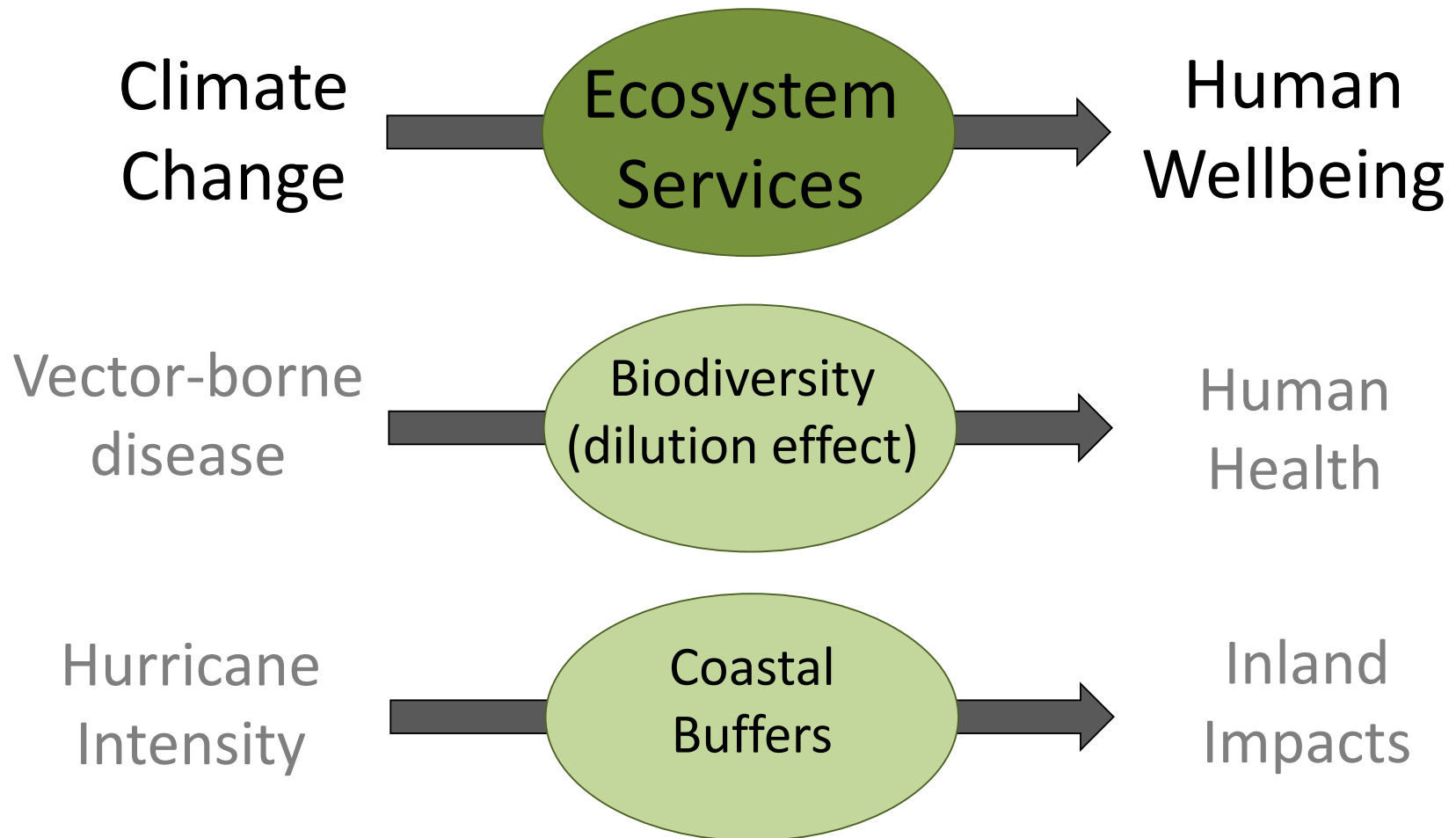


Economic Valuation of Flood Mitigation Services

Keri Bryan, Taylor Ricketts, Gillian Galford, Steve Polasky, and Jarlath O'Neil-Dunne



