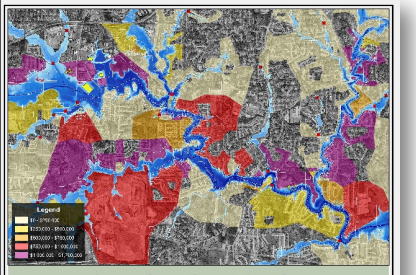
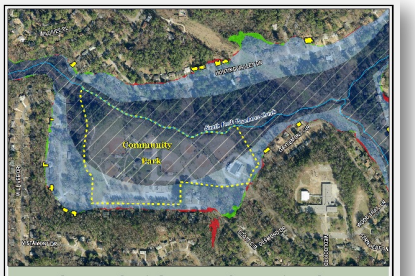
Dewberry



AT RISK POPULATION



OPEN SPACE PRESERVATION


AT RISK CRITICAL INFRASTRUCTURE

Consequence of Change: Where Flood Hazard Analysis and Flood Risk Collide

2025 TFMA Annual | Presented By: Barrett Goodwin, Dewberry and Claire Pollard, Dewberry

March 27, 2025

Presentation Overview

- What is a consequence assessment?
- Data sources for a consequence assessment (inputs)
- Results of a consequence assessment (outputs)
- Consequence assessment (Use Cases)
  - Existing conditions
  - Mitigation
  - Emergency planning
- Why Texas?

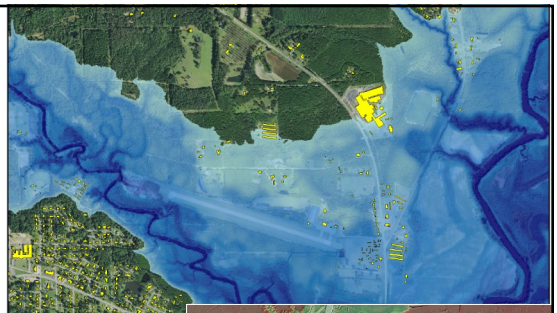
What is a consequence assessment?

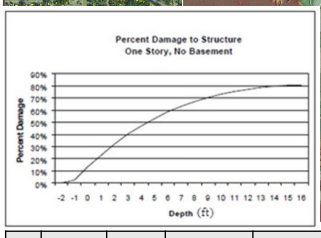
Consequence Assessment

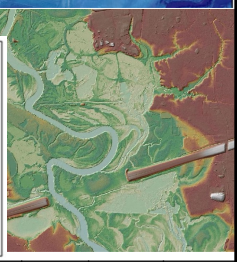
- Quantify the consequences of flood events
- Utilizes gridded flood data (depth grids) to calculate loss to:
  - Structures
  - Contents
  - Agriculture
  - Potential life loss
- Output and reported at various geographies (user-defined)

Consequence Assessment – Data Sources (Inputs)

- Engineering analysis (depth grids)
- Structure inventory
  - Foundation type
    - Foundation height
  - Construction type
  - Number of stories
  - Damage category
    - Occupancy type
  - Value structure/contents
- Population Distribution
- Depth / Damage Curve







