Belize Sustainable Ocean Plan

Welcome to

Belize Sustainable Ocean Plan

Belize Sustainable Ocean Plan Geospatial Workshop

Utilizing SeaSketch and Marxan

Date: April 14 – April 16, 2025

Location: Toucan Room, Belize Biltmore Plaza, Belize City, Belize

This is brought to you by

Belize Sustainable Ocean Plan

in partnership with

BELIZE COASTAL ZONE MANAGEMENT AUTHORITY & INSTITUTE

The Nature Conservancy Belize

Belize Fund For A Sustainable Future

BLUE BOND and Finance Permanence Unit
OFFICE of the PRIME MINISTER

House Keeping

Phones & Devices

Please silence phones and devices during sessions.
Laptops/tablets welcome for note-taking and workshop tasks.

Break Times

Morning Break: 10:30 – 10:45 AM
Lunch Break: 12:00 – 1:00 PM (Lunch provided)
Afternoon Break: 3:30 – 3:45 PM

Wi-Fi Access

Free Wi-Fi available. Details will be shared at your tables

Restrooms

Restrooms are located outside.

House Keeping

Phones & Devices

Please silence phones and devices during sessions.

Laptops/tablets welcome for note-taking and workshop tasks.

Engagement

Please participate actively in all activities.

Group discussions and team tasks are key parts of the workshop.

Feedback

Daily feedback forms will be shared.

Health & Safety

Please follow venue health protocols.

If you feel unwell, inform a facilitator privately.

Belize Sustainable Ocean Plan

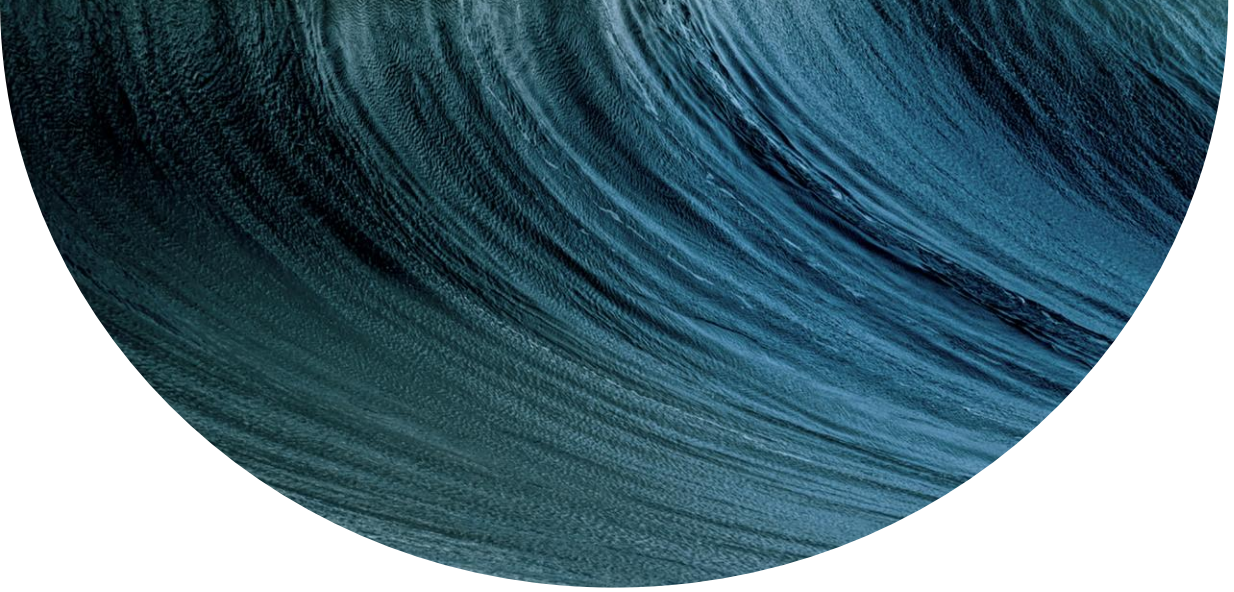
Day 2: SeaSketch & Marxan

Belize Sustainable Ocean Plan Geospatial Workshop

Date: April 15, 2025

GROUND RULES FOR PARTICIPATION

1. **Assume Positive Intent** – We're here to co-create, not compete.
2. **One Mic, Many Voices** – Let's ensure everyone can speak.
3. **Use the Parking Lot** – If a discussion is deep but off-topic, we'll note it and revisit if time allows.
4. **Yes, And...** – Encourage building on each other's ideas
5. **Embrace Learning and Discomfort** – Some sessions will be new or technically complex; let's help each other through.
6. **Be Present** – Phones on silent, laptops for workshop tasks only.
7. **Respect Time and Process** – Stick to time slots, rotation rules, and prompt transitions.



TECH CHECK!

Everyone should have:

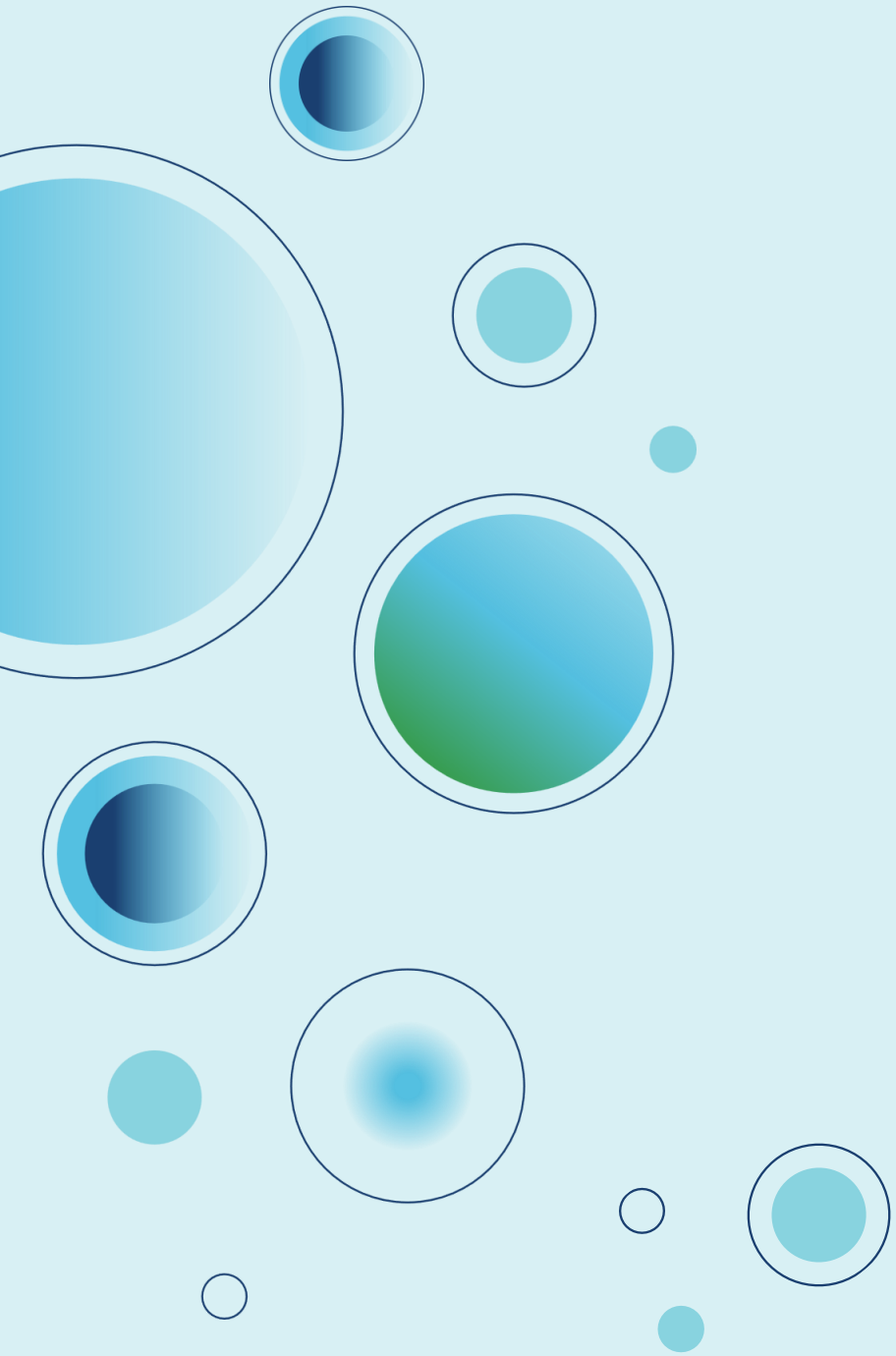
- A laptop
- Wifi Connection OK?
- Access to digital resources and any pre-read materials
- Power cable

Please raise your hand now if you need assistance!

DAY 2 - AGENDA

Focus: Deepen tool use, explore use cases, and gather stakeholder input

Time	Session	
8:45 am	**Doors Open, Networking**	
9:15 am	**Day 1 Recap & Overview of Day 2**	"What ocean feature are you?" metaphor
9:30 am	**SeaSketch as a Facilitation Tool**	Stakeholder role-play using tools for decision-making
11:30 am	**Activity Reflection**	Discuss trade-offs, facilitation challenges
12:00 pm	**Lunch**	
1:00 pm	**Marxan Review**	
1:30 pm	**Conservation Features Overview**	
2:00 pm	**Activity: Identify Conservation Features and Targets**	
3:30 pm	**Coffee Break**	
3:45 pm	**Activity: Results Discussion**	Small group rounds (e.g., World Café) on key topics: Conservation features Target setting Planning priorities
4:30 pm	**Wrap up: Question & Answer Reflection**	
5:00 pm	**Adjourn**	Visual synthesis and sticky-note feedback



Belize Sustainable Ocean Plan

Day 2: SeaSketch & Marxan

Belize Sustainable Ocean Plan
Geospatial Workshop

April 15, 2025

Day 1 Recap and Agenda Updates

April 15, 2025
9:15 – 9:30

Session Goal:

- Reflect on Day 1 takeaways, align expectations for Day 2.

Share Feedback

Expected Outcome:

ACTIVITY

MAPPING CONNECTIONS

Instructions: (5 Mins)

- **Ocean Metaphor:** Write on your sticky note: What part of the ocean or coast best represents your role in this project, and why?
  - **Example: I'm the coral reef — I support diverse perspectives**
  - **Example: I'm a satellite — I help see the big picture**
- **Five volunteers** will share with the group

ACTIVITY

Let’s Hear From You

Instructions: (5 mins)

- **Small Group Check-In:** In pairs or trios, discuss and write **as it relates to SeaSketch**:
  - What was a highlight from Day 1?
  - What's one thing you're still unclear about?
  - What do you hope we address today?
- **Place your sticky notes on the wallboard**

SeaSketch as a Facilitation Tool

April 15, 2025
9:30-11:30

Session Goal:

- Provide training on how to use SeaSketch Planning tool to facilitate conversations around marine zone design.

Understand how SeaSketch can be used in the context of stakeholder outreach and engagement to facilitate conversations around planning and siting high and medium biodiversity protection zones.

Expected Outcome:

ACTIVITY

Facilitated Mapping 1hr

Objective: Learn to facilitate sketching in a small group setting. **Using the forums** to capture all the nuances of the.

Instructions: (5 Mins): Get into **groups of 3**.

- **Roles:** 1 facilitator, 2 stakeholders - you decide which sector. **Facilitator will also serve as recorder and presenter.**

Facilitated Mapping 1hr

1. **Choose an MSP** in SeaSketch to use for this activity.
2. **Facilitator** opens the MSP and **guides the team** through reviewing the MSP, **noting key observations**.
3. **Run the MSP report.** Review and note **what is present, missing, or unclear**.
4. **Identify 1–2 improvements** you would make to the MSP.
5. **Edit the MSP** to reflect these changes. **Rename** the title to include the facilitator's name and (edited) (e.g., *Virginiaebacalarchico (edited)*).
6. **Bookmark** the updated geography.
7. **Upload the bookmark and collection** to your message in ***Workshop 2025 Session forum/Facilitated Discussions.*** *In your post, explain: Changes made, team's rationale, Any additional notes or recommendations.*

World Café 1: Peer Review 1hr

Instructions:

1. Select another group's MSP
2. Look for strengths and weaknesses of the group's MSP analysis
3. **What would you improve or include in the MSP analysis?**

Coffee Break

10:30 – 10:45

Reflections and Report Out

April 15, 2025
11:30 – 12:00

Session Goal:

- Reflect and capture participant insights on group dynamics, trade-offs, and challenges.

