



The Auk 125(4):980–983, 2008
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Printed in USA.

“Anchoring” and research priorities: Factors that depress bird population estimates?—Various conservation organizations maintain lists of bird species that are believed to be rare, declining, or otherwise imperiled from a conservation perspective. For example, there are the *IUCN Red List* (World Conservation Union 2006), the *Birds of Conservation Concern* (U.S. Fish and Wildlife Service [USFWS] 2002), the *WatchList* (American Bird Conservancy 2007), and the *Watch List* (Partners in Flight 2006). Many state natural-resource agencies, as well, maintain state lists of birds of conservation concern. There may be some overlap among the lists for a given bird region, but generally the respective organizations perceive conservation issues from slightly different perspectives, or they focus on different groups of birds. One such list, “High Priority Shorebirds” (USFWS unpubl. data), developed as part of the *U.S. Shorebird Conservation Plan* (Brown et al. 2001), is the focus of this letter.

The various lists of high-priority species serve several purposes. In calling attention to the species believed to be the most imperiled, they raise awareness of conservation issues among conservation organizations, research institutions, and the general public, and this awareness influences national and international conservation policy. They also guide decision-makers in allocating scarce resources for conservation and ecological research; identification of a high-priority species leads to more research being focused on that species. This is a good system, at least when a list is created and first published. However, if new and valid information on the species meets with resistance and its status is not updated, the system can become self-perpetuating, to the detriment of science and conservation.

Formal and informal institutions are quickly established around high-priority species, and partnerships are forged among research scientists, land managers, and funding agencies. Careers are built and reputations established by working on such species. Scientists can count on agency support and access to resources on the basis of a bird's presumed rarity or imperiled status. Those of us who study shorebirds have formed such an “institution” on the basis of the remarkable migration patterns and life histories of these species, and we are good at drawing further attention to them by emphasizing their decline. At any scientific meeting about shorebirds, one can hear something like this: “Of more than 30 Nearctic migratory species, more than half are declining or thought to be declining in numbers.” Although there is good evidence that such declines have occurred in some species (Howe et al. 1989, Morrison et al. 2001, Stroud et al. 2006, Bart et al. 2007), much of the information that would support such claims is unconvincing at best. We, as a scientific institution, have not always been

self-critical of some of these data or the associated proclamations, perhaps because, in one way or another, we benefit from studying high-profile, “declining” bird species.

It is not hard to imagine the professional conflicts that may arise if someone shakes up the status quo by conducting a thorough survey that shows that a high-priority species is likely more abundant, perhaps much more abundant, than was previously believed. This interesting sequence of events has occurred at least twice in the past five years, with regard to the Buff-breasted Sandpiper (*Tryngites subruficollis*) and Long-billed Curlew (*Numenius americanus*). I have had the opportunity to follow these cases at various times during that period, and I believe that a historical review may shed some light, not so much on the science per se, but on aspects of using science to establish institutional research priorities that form the basis for lists of high-priority birds.

Buff-breasted Sandpipers and Long-billed Curlews have been among the top seven “highly imperiled” species listed in *High Priority Shorebirds* (U.S. Shorebird Conservation Plan 2004) and were initially believed to have populations of 15,000 and 20,000, respectively (Brown et al. 2001, based on estimates in Morrison et al. 2001). It is interesting to note, for historical purposes, that Morrison et al. (2001) included an estimate of Long-Billed Curlew populations derived from Breeding Bird Survey data of 168,000, but this was considered unrealistic. Confidence in the Buff-breasted Sandpiper population estimate was low; it was characterized (Brown et al. 2001:20) as “likely to be in the right order of magnitude,” meaning that the actual population could be as much as 10 times higher or 1/10 as high (or the estimate could have been even more in error). The currently accepted estimate for Long-billed Curlews, on the other hand, was rated as “moderate,” defined as an “estimate *thought to be* [emphasis added] within 50% of the true number” (Brown et al. 2001:20). This should not be interpreted as a statistical statement; rather, it was simply an opinion that the estimate might have been within 50% (but it also may not have been, and no one knew the associated probabilities). Brown et al. (2001:20) stated that for most species, these population estimates should be considered “a first approximation, and subject to refinement and revision as more information becomes available.” More information has become available.

