LETTER

The changing landscape of conservation science funding in the United States

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Abstract

To understand the changing role of funding sources in shaping conservation science in the United States, we analyzed acknowledgments from published studies, trends in research funding, and survey responses from conservation scientists. Although the U.S. federal government was the most frequently acknowledged source of support overall, U.S. foundations and NGOs were the predominant sources for tropical and socioeconomic research. Acknowledgments of foundation support for conservation research increased over the last two decades, while recognition of federal funds declined. Concordant trends in funding and acknowledgments indicated a changing landscape for conservation science, in which federal support has not kept pace with the growth in conservation research efforts or needs. Survey responses from conservation scientists about their funding sources were consistent with acknowledgment data, and most (64%) indicated that shifts in funding sources and amounts affected the type of research they conduct. Ongoing changes in the funding landscape shape the direction of conservation research and may make conservation science more vulnerable to economic recessions.

Introduction

Science funding is vulnerable to shifts in economic conditions, and conservation science is no exception. During the 2008–2009 global economic downturn, U.S. conservation organizations and foundations were hard hit, with foundations losing an average of 25% of their endowments (Foundation Center 2009), and government coffers were depleted at multiple levels (CBO 2009; NGA & NASBO 2009). Because these entities historically provide the majority of support for conservation science (Zavaleta *et al.* 2008), the present economic recession is likely to have ripple effects in the future. Conservation science, the body of knowledge necessary to conserve biological diversity (Zavaleta *et al.* 2008), may be particularly vulnerable to recessions because its implications are often viewed as constraints on economic growth and because financial support for the environment typically declines during economic downturns (Elliott *et al.* 1997; Pergams *et al.* 2004). Both the sources and the amounts of funding for conservation and other sciences have the potential to influence research focus, quantity, publication rate, and impact (Zhang 1997; Liyanage & MacIntyre 2006; Goldfarb 2008; Shelton 2008; Jefferson *et al.* 2009; Wade *et al.* 2009). However, we currently lack a comprehensive understanding of the sources of funding for conservation science or how they may have shifted since the emergence of the discipline.

To better understand funding trends for U.S. conservation science, and the vulnerabilities they may

create, we analyzed funding sources over a 23-year period (1987–2009). Since it is difficult to obtain quantitative data on funding, we used the acknowledgments sections of published articles to summarize the role of different sources in supporting scientific output (Giles & Councill 2004). We focused on the journal *Conservation Biology,* which has the highest total number of citations and the second-highest 5-year impact factor among "*Biodiversity Conservation*" journals (ISI Journal Citation Reports 2008), and its new sister journal, *Conservation Letters*. Specifically, we quantified the proportion of acknowledgments from different funding sources, whether these proportions changed over time, and whether the research funded by different sources varied in focus or impact. To investigate the basis for acknowledgment patterns, we compiled budget data for U.S. conservation-oriented foundations and the U.S. federal government. In addition, we surveyed the membership of the North American section of the Society for Conservation Biology (SCB), the world's largest professional society for conservation science, about their past funding record and outlook on the future.

Methods

Literature analysis

We recorded funders acknowledged in articles in two core journals for U.S. conservation science—*Conservation Biology* and *Conservation Letters*—from their inaugural issues (1987 and 2008, respectively) through the end of 2009. We selected only studies performed at U.S. locations or by U.S.-affiliated first authors that acknowledged at least one funder. We also required that articles report original research and excluded essays, concept and opinion pieces, and reviews. We randomly canvassed *Conservation Biology* articles within the ISI Web of Science database until obtaining 22 articles per year that met our criteria (except years 1987–1992, when <22 suitable articles were published). Because *Conservation Letters* has published few articles to date, we examined all of its suitable articles ($n = 19$). We ultimately tallied 1,540 funding sources from 482 articles.

To focus on the U.S. conservation funding landscape, we categorized U.S. funding sources by funder type but lumped all non-U.S. sources into a single "foreign" category (Supplement 1, Table S1). We counted each acknowledgment as an independent source; thus, if two grants from the same source were explicitly acknowledged, both were tallied. Because the National Science Foundation (NSF) plays a leading role in funding U.S. science, we tracked this source separately from all other federal agencies. We defined foundations as any private or public U.S. organization whose mission was primarily grant making. We recognize that we may not have always identified the ultimate sources of funding (e.g., when authors credit government and foundation grants to university endowments). Where listed funding organizations represented complex collaborations, we attempted to credit the predominant source. We categorized research by location, ecosystem type, topic, taxon, and threat studied (Supplement 1, Table S1), and assessed whether the distribution of funder types differed among these research emphases relative to the overall distribution using a chi-square test.

To test for temporal trends, we used logistic regression analyses to assess year number (1–23) as a predictor of the probability that any given funder type would be acknowledged. We also considered models that included the number of funders per study as a predictor variable to control for its effect on trends. Finally, we examined whether funder type influenced an article's scientific impact, measured as the number of citations to the article in the primary literature, using generalized linear models and controlling for the effect of elapsed time and research focus on the accumulation of citations. All analyses were conducted in SAS (v9.1, SAS Institute, Cary, NC, USA).

