

GEMS Social and Economic Metrics for Restoration in the Gulf of Mexico

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Core Metrics Key

Key	Habitat Restoration (HR)	Oyster Restoration (OR)	Recreation Enhancement (RE)	Water Quality Improvement (WQ)
Core Metric				
Not Core				
N/A				

Name	Outcome	Tier Scale	Description	Protocols	HR	OR	RE	WQ
Knowledge: Number of people with additional knowledge of habitat effects and other project outcomes based on project site	Cultural Values - Knowledge (R)	2 Project	The number of people with additional awareness of habitat effects and other project outcomes due to proximity to the project, assessed using project-scale methodologies such as surveys, interviews or focus groups.	Download				
Education-related knowledge: number of people with additional knowledge of habitat effects and other project outcomes	Cultural Values - Knowledge (R)	2 Project	The number of people with additional knowledge of habitat effects and other project outcomes due to project-associated educational outreach, assessed using project-scale methodologies such as surveys, interviews or focus groups.					

Name	Outcome	Tier	Scale	Description	Protocols	HR	OR	RE	WQ
Awareness: Number of people with additional knowledge of habitat effects and other project outcomes on broader scale	Cultural Values - Knowledge (R)	2	Program	The number of people with additional awareness of habitat effects and other project outcomes due to living or working in proximity to the project, assessed using program-scale methodologies such as surveys, interviews or focus groups.	Download				
Change in program identified cultural value	Cultural Values - Other (R)	2	Program	Identification and evaluation of cultural ecosystem services (CES), which vary by community, for monitoring which vary by community, for monitoring (e.g., Pascua et al. 2017). Where possible, program team can develop framework for pre-and post-restoration monitoring of CES.					
Change in project identified cultural value	Cultural Values - Other (R)	2	Project	Identification and evaluation of cultural ecosystem services (CES), which vary by community, for monitoring (e.g., Pascua et al. 2017). Where possible, project team can develop framework for pre-and post-restoration monitoring of CES.	Download				

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Change in crop or livestock revenue	Economic Activity - Agriculture (R)	1	Project	The change in reported annual revenue from crop or livestock yield from farms participating in agricultural BMPs. Reported annually and pre-post project implementation.	
Number of aquaculture jobs supported by project	Economic Activity - Finfish/Shellfish Harvest (R)	1	Project	The number of jobs directly supported by an oyster aquaculture project during operation (jobs supported through design and construction would be included in the "restoration jobs" metric below) reported as full-time employee equivalents every year.	  









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Name	Outcome	Tier Scale	Description	Protocols	HR	OR	RE	WQ
Change in economic activity from project associated commercial fish harvest	Economic Activity - Finfish/Shellfish Harvest (R)	2	Program	Jobs, labor income, gross state product, and total industry output modeled annually based on NOAA commercial harvest data and state data (e.g. Florida commercial fisheries) for relevant species. Change in economic activity from commercial fish harvest could be due to changes in target populations or areas closed to harvest due to water quality issues. Reporting harvest and revenue (intermediate outputs for calculating this metric) may also be useful to give a full picture on how commercial harvest patterns have changed in response to the project.				
Change in economic activity from project associated commercial aquaculture harvest	Economic Activity - Finfish/Shellfish Harvest (R)	2	Program	Jobs, labor income, gross state product, and total industry output modeled annually based on commercial harvest data and state data (e.g. USDA Census of Aquaculture) for relevant species.				
Change in local business revenue from project disruption	Economic Activity - Local Business (R)	2	Project	The change in reported revenue from local businesses whose normal operations are temporarily or permanently impacted by disruption from project construction. Reported pre and post project construction.				

Name	Outcome	Tier Scale	Description	Protocols	HR	OR	RE	WQ
Change in recreation and tourism associated economic activity associated with a closure period	Economic Activity - Recreation and Tourism (R)	R & D Program	Change in economic activity from recreation and tourism in area with repeated or long-term closures. This can be measured with a location-specific scenario analysis or survey instrument.					
Number of jobs supported through recreational fishing at project site	Economic Activity - Recreation and Tourism (R)	2 Project	The number of direct, indirect, and induced jobs associated with recreational fishers visiting the restored reef, based on fishing expenditures determined through a survey of recreational fishing anglers conducted by the restoration project.	Download				
Change in recreational fishing expenditures associated with project site visitation	Economic Activity - Recreation and Tourism (R)	2 Project	Estimate of total recreational fishing expenditures due to the project compared to baseline of recreational fishing expenditures in surrounding area, calculated as the number of recreational fishing trips to the project site (estimated from random sampling counts as part of structured monitoring) multiplied by the average trip expenditure (from NOAA FEUS 2018 Report).	Download				

