



JEFFERSON

COUNTY COLORADO

Open Space

Jefferson County Open Space

Forest Health Plan 2022, Executive Summary

From the Director

Our love of trees starts in our backyard and extends to everything we do, from walking down a street, to a picnic in the shade, to the thousands we pass that make our outdoor experience richer. Whether the forest is urban or remote, trees have the same effect on us and our environment. They cool us, calm us, provide habitat for wildlife, save energy, are a force in offsetting climate change, and add beauty to any landscape.

Thanks to your ongoing support, Jefferson County Open Space manages thousands of acres of forested land. In some areas, the disruption of natural occurrences coupled with nearby development has created heightened fire risks that could be harmful to people, structures, and the health of the forest. As such, human intervention in the form of strategic tree thinning and ongoing management is necessary. The aim of this comprehensive plan is to identify priorities, best practices, strategies, partnerships, and education initiatives to keep our forests healthy. The plan was developed collaboratively with many partners and stakeholders and uses state of the art Geospatial (GIS) technology to study and identify where our resources will have the greatest impact. This approach has given us county-wide data and analysis to support efforts across the Jefferson County landscape on public and private lands.

It is important to note that fuel reduction is one of several important parts of reducing wildfire risks and impacts to people and structures. This plan identifies that if we collectively invested \$500 Million in fuel reduction it would only reduce our fire risk by 44%. We must take a multi-pronged approach to keep our precious forests healthy and reduce risks to people and structures. To accomplish the goals of this plan and Jeffco Wildfire Safe we must work strategically across the landscape of public and private lands.

Our 2020-25 Conservation Greenprint strategic plan has a goal of completing this Forest Health Plan and tree thinning on 1,000 acres of our forested lands. This work includes removing over 800,000 trees from the landscape which will have a long-term benefit to both forest health and reduced catastrophic fire risk. These efforts dovetail with the county-wide Jeffco Wildfire Safe program which has three pillars: Safe People and Structures, Fuel Reduction, and Biomass Recycling.

To achieve these goals, we will partner with landowners and focus on reducing wildfire risk to surrounding communities and improving forest health, vegetation, and wildlife habitat.

Happy Trails,



Tom Hoby, CPRE
Director



FOREST MANAGEMENT HISTORY

1979

First timber stand improvement project completed at Mount Falcon Park. 15 acres were treated in coordination with Colorado State Forest Service.

1980's

In line with forest management practices of the time, treatments focused on timber stand improvements, wildfire mitigation, and park aesthetics. Forest pest control was a unifying theme across these focuses.

1988

Jeffco Open Space initial Forest Management Plan adopted, including park-specific recommendations and action plans.

This plan has been in use for over 30 years and is the basis for the updated Forest Health Plan.

1990's

Following Forest Management Plan recommendations, park property and forest inventories began. Data collection expanded to include fuel loading, understory vegetation, and wildlife indicators.

Forest management focused on managing mountain pine beetle outbreaks, creating shaded fuel breaks, and improving overall forest health.

2000's

Jeffco Open Space began to incorporate prescribed fire as a management tool, aiming to restore ponderosa pine stands and native meadows.

Prescribed fires were conducted at White Ranch, Elk Meadow, and Mount Falcon Parks.

Additionally, efforts at Meyer Ranch and Flying J Ranch Parks focused on creating one-to-two acre openings by cutting suppressed lodgepole pine stands.

2010-PRESENT

Jeffco Open Space shifts to digital inventory and data collection, increasing partnership collaboration and expanding knowledge sharing.

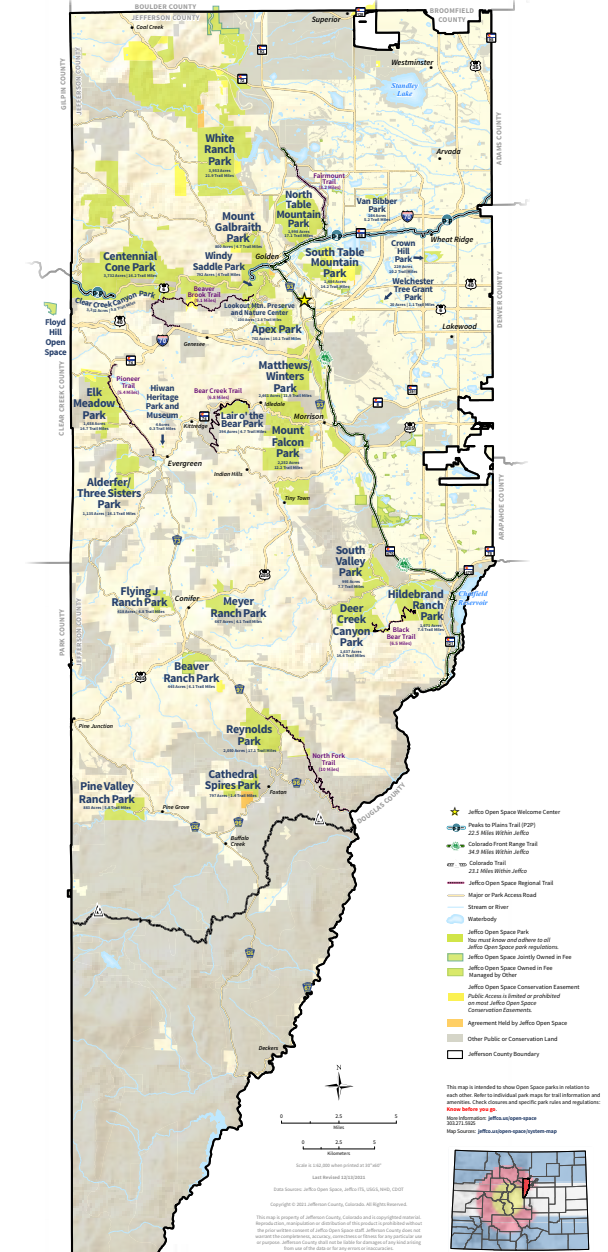
Forest Health Plan Update begins in 2020 and aims to inform collaborative and strategic forest management in Jefferson County.

