A Collaborative Fire Hazard Reduction/ Ecosystem Restoration Stewardship Project in a Montana Mixed Ponderosa Pine/Douglas-Fir/ Western Larch Wildland Urban Interface

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Abstract—*Forest Service managers and researchers designed and evaluated alternative disturbance-based fire hazard reduction/ecosystem restoration treatments in a greatly altered low-elevation ponderosa pine/Douglas-fir/western larch wildland urban interface. Collaboratively planned improvement cutting and prescribed fire treatment alternatives were evaluated in simulations of disturbance processes and interactions with the partially restored wildland urban interface conditions. The SIMPPLLE modeling system was used to reconstruct historic landscape conditions across a broad range of fire regimes and to model future landscapes that reduce fire severity, restore wildlife habitats, reduce bark beetle severity; and disclose environmental effects.*

Introduction

The Frenchtown Face, on the Ninemile Ranger District of the Lolo National Forest, is a south to southwest facing landscape approximately 15 miles west of Missoula, Montana (figure 1). The 96,381 acre landscape is comprised of the Lolo National Forest (45 percent), private ownerships (27 percent), Plum Creek Timberlands (25 percent), and Montana Department of Natural Resources and Conservation land (3 percent). The landscape character is integral to the rural community settings of Frenchtown and Huson, located on the southern edge of the project boundary.

Figure 1—Frenchtown Face topography.

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Roughly one-third of the landscape is considered benchlands that gradually rise in elevation from the Clark Fork River to the toe of the steeper mountain slopes along the Ninemile Fault. The benchlands are characterized by open grassland, agricultural land, and/or residences within the forest that make up the wildland urban interface zone. The forested residence benchland areas consist mainly of ponderosa pine/Douglas-fir habitat types with inclusions of western larch.

In 1992 the Lolo National Forest implemented a landscape approach to ecosystem management: management for healthy and sustainable communities and landscapes, and management for sustainable human values, uses, and populations. Using this approach, 15 landscapes, or ecosystem management areas, of the Ninemile Ranger District were prioritized by restoration needs. The highest priority for restoration were landscapes containing the greatest amount of low-elevation warm forest habitat types characterized by low intensity, frequent fire regimes. Frenchtown Face became the fourth major project addressing this approach.

In March 2000, an additional landscape analysis highlighted the need to restore the landscape components of composition, structure, and function to near presettlement times. The new analysis pointed out the need for:

- fuel reductions in wildland urban interface and upland forests;
- improved forest health;
- reductions of insects and diseases from abnormally elevated risk levels;
- improved big game winter range;
- enhancement and recruitment of old growth forests; and
- meeting Lolo Forest Plan expectations in recreation and aesthetic scenery values.

Current Landscape Conditions

Restoration of ponderosa pine forests to landscapes resembling presettlement times has become a necessity due to the current upward density trends of small diameter trees along with higher fuel loading levels (Bonnicksen and Stone 1982; Chang 1996; Parker 1984; Parsons and DeBenedetti 1979). Fire suppression, historic grazing, timber harvesting, and climatic changes have all played a role in the upward trends of density and fuel loadings within the Frenchtown Face restoration project area (Arno and others 1997; Parsons and DeBenedetti 1979; Skinner and Chang 1996). The probability of high severity wildfire and deterioration of ecosystem integrity have increased on the landscape (Dahms and Deils 1997; Patton-Mallory 1997; Stephens 1998; Weatherspoon and Skinner 1996). This deterioration is similar to conditions reported in the Blue Mountains of Oregon and Washington (Everett 1993), the Columbia River Basin (Quigley and Cole 1997), and the Sierra Nevada Ecosystem Project (SNEP 1996, Weatherspoon and Skinner 1996). All of these have highlighted the need for large-scale, strategically located small tree thinning, fuel treatment, and use of prescribed fire (McIver and others 2001).

The dense, young ponderosa pine/Douglas-fir forests that occupy the low elevation areas of the Frenchtown Face are substantially different from historic ponderosa pine stands as a result of fire suppression. Several wildlife species are at risk as a result. The goals of the Frenchtown Face project include restoring habitat for those species. Wildlife species in the Frenchtown

Face area include those typical for the Northern Rockies. Species of special interest due to their sensitive, management indicator, or federally listed status include pileated woodpeckers, flammulated owls, northern goshawks, mule deer, elk, wolves, American martens, fishers, wolverines, and Canada lynx.

Along with wildlife habitat restoration, invasive weed mitigation is a major component of the project. Invasive weeds are abundant in much of the low elevation portions of the Frenchtown Face. Weeds can substantially reduce the forage productivity for wintering deer and elk (USDA 1999). Weeds have a competitive advantage over native plants and are shade-intolerant and disturbance-dependent, which complicates the restoration of frequent, fire-dependent forests.

Historic Landscape Conditions

The historic range of variability (HRV) encompasses a large temporal range that produced ecological conditions that were sustainable over a long time frame. The HRV attempts to describe the ecosystems prior to influences from European descendents. Human influences are considered a part of the natural condition. The HRV was developed from several sources: findings of the Interior Columbia Basin (USDA 1997); Fischer and Bradley (1987); Losensky (1993); a fire history study (Losensky 1989) within the analysis area; and SIMPPLLE simulations.

Two vegetation groupings used in this project are: (1) habitat type groups (HTG) as used in the Lolo Forest Plan (April 1987); and (2) fire groups (FG) (Fischer and Bradley 1987). Only the habitat types that comprise the warm, dry lower slopes are a focus of this project. These areas represent 61 percent of the project area.

