# GEMS Project
## Gulf of Mexico Ecosystem Service Logic Models and Socio-Economic Metrics

## WHY GEMS?

After the Deepwater Horizon Oil Spill, the National Academies called for measurement of the social and economic impacts of the large-scale investments in restoring the Gulf of Mexico. While billions of dollars have been and are still being spent on Gulf coast restoration, there is no reporting on what restoration is contributing to economic and social recovery in the Gulf. Despite existing goals for economic revitalization and community resilience, plus emerging goals for climate response, job growth and equity, social and economic outcomes from restoration largely remain a mystery.

## WHAT is GEMS?

The GEMS project helps to fill this gap by laying the groundwork for consistent and widespread reporting on social and economic impacts of restoration investments in the Gulf. It is a collaboration of the Nicholas Institute at Duke University, the Harte Research Institute at Texas A&M–Corpus Christi, The Nature Conservancy, and The Bridge Collaborative. Practitioners, funders, researchers, and



**Habitat restoration**
- Beach restoration
- Mangrove restoration
- Salt marsh restoration
- Seagrass restoration
- Living shoreline creation
- Oyster reef restoration (6 types)
- Restoring hydrologic connectivity (to promote habitat recovery)

**Recreation enhancement**
- Boat ramps (building and restoring)
- Fishing pier installation
- Trails and boardwalks (building and restoring)

**Water quality improvement**
- Storm water management infrastructure installation
  - Gray and green
- Septic to sewer conversion
- Wastewater treatment plant upgrades
- Agricultural BMPs

stakeholders from across the Gulf co-created logic models that show pathways linking over 20 different coastal restoration project types to social and economic outcomes. Metrics for monitoring each of these outcomes were identified (44 in total), and commonly recurring metrics were compiled into a short list of "core metrics." These core metrics can be used for comparing or rolling up results across projects. We provide measurement protocols to measure how much social and economic outcomes change, and who is affected by those changes, providing an entry point for considering equity. All these resources exist on a web tool that can help inform planning and monitoring at both the project and program scales.

## What Social and Economic Outcomes Result from Gulf Restoration?

The restoration logic models show direct impacts—like job creation—and impacts that come from ecological changes—like reduced shoreline erosion and property impacts. We found strong connections between Gulf restoration approaches and seven general aspects of social and economic change.



Types of Social & Economic Change Linked to Gulf Restoration

Economic Activity · Human Health · Water Costs · Social Cost Carbon · Property Protection · Cultural Values · Social Disruption

## How can the GEMS resources be used?

Managers, practitioners and researchers can use GEMS resources to add social and economic outcomes to existing ecologically-oriented programs, plan for social and economic impacts from the beginning of new restoration programs, choose relevant and practical metrics, and monitor chosen metrics.

**Identify social and economic goals for restoration project or program planning.** Potential social and economic benefits of a project or program can be identified and illustrated using the GEMS logic models. GEMS models for each restoration activity can be used as is, or edited to match the specifics of a given project context. This is an example of the logic models produced. The figure shows how salt marsh restoration is expected to change environmental conditions (grey), human behaviors (blue) and social or economic outcomes (yellow). Dark lines show the strongest links most likely to respond to salt marsh restoration.

