



Phase I Wildfire Risk Assessment

**Waterton Business Park
Douglas County, Colorado**

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1.0 Introduction

This Phase I Wildfire Risk Assessment (WRA) has been prepared for the Waterton Business Park Property (Property) located along Waterton Road, east of North Moore Road in Douglas County, Colorado (**Figure 1 – Property Location Map**).

The 327.3-acre Waterton Business Park Property is made up of three (3) parcels (Parcel ID 2229-321-00-001, 2229-321-00-003, and 2229-321-00-004) and portions of three (3) parcels (Parcel ID 2229-332-00-002, 2229-333-00-005, and 2229-324-00-002) and consists of primarily disturbed shrubland. A large portion of the property, approximately 150 acres, consists of vacant land containing a former powder plant. Approximately 50 acres of the property are utilized as the storage yard for Douglas County including a soil stockpile, materials and machinery, materials for winter roadway treatment, and demolished concrete and asphalt rubble. The remainder of the property consists of vacant grassland and shrubland, a detention pond, a small area managed for EVO Training purposes, and unimproved roads. One (1) ephemeral stream runs along the southwestern boundary and two (2) ephemeral streams run perpendicular to the eastern boundary

2.0 General Property Description

2.1 Location

The Waterton Business Park Property is located northwest of Sedalia, along Waterton Road, east of North Moore Road. The Property Sections 32 and 33, Township 6 South, Range 68 West, and Sections 4 and 5, Township 7 South, Range 68 West in Douglas County, Colorado. The center latitude/longitude of the Property is 39.4877889N, -105.0209708W. The average elevation of the Property is approximately 5,700 feet above sea level (ASL).

The Property is located within the Pine-Oak Woodlands (26i) ecoregion of the Southwestern Tablelands (Chapman, et al. 2022). This ecoregion occurs in the foothills between Denver and Colorado Springs and is made up of dissected plains and hills. Natural vegetation in this ecoregion includes ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), western serviceberry (*Amelanchier alnifolia*), needle-and-thread (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), and sideoats grama (*Bouteloua curtipendula*). Land uses include rangeland and urban and residential development.

The Property is within the Rocky Mountain Range and Forest Land Resource Region (LRR) and the Southern Rocky Mountains Major Land Resource Area (MLRA) (NRCS 2022). This LRR is characterized by a sprawling chain of rugged mountains, broad valleys, and high plateaus from New Mexico to Canada. The average annual precipitation ranges from 6 inches (160 millimeters) in some of the valleys to more than 100 inches (2,540 millimeters) on some of the mountain peaks. The average annual temperature ranges from 22 to 60 degrees F (5.6 to 16 degrees C). This MLRA is characterized by two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. Elevation typically ranges from 6,500 to 14,400 feet. The headwaters of many of the major rivers on the High Plains and the Colorado Plateau are in this area. The Continental (or Great) Divide also is in this area. Land use is dominantly forest, followed by shrubland and grassland or pasture. The mountain slopes generally are forested, and the valleys are dominated by shrubs and grasses. Grazing is the leading land use in the valleys and mountains, but timber production is important

on some of the forested mountain slopes. Recreation is an important use throughout the region. Some of the valleys are irrigated, and some are dry-farmed (NRCS 2022).

2.2 Property Description

The project site is bound to the north by a commercial business, to the east by county-owned vacant land (Sterling Ranch Conservation Easement), to the south by county-owned land, and to the west by county-owned land and residential lots. From the earliest aerial of 1944, the powder plant can be observed within the eastern portion of the project site. The remaining portions of the project site were primarily vacant grassland from the earliest aerial to 1971 when unimproved roads and buildings were constructed.

Between 1971 and 1978, two impounded ponds were constructed in the eastern extent. Little to no change occurred within the limits from 1978 to 2015. From 2017 to present day, the Douglas County storage yard has expanded throughout the eastern portion of the site.

The existing vegetation on the Property consists of grasslands and shrublands dominated by kochia (*Bassia scoparia*), blue grama (*Bouteloua gracilis*), rubber rabbitbrush (*Ericameria nauseosa*), curly dock (*Rumex crispus*), common mullein (*Verbascum thapsus*), cheatgrass (*Bromus tectorum*), field bindweed (*Convolvulus arvensis*), diffuse knapweed (*Centaurea diffusa*), little bluestem (*Schizachyrium scoparium*), scotch thistle (*Onopordum acanthium*), western wheatgrass (*Elymus smithii*), field peppergrass (*Lepidium campestre*), basin wildrye (*Leymus cinereus*), and side-oats grama (*Bouteloua curtipendula*). Sparse stands of ponderosa pine (*Pinus ponderosa*), Russian olive (*Elaeagnus angustifolia*), creeping juniper (*Juniperus horizontalis*), Rocky Mountain juniper (*Juniperus scopulorum*), and silver maple (*Acer saccharinum*) were present within the east-central portion of the Property.

2.3 Climate

Climatic data from the weather station in Castle Rock (051401), Colorado, approximately 10 miles southeast of the Property, provides the following averages based on records from 1893 to 2016 continuous data collection:

- Average annual maximum temperature: 63.4 °F
- Average annual minimum temperature: 31.3 °F
- Average annual total precipitation: 17.04 inches
- Average annual total snowfall: 60.8 inches

3.0 Wildfire Hazard Assessment

3.1 Wildfire Risk Assessment

The potential for wildfire or fire risk is the likelihood wildfire will ignite from natural or human causes, with potential for damages to people, property, and/or the environment. Risk is defined as the possibility of loss or harm from wildfire. To assist communities with assessing wildfire hazards and risks, the Colorado State Forest Service developed the Colorado Wildfire Risk Assessment (COWRA) Portal. The COWRA provides tools, information, reports, and analyses to assist wildfire risk assessment for the Waterton Business Park. The report generated several indicators of risk elements. The Wildfire Risk Assessment described several fire behavior characteristics potentially impacting the development of the Waterton Business Park Property (*Appendix A – Colorado Wildfire Risk Assessment Summary Report*).

A summary of this report's findings indicates the current wildfire risk is low; fire rate of spread is low to moderate over most of the Property due to fuel types and fire behavior. Expected flame lengths are low to

moderate, (0-6 feet); and the likelihood of starting a wildfire is moderate to high. The report classifies the wildfire risk for the Waterton Business Park Property “lowest to low.”

Burn Probability Map is the annual probability of any location burning due to wildfire. The Burn Probability Map represents the likelihood of a fire starting based on high and extreme weather conditions to simulate each ignition because these conditions account for the vast majority of the annual acres burned. The assessment indicates ~ 81% of the Waterton Business Park Property is in the high threat class of wildfire occurrence during high to extreme fire weather conditions.

Rate of spread is the speed at which fire moves across the landscape. Influenced by fuels, weather, and topography COWRA assessed 83% percent of the Property is in areas defined as moderate to high rate of spread, with fire projected to move across the landscape 12 to 60 feet per hour.

Flame length is an indicator of fire intensity and is often used to indicate how much heat is being generated by the fire. Approximately 75% of the Waterton Business Park Property is represented by the lowest to low classification, with flame lengths projected from 0 to 4 feet or greater in length. The remainder of the Property is in moderate classifications with flame lengths projected from 4 to 6 feet in length.

The fire intensity scale identifies areas where significant fuel hazards and associated dangerous fire behavior potential exist. The fire intensity scale provides a standard scale to measure potential wildfire intensity. Approximately 80% of the Waterton Business Park Property is represented with a scale of low to moderate on Fire Intensity Scale.

The Wildfire Risk to Assets is a composite map created by combining the Values at Risk Rating and the Burn Probability layers. It identifies areas with the greatest potential impacts from a wildfire. The Values at Risk Rating is a key component of Wildfire Risk and is comprised of several individual layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Watershed Protection risk outputs. Wildfire risk ranges from very low to low across the Property.

4.0 Existing Infrastructure

4.1 Fire District Coverage

The Property is covered by the South Metro Fire Protection District (*Appendix B – Fire District Coverage Maps*). South Metro Fire Protection District Station 40 is located approximately 2.40 miles northeast of the Property. Built in 1994, Station 40 is located in the Chatfield States Community near Titan Parkway and U.S. Highway 85 in Unincorporated Douglas County. Station 40 houses Paramedic Engine 40, Brush Engine 40 and Tender 40 with 4 total personnel. Brush Engine 40 is a wildland Type 3 apparatus specially designed for urban interface fires and is cross-staffed by Engine 40 when needed. The crew also cross-staffs Tender 40 which carries 3,000 gallons of water to fires occurring in rural areas with no fire hydrants.

4.2 Existing Water Supply

The existing water supply in the vicinity of the Waterton Business Park Property is Dominion Water and Sanitation District (DWSD) (*Appendix C – DWSD New Water Connection Request Form*). There are existing 8" diameter PVC water mains available for connection at two (2) locations: 1) Moore Road east of Yellowcress Street and 2) Moore Road at the intersection of Waterton Road. The existing 8" stubs are proposed to be used for connection, with two (2) water main extensions proposed to serve the Property. The extensions will be 12" diameter PVC water main that will extend along Moore Road and the future North EVOC Road as well as along Waterton Road.

CDM Smith reviewed the potential to serve the Waterton Business Park with fire flow by extending the two (2) new water main alignments as referenced above and connecting to the existing stubs at Waterton Road / Moore Road and Moore Road / Yellowcress Street. The scenarios modeled for the Property included 1) extending one 12" water main from the existing stub at Yellowcress Street and Moore Road to the Site and 2) extending both 12" water mains from the existing stubs at Yellowcress St / Moore Road and Waterton Road / Moore Road. Their findings were as follows:

- 1) For scenario 1, where only the extension from Yellowcress St / Moore Road is provided, fire flow is achievable at the north limits of the Property, but not the southern limits. This scenario allows for a staged development of the proposed business park, where the northern portion is developed first.
- 2) For scenario 2, where both 12" PVC water main extensions are provided to the Property, there is sufficient fire flow for the entire Property at all anticipated connection points.

It is recommended that the proposed development be served by the DWSD water mains available for connection, and that the development be staged such that fire flow capacity is available from the water mains to serve the developed portions of the Property. Fire Hydrant assemblies shall be provided along the new water main alignments per typical DWSD standards and separations appropriate to the proposed use. Further, it is anticipated that the proposed buildings will be outfitted with sprinkler systems according to the current International Building Code, appropriate with the proposed uses and building form of any new construction.

5.0 Conclusions and Recommendations

The Douglas County Community Wildfire Protection Plan (CWPP) includes a county-wide wildfire hazard assessment, identification of communities at risk, and recommendations on how communities can reduce their risk to wildfire. The Colorado Wildfire Risk Assessment Portal classifies the wildfire risk for the Waterton Business Park Property "lowest to low." A future Wildfire Mitigation Plan created by a Certified Forester is recommended to assess the potential wildfire hazard and make wildfire mitigation strategic and tactical recommendations, identify any forest health concerns and make appropriate management recommendations, assist Waterton Business Park in meeting the requirements of the Douglas County Land Development Regulations, and more.

6.0 Literature Cited

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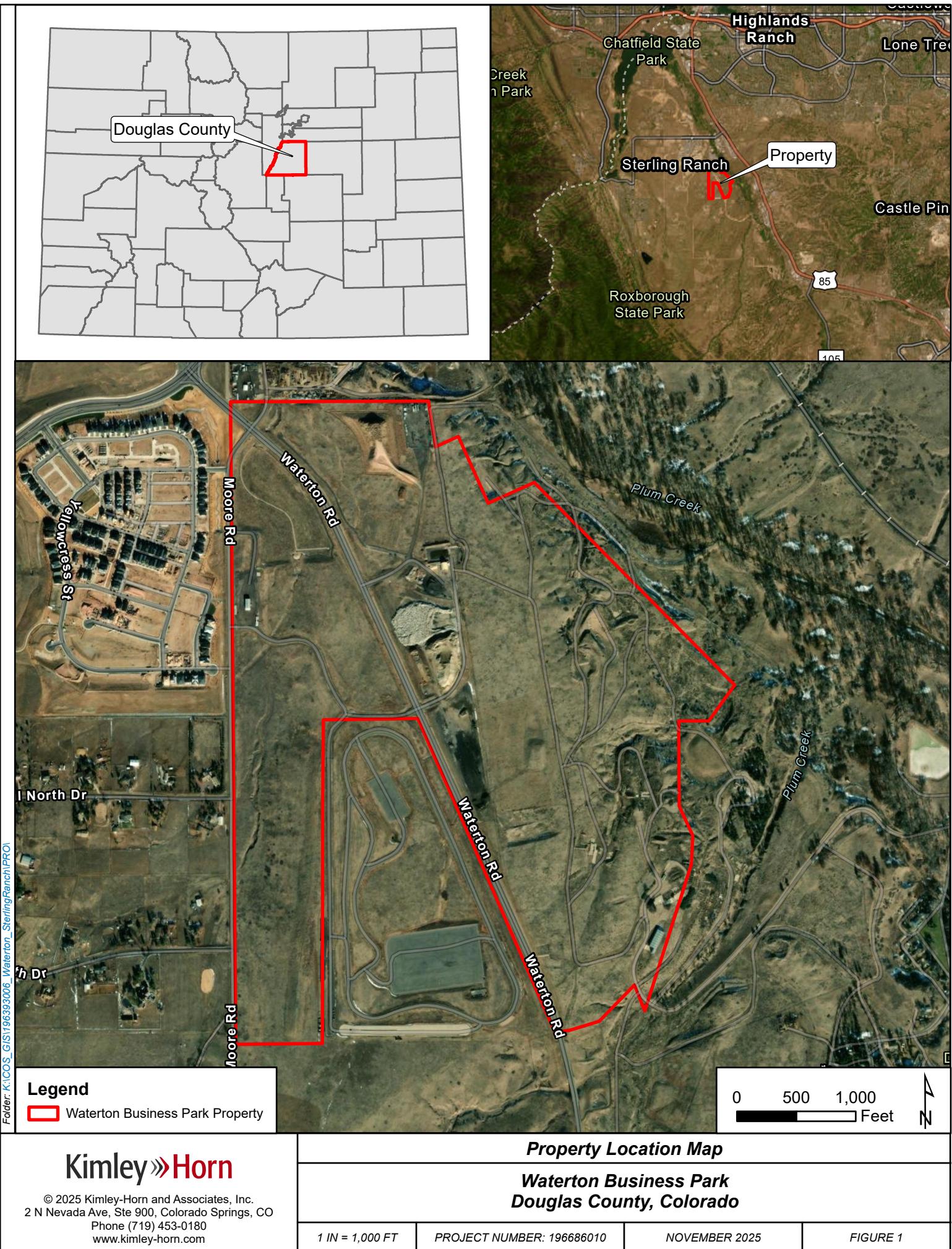
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Figures

Figure 1 – Project Location Map

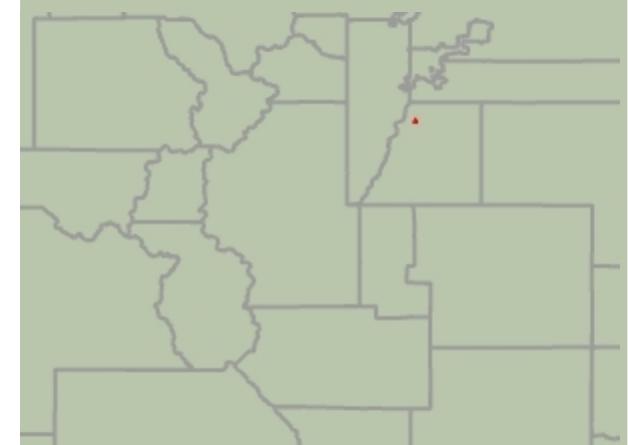


Appendix A
Colorado Wildfire Risk Assessment Summary Report

2022 Colorado Wildfire Risk Assessment Summary Report



Waterton
Business Park



**Report was generated using
www.ColoradoForestAtlas.org**

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Disclaimer

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User should also note that property boundaries included in any product do not represent an on-the-ground survey suitable for legal, engineering, or surveying purposes. They represent only the approximate relative locations.

Introduction

Colorado Wildfire Risk Assessment Report

Welcome to the Colorado Wildfire Risk Assessment Summary Reporting Tool.

This tool allows users of the Risk Reduction Planner application of the Colorado Forest Atlas 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 PDF format.

The report has been designed so that information from the report can 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 Forest Atlas web portal.

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



Products

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

COWRA Product	Description
Wildland Urban Interface	Housing density depicting where humans and their structures meet or intermix with wildland fuel
Wildland Urban Interface Risk	A measure of the potential impact on people and their homes from wildfire
Wildfire Risk to Assets	The overall composite risk occurring from a wildfire derived by combining Burn Probability and Values at Risk Rating
Burn Probability	Annual probability of any location burning due to wildfire
Terrain Difficulty Index	Reflects the difficulty to suppress a fire given the terrain and vegetation conditions that may impact ground resource access and capabilities
Characteristic Flame Length	A measure of the expected flame length of a potential fire
Fire Intensity Scale	Quantifies the potential fire intensity by orders of magnitude
Fire Type	Potential for canopy fire type for extreme weather conditions (canopy fire potential)
Rate of Spread	The speed with which a fire moves in a horizontal direction across the landscape
Surface Fuels	Characterization of surface fuel models that contain the parameters for calculating fire behavior outputs
Vegetation	General vegetation and landcover types
Watershed Protection Risk	A measure of risk to watershed protection areas based on the potential negative impacts from wildfire.
Riparian Assets Risk	A measure of the risk to riparian areas based on the potential negative impacts from wildfire
Forest Assets Risk	A measure of the risk to forested areas based on the potential negative impacts from wildfire

COWRA Product	Description
Building Damage Potential	Estimates the potential for building loss
Defensible Space Index	The arithmetic mean of the three defensible space components: canopy, fuels, and slope. The colors shown represent the relative range and are the average for all of the buildings in the hexagon.

Wildland Urban Interface

Reflects housing density depicting where humans and their structures meet or intermix with wildland fuels

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.



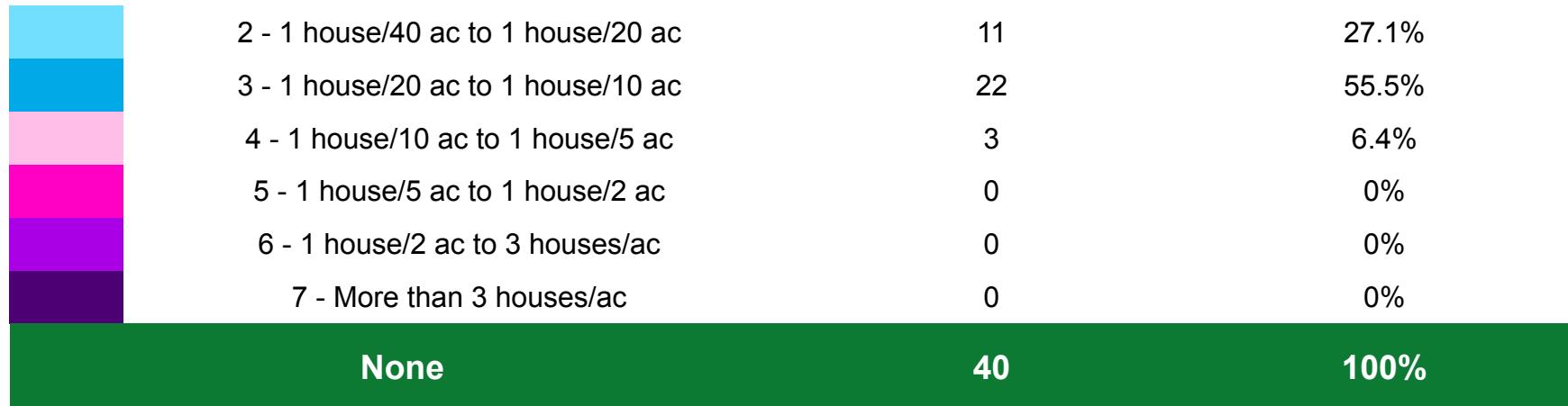
The Wildland Urban Interface (WUI) layer reflects housing density depicting where humans and their structures meet or intermix with wildland fuels. In the past, conventional wildland-urban interface data sets, such as USFS SILVIS, have been used to reflect these concerns. However, USFS SILVIS and other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

The new WUI data set is derived using advanced modeling techniques based on the Where People Live (housing density) data set and 2021 LandScan USA population count data available from the Department of Homeland Security, HSIP data. 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. Fringe urban areas, i.e. those on the edge of urban areas directly adjacent to burnable fuels are included in the WUI. Advanced encroachment algorithms were used to define these fringe areas.

Data is modeled at a 20-meter grid cell resolution, which is consistent with other CO-WRA layers. The WUI classes are based on the number of houses per acre. Class breaks are based on densities well understood and commonly used for fire protection planning.



