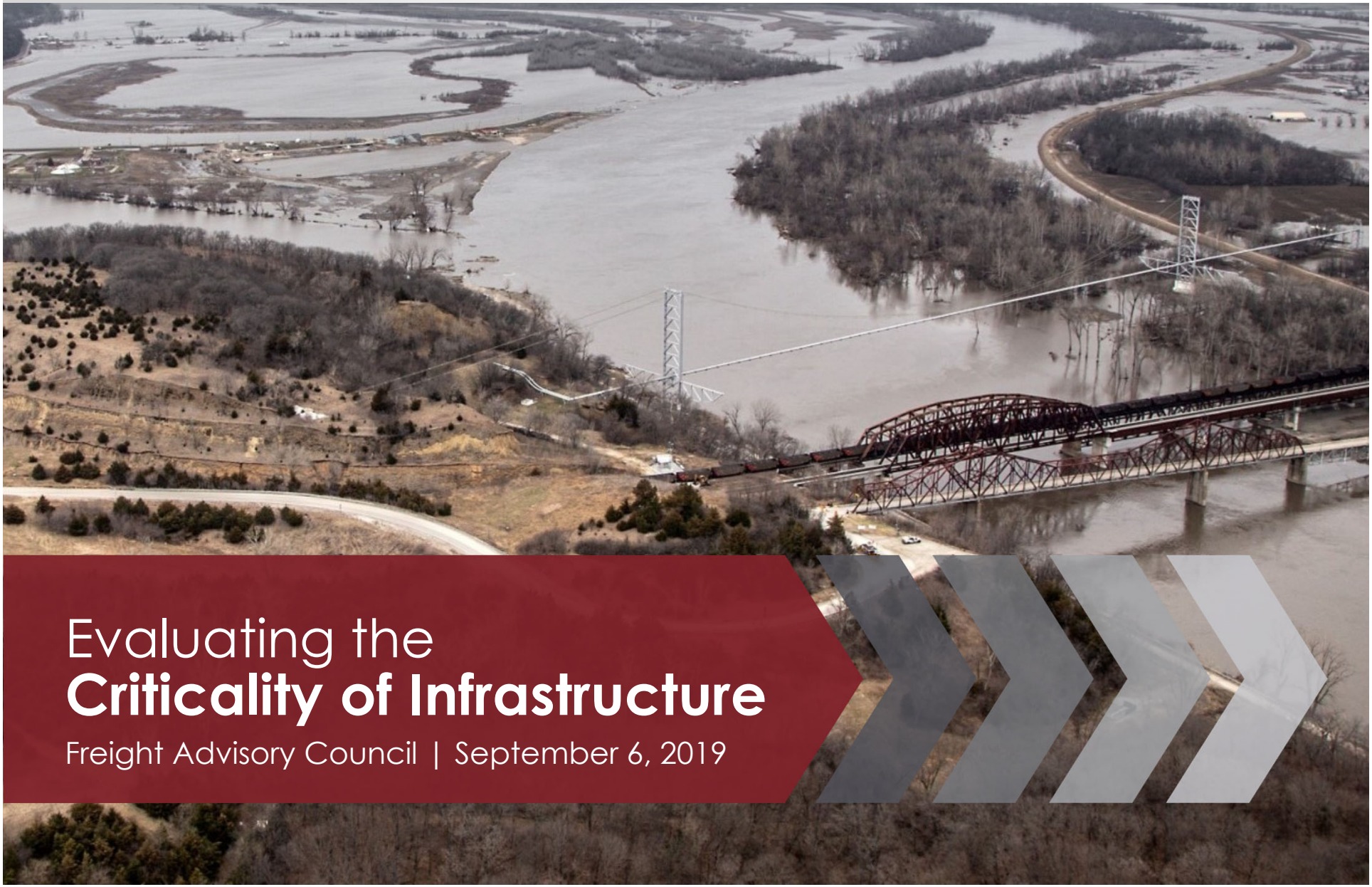
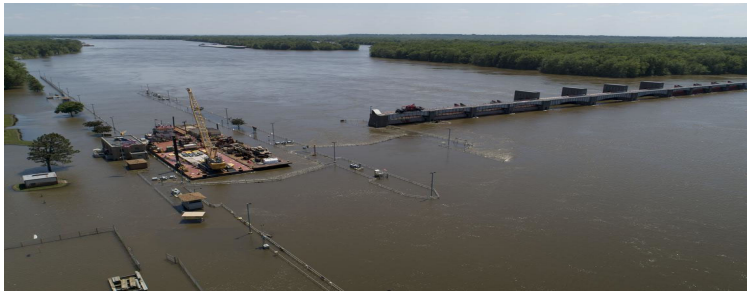
IOWA DOT
GETTING YOU THERE



Evaluating the **Criticality of Infrastructure**

Freight Advisory Council | September 6, 2019

EVALUATING THE CRITICALITY OF INFRASTRUCTURE



Input objective

Identify factors that should be considered when systematically evaluating the criticality of infrastructure and the relative importance of such factors.

Intended use

Systematic evaluation and inclusion of resiliency factors in the State Long-Range Transportation Plan, Freight Plan, and Rail Plan.

