

A photograph of a concrete bridge over a river. The water is turbulent and white with foam. Large logs and branches are piled on top of the bridge structure. Yellow and black striped hazard signs are visible on the bridge. The sky is overcast and grey.

Resilience Improvement Plan

Development and Implementation

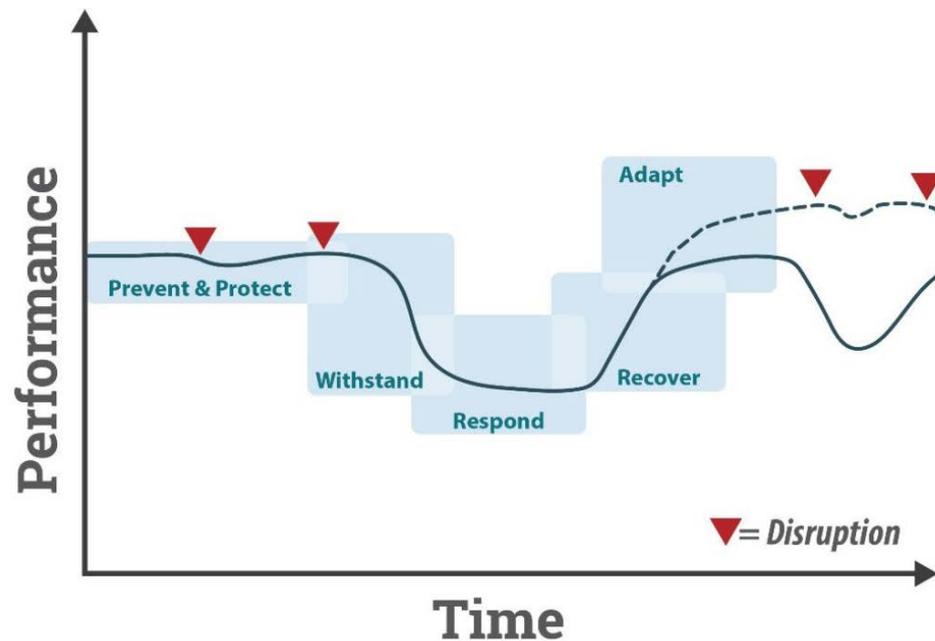


Outline

- What is resiliency?
- Why focus on resiliency?
- How is the Iowa DOT building resiliency?
- Spotlight: Resilience Improvement Plan

What is resiliency?

Ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and quickly recover from disruptions.



