Texas Wildfire Risk Assessment Summary Report

Texas A&M Forest Service

Sample Project

Report was generated using www.texaswildfirerisk.com

Report version: 5.0

Report generated: 11/4/2024

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Introduction

TWRA Summary Report

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

Map Products and Descriptions

Each map product in this report is accompanied by a general description, table, chart, or map. Please see the table below for a list of data layers available in the Summary Report.

Layer	Description
Wildfire Occurrence Statistics	Information regarding number of fires, acres suppressed and cause of fire.
Burn Probability	Burn Probability is the likelihood of wildfire burning a specific location within one calendar year or wildfire season.
Wildfire Exposure Score	Wildfire Exposure Score combines wildfire likelihood (Burn Probability) and damage to homes (Damage Potential) for all areas regardless of whether a structure currently exists at that location.
Damage Potential	Damage Potential represents the possible damage from wildfire to a home or parcel considering both fire intensity and embers from nearby fuel.
Housing Unit Density	This layer displays housing unit density measured in housing units per square kilometer.
Housing Unit Impact	Housing Unit Impact represents the relative potential impact to housing units if a fire were to occur.
Housing Unit Risk	Housing Unit Risk represents the relative potential risk to housing units.
Sources of Ember Load to Buildings	This layer displays the potential for fuel to be a source of embers to buildings.
Functional Wildland Urban Interface	This dataset classifies the land near buildings into wildfire risk mitigation zones.
Characteristic Fire Intensity Scale	Quantifies the potential fire intensity by orders of magnitude as determined by fuel and a range of possible wind and weather conditions.
95th Percentile Fire Intensity Scale	95th Percentile (Average-Worst) Fire Intensity Scale quantifies fire intensity by orders of magnitude as determined by the worst five percent of wind and weather conditions.
Characteristic Flame Length	Flame length measures the height of flames as determined by fuel and a range of possible wind and weather conditions.
95th Percentile Flame Length	95th Percentile (Average-Worst) Flame Length measures the height of flames as determined by the worst five percent of wind and weather conditions.
Characteristic Rate of Spread	This layer represents the rate of spread (ROS) as determined by fuel and weather characteristics across a full range of possible wind and weather conditions.
95th Percentile Rate of Spread	95th Percentile (Average-Worst) Rate of Spread measures the rate of spread as determined by the worst five percent of wind and weather conditions.
Probability of Crown Fire	This layer shows the likelihood of experiencing at least mid-grade passive crown fire.

Layer	Description
Probability of Exceeding Manual Control	This layer shows the likelihood that flames at the head of the fire will exceed 4 feet, which is generally considered the limit for manual fire control.
Probability of Exceeding Mechanical Control	This layer shows the likelihood that flames at the head of the fire will exceed 8 feet, which is considered the limit for mechanical fire control in fire operations.
Probability of Extreme Fire Behavior	This layer shows the likelihood that flames at the head of the fire will exceed 11 feet, which is considered threshold for extreme fire behavior in fire operations.
Suppression Difficulty Index	Suppression Difficulty Index provides a rating of relative difficulty in performing wildfire control work considering factors like terrain, access, fuel, and fire behavior.
Wildfire Hazard Potential	Wildfire Hazard Potential maps challenges to wildfire control and includes information such as Burn Probability, small-fire ignition density, fire intensity measures, and fuel/vegetation type.
Conditional Ember Production Index	A relative index of the potential ember production if a fire were to occur.
Conditional Ember Load Index	A relative index of the potential for a location to receive embers from surrounding land if a fire were to occur.
Surface Fuels	Contains the parameters needed to compute surface fire behavior characteristics.
Percent Slope	Percent Slope measures the rate of change of elevation over a given horizontal distance, expressed as a percent.

Wildfire Hazard

The information in this section of the report describes the historical trends in wildfire, the annual likelihood of wildfire based on fire modeling, and two integrated hazard layers characterizing wildfire risk to homes - including a measure of ember load from nearby fuel.

Contents:

Wildfire Occurrence Statistics

Description

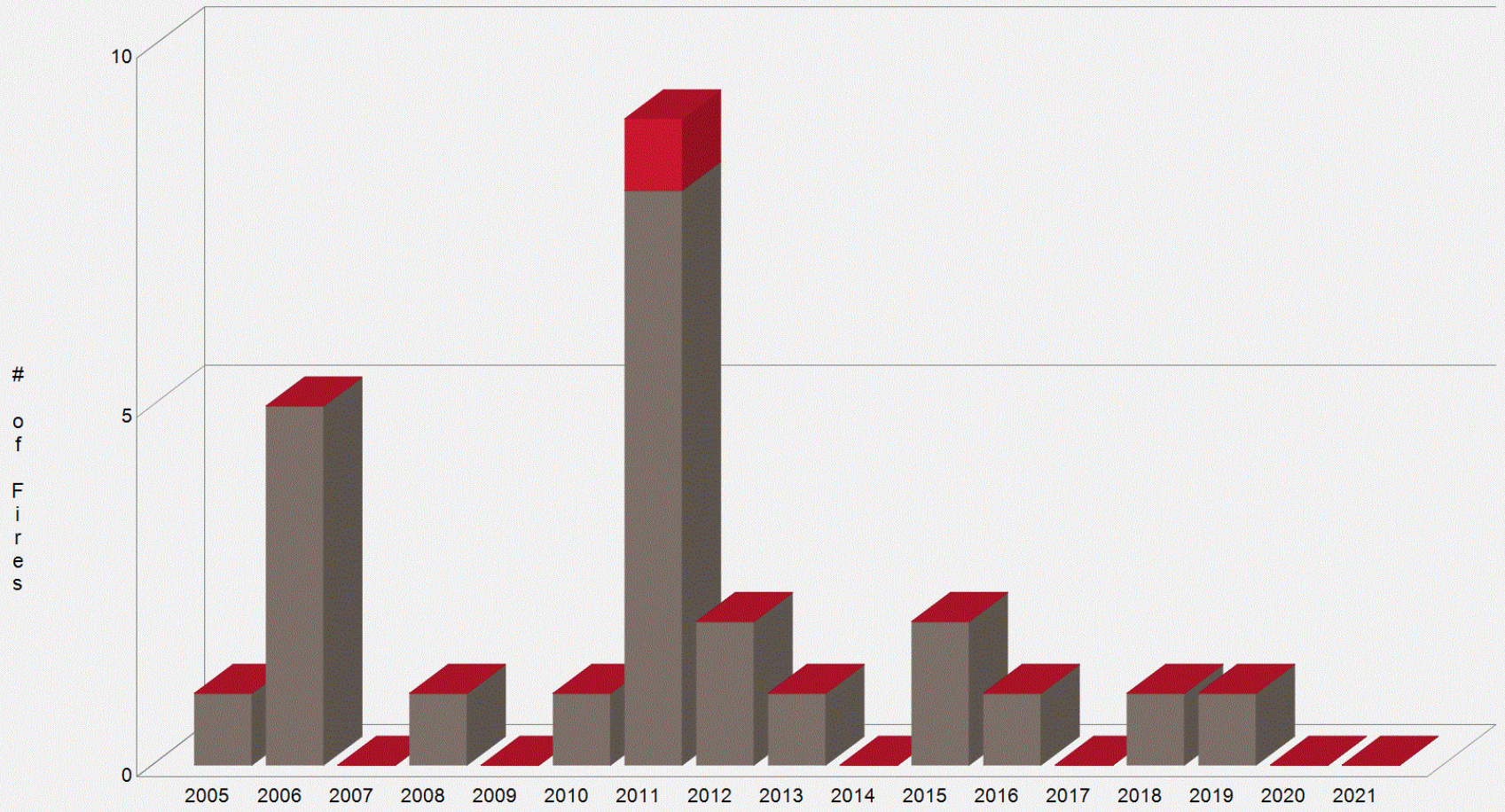
Wildfire occurrence statistics provide insight as to the number of fires, acres burned and cause of fires in Texas. These statistics are useful for prevention and mitigation planning. They can be used to quantify the level of fire business, determine the time of year most fires typically occur, and develop 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.

Seventeen 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 2021. The compiled fire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations.

Sample Project

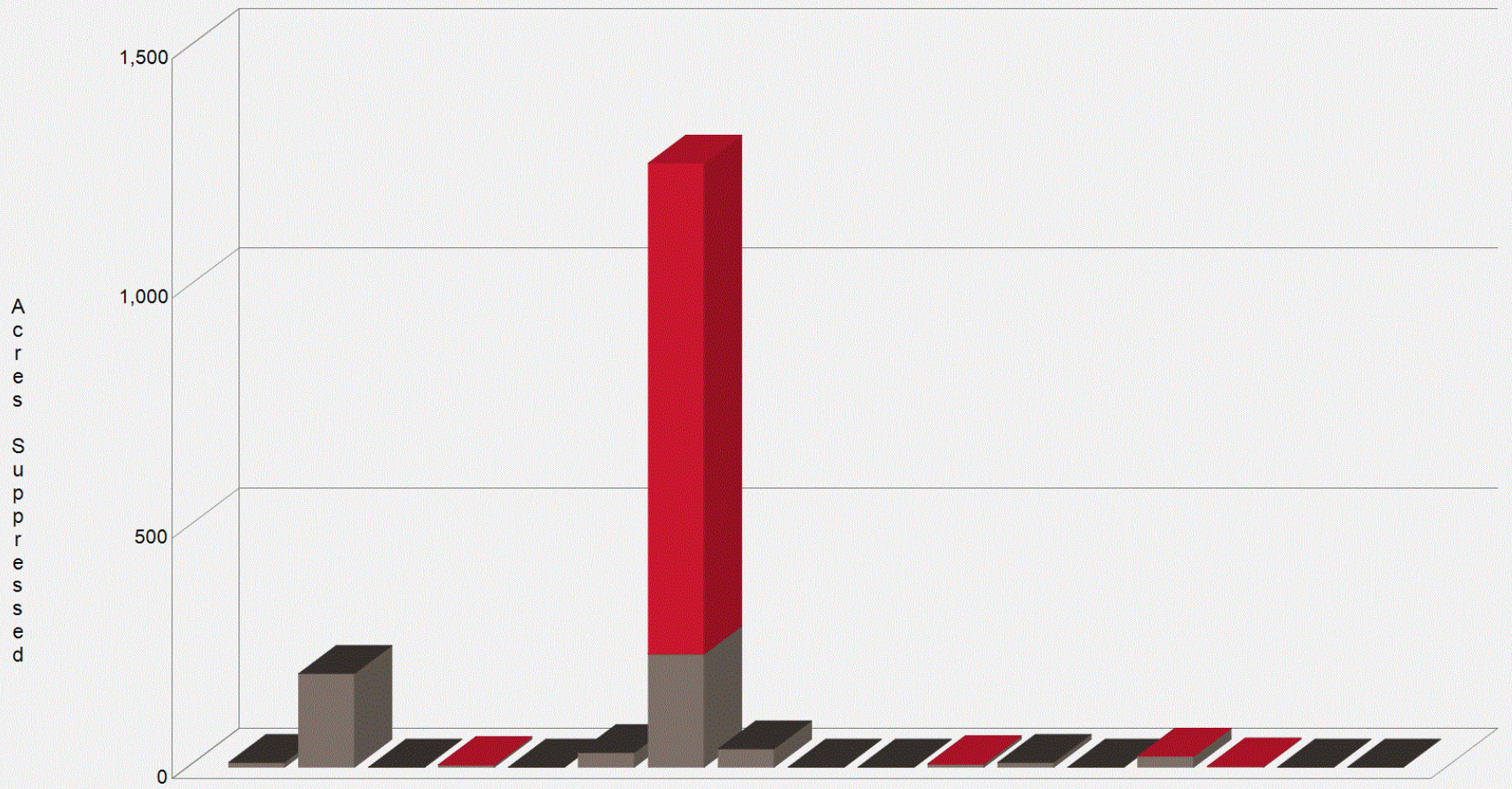
Number of Wildfires Reported by Agency
2005 - 2021



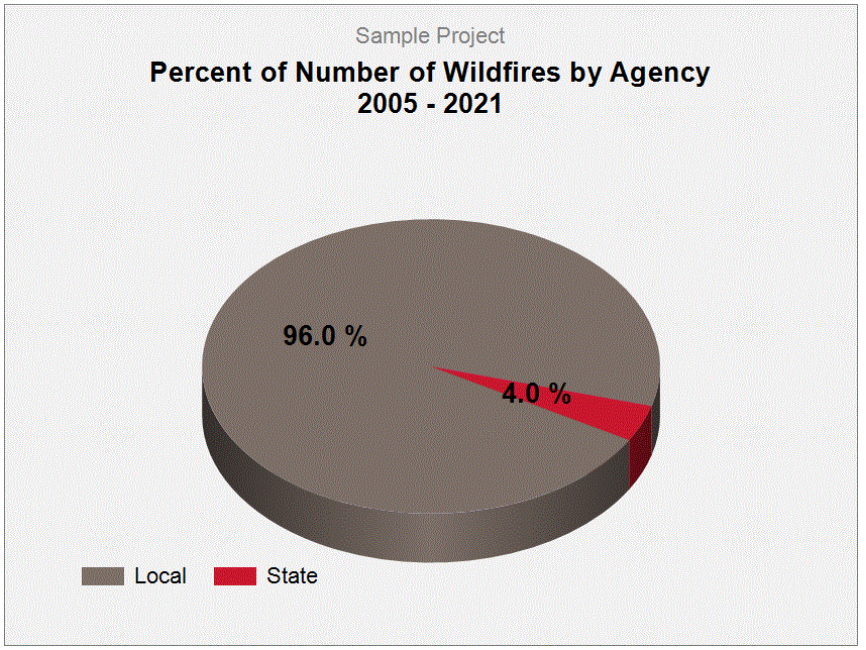
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Local	1	5	0	1	0	1	8	2	1	0	2	1	0	1	1	0	0
State	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

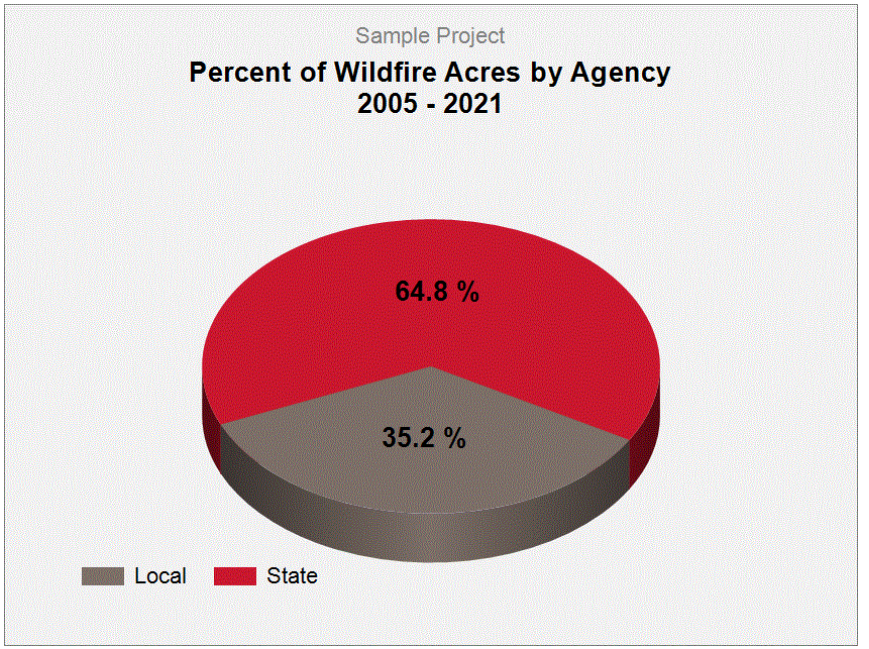
Sample Project

Wildfire Acres Reported by Agency
2005 - 2021



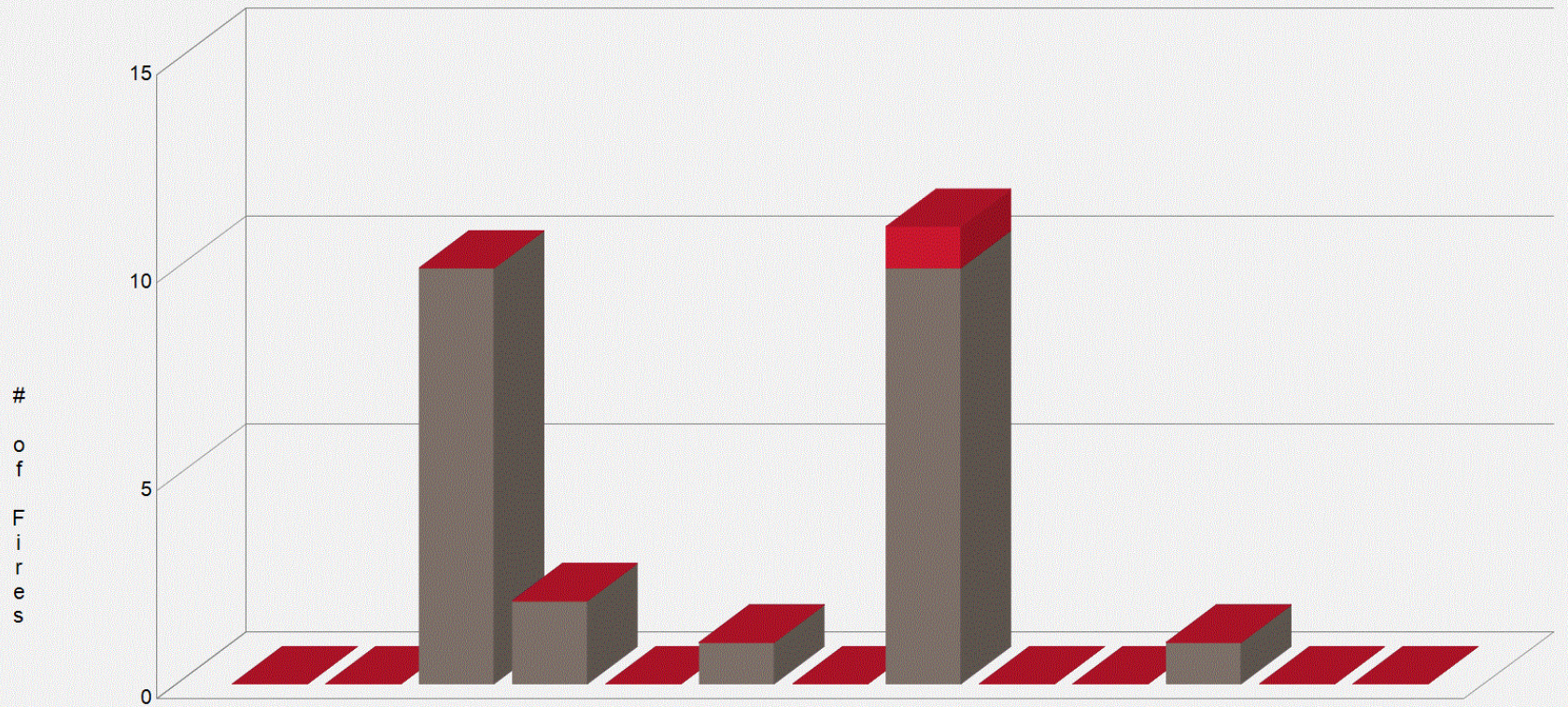
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Local	10	195	0	5	0	30	236	38	0	0	7	10	0	23	2	0	0
State	0	0	0	0	0	0	1023	0	0	0	0	0	0	0	0	0	0


Sample Project
Percent of Number of Wildfires by Agency
2005 - 2021
96.0 %
4.0 %
Local
State


Sample Project
Percent of Wildfire Acres by Agency
2005 - 2021
64.8 %
35.2 %
Local
State

Sample Project

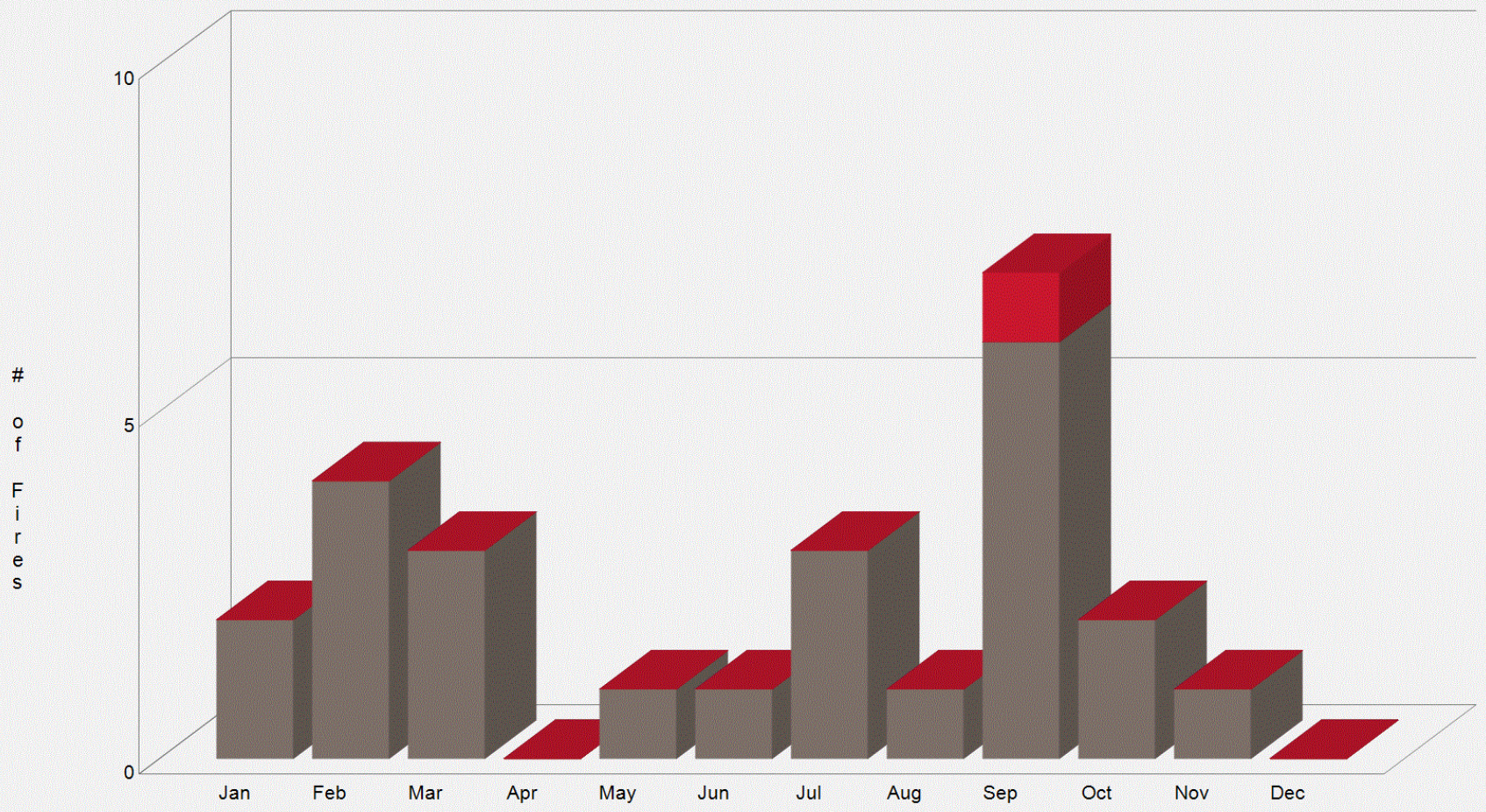
Cause of Wildfires Reported by Agency
2005 - 2021



	Campfire	Children	Debris Burning	Equip. Use	Fireworks	Incendiary	Lightning	Misc.	Power Lines	Railroads	Smoking	Structure	Unknown
Local	0	0	10	2	0	1	0	10	0	0	1	0	0
State	0	0	0	0	0	0	0	1	0	0	0	0	0

Sample Project

Number of Wildfires Reported per Month by Agency
2005 - 2021



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Local	2	4	3	0	1	1	3	1	6	2	1	0
State	0	0	0	0	0	0	0	0	1	0	0	0

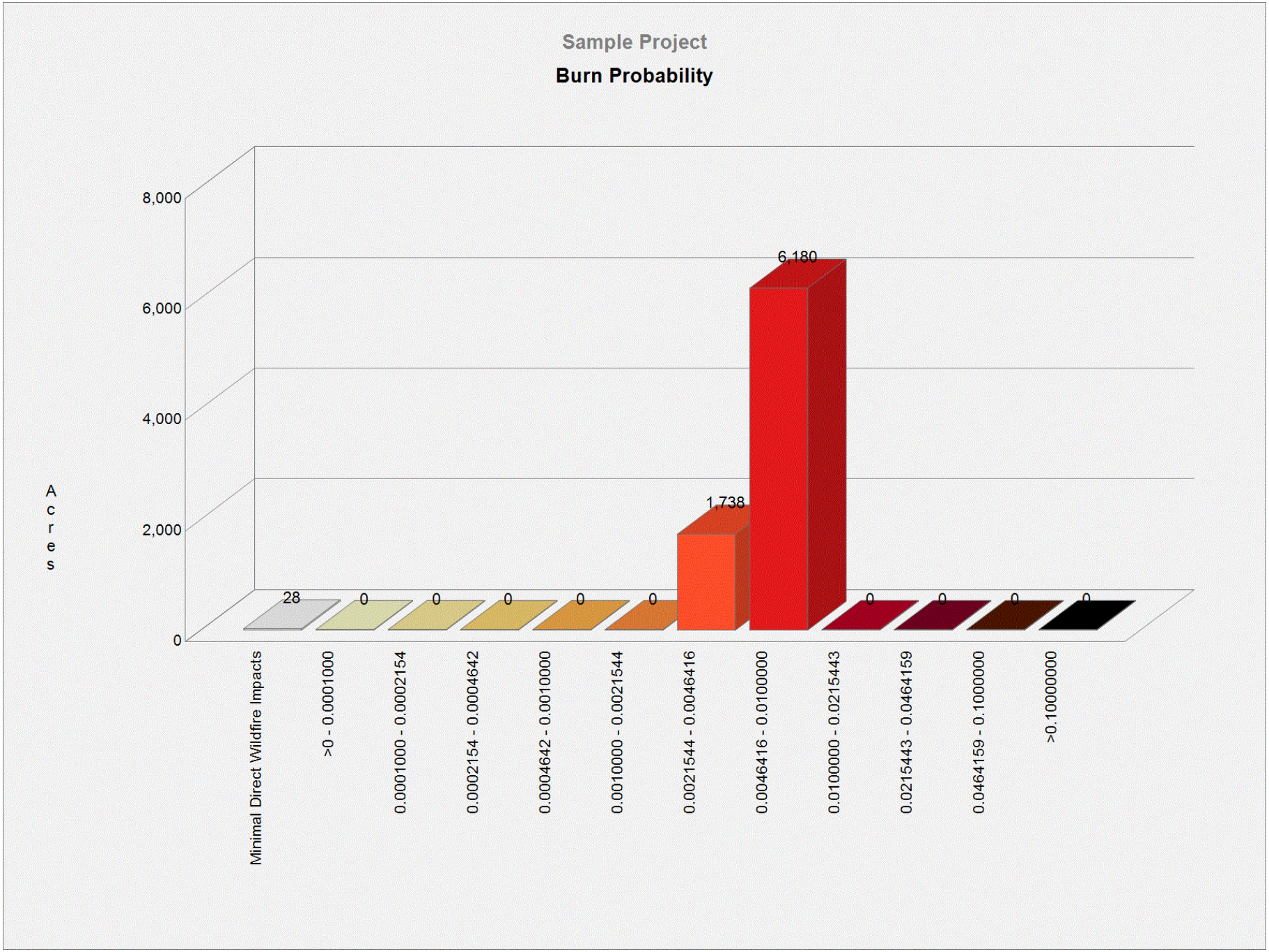
Burn Probability

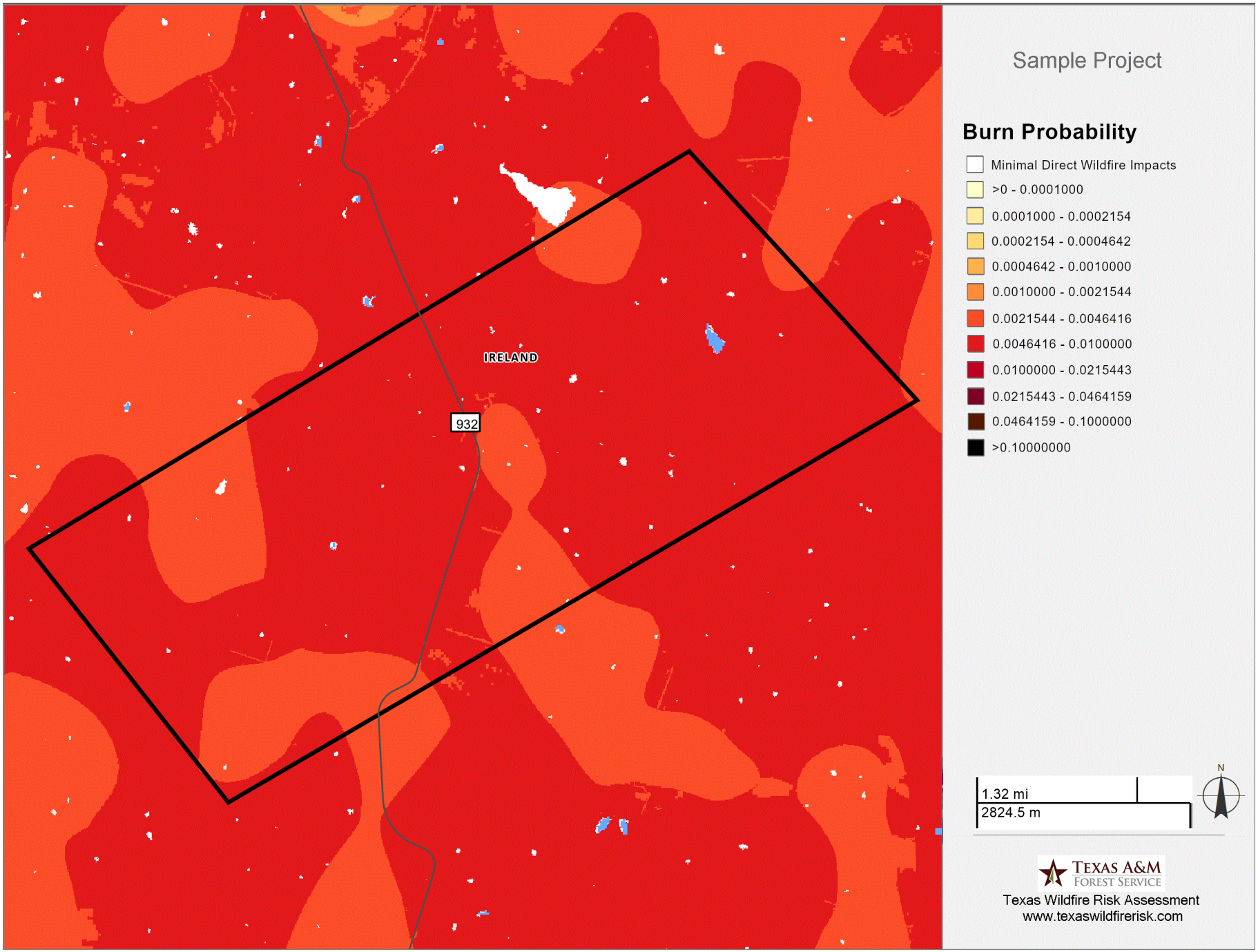
Burn probability is the likelihood of wildfire burning a specific location within a set time frame - commonly represented as the chance of burning during one calendar year or wildfire season.

