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Forest Restoration and Forest Communities: Have Local Communities Benefited from Forest Service Contracting of Ecosystem Management?

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Abstract Conservation-based development programs have sought to create economic opportunities for people negatively impacted by biological diversity protection. The USDA Forest Service, for example, developed policies and programs to create contracting opportunities for local communities to restore public lands to replace jobs lost from reduced timber harvest. This article examines 12 years of Forest Service land management contracting in western Oregon, Washington, and northern California to evaluate if contractors located in communities near national forests have been awarded more land management contracts and contract value over time. We find that land management contracting spending has declined dramatically and, once we control for intervening factors, we find that local contractors have received a smaller proportion of land management contracts over time.

Keywords Conservation-based development · Forest communities · Procurement contracting · Forest Service · Northwest Forest Plan

Introduction

For at least a decade in the United States and much longer in Third World contexts, conservationist, nongovernmental and international aid organizations, foundations, and some governments have argued that successful conservation of natural resources and protection of biodiversity requires attention to the economic needs of the people whose livelihood depends on these resources, be they North American old growth forests, African big game, or Caribbean giant sea turtles (Gray and others 2001; Jungwirth 2002; Wells and Brandon 1992). Developing economic benefits from conservation and preservation creates incentives for those sorts of activities and makes it possible for people to change how they use natural resources. These entities have sought to create economic opportunity while protecting or restoring natural resources and biodiversity. Programs have sought, for example, to employ locals as forest guards to prevent wildlife poaching, develop nature-based tourism, create incentives for sustainable forest use through forest certification, shift control of forests to local communities, and develop industries that can restore degraded ecosystems. Others, particularly in the United States, have argued that forest amenities, such as scenic beauty, create significant economic opportunity by attracting retirees, second homeowners, telecommuters, and tourists (e.g., Power 1996). These "ecology and economy" approaches are growing in popularity in the United States (Daly 2003; Little 1996). But, little has been done to evaluate the economic benefits for people and communities who have depended on the resources in the past and especially those who have the fewest economic alternatives available once extractive use is prohibited.

Much of the literature about the potential of these approaches in the United States has been positive but largely theoretical or speculative. There is some literature about ecotourism that includes economic valuation models—but less frequently is there information about who benefits from the ecotourism, second home ownership, and the like (e.g., Bhat and others 1998). In addition, understanding the economic impact of ecotourism is often difficult because economic data is not collected. With

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forest certification, one study suggests that many forest certification programs have been created with large industrial landowners in mind, and the costs associated with them may limit small landowners' participation (Rickenbach 2002). Moreover, a survey of certified land managers found that two-thirds of those surveyed believed that the costs of certification currently outweigh the benefits, although most do hope that they will see more benefit in the future (Hartsfield and Ostermeier 2003). There is considerable room for debate and need for information about the economic impacts of "ecology and economy" programs, especially about the impact on those who are most economically vulnerable when resource use changes.

If there has been relatively little study of ecotourism and certification, there has been even less research about one of the central "ecology and economy" approaches associated with public lands, especially national forests, in the United States—the idea that economic opportunities through forest and watershed restoration would replace some of the losses associated with the reduced federal timber harvests. There have been a few evaluations of displaced forest worker training programs, which considered how many people were trained to undertake restoration activities or the strengths of weaknesses of training programs, but these studies do not tell us if there have been new jobs or business opportunities or who benefited from those opportunities (Daniels and others 2000; Hallock 1998). But, for nearly a decade, creating economic benefit for local, rural, or economically distressed communities restoring public lands has been the central "ecology and economy" strategy to respond to the reduced federal timber harvest that came with ecosystem management, yet we know little about the impacts of this strategy on public lands communities.

Using a 12-year analysis (1990−2001), this study considers whether the USDA Forest Service has created new economic opportunities restoring public lands and the extent to which local communities have benefited from these opportunities. This study is part of the larger socioeconomic monitoring effort of the Northwest Forest Plan, which sought to identify changes in the goods and services that the Forest Service provided with the coming of the Northwest Forest Plan and changes in rural communities located near national forests that were affected by the Plan (Charnley 2006).

Background

Timber Dependency and Community Stability

The Forest Service has long argued that forest management created rural economic opportunity, primarily through its timber sale program. Between World War II and about 1992, the Forest Service policy focused on creating community stability through an even flow of timber harvested from national forests, not the protection and restoration of biodiversity (Schallau 1989; Schallau and Alston 1987). Forest Service budgeting and justification for congressional appropriations linked timber harvest and job creation, and the impacts on rural communities and businesses was a significant variable in Forest Service computer models that generated proposed harvest levels on national forests (Hirt 1994; Sample 1990).

This federal timber harvest, along with private harvest, created communities in the Pacific Northwest and elsewhere in the United States that were dependent on timber harvest for their economic well-being. Although timber dependency had declined in many regional cities and some rural communities by the late 1980s in the American West, for many forest communities, particularly those near public lands, significant employment came directly or indirectly from timber management and other natural resource activities. In some places, even when timber and wood products were not the most important part of the economy, it was of central importance culturally (Carroll 1995). These timber dependent communities had been hit hard in the early 1980 recession, which had been particularly difficult for the forest products industry particularly. Temporary and permanent mill closures, industrial restructuring, and mechanization had created considerable hardship from which many timber dependent communities had not fully recovered (Weeks 1990). The spotted owl injunctions of the late 1980s and early 1990s were devastating for many of those within the communities and families surrounded by national forests and involved in the timber industry, and which had cultural and historical attachment to the place and sector in which they worked (Carroll and others 2000; Charnley 2006).

Between 1990 and 2000, western Oregon and Washington, and northern California lost about 30,000 forest products jobs, of which about 11,400 were lost between 1990 and 1994 because of the injunctions banning timber harvest on Forest Service and Bureau of Land Management (BLM) lands in the territory of the northern spotted owl (Charnley and others 2006).

In this context, economic and cultural dependency on public timber harvest was one of the central issues of the issues of the Northwest Forest Crisis (Forest Ecosystem Management Assessment Team 1993). Any politically acceptable agreement to change federal forest management had to somehow address timber dependency by providing new opportunities for those who had lost jobs. One solution was to create new jobs in ecosystem management—forest restoration and maintenance (Gray and others 2001). The Jobs in the Woods Program, which was created as part of the political agreements associated with the Northwest Forest Plan, was the first of several Forest Service authorities to use

forest and watershed restoration as a local economic opportunity for forest communities near public lands.

Policies to Create Community Benefit

With the end of industrial-scale timber management on national forests in the early 1990s in the Pacific Northwest, several federal and state agencies and nonprofit organizations sought to create new economic benefits for forest communities from national forests and other public lands, now as by-product of restoration instead of timber harvest (Gray and others 2001; Hallock 1998; Spencer 1999). Instead of industrial-scale timber management, the Forest Service would focus on the restoration and maintenance of forest habitat for spotted owls and other old-growth dependent species, and stream habitat for salmon and other fisheries. Rather than conversion of forests to timber plantations, the agency would restore ecological processes in national forests in the Pacific Northwest. Now, instead of selling large quantities of timber to provide economic opportunity, the Forest Service would contract forestry services that would restore national forests in the region.

The Jobs in the Woods Program, which began in 1994 as part of the Northwest Forest Plan, was the first of these efforts. As part of the program, the Secretaries of Interior and Agriculture issued a waiver that allowed the federal land management agencies to direct its contracts for watershed restoration to contractors located anywhere in the 58 affected counties of the Northwest Forest Plan in western Oregon and Washington and northern California (Willamette National Forest 1999). The waiver was fairly broad; it targeted all types of communities in the region, not just those that the Northwest Forest Plan would most heavily impact. We now know that contractors located in these counties already captured 85% of contract value from the forests in the Northwest Forest Plan area, suggesting that the opportunity for shifting contracting markets to create new benefit would be limited under this policy (Moseley 2005). In addition, Congress did not really appropriate new money for the Jobs in the Woods Program, but rather reprogrammed existing Forest Service budgets in the region for spending on restoration activities.

However, the Jobs in the Woods Program was only the first of several explicit policies to create economic opportunity through federal land management contracting. Subsequent authorities and directions in 1998, 2000, 2001, 2003, and 2005 were more targeted and sought to meet "local social and economic needs" and "local and rural community needs" by allowing the Forest Service to consider "the commitment of contractors to hire highly qualified or local residents" (Kitzhaber and others 1998). For a more detailed description of the authorities, see Moseley and Toth (2004). Although the exact language varied from authority to authority, the target groups have typically been businesses and workers in communities near national forests. If these authorities were effective, we would expect to see a progression through the 1990s and early 2000s toward increasing the proportion of contracts awarded to contractors from communities near national forests where the work was to be performed.

