REQUIREMENTS FOR PROCESSING WILDFIRE EFFECTS DEPARTURE (UNCHARACTERISTIC WILDFIRE)

NOTE: This documentation contains processing information for projected as well as current information. The projected data can be found in the released dataset SDEIS Landscape Variables Database (DBSLNDSV, #968).

Logic Overview

Uncharacteristic wildfires—
These are wildfires that have effects and behavior that are outside the normal range of effects and behavior for the historical (natural) system. The normal range is considered to be within the 400 year historic range of variability minimum + 25% and maximum - 25%. The 400 year period includes the variation that is predicted to occur within the recent and current climate without influence of Euro-American settlement influence. The historical regime accounts in general for the cumulative biotic adaptation and soil development influences of the past 10-15 thousand years since the last glacial period. Many native species adaptations evolved over the last 1-3 million years in response to changing paleo-ecological climates and disturbances.

Uncharacteristic wildfire behavior—
These kinds of wildfires produce substantial resistance to wildfire control. This resistance to control results in a 90% chance that a wildfire ignition in flammable wildland fuels during periods of high fire weather danger will not be controlled or contained during initial attack. Average cost of fire suppression = $1000 per acre.

Uncharacteristic wildfire effects—
These kinds of wildfires cause higher severity effects than those that occurred within the normal range of fire events during soil development over the past 10,000 years or within the normal dynamic changes of vegetation. Consequently, soils are heated to levels that have high chance of creating hydrophobic conditions. Chance of soil erosion is greatly increased because of the severe reduction in upper layer vegetation, mortality to the soil surface vegetation root crown cover, and high consumption of litter and wood.

Uncharacteristic wildfire effects are determined by evaluating the probability that differences between the historical (inherent biophysical or natural) fire intensity regime and the current (human induced) fire intensity regime will produce uncharacteristic effects.

The following table illustrates the various combinations that can occur.

	Wildfire Severity to Biotic Diversity, Vegetation Cover and Structure, Hazard of Soil Erosion, and Resistance to Control	
Historical Fire Regime	**Low Current Fire Intensity Regime**	**High Current Fire Intensity Regime**
Low Historical Fire Intensity Regime	Low	High
High Historical Fire Intensity Regime	Low	Moderate

None - low probability of wildfire occurrence.

Low - Low Historical and Low Current: these fires have effects that occur within the normal range of occurrence with 95% probability, and have low resistance to wildfire control with 99% probability.

High - Low Historical and High Current: these fires have effects that occur outside the normal range of occurrence with 90% probability, and have high resistance to wildfire control with 95% probability.

Low - High Historical and Low Current: these fires have effects that occur within the normal range of occurrence with 99% probability, and have low resistance to wildfire control with 99% probability. These types of low intensity disturbances were very common as intermediate events in the historically high intensity regimes and usually occurred during low to moderate fire weather conditions.

Moderate - High Historical and High Current: these fires have effects that occur outside the normal range of occurrence with 90% probability, and have high resistance to wildfire control with 60% probability. Even though these regimes were historically high intensity, the wildfires that occur currently are commonly occurring in fuels that have higher loadings and are more contiguous than occurred within the normal historical range. Consequently, they commonly have more severe effects and inherently have higher potential for resistance to control than low intensity regimes.

Processing

The following process should be used to create the Uncharacteristic Wildfire variable by Alternative and Year. NOTE: "Xx" is used in reference to all SDEIS Simulations, X1, X2, and X3.

Process 1.0 -- Assign Terrestrial Community Groups (TCG) to H6AMPH strata.

Process 1.1 -- Assign Terrestrial Community Groups to H6AMPH Strata for Current, Year 0.

Process 1.2 -- Assign Terrestrial Community Groups to H6AMPH Strata for Xx Yr.

Process 2.0 -- Assign Wildfire Severity / Severe Soil Vegetative (WFSV) using the Uncharacteristic Wildfire Lookup Table (UWL) to PVTGRP/HDI/TCG combinations.

