

Economic Valuation of the Montego Bay Marine Park

Methodology Test Cases



Presenter:
Brian L. Zane

- What?
 - A means to estimate the value of environmental resources
- How?
 - Different methodologies exist
 - Total economic value = direct-use value + indirect-use value + non-use value
 - Direct – Earnings dependent on the resource (tourism, fishing)
 - Indirect – biological support, physical protection
 - Non-Use – option/existence, general knowledge that a resource will still be in place for the next generation
- Why?
 - Consider Conservation vs Development...
 - Development quantified in economic terms; Conservation traditionally qualified in qualitative or scientific terms.
 - Economic Valuation provides us with a means to present environmental values in the same way development projects are presented.
 - Apples for Apples

Economic Valuation

- *Complete three economic valuation methodologies*
- *Garner peer input*
- *Feed outputs into national/international databases*
- *Adjust tools?*
- *Promote wide-scale adoption of selected methodology*

Purpose of the exercise

| Methodology | Source |
|--|---------------------------|
| 1. Value Transfer - Spatial Distribution of Ecosystem Service Values | Troy/Wilson |
| 2. Coral Reef Valuation - Tourism & Recreation | World Resources Institute |
| 3. Coral Reef Valuation - Fisheries | World Resources Institute |



Coral Reef Valuation Tool (v2.0)
 A tool to guide the economic valuation of goods and services from coral reefs

Tourism and Recreation Component

Main Menu
 Project Description

Developed at the World Resources Institute

In collaboration with Buccoo Reef Trust, Caribbean Natural Resources Institute, Institute of Marine Affairs, University of the West Indies-Sustainable Economic Development Unit, and the Government of St. Lucia.

The Valuation Tool and Manual were developed through the generous support of the John D. and Catherine T. MacArthur Foundation, the United Nations Environment Program – Caribbean Environment Program, the Ocean Foundation, the Oak Foundation, the Henry Foundation, the Curtis and Edith Munson Foundation, the Netherlands Ministry of Foreign Affairs, SwedBio, the Chino Cienega Foundation, the International Coral Reef Action Network and the Buccoo Reef Trust.

PLEASE NOTE:
 By using the Coral Reef Valuation Tool you agree to be bound by all of the terms and conditions stated in the License Agreement. To view the terms of use and limitation of liability [click here](#).

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Fisheries Component

Main Menu
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Photo: K. Desai

The Methodologies

Similarities

- 1) **Purpose/Intent** – Quantify the financial value/contribution of ecosystem services towards the local economy

Differences

- 1) **Scope** – Coral Reef specific vs All habitats
- 2) **Medium** – Graphic vs Numeric
- 3) **Inputs** – Research vs indigenous knowledge
- 4) **Scenarios** – Dynamic analysis vs static assessment

Methodology Comparison

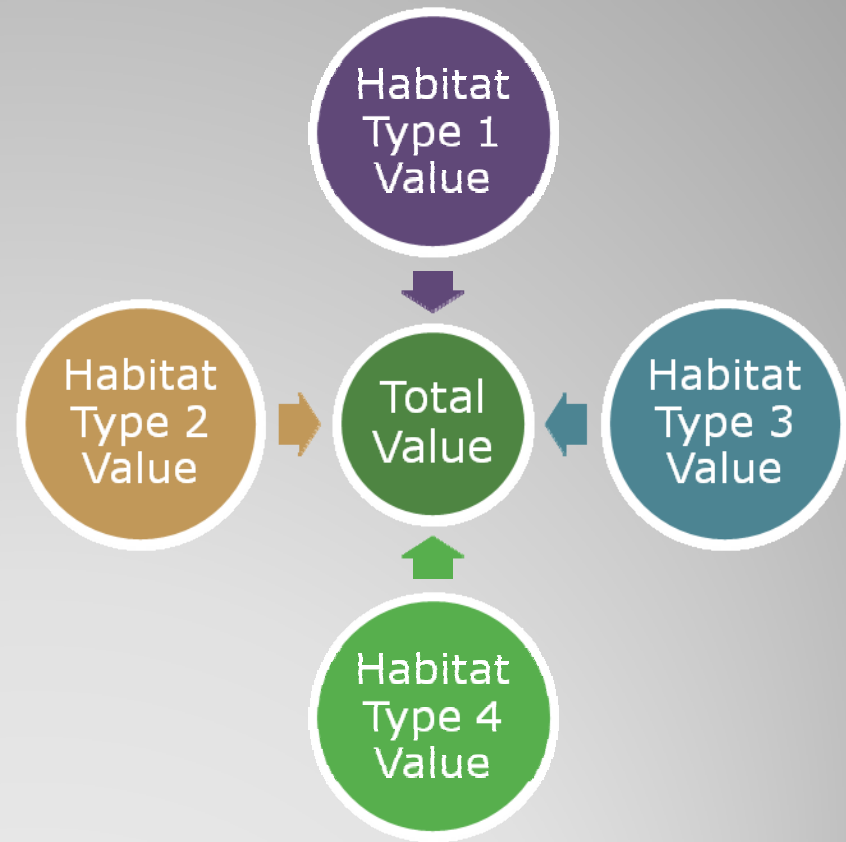


Value Transfer

Adapted from: Austin Troy, Matthew A. Wilson
ECOLOGICAL ECONOMICS

Mapping ecosystem services: Practical Challenges and opportunities
in linking GIS & Value Transfer

- Values of different habitats are determined
- Habitat areas are calculated using GIS
- Total ESV is determined by combining values



Theory

Process

- GIS used to outline ecological resource types
- Spreadsheets to multiply resource area against multiplier (\$ contribution/hectare/yr)