Warm-Dry Forest Vegetation of Lower Slopes

Historical conditions perpetuated seral forests of ponderosa pine and western larch in association with Douglas-fir and, in some instances, lodgepole pine. The dry benchlands at low elevations during presettlement were typified by open grown stands of old growth ponderosa pine of large sawtimber size (Losensky 1993). Frequent low intensity fires kept litter and slash accumulations very low, brush species were less common than present day and more succulent, and Douglas-fir was a minor component of the forests. Fire thinned saplings, removed Douglas-fir thickets, and caused pitching of tree boles, which created long-standing snags. Stand replacement events were rare. Tree mortality was largely in the form of small pockets of windthrow, root disease, or bark beetle activity. These small openings were soon regenerated by ponderosa pine and Douglas-fir with ponderosa pine being favored by frequent fire.

Adjacent toe-slopes are characterized as warm-dry to warm-moist Douglas-fir, grand fir, ponderosa pine, and larch. Associated firegroups 4, 6, and 11 characterize these environments. A tendency toward overstocking and development of the dense understories increase the hazard of stand-replacement fires on these sites.

On the north sides of these ridges, it was not uncommon for Douglas-fir to dominate all stages of succession. Ponderosa pine, larch, and lodgepole pine are seral components whose abundance varies by habitat type phase. Figure 2 displays the current extent of the dominant cover types. Figure 3

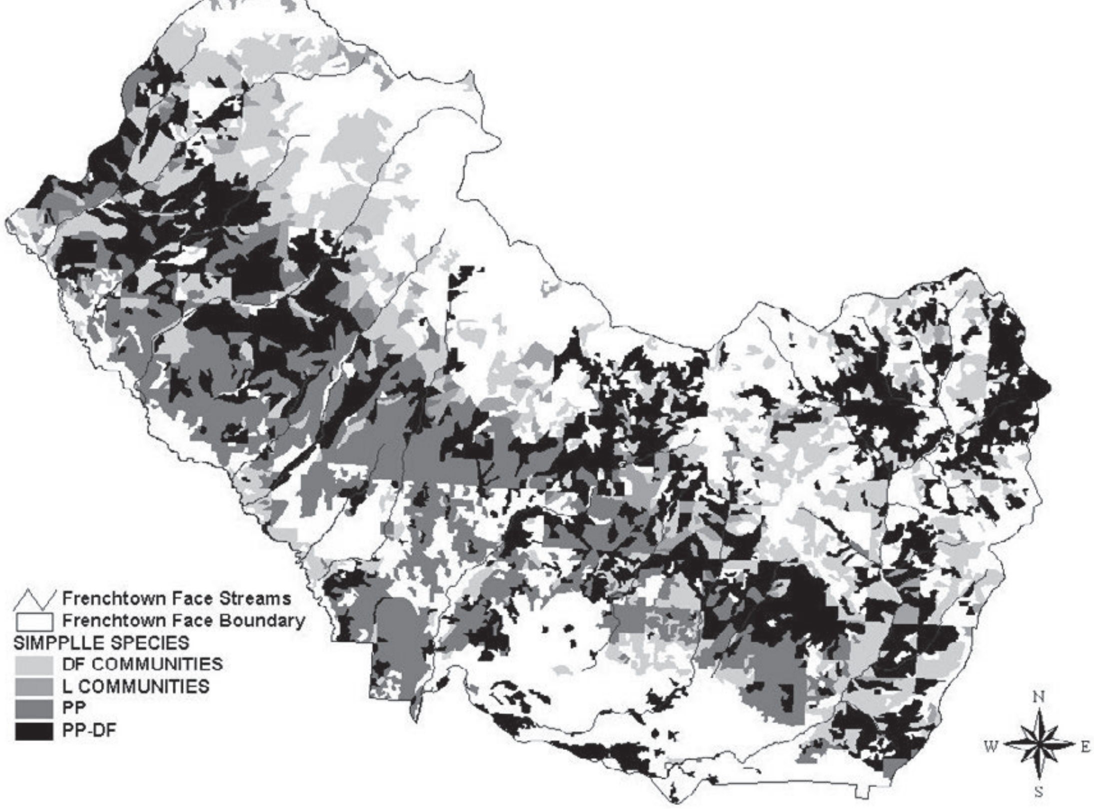

Figure 2—Current ponderosa pine, ponderosa pine/Douglas-fir, larch, and Douglas-fir cover types within Frenchtown Face.

