Conservation Biology

Diversity

Expanding career pathways in conservation science

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Since its inception, conservation biology has inspired thousands of students, spurred the creation of new initiatives, organizations and agencies, and informed conservation efforts worldwide. Nevertheless, global biodiversity loss is accelerating (Butchart et al. 2010), and our field needs to change to keep pace with mounting challenges. Conservation would benefit if scientists more enthusiastically pushed the institutional boundaries of our field through their efforts to expand their own and others' career options and professional opportunities. We discuss several key areas of expansion, a critical subset of a longer list of comprehensive solutions. We aim to spark productive conversation and self-reflection to galvanize individual and institutional change in our field.

Innovation consists of "purposeful, focused change in an enterprise's economic or social potential" (Drucker 2002). Professional innovation in our field, to boost such social potential, is essential to attract more and more diverse talent to conservation and to expand our efficacy in a fast-changing world (Table 1). New, creative career configurations, as well as expansions of existing ones, can create the conditions for rapid and needed growth in the dimensionality and reach of conservation science. Primary internal barriers to change include fear of change, perverse incentives, and static policies. Compounding these challenges, scientists face difficulties finding stable career opportunities that encourage exploration, leading to the loss of creative talent to other fields. For those who remain, growing workloads and increased reactivity of agencies and organizations to emergencies reduce time available to pursue novel and potentially high-impact ideas. Moreover, incentives too often reward predictability over boldness (Voosen 2015) and publication over other outcomes that might provide greater societal benefits (Hessels et al. 2009; Bornmann 2013). We briefly illuminate each of these barriers below, drawing on a few examples from our and others' experiences. Although we focus on North America, these shifts can, should, and in cases are already occurring everywhere but lack widespread recognition.

All conservation scientists can contribute to professional innovation. Established scientists are well positioned to shift norms such as rewards for conservation problem-solving; expand the scope and emphasis of training; and hire and promote using criteria that favor creativity and diverse perspectives. They can draw on institutional resources to build new efforts and create incubation spaces; seek partners from varied backgrounds; and lead by example. Early-career scientists and students can seize opportunities for professional development, create paradigm-shifting "coherent groups" of peers (Parker & Hackett 2012), and take on novel leadership roles and interdisciplinary opportunities that bridge to social and economic sectors. Programs already exist to boost individuals' professional and social capacity; examples include The Leopold Leadership Program for mid-career scientists (http://leopoldleadership.stanford.edu/about/mission) and the Luc Hoffman Institute Fellows (luchoffmanninstitute.org) for early-career scientists. Formal programs reach only a small number, however, with curricula determined by a select group. Diverse, emergent, informal experimentation among young conservation scientists therefore remains essential.

How Can Deep Change be Achieved?

Diversification

Not every emerging conservation scientist is made in the mold of the field's previous leaders, nor need they be. Increasing diversity boosts our field's capacity, creativity, inclusiveness, and reach and can cultivate stronger

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Table 1. Increasing internal effectiveness, diversity, and numbers of people are interrelated pathways to transform conservation science's reach and effectiveness.

"Inward-focused innovations"	*"Outward-focused innovations"*
Focus on outcomes and incentives	Value broader skill sets and perspectives
Reward creativity and risk-taking	Retain talent by lowering barriers
Communicate more broadly	Partner with other sectors
Share and build on successes	Create a culture of mentorship
Promote cross-fertilization with other sectors	Increase public constituency

Mechanisms to boost effectiveness within one's research program or organization (inward-focused innovations) can both stimulate and benefit from efforts to increase numbers and diversity among early career conservation professionals (outward-focused innovations).

critical analysis and performance. Engaging diverse peers deepens thinking and reduces errors and superficial groupthink (Antonio et al. 2004; Sommers et al. 2008). Working across differences is challenging, but has the potential to yield better outcomes (Levine et al. 2014). A mounting literature explores the diversity in conservation and the need to bolster inclusion for effectiveness and equity (e.g., Foster et al. 2014). Embracing multiple facets of diversity—socioeconomic, racial, gender, geographic, disciplinary, and professional—increases our relevance, sophistication, and impact, broadens the appeal of our field, and challenges us to regularly revisit and reimagine our assumptions and perceptions (Taylor 2014).

