



# Ecosystem Services Opportunities

Opportunities for Advancing Coastal and Ocean  
Monitoring and Conservation in the Gulf of Mexico  
through International Partnerships: USA-Cuba-Mexico

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# Challenges

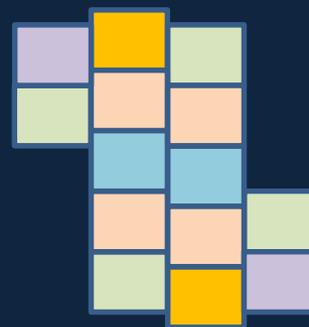
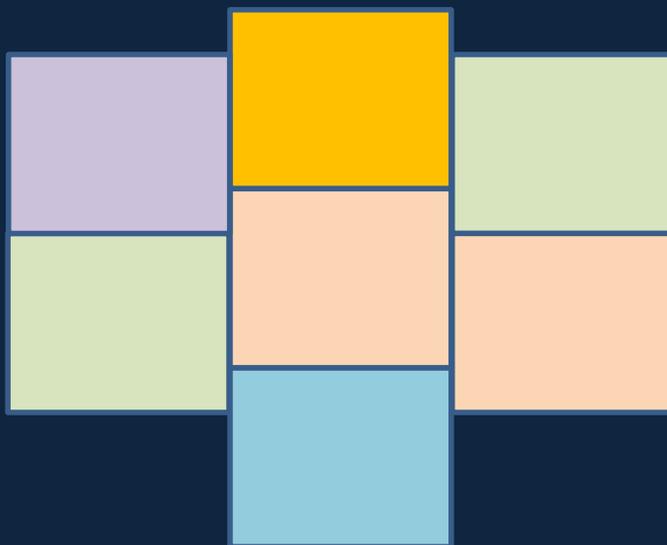
1. Collecting “enough” and the “right” bio-geo-physical (BGP) data to answer \_\_\_\_\_ science question or support \_\_\_\_\_ policy need.
2. Understanding the vulnerabilities of human communities to environmental change through social-behavioral-economic (SBE) approaches.
3. Bringing 1 & 2 together in a meaningful way.

# Challenges

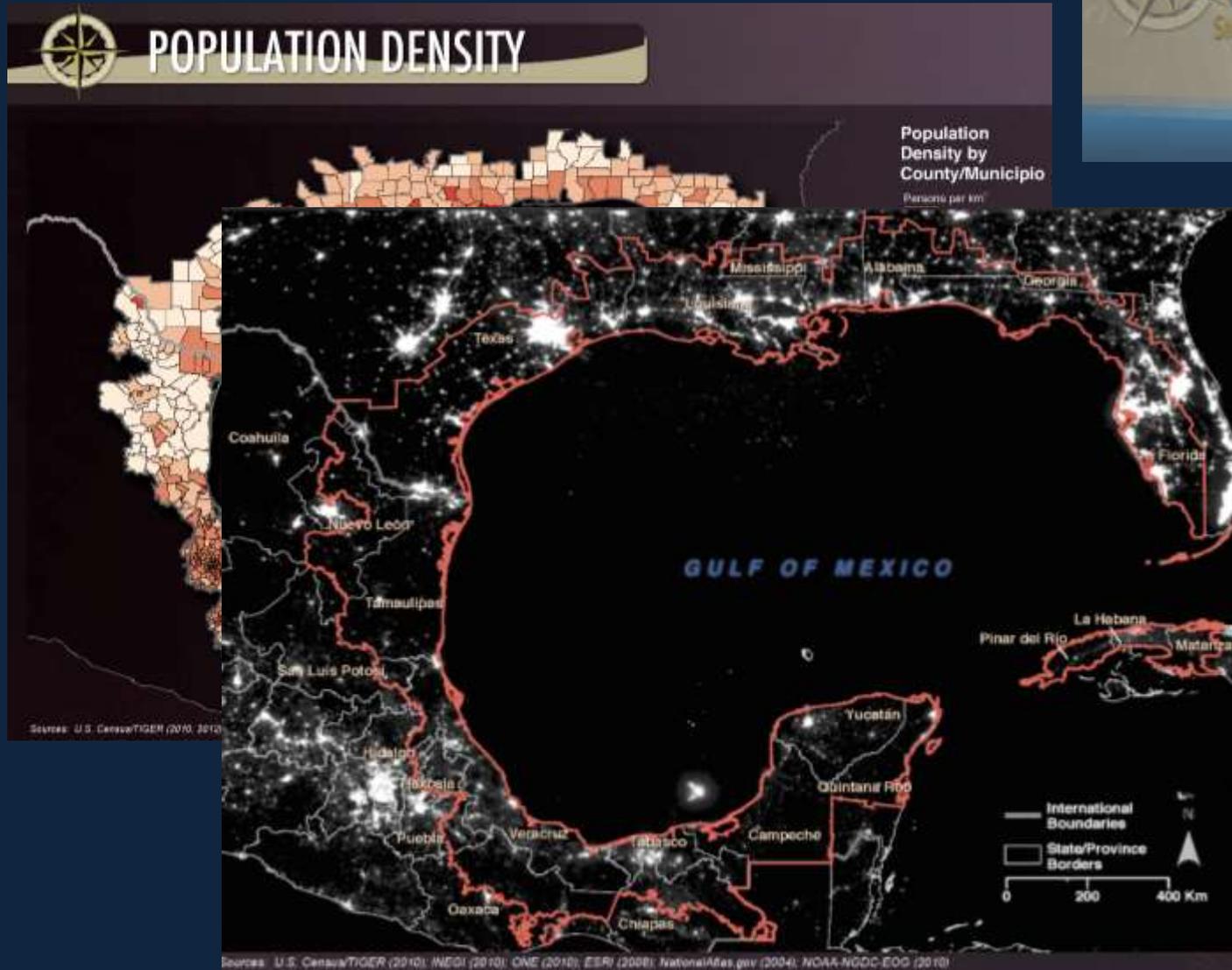
- Matching the data with the question with the need.



