TECHNICAL SUMMARY OF THE JAMAICA ECOREGIONAL PLANNING (JERP) MARINE ANALYSIS

DRAFT

Nathalie Zenny
TNC Jamaica Country Programme
October 2006

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

I. INTRODUCTION

The Jamaica Ecoregional Planning Project (JERP) began as part of the Greater Caribbean Ecoregional Assessment (GCERA). Jamaica, the third largest Caribbean island-nation with high terrestrial and freshwater species endemism and a marine area approximately 25 times that of its land mass, was selected for in-depth analysis under this project. The JERP, for which the first iteration was completed in July 2006, outlines the conservation areas and strategies necessary for the longterm persistence and protection of Jamaica's freshwater, marine and terrestrial biodiversity[1]. This first iteration is the culmination of a three year effort involving the collection, analysis and synthesis of available biological and socio-economic data relevant to biodiversity conservation on the island and in its waters. The JERP was led by The Nature Conservancy's (TNC) Jamaica Country Programme and supported by a multidisciplinary group of local and international scientists, technicians and conservation practitioners. Freshwater, Marine and Terrestrial analyses have all been conducted on separate but parallel tracks and are currently being integrated.

Who is TNC?
The Nature Conservancy (TNC) is an international non-profit organisation that seeks to preserve the plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. TNC has been actively working in Jamaica since 1989, collaborating with government and non-government agencies, organizations and research institutions involved in the protection of Jamaica's natural environment.

II. OBJECTIVES OF THE JAMAICA ECOREGIONAL PLAN (JERP)

The methodology used for the JERP marine analysis was TNC's Ecoregional Planning (ERP) process. ERP is an iterative science-based, data-driven planning process which serves to more effectively plan and implement conservation strategies and activities at an ecoregional and landscape/seascape scale and provide a strong rationale for multi-scale (ecoregion, ecosystem and site-based) conservation investments.

The primary JERP objectives are to:

1. Design a network of conservation areas that will conserve the diversity of freshwater, terrestrial and marine species, communities and ecosystems in Jamaica.
2. Guide Jamaica's conservation priorities and actions for the country's CBD commitments.
3. Provide a scientific basis and methodology for island-wide conservation planning and informed sustainable development.

Box 1. JERP Ecoregional Planning Steps:

1. **Data collection** and review of existing information on biodiversity, human activities and protected areas,
2. **Stratification** of the ecoregion (i.e. Jamaica) and selection of elements of marine biodiversity or **Conservation Targets** (ecosystems, communities and species) which serve as a comprehensive representation (notwithstanding data limitations) of Jamaica's marine biodiversity,
3. **Identification and analysis of human activities** impacting Jamaica's marine biodiversity (threats),
4. **Screening of targets** to determine their ecological integrity/viability,
5. Assessment of the **effectiveness of current Protected Area network** to identify gaps and establish priorities for action and protection,
6. Development of **Conservation Goals** (that is, the amount of the target distribution to be managed for conservation and/or restoration),
7. Selection and prioritisation of **Conservation Areas**,
8. Development and prioritisation of **Conservation Strategies**.

III. TECHNICAL APPROACH AND RESULTS

TNC's ERP methods consist of a multi-step process as illustrated in the *Geography of Hope* (TNC 2000). The JERP marine analysis generally followed the *Geography of Hope* guidelines, adapting and modifying the methods to fit the Jamaican context (Box 1). The analysis was based on the best data available at a national scale and was subject to extensive peer review by local and international marine and coastal resource experts and managers. Complete details of the marine analysis have been documented in a full technical report.

1. Data collection.

JERP is an important step towards assembling a national GIS (Geographic Information Systems) database of biodiversity and socio-

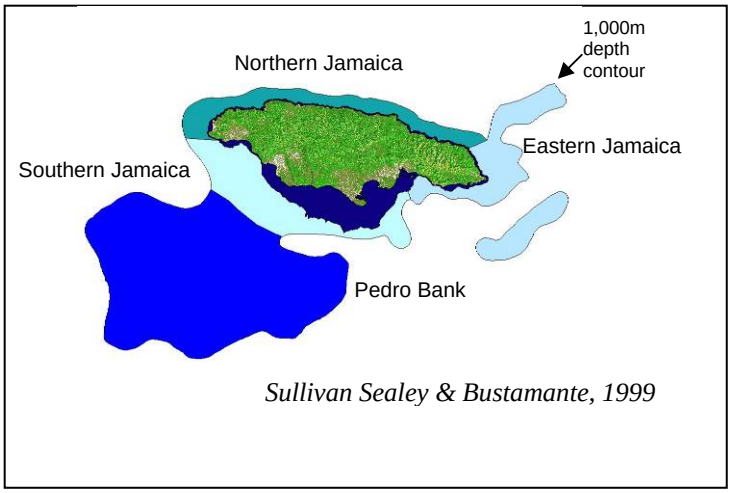
[1] It is important to note that conservation areas may or may not be recommended as actual Protected Areas. The objective of the ERP process is not to deliver a Protected Area Plan, but rather to identify those critical areas which will require one form of management strategy or another for effective biodiversity conservation (which will comprise of multiple strategies and may or may not include the designation of a Protected Area).

economic information. GIS was the primary tool of the marine JERP analysis using pre-existing GIS and non-GIS information collected from various sources – government agencies, private consultants, NGOs and academia[2]. Where there were gaps or errors within the information, revisions were done in-house by TNC.

2. Stratification of the Jamaican Ecoregion and selection of JERP marine conservation targets, the elements of biodiversity.

Stratification of the Jamaican ecoregion is critical in order to account for spatial and genetic variation among target occurrences and to ensure representation and resilience, particularly as it relates to distribution of risk such as disease, bleaching or natural disturbances such as hurricanes. The outer boundary for the JERP marine planning area was defined by the 1,000m depth contour. Identification and mapping of targets was restricted to less than or up to the 200m depth contour due to data limitations. The stratification system used was adopted from a preliminary regional ERP analysis done by TNC in 1999, *Setting Geographic Priorities for Marine Conservation in Latin America and the Caribbean* (Sullivan and Bustamante 1999). Marine Stratification Units (MSUs) were defined based on the oceanographic processes, the bathymetry and other geophysical and environmental processes and dominant natural community types occurring within the Jamaican marine environment (Figure 1).

Figure 1. Stratification of Jamaica's Marine Ecoregion defined by the 1,000m depth contour, with delineated Marine Stratification Units (MSUs).



Thirteen marine JERP targets were identified, guided by ERP criteria and those targets set at a regional level for the Greater Caribbean Ecoregional Assessment. These targets range from coarse to finer scales, including ecosystems such as coral reefs, mangrove forests and seagrass beds, areas of breeding and roosting seabird and migrant shorebird aggregations and single-species distributions such as the endangered West Indian Manatee (Box 2).

Figure 2 illustrates the overall distribution of targets. More detailed maps of the target distributions can be found in the Appendix of this document. Table 1 lists the main data sources and references used for the target distribution mapping as well as the MSUs in which the target occurs. All mapped target distributions underwent an extensive review process[3].

Box 2. JERP Marine Conservation Targets

- Sandy shores
- Rocky shores
- Sea turtle nesting beaches
- Mangroves
- Estuarine areas
- Seagrass beds
- Corals & coral reefs
- Soft bottom communities
- Seabird nesting & roosting areas
- Overwintering shorebird areas
- Cays
- Inshore & offshore banks
- Manatees

[2] GIS software used: Arcview 3.3 and ArcGIS 9.0

[3] Targets were reviewed by TNC colleagues and local experts through individual consultations and 2 review workshops held in Kingston in October 2004 and February 2006.

Figure 2. Spatial distribution of JERP marine biodiversity[4].

