



Renaud Barbero, Eric Maillé



Réseau WUI-net – 6 déc 2018

Changement climatique et risque d'incendie aux interfaces habitat-forêt: le cas des Etats-Unis

Fires occur in various ecosystems, from the western cordillera in the Pacific NW...



...to Appalachian forests in the east...



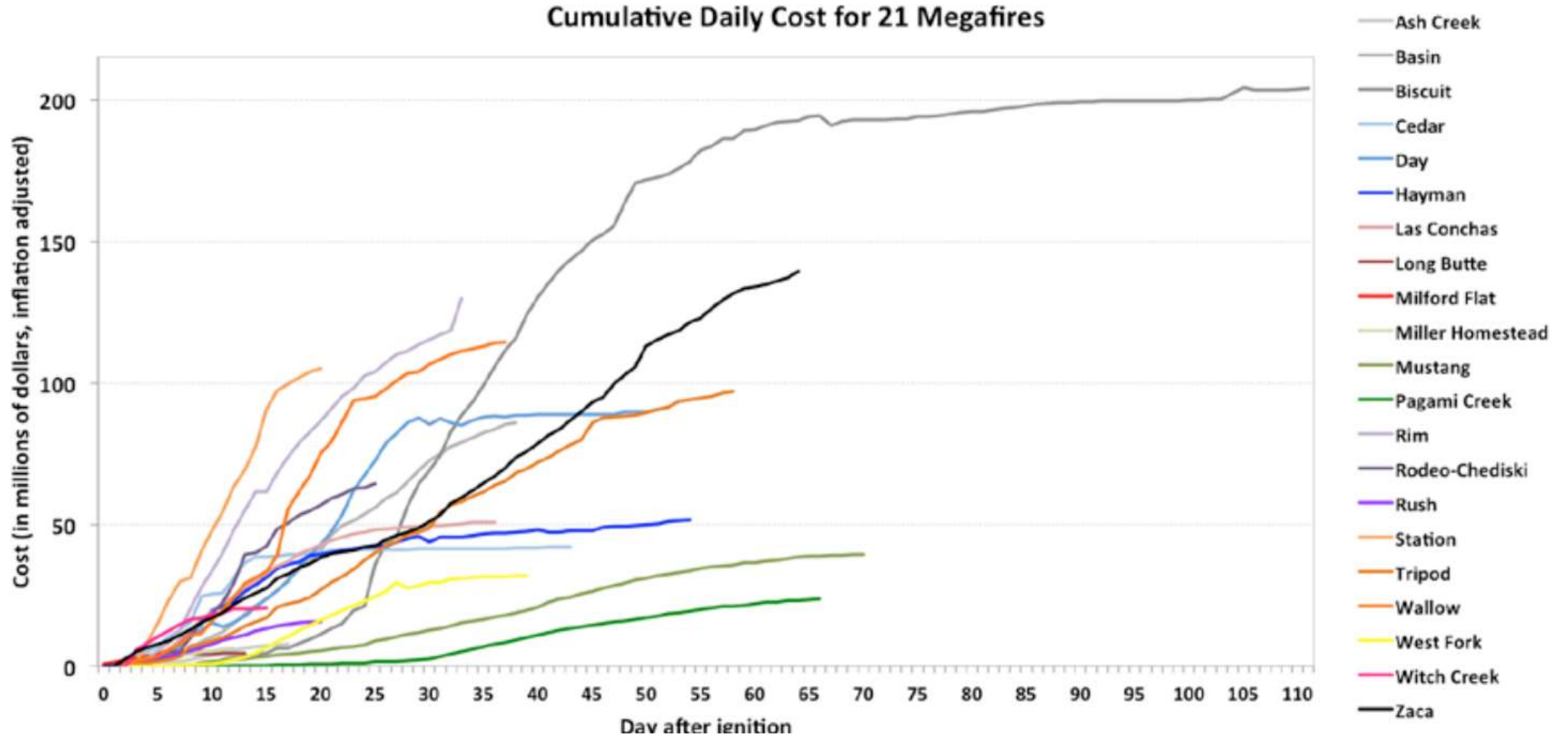
...to semi-arid landscapes in the SW



...and put infrastructures at risk



Cumulative suppression costs for 21 large fires

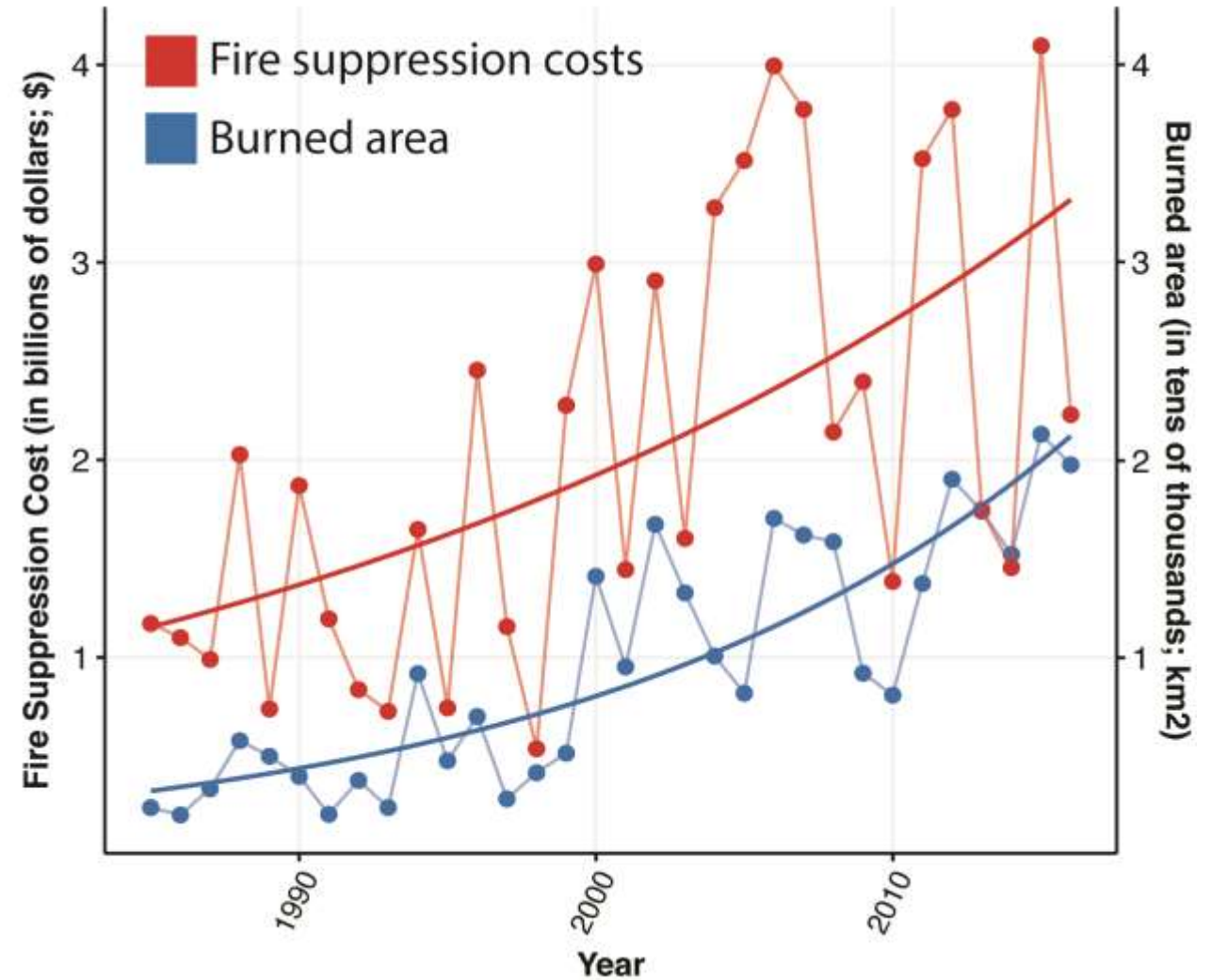


Courtesy: Brian Stocks

Trend in fire suppression costs

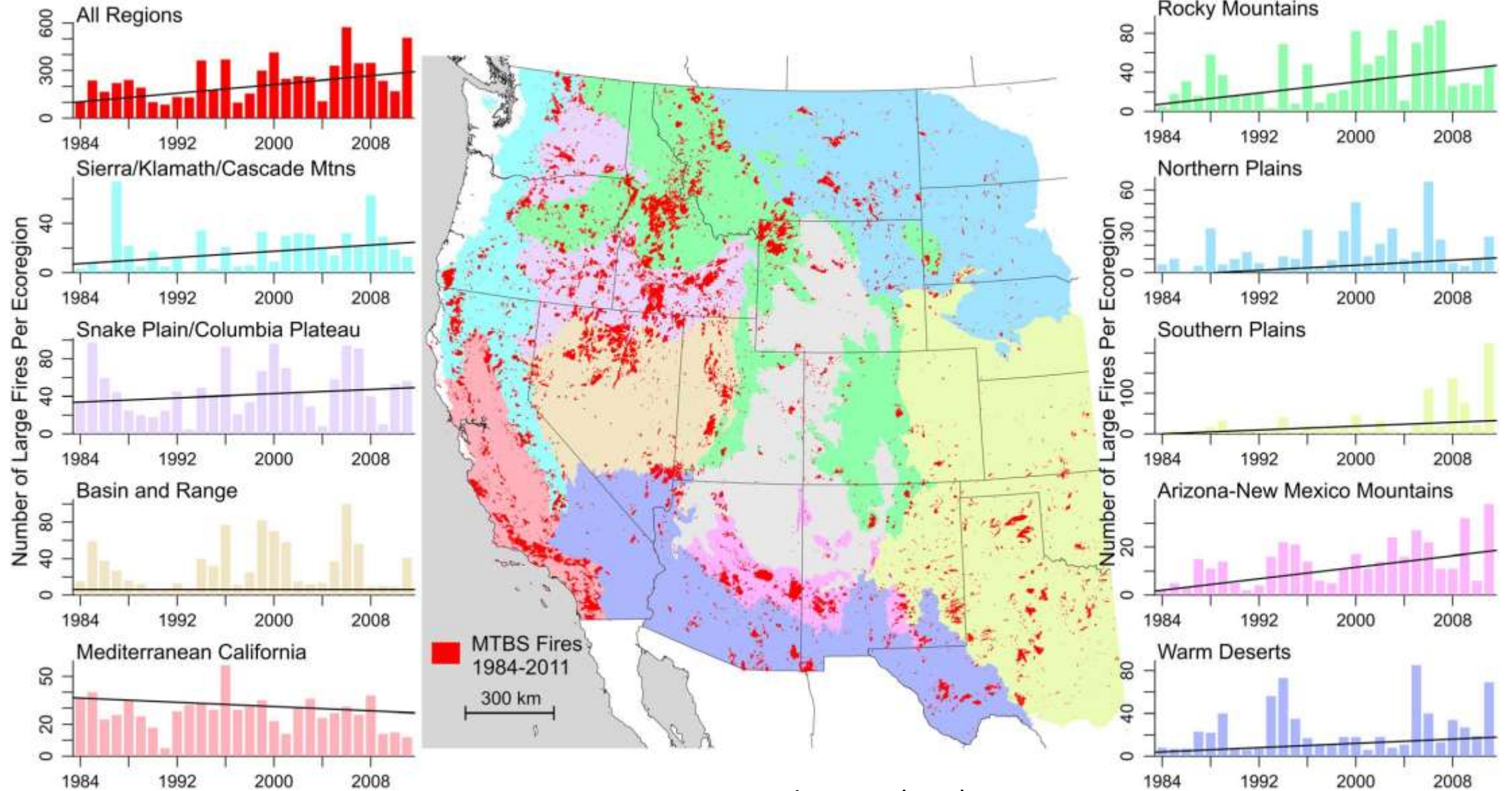
