Description of Scenario 1B, Forest Resiliency, Vulnerability, and Departure from Desired Conditions

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This Scenario compares forest Desired Conditions (DC) with current conditions to represent factors that contribute to ecosystem diversity and vulnerabilities to disturbance agents likely to impede a trajectory toward achieving those desired conditions. These DCs and the departure from the DCs represent our current view of forest resiliency, or lack thereof in some cases, under current climatic conditions. Adaptation strategies will need to be assessed, and DCs may need to be modified as we learn more about the trajectory climate change may influence future forest vulnerabilities to disturbance agents.

This analysis takes advantage of all of the studies documented in the Region One planning records, and Comprehensive Evaluation Reports (CER) concerning how the Historic Range of Variation (HRV) of forest vegetation helped to **inform** Desired Conditions for forest vegetation in the Draft Forest Plans for the Nez Perce, Clearwater, IPNF, Kootenai, Flathead, Lolo, Bitterroot, and the DC, Goals and Objectives from the Revised Forest Plan for the Beaverhead-Deerlodge NF. Information and analysis completed as part of the East-Side Analysis of the Management Situation (AMS 2001) in terms of HRV modeled for 21 Geographic Areas using SIMPPLLE, was used to approximate a reasonable estimate of DC for those areas within the Helena, Lewis and Clark, Gallatin, and Custer National Forests. Non forest vegetation vulnerabilities were assessed in Scenario 1C for all Forests including the Dakota Prairie Grasslands.

These evaluations were completed on 55 Analysis Areas similar to Baily's Subsections, and were modified to fit watershed and State boundaries for ease of analysis in the Ecosystem Management Decision Support (EMDS) model. Desire Conditions, were taken directly from the Draft or Revised Forest Plans located at:

http://www.fs.fed.us/r1/wmpz/documents/
http://www.fs.fed.us/kipz/documents/plmp/CER/index.php
http://www.fs.fed.us/cnpz/forest/documents/index.shtml
http://www.fs.fed.us/cnpz/forest/documents/sup_docs/index_forveg_clw.shtml
http://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5052767.pdf (B-D)

Current conditions were evaluated using the periodic FIA plot data located within each of the 55 S1B Analysis Areas. Vegetation attributes contained in the DCs and the current condition include primary dominance types in terms of species composition, size classes of the forest, and density of the dry forest portion of each landscape. The Dominance Types and the Size Class Desired Conditions were taken directly from the Draft or revised Forest Plans. However, these Plans, at the time of this assessment, did not have specific desired conditions for density for the Dry Forest Type. For this assessment we used FVS and FFE to look at a range of Basal Areas that would result in reduced crown fire behavior and lower bark beetle hazard. (see appendix for examples) A range of 55-75

square feet of basal area was used on west-side Forests as a desirable density to achieve these objectives, while 40-70 sq ft of BA was used in the analysis on east-side Forests. A range of 40-60% of the Dry Forest Type for these densities, on each forest, was used as a desired condition for density of the Dry Forest Type until more specific information becomes available during the planning process. The means were used to evaluate how close to desired conditions an attribute currently is. This data is available in spreadsheets that also contain the evaluation of confidence interval with the lower bound, mean and upper bound. This information allows the user to determine how confident we are in the estimates of current condition. In some cases the confidence interval may span outside the DC while the mean is within the DC. In this case, we would be less certain that the true mean is within the DC and we may be less certain how departed and attribute actually is if the true mean were known. One limitation of using the periodic data is that these plots for the most part were measured during the 1990s, prior to significant bark beetle outbreaks and fires during 2000 to present. Annualized FIA plot data for the last five years was not yet available for this analysis, but will be used to update this evaluation as soon as it does become available. This should provide a reasonable monitoring opportunity in terms of changes due to disturbance.

Current and projected hazards, risks, and probabilities of disturbance agents such as insects and diseases, fire burn probability, and noxious weeds were evaluated for those risks to further impeding progress, or providing progress toward DCs in the EMDS decision model for this S1B scenario. A departure quantity or "index" was calculated using the DC and CC information, then evaluated against the known insect and disease disturbance since 2000 from the Aerial Detection Survey, and the future disturbance probabilities or risks as noted above. Each S1b Analysis Area was then given a relative number or "vulnerability index" to represent the vegetation DC values at risk, to enable comparison across the Region or Sub Region (North Idaho, Western Montana, Eastern Montana, DPG). The higher the index, the higher priority it might be to direct management actions to reduce vulnerability and further make progress toward DCs. One limitation of this analysis is that it does not include the influence that the spatial pattern of compositions, size classes, and density classes may have on the resiliency of the forest. This can be evaluated using a landscape simulation model (such as SIMPPLLE), such as been completed for the evaluation of HRV for Forest Plan Revision. A DC for pattern within an Analysis Area or landscape would be a helpful addition to further assess forest resiliency.

Metadata including links to basis for DCs, Spatial GIS map of the S1B Analysis Areas, and evaluation spreadsheets are available with the details of the evaluation.