Burn Probability can be expressed as a fraction (ex. 0.005) or odds (1-in-200) and is based on fire behavior modeling across thousands of simulations of possible fire seasons. In each simulation, factors contributing to the probability of a fire occurring, including weather and ignition likelihood are varied based on patterns derived from observations in recent decades. It is not predictive and does not reflect any currently forecasted weather or fire danger conditions. Burn Probability does not say anything about the intensity of fire if it occurs.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Burn Probability Category	Acres	Percent
	Minimal Direct Wildfire Impacts	28	0 %
	>0 - 0.0001000	0	0 %
	0.0001000 - 0.0002154	0	0 %
	0.0002154 - 0.0004642	0	0 %
	0.0004642 - 0.0010000	0	0 %
	0.0010000 - 0.0021544	0	0 %
	0.0021544 - 0.0046416	1,738	22 %
	0.0046416 - 0.0100000	6,180	78 %
	0.0100000 - 0.0215443	0	0 %
	0.0215443 - 0.0464159	0	0 %
	0.0464159 - 0.1000000	0	0 %
	>0.10000000	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Burn Probability
Acres
8,000
6,000
4,000
2,000
0
28
0
0
0
0
0
1,738
6,180
0
0
0
0
Minimal Direct Wildfire Impacts
>0 - 0.0001000
0.0001000 - 0.0002154
0.0002154 - 0.0004642
0.0004642 - 0.0010000
0.0010000 - 0.0021544
0.0021544 - 0.0046416
0.0046416 - 0.0100000
0.0100000 - 0.0215443
0.0215443 - 0.0464159
0.0464159 - 0.1000000
>0.10000000


Sample Project
Burn Probability
Minimal Direct Wildfire Impacts
>0 - 0.0001000
0.0001000 - 0.0002154
0.0002154 - 0.0004642
0.0004642 - 0.0010000
0.0010000 - 0.0021544
0.0021544 - 0.0046416
0.0046416 - 0.0100000
0.0100000 - 0.0215443
0.0215443 - 0.0464159
0.0464159 - 0.1000000
>0.10000000
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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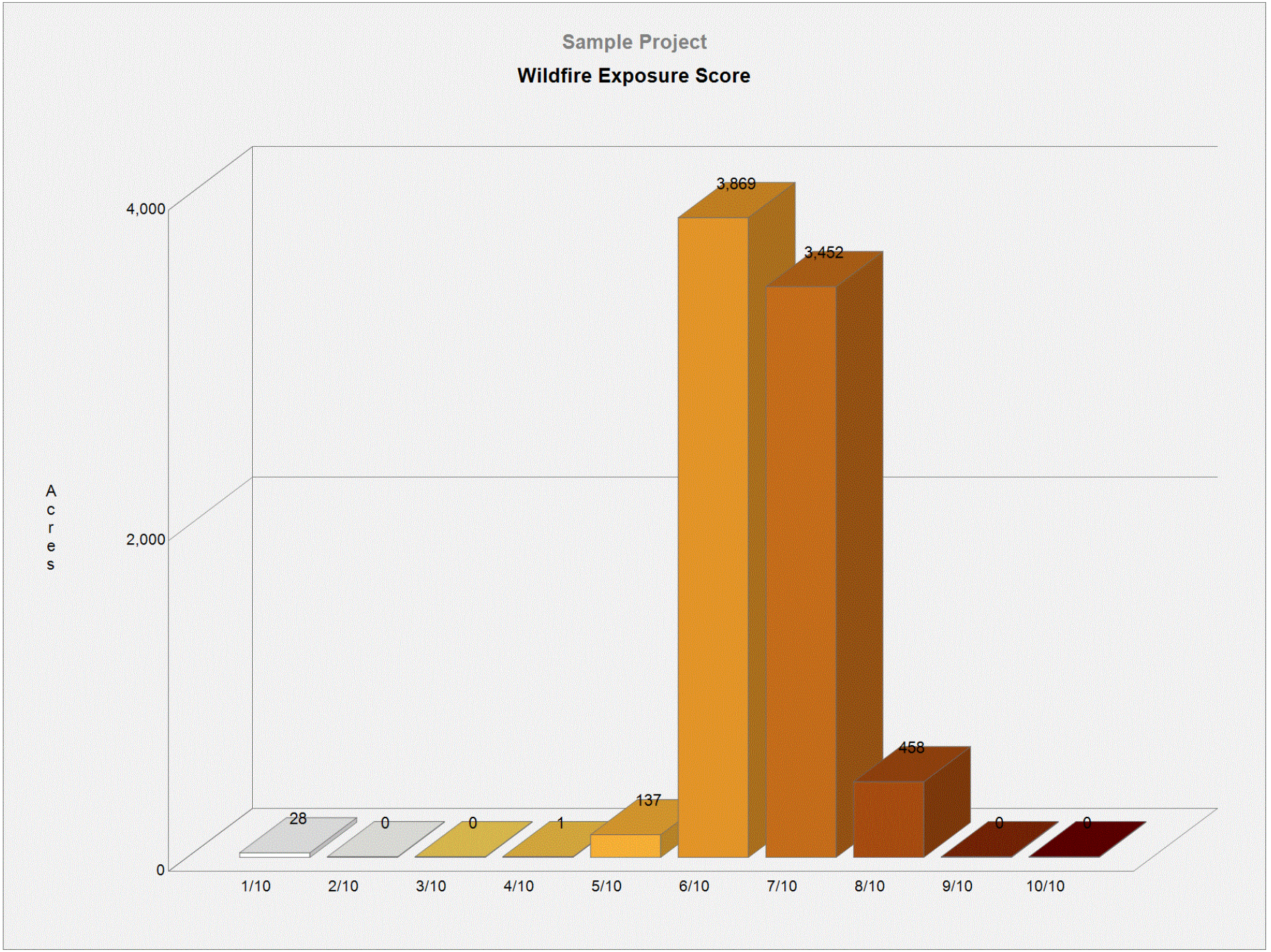
Wildfire Exposure Score

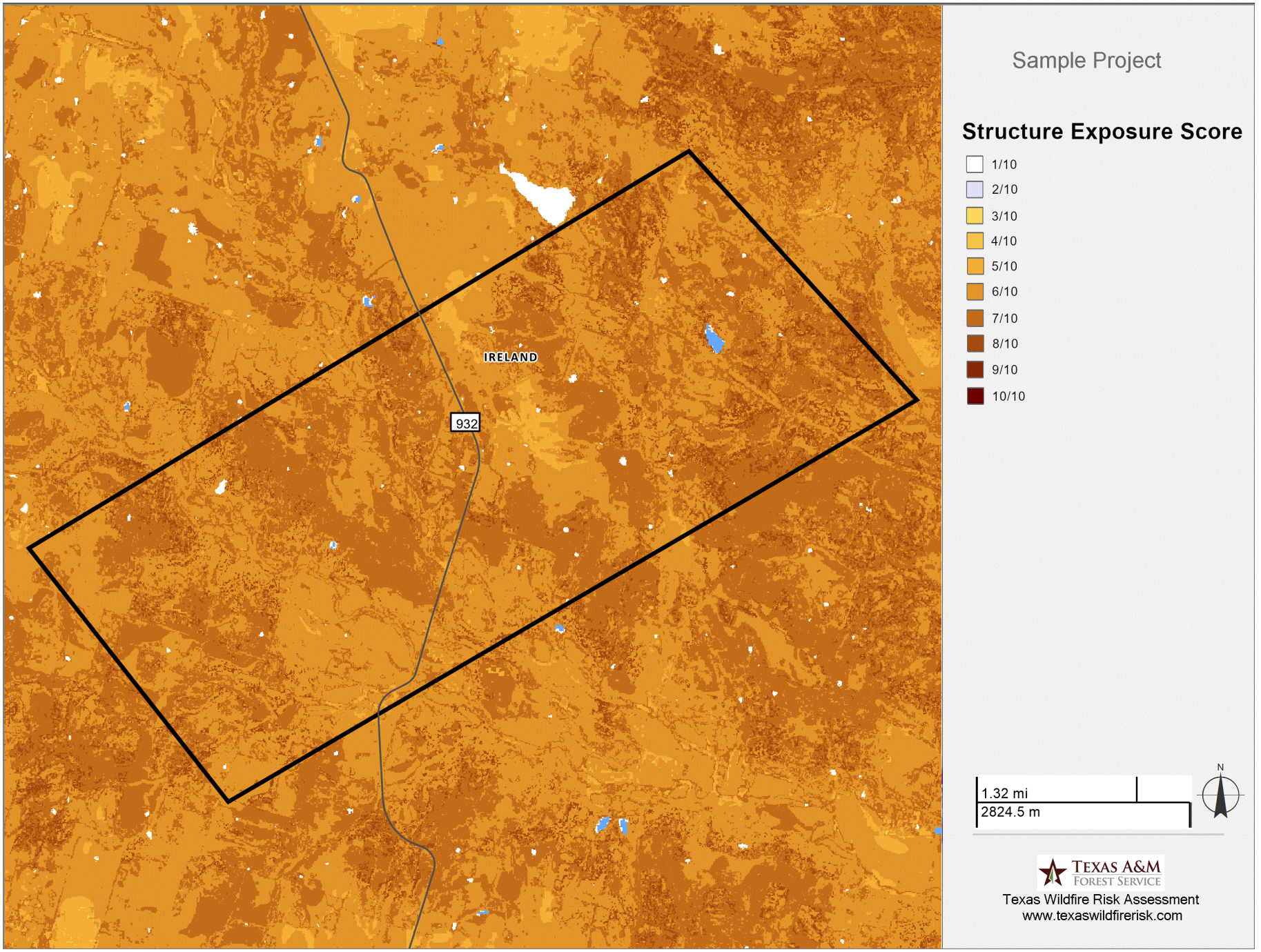
Wildfire Exposure Score (also called “Structure Exposure Score”) combines two important wildfire factors related to structure exposure: the chance of wildfire (Burn Probability – defined as the likelihood of wildfire burning a specific location within a calendar year or wildfire season) and the potential damage to homes from wildfire (Damage Potential – defined as an estimate of damage that a wildfire could cause to homes considering both fire intensity and embers from nearby fuel).

Exposure scores are provided for all areas regardless of whether a structure currently exists at that location. Each Wildfire Exposure Score category accounts for a 1.5 times (or 50 percent) difference in exposure. For example, a structure located within Class 3/10 is 1.5 times more exposed than one in Class 2/10, and so on.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Wildfire Exposure Score Category	Acres	Percent
	1/10	28	0 %
	2/10	0	0 %
	3/10	0	0 %
	4/10	1	0 %
	5/10	137	2 %
	6/10	3,869	49 %
	7/10	3,452	43 %
	8/10	458	6 %
	9/10	0	0 %
	10/10	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Wildfire Exposure Score
Acres
4,000
2,000
0
28
0
0
1
137
3,869
3,452
458
0
0
1/10
2/10
3/10
4/10
5/10
6/10
7/10
8/10
9/10
10/10


Sample Project
Structure Exposure Score
1/10
2/10
3/10
4/10
5/10
6/10
7/10
8/10
9/10
10/10
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Damage Potential

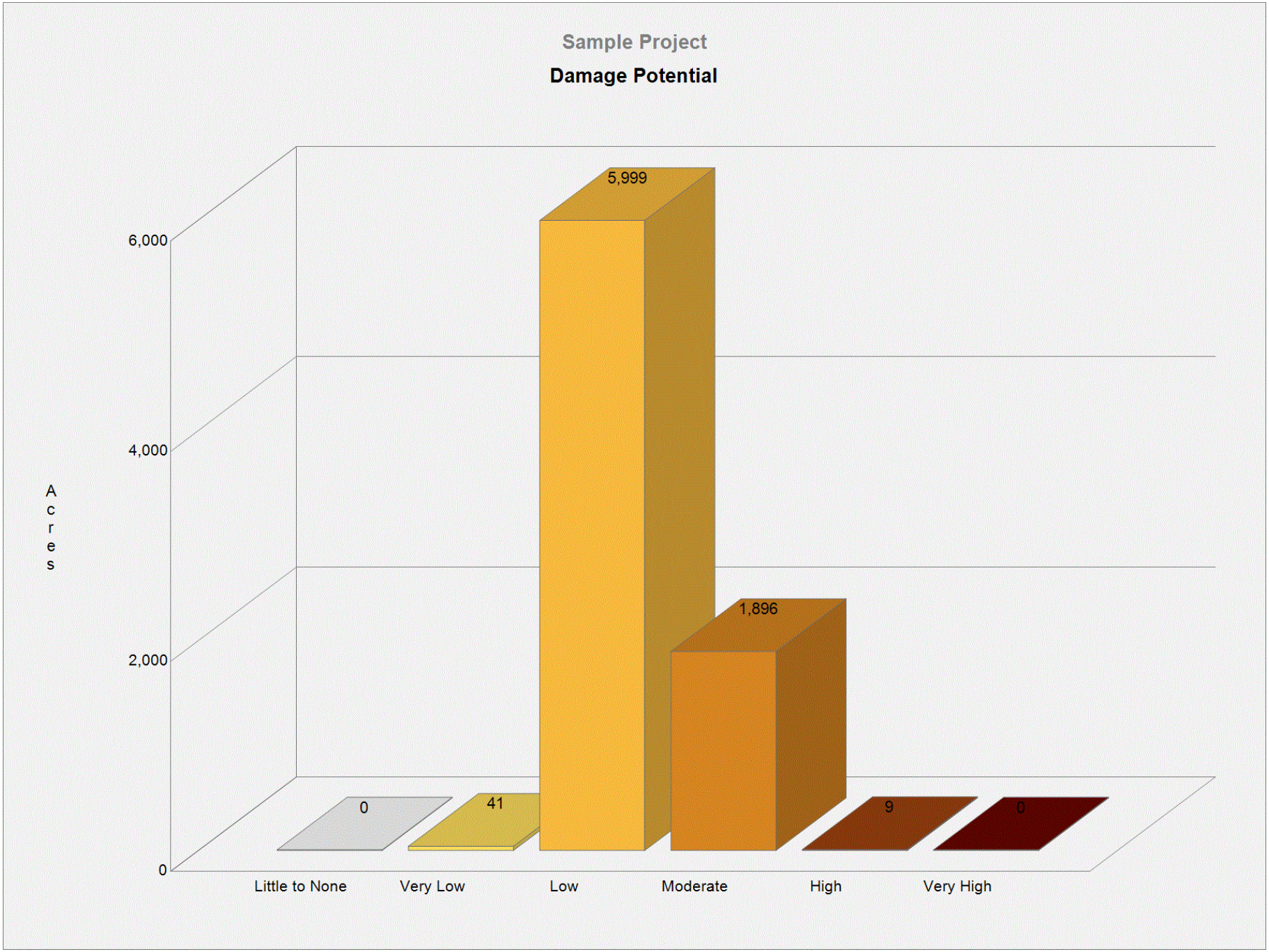
Damage Potential provides an index of potential damage to homes from wildfire. It considers factors like flame length and embers lofted from nearby fuel.

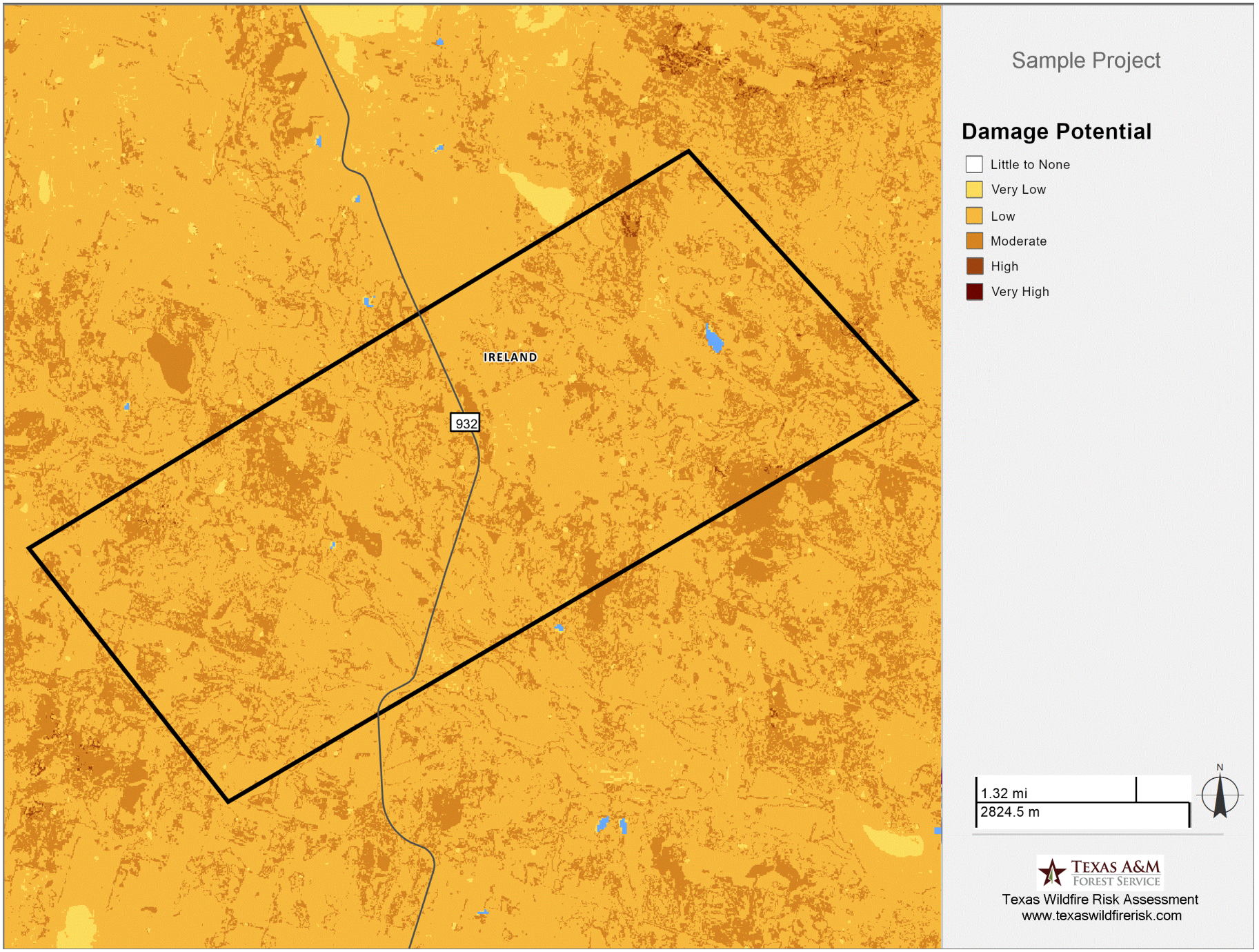
Damage Potential is a relative index (from low to high), that provides a broad measure of the possible damage from wildfire, based generally on the landscape, rather than specific characteristics of a home or parcel. For planning uses and broad applications, the index is calculated for all areas regardless of whether a structure currently exists at that location. This index does not incorporate a measure of wildfire likelihood.

Damage Potential is a fire-effects measure and includes flame-length estimates that reflect all spread directions (heading, backing, and flanking). Intensities from nonheading spread directions are considerably lower than those at the head of the fire.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Damage Potential Category	Acres	Percent
	Little to None	0	0 %
	Very Low	41	1 %
	Low	5,999	75 %
	Moderate	1,896	24 %
	High	9	0 %
	Very High	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Damage Potential
Acres
6,000
4,000
2,000
0
5,999
1,896
41
0
9
0
Little to None
Very Low
Low
Moderate
High
Very High


Sample Project
Damage Potential
Little to None
Very Low
Low
Moderate
High
Very High
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

Risk to Homes and Communities

The information in this section provides useful information for communities to help prepare for and prevent wildfires.

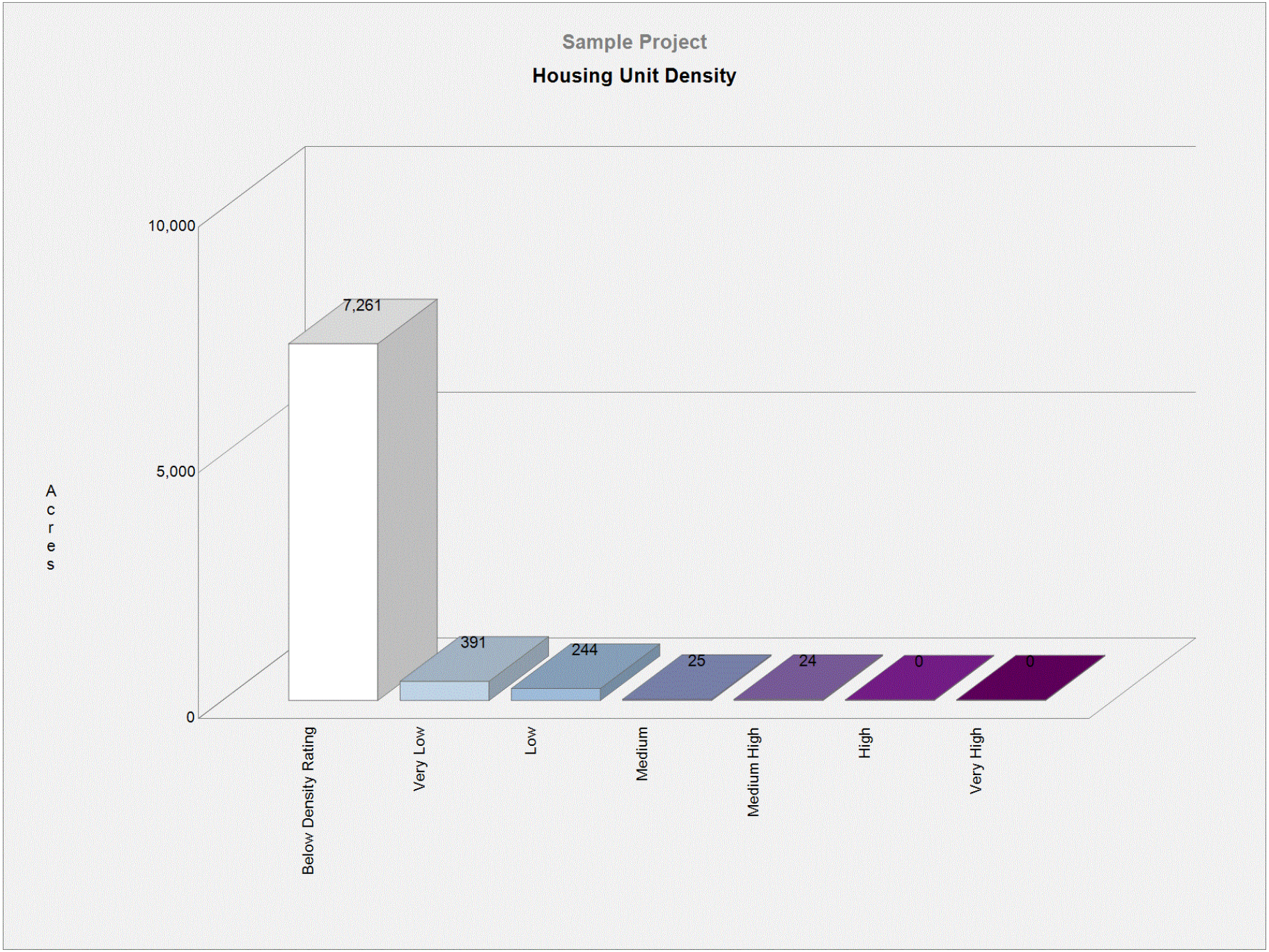
Contents:

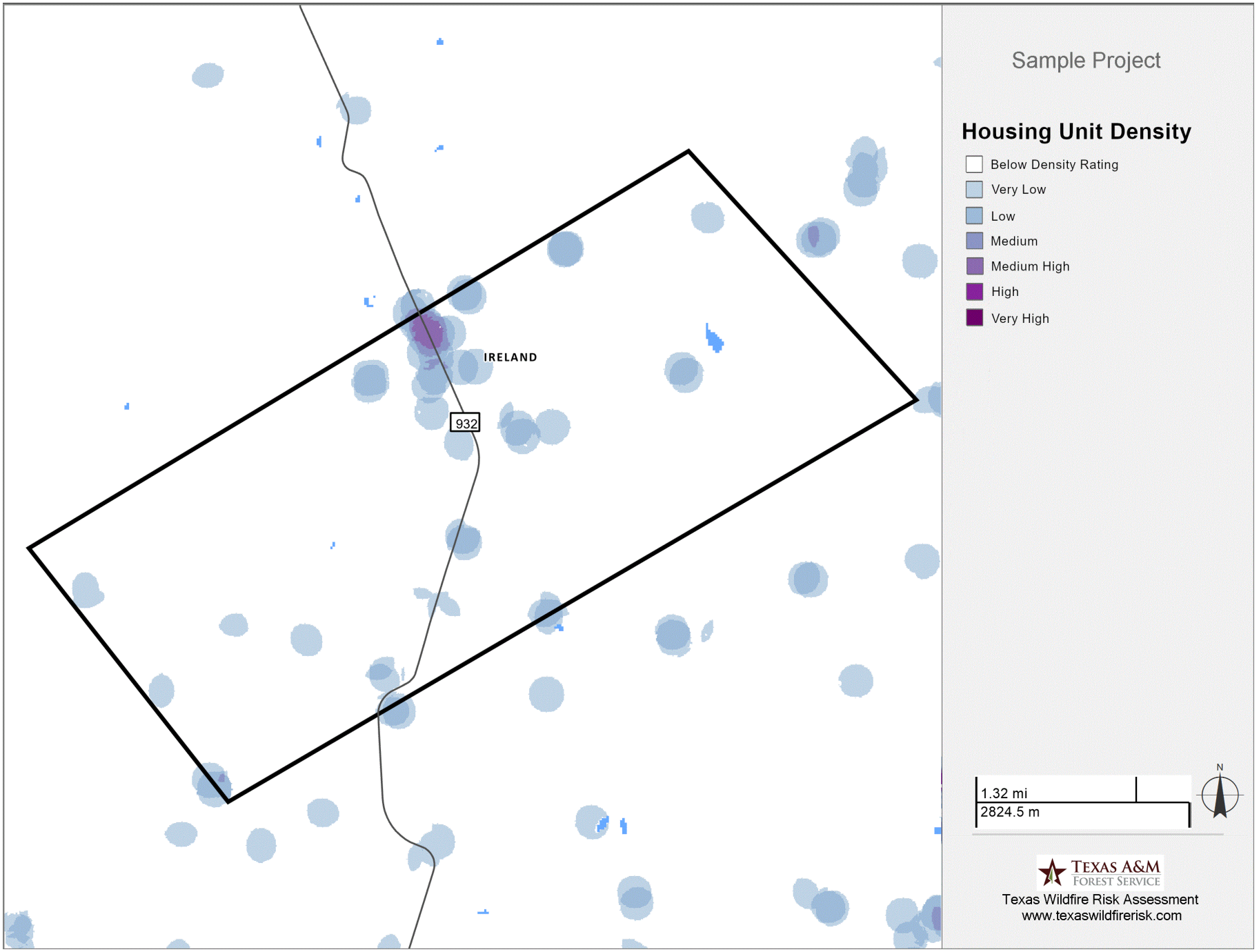
Housing Unit Density

This layer displays housing unit density measured in housing units per square kilometer and reflects 2020 estimates of housing unit counts from the U.S. Census Bureau, combined with building footprint data from Onegeo and USA Structures - both reflecting 2022 conditions. The same methodology was used here as was used to produce the Housing Unit Density layer created as part of the Wildfire Risk to Communities Project (Jaffe et al., 2024; WRC, 2024). However, housing unit counts and density (housing units/km2) were calculated at 10-m resolution for TWRA.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023