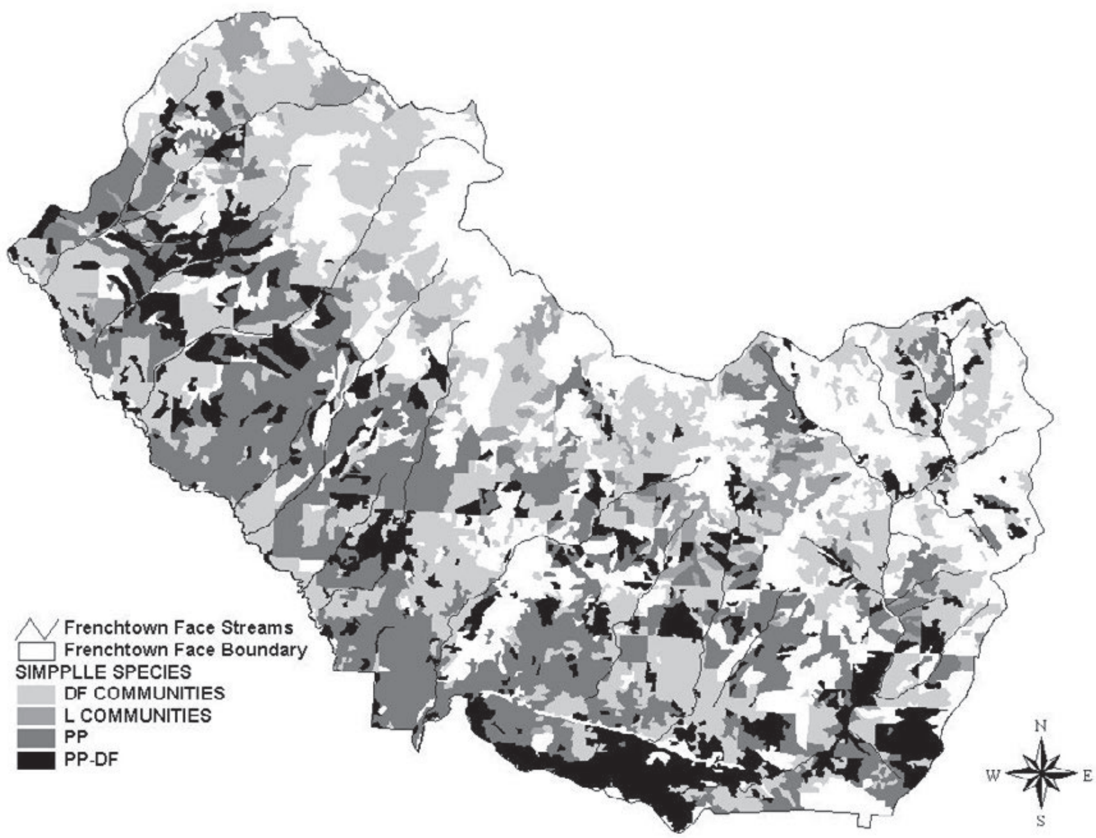

Figure 3—Historic representation of ponderosa pine, ponderosa pine/Douglas-fir, larch, and Douglas-fir cover types produced by SIMPPLLE simulations.

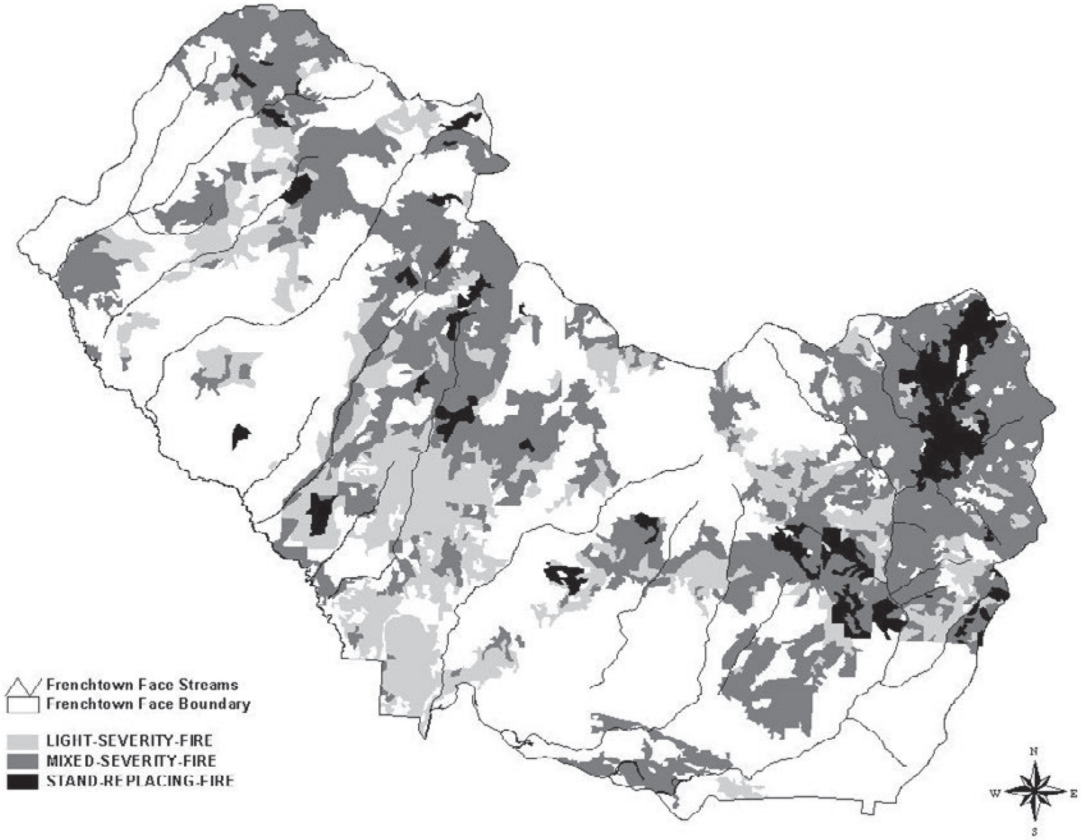

Figure 4—Simulated occurrence of light-severity, mixed-severity, and stand-replacing fire on a historic representation of the Frenchtown Face landscape for a one-decade period.

displays a representation of historic cover types produced by SIMPPLLE simulations. Stand-replacing fire hazard like the adjacent toe-slopes tendency increased on these sites due to dense understory vegetation. A wide array of forest structures and compositions within the natural fire regime are possible (figure 4). Stands tended to be evenly distributed over the various age classes with 30 percent less than 40 years of age and 35 percent old growth (Losensky 1993).

