2023 COASTAL MASTER PLAN
COMMITTED TO OUR COAST

LANDSCAPE MODELING: FINAL MODEL IMPROVEMENTS AND SCENARIO SETTINGS

ERIC WHITE

January 12, 2021

LANDSCAPE MODELING IN THE ICM: UPDATE

PRESENTATION OUTLINE

- Final model improvements to ICM-LAVegMod & ICM-Morph
  - Quick overview of spatial resolutions
  - ICM-LAVegMod coverages, dispersal, weighted FFIBS, OMAR
- Final spatial datasets for future scenarios
  - Existing vs. initial conditions
  - DEM
  - Vegetation cover
  - Marsh edge erosion
- Future environmental forcings
  - Tidal & sea level rise
  - Fronts and hurricane surge
  - Balanced synthetic storm suite
  - Winds
  - Temperature & evapotranspiration
  - Coastal tributaries
  - Mississippi and Atchafalaya Rivers
  - Sediment rating curves

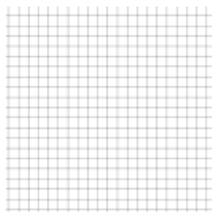
FINAL MODEL IMPROVEMENTS TO ICM-LAVEGMOD & ICM-MORPH

INTEGRATED COMPARTMENT MODEL (ICM)