XxWFSV_Yr will be by H6/PVG/HDI/TCG

Process 3.0 -- Calculate Uncharacteristic Wildfire Coefficient (UWF) per H6AMPH strata using WFSV and Adjusted Wildfire Coefficient, X1Aac_WlfYr (output from variable 9). The WFSV values from Process 2.0 were assigned at the H6AMPH/TCG level and must be converted to the H6AMPH level in this process using an area weighted average WFSV value.

XxUWF_Yr = H6AMPH strata weighted average of WFSV * XxAac_WlfYr

Logic: This is the amount of simulation (Xx) uncharacteristic (high intensity) wildfire which would burn with severity exceeding the characteristic effects of fire on soil and vegetation. Zero values for wildfire do not reduce this probability because it is a cumulative value for the amount of wildfire that occurs. When wildfire is zero then the calculated value becomes zero.

Process 4.0 -- Calculate Subwatershed Uncharacteristic Wildfire Event Probability (UWEP) by HUC6 to get H6XxUWEP_Yr.

Process 4.1 -- Sum all the H6AMPH strata area to get the total area in the HUC6 (Total HUC6 Area).

Process 4.2 -- Calculate HUC6 Uncharacteristic Wildfire Occurrence weighted average.

H6 XxUWF_Yr = ((H6AMPH XxUWF_Yr Value) * (H6AMPHArea)) / Total HUC6 Area)

Do a Frequency Diagram at this point. All values should be $\leq$ 1.0.

Process 4.3 -- Set all the H6AMPH strata (UWF) Uncharacteristic Wildfire Occurrence values that are less than or equal to the H6 weighted average (H6 XxUWF_Yr) to zero creating a new table, H6AMPH XxUWFaavg_Yr.

If H6AMPH XxUWF_Yr $\leq$ H6 XxUWF_Yr,
Then
H6AMPH XxUWFaavg_Yr = H6AMPH XxUWF_Yr

If H6AMPH XxUWFaavg_Yr > 1.0 then set H6AMPH XxUWFaavg_Yr = 1.0
Else
H6AMPH XxUWFaavg_Yr = 0

Process 4.4 -- Calculate the HUC6 area of above average UWF by summarizing the area of the H6AMPH strata within the HUC6s that have uncharacteristic wildfire occurrence values greater than the weighted average for the HUC6.

H6 XxUWFaavg_Area = Summary of area in H6 where H6AMPH XxUWFaavg_Yr <> 0

Process 4.5 -- Compute a new average value (the average of above average uncharacteristic wildfire occurrence for the subwatershed) by using only the strata that have a value greater than the weighted average of all H6AMPH strata in the HUC6. The new weighted average uses the sum of all of the greater than average strata area calculated in process 4.4

Should divide output from 4.4 by sum of area of output in 4.4 per HUC6.

H6 XxUWFaavg_Coef =
H6 sum of (H6AMPH XxUWFaavg_Yr * H6AMPH area) / H6 XxUWFaavg_Area

Create Frequency diagram of these values for QC and classify.

Logic: This weighted average probability is for the strata with greater than or equal to average chance of uncharacteristic wildfire for all strata with uncharacteristic wildfire occurrence in the subwatershed. Assumes only average or above average uncharacteristic wildfire probability have the opportunity to become a large HUC6 uncharacteristic wildfire event.

Wildfire Look up Table

Probability Assignments For Uncharacteristic Wildfire and Crown Fire
PVG - potential vegetation group
HDI - historical disturbance intensity regime
X1DI - disturbance intensity regime for no action (X1) alternatives all years
WFSV - probability of wildfire severe soil and vegetation effects

CRNFIR - Crown fire probability

To use table:

If PVG = x and HDI = x and TCG = x, Then .....

