Socio-Economic Analysis

Trout West Fuels Reduction Project

Rochelle Desser
April 2003

This socio-economic analysis covers a variety of topics including Environmental Justice, social issues, predicted costs of operations, predicted wildfire costs, and financial efficiency. The analysis was revised following public comments on the Trout-West Draft EIS.

The proposed actions have the potential to affect local communities and people who live, work, and play in the Trout-West area and immediate vicinity. The project area is almost entirely in Teller County. The analysis area also includes acreage in Douglas and El Paso counties. Communities most affected by the project include Woodland Park and Divide in Teller County and Colorado Springs in El Paso County. Florissant, Trumbull, and Palmer Lake are other nearby communities.

Environmental Justice

Population Demographics

Douglas and Teller counties are two of the 10 fastest growing counties in Colorado, based on percentage change between 1990 and 1999 (Ibid.). Population within El Paso County grew by 25% in the same period (Table 1).

Table 1. Population by Colorado County, 1990 - 1999

County	Population 1990	Population 1999	% Change 90-99
Douglas	60,391	164,495	172.4
Elbert	9,646	19,810	105.4
Park	7,174	14,218	98.2
Custer	1,926	3,596	86.7
Archuleta	5,345	9,581	79.3
Teller	12,468	21,303	70.9
San Miguel	3,653	6,003	64.3
Eagle	21,928	35,522	62.0
Hinsdale	467	750	60.6
Summit	12,881	20,435	58.6

Population is projected to have grown between 3 and 14 percent in the three counties since 1990. Douglas County has grown the most of the three; all are at least growing as fast as the state average.

Population growth has many implications to the need for fuels reduction. With more people comes greater risk of human caused wildfire. Increased population would also tend to increase property values and development, which increases potential losses from wildfire. Table 2 displays population by race for the counties within the analysis area.

Table 2. Population By Race in Colorado and Selected Counties

Geographic Area	Grand Total (2000)	Total One Race	White	Black or African American	American Indian and Alaska Native	Asian	Hispanic or Latino (of any race)	Some other race	Two or more races
State of Colorado	4,301,261	4,179,074	3,560,005	165,063	44,241	95,213	735,601	309,931	122,187
COUNTY									
Douglas	175,766	172,470	163,064	1,676	716	4,404	8,886	2,513	3,296
El Paso	516,929	496,716	419,673	33,670	4,725	13,099	58,401	24,293	20,213
Teller	20,555	20,144	19,510	113	200	120	718	185	411

Census data reports that the overwhelming majority of the three counties affected by the project, along with the rest of the state, identify themselves as white (Table 3).

Table 3. White Population as Percentage of County

Geographic Area	Total Population	Population One Race - White	Percent One Race-White
Douglas	175,766	163,064	93
El Paso	516,929	496,716	96
Teller	20,555	19,510	95
State-Wide	4,301,261	3,560,005	83

Income

Income within the Teller and El Paso Counties in the analysis area is similar to the average for the state. Douglas County has exceptionally high income and has the highest average income of any county in the state (Table 4).

Table 4. Estimated Median Household Income by County: Colorado and Selected Counties (1998)[1]

Geographic Area	Median Household Income	
State and County	**Estimate**	**90% Confidence Interval**
Colorado	$43,402	$41,386 to $45,417
-Douglas County	$84,645	$80,687 to $88,582
-El Paso County	$43,755	$41,041 to $46,454
-Teller County	$48,476	$45,337 to $51,598

These estimates were released in December 2001

Executive Order 12898, Environmental Justice, requires all federal agencies to consider low-income and minority population in decision-making. None of the counties in the analysis area

[1] Estimate released in 2001.

contain low-income or minority populations and no disproportionate negative effects to such communities are likely from any of the project alternatives.

Social Issues

Many social issues have been raised regarding the Trout-West Project and its potential effects on the human environment. This section addresses social issues not considered elsewhere in the Trout-West analysis.

Public and Worker Safety

Public and worker safety is always of significant concern in forestry projects. Occupational Health and Safety Administration (OSHA) guidelines would be followed in all alternatives. Traffic controls to reduce conflicts between operations and visitor's would be required in all alternatives. An increase in log truck traffic would be likely in all alternatives, with numbers of trucks increasing with potential volume of timber removed. Over the ten-year operating period, approximately 4,000 log truck loads of sawtimber could be hauled away in the Proposed Action and Alternatives A and C.

Alternative A would generate approximately 50,000 tons of non-merchantable material, which could require about 1,800 10-yard trucks to haul away. The Proposed Action and Alternative C could generate equal amounts but some of the material could be burned at the landing.

Alternative E would have the potential to nearly double these amounts. Alternatives B and D would have proportionally less logging truck traffic.

Haul routes would likely include Highways 67 and 24. County roads may also be used. Although trucks regularly travel along roads in the project area, the introduction of project-related truck traffic would be noticeable to local residents. Potential impacts would be greater for the loaded trips.

Increased truck traffic would also contribute to wear on local roads, particularly those designed to handle relatively low volumes of traffic. Teller County has expressed concern that the roads could be damaged by log truck traffic. A project design feature requires the Forest Service to include road maintenance agreements as part of any Trout-West work contract. Agreements with the county may require the operation to cover road maintenance through user fees.

