A successful educational program for minority students in natural resources

O. Eugene Maughan, Dixie L. Bounds, Susana M. Morales, and Selso V. Villegas

Abstract Historically, employees in natural resource professions have been predominantly Caucasian males. However, projected trends in population growth predict that by the year 2050, minorities will comprise almost half the United States (U.S.) population. Federal and state agencies have expressed an interest in diversifying their workforce to match the overall U.S. population. Unfortunately, many such programs have generally not been successful. One successful program is the Minority Training Program at the Arizona Cooperative Fish and Wildlife Research Unit. The program began in 1988, and 26 undergraduate and 10 graduate degrees have been granted. All students who have completed the program have been placed in natural resource professions with federal, state, tribal, or private organizations. A key factor in the success of this program is the strong mentoring component. The average annual cost/student is approximately $3,500. We believe the concepts used in this program are applicable throughout the country.

Key words diversity, graduate, minorities, Minority Training Program, undergraduate, University of Arizona

Few minorities (historically underrepresented ethnic groups such as African Americans, Native Americans, Hispanics, or Asians) enter and complete degrees in natural resources or related fields (Valdez 1995, National Science Foundation [NSF] 1996, Davis et al. 1999). Historically, natural resource professions have been dominated by non-minority (Caucasian) males (Kellert and Berry 1987, Angus 1995, Leffler and Mathews 1998). Several papers have discussed how minority professionals are underrepresented in science and natural resource disciplines (Payne and Theo 1971, Chesney 1981, Williamson 1984, Goggins and Lindbeck 1986, Powell 1990, Wyche and Frierson 1990, Culotta and Gibbons 1992, Massey 1992, Ponds 1996). Based on current trends in national demographics, researchers predict that the largest population growth will occur among minorities so that by the year 2050, almost half of the United States population will be minority (Davis et al. 1999). Researchers have suggested that if our nation is to conserve its natural resources in the future, we need to diversify our workforce to match more closely the racial and gender makeup of the overall U.S. population (Dominguez 1996, Davis et al. 1999). This means increasing the pool of minority professionals in natural resources.

To accomplish this goal we must do a better job of recruiting and retaining minorities as undergraduate and graduate students (Valdez 1995, 1996).
Many federal, state, and private agencies have devoted significant resources to addressing the problem of increasing workforce diversity in the sciences and natural resources (Wyche and Frierson 1990, Valdez 1995, Dominguez 1996). Some researchers estimate that thousands of minority mentoring programs have been started since the 1960s (Culotta and Gibbons 1992). However, despite substantial efforts and expenditures of resources, attempts to increase the number of minority students obtaining degrees in science, particularly natural resources, have met with modest success (Culotta and Gibbons 1992, Massey 1992, Sims 1992, Ponds 1996, Davis et al. 1999). In general, minority mentoring programs that have not been successful have not been well documented and cannot be found in the literature (Massey 1992, Sims 1992, Haring 1999). Haring (1997) conducted a review of minority mentoring programs and found that only a small number have been reported in the higher education literature.

Researchers have offered several possible reasons minorities do not pursue careers in natural resources: lower salary levels than other professions such as engineering, law, or medicine; lack of role models and mentors in natural resources; lack of support or encouragement by personnel in academia, state, and federal governments; and lack of awareness of possible career opportunities (Chen et al. 1989, Wyche and Frierson 1990, Massey 1992, Gilligan 1996, Ponds 1996). Haring (1997) stated that most minority mentoring programs were surprisingly similar in their approach, but most were not successful, suggesting a programmatic weakness.

One program that has been successful in educat-
Fish and Wildlife Service funded this program through a grant to the University of Arizona entitled the Native American Training Program. In 1992, the Native American Training Program was expanded to the Minority Training Program (MTP) and included all ethnic minority groups that have been traditionally under-represented in natural resource careers (i.e., Native Americans, African Americans, Hispanics, and Asians).

**Design and approach of the Minority Training Program**

Our program was established as a mentorship program to assist minority students to obtain Bachelor of Science degrees in natural resources, to encourage them to obtain advanced degrees, and to succeed as professionals in natural resource careers. The importance of mentors has been demonstrated in business, arts, education, and scientific disciplines (Roche 1979, Bogat and Rednar 1985, Wyche and Frierson 1990, Welch 1997). For example, Roche (1979) found that the most successful Wall Street executives were those who had mentors; such individuals were more likely to earn more money, be happier in their careers, and become mentors themselves.