JCOS PARK/PROPERTY	ACRES	BIOGEOGRAPHIC ZONE	COUNTY LOCATION
Alderfer/Three Sisters Park	1,135	Upper montane	Central
Apex Park	702	Lower montane	North
Beaver Ranch Park	445	Upper montane	South
Cathedral Spires Park	797	Lower montane	South
Centennial Cone Park	3,732	Lower montane	North
Clear Creek Canyon Park	3,332	Lower montane	North
Coal Creek Canyon Study Area	6,204	Lower montane	North
Deer Creek Canyon Park	1,637	Lower montane	South
Douglas Mountain Study Area	1,828	Upper montane	North
Elk Meadow Park	1,658	Upper montane	Central
Flying J Ranch Park	418	Upper montane	South
Hildebrand Ranch Park	1,671	Lower montane	South
Lair o' the Bear Park	394	Lower montane	Central
Lippincott Ranch Property	425	Lower montane	North
Lookout Mountain Preserve	100	Lower montane	North
Matthews/Winters Park	2,461	Lower montane	Central
Meyer Ranch Park	667	Upper montane	South
Mount Falcon Park	2,252	Lower montane	Central
Mount Galbraith Park	800	Lower montane	North
Mount Lindo	832	Lower montane	Central
North Table Mountain Park	1,998	Lower montane	North
Pine Valley Ranch Park	883	Lower montane	South
Reynolds Park	2,050	Lower montane	South
South Valley Park	995	Lower montane	South
White Ranch Park	3,953	Lower montane	North
Windy Saddle Park	792	Lower montane	North

Key Properties

These JCOS parks and properties are considered important for forest management because they include vegetation cover and forest types suitable for implementation of forest thinning and prescribed fire.

JEFFERSON COUNTY OPEN SPACE Parks and Regional Trails



Desired Future Conditions

Establishing desired future conditions (DFCs) at multiple scales creates a common vision for success. DFCs serve as targets that can be compared to current conditions to determine where restorative actions are needed, and they can inform treatment prescriptions for individual projects. Collectively, the DFCs define a forest landscape that is more resistant and resilient to disturbance, better adapted to climate change, that facilitates an array of forest ecosystem functions, and where ecological values are protected within a human-dominated landscape.

DFCs at the project scale are focused on ecological metrics linking projects to scientific research, historical conditions, wildlife habitat, resource protection, and current conditions. These metrics are balanced with societal expectations for high quality outdoor experiences in JCOS parks.

Management Objectives:

- Reduce risk of catastrophic wildfire
- Reduce forest stand density and canopy cover to historic norms
- Increase the presence, size, and diversity of forest openings
- Restore and maintain a mosaic of ecosystems and vegetation cover across the landscape that provide wildlife habitat diversity
- Promote fine scale variation in tree spatial patterns
- Protect and enhance old-growth features
- Where appropriate, reestablish fire through the use prescribed fire as a management tool
- Promote long-term ecosystem resilience to natural disturbance
- Assist with ecosystem adaptation to climate change
- Create aesthetically pleasing forest stands and diverse recreation opportunities



Strategic Planning and Prioritization

The Forest Health Plan used the Colorado Forest Restoration Institute’s Risk Assessment Decision Support (RADS) tool to inform management planning by assessing wildfire risk to community assets (Figure 3.4) and prioritizing treatments to most cost-effectively decrease risk to those assets. The final outcome is a treatment priority map that will show land managers where to implement treatments that have the greatest impact for the lowest cost.

We began modeling wildfire risk by using a collaborative process to identify Highly Valued Resources and Assets (HVRAs).

- **Asset:** a built structure; house, communication tower, etc.
- **Resource:** wildlife habitat, vegetation, water, etc.

HVRAs were grouped into categories (Table 3.1), each of which was assigned a relative importance weight via consensus among subject-matter experts (Table 3.2);

Each HVRA was also assigned a wildfire vulnerability value intended to represent how each HVRA would respond to flame lengths that were representative of a series of fire weather scenarios of increasing intensity (Table 3.3).

Relative HVRA response to wildfire was scaled from -100 (total loss) to +100 (entirely positive benefit), based on subject-area expert opinion.

Table 3.1. Relative importance weights used for combining HVRA categories into a composite risk map.

CATEGORY	RELATIVE IMPORTANCE
Life Safety	100
Infrastructure	90
Water	90
Vegetation Cover	90
WUI	50
Wildlife	50
Recreation	50

Table 3.3. Probabilities for weighting cNVC calculated for each fire weather scenario.

