

State of the Coast 2023 – New Orleans

Barataria Preserve Future Conditions Modeling



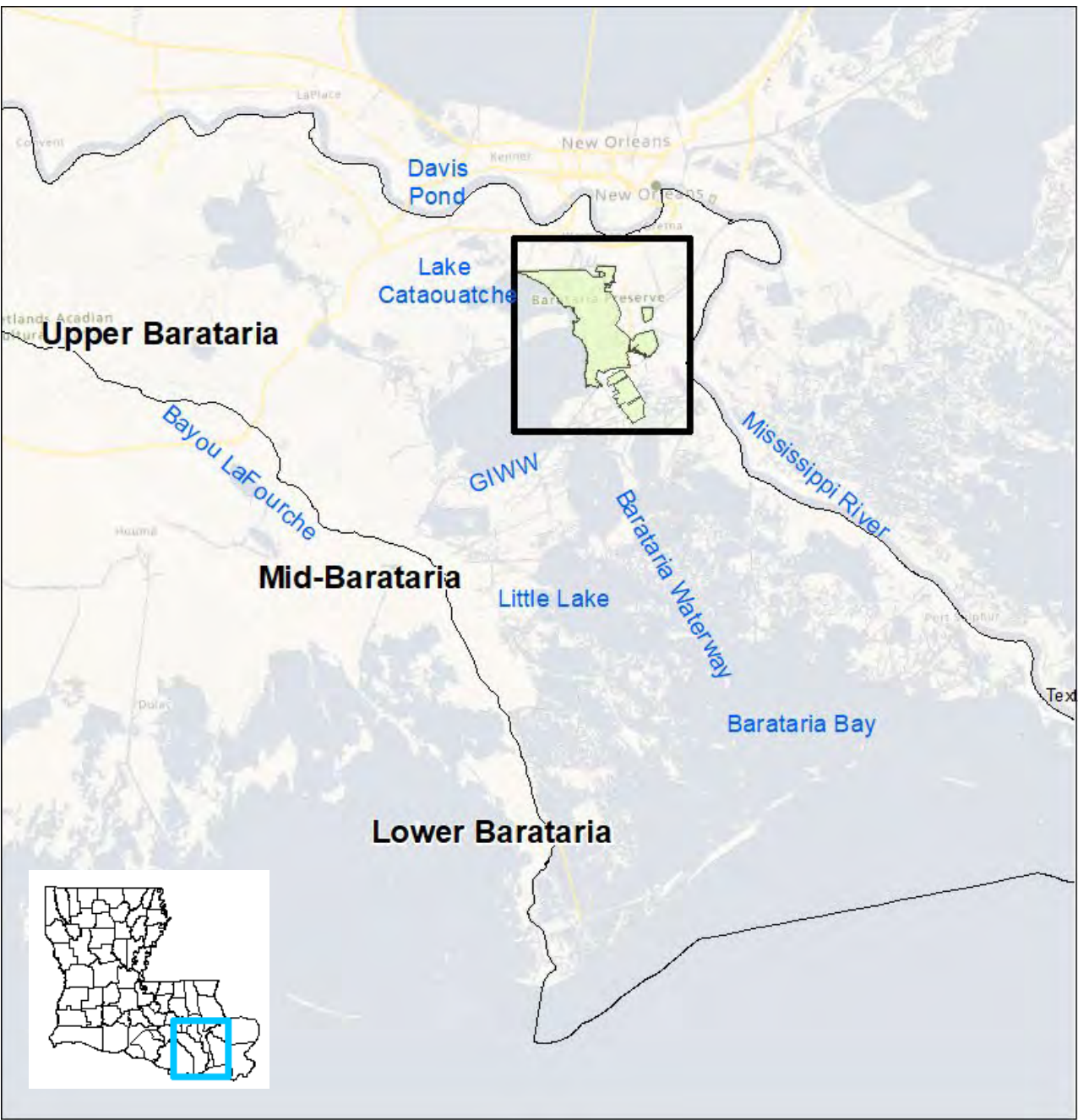
*Kevin C. Hanegan¹, Zhanxian Wang¹,
Christopher Siverd¹ and Julie Whitbeck²*

¹Moffatt & Nichol

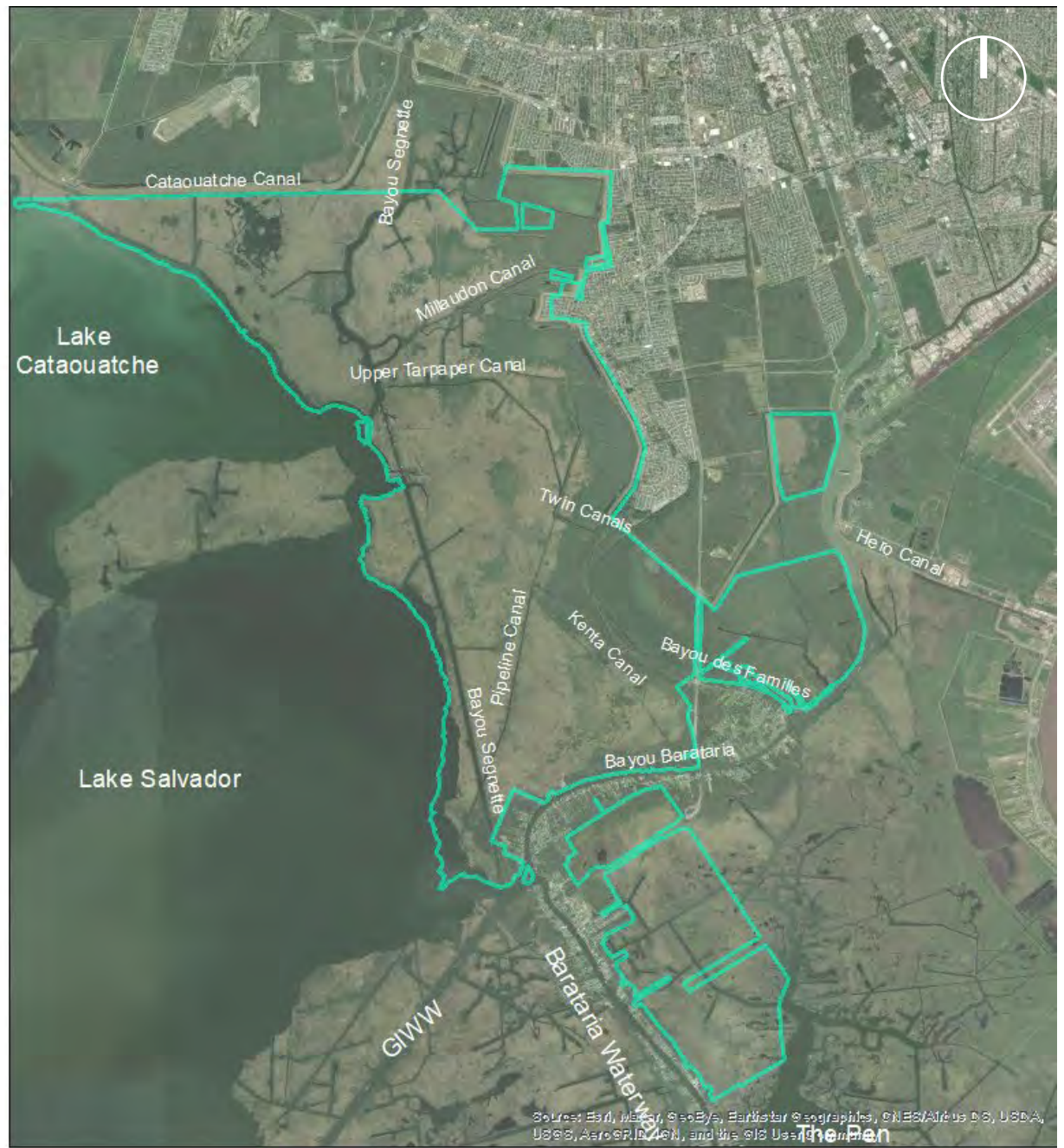
²NPS, Jean Lafitte National Historical Park and Preserve



moffatt & nichol



Barataria Preserve Barataria Basin



Sources: Esri, DeLorme, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

175 87.5 0 175 350 Miles

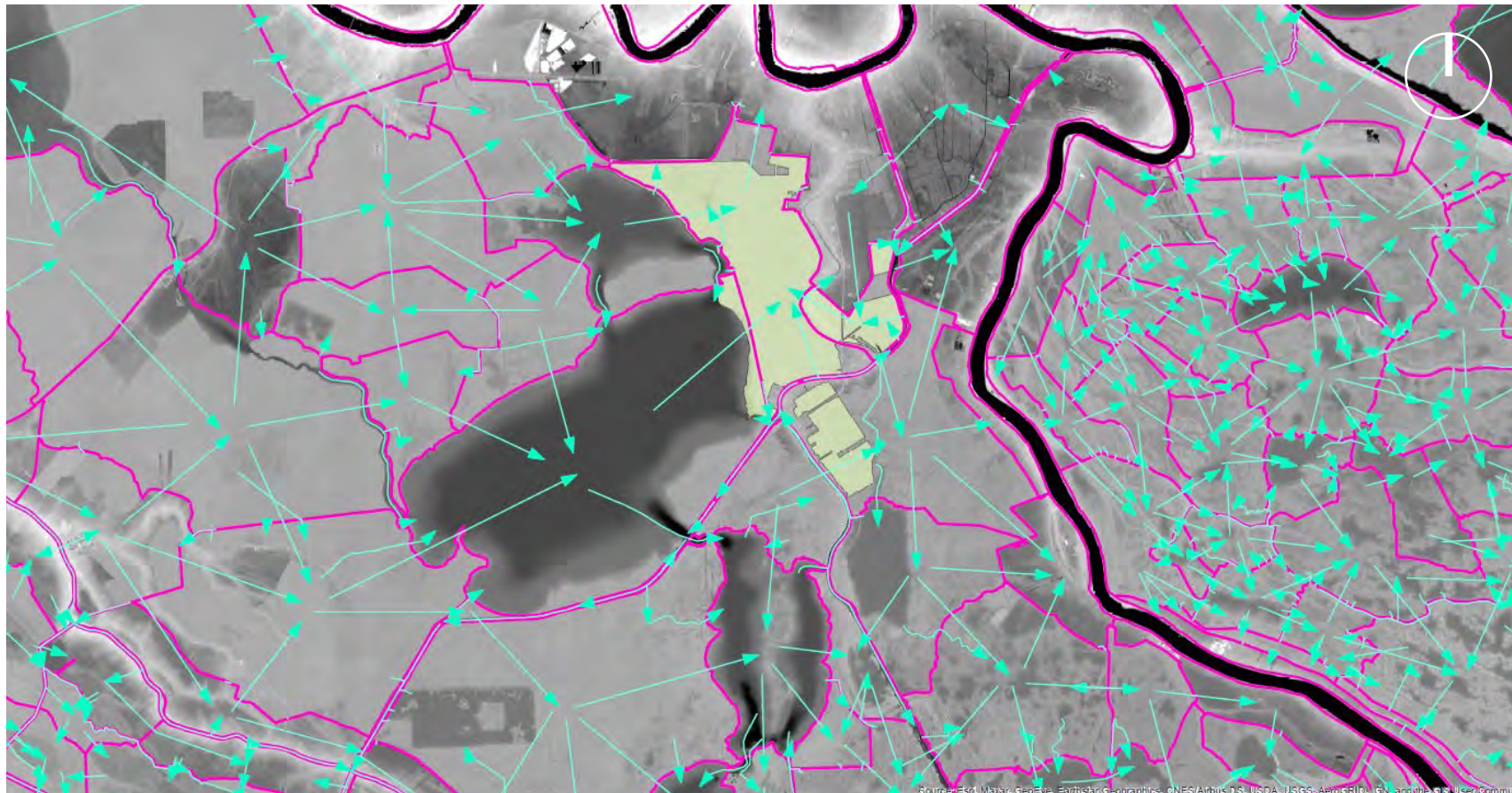


Objective and Scope

- › Provide park managers with projections of key coastal environmental conditions (inundation, salinity, vegetation) across the Preserve landscape over next 25 to 50 years.
- › Understand impacts of future environmental scenarios (SLR rates, subsidence) and planned major coastal projects
- › Develop modified version of the LA Coastal Master Plan Integrated Compartment Model (ICM) and complimentary 2D Mike21-FM model for Barataria Basin
- › Perform future conditions runs for future climatic and project scenarios

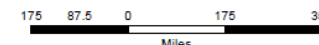


2023 Coastal Master Plan ICM



Legend

- Links
- Cells
- Barataria Preserve



- › Compartments and Links aligned with hydrologic features, but still relatively low resolution (most of preserve in single compartment)



