APPENDIX 1: WORKSHOP AGENDAS, SURVEYS, AND PARTICIPATING EXPERTS

Science Workshop 1 Agenda and Participants

Welcome and thank you for joining us. The purpose of this workshop is to elicit relevant information and expert knowledge to aide in the development of strategies and recommendations for the establishment of marine protected areas for the West Indian Manatee (*Trichechus manatus*) in Puerto Rico. Our specific goal for this workshop is to build a situation analysis of the West Indian Manatee or a common understanding of the biological, environmental, and social systems that affect this species.

TUESDAY, SEPTEMBER 14, 2010
Cabo Rojo National Wildlife Refuge

9:00 – **INTRODUCTIONS**

10:00 – **DEFINE SCOPE & VISION**

Scope : a geographic area or a thematic focus of a project. The purpose of the scope is to define the physical extent in which to concentrate efforts. Two essential questions to ask when defining the scope are:

- What is the focus of the project?
- What is the main purpose of this project?

➢ Draft scope: All marine and coastal waters in Puerto Rico that provide manatee habitat.

Vision: a general summary of the desired state or ultimate condition that is hoped to be achieved within the project area. A good vision statement should be:

- General - Broadly defined to encompass all possible project activities;
- Visionary - Outlining the desired change in the state of the targets toward which the project is working; and
- Brief - Simple and succinct so that that all project participants can describe the vision.

➢ Draft Vision: Long term survival of WITM, an endangered species, inhabiting the coastal waters and marine habitats of Puerto Rico in a managed co-existence with recreational, commercial and other users of this environment.

11:00 – **ASSESS TARGET STATUS**

Conservation Targets: species, ecological system(s)/habitat(s), or ecological process(s) chosen to represent and encompass the full suite of biodiversity in the project area for place-based conservation or the focus of a thematic program.

- Target: West Indian Manatee (*Trichechus manatus*)

Target Status Assessment: an assessment of the current "health" of a target as expressed through the most recent measurement, survey, or consensus of expert opinion. Questions to consider are:

- What is the current status of the target?
- What would a healthy state of the target look like?
- What are the ranges of normal variation of for the target(s)?
- What would an unhealthy state of a decline of a target look like over time?

12:00 – 2:00 **LUNCH**

2:00 – **IDENTIFY KEY ECOLOGICAL ATTRIBUTES**

Key Ecological Attribute (KEA): an aspect of a target's biology or ecology that if present, defines a healthy target and if missing/altered, would lead to the loss or degradation of that target over time. KEAs often answer what is needed in order for the long term survival of the conservation target and can be grouped into three classes:

- Size - a measure of the *area* or *abundance* of the conservation target's occurrence;
- Condition - a measure of the biological composition, structure and biotic interactions that characterize the occurrence.
- Landscape context - an assessment of the target's environment including *ecological processes and regimes* that maintain the target occurrence such as flooding, fire regimes and many other kinds of natural disturbance, and *connectivity* such as species targets having access to habitats and resources or the ability to respond to environmental change through dispersal or migration.

4:00 – **IDENTIFY THREATS**

Threats: anthropogenic activities that have caused, are causing, or may cause the destruction, degradation, and/or impairment of biodiversity and natural processes (targets)
Questions to consider when identifying threats and their severity:

- How does it affect the scope of the project (how widespread is the problem?)
- How much of the population does the threat affect (juveniles, adults, over 50% of habitat, etc)
- What is the likelihood of reversing the threat through a feasible intervention?

6:00 - **DISMISS**

WEDNESDAY, SEPTEMBER 15, 2010
9:00 – **REVIEW**

9:30 – **IDENTIFY CONTRIBUTING FACTORS**

Contributing Factors: the economic, cultural, political, legal, social, and/or institutional factors that drive direct threats. Contributing factors can be considered as indirect threats or as opportunities. For example, tourism can be both harmful and beneficial to a conservation target. Developing a list of contributing factors is useful in determining where and when to take action and where and when it may be beneficial to not take action.

