Louisiana's Coastal Restoration and Risk Reduction-Planning Strategies: Projects to Implementation

Bren Haase - Coastal Protection and Restoration Authority

Lucila Silva - Brown and Caldwell

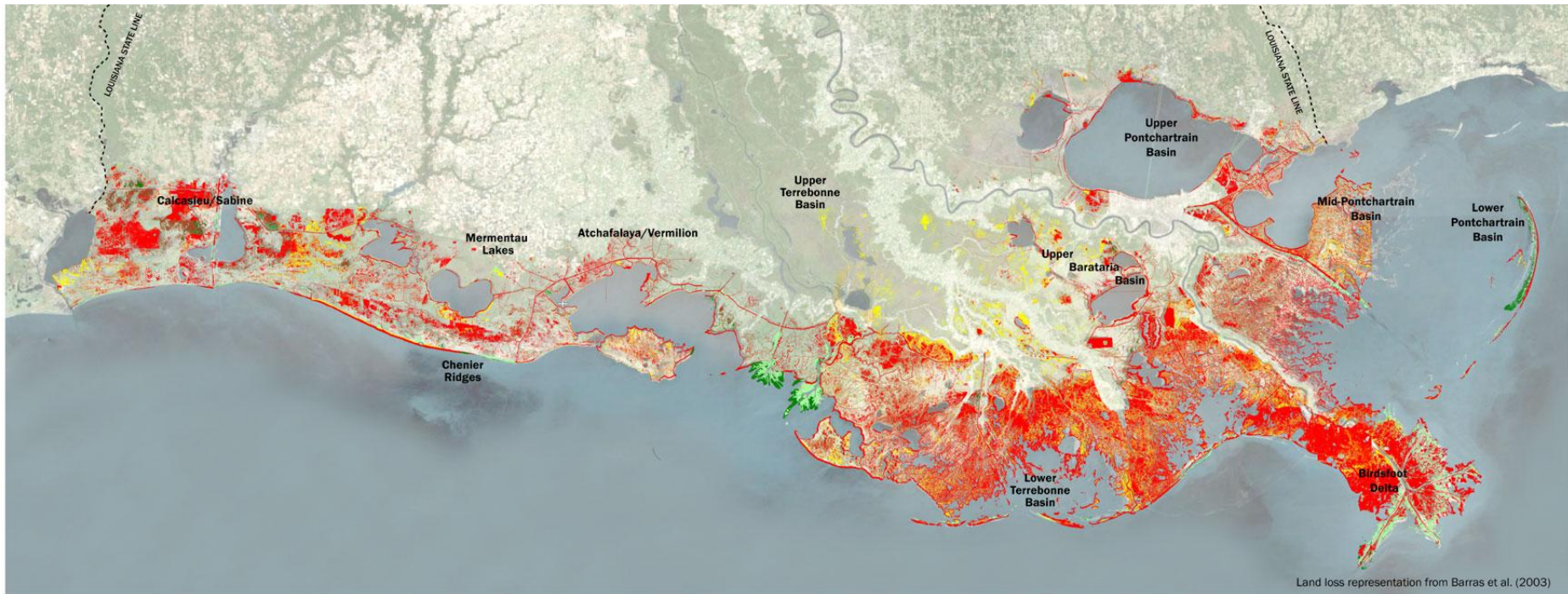03 AUG 2011 Louisiana Coastal Area Session

Kirk Rhinehart, Karim Belhadjali, Cindy Paulson, Denise Reed, David Groves, and Joanne Chamberlain

Introduction/Context

The Challenge: Nation's Coastal Crisis

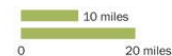Land loss representation from Barras et al. (2003)

Historic Land Loss 1932-2000

Coastal Land Change 1932-2050

- Land Loss 1932 - 2000
- Potential Land Loss 2000 - 2050
- Land Gain 1932 - 2000
- Predicted Land Gain 2000 - 2050

Based on Coastal Louisiana has lost an average of 34 square miles of land, primarily marsh, per year for the last 50 years. From 1932 to 2000 coastal Louisiana has lost 1,900 square miles of land, roughly an area the size of the state of Delaware. If nothing is done to stop this land loss, Louisiana is expected to lose another 700 square miles of land, or about equal to the size of the great Washington D.C.-Baltimore are, in the next 50 years. Further, Louisiana accounted for an estimated 90 percent of the coastal marsh loss in the lower 48 states during the 1990s.

Source: Barras et al., 2003

Approximate Scale

10 miles

0   20 miles

N

Historic and Projected Land Change (1932 -2050)

Louisiana's Crisis is a National Concern

- **1st in crude oil** production
- **2nd in natural gas** production, $70B/yr, 325,000 jobs
- **1st in LNG terminal** capacity
- **2nd in refining capacity**
- **18%** of all **waterborne commerce** in the nation (over 450mm tons of waterborne commerce) $35B/yr, 300,000 jobs
- **Largest bulk cargo port** complex
- **Henry Hub** connects 13 major pipelines
- **5** of the top **15 ports** in the world
- **Strategic Petroleum Reserve** (2 storage sites)
- Over **$3 Billion** in commercial and recreational **fisheries**.
- Over **$200 Million in ecotourism** revenues

Overview of Coastal Master Plan

Building on Past and On-Going Efforts

2012 CPRA Master Plan

Ongoing State/Federal Planning Efforts
- Miss. River Delta Management
- MRGO Ecosystem Restoration
- Southwest Coastal Study
- Donaldsonville to the Gulf
- Morganza to the Gulf
- LCA (15 Projects)
- CWPPRA (139 Projects)