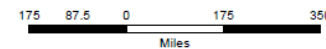
Compartment Downscaling



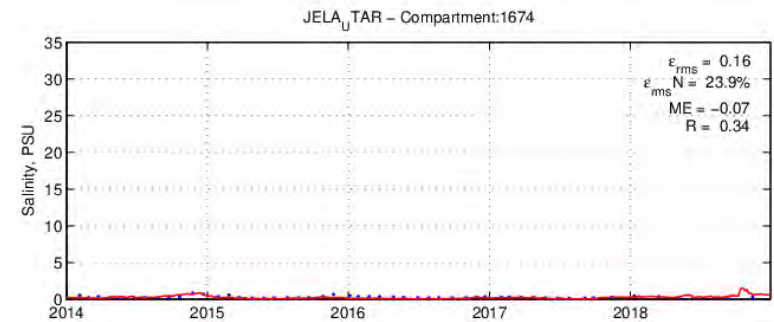
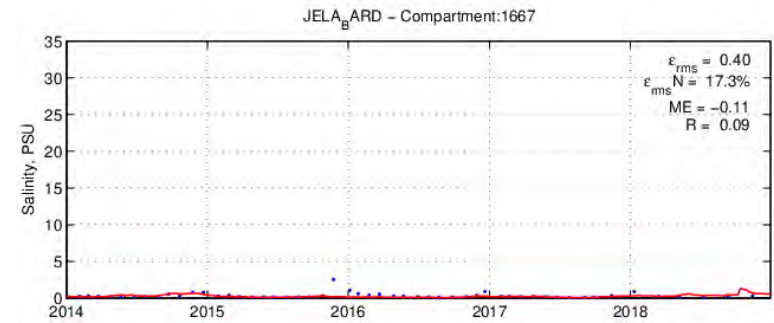
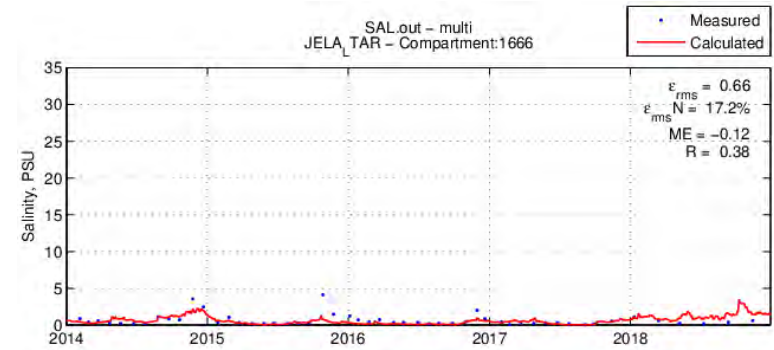
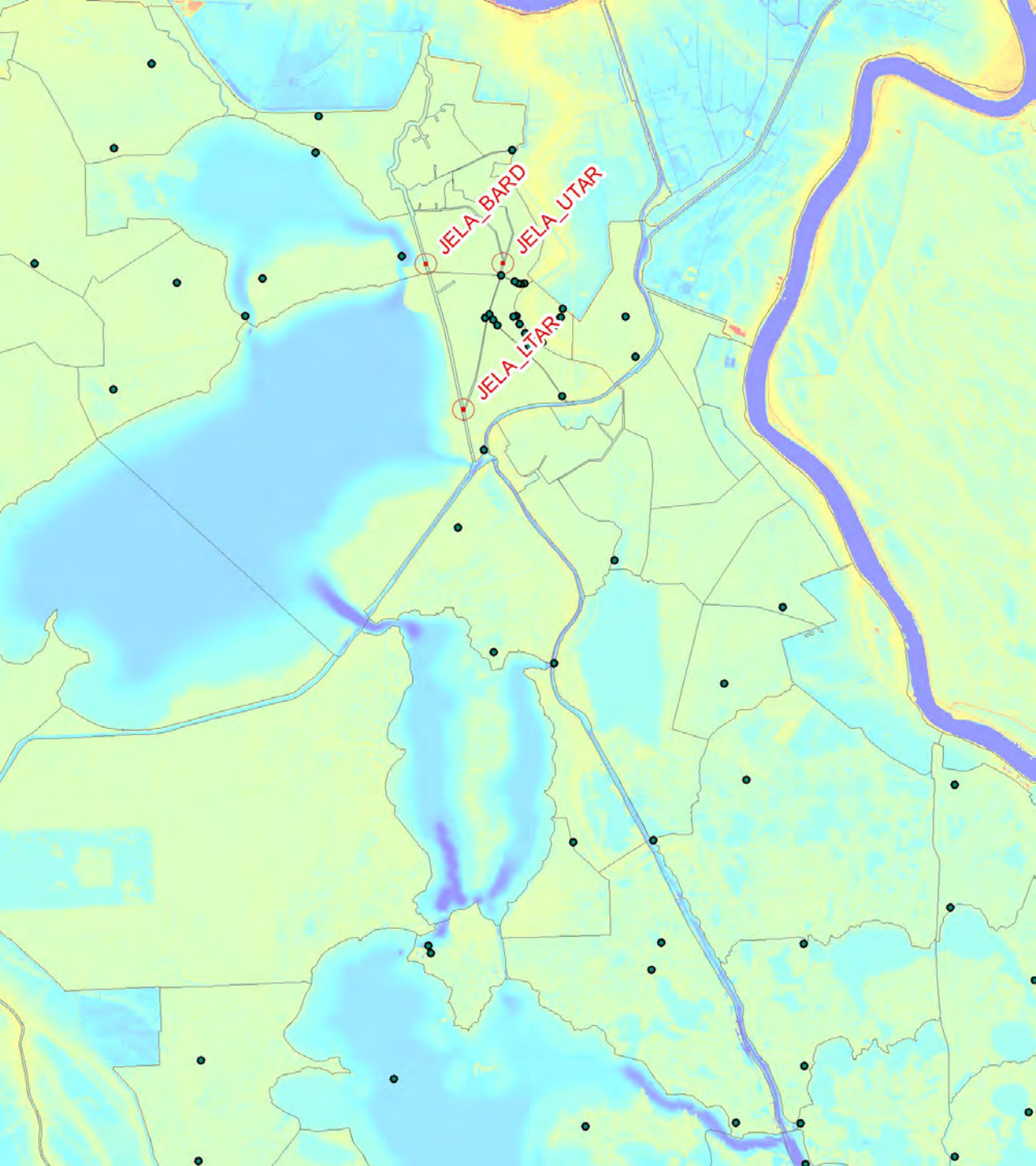
- › JELA now included in 15 compartments north of Bayou Baratavia, with most important flowpaths spatially-resolved
- › Increased resolution in Baratavia Waterway

Legend

Cells

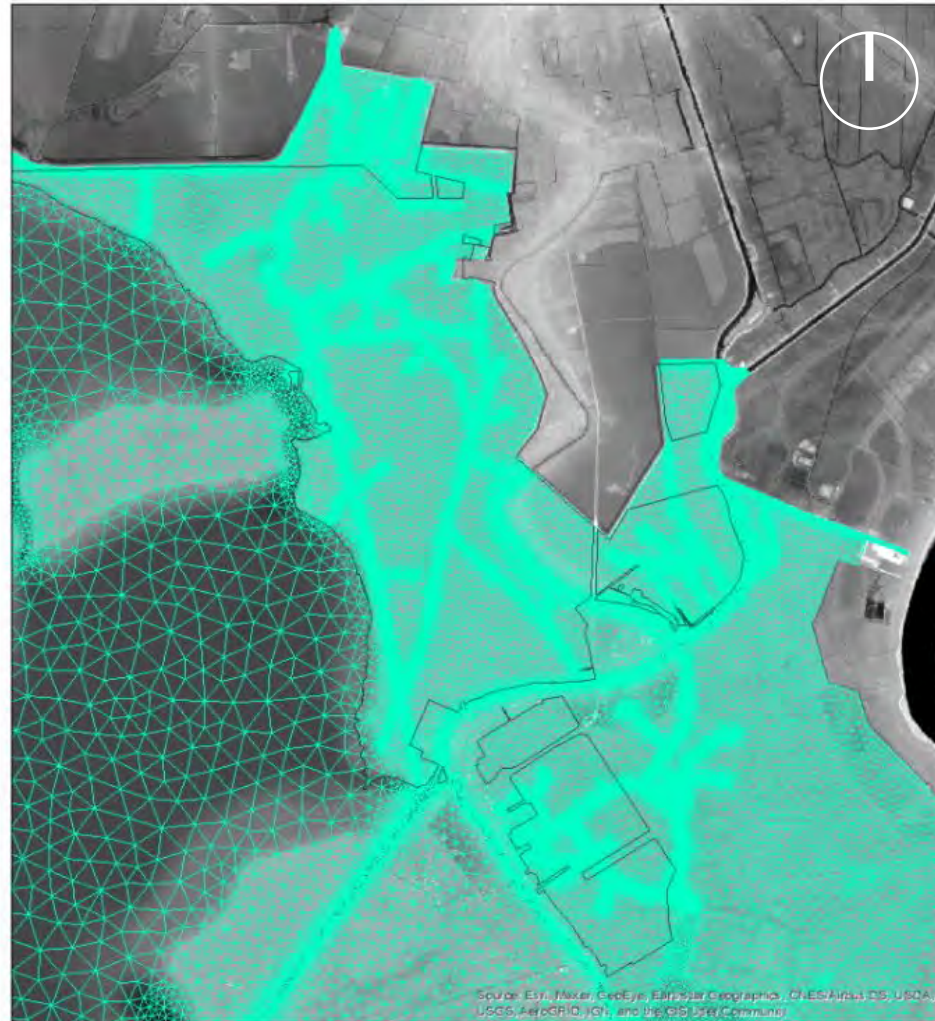
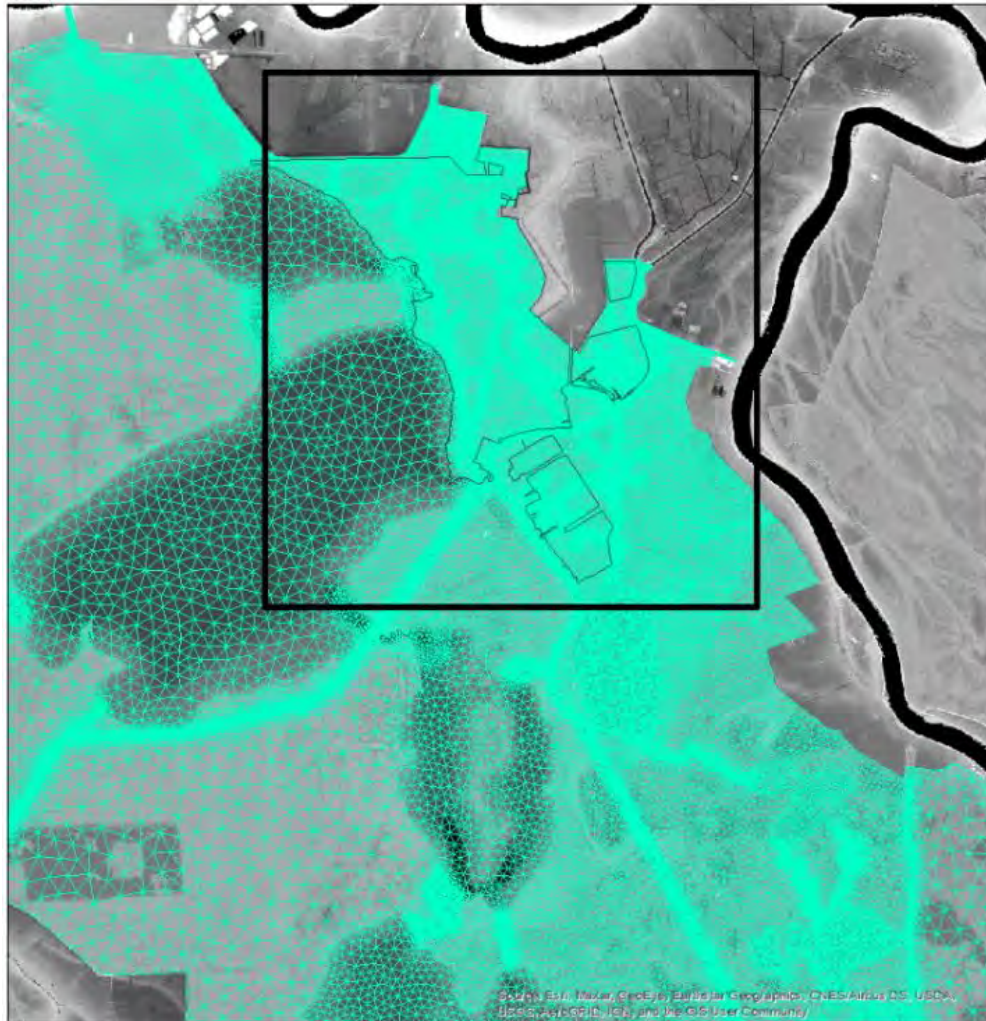


