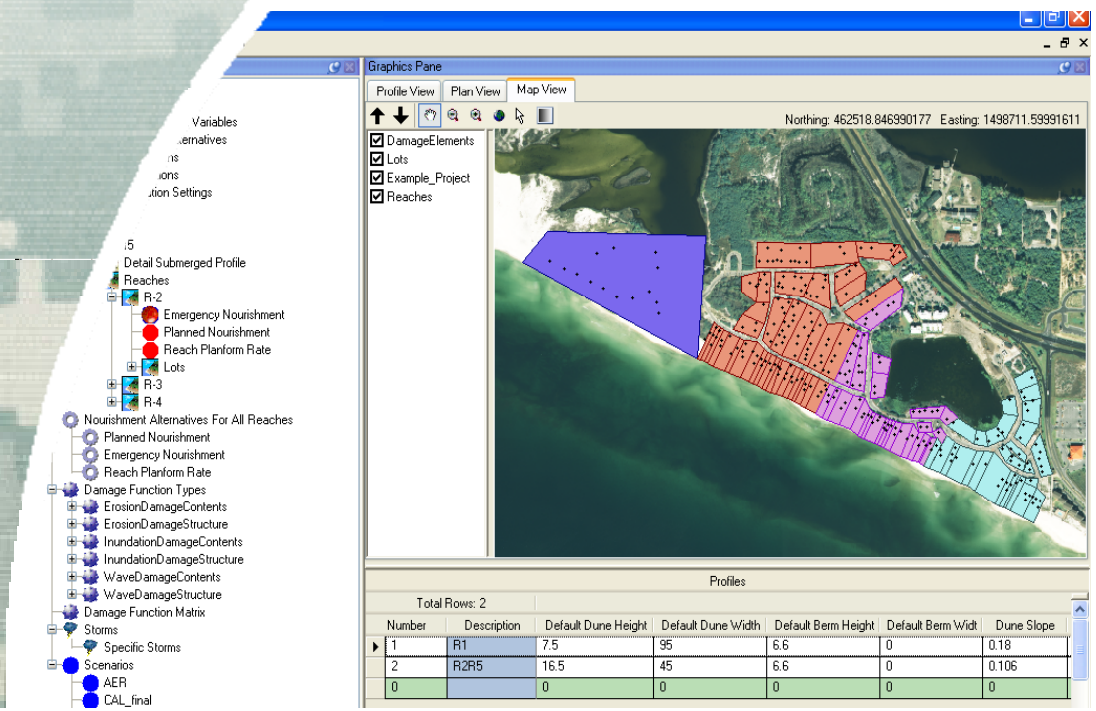
Hurricane and Storm Damage Reduction:

Modeling Tips under 3x3x3



US Army Corps of Engineers
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General Thoughts

- The leadership is serious about this
- We must be more efficient in our modeling
- Think critically→ where are the time killers?

- Start with the basics

Which model should I use??

BeachFX is certified, but is another model more appropriate to submit for review?

Simplify the Modeling Effort

Obvious efficiencies…

- Granularity → minimize number of unique profiles
- Eliminate storms that produce no change
- Beware of the precision trap → what information is needed to make the decision?
- Think about representative damage elements
  - Use sampling techniques
- Alternatives → Max, Min, Median (cut to the chase)

Historical Storm Database

- Include only those storms that caused damages
- Simplify the plausible storm plus tide effects
  - Long duration extratropical storms can occur over 12 different tidal elevations → simplify the tidal cycle to 3 to represent the range
- The number of storms/tides directly affect the number of profile response model runs (SBEACH)

Kennedy Space Center example:

- 33 extratropical & 42 tropical storms occurred historically
  - Traditional approach = 900 events in plausible storm suite
  - Eliminate tide phasing for ET storms = 603 events in plausible storm suite → (33% reduction in SBEACH simulations)

Representative Beach Profiles

- Capture only major morphology differences in defining representative profiles.
- Use the smallest number of profiles possible
- Each new profile = new set of storm model runs

Kennedy Space Center example :

- ~ 5 miles, 27 survey transects @ ~1000 ft spacing
  - 5 representative profiles (~ 900K simulations)
  - 27 representative profiles (~ 3,850K simulations)

Incremental Analysis

- Each alternative profile = new set of storm model runs
- Limit the increments to limit the number of alternatives
- Consider minimum constructible increments or overall max/min in deciding what increments to use
- Include increments of dune heights, dune width, berm width

Kennedy Space Center example :

- Increments of Dune height (1 ft), Dune Width (3 ft), Berm Width (10 ft) → ~3000K simulations
- Increments of Dune height (1.5 ft), Dune Width (5 ft), Berm Width (15 ft) → ~900K simulations

Structure Inventories

- Survey first floor elevations or estimate based on ground elevation and first floor elevation above ground?
- Should secondary structures / outbuildings be considered or just concentrate on large dollar value structures?
- Use representative structures or a sample to obtain value data.
- Use available data and mapping to the largest extent possible.
- Consider grouping structures together (by lot or by first row)

Summary

- Pay attention to the number of simulations – time required expands exponentially
- Understand the relationship(s) between Engineering models and Economics models
- Be reasonable in developing structure inventory and precision of damage element attributes

Application Support

Why not ask for help (esp. BeachFX)?

- Granularity/Resolution,
  - ▶ Reaches, Profiles, Lots, Structure Inventory
- Storm suite
- SBEACH simulations
- Calibration, Forecast simulations, Output

Resources:

- ▶ ERDC – Mark Gravens (601) 634-3809
- ▶ CESAJ – Lori Hadley (904) 232-1386