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# Risk-Informed Decision Making

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GRADUATE CERTIFICATE IN RISK MANAGEMENT



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- 
- **Planning is changing**
  - **Uncertainty = Risk**
  - **Stepping up to Risk Management**





Planning has  
changed since the  
P&G in 1983.

- Changing world
- Changing values
- Planning's evolution
- Technology
- Economic pressure
- Public involvement
- Science & uncertainty
- Emergence of risk



# Changing World



- Issues-new, riskier, complex, global
- Political transformations
- Competitive, interdependent, constantly changing
- Life is accelerated
- Change=>Uncertainty



# Changing Values



- Ecosystem health, public safety, social vulnerability, environmental service provision, development patterns, recreational, aesthetic, health impacts, cost effectiveness, civic engagement, institutional capacity building, environmental equity, carbon & energy impacts, ecological footprint, vulnerability impacts
- Changing values=>Uncertainty

# Planning Evolves



- Watershed, ecoregional, ecosystem management
- Return to multiobjective & multipurpose
- Monetary & nonmonetary
- Aligning expectations
- Sustaining planning
  - Fewer career planners
- Evolution=>Uncertainty

# Technology



- More technology
- New technology - nanotech, genome, robotics, megadata, GIS, LIDAR, and on
- Technological change=>Uncertainty

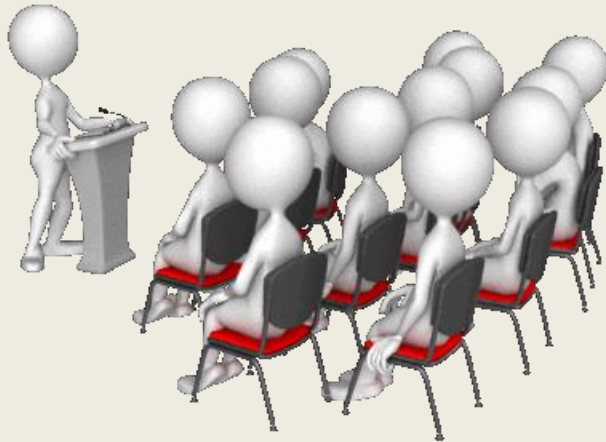
# Economic Pressure



- Aging infrastructure
- Few new starts
- New financing needed
- Organizations hitchhike on your study
- Less time & money
- Economic pressure=>Uncertainty



# Public Involvement



- More stakeholders
- Expectation of meaningful involvement
- More collaboration
- Equity, efficiency, affordability, intense opposition are constants
- Public sentiment=>Uncertainty

# Science & Uncertainty



- Science-based decisions
- Measurement importance
- Greater emphasis on uncertainty
- Data's shorter shelf life
- Future feels more uncertain



# Emergence of Risk



- 1975 Rasmussen Report
- 1980 Benzene Case
- 1983 FDA contracts with NAS –Red Book
- 1983 EPA Uses Red Book
- 2006 Actions for Change
- Decision making under uncertainty

# Risk-Informed Planning



- It is because of these changes that it is time to integrate risk analysis principles into the planning process
- Be intentional about uncertainty



In the old days,  
before uncertainty,  
we knew everything



Plan A costs \$171,000,000

That levee will be there 1000  
years from now

can float preconstructed  
elements to the project site

EAD = \$1,000,000

Water quality effects  
are negligible

We will be on schedule

Plan B costs \$209,000,000

H&H will cost \$200,000,000

We will have costs  
July 17

We can get by with  
an EA

The BCR is 1.64

There are no HTRW





- That was never true
- We were often wrong
- Uncertainty has always been our reality



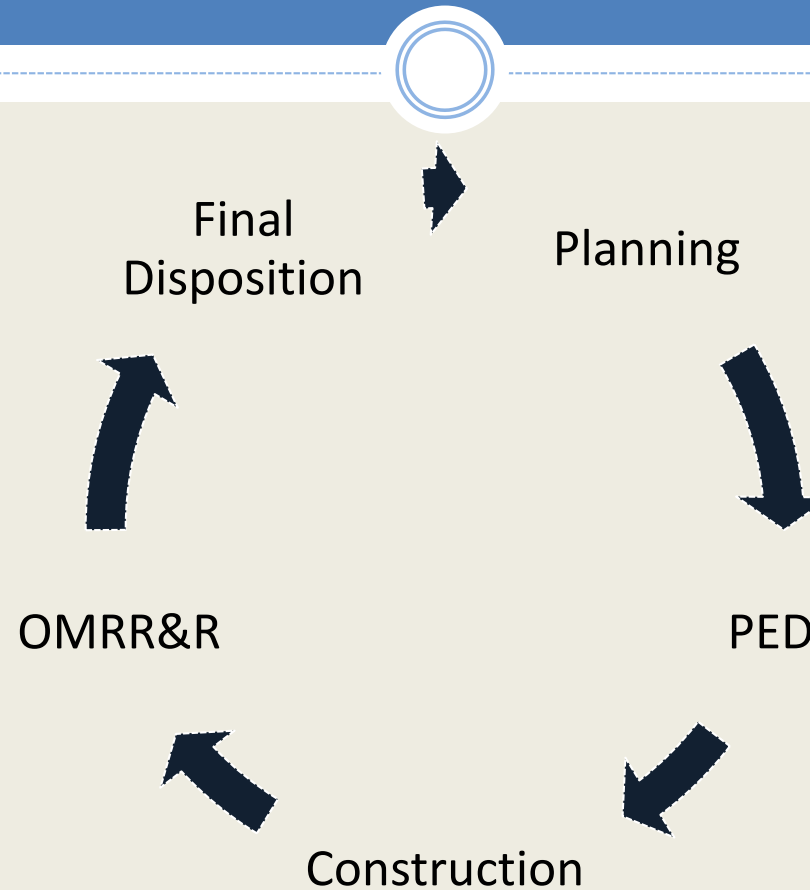


It is a fact of life.





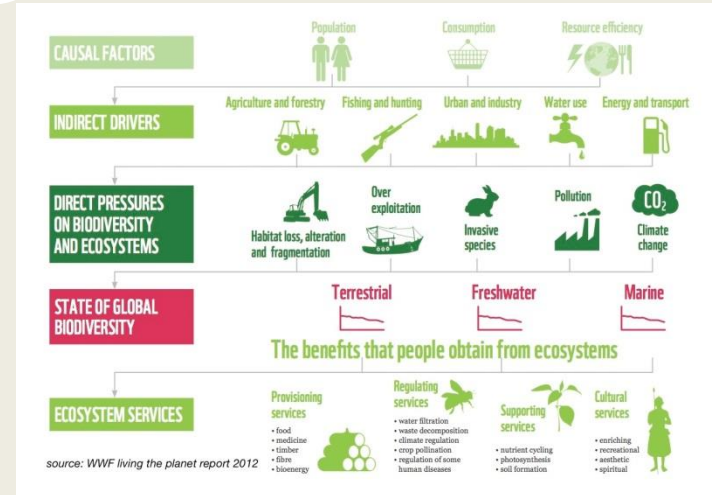
# Uncertainty Runs Throughout Project Life Cycle



