

National Flood Risk Characterization Tool

Overview of Capabilities and Current Limitations



COMPARISON REPORT

Comparison Report for Santee

Summary | Asset Damages | Inundation | Population Exposure | Asset Exposure | Vulnerability | FRM Projects | Future

Flood Event Chance: 1% Rivine 0.2% Rivine

| EXPOSURE TO FLOOD EVENT | SANTEE | HUC6 AVERAGE |
|-------------------------------|-----------------|-----------------|
| Population Exposed | 154,385 | 35,643 |
| Total Damages | \$4.3 billion | \$833.2 million |
| Police Stations Exposed (F) | 3 | 4 |
| Fire Stations Exposed (F) | 9 | 5 |
| Hospitals Exposed (F) | 1 | 1 |
| Percent Population in Poverty | 0.51% | 0.78% |
| Percent Minority Population | 1.11% | 1.29% |
| Percent Elderly Population | 0.47% | 0.69% |
| VALUE IN WATERSHED | | |
| Economic Output | \$154.7 billion | \$38.2 billion |
| Pop. Growth Rate (%) | 1.4% | 1% |

Color Key: National Percentile

25 75 90

Background & Purpose

1. Origin: Test the feasibility of identifying areas of relatively high flood risk using data on flood risk determinants derived from publically available, national-level data sources.
2. Watershed-Based Budgeting: Identify and compare watersheds in terms of various flood risk metrics in order to support Corps FRM budgeting decisions.

Flood Risk (FR) for Assets & People Defined

- $FR = f(\text{Hazard, Infrastructure, Exposure, Vulnerability})$
 - Hazard is predicted probability distribution of surface water elevations for different locations in FP from all possible floods
 - Infrastructure relates to the performance of existing flood hazard reduction works for modifying surface water levels in the face of the Hazard
 - Exposure is potential for people & assets to come into direct contact with flood waters as a result of their location in the FP
 - Vulnerability relates to characteristics of people & assets that affect the likelihood they will realize adverse consequences from exposure to hazard

Data Sources and Approach

- Hazard:
 - FEMA Digital Flood Insurance Rating Maps (DFIRMs) are used to define mapped 1% and 0.2% annual chance riverine and coastal flood zones.
- Infrastructure:
 - No data on infrastructure performance now included
 - Any area with FDR infrastructure that is NFIP accredited is **not** part of the mapped 1% annual chance flood zones shown in the model

Approach to Estimate Illustrative Flood depth Grids

- Estimating flood depth grids for flood zones:
 - National Elevation Data (10 meter) are used to estimate the distribution of flood depth within each flood zone during the flood event
 - The perimeter of each flood zone is assumed to have a flood depth of zero.
 - The Flood depth for a single point within the flood zone is estimated using the difference between the closest flood zone perimeter elevation (i.e., flood elevation) and the ground elevation.
 - This is repeated numerous times to generate a distribution of flood depth for each flood zone during the flood event.

Data Sources and Approach

- Human Exposure:
 - The DFIRM boundaries, U.S. Census Block locations, U.S. Land Use Data, and U.S. Census data are used to determine each census block's population living in each flood zone type.
 - The distribution of flood depths for each flood zone is applied to the population living in each flood zone to determine the population exposed to each flood depth during the flood event.
 - The population exposure data are aggregated across census blocks to the watershed level (HUC-8).

Data Sources and Approach

- Asset Exposure

- The DFIRM boundaries, U.S. Census Block locations, U.S. Land Use Data, and General Building Stock Inventory (from HAZUS) and the Vehicle Location Estimation System (from HAZUS) are used to determine the number, type, and value of buildings and vehicles in each census block that are located in each flood zone type.
- The distribution of flood depths for each flood zone is applied to the assets (building and vehicles) located in each flood zone to determine the assets exposed to each flood depth during the flood event.
- The asset exposure data are aggregated across census blocks to the watershed level (HUC-8).