Appendix

Example evaluation of the effect of density on fire and bark beetle hazard

Silviculture Prescription narrative Rx A: Slash trees less than 7”

This treatment is replicated in stands that have ladder fuels in stands that do not have enough stocking in trees over 7 inches DBH to effectively commercial thin at this time, is intended to reduce all ladder fuels in the less than 7 inch diameter class, to reduce crown fire potential. The treatment will slash all trees less than 7 inches and hand pile and burn the slash. 10% of the areas will not be slashed to promote wildlife habitat diversity. The stands will be prescribed burned every 10 years through year 30 to reduce canopy bulk density as well as ladder fuels and ground fuels to produce a resilient stand that does not have a characteristically high potential for crown fire. Ponderosa pine will be favored for leave in all treatments due to their ability to withstand low severity fire.

Silviculture Prescription narrative Rx B: Commercial thinning

This treatment is replicated in stands that have ladder fuels and that do have enough stocking in trees over 7 inches DBH to effectively commercial thin at this time. This is intended to reduce all ladder fuels in the less than 3 inch diameter class through slashing and piling, while commercial thinning from below to a residual basal area of 60 square feet to reduce crown fire potential. Tops will be removed during whole tree yarding as will all trees from 3” to 7” DBH and piled and burned at the landing. The stands will be prescribed burned immediately after this commercial thinning to reduce ground fuels. The stands will be prescribed burned every 10 years, (years 10, and 20 from year of commercial thinning) and beginning in year 30, a commercial thin reducing stand stocking down to 60 square feet of basal area, will be completed to reduce canopy bulk density as well as ladder fuels and ground fuels to produce a resilient stand that does not have a characteristically high potential for crown fire. Prescribe burn after this commercial thin. Ponderosa pine will be favored for leave in all treatments due to their ability to withstand low severity fire. A variation will be tested for this stand that reduces BA to 40 for commercial thin treatments.

Silviculture Prescription narrative Rx C: Commercial thinning

This treatment is replicated in stands that have ladder fuels and that do have enough stocking in trees over 7 inches DBH to effectively commercial thin at this time. This is intended to reduce all ladder fuels in the less than 3 inch diameter class through slashing and piling, while commercial thinning from below to a residual basal area of 60 square feet to reduce crown fire potential. Tops will be removed during whole tree yarding as will all trees from 3” to 7” DBH and utilized as biomass. The stands will be prescribed burned immediately after this commercial thinning to reduce ground fuels. The stands will be prescribed burned every 10 years, (years 10, and 20 from year of commercial thinning) and beginning in year 30, a commercial thin reducing stand stocking down to 60 square feet of basal area, will be completed to reduce canopy bulk density as well as ladder fuels and ground fuels to produce a resilient stand that does not have a characteristically high potential for crown fire. Prescribe burn after this commercial thin. Ponderosa pine will be favored for leave in all treatments due to their ability to withstand

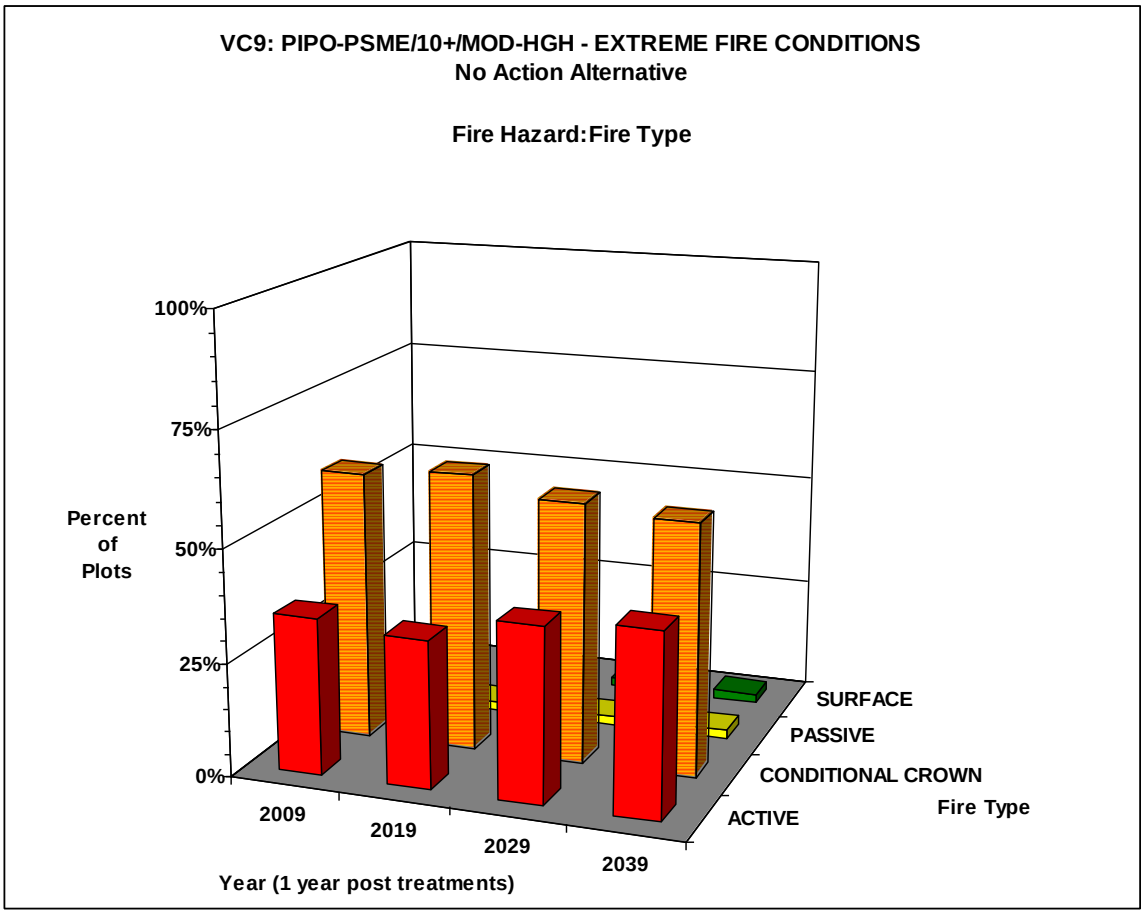
low severity fire. A variation will be tested for this stand that reduces BA to 40 for commercial thin treatments.

