3.3.3. Appendix C: Fire Regime and Condition Class Analysis

Fire Regime Condition Class

A fire regime refers to an integration of disturbance attributes including type, frequency, duration, extent (Pickett and White 1985) and severity of fire. Natural disturbances in southwest Oregon include fire, insects, pathogens, wind throw, weather, avalanche, and earthquake. Introduced disturbances include livestock grazing, mining, timber harvesting, roads, insects, and pathogens. Natural fire regimes have been altered by management activities including fire exclusion, livestock grazing, and timber harvesting to mention a few. Historic climate variability and potential global climate change have and may further impact fire regimes.

Ecosystem and landscape composition and structure results from, and in turn, influence fire regimes at different spatial and temporal scales. Disturbances and successional trajectories interact, creating patterns of vegetation across landscapes (Bormann and Likens 1979, Pickett and White 1985, Lehmkuhl and others 1994). Landscape vegetation patterns can amplify (Turner and Bratton 1987, Franklin and Forman 1987) or impede (Knight 1987, Rykiel and others 1988) the spread of disturbances across landscapes.

Five fire regime classes have been identified, to aid fire management analysis efforts, as discussed in “Mapping Historic Fire Regimes for the Western United States: Integrating Remote Sensing and Biophysical Data” (Hardy et al 1998). They reflect fire return intervals and severity.

The five fire regimes developed by Hardy, et al were modified and further stratified by a group of fire managers and ecologists on October 10, 2000, to reflect the Pacific Northwest (Oregon & Washington) conditions. For southwestern Oregon, spatial data layers were developed to display these fire regimes using the Draft Plant Series data that was developed in 1995 for the Southwest Oregon LSR Assessment and after that converted to Plant Association Groups (PAGs). The PAG data will be used to inform the Satellite imagery from LANDFIRE to separate SW Oregon into the 5 Fire Regime Groups.

Fire Regimes for this FPU: (Note: there may be variation among the species listed under each Fire Regime)

Fire Regime I; <35 years non-lethal, low-severity (mostly forested areas). (Ponderosa pine, Oregon white oak, pine-oak woodlands, Douglas-fir and dry site white fir plant associations)

Fire Regime II; <35 years stand replacing (grassland and shrublands). (Shrub-steppe community)

Fire Regime III; 35-100+ years, mixed severity. (Moist/high elevation white fir, tanoak, western hemlock series)

Fire Regime IIIa; < 50 years, mixed severity. (Dry site tanoak series)

Fire Regime IIIb**;** 50-100+ years, mixed severity. (Low elevation, wet site White fir, wet site tanoak, and low elevation western hemlock series)

Fire Regime IIIc; 100-200 years, mixed severity. (High elevation, white fir series)

Fire Regime IV; 35-100+ years stand replacing. (Shasta red fir and Port-Orford cedar associations)

Fire Regime IVa; 35-100+ years stand replacing.

Fire Regime V; 200+ years stand replacement (Western hemlock, silver fir and mountain hemlock series)

A close approximation as to the past frequency of fire occurrence, extent, and severity (Fire Regime) on particular sites is important in understanding the relative difference in vegetation and dead /down debris on these sites today. The change or departure on these sites in the amount of these materials has a direct relationship to the type of fire behavior and post fire effects these sites will support today, compared to the past. In an assessment of site-specific conditions, classifying the site's current condition compared to a reference will give some indication of the change to the type of fire severity or fire behavior characteristics. The ability to predict potential fire behavior characteristics is important for understanding the risk to people and key ecological resources.

The condition class scale was developed to exhibit this departure in severity, intensity, and frequency of fires burning in the ecosystem in its current condition as compared to their historic, or reference condition. The departure being described in these assessments results in changes to one or more of the following key ecological components: vegetation characteristics (species composition, structural stages, stand ages, canopy closure and mosaic pattern); fuel composition; fire frequency; severity and pattern; and other associated disturbances; the introduction of invasives, grazing and insect and disease mortality. Reference conditions are very useful as indicators of ecosystem function and sustainability, but do not necessarily represent desired future conditions, i.e., they may not reflect sustainable conditions under current climate, land use, or managerial constraints, and they may not be compatible with social expectations.

