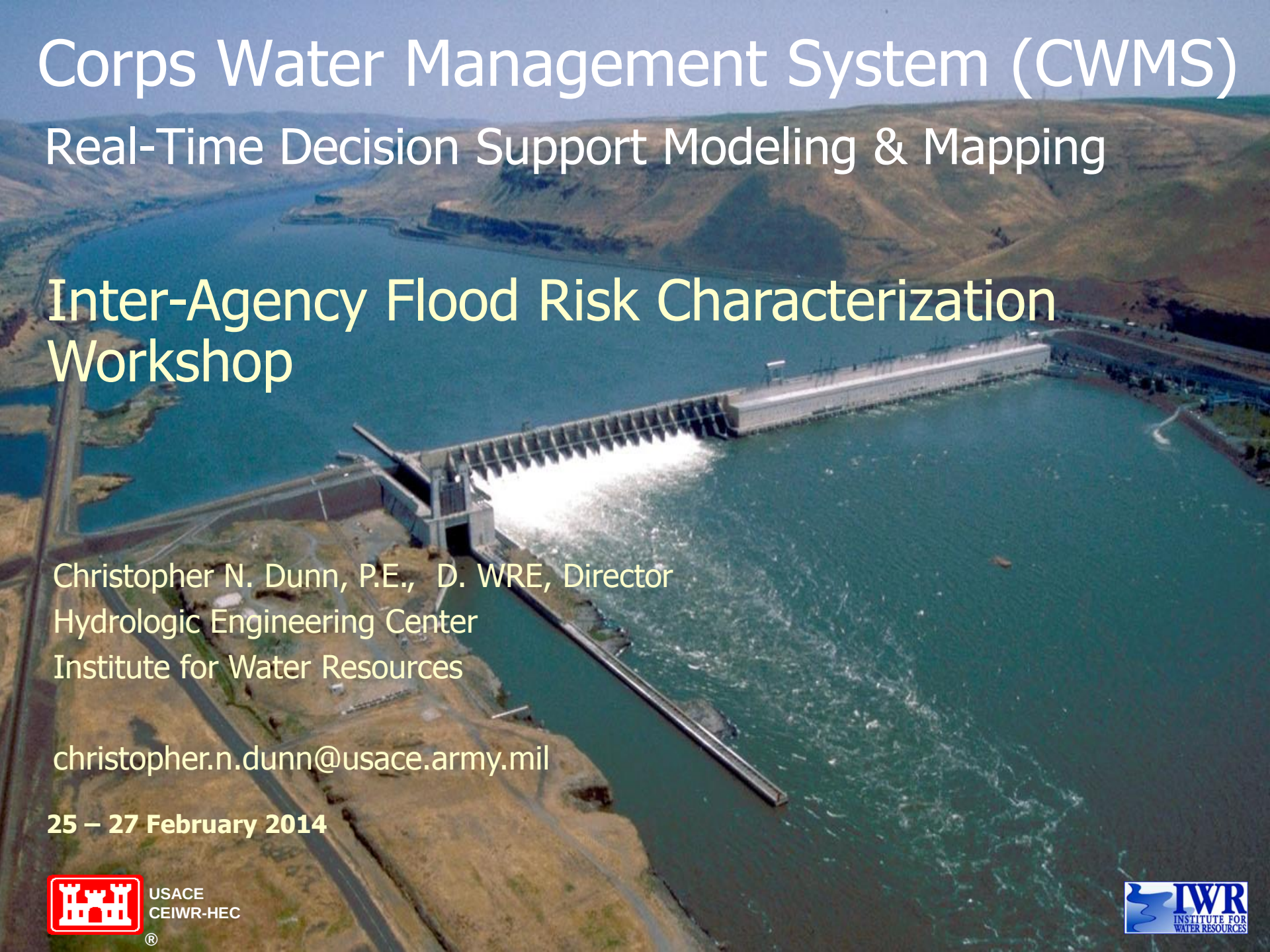
Corps Water Management System (CWMS)

Real-Time Decision Support Modeling & Mapping



Inter-Agency Flood Risk Characterization Workshop

Christopher N. Dunn, P.E., D. WRE, Director
Hydrologic Engineering Center
Institute for Water Resources

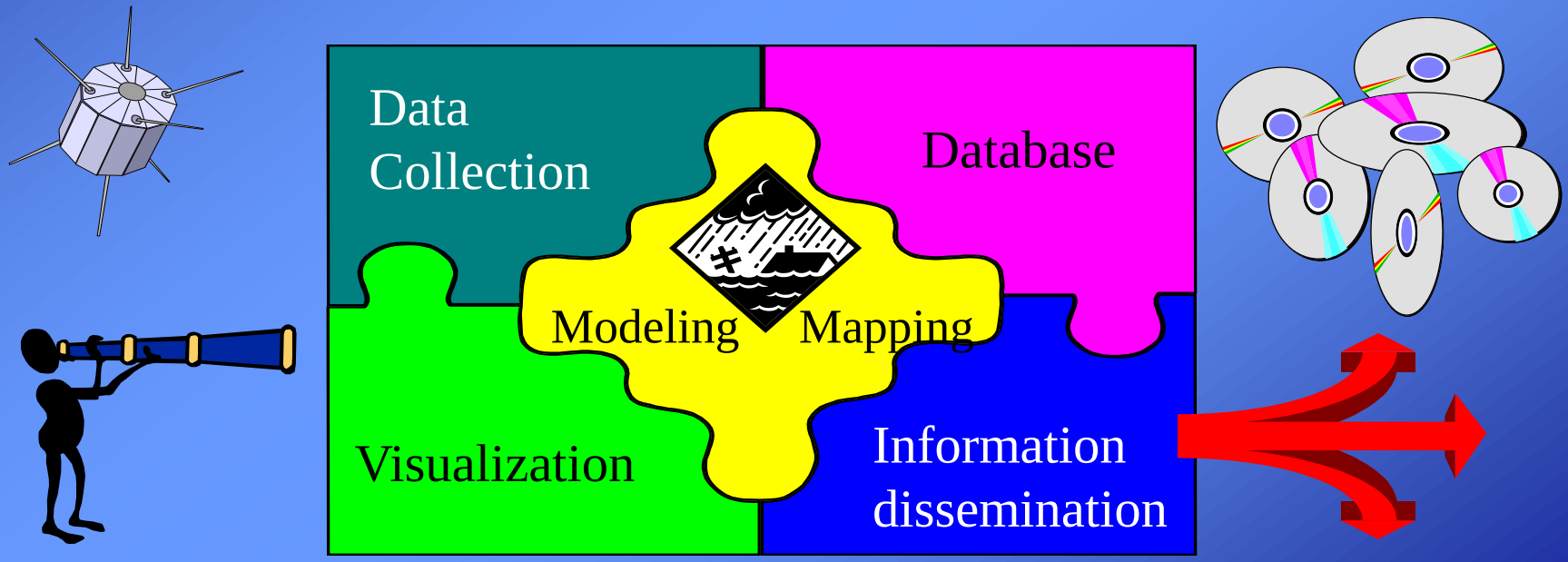
christopher.n.dunn@usace.army.mil

25 – 27 February 2014

USACE
CEIWR-HEC

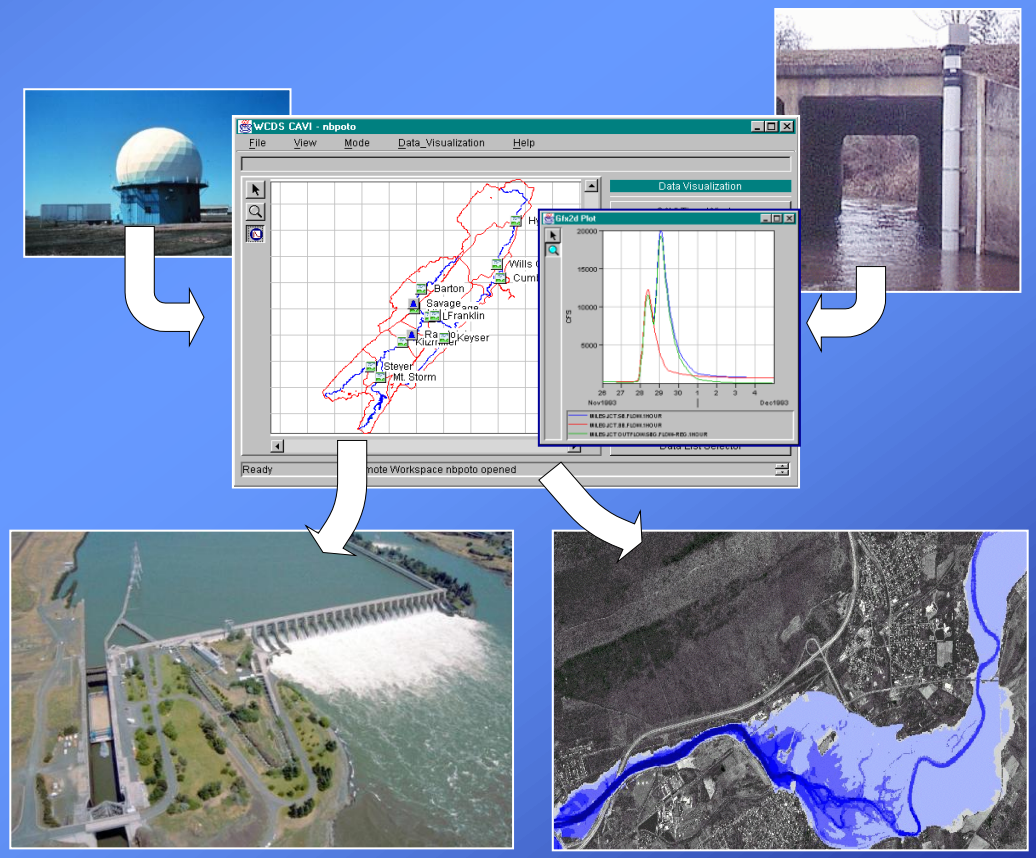
Corps Water Management System (CWMS) Overview

An integrated suite of hardware, software, and communication resources supporting Corps' real-time water management mission.



