Texas Wildfire Risk Assessment Summary Report

Sierra_West_Firewise_2017_10_27_2017

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Introduction

TWRA Summary Report

Welcome to the Texas Wildfire Risk Assessment Summary Report for Briscoe. This report contains a set of selected products developed by the Texas Wildfire Risk Assessment project, which have been summarized explicitly for the Sierra_West_Firewise_2017_10_27_2017 project area.

The **Texas Wildfire Risk Assessment** (TWRA) provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation planning in Texas. Results of the assessment can be used to help prioritize areas in the state where tactical analyses, community interaction and education, or mitigation treatments might be necessary to reduce risk from wildfires. The TWRA products included in this report are designed to provide the information needed to support the following key priorities:

- Identify areas that are most prone to wildfire
- Identify areas that may require additional tactical planning, specifically related to mitigation projects and Community Wildfire Protection Planning
- Provide the information necessary to justify resource, budget and funding requests
- Allow agencies to work together to better define priorities and improve emergency response, particularly across jurisdictional boundaries
- Increase communication with local residents and the public to address community priorities and needs
- Plan for response and suppression resource needs
- Plan and prioritize hazardous fuel treatment programs

To learn more about the TWRA project or to create a custom summary report, go to www.texaswildfirerisk.com.

Products

Each product in this report is accompanied by a general description, table, chart and/or map. A list of available TWRA products in this report is provided in the following table.

TWRA Product	Description
Wildland Urban Interface	Depicts where humans and their structures meet or intermix with wildland fuel
Values Response Index	Represents a rating of the potential impact of a wildfire on values and assets
WUI Response Index	Represents a rating of the potential impact of a wildfire on people and their homes
Pine Plantation Index	Represents a rating of the potential impact of a wildfire on pine plantations
Community Protection Zones	Represents those areas designated as primary and secondary priorities for community protection planning
Wildfire Threat	Likelihood of a wildfire occurring or burning into an area
Wildfire Ignition Density	Likelihood of a wildfire starting based on historical ignition patterns
Wildfire Occurrence Statistics	Information regarding number of fires, acres suppressed and cause of fire
Characteristic Rate of Spread	Represents the speed with which a fire moves in a horizontal direction across the landscape
Characteristic Flame Length	Represents the distance between the tip and base of the flame
Intensity	Quantifies the potential fire intensity for an area by orders of magnitude
Fire Type - Extreme	Represents the potential fire type (surface or canopy) under the extreme percentile weather category
Surface Fuels	Contains the parameters needed to compute surface fire behavior characteristics
Vegetation	General vegetation and landcover types
Pine Age	Age of pine and mixed pine/deciduous forest
Pine Plantations	Pine stands that are planted and actively managed for financial gain or other economic reasons

Wildland Urban Interface

Description

Texas is one of the fastest growing states in the Nation, with much of this growth occurring adjacent to metropolitan areas. This increase in population across the state will impact counties and communities that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire. In Texas nearly 85 percent of wildfires occur within two miles of a community.

For the project area, it is estimated that **105** people or **100.0 % percent** of the total project area population (**105)** live within the WUI.

The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. WUI housing density is categorized based on the standard Federal Register and U.S. Forest Service SILVIS data set categories. The number of housing density categories is extended to provide a better gradation of housing distribution to meet specific requirements for fire protection planning activities. While units of the data set are in houses per sq. km., which is consistent with other data such as USFS SILVIS, the data is presented as the number of houses per acre to aid with interpretation and use in Texas.

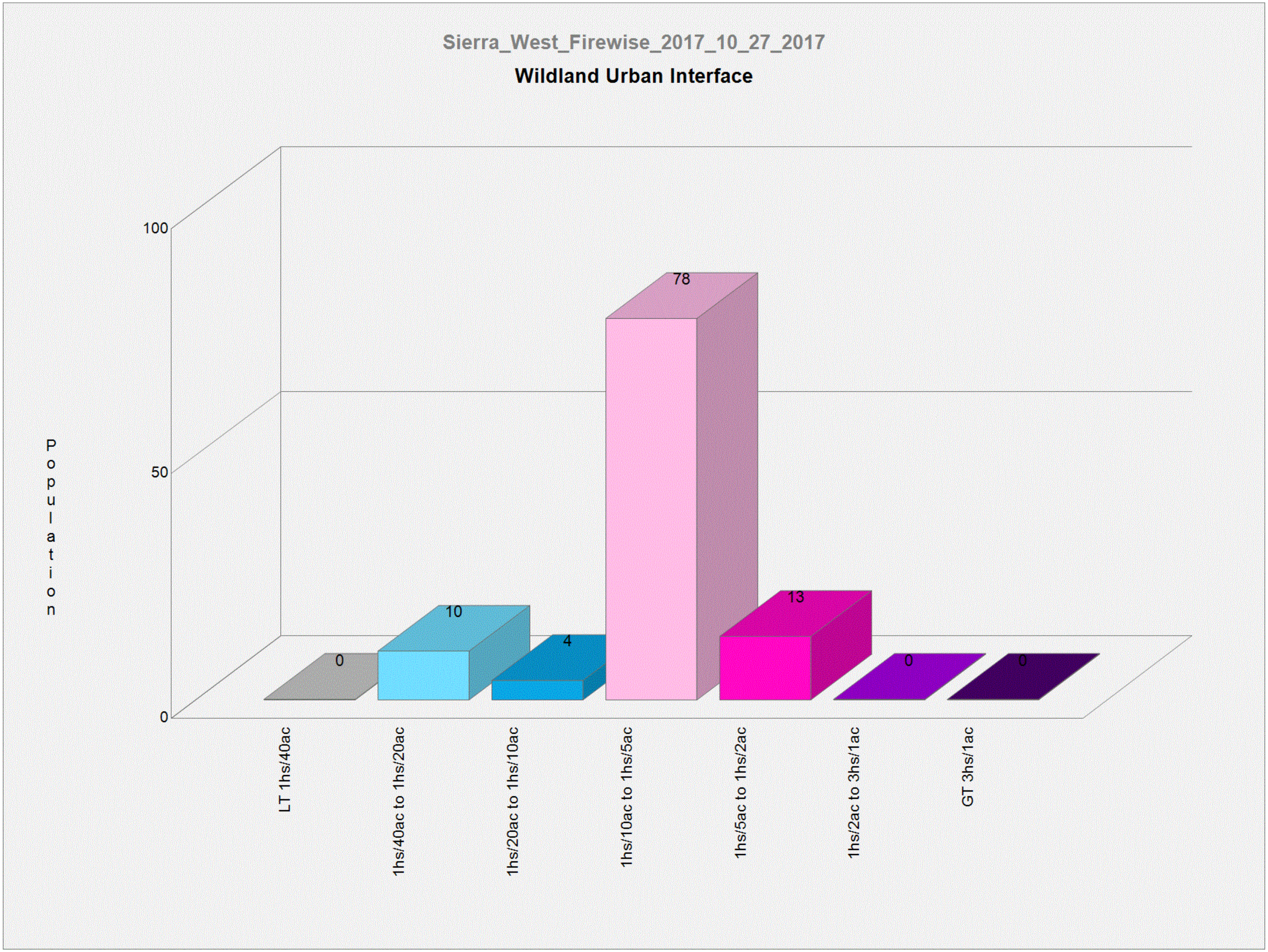
In the past, conventional wildland urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources do not provide the level of detail needed by the Texas A&M Forest Service and local fire protection agencies.

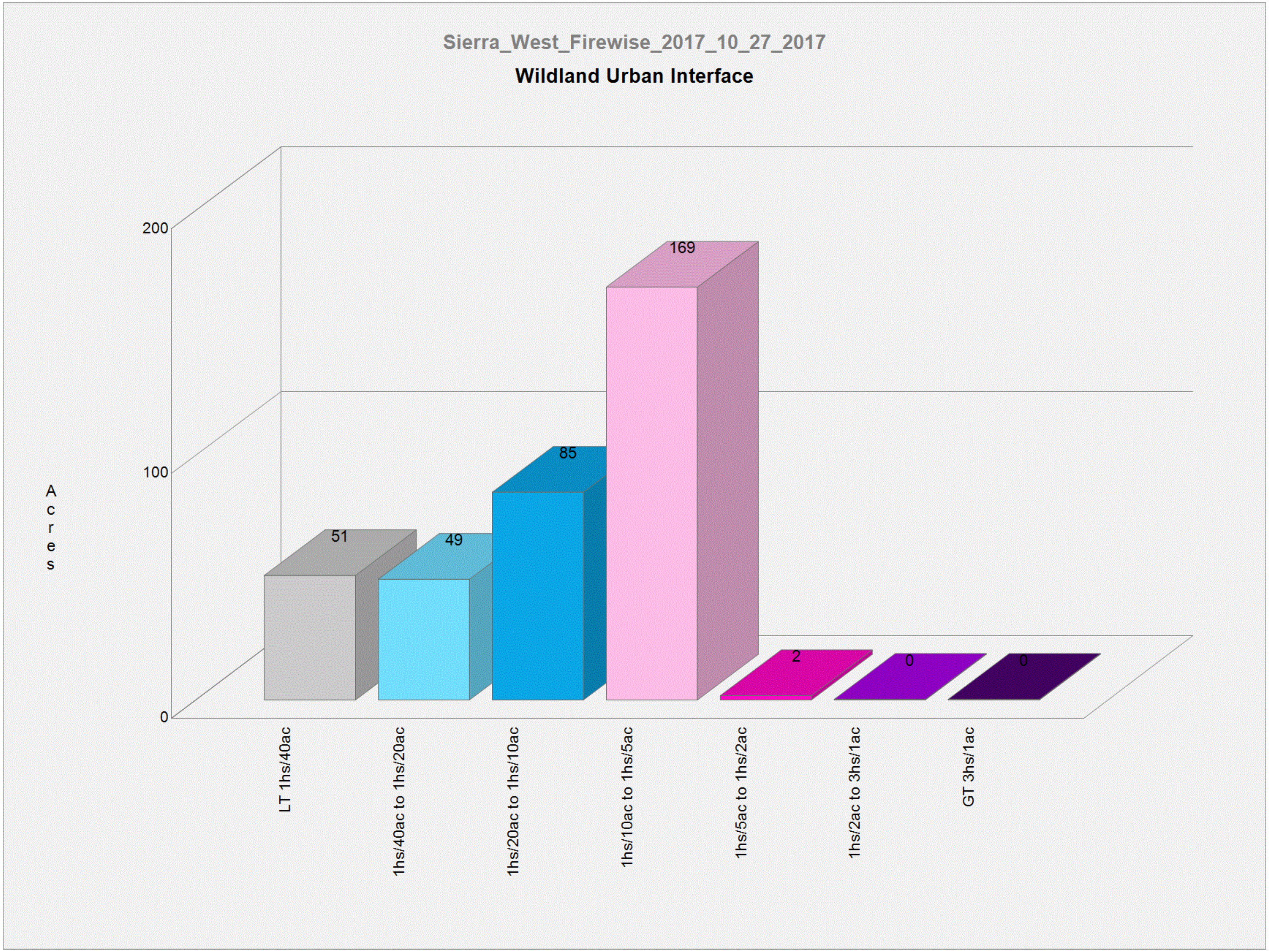
The new WUI dataset is derived using advanced modeling techniques based on the Where People Live dataset and LandScan USA population count data available from the Department of Homeland Security, HSIP Freedom Data Set. WUI is simply a subset of the Where People Live dataset. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire.

A more detailed description of the risk assessment algorithms is provided in the TWRA Final Report, which can be downloaded from www.texaswildfirerisk.com. Data is modeled at a 30-meter cell resolution, which is consistent with other TWRA layers.

WUI – Population and Acres

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
LT 1hs/40ac	0	0.0 %	51	14.3 %
1hs/40ac to 1hs/20ac	10	9.5 %	49	13.8 %
1hs/20ac to 1hs/10ac	4	3.8 %	85	23.9 %
1hs/10ac to 1hs/5ac	78	74.3 %	169	47.5 %
1hs/5ac to 1hs/2ac	13	12.4 %	2	0.6 %
1hs/2ac to 3hs/1ac	0	0.0 %	0	0.0 %
GT 3hs/1ac	0	0.0 %	0	0.0 %
Total	**105**	**100.0 %**	356	100.0 %


Sierra_West_Firewise_2017_10_27_2017
Wildland Urban Interface
Population
100
50
0
0
10
4
78
13
0
0
LT 1hs/40ac
1hs/40ac to 1hs/20ac
1hs/20ac to 1hs/10ac
1hs/10ac to 1hs/5ac
1hs/5ac to 1hs/2ac
1hs/2ac to 3hs/1ac
GT 3hs/1ac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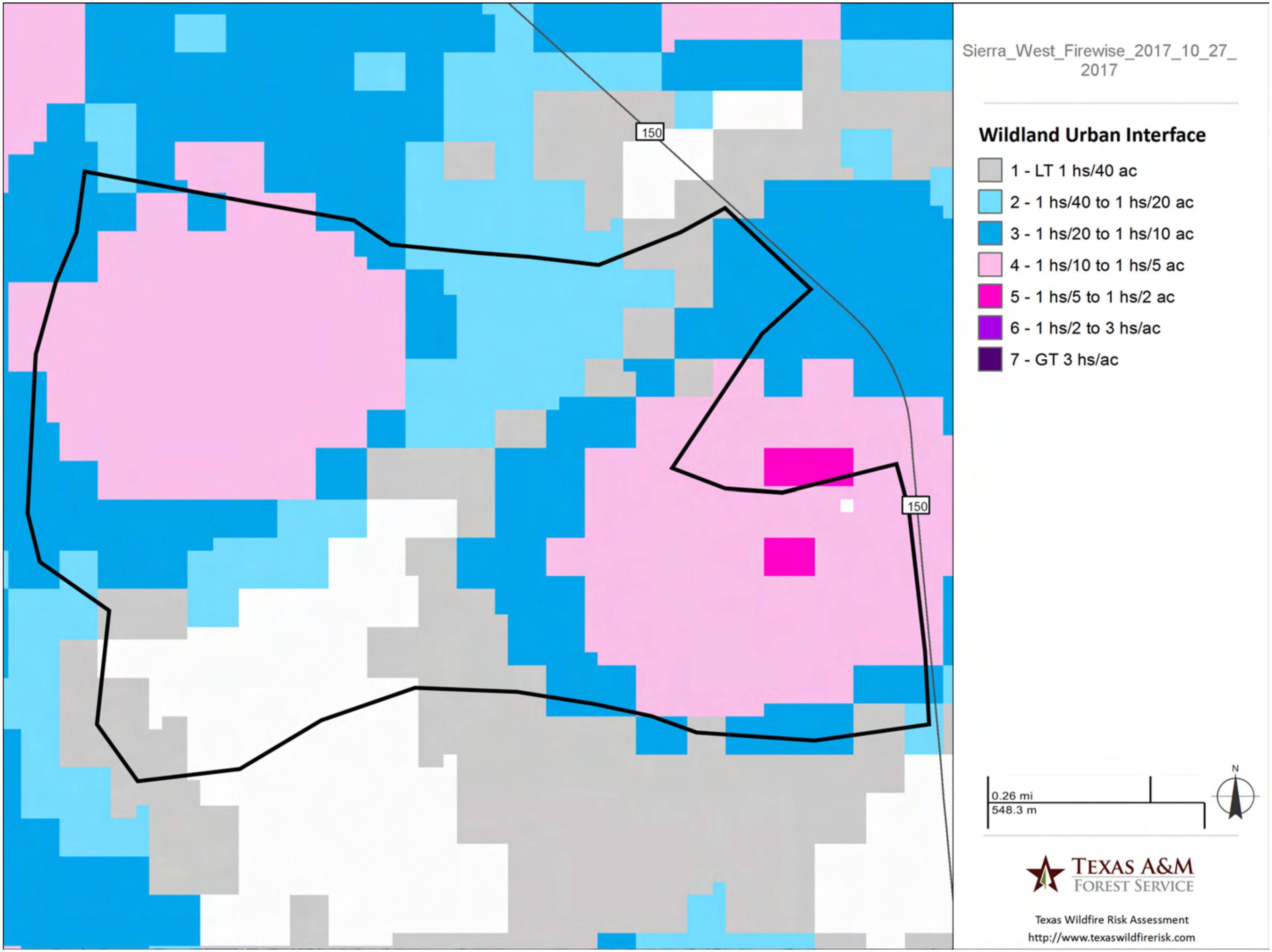
Wildland Urban Interface
200
100
0
Acres
51
49
85
169
2
0
0
LT 1hs/40ac
1hs/40ac to 1hs/20ac
1hs/20ac to 1hs/10ac
1hs/10ac to 1hs/5ac
1hs/5ac to 1hs/2ac
1hs/2ac to 3hs/1ac
GT 3hs/1ac


150
150
Sierra_West_Firewise_2017_10_27_2017
Wildland Urban Interface
1 - LT 1 hs/40 ac
2 - 1 hs/40 to 1 hs/20 ac
3 - 1 hs/20 to 1 hs/10 ac
4 - 1 hs/10 to 1 hs/5 ac
5 - 1 hs/5 to 1 hs/2 ac
6 - 1 hs/2 to 3 hs/ac
7 - GT 3 hs/ac
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Values Response Index

Description

The Values Response Index (VRI) layer reflects a rating of the potential impact of a wildfire on values or assets. The VRI is an overall rating that combines the impact ratings for Wildland Urban Interface (housing density) and Pine Plantations (pine age) into a single measure. The individual ratings for each value layer, Wildland Urban Interface and Pine Plantations, were derived using a Response Function modeling approach.

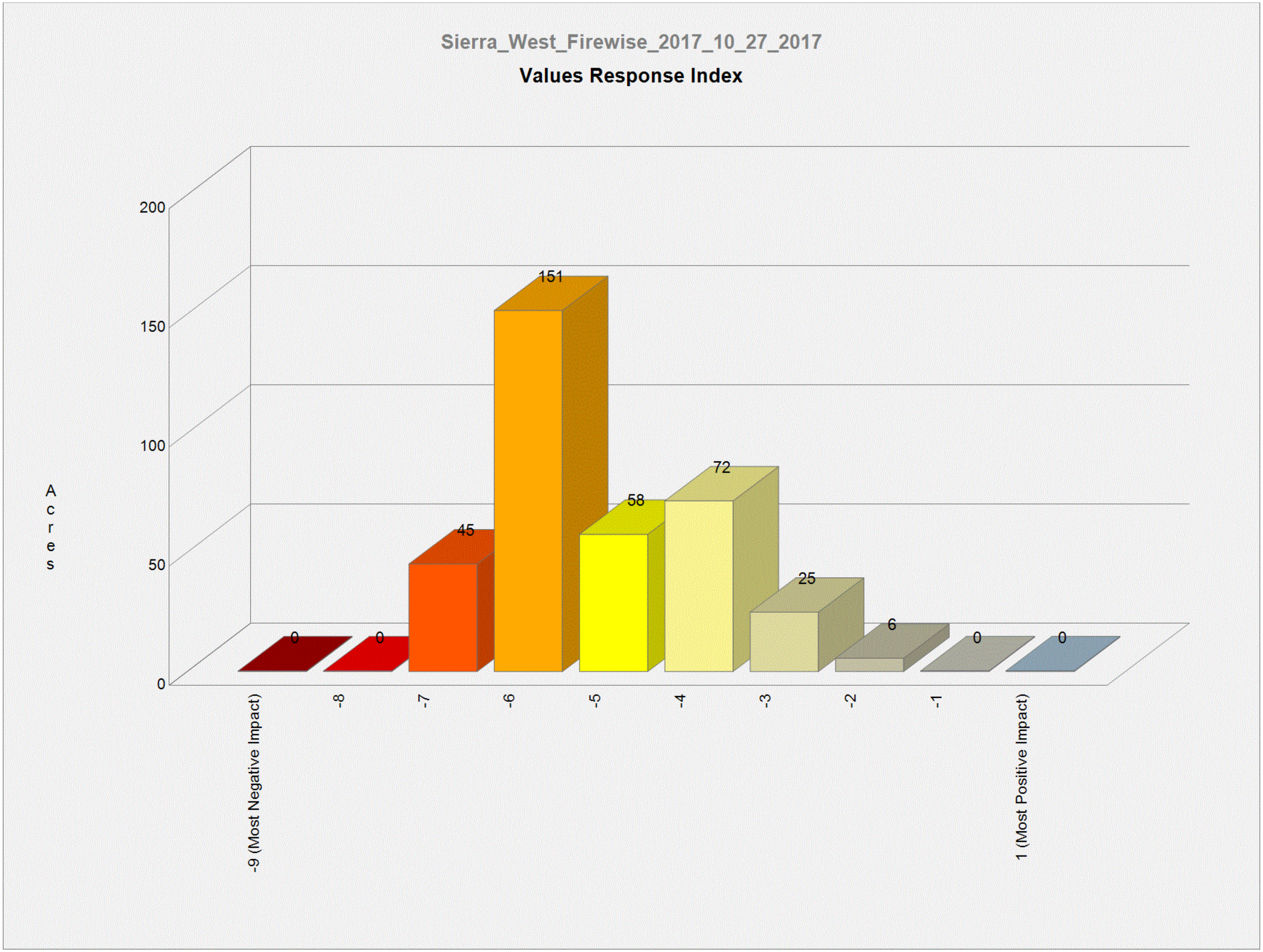
Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length. These net changes can be negative (adverse) or positive (beneficial). The theoretical range of values is from -9 to 9, with -9 representing the most adverse impact and 9 representing the most positive impact. Zero reflects no impact. The practical range is typically much smaller, however. For the TWRA, the range of values is from -9 to1. Zero values are not included because they reflect no impact to the value or asset.