Name	Outcome	Tier	Scale	Description	Protocols	HR	OR	RE	WQ
Change in recreational activity expenditures associated with project site visitation	Economic Activity - Recreation and Tourism (R)	2	Project	Estimate of total recreational activity expenditures due to the project compared to baseline of recreational activity expenditures in surrounding area, calculated as the number of recreational trips to the project site (estimated from random sampling counts as part of structured monitoring).	Download				
Change in economic activity from recreational fishing	Economic Activity - Recreation and Tourism (R)	2	Program	Jobs, labor income, gross state product, and total industry output modeled annually at a county to regional level. Angler surveys will account for the difference in activity associated with a restoration project, which would then be used as input into the economic impact analysis (see Texas Half Moon Reef example [PDF]).					
Number of restoration jobs supported by project	Economic Activity - Restoration/Intervention (R)	1	Project	The number of jobs directly supported by the restoration project, including but not limited to project design, construction, project site maintenance, education, and monitoring, reported every year.	Download				
Total restoration expenditures by project	Economic Activity - Restoration/Intervention (R)	1	Project	The total amount of money spent on the restoration project as reported in the project budget every year.	Download				

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Change in economic activity from restoration spending	Economic Activity - Restoration/Intervention (R)	2	Program	Jobs, labor income, gross state product, and total industry output would be modeled based on project expenditures.					
Change in number of drownings/spinal injuries/rescue incidents	Human Health - Drownings and Other Injuries	R & D	Project	(Per number of visitors to the site.) Number of injuries and drownings after project implementation, measured through surveys of beach patrol or reviewing available incident reporting data.					
Proportion of protein or nutrition from food harvested at restoration site	Human Health - Food Security for Communities (R)	R & D	Program	Relative measure of contribution of subsistence harvest from areas with restoration projects (e.g. seafood, birds, mushrooms) to household nutrition, measured by adding questions to existing national nutrition surveys.					
Proportion of surveyed harvesters who say that food caught/harvested at the site is important for feeding their household	Human Health - Food Security for Communities (R)	2	Project	Estimate of proportion of surveyed harvesters who say that food harvested at project site is important for feeding their household and if that has changed since the installation of the project at site	Download				
Change in cognitive function	Human Health - Mental Health & Psychological Well-Being (R)	2	Project	Change in performance on simple recall or other cognitive function tests pre- and post-recreation activity or time at project site.	Download				

Name	Outcome	Tier Scale	Description	Protocols	HR	OR	RE	WQ	
Change in subjective well-being	Human Health - Mental Health & Psychological Well-Being (R)	2	Project	Change in self-reported state of well-being. Survey of visitors pre- and post-time at project site.	Download				
Change in number of reported cases of mosquito-borne illness in counties near the project site	Human Health - Mosquito-Borne Illness (R)	R & D	Project	Change in number of reported cases of mosquito-borne illness in counties near the project site, measured through available CDC, hospital, and clinic data and groundtruthed with survey instruments. Such measurements have not yet taken place and are in the R&D Phase.					
Change in number of days evacuation routes are closed	Human Health - Public Safety (Related to Evacuations) (R)	1	Project	Change in the number of times that an evacuation route adjacent to the project site is inaccessible due to flooding, based on a simple count of closures.					
Change in number of reported cases of respiratory illness in counties near the project site	Human Health - Respiratory Disease (R)	R & D	Project	Change in number of reported cases of respiratory disease in counties near the project site, measured through available CDC, hospital, and clinic data and groundtruthed with survey instruments. Such measurements have not yet taken place and are in the R&D Phase.					

Name	Outcome	<u>Tier Scale</u>	Description	Protocols HR OR RE WQ
Change in number of reported cases of seafood associated disease in counties near the project site	Human Health - Seafood Associated Disease (R)	R & D Project	Change in number of reported cases of seafood associated disease in counties near the project site, measured through available CDC, hospital, and clinic data and groundtruthed with survey instruments. Such measurements have not yet taken place and are in the R&D Phase.	
Change in number of reported cases of skin and respiratory affects in counties near the project site	Human Health - Skin and Respiratory Effects of Toxin Exposure (R)	R & D Project	Change in number of reported cases of toxin-exposure related skin and respiratory effects in counties near the project site, measured through available CDC, hospital, and clinic data and groundtruthed with survey instruments. Such measurements have not yet taken place and are in the R&D Phase.	
Change in number of reported cases of waterborne diseases in counties near the project site	Human Health - Waterborne Disease (R)	R & D Project	Change in number of reported cases of waterborne disease in counties near the project site, measured through available CDC, hospital, and clinic data and groundtruthed with survey instruments. Such measurements have not yet taken place and are in the R&D Phase.	

