

# SMART Planning

## Utilizing Risk Assessment Methodologies for Public Safety and Flood Risk Management

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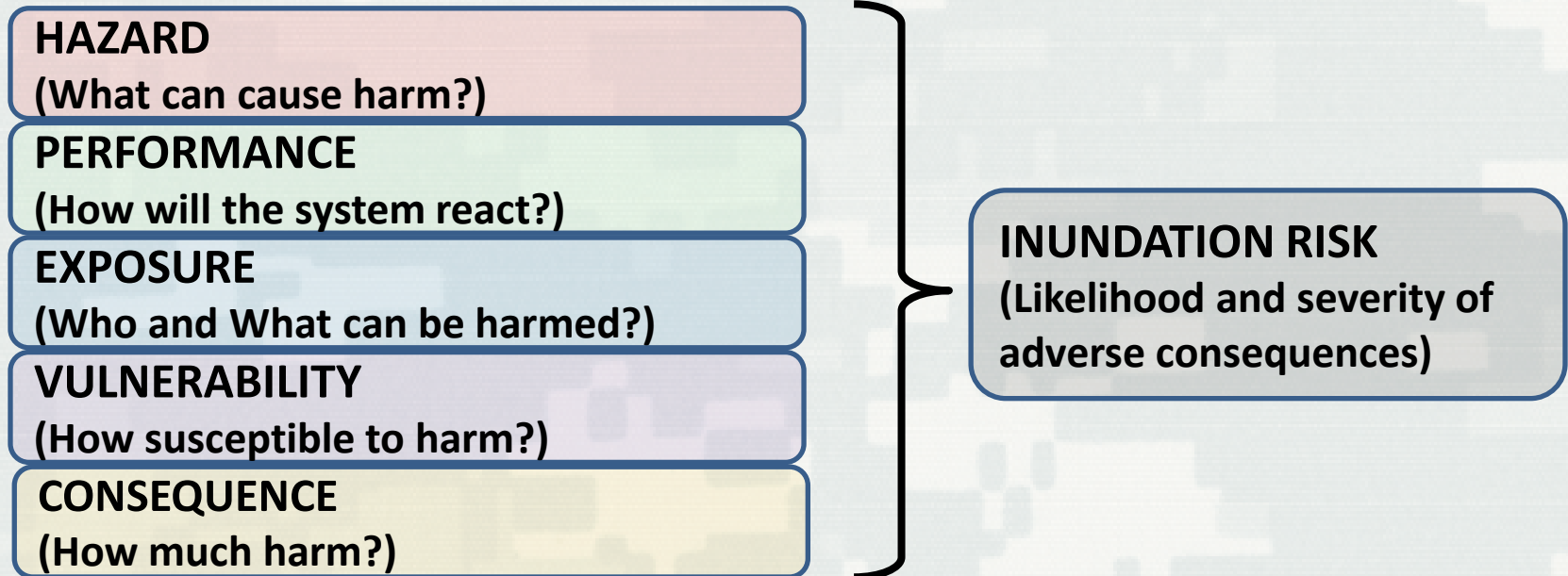
# Today's Agenda

- Risk Assessment concepts
  - Public Safety and Planning
  - What Metrics Should be Used?
  - How are the metrics generated?
  - Examples
- 
- More info in Dam Safety Reg ER1110-2-1156  
[http://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER\\_1110-2-1156.pdf](http://www.publications.usace.army.mil/Portals/76/Publications/EngineerRegulations/ER_1110-2-1156.pdf)  
(Ch 2&5 for concepts, Ch 3 for risk assessments, Ch 9 for modification studies)

