

U.S. Army Corps of Engineers

Lessons and Observations from the Dam and Levee Safety Programs

October 2012

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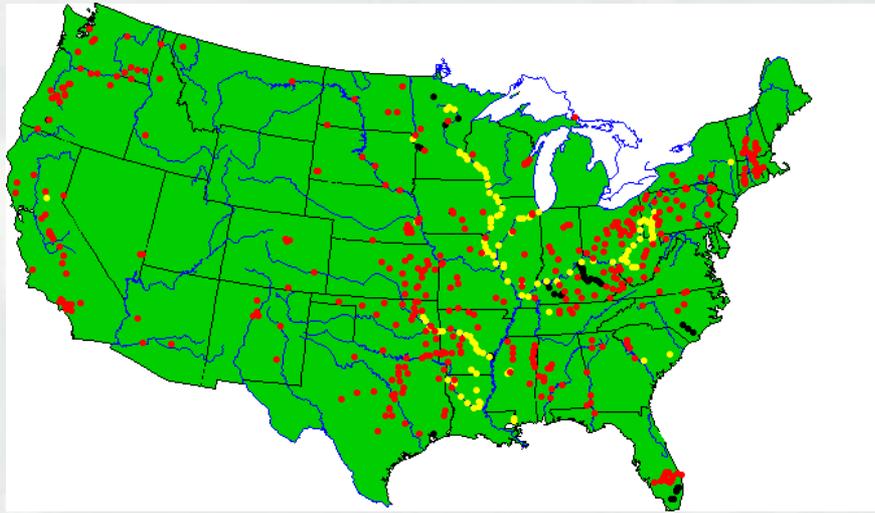


Outline

- Strategic Transformation
- Program Summaries and Budgets
- Challenges, Observations and Lessons



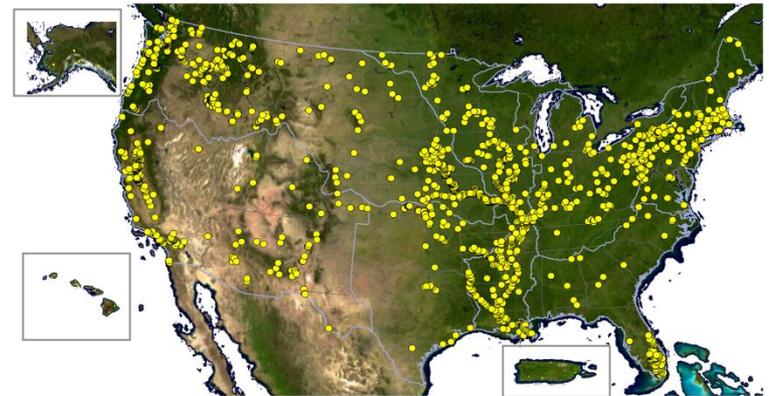
Current Safety Environment: State of Infrastructure



702 Dams

***Infrastructure follows Floods,
People Follow Infrastructure***

- Portfolio Stats:
 - ▶ Very Large
 - ▶ Aging (+55 years)
 - ▶ Relatively untested
 - ▶ Geotechnical Challenges



+2,500 Levee Systems

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Strategic Transformation

- **Planning Modernization:**

- ▶ Levee modifications shall follow new planning paradigm – SMART Planning / 3x3x3
- ▶ Integration across disciplines, programs, and communities of practice
- ▶ Life safety risks are an explicit consideration in levee safety and planning
- ▶ Decision oriented

- **Methods of Delivery:**

- ▶ Dam/Levee Production Centers approach to building technical competencies
- ▶ New oversight committees in geotechnical, geology, and drilling
- ▶ Training and developmental assignments



Strategic Transformation (Continued)

- **Infrastructure Strategy:**

- ▶ Mature decision processes for projects and portfolios
- ▶ Leading in method, policy, and organizational structure/practice.

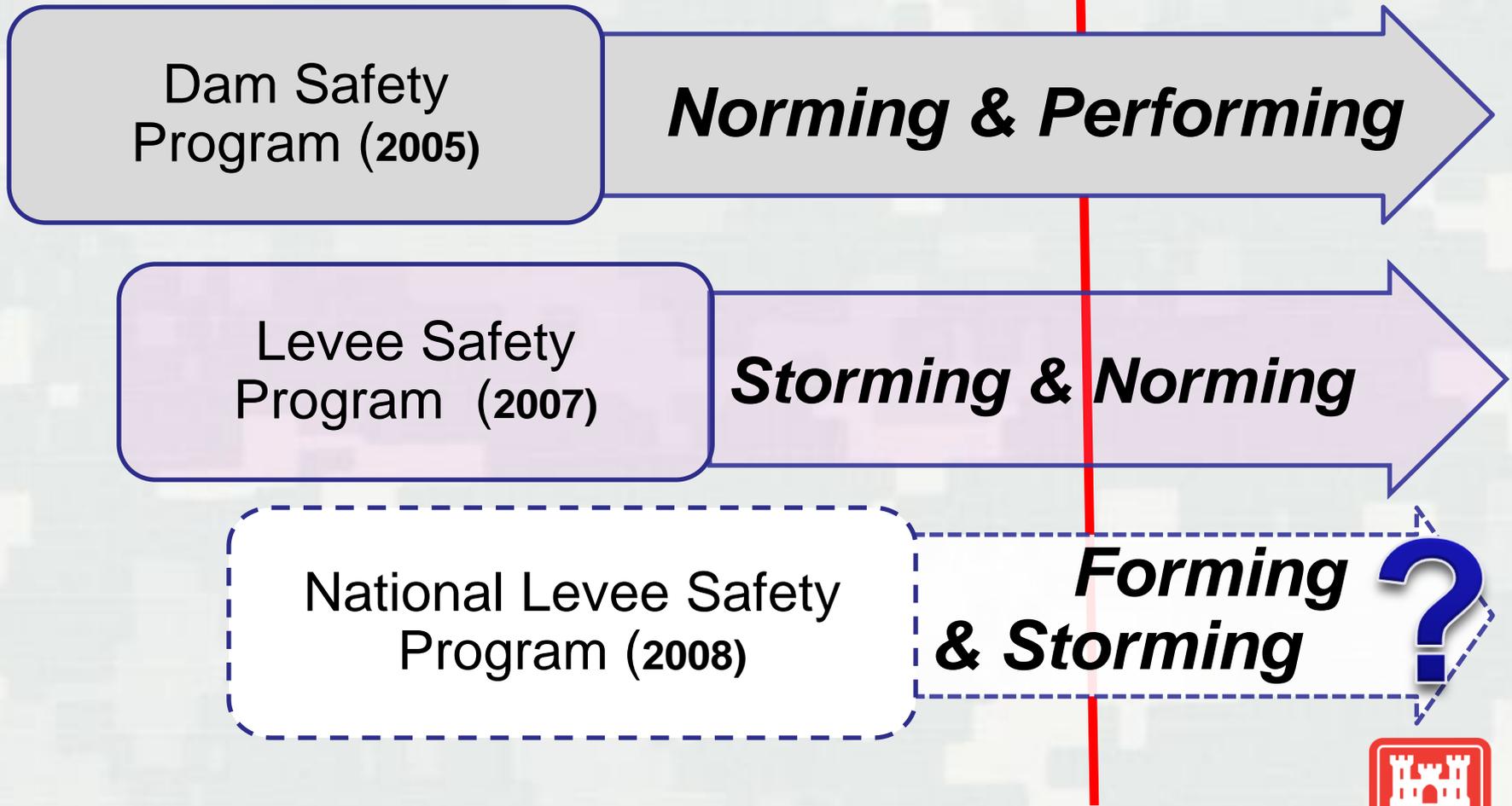
- **Integrated Investments:**

- ▶ Portfolio investment strategy (plan) for levees has structured decisions
- ▶ Objective and based on criteria

