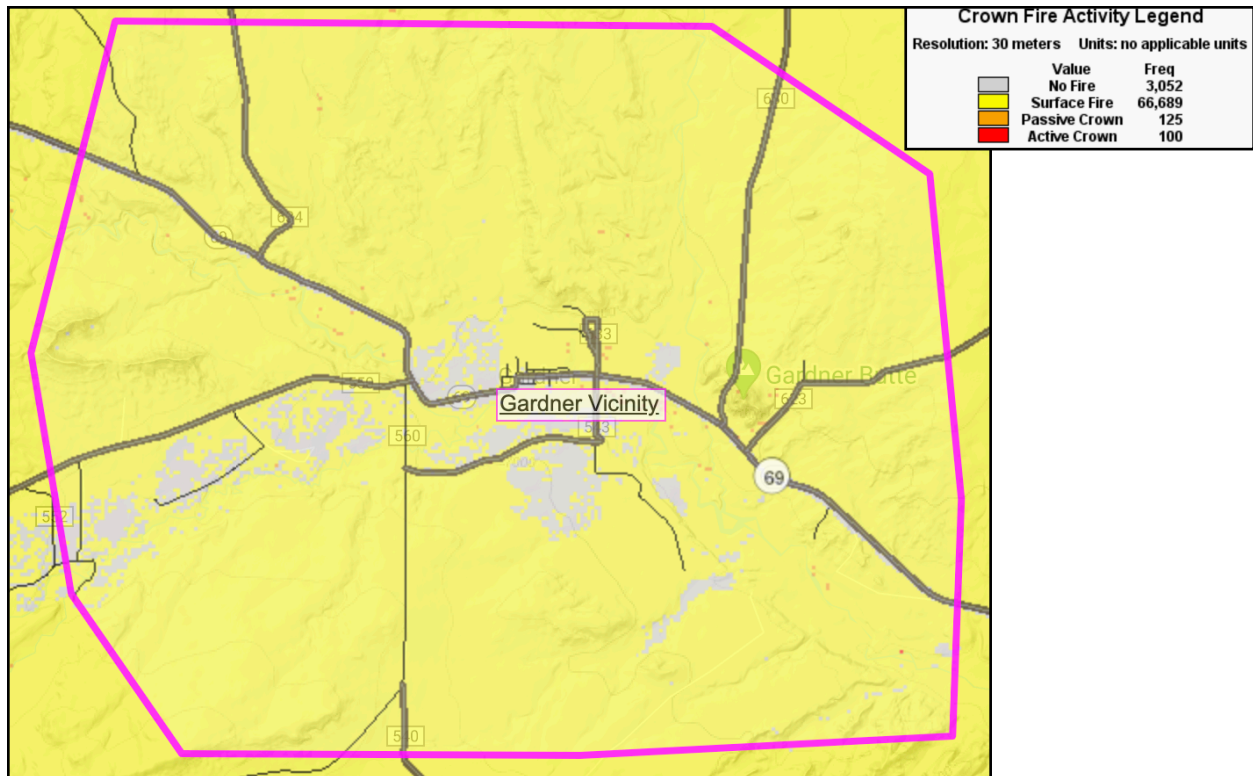


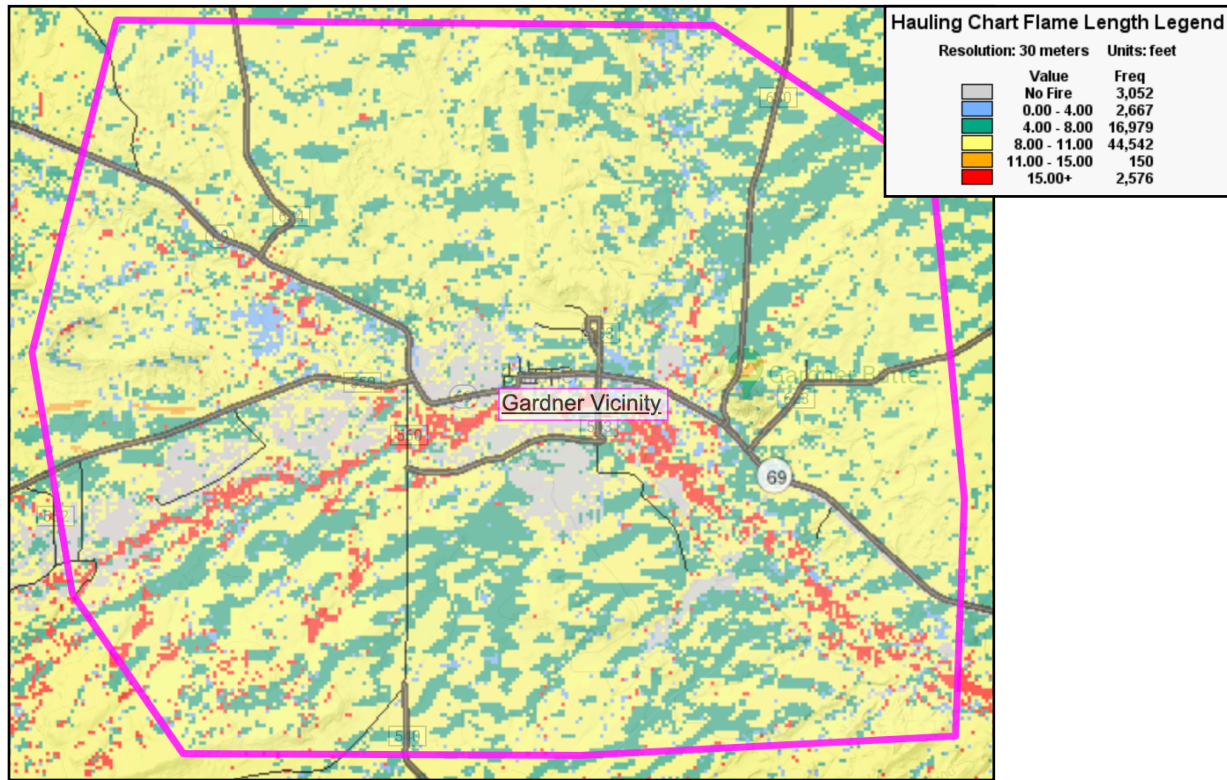
Gardner Area Flame Length Output

Flame Length output: The scattered green pixels show areas that are of very low flame lengths but are of such a small consequence that they will most likely not alter fire behavior much. Most of the analysis area is made up of flame lengths that are in the 5.5 to 10 foot range. This demonstrates that most fires under these dry conditions will need to have an engine included in the response, since flames over 4 feet are not easily handled with individuals or hand crews. The rest of the analysis area has oranges and reds along the creek bottom and in stringers of shrub and shrub/grass areas. These areas will create flames in the 10 foot and greater classes. Since the areas are not large and contiguous they will display large flames as pulses but will quickly transition to some of the shorter flames. It will still be of concern but not something that would trigger use of aerial resources unless they are on scene and can be used without getting retardant in the stream courses. The grey areas that are showing as no fire are either bare soils or agricultural areas with grazing or haying operations.



Gardner Area Crown Fire Activity Output

Crown Fire Activity output: Crown fire activity within Gardner area is pretty consistent surface fire throughout. There are some large areas to the the west and south of the town that show no fire, these are either bare ground or areas of such low fuel that they cannot consistently carry fire. There are very few pixels with passive crown fire scattered throughout the analysis area, these are most likely isolated areas of thicker brush or even scattered piñon and juniper trees.



Gardner Area Hauling Chart Output

Hauling Chart output: The hauling chart output shows that the greater majority of the analysis area is in the 8 to 11 foot flame length range as well as a significant portion in the 4 to 8 foot range, this would require use of heavy equipment most of the time. There are small, isolated areas of blue color that is in the 0 to 4 foot flame length range, these are areas that could be handled by a hand crew with out support from an engine or other heavy equipment. The orange and reds are 11 foot and higher flame lengths, these appear to be mostly in the riparian areas along the creek bottoms. There are also a few larger areas north of Gardner Butte that are most likely scattered piñon and juniper stands that might torch.