Contracting Federal Land Management

The mechanisms that these policies use to create benefit for local communities is the federal procurement contract, which most federal agencies use to purchase goods and services. The Department of Defense is probably best known for their contracting practices, but the Forest Service has long used procurement contracts to acquire goods and services from private businesses. These are not timber sales contracts, which are instruments to sell federal property (timber), nor are they grants or cooperative agreements with not-for-profit organizations and state and local governments.

The early political discussions about creating rural community benefit through contracting focused primarily on finding new opportunities for loggers, truck drivers, and mill workers performing restoration activities, neglecting the fact that there were already businesses and a workforce that performed contract forestry services activities for the Forest Service and BLM (for discussion of other forestry workforces see Brown 2000; Hartzell 1987; Mann 2001). As part of industrial-scale forest management on public lands, people worked seasonally for companies that contracted with the Forest Service and BLM to perform activities ranging from timber cruising—determining how much harvestable timber is available—to tree planting in clear cuts, tree thinning for timber stand improvement, and road building to access timber. Workers and businesses involved in labor-intensive activities, such as tree planting, small tree thinning, and fire suppression, often worked seasonally, traveling long distances as the weather changed. Although there had been cooperatives operating in this sector in the 1970s and 1980s, by the early 1980s, Hispanics began to dominate the labor force in the Pacific Northwest and worker exploitation was a common problem (Brown 2000; Mackie 1994). Much less was written about the equipment-intensive activities, such as road and bridge building; more recent research suggests that equipment-intensive contractors and workers did not typically travel far to work, compared to labor-intensive workers and that there working conditions, though seasonal and sometimes difficult, were probably not as frequently exploitive as with labor-intensive workers.

Under ecosystem management, instead of timber cruising and plantation stocking surveys, we would expect surveys for threatened and endangered species; instead of thinning for timber stand improvement, thinning for habit improvement, or fire hazard reduction; instead of planting for timber production, more complex tree planting and a shift away from the need for tree planting in clear cuts; instead of road building, road maintenance and obliteration.

Research Questions

This article seeks to understand if programs to create economic benefit through procurement contracting of land management services actually created new economic opportunities for businesses in local communities located near national forests. If the efforts to create local community benefit have succeeded, then (1) the Forest Service would have invested in restoration and management services and, (2) all else being equal, contractors located closer to national forests would have captured more of the contracts over time.

We examine Forest Service spending on contracting land management activities in the Northwest Forest Plan area between 1990 and 2001. We then evaluate whether the Forest Service awarded proportionately more contracts to nearby contractors over time by using a hierarchical linear regression model with the distance between the national forest where the work was performed as the dependent variable, the year when the contracts was obligated as the independent variable, and a series of control variables that past studies have shown affect the distance between contractor offices and the national forest where the work was performed (Moseley and Shankle 2001; Moseley and Toth 2004).

This study is part of a much larger socioeconomic evaluation of the Northwest Forest Plan after 10 years. The larger study involved monitoring changes in a number of regional indicators of the goods and services that national forests and the Bureau of Land Management provides (Charnley 2006). In addition, the larger monitoring effort included five case studies of national forest and Bureau of Land Management districts in the Northwest Forest Plan area. These case studies involved analyzing national forest or BLM district provision of goods and services data and conducting in-depth interviews with agency personnel and community residents about changes brought about by the Northwest Forest Plan (Buttolph and others 2006; Charnley and others Forthcoming; Dillingham and others Forthcoming; Kay and others 2007; McLain and others 2006). The study reported here examines changes in Forest Service contracting in the Northwest Forest Plan area, but takes a somewhat broader view of the potential policies that could be impacting changes in contracting patterns. It considers not only the Jobs in the Woods Program, which was part of the Northwest Forest Plan, but also other subsequent contracting policy changes that followed the Northwest Forest Plan.

Methods

Data

We examined Forest Service land management procurement contracting in western Oregon, Washington, and northern California between 1990 and 2001. More specifically, we chose contracts performed on national forests in the affected counties of the Northwest Forest Plan, where the first program to create rural community benefit was established (Fig. 1).

Our data comes from the Federal Procurement Data Center, which maintained a detailed database of all of the contracts awarded by all federal agencies above the "simplified acquisition threshold" which, for the Forest Service, was typically $25,000. We included Forest Service contracts associated with forest management activities including, for example, thinning, brushing, piling, noxious weed control, biological surveying, snag creation, riparian restoration, and road building, maintenance, and obliteration. We excluded all activities not associated with forest management, including, for example, building construction, personnel training, carpeting, as well as the purchase of all goods. This data does not include any timber sales, which are not procurement contracts but the sale of federal property, nor does it include wildland fire suppression contracts, which are not effectively recorded in this database and are procured using a fundamentally different system than other land management activities. We evaluate spending using contract award amounts in inflation-adjusted 2002 dollars.

Variables

We operationalize the dependent variable—local versus distant contractors—by measuring the distance between the office of the business awarded the contract and the national forest where the work was performed. The shorter the distance is, the more local or nearby the contractor. Rather than a continuous variable, it may be tempting to create a dichotomous variable of local and nonlocal. However, the definition of "local" is context specific and highly contested, and could not be meaningfully defined across large areas of the region. In addition, a continuous variable allows for more nuanced looks at change over time.

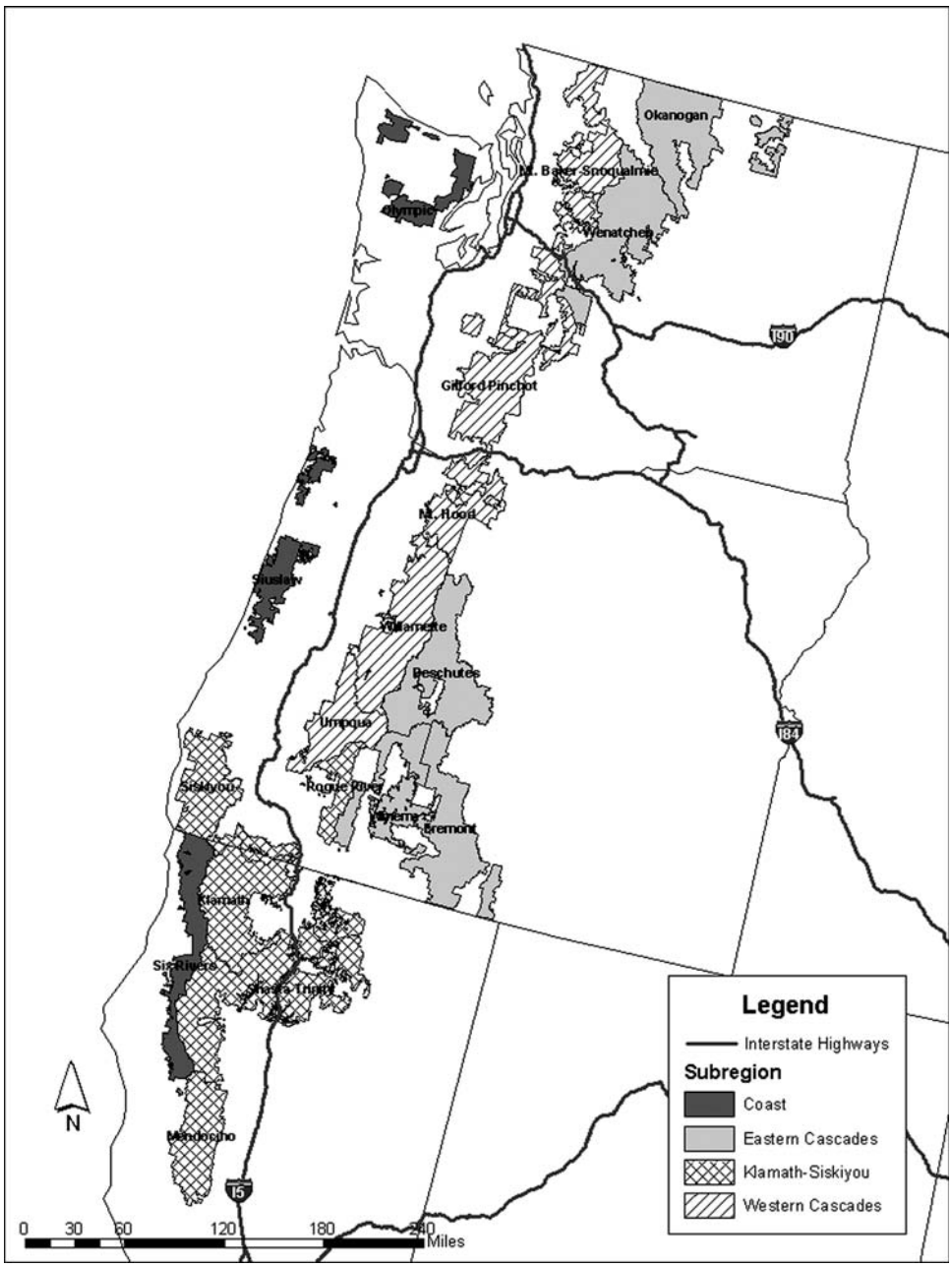

Fig. 1 Division of national forests within the Northwest Forest Plan region into sub-regions