Three statistically designed surveys were recently conducted in various parts of the Buff-Breasted Sandpiper's range. A large-scale survey during the non-breeding season in South America produced a population estimate much larger than the currently accepted estimate (R. B. Lanctot unpubl. data), though this estimate was considered inaccurate because of difficulties in delineating suitable habitat (Lanctot pers. comm.). A second survey

of migration stopover habitats along the Gulf Coast of Louisiana and Texas produced a most likely population estimate (assuming a length-of-stay of 5 days) of at least 84,000 (W. Norling unpubl. data), and a third survey conducted during spring migration in Nebraska (Jorgensen et al. 2008) had as many as 78,000 (78,000 in 2004 and 34,000 in 2005) in the eastern Rainwater Basin alone. Furthermore, the Louisiana and Nebraska estimates could be considered minimum estimates, because detectability was assumed to be 100% in Louisiana and turnover rates were not considered in Nebraska. An extensive two-year survey of Long-billed Curlews on their North American breeding grounds was recently completed (Stanley and Skagen 2007). The estimates for both years were >100,000 (164,500 in 2004 and 109,500 in 2005), or at least 5× the accepted estimate at the time. Reanalysis of the combined U.S. and Canadian data by Nations et al. (2007) produced slightly higher estimates (183,231 in 2004 and 139,131 in 2005). These recent studies on Long-billed Curlew and Buff-breasted Sandpiper are among an increasing number of investigations that attempt to develop a more rigorous statistical sampling framework for bird species that are dispersed or patchily distributed during breeding and migration (Morrison et al. 2006).

These studies have stimulated some healthy debate concerning methodology, procedures, and results. An important concern seems to be the reluctance of some scientists to accept statistical estimates, especially when the surveys cover a small portion of the species' range, small numbers of birds are recorded, and extrapolation would result in an estimate that deviates sharply upward from the previously accepted numbers. In my opinion, however, this concern seems to be especially heightened by the latter factor—an upward deviation from previously accepted numbers. As supporting evidence, I would point out that the initial estimates published by the U.S. Shorebird Conservation Plan and derived by combining unrelated counts and professional guesses (Morrison et al. 2001) were, and continue to be, accepted as a standard of comparison without much debate, despite the many biases and uncertainties associated with such estimates.

As a consequence of following these case studies, I have become increasingly aware of, and surprised at, the lack of enthusiasm in some quarters for confronting even the possibility that some shorebird populations may be larger than were previously believed. Upwardly revised estimates that one would expect to be received as good news are often perceived as a threat. I have seen study results mentioned at scientific meetings but quickly ignored or dismissed as being unreliable because they were inconsistent with earlier estimates or were not acceptable for other reasons that were not always clear. Some colleagues have been professionally attacked simply for having been associated with newer, upwardly revised estimates. Might such pressures have influenced scientists to summarily dismiss their own work or the work of others when the results deviated sharply from the accepted numbers?

Reflecting the atmosphere of skepticism surrounding the newer statistical results, Morrison et al. (2006) presented a “conservative” synthesis of the aforementioned studies for both species. They believed that the Long-billed Curlew population was one standard deviation below the mean value estimated by Stanley and Skagen (2007), and their rationale for this decision was that the resulting number would be closer to another estimate based on professional opinion, though the accuracy of the opinion was stated to

be poor or unreliable. The rationale for their Buff-breasted Sandpiper estimate was even more curious. They reported a range of numbers for Nebraska that were not the estimated mean values, but rather the means minus two standard deviations for both study years (Jorgensen et al. 2008). Furthermore, they noted that the higher of these numbers (30,000) would be similar in magnitude to the Louisiana estimate, if one were willing to assume a 15-day length-of-stay (a value that is highly unlikely and much too large given the evidence) in Louisiana. Hence, the apparent “concordance” between these two independent and arbitrary numbers led them to conclude that the population was at least 30,000. This conclusion was reached apparently without checking their assumptions or bothering to contact the original authors to discuss the methodologies that were used in the initial studies. The ad-hoc arguments used by Morrison et al. (2006) are not only inconsistent and superficial, but also make it abundantly clear that there is a huge imbalance in the standards for acceptance of scientific results for purposes of priority setting.

