



Natural marsh processes and their implications in restoration efforts

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EWN® for Sustainable Estuaries Short Course

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RESTORE
AMERICA'S
ESTUARIES



EWN®

Engineering With Nature®



US Army Corps
of Engineers®



ERDC
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EWN Elements and Wetland Processes

Producing Efficiencies



Using science and engineering to produce operational efficiencies

Using Natural Processes



Using natural processes to maximize benefit

Broadening Benefits



Increasing the value provided by projects to include social, environmental, and economic benefits

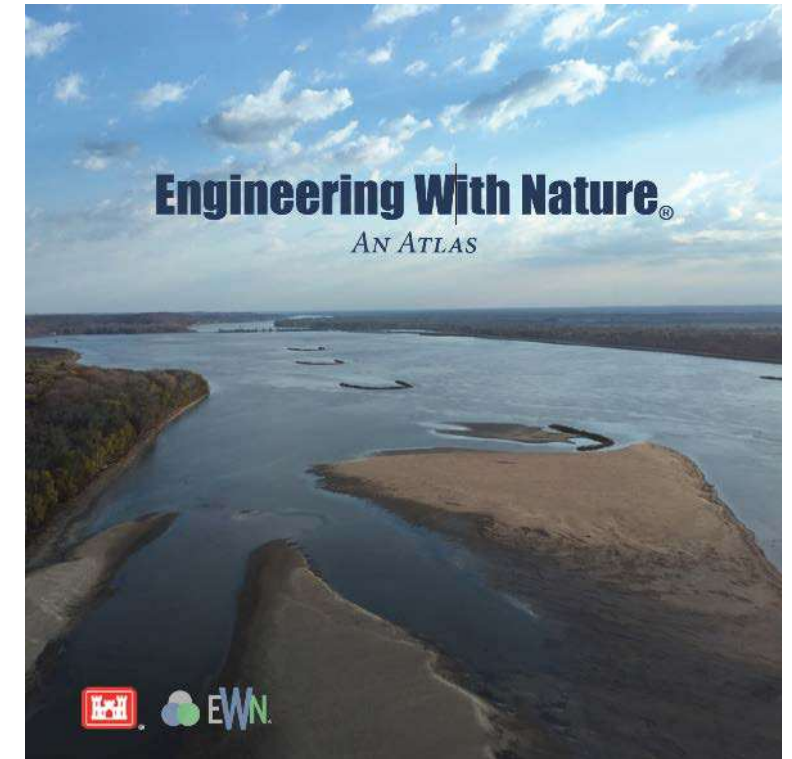
Promoting Collaboration



Using collaborative processes to organize, engage, and focus interests, stakeholders, and partners

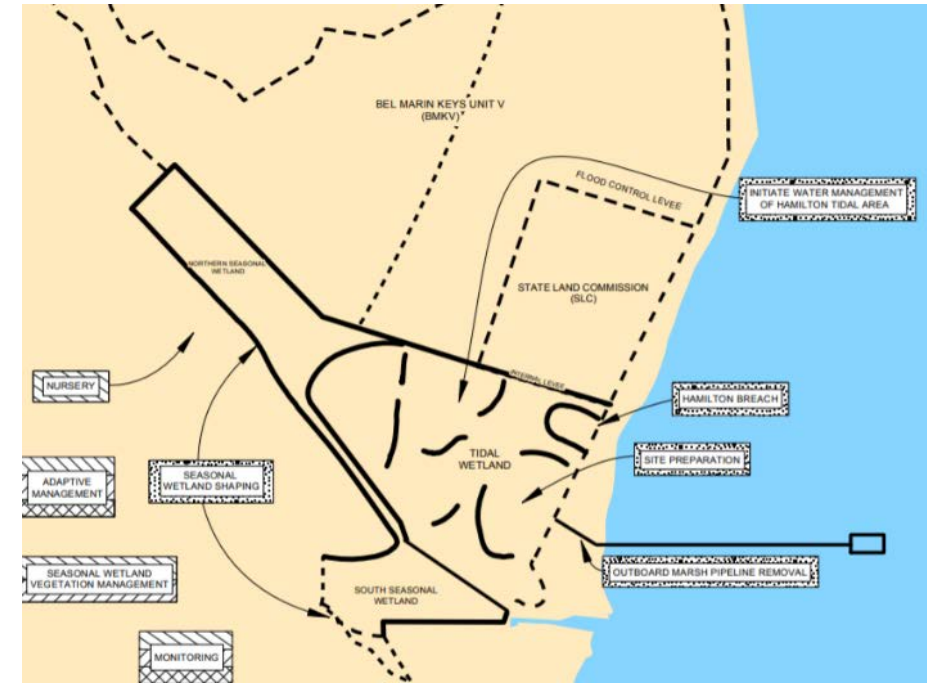
Processes and Functions of Interest

- Sediment Trapping
- Sediment Retention
- Water Quality Improvement
- Habitat Creation and Improvement
- Carbon Sequestration
- Infrastructure Protection
- Recreation
- Education
- Economy