Corps Real-Time Water Management Mission

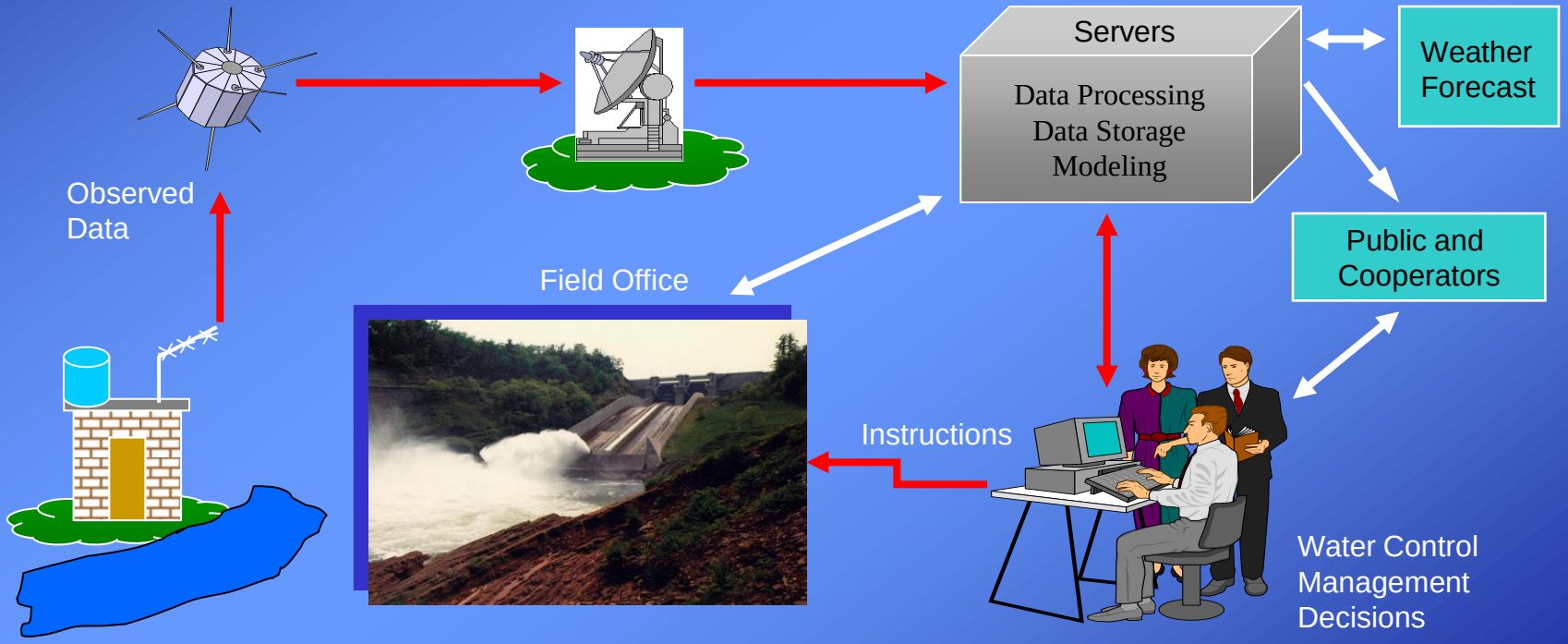
- Real-Time Decision Support for Water Management
- 700+ Multipurpose Reservoirs and Flow Control Structures, Thousands of Miles of Levees
- 120+ Section 7 Projects
- To achieve the full range of authorized purposes from all of our projects for floods droughts and everything in between



USACE
CEIWR-HEC

IWR
INSTITUTE FOR WATER RESOURCES

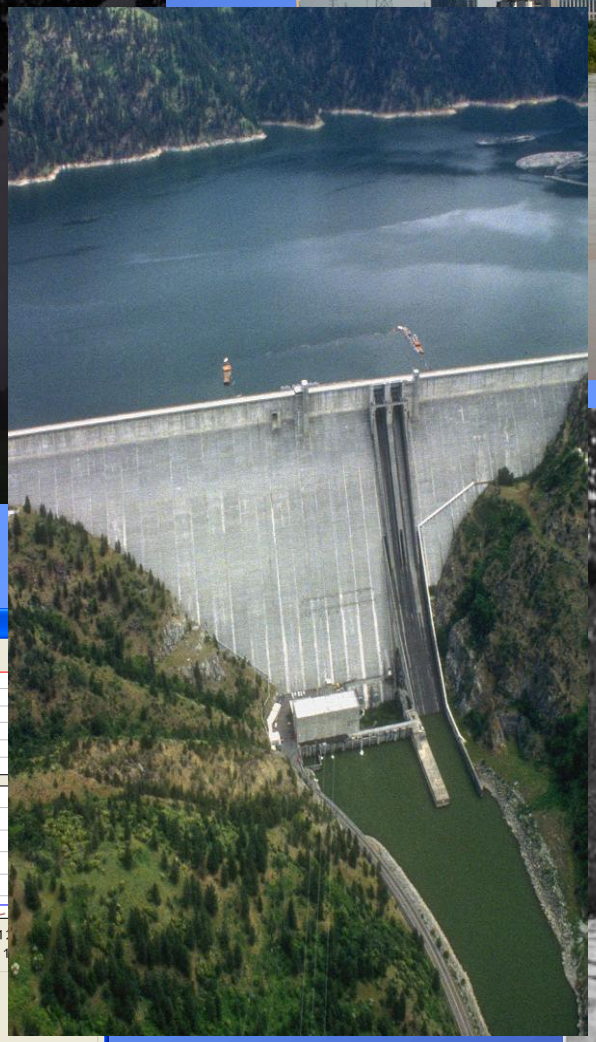
CWMS Software Integrates the Processing from Data to Water Management Decisions