Share Feedback

Expected Outcome:

REFLECTIONS AND REPORT OUT

- Participate in **large-group discussion** on:
  1. What was challenging about facilitating planning dialogue?
  2. What kinds of trade-offs came up?
  3. How did your role influence your approach?
- Highlights captured in three categories:
  1. Facilitation Wins
  2. Planning Challenges
  3. Sector Trade-offs

Lunch 11:30

We Return at 12:45

ACTIVITY

ICEBREAKER:

Instructions: (10 Mins)

- Each person will get a piece of ribbon
- Tie the ribbon to the marker
- Write the word **OCEAN** WITHOUT touching the marker

Table Check-Ins

- Any Materials needed
- Temperature of the Groups
- Log in and Tool Check
- Any Concerns or Questions before we proceed

DAY 2 AFTERNNOON SEGMENT

Focus: Deepen tool use, explore use cases, and gather stakeholder input

Time	Session	
12:00 pm	**Lunch**	
1:00 pm	**Marxan Review**	
1:30 pm	**Conservation Features Overview**	
2:00 pm	**Activity: Identify Conservation Features and Targets**	
3:30 pm	**Coffee Break**	
3:45 pm	**Activity: Results Discussion**	Small group rounds (e.g., World Café) on key topics: Conservation features Target setting Planning priorities
4:30 pm	**Wrap up: Question & Answer Reflection**	
5:00 pm	**Adjourn**	Visual synthesis and sticky-note feedback

Marxan Review

April 15, 2025
1:00 – 11:45

Session Goal:

- Provide an overview of Marxan, how it is used in MSP, the plan for using Marxan in BSOP, and an overview of the decisions needed during this workshop.

Understanding how and why Marxan will be used in the BSOP process and how they will help contribute to next steps.

Expected Outcome:

Presenter:

Kate Longley-Wood

Marine Spatial Planning Science Manager – TNC Global

Kate provides technical and process support for MSP efforts across the globe including Belize, Barbados, Seychelles, Gabon, and Kenya.

MSP Presents Us With Spatial Decision Problems

Characteristics of spatial decision problems:

- **Many alternatives**, and decisions are often surrounded by uncertainty
- Each alternative is evaluated on the basis of **multiple criteria**
- **Consequences** of the decision alternatives are spatially variable
- Some of the criteria are **qualitative** others **quantitative**

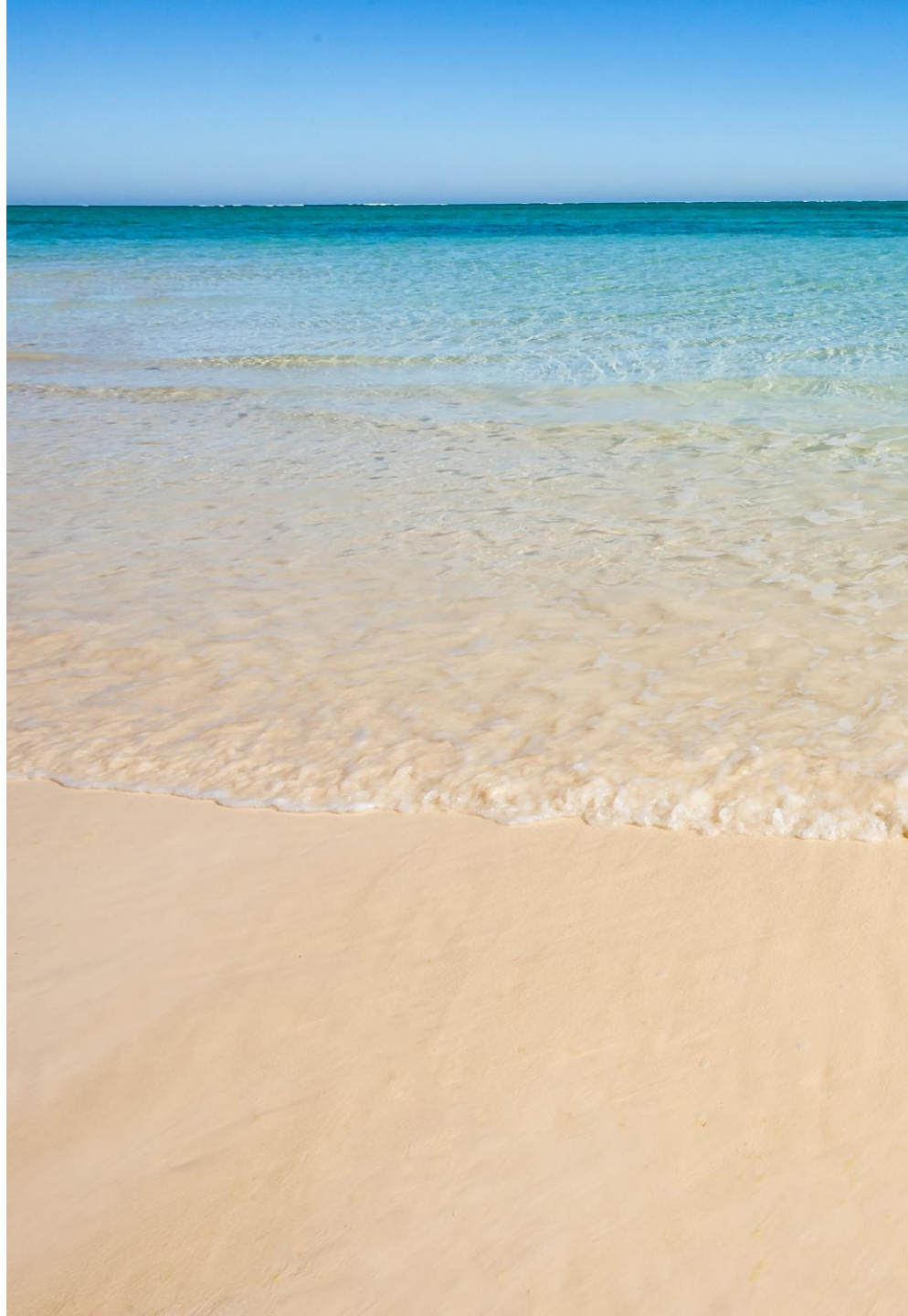
MSP Presents Us With Spatial Decision Problems

Characteristics of spatial decision problems:

- More than one decision maker (or interest group) involved in the decision-making process
- Decision makers have **different preferences** on evaluation criteria and decision consequences

Key Questions

- How well do existing spatial plans contribute to the protection of key values?
- What are the key **gaps** in protection of valued components of the land/seascape?
- Which areas meet our criteria as priorities for protection in order to fill these gaps? **Why?**



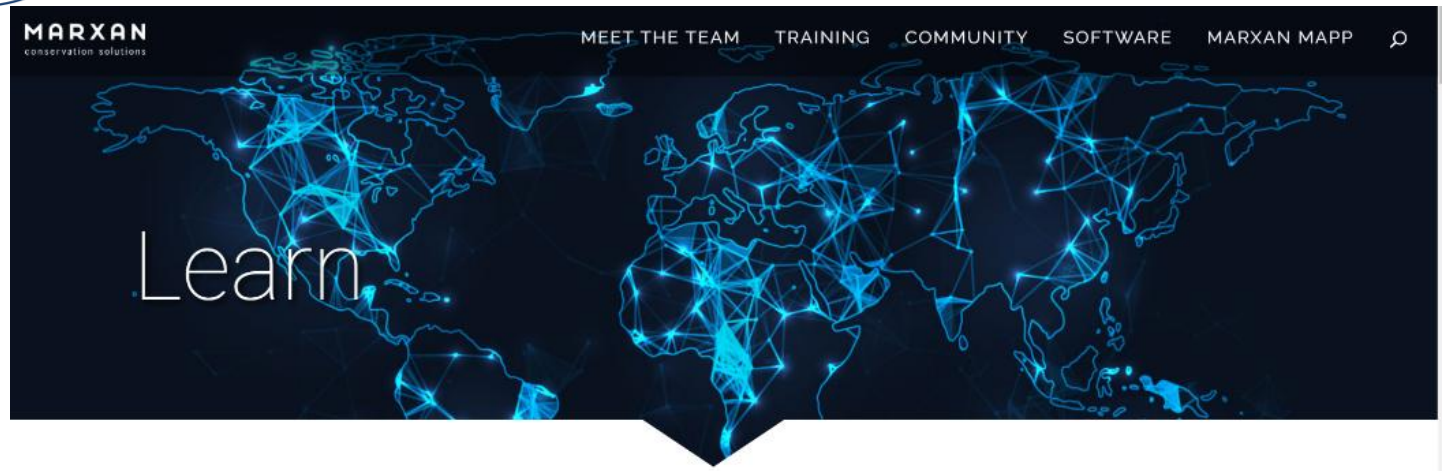
How Can Marxan Help?

A Data Exploration Tool for Systematic Conservation and Multi-Objective Planning:

- Uses **Spatial Optimization** to meet quantitative goals for representation of biodiversity and human uses.
- Supports **integration** of diverse data sets to represent values and priorities in a transparent manner

How Can Marxan Help?

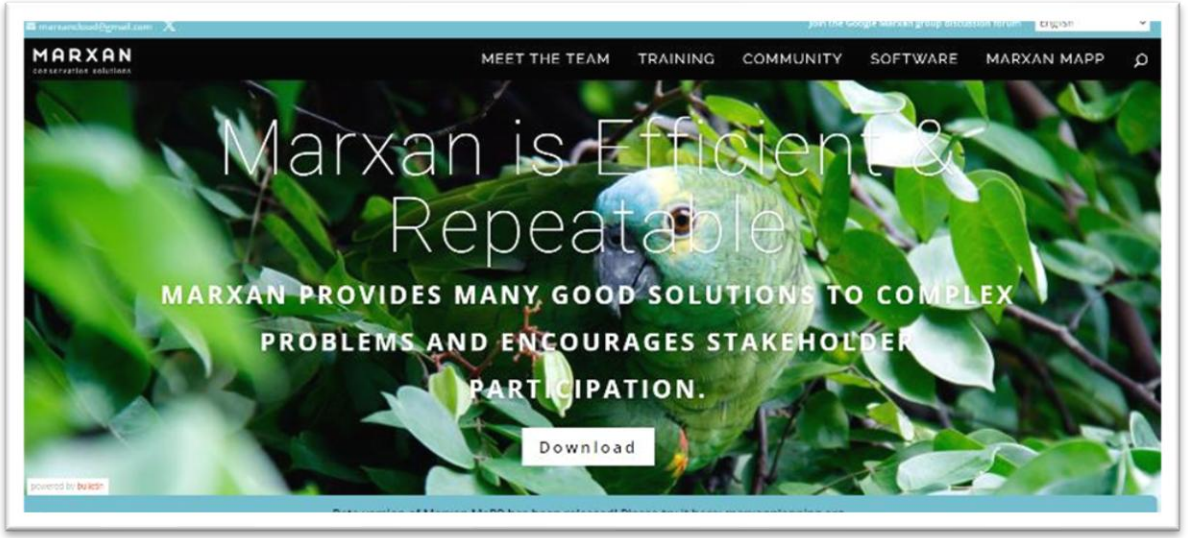
- Useful for **scenario development** and testing of assumptions
- Represents a **global best practice** in conservation and sustainable use planning