Ecosystem Services and Climate Resilience



Increasing Flood Impacts

Flooding

Wetlands
and
Floodplains

Damages

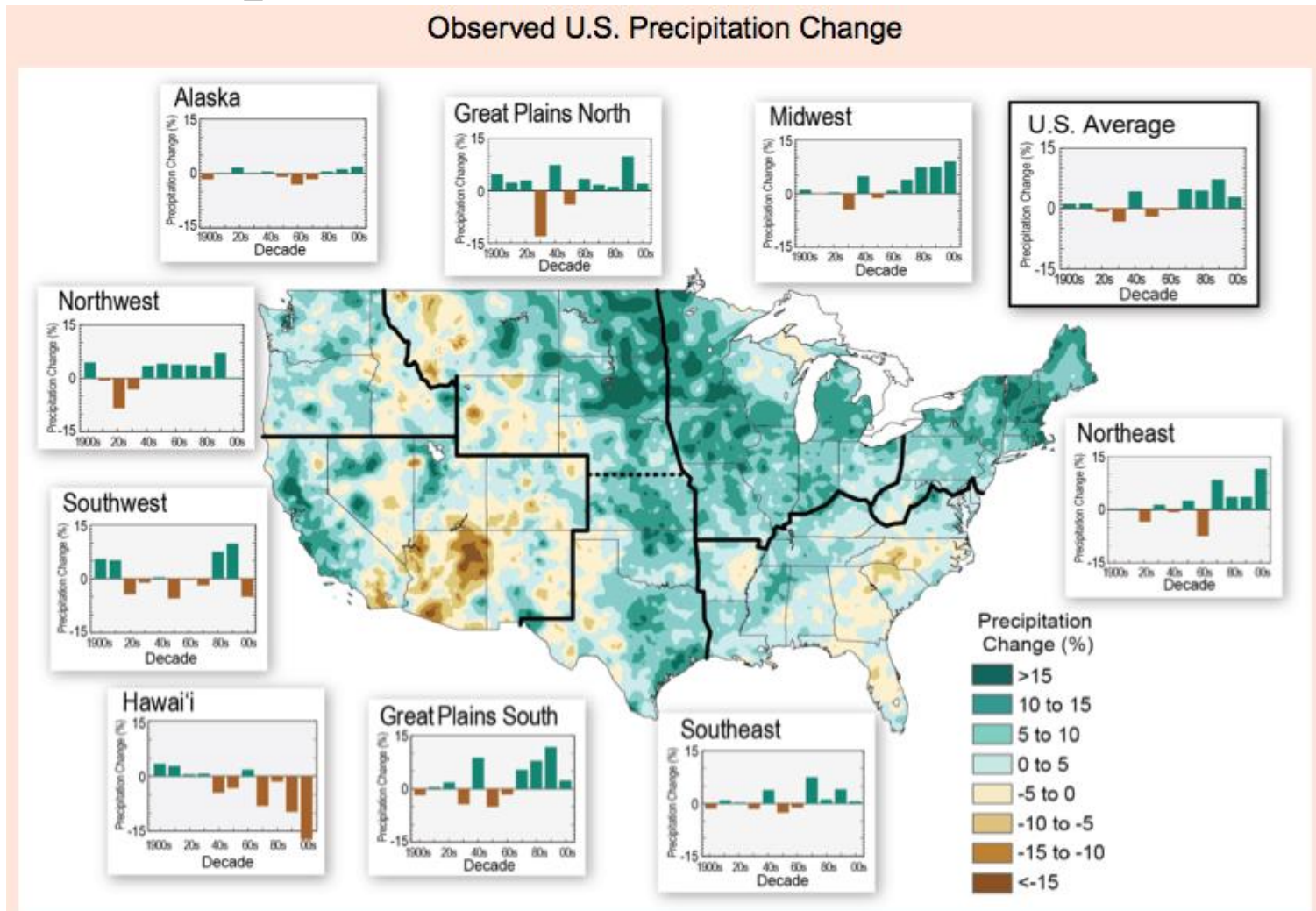


Figure 2.12. The colors on the map show annual total precipitation changes for 1991-2012 compared to the 1901-1960 average, and show wetter conditions in most areas. The bars on the graphs show average precipitation differences by decade for 1901-2012 (relative to the 1901-1960 average) for each region. The far right bar in each graph is for 2001-2012. (Figure source: adapted from Peterson et al. 2013⁴⁸).

Increasing Flood Impacts

Flooding

Wetlands
and
Floodplains

Damages

Trends in Flood Magnitude

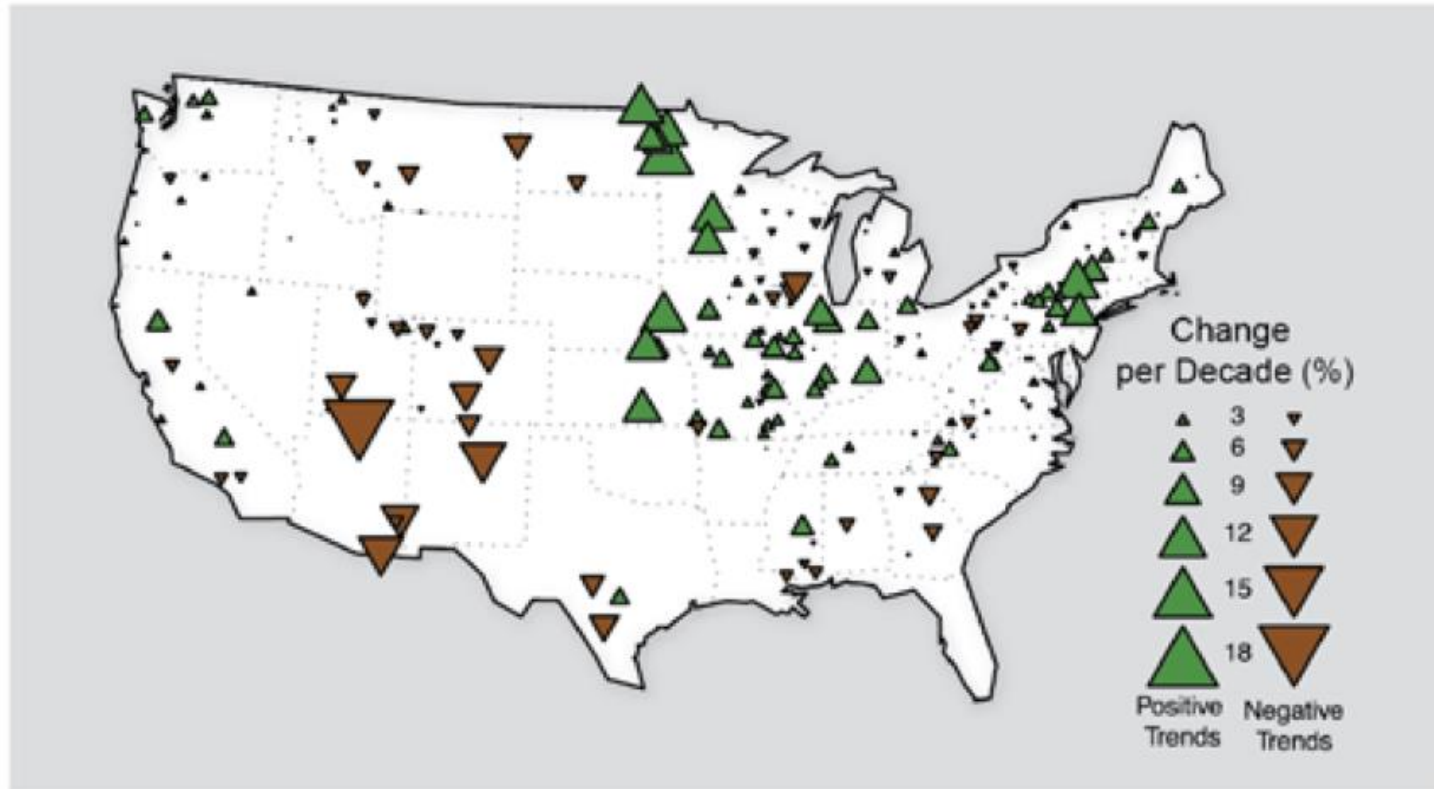


Figure 3.5. Trend magnitude (triangle size) and direction (green = increasing trend, brown = decreasing trend) of annual flood magnitude from the 1920s through 2008. Flooding in local areas can be affected by multiple factors, including land-use change, dams, and diversions of water for use. Most significant are increasing trends for floods in Midwest and Northeast, and a decreasing trend in the Southwest. (Figure source: Peterson et al. 2013⁶³).

