2011 Texas Wildfires

Common Denominators of Home Destruction

Texas A&M
Forest Service

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Introduction

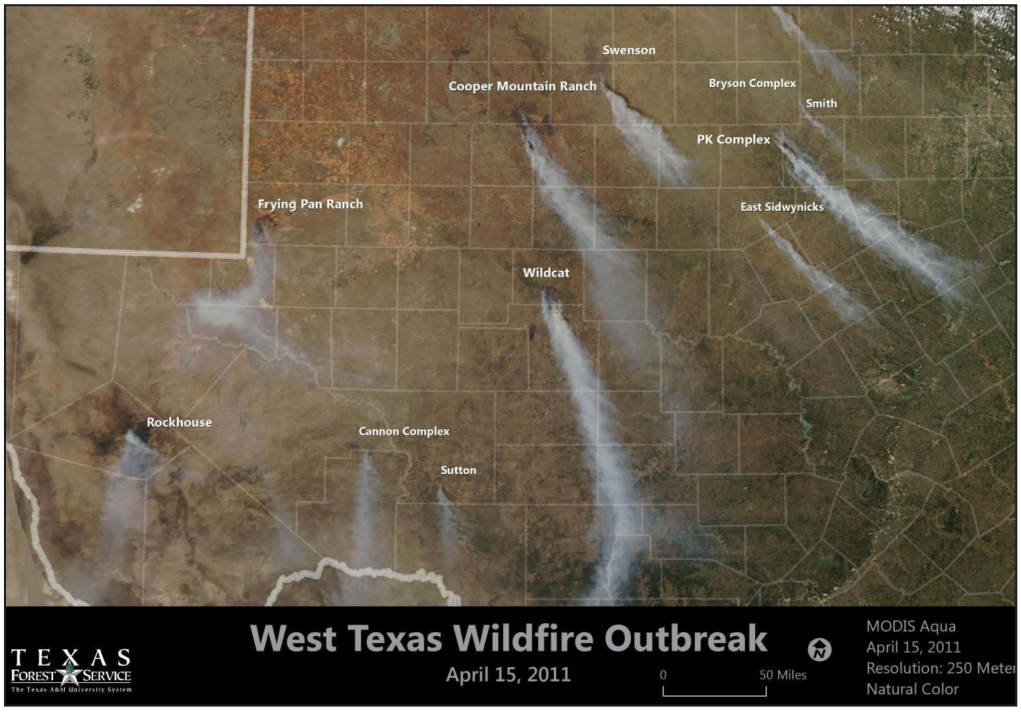
The 2011 Texas wildfire season was unprecedented. The Lone Star State saw some of the largest, most destructive blazes in its history. Firefighters from across the country responded to Texas, battling to save communities and protect lives. Four firefighters made the ultimate sacrifice, giving their lives in the line of duty. Tragically, six civilians also were killed by wildfire.

Home destruction reached record-breaking numbers with losses reported on 354 of the 31,453 wildfires that occurred in 2011, adding up to a total of 2,947 homes destroyed. Firefighters fought valiantly and saved nearly 39,000 homes — more than 13 times the number of those destroyed.

Even in the face of tragedy there are numerous lessons learned from the 2011 wildfire season. The goal of this report is to share with homeowners, firefighters and local government officials the factors that converged to cause these blazes and the best practices that were utilized to help save lives and property. Texas residents and community leaders already are using lessons learned from 2011 to take action and prepare for future wildfires.

The 2011 wildfire season was unique in its scope, duration and complexity. But while the severity of the wildfire season and number of homes threatened will change from year to year, the fundamental reasons homes burn remain the same. There are simple and inexpensive measures that residents can take to prepare for wildfire and increase the chances of home survivability. Resources also are available for community leaders who want to take action and empower their residents as partners in wildfire preparedness. Information is provided in this document to help you get started as you work to make your home and community safer from wildfire.

Note: Websites for all the linked material in this document are provided in the References section on Page 50.



Satellite imagery from April 15, 2011, shows smoke plumes across the state.

Executive Summary

We can't always stop wildfires from happening. But we can take the information and resources available and ensure that Texans have the tools they need to protect their homes and families. It is the hope of Texas A&M Forest Service that this report will provide guidance for local government officials, homeowners and the fire service.

Local government officials and community leaders

The information highlighted in this report reinforces the value of and ongoing need for community-driven wildfire mitigation efforts. When community leaders place a high priority on addressing wildfire-related issues and lead by example, it sends a clear message to the public that mitigating — or reducing — wildfire risk is important and worth the time and effort.

Some information to keep in mind as you plan for the next wildfire season:

- **Community Wildfire Protection Plans** serve as a framework for developing strategies to protect life, property and natural resources from wildfire. Learn more about Community Wildfire Protection Plans in the Best Practices for Reducing Home Destruction section of this document, which starts on Page 44.
- The safest communities are those whose leaders have planned ahead. Only then can the reality of wildfire be recognized and addressed proactively.
- Take seriously the weather alerts and wildfire warnings you receive from agencies like Texas A&M Forest Service and Texas Division of Emergency Management. Pass on appropriate information to residents and your local media.
- Take into consideration that utilities often are compromised during wildfire events. Ensure that you have an appropriate contingency plan in place.
- The Best Practices for Reducing Home Destruction section of this document may be useful in identifying programs you can implement in your community and resources to help you plan for the next wildfire.

> "Because of our pre-planning, our first responders — right in the face of an enormous, very intense fast-burning fire — were able to successfully evacuate roughly 5,000 people over a period of about four hours. I personally feel that **because of the Community Wildfire Protection Plan and because of that planning and training, we were successful in saving hundreds if not thousands of lives** in this terrible Bastrop fire."
>
> *- Bastrop County Emergency Management Coordinator Mike Fisher*

Homeowners

Little things make a big difference. We know that actions taken by homeowners can increase a home's ability to survive a wildfire. Create an evacuation plan for your family. Follow the proven strategies outlined in this document. Texas A&M Forest Service's **Firewise products** can help you develop a plan to protect your property from wildfire.

Some information to keep in mind as you prepare your home:

- Wildfire cannot sustain itself without fuel, heat and oxygen. During a wildfire, anything that potentially can burn should be considered fuel. This can include landscaping, outbuildings and even the materials used to

construct a home. The good news is that residents have the ability to reduce the vegetation on their property and increase their home's chances of surviving a wildfire.

- Through participation in programs such as **Firewise Communities USA**, residents can work individually and collectively to reduce their risks. The axiom of "strength in numbers" holds true when it comes to wildfire preparedness. The safer the community, the safer the individuals are within that community.
- When wildfires do occur under extreme conditions like those observed in 2011, they can spread rapidly. Seconds count and having a personal or family **wildfire action plan** that identifies how you will react in the event of a wildfire can save precious time.
- The Best Practices for Reducing Home Destruction section of this document may be useful in identifying what to do — and what not to do — to ensure your home is safe from wildfire.

Fire Departments

Consider this document as you discuss tactical considerations for the next wildfire season. Having a written plan that identifies high-risk areas within your community and outlines the best strategies for protecting those areas will better equip your department when the next fire occurs.

Some strategies to keep in mind as you plan include:

- Knowing why homes ignite during a wildfire gives you a better chance of defending those homes. It also helps you teach residents how to make their homes more fire-resistant.
- Many homes are destroyed after the main fire has passed and in areas with lower fire intensity. Typically, these areas have fewer suppression resources assigned to them than the more active parts of the fire. Keeping resources available to patrol these areas can help prevent additional home losses.
- Using water to extinguish fires and hot spots around homes is an effective first step in structure protection but fine fuels such as grass, leaf litter and pine straw can reignite easily. Taking time to clear even a small fuel break using hand tools can help a home survive if the fire rekindles.
- If you can see embers landing on or around homes, assume there also are embers landing in areas and

The Texas Legislature recently amended the statute that governs Texas A&M Forest Service's rating system for the Rural Volunteer Fire Department Assistance Program. It is now a requirement for TFS to factor "threat of wildfire risk" when calculating a fire department's rating number, which is considered when departments apply for grants and assistance programs.

A community's rating is calculated by the **Texas Wildfire Risk Assessment Portal (TxWRAP)** based on probability of fire occurrence, historical fire occurrence, potential fire behavior and values at risk.

Departments are encouraged to use Texas A&M Forest Service's **fire reporting database** to keep their information current so an accurate rating can be calculated.

"As structural firefighters, we're trained to defend the home, but the reality of it is **sometimes homes are not defendable.** You have to think of them as fuel. I think once you can get your firefighters to stop thinking of a home as a home and start thinking of it as fuel, then your firefighters are going to be safer and in the long run, I think you'll protect more homes. Sometimes you've got to give up a house to save four or five more, and that's a hard thing for firefighters to do."

- Borger Fire Chief
Bob Watson

spaces you can't see. Good examples of areas where embers can go unnoticed are in gutters and attics and underneath decks and pier and beam foundations. This requires checking structures frequently.

- While it may be a difficult decision for firefighters to make, committing resources to homes that can't be saved could end up costing some additional homes that could have been saved.
- Skilled professionals with specialized equipment may be needed to remove combustible attachments like fences and decks during a wildfire. If faced with the decision of removing one of these elements to save a structure, ensure that you have the tools and training to do so. Chainsaws and other tools can be effective but also dangerous. No home is worth risking the safety of a firefighter.
- Allocate some firefighting resources to evaluate threatened structures and triage which homes have the best chance of surviving. This allows for the most efficient use of limited resources and provides situational awareness for crews. This can be accomplished well ahead of the wildfire season or on the spot, if time and resources allow.
- Be prepared for multi-department emergency response.
- Develop a pre-attack plan that includes maps, contact information, water sources and attack strategies — and have it available for responders who may not be familiar with your area.
- Visit Texas A&M Forest Service's **Fire Departments page** to find training and grant opportunities that could build your department's capacity.
- The **Texas Interagency Coordination Center website** is designed to provide the fire community with easily accessible information that will be valuable in planning daily operations. Fire weather forecasts, fire risk assessments and drought indices are some of the tools that may assist in critical decisions. You also can use this site to access the statewide mutual aid plan. Forecast maps are posted daily, showing which areas of Texas may be at risk due to weather and drought conditions.

Despite the catastrophic destruction in 2011, many homes remained standing, such as this one on the Possum Kingdom Complex.

Background

Wildfire activity in Texas has increased during the past two decades, requiring the extended mobilization of fire suppression resources. According to Texas A&M Forest Service experts, the state can expect this trend to continue for years to come. Population growth and development place more Texans at risk every year as cities and towns expand into previously rural areas.

As changes occur in weather cycles, population and land use, Texas wildfires have become larger and more difficult to contain.

Significant Texas wildfire seasons occurred in the following years:

- 1996: **2,808 wildfires burned 226,575 acres** *
- 1998: **2,793 wildfires burned 197,571 acres** *
- 2000: **2,758 wildfires burned 211,939 acres** *
- 2006: **23,198 wildfires burned 2 million acres and destroyed 413 homes**
- 2008: **20,482 wildfires burned 1.6 million acres and destroyed 256 homes**
- 2009: **17,488 wildfires burned 726,502 acres and destroyed 436 homes**
- 2011: **31,453 wildfires burned 4 million acres and destroyed 2,947 homes**

* These figures exclude wildfires responded to by only local fire departments. A reporting system designed to track local fire department fires was not in place until 2005.

More than 14,000 communities have been identified as at risk for potentially devastating fires in the wildland urban interface — the area where wildland vegetation begins to intermix with homes. Since 2005, Texas A&M Forest Service's Mitigation and Prevention Department has conducted post-fire assessments to gather information used for educating residents and communities and developing strategies for protecting homes and property.

The Wilderness Ridge Fire in 2009 (pictured above) lies within the footprint of the 2011 Bastrop Complex perimeter. A natural assumption is that an area impacted by a wildfire won't burn again. However, that's not necessarily true. Homes that were in the path of the Wilderness Ridge Fire were once again threatened by the Bastrop Complex.

Causal Factors of the New Fire Regime in Texas

Weather

Since the mid-1990s, Texas has experienced larger and more complex wildfires and extended wildfire seasons, which have challenged the ability of state and local resources to protect citizens and their property.

At the root of this evolving situation is a change in the climate cycle that increases the occurrence of drought.

In 2011, Texas experienced the worst one-year drought in recorded state history, which dates back to 1895. The result was devastating wildfires and massive destruction. But the drought of 2011 was not an isolated event. In Texas, droughts have been occurring with increasing severity since 1996. One-year droughts were recorded in 1996, 1998, 1999, 2000 and 2001. Each year, the occurrence of large and complex wildfires mimicked the scope and intensity of the droughts.

In 2005, there was a rise in both scope and duration. Droughts lasted multiple years — 2005-2006 and 2008-2009 — and impacted the entire state. The threat of large and complex wildfires extended throughout the droughts, challenging the state's capacity and capability to respond effectively.

Conditions only got worse in 2011, a record-setting year. As of October 2012, there are parts of South and Northwest Texas that still have not recovered from the 2011 drought.

According to the Texas State Climatologist's Office, the state is in a period where droughts will be common, at least for the near future.

"Texas is in a period of enhanced drought susceptibility due to global ocean temperature patterns and has been since at least the year 2000," according to the state climatologist's report, ***The 2011 Texas Drought.*** "The good news is that these global patterns tend to reverse themselves over time ... Looking into the distant future, the safest bet is that global temperatures will continue to increase, causing Texas droughts to be warmer and more strongly affected by evaporation."

The prospect, then, is for additional droughts, each with a severity or intensity similar to those of recent years. If this prediction is realized, it could, in turn, lead to extended wildfire seasons with the potential for large and complex wildfires.