Hamilton Wetlands Restoration

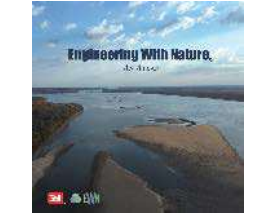
Novato, California, United States



The design allows for natural processes to deposit sediment and create channel networks by creating wave breaks and not filling sediment to grade

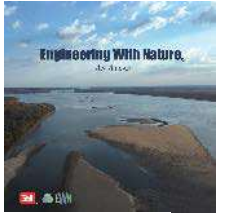


By restoring previously developed wetlands, precious habitat is added for threatened and endangered species while allowing for citizens to remain connected to their coastal world



Hamilton Wetlands Restoration

Novato, California, United States



From this...

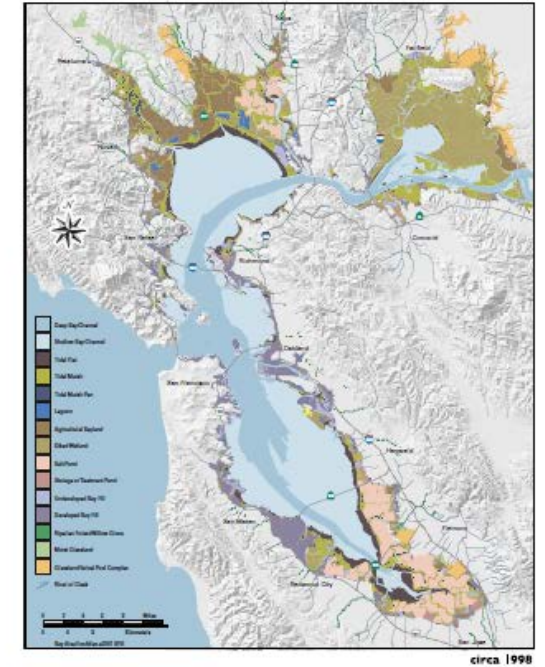
To this...