Haring (1997, 1999) defined mentoring as significant career assistance offered by a more experienced person to a less experienced person during a time of transition. The MTP provides several types of assistance to students who are making transitions from home and high school to the university, from undergraduate to graduate education, or from the university to the workplace. The MTP is patterned after typical graduate programs in academia, but provides a broader spectrum of services to undergraduate and graduate students (e.g., tutoring, counseling, financial assistance, wildlife and fisheries techniques training, career development, peer support). Each student in the MTP has an academic advisor with whom he or she meets regularly to plan strategies, schedule courses, and discuss academic issues. In addition, students meet regularly with the program coordinator, who works to help them accomplish their individual academic goals and overcome institutional and personal obstacles to success. The coordinator schedules access to mentors, tutors, counselors, and special testing, and may accompany students to meetings with professors or administrators.

**Organizational structure.** The organizational structure of the MTP includes a program director, a coordinator, a secretary, mentors, and students. The director, coordinator, and secretary work with the MTP part-time. Mentors may include faculty, staff, potential employers, graduate students, or upper-class undergraduate students. Mentors move in and out of the program based on the student needs and research opportunities mentors can provide to students. The MTP has a graduate and undergraduate component, but our approach is similar for all students.

The director oversees the program and works with the University to facilitate it. Responsibilities include working with the coordinator to establish policy and formulating plans for special situations or individual students. The director also is the point of contact between students and potential employers. This individual works with students to secure access to graduate education or employment.
depending on each student's desires or demonstrated capabilities. The director also meets regularly with students to assess their progress, encourage them in their efforts, determine their desires for further education or employment, listen to their concerns about education, work, or personal matters, and to suggest alternatives and options.

The coordinator works with each student to determine resource requirements for a successful educational experience. He or she also establishes and monitors the interface between mentors and students, evaluates mentors and students, works with the mentor to establish and coordinate tasks and assignments, and identifies research opportunities from which the students can learn important principles of natural resources management. We have had 3 coordinators in the program. Each has worked as much as 75% time as the coordinator while simultaneously seeking a graduate degree.

The secretary is a critical element in our program. This individual must be sensitive to the special needs of minority students, be persistent in dealing with bureaucracies on the student's behalf, and be alert to special problems that arise. We have found that one of the most important functions of the director, coordinator, and secretary is to listen to students and offer suggestions to help and encourage them as they progress through the university system. We believe a key factor in the success of the MTP is the mentoring component provided by the director, coordinator, graduate students, and faculty.

Undergraduate training

Undergraduates work as technicians with graduate students and faculty to conduct research projects. Undergraduates are paid up to 30 hours/week for work on these projects during the school year and full-time during summer. By working as technicians, students learn valuable skills that will assist them after graduation as they move into careers in natural resources. For example, students assist with radiotelemetry studies, mark-recapture studies, geographic information systems, water-quality assessments, and related research. The integration of minority undergraduate students with graduate students results in the formation of a professional peer group. These friendships and professional associations continue to benefit the student after they enter either graduate school or the workforce.

Undergraduate minority students are housed in offices alongside graduate students in the School of Renewable Natural Resources. The University of Arizona has willingly provided this space. We believe the daily interactions of graduate and undergraduate students are important to fostering mentoring and provide role models. Undergraduates participate in formal and informal discussions on natural resources research and management with graduate students, faculty, and staff within the School of Renewable Natural Resources.

Success of the undergraduate program. Since 1988, 42 students have enrolled in the program, with 26 (62%) having graduated with Bachelor of Science degrees, 11 (26%) students currently enrolled, and 5 (12%) students having withdrawn from the program (Table 1). Of those students who completed the undergraduate program, 12 (46%) have either completed or are currently enrolled in graduate degree programs in natural resources (Table 2). One student who completed the undergraduate program also completed masters and doctoral degrees in the MTP. Of the 26 students who received undergraduate degrees, 14 (54%) have obtained employment in natural resources (Table 3). All of the students who completed undergraduate degrees in the MTP are either in a graduate degree program or employed in natural resources.