Name	Outcome	Tier	Scale	Description	Protocols	HR	OR	RE	WQ
Number of properties or length of infrastructure adjacent to shoreline with reduced erosion after project	Property Protection & Value - Property Protection (Erosion) (R)	2	Project	Total amount of public infrastructure or private property (measured in number and type of properties, or length of road) that experiences decreased adjacent erosion rates due to the restoration project reported every year.	Download				
Modeled avoided flood damage and/or number of people with reduced flood frequency or depth	Property Protection & Value - Property Protection (Flooding) (R)	2	Project	Change in coastal or inland flood damages and/or number of people experiencing reduced flood depths or frequencies based on models that compare flood scenarios with and without the project.					
Change in property damage (per value of property) caused by flooding with the project in place (as opposed to without)	Property Protection & Value - Property Protection (Flooding) (R)	2	Project	Change in number and value of coastal or inland flood related claims payouts within the county or census tract of the project.					
Change in property value across affected properties	Property Protection & Value - Property Value (R)	2	Project	Changes to property values based on proximity to project site, using a hedonic pricing method.	Download				

Name	Outcome	<u>Tier Scale</u>	Description	Protocols	HR	OR	RE	WQ
Change in economic costs resulting from carbon emissions	Social Cost of Greenhouse Gas Emissions (R)	1	Project	Changes in economic costs resulting from carbon emissions associated with the project, measured using the social cost of carbon (a measure of the economic harm from greenhouse gas emissions emitted per ton of carbon equivalent). The current central estimate of the social cost of carbon is over \$50 per ton in today's dollars.	Download			
Change in number of critical facilities (roads, hospitals, schools) affected by stormwater flooding (with frequency and duration of closures if possible)	Social Disruption - Due to Project or Flooding (R)	2	Project	Total number of critical facilities or businesses that experienced flooding, temporary or permanent closure, or had reduced hours around project site, as measured by survey.				
Number of days of disrupted services due to project	Social Disruption - Due to Project or Flooding (R)	1	Project	Total number of days of disruption, annually, due to project construction of maintenance, as reported by project.				
Total sewer conversion costs for homeowners	Water System Costs - Cost to Property Owner	1	Project	Costs to homeowners of the septic to sewer conversion, measured in average cost per homeowner and total cost for all homeowners associated with the project (from project documentation)				

Name	Outcome	Tier Scale	Description	Protocols HR OR RE WQ	
New sewer conversion costs for homeowners	Water System Costs - Cost to Property Owner	2	Project	Net costs to homeowners for the septic to sewer conversion, incorporating average upfront cost per homeowner, average annual savings on septic maintenance, and annual water bill cost. (need to use survey).	
Change in drinking water treatment cost (at facility)	Water System Costs - Drinking Water Treatment Costs	2	Project	Change of water treatment costs since project implementation, shared by utility, and change of measured water quality near project site.	
Change in homeowner cost of fresh water for irrigation	Water System Costs - Freshwater Cost	2	Project	Change of irrigation costs outlined in homeowner utility bills since project implementation in places that use and track reclaimed water, and change of measured water quality near project site.	
Change in municipal water costs	Water System Costs - Freshwater Cost	R & D	Project	Change in municipal water expenditures based on the municipality's use of reclaimed water, as monitored by the municipality.	
Change in cost of stormwater treatment facility upgrades or maintenance due to addition of green infrastructure	Water System Costs - Gray Stormwater Infrastructure Improvement Costs	R & D	Program	Reported frequency of stormwater treatment facility upgrades, measured through survey of stormwater treatment facilities.	

Name	Outcome	<u>Tier Scale</u>	Description	Protocols HR OR RE WQ	
Episodic storm related costs	Water System Costs - Wastewater Treatment Costs	R & D	Project	<p>(Change in incidence of--or total fines paid by treatment plants for--wastewater discharge violations reported annually.)</p> <p>Change in incidence of and total fines paid by wastewater utilities due to wastewater discharge violations, from utility data, based on utility's willingness to share data.</p>	
Change in wastewater treatment cost (at facility)	Water System Costs - Wastewater Treatment Costs	R & D	Project	<p>Change in wastewater treatment cost, from utility data, based on utility's willingness to share data.</p>	