KANSAS WILDFIRE RISK EXPLORER
Area of Interest Summary Report

Leavenworth

KANSAS FOREST SERVICE
KANSAS STATE UNIVERSITY

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Introduction

Kansas Area of Interest Summary Report

The Area of Interest tool allows users of the Advanced Viewer to define a specific area to further explore components of its wildfire risk. This report has been generated explicitly for your defined Area of Interest, providing a detailed summary of each data layer which makes up the assessment. The layers for many of these map products were created with publicly available datasets and information provided by the Kansas Forest Service. To access all data layers for this Area of Interest as a GIS file, use the tool's feature to "export data as a .zip file" after defining an area.

This report was designed so that information can be copied and pasted into other plans, reports, or documents depending on user needs. Examples include, but are not limited to Community Wildfire Protection Plans, Local Fire Plans, Fuels Mitigation Plans, Hazard Mitigation Plans, and Homeowner Risk Assessments.

The Kansas Wildfire Risk Assessment provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in the state of Kansas.

Results of an assessment can be used to help prioritize areas in the state where mitigation treatments, community interaction, education, or tactical analyses might be necessary to reduce risk from wildfires.

The Kansas Wildfire Risk Explorer's map products and descriptions included in this summary report are designed to provide the information needed in support of the following key priorities:

- Identify areas most prone to wildfire.
- Plan and prioritize fuel treatments.
- Define priorities and improve emergency response across jurisdictional boundaries.
- Increase communication with residents to address community needs and priorities.
- Identify areas where additional tactical planning may be needed, especially regarding mitigation projects and Community Wildfire Protection Planning.
- Provide robust data to support resource, budget, and funding requests.
- Plan for response and wildfire suppression resource needs.

Graphs Products and Descriptions

Each graph product in this Summary 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.

Data Layer	Description
Wildfire Risk	Wildfire Risk represents the possibility of loss or harm occurring from a wildfire and is displayed in the Kansas Wildfire Risk Assessment Portal (KSWRAP) by the Wildfire Risk.
Wildfire Effects	The Wildfire Effects identifies areas with important values that could be adversely impacted by a wildfire and where fire suppression activities may be difficult. The Wildfire Effects is developed using two inputs: Combined Value Impacts and Suppression Difficulty.
Combined Value Impacts	The Combined Value Impacts is defined by the Value Impacts Rating (VIR) from the West Wide Assessment. The VIR is a collective value that represents adverse impacts by wildfire. The Value Impacts Rating (VIR) is an overall rating based on the Wildland Development Areas (WUI), Forest Assets, Riparian Assets, Drinking Water Importance Areas and Infrastructure Assets. The individual Value Impacted Categories are based on a scale of 0 to 5. This indicates a negative impact to a defined value from a wildfire.
Wildland Urban Interface	A Wildland Urban Interface (WUI) is described as an area where structures and other human improvements meet and intermingle with wildland or vegetative fuels. The WUI data set defines areas where people and homes are threatened by fire burning in wildland fuels.
Fire Occurrence Density	The Fire Occurrence Density map represents the likelihood of a wildfire igniting based on historical ignition patterns.
Fire History Statistics	Fire History Statistics provide insight as to the number of fires and cause of fires, and are useful for fire prevention and mitigation planning.

Wildfire Risk

Description

Wildfire Risk represents the possibility of loss or harm occurring from a wildfire and is displayed in the Kansas WRA (Wildfire Risk Assessment) by the Wildfire Risk.
It is a primary output of the Kansas Wildfire Risk Assessment (Kansas WRA).   Wildfire Risk combines the likelihood of a fire occurring (Fire Threat), with those areas of most concern that are adversely impacted by fire (Fire Effects), to derive a single overall measure called the Wildfire Risk. It identifies areas with the greatest potential impacts from a wildfire considering the likelihood of an area burning and the impacts to values and assets aggregated together.
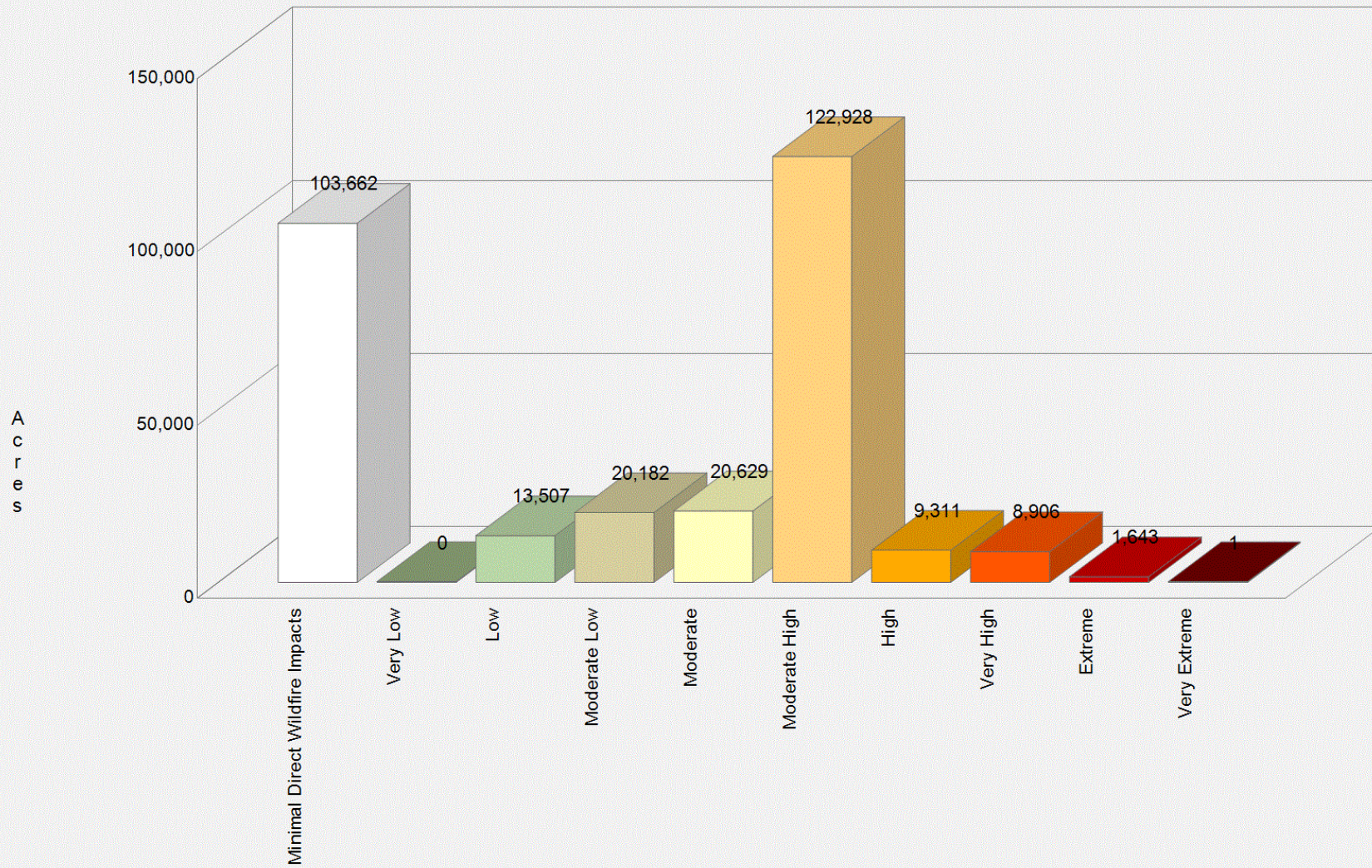
Since all areas in Kansas have the Wildfire Risk calculated consistently, it allows for comparison and ordination of areas across the entire state. Fire Threat is a measure that has been calculated which is closely related to the likelihood of an area burning. It is mapped as the Fire Threat in the Kansas WRA.
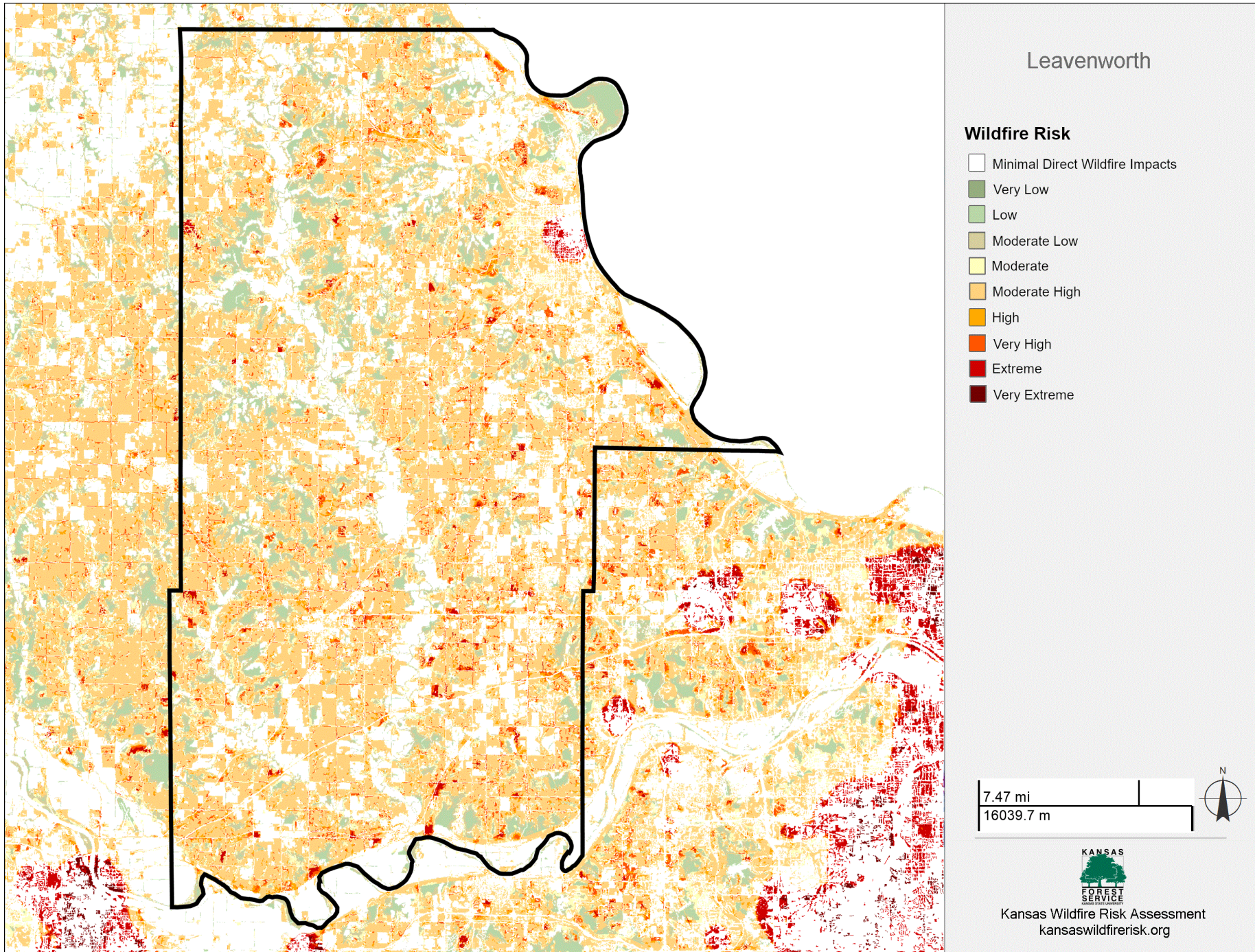
Fire Effects are comprised of two inputs: Value Impacts and Suppression Difficulty. The Fire Effects identifies those areas that have important values that could be adversely impacted by a wildfire and might be in areas where fire suppression activities are difficult. The Values Impacted defined in the Kansas WRA include Wildland Development Areas (WUI), Forest Assets, Riparian Assets, Drinking Water Importance Areas (watersheds) and Infrastructure Assets. Refer to each Values Impacted description for more information about these values.