Other Evaluation Efforts

- Past
  - Crude Oil and Biofuels Rail Transportation Study (2016)
  - State Freight and Rail Plans bottleneck analysis (2017)
  - Transportation Systems Management and Operations – ICE-Ops (2017)
- Current
  - Criticality analysis for use of Emergency Relief (ER) funds
  - ISU Resiliency Index for the State of Iowa
  - Resilience and Durability to Extreme Weather Pilot Program

Crude Oil and Biofuels Rail Transportation Study (2016)

- Determine risks, vulnerabilities, prevention methods, preparedness, and response capabilities for crude oil and biofuels railroad transportation in Iowa
- Risk and Vulnerability Analysis (RVA) factors
  - Routes and volumes of rail traffic
  - Length of railroad segments carrying crude oil or ethanol
  - Populations
  - Critical facilities
  - Risks to public health, safety, and environment
  - Previous incidents (derailments, spills, and fires)
  - Likelihood of future incidents
  - Prevention/mitigation plans and programs

State Freight and Rail Plans bottleneck analysis (2017)

- Identified physical, operational, and regulatory bottlenecks in the freight system
- Highway
  - Value, Condition, and Performance (VCAP) matrix
- Railroad
  - Flood-prone areas
  - Swing-span bridges
  - Others identified by rail companies
- Waterway
  - Locks
  - Swing-span bridges

Transportation Systems Management and Operations - ICE-Ops (2017)

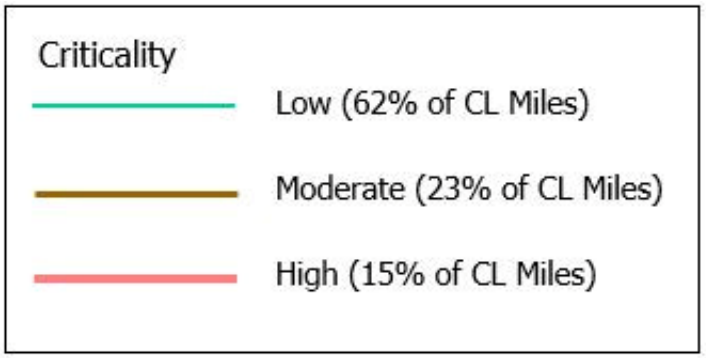
- Infrastructure Condition Index for Operations
- Screening tool to support data-driven decisions on where to apply limited resources was developed
- Factors
  - Average annual daily traffic (AADT)
  - All bottleneck occurrences per mile
  - Freight bottleneck occurrence per mile
  - Incident frequency per mile
  - Crash rate
  - Buffer Time Index (BTI)
  - Event center buffer mileage
  - Weather-sensitive corridor mileage
  - ICE rating

Criticality analysis for use of Emergency Relief (ER) funds

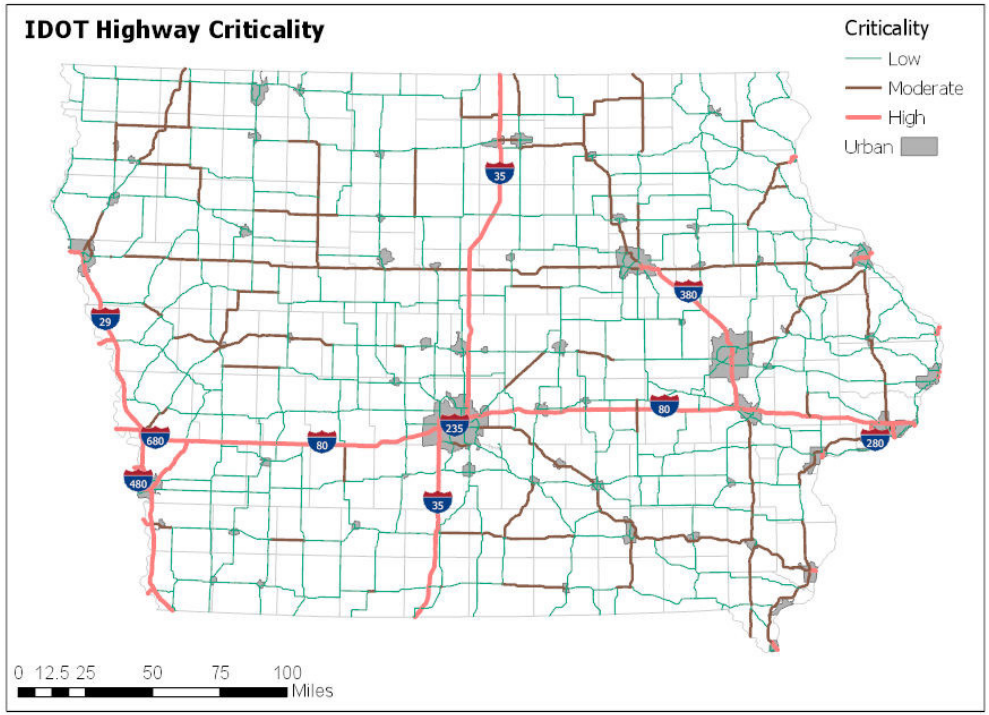
- Demonstrate and justify the use of ER funds for betterments used in the design and reconstruction of critical infrastructure impacted by flooding
- Variables/factors
  - Functional Class (usage)
  - Truck Traffic (economic impact)
  - Social Vulnerability Index (social impact)
  - Redundancy (system impact)
- Factors classified into quintiles, assigned indices, and summed to produce criticality scores
- Three classes – low, medium, and high criticality

Criticality analysis for use of Emergency Relief (ER) funds

Criteria	Weight
Usage: Functional Class	(30%)
Economic Impact: Truck AADT	(30%)
Social Impact: SoVI	(10%)
System Impact: Redundancy	(30%)



