

Hurricane Impacts On Oyster Reefs In the Mississippi Sound



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150 Years of Hurricanes

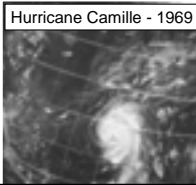
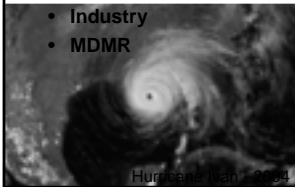


<http://hurricane.csc.noaa.gov/hurricanes/viewer.html>
Hurricanes with their eye passing within 65 nm of Long Beach, MS Zip code 39560

Hurricane Impacts

- Resource
- Water Quality
- Hurricane Recovery
- Harvesters
- Industry
- MDMR

Hurricane Katrina - 2005

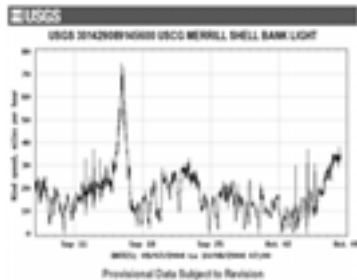


Hurricane Camille - 1969

MS Hurricane Ivan Oyster Reef Damage Assessment

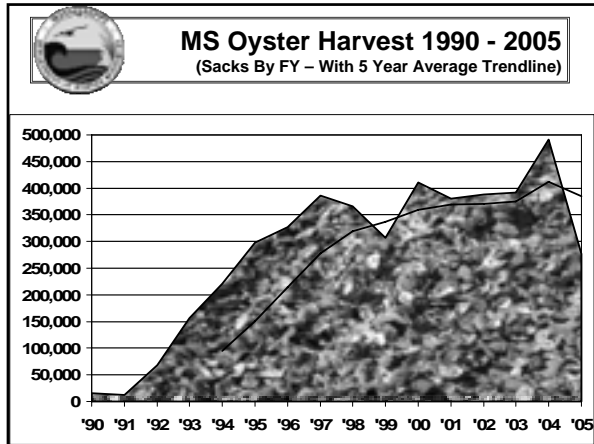
Reef	Mortality Percentage		Fresh Boxes	
	Pre %	Post %	Pre #	Post #
Telegraph Reef	1.9	6	1	9
Pass Marianne	4.1	2	7	5
Pass Christian Tonging	0	4	0	3
Pass Christian Dredging	2	3	2	8
St. Stanislaus	0.5	1	1	2
Waveland	0	4	0	3
Henderson Point	0	2	0	4
Telegraph Shell Plant	2.3	-	1	-
Additional Post-Hurricane Samples				
Long Beach	-	34	-	22
Square Handkerchief	-	4	-	9
Between the Bridges	-	1	-	1
Hornets Reef Tonging	-	1	-	1

Maximum Wind Gusts Hurricane Ivan and Ivan II in Western MS Sound



Resource

- Prior to Hurricane Katrina, Mississippi had approximately 12,000 acres of productive oyster reef habitat
- Recent annual production has approached 500,000 sacks (nearly 4 million pounds of oyster meats)
- Preliminary mortality estimates of harvestable oysters exceeds 90%



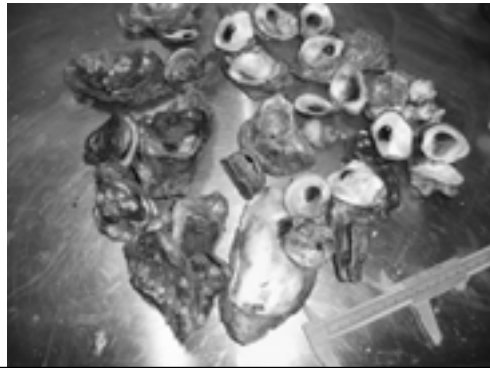
Why Oysters are at Risk for Mortality

- Location - High energy impact estuarine areas
- Sessile organisms
- Filter feeders
- Consumed raw - Public health concerns
- Bottom type requirements
- Long term crop (18-24 months to legal 3" size)
- Sensitive to environmental changes