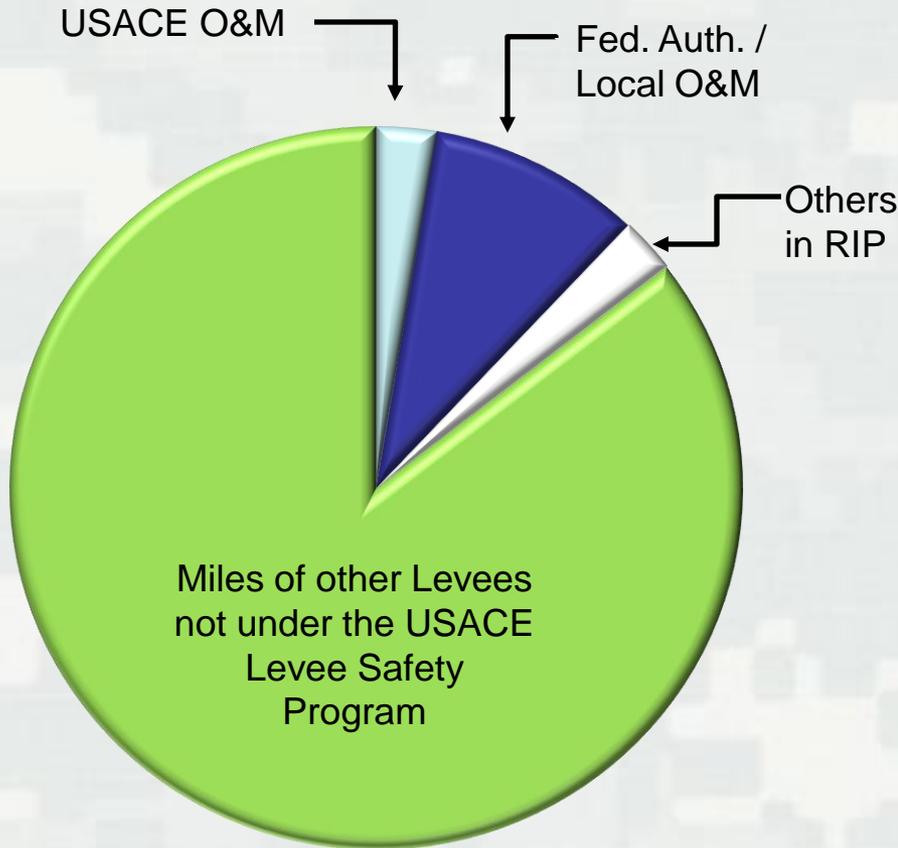


Safety Programs in Evolution

(Forming, Storming, Norming, Performing)



USACE Levee Safety Program - Portfolio Distribution



- 100,000 miles of levees in the U.S. as estimated by the National Committee on Levee Safety
- 2,700 miles – USACE operated & maintained
- 9,400 miles – Federally authorized, local sponsor operated & maintained
- 2,500 miles – Non-Federal systems in the RIP (PL 84-99)
- 85,000 miles – not in the USACE Levee Safety Program



FY 2012 Levee Safety Program

\$50.3 Million

- **\$20.4 Million: Inventory & Assessment**

- ▶ International Levee Handbook
- ▶ Levee Safety Policy and Procedures
- ▶ Project Management
- ▶ National Levee Database
- ▶ Levee Screening Tool and Assessments



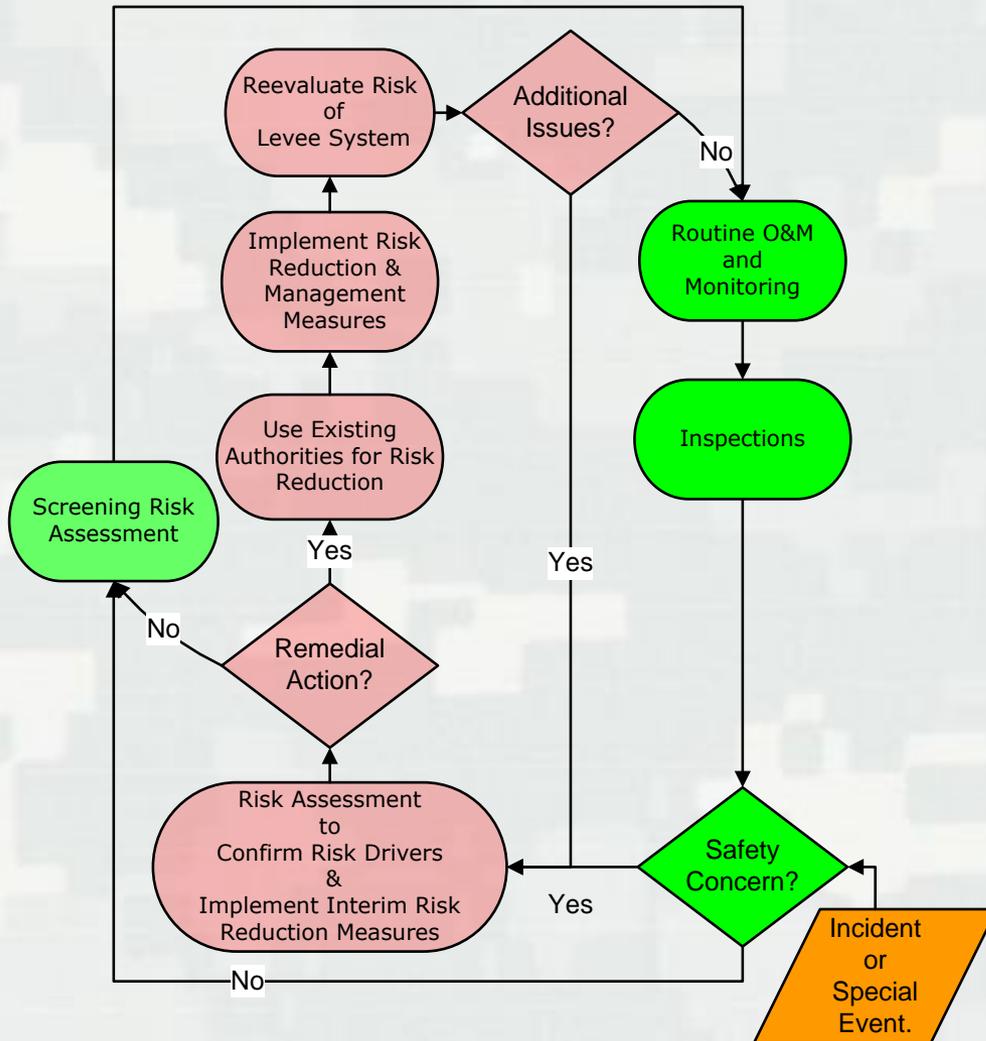
- **\$26.0 Million: ICW & Safety Program**

- ▶ Periodic Inspections
- ▶ Levee Screenings

- **\$4 Million: Risk Communications**



Routine Levee Safety Activities



- NLD launches external to Corps
- Reached halfway point for Periodic Inspections
- Continue screening level risk assessments and plan for risk communication



National Levee Database

<https://nld.usace.army.mil>

Creation began in 2006 – Open to the Public October 2011

- Interagency Steering Committee
- Incorporating other datasets
- USACE/FEMA integration team
- Outreach activities