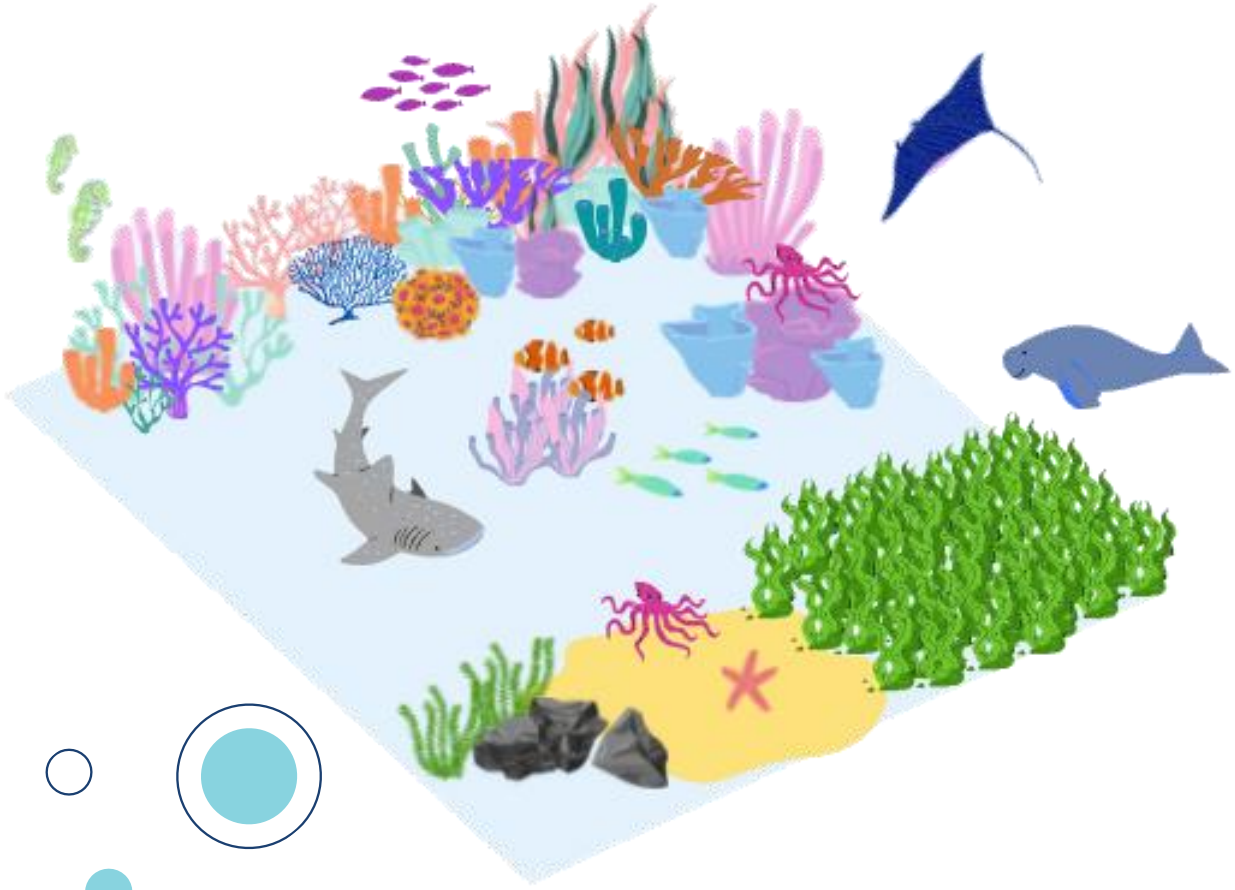
How Can Marxan Help?

Learning Resources: (MarxanSolutions.org)

- What is Marxan?
- A Framework for Systematic Conservation Planning
- Scenario Development
- Gap Analysis
- Costs and Planning Units



How Does Marxan Work?



Marxan attempts to identify locations within the planning area that **represent conservation features** at desired target levels while **minimizing overall cost**.

- Marxan utilizes optimization algorithms that act on our integrated database of values.
- Marxan outputs are based on algorithms that analyze data, it is not a “model.

In a nutshell... *Marxan attempts to find spatial representation solutions that* ***minimize 3 types of "costs"****, each potential solution is ranked by a composite score.*

Why is Marxan Useful?

- Enables a project team to *systematically* assign **spatially-explicit goals** to meet specified planning objectives

- **Spatial efficiency** is built into the modeling framework - Maximizes spatial representation of values while minimizing user-defined "costs"

- ***E.g. human activities, overall area selected, etc). Ideally, this minimizes conflicts between stakeholders.***

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MARXAN conservation solutions

Why is Marxan Useful?

- Highlights hotspot areas for simultaneous representation of **multiple values**
- Design **alternative scenarios** based on differing representation goals
- Transparent, defensible, and credible
- Where do we get the most “bang for our buck” in terms of biodiversity representation?

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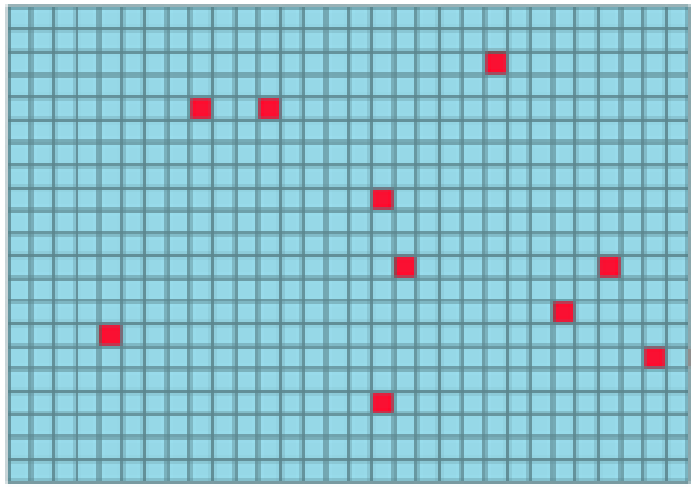
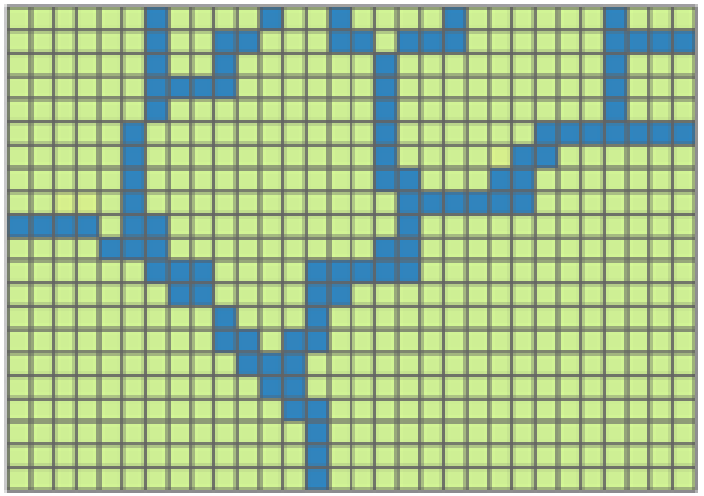
MARXAN conservation solutions

Why is Marxan Useful?



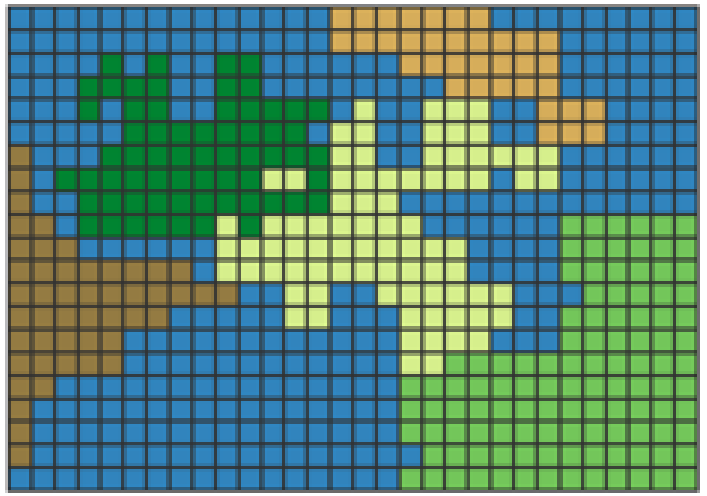
Total = 10 observations

Target = 20% (2 observations)



Total = 10 km of migration corridor

Target = 20% (2 km)



Each ecosystem type is a feature

Total area for type 1 = 10 km^2

Target = 20% (2 km^2)

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MARXAN conservation solutions

Problem Formulation: Asking the Right Question

Goals: overarching desired outcomes representing a collective vision of stakeholder aspirations regarding conservation interventions and other goals.

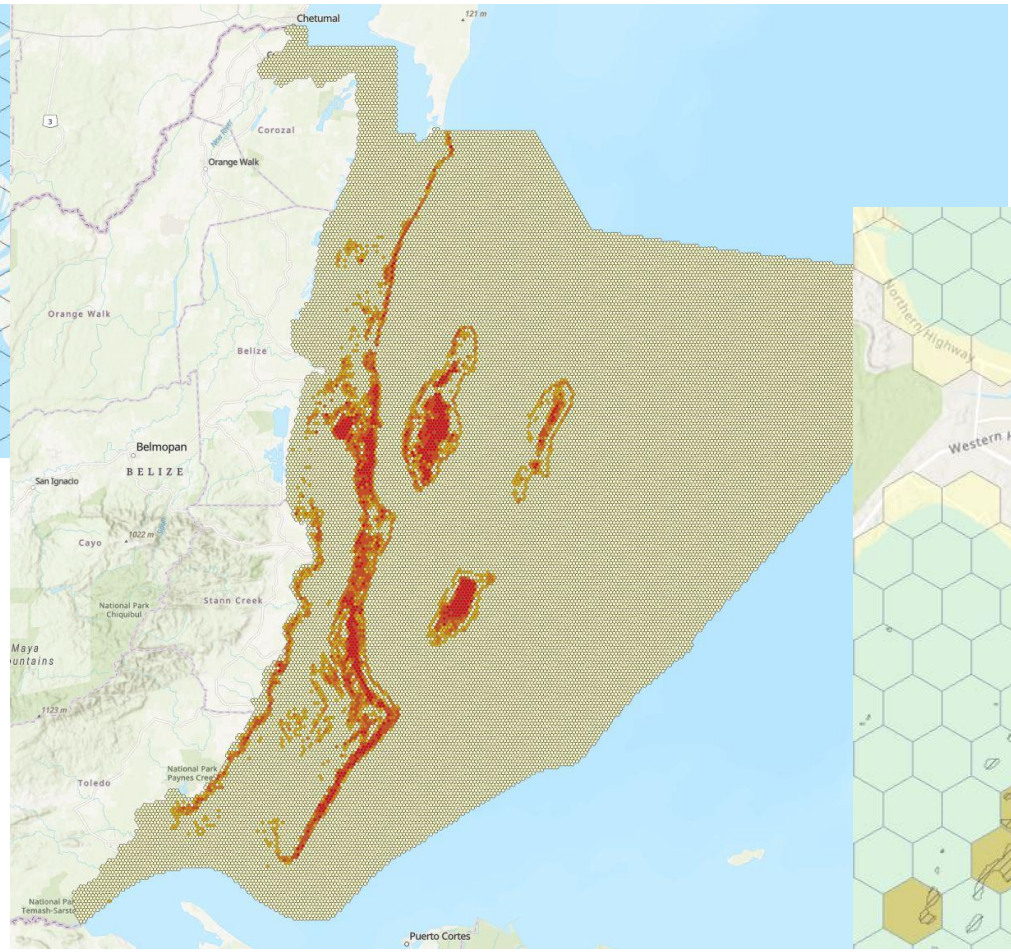
Create a system of protected areas to protect the diversity of ecosystems of the region's coral reefs while mitigating the negative economic impacts.

