

CHAPTER 17

WILDLAND FIRE

Wyoming's semi-arid climate and rural character make the state vulnerable to catastrophic wildland fires, which comprise more than 50% of all fires in Wyoming. As defined by the National Interagency Fire Center (NIFC), a "wildland fire" is any non-prescribed, non-structure fire that occurs in the wildland.

As the population and the wildland/urban interface of Wyoming increases, the more significant the risk of wildland fire hazard. Fremont County has an exceptional plan called the Fremont County Wildland Fire Management Program (Firewise), which expands on this population/wildfire relationship:

During the past few decades, population growth in the wildland/urban interface has increased greatly. Subdivisions and other high-density developments have created a situation where wildland fires can involve more buildings than any amount of fire equipment can possibly protect.

The past 100 years of wildland fire suppression has led to heavy vegetation growth and thus has greatly increased the potential fuel-load for a wildfire to burn. As the wildland/urban interface has grown into these densely packed forests, the potential for catastrophic wildland fires has increased as well.

Despite Wyoming's rural nature, this statement remains unquestionably accurate. Population growth and increased areas of wildland/urban interface are prompting policy makers, fire management organizations, and mapping technology to respond to a mounting need to mitigate wildfires to protect the residents and visitors of Wyoming.

According to the Wyoming Wildfire Mitigation Coordinator the majority of wildfires in the state are naturally started by lightning, while human-caused fires are found to be the majority in states with greater populations. Ninety-seven percent (97%) of all wildfires—both human and those caused naturally—in Wyoming are extinguished by firefighters within 10-acres of ignition.

Although different reports, assessments, plans, and programs have been developed by organizations at all levels of government, interagency coordination has proven to be extremely effective. Today Wyoming wildland fires are managed and supported to varying extents through a cooperative effort by the:

- U.S. Bureau of Land Management (BLM) Wyoming Fire Program
- Geospatial Multi-Agency Coordination (GeoMAC) Wildland Fire Support Maps
- Wyoming Fire Academy
- Wyoming Wildland Fire Plan Action Team
- National Park Service (NPS) Fire Management Program
- U.S. Fish and Wildlife Service (FWS) Fire Management Branch

- National Interagency Fire Center (NIFC)
- U.S. Bureau of Indian Affairs (BIA) Fire and Aviation Management – NIFC
- USDA Forest Service (USFS) Fire and Aviation Management
- Wyoming Fire Action Team (WYFAT)
- Wyoming State Fire Marshalls Office
- Wyoming Office of Homeland Security (WOHS)
- Wyoming State Forestry Division
- County and Local Fire Departments/Districts

Before discussing wildland fire hazard in Wyoming some key terms should be identified. The term “wildland/urban interface” or WUI is widely used within the wildland fire management community to describe any area where man-made buildings are constructed close to or within a boundary of natural terrain and fuel, where high potential for wildland fires exists. “Aspect” refers to the direction in which a slope faces. “Fuel” consists of combustible material, including vegetation, such as grass, leaves, ground litter, plants, shrubs, and trees that feed a fire.

Currently, the principle wildland fire response plan for the state is the Wyoming Wildland Urban Interface Hazard Assessment produced by a joint venture of the Wyoming State Forestry Division, USFS, BLM, NPS, and other interested parties, with the BLM hosting the data. This is a geographic information system (GIS)-based mapping mission building on The Front Range Redzone Project in Colorado—the first fire-hazard mapping program of its kind. The assessment maps fire hazard incorporating population density against slope, aspect, and fuels. With the mapping analysis evaluating areas of varying wildfire vulnerability, the final output will result in a Risk, Hazard, and Value (RHV) map displaying areas of concern (red zones) for catastrophic wildland fires (**Figures 17.1** and **17.2**). The Wyoming Wildland Urban Interface Hazard Assessment builds on the work of earlier hazard methodologies and provides new and updated data to further enhance accuracy and scale.

Additionally, the Mini Fire Mobilization 2010 Plan (Mini-Mobe) outlines areas of cooperation and coordination with respect to fire prevention, readiness, detection, fuels management, suppression, information sharing, communications, and reimbursement for shared resources. (**See Appendix**) The ‘Mini-Mobe’ was produced through a joint venture of the U.S. Bureau of Land Management (BLM); National Park Service, Intermountain Region; Bureau of Indian Affairs, Rocky Mountain Region (BIA); Fish and Wildlife Service, Mountain Prairie Region; U.S. Department of Agriculture, Forest Service Rocky Mountain and Intermountain Regions; and the Wyoming State Board of Land Commissioners, Office of State Lands and Investments, Wyoming State Forestry Division. The overarching purpose of the Mini-Mobe is to document agreement and commitment to fire management assistance and cooperation between federal, state and local agencies entering into the agreement.

History

As one of the most arid states in the U.S., Wyoming has experienced catastrophic fires. One of the earliest recorded such fires was in the summer of 1876 when the Sioux Indians retreated into the Big Horn Mountains, setting fire to the land, burning an estimated 500,000 acres to keep the United States Army, under the command of General Crook, from pursuing them. Today, fires of

equivalent magnitude can and have occurred. However, because of the wildland urban interface, the risk to human life and property has increased dramatically.

Wyoming, as home to Yellowstone National Park, has had a national impact on how fires are handled within the nation's forests. Scientists have been studying the role of fire in Yellowstone since the mid 20th century and they continue to discover new information. The history of fire in the park and its benefits explain why Yellowstone's managers believe fire is an essential natural force. (<http://www.yellowstone-natl-park.com/fire.htm>, accessed 1/11/2010) The fire of 1988 particularly impacted the nation's view on forest fires.

According to the Yellowstone National Park—the Total Yellowstone Fire Page web site, the 1988 fires in Yellowstone brought management changes and new opportunities for research. The 1988 fire in combination with other fires during the 2000 fire season resulted in recommendations being developed on how to reduce the impacts of fire on rural communities and ensure sufficient firefighting resources for the future. That report, now known as the "National Fire Plan", identified five key points that continue to emphasize interagency approaches.

- Firefighting: Continue to fight fires and be adequately prepared for the next year.
- Rehabilitation and Restoration: Restore landscapes and rebuild communities damaged by the wildfires of 2000.
- Hazardous Fuel Reduction: Invest in projects to reduce fire risk.
- Community Assistance: Work directly with communities to ensure adequate protection.
- Accountability: Be accountable and establish adequate oversight, coordination, program development, and monitoring for performance. (<http://www.yellowstone-natl-park.com/fire.htm>, accessed 1/11/2010)



Figure 17.4—Yellowstone Fires, 1988. Photograph courtesy of Wyoming State Archives.