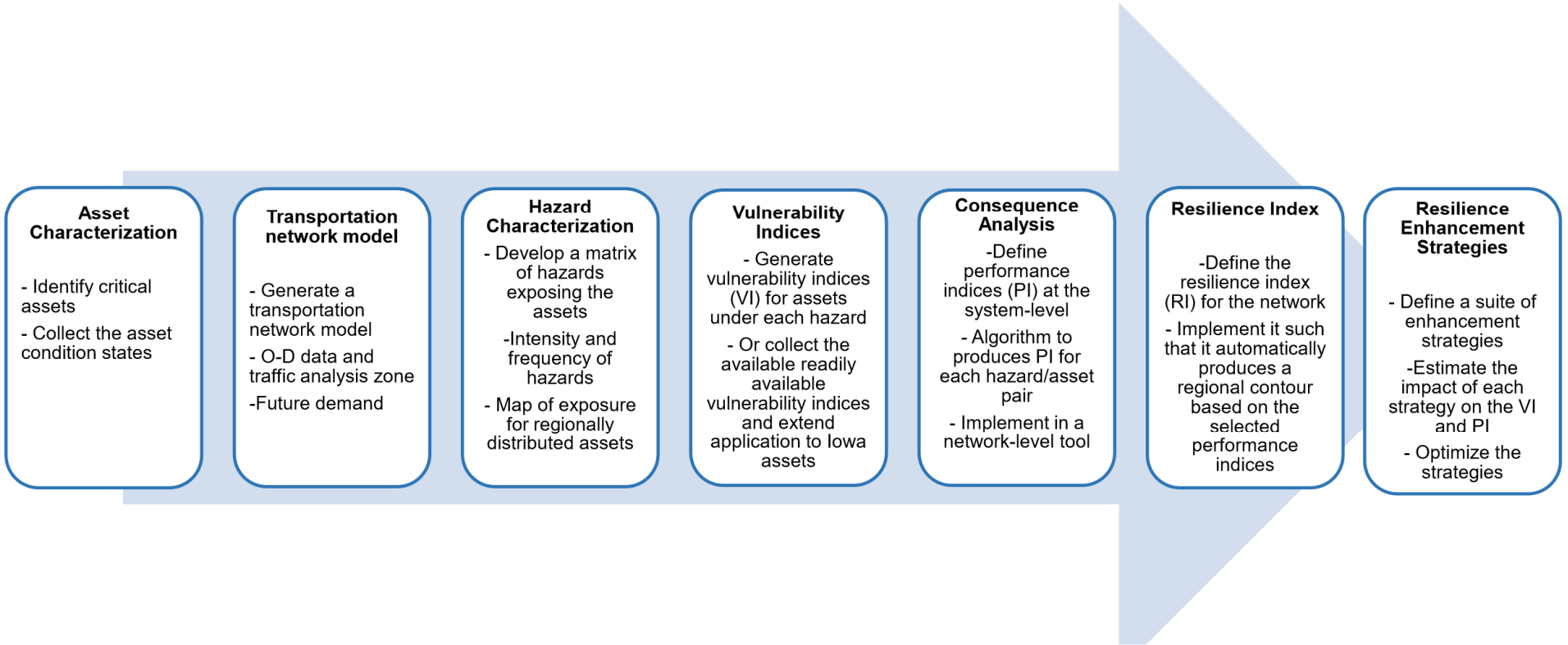
NOTE: Interstate segments and segments connected to bridges near east and west border manually rated “High”.



ISU Resiliency Index for the State of Iowa

- Define the resilience goals or targets
  - e.g., the functionality level after the disruptive events
- Understand the system characteristics
  - e.g., resolution level on the network
- Characterize disruption scenarios
  - e.g., extreme flood, snow storms, or maintenance activities)
- Estimate the consequences
  - e.g., level of physical loss, drivers' delay, economic loss, loss of accessibility
- Find optimized solutions for the possible improvements

