2021 Local Government Summit -
Leading the Change

Tools for Climate Change Adaptation Planning

WICCI Infrastructure Working Group
Rob Montgomery
Maria Hart

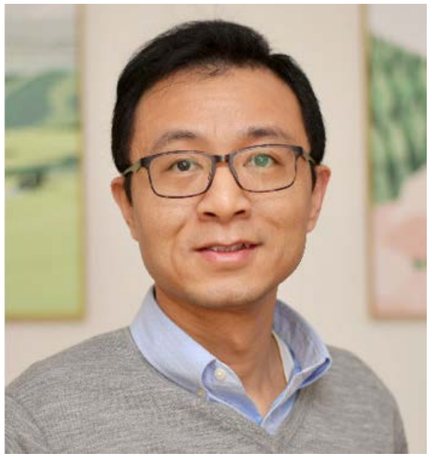
October 27, 2021

Objectives

WICCI Infrastructure Working Group	Products/Tools
Business Case for Climate Change Resilience	ROI & Trends
Climate Change Adaptation Plan	Monroe County Climate Change Task Force

WICCI Infrastructructure Working Group



Rob Montgomery, Water Resources Engineer
Dan Wright, Hydrologist, Water Resources Engineer
Maria Hart, Climate Adaptation/Transportation Planner/Workforce Development
Bu Wang, Carbon Capture, Next Gen Construction Materials

iwg@WICCI

Department of Civil and Environmental Engineering
UNIVERSITY OF WISCONSIN-MADISON

We are a group of infrastructure practitioners focused on updating civil engineering standards to adapt & mitigate climate change in Wisconsin.

IWG Products

Adaptation

The Wisconsin Rainfall Project

- Updated rainfall statistics using recent storms (done).
- Rainfall statistics for future conditions (done).
- Web portal for sharing data (6/2021).
- A "How To" for rainfall runoff modeling, urban drainage modeling, flood risk evaluation, larger or rural watershed flood frequency analyses (2022).

Mitigation

Embedded Carbon Content of Construction Materials

- Summarize embedded carbon rating systems
- Evaluation of cost implications of specifying lower embedded carbon materials
- Procedures to incorporate embedded carbon content as a criterion in construction contract bidding.

Planning

Recommendation Governor's Task Force on Climate Change

- June 2020

Wisconsin Infrastructure & Climate Change Survey 2020

- Target: Public Infrastructure Managers, Elected Officials, Planners, Consultants
- Published December 2020

Wisconsin Infrastructure & Climate Change Survey 2020

Infrastructure concerns

- Aging Infrastructure
- Pavement deterioration

Climate-related concerns

- Impacts of seasonal & extreme rainfall precipitation
- Urban flooding

Barriers

- Organizational
- Capacity - Climate Change Knowledge
- Political

Use the survey to support grant funding -
https://bit.ly/3mdcOo5

What factors allowed work on climate change to take off in your organization or municipality?

Responses

- Taking climate change actions that complement other projects
- Reframing conversations in terms of energy and the environment
- Firsthand experience with emergencies and impacts
- Buy-in from council members
- Good working relationship between staff and council
- Dedicating personnel
- Client needs
- Low emission fuels and vehicles
- Sense of urgency among elected officials and a high priority assigned to these initiatives
- Incorporating climate change considerations into planning efforts, especially watershed and hazard mitigation planning

Business Case for Adaptation Planning

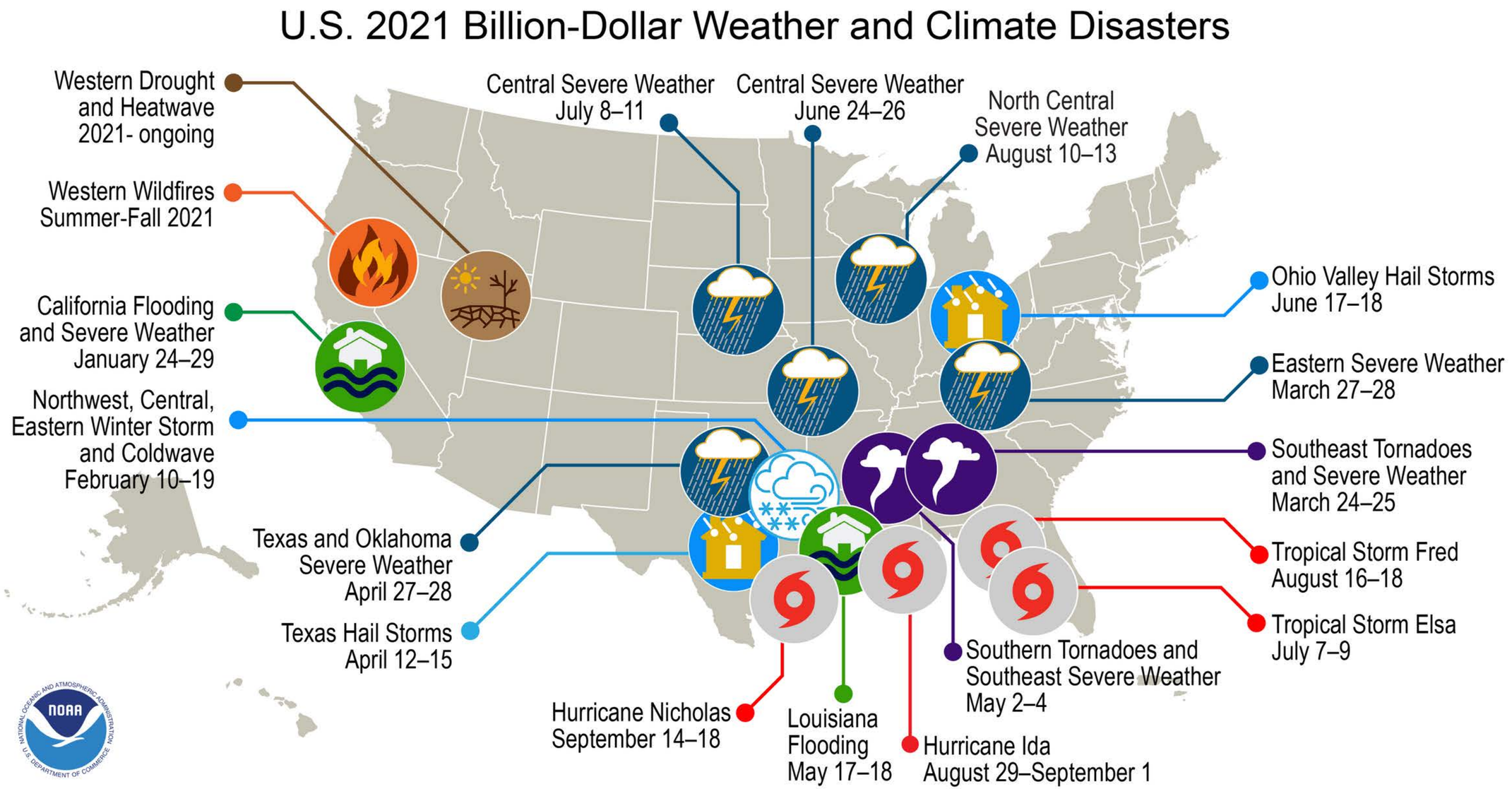
City of Thunder Bay Climate Adaptation Strategy

Learn how Thunder Bay is becoming a climate ready city at climatereadycity.com
#climateready #earthcare #tbay

Climate-Ready City

- Property destruction and/or damage
- Infrastructure destruction and/or damage
- Loss of production
- Supply chain interruption
- Unemployment from destroyed or bankrupt businesses
- Loss of biodiversity and green infrastructure
- Loss of housing price value; and,
- Lost tax revenue