In firegroups 4 and 6, large diameter snags occurred at low densities (Ritter and others 2000) and provided nest habitat for pileated woodpeckers and flammulated owls (McClelland 1977, Wright 1996). The relatively open understories provided flammulated owls opportunities to forage using a combination of drop pouncing and hawk gleaning behavior on moths and grasshoppers (Wright 1996). Frequent, non-lethal wildfires repeatedly scarred ponderosa pines. This resulted in cumulative pitch build-up that made those trees very rot-resistant after they died, resulting in snags that stood for very long periods of time (Smith 1999). Low-to-moderate stocking and frequent non-lethal underburns resulted in a high forage productivity of understory shrubs and grasses, which provided forage for high populations of wintering mule deer and elk (Hillis and Applegate 1998). These open forests also provided excellent foraging habitat for northern goshawks (Clough 2000), although the stands were generally too open for nesting. The small percentage of old growth that remains has dense, continuous understories which preclude successful foraging by flammulated owls (Hillis and others 2002). While small diameter snags are abundant, they lack the high pitch content of trees that are exposed to frequent fires, and thus have little durability after death. Mule deer and elk have been largely replaced by white-tailed deer. There has been an increase in songbirds, such as vireos and Townsend's warblers, that occupy dense forests (Hutto and Young 1999).

Collaborative Process

A community-based purpose and need, and public-recommended proposed actions for the Frenchtown Face project, were formulated through a series of public meetings

These meetings formed the basis of the environmental analysis and formal public scoping process under NEPA (National Environmental Policy Act). An underling premise of this approach is that formal public participation in the development of a proposal will lead to a more efficient and less contentious environmental analysis and project decision.

Figure 5 represents the expanded NEPA sequence process including the steps taken in collaborating with the public.

Participation was fairly broad with a cross section of local residents, forest industry, State agencies, rural fire department, and media. Separate, concurrent meetings were held with local environmental group representatives who declined to attend public meetings. Public values were expressed as purpose and need statements by the interdisciplinary team and then validated by the public at subsequent meetings.

The public identified a need for coordinated block management of noxious weed treatments, environmental education in schools, historic site interpretation, increased communication through the formation of interest groups, and enforceable decisions, e.g., road closures. Environmental group participation resulted in a reduced magnitude, or area, of timber harvest restoration treatments, and the creation of three alternatives: 2, 3, and 4.

During formal scoping, the public and environmental groups responded with issues and concerns to the proposed action. The interdisciplinary team used these responses to formulate draft alternatives. The draft alternatives were then presented at public meetings for additional feedback and adjustment.

Restoration Treatments

Ecological sustainability requires the restoration of process as well as structure (Stephenson 1999, Arno 1996). Fire regimes and stand structures

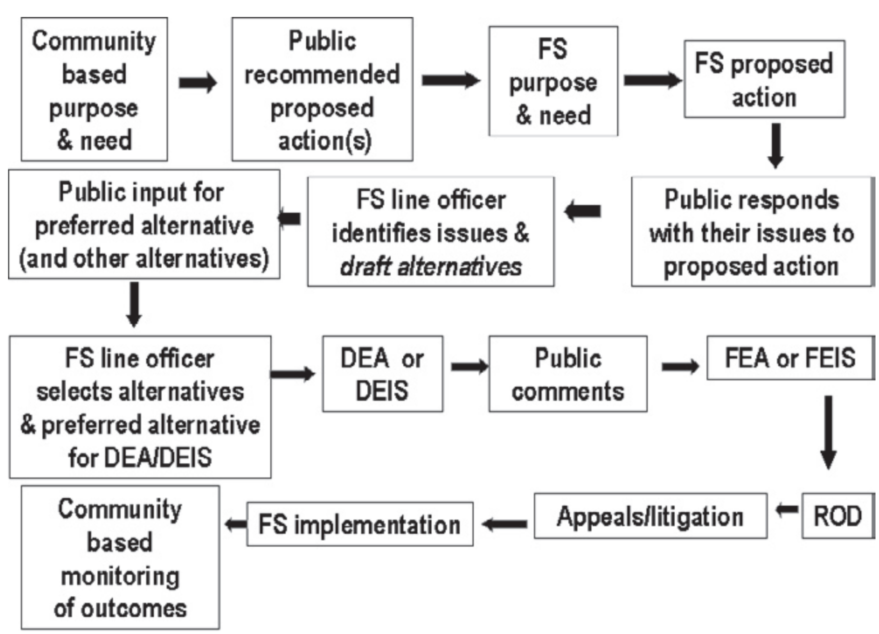

Figure 5—Frenchtown Face NEPA sequence.

interact and must be restored in an integrated way. Fire alone may be too imprecise or unsafe in many settings, so a combination of treatments may often be the safest and most certain restoration approach (Allen 2002). A recent wildland urban interface fuel reduction study (Scott 1998) conducted on the Ninemile Ranger District to compare thinning treatments found the most effective treatment was a thinning from below to a basal area of 76 ft^2/acre followed with prescribed fire (similar to the proposed action). And that periodic application of the treatment would lead to an open-structured forest of large trees with high aesthetic value.

