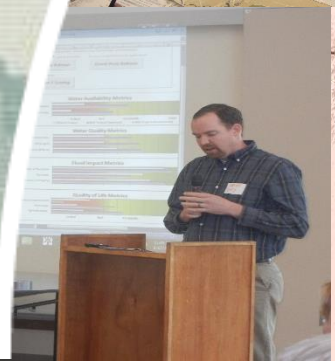
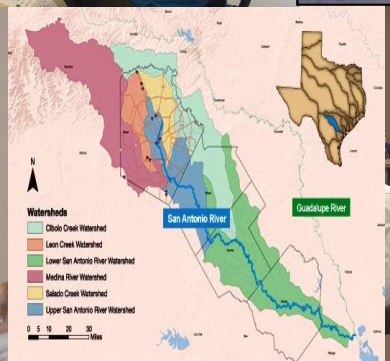
Planning CoP Webinar Series –

"Shared Vision Planning through the Multi-Hazard Tournament Framework"

Harvey Hill, USACE Institute for Water Resources
Marcia Hackett, Fort Worth District
Michelle Hamor, Norfolk District,
Jason Smith, Rock Island District

May 5, 2016





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Why are we here?

- USACE planning has evolved from singular issues to very complex “wicked problems”
- USACE Planning CoP has developed a set of skills and tools that address these evolving challenges,
- **The Multi-Hazard Tournament is an innovative framework that integrates that work and adds value.**

It's difficult to stay focused on these issues which leads to recurring cycles of complacency and panic.

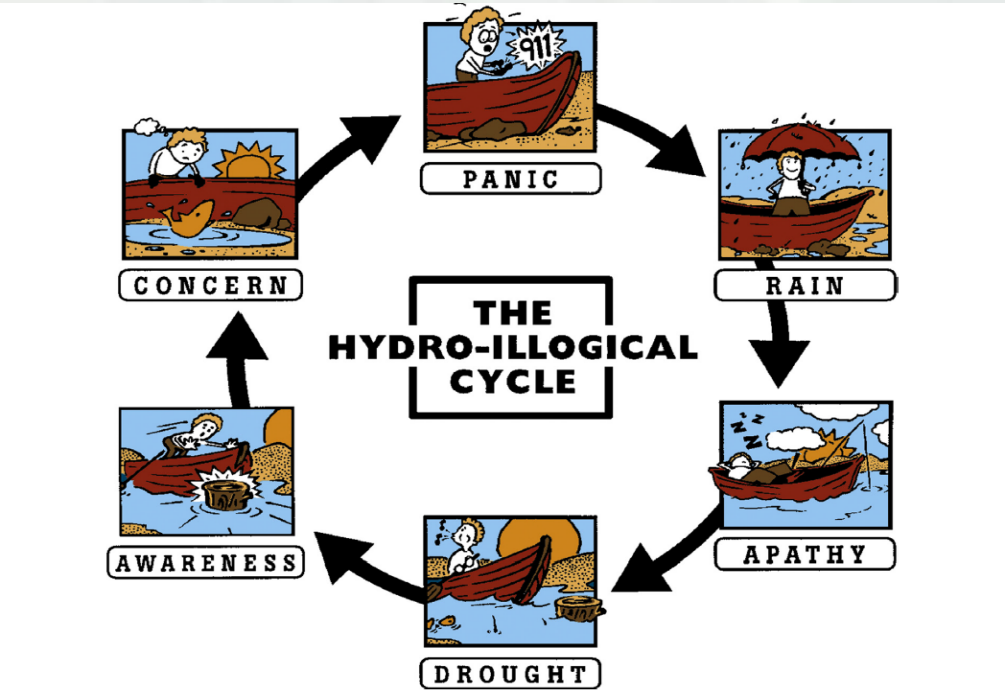

Fig. 1. The Hydro-Illogical Cycle. This cycle highlights why proactive drought preparedness has proven to be challenging (Lankford et al., 2004).

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journal homepage: www.elsevier.com/locate/wace

The Invitational Drought Tournament: What is it and why is it a useful tool for drought preparedness and adaptation?

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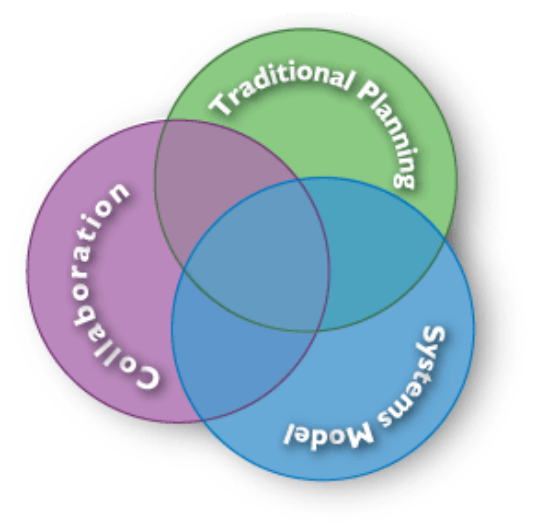
Shared Visioning Planning:
Multi-Hazard Tournaments

Traditional SVP

- Coarse level, trade-off analysis
- Iterative nature
- New directions
- Collaborate with Stakeholders

New MHT Concept

- Competitive Element
- Event-based
- Team-based Approach



Tournament Phases

Scoping Phase

- USACE District Champion Identification,
- Stakeholder Identification,
- Problem and Objectives definition
- Resource Identification

Technical Development and Logistics,

- Scenario development,
- Describe the impact of the hazard,
- Definition of the types of adaptation options,
- Identify the effects, tradeoffs and synergies of alternation adaptation choices by eliciting expert opinion or modeling,
- Develop the decision support tool,
- Create workbook
- Complete the logistics (Invitations, recruit referees, etc.)
- Design of agenda

Testing and Implementation

- Dress rehearsal,
- Actual tournament,
- Post tournament evaluation

Documentation

- Post tournament reports,
- Articles

Pre-game background material,

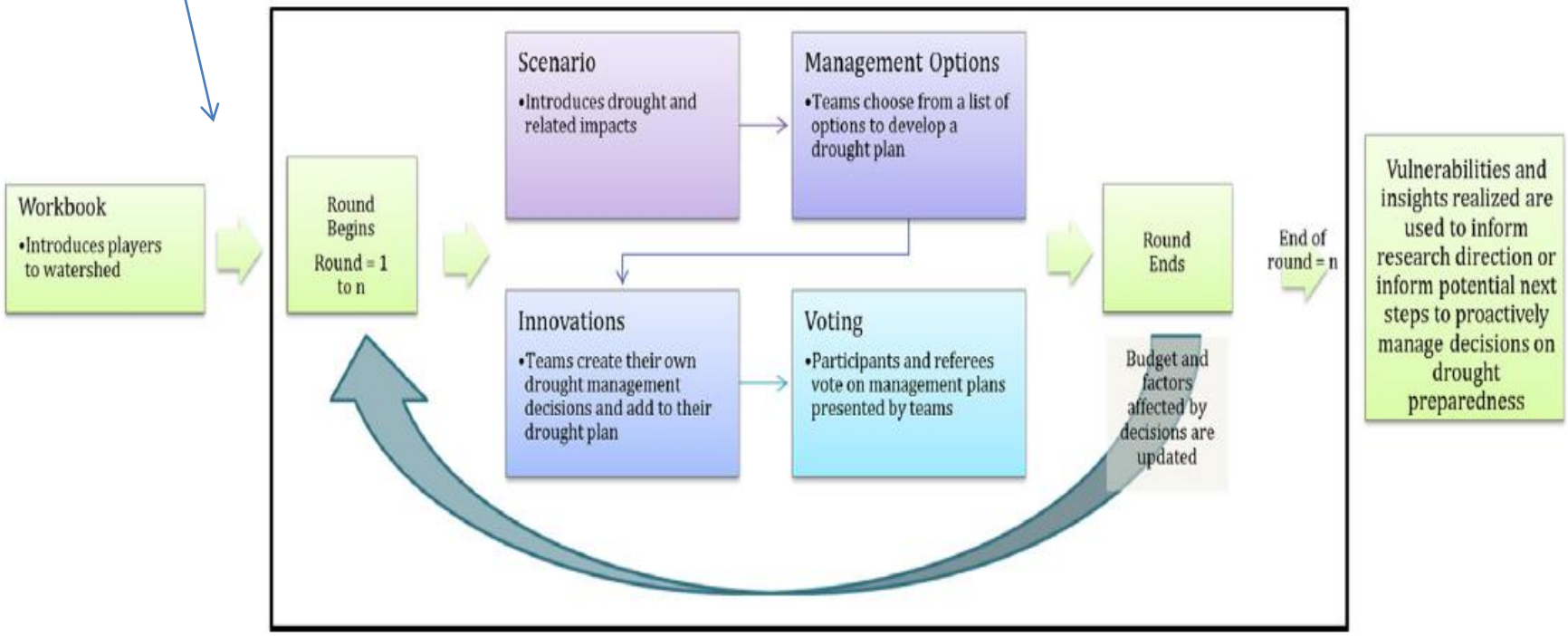


Fig. 2. The IDT Process. The IDT is an iterative process that uses a game format to arrive at an informed decision on next steps for proactive drought management and research.