2021 Climate Disasters



*This map denotes the approximate location for each of the **18 separate billion-dollar weather and climate disasters that impacted the United States January–September 2021**.*

Wisconsin Impacts

Wildfire smoke triggers Air Quality Advisory for the northern half of Wisconsin on Thursday

As the Greenwood Fire continues to burn, smoke from the blaze fills the air near Pitcha Lake (bottom left) as fire crews set back fires to better control the perimeter, Wednesday, Aug. 25, 2021, in Isabella, Minn. (Brian Peterson/Star Tribune via AP)

WARMER AND WETTER: WISCONSIN'S ECONOMY IS ALREADY SUFFERING FROM THE IMPACT OF GLOBAL WARMING

Posted by Wisconsin Public Radio | Sep 3, 2021 | Syndicated |

Return on Investment

Cost-benefit analysis tools

Moving beyond just economic valuation

FEMA Data

National Benefit-Cost Ratio (BCR) Per Peril *BCR numbers in this study have been rounded	Beyond Code Requirements	Federally Funded
Overall Hazard Benefit-Cost Ratio	$4:1	$6:1
Riverine Flood	$5:1	$7:1
Hurricane Surge	$7:1	Too few grants
Wind	$5:1	$5:1
Earthquake	$4:1	$3:1
Wildland-Urban Interface Fire	$4:1	$3:1

https://www.fema.gov/sites/default/files/2020-07/fema_mitsaves-factsheet_2018.pdf

Trends

Financial Markets Signals

May 2020

Larry Fink - Blackrock's CEO

The need is particularly urgent for cities because the many components of municipal infrastructure - from roads to sewers to transit- have been built for tolerances and weather conditions that do not align with the new climate reality. In the short term, some of the work to mitigate climate risk could create more economic activity. Yet we are facing the ultimate long-term problem...

Every government, company, and shareholder must confront climate change.

Trends

Financial Disclosures

Executive Order on Climate-Related Financial Risk

Floodfactor.com - Flooding data embedded into apps like Realtor.com and Redfin.com

Blue-lining

Banks consider climate risk for home loans, a process called ‘underwaterwriting’ or ‘blue-lining’...CNBC

Climate Migration

13 million in the US to be displaced by rising seas by end of century. https://go.nature.com/3Gkkmxl

Evolution of funding to address climate change, environmental justice

Building Resilient Infrastructure and Communities, FEMA

PROTECT Grants

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

- $8.7 billion to support state and local assessments, planning, and projects that reduce the vulnerability of transportation assets to natural disasters.

Grant recipients can receive financial incentives **if resiliency improvement plans are developed and incorporated into long-term statewide or metropolitan transportation plans.**

Justice40

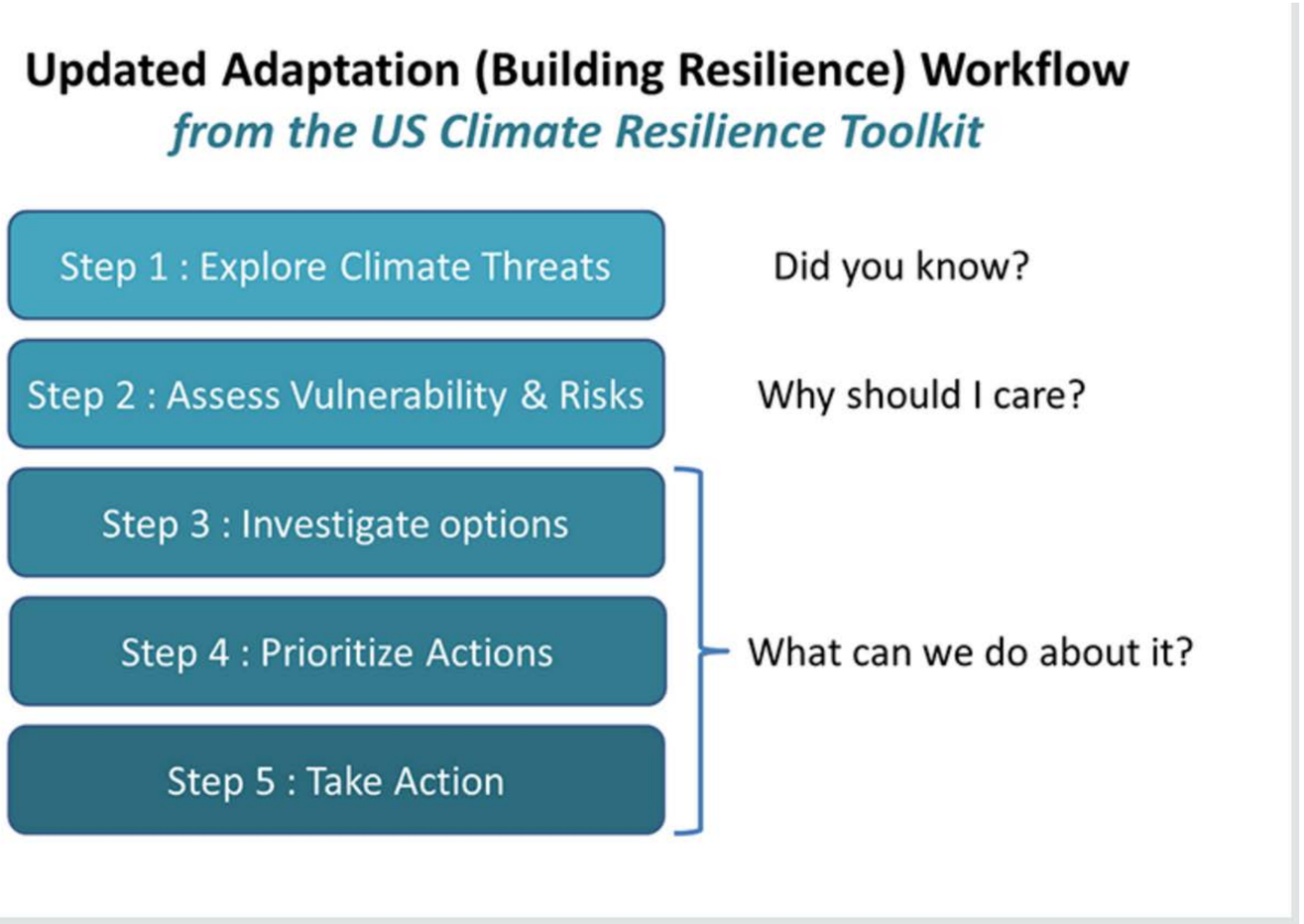
Build Back Better

Steps on how to plan for Adaptation

Physical & Social Vulnerability

Physical Tool:
Vulnerability Assessment Scoring Tool
https://www.fhwa.dot.gov/environment/sustainability/resilience/tools/

Environmental Justice Screening Tool:
https://ejscreen.epa.gov/mapper/



US Climate Resilience ToolKit

https://toolkit.climate.gov/#steps

Monroe County Climate Readiness and Rural Economic Opportunity Assessment

Project Partners

WI LAND +WATER

MONROE COUNTY WISCONSIN

Monroe County Climate Change Task Force

The Nature Conservancy

NIACS Northern Institute of Applied Climate Science

WISCONSIN DEPT. OF NATURAL RESOURCES

DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION · WISCONSIN ·

U.S. Army, Fort McCoy

WISCONSIN INITIATIVE ON CLIMATE CHANGE IMPACTS

WISCONSIN UNIVERSITY OF WISCONSIN–MADISON

Extension UNIVERSITY OF WISCONSIN–MADISON

WISCONSIN'S greenfire VOICES FOR CONSERVATION

Rainfall of August 28, 2018

High rainfall track across central Wisconsin as the storm moved from West to East

Project Goals

- Identify and Project **Future Climate Risks**
- Strategies and Practices to **Reduce Risks to Infrastructure and Watersheds**
- Identify **Climate Vulnerabilities in Farms, Forests, and Conservation Lands**
- Recommend Strategies and Practices to **Increase Climate Resiliency**
- Assess **income opportunities** for carbon offsets and other ecosystem services

HEALTHY WATERSHEDS provide storm water storage, flood control, erosion/sedimentation control, nutrient cycling, carbon storage, biodiversity, wildlife movement corridors, help reduce the effects of climate change and other natural disasters.