SPATIAL RESOLUTION

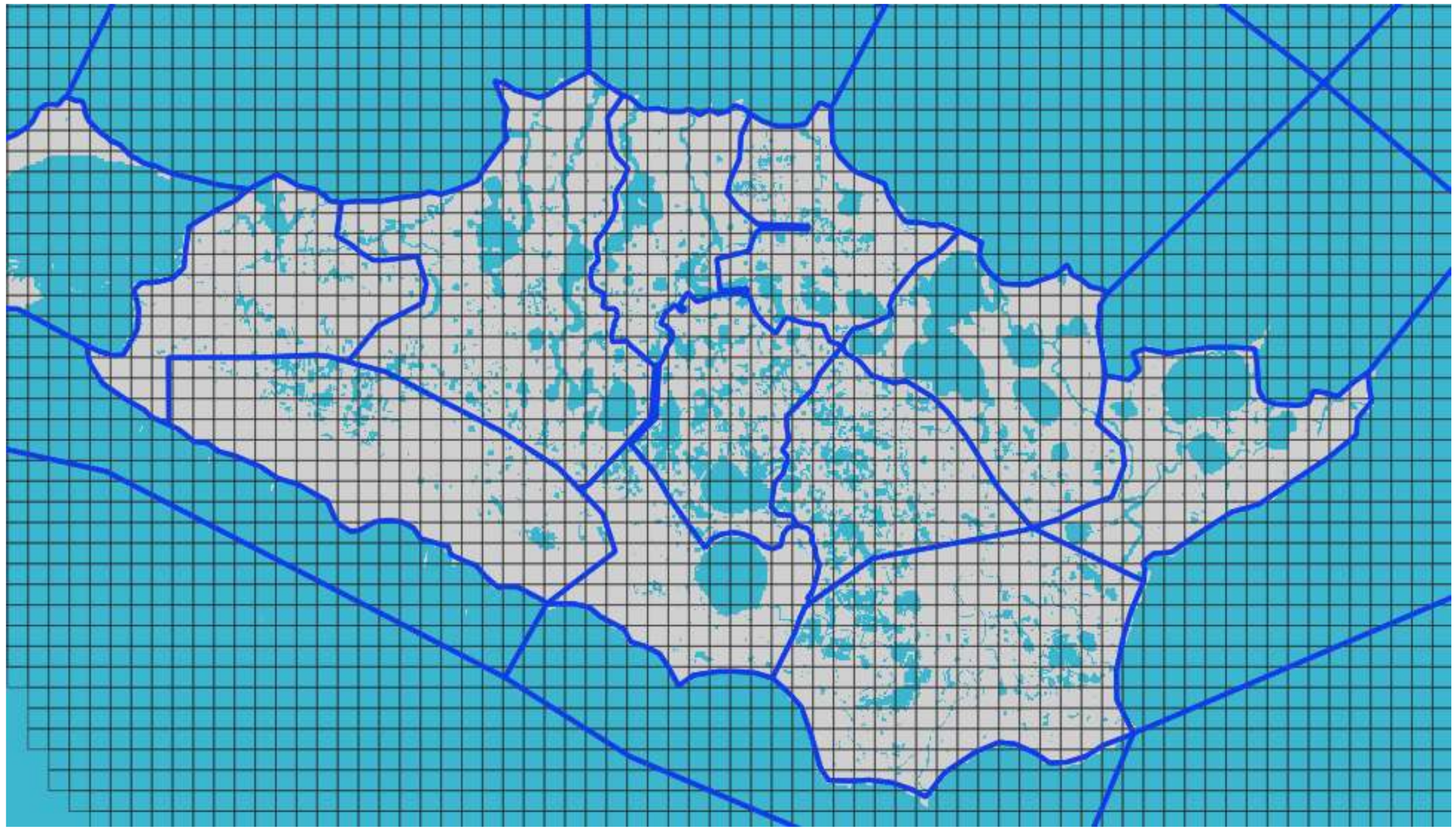
Legend

ICM-Hydro:
irregularly sized
compartment



ICM-LAVegMod & ICM-HSI:
480-m ***grid cell***

ICM-Morph:
30-m ***pixel***



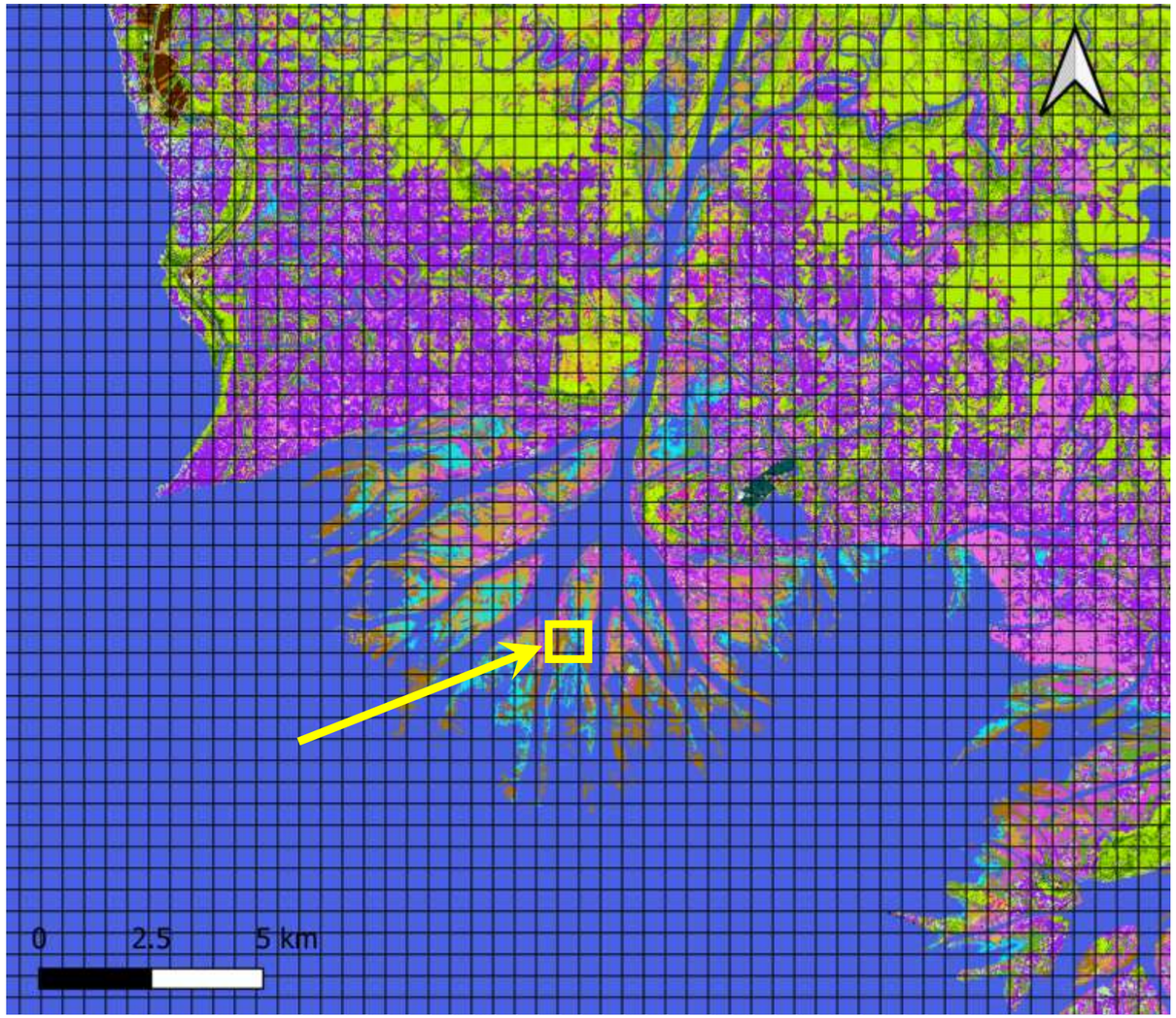
ICM resolution for Marsh Island in Vermilion Bay. Irregular polygons in dark blue are ICM-Hydro compartments; Orthogonal grid in black is the ICM-LAVegMod and ICM-HSI 480x480-m grid cells; Gray and teal landscape is the 30-m raster resolution of ICM-Morph.

INTEGRATED COMPARTMENT MODEL (ICM)

SPATIAL RESOLUTION

- ICM-LAVegMod
  - Models coverage of 43 vegetation species and bareground
  - Operates on a 480 m x 480 m grid

- ICM-Morph
  - Models elevation changes
  - Operates on a 30 m x 30 m grid (DEM pixels)



Initial conditions vegetative species land cover in the Wax Lake Outlet. Highlighted grid cell inset on next slide.