We calculated the dependent variable, distance, by measuring the distances in air miles between contractor headquarters and the national forest where the work occurred. That is, we measured the distance between the delivery-weighted center of the zip code where the contractor's office is located and the centroid of the national forest where the work was performed. ESRI, the software provider of various geographic information products, provided delivery-weighted zip code points as part of their stock data. Rather than using the ESRI zip codes point, we considered using the Census Bureau zip code tabulation areas, but discovered that they were inappropriate given the number of rural contractors that use post office or rural route addresses, which are not well covered by the tabulation areas (U.S. Census Bureau 2007). The exclusion of post office boxes and rural routes likely would have excluded rural contractors who were the intended beneficiaries of these policies being evaluated in this study. Our centroid approach also allowed us to account for the varied shape and size of national forests.

Distances could not be calculated along roads because contractors' offices could not be consistently located more accurately than the zip code and work sites could not be located more accurately than the national forest, which might extend over a million acres and contain thousands of miles of roads. Using the contractor headquarters is

reasonable because in the vast majority of cases, companies have only one office. In Oregon, which has the most forestry services companies nationwide, only one forestry services companie reported having more than one office in 2001 and only two reported multiple offices in 1997 (Moseley and Reyes 2007). In the few cases where we identified multiple offices, we used the office closest to the national forests where the work was performed. These are not multinational or even national companies. Companies that contract with the federal government must be "small businesses." Until 2000, the Small Businesses Administration (SBA) defined a small business to be $5 million in annual revenue for forestry services and $27.5 million for most road-related activities. The SBA increased size standards to $6 million $28.5 million respectively in 2001 (Small Business Administration 2005).

We could readily imagine that distant contractors hire local workers or subcontract when traveling long distances. If this were the case, then there might be local community benefit even when home offices were far from work sites. However, Moseley (2006) reports that these types of contractors rarely hire local staff when traveling long distances and do they subcontract often. The infrequency of local hiring when traveling long distances and subcontracting makes the contracting office a reasonable approximation of the location of benefit. Consequently, we can expect a relatively large fraction of the revenue associated with a contract to flow to workers and businesses near the contractors' offices.

Our independent variable is the year in which the contract was obligated, with 1990 as the reference year. In addition, we have six control variables that Moseley and Shankle (2001) and Moseley and Toth (2004) have shown to significantly explain to the variance in the dependent variable. The control variables are: price of contract (in inflation adjusted 2002 dollars), the urbanity of the national forest (measured as the distance in air miles between the forest and the closest city); and a number of categorical variables: state, subregion, the type of work done for each contract, and contractor type.

For our independent variable, we chose 1990 through 2001 as our study period because this time period provided one year before the spotted owl injunction that halted harvest of timber on public lands in the areas of the spotted owl (May 1991) and several years before and after the Northwest Forest Plan came into being (April 1994). It is difficult to know exactly how representative 1990 was of pre-injunction procurement spending. However, it is similar to the late 1980s in timber harvest levels and management orientation, suggesting that it would likely also be representative in the contracting of road building, reforestation, and other tasks associated with timber management.

We stopped the study in 2001 because this was the last year of available data at the time the study was initiated. The 2002 data was available at the time of the study, but did not include contract numbers, which made the distance analysis impossible because there could be multiple entries in the dataset for a single contract.

We used a continuous 12-year study period rather than a simple before and after variable for two reasons. First, as described above, the Jobs in the Wood Program was only one of several policies created in the 1990s and early 2000s designed to create rural and local benefit from Forest Service contracting. Second, there was no clear before and after year for the Jobs in the Woods Program because it took several years to ramp up the Jobs in the Woods program and diffuse to various national forests and in some places it petered out while other programs were put in place. These two factors suggested that it would be more profitable to look at long-term, incremental change instead of conditions before or after a particular moment in time.

We calculated the "urbanity" variable measuring the distance between the weighted center of the national forest and the weighted center of the closest city with a population of 50,000 or more people. We suspected that contractors would be more likely to cluster around urban areas for a variety of reasons, including the larger populations, access to labor markets, and other business opportunities. Thus, national forests near urban centers would likely draw more nearby contractors than national forest far from urban centers, all else equal. Previous studies suggested, however, that there is a limit to these assumptions. Although distances tend to be shorter near densely populated areas, it is not the case that that contractors are concentrated in the regions largest cities (e.g., Portland and Seattle). Rather, past studies suggest that they are concentrated in mid-sized cities that still have a natural resource economic rather than areas that have become diverse metropolises. For this reason, it was not appropriate to correct for major metropolises in addition to closest urban area, as some studies have when trying to understand the effects of major metro areas on rural housing prices (Hardie and others 2001).

To control for regional variation, we divided the national forests by state—Oregon (OR), Washington (WA), and northern California (CA). In addition, we divided the national forests into four subregions based on ecological differences: coast (Siuslaw, Olympic, Six Rivers); western Cascades (Willamette, Umpqua, Mount Hood, Gifford Pinchot, Mount Baker-Snoqualimie), eastern Cascades (Wenatchee, Okanogan, Fremont, Winema, Deschutes); Klamath-Siskiyou (Rogue River, Siskiyou, Klamath, Shasta-Trinity, and Mendocino) (Fig. 1). The map suggests that perhaps the Siskiyou National Forest should be included in the coastal subregion, but topographic features not apparent

on the map place it more logically in the Klamath-Siskiyou subregion. The coast subregion is primarily temperate rainforest, typically with steep, mountainous terrain. Although, typically, not quite as wet as the coastal mountains, the western Cascades are also quite wet and rugged. Both the coast and west Cascade regions were at the center of the nation's softwood timber economies for much of the 20th century. Eastern Cascade range is in the rain shadow of the Cascade Mountains and has a much dryer, often semi-arid, climate. The Klamath-Siskiyou subregion is dominated by an east–west mountain range and complex, deeply folded valleys and is known for its high biodiversity. Both the eastern Cascades and Klamath-Siskiyou are fire-adapted ecosystems whereas the western Cascades and coast range are more likely to be decay-dominant ecosystems.

We created a set of work type variables by classifying each contract as equipment-intensive, labor-intensive, or technical based on the product service code that is assigned to each contract. Labor-intensive work involves the use of a significant number of people doing jobs such as tree planting and thinning using chainsaws. Equipment-intensive activities involve capital-intensive pieces of equipment such as backhoes or excavators and typically involve activities such as road building or decommissioning. Technical work is high-skill such as endangered species surveying, native grass seed collection, or road engineering. The categorization is rough because some product service codes involve a wide variety of work types. For example, the product service code "other natural resource and conservation services" includes technical work such as species surveys and equipment-intensive activities such as rock crushing. We classified it as technical.

Using information supplied by the Federal Procurement Data Center, we grouped contractors into business types. The categories include small business, small disadvantaged business, and large business. For service and construction sectors such as those included in this dataset, the Small Business Administration defines small businesses based on annual revenue, varying between industries and increasing the income limit as the industry changes over time. It defines small disadvantaged business as being small, owned by a woman or minority, and enrolled in the administration's disadvantaged business program. We eliminated contracts awarded to nonprofit organizations, state and local governments, and education institutions because these entities were the recipients of only small number contracts, many of which contained obvious inaccuracies, and, based on the authors' knowledge of contracts awarded to these types of entities, the list was incomplete. One problem, for example, was that awards to state governments typically identified the state capital as the contractor office location, even when it was likely that a local office, such as a department of forestry field office, actually performed the work.