The success of the program has created pressure for expansion. We have not developed a larger program, because we think 10 to 12 students is the maximum number we can successfully mentor annually. Large numbers of students make it more difficult for administrators, mentors, and students to maintain the primary focus of the program. Our

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Enrolled</th>
<th>Completed</th>
<th>Withdrew</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAM</td>
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<td>7</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>NAF</td>
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<td>4</td>
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<td>7</td>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>AAF</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HM</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>HF</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>26</td>
<td>5</td>
<td>42</td>
</tr>
</tbody>
</table>

\[ a \text{ Native American male (NAM); Native American female (NAF); African American male (AAM); African American female (AAF); Hispanic male (HM); Hispanic female (HF).} \]
Objective was to obtain high graduation rates for qualified students, not a large number of participants.

Duration of participation in the program. Deficiencies in high school preparation and problems related to English as a second language have required some students (Native American and Hispanic) to take more than 4 years to complete degrees. We have tried to move students through the program more quickly by providing tutors for courses in which they have difficulty. However, we also have recommended occasionally that students carry lighter than normal course loads to increase their probability of success. We have worked with the University to identify students with learning disabilities and worked with faculty to allow such students to take tests and complete assignments under conditions in which there is a greater potential for success. We anticipated that some students would take longer than 4 years to obtain a degree and have incorporated this flexibility in our program.

Withdrawals from the program. We have had 5 students leave the program without completing a Bachelor of Science degree. Many of the students in the MTP have unmet financial needs. Two students left the program because of financial needs and took jobs in natural resources that promised immediate pay and benefits. Another student transferred to a junior college in another state, and 2 others left the program for personal reasons.

Graduate training

The graduate MTP developed from the undergraduate MTP. We made a concentrated effort to recruit minority students into graduate programs and provide appropriate role models. As with the undergraduate program, we provide a strong mentoring component for graduate students and a broad range of support services through the University (e.g., financial assistance, career development, wildlife and fisheries techniques training, peer support). One difference between the graduate and undergraduate programs is that graduate students are not paid an hourly wage to work on other research projects, as are the undergraduate students. Instead, graduate students receive an assistantship for work on their own research projects. Often graduate students will volunteer their time to assist with other research projects. Our program is small and there is a high degree of interaction and cooperation among students and faculty.

Success of the graduate program. Ten advanced degrees have been awarded to minority students in the program in the last 10 years. However, one student received masters and doctorate degrees. Therefore, 9 students received these 10 degrees. Two of these advanced degree recipients (one M.S. and one Ph.D.) also have served as coordinators for the graduate MTP. We currently have 5 minority students enrolled in masters degree programs. Our rate of completion in our graduate MTP is 91%. One individual (9%) left the program without

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Table 2. Ethnicity and gender of former undergraduate Minority Training students who are enrolled in or have completed graduate degrees at the Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona, 1988–1998.

<table>
<thead>
<tr>
<th>Ethnicitya</th>
<th>Enrolled</th>
<th>Completed</th>
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</tr>
</thead>
<tbody>
<tr>
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<td>NAF</td>
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<td>2</td>
</tr>
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<td>0</td>
</tr>
<tr>
<td>AAF</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>HM</td>
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<td>0</td>
<td>1</td>
</tr>
<tr>
<td>HF</td>
<td>4</td>
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<td>TOTAL</td>
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<td>6</td>
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</tbody>
</table>

a Native American male (NAM), Native American female (NAF), African American male (AAM), African American female (AAF), Hispanic male (HM), Hispanic female (HF).

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Table 3. Ethnicity of students graduating with Bachelor of Science degrees from the University of Arizona through the Minority Training Program at the Arizona Cooperative Fish and Wildlife Research Unit and their employers, 1988–1998.

<table>
<thead>
<tr>
<th>Ethnicitya</th>
<th>USFS</th>
<th>USFWS</th>
<th>GF</th>
<th>NRCS</th>
<th>CO</th>
<th>CON</th>
<th>TRB</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>2</td>
<td>5</td>
</tr>
<tr>
<td>NAF</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>HM</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>HF</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>1</td>
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<td>2</td>
<td>14</td>
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</tbody>
</table>

a Native American male (NAM), Native American female (NAF), Hispanic male (HM), Hispanic female (HF), United States Forest Service (USFS), United States Fish and Wildlife Service (USFWS), State Game and Fish Agencies (GF), Natural Resource Conservation Service (NRCS), County Government (CO), Consulting Group (CON), Tribal Game and Fish Department (TRB).
completing a degree to accept a full-time position in natural resources. Minority students who have completed advanced degrees were recruited from outside the University (7) and from the undergraduate MTP (2, Table 4). All advanced degree graduates have found professional employment (Table 5).