Photo: Michael Short, The Chronicle

Historical Baylands

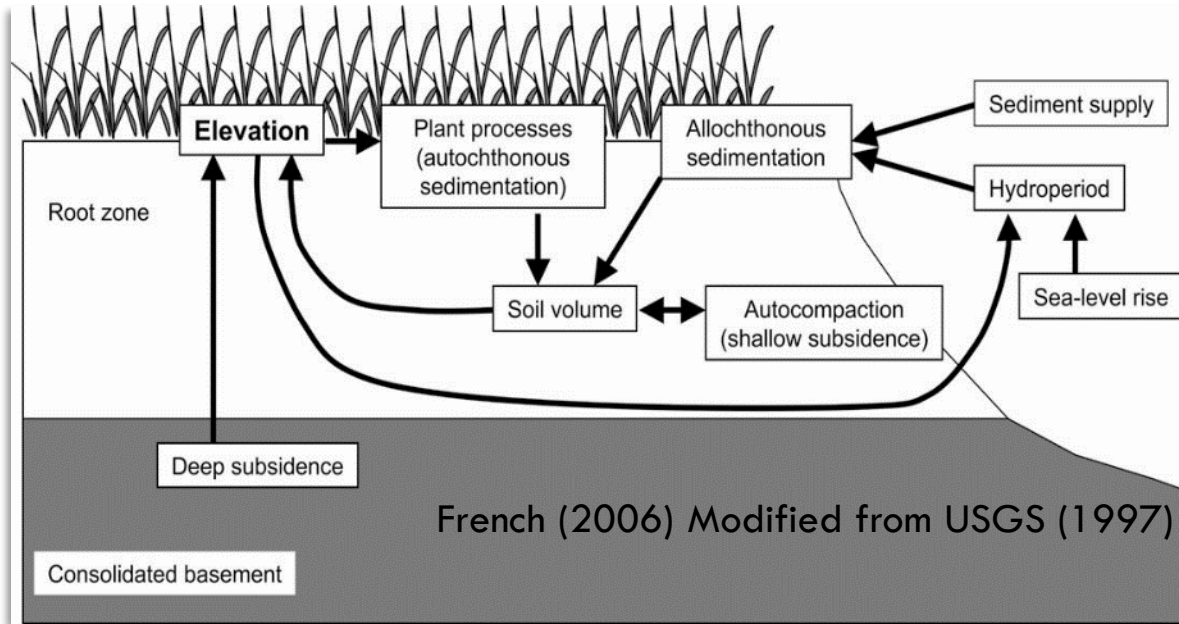
Modern Baylands



Projects like Hamilton Wetlands are crucial for building and maintaining strong relationships between stakeholders, managers, and practitioners



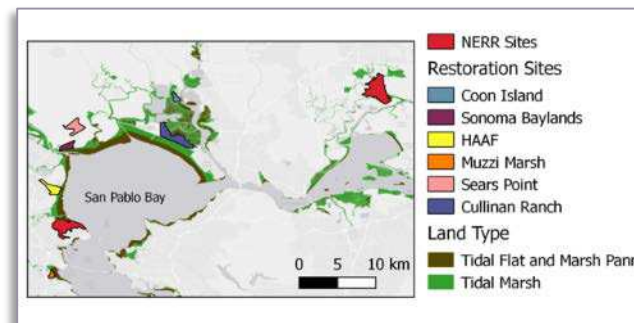
Research: Sediment Accretion in Restored Marshes



French (2006) Modified from USGS (1997)