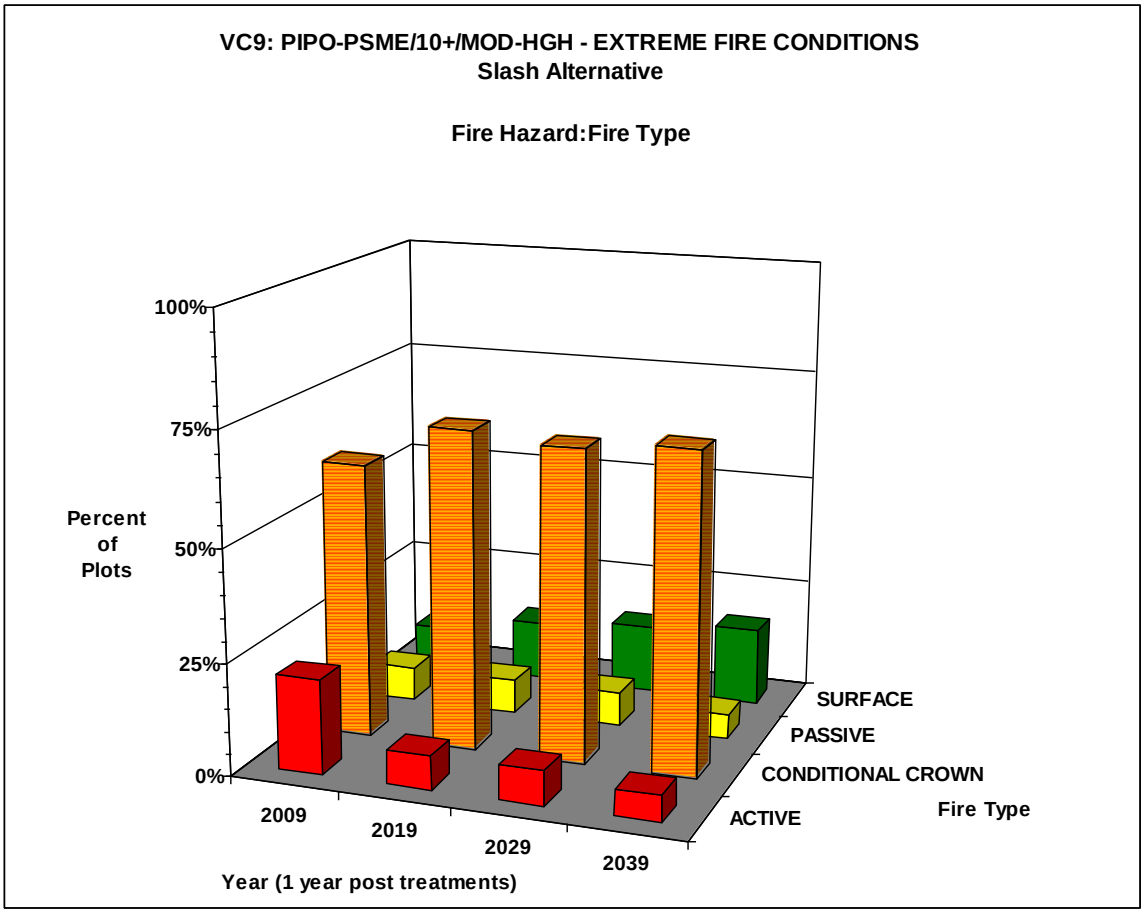
Fire Modeling

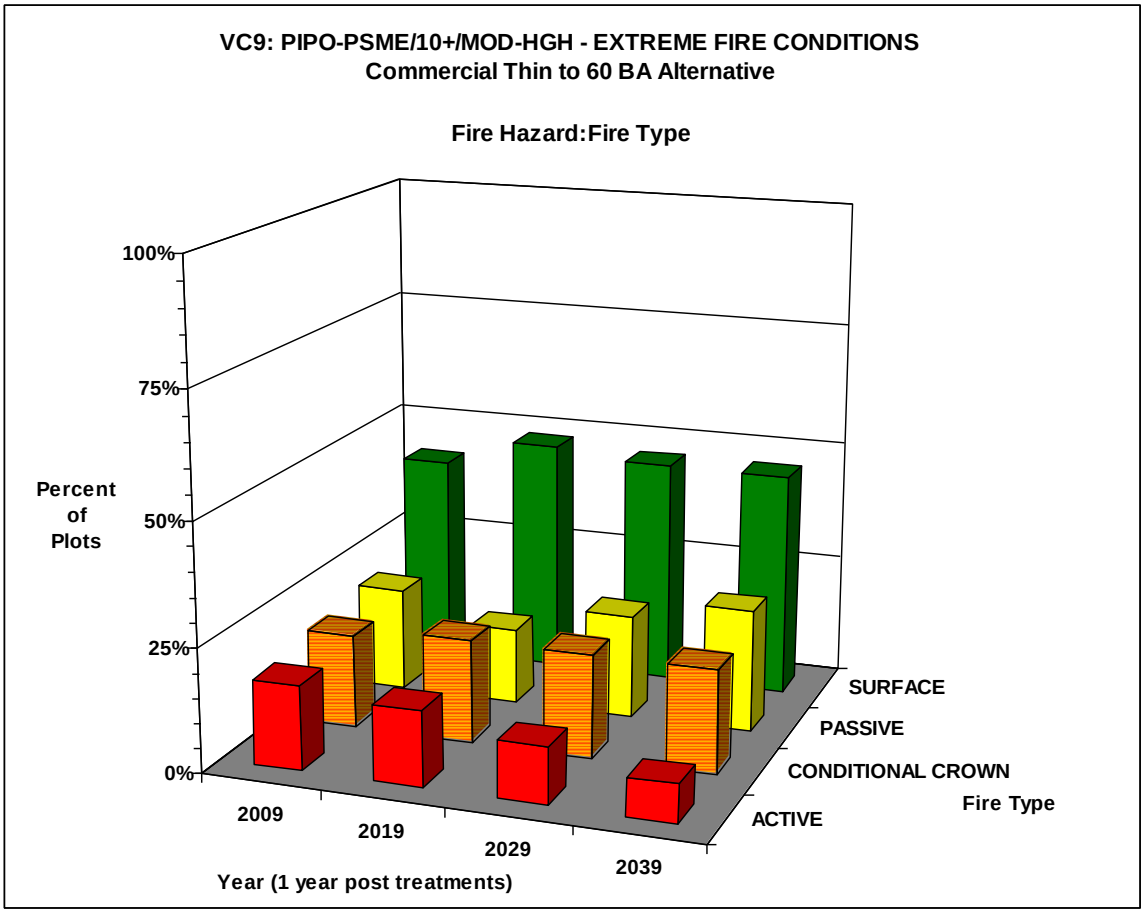
	Low Fire*	Medium * Fire	Average Fire	Bitterroot Pocket Card	Extreme Fire
20 foot wind speed	0	5-10	15	20	40
Temperature	70	75	75	>85, RH<20%	90
Percent Fuel Moistures:					
1 hour (0-1/4")	12-15	8-10	6		4
10 hour (1/4-1")	12	10	8		6
100 hour (1-3")	14	12	10		7
1000 hour (3"+)	30	20	15		12