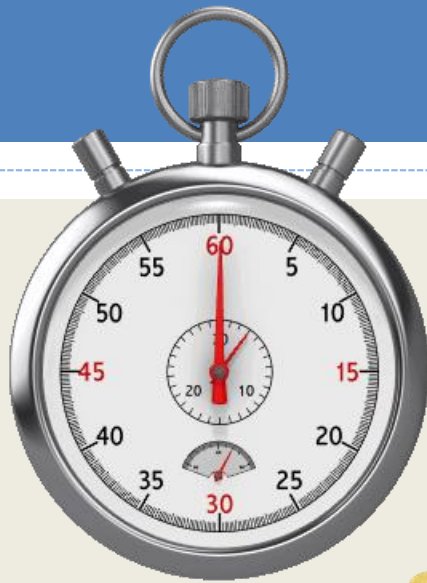
**And it gives rise to risks!**



# Risks in Community



# Study Risks



- Analytical error
- Study delays
- Study cost increase
- A poor planning decision

# Implementation Risks



- Schedule
- Cost
- Construction
- Safety



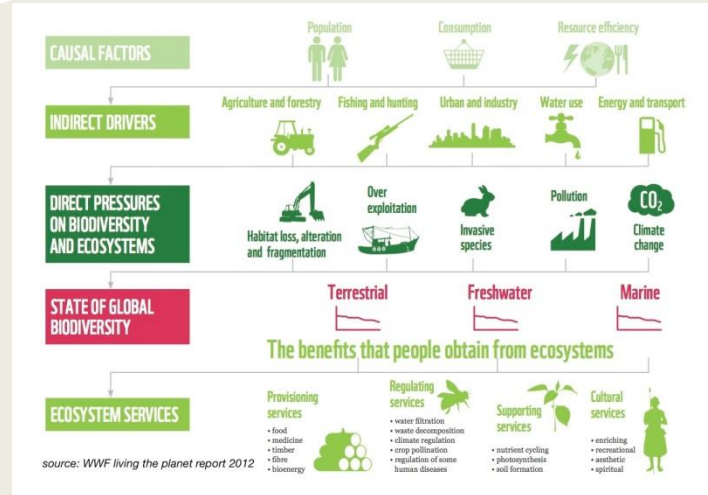
# Operation Risk




- OMRR&R costs
- Project performance
- Safety



# Outcome Risks





The only alternative to  
risk management is  
crisis management.





# You Need A Process



- USACE needs an enterprise risk management model
- Manage risk throughout the project life cycle
- Continuous decision making under uncertainty

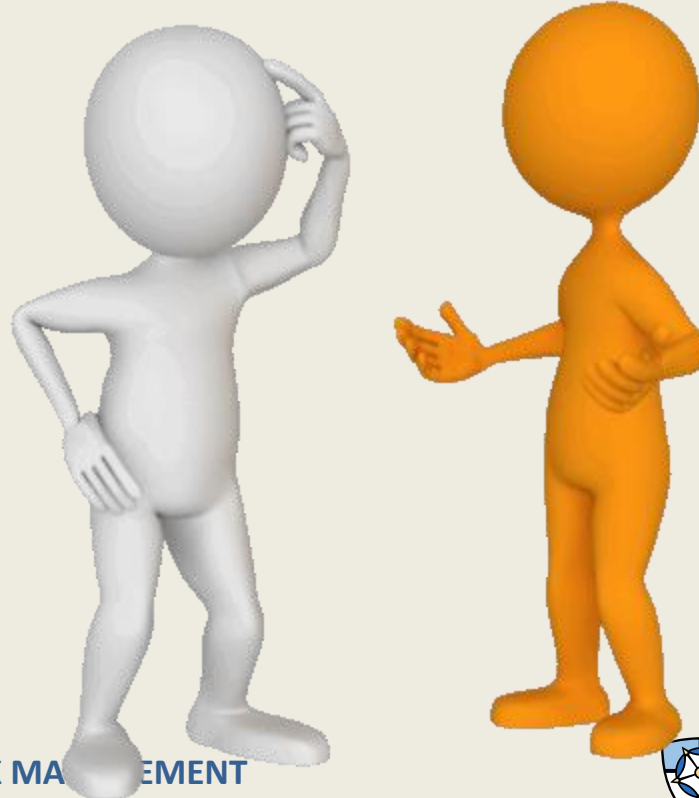


The goal is to use the data you have for the decisions you need to make. You don't need a project life's worth of data to make planning decisions. Neither do you need design data.

Use planning data for planning decisions; design data for design decisions, construction data for construction decisions and operation data for operations decisions.



Risk management is an ongoing process.



# No Perfect Answers in Planning



Wyoming Valley, PA Levee Project



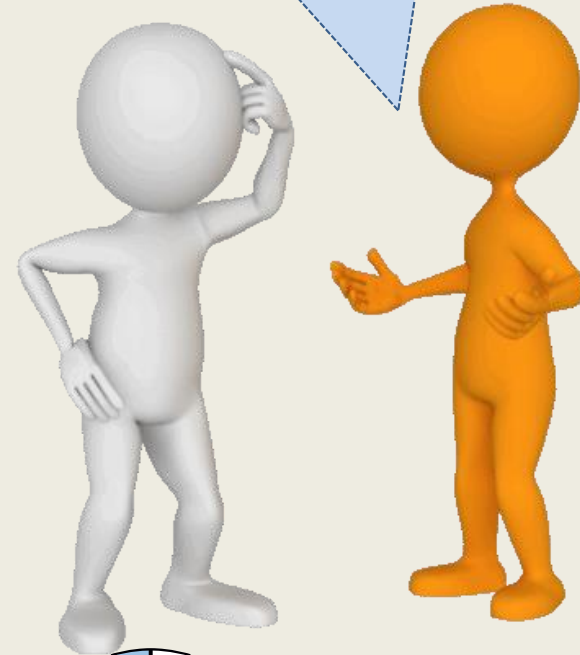
- Agnes overtopping not a failure
- Remedial work not a failure
- Levee raising not a failure
  - Cost estimated to be \$145M was \$250M