From 2000-2015, costs > \$24B

Indirect societal costs associated with wildfire events can be >30 times costs of suppression and immediate resource impacts



Association for Fire Ecology 2015, NIFC 2016, North et al. 2015, Schoennagel et al. 2017

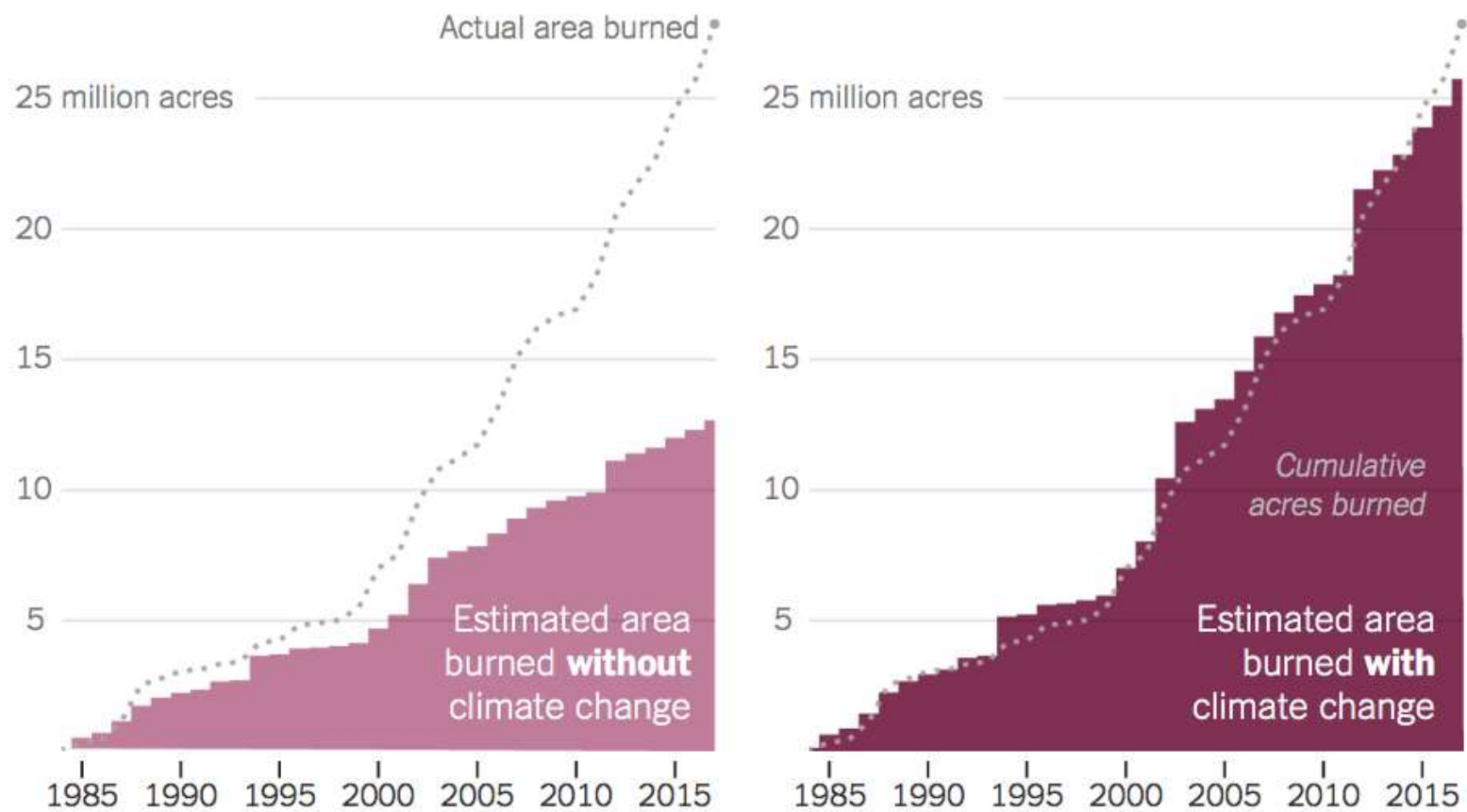
Large fires have become more frequent



Dennison et al., 2014 (*GRL*)

Half of the observed trend in burned area is attributable to climate change

In the West, Forest Fires Burn More Acres In a World Warmed by Climate Change



Source: [Proceedings of the National Academy of Sciences](#); data updated through 2017 by A. Park Williams