Recruitment

We believe there is substantial interest in natural resources in the minority community, but there are limited sources from which potential students can find out about professional opportunities (McCoy 1990). High school and even junior college guidance counselors generally have little knowledge of natural resource professions, or they may discourage minorities from considering such careers (Massey 1992). In addition, they have historically directed the most promising students into medical, law, and health-care professions, perhaps because these careers have traditionally been higher-paying than those in the natural resources. We have worked with counselors, but have had limited success in changing these patterns.

We have tried several recruitment strategies, and these methods have evolved since the program began in 1988. Three strategies have provided most of our students in the MTP. First, as our program started in the late 1980s and early 1990s, we visited predominantly minority high schools, such as Native American reservations, and made presentations to biology classes. We often used a hands-on training approach in the classroom to encourage student interest. For example, we taught the high school students how to use radiotelemetry equipment and then had students locate their classmates using radiotransmitters and receivers. As our program grew, we encouraged current MTP students to make presentations at high schools to recruit potential students. Sometimes MTP students (Native Americans or Hispanics) gave slide-show presentations and asked high school students to name wildlife or fish species in their native language. The high school students seemed to enjoy exploring their knowledge of natural resources in their native language. We found that by working directly with high school biology teachers, rather than with guidance counselors, we were more successful in identifying students who might be interested in careers in natural resources. High school biology teachers within the minority community have referred about 20% of the students in the MTP.

Second, we worked with tribal representatives to identify potential students. We found that tribal representatives often knew students who were interested in natural resources but might lack the resources to successfully make the transition from home to the University of Arizona. About 30% of our students in the MTP were referred to our program by natural resource agencies that work with the minority community.

Third, after our program was established in the

<table>
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<th>Ethnicitya</th>
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<tr>
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<tr>
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<tr>
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</tr>
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<tr>
<td>AAF</td>
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</tr>
<tr>
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<tr>
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<tr>
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<td>9b</td>
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</table>

a Native American male (NAM), Native American female (NAF), African American male (AAM), African American female (AAF), Hispanic male (HM), Hispanic female (HF), Asian male (AM), Asian female (AF).

b Ten degrees have been granted; however, one student received both an M.S. and a Ph.D.
early to mid-1990s, we found that many of our recruits (about 50%) were directed to our program by current or previous participants and staff. As students from the MTP successfully completed their education and moved into careers in natural resources, we found that personal referrals to our program were an effective recruitment tool. Similarly, while minority students worked in the MTP at the University of Arizona, they interacted with other minority students across the campus. We found this word-of-mouth, one-on-one recruitment strategy to be extremely effective. Talbert et al. (1999) also found that current participants in a minority program were very effective in recruiting new students to their program. We found that minority students at the University of Arizona sometimes changed their majors to pursue careers in natural resources after learning about the MTP and career opportunities from current MTP students.

One recruitment strategy that we did not find effective was to invite large numbers of high school or junior college students to 1–3-day workshops at the University of Arizona. At these workshops we discussed opportunities available to minority students in natural resources and the merits of the MTP. While we had no difficulty getting students to attend, and even express interest in the program, we have not recruited any students that we can trace to these activities. Therefore, we have largely discontinued this approach.

We suggest that recruitment for minority students be an active and ongoing process. Once a potential recruit is identified, we try to meet with that person individually. Current or former participants in the MTP are included in those meetings. Current or former minority students may have greater credibility with the potential minority recruit and may be less intimidating than unit staff or university faculty.

Not all students recruited end up participating in the MTP. Some chose to seek their education at other universities or in other disciplines. Several of these students continued to seek advice on issues such as courses, graduate schools, and job placement, despite career decisions that took them away from the natural resource professions. We believe providing such advice is integral to effective mentoring of students and does not limit our ability to serve students who are active in the program.

**Graduate recruitment.** We have recruited minority graduate students from the undergraduate MTP, other universities, and from natural resource agencies. The undergraduate program has enhanced our recruitment of minority graduate students. Many were attracted to the University because of the undergraduate MTP. Minority graduate students serve as role models to undergraduate minority students and help convince them that they can complete an undergraduate degree and even succeed in an advanced degree program.

Some of our graduate students in the MTP visit local elementary, junior high, and senior high schools to make presentations about natural resources. We believe it is important to expose students at all ages to the opportunities available for natural resource careers.