>3,242 Segments and >2,486 Systems

Known miles today = 14,501

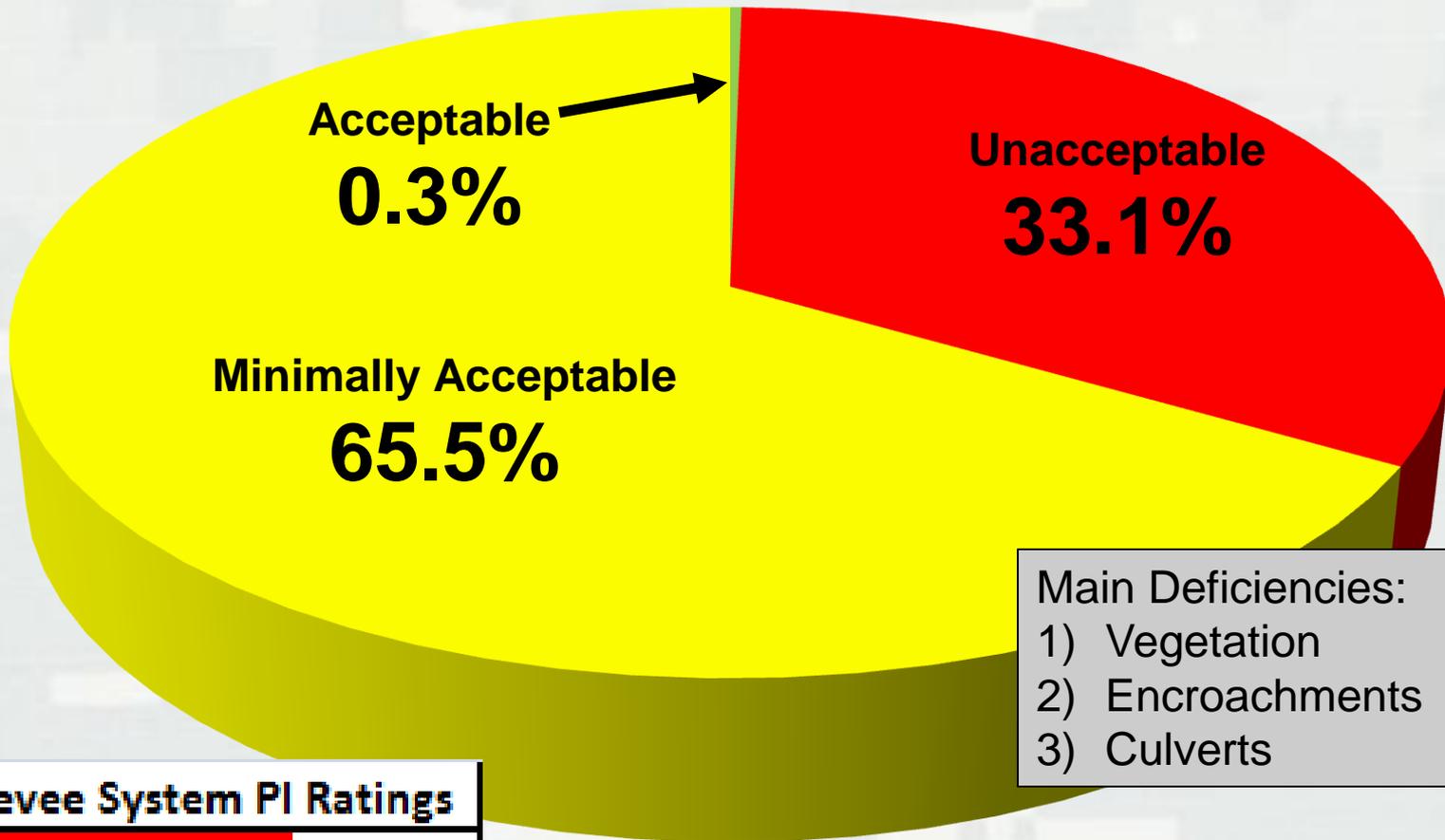
Miles Completed = 14,458 > 99.9%

Miles under contract = 43 < .1%

675,000+
Website visitors



USACE Periodic Inspection Ratings



Main Deficiencies:
 1) Vegetation
 2) Encroachments
 3) Culverts

USACE Levee System PI Ratings	
Unacceptable	274
Minimally Acceptable	552
Acceptable	3
Total Ratings	829

- 540 Systems remaining to be Inspected.
- Target Completion Date: end of FY-15

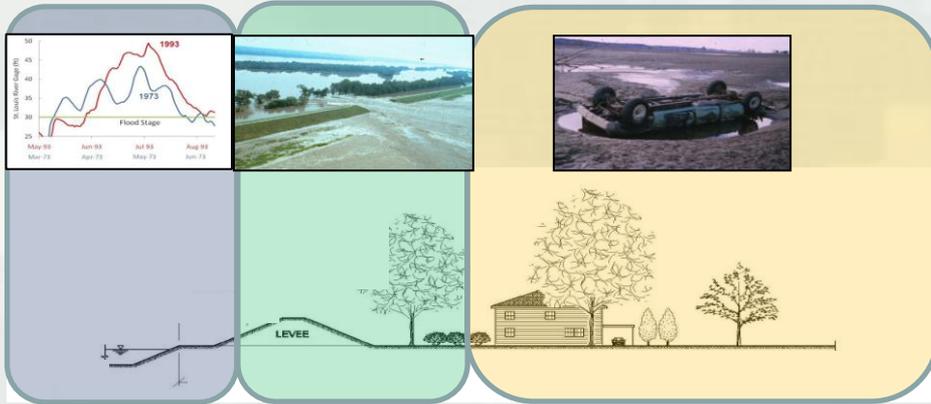


USACE Levee Safety Program

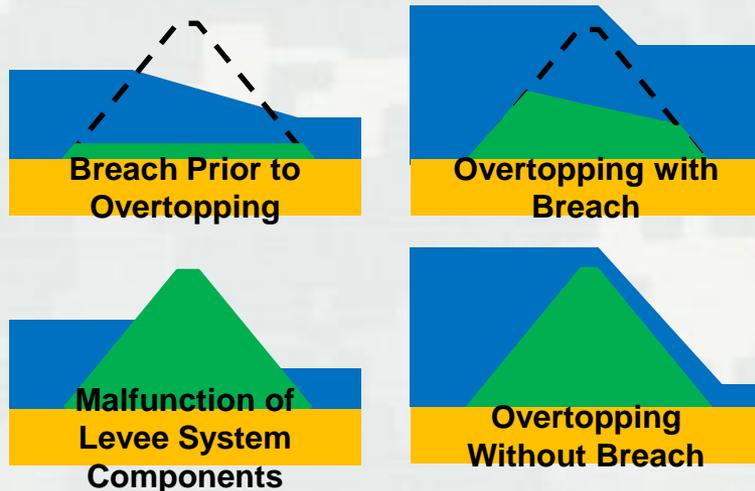
Implementing the Risk Framework



Risk Characterization



Risk = f(Hazard, Performance, Consequences)



- Scalable Risk Assessments
 - ▶ Commensurate with Decision to be Made
 - ▶ Screening Level for Entire Portfolio
 - ▶ Higher Level Risk Assessment for Non-Routine Decisions



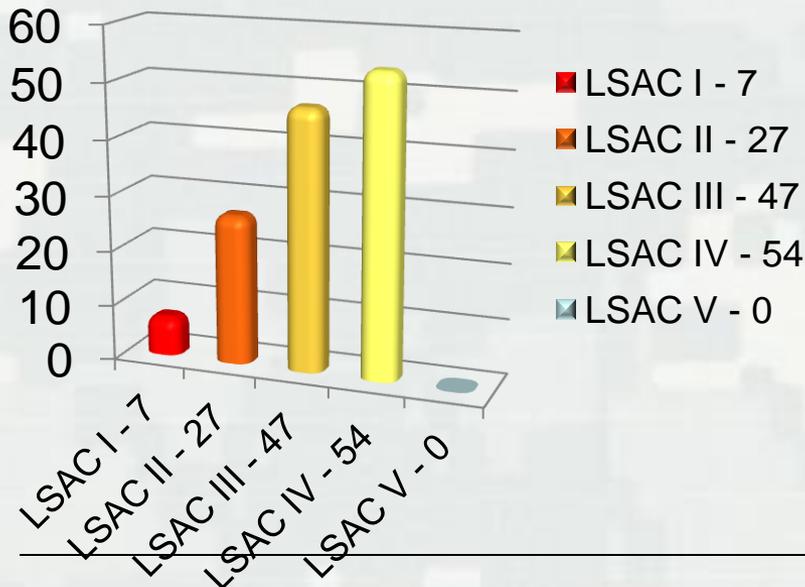
Risk Characterizations (LSAC)

By the Numbers

- Started – 834 segments
- Remaining – 2,407

Current Status:

- MSC approved – 236
- National approved – 135
 - ▶ Proposed LSAC



Actions:

(1) Continue to Refine Screening Process and Results

(2) Finalize Communication Plan

(3) Socialize Roles and Responsibilities with Districts

(4) Target Completion: FY-15



Table 3.1 - USACE Levee Safety Action Classification Table* 15 August 2012

* At any time, a levee system from any action class can become an emergency requiring activation of the emergency action plan.