Salinity Calibration Results





Mike-21 FM Barataria Basin Model

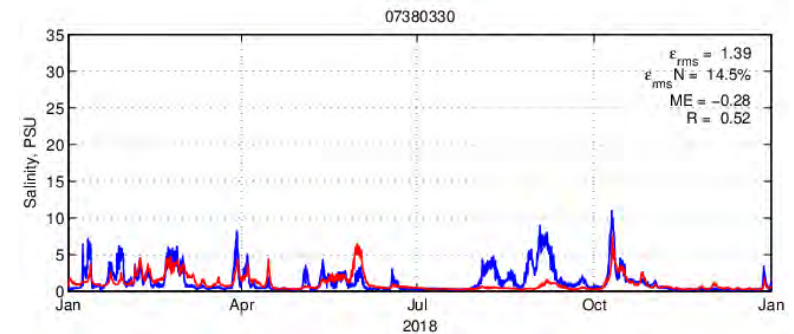
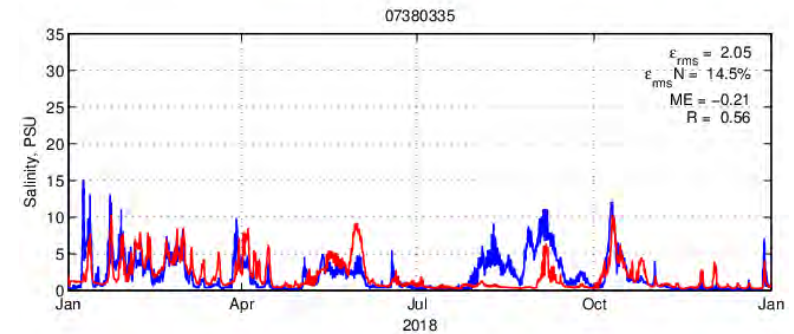
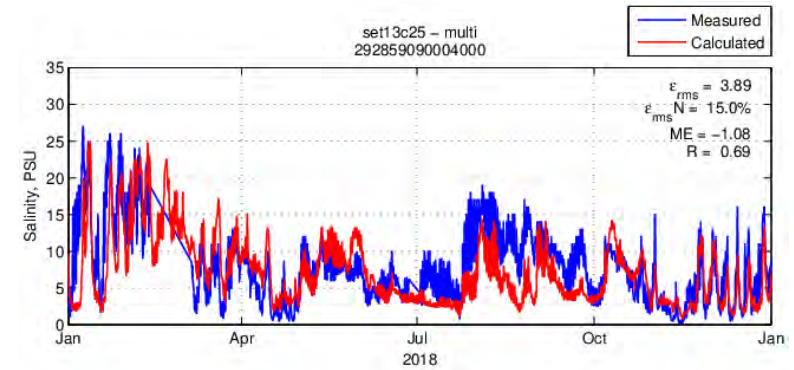
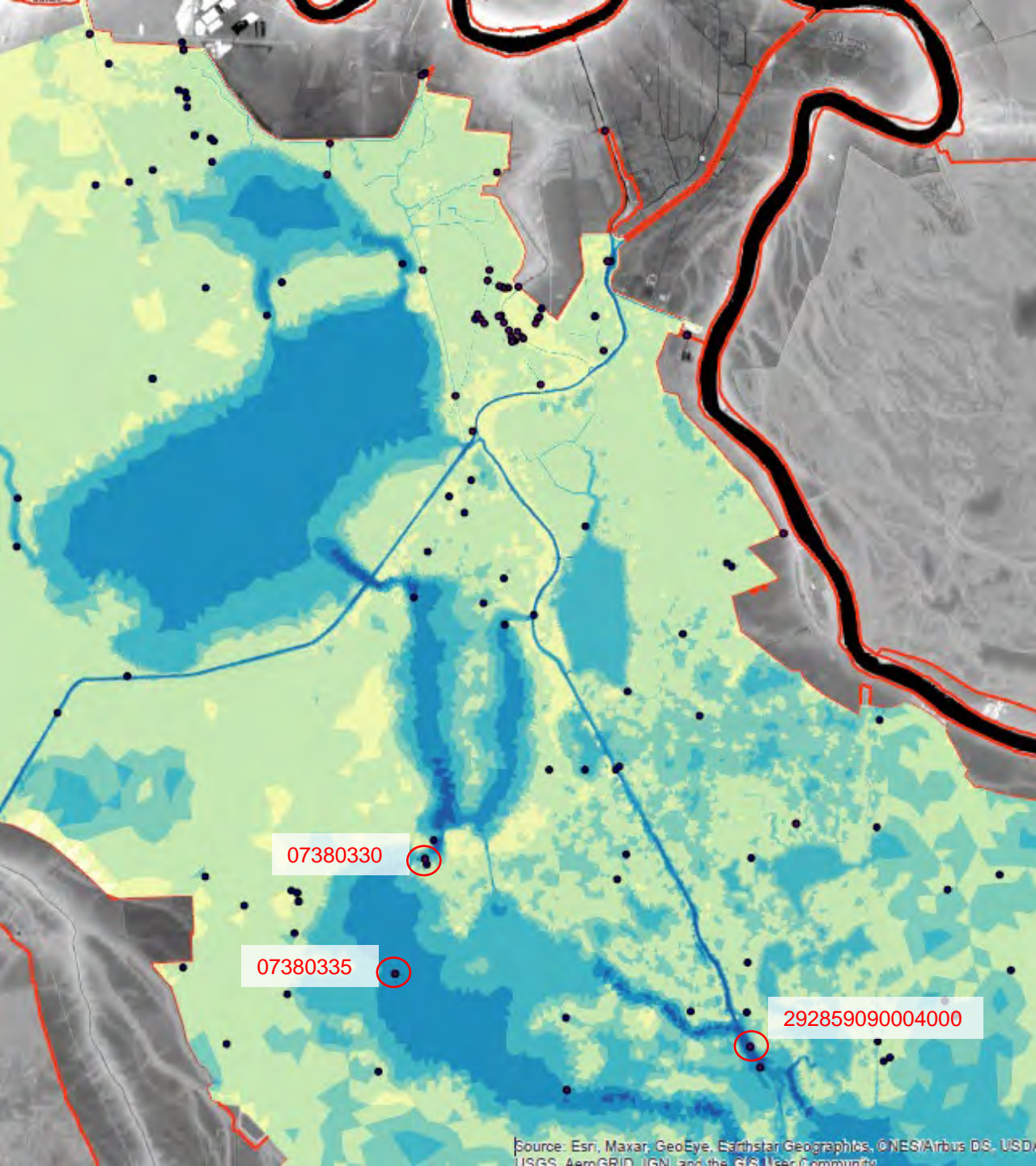


Legend

- Barataria Preserve
- Computational Mesh

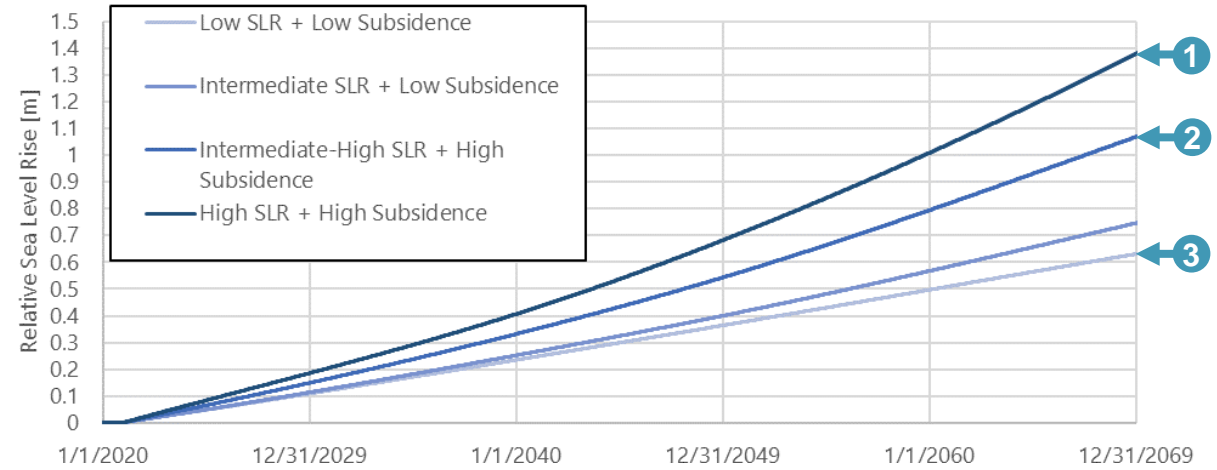
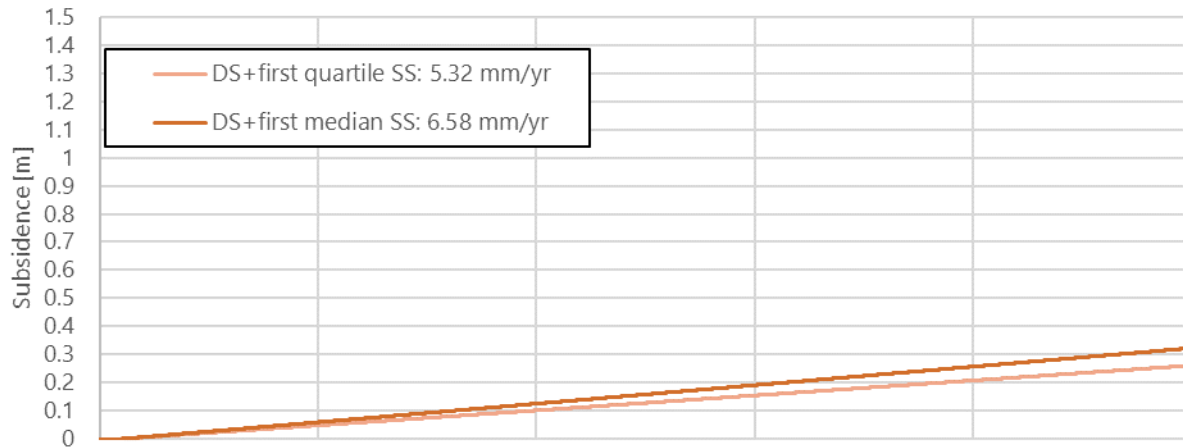
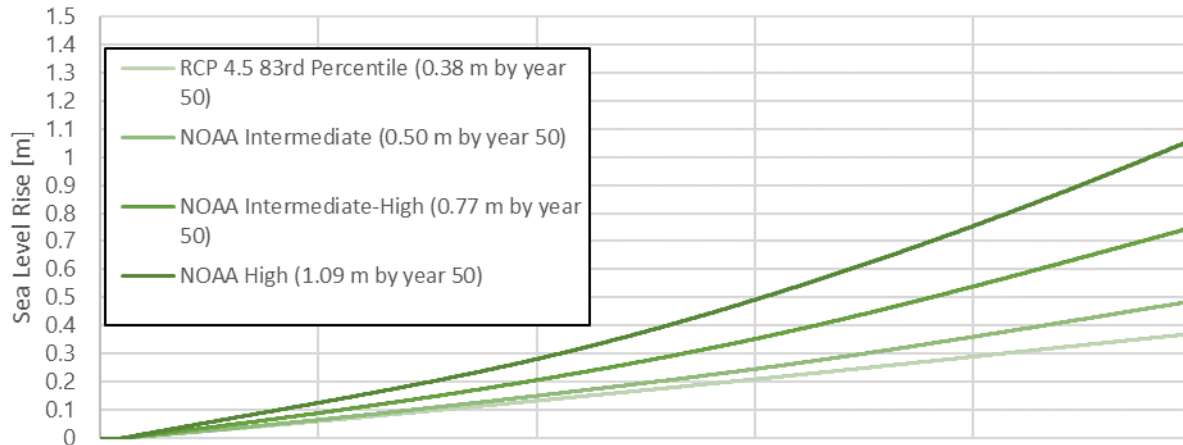