Analysis

The unit of analysis in this study is the contract. However, multiple contracts can be awarded to a single contractor. Consequently, contracts are nested within contractor, which creates a hierarchical data structure in which observations are not independent, which does not satisfy one of the assumptions of ordinary least squares regression. Fortunately, the dataset includes a unique DUNS number for each business in the dataset because all businesses, including sole proprietorships, must have a DUNS number to contract with the federal government. There is undoubtedly some measurement error in this variable because a business could reorganize itself with essentially the same ownership and same location and apply for a new DUNS number. We can expect that to happen some over a twelve-year period and therefore uniqueness of contractors is probably somewhat overestimated. Nonetheless, the availability of the DUNS numbers allowed us to use a hierarchical linear model to control for correlated data using the SAS command PROC MIXED to conduct a mixed effects model estimated with restricted maximum likelihood. In this mixed model, the random affect is applied to contractors and fixed effect to all other variables. Using PROC MIXED is preferable to ordinary least squares because it reduces the downward bias of standard error estimates that ordinary least squares regression has when observations are not independent, which is common in a longitudinal analysis (Allison 2005). Our unit of analysis was the contract and we wanted to understand both between and within contractor variation. A fixed effects method was not an appropriate tool because the data is unbalanced, with approximately one-fifth of our data set having a single contract per contractor. There is some risk that the other variables are not independent of the random affect, which could potentially violate the assumptions of random effects model. However, with the known problems of OLS and with fixed effects, this appeared to be the best approach. A Hausman test, which is often performed to check to see if this is, in fact, a problem, could not be applied here because of the unbalanced nature of the data and the relationship of the sample to the population.

The dependent variable (distance between national forest and contractor office), distance between national forest and closest city, and the contract value were all transformed to logarithmic scale prior to conducting the regression because all three tended to have distributions with lots of small values and few large values, creating a one-tailed, nonnormal distribution.

With a logarithmic dependent variable, we transformed the slope estimates for the dummy variables:

$$c^* = \exp(c) - 1,$$

where c was the original estimate of dummy variable.

Thus, dummy variable should be interpreted as follows: a shift from the reference condition to the other condition is *x%* change in the distance traveled (Halverson and Palmquist 1980). The continuous variables that had been log transformed were not further transformed for interpretation.

After eliminating cases with missing data, we had 6,666 contracts and 1,797 contractors, with the maximum number of contracts per contractor being 90 and the minimum, one.

Results

Forest Service Spending for Contracting of Land Management Services

Between 1990 and 2001, the Forest Service spent a total of $716 million on procurement of land management services in western Oregon and Washington, and northern California. Forest Service spending via procurement declined throughout the period, from annual high of $103 million in 1991 to a low of $35 million in 2001 (Fig. 2). Although 2002 was not included in this study because of a missing variable, total spending fell further in 2002 (Moseley 2005). The number of contracts that the Forest Service issued declined steadily through the study period as well. The Forest Service issued almost half as many contracts in 2001 as it did in 1990 (Table 1).

The type of work that the Forest Service contracted changed as over-all spending declined. Over time, the Forest Service reduced its spending on tree planting, a labor-intensive activity associated with intensive timber management, and increased the proportion of its spending on contracted road maintenance and decommissioning. The Forest Service also increased the proportion of its spending on technical activities such as endangered species surveying, however, technical activities made up a small percentage of spending throughout the study period. This shift in spending is the result of changing management priorities that occurred as the result of the shift from intensive timber management to ecosystem management (Moseley 2005).

Distance Between Contractor Offices and National Forests Over Time

Control Variables

Fifty-one percent of the contracts in the sample were for work performed in Oregon, which is where most of the national forest land in the study area is located, and a plurality of contracts (38%) were for work on national forests in the western Cascades. Just over half of the contracts were for labor-intensive activities and another 33% for equipment-intensive work. Seventy-four percent of contracts were awarded to small businesses, which is as expected because the Forest Service is required to set aside contracts for small businesses whenever existing small businesses can perform the work. The average contract value was $98,947, with the maximum just below $4.3 million (Table 1).

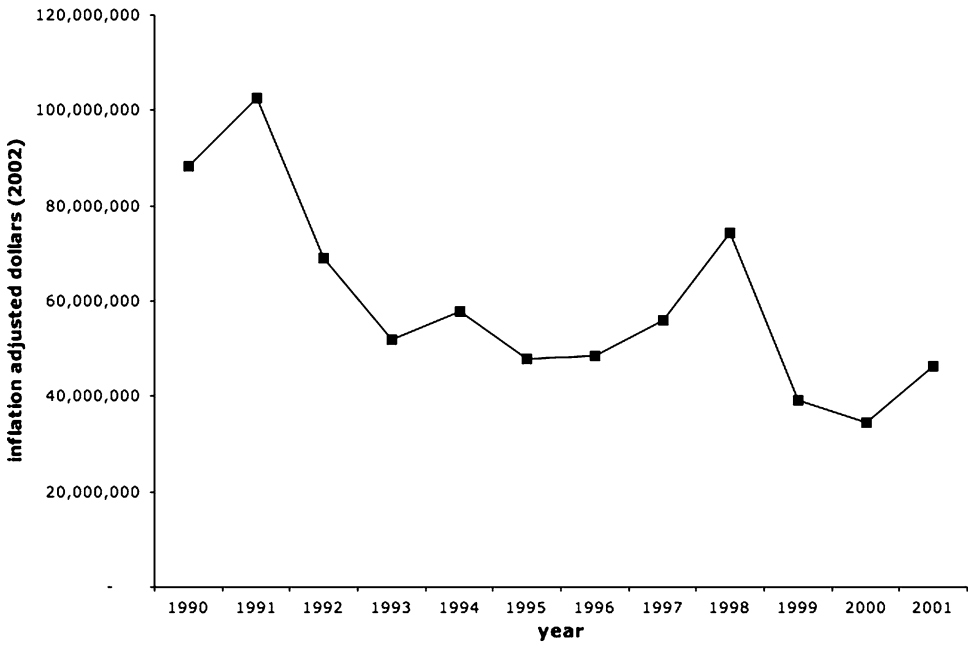

Fig. 2 Land management procurement spending

Table 1 Mean values for all variables

Mean values for all variables	*N*	Mean	Std. dev.	Minimum	Maximum
Dependent variable					
Distance btwn contr office and nat'l forest (air miles)	6666	113.58	161.32	2.05	2617.33
Control variables					
Distance btwn cosest city and nat'l forest (air miles)	6666	55.04	20.45	19.45	136.76
Contract value (2002 $)	6666	98947	181,053	169	4,282,695
State where contract was performed					
Oregon (reference)	3400	51%			
California	1479	22%			
Washington	1787	27%			
Subregion where contract was performed					
Western Cascades (reference)	2537	38%			
Coast	1289	19%			
Eastern Cascades	1448	22%			
Klamath-Siskiyou	1392	21%			
Type of business performing the contract					
Small business (reference)	4940	74%			
Small disadvantaged business	1605	24%			
Large business	121	2%			
Type of contract					
Labor-intensive (reference)	3414	51%			
Equipment-intensive	2170	33%			
Technical	1082	16%			
Independent variables					
Year when contract was obligated					
1990 (reference)	781	12%			
1991	806	12%			
1992	775	12%			
1993	534	8%			
1994	615	9%			
1995	538	8%			
1996	469	7%			
1997	486	7%			
1998	547	8%			
1999	411	6%			
2000	313	5%			
2001	391	6%			

The control variables are statistically significant in ways similar to past studies (Table 2, column 1). The value of the contract and the location of the contracts with respect to an urban center explain variance in small but significant ways. A one percent change in the distance between the national forest and the closest city leads to a 0.259% change in expected distance that contractors travel. Similarly, a one percent change in contract value creates a 0.045% change in distance.