Survey of SCB members

We polled North American SCB members based at U.S. institutions using a 16-question online survey (Supplement 2) that addressed sources of conservation research funding as well as perceptions of recent and long-term trends in funding availability, whether funding sources influence research priorities, and how the current recession and the new Obama presidential administration will impact research funding. Responses were collected in March–April 2009. To estimate the mean proportion of funding received from each funder type, we used the midpoint of the percentage range in each categorical response (0–20%, 20–40%, 20–60%, 60–80%, and 80–100%). Our methods resulted in total funding proportions exceeding 100%, likely because the distribution of actual funding proportions within the first funding bin was skewed toward zero values, but was assumed to be 10%.

Budget and discipline trends

Because the U.S. federal government does not keep a separate accounting of spending on conservation science, we estimated historical trends from annual NSF surveys of federal research and development spending in disciplines closely related to conservation science, both overall and disbursed to universities (available online at

webcaspar.nsf.gov, see Supplement 3). These data likely captured most conservation-relevant spending, but inevitably included unrelated spending. We adjusted all spending data to 2008 dollars using inflation conversion factors (U.S. Bureau of Labor Statistics 2009).

Similarly, existing databases on foundation spending do not track conservation science separately. Therefore, we used available data on foundation giving in the broad category of the environment and animals (57% of which was directed to natural resource and conservation) as a proxy for trends in spending on conservation science (Foundation Center 2009) and assumed that the proportion of this spending allocated to conservation science has not changed systematically through time. To explore this assumption, we recorded grants to academic and research institutions made by members of the Consultative Group on Biological Diversity and by the top 20 environmental grant makers (Foundation Center 2000) providing this information online, and then compared this to overall grants in the environment category from the same organizations (Supplement 4). These data do not indicate systematic trends in the proportion of environment and animals funding allocated to science and research (data not shown). Furthermore, during the interval for which we have concurrent data (1990–2007), grants to environment and animals constituted a relatively constant proportion of total foundation giving (2.4–3.6%, Foundation Center 2009). Thus, longer term historical data on total foundation giving should provide another reasonable proxy for changes in funding for conservation science.

We assumed a 6-year lag between disbursement of funding and publication of results to account for study duration as well as submission and publication delays (Kareiva *et al.* 2002; O'Donnell *et al.* 2010). Finally, we estimated growth in the field of conservation science by tallying the number of articles published in explicitly conservation-oriented journals.

Results

Literature analysis

Research funders and foci

The federal government (including NSF) was the most frequently (37%) acknowledged funder of U.S. conservation science (Figure 1A). Together, foundations and NGOs also provided substantial support, receiving 28% of acknowledgments. NGO and foundation funding occurrences were similar to those of NSF (16% and 11% vs. 15%).

The relative importance of funder type differed by research location and ecosystem type ($\chi^2 \geq 29.8$, $P < 0.001$). Together, foundations (15%) and NGOs (22%) were the most frequent funders of conservation science in the tropics (Figure 1A). Foreign sources were also particularly likely to fund U.S. research in the tropics, while the non-NSF federal and state/local governments were more likely to fund temperate and arctic research (Figure 1A). U.S. government resources dominated research funding in freshwater ecosystems (47%, Figure 2A).

The relative role of each funder type also differed among research topics ($\chi^2 \geq 52.3$, $P < 0.001$, Figure 2B). Few studies addressed socioeconomic topics (5%), but those that did were funded disproportionately by NGOs and foundations (43% Figure 2B) and foreign sources (17%). Studies of a single vulnerable species were the most numerous (35%), and funder composition mirrored the distribution overall. For other popular research topics, methods and monitoring, and planning, NGO and foundation contributions rivaled those of the entire U.S. federal government, but the distribution of funders was not statistically different from overall patterns ($P \geq 0.090$).

The relative distribution of funders differed for several taxa (Figure 2C) and threats (not shown, $\chi^2 \geq 15.4$, $P \leq 0.031$). Mammal research was disproportionately funded by NGOs (25%) and foreign sources (15%), bird research by the non-NSF federal government (31%), and research on fishes by the non-NSF federal government (28%) and state/local governments (16%). Studies of multiple taxa were frequently supported by foreign sources (15%), and research on herpetofauna by U.S. universities (24%). Studies focusing on harvest of species were disproportionately funded by foreign sources (18%), NGOs (20%), and private sources (7%), while relatively more support for invasive species research came from federal (47%) and state/local governments (10%) and universities (19%). Work on "other threats" (disease, pollution, and small population sizes) was frequently funded by NSF (24%).

Studies supported by foundations and NGOs acknowledged more funders than those supported by the federal government and U.S. universities (analysis of variance $F = 19.45$, $P < 0.001$, pairwise differences: 1.05–1.39, $P < 0.05$). Affiliations of lead authors were heavily skewed toward universities (77%, Supplement 1, Table S2). Federal employees were most frequently funded by the federal government, and foreign authors often secured foreign funding. Otherwise, authors obtained funding from diverse sources outside of their affiliations.