Levee Safety Action Class	<p style="text-align: center;">Actions for Levee Systems in this Class <i>(Adapt actions to specific levee system conditions.)</i> Additional actions in 1) apply to USACE Operated and Maintained Levee Systems; and actions in 2) apply to Levee Systems Operated and Maintained by Others in USACE Program</p>	Characteristics of this Class
<p style="text-align: center;">Extremely High Urgency</p>	<p>Immediately inspect levee system; assure O&M is up to date; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verification that warning, evacuation and emergency action plans are viable; flood inundation maps are current; there is an active community hazard awareness program; recommend purchase of flood insurance; and vigilant levee monitoring program is in place. Support portfolio priorities for risk reduction actions.</p> <p>1) Take urgent action to reduce the likelihood of a breach and mitigate consequences through implementation of interim risk reduction measures. 2) Responsible entity to implement interim risk reduction measures.</p>	<p>Probability of inundation due to breach and/or system component failure in combination with loss of life, economic, or environmental consequences results in extremely high risk. USACE considers this level of life-risk to be unacceptable except in extraordinary circumstances.</p>
<p style="text-align: center;">Very High Urgency</p>	<p>Inspect levee system; assure O&M is up to date; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verification that warning, evacuation and emergency action plan are viable; flood inundation maps are current; there is an active community hazard awareness program; recommend purchase of flood insurance; and vigilant levee monitoring program is in place. Support portfolio priorities for risk reduction actions.</p> <p>1) Take immediate action to implement interim risk reduction measures. 2) Responsible entity to implement interim risk reduction measures.</p>	<p>Probability of inundation due to breach and/or system component failure in combination with loss of life, economic, or environmental consequences results in very high risk. USACE considers this level of life-risk to be unacceptable except in extraordinary circumstances.</p>
<p style="text-align: center;">Moderate to High Urgency</p>	<p>Verify inspection is current; assure O&M is up to date; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verify that warning, evacuation, and emergency action plan are viable; flood inundation maps are current; there is an active community hazard awareness program; and routine levee monitoring program is in place; recommend purchase of flood insurance; and develop and execute levee monitoring program. Support portfolio priorities for risk reduction actions.</p> <p>1) Implement interim risk reduction measures; schedule development of risk reduction studies. 2) Responsible entity to develop interim risk reduction and risk remediation plans.</p>	<p>Probability of inundation due to breach and/or system component failure in combination with loss of life, economic, or environmental consequences results in moderate to high risk. USACE considers this level of life-risk to be unacceptable except in unusual circumstances.</p>
<p style="text-align: center;">Low to Moderate Urgency</p>	<p>Verify inspection is current; assure O&M is up to date; communicate risk findings to sponsor, state, Federal, Tribe, local officials, and public; stress improved floodplain management to include: verify that warning, evacuation, and emergency action plan are viable; flood inundation maps are current; there is an active community hazard awareness program; and routine levee monitoring program is in place; recommend purchase of flood insurance; develop and execute levee monitoring program. Support portfolio priorities for risk reduction actions.</p> <p>2) Responsible entity to develop interim risk reduction and risk remediation plans.</p>	<p>Probability of inundation due to breach and/or system component failure in combination with loss of life, economic, or environmental consequences results in low to moderate risk. USACE considers this level of life-risk to be in the range of tolerability but does not meet all essential USACE guidelines.</p>
<p style="text-align: center;">Normal Activities</p>	<p>Continue routine levee safety activities, operation and maintenance, normal inspections, stress improved floodplain management to include: annually ensure that warning, evacuation and emergency action plan are functionally tested; recommend purchase of flood insurance; maintain levee monitoring program.</p>	<p>There is a very low probability of inundation due to breach and system component failure and/or consequences are low. USACE considers this level of life-safety risk to be tolerable and meets essential USACE guidelines.</p>

Numbers Removed
References Removed
Colors Modified

Actions Moved to Center of Emphasis

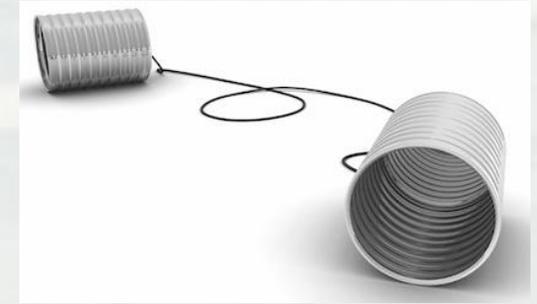
Rephrased Safety Around Tolerable Risk Concepts

Improving Dialogue on Levee Risks and Benefits

- Primary audience = non-federal sponsors
- 3-step play to improve quality of discussion and relationship with sponsor, not just delivering USACE message (partners in shared responsibility).
 - ▶ **Step One:** Written survey to 44 Districts who have held LSAC pre-release conversations – “How did it go?”
 - ▶ **Step Two:** Telephone survey to 60+ sponsors
 - ▶ **Step Three:** Update materials and approaches to improve discussion with non-federal sponsors about steps to manage risks



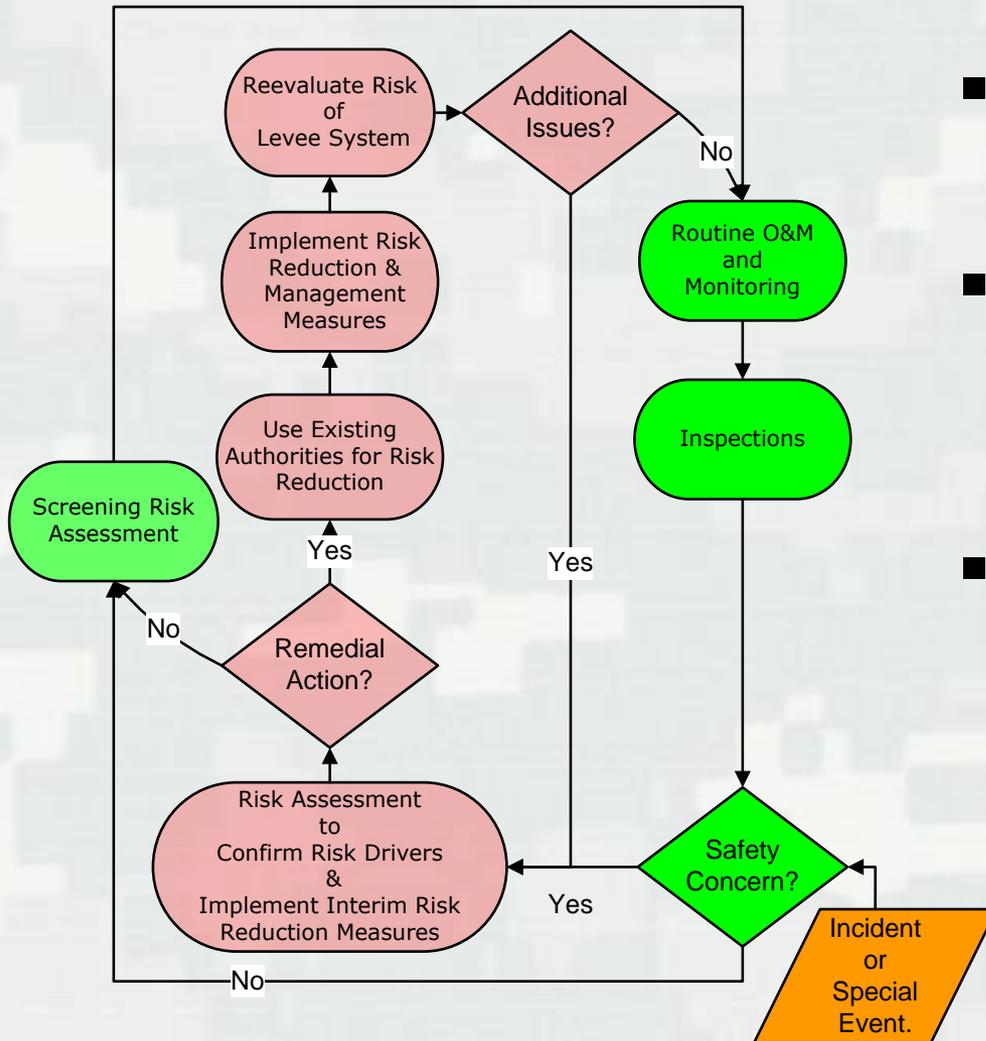
Value of Risk Dialogue for Sponsors?