INTEGRATED COMPARTMENT MODEL (ICM)

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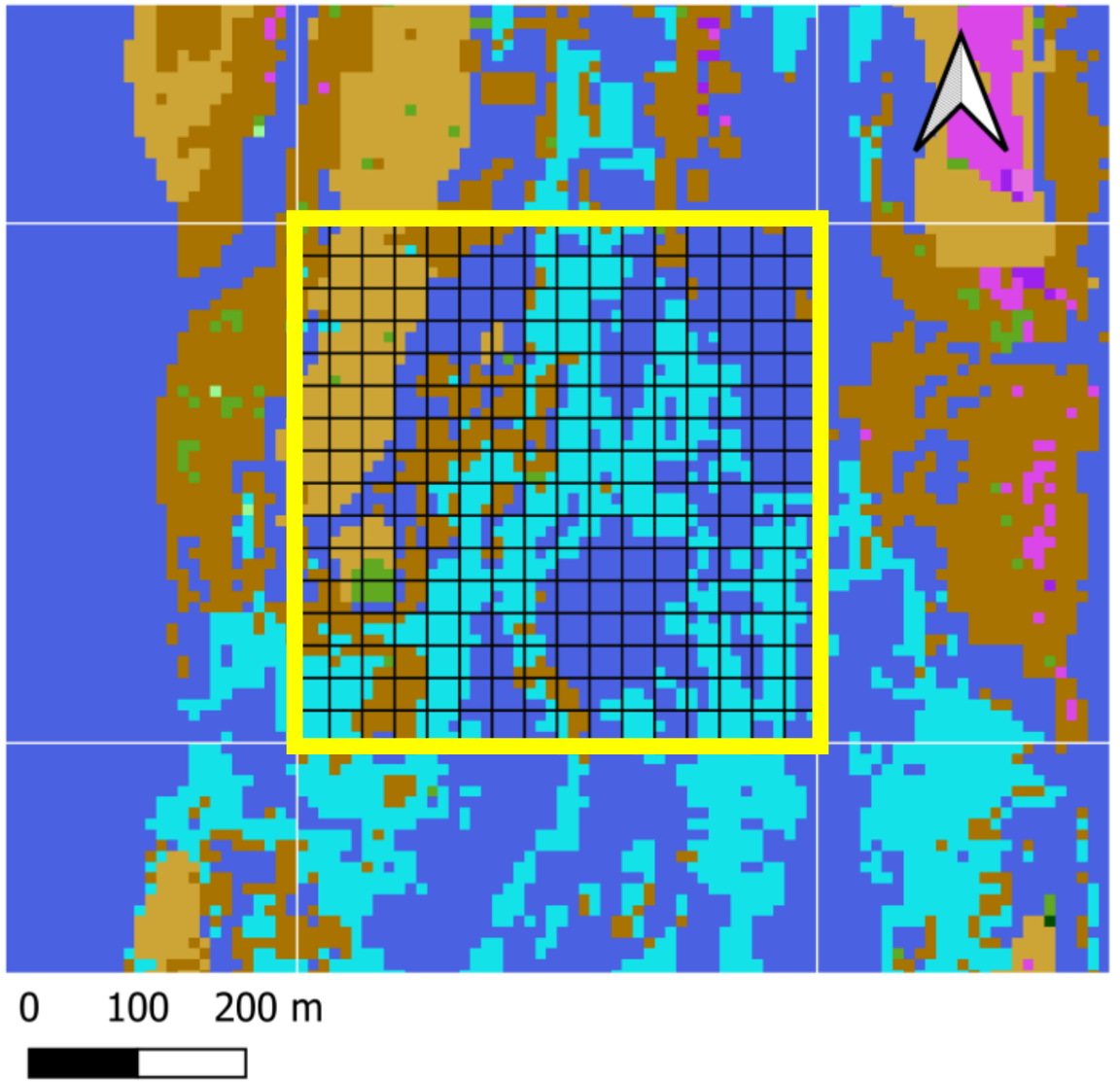
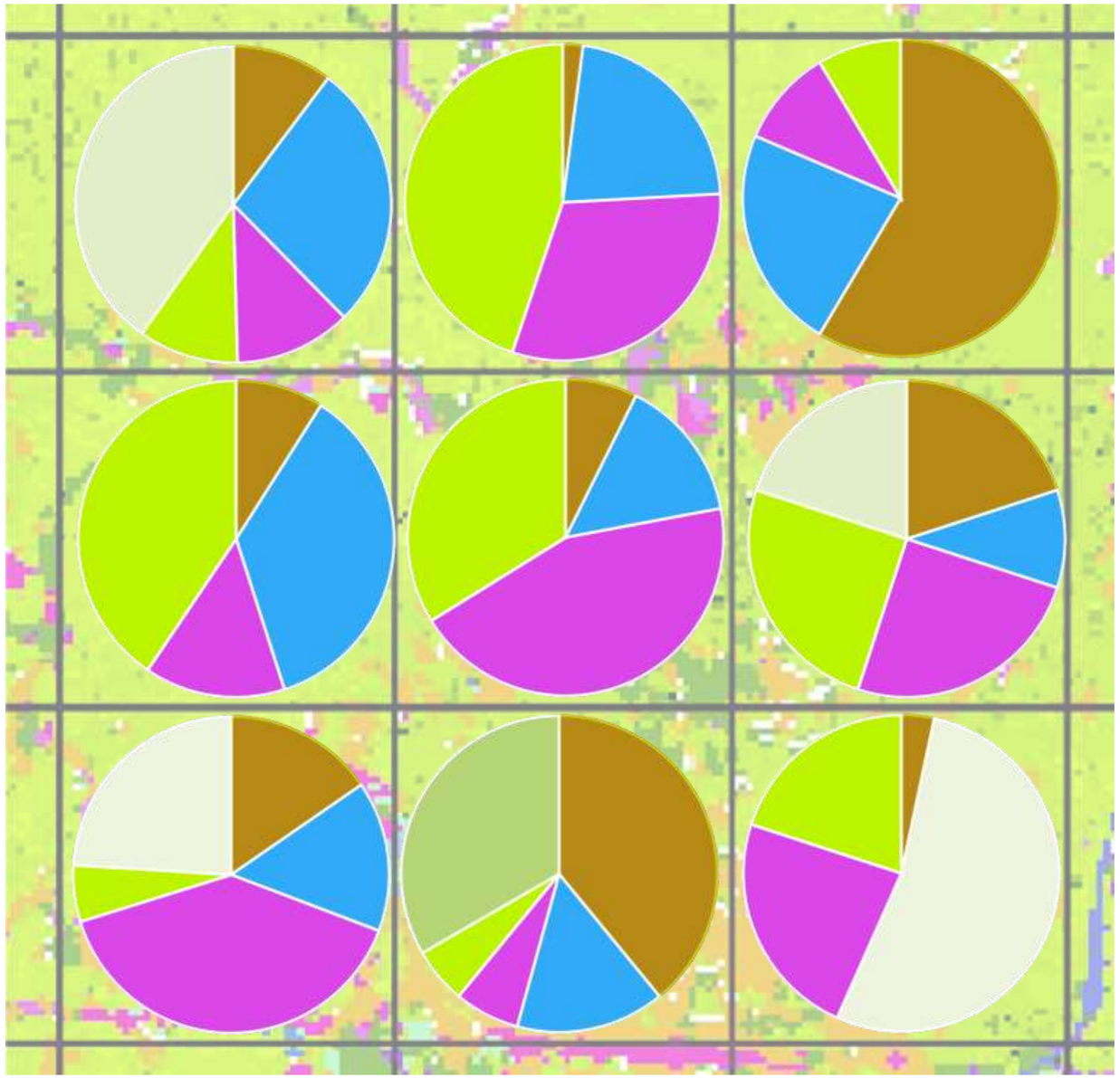


