COLORADO WILDFIRE RISK ASSESSMENT SUMMARY REPORT

Indian Springs

Report was generated using
www.ColoradoWildfireRisk.com

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Introduction

Colorado Wildfire Risk Assessment Report

Welcome to the Colorado Wildfire Risk Assessment Summary Reporting Tool.

This tool allows users of the Professional Viewer application of the Colorado Wildfire Risk Assessment (Colorado WRA) web portal to define a specific project area and generate information for this area. A detailed risk summary report can be generated using a set of predefined map products developed by the Colorado Wildfire Risk Assessment project which have been summarized explicitly for the user defined project area. The report is generated in MS WORD format.

The report has been designed so that information from the report can easily be copied and pasted into other specific 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, Homeowner Risk Assessments, and Forest Management or Stewardship Plans. Example templates for some of these reports are available for download on the Colorado Wildfire Risk Assessment web portal (CO-WRAP).

The Colorado WRA provides a consistent, comparable set of scientific results to be used as a foundation for wildfire mitigation and prevention planning in Colorado.

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

The Colorado WRA 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
- Plan and prioritize hazardous fuel treatment programs
- 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

Wildland Urban Interface

Description

Colorado is one of the fastest growing states in the Nation, with much of this growth occurring outside urban boundaries. This increase in population across the state will impact counties and communities that are located within the Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

For the **Indian Springs** project area, it is estimated that **67** people or **100.0 % percent** of the total project area population (67) live within the WUI.

The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other existing data sources did not provide the level of detail needed by the Colorado State Forest Service and local fire protection agencies.

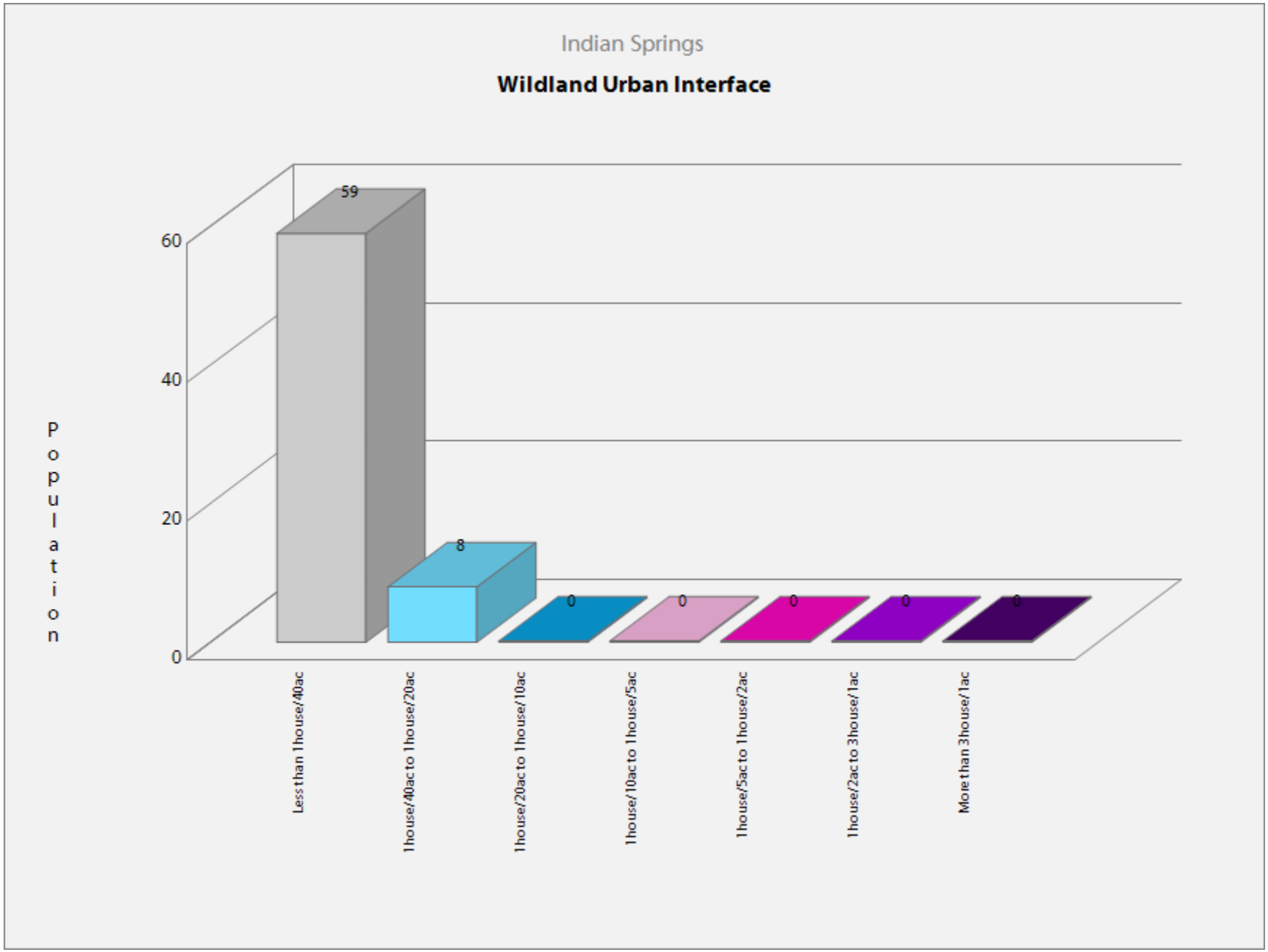
The new WUI data set is derived using advanced modeling techniques based on the Where People Live data set and LandScan USA population count data available from the Department of

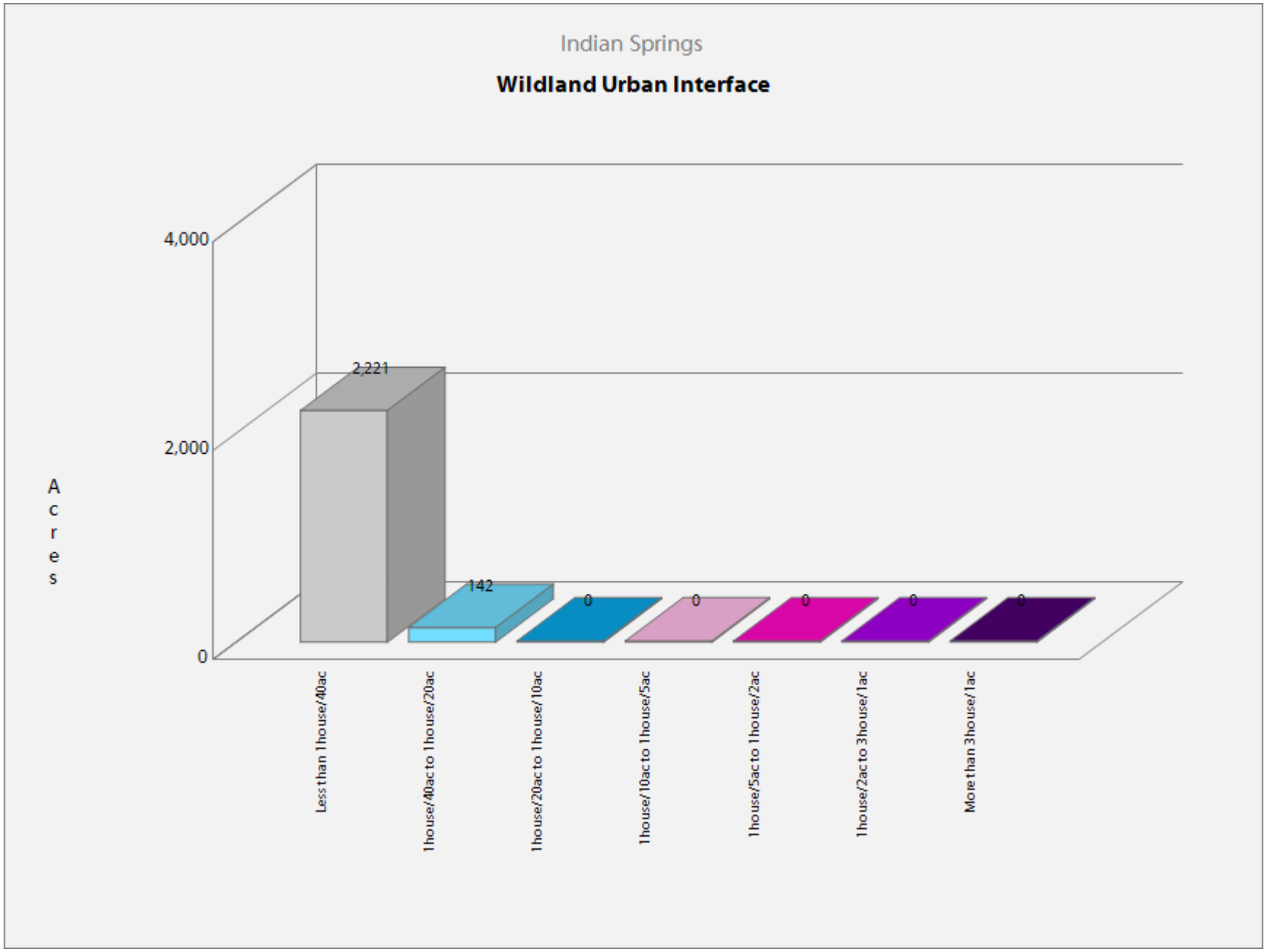
Homeland Security, HSIP Freedom data set. WUI is simply a subset of the Where People Live data set. The primary difference is populated areas surrounded by sufficient non-burnable areas (i.e. interior urban areas) are removed from the Where People Live data set, as these areas are not expected to be directly impacted by a wildfire.

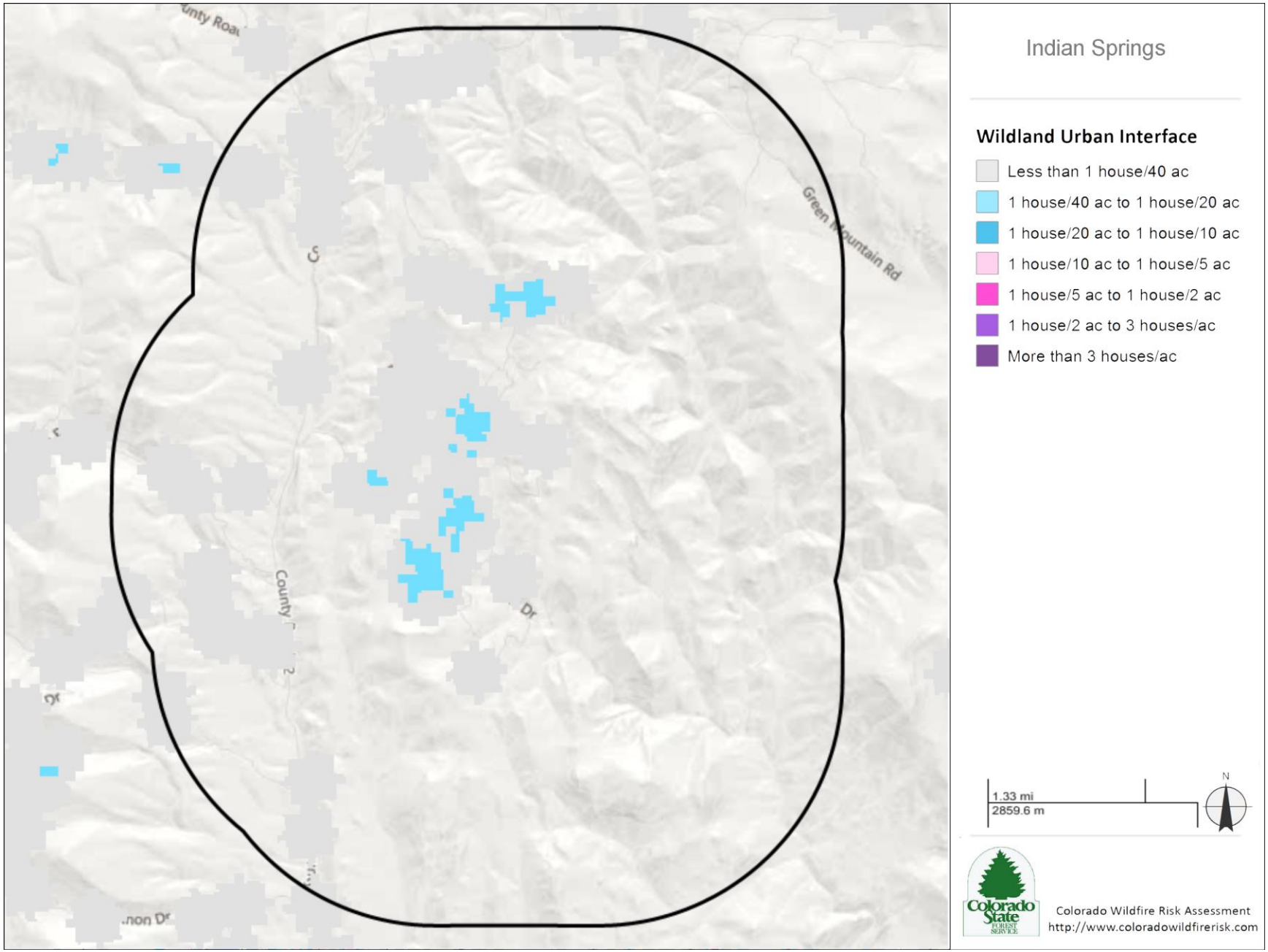
A more detailed description of the risk assessment algorithms is provided in the Colorado Wildfire Risk Assessment (Colorado WRA) Final Report, which can be downloaded from www.ColoradoWildfireRisk.com.

Data is modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers. . The WUI classes are based on the number of houses per acre. Class breaks are based on densities understood and commonly used for fire protection planning.

Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
Less than 1house/40ac	59	88.1 %	2,221	94.0 %
1house/40ac to 1house/20ac	8	11.9 %	142	6.0 %
1house/20ac to 1house/10ac	0	0.0 %	0	0.0 %
1house/10ac to 1house/5ac	0	0.0 %	0	0.0 %
1house/5ac to 1house/2ac	0	0.0 %	0	0.0 %
1house/2ac to 3house/1ac	0	0.0 %	0	0.0 %
More than 3house/1ac	0	0.0 %	0	0.0 %
Total	**67**	**100.0 %**	**2,363**	**100.0 %**


Indian Springs
Wildland Urban Interface
Population
60
40
20
0
59
8
0
0
0
0
0
Less than 1house/40ac
1house/40ac to 1house/20ac
1house/20ac to 1house/10ac
1house/10ac to 1house/5ac
1house/5ac to 1house/2ac
1house/2ac to 3house/1ac
More than 3house/1ac


Indian Springs
Wildland Urban Interface
Acres
4,000
2,000
0
2,221
142
0
0
0
0
0
Less than 1house/40ac
1house/40ac to 1house/20ac
1house/20ac to 1house/10ac
1house/10ac to 1house/5ac
1house/5ac to 1house/2ac
1house/2ac to 3house/1ac
More than 3house/1ac


Indian Springs
Wildland Urban Interface
Less than 1 house/40 ac
1 house/40 ac to 1 house/20 ac
1 house/20 ac to 1 house/10 ac
1 house/10 ac to 1 house/5 ac
1 house/5 ac to 1 house/2 ac
1 house/2 ac to 3 houses/ac
More than 3 houses/ac
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Wildland Urban Interface (WUI) Risk Index

Description

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

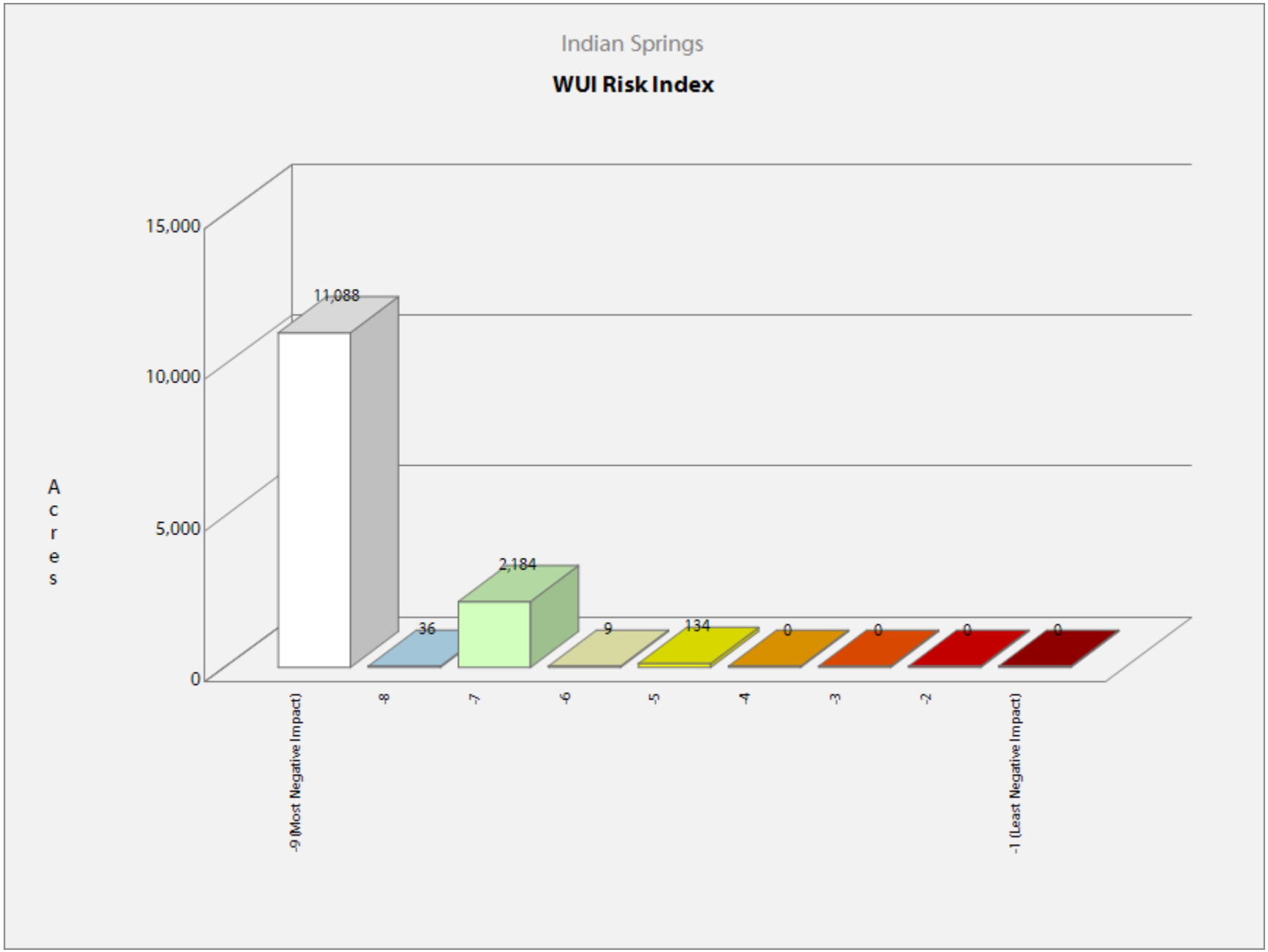
The WUI Risk Index is derived using a response function modeling approach. Response functions are a method of assigning a net change in the value to a *resource* or *asset* based on susceptibility to fire at different intensity levels, such as flame length.

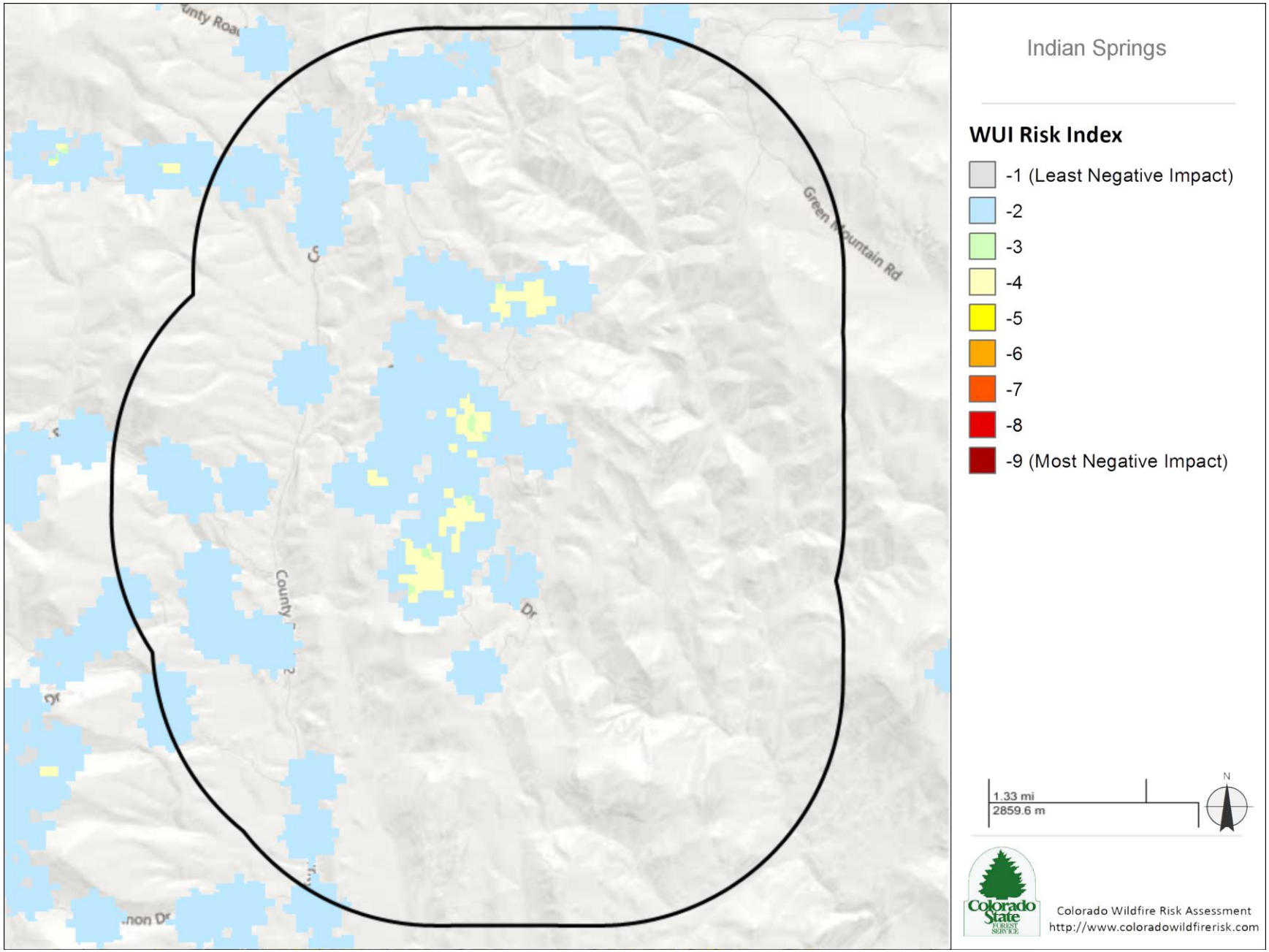
To calculate the WUI Risk Index, the WUI housing density data was combined with flame length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts led by Colorado State Forest Service mitigation planning staff. By combining flame length with the WUI housing density data, it is possible to determine where the greatest potential impact to homes and people is likely to occur.

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9, while areas with low housing density and low flame lengths are rated -1.

The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 30-meter cell resolution, which is consistent with other Colorado WRA layers.

WUI Risk Class	Acres	Percent
-1 (Least Negative Impact)	11,088	82.4 %
-2	36	0.3 %
-3	2,184	16.2 %
-4	9	0.1 %
-5	134	1.0 %
-6	0	0.0 %
-7	0	0.0 %
-8	0	0.0 %
-9 (Most Negative Impact)	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
WUI Risk Index
Acres
15,000
10,000
5,000
0
11,088
36
2,184
9
134
0
0
0
0
-9 (Most Negative Impact)
-8
-7
-6
-5
-4
-3
-2
-1 (Least Negative Impact)


Indian Springs
WUI Risk Index
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

FireWise Communities

Description

Firewise Communities/USA® is a national recognition program that provides resources to inform communities how to adapt to living with wildfire and encourages neighbors to take action together to reduce their wildfire risk. Colorado communities that take the following five steps can be recognized as Firewise:

1. Form a Firewise board or committee
2. Obtain a wildfire risk assessment from the CSFS or local fire department, and create an action plan
3. Hold a Firewise event once per year
4. Invest a minimum of $2 per capita in local Firewise actions for the year
5. Submit an application to Colorado's Firewise liaison (Courtney Peterson, CSFS, at Courtney.Peterson@colostate.edu)

The FireWise Communities/USA dataset defines the boundaries of the recognized communities. The process for mapping Firewise Communities/USA (FWC) boundaries involved multiple steps:

1. Firewise Community leaders were contacted with a request for a FWC boundary in digital or hardcopy format, as delineated by a homeowner, Community Wildfire Protection Plan (CWPP), consultant, municipality, fire district or other local entity.
2. If a boundary was not available, the FWC leaders were provided a brief tutorial on how to draw a boundary using online mapping software. These boundaries were then shared in a file format recognized by Geographic Information System (GIS) software and incorporated into a database.
3. If step 2 was not possible, FWC leaders were encouraged to draw a boundary polygon on maps, photos, plat or subdivision maps, or by verbal description of bounding properties, roads and other identifiable boundaries.
4. Boundaries provided by step 3 were digitized in GIS software and the results were then sent to the FWC leaders for confirmation.
5. If the provided FWC boundaries essentially followed CWPP boundaries, but with minor drawing errors, the FWC boundaries were "snapped" to match the CWPP boundaries. All other FWC boundaries were kept as delivered.

Note: These are estimated boundaries using a variety of methods with varying degrees of accuracy. These are not legal boundaries and should not be construed as such. The boundaries may overlap with CWPP areas and are subject to change over time as the communities develop, change, and continue to implement wildfire mitigation efforts.

To learn more about the Firewise Communities/USA recognition program or to fill out an application, visit www.firewise.org or www.csfs.colostate.edu/wildfire-mitigation/colorado-firewise-communities/.

The designated project area does not contain FireWise Community data

Community Wildfire Protection Plans (CWPPs)

Description

A Community Wildfire Protection Plan (CWPP) is a document developed and agreed upon by a community to identify how the community will reduce its wildfire risk. CWPPs identify areas where fuels reduction is needed to reduce wildfire threats to communities and critical infrastructure, address protection of homes and other structures, and plan for wildfire response capability. The Colorado State Forest Service (CSFS) supports the development and implementation of CWPPs and provides resources, educational materials and information to those interested in developing CWPPs.

The CWPP dataset represents the boundaries of those areas that have developed a CWPP. Note that CWPPs can be developed by different groups at varying scales, such as county, Fire Protection District (FPD), community/subdivision, HOA, etc., and as such, can overlap. In addition, the CWPPs can be from different dates. Often a county CWPP is completed first with subsequently more detailed CWPPs done for local communities within that county or FPD. CO-WRAP provides a tool that allows the user to select the CWPP area and retrieve the CWPP document for review (PDF).

At a minimum, a CWPP should include:

- The wildland-urban interface (WUI) boundary, defined on a map, where people, structures and other community values are most likely to be negatively impacted by wildfire
- The CSFS, local fire authority and local government involvement and any additional stakeholders
- A narrative that identifies the community's values and fuel hazards

Community input is the foundation of a Community Wildfire Protection Plan that identifies community needs and garners community support.