Flooding already has huge impacts globally

Flooding

Wetlands
and
Floodplains

Damages



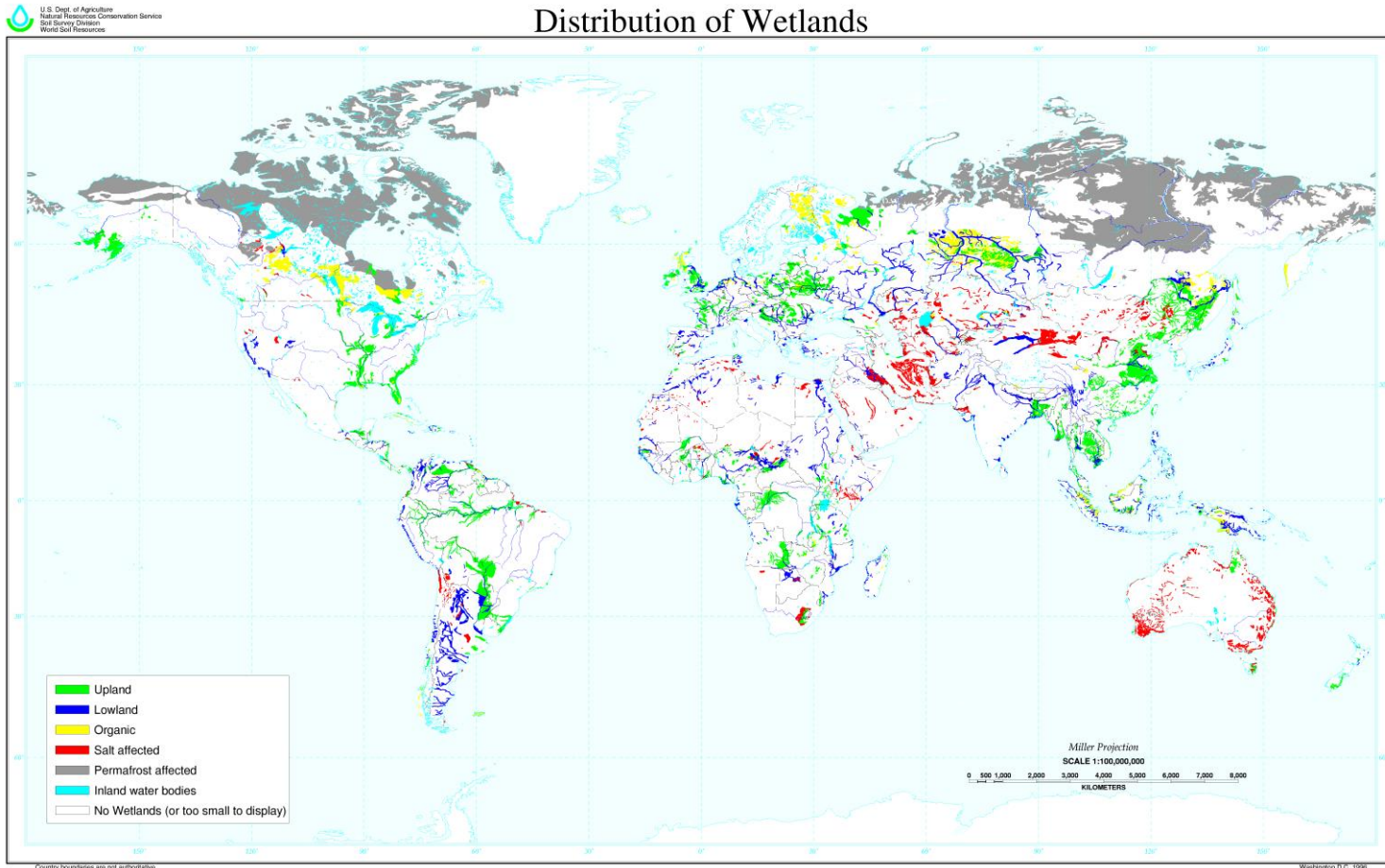
Glen Russel, LA Times Free Press

Wetlands and floodplains mitigate floods

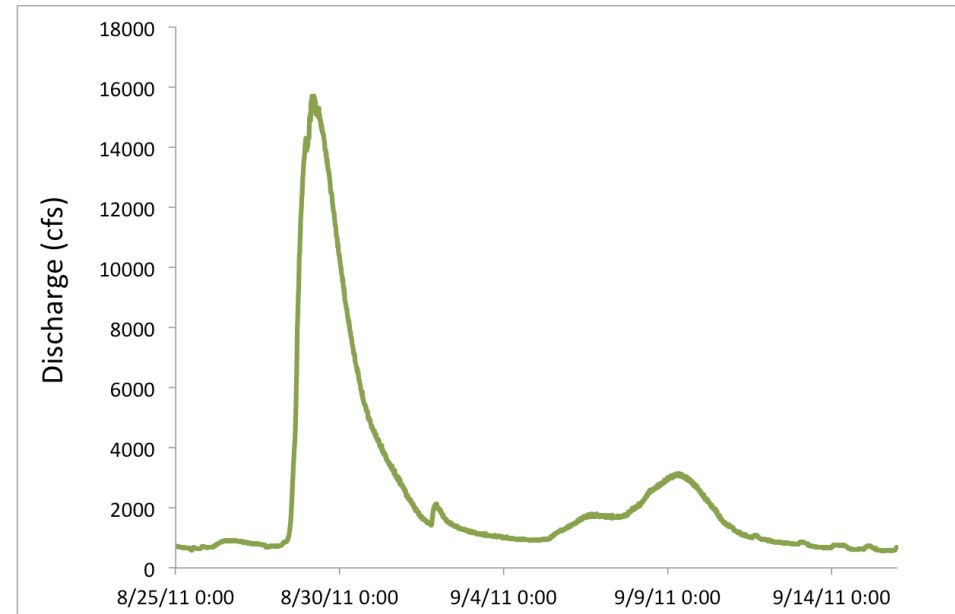
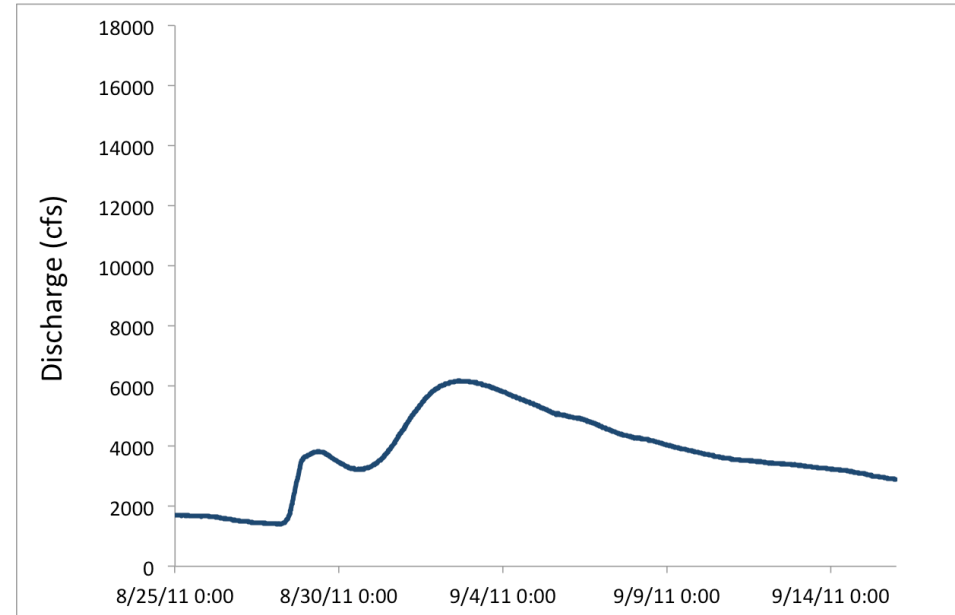
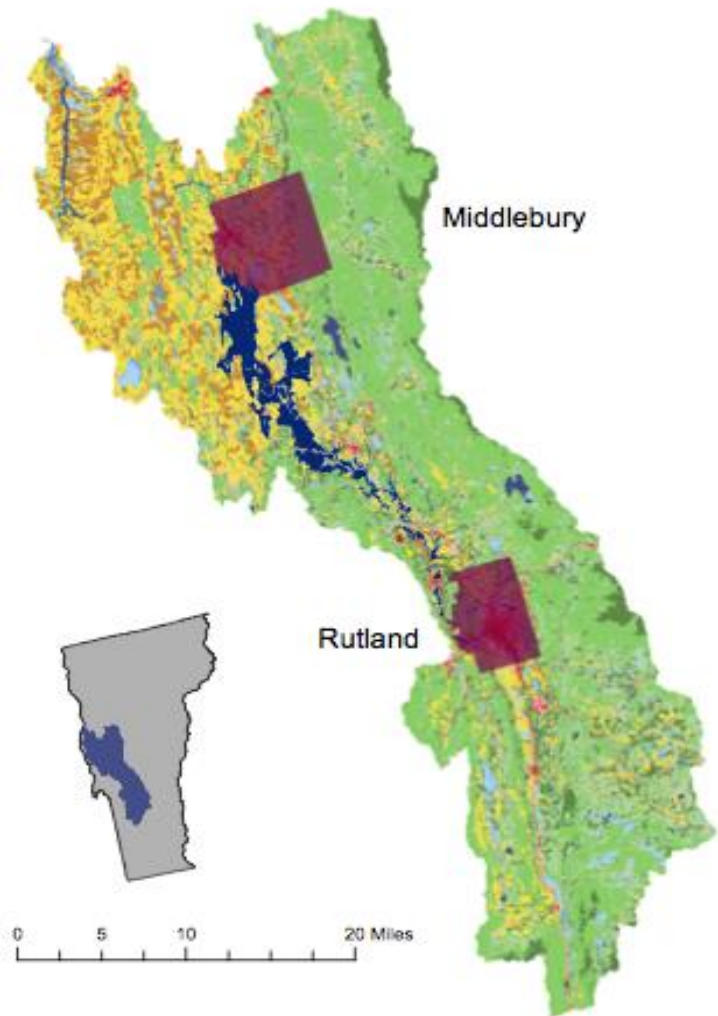
Flooding