Trends in funding sources

U.S. foundations played an increasingly important role in funding conservation science, showing an annual increase in the odds of being acknowledged of 5% over the past 23 years (Wald chi-square test, $P < 0.001$, odds

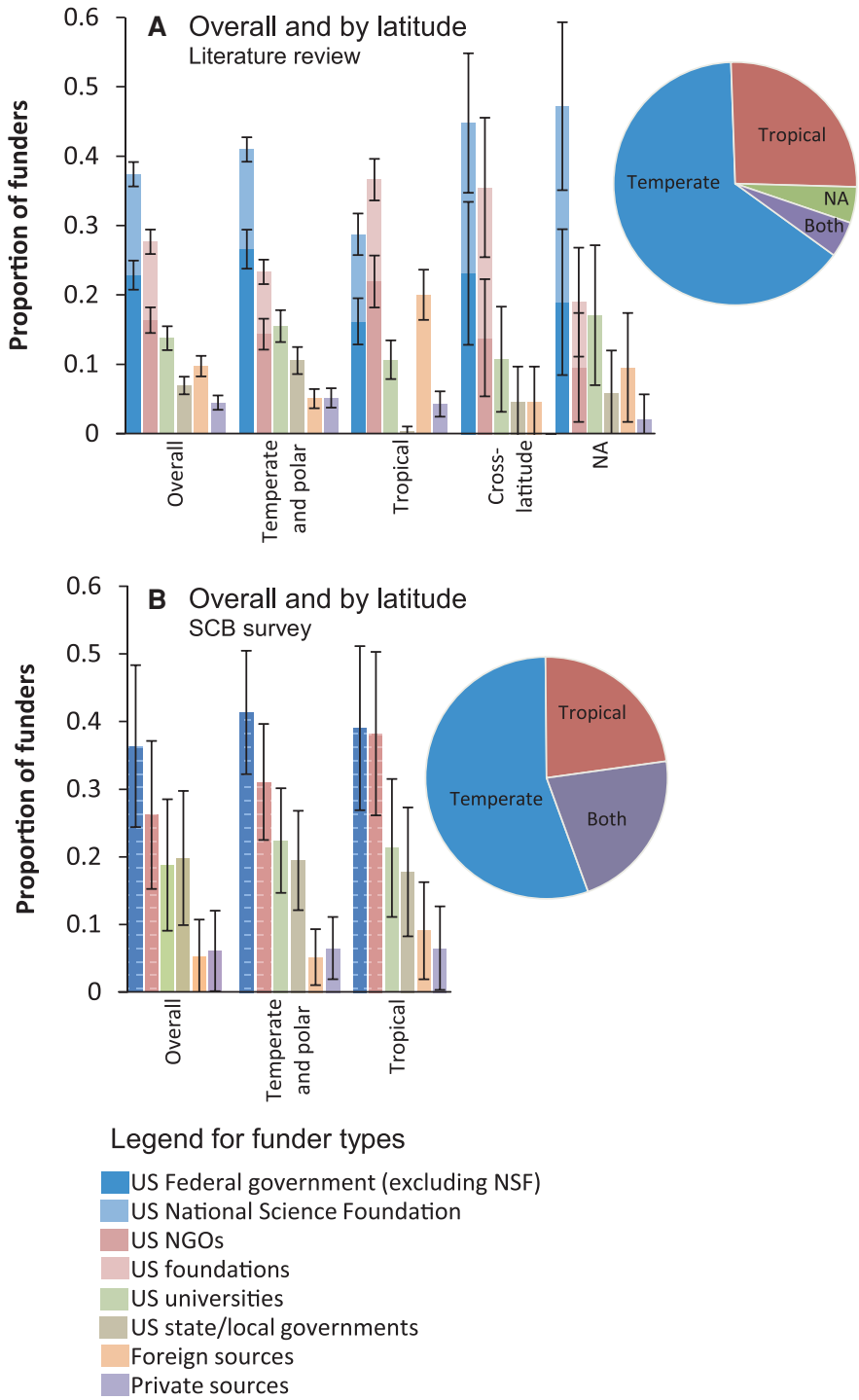

Figure 1 Relative frequency of research latitudes (pie charts) and acknowledged funding sources overall and by latitude (bar graphs) for U.S. conservation science. Results are presented for (A) research published in *Conservation Biology* and *Conservation Letters* ($n = 1{,}540$ funding sources from 482 studies, of which 64% were in temperate and polar regions, 26% tropical regions, 5% not place-based, and 5% spanning tropical and temperate regions) and (B) research reported by members of the North American section of the Society for Conservation Biology ($n = 285$ survey respondents, of which 55% worked in temperate and polar regions and 23% in tropical regions, and 22% worked in both regions [excluding 128 surveys with no response on research location]). The survey did not differentiate between NSF and other U.S. federal funding or between U.S. foundations and NGOs. Funding percents for survey respondents total more than 100% (see methods). Error bars are 95% CIs on the proportion of acknowledgments attributed to each type.

