New Orleans and Coastal Louisiana: A Review on Sustainability and Vulnerability

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Cityscope, MIT
What residents care about:
1. Natural Systems
2. Sustainable Buildings & Infrastructure
3. Public Health
4. Social & Political

“Reinhabiting NOLA” graphic removed due to copyright restrictions.

A Tulane Community Workshop Held in New Orleans, November 2005
Sustainability/Recovery Issues

• Levees and River/Coastal Wetland Restoration
• Smart Growth/Urban Ecology
• Debris Removal and Waste Management
• Sustainable Architecture/Energy Efficiency
• Environmental Health
North Breton Sound
New Orleans Nexus of the American Interior and the Gulf of Mexico
Lake Borgne
Rigolets
Lake Pontchartrain
Pass Manchac
Lake Maurepas
Mississippi River
New Orleans
Mississippi Delta
Gulf of Mexico
Breton Sound
Barataria Bay
Lake Salvador
Lac Des Allemands
Figure by MIT OCW.
Composite Recent Deltas

1. Sale-Cypremort Delta
   5000-4500 years ago

2. Cocodrie Delta
   4500-3500 years ago

3. Teche Delta
   3500-2500 years ago

4. St. Bernard Delta
   2600-1500 years ago

5. Lafourche Delta
   1500-700 years ago

6. Plaquemines Delta
   1200-500 years ago

7. Balize Delta
   500 years ago to present

Figure by MIT OCW.
The Great Mississippi River Flood of 1927

Removed due to copyright restrictions: photograph of people evacuating flooded region, and front cover image of Rising Tide: The Great Mississippi Flood of 1927 and How it Changed America, by John Barry.
Lower Mississippi River Modern Delta

What satellites and sonar tell us
Past and Projected Wetland Loss in Coastal Louisiana (1839 to 2020)

- 25 square miles/year (62 km²/year); 90% of USA loss
- One football field every 38 minutes
- An area the size of U.S. State Rhode Island (1994)
- An area the size of U.S. State Delaware (2006)
Past and future coastal wetland loss in Louisiana

predicted land loss 1932-2050
Critical restoration features:
1) Mississippi River-Gulf Outlet Canal (MRGO)
2) Small diversion at Hope Canal
3) Barataria Basin barrier shoreline restoration - Caminada headlands and Shell Island
4) Small Bayou Lafourche reintroduction
5) Medium diversion with dedicated dredging at Myrtle Grove
6) Multipurpose operation of the Houma Navigation Canal Lock
7) Terrebonne basin barrier shoreline restoration - Isles Dernieres and East Timbalier
8) Maintain land bridge between Calcasieu Lake and the Gulf of Mexico
9) Small diversion at Convent/Blind River
10) Increase Amite River Diversion Canal influence by gapping banks
11) Medium diversion at Whites Ditch
12) Gulf shoreline stabilization at Point Au Fer Island
13) Convey Atchafalaya River water to northern Terrebonne marshes
14) Modification of the Caernarvon diversion for marsh creation
15) Modification of the Davis Pond diversion for marsh creation

Other components of the TSP include:
- Science and technology program
- Demonstration projects
- Beneficial use of dredged material
- Modifications to existing water control structures
- Long-term, large-scale restoration concepts

Note:
Critical features 1 - 5 recommended for programmatic authorization
Critical features 6 - 15 recommended for approval with future authorization

Legend:
- Water control structures
- Waterways with the potential for the beneficial use of dredged material
- Mississippi River-Gulf Outlet Canal
- Freshwater and/or sediment diversion
- Freshwater Influence
- Barrier Island and shoreline restoration
- Potential beneficial use of dredged material sites
- Louisiana coastal area
Louisiana’s Coastal Wetland Functional Economic Values

• Valued at more than $100 billion (insured up to $170 billion)
• More fishery landings than any other coterminous state ($750 million/year)
• 21% of U.S. natural gas supply (oil & gas $30 billion/year)
• Protection for 25% of U.S. exported commodities ($30 billion/year)
• Agricultural value of $30 billion/year
• Largest U.S. fur harvest…not worth much these days
HURRICANE TRACKS
When sea-surface temperatures were cooler (1985-1994)

Sea-surface Temperatures
1944-2004

Figure by MIT OCW.
Now that they're warmer (1995-August 2005)

Figure by MIT OCW.
217 square miles (562 km²) of wetland to water conversion
$1.1 billion acute loss to commercial fisheries
$150 million near-term loss to oyster harvests
Funnel Effect

Photograph of rushing stormwaters removed due to copyright restrictions.
Three Separate Bowls
What Happened?

108,731 households had over 4 feet of flood water (50% of all New Orleans households)  Source: GCR

90,000 square miles (233,000 km²) flooded

approximately 1,500 Louisiana deaths

Displacement of more than 400,000 people locally - 1.3 million regionally)  Source: FEMA
## A Model of Disaster Recovery Activity
(from Vale and Campanella 2005, redrawn from *Reconstruction Following Disaster*)

<table>
<thead>
<tr>
<th>Periods:</th>
<th>Emergency</th>
<th>Restoration</th>
<th>Reconstruction I</th>
<th>Reconstruction II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Stock:</td>
<td>Damaged or Destroyed</td>
<td>Patched</td>
<td>Rebuilt (Replacement)</td>
<td>Major Construction (Commemoration, Betterment, Development)</td>
</tr>
<tr>
<td>Normal Activities:</td>
<td>Ceased or Changed</td>
<td>Return and Function</td>
<td>Return at Predisaster Levels or Greater</td>
<td>Improved and Developed</td>
</tr>
</tbody>
</table>

### Sample Indicators:
- Completion of Search and Rescue
- Restoration of Major Urban Services
- Attain Predisaster Level of Capital Stock and Activities
- Completion of Major Construction Projects
- End of Emergency Shelter or Feeding
- Return of Refugees
- Clearing Rubble from Main Arteries
- Rubble Cleared

![Figure by MIT OCW.](image-url)
Bring New Orleans Back Commission
Urban Planning Vision

New Orleans will be a sustainable, environmentally safe, socially equitable community with a vibrant economy. Its neighborhoods will be planned with its citizens and connect to jobs and the region. Each will preserve and celebrate its heritage of culture, landscape, and architecture.