SCENARIO	PERCENTILE	PROBABILITY
LOW	25th	0.01
MODERATE	50th	0.09
HIGH	90th	0.20
EXTREME	97th	0.70

COMPOSITE WILDFIRE RISK

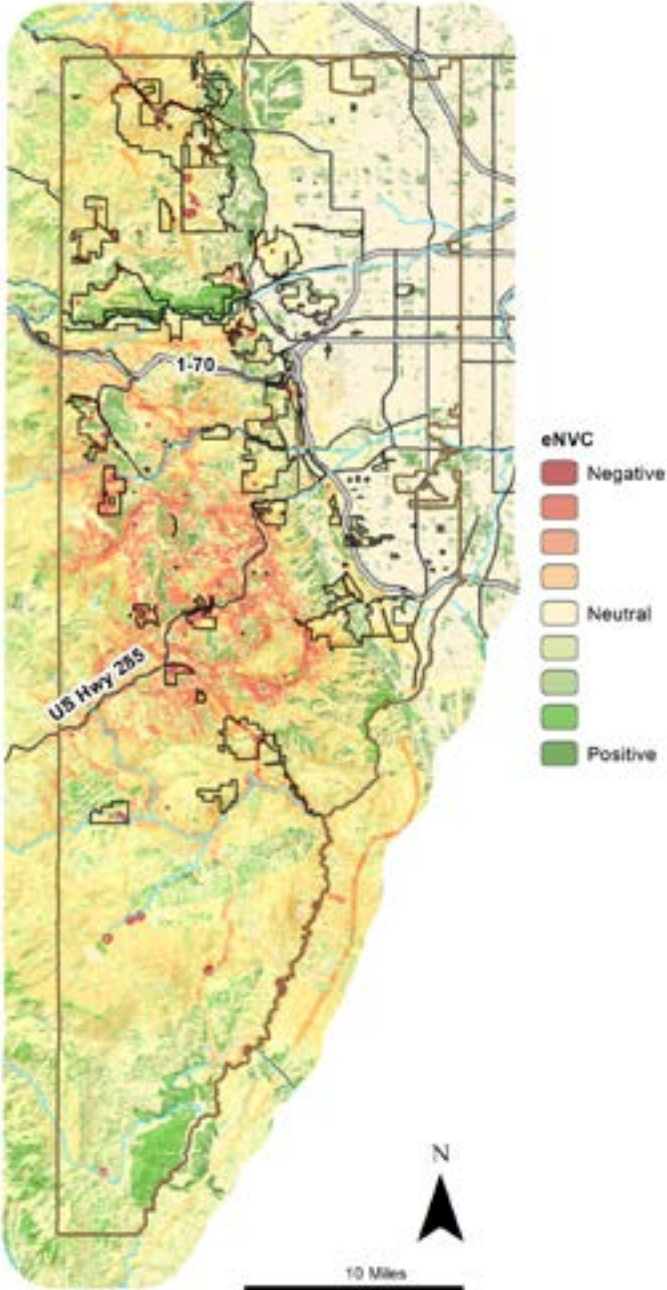


Figure 3.4. Composite wildfire risk map for Jefferson County. Negative eNVC means high risk. Positive eNVC means there is an expected benefit from wildfire.



Table 3.2. HVRA included in the risk assessment by category. The buffer distance used to define an influence zone for wildfire around the HVRA, the HVRA relative importance (%) to the category, and the relative wildfire response functions by intensity level are specified. All inputs were defined through a collaborative process using stakeholder input informed by expert opinion and data resources.

CATEGORY	HVRA	BUFFER (M)	RELATIVE IMPORTANCE	WILDFIRE RESPONSE - FLAME LENGTH (feet)					
				0-2	2-4	4-6	6-8	8-12	> 12
Life Safety	Evacuation Routes - First Priority	200	60	-20	-40	-80	-100	-100	-100
	Evacuation Routes - Second Priority	200	40	-20	-40	-80	-100	-100	-100
Infrastructure	Electrical Power Lines	200	25	-10	-20	-30	-50	-60	-80
	Communication Points	200	20	-10	-20	-30	-50	-60	-80
	Occupied Buildings	200	30	-20	-40	-80	-100	-100	-100
	Structures	200	25	-20	-40	-80	-100	-100	-100
Water	Drinking Water Protection	0	100	-20	-40	-80	-100	-100	-100
Vegetation Cover	Aspen/Aspen Mixed Conifer	0	5	30	40	60	60	40	30
	Lodgepole Pine/ Spruce-fir	0	15	25	25	50	25	-25	-50
	Mixed Conifer	0	30	25	50	50	25	-25	-50
	Ponderosa Pine	0	35	100	75	50	25	-25	-80
	Shrubland	0	10	50	50	25	-25	-75	-100
	Grassland	0	5	50	50	25	20	0	-10
WUI	Adjacent Private Property	0	100	-20	-40	-80	-100	-100	-100
Wildlife	Abert's Squirrel	0	5	100	75	0	0	-50	-100
	Bighorn Sheep Winter Range	0	15	100	100	100	50	0	-50
	Elk Winter Range	0	15	100	100	50	50	0	-100
	Mule Deer Winter Range	0	10	100	100	50	50	0	-100
	Northern Goshawk	0	15	100	100	50	0	-50	-100
	Pawnee Montane Skipper	0	25	100	80	30	20	10	0
	Preble's Jumping Mouse	0	15	70	40	0	-50	-75	-100
Recreation	Campgrounds	400	20	0	-10	-10	-20	-50	-70
	Trails	100	15	0	-10	-10	-20	-30	-30
	Picnic areas, Bridges, Stairs	100	35	0	-10	-10	-20	-50	-70
	Turnpikes/Trail Features	100	30	0	-10	-10	-20	-50	-70



Outcome Based Management

The JCOS forested park system was divided up into management units that were used to highlight areas for priority treatment. These management units considered blocks of similar vegetation that were based on floristic surveys conducted by the JCOS Natural Resources Team. The size of management units was defined by JCOS at an appropriate scale for decision making within the park system.

