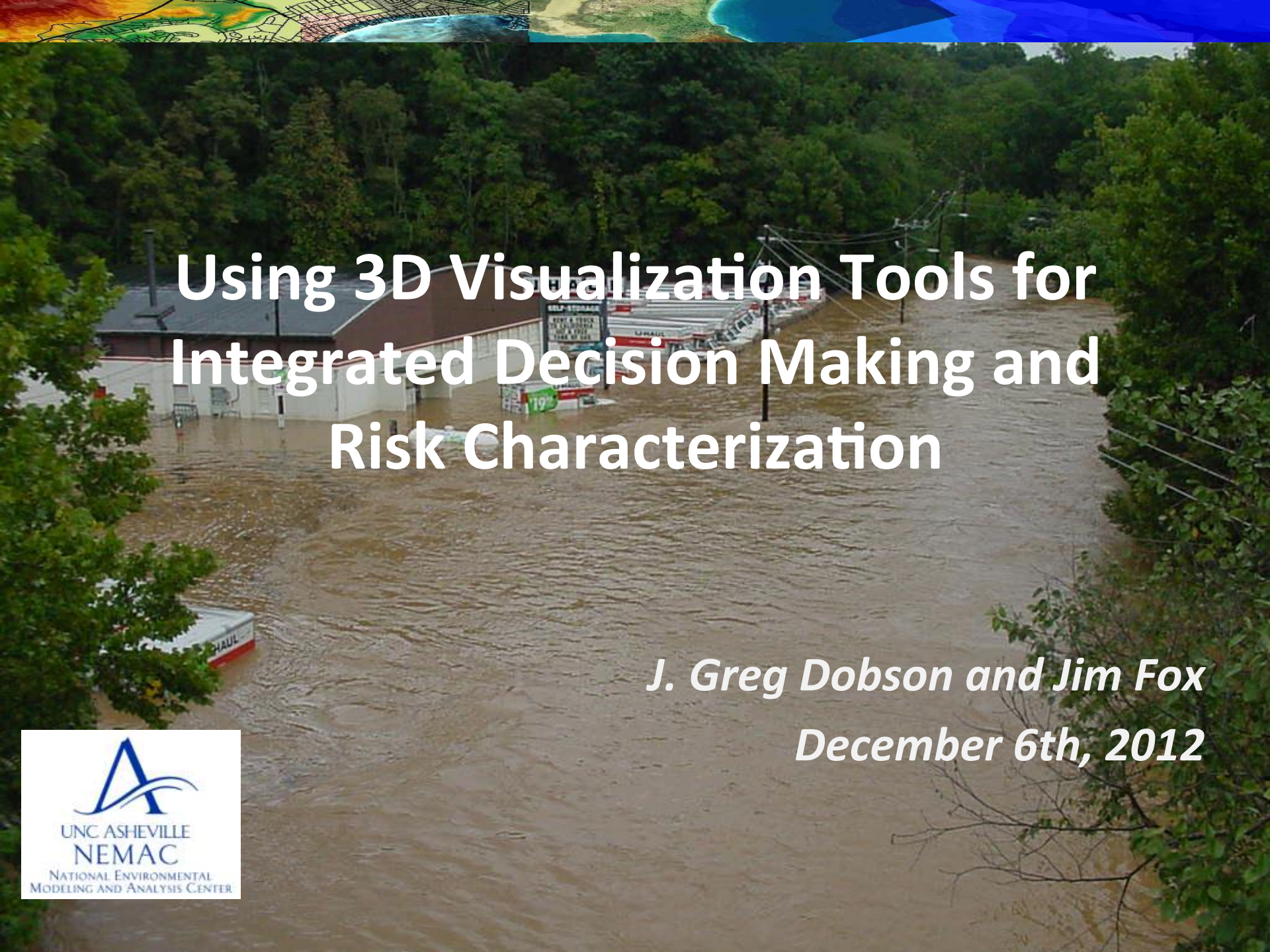

Using 3D Visualization Tools for Integrated Decision Making and Risk Characterization

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December 6th, 2012

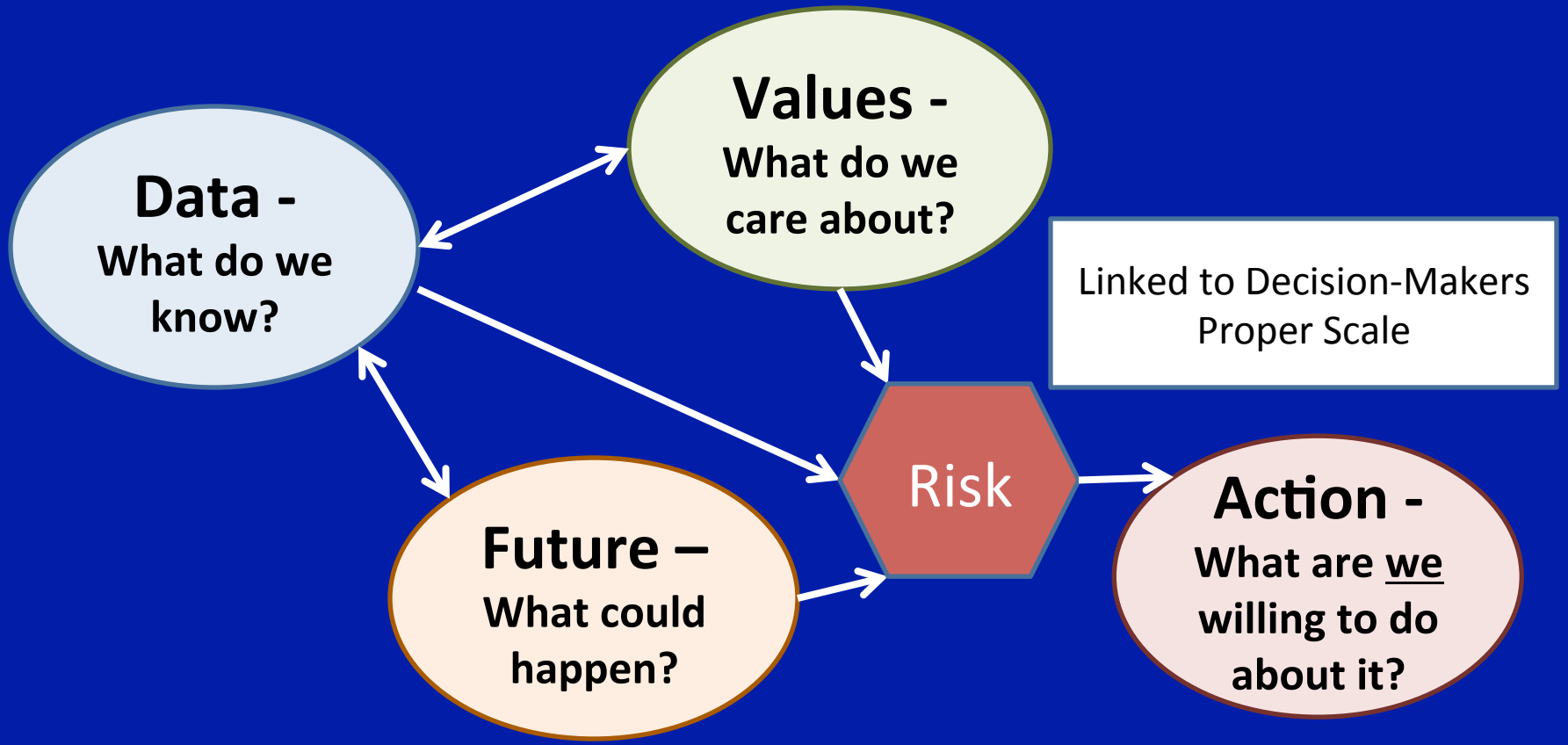
UNC ASHEVILLE
NEMAC
National Environmental Modeling and Analysis Center

Introduction

- Background – decision making, traditional approaches, why 3D visualizations
- How is 3D accomplished, what are the key components
- Adding rising water simulations to 3D visualizations
- Generating and distributing 3D content

BACKGROUND

Decision Making Building Blocks



Common Tools of the Decision Maker

- Charts and Tables and Maps – “Oh My”