## Continuous DM Under Uncertainty

# It's the Same in Planning

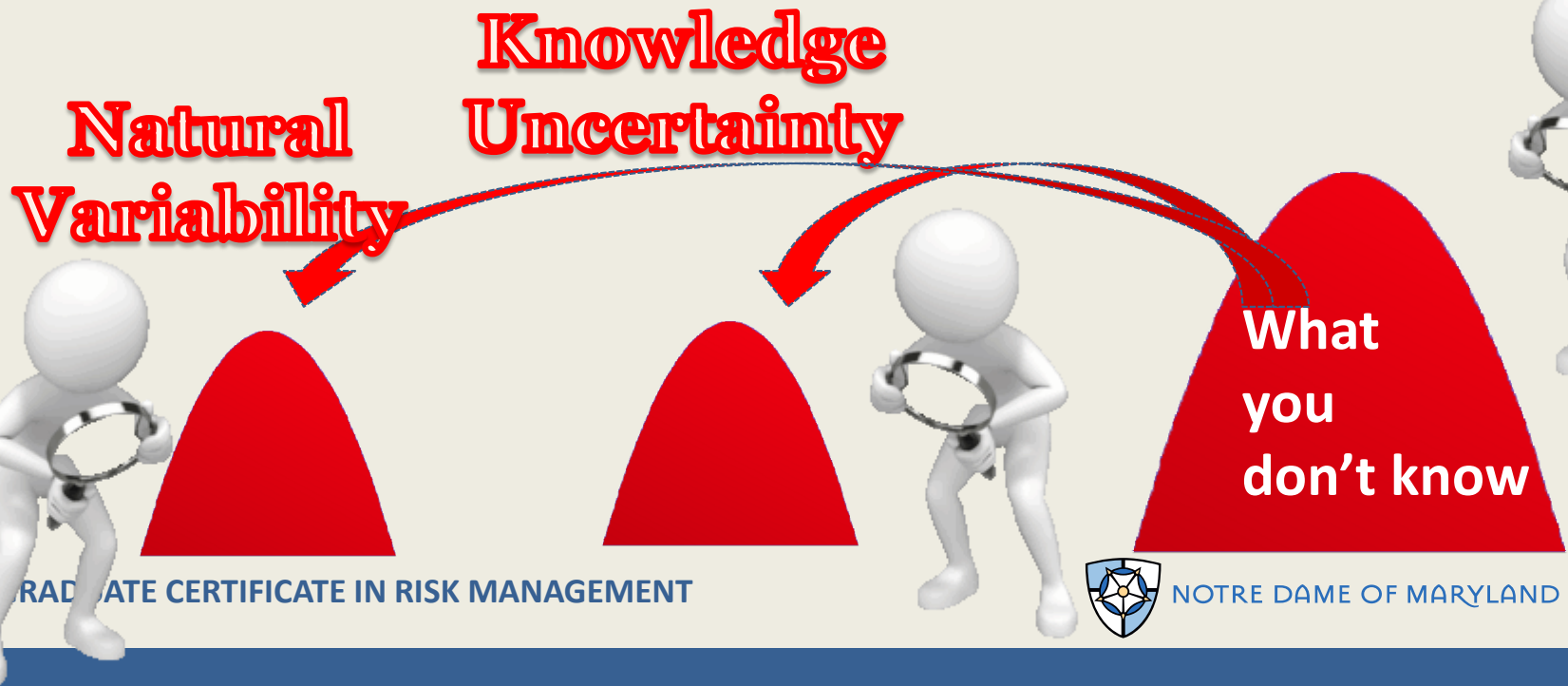
- Using parametric costs
- Assuming no HTRW
- Per unit benefit estimates
- Using existing WQ data

Manage your risks. If something happens deal with it. The world is not ending.



# Pay Attention to Uncertainty

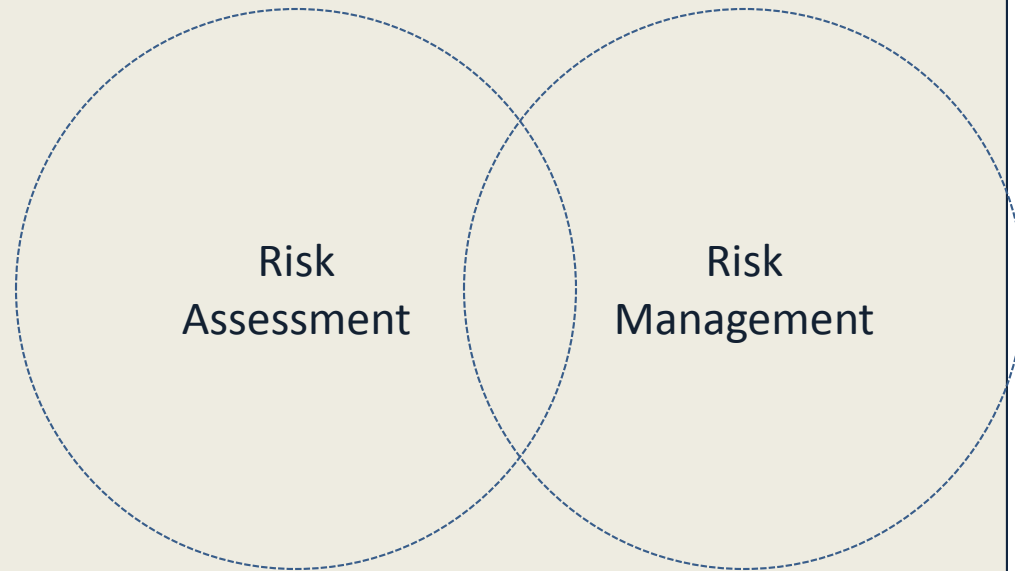
**You Can't Make It  
Go Away. Deal With It.**



# Risk Informed Decision Making



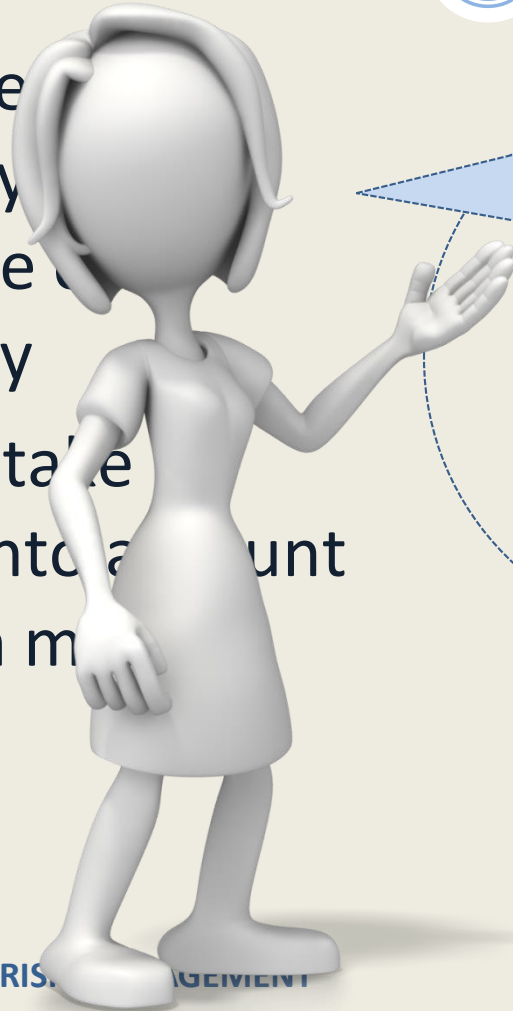
- Assessors estimate and convey significance of uncertainty
- Managers take it explicitly into account in decision making



# Risk Informed Decision Making



- Assessors evaluate and convey the significance of uncertainty
- Managers take uncertainty explicitly into account in decision making



Now, we are being intentional in how we analyze and consider the effects of uncertainty.

Assessment Management





# Risk and Planning

**Risk  
Management**

**Risk  
Communication**



**Risk Averse**

**Risk  
Assessment**

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# Transition to Risk Management Not Easy



# Food Safety CoP

## Traditional Performance Inspection Criteria

- Poultry cooked to minimum 165°F
- Shellfish from h for
- Who 140°F
- Milk pasteurized 15 sec
- Food control safety criteria  $A_w < 0.95$  &  $pH < 5.5$  for Lm
- 5 log reduction of *E. coli* O157:H7 in juice


Whatever happens must be all right if you:  
1. Follow the guidance.  
2. Look for problems.



# That Was Not Working

- Each year ~ 1 in 6 Americans get sick
  - 48,000,000 people
- 128,000 are hospitalized
- 3,000 die

CDC Home

 Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People. Saving Money through Prevention.

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## CDC Estimates of Foodborne Illness in the United States

[CDC Estimates of Foodborne Illness in the United States](#)

**CDC Estimates of Foodborne Illness in the United States**

- ▶ 2011 Estimates of Foodborne Illness
- 2011 Methods
- 1999 Methods
- Improvements in 2011 Estimates
- Differences between 2011 and 1999 Estimates
- Trends in Foodborne Illness
- Questions and Answers
- Resources

### CDC 2011 Estimates: Findings

CDC estimates that each year roughly 1 in 6 Americans (or 48 million people) gets sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases.