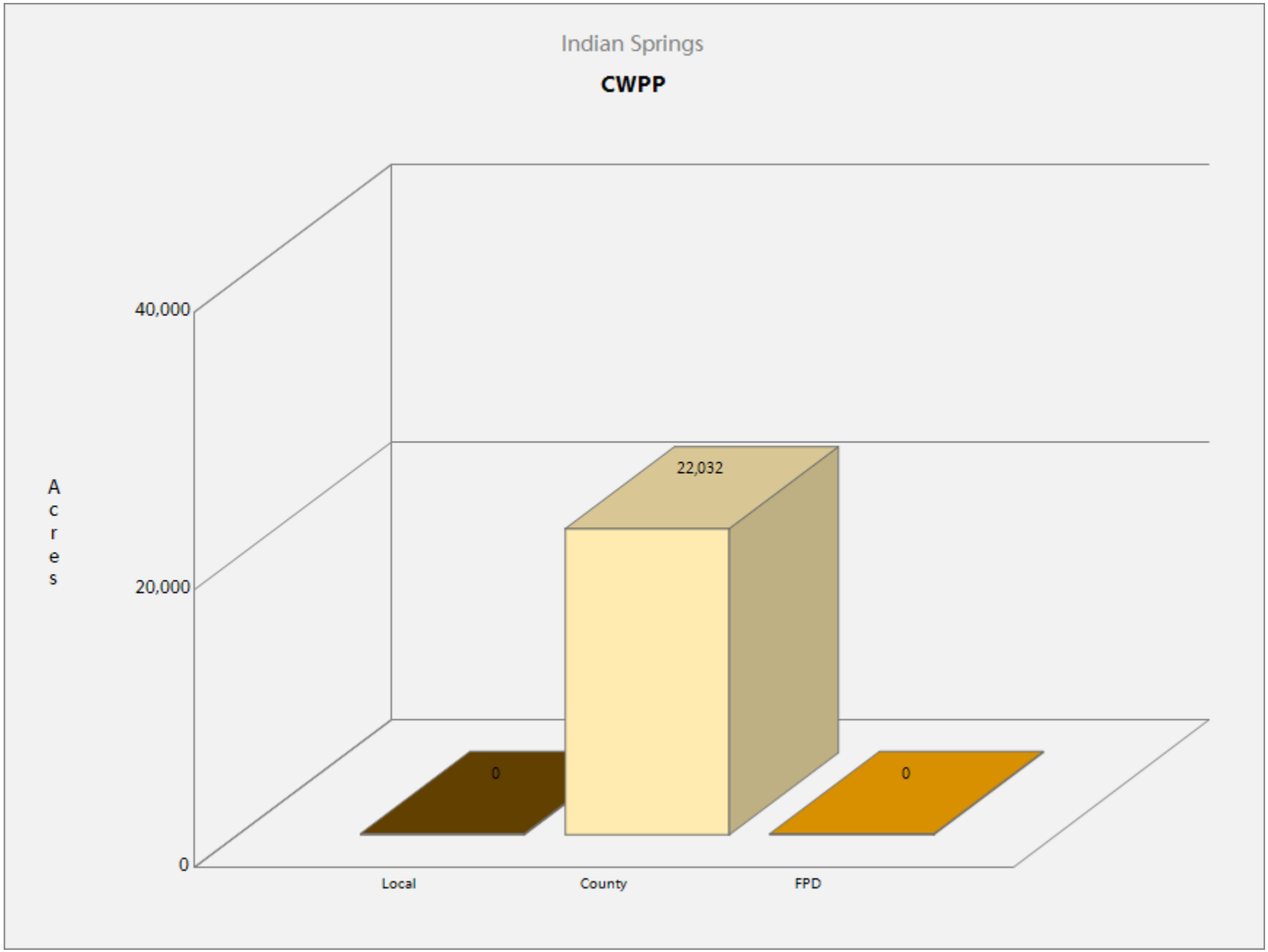
- The community's plan for when a wildfire occurs
- An implementation plan that identifies areas of high priority for fuels treatments

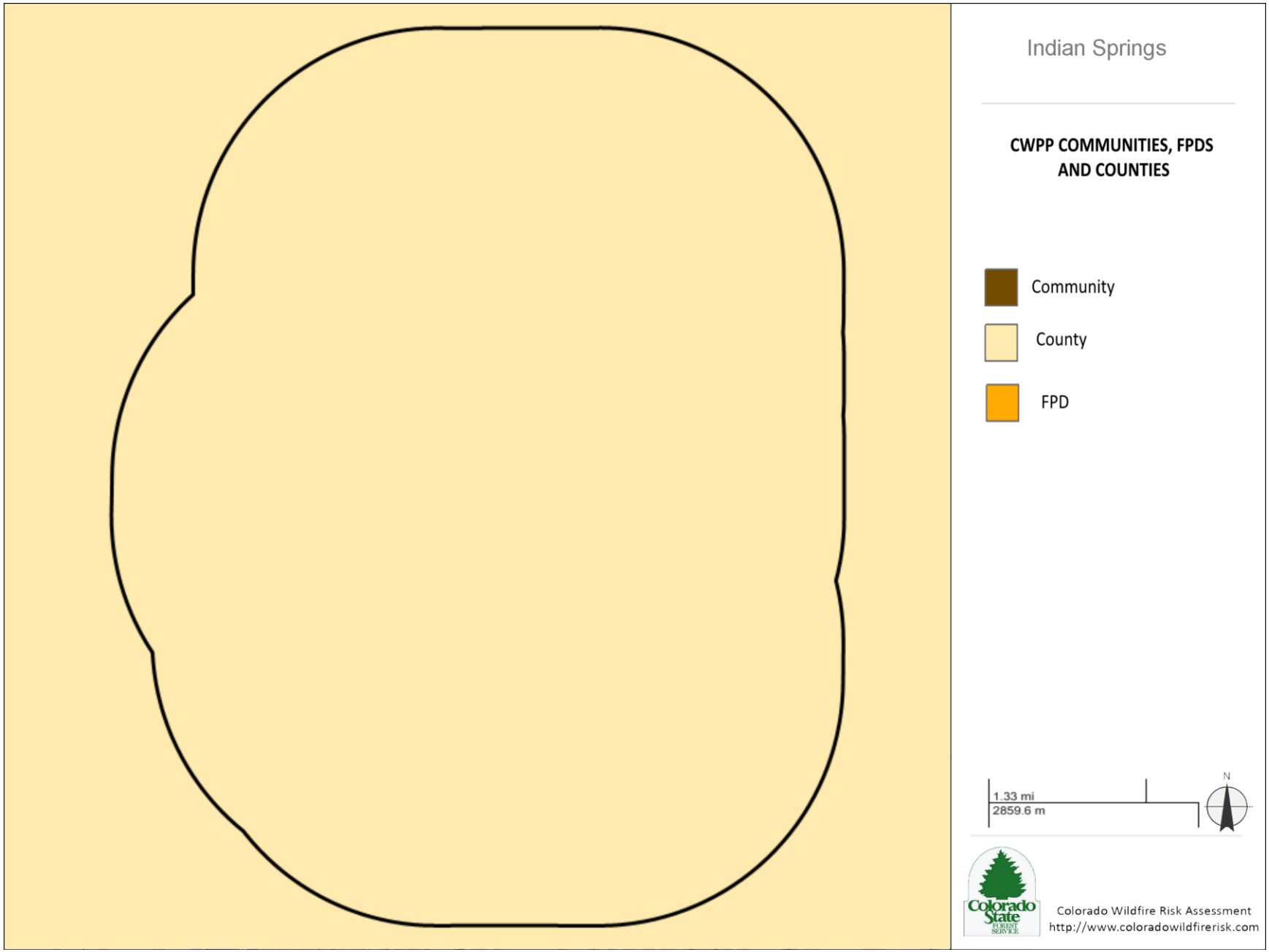
CWPPs are not shelf documents and should be reviewed, tracked and updated. A plan stays alive when it is periodically updated to address the accomplishments of the community. Community review of progress in meeting plan objectives and determining areas of new concern where actions must be taken to reduce wildfire risk helps the community stay current with changing environment and wildfire mitigation priorities.
If your community is in an area at risk from wildfire, now is a good time to start working with neighbors on a CWPP and preparing for

future wildfires. Contact your local CSFS district to learn how to start this process and create a CWPP for your community: http://csfs.colostate.edu/pages/your-local-forester.html.

For the **Indian Springs** project area, there are **1** CWPPs areas that are totally or partially in the defined project area.

Community CWPP Name	CWPP Type	CSFS District	Acres Inside Project Area	Total Acres
Fremont County	County	Canon City	22,032	1,604,105
Total Acres			**22,032**	**1,604,105**


Indian Springs
CWPP
40,000
20,000
0
Acres
22,032
0
0
Local
County
FPD


Indian Springs
CWPP COMMUNITIES, FPDS AND COUNTIES
Community
County
FPD
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Forest Management Activities

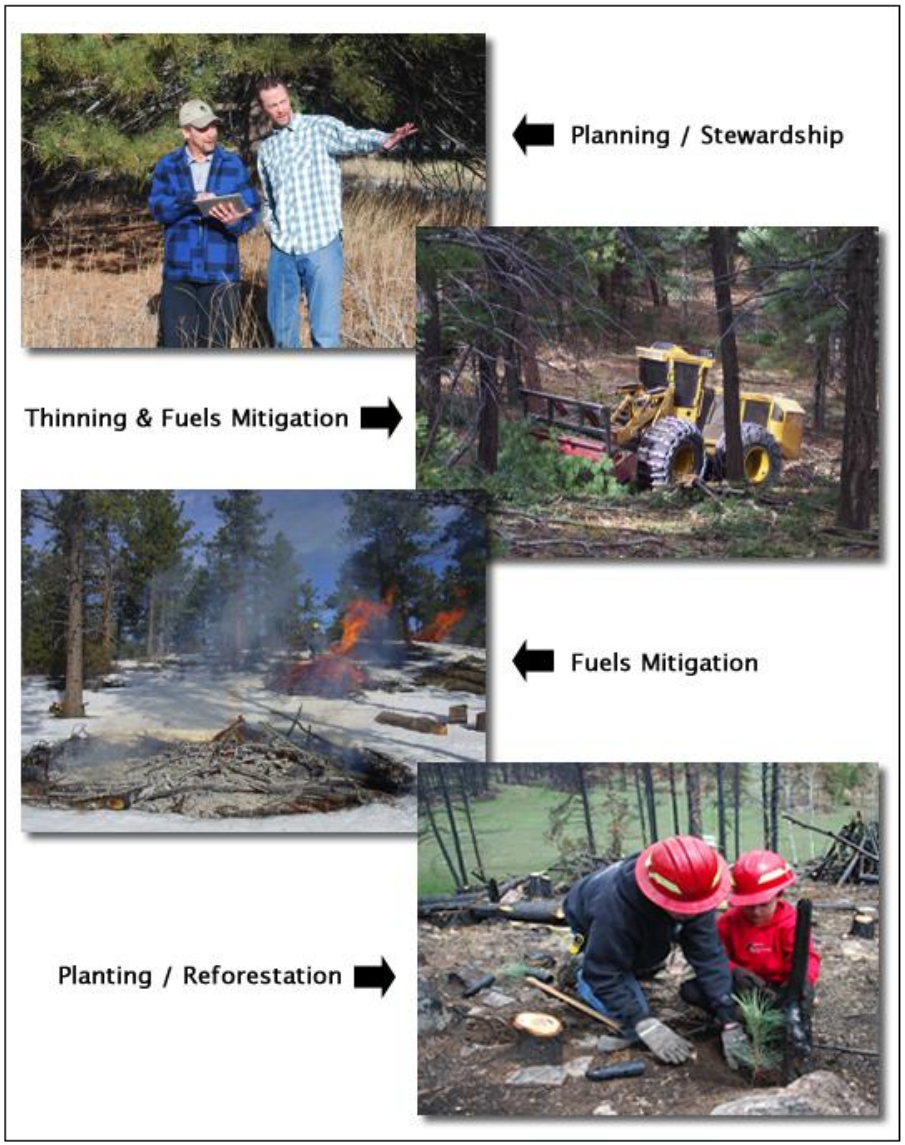
Description

Forest management activities are practices implemented on the ground to address or reach management objectives. Forest management activities are also known as treatments. They are described in Forest Management Plans, Stewardship Plans, or Community Wildfire Protection Plans and are prescribed through processes that consider current condition, future desired condition, and best science-based management practices for the type of vegetation and local environmental conditions.

The data displayed in this layer was collected by CSFS for activities that occurred during the five-year period 2008 through 2012. The forest management activities are classified by general category and year of completion. More than one activity may have occurred within any polygon. Activities in any polygon may occur in more than one year.

The legend for the activities is presented on a per year basis and identifies the type of activity that has occurred for the project report area. Note that in some cases more than one activity may occur during a year and this is identified with a separate class.

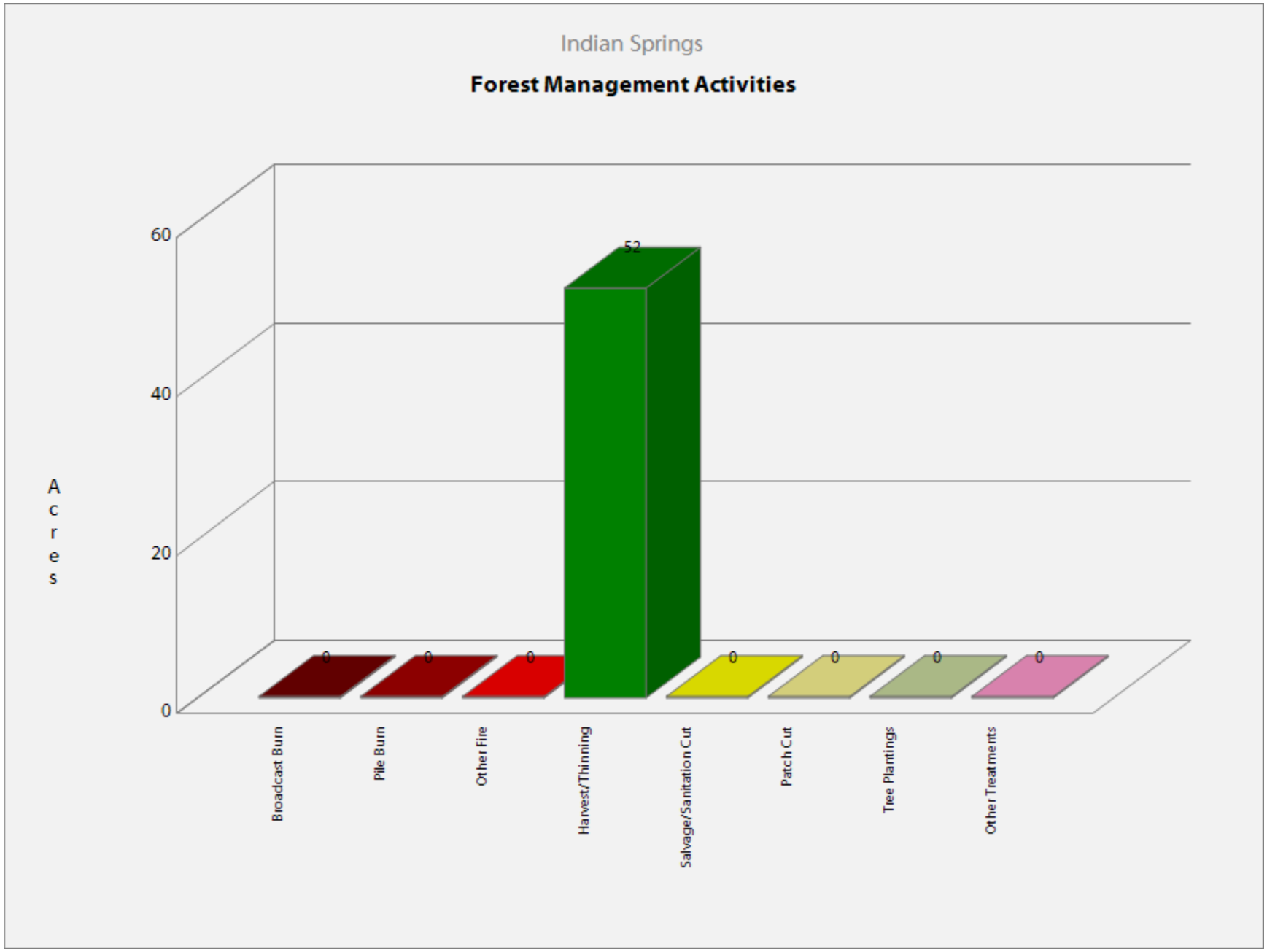
A tool is provided within CO-WRAP to select treatment activity polygons on the map and review the information about the specific activity that has occurred for the selected year. Note that individual years from 2008 to 2012 are shown as separate layers within CO-WRAP and can be queried separately.

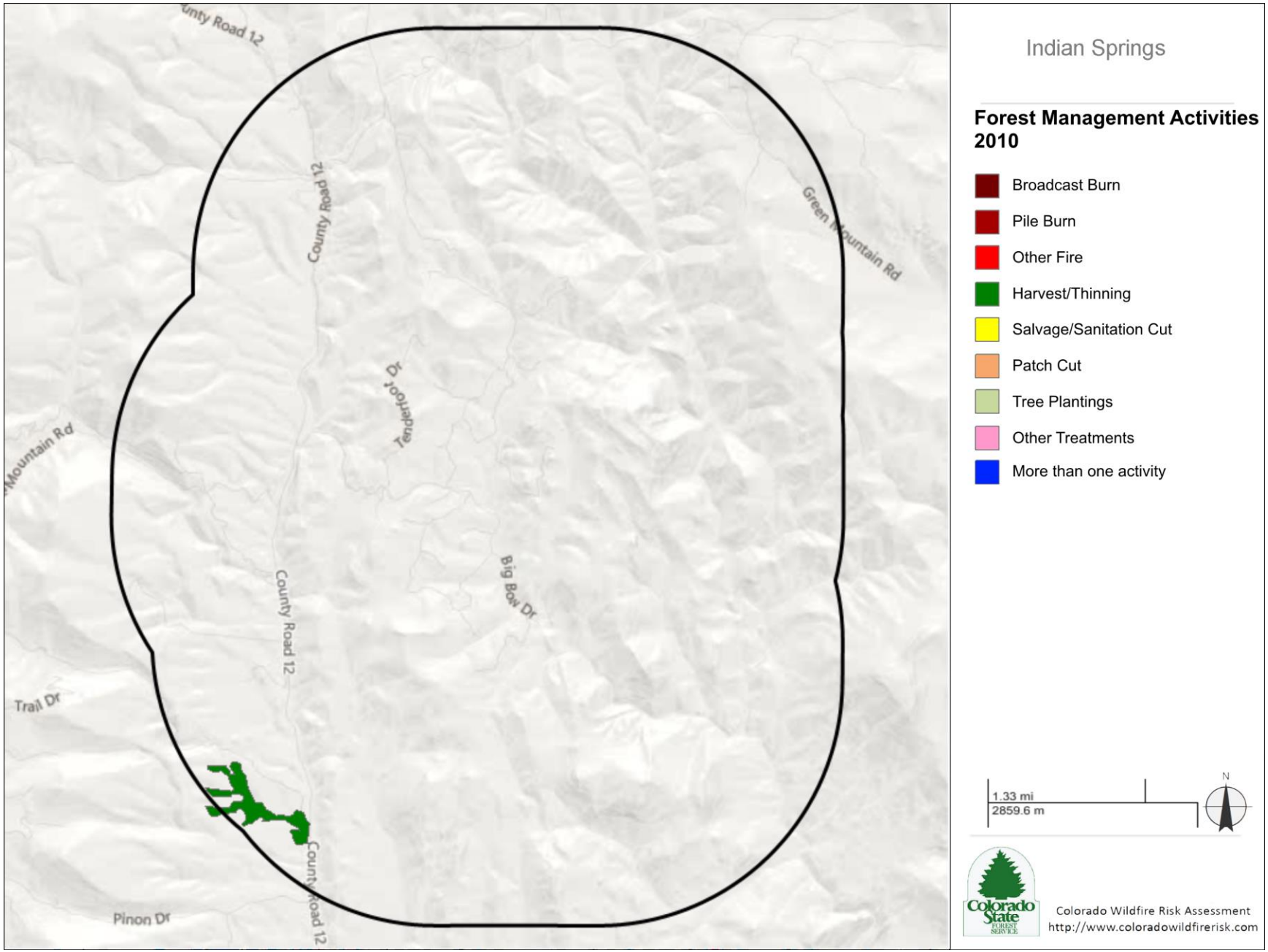


For the Indian Springs project area, there were 1 forest management activities conducted between 2008 and 2012. The following table provides a description of the activities.

Summary of Treatment Activities 2008 – 2102:

	Treatment Name	Treatment Type	Date	Description	Size (ac)
	F7-A (84.3 ac)	Harvest/Thinning	Jan 1, 2010	Additional project for the year will be a thinning in the understory at dirty gulch to open stand and attempt to regenerate Ponderosa Pine and Douglas Fir.	52
				Total Acres Treated	**52**


Indian Springs
Forest Management Activities
Acres
60
40
20
0
52
0
0
0
0
0
0
0
Broadcast Burn
Pile Burn
Other Fire
Harvest/Thinning
Salvage/Sanitation Cut
Patch Cut
Tree Plantings
Other Treatments


Indian Springs
Forest Management Activities 2010
Broadcast Burn
Pile Burn
Other Fire
Harvest/Thinning
Salvage/Sanitation Cut
Patch Cut
Tree Plantings
Other Treatments
More than one activity
1.33 mi
2859.6 m
N
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com
County Road 12
Green Mountain Rd
Sandertoot Dr
Big Bow Dr
Trail Dr
Pinon Dr

Wildfire Risk

Description

Wildfire Risk represents the possibility of loss or harm occurring from a wildfire. It is the primary output of the Colorado Wildfire Risk Assessment (Colorado WRA). Risk is derived by combining the Wildfire Threat and the Fire Effects assessment outputs. It identifies areas with the greatest potential impacts from a wildfire – i.e. those areas most at risk - considering all values and assets combined together.

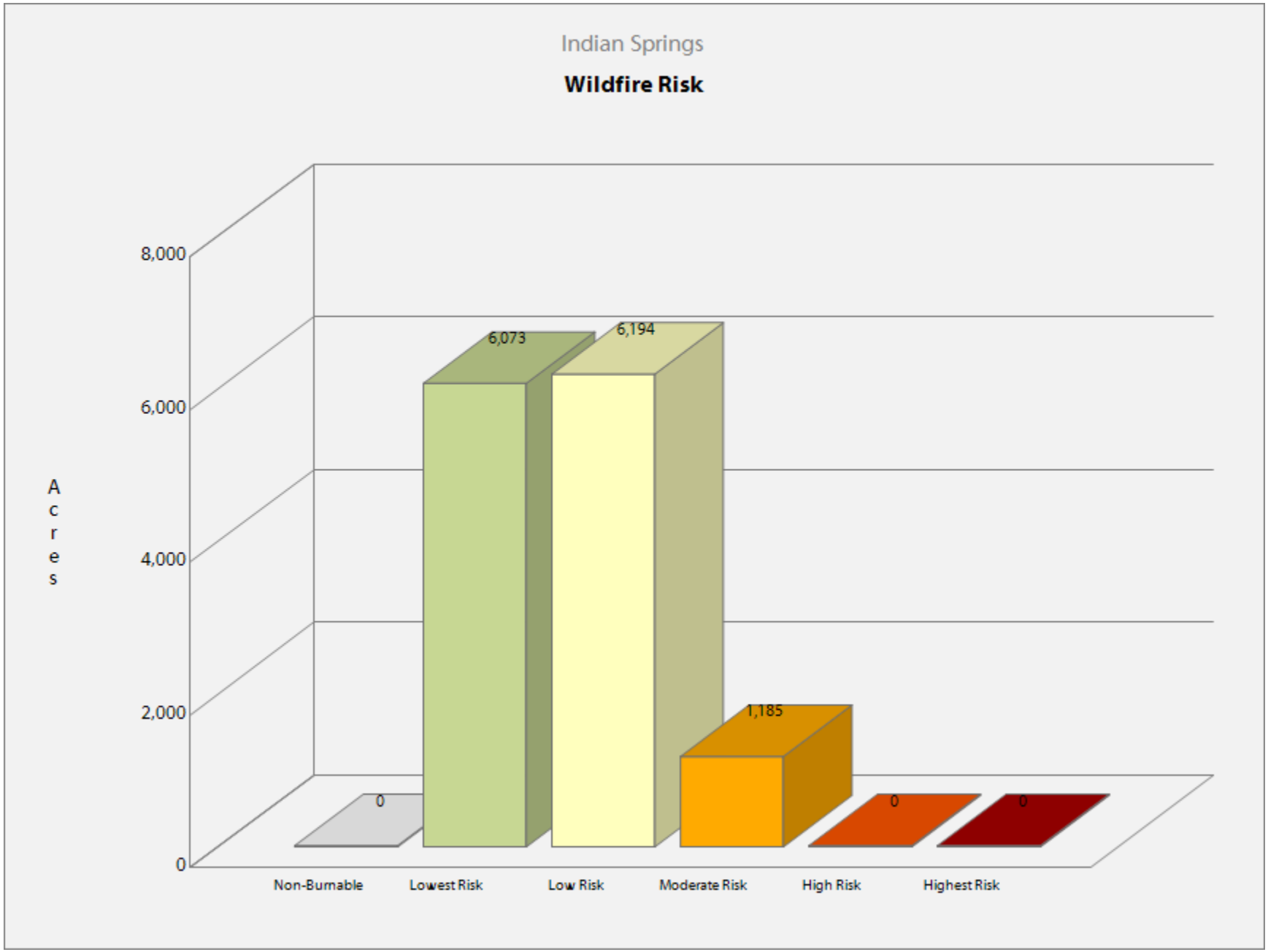
Wildfire Risk combines the likelihood of a fire occurring (threat), with those areas of most concern that are adversely impacted by fire (fire effects), to derive a single overall measure of wildfire risk.

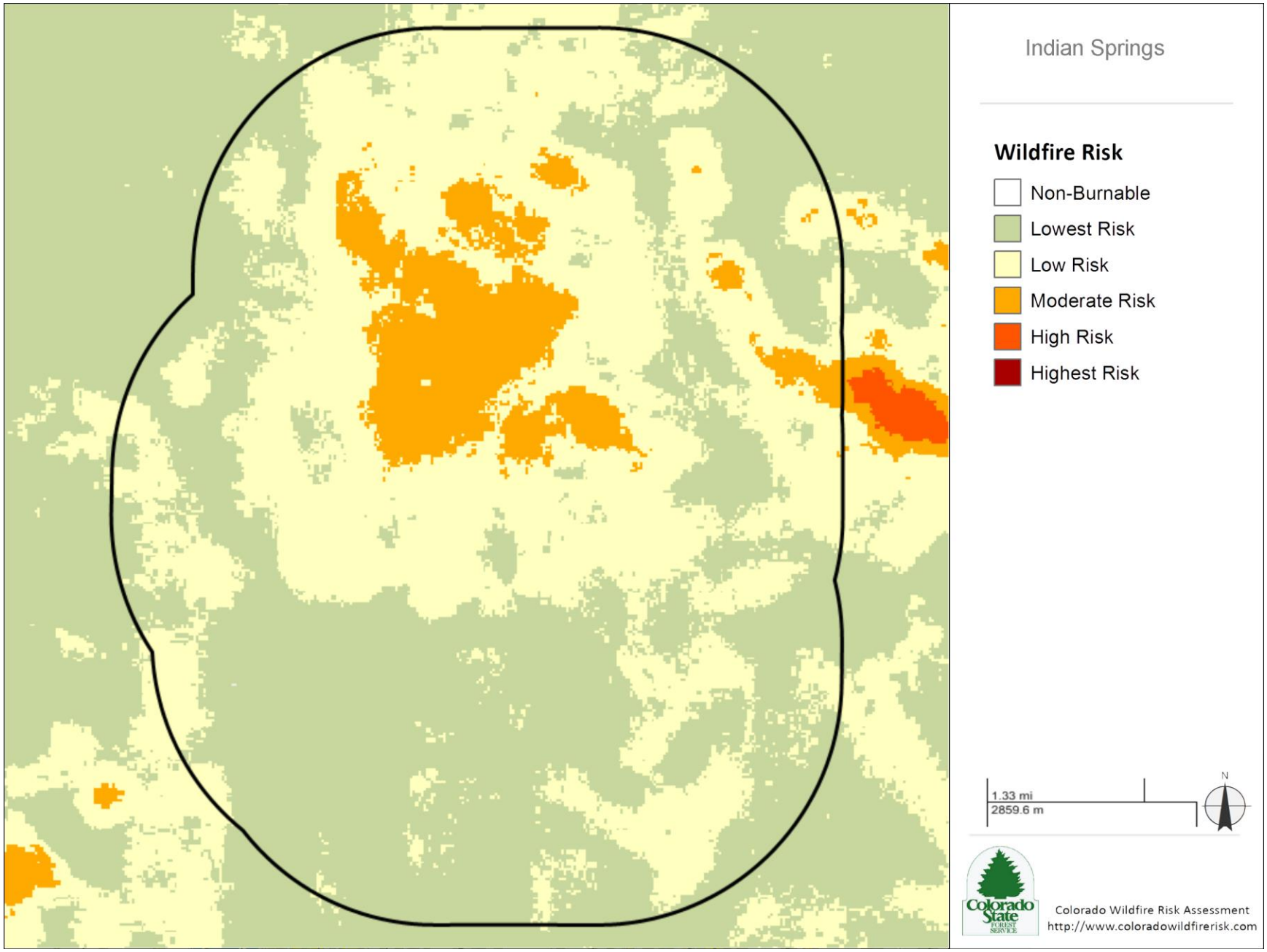
Since all areas in Colorado have risk calculated consistently, it allows for comparison and ordination of areas across the entire state.