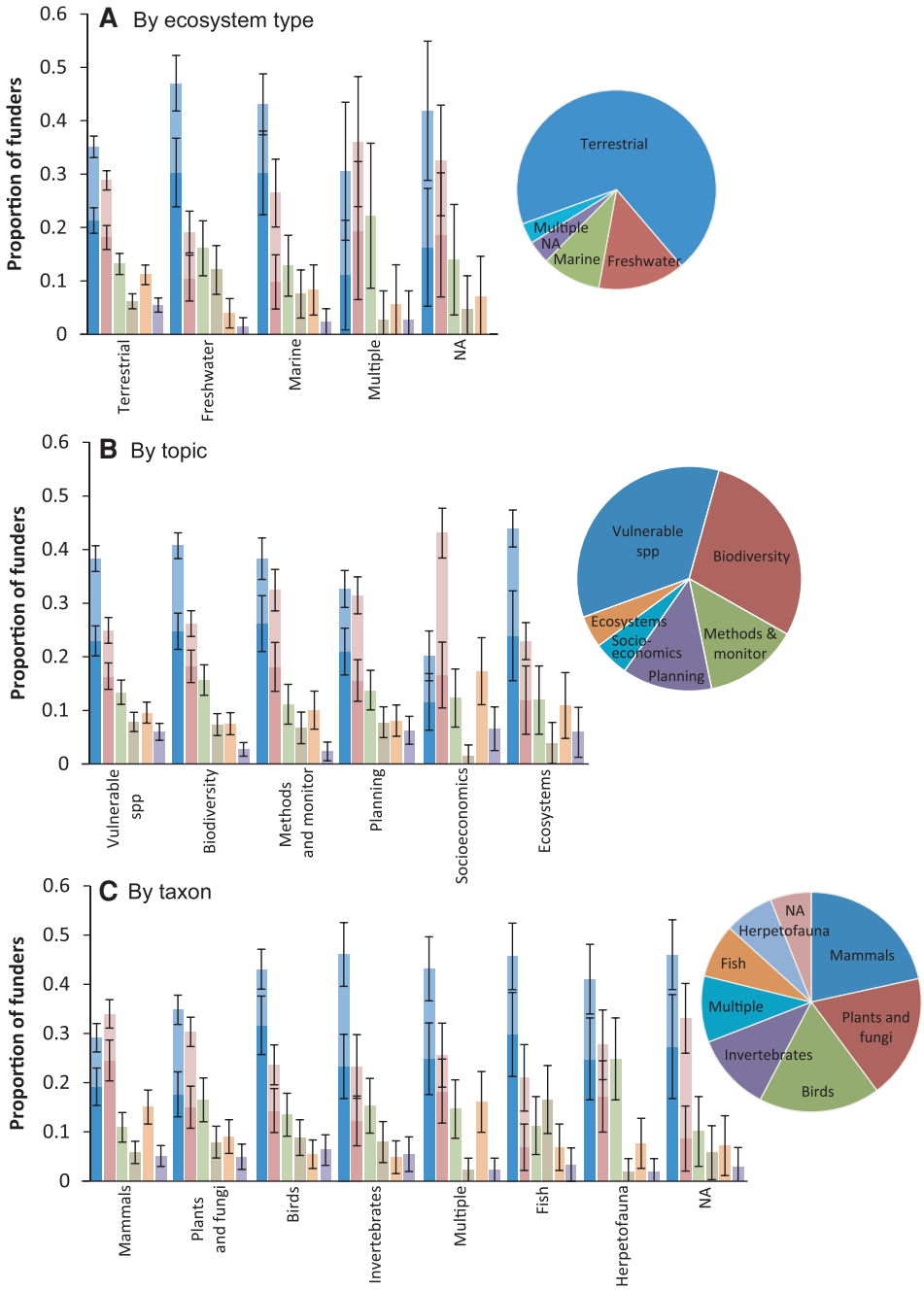

Figure 2 Relative frequency of research foci (pie charts) and acknowledged funding sources by focus (bar graphs) for U.S. conservation science based research published in *Conservation Biology* and *Conservation Letters* ($n = 1{,}540$ funding sources from 482 studies). Research was classified by (A) ecosystem (69% terrestrial, 14% freshwater, 10% marine, 4% multiple systems, and 3% not system based), (B) topic (35% vulnerable species, 29% biodiversity and species interactions, 14% methods, monitoring, and evaluation [methods and monitor], 13% systematic conservation planning, restoration, and connectivity [planning], 5% socioeconomic aspects of conservation, and 4% ecosystem services and processes), and (C) focal taxon (22% mammals, 18% plants and fungi, 18% birds, 11% invertebrates, 10% multiple focal taxa, 8% fish, 7% herpetofauna, and 6% not taxon focused). Error bars are 95% CIs on the proportion of acknowledgments attributed to each funder type.