Research following the 1988 Yellowstone fire has provided some lessons learned:

- Fertile soil with good-water holding capacity and dense, diverse vegetation before the fire recovered quickly.
- Grasslands returned to pre-fire appearance within a few years.
- Many of the burned forests were mature lodgepole; this species is re-colonizing most of the burned areas.
- The first seedlings of Engelmann spruce, subalpine fir, Douglas-fir, and whitebark pine have emerged.
- Aspen reproduction has increased because fire stimulated the growth of suckers from the aspen's underground root system and left behind bare mineral soil that provides good conditions for aspen seedlings.
- Some of the grasses that elk eat were more nutritious after the fire.
- Bears graze more frequently at burned than unburned sites.
- The fires have had no observable impact on the number of grizzly bears in greater Yellowstone.
- Cavity-nesting birds, such as bluebirds, had more dead trees for their nests; birds dependent on mature forests, such as boreal owls, lost habitat.
- No fire-related effects have been observed in the fish populations or the angling experience in the six rivers that have been monitored regularly since 1988.
- Vegetation growth has slowed erosion in watersheds that had erosion and mudslides after the fires, such as the Gibbon River. (<http://www.yellowstone-natl-park.com/fire.htm>, accessed 1/11/2010)

Fuel types in Wyoming's wildland/urban interface include sagebrush, juniper, ponderosa pine, lodgepole pine, Englemann spruce, Douglas fir, sub-alpine fir, aspen, and oak brush. When this vegetation is dry it acts as an excellent fuel, increasing fire hazard, especially near structures. **Table 17.1** is a chronological history of fires and the number of acres burned, highlighting both the figures for federal land, state and private lands, and their totals between January, 1960 and November, 2006.

Wyoming Government Property

Historically, from August 1985 forward, there has been one wildland fire resulting in damage to state-owned property. The single event resulted in one monitoring station being burned and represents a loss of \$1,687. If the past 25 years represents a loss record which can be expected to continue into the future, wildland fires are a minimal risk to state properties with an estimated annual loss of \$67. Given the value of properties in locations identified as subject to wildland fires, past history may represent an accurate loss estimate given established mitigation efforts or it may merely reflect historical good fortune. (Reference State Building Insurance Claims Appendix)

Homes in the Wildland Interface

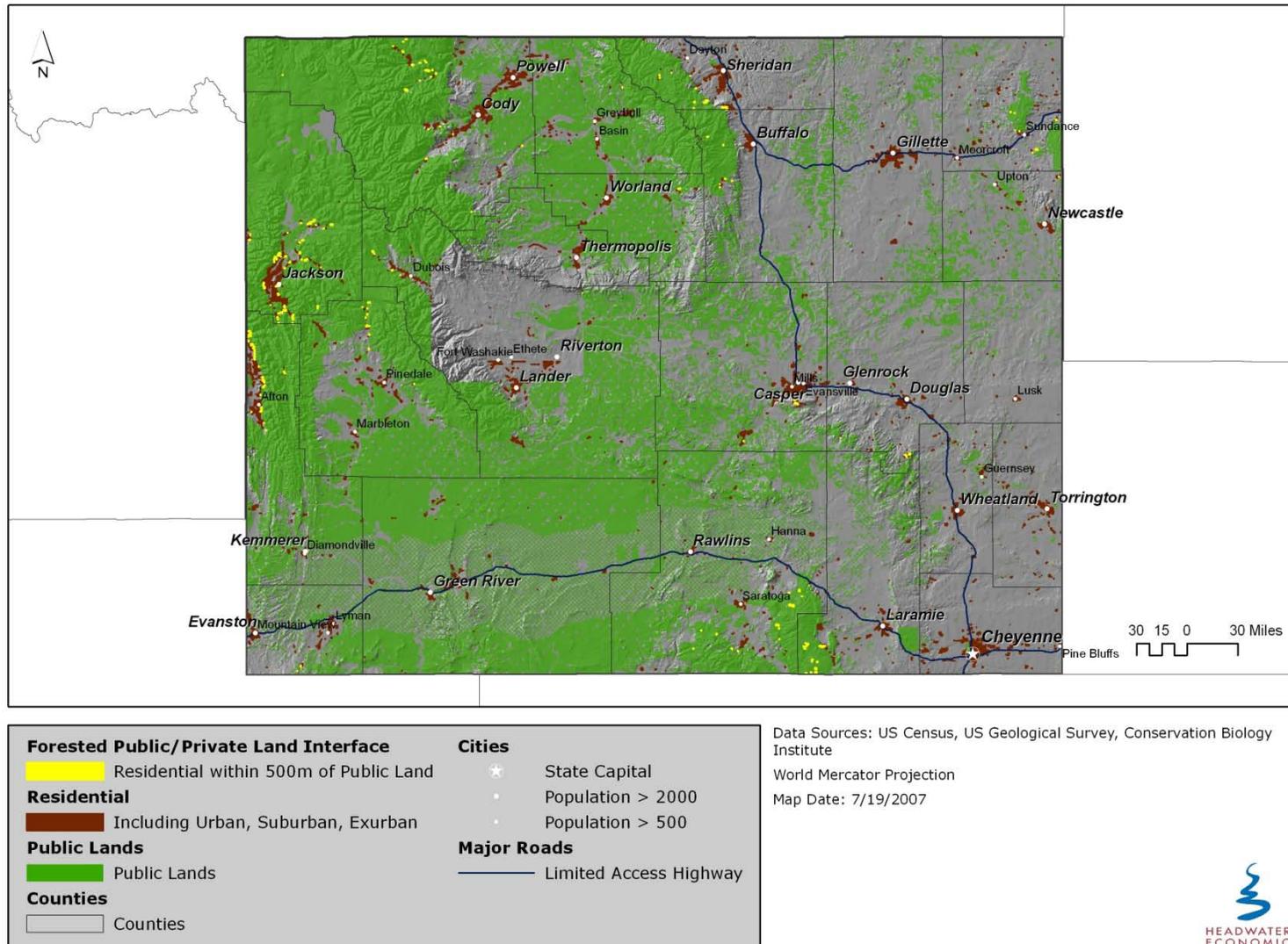


Figure 17.1 - <http://headwaterseconomics.org/pubs/wildfire/wy.php> Accessed 6/4/2011