To aid in the use of Wildfire Risk for planning activities, the output values are categorized into nine (9) categories. These are given general descriptions from Very Low to Very Extreme Wildfire Risk.

Wildfire Risk Category	Acres	Percent
Minimal Direct Wildfire Impacts	103,662	34.5 %
Very Low	0	0.0 %
Low	13,507	4.5 %
Moderate Low	20,182	6.7 %
Moderate	20,629	6.9 %
Moderate High	122,928	40.9 %
High	9,311	3.1 %
Very High	8,906	3.0 %
Extreme	1,643	0.5 %
Very Extreme	1	0.0 %
Total	300,769	100.0 %

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Wildfire Risk

Chart showing Acres by Wildfire Risk category:

Category	Acres
Minimal Direct Wildfire Impacts	103,662
Very Low	0
Low	13,507
Moderate Low	20,182
Moderate	20,629
Moderate High	122,928
High	9,311
Very High	8,906
Extreme	1,643
Very Extreme	1

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Wildfire Risk

- ☐ Minimal Direct Wildfire Impacts
- Very Low
- Low
- Moderate Low
- Moderate
- Moderate High
- High
- Very High
- Extreme
- Very Extreme

7.47 mi
16039.7 m

N

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Kansas Wildfire Risk Assessment
kansaswildfirerisk.org

Wildfire Effects

Description

The Wildfire Effects identifies areas with important values that could be adversely impacted by a wildfire and where fire suppression activities may be difficult. The Wildfire Effects is developed using two inputs: Combined Value Impacts and Suppression Difficulty.

The Combined Value Impacts is defined by the Value Impacts Rating (VIR) from the West-Wide Assessment. The VIR is a collective value representing adverse impacts by a wildfire based on the impacts to all five defined Values Impacted. The Value Impacts Rating (VIR) is an overall rating based on the five Values Impacted: Wildland Development Areas (WUI), Forest Assets, Riparian Assets, Drinking Water Importance Areas and Infrastructure Scores. The individual Value Impacted Categories are based on a scale of 1 to 9 and were derived for each of the Values Impacted using Response Function Scores.

The Suppression Difficulty data layer reflects the difficulty or relative cost of suppressing a fire given the terrain and vegetation conditions. This layer is an overall index that combines the slope steepness and the fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to the underlying terrain and vegetation.

To aid in the use of Wildfire Effects for planning activities, the output values are categorized into nine (9) categories. These are given general descriptions from Very Low to Very Extreme Wildfire Effect.

Since all areas in Kansas have Wildfire Effects calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high effects area in Eastern Kansas is equivalent to a high effects area in Western Kansas.

The Wildfire Effects 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. With care, it can be used for site specific analysis and regional, county or local protection mitigation or prevention planning.

	Wildfire Effects Category	Acres	Percent
	Minimal Direct Wildfire Impacts	103,662	34.5 %
	Very Low	50,353	16.7 %
	Low	108,882	36.2 %
	Moderate Low	3,982	1.3 %
	Moderate	11,026	3.7 %
	Moderate High	7,443	2.5 %
	High	6,309	2.1 %
	Very High	4,473	1.5 %
	Extreme	3,784	1.3 %
	Very Extreme	852	0.3 %
	Total	300,766	100.0 %

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Wildfire Effects

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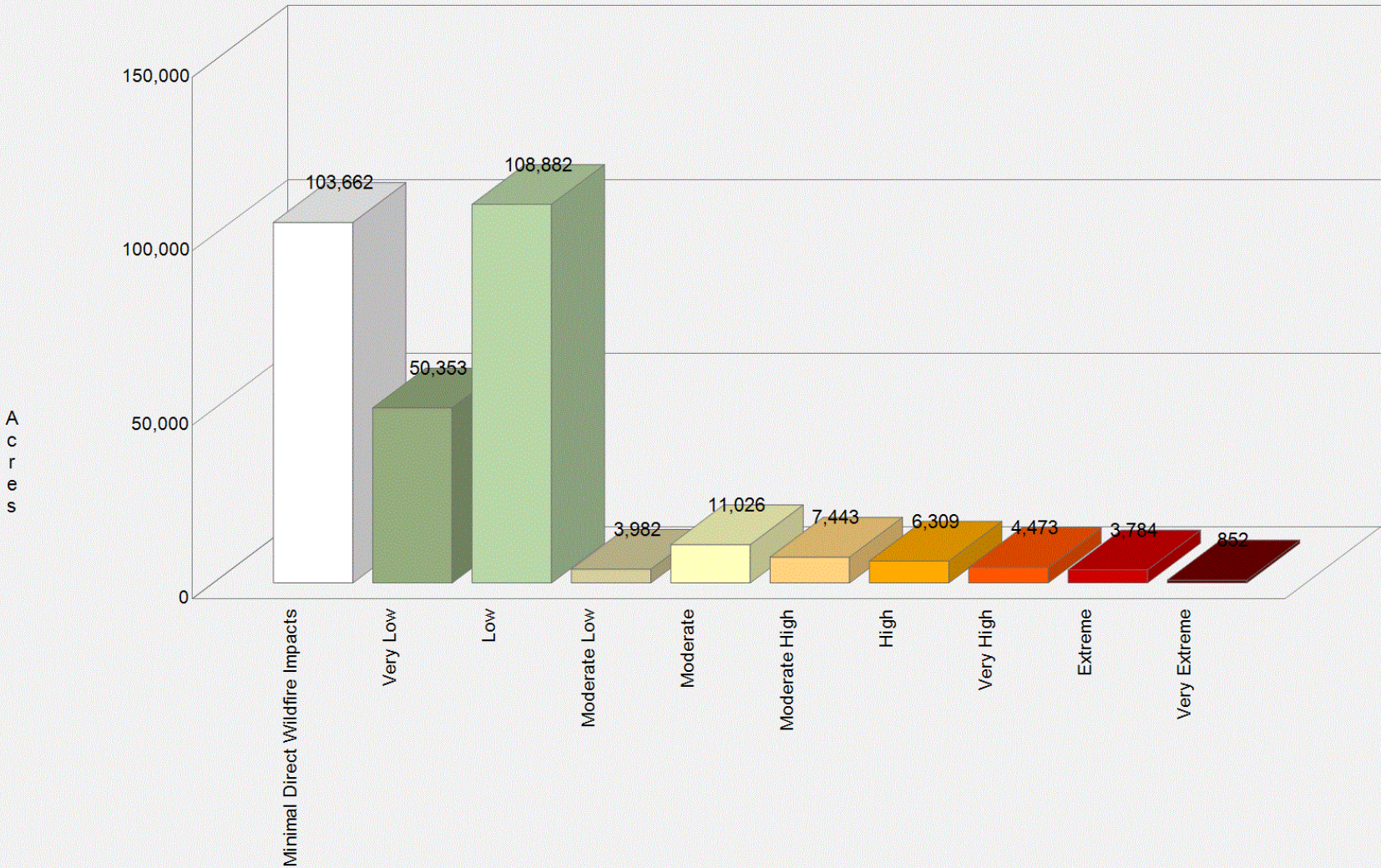
Combined Value Impacts

