



# Restoring River Island Habitat in the Atchafalaya River, LA, using Engineering With Nature® Principles

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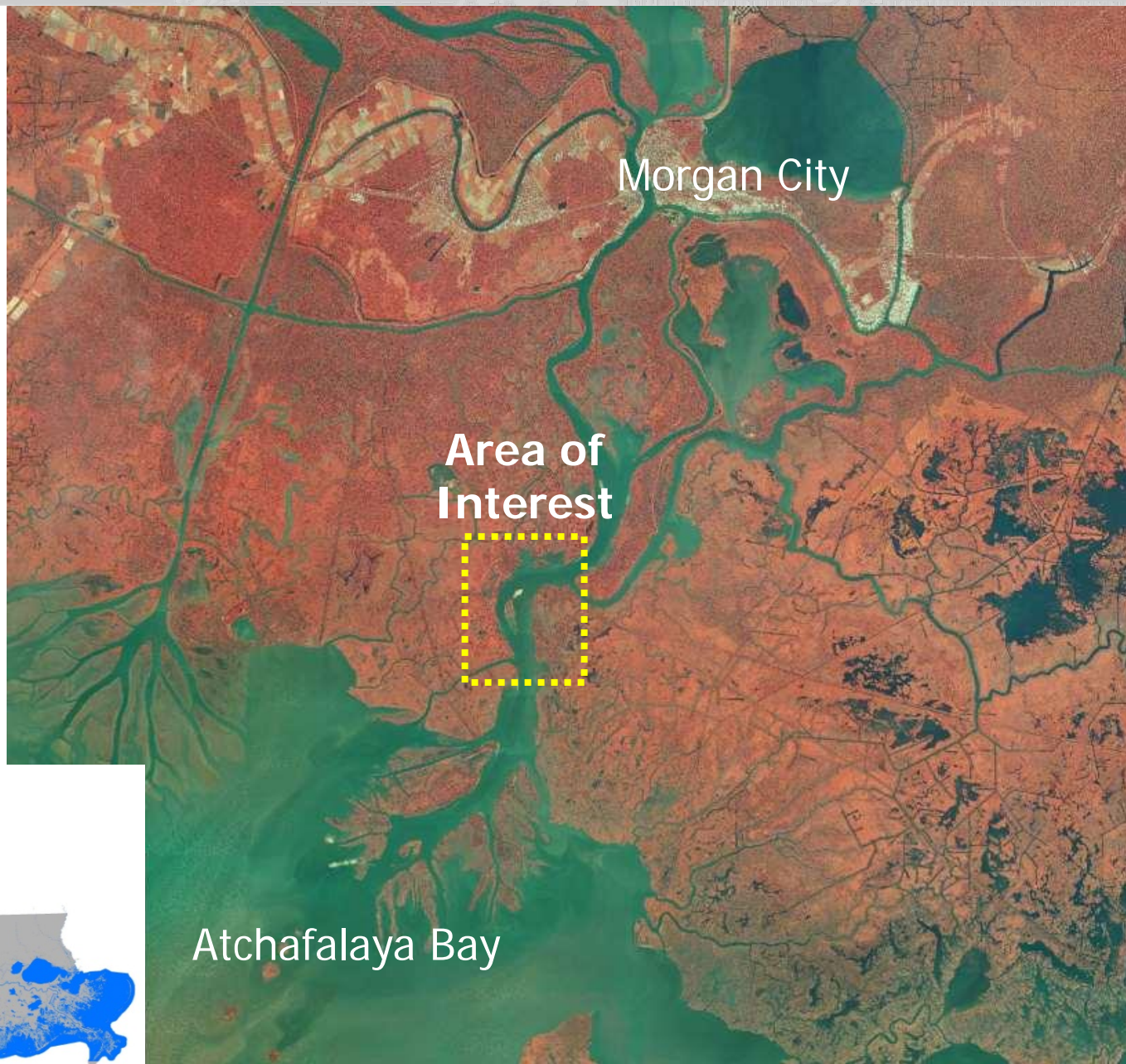
<sup>1</sup>US Army Corps of Engineers  
Engineer Research and Development Center  
Vicksburg, MS