Back to the future

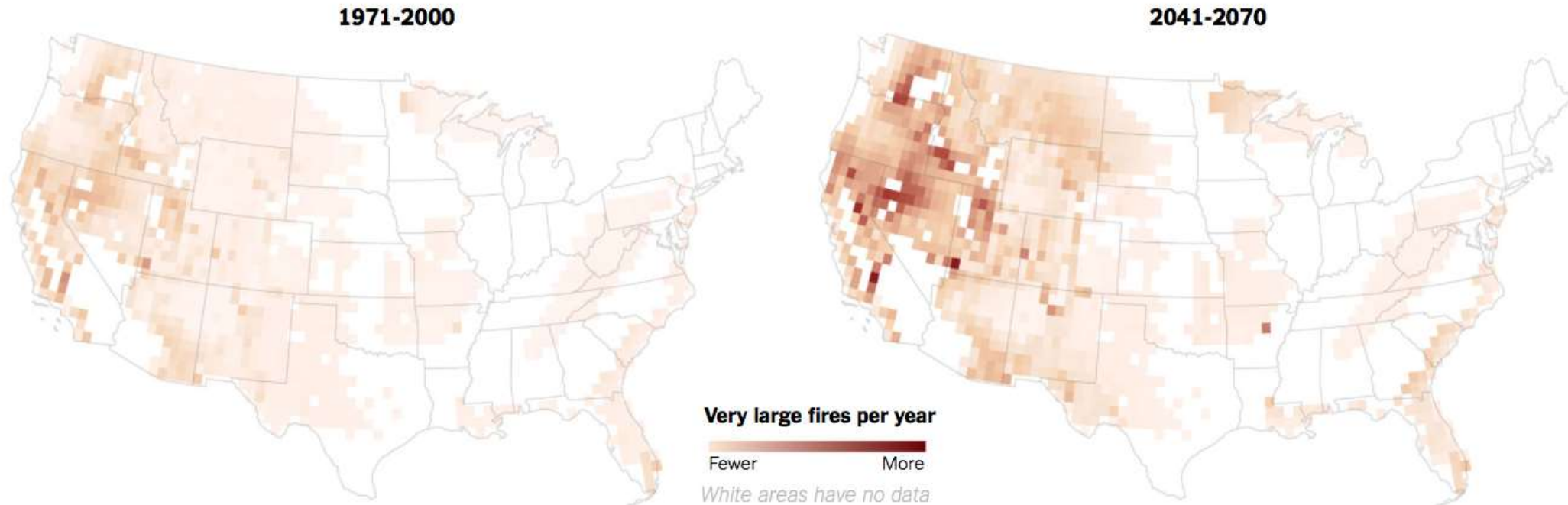


Future changes to very large fires

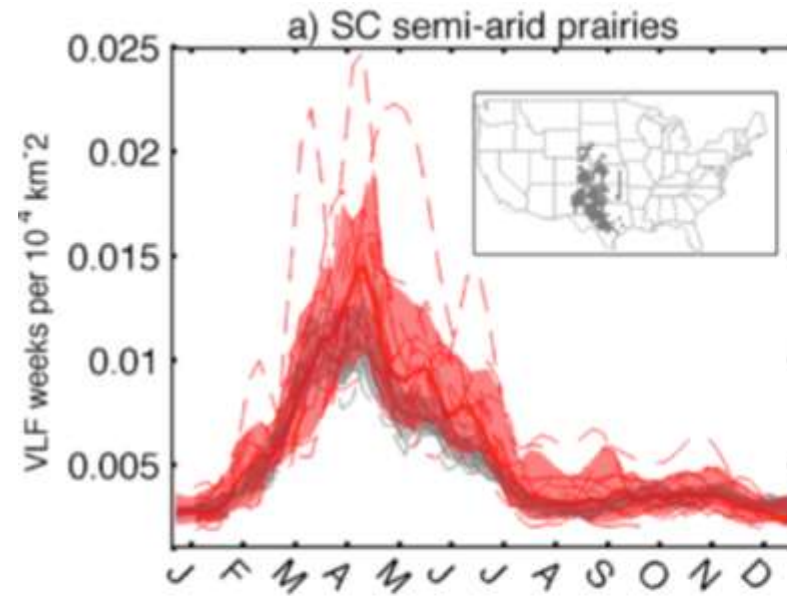


Climate Change Is Fueling Wildfires Nationwide, New Report Warns

By KENDRA PIERRE-LOUIS and NADJA POPOVICH NOV. 27, 2018

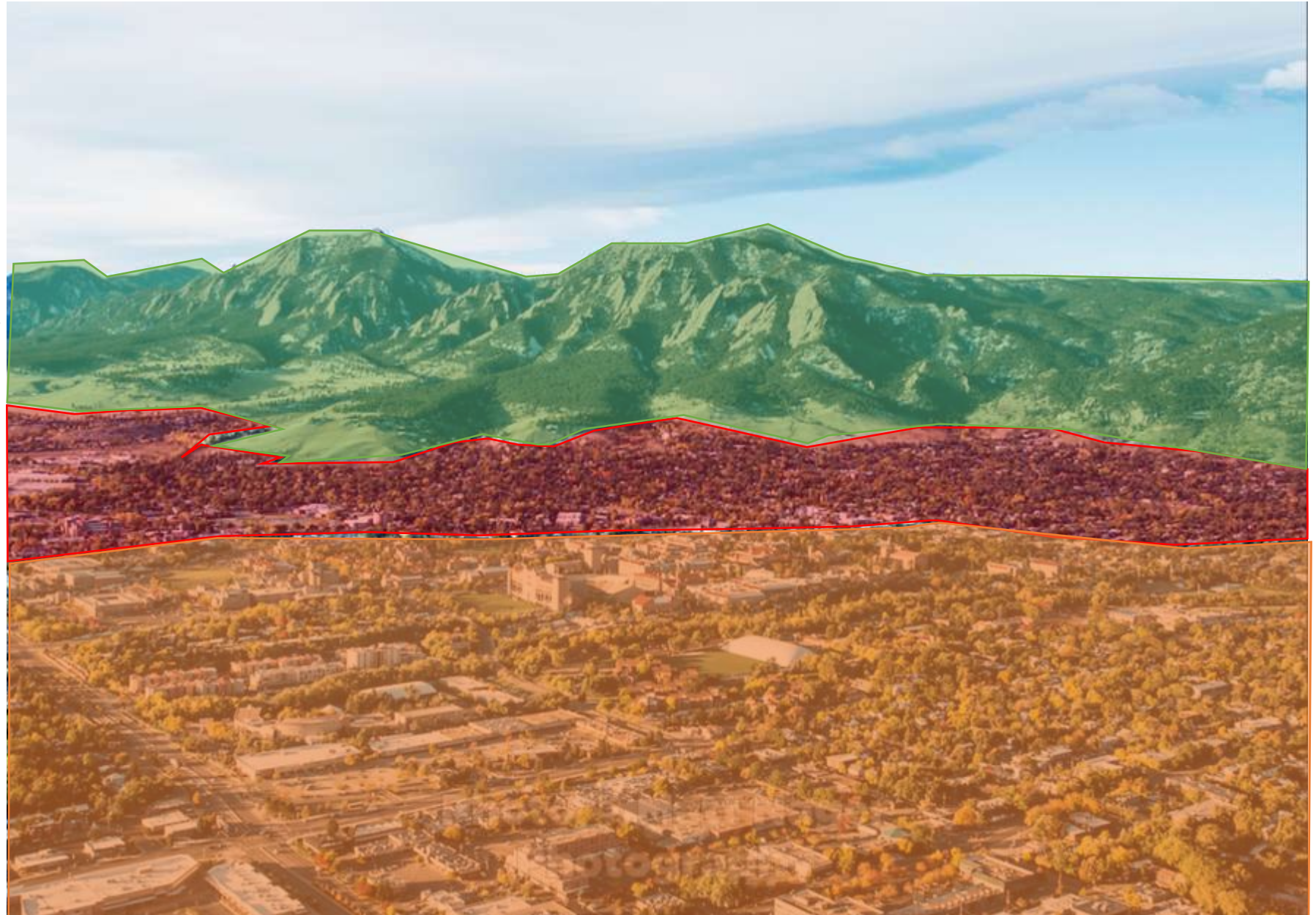


Expected changes in the seasonality



The Wildland Urban Interface (WUI)