Our prioritization framework considered three forest fuels reduction treatment types:

1. Tree thinning only
2. Prescribed fire only
3. Thinning followed by prescribed fire, where prescribed fire involves broadcast burning of the understory.

Treatment effectiveness was simulated by changing surface and canopy fuel attributes in RADS model runs. For more information on treatment effectiveness, please see Appendix B (pp 123 – 134) in the Forest Health Plan.

Treatment Types

Our prioritization framework considered three forest fuels reduction treatment types:

1. Tree thinning only
2. Prescribed fire only
3. Thinning followed by prescribed fire

Treatment Feasibility

There are other considerations within the modeling process to constrain the locations of our treatments to make sure our treatment priorities fall in areas where those treatments are sensible or even possible based on:

- Land management designations (wilderness and roadless)
- Forest presence for thinning ($\geq 10\%$ canopy cover)
- Appropriate forest types for prescribed fire

Given these constraints, either, or any, of these fuels treatment types would be feasible in 25,270 acres (58%) of JCOS park units (Table 3.6).





Table 3.6.
Acres feasible for treatment by park.
*RADS did not identify any priority acres for treatment within the park

JCOS PARK/ PROPERTY	TOTAL ACRES ACROSS MANAGEMENT UNITS	ACRES FEASIBLE FOR THINNING	ACRES FEASIBLE FOR RX FIRE	ACRES FOR RX FIRE ONLY	TOTAL ACRES FEASIBLE TREATMENT
Coal Creek Canyon Study Area	6002.4	3639.9	5558.3	2166.3	5806.3
White Ranch Park	4133.8	2722.3	4039.6	1331.3	4053.6
Centennial Cone Park	3637.8	2154.8	3503.4	1375.3	3530.1
Clear Creek Canyon Park	3393.4	2265.1	3091.7	886.7	3151.8
Matthews/Winters Park	2462.5	715.7	2330.0	1638.2	2353.8
Mount Falcon Park	2233.8	1684.6	2212.4	534.4	2219.1
Reynolds Park	2044.1	1761.1	1980.0	268.7	2029.8
North Table Mountain Park	2066.8	93.4	1960.9	1891.7	1985.1
Douglas Mountain Study Area	1819.9	1590.1	1298.8	171.9	1762.0
Deer Creek Canyon Park	1632.4	1165.8	1592.3	437.4	1603.2
Hildebrand Ranch Park	1644.7	182.1	1565.9	1394.0	1576.1
Elk Meadow Park	1474.4	791.7	1259.2	542.0	1333.7
Alderfer/Three Sisters Park	1131.2	1056.4	1025.7	49.6	1106.0
South Valley Park	994.1	66.7	852.0	788.4	855.1
Mount Lindo	831.8	700.3	804.4	121.0	821.3
South Table Mountain Park*	856.6	101.2	765.3	674.3	775.5
Mount Galbraith Park	804.6	465.2	759.5	306.2	771.5
Cathedral Spires Park	788.4	683.4	740.6	66.9	750.4
Pine Valley Ranch Park	882.0	600.7	731.0	132.1	732.8
Windy Saddle Park	746.7	452.6	691.0	250.2	702.8
Apex Park	693.8	289.1	666.1	384.1	673.2
Meyer Ranch Park	666.7	530.4	484.8	66.1	596.5
Lippincott Ranch Property	426.5	282.0	417.2	135.4	417.4
Beaver Ranch Park	445.0	347.4	340.7	48.9	396.3
Flying J Ranch Park	420.6	331.1	307.3	50.5	381.6
Lair o' the Bear Park	392.1	332.0	367.8	46.5	378.5
Mount Glennon*	357.2	66.9	338.5	274.7	341.6
Stafford Hogback*	115.7	28.0	111.2	83.2	111.2
Lookout Mountain Preserve	121.0	82.1	95.4	26.2	108.3
Crown Hill Park*	228.5	56.3	32.2	28.7	85.0
Van Bibber Park*	164.6	23.6	53.2	43.4	66.9
Welchester Tree Grant Park*	20.9	8.2	17.6	10.0	18.2
JCOS Park System	43633.8	25270.5	39993.9	16224.1	41494.6

Treatment Cost

Treatment costs were based on local expert opinion. For tree thinning-only treatments, cost was considered a function of base operating cost (~\$1,800/ac), adjusted for distance from nearest road and slope steepness. Cost increased once distance from roads exceeded 800m (875 yards) and cost increased once slope exceeded 35% (Figure 3.8).

Per-acre cost for prescribed fire was assumed to be constant depending on distance from WUI. Prescribed fire cost costs vary widely and are difficult to characterize in part because preparation costs are not consistently recorded. We therefore assumed a flat rate of \$1,000/ac when >250m from mapped WUI and \$3,000/ac when <250m from WUI to account for extra planning and increased safety measures around homes and structures (Figure 3.9).