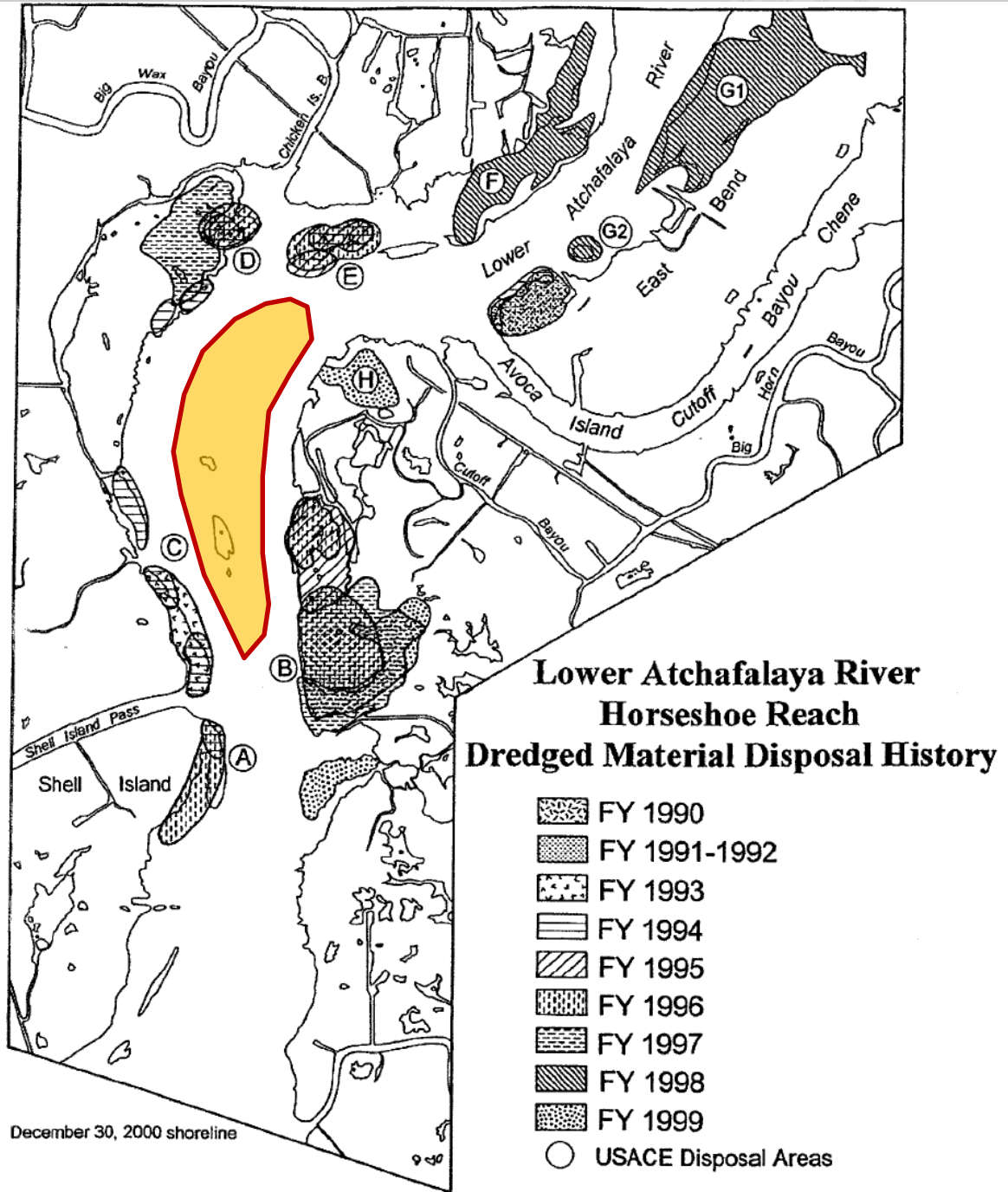
<sup>2</sup>US Army Corps of Engineers, New Orleans, LA