Please visit the [CDC Online Newsroom](#) for the December 15, 2010 [media briefing](#), [transcript](#), and [press release](#); read our feature on 2011 Estimates of Foodborne illness in the United States; and also hear the Emerging Infectious Diseases Podcast: [New U.S. Foodborne Illness Estimates](#)



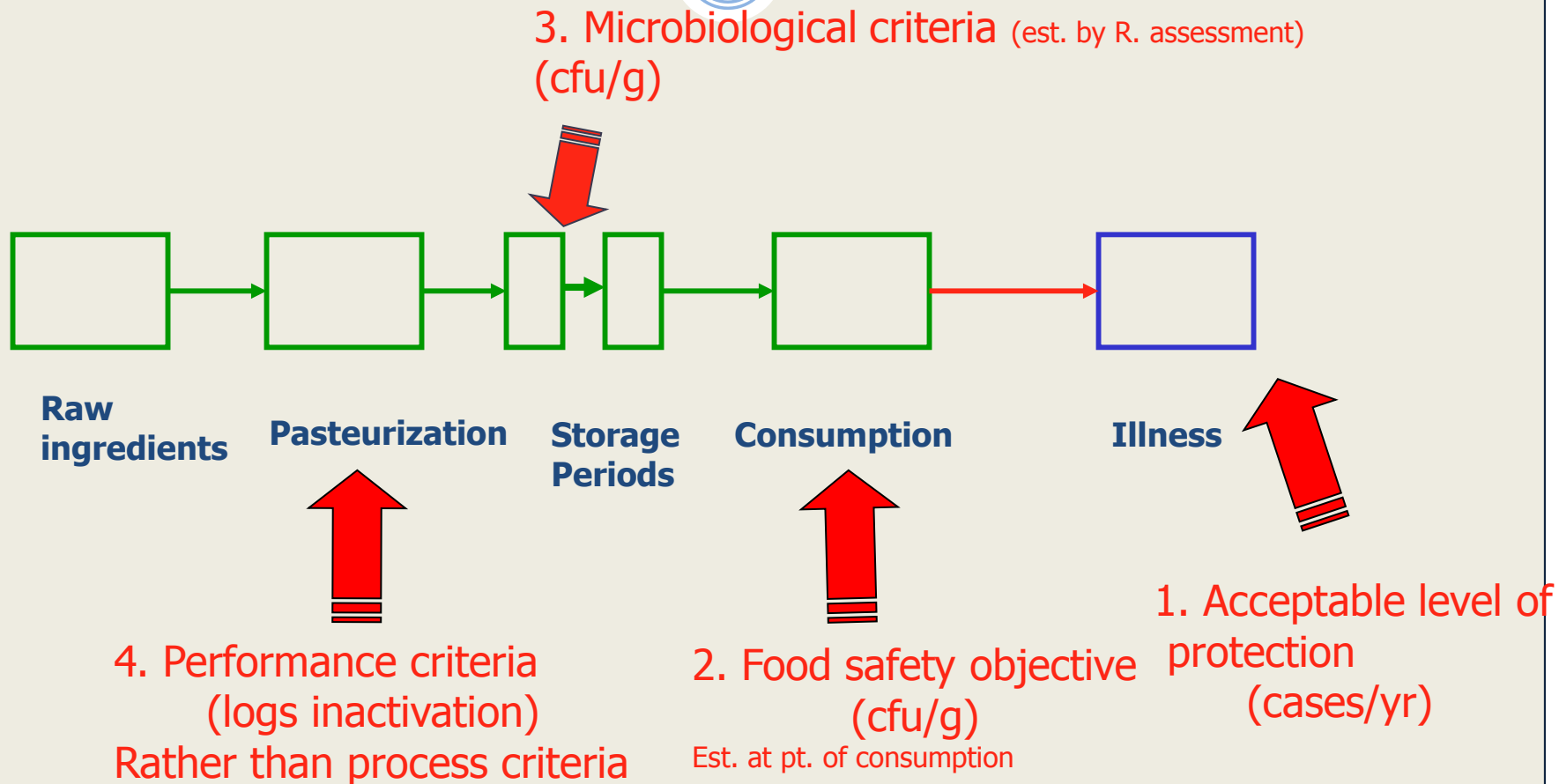
# The Key

## Risk Analysis



- Focus on desirable outcomes not rules
- Prevent problems don't solve them
- Free people to achieve outcomes

# FSO: Freedom From Procedures



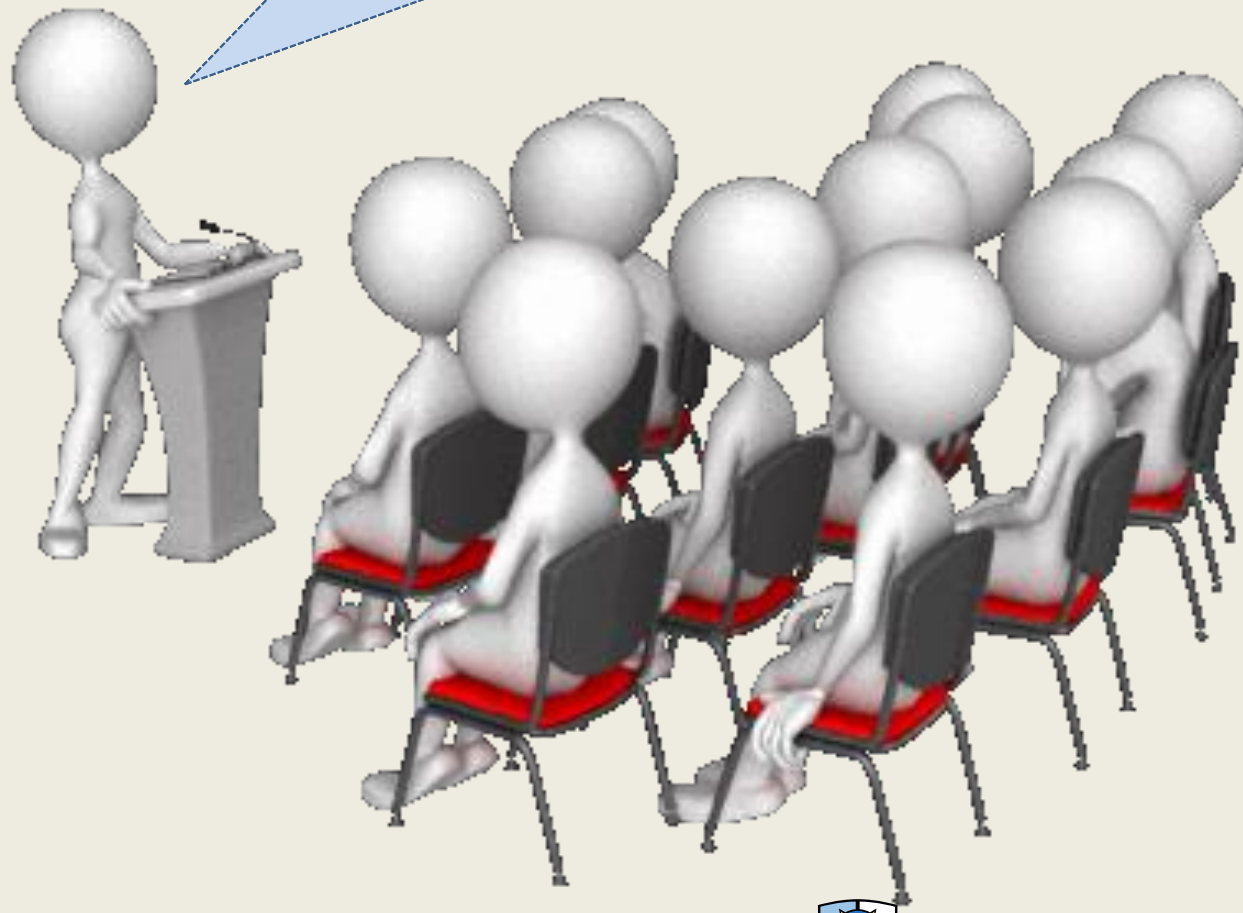
# Agencies Struggle




- APHIS-wants pest risk management textbook
- FSIS-RM to get out in front of the process
- CFSAN-used failure and success stories to define RM process



Risk management is outcome oriented decision making and those decisions are made under uncertainty.



