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# Ecosystem Services Provided by Birds

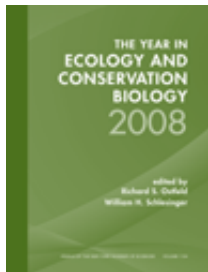
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birds; ecosystem engineering; ecosystem services; excavation; guano; nests; pest control; pollination

Ecosystem services are natural processes that benefit humans. Birds contribute the four types of services recognized by the UN Millennium Ecosystem Assessment—provisioning, regulating, cultural, and supporting services. In this review, we concentrate primarily on supporting services, and to a lesser extent, provisioning and regulating services. As members of ecosystems, birds play many roles, including as predators, pollinators, scavengers, seed dispersers, seed predators, and ecosystem engineers. These ecosystem services fall into two subcategories: those that arise via behavior (like consumption of agricultural pests) and those that arise via bird products (like nests and guano). Characteristics of most birds make them quite special from the perspective of ecosystem services. Because most birds fly, they can respond to irruptive or pulsed resources in ways generally not possible for other vertebrates. Migratory species link ecosystem processes and fluxes that are separated by great distances and times. Although the economic value to humans contributed by most, if not all, of the supporting services has yet to be quantified, we believe they are important to humans. Our goals for this review are 1) to lay the groundwork on these services to facilitate future efforts to estimate their economic value, 2) to highlight gaps in our knowledge, and 3) to point to future directions for additional research.

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