US Army Corps of Engineers®







# Problem

Capacity of Bankline Disposal Areas Exhausted

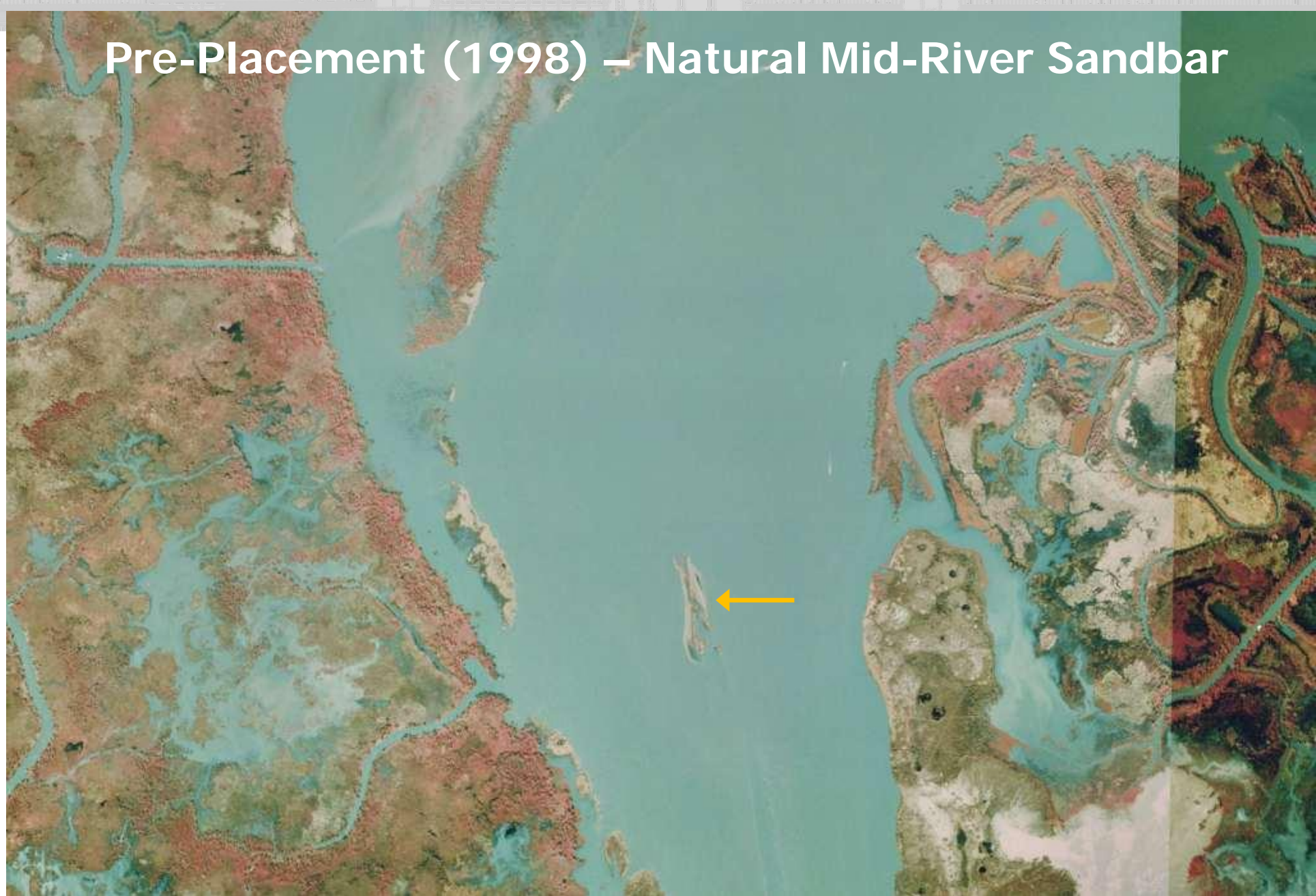
# Alternatives

~~Conversion of