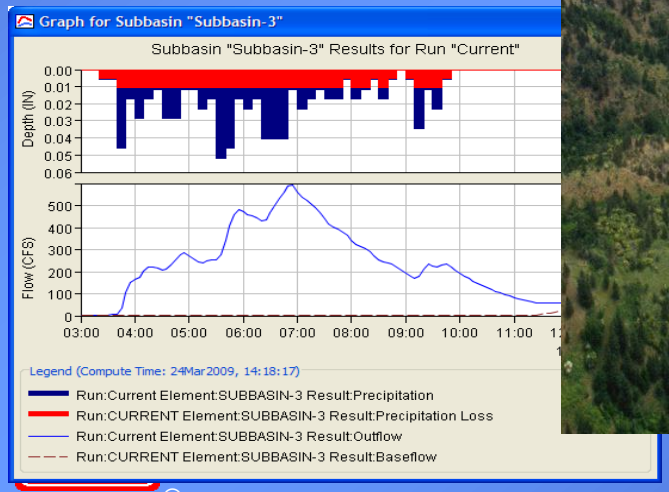


USACE
CEIWR-HEC
®

IWR
INSTITUTE FOR WATER RESOURCES

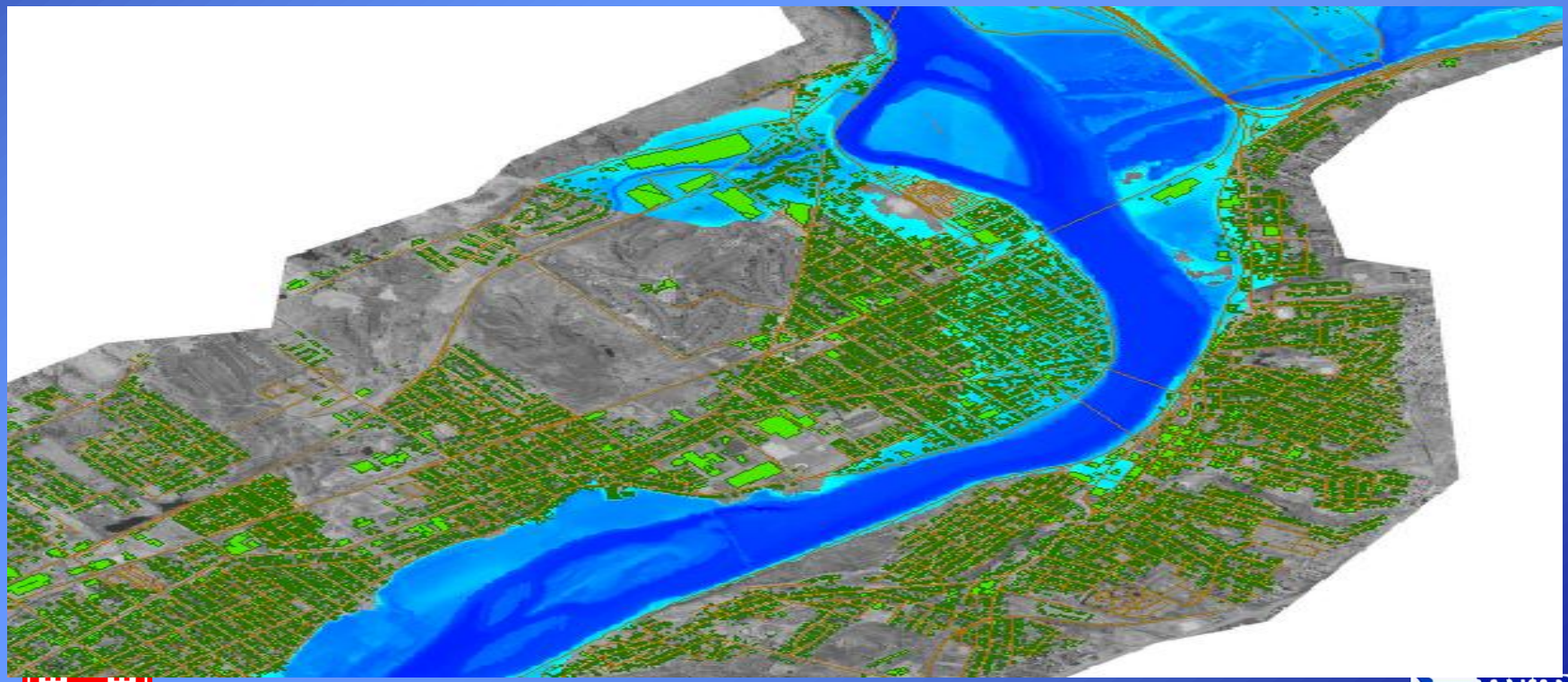
CWMS Modeling



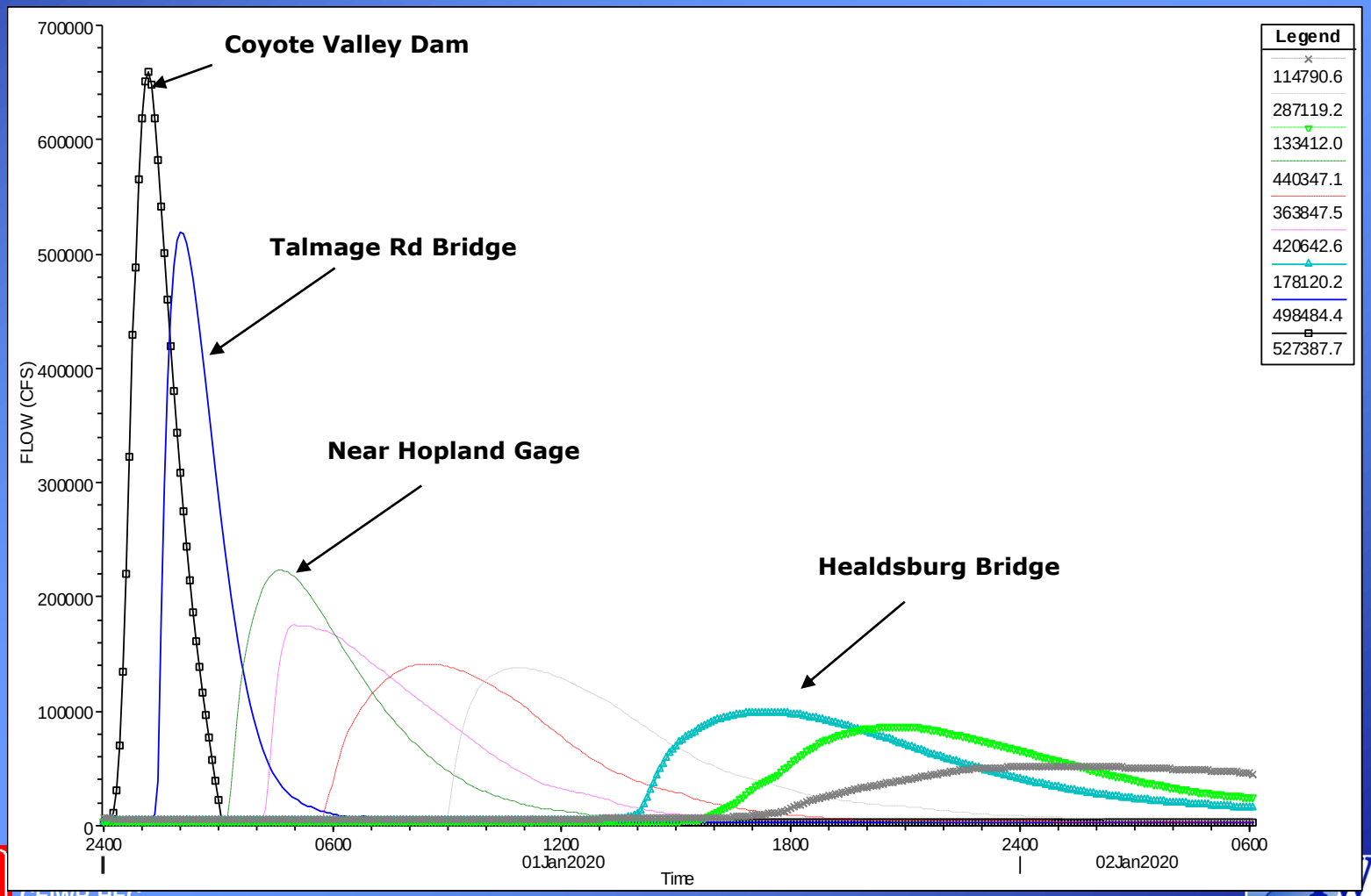


Inundation Mapping

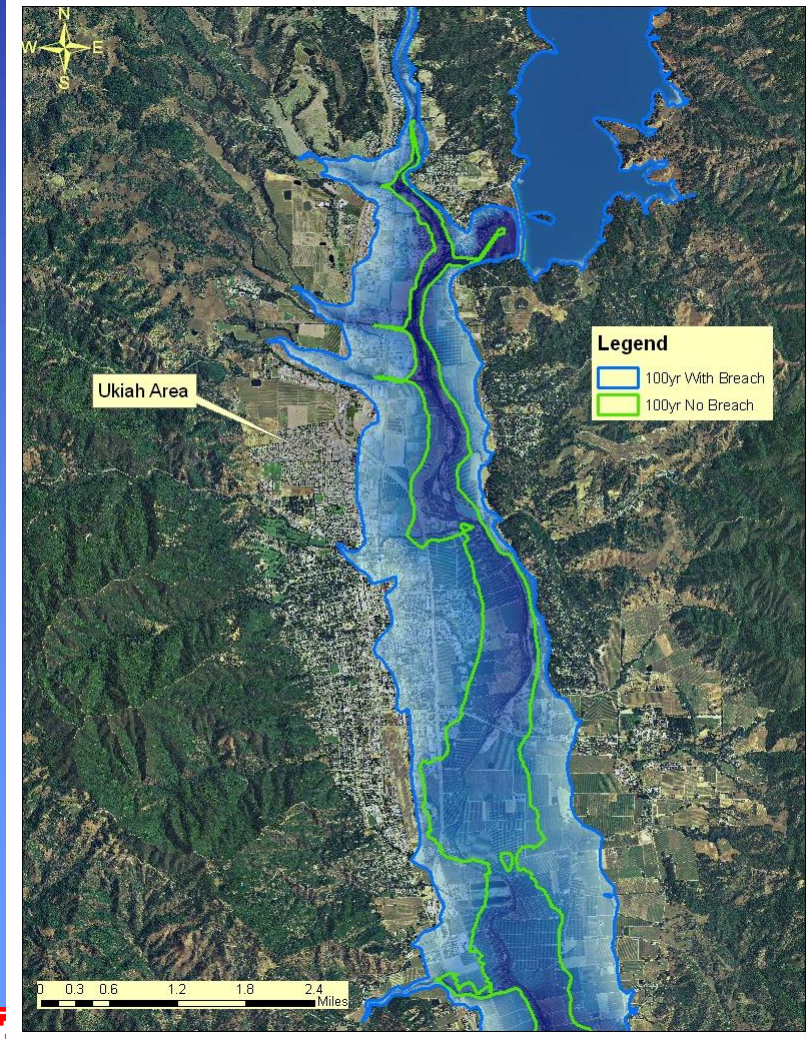
- Delineates geographic extent of flooding using model results and topography
- Inundation boundaries and depth maps are computed then viewed

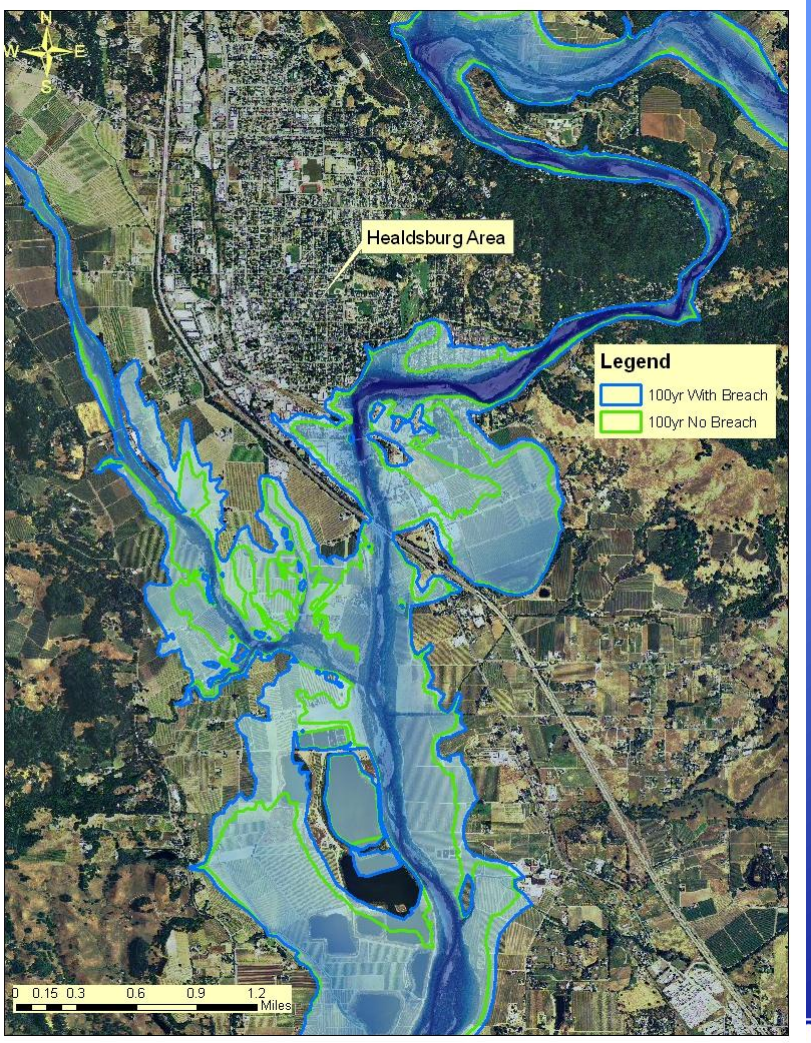


Model Results
Sunny Day Failure of Coyote Dam



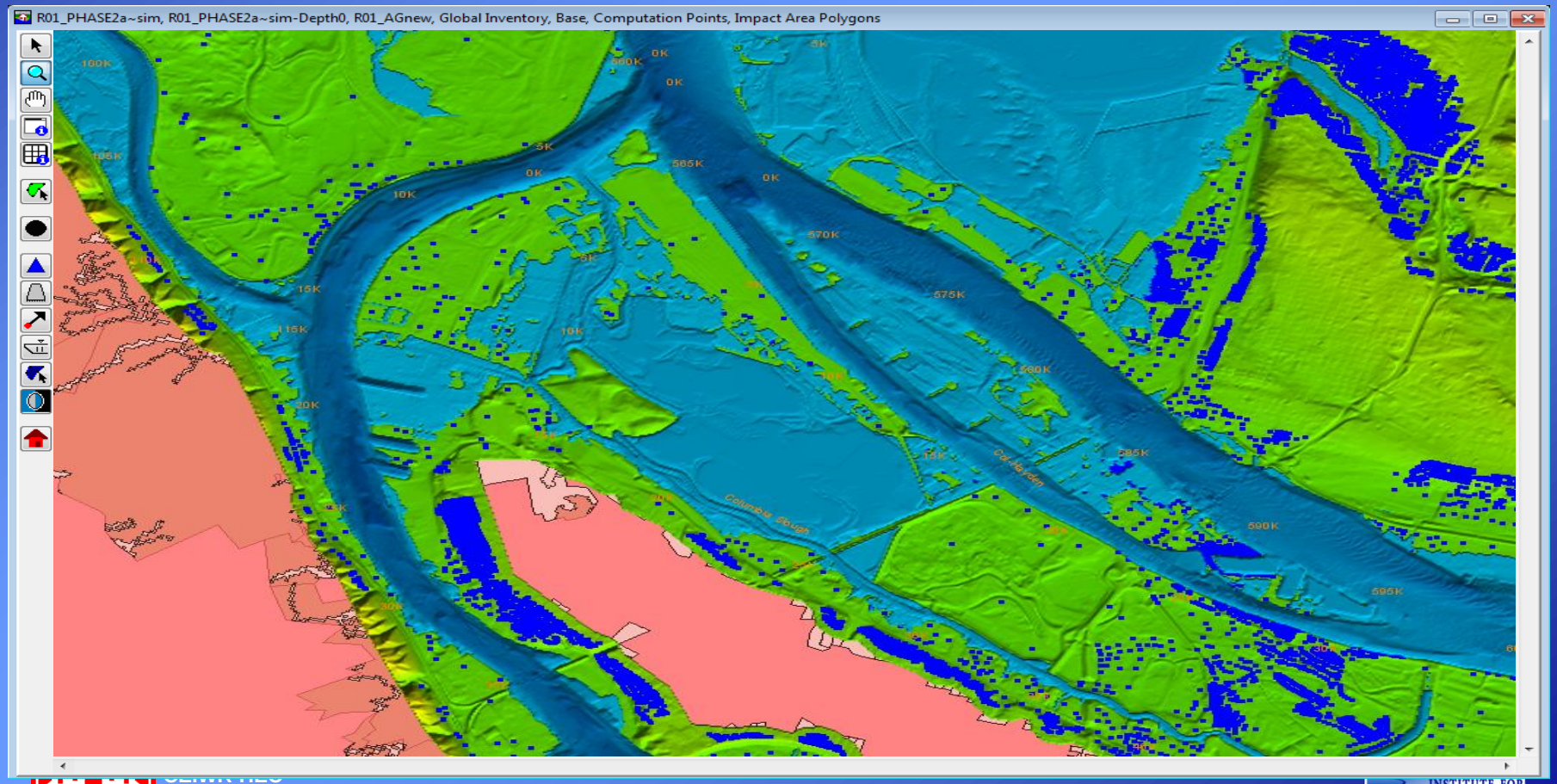
Model Results
1% Event With/Without Failure of Coyote Dam