Salinity Calibration Results





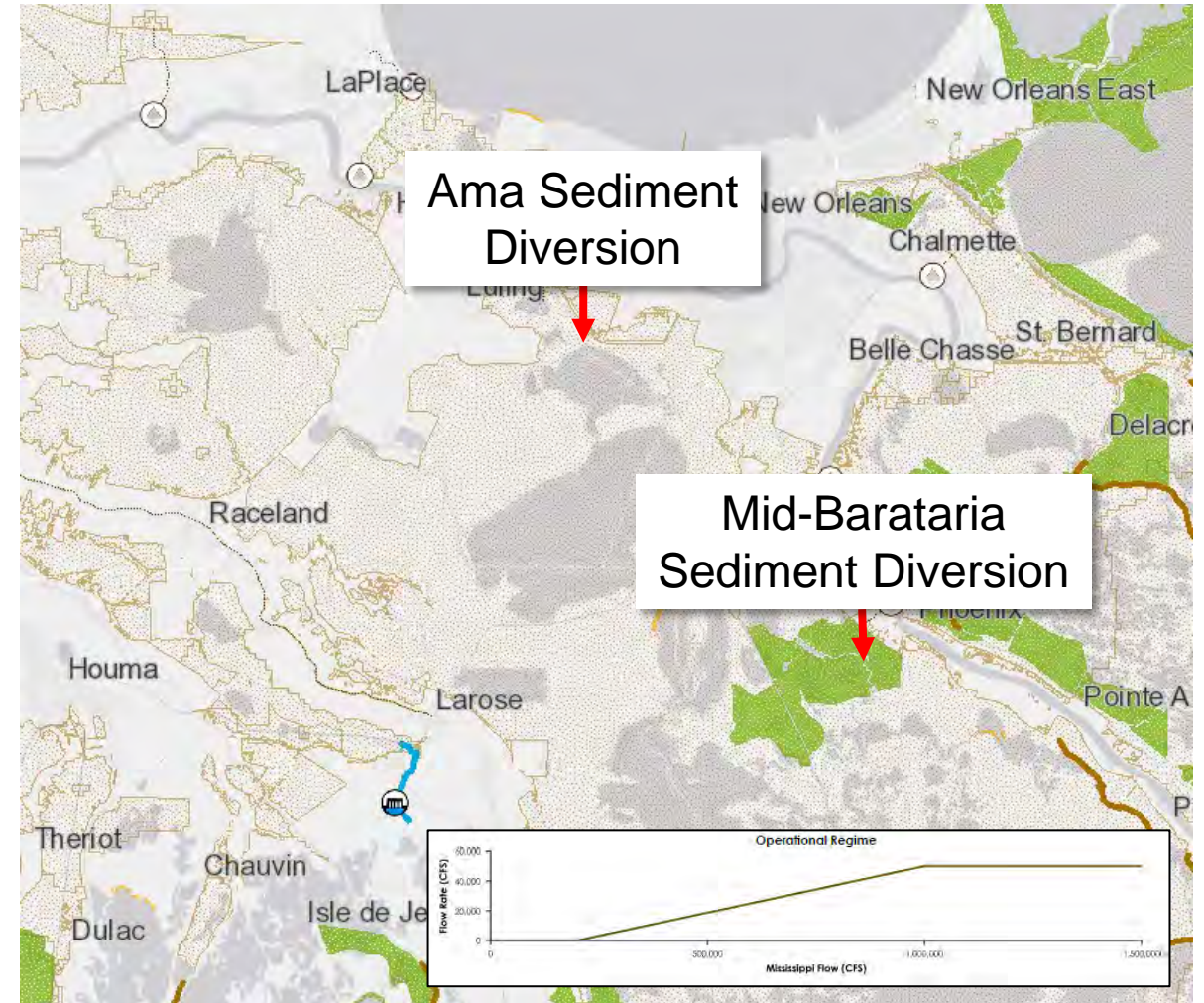
Future Environmental Scenarios – RSLR



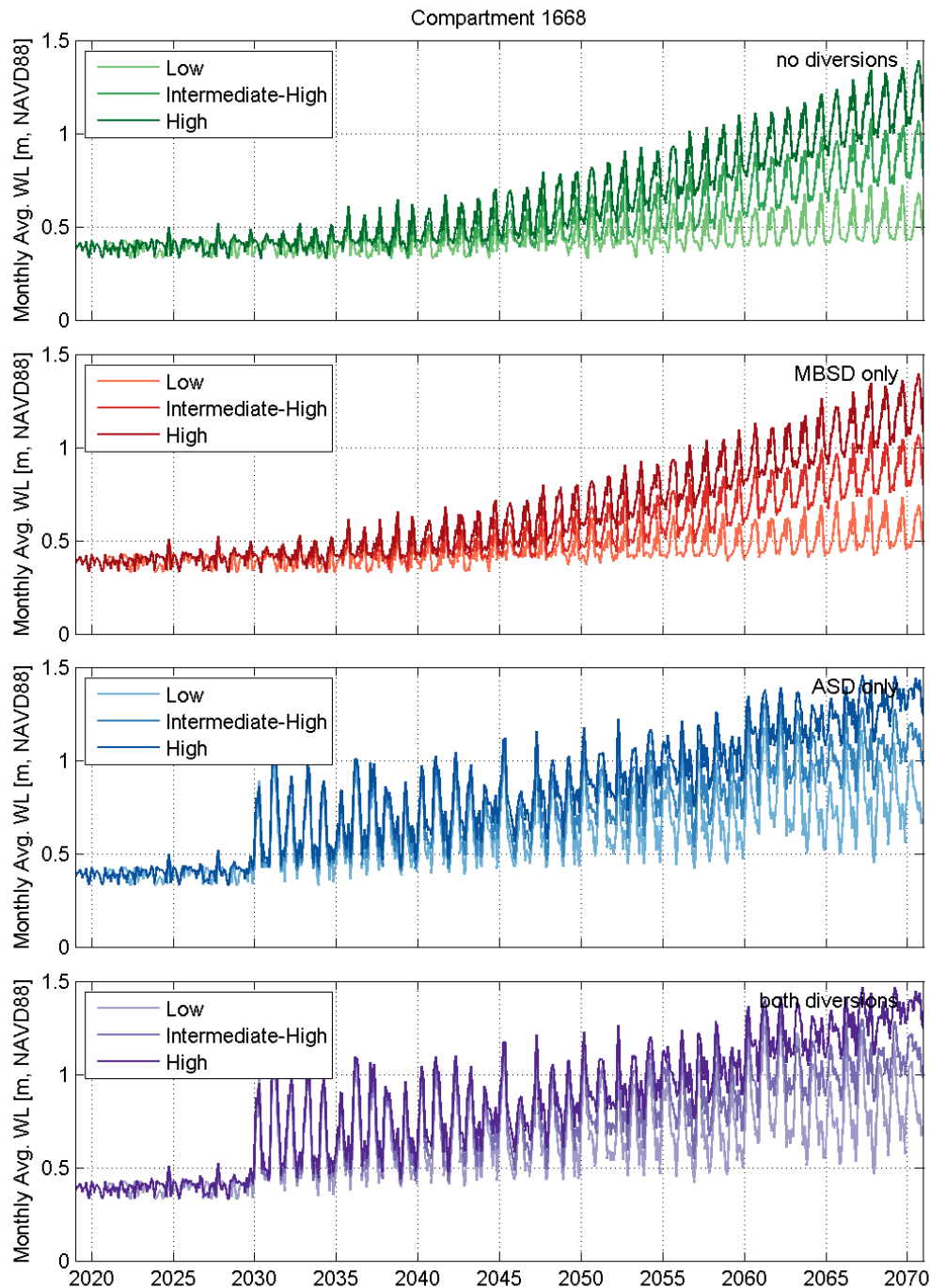


Project Scenarios: Diversion Project Implementation

- › **Mid-Barataria Sediment Diversion (MBSD)**
 - › **75,000 CFS** capacity with 5,000 cfs minimum flows
 - › Implemented at year 0
- › **Ama Sediment Diversion (ASD)**
 - › **50,000 CFS** capacity
 - › Implemented at year 10
- › **Project Scenarios**
 - › No Diversions
 - › MBSD Only
 - › ASD Only
 - › Both Diversions

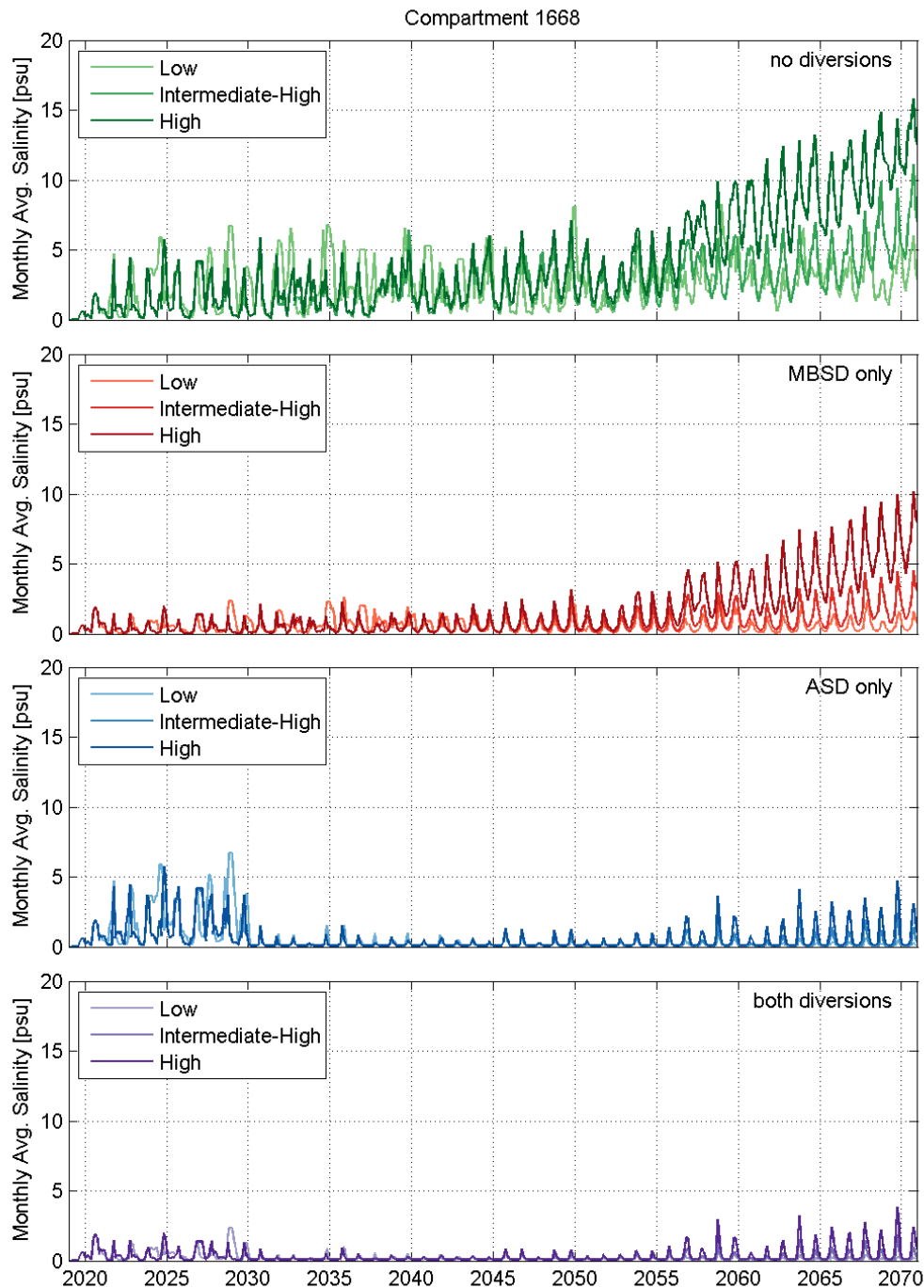


Water Levels



- › Monthly-avg water levels in Barataria Preserve
- › Each axis plots results for project scenario group
- › Plots on same axis compare results among climatic scenarios
- › Increasing water levels with SLR
 - › Large deviations from low scenario by 2050
- › In preserve north of GIWW, MBSD does not increase water levels
 - › MBSD impacts water levels south of GIWW (Fleming Tract)
- › Large increases in average water levels with ASD implementation
 - › Increases diminish somewhat with SLR