	Housing Unit Density Category	Acres	Percent
	Below Density Rating	7,261	91 %
	Very Low	391	5 %
	Low	244	3 %
	Medium	25	0 %
	Medium High	24	0 %
	High	0	0 %
	Very High	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Housing Unit Density
10,000
5,000
0
Acres
7,261
391
244
25
24
0
0
Below Density Rating
Very Low
Low
Medium
Medium High
High
Very High


Sample Project
Housing Unit Density
Below Density Rating
Very Low
Low
Medium
Medium High
High
Very High
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

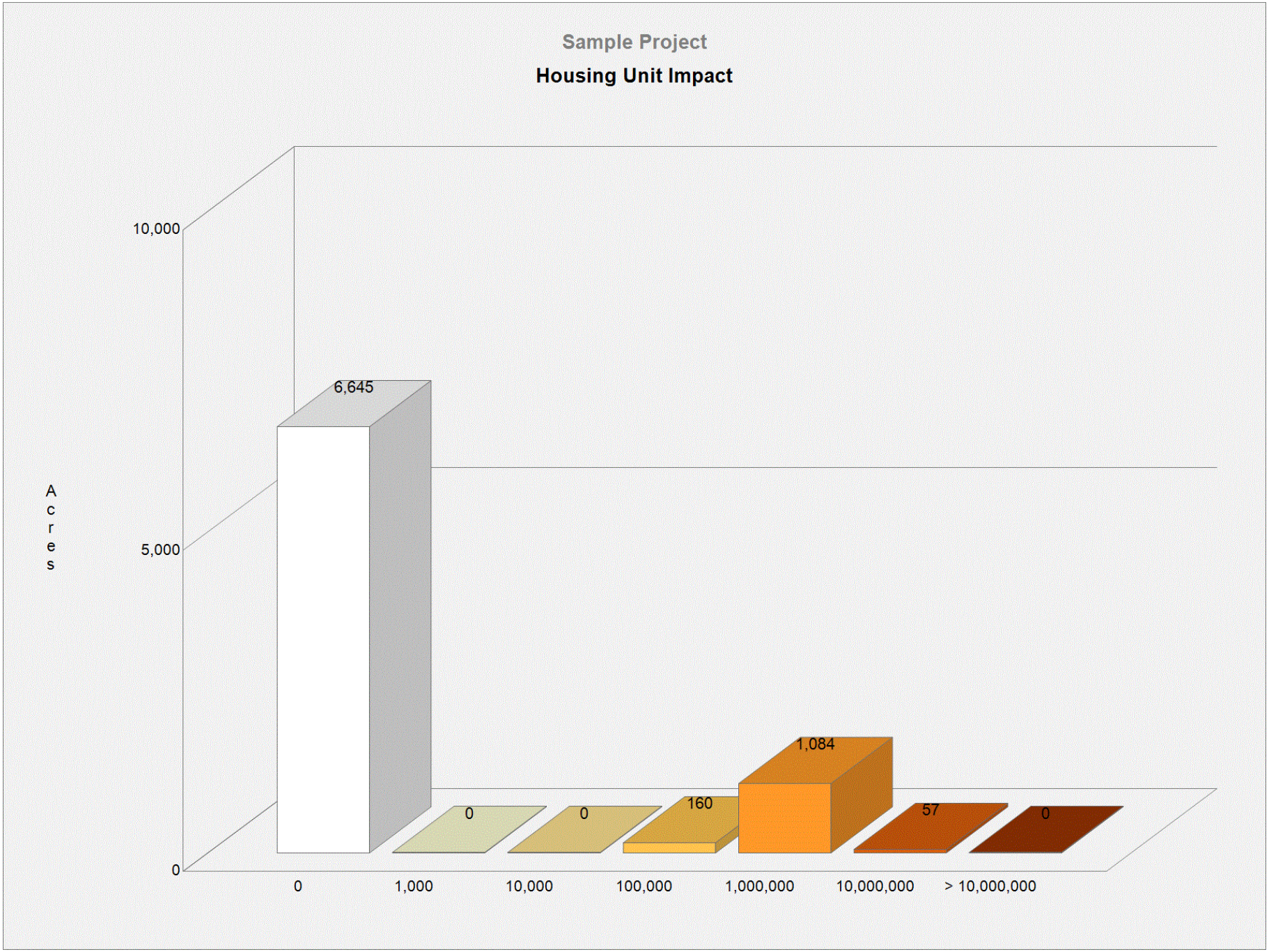
Housing Unit Impact

This dataset represents the relative potential impact to housing units if a fire were to occur. Housing Unit Impact (HUImpact) incorporates housing-unit counts with the general consequences of fire on a home as a function of fire intensity. HUImpact does not include fire likelihood and does not reflect individual structure mitigations that would influence susceptibility.

The same methodology was used here as was used to produce the Housing Unit Impact layer created as part of the Wildfire Risk to Communities Project (Jaffe et al., 2024; WRC, 2024). However, Housing Unit Impact was produced at 10-m resolution for TWRA. **Note: This legend was adjusted to account for the effect of 10-m resolution on the final values and to be comparable with the same data layer in the Southern Wildfire Risk Assessment. This adjustment is needed when comparing acres by legend class, however, original raster values should be used for any data analysis such as zonal summaries of Housing Unit Impact values.**

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Housing Unit Impact Category	Acres	Percent
	0	6,645	84 %
	1,000	0	0 %
	10,000	0	0 %
	100,000	160	2 %
	1,000,000	1,084	14 %
	10,000,000	57	1 %
	> 10,000,000	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Housing Unit Impact
Acres
10,000
5,000
0
6,645
0
0
160
1,084
57
0
0
1,000
10,000
100,000
1,000,000
10,000,000
> 10,000,000


Sample Project
Housing Unit Impact
0
1,000
10,000
100,000
1,000,000
10,000,000
>10,000,000
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Housing Unit Risk

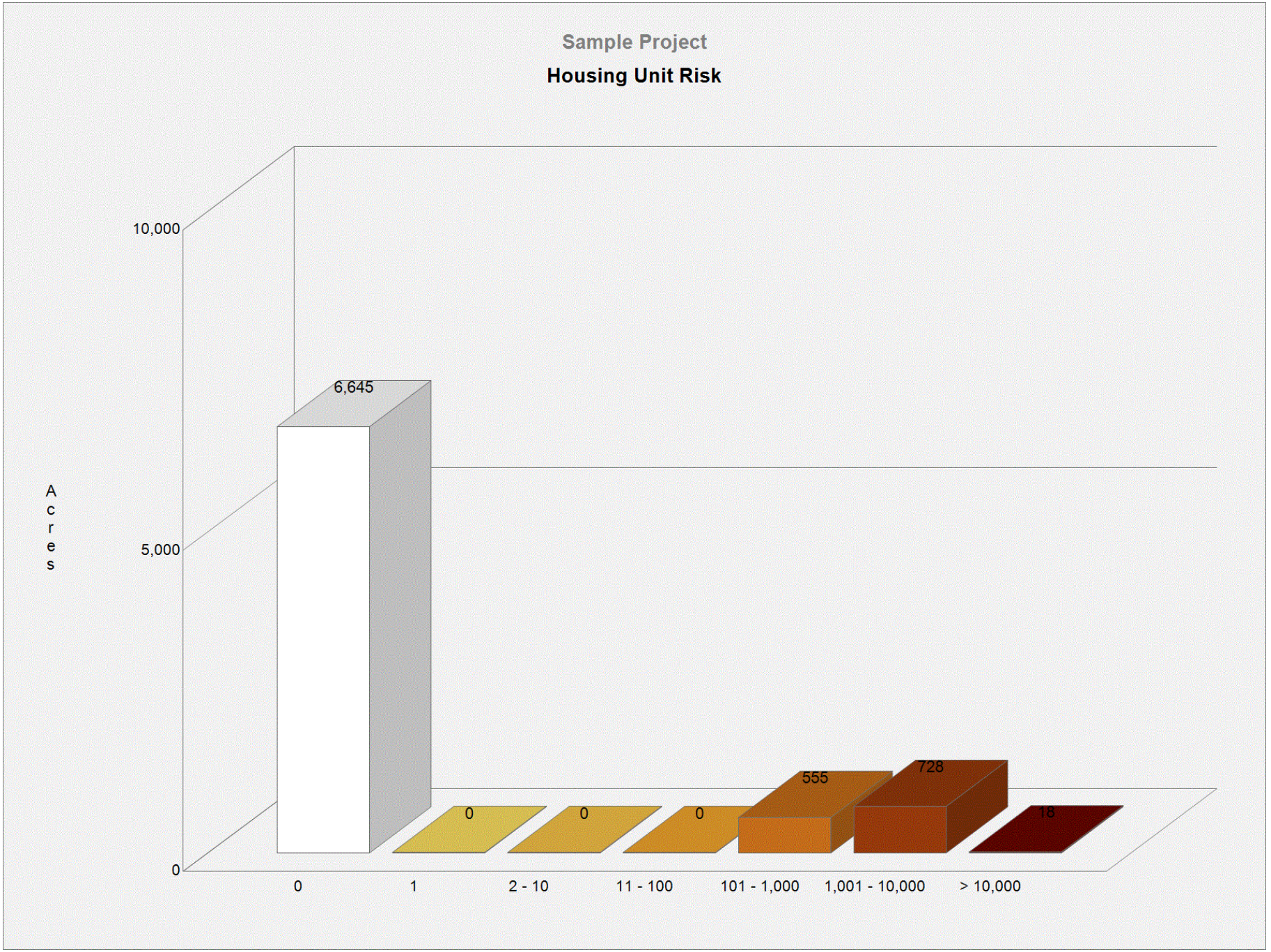
Housing Unit Risk (HURisk) represents the potential risk to housing units and incorporates both the general consequences of fire on a home as a function of fire intensity, and Burn Probability as a measure of wildfire likelihood. HURisk does not reflect individual structure mitigations that would influence susceptibility.

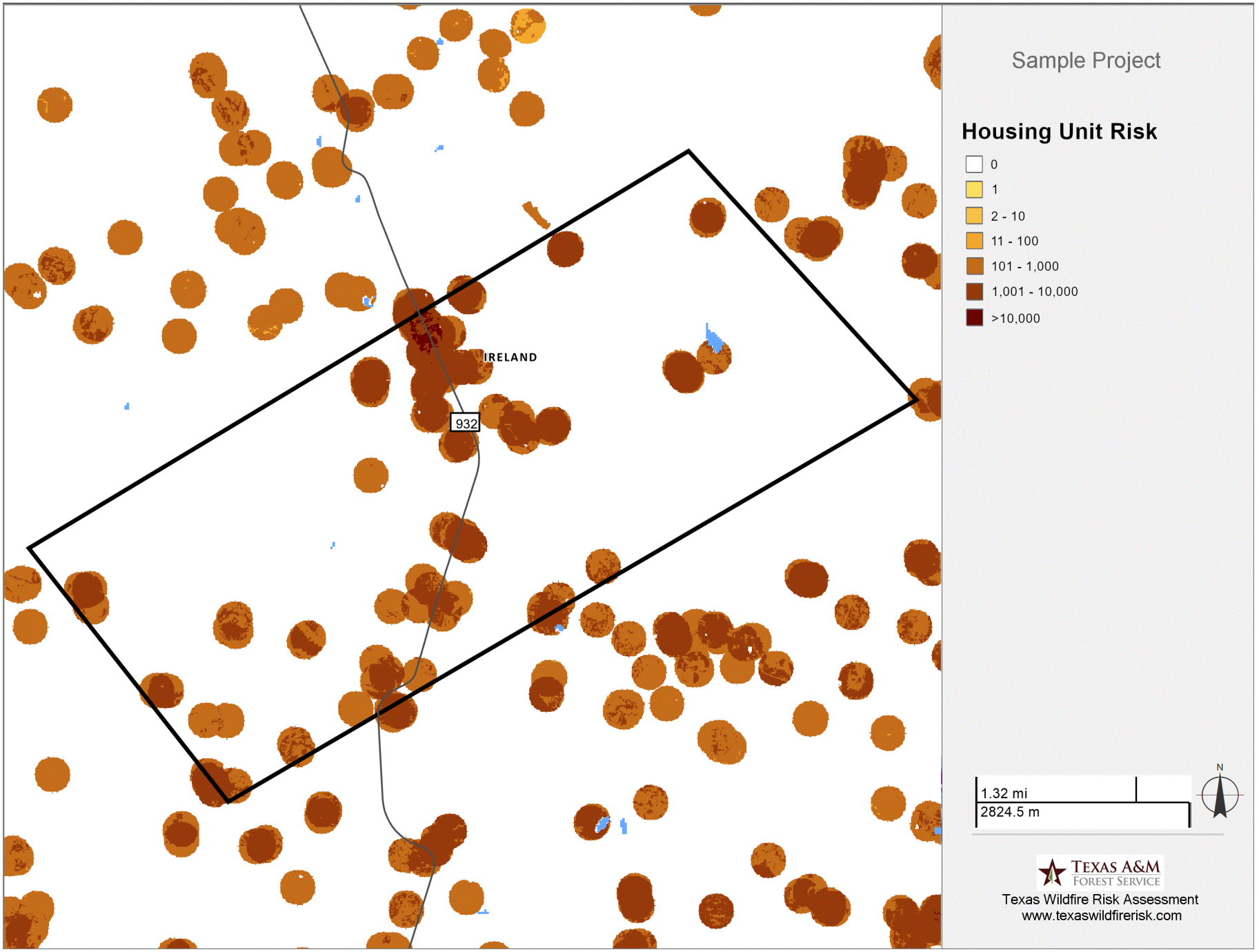
Housing Unit Risk integrates all four primary elements of wildfire risk - likelihood, intensity, susceptibility, and exposure - on pixels where housing unit density is greater than zero.

The same methodology was used here as was used to produce the Housing Unit Impact layer created as part of the Wildfire Risk to Communities Project (Jaffe et al., 2024; WRC, 2024). However, Housing Unit Impact was produced at 10-m resolution for TWRA. **Note: This legend was adjusted to account for the effect of 10-m resolution on the final values and to be comparable with the same data layer in the Southern Wildfire Risk Assessment. This adjustment is needed when comparing acres by legend class, however, original raster values should be used for any data analysis such as zonal summaries of Housing Unit Impact values.**

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Housing Unit Risk Category	Acres	Percent
	0	6,645	84 %
	1	0	0 %
	2 - 10	0	0 %
	11 - 100	0	0 %
	101 - 1,000	555	7 %
	1,001 - 10,000	728	9 %
	> 10,000	18	0 %
	Total	**7,946**	**100 %**


Sample Project
Housing Unit Risk
Acres
10,000
5,000
0
6,645
0
0
0
555
728
18
0
1
2 - 10
11 - 100
101 - 1,000
1,001 - 10,000
> 10,000


Sample Project
Housing Unit Risk
0
1
2 - 10
11 - 100
101 - 1,000
1,001 - 10,000
>10,000
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Sources of Ember Load to Buildings

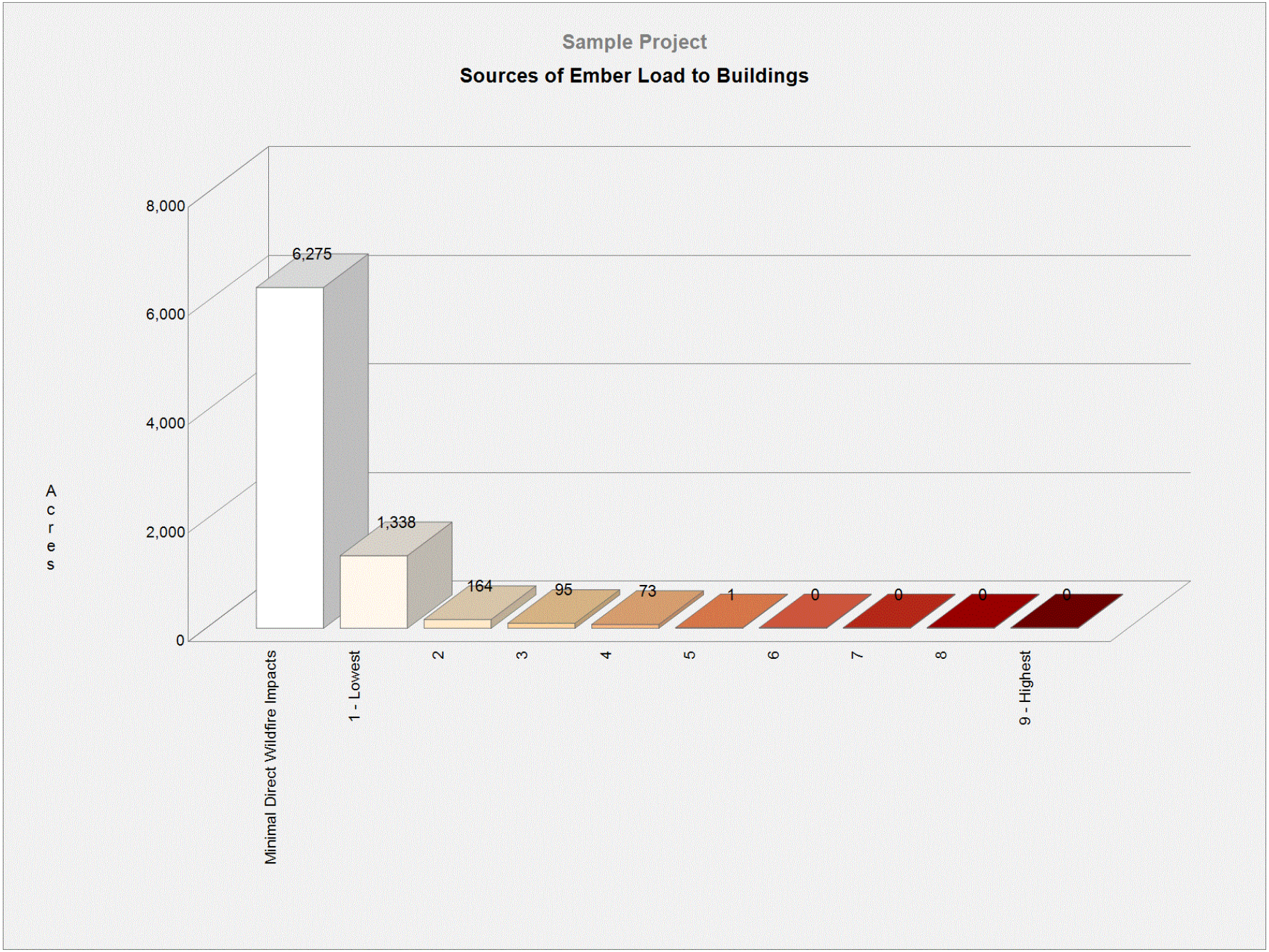
Sources of Ember Load to Buildings (SELB) is a relative index of the potential for fuel to produce embers that land where buildings are located, given that a fire occurs.

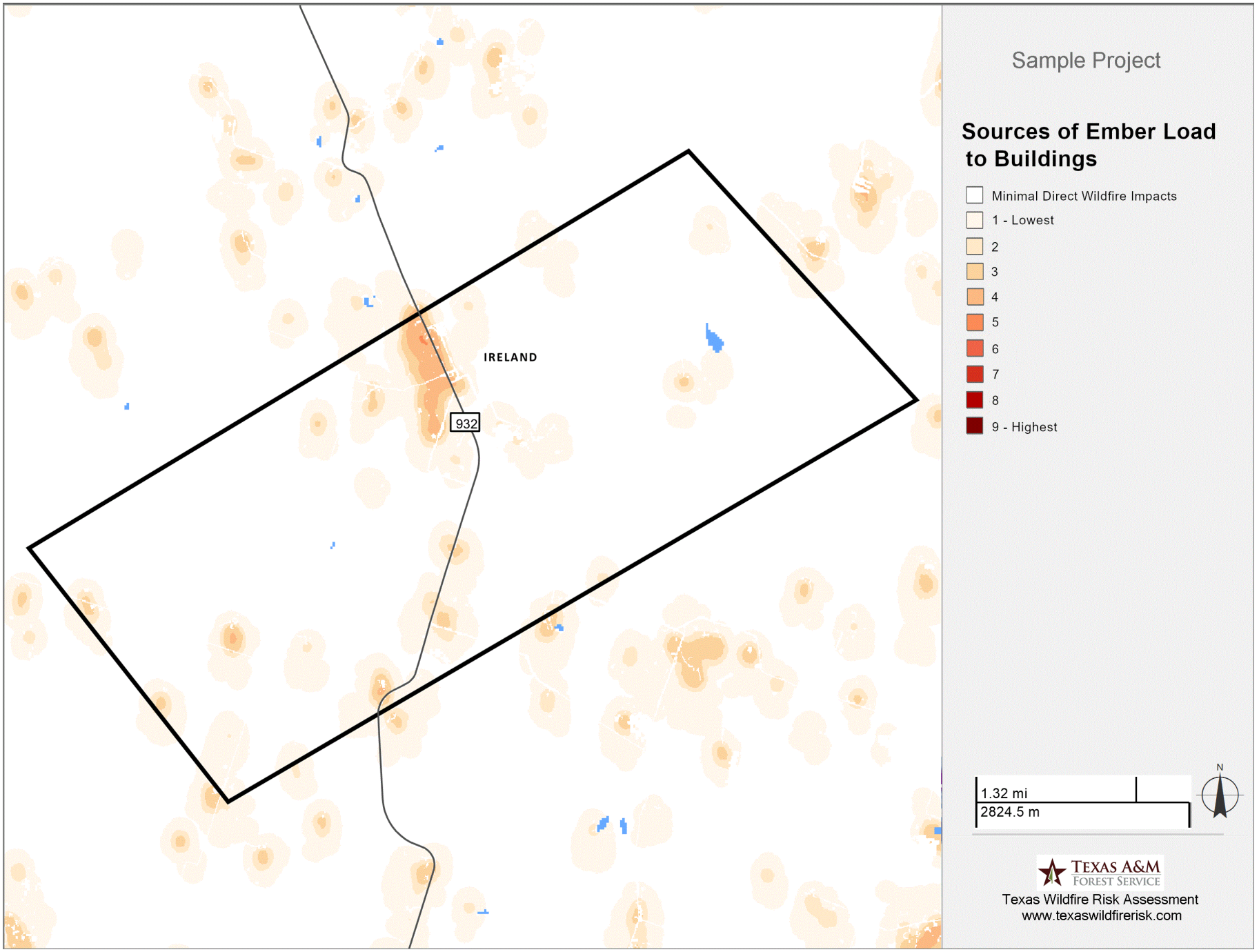
SELB identifies burnable land cover that produces embers capable of reaching nearby buildings. Units are an index of the relative number of embers rather than a count of embers produced. Ember production is a function of fire type and intensity; ember travel is a function of wind speed and direction. Ember modeling is based on fire modeling from WildEST, a process used to perform and combine multiple fire behavior simulations under a range of weather types (wind speed, wind direction, fuel moisture content). WildEST results reflect how often weather conditions occur and capture the influence of high-spread conditions. SELB is based on heading-only fire behavior and does not include the likelihood of wildfire.

The Sources of Ember Load to Buildings layer is useful for prioritizing mitigation actions to reduce the potential for ember damage to buildings.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Sources of Ember Load to Buildings Category	Acres	Percent
	Minimal Direct Wildfire Impacts	6,275	79 %
	1 - Lowest	1,338	17 %
	2	164	2 %
	3	95	1 %
	4	73	1 %
	5	1	0 %
	6	0	0 %
	7	0	0 %
	8	0	0 %
	9 - Highest	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Sources of Ember Load to Buildings
Acres
8,000
6,000
4,000
2,000
0
6,275
1,338
164
95
73
1
0
0
0
0
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest


Sample Project
Sources of Ember Load to Buildings
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Functional Wildland Urban Interface (WUI)

Functional WUI represents a classification of the land near buildings* into zones that describe the wildfire risk mitigation activities appropriate for each zone.

Direct Exposure—The Direct Exposure zone is burnable land cover within 75 m of a structure. Reducing fire intensity and ember production in this zone would reduce the exposure of nearby buildings to heat and embers. Buildings in this zone also require hardening of the structure to resist ignition.

Indirect Exposure—The Indirect Exposure zone is nonburnable land cover within 1500 m of burnable land cover that is within 75 m of a structure, meaning that embers and home-to-home spread could reach within this zone. Indirectly exposed structures would benefit from the hardening of the structure to resist ignition from embers and nearby structures, but defensible space is usually not required due to the heavily developed nature of the zone.

Critical Fireshed—The Critical Fireshed is the unpopulated land within about 2.4 km of a group of structures. Fires that originate within or spread to the Critical Fireshed have an immediate threat of reaching the nearby structures; fuel treatments that slow fire spread in this zone can reduce risk to these structures.

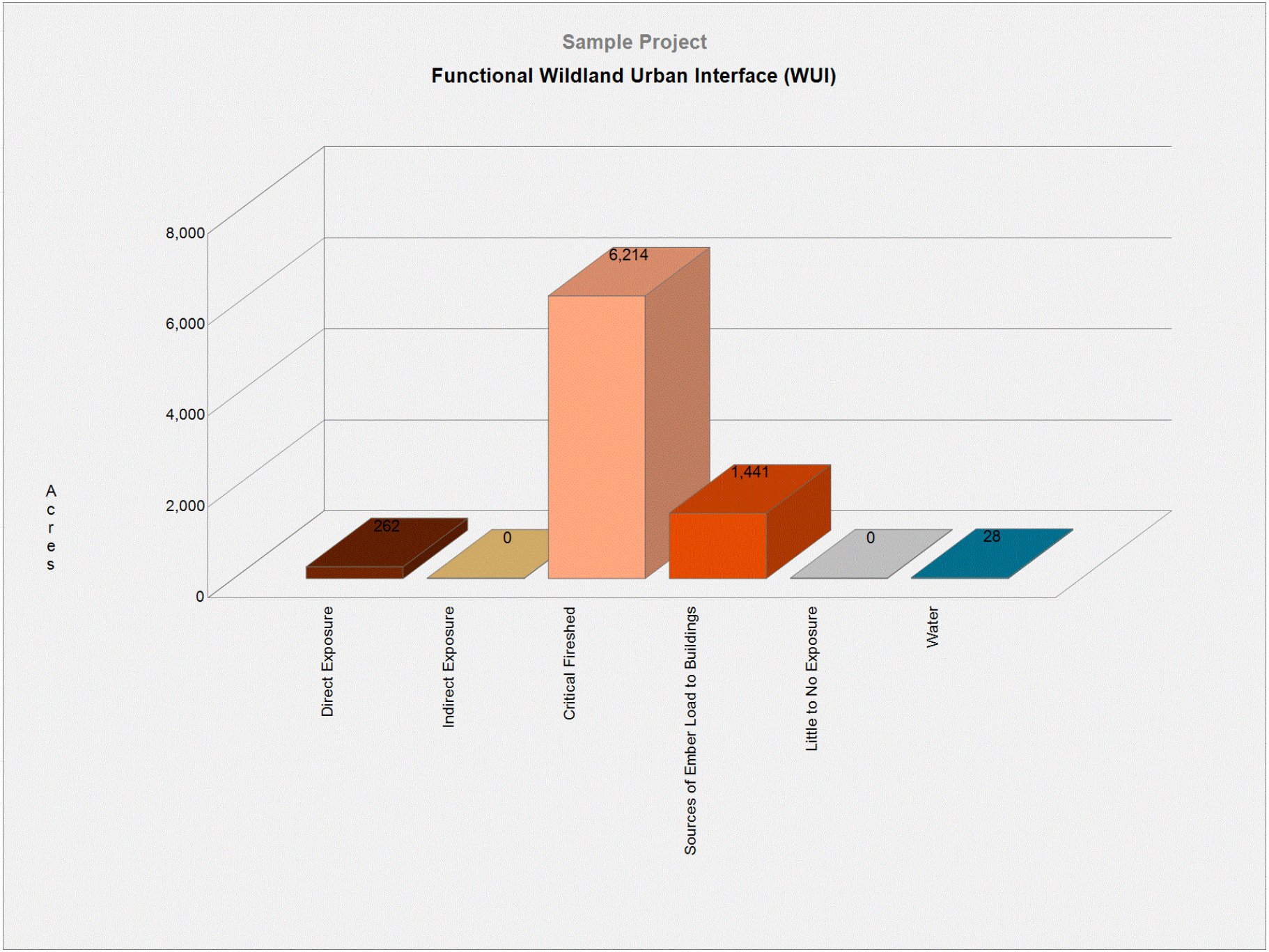
Sources of Ember Load to Buildings—These are areas of burnable land cover that produces embers capable of reaching nearby buildings. Ember production is a function of fire type and intensity, and ember travel is a function of wind speed and direction. Fuel treatment in this zone is a priority for reducing ember load to the nearby buildings.

