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PERSPECTIVES IN ORNITHOLOGY

THE NEED TO QUANTIFY ECOSYSTEM SERVICES PROVIDED BY BIRDS

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WHAT ARE BIRDS worth—what is their actual dollar value to human society? To most of us in the ornithological community, birds are invaluable. But in these times we need more specific rationales to convince policy makers and business leaders to include bird conservation in land-use and development decisions. Over the past two decades, awareness of our dependence on a variety of ecosystem services (natural ecological processes that benefit human society) and of their importance and prevalence has progressed toward the goal of making conservation a mainstream value (Ehrlich and Kennedy 2005, Perrings et al. 2010, Rands et al. 2010, Sodhi and Ehrlich 2010). Building strategies for the protection of ecosystem services into conservation and land-use planning is essentially the promotion of human survival, although many policy makers misinterpret conservation efforts as luxury. Several previous reviews have identified ecosystem services that benefit human society (Costanza et al. 1997, Daily 1997, Pimentel et al. 1997, Sekercioglu 2010). The challenge, however, is to calculate the value of ecosystem services in meaningful and relevant ways that can be used to justify the protection of ecosystem services in land-use recommendations and policy decisions (Daily et al. 2000, 2009). As the case studies below illustrate, recent work on the ecosystem services provided by birds has made good progress toward this goal, but much remains to be done. Our objectives here are to describe the ecosystem services provided by birds,

highlight recent steps toward quantifying those services, and, finally, suggest directions for future research. Overall, we emphasize that global efforts to conserve bird populations and sustain avian biodiversity also preserve the diverse ecosystem services provided by birds, thus contributing to human well-being.

DEFINITIONS AND BACKGROUND

Ecosystem services are divided into four categories (Millennium Ecosystem Assessment 2003). Provisioning services refer to natural products that are directly used by humans for food, clothing, medicines, tools, or other uses. Cultural services provide recreational opportunities, inspiration for art and music, and spiritual value. Regulating services include pest control and carcass removal. Supporting services, such as pollination, seed dispersal, water purification, and nutrient cycling, provide processes essential for ecological communities and agricultural ecosystems.

The Millennium Ecosystem Assessment's description of ecosystem services (Millennium Ecosystem Assessment 2003) is widely cited, but considerable debate continues on what constitutes an ecosystem service and how each should be quantified (Boyd 2007, Boyd and Banzhaf 2007, Matero and Saastamoinen 2007, Nijkamp et al. 2008, Bartelmus 2010, Farley and Costanza 2010, Kontogianni et al. 2010, Norgaard 2010, Wainger et al. 2010). The main issues include

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