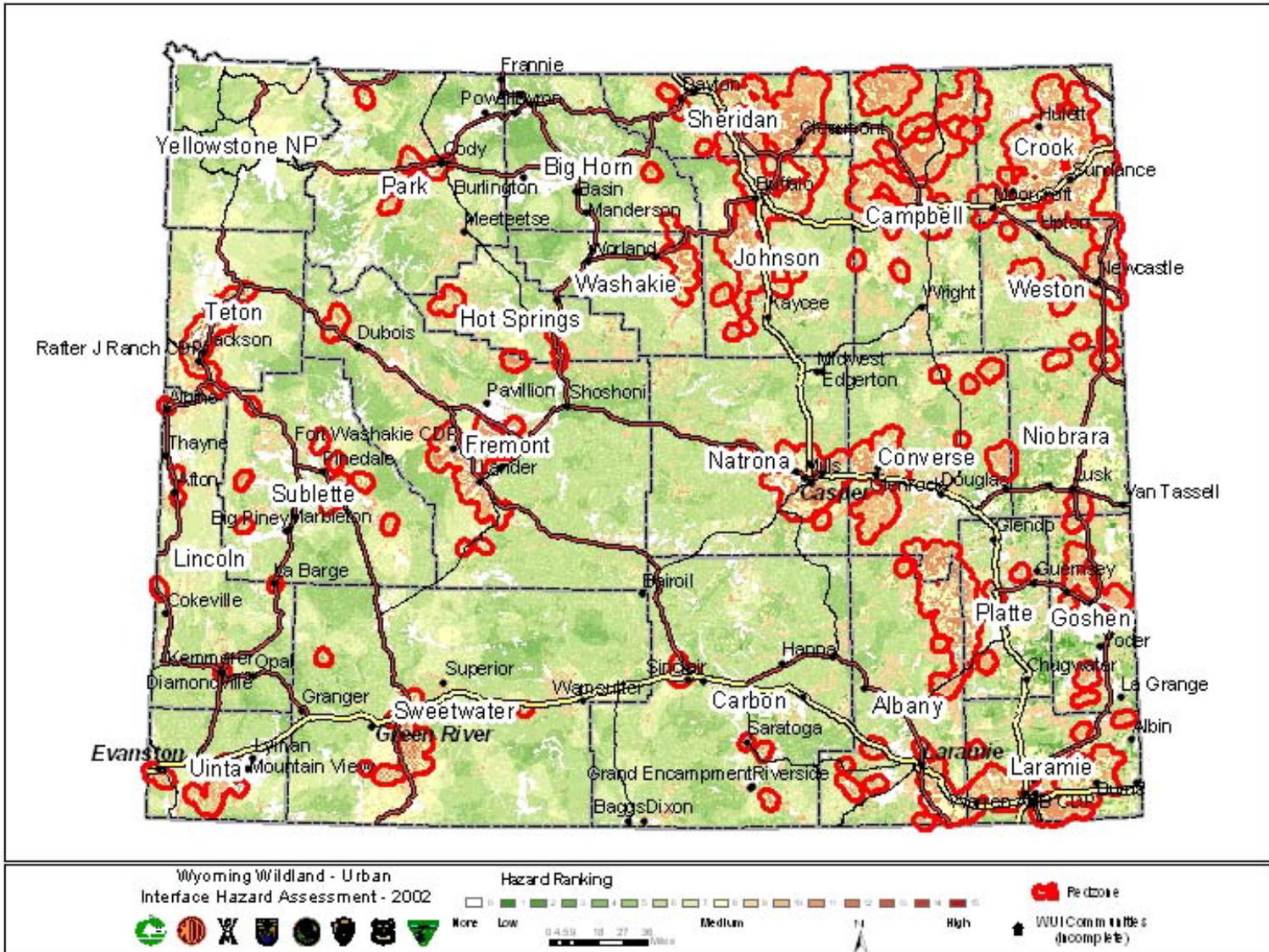


Figure 17.2—2002 Wyoming Wildland Urban Interface Hazard Assessment Red Zones

Research completed by Headwaters Economics, dated 2010 found that:

- Of the 11 western states, Wyoming has the ninth largest area of undeveloped, forested private land bordering fire-prone public lands, and ranks last (11th) among western states in the amount of forested land where homes have already been built next to public lands.
- Wyoming has over 400 square miles of forested private land that borders public lands, of which 96 percent has not yet been developed.
- Housing in Wyoming's wildland urban interface consumes a whopping 7.6 acres per person, compared to the 0.5 acres per person average on other western private lands. These are larger residential lots than in any other western state's wildland urban interface.
- Wyoming has 4,604 residences in its wildland urban interface, of which 44 percent are seasonal homes or cabins.
- Wyoming ranks eleventh (last) among western states in the number of homes built in forested areas next to public wildlands, and first in the percentage of those homes that are only seasonally occupied.

Overall, Wyoming has less developed wildland urban interface than most western states. The areas of highest existing risk from wildfire (number of square miles of the wildland urban interface with homes now) mainly occur within Park, Teton and northern Lincoln Counties. Combined, these three counties have more than 3,000 homes spread across 10 miles of wildland urban interface. Throughout Wyoming there remains potential for future home construction in more than 400 square miles of undeveloped, forested private lands adjacent to fire-prone public lands. Building homes in these high-risk areas would put lives and property in the path of wildfires. (<http://headwaterseconomics.org/pubs/wildfire/wy.php> Accessed 6/4/2011)

Top 10 Counties in Wyoming Ranked by Existing Risk

Counties are ranked by the number of square miles of developed land in the wildland interface

County and State		Developed sq. mi.	Undeveloped sq. mi.	Percent Developed	Homes	% Second Homes
Teton County	Wyoming	5.6	29.9	16.0%	2,060	23.0%
Lincoln County	Wyoming	2.9	13.5	18.0%	684	21.0%
Albany County	Wyoming	1.8	30.3	6.0%	362	88.0%
Sheridan County	Wyoming	1.7	13.9	11.0%	336	70.0%
Carbon County	Wyoming	1.5	52.2	3.0%	164	95.0%
Park County	Wyoming	1.5	28.7	5.0%	385	58.0%
Natrona County	Wyoming	0.9	8.7	9.0%	230	76.0%
Sublette County	Wyoming	0.5	16.9	3.0%	71	76.0%
Fremont County	Wyoming	0.4	23.8	1.0%	69	81.0%
Crook County	Wyoming	0.3	59.6	1.0%	54	22.0%