Condition Class is a relative description of the degree of departure from historical fire regimes and generally describes how ecosystems have reacted with fire intervals outside their historic range of variability.

Condition Class 1 = Fire frequencies are within or near the historical range, and have departed from historical frequencies by no more than one return interval; vegetation attributes are intact and functioning within the historic range**.** The risk of losing key ecosystem components is low.

Condition Class 2 **=** Fire frequencies and vegetation attributes have been moderately altered from the historical range, and fire frequencies have departed from historical frequencies by more than one return interval. The risk of losing key ecosystem components is moderate.

Condition Class 3 = Fire frequencies and vegetation attributes have been significantly altered from the historical range, and fire frequencies have departed from historical frequencies by multiple return intervals. The risk of losing key ecosystem components is high.

For the purpose of implementing RMP, LRMP and State Law direction, Fire Regimes and Condition Class (FRCC) can be a useful tool to characterize the risk to key features of ecosystems and people found throughout the planning unit.

Fire has been traditionally defined as a "disturbance event" in most ecological literature. However, fire managers and scientists now regard fire an important successional **process** for maintaining biodiversity in ecosystems, particularly in the fire driven Mediterranean ecosystems of southwest Oregon. The fire regime, the quantification of the fire processes over time, directly effects mortality, growth, decomposition and regeneration. It assures that new genetic combinations are constantly being tested through natural selection, as climate fluctuation stimulates environmental and biotic stresses. It may seem counterintuitive, but "disturbance" by fire assures the survival of the most resilient species and a diverse, healthy mosaic of age classes across the landscape.

Fire suppression has altered fire regimes across the western states. The most obvious direct affect is the accumulation of fuel that would have otherwise been burned. Indirectly, growth, regeneration, decomposition, and mortality rates also have been altered which in turn affects fire intensity and duration. Since regimes change with changing climate, it is difficult to separate the effects of suppression from climate change.

Biophysical Settings (BpS) represent the vegetation that may have been dominant on the landscape prior to Euro-American settlement and is based on both the current biophysical environment and an approximation of the historical disturbance regime. Map units are based on **NatureServe's Ecological Systems classification**, which is a nationally consistent set of mid-scale ecological units (Comer and others 2003). As used in LANDFIRE, map unit names represent the natural plant communities that may have been present during the reference period.

Structure class (sclass) categorizes current vegetation composition and structure into up to five successional states defined for each LANDFIRE Biophysical Settings (BpS) Model. An additional category defines uncharacteristic vegetation components that are not found within the compositional or structural variability of successional states defined for each BpS model, such as exotic species. Typical structural stages are:

- Early seral
- Mid seral – open canopy
- Mid seral – closed canopy
- Late seral – open canopy
- Late seral – closed canopy

A tabular database of Reference Conditions (refcon) is used to inform the model of the assumed historic amount of various successional stages in each BpS. Each BpS has a model describing the vegetation, geography, biophysical characteristics, succession stages, and disturbance regime. Descriptions also document the assumptions behind, the outstanding questions about, the contributors to, the resources used for, and the evolution of each model. The reference condition models were developed using the VDDT (Vegetation Dynamics Development Tool) software. VDDT is a public domain, aspatial, user-friendly modeling tool, available from ESSA Technologies. The VDDT data include quantitative information about the rates and pathways of succession and the frequency and effects of disturbances.

Model Outputs

The model output attempts to quantify the ecological departure in each biophysical setting and structural class by contrasting current conditions with the historical reference condition. The departure from historical fire regimes may serve as a useful ecological proxy of the potential for uncharacteristic fire effects. The map tool process does not use the historic Fire Regime map themes to advise the condition class output. It relies in departure of vegetation from the current to the modeled reference data base to arrive at condition class. Thus areas that have pronounced management activities that have taken the vegetation character in a different pathway than the reference model the condition class is more extreme without regard for the number of fire cycles that may have been missed.

Output map layers include:

LANDFIRE FRCC; which is at the sub geographic scale. This map aggregates all of the Bps' over large landscapes to produce a coarse scale picture of the condition class based mainly on vegetation departure.

Strata FRCC and **Strata departure**; depicts landscape scale combinations of Bps' at a scale closer to the analysis needed for 4th and possibly 5th field watersheds. The

aggregation still lumps large areas in tracts of land into an adjusted or median condition class based on vegetation departure from reference conditions.

