

Assessing the role of federal community assistance programs to develop biomass utilization capacity in the western United States

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ABSTRACT

As forest biomass utilization becomes cost effective to harvest, more areas at risk of catastrophic wildfire can be thinned of dense brush and small diameter trees. In an effort to increase biomass utilization, the USDA Forest Service granted more than \$36 million in National Fire Plan-Economic Action Program funds in the western United States during fiscal years 2001 to 2003. Interviews with program coordinators and grant recipients were used to characterize the types of investment strategies used and to assess accomplishments relative to national fuels reduction objectives. Findings include a strong emphasis on grants leveraging other funding sources, coordination of resources to increase utilization capacity, and the need for technical assistance to facilitate project design and implementation. We conclude that community assistance programs may help to create the type of utilization capacity necessary to reduce hazardous fuels, but that sustained progress will depend on synergistic activities on multiple fronts and improved demonstration of program accomplishments.

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1. Stimulating a “small diameter movement”

In January 2006, New York Times columnist Jim Robbins reported that a “small diameter movement” was afoot. Wildfires reducing communities to ashes would soon give way to “new uses for smaller trees, like heating schools and hospitals and construction materials, including particle board, flooring and laminated beams,” thanks to federal grants and research investments (Robbins, 2006). This was perhaps an overly optimistic assessment as we continue to witness the destructive forces of wildfire, but Robbins portrays what many have argued for some time, that investment in the end-uses of biomass removed from wildfire fuels reduction treatments is vital to offset the high costs of wildfire risk reduction and ultimately reduce the incidence of fire (Patton-Mallory, 2008). The challenge lies in knowing which end-uses will produce the greatest offset and by what means of investment are most effective for stimulating sustainable private business development. The purpose of this research is to examine the types of investment strategies used by federal community assistance programs to stimulate biomass utilization for the purpose

of hazardous fuels reduction. Community assistance programs are one approach among the many efforts needed by which local industry capacity may be expanded to find productive uses for this material (GAO, 2006).

As biomass utilization becomes cost effective, more areas at risk of catastrophic wildfire can be thinned of dense brush and small diameter trees (GAO, 2005). The challenge in many regions is that the scale and type of processing infrastructure does not match the amount or size of hazardous fuels that need to be removed (Haynes, 2003; Monserud et al., 2004). Developing this capacity has been difficult. Significant obstacles remain for providing a consistent supply of biomass to attract private investment (GAO, 2006; FPS, 2008). Removing low-value biomass has a high cost of harvesting and transportation (Han et al., 2004). And markets for higher value uses are largely absent or quickly saturated (Becker and Viers, 2007; Nechodom et al., 2008; Prestemon et al., 2008). This research provides a rare empirical study of the strategies employed by community assistance programs to overcome these challenges, and how the lessons learned from their implementation can be used to identify future funding priorities, monitor progress towards accomplishment of national fuels reduction objectives, and identify where synergies may exist to enhance public benefit and forest health. This research examines the investment strategies employed by the USDA Forest

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Service for a central set of community assistance programs collectively known as the Economic Action Programs (EAP) and closely related granting programs administered by the division of State and Private Forestry within the USDA Forest Service (USDA, 2000). Results of this research may provide insight for new federal biomass utilization and marketing initiatives and help land management agencies monitor and report program accomplishments.

2. Methods

We focus on community assistance projects targeted towards increasing biomass utilization through funding provided by the National Fire Plan (Western Governors Association, 2002; P.L. 106–291) during fiscal years 2001 through 2003, the height of funding appropriations. Three key sources of information are used to characterize utilization strategies: 1) grant project records; 2) program coordinator interviews; and 3) interviews with grantees.

