

# Home Destruction Within the Hayman Fire Perimeter

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## Introduction

The Hayman Fire report on home destruction examines the following four questions:

1. How many homes were destroyed out of the total number of homes within the Hayman Fire perimeter?
2. What was the relative wildland fire intensity associated with the destroyed homes?
3. What was the categorical cause of home ignition suggested by the associated wildland fire intensity adjacent to the home site?
4. Did community covenants and/or county regulations exist that suggest differences in the potential for home destruction?

An onsite assessment at each destroyed home provided the principal information needed to address these questions. In addition, documentation and photographs during the fire, postfire aerial reconnaissance, and meetings and discussions with Federal and county personnel and local area residents contributed important information. Although we only specifically assessed the homes destroyed, surviving homes were considered when possible. Onsite assessments occurred 3 months after the Hayman Fire, at a time when much of the specific evidence describing the nature of home destruction and survival was lost. Discussions with fire personnel and residents indicate that most homes were not actively protected when the Hayman Fire burned the residential areas.

## Number of Destroyed Homes

The Hayman Fire resulted in the destruction of 132 homes (that is, homes on permanent foundations, modular homes, and mobile homes—both primary and secondary). Some 794 homes existed within what is now the final perimeter of the Hayman Fire. Thus, 662 homes were not destroyed. The Hayman Fire resulted in about 17 percent destruction of the total homes within the fire area (table 1).

**Table 1**—The number of homes destroyed and remaining during the Hayman Fire, 2002. Information is based on county records and onsite assessments.

County	Destroyed	Remaining	Total
Douglas	45	232	277
Jefferson	1	~160	161
Park	4	144	148
Teller	82	126	208
<b>Total</b>	<b>132</b>	<b>662</b>	<b>794</b>

## Fire Intensity

A wide array of wildland fire intensities were evidenced with respect to home destruction and survivability. Figure 1 shows the range of wildland fire intensities associated with homes destroyed and a similar range with those that survived.

Research (Cohen 2000) has shown that the characteristics of the home in relation to its immediate



**Figure 1**—A 2x2 matrix of home destruction associated with the nearby wildland fire intensity. Expectations correspond to fire intensities, for example, home survival is expected if low fire intensities occur (lower right cell) and unexpected if the home is destroyed (lower left cell).

surroundings (within 100 to 200 feet) principally determine home ignitions during intense wildland fires. This area that includes the home characteristics and its immediate surroundings is called the *home ignition zone*. Figure 1 shows expected cases and unexpected cases based on an association of fire intensities and the resulting home destruction or survival. The home ignition zone provides the means for understanding the unexpected situations—homes destroyed associated with low fire intensity and surviving homes associated with high intensities. The wildland fire intensity in the general area does not necessarily cause home destruction or survival. This distinguishes the difference between the exposures (flames and firebrands) produced by the surrounding wildland fire from the actual potential for home destruction (home ignition zone) given those exposures. Recognizing that the home ignition zone principally determines home ignition potential provides an important context for interpreting the home destruction information. The home ignition zone implies that the issue of home destruction can be considered in a home site-specific context rather than in the general context of the Hayman Fire.

## Causes of Destruction

Seventy homes were destroyed in association with the occurrence of torching or crown fire in the home ignition zone. Sixty-two homes were destroyed by surface fire and/or firebrand(s). The homes destroyed correspond to the two left cases in figure 1. A destroyed home was counted in the high intensity fire category if any high intensity burning occurred in the area surrounding the home. Significant site disturbance in the time lapsed between the fire occurrence and our assessment prohibited any further analysis as to whether these high intensities could have directly caused home ignition. That is, loss of evidence and the limited time for assessment disallowed a postburn analysis of the home ignition zone.

## Covenants and Local Regulations

Significant patterns of destruction were not observed. This can likely be attributed to the wide variety of home types, designs, and building materials, the scattering of destroyed homes, the significant number of surviving homes within the fire perimeter, and the wide range of fire intensities associated with home destruction. Teller and Park County did not have any regulations in place. In 1994 Douglas County adopted an amended version of NFPA 299 (1991) as an appendix to the Uniform Building Code as well as some minimum rural water storage requirements for developments. All new developments and building permits after the adoption date are subject to these regulations. Like-

wise, Jefferson County required defensible space permits on habitable space greater than 400 ft<sup>2</sup> in 1996, but because of little new construction, few—if any—homes fall into this category in the fire area.

## Home Destruction Chronology

The following timeline is based on the fire chronology presented in the fire behavior section but focuses on the progression of the fire in relation to homes destroyed (fig. 2). The exact time individual homes were destroyed is largely unknown. Furthermore, the progression of the fire may not coincide with the actual date a home burned. This is largely a function of an estimate of the fire's perimeter at a specific time and unburned areas within the perimeter that can later burn.

Most of the destroyed homes occurred in the eastern portions of the Hayman Fire area. The major fire runs on June 9 and 10, 2002, resulted in 36 homes destroyed. The major eastward fire spread a week later on June 17 and 18 produced the greater proportion of destroyed homes (87 homes).

**June 8, 2002:** No homes destroyed. Fire size: 280 acres.

**June 9:** Sustained, prefrontal southwest winds with wind speeds near 20 mph, with gusts exceeding 30 mph, pushed the fire northeast and into the Nine-J road area (County Road 59) at approximately 1800 hours; six homes were destroyed. In the evening, the fire approached State Highway 67 and burned two homes, the Horse Creek CafÉ and Saloon, and a summer home in Lazy Gulch (near Deckers) (approximately 2300 hours). Fire size: 60,133 acres.

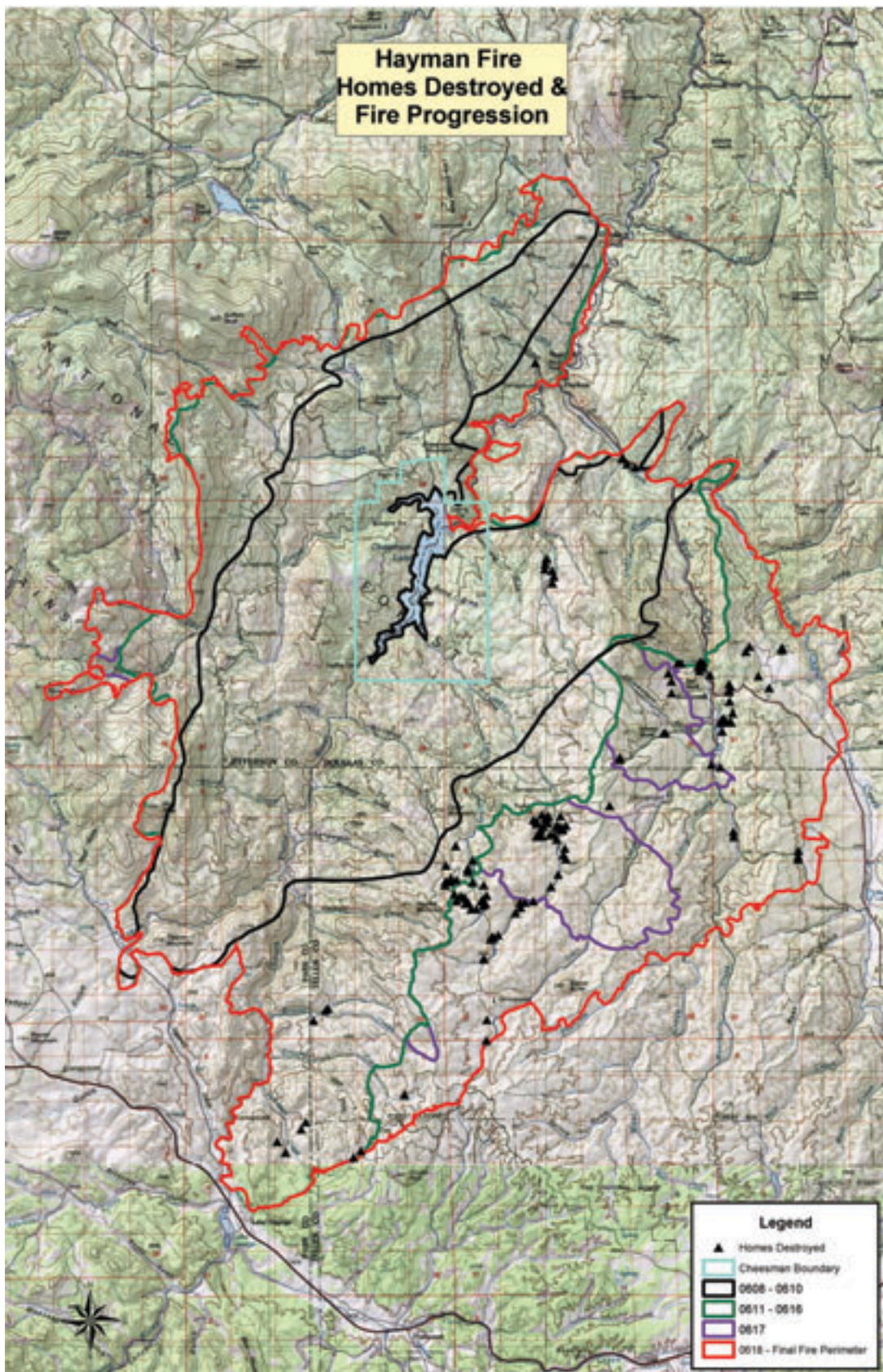
Teller Co.	0	Douglas Co.	9	Jefferson Co.	1	Park Co.	0	
<b>Homes destroyed:</b>							<b>10</b>	<b>Cumulative: 10</b>