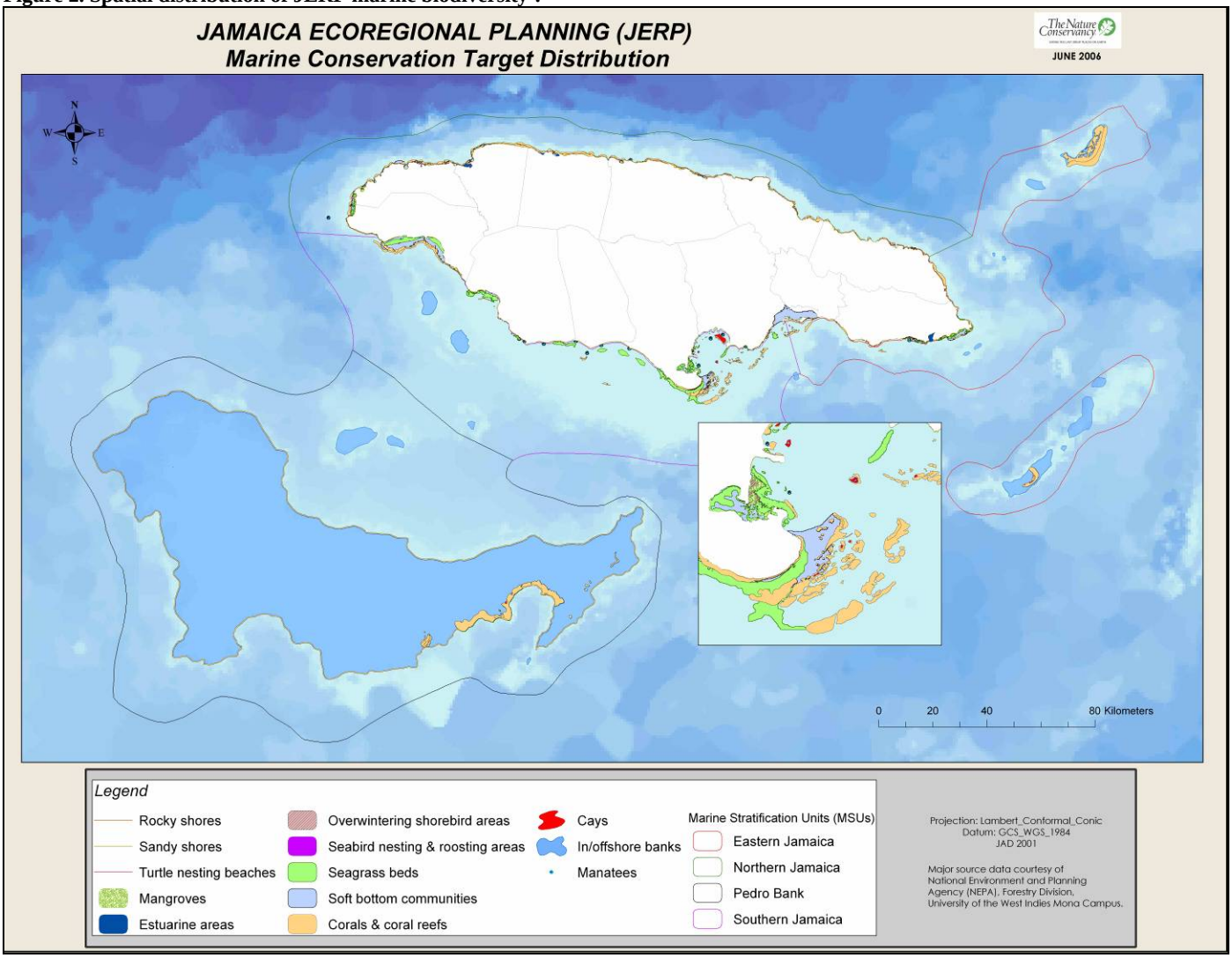


Table 1. Major Data Sources for the Mapping of JERP Marine conservation targets.

Target Name	Marine Stratification Unit (MSU)	Major data sources or references used for JERP target mapping
Sandy shores	N, S, E*	JA Coastal Atlas 1999, Greater Caribbean Ecoregional Assessment 2004, South Coast Atlas 1999, Expert review
Rocky shores	N, S, E	JA Coastal Atlas 1999, GCERA 2004, JA Country Environmental Profile 1987, South Coast Atlas 1999, Expert review
Mangroves	N, S, E	Forestry Dept. Landuse Map 1999, Alleng 1990, JA Country Environmental Profile 1987, Jamaica's Coastal Resources: A Reconnaissance Report (USAID 1995), South Coast Atlas 1999, Expert review
Estuarine areas	N, S, E	*Jamaica's Coastal Resources: A Reconnaissance Report* (USAID 1995), IKONOS satellite imagery, Expert review
Seagrass beds	N, S, E, P	Millenium Mapping 2004-06, JA Coastal Atlas 1999, South Coast Atlas 1999, Expert review
Corals & coral reefs	N, S, E, P	Millenium Mapping 2004-06, JA Coastal Atlas 1999, South Coast Atlas 1999, JA Country Environmental Profile 1987, Expert review
Soft bottom communities	N, S, E	Millenium Mapping 2004-06, JA Coastal Atlas 1999, South Coast Atlas 1999, Expert review
Cays	N, S, E, P	Millenium Mapping 2004-06, Topography maps (50k), British Admiralty Nautical Charts, JA Country Environmental Profile 1987, Expert review
In/offshore banks	S, E, P	Millenium Mapping 2004-06, South Coast Atlas 1999, Munro 1983, Expert review
Seabird nesting and roosting areas	N, S, E, P	Haynes, 1987; Downer and Sutton, 1991; Haynes-Sutton, 1997; Expert review
Overwintering shorebird areas	N, S, E, P	Based on A. Sutton field research
Turtle nesting beaches	N, S, E, P	WIDECAST report (in-draft), NEPA GIS dataset based on compilation of field surveys between 1991 and 1995, Expert review
Manatees	N, S, E	Manatee Mgmt. Plan - Brown 1993, NEPA GIS dataset based on compilation of field surveys between 1982 and 1993 (Fairbairn and Haynes, 1982; Strong, et. al. 1991), Expert review

*N, S, E, P – indicates Northern, Southern, Eastern or Pedro Bank MSUs.

3. Identification and analysis of human activities impacting Jamaica's marine biodiversity (Threats).
Human activities which impact Jamaica's marine biodiversity (threats) need to be assessed in order to evaluate the ecological condition of targets and develop effective conservation strategies. For JERP purposes, threats were identified and assessed by way of:

1. a threats survey of local academics, marine park and coastal zone managers and
2. a Cost Surface Model based on these survey results, literature and additional expert guidance.

The threats survey was limited due to a small sample size and knowledge gaps related to certain geographical areas but provided useful details about specific areas and identified threats for which current knowledge is limited (Table 2). This expert-reviewed list of threats was then used as a guide for the development of the Cost Surface Model.

Table 2. The major human activities impacting JERP marine conservation targets (Threats).

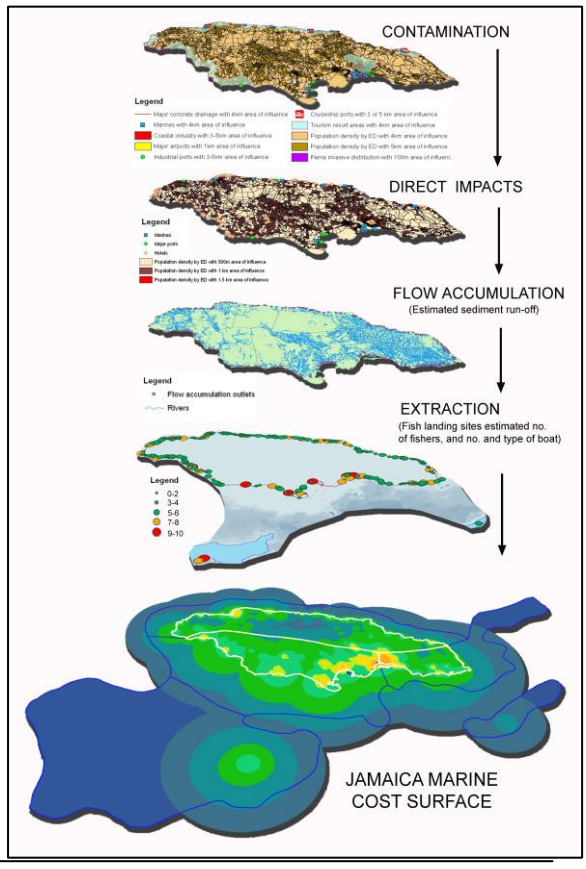
Category	Activities/Threat
Direct Impact	Unplanned/irresponsible coastal development Dredging Careless boating practices Extraction of material from mangroves Hydrological alterations/disruptions Irresponsible/careless diving practices Irresponsible/careless fishing practices/gear Light pollution (affecting turtle recruitment) Climate change
Contamination	Coastal development Invasives Deforestation & physical deterioration of watershed basins Land run-off (including agricultural, sewage and industrial discharge) Marine-based contamination Solid waste pollution (from land and sea, also includes from drainage gullies)
Extraction	Overfishing Hunting/poaching of animals and/or eggs (reptiles, birds) Seabed mining Sand mining
Watershed-based sedimentation and run-off	Deforestation & physical deterioration of watershed basins Land run-off Sand mining (rivers)

4. Target screening: the Cost Surface Model.
Using the threats list as a basis, a Marine Cost Surface Model was developed. Human activities were divided into four categories based on their impact: Direct Impact, Contamination, Watershed-based Sedimentation and Run-off, and Extraction. For each human activity considered a threat to JERP marine targets, the intensity or severity and the range of impact of that activity was estimated.

Not all threats were mapped as the data either did not exist at an ecoregional scale, or was not available in a spatial GIS medium. In some cases, surrogate data had to be used in order to estimate the threat. Activities and factors mapped ranged from, for example, population density (as a surrogate for coastal development), fishing (based on landing site information), coastal industry and marine invasives. Four spatial threat layers representing the four threat categories were generated and fed into a computer modeling tool (Human Activities Surface or HAS, Schill 2005) to generate the final marine cost surface model (Figure 3).

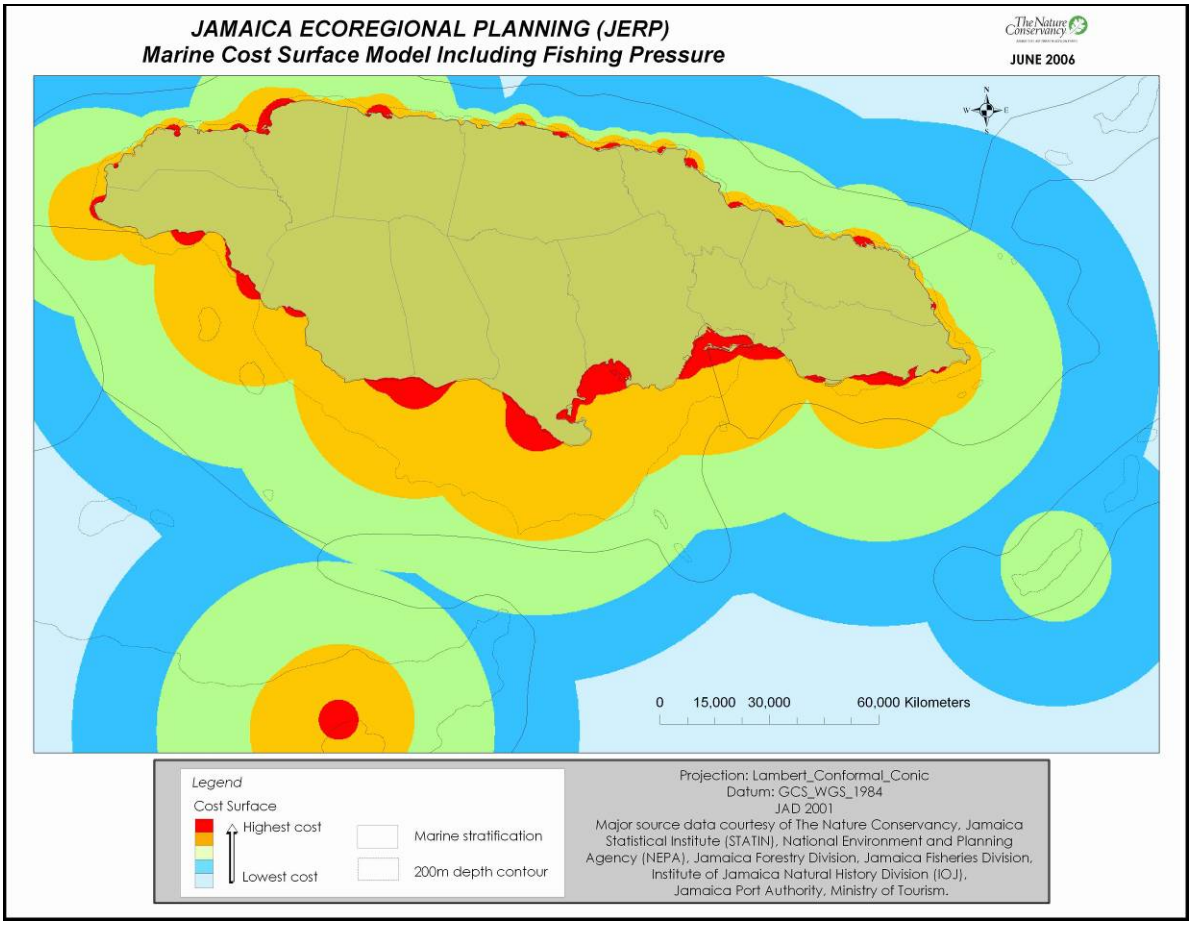
The Cost Surface is analogous to a human footprint on Jamaica's coastal and marine resources, indicating areas where we 'tread' lightly or more heavily. The model is based on an assumption: Within areas where the human footprint is larger, the higher the cost to the conservation target's condition is, and therefore the higher the cost of doing environmental conservation and management in that area.
A more detailed look at the Cost Surface indicates that densely-