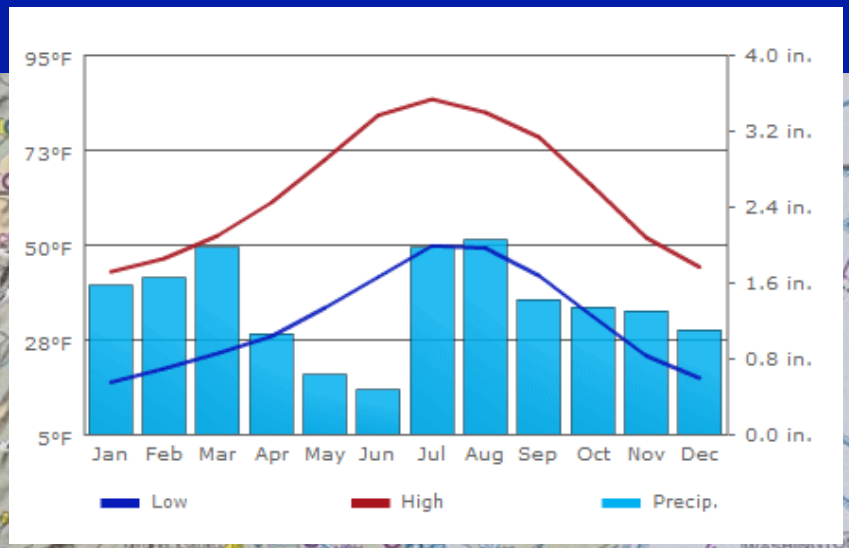
Disability status of the civilian noninstitutional population

POPULATION 5 YEARS AND OVER

	Both sexes	Male	Female
Total	257,167,527	124,636,825	132,530,702
With a disability	49,746,248	24,439,531	25,306,717
Percent with a disability	19.3	19.6	19.1

POPULATION 5 TO 15 YEARS

	Both sexes	Male	Female
Total	45,133,667	23,125,324	22,008,343
With a disability	2,614,919	1,666,230	948,689
Percent with a disability	5.8	7.2	4.3
Sensory	442,894	242,706	200,188
Physical	455,461	251,852	203,609
Mental	2,078,502	1,387,393	691,109
Self-care	419,018	244,824	174,194

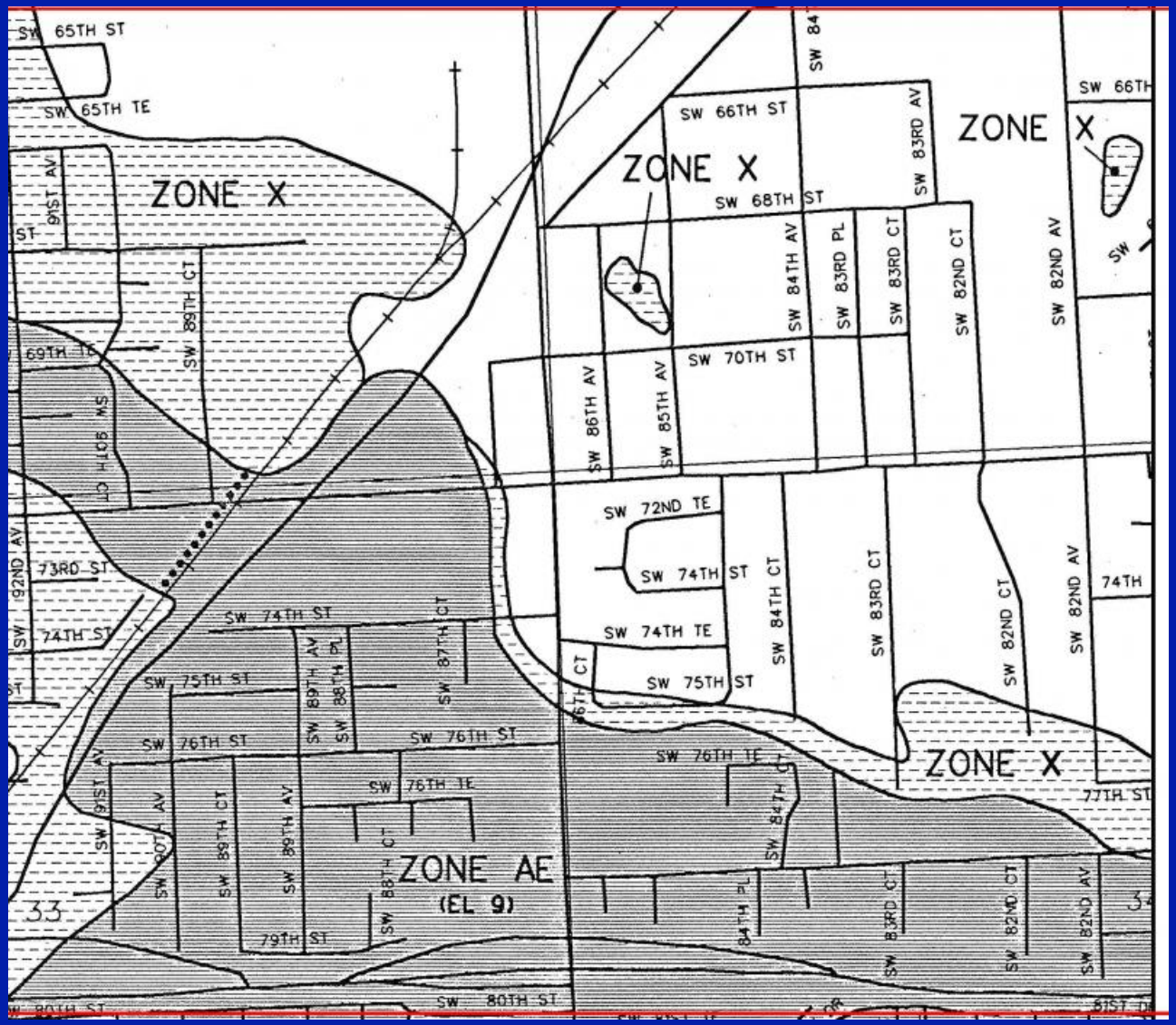


The Great Map Issue

- The reality is that most people, including many decision makers, have difficulty with “correctly” interpreting traditional 2D maps

Modern Flood Map Example

Historic Flood Map



NOAA's Online Sea-Level Rise Viewer

3D View of Downtown Ft. Lauderdale

Why 3D?

- Situational awareness
- 3D helps make data more relevant to the user
- Better suited for demonstrating the need for a proposed solution or action
- An “attention getter”
- Some Applications include:
  - Scenario planning
  - Visualizing uncertainty
  - Risk Characterization

Ensuring Data/Model Credibility

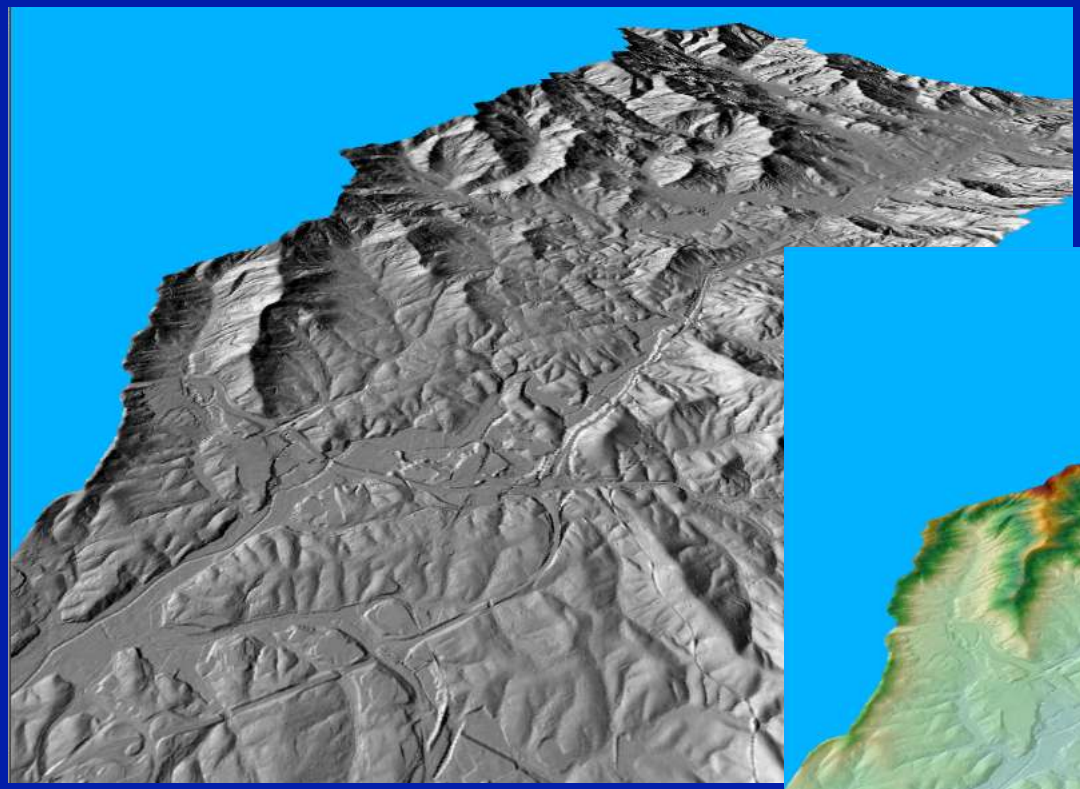
- NOAA's Three A's for Photo Visualizations
  - Accuracy
  - Accountability
  - Accessibility
- Other key questions to consider
  - Do the images / models look real
  - Are the visualizations defensible
  - How representative are the views
  - Are the visualizations sufficient for the project