Fire Effects are a key component of Wildfire Risk. Fire Effects are comprised of several inputs focusing on values and assets at risk. The purpose of Fire Effects is to identify those areas that have important values or assets that would be adversely impacted by a wildfire. Fire Effects inputs include Wildland Urban Interface, Forest Assets, Riparian Assets and Drinking Water Importance Areas (watersheds). Refer to the Values Impacted Rating for more information about Fire Effects.

To aid in the use of Wildfire Risk for planning activities, the output values are categorized into five (5) classes. These are given general descriptions from Lowest to Highest Risk.

	Wildfire Risk Class	Acres	Percent
	Non-Burnable	0	0.0 %
	Lowest Risk	6,073	45.1 %
	Low Risk	6,194	46.0 %
	Moderate Risk	1,185	8.8 %
	High Risk	0	0.0 %
	Highest Risk	0	0.0 %
	Total	**13,451**	**100.0 %**


Indian Springs
Wildfire Risk
Acres
8,000
6,000
4,000
2,000
0
6,073
6,194
1,185
0
0
0
Non-Burnable
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk


Indian Springs
Wildfire Risk
Non-Burnable
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Wildfire Threat

Description

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

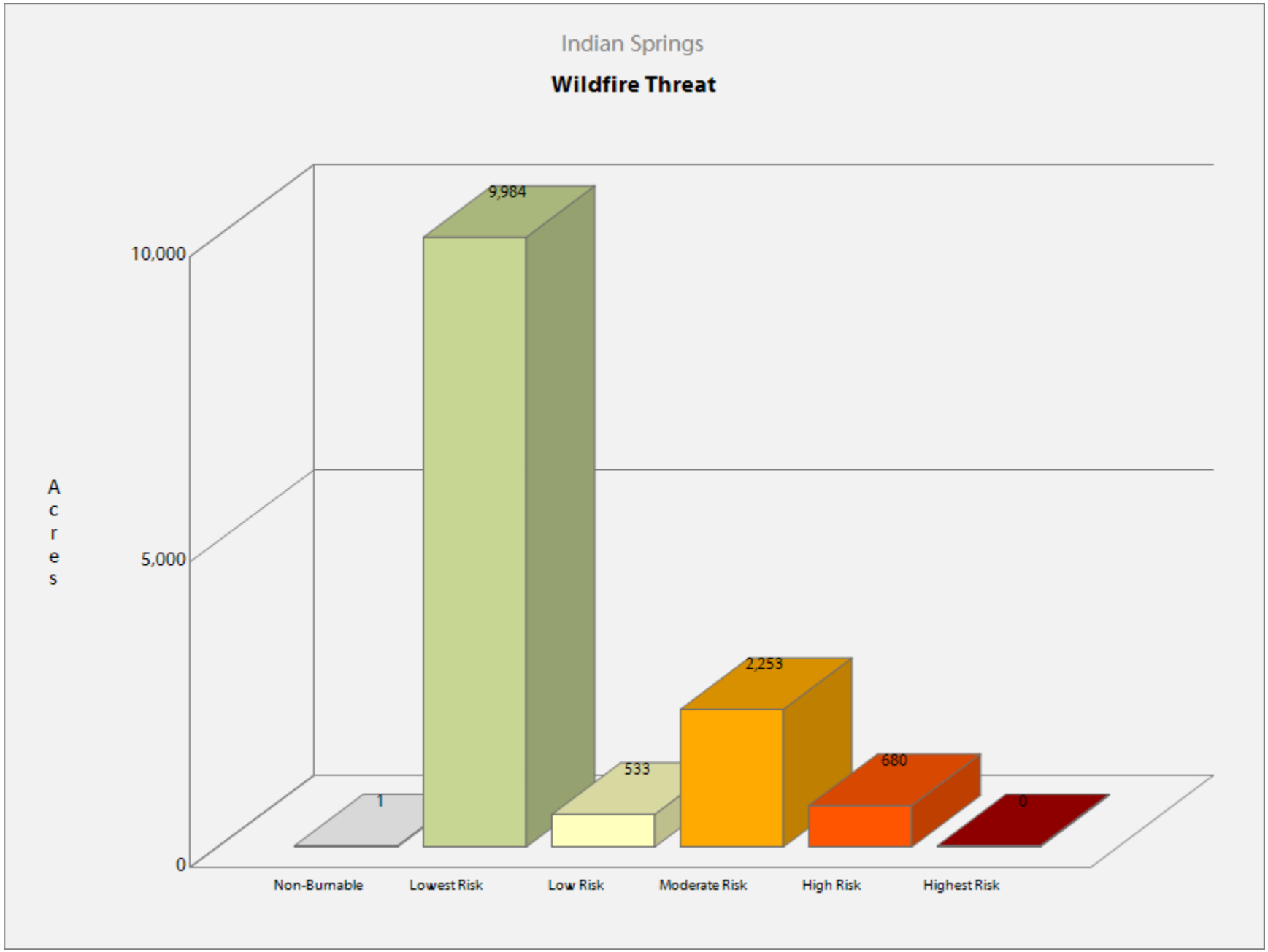
The measure of wildfire threat used in the Colorado WRA is called Fire Threat Index (FTI). FTI combines the probability of an acre igniting (Fire Occurrence) and the expected final fire size based on rate of spread in four weather percentile categories. Since all areas in Colorado have FTI calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high threat area in East Colorado is equivalent to a high threat area in West Colorado.

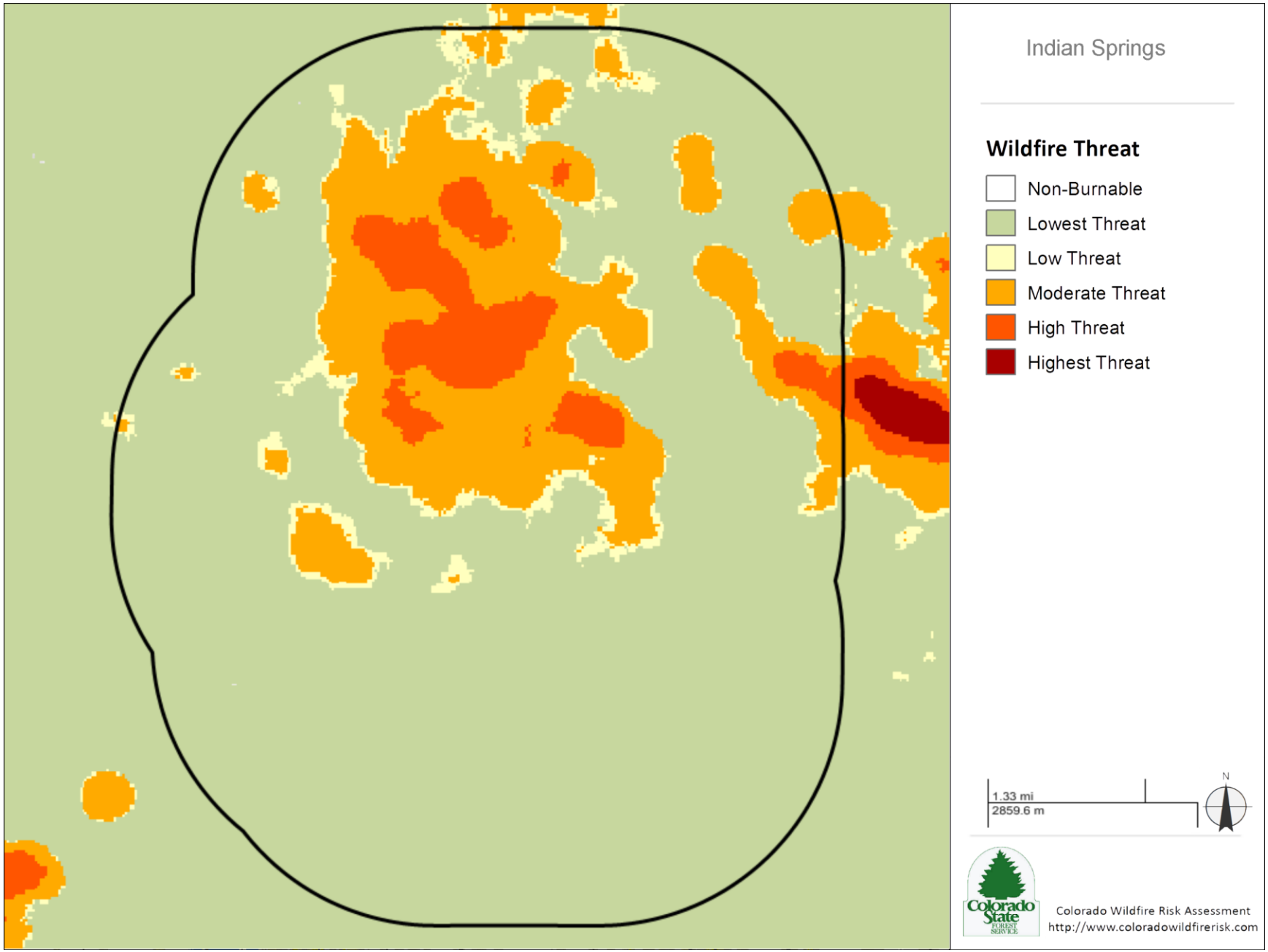
To aid in the use of Wildfire Threat for planning activities, the output values are categorized into five (5) classes. These are given general descriptions from Lowest to Highest Threat.

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

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

Wildfire Threat Class	Acres	Percent
Non-Burnable	1	0.0 %
Lowest Threat	9,984	74.2 %
Low Threat	533	4.0 %
Moderate Threat	2,253	16.7 %
High Threat	680	5.1 %
Highest Threat	0	0.0 %
Total	**13,451**	**13,451**


Indian Springs
Wildfire Threat
Acres
10,000
5,000
0
9,984
1
533
2,253
680
0
Non-Burnable
Lowest Risk
Low Risk
Moderate Risk
High Risk
Highest Risk


Indian Springs
Wildfire Threat
Non-Burnable
Lowest Threat
Low Threat
Moderate Threat
High Threat
Highest Threat
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
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Values Impacted Rating

Description

Represents those values or assets that would be adversely impacted by a wildfire. The Values Impacted Rating (VIR) is an overall Fire Effects rating that combines the risk ratings for Wildland Urban Interface (WUI), Forest Assets, Riparian Assets, and Drinking Water Importance Areas into a single measure of values-at-risk. The individual ratings for each value layer were derived using a Response Function approach.

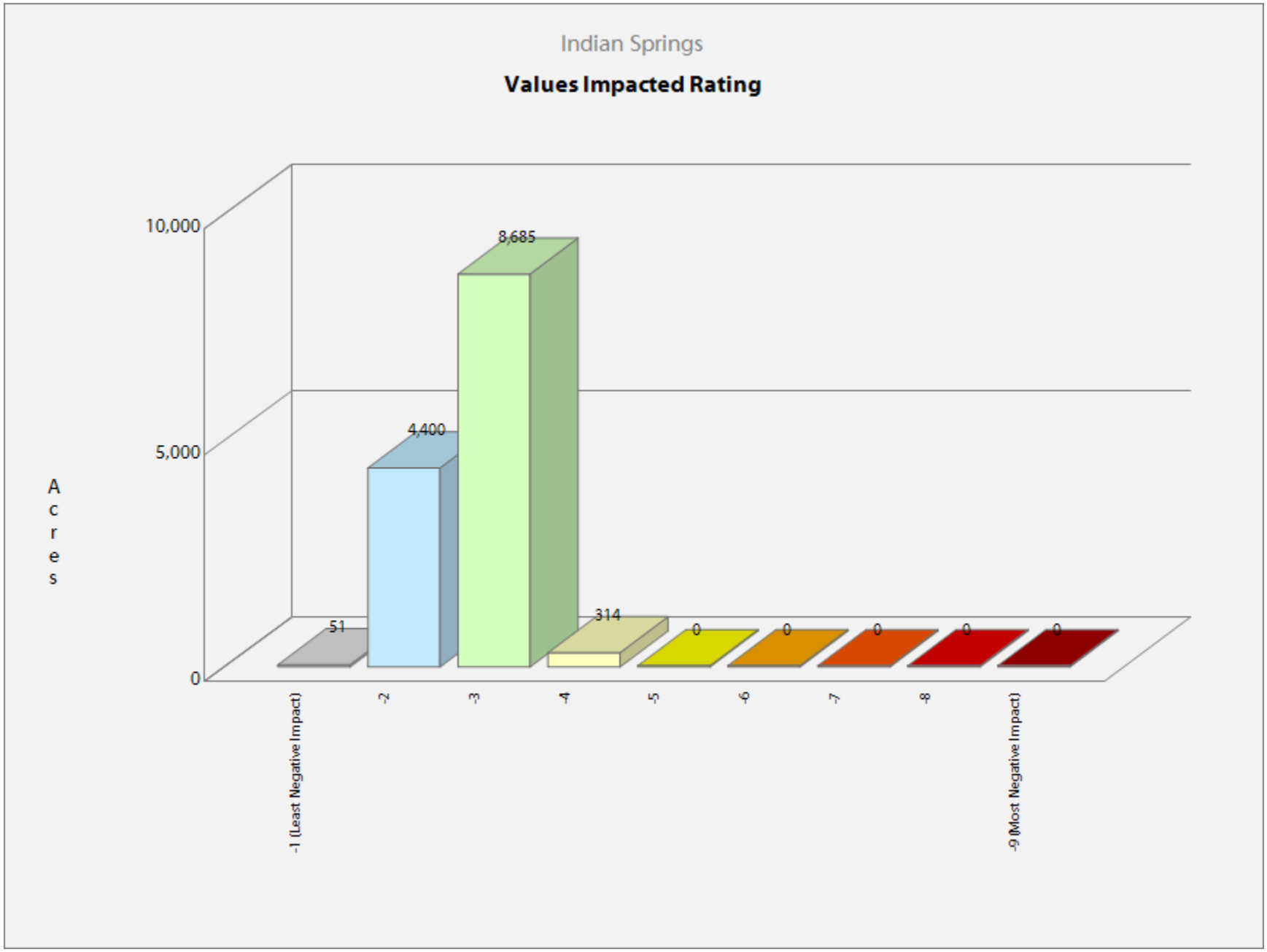
Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels. A resource or asset is any of the Fire Effects input layers, such as WUI, Forest Assets, etc. These net changes can be adverse (negative) or positive (beneficial).

Calculating the VIR at a given location requires spatially defined estimates of the intensity of fire integrated with the identified resource value. This interaction is quantified through the use of response functions that estimate expected impacts to resources or assets at the specified fire intensity levels. The measure of fire intensity level used in the Colorado assessment is flame length for a location. Response Function outputs were derived for each input data set and then combined to derive the Values Impacted Rating.

Different weightings are used for each of the input layers with the highest priority placed on protection of people and structures (i.e. WUI). The weightings represent the value associated with those assets. Weightings were developed by a team of experts during the assessment to reflect priorities for fire protection planning in Colorado. Refer to the Colorado WRA Final Report for more information about the layer weightings.

Since all areas in Colorado have the VIR calculated consistently, it allows for comparison and ordination of areas across the entire state. The VIR data was derived at a 30-meter resolution.

VIR Class	Acres	Percent
-1 (Least Negative Impact)	51	0.4 %
-2	4,400	32.7 %
-3	8,685	64.6 %
-4	314	2.3 %
-5	0	0.0 %
-6	0	0.0 %
-7	0	0.0 %
-8	0	0.0 %
-9 (Most Negative Impact)	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
Values Impacted Rating
Acres
10,000
5,000
0
51
4,400
8,685
314
0
0
0
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)


Indian Springs
Values Impacted Rating
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Suppression Difficulty Rating

Description

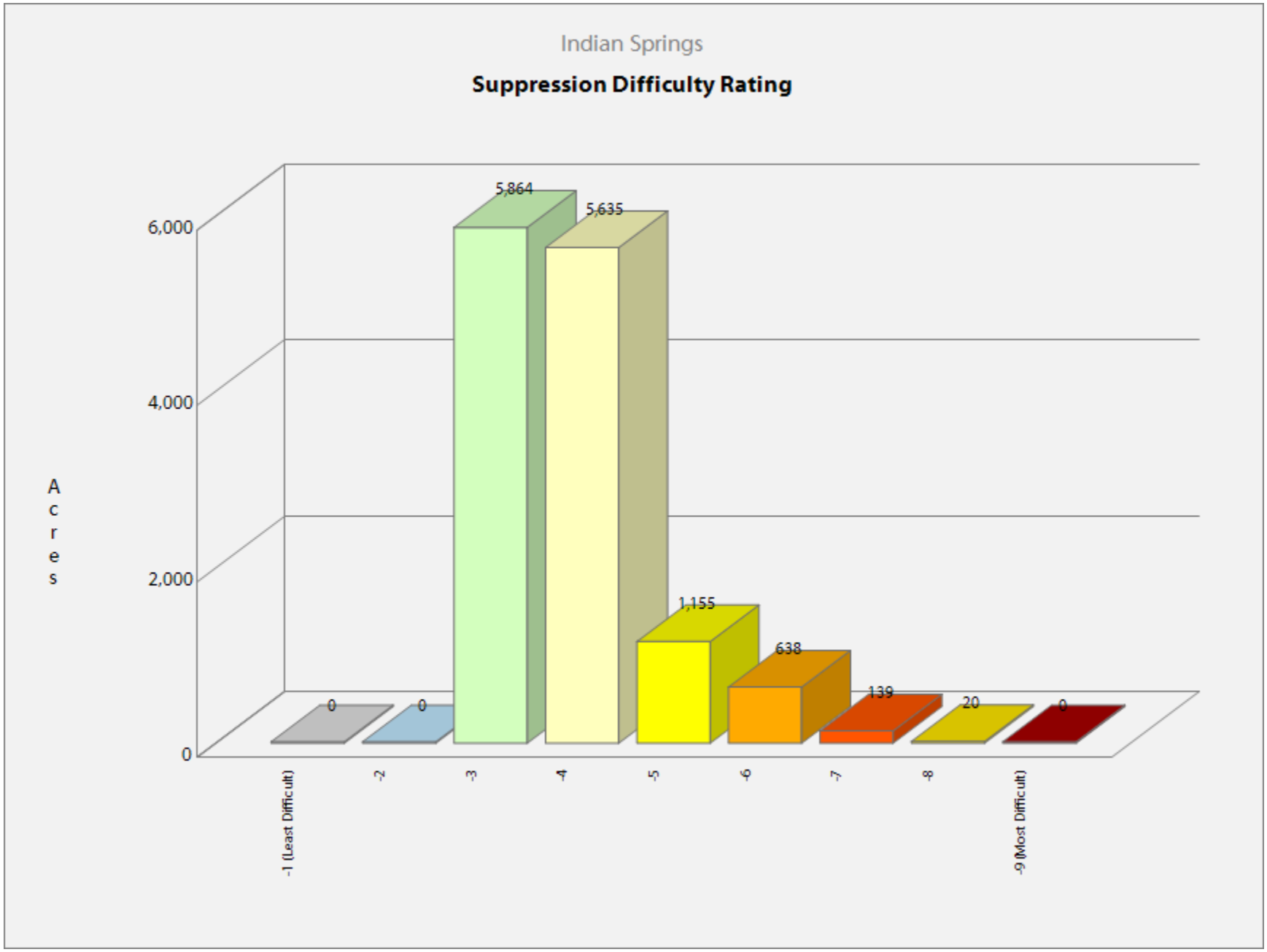
Reflects the difficulty or relative cost to suppress a fire given the terrain and vegetation conditions that may impact machine operability. This layer is an overall index that combines the slope steepness and the fuel type characterization to identify areas where it would be difficult or costly to suppress a fire due to the underlying terrain and vegetation conditions that would impact machine operability (in particular Type II dozer).

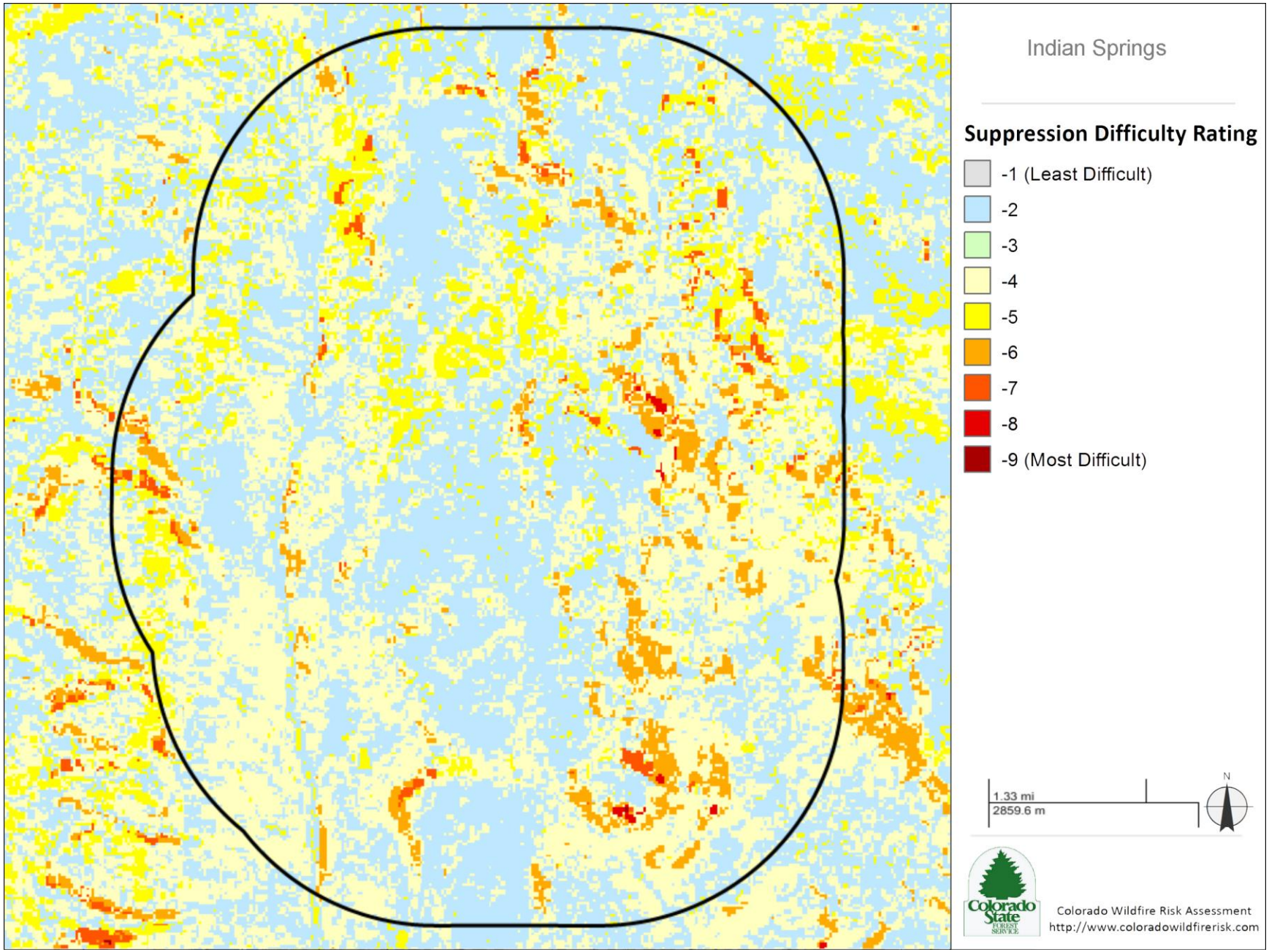
The rating was calculated based on the fireline production rates for hand crews and engines with modifications for slope, as documented in the NWCG Fireline Handbook 3, PMS 401-1.

The burnable fuel models in the Colorado WRA were grouped into three categories: slow (0-66 feet), medium (67-165 feet) and fast (greater than 165 feet).

Fireline production capability on five slope classes was used as the basic reference to obtain the suppression difficulty score. To remain constant with the Value Impacted Rating output values, a response function (-1 to –9) is assigned to each combination of fuel model group (slow, medium and fast) and slope category.

SDR Class	Acres	Percent
-1 (Least Difficult)	0	0.0 %
-2	0	0.0 %
-3	5,864	43.6 %
-4	5,635	41.9 %
-5	1,155	8.6 %
-6	638	4.7 %
-7	139	1.0 %
-8	20	0.1 %
-9 (Most Difficult)	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
Suppression Difficulty Rating
Acres
6,000
4,000
2,000
0
5,864
5,635
1,155
638
139
20
0
0
0
-1 (Least Difficult)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Difficult)


Indian Springs
Suppression Difficulty Rating
-1 (Least Difficult)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Difficult)
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Fire Occurrence

Description

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

Historic fire report data was used to create the ignition points for all Colorado fires. Data was obtained from the West Wide Risk Assessment project. The compiled fire occurrence database was cleaned to remove duplicate records and to correct inaccurate locations. The database was then modeled to create a density map reflecting historical fire ignition rates.

The measure of fire occurrence used in the Colorado WRA is called Fire Occurrence. Since all areas in Colorado have ignition density calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high occurrence area in East Colorado is equivalent to a high occurrence area in West Colorado.

