

## ORAL PRESENTATION

### HOW CAN DIATOMS BE USED TO ASSESS ECOSYSTEM SERVICES?

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Our waters have multiple uses, ranging from drinking water supply to supporting biological diversity. Water quantity and quality are important attributes for supporting these uses. Historically, policy of the United States Environmental Protection Agency has assumed that uses dependent upon water quality would be supported if we managed for waters for as near natural as possible. Thus minimally disturbed biological condition became a management goal. A more culturally diverse perspective of water uses is needed as our economy and trade become more global, which require a global perspective of environmental management and sustainability. The concept of ecosystem services, including regulatory, supporting, provisioning and aesthetic services, has developed rapidly over the past decade as a method for justifying environmental management strategies. The US Environmental Protection Agency has initiated research to explore the relationships between ecosystem services and ecological condition (i.e., deviation from natural). Conceptually, tradeoffs are expected between ecosystem services and condition, especially provisioning services and ecological condition are very differently related to nutrient gradients, one of the key contaminant gradients associated with human activities. These tradeoffs will require major conceptual changes in US policy and challenge application of current assessment methods. Diatoms could be valuable indicators of ecosystem services, directly measuring biodiversity an aesthetic service, but also regulatory, provisioning, and supporting services as well. We can adapt some of our current tools for measuring ecosystem services, such as metrics of biological condition for aesthetic services and nutrient inference models for regulatory and provisioning services. However, refinements of these models are needed for full implementation. For example, hydrogeomorphic attributes of streams will be necessary to refine inferences of productivity and nutrient retention services in streams. In addition, new indicators and indicator concepts will be needed. Models of aesthetics in streams and lakes were developed for this paper using existing databases, and clearly show tradeoffs with models of productivity. These utilize diatom inference models for benthic filamentous green algae and water clarity. Thus, the concepts of diatom indicator applications grow from models of inferences of chemical conditions and biological condition to include models of other organisms and ecosystem functions. Use of diatom indicators as proxies for ecosystem services is another stage in the every-changing marriage of diatom taxonomy, physiology, ecology, and application.