Game Process

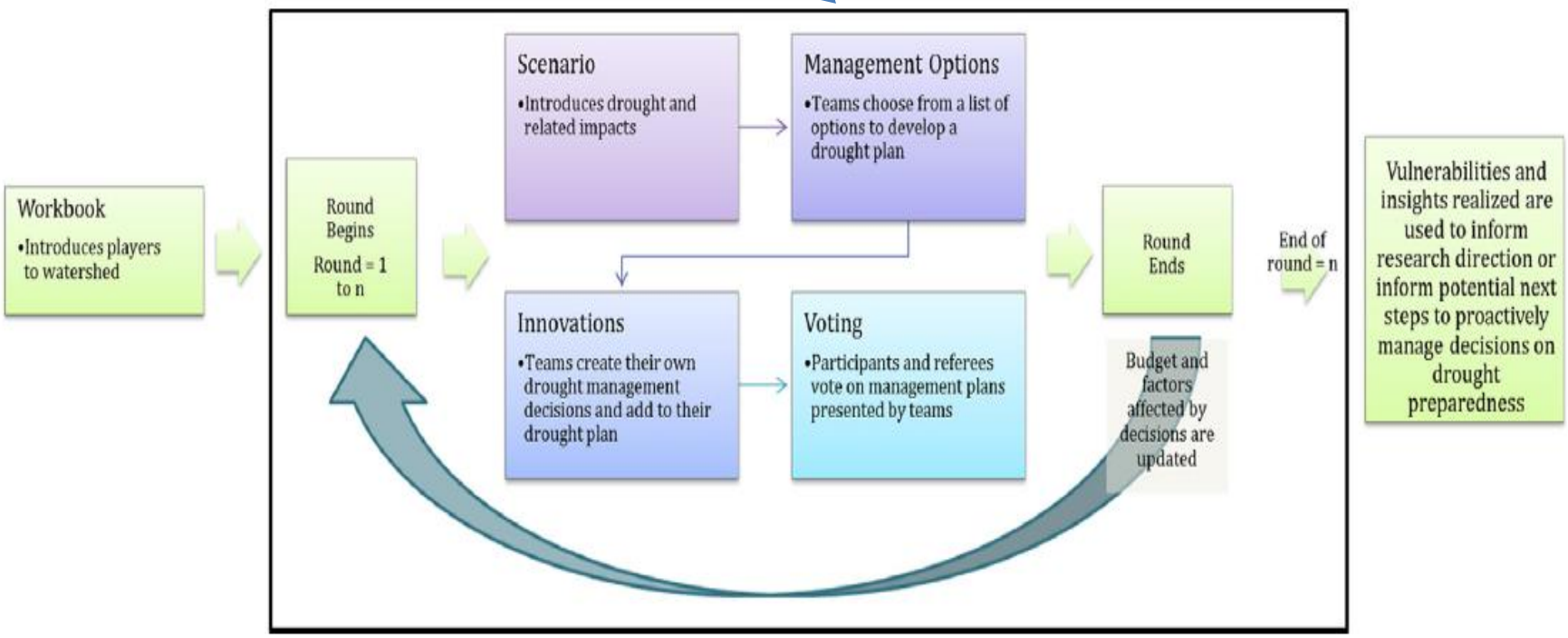


Fig. 2. The IDT Process. The IDT is an iterative process that uses a game format to arrive at an informed decision on next steps for proactive drought management and research.

Outcomes

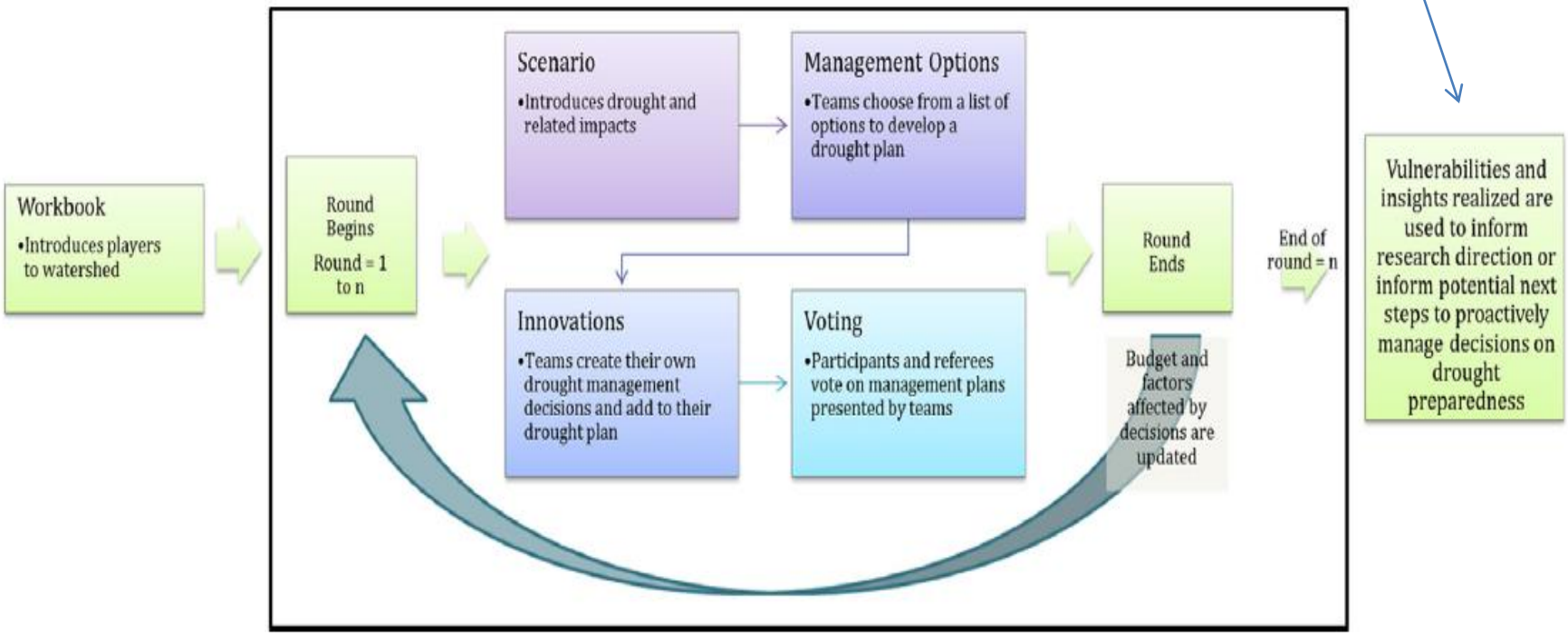


Fig. 2. The IDT Process. The IDT is an iterative process that uses a game format to arrive at an informed decision on next steps for proactive drought management and research.