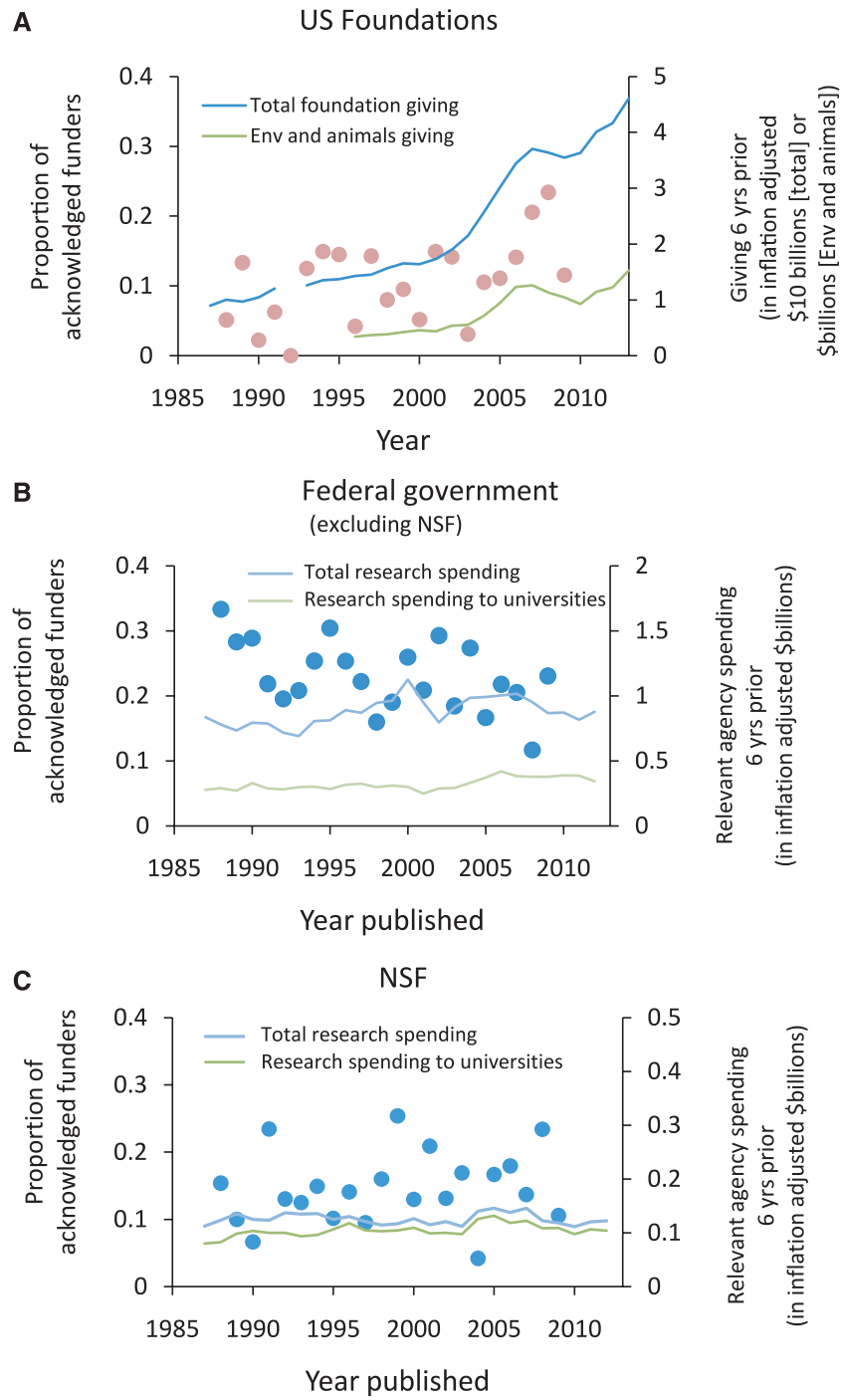

Figure 3 Trends in acknowledgments and spending by funder type. The proportion of acknowledgments attributed to each funder type for U.S.-based conservation research published in *Conservation Biology* and *Conservation Letters*, shown as solid circles, for (A) U.S. foundations, (B) the non-NSF federal government, and (C) NSF. In (A) we also show giving by foundations 6 years prior (i.e., we assume a 6-year publication delay) overall (blue line) and for environment and animals (green line); data are missing for year 1986, resulting in a gap in publication year 1992. Due to small sample sizes, acknowledgments data for 1987 and 1988 are combined. In (B) and (C), we also plot spending 6 years prior by the non-NSF federal government and by NSF on conservation-related research overall (blue line) and for the subset of this spending disbursed to universities (green line). Spending data shown from 2010 and beyond reflects spending from 2004 to 2008, which should yield publication output in 2010–2014.

ratio = 1.045, Figure 3A). Acknowledgment of non-NSF federal support declined over the same period ($P = 0.040$, odds ratio = 0.980, Figure 3B). No other trends in funding sources, including NSF (Figure 3C), were evident ($P \geq 0.200$). Funder type had less effect on the scientific impact of conservation research (likelihood ratio chi-square, $P = 0.002$) than elapsed time or latitude, ecosystem, and taxon studied (all $P < 0.001$). Within funder type, only articles with state/local government funding and private funding differed in impact from NSF funded

articles, with nonfederal government funding garnering more citations and private funding receiving fewer (P = 0.018 and 0.019, respectively).

Survey of SCB members

Respondents and research topics

Approximately half of the 285 respondents were college or university employees (54%), and another 24% worked for NGOs. The remainder was employed by federal (10%) or state/local governments (10%) or private industry (4%). A large majority of respondents worked primarily in the United States (82% vs. 68% of studies in our literature analysis included U.S. locations). Terrestrial ecosystems were the most commonly studied (78% vs. 69% for literature analysis), followed by freshwater (37% vs. 14%) and marine (26% vs. 10%) ecosystems (survey respondents could chose multiple ecosystem foci). One-quarter of respondents worked in tropical (23% vs. 26%) regions (Figure 1B). Thus, compared to authors of the journal articles analyzed above, survey respondents were more likely to be affiliated with NGOs and state/local governments, working in U.S. locations, and studying aquatic ecosystems.

Reported funding sources were similar to those acknowledged in publications (Figure 1B). The U.S. federal government was the largest source of research funding, providing an estimated 36% of total funding, and representing >60% of funds for a quarter of respondents. NGOs and foundations were the second-largest funding source, providing 26% of total funding, and representing >40% of individual funding for 26% of respondents. State/local governments and universities were also important, each contributing approximately 20% of total funding, while foreign and private sources each supplied approximately 5%. Respondents who worked for federal or state/local government received >70% of their research funding from government sources. SCB members working in the tropics tended to receive more of their funding from NGOs and foundations.