duff	150	100	100		65
live	150	100	90	<100	60

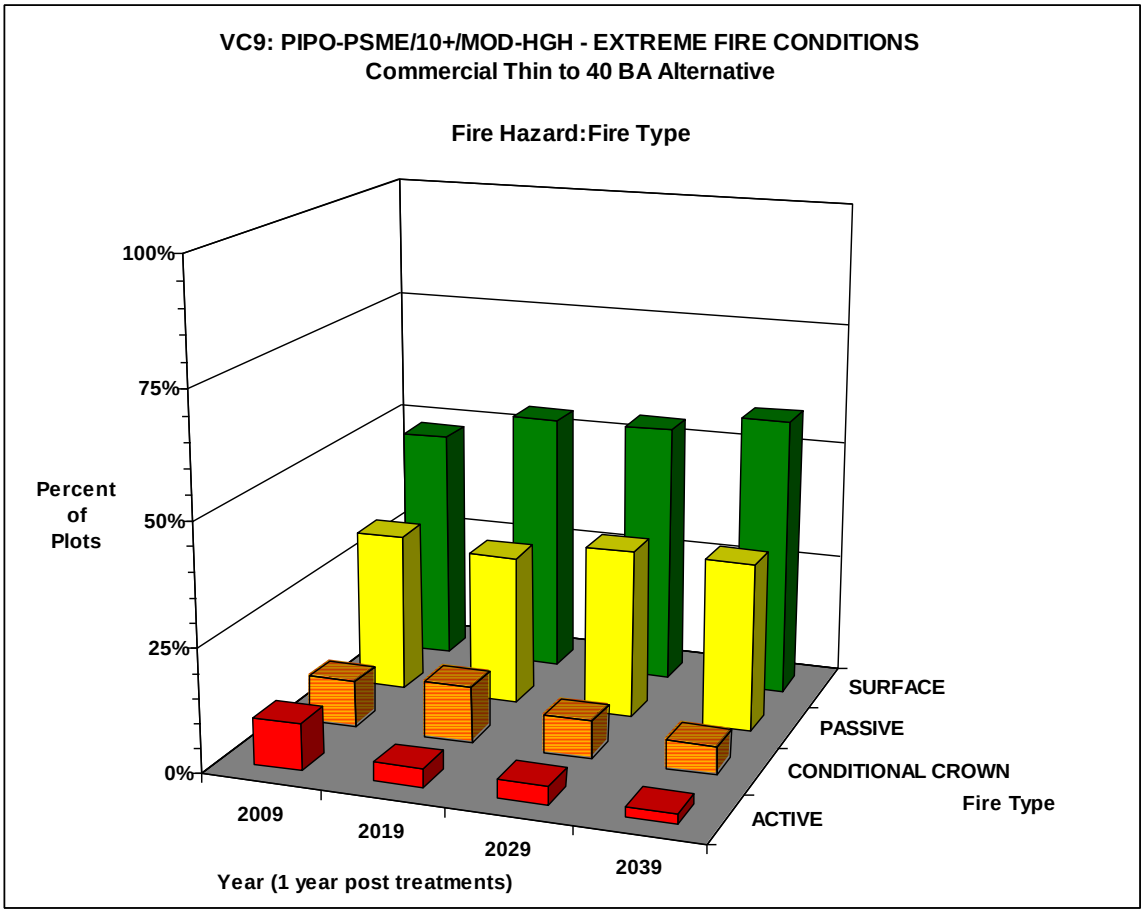
Fire modeling to test crown fire potential at various stages including **after each prescribed burn** for all prescriptions and in addition in the case of the slashing treatment, after the initial slashing hand pile and burn were completed with the assumptions in the table above.