Wetlands
and
Floodplains

Damages



The Case of the Otter Creek and Tropical Storm Irene



Research Questions

- What was the value of the Otter Creek wetlands in reducing flood damage during Hurricane Irene in 2011?
- Beyond this one event, what is the expected annual value of the wetlands in mitigating flood damages?

Approach

- A **hydrograph** without wetlands
- Change in the **extent** of flooding
- Flooded **structures**
- Value in terms of avoided **damages**
- Mean **annual value**

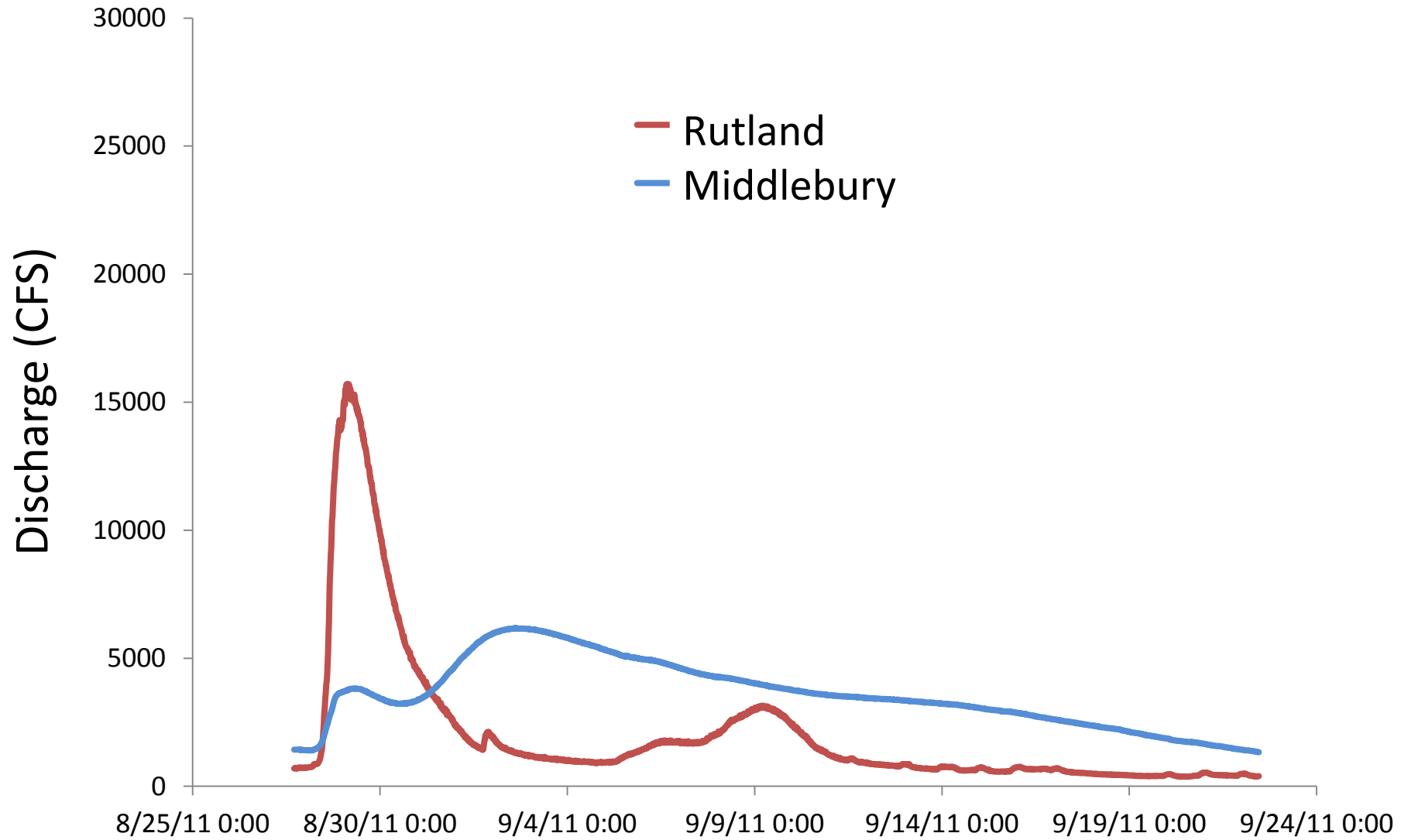