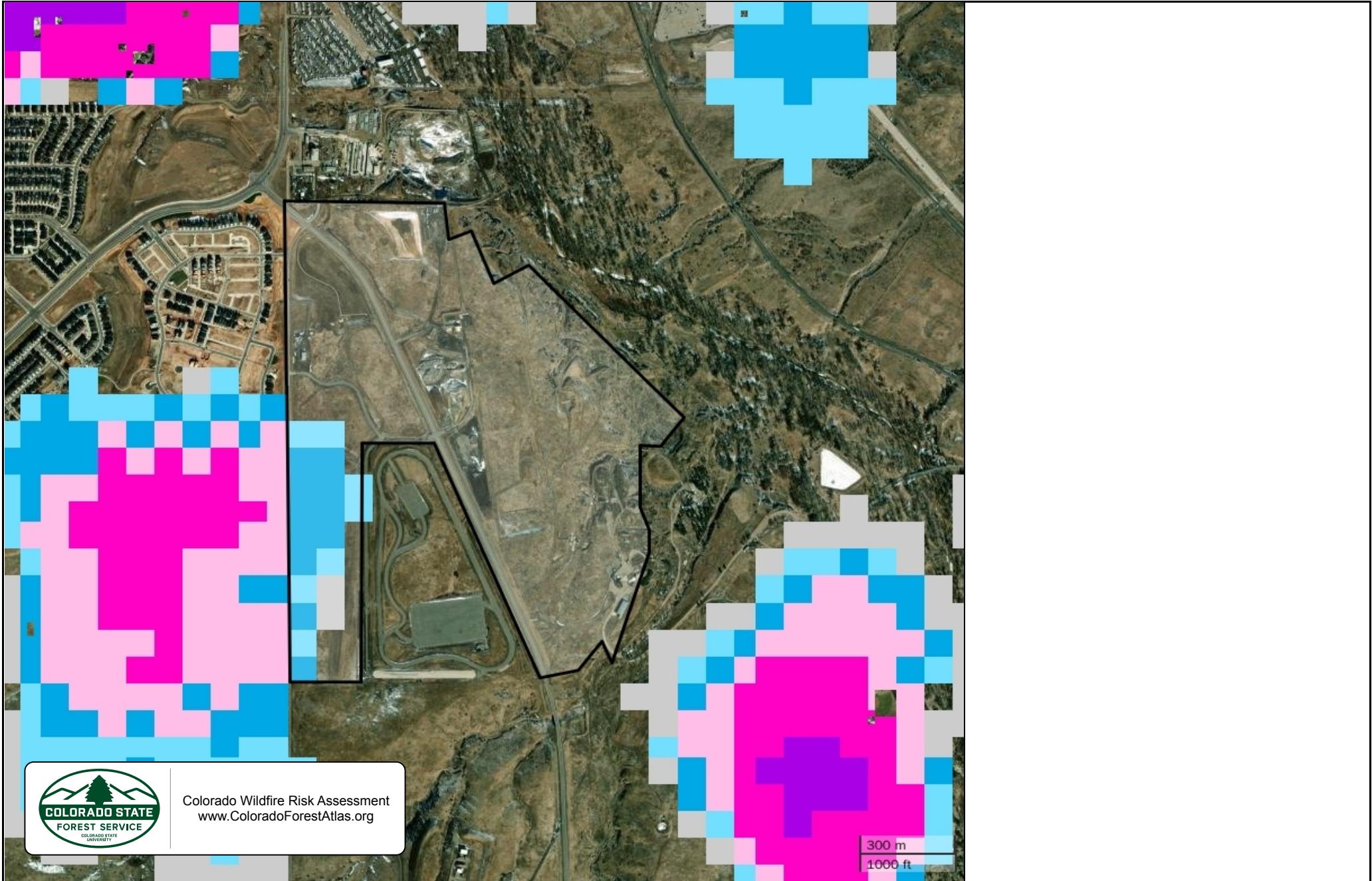
Housing Density	WUI Acres	Percent of WUI Acres
1 - Less than 1 house/40 ac	4	11%



Waterton Business Park

Wildland Urban Interface

- 1 - Less than 1 house/40 ac
- 2 - 1 house/40 ac to 1 house/20 ac
- 3 - 1 house/20 ac to 1 house/10 ac
- 4 - 1 house/10 ac to 1 house/5 ac
- 5 - 1 house/5 ac to 1 house/2 ac
- 6 - 1 house/2 ac to 3 houses/ac
- 7 - More than 3 houses/ac



Wildland Urban Interface (WUI) Risk

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 were 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. Customized urban encroachment algorithms were used to ensure those fringe urban areas were included in the WUI Risk outputs.

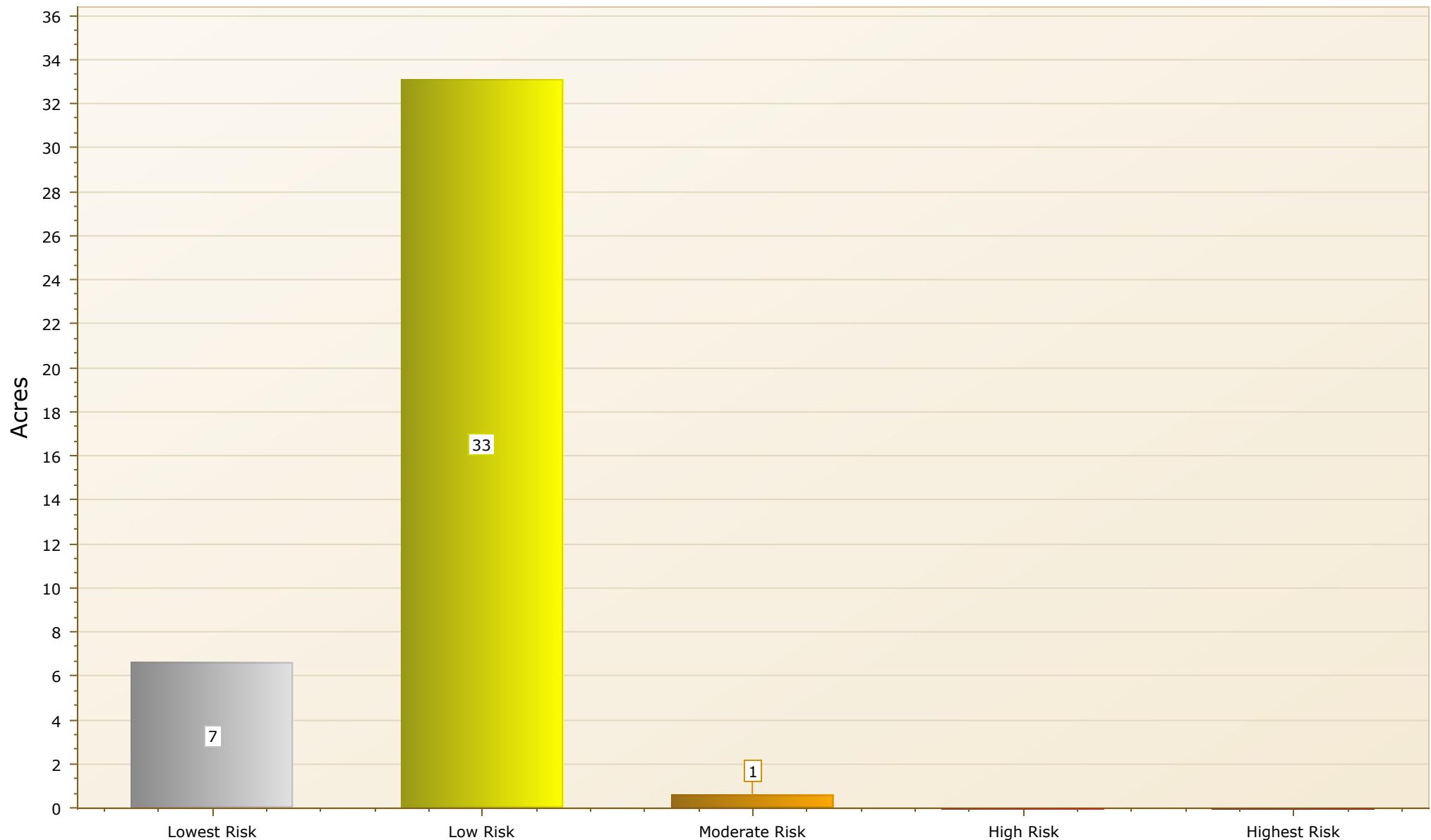
Encroachment distances into urban areas were based on the underlying fuel models and their fuel types and propensity for spotting and spreading.

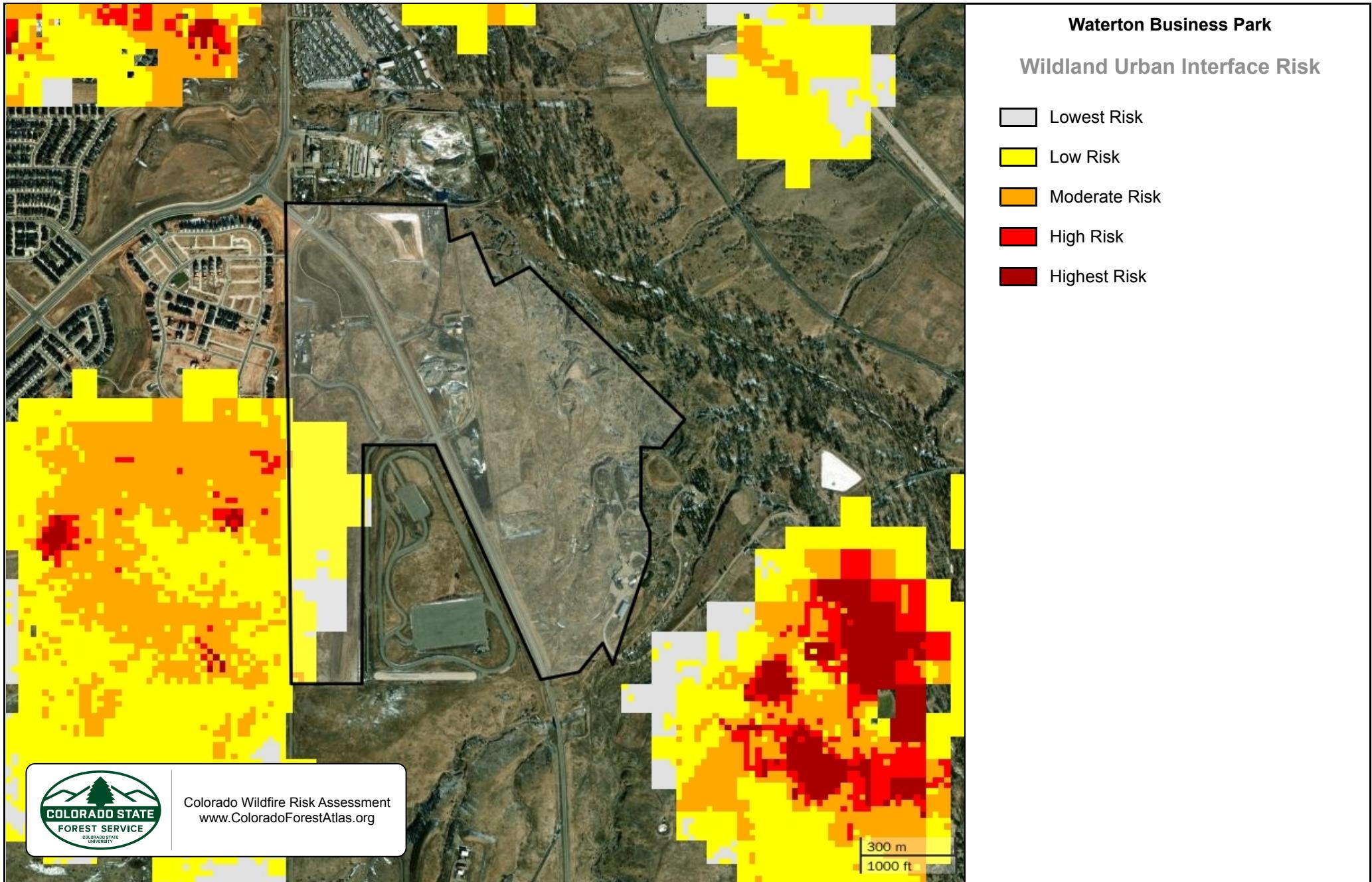
The WUI Risk Index has been calculated consistently for all areas in Colorado, which allows for comparison and ordination of areas across the entire state. Data is modeled at a 20-meter cell resolution, which is consistent with other CO-WRA layers.

WUI Risk Class	Acres	Percent
Lowest Risk	7	16.4%
Low Risk	33	82.1%
Moderate Risk	1	1.5%
High Risk		0%
Highest Risk		0%
Total	40	100%

Wildland Urban Interface Risk

Waterton Business Park





Firewise USA Recognized Sites

Description

Firewise 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 \$24.14 per dwelling unit in local Firewise actions annually
5. Create a National Fire Prevention Association (NFPA) profile and follow the application directions located at <https://portal.firewise.org/user/login>

The Firewise USA® dataset defines the boundaries of the recognized communities. Mapping Firewise USA® boundaries will generally be completed by CSFS staff.



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 USA® recognition program or to fill out an application, visit <https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA> - OR <https://csfs.colostate.edu/wildfire-mitigation/colorado-firewise-communities/>

The designated area does not contain data for this section.

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
- 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 **Waterton Business Park** test project area, there are 3 CWPPs areas that are totally or partially in the defined project area.

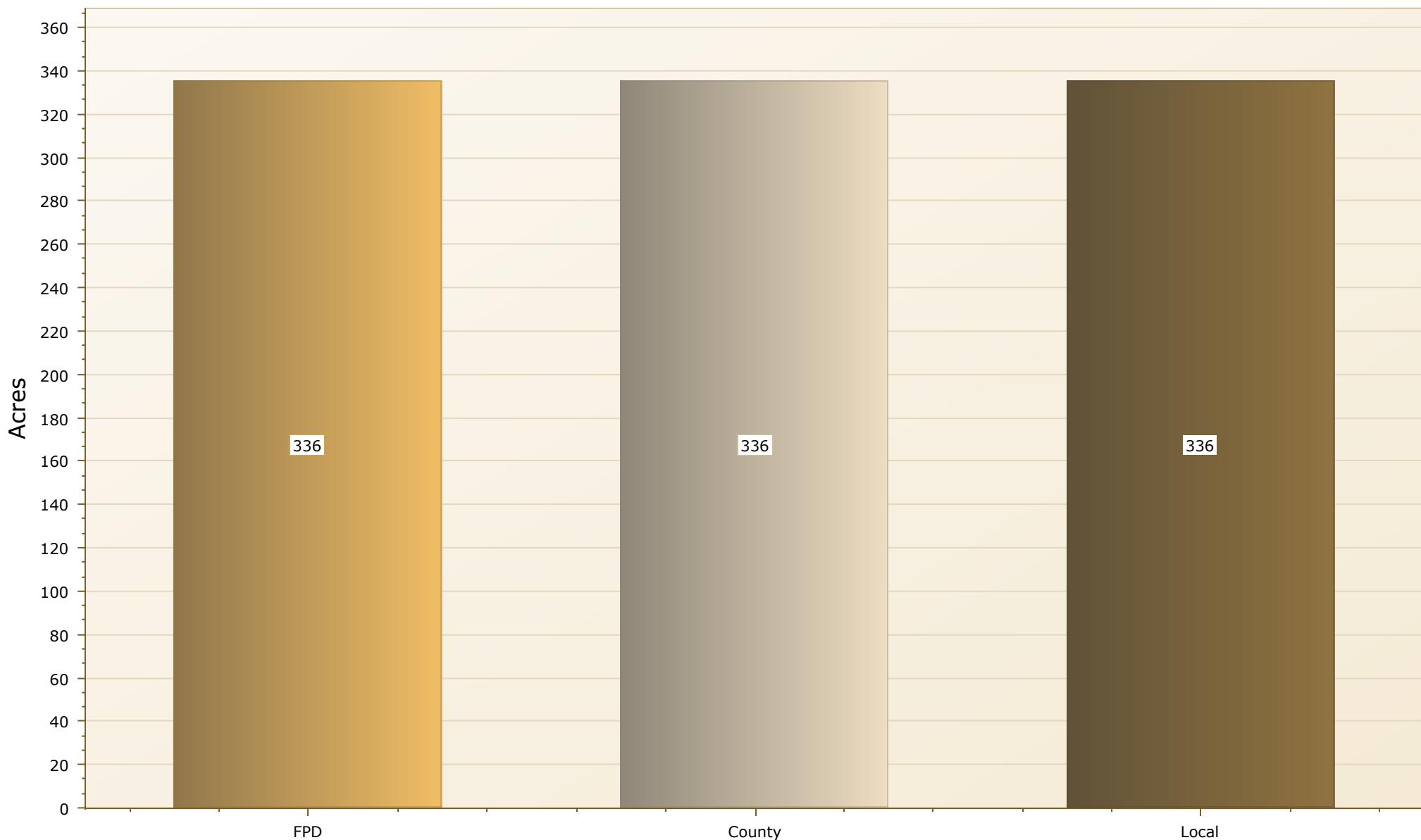


Community input is the foundation of a Community Wildfire Protection Plan that identifies community needs and garners community support.

CWPP Name	CWPP Type	CSFS District	Acres inside project area	Total Acres
South Metro Fire Rescue Authority	FPD	Franktown	336	118,410
Douglas County	County	Franktown	336	538,861
City of Castle Pines North	Local	Franktown	336	23,534
Total Acres				1,007 680,804

Community Wildfire Protection Plans

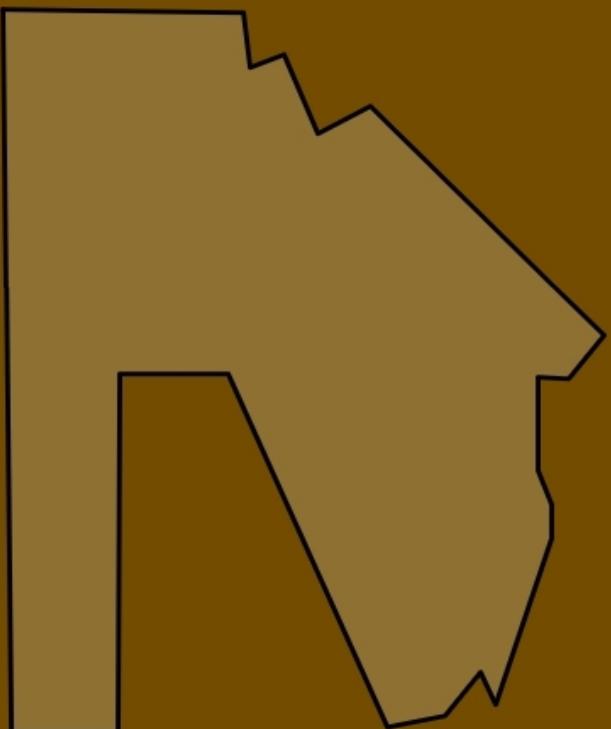
Waterton Business Park



Waterton Business Park

CWPP

- Local
- FPD
- County



Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

300 m

1000 ft

Wildfire Risk to Assets

Description

Wildfire Risk is a composite risk map created by combining the Values at Risk Rating and the Burn Probability layers.

It identifies areas with the greatest potential impacts from a wildfire – i.e., those areas most at risk when considering the four values layers.

The Values at Risk Rating is a key component of Wildfire Risk. It is comprised of several individual risk layers including Wildland Urban Interface (housing density), Forest Assets, Riparian Assets and Watershed Protection risk outputs. The WUI component is a key element of the composite risk since it represents where people live in the wildland and urban fringe areas that are susceptible to wildfires and damages. The found individual risk layers are weighted to derive the Values at Risk Rating layer.

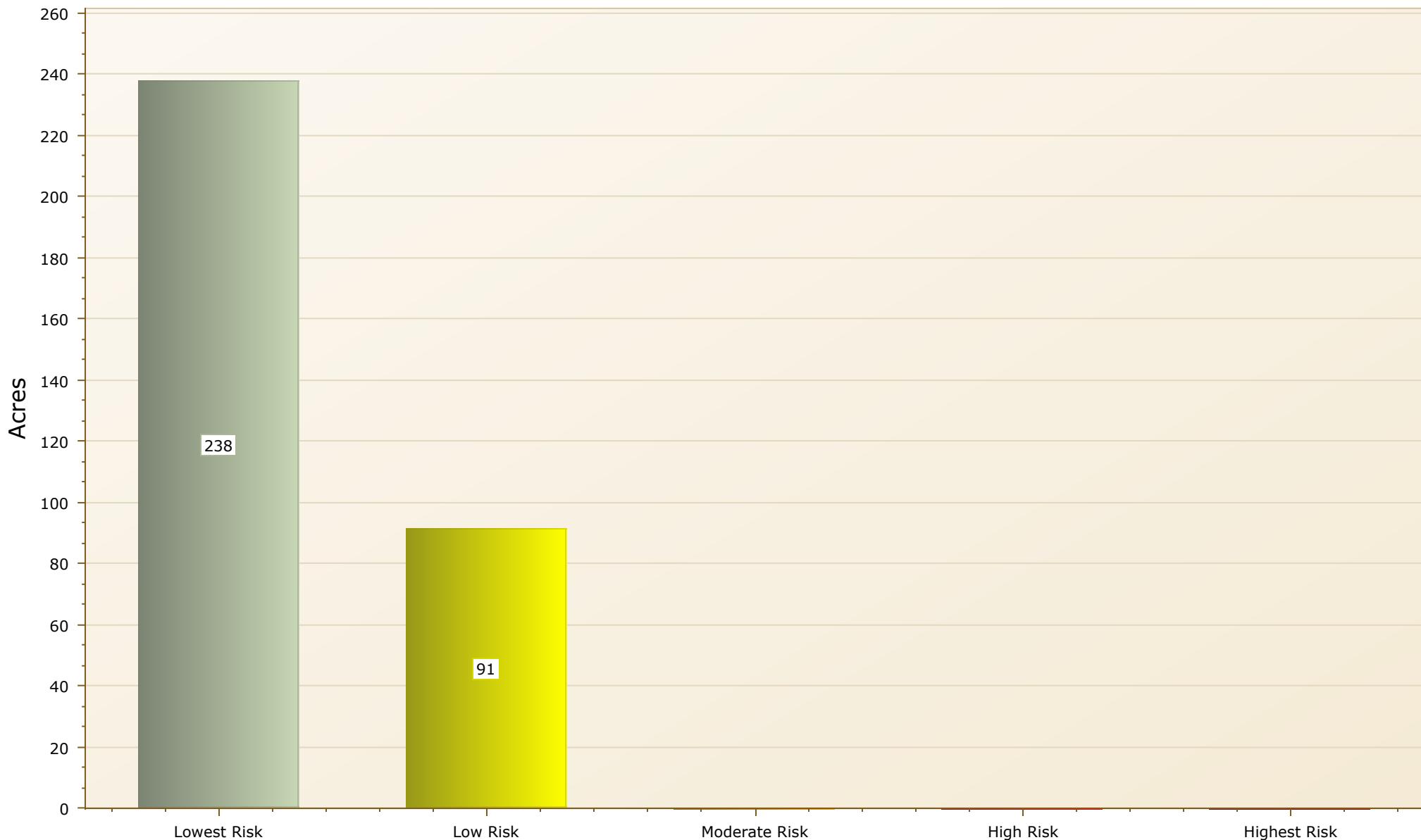
The risk map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county, or local planning efforts.

