Objective

• Participants will become familiar with numerical approach for estimating loss of life
Why the Different Approaches?

• Empirical approaches tie important parameters to historic events
  • Characteristics of built infrastructure, population, etc
  • Historic record doesn’t include scenario for typical USACE flood control
    dam (large dam above major population center)
  • Limited number of parameters make it harder to understand risk drivers
    and recommend appropriate risk reduction measures

• Simulation approaches improve ability to measure impacts on
  “non-structural” risk reduction measures
  • Explicit consideration of evacuation factors
  • Consider interaction of people with water throughout event
Essential Elements of Life Loss Estimate

- How many people are exposed to the flooding?
  - Initial distribution of people
  - Redistribution through evacuation

- How severe is the flooding?

- Are the people in a structure that can withstand the flooding?

- Will the people subjected to flooding die?
Risk Characterization

![Graph showing the relationship between Probability of Breach and Average Life Loss for different categories of levees and dams. The graph includes data points for Levees - LSAC 4, Levees - LSAC 3, Levees - LSAC 2, Levees - LSAC 1, Dams - DSAC 4, Dams - DSAC 3, Dams - DSAC 2, and Dams - DSAC 1.]
Numerical Life Loss Estimation Methods – Decision Driven

• Screening
  • Dams - Modified DSO-99-06 Method
  • Levees - Jonkman’s Method

• Higher-level Risk Assessments
  • HEC-FIA (aka LifeSim)
    • Screening validation, issue evaluation and periodic assessments, major modification studies
    • Scalable application (simplified or detailed evacuation)
Redistribution of People (Evacuation Effectiveness)
Redistribution Through Evacuation

[Graphs showing the likelihood of warning issuance delay, percentage of PAR that has received a warning, and percentage of warned PAR that has taken protective action over time.]
How Do We Reduce Uncertainty?

• Existing Information
  • Levee Screening Tool
  • Existing Reports
  • Informal Discussions
• Formal Elicitation
Managing Consequences – Improving Emergency Response

A GUIDE TO PUBLIC ALERTS AND WARNINGS FOR DAM AND LEVEE EMERGENCIES
Detailed Evacuation Modeling

In mathematical terms, the dual-regime modified Greenshields is expressed as follows:

\[ v_i = u_f, \quad 0 \leq k_i \leq k_{up} \]

\[ v_i - v_0 = (v_f - v_0) \left(1 - \frac{k_i}{k_{jam}}\right)^a, \quad k_{up} \leq k_i \leq k_{jam} \]
LifeSim Demo