**Track progress toward social and economic goals of restoration**. The logic models show which social and economic changes are likely to result from any given type of restoration action. We found that all restoration actions we explored are strongly connected to five specific aspects of economic activity and human health, and
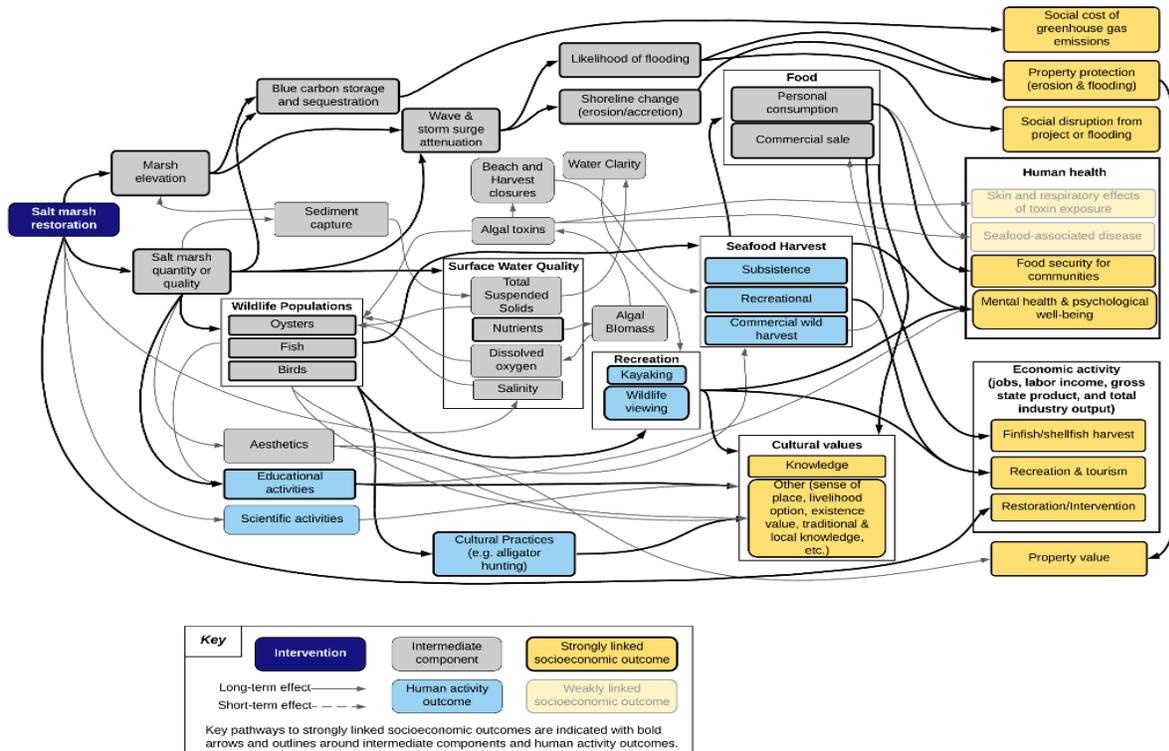
six additional metrics (in italics) are common across habitat restoration, oyster restoration and recreational enhancement projects. These common metrics serve as a useful starting point for existing programs looking to track progress toward economic and social goals/objectives of their programs.

**Choose a broader set of social and economic metrics to track.** In addition to the common metrics listed above, there are 33 additional metrics relevant to other social or economic outcomes of interest, like property protection from erosion or social disruption due to projects or flooding. The logic models can help identify which outcomes and related metrics are relevant to a project or program. The searchable GEMS database includes the full suite of metrics which can be filtered by project or program scale, ease of measurement, and project types.

**Measure social or economic changes and how they are distributed among communities.** If social and economic metrics are new to the project or program team, the GEMS measurement protocols provide a starting point for understanding how to measure change in chosen metrics. These protocols include methods for quantifying impact (how much a metric changes) and distribution of impacts (who experiences the change). For example, the methods can answer questions like "Who will have access to the restored site?," "Who will benefit from new recreation opportunities?," and "Are benefits or harms from the project equally experienced by all members of the community?"

**Assess social and economic changes driven by restoration across an estuary, state, or the entire Gulf.** There are two complementary ways to assess social and economic change at larger scales. The first requires collecting data for a common set of metrics across projects, then rolling those up across the region to get a broader assessment of impact. The second uses program scale metrics to capture changes that cannot be observed from individual projects. One program scale metric measures economic impact from restoration itself, giving a view of how much additional economic activity restoration investments leverage. Other program metrics identify economic impact from commercial fishing, aquaculture, and recreational fishing.

**By using a standardized approach across restoration types, the GEMS logic models, metrics and protocols provide a consistent starting point for revealing the social and economic benefits of Gulf restoration investments. Consistent application of these resources over time would allow clear reporting on restoration benefits to the Gulf economy and communities, and enable comparisons of restoration effectiveness, increasing investment efficiency and ensuring restoration returns.**

### Common Metrics

Restoration jobs
Restoration expenditures
Recreational activity expenditures
*Recreational fishing jobs*
*Recreational fishing expenditures*

Cognitive function
Subjective well-being
*Food security from wild harvest*

*Restoration awareness*
*Habitat knowledge*
*Project specific cultural values*