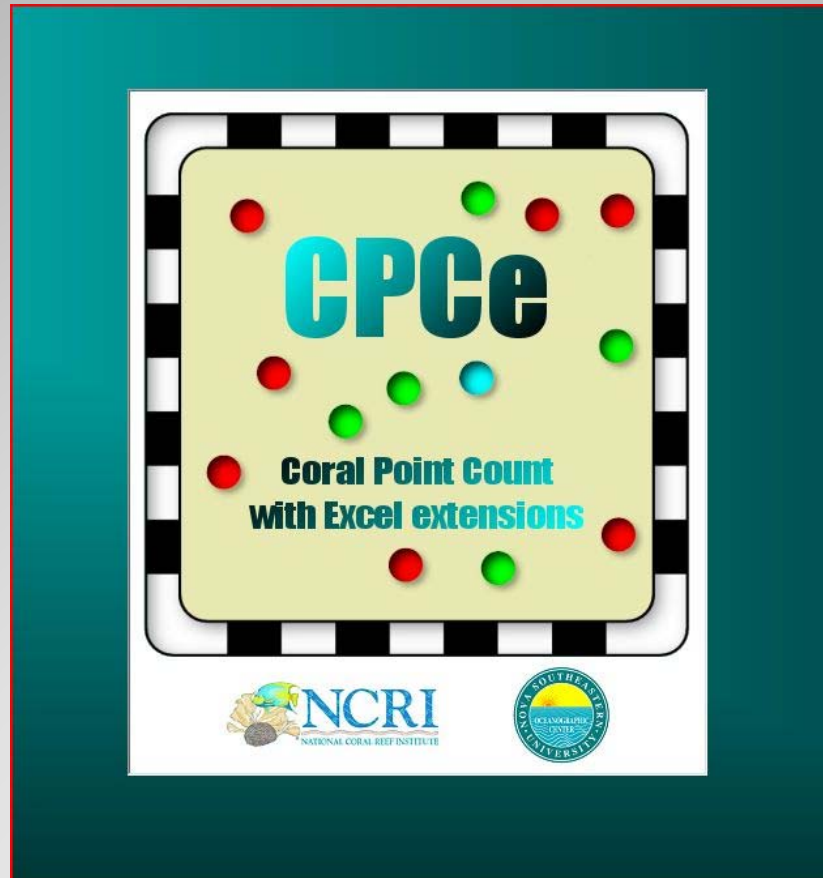
Strengths

- Relative Simplicity
- Tools - Open source (Coral Point Count) vs Commercial (Google Earth Pro; ESRI)
- Data - Not heavily dependent upon external data sources - *"involves the adaptation of existing valuation information to new contexts where valuation data is absent or limited"*
- Visual outputs - Graphic outputs readily interpreted and multi-purposed

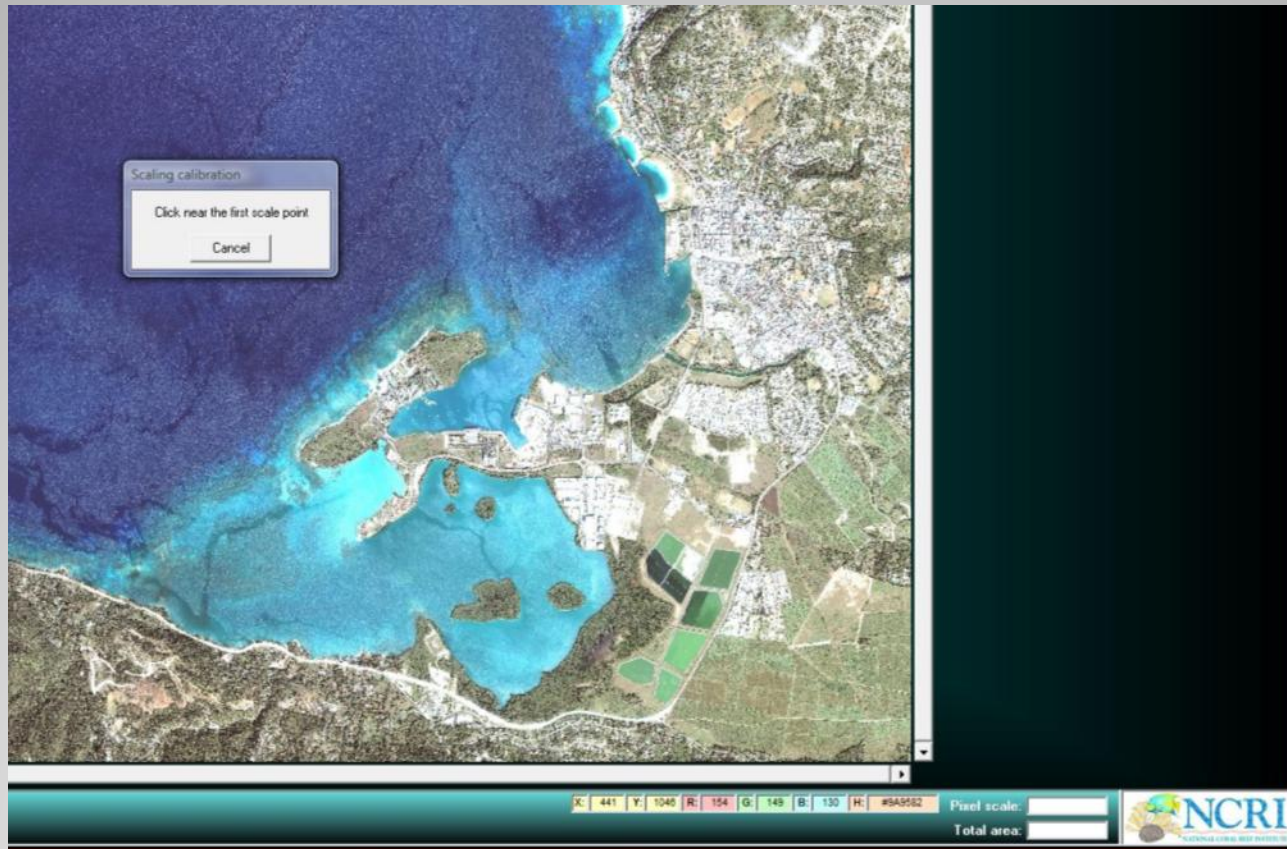
Weaknesses

- Value Multipliers not universally applicable
- Development of new multipliers is an extensive undertaking

