

NATIONAL WEATHER SERVICE Building a Weather-Ready Nation

Science to Service

Collaborative Research to Operations in Southern Plains Fire Meteorology

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Workshop on Fire Weather Forecasting - CIWRO Norman, Oklahoma – 13 February 2024



Howdy and Welcome!



Where the wind comes sweepin' down the plain.





Where the wind comes sweepin' down the plain.



This Story Begins on 27 December 2005





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"TFS conducted careful studies of "firestorms" to determine why they had been so damaging and how effectively to intervene; strengthened linkages with its federal partners...claimed the special attention of fire science in Texas and produced a worldclass literature." - Stephen J. Pyne – The Great Plains: A Fire Survey.

This is that story...





Predictable Synoptic Pattern for Fire

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Application of rudimentary science to Plains fire outbreaks analogous to severe storm forecasting in the 1950s.





Predictable Synoptic Pattern for Fire





SGPWOs/Plains Firestorms result from the same parent weather systems as severe storms.



9 April 2009 – A Pivotal Plains Fire Disaster







Mesoscale Fire Process/Predictor

Fire-effective Low-Level Thermal Ridge



"Fires are atmospheric events, as much as dust devils or hurricanes which also organize heat release from the surface" Dr. Stephen J. Pyne – Between Two Fires (2012)



Working Group for Decision Support

WILDPIRE OUTBREAK YAHOOGROUP PROPOSAL BACKGROUND ATTENTION Densig were he visible many SUV Labor, an USI Industries in a discription of terms events are some more and the second and the second are so in the second are brown from herein (197) for blacks marries and 2010 or man pixes to be with some and an Into Turn 510, 1771 Latron 1 the The state traces for prove the art (first) the picture in the time the where width your far law case you're inner, as we been needen. Ye interem and) are a a spating is suprema it shows take as is place. Upting propagation area of the bodiery Plane of planes on to have a support approved that every

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SEPTEMBER 10. 2009

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"There is a combination of fire weather and fuel conditions that combine to produce regional wildland fire outbreaks

The legacy of the April 9th outbreak may be that we are better able to narrow or quantify the area of higher risk for significant fire occurrence"

SGPWO Working Group Stated Goal:

"Three day advanced notice"

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"Fire behavior deals with statistical ensembles...Wildland fire does not merely resemble a climatic or meteorological phenomenon; it results from them and is thus another order removed from simple determinism."

Dr. Stephen Pyne – Fire in America: A Cultural History of Wildland & Rural Fire (1982)





First Collaborated Probabilistic Outlook

>60%	A REAL PROPERTY AND A REAL PROPERTY A REAL PROPERTY AND A REAL PRO
40-60%	
48 hr Probabilistic Eire Forecast IR Imagery 27 Feb 2011 25 February 2011 – 10 am	

27 February 2011

- 6 single engine air tankers
- 1 heavy air tanker
- 25 dozers
- 4 wildland fire strike teams
- 27 fire supervisors
- 6 fire prevention
- NWS deployed to ICPs in Midland, Lubbock, and Amarillo

"It is crucial that we take steps to prepare for and respond to extreme wildfires"...Governor Rick Perry 2/25/11





Southern Great Plains Wildfire Outbreaks (SGPWO)/Plains Firestorms



"A 'perfect storm' for extreme fire." Texas A&M Forest Service

Dec 2005-Feb 2024

37 SGPWOs 7.03 million acres 3,454 structures lost 44 killed, 305 injured 84% of SGPWOs result in human casualties



Summary of Probabilistic Outlooks

Probability of Significant Wildfire Occurrence – 15 December 2021



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The Probabilistic Puzzle

- Energy Release Component
- Red Flag Threat Index
- Wildland Fire Assessment System
- CIPS Analog Guidance





Red Flag Threat Index in Hi-Res Weather Models



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Conceptual Models for Plains Megafires







GOES-R Revolutionary Tool

- Timely 'hot spot notifications' innovated in Oklahoma in 2016.
- Kincade Fire visually evident in GOES-17 data 52 sec after ignition.
- 70-80% of NWS 'hot spot notifications' in OK & KS received prior to local 911 dispatch!

Ned Mar 07 2018 12:22 CS -Subject: Hot Spot -Lat: 34.311 / 34 18.635 N -Lon: -96.979 / 96 58.760 -Location: 4 miles ENE of kuty, OK

N/A WDIR: 340 WSPD: 1

County: Ca



"The least costly fires

are those that receive

heavy/rapid initial attack" Pyne 2015.

Environment + Detection = Warnings?



Neather (RFT

>90%

70th-90th

50th-70th

25th-50th

<25th

The scientific guidance for Fire Warnings was co-developed between meteorologists and fire analysts through simulations & analyses, and includes:

- Gridded environmental information (ERC percentiles & Red Flag Threat Index).
- Remote sensing (GOES-16/17) signals related to past extreme fire behavior in various fire environments.



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Integrated Team Fire Warnings

<u>At the request of State Foresters</u>, WFO Norman conducted collaborative science with OFS/TAMFS Fire Analysts to produce a <u>science-based methodology</u> for proactive <u>coordinated interdisciplinary Fire Warnings</u> for public & first responder safety – issued at the request of land/fire agencies.



Science to Service Approach for Fire

A "seminal approach" to "meteorology paired tightly with skilled operational decision making"...Matt Jeglum, NOAA/NWS/WRH.



Solutional weather service

The power of this is process is <u>informing</u> <u>strategic pre-deployments</u> that are <u>tactically routed</u> to emerging incidents.





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Comments & Questions

CIWRO Workshop on Fire Weather and Forecasting