Data Sources and Approach

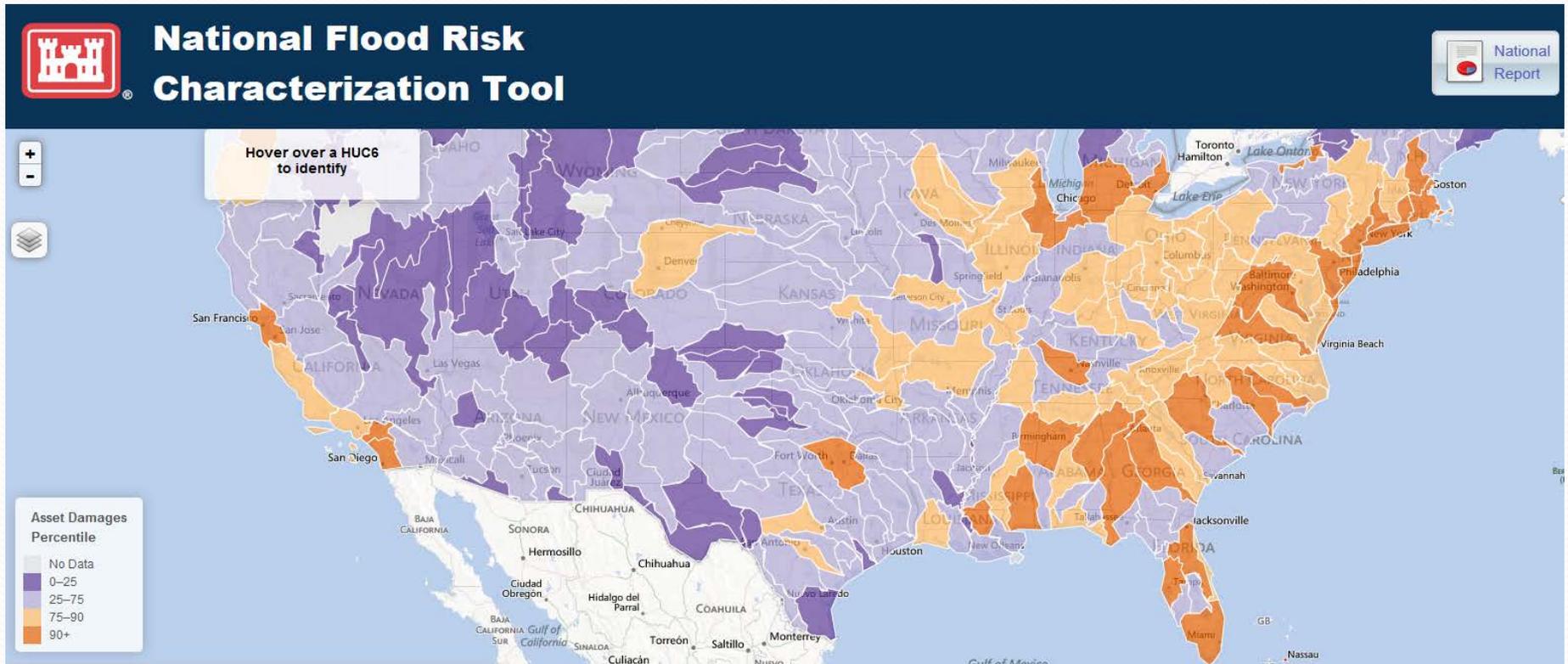
- Estimated Asset Damages
 - Using the asset exposure data (quantity and value of assets exposed at each flood depth) the NFRCT estimates the asset damages that would occur during a flood event.
 - Building characteristics, such as building stories, first floor elevation, and the existence of basements, come from HAZUS and are based on regional building data.
 - The NFRCT uses the Corps' generic depth-damage functions for three asset types: 1) residential buildings and contents; 2) nonresidential buildings and contents, and; 3) motor vehicles.
 - The estimated asset damages are aggregated across census blocks to the watershed level (HUC-8).

Data Sources and Approach

- Other NFRCT Metrics
 - Vulnerability
 - Identifies population subgroups associated with vulnerability: % over 65; % Non-White; and % Living in Poverty; also Social Vulnerability Index data
 - Data on critical infrastructure that includes police stations, fire stations, and hospitals located inside each flood zone type.
 - Economic Activity
 - Information on the total economic output of each watershed (HUC-8).
 - Future Population
 - Estimates of future population and employment growth are provided for each watershed (HUC-8) in order to distinguish areas of the country that are expected to experience relatively high growth over the next 25 years.