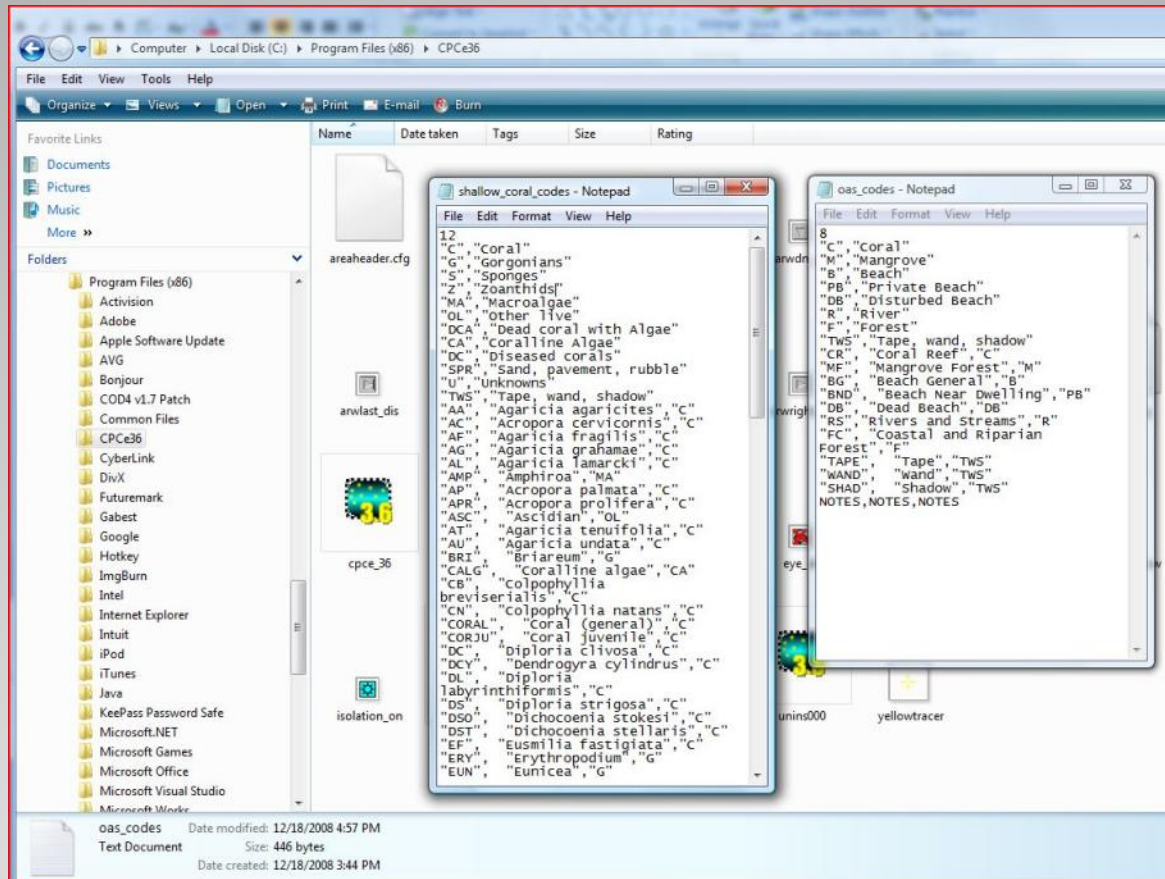
Overview



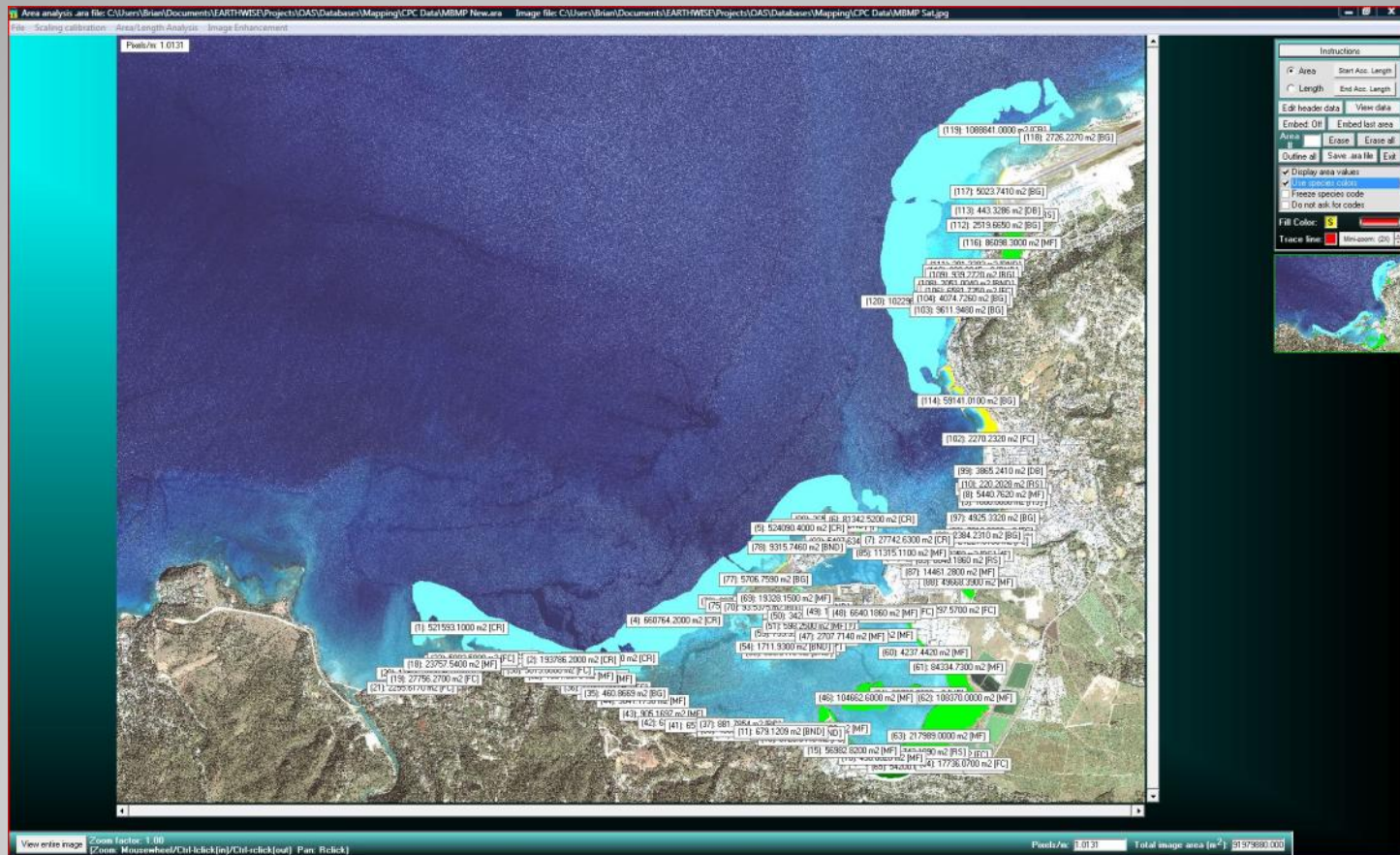
Coral Point Count



Calibrate



Create categories

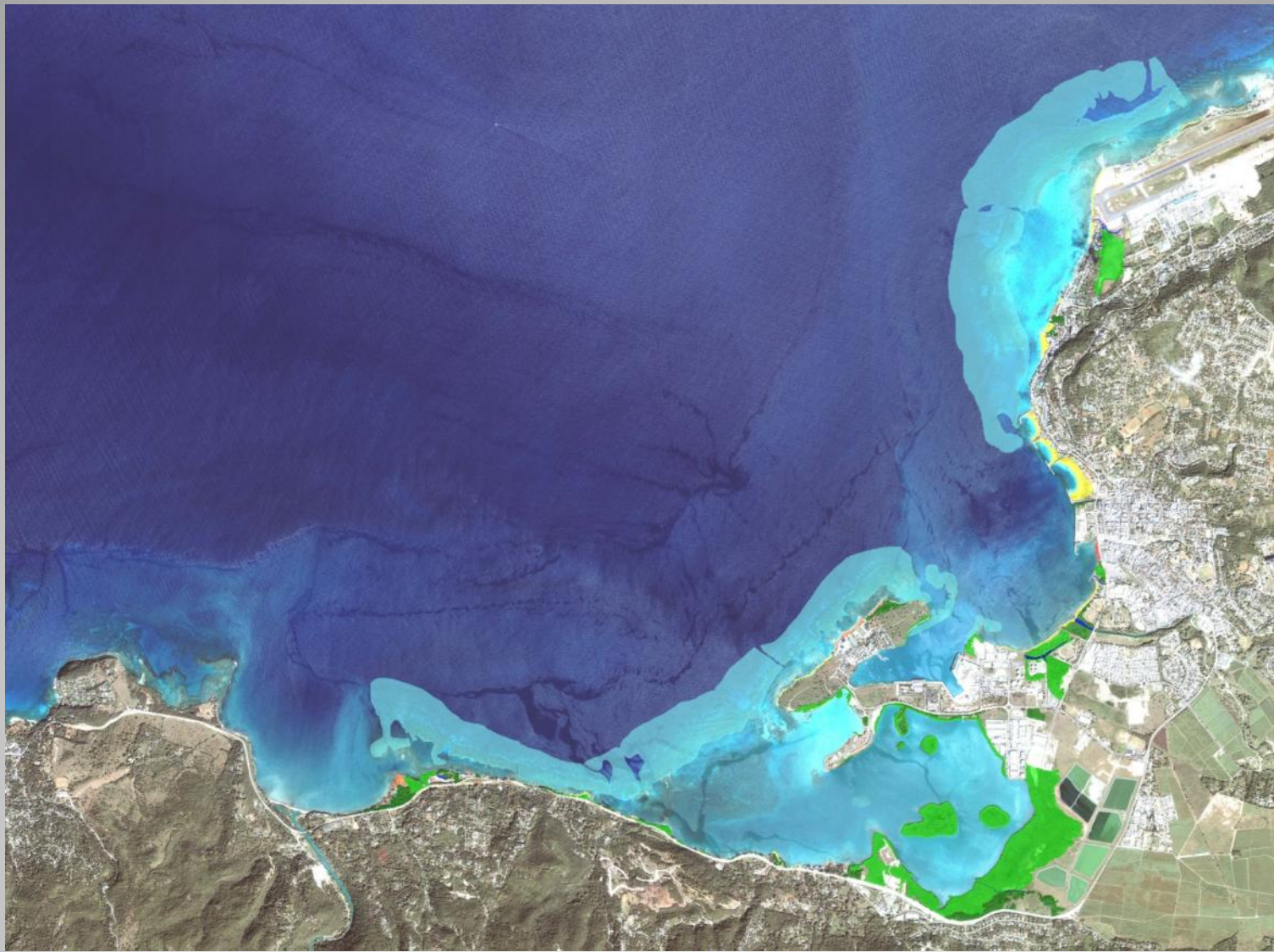


Outline Areas

The screenshot displays a GIS application window with a map at the top and a data table below. The table lists various land use areas with their respective codes and details.

| AREA # | SPECIES | SPECIES CODE | MASTER AREA | AREA | INT. AREA | EXT. AREA | NET AREA | COMMENTS |
|--------|-----------------------------|--------------|--------------|--------------|-----------|-----------|--------------|--|
| 81 | Coastal and Riparian Forest | FC | 17835 4500 | 17835 4500 | | | 17835 4500 | Seawards, ne |
| 82 | Mangrove Forest | MF | 5407 5340 | 5407 5340 | | | 5407 5340 | Seawards, se |
| 83 | Beach General | BG | 789 2223 | 789 2223 | | | 789 2223 | Seawards, ne point |
| 84 | Mangrove Forest | MF | 59796 2900 | 59796 2900 | | | 59796 2900 | Bogue Lagoon, Island 4 |
| 85 | Mangrove Forest | MF | 11315 1100 | 11315 1100 | | | 11315 1100 | Cruise Terminal north |
| 86 | Coastal and Riparian Forest | FC | 11292 5700 | 11292 5700 | | | 11292 5700 | Police Station South |
| 87 | Mangrove Forest | MF | 14461 2900 | 14461 2900 | | | 14461 2900 | Fuel Depot |
| 88 | Mangrove Forest | MF | 45668 3000 | 45668 3000 | | | 45668 3000 | Police Station North |
| 89 | Rivers and Streams | RS | 6640 1860 | 6640 1860 | | | 6640 1860 | River to police station (river or estuary, name) |
| 90 | Beach General | BG | 3911 0550 | 3911 0550 | | | 3911 0550 | Beach near HCB Park |
