

# Reliability of Two-Dimensional (2D) Hydrodynamic Models for Assessing Susceptibility of Stream Restorations to Flood Damage and Potential Effects of Climate Change

Research Question: How can different restoration approaches or techniques reduce the impacts of future climate change?

Presenter: Art Parola, Ph. D, P.E., Director, University of Louisville Stream Institute

Collaborators and contributors: Ann Arundel County, Prince Georges County, Maryland Department of Natural Resources, Maryland State Highway Administration, RK&K, Greenvest, Underwood & Associates, Berrywood Community

# Are 2D Hydrodynamic Models a reliable tool for stream restoration design?

## Research Questions Addressed:

- Research Phase I: Evaluate a design approach for stability: use of 2D models to develop engineering design of restoration sites
- Research Phase II: current and future climate conditions are evaluated through different simulated flows

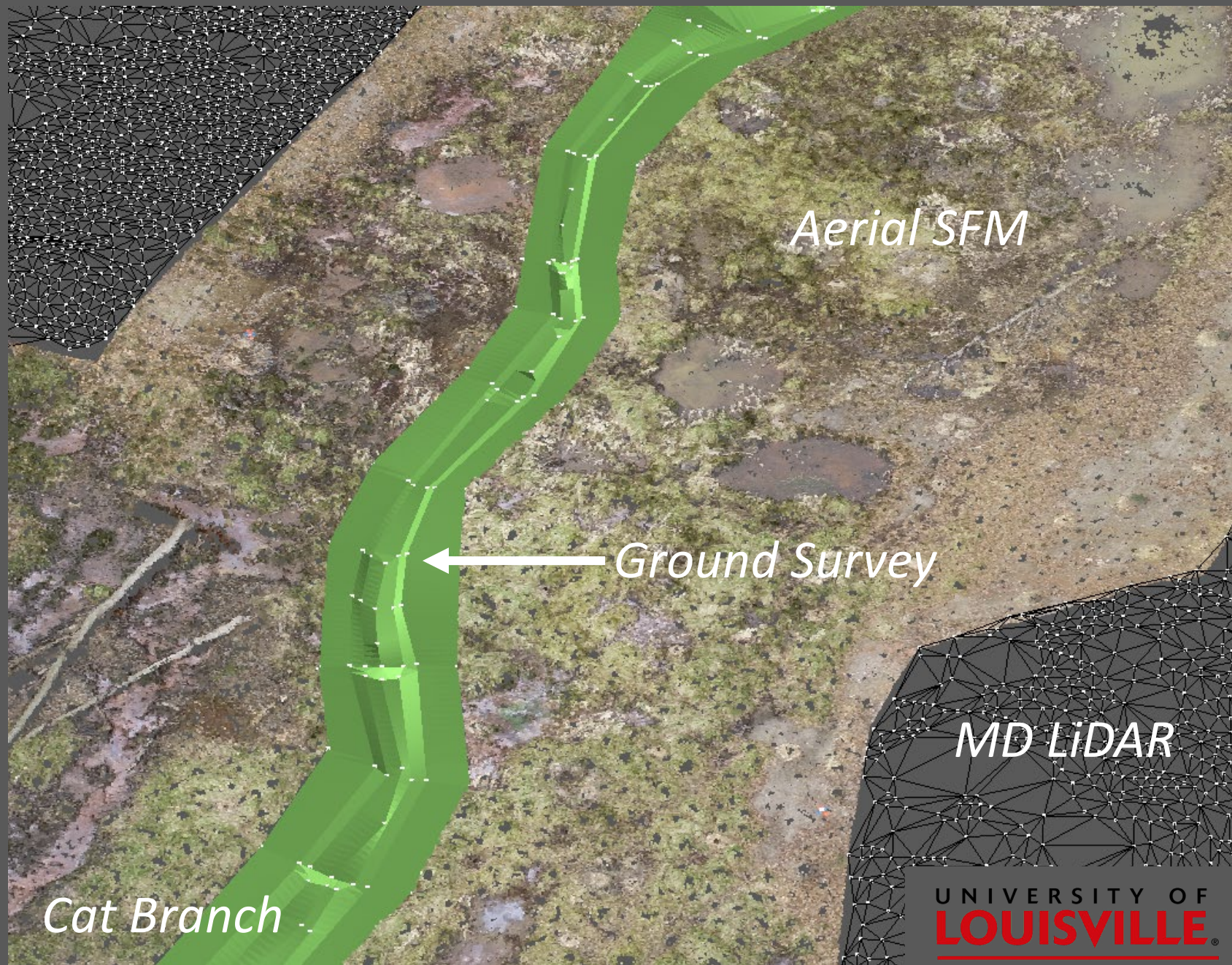
## Expected Findings

- Areas of restoration sites with expected low or high velocities/stresses will be effectively predicted by 2D models. Moderate values / threshold conditions will help refine use of the 2D model as a tool
- 2D models will be conditionally effective- better definition of areas where models are reliable under current and future flooding scenarios



# Reliability Analysis: Detailed Site Surveys

- 5 Sites in total
- 2D Hydrodynamic modeling requires a water-tight container (no holes)
- Resolution must be appropriate to capture key features





# Reliability Analysis: Ground and Aerial Imagery to Define “Damaged” Areas

- Damaged and un-damaged areas are used as training data in the model
- Damage does not mean poor design