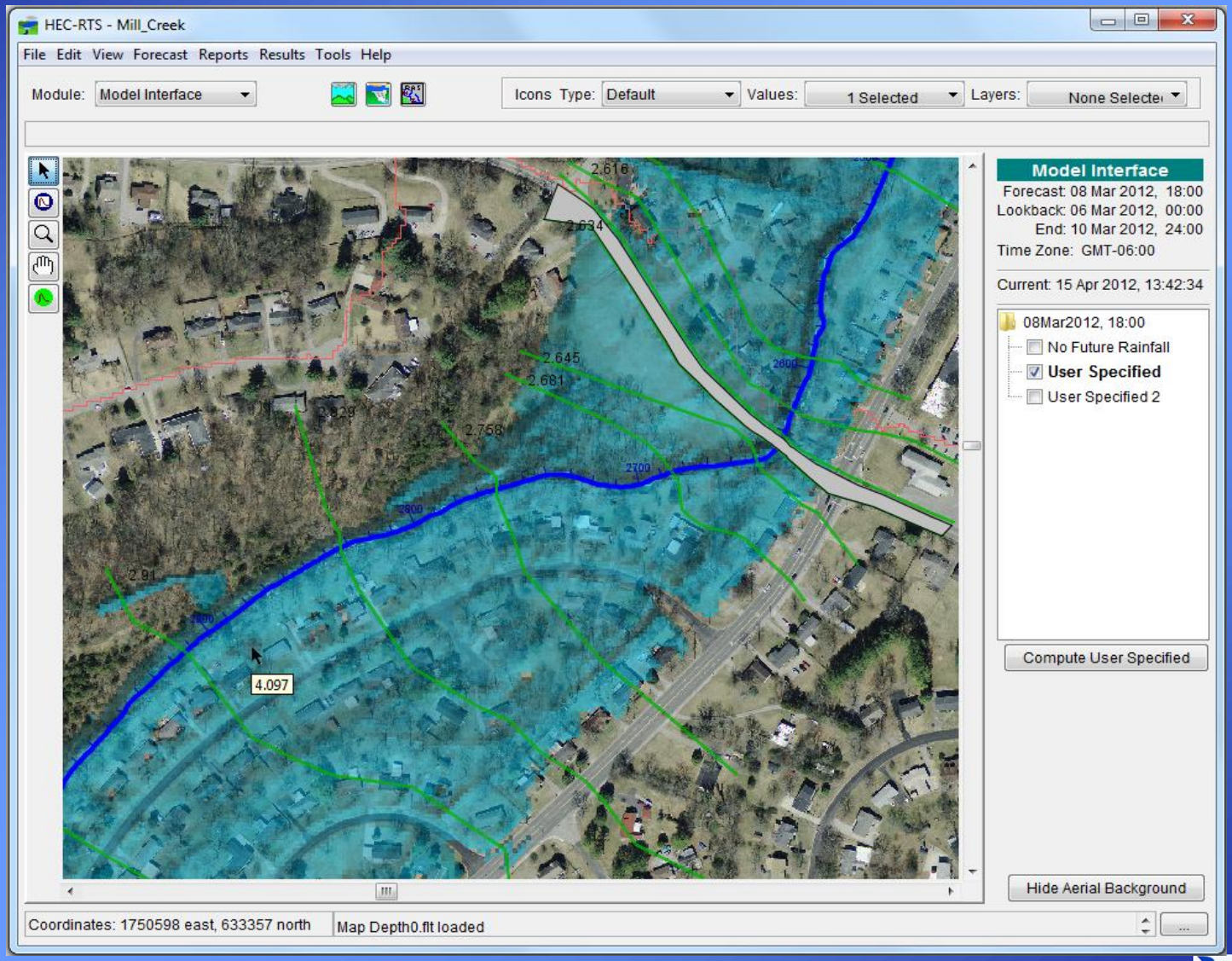


Explaining Risk thru Inundation Maps

Inundation boundaries and depth maps are viewed and used for consequence estimates but also great way to inform public of risk.

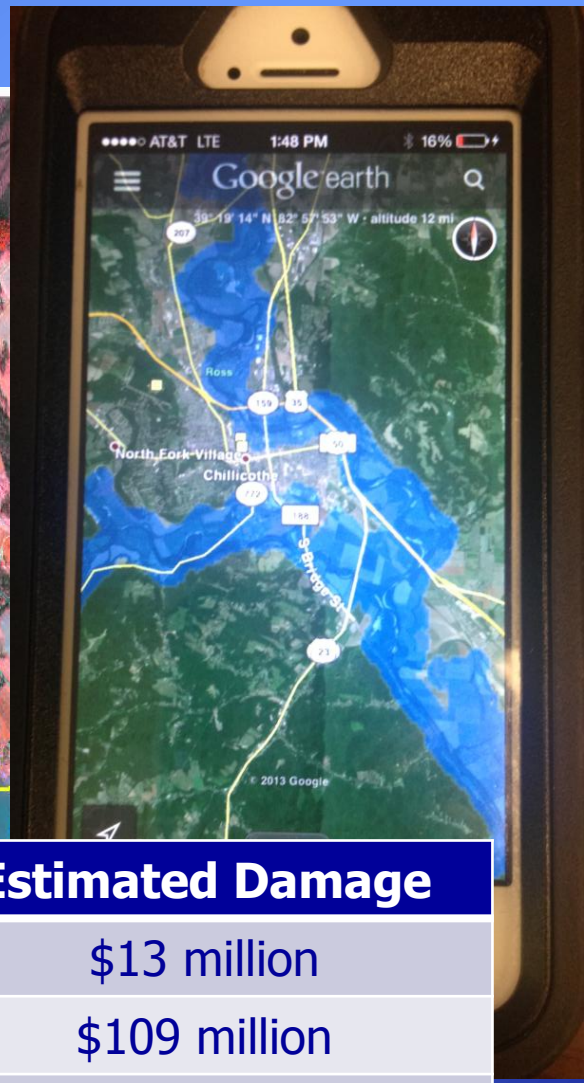


Viewing Inundation Depths



USACE
CEIWR-HEC
®

Consequence Estimation



Scenario	Structures Flooded	Estimated Damage
Normal Operation	140	$13 million
Without Projects	740	$109 million
Damage Prevented	600	$96 million