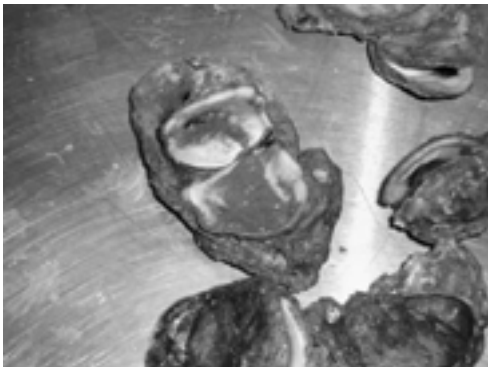
Effects on Oysters

- Scouring of reefs - Physical damage or destruction
- Increased pollution - Health and resource threat
- Mud and silt deposits - Suffocates and hinders feeding and may cause habitat loss or destruction

Oyster Mortalities - Long Beach Reef



Siltation on Long Beach Reef Oysters



Effects on Oysters

- Vegetation and debris fouling - suffocates and hinders feeding
- Lowered dissolved oxygen - suffocates oysters
- Lowered salinities due to flooding - Increased mortalities

Negative Effects

- The large volume and rapid input of fresh rainwater has a greater influence on salinity than saltwater over wash during hurricanes.
- It may take years for oysters to fully recover, and it may be a decade or more before the full effects on shellfish populations are seen. Some habitat may be permanently lost.

Negative Effects

Hurricanes also cause a loss of stratification of surface and bottom waters resulting in an initial short-term increase and then a long-term decrease in dissolved oxygen concentrations.

Moribund catfish – Pascagoula River
Photo – Lynn McCoy - MDWF&P

Positive Effects

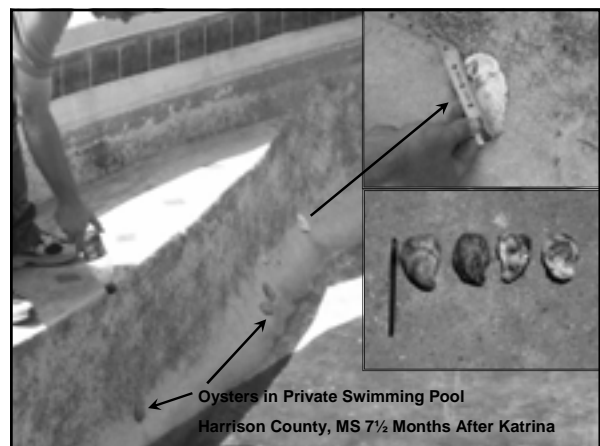
- Water churned up by a hurricane may help refurbish the fisheries.
- Nutrients tied up in the water bottom can be stirred up and redistributed back into the aquatic system, and what is initially a disaster may have beneficial long-term effects.

Positive Effects

- “Nature tends to heal itself.”
- Oysters may be induced to spawn.
- Some scouring exposes clean surfaces for oyster larvae to attach, and may also help to remove built up silt, mud and pseudofeces from oyster reefs.

Sides of the Pass Christian Yacht Club swimming pool

Young oysters growing on the sides of the Pass Christian Yacht Club swimming pool 3 months after Hurricane Katrina



Water Quality

- The DMR participates in the Interstate Shellfish Sanitation Conference (ISSC) and follows their National Shellfish Sanitation Program (NSSP) Model Ordinance Guidelines.
- Federal guidelines are followed by all shellfish producing states.
- Program compliance is monitored by the US FDA.

