

## Hand Out # 2

## CORAL REEF BENTHIC BCG MODEL - Draft

<b>BCG Level 1</b>	<b>Definition:</b> Natural or native condition— <i>native structural, functional, and taxonomic integrity is preserved; ecosystem function is preserved within the range of natural variability</i>	
	<b>Narrative:</b> Level 1 and 2 narratives were combined for the coral reef exercise; no quantitative rules were developed for Level 1	
<b>BCG Level 2</b>	<b>Definition:</b> Minimal changes in structure of the biotic community and minimal changes in ecosystem function— <i>virtually all native taxa are maintained with some changes in biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability</i>	
	<b>Narrative:</b> Coral species are highly diverse, including rare species; large old colonies ( <i>Orbicella</i> ) with high live tissue coverage; balanced population structure (old and middle-aged colonies, recruits); <i>Acroporids</i> present	
<b>BCG Metrics</b>	<b>Narrative Rules</b>	<b>Quantitative Rules</b>
Percent Coral Cover (LPI)	Coral cover high	>40% (35 – 45) <sup>a</sup>
Percent live coral cover (DEMO)	Coral cover high	>30% (20 – 40)
Percent coral mortality (DEMO)	Low percentage of tissue loss (2-D and 3-D cover)	<10% (5-15) <sup>b</sup>
Percent live cover of large, reef-building coral (DEMO) <sup>c</sup>	Substantial coverage of reef-building taxa	>30% (25 – 35)
<b>Level 2 Combination:</b> Minimum of 4 rules <sup>d</sup>		

<b>BCG Level 3</b>	<b>Definition:</b> Evident changes in structure of the biotic community and minimal changes in ecosystem function— <i>Some changes in structure due to loss of some rare native taxa; shifts in relative abundance of taxa but intermediate sensitive taxa are common and abundant; ecosystem functions are fully maintained through redundant attributes of the system</i>	
	<b>Narrative:</b> Moderate coral diversity; large old colonies ( <i>Orbicella</i> ) with some tissue loss; varied coral population structure (usually old colonies, few middle-aged, and some recruitment); <i>Acropora</i> thickets may be present; rare species absent	
<b>BCG Metrics</b>	<b>Narrative Rules</b>	<b>Quantitative Rules</b>
Total Coral Cover (LPI)	Moderate coral cover	> 20% (15-25)
Total Coral Richness (LPI)	Moderate coral richness	> 4 species (3-5)
Non-tolerant Coral Taxa Richness (LPI)	Non-tolerant BCG Attribute I, II, III, IV taxa are present	> 2 species (1-3) <sup>e</sup>
Bare Substrate and Turf with Sediment (LPI)	Minimal presence of unproductive and sedimented cover	< 30% (20-40)
% live <i>Orbicella</i> cover (DEMO)	<i>Orbicella</i> colonies are important (based on 2-D coverage)	> 20% (15-25)
<b>Level 3 Combination:</b> Minimum of first 4 rules or the <i>Orbicella</i> rule <sup>f</sup>		

<b>BCG level 4</b>	<b>Definition:</b> Moderate changes in structure of the biotic community and minimal changes in ecosystem function— <i>Moderate changes in structure due to replacement of some intermediate sensitive taxa by more tolerant taxa, but reproducing populations of some sensitive taxa are maintained; overall balanced distribution of all expected major groups; ecosystem functions largely maintained through redundant attributes</i>	
	<b>Narrative:</b> Reduced coral diversity compared to Level 3; emergence of tolerant coral species; few or no large old colonies ( <i>Orbicella</i> ), or mostly dead; <i>Acropora</i> thickets gone	
<b>BCG Metrics</b>	<b>Narrative Rules</b>	<b>Quantitative Rules</b>
Total Coral Cover (LPI)	Low to moderate total coral cover	>15% (10-20)
Non-tolerant Coral Cover (LPI)	Low to moderate non-tolerant BCG Attribute I, II, III, IV cover	> 5% (0-10) <sup>e</sup>
3-D Live Coral Cover (DEMO)	Low to moderate total coral tissue cover	> 2000 cm <sup>2</sup> /m <sup>2</sup> (1000-3000)
% live <i>Orbicella</i> cover (LPI or DEMO)	<i>Orbicella</i> present, though sparse (for DEMO, based on 2-D coverage)	> 2.5% (0-5)
Density of medium or large coral colonies (DEMO)	Medium size colonies (max D > 20cm) present in the transect	> 7.5 colonies (5-10)
Bare Substrate and Turf with Sediment (LPI)	Moderate presence of unproductive and sedimented cover	< 40% (30-50) <sup>g</sup>
<b>Level 4 Combination:</b> Minimum of the three highest membership values <sup>h</sup>		

<b>BCG Level 5</b>	<b>Definition:</b> Major changes in structure of the biotic community and moderate changes in ecosystem function— <i>Sensitive taxa are markedly diminished; conspicuously unbalanced distribution of major groups from that expected; organism condition shows signs of physiological stress; system function shows reduced complexity and redundancy; increased build-up or export of unused materials</i>	
	<b>Narrative:</b> Severely reduced coral diversity, minimal presence of colonies, tolerant coral species dominant	
<b>BCG Metrics</b>	<b>Narrative Rules</b>	<b>Quantitative Rules</b>
Total Coral Cover (LPI)	At least some living coral	> 5% (2-8) <sup>i</sup>
Density of Colonies (DEMO)	At least some living coral	> 1 colony/m <sup>2</sup> (1-2) <sup>j</sup>
Number of Non-tolerant Taxa	Attribute I, II, III, or IV taxa are not absent	> 1 species (0-2) <sup>k</sup>
<b>Level 5 Combination:</b> Minimum of the two highest membership values <sup>l</sup>		

<b>BCG Level 6</b>	<p><b>Definition:</b> Severe changes in structure of the biotic community and major loss of ecosystem function. <i>Extreme changes in structure; wholesale changes in taxonomic composition; extreme alterations from normal densities and distributions; organism condition is often poor; ecosystem functions are severely altered.</i></p>
	<p><b>Narrative:</b> Absence of colonies; those present are small; only tolerant species; little or no tissue</p>
	<p><b>Rules:</b> No rules were established for Level 6: By default, failure of Level 5 rules results in a Level 6 model prediction.</p>