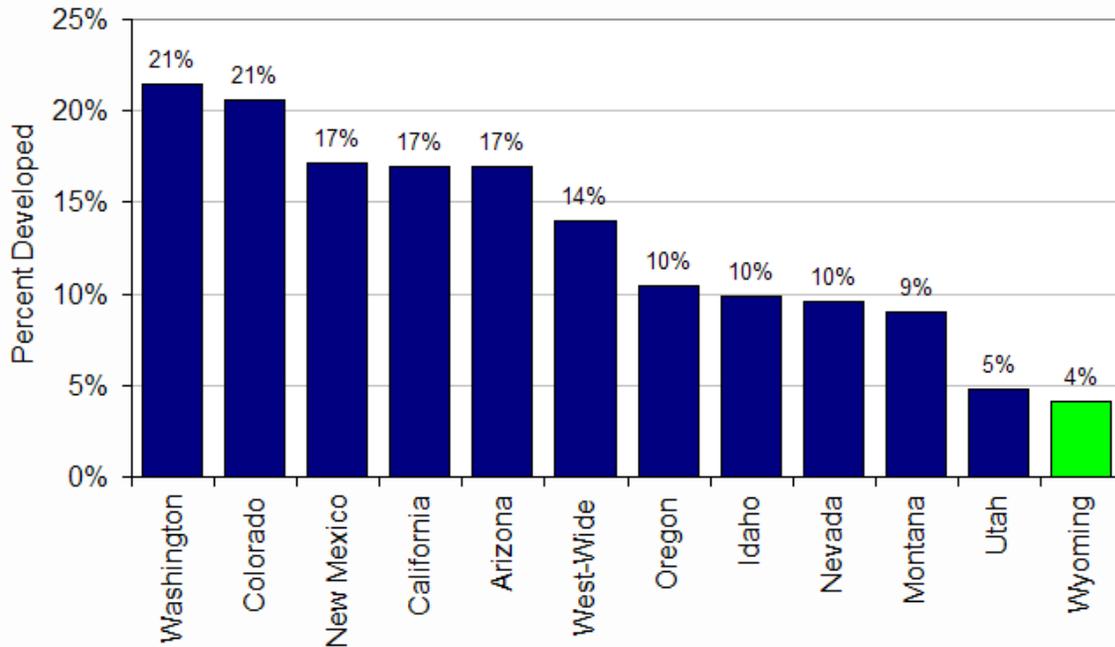
Top 10 Counties in Wyoming Ranked by Potential Risk

Counties are ranked by the number of square miles of undeveloped land in the wildland interface.

County and State		Developed sq. mi.	Undeveloped sq. mi.	Percent Developed	Homes	% Second Homes
Crook County	Wyoming	0.3	59.6	1.0%	54	22.0%
Carbon County	Wyoming	1.5	52.2	3.0%	164	95.0%
Converse County	Wyoming	0.3	34.9	1.0%	66	79.0%
Albany County	Wyoming	1.8	30.3	6.0%	362	88.0%
Teton County	Wyoming	5.6	29.9	16.0%	2,060	23.0%
Johnson County	Wyoming	0.3	28.7	1.0%	88	99.0%
Park County	Wyoming	1.5	28.7	5.0%	385	58.0%
Fremont County	Wyoming	0.4	23.8	1.0%	69	81.0%
Uinta County	Wyoming	0.0	23.8	0.0%	14	71.0%
Sublette County	Wyoming	0.5	16.9	3.0%	71	76.0%

<http://headwaterseconomics.org/pubs/wildfire/wy.php> Accessed 6/4/2011

Percent of Wildland Interface that Has Been Developed



Percent of Homes in the Wildland Interface that Are Seasonal

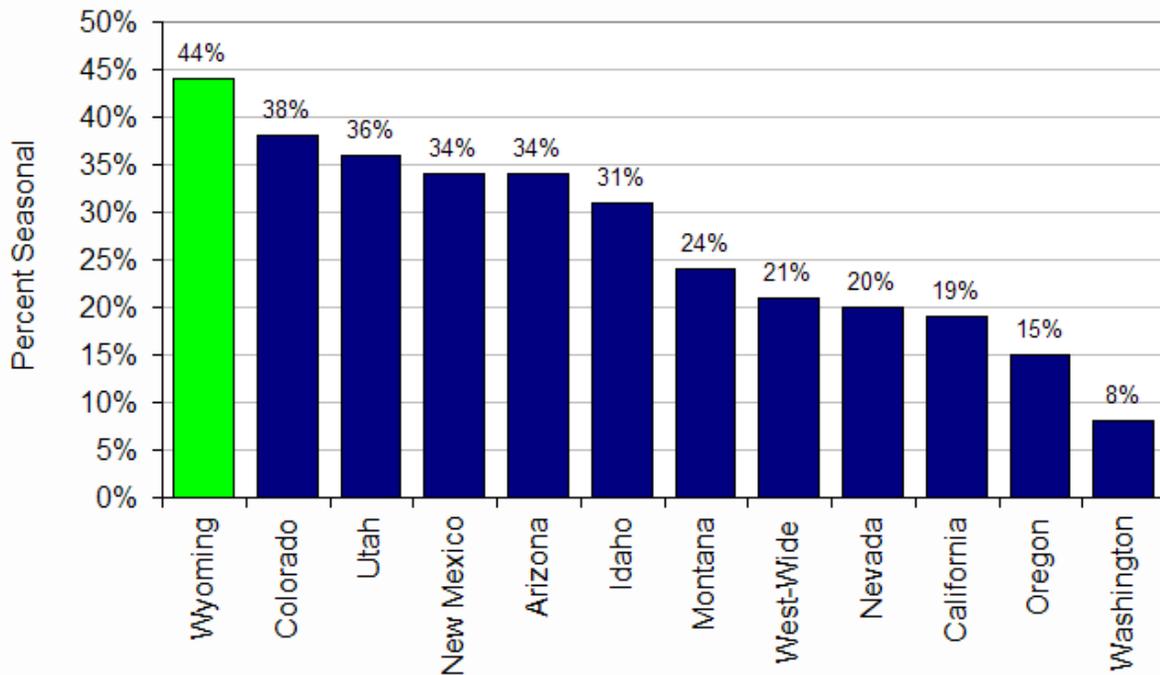


Table 17.1—Number of Wildland Fires and Acres Burned in Wyoming (1960 through 2010).