Wildlands

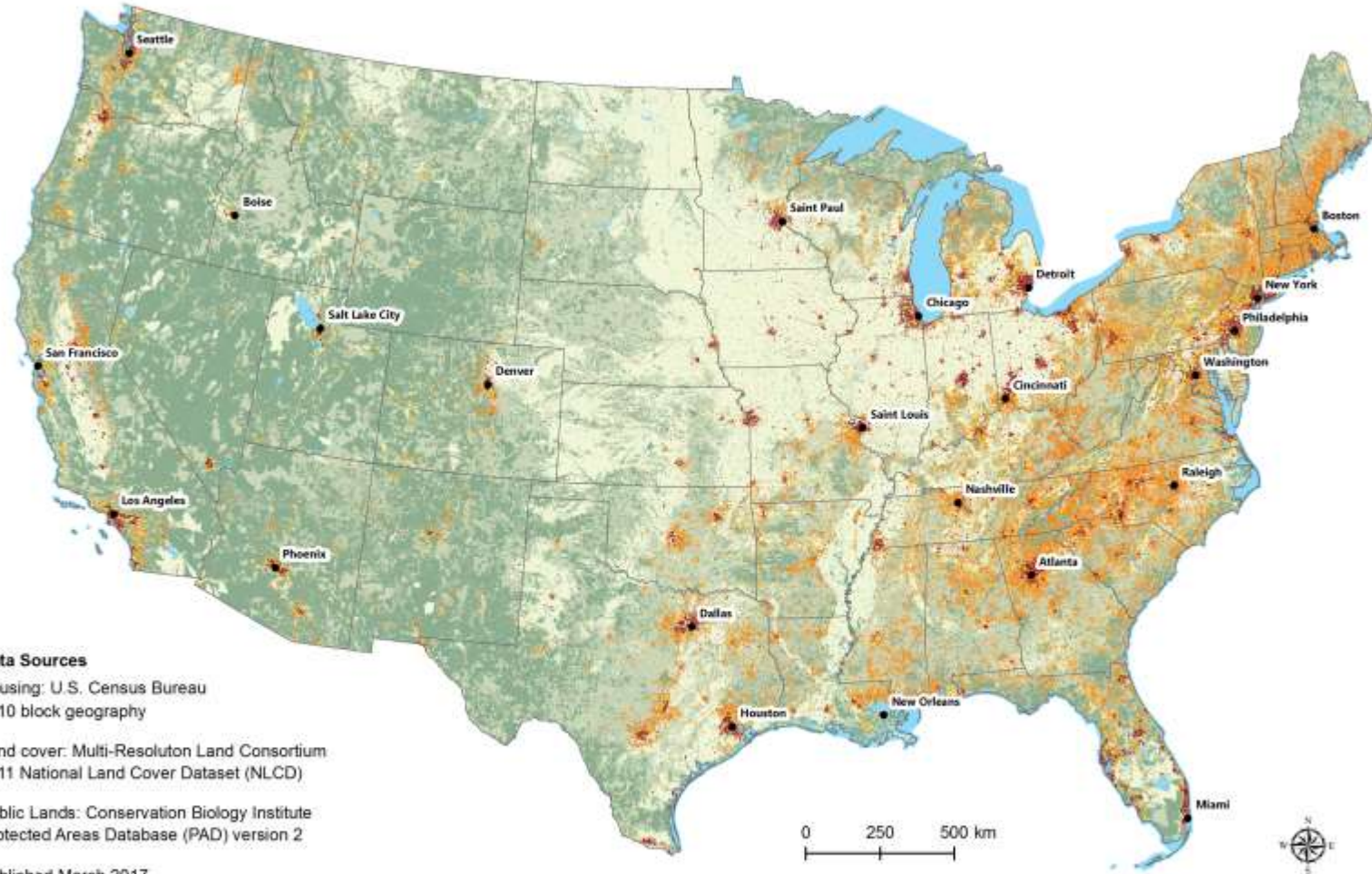


WUI

Urban

The Wildland Urban Interface (WUI)

The 2010 Wildland-Urban Interface of the Conterminous United States



Data Sources

Housing: U.S. Census Bureau
2010 block geography

Land cover: Multi-Resolution Land Consortium
2011 National Land Cover Dataset (NLCD)

Public Lands: Conservation Biology Institute
Protected Areas Database (PAD) version 2

Published March 2017

Contacts

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Wildland-Urban Interface (WUI)

- Interface
- Intermix

Non-WUI Vegetated

- No housing
- Very low housing density

Non-vegetated or Agriculture

- Low and very low housing density
- Medium and high housing density
- Water

The Wildland Urban Interface (WUI)

Florida

1990



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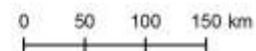
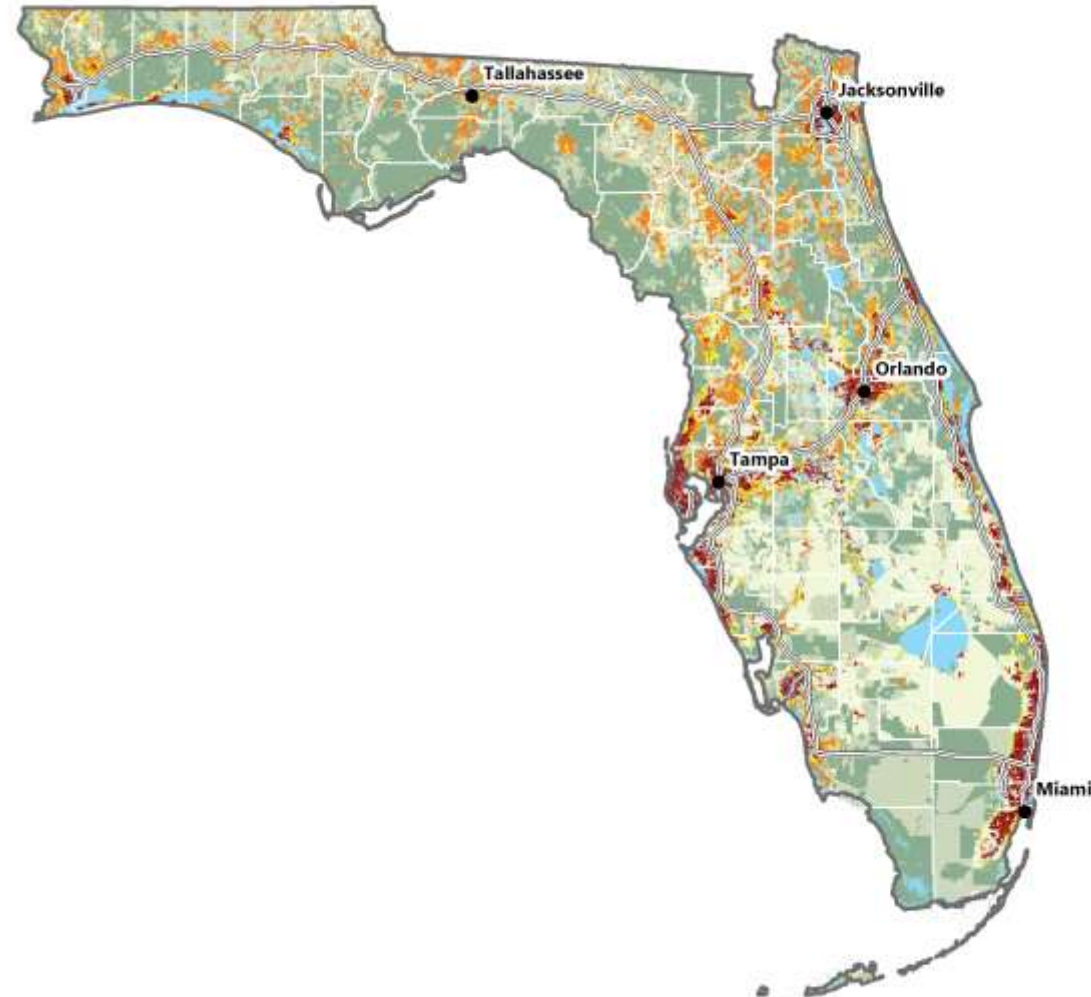
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DATA SOURCES

United States Census Bureau
1990 housing allocated to 2010 TIGER blocks

Multi-Resolution Land Characteristics Consortium
1992 Retrofit National Land Cover Dataset (NLCD)

Conservation Biology Institute
Protected Areas Database (PAD) version 2



Published October 2017

The Wildland Urban Interface (WUI)

Florida

2000



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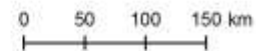
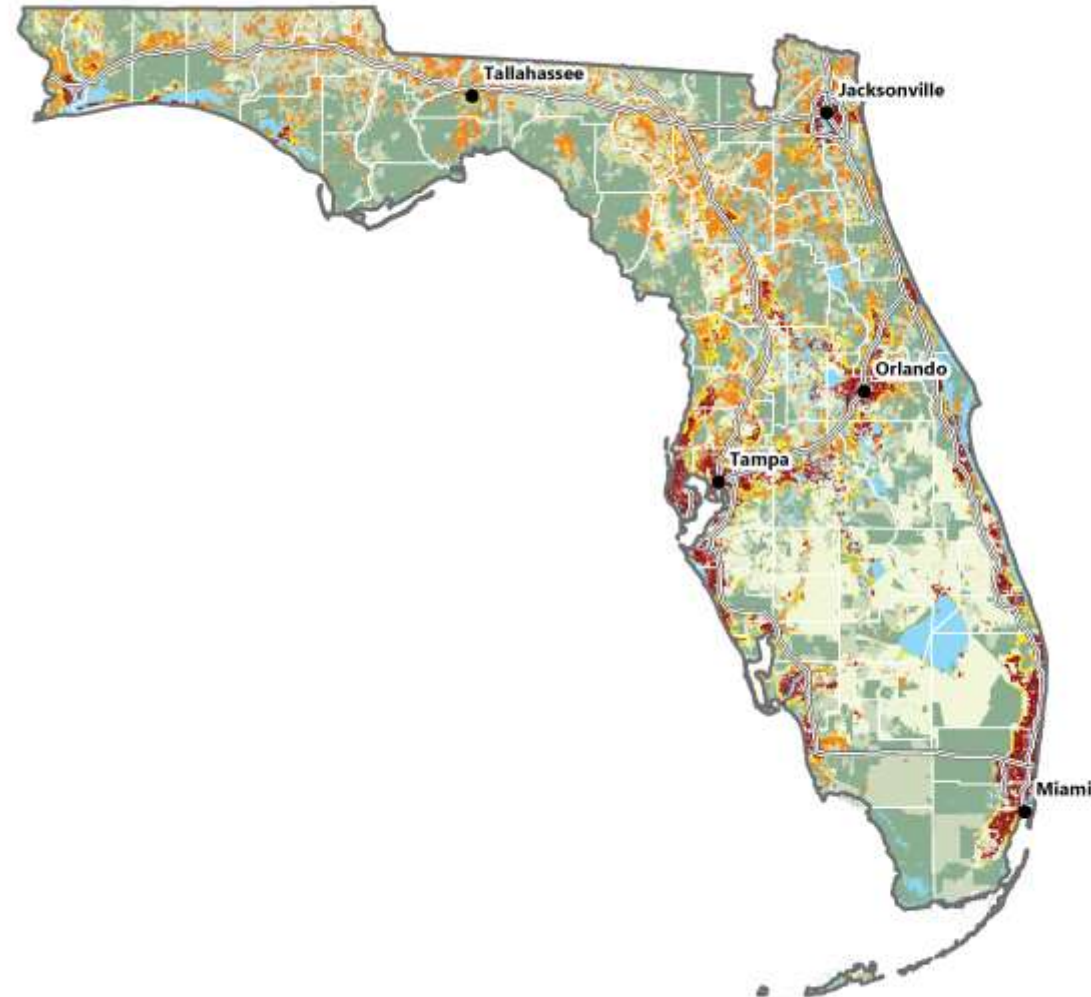
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DATA SOURCES