Note: Blank HDI indicates “assign to all cases of HDI”

PVG	**HDI**	**TCG Code**	**WFSV**	**CRNFIR**
Agricultural, Urban		AUR	0	0
Water, Rock		WRB	0	0
Woodland	L	HRB	.01	0
“Same”	H	“Same”	.01	0
Woodland	L	SHB	.1	0
“Same”	H	“Same”	.01	0
Woodland	L	MSF	1.0	1.0
“Same”	H	“Same”	.2	1.0
Dry Forest	L	HRB	.01	0
“Same”	H	“Same”	.01	0
Dry Forest	L	SHB	.01	0
“Same”	H	“Same”	.01	0
Dry Forest	L	ESF	.01	0
“Same”	H	“Same”	.01	0
Dry Forest	L	MSF	1.0	1.0
“Same”	H	“Same”	.2	1.0
Dry Forest	L	LSF	.01	.01
“Same”	H	“Same”	.01	.1
Dry Forest	L	LMF	1.0	1.0
“Same”	H	“Same”	.2	1.0
Moist Forest	L	HRB	.001	0
“Same”	H	“Same”	.001	0
Moist Forest	L	SHB	.001	0
“Same”	H	“Same”	.001	0
Moist Forest	L	ESF	.001	0

PVG	HDI	TCG Code	WFSV	CRNFIR
“Same”	H	“Same”	.001	0
Moist Forest	L	MSF	.9	.8
“Same”	H	“Same”	.2	.8
Moist Forest	L	LSF	.01	.01
“Same”	H	“Same”	.01	.01
Moist Forest	L	LMF	1.0	.9
“Same”	H	“Same”	.2	.9
Cold Forest	L	HRB	.001	0
“Same”	H	“Same”	.001	0
Cold Forest	L	SHB	.001	0
“Same”	H	“Same”	.001	0
Cold Forest	L	ESF	.001	0
“Same”	H	“Same”	.001	0
Cold Forest	L	MSF	.8	.7
“Same”	H	“Same”	.1	.7
Cold Forest	L	LSF	.01	.005
“Same”	H	“Same”	.01	.005
Cold Forest	L	LMF	.8	.7
“Same”	H	“Same”	.1	.6
Dry Shrub, Dry Grass	L	HRB	.8	0
“Same”	H	“Same”	.9	0
Dry Shrub, Dry Grass	L	SHB	1.0	0
“Same”	H	“Same”	1.0	0
Dry Shrub, Dry Grass	L	MSF	1.0	0
“Same”	H	“Same”	1.0	0
Cool Shrub	L	HRB	.005	0
“Same”	H	“Same”	.005	0
Cool Shrub	L	SHB	.01	0

PVG	HDI	TCG Code	WFSV	CRNFIR
“Same”	H	“Same”	.005	0
Cool Shrub	L	MSF	1.0	0
“Same”	H	“Same”	.8	0
Alpine, Riparian Shrub, Riparian Herb, Riparian Woodland	L		.005	0
“Same”	H		.005	0

CLASS INTERPRETATIONS - UNCHARACTERISTIC WILDFIRE EVENT DEFINITION AND CLASSIFICATION

For modeling purposes it may be necessary to classify the weighted average coefficients in the deliverable dbf files. The following suggestions are provided for determining class breaks for each coefficient for this variable.

Time Period Definitions

Current (CUR) - Current time period generally reflects the current year (1999) plus or minus five years (i.e., 1994-2004). Developed from data and models using administrative unit data from the past 10 years as one input. Reflects the disturbance from 1988 to 1997 (10-year average).

Future Decade (10) - Short-term future, projected 10 years into the future (2009) from the current year (1999) plus or minus five years (i.e., 2004-2014). Developed from data and models using the slope from the 10-year administrative unit data and probabilities of activity and disturbance occurrence that are associated with the mapping of different management prescriptions to reflect the alternatives.

Long-term (100) - Long-term future, projected as an average of the 10 future decade projections from the current year. The average over this period represents average conditions over the total 100-year period. Developed from data and models using the current year as the starting point and probabilities of activity and disturbance occurrence that are associated with the mapping of different management prescriptions to reflect the alternatives.

