

SW Climate Adaptation Science Center Webinar:

US National Climate Assessment 4: SW Ecosystems

Part I

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THE UNIVERSITY
OF ARIZONA

NCA 4 – Chapter 7: Ecosystems, Ecosystem Services and Biodiversity

- **Species & Populations**

Climate change continues to impact species and populations in significant and observable ways. Terrestrial, freshwater, and marine organisms are responding to climate change by altering individual characteristics, the timing of biological events, and their geographic ranges. Local and global extinctions may occur when climate change outpaces the capacity of species to adapt.

NCA 4 – Chapter 7: Ecosystems, Ecosystem Services and Biodiversity

- **Species & Populations**
- **Ecosystems**

Climate change is altering ecosystem productivity, exacerbating the spread of invasive species, and changing how species interact with each other and with their environment. These changes are reconfiguring ecosystems in unprecedented ways.

NCA 4 – Chapter 7:

Ecosystems, Ecosystem Services and Biodiversity

- **Species & Populations**
- **Ecosystems**
- **Ecosystem Services**

The resources and services that people depend on for their livelihoods, sustenance, protection, and well-being are jeopardized by the impacts of climate change on ecosystems. Fundamental changes in agricultural and fisheries production, the supply of clean water, protection from extreme events, and culturally valuable resources are occurring.

NCA 4 – Chapter 7: Ecosystems, Ecosystem Services and Biodiversity

- **Species & Populations**
- **Ecosystems**
- **Ecosystem Services**
- **Natural Resource Management**

Traditional natural resource management strategies are increasingly challenged by the impacts of climate change. Adaptation strategies that are flexible, consider interacting impacts of climate and other stressors, and are coordinated across landscape scales are progressing from theory to application. Significant challenges remain to comprehensively incorporate climate adaptation planning into mainstream natural resource management, as well as to evaluate the effectiveness of implemented actions.

NCA 4 – Chapter 7: Ecosystems, Ecosystem Services and Biodiversity

- **Species & Populations**
- **Ecosystems**
- **Ecosystem Services**
- **Natural Resource Management**