Three recent restoration projects on the Ninemile Ranger District treat low-elevation ponderosa pine/Douglas-fir forests of frequent low intensity fire regime in a similar fashion as the Proposed Action, Alternative 2 (i.e., Starkhorse, Petty Rock, and Sawmill-Cyr). Single tree selection retaining a residual basal area of 30 to 60 ft^2/acre thinned stands from below, cutting excess understory trees and thinning excess crowns in the overstory to partially restore historic structure. The harvesting was followed with understory prescribed burning to partially restore historic ecological processes. The average harvest volume of these three projects was 3 MBF/acre with 49 percent of the volume coming from cut trees less than 12 inches DBH, 45 percent from cut trees 12 to 19 inches DBH, and 6 percent from trees over 19 inches DBH.

Through our collaborative process, a total of five alternatives were developed.

No Action - Alternative 1

Under the No Action alternative, no new actions would be implemented.

Proposed Action - Alternative 2

The Proposed Action provides for improvement cutting and underburning on gentle slopes under 35 percent in the warm-dry sites found on the benchlands; ecosystem maintenance burning on sites not feasible for improvement cutting or on steep slopes or high risk weed sites; decommissioning of roads; aerial and ground spraying of noxious weeds; and a host of recreation and interpretation activities. Reducing the stocking to a range of 70-100 BA would increase a stand's survivability of fire under normal burning conditions and provide greater growth and resistance to insect outbreaks. A recent wildland urban interface fuel reduction study (Scott 1998) conducted on the Ninemile Ranger District to compare thinning treatments found the most effective treatment was a thinning from below to a basal area of 76 ft^2/acre followed with prescribed fire (similar to the proposed action). And that periodic application of the treatment would lead to an open-structured forest of large trees of high aesthetic value. A stocking of 70-100 BA, however, was needed to avoid substantially increasing the risk of spreading noxious weeds. The 70-100 stocking level was a recognized compromise to meet mutually exclusive public needs.

Alternative 2, But With a 12-inch Diameter Limit - Alternative 3

This alternative places a 12-inch diameter cut limit on the improvement cutting of Alternative 2. This alternative was based on the Environmental Group collaboration and the aversion to cutting large diameter trees on national forestland. Approximately 78 percent of Alternative 2 timber harvest treatments would be feasible under a 12-inch DBH limitation. Feasible treatment locations have at least 3,000 board feet (MBF) (Barbour 2001 used 2.7MBF/acre) of excess stocking between 7 inches (minimum sawlog size) and 12 inches DBH (example: 38 cut trees per acre averaging 10 inches DBH represent 20 ft^2 of basal area and 3 MBF). Using stewardship contract revenues, additional area could be treated manually and/or mechanically to remove excess trees.

No Commercial Timber Harvest - Alternative 4

This alternative differs from Alternative 2 in that all commercial timber harvests are dropped. Prescribed fire is still used.

Modified Proposed Action - Alternative 5

This alternative builds on Alternative 2 by adding improvement cutting to high weed risk sites on gentle terrain and adding improvement cutting on steep slopes to enhance a portion of the existing old growth stands.

Table 1 compares the alternatives. "Improvement cutting" (IMP) consists of both thinning from below and crown thinning to remove excess stock of merchantable-sized trees (7 to 19 inches DBH) with a target residual basal area of 70 to 100 ft^2/acre. Shade-intolerant (seral) ponderosa pine and western larch trees are favored for retention though not to the exclusion of shade-tolerant Douglas-fir. "Mechanical" (MECH) is a combination of noncommercial understory fuel reduction treatments including slashing by hand using chainsaws followed by handpiling and burning of the handpiles where smoke from underburning would be unacceptable to the surrounding residences. "Underburning" (UB) is ecosystem maintenance burning following the improvement cutting or other silvicultural systems. A spring burn removing portions of the duff and litter, down fuels, understory Douglas-fir seedlings and saplings, and aboveground segments of associated understory flora. "Improvement cutting and group tree selection" (IMPGT) is group tree selection occurring on 10 percent of the area, in scattered small one-quarter-acre to 2-acre patches of seed tree or shelterwood-like cutting. "Slash and EMB" is noncommercial hand felling of excess understory (slashing) to augment fuel conditions for the subsequent ecosystem maintenance burn (EMB) or to simply ensure that unwanted excess understory seedlings and saplings are removed. "Thin" is commercial thinning of western larch stands that contain some Douglas-fir and ponderosa pine. Underburning is planned after these harvests. "Shelterwood (SW) with reserves" is proposed to replace heavily root disease infested Douglas-fir stands with planted non-host ponderosa pine.

Table 2 shows the restoration projects associated with the alternatives.

Table 1—Comparison of harvests and prescribed fire in alternatives.

Treatment	SIMPPLLE equivalent treatment	ALT 2	ALT 3	ALT 4	ALT 5
IMP+MECH	Ecosystem management thin & underburn	152	152		152
IMP+UB	Ecosystem management thin & underburn	2602	2382		337
ITS+UB	Ecosystem management thin & underburn				3242
IMPGT+UB	Ecosystem management thin & underburn	493			599
MECH	Ecosystem management thin & underburn	387	387	539	364
SW+UB+P	Shelterwood cut w/ reserves & plant	41			41
Slsh+EMB	Ecosystem management underburn	6829	7583	10104	5727
Thin	Ecosystem management thin & underburn	139	139		139
Total acres		**10643**	**10643**	**10643**	**10624**

Table 2—Frenchtown Face restoration projects associated with the alternatives and planned to be funded through stewardship projects or other appropriations.