One stated reason for this conservatism and reluctance to accept higher numbers is that science must be more cautious about accepting what may turn out to be a population “overestimate,” because such a Type II error may cause us to divert priorities (and resources) to other issues, with negative consequences for the species in question. Although this conservative reasoning may apply in some cases, there are several reasons why it probably does not apply in the present cases. First, raising the official population estimate for a bird species would not necessarily mean that the species is less imperiled than before, because other criteria such as population and habitat trends are perhaps more useful indicators. Second, the newer estimates for Long-billed Curlews and Buff-breasted Sandpipers are perhaps the first systematically derived estimates of population size for these species and, as has been frequently discovered in wildlife studies, systematic surveys tend to reveal larger populations than were previously thought to exist (Morrison et al. 2006, Nations et al. 2007). Hence, why would one assume that these estimates could only be overestimates? Isn't it equally likely that they could be underestimates? And third, to say that there are negative consequences of adopting what may turn out to be an overestimate is a half truth. There are also negative consequences to retaining earlier estimates instead of adopting newer information derived from more thorough, systematic approaches. In failing to adopt newer data, perhaps we are sticking with the status quo at the expense of more pressing priorities for funding of research and conservation.

In their response, Lanctot et al. (2008) state that an important factor underlying the reluctance to accept upwardly revised population estimates is a concern with the validity of statistical estimates, especially where the surveys cover a small portion of the species' range and small numbers of birds are recorded. I understand their arguments and, although I do not agree with them on technical grounds, were it purely a question of proper statistical inference, this discussion would end here. But the two case studies suggest a more complicated situation involving not only science but also the parallel process of the use of science to establish official population estimates and institutional priorities.

Specifically, the case studies suggest that not only does science produce results that affect species research priorities, but the reverse can also be true—institutional species priorities can also

affect what may later be accepted in science. In both cases, there seems to be a fair amount of “anchoring” (Tversky and Kahneman 1974), whereby individuals are biased toward the initial (or earlier) estimates, which become accepted as kind of a “gold standard” despite their many well-known biases and uncertainties, whereas newer results that may lead to changes in priorities are intensely scrutinized and rejected on the basis of the smallest potential flaw. One can only guess at the factors that really contribute to such anchoring and this is, in essence, the problem on which I am focusing—there is very little transparency in the process used to establish species research priorities.

What, if anything, could be done to improve on the current process? I believe there are several things. First, a more critical and open process could be implemented to conduct the periodic reviews of population status. The U.S. Shorebird Council has recently attempted to develop a more consensual review of population estimates (B. Andres pers. comm.), but the Council functions through volunteer efforts and the shorebird community as a whole must see the process as being important if it is to succeed. In a large synthesis (e.g., Morrison et al.’s [2006] population revisions), there are a lot of data to consider, and the authors simply must rely on other shorebird biologists to help evaluate published and unpublished new information. Quite often, this task falls to scientists who conduct research on a particular species and the lack of clear protocols leads to inconsistencies in approach, as evidenced by the ad-hoc decisions made with regard to the case-study species.

Better protocols could be developed for regularly revising population estimates using procedures that would ensure transparency in the process. Although an international mechanism currently exists for updating estimates of waterbird (including shorebird) populations, there is no formal organization of this process within North America. Wetlands International coordinates updates every three years, as scheduled by the Ramsar Convention. In North America, information on shorebird populations is collected by scientists either in association with groups such as the International Wader Study Group or Wetlands International itself, and the revisions are incorporated into successive editions of *Waterbird Population Estimates* (the latest, fourth edition was published in 2006 [Delany and Scott 2006]). In North America, this process could be formalized by forming a committee operating under the auspices of the U.S. and Canadian Shorebird Conservation Plan councils or other bodies. The committee could be charged with ensuring that regular shorebird population updates are undertaken and the results published and coordinated with the international update procedure via Wetlands International. The committee would need to develop technical protocols for updating the estimates, such as (1) who should be involved in this task, (2) what data should be acceptable, and (3) in what format should “official” population estimates be derived and documented. Ideally, similar information could be concurrently assembled on shorebird and habitat trends, with similar protocols.

Furthermore, to avoid the perception of conflicts of interest, an outward-looking review process should be adopted involving scientists not participating as authors in assembling the update information. Whether it would be feasible, desirable, or productive to adopt this approach is debatable, though such a process has been initiated for land birds, whereby Partners in Flight is undertaking a review of the current status of land birds in North

America, but the Association of Fish and Wildlife Agencies (a consortium of the 50 state wildlife agencies) will actually coordinate the effort, including an extensive review of new information.

Finally, I think that it is important to recognize that the perceived conservation status of many bird species is currently based on such poor information that when data finally become available, it would behoove us to question the earlier, perhaps erroneous perceptions of conservation status. If such self-reflection is not taken seriously or is not done in a timely and systematic manner, I am inclined to believe that the lists of high-priority bird species serve no useful purpose and, in fact, can become a significant barrier to scientific progress and the public support of bird conservation.