Hydrograph

Extent

Structures

Damages

Annual Value



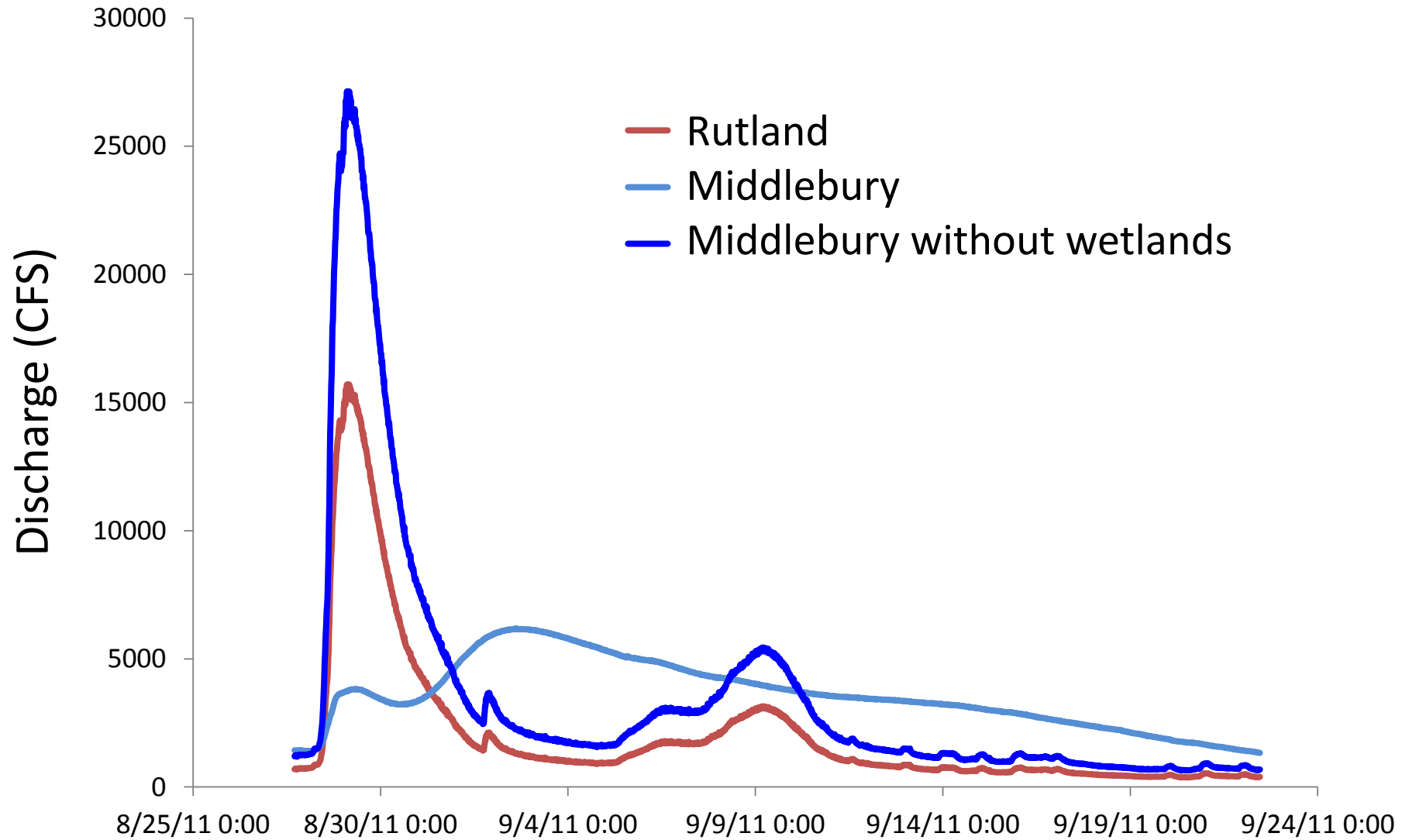
Hydrograph

Extent

Structures

Damages

Annual Value



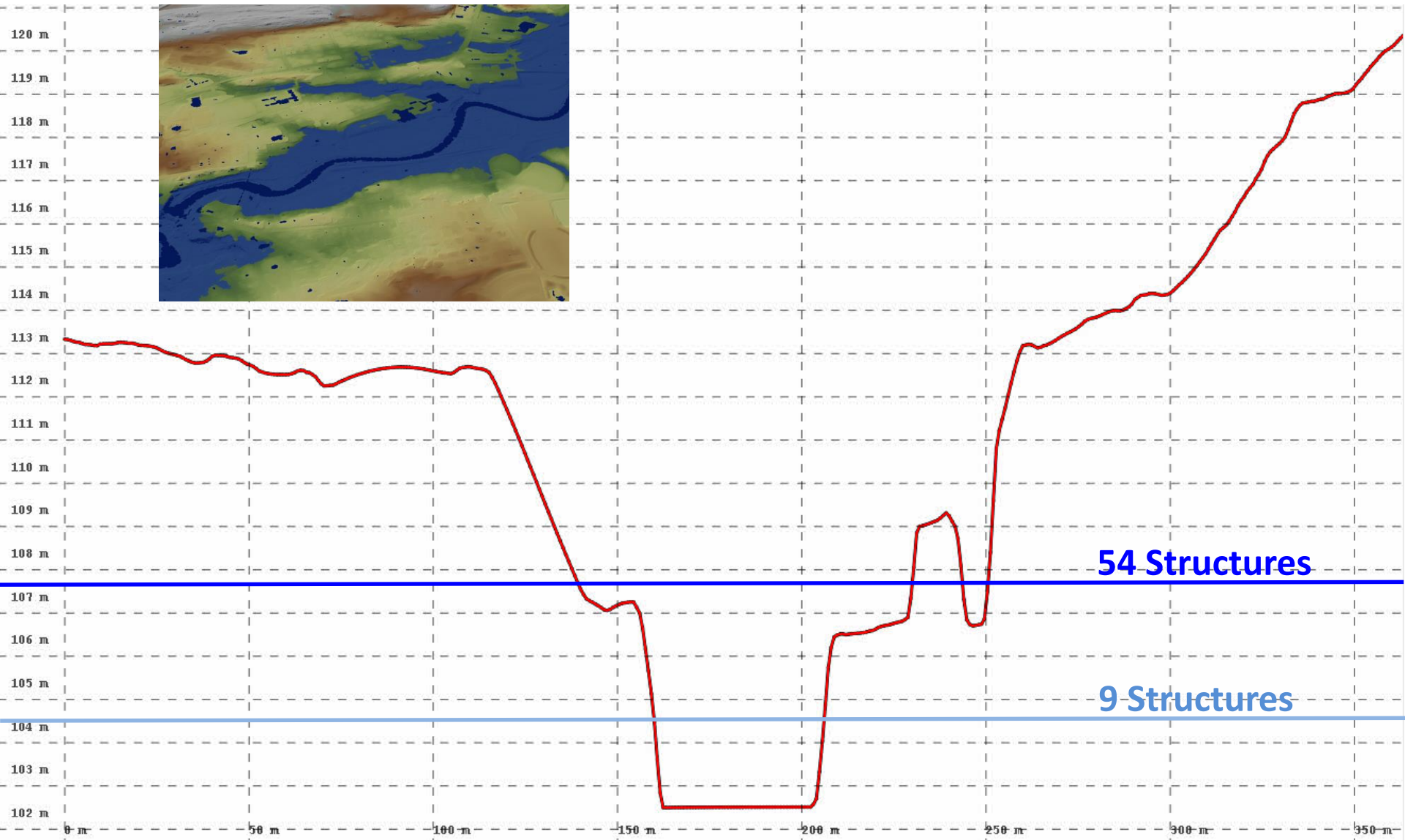
Hydrograph

Extent

Structures

Damages

Annual Value



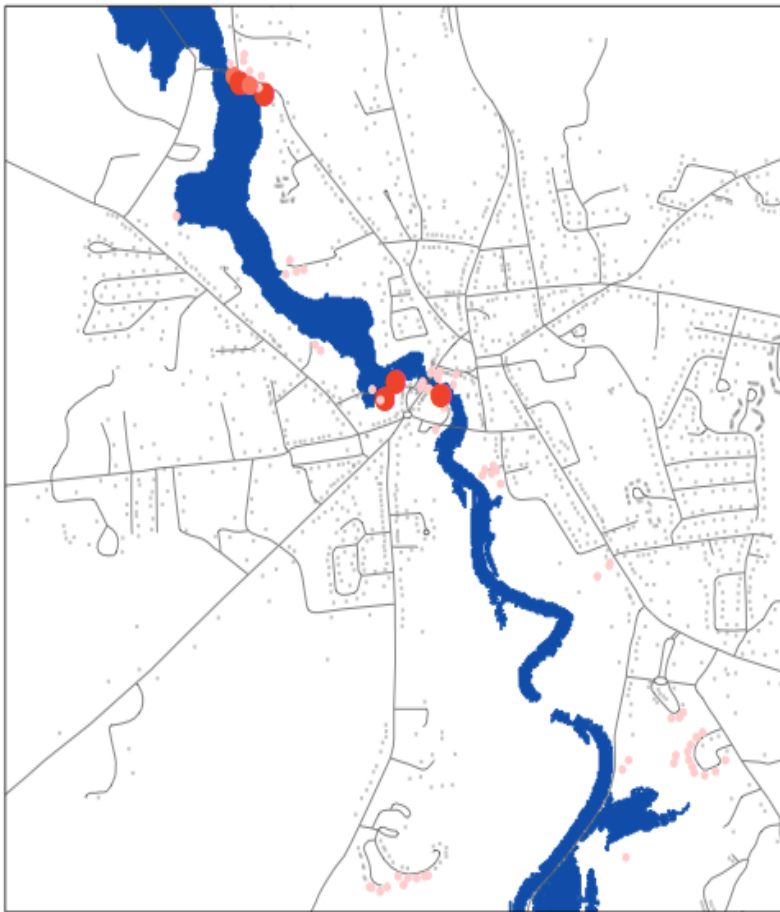
Hydrograph

Extent

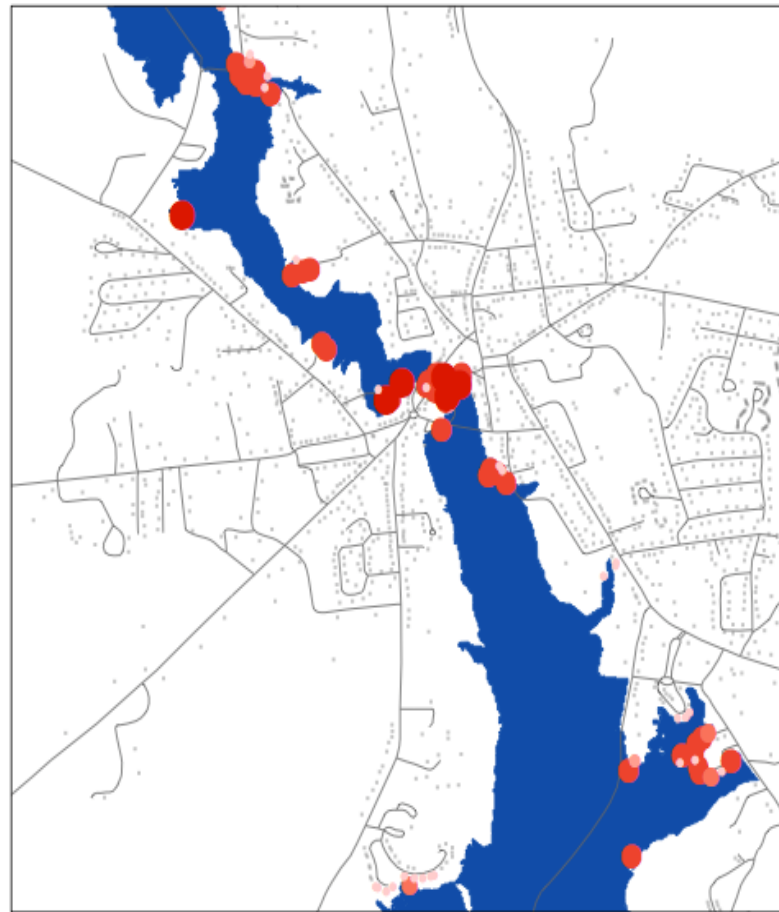
Structures

Damages

Annual Value



With Wetlands



Without Wetlands

Monetary Damages

- <\$1,000
- \$1,000-\$5,000
- \$5,000-\$10,000
- \$10,000-\$100,000
- >\$100,000