Contractors travel 53.5% further to work in California and 41.8% further to work in Washington than in Oregon. Contractors also travel 5.5% further to work on the coast, and 25.7% further to work in the eastern Cascades than in the western Cascades but 11 percent closer to work in the Klamath-Siskiyou region. These results are similar to studies of contracting patterns from 1998–1999 to 2001–2002, which found that contractors from western and southwestern Oregon dominated the contracting market throughout Oregon, Washington, and California (Moseley and Shankle 2001; Moseley and Toth 2004). Western Oregon contractors worked close to home, creating relatively short travel distances for

Table 2 Estimates from mixed effects model estimated with maximum likelihood

Dependent variable	Log of the distance between contractor office and national forest (air miles)							
	All contracts		Equipment		Labor		Technical	
		p		*p*		*p*		*p*
Intercept	2.481	<0.0001	3.748	<0.0001	1.8377	<0.0001	3.143	<0.0001
Log distance between closest city and national forest	0.259	<0.0001	−0.170	0.0138	0.4329	<0.0001	0.242	0.0235
Log contract value (2002 $)	0.045	<0.0001	0.077	<0.0001	0.0282	0.0030	0.026	0.1127
	Percent change		Percent change		Percent change		Percent change	
State where contract was performed								
Oregon (reference)								
California	53.465	<0.0001	−4.277	0.5883	72.306	<0.0001	30.695	0.0120
Washington	41.779	<0.0001	36.424	<0.0001	59.744	<0.0001	−2.084	0.7439
Subregion where contract was performed								
Western Cascades (reference)								
Coast	5.522	0.0398	2.487	0.5941	9.827	0.0065	−3.399	0.6450
Eastern Cascades	25.747	<0.0001	18.175	0.0010	21.228	<0.0001	20.744	0.0260
Klamath-Siskiyou	−10.979	0.0005	−2.022	0.7590	−6.142	0.1607	−22.810	0.0005
Type of business performing the contract								
Small business (reference)								
Small disadvantaged business	−0.775	0.7787	−4.999	0.4058	−2.107	0.5140	−3.814	0.6062
Large business	18.317	0.0358	12.075	0.2550	69.893	0.0158	−2.617	0.8195
Type of contract								
Labor-intensive (reference)								
Equipment-intensive	−13.359	<0.0001	N/A	.	N/A		N/A	
Technical	−2.428	0.3507	N/A	.	N/A		N/A	
Year when contract was obligated								
1990 (reference)								
1991	6.632	0.0269	4.416	0.4219	8.539	0.0226	7.649	0.3801
1992	18.175	<0.0001	10.539	0.0739	27.737	<0.0001	3.582	0.6771
1993	17.704	<0.0001	13.066	0.0449	22.974	<0.0001	13.247	0.1647
1994	11.494	0.0011	0.353	0.9484	16.137	0.0007	5.407	0.5688
1995	8.605	0.0185	−7.717	0.1621	16.918	0.0006	−0.810	0.9348
1996	8.156	0.0310	−3.101	0.5775	14.717	0.0068	1.733	0.8576
1997	4.221	0.2590	−9.479	0.0684	13.451	0.0170	17.798	0.0871
1998	9.826	0.0096	−5.916	0.2609	22.434	<0.0001	0.558	0.9545
1999	10.303	0.0113	−0.242	0.9679	17.986	0.0018	8.476	0.4360
2000	12.919	0.0042	1.672	0.7919	19.411	0.0026	−0.900	0.9445
2001	26.529	<0.0001	22.397	0.0010	25.257	<0.0001	1.557	0.8891
	N	6666	*N*	2170	*N*	3414	*N*	1082

Oregon and the western Cascades. But, these contractors also travel to work in California and Washington and the eastern portion of the study area, which lead to longer travel distances in those states and regions. Finally, all else being equal, contractors performing equipment-intensive activities would be expected to travel 13.3% shorter distances than those performing labor-intensive contracts. There was no significant difference between labor and technical activities, which could be the result of an actual similarity or because of the highly varied nature of technical activities and the smaller sample size.

Relationships Between Distances and Year

If the initiatives and authorities to create rural community benefit through national forest management were having an affect, we would expect that the mean distance that contractors travel to work would decrease over time. Looking only at the mean distance over time, the trend appears to be decreasing distance, although the trend appears to have been underway before 1994, when the Jobs in the Woods Program began (Fig. 3). The mean distance between contractors' offices and the national forest where the work was performed begins at 128 air miles, climbs to 146 air miles in 1993 and falls continually to 91 air miles in 1997, when mean distance begins to increase again to 115 air miles in 2001.

However, a different pattern emerges when we control for other factors such as the price of the contract, the state and subregion where the work occurred, the type of business the contract was awarded to, and type of work involved. After controlling for these factors, we see, not a decrease, but a statistically significant increase in the distance traveled over time (Table 2, column 1 and Fig. 4). Ten of the eleven years are significantly different from the reference year, 1990, but in the opposite direction from the hypothesized. For example, the expected distance in 1992 is about 18% further and 1993 is about 17% further than 1990 with the largest expected distance in 2001, the last year of the study. The expected distance does decline in mid-1990s before increasing again, suggesting that the Jobs in the Woods Program might have had a short term impact, but that results were not long lasting. Other policies that came on the heels of the Jobs in the Woods program did not appear to help keep those distances down, at least in a way that could be measured on a regional scale. It appears that factors other than these policies were impacting changes where contractors were located that were awarded national forest contracts.

At first glance, it seems unlikely that the mean distance would decline over time while the expected distance would actually increase. Looking more closely at the data however, we see that the decline in mean distance is likely the result of a dramatic decline in contracting during the study period and a change in the proportion of its contracts that are labor-intensive versus equipment-intensive.

In the early 1990s, labor-intensive contracts dominated the contracting pool but the proportion of labor-intensive contracts declined rapidly along with total spending. In 1990, 64% of the contracts that the Forest Service issued were for labor-intensive activities. This proportion fell throughout the study period, until 2001, when they made up only 43% of contracts (Fig. 5). The Forest Service tends to award labor–intensive contracts to more distant contractors than equipment-intensive contracts (Moseley and Shankle 2001; Moseley and Toth 2004). Consequently, as the proportion of labor-intensive contracts in the sample declined, so did the mean distance. But, there was no decline in the expected distance, after controlling for work type. Moreover, the expected distance for equipment and technical contracts does not change over the study period and it increases significantly for labor-intensive contracts (Table 1, columns 2–4).

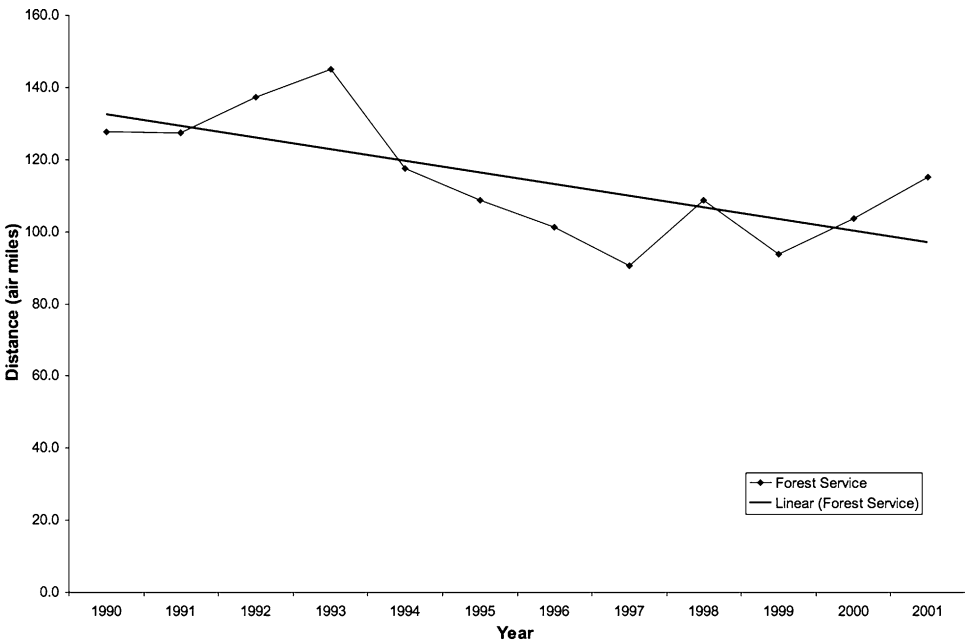

Fig. 3 Mean distance contractors traveled to work on national forests

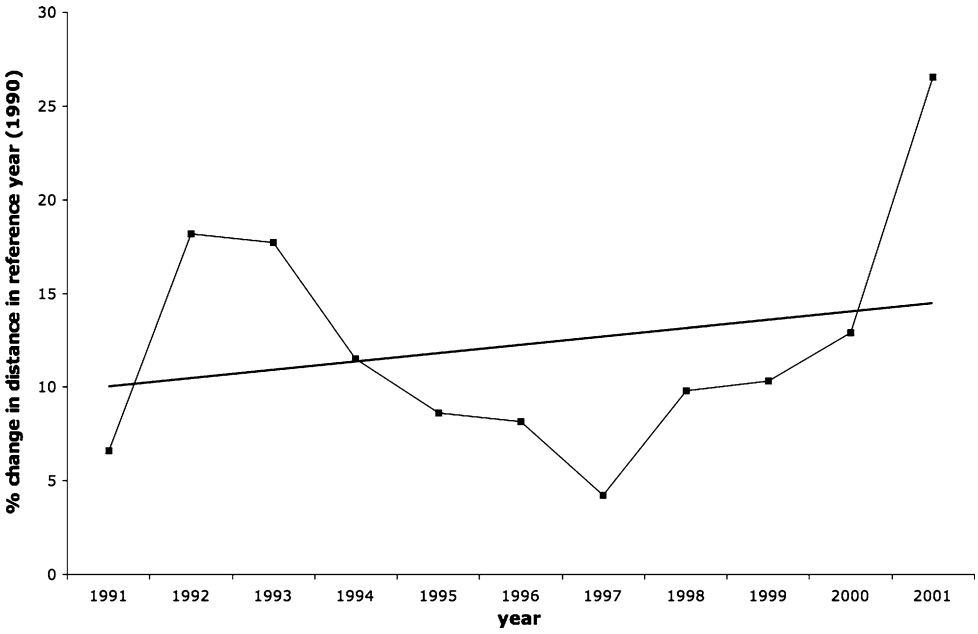

Fig. 4 Percent change from 1990 in expected distance traveled to work on national forests