Initial conditions vegetative species land cover in the Wax Lake Outlet. Highlighted grid cell location mapped on previous slide.

ICM-LAVEGMOD: VEGETATIVE COVER

SPECIES MIXTURE

- Map of 2018 land use land cover (lulc) is used to create the initial vegetation coverages
- The coverage of every species is summed in each ICM-LAVegMod grid cell
- ICM-LAVegMod tracks, annually, the species coverage percentages
- ICM-Morph tracks the location of vegetation habitat types (FFIBS)

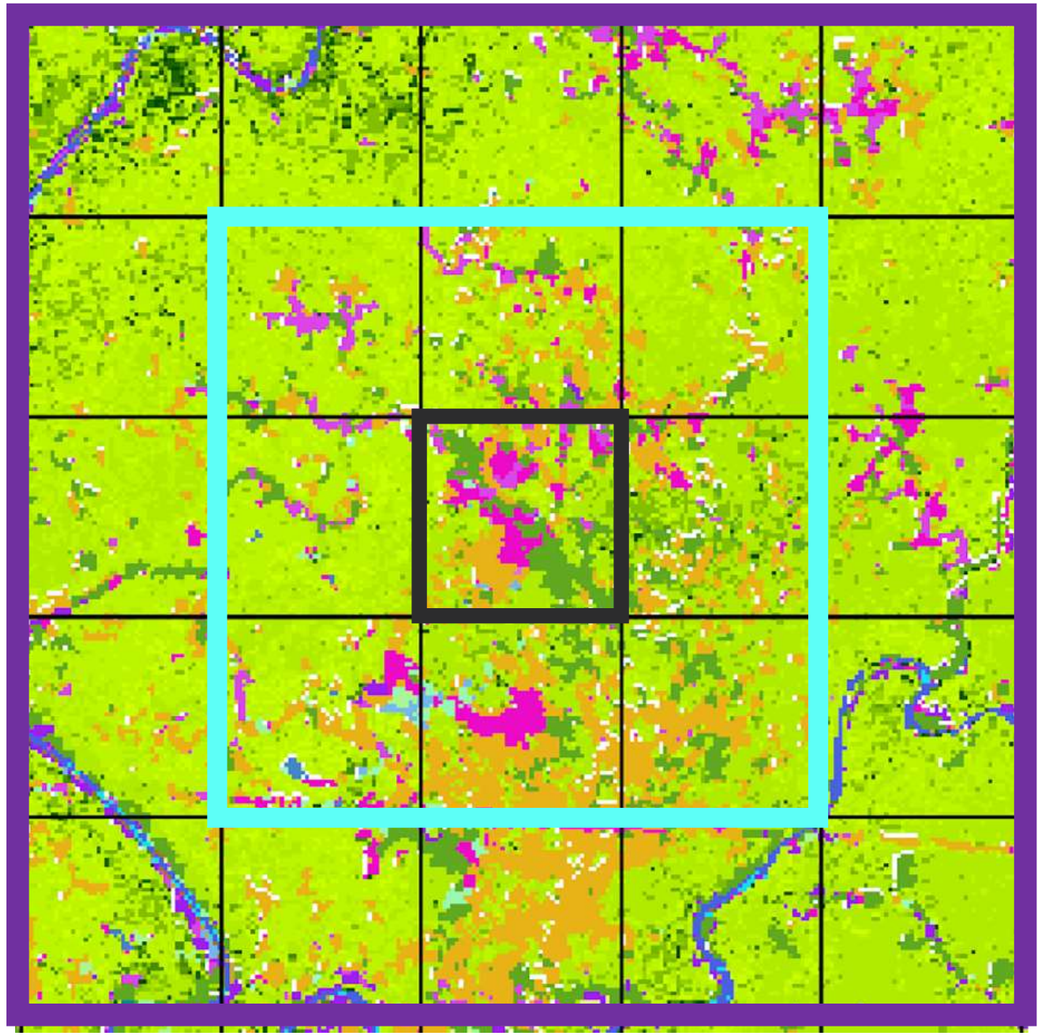


Conceptual representation of land type and vegetative species mix used by ICM-LAVegMod.