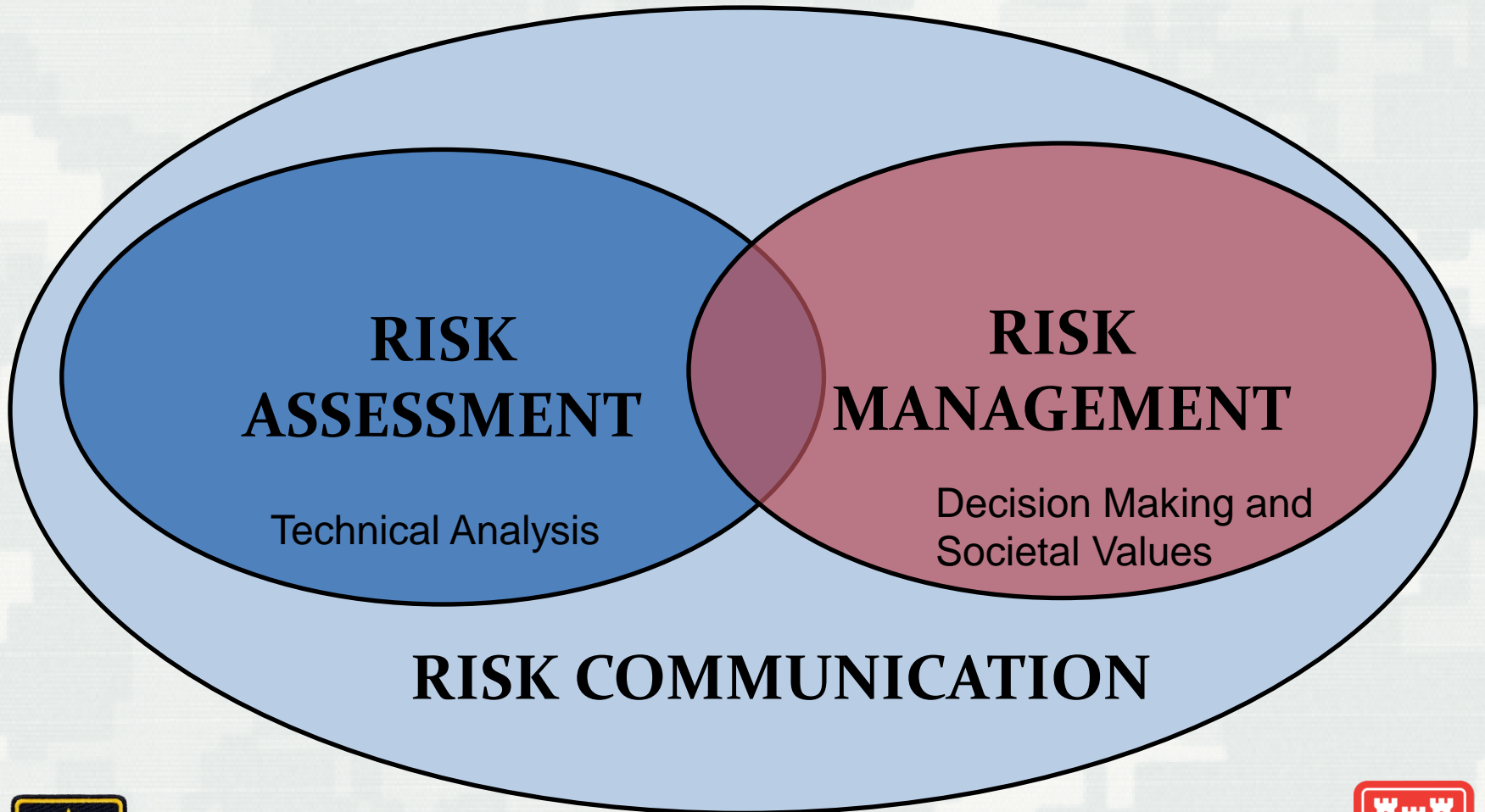


# What is a Risk Assessment?

- An approach to quantifying and describing the nature, likelihood, and magnitude of risk



# Risk Analysis – 3 Integral Parts





# Risk Assessment – 4 Questions

- What can go wrong?
- How can it happen?
- What is the likelihood?
- What are the consequences?

Helps to answer the risk management question:

- What are the best options for reducing the risk?



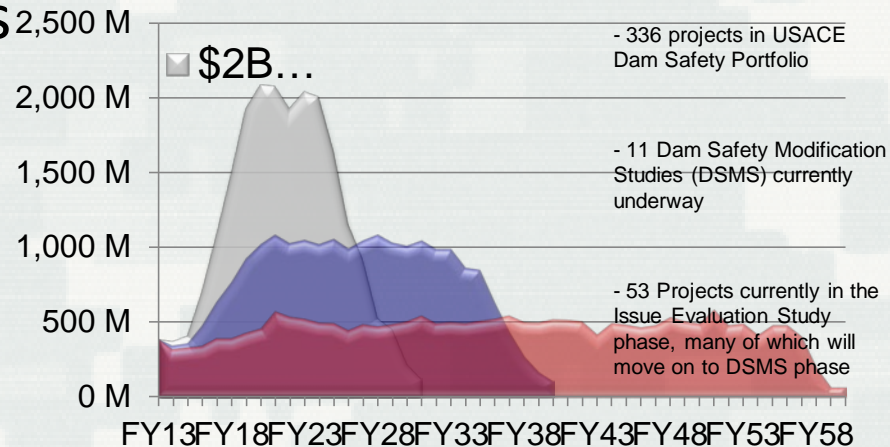
# Risk Assessments in the Safety Programs