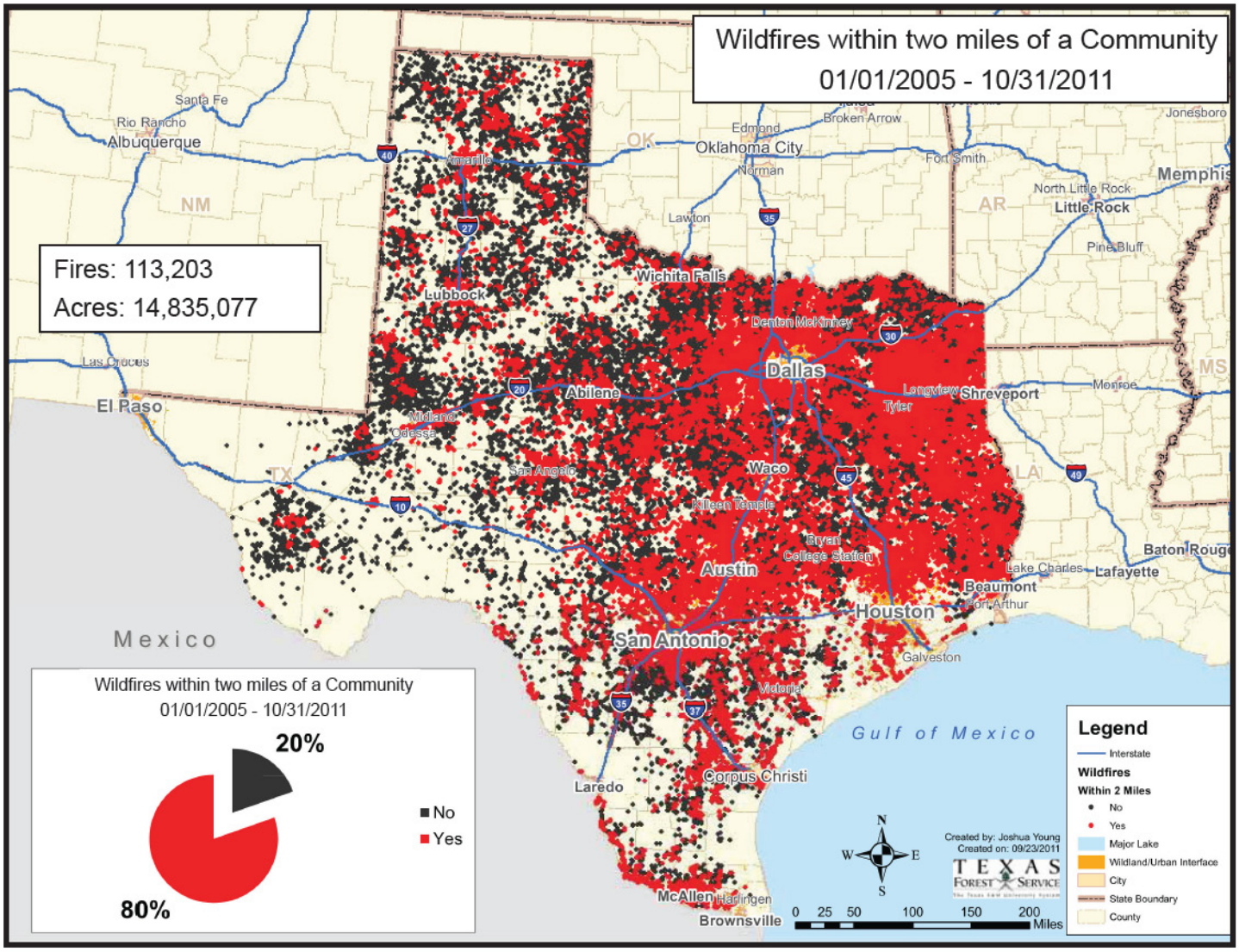
How long will this trend continue? One of the global ocean temperature patterns referred to above by the state climatologist is the Pacific Decadal Oscillation (PDO). The PDO is a multi-year pattern that changes every 25 to 30 years. When Texas is in a "cool phase" — as it is now — the state is more prone to drought. The last cool phase was during the 1950s and 1960s, a time period that also saw severe droughts. The drought of 2011 did not eclipse the drought of 1954-1956, which remains the most severe drought on record for the state due to its duration.

Based on **readings from the Joint Institute for the Study of the Atmosphere and Ocean** at the University of Washington, the PDO has been in its current phase for about 12 years, with the transition starting about 15 years ago. It is uncertain how long this cycle will last. However, when compared to the duration of previous cycles, another 15 years or so is possible.

Population

Where people live and how homes and communities are designed in fire-prone areas are some of the most important factors influencing the threat of wildfire.

It is estimated that 10 million people, or 41 percent of the state's population, live in the wildland urban interface. This trend of people moving to previously rural areas can present challenges for emergency responders and residents. The close proximity of fire departments and other emergency services decreases with lower population densities, translating to fewer resources and longer response times. Fire departments may not have enough resources to protect every home threatened, prompting the need for a triage process to determine which homes can be protected.

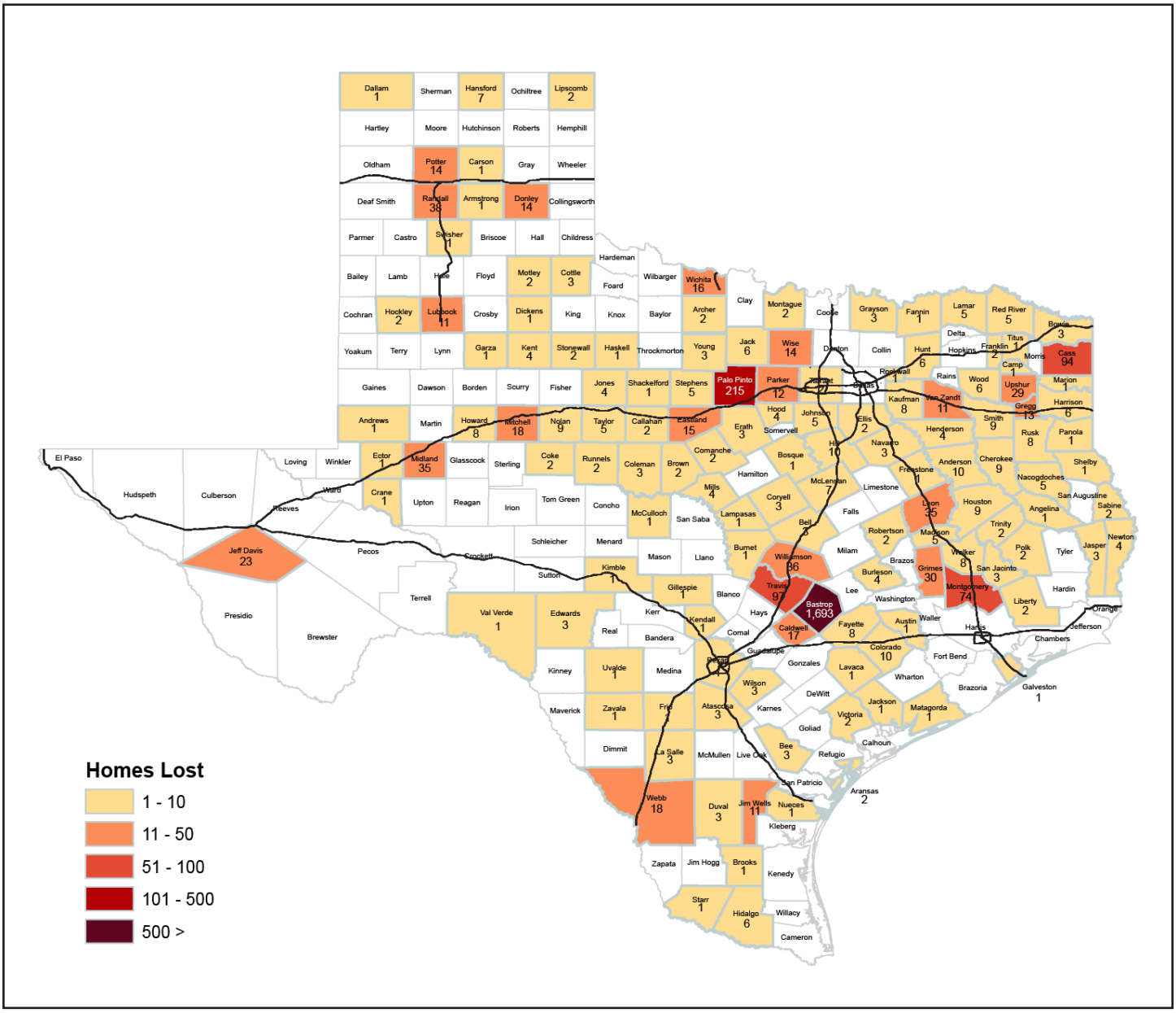


Eighty percent of wildfires in Texas occur within two miles of a community. That means 80 percent of Texas wildfires could pose a threat to life and property. It can take less than half an hour for fire to travel two miles, leaving residents very little time to evacuate. It's imperative to prepare your home and family long before a fire ignites.

This problem is compounded by the fact that the vast majority of wildfires are started by people acting carelessly. So as new developments draw more people into these previously rural areas, there are not only more homes and people to protect, but more opportunities for accidental fires.

Wildfires are no longer just a rural issue, nor are rural residents the only people at risk. Urban areas also can be vulnerable. Pockets of undeveloped land in and around communities can be a factor when considering potential losses in the wildland urban interface.

And it doesn't take a large wildfire to destroy homes. This was evidenced in 2011 by the Pinnacle and Steiner Ranch fires in Travis County and the Moonglow Fire in Williamson County. Each blaze was relatively small — around 100 acres — but destroyed between 10 and 20 homes.



In 2011, no county in Texas was immune to wildfire. Homes were destroyed in more than half the state's 254 counties. Note the pattern of destruction and how it follows interstate highways and population centers.

Land Use

Roughly 94 percent of the land in Texas is privately owned, which means the shape of our landscape is largely left up to individual property owners.

Individual land-use practices are as diverse as the landscape itself. The way land is managed, communities and homes are built and food is produced all have an impact on wildfire activity. As the state continues to see exponential population growth, the potential for fire losses will be affected by how and where homes are built.

Understanding how land-use practices influence and sometimes exacerbate wildfire risk is critical to mitigating it.

Due to land use changes, areas of Texas that previously were void of vegetation now have significant overgrowth, or "fuel loading," which can put communities at risk for wildfire.

Evolving over time, many Texas ecosystems have adapted to periodic wildfires, with some plant communities benefiting from this natural cycle.

There was a time when fire was considered a natural element; a tool that, when used judiciously, was a respected part of the Texas landscape. Our ancestors understood this and learned from those who went before them to use fire as a land management tool.

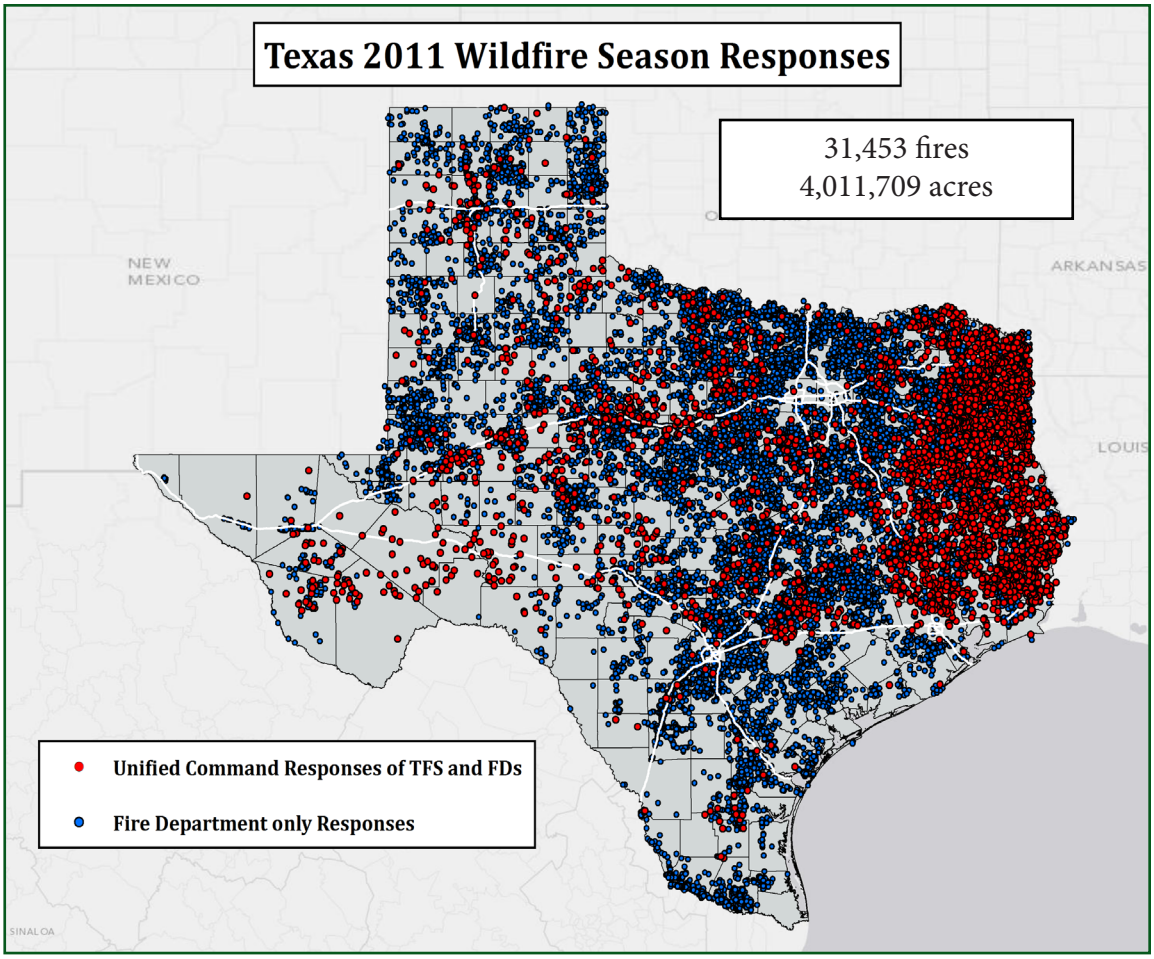
Our native plant communities have adapted. So can our wildlands. If WUI areas don't adapt to wildfire, dangerous consequences could result.

The primary land-use changes listed below impact wildfire occurrence and intensity.

- Increase in woody vegetation
- Changes in grazing practices
- Changes in commercial crop production
- Changes in wildlife management practices
- Fragmentation of land ownership
- Residents living in previously rural areas
- Overgrowth of vegetation around communities

2011 Texas Wildfire Season

The Lone Star State does not have a set wildfire season, which means wildfire potential can exist year-round. However, there are certain time frames that could be considered peak periods because of spikes in wildfire activity.



Local fire departments respond to 90 percent of wildfires in Texas. Texas A&M Forest Service responds to just 10 percent, but those fires burn 75 percent of the total acreage charred each year.