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

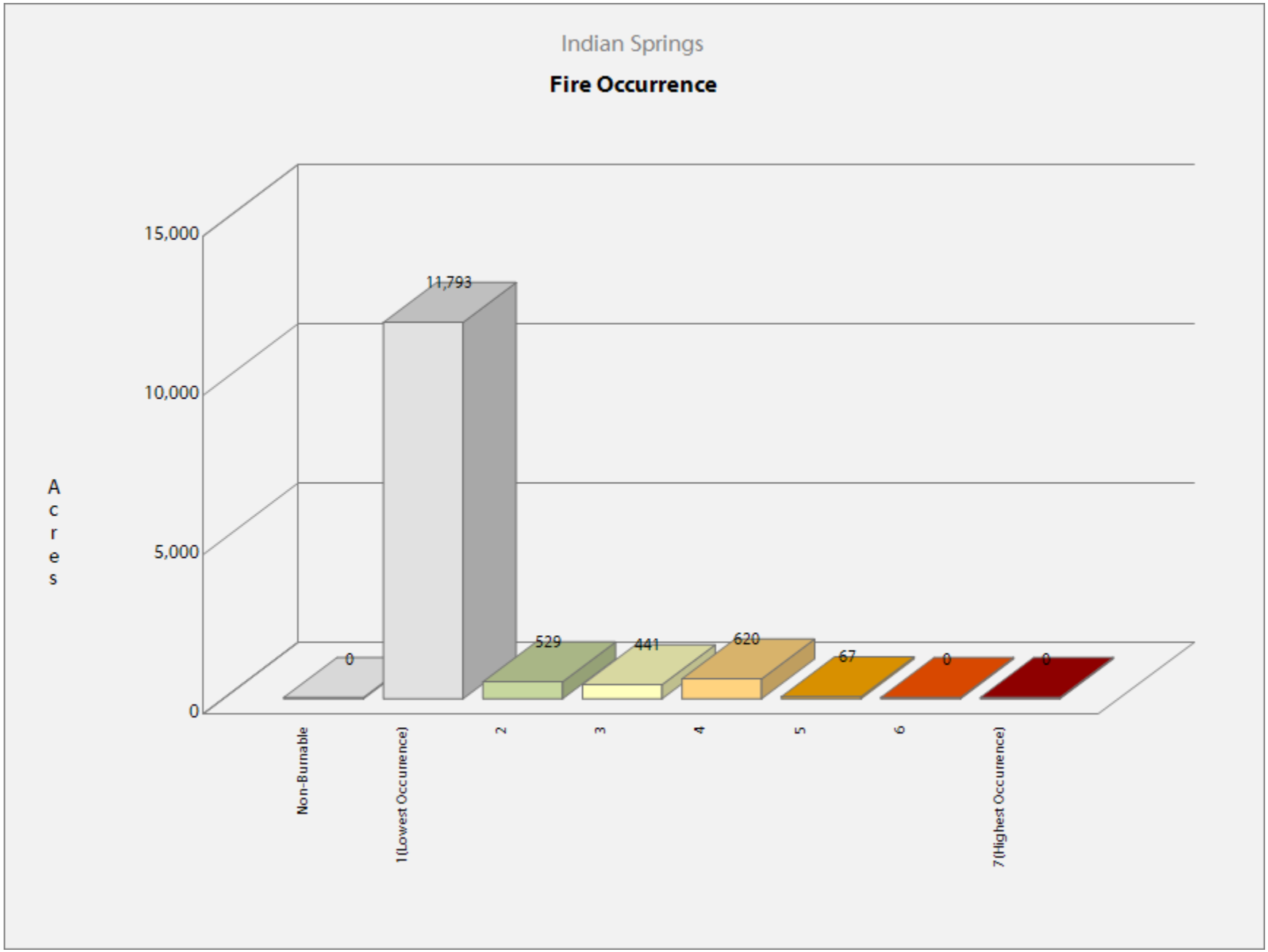
To aid in the use of wildfire ignition density for planning activities, the output values are categorized into seven (7) classes reflecting average annual ignition rates. These are given general descriptions from Low to Very High. Seven classes are used to present finer detail for mapping purposes so that transitional areas can be easily identified.

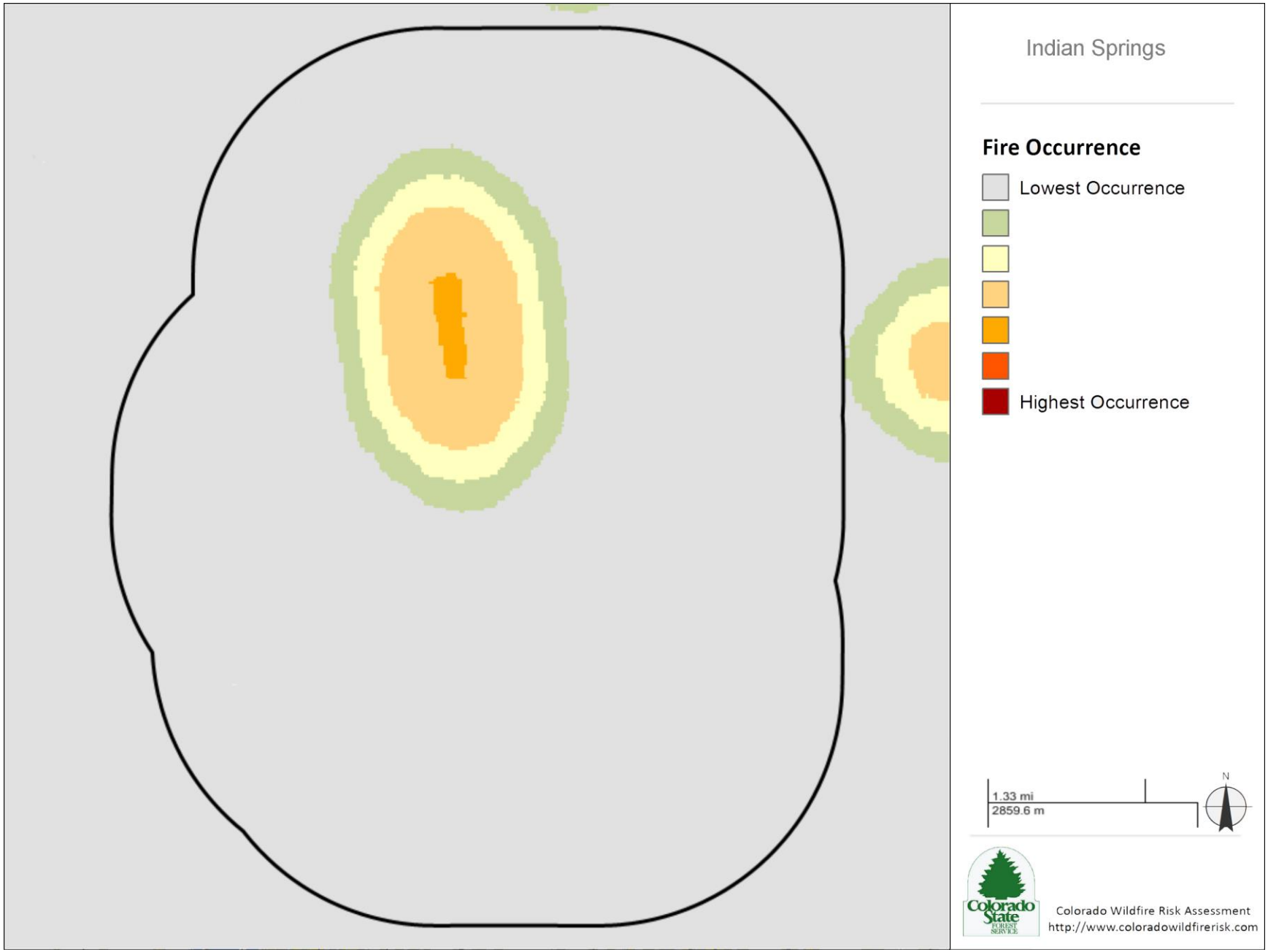
The class breaks are determined by analyzing the Fire Occurrence output values for the entire state and determining cumulative percent of acres (i.e. Class 7 has the top 3.5% of acres with the highest occurrence rate). Refer to the Colorado WRA Final Report for a more detailed description of the mapping classes and the methods used to derive these.

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

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

Fire Occurrence Class	Acres	Percent
Non-Burnable	0	0.0 %
1 (Lowest Occurrence)	11,793	87.7 %
2	529	3.9 %
3	441	3.3 %
4	620	4.6 %
5	67	0.5 %
6	0	0.0 %
7 (Highest Occurrence)	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
Fire Occurrence
Acres
15,000
10,000
5,000
0
11,793
0
529
441
620
67
0
0
Non-Burnable
1(Lowest Occurrence)
2
3
4
5
6
7(Highest Occurrence)


Indian Springs
Fire Occurrence
Lowest Occurrence
Highest Occurrence
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Fire History Statistics

Description

Fire history statistics provide insight as to the number of fires, acres burned and cause of fires in Colorado. 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.

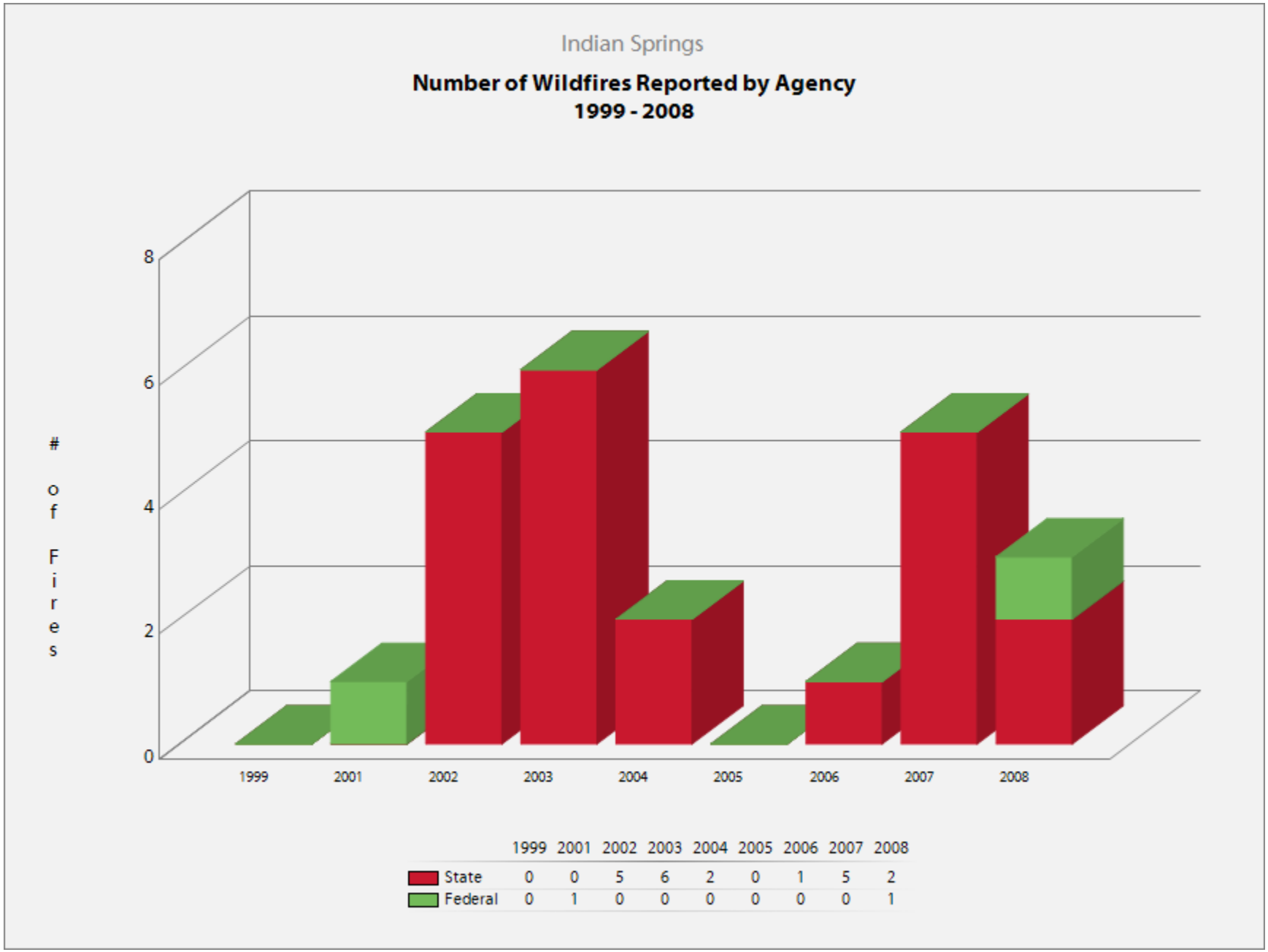
Ten years of historic fire report data was used to create the fire occurrence summary charts. Wildfire Ignition data was compiled from federal and local sources for the years 1999 through 2008. Federal wildfire ignitions were spatially referenced by latitude and longitude coordinates, and state and local wildfire ignitions were spatially referenced by zip code. All ignitions references were updated to remove duplicate records and correct inaccurate locations.

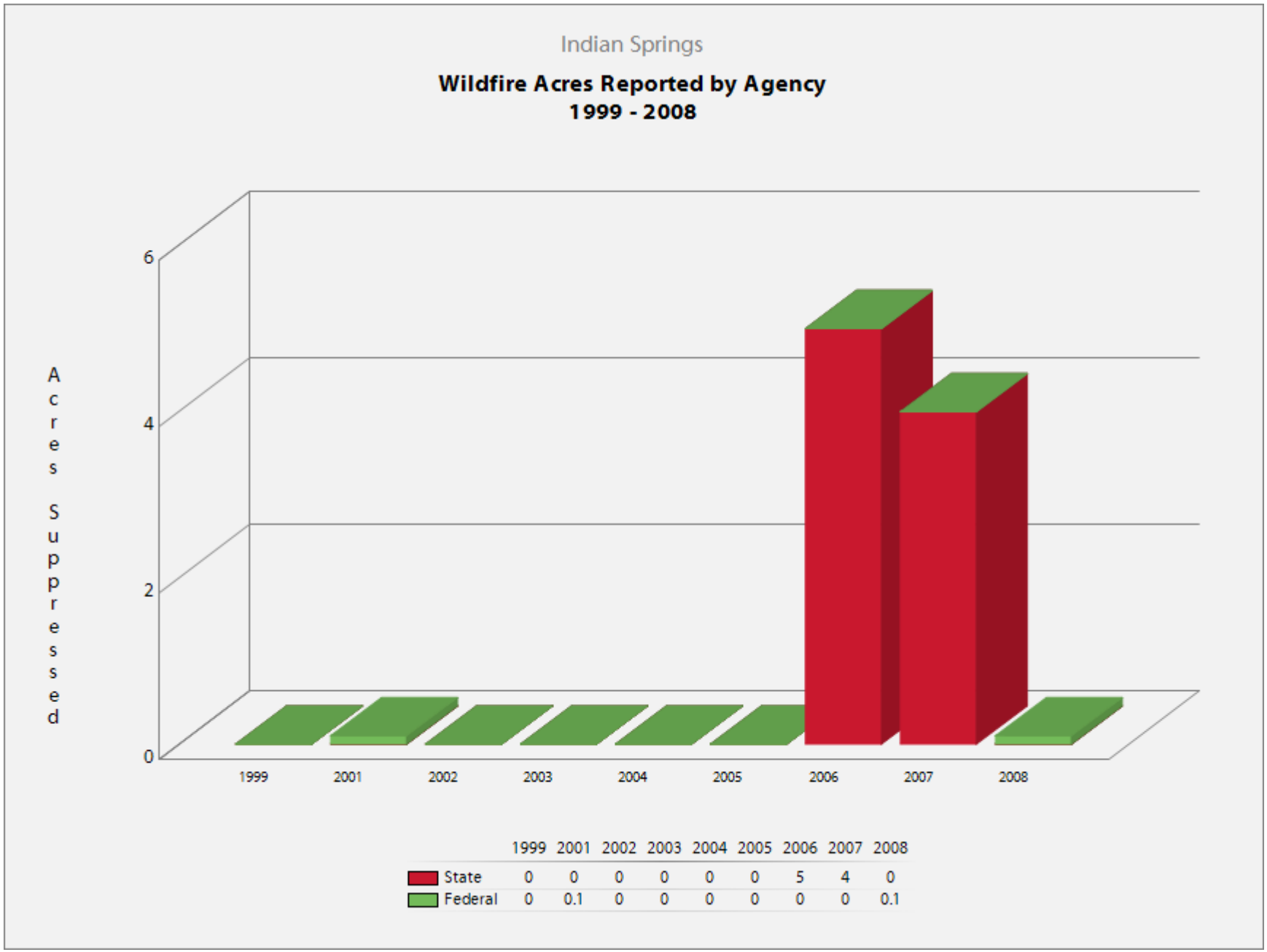
Federal wildfire ignitions are symbolized in CO-WRAP by the cause of fire. Fire reports were gathered from the following federal data sources:

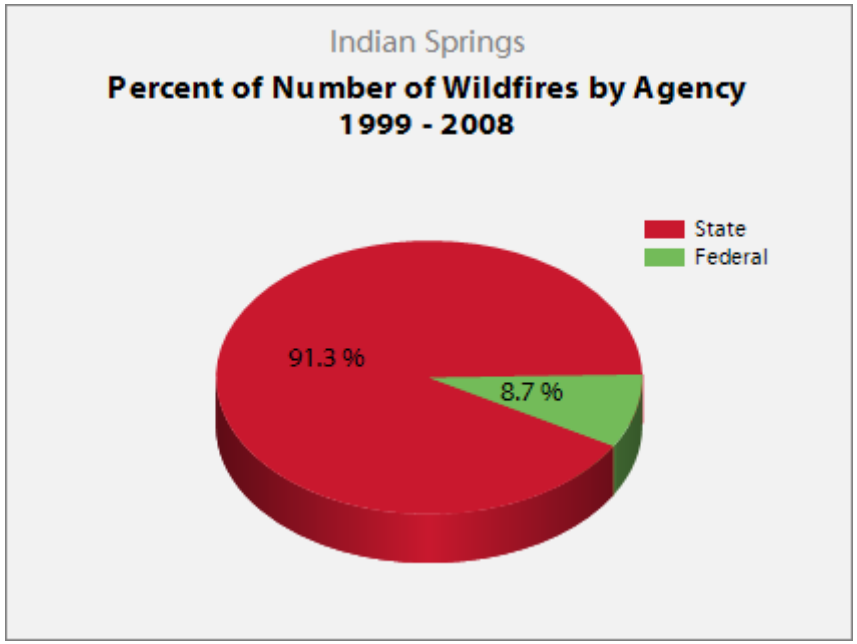
- US Forest Service
- US Fish and Wildlife Service
- Bureau of Land Management
- Bureau of Indian Affairs
- National Park Service

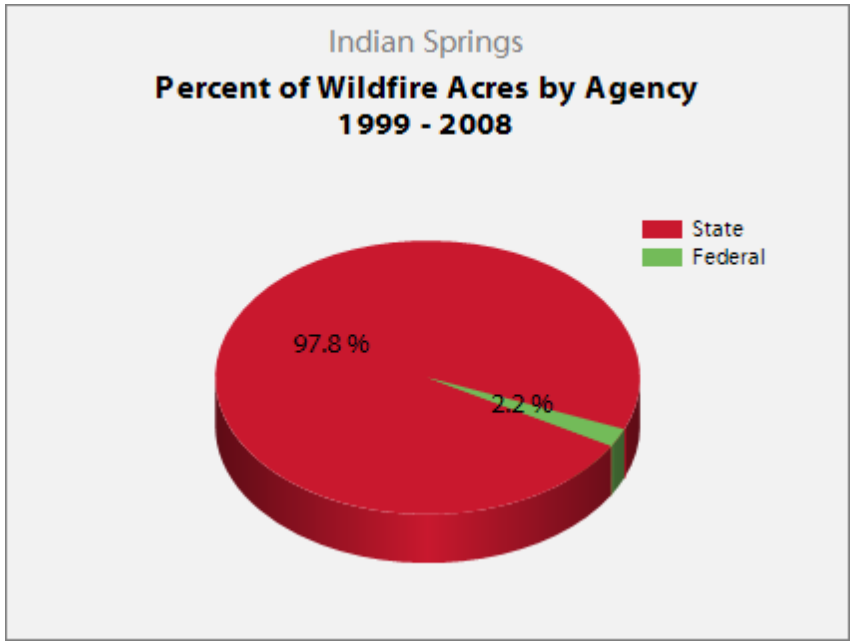
State wildfire ignitions were gathered from fire department reports submitted by:

- Volunteer Fire Departments
- Combination Fire Departments (paid and volunteer)
- Paid Fire Departments
- Fire Protection Districts
- Counties


Indian Springs
Number of Wildfires Reported by Agency
1999 - 2008
# of Fires
0
2
4
6
8
1999
2001
2002
2003
2004
2005
2006
2007
2008
1999 2001 2002 2003 2004 2005 2006 2007 2008
State 0 0 5 6 2 0 1 5 2
Federal 0 1 0 0 0 0 0 0 1

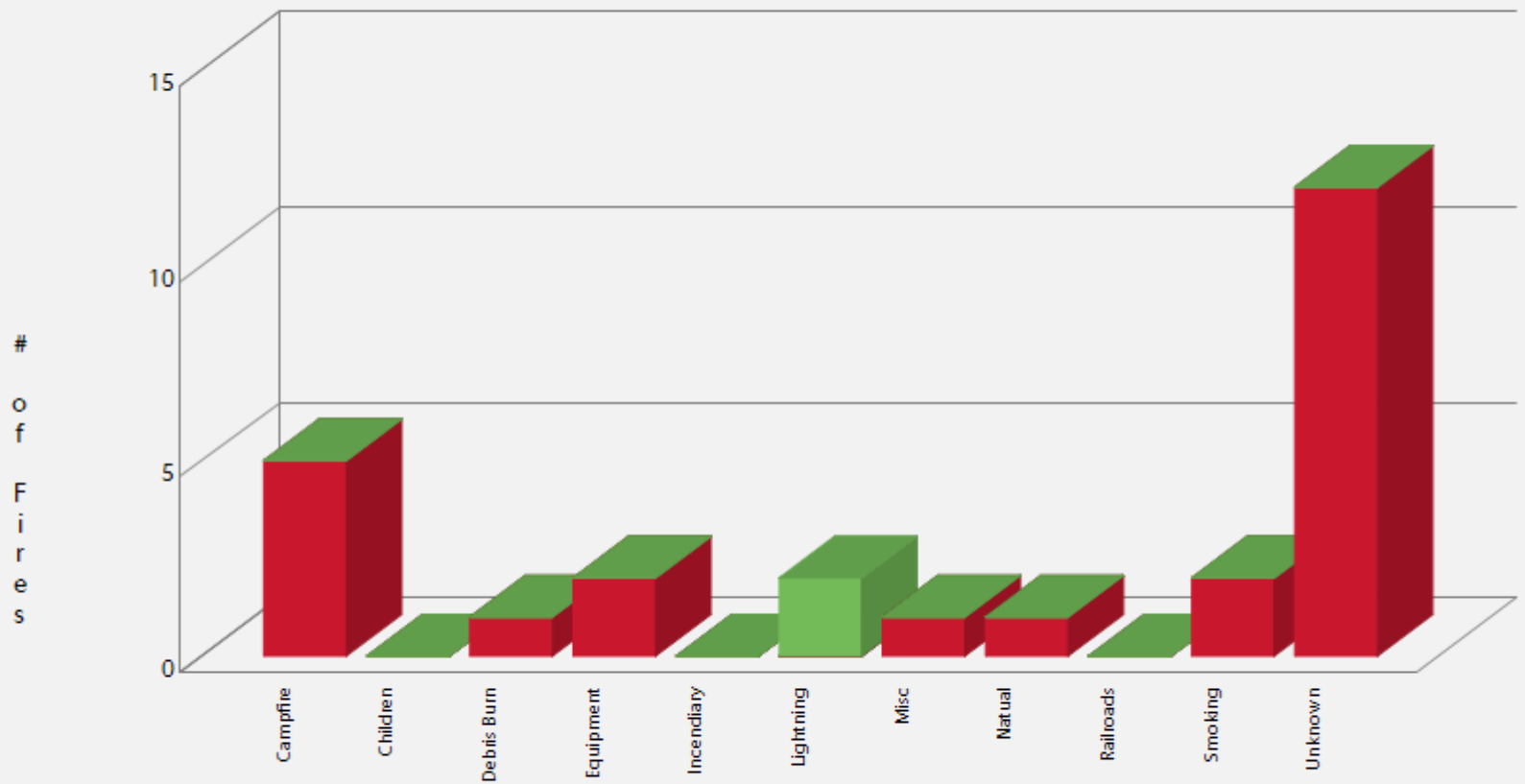

Indian Springs
Wildfire Acres Reported by Agency
1999 - 2008
Acres Suppressed
6
4
2
0
1999
2001
2002
2003
2004
2005
2006
2007
2008
1999 2001 2002 2003 2004 2005 2006 2007 2008
State 0 0 0 0 0 0 5 4 0
Federal 0 0.1 0 0 0 0 0 0 0.1


Indian Springs
Percent of Number of Wildfires by Agency
1999 - 2008
State
Federal
91.3 %
8.7 %

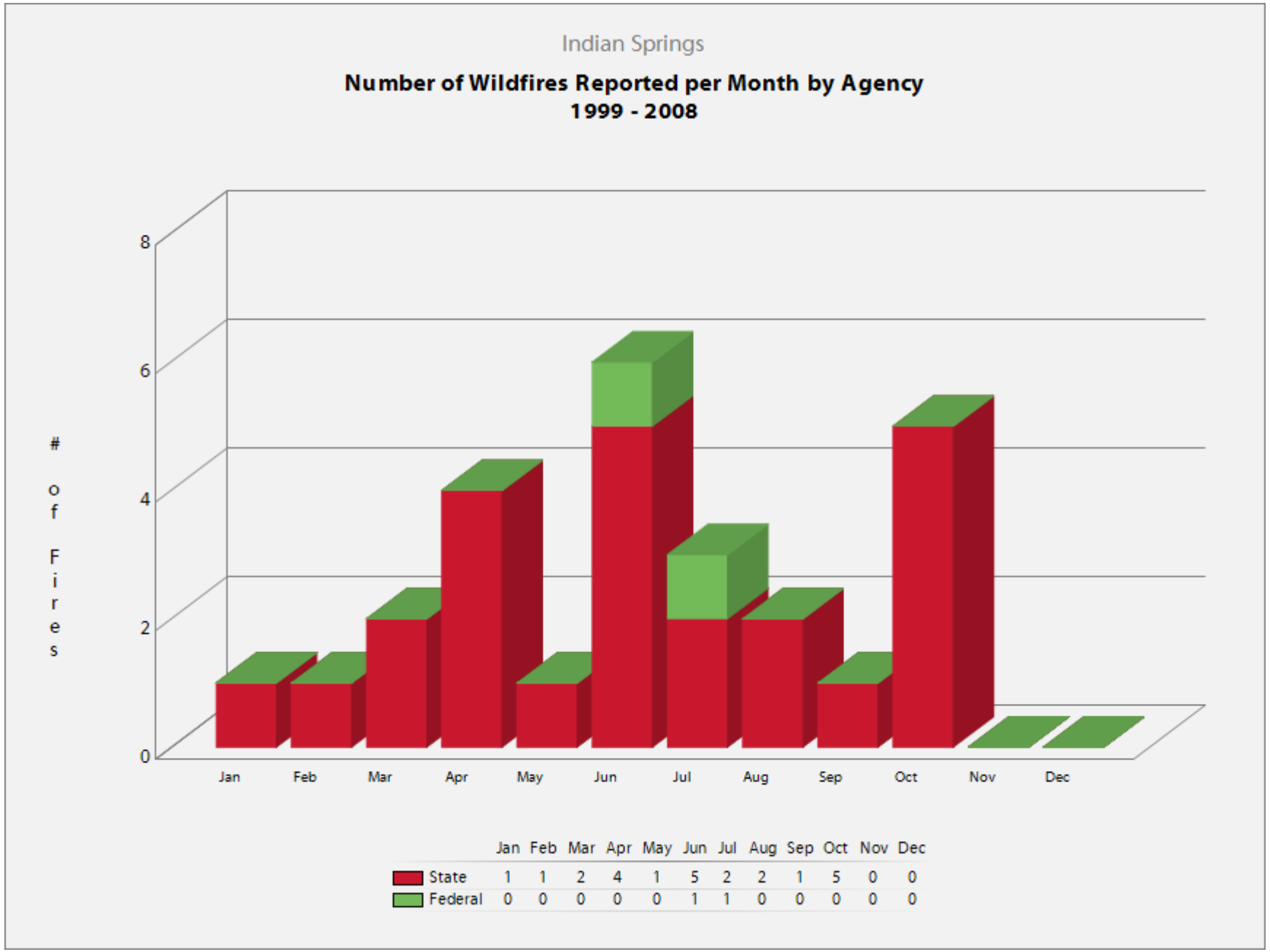

Indian Springs
Percent of Wildfire Acres by Agency
1999 - 2008
State
Federal
97.8 %
2.2 %

Indian Springs

Cause of Wildfires Reported by Agency
1999 - 2008



	Campfire	Children	Debris Burn	Equipment	Incendiary	Lightning	Misc	Natual	Railroads	Smoking	Unknown
State	5	0	1	2	0	0	1	1	0	2	12
Federal	0	0	0	0	0	2	0	0	0	0	0



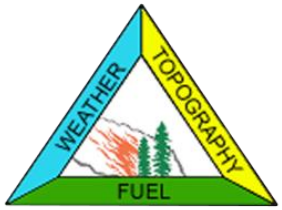
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
State	1	1	2	4	1	5	2	2	1	5	0	0
Federal	0	0	0	0	0	1	1	0	0	0	0	0

Fire Behavior

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 Colorado WRA include fire type, rate of spread, flame length and fireline intensity (fire intensity scale). These metrics are used to determine the potential fire behavior under different weather scenarios. Areas that exhibit moderate to high fire behavior potential can be identified for mitigation treatments, especially if these areas are in close proximity to homes, business, or other assets.