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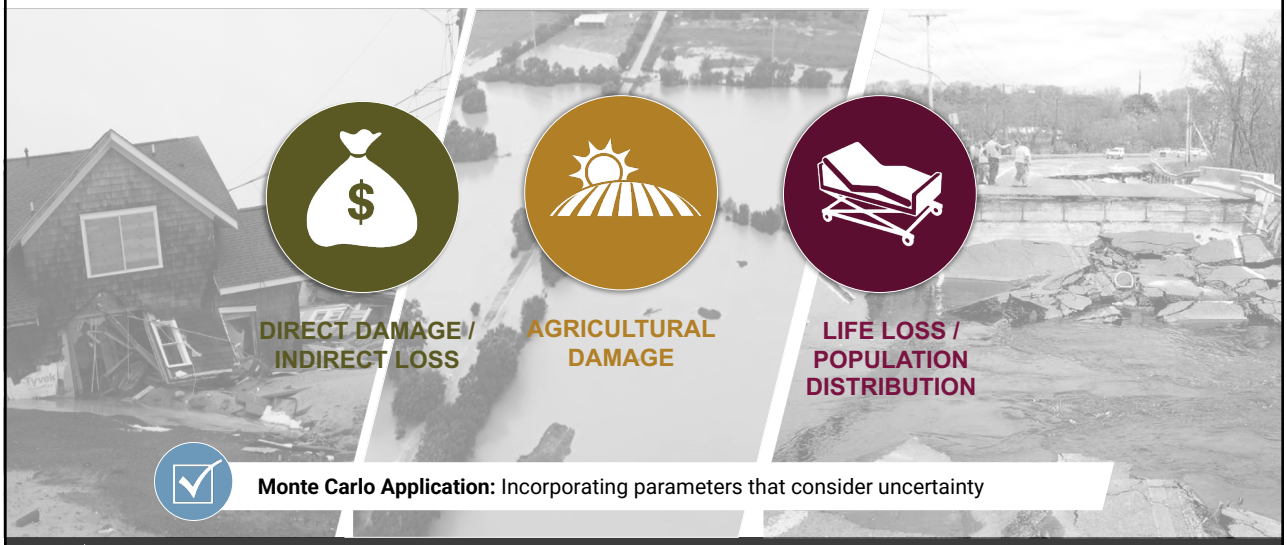
2565	220630408	Res	RES1-2SNB	358090.00	247082.00	0.99	Slab
2588	220630409	Res	RES1-2SNB	398175.00	234923.00	1.61	Pier
2620	220630408	Res	RES1-1SWB	214211.00	126384.00	1.79	Pier
2627	220630402	Res	RES1-1SNB	204347.00	141000.00	3.28	Pier

Consequence Assessment – Outputs



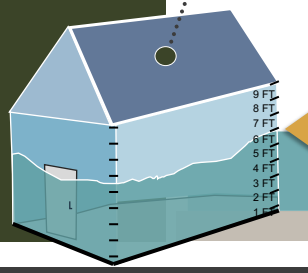
Monte Carlo Application: Incorporating parameters that consider uncertainty

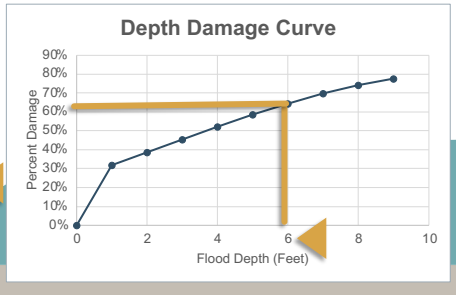
Consequence Assessment – Outputs

Direct Damage

- Point based shapefile
  - Depth of flooding at each structure
  - Structure loss
  - Content loss
  - Total loss

Structure Value = $100,000 x 62% Damage
Structural Damage = $62,000





Consequence Assessment – Outputs

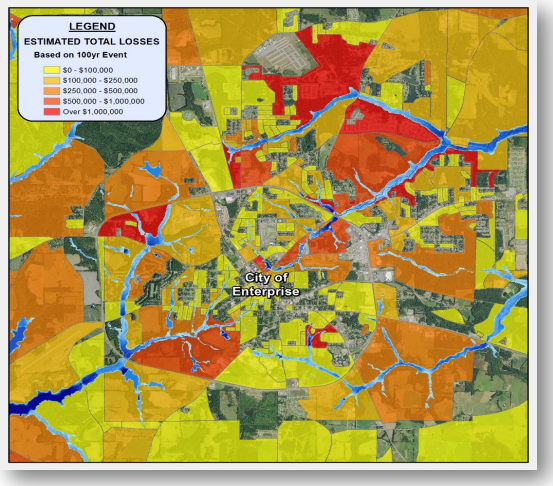
Agricultural Loss

- Point based shapefile
  - Crop type, arrival time, duration, location, and total damage for each damaged grid cell.
- Aggregate by crop type, or by any polygon loaded as a boundary shapefile.

