

# Updated Document

October 2013

## 5.5. Wildland Urban Interface

This Wildland Urban Interface or WUI poses tremendous risks to life, property and infrastructure in associated communities and is one of the most dangerous and complicated situations faced by firefighters. It is estimated that as many as 38% of new home construction in the western U.S. is adjacent to or intermixed with the WUI. (U.S. Fire Administration, 2002). WUI fires pose great challenges to fire fighters primarily because access to homes and availability of water are often limited in the WUI. Fire prevention programs such as fuel reduction initiatives and home assessment in WUI areas are extremely important. Homeowners must accept a measure of responsibility and be fully aware of the risks when deciding to locate in such an environment.

### 5.5.1 WUI Definition

In 2001, the Federal Register (Vol. 66, No. 3) defined the WUI community as any place “*where humans and their development meet or intermix with wildland fuel.*” The Federal Register goes on to describe three community categories:

*Interface Community:* where structures directly abut with Wildland Fuels (3 or more structure per acre);

*Intermix Community:* where structures are scattered throughout a wildland area (1 or more structures per 40 acres);

*Occluded Community:* where structures abut an island of wildland fuels (often in a city, e.g. park or open space).

The WUI situation in Carbon County most closely resembles the Intermix Community category although most areas have a structure density less than one per 40 acres. Despite the low density, fire managers are still concerned about these areas because of public and firefighter safety and because of the unique fire suppression tactics that must be deployed.

In 2001, six communities were identified as “urban wildland interface communities within the vicinity of federal lands that are at high risk from wildfire” (United States of America, 2001). These communities were Belfry, Bridger, Edgar, Joliet, Red Lodge and Roberts. Pursuant to direction from Congress, the lists submitted by States and Tribes have been annotated by the Secretaries to identify communities around which hazardous fuel reduction treatments on Federal lands are ongoing or were planned to begin in fiscal year 2001.

### 5.5.2 Mapping the WUI

The Federal Register also provided some criteria to consider when delineating WUI:

- Fire behavior potential situations
  - Crown fire or high intensity surface fire potential
  - Potential of torching and spotting
  - No large fire history or low fire occurrence

- Values at risk situations
  - High density of structures with lack of defensible space
  - Scattered areas of high density homes less than one mile apart
- Infrastructure situations
  - Access, water availability and fire fighting capability is absent or minimal
  - Access, water availability and fire fighting capability is limited but present
  - Access, water availability and fire fighting capability is adequate and maintained

Using the criteria and “communities at risk” identified in the Federal Register, the US Forest Service (USFS) created a regional WUI map for use at broad levels of analysis and planning as shown in Figure 5-7 (USDA Forest Service, Northern Region, Fire Aviation and Air & Engineering, 2004).

In evaluating the WUI layer developed by the USFS, it was quickly determined that a more detailed map was needed for local planning and project level use. For this reason, a new County-wide WUI map was developed as part of this CWPP.