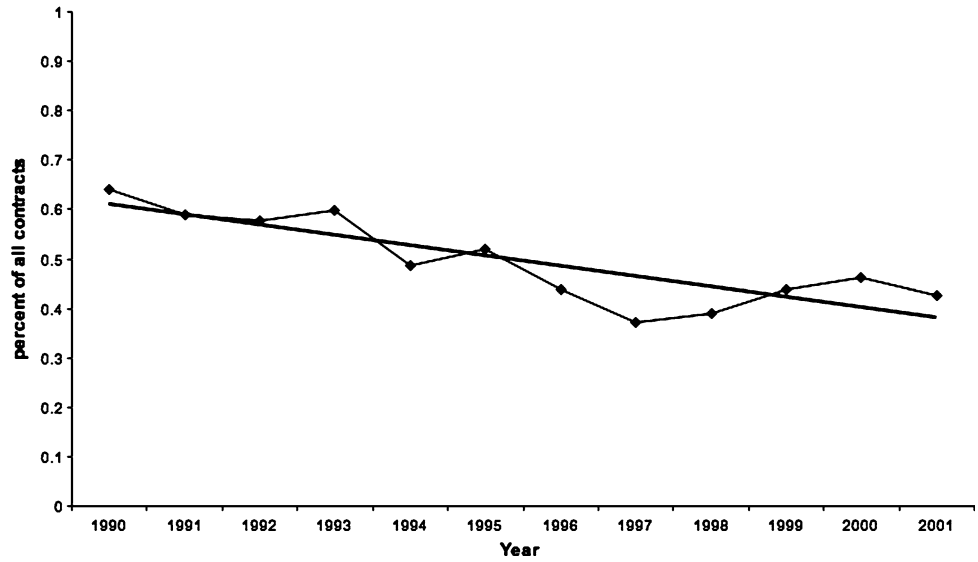

Fig. 5 Percent of land management contracts that were for labor-intensive activities

Discussion

This analysis finds that the Forest Service has not fulfilled the expectations for creating economic opportunity for public lands communities. The agency's spending on contracting of forest management activities declined considerably during the study period. The impacts on nearby contractors are somewhat more complicated. Clearly, communities near national forests saw contracting opportunities decline in absolute terms just as the rest of the region did. Contractors near national forests saw their contracting opportunities decline because funding declined over all. When taken as a whole, however, contractors located near national forests did not suffer as much as more distant contractors. This is because the shift in the type of work that the Forest Service contracted benefited nearby contractors compared to more distant contractors. Because the Forest Service reduced its equipment-intensive contracting more slowly than labor-intensive contracting, and equipment-intensive contracts are more likely to be awarded to nearby contractors, nearby contractors did somewhat better than more distant contractors.

Although nearby contractors appeared to have fared somewhat better than more distant contractors in the declining market, this appears to be the result of shifting contracting activities and not the result of policy authority

and direction to increase the proportion of awards to nearby contractors. We can conclude that the authorities did not cause a systematic increase in awards to contractors near national forests because (1) there is no significant decline in the distance that contractors travel to work after controlling for worktype and other factors, and (2) because the overall decline in mean distance began several years before the creation of the first local benefit authorities.

Why has the Forest Service not fulfilled policy expectations? It is worth discussing some of the possible reasons for the policy failure here even though it was beyond the scope of the original research questions as well as the data available for this study. After a review of government documents and an examination of Forest Service budget data, we can eliminate several possible explanations and come to fairly firm conclusions about the causes of declining spending on land management contracting. Understanding why local contractors did not increase their capture of contracts after we control for other factors would require additional research using fundamentally different methods. However, using other literature, this article can suggest some likely explanations.

Spending on Contracting

Declining spending could have had several different causes, including lack of need for restoration, a decision to use in-house staff rather than contractors to perform land management activities, or declining Forest Service budgets.

The need for costly restoration has been well documented. Throughout the study period, Forest Service watershed assessments in the region identified numerous road decommissioning projects, wildlife enhancement projects, and stream restoration needs. In addition, in 2001, a Government Accounting Office (GAO) estimated that over 5000 culverts—large metal tubes that allow streams to pass under roads—on Forest Service and BLM lands in Oregon and Washington were in need of repair or replacement because they blocked fish passage including the passage of threatened and endangered salmon. Between 1998 and 2001, the two agencies completed only 141 culvert projects. The GAO estimated that the complete cost of replacement or repair would be over $375 million dollars (Government Accounting Office 2001). In 2002, the Siuslaw National Forest estimated, for example, that its annual road maintenance costs were just over $5 million. In addition, it faced approximately $25 million in deferred road maintenance costs. Its road maintenance budget during 2002 was just over $767,000. Nationwide, the Forest Service would need approximately $500 million per year simply to eliminate the road maintenance and closure backlog. In 2000, the Forest Service received $11 million for these activities (Ihara and Hackett 2003). In 1999, the Government Accounting Office estimated that the Forest Service will need $12 billion to reduce fire hazard on 39 million acres that are at high risk of wildfire (Government Accounting Office 1999). The Forest Service faces billions of dollars of needed road removal, noxious weed treatments, and thinning and thus, lack of need for restoration cannot be the cause of declining contracting spending in the study area.

If lack of restoration needs is not the reason for lack of contracting spending, then another possibility is that the Forest Service chose to use in-house staff rather than continue to use contractors to perform land management activities. However, forest-level staffing—the staff that could perform on-the-ground activities—declined considerably during the study period as well. For example, the Willamette National Forest lost 46% of staff (296 full time equivalents) between 1990 and 1995 (Fairbanks 2003). Data compiled as part of the Northwest Forest Plan socioeconomic monitoring shows staffing declines across the Northwest Forest Plan area (Charnley 2006). An indexed comparison of forest level staffing and procurement spending in the study area shows that staffing and contracting spending falls at about the same rate between 1993 and 2001, the years for which data was available (Fig. 6).

Finally, if the lack of spending on contracting is not due to restoration need or increasing staffing, a decline in spending could be the result of declining Forest Service budgets. Forest Service budget numbers show, however, that the Forest Service's nonfire overall budget did not decline during this period; rather it increased somewhat, even controlling for inflation. However, data also complied for the Northwest Forest Planning socioeconomic monitoring project shows that the forest-level budgets in the Northwest Forest Plan area did decline rapidly (Fig. 6). By comparing indexed nation-wide Forest Service budgets, forest level budgets, contracting spending, and staffing, we see that while inflation-adjusted Forest Service budgets were stable or increased slightly, Northwest Forest Plan forests' staffing, budget, and contracting declined at roughly the same rate, although contracting spending was more erratic and, arguably, slower.