Description

The Combined Value Impacts is defined by the Value Impacts Rating (VIR) from the West Wide Assessment. The VIR is a collective value that represents adverse impacts by wildfire. The Value Impacts Rating (VIR) is an overall rating based on the Wildland Development Areas (WUI), Forest Assets, Riparian Assets, Drinking Water Importance Areas and Infrastructure Assets. The individual Value Impacted Categories are based on a scale of 0 to 5. This indicates a negative impact to a defined value from a wildfire.

	Combined Value Impacts Category	Acres	Percent
	Outside All Value Impacts Areas	39,199	13.0 %
	1 - Least Negative Impact	106,738	35.5 %
	2	142,743	47.5 %
	3	5,537	1.8 %
	4	4,283	1.4 %
	5 - Most Negative Impact	2,268	0.8 %
	Total	**300,768**	**100.0 %**

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Combined Value Impacts
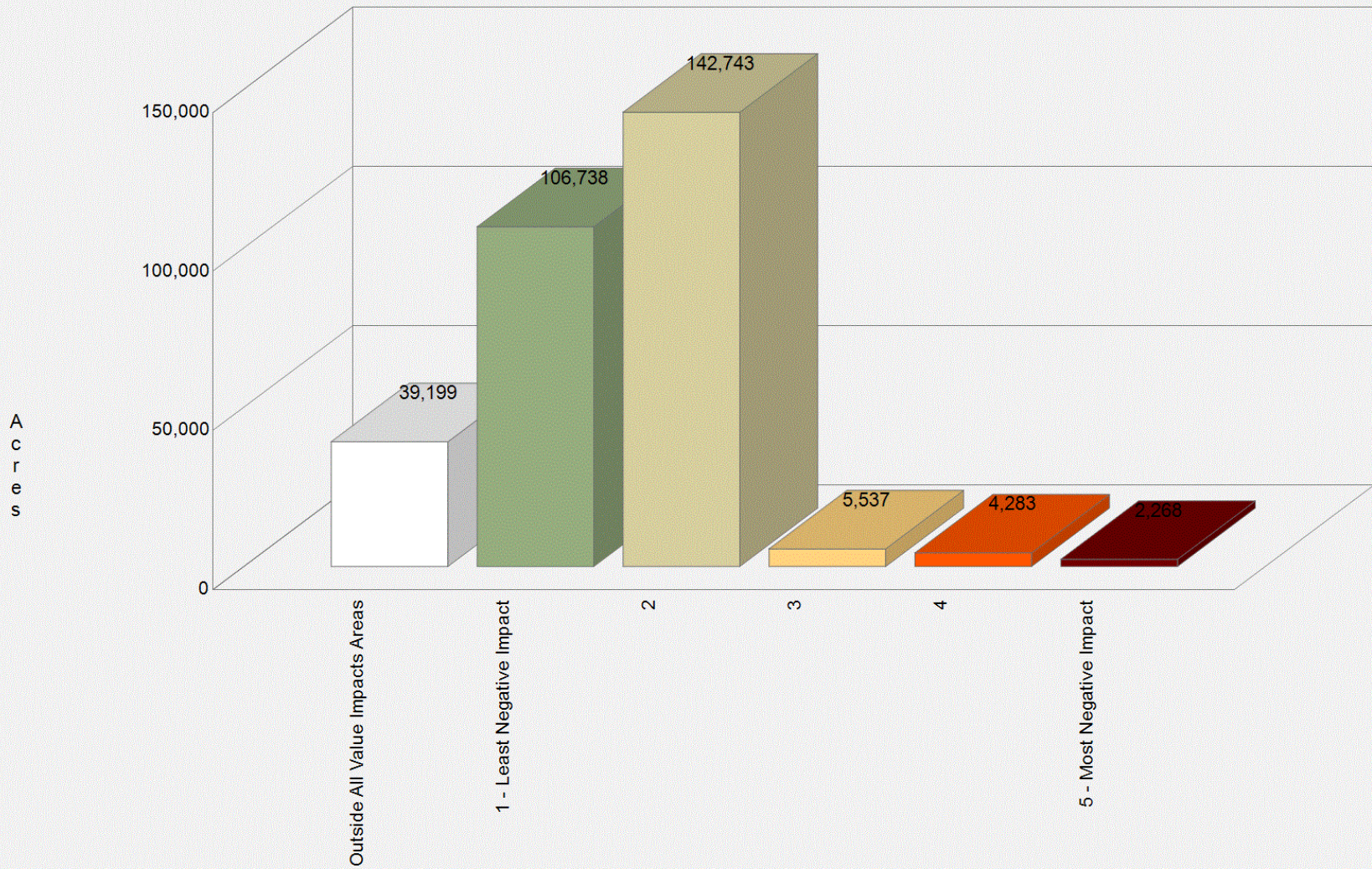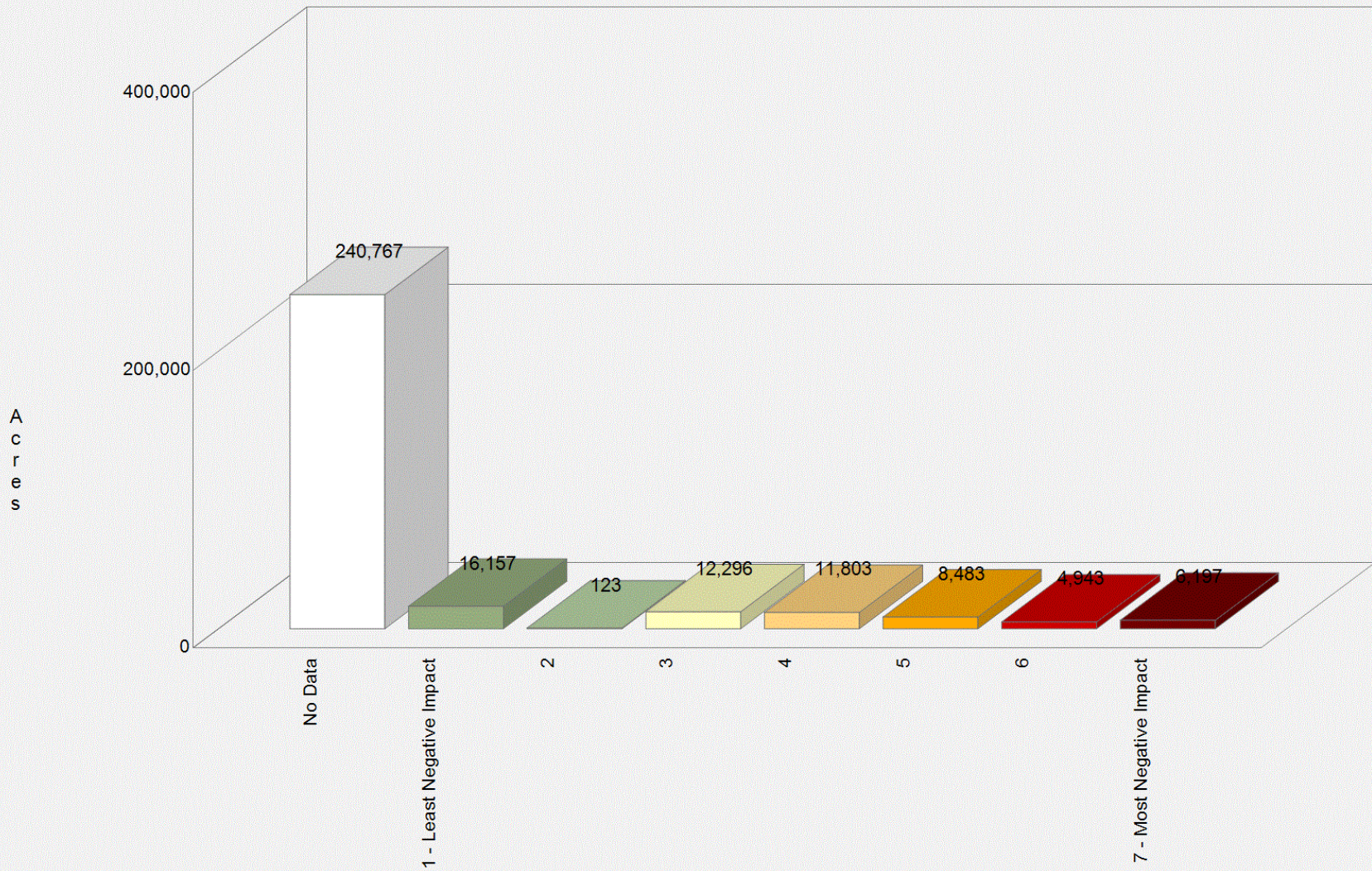
Wildland Urban Interface

Description

An 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 an area where structures and other human improvements meet and intermingle with wildland or vegetative fuels. The WUI data set defines areas where people and homes are threatened by fire burning in wildland fuels. Population growth within these areas substantially increases the threat from wildfire.