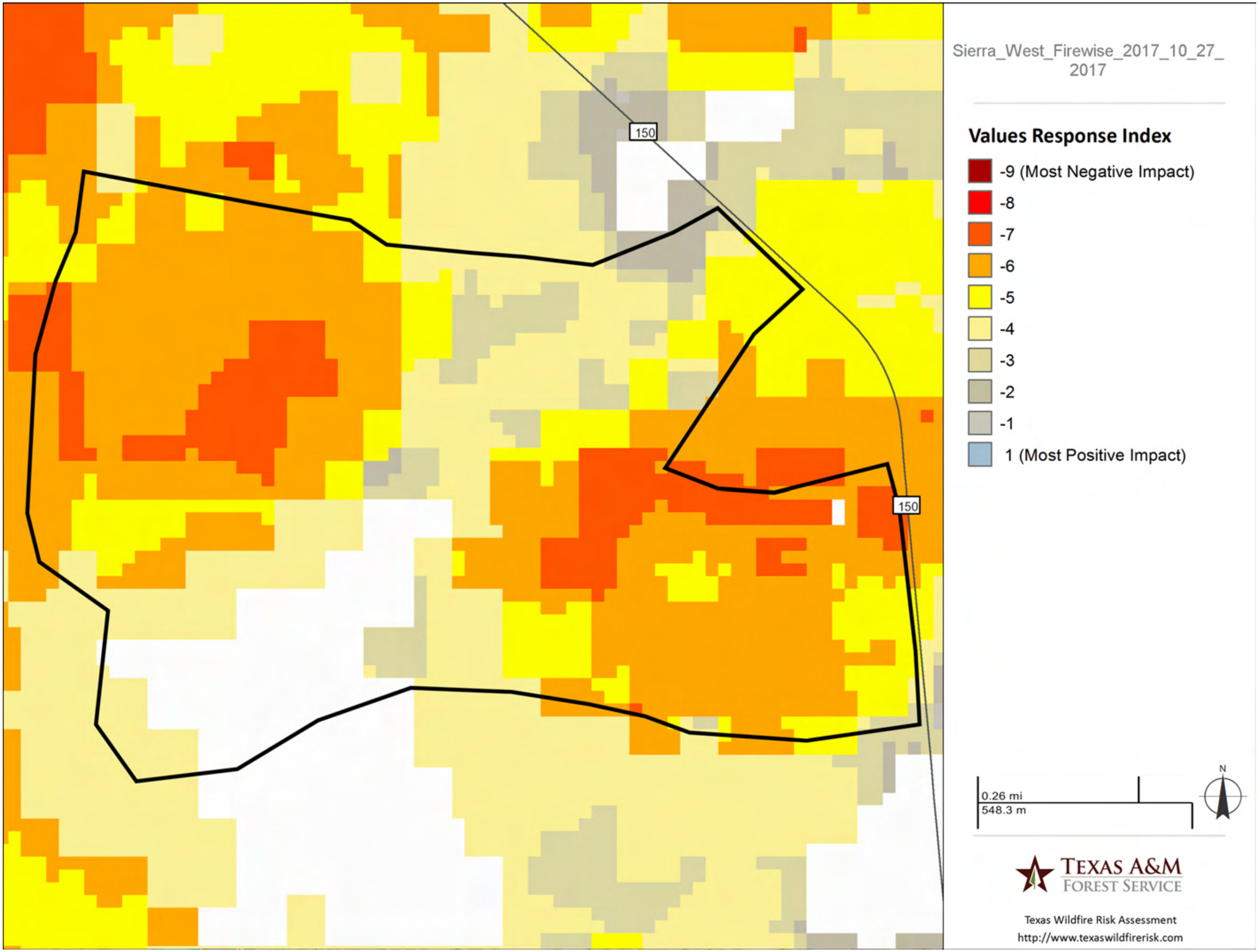
Using the Response Function approach, a rating is calculated to estimate the expected impact to values/assets at different fire intensity levels. The measure of fire intensity used in the Texas assessment is flame length (ft). Response Function outputs are first derived for each input data set and then combined to derive the Values Response Index.

Different weightings are used to combine the response function value outputs for Wildland Urban Interface (WUI) and Pine Plantations with the highest priority placed on protection of people and structures (i.e. WUI). Accordingly, WUI is given an 80% weighting and Pine Plantations a 20% weighting to calculate the statewide VRI. Response Function values and layer weightings were developed by a team of experts to reflect priorities for fire protection planning in Texas.

All areas in Texas have the VRI calculated consistently, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other TWRA layers.

Class	Acres	Percent
-9 (Least Negative Impact)	0	0.0 %
-8	0	0.0 %
-7	45	12.6 %
-6	151	42.3 %
-5	58	16.2 %
-4	72	20.2 %
-3	25	7.0 %
-2	6	1.7 %
-1	0	0.0 %
1 (Most Positive Impact)	0	0.0 %
Total	357	100.0 %


Sierra_West_Firewise_2017_10_27_2017
Values Response Index
Acres
0
50
100
150
200
0
0
45
151
58
72
25
6
0
0
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1
1 (Most Positive Impact)


150
150
Sierra_West_Firewise_2017_10_27_2017
Values Response Index
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1
1 (Most Positive Impact)
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

WUI Response Index

Description

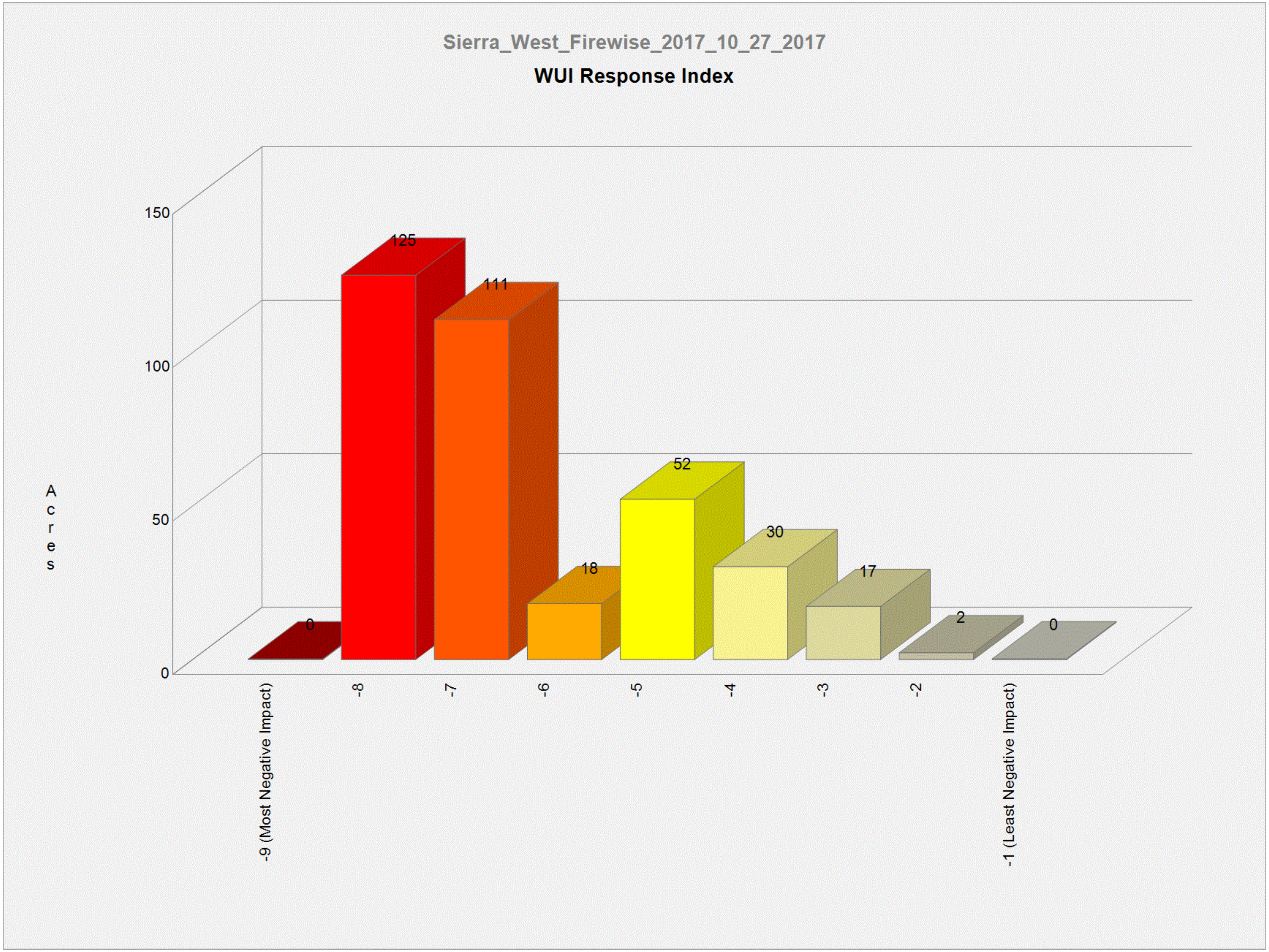
The Wildland Urban Interface (WUI) Response Index layer is a rating of the potential impact of a wildfire on people and their homes. The key input, WUI, reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes.

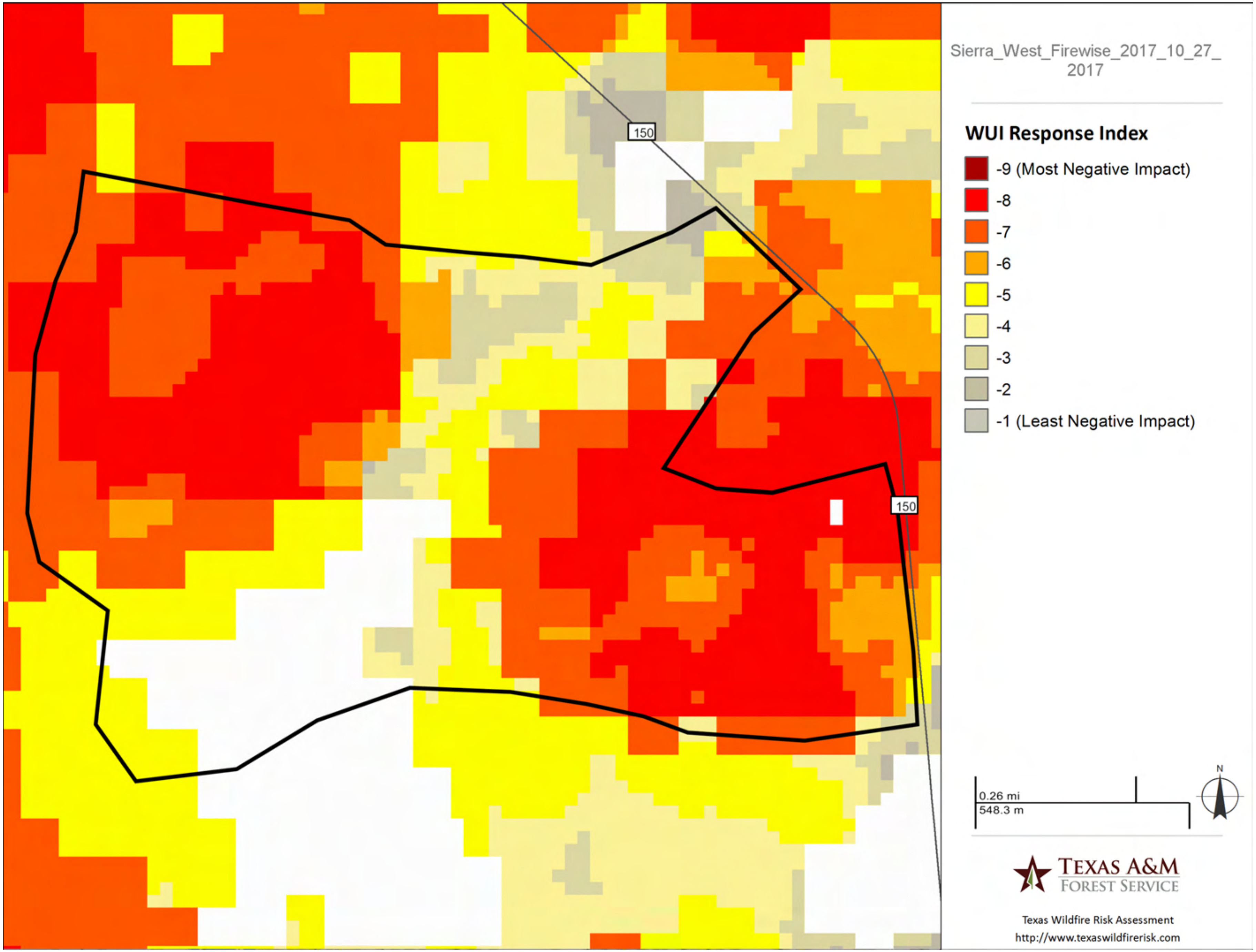
The WUI Response Index is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with 1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1.

To calculate the WUI Response Index, the WUI housing density data was combined with Flame Length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by the Texas A&M Forest Service mitigation planning staff. By combining flame length with the WUI housing density data, you can determine where the greatest potential impact to homes and people is likely to occur.

Fire intensity data is modeled to incorporate penetration into urban fringe areas so that outputs better reflect real world conditions for fire spread and impact in urban interface areas. All areas in Texas have the WUI Response Index calculated consistently, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other TWRA layers.

Class	Acres	Percent
-9 (Most Negative Impact)	0	0.0 %
-8	125	35.2 %
-7	111	31.3 %
-6	18	5.1 %
-5	52	14.6 %
-4	30	8.5 %
-3	17	4.8 %
-2	2	0.6 %
-1	0	0.0 %
Total	**355**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
WUI Response Index
Acres
150
100
50
0
0
125
111
18
52
30
17
2
0
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1 (Least Negative Impact)


150
150
Sierra_West_Firewise_2017_10_27_2017
WUI Response Index
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1 (Least Negative Impact)
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Pine Plantation Response Index

Description

The Pine Plantation Response Index layer is a rating of the potential impact of a wildfire on pine plantations. The key input, Pine Plantation Age, represents the age of pine plantations across Texas and reflects the potential susceptibility to damage from wildfire.

The Pine Plantation Response Index is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length. These net changes can be negative (adverse) or positive (beneficial). The theoretical range of values is from -9 to 9, with -9 representing the most adverse impact and 9 representing the most positive impact. Zero reflects no impact. The practical range is typically much smaller, however. For the TWRA, the range of values is from -9 to 3. Zero values are not included because they reflect no impact to the value or asset. For Pine Plantations, wildfire could have both adverse and beneficial impacts based on the age of the plantation and the corresponding fire intensity level.

To calculate the Pine Plantations Response Index, the Pine Plantation Age data was combined with Flame Length data, and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by the Texas A&M Forest Service mitigation planning staff. By combining flame length with the Pine Plantation Age data, you can determine where the greatest potential impact to pine plantations is likely to occur.

All areas in Texas have the Pine Plantation Index calculated consistently, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other TWRA layers.

The designated project area does not contain Pine Plantation Response Index data

Community Protection Zones

Description

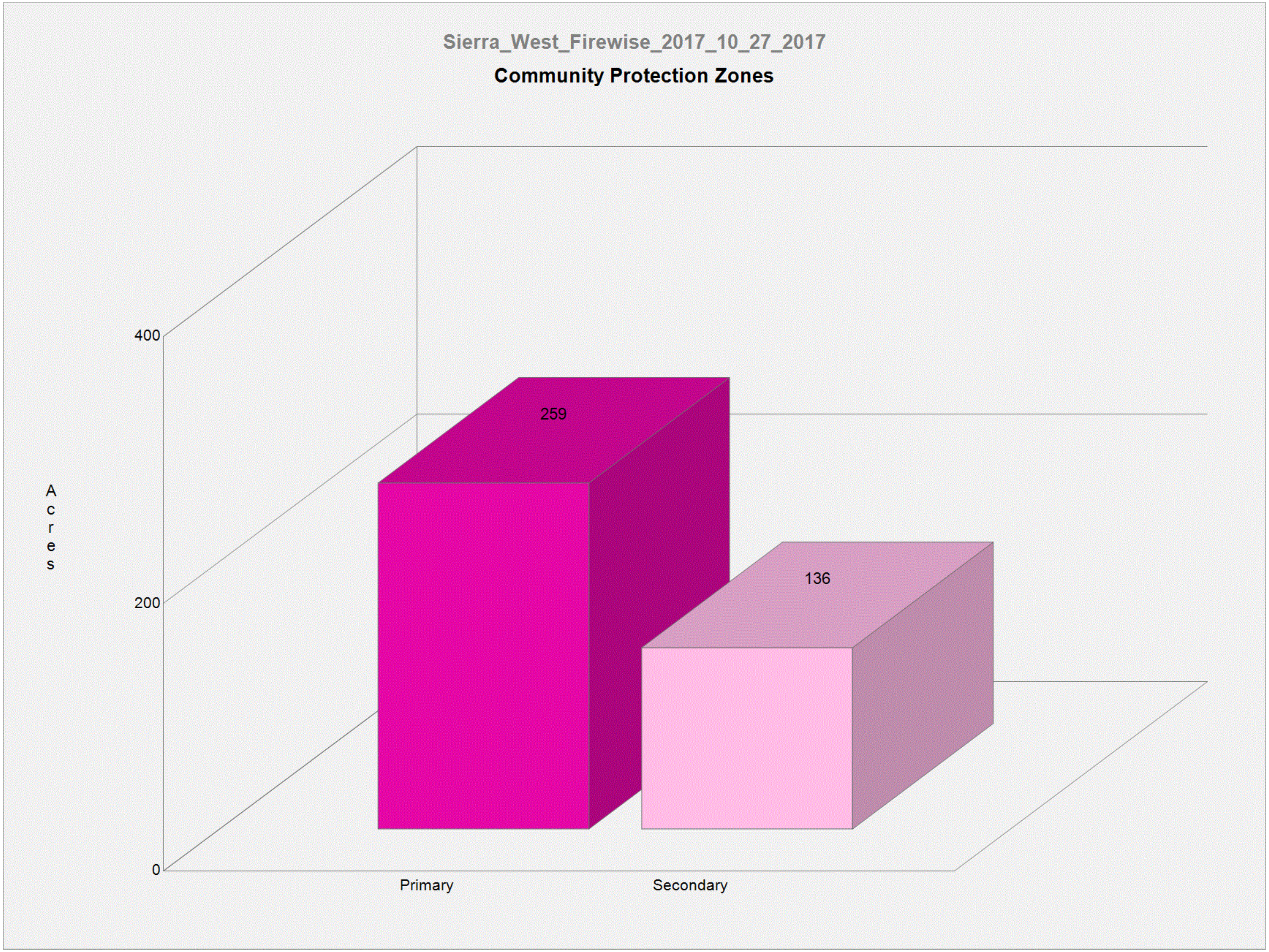
Community Protection Zones (CPZ) represent those areas considered highest priority for mitigation planning activities. CPZs are based on an analysis of the Where People Live housing density data and surrounding fire behavior potential. Rate of Spread data is used to determine the areas of concern around populated areas that are within a 2-hour fire spread distance.

General consensus among fire planners is that for fuel mitigation treatments to be effective in reducing wildfire hazard, they must be conducted within a close distance of a community. In Texas, the WUI housing density has been used to reflect populated areas in place of community boundaries. This ensures that CPZs reflect where people are living in the wildland, not jurisdictional boundaries.