Problem Formulation: Asking the Right Question

Objectives: translate goals into quantitative statements about how much of each feature of conservation interest should be represented in a conservation-area system

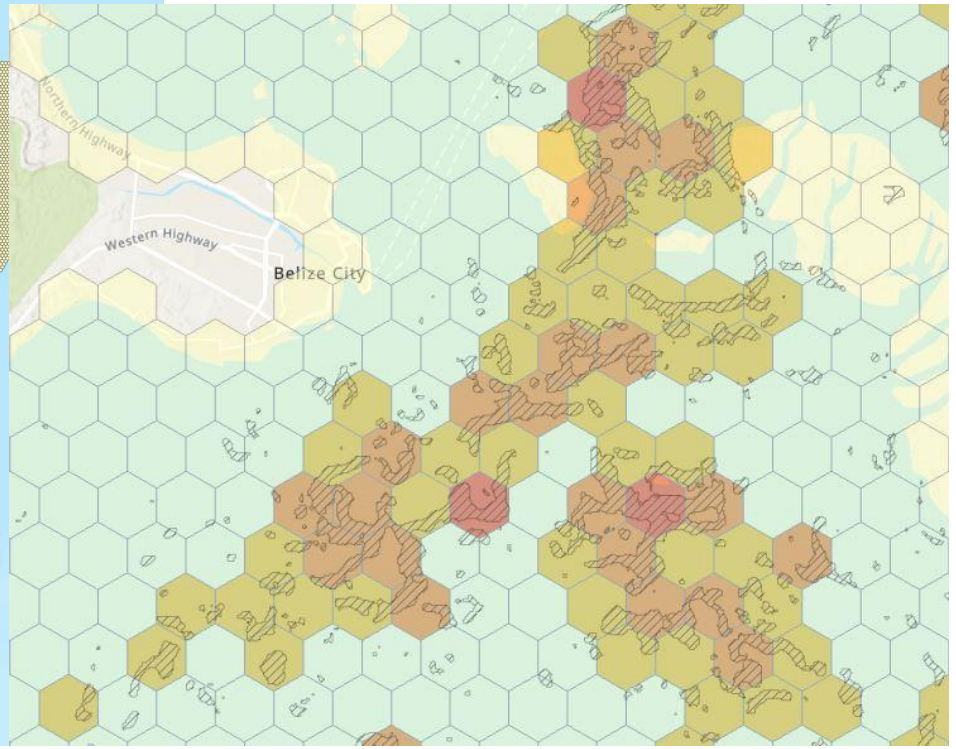
*Protect at **least 30%** of each type of coral reef habitat and distribution of reef-associated species …while minimizing the lost CPUE associated with fishing exclusion.*

Planning Area and Planning Units



Darker planning units contain more coral cover

Coral Cover by Planning Units (1km^2)



Marxan Inputs and Considerations

Features

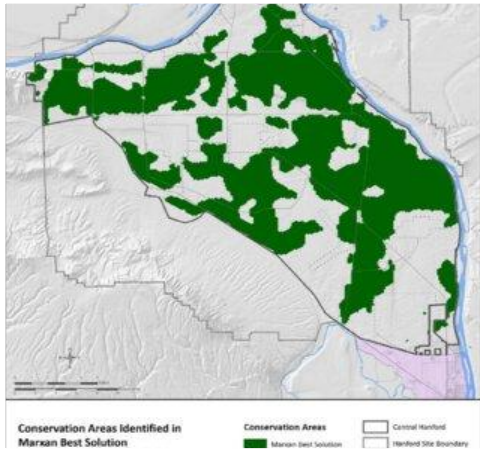
Habitats, species, or other features assigned a % protection target

Costs

Opportunity lost by assigning a protected area to a location

Lock-In/Lock-Out

Areas that should either need to be considered, or can't be considered



Boundary Length

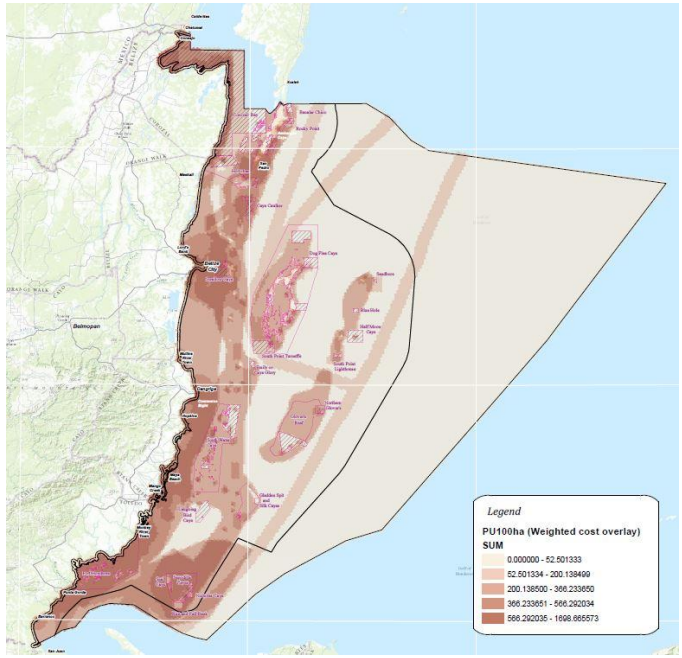
How “clustered” should the protected areas be?

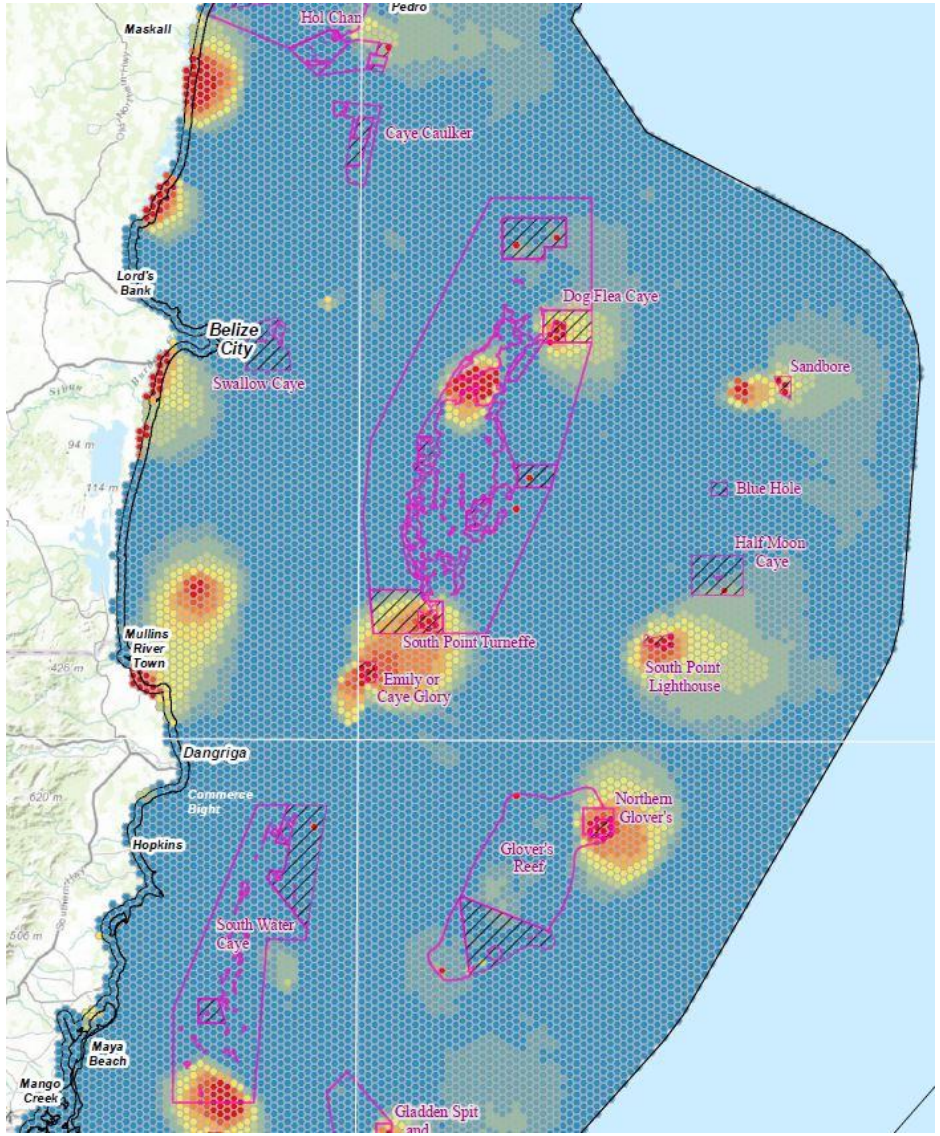
Informed by existing data and expert knowledge

Marxan Inputs Shape the Outputs

Maximize
Representation (goals) across multiple targets/criteria

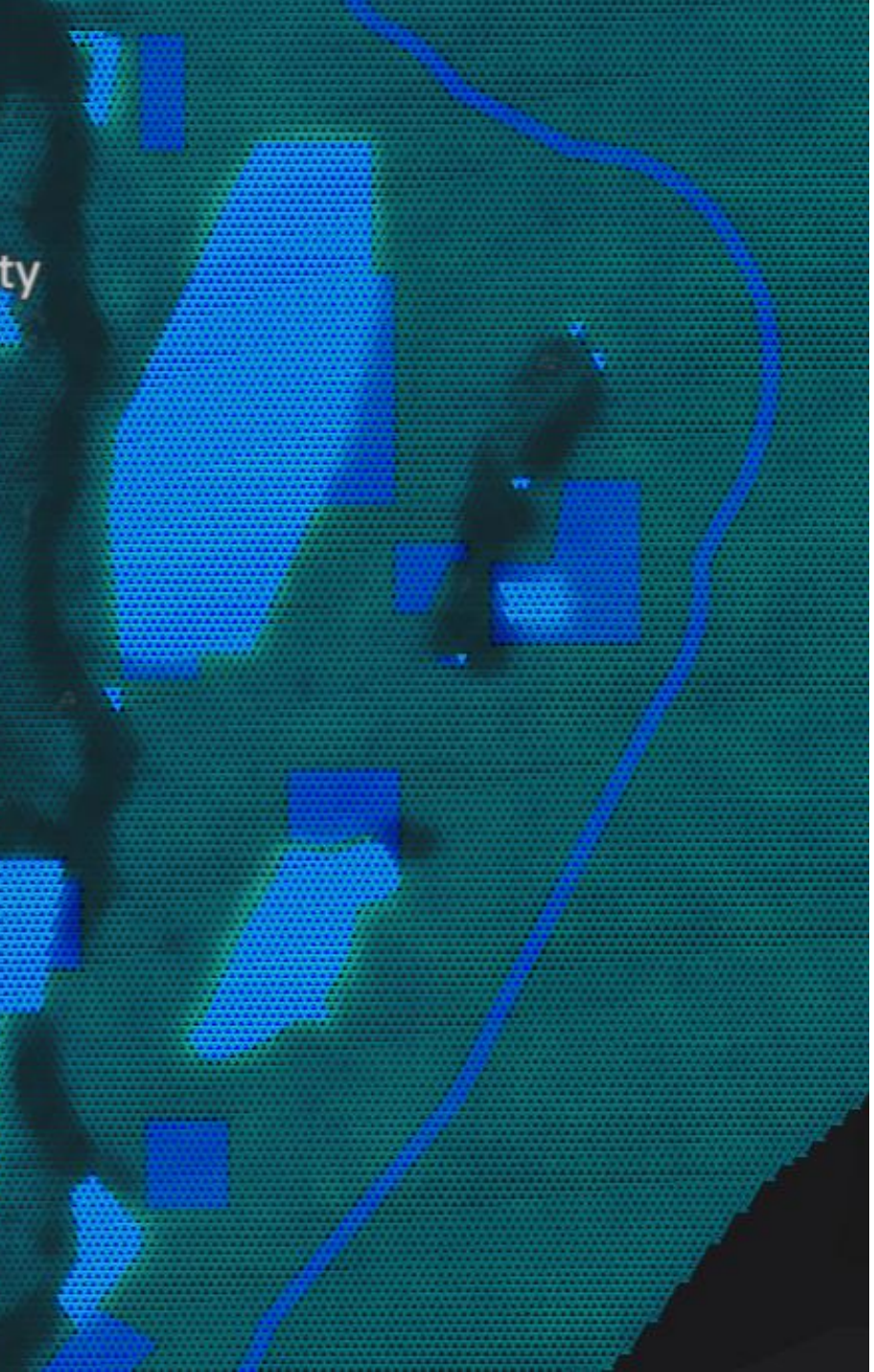
Minimize
Overall area, or overlap with undesirable areas (“costs”)





May 2024 BSOP Multi-Stakeholder Workshop Recap

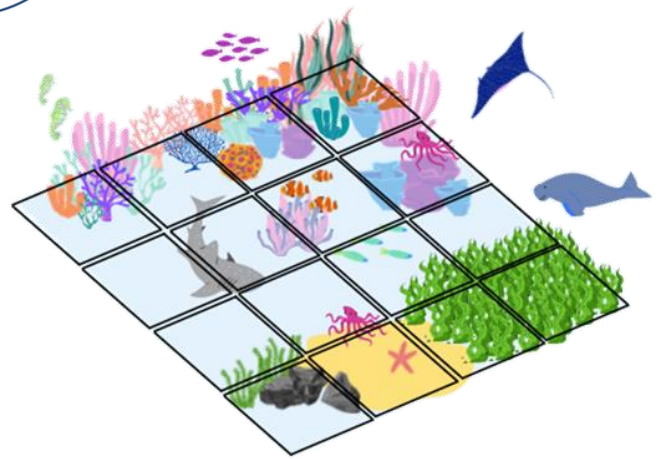
- Developed draft Compatibility Matrix
- Identified preferred planning scenario
- Overview of zoning best practices
- Ocean Use Survey draft results overview
- High-level overview of Marxan for Steering Committee and Technical Working Groups
- Marxan technical training for BSOP Core Team



Proposed Next Steps for Using Marxan in BSOP

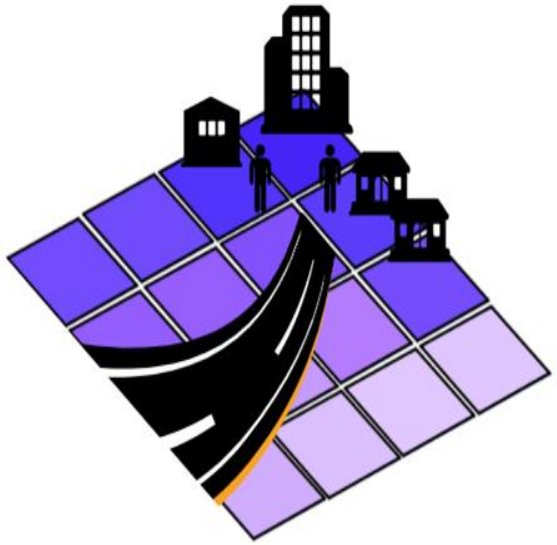
- Identify draft Marxan inputs, targets, and data gaps (this week)
- Validate inputs as needed
- Obtain additional data where needed
- Run Marxan
- Review results with stakeholders
- Adjust and repeat
- Results inform Milestone 6 High Biodiversity Protection Zones

What Decisions Are Needed?



