Fire Plan Components

The Butte Unit Fire Plan components require fire behavior analysis of the affected area. These components represent the affected areas *severe fire weather, assets as risk, fuel type* and *level of service.* These components will be defined and explained in this section. Utilizing GIS technology we can create a map of the affected area to help determine project locations and perimeters.

Severe Fire Weather

Severe fire weather is defined using the Fire Weather Index (FWI) developed by the USDA Forest Service Riverside Lab. The FWI combines air temperature, relative humidity, and wind speed into a combined score. This score is then indexed to indicate potential changes in fire behavior due to the FWI. Severe fire weather occurs when the fire weather observation (FWO) exceeds a predetermined threshold. The FWO threshold is derived from a FWI of 95 degrees Fahrenheit, relative humidity < 20%, and eye level wind speed > 7mph. Frequency of Severe Fire Weather is defined as the percent of time during a budgeted fire season a weather station records a severe fire weather reading. Butte County is within the low ranking as determined by the FWI scale model. The area does experience a number of north wind events that activate a red flag warning. During these expected red flag events the Unit takes extra precautions with increased staffing including the staging of engine, hand crew and dozer strike teams.

Assets at Risk (AAR)

The primary purpose of the Butte Unit Fire Plan is to protect the wide range of assets found on the California wildland within Butte County. Summarizing the definitions provided by the California Fire Plan the following assets are evaluated, with ranking priority 1-5 in the following manner. The analysis addressed two basic questions: What are the aggregate values of the assets at risk to wildfire? What are the losses, both economic and non-economic, in a fire?

Assets susceptible to fire damage are identified in the table below. Each AAR has a unique set of stakeholders and involves different public issues

Asset at Risk	Public Issue Category	Location and ranking methodology
Hydroelectric power	Public welfare	1) Watershed area up to 20 miles upstream from run of the river power plants, ranked based on plant capacity; 2) cells adjacent to reservoir based plants (low rank); and 3) cells containing canals and flumes (high rank)
Fire-flood watersheds	Public safety Public welfare	Watershed with a history of problems or proper conditions for future problems (south coastal plain, field/stakeholder input), ranked based on affected downstream population
Soil erosion	Environment	Ranking of post-fire erosion potential based on weighted combination of fuel characteristics, soil k-factor, slope, and peak rainfall.

Water storage	Public welfare	Watershed area up to 20 miles upstream from water storage facility, ranked based on water value and dead storage capacity of facility.
Water supply	Public health	1) Watershed area up to 20 miles from water supply facility (high rank); 2) grid cells containing domestic water diversions, ranked based on number of connections; and 3) cells containing ditches that contribute to the water supply system (high rank)
Scenic	Public welfare	Four mile view shed around Scenic Highways and 1/4 mile view shed around wild and scenic rivers, ranked based on potential impacts to vegetation types (tree versus non-tree types)
Timber	Public welfare	Timberlands ranked based on value/susceptibility to damage
Range	Public welfare	Rangelands ranked on potential replacement feed cost by region/owner/vegetation type
Air quality	Public health Environment Public welfare	Potential damages to health, materials, vegetation, and visibility; ranking based on vegetation type and air basin
Historic buildings	Public welfare	Historic buildings ranked based on fire susceptibility
Recreation	Public welfare	Unique recreation areas or areas with potential damage to facilities, ranked based on fire susceptibility
Structures	Public safety Public welfare	Ranking based on housing density and exposure (potential for structure loss in a large fire event)
Non-game wildlife	Environment Public welfare	Public and NGO land holdings specifically for protection of non-game wildlife habitat, ranked based on fire susceptibility.
Game wildlife	Public welfare Environment	Omitted due to lack of methodology/available data
Infrastructure	Public safety Public welfare	Infrastructure for delivery of emergency and other critical services (e.g. repeater sites, transmission lines, transport corridors)
Ecosystem health	Environment	Ranking based on condition class, potential for ecological damage from a severe fire event due to deviation from historical fire return interval

Mapping and Ranking AARs

For the purpose of ranking potential impacts for a given AAR, a common statewide geographic unit is required. To link the analysis to a common map source used by CAL FIRE Units, the 7 ½ minute (1:24,000 scale) quad boundaries were selected as a base. Since they cover large areas (about 35,000 acres), quads are divided into 81 grid cells, each about 450 acres. The size of these units was deemed appropriate for focusing in on high value/ high risk areas.