Year	Intensity type	Amount		
		Federal land	State & private land	Total
1960 ¹	Number of fires	159	39	198
	Number of acres burned	2,533	840	3,373
1961 ¹	Number of fires	147	57	204
	Number of acres burned	1,193	16	1,209
1962 ¹	Number of fires	116	20	136
	Number of acres burned	241	44	285
1963 ¹	Number of fires	141	31	172
	Number of acres burned	1,367	764	2,131
1964 ¹	Number of fires	143	24	167
	Number of acres burned	3,650	393	4,043
1965 ¹	Number of fires	68	15	83
	Number of acres burned	228	94	322
1966 ²	Number of fires	261	243	504
	Number of acres burned	2,391	4,908	7,299
1967 ²	Number of fires	35	156	291
	Number of acres burned	325	4,490	4,815
1968 ³	Number of fires	163	132	295
	Number of acres burned	2,551	12,122	14,673
1969 ³	Number of fires	231	396	627
	Number of acres burned	2,980	25,981	28,961
1970 ³	Number of fires	241	413	654
	Number of acres burned	7,984	11,378	19,362
1971 ³	Number of fires	209	433	642
	Number of acres burned	3,406	67,567	70,973
1972 ³	Number of fires	183	438	621
	Number of acres burned	1,362	24,078	25,440
1973 ³	Number of fires	200	444	644
	Number of acres burned	2,911	10,047	12,958
1974 ³	Number of fires	301	772	1,073
	Number of acres burned	5,000	27,847	32,847
1975 ³	Number of fires	205	513	718
	Number of acres burned	6,101	15,177	21,278
1976 ³	Number of fires	349	589	938
	Number of acres burned	7,019	14,795	21,814
1977 ³	Number of fires	369	612	981
	Number of acres burned	6,045	16,885	22,930
1978 ³	Number of fires	301	559	860
	Number of acres burned	3,392	5,220	9,152
1979 ³	Number of fires	366	598	964
	Number of acres burned	12,100	16,294	28,394
1980 ³	Number of fires	333	603	936
	Number of acres burned	2,426	15,665	18,091
1981 ³	Number of fires	406	677	1,083
	Number of acres burned	30,326	6,757	37,083
1982 ³	Number of fires	205	555	760
	Number of acres burned	1,779	16,026	17,805
1983 ³	Number of fires	177	734	911
	Number of acres burned	2,294	25,136	27,430
1984 ²	Number of fires	169	607	776

Table 17.1—Number of Wildland Fires and Acres Burned in Wyoming (1960 through 2010).

Year	Intensity type	Amount		
		Federal land	State & private land	Total
	Number of acres burned	658	13,305	13,963
1985 ²	Number of fires	352	1,252	1,604
	Number of acres burned	11,227	56,185	67,412
1986 ²	Number of fires	202	546	748
	Number of acres burned	6,385	15,325	21,710
1987 ²	Number of fires	201	816	1,017
	Number of acres burned	7,872	21,123	28,995
1988 ²	Number of fires	504	1,456	1,960
	Number of acres burned	1,413,175	124,127	1,537,302
1989 ²	Number of fires	278	738	1,016
	Number of acres burned	4,331	25,088	29,419
1990 ²	Number of fires	353	492	845
	Number of acres burned	2,221	31,499	33,720
1991 ⁴	Number of fires	379	836	1,215
	Number of acres burned	16,106	61,944	78,050
1992 ⁴	Number of fires	407	872	1,279
	Number of acres burned	6,750	33,727	40,477
1993 ⁴	Number of fires	163	303	466
	Number of acres burned	4,283	4,628	8,911
1994 ⁴	Number of fires	584	1,027	1,611
	Number of acres burned	44,207	58,480	102,687
1995 ⁴	Number of fires	250	597	847
	Number of acres burned	2,846	12,697	15,525
1996 ⁴	Number of fires	516	1,506	2,022
	Number of acres burned	105,687	417,310	522,997
1997 ⁴	Number of fires	171	738	909
	Number of acres burned	8,420	20,016	28,436
1998	Number of fires	112 ⁷	446 ⁶	558 ⁵
	Number of acres burned	17,569 ⁷	5,373 ⁶	22,942 ⁵
1999	Number of fires	158 ⁷	574 ⁶	732 ⁵
	Number of acres burned	37,204 ⁷	47,097 ⁶	84,301 ⁵
2000 ⁶	Number of fires	339	909	1,248
	Number of acres burned	261,967	358,697	620,664
2001	Number of fires	486 ⁷	219 ⁶	705 ⁸
	Number of acres burned	138,696 ⁷	18,414 ⁶	157,110 ⁸
2002 ⁶	Number of fires	303	815	1,118
	Number of acres burned	60,007	163,227	223,234
2003 ⁶	Number of fires	283	727	1,010
	Number of acres burned	44,797	22,888	67,685
2004	Number of fires	185	655	850
	Number of acres burned	2,665	23,909	26,574
2005	Number of fires	190	697	887
	Number of acres burned	8,695	17,104	25,799
2006	Number of fires	289	1,008	1,297
	Number of acres burned	57,893	262,151	320,044
2007	Number of fires	254	816	1070
	Number of acres burned	50,878	52,304	107,505
2008	Number of fires	211	533	744
	Number of acres burned	88,908	51,456	140,364
2009	Number of fires	248	422	670
	Number of acres burned	939	5,778	6,717
2010	Number of fires	321	541	562

Table 17.1—Number of Wildland Fires and Acres Burned in Wyoming (1960 through 2010).