Features

- Which habitats, species, or other features should the Marxan analysis represent?
- What should their protection targets be?
- Do we have the right data to represent these features?

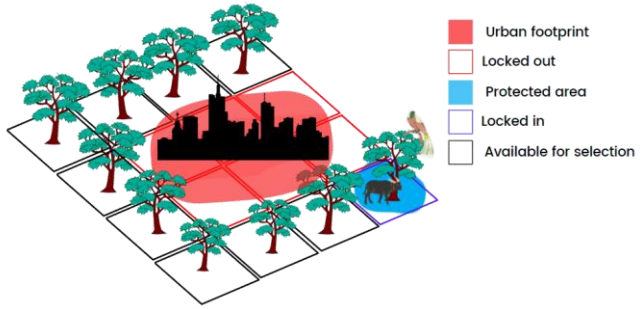


Costs

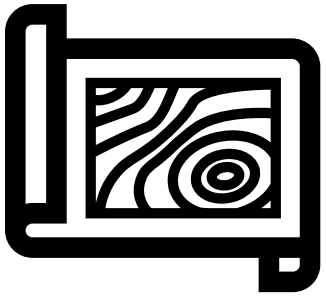
- What costs should the Marxan consider, if any?
- Do we have the right data to represent these costs spatially?
- How should they be weighted spatially?

What Decisions Are Needed?

Lock-in/Lock-out Areas



- Are there any areas that should NOT be represented in a biodiversity protection zone?
- Are there any areas that MUST be represented in biodiversity protection zones?
- Do we have the right data to represent these areas?



Other

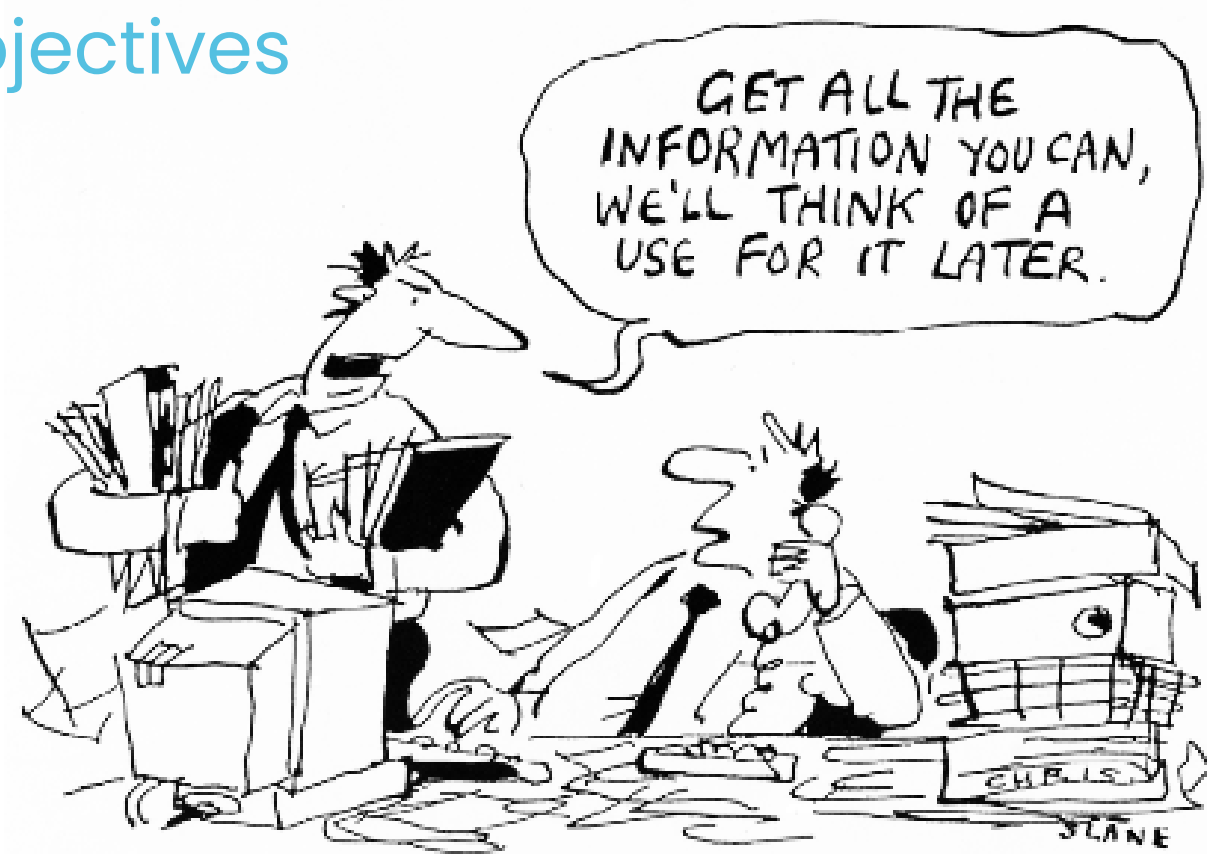
- What additional information should be considering and how do we obtain it?

What Spatial Features to Represent?

Link to goals and objectives

Data constraints:

- availability
- accessibility
- coverage
- quality

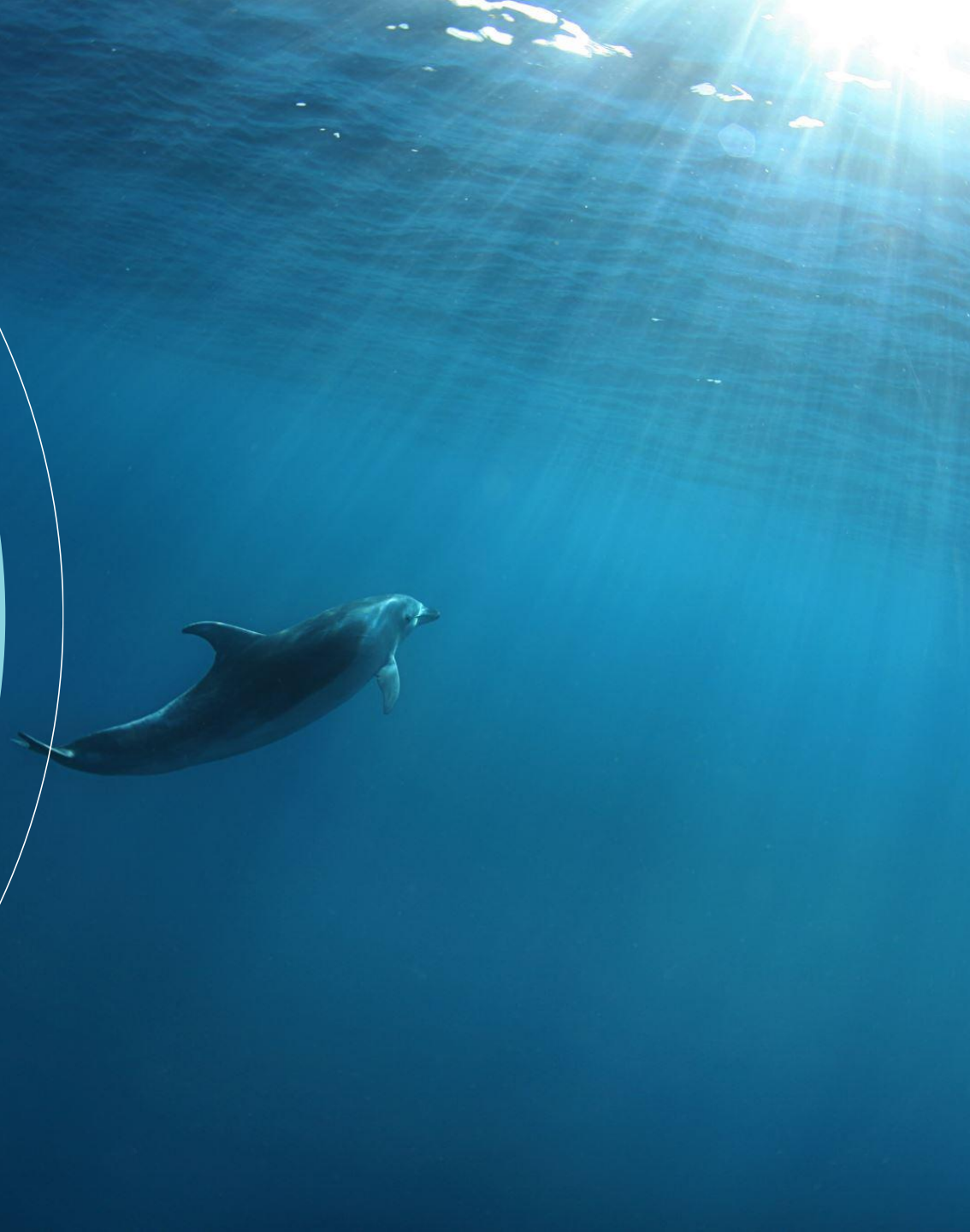


Source: H. Grantham


QUESTIONS

Conservation Features Overview

April 15, 2025
1:30-3:00



Session Goal:

- Provide an overview of conservation features and targets in Marxan.

Participants understand what features and targets are in Marxan and how they might identify appropriate spatial data inputs representing key features in the BSOP context.

Expected Outcome:

Presenter:

Rick Tingey

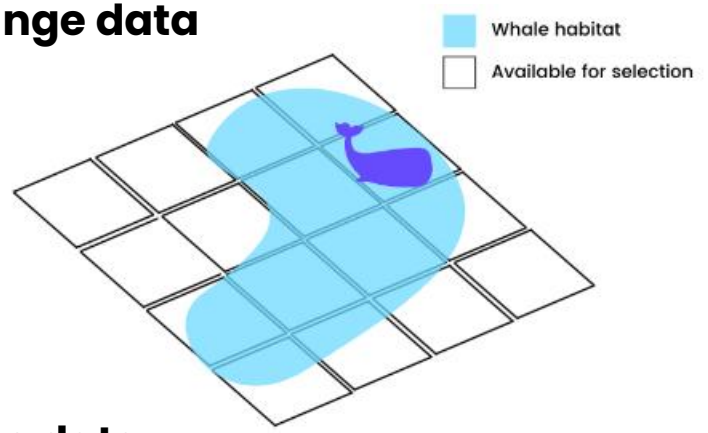
Principal

S3 Spatial Support Systems

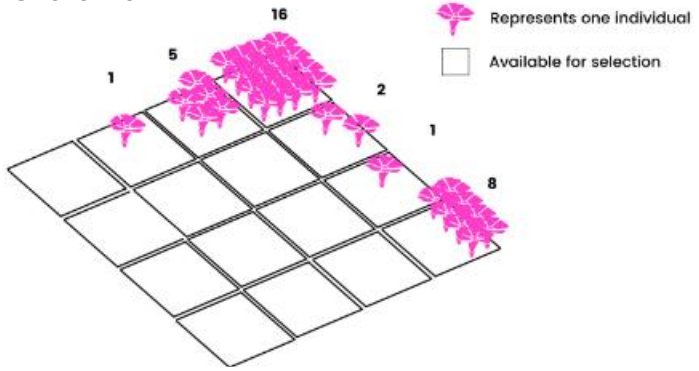
What is a Feature?