HOW TO GET TO 3D

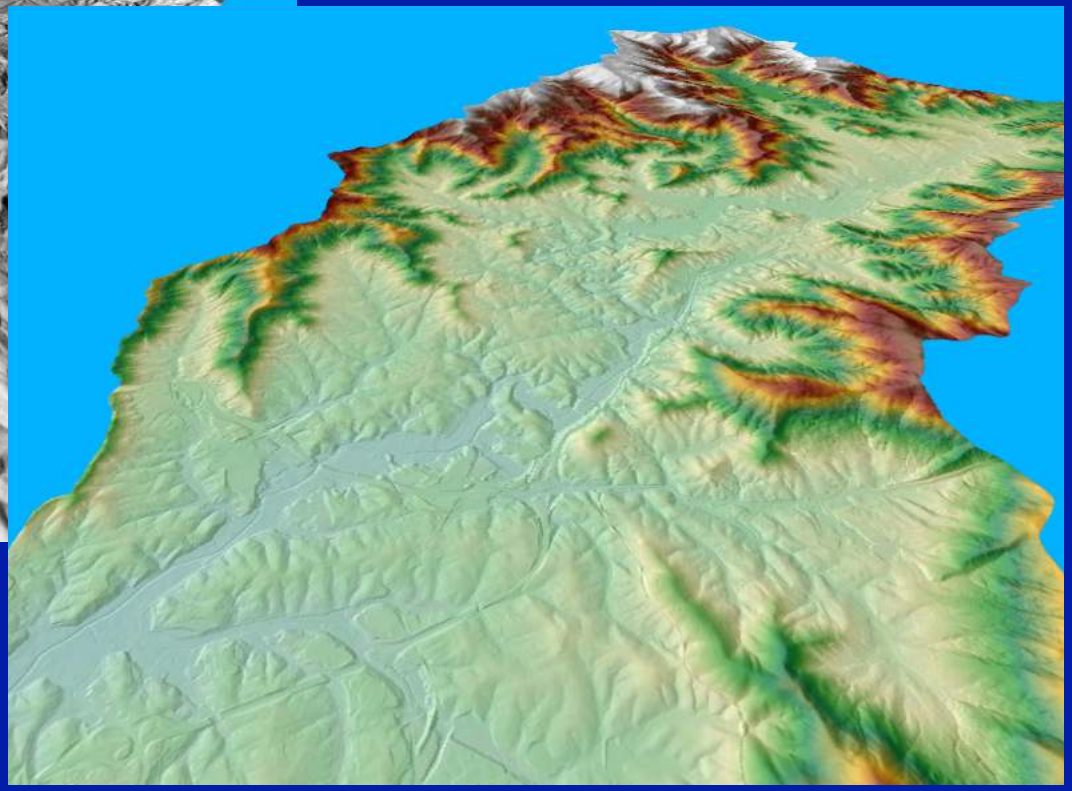
Basic Parts of a 3D Visualization

- Elevation data
- Imagery
- Key Infrastructure
  - Buildings
- Visual Overlay of Interest
  - Flooding
  - Population vulnerability
  - Plume cloud

Building the Base – Elevation is Key!!

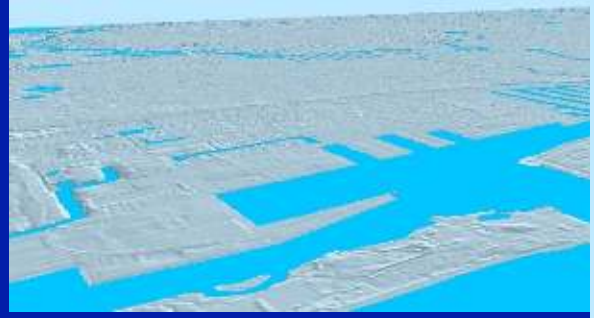


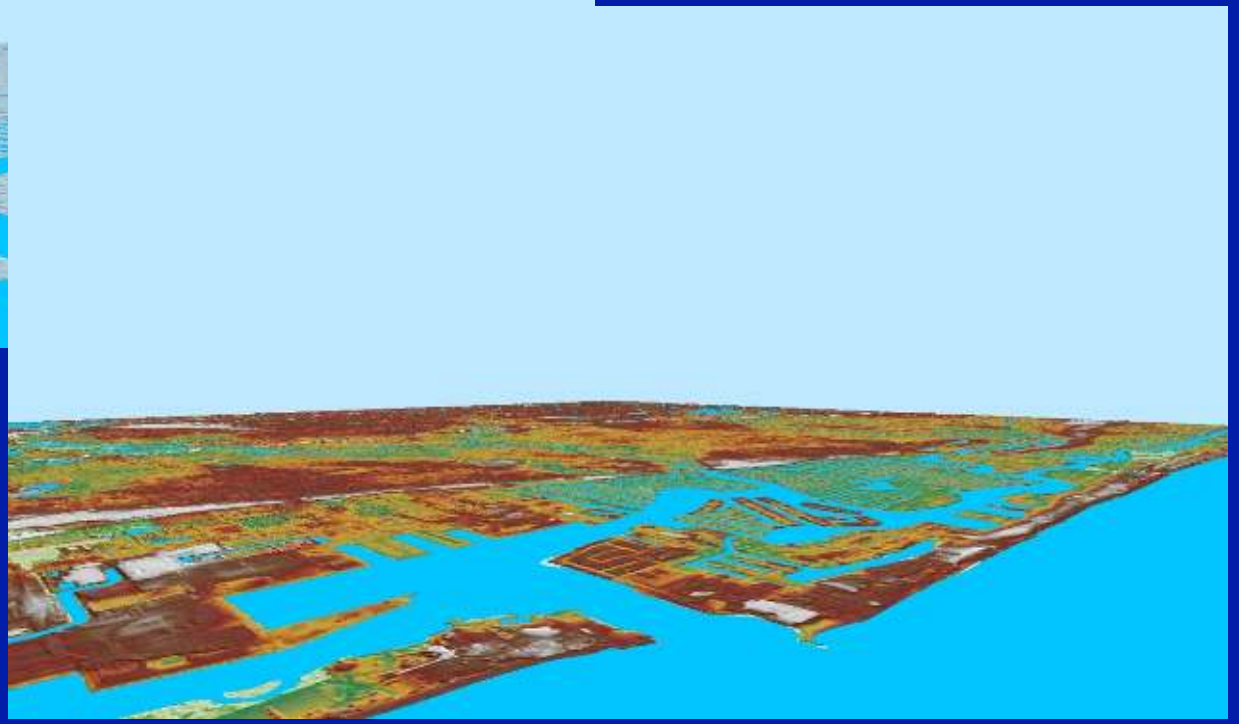
Asheville Region



Building the Base – Elevation is Key!!