Information relating to funding levels, location, and description of individual projects was collected from the national Program Management Tool database, maintained by national EAP managers and verified by regional coordinators. Official project descriptions maintained by each Regional Office were obtained and entered into a separate national database developed for this study. Biomass utilization and marketing projects were distinguished from other types of projects based upon the types of activities described. Narrative descriptions of each project were used to further classify projects by specific types of utilization and marketing activities funded. The final typology of projects provides the basis for our analysis and the sample frame for selection of grantees. It also establishes a baseline of activities upon which to assess the degree to which projects and corresponding strategies contribute to accomplishment of national fuels reduction objectives. Only projects funded in the western United States in USDA Forest Regions were analyzed due to the centralization of EAP funds and the focus on wildfire risk reduction (Fig. 1).

Staff in each western region were interviewed and asked to characterize their investment strategies, how those strategies evolved with experience, the ability to leverage private investments with federal grants, and to characterize programmatic success towards achieving national fuels reduction objectives. A total of 14 coordinators were interviewed face-to-face during the fall of 2004 with each interview lasting approximately 2 h. A process of open coding of

detailed notes taken from each interview was used to identify salient themes. Findings represent a range of themes and, where possible, focus on ascertaining patterns across coordinators noting commonalities and differences.

We then interviewed a purposive sample of grant recipients identified from the total population of utilization and marketing projects examined (Miles and Huberman, 1994). In consultation with program coordinators, 32 grantees were identified based upon the: 1) scope and types of activities accomplished; 2) relevance to national fuels reduction objectives; and 3) perceived successes and failures. Semi-structured phone interviews lasting approximately 30 min were conducted with a total of 28 grantees representing 48 projects. Interview questions focused on project accomplishments with respect to utilization capacity, unexpected outcomes, business spin-offs, and lessons learned. Open coding of detailed notes taken from each interview was used to identify a range of themes. Although responses do not represent perceptions of all grant recipients they depict a range of factors contributing to project implementation.

3. Utilization and marketing project characteristics

The National Fire Plan (NFP) Community Assistance programs were situated in a rich history of capacity building starting with the Cooperative Forest Management Act of 1950 (64 Stat. 473, as amended; U.S.C. 586c, 586d) and the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. §§ 2101–2114, P.L. 95–313 as amended) (USDA, 2003). Together they provided guidance to the USDA Forest Service for technical assistance, forest products manufacturing technologies, and market development for wood products. The 1990 Farm Bill followed with a Rural Development Title (National Forest Dependent Rural Communities Economic Diversification Act of 1990, Public Law 101–624, 7 U.S.C. 6611), which led to most of the existing rural community assistance programs being combined into one budget line item that collectively became known as the Economic Action Programs (Susan Odell and Steve Yaddof, pers. comm., USDA Forest Service, Nov. 30, 2006). We refer to the NFP-EAP as the umbrella under which the National Fire Plan funds were distributed. NFP-EAP funding began at approximately \$25 million in fiscal year 2001, was reduced to \$12.5 million in 2002, \$5 million in 2003, and subsequently eliminated in Fiscal Year 2004 (USDA, 2005). Selected projects for this study represent about two-thirds of the \$42.5 million appropriated to the NFP-EAP during fiscal years 2001 through 2003.

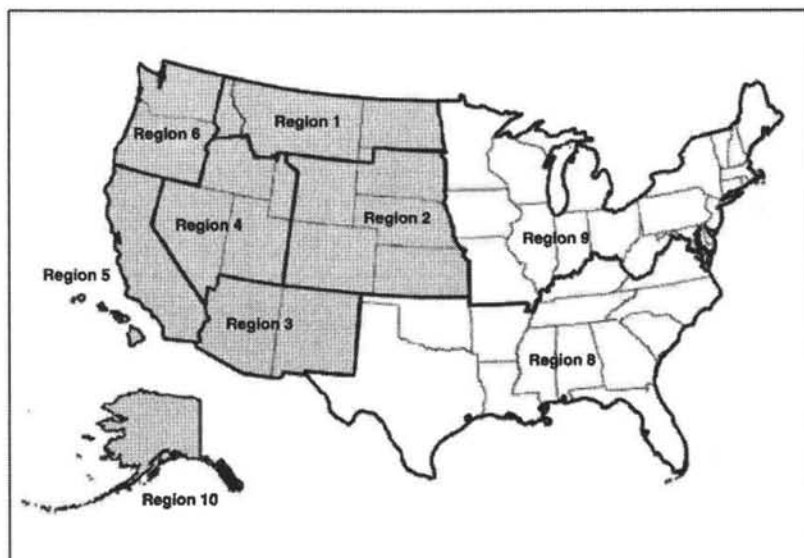


Fig. 1. USDA Forest Service regions.