**June 10:** With the arrival of the cold front (approximately 1400 hours), the southwest-southeast winds shifted, and the southeast flank spread into Lutheran Valley. Various bunk houses and outbuildings of the Lutheran Valley Retreat (LVR) were destroyed, as well as several summer homes in the adjoining area. Fire size: 81,463 acres.

Teller Co.	26	Douglas Co.	0	Jefferson Co.	0	Park Co.	0	
<b>Homes destroyed:</b>							<b>26</b>	<b>Cumulative: 36</b>

**June 11:** Cold front winds from the north persisted and pushed the fire into the Beaver Creek drainage, burning three homes (south of Forest Road 220/897). Fire size: 82,000-96,000 acres.

Teller Co.	3	Douglas Co.	0	Jefferson Co.	0	Park Co.	0	
<b>Homes destroyed:</b>							<b>3</b>	<b>Cumulative: 39</b>



**Figure 2**—Locations of destroyed homes in relation to the Hayman Fire progression. The lines correspond to the estimated position of the perimeters at the end of June 10, 16, 17, and the final fire perimeter.

**June 12 through 13:** Frontal winds continued to advance the fire southeast into Crystal Creek on June 12 and Vermillion Creek (Tom's Ranch or Forest Road 200)/Indian Creek (north of Lake George) on June 13, destroying six homes.  
Fire size: 97,000 acres.

Teller Co.	2	Douglas Co.	0	Jefferson Co.	0	Park Co.	4
<u>Homes destroyed:</u>		6		<u>Cumulative:</u>		45	

**June 14 through 16:** No homes destroyed.  
Fire size: 99,590 acres.

**June 17:** Weather conditions of the previous 6 days changed at about noon. Winds shifted and increased from the west-northwest, pushing the eastern flank of the fire into Turkey Rock Ranch, Thunder Butte subdivision, Bell Rock, and Stump Road (County Rd. 68).

Teller Co.	30	Douglas Co.	16	Jefferson Co.	0	Park Co.	0
<u>Homes destroyed:</u>		46		<u>Cumulative:</u>		91	

Fire size: 109,609 acres.

**June 18:** Weather experienced on June 17 persisted; the entire southeast, east, and northeast flanks spread into Trout Creek Ranch, Wildhorn Ranch, West Creek Lakes, and the Painted Rock area (County Road 78).

Teller Co.	21	Douglas Co.	20	Jefferson Co.	0	Park Co.	0
<u>Homes destroyed:</u>		41		<u>Cumulative:</u>		132	

Fire size: 135,174 acres.

**June 19 through 28:** No homes destroyed.  
Fire size (final): 138,114 acres.

## Assessment Methods

A qualitative, onsite assessment was done at each home destroyed by the Hayman Fire. The main objectives of the assessment were to (1) locate and record the GPS coordinates of each destroyed home, (2) determine for the general area and for each destroyed home the associated wildland fire intensity, and (3) determine the likely categorical cause of ignition (surface fire/firebrand or torching/crown fire). Each destroyed home site was photographically documented, and general area photographs were taken from an aerial survey. County assessors provided locations of recorded burned homes. Discussions with local area residents also aided in locating destroyed homes. We visited 132 homes over 2 weeks; approximately 800 photos were taken.

The field assessments for each destroyed home occurred the middle of September 2002, about 3 months after the homes burned. Site disturbance during that

period (for example, home debris removal, tree removal, rebuilding activities) eliminated much of the evidence important for highly reliable determinations of the categorical ignition cause. The occurrence of high intensity burning adjacent to a home site does not necessarily cause direct home ignition (fig. 1, upper right cell), and this can usually be determined immediately after the fire. For this assessment, the lack of adequate evidence and the assessment's time constraints dictated our assumption that any high intensity burning adjacent to the home site categorically designated the cause to be tree torching/crown fire.

The assessment process was as follows:

- Record the address, local area map designation, and GPS location.
- When possible, note the dominant vegetation, canopy cover, surface fuel, aspect, and slope.
- Categorically estimate the general area intensity (GAI). (This indicates the potential firebrand exposure to the home ignition zone without significant flame heating.)
- Categorically estimate the site-specific intensity (SSI). (This indicates the potential exposure to direct flame heating.)
- Categorically designate the probable ignition source of the home (for example, surface/firebrand or tree torching/crown fire).
- Record if there was unburned fuel in the immediate home area as well as unburned homes in the general vicinity (within approximately 0.25 mile).
- Take digital photographs of the site from the four cardinal directions, as well as any other points of particular interest (such as the likely path of the fire, unconsumed fuel, unburned homes).

## Specific Area Assessment

The 132 homes burned on the Hayman Fire were clustered into groups based on location and time of destruction. Eight assessment groups were delineated (fig. 3) and are listed below in relative order of occurrence (table 2). Each of the assessment groups is specifically examined. The destroyed homes are displayed on maps delineating fire severity. Corresponding photos provide a clearer understanding of the nonuniform burn patterns associated with homes destroyed and those that survived. The photos show burned homes as well as unburned homes in the same area. Many of the photos show trees with dead needles remaining that were unconsumed during the fire. This indicates that the intensities at those locations were not sufficient to initiate combustion in tree canopies.



**Figure 3**—The 132 destroyed homes were clustered into eight assessment groups according to area proximity and the fire progression.

**Table 2**—Assessment groups based on relative order of destruction during the Hayman Fire.

	<b>Homes destroyed</b>
Deckers/Nine-J Rd.	10
Lutheran Valley	26
Tom's Ranch/Indian Creek/West Teller Co.	12
Thunder Butte Subdivision/Bell Rock	11
Turkey Rock Ranch	28
Lost Valley/Wildhorn Ranch	14
West Creek Lakes/Stump Rd./County Rd. 78	25
Trout Creek Ranch	6

## Deckers/Nine-J Road

This assessment group consists of home(s) north-west and southeast of Deckers and the Nine-J Road area (County Road 59) (fig. 4). One summer cabin was destroyed in Lazy Gulch (Jefferson County), just northwest of Deckers along State Highway 126 (fig. 5, 6). Three additional structures—two primary residence

and the Horse Creek Cafe and Saloon (fig. 7)—were destroyed southeast of Deckers (State Highway 67). General area intensity (GAI) was high, where as the site-specific intensity (SSI) was moderate to low in Lazy Gulch and high to moderate along State Highway 67. In the Nine-J Road area, six homes were destroyed; GAI and SSI were high (fig. 8).