Fort Lauderdale

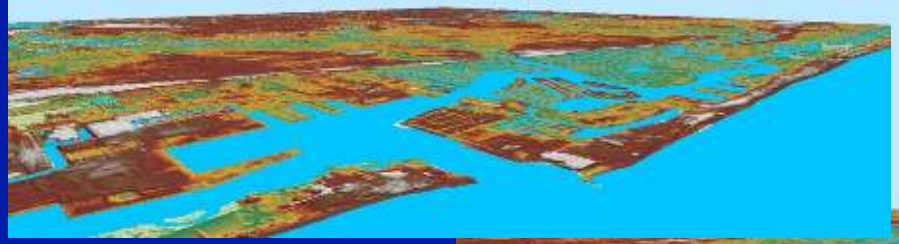




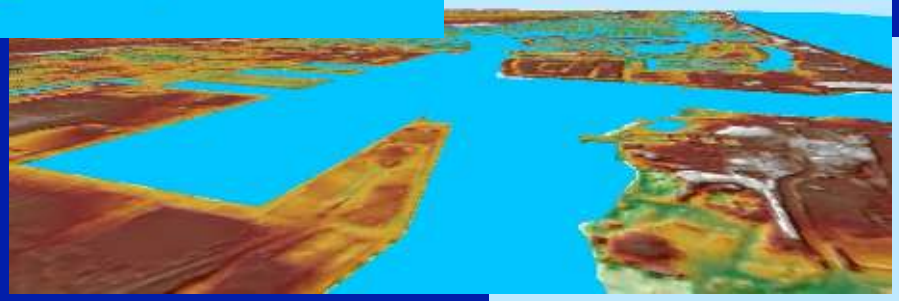
Scale Considerations

Coast

It's all about the decision



Port



Downtown

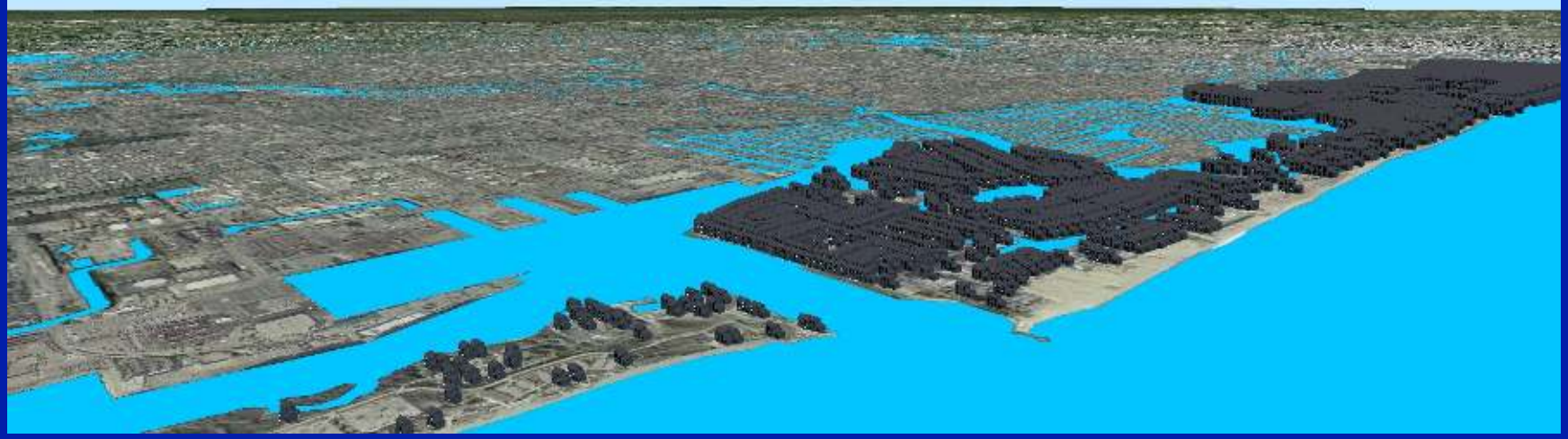
Types of 3D Building Models

- 3D Building Model Symbology
  - Most basic, easiest to generate
  - Least detailed / realistic
- Sugar Cubes
  - Intermediate, assuming data already exists
  - Resembles actual environments, can do analysis
- Detailed Models
  - Advanced, most detailed