*Cat Branch*



*Cattail Creek*

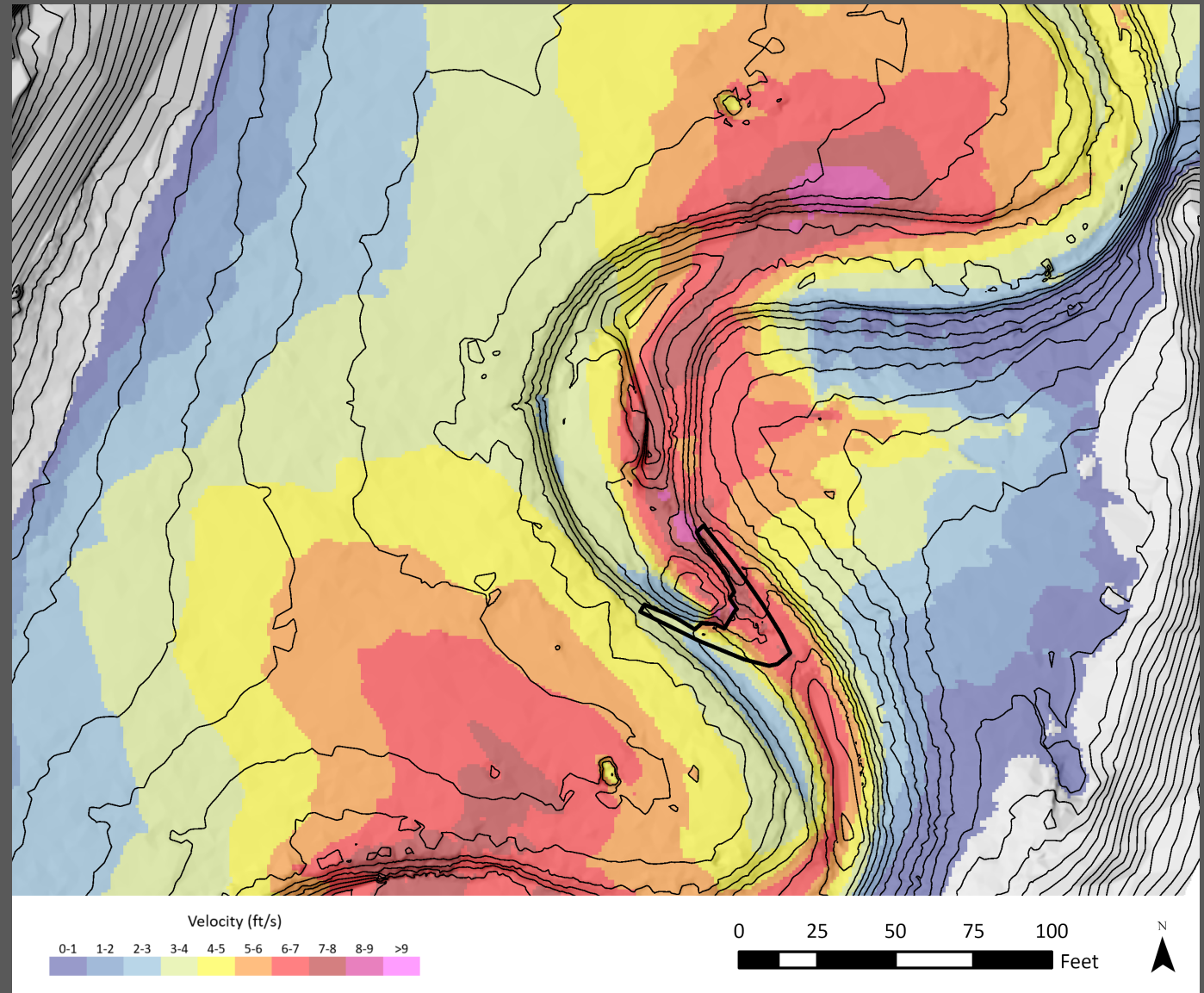


*Furnace Creek*



# Reliability Analysis: 2D Hydrodynamic Modeling

- Determine predicted velocities and stresses in damaged/un-damaged areas
- Evaluate 2D model effectiveness in different restoration types and components