United States Census Bureau
2000 housing allocated to 2010 TIGER blocks

Multi-Resolution Land Characteristics Consortium
2001 National Land Cover Dataset (NLCD)

Conservation Biology Institute
Protected Areas Database (PAD) version 2



Published October 2017

The Wildland Urban Interface (WUI)

Florida

2010



Wildland-Urban Interface (WUI)

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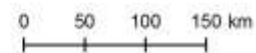
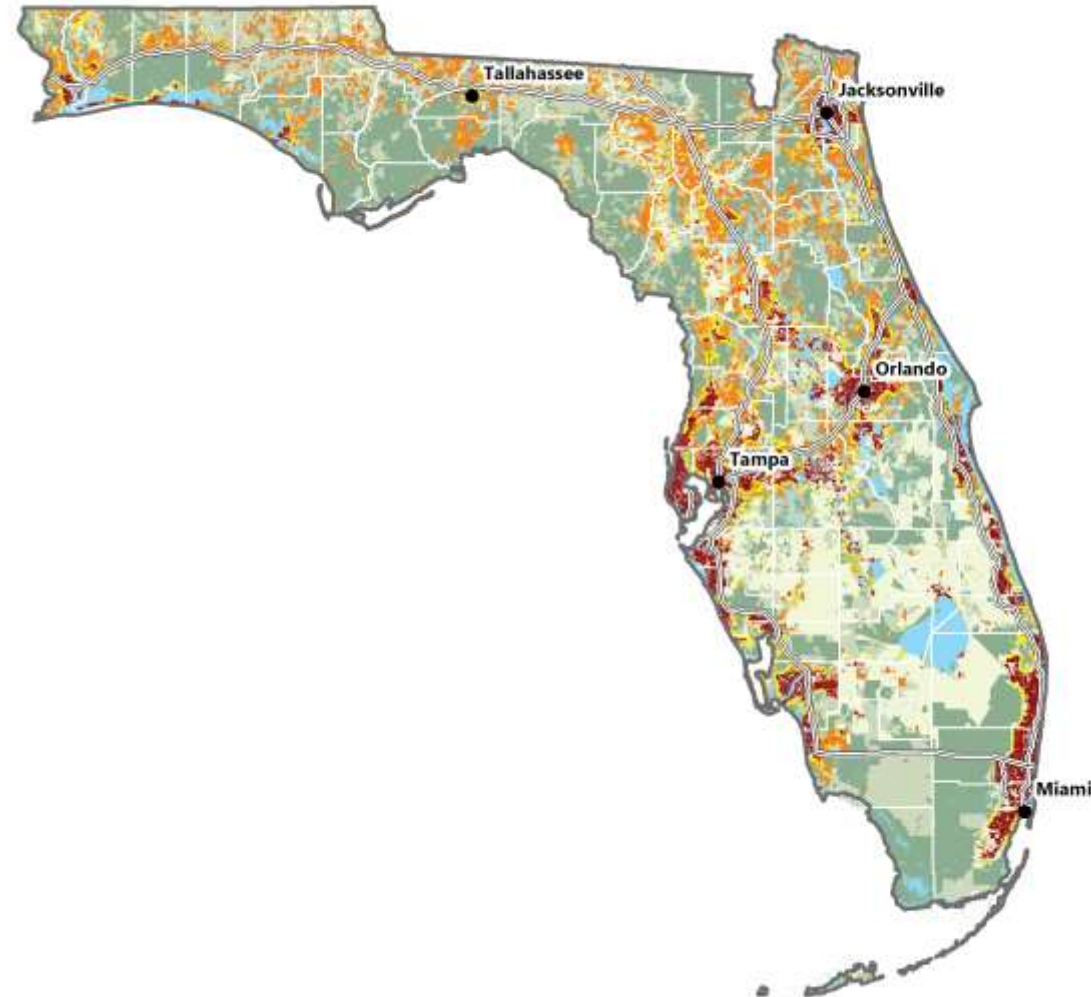
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2010 TIGER blocks

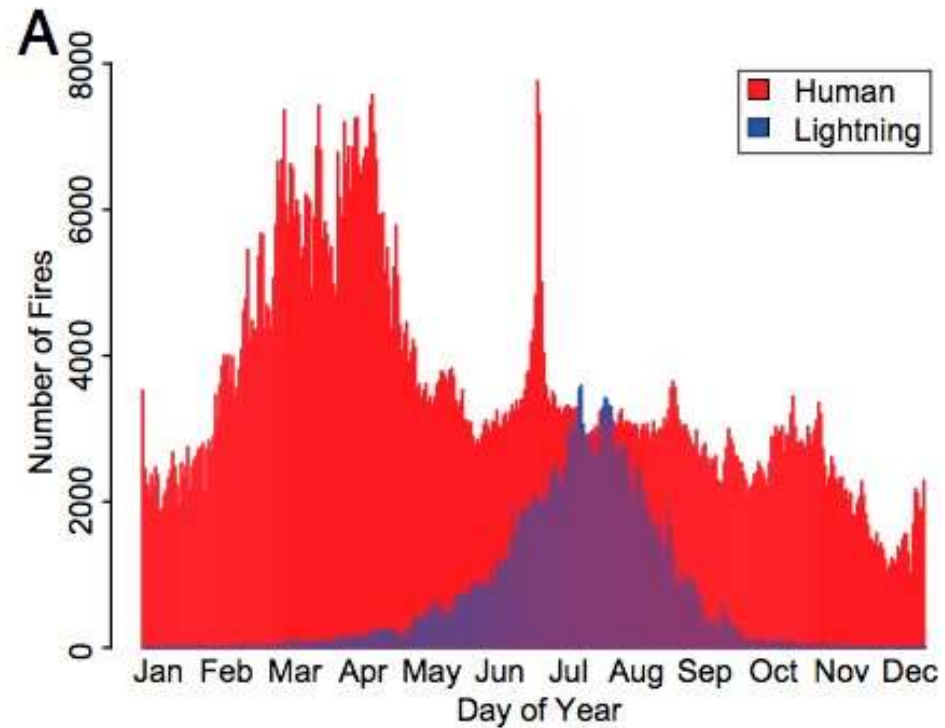
Multi-Resolution Land Characteristics Consortium
2011 National Land Cover Dataset (NLCD)