Per-acre cost for the tree thinning plus prescribed fire treatment was assumed to be the sum of the thinning and prescribed fire treatment costs. The complete treatment costs are shown in Figure 3.10.

THIN ONLY COST

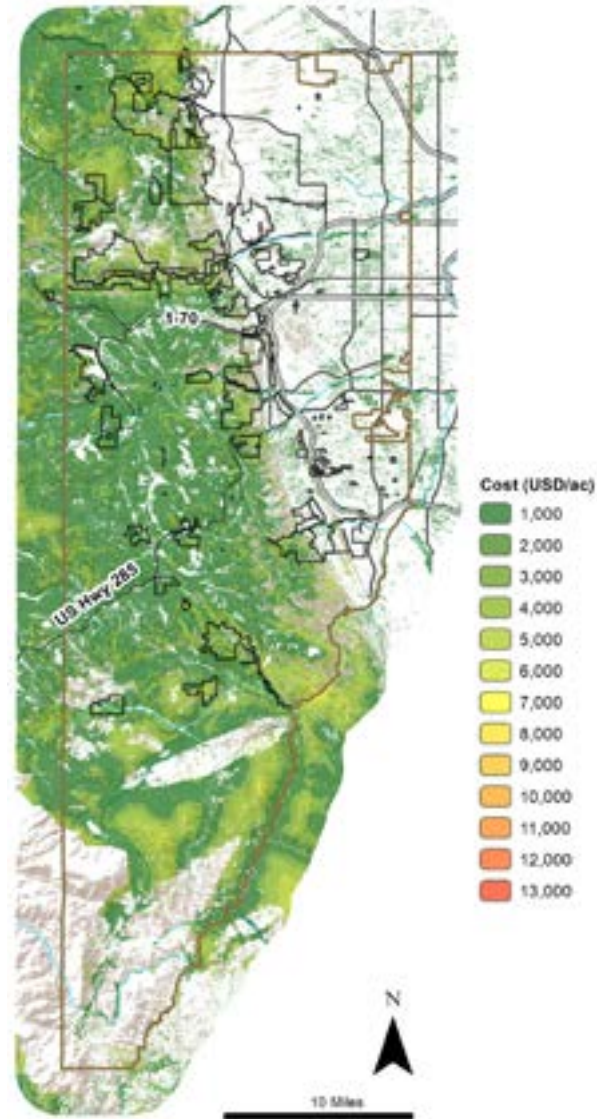


Figure 3.8. Thin only treatment costs for Jefferson County estimated using distance from roads and slope steepness.

RX FIRE ONLY COST



Figure 3.9. Prescribed fire-only treatment costs for Jefferson County estimated as a constant value based on distance to WUI.

THIN + RX FIRE COST



Figure 3.10. Thin + prescribed fire treatment costs for Jefferson County estimated as the sum of the thinning and prescribed fire costs.

Modeling Wildfire Risk Reduction

Table 3.7 shows wildfire risk reduction potential by park. Percent risk reduction is the amount of risk reduction each park contributes to the total risk reduction across the JCOS park system if every feasible acre were treated. Average risk reduction per acre is a relative measure of expected Net Value Change before and after simulated treatments. Higher values indicate greater average wildfire risk reduction for a park.



JCOS PARK/ PROPERTY	PERCENT OF TOTAL RISK REDUCTION	AVERAGE RISK REDUCTION PER ACRE
Lookout Mountain Preserve	1.9	471
Beaver Ranch Park	4.4	30.1
Flying J Ranch Park	4.7	28.9
Reynolds Park	8.3	24.2
Alderfer/Three Sisters Park	8.6	23.3
Meyer Ranch Park	4.6	23.1
Elk Meadow Park	6.8	12.8
South Valley Park	2.5	10.2
Pine Valley Ranch Park	3.2	9.5
Deer Creek Canyon Park	4.3	7.9
Apex Park	1.1	6.9
Mount Lindo	2.4	6.8
Douglas Mountain Study Area	3.9	6.4
Lair o' the Bear Park	0.9	6.1
White Ranch Park	10.6	5.8
Windy Saddle Park	1.4	5.2
Mount Galbraith Park	1.3	4.8
Hildebrand Ranch Park	2.4	4.2
Cathedral Spires Park	1.3	4.0
Mount Falcon Park	3.8	3.9
Coal Creek Canyon Study Area	8.5	3.7
North Table Mountain Park	2.9	3.7
Matthews/Winters Park	3.0	3.5
Lippincott Ranch Property	0.5	2.8
Centennial Cone Park	3.9	2.7
Stafford Hogback	0.1	2.6
Clear Creek Canyon Park	2.4	2.0
Mount Glennon	0.3	1.9
South Table Mountain Park	0.1	0.3
Van Bibber Park	0.0	0.3
Welchster Tree Grant Park	0.0	0.1
Crown Hill Park	0.0	0.0
JCOS Park System	100.0	9.2

Treatment Risk Reduction

Reduction in wildfire risk resulting from tree-thinning only treatments was greatest in the central portion of the county, where many HVRAs are concentrated. The prescribed fire-only treatment reduced risk over a broader area of Jefferson County than the thin only treatment, while the tree-thinning plus prescribed fire treatment showed the greatest risk reduction per pixel, because it summed the risk reduction benefits of both treatments.