Watershed Health Indicators

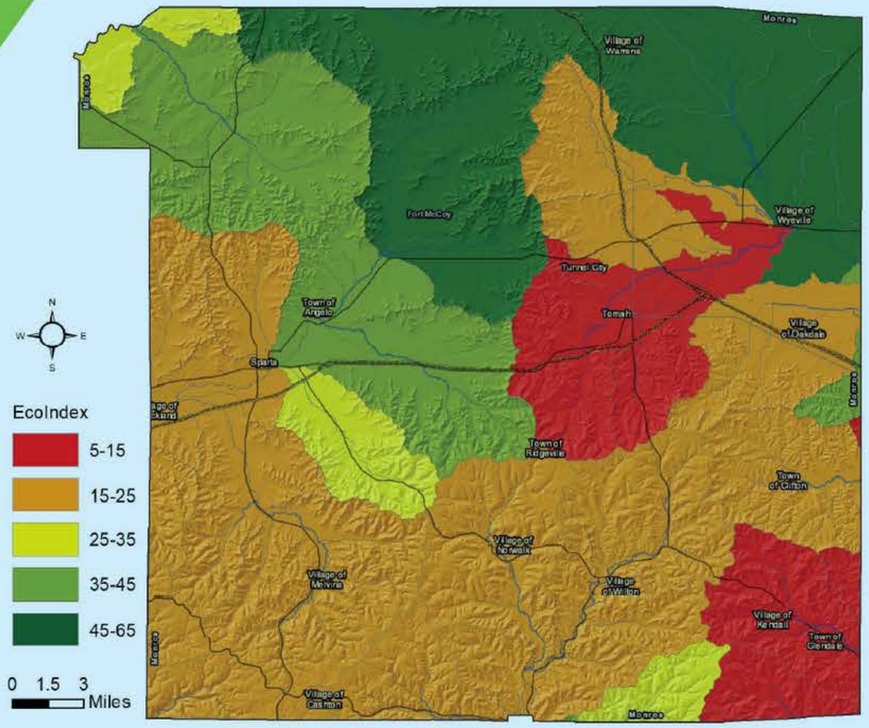
- Amount of forest cover
- Forest cover in riparian zones
- Amount of wetlands
- Aquatic habitat condition
- Environmental Corridors

WATERSHED STRESSES are factors that limit the ability of watersheds to respond to environmental impacts or to provide human and environmental benefits.

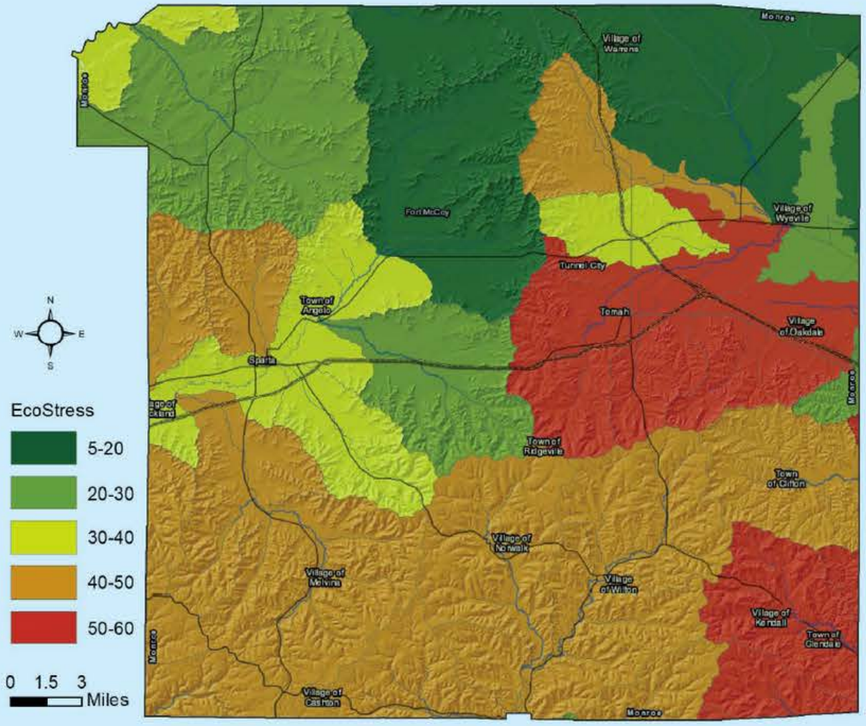
Watershed Stress Indicators

- Amount of impervious cover (e.g. developed areas, roads, buildings, etc.
- Amount of row crops
- Amount of agricultural uses without conservation buffers
- Amount of drainage ditches
- Amount of erodible soils and steep slopes