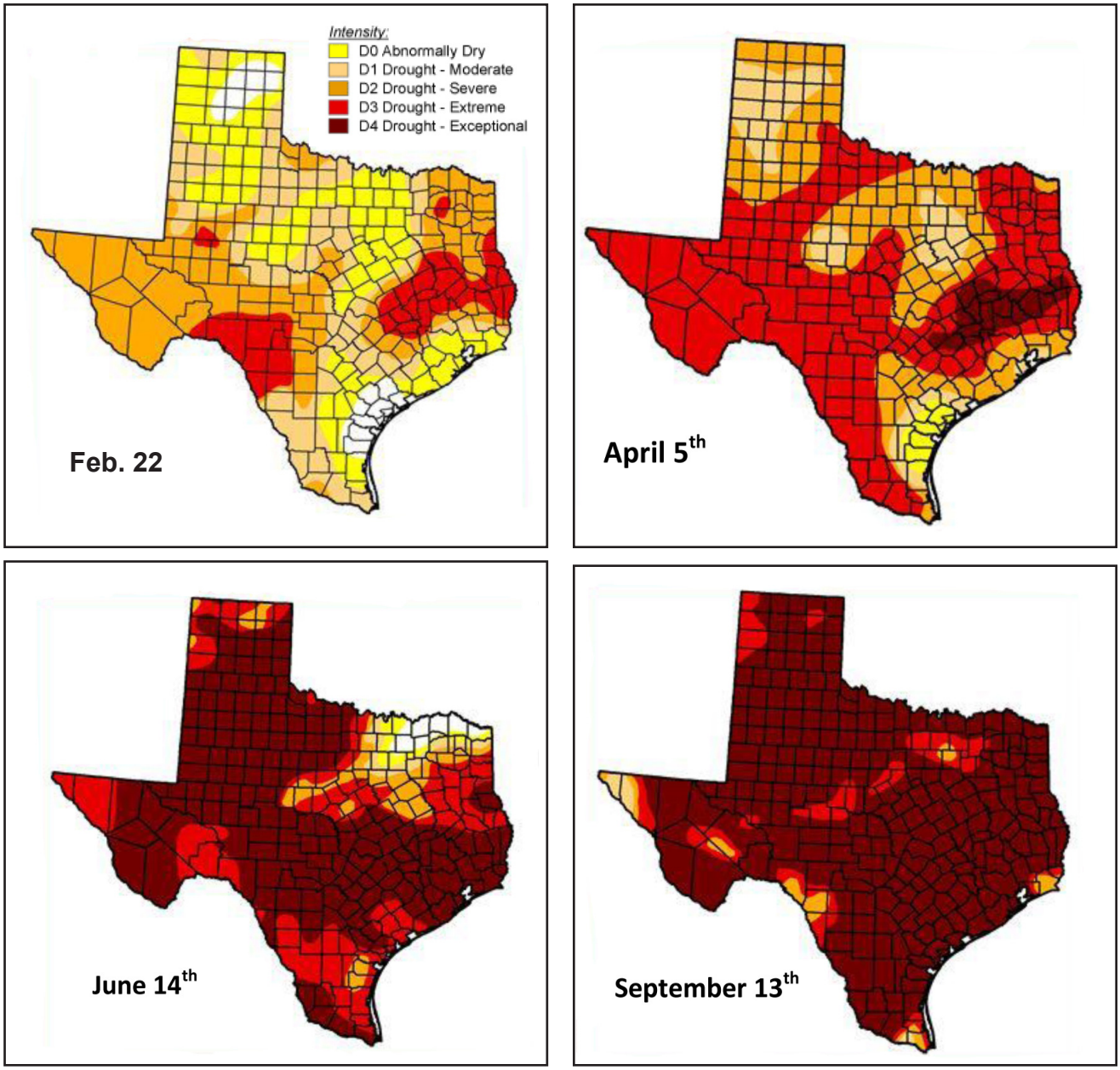
The first peak period generally runs from mid-February to the end of April. Sometimes called a winter or spring wildfire season, the period is characterized by wind-driven fires burning in frost-cured grasses. The driving force for these wildfires are the frequent frontal passages that come in from the west, bringing with them strong winds and dry air that can produce large, fast-moving wildfires.

The second peak period can be linked to the late summer drying that occurs from July through mid-September. These summer wildfires often are driven by an abundance of critically dry or dead vegetation that serves as fuel for the fires. This period is characterized by smaller but higher-intensity fires burning in timber and brush, including the post oak woodlands of North Central Texas, live oak and juniper woodlands of the Hill Country and pine forests of East Texas. These regions and others support fuel-driven summer fires when vegetation becomes critically dry.

Typically, Texas sees short periods of increased fire occurrence throughout the year with just a few of the fires reaching a significant size or complexity. The drought conditions and fire activity experienced throughout 2011 — one of the worst wildfire seasons in state history — may be representative of a new normal. Experts warn that drought and the other causal factors outlined in the preceding pages could result in repeats of 2011 with widespread fire activity and extended, year-long wildfire seasons.

The drought that plagued Texas in 2011 actually began in October 2010. According to **Texas State Climatologist John Nielsen-Gammon**, the 12-month period from October 2010 through September 2011 was the driest 12-month period in Texas history.

As the maps below depict, the severe drought steadily worsened, setting the stage for dangerous wildfires.



But the problem began long before the drought. In summer 2010, four tropical systems passed over Texas, dumping an overabundance of rain on the state. That, in turn, produced rapid grass growth across the Texas Plains. The vegetation served as kindling once it was cured by the first winter freeze.

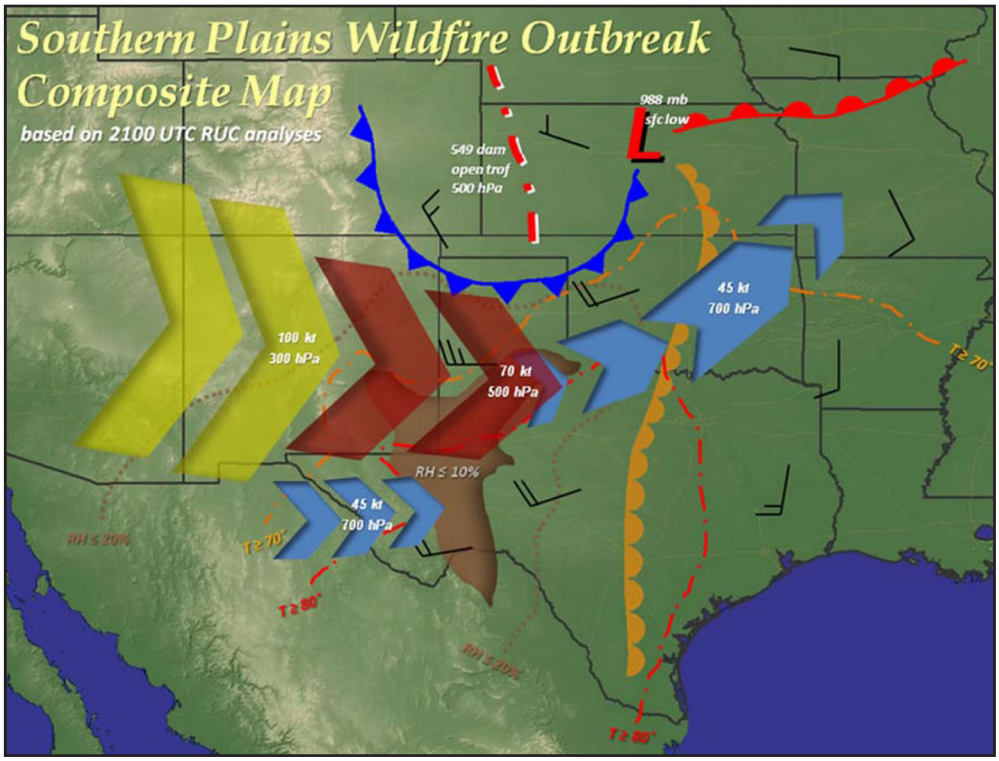
To prepare Texans for what was to come, the Texas A&M Forest Service Predictive Services Department published in September 2010 the ***Winter 2011 Outlook*** forecasting an active and problematic winter/spring wildfire season.

Southern Plains Wildfire Outbreaks

Adding to the complexity of the 2011 wildfire season was the occurrence of Southern Plains Wildfire Outbreaks.

Wildfires that ignite during a Southern Plains Wildfire Outbreak are considered a true force of nature.

Occurring mostly in the winter and spring, weather conditions must be just right for these massive and destructive fires — or groups of fires — that often last all day and can't be stopped by firefighters. When an outbreak occurs, the weather is truly in control. Aggressive firefighting techniques don't work. The only thing you can do is move people out of harm's way.



To learn more about Southern Plains Wildfire Outbreaks, visit texasfirestorm.org.

This phenomenon first was identified in 2009 by National Weather Service meteorologists Greg Murdoch and Todd Lindley. They pinpointed a composite pattern of upper air features that create the high-impact, dangerous fire weather associated with these outbreaks.

In general, the Southern Plains outbreak pattern is associated with a strong upper level low pressure center. The upper level low approaches Texas from the west, dragging a cold frontal boundary with it as it crosses near or north of the Texas High Plains. The high-impact weather produced by the outbreaks can be found in a wedge of warm, dry, unstable air that is pushed ahead of the cold front. The leading edge of this wedge generally is referred to as a dryline.

The high-impact weather that exists in this wedge between the cold front and the dryline brings strong southwest winds, above-normal temperatures and very dry air or low relative humidity. Murdoch and Lindley, along with other meteorologists, have published **several studies** that explain the composite pattern and provide the guidance needed to forecast a Southern Plains Wildfire Outbreak before it happens. Forecasting such an outbreak days before it occurs is imperative for public safety. The news is immediately shared with local law enforcement and emergency management officials, who, in turn, pass on the information to local residents, allowing them the time needed to evacuate.

Nineteen outbreaks — also dubbed firestorms — have been reported in Texas since 2005. Almost half of those occurred in 2011; nine total between February and June. Cumulatively, these outbreaks resulted in the deaths of 24 people, the destruction of 1,770 structures and the burning of more than 3.7 million acres of land.

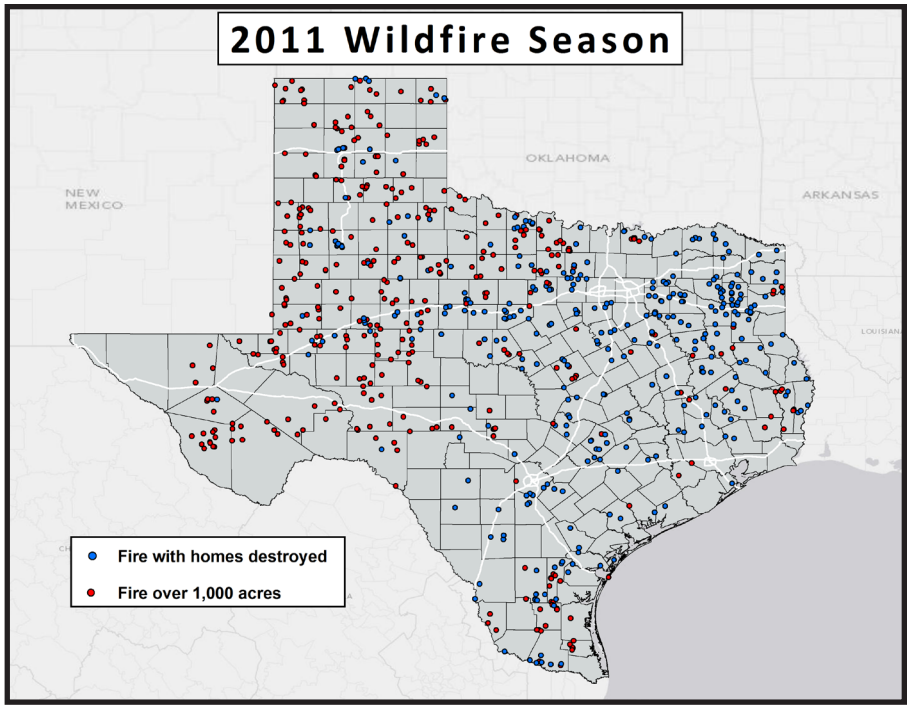
Texas Southern Plains Wildfire Outbreaks 2005-2009

Event Date	Wildfires	Acres	Fatalities	Structures Destroyed
27 Dec 2005	52	60,823	3	341
1 Jan 2006	43	303,570	0	115
12 Jan 2006	16	39,173	0	48
12 March 2006	27	1,102,044	13	102
6 April 2006	26	119,846	0	42
15 Apr 2006	10	23,135	0	7
25 Feb 2008	32	377,568	1	5
14 March 2008	29	263,375	0	31
4 April 2009	23	33,830	1	35
9 April 2009	29	235,792	4	339
10 Days	**287**	**2.5 Million**	**22**	**1,065**

Texas Southern Plains Wildfire Outbreaks 2011

Event Date	Wildfires	Acres	Fatalities	Structures Destroyed
27 Feb	197	262,434	0	132
22 March	105	12,556	0	4
03 April	112	19,883	0	11
09 April	144	582,615	1	361
14 April	76	85,287	0	3
15 April	270	50,321	1	58
26 April	82	50,235	0	56
24 May	100	127,732	0	16
20 June	169	86,966	0	64
9 Days	**1,255**	**1,278,029**	**2**	**705**

A record-breaking wildfire season



In 2011, available fuels and significant weather events combined to produce one of the most active wildfire seasons in Texas history, as well as some of the most dramatic high-impact fire days. As part of the state response, Texas A&M Forest Service mobilized 16,690 emergency responders, 244 bulldozers, 986 engines and 255 aircraft from around the nation. Working alongside tens of thousands of local and state firefighters, these resources responded to more than 31,000 fires that burned more than 4 million acres and destroyed 2,947 Texas homes.

Records set in 2011 include:

- Six of the 10 largest documented wildfires in state history occurred in April 2011
- The most homes destroyed by a single wildfire —1,660 homes; Bastrop Complex
- The largest wildfire ever to burn in East Texas — 41,050 acres; Bear Creek Fire
- The most acres burned in a single wildfire season — 4,011,709 acres
- The most homes saved in a single wildfire season — 38,962 homes

Primary factors leading to home ignition during the 2011 wildfire season include:

- Wildfires driven by high winds sent a profuse amount of embers ahead of the main fire. These winds forced embers into home ventilation systems and underneath pier and beam foundations, igniting homes from within. They also ignited combustible materials — such as railings, decks or awnings — on or around homes.
- Combustible attachments to homes that were not pre-treated with fire-resistant paint or chemicals acted as a fuse that led fire right up to the home. Fires often spread to surrounding homes from vehicles, outbuildings, firewood and other combustible items that already had caught fire and were generating a tremendous amount of heat.
- Windows not designed to withstand heat fractured, creating an opportunity for flames and embers to penetrate homes.
- Landscapes with highly combustible vegetation — such as flammable plants — leading up to a home and landscape elements such as combustible railroad ties, railings and walkways created a path for fire to follow and made homes more susceptible to ignition.
- Homes that caught fire generated so much heat and so many embers that they essentially became fuel for the fire and ignited surrounding homes and structures.

In 2011, wildfires burned from border to border. This report examines some of those fires in an effort to better understand why homes were destroyed and prevent future destruction. February, April, June and September were peak months during the 2011 wildfire season. The pages that follow detail the wildfire activity and home destruction during those months.