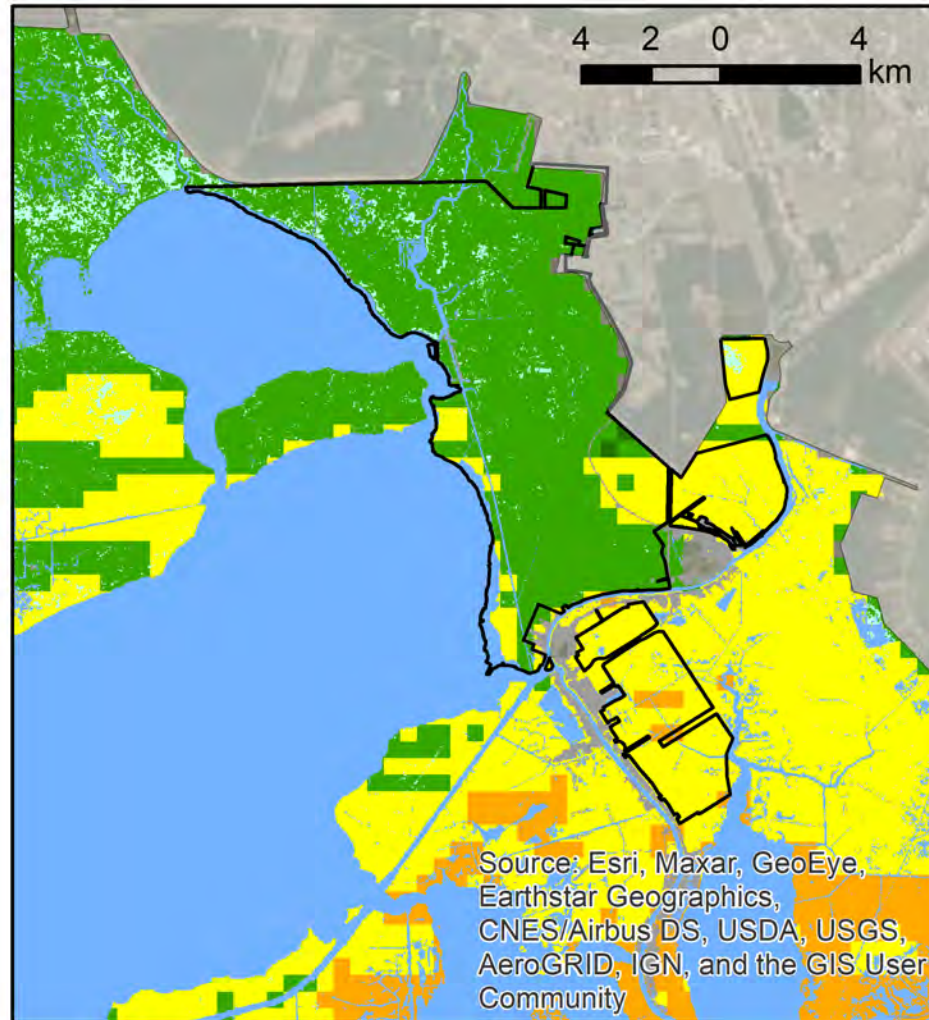
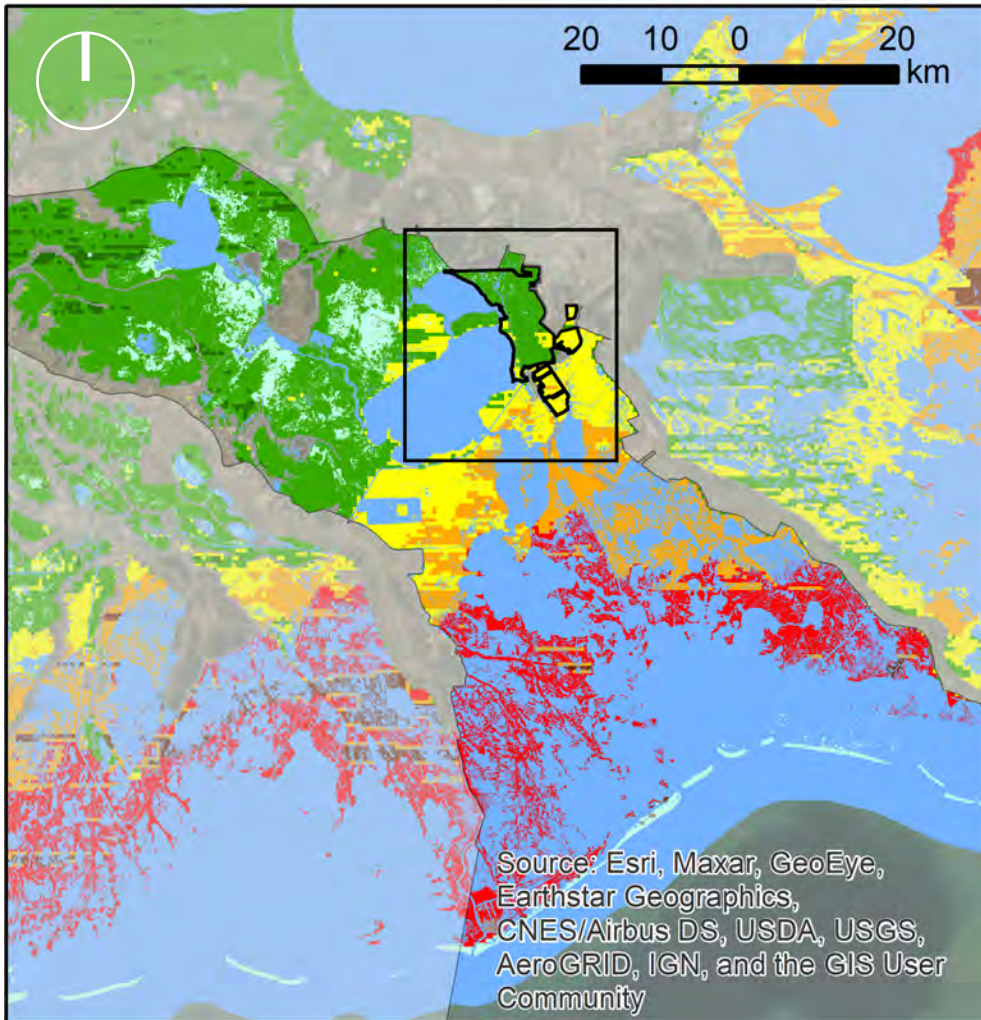
Salinities



- › Monthly-avg salinities in Barataria Preserve
- › More stable through time compared to water levels
 - › Long-term trends more dependent on project scenarios
- › In No Diversions scenario, salinities increase in final decade in High scenario and only in final years in lower SLR scenarios
- › MBSD reduces salinities to stable levels (for all but High scenario)
 - › No long-term increase for Low scenario
- › ASD significantly lowers salinities to near zero
 - › Near zero salinities persist for low scenario



Low Scenario No Diversions Year 2



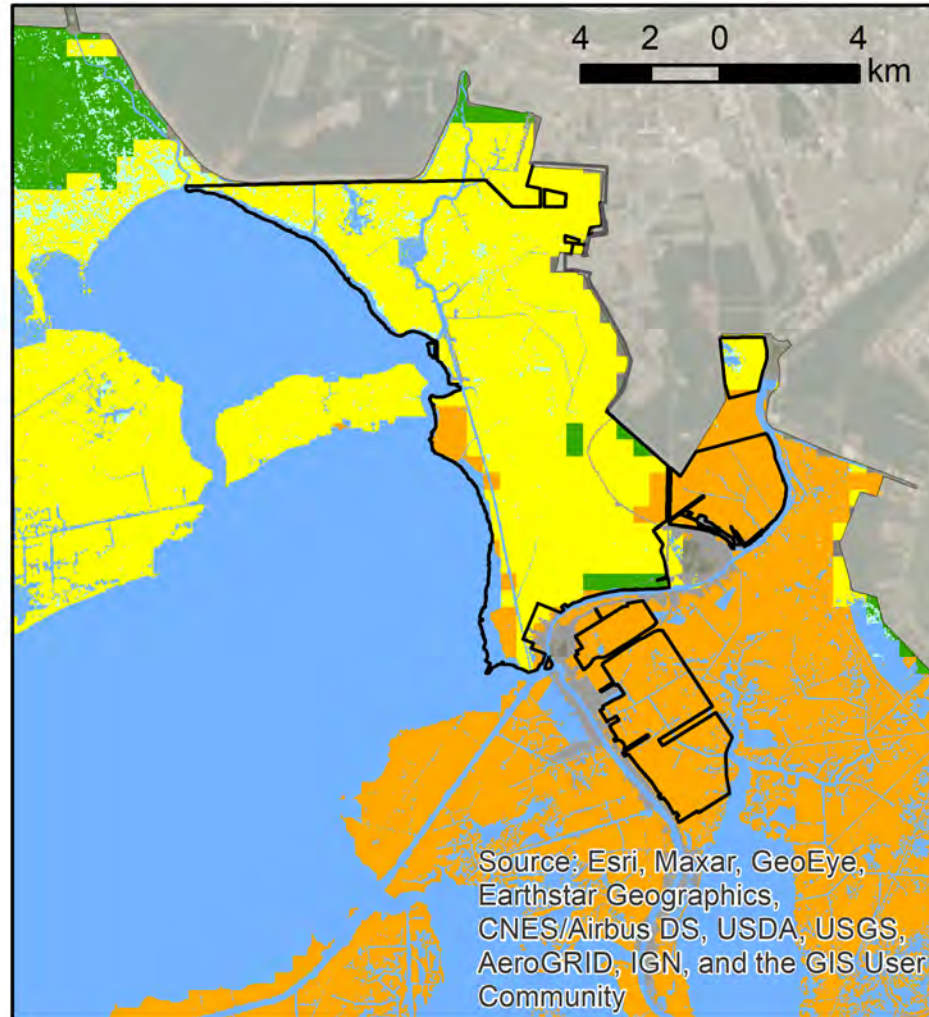
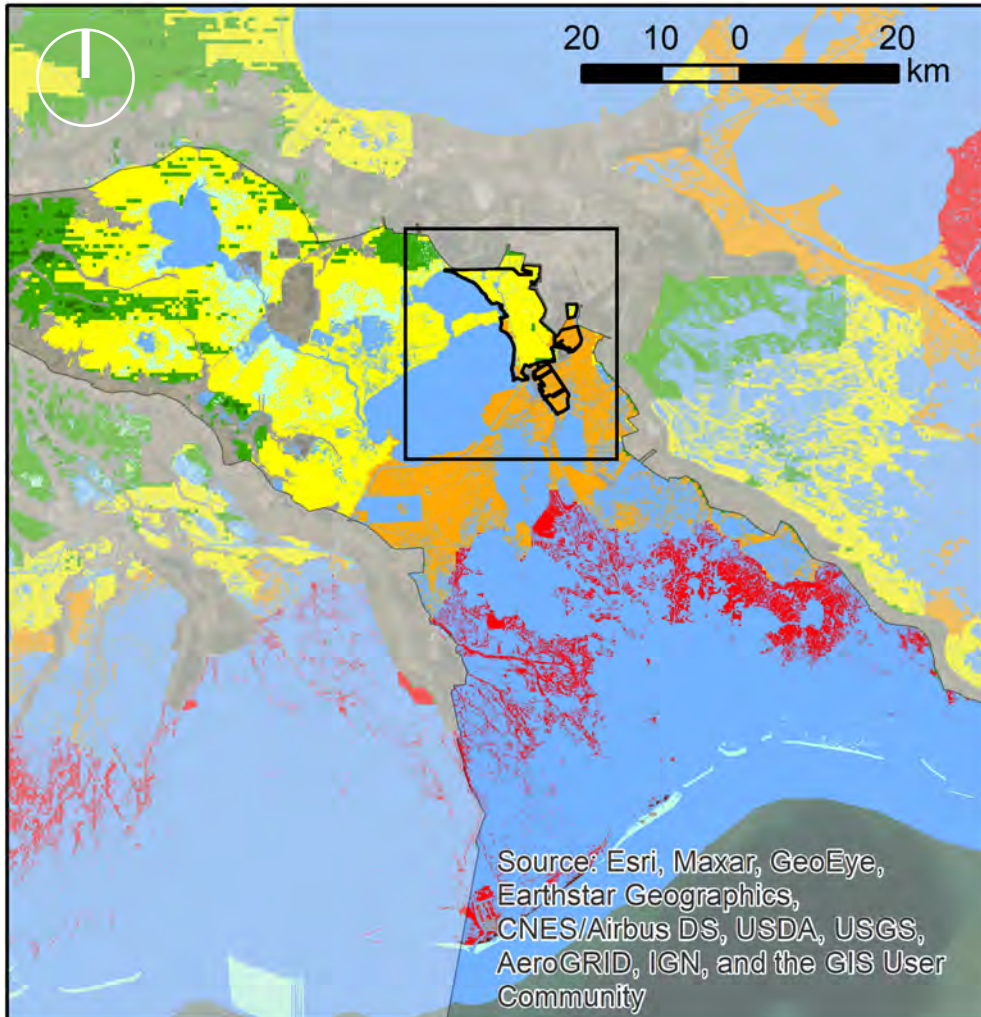
S06 - G503
FWOA, no diversions
Year 02

- Habitat Type**
- forested
 - fresh marsh
 - intermediate marsh
 - brackish marsh
 - saline marsh
 - water
 - mudflat/bareground
 - developed/upland
 - flotant