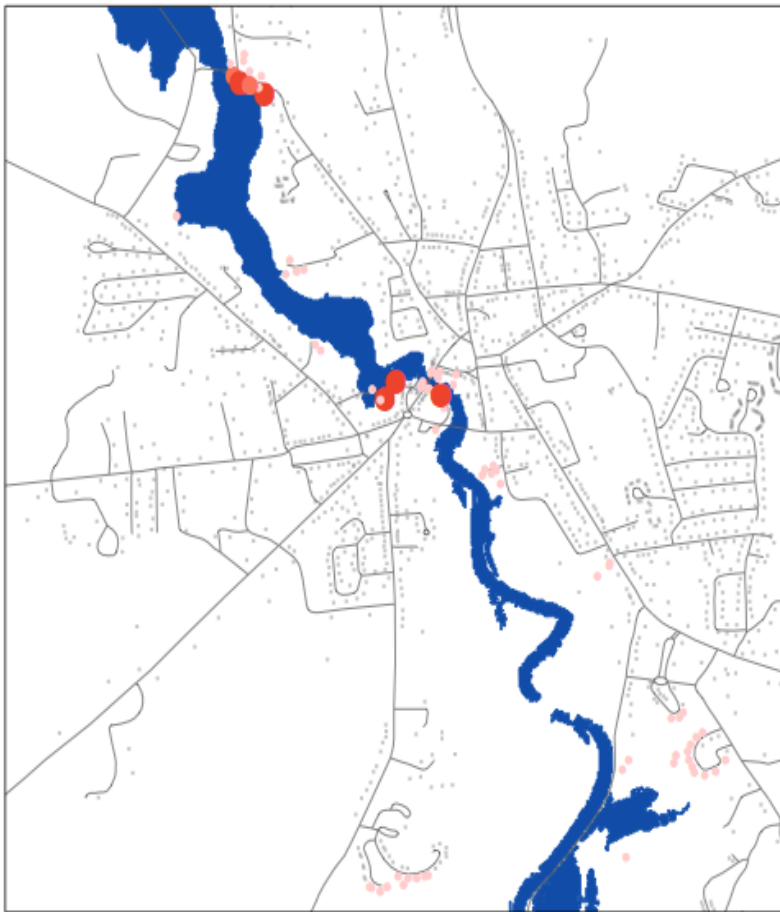
Hydrograph

Extent

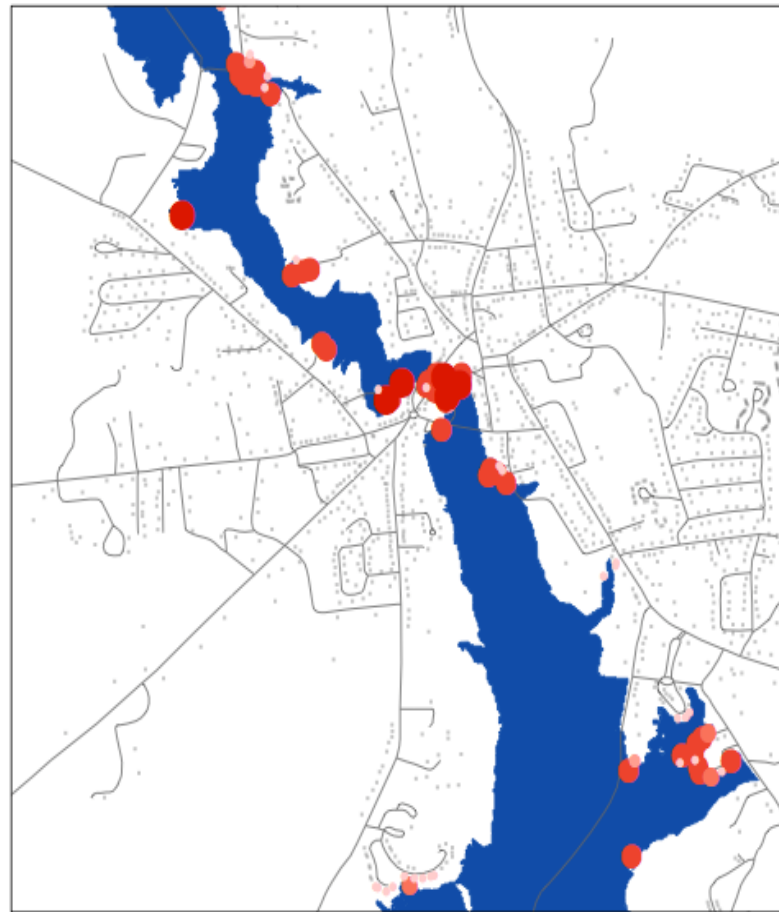
Structures

Damages

Annual Value



With Wetlands
\$.14 million



Without Wetlands
\$ 2.4 million

Monetary Damages

- <\$1,000
- \$1,000-\$5,000
- \$5,000-\$10,000
- \$10,000-\$100,000
- >\$100,000