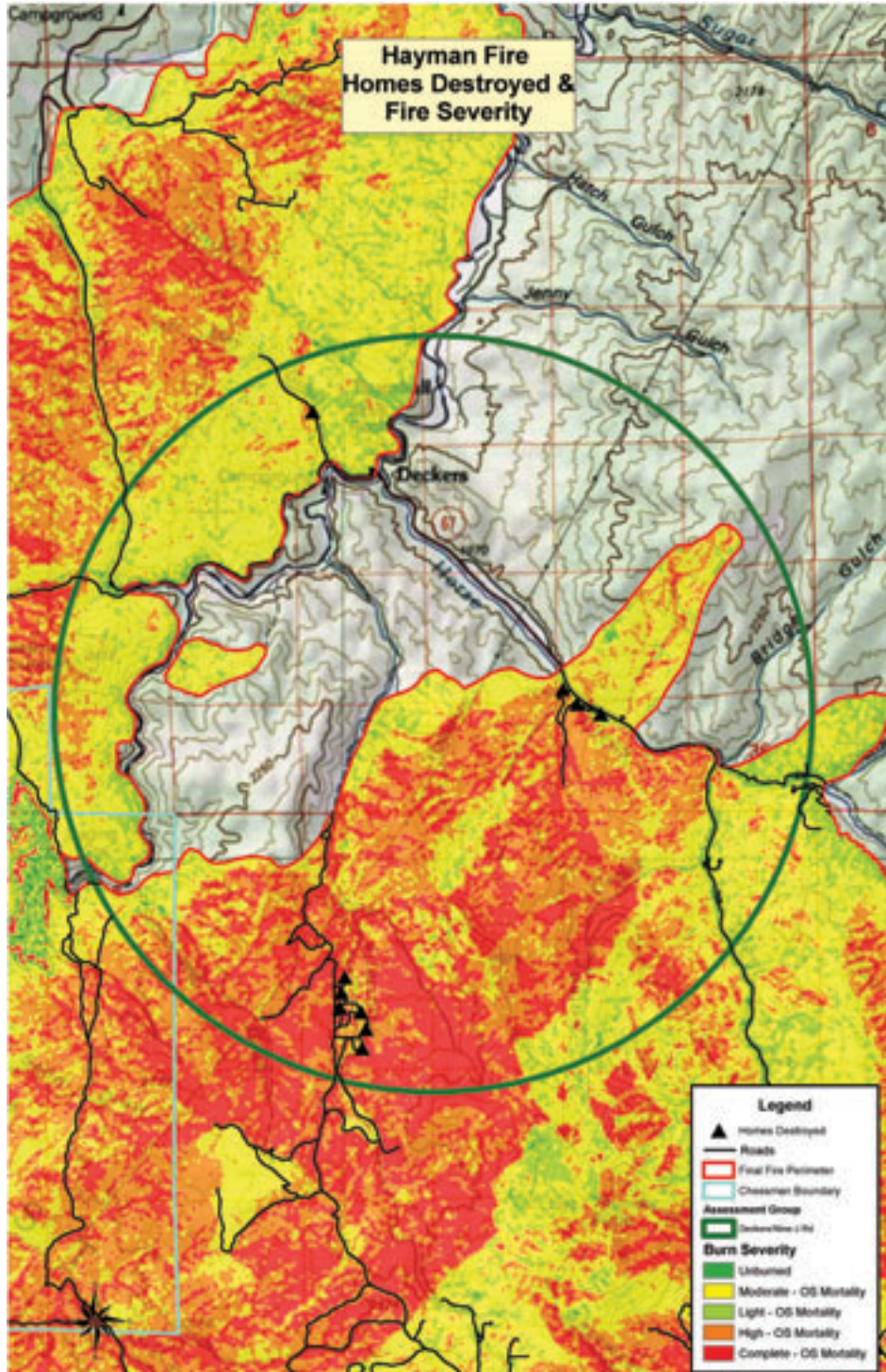


Figure 4—The Deckers/Nine-J Road assessment group with the associated fire severity.



**Figure 5**—Aerial view looking north at Lazy Gulch (State Highway 67, northwest of Deckers). The circle indicates where the summer home was destroyed. Note the unburned homes below the circle.



**Figure 6**—Site view of the summer home destroyed in Lazy Gulch (State Highway 67, northwest of Deckers). The remaining needle kill indicates a surface fire next to the home without tree torching and crowning.



**Figure 7**—The destroyed remains of the Horse Creek Cafe and Saloon on State Highway 67, southeast of Deckers. Note the unburned vegetation. (Photo by R. Moraga)



**Figure 8**—Aerial view looking to the south-southwest of Nine-J Road (County Road 59). Circled areas indicate where a home was destroyed. Note the unburned home with the green roof.



## Lutheran Valley

Twenty-six homes were destroyed in Lutheran Valley Ranch (fig. 9, 10) as well as several outbuildings and

bunkhouses at the Lutheran Valley Retreat. To the northeast the GAI was moderate to high and the SSI was moderate to low (fig. 11); all other areas experienced high GAI and high to moderate SSI (fig. 12).