For a given AAR, grid cells must be ranked as high, medium, or low based on potential impacts from a large fire event, if one were to occur, rankings are developed based on the potential physical fire effects as well as the human valuation of those effects. For example, for the air quality AAR the physical effects of a large fire in timberlands are higher than grasslands due to production of a larger volume of smoke. The valuation of this effect will differ based on the additional factors of how many

people are potentially affected within specific air basins. For example, a timberland fire affecting the Northeast Plateau air basin will have a lower ranking than one that affects the Sacramento Valley air basin.

The potential physical effects of a large fire also include a susceptibility component for assets such as structures, historic buildings, or recreation that involve specific sites within a quad 81st. For example, the ranking procedure for structures involves a valuation component based on the number of housing units within a grid cell as well as a susceptibility component, or exposure. The exposure measure includes site-specific factors near housing such as vegetation clearance, roof type, and accessibility.

Fuel Load

The fuel assessment layer exemplifies the local fire hazard situation. The fuels assessment is a very useful tool in assisting pre-fire planners and fire safe councils target critical areas for prescriptions. This assessment evaluates current flammability of a particular fuel type, given location on the slope, affects from weather conditions, surface and ladder fuels, and crown density. Fuel in context of wildfire, refers to all combustible material available to burn within a given area of land. Grass, brush and timber are the most common fuels found in the Sierra Nevada ecosystem. These fuels have specific burning characteristics based on several inherent factors. These factors include moisture content, volume, live to dead vegetation ratio, size, arrangement and plant's genetic make up. All of these contribute to a fire's spread, its intensity, and ultimately its threat to assets.

The planning belt for Butte flows in a consistent elevation ladder from barren (farmlands) to grass into brush and finally into timber. This identification is important because it relates directly to the fire hazard these fuels identify with in their burning characteristics. Local conditions (micro-climates) also affect fuel type and density. North facing slopes tend to get slightly more rainfall and less sun favoring the development of hardwood and succulent species. Southern exposures are dominated by brush and conifer species which have adapted to drier, poor soil conditions.

Grass burns rapidly with a short period of intensity with maximum heat output. Brush, on the other hand, has a long sustained high heat output making fire suppression more difficult. Timber, while more difficult to initiate large fires, once established creates a defensive firefighting posture due to the intensity of the burning characteristics.

Fuel load as explained previously falls into three general categories as it affects wildland fire proliferation within the Butte Unit. Overall there are 256 fuel models however for planning purposes most fuel modeling is based on one of the 13 types defined by the National Wildfire Coordinating Group Fuel Model. The Planning Belt for Butte consists of seven categories as they extend from the valley floor into Plumas County. These models are compared to the past fire history for the area to create a final vegetation layer.

The final phase of determining fuel hazard rating involves combining crown fuel characteristics and surface fuel characteristics. Where applicable, the ladder and crown fuel indices convey the relative abundance of these types of fuels. The indices take values ranging from 0 to 2, with 0 indicating "absent", 1 representing "present but spatially limited", and 2 indicating "widespread". These indices indicate the probability that

torching and crown fire will occur if the stand were subjected to a wildfire under adverse environmental conditions.

The total hazard rating includes not only hazard posed by surface fire, but also hazard by involvement of canopy fuels. The hazard ranking includes this component by adjusting the surface hazard rank according to the value of the ladder and crown fuel indices. Specifically, the surface hazard rank increases a maximum of one class in all situations where the sum of the ladder and crown fuel indices is greater then or equal to two.

The potential fire behavior drives the hazard ranking. A rank is attributed to each Q81st (450 acre parcel) within Butte Unit's State Responsibility Area. The ranking method portrays hazard ratings as moderate, high or very high. This map provides another tool for determining pre-fire prescriptions. Various prescription types will better correlate to specific types of fuel models. Additionally, structures are not equated into the fuel ranking model. Structural ignition defense is best achieved with PC 4291 compliance. Suppression agencies do not expect these measures to stop a large scale wildfire. However a non-compliant PC 4291 structure that is ignited during a wildfire will significantly increase the wildfire spread. Combining this knowledge is paramount in developing a community defense plan against wildfire. Fires in grass burn rapidly, but can be stopped by a roadway or plowed fire breaks. Fires in brush often burn with an intensity that prevents fire crews from safely applying water to the flame front. Timber fires can ignite new fires (spot fires) miles ahead of the main blaze. Only wide scale pre-fire management programs can reduce the potential of wildfire catastrophe.

