

Stuff Happens: Robustness and Flexibility as Tools for CERP Adaptive Management

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CERP Adaptive Management

- Structured management approach
- Address uncertainty by testing hypothesis
- Link science to decision making
- Adjust implementation when necessary to increase likelihood of restoration success

(CERP AIMG, 2010)

Introduction – Flexibility and Robustness

- A CERP Adaptive Management (AM) Principle – to address uncertainty incorporate flexibility and robustness into all phases of CERP
- CISRERP (2006) supported use of robustness – ability of key design parameters to operate effectively in the face of variability and uncertainty of future events
- Ecological risks and responses may not be as predictable as engineering results (CERP AIMG, 2010)

Background

- Concept of using robustness in Water Resources Planning, Engineering, and Management around since 1970's
- Has roots in concept of ecological resilience
- Pioneering work by Buzz Holling and Myron Fiering

Robustness - Why and What

- Best way to enhance sustainability is maintain reversibility and robustness
- Reversibility – keep design and management options open for future generations
- Robustness – ability to adapt to varying, unforeseen future conditions with little additional costs
- Robust systems designed to be near cost effective for wide range of possible future conditions

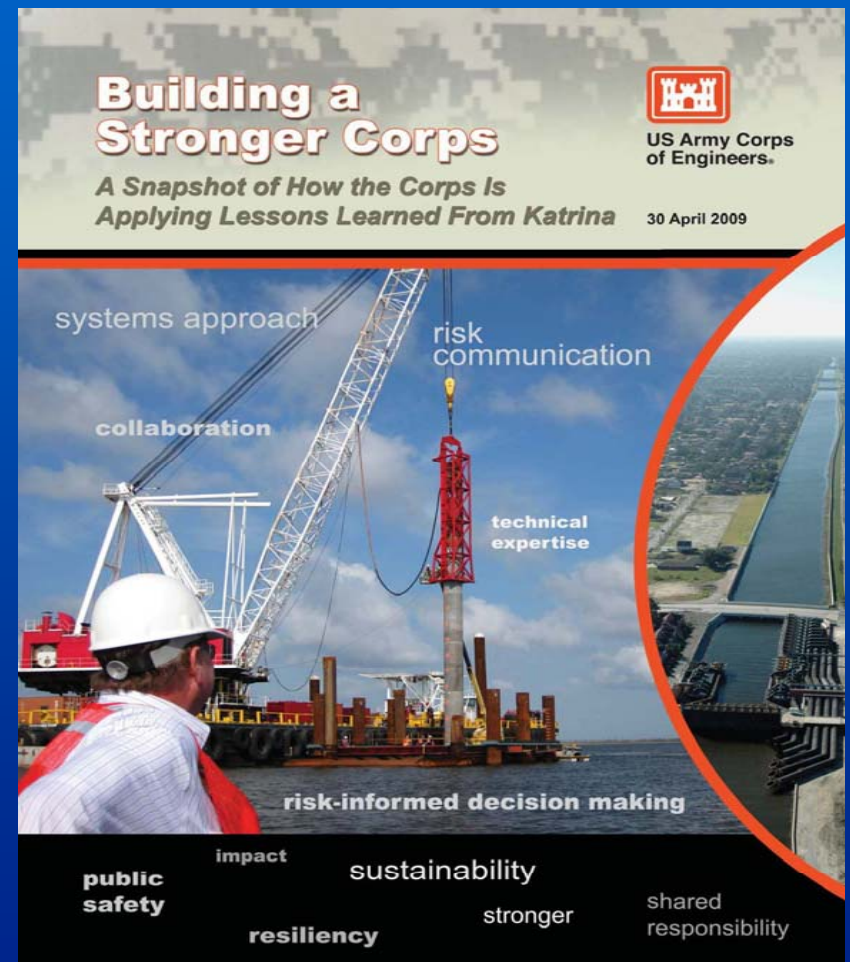
UNESCO Working Group/ASCE Task Committee on Sustainability (Loucks and Gladwell, 1999)

History Can Help Teach Us:

- Why the need for tools to address uncertainty
- “Unintended Consequences of Purposeful Social Action” (Merton, 1936)
- Need to avoid hubris that we know everything
- The “optimal solution” may not be the true “optimal solution” in the long run

Lessons Learned - Robustness and Flexibility

- Army Corps of Engineers' *Learning Organization Doctrine* (2003) – learn systematically what works and what does not work
- Central and Southern Florida Project lessons
- Hurricane Katrina lessons – Corps of Engineers Actions for Change