Monroe County Watershed Ecological Index

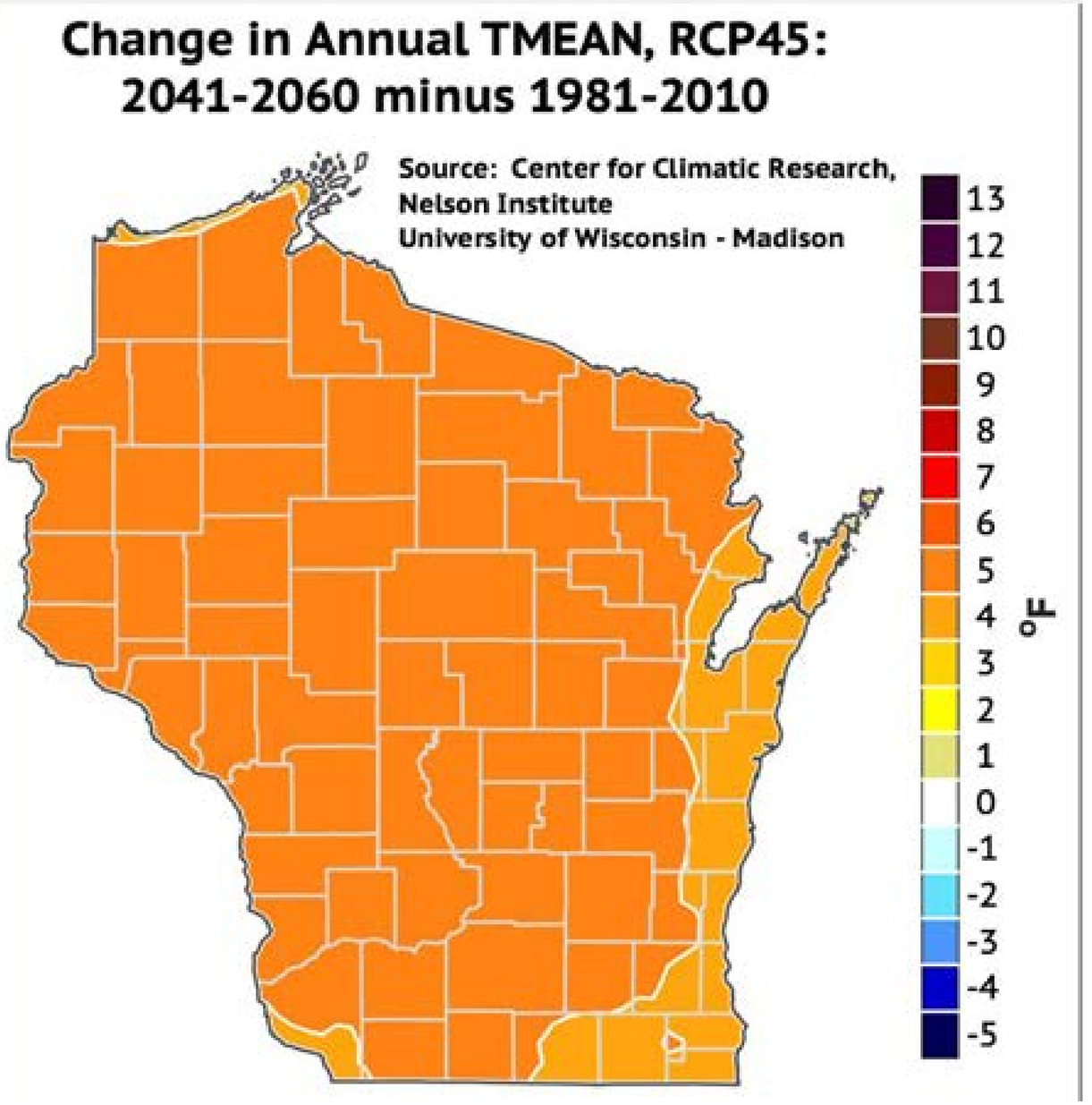


Monroe County Watershed Stress Index



The Future in 2050
Substantially warmer

- Average annual temperature increase: 4 °F
- Winter + 5 °F
- Spring + 4 °F
- Summer + 4 °F
- Fall + 5 °F
- Fewer very cold nights