The WUI layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional interface data sets, such as U.S. Forest Service developed SILVIS data layer, have been used to reflect these concerns. However, the SILVIS data layer and other existing data sources did not provide the level of detail needed by the Kansas Forest Service and local fire protection agencies. The WUI data set is derived using modeling techniques based on the Where People Live data set and population count data available to government agencies from the Department of Homeland Security. The LandScan (2009) data obtained from the Department of Homeland Security was used to develop the Where People Live (WPL) data set. The Wildland Development Area (WDA) data set was developed from the Where People Live (WPL) data set by identifying areas that may be impacted by fire burning in wildland fuels.

The areas removed from the WPL data set are not expected to be directly impacted by fire burning in wildland fuels. Data is modeled at a 30-meter cell resolution, which is consistent with other Kansas WRA layers. The Wildland Urban Interface classes are based on the number of houses per acre. Class breaks are based on densities understood and commonly used in fire protection planning.

	Wildland Urban Interface Category	Acres	Percent
	No Data	240,767	80.1 %
	1 - Least Negative Impact	16,157	5.4 %
	2	123	0.0 %
	3	12,296	4.1 %
	4	11,803	3.9 %
	5	8,483	2.8 %
	6	4,943	1.6 %
	7 - Most Negative Impact	6,197	2.1 %
	Total	**300,769**	**100.0 %**

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Wildland Urban Interfaces

Acres

- 400,000
- 200,000
- 0

| Category	Value
No Data	240,767
1 - Least Negative Impact	16,157
2	123
3	12,296
4	11,803
5	8,483
6	4,943
7 - Most Negative Impact	6,197

Fire Occurrence Density

Description

The Fire Occurrence Density map represents the likelihood of a wildfire igniting based on historical ignitions patterns. Occurrence is derived by modeling historic wildfire ignition locations to create an ignition density map. The ignition rate is measured in the number of fires per 1,000 acres per year. Caution, it is important to not view this as a probability, but as an ignition rate or frequency. Historic fire report data for the period 2010-2019 was used for ignitions with a defined location (latitude and longitude). The compiled fire occurrence database was examined to remove duplicate records. The database was modeled to create a fire occurrence density map reflecting historical fire ignition rates. The measure of fire occurrence used in the Kansas Wildfire Risk Explorer is called Fire Occurrence Density. Fire occurrence is a key input in the calculation of wildfire threat. Many Kansas wildfires are human caused, so a repeatable spatial pattern of ignitions develop over time. This pattern identifies areas where wildfires are most likely to ignite and fire prevention and education efforts can be planned accordingly.

	Fire Occurrence Density Category	Acres	Percent
	Minimal Direct Wildfire Impacts	33,211	11.0 %
	Very Low	127,573	42.4 %
	Low	107,930	35.9 %
	Moderate Low	22,295	7.4 %
	Moderate	5,957	2.0 %
	Moderate High	1,772	0.6 %
	High	917	0.3 %
	Very High	1,112	0.4 %
	Total	300,767	100.0 %

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Fire Occurrence Density

Acres

- Minimal Direct Wildfire Impacts: 33,211
- Very Low: 127,573
- Low: 107,930
- Moderate Low: 22,295
- Moderate: 5,957
- Moderate High: 1,772
- High: 917
- Very High: 1,112
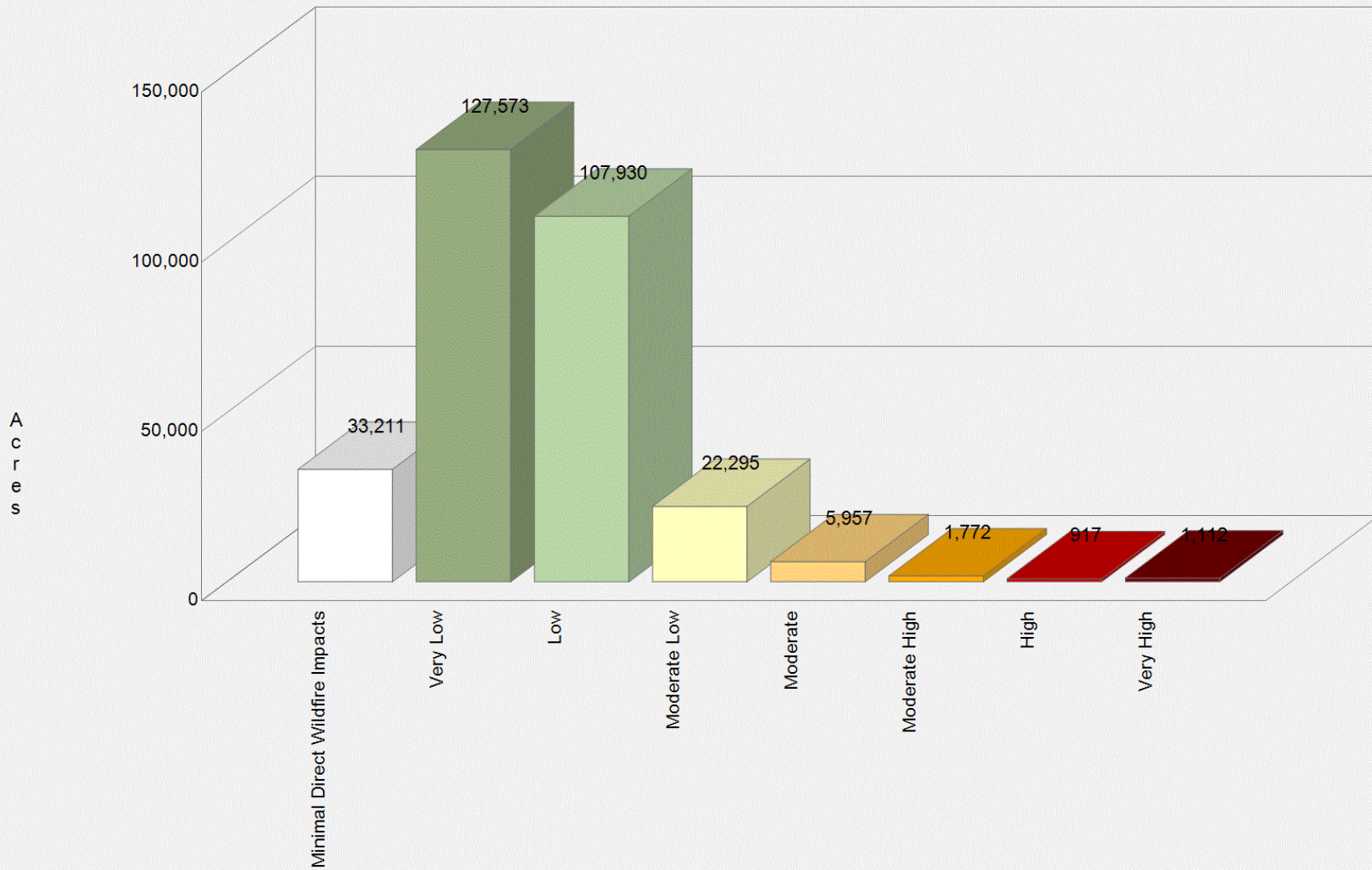
Fire History Statistics

Description

Fire History Statistics provide insight as to the number of fires and cause of fires in Kansas. These statistics are useful for fire 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 program aimed at reducing the fire occurrence rate based on specific fire cause information.

Ten years of historic fire report data where fires had a specific defined location were used to create the fire occurrence summary charts. Wildfire Ignition data was compiled from federal and state sources for the years 2010-2019.

Federal and state provided wildfire ignition data was spatially referenced by latitude and longitude coordinates. All ignition references were updated to remove duplicate records.