Other Initiatives
- Coastal Sustainability Studio
- Dutch Perspective
- LA Speaks
- New Framework
- Envisioning the Future
- Drawing LA's New Map

Previous Planning Efforts
- 2007 CPRA Master Plan
- Coast 2050
- LCA
- LACPR
- Others

2012 CPRA Master Plan Update
Building on Other Efforts

July 2010

CPRA

OFFICE OF
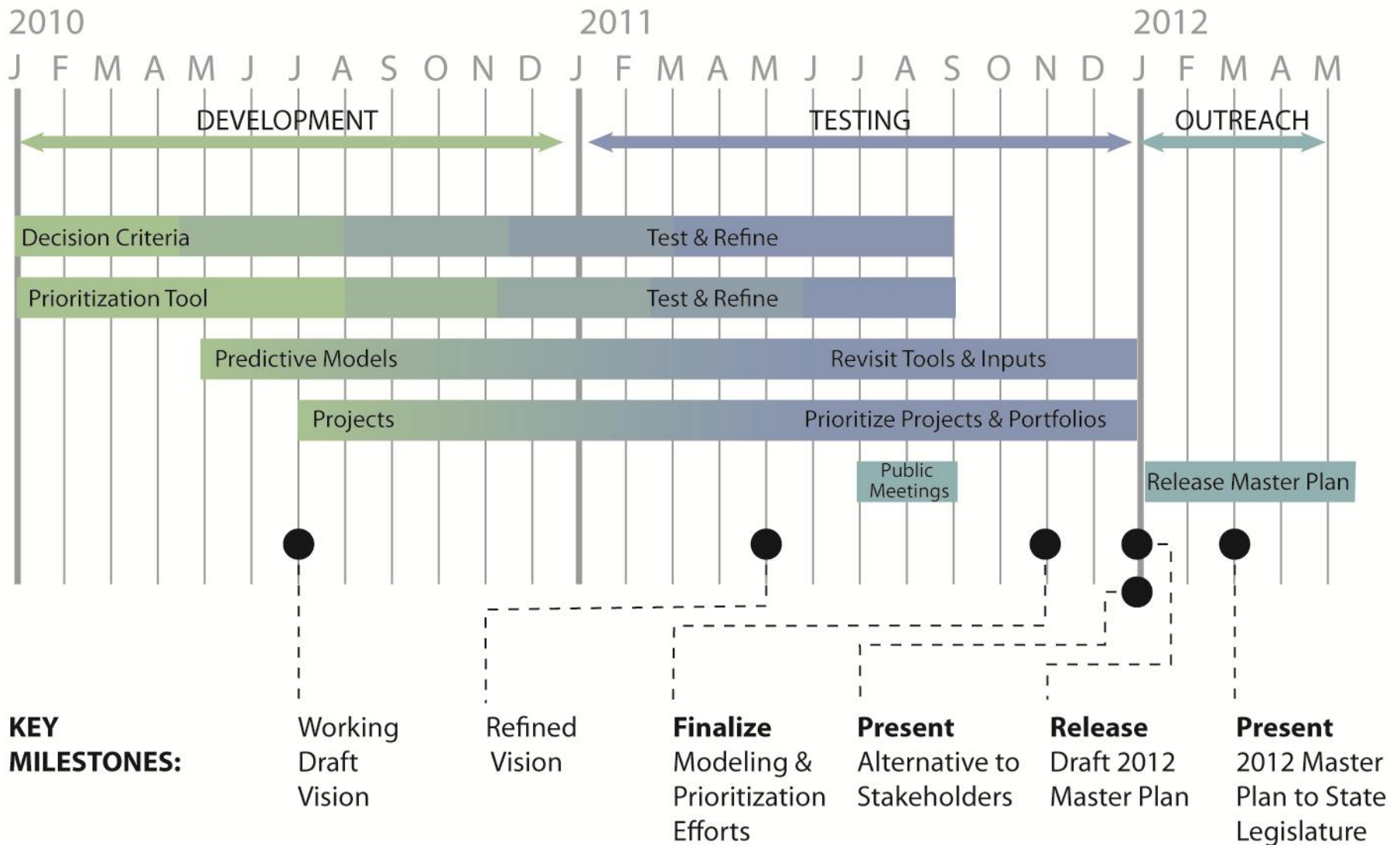Coastal Protection
and Restoration

More than Concepts and Broad Strategies – An **Actionable** Implementation Plan with Expected **Project Outcomes**

Also Provides New Elements

- **Vision**
- **Decision Criteria, Constraints, and Uncertainties**
- **Comprehensive Project-effects Models**
- **Prioritization Tool**
- **Prioritized Project Portfolios**
- **Expected Outcomes**
- **Adaptive Management and Implementation Plan**
- **Long–term Funding Scenarios**

Master Plan Timeline

2010 — J F M A M J J A S O N D
2011 — J F M A M J J A S O N D
2012 — J F M A M

DEVELOPMENT — TESTING — OUTREACH

Decision Criteria — Test & Refine

Prioritization Tool — Test & Refine

Predictive Models — Revisit Tools & Inputs

Projects — Prioritize Projects & Portfolios

Public Meetings

Release Master Plan

KEY MILESTONES:

Working Draft Vision

Refined Vision

Finalize Modeling & Prioritization Efforts

Present Alternative to Stakeholders

Release Draft 2012 Master Plan

Present 2012 Master Plan to State Legislature
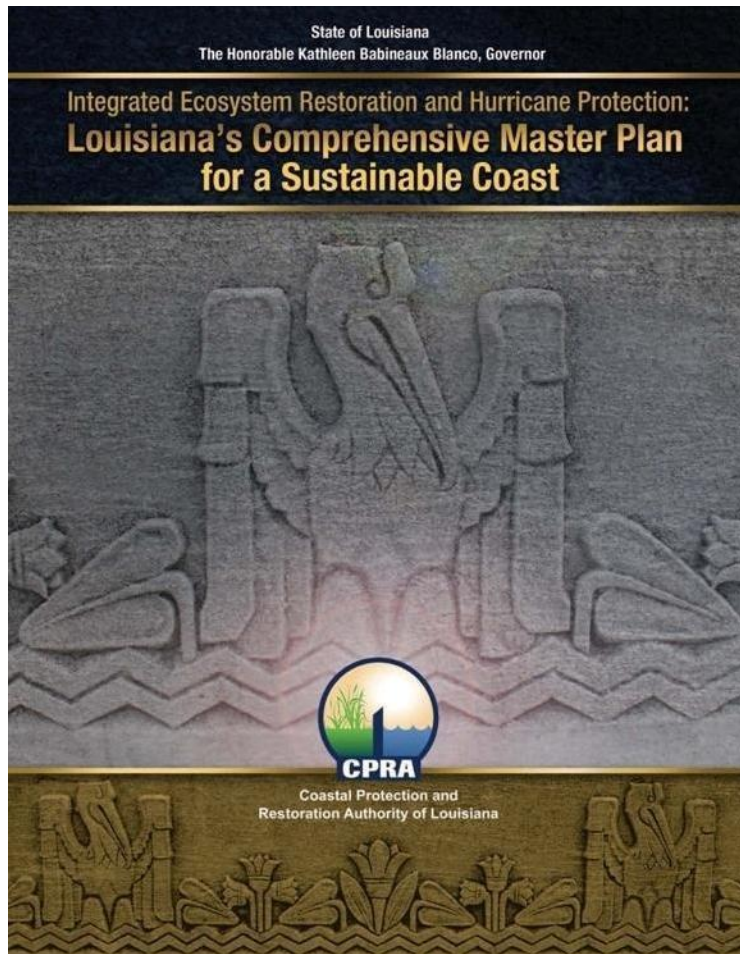
Vision

Importance of A Vision

- Past plans guided by broad goals and project-specific objectives

- Provides a common view about what we want to achieve

- A path to focus state investments

- Ability to understand and confront trade-offs
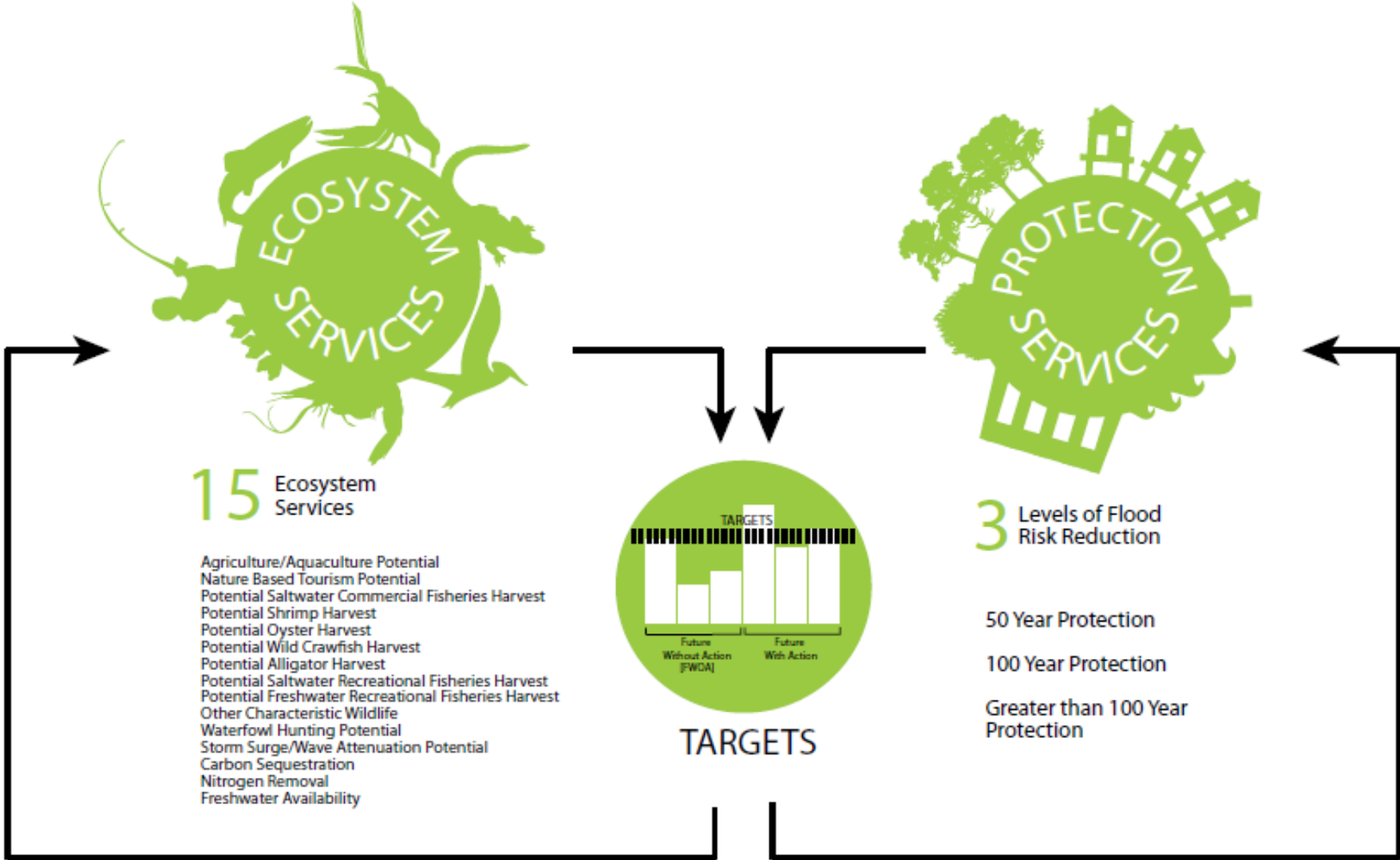
We want the vision to be ambitious and achievable

?