Features are the important habitats, species, processes, activities, and discrete areas that you want to consider in your planning process.

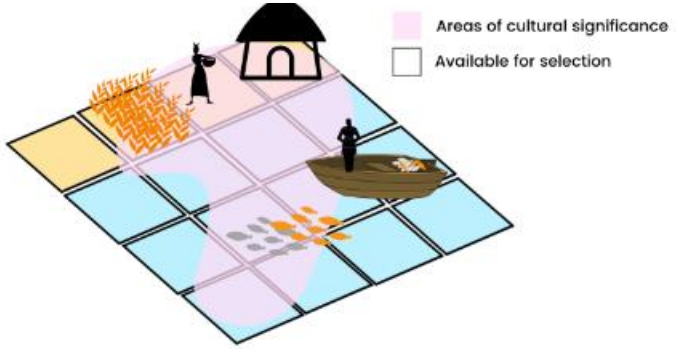
Species range data



Abundance data

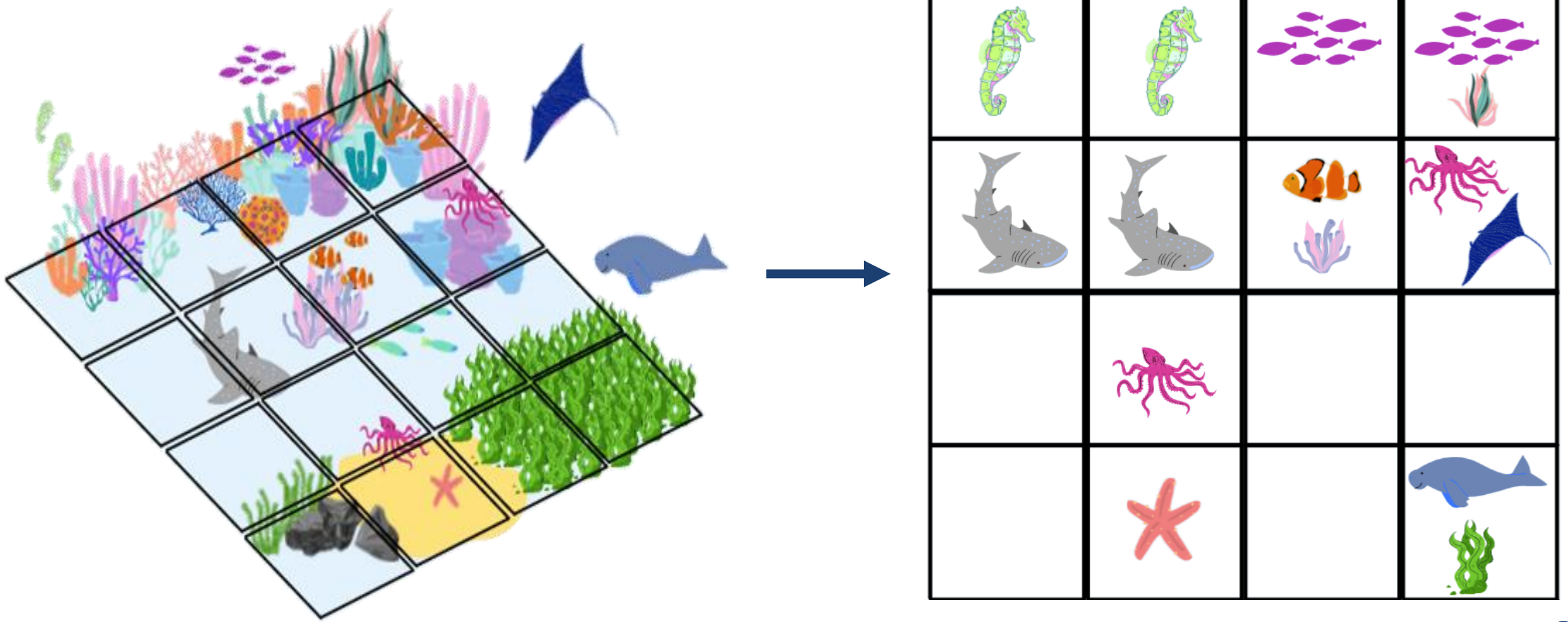


Socio-economic, cultural and traditional uses



MARXAN
conservation solutions

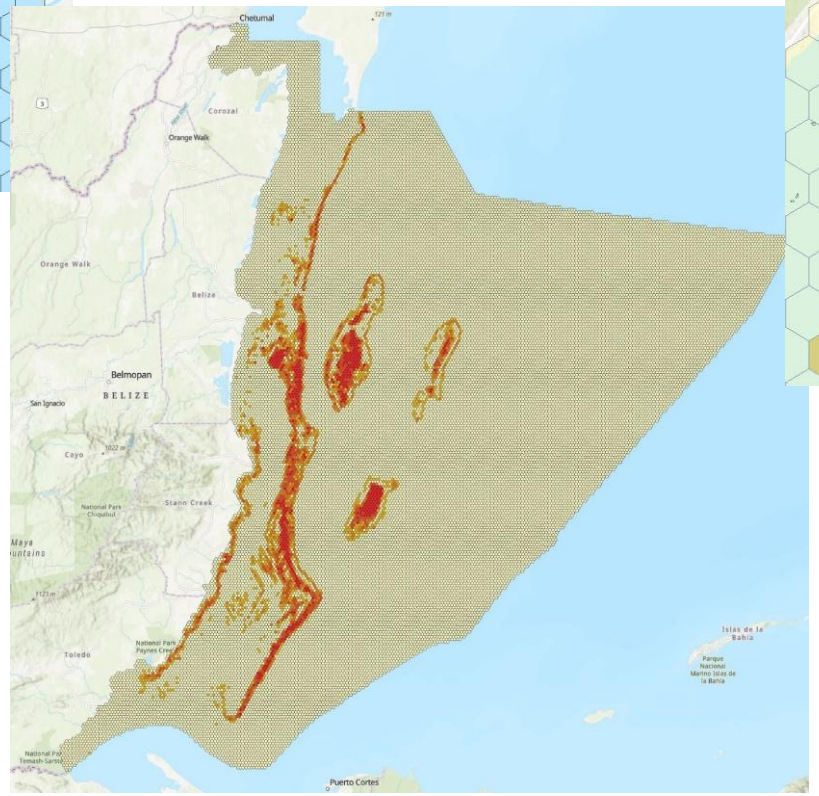
Features are Summarized by Planning Units

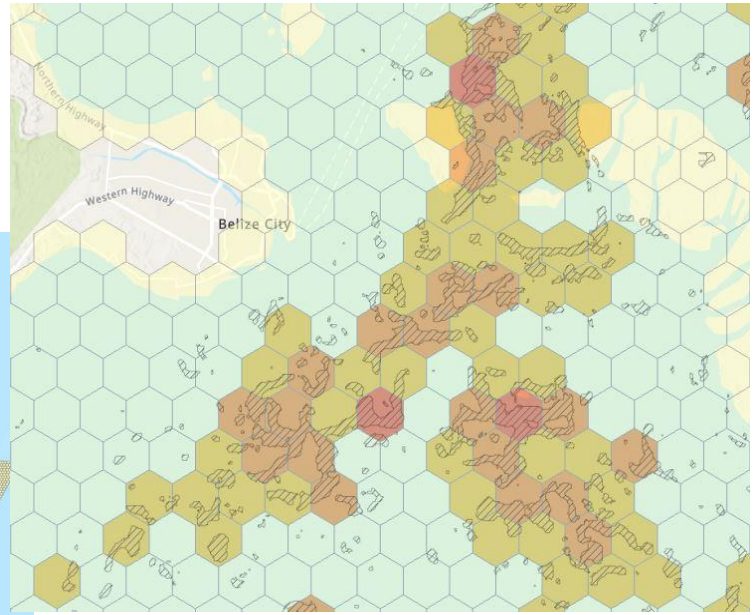


MARXAN
conservation solutions

Planning Area and Planning Units

Coral Cover





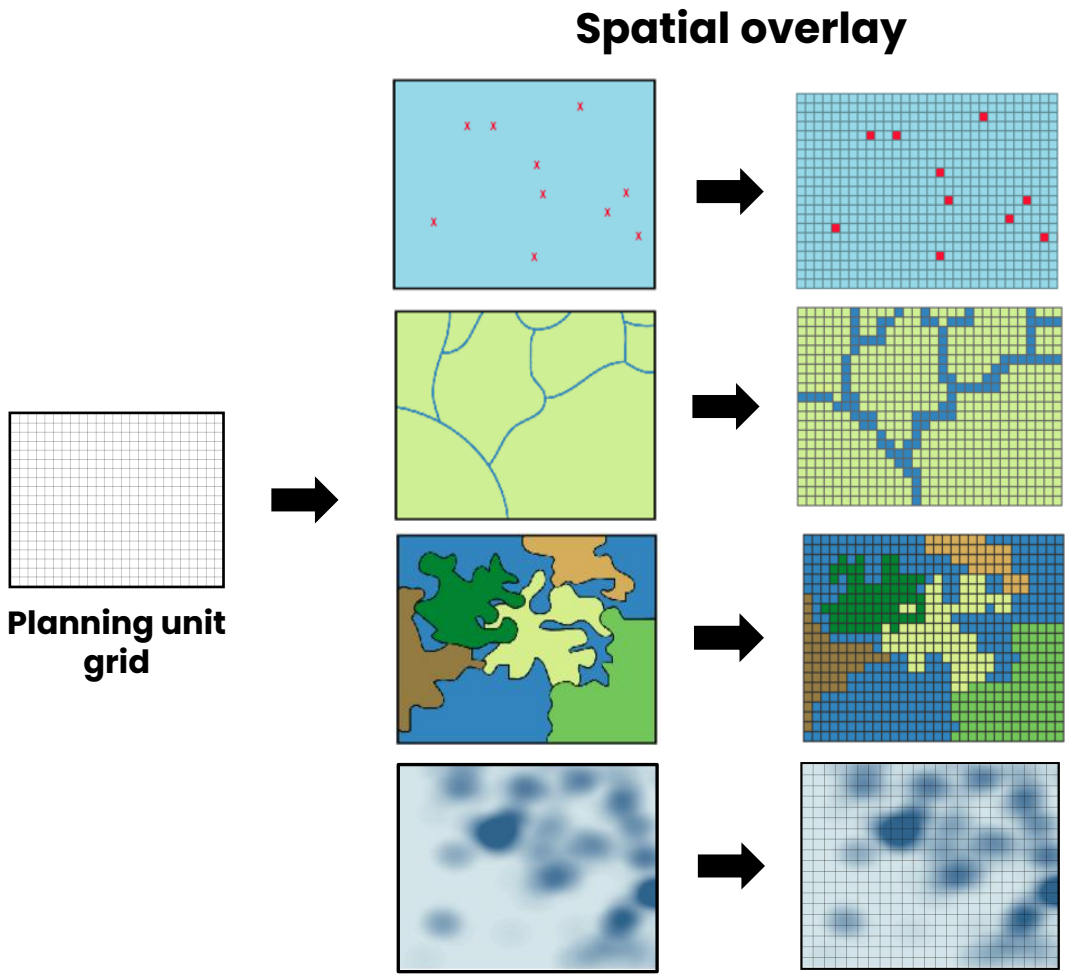
Coral Cover by Planning Units (1km^2)

Darker planning units contain more coral cover

Marxan Database Development

The Marxan database details the amount of each conservation feature present in each planning unit

- Allows Marxan to determine where features are distributed across the seascape.