Figure 3. Construction of the Marine Cost Surface Model.



populated areas with a high level of human activity and associated impact have the highest cost for conservation purposes (in red) and those rural, more isolated and less densely populated areas have lower associated costs (in green and blue) (Figure 4). More detailed maps showing the threat layers used to develop the cost surface and the cost surface without fishing activity can be found in the Appendix.

Figure 4. JERP Marine Cost Surface including fishing pressure.



The Marine Cost Surface indicates a coastal environment which is heavily impacted by human activities, a condition common to many Small Island Developing States. While the Cost Surface is limited by the amount and quality of data it analyzes, it provides a useful preliminary spatial modeling of Jamaica's human footprint on its marine environment which can inform not only conservation action but national sustainable planning and development. Additionally, as more data becomes available, the model provides the capability for further and more detailed refinements.

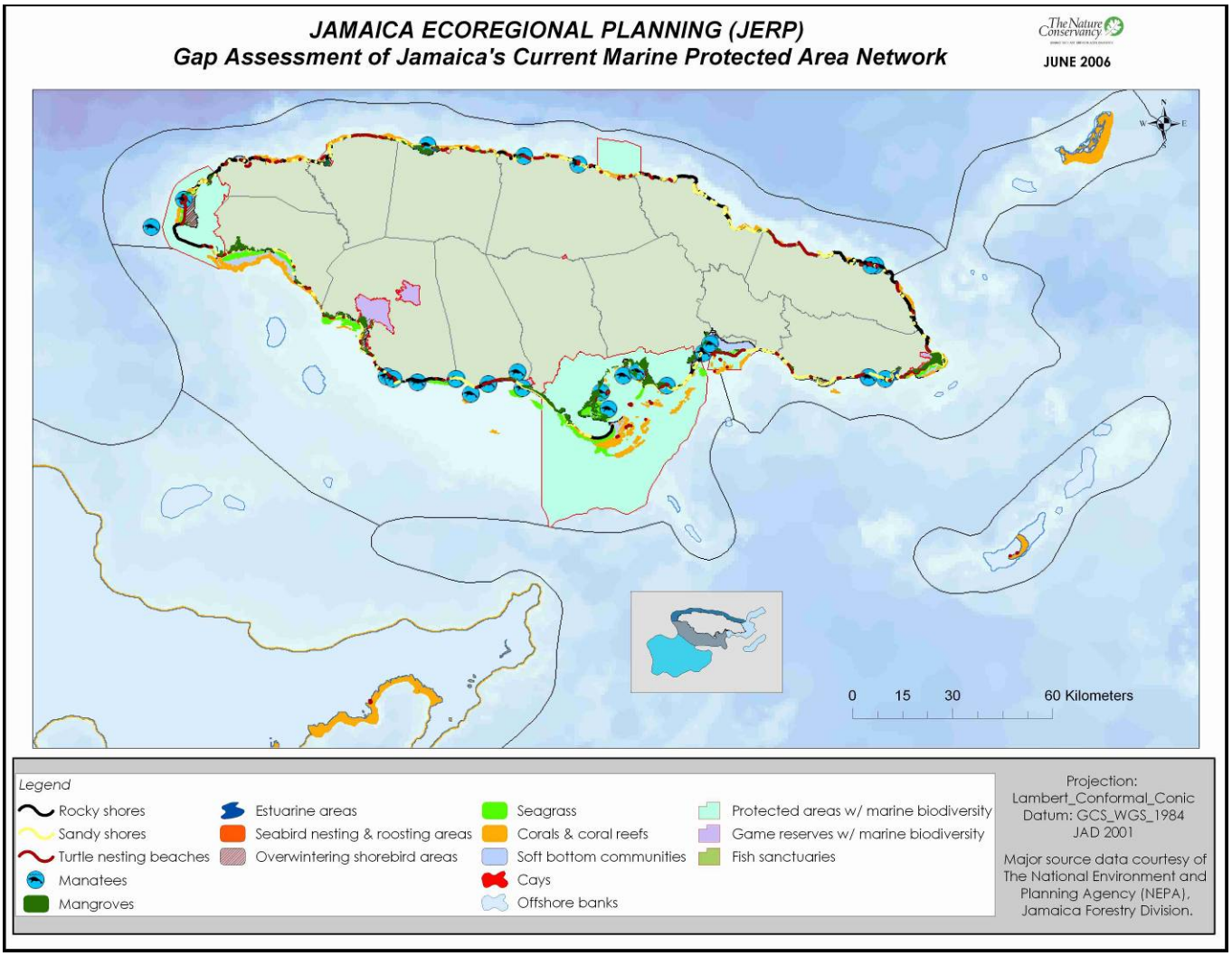
5. Protected Area Gap Assessment

The gap assessment was conducted to determine the effectiveness of the current Protected Area (PA) network in the conservation of marine biodiversity and consequently identify and recommend priorities for conservation action in a revised conservation area network.

Three aspects of the Protected Area Network were analysed (Figure 5):

- Representation: indicates whether the target is sufficiently represented and replicated in the PA network.
- Ecological Integrity: indicates whether the represented targets are in adequate ecological condition and whether factors such as connectivity have been accounted for (for the marine analysis this was evaluated at a very course and qualitative scale due to data and knowledge gaps in the marine realm).
- Management: indicates whether the represented targets are protected in reality by the appropriate management systems.

Figure 5. Gap Assessment of Jamaica's Current Marine Protected Area Network.



Results are as follows:

Target coverage within Protected Areas:

1. There is significant coverage of the Northern MSU targets:
   - 83% of the targets (10 of 12 targets) have 20% or more coverage within Marine/National Parks and Protected Areas in addition to coverage within Game Reserves[3]
   - 92% (11 of 12) of targets meet the CBD 10% goal within Marine/National Parks and Protected Areas
2. There is significant representation of the Southern MSU targets:
   - 69% (9 of 13) targets have 30% or more coverage within Marine/National Parks and Protected Areas in addition to coverage within Game Reserves - the majority of the coverage being within the Portland Bight Protected Area
   - 92% (12 of 13) targets have 20% or more coverage within Marine/National Parks and Protected Areas in addition to some coverage within Game Reserves

Representation gaps in Jamaica's current system:

1. 69% (9 of 13) of Eastern MSU targets have no representation at all within Marine/National Parks or Protected Areas. Of these 9 targets, 88% of the Eastern Jamaica Mangrove target distribution falls within the Holland Bay Game Reserve and 72% of the Eastern Jamaica Estuarine Areas target distribution falls within the Bowden Fish Sanctuary (Figure 17)
2. The entire Pedro Bank MSU has no coverage within the current Protected Area System

[3] There is some overlap in coverage here as the Bogue Lagoon Game Reserve falls within the boundaries of the Montego Bay Marine Park.

3. Offshore Bank targets are unrepresented throughout the MSUs
4. Northern Seabird Nesting and Roosting Areas are also unrepresented.

Ecological gaps:

1. Only 15% (2 of 13 – Turtle Nesting Beaches and Sandy Shores) Eastern MSU targets meet the 10% CBD recommendation (or higher) within Marine/National Parks or Protected Areas (Figure 17).
2. Another 15% (2 of 13 – Corals and Coral Reefs and Overwintering Shorebird Areas) of Eastern MSU targets have only 5% or less representation within the Marine Parks or Protected Areas however 65% of the shorebird area target's distribution falls within the Holland Bay Game Reserve.
3. With the exception of the Portland Bight Protected Area because of its large size (135,640 ha of marine area), the current Protected Area system does not consider any large seascape functions and connectivity inherent to marine environments.

Management gaps:

While the assessment reveals a certain level of existing marine biodiversity representation within Marine Protected Areas, the management effectiveness for actually protecting this biodiversity is very poor. A coarse analysis as described in the full JERP Marine report revealed a very weak and strikingly underfunded management regime for effective marine protection nationally.

6. & 7. How much do we need to conserve and where? Setting goals and drafting conservation areas.

