue to build upon it’s work with IES by working with scientists and educators from throughout the ecological community.

The overall vision for this next phase of SEEDS involves a six-year plan divided into three, two-year phases. The first phase will continue to develop activities at the grassroots level, particularly campus ecology chapters, and will support additional research fellowships for students at HBCUs and Tribal Colleges, and professional development for faculty at ESA Annual Meetings. In addition, ESA will work with Native Americans to develop a plan for recruiting American Indian students. In the next phase, ESA will reach out to Latino students, develop a growing presence of SEEDS programs on campuses nationwide, and build partnerships with field stations, research institutes and Long Term Ecological Research sites for hosting fellows and faculty professional development activities. In the third phase, ESA will focus systemically on strategies for sustaining a minority presence locally, regionally and nationally as an integral part of the Ecological Society of America.

The timing is right.

The necessary conditions are present.

SEEDS. Watch them grow.



# SEEDS Participants 1996-2002

## SEEDS Faculty

Dr. Alex Acholonu, Alcorn State University, 1999-2002  
Dr. Voletta Williams, Alcorn State University, 1999-2000

Dr. Mike John, Bethune-Cookman College, 1999-2002  
Dr. Terry Green, Bethune Cookman College, 2000-2002  
Dr. E. Frank Ekpo, Bethune Cookman College, 1999

Dr. John Elwood, Claflin College, 1997  
Dr. Shingara Sandhu, Claflin College, 1997

Mr. Gilbert Rochon, Dillard University, 1997

Dr. William Hopper, Florida Memorial College, 1998-2002  
Dr. H.K. Chaudhari, Florida Memorial College, 1998-2002  
Dr. Rose Marry Stiffen, Florida Memorial College, 1998-2002  
Dr. Edwin Gines-Candelaria, Florida Memorial College, 1998

Dr. Barbara Abraham, Hampton University, 1999-2002  
Dr. Deborah Bodolus, Hampton University, 1999-2002

Dr. George A. Middendorf, III, Howard University, 1999-2002  
Dr. Muriel E. Poston, Howard University, 1999-2002  
Dr. Mary McKenna, Howard University, 1999-2002

Dr. Stanley Abell, LeMoyne-Owen College, 2000-2002  
Dr. Delphia Harris, LeMoyne Owen College, 2000-2002

Dr. Padma Uppala, Oakwood College, 1998-2002  
Dr. Alexandrine Randriamahefa, Oakwood College, 1998-2002  
Dr. Anthony D. Paul, Oakwood College, 1998

Dr. C. R. Nair, Paine College, 1998-2002  
Dr. Jack Hayes, Paine College, 1998-2002

Ms. Doris Wilson, Rust College, 1999-2001  
Dr. Chandra Tummalapalli, Rust College, 2000-2002  
Ms. Joyce Johnson, Rust College, 2002  
Dr. Zahir Qureshi, Rust College, 1998  
Dr. Brankley Spight, Rust College, 1997

Dr. Ken Altston, St. Augustines College, 1997  
Mr. Clarence Branch, St. Augustines College, 1997

Dr. Ramble O. Ankumah, Tuskegee University, 1997-2002  
Dr. Douglas R. Hileman, Tuskegee University, 1997-2002  
Dr. Sherwood McIntyre, Tuskegee University, 1997-2001  
Dr. Audrey Trotman, Tuskegee University, 1997-2002

Dr. Leonard Wilmer, Wiley College, 1997

## SEEDS Advisory Board

Dr. Ciriaco Q. Gonzales, Cirgo Associates, 1999-2002  
Ms. Zakiya Holmes, North Carolina State University (graduate student), 1999-2002  
Ms. Kristie King, Environmental Careers Organization, 1999-2002  
Dr. Godwin Mbamalu, Johnson C. Smith University, 1999-2002  
Dr. Charles H. Nilon, University of Missouri-Columbia, SEEDS Advisory Board Chair, 1997-2002  
Ms. Stephanie Shoemaker, 2000-2002

## SEEDS ESA Partners

Dr. Thomas L. Arsuffi, Southwest Texas State University  
Dr. Henry L. Bart, Jr., Tulane University (Dillard University)  
Dr. Cynthia Bennington, Stetson University  
Dr. Marianne K. Burke, Southern Research Station USDA Forest Service  
Dr. Daniel Childers, Florida International University  
Dr. Mary Crowe, Coastal Carolina University  
Dr. Robert O. Lawton, University of Alabama in Huntsville  
Dr. F. Douglas Martin, Westingtonhouse Savannah River Company  
Dr. Mary S. Miller-Goodman, Auburn University  
Dr. Martin H. Posey, University of North Carolina at Wilmington (St. Augustine's College)  
Dr. Lawrence R. Shaffer, The University of Mississippi  
Dr. Boyd R. Strain, Duke University (St. Augustine's College)  
Dr. Deborah Waller, Old Dominion University  
Dr. Howard H. Whiteman, Murray State University  
Dr. Paula Williamson, Southwest Texas State University

## SEEDS Leaders and Staff

Dan Durett, UNCF Dept. of Environmental Education Programs, SEEDS Co-Director, 1996-1998  
Susan Veres, UNCF Dept. of Environmental Education Programs, SEEDS Coordinator, 1997-1998, Co-Director, 1998-2000  
Elvan Gur-Edeman, UNCF, SEEDS Co-Director, 2000-2002  
Ilana Schoenfeld, ESA, SEEDS Coordinator, 1996  
Nadine Lymn, ESA, SEEDS Advisor, 2000-2002  
Susan Musante, ESA, SEEDS Coordinator, 2000-2001  
Jason Taylor, ESA, SEEDS Co-Director, 2001-2002  
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Alan R. Berkowitz, IES, SEEDS Co-Director, 1996-2002  
Stephanie Shoemaker, IES, SEEDS Coordinator, 1997-1999  
Melissa Jurgensen-Armstrong, IES, SEEDS Coordinator, 2000-2002  
Heather Dahl, IES, SEEDS Assistant, 2000-2002



# Seeds

Strategies for Ecology Education,  
Development and Sustainability  
[www.esa.org/seeds/](http://www.esa.org/seeds/)



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