## Activity 1: You Make the Call

**Goal:** To integrate various information from different sources and at different temporal and spatial scales to determine the risk of bleaching at your reef.

**Purpose:** The purpose of the "You Make the Call" exercise is to integrate information from many different sources to determine if the reef you are managing is at risk for bleaching. The exercise spans three weeks, and participants will consider how changing weather, sea surface temperature, and local conditions might change the threat of bleaching.

**Instructions:** Instructor will divide participants up into four groups based on their location in the room. Your group will receive a piece of paper with a type of reef and basic information about the reef. The information will include:

- Reef type
- Tidal range
- Important information about adjacent landscape features, uses, etc.
- Current Conditions
    - Recent Weather
    - Satellite Bleaching Alert Status
    - Bleaching Observations
    - Other Relevant Events

Based on current conditions for this first week including recent weather, satellite bleaching alert status, bleaching observations and other events you will be asked to determine how great a threat your reef is for widespread coral bleaching. Once the threat level is determined for week 1, updated information for week 2 and then week 3 will be passed out. Based on changes in weather, satellite bleaching alert status, etc. participants will be asked to revise their threat level over time.

## Activity 2a: MPA Reef Classification

**Goal:** To develop a classification map of the major reefs types and zones for your region

**Purpose:** The reef classification map will be used in the next exercise to identify representative and resilient reefs and replicates for selection as MPAs/zones. It can also be used to develop the sampling design for a rapid response plan for a major coral bleaching.

**Instructions:**

1. Delineate major reef types (e.g., atolls, barrier, fringing, patch) and zones (e.g., fore reef, back reef, spur and groove) on your map
2. Identify three factors that explain major coarse divisions in coral reef communities across your region (e.g., wave energy, ocean circulation, isolation)
3. Identify three factors that explain finer level differences (e.g., depth, salinity, turbidity)
4. Apply these factors to differentiate among the reef types and zones on your map
5. Draw divisions on your map and note the reasons.

This should be done using maps provided (or that you brought with you). Use markers to draw boundaries, make notes, or highlight special features on your map. Record your decision-making process in the notes section so that you may return to this activity in the future.

**OUTPUT:** Country map with reef areas classified

## Activity 2b: MPA Design and Zoning

**Goal:** To design a network and zoning scheme of your MPA.

**Purpose:** Using information developed in the reef classification exercise, identify representative and resilient reefs and replicates for selection for MPAs/zoning schematic. This preliminary work can be used to begin the process of designation or consideration of zones in existing managed areas with stakeholders at your site(s).

**Instructions:**
Based on the information you developed in the classification exercise and the criteria listed below, choose a portfolio of MPA sites for your country or zoning scheme for your site. This should be done using maps provided (or that you brought with you). Use markers to draw boundaries, make notes, or highlight special features on your map. Record your decision-making process in the notes section so that you may return to this activity in the future.

**Step 1:** Review criteria below to further describe your area

- Good example of reef or habitat type
- Good condition
- High biodiversity
- Low level of threat
- Survived bleaching
- Recovering well from bleaching mortality or disturbance
- High habitat complexity
- Replicates of the above at regular intervals (20 km where possible) by Latitude/Longitude

**Step 2:** Identify Critical Areas

**Step 3:** Choose a portfolio of MPA sites for your country or zoning scheme for your site using what you've learned about resilience and rules of thumbs for connectivity, critical areas, size, shape, spacing, and socioeconomic criteria

**Step 4:** Peer review your work within your group (if more than one country)– prepare to report back in a 30 minute poster session at end of exercise

**OUTPUT:** Country map with MPA or MPA network design/zoning scheme

**Rules of Thumb Checklist for MPA/Network Design**

*Representation & Replication*

- Good representation of habitat types, structure, function, physical conditions
- Minimum of 3 replicates of each habitat type/condition (classified area)

*Critical Areas*

- Inclusion of important nesting, breeding, and nursery grounds
- Inclusion of special areas (e.g., likely resilience/resistance to bleaching, ecologically sensitive areas)

*Connectivity*

- Inclusion of known 'source' areas
- Protection of habitat linkages (e.g., reef to seagrass to mangrove)

