SAN DIEGO COASTKEEPER
KEEPING THE COAST CLEAR

Global Climate Change: Sea-Level Rise, Critical Coastal Habitats, and Coastal Water Quality in the San Diego Region

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Project Information & Proponents

- Funding for this model application was provided through a grant from the San Diego Foundation (*Global Climate Change: Sea-Level Rise, Critical Coastal Habitats, and Coastal Water Quality in the San Diego Region.)*
  - San Diego State University also provided extensive GIS processing in support of this analysis and the conversion of LiDAR data for the entire spatial domain of the city of San Diego into a high resolution digital elevation model.
- Sea Level Rise Affects Marshes Modeling (SLAMM) done by Jonathan Clough of Warren Pinnacle Consultants
  - http://warrenpinnacle.com/prof/SLAMM/

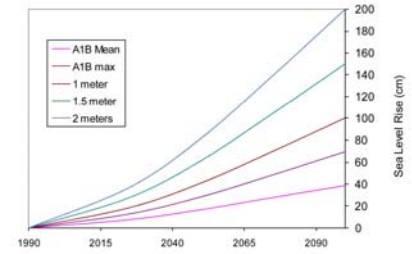
warren pinnacle consulting, inc.
The San Diego Foundation
San Diego State University

SLAMM background & methodology

- SLAMM 5 was run using scenario A1B from the Special Report on Emissions Scenarios (SRES)
  - Rapid economic growth & global population that peaks mid-century and declines thereafter & rapid introduction of new & efficient technologies
  - IPCC WGI Fourth Assessment Report (IPCC, 2007) suggests a likely range of 0.21 to 0.48 meters of SLR by 2090-2099 "excluding rapid dynamical changes in ice flow"
  - A1B-mean scenario predicts 0.40 meters SLR by 2100; A1B Max is 0.7 M SLR

Sea Level Rise Scenarios

Figure 2: Summary of SLR Scenarios Utilized



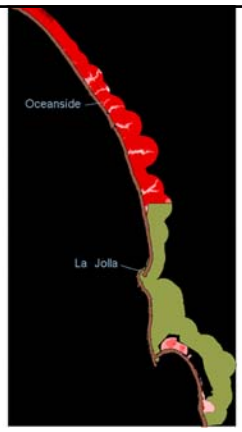
SLAMM process overview

- **Inundation:** Calculated based on the minimum elevation and slope of the cell.
- **Erosion:** Triggered given a maximum fetch threshold and proximity of the marsh to estuarine water or open ocean.
- **Overwash:** Barrier islands undergo overwash at a fixed storm interval. Beach migration and transport of sediments are calculated. (N/A)
- **Saturation:** Migration of coastal swamps and fresh marshes onto adjacent uplands-- response of the water table to rising sea level.
- **Accretion:** Vertical rise of marsh due to buildup of organic and inorganic matter on the marsh surface. Rate differs by marsh-type.

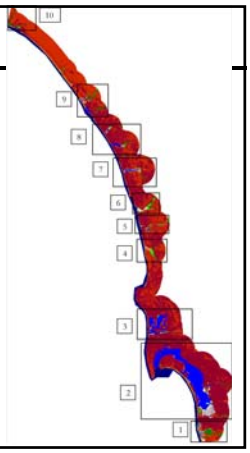
Detailed SLAMM Land Categories

- 23 Categories derived from NWI (National Wetlands Inventory)
- May be specified as "protected by dikes or seawalls"
  - Dry Land: Developed and Undeveloped
  - Swamp: General, Cypress, & Tidal
  - Transitional Marsh: Occasionally Inundated, Scrub Shrub
  - Marsh: Salt, Brackish, Tidal Fresh, Inland Fresh, Tall Spartina
  - Mangrove: Tropical Settings Only
  - Beach: Estuarine, Marine, Rocky Intertidal
  - Flats: Tidal Flats & Ocean Flats
  - Open Water: Ocean, Inland, Riverine, Estuarine, Tidal Creek