| 91 | Mangrove Forest | MF | 33157 0800 | 33157 0800 | | | 33157 0800 | Sunfest Grounds |
| 92 | Beach General | BG | 1503 4200 | 1503 4200 | | | 1503 4200 | Fuel Depot, west |
| 93 | Beach General | BG | 2304 2310 | 2304 2310 | | | 2304 2310 | Montego River Valley |
| 94 | Coastal and Riparian Forest | FC | 21221 3100 | 21221 3100 | | | 21221 3100 | Montego River Valley, riparian mixed forest and brush |
| 95 | Rivers and Streams | RS | 4831 7940 | 4831 7940 | | | 4831 7940 | Montego River |
| 96 | Coastal and Riparian Forest | FC | 7319 3060 | 7319 3060 | | | 7319 3060 | Montego River Valley, riparian mixed forest/brush, North |
| 97 | Beach General | BG | 4925 3320 | 4925 3320 | | | 4925 3320 | River Bay Fishing Village, points south |
| 98 | Coastal and Riparian Forest | FC | 2307 2570 | 2307 2570 | | | 2307 2570 | River Bay Craft Village |
| 99 | Dead Beach | DB | 3885 2410 | 3885 2410 | | | 3885 2410 | Dead Beach south of Dame Gully outfall |
| 100 | Dead Beach | DB | 286 4585 | 286 4585 | | | 286 4585 | Railway Lane gully outfall |
| 101 | Coastal and Riparian Forest | FC | 2054 8010 | 2054 8010 | | | 2054 8010 | Low coastal brush north of River Bay Craft Village |
| 102 | Coastal and Riparian Forest | FC | 2270 2320 | 2270 2320 | | | 2270 2320 | North Gully, south |
| 103 | Beach General | BG | 9611 9480 | 9611 9480 | | | 9611 9480 | Doctor's Lane Beach |
| 104 | Beach General | BG | 4074 7260 | 4074 7260 | | | 4074 7260 | Conwall Beach |
| 105 | Coastal and Riparian Forest | FC | 3276 7340 | 3276 7340 | | | 3276 7340 | Conwall Beach mixed |
| 106 | Coastal and Riparian Forest | FC | 6591 7250 | 6591 7250 | | | 6591 7250 | Groynesend |