Low Scenario No Diversions Year 51



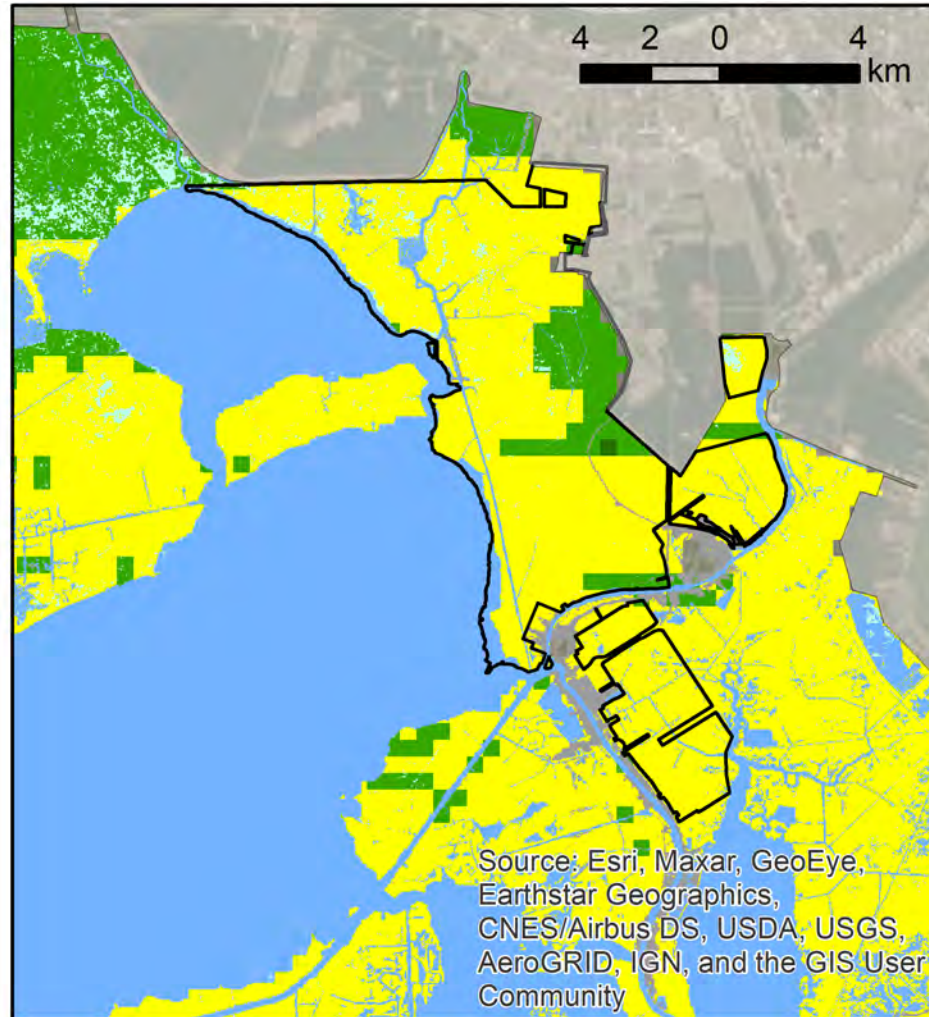
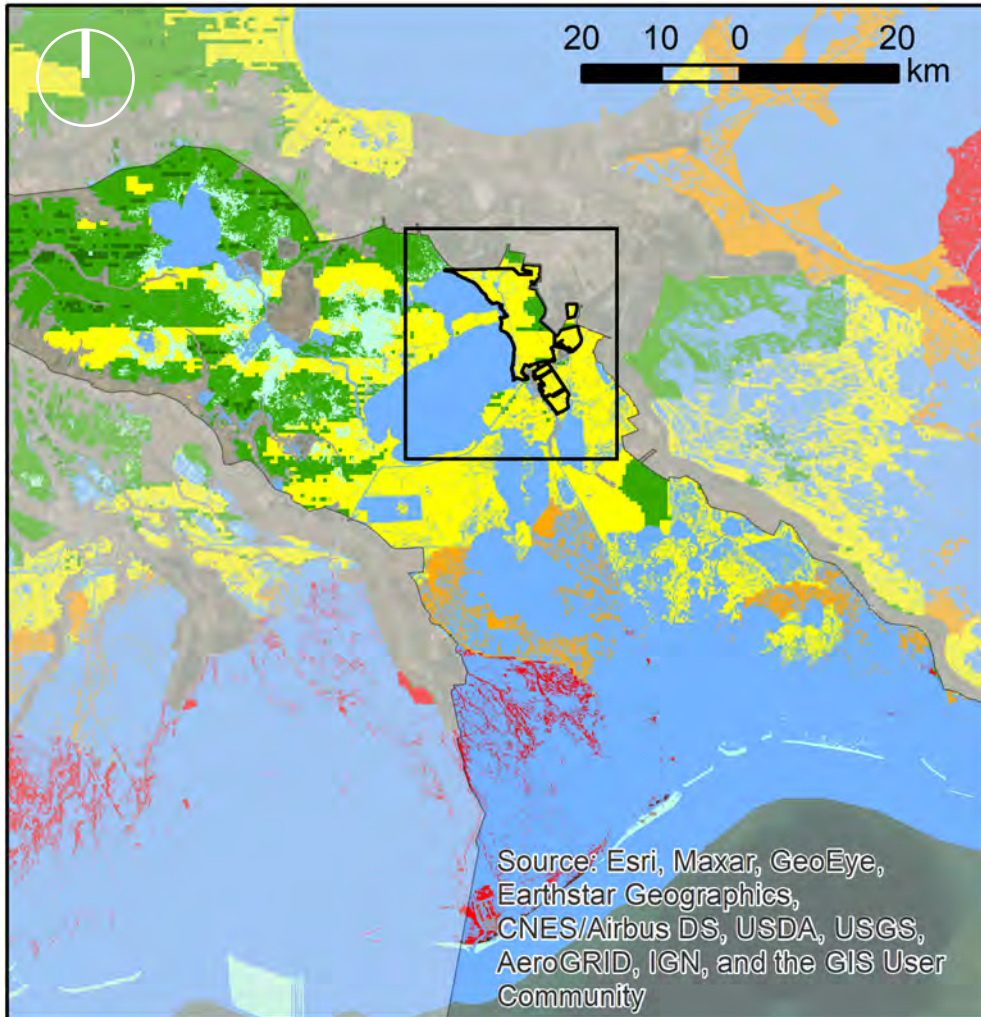
S06 - G503
FWOA, no diversions
Year 51

- Habitat Type**
- forested
 - fresh marsh
 - intermediate marsh
 - brackish marsh
 - saline marsh
 - water
 - mudflat/bareground
 - developed/upland
 - flotant





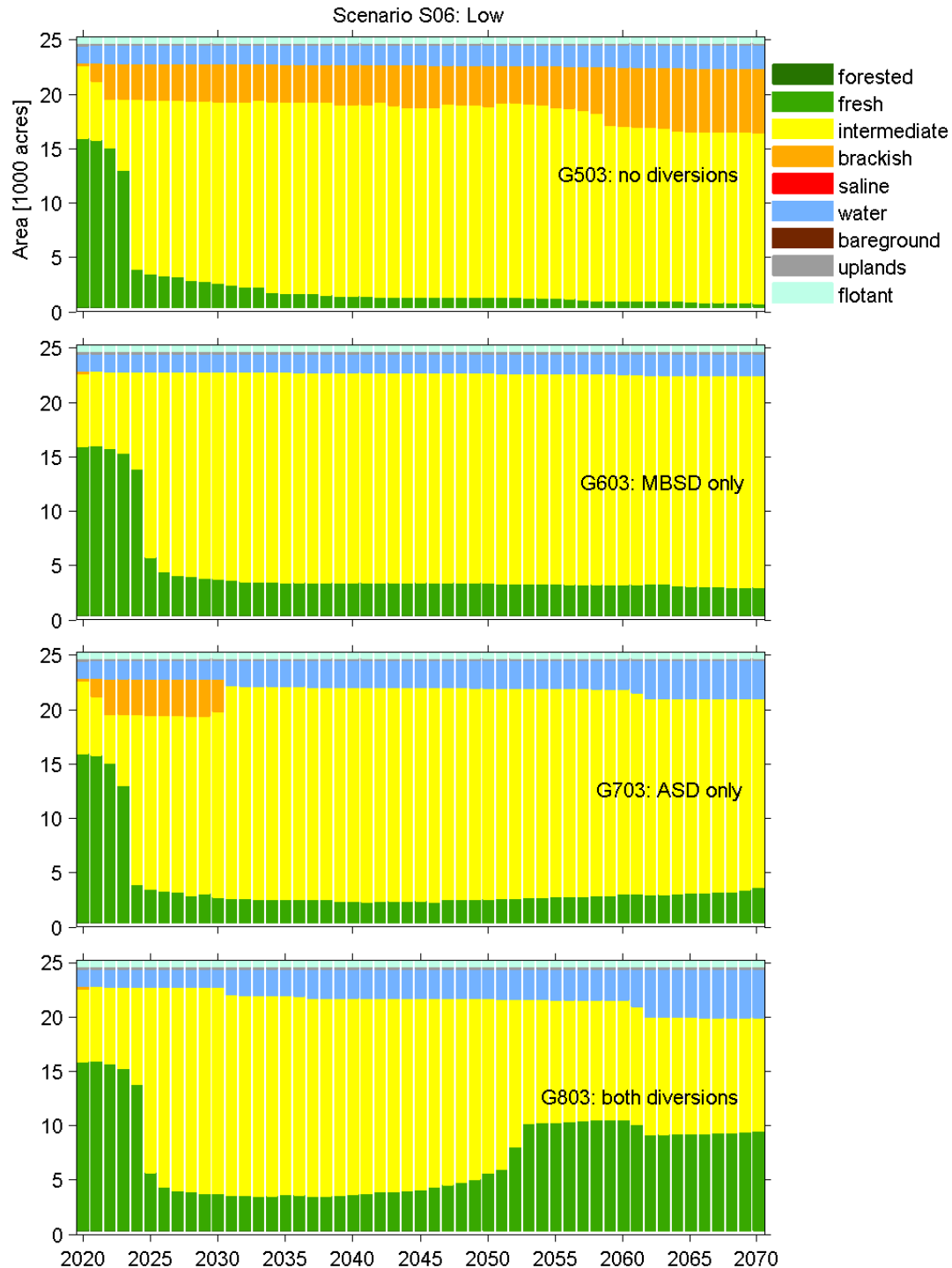
Low Scenario MBSD only Year 51



S06 - G603
Mid-Barataria Only
Year 51

- Habitat Type**
- forested
 - fresh marsh
 - intermediate marsh
 - brackish marsh
 - saline marsh
 - water
 - mudflat/bareground
 - developed/upland
 - flotant