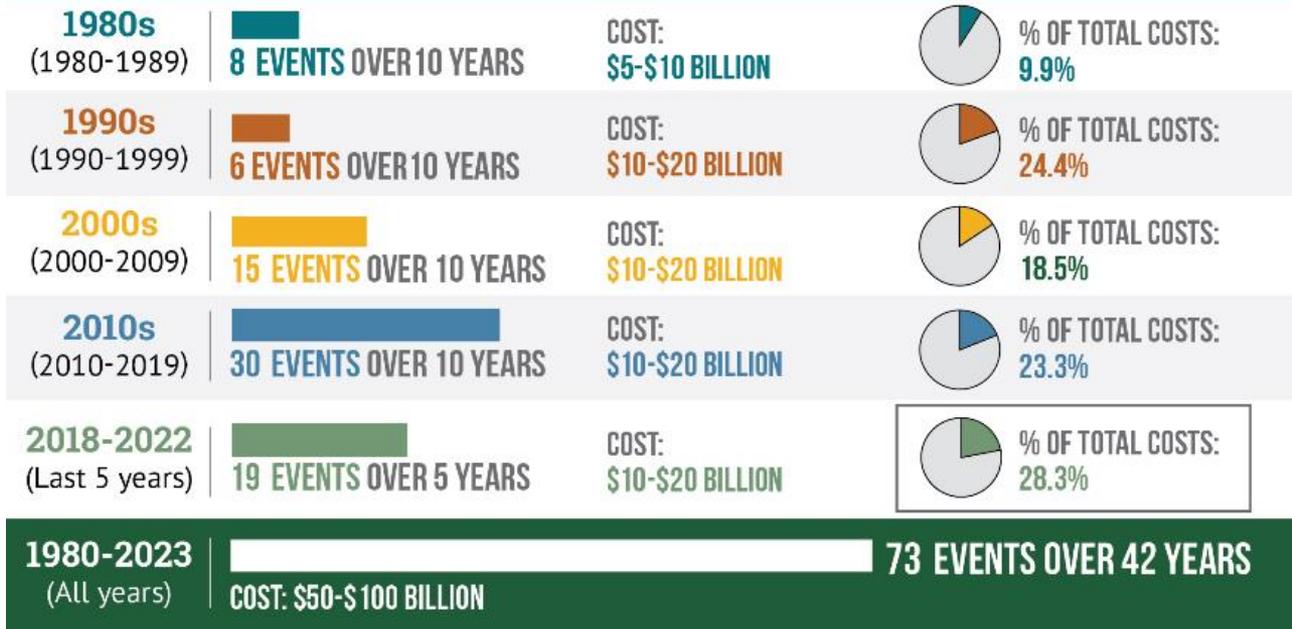
Four Rs of resilience

 Robust	The system is strong enough to withstand a given level of stress or demand without suffering degradation or loss of function.	 Redundant	Elements of a system exist that are substitutable and capable of satisfying the functional requirements of the system in the case of disruption.
 Resourceful	There are resources (e.g., monetary, physical, technological, and informational) available that can be leveraged in the process of recovery.	 Responsive	There is capacity to meet priorities and achieve goals in a timely manner in order to minimize losses, recover functionality, and avoid future disruption.

Why focus on resiliency?

BILLION-DOLLAR DISASTERS FROM 1980-2023

Statistics valid as of May 8 2023



Source: NOAA National Centers for Environmental Information

How is the Iowa DOT building resiliency?

Resiliency and Sustainability Committee (RSC)

Created in 2019 in response to significant flooding; Now tasked with preparing for and reduce the impact of future disruptions to the system

Promoting Resilient Operations for Transformative, Cost-saving Transportation (PROTECT) Program

Formula and discretionary funds for support of resilience planning activities and implementation of improvements to at-risk infrastructure

Resilience Improvement Plan (RIP)

Addresses transportation system resilience to current and future weather events and natural disasters