Pass Christian Yacht Club swimming pool

Negative Effects

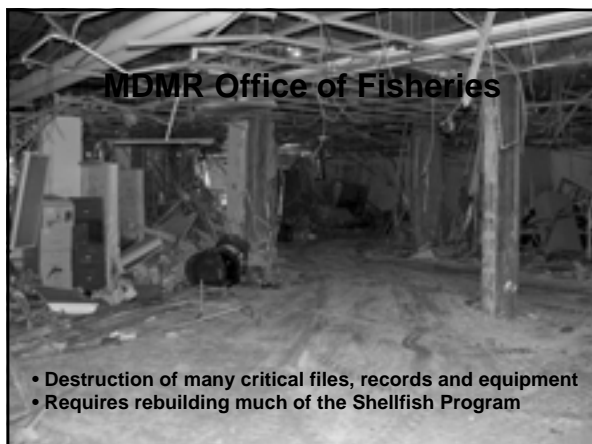
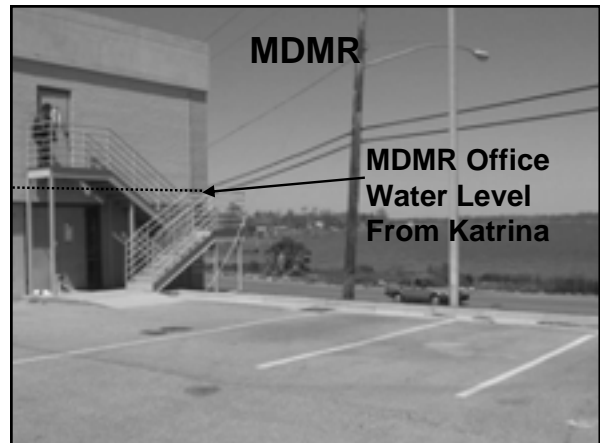
- Household and industrial chemicals, motor oil, pesticides, building materials and organic debris are among the diverse pollutants that typically end up in coastal waters.
- Catastrophic loss of electric power, which can disrupt operations at chemical and industrial facilities may result in discharges that pollute the environment.

Gulfport Beach

Negative Effects

- Flooding overloads wastewater treatment facilities
- Debris may clog sewers resulting in overflow
- Damage or destruction of WWTP and lift stations

U.S. Hwy. 90 Gulfport, MS

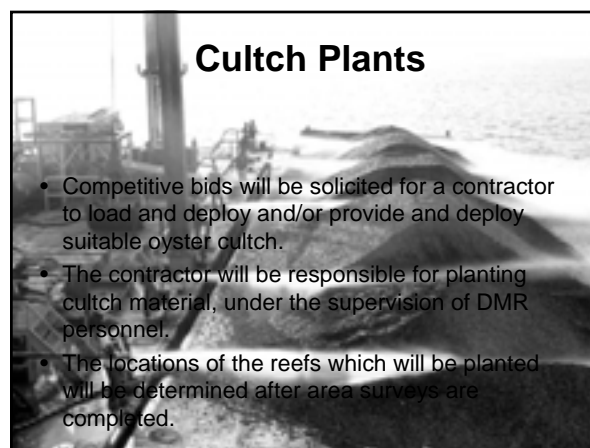
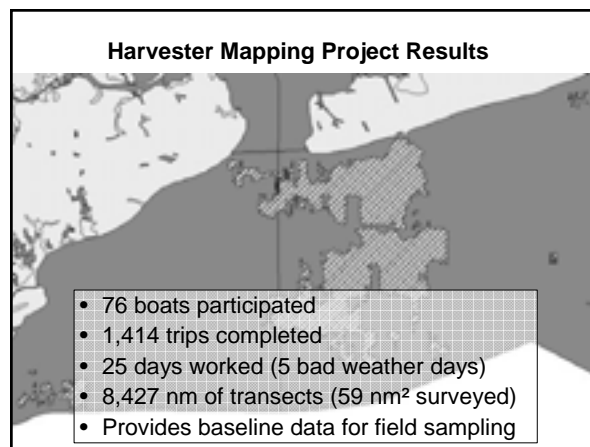
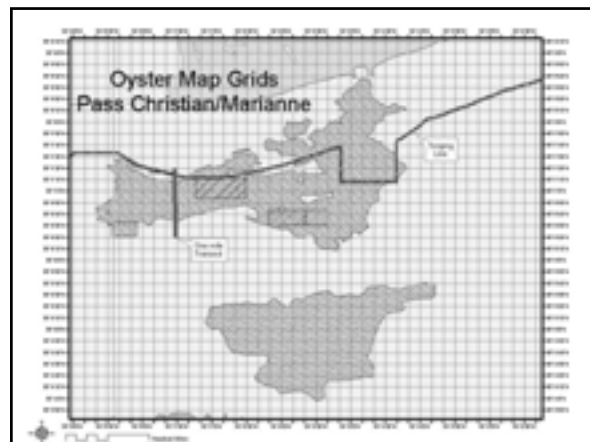


- Destruction of many critical files, records and equipment
- Requires rebuilding much of the Shellfish Program





Even without the loss of critical records, damage from Hurricane Katrina necessitated the update of surveys of actual or potential sources of pollution.