- The Dam and Levee Safety Programs use scalable risk assessments
- Typically three levels of rigor
  - Screening level assessment (equiv to Recon)
  - Issue evaluation (equiv to Recon, early feas)
  - Modification Study (equiv to feasibility level)



# Planning and the Safety Programs

- From February webinar
  - 11 dam safety modification studies (DSMS) in progress
  - 53 in Issue Evaluation
  - Many of these 53 will lead to modification studies (DSMS)
  - Similar needs in levee portfolio (2700 segments of concern)



# Risk Metrics and Public Safety

## Good

- Expected annual life loss
- Expected annual damages
- Individual risk

## Not So Good

- Life loss (single event)
- Damage (single event)
- Performance or condition
- Population at risk
- Evacuation routes
- Average depth
- Etc



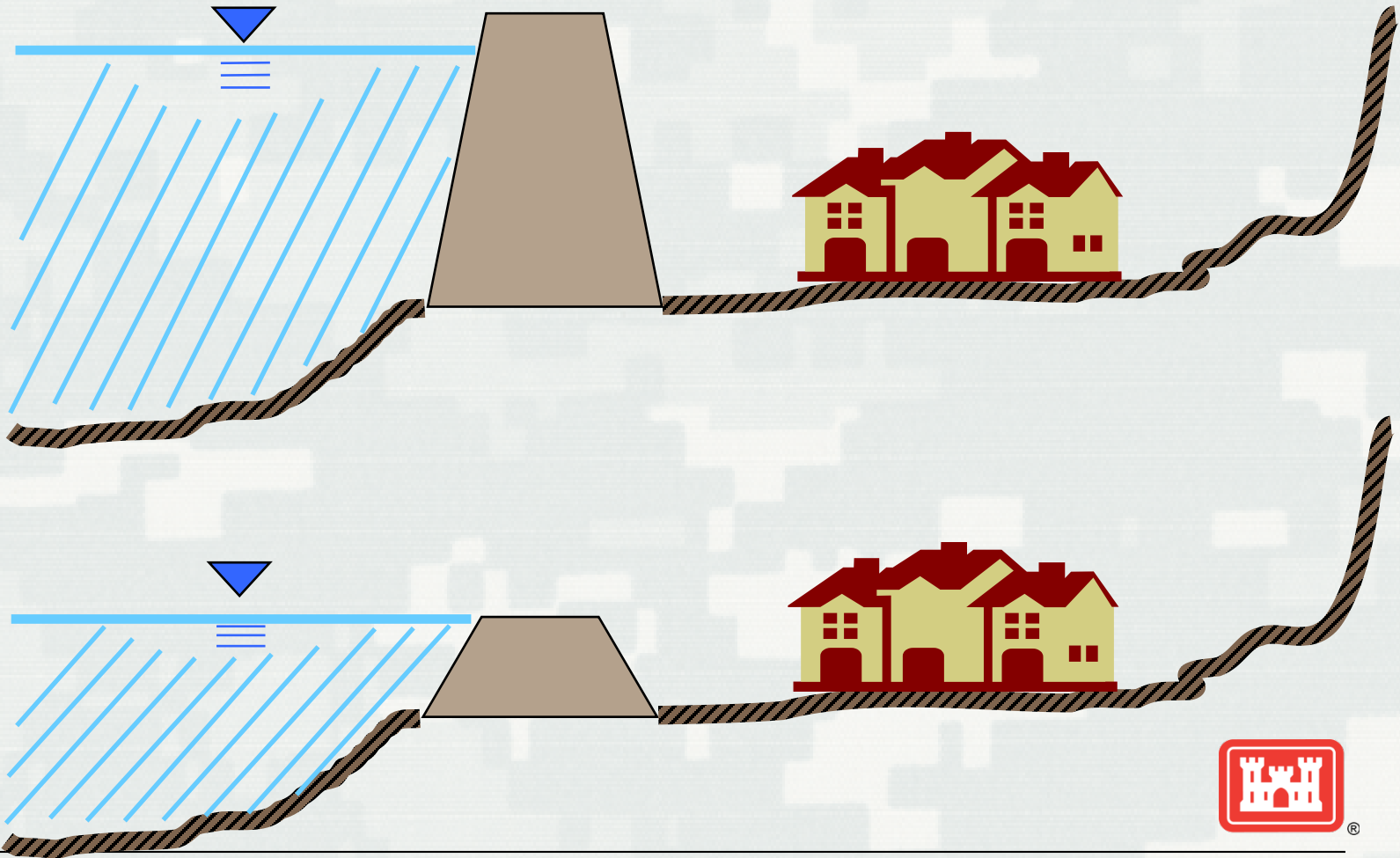