ISU Resiliency Index for the State of Iowa



Extreme Weather and Infrastructure Resilience

BI-STATE REGIONAL COMMISSION

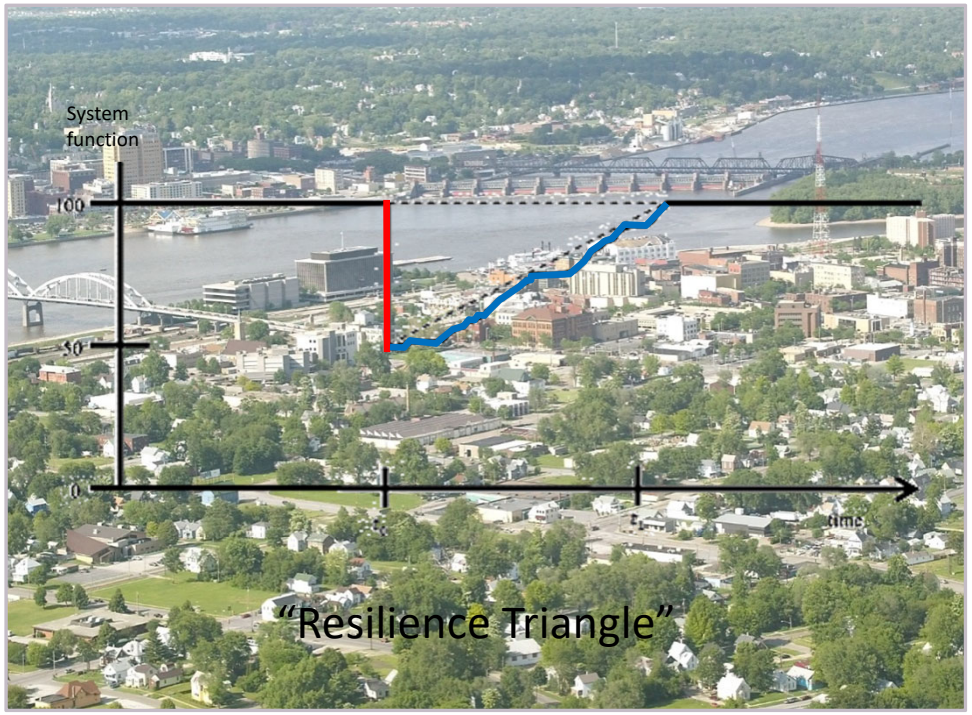
FHWA PILOT PROJECT

U.S.Department of Transportation
Federal Highway Administration

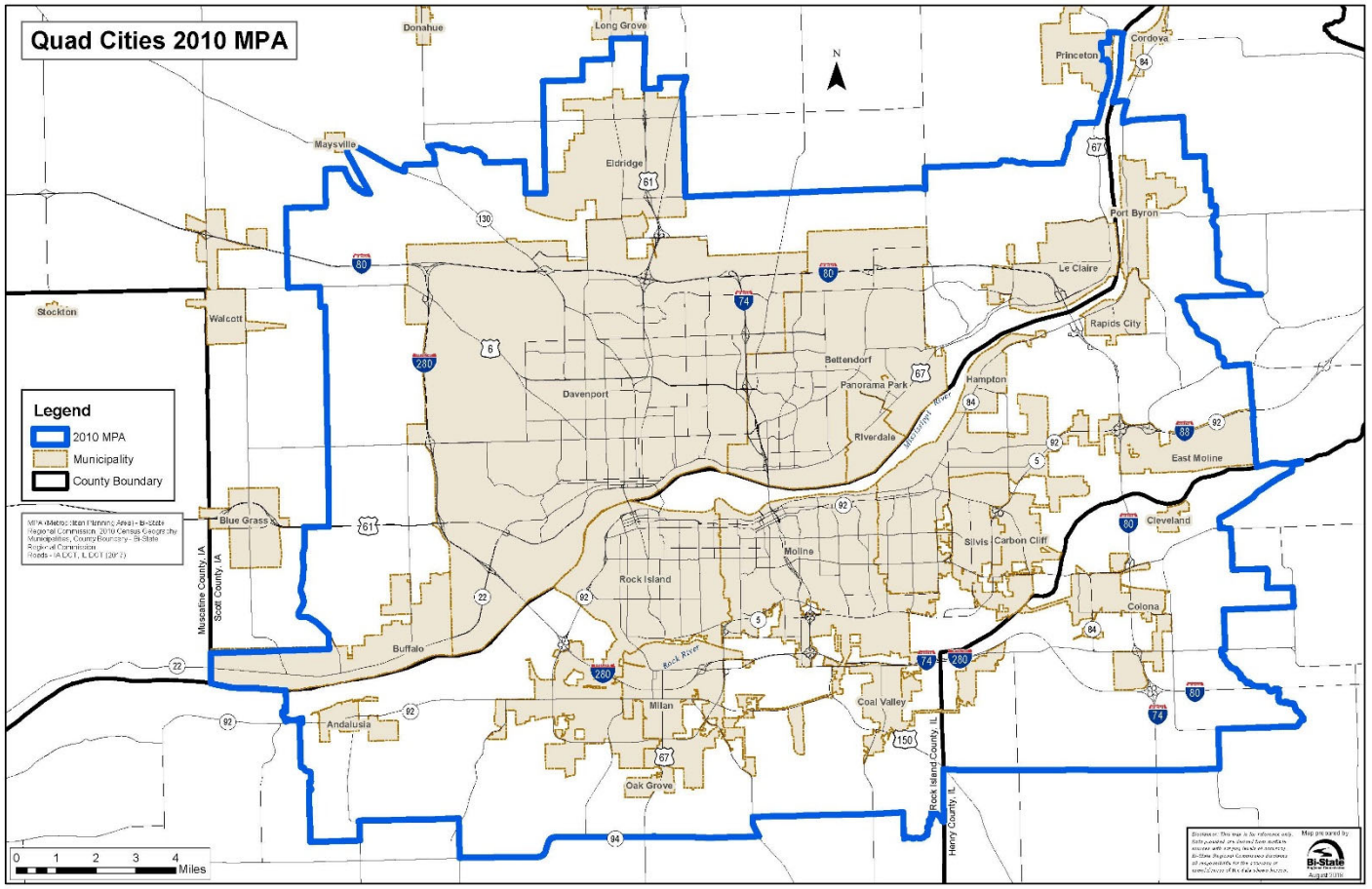
Bi-State
Regional Commission

Purpose of the Grant

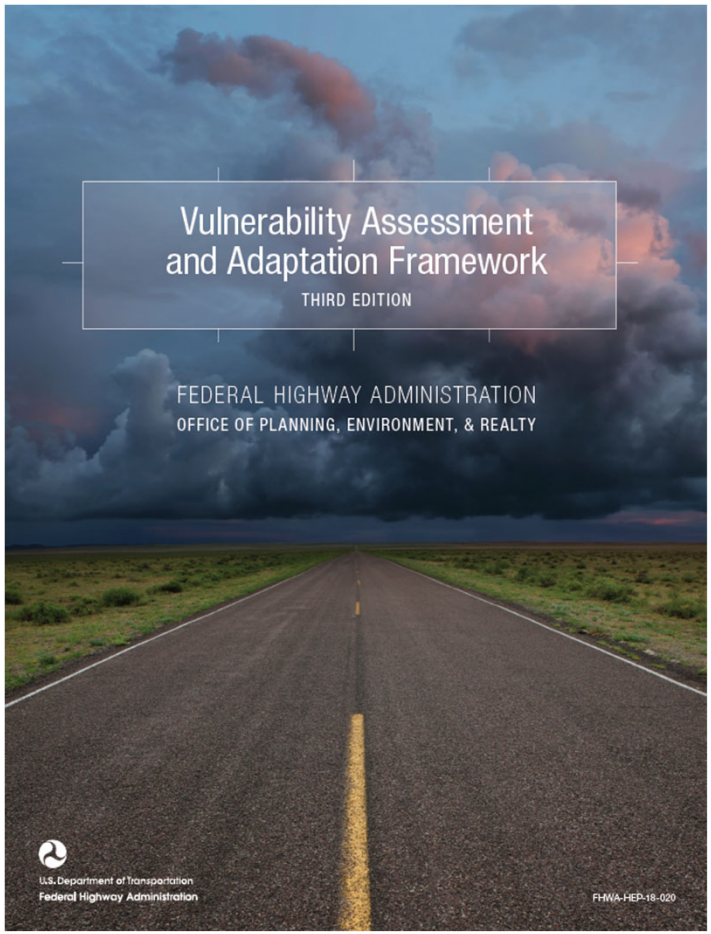
- Conduct vulnerability assessment
- Determine strategies to mitigate impacts