PacMARA
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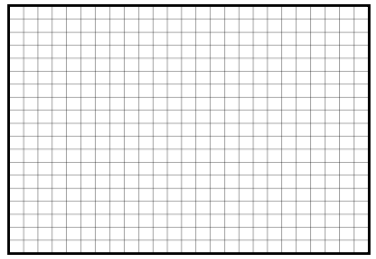
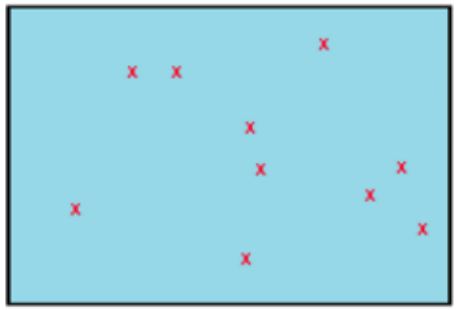
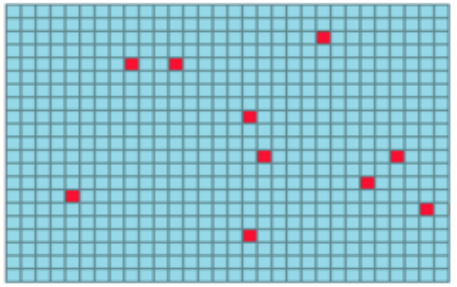
MARXAN
conservation solutions

Spatial overlay

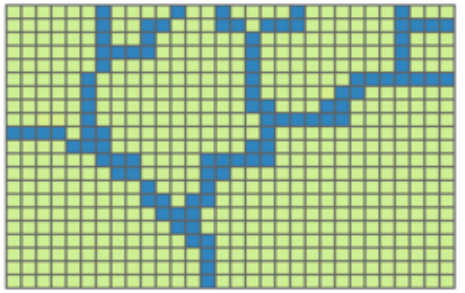


Planning unit grid

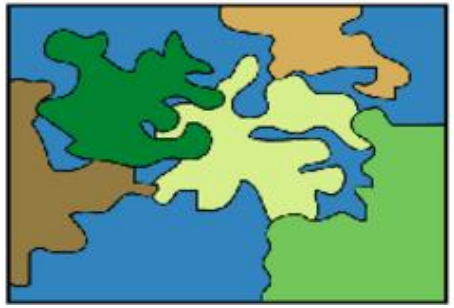


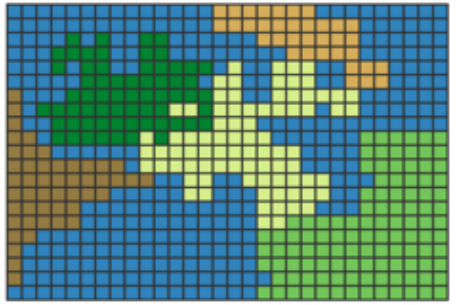


Presence/Absence
Counts

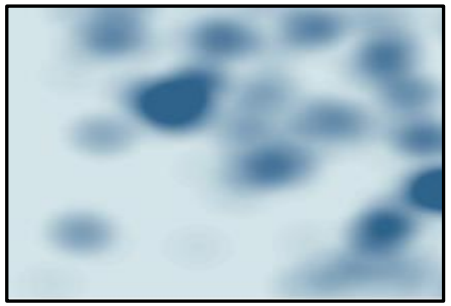


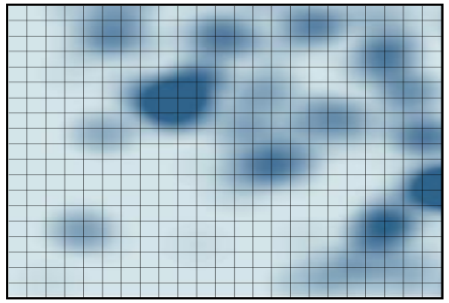
Presence/Absence
Length





Area



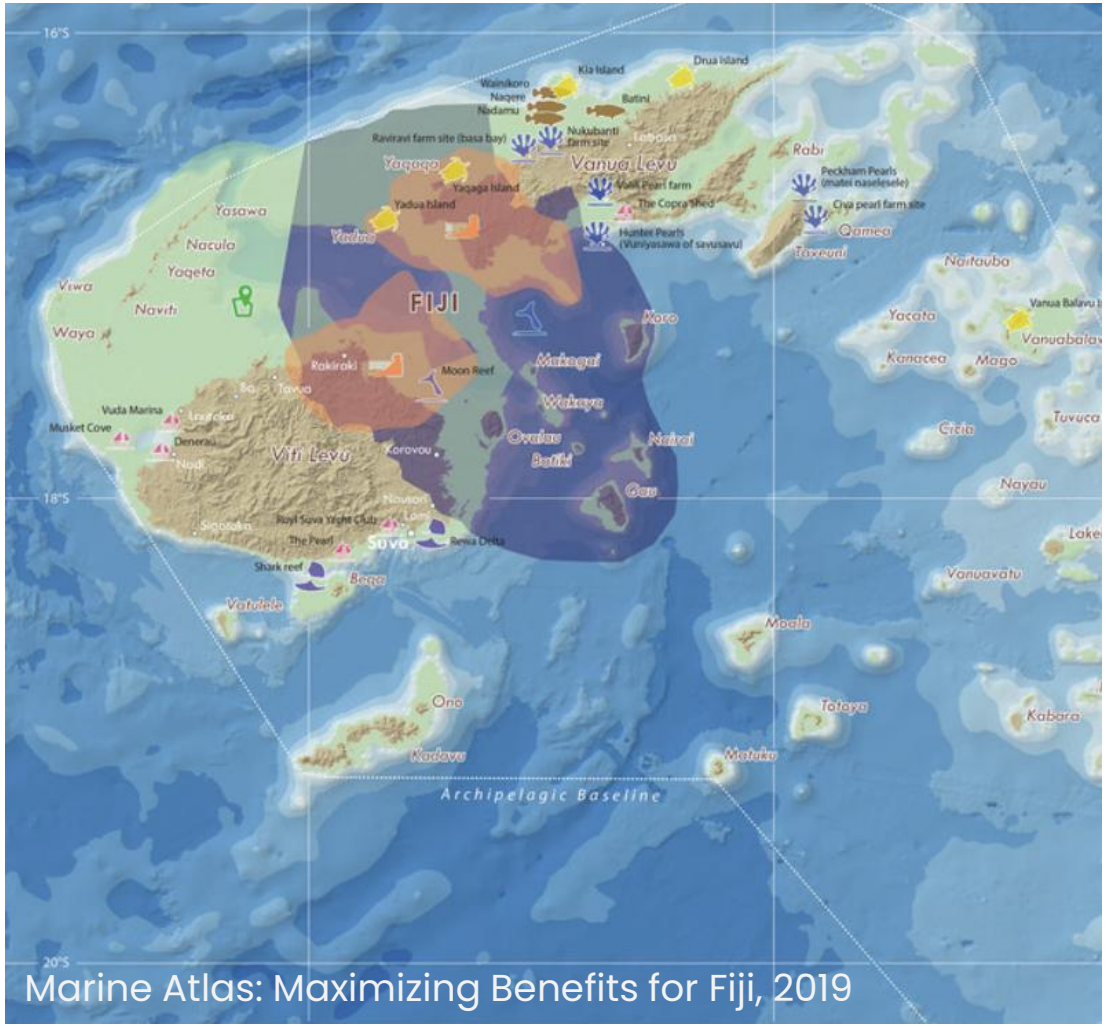


Spatial statistics

What Types of Features Should Be Included?

It depends on your goals/objectives and the availability of data, but consider…

- Broad surrogates ***(coarse filter)*** – *bioregions, geomorphic classes, habitats*
- Direct measures of biodiversity or special features ***(fine filter)*** – *species, coral reefs, spawning sites*
- Ecological processes – *ecological links, migration corridors*
- Other features of conservation interest – *special and culturally important sites*

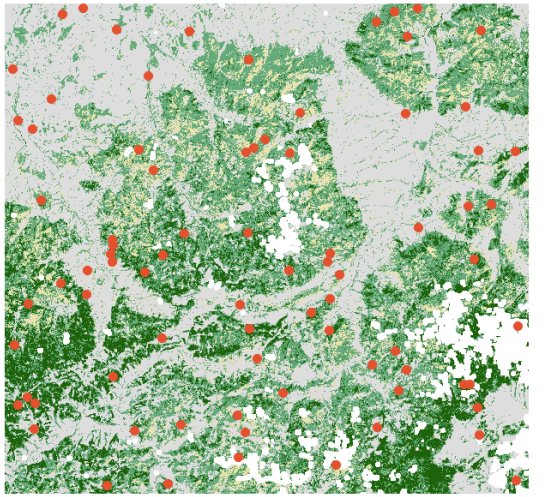


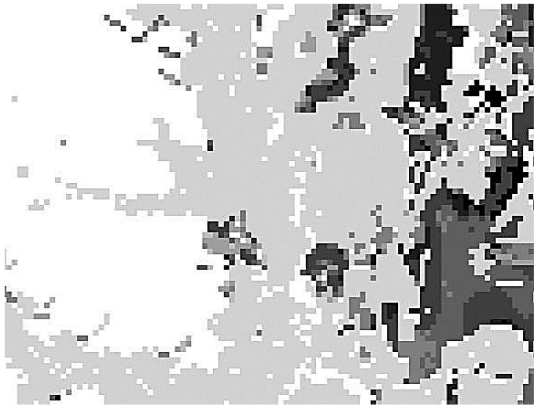
Marine Atlas: Maximizing Benefits for Fiji, 2019

How Much Data Do We Need?

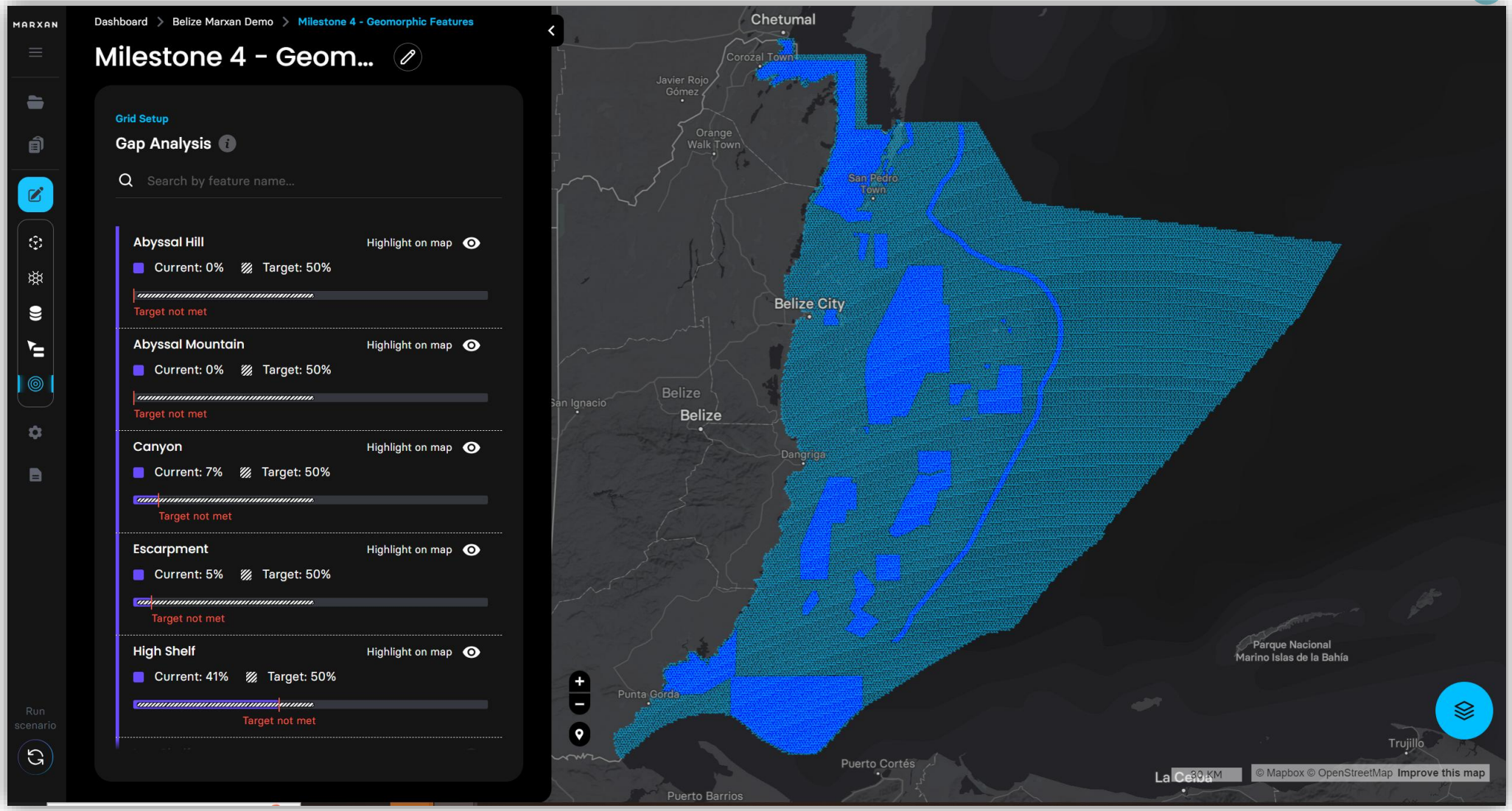
There is **no minimum requirement** to run Marxan; it depends on your goals/objectives and data availability, **but** the results are as good as the data used; evaluate its quality…