Trends in funding sources

Almost 40% of respondents indicated that prior to the recent economic downturn (beginning mid-2008) funding for conservation research had decreased over the years they had been applying for it (median = 10 years). Only 16% thought that funding had increased, and the remainder saw no overall trend (21%) or had no opinion (23%). When considering each funding source individually, most of those expressing an opinion indicated declines from the federal government (58%), NGOs and foundations (60%), universities (55%), state/local governments (65%), and private sources (60%). Few respondents reported increased funding (13–26% by source). Most respondents indicated that changes in the *amount* of funding had "moderately" (43%) or "substantially" (21%) affected the type of research that they do. Furthermore, most reported that changes in the *sources* of funding had "moderately" (45%) or "substantially" (19%) affected the type of research that they do.

Most (83%) respondents anticipated that the current economic crisis would decrease funding for conservation research in the next 5 years (Figure 4). At the same time, 76% expected that the Obama administration would increase funding during the same time period. Overall, expectations for net changes in the amount of funding for conservation research over the next 5 years were nearly evenly split between increase (36%), decrease (35%), and remain constant (29%).

Budget trends for major funders

We investigated spending by the U.S. federal government and U.S. foundations from 1981 to 2003, corresponding to our literature analysis interval of 1987–2009 with a 6-year lag from funding to publication. Inflation-adjusted spending on conservation science-related fields by the non-NSF federal government and by NSF was essentially flat, with spending in 2003 only 4–5% higher than in 1981 (Figure 3B and C). The non-NSF federal government awarded 36% of its conservation science-related spending to universities on average, while NSF awarded

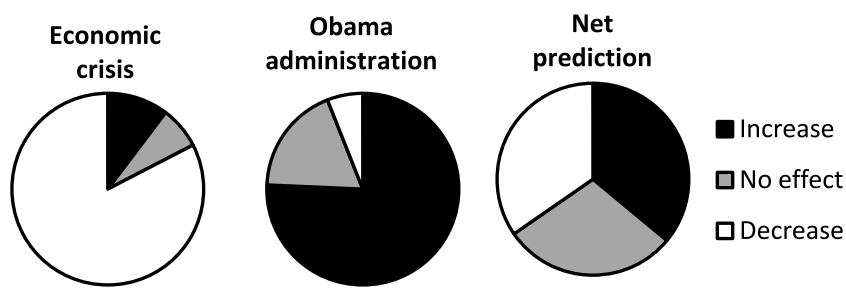

Figure 4 Funding outlook by members of the North American section of SCB (n = 285). We asked members their expectations for funding changes in light of the current economic crisis, the Obama administration, and the combined effect of both.

an average of 83% of its funds to universities. For both the non-NSF federal government and for NSF, spending directed to universities was 36% higher in 2003 than in 1981.

We estimate that foundation spending on conservation science increased more substantially over the same time interval. From 1990 to 2003, inflation-adjusted giving to environment and animals increased 205%, while from 1981 to 2003, total foundation giving increased 295% in inflation-adjusted dollars (Figure 3A).

On average, foundations allocate 11% of their conservation budgets to science (Zavaleta *et al.* 2008). To roughly compare the relative contributions of different funders, we applied this percent to foundation spending in the environment and animals category, estimating that in 2001 and 2003 (corresponding to acknowledgments in 2007 and 2009), foundations contributed \$139M and \$115M to conservation science, while NSF contributed \$146M and \$119M, and the non-NSF federal government spent \$1018M and \$870M (all amounts are in 2008 dollars). All of these estimates include funding for conservation and related environmental fields.

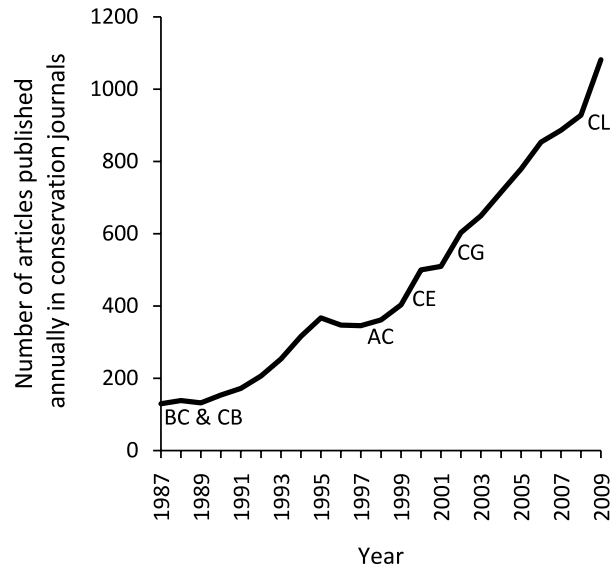

Figure 5 Growth in published articles through time (738% since 1987) for conservation research journals—*Conservation Biology (CB)*, *Biological Conservation (BC)*, *Animal Conservation (AC)*, *Conservation Ecology (now Ecology and Society) (CE)*, *Conservation Genetics (CG)*, and *Conservation Letters (CL)*. Labels indicate year first published. *Biological Conservation* was started in 1968.