Recommendations

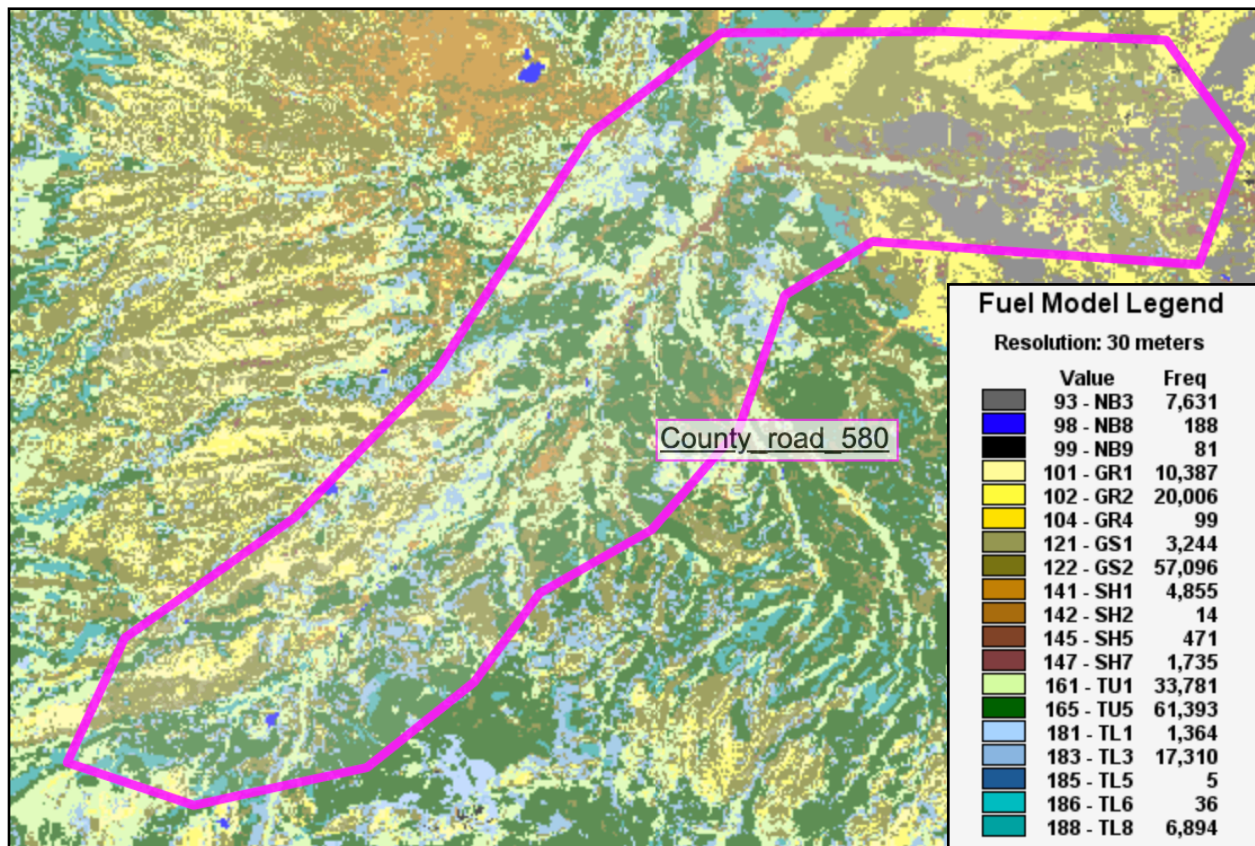
Gardner looks to be in pretty good shape as far as not having the worry about much large, sustained long term fires on the landscape, however they are threatened by what could be short duration but fast moving fires. With this in mind, it is still important to have areas mitigated around homes that are especially susceptible to fires moving from the wildland onto properties that are on the edge of town. Mowing

and making sure that all burnables next to the house have been moved away a sufficient distance from structures will ensure that fast moving fires would not impinge improvements. If there are tree rows or wind breaks around homes, they need to have the surface fuels mowed and kept so that fire cannot transition into the trees. Along the riparian areas willows can be cut to make them not as continuous fuels that would carry fire for long distances. These might need to be maintained every few years since the willows will grow back fairly vigorously after being cut.