→ *\$ 2.3 million*

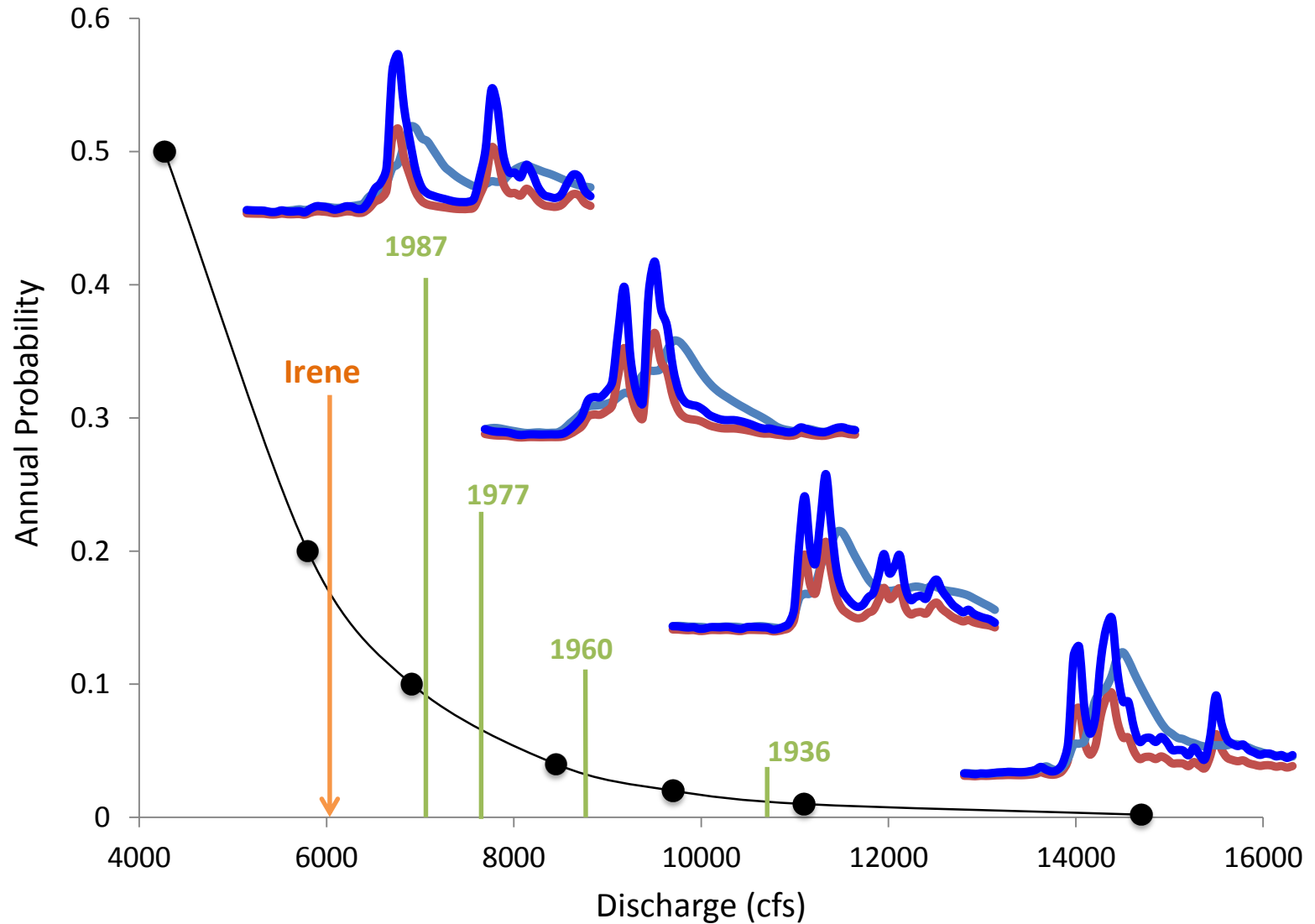
Hydrograph

Extent

Structures

Damages

Annual Value



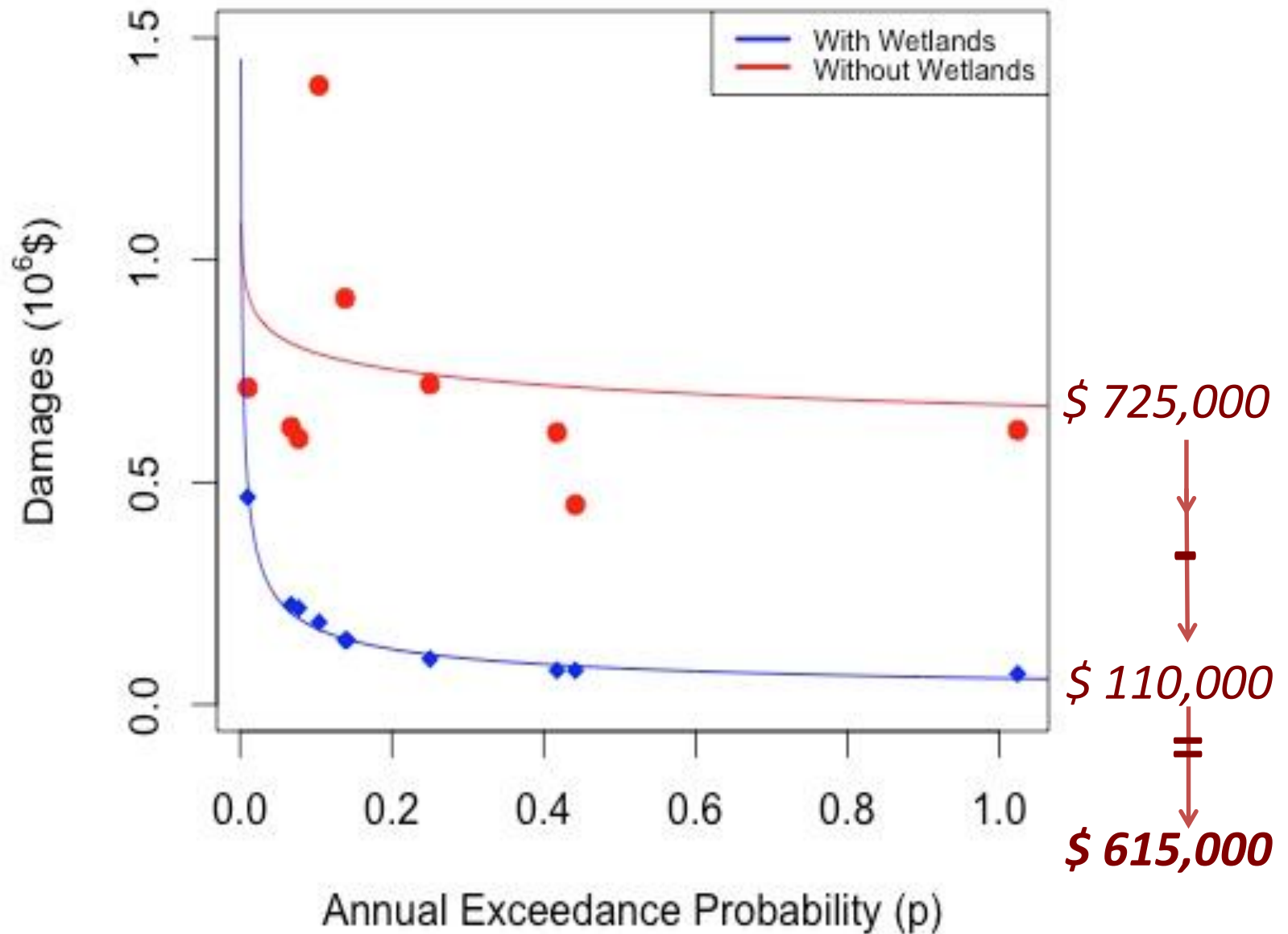
Hydrograph

Extent

Structures

Damages

Annual Value



Conclusion: Wetlands and floodplains mitigate floods



- In applying this case study elsewhere, the percent reduction in damages may be more informative than the dollar values presented here.
- Although our modeling approach is simple, our key findings are robust to uncertainties.
- **These values warrant the consideration of flood mitigation services in decisions.**

Thanks and acknowledgements:

