APPLYING THE BIOLOGICAL CONDITION GRADIENT TO U.S. EPA REGION 2 CORAL REEFS

The objective of the U.S. Clean Water Act (1972) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The Biological Condition Gradient (BCG) is a conceptual model that can help managers and practitioners to define the ecological attributes constituting biological integrity and to apply scientific methods for measuring and evaluating the attributes. The BCG has been applied in New England streams to describe expectations for the macroinvertebrate assemblage relative to the human disturbance gradient. Though not typically assessed in New England, coral reefs are within US EPA Region 2 (which includes Puerto Rico and the U.S. Virgin Islands) and have been described using the same BCG concepts that have been used in New England streams. Through an iterative process spanning nine years, scientists from across the U.S. Caribbean reviewed, discussed, and interpreted EPA, NOAA, and fishery-independent survey data collected along fore-reef habitats off the coasts of the U.S. Caribbean islands. The expert panelists applied their knowledge of the benthic and fish taxa, historical conditions, prevalent pressures and stressors, and ecological structure and functions to develop quantitative decision rules describing six levels of coral reef ecosystem conditions. The resultant reef benthic and fish BCG models provide effective tools for identifying healthy and degraded coral reef ecosystems and have potential for global application. The assessment framework had not previously been applied in reefs, and the experts were relatively unaware of typical assessment frameworks as used in streams. Therefore, model calibration required a lengthy BCG orientation process and compilation of multiple data sets to accommodate model-building requirements. At the same time, workgroup interruptions were caused by hurricanes, earthquakes, and two government shut-downs. Despite the difficulties, BCG models were developed to inform management protection and restoration activities for two reef assemblages.

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Mr. Jessup manages large and complex projects and task orders for the U.S. EPA, states, tribes, and territories. He regularly applies ecological concepts, especially of stressor-response relationships, to develop criteria and assessment tools for water quality, physical habitat quality, and biological integrity. He has coordinated panels of ecological experts to develop predictive decision models based on the Biological Condition Gradient (BCG), recently for fish and benthic assemblages of Caribbean reefs using EPA and NOAA monitoring data.

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