

Increasing Diversity in Conservation Science through Education Policy: Barriers to Success and Ways Forward

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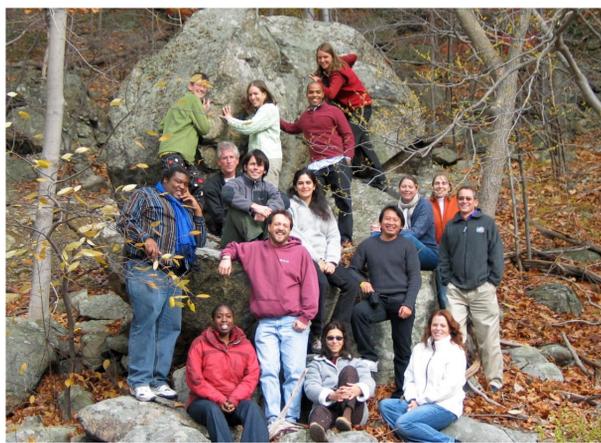
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SUMMARY

The protection of 'common pool' natural resources depends on the support of a wide diversity of citizens. Thus, a more diverse workforce in conservation science is crucial to achieving the goals of biodiversity conservation. Historically underrepresented groups (HUGs) including African-Americans, Hispanics, and American Indian/Alaska Natives are not represented well in the United States' science, technology, engineering, and mathematics (STEM) workforce, including in the environmental and conservation sciences (Figure 1). Here, we summarize research on the academic, financial, and social barriers to STEM degree completion for students from HUGs as well as key intervention strategies to retain students from HUGs in STEM (Table 1). Our review suggests that institutions must increase recruitment of students from HUGs, retention of students from HUGs in STEM majors, and support for career placement of students from HUGs to work towards the goal of increasing the diversity of environmental and conservation science scholars. We recommend a unique set of specific steps to integrate across these approaches in the environmental and conservation sciences: 1) enhance research opportunities and peer-to-peer mentoring, 2) foster connections with minority-serving institutions, and 3) engage the power of professional society networks.



Why diversity?

- The protection of natural resources depends on the support of a wide diversity of citizens, or stakeholders (1)
- Having a diverse set of points of view results in better group decision-making (2)

Photo: Enhancing Diversity in Conservation Science Workshop, Black Rock Forest, NY 2007

Barriers to Success

Approximately the same percentage of HUGs intend to major in STEM fields, but far fewer students from HUGs go on to graduate with a degree in STEM compared to white and Asian-American students (3,4). These are some major reasons for this 'leaky pipeline':

Financial barriers

- Students from HUGs that leave STEM majors are more likely to come from families with lower incomes or attend school part-time (while working more than 15 hrs per week). Many students from HUGs and their families are also loan averse (3,5).

Academic barriers

- Students from HUGs may experience non-college bound academic tracking, meaning they leave the STEM pipeline before being introduced to conservation science (6). Or, they leak from the STEM pipeline during their second or third year in college when they encounter 'gateway' courses such as introductory biology, chemistry, and calculus. Gateway courses are often associated with an impersonal, competitive learning culture (7) that may reinforce the low expectations of some teachers, educational systems, and unwelcoming professions that have historically burdened students from HUGs ('stereotype threat,' 8).

Social barriers

- Anti-intellectual social pressure and academic isolation is a key issue for students from HUGs. Perceived levels of individualism and competition in STEM fields can have the negative effect of producing social isolation from peers (9). In addition, students from HUGs may fear rejection by their community, family, and friends who do not value or see a need for higher education, especially at the graduate level (10).



Table 1. Major categories of intervention strategies to increase the retention of students from HUGs in STEM, based on our review of the current literature.

Financial support	Provide funds for college, especially as gift aid (grants, tuition waivers, and scholarships) and information to help students and their parents when applying for financial aid.
Mentoring and advisement	Build a mentorship program where mentors serve as role models, offer day-to-day advice, open professional doors for the mentee, and provide access and information to mentees that encourage them to meet and network with their future professional peers.
Research opportunities	Offer research mentorship and hands-on research experiences both pre-college and in college.
Curriculum reform	Offer academic bridge programs or workshops that foster collaborative learning environments to better prepare students for gateway courses.
Cohort building	Create accepting and supportive communities of scholars or fellows. Peer-advisement opportunities are particularly successful at achieving academic and social integration, and to provide support and motivation to incoming students.
Career counseling and awareness	Build career fluency skills and provide opportunities to network. Especially in the environmental and conservation sciences, students may not be aware of jobs that are available.