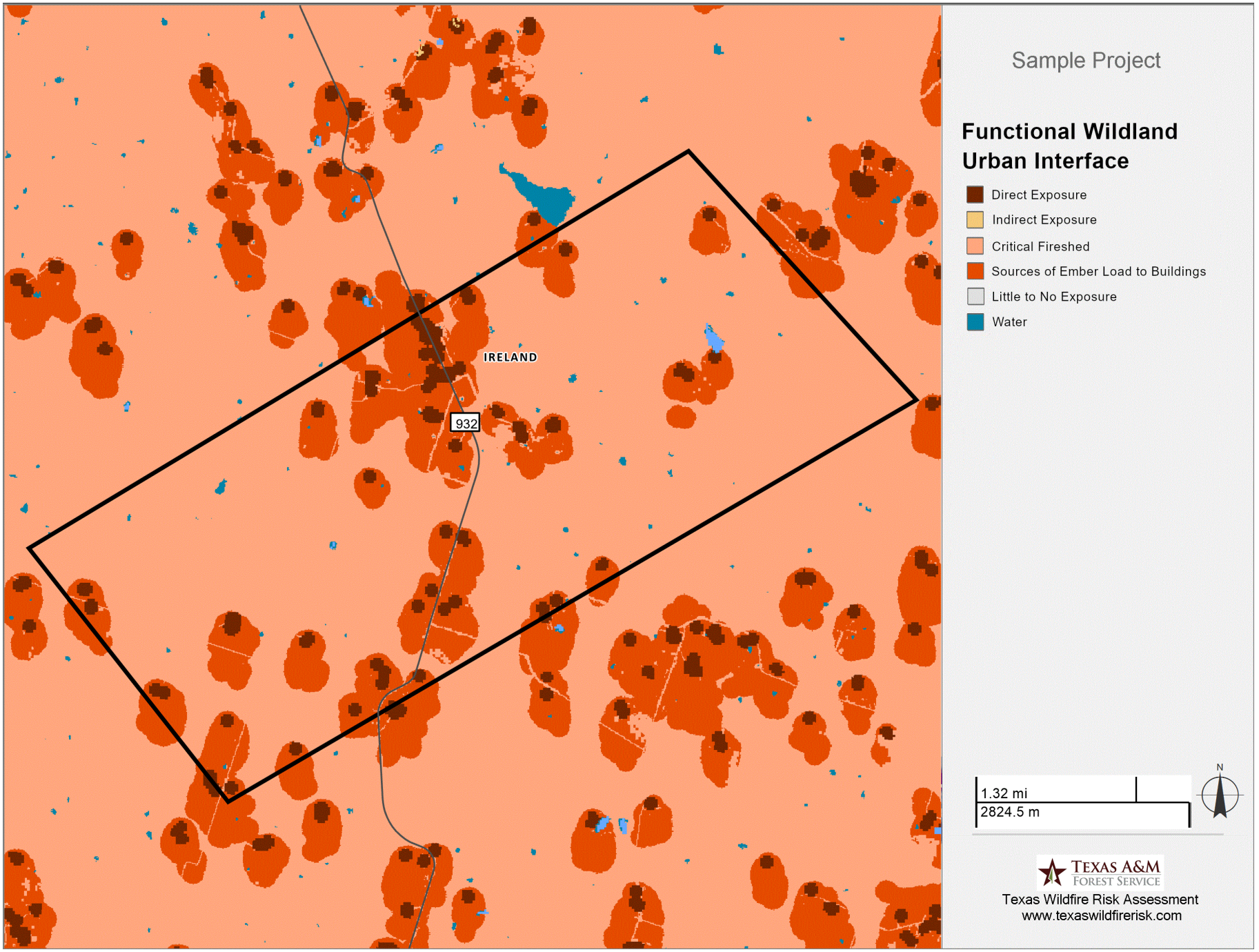
Little-to-no Exposure—The Little-to-no Exposure zone is nonburnable land that is within 75 m of a structure but greater than 1500 m from a large (500 ha) contiguous block of burnable land cover. Flames—even from home-to-home spread—and embers are unlikely to reach the Little-to-no-Exposure zone, but smoke and evacuations could still impact this area.

*Buildings used in producing Functional WUI are defined as greater than 40 sq meters.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	262	3 %
	Indirect Exposure	0	0 %
	Critical Fireshed	6,215	78 %
	Sources of Ember Load to Buildings	1,441	18 %
	Little to No Exposure	0	0 %
	Water	28	0 %
	Total	**7,946**	**100 %**


Sample Project
Functional Wildland Urban Interface (WUI)
Acres
8,000
6,000
4,000
2,000
0
262
0
6,214
1,441
0
28
Direct Exposure
Indirect Exposure
Critical Fireshed
Sources of Ember Load to Buildings
Little to No Exposure
Water


Sample Project
Functional Wildland Urban Interface
Direct Exposure
Indirect Exposure
Critical Fireshed
Sources of Ember Load to Buildings
Little to No Exposure
Water
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

Flame Front Characteristics

The information in this section of the report describes fire behavior characteristics at the flaming front of the fire.

Contents:

Fire Behavior Overview

Description

Fire behavior is the manner in which a fire reacts to 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 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 SWRA includes composition and characteristics for both surface fuels and canopy fuels. Significant increases in fire behavior will 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 (Fire Program Solutions, L.L.C, 2005).
- **Canopy Base Height** is the lowest height above the ground above which here is sufficient canopy fuel to propagate fire vertically (Scott & Reinhardt, 2001). 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, plot, or group of trees, not of an individual tree. Canopy bulk density is used to predict whether an active crown fire is possible.

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 wind speed.

Weather variables were acquired from gridded weather data to generate 216 weather scenarios comprised of 9 wind speeds, 8 wind directions, and 3 moisture scenarios. Rather than employing multiple percentile weather categories (as previously used in the SWRA fire behavior calculations), the fire behavior modeling in the SWRA update is calculated with the Wildfire Exposure Simulation Tool (WildEST).

WildEST is a cloud-based system that uses a custom implementation of the FlamMap fire modeling system (Finney 2006) to produce simulations under a range of weather types (wind speed, wind direction, fuel moisture content). The 216 FlamMap runs are combined into a single output by weighting each scenario according to weather type probabilities that reflect how often each weather scenario occurs in the record, its co-occurrence with historical fire ignitions, and the influence of high-spread conditions (such as the disproportionate impact of hot, dry, and windy conditions on fire growth).

Two sets of results are provided for each of the Flame Front Characteristic layers. Results using all 216 weather scenarios are labeled “Characteristic” while “95th Percentile” or average-worst Flame Front Characteristics demonstrate the impact of the top five percent of weather types. These results represent an average of the worst 5% of weather types, weighted according to the frequency of the weather type and the influence of high-spread conditions.

Topography

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

Characteristic Fire Intensity Scale

Characteristic Fire Intensity Scale (FIS) specifically identifies where significant fuel hazards and associated dangerous fire behavior potential exist based on fuel and weighted across a full range of wind and weather conditions calculated using WildEST. Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculations. These estimates include the contribution of crown fuel and crowning fire intensity.

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.

1. 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.

2. Class 2, 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.

3. Class 3, Moderate:
Flames up to 9 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.

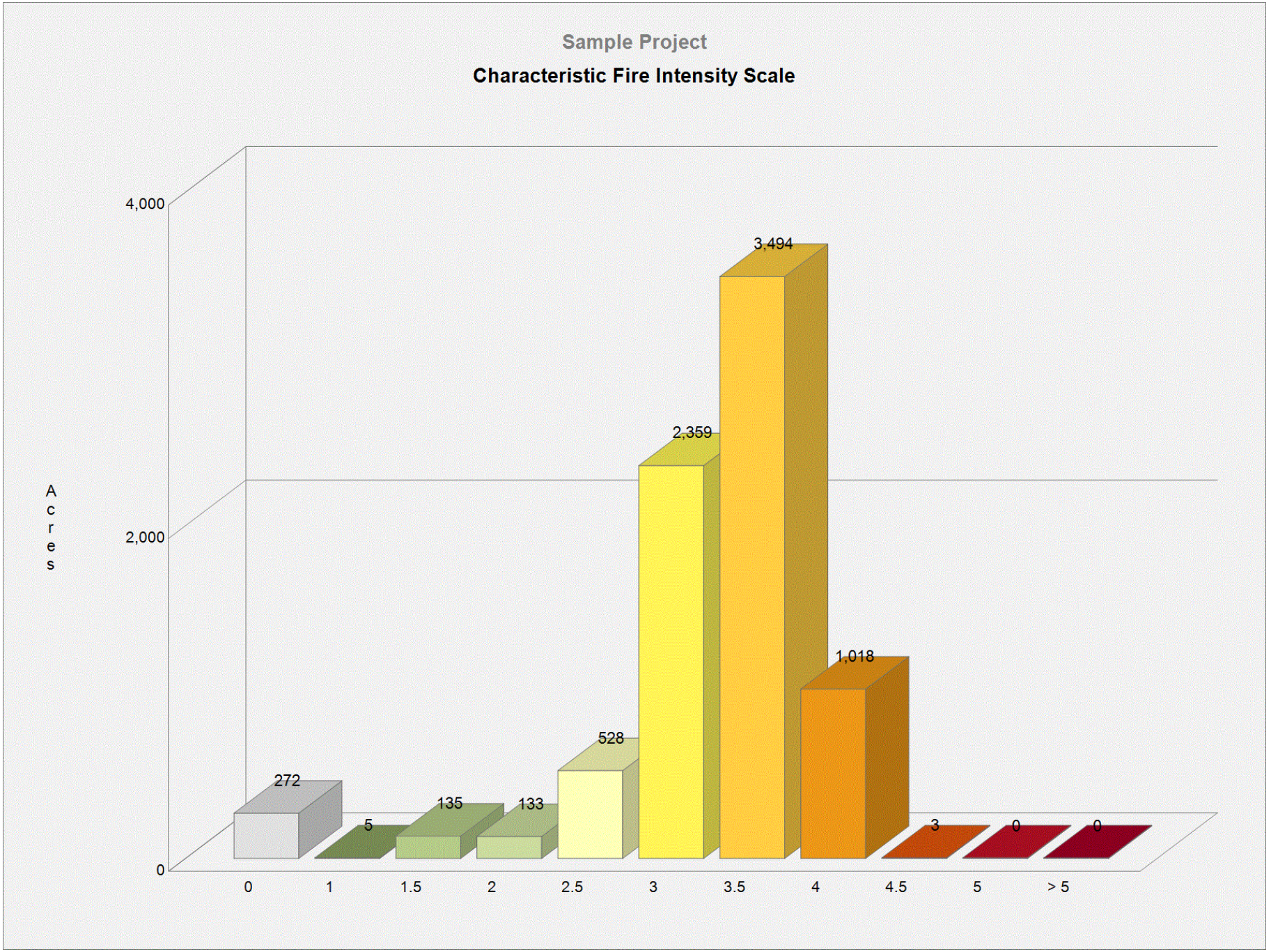
4. Class 4, High:
Large Flames, up to 40 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

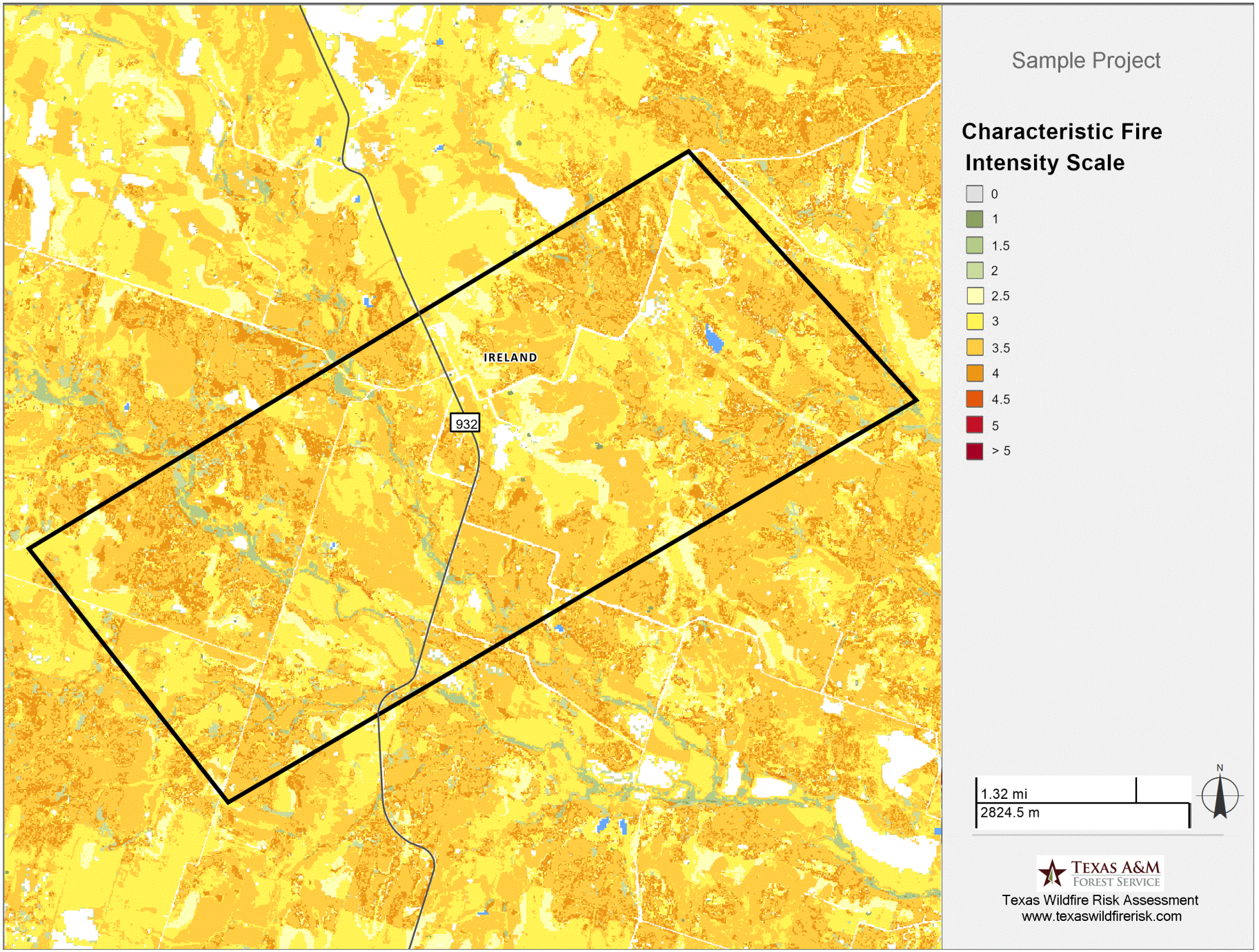
5. Class 5, Very High:
Flames exceeding 200 feet in length; expect extreme fire behavior.

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.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Characteristic Fire Intensity Scale Category	Acres	Percent
	0	272	3 %
	1	5	0 %
	1.5	135	2 %
	2	133	2 %
	2.5	528	7 %
	3	2,359	30 %
	3.5	3,494	44 %
	4	1,018	13 %
	4.5	3	0 %
	5	0	0 %
	> 5	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Characteristic Fire Intensity Scale
Acres
4,000
2,000
0
272
5
135
133
528
2,359
3,494
1,018
3
0
0
0
1
1.5
2
2.5
3
3.5
4
4.5
5
> 5


Sample Project
Characteristic Fire Intensity Scale
0
1
1.5
2
2.5
3
3.5
4
4.5
5
> 5
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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95th Percentile Fire Intensity Scale

This layer represents the "average-worst" 95th Percentile Fire Intensity Scale at the flaming front of the fire. Here, fireline intensity is represented as the standard Fire Intensity Scale (Log10 of fireline intensity) as determined by fuel and weather characteristics. These results are weighted according to the Weather Type Probabilities (WTPs) from the highest five percent of possible wind and weather conditions and include the contribution of crown fuel and crowning fire intensity, if applicable. Fireline intensity is calculated using WildEST. Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculations.

Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consists 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.

1. 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.

2. Class 2, 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.

3. Class 3, Moderate:
Flames up to 9 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.

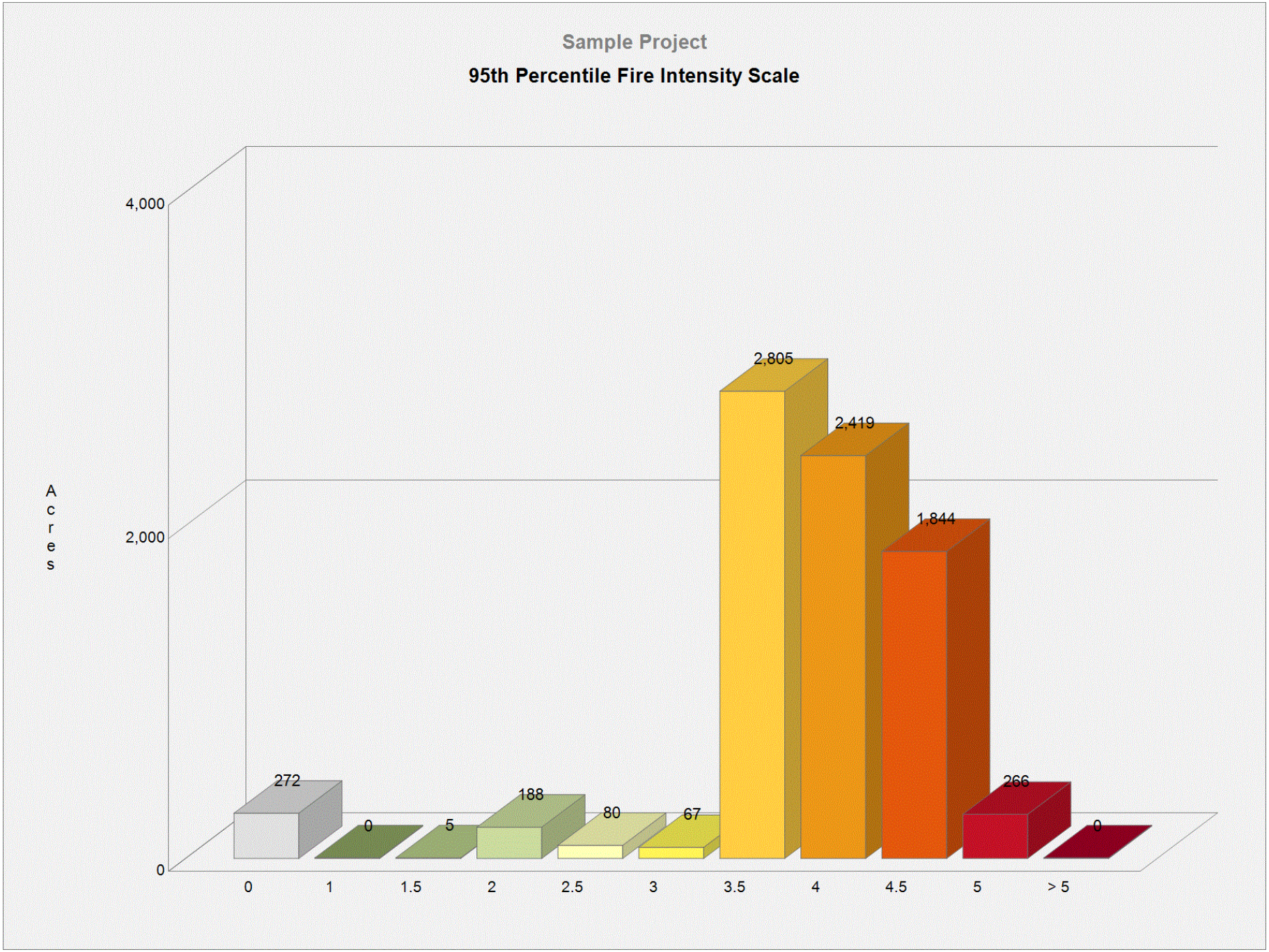
4. Class 4, High:
Large Flames, up to 40 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.

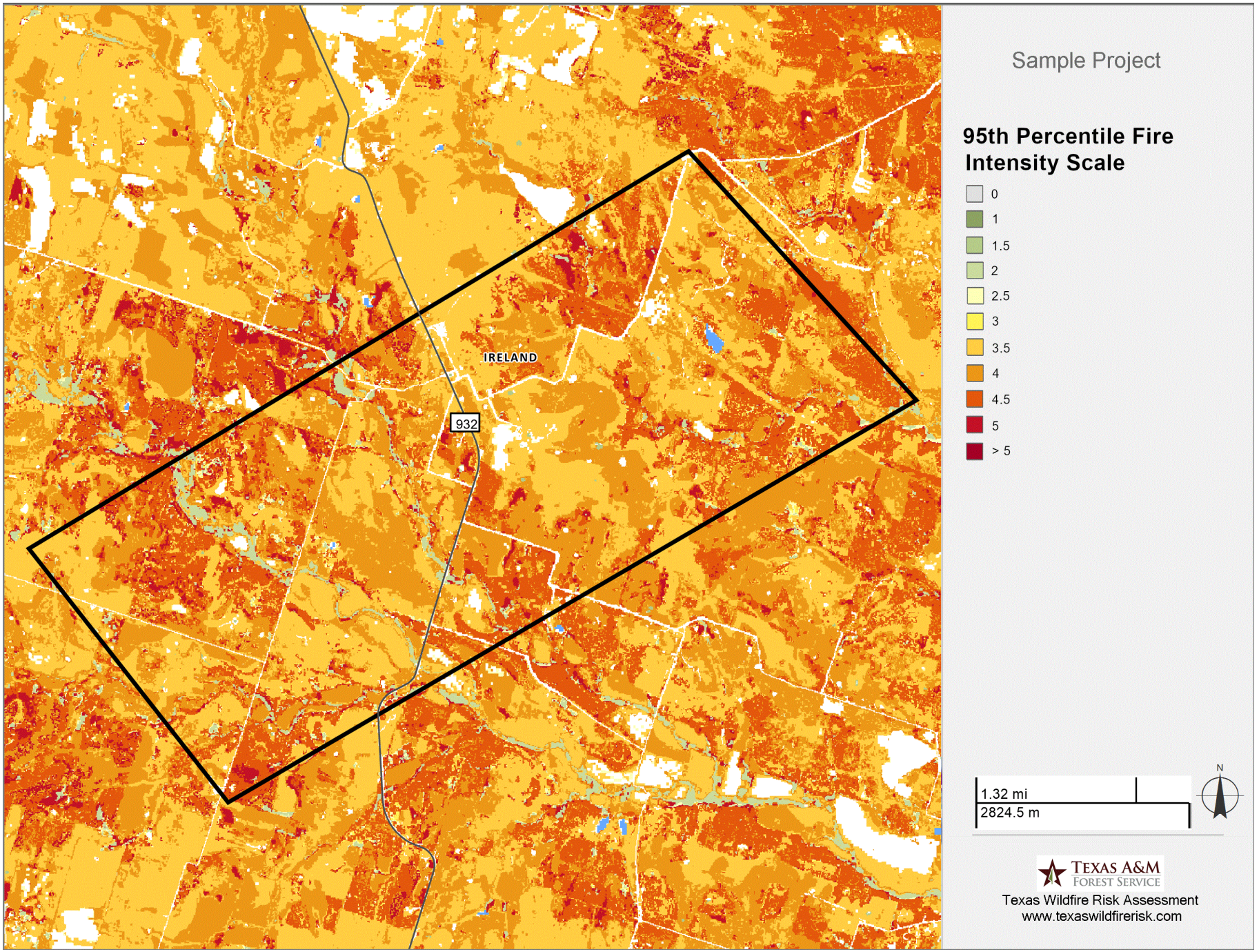
5. Class 5, Very High:
Flames exceeding 200 feet in length; expect extreme fire behavior.

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.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	95th Percentile Fire Intensity Scale Category	Acres	Percent
	0	272	3 %
	1	0	0 %
	1.5	5	0 %
	2	188	2 %
	2.5	80	1 %
	3	67	1 %
	3.5	2,805	35 %
	4	2,419	30 %
	4.5	1,844	23 %
	5	266	3 %
	> 5	0	0 %
	Total	**7,946**	**100 %**


Sample Project
95th Percentile Fire Intensity Scale
Acres
4,000
2,000
0
272
0
5
188
80
67
2,805
2,419
1,844
266
0
0
1
1.5
2
2.5
3
3.5
4
4.5
5
> 5


Sample Project
95th Percentile Fire Intensity Scale
0
1
1.5
2
2.5
3
3.5
4
4.5
5
> 5
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

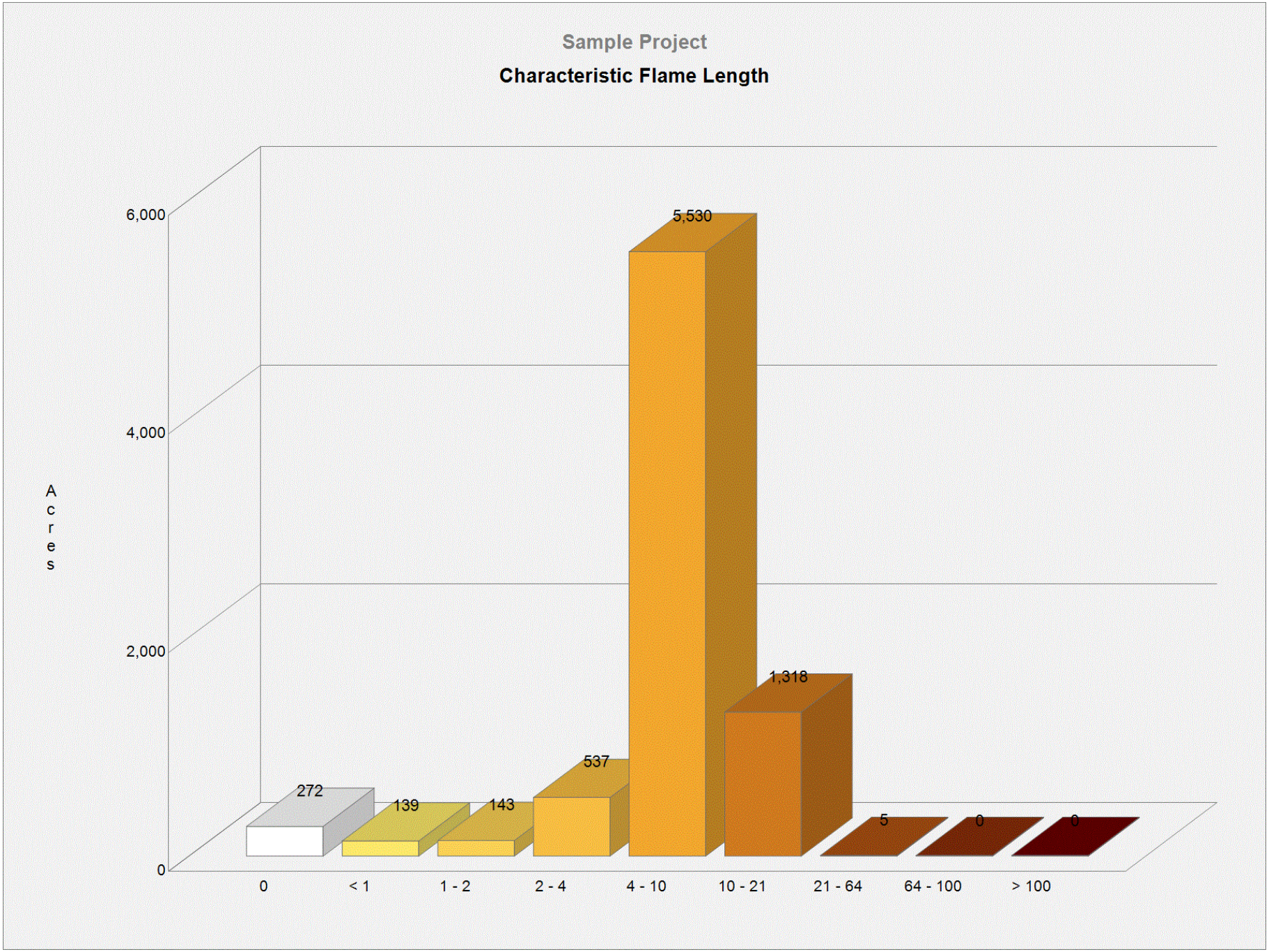
Characteristic Flame Length

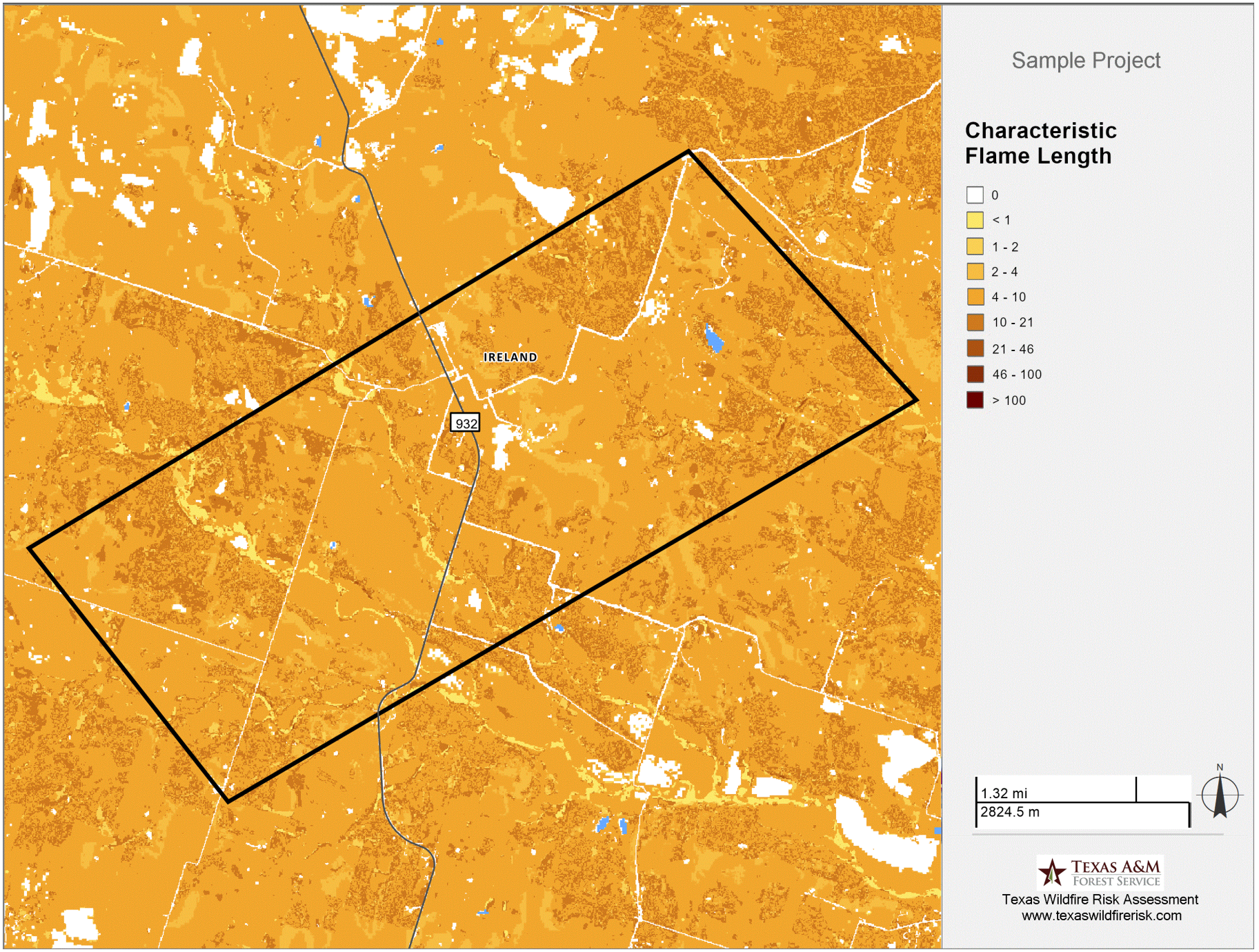
This layer represents the flame length (in feet) as determined by fuel and weather characteristics. These results are weighted across a full range of possible wind and weather conditions and include the contribution of crown fire flame lengths, if applicable. Flame length is calculated using WildEST, a process used to perform and combine multiple fire behavior simulations under a range of weather types (wind speed, wind direction, fuel moisture content). Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculations.