# USACE's Traditional Performance Criteria



US Army Corps of Engineers

HOME • USACE PUBLICATIONS • ENGINEER REGULATIONS

USACE PUBLICATIONS ARMY PUBLICATIONS RELATED PUBLICATIONS

Engineer Regulations

Search

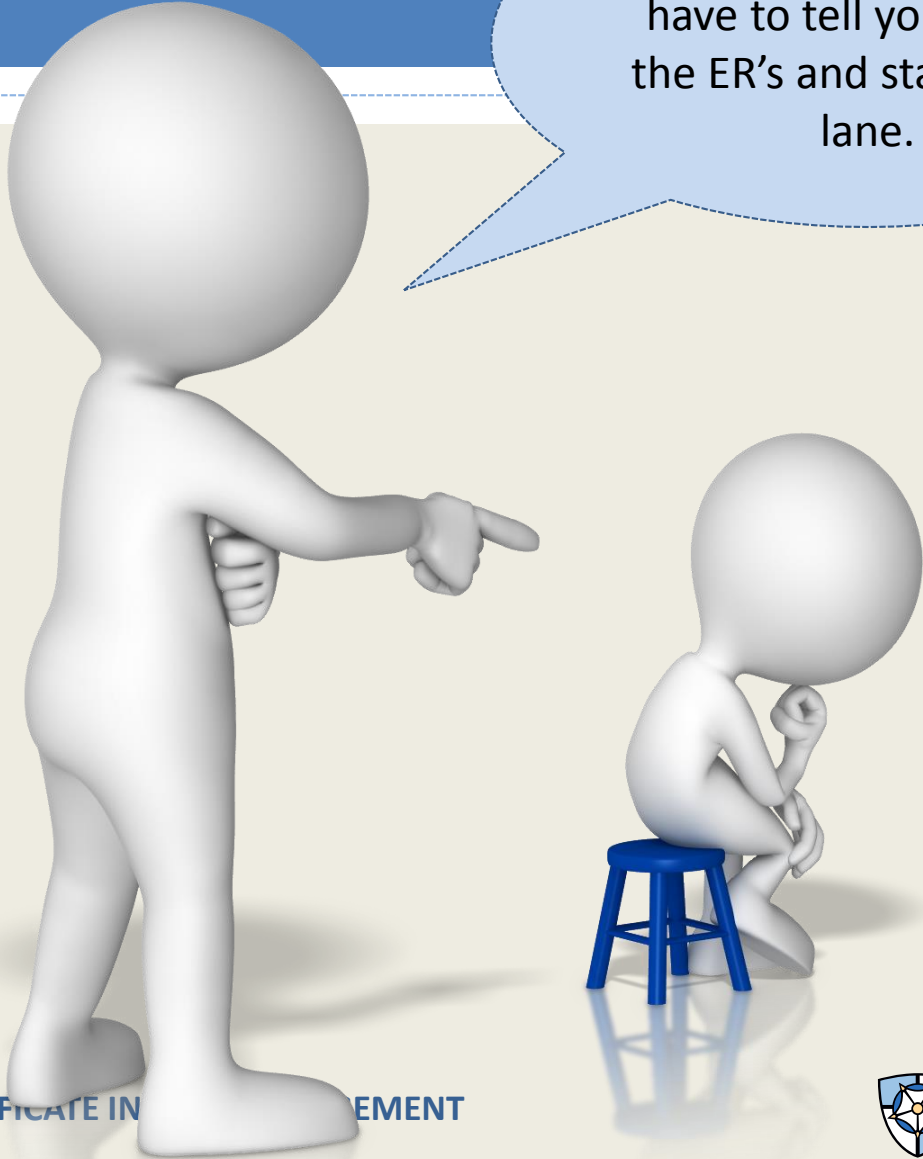
Pub Number <sup>1</sup>	Proponent	Title
ER 1-1-11	CEMP-CE	Progress, Schedules, and Network Analysis Systems
ER 1-1-25	CERM-MP, DAEN-RMM-P	Command Visits
ER 1-2-2	CECW-PL	Water Resources Policies and Authorities Substantive Congressional Contacts (RCS: CECW-P-21)
ER 5-1-9	CERM-M	Assignment and Transfer of Project Responsibilities
ER 5-1-10	CECW-CE	Corps-wide Area of Work Responsibility
ER 5-1-11	CECW-CB	U.S. Army Corps of Engineers Business Process
ER 5-1-13	CERM-P	U.S. Army Corps of Engineers Policy on Regional Business Centers (RBCs)
ER 5-1-14	CERM	Resource Management - USACE Quality Management System
ER 5-1-15	CESI-P	Strategic Management
ER 5-1-16	CEMP-CN	Management Capacity Development - International
ER 10-1-5	CERM-MO	Mississippi River Commission
ER 10-1-8	CERM-MO	U.S. Army Engineer Waterways Experiment Station
ER 10-1-11	CERM-OO	U.S. Army Engineer Housing Support Center
ER 10-1-16	CERM-O	U.S. Army Coastal Engineering Research Board
ER 10-1-22	CERM-M	U.S. Army Engineering and Support Center, Huntsville

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Avoid the ad hoc  
assemblage of  
requirements and  
control measures,  
e.g.,

291 Engineering  
Regulations!





How many times do I  
have to tell you, follow  
the ER's and stay in your  
lane.

Planning  
sucks.



# Outcomes

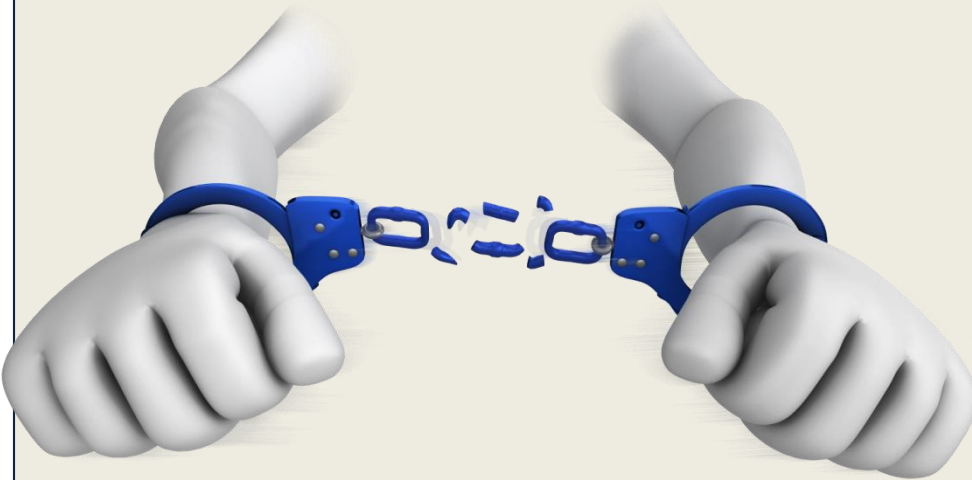
- Lives lost
- Flood damages
- Navigation disruptions
- Reallocation studies
- Dam Safety
- Levee Safety
- Dam removal
- CERP
- Ecosystem restoration
- Cost estimating
- Project-based budgeting
- ANS



How's that ER  
management  
working for ya?