- Consistent throughout the region
- Preferably spatially continuous data
- Absence of data ≠ conservation feature is not present
- May need to interpolate or model the distribution of species or habitats before using it in planning
- Always consider local knowledge

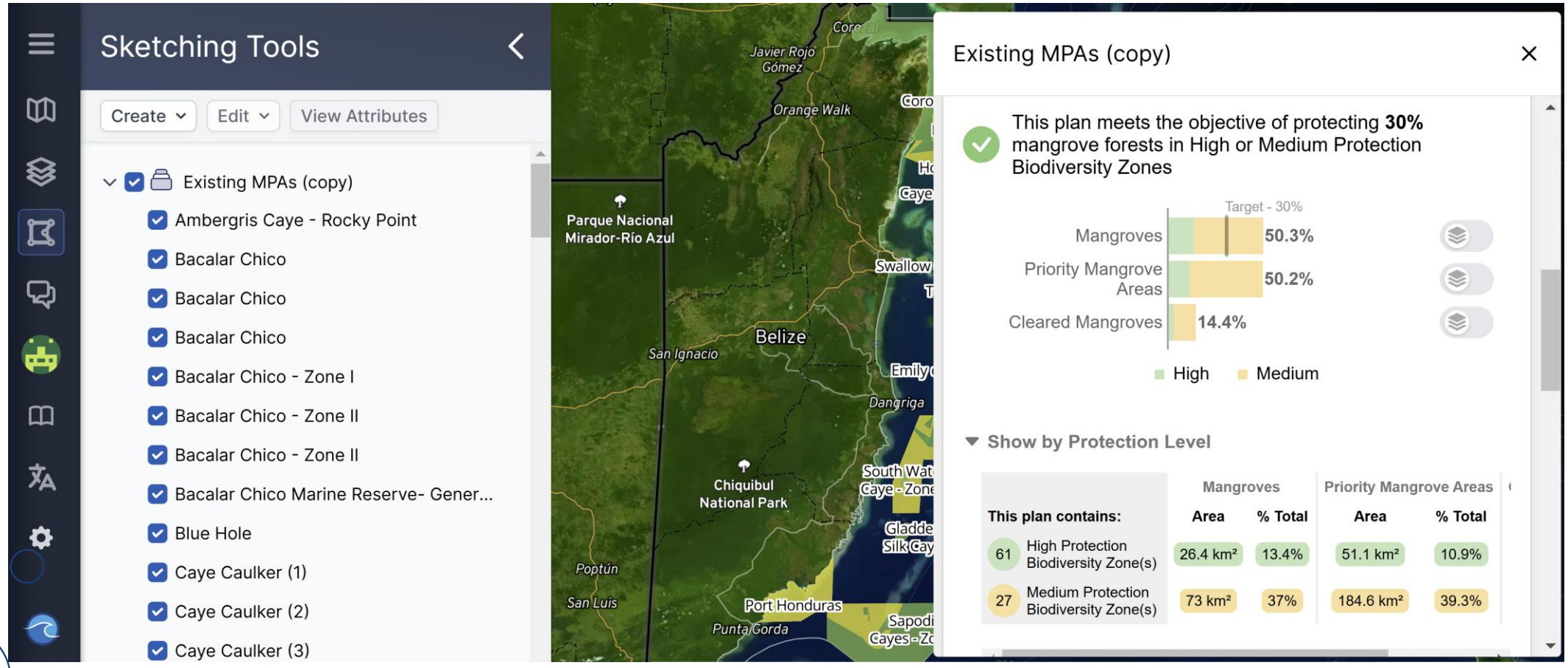




Gap Analysis and Setting Targets



What do we Know About Current Feature Representation?



Run a report in SeaSketch!

Best Practices for Choosing Features

F - Focal species and habitats

E - Ecological importance

A - Available spatial data

T - Targets

U - Underrepresented areas

R - Rare or threatened ecosystems

E - Expert and community input

S - Stakeholder-relevant

Best Practices for Choosing Feature Targets

Set Draft Targets to Guide Scenario Development

- Align targets with existing commitments
- Consult Stakeholders
- Use **30% as a starting point** for feature representation (aligned with global **30x30** goals)

Best Practices for Choosing Feature Targets (Cont'd)

Set Draft Targets to Guide Scenario Development

- Apply higher targets for rare, critical, or vulnerable features
- Use moderate targets for widespread or less sensitive features
- Conduct a gap analysis
  - *set targets to build on existing protection*
- Run multiple target scenarios to understand trade-offs and options

Best Practices for Choosing Feature Targets (Cont'd)

Use Targets to Explore, Not Dictate

- Even if official targets don't exist, **scenario-based targets help guide the analysis**
- Explore multiple target levels (e.g., 10%, 20%, 30%) to understand trade-offs
- Avoid locking into one solution too early - **let Marxan show the options**

Best Practices for Choosing Feature Targets (Cont'd)

Use Targets to Explore, Not Dictate

- Targets give us a way to measure the ecological value of different protected area scenarios

- Not all ocean spaces are the same, we strive to maximize the representation of important features in a given solution

Example Features for Belize

FEATURE TYPE	SUGGESTED TARGET (%)	RATIONALE
Rare or Endangered Habitats		Irreplaceable; small area; high vulnerability
Critical Species Areas (e.g., turtle nesting beaches, manatee corridors)		Key for species persistence; often limited spatially
Spawning Aggregation Sites		Essential for fisheries replenishment; highly sensitive
Coral Reefs (Healthy / Resilient)		High biodiversity; threatened by climate impacts; cornerstone ecosystems
Mangroves & Seagrass Beds		Nursery habitats, coastal protection, blue carbon
Fish Nursery or Recruitment Areas		High functional value; supports livelihoods
Widespread Habitat Types (e.g., sand flats, deep water habitats)		Ecologically important but common; lower irreplaceability
Climate Refugia or Deep-water Reefs		More likely to persist under warming; key for long-term resilience
Existing MPA Coverage	(Used to inform new targets)	Conduct gap analysis first to adjust remaining needed protection

Potential Features for Belize

- Ecosystems
- Storm surge
- Wind energy
- Tidal wave
- Sea surface temperatures/refugia
- Acidification
- Fish stocks
- Key indicator species
- Bathymetric
- Sea level rise
- Water quality
- Suspended solids
- Hurricane paths
- Ecosystem services data
- Development areas
- Cultural sites
- "Smart Coast" vulnerable communities
- Areas of climate refugia (species/habitats)
- Commercially important species
- Features at high risk to climate change


QUESTIONS

Identify Conservation Features and Targets

April 15, 2025
2:00-3:30

2:00 PM - CONSERVATION FEATURES AND TARGETS - WORLD CAFÉ ROUND 2

- Rotate through 4 themed tables (20 minutes per table) [**Themes:** Sensitive ecosystems; Geology/Geomorphology; Ecosystem Services; Key species/species habitats, **other**]
- At each table:
  - Read the feature summary
  - Use dot stickers to vote on feature priority as it relates to your sector (High, Medium, Low)
  - Discuss and recommend target percentages **(target is at least 30% by feature)**

2:00 PM - CONSERVATION FEATURES AND TARGETS - WORLD CAFÉ ROUND 2

- Prompts for groups to consider:
  - Do you recognize these features in your work?
  - Should we increase protection targets for any features?
  - Are there areas we're missing?
  - Are there data gaps that need to be addressed?

Sample of recording form:

- **Table #: Feature Theme:**

Feature Name	Data Quality	%Current Protection	Your Priorty Rating	Target %	Notes
Mangroves	Completeness and accuracy	% currently protection if known	□High □ Med □ Low	Suggested %	Sector / Data Source if not available
			□ High □ Med □ Low		
			□ High □ Med □ Low		
			□ High □ Med □ Low		

Coffee Break

3:30 – 3:45

Reflections and Report Out

April 15, 2025
3:45-4:30

Session Goal:

- Groups present using their worksheet or summary flipchart
- Keep presentations concise (2–3 min each)

Each group presents highlights of their target-setting discussions:

- Which features were ranked as most critical
- What target % range was proposed and why
- Any internal disagreements or data concerns

Expected Outcome:

3:45 PM - READ OUT OF ACTIVITY RESULTS BY GROUP

- Each group will present highlights (2-3 minutes each):
  - Which features were ranked as most critical
  - What target percentage range was proposed and why
  - Any disagreements or data concerns
- Facilitators will capture reported targets on the central flipchart

Wrap up

April 15, 2025
3:30-4:00

Session Goal:

- Reflect on Day 2 and gather participant feedback to inform Day 3 adjustments.

Participants surface unresolved questions or needs.

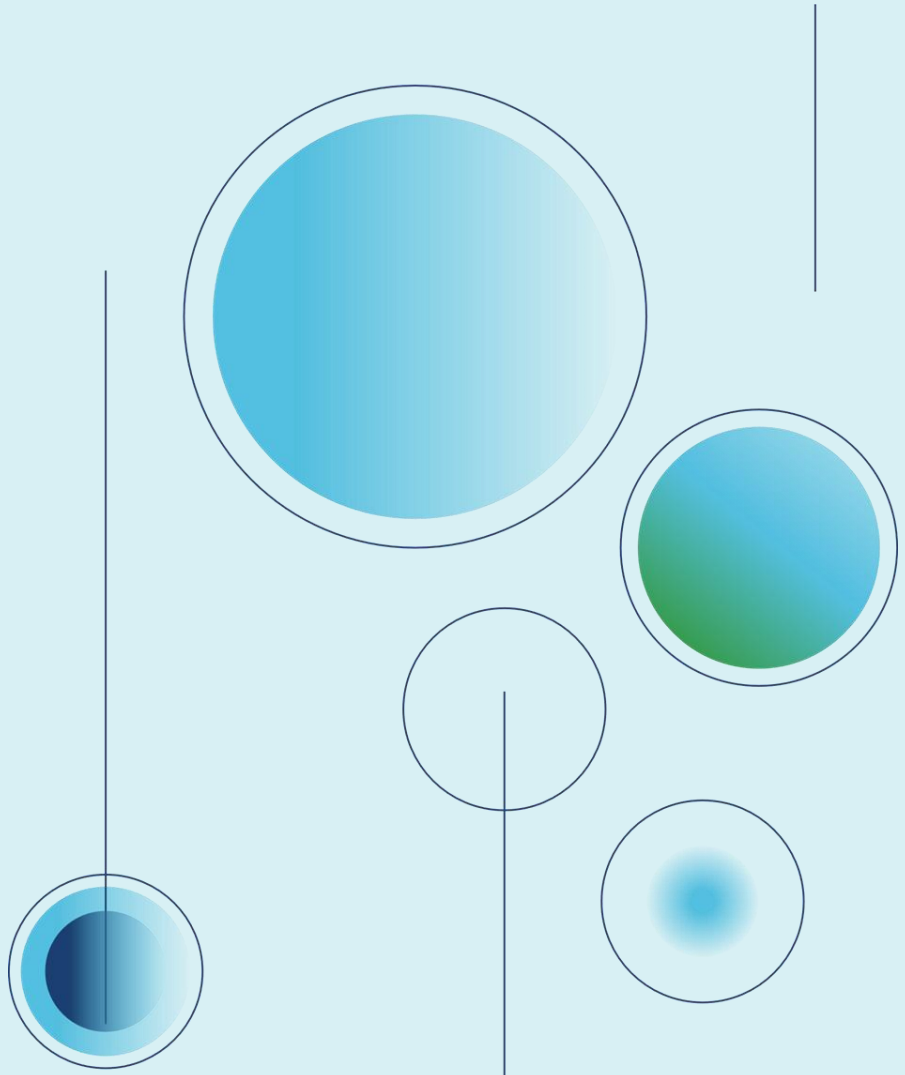
Expected Outcome:

3:30 PM - WRAP UP

- Write on index card by group: Guided questions
  - What's still unclear?
  - What should we revisit tomorrow?
  - What would help you engage better?
- Post your notes on the reflection board before leaving

Belize Sustainable Ocean Plan

PARKING LOT



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Thank you for participating

Belize Sustainable Ocean Plan

BELIZE COASTAL ZONE MANAGEMENT AUTHORITY & INSTITUTE

The Nature Conservancy Belize

Belize Fund For A Sustainable Future

BLUE BOND and Finance Permanence Unit
OFFICE of the PRIME MINISTER