Uses for this flame length dataset include comparison of expected flame-lengths across the landscape for identifying wildfire hazards to the public and exploring hazard mitigation opportunities for communities and land management agencies.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Characteristic Flame Length Category	Acres	Percent
	0	272	3 %
	< 1	139	2 %
	1 - 2	143	2 %
	2 - 4	537	7 %
	4 - 10	5,531	70 %
	10 - 21	1,318	17 %
	21 - 46	5	0 %
	46 - 100	0	0 %
	> 100	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Characteristic Flame Length
Acres
6,000
4,000
2,000
0
272
139
143
537
5,530
1,318
5
0
0
0
< 1
1 - 2
2 - 4
4 - 10
10 - 21
21 - 64
64 - 100
> 100


Sample Project
Characteristic
Flame Length
0
< 1
1 - 2
2 - 4
4 - 10
10 - 21
21 - 46
46 - 100
> 100
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
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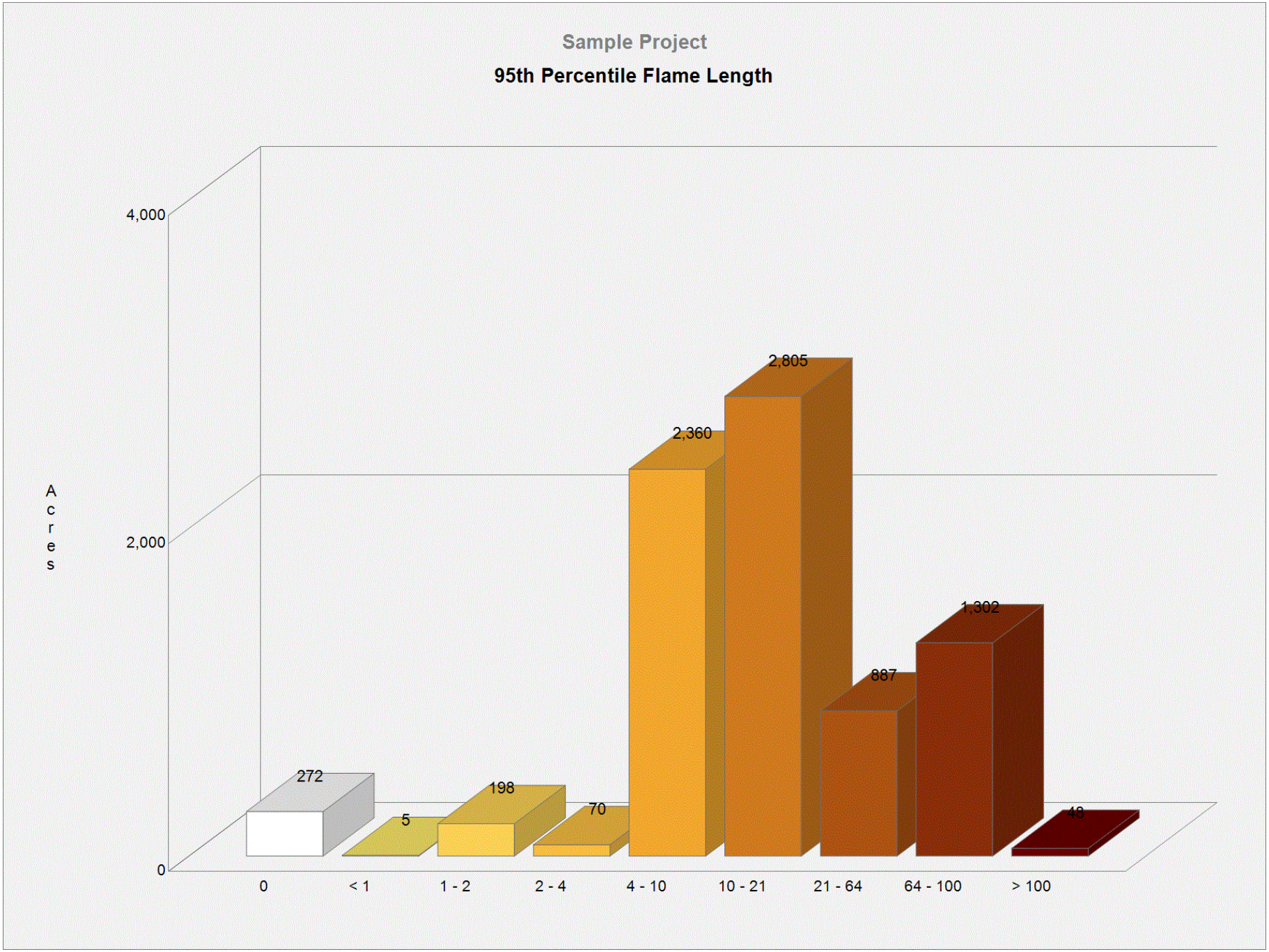
95th Percentile Flame Length

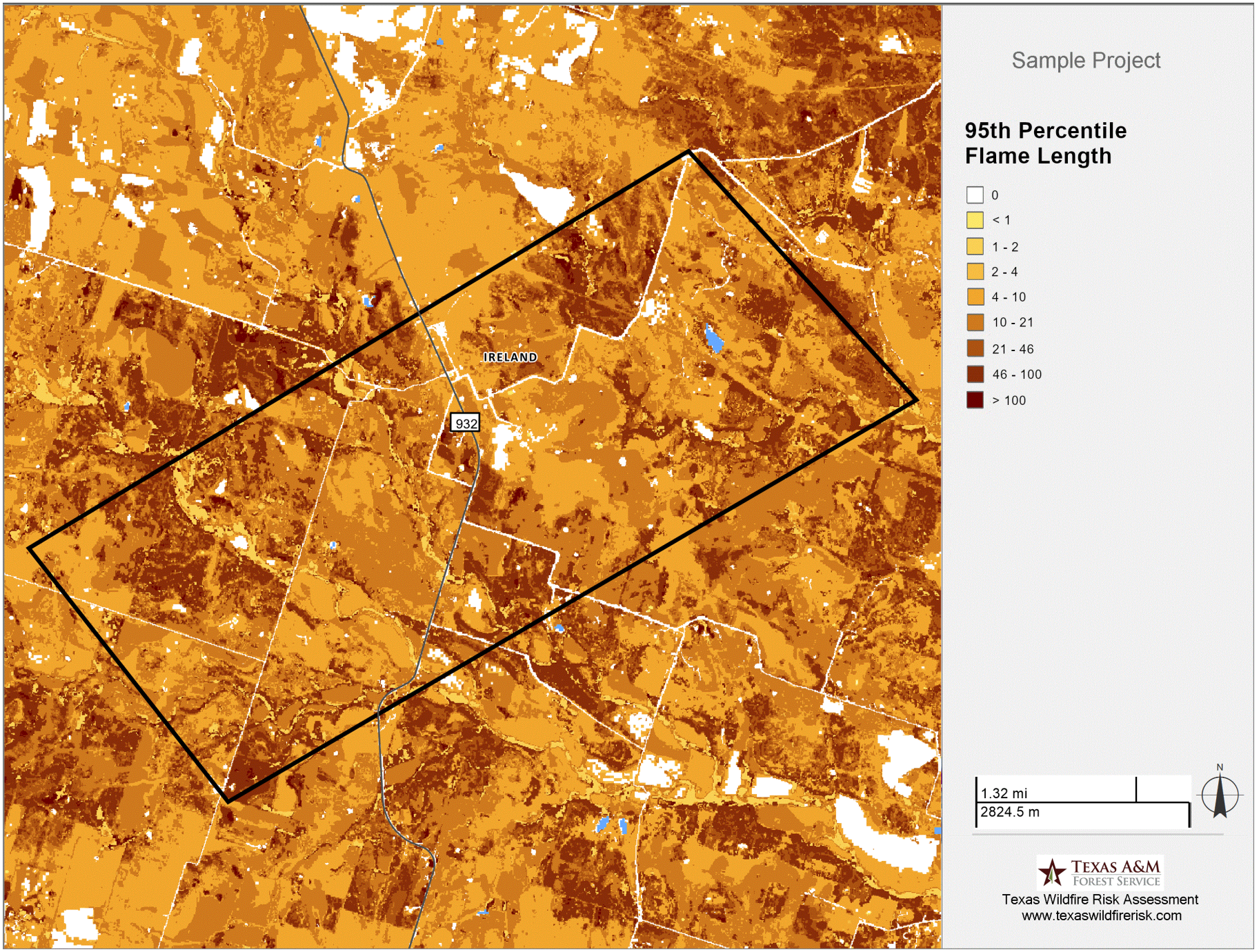
This layer represents the "average-worst" 95th Percentile Flame Length (in feet) at the flaming front of the fire as determined by fuel and weather characteristics. These results are weighted according to the Weather Type Probabilities (WTPs) from the highest five percent of possible wind and weather conditions and include the contribution of crown fire flame lengths, if applicable.

Flame length is calculated using WildEST, a process used to perform and combine multiple fire behavior simulations under a range of weather types (wind speed, wind direction, fuel moisture content). Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculation.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	95th Percentile Flame Length Category	Acres	Percent
	0	272	3 %
	< 1	5	0 %
	1 - 2	198	2 %
	2 - 4	70	1 %
	4 - 10	2,360	30 %
	10 - 21	2,805	35 %
	21 - 46	887	11 %
	46 - 100	1,302	16 %
	> 100	48	1 %
	Total	**7,946**	**100 %**


Sample Project
95th Percentile Flame Length
Acres
4,000
2,000
0
272
5
198
70
2,360
2,805
887
1,302
48
0
< 1
1 - 2
2 - 4
4 - 10
10 - 21
21 - 64
64 - 100
> 100

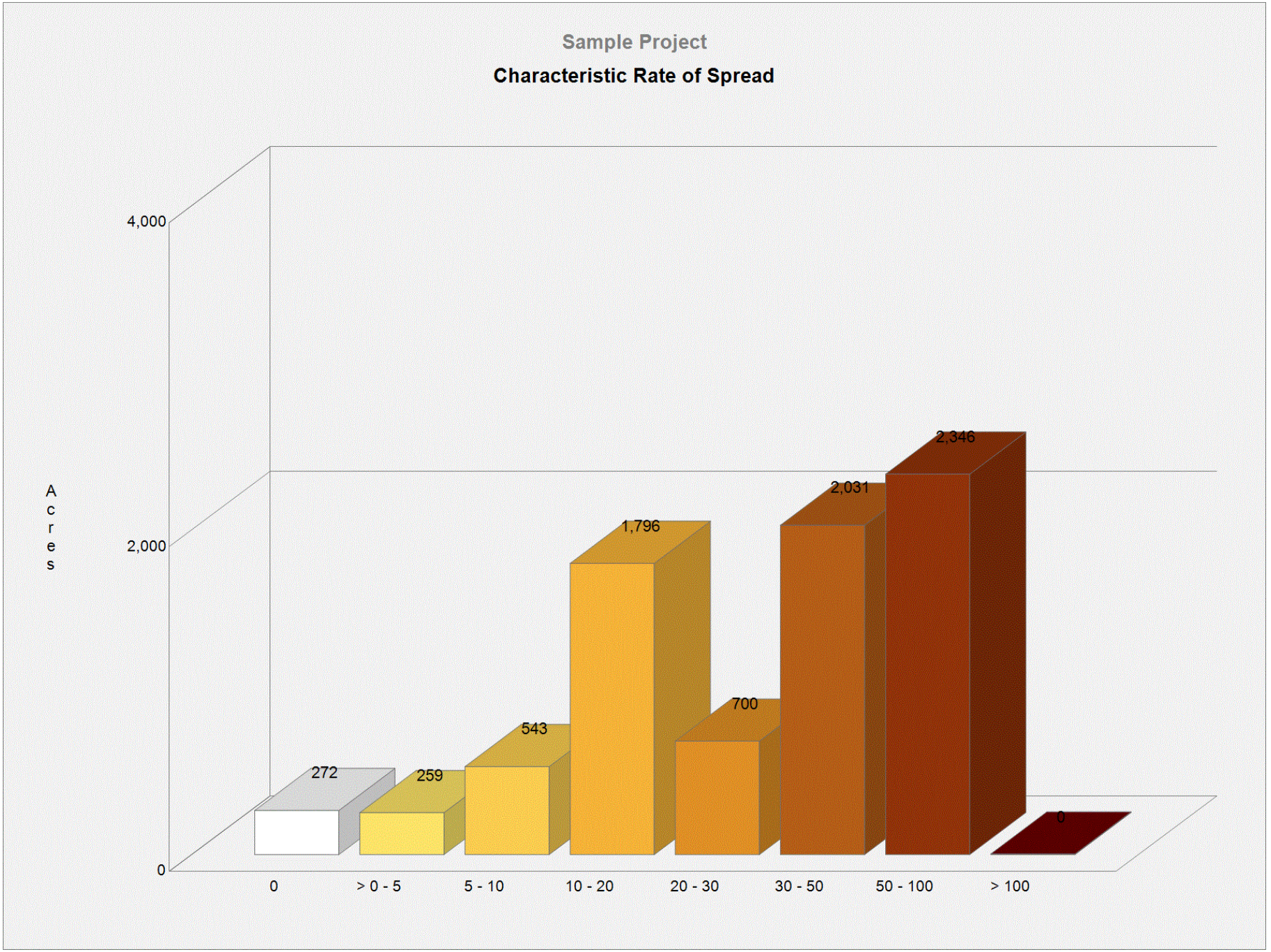

Sample Project
95th Percentile
Flame Length
0
< 1
1 - 2
2 - 4
4 - 10
10 - 21
21 - 46
46 - 100
> 100
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

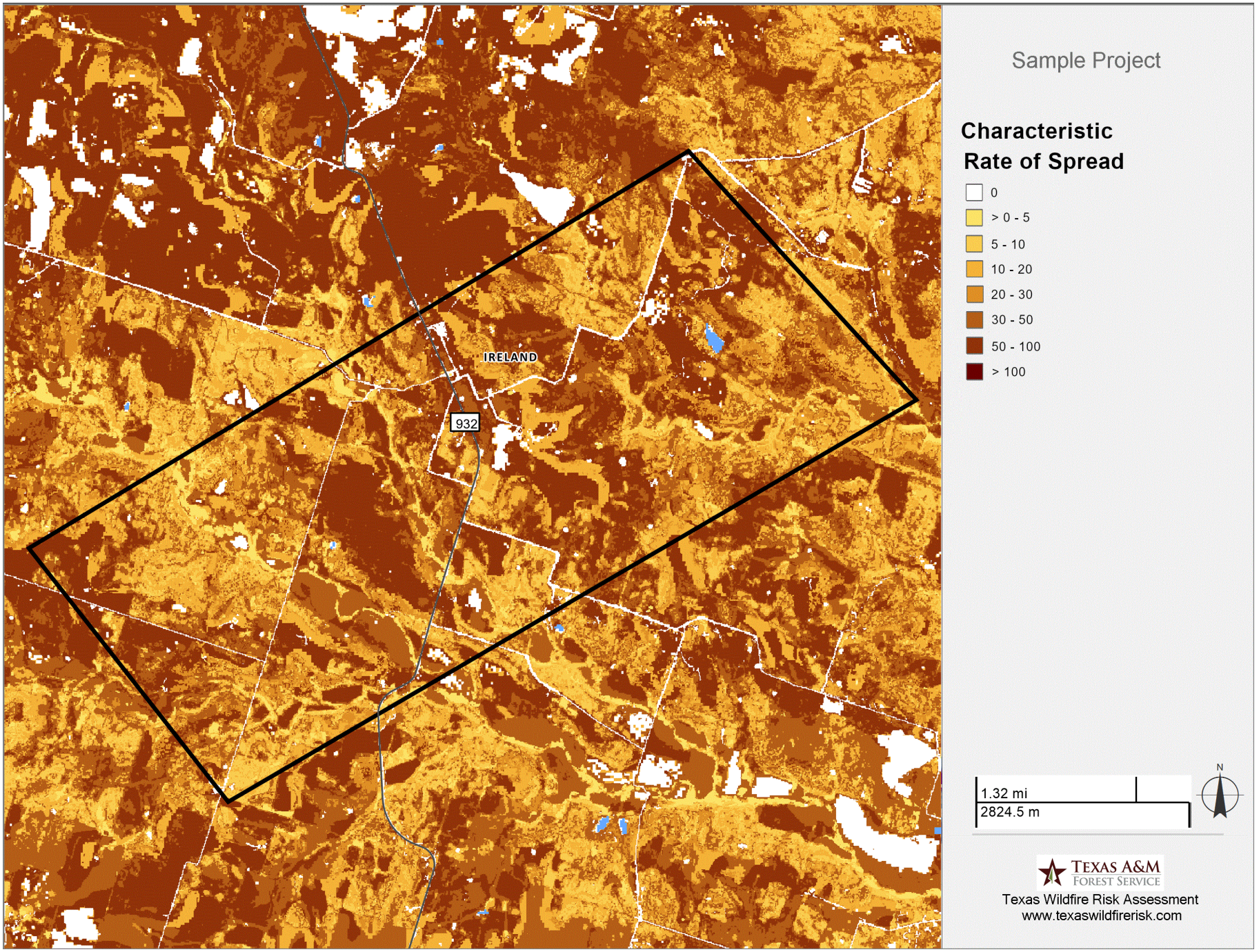
Characteristic Rate of Spread

This layer represents the rate of spread as determined by fuel and weather characteristics. These results are weighted across a full range of possible wind and weather conditions and include the contribution of crown fire spread rate, if applicable. Note: Burnable cornfields in the fall harvest season have been excluded from this dataset. Rate of Spread is calculated using WildEST, a process used to perform and combine multiple fire behavior simulations under a range of weather types (wind speed, wind direction, fuel moisture content). Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculations. Note: Burnable cornfields in the fall harvest season have been excluded from this dataset.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Characteristic Rate of Spread Category	Acres	Percent
	0	272	3 %
	> 0 - 5	259	3 %
	5 - 10	543	7 %
	10 - 20	1,796	23 %
	20 - 30	700	9 %
	30 - 50	2,031	26 %
	50 - 100	2,346	30 %
	> 100	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Characteristic Rate of Spread
Acres
4,000
2,000
0
272
259
543
1,796
700
2,031
2,346
0
0
> 0 - 5
5 - 10
10 - 20
20 - 30
30 - 50
50 - 100
> 100


Sample Project
Characteristic
Rate of Spread
0
> 0 - 5
5 - 10
10 - 20
20 - 30
30 - 50
50 - 100
> 100
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

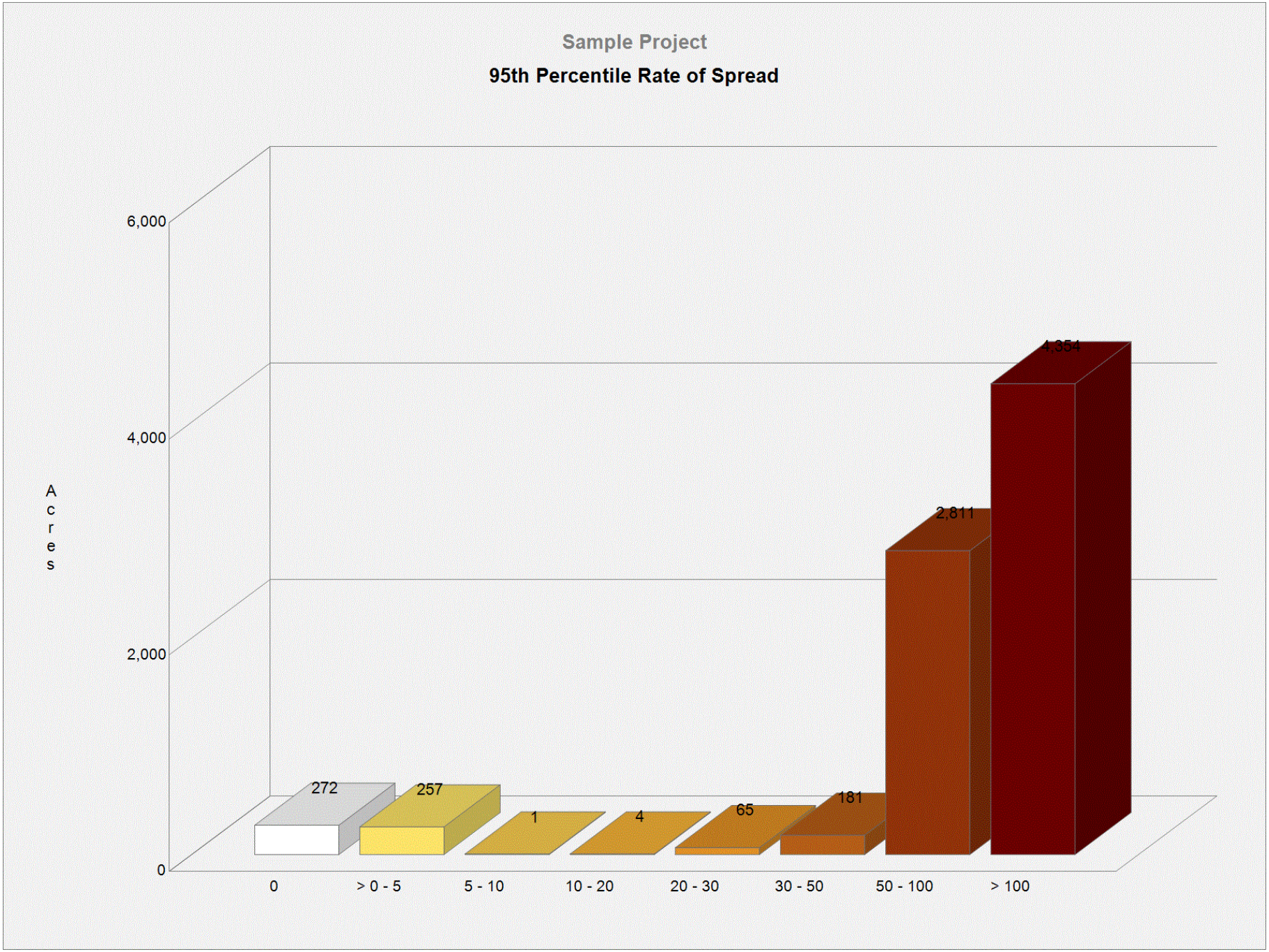
95th Percentile Rate of Spread

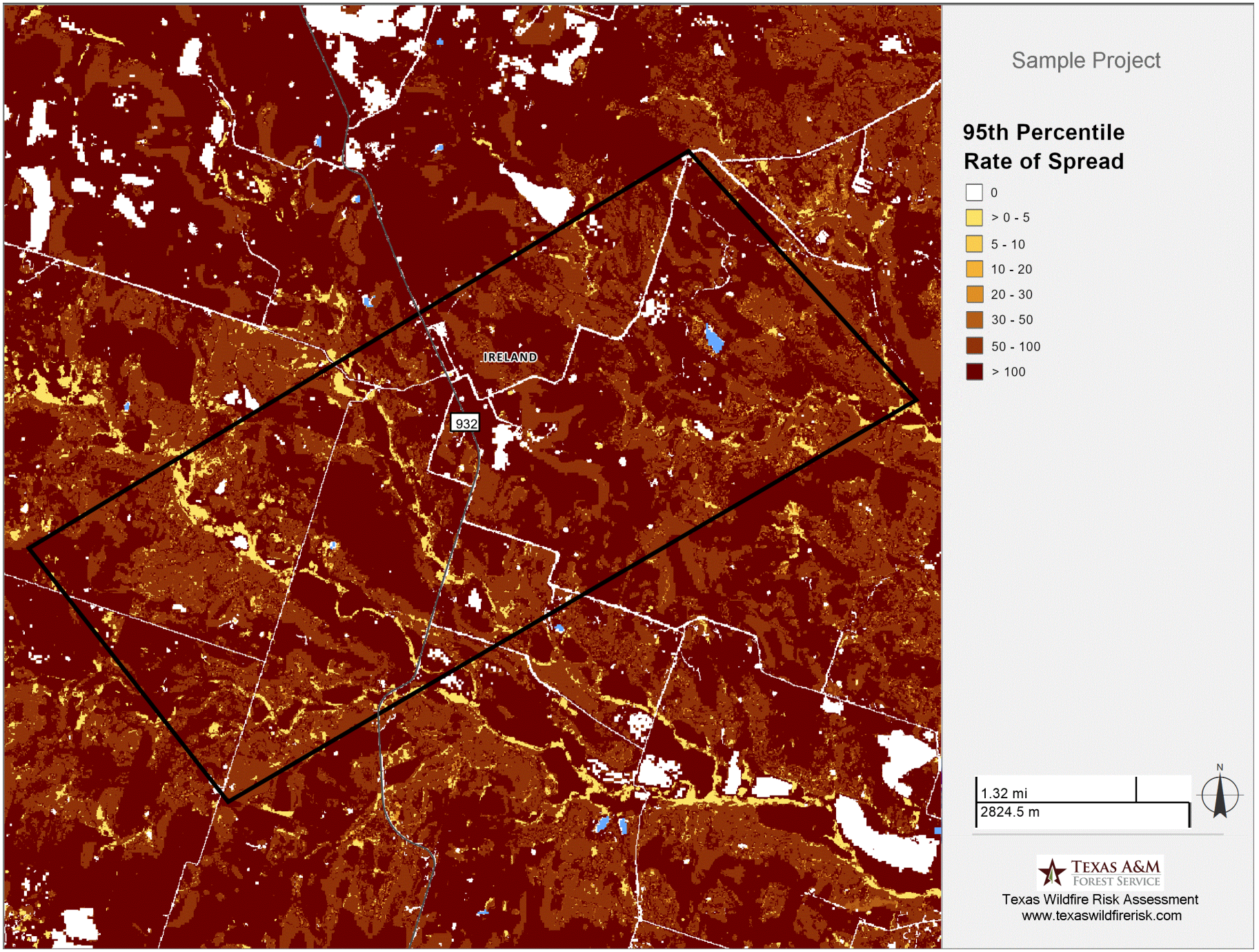
This layer represents the "average-worst" 95th Percentile Rate of Spread (ch/h) at the flaming front of the fire as determined by fuel and weather characteristics. These results are weighted according to the Weather Type Probabilities (WTPs) from the highest five percent of possible wind and weather conditions and include the contribution of crown fire spread rate, if applicable.