| 107 | Beach General | BG | 336 1502 | 336 1502 | | | 336 1502 | Greenwood beach area |
| 108 | Beach Near Dwelling | BND | 2051 0040 | 2051 0040 | | | 2051 0040 | Decarneron |
| 109 | Beach General | BG | 939 2720 | 939 2720 | | | 939 2720 | Sandals Inn |
| 110 | Beach Near Dwelling | BND | 269 8945 | 269 8945 | | | 269 8945 | Dead End Private |
| 111 | Beach Near Dwelling | BND | 291 3302 | 291 3302 | | | 291 3302 | Dead End Private (north) |
| 112 | Beach General | BG | 2519 6650 | 2519 6650 | | | 2519 6650 | Buccaners Beach |
| 113 | Dead Beach | DB | 443 3286 | 443 3286 | | | 443 3286 | Airport outfall, south |
| 114 | Beach General | BG | 591 41 0100 | 591 41 0100 | | | 591 41 0100 | Hospital, Aqueduct and Dump Up Beaches |
| 115 | Rivers and Streams | RS | 4382 5200 | 4382 5200 | | | 4382 5200 | Airport Entryway |
| 116 | Mangrove Forest | MF | 86098 3000 | 86098 3000 | | | 86098 3000 | Airport marsh wetland lagoon |
| 117 | Beach General | BG | 5023 7410 | 5023 7410 | | | 5023 7410 | Airport |
| 118 | Beach General | BG | 2726 2270 | 2726 2270 | | | 2726 2270 | North-east boundary |
| 119 | Coral Reef | CR | 1086841 0000 | 1086841 0000 | | | 1086841 0000 | Airport Reef |
| 120 | Coral Reef | CR | 1022969 0000 | 1022969 0000 | | | 1022969 0000 | Vale and points north-south |
| 121 | Mangrove Forest | MF | 18507 7500 | 18507 7500 | | | 18507 7500 | Bogue Lagoon, Island 4 |
| 122 | Mangrove Forest | MF | 33463 0300 | 33463 0300 | | | 33463 0300 | Bogue Lagoon, rv border |
| 123 | | | 16712 0300 | 16712 0300 | | | 16712 0300 | |