12:00 – **DISMISS**

IN ATTENDANCE: Inter American University of Puerto Rico Manatee Center (A. Mignucci-Giannoni, R. Rosario), Jobos Bay National Estuarine Research Reserve (A. Dieppa, C. Gonzales), PBS&J Caribe (F. Perez), Puerto Rico Department of Natural and Environmental Resources (N. Jimenez, M. Garcia, G. Rodriguez, E. Nieves), University of Puerto Rico (V. Vicente, R. Armstrong), US Geological Survey (B. Bonde), and US Fish and Wildlife Service (C. Pacheco, M.Vargas, M. Rivera, J. Saliva, J. Zegarra, D. Flemming, E. Muniz)

Science Workshop 2 Agenda and Participants

WEDNESDAY, NOVEMBER 3, 2010
USFWS Caribbean Field Office

9:00 - **WELCOME AND INTRODUCTIONS**

9:45 - **OVERVIEW MPA PROJECT PROCESS AND WORKSHOP OBJECTIVES**

- Research Effort Scope & Objectives
    - Define manatee requirements, threats, objectives
    - Evaluate coastal PR waters for potential contribution to MPA objectives
    - Compare predicted outcomes of alternative MPA scenarios
- Step 1: Map Knowledge Structure
    - Identify causal relationships between target status and anthropogenic activities
    - Distinguish direct and indirect threats, identify knowledge gaps
    - Define pathways by which conservation actions impact target status
    - Map results chains that achieve quantitative, hypothesis driven MPA objectives
- Step 2: Apply Knowledge to Value Landscapes
    - "Diagnosis" of pixels for potential habitat quality, threat risk, and MPA impacts
    - Gather spatial data sets and define proxy associations
    - Apply values to proxy variable landscapes
    - Define equations to combine values
- Step 3: Model Conservation Scenarios
    - Identify design objectives & constraints
    - Define and model alternative MPA scenarios

10:30 - **REVIEW & EDIT KNOWLEDGE STRUCTURE**

- Review, edit, approve base Miradi diagram
    - Core of targets and threats

- Review and approve MPA strategies
    - Review tabular survey results
    - Review survey results within Miradi diagram
    - Show draft results chains

11:45 **- MANATEE TELEMETRY RESEARCH PRESENTATION (JIM REID)**

12:15 **- LUNCH**

1:30 **- REVIEW & EDIT GIS PROXY DATA & KNOWLEDGE STRUCTURE ASSOCIATIONS (ASHTON)**

- Review and approve data sources and association with elicited knowledge
    - Potential habitat (Freshwater, Seagrass, Water Depth, Shelter)
    - Threat risk (Sedimentation, Motorized watercraft, Impaired Waters)
- Confirm "no relevant spatial data" list
- Confirm "not relevant to MPA planning" list

4:00 **- DEFINE EXPECTED ROLE OF MPAS (ASHTON)**

- Given current knowledge, available spatial data, and possible MPA actions:
    - E.g. What metric is to be maximized/minimized? What do MPAs do? # manatee protected? area seagrass protected? What will be measure of success for MPA?
    - Define scope and objective for MPA

5:30 - **DISMISS**

THURSDAY, NOVEMBER 4, 2010

9:00 - **DEFINE 5 ALTERNATIVE MPA DESIGN SCENARIOS (ASHTON)**

- Define equations to value pixels based on habitat & threats alone
- Define equations to apply MPA action effects
- Define design objectives & constraints that could overrule simple value rules

12:15 - **DISMISS**

IN ATTENDANCE: Inter American University of Puerto Rico Manatee Center (R. Rosario), Jobos Bay National Estuarine Research Reserve (A. Dieppa, C. Gonzales), Puerto Rico Department of Natural and Environmental Resources (N. Jimenez, G. Rodriguez), US Geological Survey (J. Reid), and US Fish and Wildlife Service (J. Saliva, J. Zegarra, D. Flemming)

Survey 1 Questionnaire: MPA Threat Reduction Impacts

This survey was administered through the online tool Surveymonkey. It was sent to all workshop participants (19 individuals). Eleven individuals responded. Participation through Surveymonkey is anonymous.

COVER LETTER

Dear participants of the manatee workshop held September 14 -15, 2010,

As a follow up from the previous workshop and to prepare for the future workshop being held the first week of November, 2010 we would like to request your participation in a brief survey. The purpose of this survey is to gather information from expert stakeholders concerning how Manatee Protection Areas (MPAs) can reduce or mitigate specific threats to manatees and seagrass habitat. MPAs are spatially discrete areas where certain anthropogenic activities can be regulated to minimize impact to manatees and their habitat in Puerto Rico.

Attached to this email are two PDFs and a url. One PDF defines the terms used in the survey, and the other PDF is the survey itself. We recommend printing out both PDFs and reading through the definitions of terms and the survey carefully. Clicking on the url will open the survey itself. Please answer each question to the best of your ability.

IN THE ABSENCE OF A RESPONSE, WE WILL DEFAULT TO AN ASSUMPTION OF "NO EFFECT", SO PLEASE REVIEW CAREFULLY.