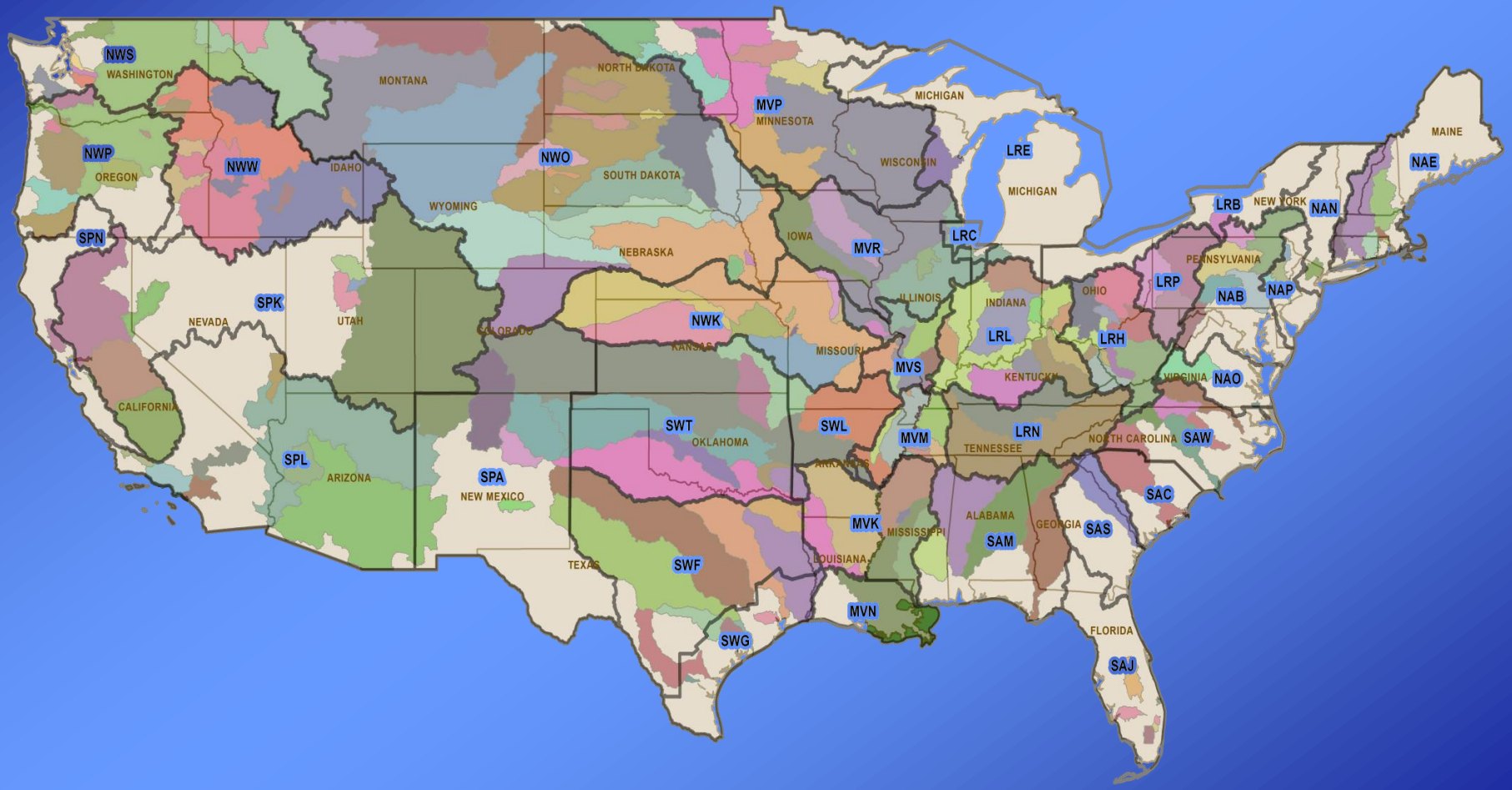
USACE
CEIWR-HEC

IWR INSTITUTE FOR WATER RESOURCES

Nashville Flooding – May 2010

CWMS National Implementation

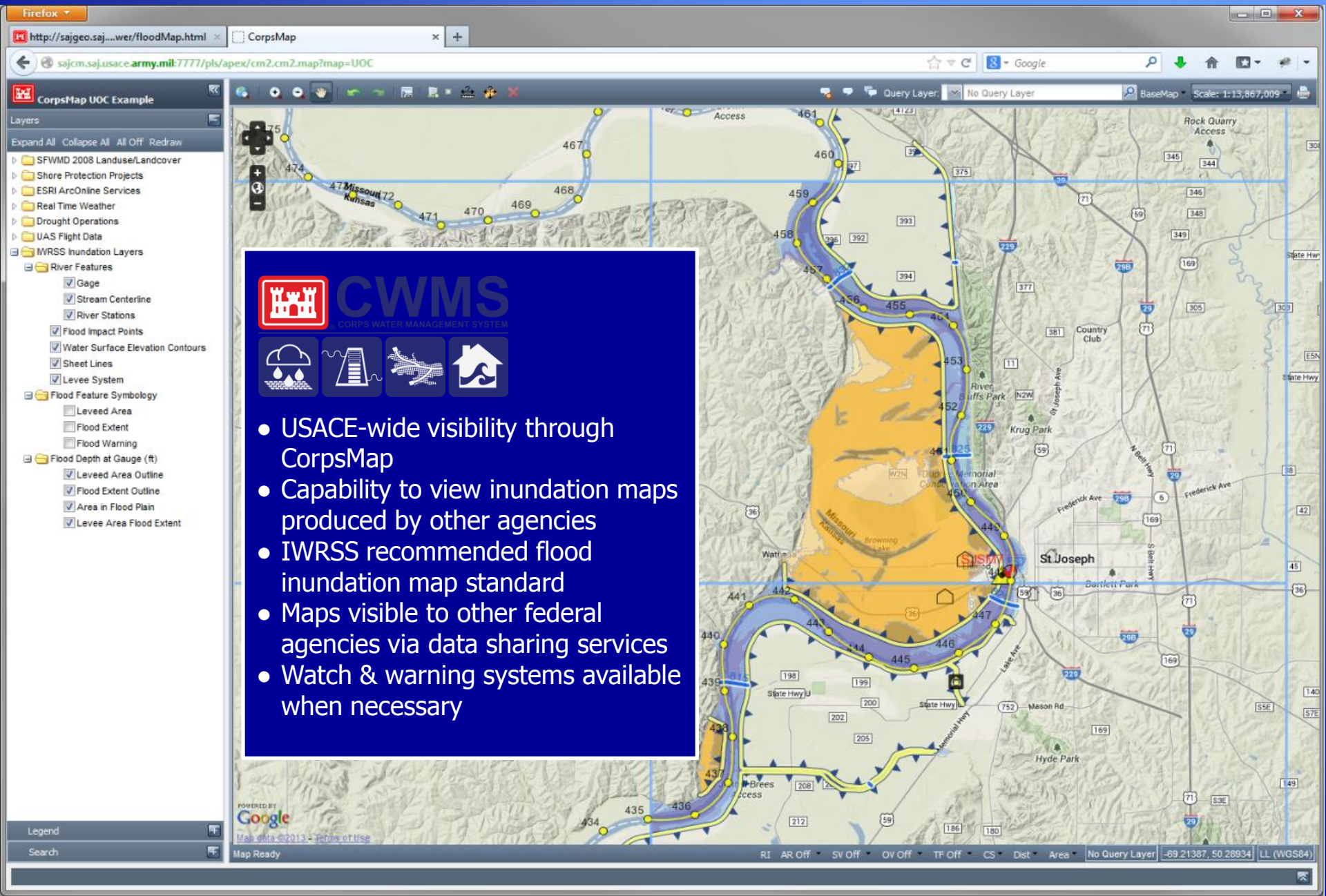
(Supports UIS & Planning Transformation…)



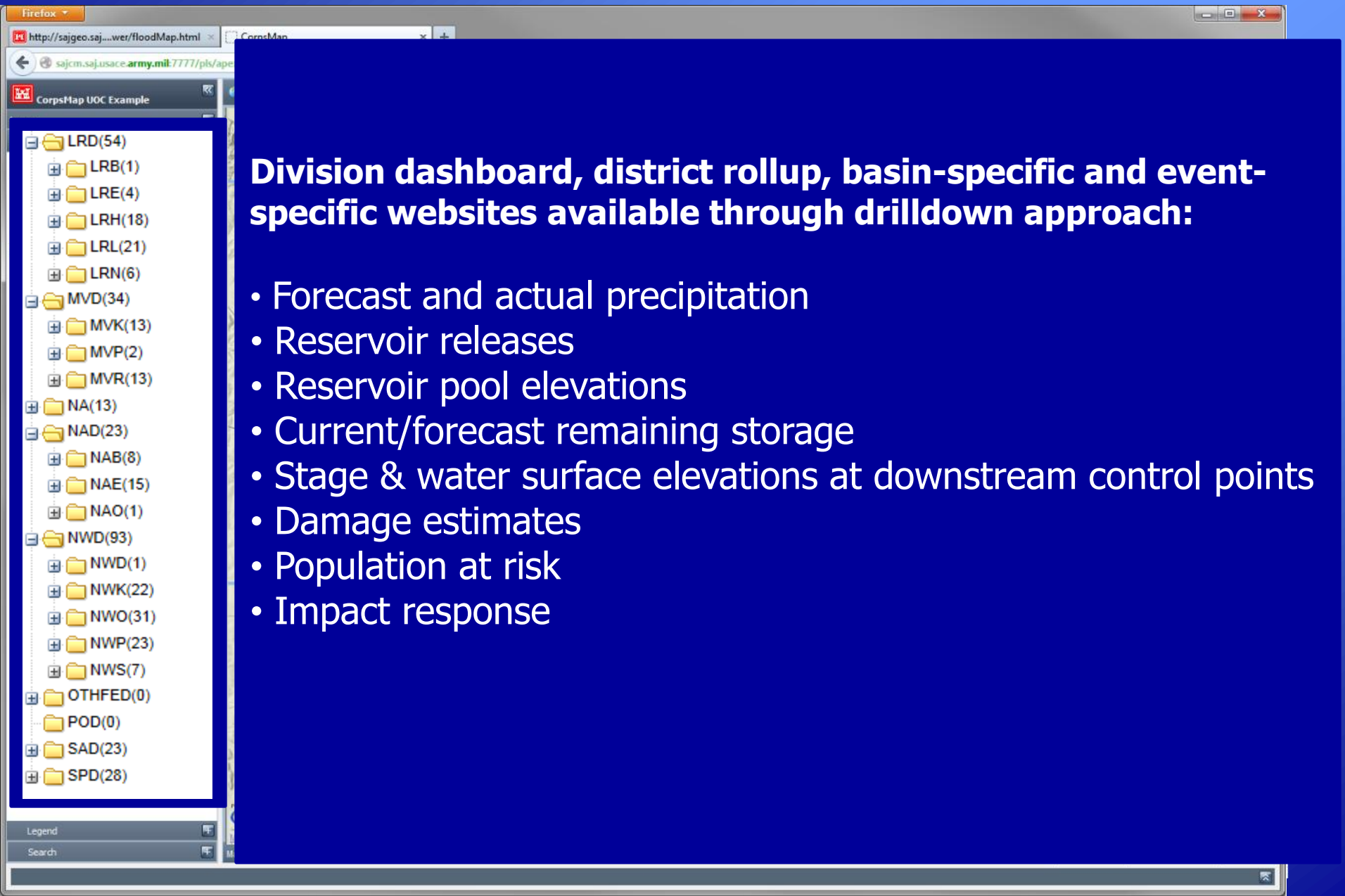
USACE
CEIWR-HEC
®

IWR
INSTITUTE FOR WATER RESOURCES

Nationally Consistent Viewing of Inundation Maps



Nationally Consistent CWMS Reporting

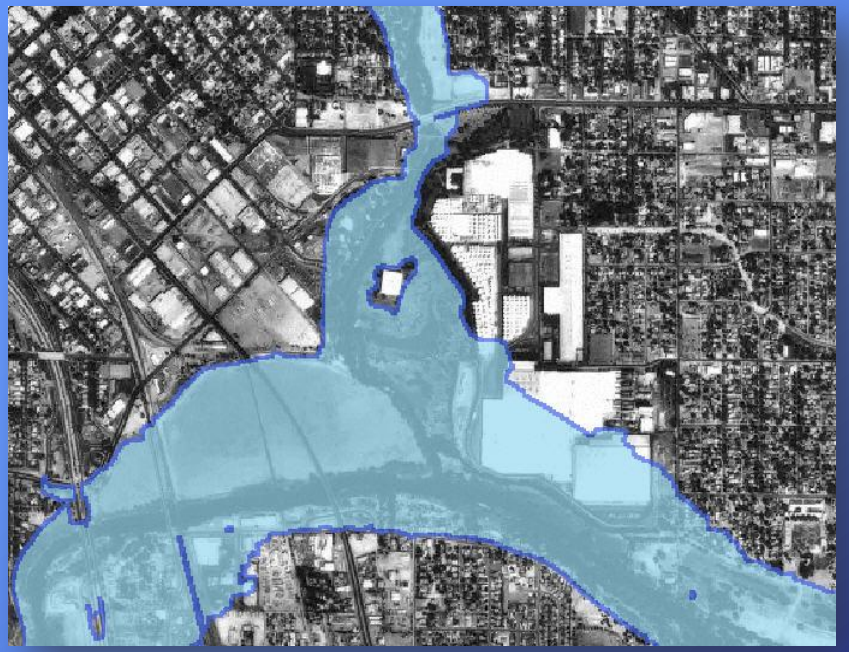


Division dashboard, district rollup, basin-specific and event-specific websites available through drilldown approach:

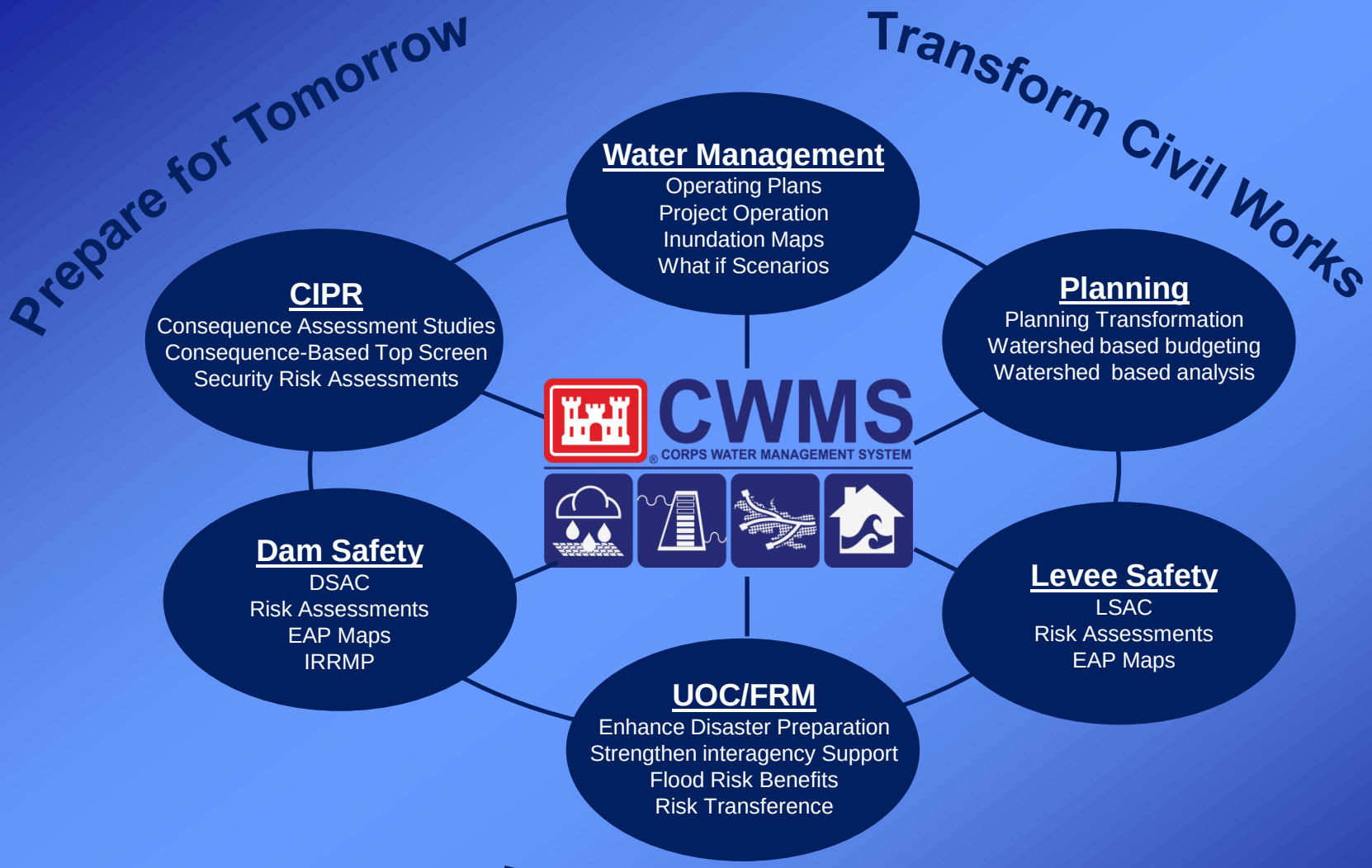
- Forecast and actual precipitation
- Reservoir releases
- Reservoir pool elevations
- Current/forecast remaining storage
- Stage & water surface elevations at downstream control points
- Damage estimates
- Population at risk
- Impact response

Other Flood Risk Metrics

- Economic and Environmental Performance
- Annual Exceedance Probability
- Conditional Non-Exceedance Probability
- Long-Term Exceedance Probability
- Risk Maps
- Loss-of-life