Rate of Spread is calculated using WildEST, a process used to perform and combine multiple fire behavior simulations under a range of weather types (wind speed, wind direction, fuel moisture content). Rather than weighting results solely by how frequently the weather conditions occur, the WildEST process factors the greater influence of high-spread conditions into the weighting calculations.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	95th Percentile Rate of Spread Category	Acres	Percent
	0	272	3 %
	> 0 - 5	257	3 %
	5 - 10	1	0 %
	10 - 20	4	0 %
	20 - 30	65	1 %
	30 - 50	181	2 %
	50 - 100	2,811	35 %
	> 100	4,354	55 %
	Total	**7,946**	**100 %**


Sample Project
95th Percentile Rate of Spread
Acres
6,000
4,000
2,000
0
272
257
1
4
65
181
2,811
4,354
0
> 0 - 5
5 - 10
10 - 20
20 - 30
30 - 50
50 - 100
> 100


Sample Project
95th Percentile
Rate of Spread
0
> 0 - 5
5 - 10
10 - 20
20 - 30
30 - 50
50 - 100
> 100
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

Probability of Crown Fire

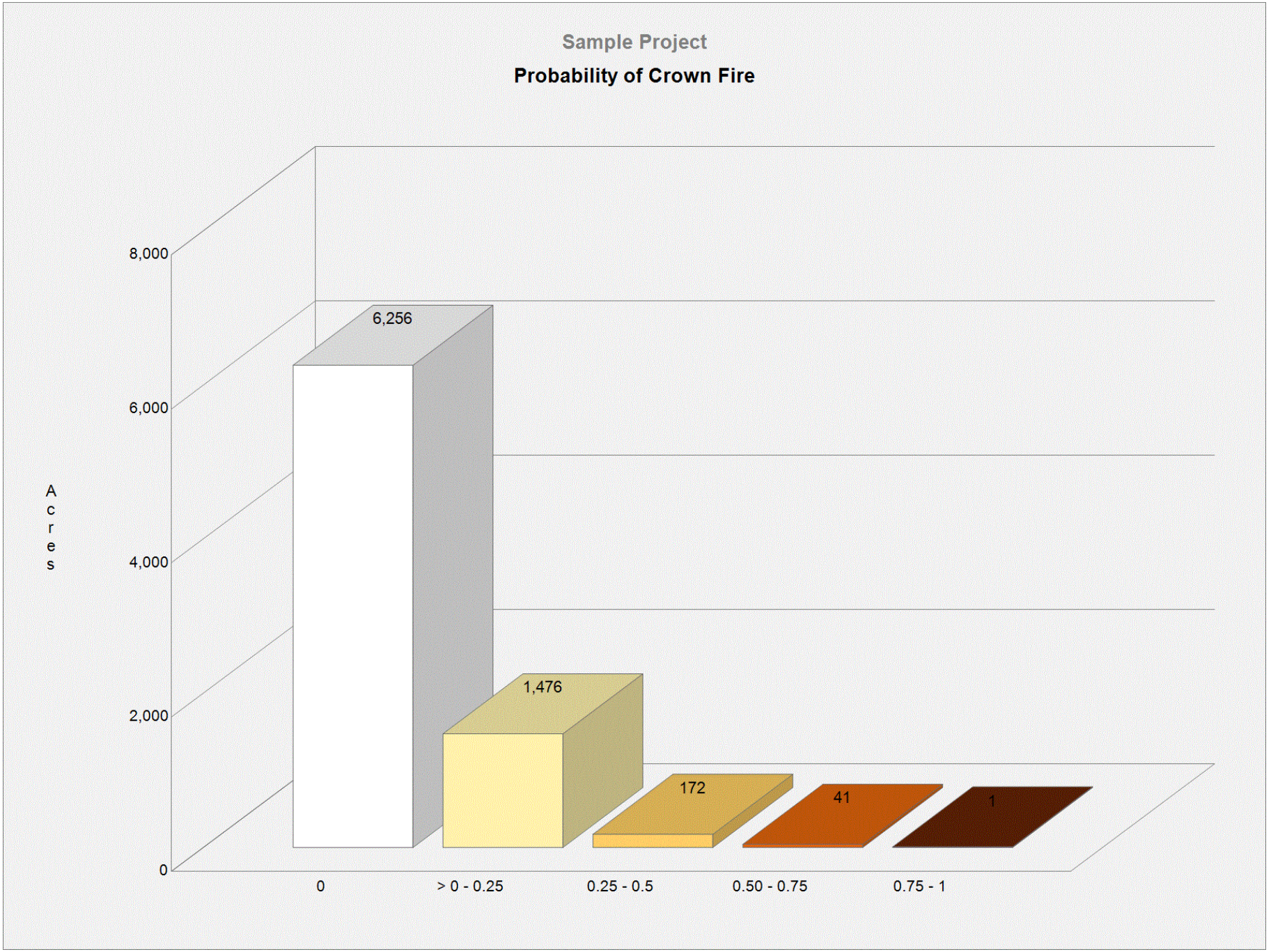
This layer shows the likelihood of the head of the fire experiencing crown fire (at least mid-grade passive crown fire). The head of the fire exhibits the most extreme fire behavior, demonstrating the highest intensity and fastest spread rates.

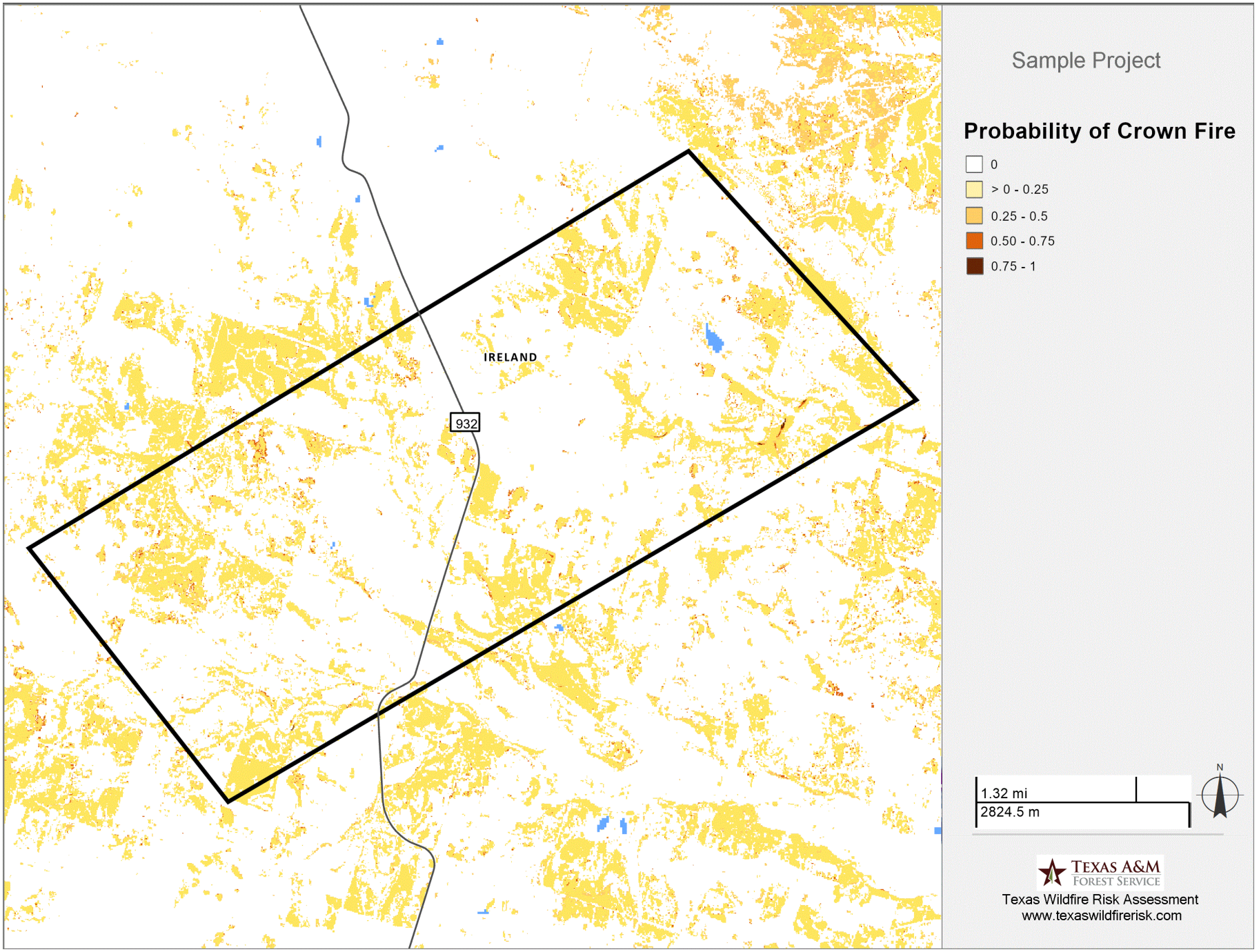
Crown (or canopy) fires are very dangerous, destructive, and difficult to control due to their increased fire intensity. From a planning perspective, it is important to identify where these conditions are likely to occur on the landscape so that special preparedness measures can be taken if necessary.

Higher probability values indicate a high likelihood of crown fire. Probability results reflect fuel characteristics and the flame lengths produced under a range of weather conditions. These probabilities do not include the likelihood of a wildfire occurring, rather, they provide information about the likelihood of a location experiencing crown fire, if a wildfire were to occur.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Probability of Crown Fire Category	Acres	Percent
	0	6,256	79 %
	> 0 - 0.25	1,476	19 %
	0.25 - 0.5	172	2 %
	0.50 - 0.75	41	1 %
	0.75 - 1	1	0 %
	Total	**7,946**	**100 %**


Sample Project
Probability of Crown Fire
Acres
8,000
6,000
4,000
2,000
0
6,256
1,476
172
41
1
0
> 0 - 0.25
0.25 - 0.5
0.50 - 0.75
0.75 - 1


Sample Project
Probability of Crown Fire
0
> 0 - 0.25
0.25 - 0.5
0.50 - 0.75
0.75 - 1
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Challenges to Fire Operations

The information in this section of the report describes fire behavior information useful in operational fire planning and for identifying fuel treatment opportunities.

Contents:

Probability of Exceeding Manual Control

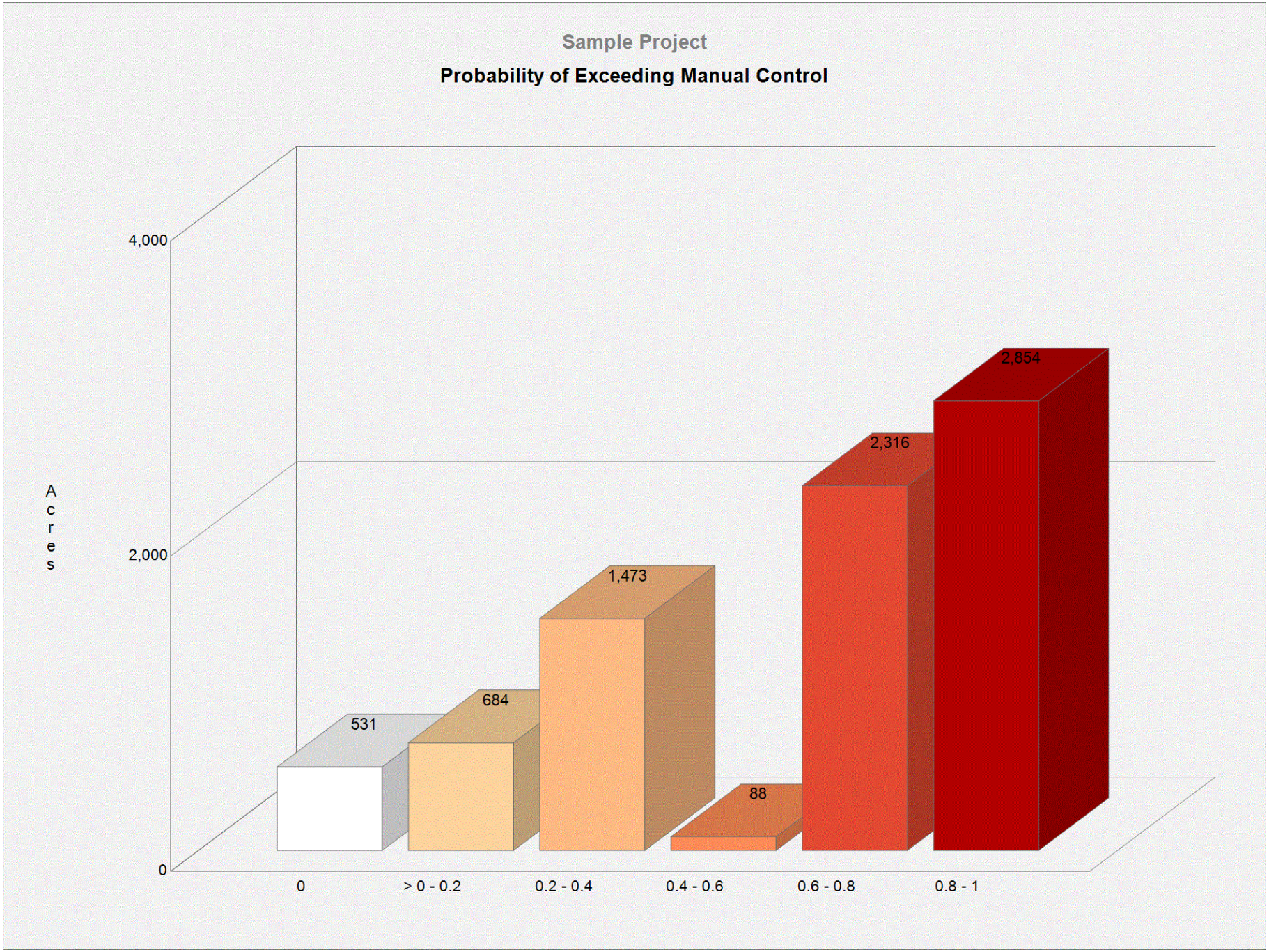
This layer shows the likelihood that flames at the head of the fire will exceed 4 feet, which is generally considered the limit for manual fire control. The head of the fire exhibits the most extreme fire behavior, demonstrating the highest intensity and fastest spread rates.

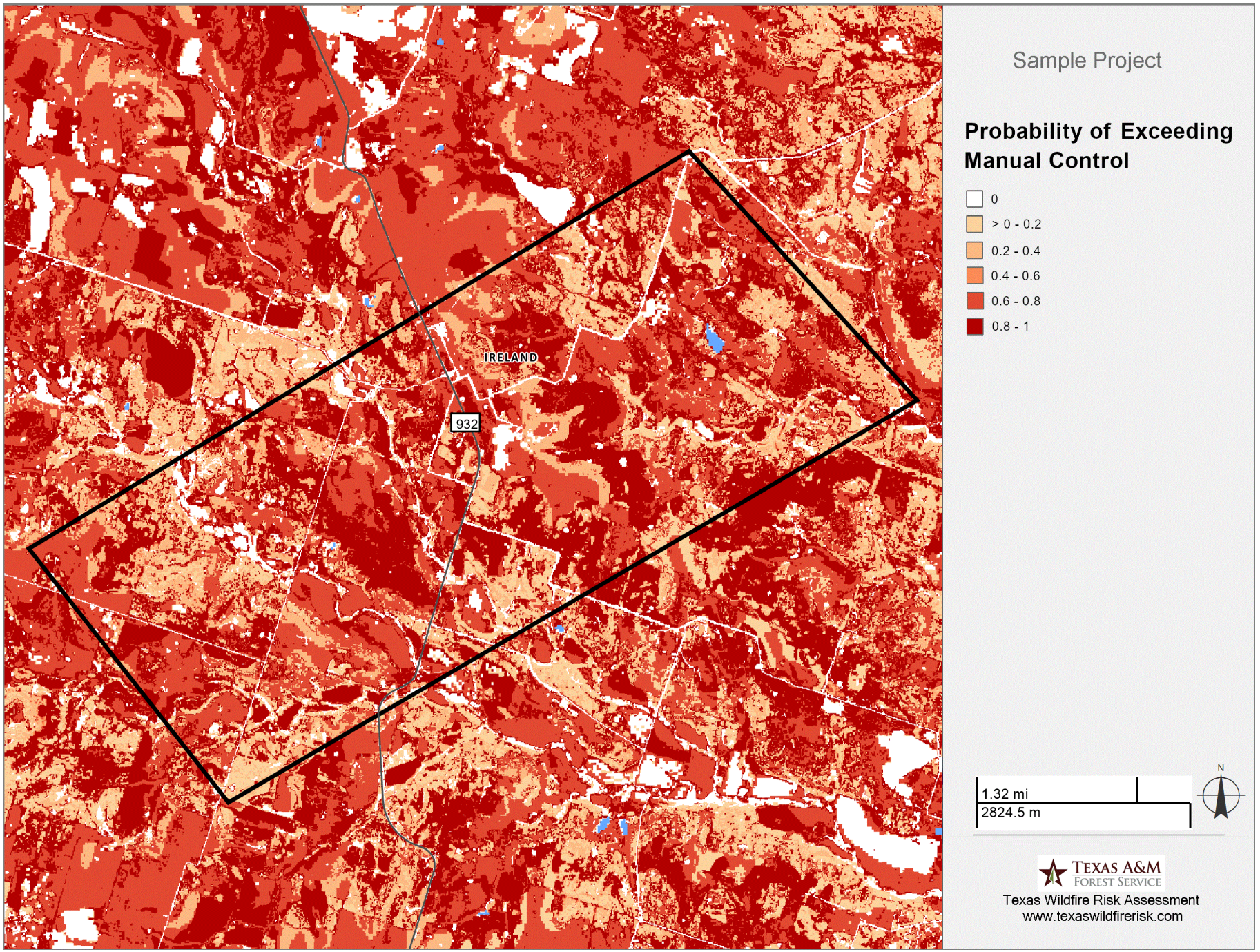
Higher probability values indicate a lower chance of success using manual control measures (i.e. hand crews and hand line). Probability results reflect fuel characteristics and the flame lengths produced under a range of weather conditions. These probabilities do not include the likelihood of a wildfire occurring, rather, they provide information about flame lengths if a wildfire were to occur.

Flame length exceedance probabilities refer to the likelihood of flames reaching or surpassing a certain height, typically measured from the leading edge or "head" of a fire. These probabilities provide insight into the range of potential flame lengths under various weather conditions. For example, if the probability of exceeding a certain flame length threshold is 0.2 (20%), it means there is a 20% chance that flames exceed that height under the range of modeled weather scenarios. It also means that 80% of flame lengths are expected to be below the threshold. These probabilities help fire management personnel anticipate and plan for the potential intensity of wildfires in a specific area.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Probability of Exceeding Manual Control Category	Acres	Percent
	0	531	7 %
	> 0 - 0.2	684	9 %
	0.2 - 0.4	1,474	19 %
	0.4 - 0.6	88	1 %
	0.6 - 0.8	2,316	29 %
	0.8 - 1	2,854	36 %
	Total	**7,946**	**100 %**


Sample Project
Probability of Exceeding Manual Control
Acres
4,000
2,000
0
531
684
1,473
88
2,316
2,854
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


Sample Project
Probability of Exceeding Manual Control
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Probability of Exceeding Mechanical Control

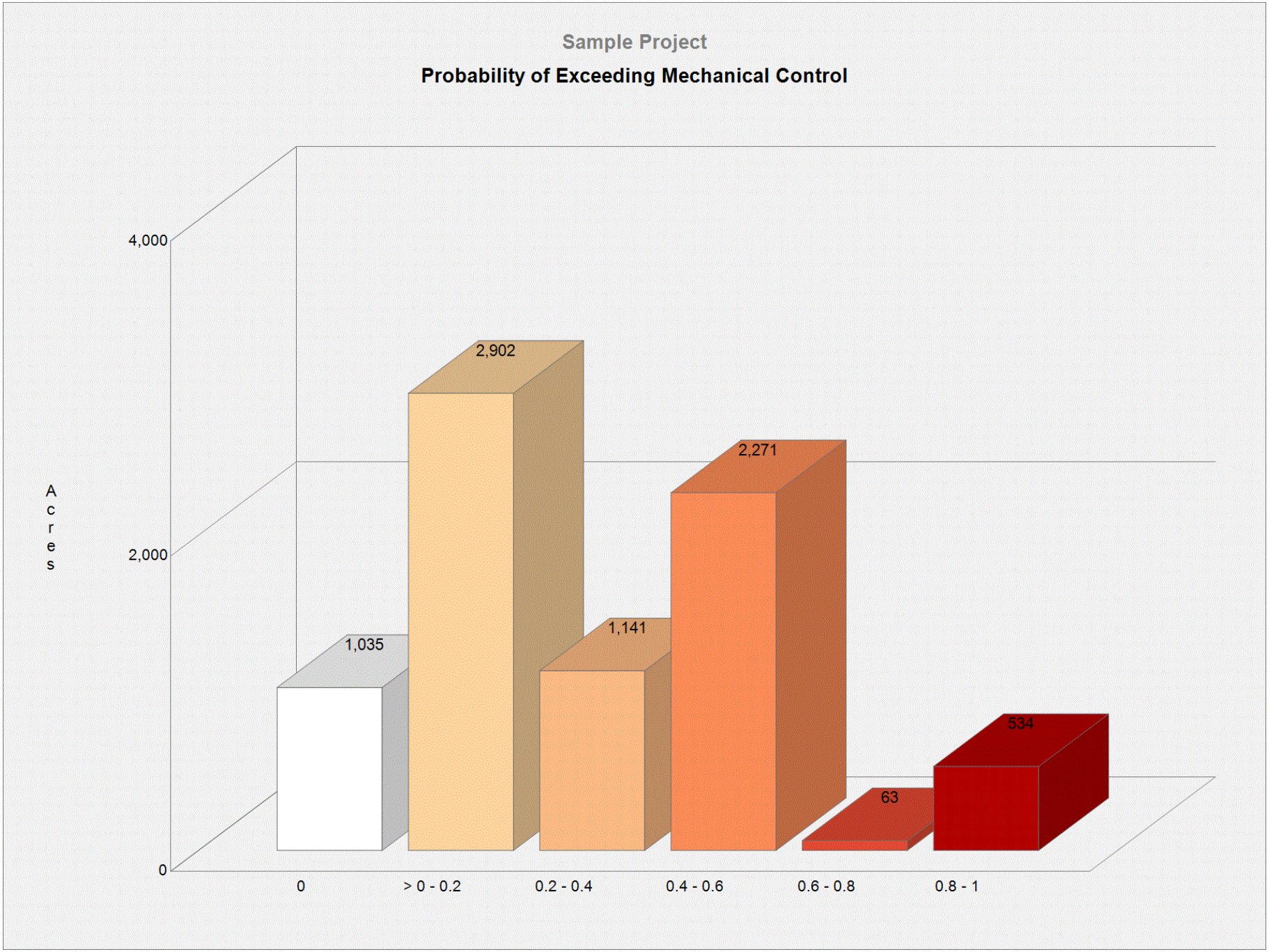
This layer shows the likelihood that flames at the head of the fire will exceed 8 feet, which is considered the limit for mechanical fire control in fire operations. The head of the fire exhibits the most extreme fire behavior, demonstrating the highest intensity and fastest spread rates.

Higher probability values indicate a lower chance of success using mechanical control measures such as dozers and engines. Probability results reflect fuel characteristics and the flame lengths produced under a range of weather conditions. These probabilities do not include the likelihood of a wildfire occurring, rather, they provide information about flame lengths if a wildfire were to occur.

Flame length exceedance probabilities refer to the likelihood of flames reaching or surpassing a certain height, typically measured from the leading edge or "head" of a fire. These probabilities provide insight into the range of potential flame lengths under various weather conditions. For example, if the probability of exceeding a certain flame length threshold is 0.2 (20%), it means there is a 20% chance that flames exceed that height under the range of modeled weather scenarios. It also means that 80% of flame lengths are expected to be below the threshold. These probabilities help fire management personnel anticipate and plan for the potential intensity of wildfires in a specific area.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Probability of Exceeding Mechanical Control Category	Acres	Percent
	0	1,035	13 %
	> 0 - 0.2	2,902	37 %
	0.2 - 0.4	1,141	14 %
	0.4 - 0.6	2,271	29 %
	0.6 - 0.8	63	1 %
	0.8 - 1	534	7 %
	Total	**7,946**	**100 %**


Sample Project
Probability of Exceeding Mechanical Control
Acres
4,000
2,000
0
1,035
2,902
1,141
2,271
63
534
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


Sample Project
Probability of Exceeding Mechanical Control
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
IRELAND
932
1.32 mi
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Probability of Extreme Fire Behavior

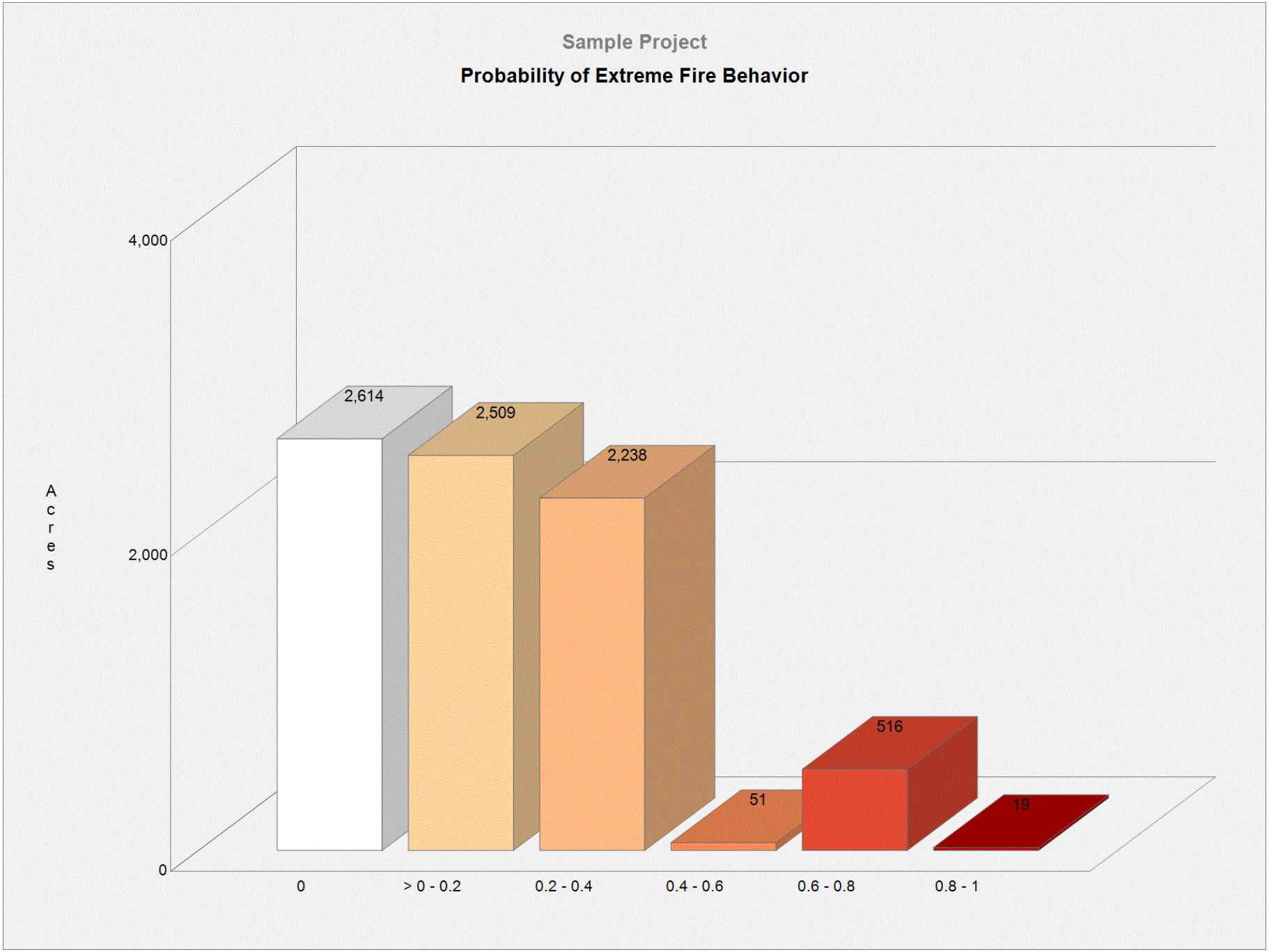
This layer shows the likelihood that flames at the head of the fire will exceed 11 feet, which is considered threshold for extreme fire behavior in fire operations. The head of the fire exhibits the most extreme fire behavior, demonstrating the highest intensity and fastest spread rates. Flames of this height can indicate extreme fire behavior and present significant challenges for suppression efforts.

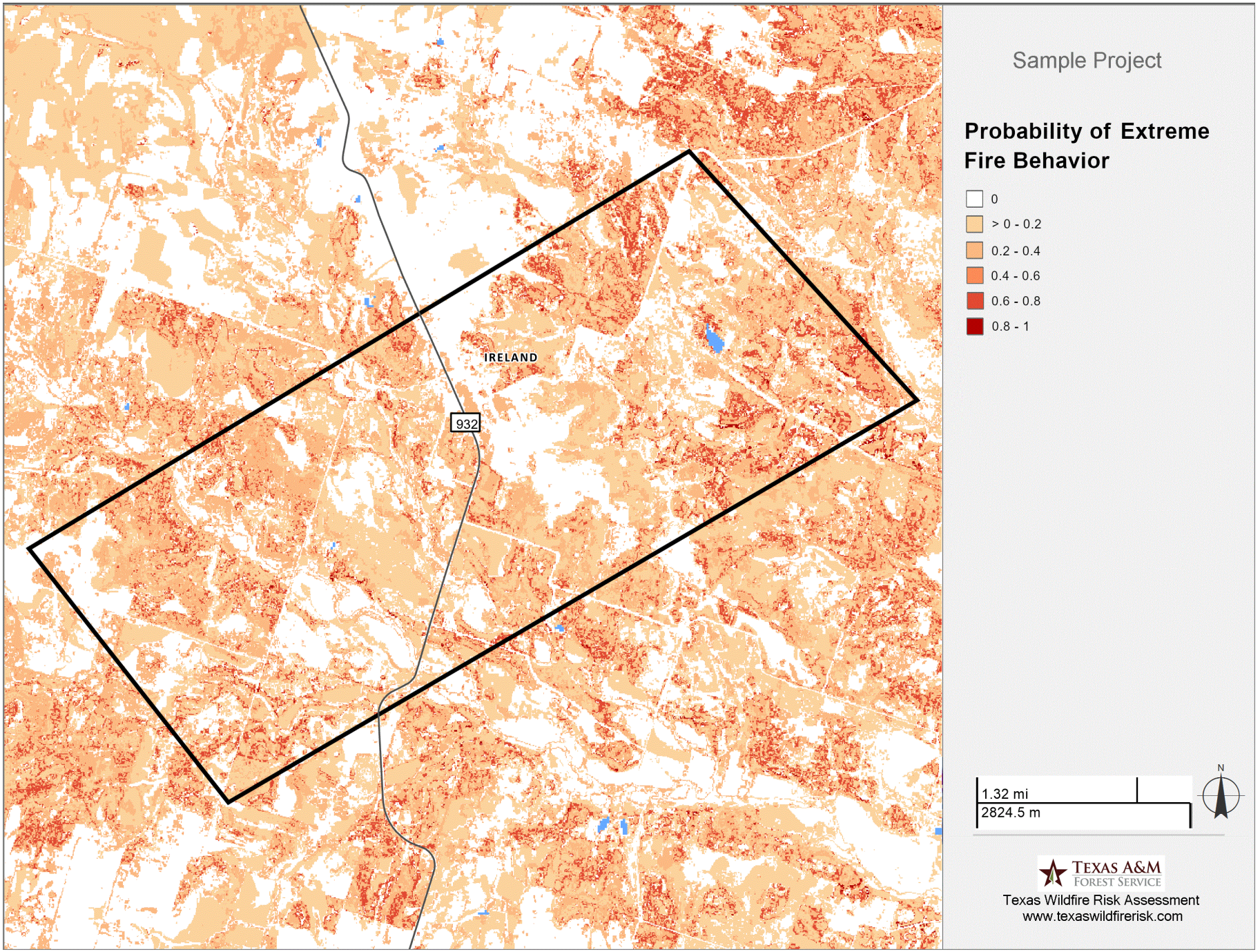
Higher probability values indicate a high likelihood of extreme fire behavior such as crowning and spotting. Probability results reflect fuel characteristics and the flame lengths produced under a range of weather conditions. These probabilities do not include the likelihood of a wildfire occurring, rather, they provide information about flame lengths if a wildfire were to occur.