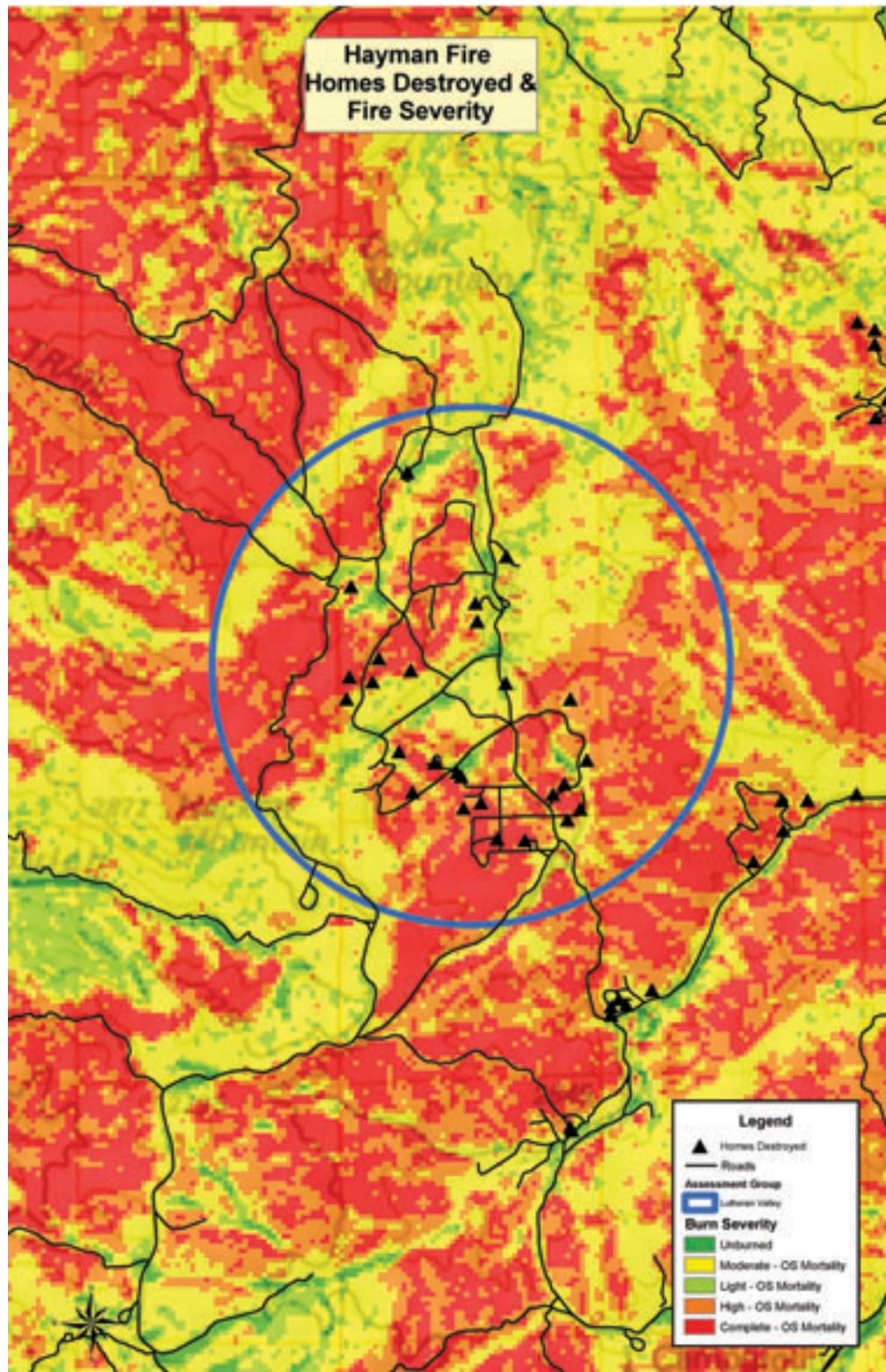


Figure 9—Lutheran Valley Ranch assessment group with the associated fire severity.



**Figure 10**—Aerial photograph of Lutheran Valley Ranch. (Photo produced by Jim Ellenwood)



**Figure 11**—Home destroyed in Lutheran Valley Ranch; ignition cause was designated as surface fire and/or firebrand.

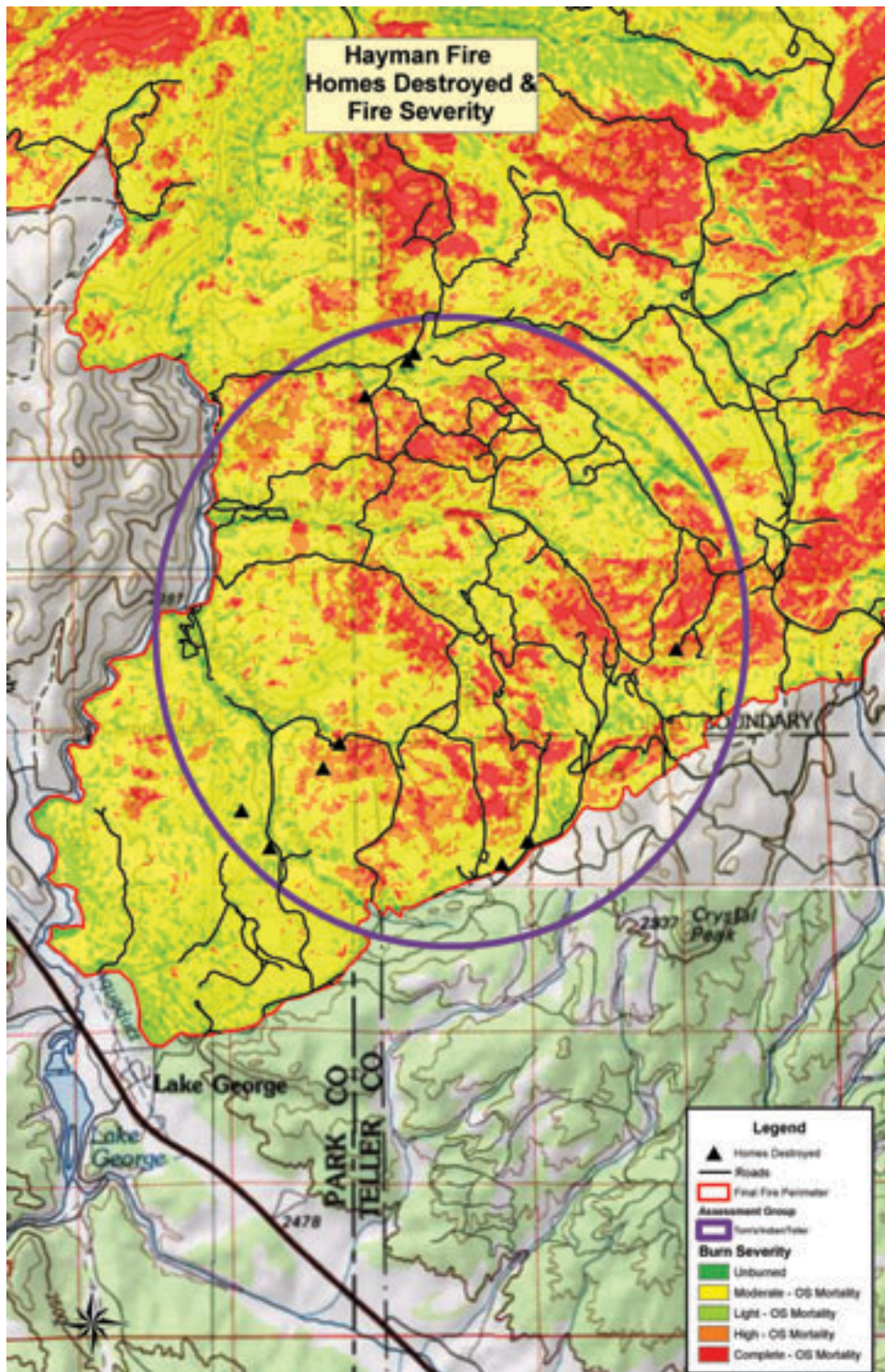


**Figure 12**—Another example home destroyed in Lutheran Valley Ranch. The ignition cause was designated as torching/crown fire.

## Tom's Ranch/Indian Creek/West Teller County

Twelve homes were destroyed in the southern end of the fire perimeter (fig. 13). Homes in Tom's Ranch

(Forest Road 200) experienced a range of intensities (both GAI and SSI) (fig. 14, 15). The GAI of the Indian Creek area was moderate and the SSI was moderate to low. Homes in west Teller County experienced high to moderate GAI and moderate to high SSI.



**Figure 13**—The Tom's Ranch/Indian Creek/West Teller County assessment group with the associated fire severity.



**Figure 14**—Home site where a structure was destroyed in Tom's Ranch (Forest Road 200). The ignition cause was designated as surface fire and/or firebrand.