Year	Intensity type	Amount		
		Federal land	State & private land	Total
(Estimate)	Number of acres burned	23,926	67,062	90,988

¹ USDA Forest Service, Annual Fire Report for the National Forests

² USDA Forest Service, Summary of Forest Fire Statistics for the US (CD from USDA FS, Washington, DC)

³ USDA Forest Service, Wildfire Statistics

⁴ USDA Forest Service, Wildland Fire Statistics

⁵ Wyoming State Forestry Division

⁶ USDA Forest Service, Rocky Mountain Area and Coordination Center 1998-2003 Annual Report Figures

⁷ Subtracted “State and Private” from “Total”

⁸ Wyoming State Fire Marshal

Impacts

When an analysis between annual precipitation rates and acreage burned is conducted, it reveals that there is a relationship between the variables. The average annual acres burned from 1960 to 2007 are 147,787.19, with a maximum acreage of 1,537,302 in 1988 and a minimum of 285 in 1962. Since 1999 Wyoming has been experiencing a significant drought yielding an average of 230,599 acres burned between 1999 and 2003—a considerable difference of 156,549 average acres from the 43-year span, 1960 to 2003—providing evidence for the precipitation/acreage burned relationship.

Figure 17.3 displays a relationship between annual precipitation and the number of acres burned from wildland fires from 1960 to 2006. It is apparent that a precipitation decrease yields an increase in acreage burned. The most dramatic example is in 1988 where a total of 1,537,302 acres were burned and 8.55 inches of precipitation fell that year. Both figures are a record high and low, respectively, between the years 1960 and 2006.

Future impacts can be determined by weather analysis and prediction with drought and precipitation, and continuing studies with this relationship can be pursued further.

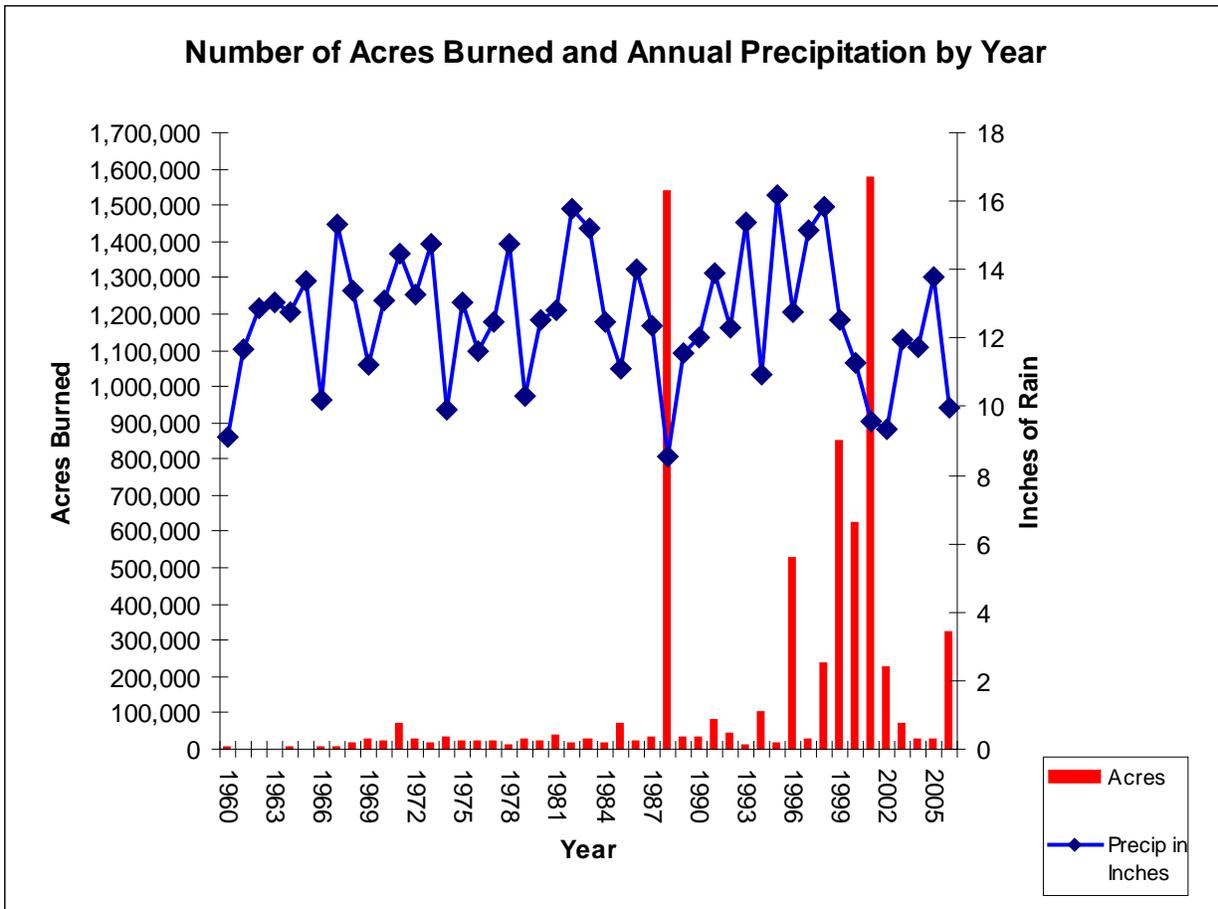


Figure 17.3—Relationship Between Annual Precipitation and Number of Wildland Acres Burned.

Building exposure value, or structures that have potential to be involved in a wildland fire, identifies the amount of potential damage to a particular county during a fire (**Table 17.2**). The total estimated damage for the entire state of Wyoming is more than \$8.5 billion. The five counties with the most potential damage are Teton, Sheridan, Laramie, Natrona, and Campbell totaling an estimated damage of over \$5.8 billion. The least potential estimated damage totaling more than \$61 million would strike the five counties of Big Horn, Niobrara, Washakie, Platte, and Hot Springs. Big Horn County would sustain a mere estimated damage of approximately \$1 million, while Teton County would suffer more than \$1.5 billion.

Table 17.2—Wildland Fire Building Exposure Values by County (USD).	
County	Amount of damage
Big Horn	1,090,772
Niobrara	4,852,748
Washakie	11,368,310
Platte	18,264,504
Hot Springs	25,587,017
Goshen	37,962,569
Carbon	83,931,249
Sublette	95,442,304
Uinta	105,943,675
Converse	132,529,212
Lincoln	171,746,619
Crook	184,102,247
Park	194,432,223
Albany	261,395,171
Sweetwater	279,772,342
Weston	311,602,160
Fremont	322,353,040
Johnson	451,817,404
Campbell	741,143,167
Natrona	894,951,685
Laramie	1,107,754,091
Sheridan	1,544,049,533
Teton	1,546,011,448
TOTAL	\$8,528,103,488

Local Mitigation Plan Risk Assessments

A review of the local plans reflects all counties consider wildland fire to be a hazard within their borders, as they each address the hazard within their local plan. Those counties addressing the issue of wildland fire utilize data available to them through the State Multi-Hazard Mitigation Plan. Several counties have developed firewise communities within their borders, making mitigation efforts and fire prevention education a priority. This is particularly true of those counties within the mountain ranges of Wyoming. Counties addressing wildland fire have ranked wildland fire risks within their borders based on the population impacted, probability of occurrence within their borders and the property impacted.