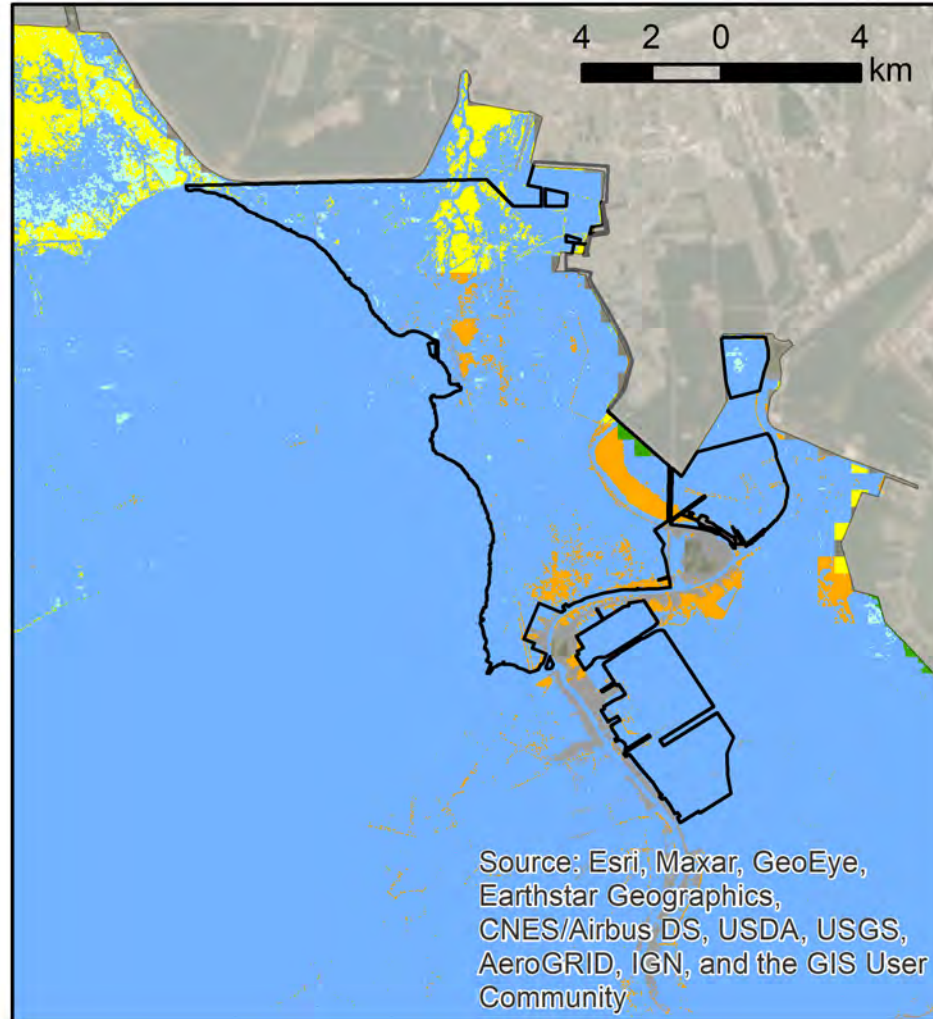
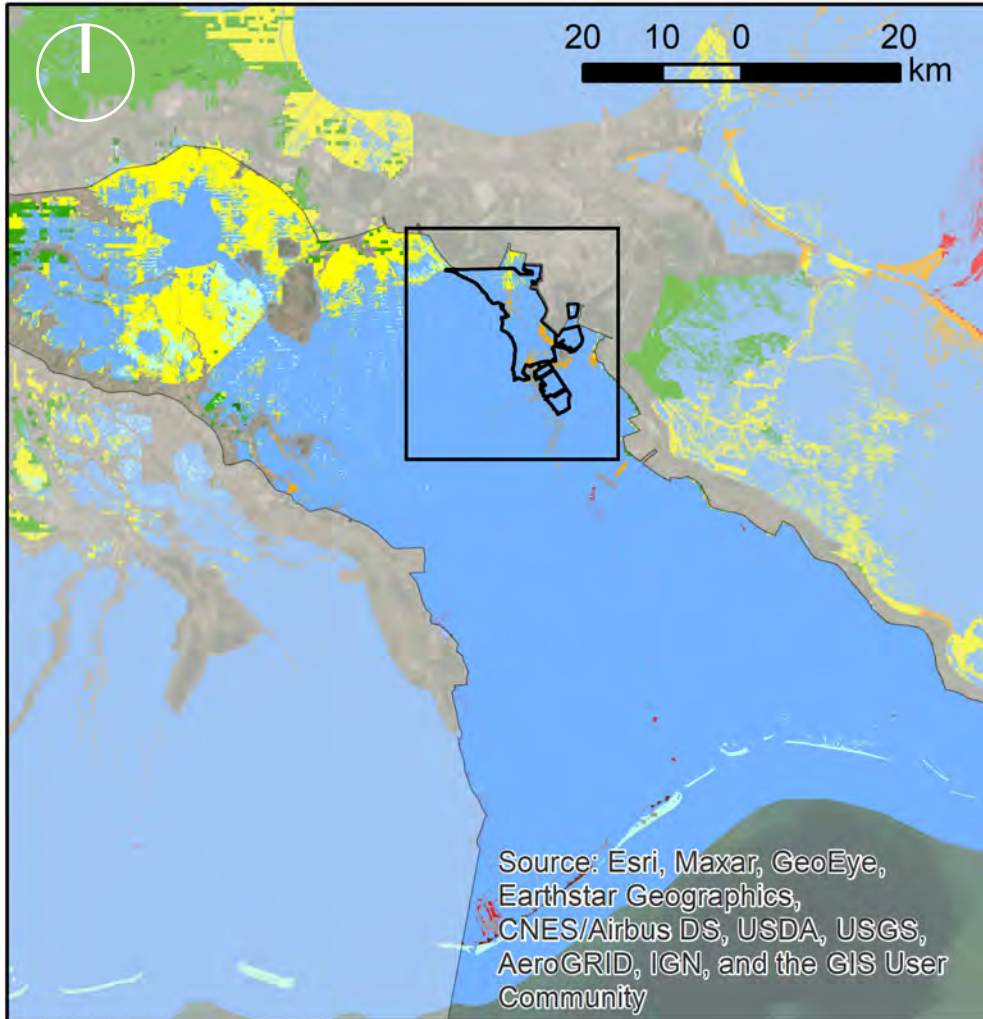


Low Scenario Summary

- › Area of each wetland vegetation community within the 25k acre preserve boundary through time
- › Nearly all of preserve land area remains through 50 years
 - › Shifting vegetation community dynamics that vary with project scenario
- › Early transition from fresh to intermediate and brackish
- › MBSD builds land and preserves fresh and intermediate marshes in mid-basin, prevents transition to brackish



Intermediate-High No Diversions Year 51



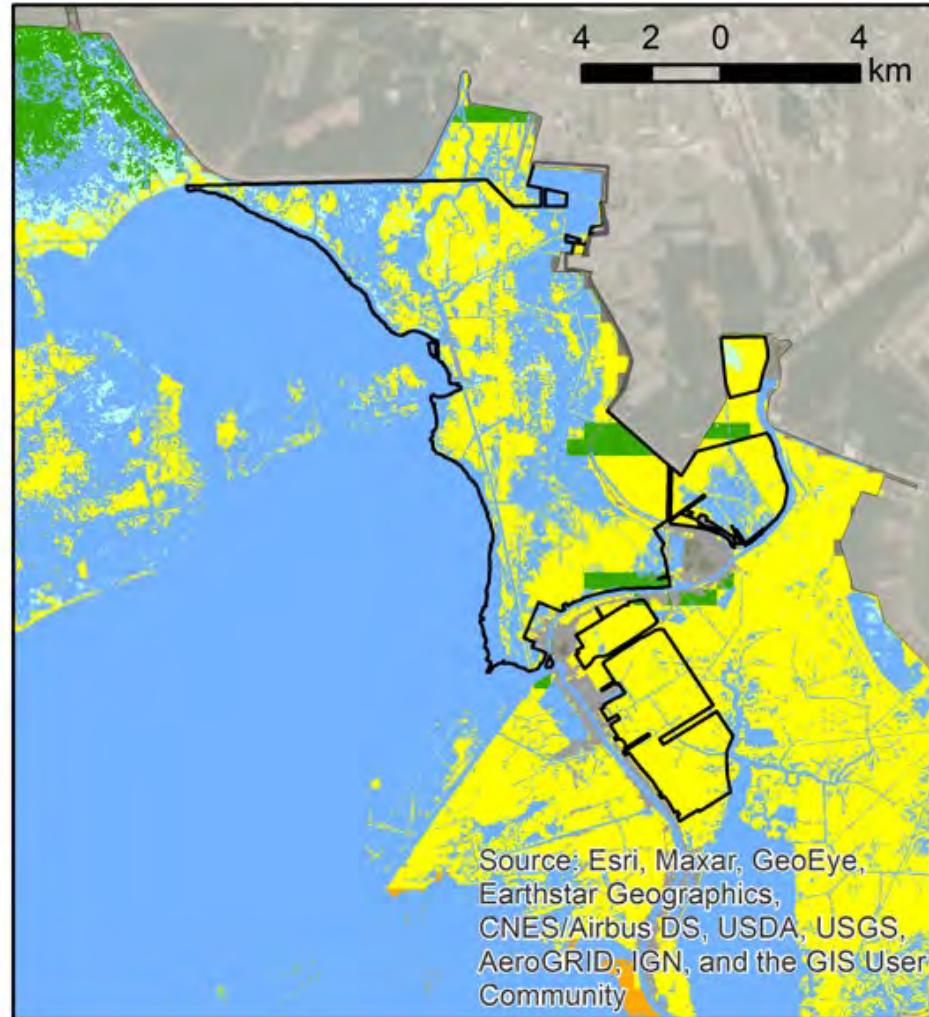
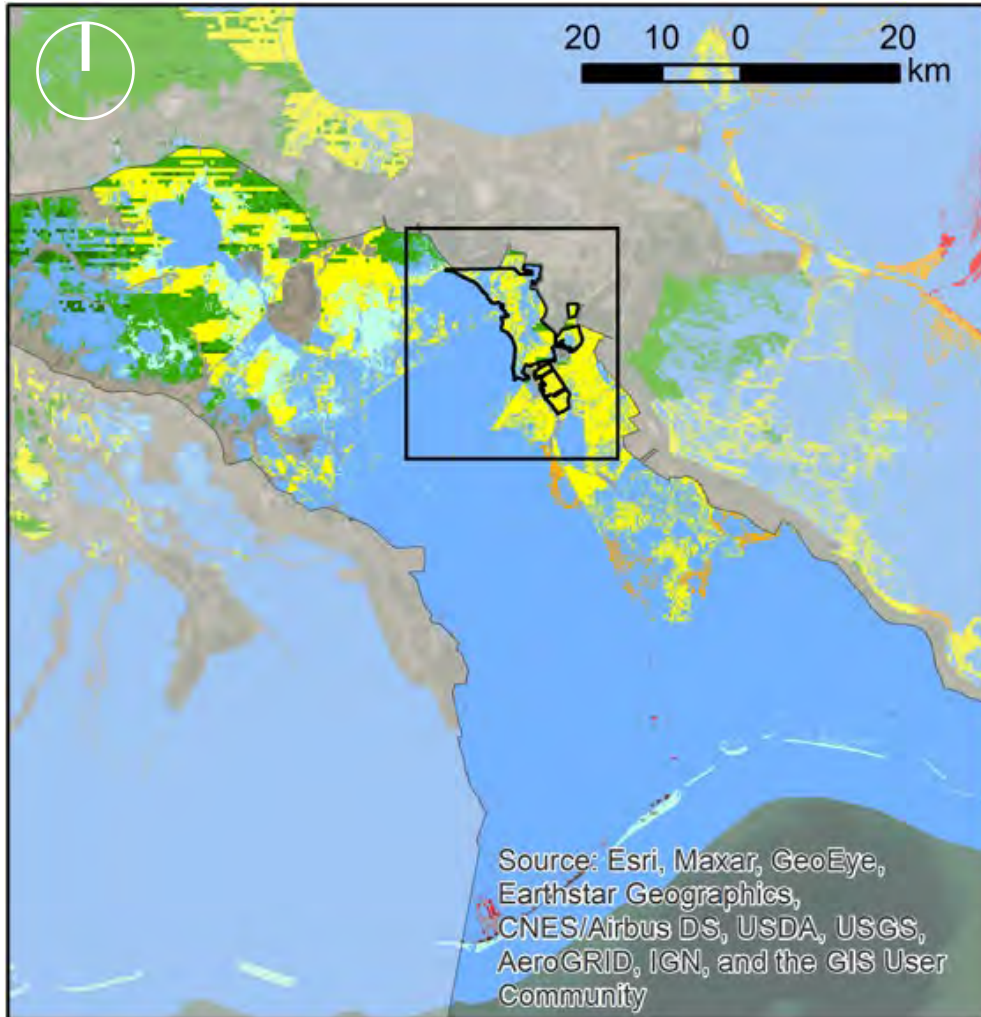
S08 - G503
FWOA, no diversions
Year 51

- Habitat Type**
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 - fresh marsh
 - intermediate marsh
 - brackish marsh
 - saline marsh
 - water
 - mudflat/bareground
 - developed/upland
 - flotant