RESILIENCE IMPROVEMENT PLAN



2024



Outline

Introduction

Background and purpose

Understanding Iowa

Demographic, environmental, and transportation profiles

Understanding Iowa's Hazards

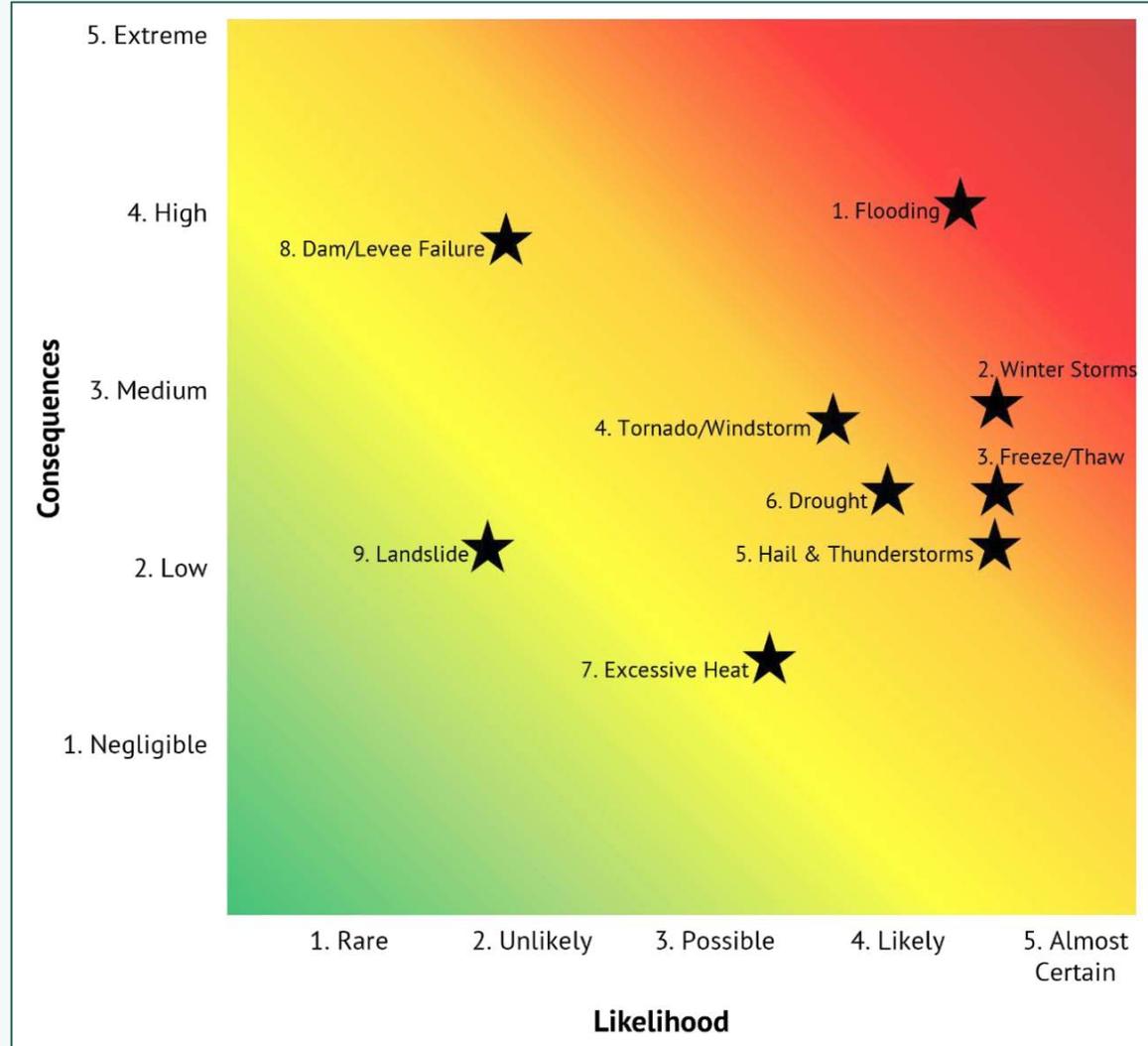
Assessment and prioritization of natural hazards