# Risk-Informed Planning



- Can set planners free!
  - Less guidance
  - More creativity
  - More innovation
  - Assume more risk
  - Better outcomes!



# Risk Management

# Traditional



- Objectives Focused
- Predictive Indicators
- Foresight
- Strategic
- Creates and captures value

- Event Focused
- Post-action Response
- After-thought
- Transactional
- Protects Value



Which best describes  
what you want to be?



# RISK MANAGEMENT

- Protect life, health & safety
- Energize the economy
- Reduce risk from disasters



# TRADITION

- Stay in your lane
- Follow the guidance
- Whatever happens must be okay






USACE

**Traditional  
Approach**

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It's risk management  
or it is not. Commit or  
go back!

**Risk  
Management**



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# USACE Transition Challenge



## To Risk Management



## From Project Building

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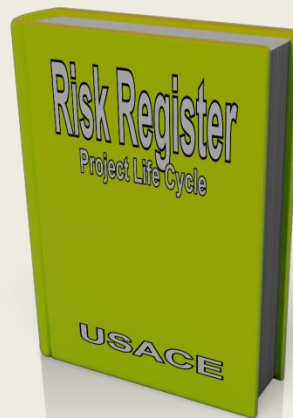


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# Risk Management Agency

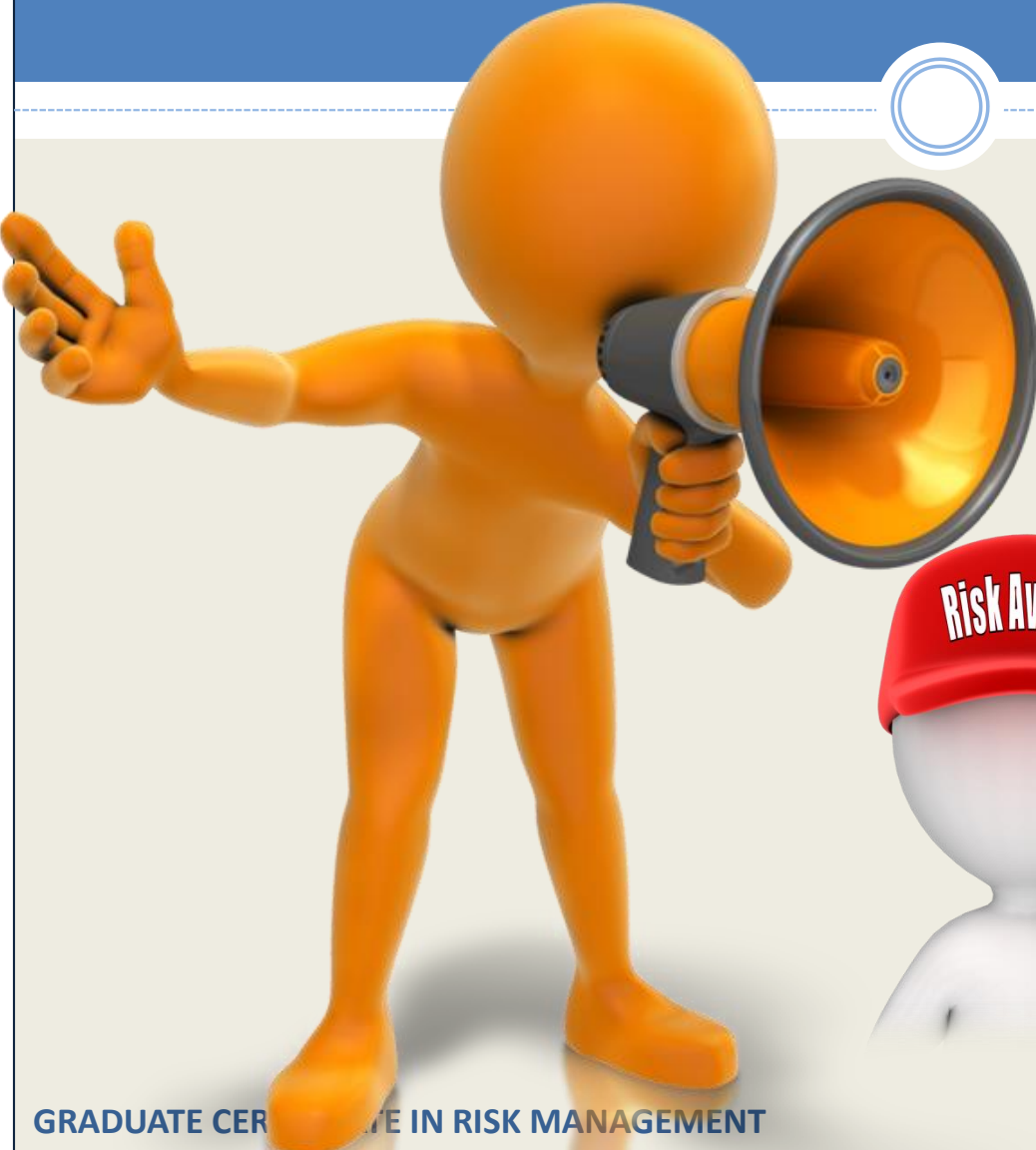
- The goal is to assume risk judiciously, mitigate it when possible, and prepare yourselves to respond effectively and efficiently when necessary







But what does it really mean?



You must both  
take and avoid  
risks!

Risk Avoider

Decision  
making  
must  
evolve.

Risk Taker

# Decision Making Under Uncertainty

Can't you just give me the damn number!

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10 15 20 25 30 35 40 45 50

Poor boss, he does not understand. There is no such thing as the number. There is too much uncertainty.



We need to use all the good information we generated in our risk assessment to make risk-informed decisions.

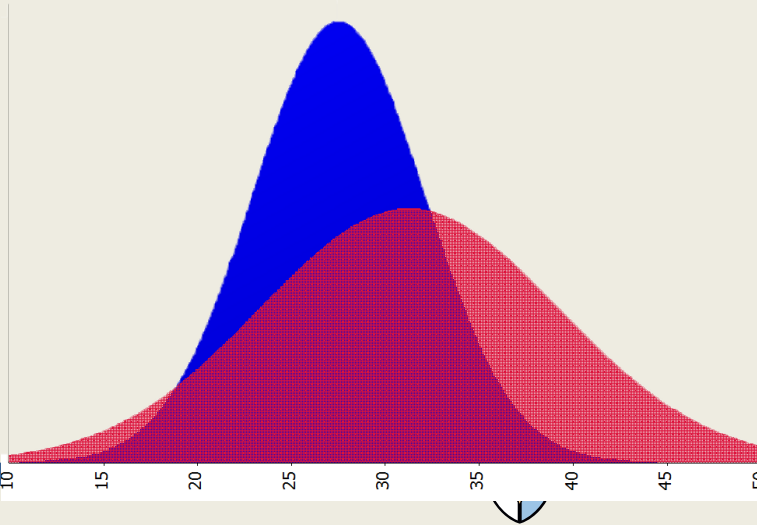
This is going to frustrate people for awhile.