Nyman et al. 2016



Preservation and community: Yanweizhou Wetland Park

Jinhua, China



Park during typical dry season



Park during 20-y monsoon flooding level

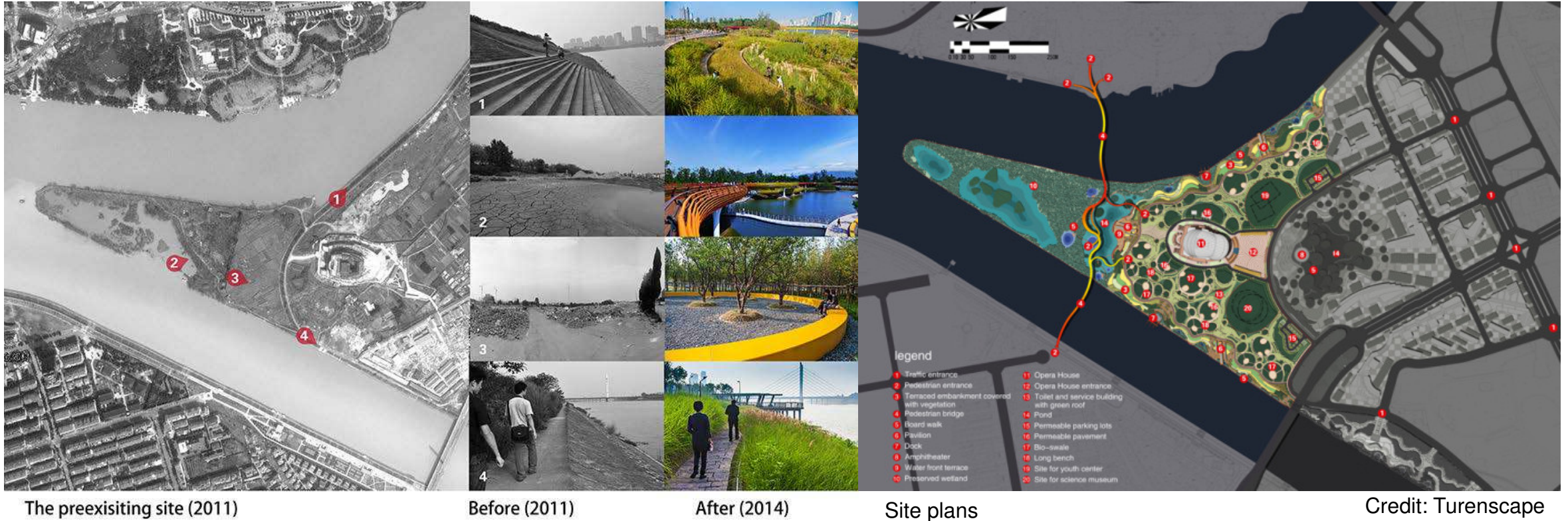


Credit: Turenscape



Preservation and community: Yanweizhou Wetland Park

Jinhua, China



Promoting connectivity between two urban areas and their wetland habitat