Geographic Focus



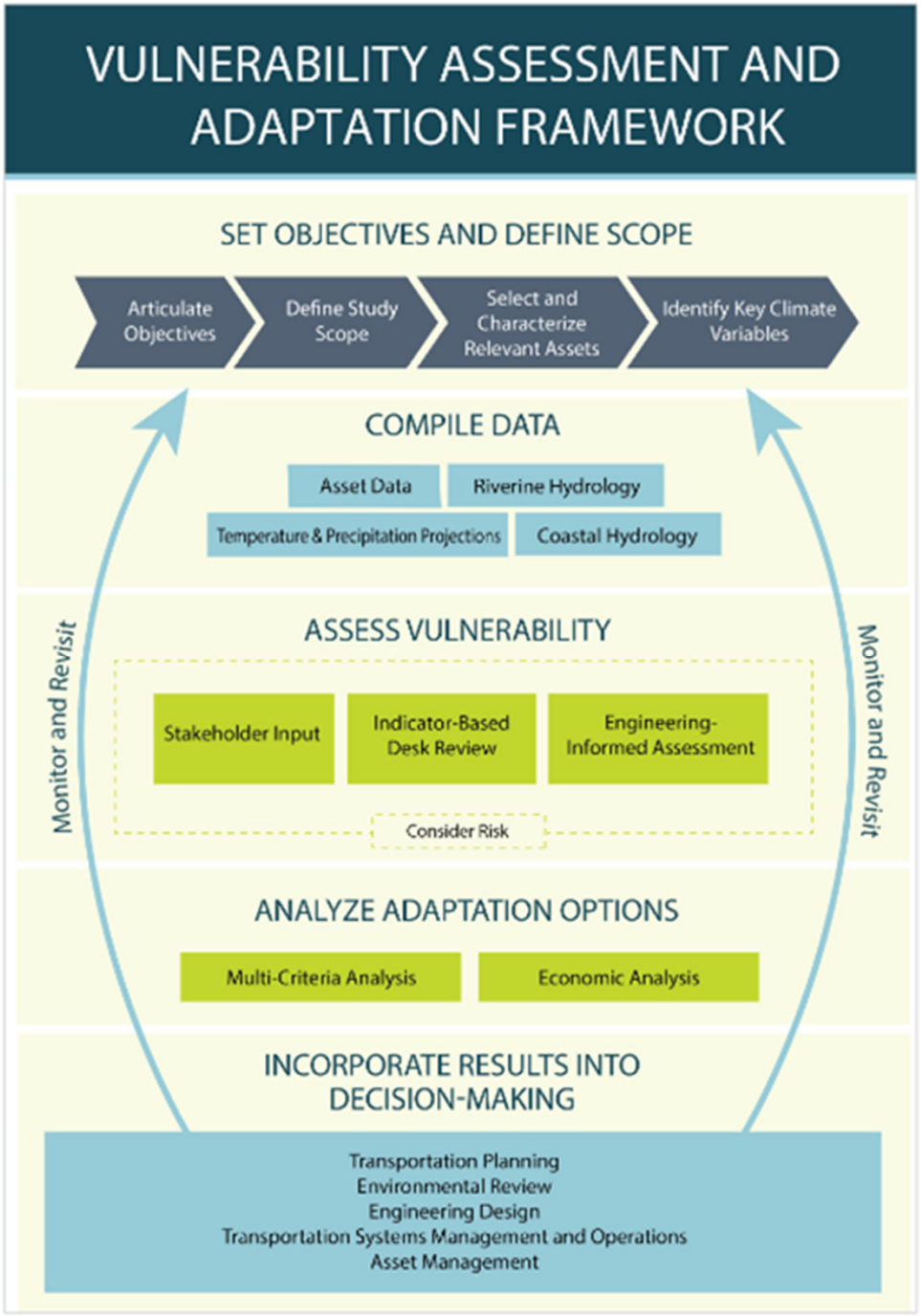
Vulnerability Assessment



- Provides structured process for conducting a vulnerability assessment
- Suggests ways to use results in practice
- Features examples from other similar projects
- Includes links and references to related resources and tools

Project framework

- Set objective and define scope
- Compile data
- Assess Vulnerability
- Analyze adaption options
- Incorporate results into decision-making



Multi-modal Facilities

- I-74, I-80, I-88, I-280
- State highways
- Municipal streets and roads
- Airports
- Railroad lines
- Lock and dam 15
- Transit hubs
- Trails

Extreme weather in the QC

- River flooding
- Flash flooding
- Combined storms
  - Hail
  - Lightning/ thunder
  - High winds
- Severe winter storm
- Extreme heat
- Tornadoes