Conservation Biology Institute
Protected Areas Database (PAD) version 2



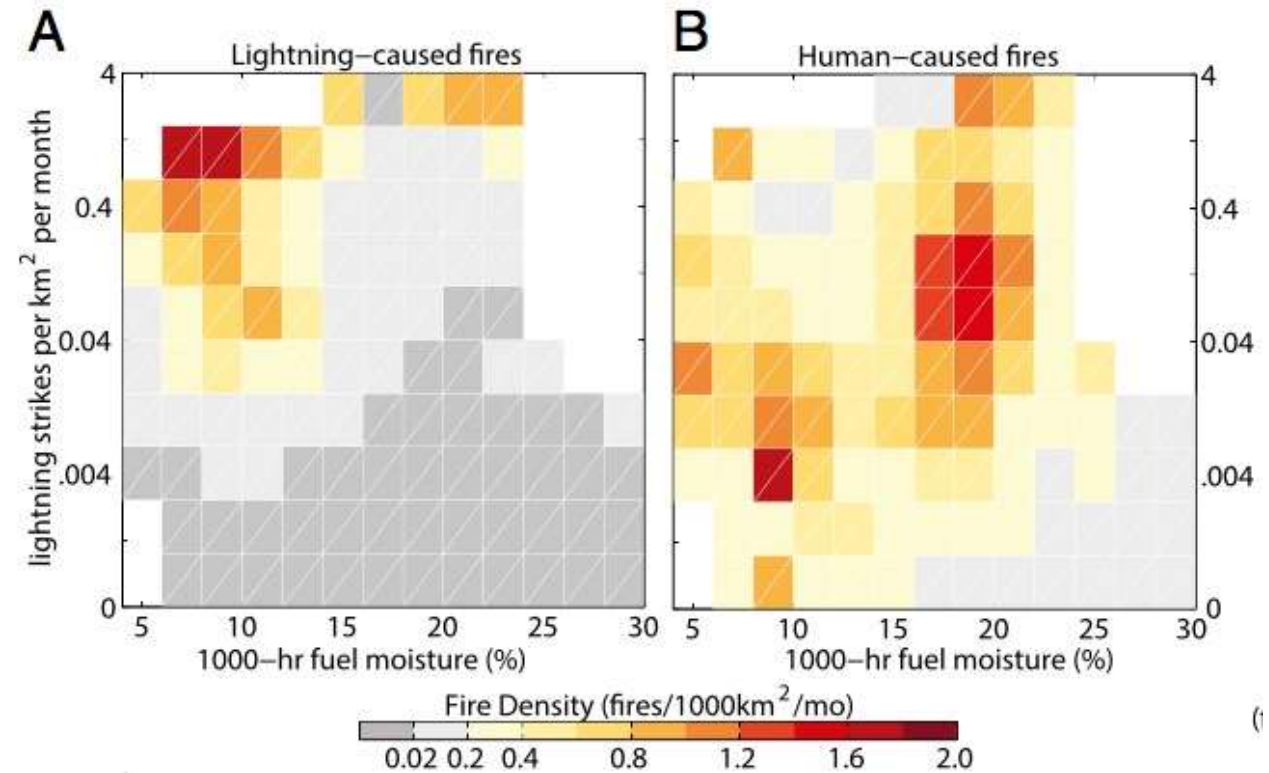
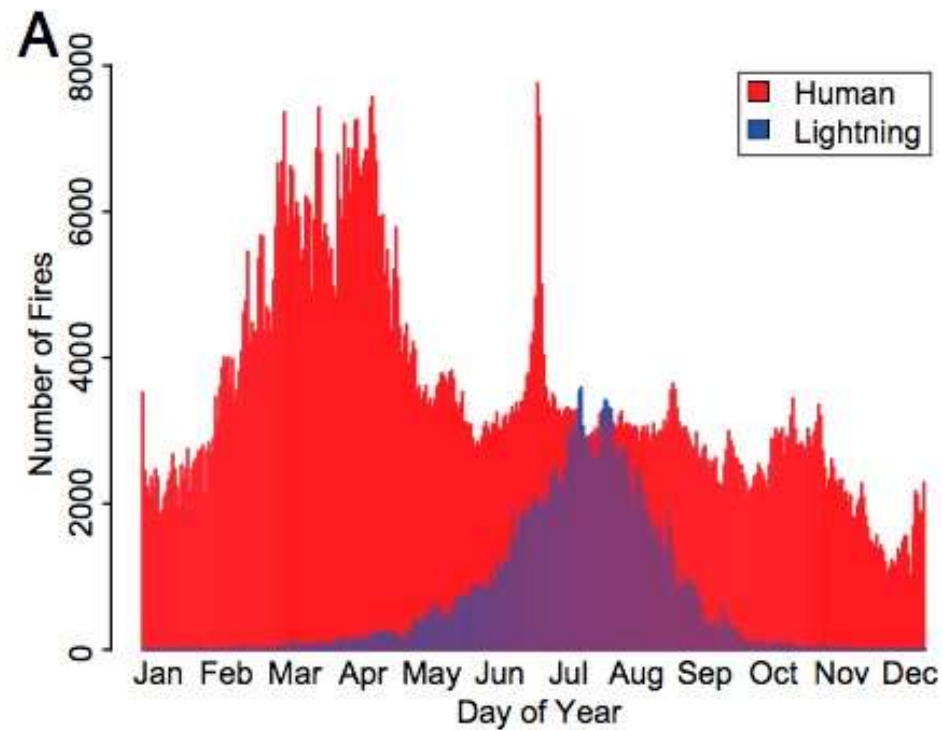
Published October 2017

Humans are the major driver of fire



1. Increased the length of the wildfire season (**3x**)

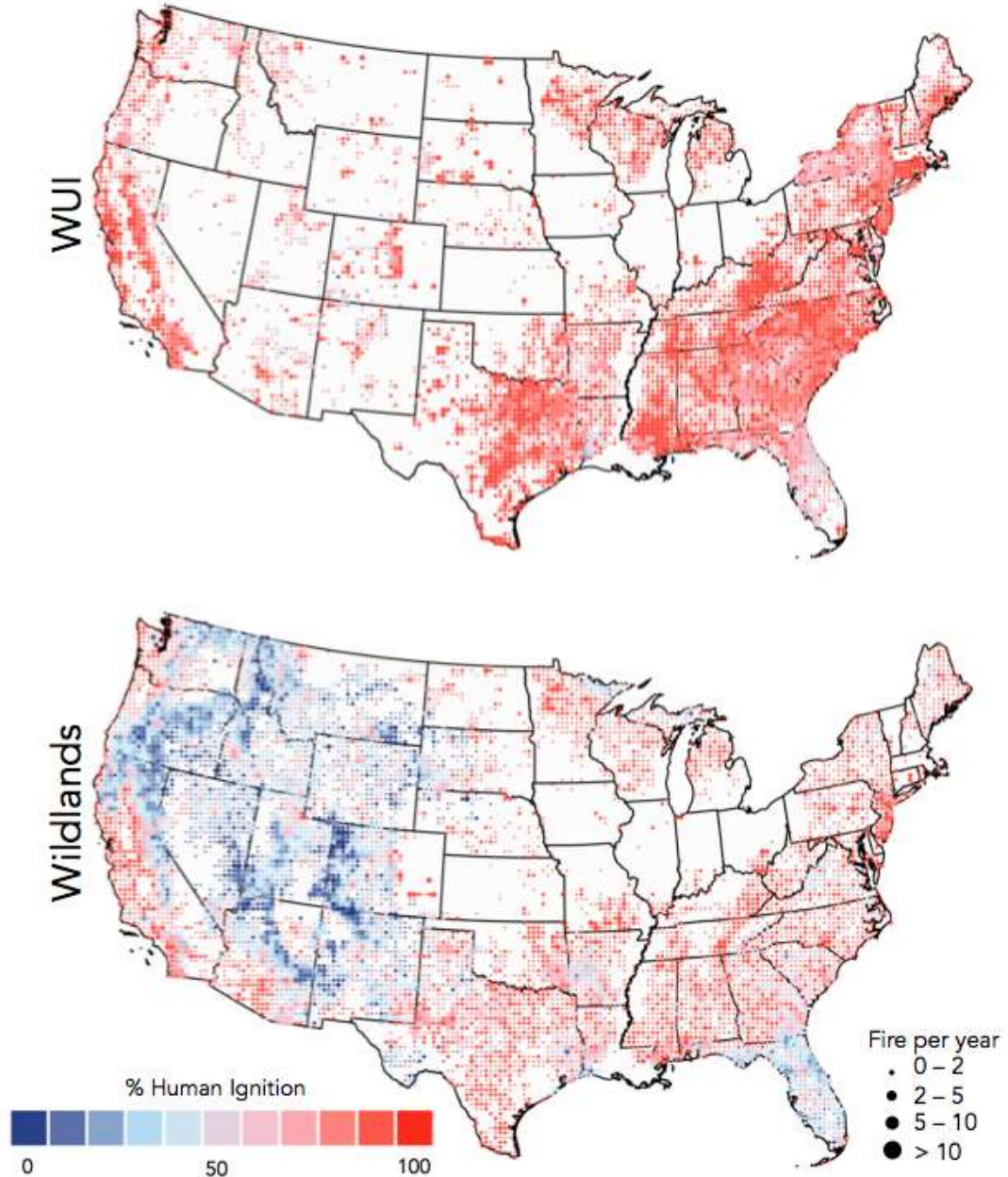
Humans are the major driver of fire



Balch et al. 2017

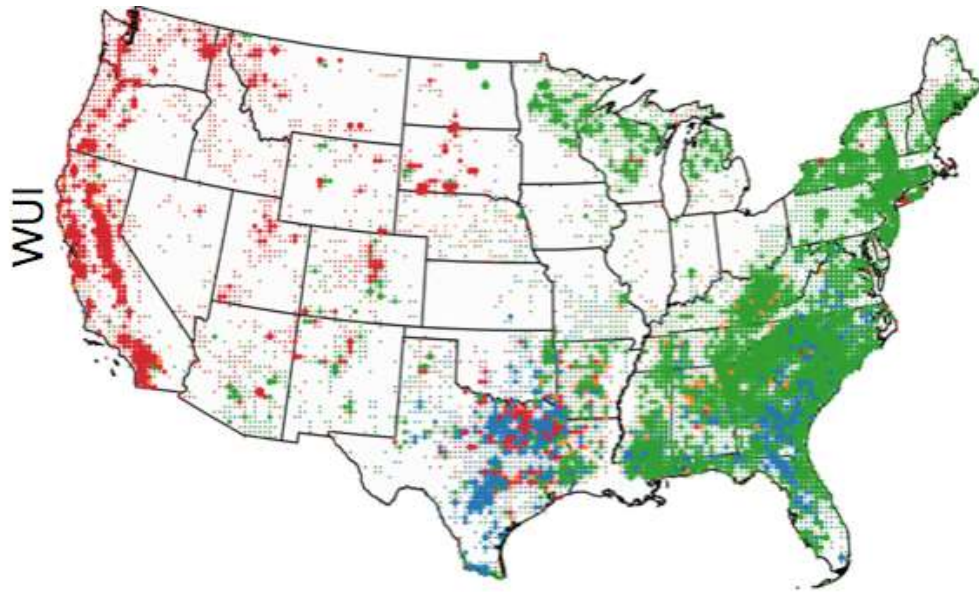
1. Increased the length of the wildfire season (**3x**)
2. Shifted the “fire niche” into **wetter fuel condition**

Humans are the major driver of fire



- **82%** (n = 691, 164) of all wildfires were **human-ignited**
- **96%** of all wildfires in the **WUI** are caused by **humans**
- **Human ignitions** account for an average of **4x more** fires per year in the **WUI** as compared to Wildlands
- **Human ignitions** in the **WUI** accounts for **>2x** more fires per year in the **east** than the **west**.

