
A Comparison of the Costs of Forest Service and Contract Fire Crews in the Pacific Northwest

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ABSTRACT: *Rising wildfire suppression expenditures on public land in the United States have led to increased scrutiny of wildfire management practices. One area that has received particular attention is the Forest Service's increasing reliance on contract fire crews. Because a contract crew rate includes several costs that are not included in the wage costs of a Forest Service crew, it is difficult to determine if this increasing reliance on contract fire crews increases or decreases wildfire suppression costs. The full cost of 33 Forest Service type II fire crews dispatched during the 2003 fire season from five national forests in Oregon and Washington are estimated and compared with the cost of contract crews dispatched in the same region. Results suggest that if sufficient work is available to keep a Forest Service crew productively employed throughout a fire season, then the daily cost of a Forest Service type II crew is lower than the daily cost of a contract crew. West. J. Appl. For. 20(4):233–239.*

Key Words: Type II fire crew, wildfire suppression, Oregon, Washington, Region 6, Forest Service, contract fire crews.

The cost of wildfire suppression on federal land in the United States has risen sharply in the last 10 years, resulting in increased scrutiny of federal wildfire management budgets (Donovan and Rideout 2003). In particular, the 2000 and 2002 fire seasons, during which federal suppression expenditures exceeded one billion dollars for the first time, focused attention on ways of controlling suppression costs. One practice that has received particular scrutiny is the Forest Service's increasing reliance on contract fire crews. In contrast to Forest Service fire crews, contract crews are only called on, and paid, when needed. A superficial comparison of the cost of contract and Forest Service crews shows contract crews to be significantly more expensive. (For example, the hourly cost of a contract wildland firefighter in the Pacific Northwest ranges from approximately \$25 to \$40 per hour, whereas the base hourly wage cost of most Forest Service firefighters is less than \$15 an hour.) This is a misleading comparison, however, as the contract crew rate includes several costs that are not included in the Forest Service rate. For example, the wage rate of Forest Service crews does not include workers' compensation insurance or equipment costs. Therefore, the purpose of this article is to estimate the total cost of operating a Forest

Service crew, allowing a meaningful cost comparison between Forest Service and contract crews.

Methods

There are two main categories of fire crews used for wildland firefighting. Type I crews can be used for all aspects of fire suppression, and typically have more training and experience. Type II crews are less likely than type I crews to be used for hotline work and more likely to be used for holding operations and mop-up (Pyne et al. 1996). The Forest Service does not use type I contract crews; therefore, a standard 20-person type II crew is used as the basis for the following cost comparison. In addition, because of difficulties in obtaining the necessary data, the analysis is restricted to the Pacific Northwest region (Region 6—Oregon and Washington) of the Forest Service. The costs of contract and Forest Service crews may be significantly different in other regions of the country, although I have no a priori reasons to believe that crews in the Pacific Northwest are more or less expensive than in other regions.

After consultations with fire managers and human resource specialists, I identified nine categories of costs that needed to be considered when estimating the cost of a Forest Service type II crew: wages, retirement/healthcare/social security, workers' compensation cost (the Forest Service is self-insured with respect to workers' compensation claims), human resource support, training, vacation, unemployment, equipment, and transportation. Costs that are

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common to Forest Service and contract crews were not included in the analysis. For example, the cost of providing meals in fire camp was not considered, as meals are also provided to contract crews. The purpose of this analysis is not to provide a complete accounting of all the costs associated with operating a type II Forest Service crew, but rather to estimate the cost of a Forest Service crew relative to a comparable contract crew.

I used the daily cost of a crew to compare Forest Service and contract type II crews. The calculation of daily cost requires assumptions about the length of a fire season and the number of hours worked in a day. After consultations with fire managers in Region 6, I decided on a 120-day fire season, of which 90 days are productive work days, and a 14-hour workday. After an initial cost comparison, sensitivity analysis was used to determine if results are sensitive to changes in these assumptions.