	Proposed Action Alternative 2		Modified Proposed Action Alternative 5	
Stewardship funded activity	**Proposed**	**Likely funded through stewardship**	**Proposed activity**	**Likely funded through stewardship**
Road construction				
Long-term road	0 miles	0 miles	0 miles	0 miles
Short-term road	5.24 miles	5.24 miles	5.94 miles	5.94 miles
Road reconstruction	56.21 miles	56.21 miles	65.82 miles	65.82 miles
Road obliteration	17.68 miles	17.68 miles	22.91 miles	22.91 miles
Road decommissioning	76.8 miles	24.7 miles	114.7 miles	114.7 miles
BMP implementation	65.3 miles	43.77 miles	66.69 miles	66.69 miles
Culvert removal/replacement	19	2	19	15
Little McCormick Cr. stream restoration	0.5 miles	0.5 miles	0.5 miles	0.5 miles
Stony Cr. diversion restoration	0.5 miles	0 miles	0.5 miles	0 miles
Mule pasture/riparian fencing	0.25 miles	0 miles	0.25 miles	0 miles
Weed treatment	6100 acres	6100 acres	6100 acres	6100 acres
Recreation				
Mountain biking trail	0.25 miles	0 miles	0.25 mile	0 miles
Horse trail reconstruction	1.5 miles	0 miles	1.5 miles	0 miles
Dev. parking area	2	0	2	0
Parking area-update/improve	8	0	8	0
OHV trailheads	2	0	2	0
OHV trail	0.5 miles	0 miles	0.5 miles	0 miles
Education				
Signs	3	2	3	2
OHV curriculum	1	1	1	1
Student Monitoring Program-dev.	1	1	1	1

Comparison of Alternatives

Alternatives 3 and 4 were eliminated from the detailed study after a closer assessment. Attempting to prescribe-burn overly dense sawlog-sized live stands to meet the purpose and need is impractical without first removing "excess" trees (Allen 2002). Both Alternative 3 and 4 result in an accumulation of basal area over time (Barbour 2001) as trees 12 inches DBH and larger are never removed by timber harvest (Alt 3) and most trees over 5 inches DBH are never removed by prescribed fire (Alt 4). These alternatives create and maintain densely stocked stands of uniform-sized trees that have a high risk of bark beetle infestations (Barbour 2001) and fail to restore forest health or reduce the risk of stand replacement wildfires (Fiedler 2001). Sites with mechanical fuel treatment appear to have more dramatically reduced fire severity compared to sites with prescribed fire only. Forests with much lower density and larger trees have less continuous crown and ladder fuels, higher crowns off the ground, and thicker bark resulting in lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet 1999).

The comparison of alternatives utilized simulations by SIMPPLLE.

The relatively small area treated under restoration timber harvests provides little distinction between alternatives (see table 1), including the No Action alternative, Alternative 1, on a landscape basis as reflected in SIMPPLLE simulations. There are no significant differences in simulated processes such as bark beetles, root disease, and fire, between alternatives at the landscape level. Figure 6 displays the level of fire that is simulated to occur with the alternatives and no treatment.

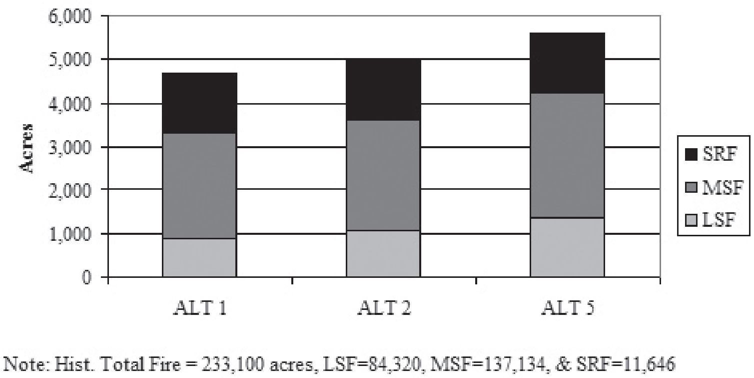

Figure 6—Acres of stand replacement fire (SRF), moderate severity fire (MSF), and low severity fire (LSF) simulated over 50 years by alternative.

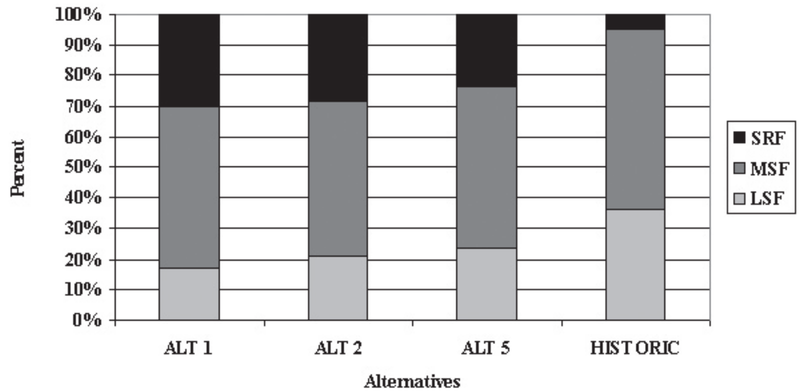

Figure 7—Distribution of stand replacement fire (SRF), moderate severity fire (MSF), and low severity fire (LSF) simulated over 50 years by alternative compared to the simulated historic condition.

Figure 7 displays the distribution of fire types between the alternatives and the historic representation created by SIMPPLLE. The two alternatives display very light gains toward the distribution modeled to be the historic representation.

Table 3 displays the area of restoration timber harvests by alternative.

Figures 8 and 9 display a slight shift in both ponderosa pine and ponderosa pine/Douglas-fir cover types toward the simulated historic conditions.

