

ECOLOGIC AND PRECURSOR SUCCESS CRITERIA FOR SOUTH FLORIDA ECOSYSTEM RESTORATION

*A Science Sub-Group Report to the Working Group of the South Florida Ecosystem
Restoration Task Force*

May 1997

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for South Florida ecosystem restoration**

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[Ecologic and precursor success criteria for south Florida ecosystem restoration](#)

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CHAPTER 1: INTRODUCTION

Formulation of success criteria relative to ecologic indicators and monitoring factors relative to those indicators is integral to conducting adaptive management to restore ecosystems and solve other complex ecologic problems. Species, communities, and ecosystem functions are examples of ecologic indicators. Relative abundance, reproductive output, and landscape complexity are examples of factors related to these indicators that can be monitored. Ecologic indicators and success criteria based on these indicators provide the foundation for evaluating the effectiveness of management actions. An evaluation process has several critical functions. It shows managers whether projects, once implemented, are meeting expectations or if adjustments should be made. An evaluation process identifies the critical information models should provide to enable the most promising management strategies to be selected from various proposed alternatives. The set of scores defined by the evaluation process can form an annual report card to help decision-makers and the public follow progress.

The Science Subgroup, in its 1993 report to the Working Group (SSG 1993), suggested a number of success criteria for restoration of the region as a whole and several defined subregions. The original criteria were reviewed by the Science Subgroup in April 1996, and an initial set of 20 were selected to recommend for evaluating implemented restoration actions. Each success criterion was assigned to a Science Subgroup member, who was asked to form a team of experts to (1) develop the success criteria in more specific terms, (2) provide justifications for their use, and (3) describe the indicator(s) to be used. In relation to each success criterion and indicator, the teams were asked to identify factors that could be measured and develop indices that could be scored. These criteria and indicators would be used to help design modeling and monitoring programs and in an evaluation and reporting process.

Reports prepared by each of these groups were submitted to the Workshop on Ecological Sustainability Criteria for South Florida, which was held 25-26 April 1996 at the Rosenstiel School of Marine and Atmospheric Science, University of Miami, Miami, Florida. The stated purpose of the Workshop was "to review the scientific basis for the selection of indicators and criteria used to evaluate the success of the restoration process and to broaden public and academic participation in the process."

The main criticisms expressed in the written review from the Workshop concerned the process of selecting the success criteria and their overall presentation, including nomenclature. Future workshops were proposed by the Workshop convertors to (1) revise the nomenclature to conform to that presently established in the "risk assessment" literature and (2) prepare conceptual models that relate specific ecologic indicators and success criteria to anthropogenic system alterations thought to have caused ecologic damage. Explaining those relationships would improve communication between scientists, engineers, and managers concerning how the system should be redesigned to bring about ecological improvements.

The present document presents 14 reports, each on success criteria concerning a specific topic. Several reports are revisions based on critiques of the Workshop or have been otherwise updated

since presented at the Workshop. Others are the original reports because little need for improvement was seen or because the recommendations concerning them were beyond the scope of this effort. In some reports, several of the original criteria that were closely related have been combined. Each report is the product of a team of experts on the topic addressed. Collectively, these reports represent the distillation of the best professional judgment of dozens of collaborators and many months of preparation time.

In the view of the Science Subgroup, "success criterion" means direction and type of change. By definition, "success criterion" means a rule for evaluating whether improvement has occurred. Success criteria must be viewed in the context of indicators. Indicators are either process (e.g., production, respiration, expansion or contraction) or status (e.g., population size, landcover) variables. Indicators must be measurable or quantitatively relatable to variables that can be measured.

As conceived by the Science Subgroup, success criteria and associated indices are of two types, "precursor" or "ecologic". "Precursor" indices refer to nonbiological variables that must be changed in order for ecologic improvements to occur. Precursor indices are useful because they will be first to change, and tracking them is necessary because the expectation is that they must change in the desired way before any biological changes will occur. Restoration actions will operate more directly on precursor conditions than on ecologic conditions. Relationships of precursor conditions to ecologic conditions were implicit in the selections made by the Science Subgroup and are based on best current knowledge. This report includes the precursor-based and ecologic-based success criteria in [Table 1](#).

The relationships between precursor and ecologic success criteria can be inferred from [Figures 1](#) and [2](#), which show major observed ecologic problems in South Florida and likely causal changes. Causal changes are at the top of each diagram; precursors, which result from the changes, are immediately below them, and ecologic problems are in the lower part of each diagram. Ecologic problems are shown at several levels because some ecologic problems lead to other problems. [Figure 1](#) focuses on problems in freshwater and associated upland landscapes, and [Figure 2](#) focuses on problems in estuarine to marine landscapes. There are undoubtedly additional relationships to those shown in these figures, which concentrate on the problems that are the bases of the set of success criteria proposed by the Science Subgroup.

References

Science Subgroup. 1993. Federal objectives for the South Florida restoration. Science Subgroup of the South Florida Management and Coordination Working Group. Federal Task Force. 87 pp.

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Table 1. Indicators and success criteria proposed by the Science Subgroup and contained in this report

Type	Indicator	Success criteria
Precursor	Hydropatterns	Restoration of temporal and spatial patterns of depth and flow, as approximated by the Natural System Model and biologic information.
Precursor	Organic soils	Restoration of the natural balance of organic soil accretion and subsidence throughout the system (reduce subsidence).
Precursor	Nutrients	Reduction in phosphorus loading
Precursor	Estuarine salinity patterns	Reinstatement of natural salinity patterns in relation to rainfall
Precursor	Water clarity	Improvement in water clarity in estuaries.
Precursor & Ecologic	Landscape patterns and spatial extent	Restoration of natural landscape patterns with reduction in nutrient-tolerant and exotic plant species and increased spatial extent of natural areas (e.g., buffers, wildlife corridors).
Ecologic	Periphyton communities	Restored natural taxonomic composition of periphyton communities.
Ecologic	Coral reefs	Improvement of coral reef conditions.
Ecologic	Contaminant body burdens	Reduction in mercury body burdens in top carnivores.
Ecologic	Fish abnormalities	Reduced prevalence of abnormalities in estuarine fish.
Ecologic	Keystone & imperiled species	Recovery of healthy populations of keystone and imperiled species.
Ecologic	Wading birds	Reestablishment of healthy wading bird populations.
Ecologic	Fish populations/communities	Reestablishment of estuarine and inland fish populations and communities.
Ecologic	Fishery species	Improved recruitment of fishery species (e.g., pink shrimp).