The International Convention on Biological Diversity (CBD) guidelines recommend that a minimum of 10% of countries' biodiversity be effectively conserved by 2010. Nations like Grenada and the Federated States of Micronesia have been proactive and have officially committed to protecting 25-30% of their nearshore marine environment. For JERP purposes, a minimum ten percent goal was set as well as target-specific goals based on criteria such as rarity and vulnerability to human impacts (Table 3)[4].

Table 3. JERP Marine Conservation Target-Specific Goals (% of total distribution).

1. Sandy shores	20	8. Soft bottom communities	20
2. Rocky shores	20	9. Seabird nesting and roosting areas	50
3. Turtle nesting beaches	50	10. Overwintering shorebird areas	30
4. Mangroves	50	11. Cays	30
5. Estuarine areas	20	12. Offshore banks	10
6. Seagrass beds	30	13. Manatees	50
7. Corals and coral reefs	10-30*	* A 10% goal was assigned to the Pedro Bank Coral & Coral Reef target due to its very large size relative to the other stratified reef targets and the conservation feasibility of managing such an extensive area.	

Once the goals had been determined, conservation areas were identified using a combination of GIS-based modeling and more intuitive ranking tools:

(a) **Marxan** is a DOS-based site-selection software program developed to facilitate the design of marine protected areas (Ball & Possingham 2000). Using the GIS layers of the target distributions, the Cost Surface results and the defined conservation goals as inputs, Marxan selected those planning units (1km-sided hexagons) across the Jamaican marine ecoregion containing the highest biodiversity value at the lowest cost (as defined by the minimum area needed to meet the conservation goals and an avoidance of areas with an associated high-threat cost).

(b) A simple **priority-setting** tool was also developed. Using expert-selected Areas of Significant Biodiversity (ABS), key indicators representing the relative biological significance, relative threat intensity and the conservation feasibility of each of the 16 ABSs were ranked (Table 4).

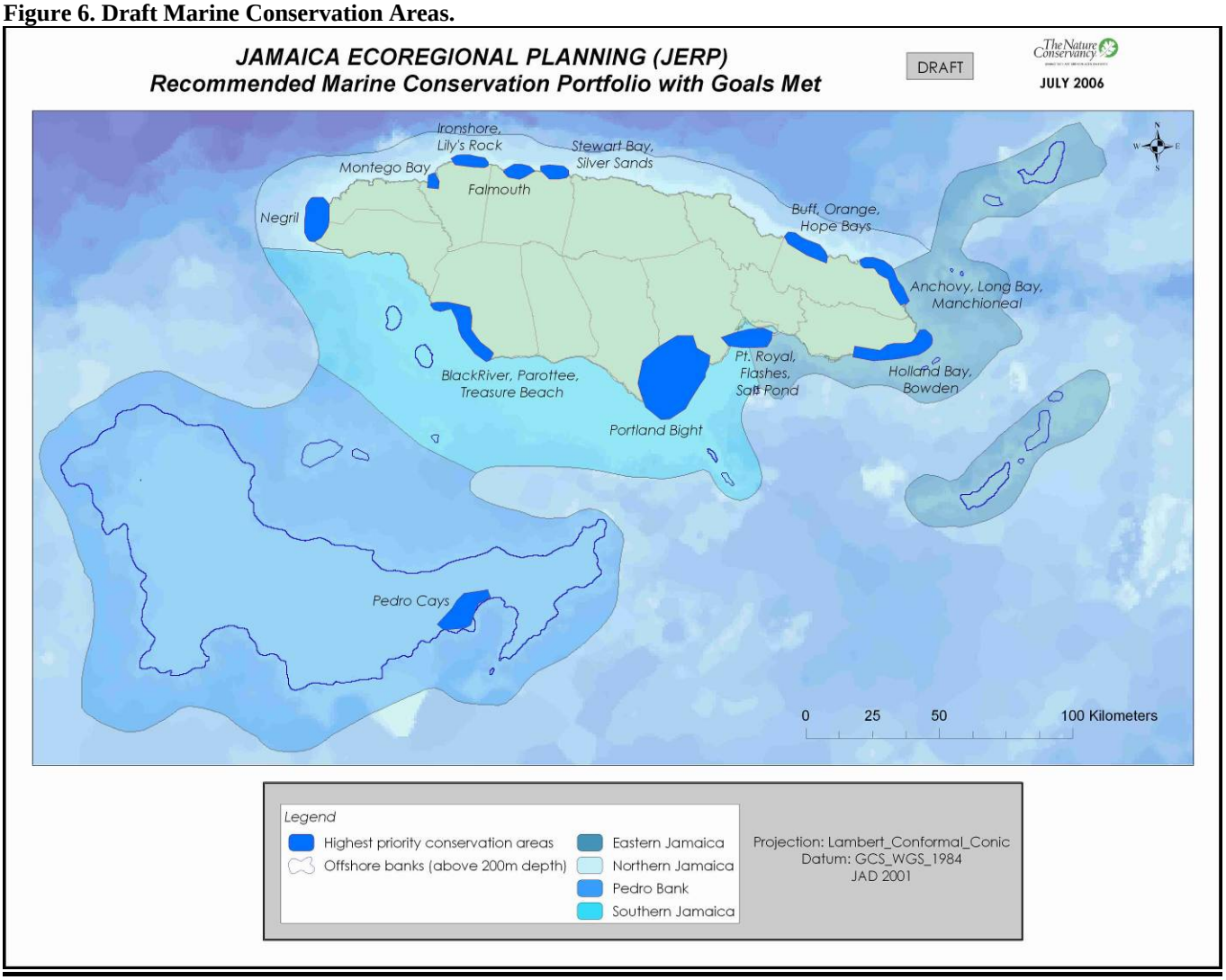
[4] Target-specific goals were determined using recommendations in the current literature and international guidelines based on fisheries models, species-area curves and landscape theory/connectivity.

Table 4. Criteria for ranking Areas of Significant Biodiversity (ABS).	
Criteria	**Measures**
Relative Biological Significance (High, Medium)	Habitat Representation & Heterogeneity (# of targets relative to total target # in Marine Stratification Unit), Endangered Species (Manatees), Source Area (Seabird Nesting & Roosting Areas & Turtle Nesting Beaches)
Relative Threat Intensity (High, Medium, Low)	Presence/Absence of mapped threats (by Threat Category) within Areas of Biodiversity Significance (ABS)
Conservation Feasibility (3,2,1,0)	3 - ABS is contained within or intersects a Protected Area (PA); 2 - ABS is contained within or intersects a Game Reserve/Fish Sanctuary; 1 - ABS is contained within or intersects a Proposed PA or has some protective legislation; 0 - no PA status

These prioritized ABSs were then overlaid with the Marxan results to determine the conservation areas. As a final check, the normalized Relative Biodiversity Index (nRBI) was used to verify the recommended conservation areas. The nRBI quantifies the area-weighted relative contribution of each planning unit compared to the total distribution of each conservation target.

The recommended conservation areas support the current system of marine protected areas as well as identify inshore and offshore areas not being represented (Figure 6). Areas are currently being reviewed in order to develop strategies for implementation, including but not limited to protected area strategies.

Figure 6. Draft Marine Conservation Areas.



8. Strategies

Conservation strategies are direct action and supporting activities that either abate the threats to or restore and maintain the ecological integrity of conservation targets. Ideally conservation strategies in ecoregional plans are effective over multiple areas and are prioritised according to (1) how well they protect biodiversity in all three realms (freshwater, terrestrial and marine) (2) their feasibility and (3) the urgency of the strategic action (as in the case with severe threats or narrow windows of opportunity for action). JERP conservation strategies were explicitly linked with the findings of the Protected Area Gap Assessment and the Threats Assessment as well as data gaps elucidated by the JERP analysis, and will be primarily focused on conservation areas.

The marine JERP strategies are currently being refined. Table 6 provides a synthesis of draft JERP marine strategies to date.

Table 6. A Synthesis of JERP Marine Strategies.

JERP ANALYSIS FINDINGS	RECOMMENDATION	ACTIONS
The Northern and Southern MSUs are relatively well represented in the current MPA system (on average >20% protection) however there is little or no protection for targets within the Eastern and Pedro Bank MSUs.	Fill conservation target gaps not currently included within Protected Areas (PAs) addressing high-medium priority areas first, e.g. Representation gaps – Pedro Bank MSU. Ecological gaps – 11 of 13 Eastern MSU targets.	Target Pedro Bank beginning with the Pedro Cays as an effective Fisheries Management Area with a Management Plan, zoning regulations and surveillance.
		Upgrade Morant Point Game Reserve to PA status.
		Support active biodiversity management within Bowden Fishing Sanctuary.
		Reactivate the Sea Turtle Rescue Network (STRN) as a means of increasing awareness, monitoring and research towards improved protection of turtles within JERP highest priority conservation areas.
		Engage the tourism sector in conservation initiatives and promote best practices (perhaps using Jamaica Protected Areas Trust (JPAT) as the mechanism).
		Explore co-management of JERP highest priority conservation areas which are not included within the PA system, perhaps through Parish Councils and community-based organizations.
The current MPA system does not ensure an adequate level of connectivy between targets.	Specifically examine connectivity gaps.	Research ecological processes and connectivity as a basis for further refining and revising protected area boundaries.
The current Jamaican MPA system suffers from 'paper parks' – parks declared in the legislation but for which management effectiveness is very poor in reality. Limited local capacity to assess, plan and implement coastal and marine biodiversity conservation; no or very limited finances.	Address MPA management effectiveness and enforcement of regulations.	Further engage and train Marine Police, JDF Coast Guard, the Courts and fishing communities in active conservation & enforcement using Pedro Bank as a pilot site.
	Funding	Devise long-term sustainable financing strategies specifically targeting Pas (e.g. Portland Bight, Coral Spring, Glistening Waters and Negril) and high-leverage and/or multisite actions through JPAT.
		Engage local private sector at high-priority, high-profile sites for financial and other support (e.g. Pedro Bank).
	Capacity-building	Build technical and management capacity within MPAs through a pooled expert base and training opportunities within the Jamaica Protected Areas Trust (JPAT).