Noise

Project-related activities would generate noise. Sound is typically described using the decibel (dB) scale, a logarithmic rating system that accounts for large differences in audible sound intensities. Studies addressing the effects of noise on people need to consider the frequency response of the human ear. Sound measuring instruments are, therefore, often designed to respond to or ignore certain frequencies. The frequency-weighting most often used to evaluate environmental noise is A-weighting. Measurements from instruments using this system are reported in "A-weighted decibels," or dBA. This scale accounts for the human perception of a doubling of loudness as an increase of 10-dBA. A 70-dBA sound level, for example, sounds twice as loud as a 60-dBA sound level. Factors affecting potential noise impacts include distance from the source, frequency of the sound, absorbency of the ground, the presence of obstructions, and the duration of the sound.

Light automobile traffic at 100 feet has a typical sound level of 50 dBA. A heavy truck at 50 feet has a typical sound level of 90 dBA. Because the dB scale used to describe noise is logarithmic, a doubling of a traffic noise source (i.e., twice as much traffic on a road) produces a 3-dBA-increase average roadway noise. Average sound levels due to line sources such as traffic decrease with distance from the road at a rate of 3 to 4.5 dBA per doubling of distance from the road. Vegetation attenuates noise if it is dense and deep enough. Intervening vegetation may also create a soft surface over which the noise would travel and would be expected to absorb sound energy.

Project-related logging truck trips would likely be spread throughout the day and limited to weekdays and business hours when resident and visitor populations are less. Each truck would likely represent a discrete rather than a cumulative addition from a noise perspective and would be comparable to the sound level presently generated by other trucks using project area roads.

Vegetation treatment and revegetation activities would also generate noise. Possible vegetation treatment noise sources include chain saws and loaders. A chain saw has a specific event sound level of 110 dBA and the Forest Service requires that chain saw operators wear earplugs. A front-end loader going through various cycles has a typical hourly average sound of 75 dBA at 100 feet. Average sound levels due to discrete point sources, such as chainsaws, decrease at a rate of 6 dBA per doubling of distance from the source. Intervening vegetation would be expected to absorb some sound energy.

Control of Prescribed Burns

One major public issue is the potential for prescribed burns to get away. This risk is inherent in prescribed burning. Many design features and mitigation measures have been built into the project to reduce the risk of prescribed burns getting out of control.

1. The application of prescribed burning zones, where the least risky fuels reduction methods within 600 feet of private lands (whole tree yarding, no burning), piling and burning (low risk of burns getting away) within 1 mile of private lands, and prescribed burning only approved greater than 1 mile from private land.
2. A Prescribed Fire Burn Plan and Smoke Management Plan must be approved before any proposed prescribed burn can be implemented. The purpose of this plan is to prevent the possibility of a prescribed fire escape. There are 19 elements in the Burn Plan. All elements are designed to structure a safe and controlled burn to meet management objectives for that area. Some of the required components are very specific. Among those elements are the following: fuel characteristics, protection of sensitive features, prescribed fire prescriptions, predicted fire behavior in the units, predicted fire behavior outside the burn unit(s) under worst-case weather conditions for contingency planning, weather data collection, smoke management and air quality, ignition procedures, test fire and recording results, holding procedures, safety and special considerations, public relations, escaped fire contingency plan, burn day go-no go checklist, technical review, and National Wildfire Coordination Group (NWCG) complexity rating.

No Action and Alternative A have no risk of controlled burns getting away. However, the No Action alternative has the greatest risk of wildfire, which would likely have greater adverse effects than an uncontrolled burn (depending on circumstances like time of year, weather, etc).

Alternative B does not include any broadcast burning, thus would have fewer risks of escaped fire than the Proposed Action or Alternatives C and E.

Alternative D includes broadcast burns closer than 1 mile from private land, so this alternative has slightly greater risks to private property. The alternative would be feasible and careful burn planning would reduce potential risks of escaped fire.

Cumulative Effects

Ongoing operations within the analysis area have the potential to contribute to increased truck traffic and noise. The Trout Creek Timber Sale and Hayman Salvage may be ongoing operations that occur during or before Trout-West Fuels Reduction operations. All the projects include similar mitigation to protect worker and public safety and reduce the adverse social effects of operations. The Hayman Salvage does not include prescribed burning. The Trout Creek timber sale does include a small amount of prescribed burning yet to be accomplished.

Economic Analysis

The Analysis Area

The analysis area is the Trout and West Creek watersheds (excluding Horse Creek).

Purpose and Need for Trout-West Project

Hazardous fuels need to be treated within the Trout-West project area to reduce the potential for adverse effects from wildfire and provide for firefighter and public safety. Much of the Trout-West area contains forests that burn hotter than historic forests (Kaufmann 2000; Hann 2001). Nearby, recent fires have led to catastrophic losses of watershed values, homes, property, and wildlife habitat. Lives have been lost as a result of wildfire and floods that came afterwards. Without action, catastrophic losses from wildfire are nearly certain to occur. The Trout-West Project is intended to reduce the potential for catastrophic losses.

Costs of Operations

Stephen O'Brien, Logging Systems Specialist, provided a range of costs for the yarding, chipping, prescribed burning, and roadwork proposed for each alternative (Table 5; Figure 1). Documentation for costs is appended to this report.