*Size, Spacing, Shape*

- 10-20 km diameter at minimum width
- Fewer large better than many small
- 10-20 km between core zones or MPAs
- Regular shapes easy to delineate and enforce (e.g., squares, rectangles, straight lines)

*Socioeconomics*

- Consider locations away from industrial areas or other high impact land use areas
- Consider existing activities that may be impacted or have negative impact on MPA (e.g., traditional use, commercial use, recreational use)
- Consider user conflicts to minimize future problems

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## Building Resilience into MPA Network Design[1]

**Reef Resilience Principle: Representation, replication, and risk-spreading** – This important step helps to address the uncertainty managers face because of the incomplete knowledge of resilience science. This step calls for managers to protect multiple examples of the full range of coral habitat types, including critical habitats of target species. Replication of each habitat type at multiple locations reduces the risk of any one type being totally lost during a major bleaching event or hurricane, for example. So, if any one coral community is lost, others remain to provide necessary larvae and help it to recover.

| Design Principles | Action |
|---|---|
| For larger areas (scale of 100s-1000s km), Conserve representative examples of each bioregion (i.e., biologically distinct ecosystem). For smaller areas (scale 10s of km or less) select reef types and the major reef zones that are found on atolls and barrier reefs to serve as proxies for community types.<br><br>Include a "sufficient" number and area of each bioregion or reef type and major reef zone, and spread them out geographically (e.g., at different latitudes) to reduce the chances that they will all be negatively impacted at the same time. Aim to include a least 30% of the area of each target ecosystem where feasible.<br><br>Where information is available, include a minimum amount (see above) of each ecosystem and community type within each bioregion (to ensure that all known communities and habitats are protected).<br><br>Choose representative areas based on knowledge (high biodiversity areas, complementarity) to maximize the number of species protected. | Classify and map reef types and major reef zones or other distinct community types, and categorize these by their functional groups and biodiversity. Based on the results of field surveys where these exist or in combination with expert knowledge, include the following:<br>• Coral reef types categorized by location, including reef type and position relative to the shore (e.g., inshore fringing reefs, mid-shelf patch reefs, barrier reef, atoll) and degree of exposure to wave energy<br>• Seagrasses<br>• Mangroves<br>• Relevant deepwater habitats.<br><br>Determine community structure and biodiversity of each category of the classification and use this information to further differentiate between representative types of each category.<br><br>Select and protect multiple examples of the full range of coral community types with their associated habitats. |

[1] Sources: TNC Resilience Model; Building Resilience into MPA Design: Kimbe Bay, PNG (TNC-Lokani and Green); Salm, Done and McLeod ….

**Reef Resilience Principle: Protect refugia and other critical habitats** – It is also important to protect communities that are naturally positioned to survive global threats. These refuges provide secure and essential sources of larvae to enhance the replenishment and recovery of reefs damaged by bleaching, hurricanes, or other events.

| Design Principles | Actions |
|---|---|
| Choose sites that are more likely to be resistant or resilient to global environmental change. In particular, include areas that:<br>• may be naturally more resistant or resilient to coral bleaching;<br>• include critical habitats for key species;<br>• support high species diversity;<br>• contain a variety of habitat types in close proximity to each other. | Identify and map the location of resistant reefs that avoid or survive bleaching and resilient reefs that recover quickly and well from bleaching events.<br><br>Select and protect examples of both resistant and resilient reefs.<br><br>Map the location of critical habitats of key target species, including spawning aggregations (permanent or transient) and nursery, developmental and feeding habitats, and migration corridors of:<br>• larger groupers, snappers, and other key species targeted by fisheries<br>• sea turtles<br>• cetaceans<br>• species with limited distribution and abundance<br>• vulnerable species (e.g., sharks, and those on the IUCN red list)<br><br>Where data, funds and expertise are available, develop hydrodynamic models to help identify areas of mixing of deep cool water with heated surface water to help identify bleaching resistant areas<br><br>If high technology solutions are not in reach:<br>• summarize best available information on past events based on local knowledge and field observations<br>• design rapid response protocol to enable a major bleaching event to be tracked, the impact measured, and observations compared to high resolution (1 km) sea surface temperature maps.<br><br>From data gathered through field surveys or expert knowledge, identify coral communities with broad size frequency distributions, including small, intermediate and large size classes. Small/young and intermediate sizes indicate strong regular recruitment. Larger colonies indicate natural long-term survival of catastrophic events. These are important indicators of resistance/resilience. A high ratio of live to dead coral is also a good indicator of resilience. |