2007 Master Plan

State of Louisiana
The Honorable Kathleen Babineaux Blanco, Governor

Integrated Ecosystem Restoration and Hurricane Protection:
Louisiana's Comprehensive Master Plan for a Sustainable Coast

CPRA
Coastal Protection and
Restoration Authority of Louisiana

1. **Reduce economic losses** from storm-based flooding
2. Promote a **sustainable coastal ecosystem** by harnessing natural system processes
3. Provide habitats suitable to **support** an array of **commercial** and **recreational activities coast-wide**
4. Sustain Louisiana's unique **heritage and culture**

2012 Master Plan Update:

5. Provide a **viable working coast** to **support industry.**

Integrated Approach

15 Ecosystem Services

Agriculture/Aquaculture Potential
Nature Based Tourism Potential
Potential Saltwater Commercial Fisheries Harvest
Potential Shrimp Harvest
Potential Oyster Harvest
Potential Wild Crawfish Harvest
Potential Alligator Harvest
Potential Saltwater Recreational Fisheries Harvest
Potential Freshwater Recreational Fisheries Harvest
Other Characteristic Wildlife
Waterfowl Hunting Potential
Storm Surge/Wave Attenuation Potential
Carbon Sequestration
Nitrogen Removal
Freshwater Availability

TARGETS

3 Levels of Flood Risk Reduction

50 Year Protection

100 Year Protection

Greater than 100 Year Protection

Ecosystem Services

Coastwide Ecosystem Services

Agricultural/Aquaculture

Shrimp Harvest Potential

Oyster Harvest Potential

Surge/Wave Attenuation

Nature-Based Tourism

Carbon Sequestration
Nitrogen Removal

Other Characteristic Wildlife

Freshwater Availability

Wild Crawfish Potential

Alligator Harvest Potential

Freshwater Recreational Fisheries

Waterfowl Hunting Potential

Commercial Saltwater Fisheries

Recreational Saltwater Fisheries

Levels of Ecosystem Services

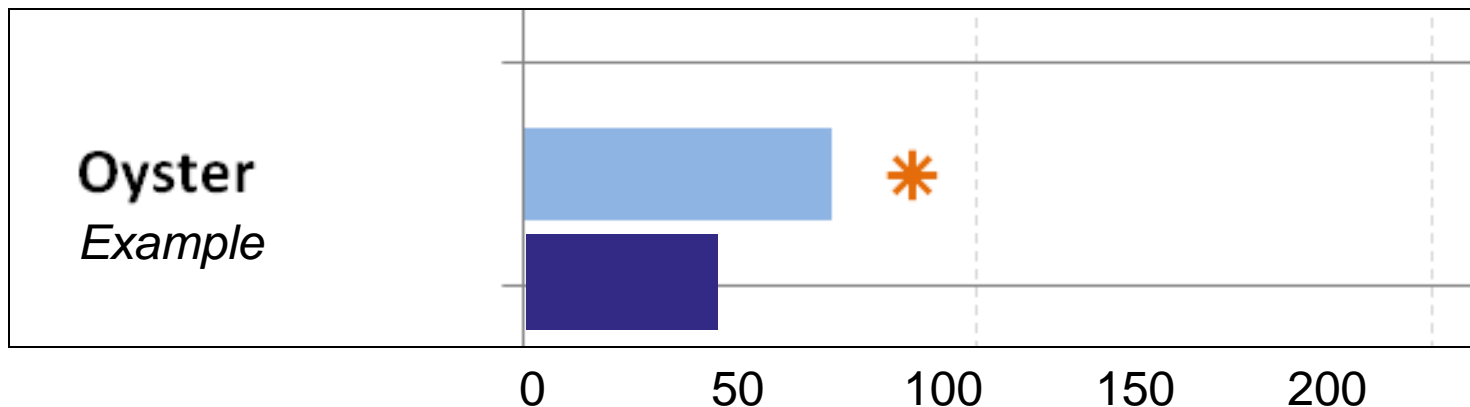Increasing

Not Applicable

Existing

Decreasing

Benchmarking Targets: Current, FWOA

- Targets (*)
  - Developed vision and targets in April 2010 (OCPR 2-day retreat)
  - Reviewed and refined with LDWF and FDT (Sept 2010)
- Current Conditions (   )
  - Estimated using predictive models
- FWOA conditions (yr 50) (   )
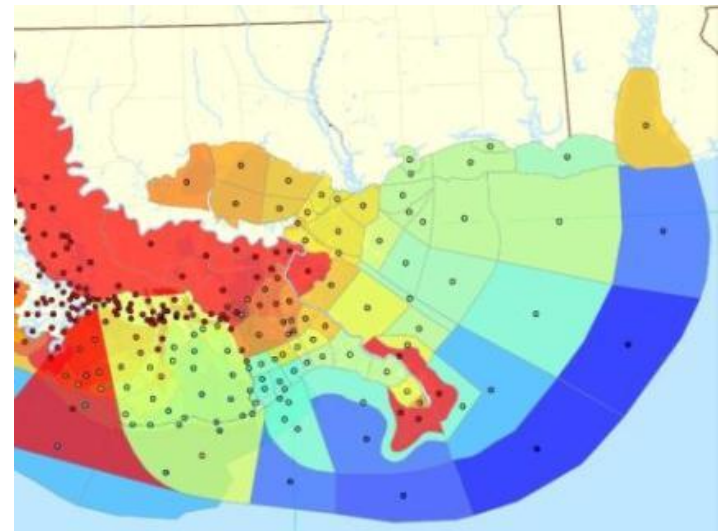 - Estimated using predictive models