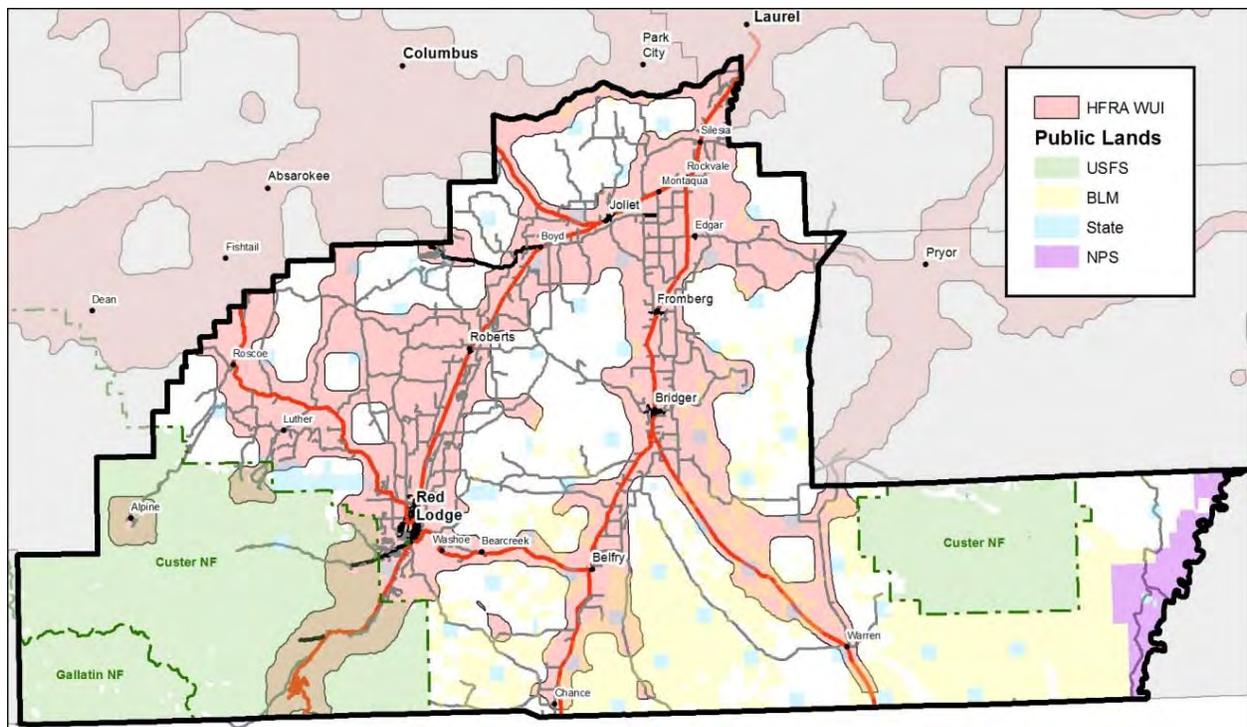


Figure 5-7. Map of Carbon County map showing a modeled version of the Healthy Forest Restoration Act (HFRA) WUI

### 5.5.3 Methodology

At the time of this writing, no accepted or standardized methodology was in place for mapping the WUI at the County level. For this reason, the County, with assistance from Red Lodge Fire Rescue, developed a simple, yet defensible method for mapping the WUI outside the National

Forest. The methodology was used to map the WUI and combined with an existing WUI layer developed by the Custer National Forest to produce a county-wide WUI map.

### ***Custer National Forest Approach to Mapping WUI***

The Custer National Forest (CNF) developed a WUI map for the forest in 2011. This approach focused mostly on human occupancy within the Forest and egress along major transportation corridors. To capture these areas within the WUI, the CNF applied a 1.5 mile buffer on the interior of the Forest boundary in combination with a 0.75 mile buffer around major roads entering the Forest (Stockwell, 2012). The resulting WUI designation can be seen in Figure 5-8.