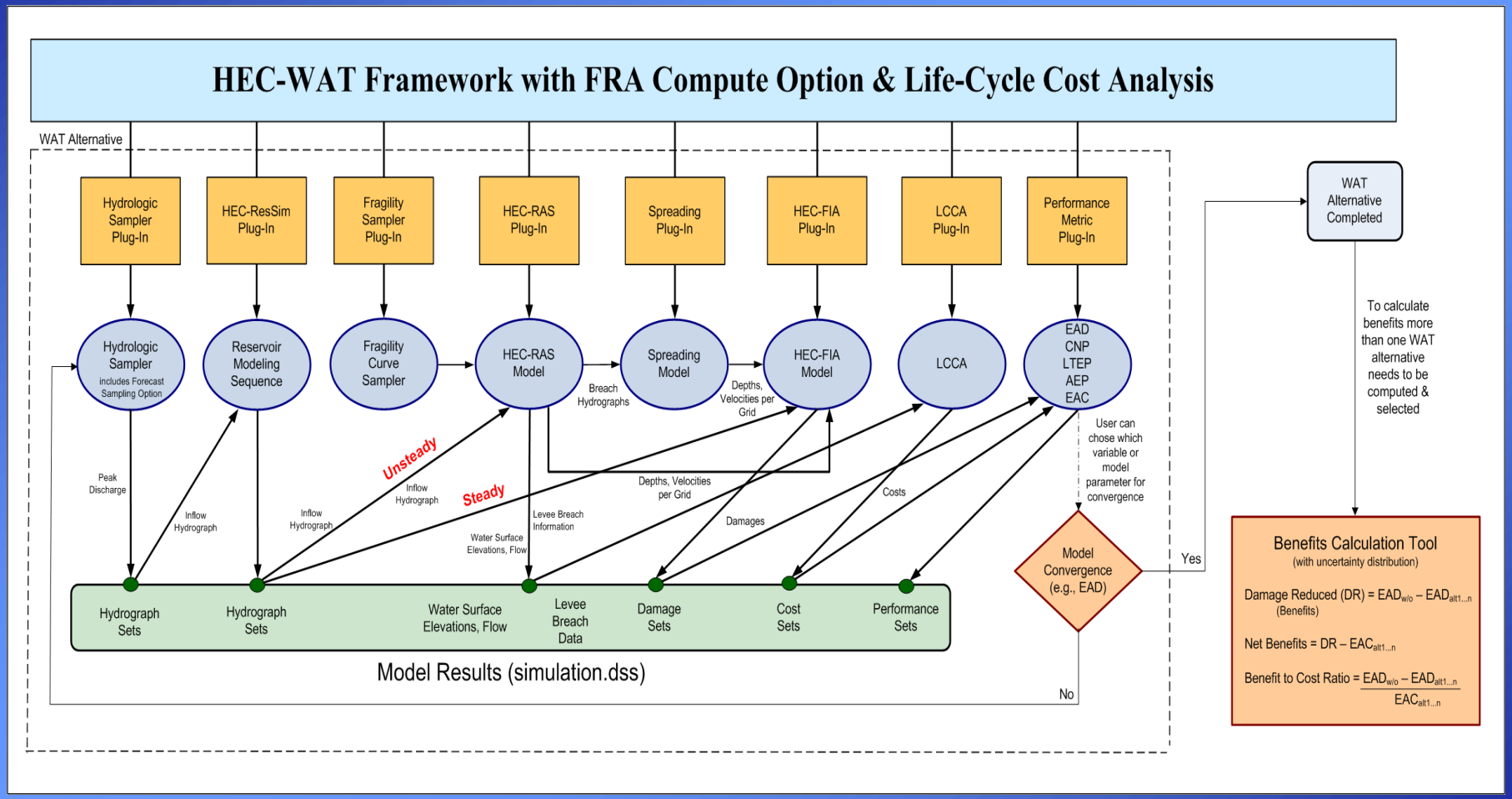
Fortunately CWMS Supports



USACE
CEIWR-HEC

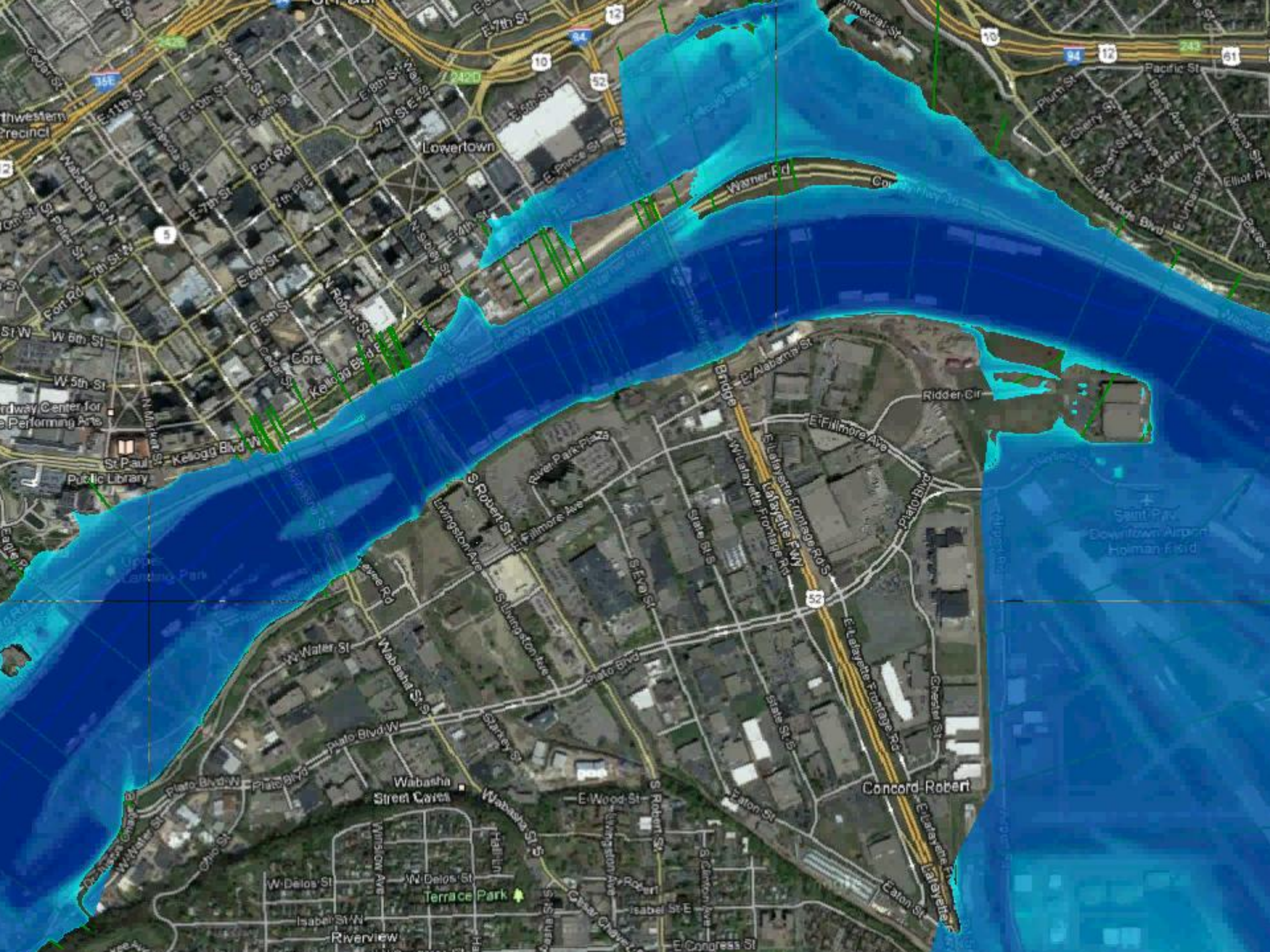
IWR
INSTITUTE FOR WATER RESOURCES

HEC-WAT to Perform Watershed, System, Risk and Life-Cycle Evaluations

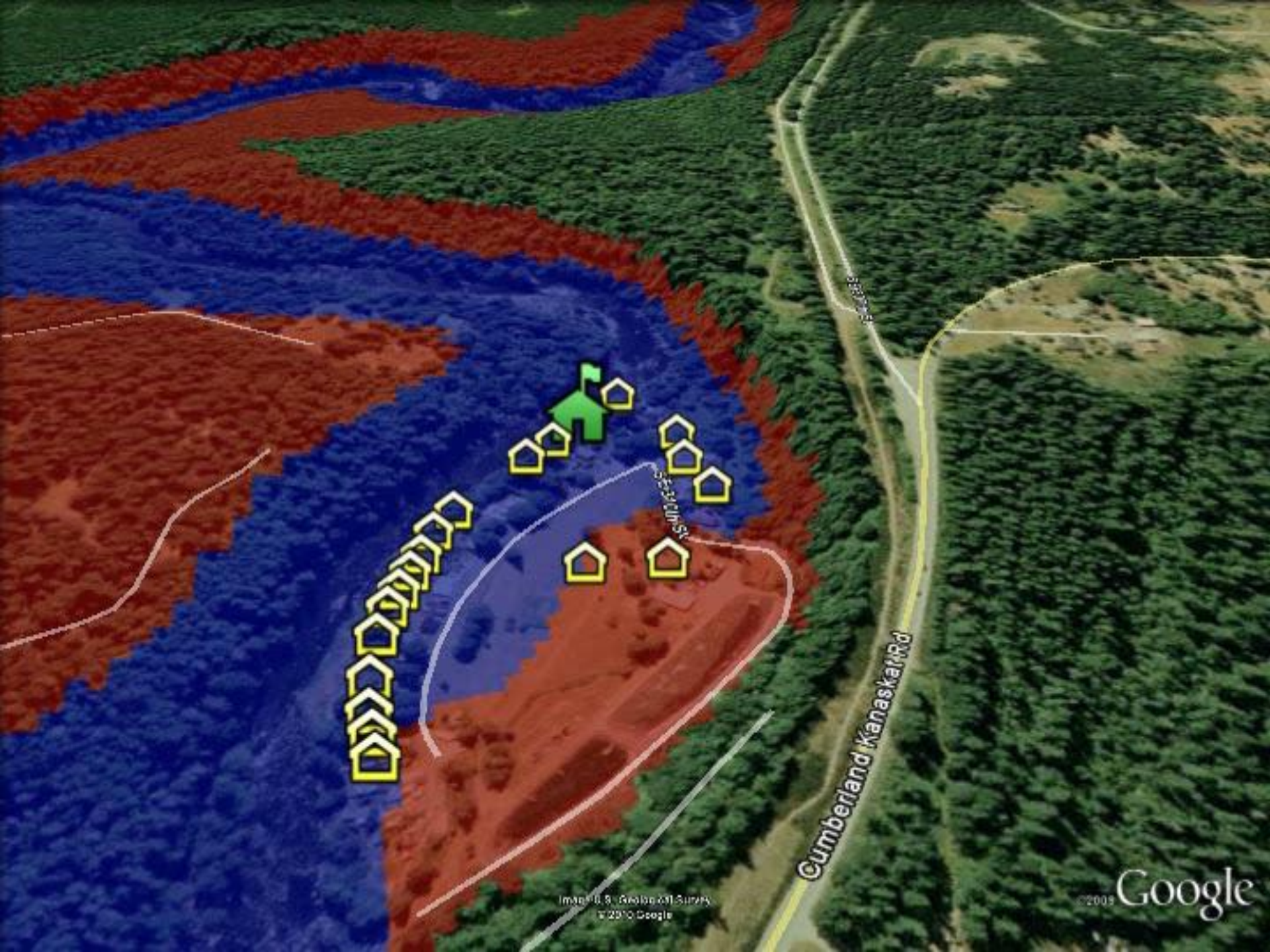


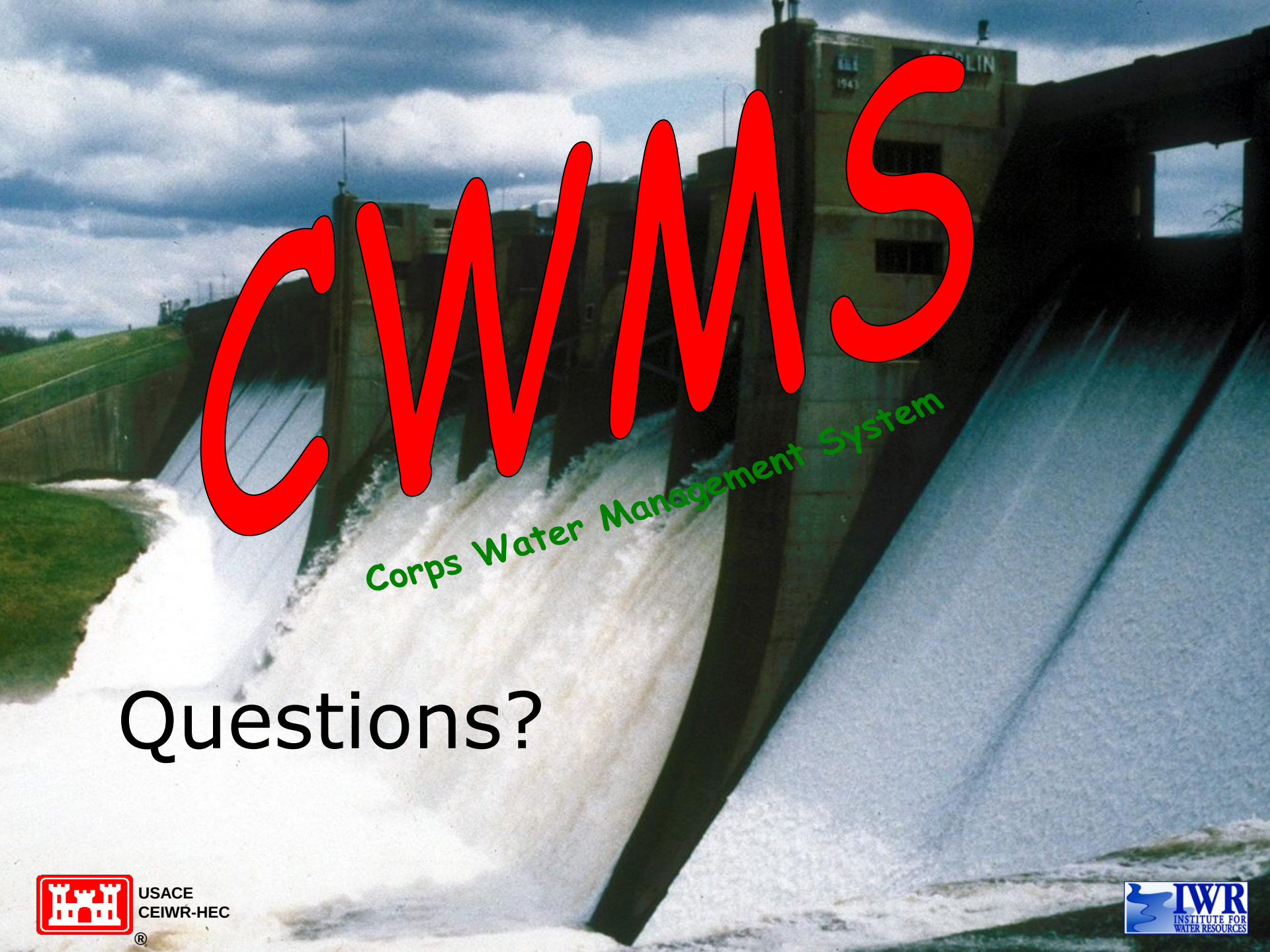
USACE
CEIWR-HEC
®

IWR
INSTITUTE FOR WATER RESOURCES



Lowertown
Core
St Paul
Public Library
Wabasha
Street Caves
Concord-Robert
Terrace Park
Riverview
Kellogg Blvd W
W 5th St
W 6th St
E 7th St
E 6th St
E 5th St
E 4th St
Warner Rd
E Alabama St
E Fillmore Ave
Ridder Cir
River Park Plaza
Plato Blvd
Plato Blvd W
W Water St
S Robert St
S Livingston Ave
State St S
Wabasha St S
E Wood St
W Delos St
Isabel St E
E Congress St
Eaton St
Lafayette Fwy
Mounds Blvd
Pacific St


Cumberland Kanaskat Rd
Google



Questions?

USACE
CEIWR-HEC
®

IWR
INSTITUTE FOR WATER RESOURCES

Risk Analysis Hang-ups

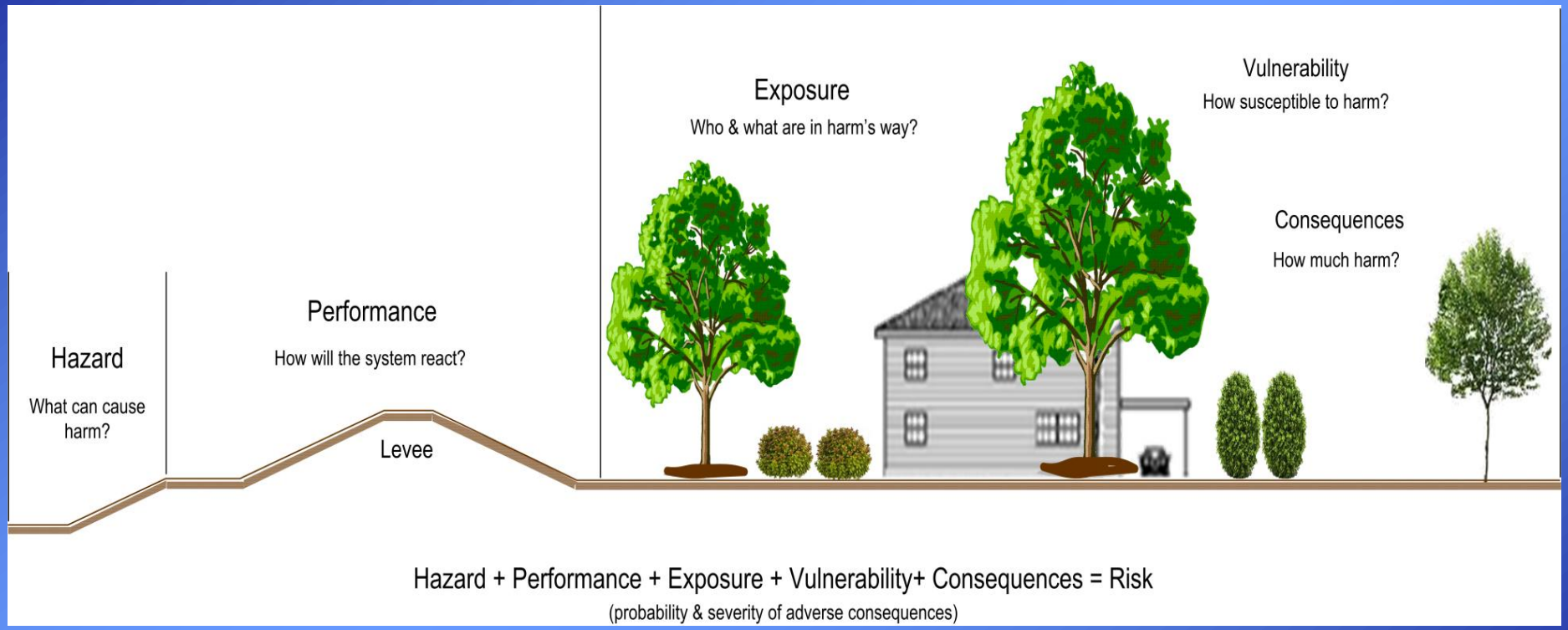
- Design Standard Paradigm. (People tend to be risk adverse.)
- It can't be done. (i.e. Lack of understanding by the practitioners.)
- What is the value added? (How do we make decisions differently?)
- It costs too much.
- How do we communicate to the Stakeholders?
- How do we communicate to the Decision Makers?