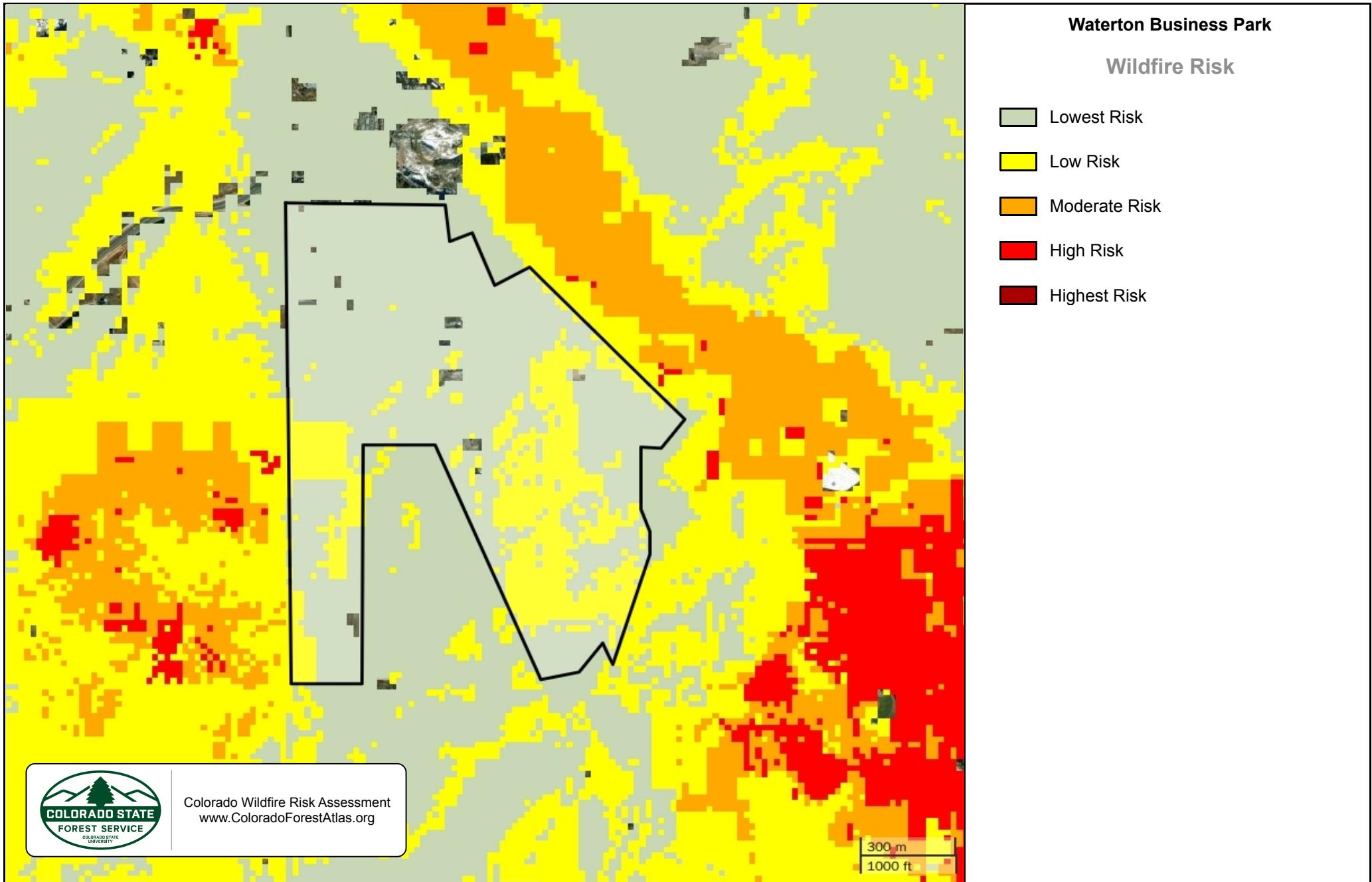
Wildfire Risk	Acres	Percent
Lowest Risk	238	72.2%
Low Risk	91	27.8%
Moderate Risk		0%
High Risk		0%
Highest Risk		0%
Total	329	100%



Wildfire Risk to Assets

Waterton Business Park





Burn Probability

Description

Burn Probability (BP) is the annual probability of any location burning due to a wildfire.

The annual BP was calculated as the number of times that a cell was burned and the number of iterations used to run the models. The annual BP was estimated for Colorado by using a wildfire simulation approach with Technosylva's Wildfire Analyst software ([Wildfire Analyst](#)). A total number of 2,342,334 fires were simulated (3,200,000 if we consider those fires outside the Colorado border which were used in a buffer area around the study area to compute BP) with a mean ignition density of 8.68 fires/km². The ignition points were spatially distributed evenly every 500 meters across the state. Only high and extreme weather conditions were used to run the single fires because they usually burn most of the annual burned area. All fires simulations had a duration of 8 h. After simulating all the fires, some cells were not burned by any simulated fire, resulting in a BP value of zero. Some cells were non-burnable due to the associated fuel type (i.e. water, roads, urban, agricultural areas, barren areas). However, the lowest BP value found in "burnable" cells was assigned to cells where the simulated fires did not reach.

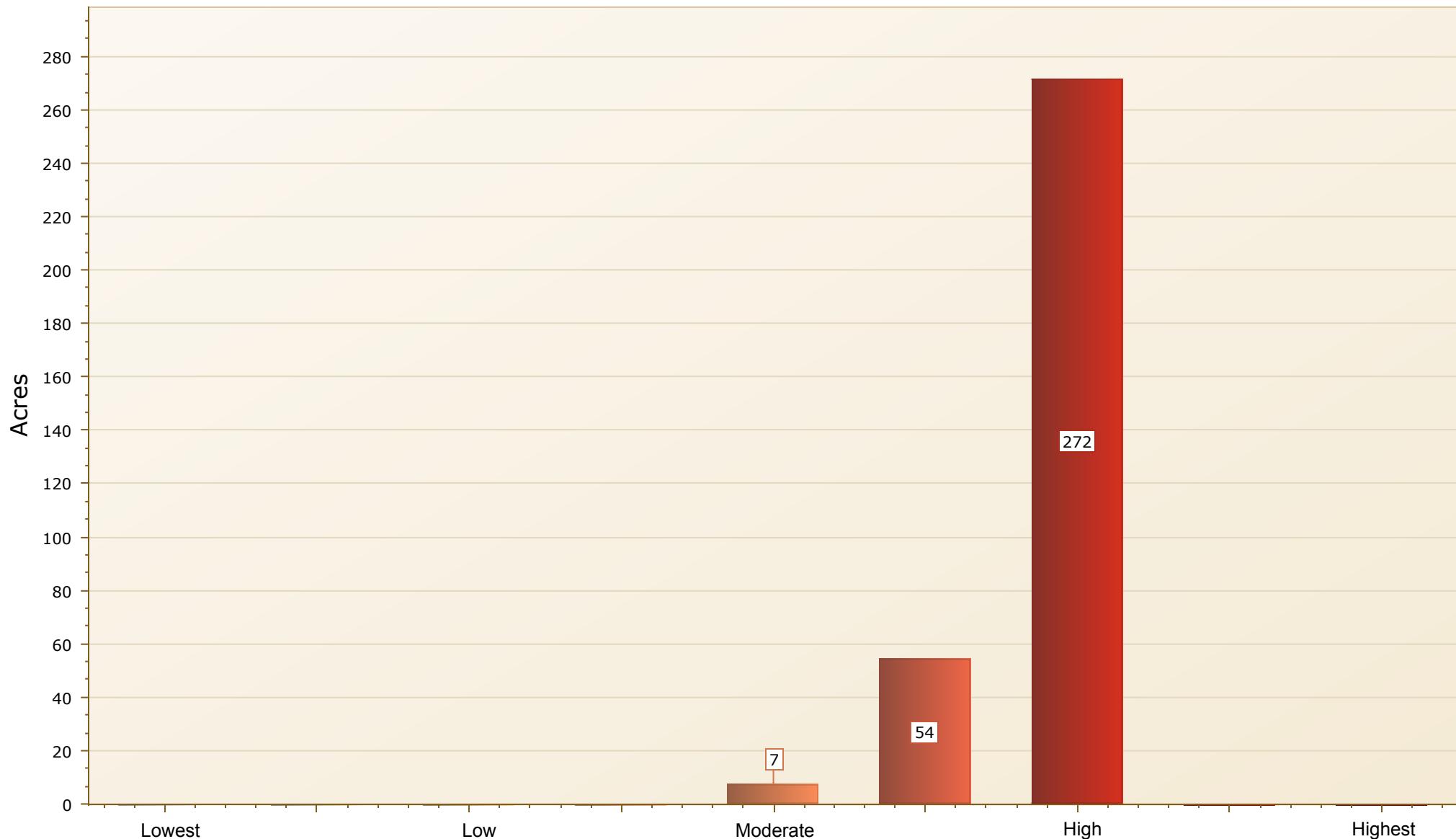
The Wildfire Analyst fire simulator considered the number of times that the simulated fires burned each cell. After that, results were weighted by considering the historical fire occurrence. The weighting was done by assessing the relation between the annual historical fire ignition density in Colorado and the total number of simulated fires with varying input data in high and moderate weather scenarios and the historical spatial distribution of the ignition points.

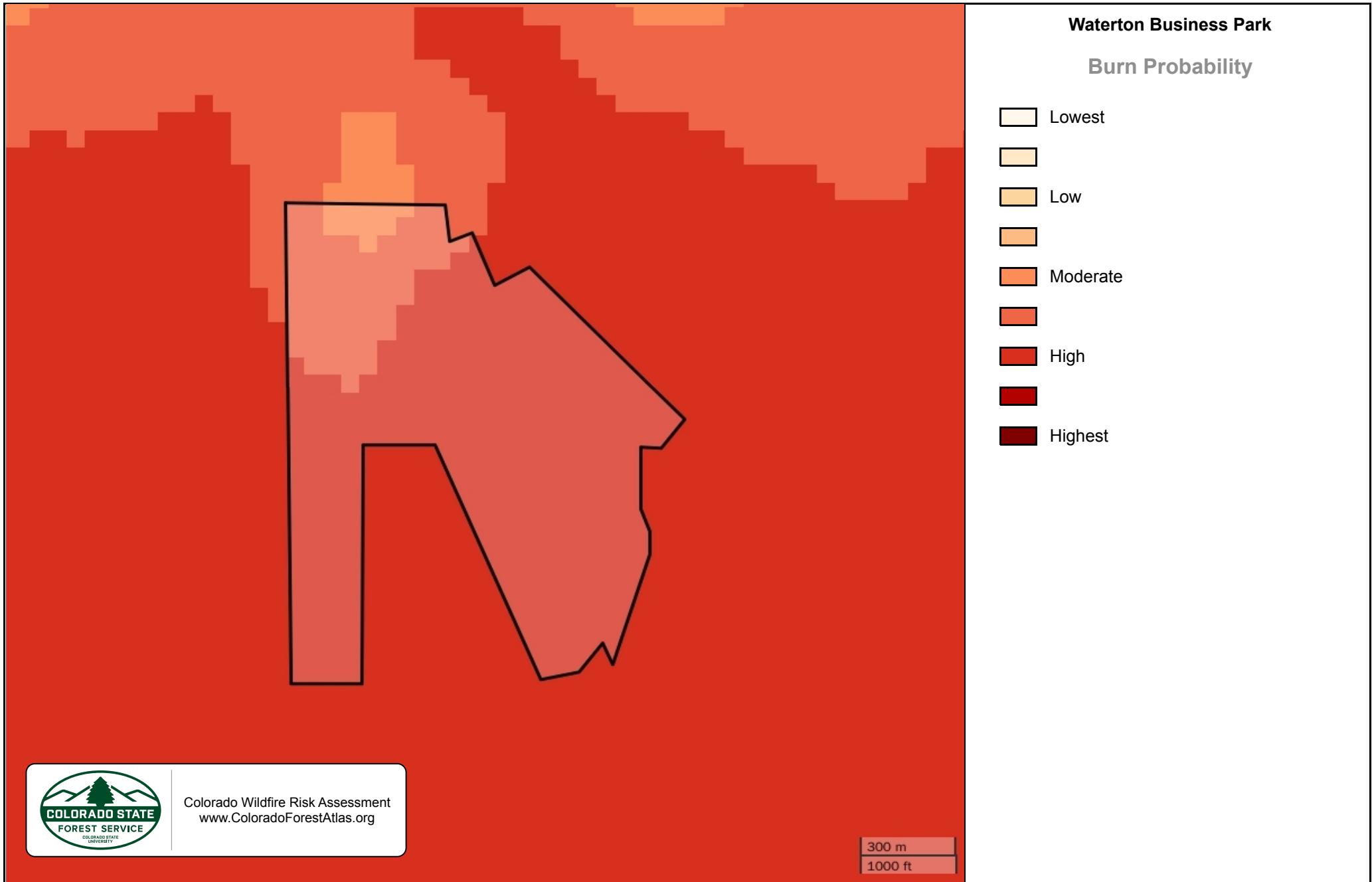
The probability map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local protection mitigation or prevention.

Burn Probability	Acres	Percent
Lowest		0%
		0%
Low		0%
		0%
Moderate	7	2.2%
	54	16.3%
High	272	81.4%
		0%
Highest		0%
Total	333	100%

Burn Probability

Waterton Business Park





Terrain Difficulty Index

Description

The 2012 and 2017 CO-WRA included a simple metric that described suppression difficulty based on fireline dozer rates. For 2022 CO-WRA, this standalone metric has been updated to reflect a more enhanced definition of areas where access to fires and suppression from ground resources is difficult. Although not a component of the standard risk assessment outputs, this metric is provided as it helps inform which areas may have limited suppression capabilities, especially for initial attack, across the State.

The Terrain Difficulty Index (TDI) is a metric that describes the characteristics of the landscape which evaluates the difficulty of extinction, especially in initial attack, although it can also be extrapolated to extended attacks. This static index quantifies the availability of access for the arrival of terrestrial means, the ability to penetrate the area where the fire originates, and the difficulty of extinguishing fuels.

Indicators such as the Accessibility Index, Penetrability Index and Fireline Opening Index (construction) have been used for the formulation of TDI. This index is based on other indices such as the Wildfire Suppression Difficulty Index (terrestrial) (SDIt) (Matthew P Thompson et al, 2018. Francisco Rodriguez and Silva et al, 2020.) which is a quantitative rating of the relative difficulty to perform fire control work. However, TDI is dynamic as it incorporates changes in surface fuels over time providing a less static perspective for a planning point of view.

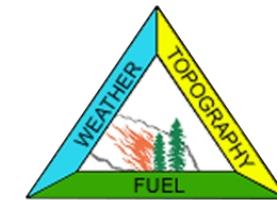
The designated area does not contain data for this section.

Wildfire Behavior Outputs

Description

Fire behavior is the way 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:

1. 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. The 2022 assessment uses the latest 2022 calibrated fuels for Colorado. The following custom fuels were included to improve the fire modeling in timber, WUI and agricultural areas:

- Timber: 2 new categories (171 and 191)
- Urban: 7 new categories (911,912,913,914,915,916 and 919)
- Roads: 5 new categories (941,942,943,944 and 949)
- Agriculture: 4 new categories (931,932,938 and 939)
- Water: 3 new categories (981,982 and 989)

2. 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.

3. 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.



4. **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.

5. **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

Weather data (1979-2022) from gridMET was used to analyze potential weather scenarios in which assessing fire behavior and spread. gridMET is a dataset of daily high-spatial resolution (~4-km, 1/24th degree) surface meteorological data covering the contiguous US. Air temperature data at 2m, relative humidity at 2m, and wind speed and direction at 10 m were all downloaded and used.

After computing the weather percentiles of the gridMET variables, data was interpolated using IDW algorithms (Inverse Distance Weighting) at 20-meter pixel resolution.

Dead fuel moisture content was estimated using the model of Rothermel and Rinehart (1983). Both temperature and air relative humidity at 2m from gridMET was used to define the fuel moisture model. The model also considered elevation and aspect to take into account the accumulated solar radiation at 14h (local time). 1% and 2% were added to the 1h-dead fuel moisture content to estimate 10h and 100h dead fuel moisture content, respectively.

For the first time in CO-WRA risk assessments, both herbaceous and woody live fuel moisture content was modelled using Technosylva's proprietary models based on optical imagery, drought indices and phenology. The models were trained with the WFAS National live fuel moisture content. Foliar moisture content in the canopies was considered as a constant value (80%) across the entire state.

Wind speed at 10 m was estimated at 20 ft applying a wind adjustment factor to use 20-ft wind speed in the fire spread and behavior equations. Afterward, wind speed percentiles were computed to use these data in the FB analysis at 20-meter pixel resolution. Wind direction for Colorado was analyzed for a 40-year period (1979-2022) considering the calculated wind speed percentiles from gridMET data. Predominant wind direction is from SW to NE, especially when wind speed is high or very high.

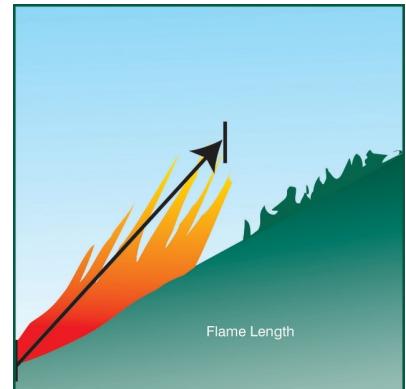
Characteristic Flame Length

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. Flame length is the measure of fire intensity used to generate the Fire Effects outputs for the CO-WRA and it 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 20-meter grid cell in Colorado.

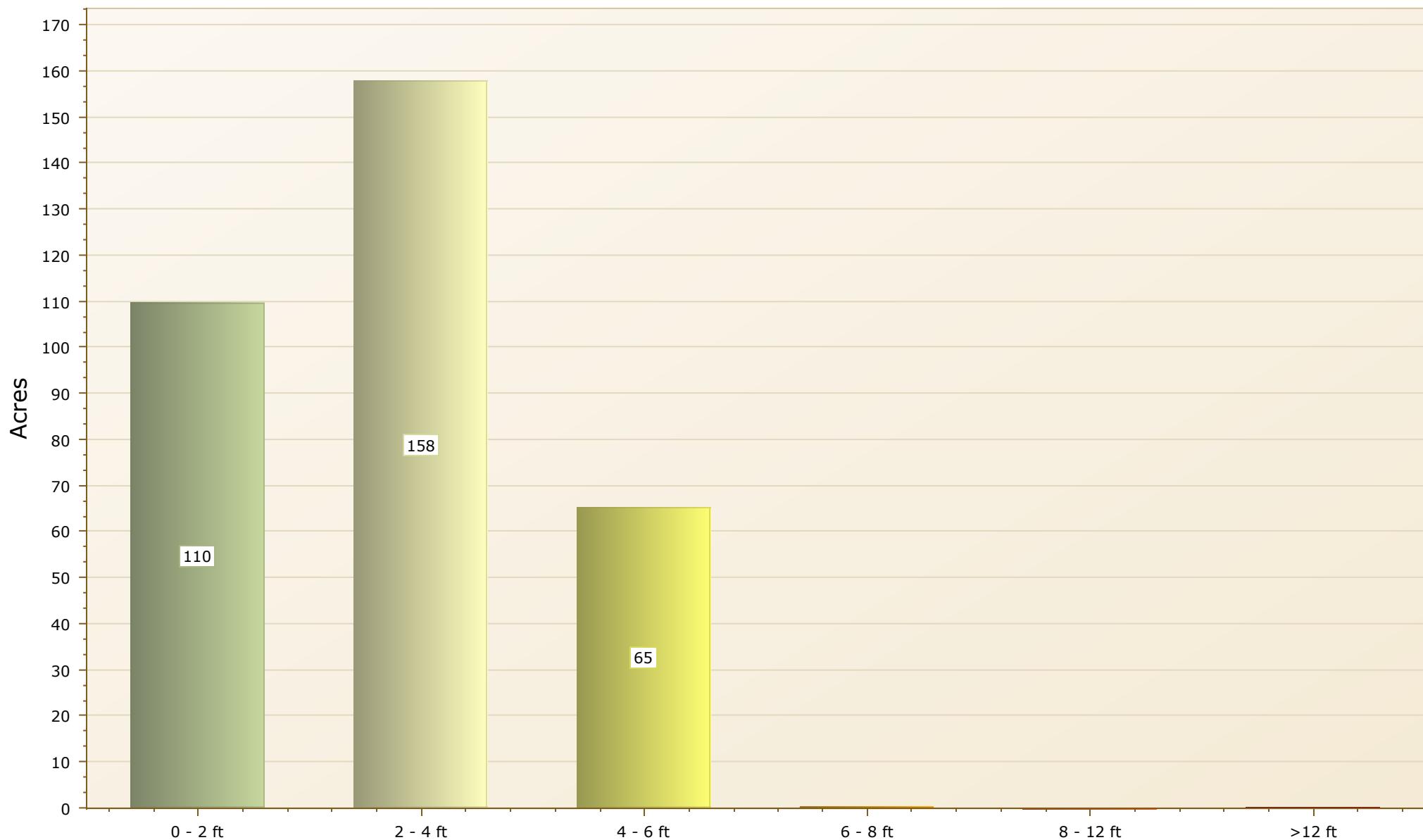
The Characteristic Flame Length represents the weighted average for all four weather percentiles. While not discussed in this report, the individual percentile weather Flame Length outputs are available in the CO-WRA data.