Define Areas

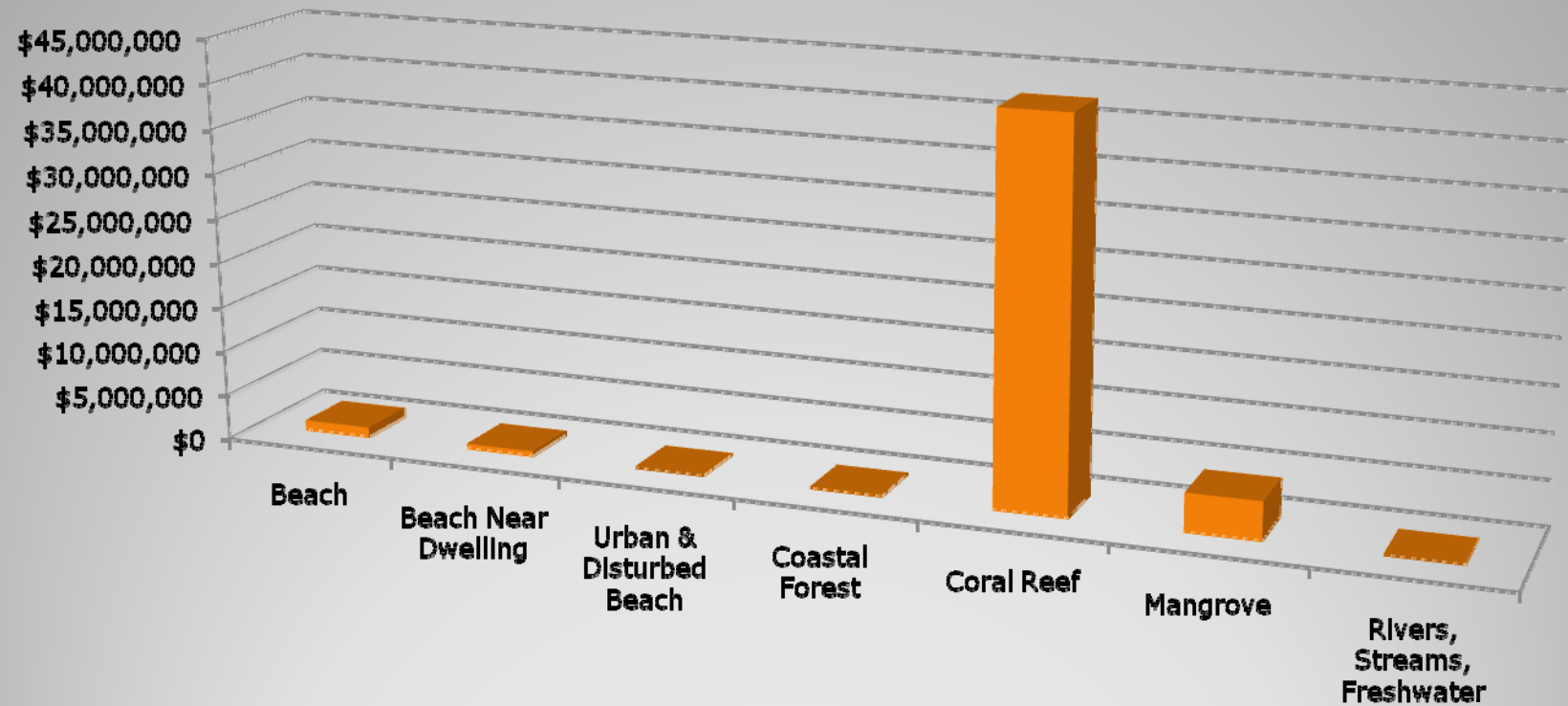


Value Transfer - Results

| Ecosystem Type | \$/ha/yr | Total Hectares | Total Contribution |
|--|-----------------|-----------------------|---------------------------|
| Beach | \$88,000 | 10.92 | \$960,849.54 |
| Beach Near Dwelling | \$117,000 | 3.47 | \$405,493.69 |
| Urban & Disturbed Beach | \$0 | 0.46 | \$0.00 |
| Coastal Forest | \$1,826 | 23.41 | \$42,749.49 |
| Coral Reef | \$100,000 | 422.27 | \$42,226,522.50 |
| Mangrove | \$37,500 | 108.61 | \$4,072,913.20 |
| Rivers, Streams, Freshwater | \$1,595 | 2.10 | \$3,348.74 |
| MONTEGO BAY MARINE PARK - TOTAL ESV | | | \$47,711,877.16 |