**Career and graduate student placement**

We assist students in career and graduate student placement. Job placement has been relatively easy, and students often have several choices of jobs. One difficulty has been potential employers who offer immediate financial security (jobs) to students who have not yet completed their undergraduate degree or who could clearly benefit from obtaining an advanced degree. We discourage potential employers from making such offers and encourage students to decline such offers if they are made. We try to help students see the long-term benefits of completing or continuing their education and use mentors and former program participants to encourage students to stay in school.

Some agencies have been very willing to adjust their hiring objectives to allow students to complete a bachelor’s degree or to encourage them to enter a graduate program. One example has been the willingness of the United States Fish and Wildlife Service with electrofishing on the White Mountain Apache Reservation.
Wildlife Service to convert undergraduate into graduate cooperative education agreements (now Student Career Experience Program). This conversion deprives the agency of the services of the student for an additional period of 2 or more years but ultimately provides a more experienced employee. Other agencies (e.g., Bureau of Land Management, United States Forest Service) have allowed students to work part-time while completing their undergraduate degrees. Success of the student who is working part-time is dependent on the agency allowing sufficient time for class work and homework. Unfortunately, not all agencies are willing to make these adjustments to facilitate the completion of a student's education. Perhaps such agencies place a greater priority on immediate job responsibilities than on the long-term benefits gained from additional education.

**Peripheral benefits derived from the program.**

Not all benefits from this program have accrued to individual participants. Mentors have benefited from the availability of technical assistance for research from students in the MTP. The local chapter of the national organization of Minorities in Agriculture and Natural Resources has benefited from the infusion of minorities in the University. Several participants in the MTP have served as officers in this organization, and most minority training students are members. The University also has recognized the contributions of these students. Several students have received Centennial Achievement Awards or Outstanding Native American Student Awards. These awards are given each year to minority students to recognize outstanding achievement and service to the University of Arizona and the community.

The School of Renewable Natural Resources has benefited from the skills that many minority students bring to the program. Many have pursued other careers (e.g., mechanics, sales, farming–ranching, auto body, carpentry) before entering the program and are fluent in more than one language. These skills most often benefit wildlife and fisheries research projects but also may benefit the entire University.

### Financial cost of the program

Funding for the MTP comes from the United States Department of Interior, specifically the United States Fish and Wildlife Service (1988–1993), National Biological Service (1994–1995), and the Biological Resources Division of the United States Geological Survey (1996–present). In addition, the School of Renewable Natural Resources of the University of Arizona provides in-kind support such as office space, utilities, copying, administrative overhead, and secretarial support.

Direct funds for this program have averaged about $121,000/year, with University overhead at 15% ($18,000), for total annual costs of about $139,000 (Table 6). These funds generally pay the salary of the coordinator (one coordinator was paid from other sources) and the salaries and operational expenses of the students. No salaries for other administrative staff are charged to the project. Occasionally, program funds have been used to initiate or complete minority graduate student thesis research, but most graduate research has been supported by funds from sources other than the MTP, such as the United States Fish and Wildlife Service and the Arizona Game and Fish Department.

We have enrolled about 10–12 undergraduate students a year in the program. The average cost/student/year has been about $3,500. The average cost per Bachelor of Science degree recipient has been about $16,000 over 4 to 5 years.

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**Table 6. Annual budget for the Minority Training Program at the Arizona Cooperative Fish and Wildlife Research Unit, University of Arizona.**