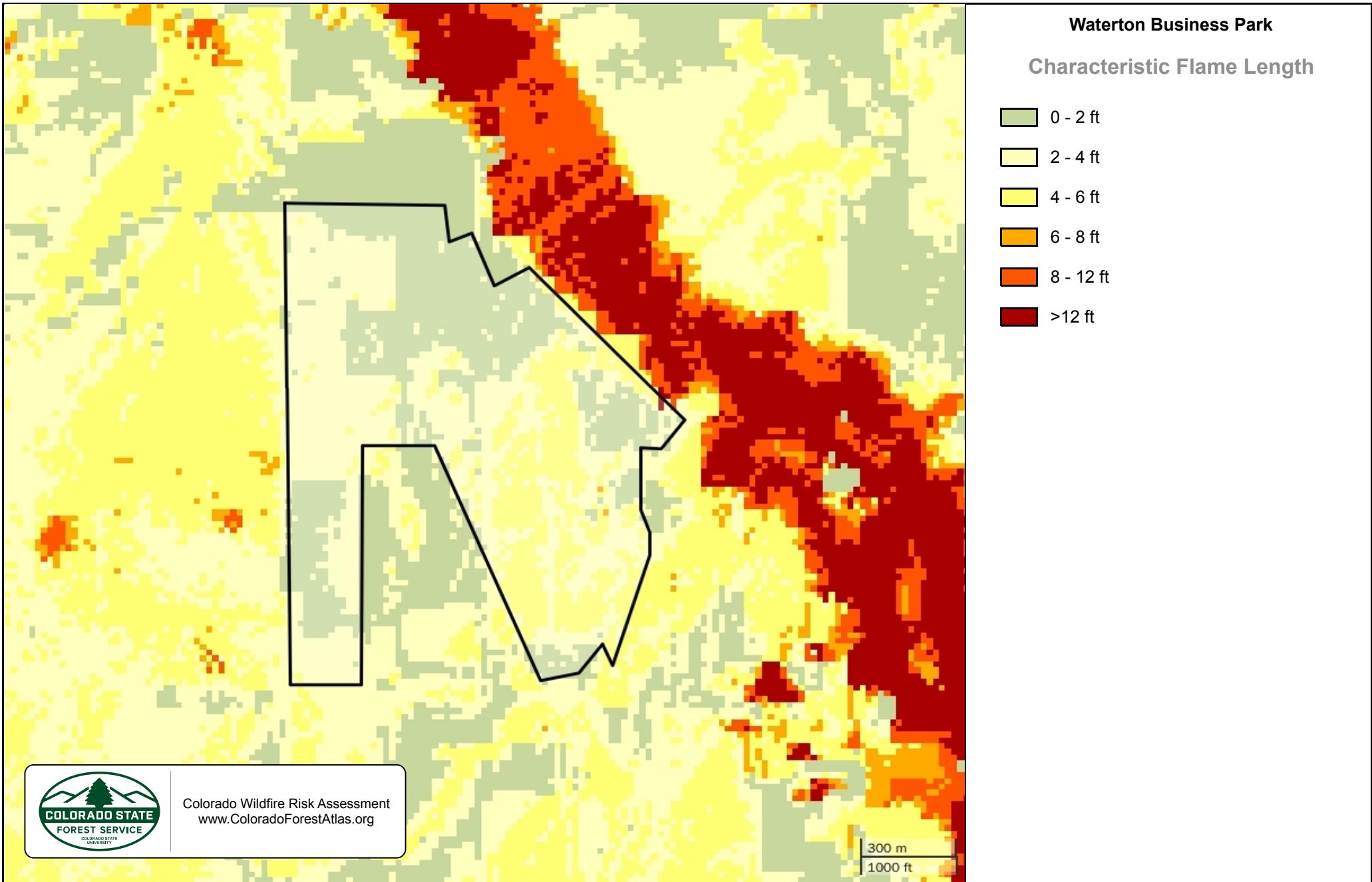


Characteristic Flame Length	Acres	Percent
0 - 2 ft	110	30.8%
2 - 4 ft	158	44.3%
4 - 6 ft	65	18.3%
6 - 8 ft		0.1%
8 - 12 ft		0%
>12 ft		0%
Total	333	94%

Characteristic Flame Length

Waterton Business Park





Fire Intensity Scale

Description

Quantifies the potential fire intensity by orders of magnitude.

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. Class 2, Low:

Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.

3. Class 3, Moderate:

Flames up to 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.

Burn Probability 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.

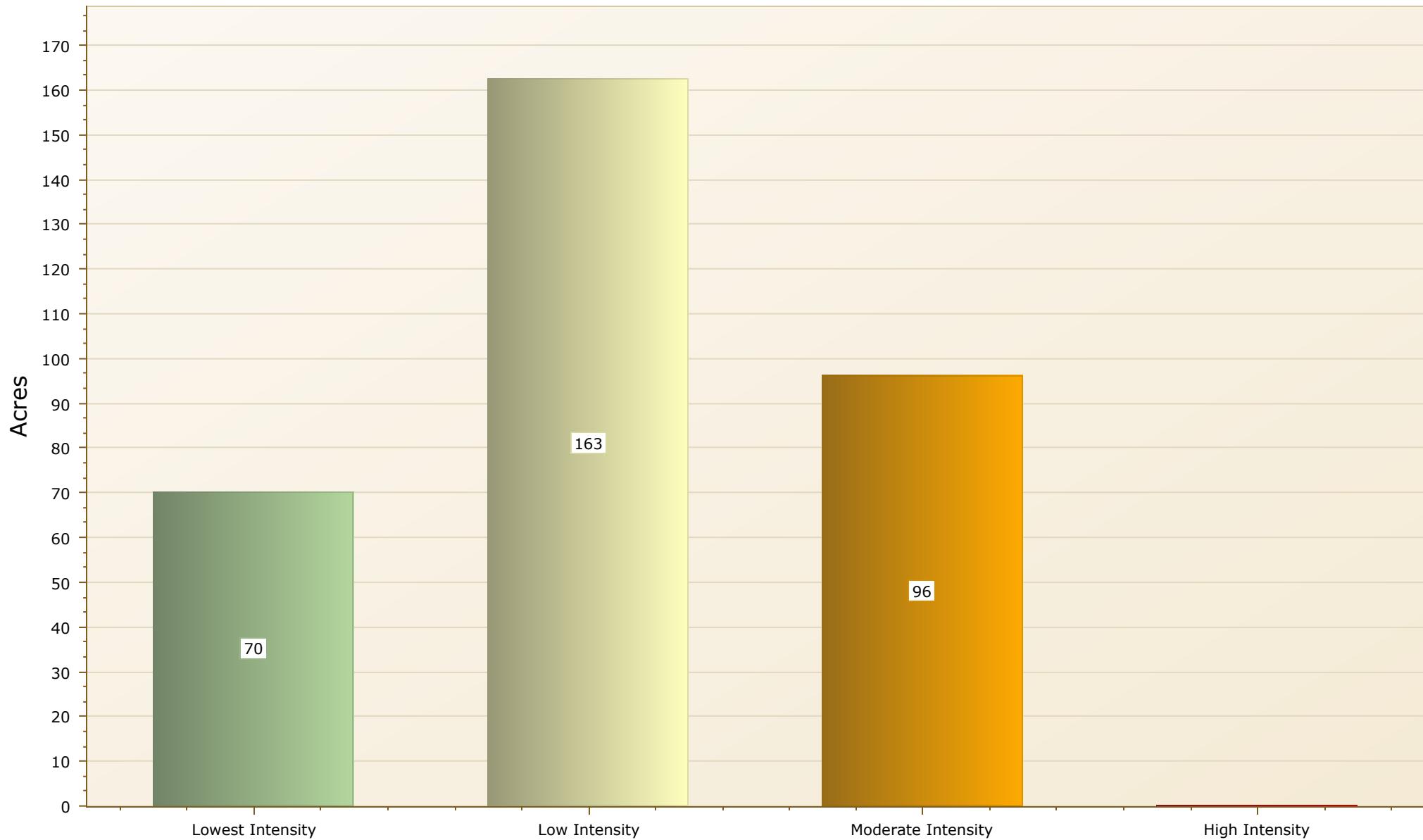
Fire intensity scale is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography – and the spread itself (back, flank or head fire influences fire behavior for a given pixel for a specific fire simulation). Weather is by far the most dynamic variable as it changes frequently. Thus, each pixel may burn many times with different fire spread patterns based on the aforementioned factors. The fire intensity scale maps represent an average fire intensity map.

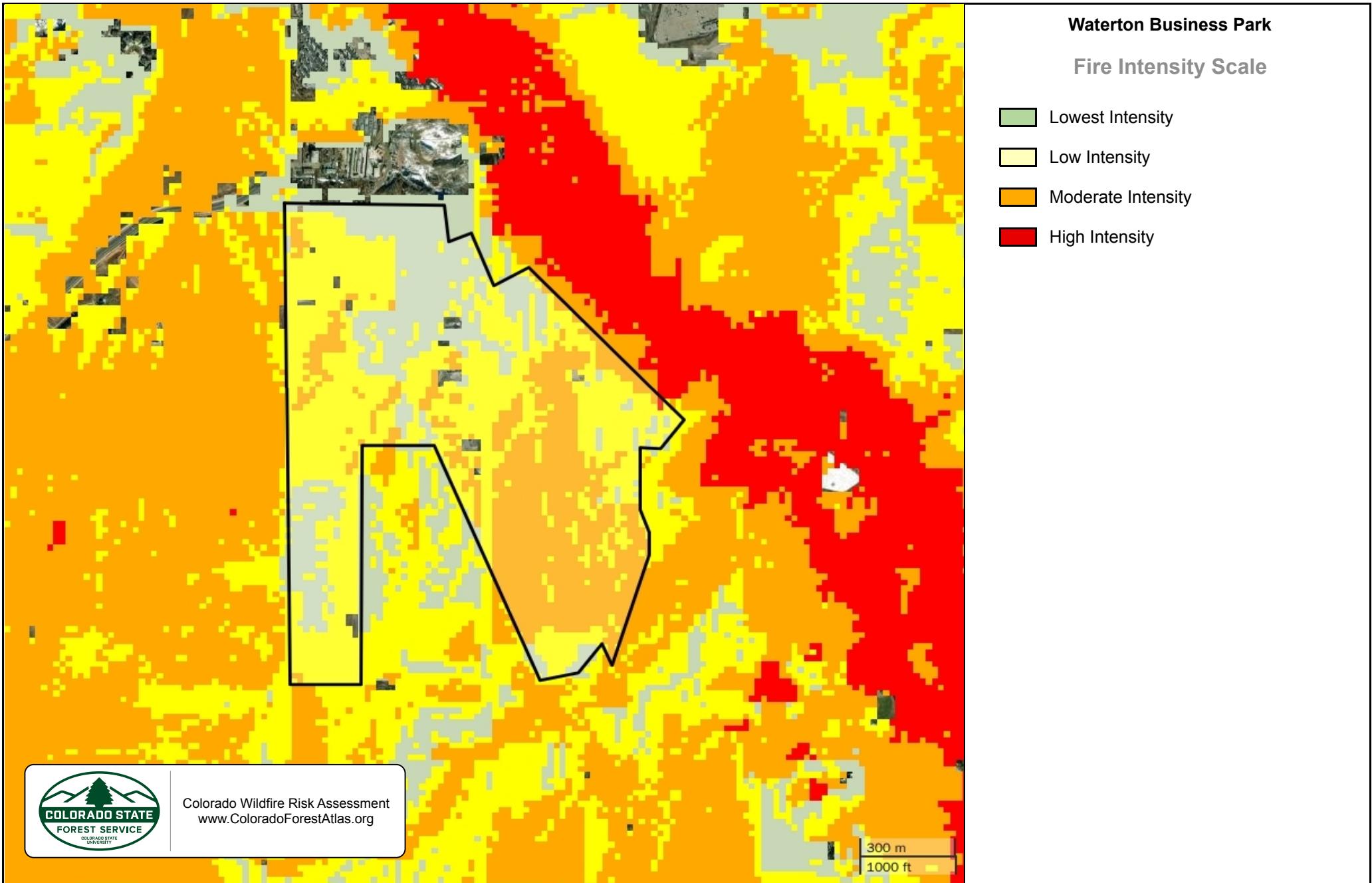
The fire intensity scale map is derived at a 20-meter resolution. This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county, or local planning efforts.

FIS Class	Acres	Percent
Lowest Intensity	70	21.3%
Low Intensity	163	49.4%
Moderate Intensity	96	29.2%
High Intensity		0.1%
Total	329	100%

Fire Intensity Scale

Waterton Business Park





Fire Type

Represents the potential fire type under the extreme percentile weather category.

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. The Fire Type 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).
- Conditional Crown Fire – A type of crown fire in which an active crown fire is possible but one would not be predicted to initiate. Two outcomes are possible in that situation: surface fire if the fire starts in the stand as a surface fire, or active crown fire if fire enters the stand as an active crown fire.
- 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).



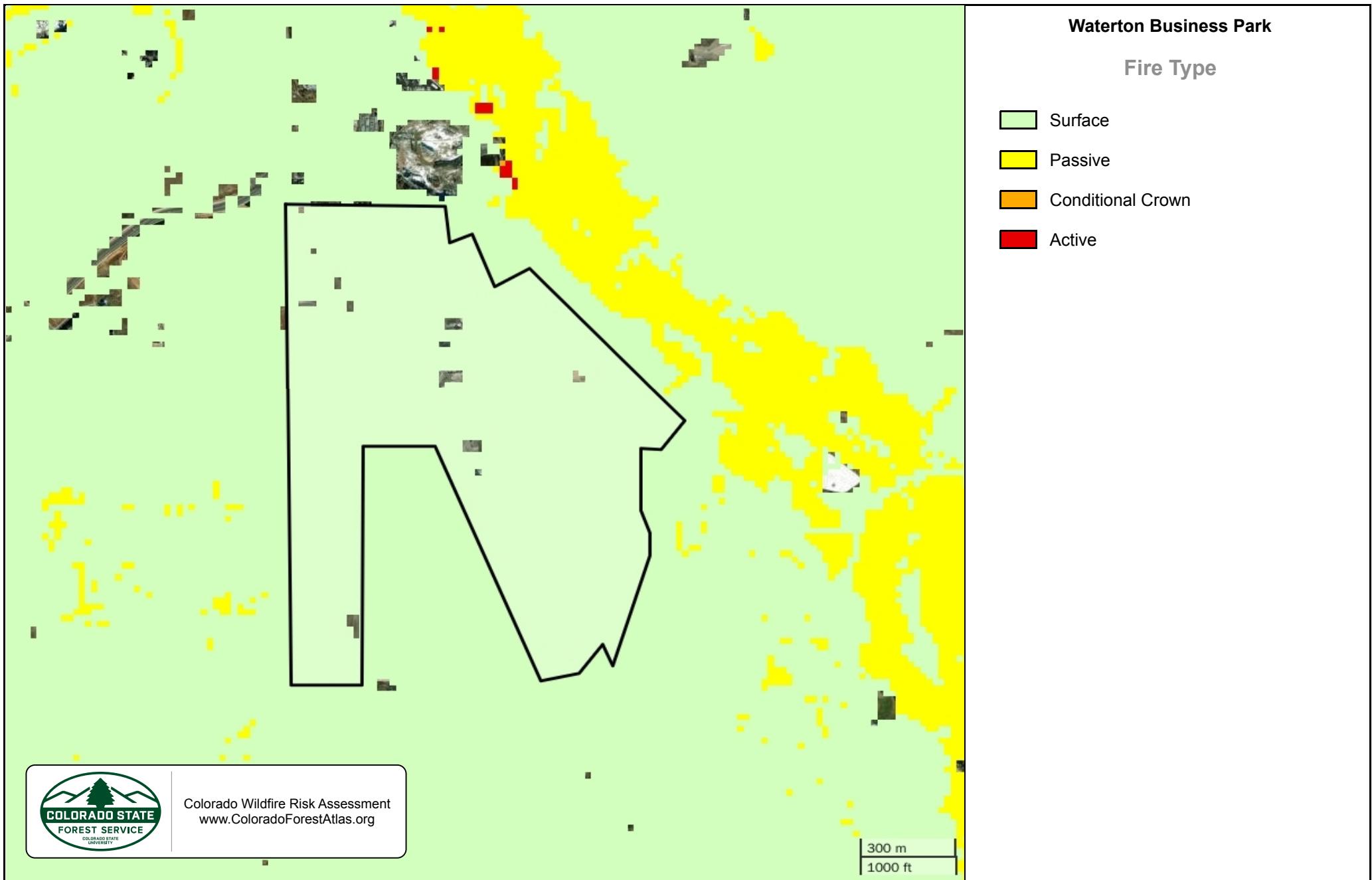
The fire type map is derived at a 20-meter resolution and was estimated based on the extreme weather scenario (percentile 97th). This scale of data was chosen to be consistent with the accuracy of the primary surface fuels dataset used in the assessment. While not appropriate for site specific analysis, it is appropriate for regional, county or local planning efforts.

Fire Type	Acres	Percent
Surface	329	100%
Passive		0%
Conditional Crown		0%
Active		0%
Total	329	100%

Fire Type

Waterton Business Park





Rate of Spread

The typical or representative rate of spread of a potential fire based on a weighted average of four percentile weather categories.

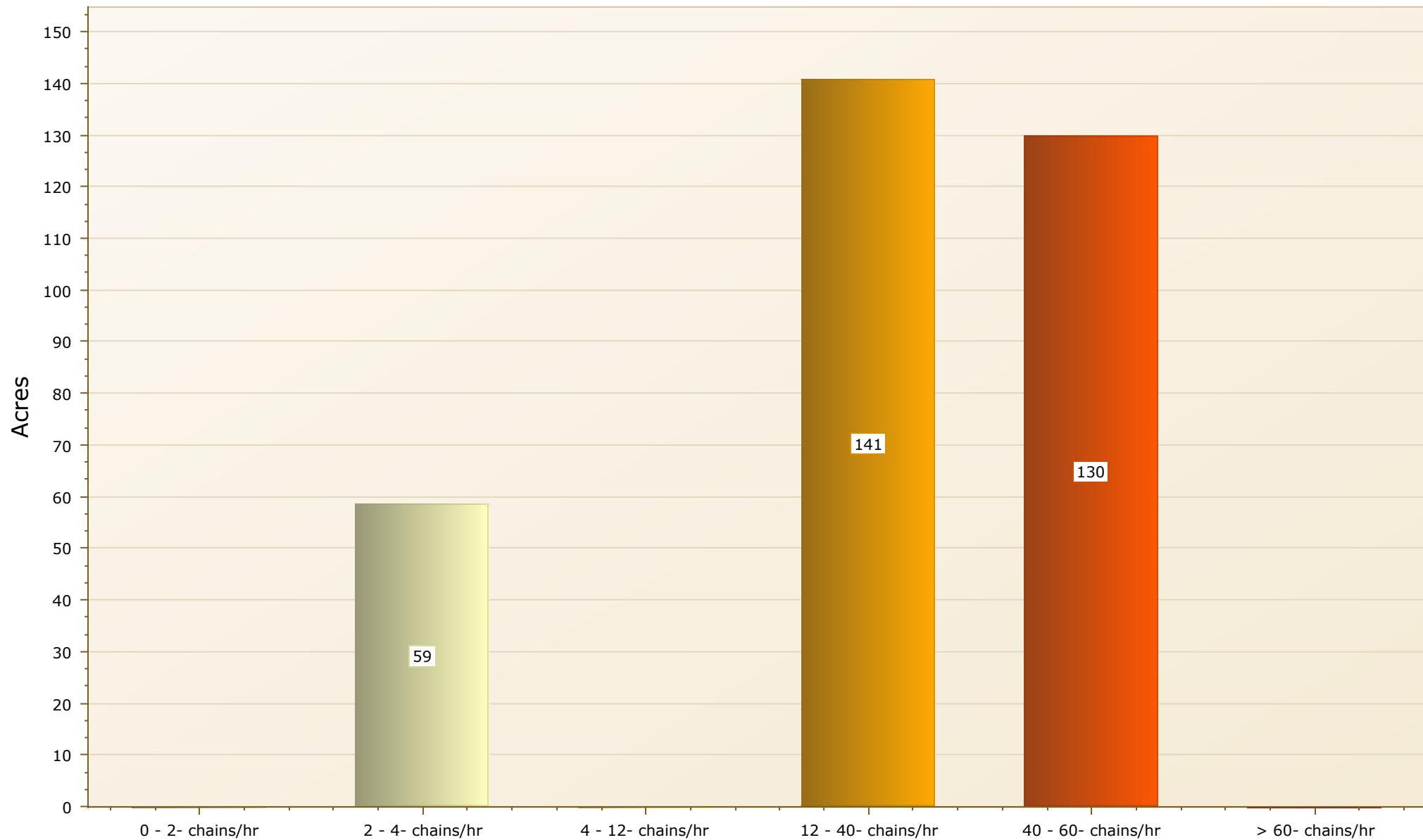
Rate of spread is the speed with which a fire moves in a horizontal direction across the landscape, usually expressed in chains per hour (ch/hr) or feet per minute (ft/min). For purposes of the CO-WRA, this measurement represents the maximum rate of spread of the fire front.