Facilitator

Teams

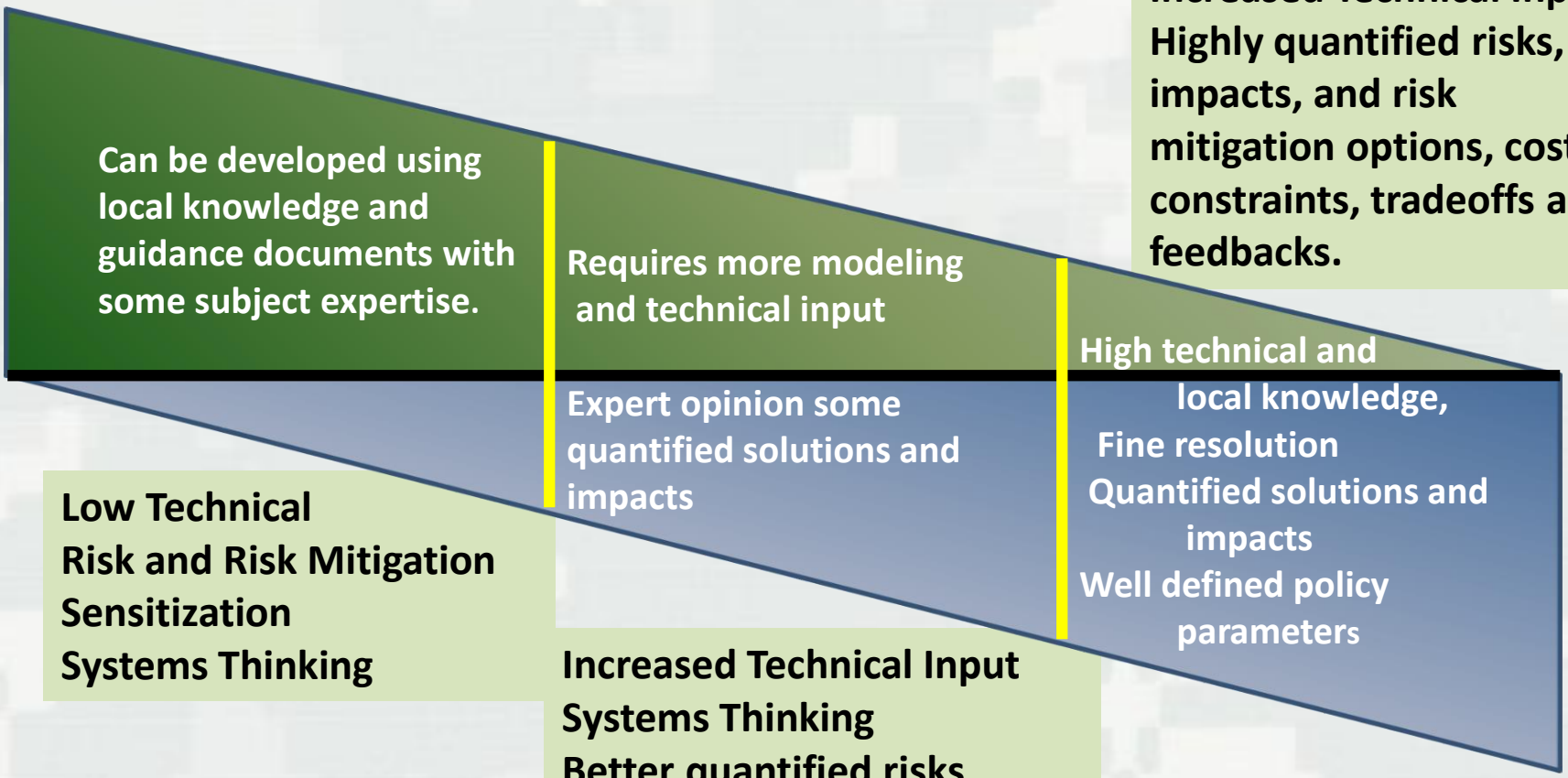
Referees

Tournament creators and implementers

The “Fans” (Observers)

Progressive Complexity

Increasing quantification of Risks, Solutions, Impacts and Costs.

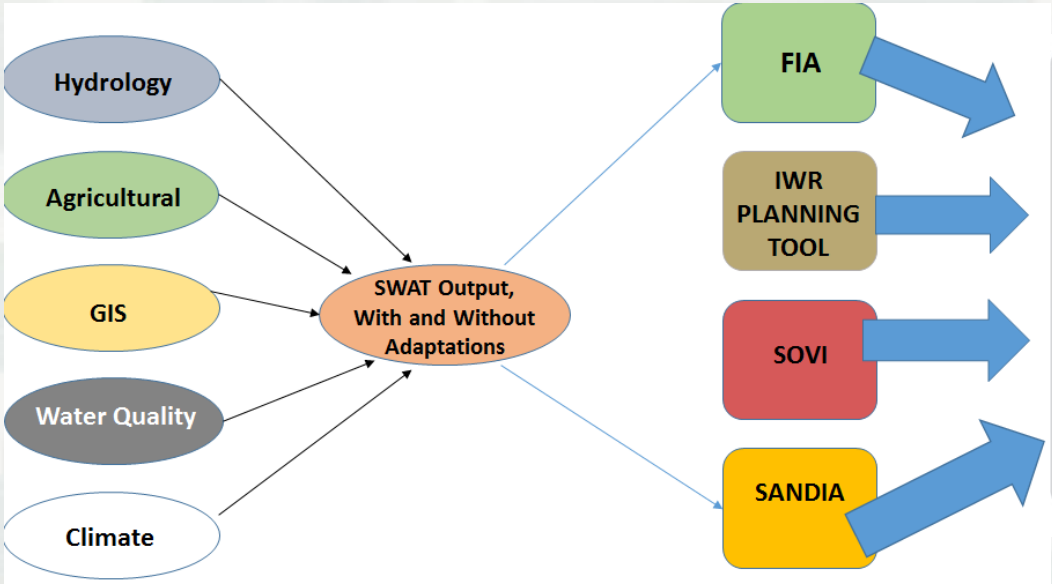


Increased Technical Input
Highly quantified risks, impacts, and risk mitigation options, costs, constraints, tradeoffs and feedbacks.

Low Technical
Risk and Risk Mitigation
Sensitization
Systems Thinking

Increased Technical Input
Systems Thinking
Better quantified risks, impacts, and risk mitigation options, costs , constraints, tradeoffs and feedbacks.

Example of Linking Planning Tools and Objectives of the Planning Community



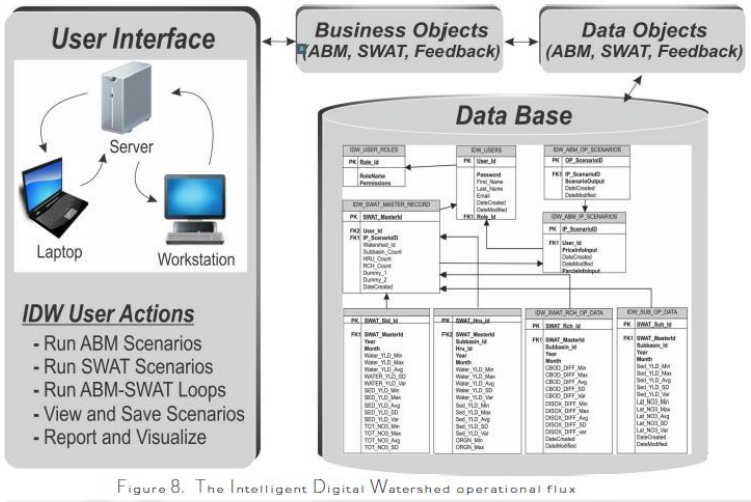


Figure 8. The Intelligent Digital Watershed operational flux

Outcomes

- Supports a more systematic understanding of the constraints, potential solutions, and preferences of decision-makers within a watershed.