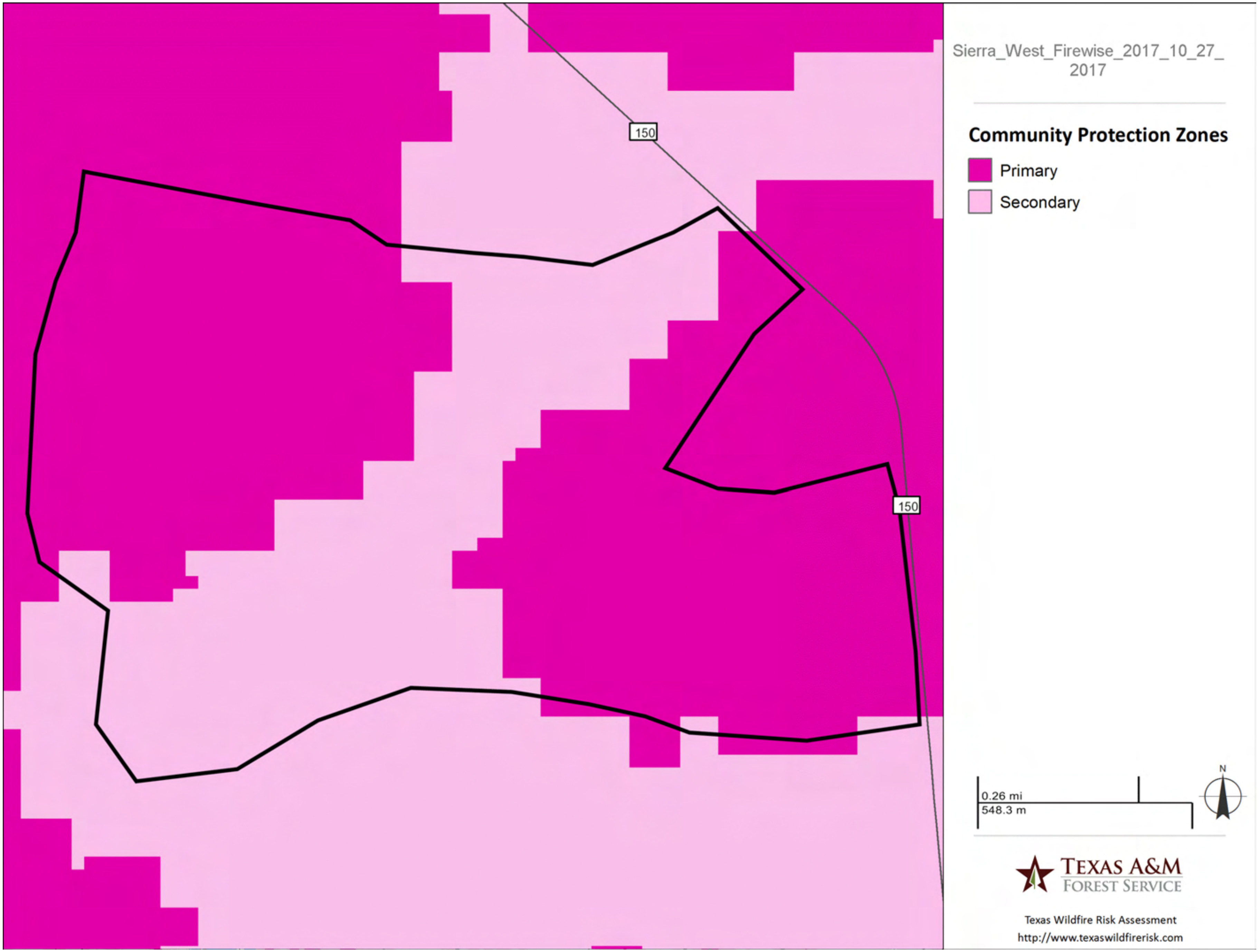
CPZs represent a variable width buffer around populated areas that are within a 2-hour fire spread distance. Accordingly, CPZs will extend farther in areas where rates of spread are greater and less in areas where minimal rate of spread potential exists. CPZ boundaries inherently incorporate fire behavior conditions.

All areas in Texas have the CPZs calculated consistently, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other TWRA layers.

Class	Acres	Percent
Primary	259	65.6 %
Secondary	136	34.4 %
Total	**395**	**100.0 %**



Sierra_West_Firewise_2017_10_27_2017
Community Protection Zones
400
200
0
Acres
259
136
Primary
Secondary


150
150
Sierra_West_Firewise_2017_10_27_2017
Community Protection Zones
Primary
Secondary
0.26 mi
548.3 m
N
TEXAS A&M FOREST SERVICE
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Wildfire Threat

Description

Wildfire Threat is the likelihood of a wildfire occurring or burning into an area. Threat is derived by combining a number of landscape characteristics including surface fuels and canopy fuels, resultant fire behavior, historical fire occurrence, percentile weather derived from historical weather observations, and terrain conditions. These inputs are combined using analysis techniques based on established fire science.

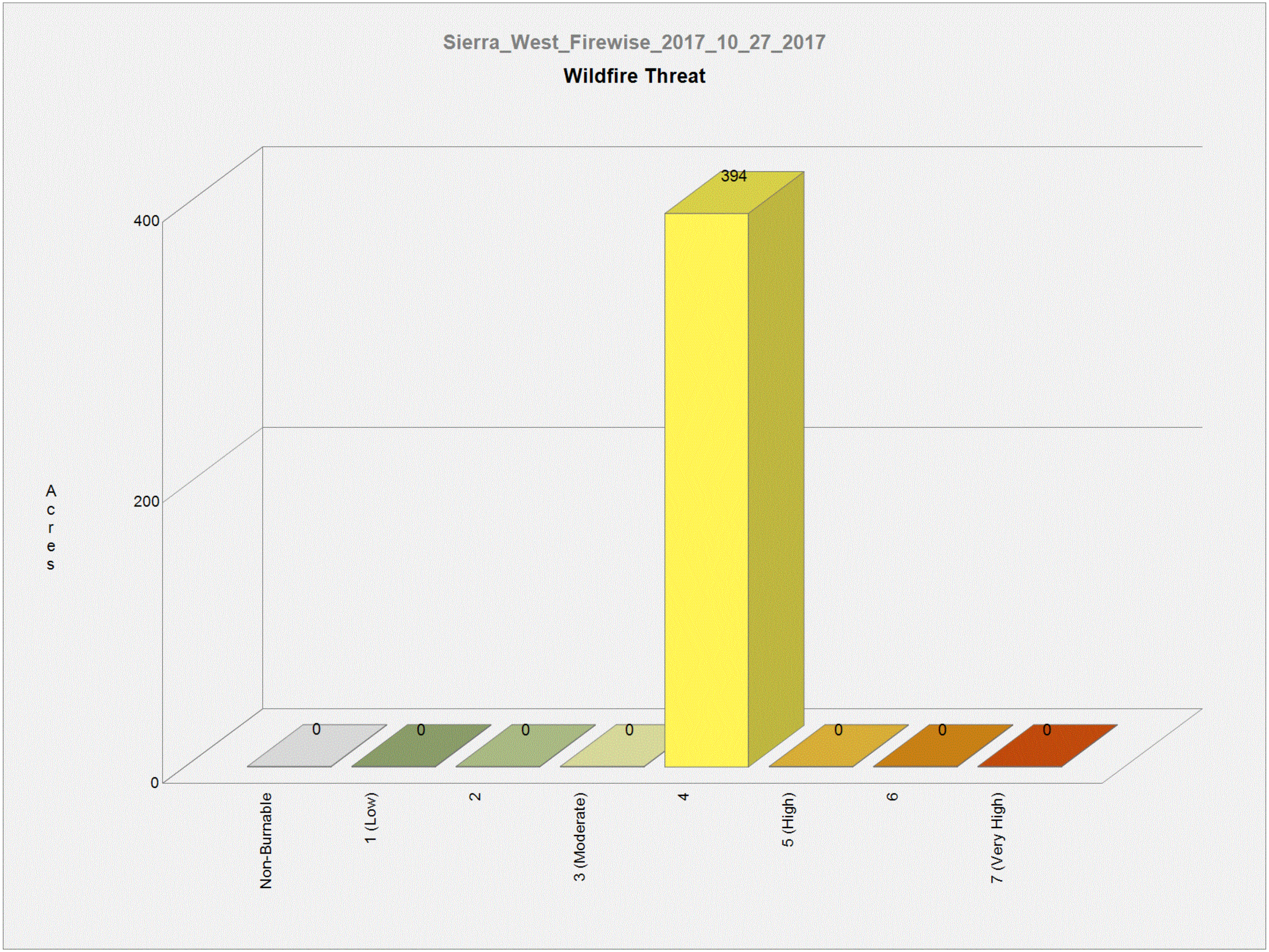
The measure of wildfire threat used in the Texas Wildfire Risk Assessment (TWRA) is called Wildland Fire Susceptibility Index, or WFSI. WFSI combines the probability of an acre igniting (Wildfire Ignition Density) and the expected final fire size based on rate of spread in four weather percentile categories. WFSI is defined as the likelihood of an acre burning. Since all areas in Texas have WFSI calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high threat area in East Texas is equivalent to a high threat area in West Texas.

To aid in the use of Wildfire Threat for planning activities, the output values are categorized into seven (7) classes. These are given general descriptions from Low to Very High threat.

The threat map is derived at a 30 meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention planning.

A more detailed description of the risk assessment algorithms is provided in the TWRA Final Report, which can be downloaded from www.texaswildfirerisk.com.

Class	Acres	Percent
Non-Burnable	0	0.0 %
1 (Low)	0	0.0 %
2	0	0.0 %
3 (Moderate)	0	0.0 %
4	394	100.0 %
5 (High)	0	0.0 %
6	0	0.0 %
7 (Very High)	0	0.0 %
Total	**394**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Wildfire Threat
Acres
400
200
0
394
0
0
0
0
0
0
0
Non-Burnable
1 (Low)
2
3 (Moderate)
4
5 (High)
6
7 (Very High)


150
150
Sierra_West_Firewise_2017_10_27_2017
Wildfire Threat
Non-Burnable
1 (Low)
2
3 (Moderate)
4
5 (High)
6
7 (Very High)
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Wildfire Ignition Density

Description

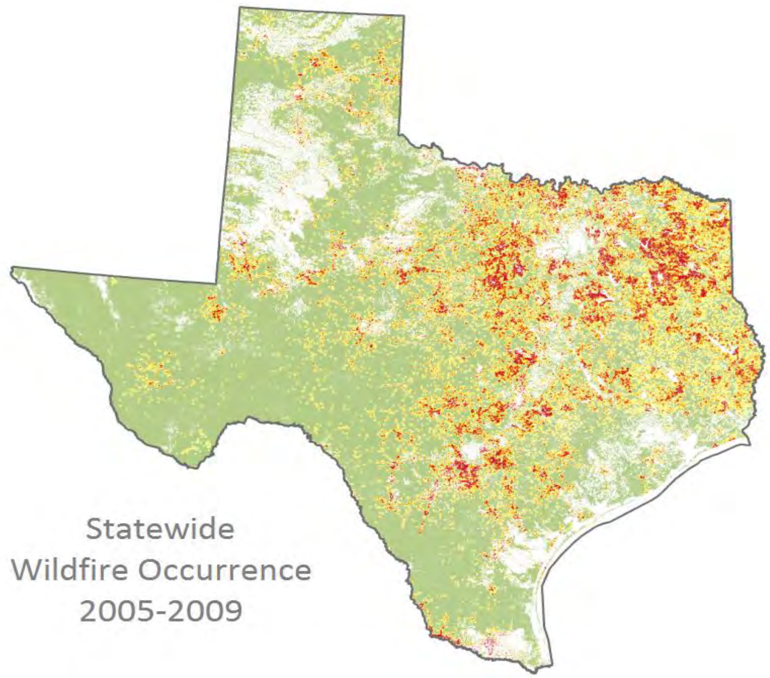
Wildfire Ignition Density is the likelihood of a wildfire starting based on historical ignition patterns. Occurrence is derived by modeling historic wildfire ignition locations to create an average ignition rate map. The ignition rate is measured in the number of fires per year per 1000 acres.

Five years of historic fire report data was used to create the ignition points for all Texas fires. Data was obtained from federal, state and local fire department report data sources for the years 2005 to 2009. For East Texas, additional fire data was obtained for state fires for the years 2000 to 2004. The compiled wildfire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations. The database was then modeled to create a density map reflecting historical fire ignition rates.

The measure of wildfire occurrence used in the Texas Wildfire Risk Assessment (TWRA) is called the Wildfire Ignition Density. Since all areas in Texas have Ignition Density calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high occurrence area in East Texas is equivalent to a high occurrence area in West Texas.

Wildfire Ignition Density is a key input into the calculation of the Wildfire Threat output. In particular, with most Texas fires being human caused, there is a repeatable spatial pattern of fire ignitions over time. This pattern identifies areas where wildfires are most likely to ignite and prevention efforts can be planned accordingly.

The TWRA Wildfire Ignition Density map is enhanced from the map derived in the Southern Wildfire Risk Assessment (SWRA) project. In particular, the Texas Wildfire Ignition Density map was derived from a larger sampling of ignition data points, including numerous volunteer and state fire reports. Previously, the SWRA was not able to incorporate many state or local data sources due to the limited availability of data. However, due to the implementation of a statewide fire reporting system, and new incentives for reporting by volunteer fire departments, there has been an increase in the number of fires reported, and an improvement in the quality of the fire ignition locations. The use of this data provides a better representation of the wildfire occurrence across the state than previously derived in the SWRA project.

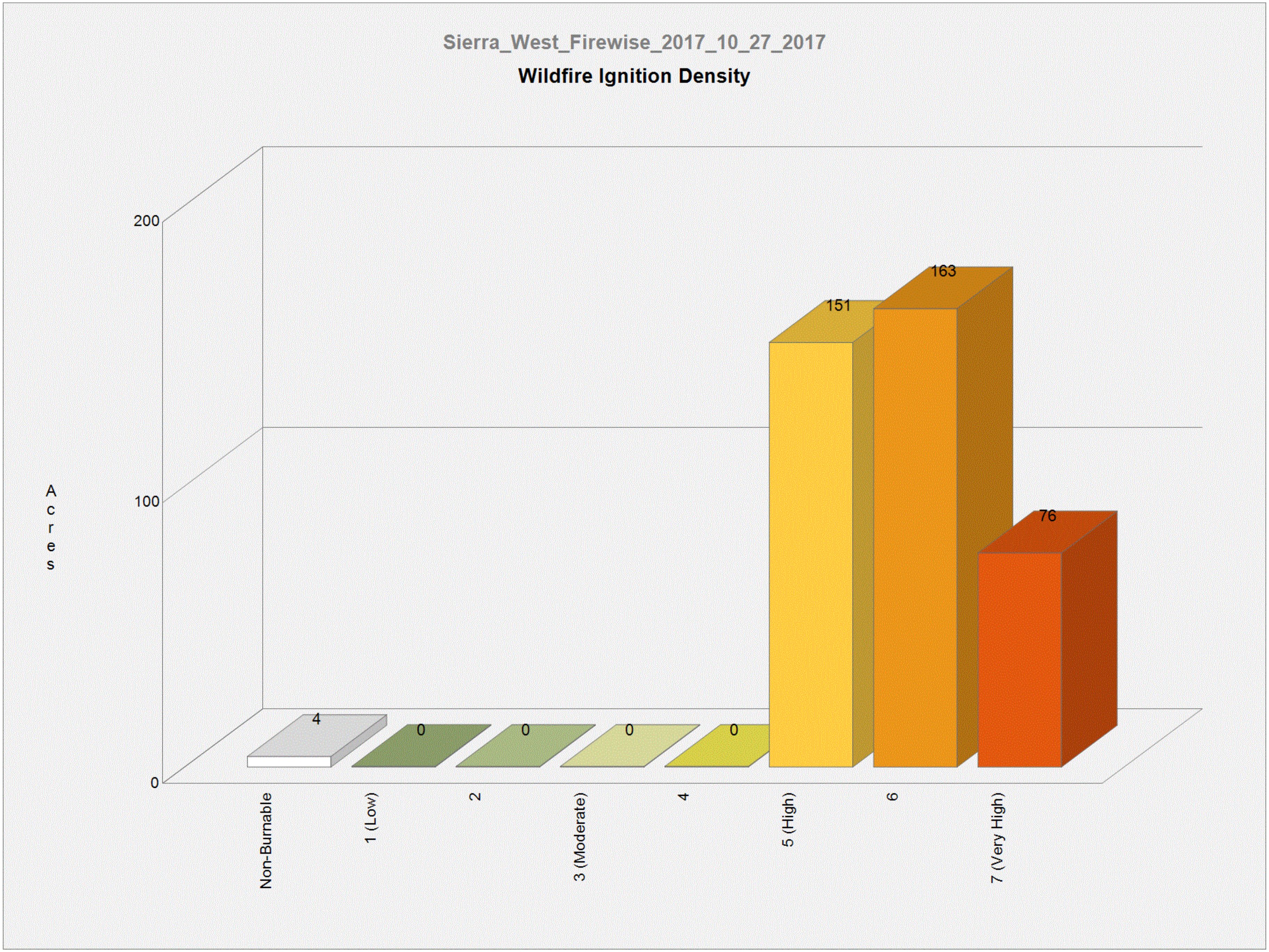


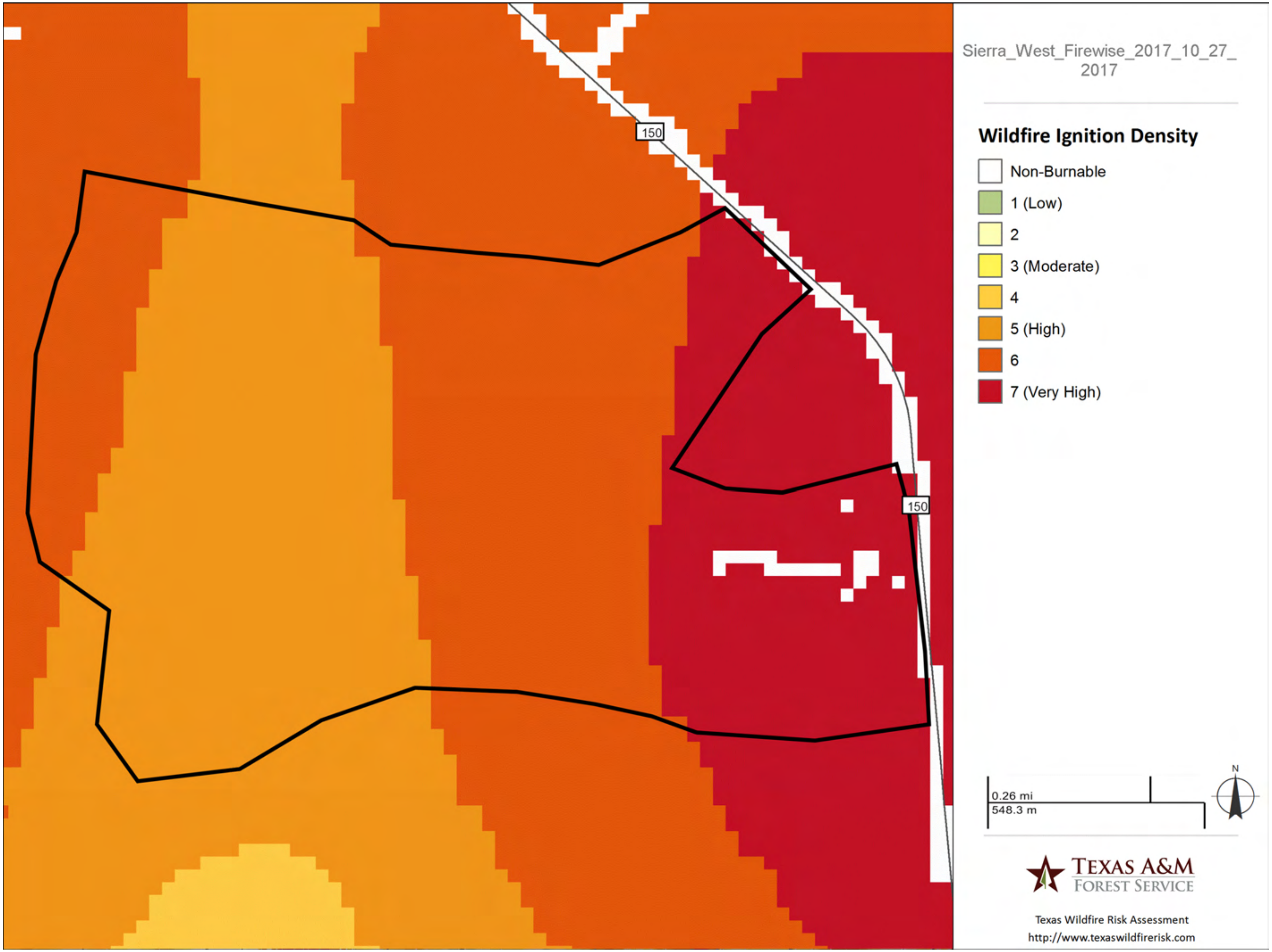
To aid in the use of Wildfire Ignition Density for planning activities, the output values are categorized into seven (7) classes reflecting average ignition rates. These are given general descriptions from Low to Very High. Seven classes are used to present finer detail for mapping purposes so that transitional areas can be easily identified.
The class breaks are determined by analyzing the Wildfire Ignition Density output values to reflect for the entire state.