Table 3—Restoration timber harvest acres under each alternative shown as a percentage of: (1) warm, dry benchlands on national forest lands; (2) total national forest lands in the analysis area; and (3) the entire landscape across all ownerships.

Alternatives	Restoration timber harvest acres	Warm-dry benchlands National Forest lands	Total National Forest lands	Entire landscape
No Action	0	0%	0%	0%
ALT 2 – Proposed Action	3,405	11.7%	7.4%	3.5%
ALT 5 – Mod. Proposed Action	4,530	15.6%	9.8%	4.7%

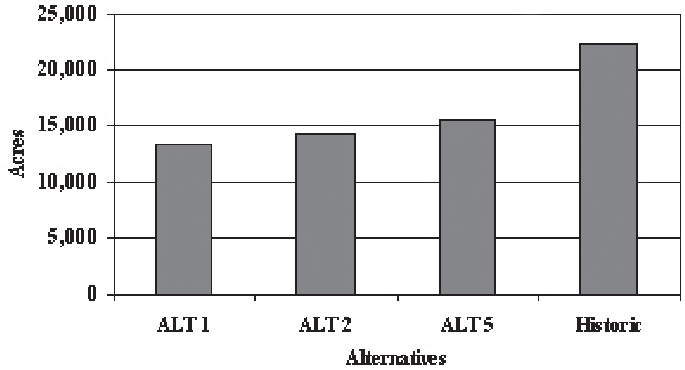

Figure 8—Post treatment ponderosa pine acreage in the entire Frenchtown Face landscape simulated over 50 years by alternative compared to the simulated historic condition.

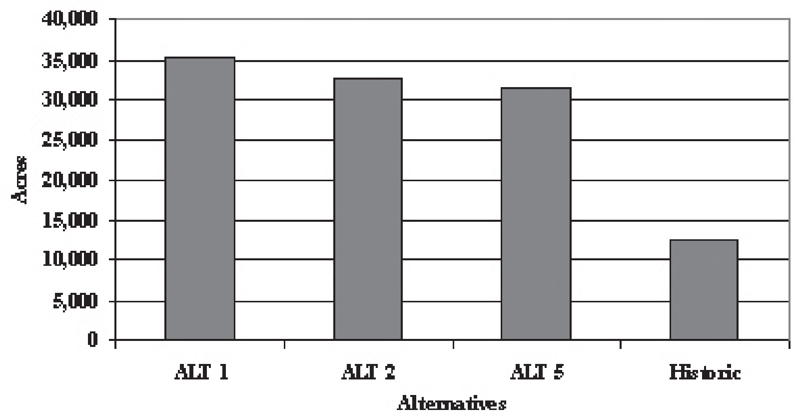

Figure 9—Post treatment ponderosa pine/Douglas-fir acreage in the entire Frenchtown Face landscape simulated over 50 years by alternative compared to the simulated historic condition.

However, very little change in density is made toward the historic condition with either alternative, as can be seen in figures 10 and 11.

Although major differences may not exist on a total landscape scale as a result of the alternatives, significant differences do exist between alternatives at very specific locations within the wildland urban interface in comparison with untreated conditions.

Since all of these alternatives treated a small portion of the total landscape, SIMPPLLE simulations were made increasing the magnitude of treatment by three-fold to help identify the level of treatments needed to have an impact on the total landscape.

A comparison of the simulated acres of fire spread from a single "locked-in" mixed severity fire was made between the original treatment acres and a tripled treatment acres. The simulations were made using average conditions with no extreme fire probability and no fire suppression. The tripled treatment acres had slightly fewer simulated fire acres. Tripling treatments and locking in a mixed-severity fire with extreme conditions, wind-driven, on the Frenchtown Face showed a dramatic difference in the amount of fire spread received from one locked in fire. Figure 12 represents the difference between tripling versus original acreage treated in Alternative 2, the proposed action, and Alternative 5, the modified proposed action.

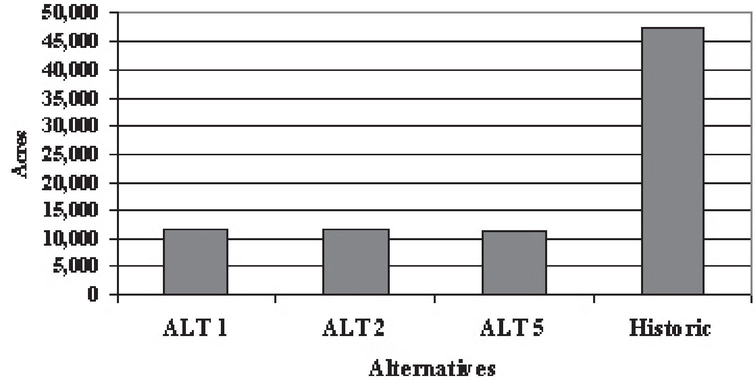

Figure 10—Post treatment acreage with 15-39% canopy coverage in the entire Frenchtown Face landscape simulated over 50 years by alternative compared to the simulated historic condition.