Considering relative risk across the JCOS park system, risk reduction potential was greatest in White Ranch Park. By treating all feasible acres within White Ranch Park, JCOS would reduce the overall risk to the JCOS park system by approximately 10%. However, on a per acre basis, Lookout Mountain Preserve had the highest risk reduction, so that a single acre treated at that park reduced risk substantially more relative to even the largest parks, such as Clear Creek Canyon.

Risk reduction estimates are mapped for each treatment type in Figure 3.11 through Figure 3.13.

THIN ONLY RISK REDUCTION

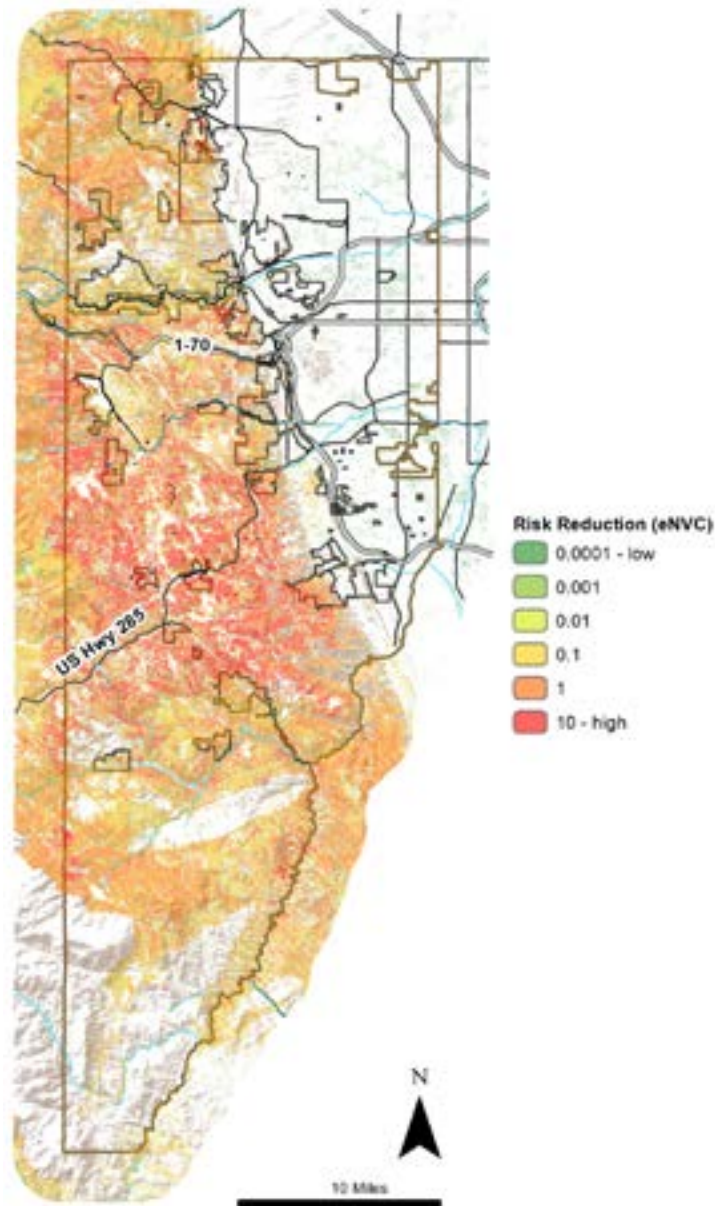


Figure 3.11. Estimated risk reduction for the thin only treatment.

RX FIRE ONLY RISK REDUCTION

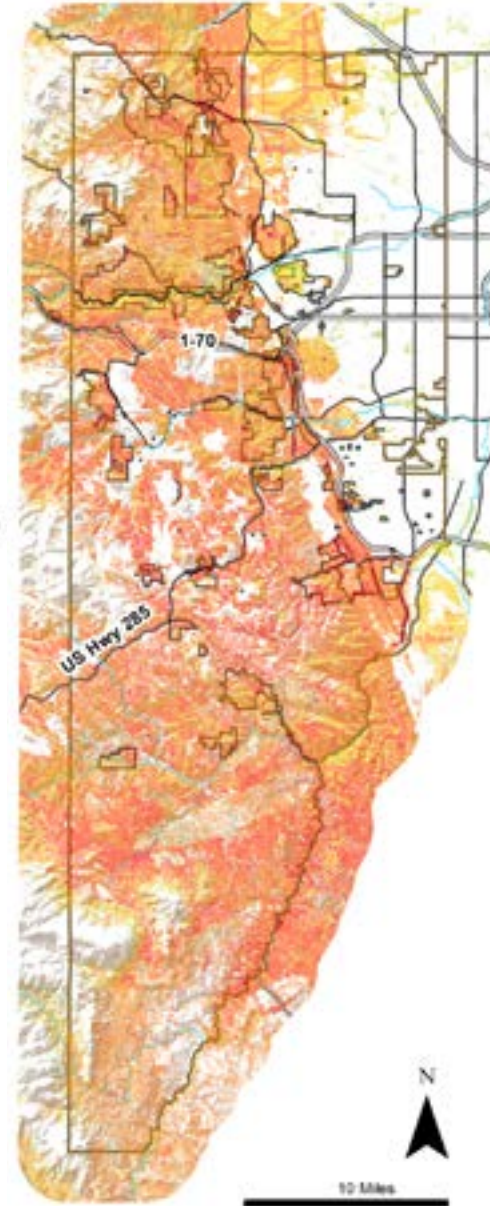


Figure 3.12. Estimated risk reduction for the prescribed fire only treatment.