Table 5. Cost of Operations for Alternatives by Element

Alternative	Cost Element/Dollars				
	Yarding	Burning/ chipping	Road	Other	Total
PA	7,886,221	6,218,400	2,058,000	870,000	17,032,621
A	11,055,450	5,000,000	2,058,000	585,000	18,698,450
B	7,015,938	4,333,400	1,457,000	420,000	13,226,338
C	8,943,344	6,218,400	1,568,000	870,000	17,599,744
D	2,674,814	2,861,000	495,000	180,000	6,210,814
E	14,183,214	9,194,600	2,058,000	375,000	25,810,814

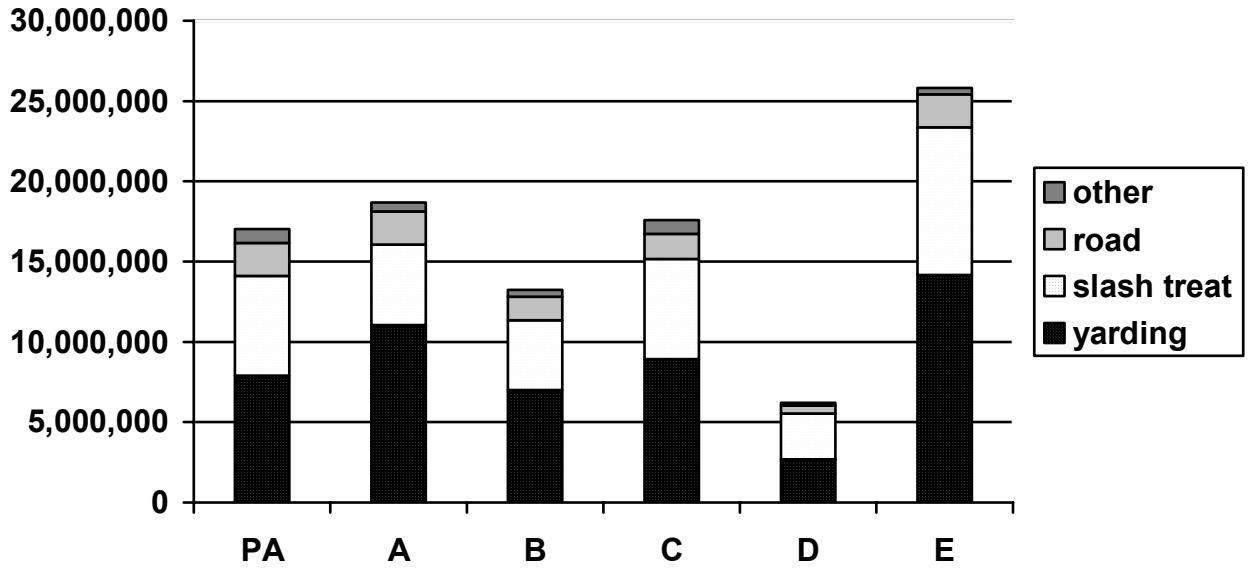

Figure 1. Operations Costs of Action Alternatives

Operations Costs – Net Value

Merchantable timber (ponderosa pine and Douglas-fir) may be produced as a by-product of fuels reduction and sold. Unmerchantable timber would also be produced and could be sold as chips or fuelwood. Any wood sold would offset the costs of operations, depending on market conditions.

No value was attributed to merchantable or unmerchantable volume. The timber industry in the Rocky Mountain States is undergoing major shifts. The sale of mills, retooling mills, changing product mixes, changing timber supplies, low prices are all occurring throughout Colorado, Wyoming, and South Dakota. This, combined with ever-larger market forces, requires us to change the way we understand the industry. A "regional" stud mill today may be a "local" niche mill tomorrow. Narrowly defined timber demand is not as helpful as it once was.

No large mills currently exist within the southern Front Range of Colorado. Timber from the Upper South Platte project to the north was purchased by a mill in Montrose, Colorado. The closest major mill is Bighorn Lumber in Laramie, Wyoming.

There are many small mills sprinkled throughout Colorado, but it is not certain whether they are of sufficient size to handle the entire volume produced by the Proposed Action or any of the action alternatives. Consequently, the demand for timber cannot be characterized as "local," but rather is "regional" in nature. One long-term goal of the National Fire Plan is to further develop markets and firms that can assist the Forest Service in fuels reduction and forest management. The Trout-West Project is expected to provide opportunities for wood product utilization and some volume is likely to be sold as sawlogs.

Sawlogs and unmerchantable material would be disposed by burning or chipping, or would be exported off-site as a wood product. Selling sawlogs produced as a result of fuels reduction would improve the economic efficiency of the project. The present value costs of operations over a nine-year period is presented in Table 6.

Table 6. Present Value, Costs of Operations Over a Nine-Year Period

Alternative	Present Value, Operations Costs (Costs applied to a 9-year period, 4% discount rate)
NA	0
PA	-14.6 million
A	-16.0 million
B	-11.4 million
C	-15. 1 million
D	-5.3 million
E	-22.2 million

No Action has the greatest present value, since it requires no funding. Alternatives D and B have less cost than the other action alternatives, but with a relative loss of effectiveness. Alternatives A, C and E and the Proposed Action are all effective in reducing potential for damaging wildfire. The Proposed Action is most efficient, followed by Alternatives C, A and E.