Stand FRCC and **stand FRCC departure**; depicts the FRCC analysis at the finest scale practical for the application needs in the context of what is needed to be analyzed balanced against the specificity of the data layers available for the analysis (Landfire).

Sclass departure; where current vegetation differs in amount to the historic condition in terms of structural class (ie, early, mid closed and open, late open, closed, and uncharacteristic) captured in all the landscape units. While viewing the stand FRCC layer this departure determines the condition class more or less pixel by pixel at the 6th field watershed resolution. Scale is 0-100 breakpoints for condition class are 1=33, 2=66, etc.

Sclass percent difference; percent difference between current and reference conditions in structure class on a scale of -100 to +100 which will further display areas of difference in terms of vegetation departure. This scale is used to determine the relative difference in structure class as compared to the reference.

Sclass relative difference; the scaling of sclass percent difference in current vegetation compared to reference conditions such that negative values from -100 to -33 display the range of trace, and under-represented structure classes and positive values from +33 to +100 displays the range of over-represented and abundant, while values of -33 to +33 show areas that are similar to the reference condition.

The significance of these groups is to inform practitioners as to areas that may need treatments or monitoring to bring them closer to the ecosystem resilience of the reference condition (ie, abundance of mid closed stands compared to the reference may indicate that these stands need to be brought more to the mid open or late open development in order to replicate the systems that were functioning in a healthy manner prior to European settlement).

Prioritized FRCC; In response to requirements of the Federal Land Assistance, Management, and Enhancement (FLAME) Act of 2009, the Wildland Fire Leadership Council (WFLC) directed the development of the **National Cohesive Wildland Fire Management Strategy (Cohesive Strategy)**. The Cohesive Strategy, as well as other documents founding the National Fire Plan prioritizes the areas that treatments are to take place with the funds provided by the initiative. According to these documents priority of treatments should be focused on fire regimes 1, 2 and 3, in condition class 2, 3 in that order.

In the prioritization mapping used here, Stand FRCC is used to judge the condition class at the 6th field watershed level scale. Because, ecological departure mapping is not attributed to cause and much of the departure is due to the influence of management practices, a modification was made to include fire regime in the

prioritization. In this prioritization scheme, a large priority number is of higher significance than a lower number.

Cohesive Strategy Prioritization		
FR	**CC**	**Priority**
1	3	15
2	3	14
1	2	13
2	2	12
3	3	11
3	2	10
1	1	9
4	3	8
4	2	7
5	3	6
5	2	5
2	1	4
3	1	3
4	1	2
5	1	1

Calculation of Fire condition Class

Fire Regime Condition Class (FRCC) is an interagency, tool for determining the degree of departure from reference condition vegetation, fuels and disturbance regimes. It is a tool to help guide management objectives and set priorities for treatments.

Condition class descriptions: Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber harvesting, grazing, introduction and establishment of exotic plant species, insects and disease (introduced or native), or other past management activities.

Condition Class	Attributes	Example Management Options
Condition Class 1	·Fire regimes are within or near an historical range. ·The risk of losing key ecosystem components is low. ·Fire frequencies have departed from historical frequencies by no more than one return interval. ·Vegetation attributes (species	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.

Condition Class	Attributes	Example Management Options
	composition and structure) are intact and functioning within an historical range.	
Condition Class 2	·Fire regimes have been moderately altered from their historical range. ·The risk of losing key ecosystem components has increased to moderate. ·Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. These results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ·Vegetation attributes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
Condition Class 3	·Fire regimes have been significantly altered from their historical range. ·The risk of losing key ecosystem components is high. ·Fire frequencies have departed from historical frequencies by multiple return intervals. These results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ·Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime.

These definitions are qualitative to allow for local variation and application. They rely heavily on temporal variation (frequency, which is highly variable even within a plant association and more variable at the next level of classification, the plant association group PAG) and indicate the influence of landscape. While fire frequency reflects an estimated central tendency, stand conditions are directly related. For example, as fire cycles are missed diameters increase, crown cover increases, and usually the number

of layers increase. These variables not only verify missed cycles, they validate on the ground fuel conditions related to fire risk. Thus, condition class reflects both the temporal and spatial variability across the landscape that can be used to evaluate relative fire risk.