Record Crests

22.70 ft on 5/2/2019 1st

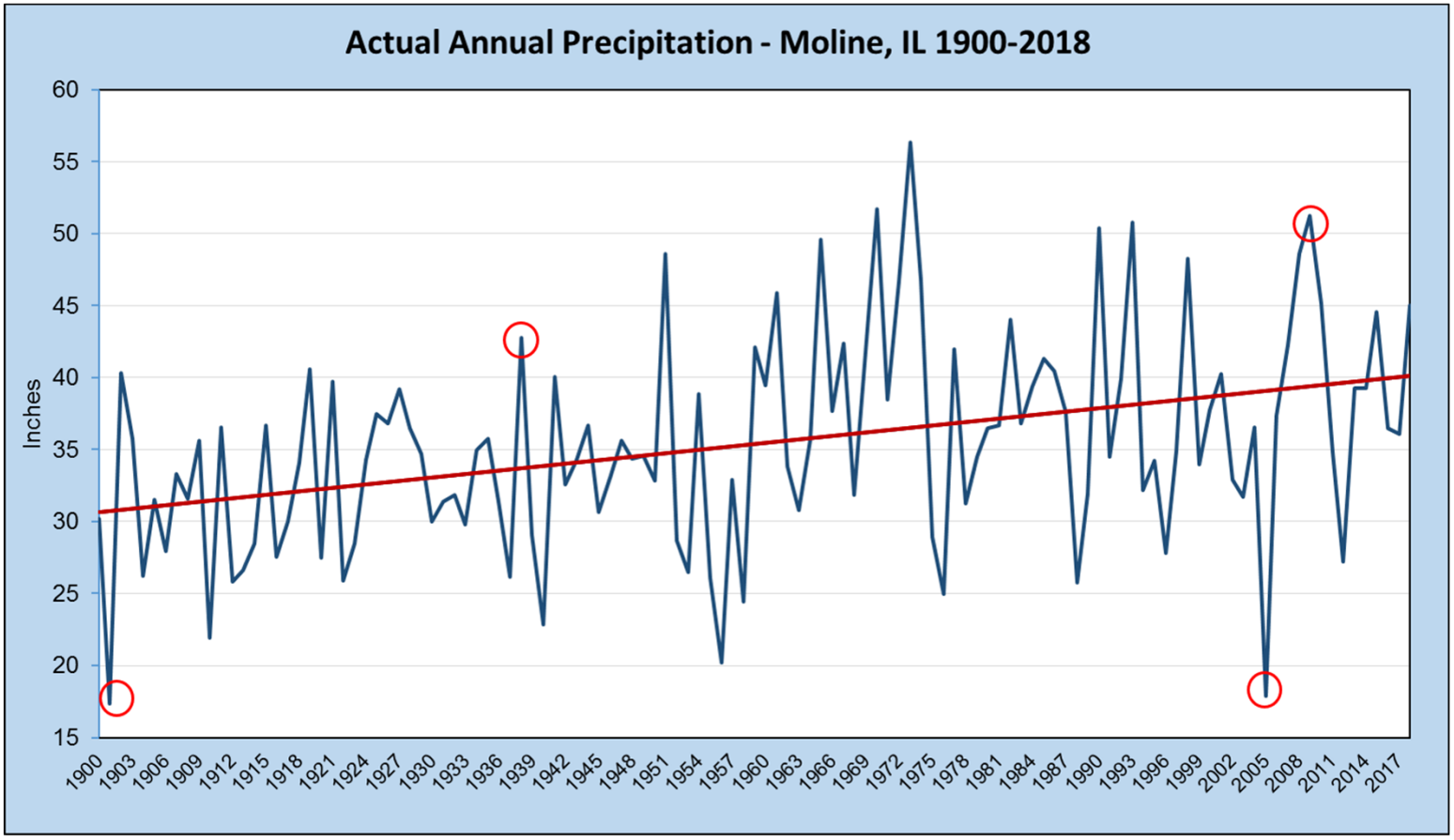
22.63 ft on 7/09/1993 2nd

Records for Consecutive Days above Flood Stage

96 days: 2019 – 3/15 to 6/18

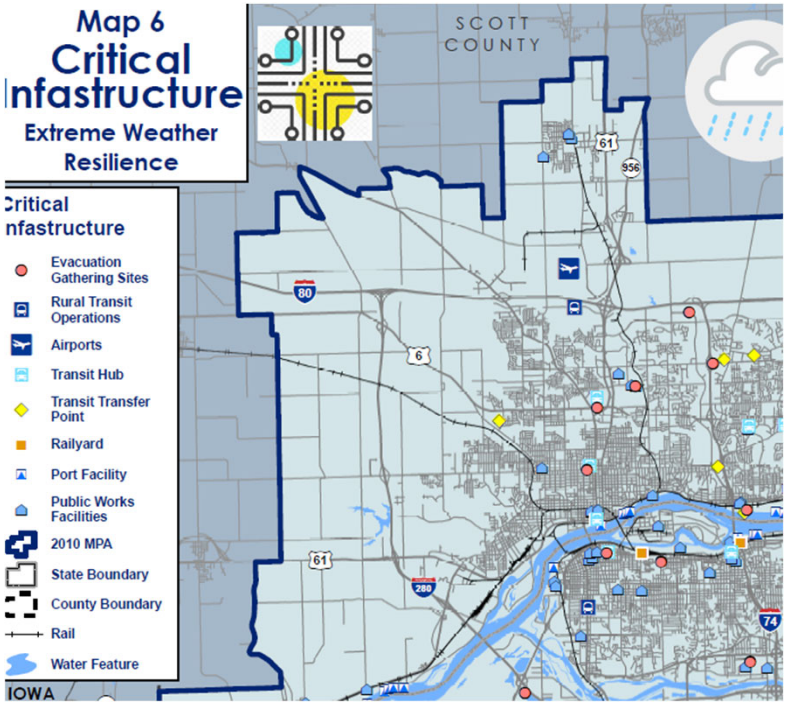
43 days: 2011 – 3/29 to 5/10