ICM-LAVEGMOD: SPECIES ATTRIBUTES

DISPERSAL CLASS

- The dispersal class describes how far a species can spread
- Three classes:
  - Low = Can move 1 box
  - Medium = Can move 2 boxes
  - High = Can move anywhere
- Species growth is based off both establishment probability and how present the species is in the area

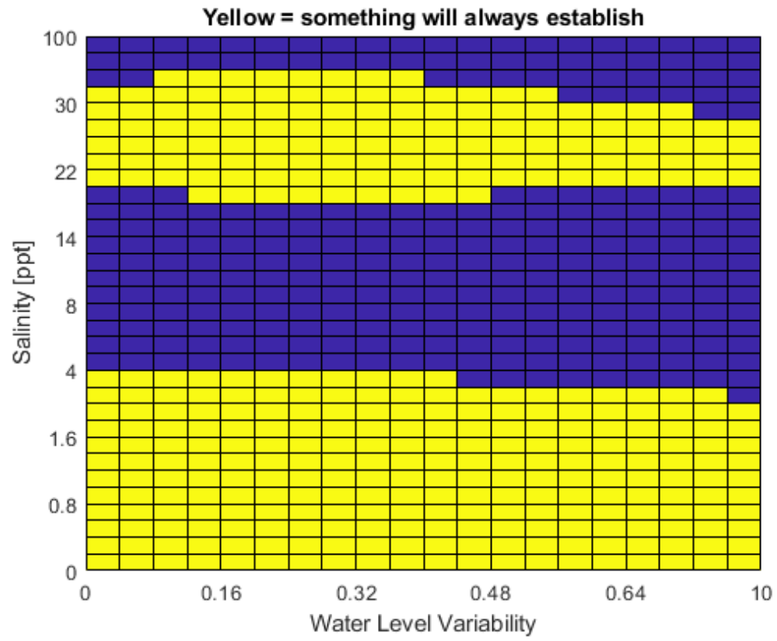


Dispersal zones used within ICM-LAVegMod.

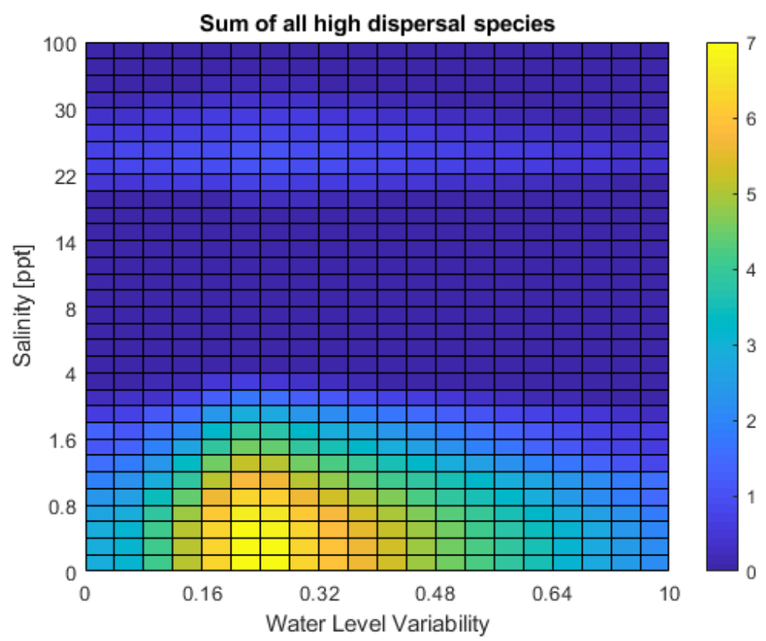
ICM-LAVEGMOD: SPECIES ATTRIBUTES

SALINITY CONDITIONS AND DISPERSAL DISTANCE

- Establishment will always occur if salinity is lower than~3 ppt or greater than ~20 ppt (yellow area)
- Otherwise (blue area), only nearby species will be able to establish



Salinity zones where vegetation species will always establish (yellow), or where only nearby vegetation species can move in (blue).