**Reef Resilience Principle: Effective management** – Effective management is at the core of resilience. Managers need to protect reefs from direct threats such as pollution, sedimentation, and destructive fishing (including overfishing) and keep them healthy. The healthier the reefs, the more resilient the corals are, the greater the chance of successful recruitment, and the more likely they will be to bounce back after a catastrophic event.

| Design Principles | Actions |
|---|---|
| Strong government and community support for MPAs and a collaborative approach to MPA management will help to reduce management challenges.<br><br>Consider sea and land use, particularly proximity to threats and other protected areas and impacts on water quality.<br><br>Consider if the distribution and status of biological community types are the result of natural processes or human impacts – the community state may not be natural and may not be reversible, perhaps requiring this to be a lower priority sites for conservation.<br><br>Recognizing that MPAs and MPA networks cannot address all threats to target ecosystems, particularly those originating from outside MPA boundaries (e.g., runoff from land use practices), for management to be effective, every effort should be made to embed these in broader management frameworks, such as integrated coastal zone management or large multiple use zoning plans.<br><br>Consider management of functional groups (e.g., reef builders, predators, herbivores) within reefs and of linkages among reefs and associated habitats (e.g., seagrasses, mangroves, and adjacent deep water habitats) as a means to achieve an ecosystem based focus to management.<br><br>Conserve rare and threatened species (e.g., cetaceans, | Establish partnerships with concerned agencies to enable collaboration across resource management sectors (fisheries, conservation, rural development, land use, water use, agriculture, urban development, etc. as appropriate) and integration of coral reef conservation into broader policy and management frameworks.<br><br>Regularly meet and consult with local government and community leaders over management issues and strategies and seek joint solutions to resolve major issues, including the development of alternative livelihoods for affected community members where feasible.<br><br>Determine the levels of use of coral reefs for different purposes and the degree of dependence of local communities on these resource uses – use the information to direct management effort toward those sectors of the communities that are most dependent on coral reefs and collaboratively seek solutions to resolve issues and abate threats.<br><br>Determine the distribution and extent of local human impacts through:<br>• land use patterns and their downstream impacts on coral reef systems;<br>• direct resource use (particularly fishing) – use this information to direct management effort to control the impacts of damaging uses.<br><br>Embed a series of no-take zones in the MPA as a means to build populations and achieve balance between different functional groups, such as predator and herbivore fishes.<br><br>Prohibit all forms of extractive use and control visitor access in the protected, bleaching resistant refugia sites.<br><br>Manage for good water quality by addressing sources of pollution that create conditions which favor algal growth and prevent coral larvae from settling.<br><br>Commission research into the role and correct balance of functional groups to inform |

| | |
|---|---|
| dugongs/manatees, sea turtles, seabirds, sharks, and crocodiles).<br><br>Emerging global threats, like climate related coral bleaching with all of its unknowns, require an adaptive approach to management. | management strategies.<br><br>In the absence of information on functional groups, consider mass removal of coral predators (e.g., crown-of-thorns starfishes and predatory mollusks) from reefs that are recovering from bleaching or other major events and manage fisheries to maintain herbivores at levels that effectively reduce algal competition with coral larval settlement.<br><br>Map out the information from dedicated surveys or expert/local knowledge on the distribution and abundance of rare, threatened or vulnerable species (and their critical habitats) and include these in specially protected zones.<br><br>Design MPA and zone boundaries to be flexible in space and time so that these can be expanded or contracted, have seasonal or other fixed time limits, be moved to different levels of protection, and so be made to be more responsive to changing conditions.<br><br>Tailor monitoring programs to address issues of bleaching resistance, determine connectivity patterns, and accommodate rapid response to bleaching events. A rapid response mechanism allows managers to engage local users to help track the bleaching impact and to measure and interpret the response in light of different factors that might explain the different levels of mortality and recovery. |

**Reef Resilience Principle: Incorporate connectivity** – Some reefs may be sufficiently large to be self-seeding. Others may rely on reefs up current to provide the larvae they need for replenishment. Understanding how and where the larvae of corals and other reef species are distributed enables managers to identify source and sink reefs and to link these into a network of protected areas that is mutually replenishing. In this way, coral habitats that are damaged by bleaching or other causes can be repopulated by larvae from healthy reefs that are positioned up current.