Results

Contract Crew Costs

The Oregon Department of Forestry maintains records of contract fire crews dispatched from the Pacific Northwest. During the 2003 fire season, Region 6 of the Forest Service used 2,831 contract crew days (unpublished Oregon Department of Forestry data on file with the author). The daily cost of a 20-person type II contract crew ranged from \$6,970 to \$11,270 with a mean of \$7,791 for a 14-hour workday. Contractors do not receive premium pay such as overtime, Sunday, nighttime differentials, or hazard pay. In addition, daily crew cost includes a \$60 charge levied by the Oregon Department of Forestry.

Forest Service Crew Costs

Direct Wage Costs

In Region 6, as in other regions of the country, the Forest Service draws on a number of sources to form type II crews. Some employees are hired for a fire season specifically to be on a type II crew, some are temporarily taken from other jobs within the Forest Service, and others are emergency administratively determined (AD) hires. (AD hires do not receive the benefits of permanent or temporary employees, nor do they receive hazard or overtime pay.) The mix of different types of employees differs from crew to crew and has the potential to significantly affect costs. I obtained data on the employment status (permanent, temporary, or AD) and grade and step (All government scale workers are paid on a 15-grade scale. Within each grade are 10 steps. Typically, employees are automatically moved up a step because

of seniority, but must receive a discretionary promotion to move from one grade to another. The differential between two grades is approximately four times the differential between two steps. Specific pay rates may be seen at http://www.opm.gov/oca/05tables/pdf/g_s_h.pdf) of 33 crews formed on the Mount Hood, Gifford Pinchot, Okanagon/Wenatchee, and Wallowa-Whitman National Forests during the 2003 fire season. Although these fire crews do not represent a random sample of all crews formed in Region 6 during the 2003 fire season, there are a sufficient number to provide a good range of variability.

Wage costs differ significantly depending on whether the crew is receiving hazardous duty pay. All Government Scale (GS) employees receive an additional 25% in hazard pay if the fire they are fighting is uncontrolled. Data were not available on the number of crews that worked on uncontrolled as opposed to controlled fires. Therefore, after consultations with Region 6 fire managers, I assumed that crews worked on uncontrolled fires 80% of the time.

Overtime payments also significantly affect the cost of a fire crew. In this analysis, I used a 14-hour workday as the basis for comparing the cost of a Forest Service crew and a contract fire crew. All GS-scale employees receive an additional 50% in pay for all hours worked over 8 hours. Therefore, in this analysis, all GS-scale employees receive 6 hours of overtime a day, assuming an 8-hour normal workday.

Healthcare, Retirement, Social Security, and Medicare Costs

Contributions to employee healthcare, retirement, social security, and Medicare add to the hourly cost of GS-scale employees. The magnitude of these additional costs depends on whether the employee is permanent or temporary, whether the employee is receiving overtime or hazard pay, and whether the employee is covered under the Federal Employee Retirement System (FERS) or the Civil Service Retirement System (CSRS). The sum of these additional costs and direct wage costs is generally referred to as the cost to government (CTG) of an employee. Table 1 compares costs for employees under the FERS and CSRS retirement schemes. (The retirement costs of firefighters under CSRS or FERS are 0.5 percentage points higher than for regular civilian employees.) Among permanent civilian federal employees, 58% are under FERS, and 42% are under CSRS. (Temporary employees do not receive retirement benefits. The FICA/HIT, FEHBA, and FEGLI costs for temporary employees are the same as permanent employees

Table 1. Costs to government of Federal Employee Retirement System (FERS) and Civil Service Retirement System (CSRS).

	FERS	CSRS
Percentage of federal workforce	0.58	0.42
Federal Insurance Contribution Act and Health Information Technology (FICA/HIT)	7.65%	1.45%
Retirement	11.90%	7.50%
Thrift Savings Plan (TSP)	3.00%	
Federal Employee Health Benefits Act (FEHBA)	\$110.31 per month	\$110.31 per month
Federal Employee Group Life Insurance (FEGLI)	0.00825%	0.00825%

under the FERS system.) However, the average age of firefighters is likely lower than the average for civilian federal employees; therefore, it is probable that more than 58% of firefighters are under FERS. However, as firefighter-specific data on the FERS/CSRS ratio were not available, I used the government-wide average for the following analysis. Note that for the 33 crews under study, only 22% are permanent employees; therefore, even if significantly more than 58% of firefighters are under FERS, there would be only a small change in costs.