The summary of results of the analysis are included in the following graphs:



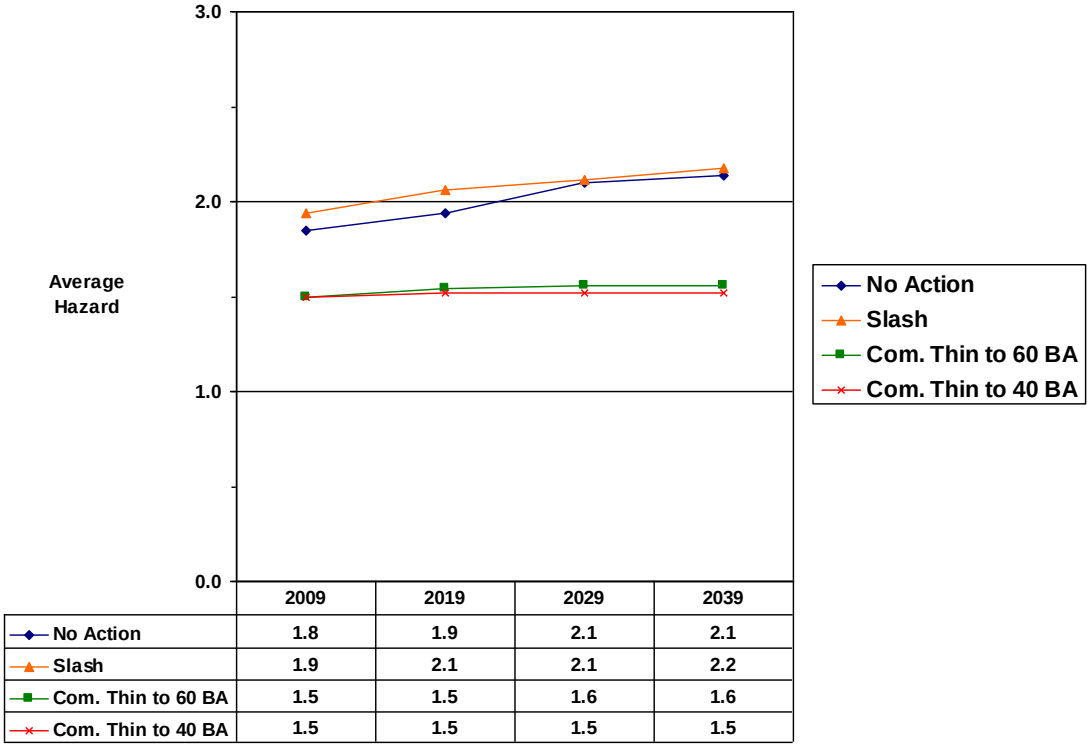

VC9: PIPO-PSME/10+/MOD-HGH - EXTREME FIRE CONDITIONS
Slash Alternative
Fire Hazard:Fire Type
100%
75%
50%
25%
0%
Percent of Plots
2009
2019
2029
2039
Year (1 year post treatments)
SURFACE
PASSIVE
CONDITIONAL CROWN
ACTIVE
Fire Type


VC9: PIPO-PSME/10+/MOD-HGH - EXTREME FIRE CONDITIONS
Commercial Thin to 60 BA Alternative
Fire Hazard:Fire Type
100%
75%
50%
25%
0%
Percent of Plots
2009
2019
2029
2039
Year (1 year post treatments)
SURFACE
PASSIVE
CONDITIONAL CROWN
ACTIVE
Fire Type