The Wildfire Ignition Density map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention planning.

A more detailed description of the risk assessment algorithms is provided in the TWRA Final Report, which can be downloaded from www.texaswildfirerisk.com.

Class	Acres	Percent
Non-Burnable	4	1.0 %
1 (Low)	0	0.0 %
2	0	0.0 %
3 (Moderate)	0	0.0 %
4	0	0.0 %
5 (High)	151	38.3 %
6	163	41.4 %
7 (Very High)	76	19.3 %
Total	**394**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Wildfire Ignition Density
Acres
200
100
0
4
0
0
0
0
151
163
76
Non-Burnable
1 (Low)
2
3 (Moderate)
4
5 (High)
6
7 (Very High)


150
150
Sierra_West_Firewise_2017_10_27_2017
Wildfire Ignition Density
Non-Burnable
1 (Low)
2
3 (Moderate)
4
5 (High)
6
7 (Very High)
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

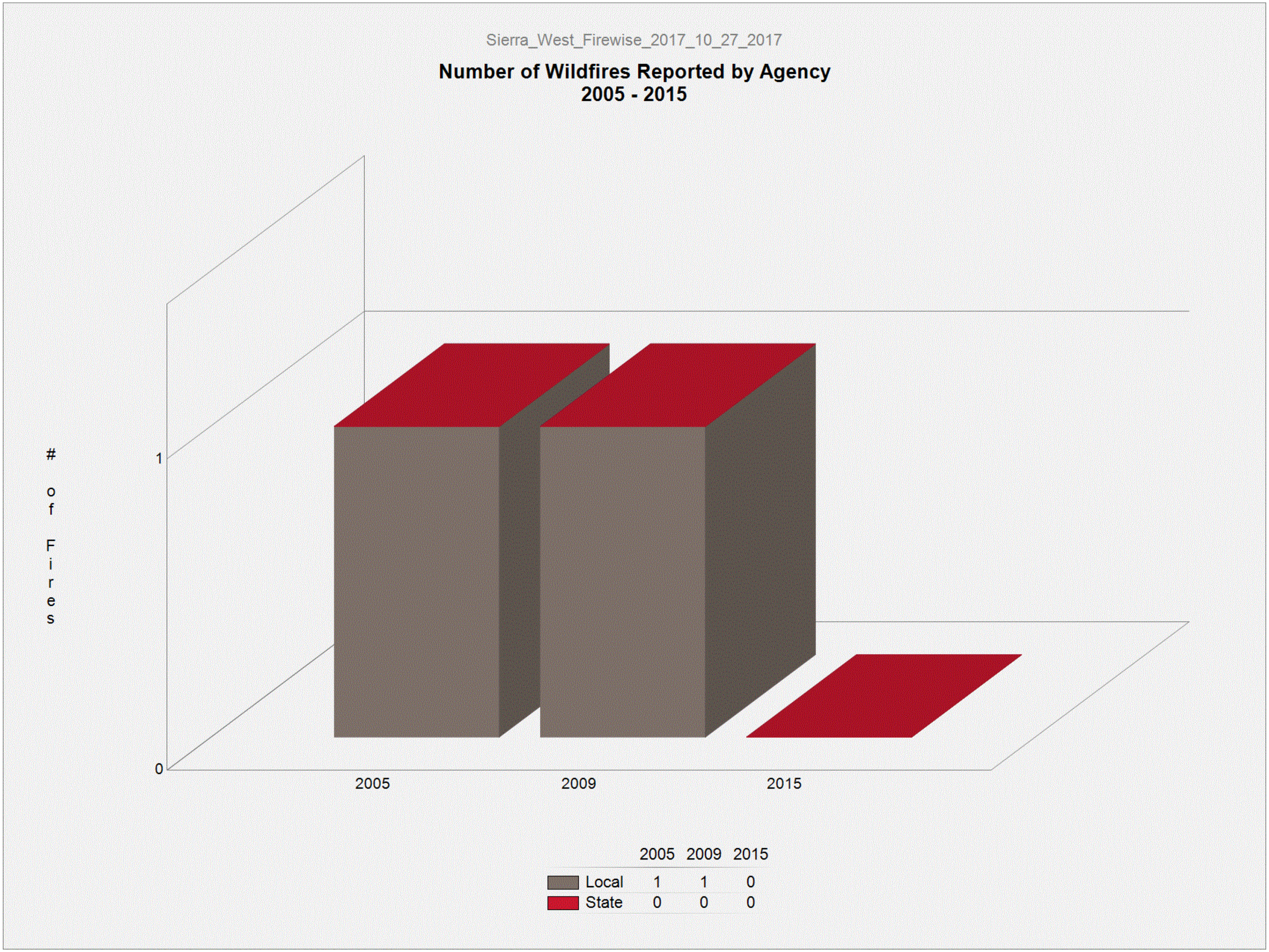
Wildfire Occurrence Statistics

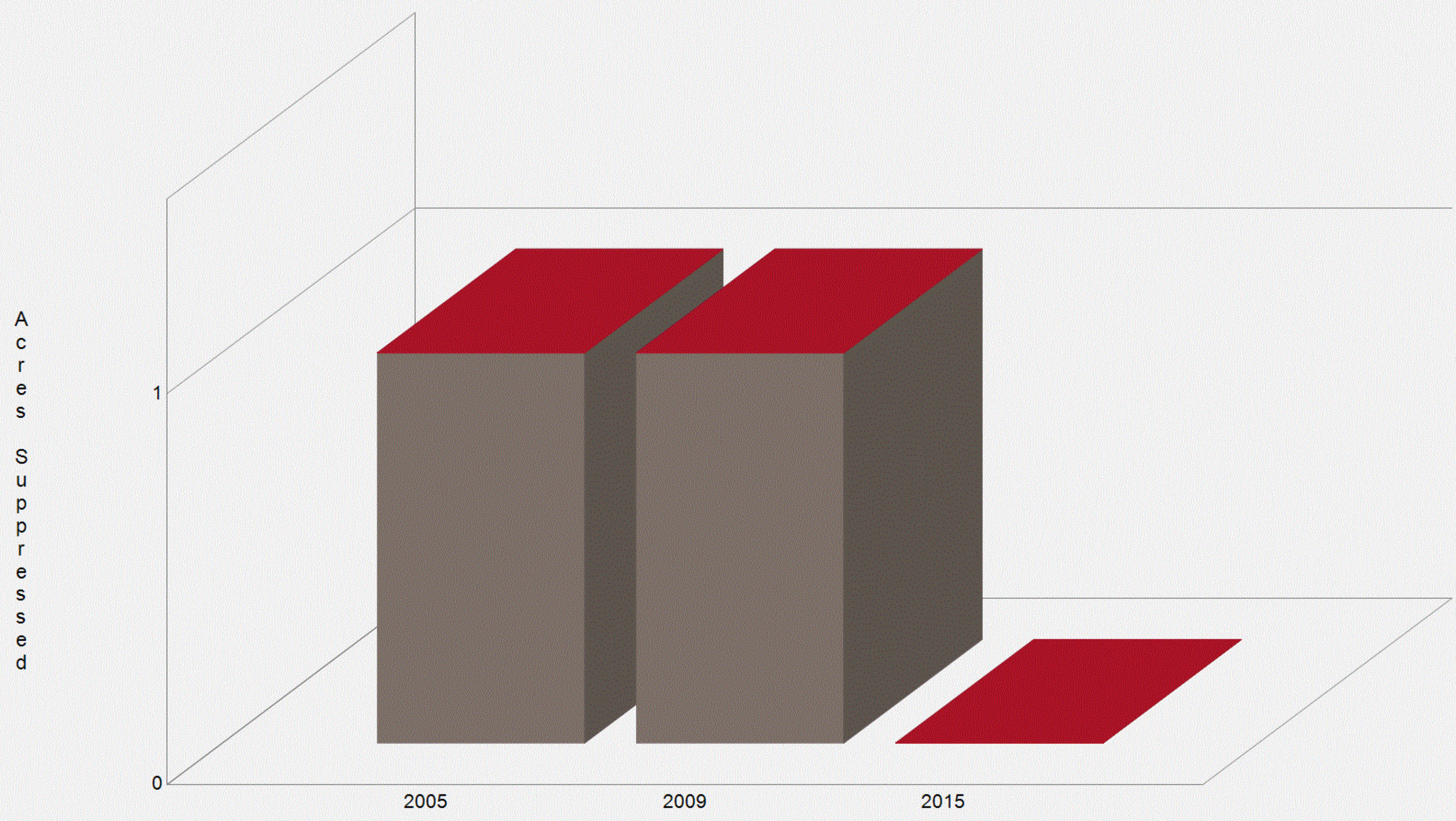
Description

Wildfire occurrence statistics provide insight as to the number of fires, acres burned and cause of fires in Texas. These statistics are useful for prevention and mitigation planning. They can be used to quantify the level of fire business, determine the time of year most fires typically occur, and develop a fire prevention campaign aimed at reducing a specific fire cause. The fire occurrence statistics are grouped by primary response agency type, which include:

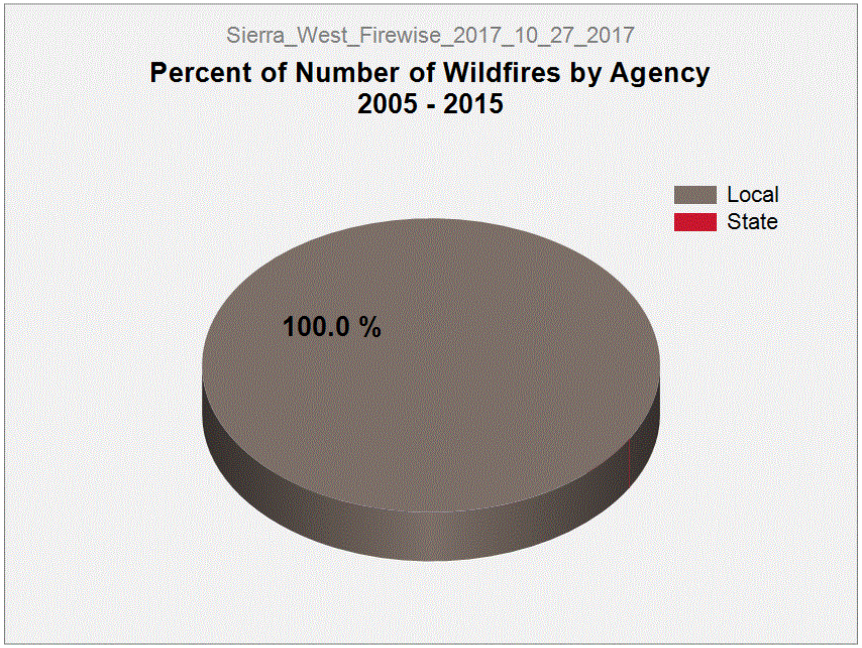
- **Texas Forest Service (TFS)** – The Texas Forest Service fire occurrence database represents all state-reported fires.
- **Local** – The local category includes fires reported via Texas Forest Service's online fire department reporting system. It is a voluntary reporting system that includes fires reported by both paid and volunteer fire departments since 2005.

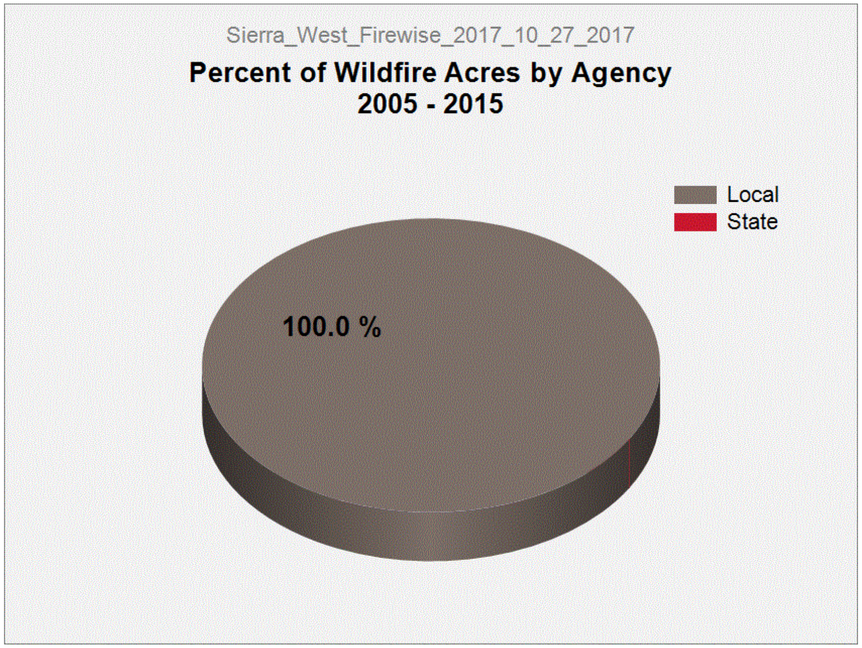
Sixteen years of historic fire report data was used to create the fire occurrence summary charts. Data was obtained from state and local fire department report data sources for the years 2005 to 2015. The compiled fire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations.


Sierra_West_Firewise_2017_10_27_2017
Number of Wildfires Reported by Agency
2005 - 2015
# of Fires
1
0
2005
2009
2015
2005 2009 2015
Local 1 1 0
State 0 0 0



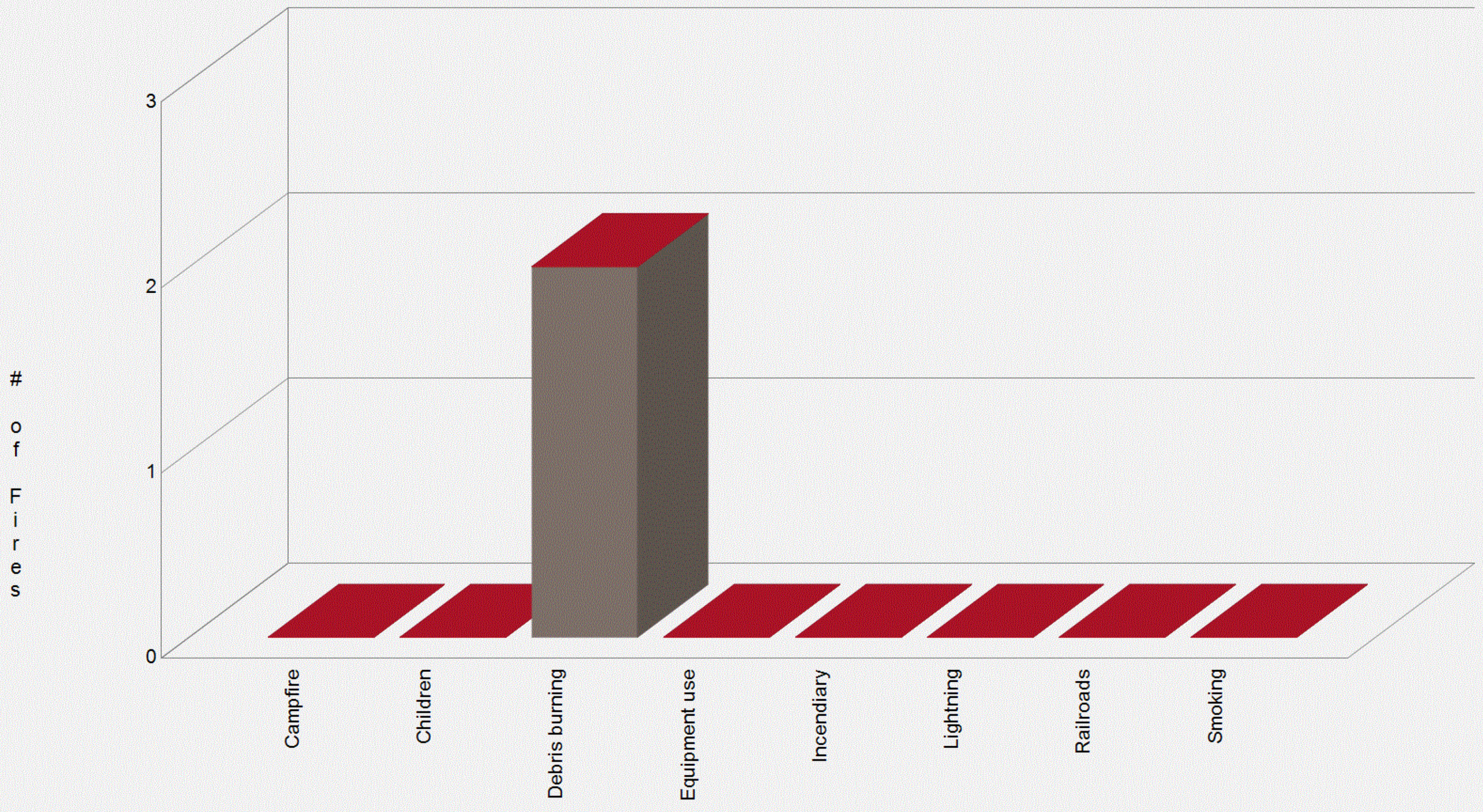
	2005	2009	2015
Local	1	1	0
State	0	0	0


Sierra_West_Firewise_2017_10_27_2017
Percent of Number of Wildfires by Agency
2005 - 2015
Local
State
100.0 %


Sierra_West_Firewise_2017_10_27_2017
Percent of Wildfire Acres by Agency
2005 - 2015
Local
State
100.0 %

Sierra_West_Firewise_2017_10_27_2017

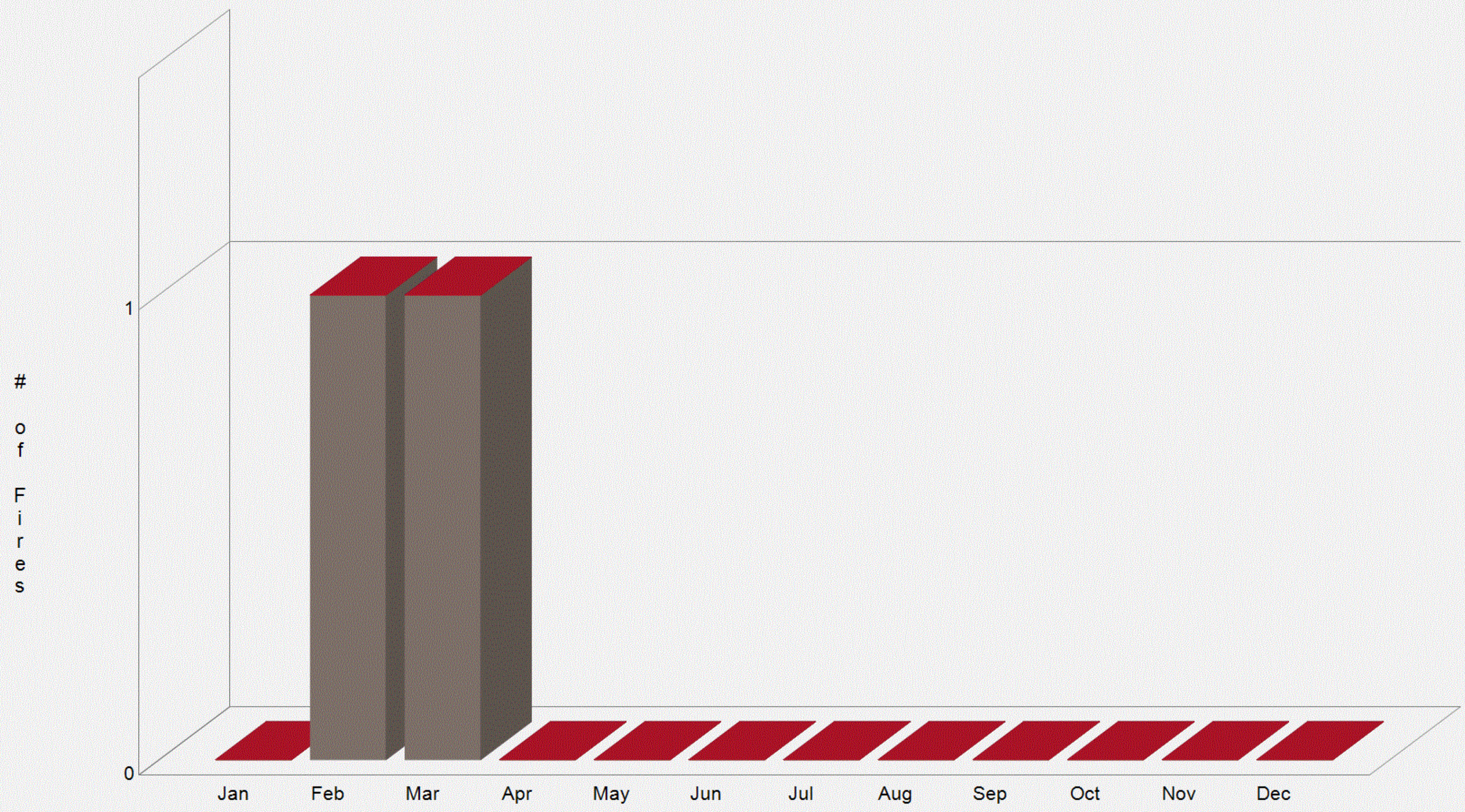
Cause of Wildfires Reported by Agency
2005 - 2015



	Campfire	Children	Debris burning	Equipment use	Incendiary	Lightning	Railroads	Smoking
Local	0	0	2	0	0	0	0	0
State	0	0	0	0	0	0	0	0

Sierra_West_Firewise_2017_10_27_2017

Number of Wildfires Reported per Month by Agency
2005 - 2015



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Local	0	1	1	0	0	0	0	0	0	0	0	0
State	0	0	0	0	0	0	0	0	0	0	0	0

Fire Behavior Overview

Description

Fire behavior is influenced by the following environmental influences:

1. **Fuels**
2. **Weather**
3. **Topography**

Fire behavior characteristics are attributes of wildland fire that pertain to its spread, intensity, and growth. Fire behavior characteristics utilized in the Texas Wildfire Risk Assessment (TWRA) include fire type, rate of spread, flame length and fireline intensity (fire intensity scale). These metrics are used to determine the potential fire behavior under different weather scenarios. Areas that exhibit moderate to high fire behavior potential can be identified for mitigation treatments, especially if these areas are in close proximity to homes, business, or other assets.