- Breadth versus depth and higher versus lower resolution are important decisions for both BGP and SBE sciences.



# A Jumping off Point





# POPULATION DEMOGRAPHICS



# TRANSPORTATION



# PROTECTED AREAS



## Protected Areas: Terrestrial and Marine

- Protected Areas Inside Coastal Belt
- Protected Areas Outside Coastal Belt
- Coastal Belt

This map represents designated terrestrial and marine protected areas on the international, national, and local levels as of September 2012 for U.S./Mexico and 2010 for Cuba. U.S. marine protected areas that have been designated as gear-restricted areas, fishery closures, and reef fish stressed areas by the National Marine Fisheries Service (NMFS) have been excluded. Most Cuban protected areas on the local level are not shown due to data unavailability.

Sources: U.S. Census/TIGER (2010); INEGI (2010); OMB (2010); ESR (2008); NacionalAtlas.gov (2004); USGS, NGA, NASA, GEBCO, CGIAR, Intermap, Oregon Metro (2012); SNAP (2010); IUCN and UNEP-WCMC (2012); PNAS (2004)

## Habitats



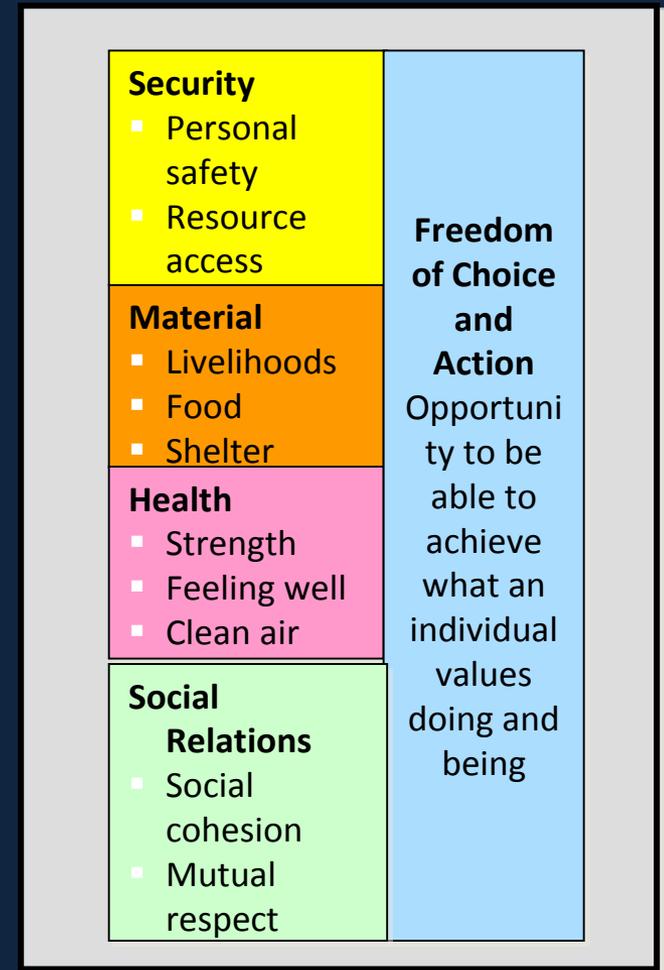
### Ecosystem Services

- Storm protection
- Water supply
- Food
- Raw materials
- Ornamental resources
- Recreation
- Science and education
- Spiritual and historic
- -----

Ecosystem Services...