Oyster
Example

0   50   100   150   200

FWOA Outputs

Outputs (annual)

- Land Change
- Fragmentation
- Elevation
- Soil Organic Carbon Pool
- Vegetation
- TSS
- Salinity

Analysis

- Elevation change
- Collapse thresholds (RSLR, OM inputs, Sediment input): basin-wide
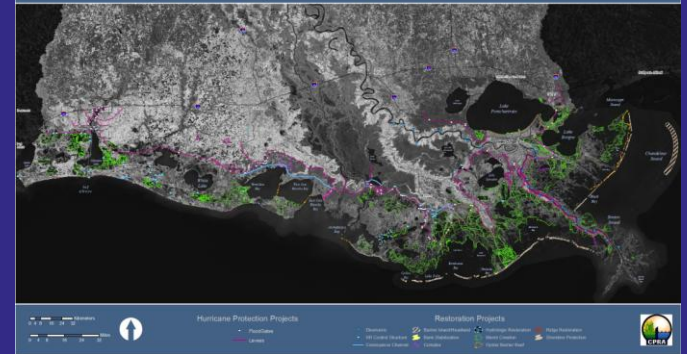- Soil carbon storage/sequestration change

Storm Surge and Wave Flood Risk Reduction

Multiple Approaches to Reduce Risk

- Current landscape

- Structural projects (e.g., levees)

- Nonstructural projects (e.g., elevating structures)

- Ecosystem restoration projects

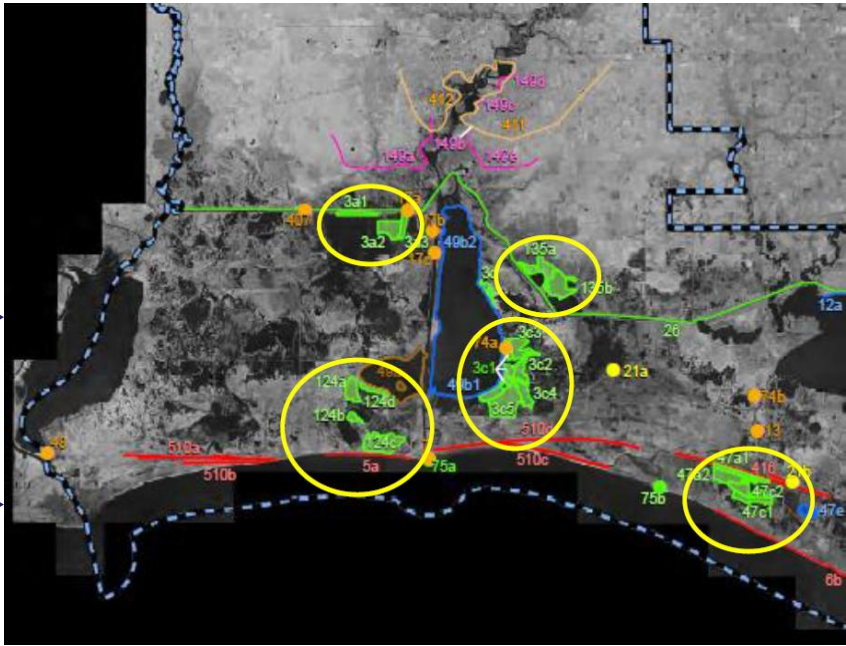Projects Under Analysis in Louisiana's 2012 Coastal Master Plan

Project Overview

Project Inventory

Started with over 1500 projects

↓

Established Screening Criteria
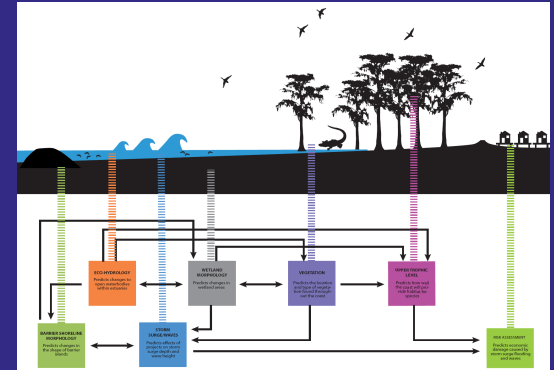
↓

Combined/Standardized Projects

↓

Project List Modified Based on Input from Stakeholders

↓

List of Final Projects for Analysis under 2012 Coastal Master Plan
170 Non-Structural Projects
34 Structural Projects
214 Restoration Projects