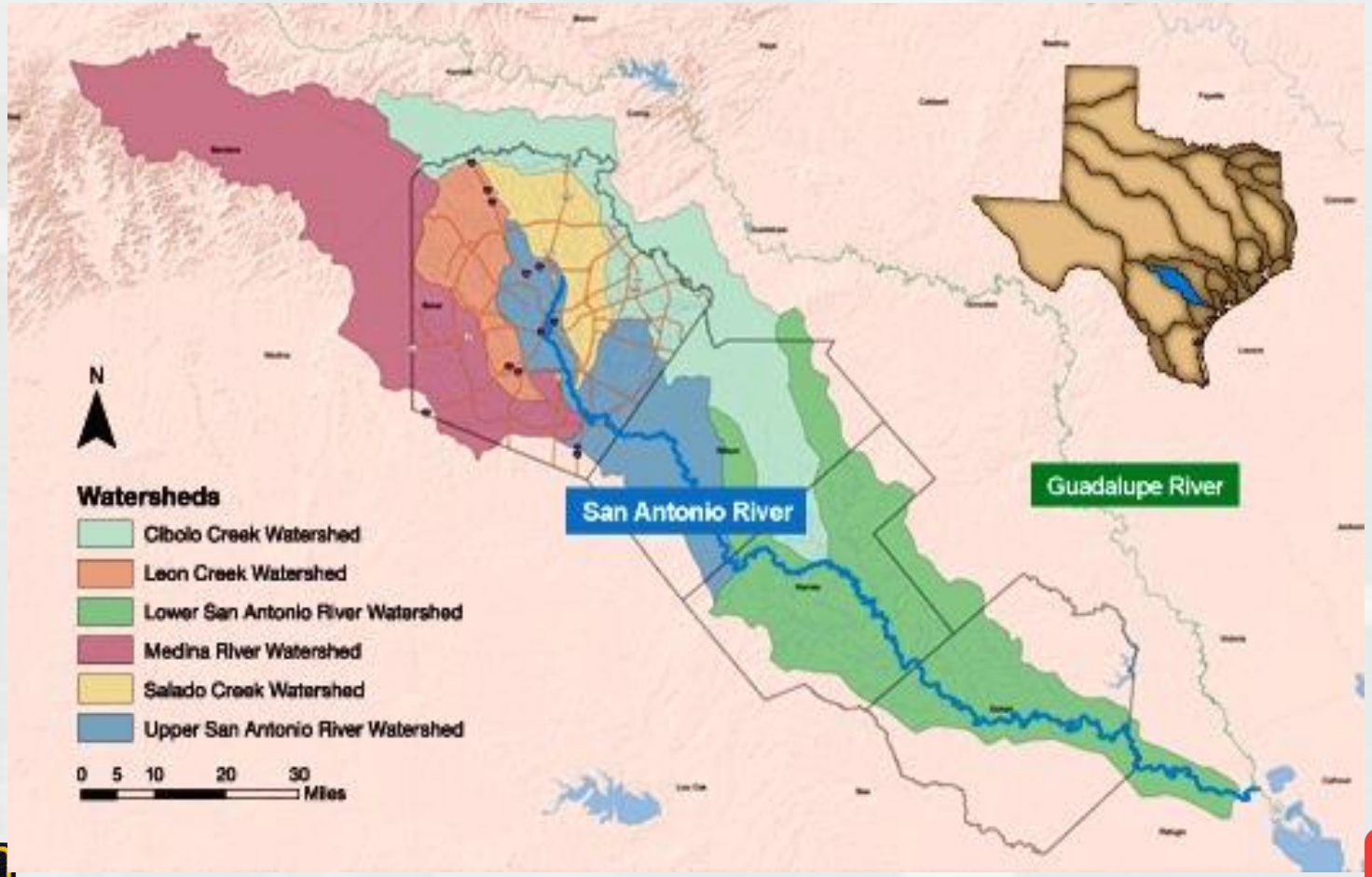
- Raise awareness of flood, drought and water quality threats and adaptation options.

- Supports conflict resolution in watersheds both domestically and internationally.

How Might It Support Corps Activities?

- **Planning**
  - *Flood Risk Reduction*
  - *Water Storage*
  - *Identification of Water management facilities and policy modifications*
- Shared Vision Planning and Stakeholder Engagement
- Exploration of Adaptive Protocols for Operations

Texas Multi-Hazard Tournament



Texas MHT Planning Design & Technical Teams

SAN ANTONIO RIVER AUTHORITY
Leaders in Watershed Solutions

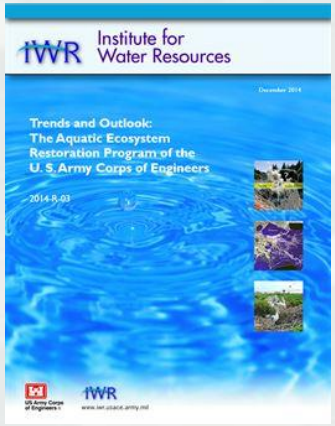
U.S. Army Corps of Engineers®

USGS
science for a changing world

National Drought Mitigation Center

NOAA

SCIENCE & TECHNOLOGY POLICY FELLOWSHIPS
AAAS



SOUTH CENTRAL CLIMATE SCIENCE CENTER
USGS

NIDIS
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

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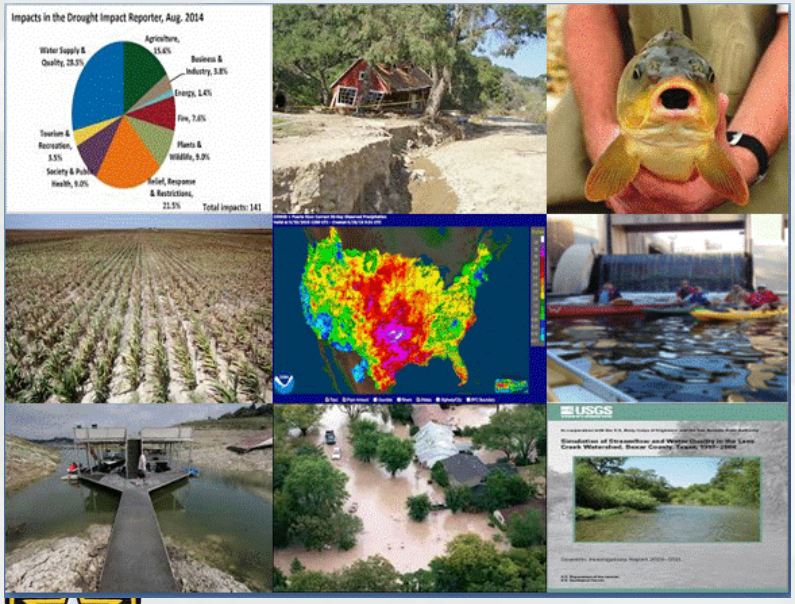
Texas MHT Playbook