Given the declining forest-level budgets, contracting, and staffing in the Northwest Forest Plan area and absence of a decline in Forest Service budgets, decline in contracting is likely the result of declining forest-level budgets in the Northwest Forest Plan area. Because Congress does not set regional or forest-level budgets, the executive level of the Forest Service, Office of Management and Budget, or the Administration are the ones that likely decided to reduce the funds provided to the national forests in the study area. This decision in turn reduced both contracting

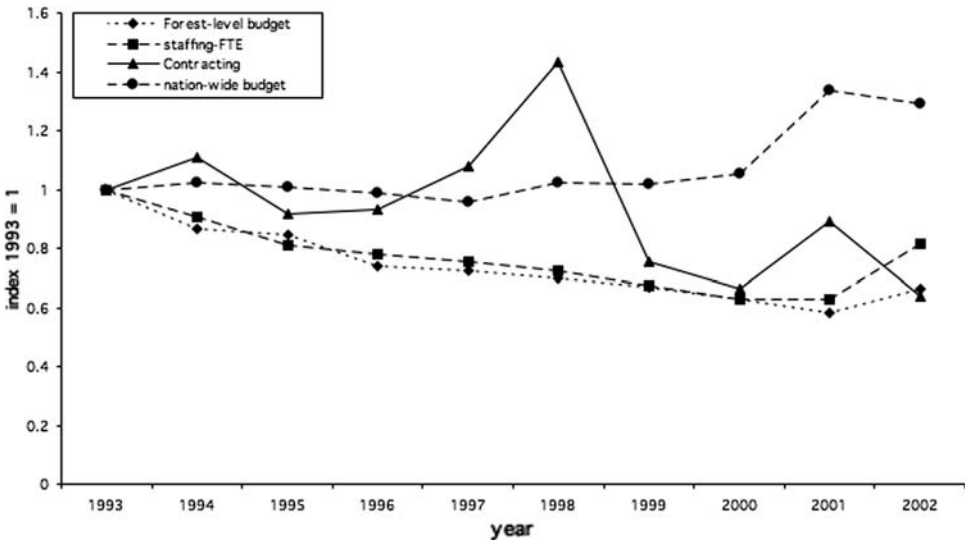

Fig. 6 Indexed forest-level budgeting, staffing, and contracting in Northwest Forest Plan Area forests in Oregon and Washington compared to nation-wide Forest Service budget, excluding fire management

spending and staffing levels on the forests during the study period. Despite the need for restoration and the policy promise of the Northwest Forest Plan to replace logging and mill jobs with jobs restoration in national forests, the Forest Service could not deliver on this promise because it has lacked the funding to do so at the level where on-the-ground restoration could occur.

Local Benefit

Explaining the pattern of contract capture is a somewhat more complicated task. Definitive explanations are largely beyond the scope of the methodological approach of this article, but we can suggest likely explanations building on the Northwest Forest Plan monitoring case studies as well as other literature.

As suggested above, the decrease in mean distance is largely explained by the shift in the type of work involved in contracting. Viewed from one angle, it appears that this "ecology and economy" strategy did not create the new benefits because, after controlling for other factors, expected distances increased. Viewed from another angle, however, the shift from timber management to ecosystem management changed the type of forestry services that the Forest Service needed and this created some new opportunity for local contractors performing these new activities. But, the question remains, why wasn't there any increase in local benefit that could be attributed to the new authorities? There are a number of possible reasons for this.

First, the authorities many not have been carefully enough defined to have the desired impact. This can most readily be seen with the Jobs in the Woods waivers, which allowed the Forest Service to direct work only to businesses anywhere in the affected counties of the Northwest Forest Plan not just to communities local to the national forests where the work was to be performed. Given that most of the Forest Service's contractors were already located in the affected counties, this was a blunt instrument for creating benefits for public lands communities. Later, authorities were more focused, but several of them did not come into affect until the early 2000s. Perhaps not enough time has passed to see their impacts on the overall contracting market. Other studies have suggested the National Fire Plan's local benefit authority did have some impact in 2001 and 2002, when compared to regular contracts (Moseley and others 2003; Moseley and Toth 2004).

Second, national forests may have chosen not to use the authorities. Although some national forests such as the Sweet Home District of the Willamette did focus deliberately on creating local community benefit, many likely have not (Buttolph and others 2006; Charnley 2006; Kay and others 2007; Moseley 2002). It is an open question how frequently these authorities have been used and, when they were used, how much weight local benefit carried compared to other factors such as price and the past performance of the contractors. The Forest Service does not collect these data systematically. No comprehensive evaluation has considered the actual use of the authorities because the only way to gather the information needed for an evaluation would be to examine individual paper contracts that are housed at national forest supervisors' offices. A review of a handful of innovative contracts in the early 2000s suggested that price was often the most important evaluation criteria and local benefit was infrequently considered (Moseley 2002). A more recent study suggests that the Forest Service rarely considers local benefit when awarding contracts in New Mexico (Moseley and Stone 2007).

There are at least two possible reasons for their limited use. One, contracting officers have a long history of using

contracting processes that award contracts to the lowest bidder, without considering other factors such as quality or local community benefit (Charnley 2006). Some contracting officers appear to local benefit authorities as contrary to these principles of free and open competition (Moseley 2002). Two, the Forest Service has a long history of using natural resource-based targets to measure accomplishments. Achieving these targets results in additional funding and staffing as well as promotion. Although timber harvests targets are perhaps the best known of these, the Forest Service faces targets for most of its activities, including restoration. These targets did not disappear with the end of industrial scale forest management, and, in fact have been increasing in importance in recent years as the Office of Management and Budget is directing the Forest Service and other agencies to implement performance based budgeting, which explicitly ties current budgets to past performance (Gregory 2005). This places considerable pressure on the agency to perform the greatest amount of restoration at the lowest possible costs. These fiscal pressures to accomplish natural resource objectives may well be trumping implementation of programs that might raise costs.

Third, it is possible that the Forest Service used the local benefit authorities, but local businesses, for some reason, still did not capture contracts. It is difficult to know if local contractors are losing out to more distant bidders, don't exist, or are not bidding because, unlike with timber sales, information about who bids on contracts is confidential.

Perhaps, there are few businesses in communities near national forests that can take advantage of the preferences. The forestry services sector has long been regional in nature, with contractors and their workers traveling long distances to work. This is particularly true for labor-intensive activities such as tree planting and thinning. In addition, markets for labor-intensive activities can be quite competitive and involve immigrant labor exploitation (Casanova and McDaniel 2005; Hartzell 1987; Mackie 1994; Mann 2001; McDaniel and Casanova 2003; Sarathy 2006). In this context, a small price advantage given to a local contractor many not be enough to overcome a low bid from a company that has access to an abundant supply of immigrant labor.

Shrinking federal contracting opportunities likely make competition even more intense. Furthermore, reduced and inconsistent contracting make it difficult to rely on nearby national forests as customers (Buttolph and others 2006; Charnley 2006). It may be that, in a shrinking market, businesses located farther away from national forests on major transportation corridors have been more likely to survive because they can work more easily on multiple forests, which may be increasingly necessary in a declining market.

Conclusion and Implications

The Forest Service spending on contracted forest management, restoration, and maintenance activities dramatically declined during the 1990s. Given the threefold decline in spending, the Forest Service could not have maintained existing forestry services business opportunities and jobs, much less create new opportunities for displaced mill workers and loggers. In addition, the Forest Service did not increase the proportion of contracts or spending awarded to locals beyond what had occurred as a result of the shift from labor-intensive to equipment-intensive activities. Because of this shift in worktype, however, local economic opportunity probably declined somewhat more slowly than it might have otherwise.

Declining spending on contracting was likely the result of declining forest-level budgets in the Northwest Forest Plan area. The cause of lack of increased local benefit is less clear but may be the result of inadequate policy direction, conflicting mandates, long-standing competitive regional markets, and/or inadequate business capacity in public lands communities.

This study has implications for the larger project of using forest restoration as an economic development strategy and "ecology and economy" approaches to environmental management more generally. Creating policies, program, and directives to create economic opportunity while pursuing ecologically-based environmental management by no means guarantees that a program will succeed. Just as ecological impacts of such programs need to be monitored and evaluated, so do the socioeconomic ones; conservation-based development does not succeed unless there are both ecological and socioeconomic benefits for target populations. Incorporating socioeconomic policies into the practices of natural resource agencies may confront significant institutional and political barriers (Meidinger 1997). In this case, this challenge was apparent in the decline of forest-level budgets (and therefore investments in restoration) despite significant ecological need for restoration as well as a policy commitment to use restoration as an economic development strategy. These budgets had long been tied to timber harvest levels; when policy moved away from intensive timber management, budget allocation processes did not follow. The barriers to creating local benefit are likely even more complex, perhaps a result of pre-existing institutional and cultural arrangements and conflicting policy mandates. This article—both its findings and limitations—points to the importance of not only tracking economic outcomes but also unpacking the management and market institutions that affect policy implementation.