3.1. Project funding by region

From fiscal years 2001 through 2003 the USDA Forest Service funded more than 2000 NFP-EAP projects in western regions, of which 301 had an explicit goal of increasing the utilization of low-value small diameter trees and biomass removed by hazardous fuels reduction treatments (Table 1). In Regions 1 and 4, which encompasses much of Utah, Nevada, Idaho, Montana and North Dakota, about \$7.5 million was granted to NFP-EAP projects for utilization and marketing, which represented 22% of all NFP-EAP projects in the region. Most were less than \$75,000 but ranged up to \$855,000 in size. In Region 3 – Arizona and New Mexico – 70% of projects and more than \$5.5 million in funding were used to support utilization and marketing with projects ranging up to \$400,000. And in Region 2 – Colorado, Wyoming, South Dakota, Nebraska and Kansas – 16% of NFP-EAP projects funded were for utilization and marketing, totally nearly \$2.0 million with most of them smaller than \$50,000 and not more than \$160,000.

Differences among these regions in terms of the number of projects funded, types of projects, and funding amounts reflects variations in existing wood manufacturing infrastructure, market conditions, and threats of wildfire to communities. In Arizona and New Mexico, for instance, where there exists diminished biomass processing infrastructure (Spelter and Alderman, 2003), there is a corresponding emphasis on using available NFP-EAP funds to rebuild that capacity. Alternatively, in Oregon and Washington State (Region 6), which arguably has more manufacturing capacity, only about 7% of all NFP-EAP projects were related to biomass utilization and in California and Hawaii (Region 5) only 9% were used for utilization and marketing with most projects smaller than \$50,000. Interestingly, many businesses and communities receiving NFP-EAP funds in Regions 5 and 6 were also recipients of federal aid via the Northwest Economic Adjustment Initiative, which was a framework of federal programs to mitigate for changing forest-based economic conditions in the 1990s (Christensen et al., 1999). A vast majority of projects in these regions focused on other aspects of implementing the NFP, such as wildfire risk assessment and planning, homeowner education, and forest health monitoring.

Region 3 is unique in that Congress also earmarked EAP funds for the Four Corners Sustainable Forests Partnership and separately to the Collaborative Forest Restoration Program. The Four Corners Sustainable Forests Partnership began in 1997 as a four-state effort in Arizona, New Mexico, Colorado and Utah to reduce wildfire risks by investing in projects having the capacity to affect forest restoration through economic development. Beginning in 1999, Congress funded the program using a combination of existing EAP authorities and granting about \$2.5 million to 55 utilization and marketing projects in the western United States from fiscal years 2001 through 2003. The Collaborative Forest Restoration Program, which was also administered by the USDA Forest Service through State and Private Forestry, was piloted in New Mexico through the Community Forest Restoration Act of 2000 (Title VI,

P.L. 106–393). A total of \$5 million was appropriated annually from fiscal years 2001 through 2006 to provide cost-share grants for wildfire risk reduction, ecosystem restoration, biomass utilization, and the creation of forest-related local employment. During fiscal years 2001 through 2003, about \$5.6 million was granted to 20 projects specifically for biomass utilization.