Implementation

Iowa's resiliency toolbox, funding, and projects

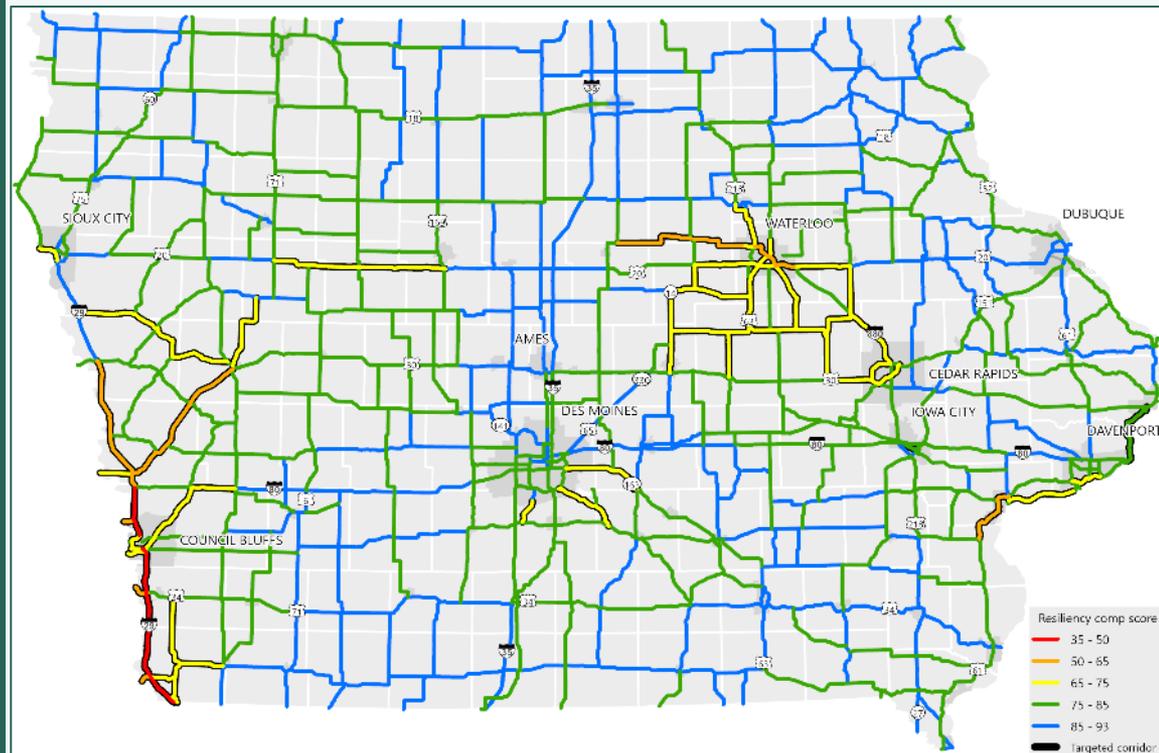
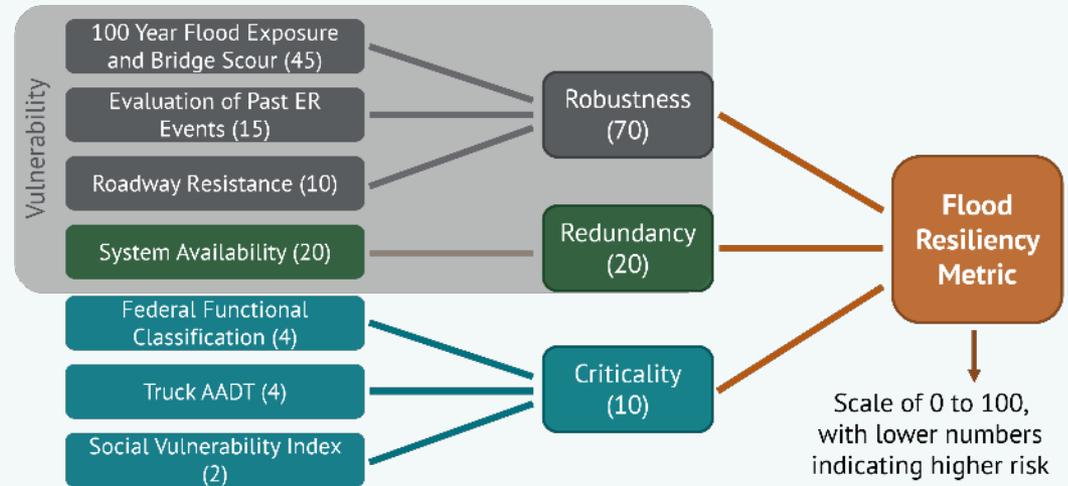
Hazard assessment

- Documents and analyzes nine natural hazards
- Organized into three tiers for mitigation methods
- Likelihood x Consequence = Risk



Flooding

- Top risk
- Most common natural disaster in the state
- In the last 30 years, every county in the state has received at least five Presidential Disaster Declarations that included flooding
- Flood resiliency analysis



Resiliency Toolbox

- Planning level resource that identifies approaches for each hazard
- Multifaceted approach:
 - Strategies
 - Countermeasures
 - Research
- Alignment with four Rs of resilience