Ignition Workload Analysis (IWA)

The legislature has charged the Board of Forestry and CAL FIRE with delivering a fire protection system that provides an equal level of protection for lands of similar type (PRC 4230). To accomplish this, CAL FIRE utilizes an assessment process which evaluates the level of service currently afforded a particular wildland area with the level of fire protection being provided for the same area. The rating is expressed as the percentage of fires that are successfully extinguished during initial attack. Success is defined as those fires that are controlled during the initial attack phase by limited resources before unacceptable damage and cost are incurred.

CAL FIRE's ignition workload analysis (IWA) rating is a relative system which attempts to measure the impact of fire on various assets at risk. IWA is an approximation method which has been proposed to allow the unit to proceed with a damage-plus-cost analysis assessment of fire protection performance. The IWA rating also provides a way to integrate the contribution of various program components (fire protection, fire prevention, planning, fuels management and fire suppression) toward the goal of keeping damage and cost within acceptable limits.

In this system, a 'fire' may be considered a failure based upon the level of resource commitment and the fire's size. Unfortunately, this type of analysis oversimplifies the myriad of factors that truly determine initial attack (IA) success. Example, IA failures that are a result of excessive resource draw-down and/or adverse fire weather, that create fire behavior beyond what IA resources are normally able to handle.

The IWA rating is a ratio of successful initial attack fire suppression efforts to the total number of fire starts. This rating utilizes GIS to graphically display the success and failures of the fire protection system by overlaying 10 year wildfire history onto a map and deriving the average annual number of fires by size, severity of burning conditions and assets lost. The LOS rating can be readily used to describe the degree of success of fire protection services to "civilian stakeholders."

The result is an initial attack success rate measured as a percentage of fires by vegetative type and area. Success is defined as those fires that are controlled before unacceptable damage and cost are incurred and where initial attack resources are sufficient to control wildfires.

Fires are grouped into "success" and "failure" categories based on various factors. The assessment groups fires by general vegetation planning belts. Within the planning belt fires are further classified based on final fire size and weather conditions at the time of ignition. As we implement various prescriptions, we can break these data sets out as a whole or compartmentalize them and begin to correlate the data to better determine the effectiveness of the prescriptions.

When the IWA is overlaid onto a fire history map, we can see where projects have been successful. What the LOS does not record are successes in overall reduction of a 'fires' potential or structure saves within larger fires.

This assessment program only records fires that meet certain parameters. Those parameters are grass fires over 300 acres, brush fires over 50 acres, timber fires over 10 acres or wildland fires which destroyed 3 or more structures or caused damages over $300,000 dollars.

Structural Ignitability and Home Defense

One of the key components in the CWPP is the protection of structures during the event of a wildfire. As explained earlier, this critical asset is one of the most difficult and costly to defend during a wildfire.

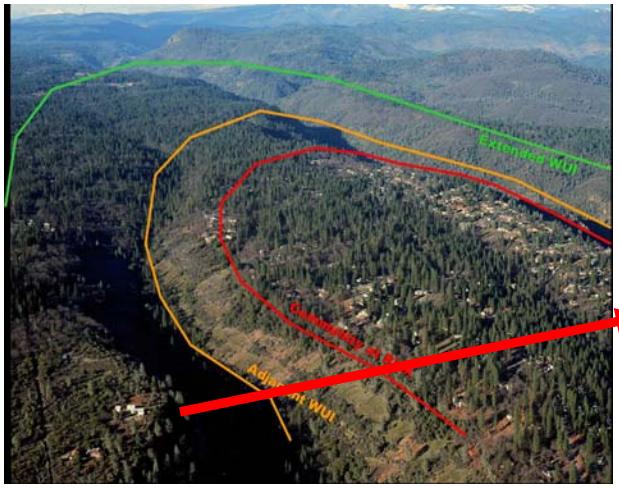
Compliance with PRC 4291 regulations gives the best opportunity for structural survivability during a large wildfire. However, it is not enough to have defensible space without giving careful thought and effort toward improving the homes resistance to structural ignitability.