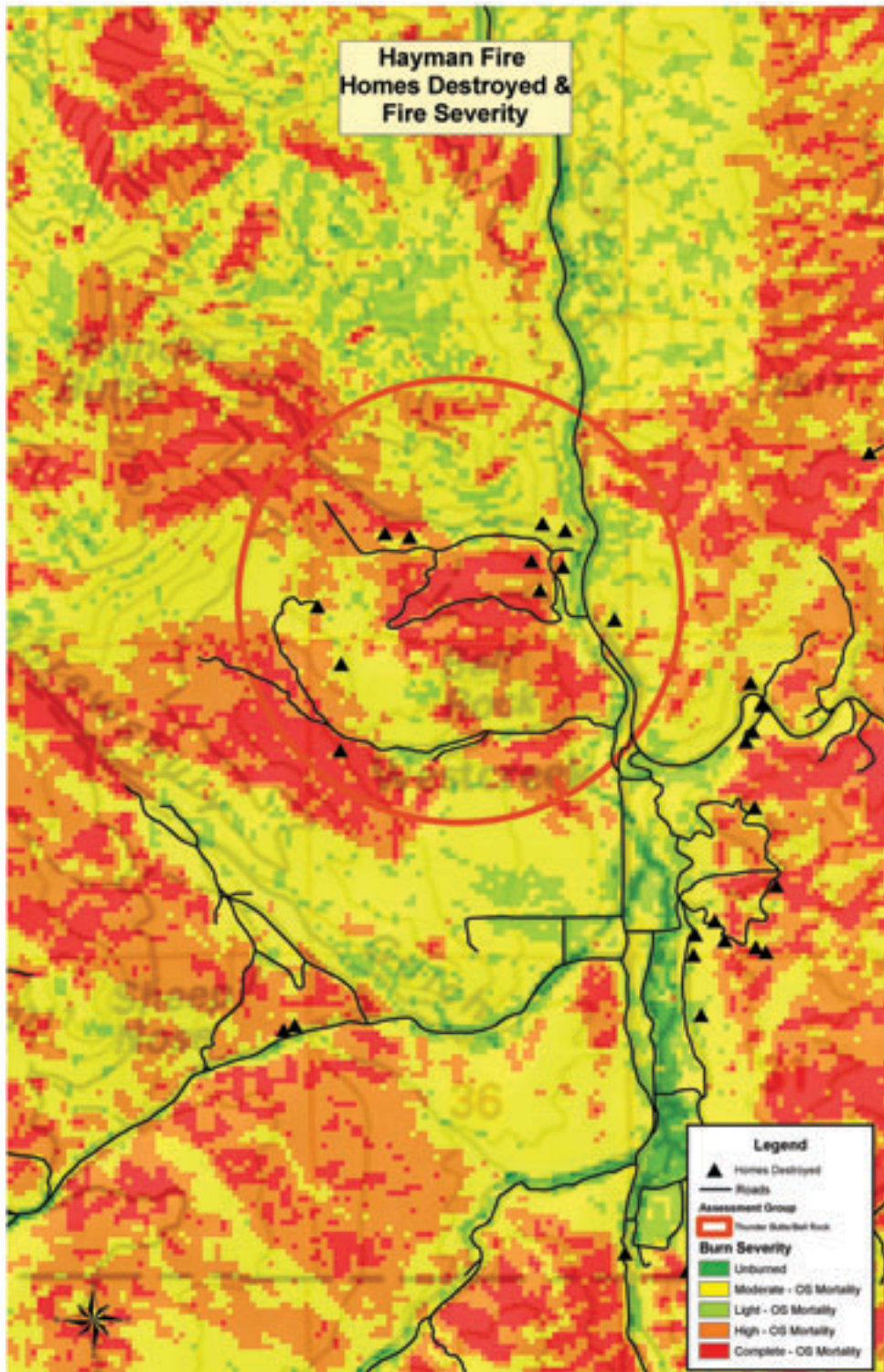


**Figure 15**—Home destroyed in Tom's Ranch (Forest Road 200); ignition cause was designated as torching/crown fire. Note the unburned tree canopies scattered throughout the area.

## Thunder Butte Subdivision/Bell Rock

This assessment group consists of seven homes in Thunder Butte Subdivision, one home on the east side of State Highway 67, and three homes south and west

of Bell Rock along Bell Rock Road (fig. 16). The GAI was high and the SSI was high to moderate in the Thunder Butte area (fig. 17, 18). The GAI was high to moderate and the SSI was moderate to low in the Bell Rock Area (fig. 19).



**Figure 16**—Thunder Butte Subdivision/Bell Rock assessment group with the associated fire severity.



**Figure 17**—Aerial photograph looking west through the Thunder Butte Subdivision with Bell Rock (top left) and the east face of the Thunder Butte bowl (top right).



**Figure 18**—Destroyed home in the Thunder Butte Subdivision designated as torching/crown fire cause. The garage is in the foreground and the home is in the background. The trees in the immediate vicinity were severely burned by the structure fire.



**Figure 19**— This home, southwest of Bell Rock, was designated as destroyed by surface fire and/or firebrand.  
(Photograph by Jeff DePooter)



## Turkey Rock Ranch

Twenty-eight homes in Turkey Rock Ranch were destroyed (fig. 20, 21). Homes on the north and east

side of the subdivision experienced moderate to low GAI and SSI (fig. 22); however, the GAI on the south and west sides were high with the SSI high to moderate (fig. 23).

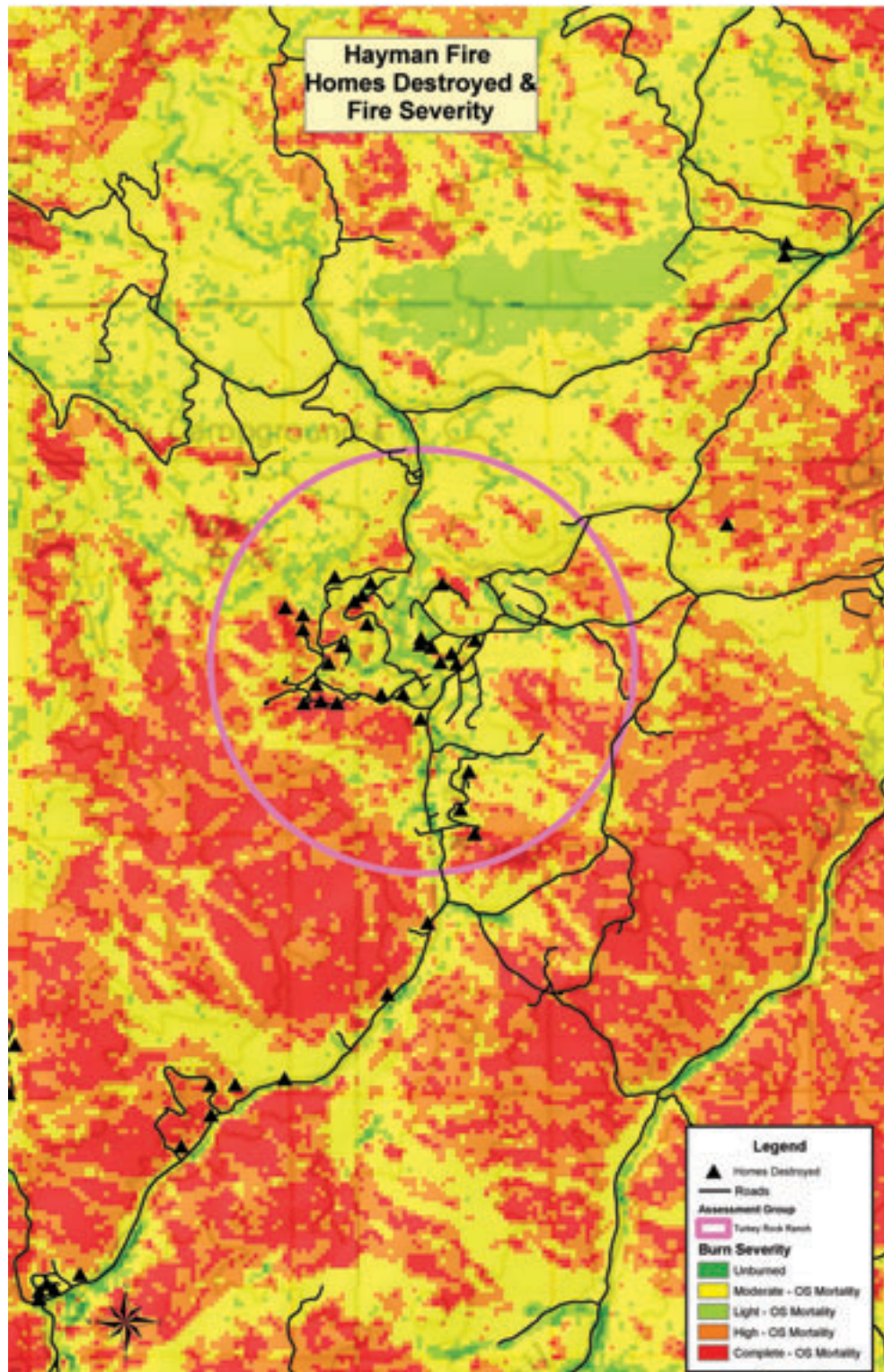
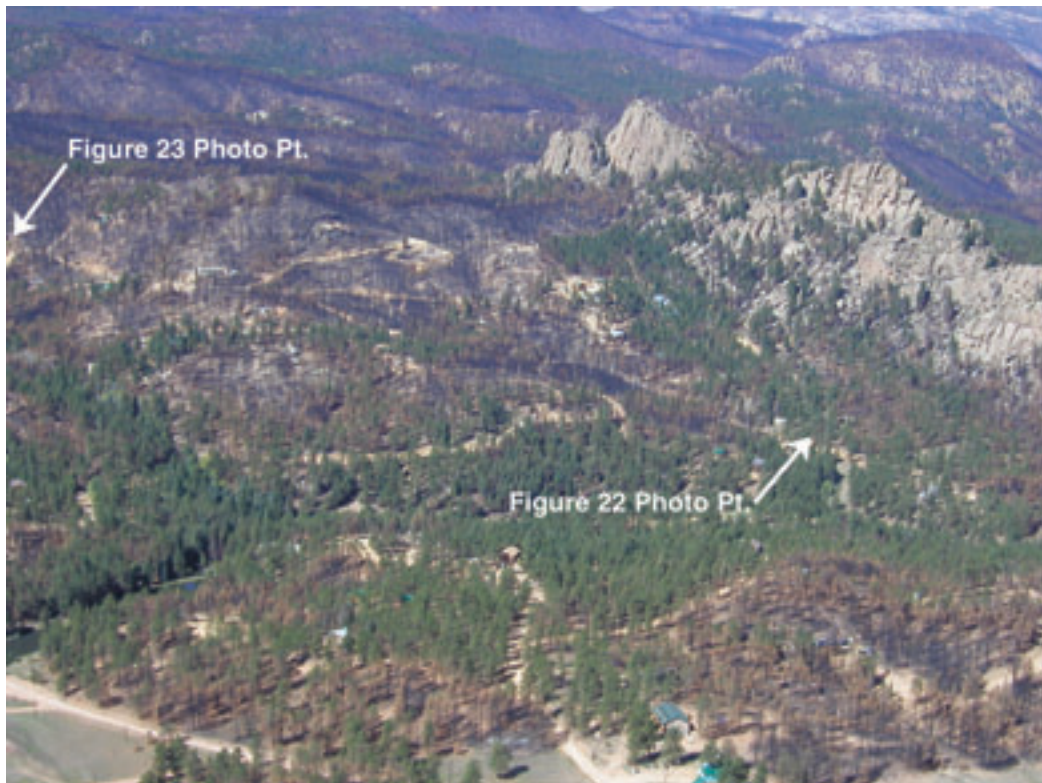