- Understand how USACE Views and Prioritizes their Project for Federal Action
 - Technical Assistance
 - Flood Fighting
 - Study Priorities
 - Construction Priority
- Improve Communication of the Benefits and Risks to All Stakeholders
- Inform Sponsor of Risk Reduction Actions
 - Structural
 - Interim Repairs
 - Long Term Repairs
 - Non-Structural
 - Land Development
 - Building Codes
 - Emergency Action Plans



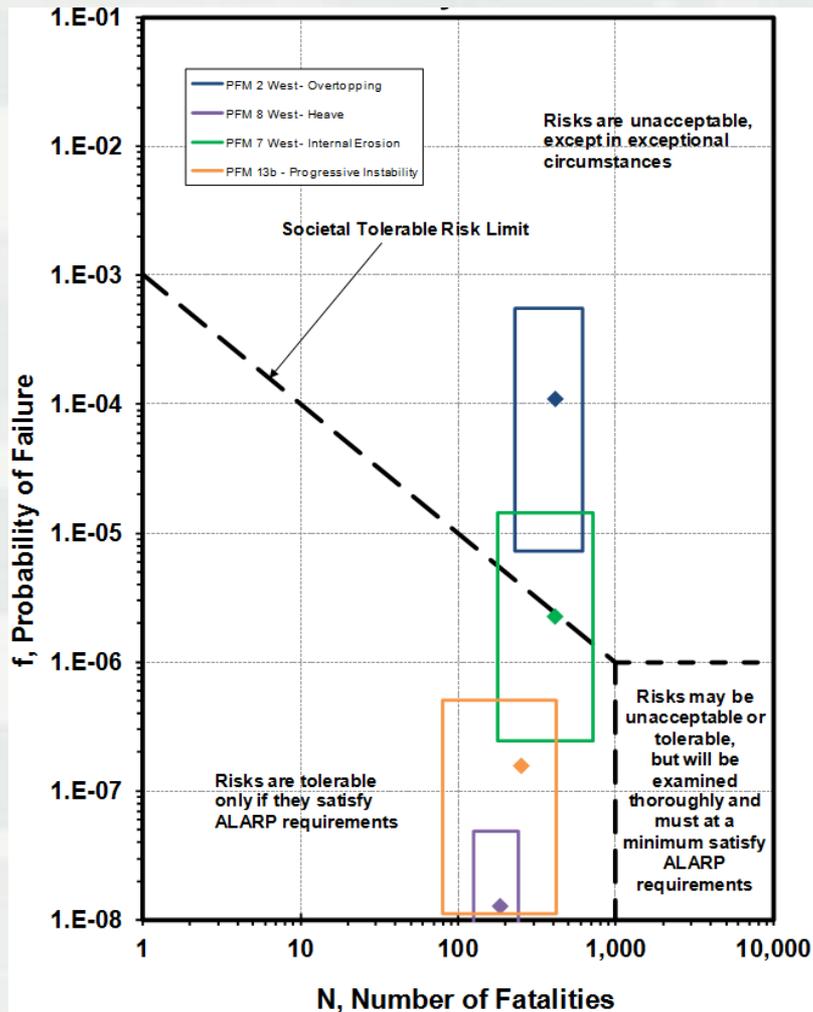
Non-Routine Levee Safety Activities



- Issued guidance for IRRMs
- Developing process for higher level risk assessments
- SJ/FRM will play role in non-routine process to develop risk reduction solutions



Non-Routine Risk Characterization



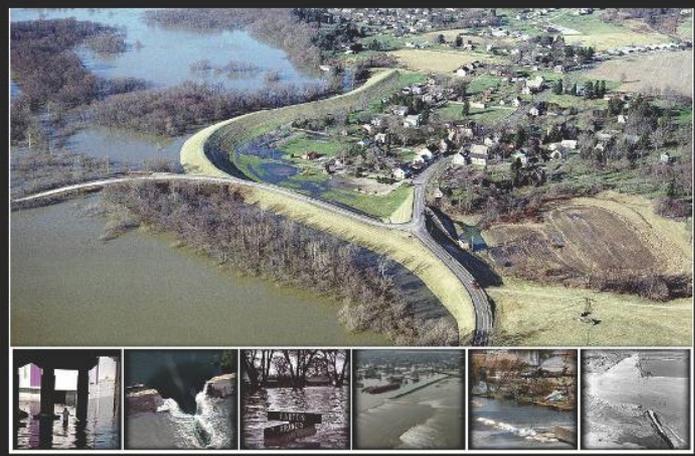
Higher Level Risk Assessments:

- ▶ Confirm LSAC
- ▶ Use in Recon and Feasibility Study Phases
- ▶ On-Going Pilots: Natomas, Sutter, Kansas City, St. Louis, Dallas



New Levee Safety EC Development

- Stakeholder Feedback
 - ▶ Webinars
 - ▶ Workshops
 - ▶ 1,500+ comments received
 - ▶ 1,200+ comments on the Inspection Checklist
- HQ Vetting – Fall 2012
- Draft EC – Early 2013
- Final EC – Summer 2013



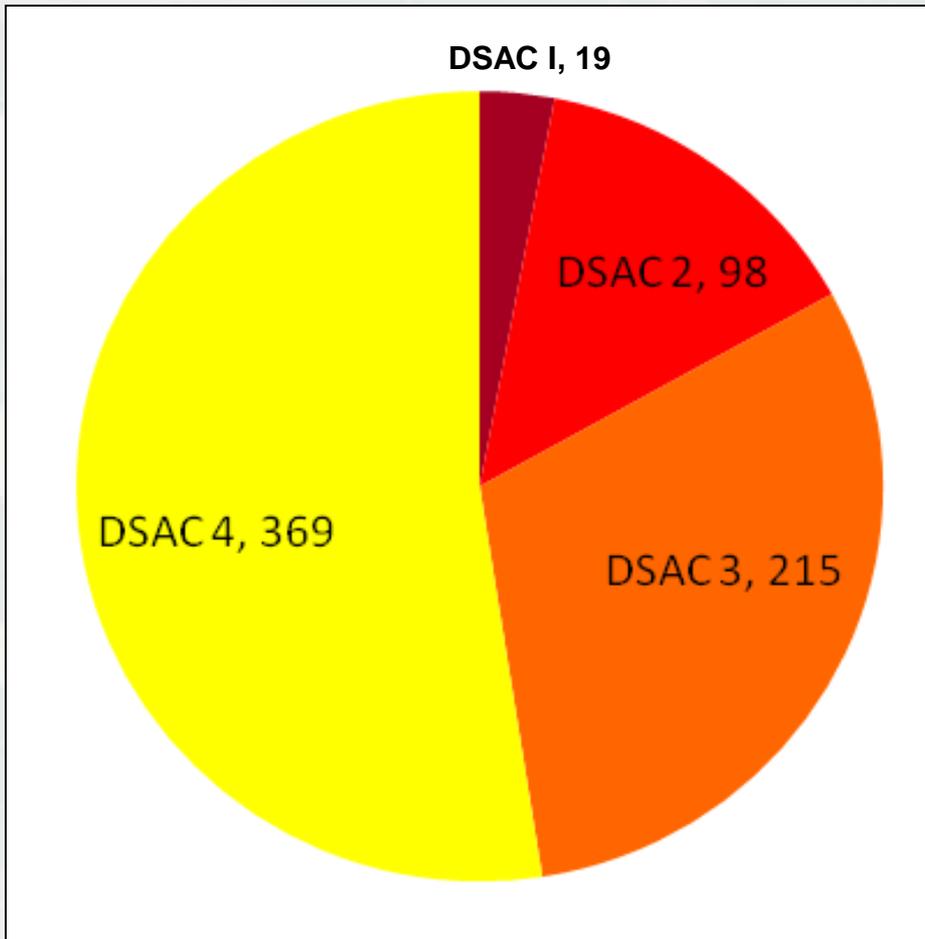
USACE Levee Safety Program
Engineer Circular Development
Workshop

24-26 May 2011, Washington, DC
28-30 June 2011, Denver, CO

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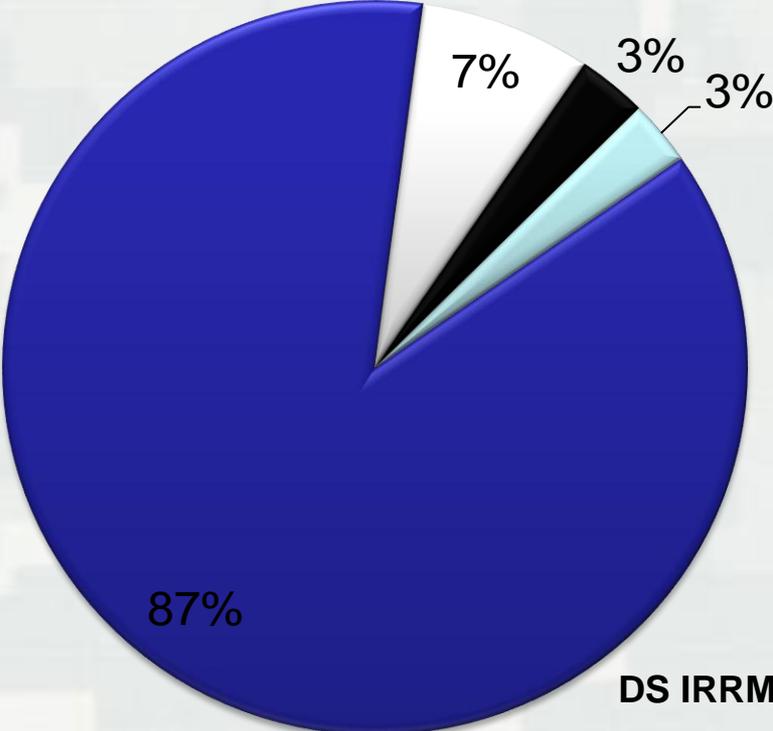
USACE Dam Safety Action Classification Dam Portfolio Distribution