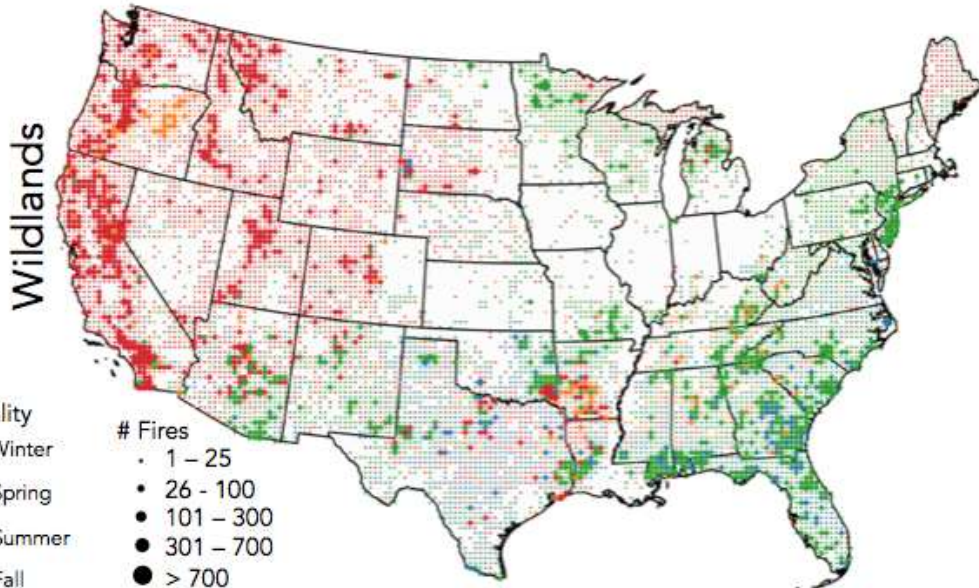
Fire seasonality



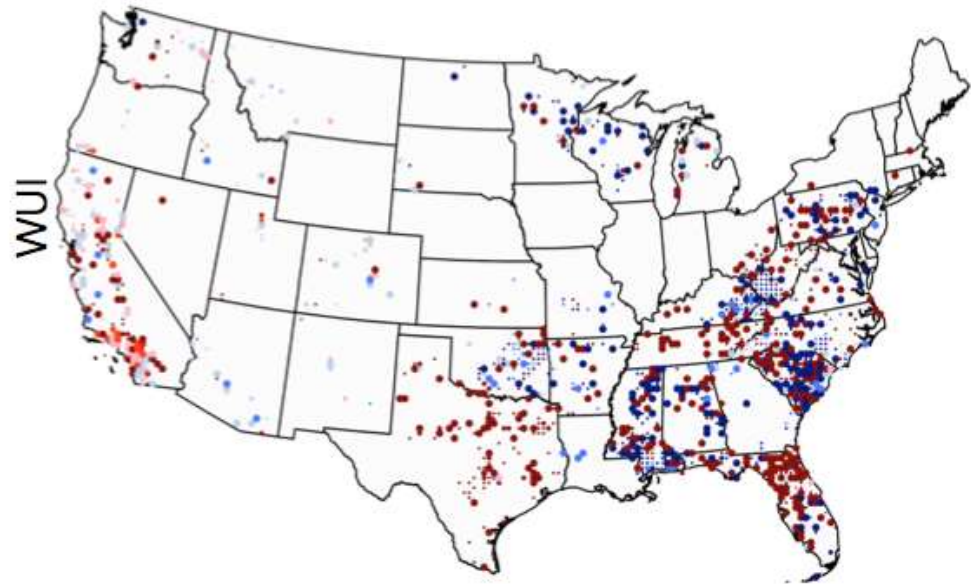
- The **WUI** experienced **203% more human-ignitions** (n = 69, 476) in the **spring** than summer.

- **Human-ignitions** accounted for **95%** (n = 268, 287) of all **spring** wildfires

- **Human-ignitions** accounted for **59%** (n = 114, 047) of all **summer** wildfires



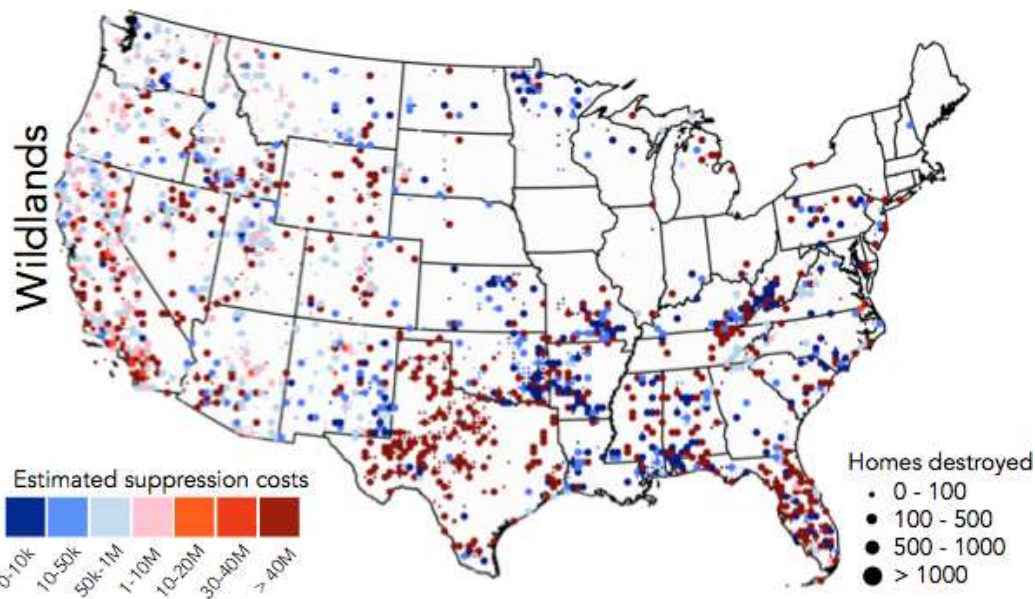
Human-started fire: costs vs homes destroyed