Playbook for the San Antonio Watershed

Multi-Hazard Tournament
Version 1.0



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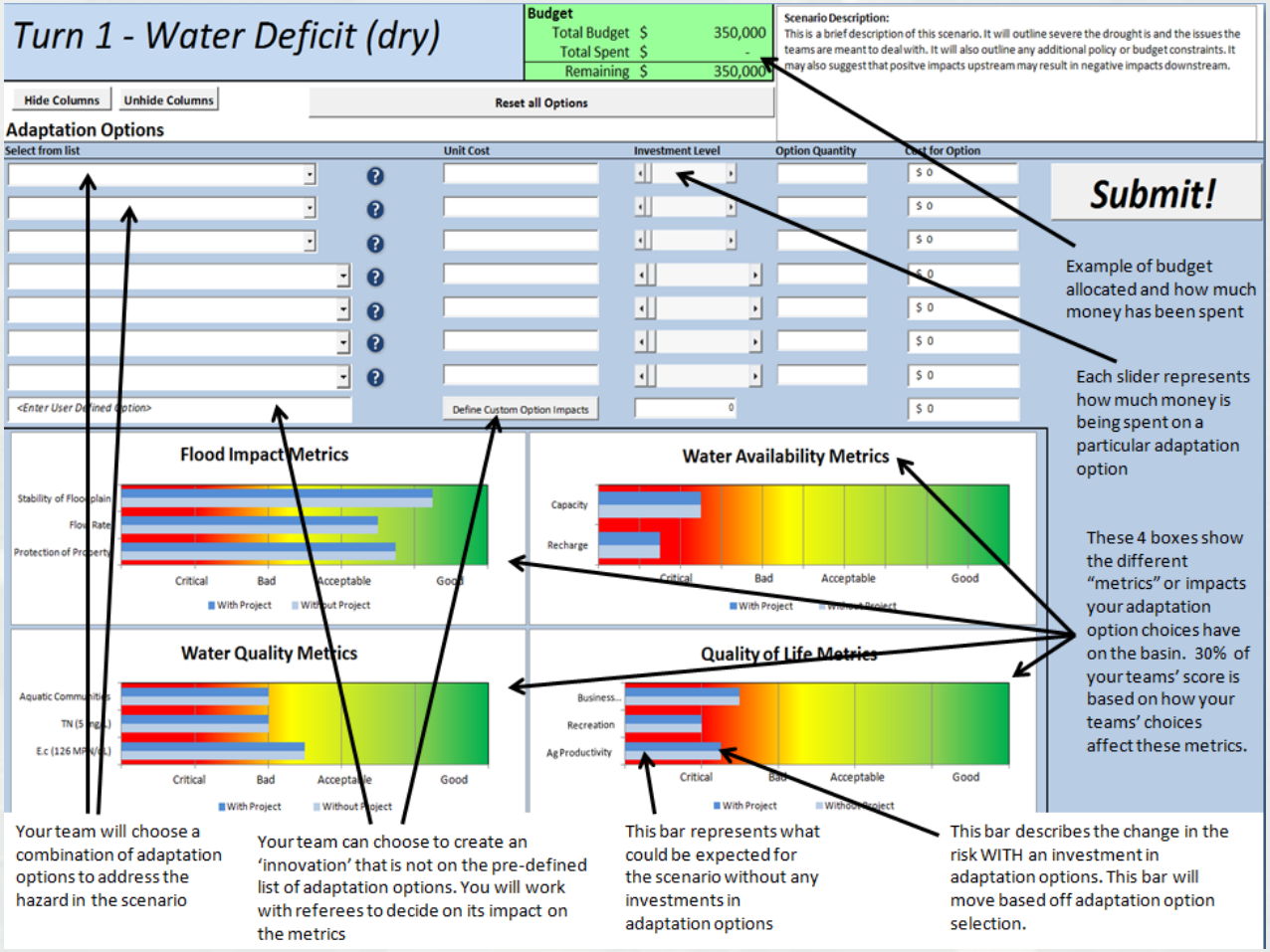
Texas MHT Decision Support Tool



Texas MHT – September 17, 2016

- Achievements:
  - Successful demonstration that tournament methodology is adaptable to range of issues
  - Development of replicable tournament ‘playbook’, adaptation option matrix, DST, and tournament scoring improvements
  - Positive feedback from stakeholders regarding greater understanding of watershed issues and need for tradeoffs

Lessons Learned from Texas MHT

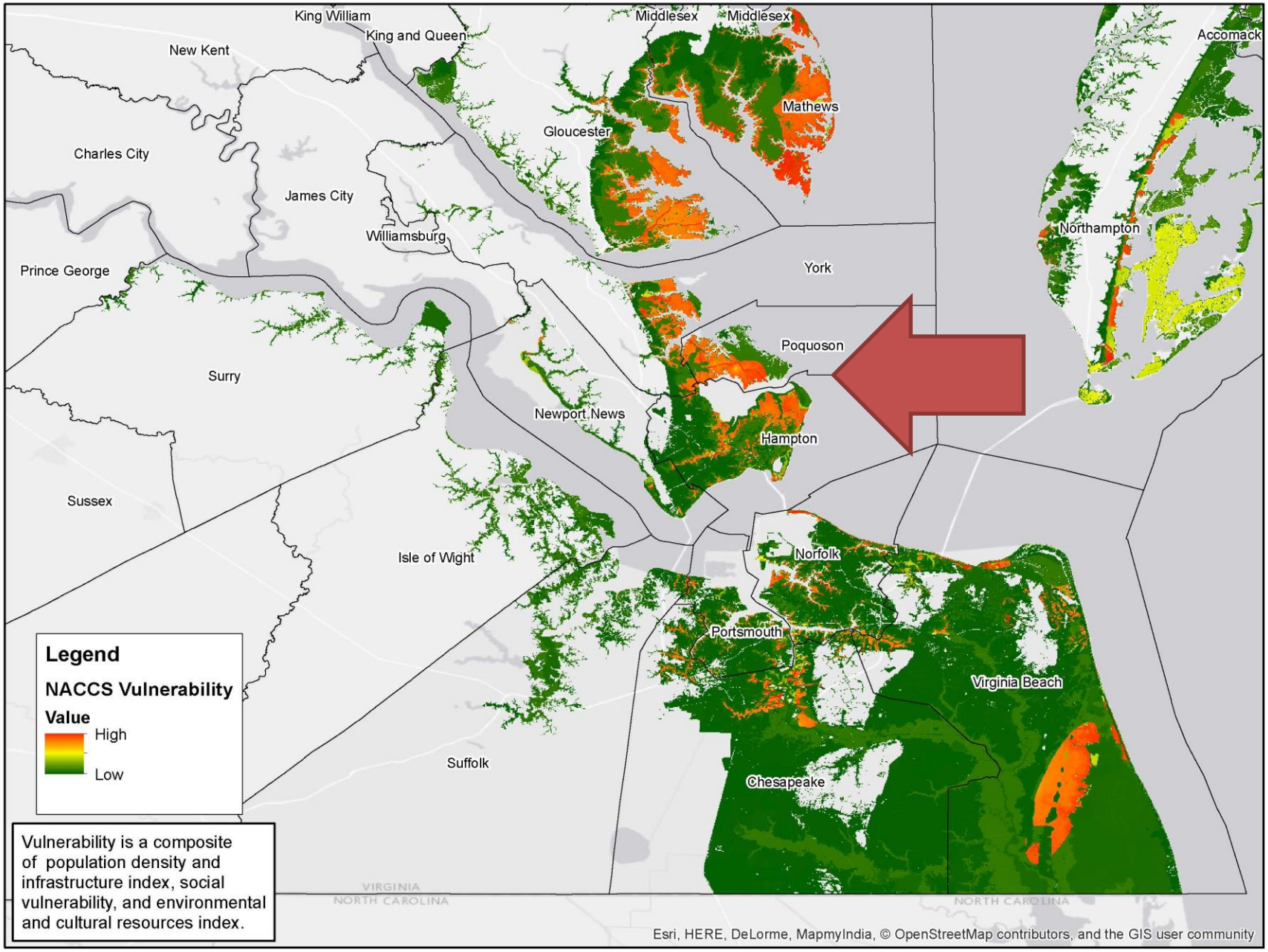
Participant feedback indicates the Texas MHT:

- Provided a successful method for collaborating with partners and stakeholders
- Verified that the process can be adapted to include multiple hazards and multiple variables.
- Indicated that the process and products and tools developed can be replicated and can provide a scalable, disciplined approach for applying a risk-informed process to help inform stakeholders and advise decision makers

Peninsula Regional Multi-Hazard Tournament

Why host a tournament?

1. USACE cannot do it alone – We need savy partners
2. Regional focus on actual problems
   - Management measure consideration within capital budgets could lead to CRS points.
3. Develop a PPI (CRS Points)
4. Develop a template floodplain management plan (CRS Points)


King William
King and Queen
New Kent
Middlesex
Middlesex
Accomack
Mathews
Gloucester
Charles City
James City
Williamsburg
Northampton
Prince George
York
Poquoson
Surry
Newport News
Hampton
Sussex
Isle of Wight
Norfolk
Portsmouth
Virginia Beach
Suffolk
Chesapeake
Legend
NACCS Vulnerability
Value
High
Low
Vulnerability is a composite of population density and infrastructure index, social vulnerability, and environmental and cultural resources index.
VIRGINIA
NORTH CAROLINA
NORTH CAROLINA
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