Hydraulic Engineering Examples of Robustness

- Problems with unbalanced gate openings
- Gate pier extensions would fix the problem with unbalanced gate openings
- Weirs versus gated spillways and culverts
- For weirs - stoplogs versus less easily removed sections



Some Challenges to Using Robust Alternatives

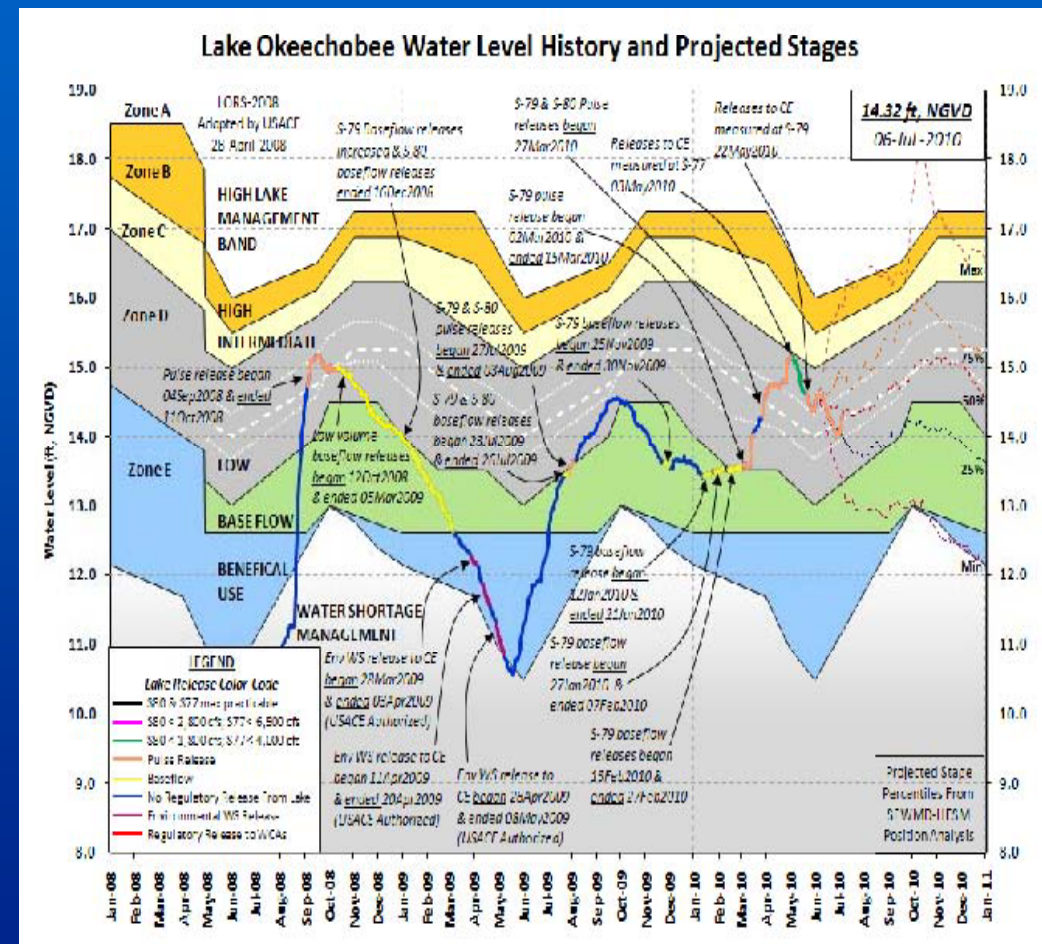
- Can cost more
- May not be the “optimal solution”
- How to measure the benefits of robust alternatives?
- Lack of appreciation, understanding, or willingness to deal with uncertainties
- Short term versus long term view
- Crossing interdisciplinary boundaries
- Trust issues

Operational Flexibility and CERP Adaptive Management

- Operational flexibility used in real-time operations
- Operational flexibility and CERP Adaptive Management not synonymous
- Operational flexibility can be a tool in CERP Adaptive Management

Questions about Operational Flexibility and CERP Adaptive Management

- Real time operations versus testing hypothesis
- Spatial and temporal scale issues for use in Adaptive Management?
- Can monitoring measure these changes?
- Feedback loop from monitoring and assessment?



Some Challenges for Using Operational Flexibility

- Stakeholder desires for certainty
- Issues with trust
- Savings Clause / Project Assurances
- Identification of Water / Water reservations
- NEPA compliance

Summary

- Robustness and flexibility can be useful tools for Adaptive Management
- Helps deal with uncertainty and keeps options open for the future
- Challenges to use of robustness and flexibility

Questions?