Fuels

The Colorado WRA includes composition and characteristics for both surface fuels and canopy fuels. Assessing canopy fire potential and surface fire potential allows identification of areas where significant increases in fire behavior affects the potential of a fire to transition from a surface fire to a canopy fire.

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

- **Surface Fuels** are typically categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter, and 4) slash. They are generally referred to as fire behavior fuel models and 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 is the average height of the dominant and co-dominant trees in a stand. It is used to compute wind reduction to mid-flame 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 sufficient canopy fuel exists to vertically propagate fire (Scott & Reinhardt, 2001). Canopy base height is a property of a plot, stand or group of trees, not an individual tree. For fire modeling, canopy base height is an effective value that incorporates ladder fuels, such as tall shrubs and small trees. Canopy base height is used to determine whether 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 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 time-lag fuel moistures, herbaceous fuel moisture, woody fuel moisture and the 20-foot, 10-minute average wind speed. To collect this information, weather influence zones were established across the state. A weather influence zone is an area where, for analysis, the weather on any given day is considered uniform.

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

The four percentile weather categories include:

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

For a detailed description of the methodology, refer to the WWA Final Report at www.ColoradoWildfireRisk.com.

Topography

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

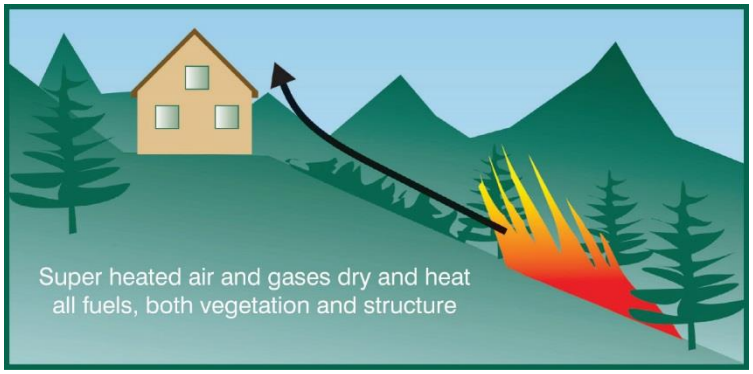
FIRE BEHAVIOR CHARACTERISTICS

Fire behavior characteristics provided in this report include:

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

Characteristic Rate of Spread

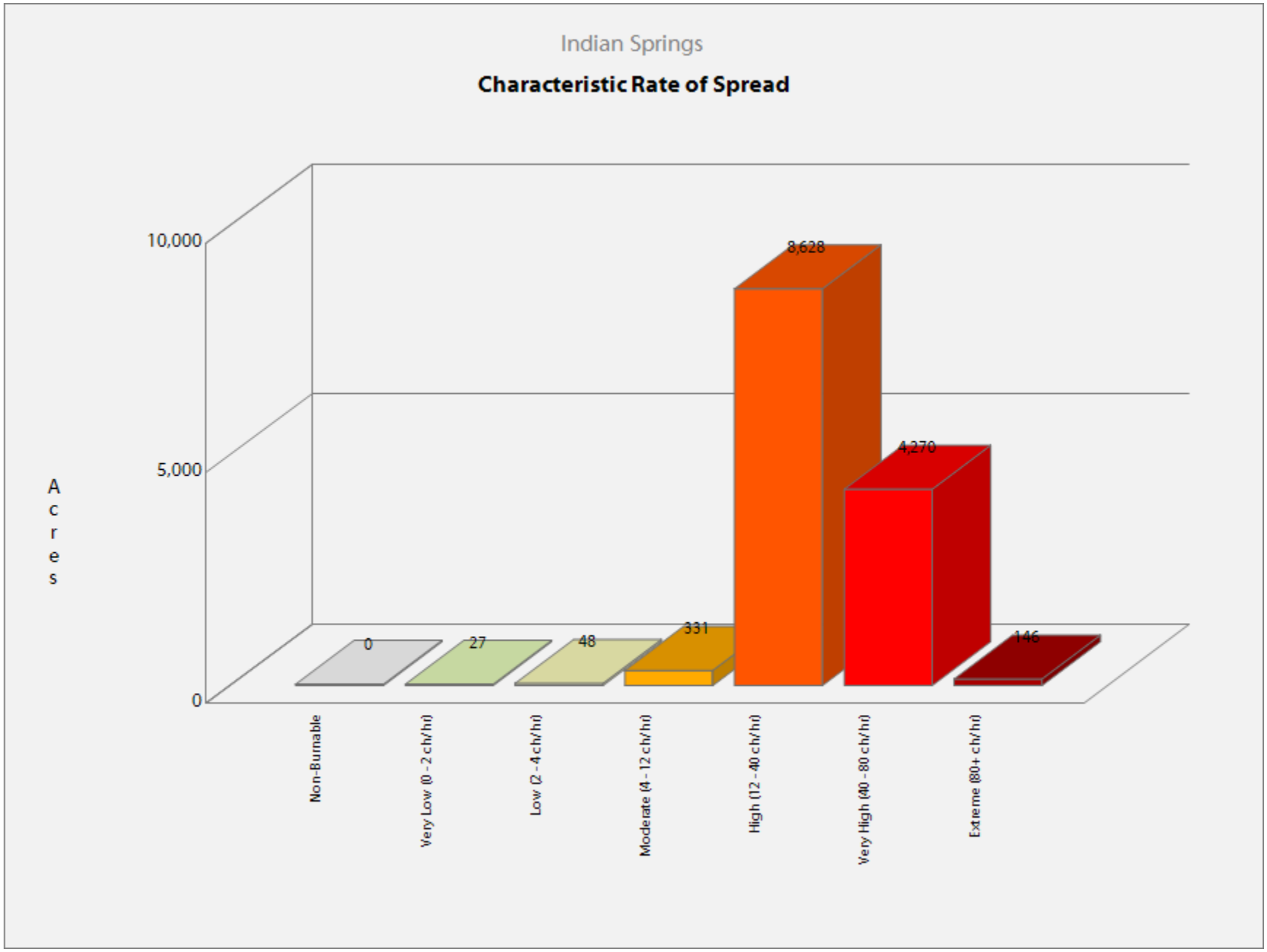
Characteristic Rate of Spread is the typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories. Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour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

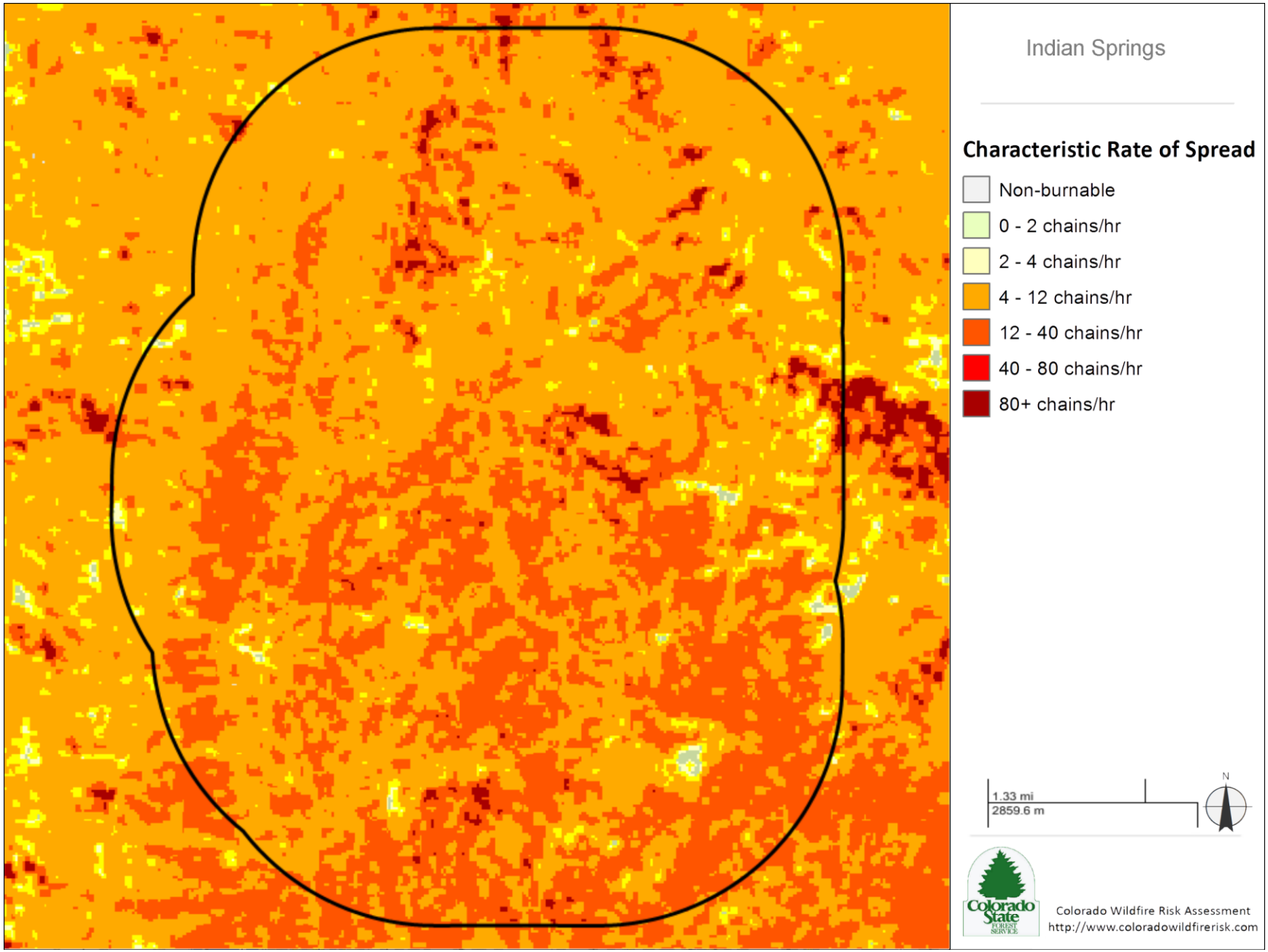


Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 11 weather influence zones in Colorado.

This output represents the weighted average for all four weather percentiles. While not shown in this report, the individual percentile weather ROS outputs are available in the Colorado WRA data.

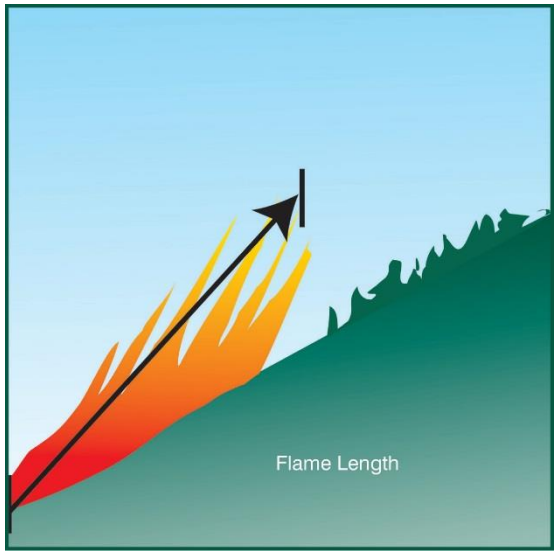
Rate of Spread	Acres	Percent
Non-Burnable	0	0.0 %
Very Low (0 - 2 ch/hr)	27	0.2 %
Low (2 - 4 ch/hr)	48	0.4 %
Moderate (4 - 12 ch/hr)	331	2.5 %
High (12 - 40 ch/hr)	8,628	64.1 %
Very High (40 - 80 ch/hr)	4,270	31.7 %
Extreme (80+ ch/hr)	146	1.1 %
Total	**13,451**	**100.0 %**


Indian Springs
Characteristic Rate of Spread
Acres
10,000
5,000
0
0
27
48
331
8,628
4,270
146
Non-Burnable
Very Low (0 - 2 ch/hr)
Low (2 - 4 ch/hr)
Moderate (4 - 12 ch/hr)
High (12 - 40 ch/hr)
Very High (40 - 80 ch/hr)
Extreme (80+ ch/hr)


Indian Springs
Characteristic Rate of Spread
Non-burnable
0 - 2 chains/hr
2 - 4 chains/hr
4 - 12 chains/hr
12 - 40 chains/hr
40 - 80 chains/hr
80+ chains/hr
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Characteristic Flame Length

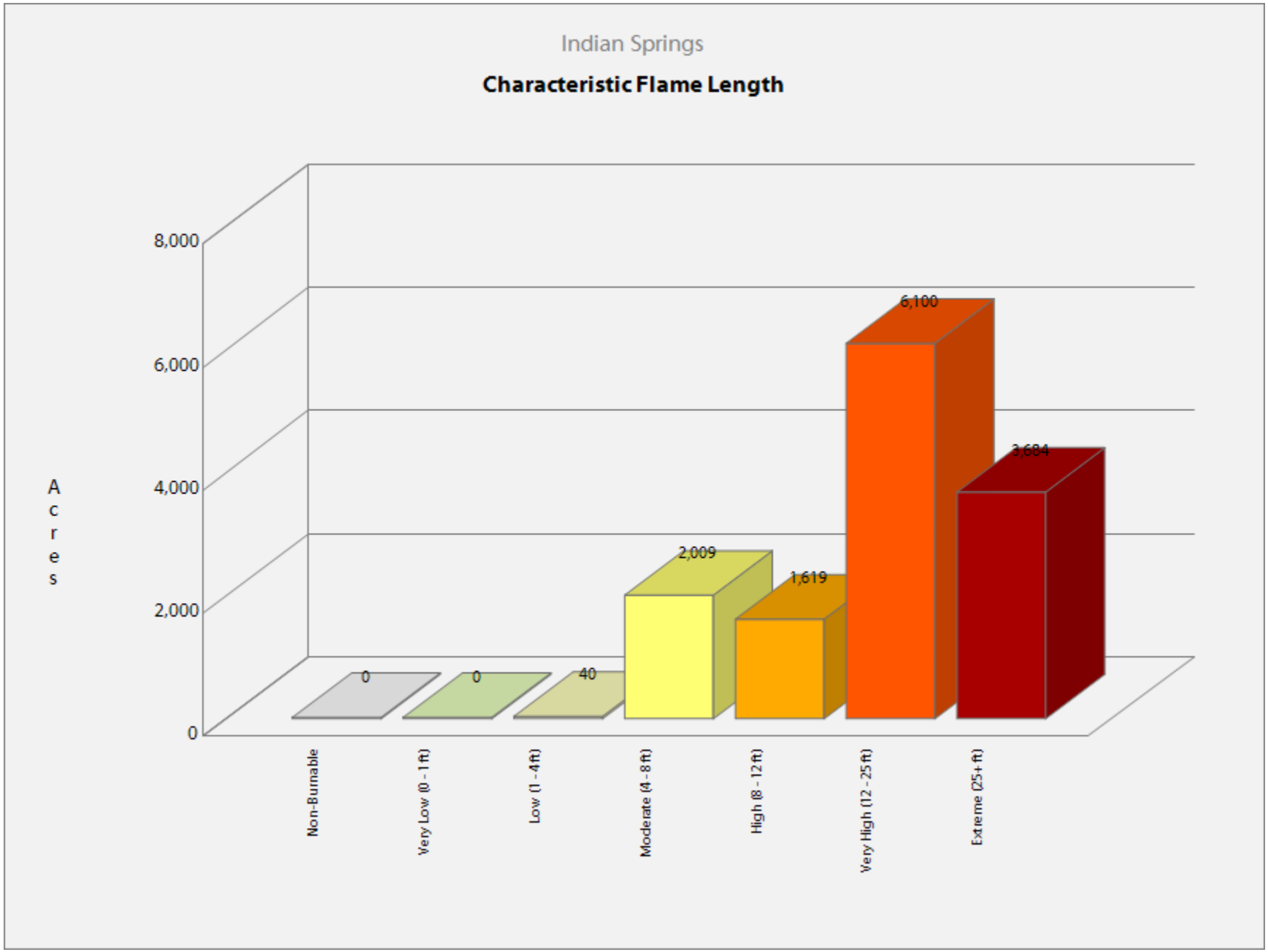
Characteristic Flame Length is the typical or representative flame length of a potential fire based on a weighted average of four percentile weather categories. Flame Length is defined as the distance between the flame tip and the midpoint of the flame depth at the base of the flame, which is generally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

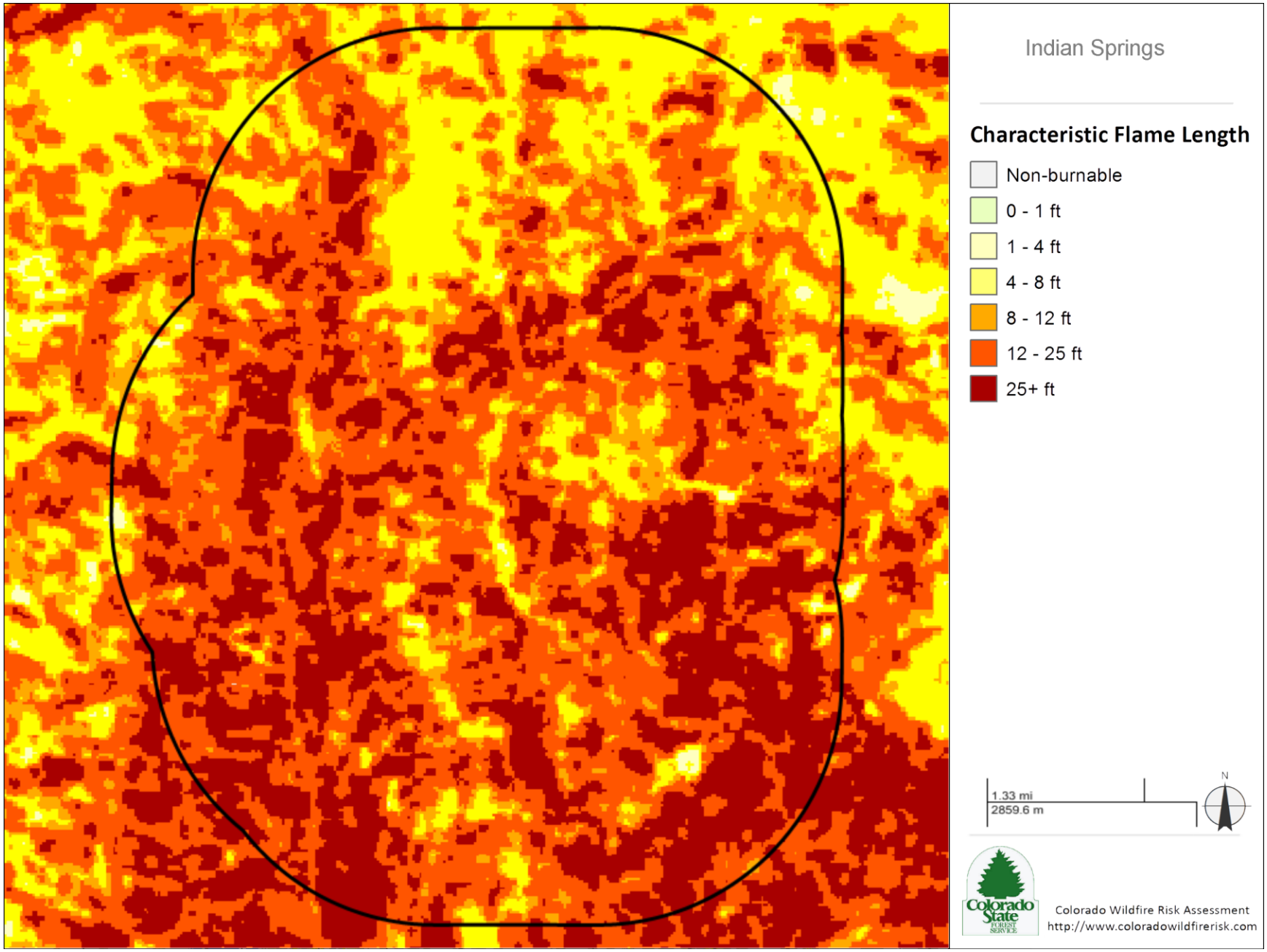


Flame length is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 11 weather influence zones in Colorado.

This output represents the weighted average for all four weather percentiles. While not shown in this report, the individual percentile weather Flame Length outputs are available in the Colorado WRA data.

Flame Length	Acres	Percent
Non-Burnable	0	0.0 %
Very Low (0 - 1 ft)	0	0.0 %
Low (1 - 4 ft)	40	0.3 %
Moderate (4 - 8 ft)	2,009	14.9 %
High (8 - 12 ft)	1,619	12.0 %
Very High (12 - 25 ft)	6,100	45.3 %
Extreme (25+ ft)	3,684	27.4 %
Total	**13,451**	**100.0 %**


Indian Springs
Characteristic Flame Length
Acres
8,000
6,000
4,000
2,000
0
0
0
40
2,009
1,619
6,100
3,684
Non-Burnable
Very Low (0 - 1 ft)
Low (1 - 4 ft)
Moderate (4 - 8 ft)
High (8 - 12 ft)
Very High (12 - 25 ft)
Extreme (25+ ft)


Indian Springs
Characteristic Flame Length
Non-burnable
0 - 1 ft
1 - 4 ft
4 - 8 ft
8 - 12 ft
12 - 25 ft
25+ ft
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Fire Intensity Scale

Description

Fire Intensity Scale (FIS) specifically identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. Similar to the Richter scale for earthquakes, FIS provides a standard scale to measure potential wildfire intensity. FIS consist of five (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.

1. **Class 1, Lowest Intensity:**
   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. **Class2, Low:**
   Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
3. **Class 3, Moderate:**
   Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
4. **Class 4, High:**
   Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
5. **Class 5, Highest Intensity:**
   Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

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

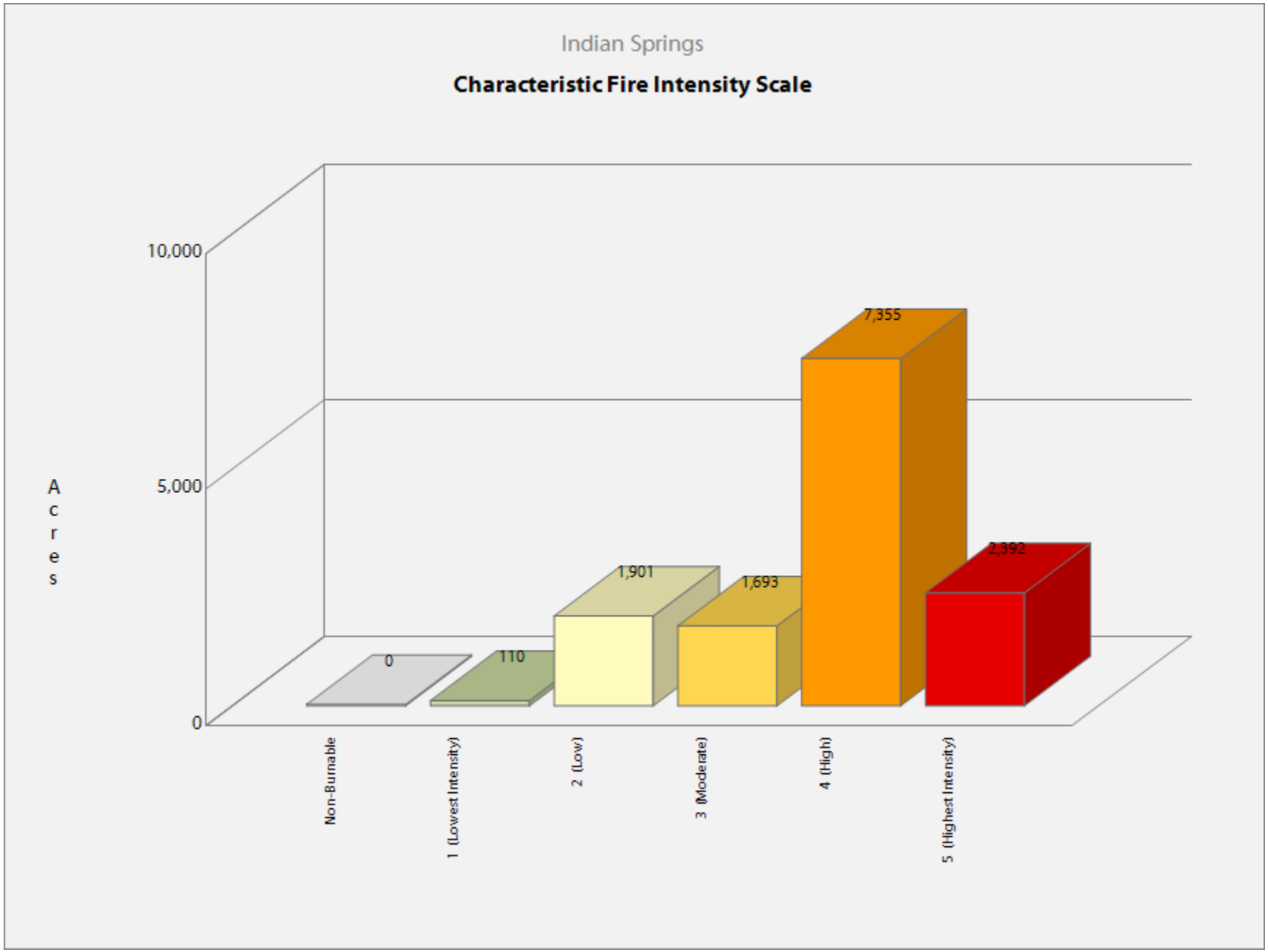
Since all areas in Colorado have fire intensity scale calculated consistently, it allows for comparison and ordination of areas across the entire state. For example, a high fire intensity area in Eastern Colorado is equivalent to a high fire intensity area in Western Colorado.

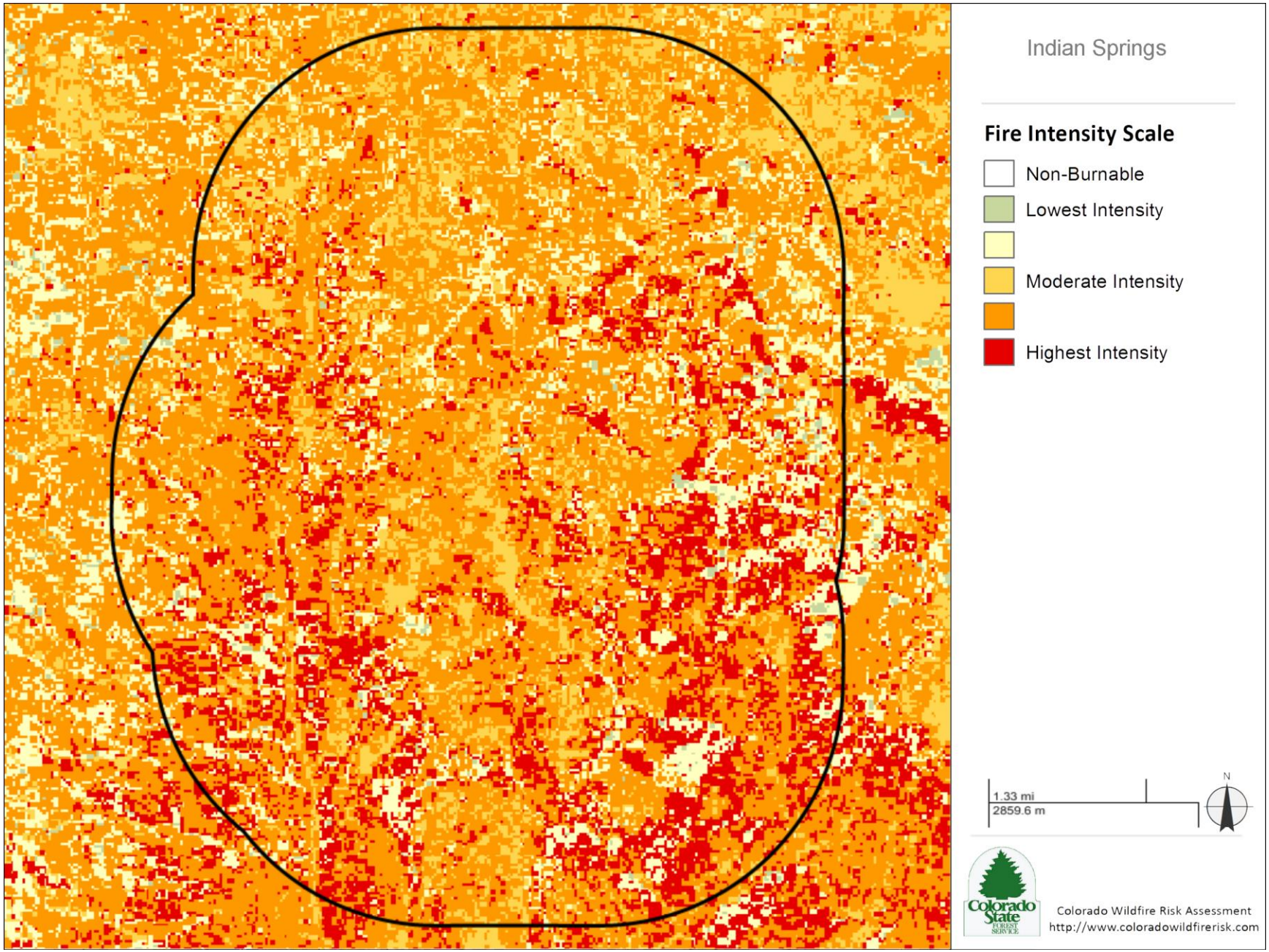
Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently.