...are the benefits that we receive from our natural environment that impacts human well-being.

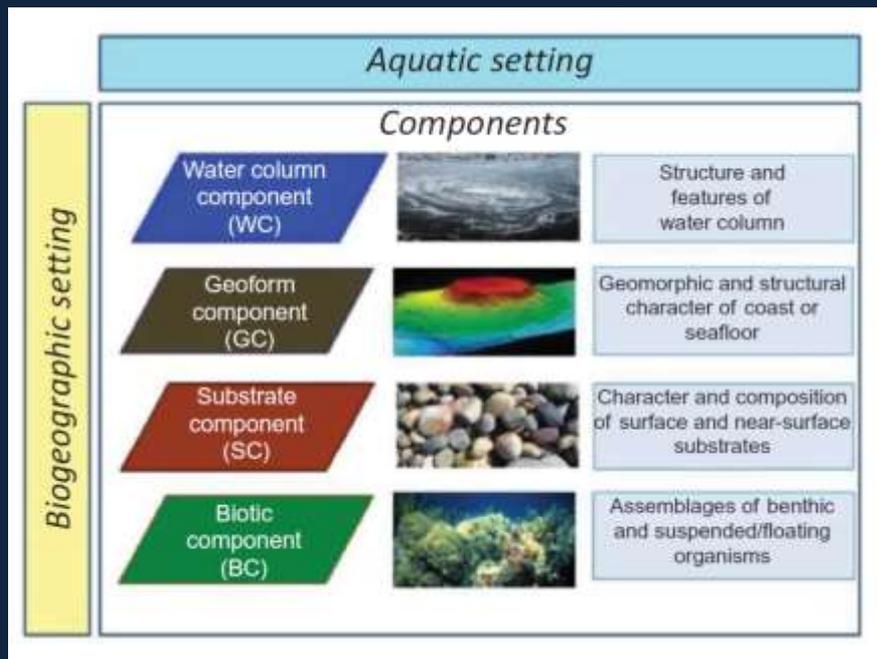
## Constituents of Well-Being



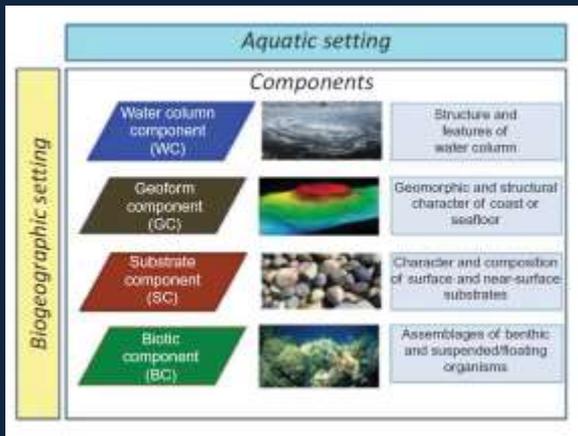
(Millennium Ecosystem Assessment definition of constituents of well-being)

# Challenges → Opportunities

- Ecosystem services work is important to Cuba, Mexico, and the USA
- The Coastal and Marine Ecological Classification System (CMECS) may provide an opportunity for the three countries to work together on this.



- A framework has been developed to connect the biogeophysical system and ecosystem services (Carollo, Allee, Yoskowitz, 2013)



A series of expert workshops identified the top five ecosystem services for each of the habitats in the USA.