Table 6. A Synthesis of JERP Marine Strategies.		
JERP ANALYSIS FINDINGS	**RECOMMENDATION**	**ACTIONS**
Current legislation is weak.	Revise national marine conservation and fisheries regulations to effectively reflect current and future conservation and fisheries stock restoration needs.	Support completion of new draft Fisheries Policy and Fishing Bill for Cabinet review and legislation.
There are critical research and information gaps to be filled to effectively conserve and restore conservation targets.	Fill priority information gaps to directly inform national marine conservation objectives.	Design an applied National Research framework which will underpin and inform Jamaica's marine conservation needs and priorities, and guide the Dept. of Life Sciences, University of the West Indies programme, specifically to: 1. Address important conservation gaps (species, communities, important ecological phenomena) including: ▪ Status of rare, endangered and keystone coastal and pelagic species such as manatees, cetaceans, sharks, turtles, crocodiles ▪ Historic (and current) fish and conch spawning aggregations ▪ Marine micro and meiofauna ▪ Essential breeding, nesting and feeding areas (especially for keystone, rare and endangered species) ▪ Establish a well-documented historic baseline for conservation targets (species, habitats & ecosystems) 2. Standardize marine monitoring techniques across Jamaica for comparative national-scale analysis. 3. Develop a national digital bathymetry database.
At a country-wide scale, the top threats are overfishing, coastal development, land-run off and sedimentation and solid waste.	Further refine decision-support tools for effective, longterm threat management and forecasting.	Further develop and refine the JERP Cost Surface model for use as an applied management (and predictive) tool as well as a research and learning tool for tertiary-level and Integrated Coastal Management training.
	Mitigate or reduce main threats to marine conservation targets at national and site-scale.	Explore diversification of fishing practices and selective fishing activities towards reducing fishing pressure at specific high-leverage pilot sites such as Pedro Bank and other high-priority PAs.
		Improve watershed management in 1-2 priority watersheds (e.g. Rio Grande, Black River, Martha Brae or Drivers River) to demonstrate practical approaches to integrated freshwater, terrestrial and coastal ecosystem management.
		Engage the Jamaica Fisherman's Co-operative Union and other south coast co-operatives and fishing associations in advancing the idea of and generating support for co-management of Pedro Bank fisheries.
Many targets require restoration interventions to be ecologically and socio-economically resilient over the longterm.	Initiate priority restoration projects of habitats and species.	Control/eradication of invasives and propagation of native species (e.g. mangroves).
		Support implementation of species recovery plans (e.g. West Indian Manatee, sea turtles).

Table 6. A Synthesis of JERP Marine Strategies.		
JERP ANALYSIS FINDINGS	**RECOMMENDATION**	**ACTIONS**
There is limited support for and public awareness about the crisis facing Jamaica's marine environment.	Initiatite a wide-scale public and private sector campaign to raise awareness and interest.	Develop and disseminate public education materials on Jamaica's fisheries and coral reef (marine) crisis and the importance of restoration/protection of these resources in their provision of critical environmental services.

IV. MAIN PRODUCTS AND NEXT STEPS

The main products of the Jamaica Ecoregional Plan are as follows:

1. Framework and methodology for integrated biodiversity conservation planning in Jamaica.
2. GIS database of freshwater, marine and terrestrial biodiversity and socio-economic activities impacting this biodiversity. This can be accessed on the Internet at:

http://maps.cathalac.org/website/tncmaps/tncmain.html

3. Recommended draft conservation areas and actions for Jamaica's biodiversity.

The next steps will be to:

1. Conduct a review of the recommended draft conservation areas with local and international marine and coastal managers and experts.
2. Further refine and prioritise strategies though this peer review
3. Collaboratively develop an implementation action plan to begin with actions in the highest priority conservation areas and
4. Continue improving the data used to inform biodiversity conservation.

Complete details for the marine analysis of the JERP can be found in the draft *Jamaica Ecoregional Planning (JERP) Marine Analysis Report* available from TNC.

Acknowledgements
TNC Jamaica deeply appreciates the support we received during the marine JERP analysis between January 2003 and June 2006. This analysis for Jamaica was possible only because of the contributions and critique of numerous persons, organisations and agencies. It drew heavily on information that was previously generated and analysed by the National Environment & Planning Agency (NEPA), the Fisheries Division, the National Survey Department, the Ministry of Tourism and the Jamaica Tourist Board (JTB), the Jamaica Statistical Institute (STATIN), the University of the West Indies (UWI) Mona Campus and the Forestry Department. Additional support was obtained from the Mines and Quarries Division (MQD) of the former Ministry of Land and the Environment.

References:

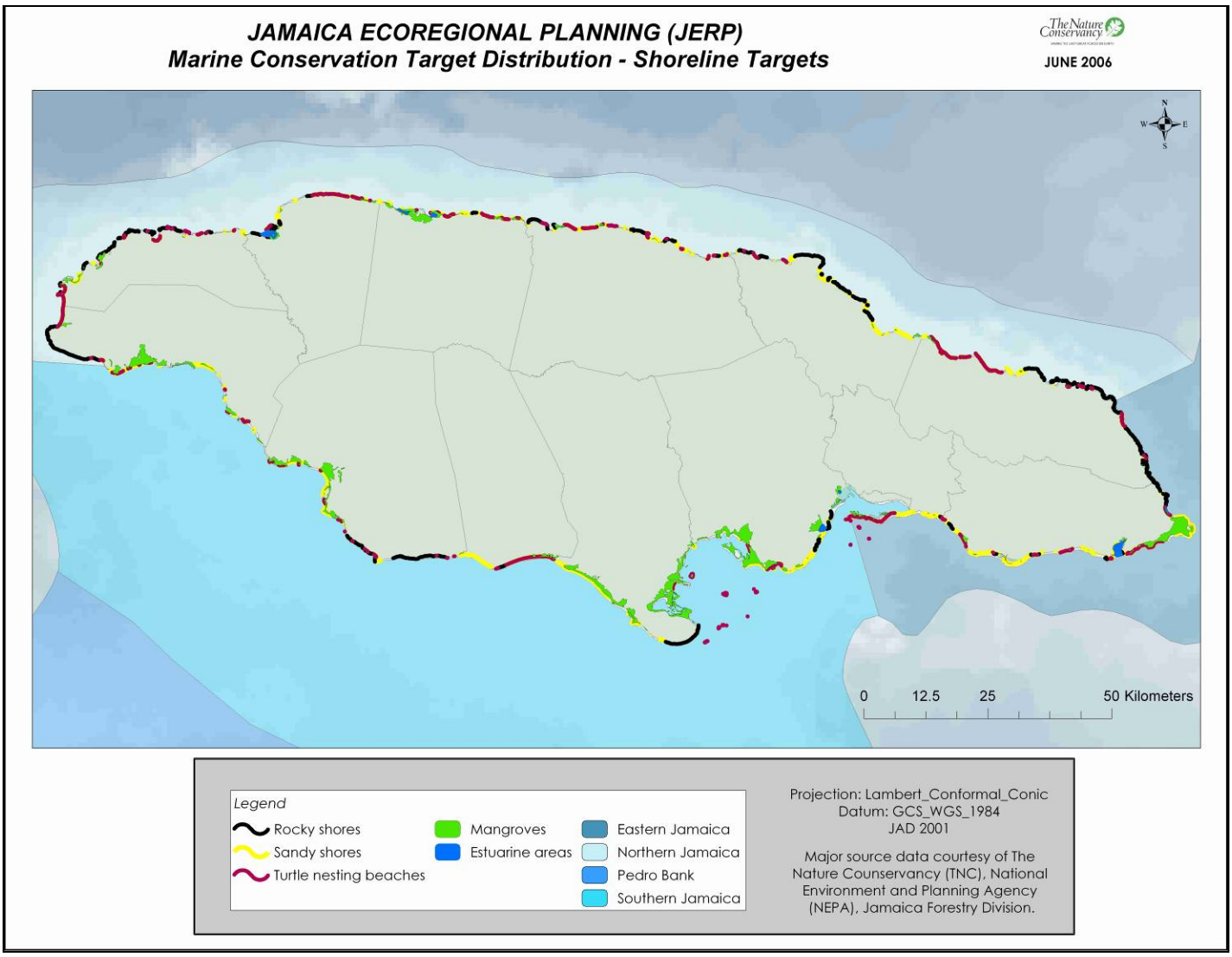
Sullivan Sealey, K. and G. Bustamante, 1999. *Setting Geographic Priorities for Marine Conservation in Latin America and the Caribbean.* TNC, Arlington, Virginia, USA.

TNC 2000. *Designing a Geography of Hope: A Practitioner's Handbook to Ecoregional Conservation Planning*. TNC, Arlington,Virginia, USA.