# Help The Decision Maker



- Develop and use risk information to aid decisions made under uncertainty





# New Decision Metrics

- Life safety risk
  - Number of lives at risk, social vulnerability
- Economic risk
  - Net economic benefits, financial risks
- Engineering risk and reliability
  - PUP
  - Fragility curves



# New Risk Metrics



- Residual risk
- New risk
- Transformed risk
- Transferred risk
- New metrics
  - DSAC Class I - V
  - LSAC Class I - V
  - Partitioned risk





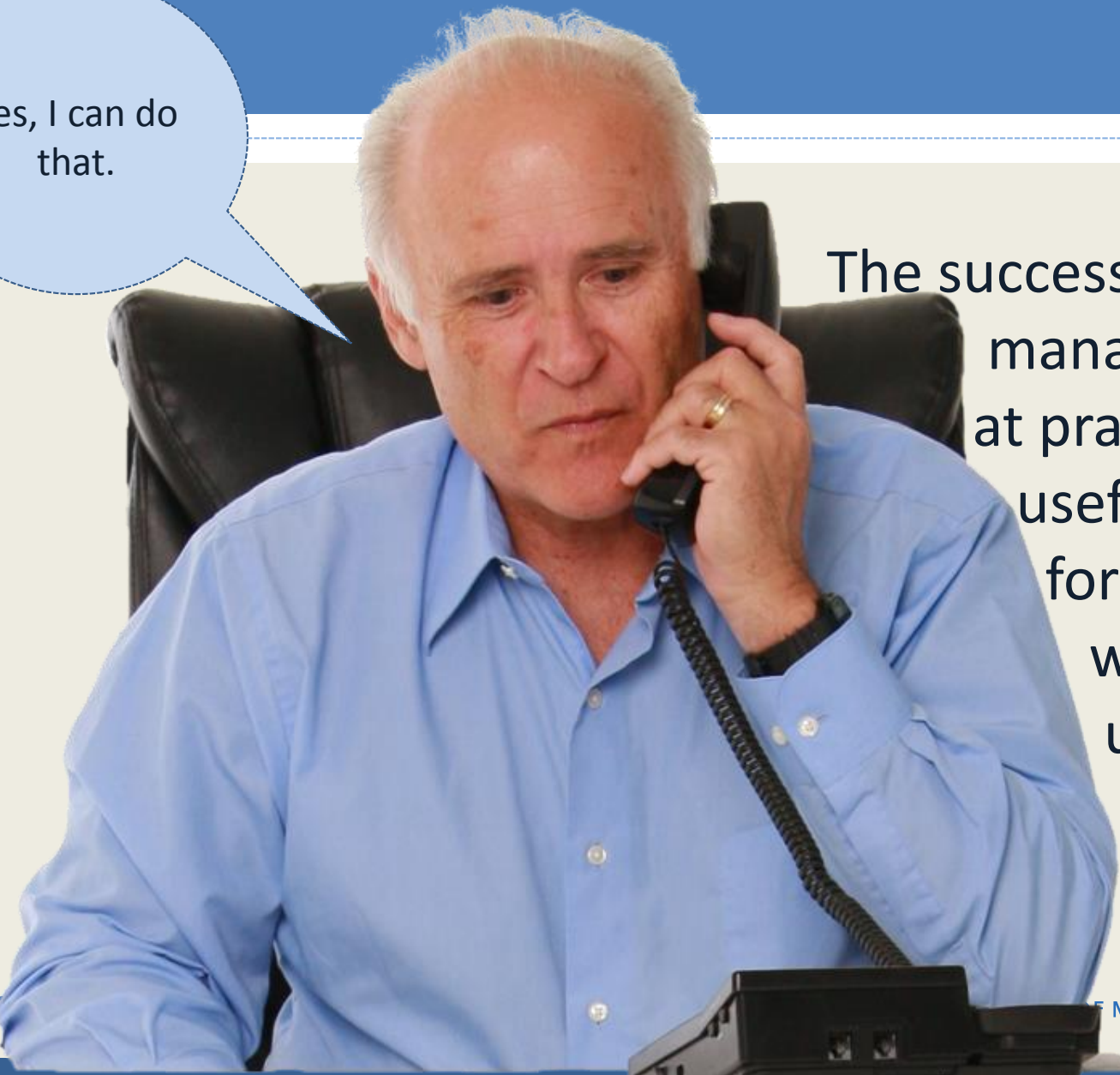
What am I supposed to  
do with these new  
metrics?



# Make Decisions!



- How much detail is enough for now?
- What level of risk is tolerable?
- How will we manage risks to limit undesirable outcomes in planning studies?



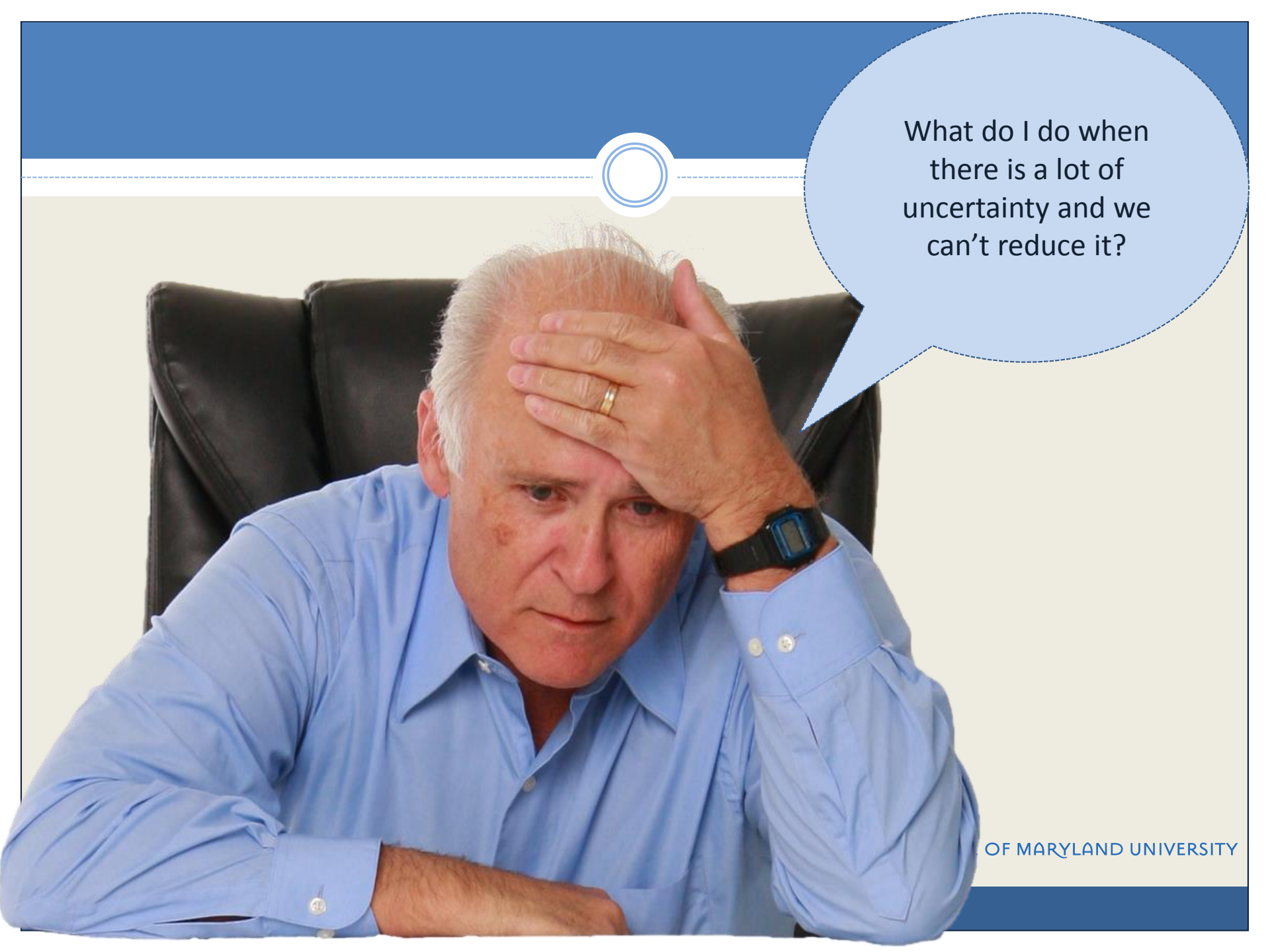
Yes, I can do that.