Below is a table outlining information mined from the local plans' wildland fire hazard sections. The table shows previous historical incidents of wildland fire within each county's borders as outlined in their plans and extrapolates, based on population impacted, probability of occurrence within their borders, and property impacted, the risk perceived by each county relative to wildland fire hazards. You will note all counties with mitigation plans consider the hazard to rank from medium-high to high within their borders. Most do not state a specific number of incident occurrences but recognize there are multiple events each year, and reflect significant potential damage as a result of wildland fire.

**Wildland Fire
Information Mined from Local Plans**

COUNTY	Plan Y/N	Year Approved	Included in Plan	Rank-High, Medium, Low	Loss Potential	Previous Incident(s)
ALBANY	Y	2010	Y	High	By Statewide Census Block	Multiple/yr
BIG HORN	Approvable	2010	Y	Medium-High	\$1.09 million	Multiple-6 major
CAMPBELL	Expired	2005	Y	Medium	\$741 million	Incomplete-Multiple/yr
CARBON	Y	2008	Y	Medium-High	\$84 million quoted from State Plan	Multiple/yr
CONVERSE	N/Draft	2005			Incomplete Information	
CROOK	N/Draft	2003	Y		State-level Info from State Plan	
FREMONT	Expired	2005	Y	Medium-High	\$320 million quoted from State Plan	Multiple/yr
GOSHEN	Y	2007	Y	High	\$37.6 million	Multiple/yr
HOT SPRINGS	N					
JOHNSON	Y	2008	Y	High	Historical-\$900,000/event	Multiple/yr
LARAMIE	Expired	2005	Y		Incomplete Information	
LINCOLN	Y	2006	Y	High	\$170 million	6
NATRONA	Approvable	2010	Y	Medium	\$42.2 million	Multiple/yr
NIOBRARA	Y	2009	Y	High	\$4.85 million quoted from State Plan	Multiple/yr
PARK	Y	2006	Y	High	\$194 million	Multiple/yr
PLATTE	Expired	2004	Y	Medium-High	Not Stated	Not Stated
SHERIDAN	Y	2009	Y	High	\$389 million	Multiple/yr
SUBLETTE	Y	2008	Y	High	\$94.5 million	Annually
SWEETWATER	N					
TETON	Y	2009	Y	High	\$1,537.84 million	Multiple/yr
UINTA	N/Draft	2011	Y		\$105 million	Multiple/yr
WASHAKIE	Expired	2005	Y	High	\$11.3 million	Multiple/yr
WESTON	N					
NORTHERN ARAPAHO TRIBE	N					
EASTERN SHOSHONE TRIBE	N					

Proposed State Mitigation Projects

The following mitigation projects have been proposed by state, federal, and local entities in the process of generating the Wyoming Multi-Hazard Mitigation Plan. Chapter 22 has all proposed mitigation projects.

- Increase number of firewise communities in state.
- Air quality impact studies on Wyoming livestock.
- Develop plans for livestock evacuation and food supplies in the event of wildland fires.
- Study of predator populations and impact of wildland fires.
- Planning study determining the location and extent of electrical arching related to overhead power and communication lines.
- Increased weed control along railroad lines.
- Generate information on adopting guidelines and ordinances related to wildland fire.
- Education, to include construction material alternatives.
- Fuel Load Reduction.
- Work with CoCoRAHS weather spotters to report wildland fires.
- Revegetate burned areas to minimize soil erosion or landslide formation.
- Provide all-hazards weather radios to all residences in Wyoming.
- Identify and inspect shelters in hazard prone areas.
- Research feasibility and costs of adding new frontage roads /detour routes to I-80, I-90, and I-25 to prevent significant delay in traffic flow and resultant economic loss and possible loss of life.

- Provide hazards info to shelters, emergency facilities in public buildings, campgrounds, and phone books.
- Provide emergency phones at strategic locations with direct lines to emergency dispatch services.
- Develop reseeding plans for losses due to all hazard events.
- GIS training for local jurisdictions with emphasis on hazards recognition and analysis for application to mitigation planning.
- Investigate opportunities for developing or improving warning systems as a means to reduce loss of life, damage to property, and economic losses.
- Education programs encompassing multi-hazard insurance for business, resident and government application.
- Education programs encompassing multi-hazard mitigation for business, resident and government application.
- Planning studies regarding transportation of essential and/or key personnel during all hazard events.
- Continue outreach to counties on identifying cost effective and feasible mitigation projects.
- Promote Continuity of Operations and Continuity of Government, statewide.
- Maintain and continue to expand hazards databases that were generated for the State Hazard Mitigation Plan. Seek new sources of information.
- Identify, document, and advertise all volunteer agency's locations and contact information.

Ongoing Mitigation Projects

Mitigation of wildland fire hazard in Wyoming has been undertaken through various efforts of technology, public education and awareness, and projects to reduce or eliminate fuels. The Wyoming Wildland Urban Interface Hazard Assessment is the primary statewide mapping project to determine areas of wildfire-prone areas. Apart from statewide ventures, individual communities and counties are also working to protect their areas from severe fires through the Firewise Program with assistance of the Wyoming State Forestry Division and the National Fire Plan.

Because of the importance of Wyoming Wildland Urban Interface Hazard Assessment and the GIS platform on which it is built, a segment of this report will discuss its use in wildfire management. **Figure 17.1** is the base map that identifies areas of wildland fire hazard ranking. **Figure 17.2** highlights the red zones, verifying that they are concentrated in areas of increased population.

Wildfire Mitigation Approaches

1. **Technology**

- GIS: mapping the WUI.
- Up-to-date fire suppression equipment.

2. **Public Education**

- State/county Firewise programs.
- State/county workshops
- USDA Forest Service and National Park Service publications and websites.

3. **Projects**

- Fuel reduction in the WUI.
- Restricting structures from being built in wildfire-prone areas.
- Increasing awareness of Firewise rural home and business landscaping.
- Prescribed fire.