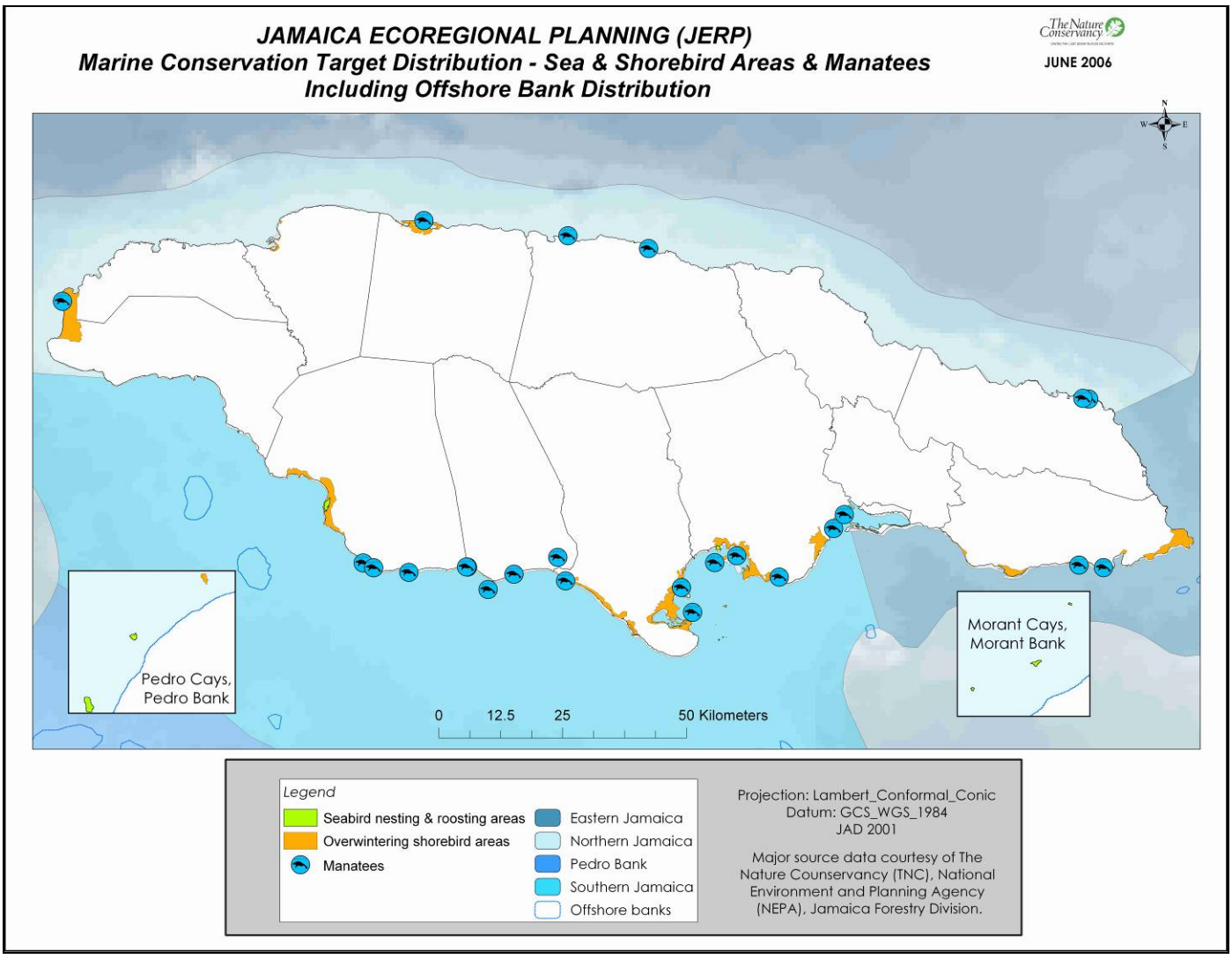
FOR MORE INFORMATION PLEASE CONTACT:
Nathalie Zenny
TNC Jamaica
(876)754-4579 x 27
nzenny@tnc.org

APPENDIX

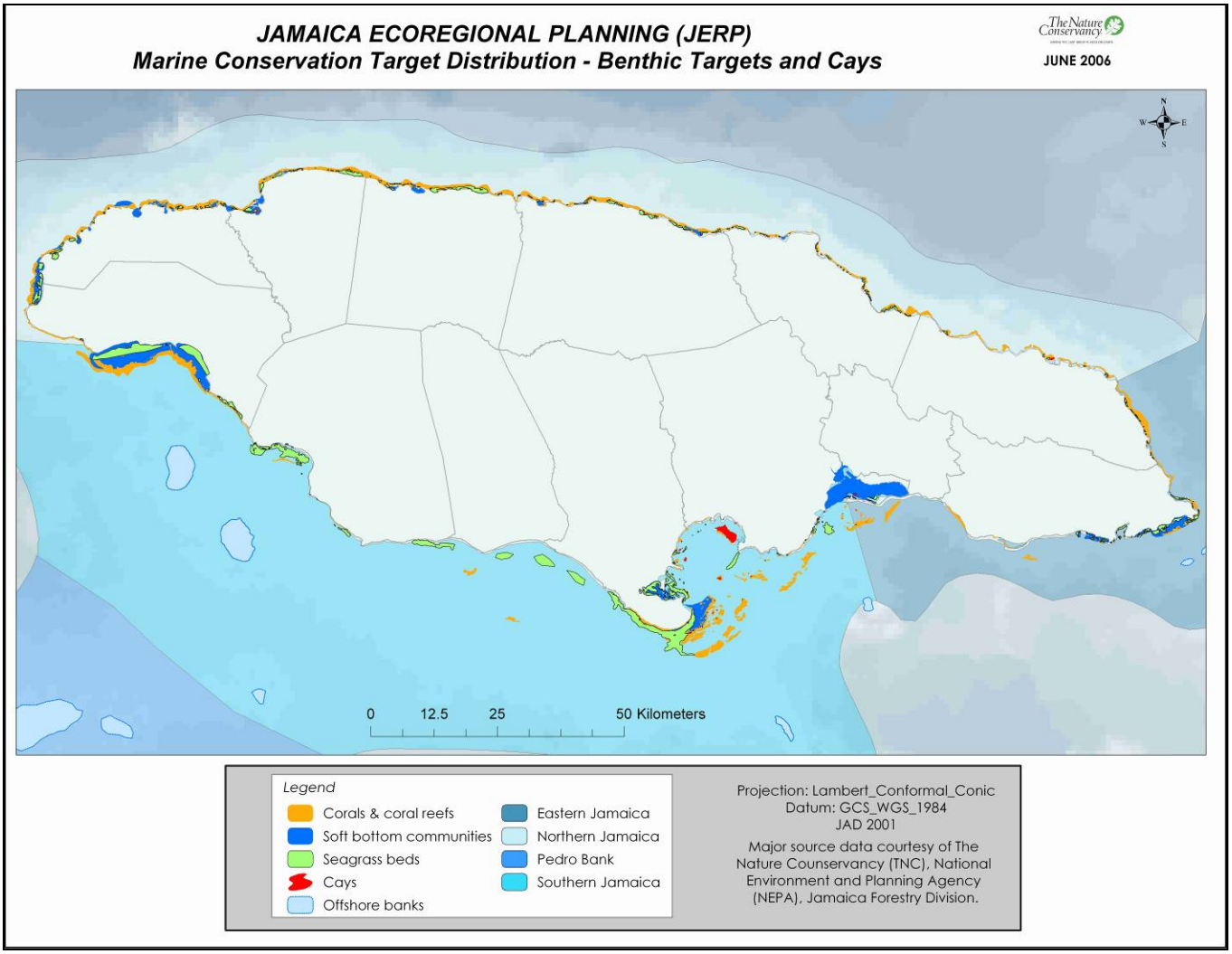
Map 1. Distribution of marine shoreline conservation targets in Jamaica.



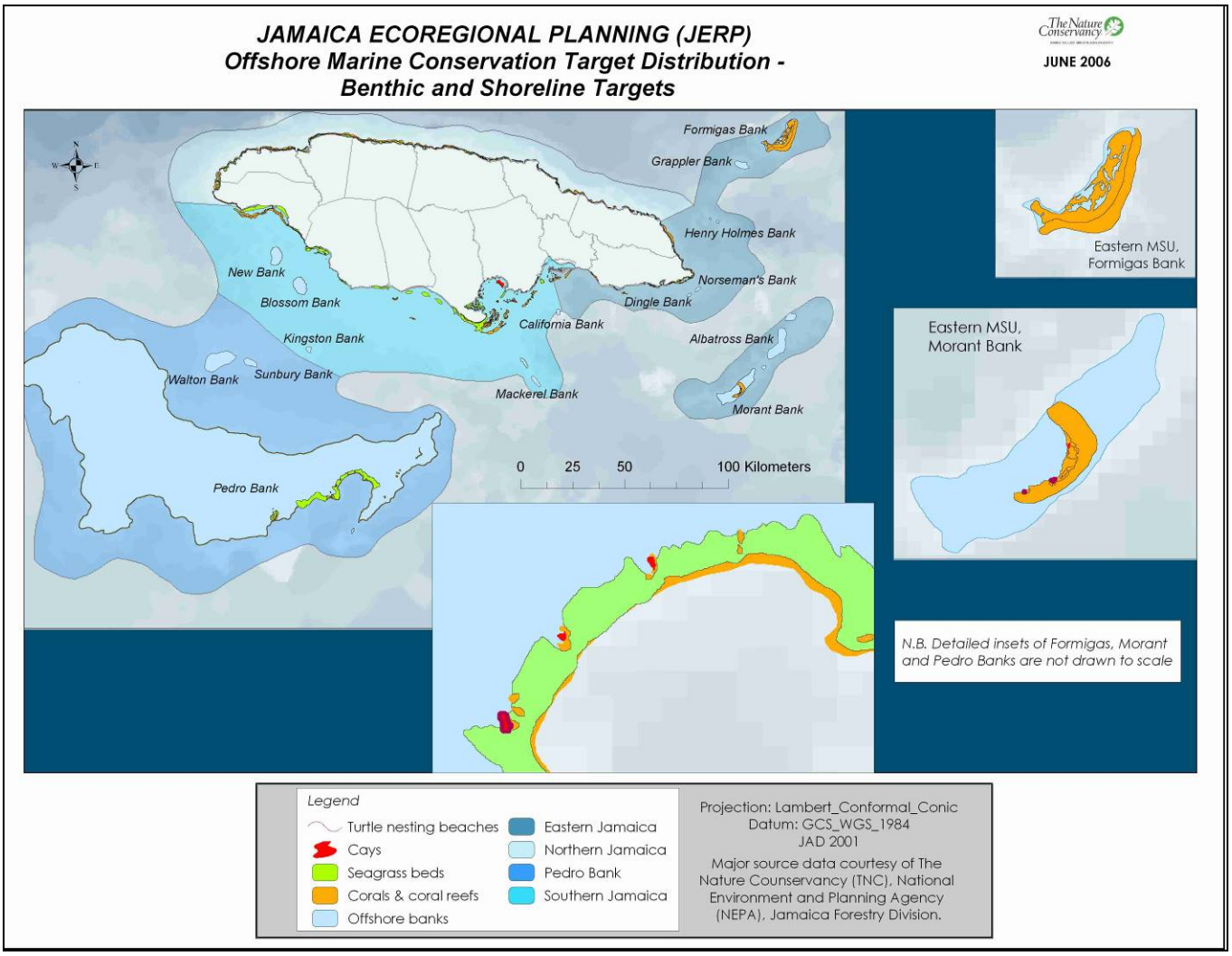
Map 2. Distribution of marine conservation targets in Jamaica, seabird and shorebird areas and manatees.