Flame length exceedance probabilities refer to the likelihood of flames reaching or surpassing a certain height, typically measured from the leading edge or "head" of a fire. These probabilities provide insight into the range of potential flame lengths under various weather conditions. For example, if the probability of exceeding a certain flame length threshold is 0.2 (20%), it means there is a 20% chance that flames exceed that height under the range of modeled weather scenarios. It also means that 80% of flame lengths are expected to be below the threshold. These probabilities help fire management personnel anticipate and plan for the potential intensity of wildfires in a specific area.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Probability of Extreme Fire Behavior Category	Acres	Percent
	0	2,614	33 %
	> 0 - 0.2	2,509	32 %
	0.2 - 0.4	2,238	28 %
	0.4 - 0.6	51	1 %
	0.6 - 0.8	516	6 %
	0.8 - 1	19	0 %
	Total	**7,946**	**100 %**


Sample Project
Probability of Extreme Fire Behavior
Acres
4,000
2,000
0
2,614
2,509
2,238
51
516
19
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1


Sample Project
Probability of Extreme Fire Behavior
0
> 0 - 0.2
0.2 - 0.4
0.4 - 0.6
0.6 - 0.8
0.8 - 1
IRELAND
932
1.32 mi
2824.5 m
N
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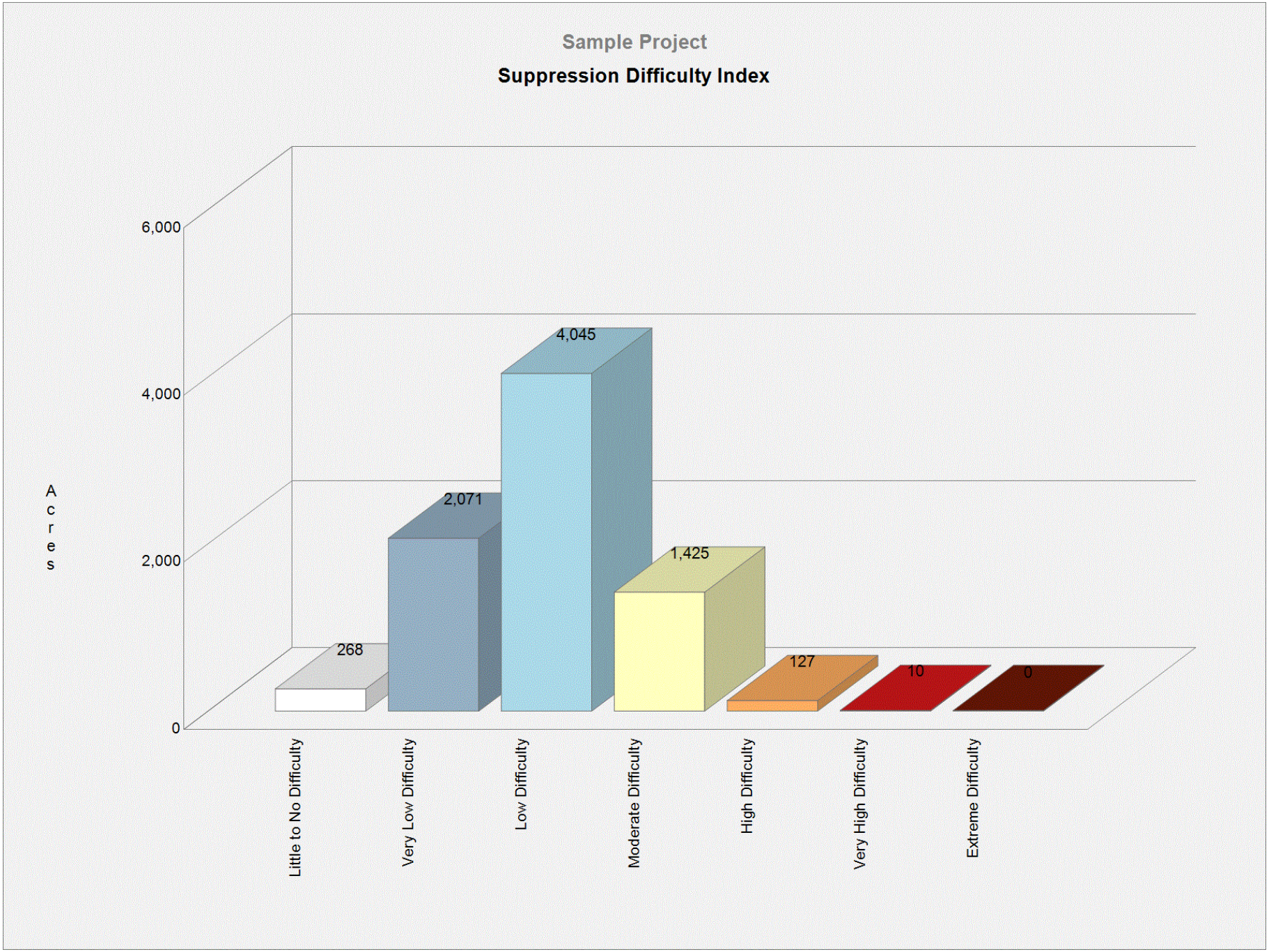
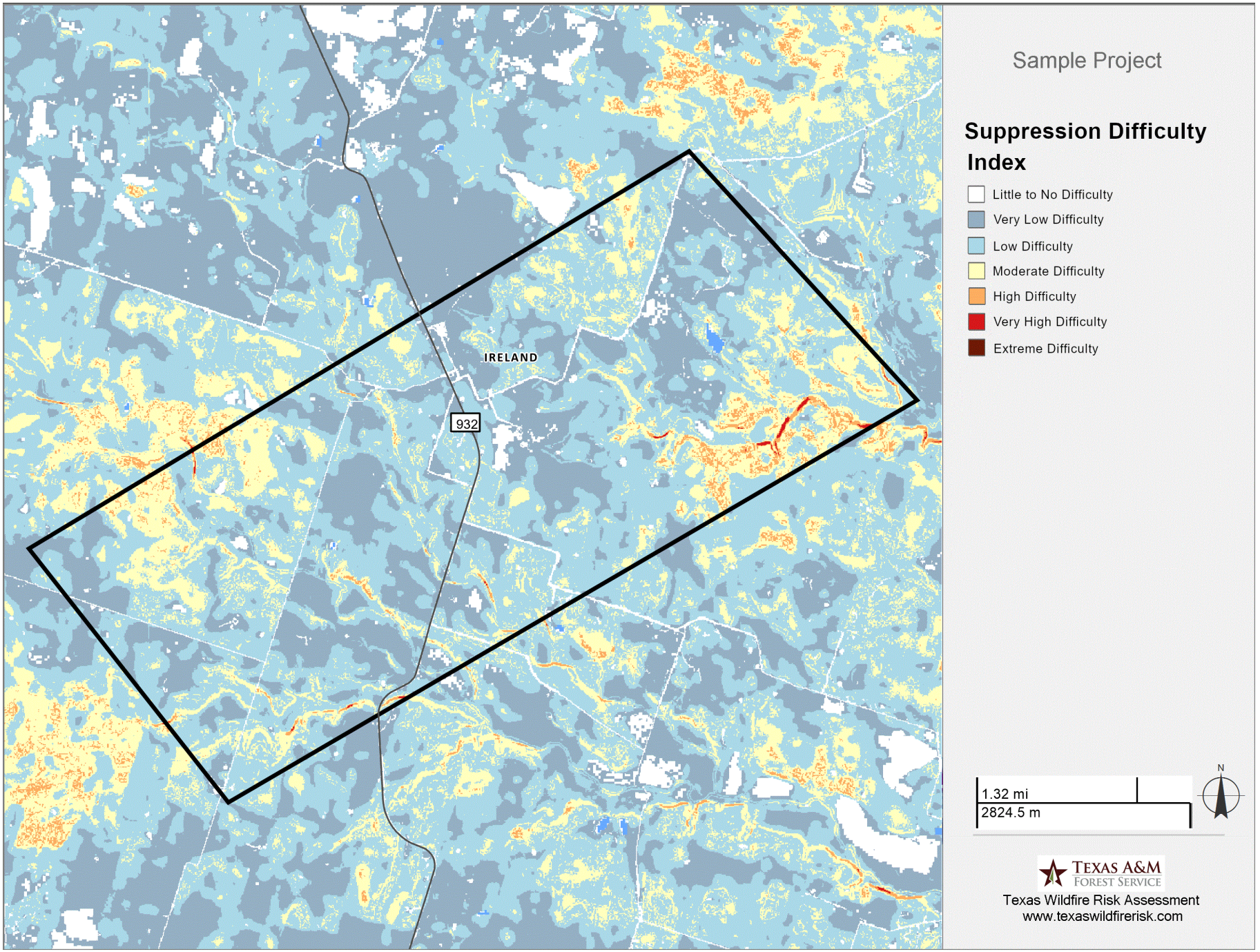
Suppression Difficulty Index

Suppression Difficulty Index can inform fire management decisions related to suppression strategies and resource placement. It classifies fire suppression challenges into six levels, ranging from very low to extreme. Blue areas indicate relatively manageable conditions with some combination of gentle terrain, less resistant fuels, easier access, and milder fire behavior. Red areas highlight tougher conditions with steep terrain, limited access, and more-intense fire activity. This index does not consider aerial suppression strategies, overhead hazards to firefighters like standing dead trees, and does not include the likelihood of a wildfire occurring.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Suppression Difficulty Index Category	Acres	Percent
	Little to No Difficulty	268	3 %
	Very Low Difficulty	2,071	26 %
	Low Difficulty	4,045	51 %
	Moderate Difficulty	1,425	18 %
	High Difficulty	127	2 %
	Very High Difficulty	10	0 %
	Extreme Difficulty	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Suppression Difficulty Index
Acres
6,000
4,000
2,000
0
268
2,071
4,045
1,425
127
10
0
Little to No Difficulty
Very Low Difficulty
Low Difficulty
Moderate Difficulty
High Difficulty
Very High Difficulty
Extreme Difficulty


Sample Project
Suppression Difficulty Index
Little to No Difficulty
Very Low Difficulty
Low Difficulty
Moderate Difficulty
High Difficulty
Very High Difficulty
Extreme Difficulty
IRELAND
932
1.32 mi
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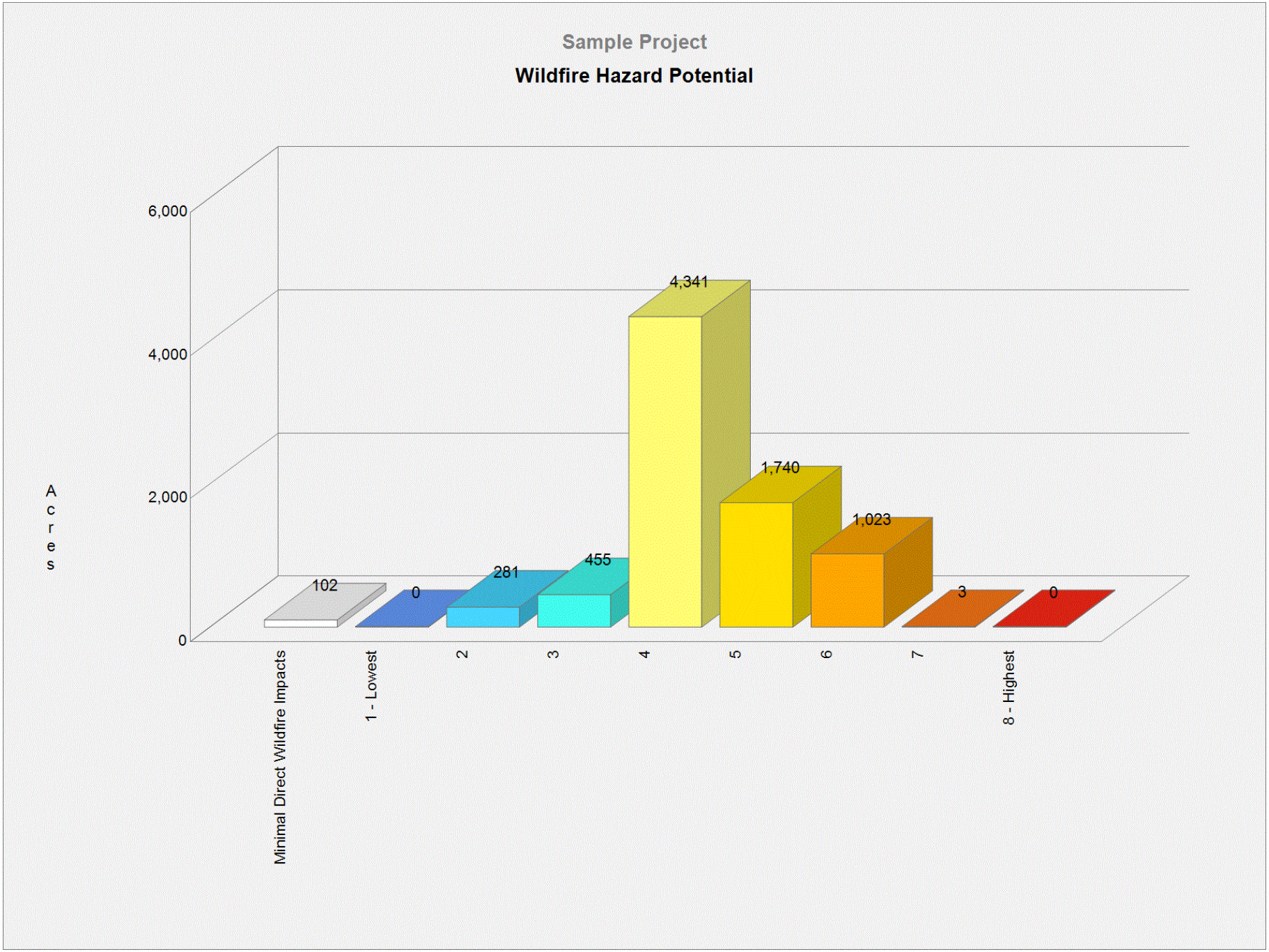
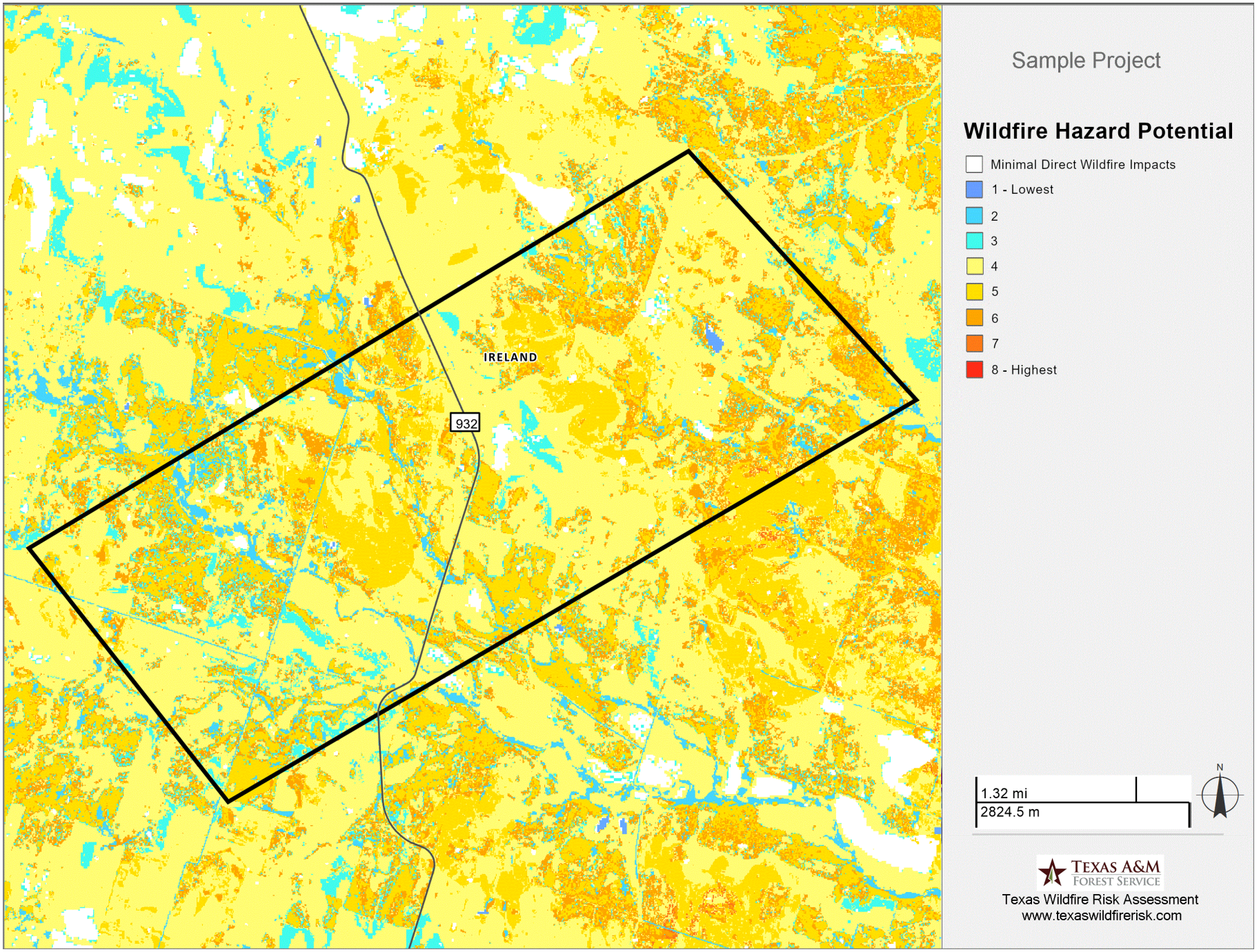
Wildfire Hazard Potential

Wildfire Hazard Potential is mapped with eight classes, ranging from low (blue) to high (red) hazard levels. The highest classes indicate areas with fuels more prone to experiencing extreme fire behavior during severe fire-weather conditions. Although Wildfire Hazard Potential is useful for long-term planning purposes, it does not incorporate current or forecasted weather conditions and should not be relied upon as a seasonal outlook.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Wildfire Hazard Potential Category	Acres	Percent
	Minimal Direct Wildfire Impacts	102	1 %
	1 - Lowest	0	0 %
	2	281	4 %
	3	455	6 %
	4	4,341	55 %
	5	1,740	22 %
	6	1,023	13 %
	7	3	0 %
	8 - Highest	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Wildfire Hazard Potential
Acres
6,000
4,000
2,000
0
102
0
281
455
4,341
1,740
1,023
3
0
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8 - Highest


IRELAND
932
Sample Project
Wildfire Hazard Potential
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8 - Highest
1.32 mi
2824.5 m
N
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Ember Characteristics

The information in this section of the report identifies the locations most likely to produce embers and the areas most likely to receive embers, given a wildfire occurs. Ember modeling is based on fuel characteristics, climate, and topography.

Contents:

Conditional Ember Production Index

Conditional Ember Production Index (cEPI) provides a relative index of embers produced at a location, given that a fire occurs.

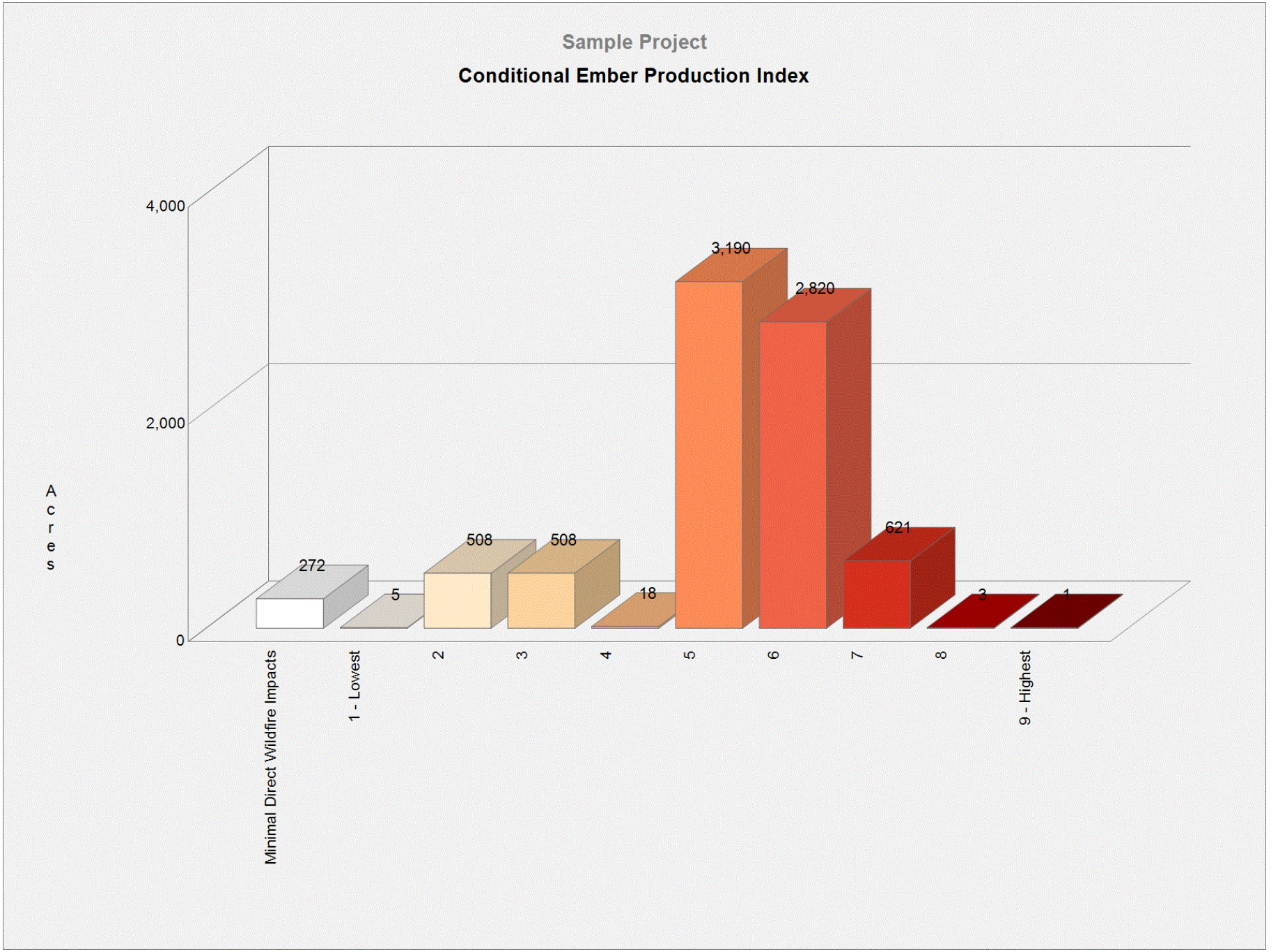
Ember production is based on surface and canopy fuel characteristics, climate, and topography within the pixel. Units are an index of the relative number of embers rather than a count of embers produced. Conditional EPI is based on heading-only fire behavior and does not include the likelihood of wildfire.

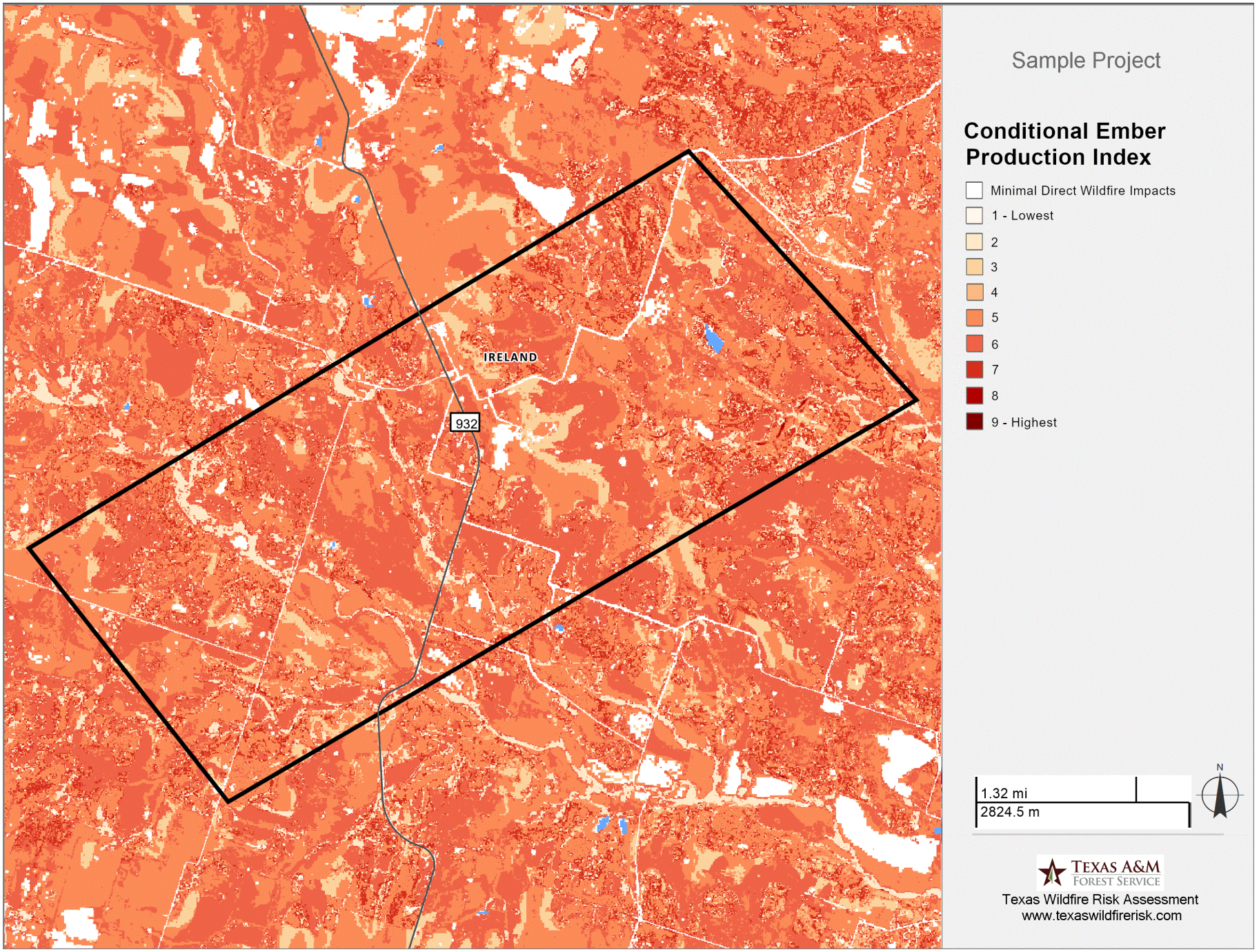
Embers can be produced from any burnable fuel source in the fuelscape, dependent on the wind and weather characteristics that lead to lofting embers.