Each home needs to do as much as possible to mitigate their properties so that there are not wood piles next to structures, needles on roofs and gutters, etc. Flammable grasses and shrubs should be mowed and trimmed particularly when close to foundations, but even when out in the open to minimize flame lengths. Recommended guidelines that are laid out in the [Home Ignitions Zone Checklists](#) that the Colorado State Forest Service has prepared will help home owners answer many of their questions. These can be found at: <https://csfs.colostate.edu/wildfire-mitigation/home-ignition-zone-checklists/>

County Road 580

The fuel models for the County Road 580 area are split into three seemingly distinct areas. The northeast is ranching lands with scattered homes and mostly in the grass and grass/shrub models, as well as a few areas of non-burnable models. The non-burnable areas are alfalfa and grass hay fields that are irrigated and actively cut during the summer season. The large expanses of grass/shrub fuel models are dry



County Road 580 Fuel Model Output

uplands with a mixture of four-wing salt bush, black greasewood, rubber rabbit brush with short grasses (natives and cheat grass) and weeds mixed in between.

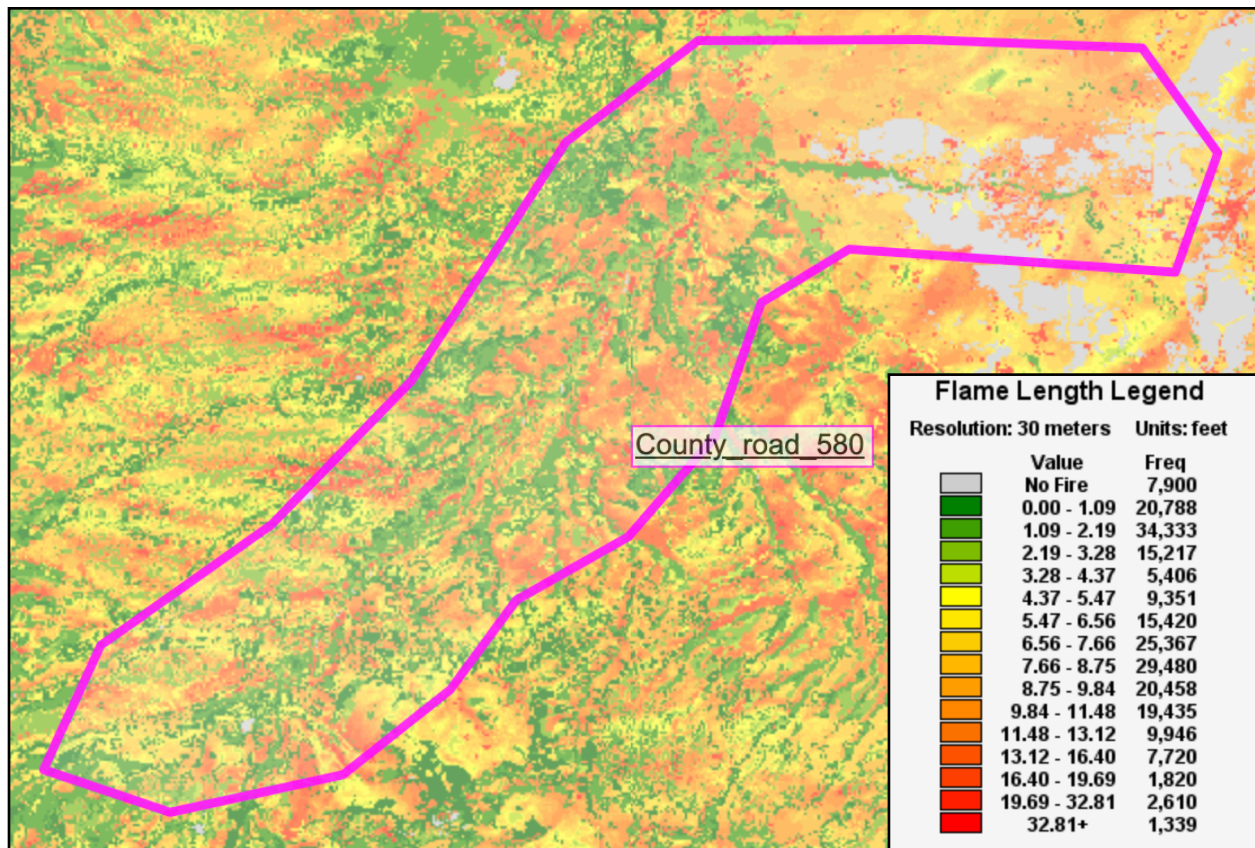
The middle section has a mixture of timber understory and timber litter models. Species present in the timber understory on the south facing slopes are piñon/juniper and scattered limber pines with sparse grass and shrubs. The north aspect slopes are some piñon/juniper with Douglas fir and ponderosa pine. The timber litter