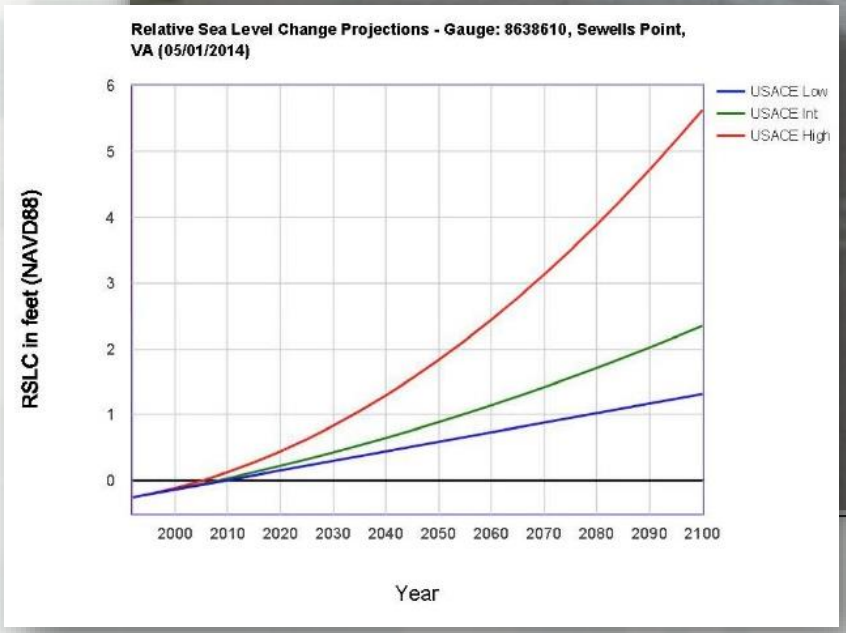
Peninsula Regional Multi-Hazard Tournament

- Objectives
  - Increase awareness of regional water management problems
  - Identify opportunities to leverage existing funding sources for watershed solutions
  - Investigate potential risk management measures to reduce risk
  - Develop a tool that can be used to consider options

Peninsula Regional Multi-Hazard Tournament

Problems

- Coastal Flooding and Relative Sea Level Rise



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Peninsula Regional Multi-Hazard Tournament

Problems

Peninsula Regional Multi-Hazard Tournament

Opportunities

Peninsula Regional Multi-Hazard Tournament

Management Measures

Table IV-4. Coastal Storm Risk Management and Resilience Attributes Associated with the Full Array of Measures

Aggregated Measure Type[1]	Category[2]	Coastal Storm Risk Management Function			Multi-Benefits[3]	Resilience
		Flooding	Wave Attenuation	Erosion		Adaptive Capacity[4]
Acquisition (building removal) and relocation[5]	Non-STR	High	High	High	High	High
Building retrofit (e.g., floodproofing, elevating structures, relocating structures, ringwalls)	Non-STR	High	Low	Low	Low	Low
Enhanced flood warning and evacuation planning (early warning systems, emergency response systems, emergency access routes)	Non-STR	Low	None	None	Low	High
Land use management/ conservation and preservation of undeveloped land, zoning, and flood insurance	Non-STR	Medium	None	None	High	Medium
Deployable floodwalls	STR	Medium	None	None	None	Low
Floodwalls and levees	STR	High	Low	None	Low	Low
Shoreline stabilization (seawalls, revetments, bulkheads)	STR	Low	High	High	Low	Low
Storm surge barriers	STR	High	Medium	None	Low	Low
Barrier island preservation and beach restoration (beach fill, dune creation)	STR/NNBF	High	High	Medium	High	High
Beach restoration and breakwaters	STR/NNBF	High	High	High	High	Medium
Beach restoration and groins	STR/NNBF	High	High	High	High	Medium
Drainage improvements (e.g., channel restoration, water storage/retention features)	STR/NNBF	Medium	Low	Medium	Medium	Low
Living shorelines	STR/NNBF	Low	Medium	Medium	High	High
Overwash fans (e.g., back bay tidal flats/fans)	NNBF	Low	Medium	High	Medium	High
Reefs	NNBF	Low	Medium	Medium	High	High
Submerged aquatic vegetation	NNBF	Low	Low	Low	High	Medium
Wetlands	NNBF	Low	Medium	Medium	High	High

1 *An extensive list of management measures was compiled as part of the NACCS Measures Working Meeting in June 2013. The measures presented here represent an aggregated list of the categories of measures and corresponding conceptual parametric unit cost estimates.*

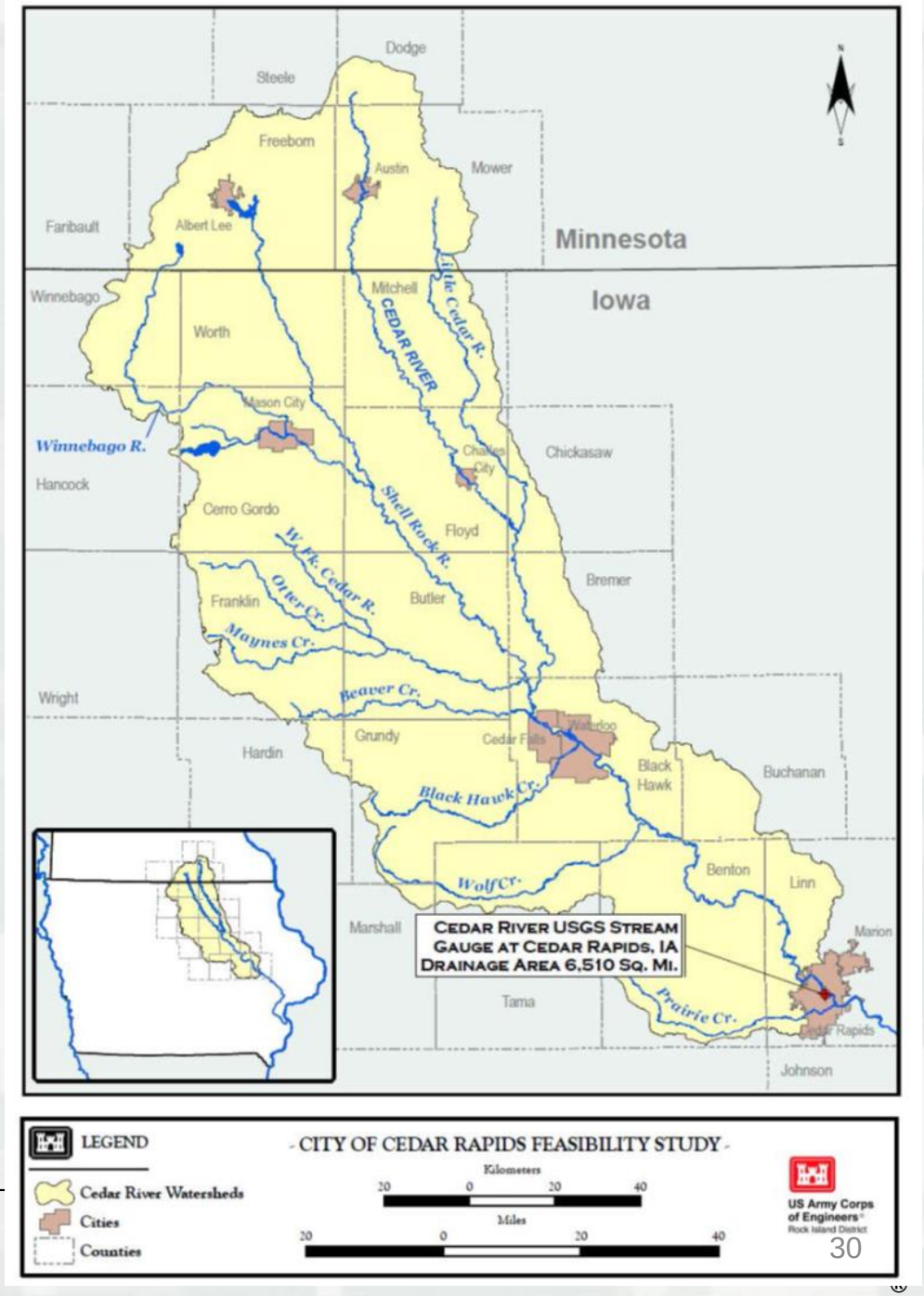
2 *STR = structural measure, Non-STR = nonstructural measure, and NNBF = Natural and Nature-Based Features measure. Multiple measures are listed if the aggregated measure type is made up of a combination of measures.*

3 *Multi-benefits focus on socioeconomic contributions to human health and welfare above and beyond the risk management benefits already highlighted in this table (i.e., flooding, wave attenuation, etc.). These benefits could include increased recreational opportunities, development of fish and wildlife habitat, provisioning of clean water, production of harvestable fish or other materials, etc.*

4 *Adaptive capacity is the assessment of a measure's ability to adjust with changing conditions and forces (including sea level change) through natural processes, operation and maintenance activities, or adaptive management, to preserve the measure's function.*

5 *Acquisition, relocation, and buyouts do not actually prevent flooding and erosion but remove the population and associated development from its effects.*

Cedar Rapids Regional Multi-Hazard Tournament



Cedar Rapids Regional Multi-Hazard Tournament:
An IWRM planning process

- SH engagement using 6-step planning process
- Base in reality as much as possible
- Allow SH competitive nature to recommend plans allowing for failure in order to learn what works best and why.
- Give them a second chance to test with a changing climate. Does the decision still make sense?