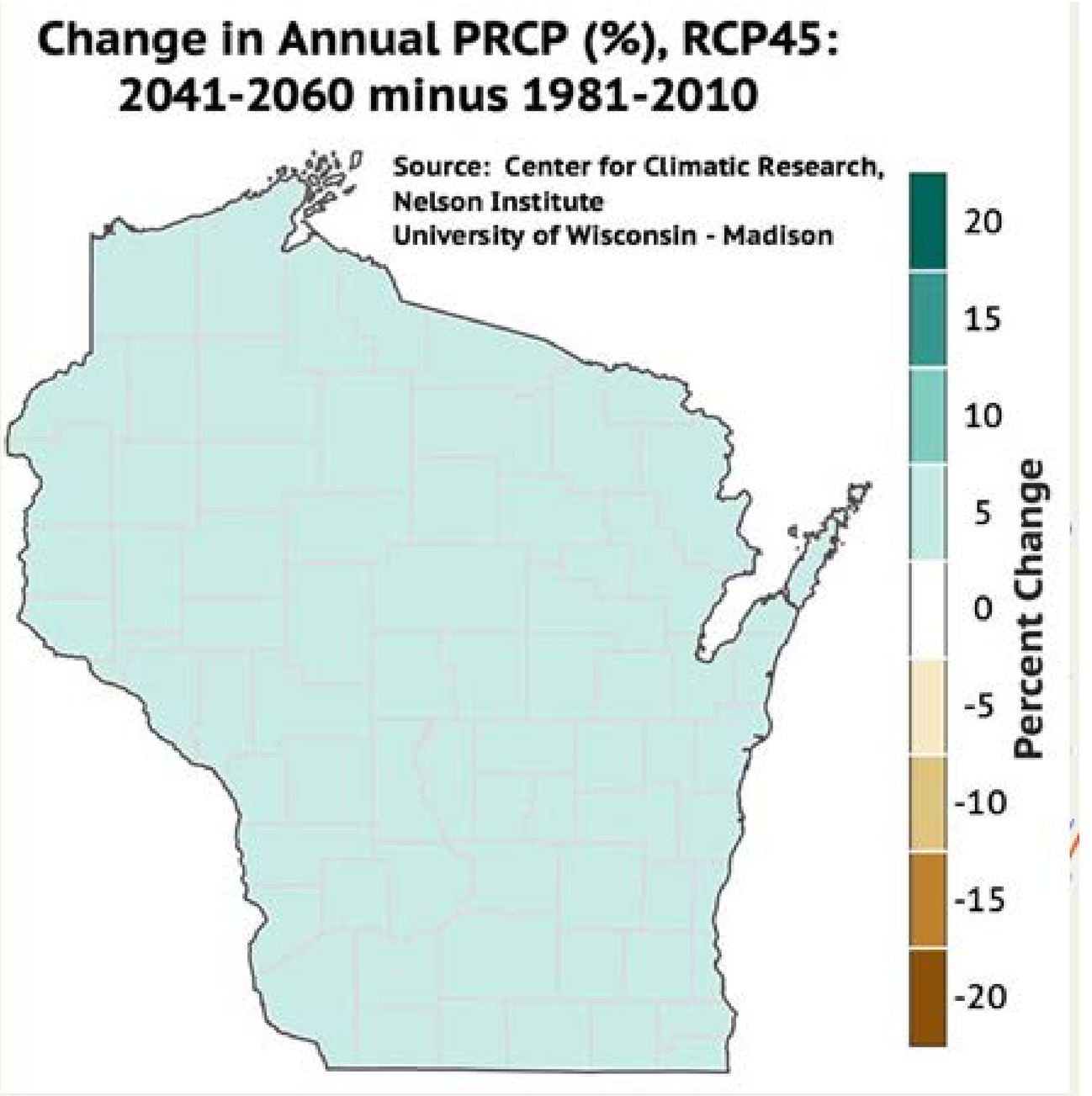


And wetter

+Annual precip + 5%

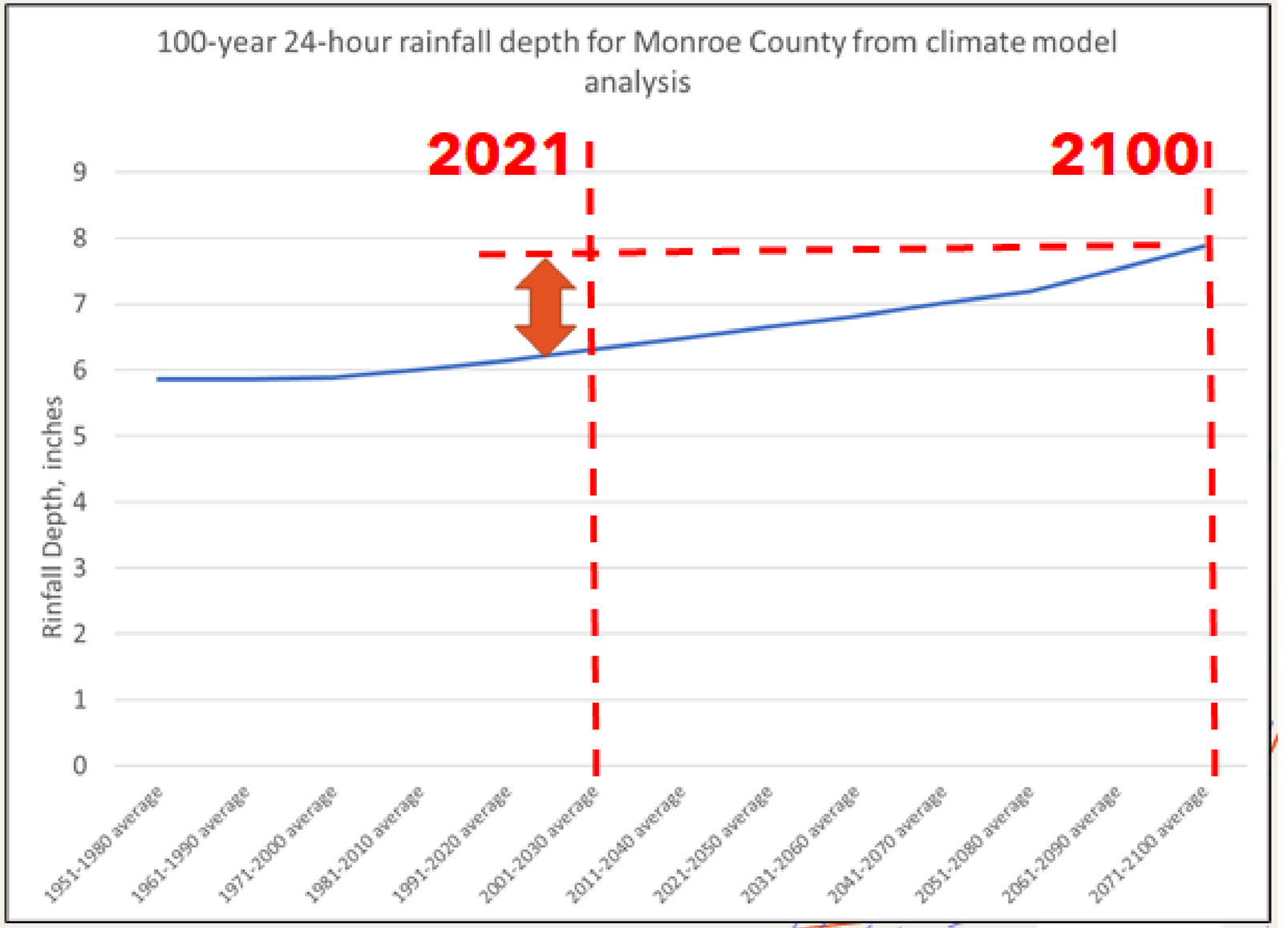
+Winter + 10%

+Summer – uncertain



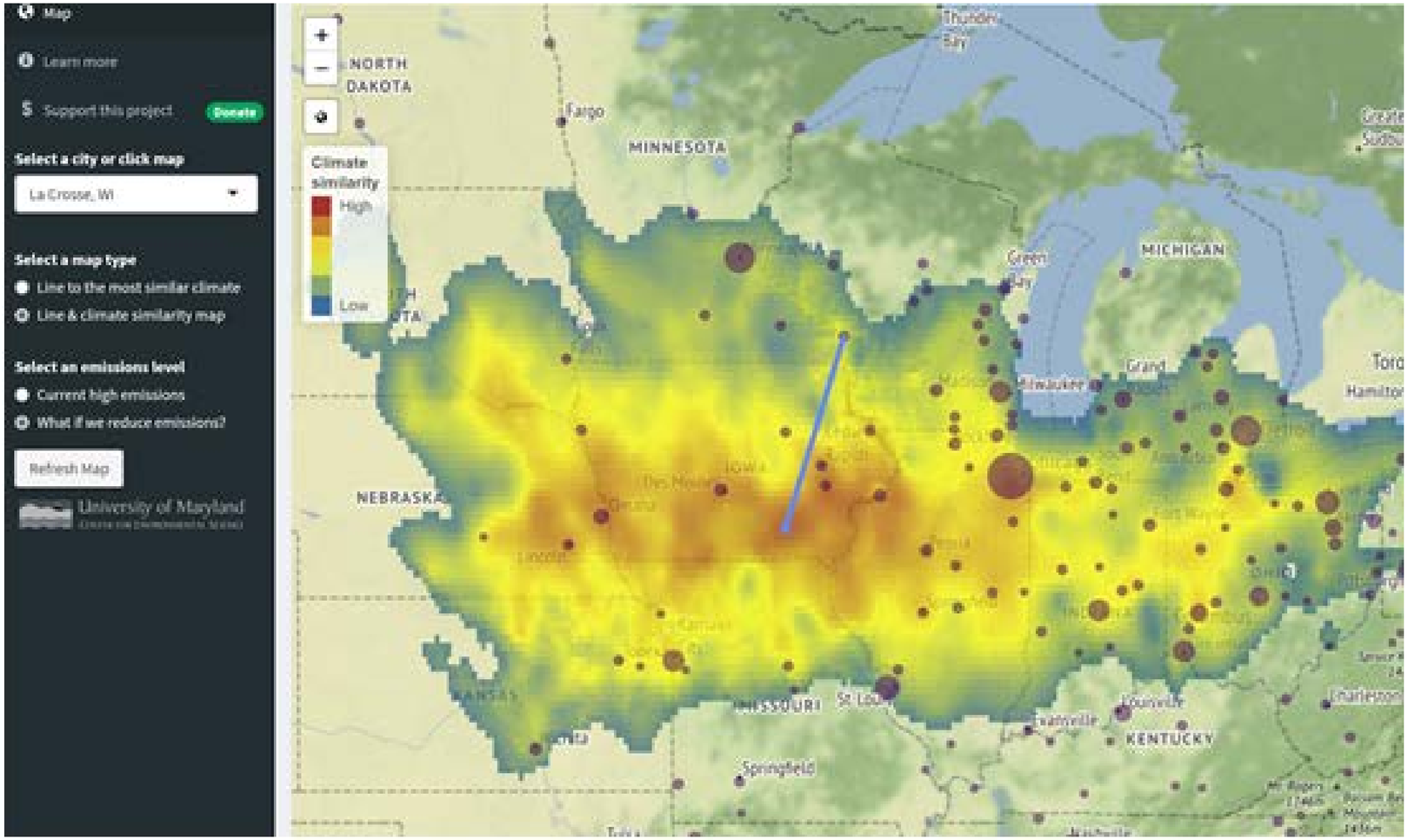
And Larger extreme storms

- Based on analysis of climate model data.
- More than 20% increase in 100-year storm depth by 2100
- *10% increase in 100-year storm by 2050*
- *Extraordinarily large storms, although still rare, will be more likely in the future*