Fuels

The TWRA includes composition and characteristics for both surface fuels and canopy fuels, whereas the original Southern Wildfire Risk Assessment (SWRA) only included surface fuels. Being able to assess canopy fire potential in addition to surface fire potential represents a significant enhancement for the TWRA. Significant increases in fire behavior will now be captured if the fire has the potential to transition from a surface fire to a canopy fire.

Fuel datasets required to compute both surface and canopy fire potential include:

- **Surface Fuels**, generally referred to as fire behavior fuel models, provide the input parameters needed to compute surface fire behavior.
- **Canopy Cover** is the horizontal percentage of the ground surface that is covered by tree crowns. It is used to compute wind reduction factors and shading.
- **Canopy Ceiling Height/Stand Height** is the height above the ground of the highest canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. A good estimate of canopy ceiling height would be the average height of the dominant and co-dominant trees in a stand. It is used for computing wind reduction to midflame height and spotting distances from torching trees .
- **Canopy Base Height** is the lowest height above the ground above which there is sufficient canopy fuel to propagate fire vertically . Canopy base height is a property of a plot, stand, or group of trees, not of an individual tree. For fire modeling, canopy base height is an effective value that incorporates ladder fuel, such as tall shrubs and small trees. Canopy base height is used to determine if a surface fire will transition to a canopy fire.

- **Canopy Bulk Density** is the mass of available canopy fuel per unit canopy volume (Scott & Reinhardt, 2001). Canopy bulk density is a bulk property of a stand or group of trees, not an individual tree. Canopy bulk density is used to predict whether a canopy fire can propagate through the canopy of a stand of trees.

Weather

Environmental weather parameters needed to compute fire behavior characteristics include 1-hour, 10-hour, and 100-hour timelag fuel moistures, herbaceous fuel moisture, woody fuel moisture, and the 20-foot 10 minute average wind speed. To collect this information, weather influence zones were established across the state. A weather influence zone is an area where for analysis purposes the weather on any given day is considered uniform. There are 22 weather influence zones in Texas as shown in Figure 2. Within each weather influence zone, historical daily weather is

gathered to compile a weather dataset from which four percentile weather categories are created. The percentile weather categories are intended to represent low, moderate, high, and extreme fire weather days. Fire behavior outputs are computed for each percentile weather category to determine fire potential under different weather scenarios. The four percentile weather categories include:

- Low Weather Percentile (0 – 15%)
- Moderate Weather Percentile (16 – 90%)
- High Weather Percentile (91 – 97%)
- Extreme Weather Percentile (98 – 100%)

TWRA uses the same approach as the original Southern Wildfire Risk Assessment (SWRA) for compiling the weather parameters. For a detailed description of the methodology, refer to the SWRA Final Report at www.southernwildfirerisk.com.

Topography

Topography datasets required to compute fire behavior characteristics are elevation, slope and aspect.

FIRE BEHAVIOR CHARACTERISTICS

Fire behavior characteristics provided in this report include:

- **Characteristic Rate of Spread**
- **Characteristic Flame Length**
- **Characteristic Fire Intensity Scale**
- **Fire Type - Extreme**

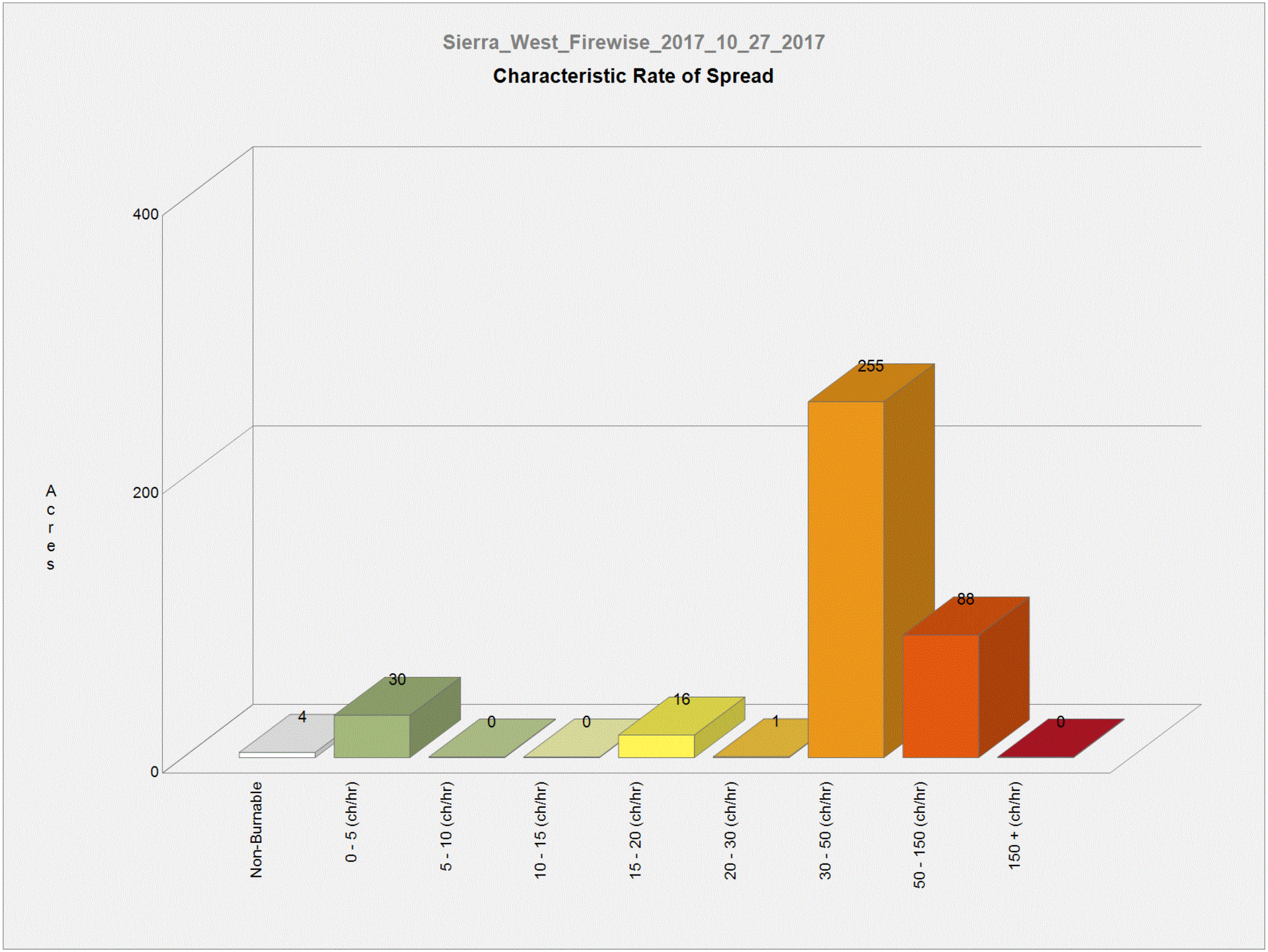
Characteristic Rate of Spread

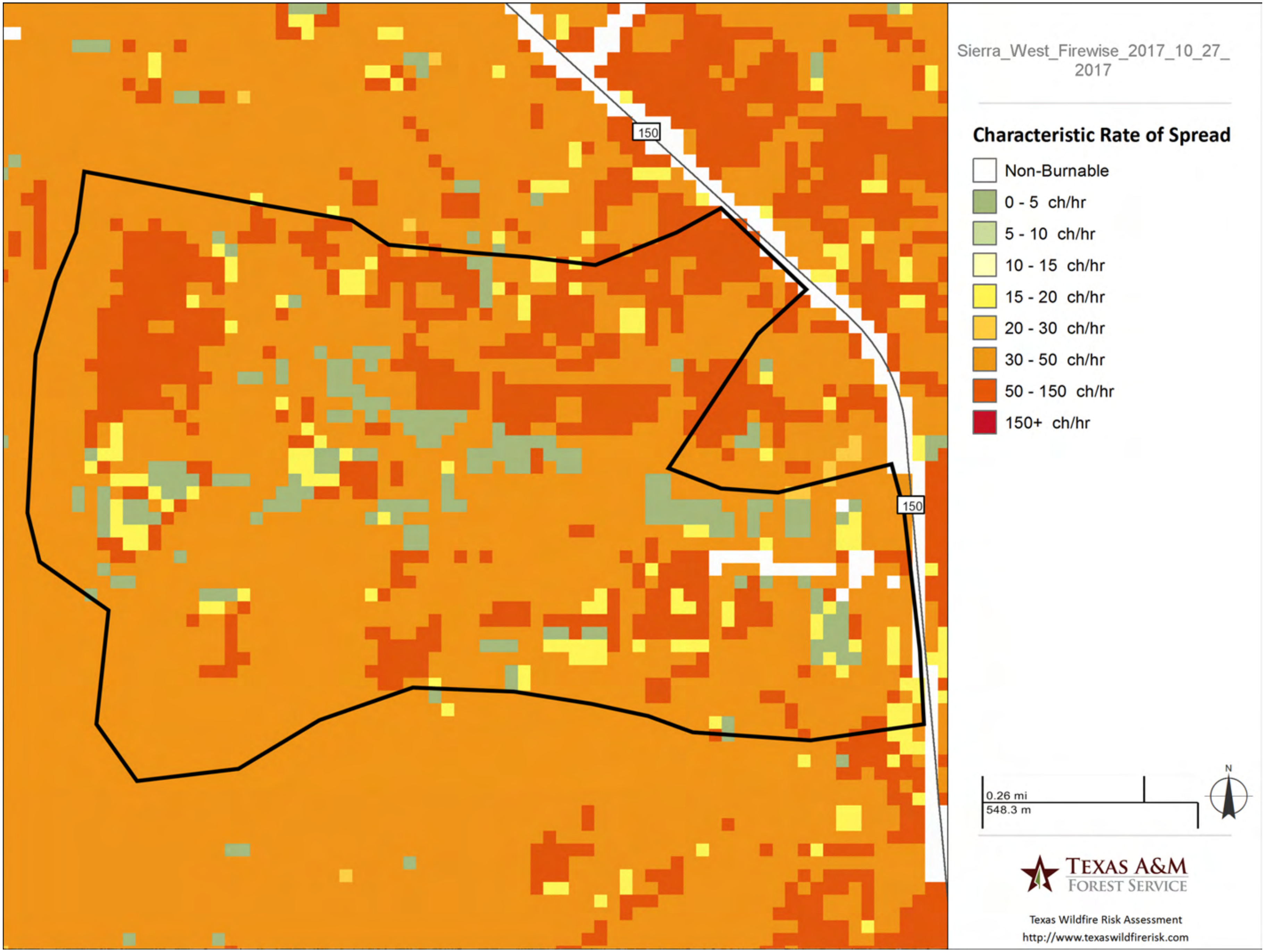
Description

Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the Texas Wildfire Risk Assessment, this measurement represents the maximum rate of spread of the fire front. Rate of Spread is the metric used to derive the Community Protection Zones.

Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Texas. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 22 weather influence zones in Texas.

Rate of Spread	Acres	Percent
Non-Burnable	4	1.0 %
0 - 5 (ch/hr)	30	7.6 %
5 - 10 (ch/hr)	0	0.0 %
10 – 15 (ch/hr)	0	0.0 %
15 - 20 (ch/hr)	16	4.1 %
20 - 30 (ch/hr)	1	0.3 %
30 - 50 (ch/hr)	255	64.7 %
50 - 150 (ch/hr)	88	22.3 %
150 + (ch/hr)	0	0.0 %
Total	**394**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Characteristic Rate of Spread
Acres
400
200
0
4
30
0
0
16
1
255
88
0
Non-Burnable
0 - 5 (ch/hr)
5 - 10 (ch/hr)
10 - 15 (ch/hr)
15 - 20 (ch/hr)
20 - 30 (ch/hr)
30 - 50 (ch/hr)
50 - 150 (ch/hr)
150 + (ch/hr)


150
150
Sierra_West_Firewise_2017_10_27_2017
Characteristic Rate of Spread
Non-Burnable
0 - 5 ch/hr
5 - 10 ch/hr
10 - 15 ch/hr
15 - 20 ch/hr
20 - 30 ch/hr
30 - 50 ch/hr
50 - 150 ch/hr
150+ ch/hr
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

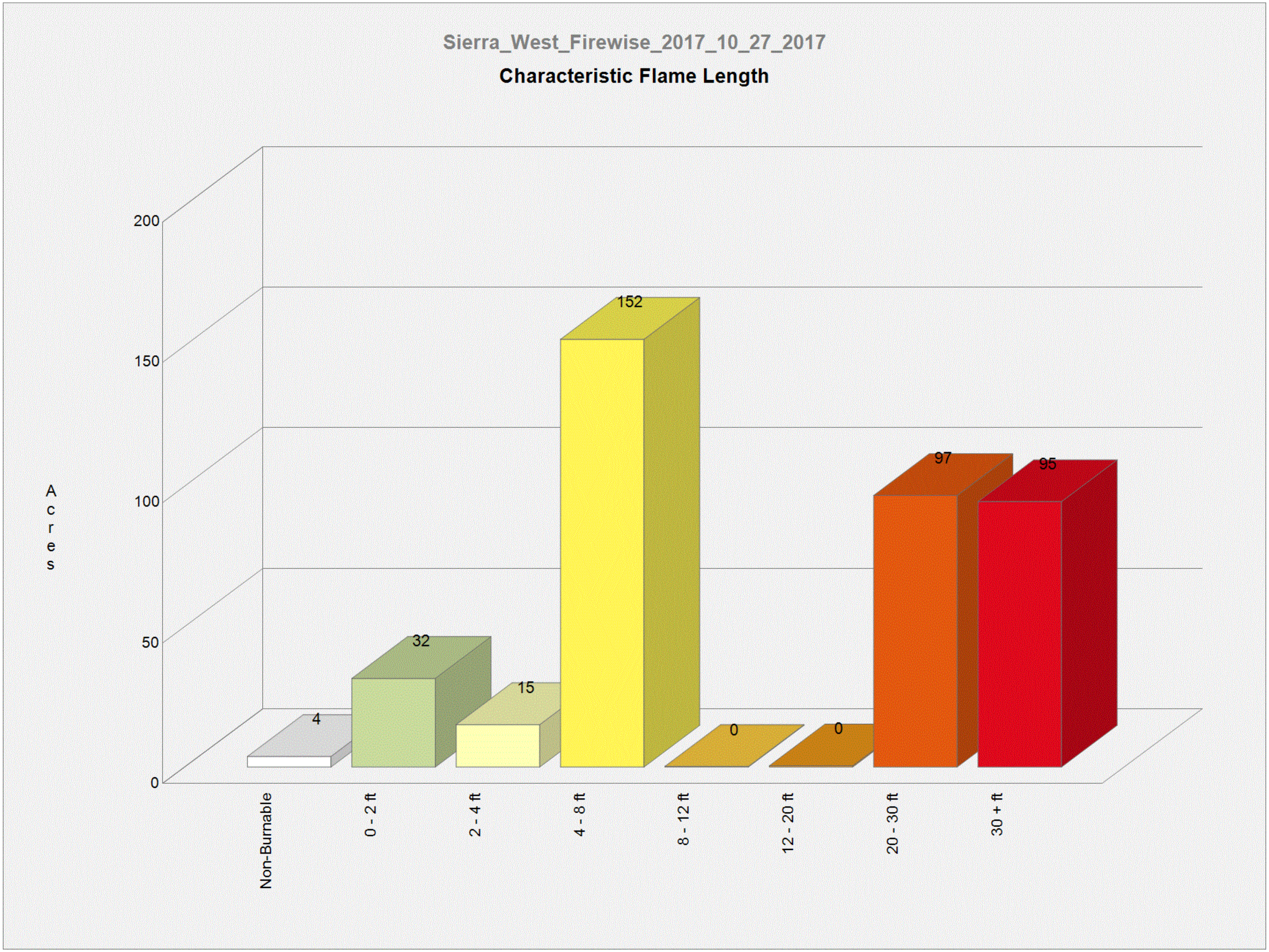
Characteristic Flame Length

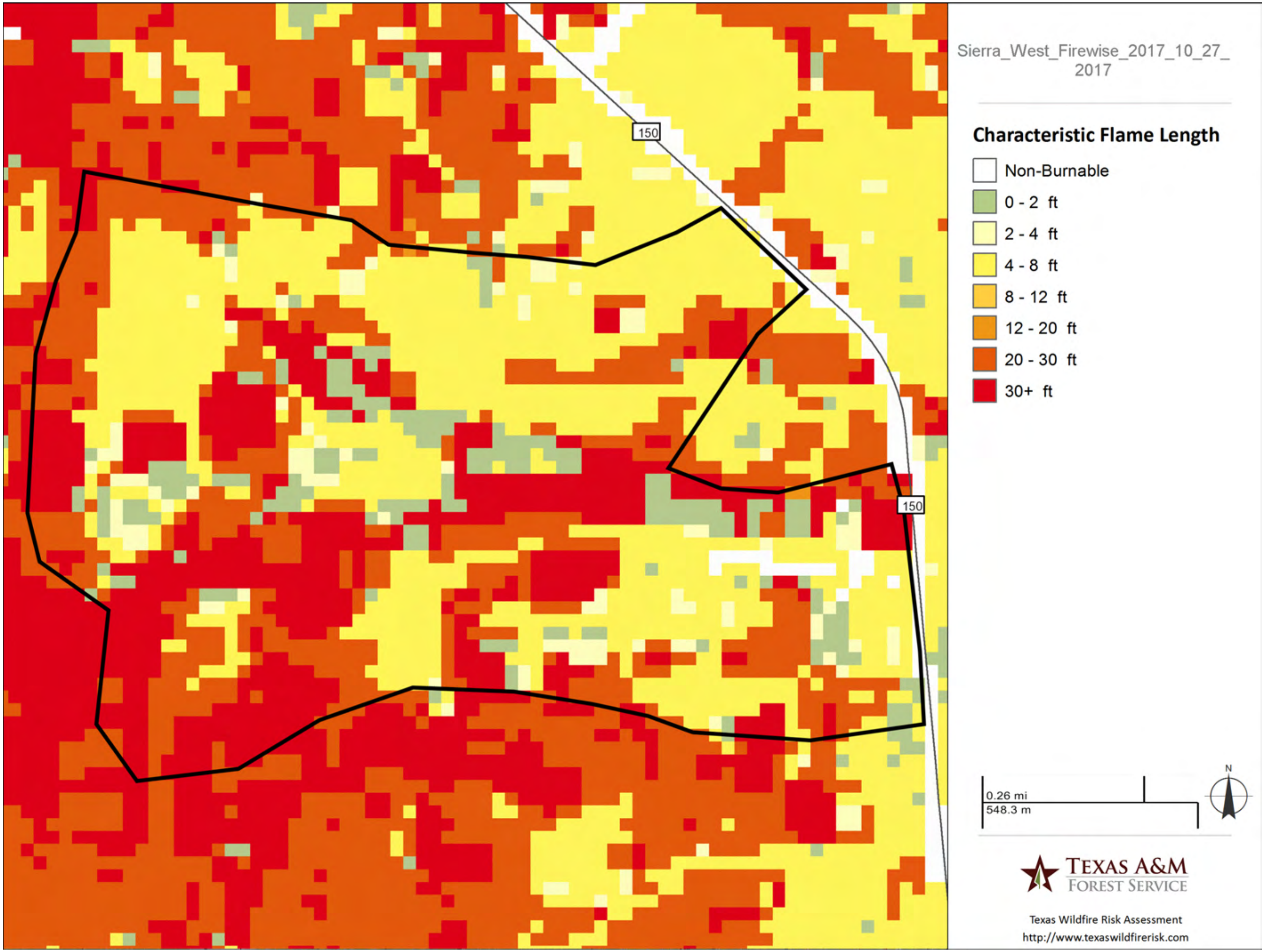
Description

Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally the ground surface. It is an indicator of fire intensity and is often used to estimate how much heat the fire is generating. Flame length is typically measured in feet (ft). Flame length is the measure of fire intensity used to generate the response index outputs for the TWRA.