Figure 20—The Turkey Rock Ranch assessment group with the associated fire severity.



**Figure 21**—Aerial photograph showing the Turkey Rock Ranch area looking west-northwest. Note the unburned homes scattered throughout the lower two-thirds of the photo.



**Figure 22**—Home in Turkey Rock Ranch designated as destroyed by surface fire and/or firebrand.

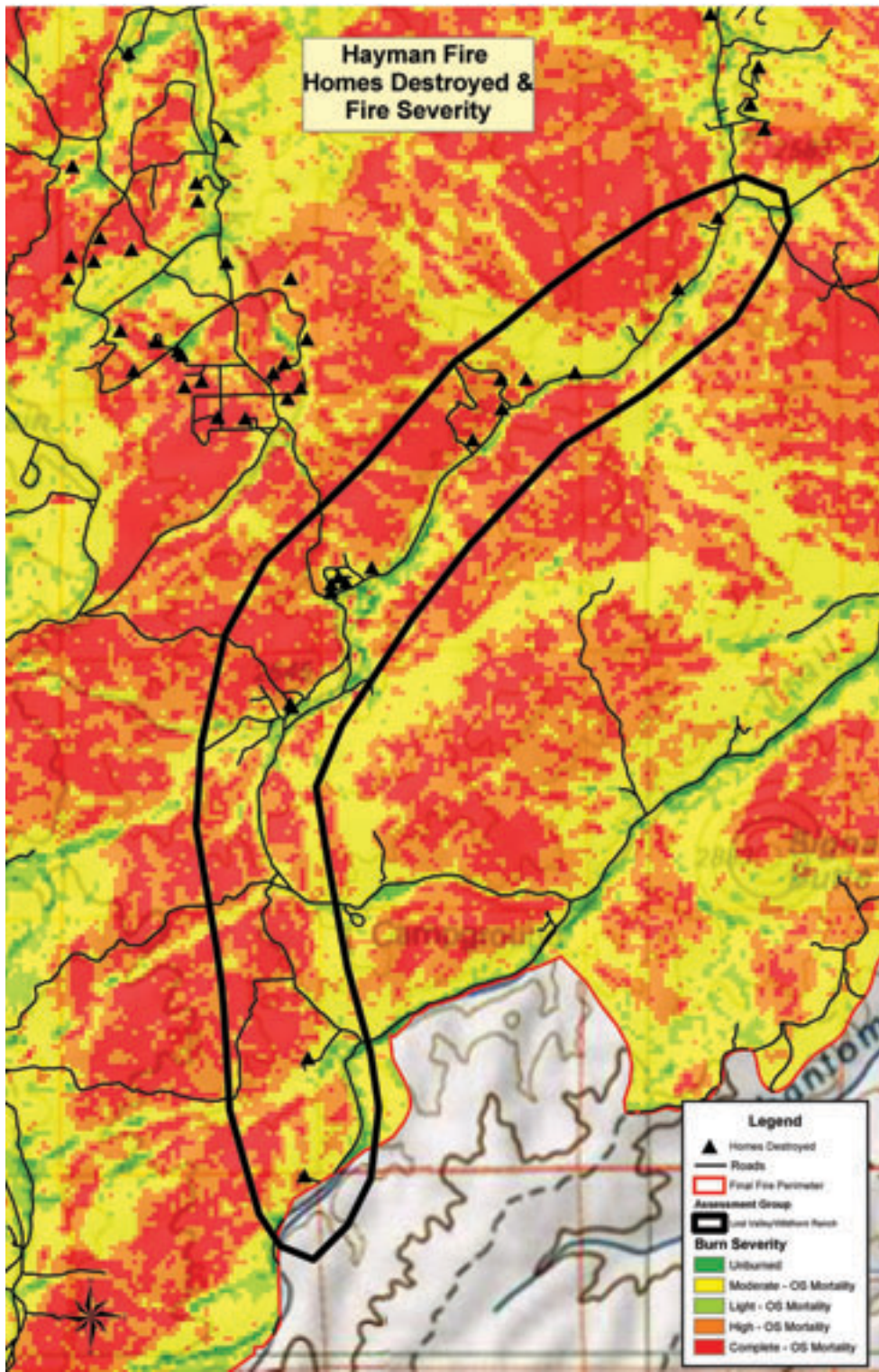


**Figure 23**—This home in Turkey Rock Ranch was designated as destroyed by torching/crown fire.

## Lost Valley/Wildhorn Ranch

This assessment group consists of the homes along Lost Valley Ranch Road (County Road 33), Wildhorn Ranch Subdivision, and the Wildhorn Lodge (fig. 24).

The GAI and the SSI in Lost Valley was high to moderate (fig. 25). The Wildhorn Ranch Subdivision (fig. 26) and Wildhorn Lodge (fig. 27) experienced high GAI and high to moderate SSI.



**Figure 24**—The Lost Valley/Wildhorn Ranch assessment group displayed in association with the fire severity.



**Figure 25**—Aerial photograph of a home in Lost Valley Ranch designated as destroyed by torching/crown fire. Note the unburned vegetation immediately adjacent to the home on the right as well as other unburned vegetation.