Wetland Disposal Areas into Upland~~

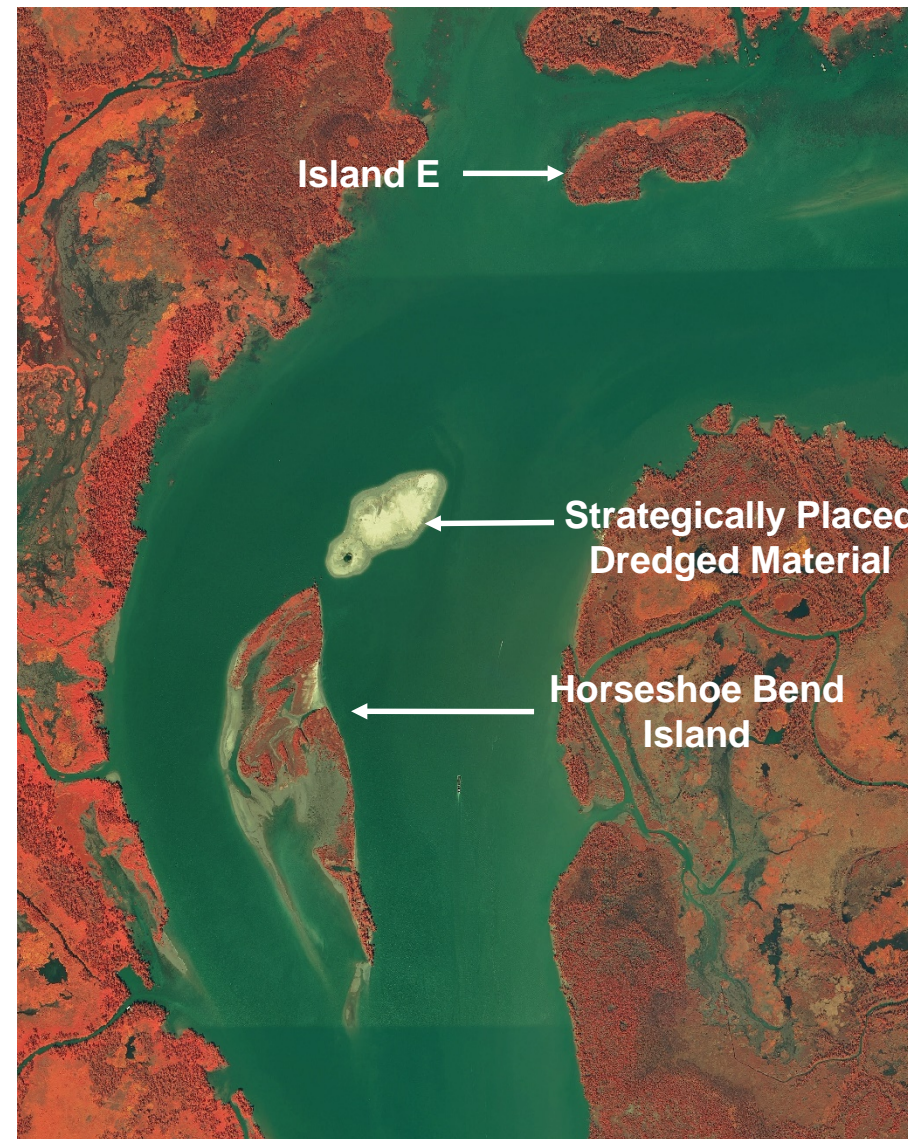
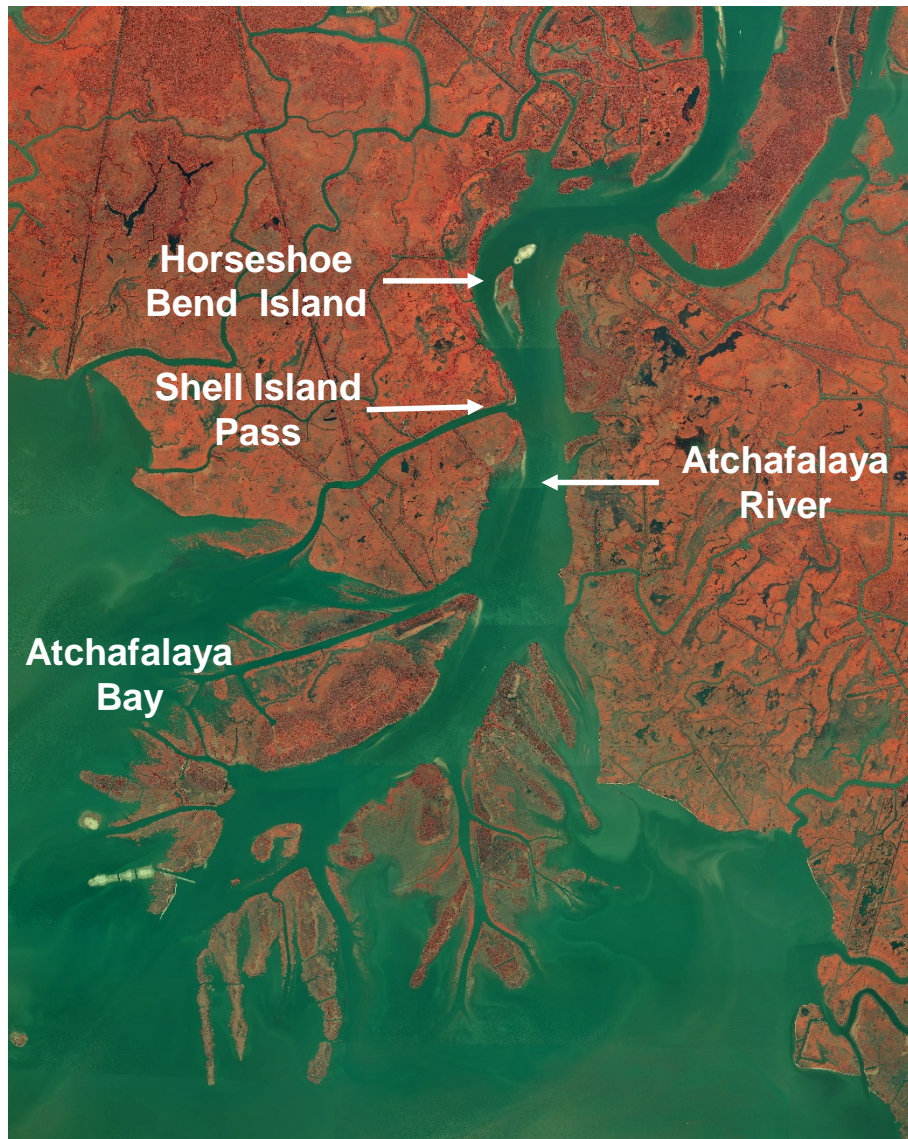
~~Open Water Disposal in Atchafalaya Bay~~