# A Note About “Population at Risk”

- Commonly discussed in FRM reports
- Population of the area is often used as metric
- Not very helpful in evaluation and comparison between plans or between with- and without
- The procedures and tools of the safety programs help to define the factors that put the population “at risk”



# Life Loss vs. PAR



# Why is that important?

- For formulation
  - What factors drive safety risk for the population?
  - Failure modes – probability, location, time to progress
  - Population - location, density, demographics
  - Warning times, response, and evacuation capacity
- For comparison, selection & justification
  - What is the difference in effectiveness between plans?
  - What are the incremental costs and benefits?



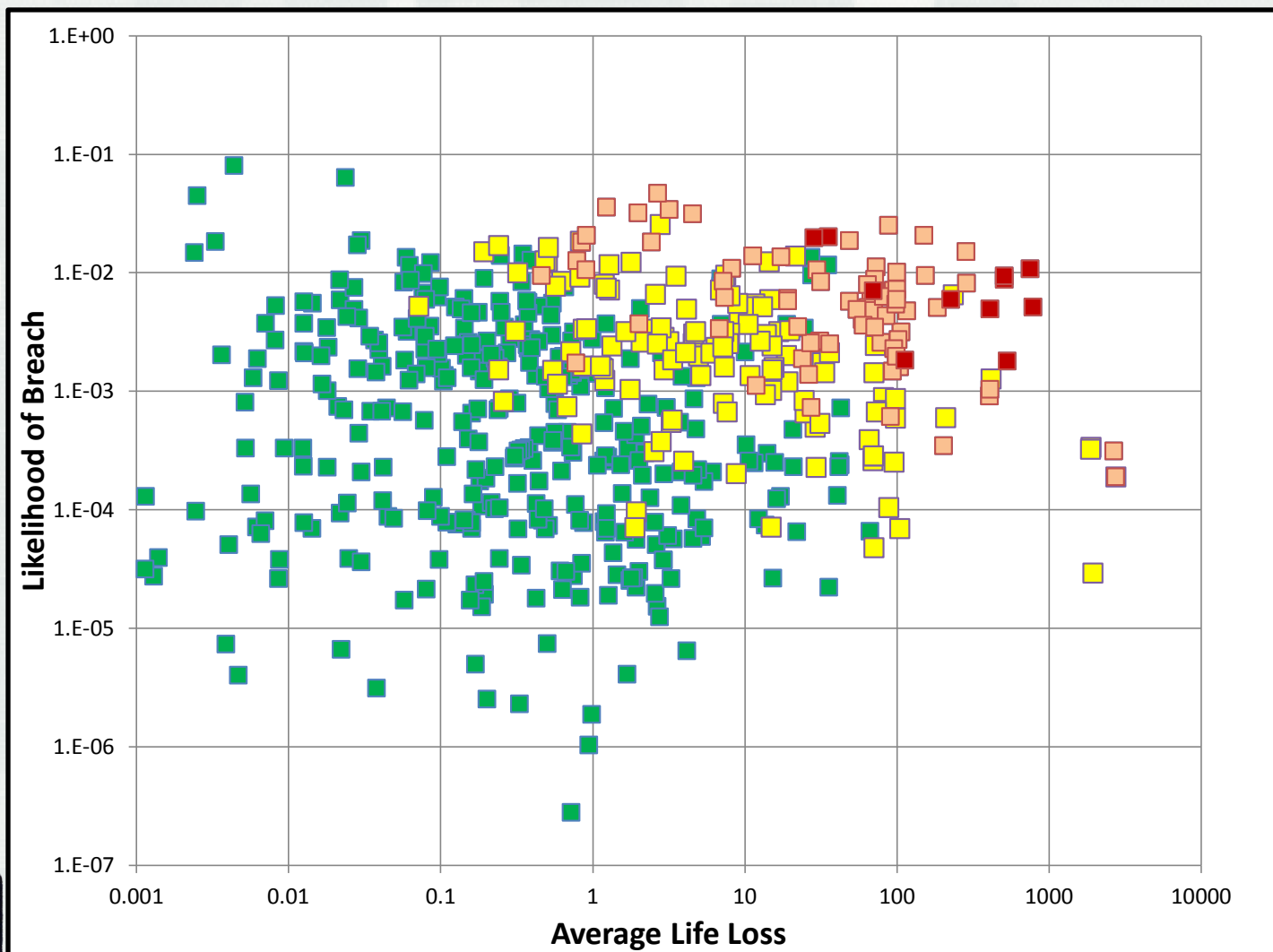
# How do we Compute Life Risk (and use that information to make decisions)?