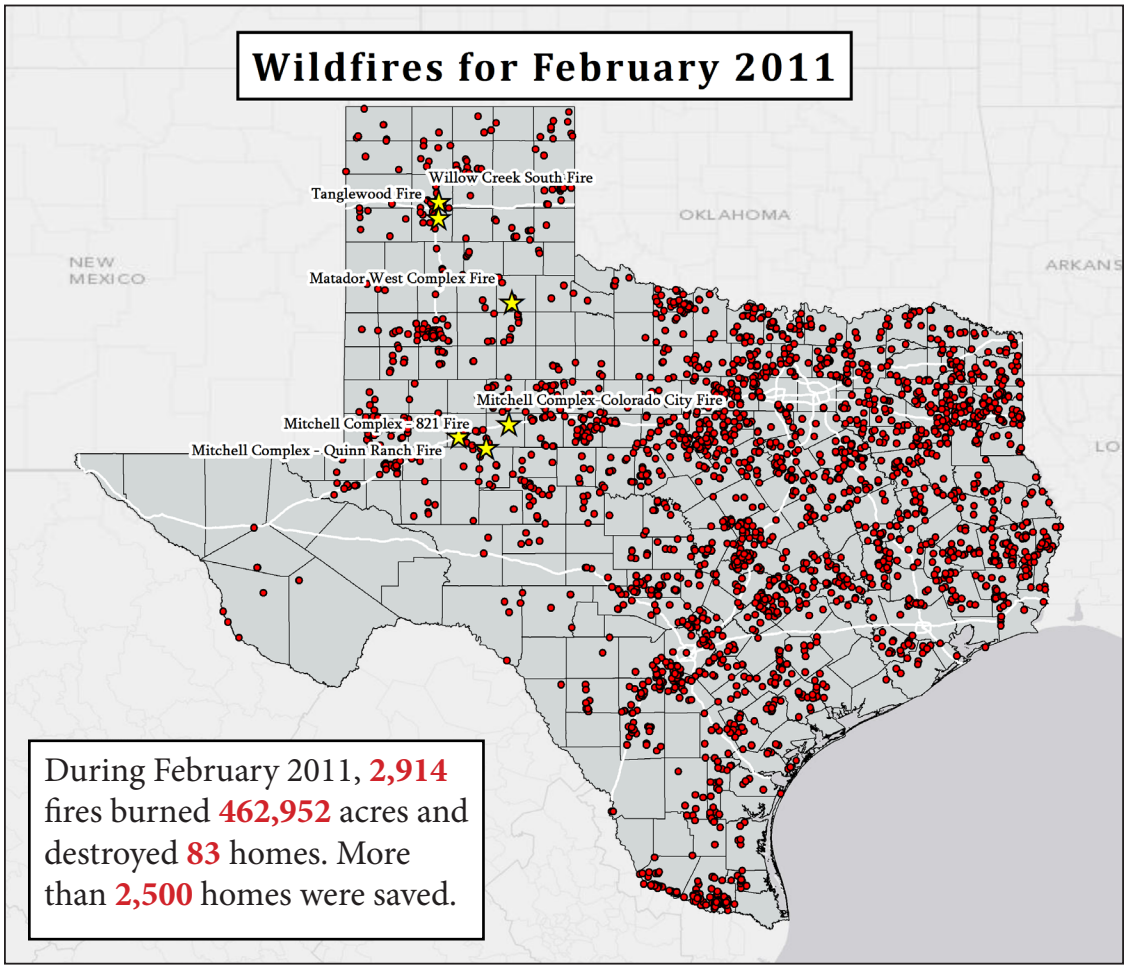
February 2011

Matador West Complex - Feb. 27, 2011
- Motley County
- 41,000 acres
- Two homes destroyed
- 34 homes saved
- Burned for eight days
- Cause not identified

Willow Creek South Complex - Feb. 27, 2011
- Potter and Carson counties
- 24,310 acres
- 30 homes destroyed
- Burned for seven days
- Caused by equipment use

Mitchell County Complex - Feb. 27, 2011
- Mitchell and Howard counties
- 18,370 acres
- 15 homes destroyed
- Burned for six days
- Caused by power lines

Tanglewood Complex - Feb. 27, 2011
- Randall County
- 1,659 acres
- 33 homes destroyed
- 236 homes saved
- Burned for six days
- Caused by power lines



During the first six weeks of 2011, the severe drought was establishing its foundation.

In mid-February, Texas A&M Forest Service began preparing for significant fire activity, which was predicted in West and Northwest Texas. In anticipation of potentially destructive wildfires, the agency activated its incident command post in Merkel, 17 miles west of Abilene. The post was staffed by the Lone Star State Incident Management Team, a group of emergency responders employed by Texas A&M Forest Service to oversee field operations during the wildfire season.

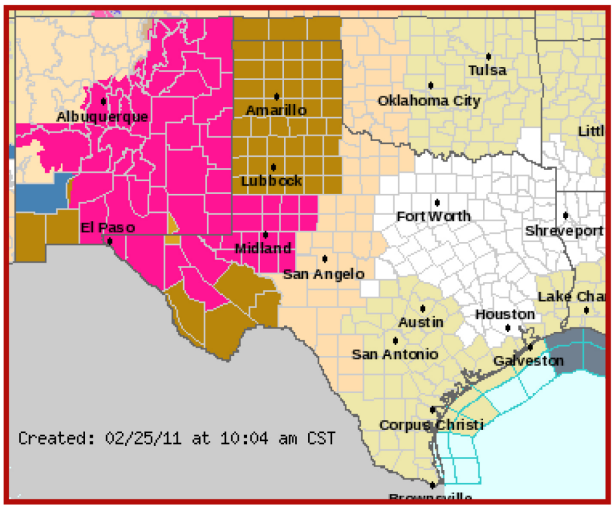
Texas Fire Weather Alert

Friday, Feb. 25, 2011

The National Weather Service has issued *Red Flag Warnings* for the counties in **red** on the map below. A *High Wind Watch* has been issued for the counties in **brown**.

Current Conditions

- **Wind Speeds:** Upwards of 20 mph in West Texas; 10 to 20 mph in North, South and Central Texas
- **Relative Humidity:** Dropping into the teens for West and South Texas; 20s for Central, North and East Texas
- **Temperatures:** Rising into the 70s in South Texas; 60s in North and West Texas



Increased fire danger is forecast through the weekend with high impact fire weather that could pose a direct threat to public safety expected on Sunday.

Above is an alert issued by Texas A&M Forest Service advising the public of the forecast for increased fire danger. An additional message was sent through the Texas Law Enforcement Telecommunications System (TLETS).

Four task forces and four additional incident management teams were strategically staged in Midland, Lubbock, Amarillo and Mineral Wells.

The effort wasn't unwarranted. On Feb. 27, the first Southern Plains Wildfire Outbreak of the year occurred. On that day, the state responded to 21 wildfires that burned more than 120,000 acres during the first operational period, or shift of work.

Wildfires on Feb. 27 included the Tanglewood Complex in Randall County, Matador West Complex in Motley County, Willow Creek South Complex in Potter and Carson counties and Mitchell County Complex in Mitchell and Howard counties. These four wildfires burned a combined 85,339 acres and destroyed 80 homes — the most homes destroyed on a single day in the Texas Panhandle.

The 1,659-acre Tanglewood Complex burned in heavy vegetation. Houses caught fire when embers entered through vents and ignited them from the inside. Many of the homes had combustible attachments such as railings, decks or awnings.

The topographic features of the community also contributed to fire behavior. Canyons and ravines channeled

high winds, increasing fire intensity and the speed at which the flames traveled. Fire travels faster uphill and pre-heats the homes and vegetation ahead of it, building intensity as it burns. Homes at the tops of canyon walls were exposed to large and intense flames.

The Tanglewood Complex ignited a little more than a year after the Palisades community — an area within the burn perimeter — was deemed at high risk for wildfire. The designation came in Fall 2010 when Texas A&M Forest Service wildland urban interface specialists joined with a local fire department to conduct a wildfire risk assessment.

More than 30 homes were destroyed on the Tanglewood Complex in Randall County.

Many of the 33 homes destroyed during the fire previously had been deemed at risk during that assessment. Some of the homes that did survive were made of fire-resistant materials or had a concrete retaining wall.

Also igniting Feb. 27 was the Willow Creek South Complex, which burned more than 24,000 acres and destroyed 30 homes. Many of these homes were made of brick and surrounded by manicured lawns — and yet still they were destroyed because of the high winds and extreme fire behavior on that day.

This home on the Willow Creek South Complex was built with fire-resistant materials and surrounded by an area of defensible space — where vegetation and combustible items had been cleared.

The lesson learned? Don't assume your community is safe just because it doesn't appear at first glance to be high-risk.

"If you had grass around your home, it would burn right up to wherever there was a break," said Wildland Urban Interface Specialist Karen Stafford. "Some of those brick homes look fire-resistant, but they're pier and beam with foundation vents. Fire was igniting the infrastructure of the homes. Once it hit the community, it was spreading

from house to house and lot to lot."

The Panhandle city of Amarillo lies in Potter and Randall counties, where the Willow Creek South and Tanglewood complexes burned. Amarillo Building Official Scott McDonald said homes that were destroyed by many of the Panhandle-area fires shared several common factors including being surrounded by excessive, uncultivated vegetation and combustible items.

The large trees around this home on the Willow Creek South Complex did not ignite; however, the frost-killed grass led fire directly to the home.

"These items appear to present the majority of the concern; however, several more factors should also be considered," he said. "In many instances property owners had wood fencing in direct contact with a building or had planted conifers close to or in direct contact with structures. In my opinion, these common conditions create the greatest hazards and are the simplest to mitigate."

The fires were eye-opening for property owners, McDonald added.

"If greater education on the effects of blowing embers could be provided in simple bite-size pieces, I believe it could help property owners become a little more proactive," he said. "It's important for them to have information about roofing materials, exterior envelope materials, soffit vent screening and architectural appendages such as decks, pergolas or carports."

A combustible fence served as a pathway, leading fire right up to this modular home on the Willow Creek South Complex.

Detailed information about recommended landscaping and construction materials can be found in the **Fire Resistant Materials** and **Firewise Landscaping in Texas** publications referenced in the Best Practices for Reducing Home Destruction section of this document.

April 2011

Swenson Fire - April 6, 2011
- Stonewall and King counties
- 122,500 acres
- Two homes destroyed
- 12 homes saved
- Burned for 18 days
- Caused by equipment use
- Ninth largest wildfire in Texas history

Rockhouse Fire - April 9, 2011
- Jeff Davis and Presidio counties
- 314,444 acres
- 23 homes destroyed
- 108 homes saved
- Burned for 37 days
- Caused by electrical fire in a home
- Third largest wildfire in Texas history

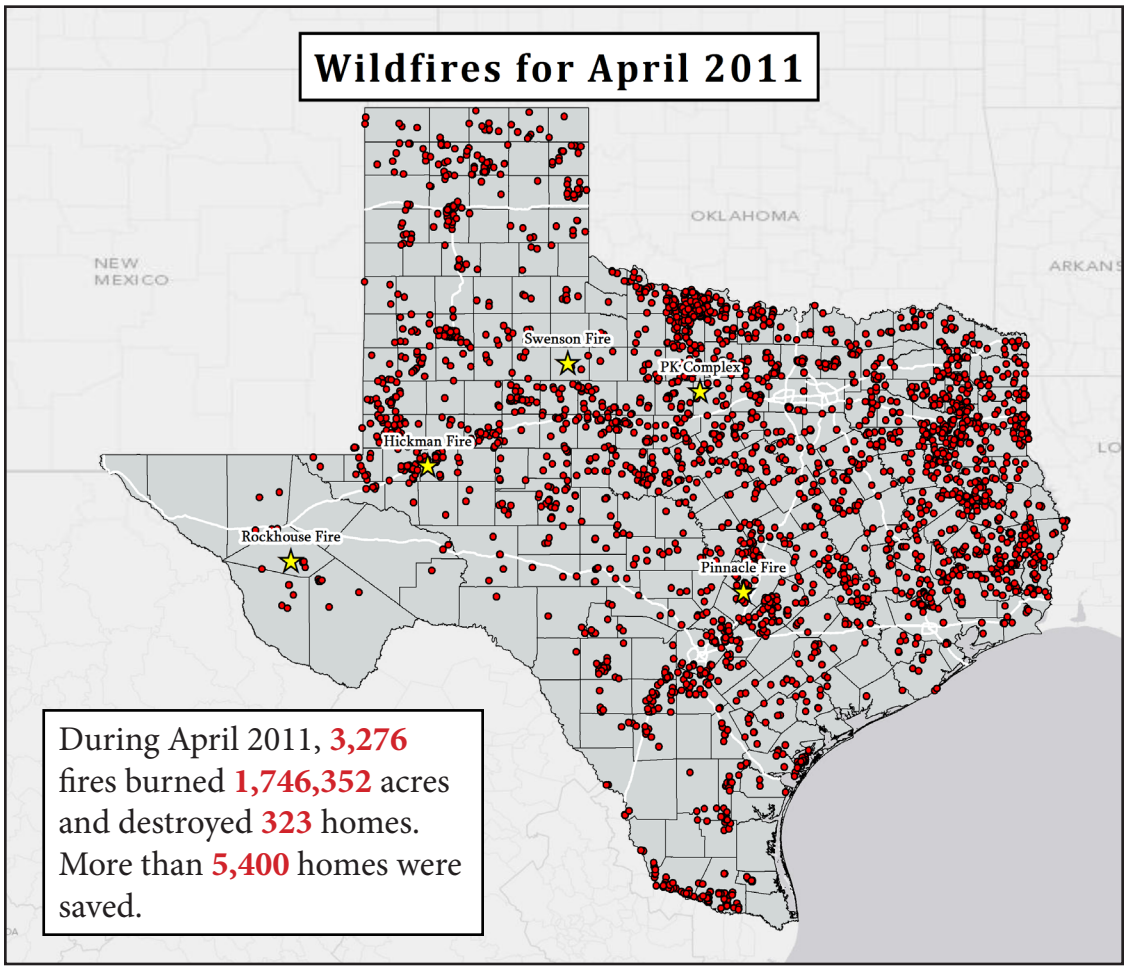
Possum Kingdom Complex - April 9, 2011
- Palo Pinto, Young and Stephens counties
- 126,734 acres
- 168 homes destroyed
- 1,249 homes saved
- Burned for 34 days
- Caused by lightning
- Eighth largest wildfire in Texas history

Swenson Fire - April 6, 2011

Pinnacle Fire - April 17, 2011

Hickman Fire - April 9, 2011
- Midland County
- 16,500 acres
- 34 homes destroyed
- 62 homes saved
- Burned for three days
- Caused by equipment use

Pinnacle Fire - April 17, 2011
- Travis County
- 100 acres
- 10 homes destroyed
- 150 homes saved
- Burned for four days
- Caused by an unattended campfire



Historically, April has been the peak month for the winter/spring wildfire season in North and West Texas. Dormant grasses still are present on the plains and frontal activity is at its peak.