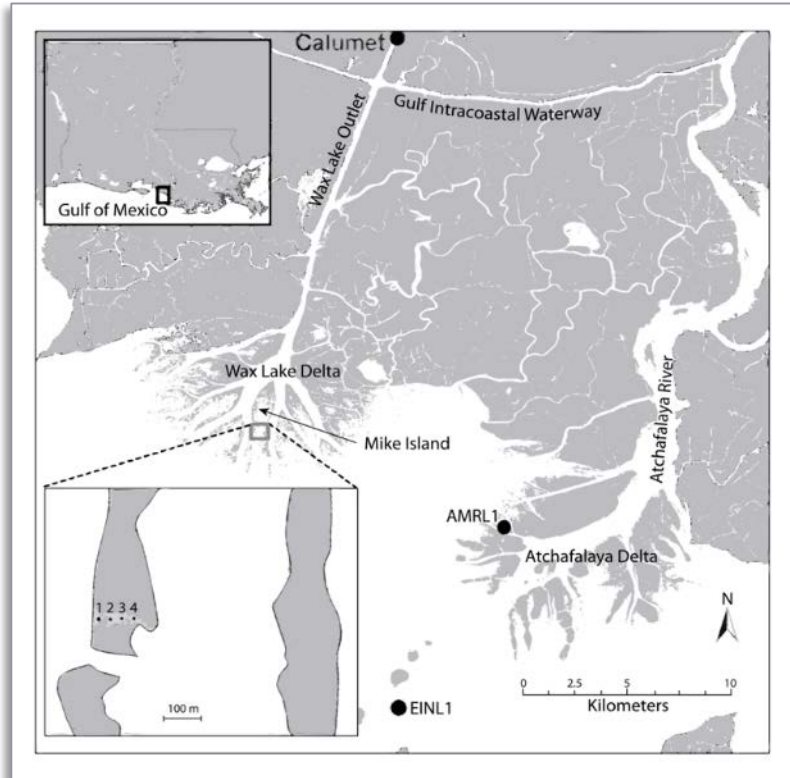


Knowing flooding will come, incorporating flood plains into design



Learning from an emergent delta

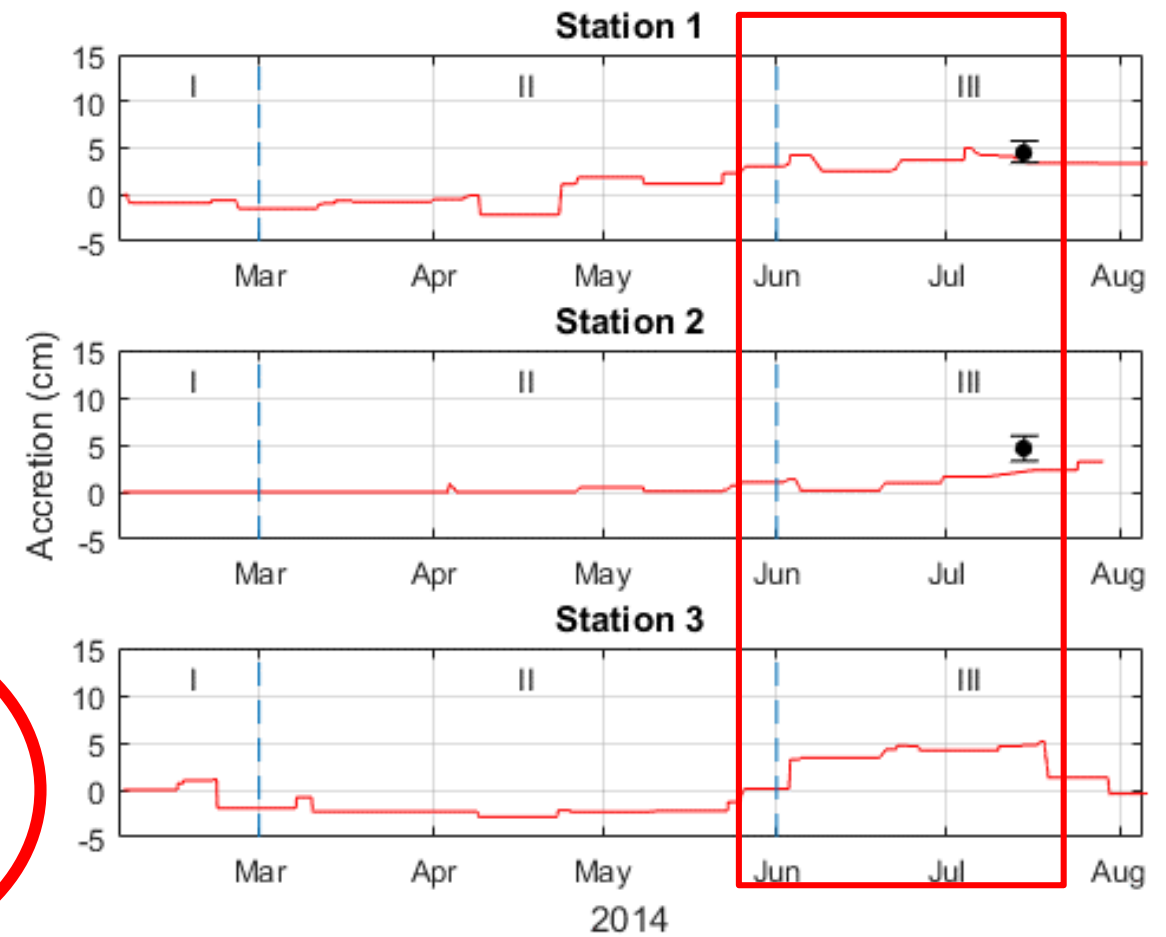
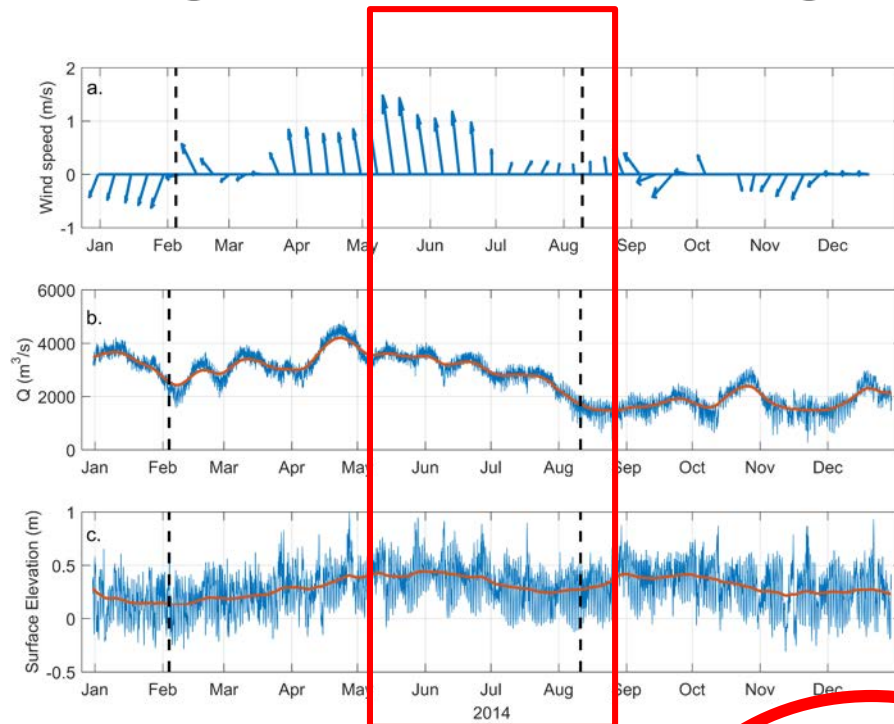
Wax Lake, Louisiana, United States



1984-2017



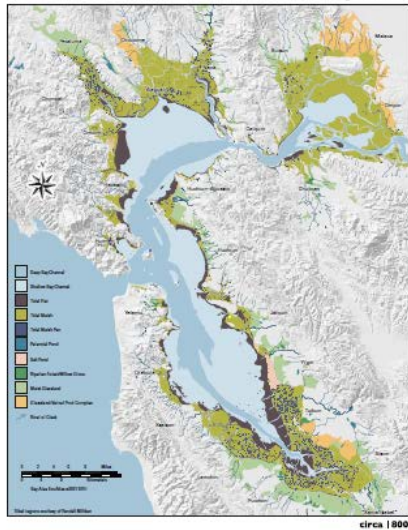
Learning from an emergent delta *Wax Lake, Louisiana, United States*