Federal agency wildfire ignitions are symbolized by the cause of fire. Fire reports were gathered from the following federal data sources:

- Dept. of Agriculture U.S. Forest Service
- Dept. of Interior U.S. Fish and Wildlife Service
- Dept. of Interior Bureau of Indian Affairs
- Dept. of Interior National Park Service

State and local wildfire ignitions were gathered from fire department reports submitted by:

- Kansas Forest Service
- Volunteer Fire Departments
- Combination Fire Departments (paid and volunteer)
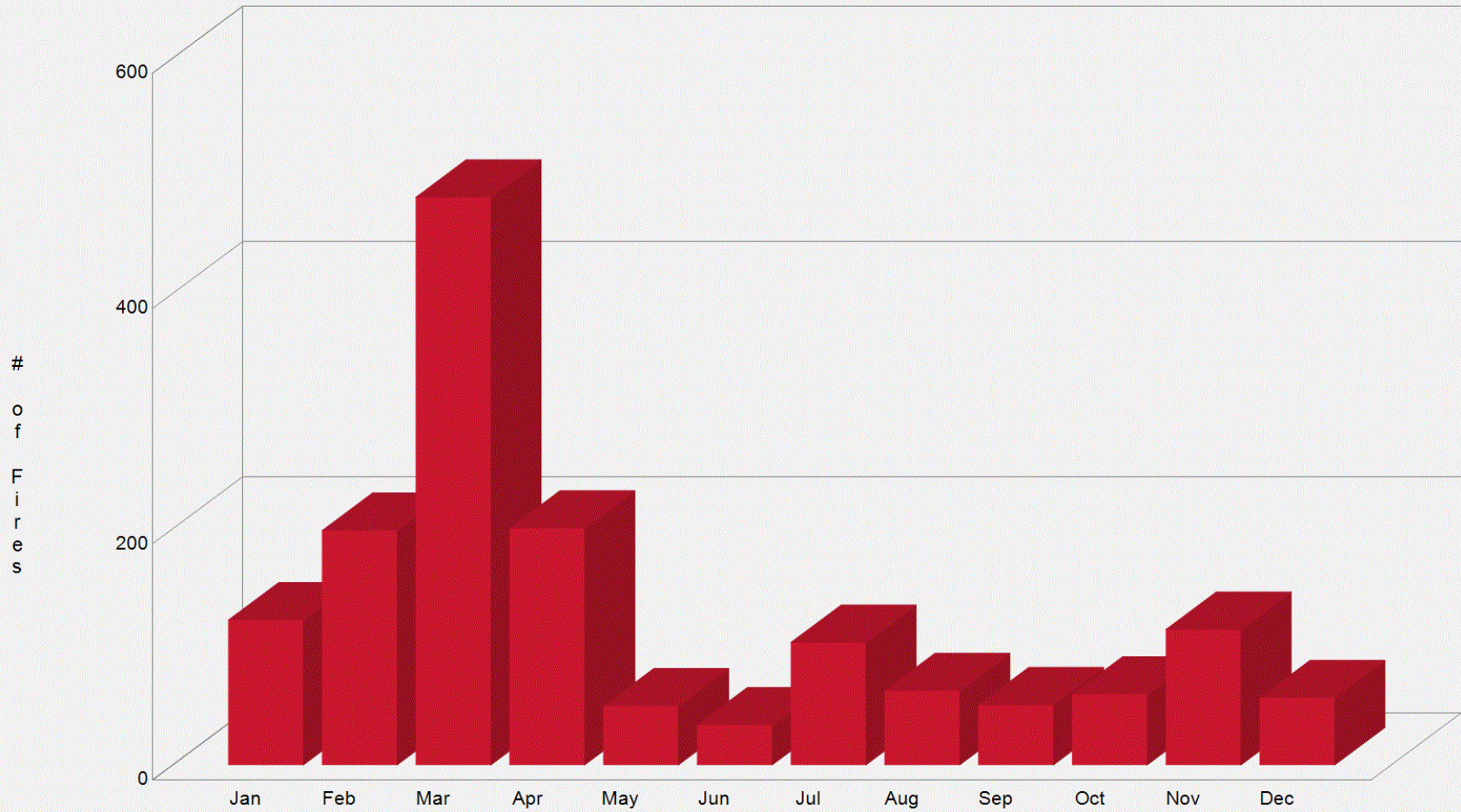- Paid Fire Departments

Number of Fires by Year
2010 – 2019
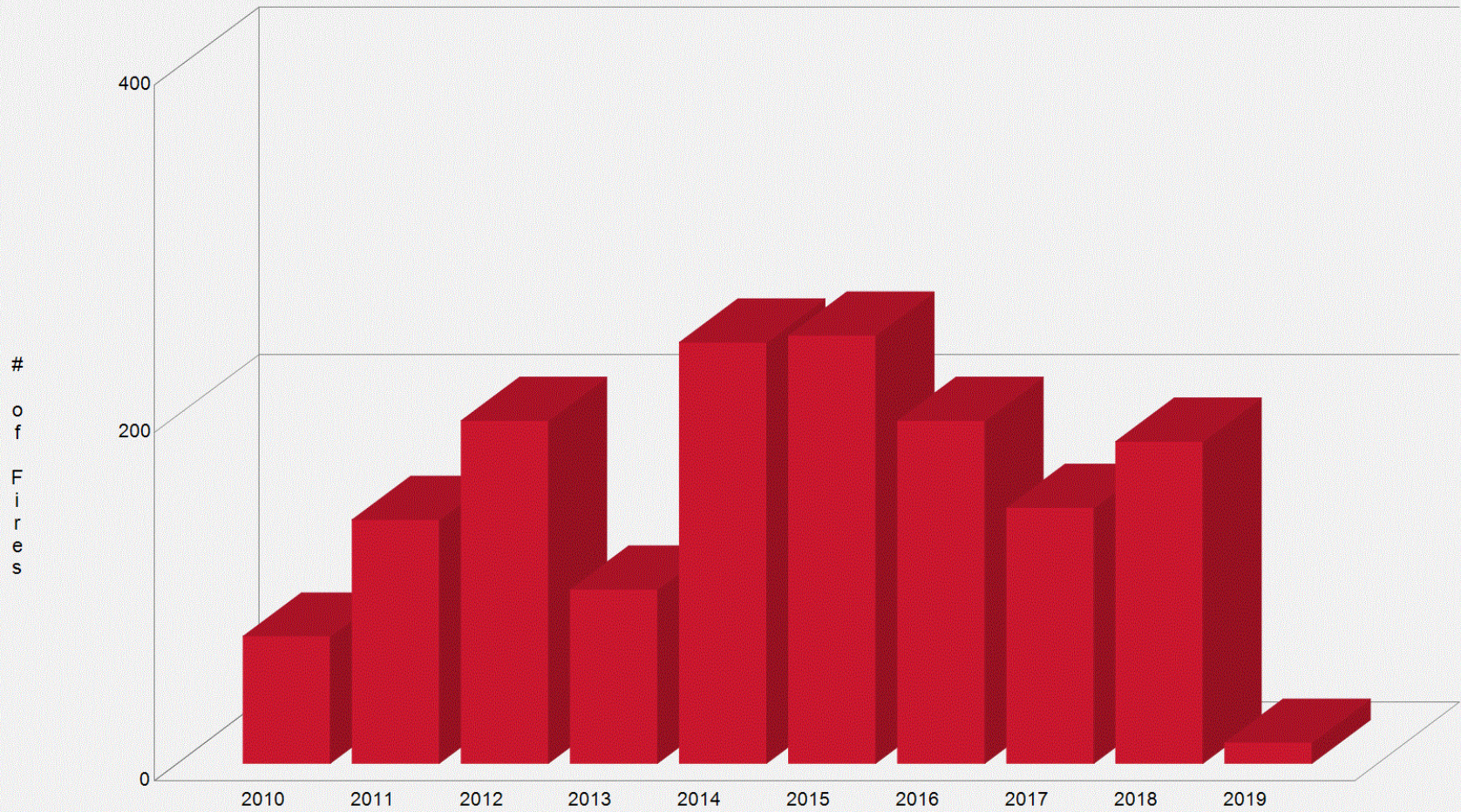
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
# of Fires	73	140	197	100	242	246	197	147	185	12

Number of Fires by Month
2010 – 2019

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# of Fires	123	199	482	201	50	34	104	63	51	60	115	57