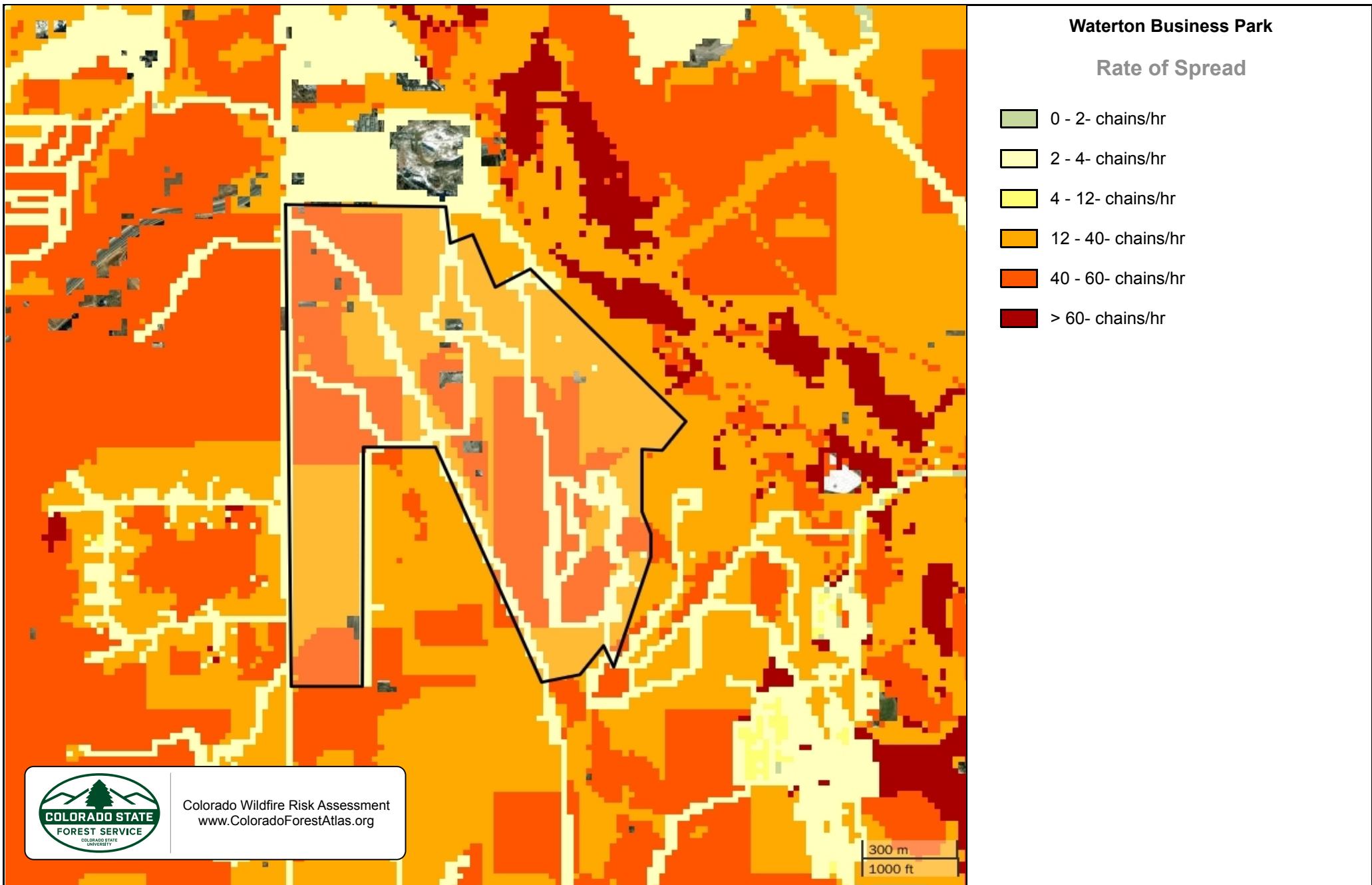
Rate of spread is a fire behavior output, which is influenced by three environmental factors - fuels, weather, and topography. Weather is by far the most dynamic variable as it changes frequently. To account for this variability, four percentile weather categories were created from historical weather observations to represent low, moderate, high, and extreme weather days for a 20-meter grid cell in Colorado.

Rate of Spread	Acres	Percent
0 - 2- chains/hr		0%
2 - 4- chains/hr	59	17.8%
4 - 12- chains/hr		0%
12 - 40- chains/hr	141	42.8%
40 - 60- chains/hr	130	39.4%
> 60- chains/hr		0%
Total	329	100%

Rate of Spread

Waterton Business Park





Surface Fuels

Fire behavior fuel models that contain the parameters required to calculate fire behavior outputs.

Surface fuels, or fire behavior fuel models as they are technically referred to, contain the parameters needed by the Rothermel (1972) surface fire spread model to compute surface fire behavior characteristics, e.g. 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 CO-WRA accounts for both surface and canopy fire potential in the fire behavior outputs.

An up-to-date surface fuel dataset at 20-meter (m) resolution was developed for this project, based on Scott and Burgan (2005) fuel models, enhanced with custom fuels created by Technosylva. The custom fuels distinguish this assessment from previous ones performed in Colorado as they allow a better characterization of fire behavior across the landscape. Additionally, the urban and road custom fuel models included in the assessment are key for better characterizing the exposure, vulnerability and risk of both buildings and population in the Wildland Urban Interface (WUI). This also allows for better modeling of fire encroachment in urban areas considering the building density, community structure and fuels surrounding the buildings and urban areas.

The following custom fuels were included in order to improve the fire modeling in timber, WUI and agricultural areas:

- Timber: 2 new categories (171 and 191)
- Urban: 7 new categories (911,912,913,914,915,916 and 919)
- Roads: 5 new categories (941,942,943,944 and 949)
- Agriculture: 4 new categories (931,932,938a and 939)
- Water: 3 new categories (981,982 and 989)

Additionally, we also considered canopy fuel data to better simulate crown fire behavior. This includes:

- canopy bulk density (CBD),
- canopy base height (CBH),
- canopy cover (CC) and
- canopy height (CH).



Unmanaged forest with dead and downed trees and branches



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

The updated fuel dataset also considered the effects of natural disturbances on vegetation (fires, insect and disease, and harvesting/fuel treatments) that occurred in Colorado from 2013 to 2022. More information about the methods used can be found in the Colorado 2022 Fuels Mapping Final Report.

Surface Fuels	Description	Acres	Percent
NB2 (92)	Snow/Ice		0%
NB3 (93)	Agricultural		0%
NB8 (98)	Open Water		0%
NB9 (99)	Bare Ground		0%
GR1 (101)	Short, Sparse Dry Climate Grass	202	60.6%
GR2 (102)	Low Load, Dry Climate Grass	58	17.3%
GR3 (103)	Low Load, Very Coarse, Humid Climate Grass		0%
GR4 (104)	Moderate Load, Dry Climate Grass		0%
GR1 (111)	Short, Sparse Dry Climate Grass - ALPINE		0%
GR2 (112)	Low Load, Dry Climate Grass - ALPINE		0%
GS1 (121)	Low Load, Dry Climate Grass-Shrub		0%
GS2 (122)	Moderate Load, Dry Climate Grass-Shrub	11	3.4%
GS3 (123)	Moderate Load, Humid Climate Grass-Shrub		0%
GS4 (124)	High Load, Humid Climate Grass-Shrub		0%
GS1 (131)	Low Load, Dry Climate Grass-Shrub - ALPINE		0%
SH1 (141)	Low Load Dry Climate Shrub		0%
SH2 (142)	Moderate Load Dry Climate Shrub		0%
SH4 (144)	Low Load, Humid Climate Timber-Shrub		0%
SH5 (145)	High Load, Dry Climate Shrub		0%
SH7 (147)	Very High Load, Dry Climate Shrub		0%
SH7 (157)	Very High Load, Dry Climate Shrub		0%
TU1 (161)	Low Load Dry Climate Timber-Grass-Shrub		0%
TU2 (162)	Moderate Load, Humid Climate Timber-Shrub		0%
TU3 (163)	Moderate Load, Humid Climate Timber-Grass-Shrub		0%
TUML1 (171)	Timber Understory Dynamic ML (TSYL 2022)		0%
TL1 (181)	Low Load Compact Conifer Litter		0%
TL2 (182)	Low Load Broadleaf Litter		0%
TL3 (183)	Moderate Load Conifer Litter		0%
TLML1 (191)	Timber Litter ML (TSYL 2022)		0%

Surface Fuels	Description	Acres	Percent
SB3 (203)	High Load Activity Fuel or Moderate Load Blowdown		0%
SB4 (204)	High Load Blowdown		0%
UIL (911)	Isolated urban surrounded by Low FB fuel		0%
USL (912)	Scattered urban surrounded by Low FB fuel		0%
UCL (913)	Urban core surrounded by Low FB fuel	1	0.4%
UIH (914)	Isolated urban surrounded by High FB fuel		0%
USH (915)	Scattered urban surrounded by High FB fuel		0%
UCH (916)	Urban core surrounded by High FB fuel		0%
UNB (919)	Unburnable urban areas		0%
ASL (931)	Agricultural Low Load Fuels, with seasonal changes of its Burnable condition		0%
ASH (932)	Agricultural High Load Fuels, with seasonal changes of its Burnable condition	4	1.2%
AGC (938)	Golf courses - Non-Burnable (no encroachment)		0%
ANB (939)	Agricultural Fields, maintained in a Non-Burnable condition		0%
RNL (941)	Minor roads Low FB	57	17%
RNH (942)	Minor roads High FB		0%
RML (943)	Major roads Low FB		0%
RMH (944)	Major roads High FB		0%
RNB (949)	Roads surrounded by non-burnable fuels		0%
WNL(981)	Minor Water streams surrounded by Low Load Fuel (moderate encroachment)		0%
WNH(982)	Minor Water streams surrounded by High Load Fuel (high encroachment)		0%
WBD(989)	Water Bodies		0%

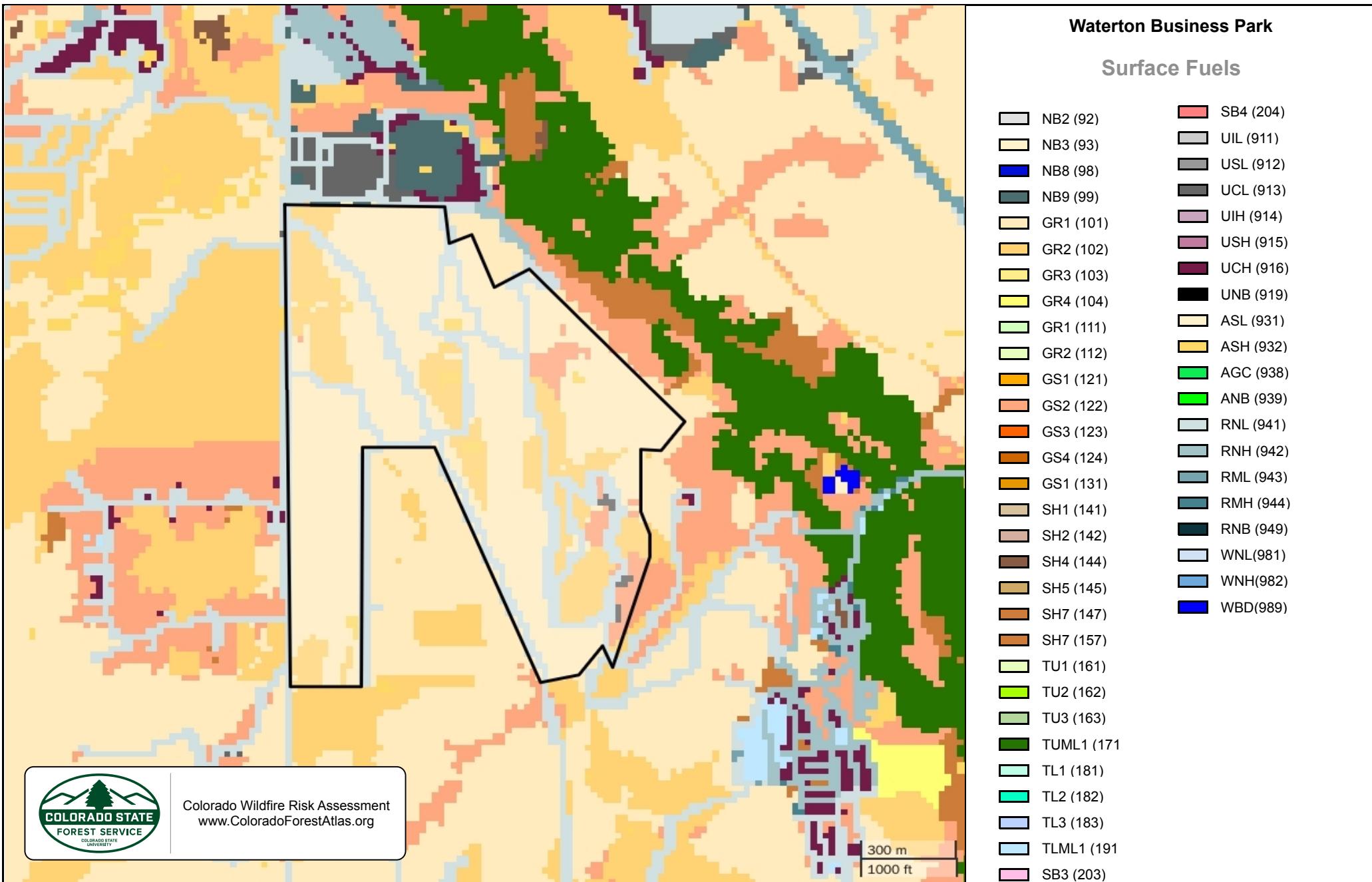
Total

333 100%

Surface Fuels

Waterton Business Park





Vegetation

The Vegetation map describes the general vegetation and landcover types across the state of Colorado.

In the CO-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 2020 LANDFIRE program data product (Existing Vegetation Type) was used to compile the Vegetation data for the CO-WRA. This reflects data current to 2020. The LANDFIRE EVT data were classified to reflect general vegetation cover types for representation with CFA.



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



Piñon-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 forest grows old

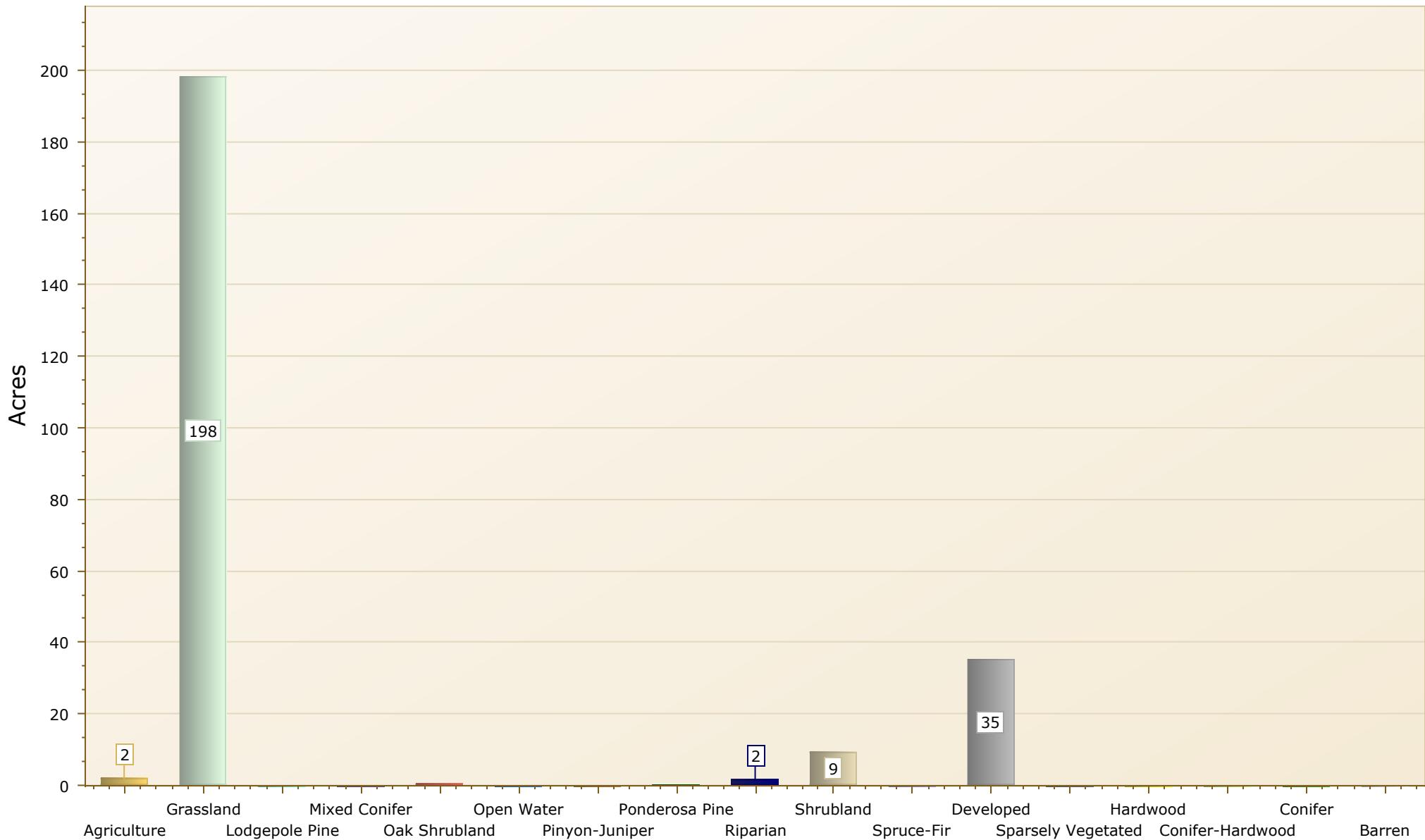


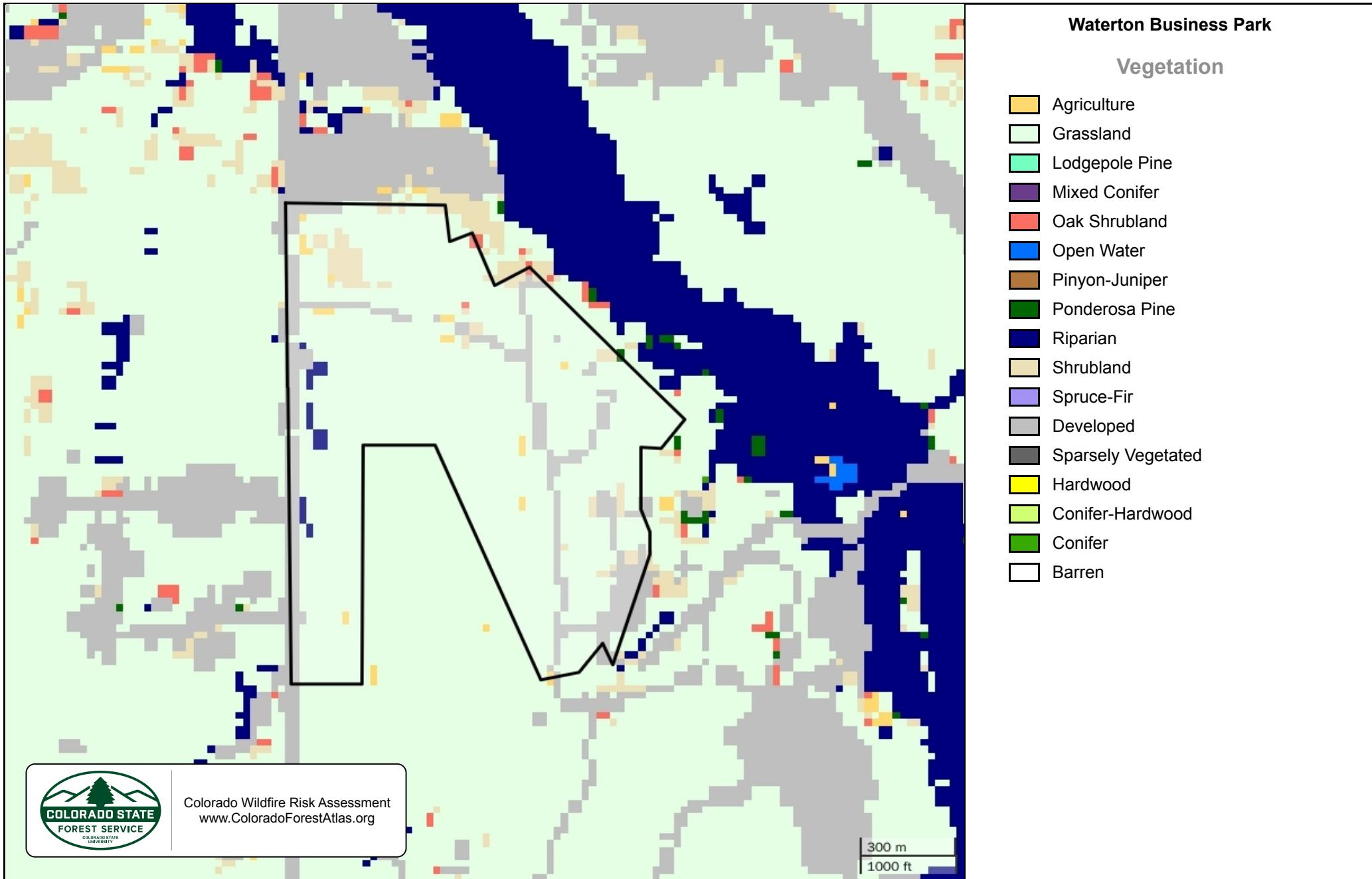
Overly dense ponderosa pine, a dominant species of the montane zone

Vegetation Class	Acres	Percent
Agriculture	2	0.8%
Grassland	198	80.1%
Lodgepole Pine		0%
Mixed Conifer		0%
Oak Shrubland		0.2%
Open Water		0%
Pinyon-Juniper		0%
Ponderosa Pine		0.1%
Riparian	2	0.7%
Shrubland	9	3.8%
Spruce-Fir		0%
Developed	35	14.3%
Sparsely Vegetated		0%
Hardwood		0%
Conifer-Hardwood		0%
Conifer		0%
Barren		0%
Total	247	100%

Vegetation

Waterton Business Park





Watershed Protection Risk

A measure of the risk to Watershed Protection Areas 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.