25 Key Message #2



Ecosystems and Ecosystem Services

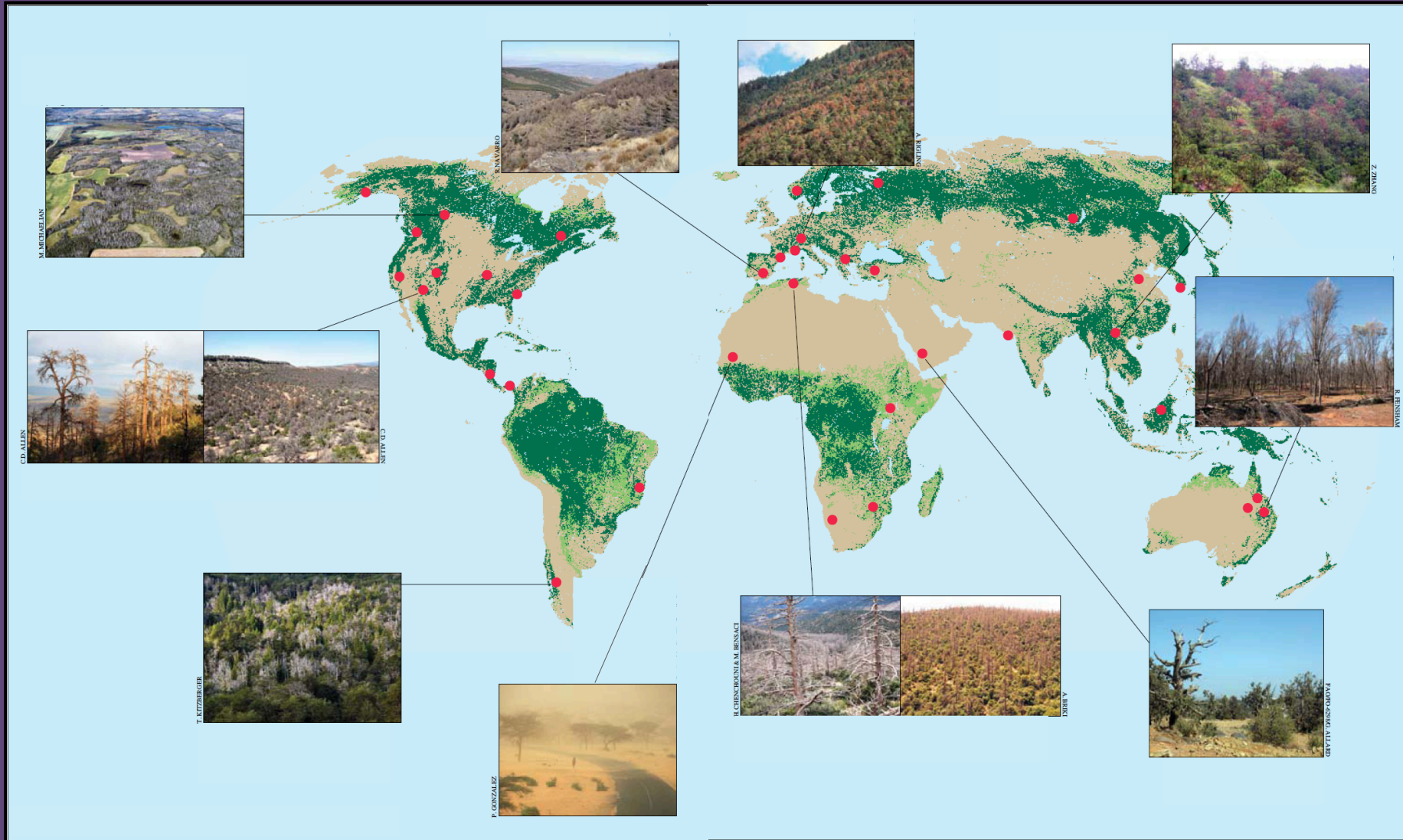
The integrity of Southwest forests and other ecosystems and their ability to provide natural habitat, clean water, and economic livelihoods have declined as a result of recent droughts and wildfire due in part to human-caused climate change.



Photos via Gregg Garfin





Drought-induced Tree Mortality

An emerging global phenomenon?



Does hotter drought kill trees faster?