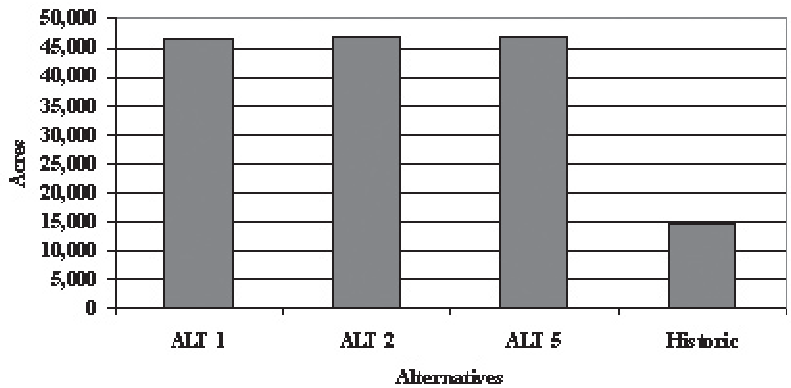

Figure 11—Post treatment acreage with 40-69% canopy coverage in the entire Frenchtown Face landscape simulated over 50 years by alternative compared to the simulated historic condition.

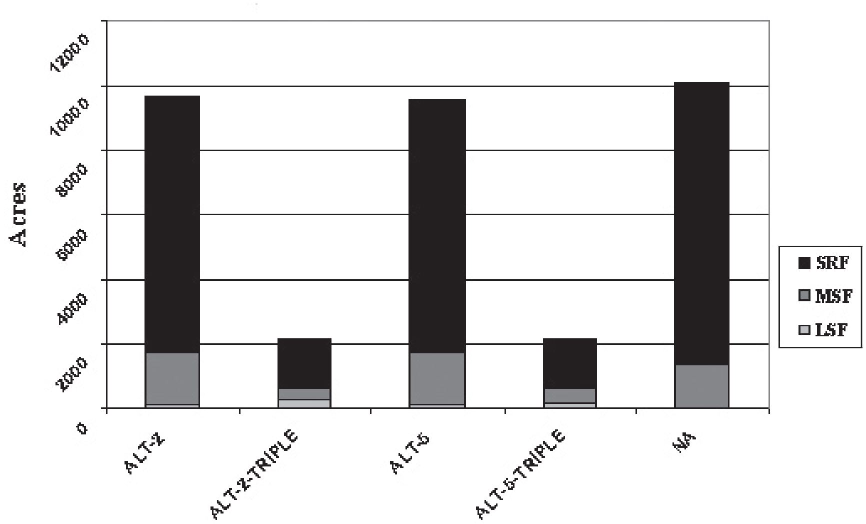

Figure 12—Comparison of simulated fire spread by fire severity for each alternative and the spread and severity of the same fire occurring when the treated area is tripled.

Project Status

The success of the collaborative process is not yet fully evident as the Draft Environmental Impact Statement (DEIS) and associated public comment period has not occurred. The Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) are scheduled for completion and publication in May 2004. The level and content of public comment to the DEIS and subsequent appeals and litigation of the respective FEIS and ROD will provide the remaining evaluation of this collaborative process.

Comparisons from SIMPPLLE provide the agencies and the public excellent opportunities to discuss many questions. SIMPPLLE demonstrated that increasing the magnitude of treatment by three-fold would have increased the odds substantially that young and old growth stands would survive severe events. This helps to address questions as: (1) How much treatment is needed to substantially reduce the risk of stand-replacing fire? (2) For species-at-risk like flammulated owls, how much treatment across the landscape is needed to turn the habitat trend into a positive direction? (3) How much treatment is acceptable given the quantified risks of not treating those landscapes recognizing the inevitable consequences? SIMPPLLE provided landscape level and stand level significance in comparing the alternatives. The SIMPPLLE model provided an improved method of describing the range of historic variability across all ownerships.

The area feasible for restoration using commercial timber harvest (4,874 acres under Alternative 5) is typically a small percentage (18 percent of the landscape warm-dry type) under second growth forest conditions. SIMPPLLE provided landscape level and stand level significance in comparing the alternatives. The SIMPPLLE model provided an improved method of describing the range of historic variability across all ownerships. Since 1992, when the Lolo National Forest implemented a landscape approach to ecosystem management, just 4,365 acres of restoration timber harvests have been implemented on the Ninemile Ranger District. This represents just 2.7 percent of the warm-dry habitat type (163,339 acres) on the District. Alternative 5 essentially doubles the total area treated by restoration timber harvests, for a combined total 5.5 percent of the district's area. Presently, no other landscape scale restoration projects using timber harvests with prescribed fire are funded for analysis. A similar level of restoration accomplishment exists for using prescribed fire in these warm-dry habitat types where the district program struggles to complete approximately 2,000 acres of ecosystem maintenance burning annually, treating about 6 percent of the warm-dry type since 1992.

The public more readily accepts restoration projects involving timber harvest to enhance wildlife habitat than projects driven by commodity-extraction. In similar restoration projects, analysis has disclosed that treating a landscape with improvement cutting and underburning has protected and recruited old growth habitat, to the benefit of such species as flammulated owls and pileated woodpeckers. While the literature supports such findings (Hillis and others 2000), further quantification has been lacking. Using SIMPPLLE provides further quantification of the risk to survivability that any timber stand has for the long-term. For instance, SIMPPLLE demonstrated that Alternative 5 still carries substantial risk that much of the warm-dry portion of the landscape could lose young and old stands to stand-replacing fire during extreme wildfire conditions. SIMPPLLE also demonstrated that increasing the magnitude of treatment by three-fold would increase the odds substantially that young and old growth stands would survive extreme wildfire conditions. Such comparisons provide agencies and the public excellent opportunities to be involved in dialogue about issues such as: (1) what amount of treatment is needed to affect a positive wildlife habitat trend and (2) how do treatments compare given the quantified risks of taking no action.

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