Mid-River Mounding of Dredged Material

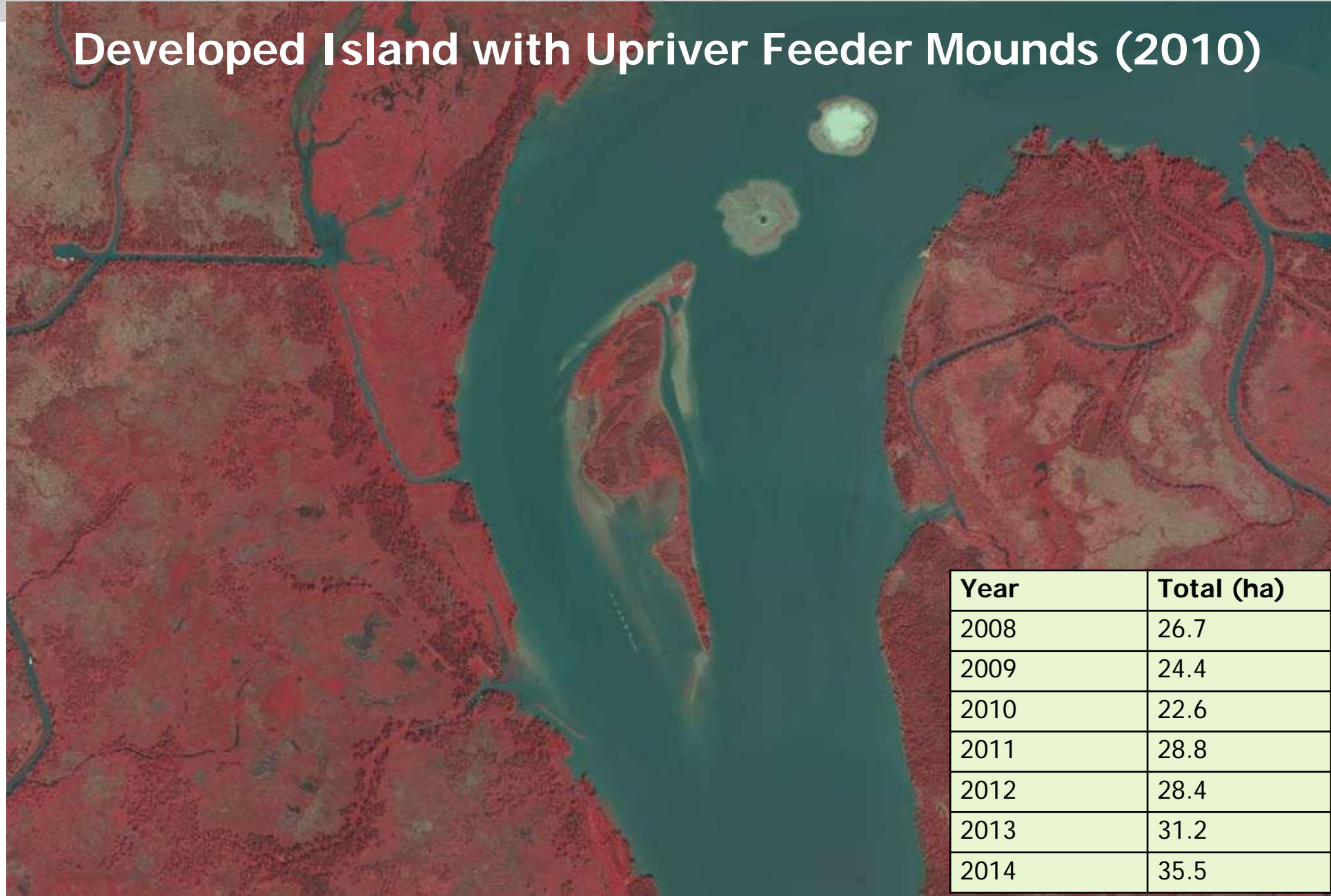
# Pre-Placement (1998) – Natural Mid-River Sandbar