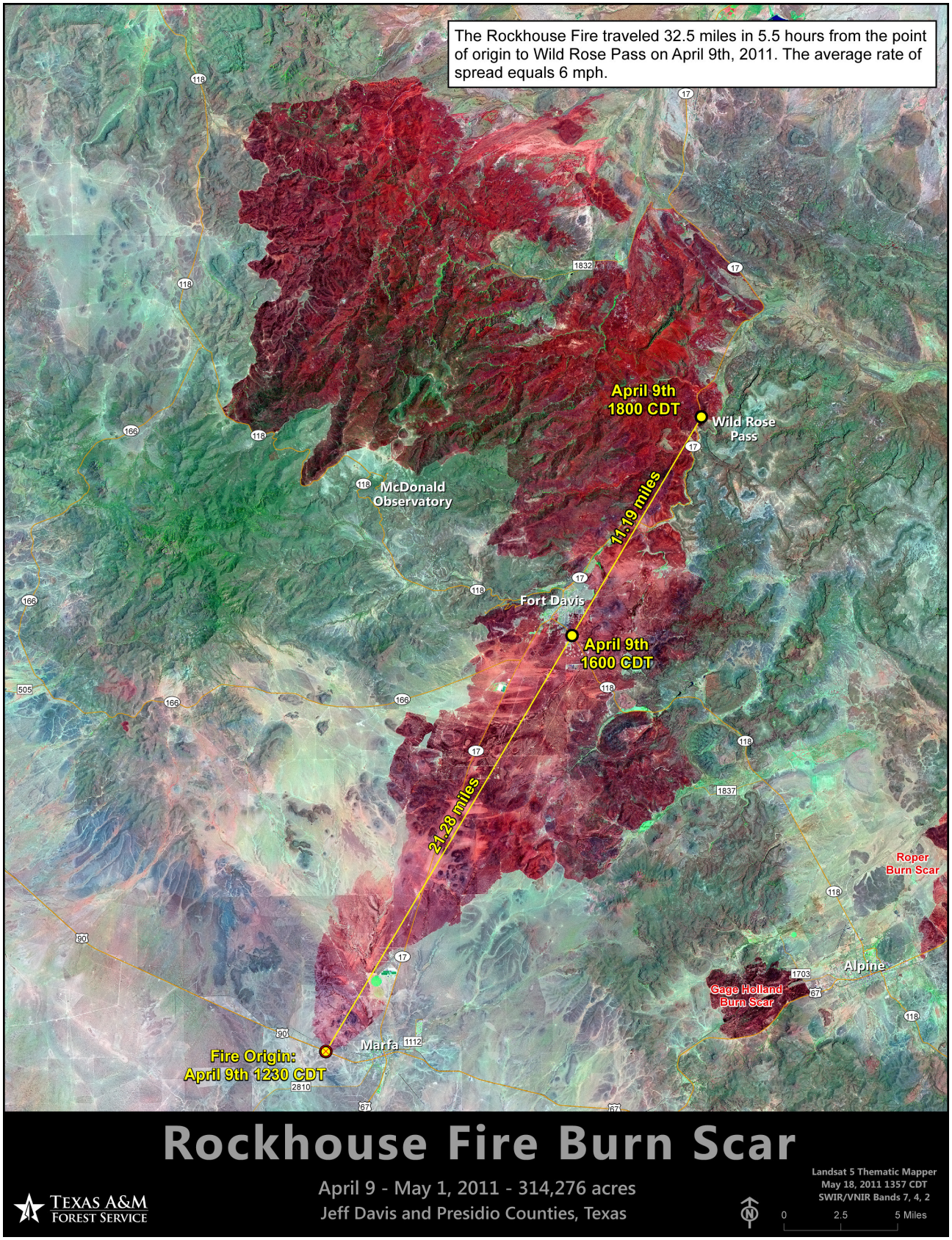
In 2011, April began with several consecutive days of accelerated drying, which left vegetation across much of the state at critically dry levels. Once vegetation becomes this dry, it's much more likely to ignite and spread into a massive wildfire — even when other critical fire weather factors aren't present.

The month's record-breaking wildfire activity kicked off April 6 with the Swenson Fire, which burned more than 122,000 acres in Northwest Texas. At the time, it was the largest fire burning in the nation and the largest of the 2011 Texas wildfire season.

Three days later on April 9, conditions aligned to create a Southern Plains Wildfire Outbreak, which resulted in 144 wildfires scorching more than 582,000 acres. Most of that destruction was the result of just three wildfires: Rockhouse, Possum Kingdom Complex and Hickman. Together, they burned 457,678 acres and destroyed 225 homes.

The Rockhouse Fire in Jeff Davis and Presidio counties was the third largest wildfire in Texas history. It ultimately burned 314,444 acres, destroyed 23 homes and threatened the University of Texas' McDonald Observatory, a world-renowned astronomical research center in the Davis Mountains.

In West Texas, wildfires are common and residents have grown to expect them. But the fires typically burn in remote, mountainous areas where they don't pose a threat to communities.



This Rockhouse Fire burn scar map shows the progression and scope of the blaze, which ignited near Marfa at 12:30 p.m. on April 9. By 4 p.m., the fire had traveled 21 miles to Fort Davis. At 6 p.m., the fire crossed Highway 17 at Wild Rose Pass, 11 miles northeast of Fort Davis.

The Rockhouse Fire was an exception. It started as an electrical fire in a home near the town of Marfa and ran 32 miles in a single afternoon, burning through the neighboring town of Fort Davis. Making matters worse was the gravity-fed, electrically-powered water system that serviced the area. When severe weather blew through on April 9, the community not only lost power, they also lost water, which hindered firefighters' efforts to save homes. After the fire, community leaders secured grant funds and upgraded their water system.

Rockhouse wasn't the only fire to break records that day. While Rockhouse was waging war on West Texas, the massive Possum Kingdom Complex was doing the same in North Texas.

The Possum Kingdom Complex — more commonly referred to as "the PK Complex" — burned more than 126,000 acres and was the eighth largest wildfire in Texas history.

The rugged terrain around Possum Kingdom Lake was a major influence on fire behavior.

The wildfire burned uphill, causing it to travel rapidly and burn intensely, exposing homes along hilltops and ridges to some of the most extreme fire behavior that emergency responders observed in 2011.

The vegetation, or fuel type, in this area consists mostly of juniper, which is considered a high-risk

> "The real lesson learned is **you have to prepare in advance**. Sometimes firefighters can't save your home. Many homes survived because of actions people took long before the fire occurred."
>
> *- Texas A&M Forest Service Wildland Urban Interface and Prevention Coordinator Justice Jones*

Flames on the Possum Kingdom Complex reached upwards of 100 feet, as evidenced by the burn marks on this 150-foot-tall water tower.

This home with fire-resistant construction and landscaping survived the Possum Kingdom Complex.

fuel because it burns intensely. The effects are even worse when junipers are drought-stricken, as they were in 2011. As a result, flame lengths on this fire reached upwards of 100 feet.

The Possum Kingdom Complex burned in parts of Palo Pinto, Young and Stephens counties, destroying 168 homes in its path.

"Juniper is a conifer, which means it has needles year-round," said Brad Smith, fire behavior analyst for Texas A&M Forest Service. "When it's dry, the canopy can support crown fire, which increases fire intensity by at least three times, most often by 10 times."

Many of the homes surrounding Possum Kingdom Lake are unoccupied secondary residences which made evacuation efforts easier. However, hundreds of people around the lake and in surrounding neighborhoods still had to be evacuated by emergency responders.

Flames from the Possum Kingdom Complex ran through the crowns of 15-foot-tall juniper trees.

April 9 Notes

Fuel and weather conditions are not normal. Expect the unexpected.

Widespread critically dry and extremely dry surface fuels.

10 consecutive days with critical fire weather.

Crown fire potential is high in live oak, juniper and pine.

This slide was included in the statewide morning briefing hosted by Texas A&M Forest Service on April 9, the day the Rockhouse, Possum Kingdom Complex and Hickman fires ignited.

When all was said and done, the fire had destroyed a total of 168 homes. At the time, it was more homes than had been destroyed by any other wildfire in Texas history, but the record would be short-lived. Little did anyone know at the time that just five months later, 10 times as many homes would be destroyed by wildfire in Bastrop.

Even though this home had non-combustible roofing, embers from the Hickman Fire ignited the attic days after the blaze passed through town.

The destruction continued across the state, with another April 9 ignition in West Texas. Burning in Midland County's flat terrain, the Hickman Fire started as a grass fire and steadily encroached on surrounding homes.

The fire ultimately destroyed 34 homes, most of them modular with attached decks and skirting that helped lead flames right up to the front door.

In one instance embers were blown into a home's attic as the fire passed by, but laid dormant for two days before igniting.

The wildfire was significant for Midland County, which is sparsely populated and hasn't traditionally seen wildfires that result in massive home destruction.

Extreme Fire Behavior

Torching — Occurs when a single tree or small group of trees "torch," or go up in flames.

Crowning — A fire that advances from treetop to treetop, more or less independent of a surface fire.

Spotting — Occurs when a fire produces sparks or embers that are carried by the wind and start new fires (spot fires) outside the perimeter of the original fire.

"This was one of the hardest [fires] to fight," Midland County Fire Marshal Dale Little told the Midland *Reporter-Telegram*. "We haven't had them with that many structures involved. We were trying to save every structure."

Conditions continued to worsen in the days that followed the April 9 wildfires. Winds gusted up to 40 mph and relative humidity dropped to single digits — conditions that were ripe for wildfire.

Eight days later on April 17, the Pinnacle Fire broke out near the community of Oak Hill in Travis County.

Though it was small — burning just 100 acres — it destroyed 10 homes. Emergency responders reported that the blaze displayed extreme behavior, running through the crowns of cedar and live oak trees, and lofting embers over entire city blocks, igniting homes far in advance of the fire.

Although the Pinnacle Fire burned only 100 acres, 10 homes were destroyed.

April ended with a tragic new record on the books: Six of the top 10 largest wildfires in Texas history had occurred in that single month, burning a combined 1 million acres and destroying almost 200 homes. As communities across Texas began to recover and rebuild, many of them looked for ways to protect themselves from future destruction.

"After the Pinnacle Fire, our executive team sat down and said, 'We've got to start getting information out there,'" said Austin Fire Lt. Josh Portie.

The fire department identified at-risk areas and distributed door hangers with information about **Firewise** landscaping practices, which can help a home withstand wildfire. They also spread the word about the national **Ready, Set, Go!** program, which teaches residents to prepare for wildfire, stay aware of conditions and be prepared to evacuate early, if needed.

"We're seeing the efforts of homeowners," Portie said. "We're seeing what they're doing to get their homes ready before a fire starts. The response from the community has been extremely positive and extremely effective."

Travis County, which encompasses the city of Austin, also has made strides in educating its residents. The county's Emergency Services District No. 4 developed a "structural triage" mapping system in Google Earth that identifies hazards and risks surrounding homes in the district.

It provides a clear visual illustration to the public that explains why firefighters sometimes have to choose which homes can be defended and which ones can't, explained Emergency Services District No. 4 Wildfire Mitigation Coordinator Kenneth Humphries.

To develop the tool, Humphries led a team in assessing all 1,200 homes in the district. Each home was assigned a score based on risks and hazards, and the scores were then color coded and plugged into Google Earth.

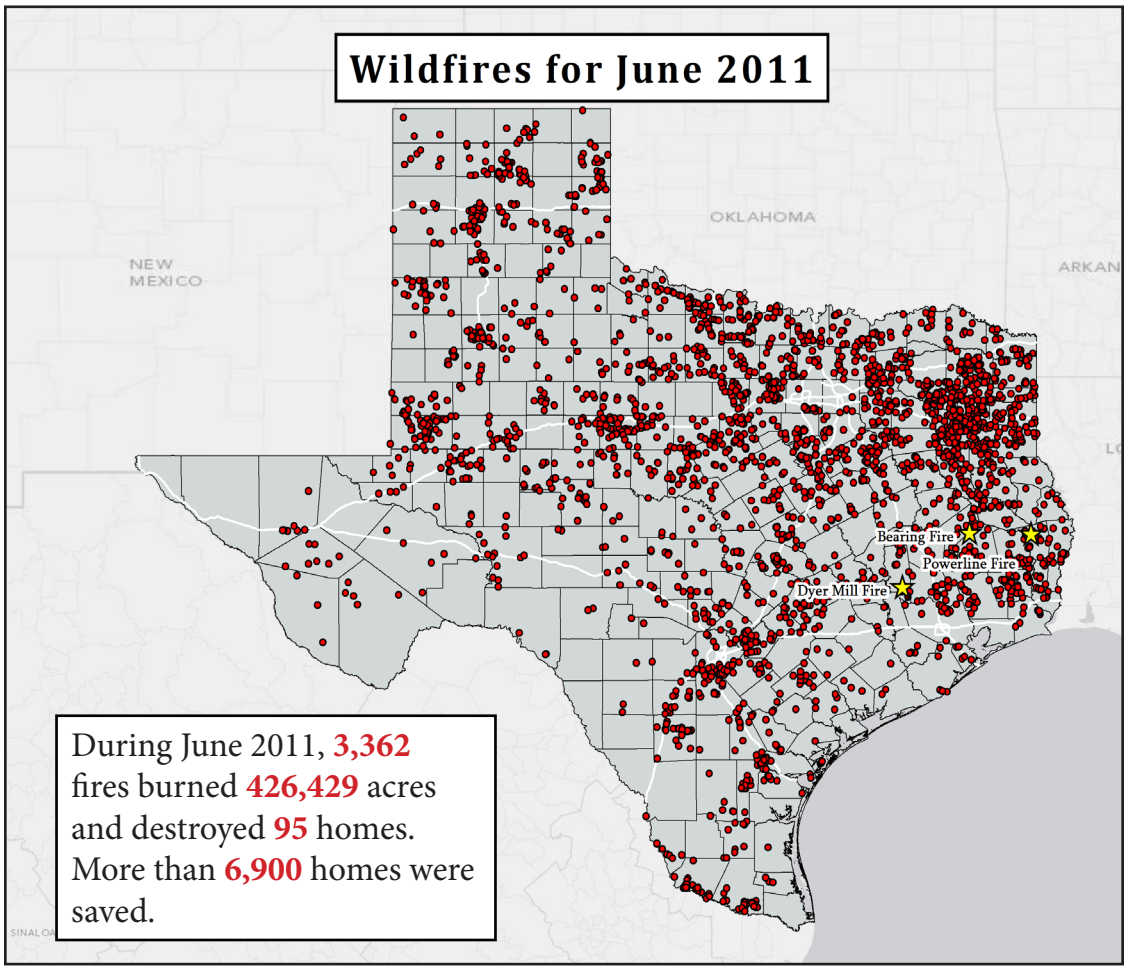
"You can see where the fire station is, how the homes are laid out and how difficult it may be to access a particular subdivision in the hilly terrain," Humphries said. "You can really see the areas that are going to take more firefighting resources to defend. Structural triaging has been an effective tool for us to show people what the fire department is up against in an overwhelming wildfire when we'd have to make those kinds of decisions."