- Screening
  - Levee Screening Tool
  - Decision - Initial Risk Characterization (LSAC)
- Issue evaluations and Mod studies
  - Potential Failure Modes Analysis
    - Brainstorming with the right people in the room
  - Event-based risk engines
    - Event-tree risk assessments or HEC-WAT/FRA
  - Decision - Tolerable risk framework

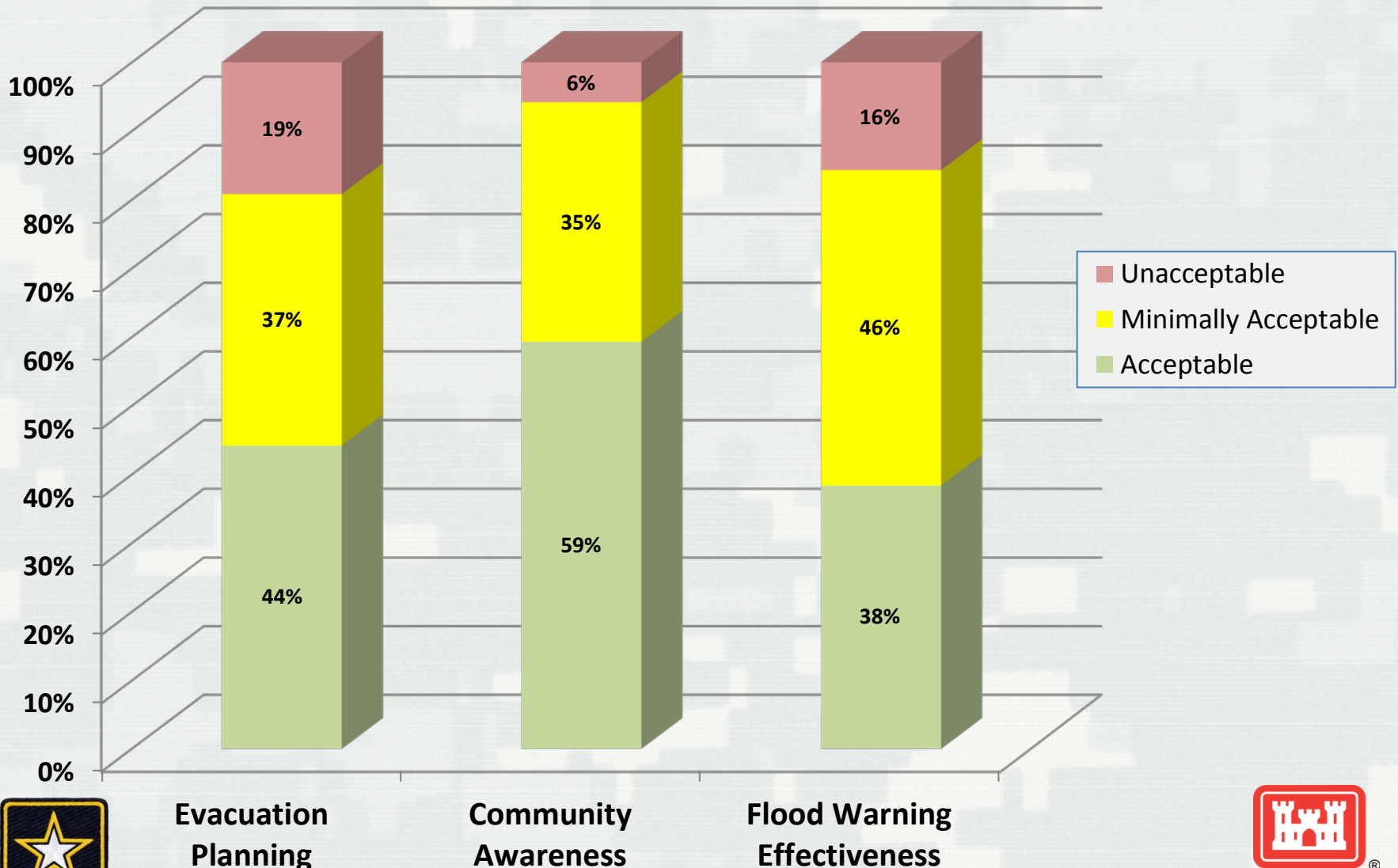




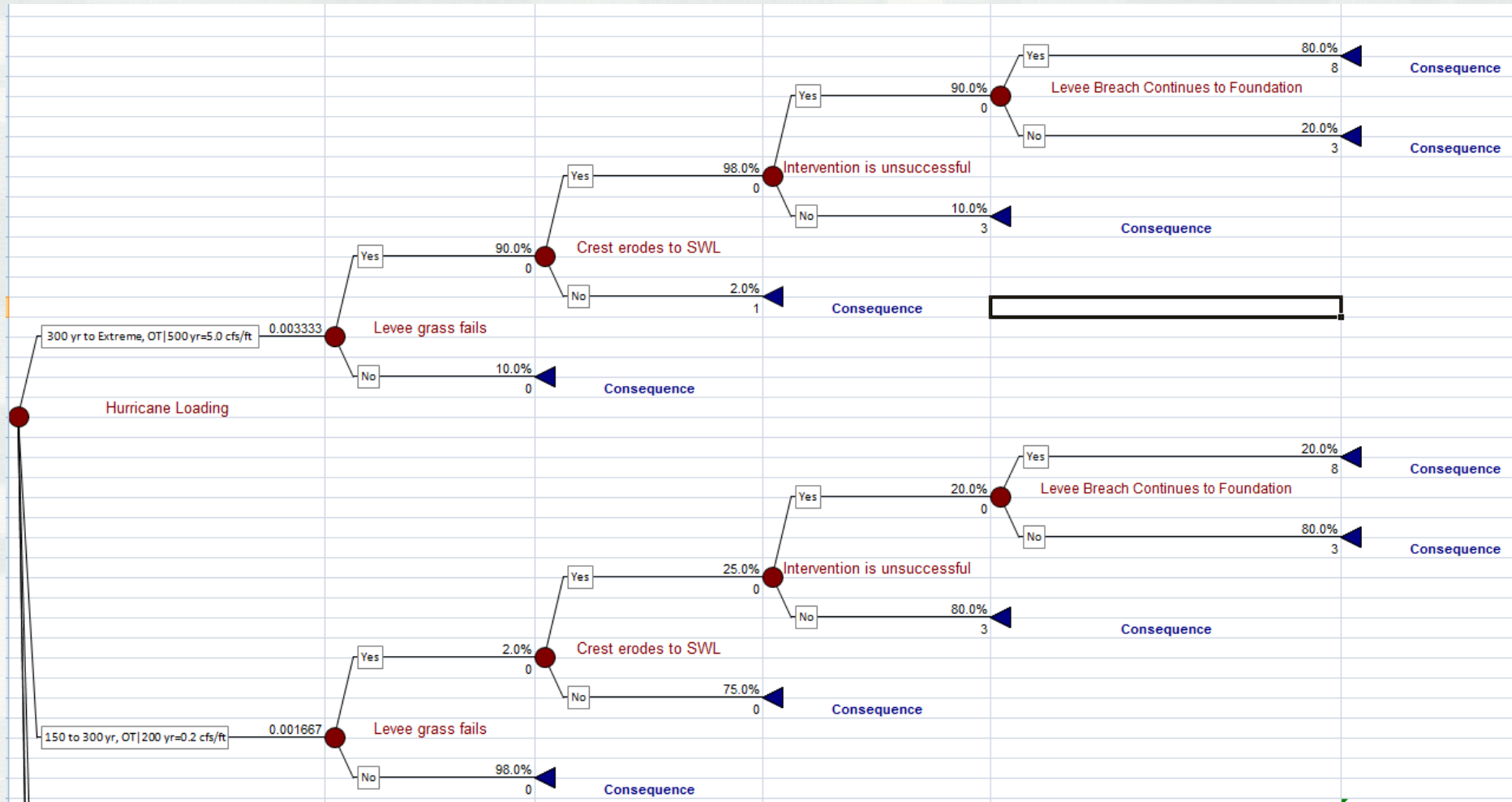
# Screening



# Life Safety Risk – Nonstructural Contributors



# Event-Tree Risk Assessments



# HEC-WAT/FRA

## (Watershed Analysis Tool)

- A planning tool for reconnaissance and feasibility studies; incorporates social and environmental consequences.
- Integrates existing event-based models (hydrologic, hydraulic, consequence, etc)
- FRA compute option applies the Monte Carlo simulation & allows for a life-cycle type computation of consequences (economic and loss-of-life) and associated performance indices.