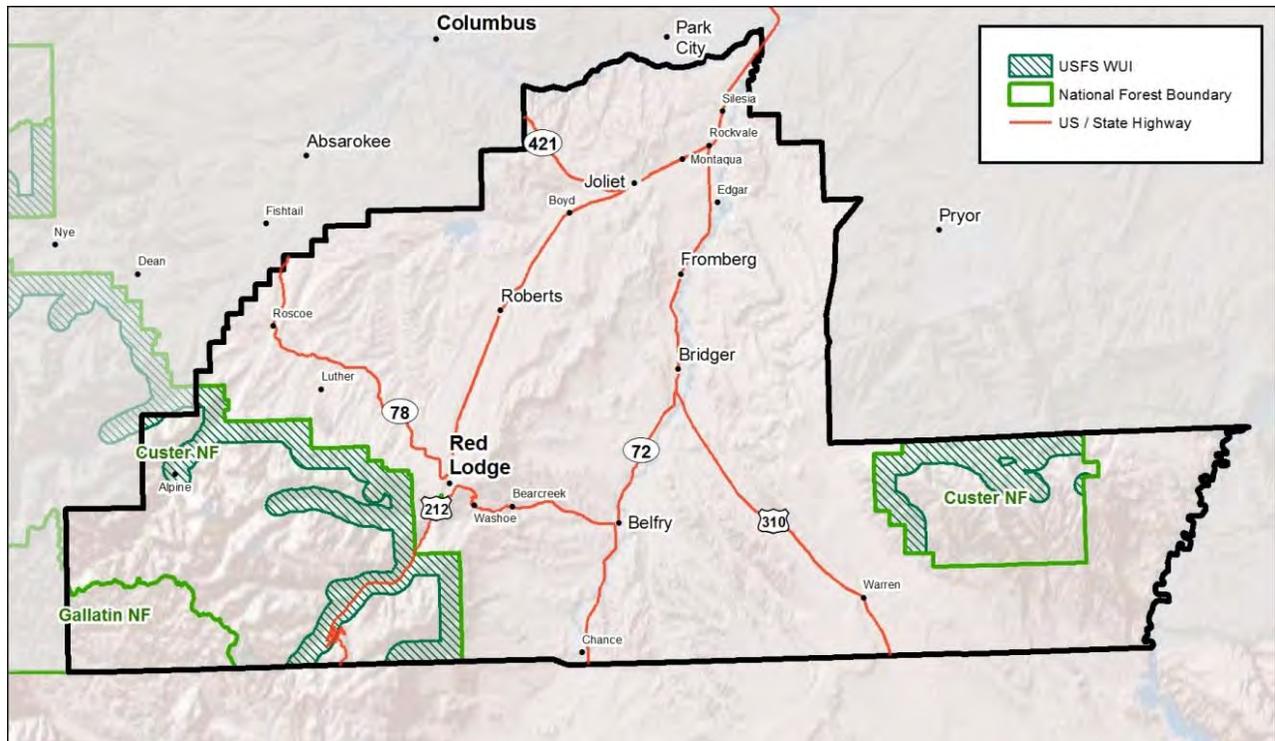


Figure 5-8. Map of Carbon County showing US Forest Service Designated WUI.

### ***County Approach to Mapping WUI***

The County approach examined moderate to heavy wildland fuels, potential for fire brands and proximity to existing structures. The specific steps in the process are outlined below.

**Step 1 - Identify and map concentrated fuels.** Research conducted by [Jack Cohen](#) and others have shown that fire is transferred to structures through two primary avenues: direct impingement (conduction) and through fire brands. When delineating the WUI for the County, these two concerns were addressed.

Direct impingement occurs when fires in heavier fuels are located close to structures. A GIS layer of Anderson fuel types (Anderson, 1982) was used to identify heavy fuels types in the County. The following four Anderson fuel types were extracted from the GIS and used when mapping wildland fuels:

### Timber (litter and understory) – Type 10

The fires burn in the surface and ground fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3-inch (7.6-cm) or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel



situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect- or disease-ridden stands, windthrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash.

### Hardwood litter – Type 9

Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing eaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines, or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.



### Closed timber litter – Type 8

Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir, and larch.



Timber (grass and understory) – Type 2

Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead/down stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands and pine stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands. Some pinyon-juniper may be in this model.



Because the Anderson fuel types were originally mapped using satellite-based, Thematic Mapper imagery and formatted as a raster GIS layer, the conversion to vector-based polygons was necessary to group distinct concentrations of these fuels and project fire brands (see Step 2). Polygons were digitized using a “heads-up”, on-screen approach, in combination with ancillary GIS layers and local field knowledge. Ancillary GIS layers included LandFire Fuel loading model (USDI - US Geologic Survey, 2008), Gap Analysis land cover and 2011 National Agriculture Imagery Program (NAIP).

**Step 2. Identify and map fire brand zones.** Several sources recommend a 1.5 mile buffer from the fuel load which is an estimate of how far an average fire brand can travel through air (108th Congress of the United States of America, 2003) (California Fire Alliance, 2001) (Stewart, 2007). While fuels within the “fire brand” area may be limited, it only takes one well placed fire brand to ignite a structure. Heavier fuels necessitated the full 1.5 mile buffer while less dense or scattered fuels required less of a fire brand distance (Table 5-3).

**Table 5-3. Fire brand buffer distances for the Anderson fuel types used in the Carbon County WUI map.**

<b>Anderson Fuel Type</b>	<b>Buffer Distance</b>
Timber (litter and understory), Closed timber litter, Hardwood litter	1.5 Miles
Timber (grass and understory) where fuel was correctly classified as Ponderosa Pine/grass or Juniper woodland/grass	1.0 Miles
Timber (grass and understory) where fuel was incorrectly classified as Timber/grass. Ancillary sources and local knowledge confirmed these areas as dense sagebrush steppe.	0.5 Miles

Figure 5-9 shows the four Anderson fuel types, the digitized fuel boundaries and the variable buffers around these boundaries based on the buffer distances defined in Table 5-3.