FEHBA costs are based on Region 6 average 2003 health insurance expenditures. These cost data are used to calculate CTG ratios for permanent and temporary employees for base, hazard, and overtime hours (Table 2).

Table 2 shows that the CTG ratio for overtime by temporary employees is higher than for permanent employees, which may initially seem counterintuitive. However, consider that the only category of costs that applies to overtime is FICA/HIT and that FICA/HIT costs are higher for temporary employees (7.65%) than for permanent employees, of whom 42% are under CSRS at a FICA/HIT rate of 1.45%.

Vacation and Training Costs

All GS-scale employees receive paid vacation, which adds to the cost of operating a Forest Service crew. Employees accrue vacation at different rates depending on their length of service. Those who have been employed by the federal government (permanent and temporary employees) for less than 3 years receive 4 hours of vacation per 2-week pay period; those who have between 3 and 15 years of service receive 6 hours, and those with more than 15 years service receive 8 hours. Information on the leave category of individual crew members was not available, therefore, I made the following simplifying assumptions. Irrespective of grade, I assumed that all GS-scale employees on pay step 1, 2, or 3 are in the 4-hour per pay period leave category (for the first three years of service, federal employees receive an annual step increase), and that all employees on a step 4 or higher are in the 6-hour per pay period leave category. This is an imperfect estimate, as some employees with experience may have been promoted, and are, therefore, on the first step of a higher grade. Assuming 10 work days per pay period, paid vacation will add 0.4 h of wage costs (at the nonhazardous, nonovertime rate) per day to employees in the 4-hour leave category, and 0.6 h of wage costs per day to those in the 6-hour leave category.

In addition, when crew members return from a standard 2-week deployment they receive a paid day off, if the day after the last day of their deployment is a regular workday.

Table 2. Cost-to-government ratios for temporary and permanent employees.

	Permanent	Temporary
Base	1.257	1.077
Base (hazard)	1.518	1.346
Overtime	1.568	1.615
Overtime (hazard)	1.830	1.884

Therefore, for a given employee, there is a five in seven chance of receiving a paid day off; spreading this paid day off over the 14 days of a deployment adds 0.408 h of nonhazard, nonovertime wage costs to the daily cost of an employee.

Training requirements also add to the cost of operating Forest Service crews. The training requirements for new and returning type II crew members on the Willamette National Forest are shown in Table 3. Although there is some variation between national forests, conversations with fire managers from other national forests suggest that the Willamette National Forest's training requirements are fairly representative. Information on which employees had firefighting experience was not available. Therefore, I assumed that all GS-scale employees on a pay step 1 and all AD employees had no firefighting experience, and that all other employees have firefighting experience. In addition, I did not consider the cost of providing the training, simply the wage costs of those attending. Training requirements adds 0.981 h of wage costs per day per new employee and 0.478 h per day per returning employee.

Equipment Costs

The cost of equipment depends on the acquisition cost of the equipment and its serviceable life. Data on equipment costs and durability were provided by the Redmond Fire Cache, and are shown in Table 4. The daily cost of equipment is \$153.90.

Workers' Compensation (OWCP) and Unemployment (UCI) Costs

The federal government is self-insured with respect to workers' compensation and unemployment claims, and so does not pay workers' compensation or unemployment insurance, but rather pays claims directly. The amounts paid by Region 6 in OWCP and UCI claims for workers engaged in all types of fire management activities (presuppression, suppression, and fuel management) in fiscal years 2001 to 2003 are shown in Table 5. Note that the payment of a claim often continues for sometime after the corresponding claim was made. In particular, payment of OWCP claims can continue for several years after the original claim. Therefore, the data in Table 5 should be carefully interpreted. A change in OWCP or UCI claim payments in a particular year need not necessarily be correlated to a change in the number of hours worked in that year.

A private contractor processes unemployment payments for the Forest Service (The Frick Company), and charges an administrative fee. The ratio of Region 6 fire management UCI payments to total Forest Service UCI payments was used to calculate how much of this administrative fee to attribute to Region 6 fire management.