Discussion

Our results highlight a mismatch between dramatic growth in the field of conservation biology over the past two decades (Figure 5) and declining acknowledgment of federal funding. Acknowledgment of funding from U.S. foundations, however, increased over this interval, indicating that conservation research is increasingly reliant on nongovernmental funding sources. Most survey respondents reported that funding from all sources had become less available over their careers, which may reflect increased competition for limited resources in a growing field.

Although changes in funding acknowledgments do not necessarily reflect similar changes in actual dollar amounts, conclusively demonstrating changes in amounts would require a comprehensive database of conservation research funding. To our knowledge, such a database does not exist. The patterns we observed in acknowledgments, however, were mirrored by proxy data on trends in spending amounts that suggested federal spending on conservation science has been relatively flat, while foundation spending has increased substantially. Our results are consistent with other studies concluding that federal spending has not matched increases in conservation threats (Steinberg *et al.* 2007), that federal funding for agency research on topics other than human health has not risen over the past decade (Shelton 2008), and that funding of U.S. university research by nonprofit organizations has increased, while such funding by the U.S. federal government has decreased from 1981 to 2003 (Vincent-Lancrin 2006).

Our focus on journal articles emphasizes trends in funding for university-based research since a large majority (77%) of authors had academic affiliations. Federal agencies (excluding NSF), however, route only about one-third of their research funds to universities, indicating that much federal spending supports conservation research by government scientists. Nonetheless, nonacademic researchers were relatively better represented in the survey of SCB members, and the relative importance of different funding sources appeared similar between the journal article analysis and the SCB survey.

Interestingly, NSF budgets in fields related to conservation science have risen only 5% over the period of our analysis, yet the rate at which the agency is acknowledged has not declined. NSF has been effective at maintaining "market share" in the rapidly growing conservation research literature despite relatively lethargic growth in funding. NSF-funded research, however, had no higher impact than work supported by most other sources, a result also found by Giles & Councill (2004) for computer science. Similarly, citation rates for foundation-backed conservation science rivaled that of other funders. These patterns suggest that changes in funding sources have not affected the impact of published research.

By increasing their profile as funders of U.S. conservation research, foundations may be influencing the direction of the field. Although the interests, skills, and values of researchers surely govern much of what is pursued, funding sources can also influence research direction (Liyanage & MacIntyre 2006; Jefferson *et al.* 2009). Indeed, nearly 65% of the SCB members surveyed felt that changes in the sources of funding through time had altered the type of research they conducted. Foundations disproportionately fund research in tropical settings as well as on socioeconomic aspects of conservation. These vital topics in conservation biology are frequently highlighted as understudied (Cleary 2006a; Higgins *et al.* 2006; Robinson 2006), hence foundation investments in these areas likely serve to broaden the field and fill critical knowledge gaps.

NGOs disproportionately funded studies on mammals and on harvest of animals and plants, which are more likely to involve charismatic wildlife species that appeal to their donor base. Non-NSF federal agencies more heavily funded research on freshwater systems and on birds and fishes, perhaps because of the economic and recreational importance of these systems and taxa. These agencies also emphasized funding for research on nonnative invasive species, which are of particular economic and environmental concern in the United States (Pimentel *et al.* 2005).

Although our data and analyses are focused on funding for conservation science in the United States, the trends we observed have implications beyond U.S. borders. The current recession is global, and the longer term pattern of decreasing governmental support and increasing nongovernmental support for research has been seen in many countries (Vincent-Lancrin 2006). In addition, U.S. research funding impacts conservation science in other countries. Thirty-two percent of the studies by U.S. researchers in our literature survey occurred outside the United States, and 18% of survey respondents listed a non-U.S. location as their primary research site. Moreover, 97% of foundation-funded tropical research occurred outside of U.S. territories. Thus, the benefits of increasing foundation funding are not restricted to the United States and may be particularly important in the tropics where government funding for conservation is more limited (Balmford & Whitten 2003).

Our results demonstrate subtle but important shifts in the funding landscape for conservation science over recent decades. When economic conditions change, the diverse priorities of funders may create unique funding vulnerabilities across ecosystems, taxa, and research topics. Funding for conservation research may be subject to substantial fluctuations during periods of economic upheaval because it is seen by some as conflicting with economic development or competing for resources with conservation actions (Cleary 2006a; Jaramillo-Legorreta *et al.* 2007). We consider conservation science a necessity for ensuring the long-term efficiency and effectiveness of conservation actions, and believe that stemming the rising threats to biodiversity and ecosystem function will require enhanced support for both conservation researchers and practitioners (Cleary 2006b; Higgins *et al.* 2006).

It remains to be seen if the trend toward greater foundation-funded conservation science will be maintained in the coming years. Although foundations have offset some of the shortfalls in federal support to conservation science over the past two decades, a recent survey found that nearly all of the top 100 foundations planned a moratorium on new awards in 2009, and foundation giving was expected to decline in 2009 and 2010 (Foundation Center 2009). At the same time, federally funded conservation science is poised to increase. The Obama administration plans to include support for environmental and conservation research activities at multiple agencies and to increase the NSF budget >50% over the 2008 level by 2014, with the Recovery Act providing an additional approximately 40% to NSF in 2010 (U.S. Office of Management and Budget 2009). SCB members in the United States are sanguine about the prospects for increased conservation science funding under the Obama administration, but they also anticipate eroding funding levels during the current recession. Regardless of how these opposing shifts play out, maintaining the intellectual rigor and practical sufficiency of conservation science depends upon reliable funding streams from both public and private sources.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Supplement 1:

Table S1: Classification scheme for research articles included in this study.