component is mostly ponderosa pine with a good loading of needle cast, dead limbs and decaying shrubs.

The creek bottoms along the riparian areas have scattered pieces of pure shrub models that are made up of willows, service berry, sumac chokecherry, Russian olive and cottonwoods. There is well developed grass and herbaceous understory that during dry seasons will carry very well and even ladder up into the Russian olive and cottonwoods.

The far southwest area of the analysis area has both timber models on the north aspects and grass and grass/shrub models on the south aspects. As the elevation goes up towards the end of the road, the timber understory models along the valley bottom pick up more aspen, blue spruce and white fir in addition to the cottonwoods and willows. There is a significant loading of dead and down material from aspens and cottonwoods and dying shrubs. The white fir is trying to take over some of the aspen stands and are only about 7 to 15 feet tall, making a significant fuel load of understory ladder fuels.

Near the end of the road to the southwest, south of the creek, the timber litter fuel models are primarily large aspen stands that are remnants from a stand replacement event such as fire or beetle kills, possibly over 100 years ago. There are stringers of limber pine, Douglas fir and white fir mixed in with open short grass meadows.

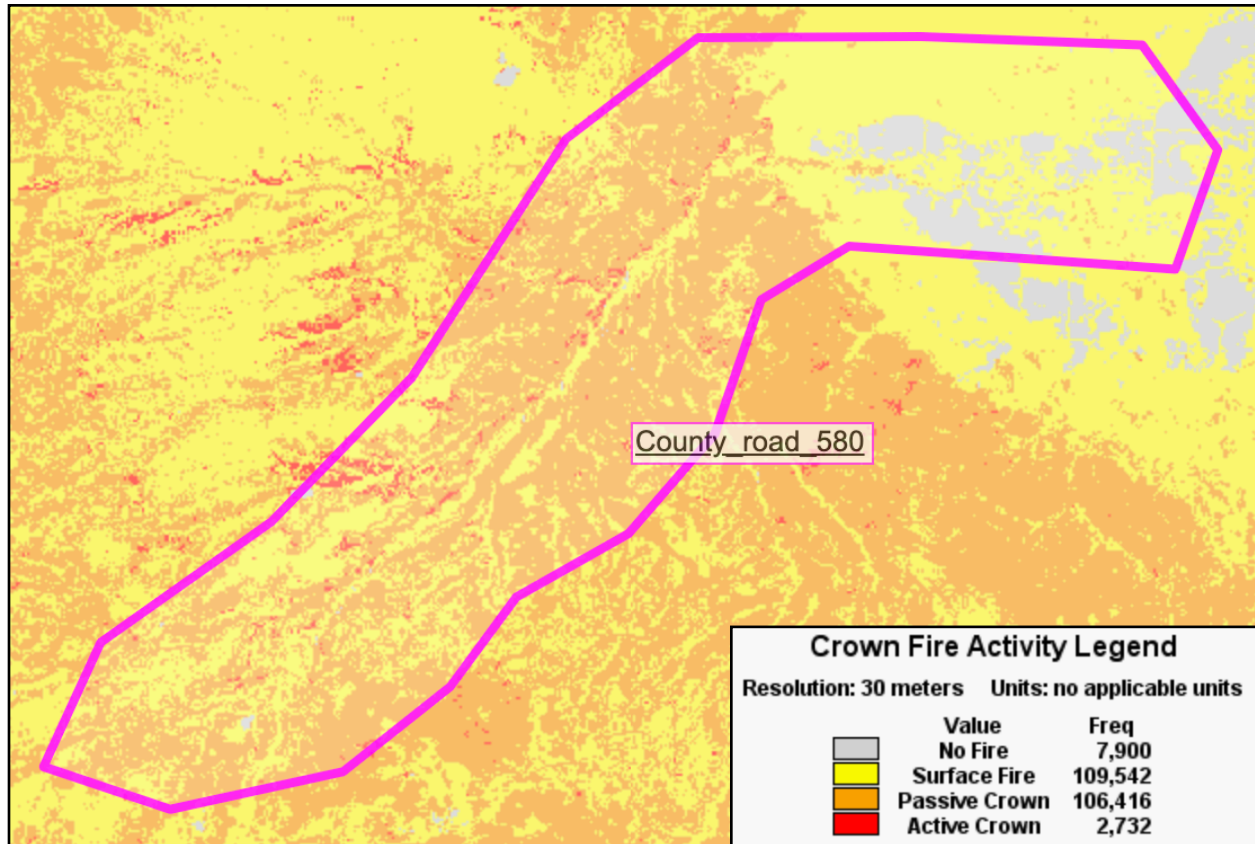


County Road 580 Flame Length Output

Flame Length output: The northeast portion of the analysis area that is mostly ranching properties shows flame lengths that indicative of the grass and grass/shrub fuel models present. Flame lengths are mostly in the in the yellow, orange and spots of red meaning that they are mostly above 5 foot in length with concentrations of fuels that could torch with longer flames. Right along the creek bottom there is a trailing piece of green or very short flames. These are mixed in with the no fire or grey color.

The central portion of the analysis area has real mixture of flame lengths, showing that depending on whether fire is burning in a timber understory that is made up of grasses and shrubs or a dense short needle mat, fire will be less active and mostly on the surface. The areas of orange to reds show that there is a more well developed understory of small trees and shrubs that can carry fire with much longer flame lengths. Some of the more dominate red areas along the creek bottom is the shrub fuel models that are much heavier in loading and more prone to ladder into the adjoining trees.

The southwest portion of the analysis area seems to be more in the middle of the flame length spectrum with the majority of the area in the yellows and oranges or 4 to 8 foot flame lengths. This is primarily due to the gain in elevation and a more diverse landscape that has small, tight canyons funneling down into the main channel along the creek bottom.