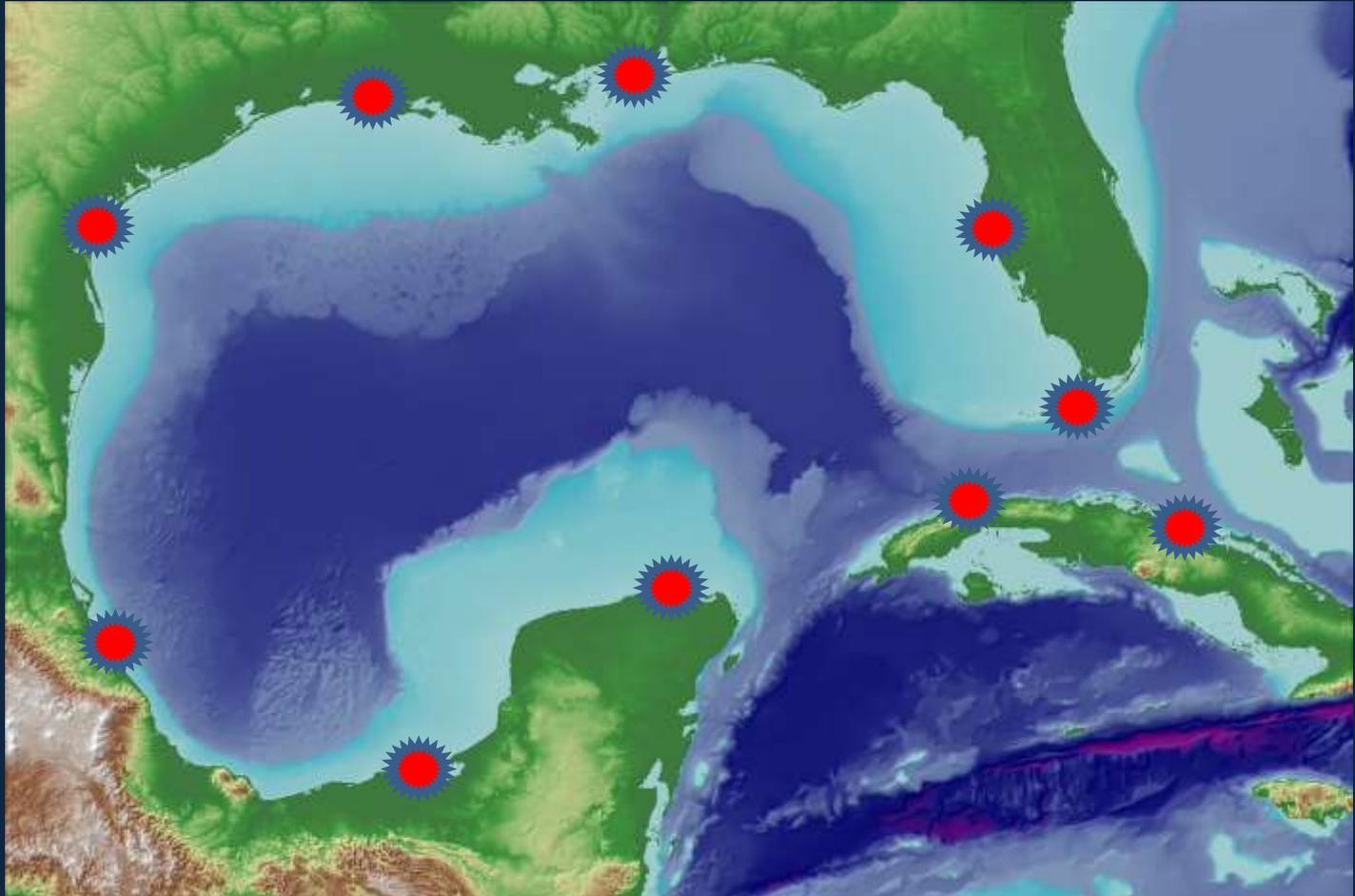
We have the opportunity to do the same thing with Cuba and Mexico and potentially harmonize amongst the three countries.

Table 3. Top five prioritized ecosystem services for each habitat type as determined by workshop participants.

Habitat type	Ecosystem service and prioritization													
	AE	BI	CB	FD	HM	HB	MR	NB	RM	RO	SE	SH	SS	WQ
Brackish marsh		2	4	5				1						3
Coral reef	2	3		5			4		1					
Dune/beach	2				1				4	5			3	
Fresh submerged aquatic vegetation		1		5				4	3					2
Freshwater marsh	5	2		4	3			1						
Forested coastal ridge				5	2				1			4	3	
Intertidal sand/mud		2		4				5	3				1	
Macroalgae		1		3				2	5				4	
Mangroves	4	1			2					5			3	
<hr/>														
	AE	BI	CB	FD	HM	HB	MR	NB	RM	RO	SE	SH	SS	WQ
Non-fresh submerged aquatic vegetation		2		1						5			4	3
Offshore shoals and banks	4	3		2	5				1					
Open water	5		3	1		4			2					
Oyster reef	5	3		1	4									2
Saline marsh	5	1		4	2					3				
Subtidal sand/mud		1		5				2	4				3	
Swamp/bottomland hardwood					1			2	5			4		3

Note: Aesthetic and Existence = AE, Biological Interactions = BI, Climate Balance = CB, Food = FD, Hazard Moderation = HM, Hydrological Balance = HB, Medicinal Resources = MR, Nutrient Balance = NB, Raw Materials = RM, Recreational Opportunities = RO, Science and Education = SE, Soil and Sediment Balance = SS, Spiritual and Historic = SH, Water Quality = WQ.

# Possibly an Ecosystem Services Observing System?



*Start with sentinel sites around the Gulf of Mexico*

Thank You

