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From Landscapes to the Sea: Challenges to Understanding How Human Land Activities Affect Aquatic Ecosystems

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The past three decades have seen much progress in our understanding of how human activities affect aquatic ecosystems. However, early successes in areas such as eutrophication and surface water acidification are now being reevaluated within a context that differs dramatically in both nature and scope. By focusing on how nutrients are transported from landscapes to estuaries, I will examine several new challenges that face scientists, managers, policy makers, and the public. While controls of point-sources have been largely successful, controls of non-point sources will demand a more synthetic approach that recognizes the full complexity of how human land-based activities affect the health of aquatic ecosystems. Recent studies of food-webs indicate that while studies of single nutrient cycles are often of limited utility, considerations of how cycles of different nutrients interact may greatly improve our understanding of the factors that control species composition and ecosystem function. Perhaps the most difficult challenge lies in the inclusion of humans as functional components of ecosystems. Such efforts include the use of social and economic trends to predict future stresses on aquatic resources, and attempts to determine the value that society places on different ecosystem services. Based on these considerations, I will argue that the future condition of aquatic resources - from landscapes to enclosed seas - will be influenced strongly by the assumptions upon which management goals are defined.