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Title: On the Scarcity Value of Ecosystem Services

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Abstract:

This paper argues that the focus of conservation today should not be on pristine wilderness alone, but on the conservation of ecosystem services and their global distribution. Such services include air and water purification, flood and drought mitigation, and waste detoxification and decomposition. The destruction or impairment of ecosystems by human activity eliminates, or at least makes scarce, the ecosystem services it provides us. Measuring the scarcity value of ecosystem services is challenging to economists because these services are independent of the market system. Concepts like substitution is difficult to apply to ecosystem services because human technology is typically not as efficient as a substitute and our understanding of the intricacies of ecosystems is lacking. To measure ecosystem scarcity value, the paper focuses on the shifting states of lakes between oligotrophic and eutrophic based on phosphorus levels. The process of sudden shifts from oligotrophic steady state (clear water) to eutrophic steady state (turbid water) is based on thresholds of phosphorus level. When a lake is in either state, it is resilient to change back to the other state. For example, it frequently takes a greater reduction in phosphorus level to return a lake to a oligotrophic state than it originally had before it shifted because each state resists change. This paper attempts to give a numerical value to the scarcity value of a lake's ability to reduce phosphorus in the water column (performed by submerged vegetation in a oligotrophic lake) as the level of phosphorus deposition increases and damages the lake's productivity to provide this, among many other, ecosystem services.

To determine this scarcity value, the probability that this ecosystem service (phosphorus reduction) will continue to be provided to society. In the example given by this paper, the probability that this ecosystem service will be provided above a minimum acceptable level is 0.8665. Therefore, the scarcity value, or the probability that this service will NOT be provided, is $1 - 0.8665 = 0.1335$.