Oyster Shell Reclamation Crew in 1930's Biloxi

(Sun-Herald Staff Photo)



**First Load of Oyster Shells
Headed to Reefs for Hurricane
Katrina Restoration**

St. Louis Bay - Remnants of US Hwy 90 Bridge and
Construction in Foreground, Railroad Bridge in Distance

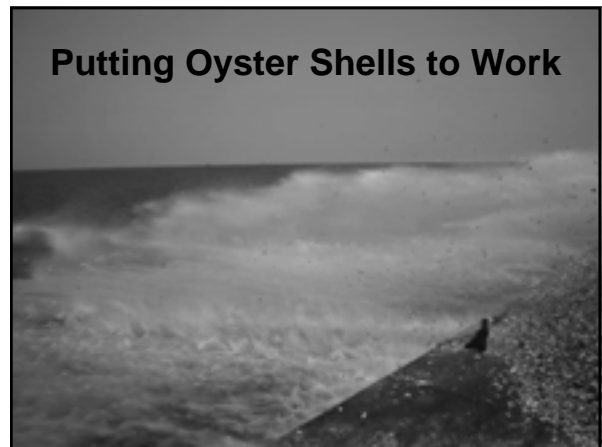
**Tug with Barges of Oyster Shells
Approaching Plant Site**

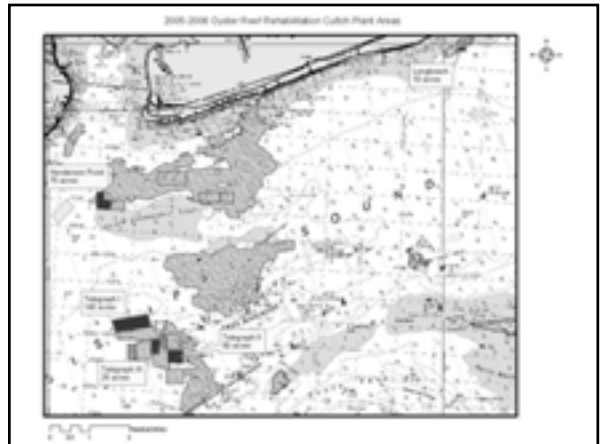
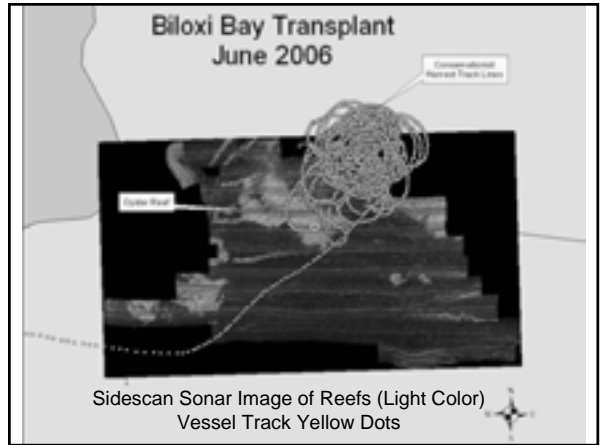
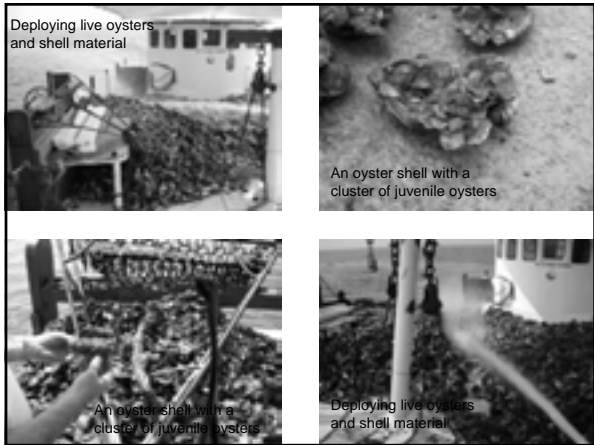
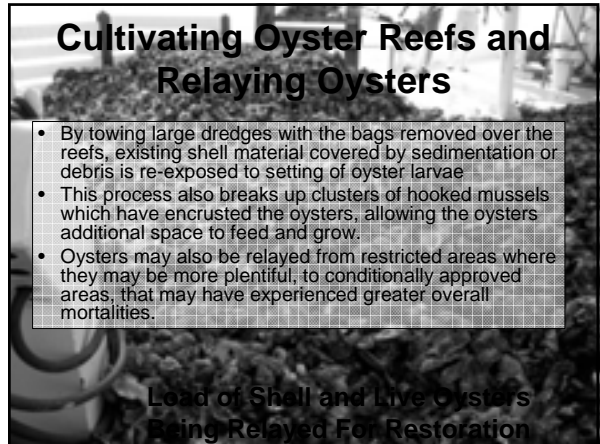