VC9: PIPO-PSME/10+/MOD-HGH - EXTREME FIRE CONDITIONS
Commercial Thin to 40 BA Alternative
Fire Hazard:Fire Type
100%
75%
50%
25%
0%
Percent of Plots
2009
2019
2029
2039
Year (1 year post treatments)
SURFACE
PASSIVE
CONDITIONAL CROWN
ACTIVE
Fire Type

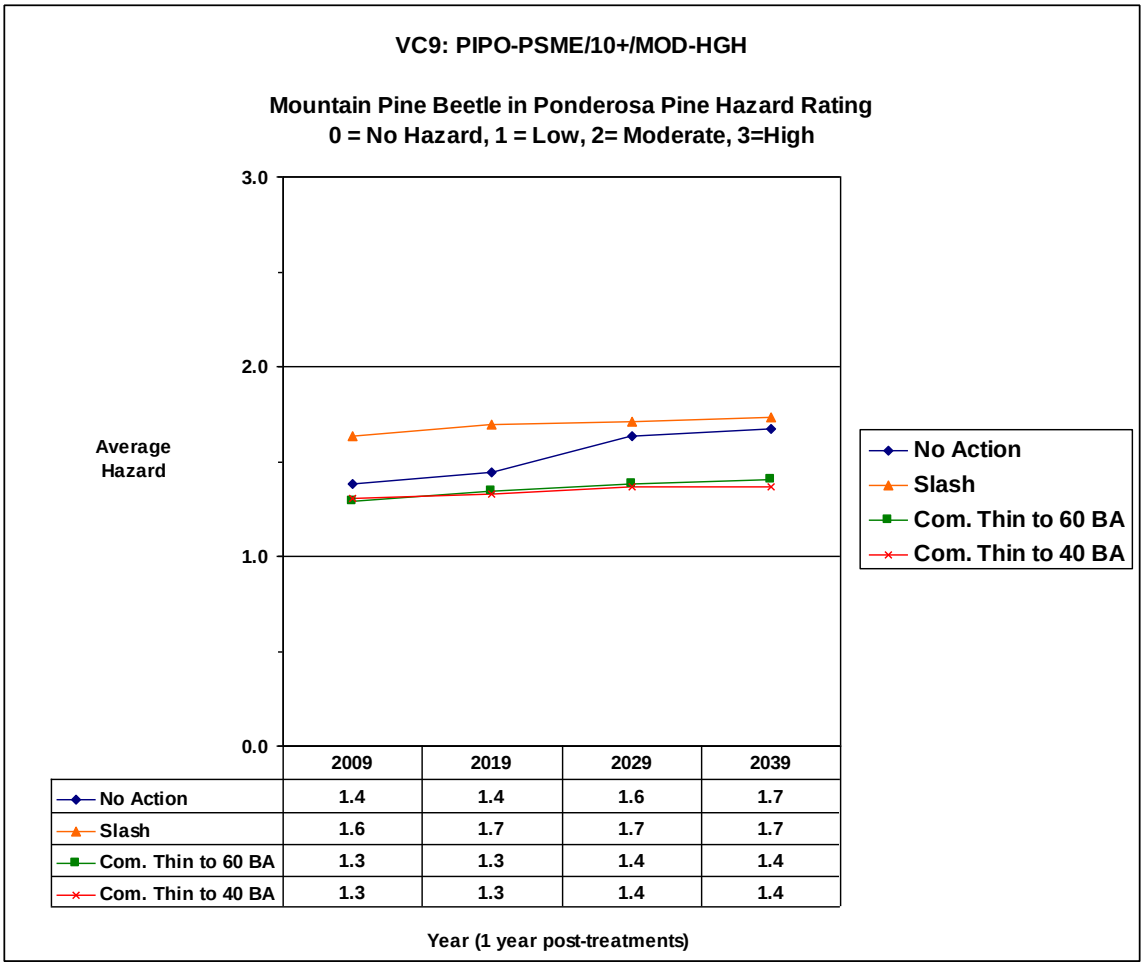
VC9: PIPO-PSME/10+/MOD-HGH

Douglas-fir Beetle Hazard Rating
0 = No Hazard, 1 = Low, 2= Moderate, 3=High



	2009	2019	2029	2039
No Action	1.8	1.9	2.1	2.1
Slash	1.9	2.1	2.1	2.2
Com. Thin to 60 BA	1.5	1.5	1.6	1.6
Com. Thin to 40 BA	1.5	1.5	1.5	1.5

Year (1 year post-treatments)



	2009	2019	2029	2039
No Action	1.4	1.4	1.6	1.7
Slash	1.6	1.7	1.7	1.7
Com. Thin to 60 BA	1.3	1.3	1.4	1.4
Com. Thin to 40 BA	1.3	1.3	1.4	1.4

Interpretation

The Forest Vegetation Simulator (FVS) along with the Fire and Fuels Extension (FFE) and bark beetle hazard model extensions were used to predict effects in terms of resilience to fire and bark beetle hazard for each scenario.