Value Transfer - Results

MBMP Ecosystem Service Values



Distribution of Values

- Pros
 - User friendly
 - Necessary inputs are free and readily accessible
 - Low dependence on external/hard to locate data sources
 - Produces both graphic and numeric results
- Cons
 - Multipliers (values) developed for NE United States
 - Not all local habitats represented
 - Challenging to develop local values, which are critical to the accuracy and validity of the tool

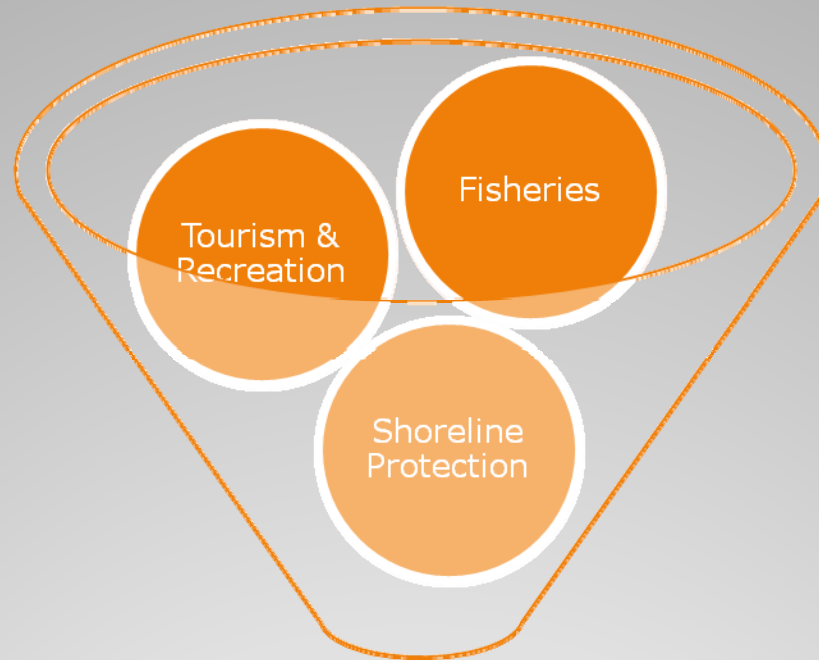
Summary



World Resources Institute

Coral Reef Valuation





**Economic
Valuation of
Coral Reefs**

Theory

Process

- Review spreadsheets & manuals
- Analyze Data requirements
- Collect Data
- Enter data, review results, modify, review, modify...
- Calculate scenarios

Strengths

- Highly detailed results
- Triangulates ESV of coral reefs
- Tools – MS Excel

Weaknesses

- Data - Heavily dependent upon external data sources
- Aspects not yet developed (Coastal Protection)
- Dependencies/Assumptions (built into formulas)
- Complexity reduces probability of widespread adoption

Overview

| Category | Value |
|--|----------------------|
| 1. Accommodation | \$109,425,592 |
| 2. Diving | \$588,430 |
| 3. Snorkeling and Boating | \$6,830,932 |
| 4. Marine Parks | \$0 |
| 5. Other Direct Expenditures - Total Value | \$0 |
| TOTAL DIRECT ECONOMIC IMPACTS | \$116,844,954 |
| 6. Total Indirect (secondary) Impacts (from multipliers) | \$0 |
| TOTAL DIRECT AND INDIRECT IMPACTS | \$116,844,954 |
| 7. Un-captured Value | |
| Local Use of Coralline Beaches | \$2,457,000 |
| Local Use from reef recreation | \$13,650 |
| TOTAL IMPACT OF REEF-RELATED TOURISM AND RECREATION | \$119,315,604 |

Coral Reef Valuation - Tourism

Marine Park Category (Zero Rated) – WHY?

No conventional cost recovery mechanisms (reflected in the tool) are currently implemented in the park.

1. Visitor Fees

- Entrance – No single entry point
- Diving – No fees in place
- Snorkeling – No fees in place
- Concessions – No concessions in operation

2. Vessel Fees

- Entry – Collected & held by Port Authority (no estimate available)
- Mooring – No fees in place

3. Other Fees

- Fishing Permits (Fisheries Division)
- Research Licenses (NEPA)

Areas where Park Manager *has* recuperated operational expenses:

1. Beach Fees

- ~US\$7,000 (3 or 4 disbursements since park inception)

2. Management Fee

- ~US\$40,000/yr (Pegged to management agreement; two years since inception)

3. National Park Trust Fund

- ~US\$25k – 35k (every second/third year depending on interest earned by fund)

Each allocation changes in frequency and amount, and doesn't fit into provided categories and therefore was not included.