Acknowledgments.—R. I. G. Morrison contributed his time to discuss these issues with me in considerable detail. B. Andres, B. Cade, C. Handel, J. Jorgensen, R. Lanctot, W. Norling, S. Skagen, and T. Stanley reviewed and contributed to earlier versions. R. Lanctot and W. Norling granted permission to cite their unpublished work.—ADRIAN H. FARMER, *U.S. Geological Survey, Fort Collins Science Center, 2150 Centre Avenue, Building C, Fort Collins, Colorado 80526, USA. E-mail: farmera@usgs.gov*

LITERATURE CITED

- AMERICAN BIRD CONSERVANCY. 2007. The United States WatchList of Birds of Conservation Concern. [Online.] Available at www.abcbirds.org/abcprograms/science/watchlist/index.html.
- BART, J., S. BROWN, B. [A.] HARRINGTON, AND R. I. G. MORRISON. 2007. Survey trends of North American shorebirds: Population declines or shifting distributions? *Journal of Avian Biology* 38:73–82.
- BROWN, S., C. HICKEY, B. [A.] HARRINGTON, AND R. [E.] GILL, [JR.], Eds. 2001. *United States Shorebird Conservation Plan*, 2nd ed. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- DELANY, S., AND D. SCOTT, Eds. 2006. *Waterbird Population Estimates*, 4th ed. Wetlands International, Wageningen, The Netherlands.
- HOWE, M. A., P. H. GEISSLER, AND B. A. HARRINGTON. 1989. Population trends of North American shorebirds based on the International Shorebird Survey. *Biological Conservation* 49:185–199.
- JORGENSEN, J. G., J. P. MCCARTY, AND L. L. WOLFENBARGER. 2008. Buff-breasted Sandpiper density and numbers during migratory stopover in the Rainwater Basin, Nebraska. *Condor* 110:63–69.
- MORRISON, R. I. G., Y. AUBRY, R. W. BUTLER, G. W. BEYERSBERGEN, G. M. DONALDSON, C. L. GRATTO-TREVOR, P. W. HICKLIN, V. H. JOHNSTON, AND R. K. ROSS. 2001. Declines in North American shorebird populations. *Wader Study Group Bulletin* 94:34–38.
- MORRISON, R. I. G., B. J. MCCAFFERY, R. E. GILL, [JR.], S. K. SKAGEN, S. L. JONES, G. W. PAGE, C. L. GRATTO-TREVOR, AND B. A. ANDRES. 2006. Population estimates of North America shorebirds, 2006. *Wader Study Group Bulletin* 111:67–85.
- NATIONS, C. S., L. L. MACDONALD, S. L. JONES, AND S. D. FELLOWS. 2007. *Population Estimates for the Long-billed Curlew in the United States and Canada*. Western Ecosystems Technology, Cheyenne, Wyoming.
- PARTNERS IN FLIGHT. 2006. PIF Continental (U.S. & Canada) Watch List Species Research & Monitoring Needs. [Online.] Available at www.partnersinflight.org/WatchListNeeds/.

- STANLEY, T. R., AND S. K. SKAGEN. 2007. Estimating the breeding population of Long-billed Curlew in the United States. *Journal of Wildlife Management* 71:2556–2564.
- STROUD, D. A., A. BAKER, D. E. BLANCO, N. C. DAVIDSON, S. DELANY, B. GANTER, R. [E.] GILL, P. GONZALEZ, L. HAANSTRA, R. I. G. MORRISON, AND OTHERS. 2006. The conservation and population status of the world's waders at the turn of the millennium. Pages 643–648 *in* *Waterbirds around the World* (G. C. Boere, C. A. Galbraith, and D. A. Stroud, Eds.). Stationery Office, Edinburgh, United Kingdom.
- TVERSKY, A., AND D. KAHNEMAN. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185:1124–1131.
- U.S. FISH AND WILDLIFE SERVICE. 2002. *Birds of Conservation Concern 2002*. Division of Migratory Bird Management, Arlington, Virginia.
- WORLD CONSERVATION UNION. 2006. 2006 IUCN Red List of Threatened Species. [Online.] Available at data.iucn.org/themes/ssc/redlist2006/redlist2006.htm.

Received 5 February 2008, accepted 10 April 2008