Photos by Peter Coles
Courtesy of Peter Coles. Used with permission.
Question for Colonized New Orleans:

We always have, are continuing, and always will, in general, live in unsafe, unsustainable conditions?
Multiple Lines of Hurricane Defense
Integrated Coastal Wetland Restoration and Levee Protection

Multiple Lines of Defense Concept (Courtesy of the Lake Pontchartrain Basin Foundation)

Figure by MIT OCW.
Flood and Stormwater Protection Plan: Unified Responsibility

- Single levee district (not 16)
  - Well, ok, how about 2?

- Corps of Engineers responsible for:
  - regional levee/pumping system
  - fund and build
  - maintain and operate

- Local municipalities responsible for local floodwalls and levees.

Figure by MIT OCW.
How will we afford CPRA Master Plan?

Federal oil & gas revenues, Passed U.S. Congress December 2006
• 8.3 million acres in eastern GoM
• Coastal states receive 37.5% of royalties
• $20M/year until 2016; $300-$500/year thereafter

Coastal Impact Assistance to States (Energy Policy Act of 2005)
• $523M 2007-2010; $2 billion for LA by 2017
• Coastal restoration and infrastructure supporting oil & gas mitigation

Water Resources Development Act
• $1.2 billion for Louisiana Coastal Area Projects
• $841 million Morganza to Gulf Levee

Existing coastal restoration and levee appropriations ($75M/year)
Flood and Stormwater Protection Plan
BNOB Parks & Open Space Plan

“Greenspace” - the new “four-letter word”
What is New Orleans’ Population?
(Lack of affordable housing is biggest constraint)

Estimates of population in New Orleans:
1960: 627,523 (peak)
August 2005 (pre-K): 437,186 (1,292,774 metro)
October 2005: 70,000 (90k daytime)
January 2006: 140,000
June 2006: 171,000 - 210,000
August 2006: 235,000 (1,065,000 metro)
Fall 2008: 250,000 est. (more? less?)

Sources: RAND Corporation, GCR, U.S. Postal Service, U.S. Census Bureau
**RAISING RULES**

Houses with more than 50% damage or new construction recommended to be at least 3 feet above the ground or meet the Base Flood Elevation requirement, whichever is higher.

**Lakeview**
*Corner of Filmore Avenue and Colbert Street*
*Ground level:* -6 ft.
*BFE:* -2.5 ft.
*What's advised:* House must meet BFE standard.

**9th Ward**
*Corner of North Johnson and Flood Streets*
*Ground level:* +0.5 ft.
*BFE:* +0.5 ft.
*What's advised:* Though already above BFE, this house on 2 foot piers would need to be elevated another foot to meet the 3-foot rule.

**Eastern New Orleans**
*Near Dwyer Road and Wilson Avenue*
*Ground level:* -12 ft.
*BFE:* -4 ft.
*What's advised:* House must meet BFE standard.

**Chalmette**
*Near Packenham Drive and Genie Street*
*Ground level:* 3.5 ft.
*BFE:* 0.5 ft.
*What's advised:* Despite being well above BFE, this house still needs to be rebuilt on 3-foot piers.

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**FEMA Advisory**

If 50%> damage, raise house to:
1) 1984 BFE or
2) 3 feet, whichever is greater.

**FEMA Assumptions**

1) No subsidence or seal level rise since 1984,
2) A 100-year flood is still a 100-year flood and
2) Floodwalls and levees will hold at “Cat 3”.

*Figure by MIT OCW.*
Encourage Neighborhoods to Live With Water
Lower 9th Ward Bayou Bienvenue Restoration Project

- Historic Habitat & Ecological Services
- Park for Recreation, Research, & Education
- Capture Rain & Stormwater Runoff and Protection
- Water Treatment for Sewerage & Water Board
- Community-driven partnership of agencies, universities, and non-profits
What are the big research and education challenges?

• Application of science to policy and practice of rebuilding and re-inhabiting a city and its coast (the science of rebuilding) that prepare for disaster

• Enhancing the interface of the built and natural environments while protecting from disaster

• Creating resilient, adaptable, and (therefore) sustainable urban ecosystems that serve their communities (*be high or floodable*)

• New Orleans can be a test case for the future of vulnerable port/delta cities worldwide.
Einstein on Sustainable Redevelopment:

- "We can't solve problems by using the same kind of thinking we used when we created them."
- "The eternal mystery of the world is its comprehensibility."
Photograph of a large debris pile removed due to copyright restrictions.

- 25 million cubic yards of “green waste”
- 280,000 tons of steel so far (1.5 NYC World Trade Centers Towers)
- > 100 million cubic yards of construction/demolition waste (22 Superdomes)
MOLDS ARE PREVALENT IN NEW ORLEANS

MOLDS FOUND POST KATRINA

*Aspergillus, Penicillium, Wallemia, Cladosporium, Alternaria, Aspergillus, Fusarium, Trichoderma*

(Trichoderma, a common soil organism was most common.
Stachybotrys, the “sick building” mold was not found)

*Analysis of her own home by Tulane mycologist, Dr. Joan Bennett in ANYAS, Jan-Feb 06*

Photograph of mold-covered furniture removed due to copyright restrictions.