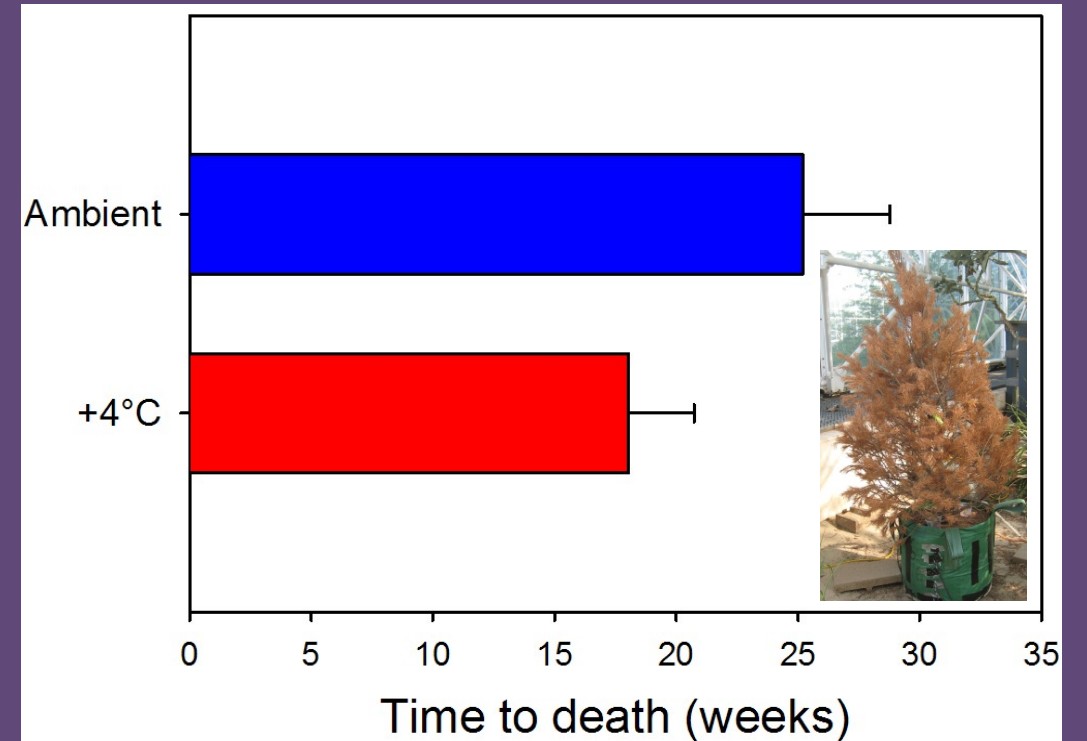
	Watered	No Water
Ambient Temp.		
+4°C		



Does hotter drought kill trees faster? YES - Substantially



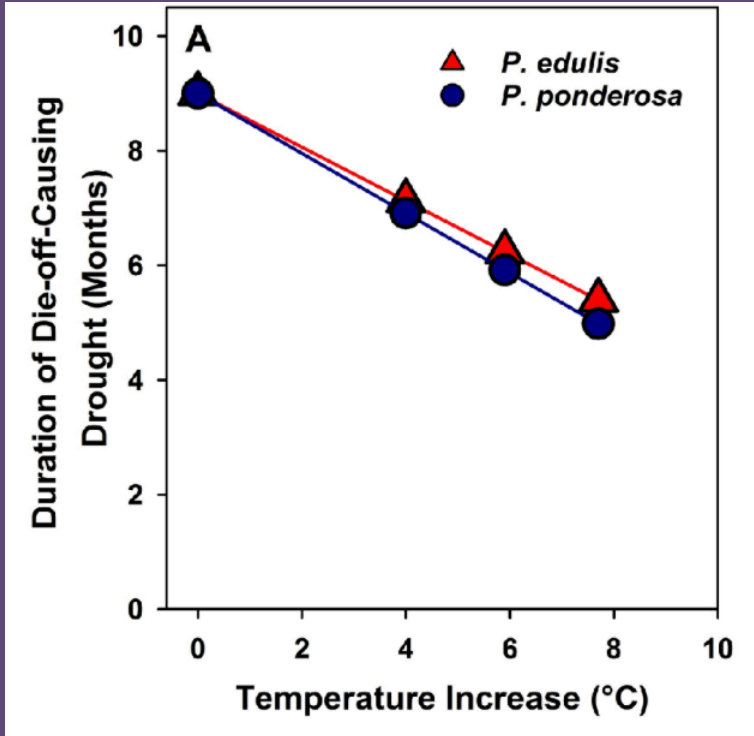
	Watered	No Water
Ambient Temp.		
+4°C		



Adams et al. 2009 *PNAS*