Anomalies – Marine Park Revenue

Cruise Ships

- Estimated +150,000 visitors to Montego Bay not accounted for
- Cruise Ship calculations not included; tool not yet developed
- Would push overall valuation figure up

Coastal Protection

- Third valuation tool not yet developed
- Would add critical third figure to overall Coral Reef Valuation figure

Multiplier

- Total Indirect Impacts
- Function did not work

Anomalies - Undervaluation

| Category | Value |
|---|--------------------|
| 1. Commercial Fisheries | \$0 |
| 1a. Fish Processing and Cleaning | \$0 |
| 3. Local Fishing | \$1,128,700 |
| TOTAL IMPACT OF REEF-RELATED FISHING | \$1,128,700 |

Coral Reef Valuation - Fisheries

- Tourism: US\$119,315,604
 - Fisheries: US\$1,128,748
 - Coastal Protection: (N/A)
- \$120,444,352**

WRI Valuation - Totals

- Coral Reef Valuation – Tourism
- Coral Reef Valuation – Fisheries
- Coral Reef Valuation – Coastal Protection

Coral Reef Valuation - Process

| Methodology | Source | Value |
|---------------------------|-------------|-------------------------------|
| Tourism | Spatial | N/A |
| | WRI | US \$119 million |
| | WB | US \$210 – 630 million |
| Fisheries | Spatial | N/A |
| | WRI | \$1,128,748 |
| | WB | US (\$1.66m) – \$7.49 million |
| Coastal Protection | Spatial | N/A |
| | WRI | N/A |
| | WB | US \$65 million |
| Value Transfer | Troy/Wilson | US\$47 million |

Results Comparison

- Preferred Methodology?
- Data Requirements
 - Sources
 - Relevance
 - Date
- Considerations for broader use
 - Stakeholders
 - Results Sharing
 - Database Integration
 - Willingness, Value, Application, Acceptance

Discussion

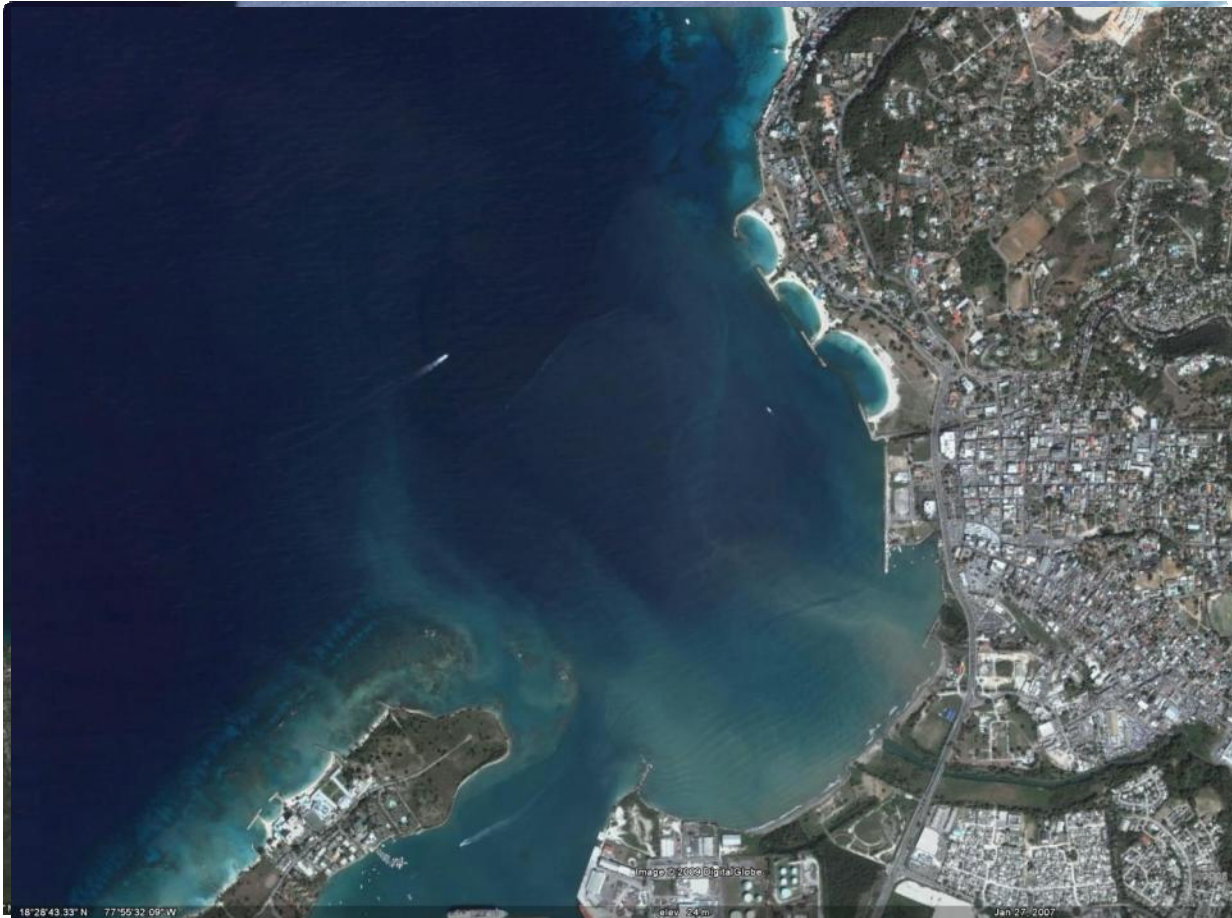
Thank you!

Brian L. Zane

| Methodology | World Bank | WRI | Value Transfer |
|--------------------|---------------------------|---------------|----------------|
| Tourism | \$210 – 630 million | \$119 Million | N/A |
| Fisheries | (\$1.66) – \$7.49 million | \$1,128,748 | N/A |
| Coastal Protection | \$65 million | N/A | N/A |
| | | | |
| Value Transfer | N/A | N/A | US\$47 million |
| | | | |

* All figures in US Dollars

Results Comparison (Alt. View)



1. Marine Park
2. Bogue Lagoon – Fish Sanctuary
3. Western Boundary of Park (Great River outflow – sediment plume)
4. Urban Gully influences

Montego Bay Marine Park Distinct Features - Google Earth

Brian L. Zane



Bogue Lagoon prior to
construction
Freeport during
construction
Cruise Terminal
Freeport/Lagoon
1990s

Historical Perspectives

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