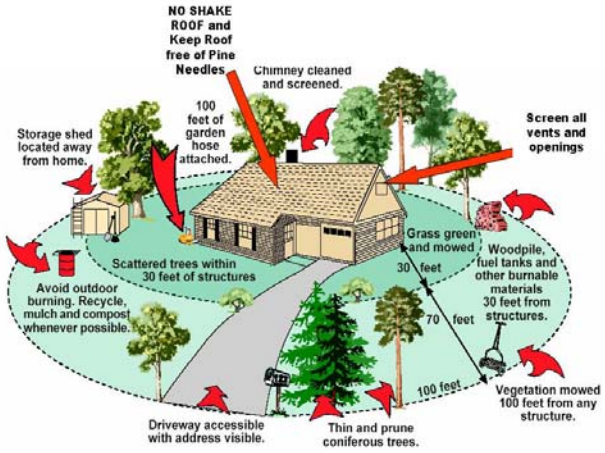
Structural ignitability is a term that describes a structure's susceptibility to catch fire during a wildland fire. Aiding a fire in this capacity would be any item allowing a fire ember to readily start a new fire. Many structures can be lost well in advance of the main fire. During firestorms, fires are often fanned by strong winds creating a blizzard of embers which blow through the air. These embers can land in a receptive fuel bed. This fuel bed can include naturally occurring materials, such as needles and leaves that accumulate on, under and near a home, material stored on or near the home such as yard furniture or woodpiles, and some types of building materials. Building materials that lend themselves readily to "structural ignitability" include the obvious shake roof and the not so obvious deck material and interior support members in the attic or sub-floor space. When reducing a structure's ignitability the mitigation measures are best accomplished by the individual homeowner.

Mitigation measures will be separated into four categories: 1. Information, Education and Planning; 2. Reducing Structure Ignitability; 3. Enhancing Suppression Capabilities and Public Safety; and 4.Hazardous Fuel Reduction Planning and Implementation. Most projects are conceptualized at the ground roots level. In this instance that would include a local fire safe council, community organization or individual. Before the project is forwarded to the Butte County Community Wildfire Protection Plan Project Review Committee, an initial review should go through the local fire suppression supervisor for the geographic area in question. For areas in the State Responsibility Area and County Responsibility Area the Butte County Fire/CAL FIRE Battalion Chief will assume this role. For areas within City Jurisdictions the Fire Chief or designee will assume responsibility. The Battalion Chief will receive a completed form from the project initiator that will address some key concerns of implementation for each project. Key components in this phase of implementation are to keep projects consistent with the fire plan area goals, ensure projects are relevant and move the best projects forward to compete with other submitted projects.

Staying with the concept of Structural Ignitability, the following page shows an illustration displaying the importance of maintaining PRC 4291 clearance as it relates to location in relevance to the community at risk and a homes place in the wildland urban interface (WUI).

Detailed Illustration of the Home Ignition Zone





<u>HOME IGNITION ZONE</u>

- ✓ **Fire resistant building construction**
- ✓ **Defensible space around the home 100 feet.**

In this illustration, the identified home falls within the Extended WUI. The location at the top of a ridge would only increase the danger of succumbing to a wildland fire. A structure such as this would benefit greatly by adhering to PC 4291 compliance.

This section will continue with a detailed look at the risk condition within the four identified focus areas. Offered will be mitigation measures that the homeowner can institute as well as measures being affected by local fire safe councils, private industry and local fire protection agencies. Mitigation measures prioritize to assist the homeowner in the following order. This order is the succession order most expected to be followed by an individual resident.

1. *Home Ignition Zone – the home and landscaping out 100 feet.'*
2. *Community at Risk Zone*
3. *Adjacent Wildland Urban Interface*
4. *Extended Wildland Urban Interface*

The goal of this section is to:
Identify situations and factors which place citizens, their property and communities at risk from wildfire, and suggest appropriate mitigation measure(s) to reduce that risk.