Tier 1 Hazards

-Highest risk scores
-Preferred mitigation method:
Take proactive steps to address these hazards

Flooding



Winter Storms



Freeze/Thaw



Tier 2 Hazards

-Medium risk scores
-Preferred mitigation method:
Have reactive strategies in place to respond when these hazards occur

Tornado/Windstorm



Hail/Thunderstorms



Drought



Tier 3 Hazards

-Lowest risk scores
-Preferred mitigation method:
Monitor hazards and support mitigation methods where appropriate

Excessive Heat



Dam/Levee Failure



Landslide



Resiliency Toolbox

- Strategies, countermeasures, and research for different hazards

Tier 1 Hazards

-Highest risk scores
-Preferred mitigation method:
Take proactive steps to address these hazards

Flooding



Winter Storms



Freeze/Thaw



Flooding Strategies



Strategies

- S1. Approve resiliency policy in the Bridge Design Manual and plan for increased precipitation events, water elevations, and flow.
- S2. Engage internal and external stakeholders regarding watershed management, flood preparation, and emergency protocols.
- S3. Allow more ponding at certain "control" structures.
- S4. Determine critical routes for emergency routing during flood events at known areas of vulnerability.
- S5. Develop a Flood Operations Plan to support in the response of future flood events.
- S6. Proactively stockpile flood fighting material and assets including AquaDam and wrapped revetment bags.
- S7. Partner with the Iowa Department of Homeland Security and Emergency Management (HSEMD) on projects that reduce road damage from flooding and erosion through stream channel improvements.
- S8. Partner with HSEMD and local jurisdictions on comprehensive flood mitigation planning that considers watershed approach or green infrastructure options, then implement planned projects to mitigate flood damage to roads by installing watershed approach practices (e.g. upstream detention), retrofitting bridges, elevating roads, or installing culverts.
- S9. Develop a comprehensive statewide flood mitigation strategy that considers flood buy-outs, watershed approach flood mitigation, levees, and other solutions and outlines where, and under what, conditions these different strategies are best applied.
- S10. Evaluate key locations to increase waterway capability including widening upstream bench and channelization of the waterway.

Flooding Countermeasures and Research



Countermeasures

- C1. Roadside and waterway erosion protection – Use engineered (e.g., concrete blocking or Flexamat) or natural (e.g., bio-retention or native planting) materials to control or stop the movement of soil along slopes.
- C2. Native plantings on roadsides – Certain native grasses and plants have deep roots that make them drought-resistant and can reduce soil erosion and flooding.
- C3. Bridge pier scour protection – Bridge scour is the removal of sediment from around bridge abutments. Countermeasures can include concrete armoring, spurs, revetments, wire enclosed riprap, etc.
- C4. Bridge/culvert conveyance improvements – Adequate sizing of bridges and culverts to ensure the proper conveyance of water through the channel and floodplain with the consideration of future increased precipitation.
- C5. Dikes/levees – Embankments of stone, cement, or soil that protect roadways and land during significant rainfalls and flooding.
- C6. Roadway/bridge grade raise – Increasing the elevation grade of a roadway or bridge to reduce overtopping due to flooding conditions.
- C7. Shoulder improvements – Increasing the width or improving the type of shoulder can mitigate the impacts of flowing water across roadways in low-lying areas.
- C8. Median crossover – Add median crossovers at key locations to allow for continued operations during flood events.