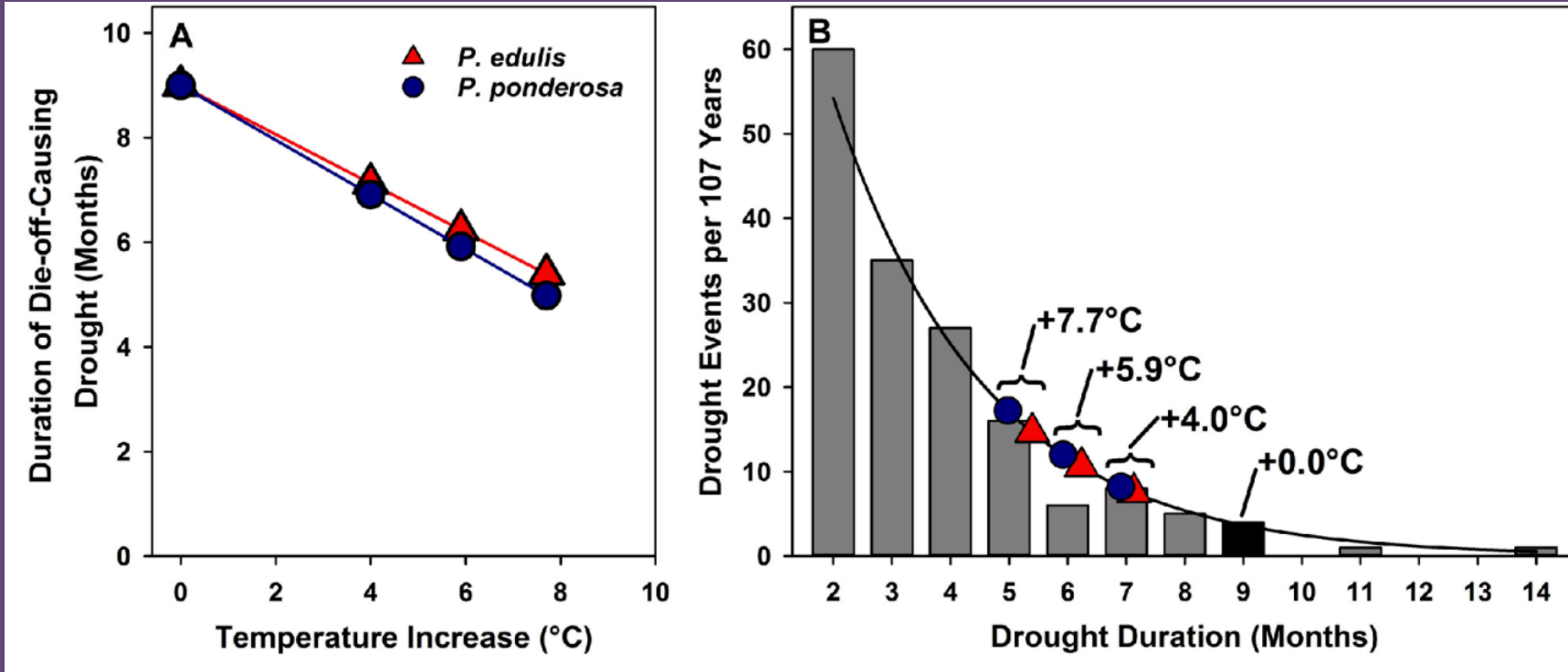
Does hotter drought kill trees faster AND FASTER?



Trees die faster
under warmer
temperatures ...

Adams et al 2017 *Environmental Research Letters*

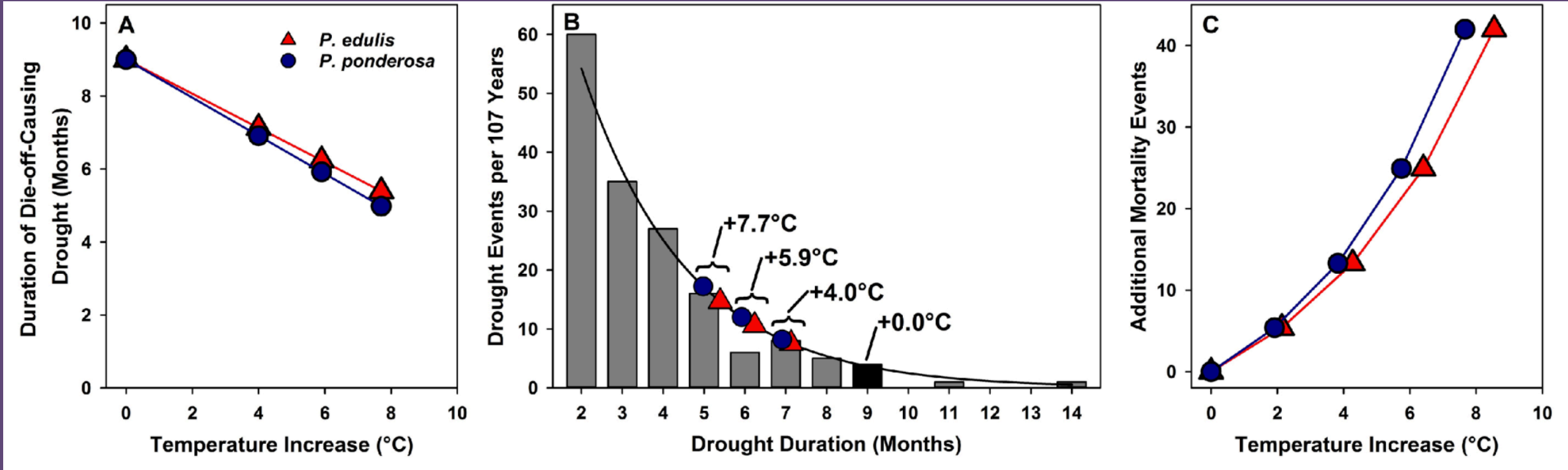
Does hotter drought kill trees faster AND FASTER?