To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for each weather influence zone in Colorado. A weather influence zone is an area where, for analysis purposes, the weather on any given day is considered uniform. There are 11weather influence zones in Colorado. The FIS represents the weighted average for all four weather percentiles.

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

FIS Class	Acres	Percent
Non-Burnable	0	0.0 %
1 (Lowest Intensity)	110	0.8 %
2 (Low)	1,901	14.1 %
3 (Moderate)	1,693	12.6 %
4 (High)	7,355	54.7 %
5 (Highest Intensity)	2,392	17.8 %
Total	**13,451**	**100.0 %**


Indian Springs
Characteristic Fire Intensity Scale
Acres
10,000
5,000
0
0
110
1,901
1,693
7,355
2,392
Non-Burnable
1 (Lowest Intensity)
2 (Low)
3 (Moderate)
4 (High)
5 (Highest Intensity)


Indian Springs
Fire Intensity Scale
Non-Burnable
Lowest Intensity
Moderate Intensity
Highest Intensity
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Fire Type – Extreme Weather

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

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

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

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

Passive Canopy Fire

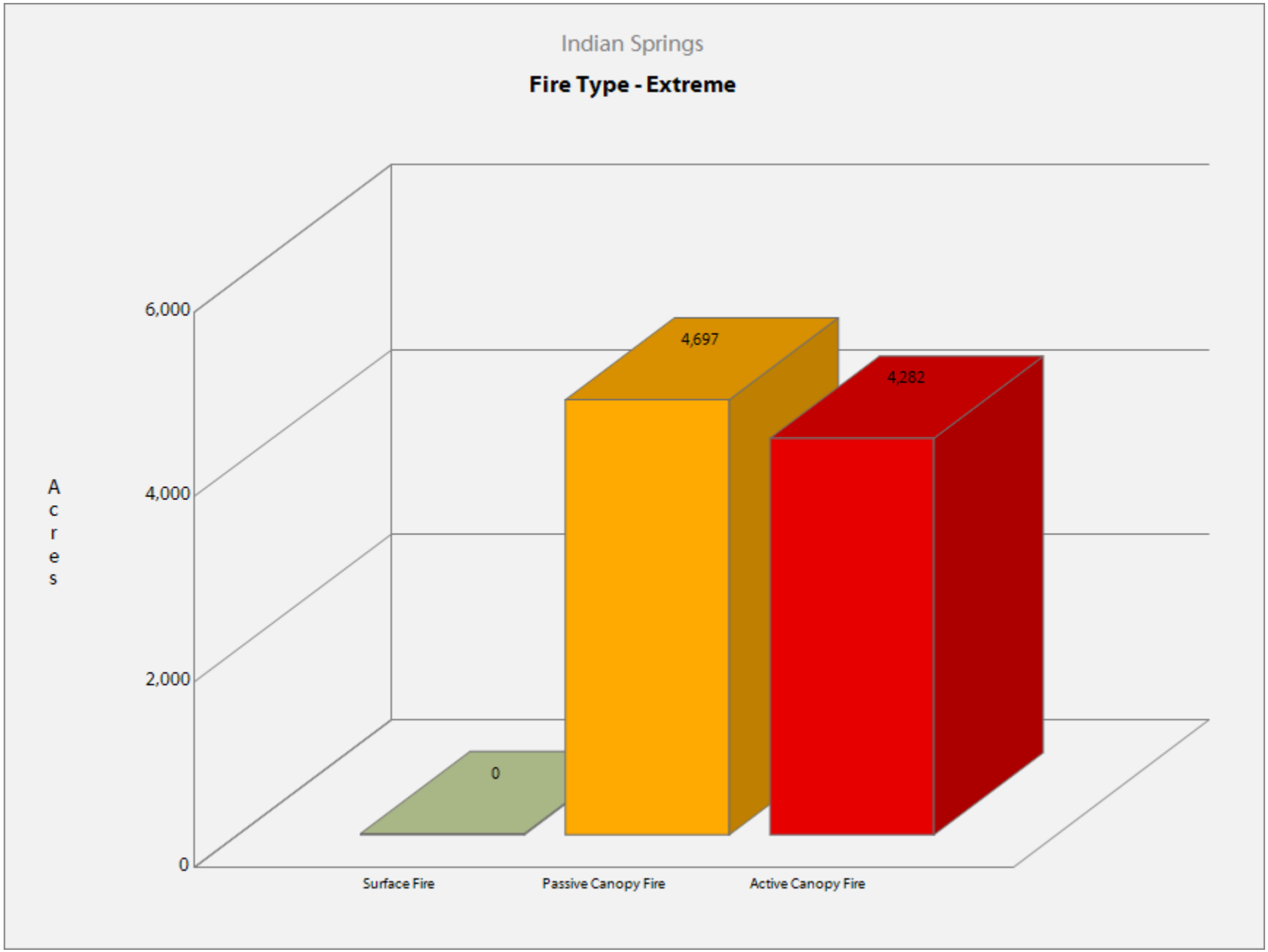
A type of crown fire in which the crowns of individual trees or small groups of trees burn, but solid flaming in the canopy cannot be maintained except for short periods (Scott & Reinhardt, 2001).

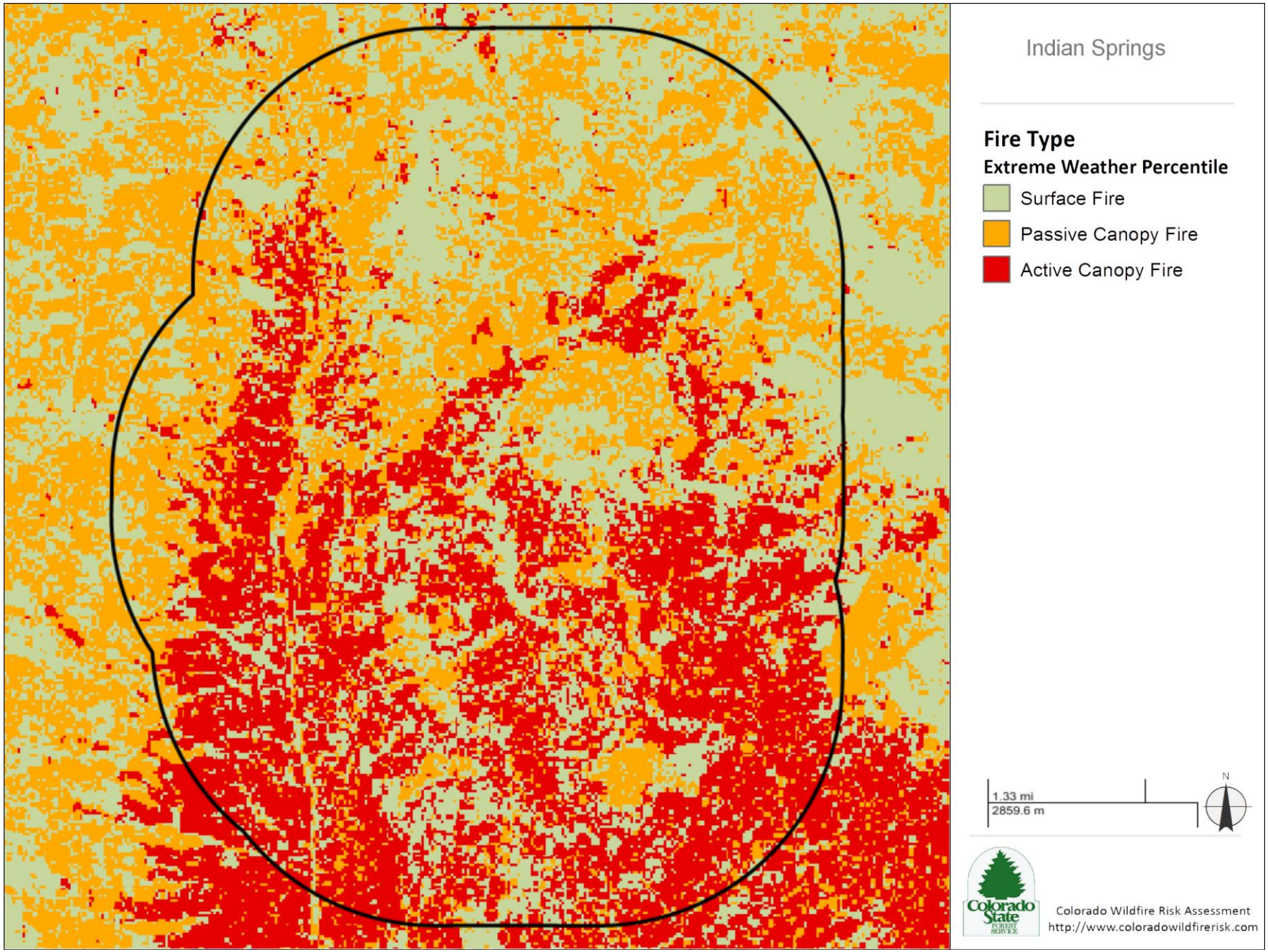
Active Canopy Fire

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

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

Fire Type – Extreme Weather	Acres	Percent
Surface Fire	0	0.0 %
Passive Canopy Fire	4,697	52.3 %
Active Canopy Fire	4,282	47.7 %
Total	**8,979**	**100.0 %**


Indian Springs
Fire Type - Extreme
Acres
6,000
4,000
2,000
0
4,697
4,282
0
Surface Fire
Passive Canopy Fire
Active Canopy Fire


Indian Springs
Fire Type
Extreme Weather Percentile
Surface Fire
Passive Canopy Fire
Active Canopy Fire
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Surface Fuels

Description

Unmanaged forest with dead and downed trees and branches

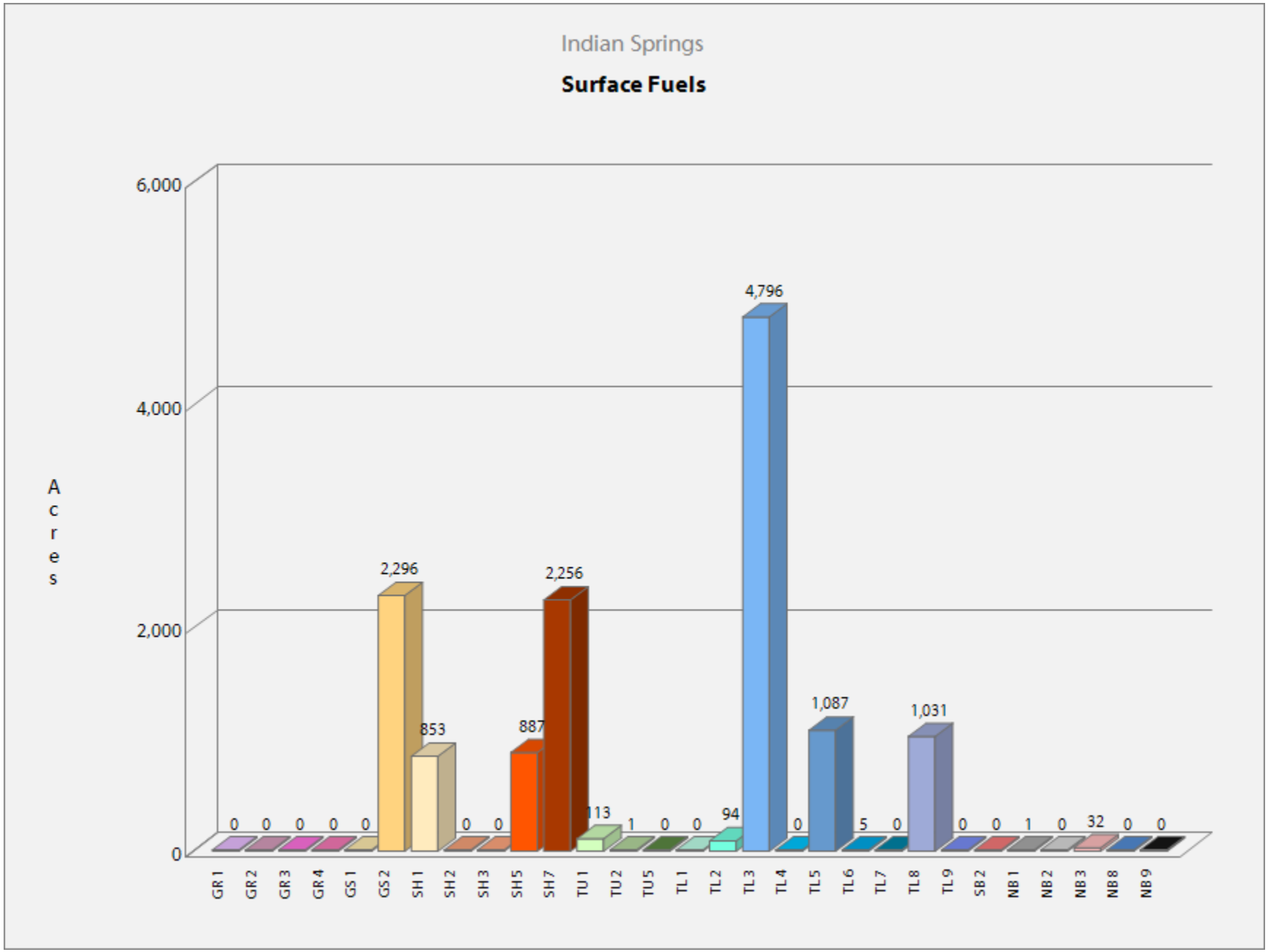
Slash on the ground indicates that forest management treatments have occurred in this area

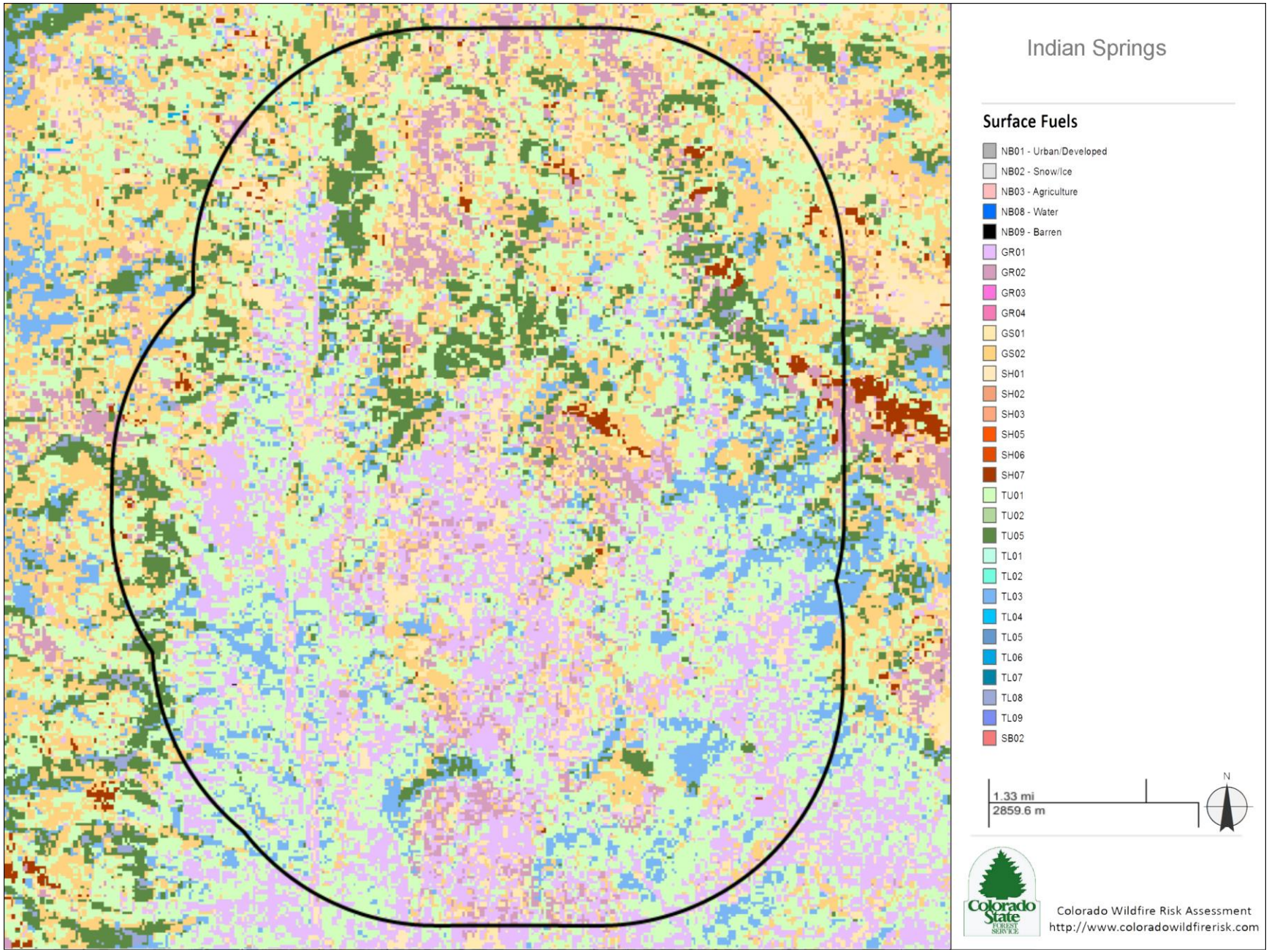
Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters required by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, including rate of spread, flame length, fireline intensity and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential. Canopy fire potential is computed through a separate but linked process. The Colorado WRA accounts for both surface and canopy fire potential in the fire behavior outputs. However, only surface fuels are shown in this report.

Surface fuels typically are categorized into one of four primary fuel types based on the primary carrier of the surface fire: 1) grass, 2) shrub/brush, 3) timber litter, and 4) slash. Two standard fire behavior fuel model sets have been published. 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. The Colorado WRA uses fuel models from the 2005 Fuel Model Set.

The LANDFIRE Program Refresh 2008 version of data products was used to compile the Surface Fuels data for the West Wide Risk Assessment and the Colorado Wildfire Risk Assessment. This reflects data through 2008. Some modifications were completed to reflect recent disturbances, such as large wildfires and pine beetle infestations, prevalent in central Colorado over recent years. These updates reflect changes in the landscape that represent conditions through 2010. Information on the process used to compile the Colorado fuels dataset can be found in the West Wide Assessment Final Report cited on the Reference Page.

Surface Fuels	Description	FBPS Fuel Model Set	Acres	Percent
GR 1	Short, Sparse Dry Climate Grass (Dynamic)	2005	0	0.0 %
GR 2	Low Load, Dry Climate Grass (Dynamic)	2005	1102	0.0 %
GR 3	Low Load, Very Coarse, Humid Climate Grass (Dynamic)	2005	0	0.0 %
GR 4	Moderate Load, Dry Climate Grass (Dynamic)	2005	0	0.0 %
GS 1	Low Load, Dry Climate Grass-Shrub (Dynamic)	2005	0	0.0 %
GS 2	Moderate Load, Dry Climate Grass-Shrub (Dynamic)	2005	2,296	17.1 %
SH 1	Moderate Load, Humid Climate Grass-Shrub (Dynamic)	2005	853	6.3 %
SH 2	Moderate Load, Dry Climate Shrub	2005	0	0.0 %
SH 3	Moderate Load, Humid Climate Timber-Shrub	2005	0	0.0 %
SH 5	High Load, Humid Climate Grass-Shrub	2005	887	6.6 %
SH 7	Very High Load, Dry Climate Shrub	2005	2,256	16.8 %
TU 1	Light Load, Dry Climate Timber-Grass-Shrub	2005	113	0.8 %
TU 2	Moderate Load, Humid Climate Timber-Shrub	2005	1	0.0 %
TU 5	High Load, Conifer Litter	2005	0	0.0 %
TL 1	Low Load, Compact Conifer Litter	2005	0	0.0 %
TL 2	Low Load, Broadleaf Litter	2005	94	0.7 %
TL 3	Moderate Load, Conifer Litter	2005	4,796	35.7 %
TL 4	Small Downed Logs	2005	0	0.0 %
TL 5	High Load, Conifer Litter	2005	1,087	8.1 %
TL 6	Moderate Load, Broadleaf Litter	2005	5	0.0 %
TL 7	Large Downed Logs, Heavy Load Forest Litter	2005	0	0.0 %
TL 8	Long-needle Litter	2005	1,031	7.7 %
TL 9	Very High Load, Broadleaf Litter	2005	0	0.0 %
SB 2	Moderate Load, Activity Fuel	2005	0	0.0 %
NB 1	Urban/Developed	2005	1	0.0 %
NB 2	Snow/Ice	2005	0	0.0 %
NB 3	Agricultural	2005	32	0.2 %
NB 8	Open Water	2005	0	0.0 %
NB 9	Bare Ground	2005	0	0.0 %
	Total		**13,451**	**100.0 %**


Indian Springs
Surface Fuels
Acres
6,000
4,000
2,000
0
0 0 0 0 0 2,296 853 0 0 887 2,256 113 1 0 0 94 4,796 0 1,087 5 0 1,031 0 0 1 0 32 0 0
GR1 GR2 GR3 GR4 GS1 GS2 SH1 SH2 SH3 SH5 SH7 TU1 TU2 TU5 TL1 TL2 TL3 TL4 TL5 TL6 TL7 TL8 TL9 SB2 NB1 NB2 NB3 NB8 NB9


Indian Springs
Surface Fuels
NB01 - Urban/Developed
NB02 - Snow/Ice
NB03 - Agriculture
NB08 - Water
NB09 - Barren
GR01
GR02
GR03
GR04
GS01
GS02
SH01
SH02
SH03
SH05
SH06
SH07
TU01
TU02
TU05
TL01
TL02
TL03
TL04
TL05
TL06
TL07
TL08
TL09
SB02
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Vegetation

Description

The Vegetation map describes the general vegetation and landcover types across the state of Colorado. In the Colorado WRA, the Vegetation dataset is used to support the development of the Surface Fuels, Canopy Cover, Canopy Stand Height, Canopy Base Height, and Canopy Bulk Density datasets.

The LANDFIRE program Refresh version of data products (Existing Vegetation Type) was used to compile the Vegetation data for the West Wide Risk Assessment and the Colorado WRA. This reflects data current to 2008. Some modifications were completed to reflect recent disturbances such as large wildfires and pine beetle infestations prevalent in central Colorado over recent years. The LANDFIRE EVT data was classified to reflect general vegetation cover types for representation with CO-WRAP.

Oak shrublands are commonly found along dry foothills and lower mountain slopes, and are often situated above Piñyon-juniper.

Piñyon-juniper woodlands are common in southern and southwestern Colorado.

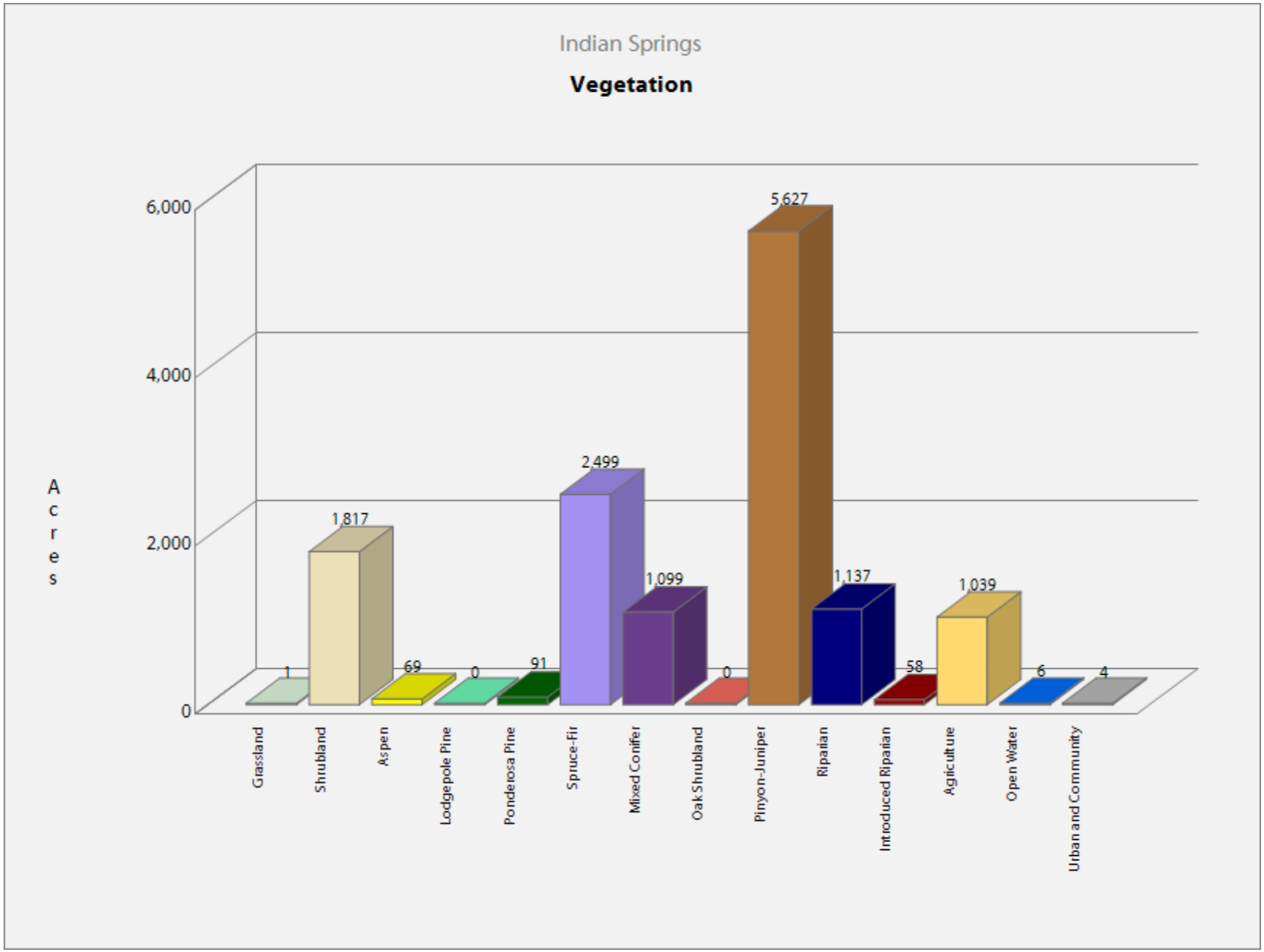
Douglas-fir understory in a ponderosa pine forest.