Estimating the cost of administering OWCP claims proved to be problematic for a number of reasons. First, OWCP claims are not administered by a private company, therefore separate costs records were not available. Second, OWCP administrative costs have several components that are difficult to estimate and exhibit great variability between claims: for example, the cost of a replacement employee and

Table 3. Training requirements for new and returning type II crew members on the Willamette National Forest.

Employee type	Description	Hours	Number of crew member that attend	Frequency (years)
All	District orientation	8	20	1
	Hose lays/pumps	2	20	1
	Line construction/fire shelters	8	20	1
	GPS/map/compass	8	20	1
	Blood-born pathogens	2	20	1
New	Guard school	32	20	1
	Right-to-know	8	20	1
	First aid/CPR	4	20	1
	Fire refresher	8	20	1
	First aid/CPR	8	20	1
Returning	Defensive driving	8	10	1
	Defensive driving—refresher	4	10	3
	Incident command training	8	5	1
	Chainsaw	28	5	1
	Chainsaw—refresher	8	10	3

Table 4. Cost and serviceable life of type II crew equipment.

Equipment	Unit cost (dollars)	Number per crew	Usable life (years)	Annual cost (dollars)
Nomex pants	61.30	40	1 to 2	1,634.67
Nomex shirt	50.63	40	1 to 2	1,350.13
Head protection	27.38	20	3	182.53
Goggles	7.00	20	1	140.00
Ear plugs (box of 200)	51.51	20	1	1,030.20
Gloves	12.04	140	1	1,685.60
Shelter	256.74	20	3	1,711.60
Individual first-aid kit	10.47	20	1	209.40
Belt first-aid kit	107.46	1	1	107.46
Head lamp	44.41	20	2	444.10
Chaps	56.59	6	1	339.54
Files (box of 12)	14.34	6	1	86.04
File handles (box of 12)	7.85	6	1	47.10
Polaski	66.18	4	0.5	529.44
McClouds	53.52	4	0.5	428.16
Shovels	33.36	6	0.5	400.32
Fire bag	44.10	20	2	441.00
Fire-line web gear	73.65	20	2	736.50
Belt weather kit	75.05	4	1	300.20
Canteens	2.78	480	1	1,334.40
Sleeping bag	53.48	20	1 to 2	713.07
Total				13,851.46

Table 5. Region 6 fire management UCI and OWCP costs, 2001–2003.

	2001	2002	2003	Mean
Direct UCI	1,562,201	1,742,000	1,242,140	1,515,447
Direct OWCP	1,027,194	992,088	1,102,669	1,040,650
Admin UCI	2,879	3,451	3,881	3,404
Admin OWCP	1,027,194	992,088	1,102,669	1,040,650
Total UCI	1,565,080	1,745,451	1,246,021	1,518,851
Total OWCP	2,054,388	1,984,176	2,205,338	2,081,301
Hours worked	4,863,581	5,637,674	4,879,430	5,126,895
UCI dollars per hour	0.322	0.310	0.255	0.296
OWCP dollars per hour	0.422	0.352	0.452	0.409

the cost of an accident investigation. Very few studies have attempted to estimate these administrative costs. I was able to obtain three case studies conducted in Forest Service Region 1. Administrative costs ranged from less than 50% of direct costs to over 400%. It is difficult to draw conclusions from three case studies, but it does appear that for larger claims, administrative costs are lower relative to direct costs. Collecting sufficient data to make an accurate estimate of administrative costs is beyond the scope of this study. Therefore, I assumed administrative costs were equal

to direct costs, and I acknowledge the uncertainty of this estimate.

The data in Table 5 are for all types of fire management activities, and are therefore not specific to type II crews. The true cost of OWCP and UCI claims for type II crews likely differ somewhat from the estimate of \$197.40 per day. However, as type II crews account for a significant proportion of wildfire management expenditures, it is probable that the above estimate is of the correct order of magnitude.

To provide some context for these cost estimates, SAIF Corporation, the largest provider of workers' compensation insurance in Oregon, typically charges \$30 to \$33 per \$100 of payroll for wildland firefighters (D. Peterson, Apr. 11, 2005, personal communication, Workers' compensation insurance rate quote for class 2702). This is equivalent to \$3.00 to \$3.30 per hour for an employee being paid \$10 per hour and is significantly more than the estimate of \$0.409 per hour in Table 5.