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References

Allison PD (2005) Fixed affects regression methods for longitudinal data using SAS. SAS Institute Inc., Cary, NC

Bhat G, Bergstrom J, Teasley RJ, Bowker JM, Cordell HK (1998) An ecoregional approach to the economic valuation of land- and water-based recreation in the United States. Environmental Management 22(1):69–77

Brown B (2000) The multi-ethnic, nontimber forest workforce in the Pacific Northwest: reconceiving the players in forest management. In: Salazar DJ, Alper DK (eds) Sustaining the forests of the Pacific coast. UBC Press, Vancouver, Canada, pp 148–169

Buttolph LP, Kay W, Charnley S, Moseley C, Donoghue EM (2006) Northwest Forest Plan—the first 10 years: socioeconomic monitoring of the Olympic National Forest and three local communities. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Carroll MS (1995) Community & the Northwestern logger: continuities and changes in the era of the spotted owl. Westview Press, Boulder, CO

Carroll MS, Daniels SE, Kusel J (2000) Employment and displacement among Northwestern forest products workers. Society & Natural Resources 13(2):151–156

Casanova V, McDaniel J (2005) "No Sobra Y No Falta": recruitment networks and guest workers in Southeastern U.S. Forest industries. Urban Forestry 34(1):45–84

Charnley S (2006) Northwest Forest Plan—the first 10 years (1994–2003): socioeconomic monitoring results. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Charnley, S, Dillingham C, Stuart C, Moseley C, Donoghue E (Forthcoming) Northwest Forest Plan—the first 10 years (1994–2003): Socioeconomic Monitoring of Klamath National Forest and Three Local Communities. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Charnley S, Donoghue EM, Stuart C, Dillingham C, Buttolph LP, Kay W, McLain RJ, Moseley C, Phillips RH, Tobe L (2006) Northwest Forest Plan—The first 10 years (1994–2003)—socioeconomic monitoring results—volume III: rural communities and economies. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Daly M (2003) The other healthy forest initiative: community-based forestry takes root in the U.S. [On-line Magazine]. Grist Magazine, September 3 2003 [cited September 3 2003]. Available from http://www.gristmagazine.com/maindish/daly09030030.asp

Daniels SE, Gobeli CL, Findley AJ (2000) Reemployment programs for displaced timber workers: lessons from Oregon. Society & Natural Resources 13(2):135–150

Dillingham, C, Poe M, Grinspoon E, Stewart C, Moseley C, Mazza R, Charnley S, Donoghue E, Meierotto L, Toth N (Forthcoming) Socioeconomic monitoring of Okanogan-Wenatchee National Forest and five local communities. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Fairbanks R (2003) Workforce Planning on the Willamette National Forest [World Wide Web]. National Federation of Federal Employees Local 457 2003 [cited July 21, 2003 2003]. Available from http://www.plv4.innercit.com/~erikh/wf_planning.htm

Forest Ecosystem Management Assessment Team (1993) Forest ecosystem management: an ecological, economics, and social assessment. U.S. Government Printing Office, Portland, OR

Government Accounting Office (1999) Western national forests: a cohesive strategy is needed to address catastrophic wildfire threats. Government Accounting Office, Washington, DC

Government Accounting Office (2001) Land management agencies: restoring fish passage through culverts on forest service and BLM lands in Oregon and Washington could take decades. Government Accounting Office, Washington, DC

Gray GJ, Enzer MJ, Kusel J (eds) (2001) Understanding community-based forest ecosystem management. Food Products Press, New York

Gregory LD (2005) Following the money: the National Fire Plan, performance measures, and funding in the USDA Forest Service. Paper presented at the Western Political Science Association Meeting, Oakland, CA, March 17–19, 2005

Hallock M (1998) Improving jobs, community, and the environment: lessons from the Ecosystem Workforce Project. Labor Education Research Center, University of Oregon, Eugene, OR

Halverson R, Palmquist R (1980) The interpretation of dummy variables in semilogarithmic equations. The American Economic review 70(3):474–475

Hardie IW, Narayan TA, Gardner BL (2001) The joint influence of agricultural and nonfarm factors on real estate value: an application to the mid-Atlantic region. American Journal of Agricultural Economics 83(1):120–132

Hartsfield A, Ostermeier D (2003) Certification: the view from FSC-certified land managers. Journal of Forestry 101(8):32–37

Hartzell HJ (1987) Birth of a cooperative: Hoedads, Inc., a worker owner forest labor co-op. Hulogos'I, Eugene, OR

Hirt PW (1994) A conspiracy of optimism: management of the National Forests since World War Two. University of Nebraska Press, Lincoln, NE

Ihara DM, Hackett SC (2003) Reinvestment in jobs, communities and forests: the benefits and costs of a National program for road removal on US Forest Service lands, a preliminary analysis. Center for Environmental Economic Development, Arcada, CA

Jungwirth L (2002) Who will be the gardeners of Eden? Chronicle of Community Spring 31–34

Kay WM, Donoghue EM, Charnley S, Moseley C (2007) Northwest Forest Plan—the first 10 years (1994–2003): socioeconomic monitoring of the Mount Hood National Forest and three local communities. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Kitzhaber J, Williams R, Zielinski E (1998) Letter to staff: state of Oregon, USDA Forest Service, Pacific Northwest Region, and USDI Bureau of Land Management, Oregon State Office

Little JB (1996) Forest communities become partners in management. American Forests 102(3):17(13)

Mackie G (1994) Success and failure in an American workers' cooperative movement. Politics and Society 22(2):215–235

Mann G (2001) The state, race, and 'wage slavery' in the forest sector of the Pacific Northwest United States. Journal of Peasant Studies 29(1):61–88

McDaniel J, Casanova V (2003) Pines in lines: tree planting, H2B guest workers, and rural poverty in Alabama. Southern Rural Sociology 19(1):73–96

McLain RJ, Tobe L, Charnley S, Donoghue EM, Moseley C (2006) Northwest Forest Plan—the first 10 years (1994–2003):

socioeconomic monitoring of Coos Bay District and three local communities. USDA Forest Service, Pacific Northwest Research Station, Portland, OR

Meidinger EE (1997) Organizational and legal challenges for ecosystem management. In: Kohm KA, Franklin JF (eds) Creating a forestry for the 21st century. Island Press, Washington, DC, pp 361–379

Moseley C (2002) A survey of innovative contracting for quality jobs and ecosystem management. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon

Moseley C (2005) Procurement contracting in the affected counties of the Northwest Forest Plan: twelve years of change. USDA Forest Pacific Northwest Research Station, Portland, OR

Moseley C (2006) Ethnic differences in job quality among contract forest workers on six national forests. Policy Sciences 39(2): 113–133

Moseley C, Balaev M, Lake A (2003) Long term trends in contracting and the impact of the National Fire Plan in northern California. Ecosystem Workforce Program, University of Oregon, Eugene, OR

Moseley C, Reyes Y (2007) Comparing job quality in logging and forestry services in oregon. Journal of Forestry 105(6):293–300

Moseley C, Shankle S (2001) Who gets the work? National forest contracting in the Pacific Northwest. Journal of Forestry 99(9): 32–37

Moseley C, Stone C (2007) Forest service use of best value contracting: a sample from the Southwest region. Ecosystem Workforce Program, University of Oregon, Eugene, OR

Moseley C, Toth N (2004) Fire hazard reduction and economic opportunity: how are the benefits of the National Fire Plan distributed? Society and Natural Resources 17(8):701–716

Power TM (1996) Lost landscapes and failed economies: the search for a value of place. Island Press, Washington, DC

Rickenbach MG (2002) Forest certification of small ownerships: some practical challenges. Journal of Forestry 100(6):43–50

Sample VA (1990) The impact of federal budget process on National Forest Planning. Greenwood Press, New York

Sarathy B (2006) The latinization of foresty management work in Southern Oregon: a case from the Rogue Valley. Journal of Forestry 104(7):359–365

Schallau CH (1989) Sustained yield versus community stability. Journal of Forestry 87(9):16–28

Schallau CH, Alston RM (1987) The commitment to community stability: a policy or shibboleth? Environmental Law 17(3):429–481

Small Business Administration (2005) Table of small business size standards [World Wide Web] 2005 [cited April 11 2005]. Available from http://www.sba.gov/size/indextableofsize.html

Spencer C (1999) Linking forest employment and forest ecosystem objectives in the Pacific Northwest. Community Development Journal 34(1):47–57

U.S. Census Bureau (2007) Zip code tabulation areas 2007 [cited October 31 2007]. Available from http://www.census.gov/geo/ZCTA/zcta.html

Weeks EC (1990) Mill closures in the Pacific Northwest: the consequences of economic decline in rural industrial communities. In: Lee RG, Field DR, Burch WRJ (eds) Community and forestry: continuities in the sociology of natural resources. Westview Press, Boulder, CO, pp 125–140

Wells M, Brandon K (1992) Peoples and parks: linking protected area management with local communities. World Bank, World Wildlife Fund, and U.S. Agency for International Development, Washington, DC

Willamette National Forest (1999) Request for quotation: vegetation remeasurement and monitoring jobs in the Woods Project. Willamette National Forest, Eugene, OR