Trees die faster
under warmer
temperatures ...

... and there are more
short droughts than
long droughts ...

Does hotter drought kill trees faster AND FASTER?



Trees die faster under warmer temperatures ...

... and there are more short droughts than long droughts ...

... so mortality events become much more frequent.

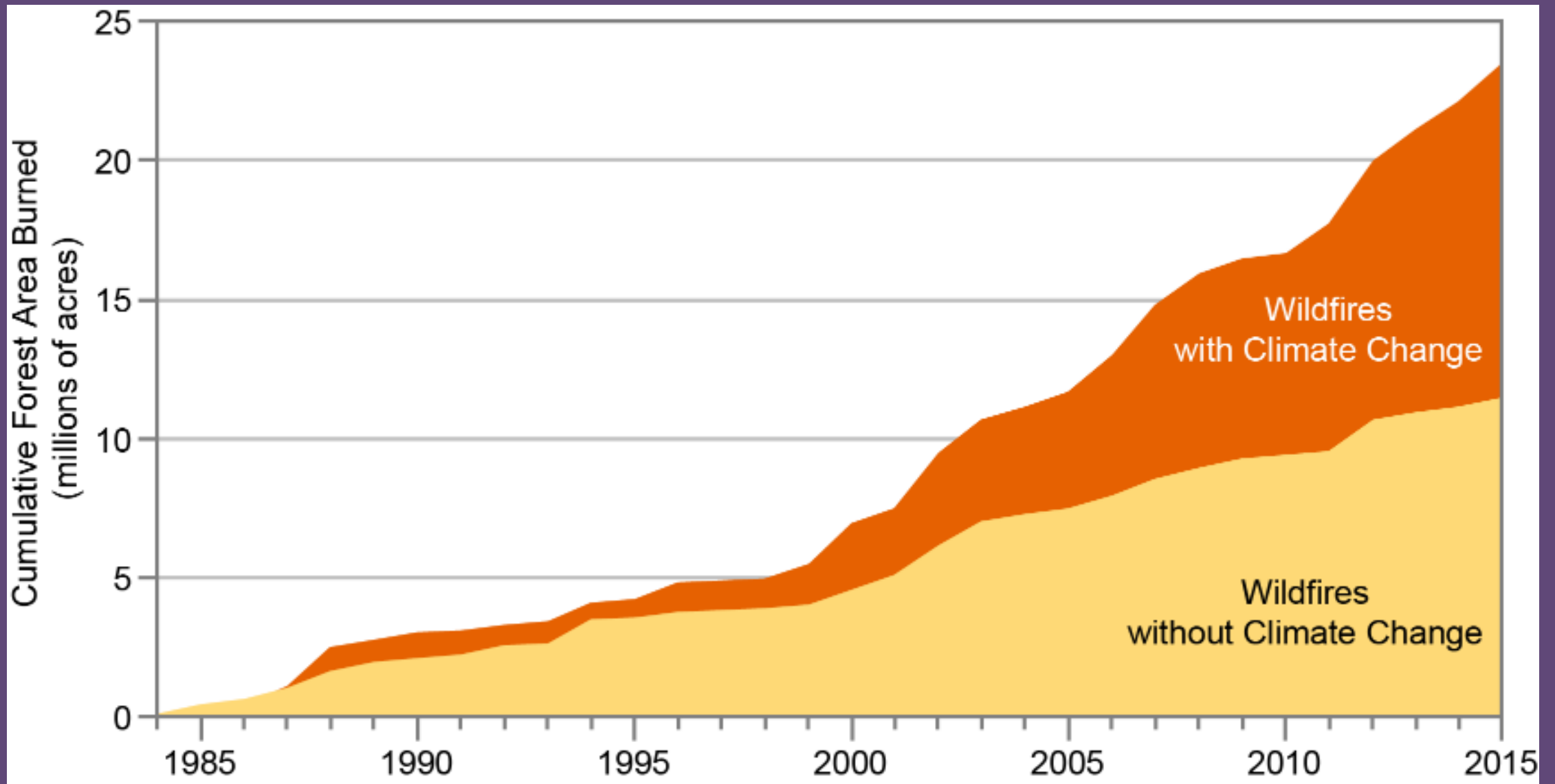
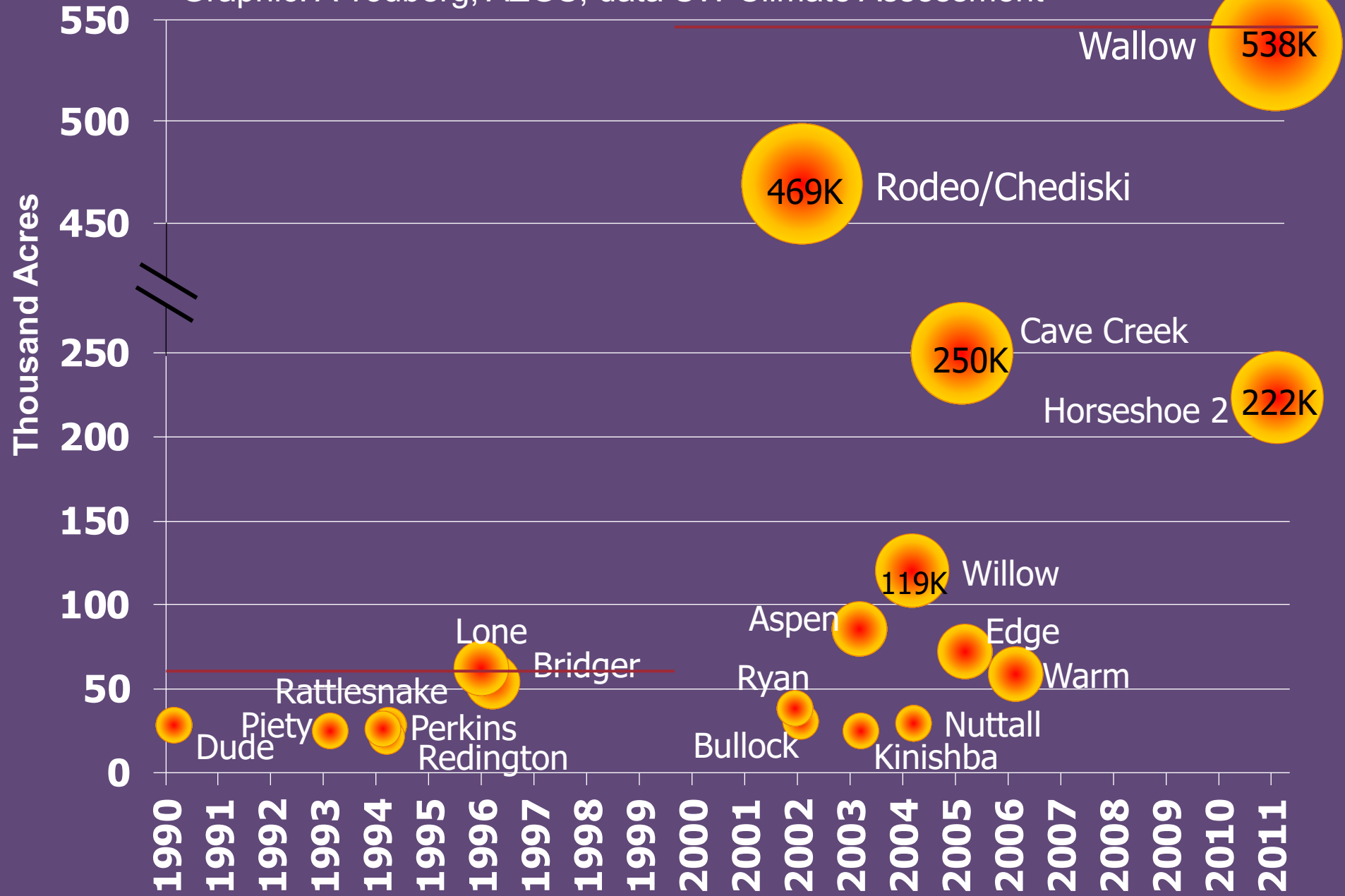