**Figure 26**—Aerial photograph looking southwest at the Wildhorn Ranch Subdivision.

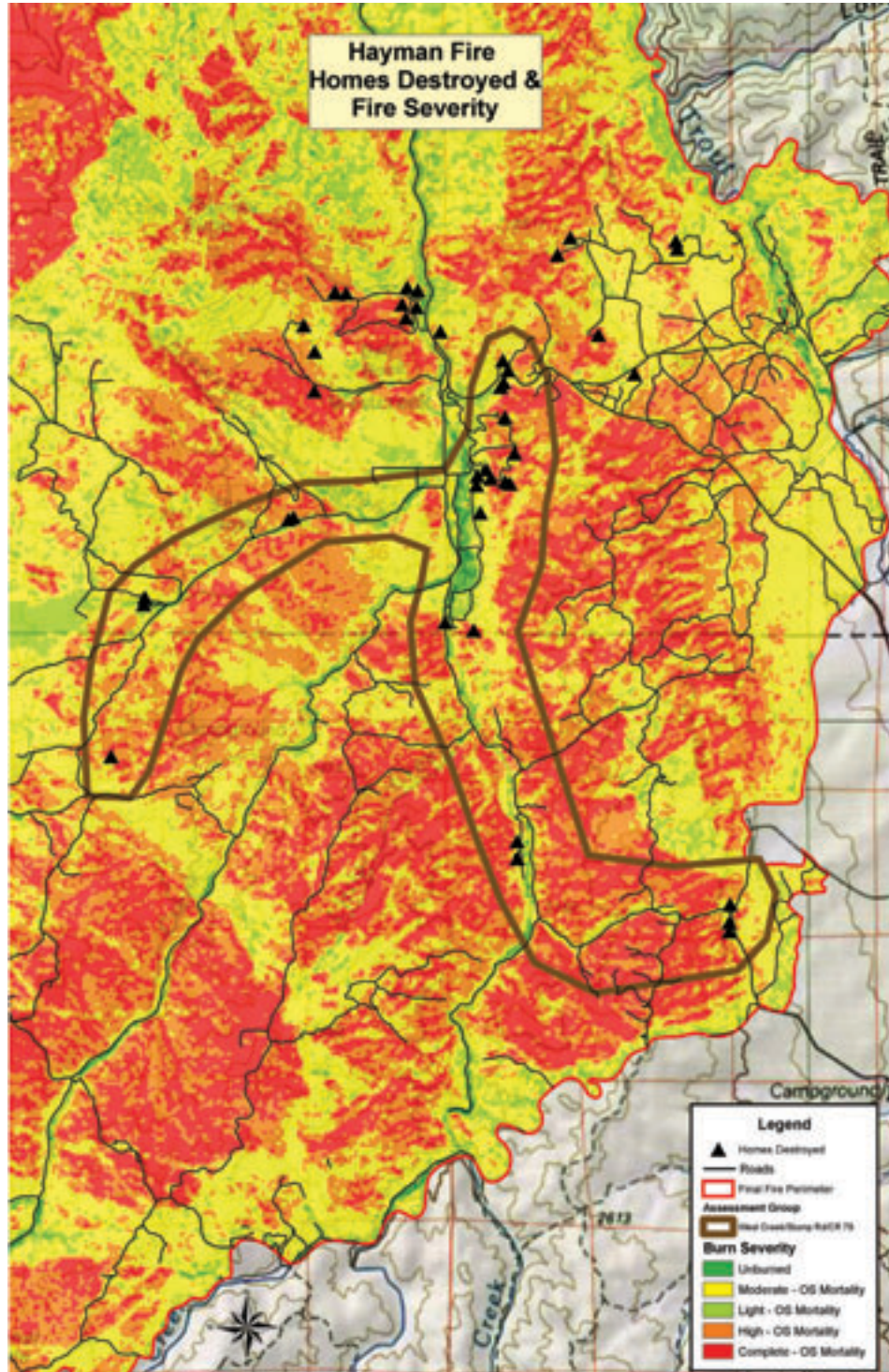


**Figure 27**—This aerial photo shows the Wildhorn Lodge and guest home. These structures were designated as destroyed by torching/crown fire.

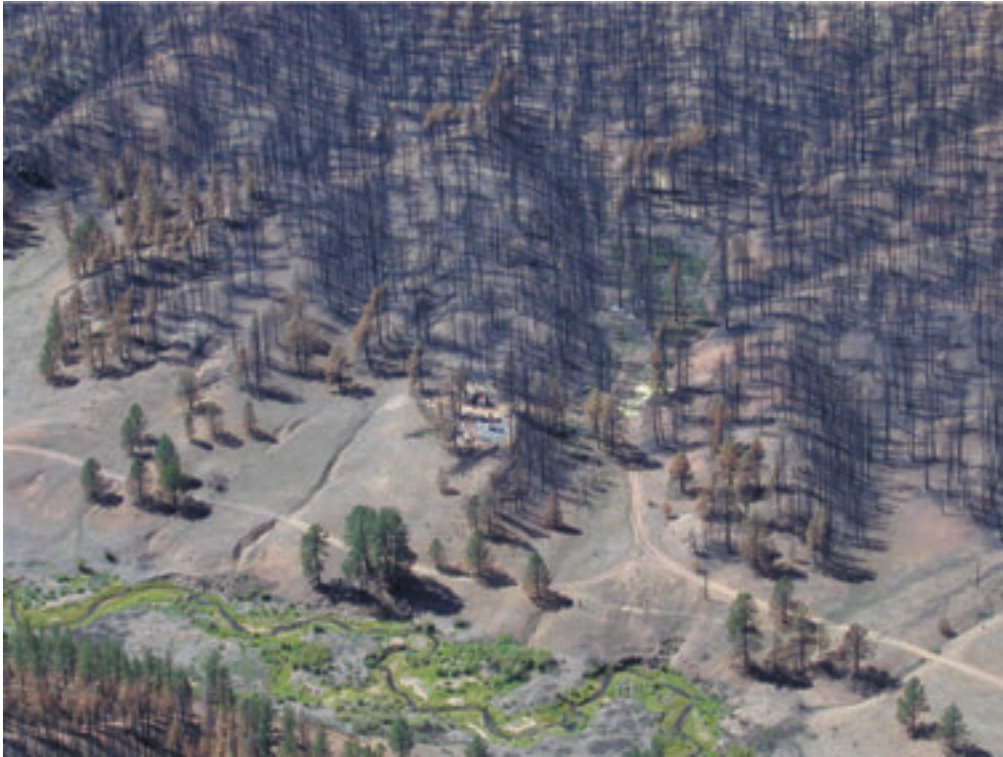
## West Creek Lakes/Stump Road/County Road 78

This assessment group consists of homes along County Road 78, including the Painted Rocks area, three homes along State Highway 67, homes along Stump Road (County Road 68), and the West Creek

Lakes community (fig. 28). Homes along County Road 78 (fig. 29, 30) and State Highway 67 (fig. 31) experienced high GAI but moderate and low SSI. The four homes along Stump Road experienced high to moderate GAI and SSI (fig. 32). Homes in West Creek Lakes experienced high to moderate GAI and moderate to low SSI (fig. 33 through 35).



**Figure 28**—The West Creek Lakes assessment group displayed in association with the fire severity.



**Figure 29**—Aerial photograph looking west-southwest showing a home destroyed along County Road 78. The ignition cause was designated as torching/crown fire.



**Figure 30**—Aerial photograph showing two homes (circled areas) destroyed along County Road 78 (Painted Rocks area). The ignition cause was designated as surface fire and/or firebrand.