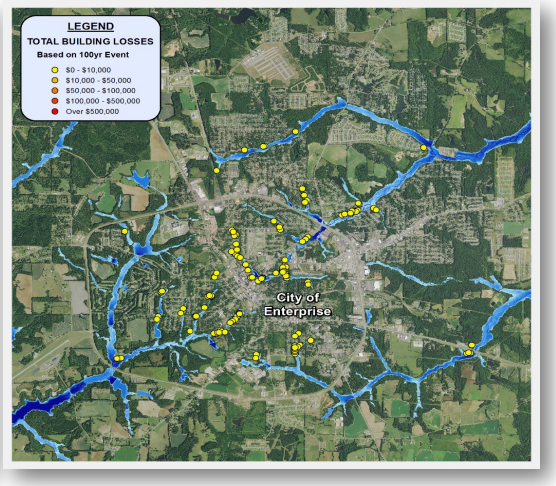
Life Loss

- Point based shapefile
  - Population at risk, loss of life, daytime/nighttime population under/over the age of 65 for each structure
- Aggregate by any polygon loaded as a boundary shapefile.

Consequence Assessment – Outputs



Total Loss (building and contents) aggregated by **Census Blocks**

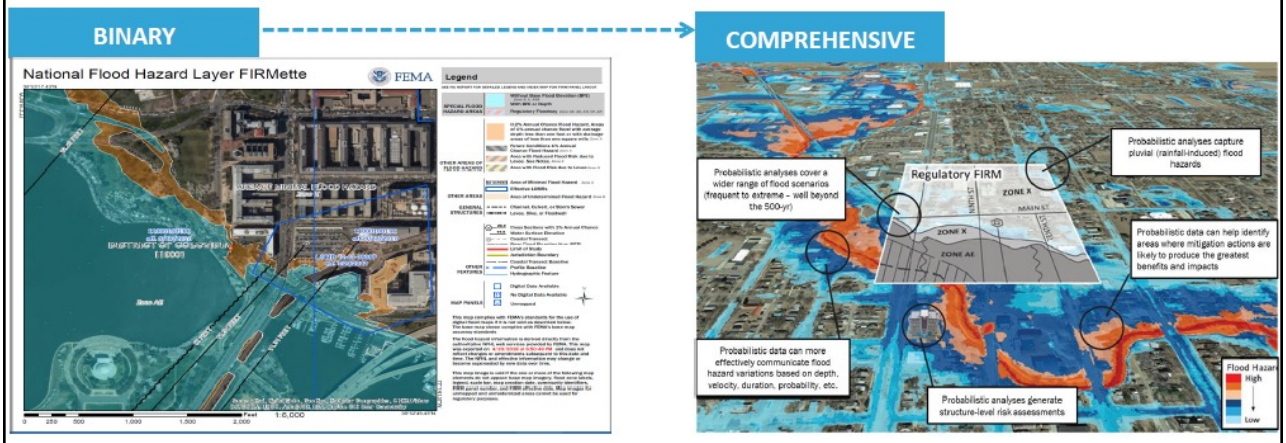


Total Loss (building and contents) at the **Structure Level**

Consequence Assessment – Use Cases

Consequence Assessment – Existing Conditions

- Deterministic (Binary) Vs. Probabilistic (Comprehensive)