<table>
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<tr>
<th>Item</th>
<th>Amount ($)</th>
</tr>
</thead>
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</tr>
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</tr>
<tr>
<td>Benefits (3.1% of salary)</td>
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</tr>
<tr>
<td>Operations ($250/student)</td>
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</tr>
<tr>
<td>Per diem when employee is in field ($15/day x 40 days)</td>
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</tr>
<tr>
<td>Per Employee Total</td>
<td>4,747</td>
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<tr>
<td>Per Year Total (10 students)</td>
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<tr>
<td><strong>Undergraduate Program</strong></td>
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</tr>
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<td>Salaries ($6/hr x 20 hr x 4.5 week/month x 8.5 months)</td>
<td>4,590</td>
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<td>Benefits (3.1% of salary)</td>
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<td>Operations ($500/student)</td>
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<td>Per diem when student in field ($15/day x 30 days)</td>
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<td>Per Student total</td>
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<td>Per Year Total (10 students)</td>
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</tr>
<tr>
<td><strong>Graduate Program</strong></td>
<td></td>
</tr>
<tr>
<td>Coordinator's Salary (50% time $1,250/month)</td>
<td>15,000</td>
</tr>
<tr>
<td>Benefits (3.1% of salary)</td>
<td>465</td>
</tr>
<tr>
<td>Operations ($500/student)</td>
<td>500</td>
</tr>
<tr>
<td>Per diem when student in field ($15/day x 60 days)</td>
<td>900</td>
</tr>
<tr>
<td>Coordinator Total</td>
<td>16,865</td>
</tr>
<tr>
<td>Total Direct Costs</td>
<td>121,155</td>
</tr>
<tr>
<td>Indirect Costs (15%)</td>
<td>18,173</td>
</tr>
<tr>
<td>Total Costs</td>
<td>139,328</td>
</tr>
</tbody>
</table>
However, these averages may underestimate actual costs per student because some students entered the program after a year or more in a junior college and did not participate for the full 4 to 5 years. In addition, some students have had additional support from grants, fellowships, and scholarships. Students have taken an average of about 5 years to complete degrees.

When we began this program, most students depended on the program to fund most of their education. However, in the last 5 years we have seen a movement away from total dependence on funding from the MTP. Student participants have become familiar with funding sources such as grants, fellowships, and scholarships as a consequence of interactions with graduate students and program and university staff. Currently, most of our undergraduate participants have funding sources in addition to those provided by working with mentors on projects.

Program success or failure

In a review of minority mentoring programs, Haring (1997) found that many programs do not last over time and that the design of most programs is remarkably similar, suggesting programmatic weaknesses. Some researchers have suggested that one reason minority programs are not more successful is lack of a clear definition of mentoring to guide research and implementation of programs (Bogat and Rednar 1985, Haring 1997, Healy 1997, and Haring 1999). Burlew (1990) stated that a major design weakness in many mentoring programs was the lack of a conceptual framework. Programs may be based on the general idea that mentoring is simply advice and support given by knowledgeable people to those who need such advice (Haring 1999). In addition, many minority programs do not track their students, so there is no way to quantitatively assess the success or failure of these programs (Gibbons 1992, Massey 1992).

Haring (1999) described typical minority mentoring programs in which a minority student is matched with an older, experienced mentor, creating mentor–student pairs. Usually, the mentor contacts the student for an initial meeting and then there is an expectation that they will continue to meet periodically. However, such programs are based on several assumptions: that mentoring is a positive experience and that mentors are helpful, that mentors are very motivated to assist students, that mentors and students were matched appropriately, and that sufficient programmatic support was available (Haring 1999).

Given the lack of success of many minority mentoring programs (Culotta and Gibbons 1992, Massey 1992, Sims 1992, Haring 1997), there may be several problems with these assumptions that may explain why more minority mentoring programs are not successful or long-lasting. A general approach to mentoring gives no clear purpose or focus to the relationship. If participants lack a clear understanding of specific program goals and the kinds of benefits that may be part of the mentoring program, it may not be successful (Bogat and Rednar 1985, Healy 1997, Haring 1999). An uninformed mentor may not know how to help with the specific needs of students. The assumption that a mentor with status will assist a student in need is not always well received by the student, perhaps because this implies that the student needs assistance due to weaknesses or deficiencies. This reinforces the hierarchy of power in a mentoring relationship in which the mentor is superior and holds a greater position of power in the relationship. Such a situation is not empowering to the student.

Sims (1992) offered 7 reasons many minority programs have not been successful: 1) programs had little oversight or assessment, 2) often was minimal commitment from top administrators or faculty, 3) programs had undefined or unrealistic goals, 4) funding was not consistent, 5) programs did not address psychological issues such as low expectations by teachers for minority students, 6) colleges recruited unprepared minority students and did not assist them adequately, and 7) programs targeted college-age students and ignored students in elementary and secondary education. Wardlow et al. (1995) also suggested that minority programs were often not successful due to limited resources and a lack of mentors to help minority students succeed in undergraduate programs.