| Design Principles | Actions |
|---|---|
| Take a system wide approach that recognizes patterns of connectivity within and among ecosystems (including linkages among coral reefs, seagrasses, mangroves, watersheds, etc.)<br><br>Where possible, include the entire ecological units (e.g., whole reefs together with their associated seagrass beds and mangroves), including a buffer around the core area of interest.<br><br>Where entire biological units cannot be included, choose larger over smaller areas to accommodate self-seeding.<br><br>Maximize acquisition and use of environmental information to determine the best configuration, recognizing the importance of connectivity in network design.<br><br>In the absence of good info on connectivity, use strategy of representation, replication, and risk spreading as an interim measure or proxy for connectivity (example reefs need to be close enough to have connectivity). | Attempt to learn about connectivity through dedicated studies of both biological and physical processes.<br><br>Implement a desktop study of best available information on currents and bathymetry to provide patterns of physical connectivity.<br><br>If resources permit, develop a hydrodynamic model to indicate likely patterns of connectivity.<br><br>Use best available information from above steps to design or commission specific studies and seek expert knowledge to determine biological connectivity patterns. |

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## Activity 3: Selecting Socioeconomic Indicators

**Goal:** Define socioeconomic assessment objectives and select relevant socioeconomic indicators for a given scenario.

**Purpose:** To think about socioeconomic assessment objectives and select relevant socioeconomic indicators given a scenario of a community experiencing the impacts of climate change.

**Instructions:**

Given scenario: A coastal community of 10,000 people experiencing the following impacts:

- Climate: Rising sea surface temperature
- Biological impacts: Mass coral bleaching, coral mortality, decreasing abundance and availability of fish stocks
- Physical impacts: Weaken reef structure, more exposure for coastal erosion during storm surge events

Your tasks:

1. Define your socioeconomic assessment objectives:

2. From the examples of socioeconomic indicators presented in the Powerpoint presentation, select ones that are relevant and appropriate for the above objectives. Propose a data collecting method for each of the selected indicators. The methods include secondary sources, household survey, key informant interview, focus group discussion, and observation.

## Activity 4: Field Trip – Evaluating Reef Resilience

**Goal:** To begin learning about one methodology for measuring reef resilience.

**Purpose:** This type of monitoring will help managers have a good idea which reefs are more or less vulnerable to bleaching. There are several advantages to having this information:

- Help target bleaching surveys
- Vulnerable areas may need more protection during & after bleaching
- Proactive steps might be taken to improve the resilience of vulnerable areas, so they would have a better chance of surviving a bleaching event
- Highly-resilient "refuge" areas may be good candidates for MPA protection

**Instructions:** Visit two field sites (reefs) that have two levels of resilience. Participants will complete one resilience worksheet per site. While still in the boat/on the beach, evaluate the above water resilience data. Once in the water, snorkel the reef area and evaluate the below water resilience data. Participants should discuss and compare their data once back on the boat or at the dock. Participants can also work through one of the community-based monitoring protocols (Coral Watch, Eyes on the Reef, etc.)

Materials:

- Snorkel gear
- Plastic Clipboards (1 per team)
- Resilience Worksheets (1 per site per team)
- Community-based monitoring protocol (optional)

**OUTPUT:** Completed field forms that compare two sites, and predict which will be more resilient to bleaching.

## Activity 5: Drafting Your Bleaching Integrated Response Plan

**Goal:** To begin drafting a bleaching response plan for the participants' area.

**Purpose:** Pre-planning before a bleaching event allows managers to quickly respond when bleaching happens. It is critical to plan ahead for staffing, funding, communications, monitoring, etc. Having a plan in place should also help managers to gain credibility and political support with reef users and decision-makers.

**Instructions:** Develop a bleaching response plan for a coral reef area under your management (*i.e.*, the area managed by one group member). You may use the GBRMPA bleaching response plan as a model or create an entirely new approach. After the exercise you will have approximately 5-7 minutes to report back to the entire group your approach.