Human Resource Support

To estimate the cost of providing human resource support to a 20-person fire crew, I contacted human resource specialists in several national forests in Region 6. All agreed that providing human resource support to wildland firefighters was inherently more time-consuming than providing support for regular civilian employees. A consensus emerged that on an annual basis, one human resource specialist could provide human resource support for 60 wildland firefighters. Assuming a GS-9 human resource specialist at an annual cost to government of \$55,000, the daily cost of providing human resource support to a crew is \$66.97.

Transportation Costs

I assume that a crew requires three crew-cab pickups (class 287) and one extended-cab pickup (class 281). The cost of these vehicles has two components. First is a fixed use rate (FUR) includes the capitalized acquisition cost, increased replacement cost, depreciation expenses, and local forest program management costs. Second is a mileage rate that includes the cost of fuel, repairs, parts, tires, etc. The average Region 6 FUR cost is \$315 per month for class 287 vehicles, and \$300 per month for class 281 vehicles. The average Region 6 mileage rate is 29 cents per mile for class 287 vehicles, and 26 cents per mile for class 281 vehicles. Finally, the average Region 6 annual number of

miles driven for both classes of vehicle is 10,500. Outside of the fire season, these vehicles are used by other Forest Service employees not engaged in firefighting. However, conversations with Region 6 fleet managers suggest that these vehicles are used more heavily during the fire season than at other times of the year. Consequently, I assume that one-half of the annual mileage of these vehicles is driven during the fire season. Therefore, transportation costs add \$121.21 a day to the cost of a Forest Service crew.

Total Costs

Combining all the above categories of costs gives the total cost of the 33 crews under study (Figure 1). The mean daily cost of the crews is \$5,283, which is \$1,395 less than the mean cost of contract crews. The majority of crews cost between \$5,200 and \$5,700 a day; however, four crews cost over \$5,700, with the most expensive costing \$7,500 a day. This price variation is due to differences in the grade mix of crew members. In particular, including higher grade (GS-7 and above) permanent employees, whose primary job was not firefighting, significantly increased costs.

Sensitivity Analysis

As was stated in the introduction, this analysis is based on assumptions about the length of the workday and the number of productive days in a fire season. Clearly, it is unlikely that these assumptions will hold for all fire crews in all circumstances. Therefore, I systematically varied these assumptions, and tracked resultant changes in daily crew costs. Specifically, I repeated the analysis assuming a 12- and 10-hour workday and a 60- and 30-productive-day fire season. Given the assumption that the maximum number of productive workdays in a fire season is 90, a 60-productive-day fire season will have 30 nonsuppression days, and a 30-productive-day fire season will have 60 nonsuppression days. The effect of changing the number of productive days in a fire season on the daily cost of a fire crew depends on