June 2011

Bearing Fire - June 17, 2011
- Polk and Trinity counties
- 20,222 acres
- One home destroyed
- 34 homes saved
- Burned for 42 days
- Caused by equipment use
- 21.4 million to 30.6 million cubic feet of timber destroyed (worth $12.8 million to $18.3 million)

Dyer Mill Fire - June 19, 2011
- Grimes County
- 5,280 acres
- 30 homes destroyed
- 1,880 homes saved
- Burned for 18 days
- Caused by a barbecue pit
- 4.7 million to 6.7 million cubic feet of timber destroyed (worth $2.5 million to $3.6 million)

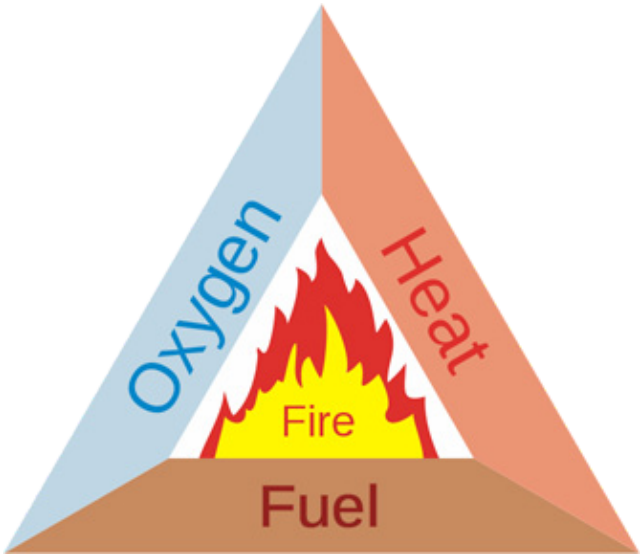
Powerline Fire - June 20, 2011
- Jasper County
- 4,197 acres
- No homes destroyed
- 20 homes saved
- Burned for 23 days
- Caused by people shooting guns at propane tanks
- 3.3 million to 5.1 million cubic feet of timber destroyed (worth $2 million to $3.1 million)



Because of spring rains, March through May normally is one of the wettest time periods of the year in Texas. But that was not the case in 2011. That three-month period was the driest March-May ever recorded in Texas, according to ***The 2011 Texas Drought***, a publication produced by State Climatologist John Nielsen-Gammon. At that point, the drought already was well-established in Texas. The abnormally dry period only made things worse.

Normally, summer fire season starts in late July, but consecutive hot, dry days stripped vegetation across the state of its moisture, setting up June as the beginning of summer fire season.

By June 17, critically high winds were forecast for much of East Texas. That, combined with exceptional drought conditions and critically-dry pine trees, laid the foundation for massive wildfires.



A fire needs three elements to burn: oxygen, heat and fuel. If any of these elements is removed, the fire will not burn.

And that's just what happened.

A series of wildfires broke out June 17 in East Texas including the Bearing Fire which burned 20,222 acres in Polk and Trinity counties and destroyed $18.3 million worth of timber.

On June 17, 2011, firefighters responded to several large, high-intensity wildfires, all of which were marked by high-intensity crown fires in high-risk timber fuels. Pictured is the smoke column from a crown fire in Jasper County.

The fire started burning in the understory vegetation on the forest floor. But high winds helped push the flames into the treetops.

Pines are considered a high-risk fuel because of their ability to produce high-intensity crown fires. Such blazes burn so intensely, they often cannot be contained by firefighters. Rather, firefighters must depend on a change in weather or vegetation. Chances of containing the fire increase significantly once the fire drops out of the crowns and back to the forest floor.

Just two days later on June 19, the Dyer Mill Fire ignited in Grimes County. The 5,280-acre blaze — one of 43 new wildfires to which

the state was called on that day alone — exhibited extreme fire behavior and blew over containment lines in six different places, according to the fire report.

The Dyer Mill Fire occurred on the fringes of the East Texas Pineywoods, where pine plantations intermingle with pasture lands. Homes are intermittently located across the diverse landscape.

More than 1,800 homes were evacuated as the Dyer Mill Fire burned through the area, producing embers that ignited homes miles away from the original fire.

This photo shows the widespread damage from the Dyer Mill Fire, where 30 homes and $3.6 million worth of timber was destroyed.

"The development pattern in this area creates unique challenges for firefighters trying to protect homes," said Justice Jones, Wildland Urban Interface and Prevention coordinator for Texas A&M Forest Service. "In a traditional neighborhood setting, firefighting resources can sometimes protect multiple homes with a single fire engine. But because homes are more spread out in this area, more resources are required to protect them. Homes built within stands of dense pine are subject to intense heat, which can easily ignite combustible materials."

The porch of this home on the Dyer Mill Fire was ignited by embers that were spread by strong winds. Fortunately, a fire engine was stationed near the home and firefighters were able to extinguish the blaze before it spread to the house.

A total of 30 homes and $3.6 million worth of timber were destroyed.

Ember intrusion was a common denominator among home destruction, especially among modular homes that were vulnerable to wildfire because they had attached decks and skirting. Many of the homes were surrounded by thick pine stands and lacked defensible space — a zone around the home clear of vegetation and combustible materials.

September 2011

Bastrop Complex - Sept. 4, 2011
- Bastrop County
- 32,400 acres
- 1,660 homes destroyed
- 1,091 homes saved
- Burned for 37 days
- Caused by power lines

Steiner Ranch Fire - Sept. 4, 2011
- Travis County
- 125 acres
- 20 homes destroyed
- 500 homes saved
- Burned for six days
- Cause not identified

Bear Creek Fire - Sept. 4, 2011
- Cass and Marion counties
- 41,050 acres
- 66 homes destroyed
- 400 homes saved
- Burned for 51 days
- Cause not identified
- Largest wildfire in East Texas history

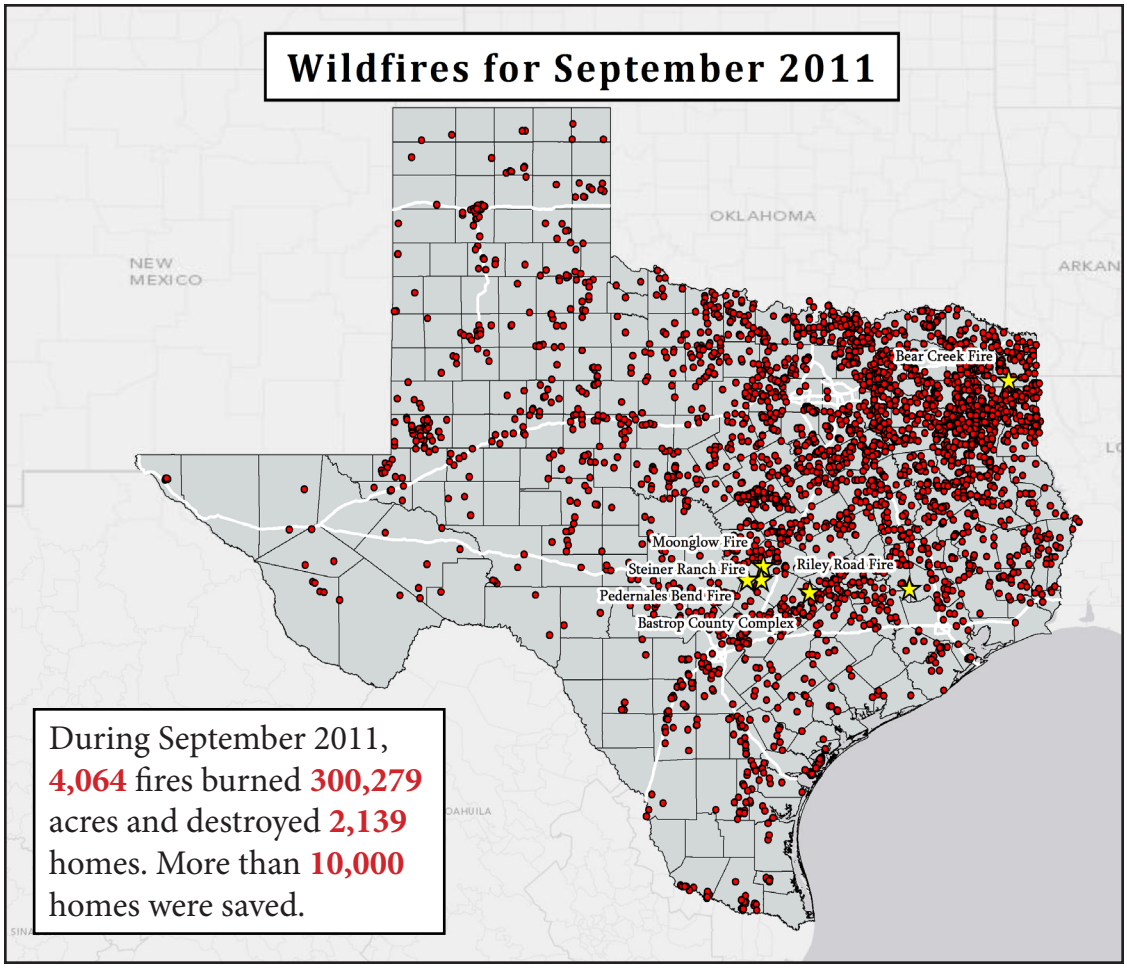
Riley Road Fire - Sept. 5, 2011

Spicewood Fire - Sept. 4, 2011

Spicewood Fire - Sept. 4, 2011
- Travis County
- 6,500 acres
- 67 homes destroyed
- 500 homes saved
- Burned for eight days
- Cause not identified

Riley Road Fire - Sept. 5, 2011
- Montgomery, Grimes and Waller counties
- 19,960 acres
- 73 homes destroyed
- 266 homes saved
- Burned for 28 days
- Caused by lightning

Moonglow Fire - Sept. 5, 2011
- Williamson County
- 84 acres
- 16 homes destroyed
- 350 homes saved
- Burned for two days
- Caused by children using a torch



In September 2011, Central Texas experienced some of the most severe drought conditions in state history. Record summer heat — the hottest summer on record for Texas — baked the landscape and vegetation growing on it. The record heat and critically dry vegetation — namely, a large expanse of pine trees — set the stage for the possibility of a destructive fire near Bastrop. All that was missing was a weather trigger.

And that weather trigger arrived on Sept. 4, when warm, dry air from Tropical Storm Lee collided with a dry cold front coming in from the west. The two air masses converged over Central Texas, with the epicenter above Bastrop County.

Forty-two wildfires already were burning when the Bastrop Complex ignited at 2:20 p.m. on Sept. 4. Texas A&M Forest Service was called to respond to the fire at 3:02 p.m., just 42 minutes later. The agency immediately deemed the wildfire a priority because of the abundance of pine trees in the area — considered high-risk timber fuels because they burn so intensely.

At 32,400 acres, the Bastrop wildfire wasn't one of the largest to burn in Texas. But it was the most destructive blaze in state history, wiping out 1,660 homes and 36 commercial buildings, and resulting in two fatalities.

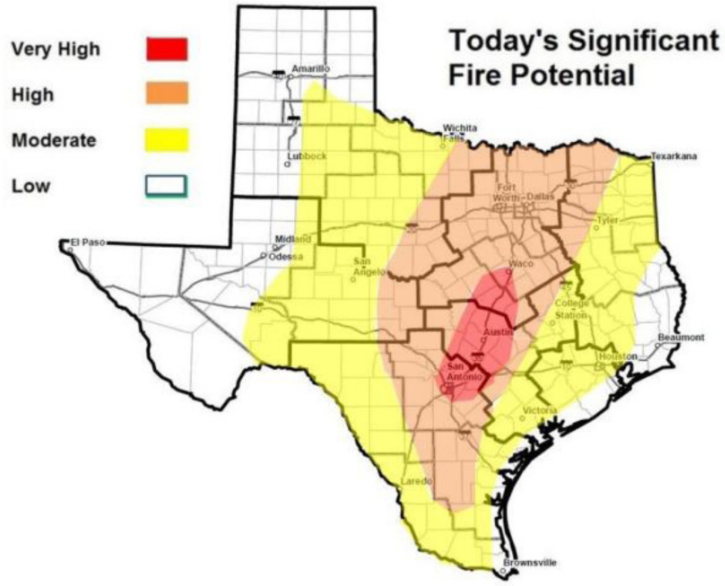
Without the pine trees and their associated vegetation, the impact of the fire would have been significantly reduced. Pine needles and branches had accumulated on the forest floor, which meant the ground was loaded with fuel for the fire. As the amount of dead vegetation — or dead litter fuel — on the forest floor increases, so does the intensity of the surface fire.

Sept. 4 Notes

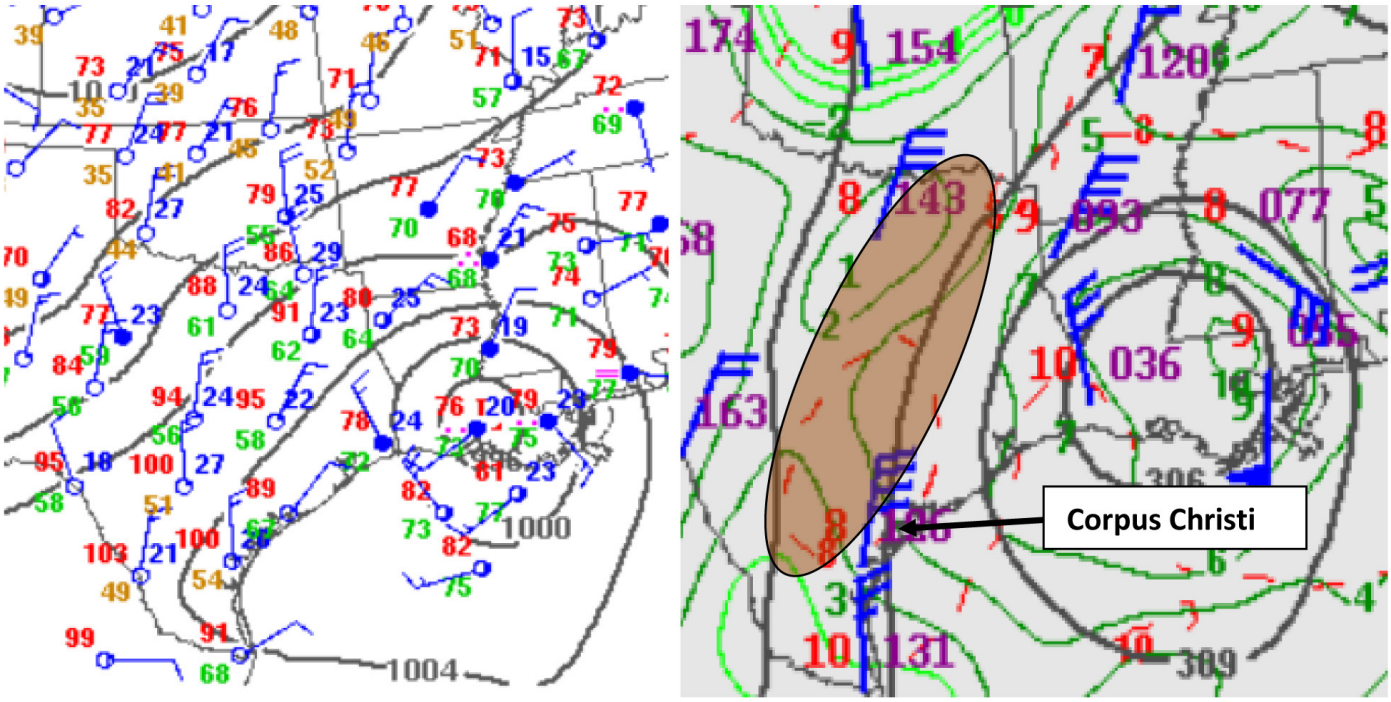
Increased wind from Tropical Storm Lee over extremely dry, high-risk fuels in East Texas, North Texas, Central Texas and portions of the Hill Country and South Texas ... High to very high significant fire potential.