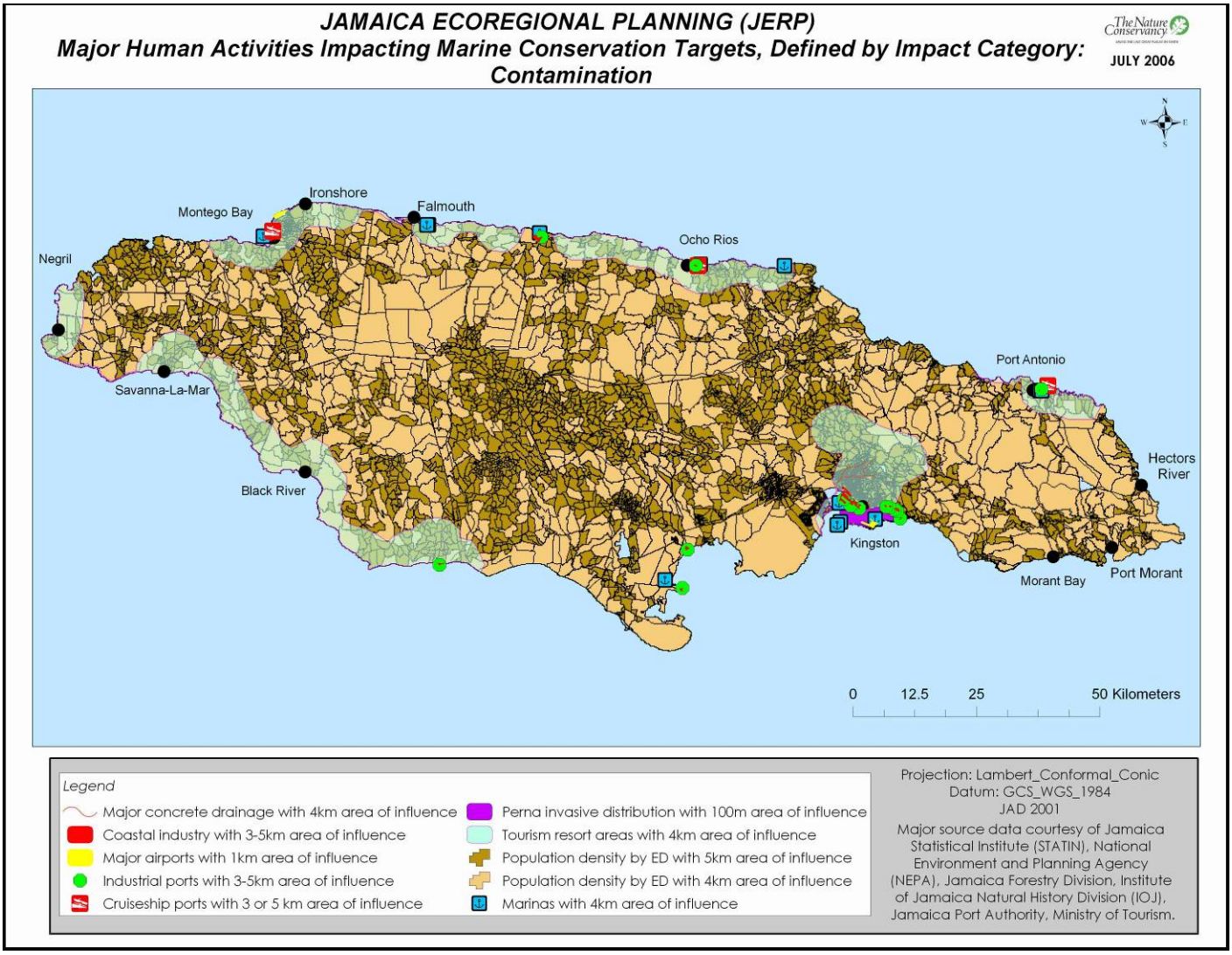
Map 3. Distribution of marine conservation targets in Jamaica, benthic targets and cays.



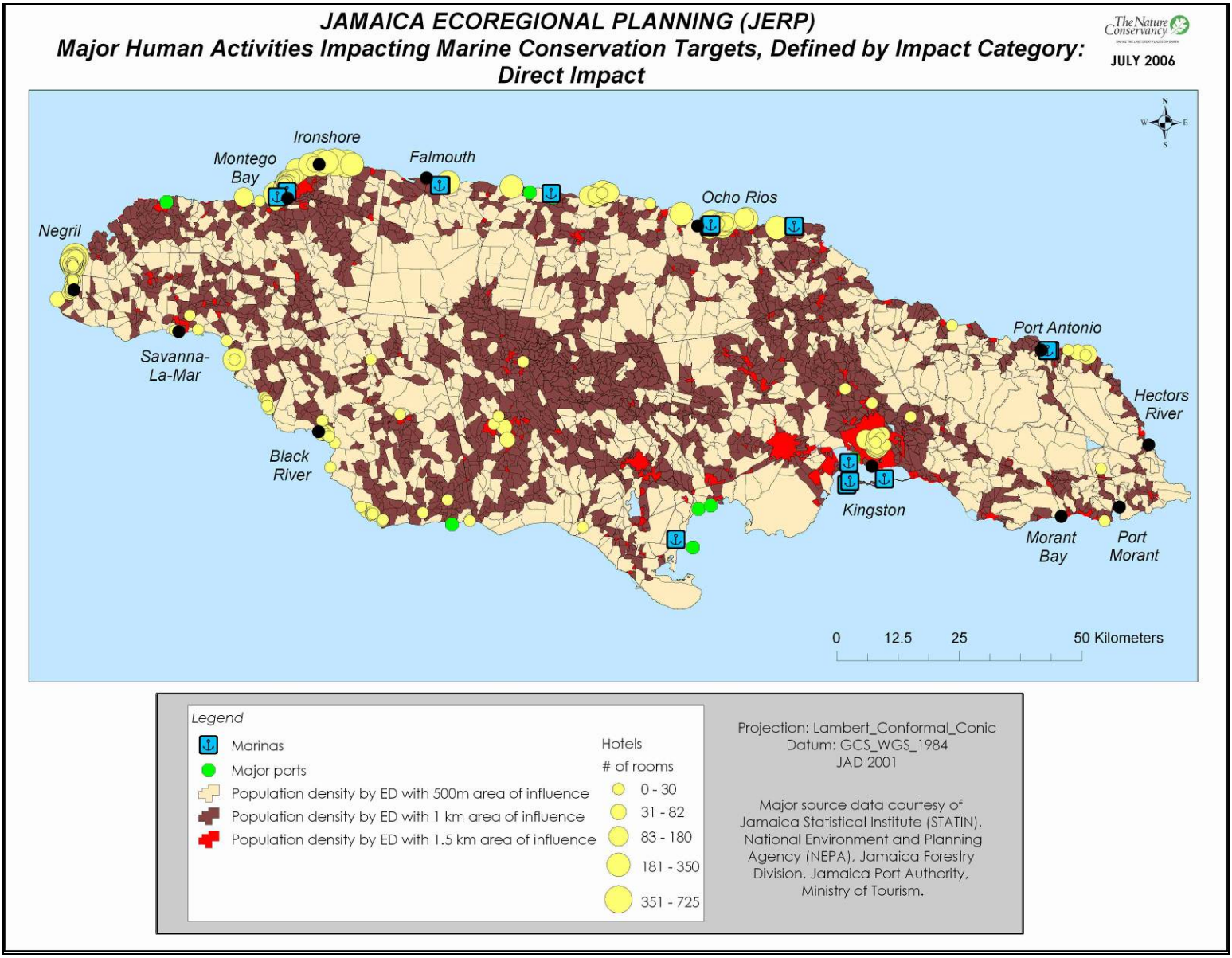
Map 4. Distribution of offshore marine conservation targets in Jamaica, benthic targets and shoreline targets and cays.