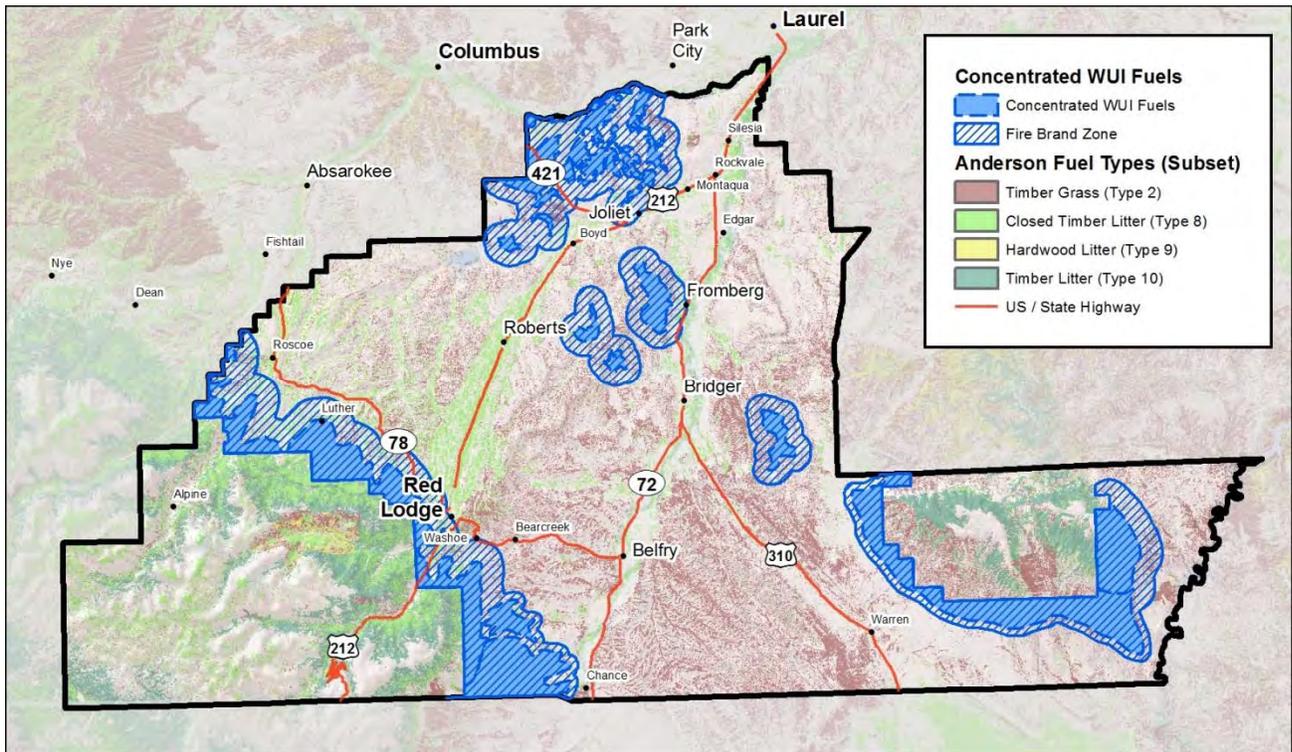


Figure 5-9. Map of Carbon County showing a subset of Anderson fuel types, digitized boundaries of concentrated fuels and fire-brand buffers.

**Step 3 - Identify and map human development concentrations.** As defined in the Montana annotated code, the WUI is the “line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.”

Given this definition, the next step in the creation of the WUI map was to identify concentrations of human development in the County. Addressed structures were previously mapped by the County (Carbon County Disaster Emergency Services (DES), 2012) and was used as the base layer for this analysis. Specifically, the GIS created a structure density map based on a 0.5 mile radius for every location in the County. The result was a map that could be classified into three categories of human development: 1-5 structures/sqmi., 5-25 structures/sqmi. and >25 structures/sqmi. Figure 5-10 shows the density of structures throughout the County using these categories.