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**Fires by Cause Type**
2010 – 2019
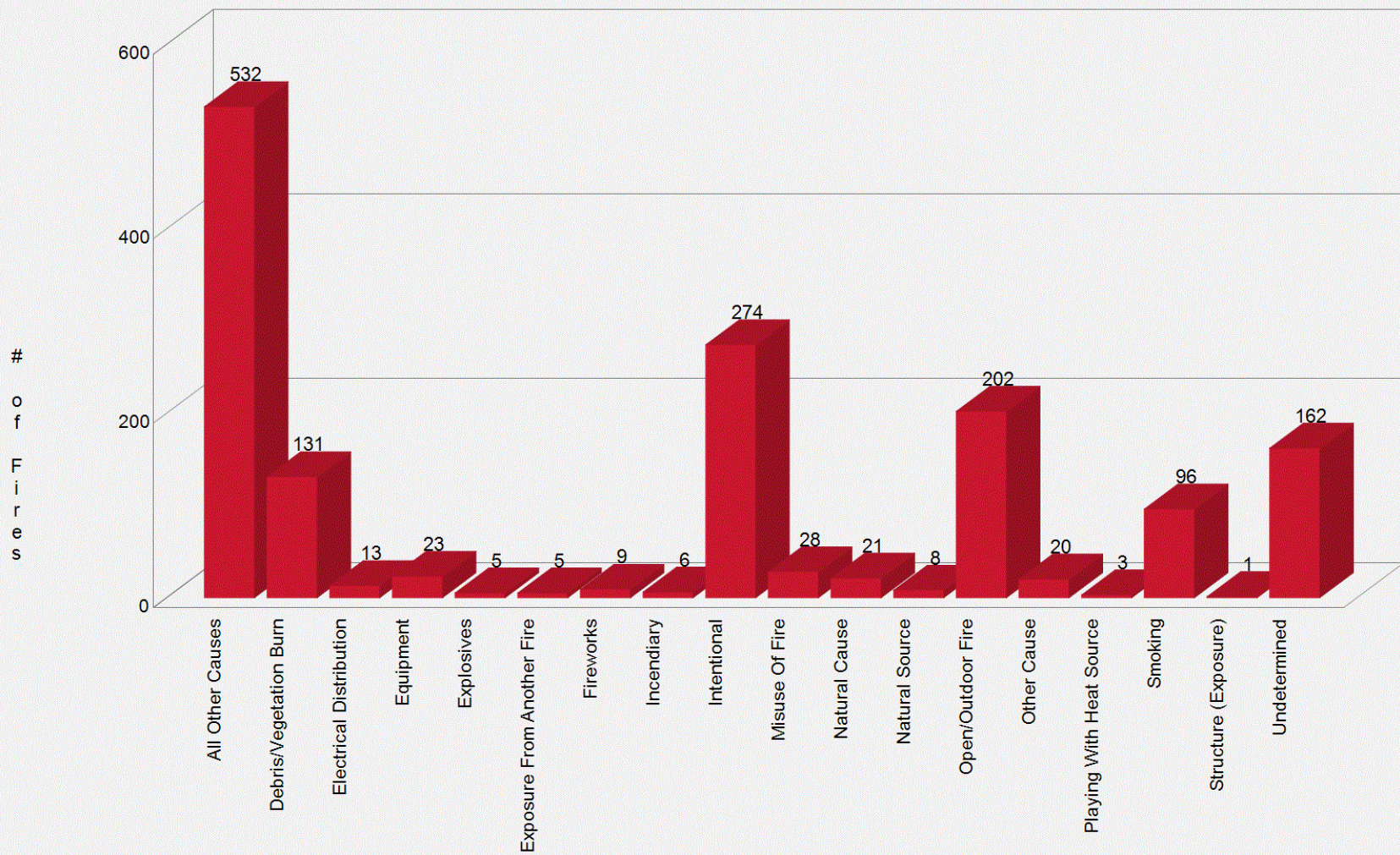
Appendix

Wildfire Threat

Wildfire Threat is a number closely related to the possibility of an acre burning shown in the Kansas Wildfire Risk Explorer by the Fire Threat.

|	Wildfire Threat Category	Acres	Percent
	Minimal Direct Wildfire Impacts	26,194	8.7 %
	Very Low	54,097	18.0 %
	Low	212,563	70.7 %
	Moderate Low	6,794	2.3 %
	Moderate	750	0.2 %
	Moderate High	351	0.1 %
	High	20	0.0 %
	Very High	0	0.0 %
	Extreme	0	0.0 %
	Very Extreme	0	0.0 %
	Total	300,769	100.0 %

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Wildfire Threat
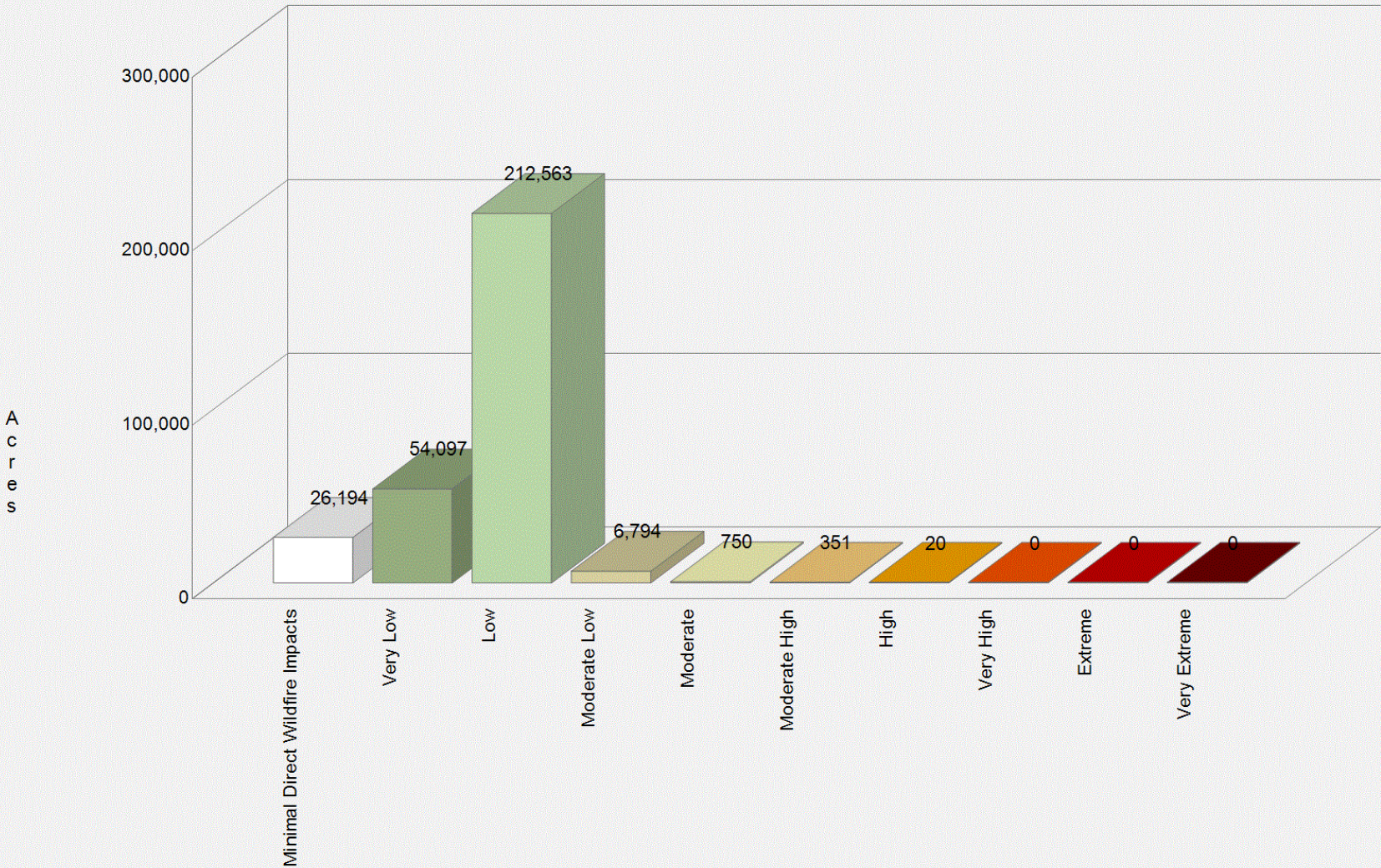
Suppression Difficulty

The Suppression Difficulty data layer reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions.

	Suppression Difficulty Category	Acres	Percent
	No Data	88,151	29.3 %
	Slow Rate 0-25 % Slope	157,115	52.2 %
	Slow Rate 26-40 % Slope	16	0.0 %
	Slow Rate 41-55 % Slope	0	0.0 %
	Medium Rate 0-25 % Slope	34,011	11.3 %
	Medium Rate 26-40 % Slope	0	0.0 %
	Fast Rate 0-25 % Slope	21,473	7.1 %
	Fast Rate 26-40 % Slope	2	0.0 %
	Total	300,768	100.0 %