Risk Analysis Hang-ups

Even for the well informed, terminology/practice continues to change.

- Risk Based
- Risk Analysis
- Risk and Uncertainty
- Risk Management
- Risk Assessment
- Risk Informed
- Residual Risk
- Probabilistic Risk Assessment
- Probabilistic Flood Risk Assessment
- Tolerable Risk

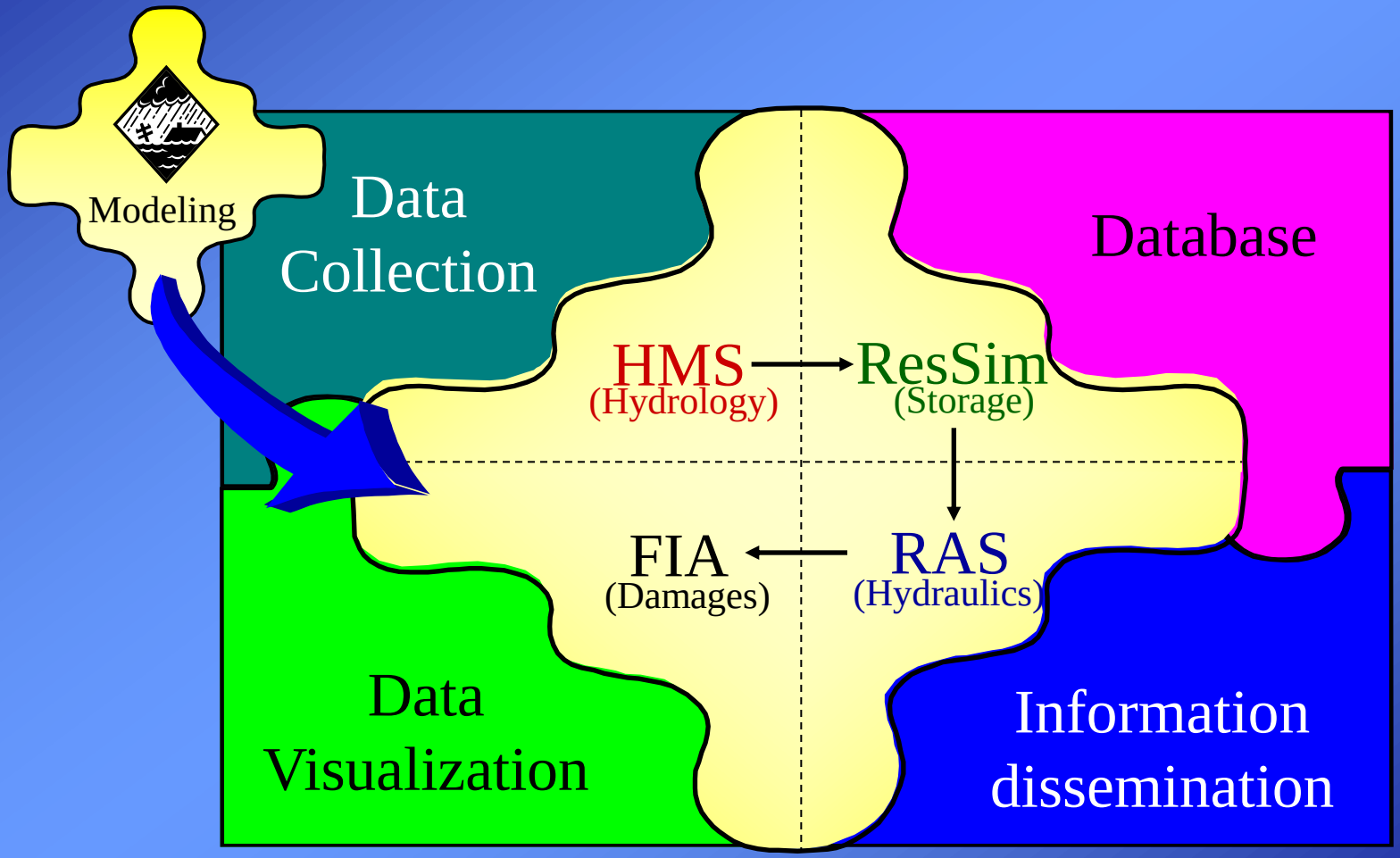
Risk Conceptualized



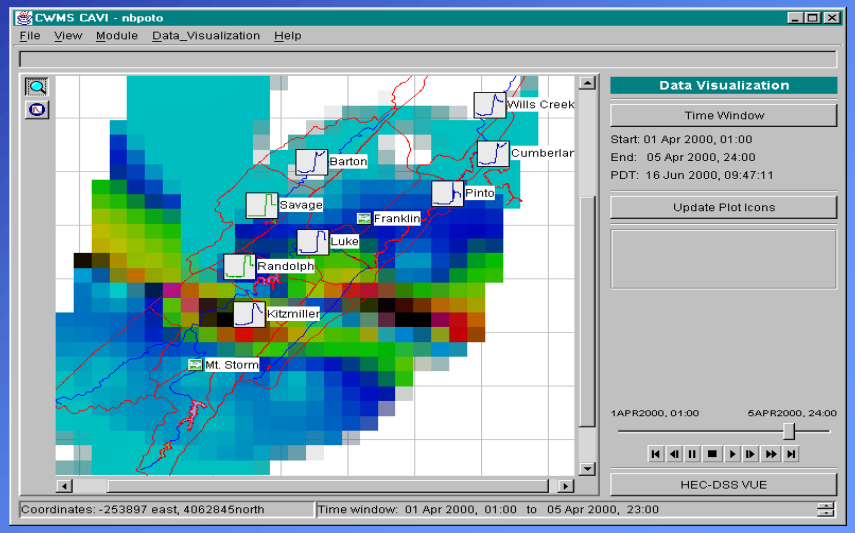
Hazard + Performance + Exposure + Vulnerability+ Consequences = Risk

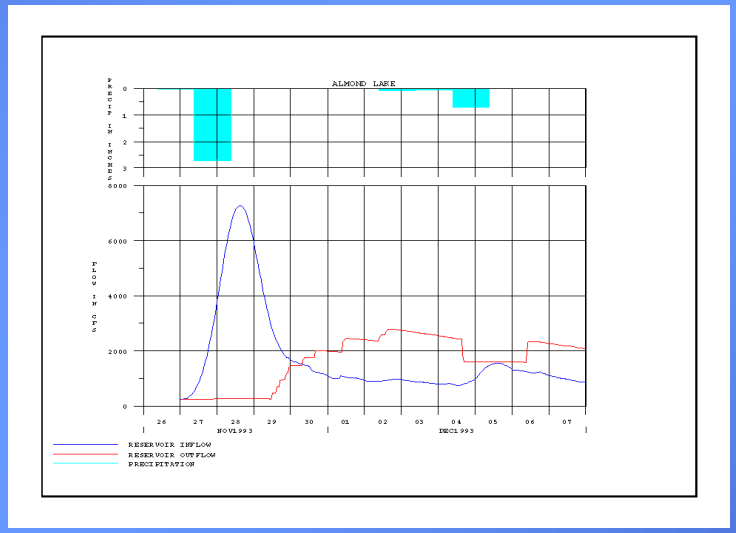
(probability & severity of adverse consequences)

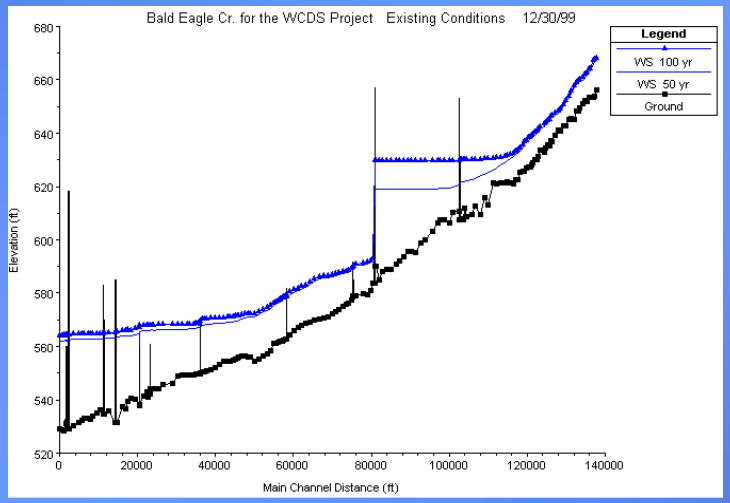
Watershed Modeling

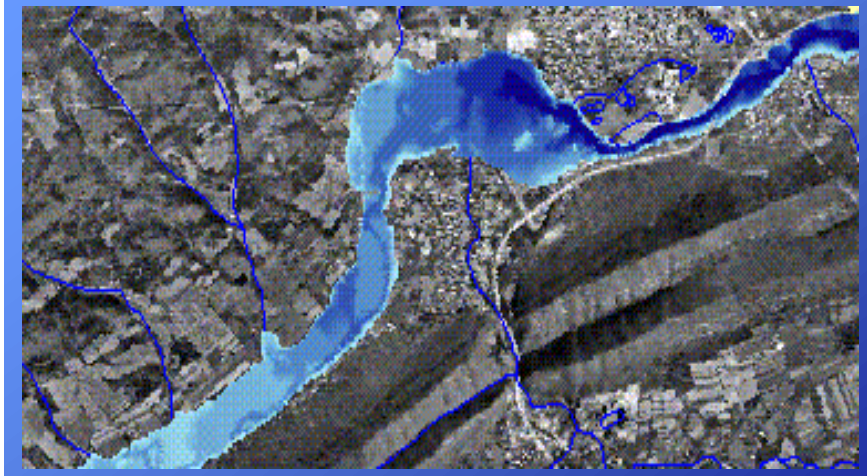


Data and Model Results Visualization









USACE
CEIWR-HEC
®

IWR INSTITUTE FOR WATER RESOURCES