Alternatives A and C treat the same acreage as the Proposed Action with the same effectiveness. Alternative A is more costly because completion of the project entirely by mechanical means is more expensive than doing some burning. Alternative C is more costly because the cost of increased helicopter yarding exceeds the cost of building and rehabilitating some temporary roads. Alternative E treats the most acreage and is therefore most expensive.

Wildfire Costs

The Hayman Fire demonstrates the catastrophic costs associated with wildfire. Wildfires are a certainty in the Trout-West area and across the National Forest throughout the western United States. The existing condition is associated with serious wildfire risk: without fuels reduction, the analysis area is likely to burn in total in a 30-year period.

Wildfire costs were estimated using data from a variety of sources, including County Assessors, the Denver Water Board, and the US Forest Service. Based on assumptions described below, the cost of wildfire for a 30-year period, under No Action, is approximately $240 million dollars.

The $240 million dollars are costs and damages borne by 1) Forest Service; 2) Interagency Fire Services (includes Forest Service and other firefighting agencies including federal, state and local); Private Landowners; and Denver Water Providers. Figure 2 depicts costs that are applied solely to the US Forest Service. This figure also includes costs of operations as described above.

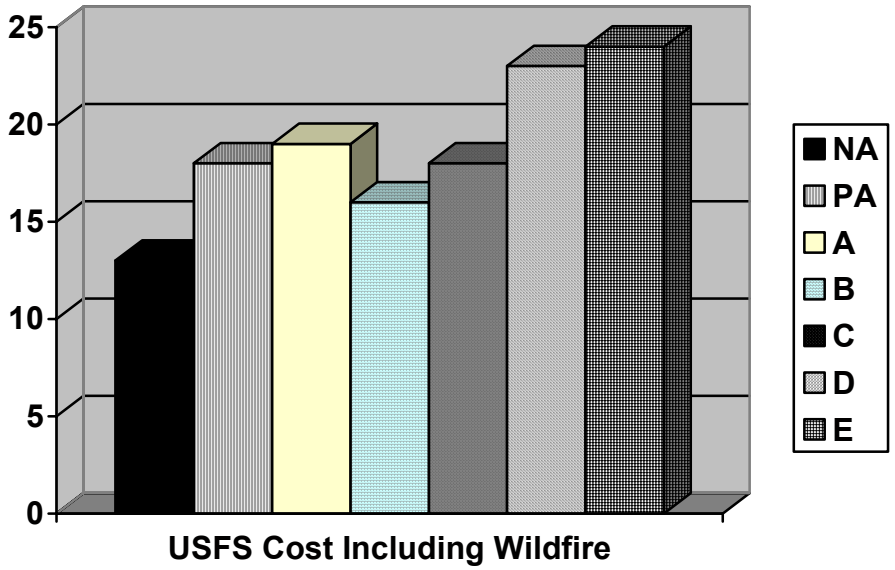

Figure 2. USFS Costs Including Wildfire

Table 7 shows the costs applied to all partners, including wildfire costs.

Table 7. Wildfire and Operations Costs: All Alternatives

Alternative	US Forest Service	Interagency Fire Services	Private Landowners	Denver Water Providers	All Partners
No Action	-$13 million	-$16 million	-$189 million	-$23 million	-$240 million
Proposed Action	-$18 million	-$2.5 million	-$58 million	-$6 million	-$84 million
A	-$19 million	-$2.5 million	-$58 million	-$6 million	-$86 million
B	-$16 million	-$3.3 million	-$82 million	-$13 million	-$115 million
C	-$18 million	-$2.5 million	-$58 million	-$6 million	-85 million
D	-$23 million	-$15 million	-$178 million	-$22 million	-237 million
E	-$24 million	-$2.5 million	-$58 million	-$6 million	-$91 million

Forest Service Financial Efficiency

If only US Forest Service costs and damages are considered (and interagency firefighting costs are not included), No Action costs the least of all alternatives (Figure 2). No Action has no operations costs and predicted losses to Forest Service infrastructure are relatively minimal. Alternative B is next most efficient. The Proposed Action and Alternatives A and C have similar costs and are mid-range efficiency. Alternatives D and E are the least efficient.

Depending on the origin of a wildfire, Interagency Fire Costs may be borne by the US Forest Service or other firefighting agency. Quicksilver was run with all interagency fire costs and emergency rehabilitation attributed to the USFS (Table 8).

Table 8. All Firefighting and Emergency Recovery Costs for Predicted Wildfires, USFS Only

Alternative	Total Costs - USFS
No Action	-$28.4 million
Proposed Action	-$20.5 million
A	-$21.9 million
B	-$19 million
C	-$21 million
D	-$37.8 million
E	-$26.6 million

When all firefighting costs are added for the predicted wildfires under each alternative, the most efficient alternative is B, followed by Proposed Action, Alternative C, Alternative A, Alternative E, Alternative D, and No Action (Table 8).