Uncharacteristic Wildfire Event Probability (UWE), Unplanned Disturbance

Subwatershed current year statistics:
Average current year non-zero values:
Standard deviation current year non-zero values:
Minimum current year non-zero values:
Maximum current year non-zero values:
Number current year zeros:
Current year distribution shape: j-shape distribution with long tail and spike. Classified into none, low, moderate, high, and very high through correlation of the above average coefficient with the input wildfire probability.
Notes on 10-year and 100-year distribution: same class breaks and similar distribution shape as current year. N, L, M, H, and VH classes same for S1/S2/S3.

Definition: Area coefficient for probability of above average size uncharacteristic wildfire events within the subwatershed. Current levels based on administrative unit 10-year average (1988-1997) as one input. Uncharacteristic wildfire events are those wildfires that have an above average probability of burning in one event more than 20 percent of the net area of the subwatershed wildland vegetation with effects outside the normal range of the historical (natural) system. The normal range is considered to be within the 400-year historic range of variability minimum plus 25 percent and maximum minus 25 percent. Uncharacteristic effects of this magnitude would have higher probabilities of reducing vegetation/litter cover, root binding capability, and heating the soil surface across large enough areas that could result in erosion events, reduction in riparian habitat condition, and increased stream temperatures.

Classification method: Stratified into classes based on the current distribution and correlation of coefficient with input wildfire probabilities (prior to determining above average event). Major wildfire events that would be contained within one subwatershed (1000-5000 gross hectares) tend to occur on a 3-6 year cycle within an ecological province. About one percent of subwatersheds within an ecological province incur these kinds of wildfire events during one of these kinds of fire years (about 3-7 large fires in an ecological province in a major wildfire year). Extreme wildfire events that contiguously burn multiple subwatersheds (5,000-

100,000 gross hectares) tend to occur on a 20-30 year cycle within an ecological province following extended drought periods. When these events occur about two percent of the subwatersheds within an ecological province can be burned during one of these kinds of fire years (about 2-4 extremely large fire events in an ecological province in an extreme wildfire year). Within the basin about 400 subwatersheds will have some type of large wildfire event over the next 100 years.

The following classifications average these long-term probabilities with the vulnerability (based on ignition probability, fuel, and terrain conditions) of the subwatershed to severe wildfire effects. The moderate, high, and very high classes have similar probabilities (0.1 or greater) of occurrence during a 100-year period, but have increasingly higher probability of severe fire effects and resistance to control. Where moderate, high, and very high classes occur in a contiguous clump there is a high probability of an extreme fire event that could burn across several or more subwatersheds.

Class	**Low**	**High**	**Interpretation**
None	0	.0000000001	No probability of an uncharacteristic wildfire event occurrence or severe fire effects and resistance to control in the subwatershed. Spatial distribution highly correlated with agricultural and urban lands in S1.
Low	.0000000002	< .05	Low probability of an uncharacteristic wildfire event in the subwatershed - wildfire event occurrence probability less than 0.1. Less than 0.5 probability of severe fire effects and resistance to control if an event occurs.
Moderate	>= .05	< .095	Moderate probability of an uncharacteristic wildfire event in the subwatershed - wildfire occurrence probability greater than 0.1. Greater or = 0.5 probability of moderately severe fire effects and resistance to control if an event occurs. Spatial distribution highly correlated with subwatersheds that have complex terrain and extensive amounts of high departure conditions in the dry shrub, cool shrub, and moist forest in S1.
High	>= .095	< .245	High probability of an uncharacteristic wildfire event in the subwatershed - wildfire occurrence probability greater than 0.1. Greater than 0.5 probability of severe fire effects and resistance to control if an event occurs. Spatial distribution highly correlated with subwatersheds that have complex terrain and extensive amounts of high departure conditions in the dry end of the moist forest, dry forest, and moist end of the dry shrub PVGs in S1.
Very High	>= .245	<= 1.0	Very High probability of an uncharacteristic wildfire event in the subwatershed - wildfire occurrence probability greater than 0.1. Greater than 0.5 probability of very severe fire effects and resistance to control if an event occurs. Spatial distribution highly correlated with subwatersheds that have complex terrain and extensive amounts of high departure conditions in the dry end of the moist forest, dry forest, and moist end of the dry shrub PVGs in S1.