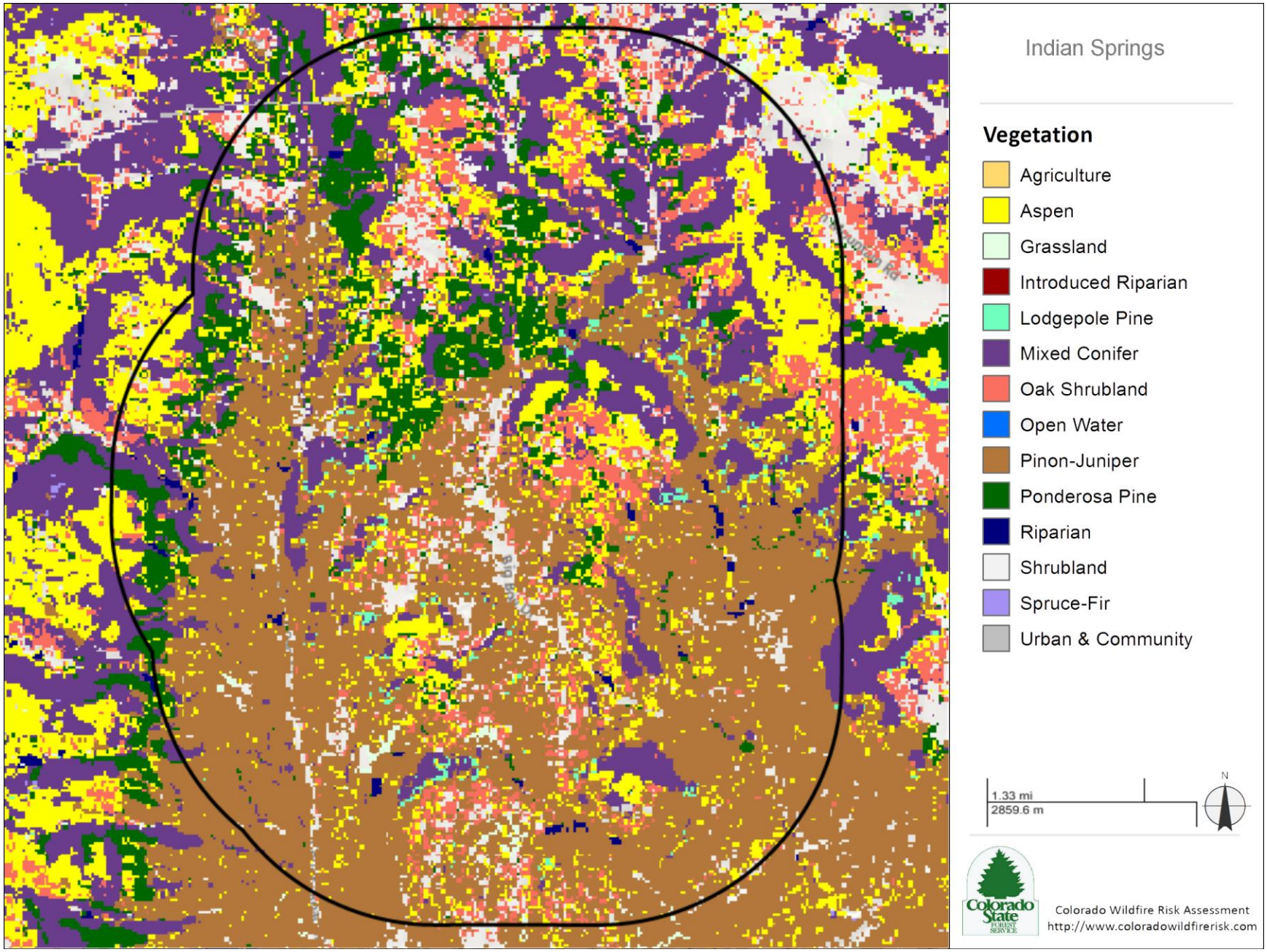
Grasslands occur both on Colorado's Eastern Plains and on the Western Slope.

Wildland fire threat increases in lodgepole pine as the dense forests grow old.

Overly dense ponderosa pine, a dominant species of the montane zone.

Vegetation Class	Acres	Percent
Grassland	1	0.0 %
Shrubland	1,817	13.5 %
Aspen	69	0.5 %
Lodgepole Pine	0	0.0 %
Ponderosa Pine	91	0.7 %
Spruce-Fir	2,499	18.6 %
Mixed Conifer	1,099	8.2 %
Oak Shrubland	0	0.0 %
Pinyon-Juniper	5,627	41.9 %
Riparian	1,137	8.5 %
Introduced Riparian	58	0.4 %
Agriculture	1,039	7.7 %
Open Water	6	0.0 %
Urban & Community	4	0.0 %
Total	**13,446**	**100.0 %**


Indian Springs
Vegetation
Acres
6,000
4,000
2,000
0
1
1,817
69
0
91
2,499
1,099
0
5,627
1,137
58
1,039
6
4
Grassland
Shrubland
Aspen
Lodgepole Pine
Ponderosa Pine
Spruce-Fir
Mixed Conifer
Oak Shrubland
Pinyon-Juniper
Ripaian
Introduced Ripaian
Agriculture
Open Water
Urban and Community


Indian Springs
Vegetation
Agriculture
Aspen
Grassland
Introduced Riparian
Lodgepole Pine
Mixed Conifer
Oak Shrubland
Open Water
Pinon-Juniper
Ponderosa Pine
Riparian
Shrubland
Spruce-Fir
Urban & Community
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Drinking Water Importance Areas

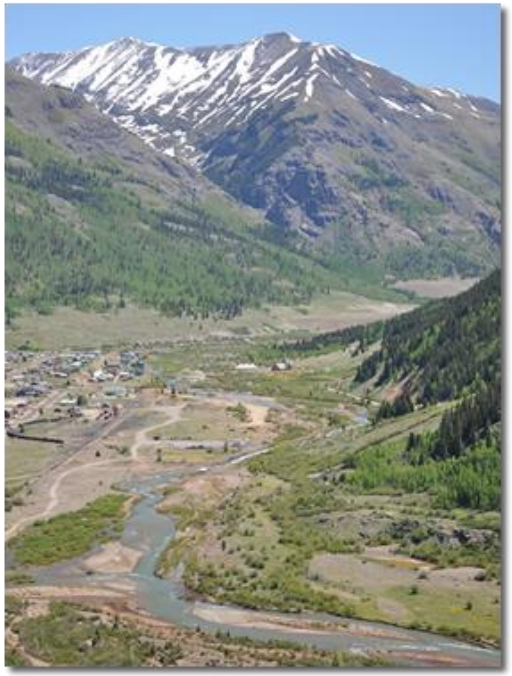
Description

Drinking Water Importance Areas is the measure of quality and quantity of public surface drinking water categorized by watershed. This layer identifies an index of surface drinking water importance, reflecting a measure of water quality and quantity, characterized by Hydrologic Unit Code 12 (HUC 12) watersheds. The Hydrologic Unit system is a standardized watershed classification system developed by the USGS. Areas that are a source of drinking water are of critical importance and adverse effects from fire are a key concern.

The U.S. Forest Service Forests to Faucets (F2F) project is the primary source of the drinking water data set. This project used GIS modeling to develop an index of importance for supplying drinking water using HUC 12 watersheds as the spatial resolution. Watersheds are ranked from 1 to 100 reflecting relative level of importance, with 100 being the most important and 1 the least important.

Several criteria were used in the F2F project to derive the importance rating including water supply, flow analysis, and downstream drinking water demand. The final model of surface drinking water importance used in the F2F project combines the drinking water protection model, capturing the flow of water and water demand, with a model of mean annual water supply.

Virtually all of Colorado's drinking water comes from snowmelt carried at some point by a river.



The headwaters of the Animas River begin near Silverton, CO at elevations greater than 12,000 feet.

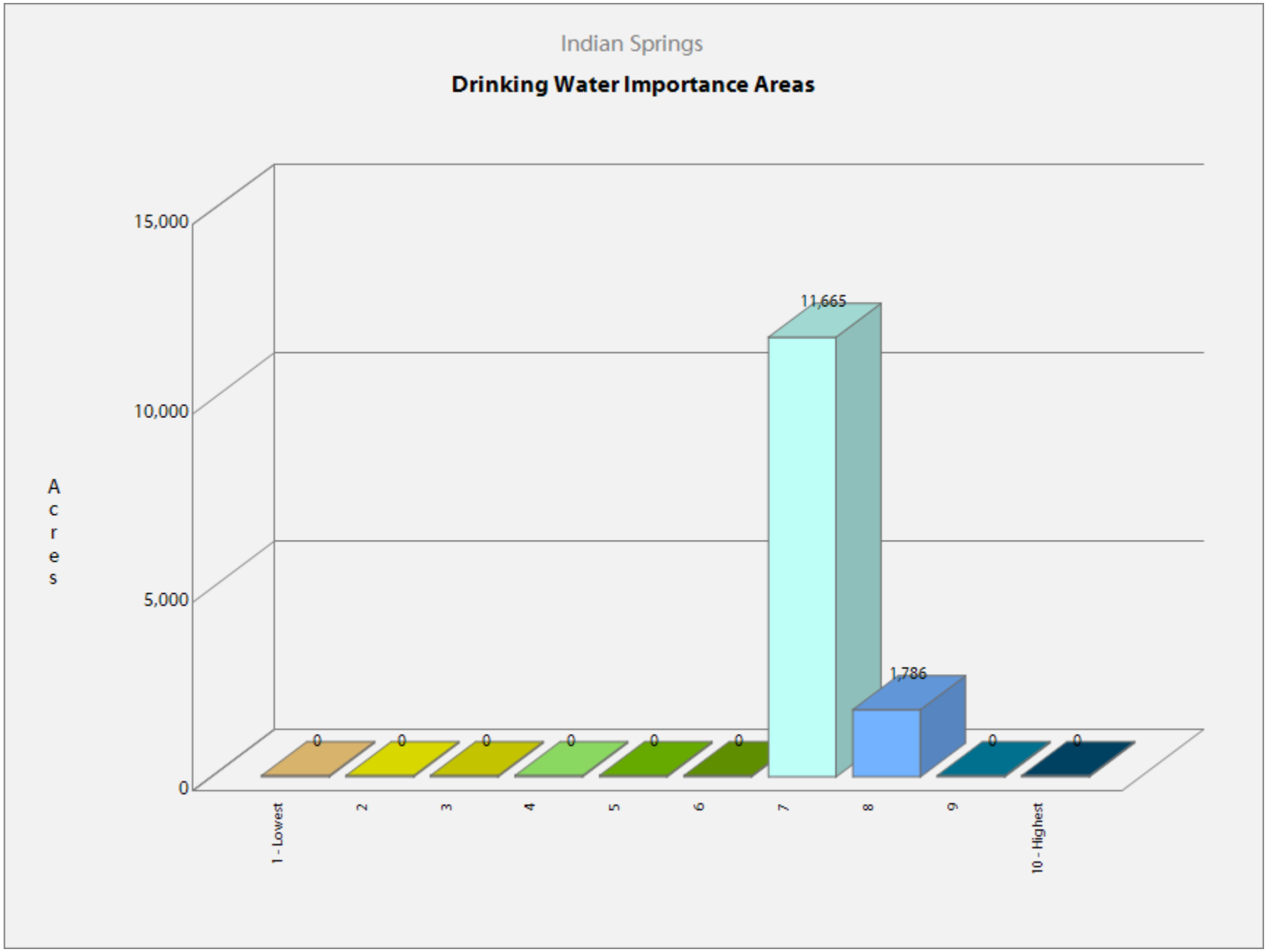
The values generated by the drinking water protection model are simply multiplied by the results of the model of mean annual water supply to create the final surface drinking water importance index.

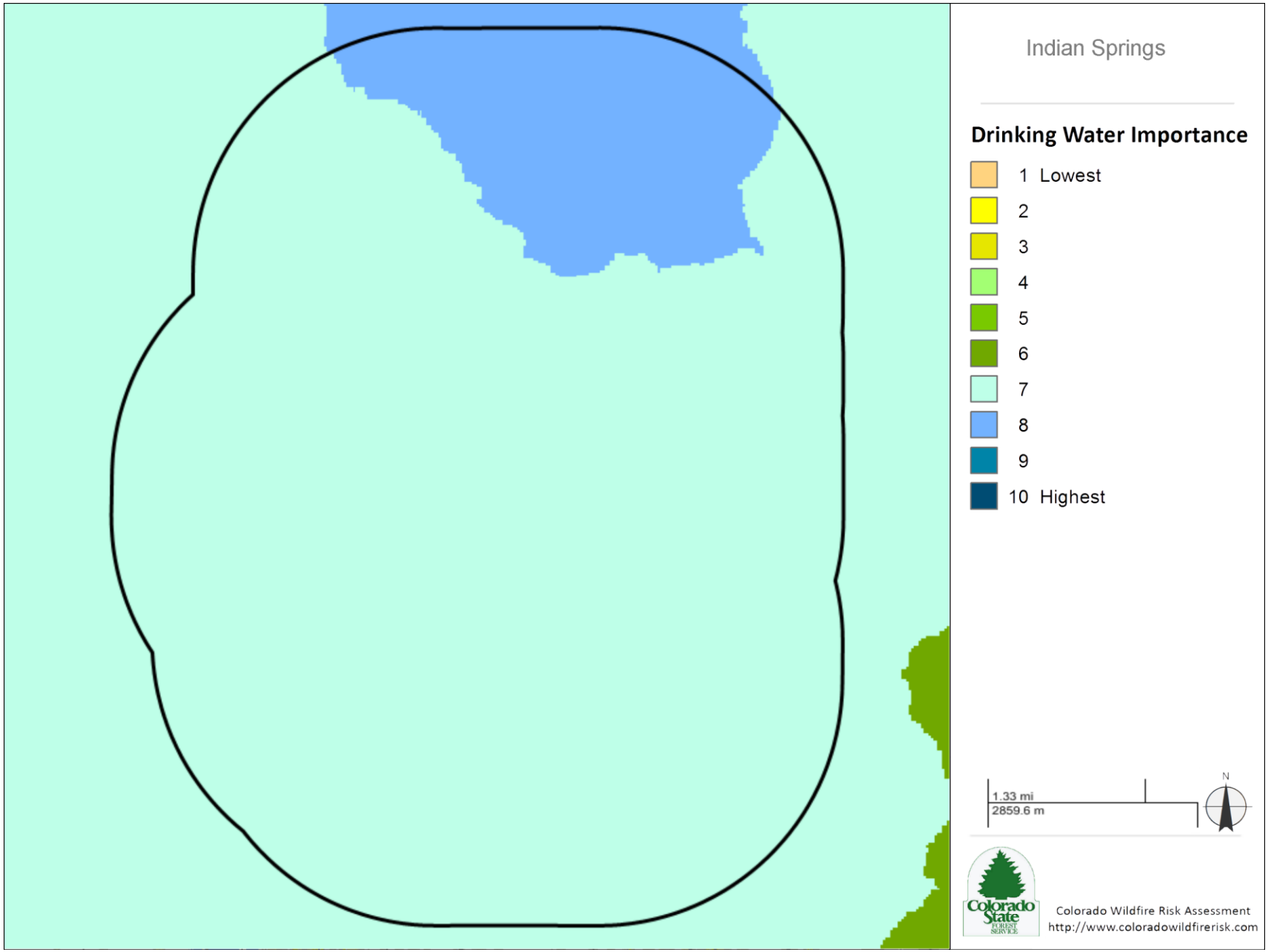
Water is critical to sustain life. Human water usage has further complicated nature's already complex aquatic system. Plants, including trees, are essential to the proper functioning of water movement within the environment. Forests receive precipitation, utilize it for their sustenance and growth, and influence its storage and/or passage to other parts of the environment.

Four major river systems – the Platte, Colorado, Arkansas and Rio Grande – originate in the Colorado mountains and fully drain into one-third of the landmass of the lower 48 states. Mountain snows supply 75 percent of the water to these river systems.

Approximately 40 percent of the water comes from the highest 20 percent of the land, most of which lies in national forests. National forests yield large portions of the total water in these river systems. The potential is great for forests to positively and negatively influence the transport of water over such immense distances.

Drinking Water Class	Acres	Percent
1 - Lowest	0	0.0 %
2	0	0.0 %
3	0	0.0 %
4	0	0.0 %
5	0	0.0 %
6	0	0.0 %
7	11,665	86.7 %
8	1,786	13.3 %
9	0	0.0 %
10 - Highest	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
Drinking Water Importance Areas
Acres
15,000
10,000
5,000
0
11,665
1,786
0
0
0
0
0
0
0
0
1 - Lowest
2
3
4
5
6
7
8
9
10 - Highest


Indian Springs
Drinking Water Importance
1 Lowest
2
3
4
5
6
7
8
9
10 Highest
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Drinking Water Risk Index

Description

Drinking Water Risk Index is a measure of the risk to DWIAs based on the potential negative impacts from wildfire.

In areas that experience low-severity burns, fire events can serve to eliminate competition, rejuvenate growth and improve watershed conditions. But in landscapes subjected to high, or even moderate-burn severity, the post-fire threats to public safety and natural resources can be extreme.

High-severity wildfires remove virtually all forest vegetation – from trees, shrubs and grasses down to discarded needles, decomposed roots and other elements of ground cover or duff that protect forest soils. A severe wildfire also can cause certain types of soil to become hydrophobic by forming a waxy, water-repellent layer that keeps water from penetrating the soil, dramatically amplifying the rate of runoff.

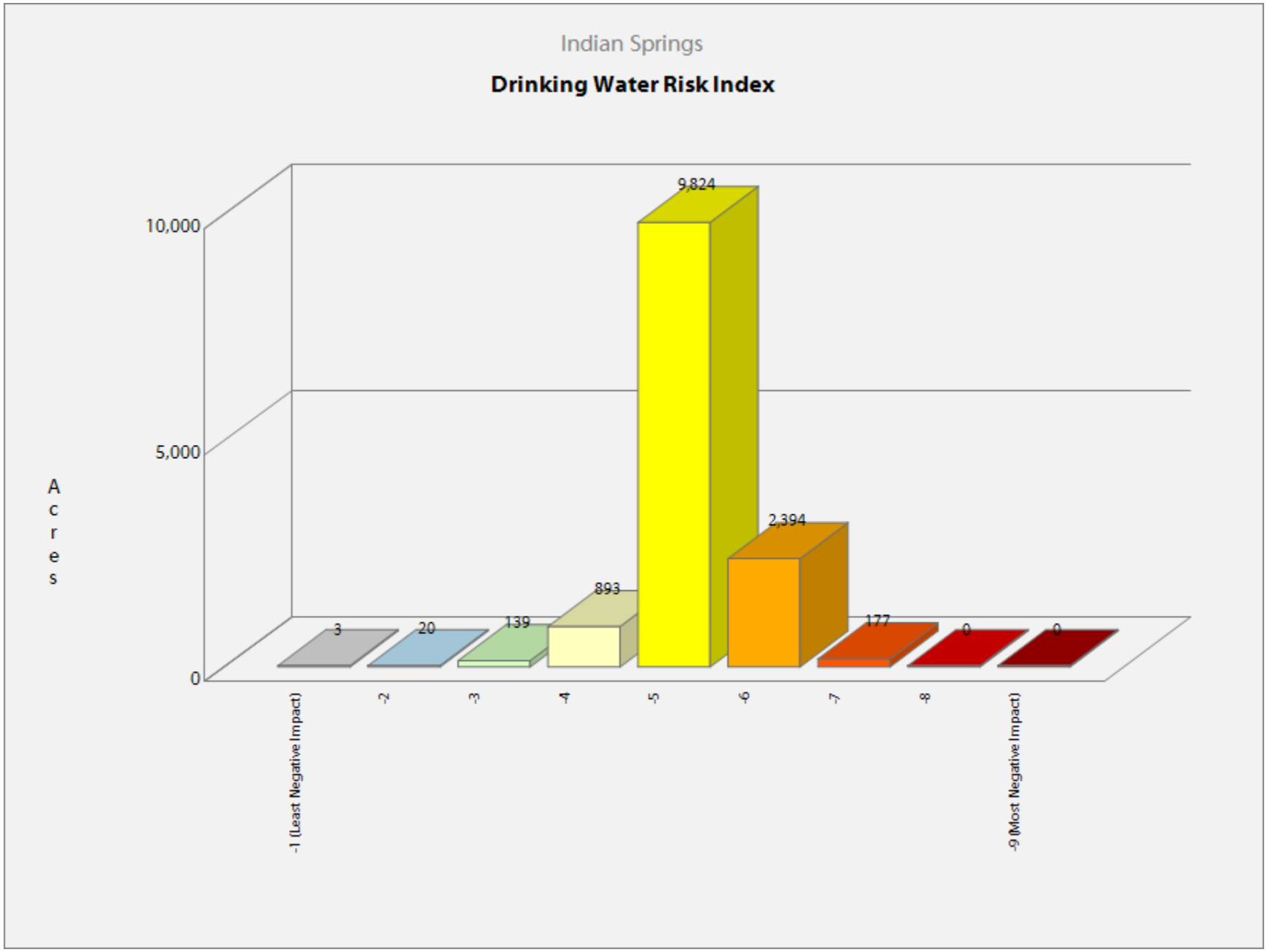
The loss of critical surface vegetation leaves forested slopes extremely vulnerable to large-scale soil erosion and flooding during subsequent storm events. In turn, these threats can impact the health, safety and integrity of communities and natural resources downstream. The likelihood that such a post-fire event will occur in Colorado is increased by the prevalence of highly erodible soils in several parts of the state, and weather patterns that frequently bring heavy rains on the heels of fire season.

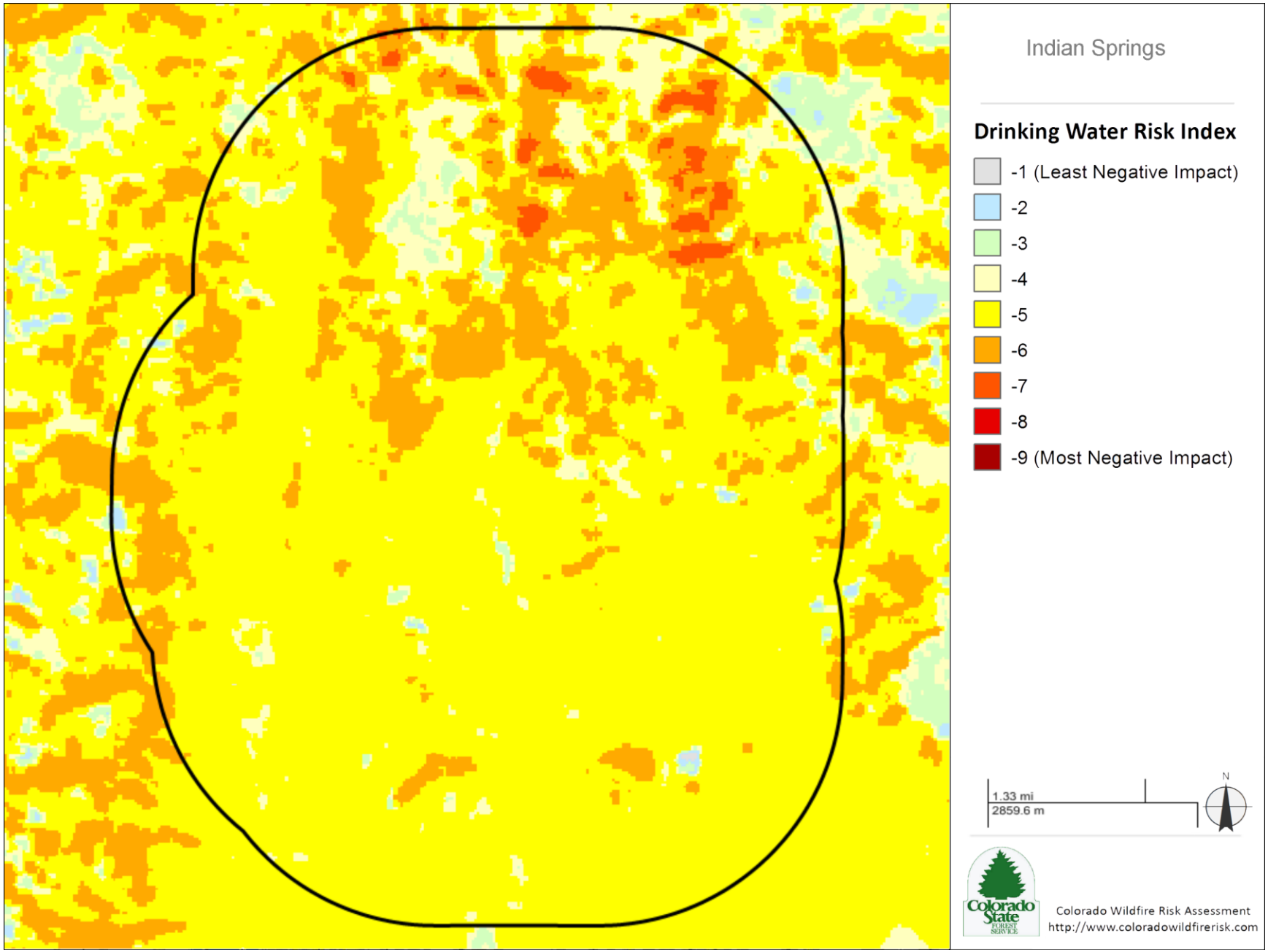
In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts.

The potential for severe soil erosion is a consequence of wildfire because as a fire burns, it destroys plant material and the litter layer. Shrubs, forbs, grasses, trees and the litter layer disperse water during severe rainstorms. Plant roots stabilize the soil, and stems and leaves slow the water to give it time to percolate into the soil profile. Fire can destroy this soil protection.