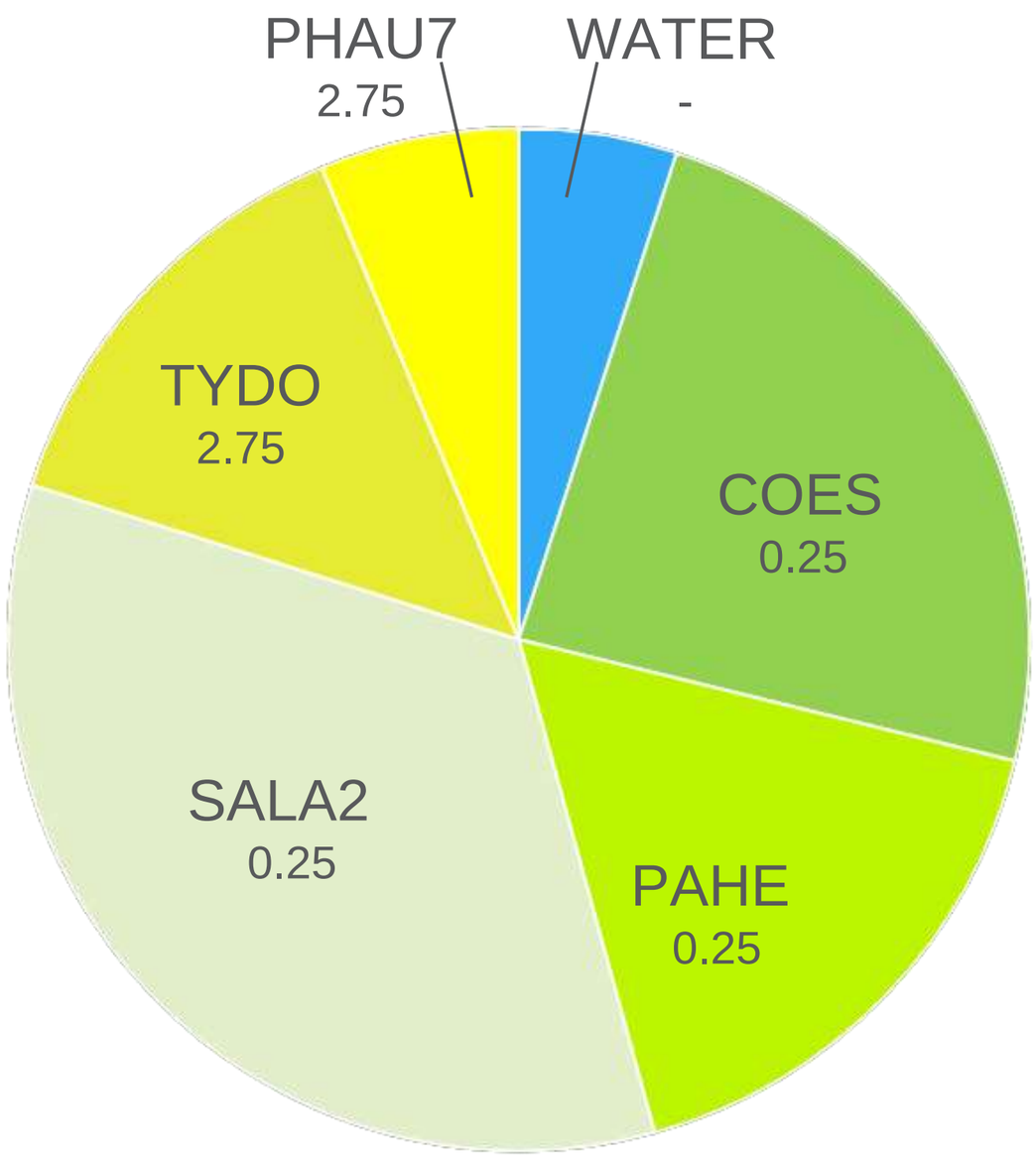
Sum of establishment probability for all species with no dispersal distance limitations.

ICM-LAVEGMOD: PROCESSES

FFIBS SCORE

- The FFIBS score is an average of the FFIBS values weighted by the area occupied by each species
- For this example:
  - PHAU7 = 2.75
  - TYDO = 2.75
  - SALA2 = 0.25
  - PAHE2 = 0.25
  - COES = 0.25

FFIBS score 0.8

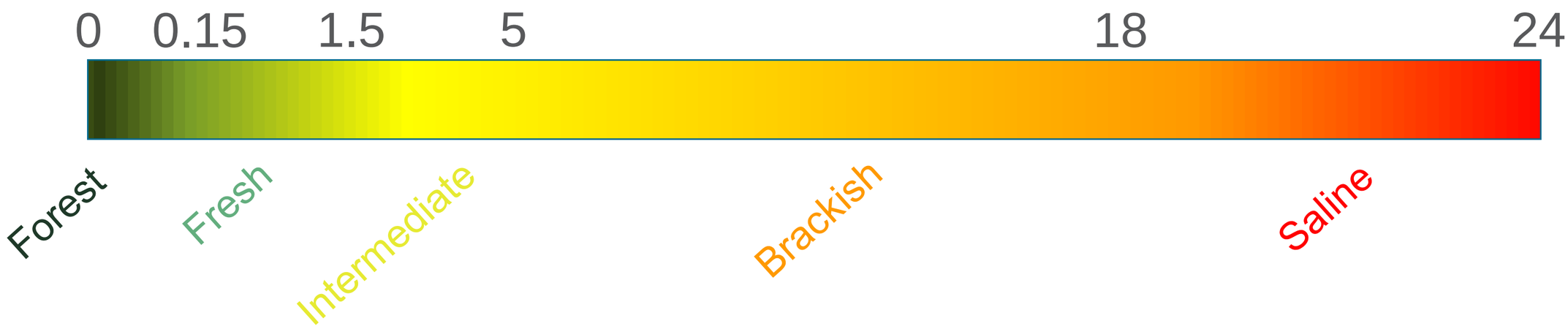


Example calculation of weighted FFIBS score.