Wildfire Costs – All Partners

When other partners who may be affected by predicted wildfire are factored in, No Action becomes the most costly alternative (Table 9). Private landowners and Denver Water Providers have much to lose from wildfire damage. Private property damage over a 30-year period is estimated at $189 million for No Action. Alternative D would reduce this to approximately $178 million. Alternative B reduces potential wildfire damage to $82 million. The Proposed Action and Alternatives A, C, and E reduce potential wildfire private property damage to $58 million dollars.

For Denver Water Providers, No Action is predicted to cost about $23 million in wildfire damage. Alternative D would cost $22 million and Alternative B would cost $13 million. The remaining alternatives are predicted to cost about $6 million each.

In total, the costs of each alternative, including operations costs over a nine-year period and predicted losses due to wildfires over a 30 year period, are displayed in Figure 3. Alternatives that reduce Condition Class across the watershed are more economically effective than those that do not.

Table 9. Total Costs (Operations + Wildfire, All Partners)

Alternative	Total Costs - All Partners
No Action	-$240 million
Proposed Action	-$84 million
A	-$86 million
B	-$115 million
C	-$85 million
D	-$237 million
E	-$91 million

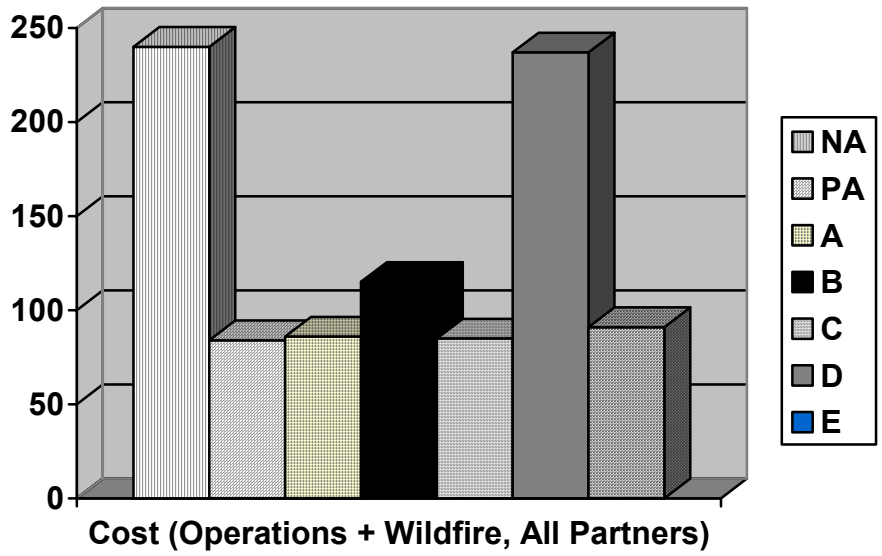

Figure 3. Total Costs (Operations + Wildfire, All Partners)

Proponents of Alternative D claim that the project would be more effective than predicted by the Interdisciplinary Team (IDT) in reducing wildfire damage, particularly when homes are the item considered. Alternative D treats acreage within ½ mile of private land, or about 30% of the Proposed Action. However, it is only predicted to slightly reduce wildfire damage because not enough acreage would be treated to slow the progress of a crown wildfire.

A second economic analysis was run with Alternative D equally effective as Alternative B in reducing wildfire damage to private property. This would reduce the total operations plus wildfire damage costs to about –$142 million, more like Alternative B.

Opportunity Costs

The Trout-West project alternatives represent a variety of trade-offs. In general, short-term costs of the operation are more than recovered by reduced wildfire losses. The alternatives that cost the least to implement (No Action, Alternatives B and D) will not likely treat sufficient acreage to reduce Condition Class and potential for wildfire damage.

Over a 30-year period, the Proposed Action and Alternatives A and C have roughly equal opportunity costs. The effects of each of the alternatives are discussed throughout the FEIS. The temporary roads forgone in Alternative C are not expected to result in unacceptable results. The burning forgone in Alternative A is feasible and can be accomplished in a safe manner.

Alternative E costs the most to implement but best meet the goal of promoting vegetation more like historic conditions.

The action alternatives are relatively expensive from a per-acre point of view. Each acre could exceed $1,000 to treat, especially when monitoring and administration costs are included (up to 20% added to the total). Part of the reason for this expense is the extensive design features intended to reduce impacts to soils and water, fish and wildlife, and scenery (among other topics). Given the design features, the IDT does not predict any direct loss of resource values from any of the action alternatives. The potential losses from wildfire far exceed those predicted for the project.

Jobs and Employment

Without knowing where the timber will be processed, we cannot estimate which communities or areas will benefit. Some local economic impacts will follow work in the woods, while others will follow processing in the mills. Assuming each acre of treatment is equal to 2 person-days of employment (one day for initial treatment, one day for follow up surface fuels treatment (mechanical or burning), the Proposed Action has the potential to require about 40,000 person-days spread out over ten years and employ about 20 people (assuming 200 workdays per year). Alternative E would provide proportionately more jobs, Alternatives B and D proportionately fewer.

Recent analyses on the Medicine Bow National Forest estimated that $335,000 of earnings are created or sustained for every million board feet harvested and processed (personal communication, Mike Retzlaff). The Proposed Action would result in earnings of at least $6,700,000 over a ten-year period.