# Study Locations in Coastal Louisiana



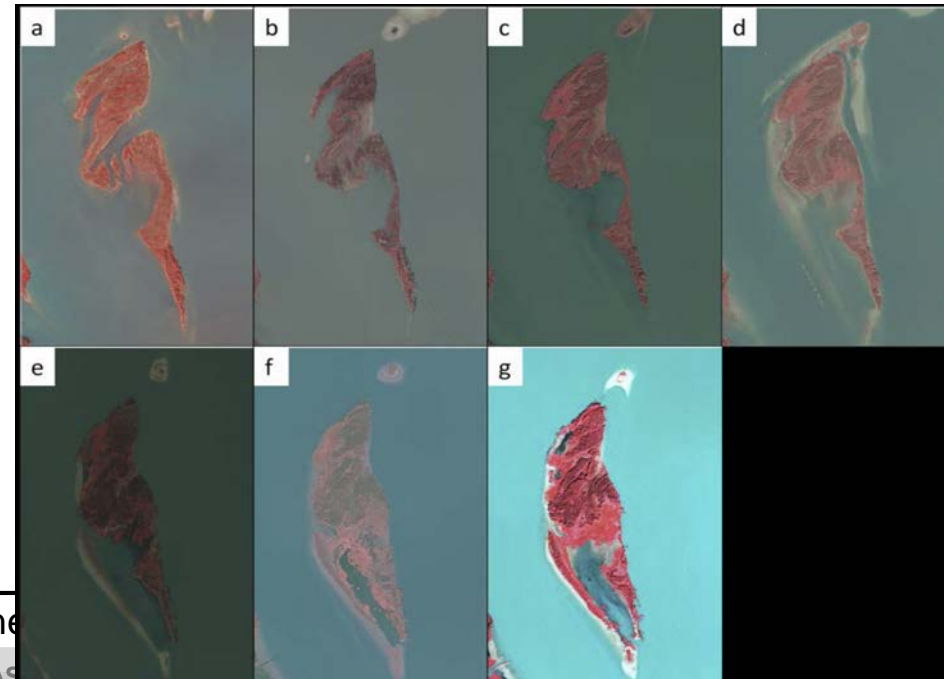
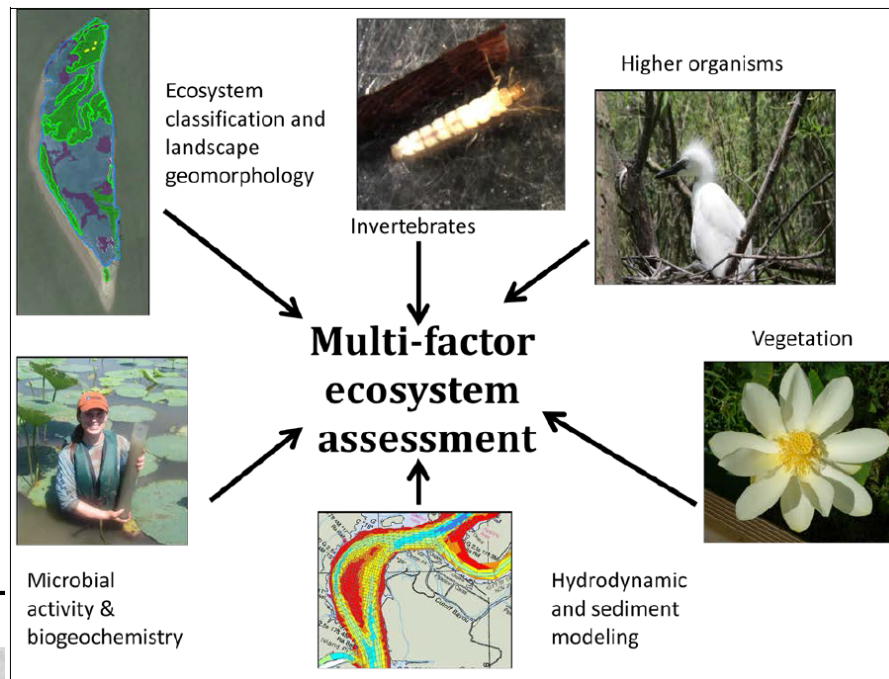
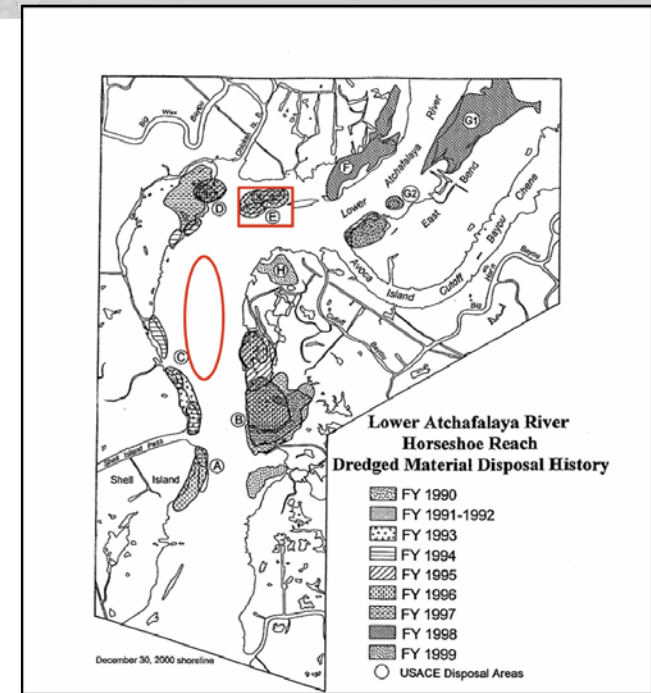
# Developed Island with Upriver Feeder Mounds (2010)