Fire

Action alternatives produce much more ground fire and passive fire due to the reduction of ground fuels, ladder fuels, and canopy bulk density through commercial thinning. Slashing is not as effective as crown fuels are not reduced enough to as effectively reduce the crown fire potential.

Bark beetle hazard

The plot data used were not initially high hazard to bark beetle mortality; however the treatments do show a continuation of a low to moderate hazard. So perpetuation of the

current low hazard through treatments over time help to maintain resilient stand conditions related to beetle hazard.

Resilience

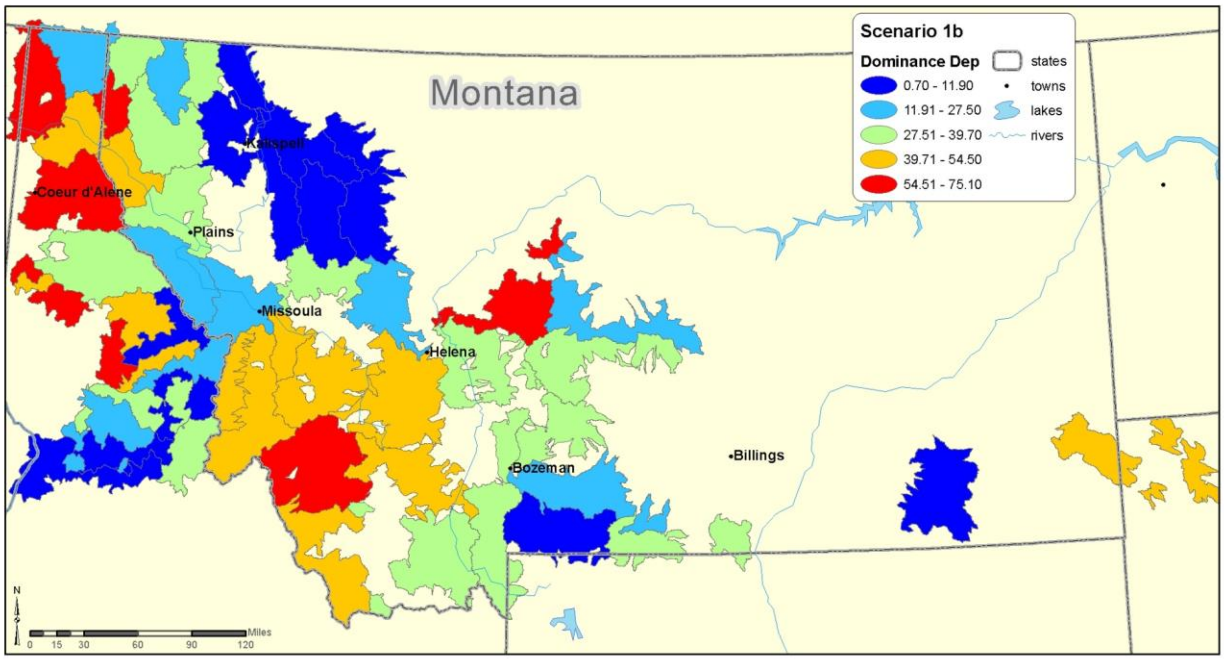
When considered together, the treatments in these stands produce more resilient composition and structure in terms of both potential fire effects and beetle hazard over time compared to the no action alternative for the time period in the analysis.