3D Building Symbology Approach

3D Building Model Symbology

Coast looking west



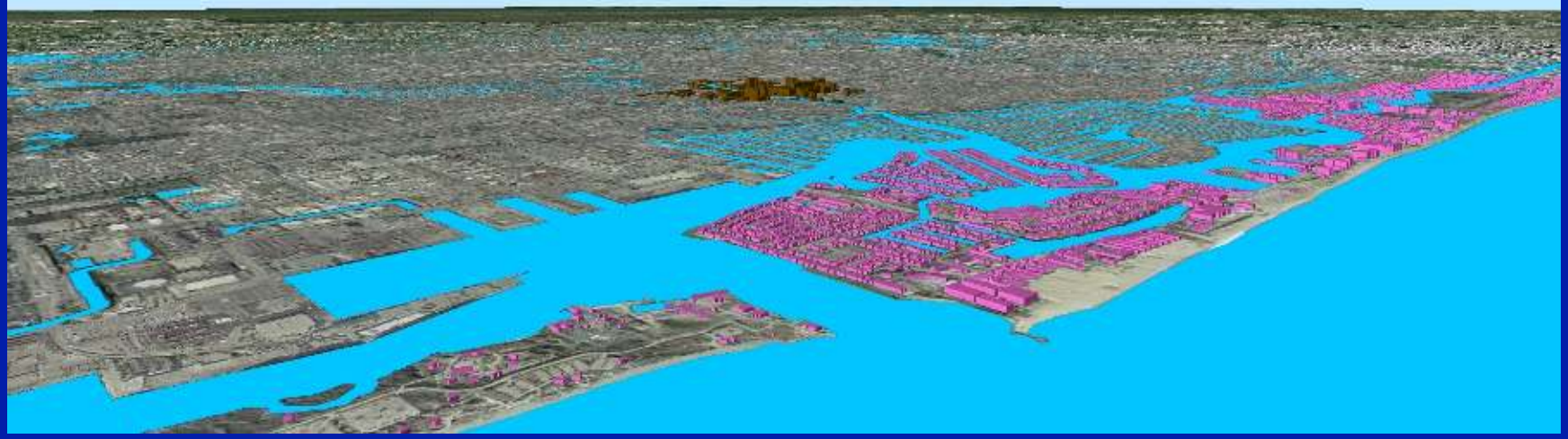
3D Building Model Symbology

Downtown looking east

Sugar Cube Approach

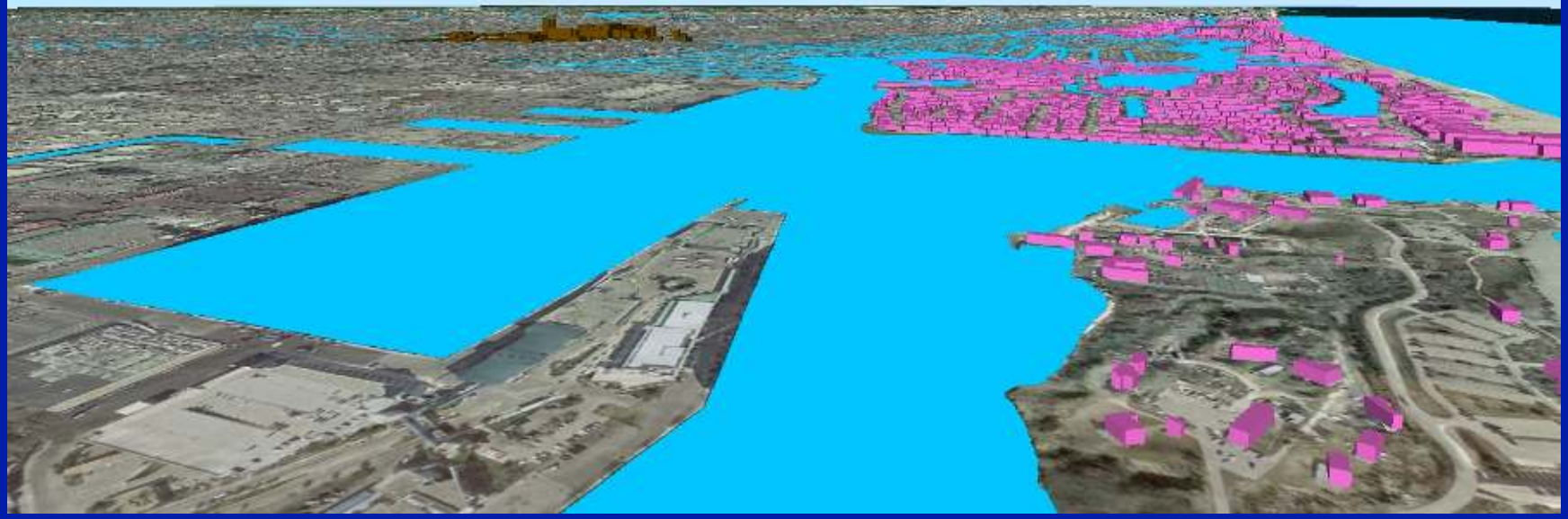
Building Sugar Cubes

Coast looking west



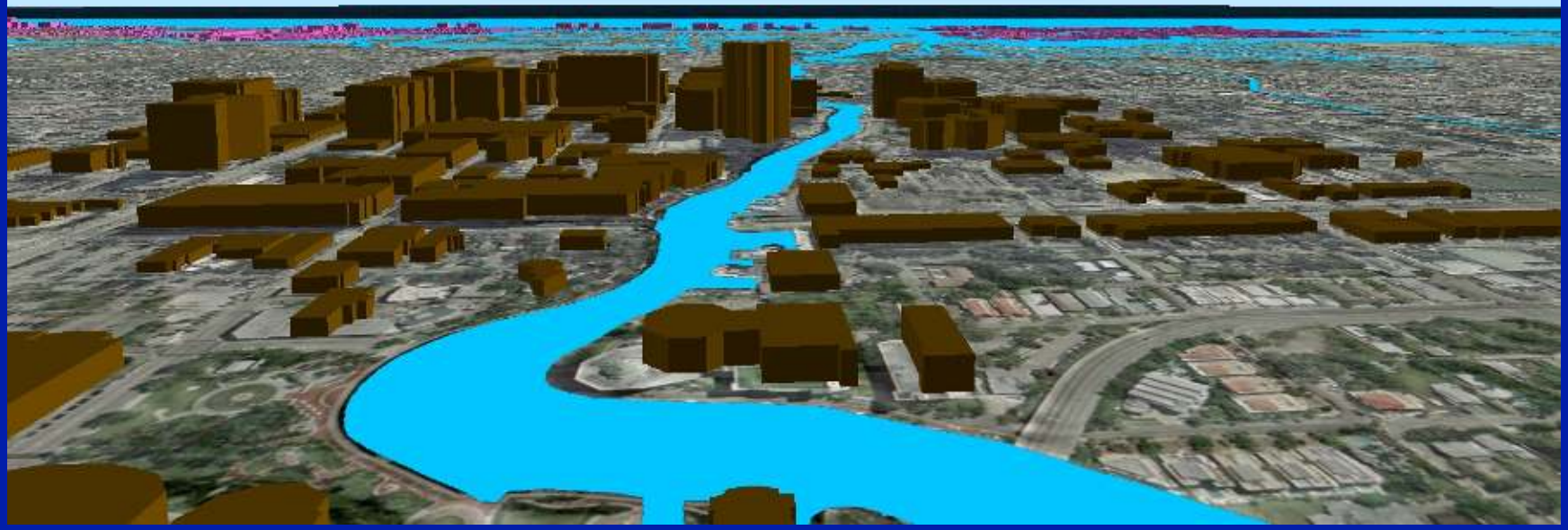
Building Sugar Cubes

Port looking north



Building Sugar Cubes

Downtown looking east



Building Sugar Cubes

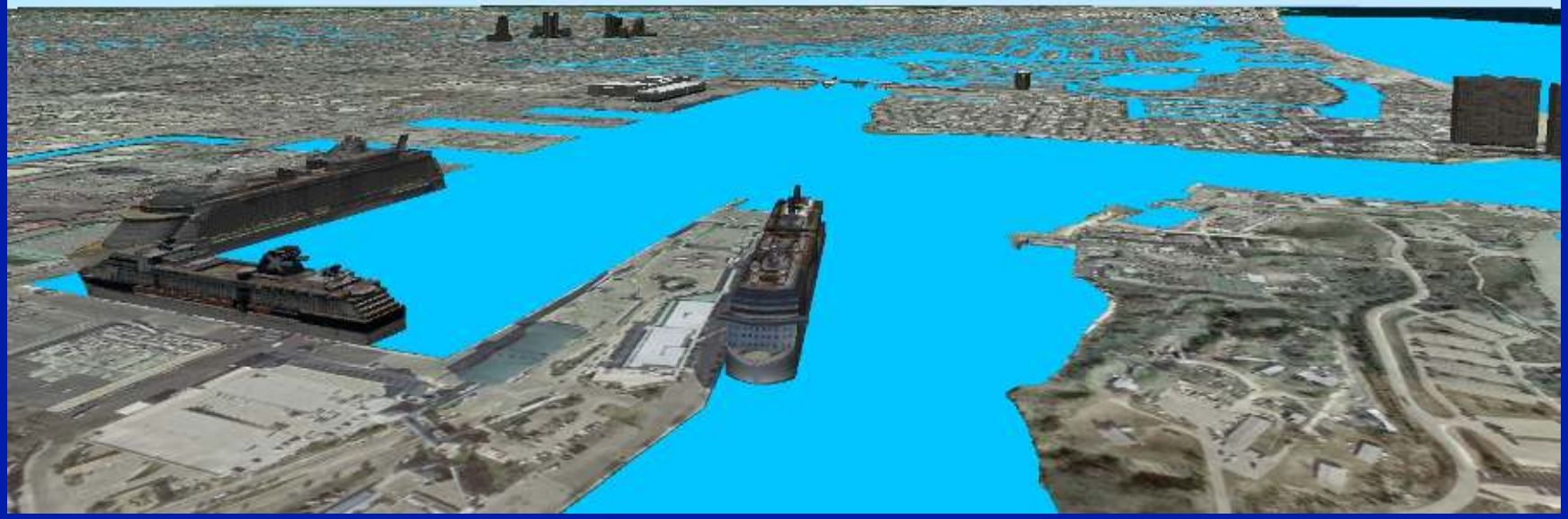
Detailed Building Model Approach