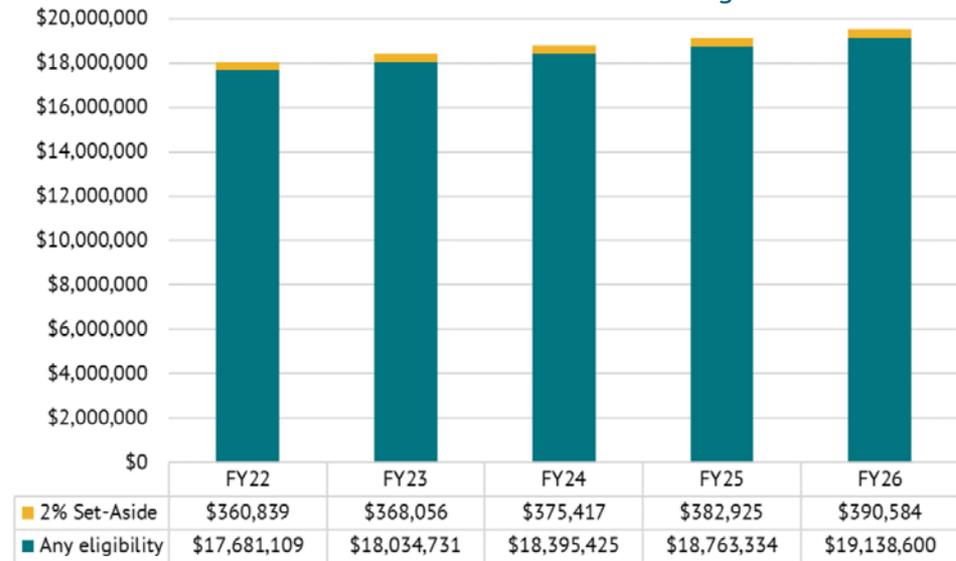
Research

- R1. Develop and populate a Riverine Infrastructure Database that supports real time flood flow and levels across Iowa.
- R2. Develop a benefit/cost analysis tool to evaluate cost effectiveness of resilience improvements.
- R3. Research how native plantings can support flood mitigation for Iowa's transportation system.