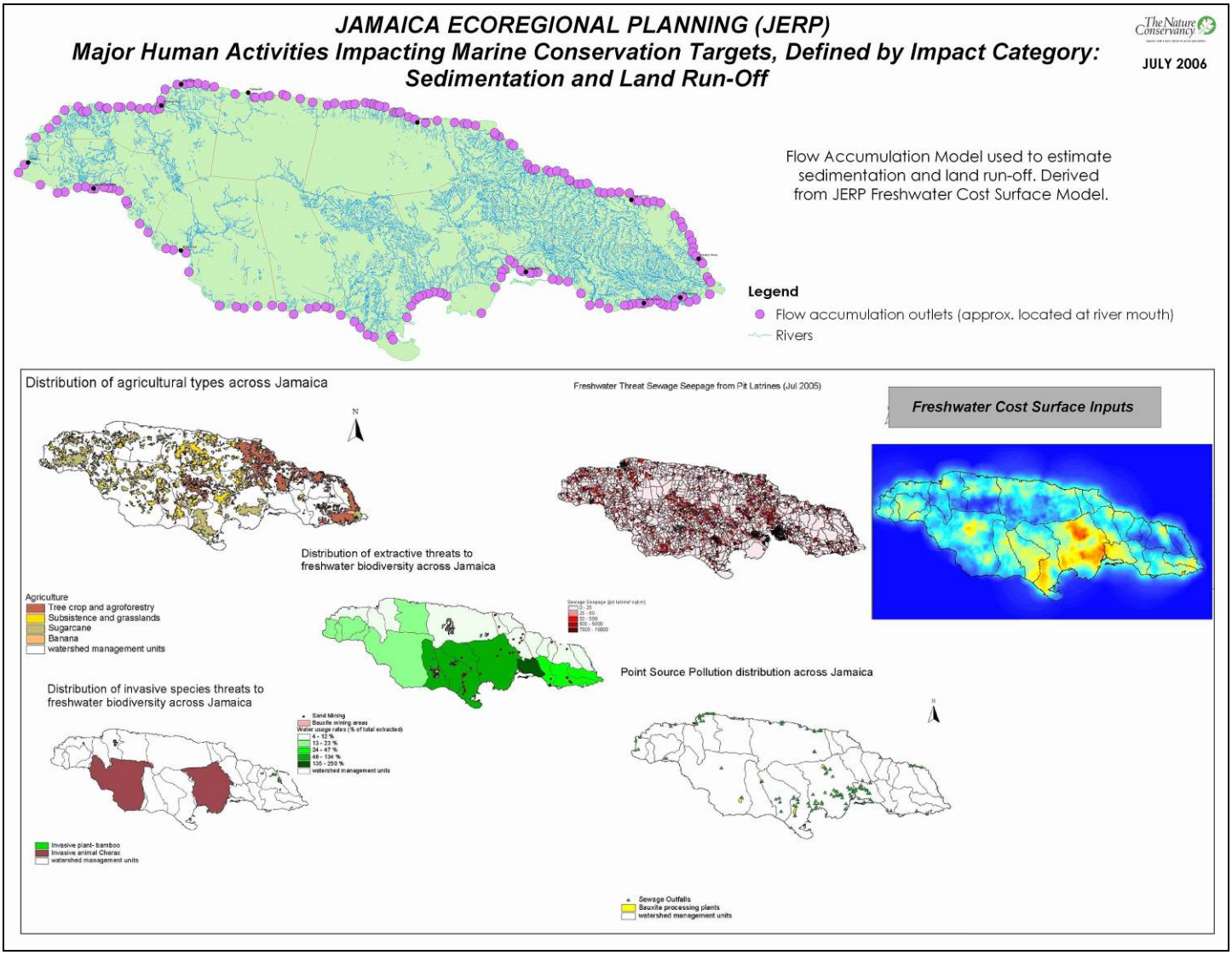
Map 5. Threat distribution as defined by category – Contamination.



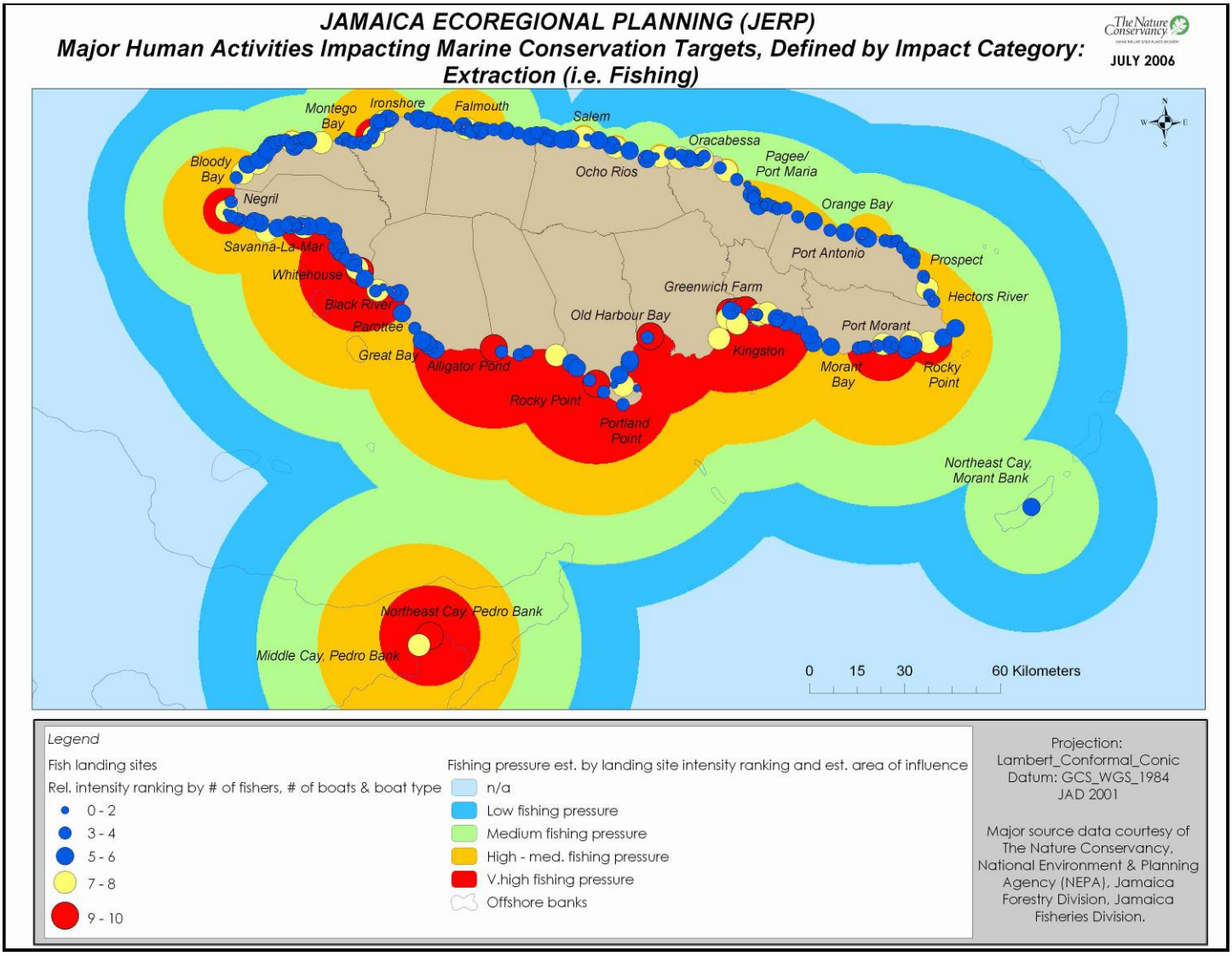
Map 6. Threat distribution as defined by category – Direct impact.



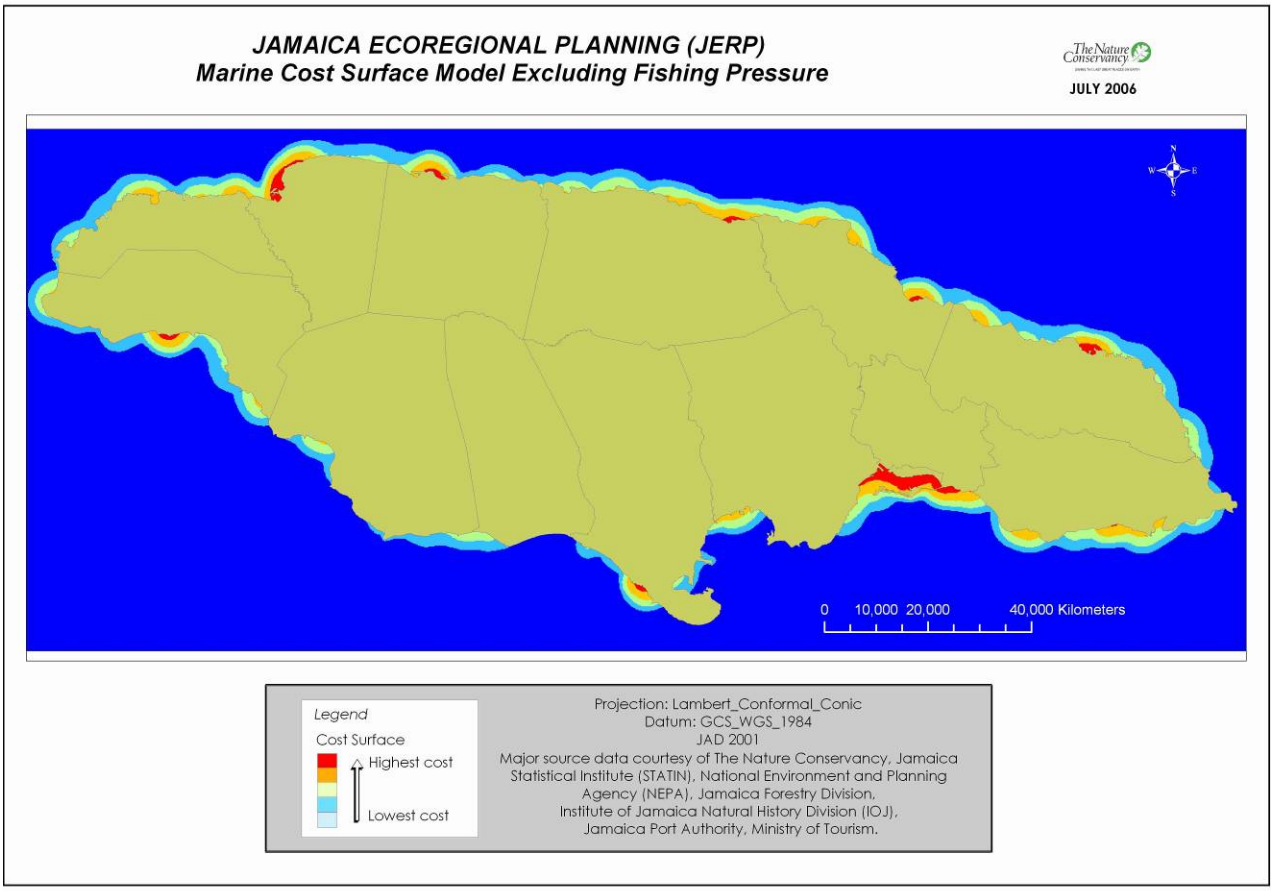
Map 7. Threat distribution as defined by category – Sedimentation and land run-off.



Map 8. Threat distribution as defined by category – Extraction (fishing).



Map 9. Cost Surface without fishing activity.



Map 10. Important areas (prioritized) for national marine conservation as identified by the JERP analysis.