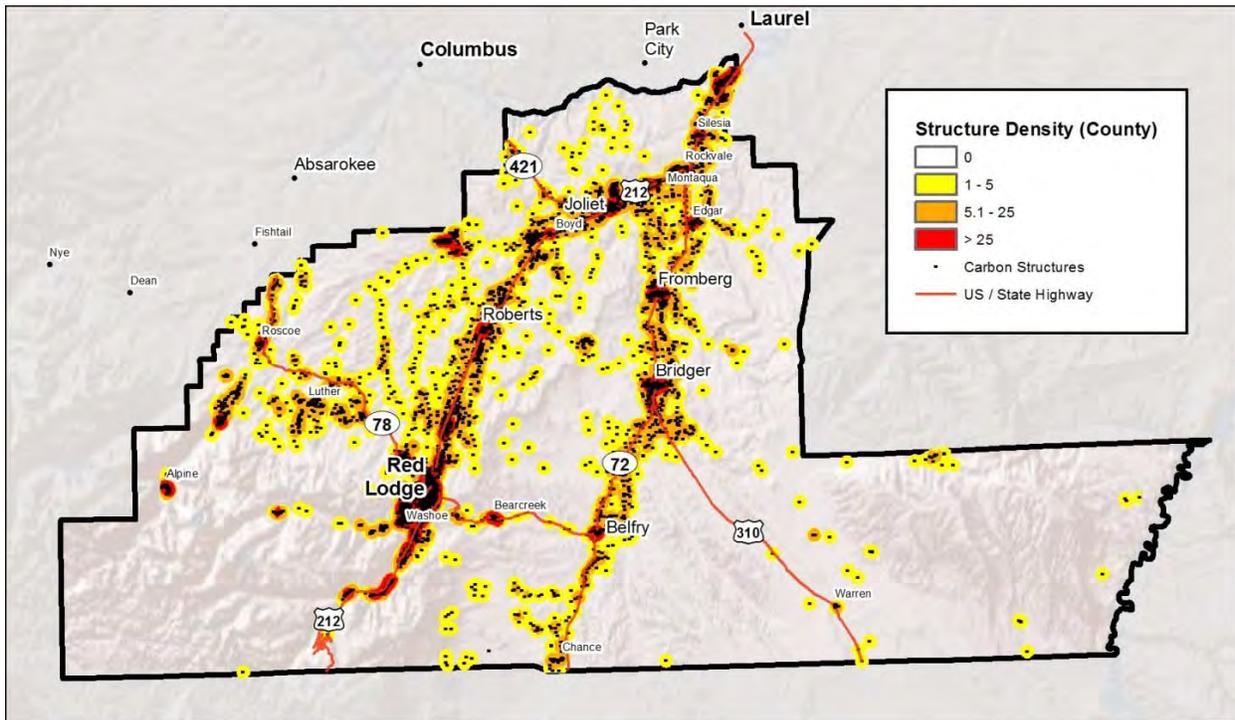


Figure 5-10. Map of Carbon County showing structure density.

**Step 4 - Combine County and USFS WUI models.** The final County WUI map, Figure 5-11, was developed by combining the wildland fuels map (with fire brand buffers), the structure density map and the existing WUI map developed by the US Forest Service. WUI categories of High, Medium and Low portrayed on the map represent the same categories used for structure density; 1-5 structures/sqmi. (Low), 5-25 structures/sqmi. (Medium) and >25 structures/sqmi. (High).

This methodology resulted in only 268 square miles (13%) of the County being classified as WUI. However, 2,552 structures (37%) were located in the WUI. Sixty-six residential subdivisions are completely within or intersect the WUI (Table 5-4).

Table 5-4. Residential subdivisions within the Wildland Urban Interface.