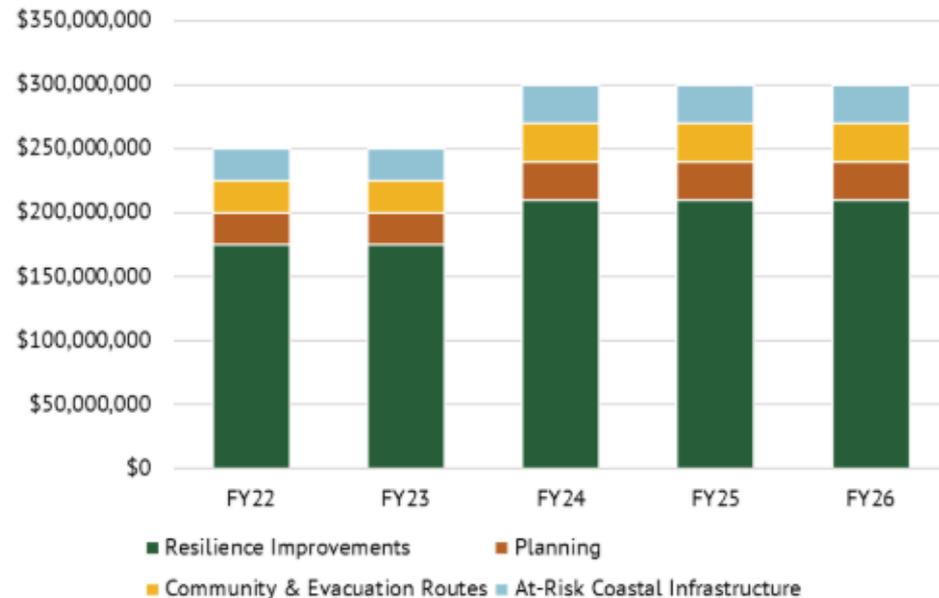
PROTECT funds

- Formula funding
- Discretionary program
- Benefits of RIP projects

Iowa's PROTECT formula funding



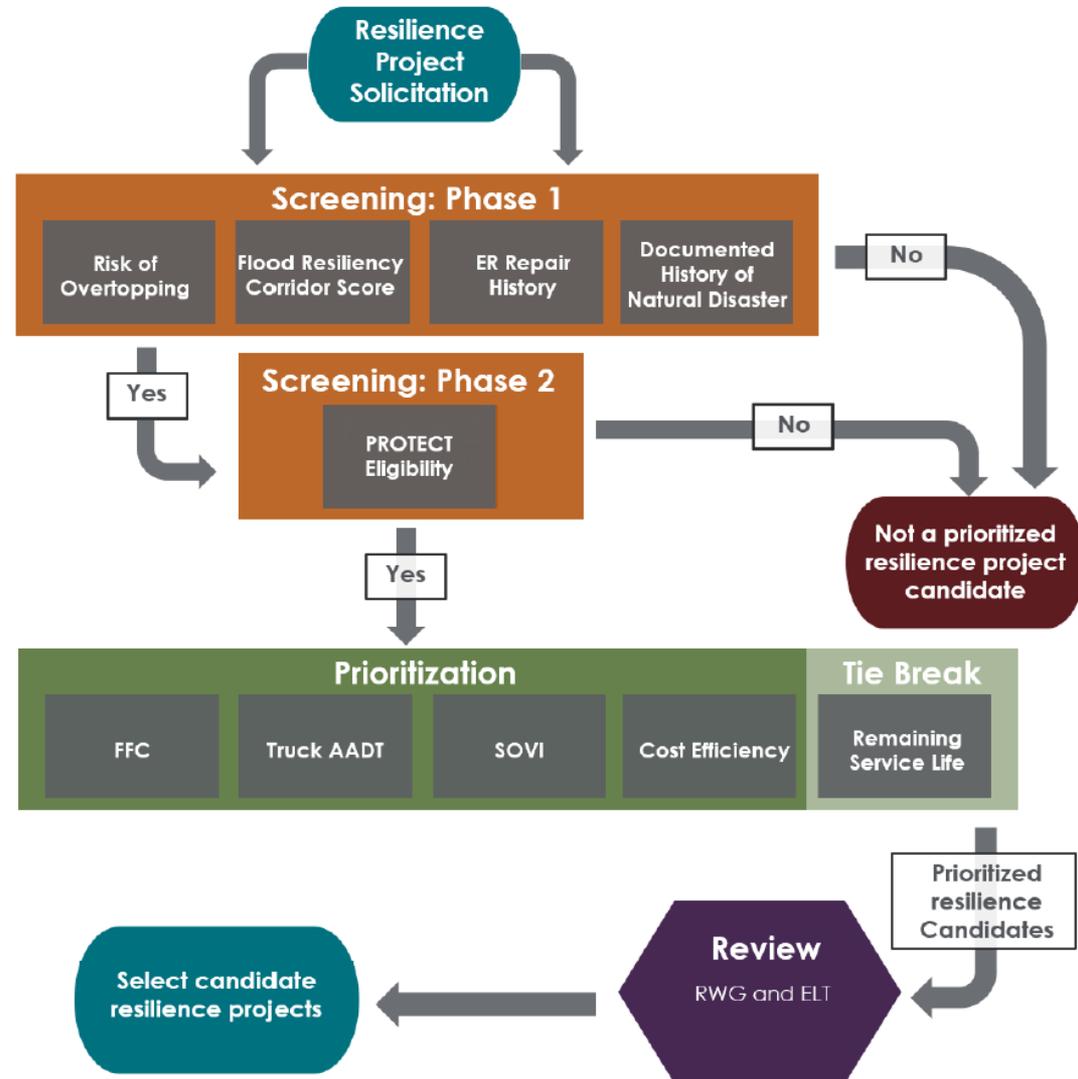
PROTECT discretionary funding



Iowa's resilience project prioritization process

Resilience projects

- Solicitation
- Screening
- Prioritization
- Output
- Other prioritized projects for future discretionary grant program applications





Resources

iowadot.gov/sustainabilityandresiliency

iowadot.gov/iowainmotion/Specialized-System-plans/Resilience-Improvement-Plan

Questions?

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