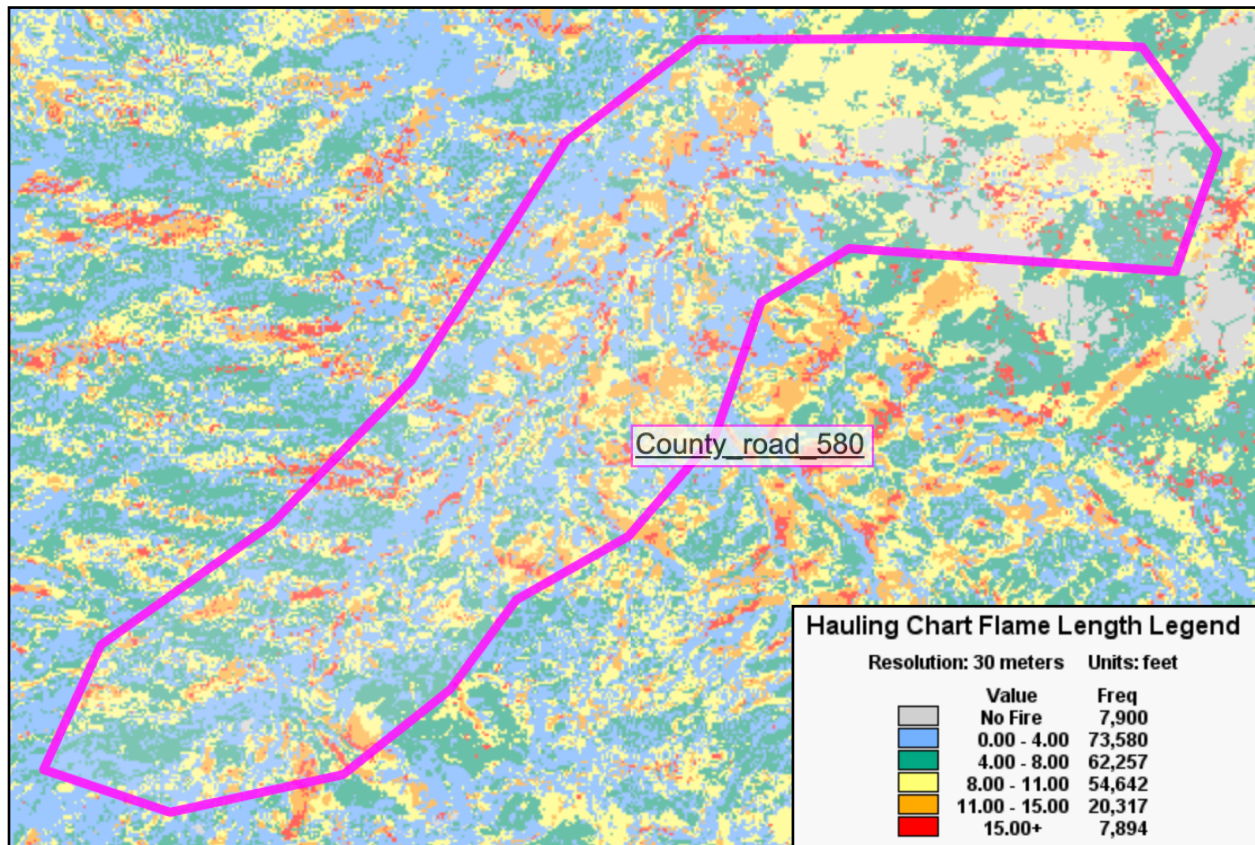


County Road 580 Crown Fire Activity Output

Crown Fire Activity output: Crown fire activity along County Road 580 is in two distinct zones. The northeastern quarter is dominated by the surface fire category with only a few passive crown fire areas and the areas that won't support fire, primarily due to it being irrigated agricultural fields. The rest of the analysis area is mostly passive crown fire with a mixture of surface fire and spots of active crown fire. The active crown fire along the northwest analysis boundary line is from stringers of shrubs.

The higher elevation area in the far southwest of the analysis area shows a mixture of passive and surface fire. This can be a good thing, since even though passive crown fire has trees independently torching, it doesn't always mean that there will be

sustained torching. Fire moving through this part of the landscape, depending on the time of day and weather conditions, might just be surface fire or spots of very isolated torching since it is such discontinuous and non-homogenous fuel types. The middle portion of the analysis area is more problematic in that there is so much more passive crown fire and very little of the surface fire. This could transition to what could act like more active crown fire much easier depending on time of day and minor shifts in wind or humidity.