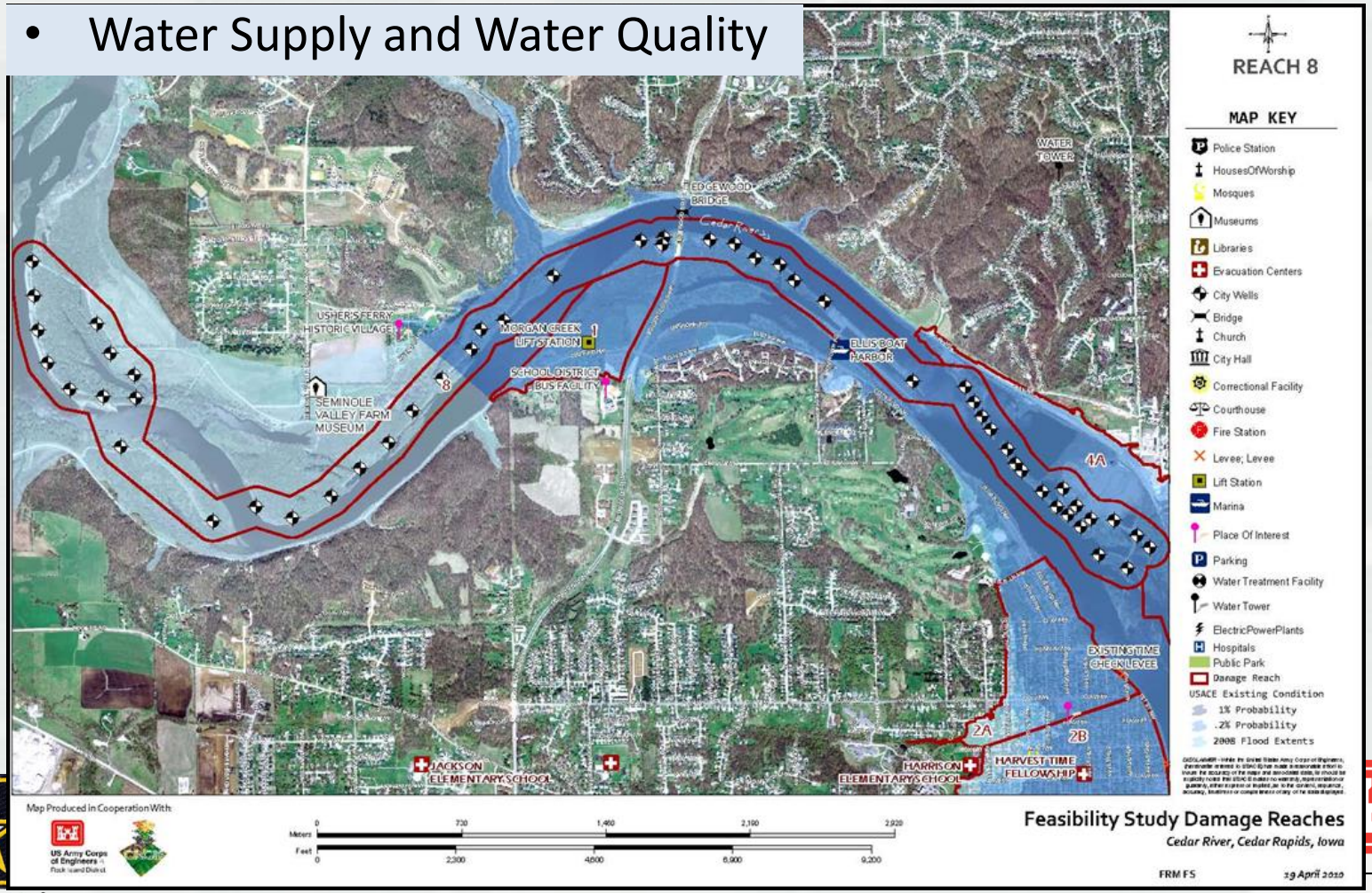
Cedar Rapids Regional Multi-Hazard Tournament - Problems

- Flooding

Cedar Rapids Regional Multi-Hazard Tournament

Problems

- Water Supply and Water Quality



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Cedar Rapids Regional Multi-Hazard Tournament

Problems

- Power Production – Nuclear Energy Water and Waste Heat

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Opportunities and Existing Conditions

- Opportunities: Define the metrics
  - What do we care about?
  - How are we going to measure those things?
- Budget, Data and Information:
  - What do we know?
  - What do we need to know?
- Models and Tools: What do we need to communicate effectively?

Formulate Alternatives – Adaptation Measures

Localized Practices	Type of Change	Capitol Cost	Annual Cost (Land Rental, O&M, etc.)
Municipal Water Supply Options			
Nitrate Removal Equipment	Water Quality resilience	$20,000,000	TBD
Raise Well Intakes	Flood resilience	$2,155,000	TBD
Install New Wells	Drought resilience	$5,000,000 / well	TBD
Flood Risk Reduction Measures			
Levees	Probability	$350,000,000	$36,000.00
Buyouts, Planning and Zoning - Elevation	Consequence	$30k/structure	$0.00
Buyouts, Planning and Zoning - Relocation	Consequence	$60k/structure	$3,000.00
Upstream Practices	**Type of Practice**	**Capitol Cost**	**Annual Cost (Land Rental, O&M, etc.)**
Water Storage			
Large FRM Dam/Reservoir	Flood and drought resilienc	600,000,000	$3,500,000.00
Small Ag Ponds	Flood resilience	$25,500 / pond	$1,275.00
Landuse Changes (Landcover and Land Management)			
Cover Crops	Landcover	$60 per acre	$3.00
Riparian Buffers	Landcover	$732 per acre	$37.00
Restored Wetlands	Landcover	$471 per acre	$24.00
Constructed Wetlands	Landcover	$9,983 per acre	$499.00
Modified Tillage Practices (no-till/strip-till)	Landcover	$20 per acre	$1.00
Filter Strips (Prairie/Grasses) / Contour Buffer Strips	Landcover	$533 per acre	$27.00
Grassed Waterways	Management	$4093 per acre	$205.00
Nutrient Management	Management	$9 per acre	$0.50
Drainage Water Management (Drain Tiles)	Management	$4 per acre	$0.20
Denitrifying Bioreactors	Management	$8000 per bioreactor	$400.00
Cedar Rapids Feasibility Report or Personelle			
IA EQIP 2016 Practice list			
City of Cedar Rapids Personelle			