GIS is a tool used to compare, capture, input, output, store, manipulate, analyze, model, and display spatial data. In the case of the Wildland Urban Interface Hazard Assessment, wildfire hazard vulnerability is determined by comparing values such as slope, vegetation, housing density, and aspect. The following is from the *Wyoming Wildland Urban Interface Hazard Assessment Methodology*—a report written by the Wyoming State Forestry Division:

The Wildland Urban Interface Hazard Assessment uses three main layers to determine fire danger—Risk, Hazard, and Values. The following lists include the data used to create each of the three layers.

1. Risk – Probability of ignition
 - a. Lightning strike density
 - b. Road density
 - c. Historic fire density
2. Hazard – Vegetative and topological features affecting intensity and rate of spread
 - a. Slope
 - b. Aspect
 - c. Fuels – interpreted from GAP vegetation information.
3. Values – Natural or man-made components of the ecosystem on which a value can be placed.
 - a. Housing density – life and property
4. Non-flammable areas mask – a mask was created to aid in the analysis for areas that will not carry fire such as water and rock areas. These areas show in the final assessment as a zero value for hazard.

The statewide Wildland Urban Interface Hazard Assessment and its resultant outputs serve two primary purposes: assisting in prioritizing and planning mitigation projects and creating a communications tool to which agencies can relate to common information and data.

Firewise is an educational project developed by the National Wildland/Urban Interface Fire Program, sponsored by the National Wildfire Coordinating Group (NWCG), and directed by the NWCG's Wildland/Urban Interface Working Team to assist communities in wildfire-prone areas with awareness and project development to mitigate wildland fire hazard.

In Wyoming, three areas have been recognized as Firewise communities by the Firewise Program, but more are applying for this status. There are 36 states that have a total of 288 recognized communities, placing Wyoming at an approximate average with its three communities. Currently, Homestead Park in Fremont County, Story in Sheridan County and Union Pass in Sublette County have been recognized. Other potential Firewise communities according to the Wyoming Wildfire Mitigation Coordinator, James Webster, include Star Valley Ranch in Lincoln County, Casper Mountain in Natrona County, and Canyon Creek in Washakie County.

The State of Wyoming Forestry Division has established a website called Firewise Wyoming <http://www.firewisewyoming.com> that includes wildfire mitigation measures for homeowners residing in forested areas as well as useful links to associated organizations involved in wildland fire management.

Webster stated that mitigation projects are primarily funded by the National Fire Plan, and emphasize fuel reduction in wildland/urban interface areas. This is accomplished through means of mechanical removal of dead forest litter and thinning of trees. Ironically, as the Fremont County Firewise Website mentioned, fire suppression for the last 100 years has led to a buildup of forest litter increasing the fuel load for potential fires.

The Wyoming State & Private Forestry Fact Sheet outlines investments made in wildfire mitigation in fiscal year 2008. Investments include nearly \$2.5 million divided between the State Fire Assistance program, State Fire Assistance-National Fire Plan, Urban and Community Forestry, Volunteer Fire Assistance and Volunteer Fire Assistance-National Fire Plan. Three hundred fifty-six (356) state fire communities were assisted.

The 2009 Wyoming State Forestry Division's Annual Report outlined the following facts related to fuels mitigation in the state:

- Seven county-wide National Fire Plan (NFP) Projects were funded in 2009 for a total of \$600,880 for program implementation and cost share to land owners.
- \$950,000 was invested in Community Assistance Funding for fuel breaks in 5 counties
- Twenty-one county-wide Community Wildfire Protection Plans (CWPP) were completed, covering 91% of the communities identifies as being at risk to wildland fire
- 200 homeowners completed Defensible Space areas around their homes covering 300+ acres, with an additional 75 homeowners signed up for defensible space projects around their homes covering 100+ acres.
- Over 10,000 homeowners contacted with informational materials on Defensible Space and Firewise construction and landscaping practices
- Over 3 miles of fuel breaks have been developed in key areas
- Firewise/Defensible space workshops were held in multiple locations across the state

Additionally, the 2009 Annual Report indicates county volunteer firemen were trained on fire truck maintenance, approximately \$336,000 was invested in parts for fire trucks around the state, 36 fire trucks were mechanically repaired, and 4 fire trucks were constructed for the counties.

Wyoming continues to be proactive and strategic in addressing wildfire mitigation projects. The Preservation and Enhancement Fund, state legislative funding utilized for fuels mitigation and road maintenance projects in a competitive process, has expended, on average, \$99,000 annually over the past six (6) years for mitigation throughout the state.

Wyoming, as part of the Council of Western State Foresters and the Western Forestry Leadership Coalition is developing a wildfire risk assessment for 17 western states, including Wyoming. The assessment is known as the "West Wide Wildfire Risk Assessment." The GIS-based project will enable focused wildfire mitigation efforts.

Mitigation activities are also undertaken as a part of the Wyoming Statewide Forest Resource Strategy. The Statewide Forest Resource Strategy targets the preservation and enhancement of the economic value inherent to forests. A portion of their strategy is mitigation of wildfire through fuel reduction by coordinating defensible space and fuel break projects for maximum

effect and resource benefit. Other strategies they have undertaken is the creation, completion and updating of Community Wildfire Protection Plans (CWPP), expanding local capabilities and community programs, increasing public wildfire prevention awareness through public service announcements and other non-traditional media outlets, and re-engaging the insurance industry.

In nature, fires occur regularly assisting in removing dead material in forested areas, allowing for new growth and rejuvenation of healthy old growth. For example pyrophytic cones require high temperatures to open and reseed (**Figure 17.5**). Unfortunately, fires cannot be allowed to burn naturally because of its encroachment on humans and their property. Therefore, forest litter must be removed through artificial methods.

Such projects to mitigate wildfire hazard, specifically fuel removal and tree thinning, are occurring in 17 Wyoming counties (all except Big Horn, Sweetwater, Carbon, Campbell, Niobrara, and Goshen). Wildland fire hazard is a more significant concern in forested areas than in the prairie because of the greater amounts of fuel. Consequently, counties where the majority of land is forest are more susceptible and require greater attention. In addition to decreasing fuel load, fire management organizations are increasing the awareness of forest home fire safety. This includes creating wildfire defensible zones and fire-resistant landscaping.



Figure 17.5—Riverton, Wyoming. Photo by Todd Heitkamp, Acting Meteorologist-in-Charge. Photograph courtesy of National Oceanic and Atmospheric Administration.