Materials:

- Flip charts (self-propping ones are easier to use)
- Colored markers
- Worksheets

Think about how you will:

- Predict mass bleaching events
- Set thresholds for declaring mass bleaching
- Assess the ecological impacts of mass bleaching
- Monitor pre-and post-bleaching to identify resilient reef areas
- Assess the socio-economic impacts of mass bleaching
- Communicate about mass bleaching before, during and after the event
- Implement management interventions to increase coral survival during events
- Fund activities called for in the plan
- Staff activities called for in the plan
- Gain support for the plan
- Will your plan address more than bleaching (disease outbreaks, crown-of-thorns, invasive species, storm events, etc.)? If so the same sort of questions as above should be considered for each event.

<u>Record your decision-making process</u> in the notes section so that you can return to this activity in the future. Refer back to the worksheets that you have filled out throughout the workshop to help you through the activity (Monitoring and Reporting Bleaching Conditions, Socioeconomic Considerations, Communication Strategies).

**OUTPUT:** Draft Bleaching/Crisis Response Plan

**If a current Rapid or Integrated Response Plan exists, revisit your plan and consider opportunities to integrate information you learned in the workshop to update the plan.

Guiding Questions:

1. Early Warning System:
    a. How often should NOAA satellite products be checked?
    b. Are there Virtual Stations close by, and are you signed up for e-mail alerts?
    c. Are there volunteers, dive operators, etc. who could be organized for a citizen monitoring system? What about pilots who fly over the reef regularly?
2. Assessment and Monitoring
    a. Can you do monitoring to try to identify resilient sites ahead of time?
    b. Who will be responsible for monitoring the extent & severity of bleaching?
    c. How will the extra monitoring be paid for, or can it be part of regular summer surveys?
3. Communications
    a. How to do pro-active communications before bleaching occurs—briefing decision-makers, press, etc.—so these groups will be on board if bleaching does happen. Any creative ideas on this from the communications/skit activity?
    b. What audiences should be contacted at the beginning of the bleaching season?
    c. What audiences should be contacted if bleaching does occur?
4. Routine Tasks during the bleaching season
    a. Who will be responsible for keeping an eye on the early warning system?
    b. Who to communicate with?
    c. What would trigger a shift to active bleaching response?
5. Responsive tasks if bleaching does occur
    a. Who will coordinate and carry out monitoring?
    b. Who to communicate with?
    c. Are there resources for follow-up surveys to assess mortality, months after the bleaching event?
    d. Who will analyze the monitoring data to look for resilient areas or places that are more vulnerable to bleaching?

## Example Bleaching Response Plan Template

**Adapted from the Great Barrier Reef Marine Park Authority Bleaching Response Plan**

**1. INTRODUCTION**
**2. PLAN OVERVIEW**
- 2.1 OBJECTIVES OF THE RESPONSE PLAN

**3. EARLY WARNING SYSTEM**
- 3.1 CLIMATE MONITORING
- 3.2 SEA TEMPERATURE MONITORING
- 3.3 Eyes on the Reef

**4. BLEACHING ASSESSMENT AND MONITORING COMPONENT**
- 4.1 SITE INSPECTIONS
- 4.2 BROAD-SCALE SYNOPTIC SURVEYS
- 4.3 INTENSIVE IN-WATER SURVEYS
- *4.3.1 Temporal scale*
- *4.3.2 Spatial scale and survey sites*
- *4.3.3 Design and data analysis*
- *4.3.5 Complementary studies*

**5. COMMUNICATION STRATEGY**
**6. SOCIOECONOMIC IMPACTS**
**7. IMPLEMENTATION**
- 7.1 RESPONSE SCHEDULE
- *7.1.1 Routine tasks*
- *7.1.2 Responsive tasks*
- 7.2 REPORTING AND BRIEFING SCHEDULES
- 7.3 DEFINITION OF TRIGGERS FOR IMPLEMENTATION PLAN

**8. MANAGEMENT INTERVENTIONS**
**9. FUNDING AND SUPPORT FOR BLEACHING RESPONSE**
- [address capacity issues here]

**10. REFERENCES**
**11. APPENDICES (include as appropriate)**

**Possible Appendices**
**APPENDIX A — Community Monitoring Reporting Form**
**APPENDIX B — Intensive Site Surveys**
**APPENDIX C — Rapid Assessment Survey Data Sheet**
**APPENDIX D — Codes for Intensive Surveys**
**APPENDIX E — Schematic Representation of Percent Cover**