Cross-fertilization

Sharing ideas and techniques can unite communities of practice around common problems (Brown et al. 2010). Cross-fertilization encompasses new forms of exchange across domains of expertise, such as design, medicine, technology, business, and the arts. One existing partnership model is extension positions at major universities, designed to link academic research to agency practice (e.g., USGS Cooperative Research Units) or private individuals (e.g., agricultural extension units). Although this model may be due for an overhaul (Rausser et al. 2008), it exemplifies cofunded affiliations that link cross-sector actors to address common challenges.

Cross-fertilization lies at the center of several other notable efforts. The Rainer Arnhold Conservation Fellows Program (mulagofoundation.org) exposes conservation entrepreneurs to approaches from design, international development, science, and technology. New conservation graduate programs emphasize practice- and leadership-based education across disciplines and sectors (e.g., Colorado State University 2016; Nelson Institute 2016). The David H. Smith Conservation Research (smithfellows.org) and Liber Ero Fellowships (liberero.ca) train postdoctoral fellows in communication, business planning, leadership, and policy. The hybrid nonprofit Conservation Science Partners (csp-inc.org) connects its staff with academic and consulting scientists globally and draws on creative practices from business, design, and the arts to rapidly respond to environmental problems.

We can grow the positive effects of cross-fertilization by organizing cross-sector trainings; embedding ourselves and others in nonconservation organizations; accepting trainees with diverse professional backgrounds and goals; training staff in cultural competency and social change; and expanding research teams, planning efforts and conferences to incorporate elements from disparate fields.

Incentives

Academic institutions tend to recruit, promote, and tenure on the basis of output quantity rather than quality or impact, promoting research that generates products over outcomes (Monastersky 2005). Other sectors, such as philanthropy and nonprofit social enterprises, attend more to outcomes (Ferraro & Pattanayak 2006). Outcomes-attentive reward systems could facilitate recruitment and advancement of scholars engaged in effective conservation, public engagement, and education. Outcomes-driven advances can be encouraged by internal cultures that value relevance, creativity, and engagement with society, as well as scientific mastery. More encompassing metrics than traditional citation impact factors of peer-reviewed papers are emerging (Priem et al. 2010; CGC 2011), though additional refinement is needed to ensure they can be quantified and fairly evaluated. Organizations can allocate more time to service or other outcomes-oriented activities in job duties. Hiring and promotion committees can reward efforts that produce clear societal benefit, including public engagement, science communication, inventions, and start-up organizations.

Support

Support from mentors and peers positively affects professional trajectories in a variety of ways. For example, mentors in conservation science can prepare students for careers different from their own by facilitating diverse professional networks and skills (e.g., USFWS 2017) and encouraging exploration beyond their own models. Financial support is also essential. Experience-based training and internships are important early-career springboards but are often unpaid. Expecting interns to work for free or below a living wage for long periods impedes

conservation's socioeconomic diversification and sends the signal that conservation is not a viable field. Compensation should not be the factor that limits recruitment and retention of a diverse and creative conservation workforce.

Embrace of Risk

Novel careers are inherently risky, so in addition to insuring sufficient rewards for success, we must provide a safety net to benefit experimenters and entrepreneurs when good ideas fail. In many fields, including business and technology, high-risk/high payoff efforts are venerated (e.g., Dietz & Rogers 2012; Miller 2014). In conservation, and in many social change ventures, limited opportunity for financial payoff through entrepreneurial success can be counterbalanced by increasing influence and leadership opportunities. For example, soft-money research or other staff positions funded by grants or contracts are usually seen as less desirable than permanent or tenure-track positions. Institutional rules should allow or facilitate higher and guaranteed pay to those willing to take greater risks, invoking the high-risk/high reward model that has fueled rapid progress in other fields. Conservation can and should celebrate individuals who accept higher risk career pathways and generate positive conservation outcomes.

Challenging Ourselves to Create Change

In fields as disparate as medicine, computing, and aeronautics, science has fueled revolutions and inspired societal change, to the benefit of all. We must be braver in dismantling the cultural, institutional, and psychological barriers that continue to limit the social impact of conservation science. In this context, we challenge all conservation scientists to consider 4 key questions: (1) How will you personally facilitate creative vision and change? (2) How well does your organization support enterprising individuals, intellectually, socially, and financially? (3) How can you boost creativity, risk-taking, and outcomes focus in your career or organization? (4) How can you recognize and reward successful efforts to catalyze new opportunities in conservation? We invite readers to join a dialogue to illuminate experiments already underway, articulate new and innovative approaches and business models at every scale, and explore how these translate into professional opportunities and cultural shifts that engage more of society—and our field—in solving conservation challenges.

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