**Problem:** Limited options for dredged material placement alternatives

**Solution:** Innovative EWN placement technique created wetland island

**Approach:** Ecological assessment documented environmental services (ES) benefits



# Case Study: Environmental Services Metrics

Assessment Metrics	Environmental Services
Ecosystem mapping	Environmental sustainability/habitat, recreation
Vegetation communities Faunal survey Invertebrate communities	Support for local and migratory species, nesting bird rookeries, and fisheries
Soil characterization Soil nutrient concentrations Soil nutrient retention capacity	Carbon sequestration, water quality improvement
Hydrodynamic and sediment transport modeling	Navigation, energy savings, safety



# ES Metrics



## Habitat:

- 86 plant species present
- >10 bird species in large nesting colonies
- Support for local fisheries

## Water quality:

- Removal of excess nutrients

## Recreation:

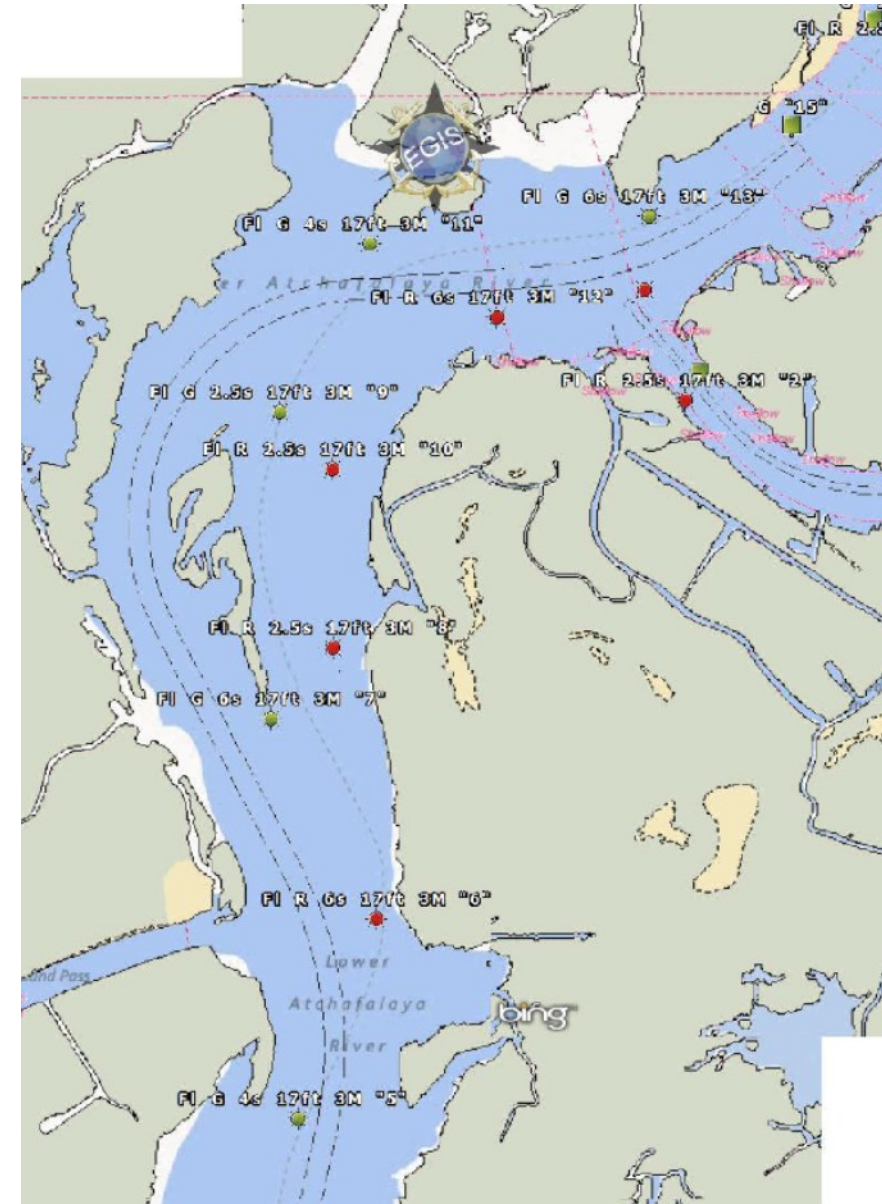
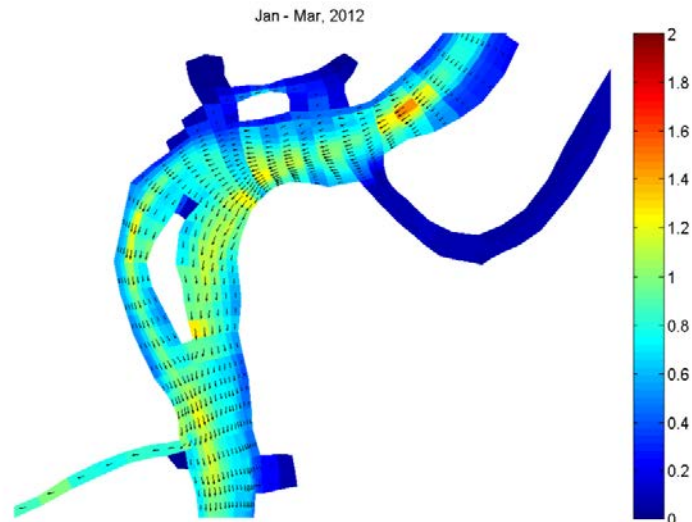
- Fishing, waterfowl hunting, camping

