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Flagships, umbrellas, and keystones: Is single-species management passÃ© in the landscape era?

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Abstract

Because it is so difficult to monitor and manage every aspect of biodiversity, several shortcuts have been proposed whereby we monitor and/or protect single species. The indicator species concept is problematic because there is no consensus on what the indicator is supposed to indicate and because it is difficult to know which is the best indicator species even when we agree on what it should indicate. The umbrella species (a species that needs such large tracts of habitat that saving it will automatically save many other species) seems like a better approach, although often whether many other species will really fall under the umbrella is a matter of faith rather than research. Intensive management of an indicator or an umbrella species (for example, by transplant or supplemental feeding) is a contradiction in terms because the rest of the community to be indicated or protected does not receive such treatment. A flagship species, normally a

charismatic large vertebrate, is one that can be used to anchor a conservation campaign because it arouses public interest and sympathy, but a flagship need not be a good indicator or umbrella. And conservation of flagship species is often very expensive. Further, management regimes of two flagship species can conflict. Ecosystem management, often on a landscape scale, is a proposed solution to problems of single-species management. Keep the ecosystem healthy, according to this view, and component species will all thrive. However, conservationists have concerns about ecosystem management. First, it is variously defined, and many definitions emphasize the commodities ecosystems provide for humans rather than how humans can protect ecosystems. Second, the term "ecosystem health" is ill-defined and associated with an outmoded, superorganismic view of the ecosystem. Third, ecosystem management seems focused on processes and so would appear to permit losses of species so long as they did not greatly affect processes like nutrient-cycling. Fourth, ecosystem management is often implemented by adaptive management. This may make it difficult to study the underlying mechanisms driving an ecosystem and to know when an entirely new management approach is needed. Thus, some conservationists see ecosystem management as a Trojan horse that would allow continued environmental destruction in the name of modern resource management.

The recognition that some ecosystems have keystone species whose activities govern the well-being of many other species suggests an approach that may unite the best features of single-species and ecosystem management. If we can identify keystone species and the mechanisms that cause them to have such wide-ranging impacts, we would almost certainly derive information on the functioning of the entire ecosystem that would be useful in its management. Some keystone species themselves may be appropriate targets for management, but, even when they are not, our understanding of the ecosystem will be greatly increased. Keystone species may not be a panacea, however. We do not yet know how many ecosystems have keystone species, and the experiments that lead to their identification are often very difficult.



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Keywords

adaptive management; ecosystem health; ecosystem management; endangered species; flagship species; indicator species; keystone species; landscape ecology; umbrella species

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