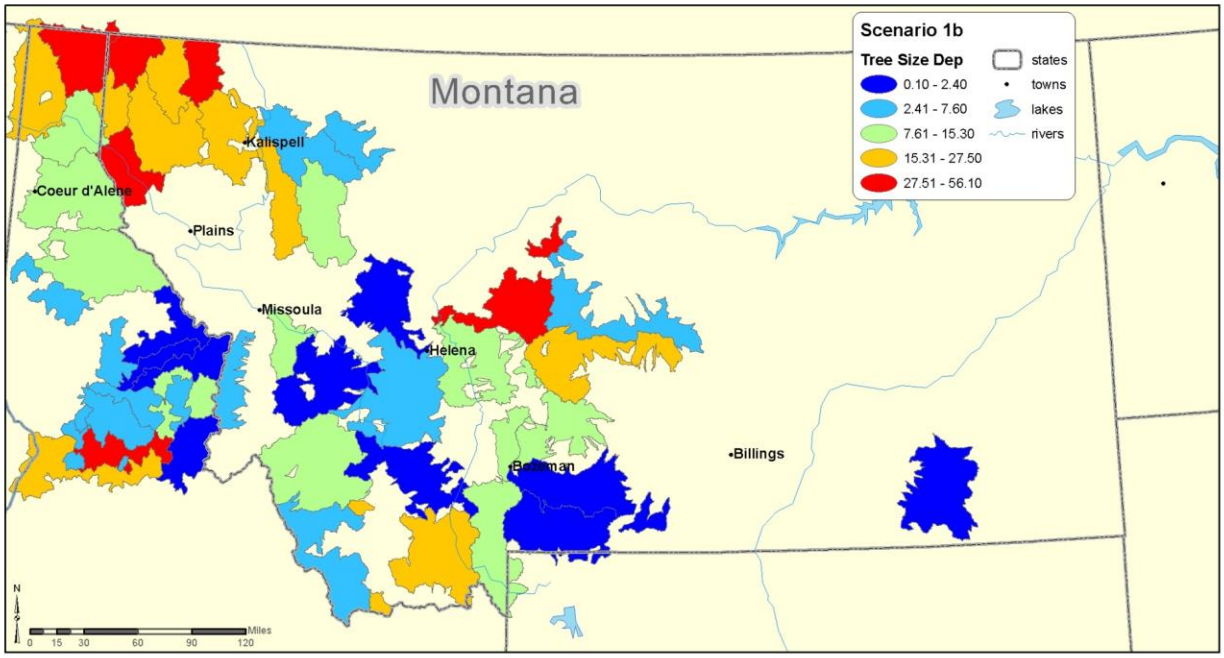
Summary

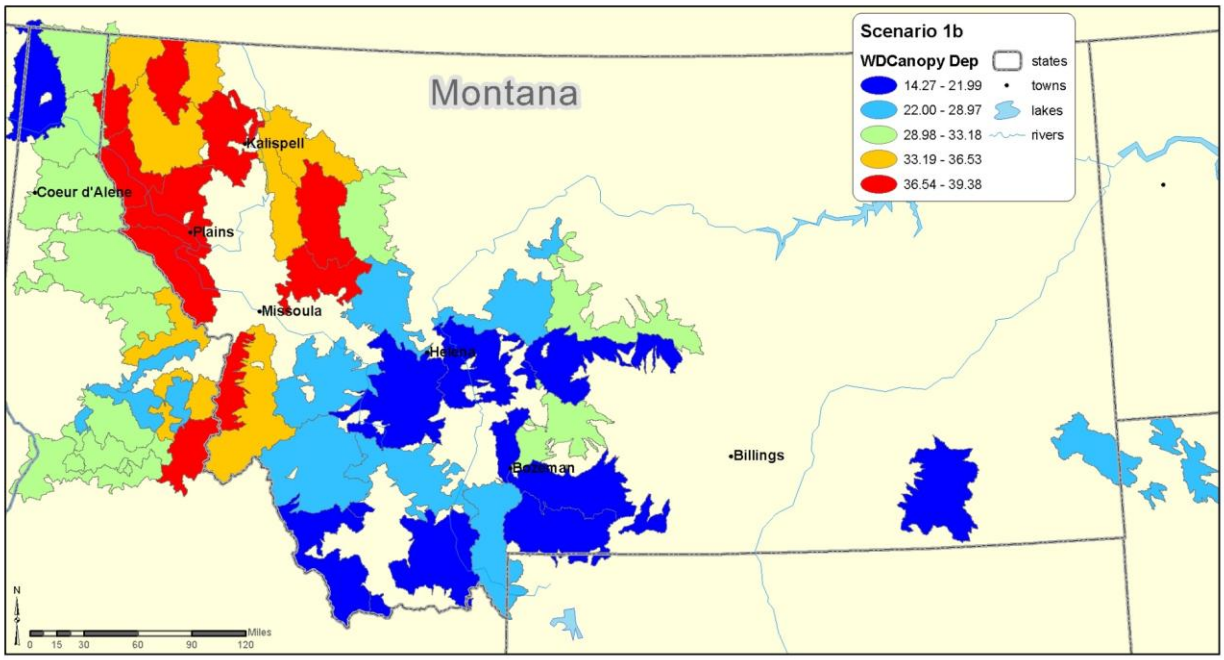
This analysis using FVS with extensions for fire and fuels, bark beetles, can be completed on any projects having plot level data taken with common stand exam procedures.

This analysis provides an example of how the issue of forest resilience can be addressed in this dry forest type example. One limitation of a stand level effects analysis is that the landscape context may produce conditions for crown fire or large scale beetle out breaks that may influence stand level mortality especially if the treatments were randomly located rather than strategically placed. Strategic placement of treatment units (pattern) need to be evaluated as well as stand level effects.

Specifics of any given stand to be evaluated at the project level will vary, so analysis results between alternatives may show other differences not apparent with the stand data in this example analysis. However, the analytical approach used, can be completed for project level effects analysis's for a variety of proposed actions.


Scenario 1b
Dominance Dep
0.70 - 11.90
11.91 - 27.50
27.51 - 39.70
39.71 - 54.50
54.51 - 75.10
states
towns
lakes
rivers
Montana
Kalispell
Coeur d'Alene
Plains
Missoula
Helena
Bozeman
Billings
N
0 15 30 60 90 120
Miles


Scenario 1b
Tree Size Dep
0.10 - 2.40
2.41 - 7.60
7.61 - 15.30
15.31 - 27.50
27.51 - 56.10
states
towns
lakes
rivers
Montana
Kalispell
Coeur d'Alene
Plains
Missoula
Helena
Billings
N
0 15 30 60 90 120
Miles


Scenario 1b
WDCanopy Dep
14.27 - 21.99
22.00 - 28.97
28.98 - 33.18
33.19 - 36.53
36.54 - 39.38
states
towns
lakes
rivers
Montana
Kalispell
Coeur d'Alene
Plains
Missoula
Helena
Billings
Bozeman
N
S
0 15 30 60 90 120
Miles