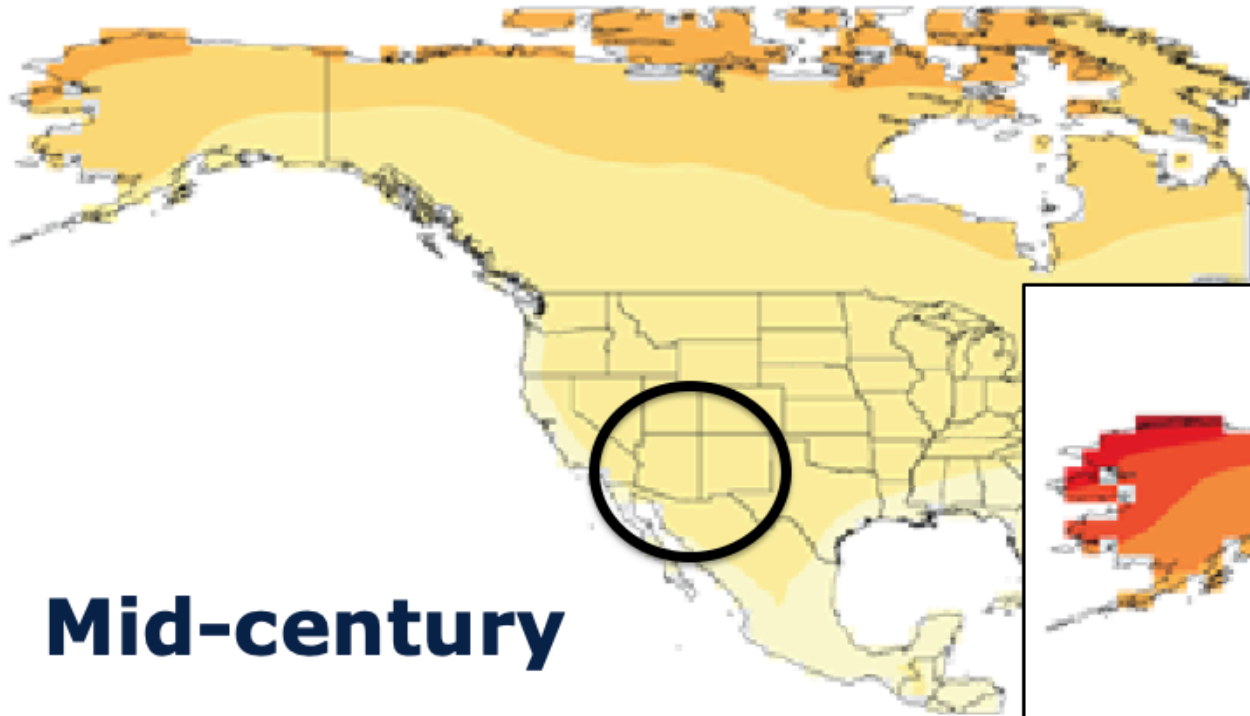
Fig. 25.4: Climate Change Has Increased Wildfire