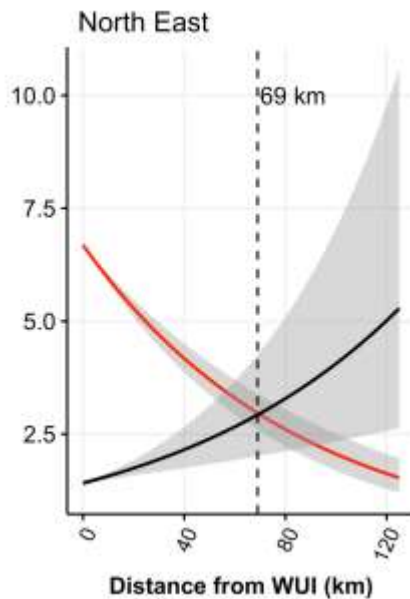
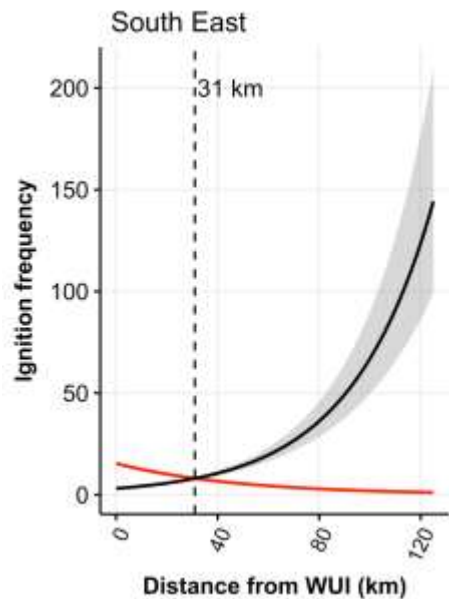
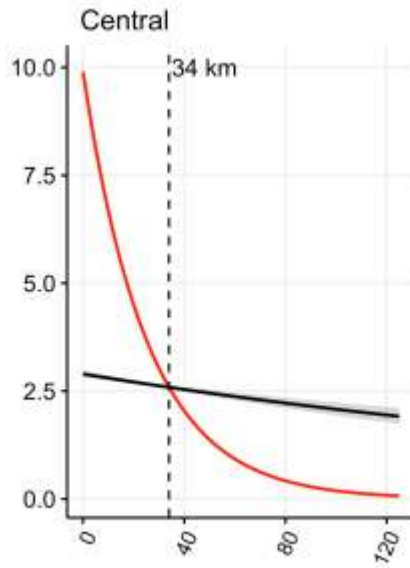
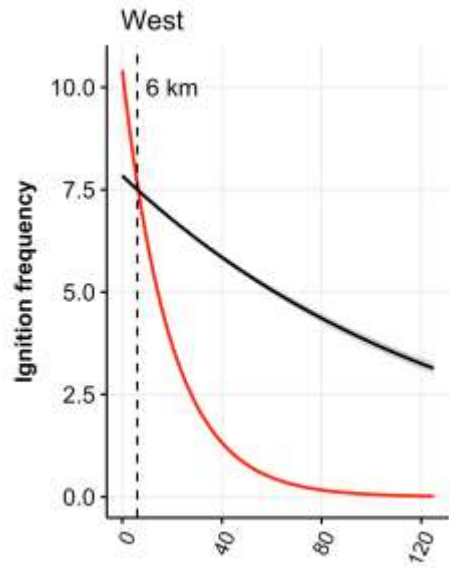
- **Human** ignitions account for **46%** of all the fire suppression **costs**

- Since 2001, fire suppression **costs** has **increased 150%**

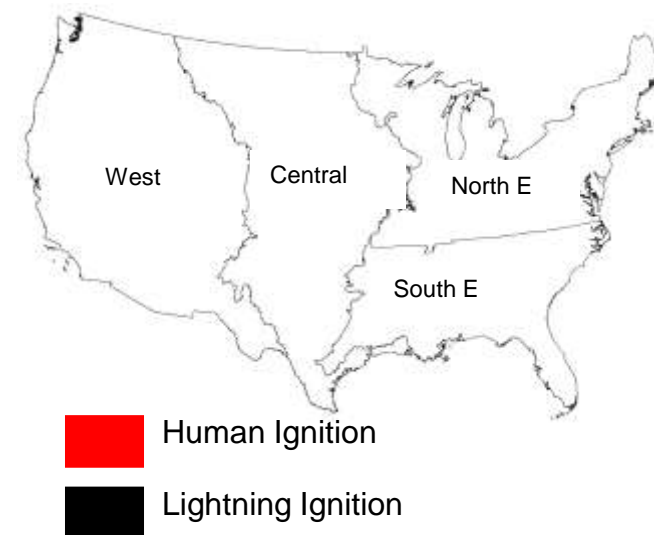
- On average, **83%** of all wildfire **costs** from fires in the **WUI** are due to **human** ignitions.



Distance from WUI: fire frequency



- **Human ignitions** in all regions **dominate** fire frequency near the WUI
- Humans **increase** fire frequency near the WUI (< 69 km) by **130 – 500%**
- All regions display human driven wildfire >2.4km from the WUI



Conclusion

- Climate has exacerbated burned area in recent decades at least where fuel and ignitions are not limiting
- Human ignitions account **45%** of the burn area and **86%** of all ignitions
- Human ignitions account for an average of **400%** more fires per year in the WUI than Wildlands
- Human ignitions increase the fire season length at the WUI by **250 – 800%**

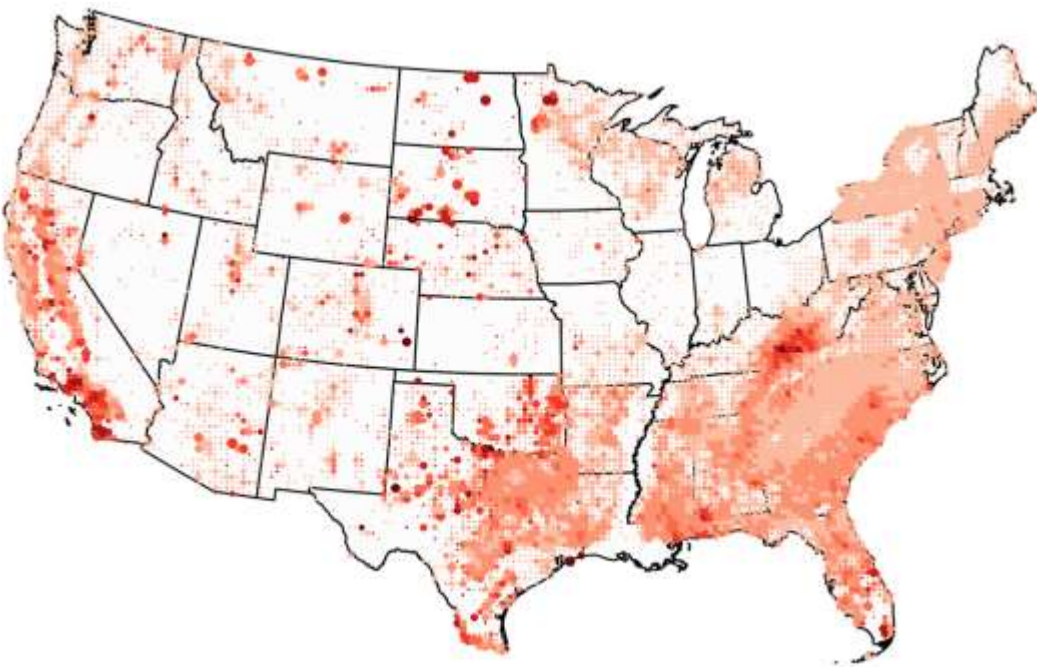
Collectively, climate change and urban sprawl have increased fire risk and will continue to do so in the future ...

Thank you for your attention !

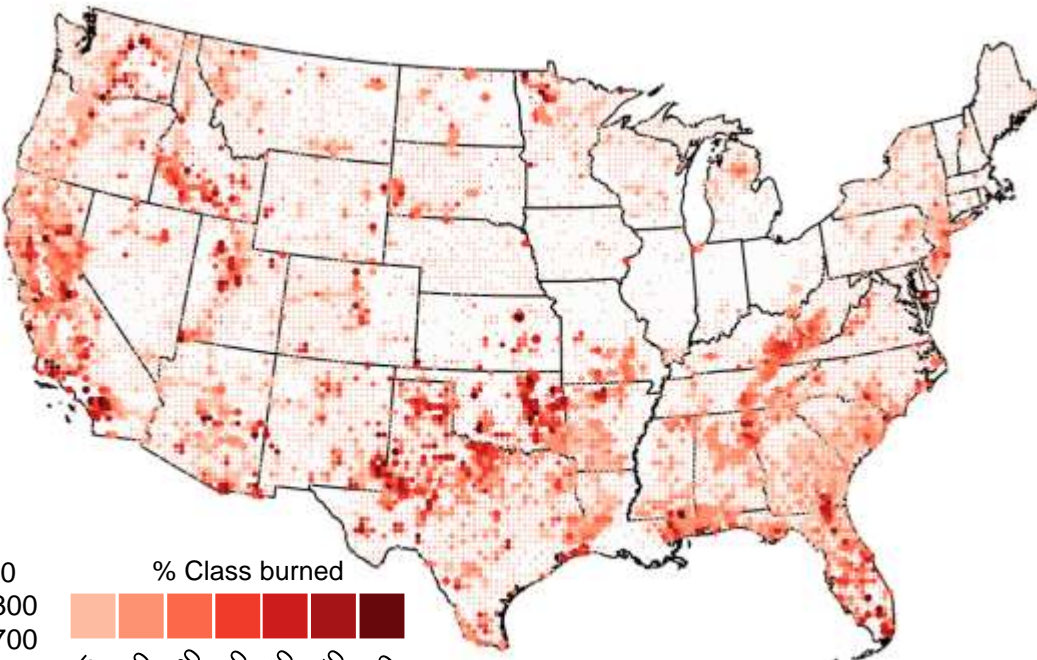
Human-started wildfire burned area

- **Human ignitions** account for **45%** (119, 817 km²) estimated burn area from 2001-2013
- The WUI areas in the **east** observed **3x** more area burned than the **west** by **human ignitions**.
- **33%** of **all wildlands** burned in the west were due to **human ignitions**

WUI



Wildlands



Fires

- 1 - 25
- 26 - 100
- 101 - 300
- 301 - 700
- > 700

% Class burned