NFRCT Outputs

- User can see how each watershed compares relative to a single flood metric (population exposure, asset exposure, asset damages, or economic activity).



NFRCT Outputs

- Can also filter to display only watersheds that meet one or more criteria related to asset damages, economic activity, population exposure, and/or asset exposure (grey areas do not meet filter requirements).

National Flood Risk Characterization Tool

Hover over a HUCs to identify

Asset Damages Percentile

- No Data
- 0-25
- 25-75
- 75-90
- 90+

ANALYSIS OPTIONS

Unit of Analysis: HUC-6

Map Metric: Asset Damages

Filter by: Raw Metric | Percentile

Asset Damages: 50 - 99

Economic Activity: 50 - 99

Current Pop. Exposure: 0 - 99

Future Pop. Exposure: 0 - 99

Asset Exposure: 75 - 99

Apply Filters

COMPARISON REPORT

Select up to 4 regions on the map for comparison.

(choose region) (choose region)

(choose region) (choose region)

Comparing Flood Risk Metrics Across Watersheds

- User can select up to 4 watersheds to compare across all flood metrics

COMPARISON REPORT

Comparison Report for: Altamaha - Santee - Yazoo - Southern Florida

Summary
Asset Damages
Inundation
Population Exposure
Asset Exposure
Vulnerability
FRM Projects
Future

Flood Event Chance: 1% Riverine 1% Coastal 0.2% Riverine

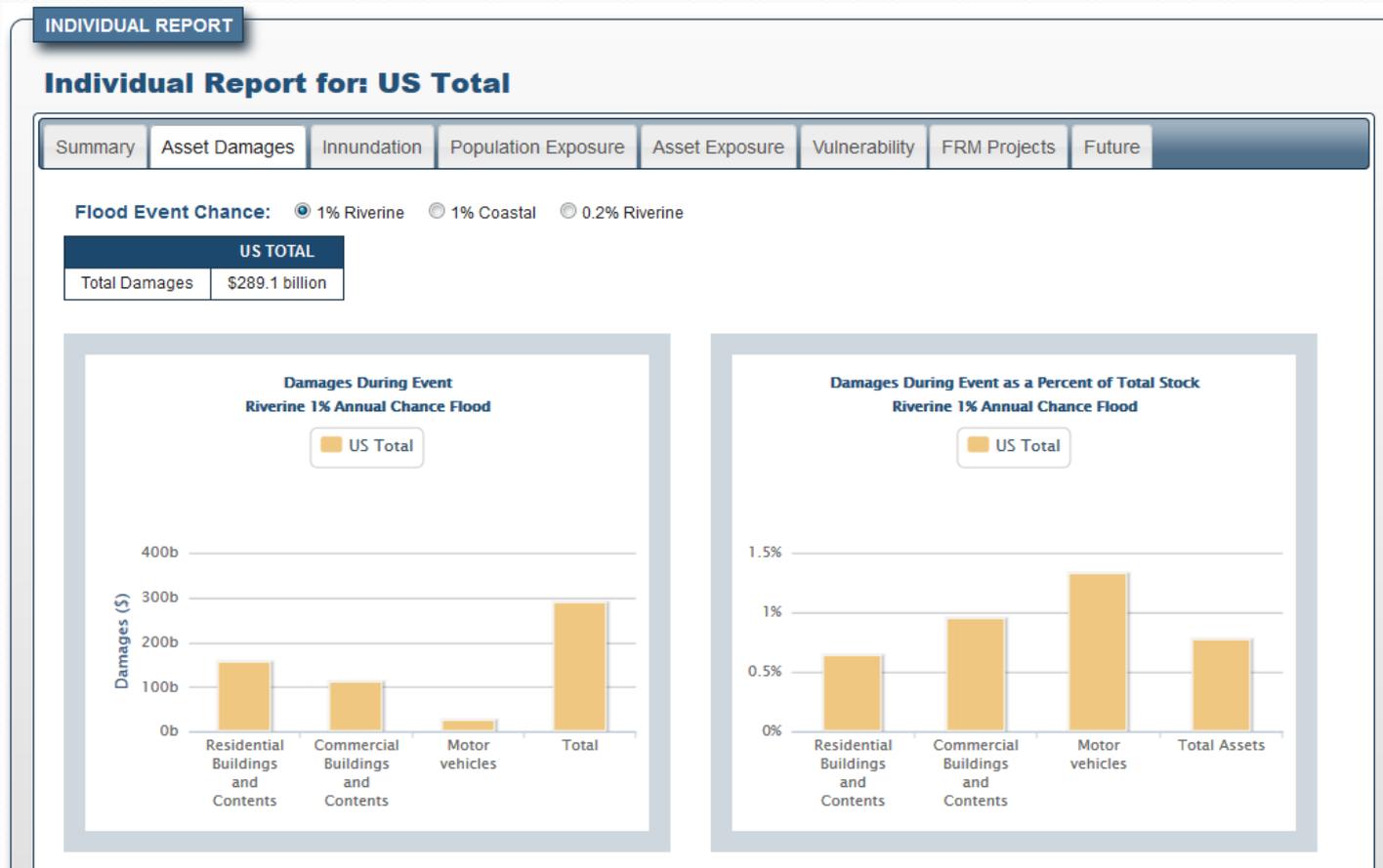
| EXPOSURE TO FLOOD EVENT | ALTAMAHA | SANTEE | YAZOO | SOUTHERN FLORIDA | HUC6 AVERAGE |
|-------------------------------|----------------|-----------------|----------------|------------------|-----------------|
| Population Exposed | 158,901 | 154,385 | 56,913 | 952,382 | 35,643 |
| Total Damages | \$3.7 billion | \$4.3 billion | \$1.1 billion | \$12.6 billion | \$833.2 million |
| Police Stations Exposed (#) | 2 | 3 | 3 | 41 | 4 |
| Fire Stations Exposed (#) | 3 | 9 | 5 | 19 | 5 |
| Hospitals Exposed (#) | 1 | 1 | 1 | 16 | 1 |
| Percent Population in Poverty | 0.82% | 0.51% | 2.56% | 1.92% | 0.78% |
| Percent Minority Population | 2.65% | 1.11% | 4.93% | 2.9% | 1.29% |
| Percent Elderly Population | 0.52% | 0.47% | 1.2% | 2.71% | 0.69% |
| VALUE IN WATERSHED | | | | | |
| Economic Output | \$98.5 billion | \$164.7 billion | \$15.3 billion | \$277.2 billion | \$38.3 billion |
| Pop. Growth Rate (%) | 1.9% | 1.4% | 0.8% | 1.6% | 1% |