- Count as of Sep 2012 is 702 dams at 556 projects
- Sep 2011 was 698 dams at 559 projects.
- DSAC chart is for all dams. Does not include one newly constructed dam that does not have a DSAC value.
- Data Source: DSPMT, 4 Sep 2012



FY 2012 Dam Safety Budget Summary

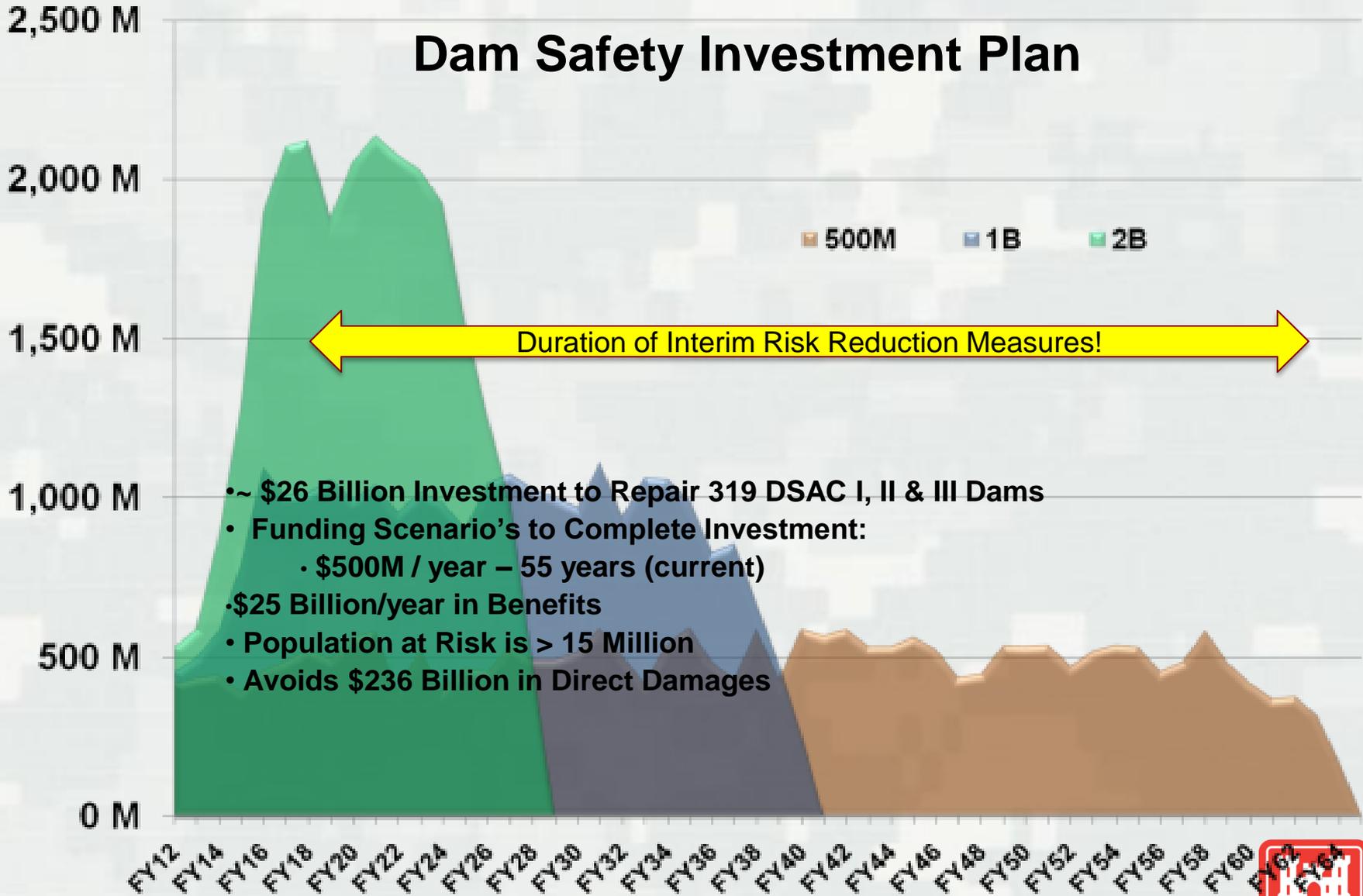


- DS IRRM in O&M
- DS Construction
- DS Wedge (Construction)
- DS Program Management (O&M)

	Budget	% of Dam Safety Budget
DS IRRM in O&M	\$14,226,000	2.9%
DS Construction	\$432,700,000	86.7%
DS Wedge (Construction)	\$37,000,000	7.4%
DS Program Management (O&MRI)	\$15,000,000	3.0%
Dam Safety Budget Total	\$498,926,000	



Dam Safety Investment Plan

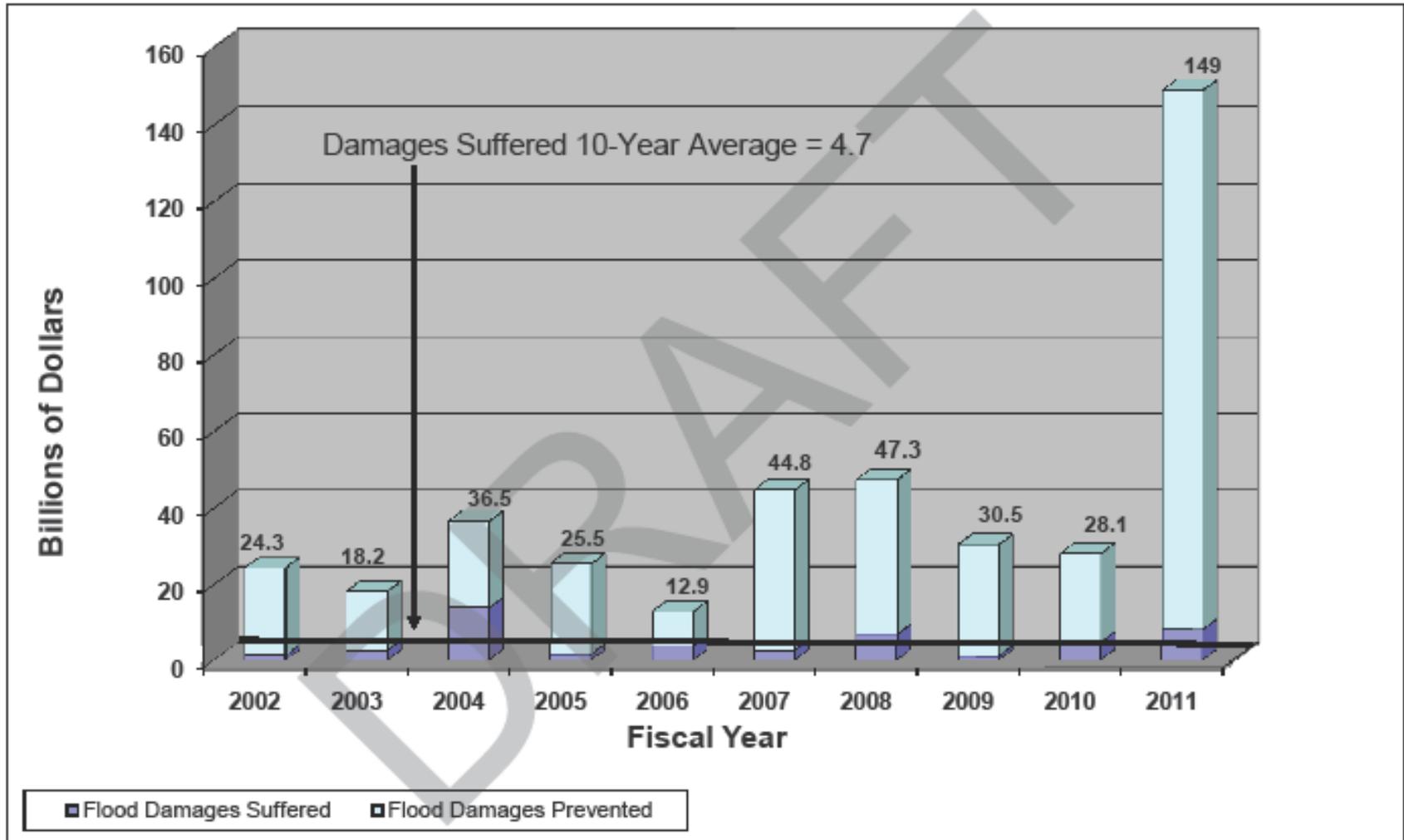


Update on USACE Safety Programs

OBSERVATIONS, CHALLENGES AND LESSONS



Let's Change the Dialogue!