At least half the firms who stand to benefit from these earnings are likely to reside within the Rocky Mountain region (personal communication, Mike Retzlaff). Many local contractors have expressed interest in the Trout-West Project.

Cumulative Effects

Local and regional projects along the Front Range have the potential to contribute to cumulative socio-economic effects. The Hayman Fire continues to have significant effects in terms of property losses and recovery costs. The costs estimated for each alternative over the next 30 years do not include costs and damages from the Hayman Fire.

Salvage is proposed on some of the Hayman Fire area; Alternative 3 in the Hayman Salvage project would remove burned trees on about 17,000 acres total. The total cost of the salvage operation is estimated as approximately $1.3 million with a return of about $500,000 from timber sold. The cumulative effect is additive and would increase the need for funding to accomplish the salvage operations along with the Trout-West Fuels Reduction Project. The salvage operation would treat 5,437 acres in West Creek and 632 acres in Trout Creek. This equates to approximately one third of the total acres proposed for salvage operations.

Fire Risk Assumptions and Analysis Methodology

Each decade, the project area (29,000 acres) is likely to experience a 10,500 acre wildfire. An additional 31,500 acres are likely to burn in the analysis area, outside the project area. These predictions are based on the work of Jim Thinnes for the Upper South Platte restoration project as applied to the Trout-West Project.

Bob Solari, Fuels Specialist for the Trout-West team, along with the IDT, evaluated the effectiveness of the Trout-West alternatives in reducing fire hazard. Each alternative was ranked by Solari in terms of its effectiveness in reducing crown fire hazard. Solari used the Trout-West Fire Regime Condition Class Analysis (USDA 2002) to evaluate project effectiveness. In the Condition Class Analysis, Hann and Strohm provided an estimate of acreage that would need to be treated to reduce Condition Class from 2 and 3 down to 1 across the watershed. Solari compared the acres proposed for treatment in each alternative to Hann and Strohm's recommendations and gave each alternative an effectiveness ranking.

This ranking is the basis for fire risk predictions inside the project area and within the watershed as a whole. The project is expected to reduce the risk of wildfire across the watershed, but not as fully as it will in the project area. Jim Thinnes provides logic for this contention in the Upper South Platte analysis. The reasoning that treatments in the project area would have indirect, beneficial effects throughout the watershed is also supported by the Condition Class analysis previously cited.

Solari estimated the probability of predicted wildfires within and outside the project area. Alternatives that are fully effective still have inherent risk of wildfire damage, due to the fire prone ecosystem in the area and the inevitability of fire starts, human or lightning-caused. The probability of damaging wildfire under each alternative is shown in Table10. No Action, at 100 percent, predicts that wildfire damage is inevitable. The predicted wildfire across the watershed each decade, under No Action, is 42,000 acres (for 30 years until most or all of the watershed has been burned). Each action alternative reduces the potential for wildfire. Full effectiveness would last 20 years once the project is complete in each alternative.

Table 10. Probability of Damaging Wildfire, By Alternative

Alternative	Project Area	Balance of Watershed
No Action	100	100
Proposed Action	20	30
Alternative A	20	30
Alternative B	50	60
Alternative C	20	30
Alternative D	80	100
Alternative E	20	30

This translates to the following acres per year of predicted wildfire for a 1, 5 and 10-year period under each alternative (Table 11).

Table 11. Wildfire Acres Within the Watershed By Year, After Project Implementation

Alternative	Wildfire Acres Within the Watershed By Year Once the Project is Complete		
	1	**5**	**10**
No Action	4,200	21,000	42,000
Proposed	1,150	5,750	11,500
A	1,150	5,750	11,500
B	2,310	11,550	23,100
C	1,150	5,750	11,500
D	3,990	19,950	39,900
E	1,150	5,750	11,500

Some wildfire risk is inherent in the ten years of implementation, before each alternative reaches its full effectiveness. For the economic analysis, I assumed that the project would be implemented over a ten-year period (2002 is year 0) and each year (starting 2003) one-tenth of the project would be completed. For each year, I assumed a proportional decrease in wildfire risk as the project was implemented. I also considered Hayman to be part of this decade's predicted wildfire (28,000 acres of the predicted 42,000; all outside the project area).

I modeled the cost of predicted wildfires in a manner consistent with the Upper South Platte (USP) Environmental Analysis. I updated those costs using more recent data where possible. Trout-West property values are based on actual assessed values within the watershed. I used Teller County Assessor notes to estimate property damage from Hayman, and applied those on a percentage basis to predicted wildfires in each alternative. I used Denver Water Board updated estimates for damage to the water supply and facilities. I used Hayman Fire data to estimate per acre costs for fire suppression and Burned Area Emergency Rehabilitation.

The analysis timeframe is 30 years. The effectiveness of the project is estimated increasing between now (year 0) and its completion at year 9, and would retain its effectiveness for 20 years (see Fire Specialist Report). Timber benefits and operations costs would occur within years 0-9; costs of wildfire are estimated for years 0 to 29. Modeled wildfire costs included Lost Improved Private Property Values, Lost Forest Service Improvements, Fire Suppression and Burned Area Rehabilitation, and damages from wildfire-associated erosion to the Denver Water Supply and Facilities.