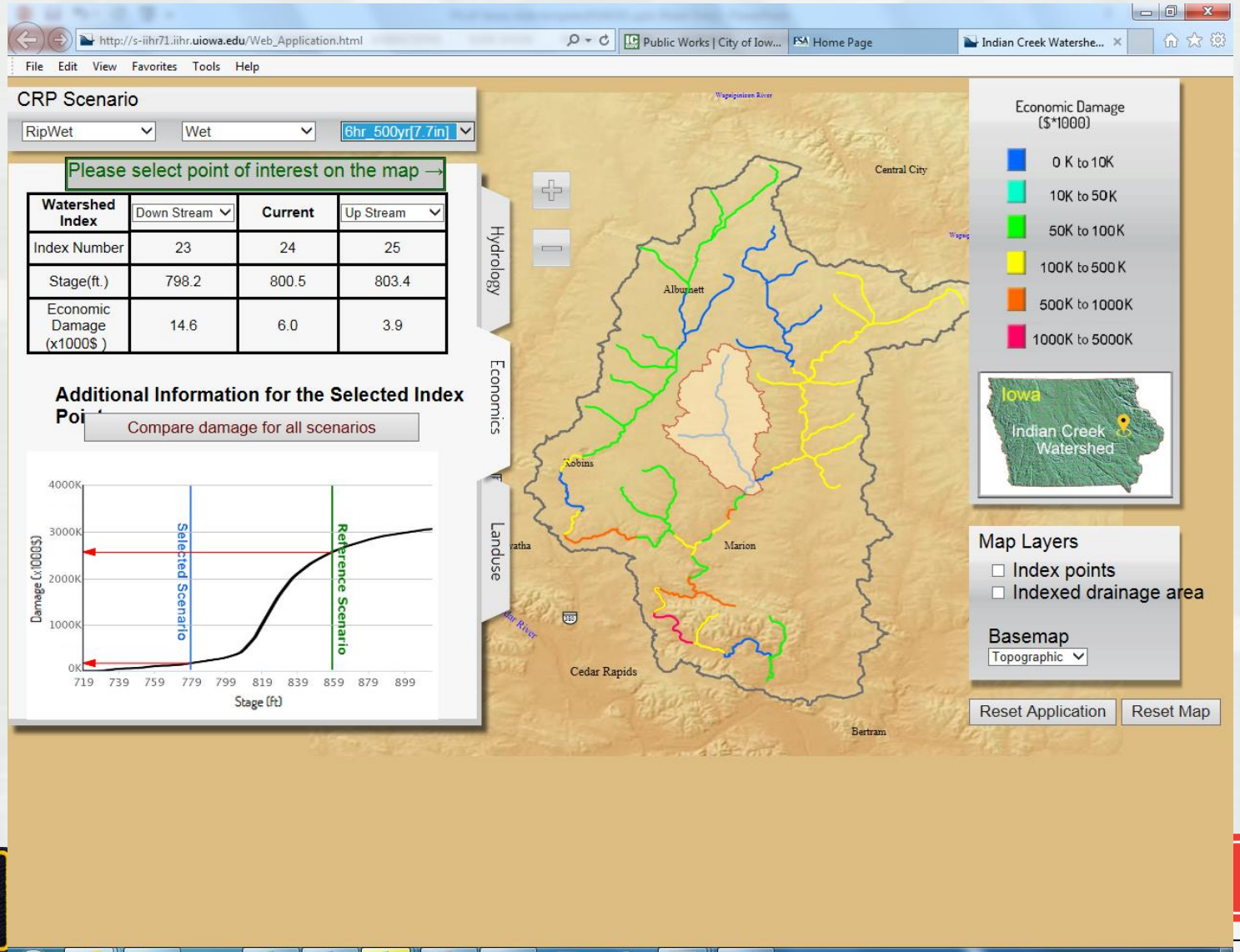
Evaluate and Visualize

- SWAT, HEC-RAS, HEC-FIA (CWMS format) and IWR Planning Suite MCDA for evaluation
- Partners applying other tools to inform certain metrics: Ecosystem Health (TNC), Temperature (DOE-Sandia Lab)
- Prototype DSS or excel: database connection to GIS maps, charts or other graphics.

Evaluate Alternatives: Metrics

Flooding Component								
Index	Metric	Description	Sector	Data Used	Economic Valuation Method	Economic Valuation Tool/Methods	Final Unit of Measurement	Notes
Structure Damage	Building and Contents	Estimate of flood related damage to residential, commerical and industrial buildings, content and vehicles	Urban	National Structure Inventory, Assessed Value, Data provided by industrial & commercial operations, HEC-RAS depth grids	Cost Avoided	Structure, Content and vehicles Damage, HEC-FIA	$ Damages / $ Invested	DAMAGED BUSINESS CONTENT ACCOUNTED FOR IN THIS METRIC
Structure Damage	Roadway Infrastructure							
Agricultural Damages	Crops	Estimate of the flood related damage to agricultural crops. Damages are a function of flood inundation, duration of flooding, type of crop, and stage of growth.	Agriculture	Crop Datalayers,HEC-RAS Depth Grids, Duration grids, damage curves by stage of growth	Cost Avoided	Crop Damage, HEC-FIA	$ Damages / $ Invested OR Acres Damaged / $ Invested	
Critical Infrastructure	Power Plants	Estimate of flood related damages to power plant facilities, lost revenue and operatational costs	Energy	DOE provided stage/damage information (curves), HEC-RAS Depth grids, operational requirements, operational revenue information, thresholds for plant shutdown, system wide cost impacts of shut down	Cost Avoided	1) Infrastructure Damage: Stage/Damage Curve evaluation based on HEC-RAS generated depth grids (stage) 2) Lost revenue due to inability to operate 3) Increased cost of operation for specified period due to damages (different fuel source Coal vs Natural Gas) 4) Other system impacts (other facility has to increase production for period of time)	$ Damages / $ Invested	
Critical Infrastructure	Waste / Water Treatment Plants	Estimate of flood related damages to water and waste water facilities and ability to operate	Urban	City provided stage/damage information (curves), HEC-RAS depth grids, operational requirements, operational revenue information, thresholds for plant shutdown, system wide impacts of shut down	Cost Avoided	1) Infrastructure Damage: Stage/Damage Curve evaluation based on HEC-RAS generated depth grids (stage) 2) Lost revenue due to inability to operate 3) Increased cost of operation for specified period due to damages (hauling solids further, etc.) 4) Other system impacts (other facility has to treat/provide water for period of time)	$ Damages / $ Invested	

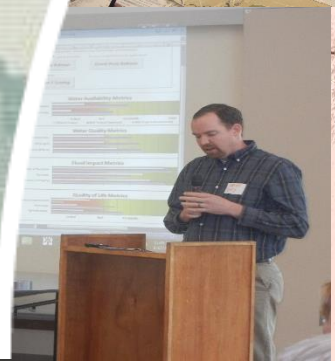
Select Alternative: Visualize Selection

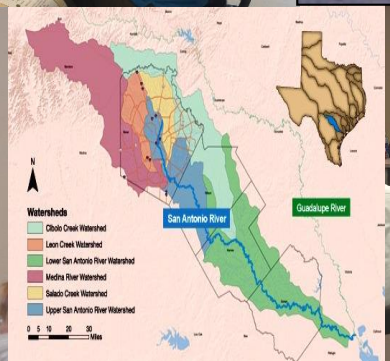


Summary

The MHT Framework:

- Is flexible,
- Has a range of applications,
- Brings together partners,
- Integrates USACE and partners' models, tools, and data,
- Applies SVP approach to aid decision-making and generate new solutions, and
- Supports risk reduction actions.





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Questions?

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

For more information:
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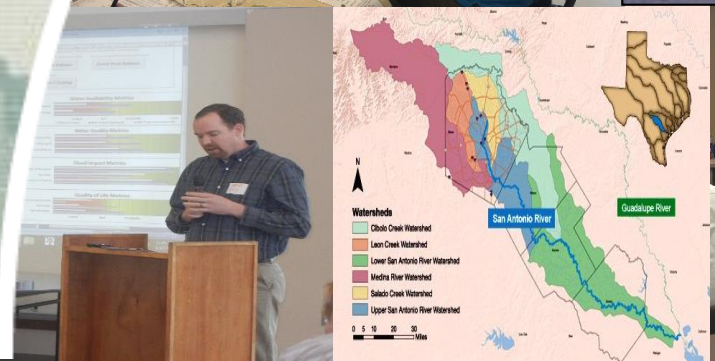

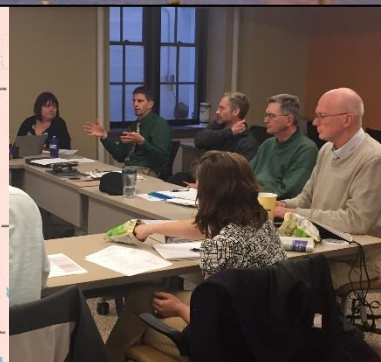

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