The Forest Products Laboratory, which also administers community assistance dollars through State and Private Forestry, administered 30 additional EAP grants in the study region. Funds were awarded for technical assistance, feasibility analyses, and wood characterization research to facilitate biomass utilization. In all, the Forest Products Laboratory awarded about \$1 million in the western United States during the study period. Combined, the Forest Products Laboratory, Collaborative Forest Restoration Program, and the Four Corners Sustainable Forests Partnership funded 105 biomass utilization and marketing projects. More than \$13 million was allocated to Region 3 followed by Regions 1 and 4 with about \$8 million and \$6.4 million in Region 10 of Alaska. Combined with NFP-EAP funding, more than \$36 million was granted to 406 projects in western USDA Forest Service regions during the study period to reduce the risk of wildfire through biomass utilization and marketing.

3.2. Types of activities funded

Utilization and marketing projects funded by the various community assistance programs spanned a broad spectrum with primary activities including: 1) manufacturing and processing; 2) economic feasibility and assessment; 3) pilot and demonstration; 4) harvesting and transportation; 5) technical outreach, education, and coordination; 6) market analysis and development; 7) product research and development; and 8) business planning. Grantees frequently engaged in several activities but that generally one or two comprised the primary focus. The Program Management Tool database was used to identify dominant activities and categorize projects into distinct groups to allow for comparisons across regions (Table 2). These data illustrate the range of activities planned and the general distribution of funding, but are not mutually exclusive.

Of the more than \$36 million in funding across the 406 total projects, manufacturing and processing projects received the greatest amount of funding, nearly \$9.6 million, and almost half of that was granted in Region 3 (Table 3). Region 10 in Alaska also awarded a substantial portion, about \$3.2 million of a total of \$6.4 million, for manufacturing and processing, followed by \$2.7 million for economic feasibility and assessment. Overall, feasibility and assessment studies ranked second in total granting comprising 76 projects and about \$8.2 million. Pilot and demonstration projects followed with about \$6.5 million in investments, one third of which was in Regions 1 and 4 to fund the Fuels for Schools program, which was a Congressional earmark jointly administered by EAP coordinators to support biomass heating technology in public schools (USDA, 2006). Region 2, which

Table 1

Funding for biomass utilization and marketing from the Economic Action Programs (EAP) in western USDA Forest Service regions, fiscal years 2001 through 2003

USDA Forest Service region	Number of NFP-EAP projects ^b	NFP-EAP funding	FCSFP-EAP funding ^c	CFRP funding ^d	FPL-EAP funding ^e	Total funding
Regions 1 and 4 (UT, NV, ID, MT, ND) ^a	68 (310)	\$7,475,792	\$285,000	–	\$291,780	\$8,052,572
Region 2 (CO, WY, SD, NE, KS)	53 (339)	\$1,962,329	\$560,455	–	\$79,993	\$2,602,777
Region 3 (AZ, NM)	56 (80)	\$5,523,600	\$1,670,600	\$5,664,989	\$310,000	\$13,169,189
Region 5 (CA, HI)	66 (752)	\$3,273,070	–	–	\$144,527	\$3,417,597
Region 6 (OR, WA)	34 (485)	\$2,674,050	–	–	\$165,851	\$2,839,901
Region 10 (AK)	24 (122)	\$6,380,924	–	–	–	\$6,380,924
Total	301 (2088)	\$27,289,765	\$2,516,055	\$5,664,989	\$992,151	\$36,462,960

^a Regions 1 and 4 are jointly administered through the Cooperative Forestry Office in Missoula, Montana.

^b Number in parentheses is the number of all funded National Fire Plan-EAP projects including for biomass utilization and marketing.

^c Funding for Four Corners Sustainable Forests Partnership-EAP projects.

^d Funding for Collaborative Forest Restoration Program projects.

^e Funding for Forest Products Laboratory-EAP projects.