Lost Improved Private Property Values

The single largest cost of wildfire is in improvements lost. Given the predictions of wildfire under No Action, over $297 million dollars of improved property value would be lost over a 30-year period. I used Hayman Fire statistics from Al Jordan, Teller County Assessor to arrive at this figure.

Before the fire, average property values in the Hayman Fire perimeter were estimated within 5 percent of average values in the watershed outside the fire area. Therefore, persistent losses associated with Hayman provide a reasonable basis for future fire loss predictions.

Hayman Fire burned 114 properties in the Trout and West Creek watersheds, all in Teller County. Total property value losses are estimated at $3,276,720, about 60 percent of $5,500,000 (the pre-Hayman value). In terms of improvements, losses were estimated at a total of $1,606,781 of a pre-Hayman improved value of $3,367,899.

I applied the percentage of improvement loss as a percentage of total value as the loss that would be persistent over time and can be used to model future fire losses: $1,606,781 / $5,500,000 = 29%. The remaining losses of property value would be recouped over time and were not included in the model.[2]

Total value of all properties in the watershed is $1,080,393,878 (source: County Assessors, Teller, Douglas and El Paso Counties). Values in the Hayman perimeter were subtracted, with the remaining total value at $1,025,393,878. I multiplied this value by 0.29 to obtain the total loss that would be predicted to occur within a 30-year period under No Action. Total loss if the entire analysis area burned in a manner similar to Hayman would be $297,364,225.

Forest Service Lost Improvements and Road Reconstruction

I used Infra data for total value of improvements such as campgrounds and picnic grounds in the watershed. I assume similar losses would occur as with private property improvements, rounded down to 25%.

I used the Upper South Platte Restoration project estimates of $2,000/mile of reconstruction on 25% of the roads damaged in the fire. I applied this to system road mileage in the Trout and West Creek watersheds and potential wildfire risk in each alternative.

Fire Suppression and Burned Emergency Rehabilitation

I visited the website for the Hayman Fire to determine total interagency suppression costs. These amounted to $284 per acre. I used the spreadsheet prepared for the Hayman BAER team, which proposed approximately $180 per acre in treatments across the fire area. I applied these values to acres of predicted wildfire per year.

Denver Water Supply and Facility

Per Don Kennedy, Denver Water Environmental Planner:

The Buffalo Creek Fire and subsequent 100-year flood did major damage to the Denver Water supply and treatment facilities. Over a million cubic yards of sediment and debris roared down the Upper South Platte River into Strontia Springs Reservoir, filling the reservoir, blocking intakes and outtakes, requiring additional chemical water treatment and shutting down the Foothills Hydro-electric plant. Damages estimated from the fire and flood were estimated as follows:

[2] Lost value of unimproved land subject to extreme fire (63 of 114 properties in the Trout-West portion of the Hayman Fire) would persist up to 30 years.

-$2,000 per day each day the Hydro-electric Plant was shut down (total of 68 days, $136,000)
-$250,000 for additional chemical treatment
-$904,000 for immediate clean up
-$8 million dollars over a ten year period ($800,000 annually for increased annual maintenance)
-$15 – 20 million for removing sediment from the reservoir

I assumed that Hayman Fire will cause such damages this decade, and future fires would cause similar damages in years 15-29 in the model.

-$136,000 for hydropower plant shut down (I applied this to years 15 and 25, assuming a one-time event)
-$250,000 for additional water treatment (applied to years 15 and 25, assuming a one-time event)
-$904,000 for post-flood clean up (applied to years 15 and 25, assuming a one-time event)
$800,000 annually for increased annual maintenance, each year, years 16-29 (so that Hayman lingering damages are not included)
$17.5 million for removing sediment from the reservoir, applied years 15 and 25

Analyst Biography

Rochelle Desser has been a NEPA Coordinator and IDT Leader since 1991. She has attended several NEPA analysis trainings and is an instructor for Forest Service NEPA training. She has attended several classes about social assessment including the Human Dimensions of Ecosystem Management and Social and Economic Analysis for National Fire Plan projects. Rochelle completed the Community and Economic Development Institute at Portland State University. She has prepared several social assessments and has reviewed countless economic analyses in NEPA documents. Rochelle attended the Hutchins School of Interdisciplinary Studies and has an Associate of Science Degree in Geo-technology. Rochelle consulted with the Region 2 Economist Mike Retzlaff in using Quicksilver and this Economic Analysis.

Analysis Details

I used QuickSilver (version 5.004.45) to evaluate net value of each alternative over 30 years. Quicksilver input and output records are in the analysis files. Tables 12 and 13 describe how operations costs were figured for this analysis.