3D Detailed Building Models

Coast looking west

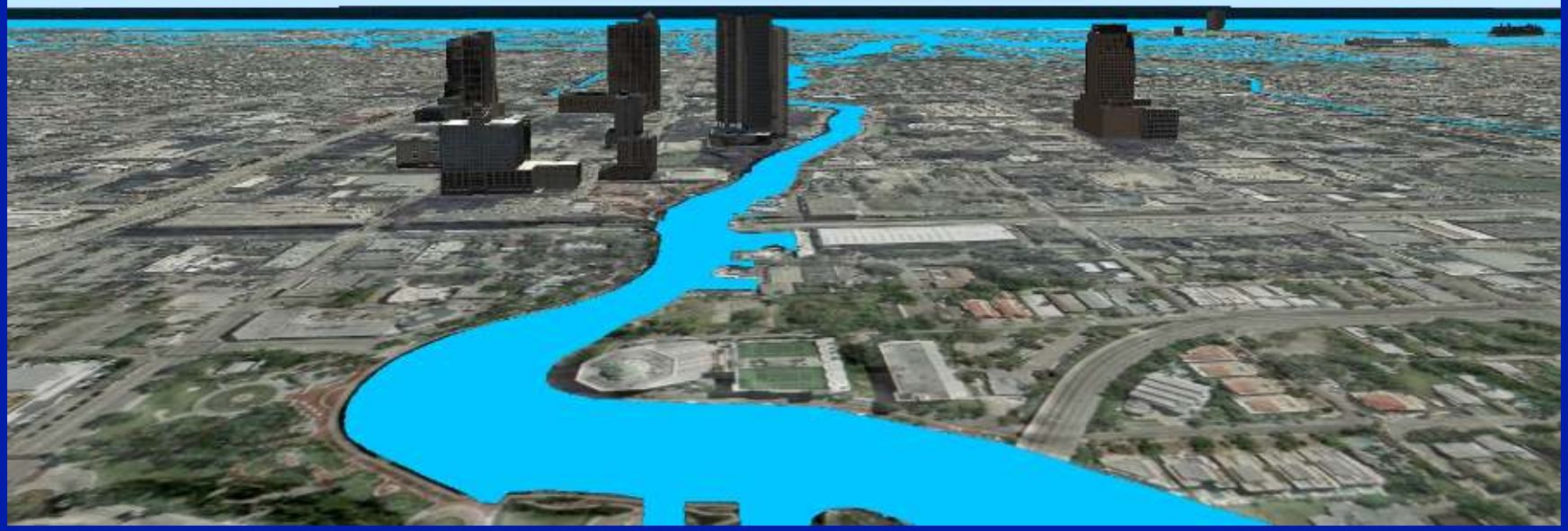
3D Detailed Building Models

Port looking north



3D Detailed Building Models

Downtown looking east

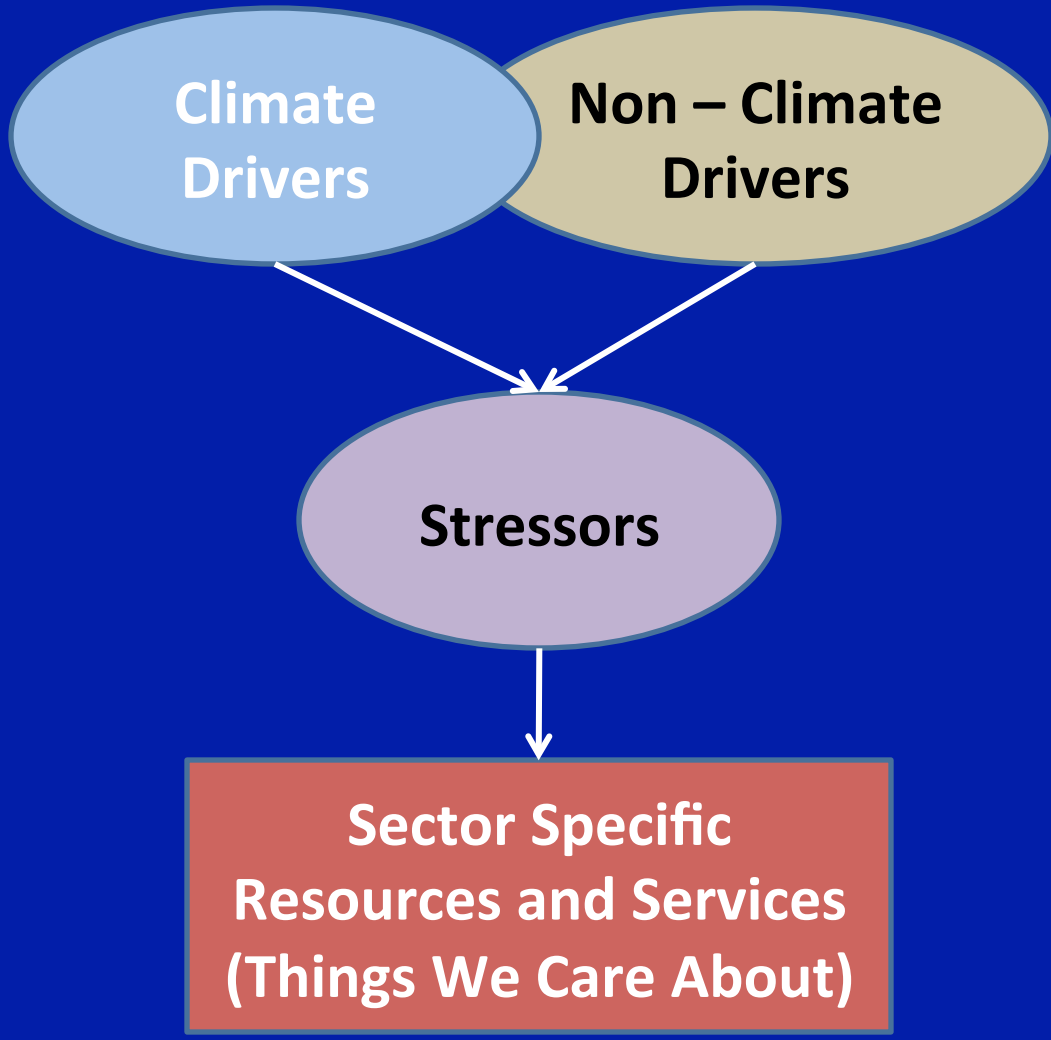


3D Detailed Building Models

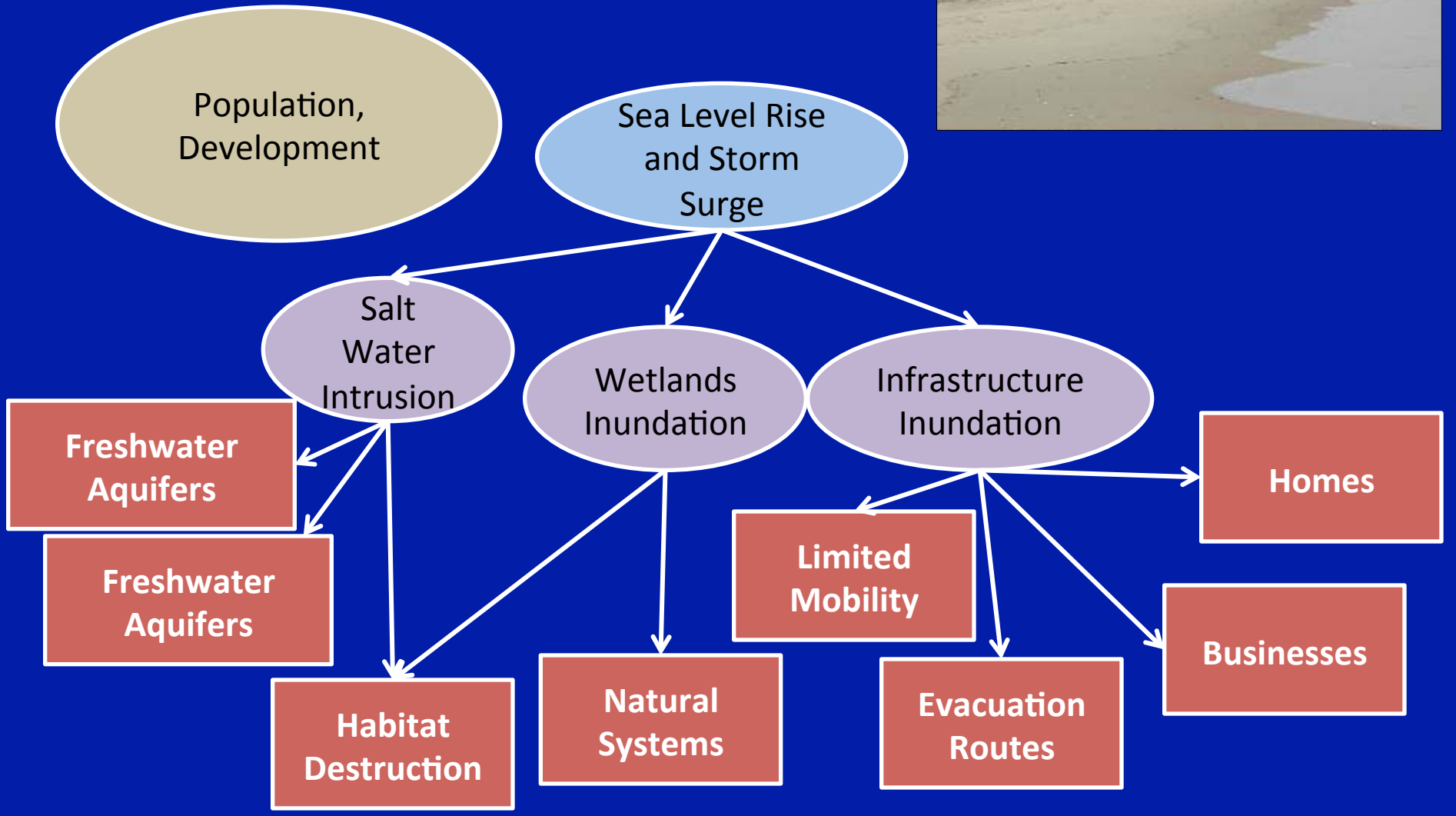
RISING WATER OVERLAY

FRAMEWORK FOR CLIMATE ASSESSMENTS

- Severity of impacts depend on the **vulnerability** of the system
- How are resources or services affected?
- How do we measure what it is we value?