Deployment Begins



Putting Oyster Shells to Work





Oyster Stewardship Project

- The MDMR will develop and implement an oyster stewardship project to better inform and promote the active involvement of oyster harvesters and the industry in harvest practices and other techniques that can be used to assist resource managers in the judicious utilization of oyster resources of the state.
- Harvesters and industry representatives will be heavily involved throughout the development and implementation process through meetings, surveys and individual contacts.
- Innovative methods of improving the resource potential will be investigated and implemented where feasible.

Surveying, Mapping and Marking of Public Oyster Reefs and Potential Cultivation and Cultch Planting Sites

- Mapping of public oyster reefs will be done using real time differential global positioning system (GPS) and side-scan sonar.
- DMR personnel will survey reef areas and verify bottom types using poles, dredges and side-scan sonar.
- Areas will be identified which are excessively silted over and need to be cultivated; need additional cultch material or are suitable for new oyster reef development.
- Total reef acreage estimates will be calculated.
- The DMR will mark selected reef areas with buoys or other suitable markers.

Benthos C3D
High Resolution
Side Scan Sonar System



Internet Resources

- The Katrina Impact Assessment Project - <http://www.ncddc.noaa.gov/Katrina>
- Marine Environmental Impacts of Hurricane Katrina - http://www.st.nmfs.noaa.gov/hurricane_katrina/water_sediment_survey.html
- Louisiana Hurricane Resources - <http://www.laseagrant.org/hurricane/archive/fisheries.htm>
- DMR Replanting Storm Damaged Oyster Reefs - <http://www.wlox.com/Global/story.asp?S=4945137>
- Shellfish suffer in hurricane's wake - <http://washingtontimes.com/national/20050915-112917-4000r.htm>



Harvesters

- Post Katrina, Mississippi has 33 licensed oyster vessels, normally ~375
- ~ 30 to 40 percent of oyster vessels were destroyed
- Size of harvest vessels ranges from small tonging skiffs less than 20 feet in length to large dredge boats in excess of 65 feet in length

Effects on Harvesters

- Flooding
- Physical damage or loss of vessels and infrastructure such as piers, fuel docks and ice houses
- Reduced short to long term prospects

Helping Harvesters

- Provide records of harvest
- Derelict vessel removal
- Apply for disaster assistance
- Reef rehabilitation activities

Industry

- Post Katrina, Mississippi has 26 permitted wholesale seafood dealers and processors of which 15 are currently certified shellfish (oyster) processors or shellfish reshippers (Normally, 76 and 37 respectively)
- 69 dealer or processor facilities were severely damaged or destroyed by Hurricane Katrina

Effects on Industry

- Flooding
- Physical damage or loss of facilities
- Catastrophic power outages - freezer coolers
- Product contamination and loss
- Reduced short to long term prospects
- Loss of harvester capacity
- Loss of clients

DMR Involvement with the Industry

- Cooperative agreement with the US FDA
- Document damage
- Condemn product
- Certify destruction of condemned product
- Assist in recovery efforts