TOTAL
418 Projects

Modeling

Science-Based Tools

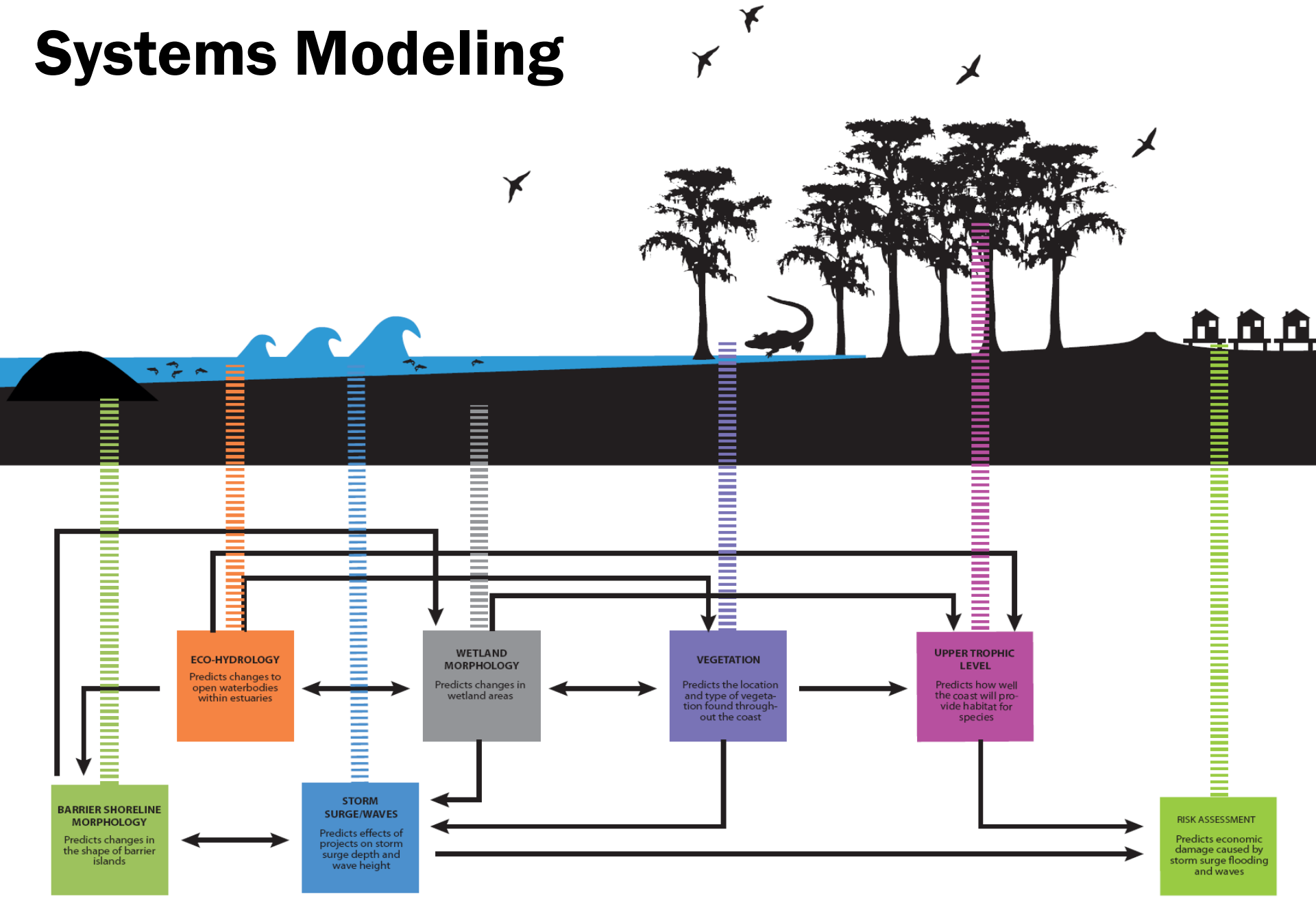Tools developed for planning effort to provide technical and scientific information to support the decision-making process
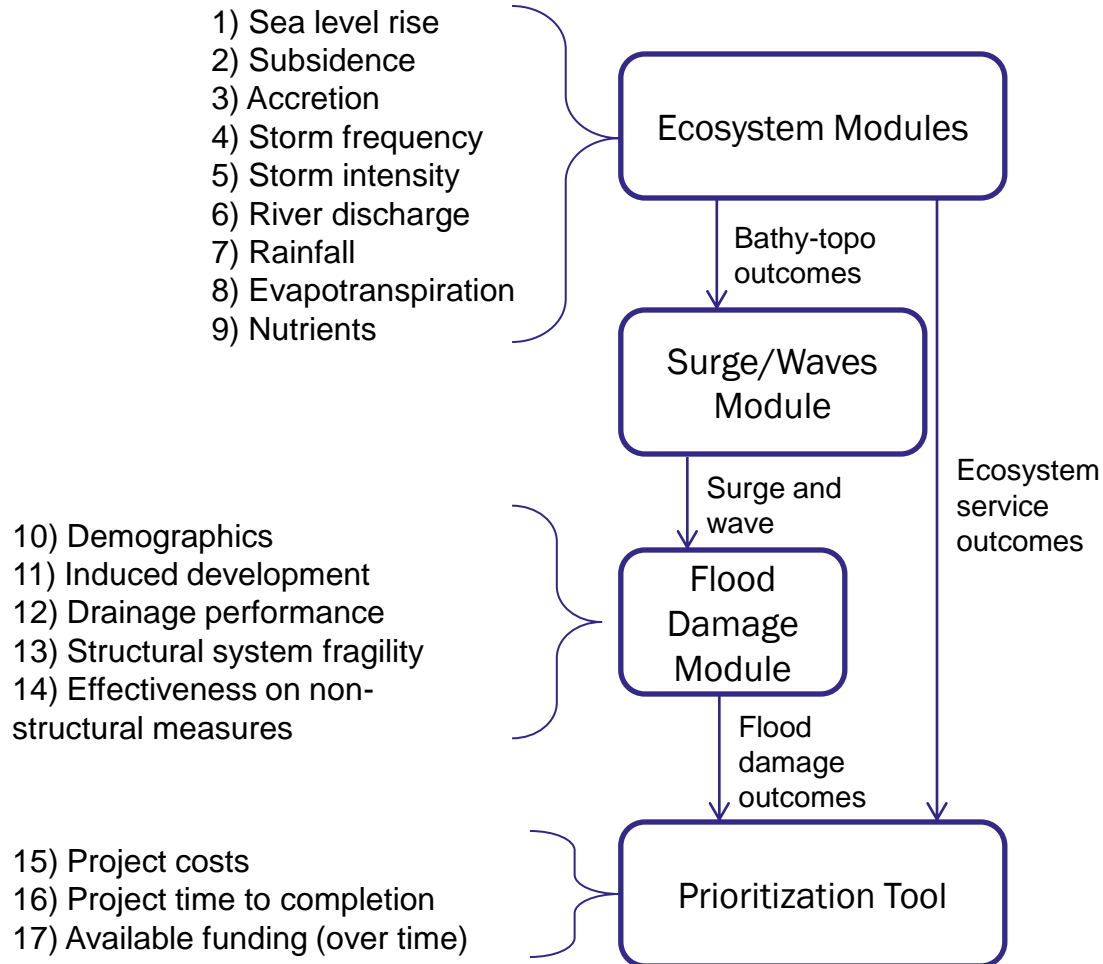
- Predictive Models
  - Computer tools we use to predict the future without action and the effects of projects on the coast