Changing winds with frontal boundary and thunderstorms will be present.

High-risk fuels in high to very high significant fire potential will produce extreme fire behavior ... Public and firefighter safety at risk.



Texas A&M Forest Service officials discussed the slides above during the statewide morning briefing on Sept. 4, 2011.



This graphic of observed conditions shows that the combination of a cold front and Tropical Storm Lee resulted in increased winds. On the left is a surface map depicting wind in knots and showing Tropical Storm Lee near the Louisiana coast at 7 p.m. on Sept. 4. The graphic on the right shows the 700 mb height pattern with dry air to the west of Tropical Storm Lee circulation in central Louisiana at 7 p.m. on Sept. 4. These graphics helped to validate the forecast issued by the National Weather Service for Sept. 4.

Once the fire began burning in the pine trees, it quickly spread south. Fire intensity was extreme as the blaze moved through the crowns of pine trees, with flames reaching up to 300 feet. It was unsafe for firefighters to attack the blaze head-on. The Bastrop Complex was a true force of nature — and could not be stopped until the weather changed or it ran out of pine to burn.

The smoke column over Bastrop indicates an intense, wind-driven crown fire.

This wasn't the first time Bastrop County was devastated by wildfire. The 900-acre Craft's Prairie Fire in 1984 and the 1,491-acre Wilderness Ridge Fire in 2009 destroyed a combined 52 structures.

"The Wilderness Ridge Fire was in the footprint of the 2011 Bastrop fire," said Justice Jones, Texas A&M Forest Service Wildland Urban Interface and Prevention coordinator. "If an area has burned once, it can burn again."

This Bastrop home caught fire after flames crept through surrounding pine needles and bushes until they reached the eaves of the house.

Bastrop officials were aware of the potential danger their community faced the day of the 2011 wildfire — and they moved swiftly to evacuate more than 5,000 residents in four hours. Because of the extreme fire behavior that would occur on this fire, home destruction was almost inevitable, and moving people out of harm's way became the top priority.

Bastrop Fire Chief Henry Perry said training and experience were key elements to the response efforts on the 2011 fire.

This photo captures the head of the fire as it crosses Highway 71. The strength and momentum of this head fire was resistant to suppression efforts including aircraft.

"The best thing we did in advance — other than developing a Community Wildfire Protection Plan – was ensuring our equipment was up to date," Perry said. "We take advantage of every grant program available. I believe in mandatory training, using the incident command system and wearing proper personal protective equipment. And all that paid off because once that fire popped, we knew we weren't going to get any help from surrounding counties. They had fires of their own that were already going."

Of the 2,853 total structures within the Bastrop fire perimeter, 1,157 survived, due to the efforts of firefighters and defensive actions taken by homeowners in advance.

Suppression resources weren't able to access many of those homes because of the extreme fire behavior, which proves the homes were able to survive on their own.

Chief Perry said while he hopes that Bastrop firefighters have now responded to the most destructive wildfire they'll see in their careers, it's important to remain constantly vigilant.

"My advice to anyone in an at-risk community is to mitigate," he said. "You do that by fuels reduction. We had sawyers out there [the day of the fire] sawing off decks, but you can't move every tree out of the way. You've got to be proactive."

Many communities were at risk on Sept. 4, 2011. As wildfire raged through Bastrop, two more fires — Steiner Ranch and Spicewood — started in neighboring Travis County.

More than 1,000 homes were evacuated in the Steiner Ranch community in advance of the approaching fire, which spread from structure to structure via wooden decks and other contiguous fuels. The Steiner Ranch Fire was just 125 acres, but it destroyed 20 homes. The Spicewood Fire burned 6,500 acres and destroyed 67 homes.

The dangerous fire behavior wasn't limited to Central Texas. The largest wildfire in East Texas history also started that day.

The Bear Creek Fire burned 41,050 acres of heavy timber in Marion and Cass counties, destroying 66 homes.

Typically fires in East Texas remain relatively small because the land is fragmented and firefighters have better access to it, and there are more resources available to respond. But the winds from Tropical Storm Lee quickly pushed the fire through the pine plantation.

"The factors that contributed to home loss on Bear Creek were tropical storm winds, contiguous fuels and a lack of defensible space around the homes," said Texas A&M Forest Service Wildland Urban Interface Specialist Lee McNeely. "Fires were everywhere, so we were competing for resources."

By the end of the day on Sept. 4, more than 430 wildfires had been reported across the state.

There appeared to be no relief in sight as just one day later, state resources were called to the Riley Road Fire, which burned 19,960 acres and destroyed 73 homes. It threatened the densely-populated city of Magnolia in Montgomery County, as well as parts of neighboring Grimes and Waller counties.

Considered the largest wildland urban interface fire in East Texas history, the blaze stopped just short of the Harris County line, home to the city of Houston.

It even burned through a planned high-density subdivision, where roads and infrastructure were in

The Bear Creek Fire destroyed 66 homes in Marion and Cass counties.

This home on the Riley Road Fire didn't ignite because a portion of the attached fence was removed, preventing the fire from spreading to the house. Many other homes in the fire's path weren't as fortunate.

place, but fortunately only a few homes had been built.

The fire burned in an area of mature pine stands with abundant understory — shrubs and plants growing beneath the canopy of the forest. This led to crown fires that lofted embers ahead of the main blaze.

"That created a leapfrog effect for firefighters to contend with," Jones said.

Many homes were threatened multiple times as fires smoldering in pine needles and tree roots rekindled when humidity levels dropped and winds increased.

Sixteen homes were destroyed by the Moonglow Fire in Williamson County.

Continuous patrol of these homes was a key factor in preventing ignitions after the fire already passed through. In many instances when homes did ignite, combustible attachments — such as decks — were a contributing factor because they led flames right up to the home.

The Riley Road Fire wasn't the only new ignition on Sept. 5. Just 150 miles to the west, the Moonglow Fire burned 84 acres and destroyed 16 homes in Williamson County — the largest per-acre home loss fire in Texas history.

"Sometimes people think the bigger the fire, the more destructive it is," Jones said. "But when it comes to home loss, it's more about location."

The September wildfires would be among the final destructive blazes of the wildfire season, which officially ended on Oct. 31, 2011.

"There was a clear demarcation between October and November," said Tom Spencer, Predictive Services department head for Texas A&M Forest Service. "In October, we were having more fires and larger fires, and they were exceeding the capability of local fire departments. By November, we were having fewer fires and smaller fires, and local fire departments were able to manage them without help from the state."

"**Consider your home and anything attached to it as one potential fuel source**. You can't make the assumption that because your home is mostly non-combustible, it won't burn. You can do simple, inexpensive things, like create a fire break around your house with gravel, that will improve the structure's chances of survivability."

- Texas A&M Forest Service Wildland Urban Interface and Prevention Coordinator Justice Jones

Common Denominators of Home Destruction

Primary factors leading to home ignition during the 2011 wildfire season are listed and illustrated in the pages that follow.

- Wildfires driven by high winds sent a profuse amount of embers ahead of the main fire. These winds forced embers into home ventilation systems and underneath pier and beam foundations, igniting homes from within. They also ignited combustible materials — such as railings, decks or awnings —on or around homes.

Open or unscreened foundation vents provided embers access to a vulnerable pier and beam foundation.

Combustible soffits can melt or ignite, giving embers access to an attic. Once inside, the embers can go undetected until it is too late to save the home.

- Combustible attachments to homes that were not pre-treated with fire-resistant paint or chemicals acted as a fuse that led fire right up to the home.

Combustible materials on and around decks can increase the chances of ignition.

Combustible decks that aren't treated with fire-resistant paint or chemicals are more likely to catch fire.

- Fires often spread to surrounding homes from vehicles, outbuildings, firewood and other combustible items that already had caught fire and were generating a tremendous amount of heat.

Patio furniture can provide a wildfire enough fuel to ignite a home. Note the green trees on each side of the home did not catch fire, which means they were not contributing factors.

- Windows not designed to withstand heat fractured, creating an opportunity for flames and embers to penetrate homes.

Embers from a nearby fire gained access to this home's interior, igniting it and causing significant damage.

- Landscapes with highly combustible vegetation — such as flammable plants — leading up to a home and landscape elements such as combustible railroad ties, railings and walkways created a path for fire to follow and made homes more susceptible to ignition.

Relatively fire-resistant homes can ignite during low-intensity wildfires if a path of combustible material, such as stairs or support beams, leads the fire up to the home.

- Homes that caught fire generated so much heat and so many embers that they essentially became fuel for the fire and ignited surrounding homes and structures.

This photo shows an example of structure-to-structure ignition. Note the unburned vegetation surrounding the home, which indicates ground fire intensity was low and points to ember intrusion as a probable factor in ignition.

Many homeowners took action to prepare their homes for wildfire before the blazes occurred.

The concrete driveway and gravel walkway created a critical space that firefighters needed to defend this home in the path of the Pinnacle Fire in Austin.

The noncombustible brick retaining wall along the back of this home helped stop the spread of the Pinnacle Fire. Conversely, retaining walls constructed out of combustible materials such as railroad ties can ignite easily and burn intensely for long durations.

Wildfire traveled unimpeded through the landscape of this home, igniting shrubbery in front of a window. Fortunately, the homeowners used fire-resistant, double-paned windows. Although the first pane was compromised, the inner pane withstood fracture, helping the home survive.

The tiered landscape, elevated retaining wall, irrigated lawn, gravel fire break and non-combustible wrought-iron fence likely provided additional protection to this home.

Best Practices for Reducing Home Destruction

The 2011 wildfire season was devastating and left an unforgettable mark on the lives of many Texans. Emerging from the ashes are numerous success stories that have inspired others to take action. Heroic first responders battled some of the most extreme blazes Texas ever has seen and saved nearly 40,000 homes. And firefighters weren't alone in the battle. Many residents took action to reduce the threat of wildfire around their homes and communities. These efforts will make a tremendous impact as Texas prepares for future wildfires.

Texas A&M Forest Service began a public education campaign in Fall 2010 to prepare communities for the dangerous wildfire season that was to come. Post-fire research found that the campaign helped heighten public awareness, which may have resulted in fewer deaths and injuries and less home destruction. Of the 31,453 wildfires that occurred throughout the year, just 354 — or 1 percent of the total — destroyed homes.

But one home destroyed is one too many. The pages that follow outline strategies and tools for homeowners, local government officials and emergency responders to determine wildfire risks and protect their homes and communities from future wildfires.

This home was constructed with fire-resistant materials — masonry siding and noncombustible roofing — and used Firewise landscaping practices that greatly increased its survivability and created a safer working environment for firefighters.

When preparing for wildfire, the first step is to know your risk.

The **Texas Wildfire Risk Assessment Portal (TxWRAP)**, launched in April 2012, offers a host of tools to help homeowners and professionals assess wildfire risk and teach them how to reduce it.

TxWRAP calculates risk for a particular area by looking at historical fire occurrence and the location of people and structures in the wildland urban interface. Users then are linked to products from Texas A&M Forest Service that will guide them through the steps they can take to better protect their homes from wildfire.

Professional users — city planners, fire chiefs, county judges and others — can use TxWRAP to generate specific information about fuels, topography and characteristic fire behavior in their area. TxWRAP also generates a 74-page report that can be used as a tool to support grant applications, mitigation projects and resource allocation.

It's also important to evaluate the construction materials used to build your home and manage the vegetation surrounding it. The **Firewise** program covers best practices for home construction and landscaping, outlining how homeowners can create defensible space — a zone free of combustible material — to protect their property.

The document **Fire Resistant Materials** makes the following recommendations on home construction and repairs:

- Vents provide the perfect opening for embers. Add a 1/8-inch metal screen over vent openings to create a barrier.
- Keep combustible materials such as leaves and pine needles cleared from the roof.
- Use ignition-resistant roofing materials such as metal, concrete or clay roof tiles and fiberglass asphalt composition shingles.
- Remove debris from gutters and use metal

Firewise Communities USA

To become "**Firewise**," a community must:

- Obtain a wildfire risk assessment
- Create an action plan based on the assessment
- Conduct a community cleanup event
- Invest a minimum of $2 per capita in local Firewise actions
- Submit an application to state Firewise liaison Patrick Allen at **pallen@tfs.tamu.edu**

Download **products** on embers, Firewise landscaping, Firewise construction and vegetation management.

gutters and gutter guards.
- Use cement board, masonry or stucco siding, and make sure there are no crevices or holes that could potentially catch embers.

The document **Firewise Landscaping in Texas** makes the following recommendations on landscaping:
- Keep plants properly watered and avoid large clumps of plants that can generate high heat.
- Highly flammable plants should be removed or isolated.
- Around the home, use material such as rock or stone instead of mulch to create a buffer between the grass and foundation. Small shrubs with low density can provide beauty and other benefits.
- Remove dead and dying plants.
- Keep shrubs small, prune and clean under all plants and maintain a green and mowed lawn.

Following the 2011 wildfire season, many homeowners shared success stories detailing how Firewise construction and landscaping practices helped save their homes.