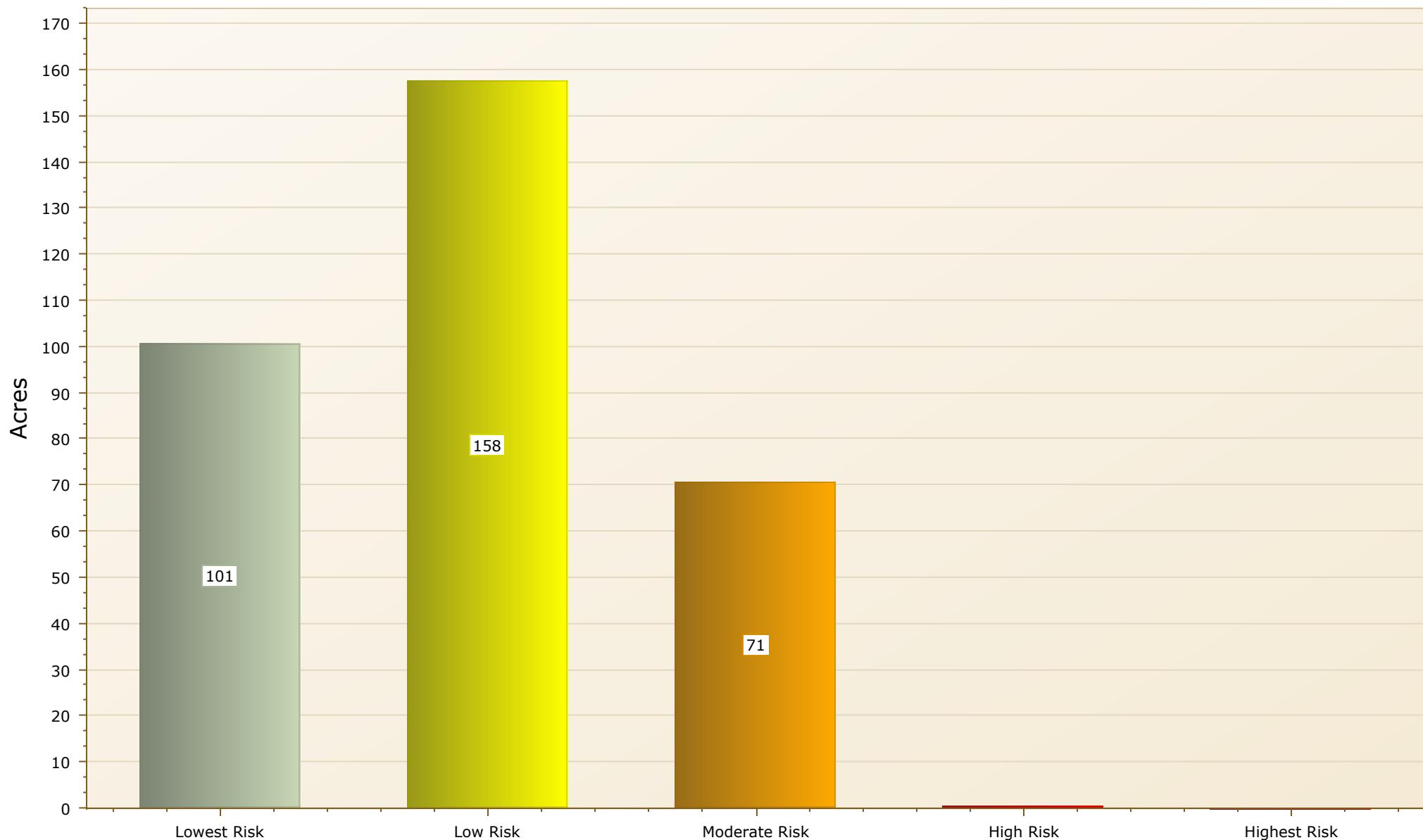
In the aftermath of the 2002 fire season, the Colorado Department of Health estimated that 26 municipal water storage facilities were shut down due to fire and post-fire impacts. The potential for severe soil erosion is a consequence of wildfire because as a fire burns, it destroys plant material and 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.

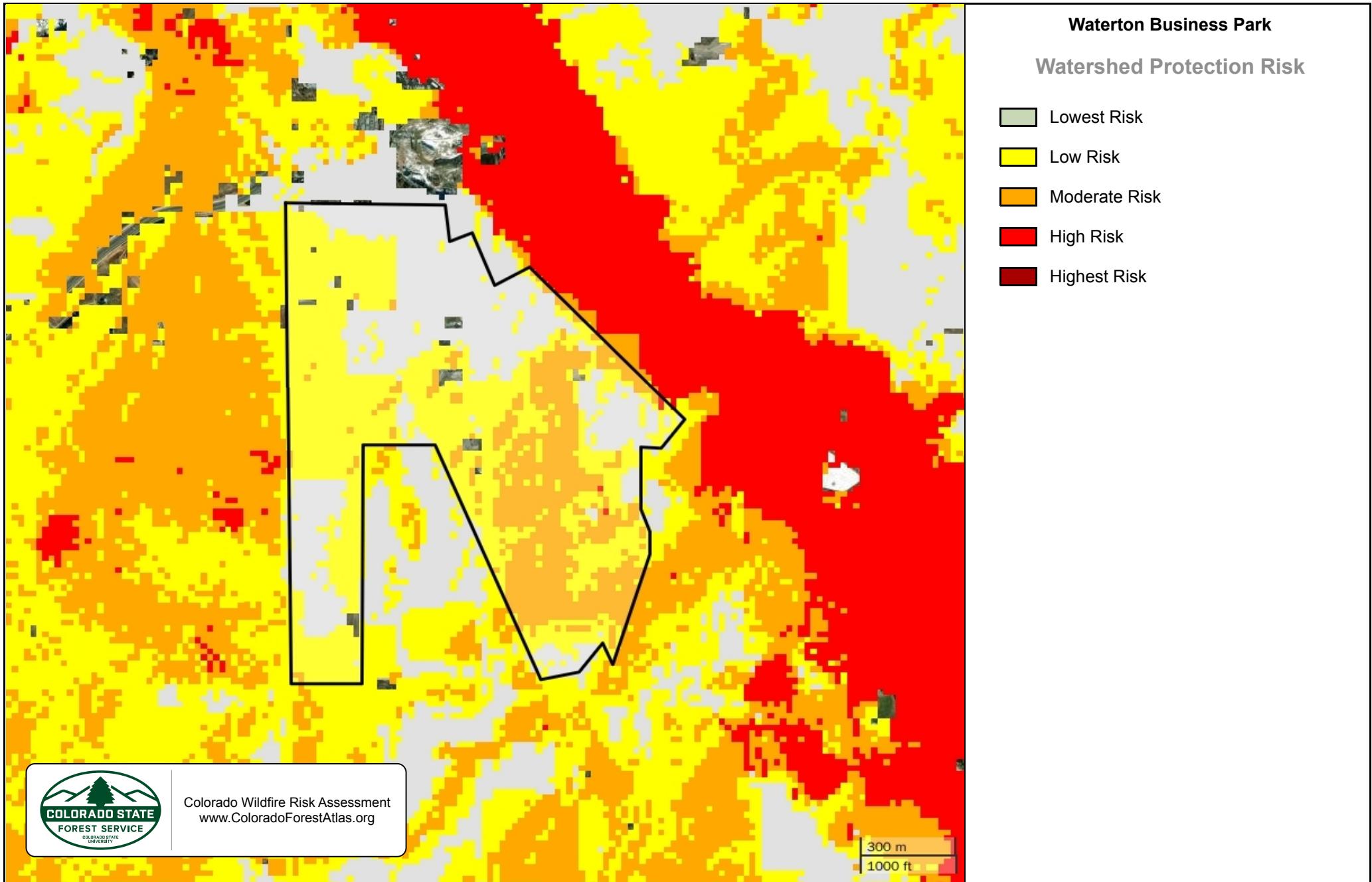
The risk index has been calculated by combining the Watershed Protection data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and high importance for ecosystem services. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and a low importance for ecosystem services. The response function outputs were combined into 5 qualitative classes.

Watershed Protection Risk	Acres	Percent
Lowest Risk	101	30.6%
Low Risk	158	47.9%
Moderate Risk	71	21.4%
High Risk		0.1%
Highest Risk		0%
Total	329	100%

Watershed Protection Risk

Waterton Business Park





Riparian Assets Risk

A measure of the risk to riparian areas based on the potential negative impacts from wildfire.



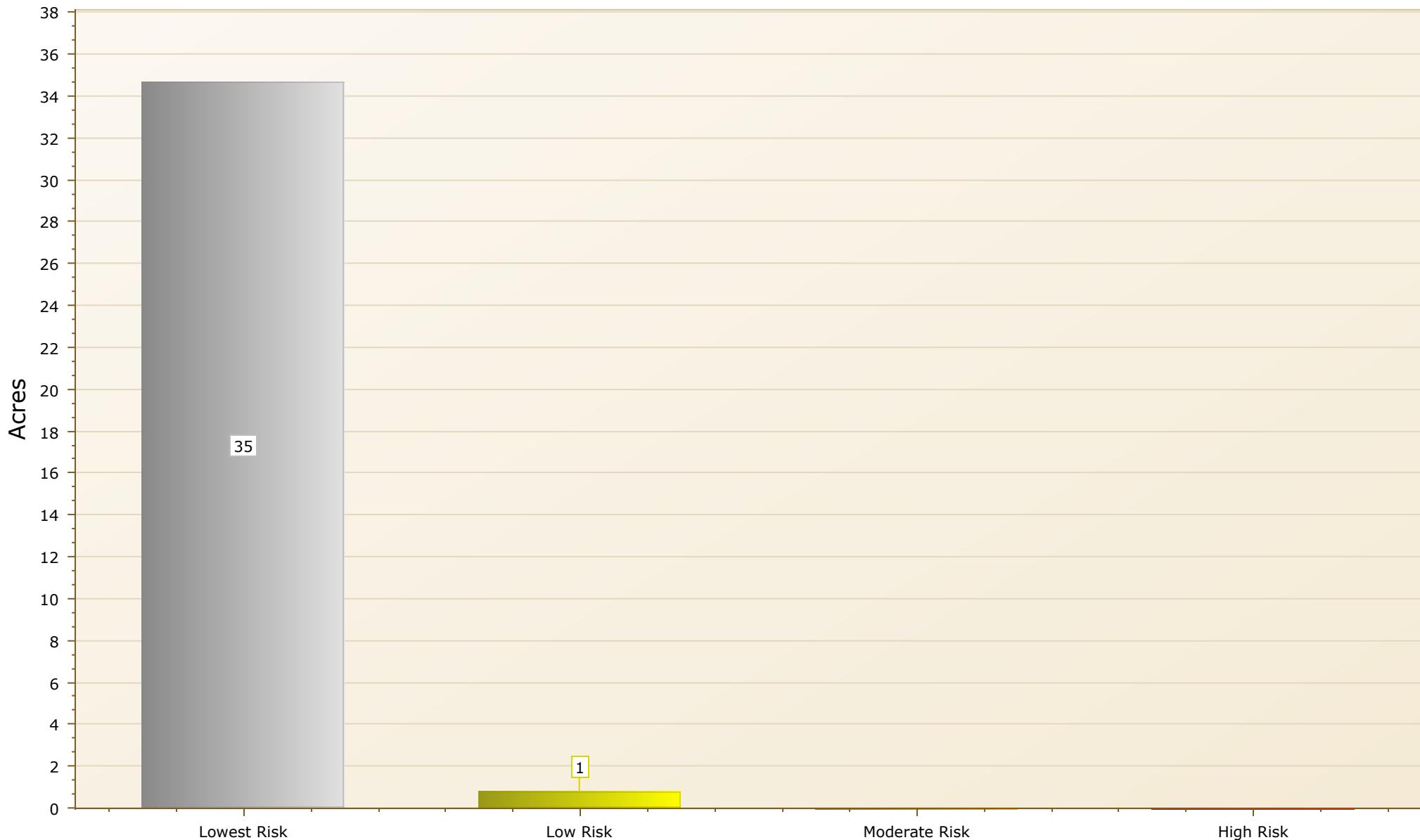
The risk index has been calculated by combining the Riparian Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and high importance for ecosystem services. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and a low importance for ecosystem services. The response function outputs were combined into 5 qualitative classes.

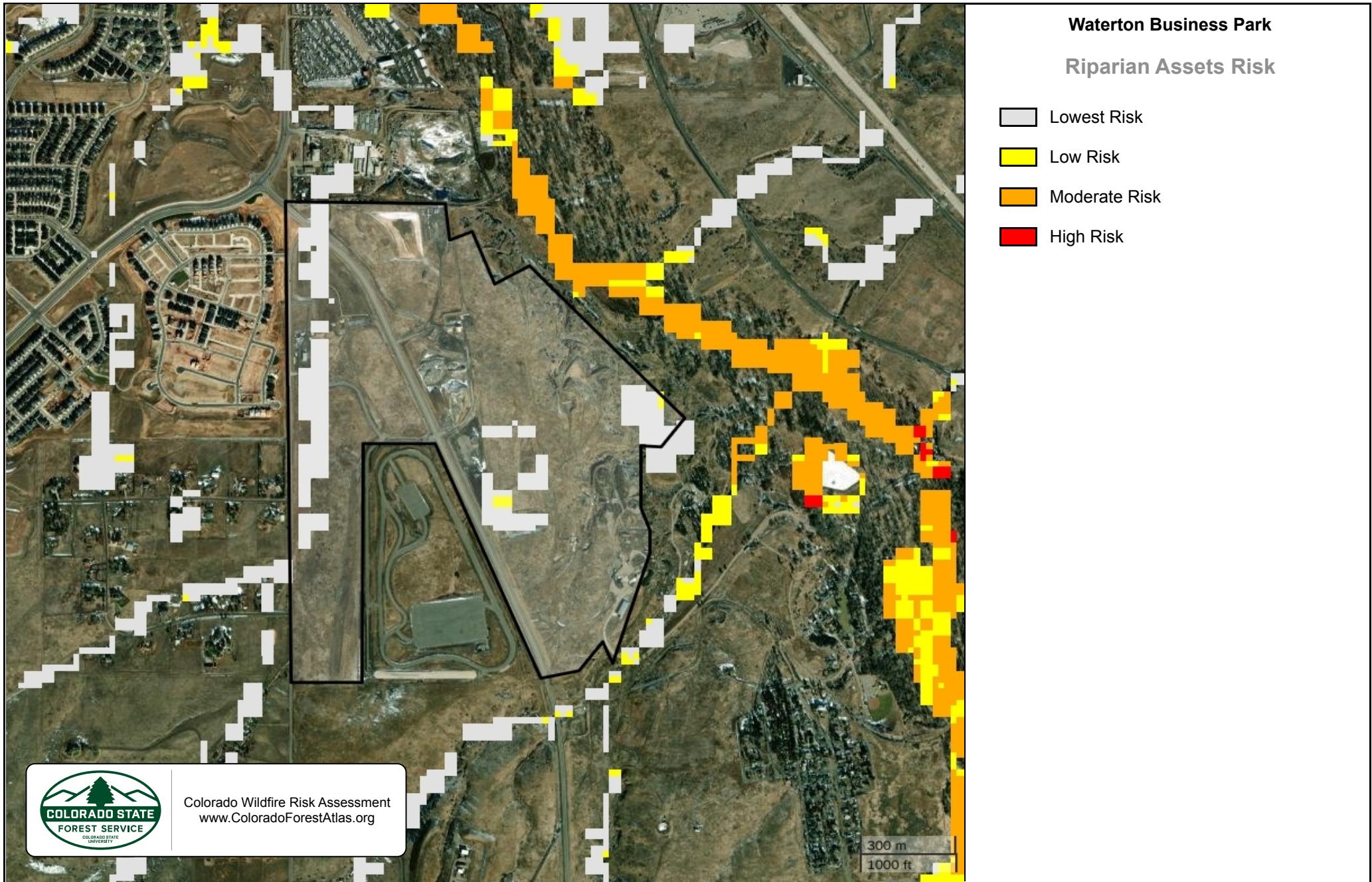
This risk output is intended to supplement the Watershed Protection Risk Index by identifying wildfire risk within the more detailed riparian areas.

Riparian Assets Risk	Acres	Percent
Lowest Risk	35	97.8%
Low Risk	1	2.2%
Moderate Risk		0%
High Risk		0%
Total	35	100%

Riparian Assets Risk

Waterton Business Park





Forest Assets Risk

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. This layer identifies those forested areas with the greatest potential for adverse effects from wildfire.

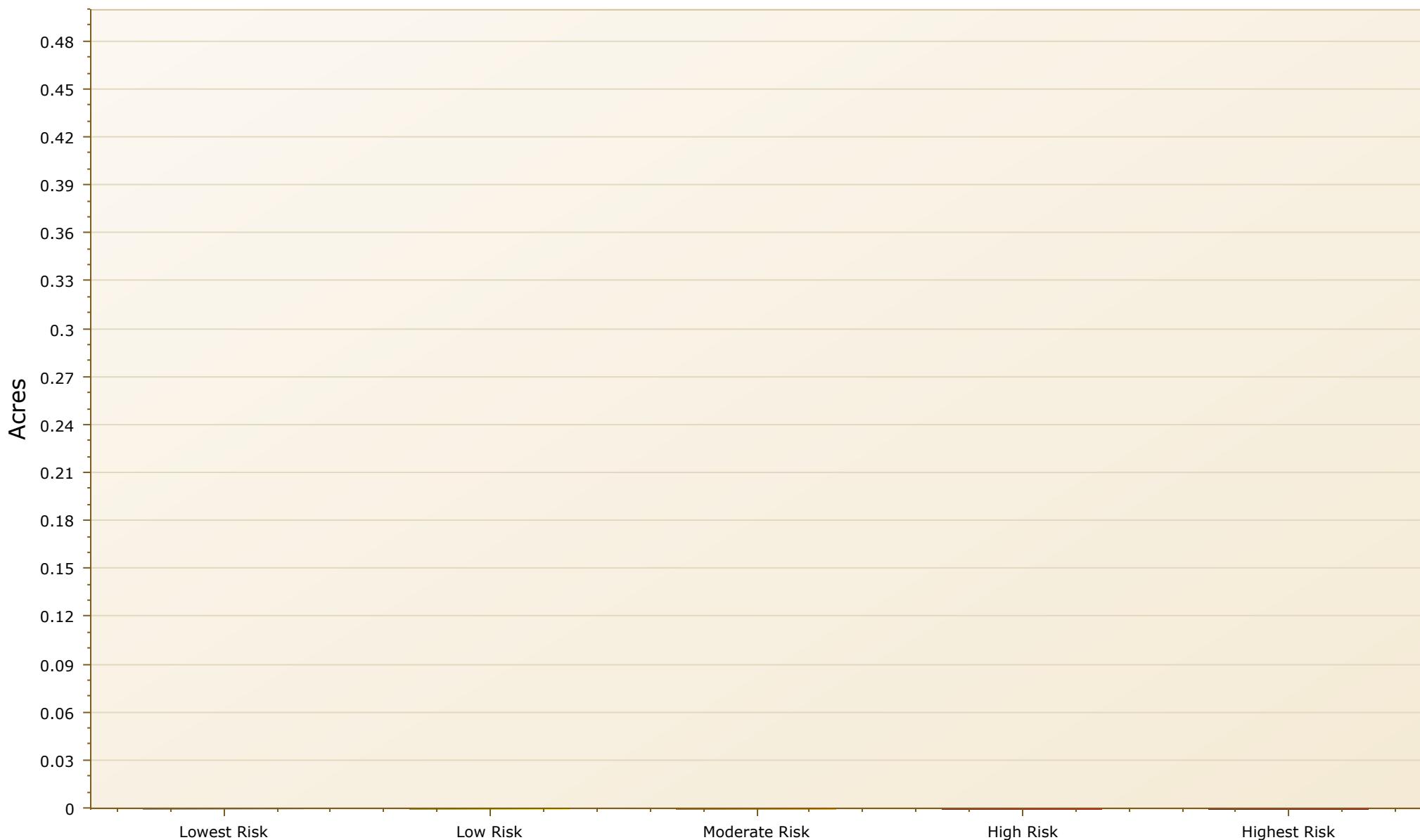
The risk index has been calculated by combining the Forest Assets data with a measure of fire intensity using a Response Function approach. Those areas with the highest negative impact (-9) represent areas with high potential fire intensity and low resilience or adaptability to fire. Those areas with the lowest negative impact (-1) represent those areas with low potential fire intensity and high resilience or adaptability to fire. The response function outputs were combined into 5 qualitative classes.

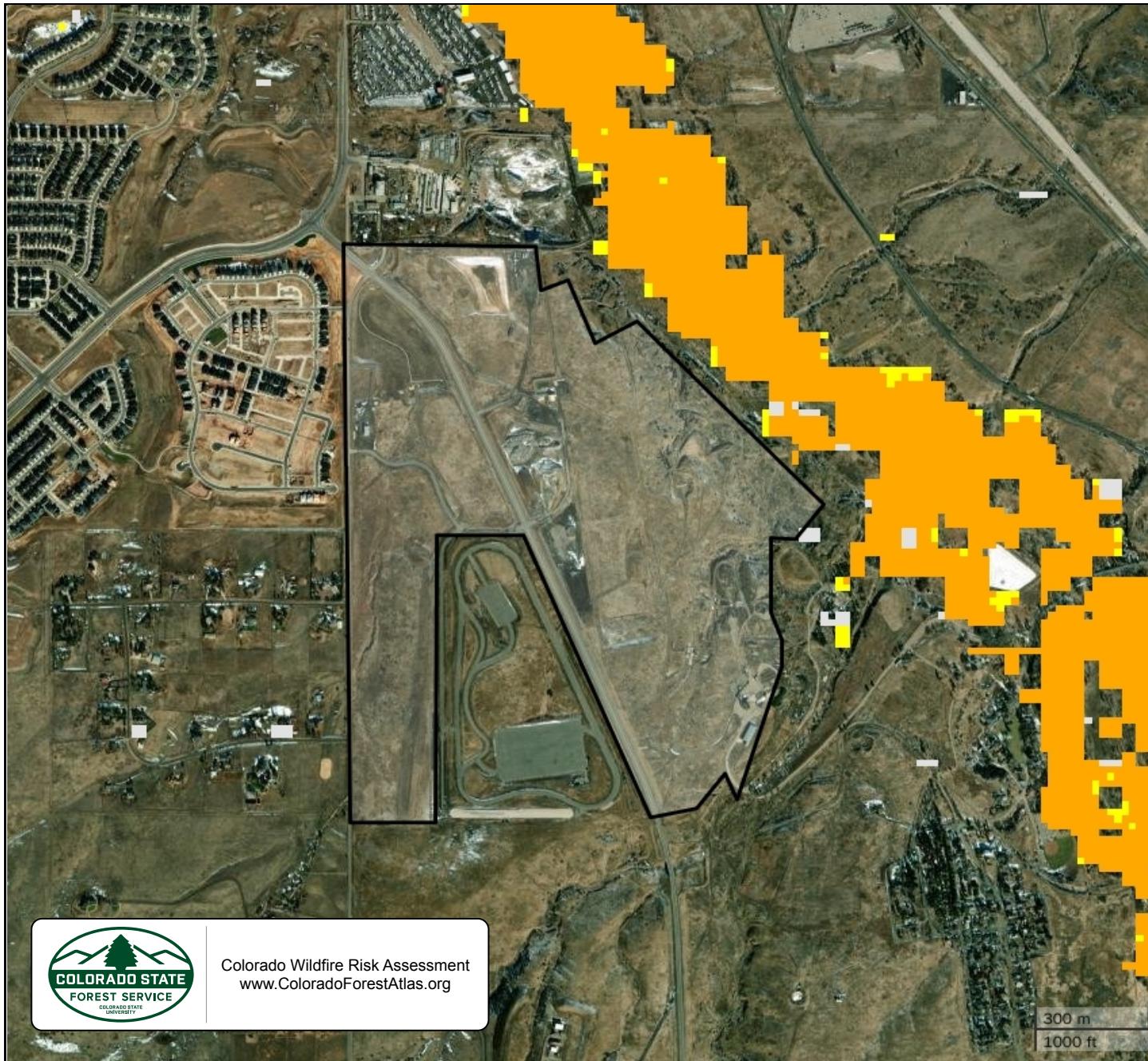
This risk output is intended to provide an overall forest index for potential impact from wildfire. This can be applied to consider aesthetic values, ecosystem services, or economic values of forested lands.