- Planning Tool
  - Used to compare projects fairly and objectively and inform decision making.

Predictive Models   Planning Tool

Decision Making Process

Systems Modeling

ECO-HYDROLOGY
Predicts changes to open waterbodies within estuaries

WETLAND MORPHOLOGY
Predicts changes in wetland areas

VEGETATION
Predicts the location and type of vegetation found throughout the coast

UPPER TROPHIC LEVEL
Predicts how well the coast will provide habitat for species

BARRIER SHORELINE MORPHOLOGY
Predicts changes in the shape of barrier islands

STORM SURGE/WAVES
Predicts effects of projects on storm surge depth and wave height

RISK ASSESSMENT
Predicts economic damage caused by storm surge flooding and waves

Scenarios Reflect Different Combinations of Uncertain Factors

1) Sea level rise
2) Subsidence
3) Accretion
4) Storm frequency
5) Storm intensity
6) River discharge
7) Rainfall
8) Evapotranspiration
9) Nutrients

Ecosystem Modules

Bathy-topo outcomes

Surge/Waves Module

Ecosystem service outcomes

Surge and wave

10) Demographics
11) Induced development
12) Drainage performance
13) Structural system fragility
14) Effectiveness on non-structural measures

Flood Damage Module

Flood damage outcomes

15) Project costs
16) Project time to completion
17) Available funding (over time)

Prioritization Tool

Project-Effects Models

Project - Effects Models	Team Leader
Eco-hydrology	Dr. Ehab Meselhe, ULL + 9 members
Vegetation	Dr. Jenneke Visser, ULL + 8 members
Wetland Morphology	Dr. Greg Steyer, USGS + 6 members
Barrier Island Morphology	Dr. Mark Kulp, UNO + 6 members
Upper Trophic Level	Dr. Andy Nyman, LSU + 8 members
Storm Surge	Dr. Joe Suhayda/Arcadis, + 3 members
Storm Damage/Risk	Dr. Jordan Fischbach, RAND + 7 members

Over 60 Modeling Team Members, Support Staff, and Technical Advisory Committee Members

Prioritization Tool

Prioritization Tool Builds on Decision Science, Resource Planning, and Risk Analysis

- Multi-criteria decision analysis
  - Evaluate projects using multiple decision criteria

- Least-cost planning
  - Choose projects and portfolios that achieve objectives with the fewest resources

- Constrained optimization
  - For given planning assumptions and constraints, identify projects that best achieve objectives

- Robust decision methods
  - Evaluate projects under numerous scenarios reflecting uncertainty
  - Choose portfolios that are robust