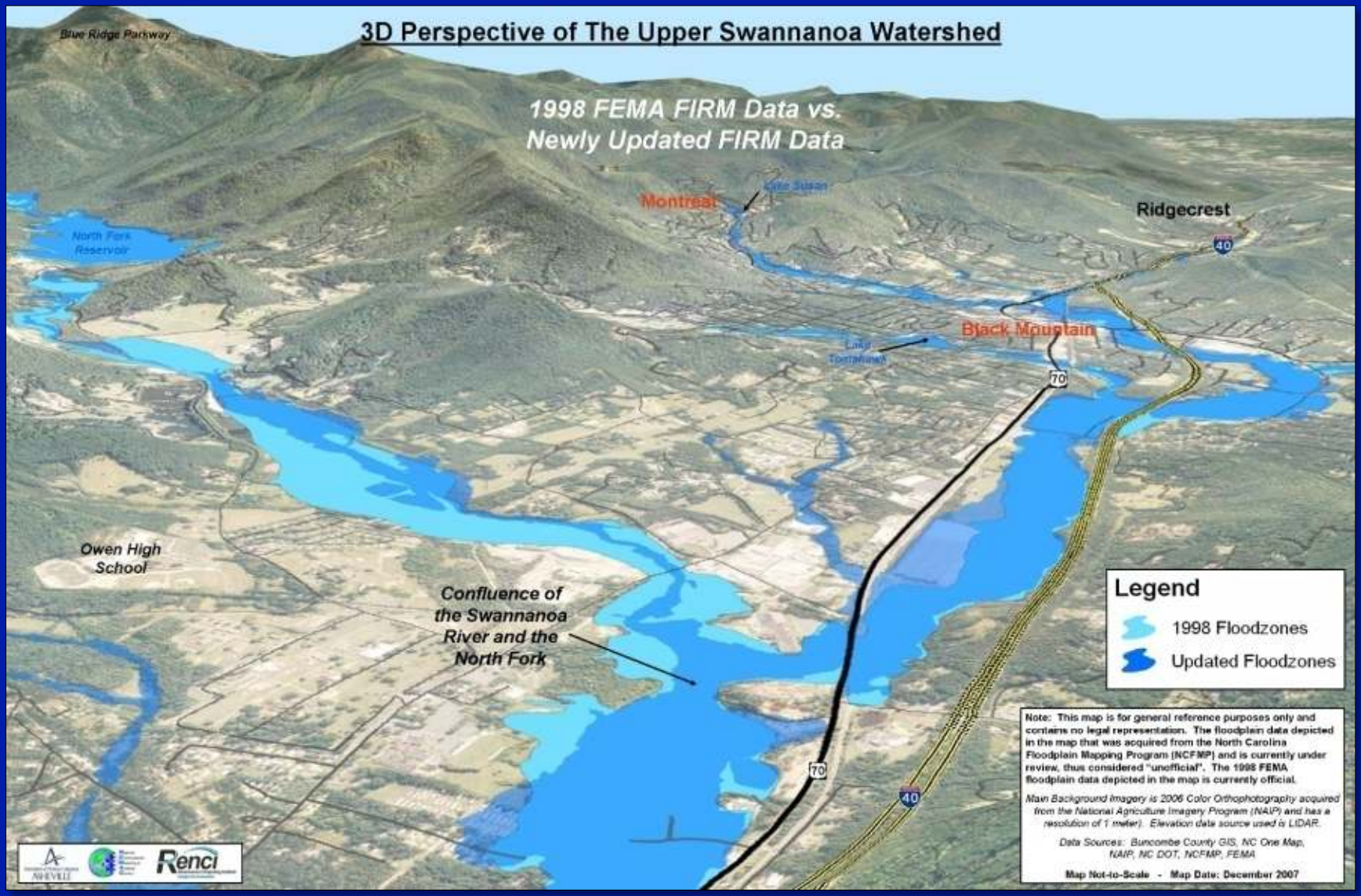
Climate Assessment
Conceptual Model of Linked Relationships
Sea Level Rise and Storm Surge



Rising Water Simulations

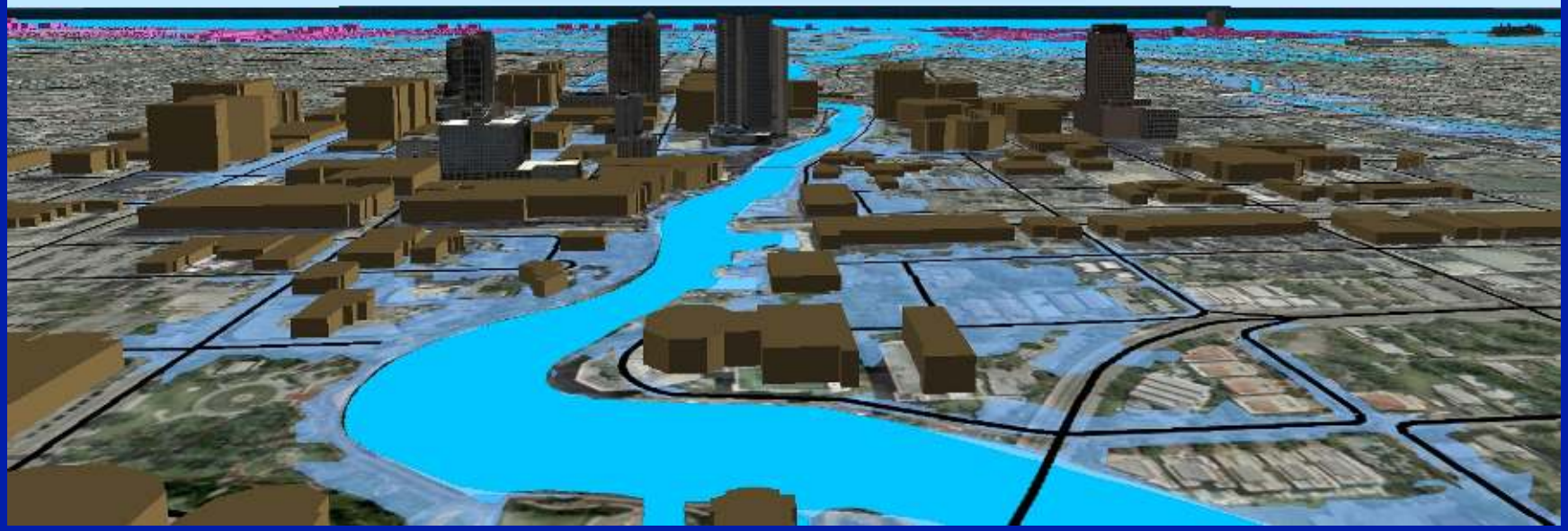
- With elevation and 3D models in place, can now do rising water simulations
  - Flooding
  - Storm surge
  - Sea level rise
- Simulations can only be as detailed as the data that feed into them
  - Bathtub approach vs. USGS hydro models