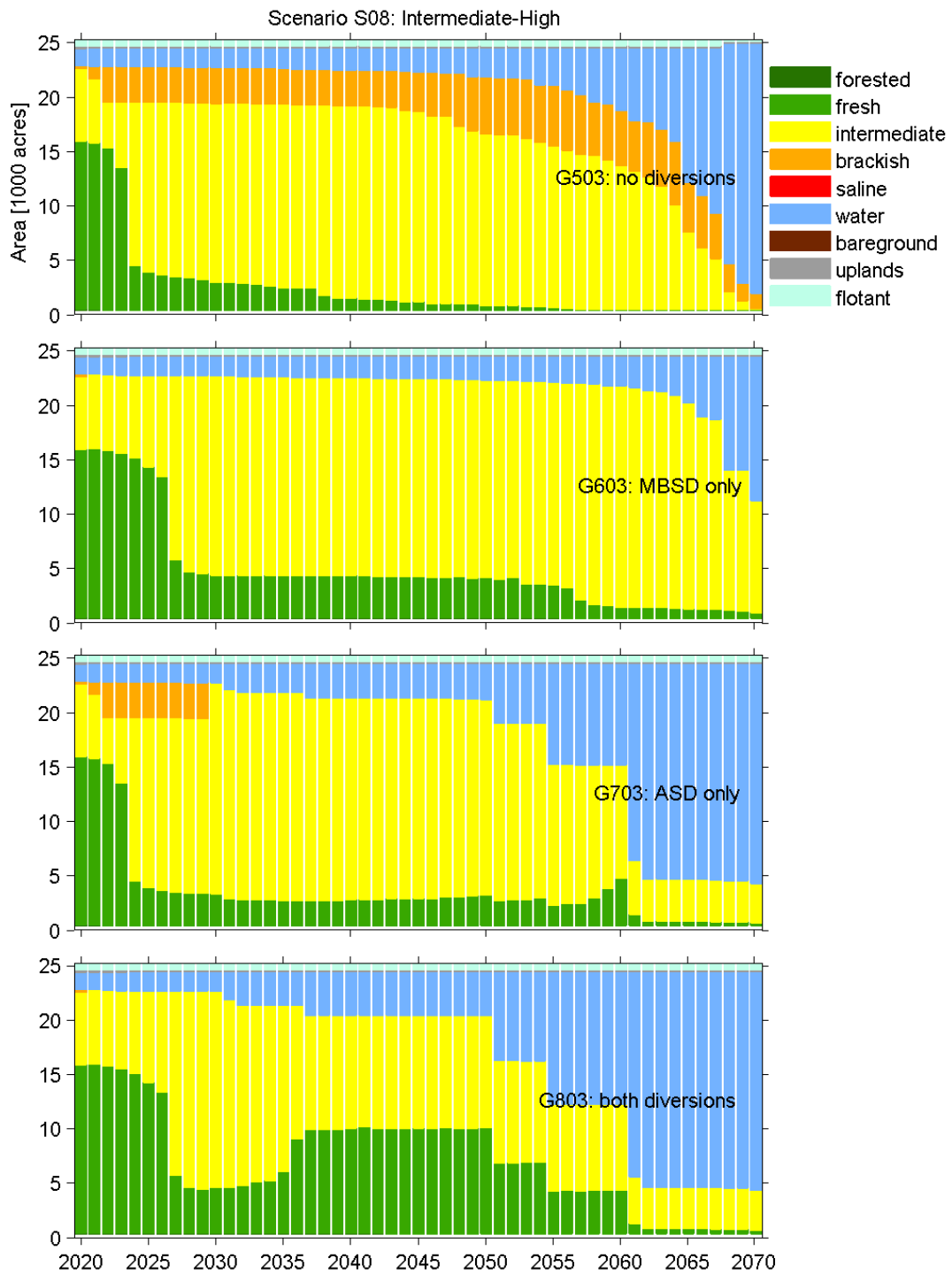
Intermediate-High MBSD only Year 51



S08 - G603
Mid-Barataria Only
Year 51

- Habitat Type**
- forested
 - fresh marsh
 - intermediate marsh
 - brackish marsh
 - saline marsh
 - water
 - mudflat/bareground
 - developed/upland
 - flotant



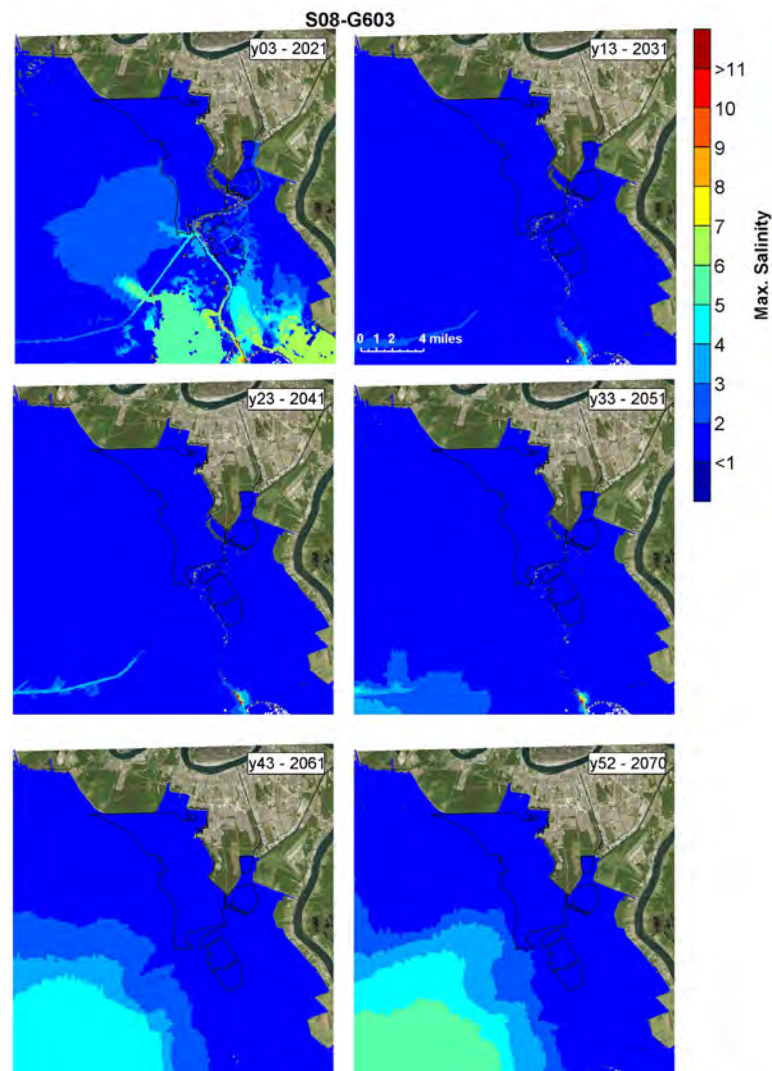
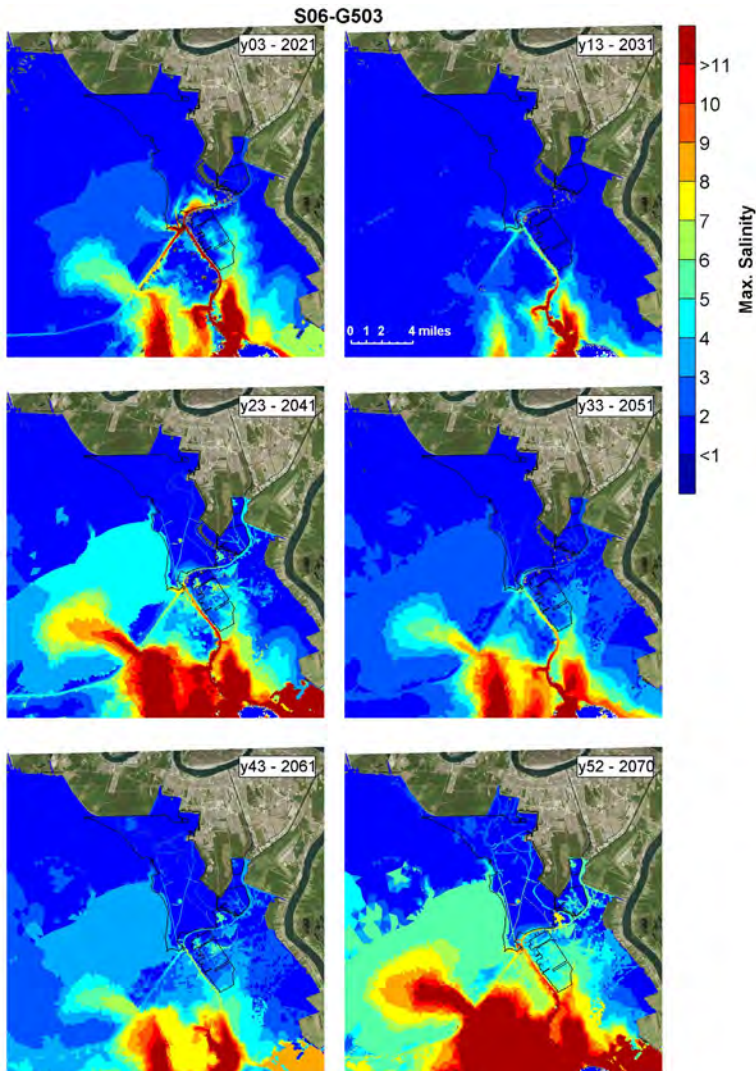


Intermediate-High Scenario Summary

- › Significant land loss does not occur until the later decades of the simulation
- › Total land loss and vegetation community composition at end of simulation is heavily influenced by project implementation
- › The freshwater influence and enhanced far-field accretion associated with the MBSD preserve intermediate marsh south of the GIWW and in portions of the northern preserve area
- › The ASD operations preserves areas south of the GIWW, though with additional inundation loss of fresh marsh systems in the far upper basin and northern parts of the preserve.
- › Both diversions preserve more fresh habitat for longer

Low Scenario No Diversions

Intermediate-High Both Diversions



- › Maximum salinities show saline intrusion pathways, with increasing intrusion in later years
- › Saline intrusion into the preserve is prevented due to increased freshwater despite the higher SLR in this scenario



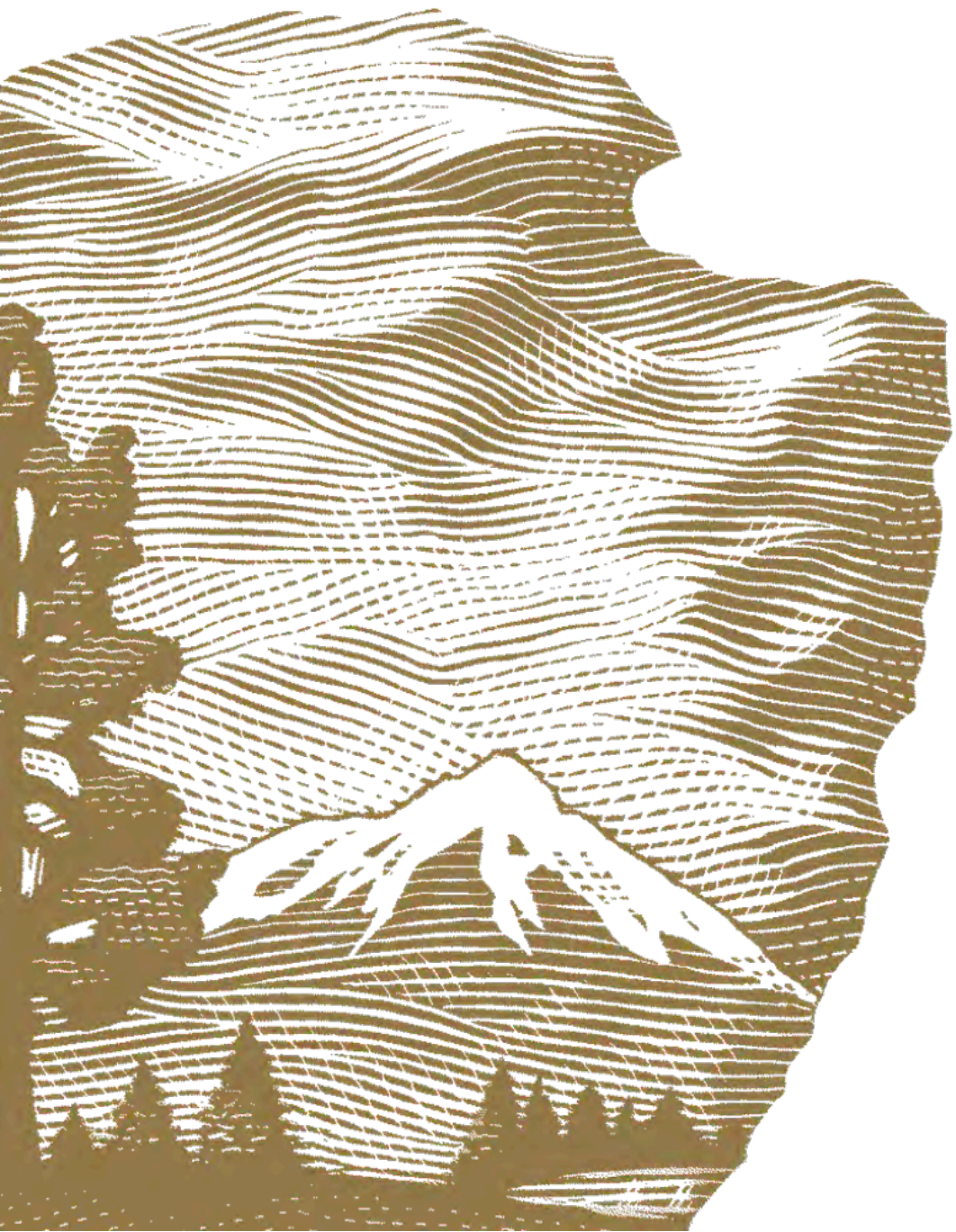
Conclusions

› **Coastal landscape trajectories vary significantly among the three climatic scenarios**

- › **Low** – most of preserve landscape remains as marsh through 50 years
- › **Intermediate-High** – significant land loss does not occur until the later decades of simulation, with total land loss and vegetation influenced by project scenario
- › **High** – nearly all preserve land area lost by year 50 regardless of project scenario. Collapse of various areas are delayed or accelerated depending on which diversion project was implemented

› **Water level increase with SLR**

- › Higher SLR scenarios deviate significantly from low scenario by approx. 2050
- › MBSD has minor influence on water levels north of the GIWW, while ASD increases water levels across preserve
- › **With no diversions, salinity regime in preserve remains stable for next 30 to 40 years, then could become much saltier under higher SLR scenarios**
- › **MBSD lowers salinities in preserve, though they could increase again in later years under high SLR**
- › **ASD keeps preserve completely fresh for several decades after project implementation, though with higher inundation**



State of the Coast 2023– New Orleans

Thank you