Color Key: National Percentile

| | | | |
|---|----|----|----|
| 0 | 25 | 75 | 90 |
|---|----|----|----|

National-Level Output

- The NFRCT also provides a National Level Report of flood risk metrics.



Current Limitations: Hazard & Damages

- Hazard Data. The NFHL includes areas affected by the 1% annual chance floods and to a lesser extent, the 0.2% annual chance floods. Therefore, the NFRCT flood zones are defined only in terms of areas subject to these two flood events.
- No infrastructure performance data. By definition, the flood zones identified as subject to 1% annual chance flood do not include areas served by FDR infrastructure that is NFIP accredited.
- Asset Damages. NFRCT uses an ad hoc procedure to estimate flood depth grids in order to get to asset damages. This is the weakest part of the model data and estimates.

Current Limitations: Exposure

- Flooding is extremely site specific, and the location of a building within a flood zone can mean the difference between exposure to low flood depths and little or no damage, and much higher flood depths and damage. The NFRCT assumes that all assets are equally distributed within the urbanized portion (according to available land use data) of the Census block in which they are located.
- The NFRCT relies on state-level or regional-level data regarding asset features, such as number of floors and first floor elevations for residential buildings. Therefore, for areas with stricter building codes than average, the NFRCT may overestimate the level of flood damage. Likewise, flood damage may be underestimated for areas with less stringent building codes.

Assessing residual National Flood Risk & Risk Reduction: Information Needs

1. Area-specific data on full flood hazard
 2. Area-specific data on FDR infrastructure and expected performance
 3. Area-specific depth grids calculated using data from items 1 and 2
 4. Area-specific exposure & vulnerability data for people and assets
- The Corps levee and dam safety programs are generating data on items 1-4 for those areas served by Corps-built FDR infrastructure