# USACE Life Loss Estimation Methods – Decision Driven

- Screening - Minimal resource requirement
  - Dams - Modified USBR Method
  - Screening - Simplified Jonkman's Method

- HEC-FIA

- Screening validation, CIPR, issue evaluation and periodic assessments
  - Moderate resource requirement

- LifeSim

- Same as HEC-FIA, evac. modeling
  - Larger resource requirement

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Scalable methods – effort from one applicable to more rigorous method



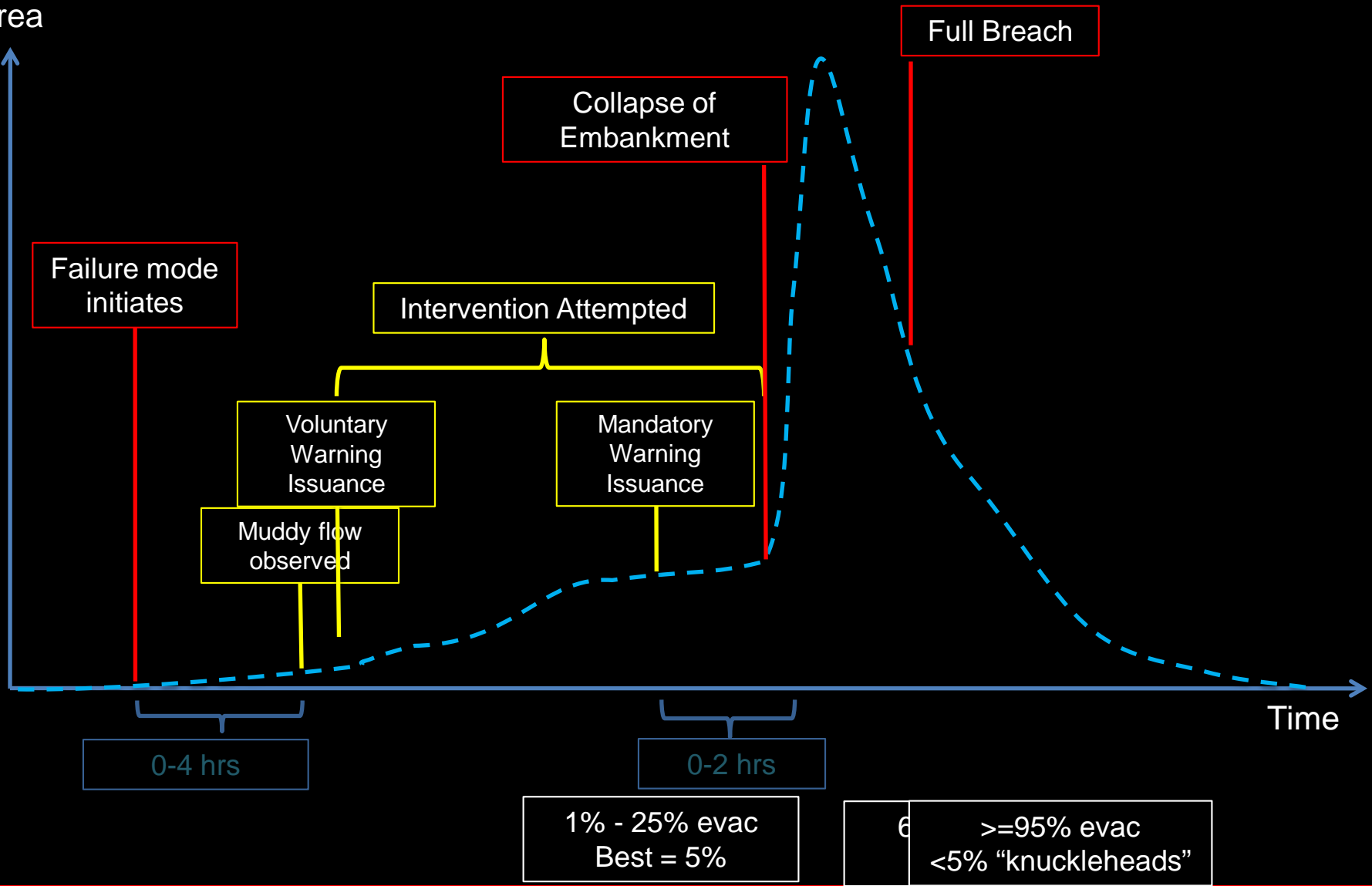
# Life Loss Estimation – Essential Elements

