



## ECOSYSTEM SERVICES RESEARCH PROGRAM

### PROTECTING CORAL REEF ECOSYSTEMS

#### Issue

Coral reef ecosystems provide valuable services to society -- food, coastal protection, fishing, recreation, education, and water quality, as well as cultural and aesthetic enjoyment. Yet coral reefs are in serious decline, partly from global change factors such as high seawater temperatures, and partly from pollutants in watershed runoff.

Human land use and human activities are largely responsible for excess sediment, nutrients, and contaminants that are harmful to coral reef communities. Pollution from continued population growth and economic development in coastal zones further threaten these valued ecosystems.

Effective protection of coral reefs begins with the recognition and appreciation of services they provide. Land-use and water management decisions are improved with full understanding of potential economic and social losses to

downstream resources such as coral reefs. Currently, however, managers have little information on coral reef values or how to estimate them.

Decision-support tools are needed to:

- Estimate the monetary and social value of reef services
- Link services to the reef attributes that provide them, such as stony corals and reef fish
- Prioritize management decisions for optimal delivery of services
- Compare sustainability of reef attributes and services under different management and environmental scenarios.

#### Science Objective

Coral reef research is being conducted in the Ecosystem Services Research Program (ESRP) in EPA's Office of Research and Development

to provide decision support tools for protection, enhancement, restoration and sustainability of coral reef ecosystems and the services they provide. The tools will provide managers the means to prioritize and evaluate land use decisions with better knowledge of downstream costs and benefits to coral reef services.

Research will:

- Identify, characterize, and estimate the monetary and social value of coral reef services and the reef attributes that provide these services
- Identify, characterize and assess human activities, both adverse and beneficial, that influence the delivery of services from coral reefs
- Generate spatially-explicit models to forecast local and regional sustainability of coral reef ecosystems and services

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under different management and environmental scenarios

Initial research will examine four services believed to have the greatest value;

- Shoreline protection
- Tourism
- Fish production
- Biodiversity

The reef attributes that provide these services include stony corals, soft corals and sponges, fish and benthic invertebrates.

### Application and Impact

Tools developed by the Ecological Research Program will provide resource managers the means to estimate and forecast the value of coral reef ecosystems for the local and regional community.

Incorporation of this value into land-use and water management decisions provides a more realistic perception of overall costs and benefits.

Application of tools to better understand sustainability of coral reefs will support management

decisions that sustain ecosystem services.

Coral reefs worldwide are declining; methods developed and information gained from research will strengthen global efforts underway to understand the causes and ultimate consequences of this decline.

The research will improve the capacity of local jurisdictions to employ the Clean Water Act for protection of coral reef services. Two key components are directly supported: value of ecosystem services is critical for development of designated waterbody uses and ecosystem assessment is necessary to establish biological criteria for water quality standards.

Research also will fulfill goals of the President's Ocean Action Plan (2004) which instructs EPA to develop biological assessment methods and regulatory tools (biocriteria) to evaluate coral reef health and associated water quality. The purpose of the plan is to identify reefs at risk and assess restoration techniques.

With the research conducted by the Ecological Research Program, EPA

will support ongoing efforts of federal agencies, states and territories forming the U.S. Coral Reef Task Force. The mission of the Task Force is to lead, coordinate, and strengthen federal government actions to better preserve and protect coral reef ecosystems.

### REFERENCES

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EPA Web site: Coral Bioindicators and Biocriteria  
[http://www.epa.gov/bioindicators/coral/coral\\_biocriteria.html](http://www.epa.gov/bioindicators/coral/coral_biocriteria.html)

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