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Supression Difficulty

Acres

- 200,000
- 100,000
- 0

157,115
88,151
16
0
34,011
0
21,473
2

No Data
Slow Rate 0-25 % Slope
Slow Rate 26-40 % Slope
Slow Rate 41-55 % Slope
Medium Rate 0-25 % Slope
Medium Rate 26-40 % Slope
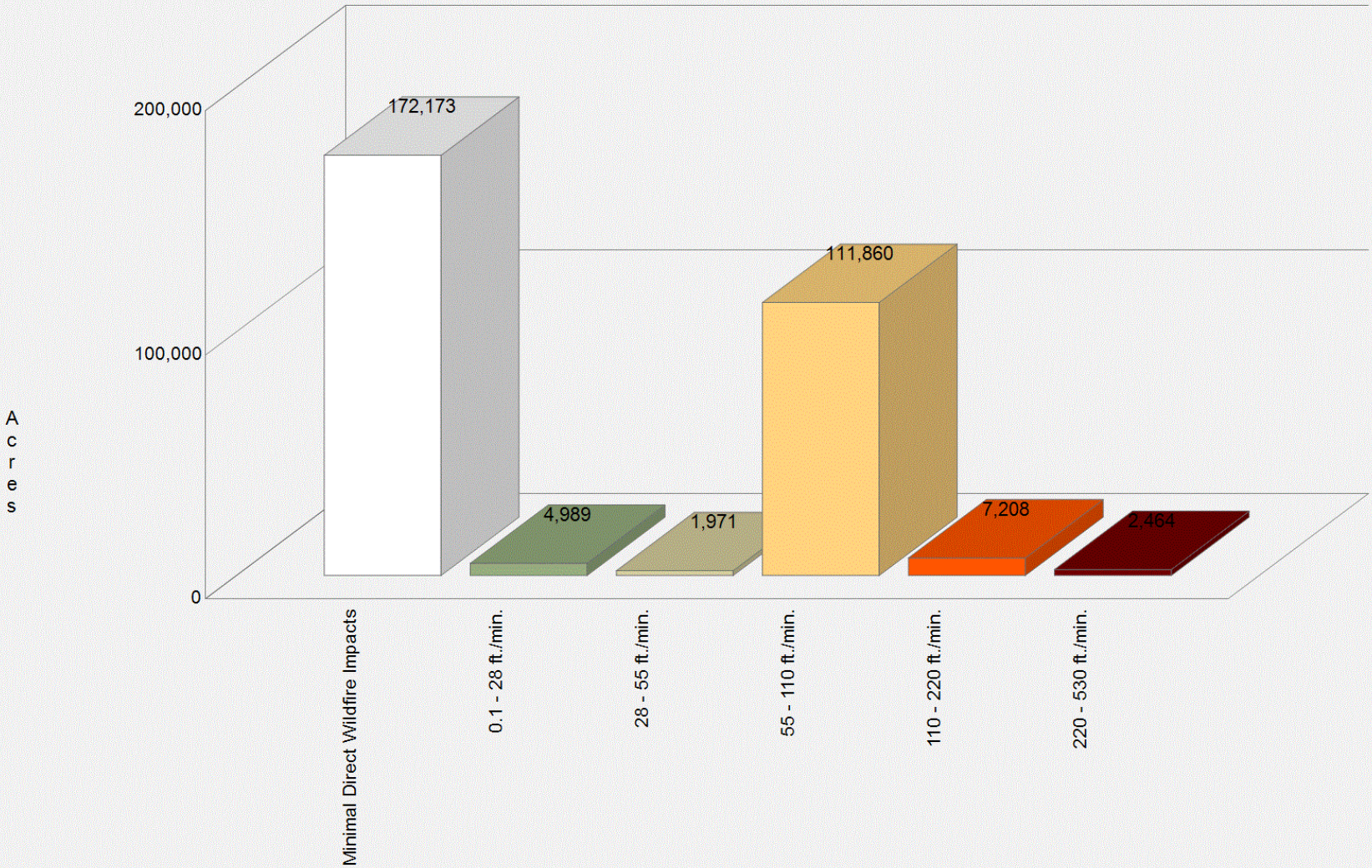Fast Rate 0-25 % Slope
Fast Rate 26-40 % Slope
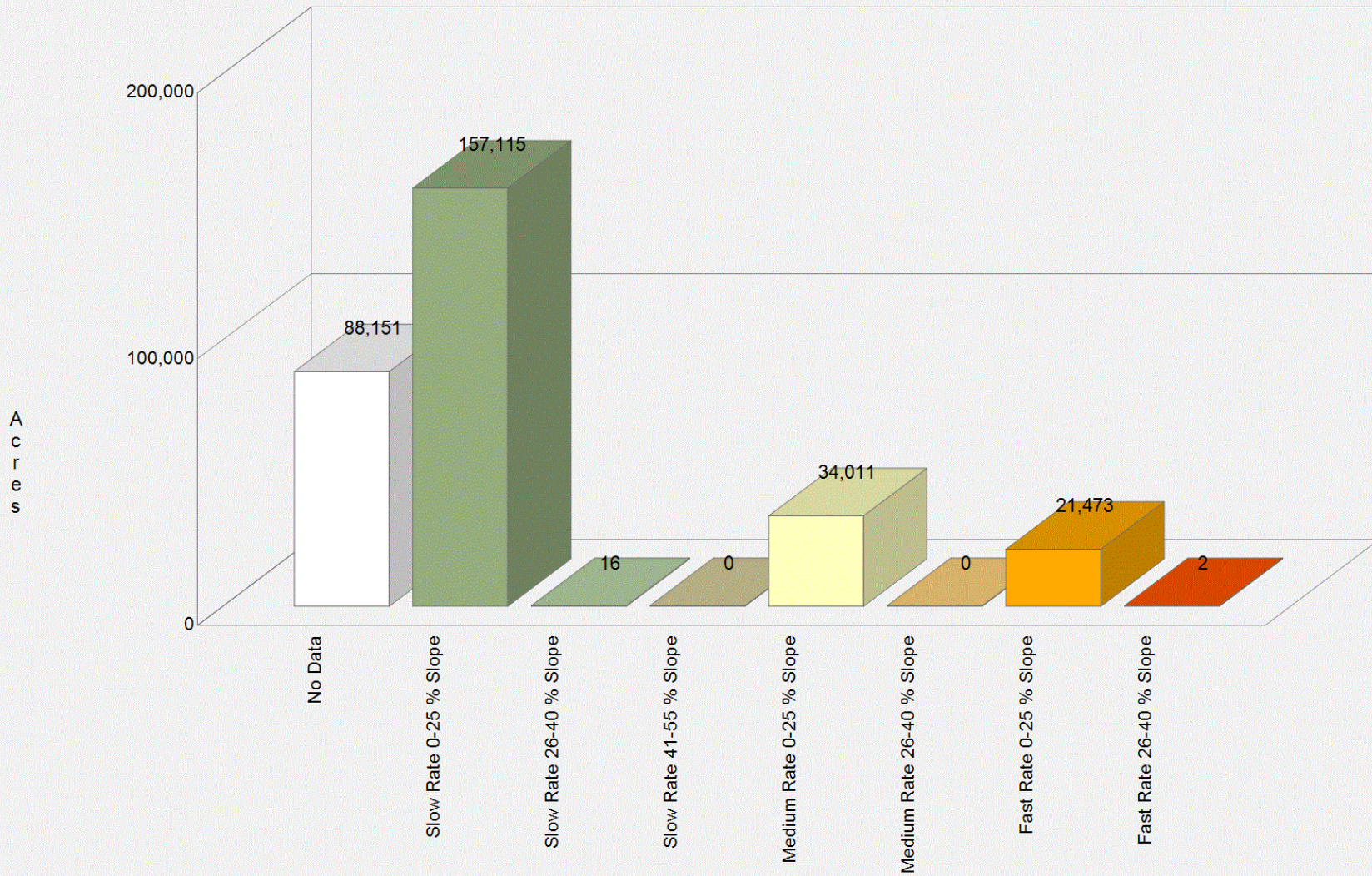
Rate of Spread - Extreme

Extreme rate of spread is based on the Extreme Percentile Category which represents the 98 to 100 percentile weather conditions for fuel moisture and wind speed.

	Rate of Spread - Extreme Category	Acres	Percent
	Minimal Direct Wildfire Impacts	172,173	57.3 %
	0.1 - 28 ft./min.	4,989	1.7 %
	28 - 55 ft./min.	1,971	0.7 %
	55 - 110 ft./min.	111,860	37.2 %
	110 - 220 ft./min.	7,208	2.4 %
	220 - 530 ft./min.	2,464	0.8 %
	Total	300,665	100.0 %

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Rate of Spread

Acres

200,000	
172,173	(Minimal Direct Wildfire Impacts)
111,860	(55 - 110 ft./min.)
100,000	
4,989	(0.1 - 28 ft./min.)
1,971	(28 - 55 ft./min.)
7,208	(110 - 220 ft./min.)
2,464	(220 - 530 ft./min.)
0	

Minimal Direct Wildfire Impacts

0.1 - 28 ft./min.

28 - 55 ft./min.

55 - 110 ft./min.

110 - 220 ft./min.

220 - 530 ft./min.

Flame Length - Extreme

Extreme flame length is based on the Extreme Percentile Category which represents the 98 to 100 percentile weather conditions for fuel moisture and wind speed.