Rising Water in the Mountains



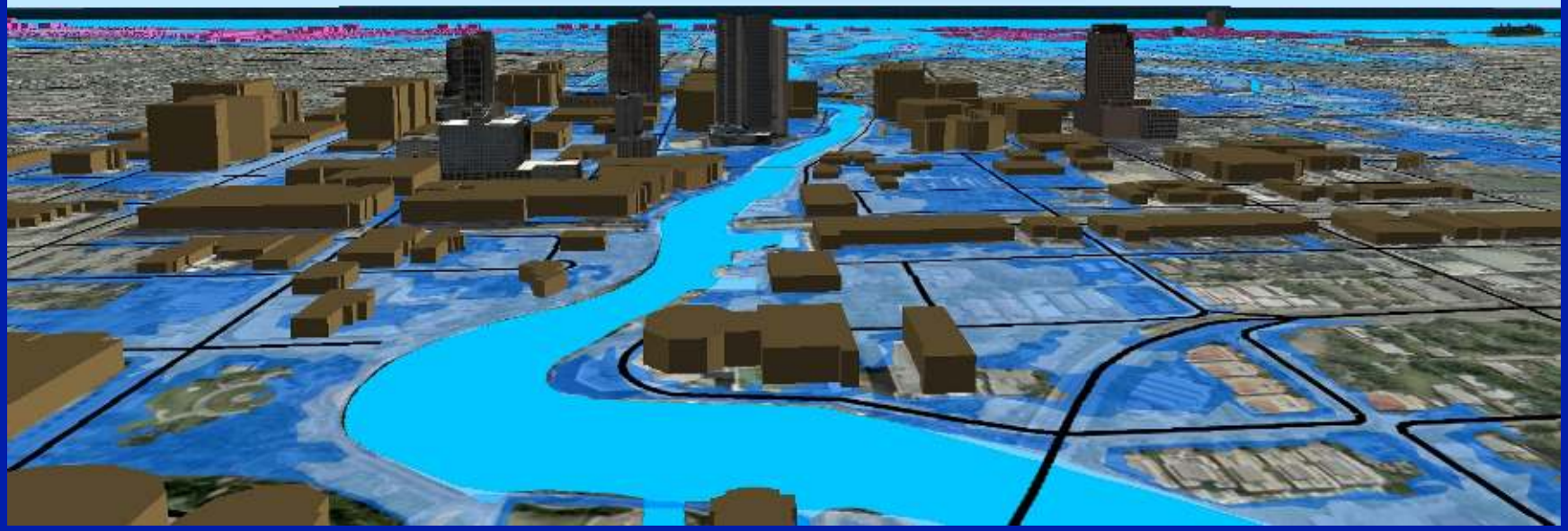
Category 1 and 2 Storm Surge

Downtown looking east



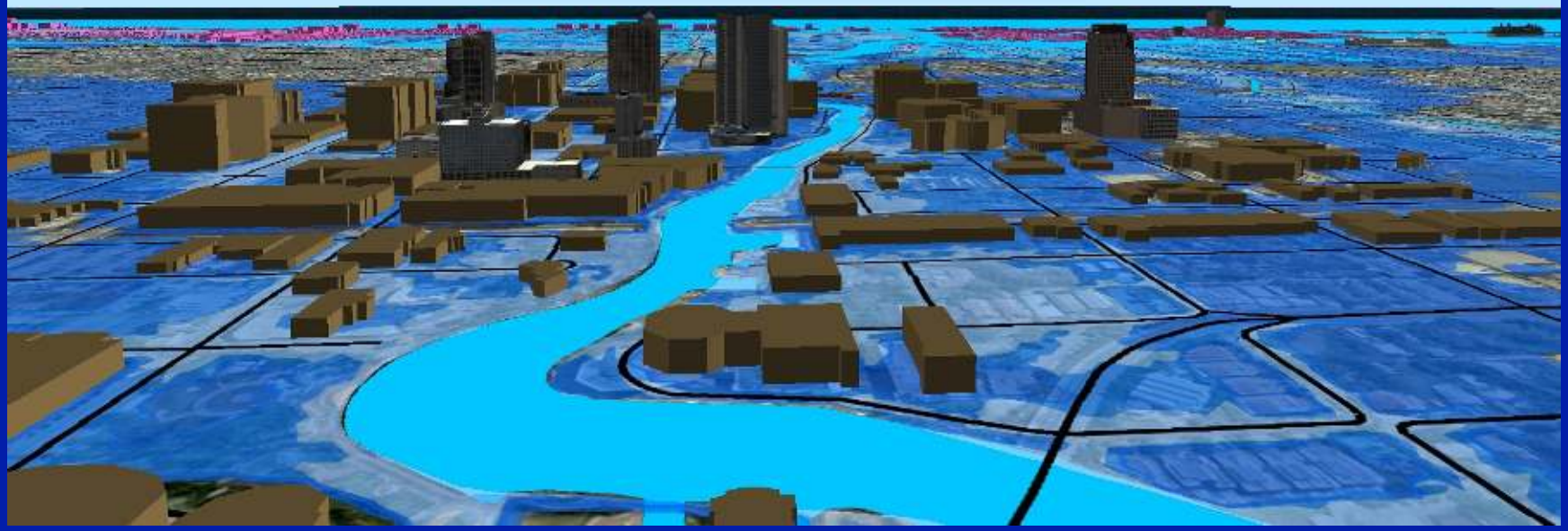
Category 1 - 3 Storm Surge

Downtown looking east



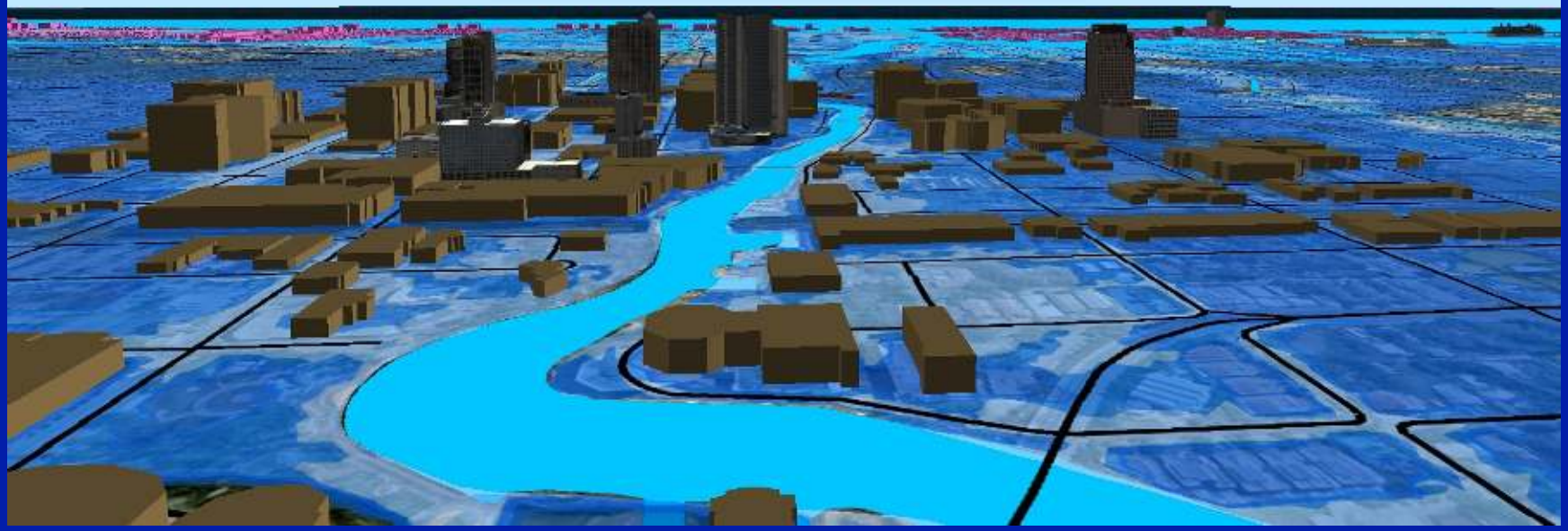
Category 1 - 4 Storm Surge

Downtown looking east



Category 1 - 5 Storm Surge

Downtown looking east



CONTENT GENERATION AND DISSIMINATION

Content Development Platforms

- Esri's ArcGIS
  - 3D Analyst Extension
    - ArcScene
    - ArcGlobe
  - CityEngine
- Trimble SketchUp
  - Formerly Google SketchUp
- Unity3D
- NewTeck's LightWave

Dissemination Products and Platforms

- Posters (2D and 3D)
- Movies
  - Desktop / Viz Wall
  - Web (YouTube)
  - Immersive (GeoDome)
- Interactive Viewers
  - Desktop
  - Web
  - TouchScreen / TouchTable

3D Graphic Examples


Biltmore Village


BV Test
[Hide Menu]
Terrain Textures
Base River Level
100 Year Flood Plain
River Levels
Flood

Challenges

- Effectively and efficiently incorporating real-world data (GIS data) into 3D visualizations
- Integrating with existing GIS infrastructure
  - Data Storage, database connections
- Technology
  - Software learning curves
  - Hardware
- Resources
  - Time
  - Money

Summary

- 3D Visualization tools provide an alternative “look” at real world issues (rising water)
- Creating 3D visualizations correctly and realistically impacts the final products
- Its all about the decision, make the visualizations relevant and meaningful for the user

QUESTIONS?

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