400 Ranch	Grand View North	Mountainbrook	Rocky Fork Acres
Aspen Hollow	Grand View South	Nordic Estates	Rolling Hills
Aspen Ridge Ranch	Grill	North Twenty Estates	Rosebud Ranch
Beartooth Business Park	Grizzly Peak	Owen	Salo Homesites
Beartooth Mountain Estates	Harnish Meadows	Palisades Basin Ranches	Sandhill Springs
Beartrap Estates	Kane	Palisades Properties	Sheep Mountain
Berg N Dahl	Lamb Estates	Point of Rocks	Spires
Black Butte Ranch	Lazy D Ranch	Ponderosa Estates	Sun Ridge
Canyon Ranches	Lazy SL Ranches	Raymond	Sundance
Canyon View	Little Willow Creek Prop.	Remington Ranch	Tipi Village
Cedar Creek	Meadowood	Remington Ranch West	Wadsworth Cabin Sites
Cottonwood Coulee	Meeteetse Meadows	Rimrock View	Wapiti
Creek Hill	Mountain Meadows	RLCCE	Waples
Creekside Estates	Mountain Shadow	RnR Elk Resort	Waples/Red Lodge Estates
Eagle Point	Mountain View	Rock Creek Estates	West Fork Estates
Gramling Orchard	Mountain Waters	Rock Creek Mine	Wilderness Estates