Forest Assets Risk	Acres	Percent
Lowest Risk		0%
Low Risk		0%
Moderate Risk		0%
High Risk		0%
Highest Risk		0%
Total		0%

Forest Assets Risk

Waterton Business Park





Waterton Business Park
Forest Assets Risk

- Lowest Risk
- Low Risk
- Moderate Risk
- High Risk
- Highest Risk



Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

Building Damage Potential

This metric estimates the potential for building loss and was derived using proprietary data from Technosylva Inc. on building damages that was created by analyzing 13 years of building damage data from state agency inspections after large fires.

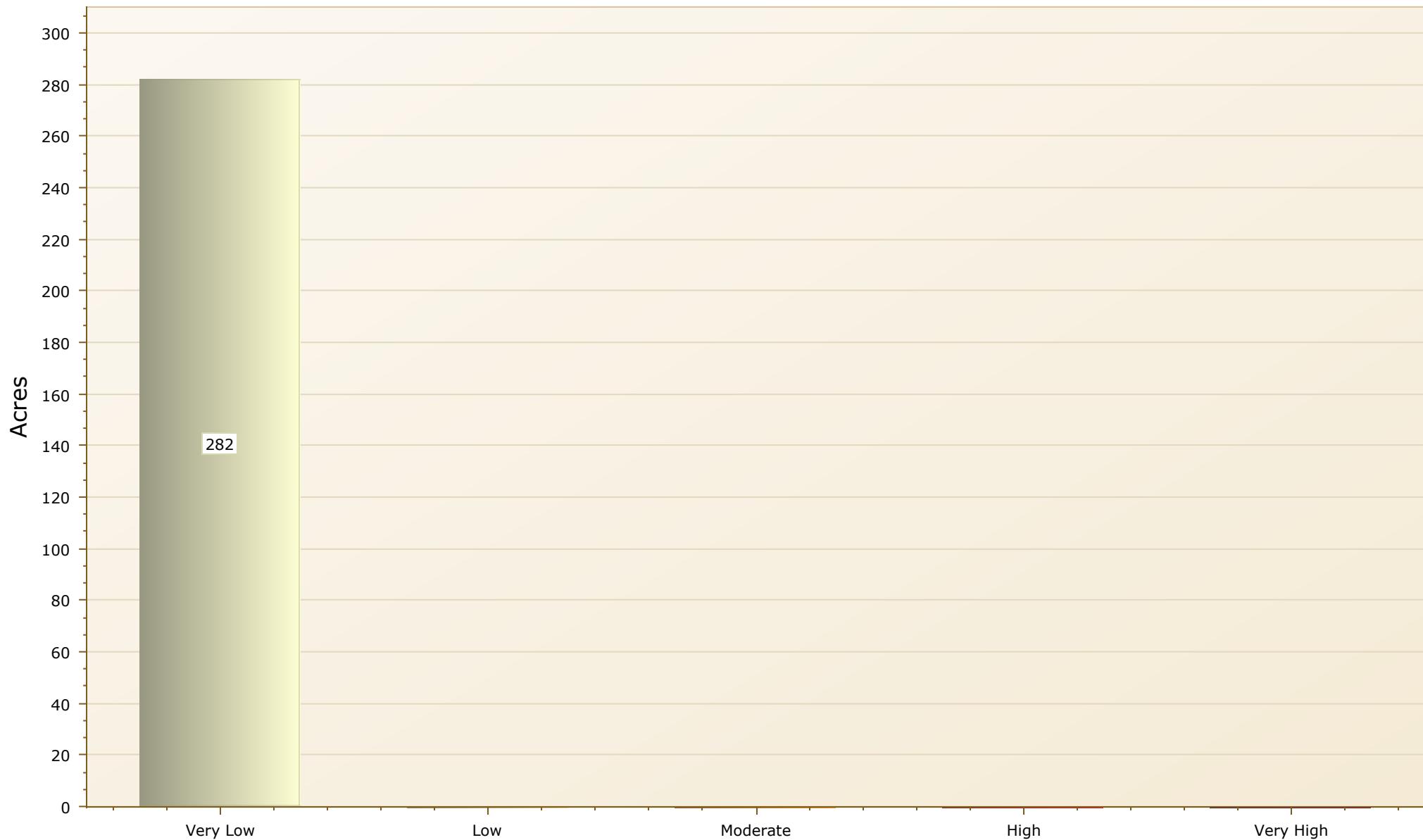
BDP is a spatially variable metric that is calculated on a building-by-building basis and aggregated to Uber H3 hexagons, providing a measure of the number of potential buildings lost based on the number of buildings threatened by fires in the specific area. BDP was calibrated using Machine Learning algorithms that identified the key factors that influenced building loss from historical damage inspection databases. The model has been calibrated using 13 years of damage inspection data and validated across multiple Western States with current wildfire data.

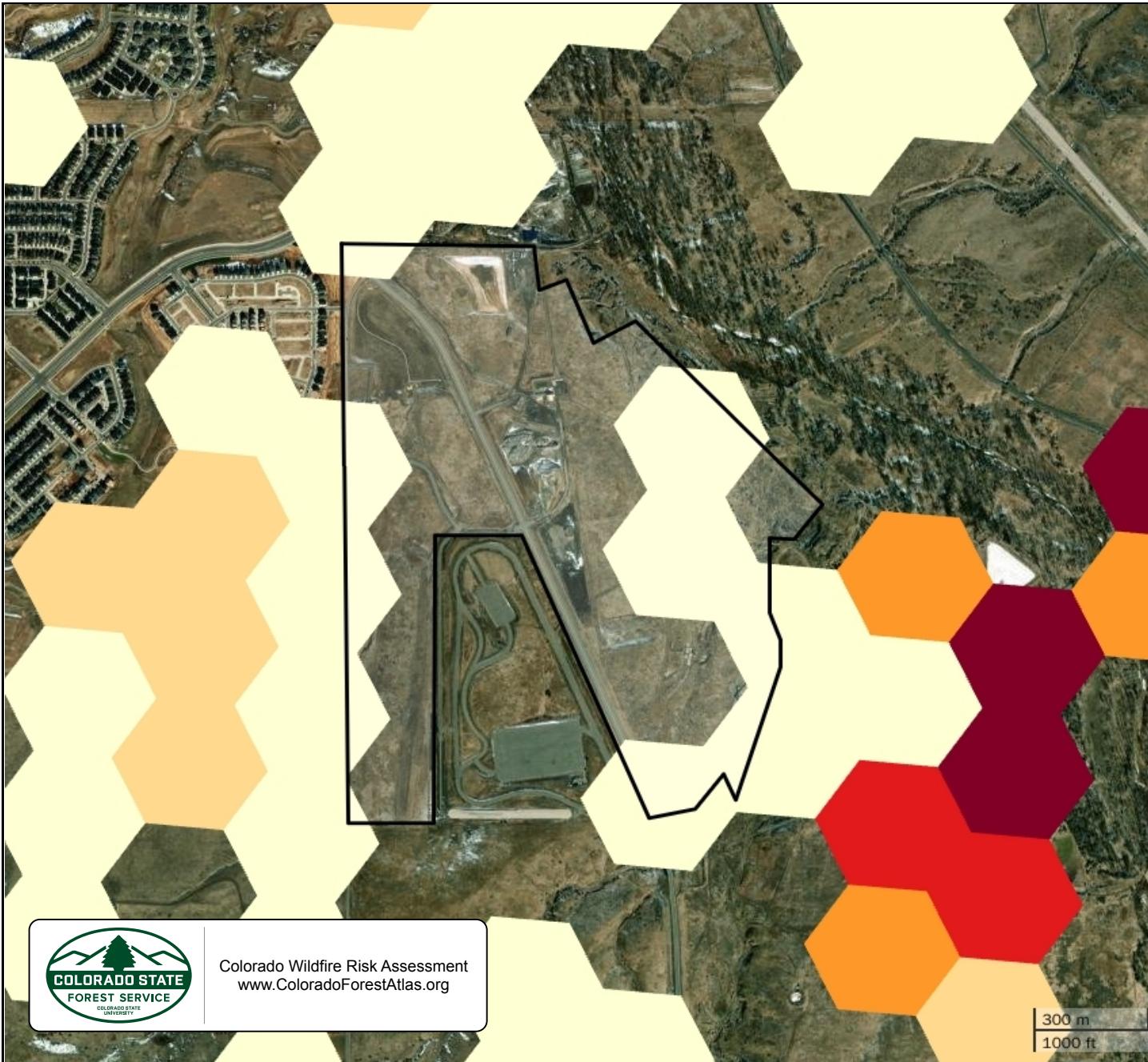
BDP is available as a static risk layer, although a key factor involved in the metric is conditional fire behavior. Conditional Flame Length derived in the fire behavior analysis conducted for the 2022 CO-WRA was used. However, the metric can also be used as a dynamic layer when modulated by the fire intensity of an active wildfire through conventional fire behavior analysis. Although applied as a static layer for the 2022 CO-WRA, the metric is used operationally in California by state agencies and private industry for risk forecasting

Building Damage Potential	Acres	Percent
Very Low	282	100%
Low		0%
Moderate		0%
High		0%
Very High		0%
Total	282	100%

Building Damage Potential

Waterton Business Park





Waterton Business Park

Building Damage Potential

- Very Low
- Low
- Moderate
- High
- Very High



Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

Defensible Space Index

The defensible space in a Wildfire Urban Interface (WUI) analysis context refers to the space that surrounds a specific building and can be used to define the hazard, or the exposure, to a wildfire occurrence. In this area, natural and manmade fuels are treated, cleared or reduced to slow the spread of wildfire near structures.

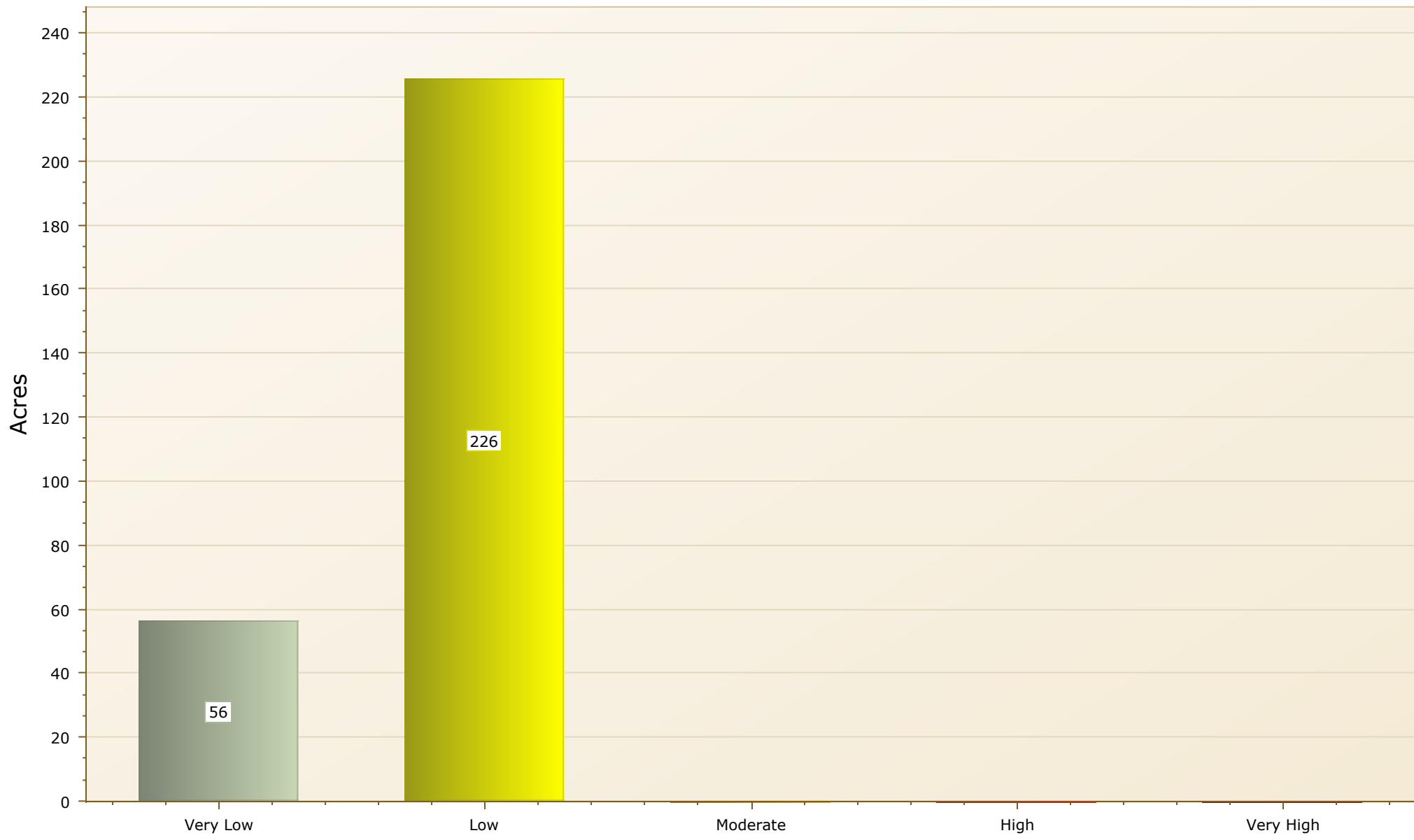
Individual building footprints were used to identify structure locations. Buildings were then grouped using Uber's hexagonal hierarchical spatial index. Within each hexagon, the building values were averaged and applied to the hexagon to remove building specific metrics. This provides a detailed measure of defensible space characteristics for small areas consistent with the accuracy of the structure locations and wildfire fuels and risk analysis data.

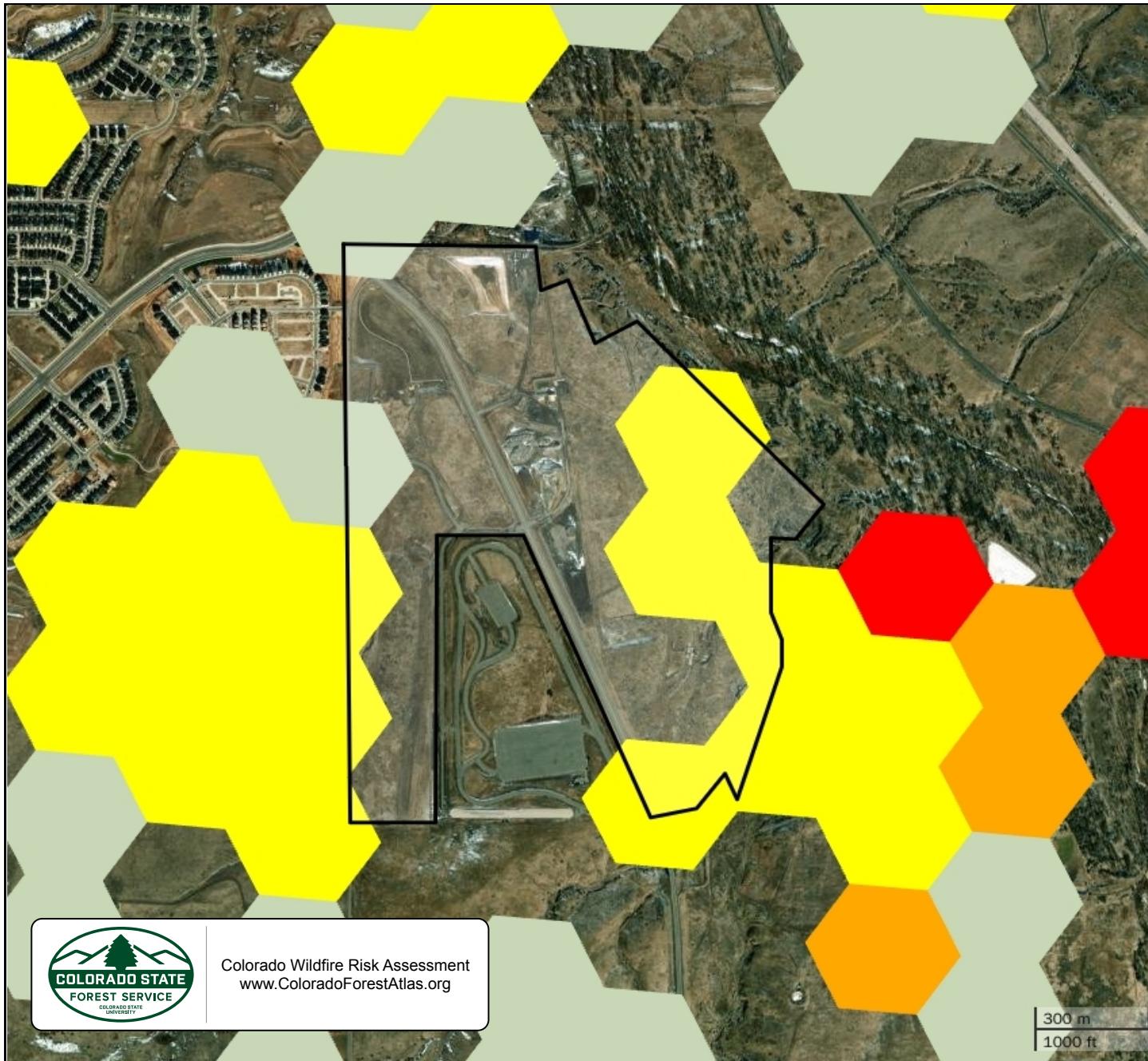
Each hexagon in the defensible space risk has a relative value from 0 to 1 that represents the average building hazard in that hexagon. This defensible space value is based on three spatial components/variables: 1) canopy cover, 2) slope, and 3) fuel models present within the buffer around the buildings analyzed.

Defensible Space Index	Acres	Percent
Very Low	56	20%
Low	226	80%
Moderate		0%
High		0%
Very High		0%
Total	282	100%

Defensible Space Index

Waterton Business Park





Waterton Business Park

Defensible Space Index

Very Low

Low

Moderate

High

Very High



Colorado Wildfire Risk Assessment
www.ColoradoForestAtlas.org

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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.