Table 2

Types of activities funded by Economic Action Programs for biomass utilization and marketing in western USDA Forest Service regions, fiscal years 2001 through 2003

Project activity	Definition	Examples
Manufacturing and processing	Retrofitting manufacturing facilities and expanding and/or constructing processing infrastructure	• Purchase and installation of log peeler and dowel machine • Construction of dry-kilns and lumber storage facility
Economic feasibility and assessment	Evaluating feasibility of projects including resource availability, financial analysis, and community economic assessment	• Conduct feasibility study of a biomass-to-energy plant • Assess cost effectiveness of portable milling equipment
Pilot and demonstration	Implementing test projects to pilot ideas and demonstrate new techniques for harvesting and processing small diameter wood and biomass	• Construction of visitor kiosk using roundwood engineering • Installation of biomass district heating system in a public school
Harvesting and transportation	Expansion of forest operations for harvesting, handling, and transportation	• Purchase chipper to provide fuel wood for heating system • Fund fuel reduction project and transport material for mulching
Technical outreach, education, and coordination	Providing training and technical assistance to businesses, community education, and partner coordination	• Hire small wood enterprise agent to provide technical assistance • Fund partnership outreach and coordination of programs
Market analysis and development	Providing assistance and analyses for woody biomass market development	• Assess the competitiveness of biomass products in the marketplace • Market awareness campaign for small diameter wood products
Product research and development	Conducting research and development activities for new products using biomass and small diameter wood	• Development and testing of wood-plastic composites • Create engineering plans for roundwood trusses
Business planning	Providing assistance to businesses for financial planning, and creation of loan programs	• Establish small diameter business incubator and log sort yard • Provide low interest loans and business planning

awarded the least amount for biomass utilization, focused efforts on outreach, education, and partnership coordination, or about \$0.5 million. The front range of Colorado and the southwest corner of the state received the bulk of this funding working closely with state organizations to provide project assessments, market analysis, and business planning.

Value-added products were an important component of many projects, although product research and development were among the least funded. Separate federal assistance programs like the USDA-Department of Energy Biomass Research and Development Initiative, as authorized by the Biomass Research Development Act of 2000 (Title III, P.L. 106–224) and the Healthy Forest Restoration Act of 2003 (P.L. 108–148), provided more than \$20 million annually for research in targeted aspects of biomass utilization, thus reducing the burden on EAP. Fewer grants were also awarded for market development (\$2.29 million) and business planning (\$1.29 million), which comprised 10% of all project activities, despite observations by coordinators that grantees lack viable markets and have poor business planning.

4. Program coordinator strategies

4.1. Federal investment in capacity building

Program coordinators were asked a series of questions characterizing regional investment strategies, how strategies evolved with experience, and approaches to leveraging private investment and capacity building. Fundamental in all regions was the desire to build capacity for hazardous fuels reduction by providing financial and technical assistance. An important tenet of this strategy was providing assistance that did not result in spending federal dollars on the actual treatment of national forest lands. Rather, investments were in activities to facilitate enterprise development. Coordinators typically viewed their role as funding missing pieces of the local utilization landscape, which could include investment in the manufacturing infrastructure capable of using the size and volume of material generated from fuels reduction projects. One coordinator observed that, where communities have historically depended upon federal timber, and capacity and capital have been almost exclusively geared towards extraction of large trees, an abrupt downturn in supply was devastating. The ability of private businesses to recapitalize for harvesting and processing small diameter trees is limited by lack of financial incentive, especially where the value of those trees is marginal. As stated by one program coordinator:

It is rare that small wood utilization and marketing opportunities become successful without substantial investment in additional fundamentals. Those fundamentals include mobilizing financial and technical resources for industry development and re-capitalization, building relationships among key stakeholders, and anticipating opportunities corresponding to community desires.