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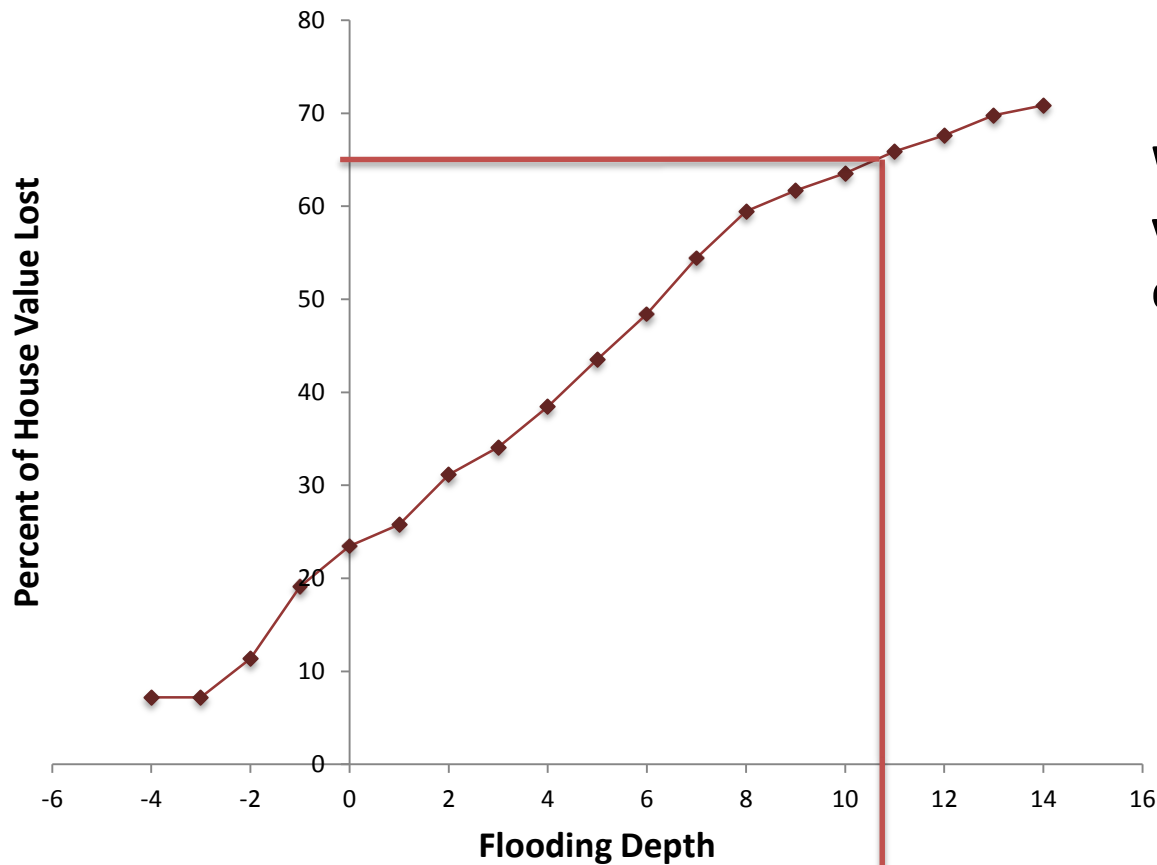
USDA- McIntire-Stennis
Crea Lintilhac Foundation



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FAO-UNESCO, Soil Map of the World, digitized by ESRI. Soil climate map, USDA-NRCS, Soil Science Division, World Soil Resources, Washington D.C.



What is the monetary value of those avoided damages?

- 1) Property Value
- 2) Proportion of that value lost

Flooding Depth (m)	% Loss	Property Value	\$ Damage
4.11	62.89	\$489800	\$308054.30
3.53	55.44	\$489800	\$271567.19
1.17	24.96	\$374300	\$93415.46
-3.75	0.00	\$753500	\$0.00
-0.70	0.00	\$335900	\$0.00