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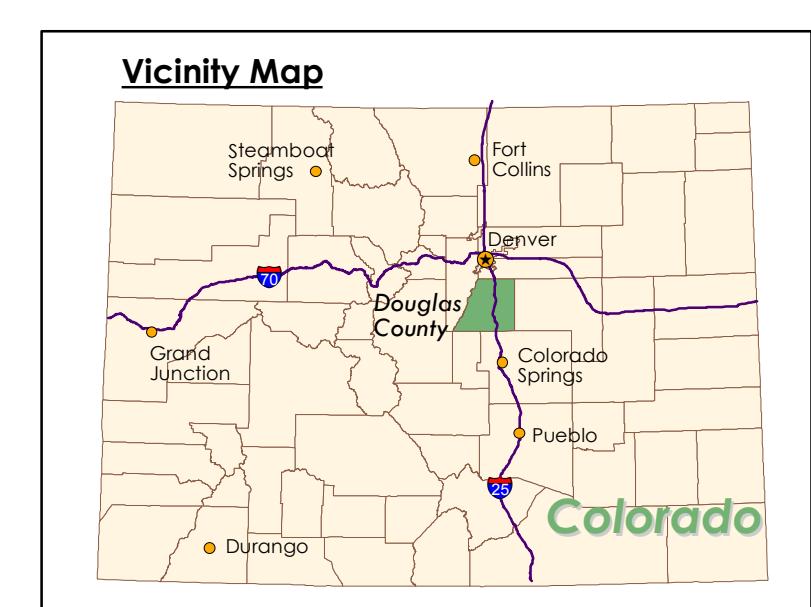
Appendix B
Fire District Coverage Maps

DOUGLAS COUNTY FIRE PROTECTION DISTRICTS

Douglas County, Colorado

Legend

- Fire Stations
- Areas Not Service by Fire Districts
- Aurora Fire
- Castle Rock
- Daniels Park (South Metro & Littleton Response)
- Franktown
- Jackson 105
- Larkspur
- Littleton
- Mountain Communities
- North Fork
- South Metro
- West Douglas
- West Metro
- County Boundary
- Parcels
- Sections
- Interstate
- US Highway
- State Highway
- Toll Highway
- Major Road
- Local Road
- Forest Road
- Gated Access
- Private Road
- Access Easement
- Emergency Access Roads
- Entrance/Exit Ramp



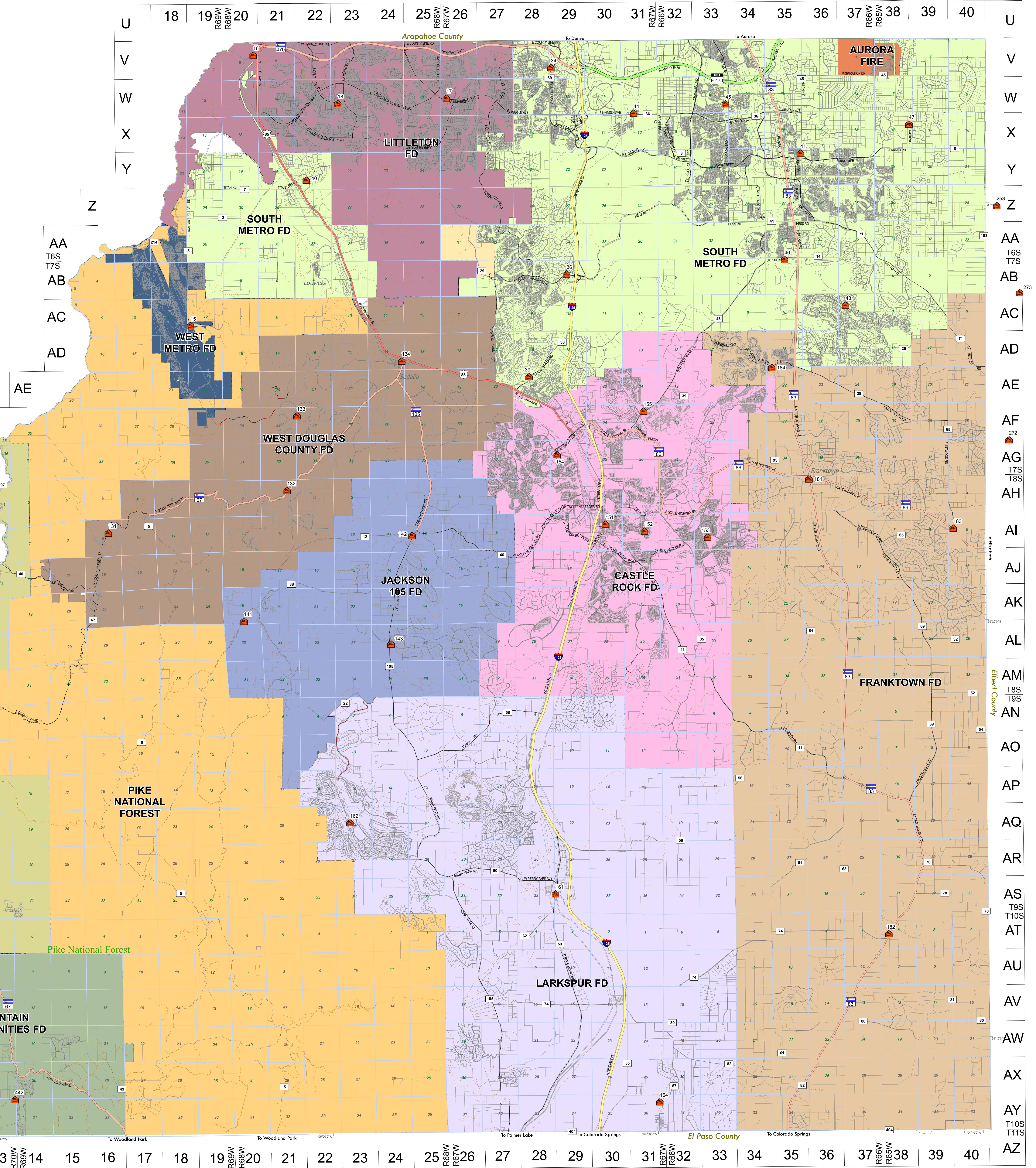
1 0.5 0 1 2
Miles
1:63,360
1 inch equals 1 mile

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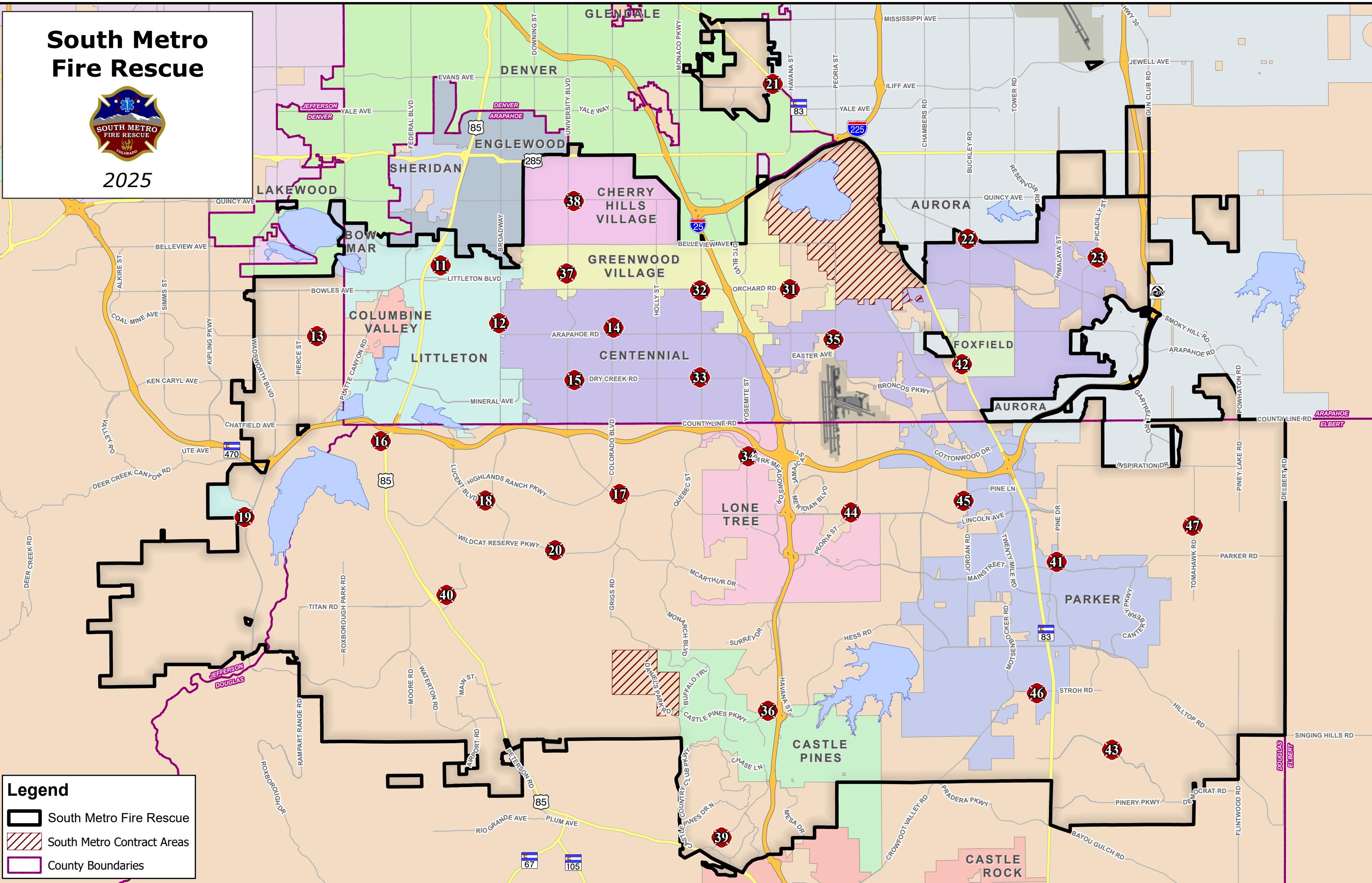
Douglas County GIS Division
Philip S. Miller Bldg., 100 Third St.
Castle Rock, Colorado 80104



South Metro Fire Rescue



2025



Appendix C
DWSD New Water Connection Request Form



DWSD NEW WATER CONNECTION REQUEST FORM

Date: 9/25/2025

Name: Waterton Business Park – Phase 1	Land Use: Mixed-Use Sports Complex
Point of Contact: Caitlin Sheahan	Parcel Number: 222932100003
Phone/Email: (970) 986-6784	Expected Water Use (average demand): Demand (Commercial): 2,500 gpd (1.7 gpm) Acres: 48 acres Total Demand: 120,000 gpd (83 gpm) Fire flow demand: 3,500 gpm @ 20 psi
New Connection Location: Existing Waterline built with Sterling Ranch Filing 6C within Moore Road. Three connections to proposed waterline within Waterton Road.	

The purpose of this form is to provide information pertinent to Zebulon Regional Sports Complex for a new connection to the Dominion Water and Sanitation District (DWSD) water distribution system. The information provided in this form was taken from the Water Master Plan hydraulic model (InfoWater Pro version 2023.3, December 2022) prepared by CDM Smith. The results provided in this form are subject to change upon future updates to the model.

The connection node modeled for the tie-in point is shown in **Figure 1** and **Figure 2**. All demands are placed on Connection Point #3.

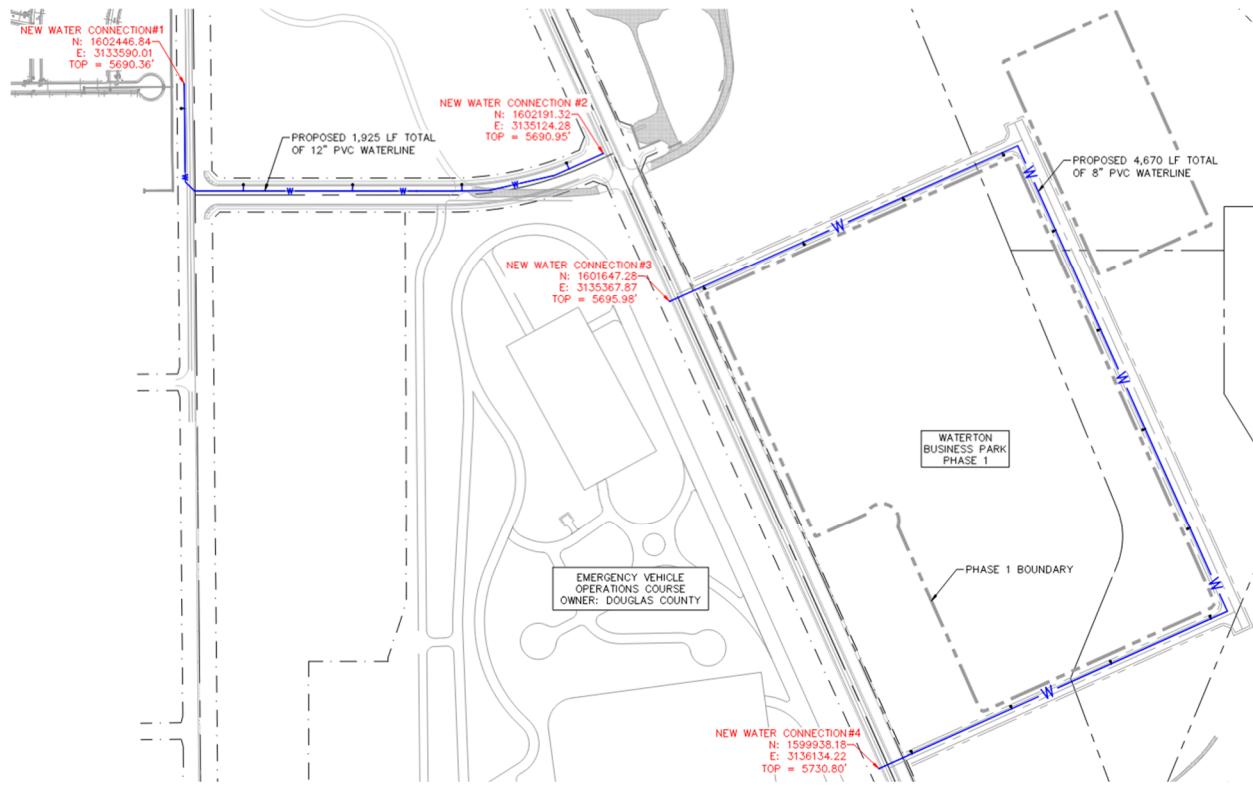


Figure 1. Location for New Connection Points

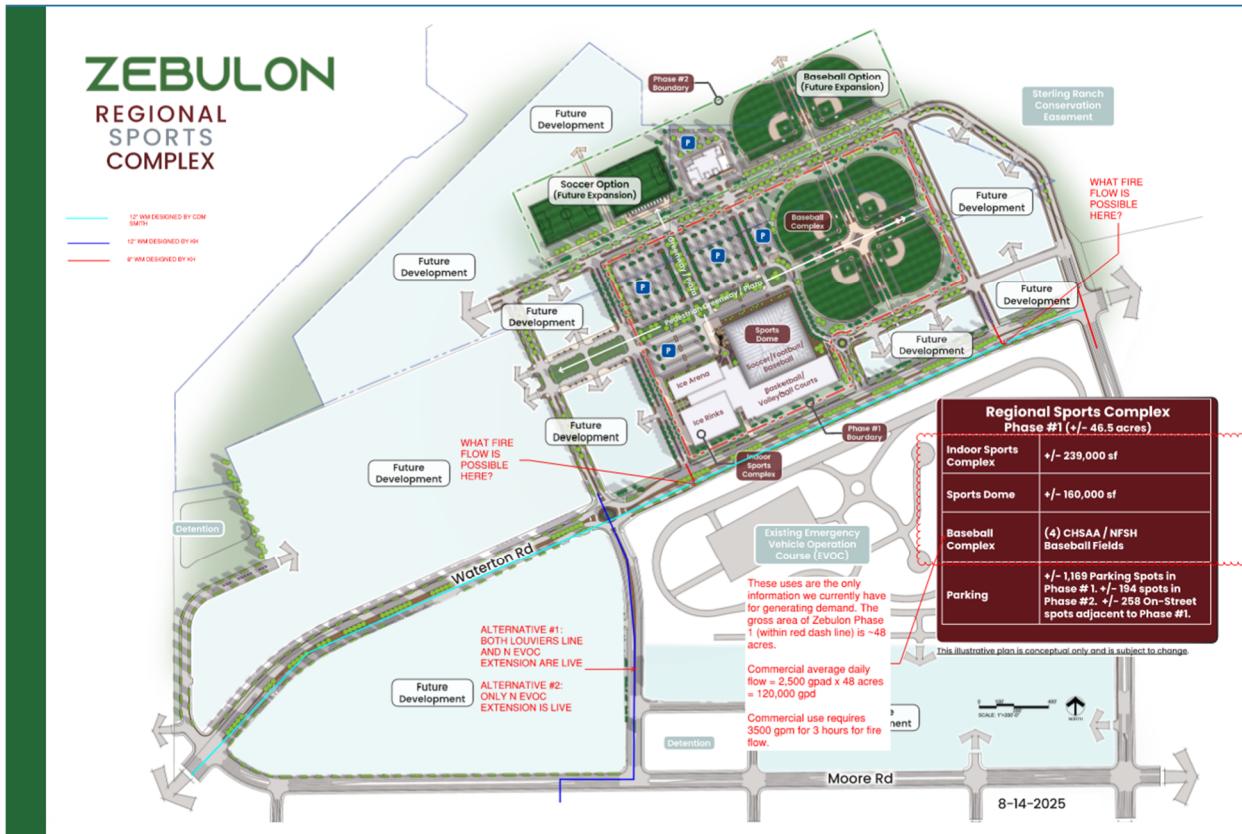


Figure 2. Description of Proposed Construction

Two alternative scenarios were analyzed, as shown in **Figure 3** and **Figure 4**. The first is in the near future scenario (as defined in the WMP) and includes the construction of both the 12-in Louviers line and the 8-in N EVOC extension. The second is under the existing system scenario, including Filing 6C but no additional development in the Waterton Business Park. In both alternatives, demands are placed on Connection #4, as shown in Figure 1. Alternative 1 has a maximum day demand of 3,800 gpm, and Alternative 2 has a maximum day demand of 2,160 gpm. The proposed Zebulon Sports Complex is in the middle zone, which is controlled by the Waterton x Middle Fork PRV. This PRV has a setting of 43.27 psi, or 5,932 ft of HGL.

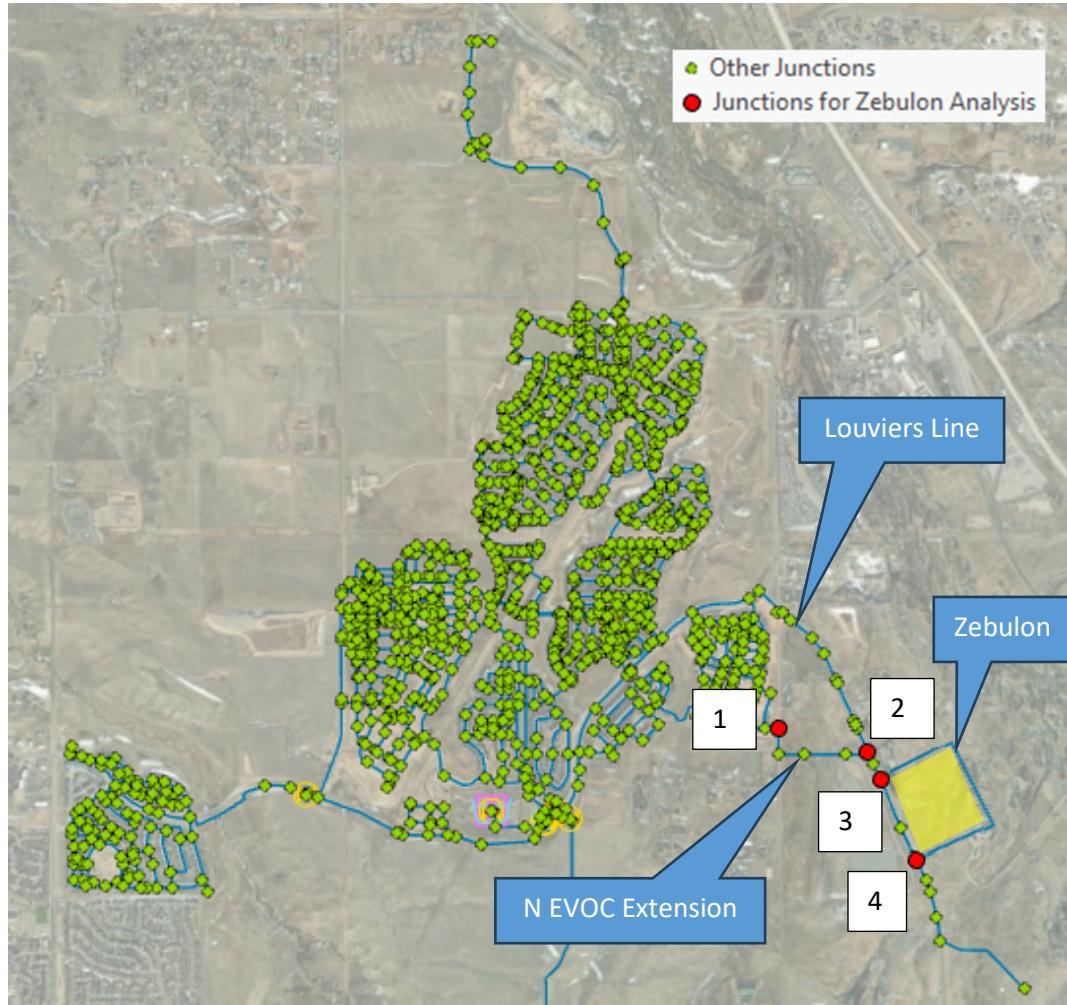


Figure 3. Alternative 1 (Both Louviers and N EVOC Extension)



Figure 4. Alternative 2 (Only N EVOC Extension)

Table 1 contains results from the model for Kimley-Horn use intended to inform the design of the new water connection.



Table 1. Model Results by Scenario

New Water Connection No. ¹	Elevation (ft)	Alternative 1 (Both Louviers and N EVOC Extension)		Alternative 2 (Only N EVOC Extension)	
		Pressure / HGL Range ²	Available Fire Flow @ 20 psi	Pressure / HGL Range ²	Available Fire Flow @ 20 psi
1	5,690	89 – 102 psi 5,896 – 5,927 ft HGL	7,370 gpm	96 – 104 psi 5,912 – 5,930 ft HGL	5,870 gpm
2	5,691	88 – 102 psi 5,894 – 5,927 ft HGL	6,500 gpm	96 – 104 psi 5,912 – 5,930 ft HGL	4,270 gpm
3 (north end of Zebulon)	5,696	85 – 100 psi 5,894 – 5,927 ft HGL	5,410 gpm	93 – 101 psi 5,912 – 5,930 ft HGL	3,960 gpm
4 (south end of Zebulon)	5,731	70 – 85 psi 5,893 – 5,927 ft HGL	3,960 gpm	77 – 86 psi 5,910 – 5,930 ft HGL	1,290 gpm

¹See Figure 1

²During week-long maximum day scenario, with no fire flow



In Alternative 1 with both the Louviers 12-inch extension and North EVOC 12-inch extension installed, there is sufficient fire flow at all connection points, as shown in Table 1.

In Alternative 2 with only the North EVOC 12-inch extension installed (and before construction of the Louviers extension), there is not sufficient fire flow at Connection #4. This is because under the proposed Alternative 2, the south end of Zebulon would be served by a single 8-inch line. An 8-inch flowing at 3,500 gpm has a velocity of 23 feet per second, which is higher than acceptable engineering practices and therefore not recommended. To provide adequate fire flow to the entire Zebulon area, the Louviers 12-inch extension along the Waterton Road must be provided.

Other alternatives which were not evaluated may include upsizing the 8-inch line around Zebulon, and/or installing an additional segment of the Louviers pipeline, such as the 12-inch segment on Waterton Road along the western boundary of Zebulon, or between Connections 3 and 4 in Figure 1.