Flame length is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Texas. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 22 weather influence zones in Texas.

Flame Length	Acres	Percent
Non-Burnable	4	1.0 %
0 - 2 ft	32	8.1 %
2 - 4 ft	15	3.8 %
4 - 8 ft	152	38.5 %
8 - 12 ft	0	0.0 %
12 - 20 ft	0	0.0 %
20 - 30 ft	97	24.6 %
30 + ft	95	24.1 %
Total	**395**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Characteristic Flame Length
Acres
200
150
100
50
0
4
32
15
152
0
0
97
95
Non-Burnable
0 - 2 ft
2 - 4 ft
4 - 8 ft
8 - 12 ft
12 - 20 ft
20 - 30 ft
30 + ft


150
150
Sierra_West_Firewise_2017_10_27_2017
Characteristic Flame Length
Non-Burnable
0 - 2 ft
2 - 4 ft
4 - 8 ft
8 - 12 ft
12 - 20 ft
20 - 30 ft
30+ ft
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Characteristic Fire Intensity Scale

Description

Characteristic Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist based on a weighted average of four percentile weather categories. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of 5 classes where the order of magnitude between classes is ten-fold. The minimum class, Class 1, represents very low wildfire intensities and the maximum class, Class 5, represents very high wildfire intensities. Refer to descriptions below.

- **Class 1, Very Low:**
  Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
- **Class2, Low:**
  Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
- **Class 3, Moderate:**
  Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
- **Class 4, High:**
  Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
- **Class 5, Very High:**
  Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

To aid in viewing on the map, FIS is presented in 1/2 class increments. Please consult the TxWRAP User Manual for a more detailed description of the FIS class descriptions.

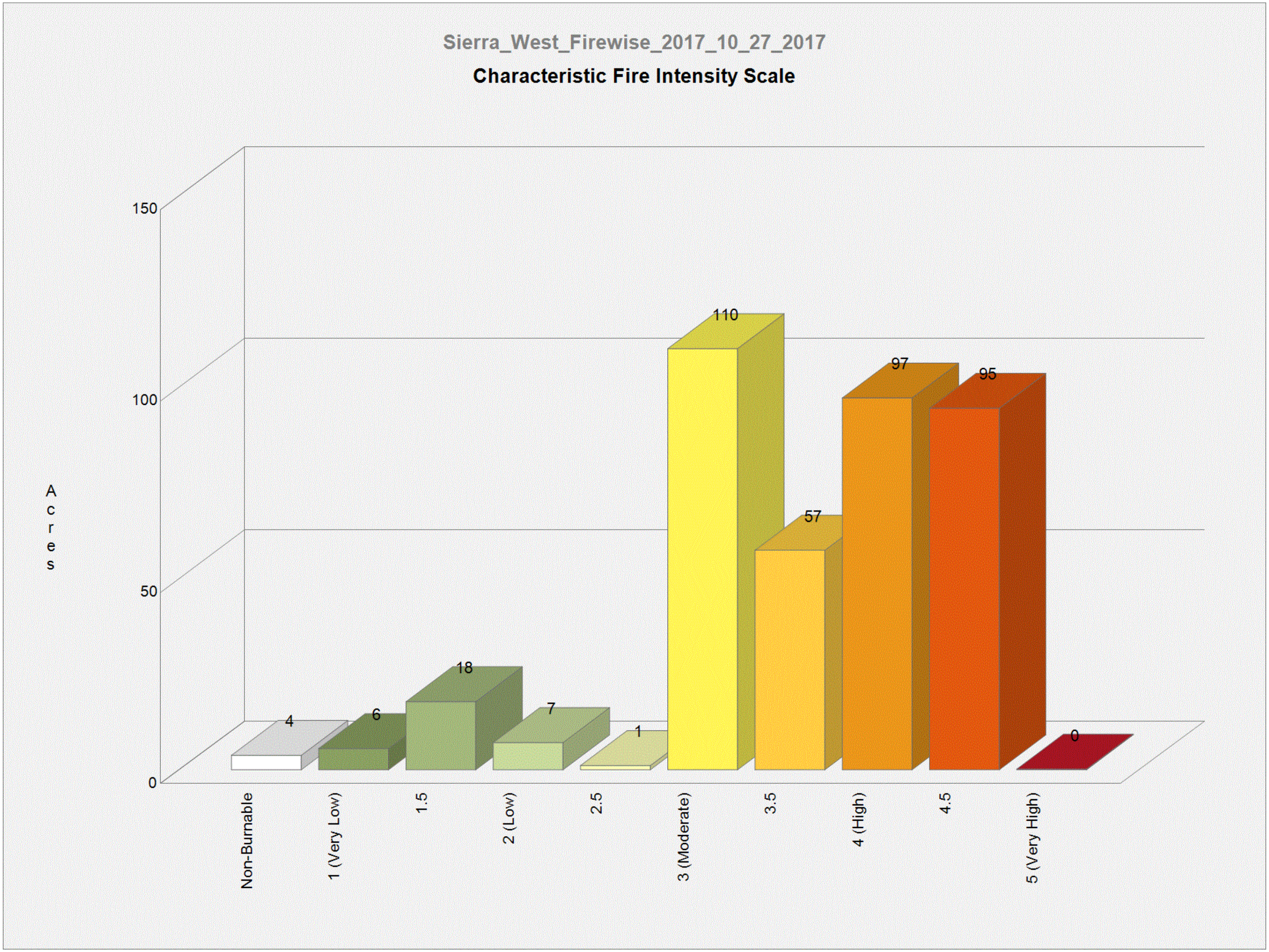
Wildfire Threat and Fire Intensity Scale are designed to complement each other. Unlike Wildfire Threat, the Fire Intensity Scale does not incorporate historical occurrence information. It only evaluates the potential fire behavior for an area, regardless if any fires have occurred there in the past. This additional information allows mitigation planners to quickly identify areas where dangerous fire behavior potential exists in relationship to nearby homes or other valued assets.

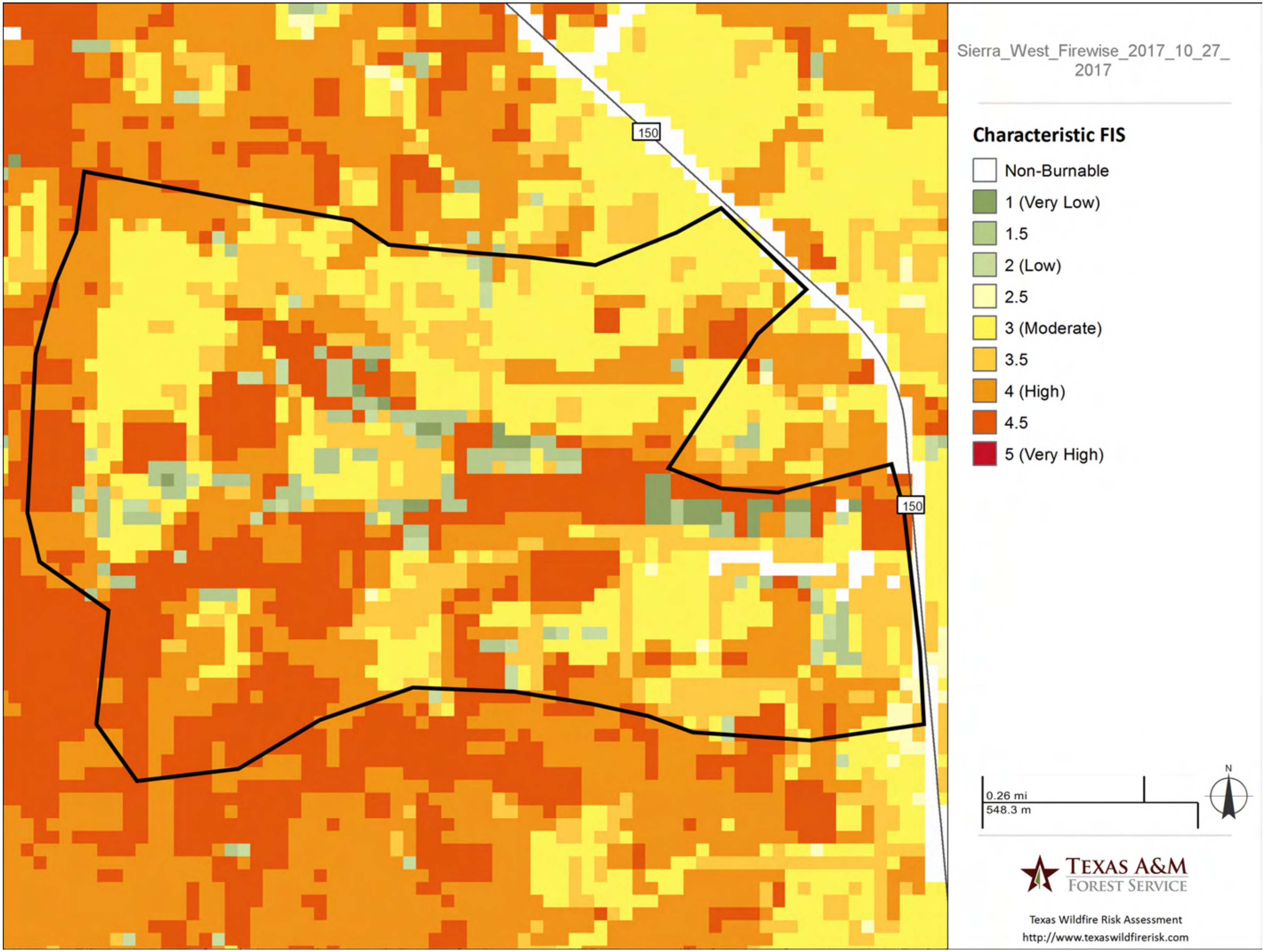
Since all areas in Texas have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in East Texas is equivalent to a high fire intensity area in West Texas.

Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Texas. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 22 weather influence zones in Texas.

The fire intensity scale map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Class	Acres	Percent
Non-Burnable	4	1.0 %
1 (Very Low)	6	1.5 %
1.5	18	4.6 %
2 (Low)	7	1.8 %
2.5	1	0.3 %
3 (Moderate)	110	27.8 %
3.5	57	14.4 %
4 (High)	97	24.6 %
4.5	95	24.1 %
5 (Very High)	0	0.0 %
Total	**395**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Characteristic Fire Intensity Scale
Acres
150
100
50
0
4
6
18
7
1
110
57
97
95
0
Non-Burnable
1 (Very Low)
1.5
2 (Low)
2.5
3 (Moderate)
3.5
4 (High)
4.5
5 (Very High)



150
150
Sierra_West_Firewise_2017_10_27_2017
Characteristic FIS
Non-Burnable
1 (Very Low)
1.5
2 (Low)
2.5
3 (Moderate)
3.5
4 (High)
4.5
5 (Very High)
0.26 mi
548.3 m
N
TEXAS A&M FOREST SERVICE
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Fire Type – Extreme

Description

There are two primary fire types – surface fire and canopy fire. Canopy fire can be further subdivided into passive canopy fire and active canopy fire. A short description of each of these is provided below.

Surface Fire
A fire that spreads through surface fuel without consuming any overlying canopy fuel. Surface fuels include grass, timber litter, shrub/brush, slash and other dead or live vegetation within about 6 feet of the ground.

Passive Canopy Fire
A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

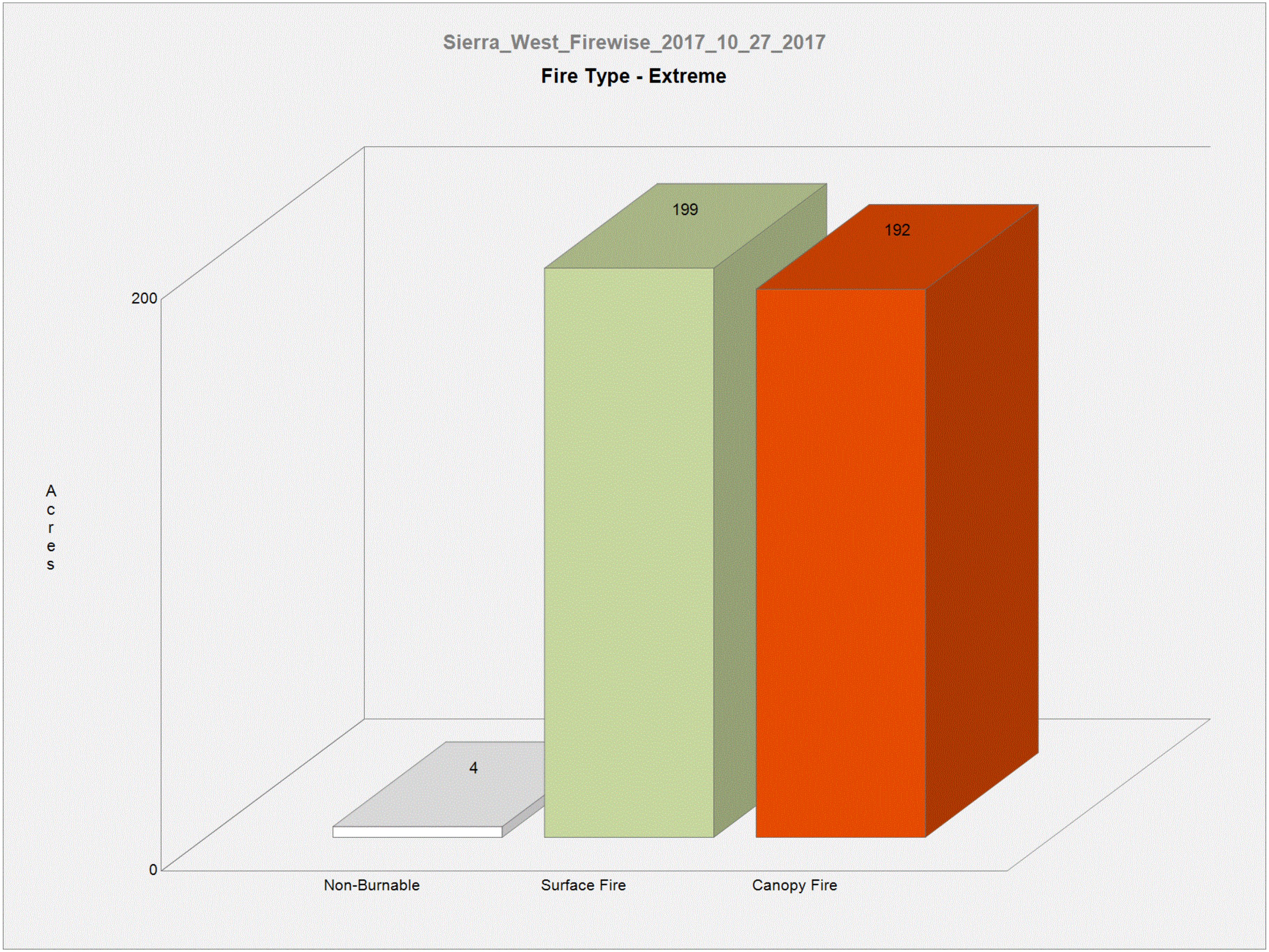
Active Canopy Fire
A crown fire in which the entire fuel complex (canopy) is involved in flame, but the crowning phase remains dependent on heat released from surface fuel for continued spread (Scott & Reinhardt, 2001).

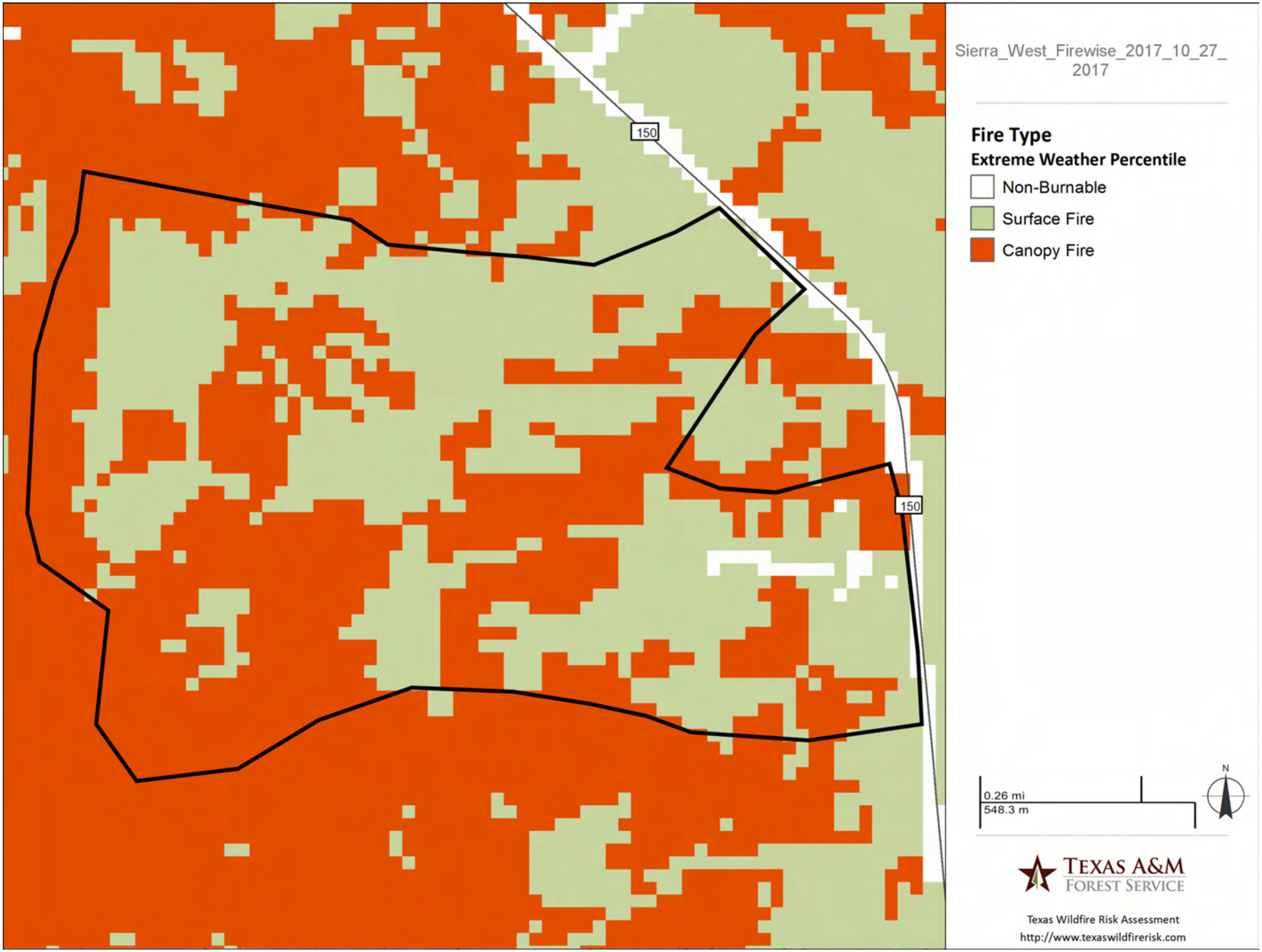
Fire Type – Extreme represents the potential fire type under the extreme percentile weather category. The extreme percentile weather category represents the average weather based on the top three percent fire weather days in the analysis period. It is not intended to represent a worst case scenario weather event. Accordingly, the potential fire type is based on fuel conditions, extreme percentile weather, and topography.