THIN + RX FIRE RISK REDUCTION

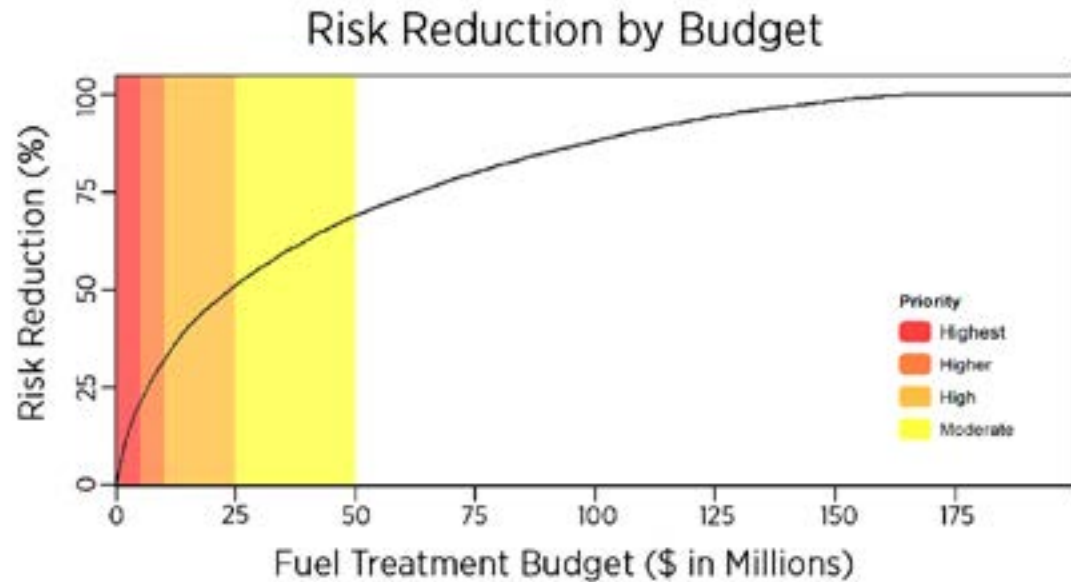


Figure 3.13. Estimated risk reduction for the thin + prescribed fire treatment.

JCOS Wildfire Risk Priorities

The wildfire risk prioritization map prioritized acres in 25 of the JCOS parks, totaling 12,881 acres (Figure 3.15, Table 3.9) or 31% of the feasible acres in JCOS parks. 1,341 acres were identified as the highest priority, occurring in nine JCOS parks.

An avoided-risk analysis showed that treating the highest priority areas (1,341 acres) would reduce overall risk within the JCOS park system by approximately 20% at a budget cost of \$5 million (Figure 3.17a). Increasing the budget to \$10 million to treat additional higher priority acres would reduce risk by another 10% for a total of 30% risk reduction across 2,383 acres in 11 parks (Table 3.9 , includes the highest and higher priority acres). Treating all of the priority acres within the JCOS park system at a budget cost of \$50 million would overall risk by about 70%. Prescribed fire and thinning + prescribed fire were identified as the most cost-effective treatments across the possible range of budgets to achieve the greatest amount of wildfire risk reduction.