LiDAR / NED



Numbered output sites

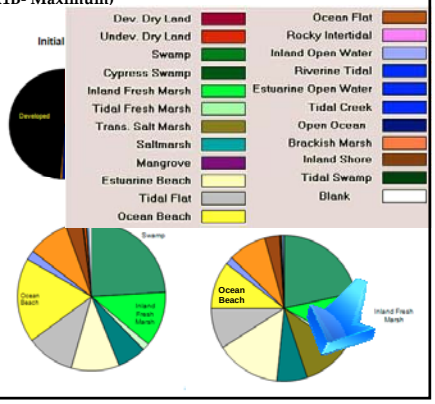


Overall regional results

	Init. Cond. (ha)	A1B-Max Year 2100 (ha)	Pct. of Coverage (Initial Cond.)	Mean Pct. Change	Maximum Pct. Change	1.5 meter Pct. Change
Dry Land	19,821	19,510	28.8%	1%	2%	3%
Developed	33,348	32,841	48.4%	1%	2%	5%
Swamp	1,074	961	1.6%	7%	11%	18%
Inland Fresh Marsh	537	513	0.8%	1%	4%	23%
Tidal Fresh Marsh	69	66	0.1%	0%	4%	42%
Trans. Marsh	3	463	0.0%	11875%	17361%	27434%
Saltmarsh	278	302	0.4%	14%	9%	199%
Estuarine Beach	470	641	0.7%	16%	36%	122%
Tidal Flat	467	402	0.7%	14%	14%	0%
Ocean Beach	825	470	1.2%	38%	43%	35%
Inland Open Water	94	77	0.1%	15%	18%	23%
Estuarine Open Water	5,543	5,732	8.0%	2%	3%	10%
Open Ocean	5,763	6,370	8.4%	9%	11%	13%
Brackish Marsh	399	378	0.6%	2%	5%	51%
Inland Shore	161	147	0.2%	7%	8%	13%
Tidal Swamp	10	8	0.0%	11%	20%	35%
Rocky Intertidal	24	12	0.0%	43%	51%	62%
Riverine Tidal	10	4	0.0%	49%	63%	81%
Tidal Creek	21	21	0.0%	0%	0%	0%
Sum of Categories (ha)	68,917	68,917				

(Red numbers represent losses, blue numbers represent net gains)

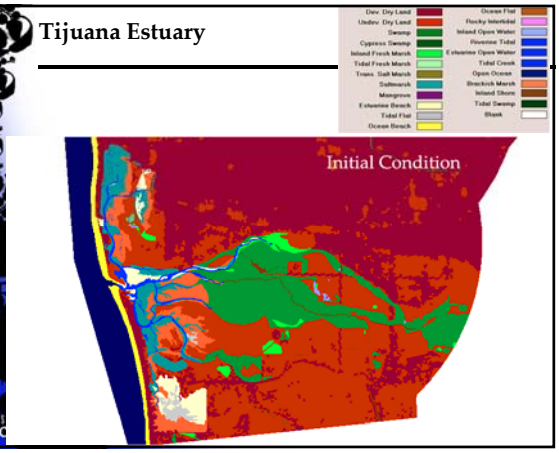
San Diego County: Initial Condition compared to Year 2100 (Scenario A1B- Maximum)



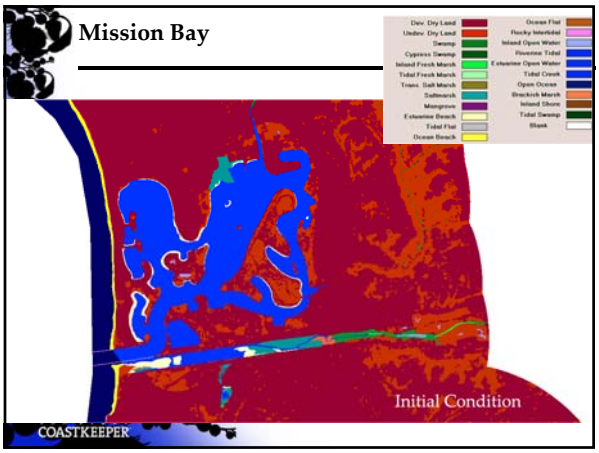
Public Engagement

- Using SDCK Watershed wiki to engage the public in understanding the implications of climate change:
- www.sdwatersheds.org
- http://www.sdwatersheds.org/wiki/index.php/SLAMM

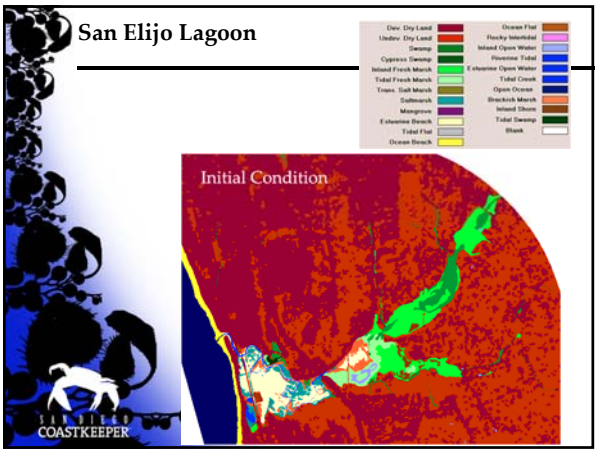
Tijuana Estuary



Mission Bay



San Elijo Lagoon



Policy recommendations and considerations

- Impacts to wetland functioning as a consequence of SLR and Climate Change
  - Lower flows from watersheds may result in fewer coastal exceedances (because of drought) and more concentrated urban run-off (because of water conservation)
  - Need for increased buffers to protect areas impacted by Sea Level Rise
  - Need to protect threatened coastal habitat, especially high-value habitat and allow for better wetland functioning through invasive species removal

Incorporating SLAMM data into planning efforts

- IRWMP
  - Prioritize invasive removal for areas identified as having priority habitat
  - Climate Change Adaptation strategies
- Urban Water Management Plans
  - Seawater intrusion into groundwater basins (existing and potential)
  - Climate-responsible water supplies (mitigation)

Thanks

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