MONITORING WHAT MATTERS

Creative, cross-cutting and collaborative approaches to tracking Gulf of Mexico ecosystem recovery

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Acknowledgements:
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Restoration effects
Habitat restoration
Habitat protection
Aiding natural processes
Mitigating stressors

Environmental change
Sea level rise
Warming ocean temps
Changes in $\text{H}_2\text{O}$ flows
Changes in prey abundance

Ecosystem Health

MONITORING AND ADAPTIVE MANAGEMENT
Reduced uncertainty

Restoration effects
Habitat restoration
Habitat protection
Aiding natural processes
Mitigating stressors

Outcomes

2010
2017
2032

Time

Measures of system health

DWH oil disaster
What should be monitored?
CHARTING THE GULF

Analyzing the Gaps in Long-term Monitoring of the Gulf of Mexico
GAP ANALYSIS

BP Oil Spill Injuries & Ecosystem Drivers

Monitoring Inventory

Gaps in Coverage

Monitoring Priorities

Species/ Areas

Space

Time
Shallow- and Mid-water Corals

Summary

Monitoring of shallow- and mid-water corals should be modified or expanded to assess long-term impacts from exposure to hydrocarbons or chemical dispersants during the BP oil disaster. The monitoring priorities for shallow- and mid-water corals include developing high-resolution distribution maps of these ecosystems within the Gulf, monitoring marine conditions that affect recovery and establishing sentinel sites for elucidating long-term trends from global climate change. The current focus of long-term monitoring is primarily to track community status and species composition of coral reefs and associated fish communities. The majority of existing monitoring efforts are conducted in marine protected areas such as the national marine sanctuaries and habitat areas of particular concern, which are managed through fishing gear restrictions. These protected area programs are invaluable, as they help establish the record of baseline conditions in the face of catastrophic events like the BP oil disaster. These long-term data records can serve as reference conditions for documenting oil impacts of other reef communities throughout the Gulf of Mexico and can aid in tracking recovery. The existing long-term efforts address some monitoring priorities, but overall they are either not integrated in a manner that allows for broad geographic comparability, or they are limited in scope and not designed for tracking BP oil disaster recovery. In order to establish a scientifically defensible monitoring program for recovery tracking, significant additional investments need to be made to develop and expand the monitoring network that can not only inform recovery status but also begin to create a regionwide understanding of broadscale impacts from ecosystem drivers, such as climate change.

Gaps Identified

<table>
<thead>
<tr>
<th>Monitoring Priority</th>
<th>Species</th>
<th>Space</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantify status and trends of Gulf corals</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>High resolution mapping of coral and hard-bottom habitats</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Monitor community processes at existing restoration projects</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Full suite physical/chemical monitoring</td>
<td>1</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Sentinel site monitoring / climate change / ocean acidification</td>
<td>1</td>
<td>7</td>
<td>7</td>
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**EXPLANATION OF GAPS**

1. Not applicable (no priority species identified).
2. Majority of efforts are limited to the national marine sanctuaries.
3. Existing surveys meet this priority.
4. Monitoring efforts are opportunistic and intermittent.
5. Several long-term surveys have been terminated.
6. No sustained monitoring of full suite physical/chemical parameters.
7. An integrated sentinel program does not yet exist.
Shallow- and Mid-water Corals

Gulf of Mexico

Existing Studies

SHALLOW- AND MID-WATER CORALS LONG-TERM MONITORING


Map Legend

- East and West Flower Garden Banks Coral Surveys (131)
- SEAMAP Gulf of Mexico Reef Fish Survey (062)
- Flower Garden Banks NMS Stetson Bank Coral Monitoring (314)
- Florida Keys NMS WQPP Coral Reef Eval. & Monitoring (295)
- Acropora Corals, Other Benthic Coral Reef Orgs & Marine Debris (169)
- NMFS Northern Gulf of Mexico MPA Surveys (315)
- NOAA SEFSC Population Status of Elkhorn Coral (136)
- NMFS Pulley Ridge Fish Survey (316)
- FDEP CAMA Aquatic Preserve Coral Monitoring (132)
- USGS Coral Reef Ecosystem Studies (CREST) (899)
- SEAMAP Gulf of Mexico Vessel Longline Survey (064)

KEY LESSONS

- Most monitoring is at national marine sanctuaries.
- No integrated sentinel site program for monitoring climate change impacts.
- No Gulf-wide efforts for regional trends.
Physics and biology are tightly interconnected in the Gulf.

- **Rivers bring terrestrial organic matter and nutrients into the nearshore ocean.** Organic material moves across the shelf and into canyons, carrying a rich food source to the deep-water organisms.

- **High levels of nutrients fertilize shelf waters and cause exuberant growth of plankton, which settles to the bottom and promotes bacterial growth and hypoxia.** A large "dead zone" forms every summer on the shelf west of the Mississippi River.

- **Microbial breakdown** of organic material releases nutrients, which can be returned by upwelling to the sunlit zone. There they are available to photosynthetic plankton at the base of the food chain.

- **The Loop Current** carries warm water into the Gulf and gives rise to both clockwise and counter-clockwise eddies. Counter-clockwise eddies cause upwelling of cold, nutrient-rich water from the deep.

- **The "Bermuda high"** brings persistent south-easterly winds. Winter cold fronts force surface water offshore and sub-surface flow into estuaries. Strong winds during spring storms cause high inshore turbidity from sediments.
Increased understanding of Gulf of Mexico ecosystem

Track ecosystem response to restoration & drivers/stressors

Track recovery of resources impacted by the oil disaster

Track program level outcomes and success

Track project level success
Restoration: Sum is Greater than its Parts

Add up the parts using a common currency
## Monitoring Indicators for Tracking Restoration Results

<table>
<thead>
<tr>
<th>Restoration Success Indicators*</th>
<th>Overarching Restoration Goals</th>
<th>Restoration Efforts</th>
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<tbody>
<tr>
<td>Habitat Extent</td>
<td>Restore and Conserve Habitat</td>
<td>RESTORE &amp; NRDA Goal</td>
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<tr>
<td>Habitat Connectivity</td>
<td></td>
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<tr>
<td>Species Composition</td>
<td>Replenish &amp; Protect Living Coastal &amp; Marine Resources</td>
<td>RESTORE &amp; NRDA Goal</td>
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<tr>
<td>Abundance &amp; Recovery</td>
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<tr>
<td>Fisheries Bycatch</td>
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<tr>
<td>Nutrient Loading</td>
<td>Restore Water Quality and Quantity</td>
<td>RESTORE &amp; NRDA (minus “quantity”) Goal</td>
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<tr>
<td>Water Body &amp; Fishing Closures/Advisories</td>
<td></td>
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<tr>
<td>Coastal Landscape Connectivity</td>
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<tr>
<td>Sediment Transport and Delivery (Coastal)</td>
<td>Restore &amp; Enhance Natural Processes and Shorelines</td>
<td>RESTORE objective &amp; aligns with NRDA Restoration Category Goals</td>
</tr>
<tr>
<td>Progress Toward Restoring Normative Flows (Fresh-water flows)</td>
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* Preliminary, still in review
Ocean Conservancy Monitoring Inventory - Now Online

https://erma.noaa.gov/gulfofmexico/erna
The End

Download the gap analysis at oceanconservancy.org/gapanalysis

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