Canopy fires are very dangerous, destructive and difficult to control due to their increased fire intensity. From a planning perspective, it is important to identify where these conditions are likely to occur on the landscape so that special preparedness measure can be taken if neces sary. The Fire Type – Extreme layer shows the footprint of where these areas are most likely to occur. However, it is important to note that canopy fires are not restricted to these areas. Under the right conditions, it can occur in other canopied areas.

The fire type - extreme map is derived at a 30-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Fire Type	Acres	Percent
Non-Burnable	4	1.0 %
Surface Fire	199	50.4 %
Canopy Fire	192	48.6 %
Total	**395**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Fire Type - Extreme
200
0
Acres
199
192
4
Non-Burnable
Surface Fire
Canopy Fire


150
150
Sierra_West_Firewise_2017_10_27_2017
Fire Type
Extreme Weather Percentile
Non-Burnable
Surface Fire
Canopy Fire
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Surface Fuels

Description

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters needed by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, such as rate of spread, flame length, fireline intensity, and other fire behavior metrics. As the name might suggest, surface fuels only account for the surface fire potential. Canopy fire potential is computed through a separate but linked process. The Texas Wildfire Risk Assessment accounts for both surface and canopy fire potential in the fire behavior outputs. This represents a significant enhancement over the Southern Wildfire Risk Assessment (SWRA) where only the surface fire potential was considered.

Surface fuels are typically categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter and 4) slash. There are two standard fire behavior fuel model sets published for use. The Fire Behavior Prediction System 1982 Fuel Model Set contains 13 fuel models and the Fire Behavior Prediction System 2005 Fuel Model Set contains 40 fuel models. The TWRA uses fuel models from both sets, as well as two additional custom fuel models devised by Texas A&M Forest Service. The two custom fire behavior fuel models include 9PPL and 9HWD, both of which are a variation of Fuel Model 9 from the 1982Fuel Model Set. For a complete list of the fuel models utilized in the TWRA refer to the following table.

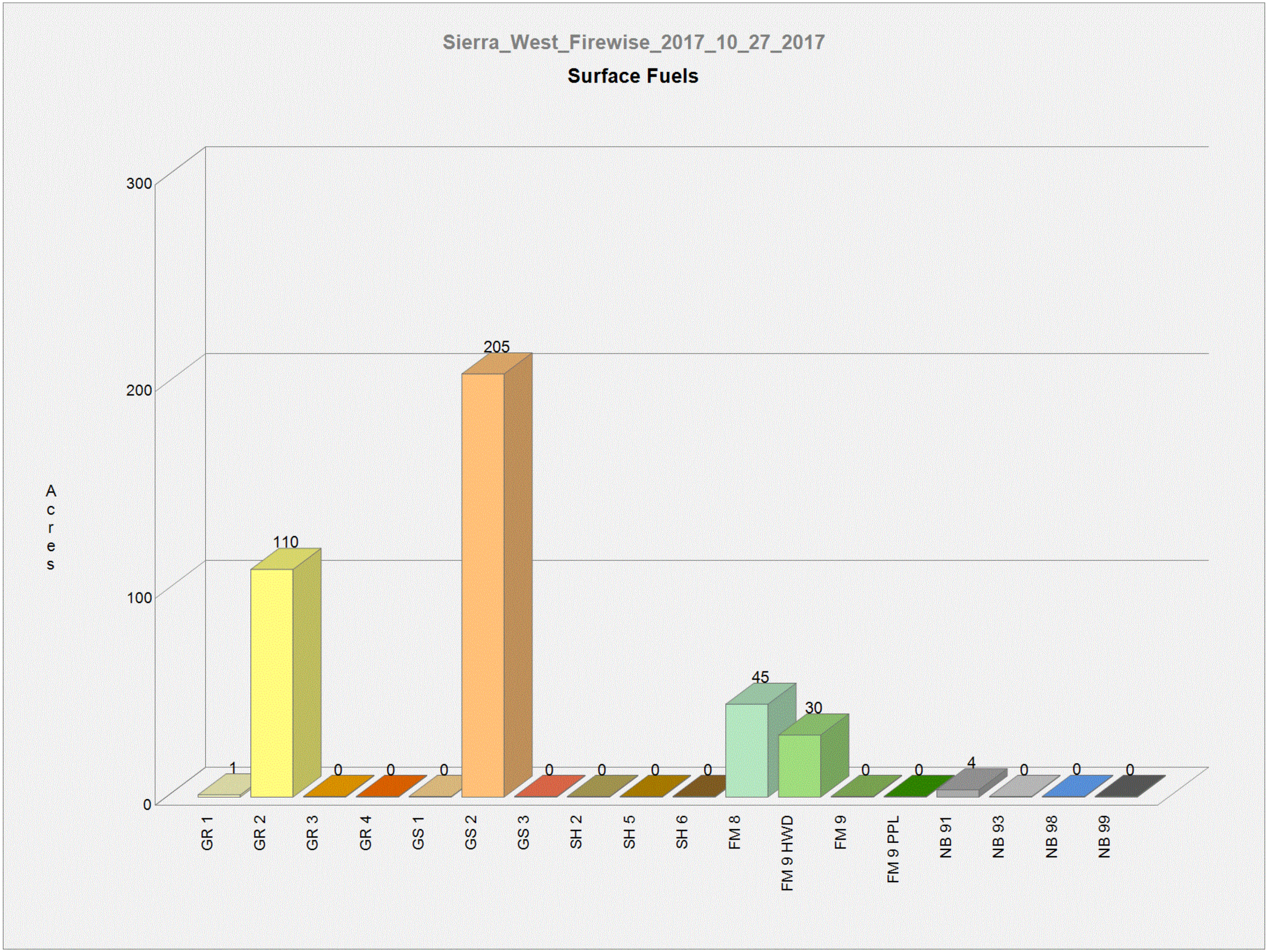
9PPL is intended to model elevated fire behavior associated with dense pine plantations/ pine stands that have an increased timber litter fuel bed depth as compared to a standard Fuel Model 9. (*Note that Fuel Model 7 from the 1982 Fuel Model Set exists in localized areas in southeast Texas, but is not included in the fuel model list. The reason is that it could not be accurately mapped due to technical limitations. Areas of Fuel Model 7 will be mapped as 9PPL, which exhibits the closest fire behavior characteristics.*)

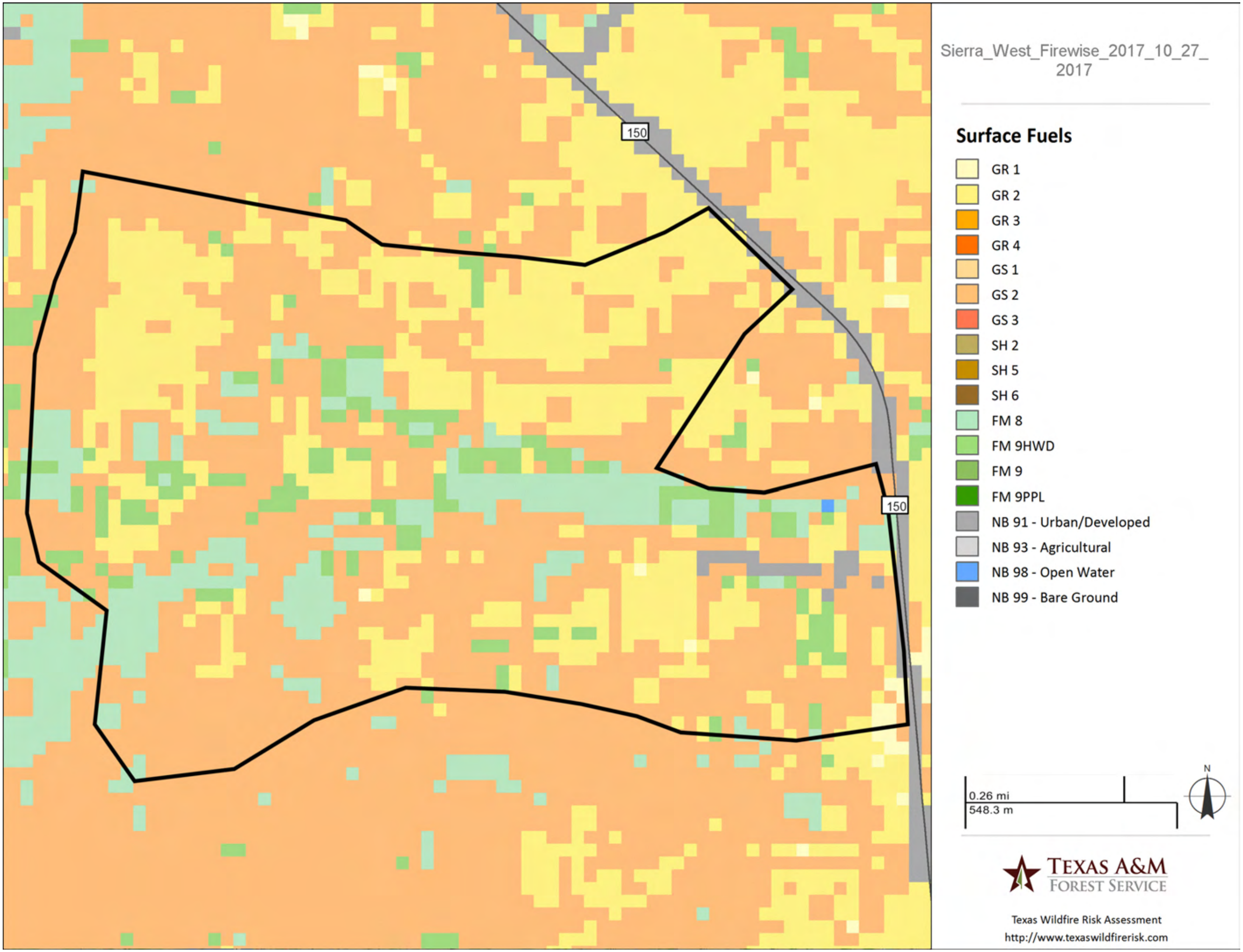
9HWD is intended to model lower fire behavior for hardwood stands with a fluffy litter layer. The main difference from a Fuel Model 9 is the absence of pine litter in the fuel bed component.

Creation of the 30-meter statewide surface fuels dataset is a compilation of three datasets:

1. A Texas modified version of Landfire National (www.landfire.gov) was used as the foundation for the surface fuels map. Using Landfire data and methods, a team of fire behavior and vegetation experts met in Texas to recalibrate the surface fuels dataset in order to create a version specific to Texas. Satellite imagery used in the classification is circa 2001.
2. The East Texas Fuels Classification Project sponsored by Texas A&M Forest Service supplied the surface fuels data for 65 counties in East Texas. Satellite imagery used in the classification is circa 2007.
3. Specific evergreen vegetation classes (i.e. juniper, mixed juniper, and live oak) were extracted for Central Texas from the Texas Ecological Systems Classification Project - Phase 1 and cross-walked to surface fuel models as these areas weren't distinctly mapped by Landfire. This project is sponsored by Texas Parks and Wildlife and contracted to Missouri Resource Assessment Partnership. Satellite imagery used in the classification is circa 2007/2008.

Model	Surface Fuels Category	FBPS Fuel Model Set	Acres	Percent
GR1	Short, Sparse Dry Climate Grass (Dynamic)	2005	1	0.3 %
GR2	Low Load, Dry Climate Grass (Dynamic)	2005	110	27.8 %
GR3	Low Load, Very Coarse, Humid Climate Grass (Dynamic)	2005	0	0.0 %
GR4	Moderate Load, Dry Climate Grass (Dynamic)	2005	0	0.0 %
GS1	Low Load, Dry Climate Grass-Shrub (Dynamic)	2005	0	0.0 %
GS2	Moderate Load, Dry Climate Grass-Shrub (Dynamic)	2005	205	51.9 %
GS3	Moderate Load, Humid Climate Grass-Shrub (Dynamic)	2005	0	0.0 %
SH2	Moderate Load Dry Climate Shrub	2005	0	0.0 %
SH5	High Load, Dry Climate Shrub	2005	0	0.0 %
SH6	Low Load, Humid Climate Shrub	2005	0	0.0 %
FM8	Closed timber litter (compact)	2005	45	11.4 %
FM9 HWD	Hardwood litter (fluffy) - Low Load for Texas	2005	30	7.6 %
FM9	Long-needle (pine litter) or hardwood litter	2005	0	0.0 %
FM9 PPL	Long-needle (pine litter, plantations) - High Load for Texas	2005	0	0.0 %
NB91	Urban/Developed	2005	4	1.0 %
NB93	Agricultural	2005	0	0.0 %
NB98	Open Water	2005	0	0.0 %
NB99	Bare Ground	2005	0	0.0 %
	Total		**395**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Surface Fuels
Acres
300
200
100
0
1
110
0
0
0
205
0
0
0
0
45
30
0
0
4
0
0
0
GR 1
GR 2
GR 3
GR 4
GS 1
GS 2
GS 3
SH 2
SH 5
SH 6
FM 8
FM 9 HWD
FM 9
FM 9 PPL
NB 91
NB 93
NB 98
NB 99


150
150
Sierra_West_Firewise_2017_10_27_2017
Surface Fuels
GR 1
GR 2
GR 3
GR 4
GS 1
GS 2
GS 3
SH 2
SH 5
SH 6
FM 8
FM 9HWD
FM 9
FM 9PPL
NB 91 - Urban/Developed
NB 93 - Agricultural
NB 98 - Open Water
NB 99 - Bare Ground
0.26 mi
548.3 m
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Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Vegetation

Description

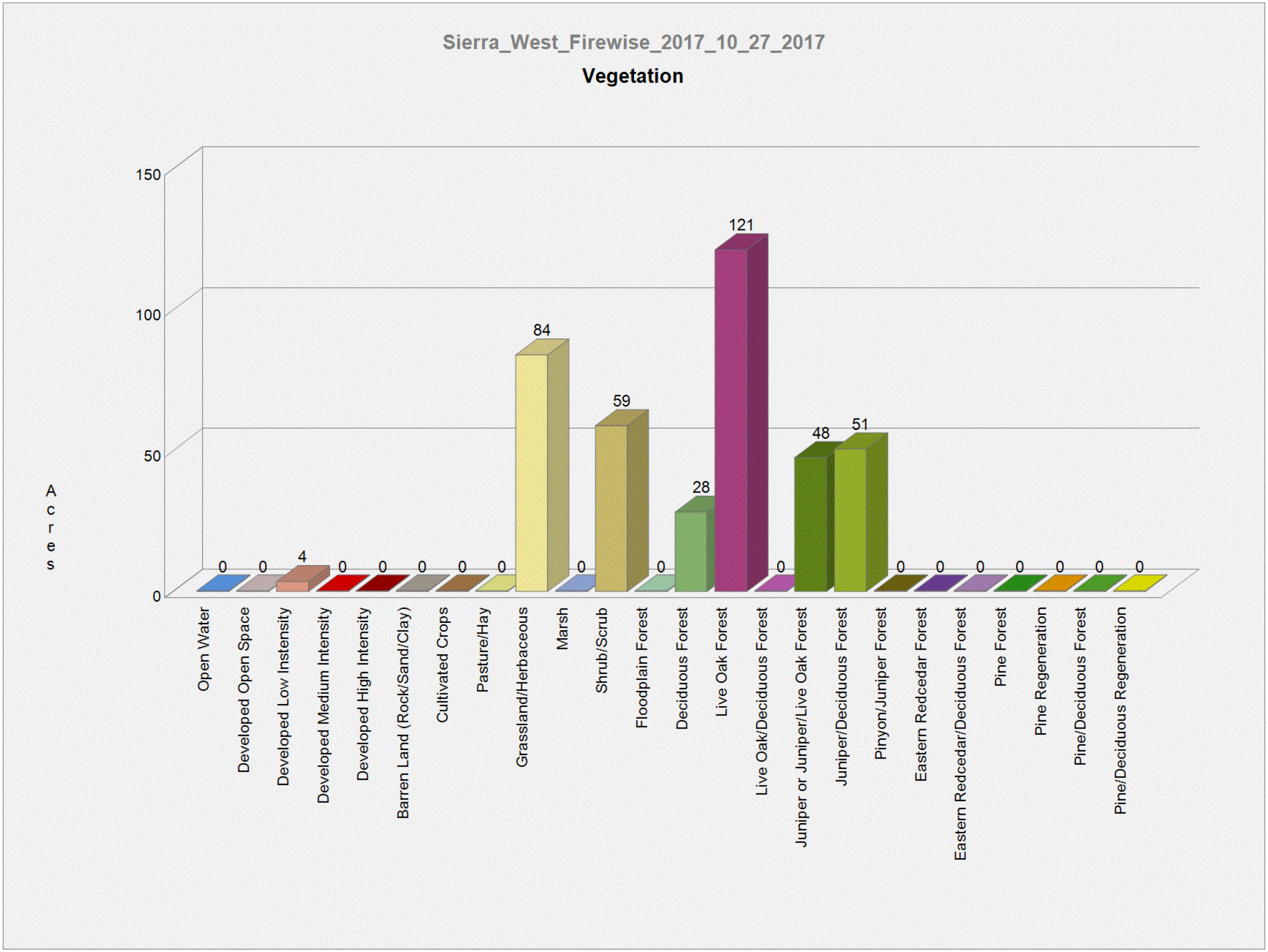
The Vegetation map describes the general vegetation and landcover types across the state of Texas. In the Texas Wildfire Risk Assessment (TWRA), the Vegetation dataset is used to support the development of the Surface Fuels, Canopy Cover, Canopy Stand Height, Canopy Base Height, and Canopy Bulk Density datasets. The vegetation classes with descriptions are shown in the following table.

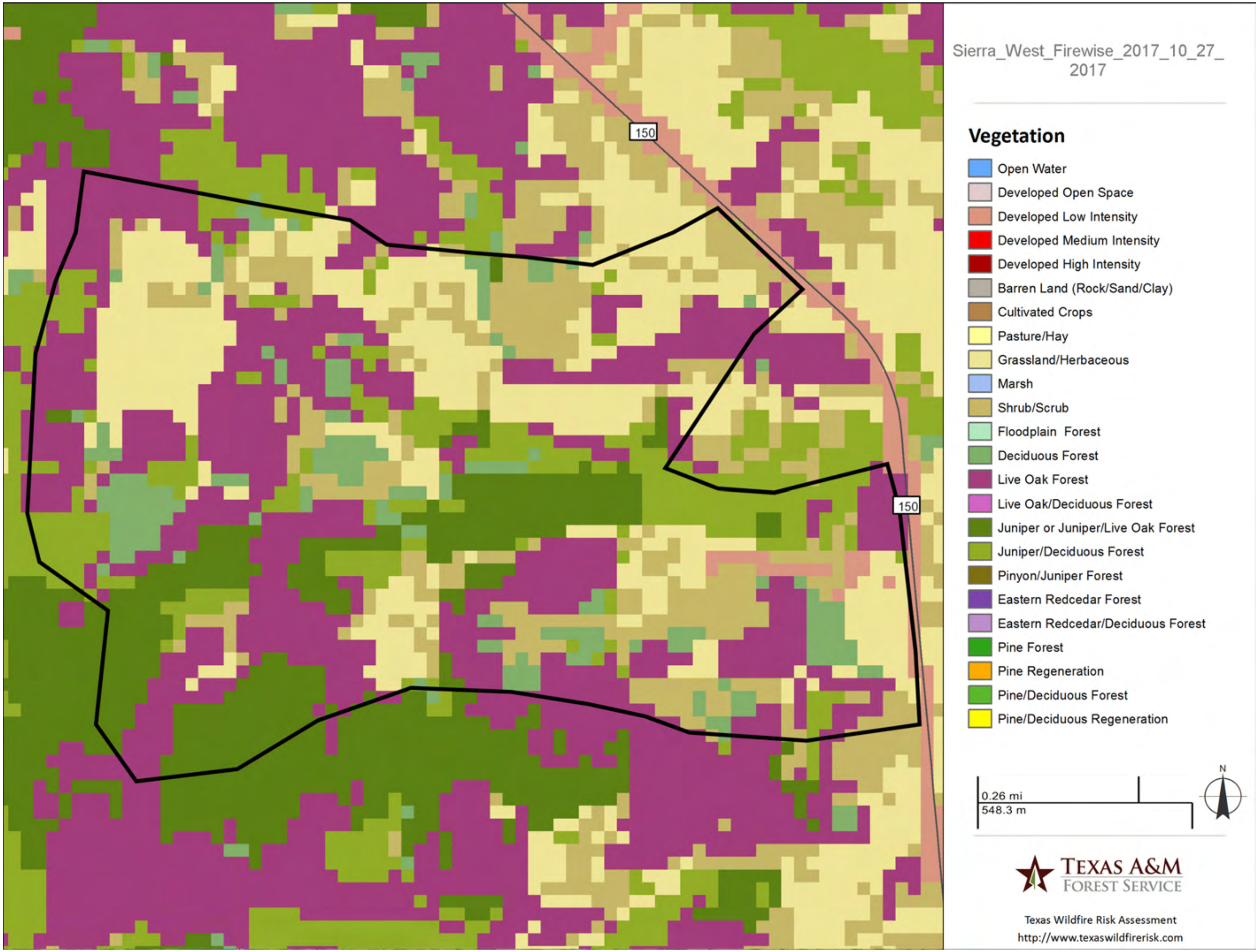
For the purposes of the TWRA, special consideration was given to mapping of evergreen forest types (i.e. pine, redcedar, juniper, live oak, and pinyon) due to their potential to support passive and active crowning.