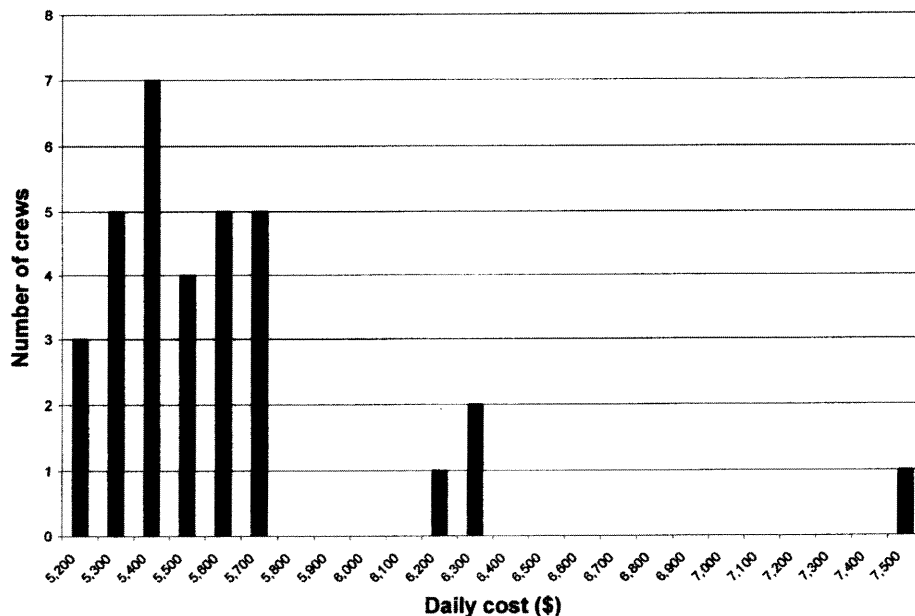


Figure 1. Total daily cost of 33 Forest Service type II crews dispatched from the Pacific Northwest during the 2003 fire season.

which employees must still be paid on these nonsuppression days, and on the availability and prevailing wage of alternative work. I assumed that on all nonsuppression days all permanent employees who have been temporarily assigned to a fire crew return to their normal duties (and thus accrue no cost to the fire crew), and that all AD employees are laid off. The remaining employees receive 8 hours of nonhazard pay.

If work with a prevailing wage equal to a crew's regular wage is available, then none of the wage costs from the nonsuppression days need to be considered. However, if no alternative work is available, then all of the wage costs from nonsuppression days need to be added to the daily cost of operating a fire crew on productive days. I calculate the daily cost of a fire crew under the following three assumptions: no alternative work is available on nonsuppression days; alternative work is available that has a prevailing wage one-half that of a crew's regular wage (or looking at it another way, work with a prevailing wage rate equal to a crew's regular wage is available on one-half of the nonsuppression days.); alternative work is available that has a prevailing wage equal to a crew's regular wage.

Other assumptions were required to calculate changes in daily costs. I assumed that the daily cost of equipment is unchanged. That is, if a crew works one-half the number of days, then the equipment lasts twice as long. I assumed that the daily cost of UCI claims is unchanged. However, I assumed that the cost of OWCP claims changes in proportion to the number of hours worked. I assumed that the total cost of human resource support is unchanged. Therefore, if the number of productive days is reduced by 50%, then the daily cost of human resource support doubles. I assume that the average daily miles driven remains unchanged. However, the monthly FUR cost must be paid irrespective of the number of productive days. Therefore, as the number of productive days declines, the daily cost of transportation increases.

Table 6 shows the daily cost of a Forest Service crew under different assumptions about the length of the workday, the number of productive days in a fire season, and the prevailing wage of alternative work. Table 7 shows these costs as a percentage of the cost of a contract crew. Tables

Table 6. The daily cost of a Forest Service crew under different assumptions about the length of the workday, the number of productive days in a fire season, and the prevailing wage of alternative work.

	90 days	60 days	30 days
		100%	
14 h	5,539	5,705	6,203
12 h	4,751	4,917	5,416
10 h	3,963	4,129	4,627
		50%	
14 h	5,539	6,159	8,020
12 h	4,751	5,371	7,233
10 h	3,963	4,583	6,444
		0%	
14 h	5,539	6,613	9,837
12 h	4,751	5,825	9,050
10 h	3,963	5,037	8,261

Table 7. The daily cost a Forest Service crew as a percentage of the price of a contract crew under different assumptions about the length of the work day, the number of productive days in a fire season, and the prevailing wage of alternative work.

	90 days	60 days	30 days
		100%	
14 h	71.1	73.2	79.6
12 h	71.1	73.6	81.1
10 h	71.2	74.2	83.1
		50%	
14 h	71.1	79.1	102.9
12 h	71.1	80.4	108.3
10 h	71.2	82.4	115.8
		0%	
14 h	71.1	84.9	126.3
12 h	71.1	87.2	135.5
10 h	71.2	90.5	148.4

6 and 7 show that reducing the number of hours in a workday reduces the absolute and relative costs of a Forest Service crew. In contrast, reducing the number of productive days in a fire season, or reducing the prevailing wage of alternative work, increases the relative cost of a Forest Service crew.