*2005 Value does not include floods losses due to hurricanes Katrina and Rita.



Life Safety is Paramount

Protecting People, Not Infrastructure

**Risk
Informed**



**2010-2012:
\$2B Savings**



Clear

Concise

Useful

Transparent



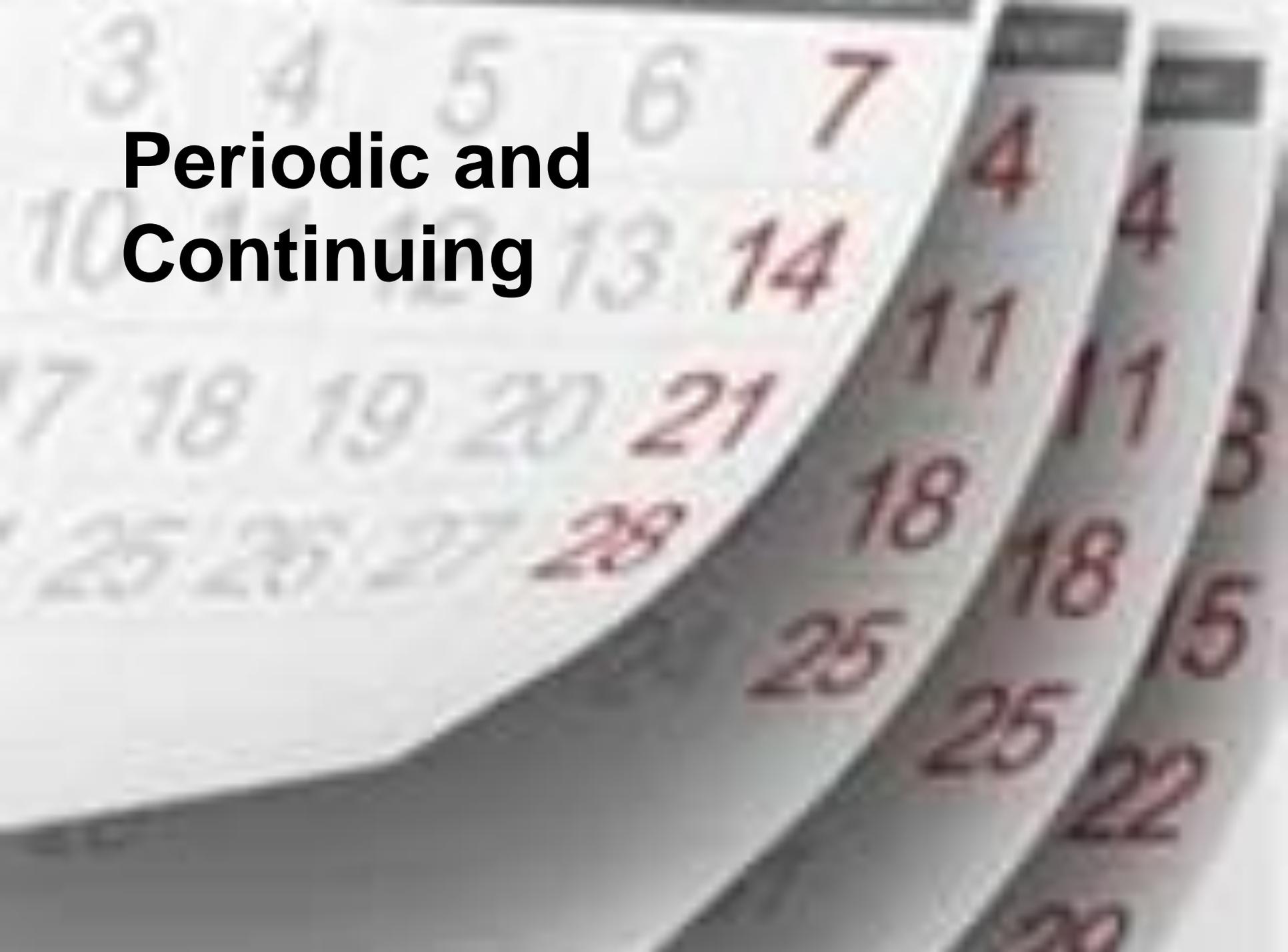
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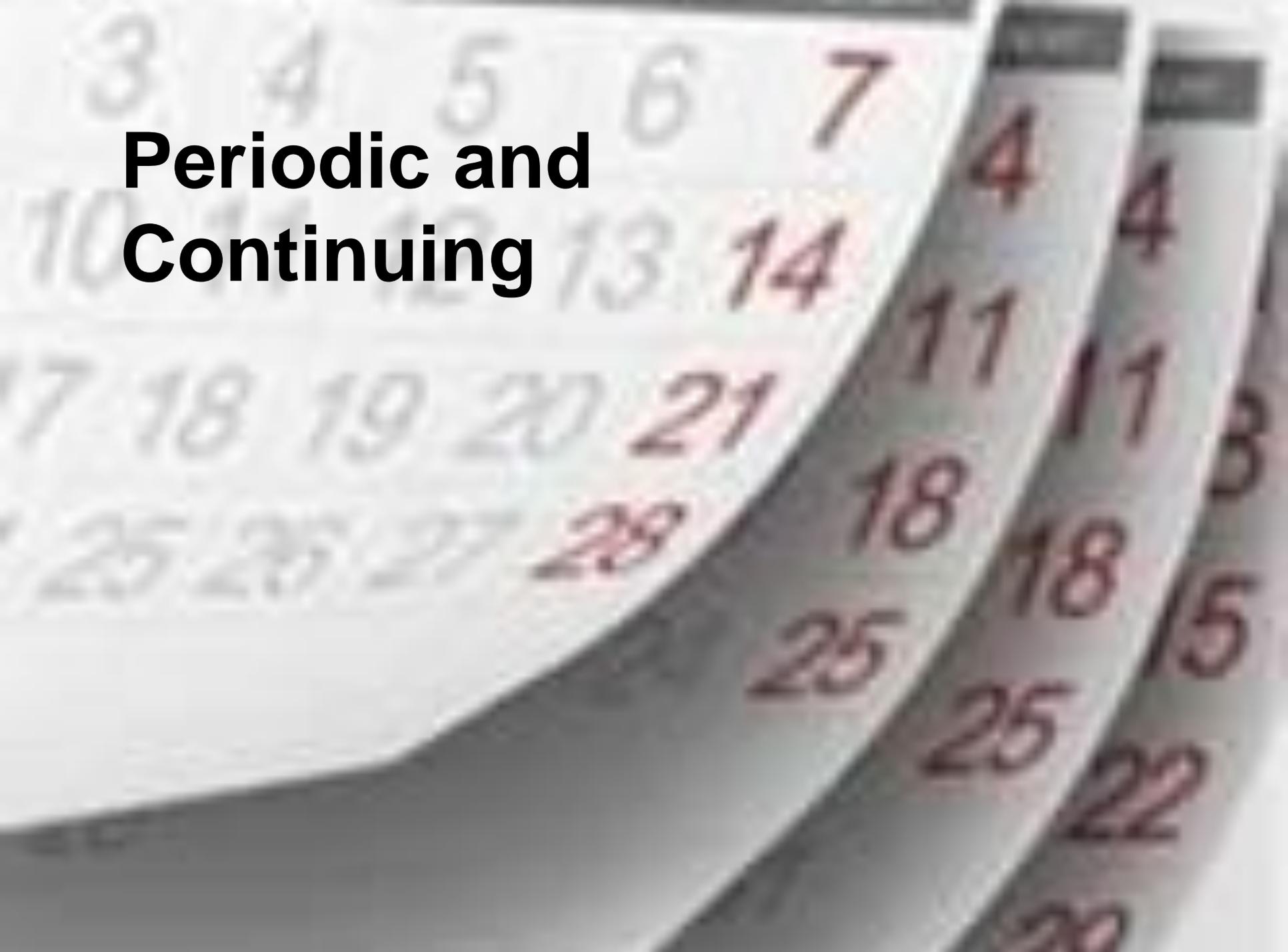
Shared Risks, Shared Responsibility