Conditional EPI is useful for prioritizing fuel treatments to reduce the potential for ember production in volatile fuel types.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Conditional Ember Production Index Category	Acres	Percent
	Minimal Direct Wildfire Impacts	272	3 %
	1 - Lowest	5	0 %
	2	508	6 %
	3	508	6 %
	4	18	0 %
	5	3,190	40 %
	6	2,820	35 %
	7	621	8 %
	8	3	0 %
	9 - Highest	1	0 %
	Total	**7,946**	**100 %**


Sample Project
Conditional Ember Production Index
Acres
4,000
2,000
0
272
5
508
508
18
3,190
2,820
621
3
1
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest


Sample Project
Conditional Ember Production Index
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
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Conditional Ember Load Index

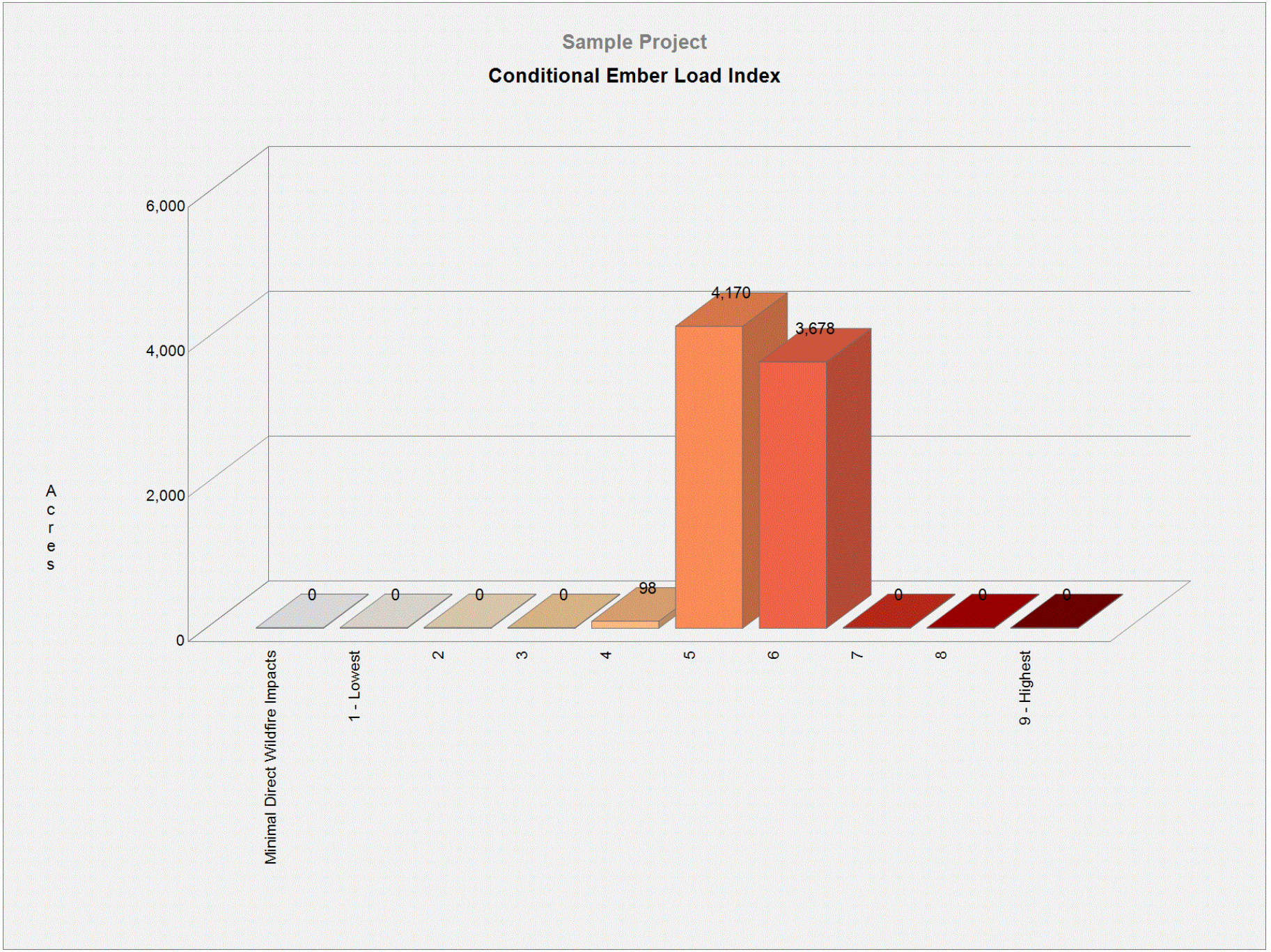
Conditional Ember Load Index (cELI) provides a relative index of embers received at a location, given that a fire occurs.

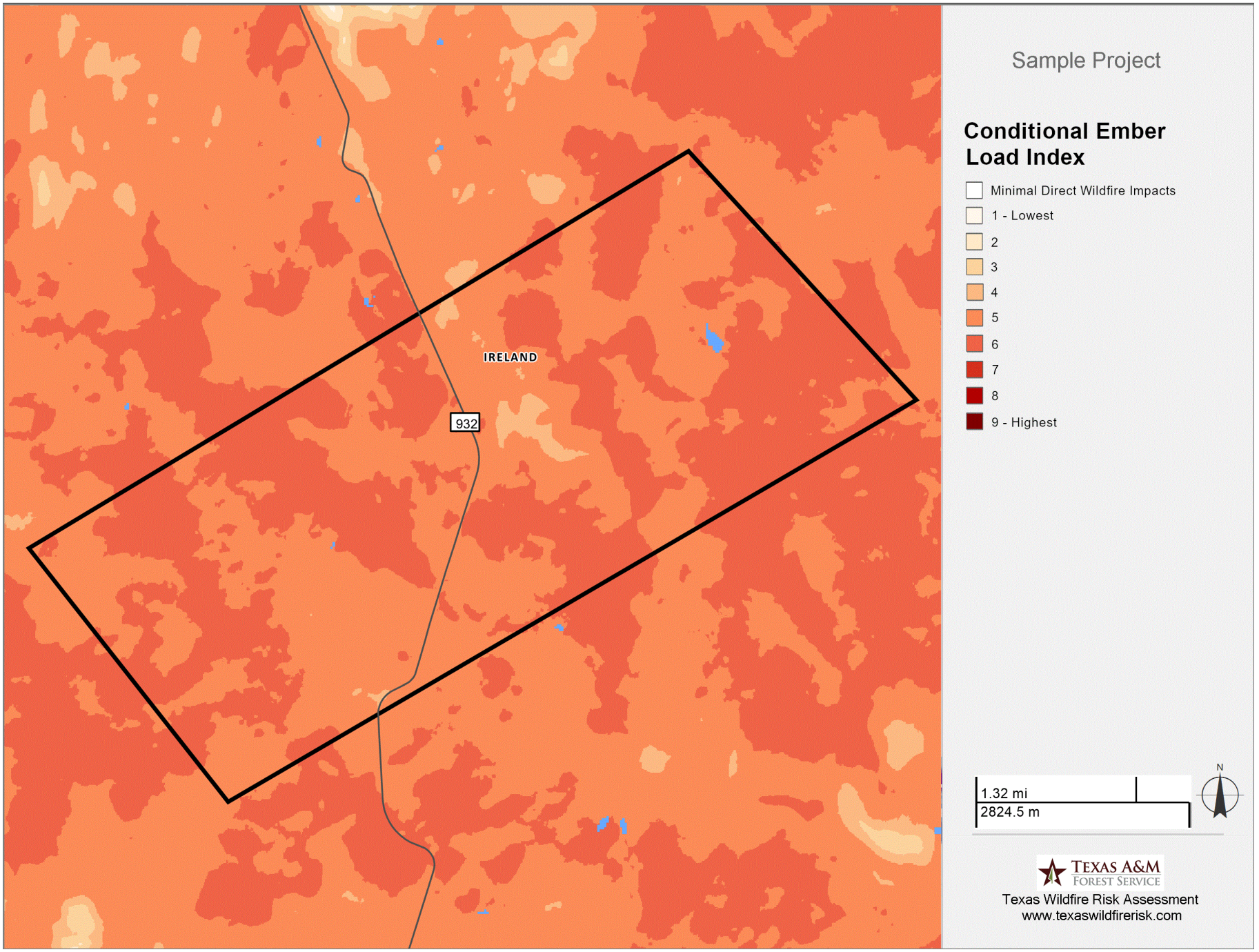
Ember load is based on surface and canopy fuel characteristics, climate, and topography within the pixel. Ember load incorporates downwind ember travel. Units are an index of the relative number of embers rather than a count of embers produced. Conditional ELI is based on heading-only fire behavior and does not include the likelihood of wildfire. Embers can be received by any pixel in the fuelscape; including both burnable and nonburnable fuel types.

Conditional ELI can be used to prioritize building hardening activities to resist ember ignition.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Conditional Ember Load Index Category	Acres	Percent
	Minimal Direct Wildfire Impacts	0	0 %
	1 - Lowest	0	0 %
	2	0	0 %
	3	0	0 %
	4	98	1 %
	5	4,170	52 %
	6	3,678	46 %
	7	0	0 %
	8	0	0 %
	9 - Highest	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Conditional Ember Load Index
Acres
6,000
4,000
2,000
0
0
0
0
0
98
4,170
3,678
0
0
0
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest


Sample Project
Conditional Ember Load Index
Minimal Direct Wildfire Impacts
1 - Lowest
2
3
4
5
6
7
8
9 - Highest
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
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Landscape Characteristics

The information in this section of the report describes the type of fuel characterized by the surface fuel model map and the percent slope, which is useful for characterizing conditions important for operating equipment.

Contents:

Surface Fuels

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. Surface fuels include grass, timber litter, shrub/brush, slash and other dead or live vegetation within about 6 feet of the ground and are shown here at 10-meter resolution.

This surface fuel map represents a combined effort by Texas A&M Forest Service (TAMFS) and Pyrologix to generate a custom, fine-resolution fuelscape built with 10-m vegetation data derived from Sentinel-2 imagery and reflects fuel disturbances through 2022 (Pyrologix, 2024).

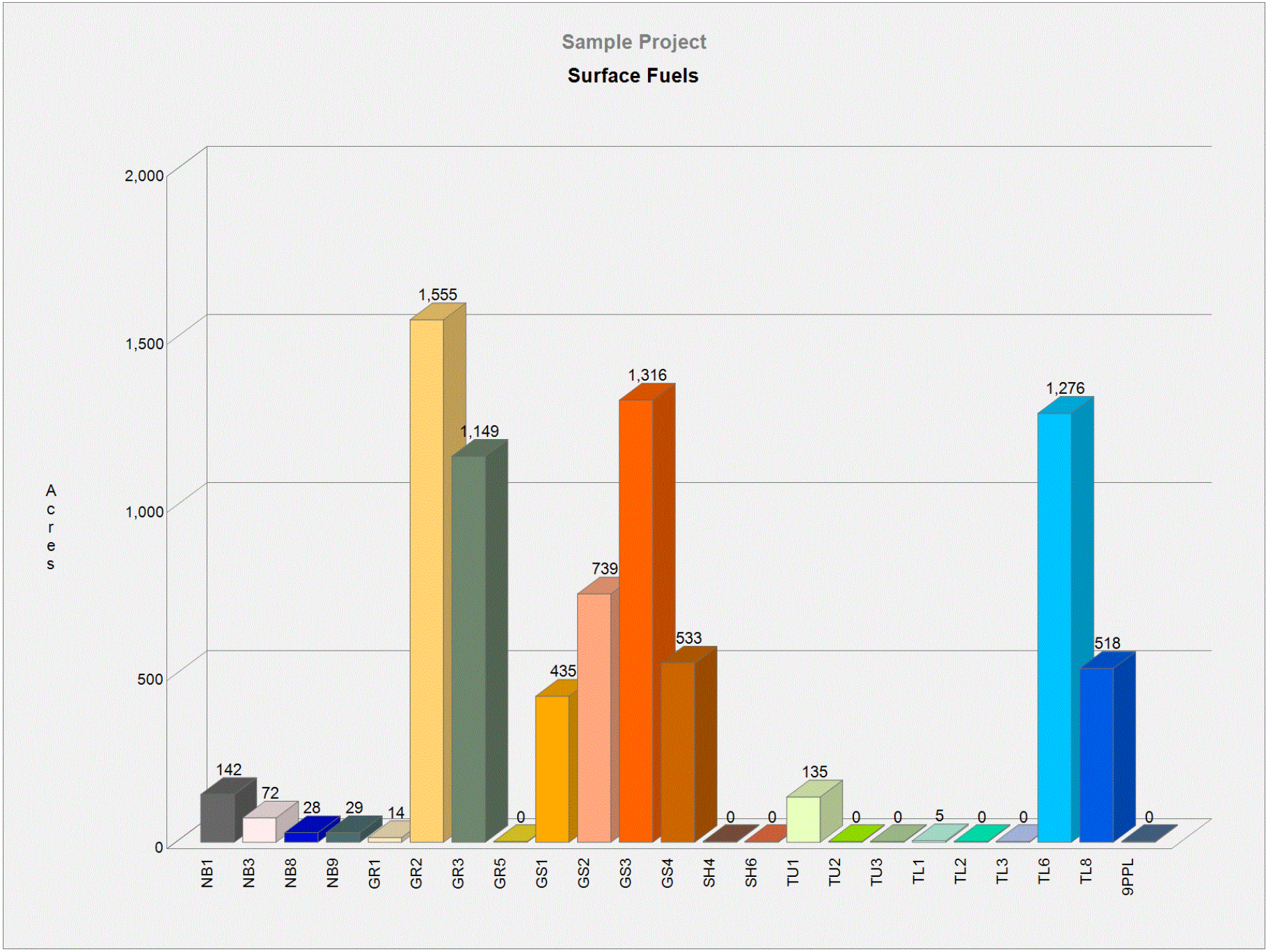
Surface fuels are typically categorized into four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter and 4) slash. There are two standard fire behavior fuel model sets published for use. The Fire Behavior Prediction System 1982 Fuel Model Set (Anderson, 1982) contains 13 fuel models and the Fire Behavior Prediction System 2005 Fuel Model Set (Scott & Burgan, 2005) contains 40 fuel models. One custom fuel model (9PPL) was used to characterize fire behavior in deep pine litter associated with closed pine plantations and dense natural pine stands.

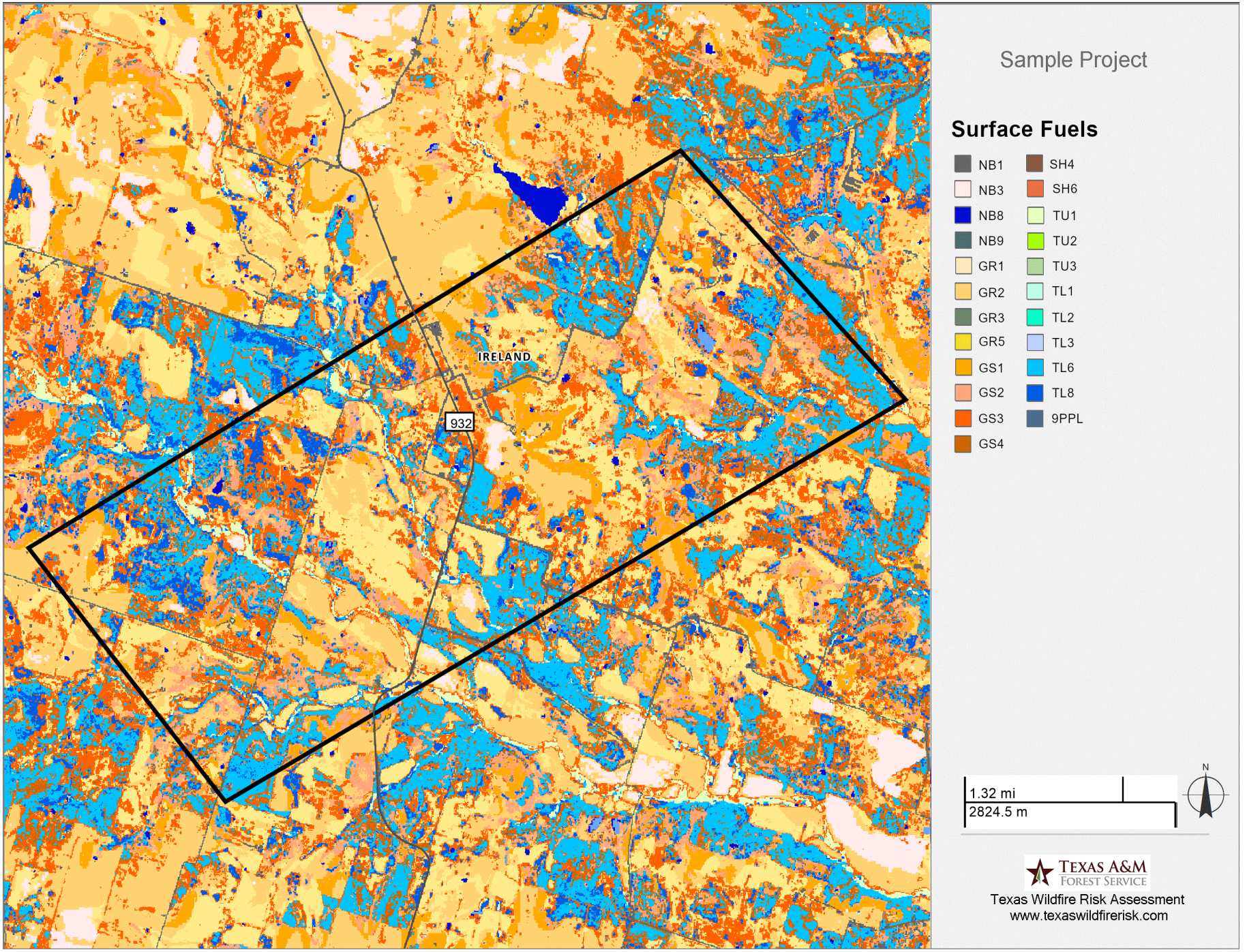
A detailed fuels calibration process was undertaken that involved collaboration with fuels and fire behavior specialists across the State. Workshops were held to review the fuelscape products and calibrate the data by modifying specific vegetation and fuels classes to better reflect local knowledge and input.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
Non-burnable Fuel Type Models (insufficient wildland fuel to carry a wildland fire under any condition)				
NB1	2005	Urban or suburban development; insufficient wildland fuel to carry wildland fire. Includes roads.	143	2 %
NB3	2005	Agricultural field, maintained in nonburnable condition.	72	1 %
NB8	2005	Open water	28	0 %
NB9	2005	Bare ground	29	0 %
Grass Fuels Type Models (nearly pure grass and/or forb type)				
GR1	2005	Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low.	14	0 %
GR2	2005	Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate.	1,555	20 %
GR3	2005	Very coarse grass, average depth about 2 feet. Spread rate high; flame length moderate.	1,149	14 %
GR5	2005	Dense, coarse grass, average depth about 1 to 2 feet. Spread rate very high; flame length high.	0	0 %
Grass-Shrub Fuels Type Models (mixture of grass and shrub, up to 50 percent shrub coverage)				
GS1	2005	Shrubs are about 1 foot high, low grass load. Spread rate moderate; flame length low.	435	5 %
GS2	2005	Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate.	739	9 %
GS3	2005	Moderate grass/shrub load, average grass/shrub depth less than 2 feet. Spread rate high; flame length moderate.	1,316	17 %
GS4	2005	Heavy grass/shrub load, depth greater than 2 feet. Spread rate high; flame length very high.	533	7 %

Surface Fuel	FBPS Fuel Model Set	Description	Acres	Percent
Shrub Fuel Type Models (Shrubs cover at least 50 percent of the site, grass sparse to nonexistent)				
SH4	2005	Low to moderate shrub and litter load, possibly with pine overstory, fuel bed depth about 3 feet. Spread rate high; flame length moderate.	0	0 %
SH6	2005	Dense shrubs, little or no herb fuel, depth about 2 feet. Spread rate high; flame length high.	0	0 %
Timber-Understory Fuel Type Models (Grass or shrubs mixed with litter from forest canopy)				
TU1	2005	Fuelbed is low load of grass and/or shrub with litter. Spread rate low; flame length low.	135	2 %
TU2	2005	Fuelbed is moderate litter load with shrub component. Spread rate moderate; flame length low.	0	0 %
TU3	2005	Fuelbed is moderate litter load with grass and shrub components. Spread rate high; flame length moderate.	0	0 %
Timber Litter Fuel Type Models (dead and down woody fuel litter beneath a forest canopy)				
TL1	2005	Light to moderate load, fuels 1 to 2 inches deep. Spread rate very low; flame length very low.	5	0 %
TL2	2005	Low load, compact. Spread rate very low; flame length very low.	0	0 %
TL3	2005	Moderate load conifer litter. Spread rate very low; flame length low.	0	0 %
TL6	2005	Moderate load, less compact. Spread rate moderate; flame length low.	1,276	16 %
TL8	2005	Moderate load and compactness may include small amount of herbaceous load. Spread rate moderate; flame length low.	518	7 %
Custom Fuel Type Models				
9PPL	Custom	Long-needle (pine litter, plantations) with a high load.	0	0 %
		Total	**7,946**	**100 %**


Sample Project
Surface Fuels
Acres
2,000
1,500
1,000
500
0
142
72
28
29
14
1,555
1,149
0
435
739
1,316
533
0
0
135
0
0
5
0
0
1,276
518
0
NB1
NB3
NB8
NB9
GR1
GR2
GR3
GR5
GS1
GS2
GS3
GS4
SH4
SH6
TU1
TU2
TU3
TL1
TL2
TL3
TL6
TL8
9PPL


Sample Project
Surface Fuels
NB1
NB3
NB8
NB9
GR1
GR2
GR3
GR5
GS1
GS2
GS3
GS4
SH4
SH6
TU1
TU2
TU3
TL1
TL2
TL3
TL6
TL8
9PPL
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
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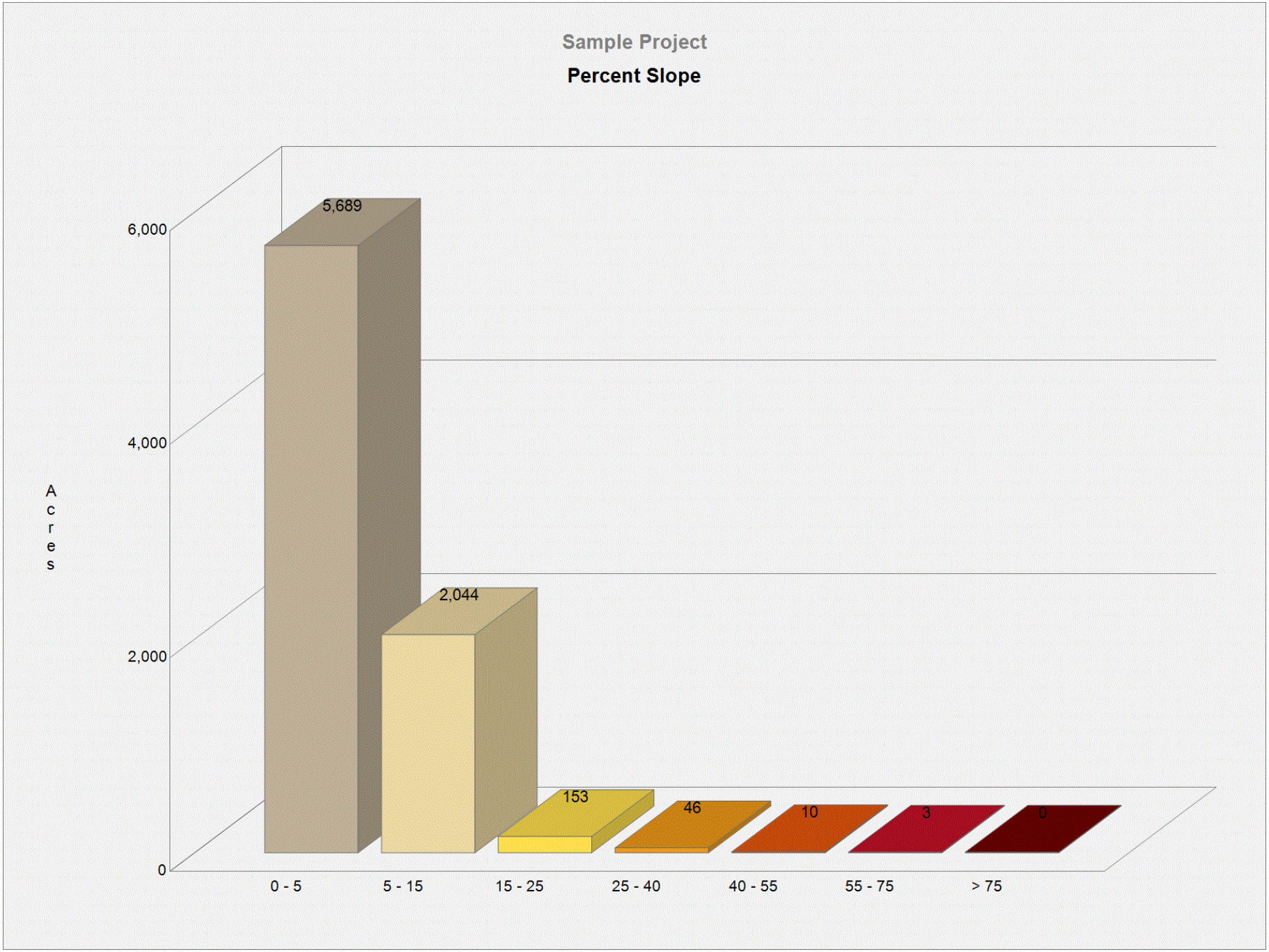
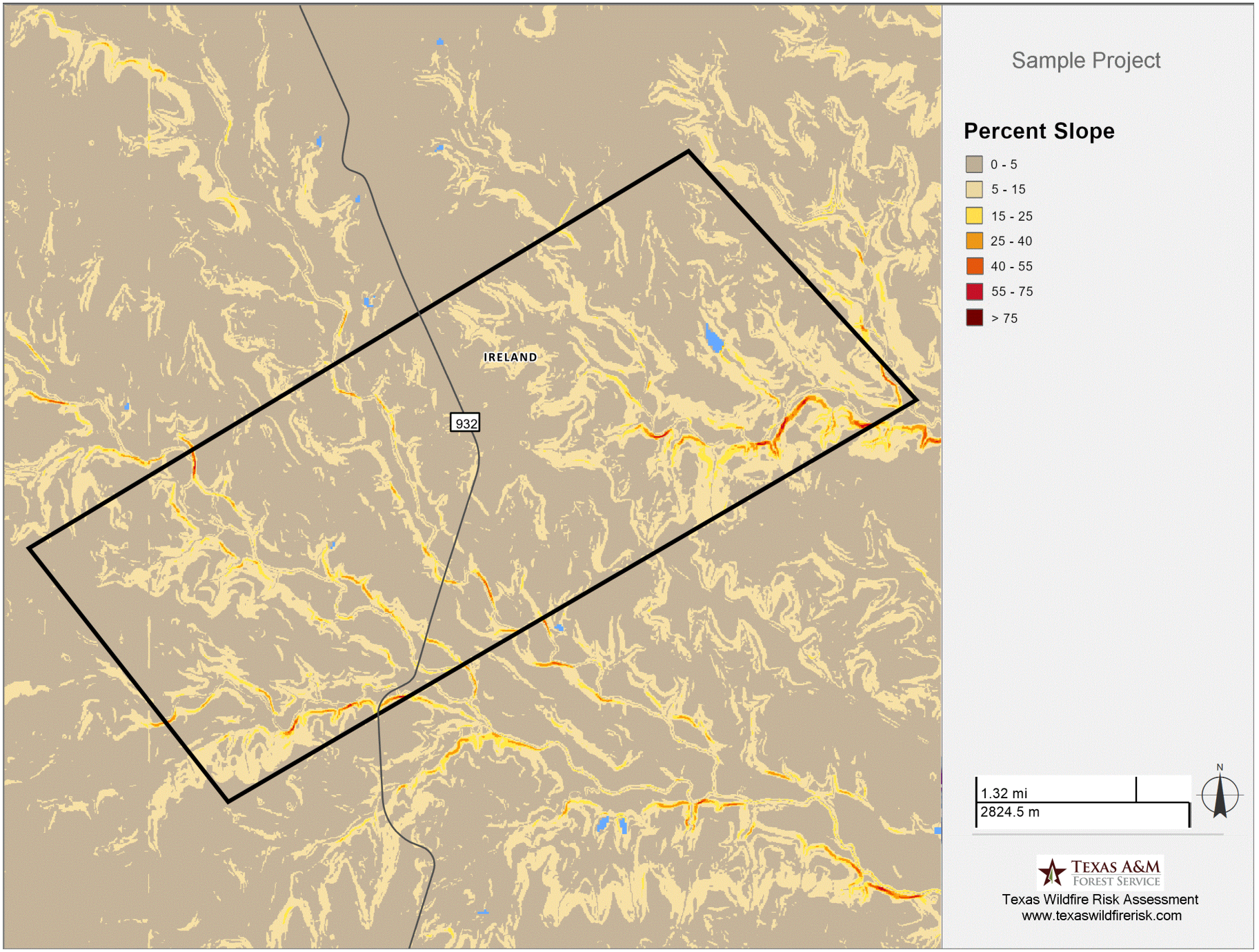
Percent Slope

Percent Slope measures the rate of change of elevation over a given horizontal distance (rise over run), expressed as a percent. Percent slope is used to characterize the local conditions for operating equipment. Slope identifies the inclination at a single location based on the adjacent elevation values. Steep local conditions can severely restrict the movement of equipment and resources for suppression and intensify fire behavior.

Data Source: Texas Wildfire Risk Assessment, Pyrologix 2023 (includes fuel disturbances through 2022)

	Percent Slope Category	Acres	Percent
	0 - 5	5,689	72 %
	5 - 15	2,044	26 %
	15 - 25	153	2 %
	25 - 40	46	1 %
	40 - 55	10	0 %
	55 - 75	3	0 %
	> 75	0	0 %
	Total	**7,946**	**100 %**


Sample Project
Percent Slope
Acres
6,000
4,000
2,000
0
5,689
2,044
153
46
10
3
0
0 - 5
5 - 15
15 - 25
25 - 40
40 - 55
55 - 75
> 75


Sample Project
Percent Slope
0 - 5
5 - 15
15 - 25
25 - 40
40 - 55
55 - 75
> 75
IRELAND
932
1.32 mi
2824.5 m
N
Texas A&M Forest Service
Texas Wildfire Risk Assessment
www.texaswildfirerisk.com

References

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More information about the wildfire risk and hazard data produced for the Texas Wildfire Risk Assessment is available in the project reports:

Contemporary Wildfire Hazard Across Texas. Prepared for Texas A&M Forest Service. Retrieved from https://pyrologix.com/reports/TWRA_WildfireHazardReport.pdf

A 10-m fuelscape for All-lands in Texas. Prepared for Texas A&M Forest Service. Retrieved from https://pyrologix.com/reports/TWRA_Fuelscape_Report.pdf

Documentation on the Wildfire Exposure Simulation Tool (WildEST) is available from: https://pyrologix.com/reports/WildEST Documentation.pdf

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