ICM-LAVEGMOD: SPECIES ATTRIBUTES

FFIBS SCORE

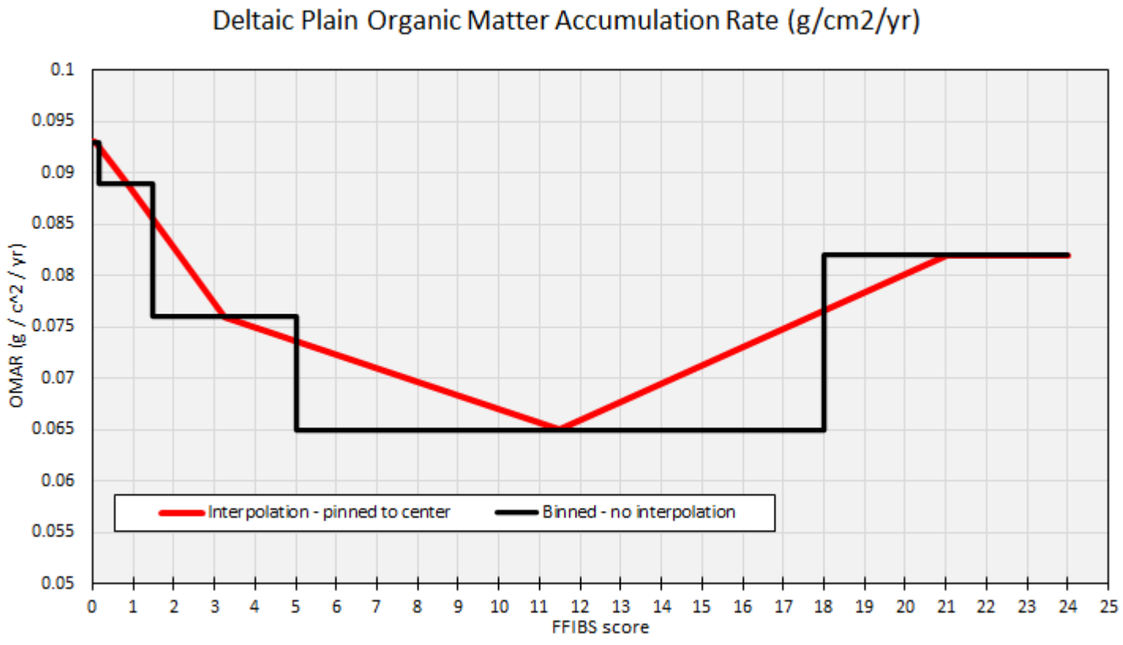
- Every vegetation species is given a value based on salinity regime

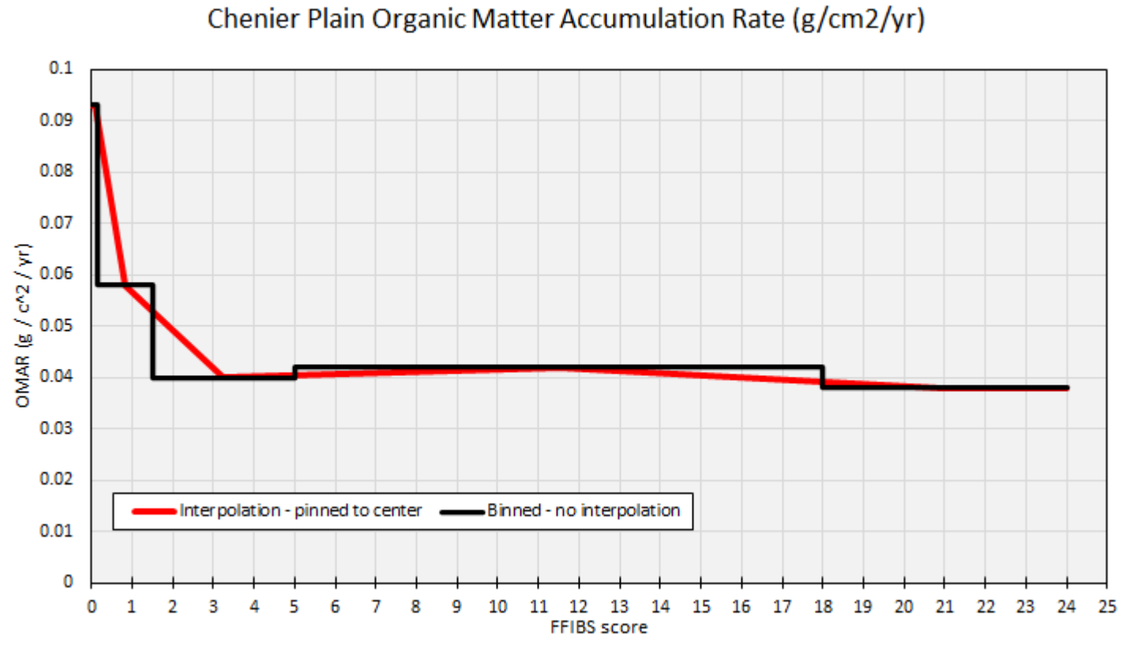


- A FFIBS score is calculated for each ICM-LAVegMod grid cell
- The FFIBS score is an average of the FFIBS values weighted by the area occupied by each species