Federal investments were viewed as key to helping businesses build the technical and physical capacity necessary. There was, however, a range of perceptions of the extent to which investments could be effective. On the one hand, coordinators shared the belief that grant

Table 3

Total Economic Action Programs (EAP) funding by type of biomass utilization and marketing project by western USDA Forest Service region, fiscal years 2001 through 2003^a

USDA Forest Service region (no. of projects)	Region 1	Region 2	Region 3	Region 5	Region 6	Region 10	Total funding
Project type	Regions 1–4	Region 2	Region 3	Region 5	Region 6	Region 10	Total funding
Manufacturing and processing	\$1,226,222 (17)	\$223,000 (8)	\$4,749,321 (41)	\$52,500 (2)	\$140,072 (2)	\$3,183,074 (18)	\$9,574,189 (88)
Economic feasibility and assessment	\$2,762,980 (16)	\$514,800 (15)	\$240,361 (6)	\$1,204,143 (25)	\$708,845 (12)	\$2,743,950 (2)	\$8,175,079 (76)
Pilot and demonstration	\$2,246,414 (17)	\$376,699 (12)	\$2,273,187 (11)	\$789,089 (12)	\$814,079 (10)	\$89,100 (1)	\$6,588,568 (63)
Harvesting and transportation	\$115,000 (2)	\$70,000 (3)	\$3,088,371 (24)	\$508,465 (13)	–	–	\$3,781,836 (42)
Tech outreach, education, and coordination	\$429,054 (14)	\$522,355 (13)	\$1,012,788 (7)	\$346,423 (6)	\$213,000 (2)	\$194,500 (2)	\$2,718,120 (44)
Market analysis and development	\$567,815 (7)	\$446,300 (9)	\$400,000 (7)	\$130,450 (3)	\$575,520 (3)	\$170,300 (1)	\$2,290,385 (30)
Product research and development	\$160,066 (7)	\$36,000 (3)	\$959,161 (12)	\$25,000 (1)	\$308,385 (7)	–	\$1,488,612 (30)
Business planning	\$503,321 (6)	\$308,623 (5)	\$352,000 (5)	\$42,000 (2)	\$80,000 (1)	–	\$1,285,944 (19)
Other unknown ^b	\$41,700 (3)	\$105,000 (3)	\$94,000 (2)	\$319,527 (6)	–	–	\$560,227 (14)
Total	\$8,052,572 (89)	\$2,602,777 (71)	\$13,169,189 (115)	\$3,417,597 (70)	\$2,839,901 (37)	\$6,380,924 (24)	\$36,462,960 (406)

^a Total funding for projects supported by the National Fire Plan-EAP, Four Corners Sustainable Forests Partnership-EAP, Collaborative Forests Restoration Program, and Forest Products Laboratory-EAP.

^b Unavailable description for project classification.

programs such as the EAP can create financial dependency without stimulating private investment. On the other hand, they also felt that the federal government should share in the risk of investing in financially uncertain enterprises, especially when those investments are critical to the delivery of public benefits like community wildfire protection or the restoration of public forests and watersheds. Ultimately, how coordinators viewed the role of federal investments in relation to regional utilization shortcomings influenced the types of projects funded.

4.2. Project selection

Levels of previous investment, existing infrastructure, forest characteristics, and management needs were found to vary across regions and influenced differences in administrators' priorities for the types of projects ultimately funded. National EAP program managers empowered program coordinators to set regional priorities for using appropriated funds based on their unique needs. Despite differences, coordinators shared the goal of increasing hazardous fuels reduction projects through biomass utilization — goals that would at a later point become central to the Healthy Forest Restoration Act. One coordinator observed that USDA Forest Service community assistance programs had long provided a nexus among fuels reduction, rural community capacity, and economic development. The implication was that EAP would become a logical set of programs for implementing the NFP given their existing capacity.

In selecting projects, coordinators sought out grantees that could succeed without long-term subsidies, grantees with a record of success, and "diamonds-in-the-rough" that required nurturing but had potential to fill critical voids in the local processing chain. Ideas with high utilization potential but unproven capacity were viewed as risky, but in some cases were fostered with development grants to fund research and proof-of-concept. One coordinator targeted investments along an "innovation curve" whereby funding was awarded based on potential contribution, grantee capacity, and how projects fit into the trajectory of local utilization needs. Other coordinators sought to diversify investments at different stages of innovation, taking a portfolio approach with less emphasis on fulfilling particular voids.