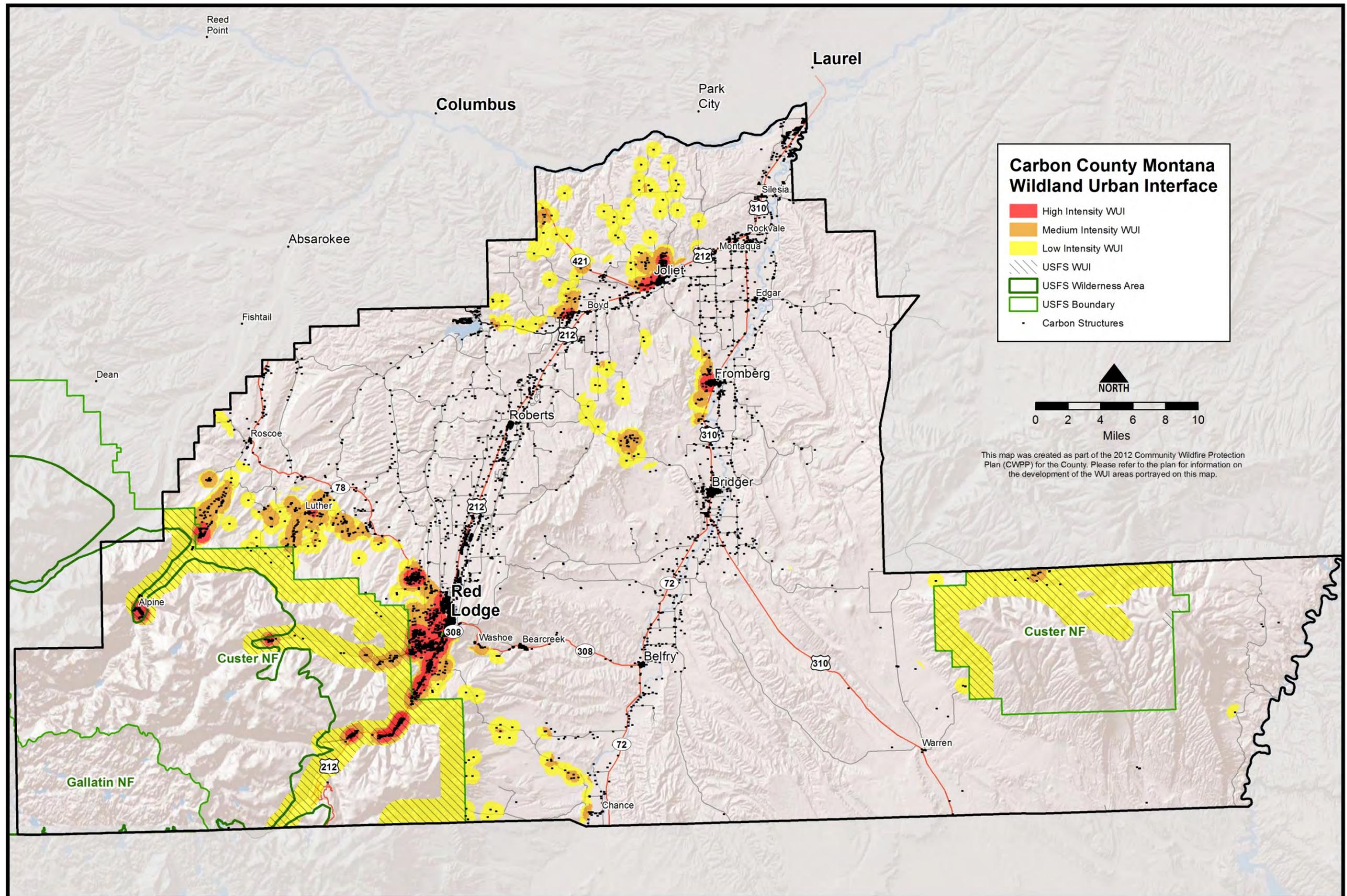


Figure 5-11. Map of Carbon County showing the Wildland Urban Interface (WUI).

In addition to these subdivisions there are five of summer home areas, three recreational camps, and one research facility located within the forest boundary, permitted by the US Forest Service.

The summer home areas in the West Fork drainage include 21 cabins in Camp Senia, 3 cabins in Dutch Creek and 4 other scattered cabins in the West Fork drainage. The permitted summer home areas in the Main Canyon include Spring Creek with 22 cabins, Corral Creek with 9 cabins, Sheep and Snow Creek with 30 cabins.

Recreational camps include the Timbercrest Girl Scout Camp, Westminster Spires Camp and the Lions Beartooth Mountain Youth Camp. Timbercrest is located in the West Fork drainage, with an estimated 34 structures, mostly small cabins. The camp is located in the lower Dutch Creek drainage along West Fork Road. Westminster Spires Camp is located in the Main Fork and has 13 structures. The Lions Camp is located near the confluence of the Lake/Main Fork of Rock Creek and has approximately 22 structures.

The Yellowstone Bighorn Research Association (YBRA) camp is situated high up on the east slope of the Main Canyon of Rock Creek approximately five miles south of Red Lodge. The camp has a large number of wooden structures, is located in the timber, and is difficult to access. The camp is occupied around the clock during the fire season with staff and students. One steep dead-end road serves the camp. The staff is active in practicing fire prevention and response and has some water for fire protection stored on site. Fuels reduction around the YBRA facility was completed in 2011 by Red Lodge Fire Rescue with funding from the BLM.

Recreation Staff Officer for the Beartooth District, Jeff Gildehaus, estimates that approximately 30% of these structures have wooden shake roofs. The remaining 70% have roofs of either metal or composition shingle. The structures themselves are all built of wood. Some also have stone features such as chimneys. In all but a few cases, defensible space has not been created around these structures.

In addition to the summer homes and the homes located within subdivisions, there are a number of individual homes located in the Main Canyon and near the base of the West Fork of Rock Creek. In the Main Canyon most of the homes are situated either along the creek bottom or on the first terrace above the creek.



**Figure 5-12. Picture of Home situated in the bottom of the West Fork of Rock Creek drainage.**

Several homes in the Main Canyon, however, are located on the steep side slopes of the canyon. Access is difficult due to road grades and fuels are a mixture of grass and scattered pine. Upslope from these homes are heavier fuels and even steeper terrain with no vehicle access. There are no water sources at these homes for fire protection other than the domestic wells which in some cases yield very small amounts of water.

Other subdivisions located just outside of the WUI, but still having wildland fire concerns is Sam's Retreat and Mountain View subdivisions on the north side of Cooney Reservoir. Combined, these subdivisions have 62 homes/cabins/trailers present. Access to the subdivisions is limited by steep, narrow roads and flashy fuels surround the subdivisions.

## **5.6. Assessment of Risk**

### **5.6.1 Ignition Profile**

Nine ignition sources for wildland fire were identified by the members of the Carbon County Fire Council on October 21, 2004. These sources include: lightning; highways and roads; railroads; power lines; equipment and industrial activity, recreational activity, rural residents, escaped controlled burns, and other sources. Fire Council members mapped common ignition sources and locations based upon their experience during the Fire Council meeting held on January 20, 2005. Map locations were identified based upon the criteria of four or more starts at or near the location over a 10-year period.

In general, relatively higher numbers of lightning starts occurred in the Pryor Mountains and the higher mountainous country south and west of Red Lodge. Human-caused ignitions occurred along roadways and near rural residences. Power line ignitions occurred where the lines were exposed to high winds, for instance between Red Lodge and Belfry. Railroad