Table S2: Cross-classification of lead author affiliations and the frequency of funding by different funding entities.

Supplement 2: Web-based survey distributed to the North American Section of the Society for Conservation Biology.

Supplement 3: Estimating federal spending on conservation science.

Supplement 4: Assessing the proportion of foundation grants on animals and environment allocated to science.

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References

Balmford, A., Whitten T. (2003) Who should pay for tropical conservation, and how could the costs be met? *Oryx* **37**, 238–250.

CBO. (2009) The budget and economic outlook: an update. *The Congress of the United States*. Congressional Budget Office, Washington, DC.

Cleary, D. (2006a) The questionable effectiveness of science spending by international conservation organizations in the tropics. *Conserv Biol* **20**, 733–738.

Cleary, D. (2006b) Who needs to spend money on conservation science anyway? *Conserv Biol* **20**, 1567–1568.

Elliott, E., Seldon B.J., Regens J.L. (1997) Political and economic determinants of individuals' support for environmental spending. *J Environ Manage* **51**, 15–27.

Foundation Center. (2000) Top 50 U.S. Foundations Awarding Grants for Environment, circa 1998. Foundation Center Statistical Services. Available from: http://foundationcenter.org/findfunders/statistics/pdf/04_fund_sub/1998/50_found_sub/sub_c_8.pdf. Accessed 1 April 2010.

Foundation Center. (2009) *Foundation yearbook: facts and figures on private and community foundations*. July 2009 edition, New York, NY.

Giles, C.L., Councill I.G. (2004) Who gets acknowledged: measuring scientific contributions through automatic acknowledgment indexing. *Proc Natl Acad Sci U S A* **101**, 17599–17604.

Goldfarb, B. (2008) The effect of government contracting on academic research: does the source of funding affect scientific output? *Res Policy* **37**, 41–58.

Higgins, J.V., Touval J.L., Unnasch R.S. *et al*. (2006) Who needs to spend money on conservation science anyway? *Conserv Biol* **20**, 1566–1567.

Jaramillo-Legorreta, A., Rojas-Bracho L., Brownell R.L. *et al*. (2007) Saving the vaquita: immediate action, not more data. *Conserv Biol* **21**, 1653–1655.

Jefferson, T., Di Pietrantonj C., Debalini M.G., Rivetti A., Demicheli V. (2009) Relation of study quality, concordance, take home message, funding, and impact in studies of influenza vaccines: systematic review. *Br Med J* **338**, b354.

Kareiva, P., Marvier M., West S., Hornisher J. (2002) Slow-moving journals hinder conservation efforts. *Nature* **420**, 15–15.

Liyanage, S.S., MacIntyre C.R. (2006) Do financial factors such as author page charges and industry funding impact on the nature of published research in infectious diseases? *Health Info Libr J* **23**, 214–222.

NGA, NASBO. (2009) *The fiscal survey of states*. National Governors Association and the National Association of State Budget Officers, Washington, DC.

O'Donnell, R.P., Supp S.R., Cobbold S.M. (2010) Hindrance of conservation biology by delays in the submission of manuscripts. *Conserv Biol* **24**, 615–620.

Pergams, O.R.W., Czech B., Haney J.C., Nyberg D. (2004) Linkage of conservation activity to trends in the US economy. *Conserv Biol* **18**, 1617–1623.

Pimentel, D., Zuniga R., Morrison D. (2005) Update on the environmental and economic costs associated with alien-invasive species in the United States. *Ecol Econ* **52**, 273–288.

Robinson, J.G. (2006) Conservation biology and real-world conservation. *Conserv Biol* **20**, 658–669.

Shelton, R.D. (2008) Relations between national research investment and publication output: application to an American paradox. *Scientometrics* **74**, 191–205.

Steinberg, A.J., Sereres C.S., Burrows M., MacIsaac, H.J. (2007) Temporal pattern of government funding for nonindigenous species research in the Great Lakes. *J Great Lakes Res* **33**, 136–142.

U.S. Bureau of Labor Statistics. (2009) Consumer Price Index inflation calculator. Available from: http://www.bls.gov/data/inflation_calculator.htm. Accessed 23 October 2009.

U.S. Office of Management and Budget. (2009) A new era of responsibility: renewing America's promise. Available from: http://www.whitehouse.gov/omb/assets/fy2010_new_era/a_new_era_of_responsibility2.pdf. Accessed 30 March 2010.

Vincent-Lancrin, S. (2006) What is changing in academic research? Trends and futures scenarios. *Eur J Educ* **41**, 169–202.

Wade, L., Whitehead H., Weilgart, L. (2009) Conflict of interest in research on anthropogenic noise and marine mammals: does funding bias conclusions? *Mar Policy* **34**, 320–327.

Zavaleta, E., Miller, D.C., Salafsky, N. *et al*. (2008) Enhancing the engagement of the U.S. private foundations with conservation science. *Conserv Biol* **22**, 1477–1484.

Zhang, H.Q. (1997) More authors, more institutions, and more funding sources: hot papers in biology from 1991 to 1993. *J Am Soc Inf Sci* **48**, 662–666.