Thank you for your time and contributions,
Louise Alexander

DEFINITIONS OF TERMS (PROVIDED TO ALL PARTICIPANTS)

- **MPA**: Manatee Protection Area(s).
- **Manatee sanctuary**: All waterborne activities are prohibited except by authorized officers and personnel.
- **Slow speed**: The speed at which a water vehicle proceeds when it is fully off plane and completely settled in the water and not creating an excessive wake.
- **Waterborne activities**: Includes swimming, diving (including skin and scuba diving), snorkeling, water skiing, surfing, fishing, the use of water vehicles, and dredging and filling operations
- **Watercraft**: Includes boats, ships, barges, surfboards, personal watercraft, water skis, jet skis or any other device or mechanism where the primary or incidental purpose of which is locomotion on, across, or underneath the surface of the water
- **Seasonally**: The months from November through February when there is typically a low vessel concentration in and around Puerto Rico.
- **Non-motorized watercraft**: Water vehicles that do not use engines and are propelled manually or by the wind (sailboats, row boats, windsurfers, kayaks, etc).

INSTRUCTIONS

Please select whether there will be a high reduction, a medium reduction, low reduction, or no effect for the specific threat in the columns. For example, if an MPA was designated as a sanctuary, would the threat of anchoring to seagrass beds be highly reduced (High), moderately reduced (Medium), not have much of an impact (Low), or have no impact (No effect) on the threat?

QUESTIONS

1. How would each possible MPA regulation, restriction or action reduce the following threats to seagrass beds?

	Anchoring	Dredging	Construction of facilities (piers, marinas, boat ramps)	Propeller cutting	Boat groundings	Nutrient loading
MPA is a sanctuary						
Only non-motorized watercrafts allowed						
Motorized watercraft permitted seasonally						
Motorized watercraft restricted to slow speeds						
Mooring buoys						
Distribution of educational materials						

2. How would each possible MPA regulation, restriction or action reduce the threat of motorized watercraft collision to manatees?

	Propeller cutting	Watercraft races	Watercraft collision	Shipping channels	Boating facilities (piers, marinas, boat ramps)	Noise pollution	Watercraft disturbance
MPA is a sanctuary							
Only non-motorized watercrafts allowed							
Motorized watercraft permitted seasonally							
Motorized watercraft restricted to slow speeds							
Mooring buoys							
Distribution of educational materials							

3. How would each possible MPA regulation, restriction or action reduce the threat of a "take" to manatees

	By-catch	Net / Abandoned gear entanglement	Poaching	Harrasment (feeding, watering, disturbing)
MPA is a sanctuary				
Only non-motorized watercrafts allowed				
Motorized watercraft permitted seasonally				
Motorized watercraft restricted to slow speeds				
Mooring buoys				
Distribution of educational materials				

4. How would each possible MPA regulation, restriction or action reduce the threat of pollution to manatees?

	Oil spills	Bilge dumping	Ingestion of debris/trash
MPA is a sanctuary			
Only non-motorized watercrafts allowed			
Motorized watercraft permitted seasonally			
Motorized watercraft restricted to slow speeds			
Mooring buoys			
Distribution of educational materials			

5. Are there any threats or information that we have neglected to include that could be mitigated or reduced by the creation of MPAs?

Survey 2 Questionnaire: Threats Ranking

This survey was administered by email. It was sent to all workshop participants (20 individuals). Responses were received from: B. Bonde (USGS), A. Dieppa (JBNERR), D. Flemming (USFWS), M. Garcia (PRDENR), C. Gonzales (JBNERR), N. Jimenez (PRDENR), F. Perez (PBS&J), J. Reid (USGS), J. Saliva (USFWS), M.Vargas (USFWS), and J. Zegarra (USFWS).

INSTRUCTIONS

At the first workshop, experts identified anthropogenic related activities that are having or could have a negative impact on the Antillean manatee population. These factors are categorized as indirect threats or direct threats. Direct threats are actual events that cause harm to manatees or their key ecological attributes. Indirect threats are factors that lead to direct threats.

This questionnaire lists direct threats to manatees and seagrass with the purpose to give experts the opportunity to rank the level of threat based on three criteria: percentage of population affected, severity or level of damage the threat poses to targets, and the reversibility of the threat. Each direct threat is listed under the left-hand column titled “Direct Threat”. Under the columns titled “Scope”, “Severity”, or “Irreversibility (Permanence)” please circle what you consider the most appropriate answer for each threat. For example, under the Scope column – please circle the percentage of the manatee population you believe is likely to be affected by motorized boat collisions. Under the Severity column please circle the level of damage (low, medium, high, very high) that you believe will affect the total population. Under the Irreversibility column circle the degree (low, medium, high, very high) to which a threat can be reversed. Definitions for what is meant by low, medium, high and very high as they pertain to Severity and Irreversibility are listed under those columns. Please note there are two sections to this questionnaire – one that asks experts to rank direct threats to manatees and one that asks for the ranking of direct threats to seagrass.