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## MONITORING AND REPORTING BLEACHING CONDITIONS

The activities in the right-hand column are examples of activities related to monitoring and reporting bleaching co these as is appropriate for your site. It is important to identify these activities and who will be responsible for con back-up who is not likely to be on travel or vacation at the same time as the primary person. Determine the timir Great Barrier Reef Marine Park Authority table of activities is provided on the back of this sheet as an example.

| Frequency (e.g. weekly) | Timing (e.g. every Monday) | Person Responsible (also provide back-up) | Activity (modify and fill in other activities as needed) |
|---|---|---|---|
| Routine tasks: | | | |
| | | | Check the NOAA Seasonal Bleaching Outlook |
| | | | Check NOAA HotSpot & DHW maps on web |
| | | | Receive and review Coral Reef Watch Satellite Bleaching Alert u |
| | | | Review weekly weather summary (e.g., air temp, cloud cover and |
| | | | Review Coral Reef Watch reports and update maps |
| | | | Make use of traditional Hawaiian seasonal prediction tools |
| | | | Brief senior management team on weather and heating condition |
| | | | (optional: if you publish bleaching conditions on your website): S and coral conditions and draft bleaching risk current conditions re recent images. Announce web update and send brief report. |
| | | | Monitor extent of bleaching using existing information channels a |
| | | | Advise senior management if dramatic worsening of conditions is |
| | | | Others: |
| Responsive tasks: | | | |
| | | | Actively solicit confirmatory bleaching reports from reliable source monitoring participants, field scientists, tourist/dive operators, etc |
| | | | Alert relevant project coordinators and managers |
| | | | Brief senior management |
| | | | Brief elected officials |
| | | | Prepare media position, draft statement and consult with media c |
| | | | Brief all staff, stakeholders and collaborators |
| | | | Release media statement |
| | | | Actively promote and solicit submissions to online bleaching repo spatial coverage |
| | | | Implement Bleaching Assessment and Monitoring component |
| | | | Others: |

## MONITORING AND REPORTING BLEACHING CONDITIONS

**EXAMPLE: From GBRMPA Bleaching Response Plan**

| Frequency | Timing | Person Responsible (back-up) | Activity |
|---|---|---|---|
| weekly | Monday | | Check GBRMPA ReefTemp and NOAA HotSpot maps on web |
| | | | Receive updated Great Barrier Reef sea temperature graphs from AIMS |
| | | | Review weekly weather summary, for example air temp, cloud cover and wind from Bureau of Meteorology |
| | | | Review BleachWatch (including BleachWatch Aerial) reports and update maps |
| | | | Print out ReefTemp and NOAA HotSpot maps for GBRMPA Climate Change Group Director to brief senior management team |
| Weekly/ fortnightly | Tuesday | | Summarise weather, sea and coral conditions and draft bleaching risk current conditions report for website. Include recent images. |
| Weekly/ fortnightly | Wednes-day | | Have updated current conditions report reviewed, approved and published on external web |
| | | | Announce web update and send brief report |
| Weekly/ fortnightly | Constant | | Monitor extent of bleaching using existing information channels and evaluate for trends (ie change in bleaching extent) |
| | | | Advise GBRMPA senior management team and the Minister for the Environment, Heritage and the Arts if dramatic worsening of conditions is evident |
| Event-based | High bleaching risk | | Actively solicit confirmatory bleaching reports from reliable sources, including BleachWatch participants, Day-to-Day Management field officers, AIMS, other researchers, etc. |
| | | | Alert relevant project coordinators and managers |
| | | | Brief GBRMPA senior management team |
| Event-based | Moderate bleaching event detected | | Brief GBRMPA executive and the Minister for the Environment, Heritage and the Arts |
| | | | Prepare media position, draft statement and consult with GBRMPA media coordinator and executive |
| | | | Brief all GBRMPA staff, stakeholders and collaborators |
| | | | Release media statement |
| | | | Actively promote and solicit submissions to online bleaching reports to provide wide spatial coverage |
| | | | Implement Bleaching Assessment and Monitoring component |

## SOCIOECONOMIC CONSIDERATIONS

It is important to consider the impacts to human users of coral reefs from climate change and coral bleaching. These will have both direct impacts, from the bleaching itself, especially when there is coral mortality, and indirect impacts from management measures intended.