WILDFIRE RISK PRIORITIES

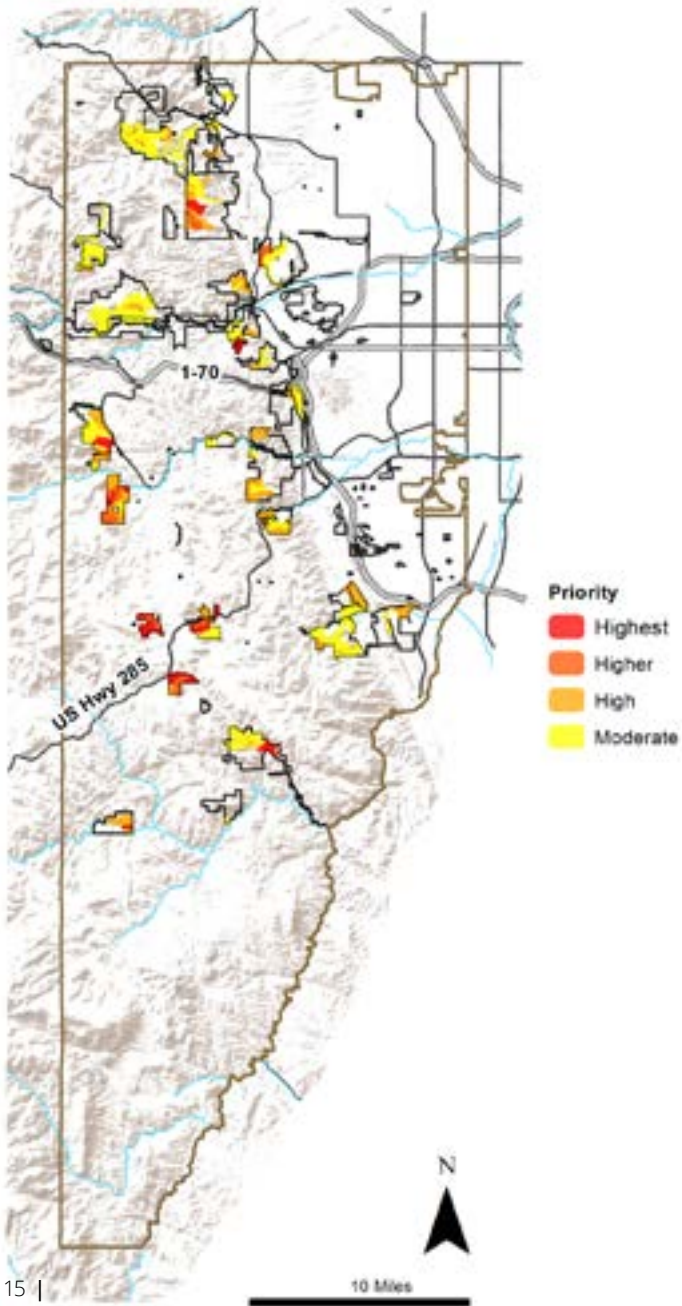


Table 3.9. Wildfire risk priorities by park. The percent of total feasible acres is the percent treatable acres within each park that are a priority.

*RADS did not identify any priority acres for ecological benefit within the park.

Figure 3.15. Wildfire risk fuel treatment prioritization for JCOS. Highest, higher, high, and moderate treatment priorities correspond to \$5M, \$10M, \$25M, and \$50M fuel treatment budgets.

JCOS PARK/PROPERTY	HIGHEST	HIGHER	HIGH	MODERATE	TOTAL PRIORITY ACRES	PERCENT OF TOTAL FEASIBLE ACRES (%)
Flying J Ranch Park	292.9	67.4	0.0	0.0	360.3	94.4
Elk Meadow Park	244.4	0.0	261.8	576.9	1083.1	81.2
Meyer Ranch Park	161.0	38.5	57.6	265.8	522.8	87.7
White Ranch Park	149.4	207.9	346.0	284.7	988.1	24.4
Beaver Ranch Park	144.1	136.6	90.3	0.0	371.0	93.6
Reynolds Park	129.0	0.0	56.7	513.7	699.4	34.5
Lookout Mountain Preserve	100.3	0.0	0.0	0.0	100.3	92.6
Alderfer/Three Sisters Park	91.2	416.1	490.2	81.4	1078.8	97.5
Pine Valley Ranch Park	28.5	0.0	246.4	0.0	274.9	37.5
North Table Mountain Park*	0.0	117.2	0.0	320.7	437.9	22.1
Mount Lindo	0.0	58.0	214.6	236.6	509.3	62.0
Mount Falcon Park	0.0	0.0	363.2	138.1	501.3	22.6
Coal Creek Canyon Study Area	0.0	0.0	337.4	1116.2	1453.6	25.0
South Valley Park*	0.0	0.0	236.0	217.3	453.2	53.0
Mount Galbraith Park	0.0	0.0	216.2	27.6	243.7	31.6
Matthews/Winters Park	0.0	0.0	202.8	184.1	387.0	16.4
Deer Creek Canyon Park	0.0	0.0	193.0	638.0	831.1	51.8
Hildebrand Ranch Park*	0.0	0.0	174.8	66.7	241.5	15.3
Centennial Cone Park	0.0	0.0	70.9	985.4	1056.4	29.9
Windy Saddle Park*	0.0	0.0	56.0	156.1	212.2	30.2
Douglas Mountain Study Area	0.0	0.0	52.9	476.4	529.3	30.0
Apex Park	0.0	0.0	38.7	72.5	111.2	16.5
Clear Creek Canyon Park	0.0	0.0	0.0	314.2	314.2	10.0
Lair o' the Bear Park	0.0	0.0	0.0	94.5	94.5	25.0
Cathedral Spires Park	0.0	0.0	0.0	26.0	26.0	3.5
JCOS Park System	1340.8	1041.7	3705.5	6793.0	12881.1	31.0

Action Plan

The results of the Wildfire Risk Assessment give JCOS a blueprint for developing work plans over the next several years. The Wildfire Risk Assessment identified 1,340 acres as “highest” priority for management (Table 3.9).

The assessment indicated that 235 of those “highest” priority acres are calling for prescribed fire treatments only, and those acres may not be prioritized for treatment until prescribed fire becomes a viable option for JCOS. The remaining 1,105 acres in the “highest” priority category align closely with the Conservation Greenprint goal of treating 1,000 acres by the end of 2025. It is important to understand that the Wildfire Risk Assessment is a tool and not a one size fits all approach. JCOS staff will generally treat “highest” priority acres first, when possible, but some situations may elevate the value of working in lesser priority areas.

By assessing both wildfire risk and ecological benefit, we have identified our parks where actions will benefit wildlife and where our actions will mitigate risk to communities. This approach will help us strategically target grant funding to link habitat restoration or wildfire risk funding to places where it will provide greatest benefit.

Model Results

The results are being used to inform the work plans for other aspects of JCOS natural resource management. Knowing the schedule of where forestry treatments will take place allows our botanists and wildlife ecologists time to set up monitoring plots to evaluate the impacts of our work.

[View the full Jefferson County Open Space Forest Health Plan](#)