ICM-LAVEGMOD & ICM-MORPH: ORGANIC MATTER ACCUMULATION

LINEARLY INTERPOLATED OMAR BY FFIBS SCORE

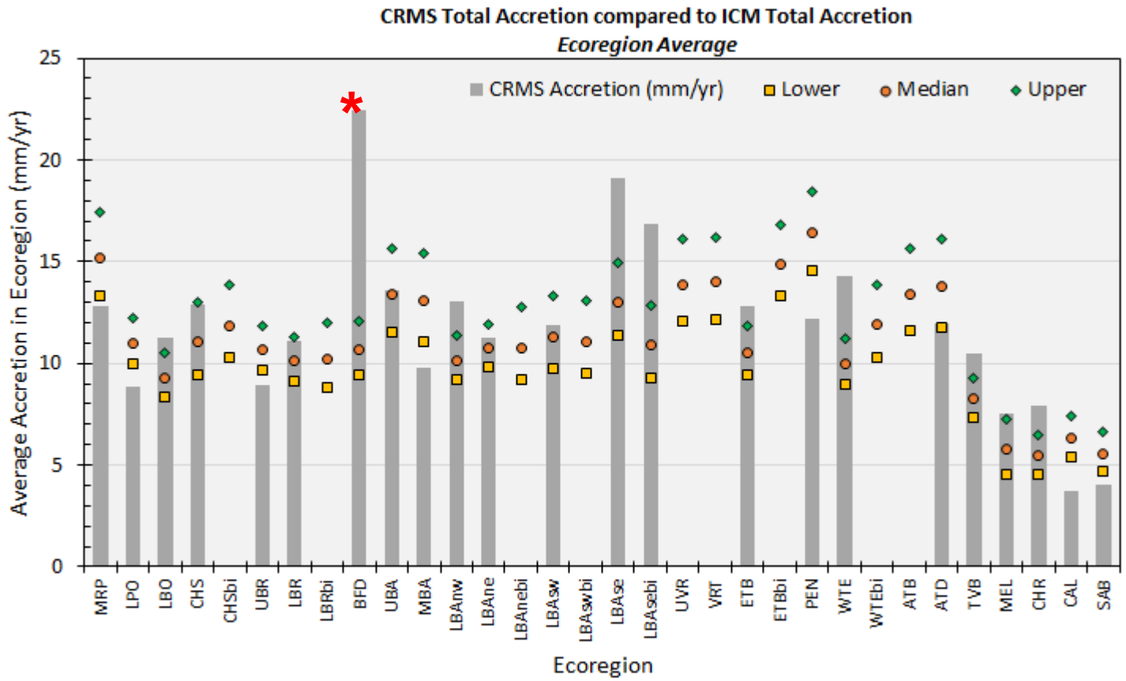


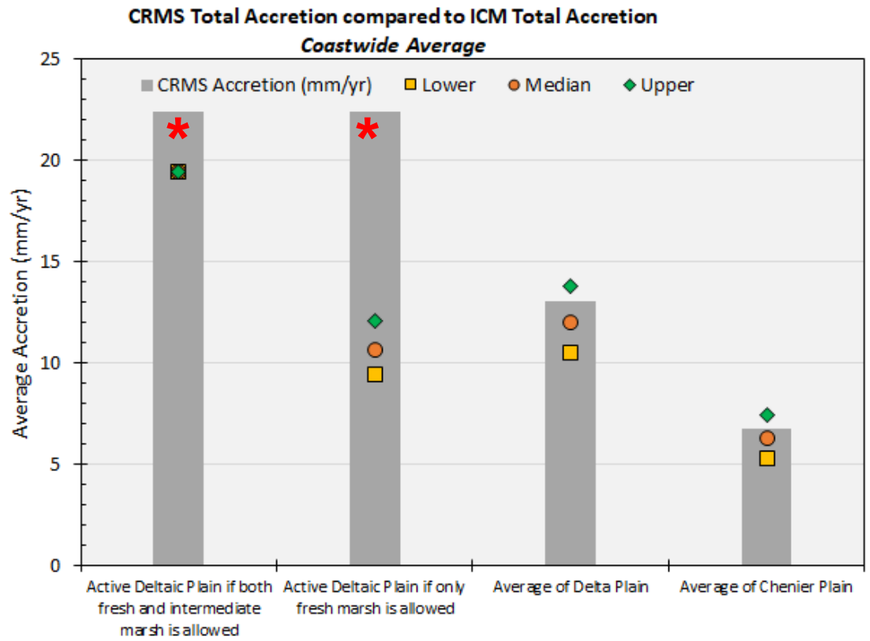


- For each habitat type classification within the CRMS network, organic matter accumulation rates (OMAR) were determined for each FFIBS type within the deltaic and chenier plains
- Three OMAR values provided for each FFIBS type: lower, median, & upper

ICM-LAVEGMOD & ICM-MORPH: ORGANIC MATTER ACCUMULATION

LINEARLY INTERPOLATED OMAR BY FFIBS SCORE





- Total accretion, as predicted with ICM during Cal/Val (dots), as compared to total accretion as measured at CRMS sites (gray bars)
- Range in simulated values (lower, median, upper) come from the variability in the OMAR input tables to ICM-Morph

Above plots show active deltaic locations defined via only fresh marsh (FFIBS < 1.5) or fresh and intermediate (FFIBS < 3). The latter option is used in FWOA simulations.