- Initial distribution of people
  - Redistribution of people
    - Warning
    - Response
    - Evacuation potential
  - Flood characteristics
    - Arrival time, depth, velocity
  - Shelter provided by final location
  - Fatality rates
- Evacuation Effectiveness

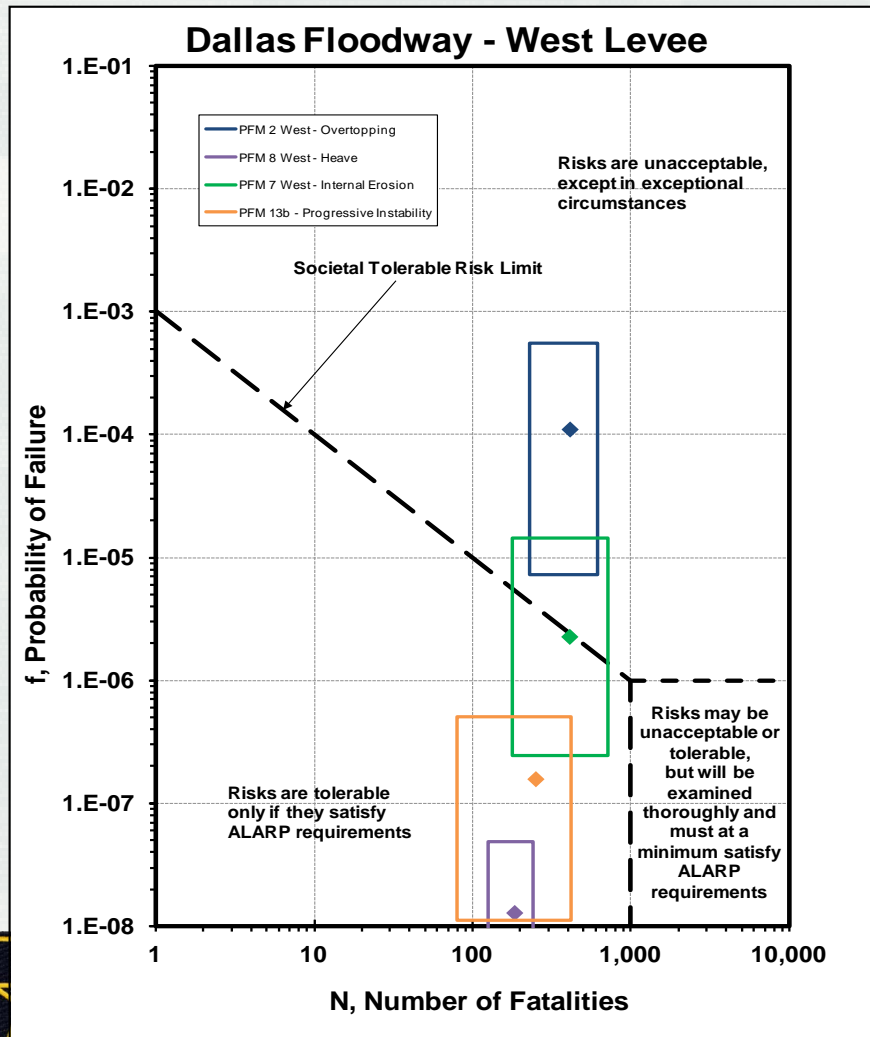


# Breach prior to OT (50-75% load)

Flow into  
leveed  
area



# Tolerability of Risk (TRG)



- Risks that are Commensurate with Benefits
- Risks that Society does not believe are negligible
- Risks that owners keep under review
- Risks that are reduced further if warranted (ALARP)





# Questions?

Type questions in the chat box.  
We will answer as many  
as time allows.

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**PLANNING SMART  
BUILDING STRONG**