Example:

	Manatee		
Direct Threat	**Scope:** Proportion of the population that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends.	**Severity** - Within the scope, the level of damage to populations from the threat that can reasonably be expected given the continuation of current circumstances and trends.	**Irreversibility (Permanence)** - The degree to which the effects of a threat can be reversed and the manatee population affected by the threat restored.
Motorized watercraft collision	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High

PART 1: THREATS TO MANATEES

	Manatee		
Direct Threat	**Scope:** Proportion of the population that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends.	**Severity -** Within the scope, the level of damage to populations from the threat that can reasonably be expected given the continuation of current circumstances and trends.	**Irreversibility (Permanence) -** The degree to which the effects of a threat can be reversed and the manatee population affected by the threat restored.
Motorized watercraft collision	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Net/ Abandoned gear entanglement	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Exposure to contaminants/ chemical pollutants	1 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Manatee harassment	1 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Bycatch	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Poaching	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Ingestion of debris/trash	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Lack/ degradation of fresh water	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Oil Spills	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
		Definitions of low, med, high, very high for severity of threat	*Definitions of low, med, high, very high for irreversibility of threat*
		Low: Threat is likely to **slightly degrade/reduce** the target or by **1-10%** within ten years **Medium:** Threat is likely to **moderately degrade/reduce** the target or its population by **11-30%** within ten years **High:** Threat is likely to **seriously degrade/reduce** target or reduce its population by **31-70%** within ten years **Very High:** Threat is likely to **destroy or eliminate** target, or reduce its population by **71-100%** within ten years	**Low:** Effects of threat **are easily reversible** - target can be restored at a **low cost and/or within 0-5 years** **Medium:** Effects of threat **can be reversed** and the target restored with a **reasonable commitment** of resources and/or within **6-20 years** **High:** Effects of the threat **can technically be reversed** and the target restored, but it is **not practically affordable** and/or it would take **21-100 years** to achieve **Very High:** Effects of threat **cannot be reversed** and it is **very unlikely** target can be restored

PART 2: THREATS TO SEAGRASS

	Seagrass		
Direct Threat	**Scope:** Proportion of seagrass that can reasonably be expected to be affected by the threat within ten years given the continuation of current circumstances and trends.	**Severity -** Within the scope, the level of damage to seagrass from the threat that can reasonably be expected given the continuation of current circumstances and trends.	**Irreversibility (Permanence) -** The degree to which the effects of a threat can be reversed and area of seagrass affected by the threat restored.
Nutrient loading	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Turbidity	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Seagrass Scarring	0 - 10% 11 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
Oil Spills	1 - 10% 10 -30% 31 - 70% 71 - 100%	Low / Med / High / Very High	Low / Med / High / Very High
		Definitions of low, med, high, very high for severity of threat	*Definitions of low, med, high, very high for irreversibility of threat*
		Low: Threat is likely to **slightly degrade/reduce** the target or by **1-10%** within ten years **Medium:** Threat is likely to **moderately degrade/reduce** the target or its population by **11 30%** within ten years **High:** Threat is likely to **seriously degrade/reduce** target or reduce its population by **31-70%** within ten years **Very High:** Threat is likely to **destroy or eliminate** target, or reduce its population by **71-100%** within ten years	**Low:** Effects of threat **are easily reversible** - target can be restored at a **low cost and/or within 0-5 years** **Medium:** Effects of threat **can be reversed** and the target restored with a **reasonable commitment** of resources and/or within **6-20 years** **High:** Effects of the threat **can technically be reversed** and the target restored, but it is **not practically affordable** and/or it would take **21-100 years** to achieve **Very High:** Effects of threat **cannot be reversed** and it is **very unlikely** target can be restored

Expert Review Sessions

TUESDAY, MARCH 22, 2011
USFWS Caribbean Field Office, Boqueron, PR

IN ATTENDANCE:
Marelisa Rivera
Jan Zegarra
Maritza Vargas
Angel Dieppa
Carlos Pacheco
José Cruz-Burgos
Silmarie Padrón

THURSDAY, MAY 5, 2011
PRDENR Headquarters, San Juan, PR

IN ATTENDANCE:
Antonio Mignucci-Giannoni
Nilda Jimenez
Jan Zegarra
Jorge Saliva
Maritza Vargas
Mayra Garcia

WEDNESDAY, MAY 25, 2011
USGS Sirenia Project Office, Gainesville, FL

IN ATTENDANCE:
US Geological Survey (B. Bonde, J. Reid, D. Slone)