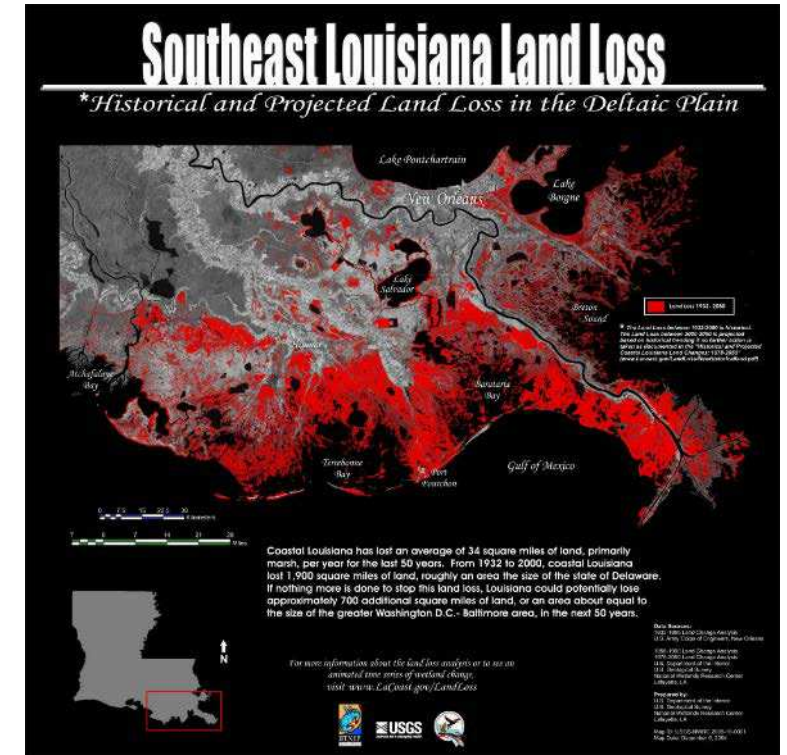
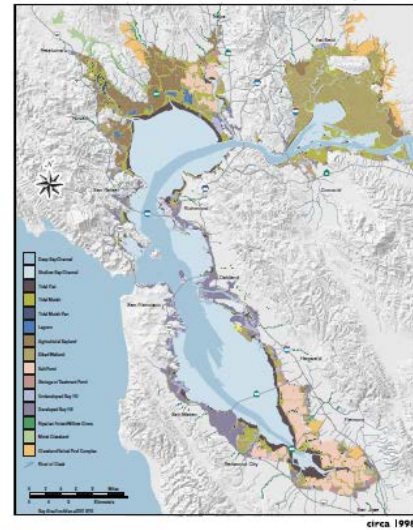
Current Research: A Framework for Systematic Wetland Beneficial Use of Dredged Sediments