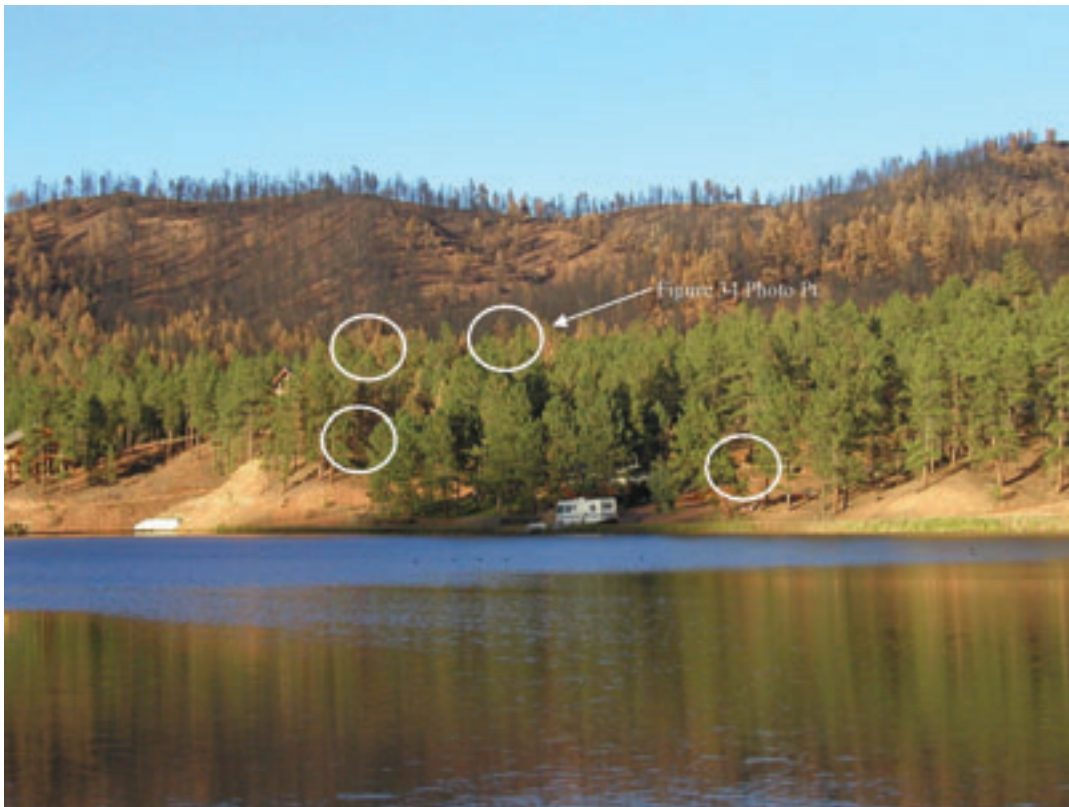




**Figure 31**—This view looking to the south shows a destroyed home along State Highway 67. Although the crown fire crested the ridge, the home is surrounded by unconsumed vegetation (albeit killed), indicating that the crown fire did not directly ignite this home.



**Figure 32**—The homes in this scene (circled) along County Road 68 (Stump Road) were designated as destroyed by torching/crown fire. The home farthest away in the view is being rebuilt.



**Figure 33**—This view looking east in West Creek Lakes shows homes (circled) destroyed by surface fire and/or firebrands.



**Figure 34**—Surface fire and/or firebrands destroyed this home in West Creek Lakes.



**Figure 35**—This home in West Creek Lakes was designated as destroyed by torching/crown fire.

## Trout Creek Ranch

Six homes were burned in the Trout Creek Ranch area (fig. 36). All but one of the homes were on cul-de-sacs and

experienced moderate to high GAI and high to moderate SSI (fig. 37, 38). The one exception was a home on Trout Creek that experienced moderate to low GAI and SSI (fig. 39).

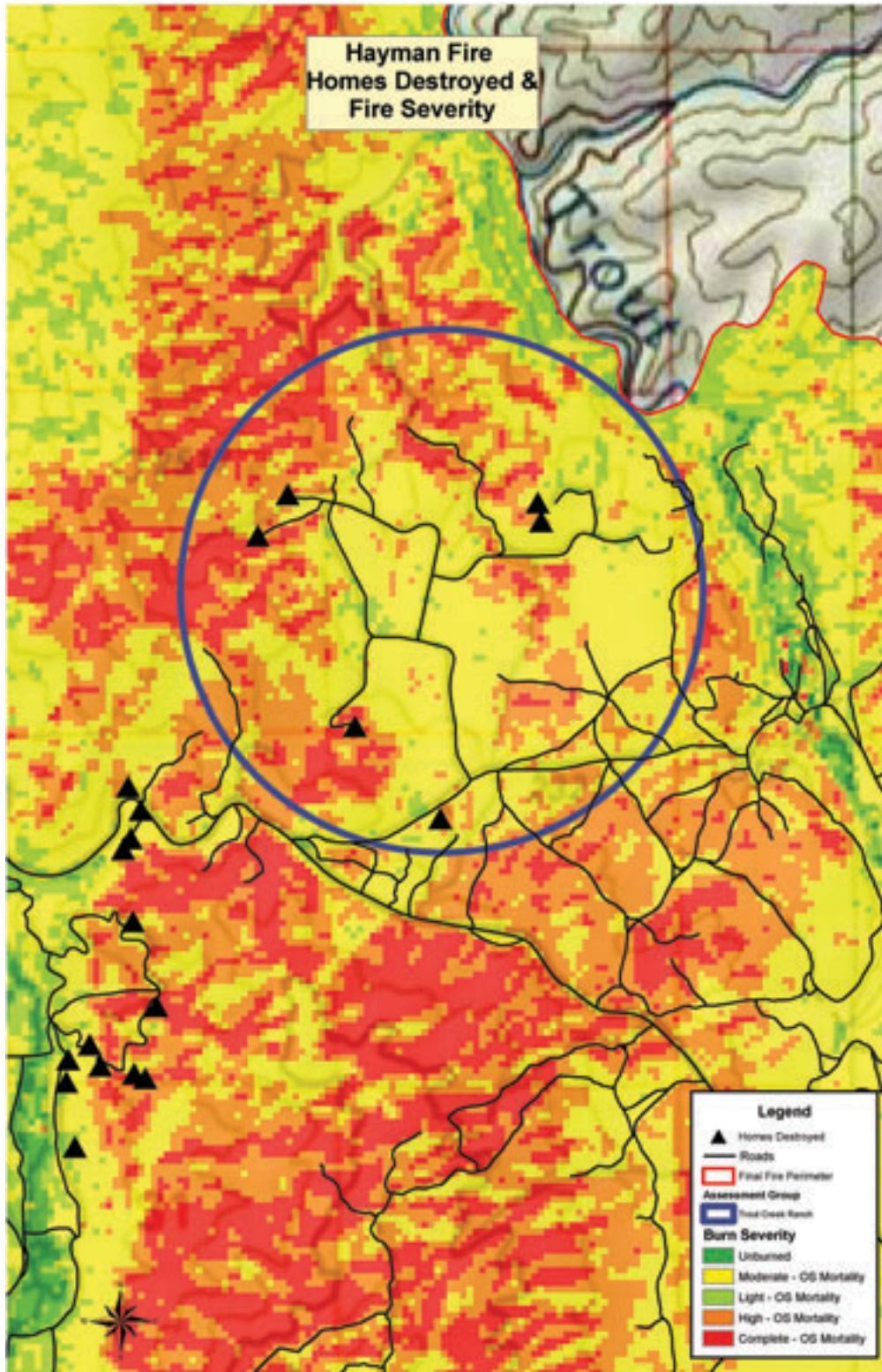


Figure 36—Trout Creek Ranch assessment group displayed in associated with the fire severity.



**Figure 37**—View of the west side of Trout Creek Ranch looking northwest toward two homes destroyed on a cul-de-sac.



**Figure 38**—These homes on the east side of Trout Creek Ranch were designated as destroyed by torching/crown fire.



**Figure 39**—This home, on the south side of Trout Creek Ranch, was designated as destroyed by surface fire and/or firebrand.

## References

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- Cohen, Jack D. 2000. Preventing disaster: home ignitability in the wildland-urban interface. *Journal of Forestry* 98(3): 15-21.
- National Fire Protection Agency (NFPA). 1991. *Protection of Life and Property from Wildfire*. NFPA 299.