Discussion

This study compares the daily costs of operating a Forest Service crew and a contract type II fire crew. Assuming a 14-hour workday and 90-productive days in a fire season, the mean cost of the 33 crews under study is \$5,539, which is \$2,252 less than the mean cost of \$7,791 for a contract fire crew. However, changes in assumptions about the length of the workday, the number of productive days in a fire season, and the prevailing wage of alternative work can change the absolute and relative costs of a Forest Service crew. Therefore, this study should not be interpreted as showing that Forest Service crews are cheaper than contract crews, but rather as showing the relative cost of a Forest Service crew under a series of different assumptions.

Results show that the cost advantage of Forest Service crews is greatest when nonproductive days are minimized. In general, fire managers should consider using a Forest Service crew instead of a contract crew if one of the following two conditions is met. First, a manager believes that an upcoming fire season will provide continuous or close to continuous work for a crew. Second, alternative work is available that has a prevailing wage comparable with a crew's regular wage, allowing a crew to be continually productive throughout the fire season. Conversely, if neither of these conditions is met, then managers should consider using a contract crew.

In this study, I have attempted to consider all factors that affect the relative costs of Forest Service and contract crews. However, time, budget, and data availability concerns limited the scope of the study. Therefore, results should be interpreted with care. The following two points are of particular concern.

First, this study looked solely at costs, implicitly assuming that there is no difference in the productivity of Forest

Service and contract crews. To properly interpret the cost estimates in this study, further work is necessary, testing whether there is a difference in the productivity of the two types of crews. In addition, there may be systematic productivity differences among Forest Service crews. In particular, future research is needed to determine whether the inclusion of higher grade employees affects a crew's productivity.

Second, this study has not captured all the costs of operating a Forest Service crew. For example, I included equipment costs, but not the wage costs of employees who purchase and maintain equipment at fire caches. I included the wage cost of crew members attending training, but not the wage cost of instructors. There are inherent difficulties in estimating the costs of a small part of a larger organization, particularly when the accounting system of the larger organization is not designed for such an analysis. As one moves away from costs unique to type II crews, it becomes increasingly difficult to determine how to apportion costs. In some cases I have made estimates, such as the cost of providing human resource support, and in other cases I have not. However, just because a cost is difficult to estimate does not mean it should not be included in an accounting of the true cost of a Forest Service crew. Therefore, I re-emphasize the need for caution when interpreting these results.

One category of costs that I omitted from the analysis warrants particular attention. An overhead charge must be paid out of the Region 6 fire management budget based on the number of full-time equivalent employees in the previous fiscal year. Therefore, hiring an additional Forest Service crew increases the overhead charge in the next fiscal year. The overhead charge covers a diverse range of costs, such as support of the Chief's office, the capital fund to replace computers, subscriptions to the Federal Register, and toner for copy machines. However, it is crucial to distinguish between an accounting mechanism the Forest Service uses to cover overhead costs and the incremental change in costs that result from hiring a Forest Service crew as opposed to a contract crew. For example, the overhead

charge includes fixed costs such as the cost of subscribing to the Federal Register, which clearly would not be affected by hiring a Forest Service crew as opposed to a contract crew. Other costs in the overhead charge are not fixed, and may be affected by the choice to hire a Forest Service crew or a contract crew. For example, providing administrative support for an additional Forest Service crew may require additional computers. However, the component of the overhead charge that covers computer costs does not necessarily reflect the incremental increase in computer costs resulting from hiring an additional Forest Service crew. The overhead charge attributes costs without making a distinction between types of employees. For example, it seems unlikely that hiring an additional 20-person fire crew would require the same number of computers as hiring 20 seasonal interns to do data entry. Therefore, because there is no simple way to determine how costs covered by the overhead charge actually change as a result of hiring a Forest Service crew as opposed to a contract crew, I have omitted the overhead charge from the analysis.

Differences in the grade mix of Forest Service crews in this study resulted in substantial differences in daily costs. Although there may be good reasons for including higher grade employees on a crew, if too many higher grade employees are used, a Forest Service crew may lose its cost advantage over a contract crew, unless the higher pay of these employees is offset by increases in productivity.

In conclusion, this study suggests that the daily cost of a Forest Service type II crew is lower than a contract crew. However, to maintain this cost advantage, managers should consider the grade mix of a crew and the availability of continuous work.

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