Historical Baylands



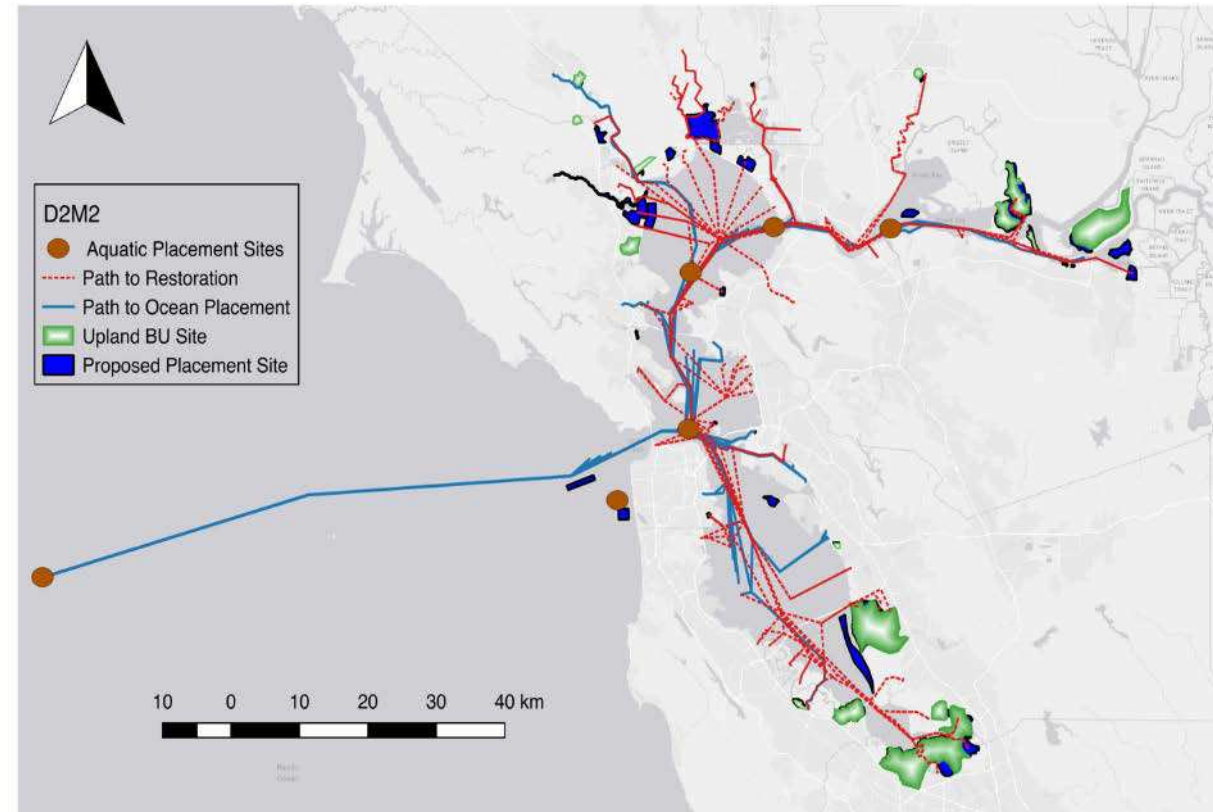
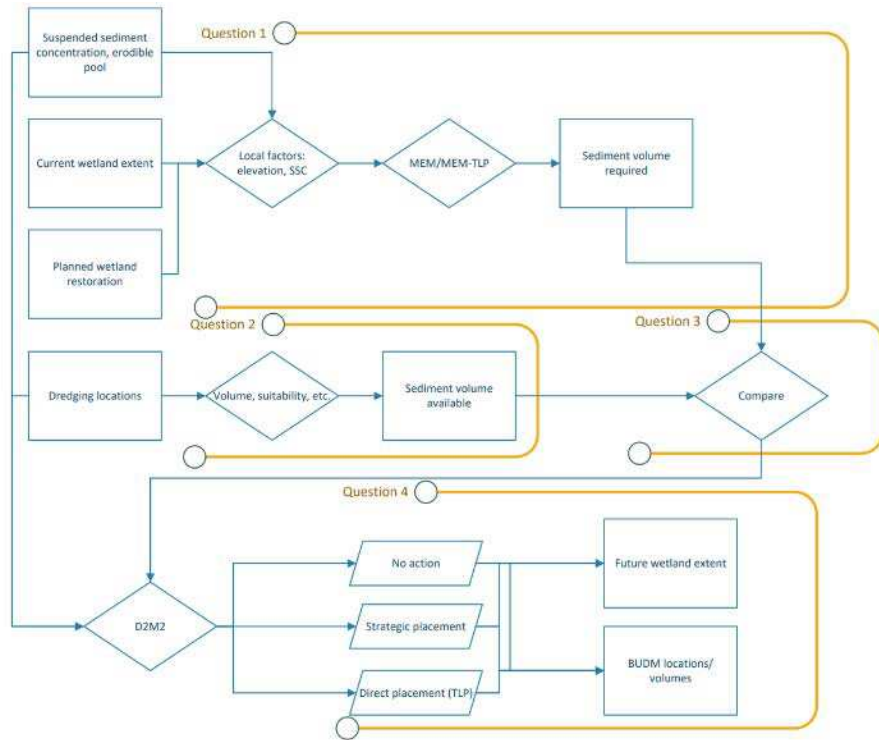
Modern Baylands



- What is the amount of sediment available from dredging?
- Where are the dredging locations?
- What proportion of that sediment is suitable for placement in intertidal habitats?



A Framework for Systematic Wetland Beneficial Use of Dredged Sediments



Salt Marsh Development with a Mud Motor

Koehoal, Tzummarum, Kingdom of the Netherlands



Using the best numerical and tracer science available, researchers predict and validate the direction and magnitude of sediment transport under various natural scenarios to determine optimal placement.



This project uses the approach of allowing natural tidal currents to move sediments, both reducing handling costs and allowing for natural processes to steer marsh development.