Local Trends

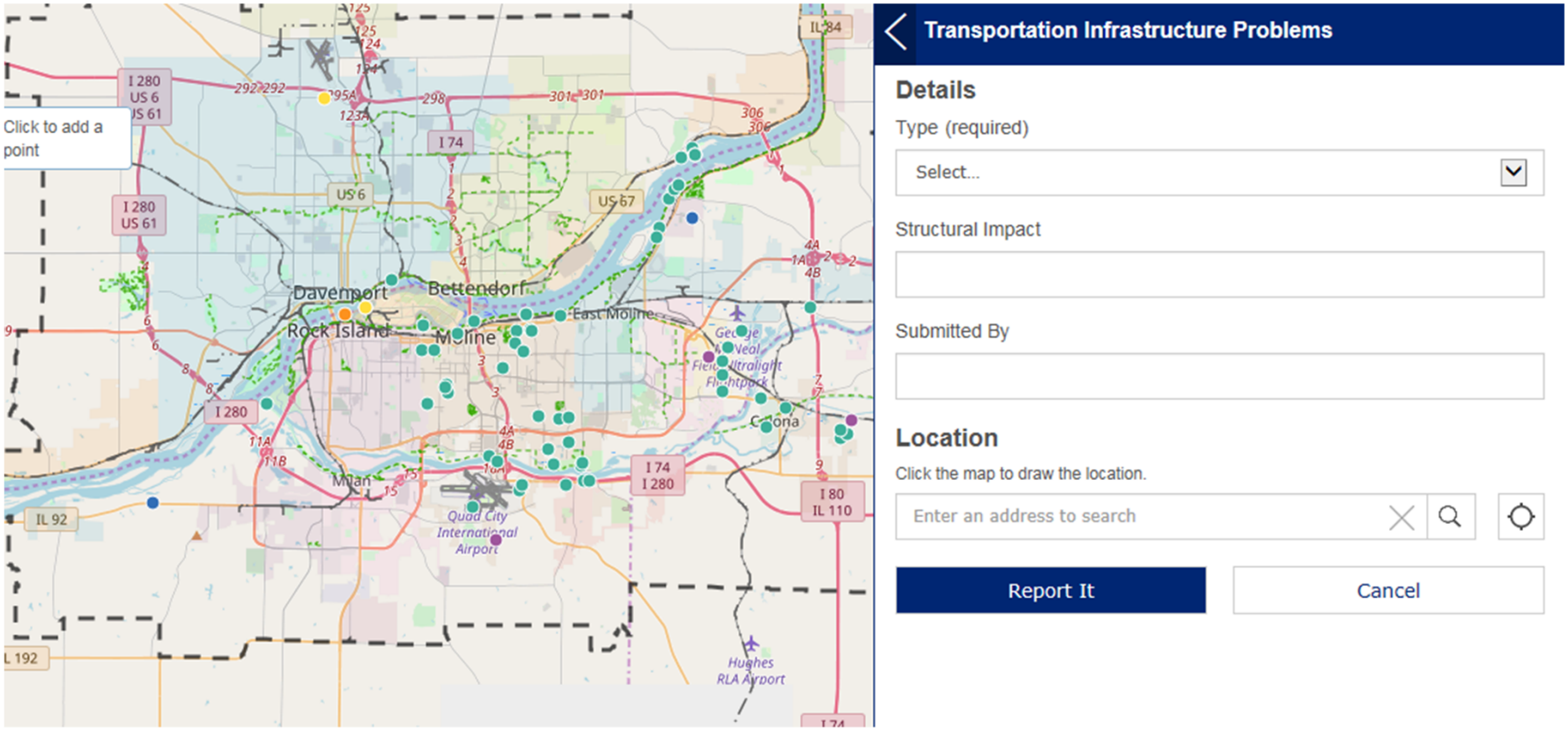


Critical Infrastructure & Facilities

- Evacuation gathering sites
- Public works facilities
- Transit hubs
- Transit transfer points
- Rural transit operations
- Airports
- Port facilities
- Railyard