The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

Class	Acres	Percent
-1 (Least Negative Impact)	3	0.0 %
-2	20	0.2 %
-3	139	1.0 %
-4	893	6.6 %
-5	9,824	73.0 %
-6	2,394	17.8 %
-7	177	1.3 %
-8	0	0.0 %
-9 (Most Negative Impact)	0	0.0 %
Total	**13,451**	**100.0 %**


Indian Springs
Drinking Water Risk Index
Acres
10,000
5,000
0
3
20
139
893
9,824
2,394
177
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)


Indian Springs
Drinking Water Risk Index
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Riparian Assets

Description

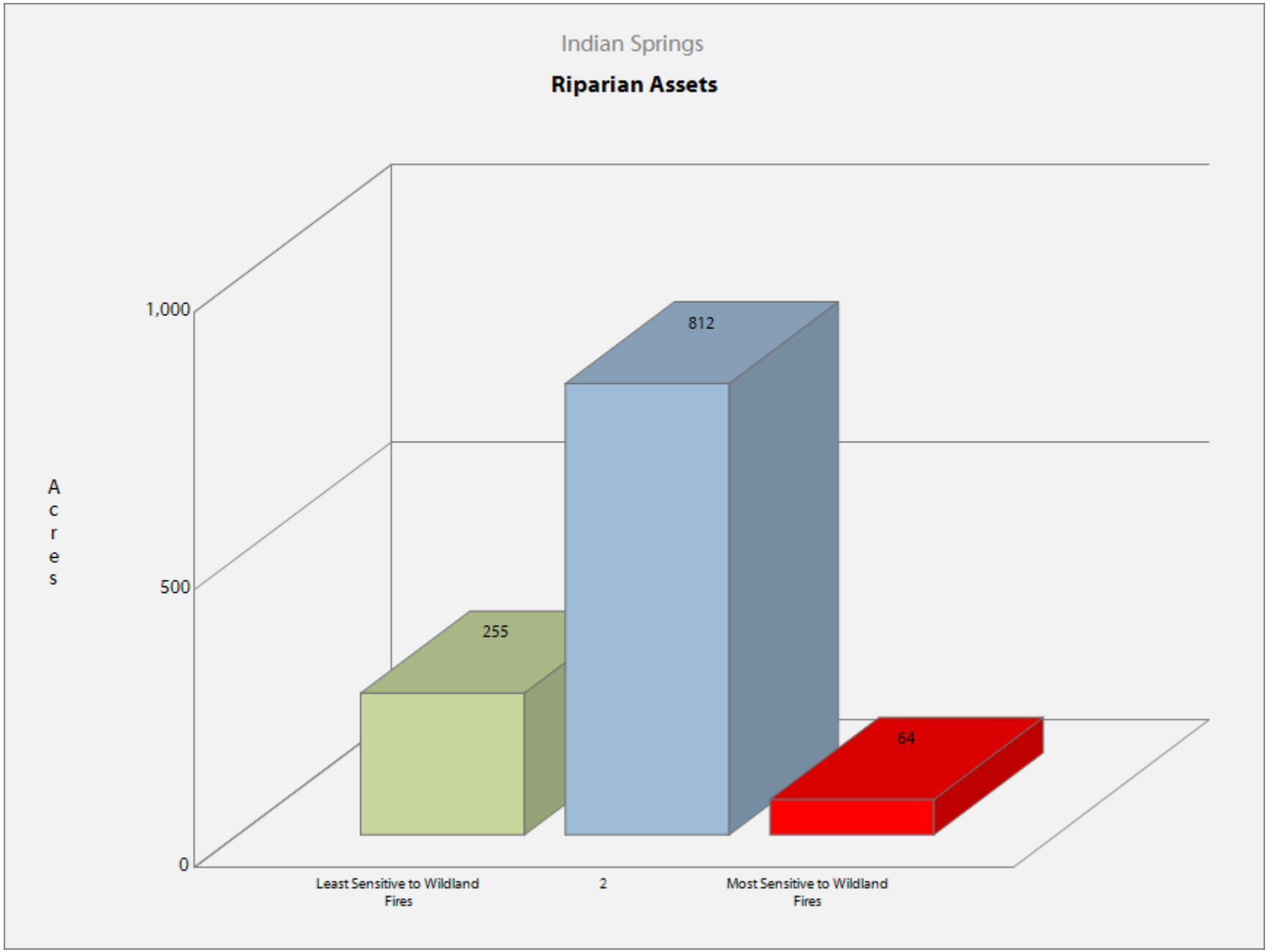
Riparian Assets are forested riparian areas characterized by functions of water quantity and quality, and ecology. This layer identifies riparian areas that are important as a suite of ecosystem services, including both terrestrial and aquatic habitat, water quality, water quantity, and other ecological functions. Riparian areas are considered an especially important element of the landscape in the west. Accordingly, riparian assets are distinguished from other forest assets so they can be evaluated separately.

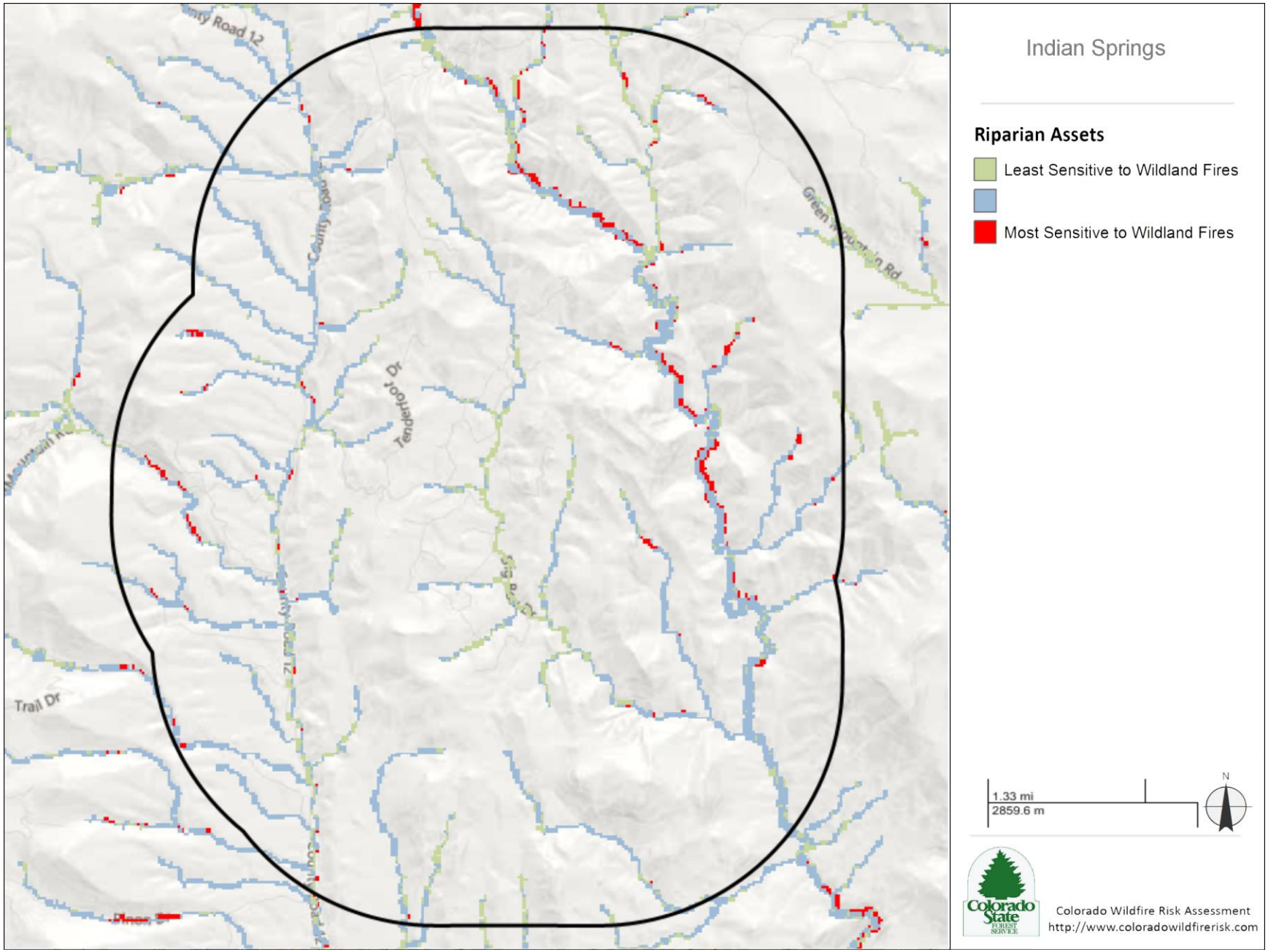
The process for defining these riparian areas involved identifying the riparian footprint and then assigning a rating based upon two important riparian functions – water quantity and quality, and ecological significance. A scientific model was developed by the West Wide Risk Assessment technical team with in-kind support from CAL FIRE state representatives. Several input datasets were used in the model including the National Hydrography Dataset and the National Wetland Inventory.

The National Hydrography Data Set (NHD) was used to represent hydrology. A subset of streams and water bodies, which represents perennial, intermittent, and wetlands, was created. The NHD water bodies data set was used to determine the location of lakes, ponds, swamps, and marshes (wetlands).

To model water quality and quantity, erosion potential (K-factor) and annual average precipitation was used as key variables. The Riparian Assets data is an index of class values that range from 1 to 3 representing increasing importance of the riparian area as well as sensitivity to fire-related impacts on the suite of ecosystem services.

Riparian Assets Class	Acres	Percent
Least Sensitive to Wildland Fires	255	22.5 %
	812	71.8 %
Most Sensitive to Wildland Fires	64	5.6 %
Total	**1,130**	**100.0 %**


Indian Springs
Riparian Assets
Acres
1,000
500
0
812
255
64
Least Sensitive to Wildland Fires
2
Most Sensitive to Wildland Fires


Indian Springs
Riparian Assets
Least Sensitive to Wildland Fires
Most Sensitive to Wildland Fires
1.33 mi
2859.6 m
N
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com
Trail Dr

Riparian Assets Risk Index

Description

Riparian Assets Risk Index is a measure of the risk to riparian areas based on the potential negative impacts from wildfire. This layer identifies those riparian areas with the greatest potential for adverse effects from wildfire.

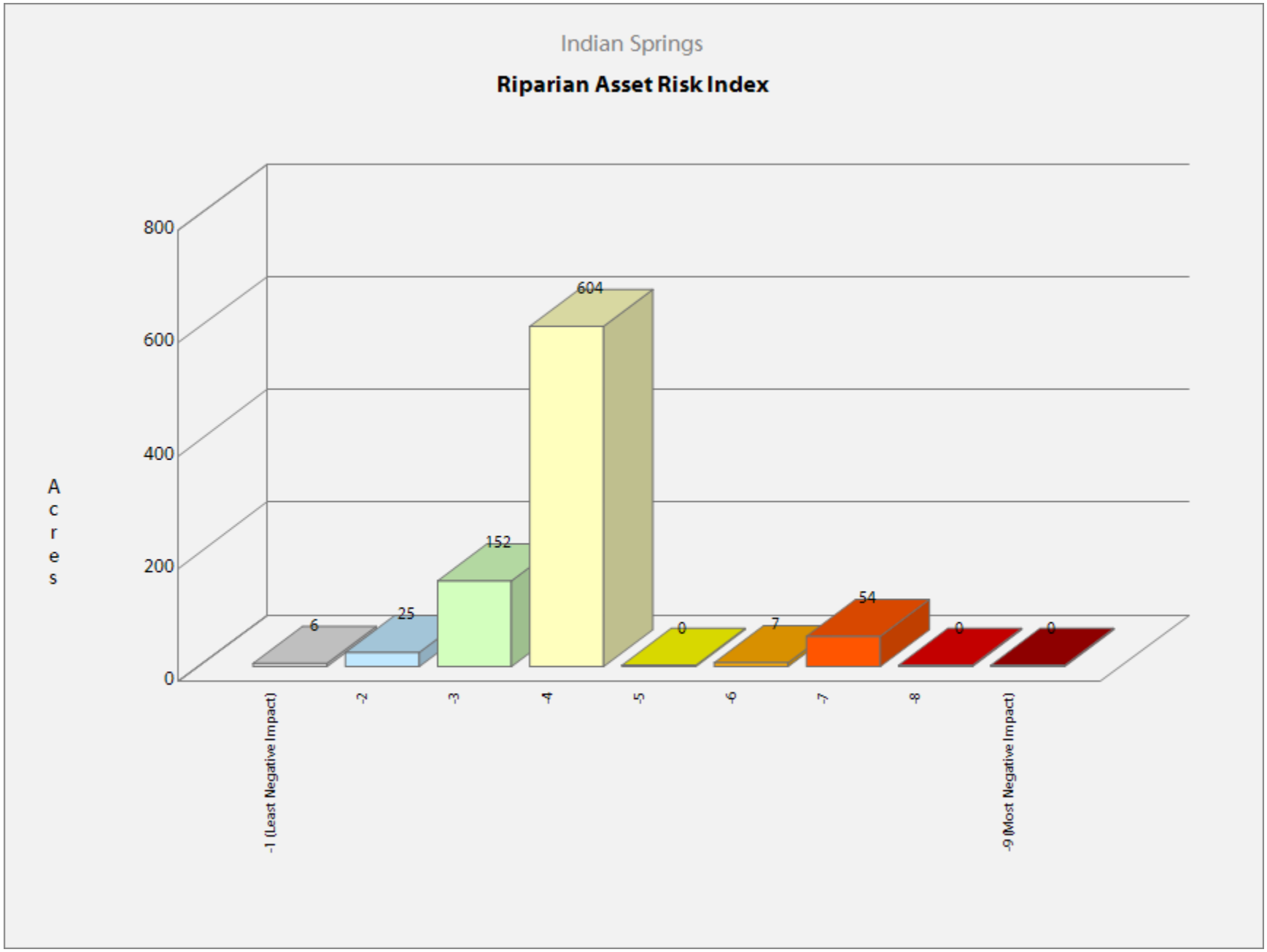
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

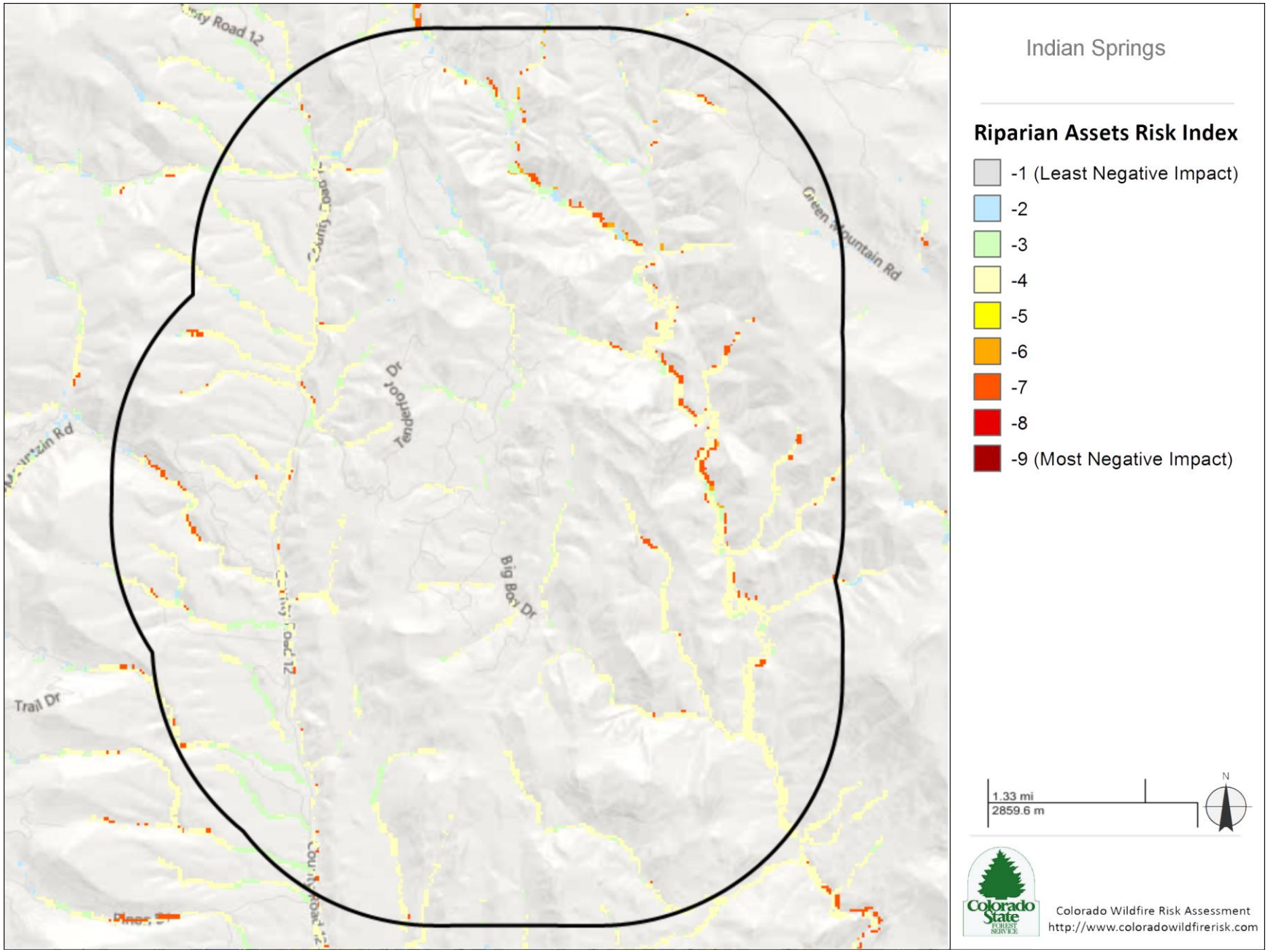
The risk index has been calculated by combining the Riparian Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and high

importance for ecosystem services. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and a low importance for ecosystem services.

This risk output is intended to supplement the Drinking Water Risk Index by identifying wildfire risk within the more detailed riparian areas.

Riparian Assets Risk Class	Acres	Percent
-1 (Least Negative Impact)	6	0.7 %
-2	25	3.0 %
-3	152	17.9 %
-4	604	71.2 %
-5	0	0.0 %
-6	7	0.8 %
-7	54	6.4 %
-8	0	0.0 %
-9 (Most Negative Impact)	0	0.0 %
Total	**848**	**100.0 %**


Indian Springs
Riparian Asset Risk Index
Acres
800
600
400
200
0
6
25
152
604
0
7
54
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)


Indian Springs
Riparian Assets Risk Index
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
Green Mountain Rd
Big Boy Dr
Trail Dr
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

Forest Assets

Description

Forest Assets are forested areas categorized by height, cover, and susceptibility/response to fire. This layer identifies forested land categorized by height, cover and susceptibility or response to fire. Using these characteristics allows for the prioritization of landscapes reflecting forest assets that would be most adversely affected by fire. The rating of importance or value of the forest assets is relative to each state's interpretation of those characteristics considered most important for their landscapes.

Canopy cover from LANDFIRE was re-classified into two categories, open or sparse and closed. Areas classified as open or sparse have a canopy cover less than 60%. Areas classified as closed have a canopy cover greater than 60%.

Canopy height from LANDFIRE was re-classified into two categories, 0-10 meters and greater than 10 meters.

Response to fire was developed from the LANDFIRE existing vegetation type (EVT) dataset. There are over 1,000 existing vegetation types in the project area. Using a crosswalk defined by project ecologists, a classification of susceptibility and response to fire was defined and documented by fire ecologists into the three fire response classes.

These three classes are sensitive, resilient and adaptive.

- **Sensitive** = These are tree species that are intolerant or sensitive to damage from fire with low intensity.
- **Resilient** = These are tree species that have characteristics that help the tree resist damage from fire and whose adult stages can survive low intensity fires.
- **Adaptive** = These are tree species adapted with the ability to regenerate following fire by sprouting or serotinous cones

Forest Assets Class	Acres	Percent
Adaptive	64	0.6 %
Resilient	9,161	82.3 %
Sensitive	1,907	17.1 %
Total	**11,132**	**100.0 %**

Forest Assets Risk Index

Description

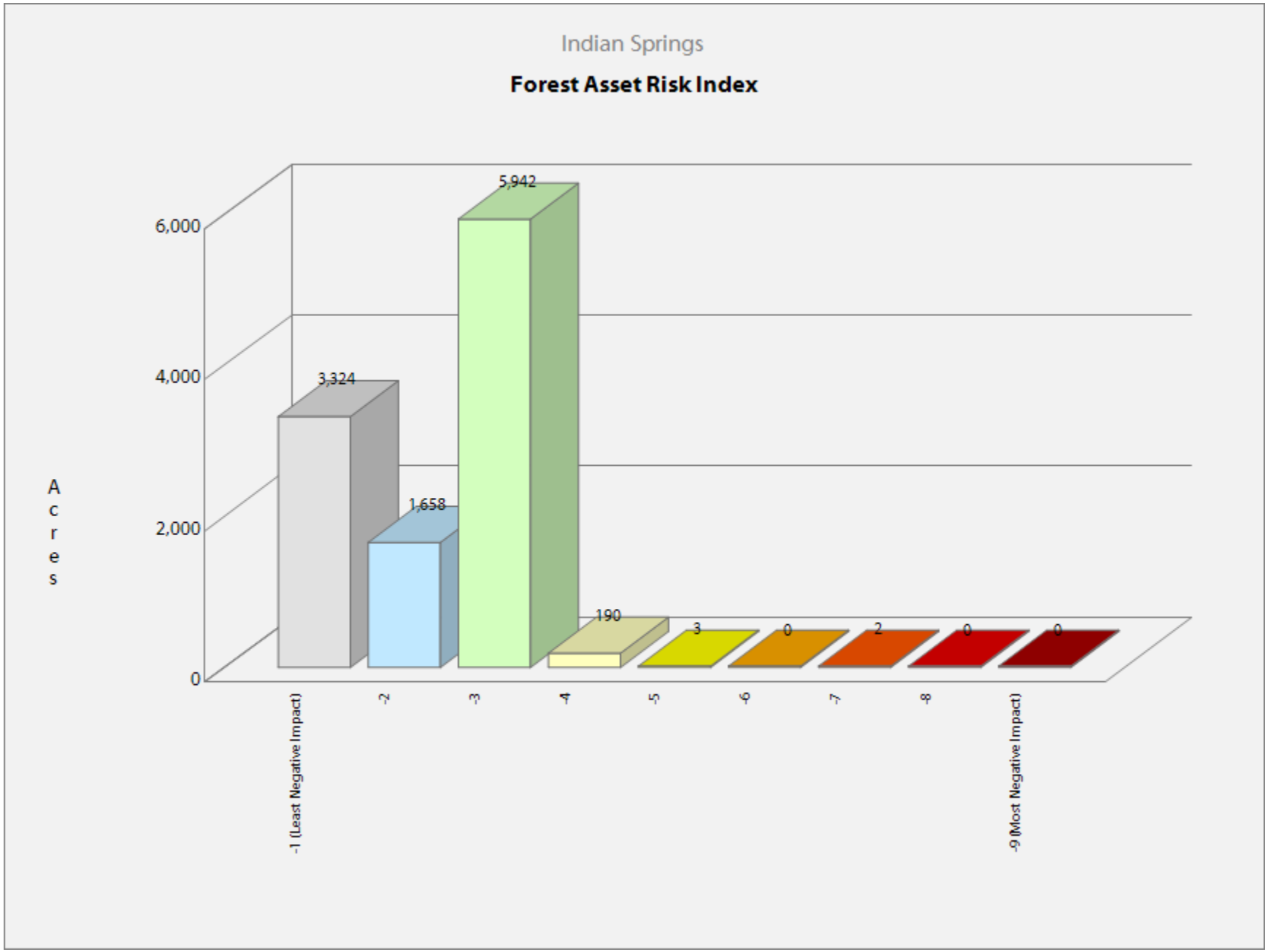
Forest Assets Risk Index is a measure of the risk to forested areas based on the potential negative impacts from wildfire. This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.

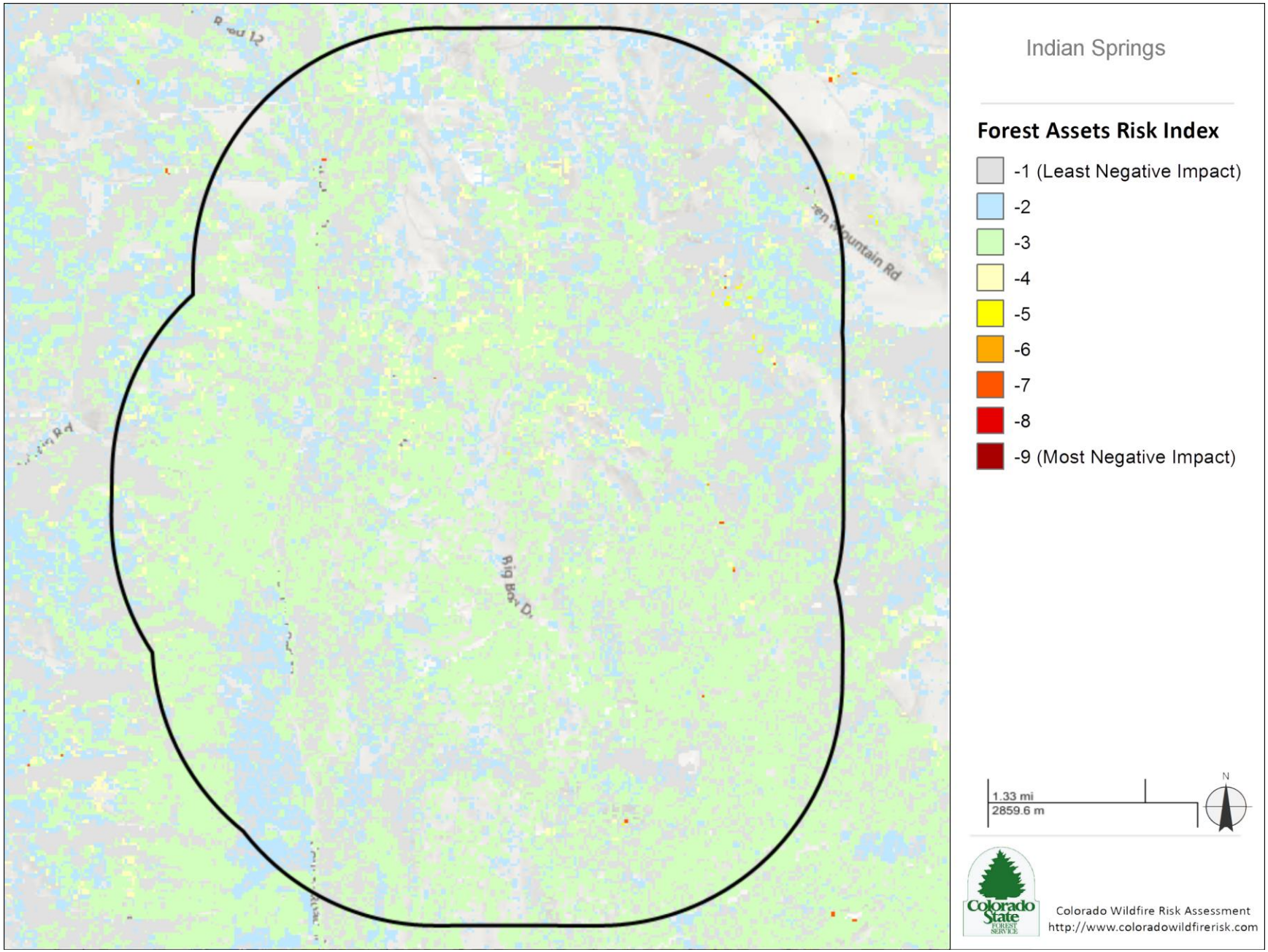
The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

The risk index has been calculated by combining the Forest Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and low resilience or adaptability to fire. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and high resilience or adaptability to fire.

This risk output is intended to provide an overall forest index for potential impact from wildfire. This can be applied to consider aesthetic values, ecosystem services, or economic values of forested lands.

Forest Assets Risk Class	Acres	Percent
-1 (Least Negative Impact)	3,324	29.9 %
-2	1,658	14.9 %
-3	5,942	53.4 %
-4	190	1.7 %
-5	3	0.0 %
-6	0	0.0 %
-7	2	0.0 %
-8	0	0.0 %
-9 (Most Negative Impact)	0	0.0 %
Total	**11,120**	**100.0 %**


Indian Springs
Forest Asset Risk Index
Acres
6,000
4,000
2,000
0
3,324
1,658
5,942
190
3
0
2
0
0
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)


Indian Springs
Forest Assets Risk Index
-1 (Least Negative Impact)
-2
-3
-4
-5
-6
-7
-8
-9 (Most Negative Impact)
1.33 mi
2859.6 m
N
Colorado State Forest Service
Colorado Wildfire Risk Assessment
http://www.coloradowildfirerisk.com

References

Anderson, H. E. (1982). Aids to determining fuel models for estimating fire behavior. USDA For. Serv. Gen. Tech. Rep. INT-122.

Colorado State Forest Service (2012). Colorado Wildfire Risk Assessment 2012 Final Report. A final report developed by CSFS and DTS (Fort Collins, CO) documenting the technical methods and specifications for the Colorado WRA project.

National Wildfire Coordinating Group (NWCG). (2008). Glossary of Wildland Fire Terminology. Publication Management System document PMS-205.

National Wildfire Coordinating Group (2004). Fireline Handbook. NWCG Handbook 3. PMS 410-1. NFES 0065. National Interagency Fire Center. Boise, Idaho 83705.

Scott, J. H., & Burgan, R. E. (2005). Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model. Ft. Collins, CO, Rocky Mountain Research Station: USDA Forest Service, Gen. Tech. Rpt. RMRS-GTR-153.

Scott, J. H., & Reinhardt, E. D. (2001). Assessing the Crown Fire Potential by Linking Models of Surface and Crown Fire Behavior. Ft. Collins, CO, Rocky Mountain Research Station: USDA Forest Service, Research Paper RMRS-RP-29.

West Wide Risk Assessment, Western Forestry Leadership Coalition (2012). West Wide Risk Assessment Final Report. Salem, OR. A final report developed by the WWA Technical Team documenting the methods and specifications of the WWA project.