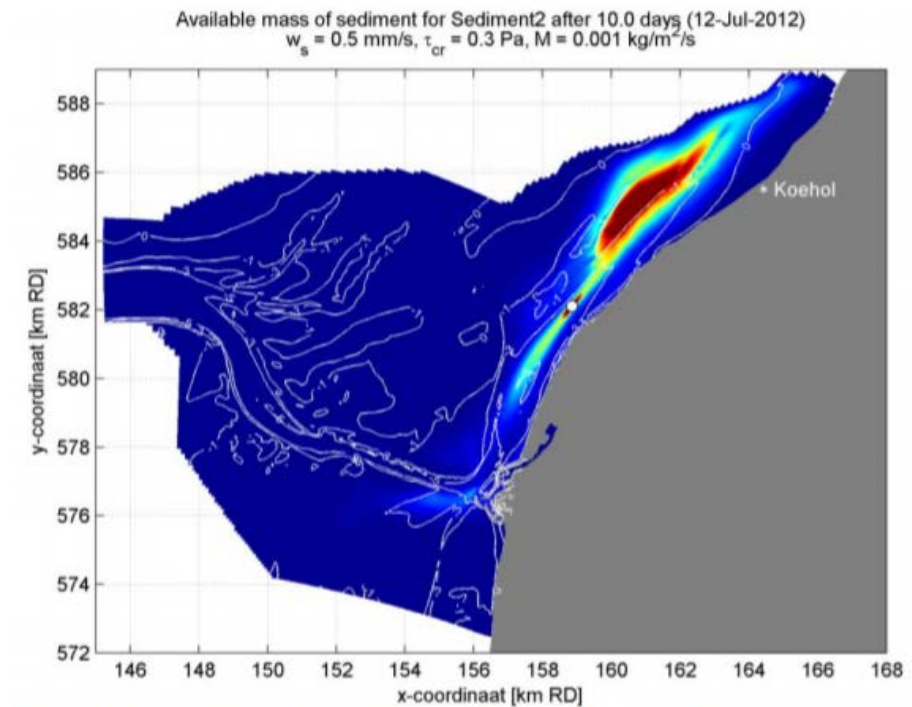
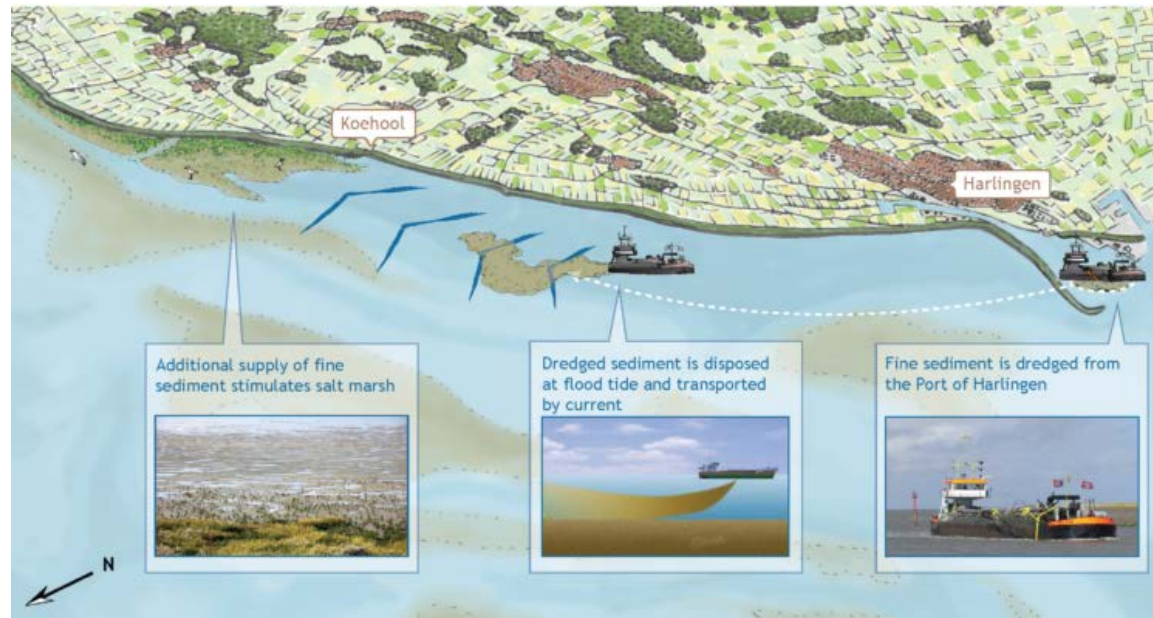


Salt Marsh Development with a Mud Motor

Koehoal, Tzummarum, Kingdom of the Netherlands



The Mud motor



Figuur 3.5 Computed deposition pattern resulting from 10 days continuous release of sediment (settling velocity of 0.5 mm/s; critical shear stress of 0.3 Pa) from the location indicated with a white dot. From Vroom (2015).





Image © 2018 DigitalGlobe

Google Earth