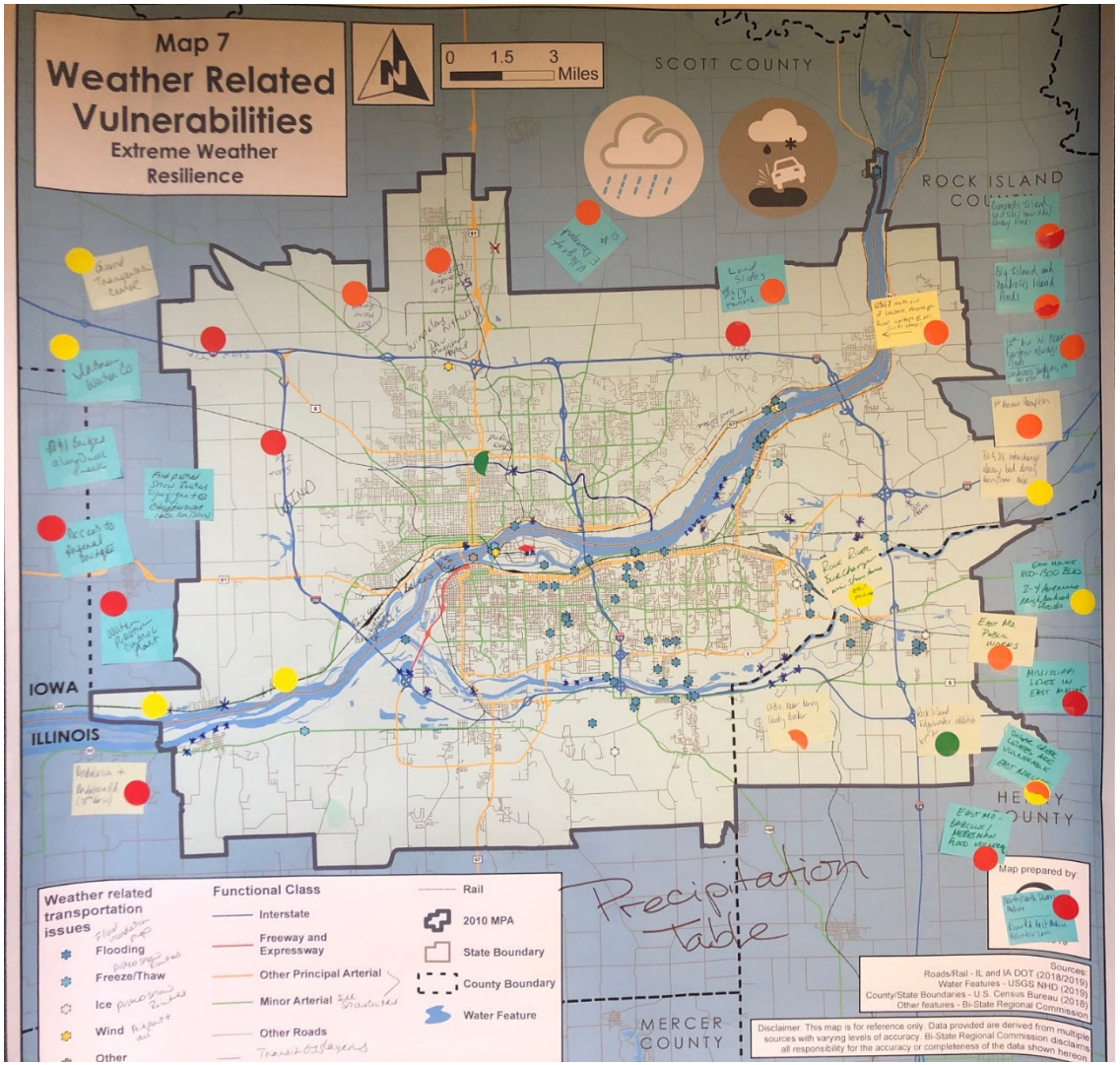


Stakeholder Survey & Interviews



Stakeholder Workshop

- Vulnerability assessment
- Adaptation options



Next Steps

Priorities and Opportunities for Adaptation

+

Integrate Results & Recommendations

Sept.-Dec. 2019

- Workshop Results
- Advisory Committee for Progress to Date
- Adaptation Strategies
- MPO Technical Committee
- Draft Resilience Study Report & Recommendations for the LRTP
- Peer Exchange

Jan.-March 2020

- Draft to MPO Technical Committee and Advisory Committee
- Final Report to FHWA

Questions? Suggestions?

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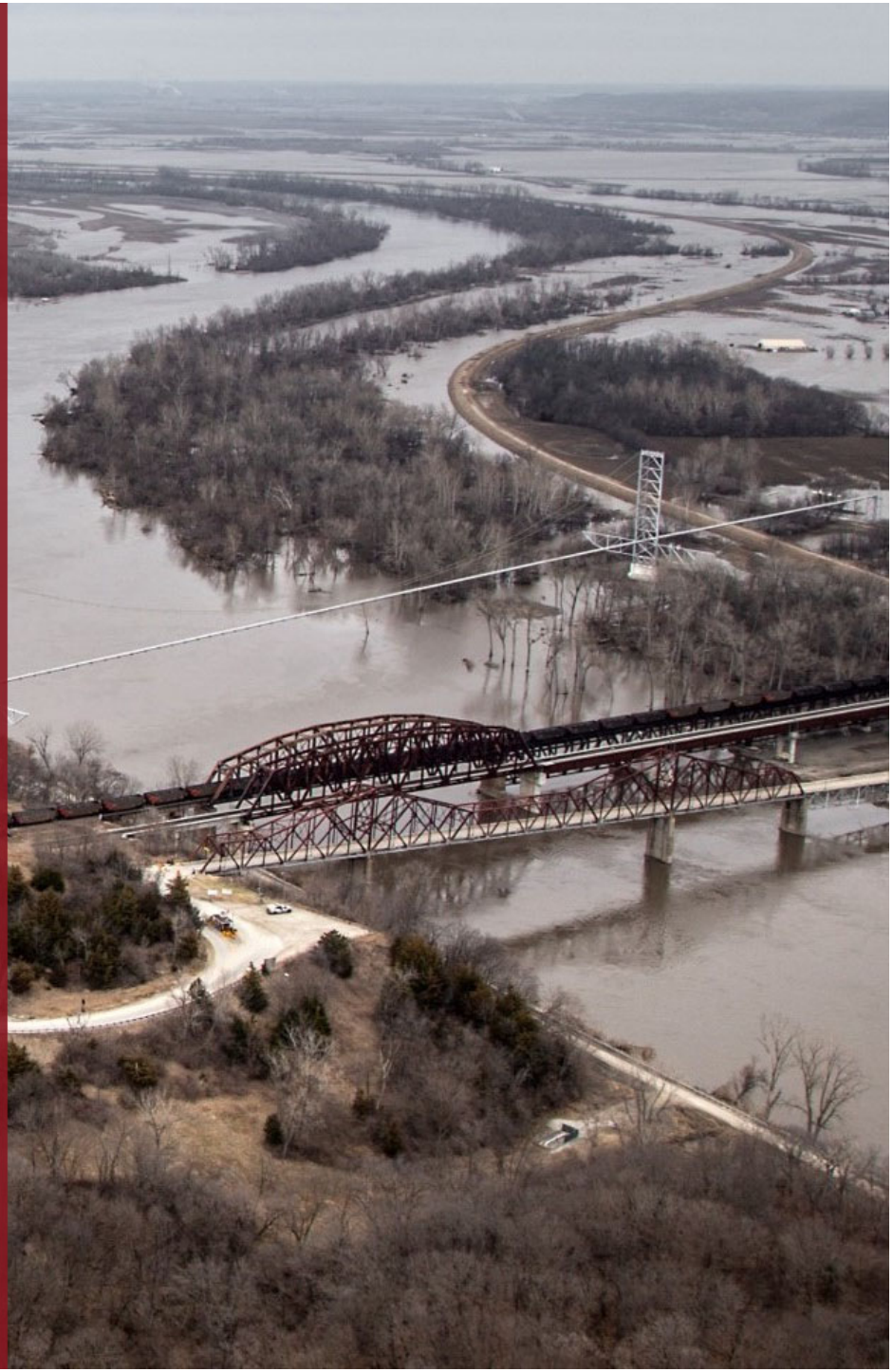
Input **Exercise**

Factors for systematically evaluating the criticality of infrastructure



Exercise Objective

- Identify factors for evaluating the criticality of multimodal infrastructure
- For example:
  - Usage/importance
  - System redundancy
  - Proximity to facilities/multimodal connections
  - Bottlenecks/pinch points
  - Susceptibility to disaster

Next steps

- Iowa DOT intends to use this information to complete infrastructure criticality analysis for the next State Freight Plan and State Long Range Transportation Plan

THANK YOU FOR YOUR TIME AND ATTENTION