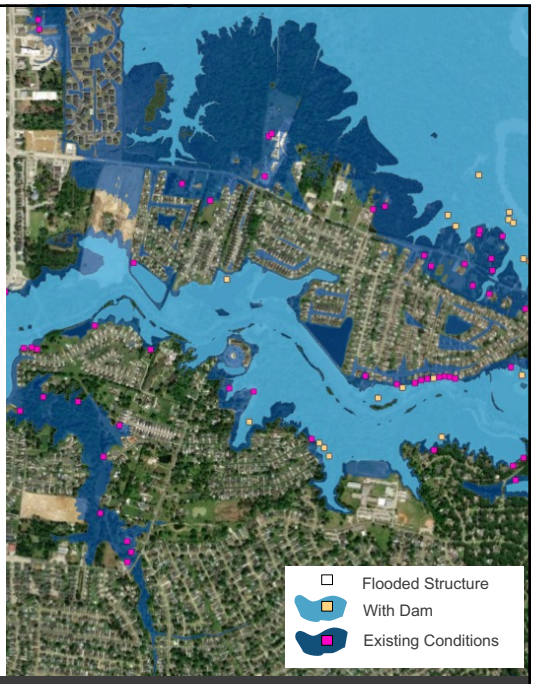


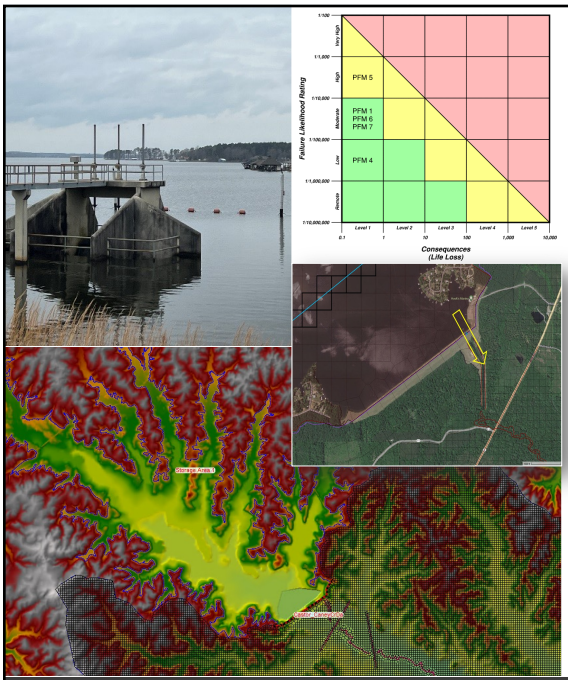
Consequence Assessment – Mitigation

- Risk Assessment
  - Existing conditions = baseline
- Alternative analysis for funding projects
  - Master planning

10-YEAR FLOOD ELEVATION REDUCTION (FEET)	100-YEAR FLOOD ELEVATION REDUCTION (FEET)
6.9	9.3

FLOOD EVENT	STRUCTURES BENEFITING	ADDITIONAL STRUCTURES WITH DECREASED FLOODING	ECONOMIC LOSSES AVOIDED
10-year flood	1,965	2,705	$167,993,991
100-year flood	12,932	5,702	$1,085,752,000





Consequence Assessment – Emergency Planning

- Dam Safety
  - Dam breach studies
    - Magnitude of inundation area
    - Peak flow elevations
    - Arrival times for peak flow
    - Estimate likelihood of failure
    - Alternative development
  - Risk Assessment
    - Life loss
    - Economic loss (when life loss is small)

	Existing	Alternative 1	Alternative 2	Alternative 3
Upstream Impacts – Inflow Design Hydrograph (100% PMF)				
Structures Impacted	28	28	28	28
Life Risk (Loss of Life)	5.71	5.71	5.71	5.71
Damages	$5,151,572	$5,169,558	$5,233,254	$5,175,461

Consequence Assessment – Why Texas?

Consequence Assessment – Why Texas?

- Statewide flood planning effort assessing existing exposure / conditions, looking at alternative analysis
- Flood project funding, mitigation planning
- Grant funding
- Dam safety planning
- Master Planning
- Floodplain Management
- Benefit cost analysis federal, state, local