# Reliability Analysis: 2D Hydrodynamic Modeling

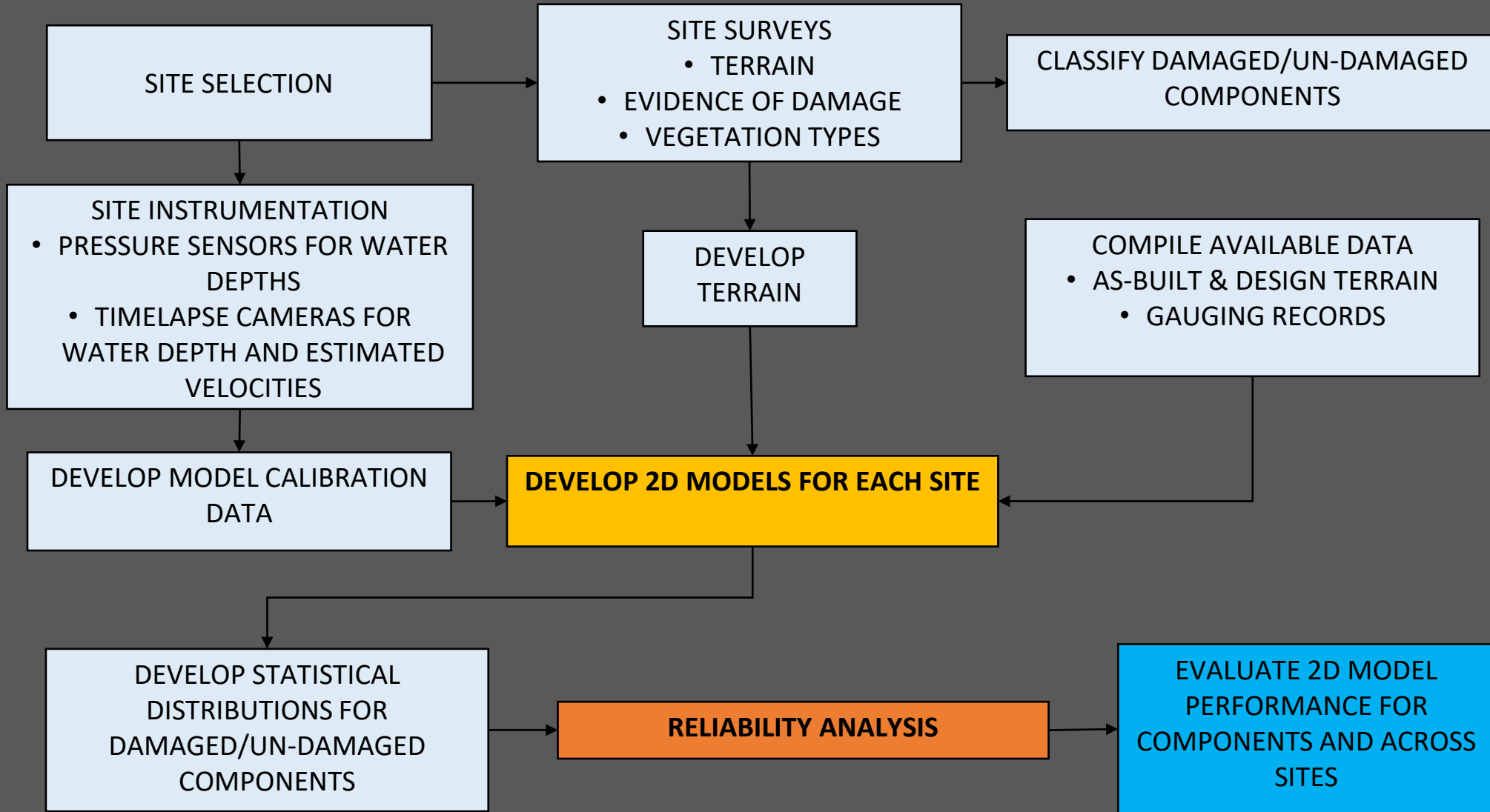
- Constrain / approximately calibrate models based on estimates of observed flooding (Phase 1)
- Use direct sensing of floods, partner observations and surrounding gage data
- Use extreme flood estimates for current and future conditions analysis (Phase 2)