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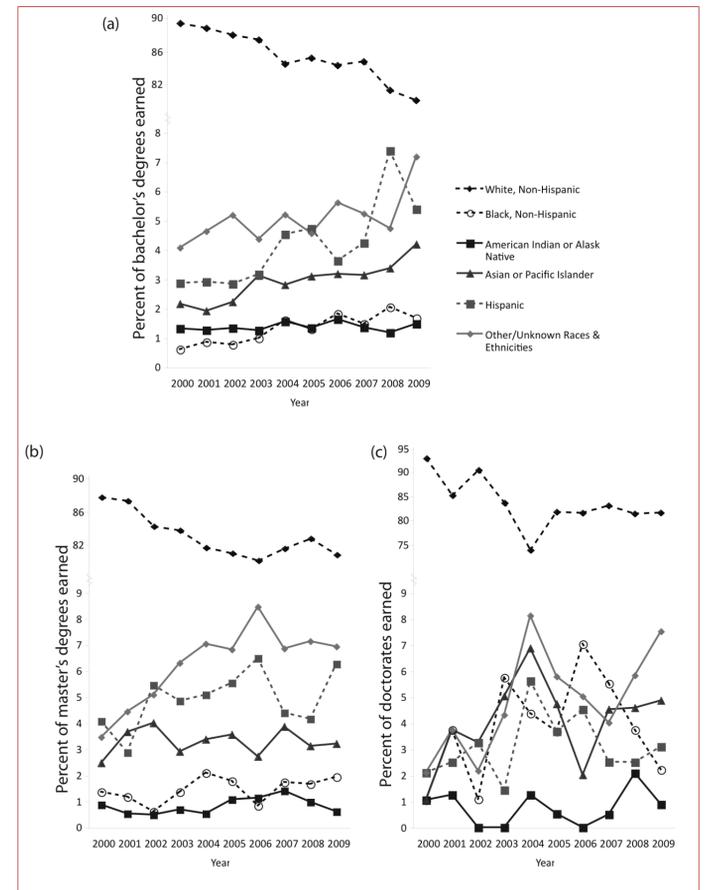


Figure 1. Percent of total bachelor's (a), master's degrees (b), and doctorates (c) earned in environmental and conservation science-related fields from 2000-2009. Data compiled from the IPEDS Completion Survey (11, 12) for degrees in range science and management, natural resources conservation and research, environmental science, natural resources management and policy, forest management, wildlife science and management, environmental biology, and conservation biology.

Key Recommendations to Increase Diversity in the Environmental and Conservation Sciences

We recommend a unique set of steps tailored to the environmental and conservation sciences that integrate across the major categories of intervention strategies.

Mentoring

- *Research mentoring.* Undergraduate research opportunities in the conservation sciences, and especially those that offer financial support, would be powerful tools to both retain students and introduce students to careers in the field.
- *Peer-to-peer mentoring.* Because of the lack of conservation scientist faculty and professionals from HUGs, peer associations around conservation science will be essential to building self-efficacy for students from HUGs (13) and to create a strong learning community that is both academic and social.

Tapping in to minority-serving institutions

- Minority-serving institutions (MSIs) are post-secondary colleges or universities in the U.S., founded to serve racial or ethnic communities. These institutions are a key resource for curriculum reform ideas, and, because one-third of Hispanic and African-American undergraduate scientists come from MSIs, they are a crucial source of students for conservation graduate programs and engagement in the conservation workforce as practitioners and/or educators (14).

Calling on professional societies

- Professional societies play a role as a powerful node within a professional network. We recommend that societies such as the Society for Conservation Biology (SCB) develop an explicit plan to diversify membership that includes an integrated conservation education pipeline, including undergraduate student field trips, research fellowships, and annual meeting travel awards with built-in mentorship opportunities. The power of conference mentorship within the conservation community is already being put to use at our Student Conference on Conservation Science (<http://symposia.cbc.amnh.org/sccsny/>).

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