The successful risk manager arrives at practical and useful solutions for dealing with uncertainty

# Risk Narratives

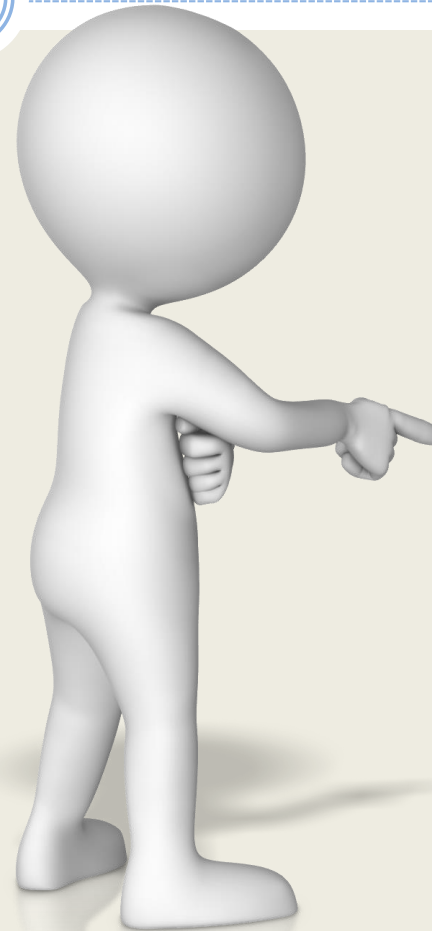
- We need to tell vivid and honest stories
- Proclaim uncertainty
- How do we convey what a levee overtopping would mean?






What do I do when  
there is a lot of  
uncertainty and we  
can't reduce it?


Live with it and  
don't punish  
responsible risk  
taking.







We'll learn  
from it!



If you take risks  
some of them  
will turn out  
poorly.



Let's  
summarize.

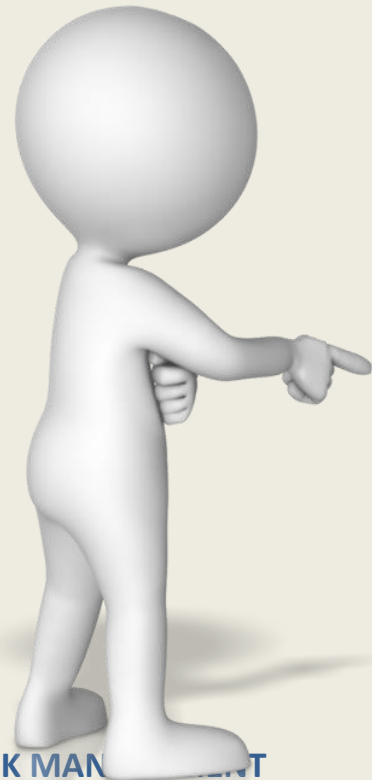




# Take Away 1



- Planning has changed so USACE should change the way it plans



**Risk-informed  
planning**



# Take Away 2



- Uncertainty has always been there, it is time to deal with it



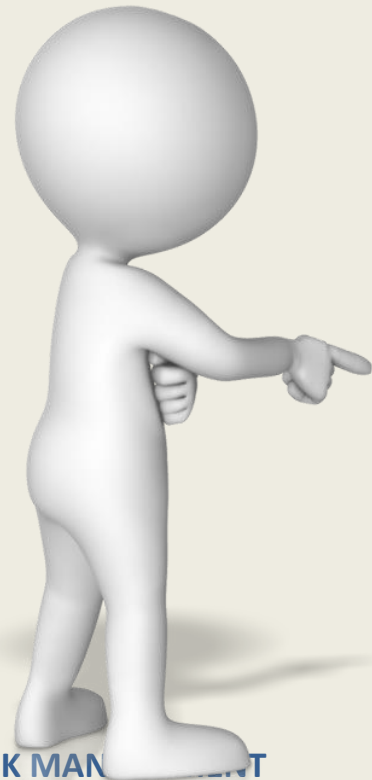
**Risk assessors and  
risk managers must  
both address uncertainty  
in their work**



# Take Away 3



- You are either doing risk management or you're doing something else



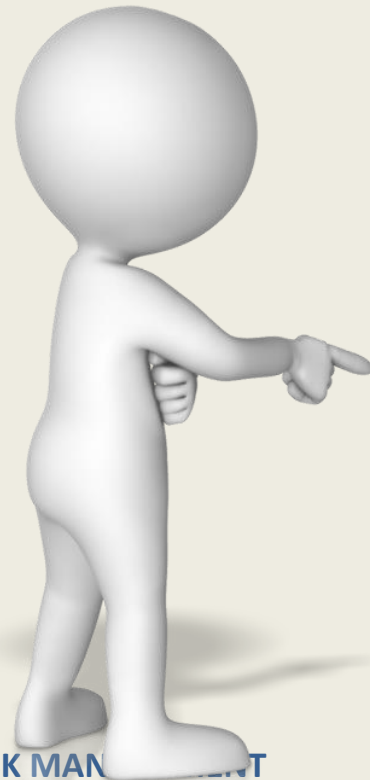
**Commit to strategic  
risk management**



# Take Away 4



- Risk managers balance risk taking and avoiding risk to achieve goals



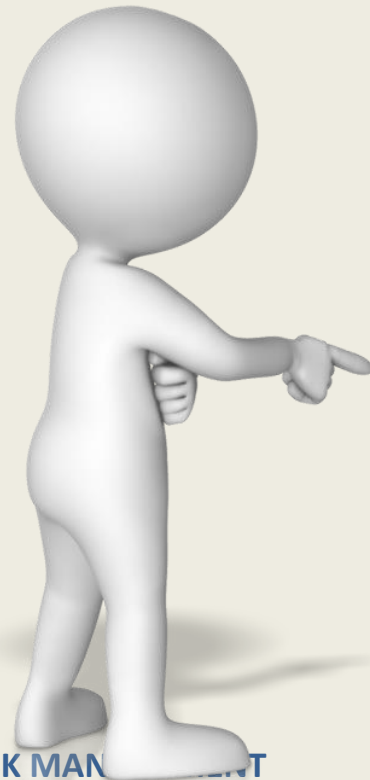
**You must take  
some risks to move  
forward**



# Take Away 5



- The USACE has the opportunity to become the Nation's risk management leader



**Adopt an enterprise  
risk management  
model**



# Thank you.



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