Perhaps the MTP has been successful because the Department of the Interior and the University of Arizona annually review the program. We have a strong commitment from administrators at federal and state levels, and our funding has been consistent since the program started in 1988. Our program has specific goals, which are to assist minority students in completing Bachelor of Science degrees, obtaining graduate degrees, and entering careers in natural resources. We offer various types of assistance (e.g., academic, financial, psychological, social, peer support) to help our students overcome any
problems that might prevent them from completing their education and entering careers in natural resources.

Healy (1997) defined mentoring as a dynamic, reciprocal relationship between a mentor and a student aimed at promoting the career development of both. Haring (1997) identified 2 types of mentoring models: 1) grooming and 2) networking (Haring 1997). In the grooming model, a traditional hierarchical structure exists in which the mentor holds position and power over a student and there is a one-way flow of benefits from mentor to student (Haring 1997, Talbert et al. 1999). Haring (1997) identified the networking model as a preferred model for minority programs. The networking model has several characteristics: collaboration occurs among several individuals to exchange psychological, social, and career benefits; there is an intentional de-emphasis of hierarchy and power within the mentoring relationship; there are opportunities for participants to fulfill the roles of mentors and mentees; and a skilled facilitator implements the program (Haring 1997, Talbert et al. 1999).

We believe the approach we used with the MTP supports Healy’s (1997) definition and Haring’s (1997) network mentoring model. For example, we encourage a 2-way flow of benefits in the relationships among mentors and students. Students assist mentors with research projects, data collection, boat and vehicle repairs, and foreign language translations; mentors assist students with wildlife and fisheries training, academics, and social, psychological, financial, and vocational support. Talbert et al. (1999) also found that students in a minority program provided substantial benefits to administrators, faculty, and staff by helping university personnel accomplish their goals of recruitment and retention of minorities and by enhancing the cultural sensitivity of university personnel and fellow students. We do not promote a hierarchical structure in the MTP. We encourage daily interactions and an exchange of ideas among undergraduates, graduate students, faculty, and staff, all of whom share offices in the same building. We define mentor and mentee by career stages rather than by age or position. Fortunately, we have several skilled facilitators to assist with the MTP including the director, coordinator, and secretary. These individuals work together to make the MTP successful.

Haring (1999) suggested that the network mentoring approach is a departure from more traditional approaches. The MTP approach we use encourages mentors and mentees to work together and exchange benefits in a reciprocal manner. We expect that each person (mentors and mentees) will contribute to the overall success of the program. We believe that this approach empowers all participants to develop professionally and personally and demonstrates the concept of a successful networking mentoring model suggested by Haring (1997, 1999).

We believe the concepts we used in the MTP may be useful to other agencies and universities throughout the nation. We used approaches that were successful in other academic programs and adapted them to minority graduates and undergraduates. The concepts are simple, but do require consistent funding and commitment from program administrators and staff. We believe successful programs using this model could be developed throughout the United States.

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O. Eugene (Gene) Maughan (above-right, meeting with a student in the MTP) was the Leader of the Arizona Cooperative Fish and Wildlife Research Unit from 1987–2000. Gene died on 12 April 2000 after a long struggle with leukemia. He was a recognized expert on the ecology of fishes and completed his Ph.D. in zoology at Washington State University, his M.S. at the University of Kansas, and his B.S. in zoology from Utah State University. Gene began his career with the Virginia Cooperative Fishery Research Unit in 1972. He was Leader of the Oklahoma Cooperative Fish and Wildlife Research Unit from 1977 to 1987. Gene's living legacy is the Minority Training Program that he began and fostered at the University of Arizona in 1988.

Dixie L. Bounds (below) is the Assistant Unit Leader, Wildlife Research, with the Maryland Cooperative Fish and Wildlife Research Unit at the University of Maryland Eastern Shore. She received her Ph.D. and M.S. degrees in wildlife and fisheries science from the University of Arizona, M.A. in public policy analysis from Rutgers University, and B.A. in economics and
political science from Goucher College. Dixie serves as Student Affairs Director for the Maryland–Delaware Chapter of The Wildlife Society. Susana M. (Susy) Morales (above) is Project Manager for the Harris Environmental Group in Tucson, Arizona. Susy completed her B.S. and M.S. degrees in wildlife and fisheries science at the University of Arizona. Selso V. Villegas (above-right shown sampling plants in the Sonoran Desert) is a water resources specialist for the Tohono O’odham Nation. Selso completed his Ph.D., M.S., and B.S. degrees in wildlife and fisheries science at the University of Arizona.

**Associate editor: Grado**