Largest Arizona Wildfires, 1990-2012 (SWCC Historic Data)

Graphic: A Youberg, AZGS; data SW Climate Assessment



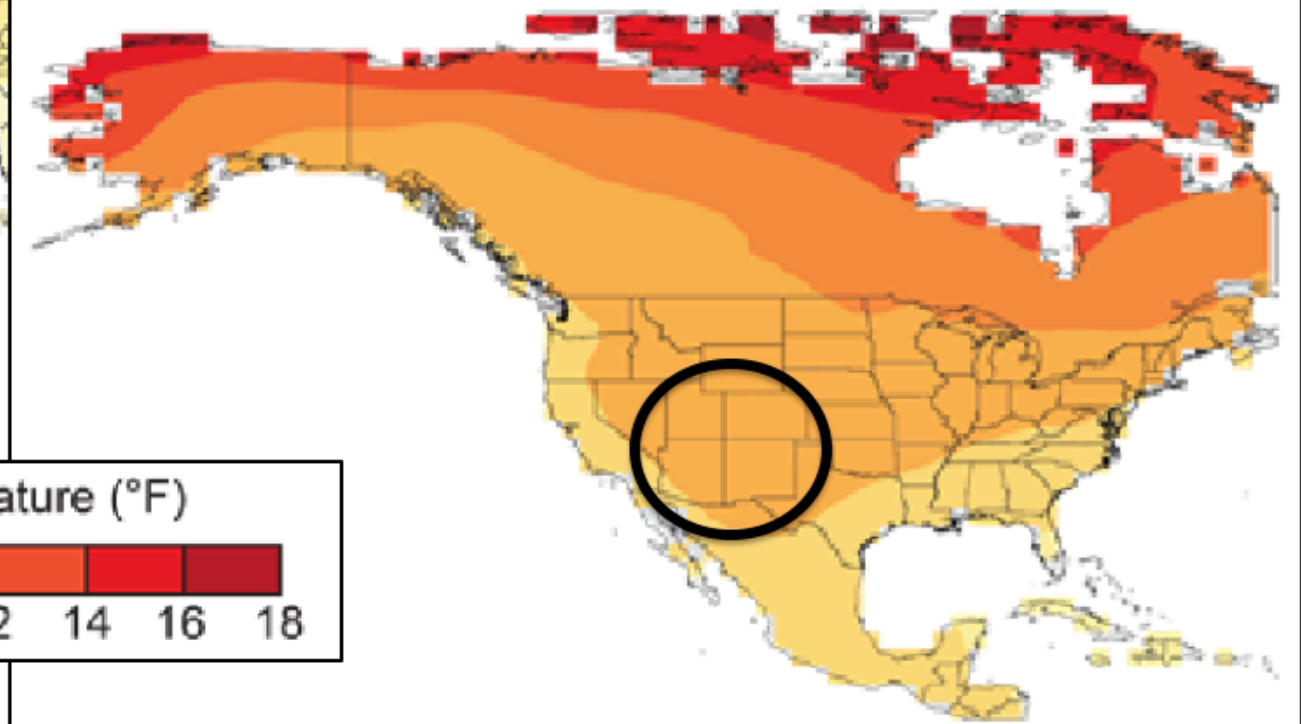
Higher Scenario (RCP8.5)



Mid-century

End of century

Higher Scenario (RCP8.5)



Change in Temperature (°F)



25 Key Message #2



Ecosystems and Ecosystem Services

The integrity of Southwest forests and other ecosystems and their ability to provide natural habitat, clean water, and economic livelihoods have declined as a result of recent droughts and wildfire due in part to human-caused climate change.

25

Key Message #2



Ecosystems and Ecosystem Services

The integrity of Southwest forests and other ecosystems and their ability to provide natural habitat, clean water, and economic livelihoods have declined as a result of recent droughts and wildfire due in part to human-caused climate change. Greenhouse gas emissions reductions, fire management, and other actions can help reduce future vulnerabilities of ecosystems and human well-being.