Table 12. Explanation of Costs of Operations Spreadsheet Elements

Spreadsheet Item	Costs
Helo Yard - merch (mbf)	Used average of $500 per mbf plus surcharge for no burning zone.
Helo Yard - non merch (ton)	Used average of $60 per ton plus surcharge for no burning zone.
Tractor Yard - merch (mbf)	Used average of $180 per mbf plus surcharge for no burning zone.
Tractor Yard - nonmerch (ton)	Used average of $35 per ton plus surcharge for no burning zone.
subtotal yarding	Sum of the above
Max yarding surcharge for no burn (%)	Adds 50% yarding surcharge for no burn acres.
Total yarding	Sum of yarding plus the surcharge
Chipping in Alt A	Used 5 million dollars
Onsite Treat/no yarding (acre)	Used average of $300 per acre
New temp + rehab (mi)	Used $35,000 per mile for new temp construction and eventual rehab
Unclassified road + rehab (mi)	Used $27,000 per mile for re-construction and eventual rehab
System Road	Used $4000 per mile for system road maintenance
total road	Sum of the above
Pile Burning (tractor acre)	Used average $300 per acre
Pile Burning (helicopter acre)	Used average $1000 per acre
Broadcast Burning (tractor acre)	Used average $200 per acre
Broadcast Burning (helicopter acre)	Used average $450 per acre
total burning	Sum of the Above
Broadcast Burning in Alternative D	Used higher costs - $500 per acre for tractor acres, $1000 per acre for helicopter acres. Higher costs are justified because Alternative D is associated with more residual trees to be left and less material removed. Also, broadcast burning closer than 1 mile from private land would likely be more expensive than burning further away due to nearby values at risk.
Tons to ccf ratio	3.1 tons per ccf
Total Yarding	Sum of all yarding
Total Onsite	Sum of onsite treatment
Total Road	Sum of road costs
Total Burning	Sum of burning costs
Total Cost	Sum of the above
Average Cost per acre treated	Total cost divided by acres treated

Table 13. Costs of Operations Spreadsheet

Cost Element	PA unit	PA Cost	Alt A unit	Alt A Cost	Alt B unit	Alt B Cost	Alt C unit	Alt C Cost	Alt D unit	Alt D Cost	Alt E unit	Alt E Cost
	Costs are in Dollars											
Helo Yard - merch (mbf)	4609	2,304,500	4609	2,304,500	3544	1,772,000	7055	3,527,500	1829	914,500	8913	4,456,500
Helo Yard - non merch (ton)	12918	775,080	12918	775,080	19775	1,186,500	19775	1,186,500	9887	593,220	19346	1,160,760
Tractor Yard - merch (mbf)	15428	2,777,040	15428	2,777,040	11224	2,020,320	13103	2,358,540	1904	342,720	29840	5,371,200
Tractor Yard - nonmerch (ton)	43248	1,513,680	43248	1,513,680	36726	1,285,410	36735	1,285,725	10290	360,150	64768	2,266,880
subtotal yarding		7,370,300		7,370,300		6,264,230		8,358,265		2,210,590		13,255,340
Max yarding surcharge for no burn (%)	0.07	515,921	0.5	3685150	0.12	751,708	0.07	585,079	0.21	464,224	0.07	927,874
Total yarding		7,886,221		11,055,450		7,015,938		8,943,344		2,674,814		14,183,214
Onsite Treat/no yarding (acre)	950	285,000	0	0	300	90,000	950	285,000	0	0	1250	375,000
light thinning (acre)	1950	585000	1950	585000	1100	330000	1950	585000	600	180000	0	0
New road + rehab (mi)	14	490,000	14	490,000	12	420,000	0	0	0	0	14	490,000
Unclassified road + rehab (mi)	48	1,296,000	48	1,296,000	31	837,000	48	1,296,000	13	351,000	48	1,296,000
System Road	68	272,000	68	272,000	50	200,000	68	272,000	36	144,000	68	272,000
total road		2,058,000		2,058,000		1,457,000		1,568,000		495,000		2,058,000
chipping (appx 300 per acre)				5,000,000								
Pile Burning (tractor acre)	7038	2,111,400	0	0	7038	2,111,400	7038	2,111,400	0	0	10,557	3,167,100
Pile Burning (helicopter acre)	2222	2,222,000	0	0	2222	2,222,000	2222	2,222,000	0	0	3200	3,200,000

Cost Element	PA unit	PA Cost	Alt A unit	Alt A Cost	Alt B unit	Alt B Cost	Alt C unit	Alt C Cost	Alt D unit	Alt D Cost	Alt E unit	Alt E Cost
Broadcast Burning (tractor acre)	3440	688,000	0	0	0	0	3440	688,000	1958	979,000	5160	1,032,000
Broadcast Burning (helicopter acre)	2660	1,197,000	0	0	0	0	2660	1,197,000	1882	1,882,000	3990	1,795,500
total burning/chipping (ac)	15360	6,218,400		5,000,000	9260	4,333,400	15360	6,218,400	3840	2,861,000	22,907	9,194,600
Total yarding		7,886,221		11,055,450		7,015,938		8,943,344		2,674,814		14,183,214
Onsite Treat/no yarding (acre)	950	285,000	0	0	300	90,000	950	285,000	0	0	1,250	375,000
light thinning (acre)	1950	585000	1950	585000	1100	330000	1950	585000	600	180000	0	0
total road		2,058,000		2,058,000		1,457,000		1,568,000		495,000		2,058,000
total burning		6,218,400		5,000,000		4,333,400		6,218,400		2,861,000		9,194,600
Grand Total		17,032,621		18,698,450		13,226,338		17,599,744		6,210,814	981	25,810,814
Average cost per acre	20170	844	19220	973	13570	975	20,170	873	6750	920	26320	981