Use this table to identify populations who may be affected by major coral bleaching events. These impacts will be important to report to the media and to elected officials. It is also important to understand up front the economic impacts of certain management measures (e.g. dredging bans during bleaching events).

| Type of event | Populations who may be affected by bleaching (e.g. dive operators, fishermen) | Type of impact (social, cultural, economic) | Actions that may lessen impacts (examples: pre-bleaching warnings, economic mitigation, etc) |
|---|---|---|---|
| **Direct impacts** | | | |
| Moderate bleaching | 1. | | |
| | 2. | | |
| | 3. | | |
| Severe bleaching | 1. | | |
| | 2. | | |
| | 3. | | |
| Post-bleaching coral mortality | 1. | | |
| | 2. | | |
| | 3. | | |
| | | | |
| **Indirect impacts** | | | |
| Fishing restrictions | 1. | | |
| | 2. | | |
| Recreational use restrictions | 1. | | |
| | 2. | | |
| Restrictions on coastal development/ dredging | 1. | | |
| | 2. | | |
| Other: | | | |
| | | | |

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## COMMUNICATIONS STRATEGY

The following provides a briefing schedule to senior management, the governor or other elected official, the press and the message to be conveyed according to the risk or severity of bleaching. Fill in dates and triggers that are appropriate to your site. Think about the message that should be conveyed in each of these cases. The Great Barrier Reef Marine Park Authority table of activities is provided on the back of this sheet as an example.

| | | Briefings | | | | |
|---|---|---|---|---|---|---|
| Approx. date (adjust per your site) | Trigger[1] | Senior Management | Elected official | Stakeholders and partners | The media | Examples of messages (tailor to your own site): |
| 1 June | | | | | | Summer approaching; bleaching risk period; we are prepared |
| | High bleaching risk | | | | | Temperatures unusually high; coral bleaching event probable |
| | Moderate bleaching | | | | | High temperatures recorded; moderate bleaching observed; areas worst affected |
| | Severe bleaching | | | | | Very high temperatures recorded; severe bleaching observed; areas worst affected; mortality likely |
| 15 July | | | | | | Temperature trends for first half of summer; summary of reports of coral bleaching |
| 15 September | No bleaching | | | | | Summer concluding; bleaching risk period over; no significant bleaching observed |
| | Moderate or severe bleaching | | | | | High water temperatures recorded during summer; bleaching observed; preliminary assessment of extent and severity; detailed surveys underway |
| 15 October | Moderate or severe bleaching | | | | | Summary of full extent and severity of bleaching; implications for the reef |
| Monthly | | | | | | Updates on temperature trends and coral condition; also publish to web and email to all staff |

## EXAMPLE: **GREAT BARRIER REEF MARINE PARK AUTHORITY COMMUNICATIONS STRATEGY**

| | | Briefings | | | |
|---|---|---|---|---|---|
| Approx. date | Trigger[1] | Senior Management | Minister | Stakeholders | Message |
| 1 Dec | | ^ | ^ | ^ | Summer approaching; bleaching risk period; GBRMPA prepared |
| 20 Dec | | ^ | | | Temperature trends for December; plans for Christmas break |
| | High bleaching risk | ^ | ^ | | Temperatures unusually high; coral bleaching event probable |
| | Moderate bleaching | ^ | ^ | ^ | High temperatures recorded; moderate bleaching observed; areas worst affected |
| | Severe bleaching[2] | ^ | ^ | ^ | Very high temperatures recorded; severe bleaching observed; areas worst affected; mortality likely |
| 15 Feb[3] | | ^ | | | Temperature trends for first half of summer; summary of reports of coral bleaching |
| 31 March | No bleaching | ^ | ^ | ^ | Summer concluding; bleaching risk period over; no significant bleaching observed |
| | Moderate or severe bleaching | ^ | ^ | ^ | High water temperatures recorded during summer; bleaching observed; preliminary assessment of extent and severity; detailed surveys underway |
| 31 April | Moderate or severe bleaching | ^ | ^ | ^ | Summary of full extent and severity of bleaching; implications for Great Barrier Reef |
| Monthly[4] | | ^ | | | Updates on temperature trends and coral condition; also publish to web and email to all staff |