Systems Approach





**Periodic and
Continuing**



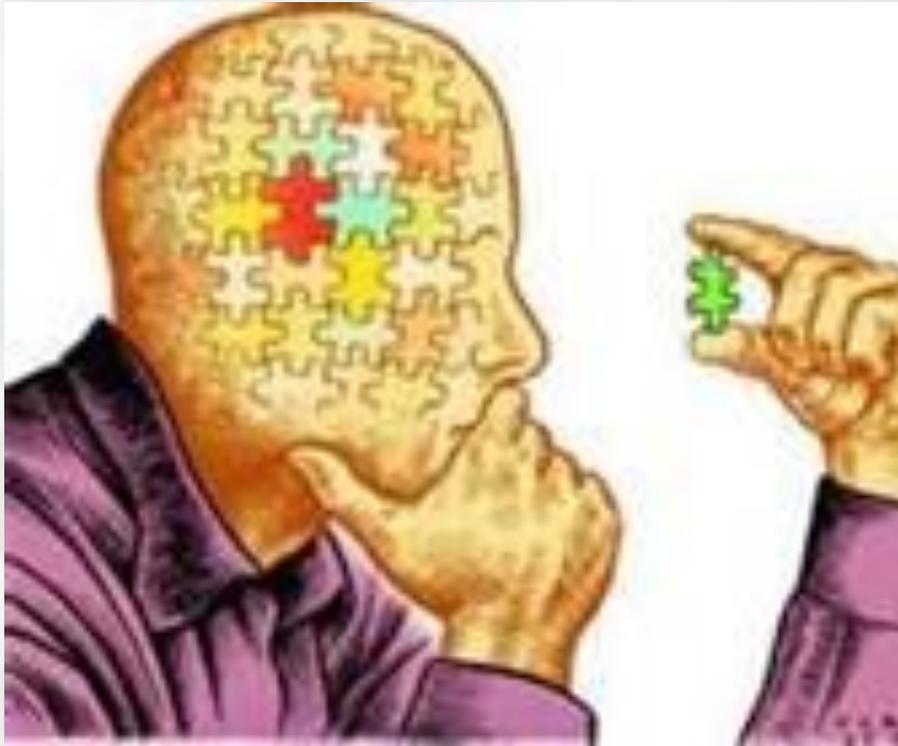


First, Do No Harm...

A black and white photograph of a power line tower. A thick, dark wire is sagging significantly between two towers, indicating a failure of the insulator or the wire itself. The background shows a dense forest of trees under a bright sky. The text "Understand Potential Failure Modes!" is overlaid on the right side of the image.

**Understand
Potential Failure
Modes!**

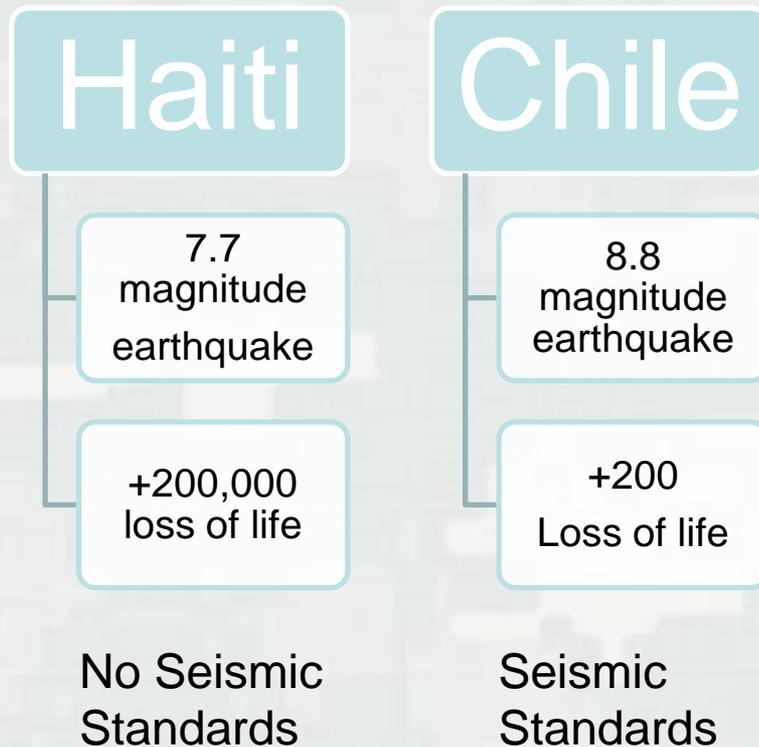
Critical Thinking



- Institutionalize Lessons in Policy...
- ...Add Critical Thinking in all Cases (be Risk Informed)
- Be Decision Oriented



Engineering Standards: Why you Should Care



- Standards are Prudent means to address unlikely events
- One size does not fit all
- We will never know everything we need to know



Dam Safety Production Centers

- Command Council approved moving forward*
- ER issued outlining the MCX role
- The center locations and POCs are;

- ▶ LRD @ LRH (Center and MCX) – Steven P. Morgan, LRH
- ▶ SWD @ SWT/SWL – Wade Anderson, SWT
- ▶ NAD @ NAE – John Bianco, NAD ★
- ▶ SAD @ SAM and SAJ – Stephen Duba, SAD ★
- ▶ MVD @ MVK – Chuck E. Mendrop, MVK ★
- ▶ SPD @ SPK – Rick Poepelman, SPK
- ▶ NWD/POD/TAD @ NWO – John Bertino, Jr. NWO

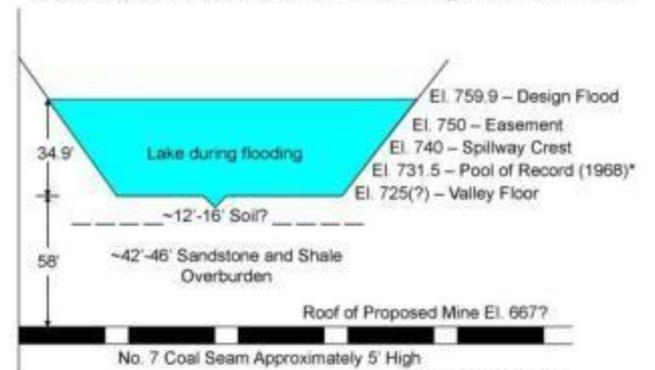
- Plan of Operations Completed



Mineral Extraction – National Concern



Conceptual Cross Section of Mining Beneath Lake

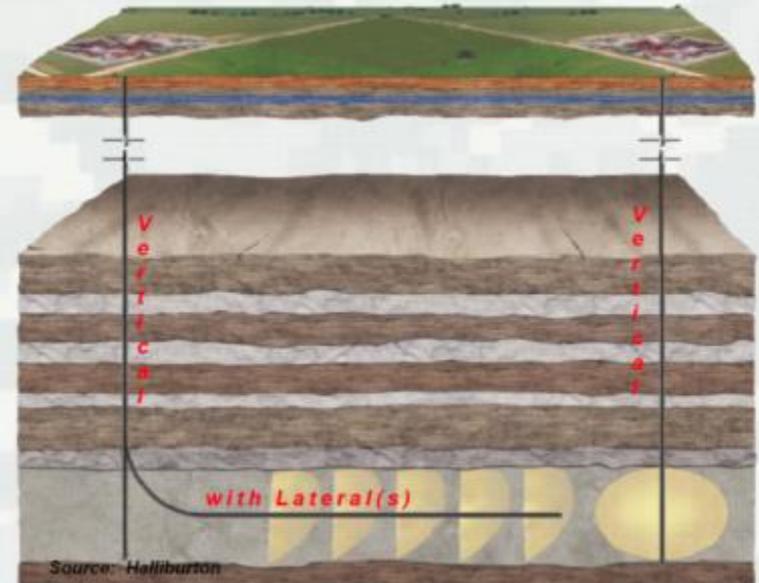


* NOTE: Pool exceeds El. 725 on about a two (2) year frequency

Burr Oak Lake, OH
 Conceptual – not to scale
 El. 721 – Normal Pool



Source: Energy Information Administration based on data from various published studies. Updated: May 9, 2011



Summary Observations

- Program is leading the way with national risk informed prioritization and production centers
- Foundation of the Safety Program is improving;
 - ▶ People, Process, and Policy
 - ▶ Results
- Metrics confirms progress continues
- The “bottleneck” for the agency is senior level dam engineers – specifically Geotechnical Engineers and Geologists



Questions?



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