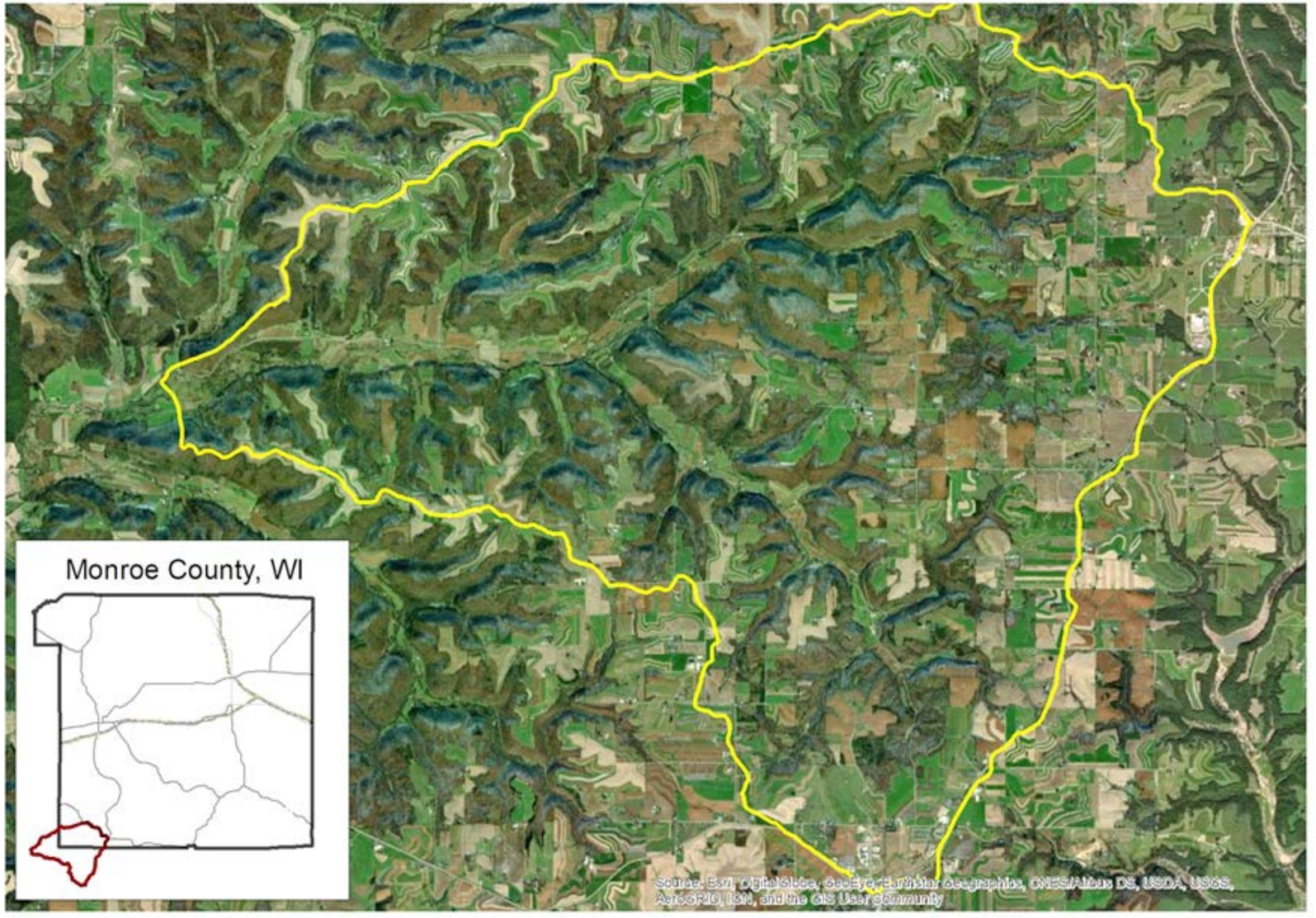
University of Maryland analysis for emission scenario 4.5 at year 2080

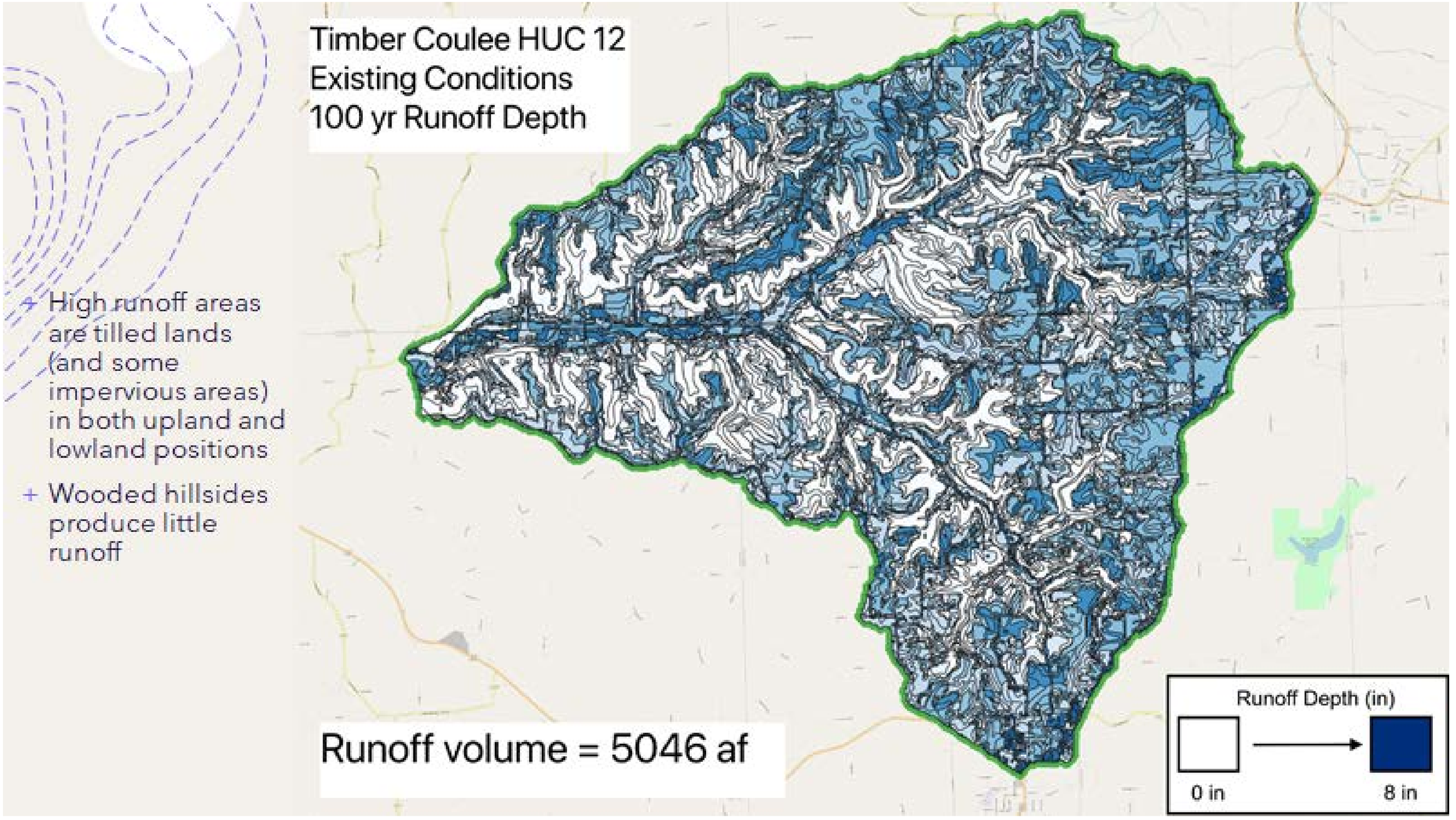
Analogous climate areas – anticipated climate conditions in Monroe County are similar to south central Iowa. Strongest correlation is with Ottumwa, Iowa