Project Team & Collaborative Effort

Outreach and Engagement
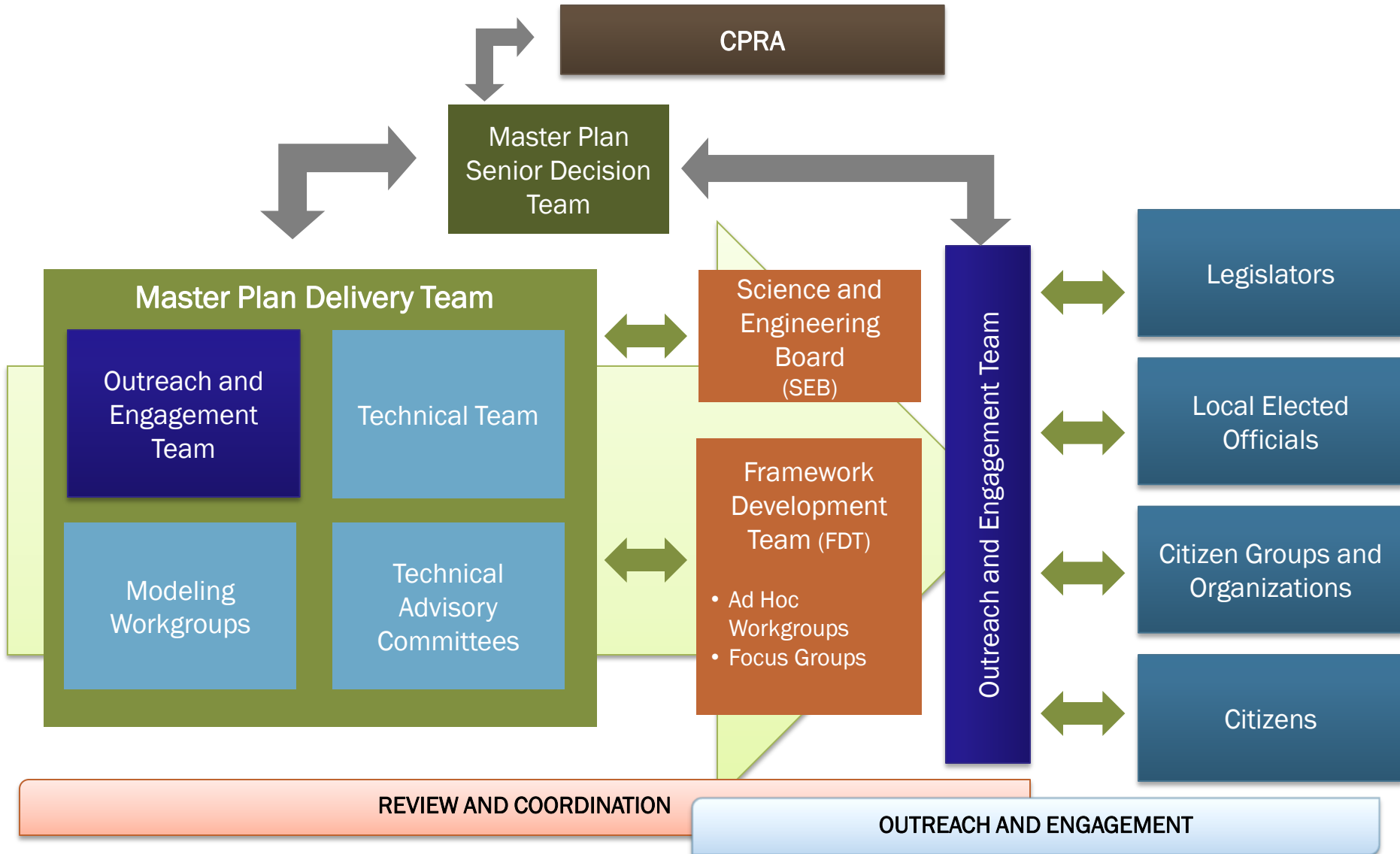
Framework Development Team-
Over 30 Federal, State, NGO, Academic, Community, and Industry Organizations

Technical Advisory Committees

Project-Effects Models TAC

- **Steve Ashby,** USACE Eng. Res. Dev. Center
- **John Callaway**, University of San Francisco
- **Fred Sklar**, South Florida Water Mgmt. District
- **Si Simenstad**, University of Washington

Prioritization Tool TAC

- **John Boland**, John Hopkins
- **Ben Hobbs**, John Hopkins
- **Len Shabman**, Virginia Tech

Cultural Heritage TAC

- **Don Davis**, Louisiana State University
- **Carl Brasseaux**, University of Louisiana Lafayette
- **Maida Owens**, LA Dept. of Cultural, Recreation, Tourism

National Science and Engineering Board - Independent Technical Review

Ecosystem Science / Coastal Ecology

- **William Dennison,** University of Maryland
- **Edward Houde,** University of Maryland
- **Katherine Ewell,** University of Florida

Engineering

- **Robert Dalrymple,** Johns Hopkins University
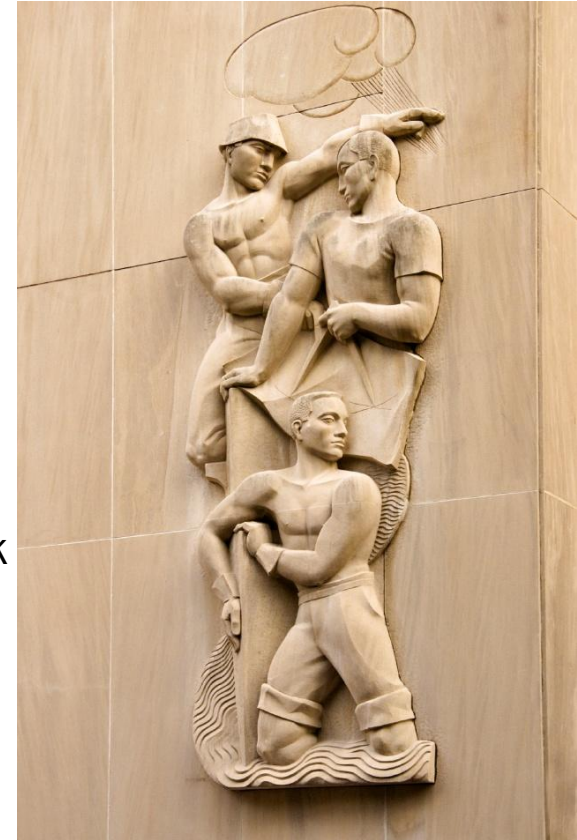- **Jos Dijkman**, Deltares

Geosciences

- **Charles Groat**, University of Texas, Austin Social Science +Risk
- **Greg Baecher,** University of Maryland
- **Philip Berke**, University of North Carolina – Chapel Hill
-

Climate Change

- **Virginia Burkett**, U.S. Geological Survey

Environmental/Natural Resource Economics

- **Edward Barbier**, University of Wyoming

Questions

Bren Haase
Bren.Haase@La.gov

www.CoastalMasterplan.La.gov

Lucila Silva
LSilva@BrwnCald.com