08/28/2013

# ES Metrics

## Hydrodynamics and Navigation:

- Increased flow velocity and sediment transport, creating new channel
- Decreased the need for additional dredging
- Allowed for channel realignment, reducing fuel use and travel time, increased safety



# Quantifying ES Benefits

Environmental Services	Horseshoe Bend Amount	Conversion	Value	Units
<b>Hypoxia Reduction</b>	35 ha (85 ac) wetlands	7% reduction estimated for 10,093 km <sup>2</sup>	0.00028%	Nitrogen reduction in Gulf of Mexico
<b>Emission Reductions</b>	49 liters (13 gal)/trip fuel savings each year by 1400 tugs and cargo ships annually  1.27 million gallons in dredging reduction over 10 years	145,000 gal/yr of diesel fuel saved	1,484	Metric tons of carbon dioxide equivalent (MTCO <sub>2</sub> e)
<b>Carbon Sequestration</b>	6.15 ha (15 ac) emergent wetlands	86 g-C/m <sup>2</sup> each year over 100 years	5,220 kg	Average C per year
<b>Navigation Support and Maintenance</b>	\$22.9M -\$10M over 3 yrs	\$12.9M/3 yrs	\$4.3M	2015 US\$

# Quantifying ES Benefits

<b>Environmental Service</b>	<b>Horseshoe Bend</b>	<b>Island E</b>	<b>Shell Island Pass</b>
<b>Carbon Sequestration Estimate</b>	5,220 kg C/yr	2,645 kg C/yr	2,871 kg C/yr
<b>Hypoxia Reduction in the Gulf</b>	0.00028%	0.00019%	--
<b>Nitrogen Removal (annual)</b>	1,645.5 kg/yr	1,577.2 kg/yr	2,404.0 kg/yr
<b>Emission Reductions</b>	1,484 MTCO <sub>2</sub> e	--	--
<b>Navigation Support and Maintenance</b>	\$4.3M	--	--

Dashes indicate insufficient data

# Summary

- Multi-factor approach quantified metrics needed for ES valuation
- Engineering with Nature® produces multiple benefits
- ES valuation results highlight the full environmental and climate change benefits
- Documenting ES benefits promotes use of innovative and sustainable solutions



# Products and Recognition

Foran, C.M., Burks-Copes, K.A., Berkowitz, J., Corbino, J., and Suedel, B.C. 2018. Quantifying Wildlife and Navigation Benefits of a Dredging Beneficial Use Project in the Lower Atchafalaya River: A Demonstration of Engineering With Nature®. Integr. Environ. Assess. Manage. DOI: 10.1002/ieam.4084.

Berkowitz, Kim, Beane, Evans, Summers, Suedel, Flanagin, Corbino. 2017. A Multi-Factor Ecological Assessment of Dredged Material Supported Wetlands in the Atchafalaya River, Louisiana: An Engineering With Nature Demonstration Project. ERDC/EL TR-17-5.

Berkowitz, Green, VanZomeran, White. 2016. Ecological Engineering. 97: 381–388.

Berkowitz, Beane, Evans, Suedel, Corbino. 2015. Ecological survey of a dredged material supported wetland in the Atchafalaya River, Louisiana. Wetland Science and Practice. 32(1).

Suedel, B., Berkowitz, J., Kim, S., Beane, N., Summers, E., Evans, D, and Corbino, J. 2015. Terra Et Aqua. 140:26-31.



2015 Western Dredging Association Gold Environmental Excellence Award

2017 Western Dredging Association Adaptation to Climate Change Award

PIANC Working with Nature certified



# Thanks for listening!



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# Extra Slide: Dredge Fuel Consumption Savings

- **Projected maintenance HB: 1.1 MCY annually**
- **Projected maintenance CC (post construction): 750,000 CY every 3 yr**
- **Based on 27-30 in cutterhead dredge, removal of 1.1 MCY consumes ~160,000 gal diesel. Assuming same type material settles in CC, removal of 750,000 CY consumes ~109,000 gal fuel**
- **HB 10 years = 10 maintenance events (=1.6 M gal fuel total) vs. 3 maintenance events for CC (=327,000 gal fuel total/3 events)**
- **Realized fuel savings over 10 years (by switching) ~1.27 M gal**
- **CC not dredged since construction in 2014, but some shoaling recently noted along the left-descending bank**
- **If funding was available it is reasonable to assume CC would have been dredged 3 years after construction**