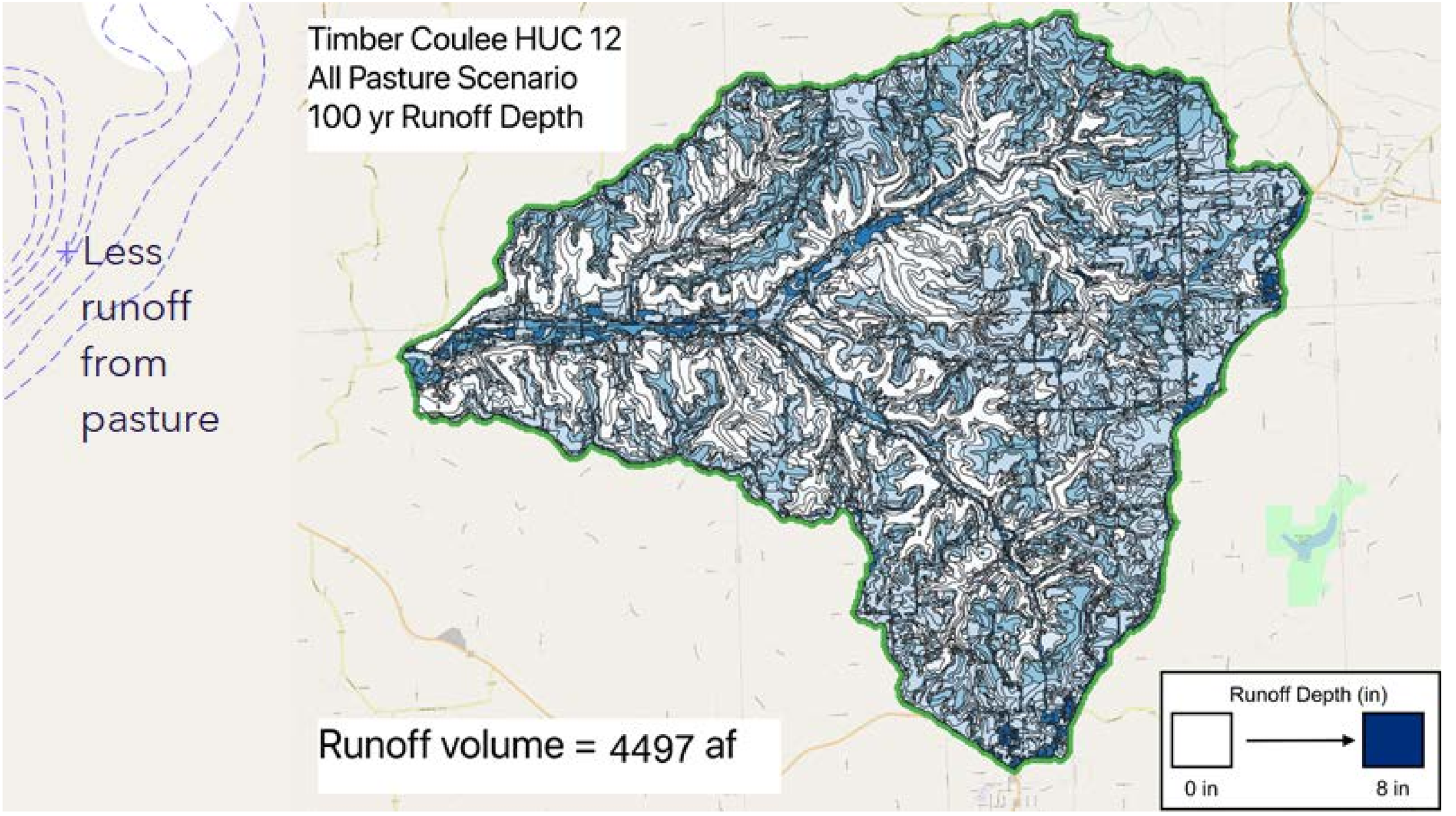


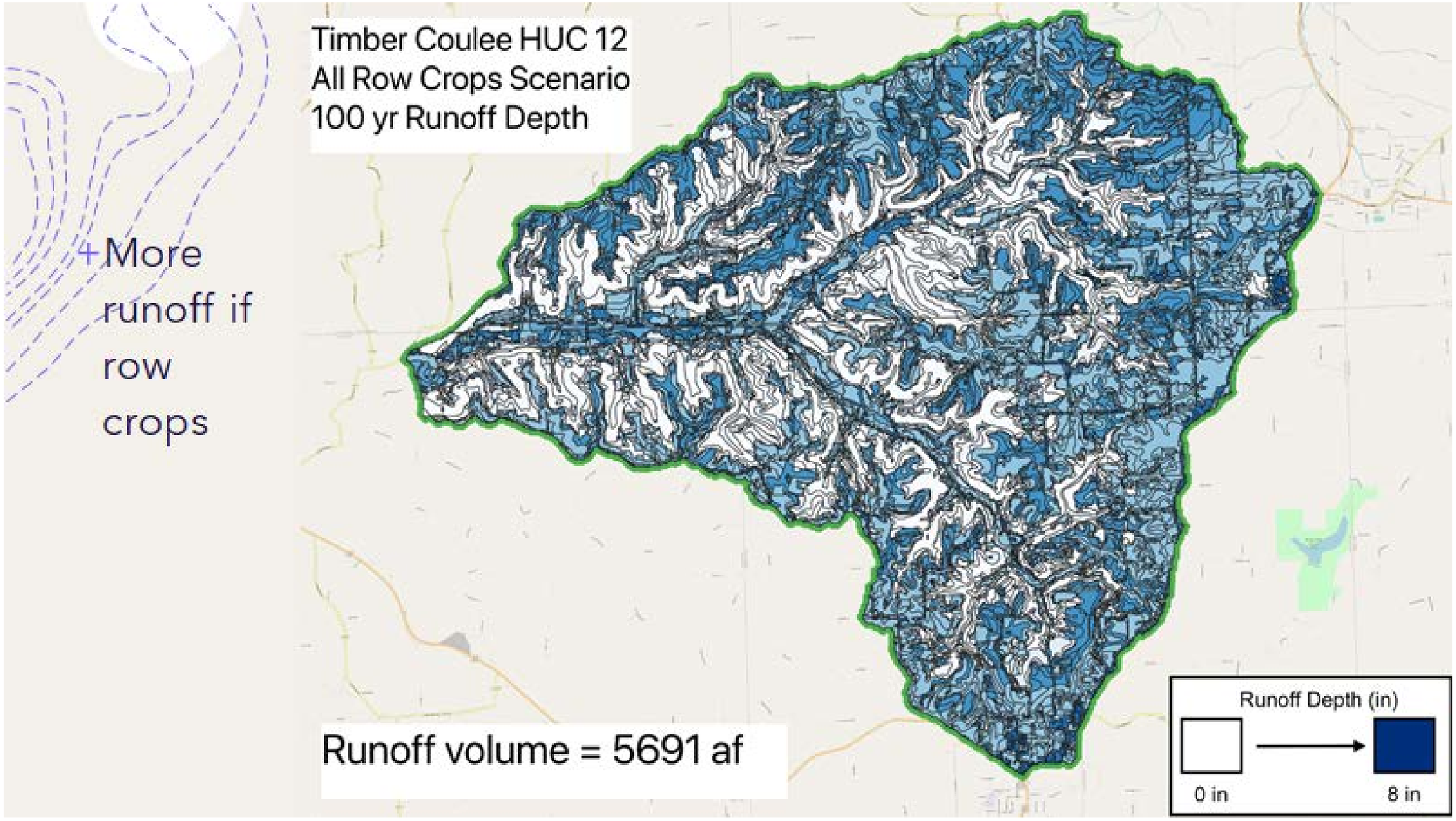
- https://fitzlab.shinyapps.io/cityapp/

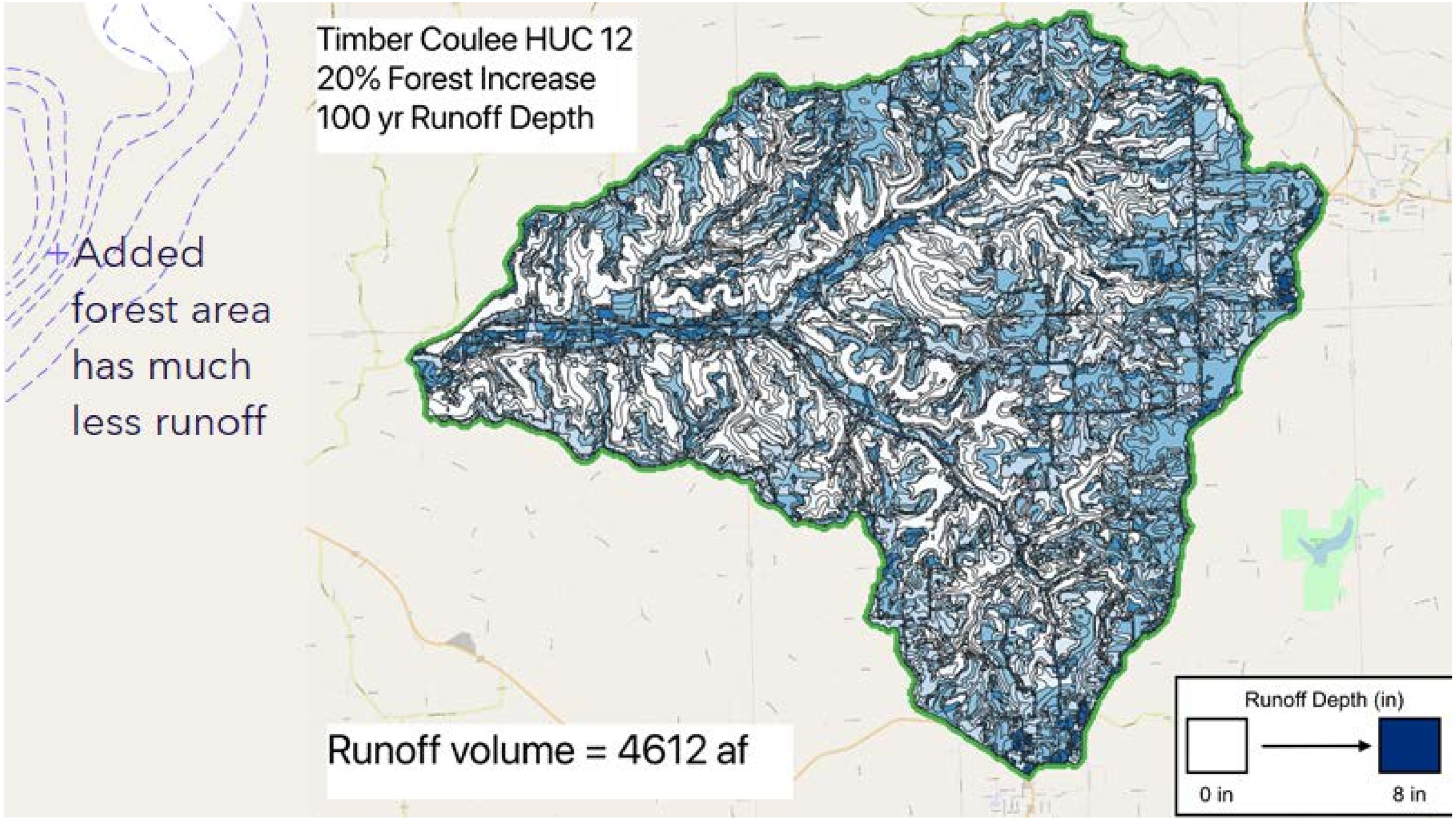
Timber Coulee Watershed




Timber Coulee HUC 12
Existing Conditions
100 yr Runoff Depth
+ High runoff areas are tilled lands (and some impervious areas) in both upland and lowland positions
+ Wooded hillsides produce little runoff
Runoff volume = 5046 af
Runoff Depth (in)
0 in
8 in


Timber Coulee HUC 12
All Pasture Scenario
100 yr Runoff Depth
Less runoff from pasture
Runoff volume = 4497 af
Runoff Depth (in)
0 in
8 in


Timber Coulee HUC 12
All Row Crops Scenario
100 yr Runoff Depth
+More runoff if row crops
Runoff volume = 5691 af