Creation of the 30-meter statewide vegetation dataset was created from a compilation of three datasets:

1. National Landcover Dataset 2001, sponsored by the US Geological Survey (USGS), formed the foundation for the vegetation map. Satellite imagery used in the classification is circa 2001.
2. East Texas Fuels Classification Project, sponsored by Texas A&M Forest Service, supplied the vegetation data for 65 counties in East Texas. Satellite imagery used in the classification is circa 2007.
3. Specific evergreen vegetation classes (i.e. juniper, mixed juniper, and live oak) were extracted for Central Texas from the Texas Ecological Systems Classification Project - Phase 1 to enhance the vegetation map. This project is sponsored by Texas Parks and Wildlife and contracted to Missouri Resource Assessment Partnership. Satellite imagery used in the classification is circa 2007/2008.

Class	Description	Acres	Percent
Open Water	All areas of open water, generally with < 25% cover of vegetation or soil	0	0.0 %
Developed Open Space	Impervious surfaces account for < 20% of total cover (i.e. golf courses, parks, etc…)	0	0.0 %
Developed Low Intensity	Impervious surfaces account for 20-49% of total cover	4	1.0 %
Developed Medium Intensity	Impervious surfaces account for 50-79% of total cover	0	0.0 %
Developed High Intensity	Impervious surfaces account for 80-100%of total cover	0	0.0 %
Barren Land (Rock/Sand/Clay)	Vegetation generally accounts for <15% of total cover	0	0.0 %
Cultivated Crops	Areas used for the production of annual crops, includes land being actively tilled	0	0.0 %
Pasture/Hay	Areas of grasses and/or legumes planted for livestock grazing or hay production	0	0.0 %
Grassland/Herbaceous	Areas dominated (> 80%) by grammanoid or herbaceous vegetation, can be grazed	84	21.3 %
Marsh	Low wet areas dominated (>80%) by herbaceous vegetation	0	0.0 %
Shrub/Scrub	Areas dominated by shrubs/trees < 5 meters tall, shrub canopy > than 20% of total vegetation	59	14.9 %
Floodplain Forest	> 20% tree cover, the soil is periodically covered or saturated with water	0	0.0 %
Deciduous Forest	> 20% tree cover, >75% of tree species shed leaves in response to seasonal change	28	7.1 %
Live Oak Forest	> 20% tree cover, live oak species represent >75% of the total tree cover	121	30.6 %
Live Oak/Deciduous Forest	> 20% tree cover, neither live oak or deciduous species represent >75% of the total tree cover	0	0.0 %
Juniper or Juniper/Live Oak Forest	> 20% tree cover, juniper or juniper/live oak species represent > 75% of the total tree cover	48	12.2 %
Juniper/Deciduous Forest	> 20% tree cover, neither juniper or deciduous species represent > 75% of the total tree cover	51	12.9 %
Pinyon/Juniper Forest	> 20% tree cover, pinyon or juniper species represent > 75% of the total tree cover	0	0.0 %
Eastern Redcedar Forest	> 20% tree cover, eastern redcedar represents > 75% of the total tree cover	0	0.0 %
Eastern Redcedar/Deciduous Forest	> 20% tree cover, neither eastern redcedar or deciduous species represent > 75% of the total tree cover	0	0.0 %
Pine Forest	> 20% tree cover, pine species represent > 75% of the total tree cover	0	0.0 %
Pine Regeneration	Areas of pine forest in an early successional or transitional stage	0	0.0 %
Pine/Deciduous Forest	> 20% tree cover, neither pine or deciduous species represent > 75% of the total tree cover	0	0.0 %
Pine/Deciduous Regeneration	Areas of pine or pine/deciduous forest in an early successional or transitional stage	0	0.0 %
Total		**395**	**100.0 %**


Sierra_West_Firewise_2017_10_27_2017
Vegetation
Acres
150
100
50
0
0
0
4
0
0
0
0
0
84
0
59
0
28
121
0
48
51
0
0
0
0
0
0
0
Open Water
Developed Open Space
Developed Low Instensity
Developed Medium Intensity
Developed High Intensity
Barren Land (Rock/Sand/Clay)
Cultivated Crops
Pasture/Hay
Grassland/Herbaceous
Marsh
Shrub/Scrub
Floodplain Forest
Deciduous Forest
Live Oak Forest
Live Oak/Deciduous Forest
Juniper or Juniper/Live Oak Forest
Juniper/Deciduous Forest
Pinyon/Juniper Forest
Eastern Redcedar Forest
Eastern Redcedar/Deciduous Forest
Pine Forest
Pine Regeneration
Pine/Deciduous Forest
Pine/Deciduous Regeneration


150
150
Sierra_West_Firewise_2017_10_27_2017
Vegetation
Open Water
Developed Open Space
Developed Low Intensity
Developed Medium Intensity
Developed High Intensity
Barren Land (Rock/Sand/Clay)
Cultivated Crops
Pasture/Hay
Grassland/Herbaceous
Marsh
Shrub/Scrub
Floodplain Forest
Deciduous Forest
Live Oak Forest
Live Oak/Deciduous Forest
Juniper or Juniper/Live Oak Forest
Juniper/Deciduous Forest
Pinyon/Juniper Forest
Eastern Redcedar Forest
Eastern Redcedar/Deciduous Forest
Pine Forest
Pine Regeneration
Pine/Deciduous Forest
Pine/Deciduous Regeneration
0.26 mi
548.3 m
N
TEXAS A&M FOREST SERVICE
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

Pine Age

Description

Pine Age is a map of pine and mixed pine/deciduous stands in 2007. Pine age is one the key inputs used to assist with the development of several fuel datasets including, surface fuels, canopy ceiling height/stand height, canopy base height and canopy bulk density. The age classes are as follows: 0-3 years, 4-6 years, 7-9 years, 10-12 years, 13-15 years, 16-18 years, 19-21 years, 22-30 years, and 30 + years.

In the pine forests of East Texas, pine stands are an important consideration in the overall wildfire management of the area. Many stands are planted and managed as a financial investment by private landowners, timber companies, timber management investment organizations (TIMOs), or real estate investment trusts (REITs). Other stands may be used for recreation and/or represent prime wildlife habitat for critical or endangered species.

As wildland fire managers, it is our job to ensure these areas are properly protected from wildfires. Age is often a good indicator of the potential fire behavior and value associated with pine stands, as well as the susceptibility of the stand to be damaged from wildfire. For example, young stands mixed with grass and smaller-sized trees have the potential to exhibit extreme fire behavior and are very susceptible to damage. However, these young stands typically have less value associated with them as compared to more mature pine stands. As a pine stand ages it typically becomes less susceptible to damage from wildfires.

The pine age map is used to determine the age distribution and area for each age class, as well as their location on the landscape. Planners can quickly identify possible areas where these age classes of interest are located for further analysis.

Pine Age was produced as part the East Texas Fuels Classification Project sponsored by Texas A&M Forest Service. The Pine Age map was created by analyzing a time series of satellite images collected between 1972 and 2007. The process involves monitoring the growth and removal of timber stands on a three-year cycle. Once a timber stand is recorded as removed, it is tagged as zero to three years old. From this point, the stand is grown forward for each subsequent cycle in order to determine the age of the stand.

Discrimination between pine stands and mixed pine stands younger than 10 years of age is very difficult using 30-meter satellite imagery due to the lack of identifiable canopy at those ages. These stands are typically categorized as “transitional” forest, but for the purposes of the ETFCP, a distinction was made between the two. This distinction was made using probability algorithms based on previous vegetation and ownership patterns.

The designated project area does not contain Pine Age data

Pine Plantation

Description

Pine plantations are pine stands that are planted and actively managed for financial gain or other economic reasons. For the purpose of the Texas Wildfire Risk Assessment (TWRA), pine plantations are a key input to the Values Response Index. The Pine Plantation map represents conditions in 2007.

The forest sector in Texas has a major impact to the Texas economy. It is the 3rd most important agricultural commodity in Texas, and the most important in 28 out of the 43 East Texas counties. It produces $22 billion in industry outputs and employs 80,000 workers. Managed plantations have a significant role in the forest sector, because they supply the majority of the timber needed by the mills to produce paper and lumber products.

Plantations are planted by private landowners, timber companies, timber management investment organizations (TIMOs), and real estate investment trusts (REITs). As wildland fire managers, it is our job to ensure these investments are properly protected.
The Pine Plantation map is used to identify where plantations are located on the landscape. Planners can use this map to quickly determine where additional planning and analysis may be required to protect this valuable resource.

The Pine Plantation 2007 map was produced as part the East Texas Fuels Classification Project sponsored by Texas A&M Forest Service. It was created by analyzing satellite imagery, modeling the Pine Age 2007 dataset, and utilizing Forest Inventory and Analysis (FIA) statistics.

The Pine Plantation 2007 dataset is comprised of three classes, primarily based on age and canopy cover.

- **Pine Plantation (Established)** – These stands are less than 30 years old and can be detected as pine via satellite remote sensing techniques. FIA statistics indicate that stands 30 years old or less have an extremely good chance (greater than 75%) of being a plantation and that stands older than 30 years have a good chance (greater than 75%)of being a natural stand.

- **Pine Regeneration** – These stands are less than 10 years old and do not possess sufficient canopy to be detectable as pine plantation via satellite remote sensing techniques; however, the probability is <u>high</u> for this class to be considered pine plantation. This distinction is made using probability algorithms based on previous vegetation and ownership patterns. The typical age for this class is between 0 – 6 years.

- **Pine/Deciduous Regeneration** - These stands are less than 10 years old and do not possess sufficient canopy to be detectable as pine plantation via satellite remote sensing techniques; however, the probability is <u>moderate</u> for this class to be considered pine plantation. This distinction is made using probability algorithms based on previous vegetation and ownership patterns. The typical age for this class is between 0 – 6 years.

Discrimination between pine stands and mixed pine stands younger than 10 years of age is very difficult using 30-meter satellite imagery due to the lack of identifiable canopy at those ages. These stands are typically categorized as "transitional" or regeneration forest. For the purposes of the TWRA, however, a distinction is made between the two.

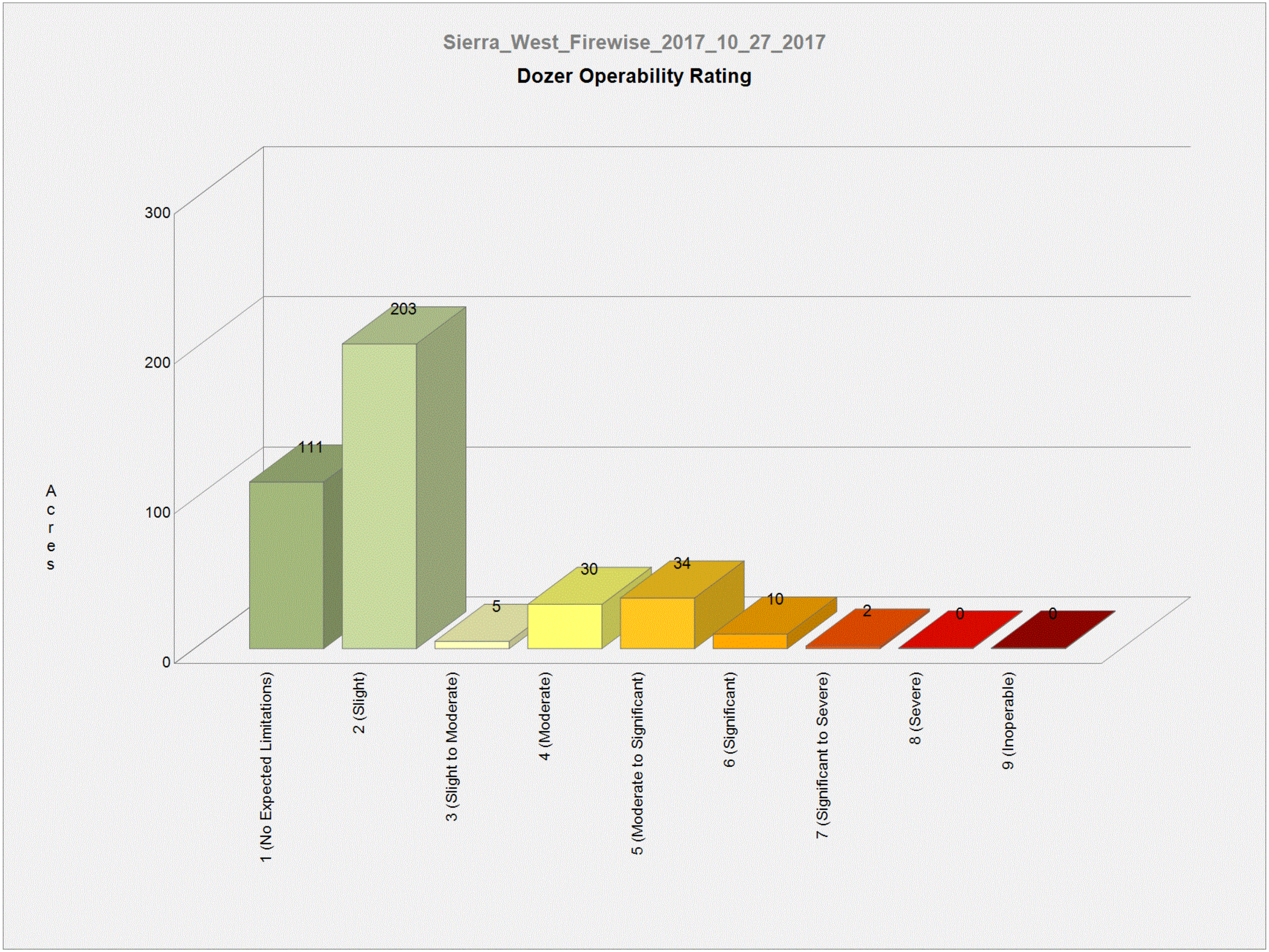
The designated project area does not contain Pine Plantation data

Dozer Operability Rating

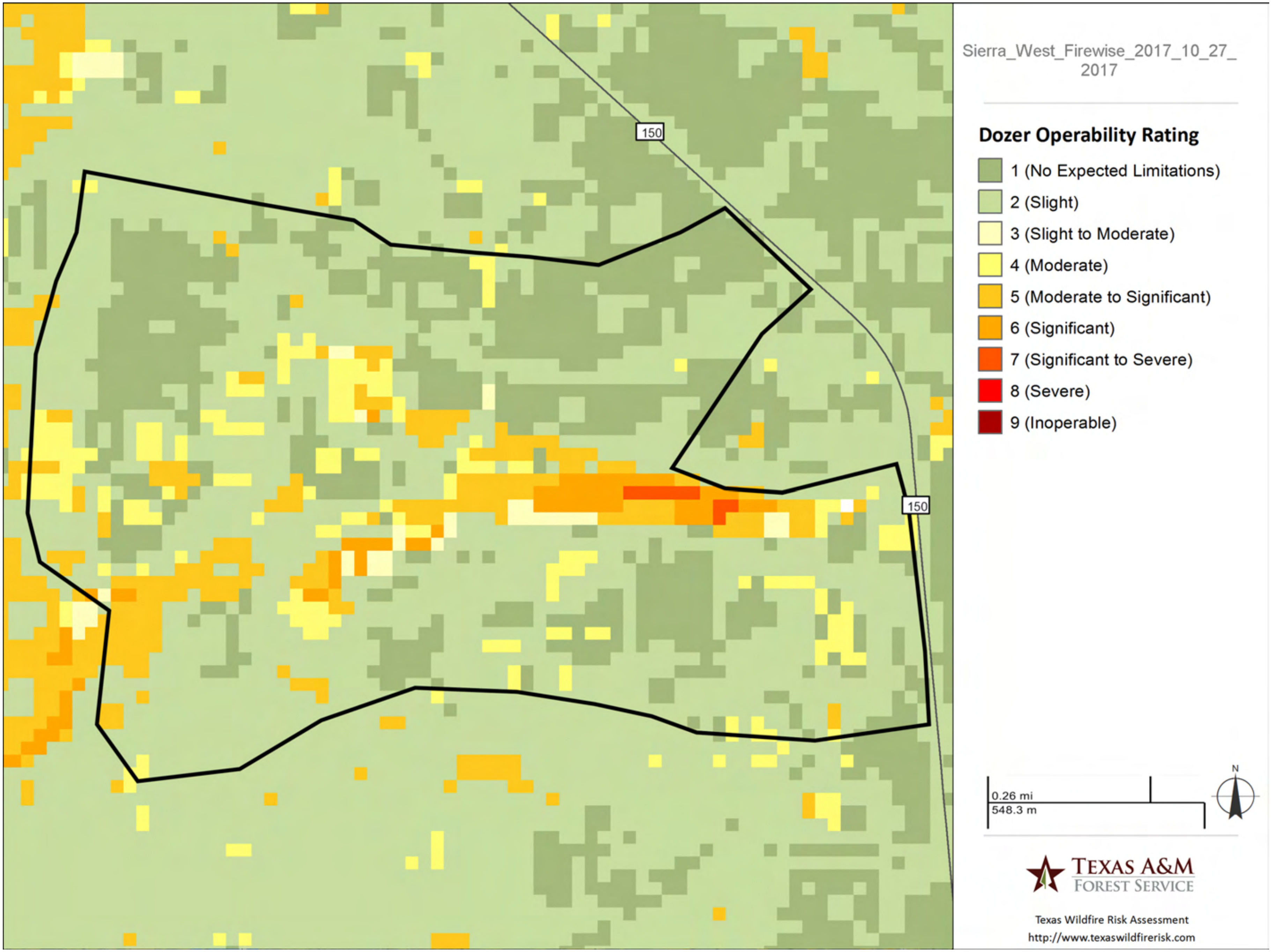
Description

The Dozer Operability Rating (DOR) expresses how difficult it is to operate a dozer in an area based on limitations associated with slope and vegetation/fuel type. Using the fireline production rates published in the NWCG Fireline Handbook 3 (PMS 410-1) as a guide, operability values were assigned to a matrix based on 6 slope classes and 10 vegetation/fuels classes. The possible values range from 1 to 9, with 1 representing no limitations and 9 being inoperable.

Class	Acres	Percent
1 (No Expected Limitations)	0	0.0 %
2 (Slight)	0	0.0 %
3 (Slight to Moderate)	2	0.5 %
4 (Moderate)	10	2.5 %
5 (Moderate to Significant)	34	8.6 %
6 (Significant)	30	7.6 %
7 (Significant to Severe)	5	1.3 %
8 (Severe)	203	51.4 %
9 (Inoperable)	111	28.1 %
Total	**395**	**100.0 %**



Sierra_West_Firewise_2017_10_27_2017
Dozer Operability Rating
Acres
300
200
100
0
111
203
5
30
34
10
2
0
0
1 (No Expected Limitations)
2 (Slight)
3 (Slight to Moderate)
4 (Moderate)
5 (Moderate to Significant)
6 (Significant)
7 (Significant to Severe)
8 (Severe)
9 (Inoperable)



150
150
Sierra_West_Firewise_2017_10_27_2017
Dozer Operability Rating
1 (No Expected Limitations)
2 (Slight)
3 (Slight to Moderate)
4 (Moderate)
5 (Moderate to Significant)
6 (Significant)
7 (Significant to Severe)
8 (Severe)
9 (Inoperable)
0.26 mi
548.3 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
http://www.texaswildfirerisk.com

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