	Flame Length - Extreme Category	Acres	Percent
	<= 1 ft.	172,173	57.3 %
	1 - 5 ft.	4,990	1.7 %
	5 - 10 ft.	113,839	37.9 %
	10 - 25 ft.	9,664	3.2 %
	25 - 60 ft.	0	0.0 %
	Total	300,666	100.0 %

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Flame Length

Acres

| Flame Length	Acres
<= 1 ft.	172,173
1 - 5 ft.	4,990
5 - 10 ft.	113,839
10 - 25 ft.	9,664
25 - 60 ft.	0
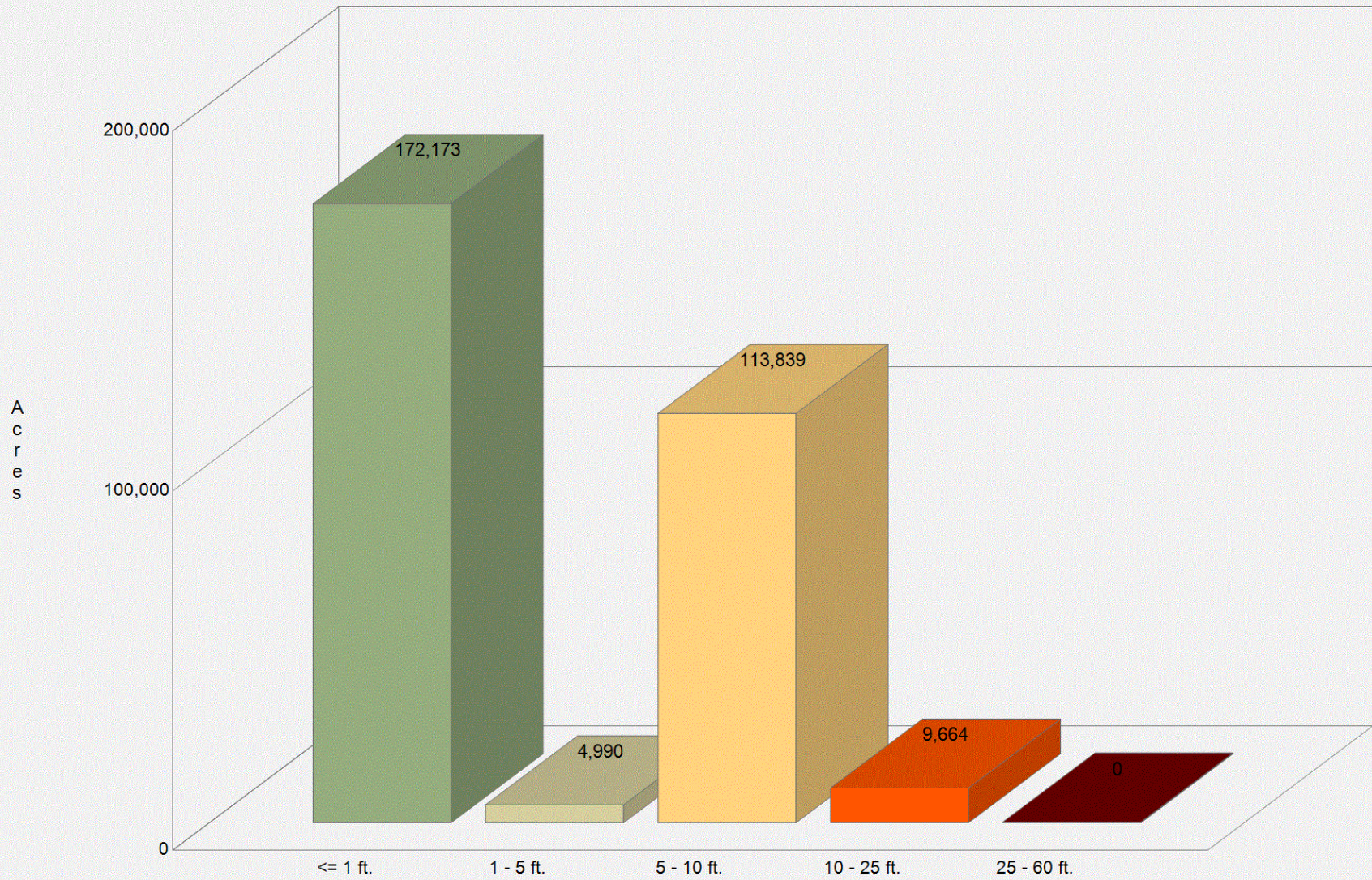
Infrastructure Assets

The Infrastructure Assets Layer is created through the combination of known infrastructure locations such as schools, airports, hospitals, roads and railroads with Response Function Scores. Final values are based on a scale of 1 to 7 and were derived using Response Function Scores.

	Infrastructure Assets Category	Acres	Percent
	No Data	153,869	51.2 %
	1 - Least Negative Impact	137,085	45.6 %
	2	1,055	0.4 %
	3	8	0.0 %
	4	3,120	1.0 %
	5	3,920	1.3 %
	6	197	0.1 %
	7 - Most Negative Impact	1,515	0.5 %
	Total	300,769	100.0 %

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Infrastructure Assets
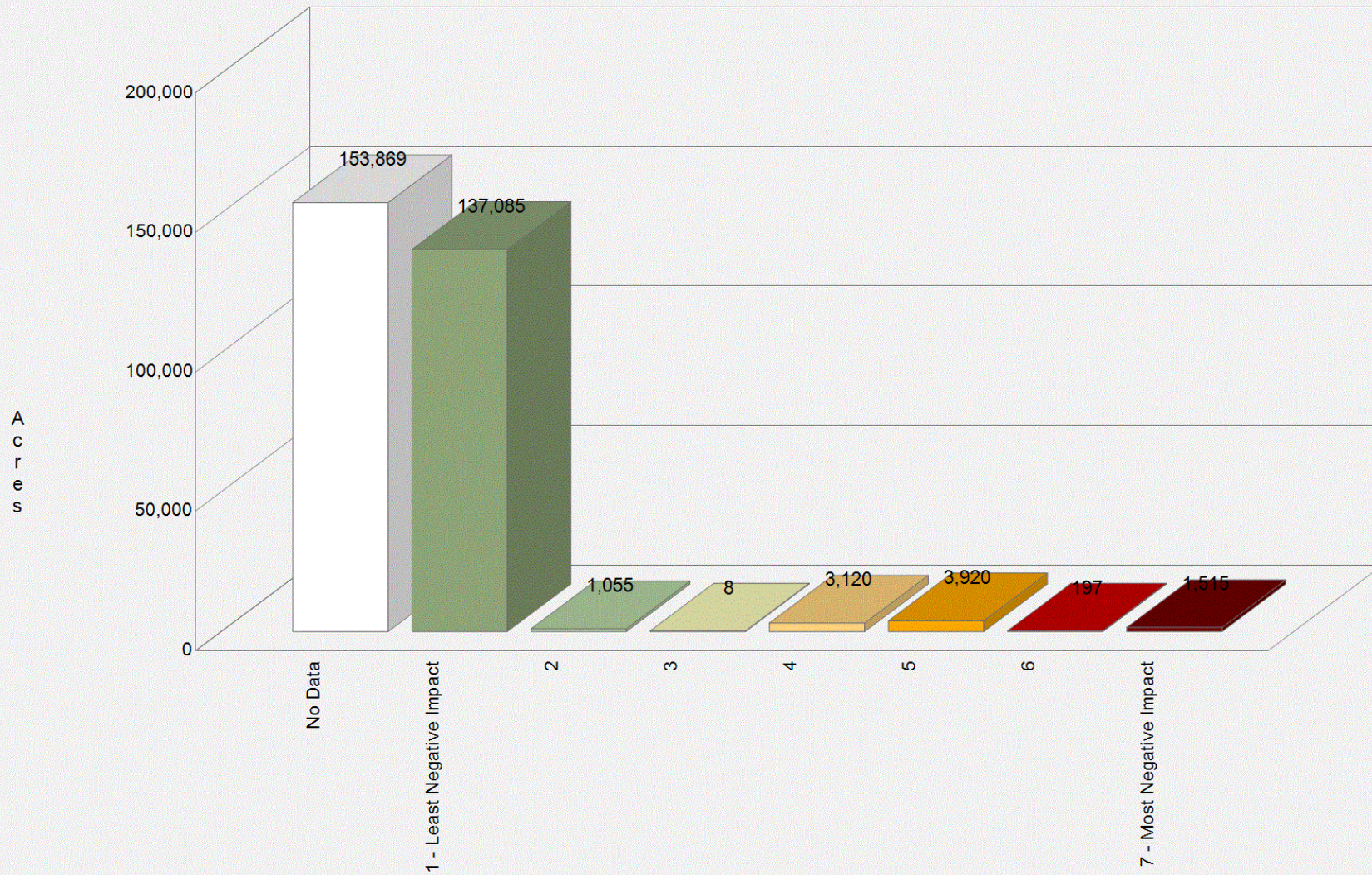
Area of Interest (AOI)

- *Forest Action Plan Priority Areas intersecting AOI*

  Glaciated Region, Wooded Plains

- *Fire Districts intersecting AOI*

  Alexandria, Atchison County Fire District 3 - Walnut, Atchison County Fire District 4 - Mt Pleasant, Bonner Springs Fire District, Douglas County Consolidated Fire District #1, Easton, Fairmount Township Fire Department, Fort Leavenworth Fire Department, Jefferson County Fire District 10, Jefferson County Fire District 12, Jefferson County Fire District 4, Jefferson County Fire District 9, Jefferson County Fire District 9, Kansas City Kansas Fire District, Kickapoo, Lansing/H.P./Del, Lawrence - Douglas County Fire Medical, Leavenworth Fire Department, Northwest Consolidated Fire District, Reno, Sherman Township Fire Department, Stranger, Tonganoxie Fire Department, Tonganoxie Township Rural Fire Department

- *Notable Fire Perimeters intersecting AOI*

  206th, Ida Rd, Loring Rd, McGee, Tallent, Tonganoxie Rd

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