*Furnace Creek*

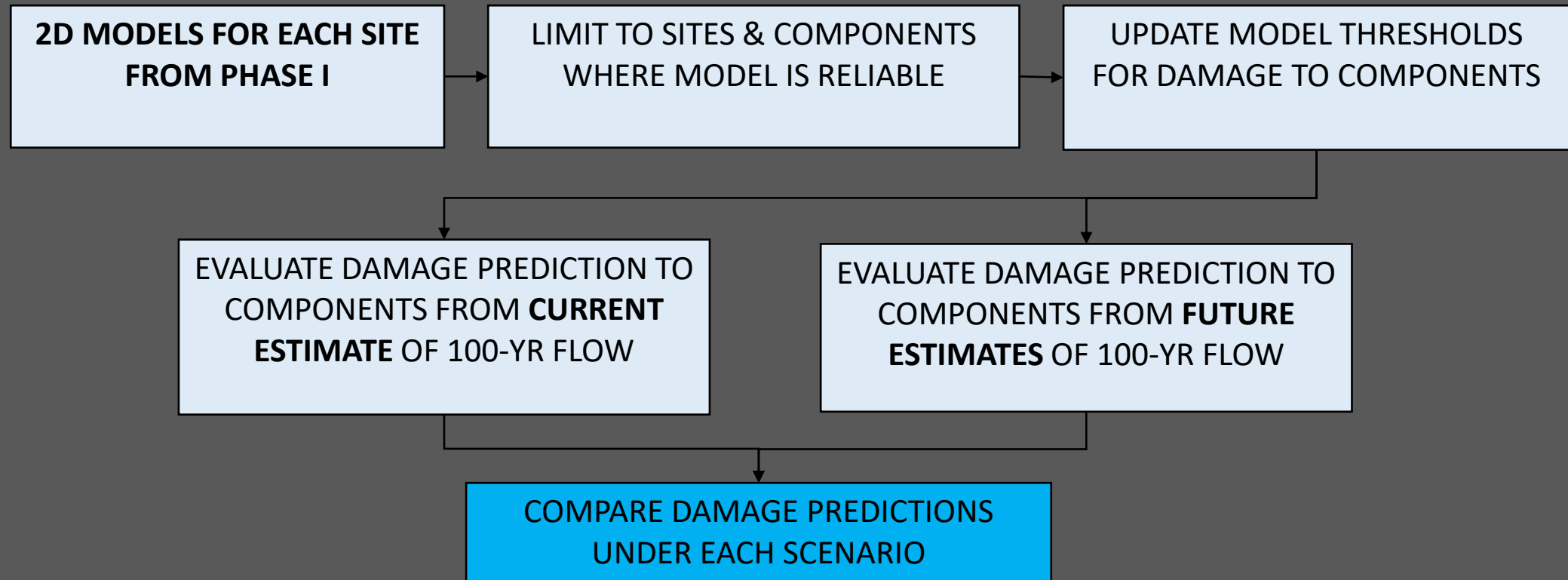


# Phase I: 2D Model Reliability Analysis





# Phase II: Current and Future Conditions Analysis



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