One family in Bastrop consulted with a Texas A&M Forest Service Wildland Urban Interface specialist prior to building their home. They incorporated all Firewise construction recommendations, and when the fire approached their home in the Tahitian Village subdivision on Sept. 4, "it hit the landscaping and stopped, even as embers landed on and around the home," said Wildland Urban Interface and Prevention Coordinator Justice Jones. "The ignition-resistant construction material robbed the fire of the fuel it needed to sustain itself. The fire basically walked around the house."

Proactive measures like that, coupled with valiant efforts by first responders, saved homes and lives in Bastrop. Of the 2,853 structures within the Bastrop fire perimeter, 1,157 survived. The same was true across the state, as more than 39,000 homes were saved during the 2011 wildfire season.

Many community leaders across the state planned in advance of the wildfire season, while others are taking action based on the lessons they learned from it.

"By taking advantage of existing tools and getting that information out to the public, we think we can build communities that are truly fire-resistant," said Harris County Fire Marshal Mike Montgomery. "Some of the

Ready, Set, Go!

The **Ready, Set, Go!** program is a tool firefighters can use to teach those who live in high-risk areas how to best prepare themselves and their properties for wildfire.

The program emphasizes three tenets:

- **Ready** — Prepare your home and family for wildfire ahead of time.
- **Set** — Stay aware of conditions and know what's going on around you.
- **Go** — Be prepared to evacuate early, if needed.

Download your own **Personal Wildfire Action Plan**.

examples we're talking about are very simple and low cost to property owners: building defendable spaces around homes and other structures, then also creating defendable spaces farther away from your home through fire-resistant landscaping. The final step is proper community planning, better egress and ingress routes into communities, adequate turnaround spaces for fire trucks, things like that."

One tool that community leaders are using to educate residents is the national **Ready, Set, Go!** program — through which firefighters teach homeowners how to better prepare their properties for wildfire and develop an evacuation plan.

The enhanced awareness generated by Ready, Set, Go! meetings held across the state in advance of the 2011 wildfire season led to informed citizens and responders and many successful, life-saving evacuation efforts. More fire departments in Texas participate in this program than anywhere else in the nation.

On Sept. 5, the Riley Road Fire burned almost 20,000 acres in three counties and destroyed more homes than any other wildfire in East Texas history. Despite the massive destruction, there were no fatalities reported, and emergency responders successfully evacuated hundreds of residents.

Mineral Wells fuel mitigation

Texas A&M Forest Service recently worked with the Texas Army National Guard, Texas Parks & Wildlife Department and Parker County on a fuels reduction and habitat management project.

A group of 30 conducted a prescribed burn on Mineral Wells State Park and Fort Wolters. About 93 acres on the National Guard base and 211 acres on the state park were treated. Texas Forest Service task force members provided a leadership role, working alongside eight National Guard personnel and 14 Parker County firefighters.

Texas A&M Forest Service and Texas Parks and Wildlife Department provided equipment, and the National Guard brought two Type 6 engines. Parker County provided three Type 6 engines and a tender.

"This was a great interagency effort that resulted in the reduction of wildland fuels on more than 300 acres," said Program Coordinator Rich Gray. "At the same time, it provided a realistic training opportunity for the National Guard and Parker County firefighters."

Texas A&M Forest Service

Texas A&M Forest Service and local fire departments conduct statewide fuels reduction projects including this effort in Parker County.

Several Ready, Set, Go! meetings were held in the area prior to the fire, and Magnolia Fire Chief Gary Vincent has credited the outreach by the local fire service and Texas A&M Forest Service as one of the reasons why the Riley Road evacuation effort was successful. Residents clearly understood the risk and heeded the warnings.

Other communities came together after being ravaged by wildfire to look at lessons learned and how they could better protect themselves in the future. Many began working toward the national **Firewise Communities** designation. The program empowers residents to prepare their neighborhoods for wildfire by obtaining a risk assessment, creating an action plan, conducting community cleanup events and investing a minimum of $2 per capita in local Firewise actions.

> "Some things we've done to address our wildland urban interface threat are **increase our training and look at our response methodology**. We're constantly trying to revamp and improve."
>
> *- Austin Fire Lt. Josh Portie*

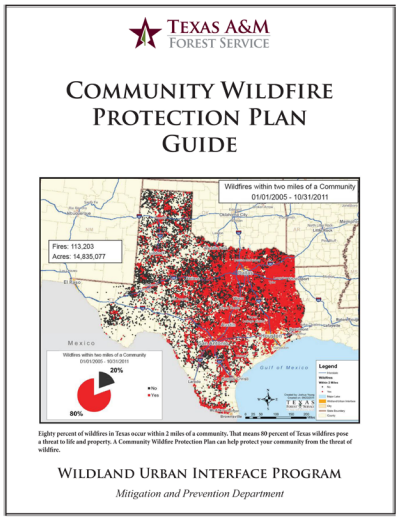
The city of Amarillo began working on its Firewise designation after the Tanglewood Complex destroyed 33 homes in February 2011. Amarillo and other Panhandle

communities, in conjunction with Texas A&M Forest Service, also hosted a Wildland Urban Interface Summit in 2012 to bring community leaders, residents and firefighters together to discuss strategies and tools for reducing wildfire risks. Also in 2012, city leaders took an innovative step by enacting a weed abatement ordinance to reduce hazardous vegetation throughout the city.

Affected by the Possum Kingdom fires of 2011, The Ranch, a community consisting primarily of secondary residences, pulled together en masse and worked to ensure that their homes were prepared, should they be confronted with another fire. The residents reduced vegetation throughout the community and earned a Firewise designation.

Community Wildfire Protection Plans

Community Wildfire Protection Plans are designed to assess hazards, identify risks and set goals for mitigating those challenges. The plans, also known as CWPPs, serve as a framework to protect life, property and natural resources from wildfire.


TEXAS A&M FOREST SERVICE

COMMUNITY WILDFIRE PROTECTION PLAN GUIDE

Wildfires within two miles of a Community 01/01/2005 - 10/31/2011

Fires: 113,203
Acres: 14,835,077

Mexico

Gulf of Mexico

Legend

Wildfires within two miles of a Community 01/01/2005 - 10/31/2011

20%

80%

Eighty percent of wildfires in Texas occur within 2 miles of a community. That means 80 percent of Texas wildfires pose a threat to life and property. A Community Wildfire Protection Plan can help protect your community from the threat of wildfire.

WILDLAND URBAN INTERFACE PROGRAM

Mitigation and Prevention Department

Community leaders at the Davis Mountain Resort in West Texas did the same, seeking the Firewise designation after the Rockhouse Fire threatened their homes in April 2011. When the Livermore Ranch blaze ignited in the same area the following year, residents were prepared, and no homes were destroyed.

In Bastrop County, leaders have long recognized the potential risk wildfire poses to residents and natural resources in the area. In 2006, before the Wilderness Ridge Fire and five years before the Bastrop Complex, county officials developed one of the first **Community Wildfire Protection Plans**, designed to assess hazards, identify risks and set goals for mitigating those challenges. The plans, also known as CWPPs, serve as a framework to protect life, property and natural resources from wildfire.

Cedar Hill in Dallas County developed a Community Wildfire Protection Plan prior to the 2011 wildfire season, and used it to identify training and equipment needs, fuel mitigation projects and risk-reduction strategies.

"This document, while it's not a specific plan that tells people to do one specific thing or another, it's a general idea that our city leaders have developed and adopted to say these are the things we want to do," said Cedar Hill Fire Chief John Ballard. "We want to look at sustainable materials. We want to make defensible spaces. We want to make the community maintain its natural beauty

"If you don't have a Community Wildfire Protection Plan, you don't realize the benefit this plan will bring **not only in wildfire situations but in every emergency or disaster situation that you may encounter.** By working together as a team, this plan brought together a united front for Walker County, the city of Huntsville, Riverside and New Waverly."

- Butch Davis, Walker County Emergency Management Coordinator

but we want to make it defensible and minimize the danger of a wildfire issue in our interface."

Cedar Hill officials are working with Texas A&M Forest Service representatives to build demonstration areas for citizens to observe the fuel reduction projects in progress.

"We don't want [residents] to think this is a 'bulldoze it and wipe it clean' deal," Ballard said. "This is a reduction plan to make the area defensible but maintain the beauty that it has from the forest. Our citizens can go out and see what a fuel reduction project looks like. They can get a much better understanding of the scope and breadth of what the program is trying to accomplish."

This well-maintained landscape helped keep flames from the intense Possum Kingdom Complex far enough from this home to prevent ignition. Its non-combustible roofing, lower-level siding and support beams may have protected it against ember intrusion.

Bob Watson, fire chief in the Panhandle city of Borger, said it's imperative for community leaders to plan in advance for wildfire.

"Fire is not going away," Watson said. "Fire behavior is changing. Climate is changing. There are a lot of things that point to our fires getting worse instead of better. For a city not to pay attention to that, I think that's ludicrous. As fire chiefs, as city officials, it's your job to protect your city."

During the heat of the wildfire season in 2011, Leander city officials adopted a wildland urban interface code designed to address future developments and build communities that are better adapted to wildfire.

When entire communities are threatened, it's almost inevitable that there won't be enough firefighters to protect every home. In 2011, many of the blazes were so massive and moved so quickly into populated areas, first responders had to focus instead on saving lives and ensuring residents were out of harm's way.

The survival of homes during these fires largely depended on actions taken by homeowners prior to the fire. Homeowners who prepared ahead of time and created defensible space around their homes helped provide firefighters with a safer working area, allowing them to stay and defend homes, when given the chance.

An electronic version of this report can be downloaded at http://texasfirewise.org.

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References

- The 2011 Texas Drought (State Climatologist John Nielsen-Gammon): **http://climatexas.tamu.edu/files/osc_pubs/2011_drought.pdf**
- Be Embers Aware: **http://texasfirewise.org**
- Community Wildfire Protection Plans: **http://texasfirewise.org**
- Fire Department Reporting Database: **http://tfsfrp.tamu.edu/TFSReporting**
- Fire Departments grants, training and assistance programs: **http://texasfd.com**
- Fire Resistant Materials: **http://texasfirewise.org**
- Firewise Communities USA: **http://firewise.org**
- Firewise Landscaping in Texas: **http://texasfirewise.org**
- Joint Institute for the Study of the Atmosphere and the Ocean, Digital Values of PDO Index (Nate Mantua): **http://jisao.washington.edu/pdo/PDO.latest**
- Personal Wildfire Action Plan: **http://texasfirewise.org**
- Ready, Set, Go!: **http://wildlandfirersg.org**
- Southern Plains Wildfire Outbreak Papers (Todd Lindley and Greg Murdoch): **http://www.srh.noaa.gov/lub/?n=science-wtefirewx-papers**
- Texas A&M Forest Service: **http://tfsweb.tamu.edu/**
- Texas A&M Forest Service Predictive Services Winter 2011 Outlook: **http://ticc.tamu.edu/Documents/PredictiveServices/Outlooks/Winter2011Outlook092410.pdf**
- Texas Firestorm: **http://texasfirestorm.org/**
- Texas Interagency Coordination Center: **http://ticc.tamu.edu**
- Texas Wildfire Risk Assessment Portal: **http://www.texaswildfirerisk.com**
- Vegetation Management in the Wildland Urban Interface: **http://texasfirewise.org**

2011 Texas Wildfires

Common Denominators of Home Destruction

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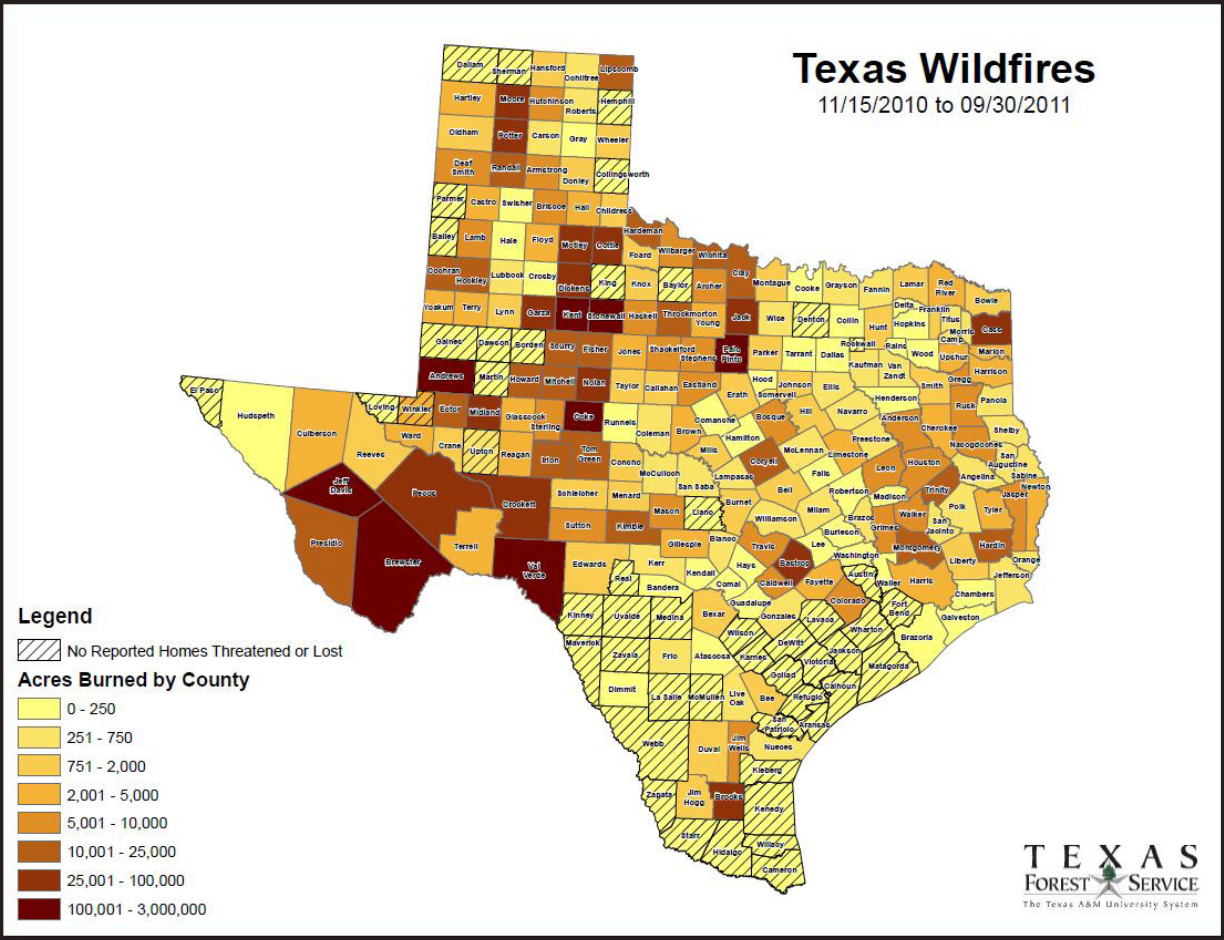

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