County Road 580 Hauling Chart Output

Hauling Chart output: The hauling chart output shows that about two-thirds of the analysis area is in the 0 to 8 foot flame length range as well as a scattered portions in the 8 to 11 foot range, this would require the use of heavy equipment most of the time. Given that the canyon is steep sided in places and very rocky, dozers would have difficult time getting wirelines established. The orange and reds are 11 foot and higher flame lengths, these appear to be mostly in the stringers of timber on north aspects or areas along the creek bottoms with shrubs and small trees underneath the over-story.

Recommendations

The density of homes within this analysis area is not very high, like a subdivision might be. This area is mostly rural ranching properties that are not very close together. The ranches in the eastern portion of the analysis area are surrounded by irrigated fields. This would help to buffer them from larger fires coming off the mountains to the west, however, they are most at risk from a smaller fire that may start in a field or neighboring structures and make large moves in a short period of time before fire departments may be able to arrive. The alfalfa and hay fields usually are cut in the fall and then grazed through the winter and makes for much more muted fire behavior. Field stubble can still burn very quickly and with large consequences to homes if they are not properly maintained. Cutting and trimming trees that might be ladder fuels and that could endanger structures is important even in a seemingly rural landscape. Some of the ranches have significant grass and herbaceous growth in and around old farm equipment, vehicles and other things stored on the property that makes mowing difficult.

On up the canyon, the ranches and summer cabins that are nestled in the trees have significantly more work to be done. Cottonwood trees, shrubs and tall grasses are the biggest threats to these properties. Most have mowed grass lawns on at least one side of the home or structure, this is good but the other sides where there are taller shrubs or grasses are more problematic. Mowing and trimming following guidelines from the State Forest Service in the late summer or when the dry season approaches is key.

The Singing River Ranch about half way up the canyon appears to be in very good shape. On the west side of the ranch and between the ranch buildings in the trees and the canyon edge, there is a hay field that is actively being managed. As long as it is left in a cut state going into the dry fall, this will help form a buffer from a fire that could be coming from the west. The property is mostly mature aspen with a few other conifer species that are well trimmed and not in a dense patch. Grass lawns are scattered throughout the property and very well maintained. However just outside the maintained property the timber stands are very dense, tree crowns interlocking with each other and a significant fuel load of dead and down trees and small white fir trees (4-8 foot tall) in the under-story making a very hazardous ladder fuel risk.

The Huerfano State Wildlife Area also has a very well developed fuel load in and around the sites that could put the improvements at risk. Most of the time campers do a pretty good job of fuels reduction near campsites while they forage for firewood but it is the green vegetation that doesn't get removed that during certain times of the year put them at risk.

In all the areas near properties or other values at risk, thinning from below and thinning the number of large trees per acre would open up the stands and make it less likely that fire could go from tree to tree. "Crown separation is a more critical factor for fuel-breaks than a fixed tree density level. A minimum 10-foot spacing between the edges of tree crowns is recommended on level ground. As slope increases, crown spacing should also increase. However, small, isolated groups of trees may be retained for visual diversity. Increase crown spacing around any groups of trees left for aesthetic reasons and to reduce fire intensities and torching potential." (Dennis)

Each home needs to do as much as possible to mitigate their properties so that there are not wood piles next to structures, needles on roofs and gutters, etc. Flammable grasses and shrubs should be mowed and trimmed particularly when close to foundations, but even when out in the open to minimize flame lengths. Recommended guidelines that are laid out in the [Home Ignitions Zone Checklists](#) that the Colorado State Forest Service has prepared will help home owners answer many of their questions. These can be found at: <https://csfs.colostate.edu/wildfire-mitigation/home-ignition-zone-checklists/>

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Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model, Scott & Bergen, 2005, published by the USDA Forest Service, General Technical Report RMRS-GTR-153

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Definitions

Chain(ch) is a standard unit of measure used by many different specialties including forestry and fire and is 66 feet in length. There are 80 chains in a mile.

Moisture of Extinction is also known as extinction moisture content. The fuel moisture content at which a fire will not spread, or spreads only sporadically and in a non-predictable manner.