Runoff Depth (in)
0 in
8 in


Timber Coulee HUC 12
20% Forest Increase
100 yr Runoff Depth
+Added forest area has much less runoff
Runoff volume = 4612 af
Runoff Depth (in)
0 in
8 in

Increasing Climate Resilience – Key Strategies

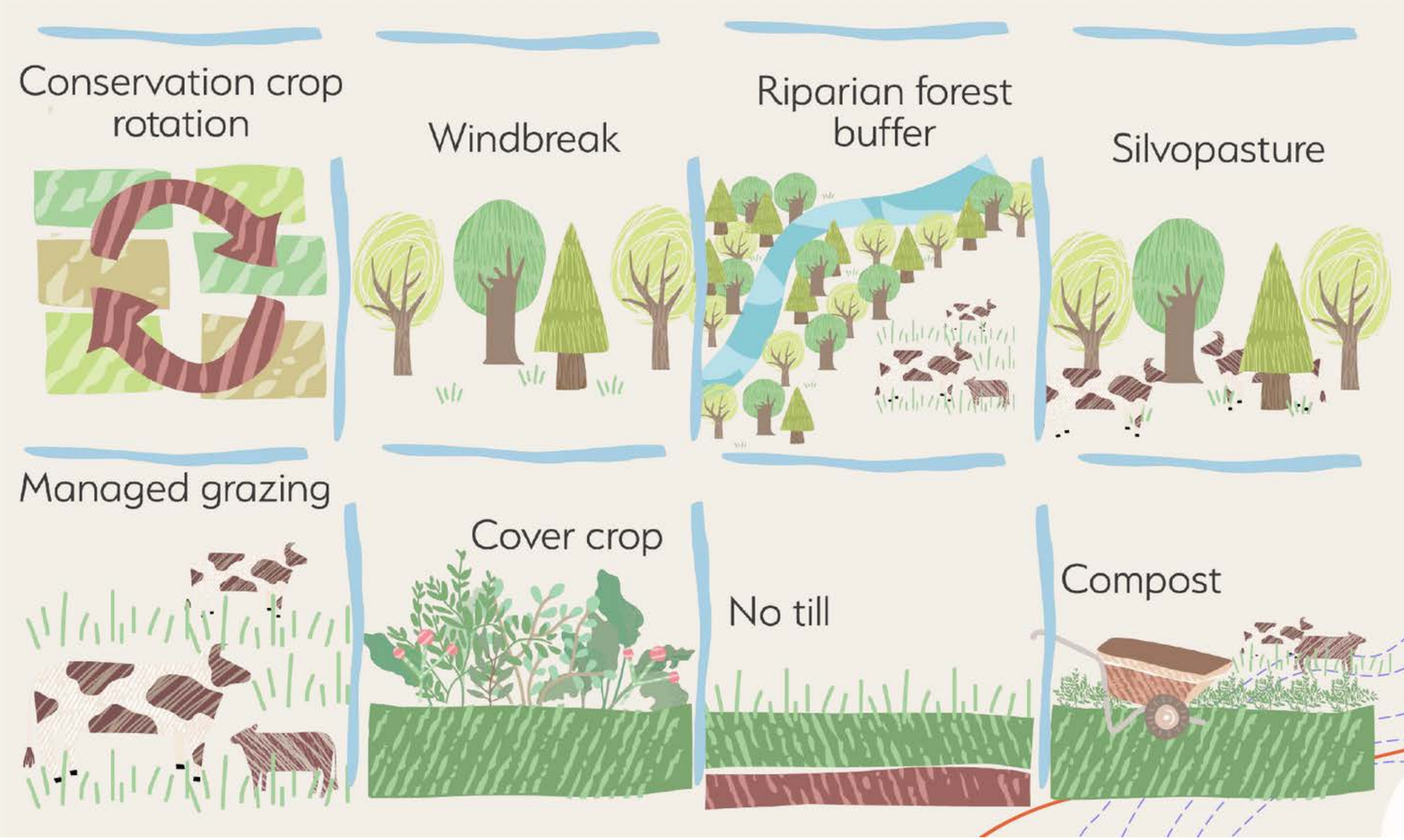
- Protecting People and Property
- Conservation in Land Use
- Restoring Forests, Grasslands, and Wetlands

❖Restoring Forests, Grasslands, and Wetlands

- ❖ Reforestation
- ❖ Wetland and Watershed Restoration
- ❖ Restore grasslands
- ❖ Restore perennial cover in floodplains / floodways

FarmToolbox

Increase soil organic carbon → Improve soil health → Ensure resiliency



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