Also influencing coordinators, selection was their attitude towards risk. Some were more inclined to experiment with unproven ideas whereas others looked for indicators of success such as willingness to put forward greater personal investment as a demonstration of commitment and risk-sharing. In other regions, risk was assessed based on whether funds supported community groups or private businesses. In Region 3, for example, NFP-EAP and Four Corners Sustainable Forests Partnership coordinators preferred to grant directly to businesses as opposed to nonprofit organizations because businesses, it was felt, have greater motivation to become financially self-sufficient and thus were more likely to contribute to timely accomplishment of fuels reduction objectives. Such projects were typically located in areas with some level of existing wood products infrastructure, were part of established business networks, and enjoyed strong community support. In other regions coordinators were less comfortable granting to businesses, particularly where greater industry capacity existed. They feared the appearance of giving preference to one project over another. They also felt that entrepreneurs would be more successful if required to seek out and secure their own financing. Not only would business plans be more viable, but that they would be less likely to view federal assistance as an entitlement. Instead, grants were commonly used in Regions like 5 and 6 for feasibility studies to generate technical knowledge for potential investors (Table 3).

Regardless of regional differences, or the range of grantee experiences and capacity, coordinators were equally concerned about a lack of established networks of technical experts. They expressed a need for assistance in reviewing grant proposals, making decisions about the types of projects in which to invest, and improving the quality of

technical assistance provided to grantees during implementation. Insufficient expertise to evaluate business plans or to assess project feasibility resulted in the selection of some projects contributing little towards national fuels reduction objectives. This was especially a concern for emerging biomass conversion technologies related to biofuels.

4.3. Project clustering

Strategies for investment changed over time with respect to the types of projects funded and how projects were implemented. Several coordinators reported taking a more strategic approach following awards from the initial NFP-EAP funds in 2001. Initially, coordinators placed a greater emphasis on developing specialty markets in which greater value-added recovery could be achieved. This in time came to be seen as an inefficient strategy relative to the magnitude of fuels reduction needed. Projects were small in scale and resulted in the treatment of few acres relative to the level of investment required. Coordinators' tactics evolved to seeking out projects that could complement existing industry efforts and thereby leverage activities accomplished. Clustering of projects in sequential funding cycles was used to create synergistic opportunities and to fill voids, whether for the purchase of key manufacturing equipment or technical assistance to business for harvesting planning. It was also common to fund multiple projects within a single location to maximize the movement of material from the forest to manufacturing facilities, and finished products to consumers. This included leveraging EAP funds with dollars from other community assistance programs. In New Mexico, for instance, the NFP-EAP routinely provided startup funds and the Four Corners Sustainable Forests Partnership followed with additional assistance to expand the scope. And finally, the Collaborative Forest Restoration Program followed with funds for fuel reduction activities taking advantage of the newly created capacity and infrastructure.

It was also not uncommon for grantees to need assistance on multiple fronts like business planning, engineering, or market analysis. To increase success, many coordinators felt that multiple sources of funding would ultimately be needed. Yet, they frequently funded singular projects citing limited resources, short funding cycles, and a desire for grantees to assume a greater proportion of financial risk. An unintended consequence was the under-funding of projects with smaller grants over a number of years by providing just enough assistance to get started but not enough to be self-sustaining beyond initial investment and periods of market instability. One coordinator noted the irony in that "small businesses often lack the capacity to deal with large grants, but large investments are exactly what are needed for them to be successful."

4.4. Program autonomy

Overall, program coordinators possessed a high degree of autonomy to distribute funds according to regional priorities. They frequently channeled funds through university extension agents, state foresters, economic development agencies, and non-profit organizations. In Region 2, for example, 28 projects were managed cooperatively through a partnership with Colorado State University and the Colorado State Forest Service. Networks that formed among these entities provided an alliance to grant and administer NFP-EAP funds and leverage external resources. Similarly, the Montana Community Development Corporation and the Bitterroot Resource Conservation and Development Council worked closely with Region 1 coordinators to provide project oversight and assessment of local utilization needs.

While autonomy allowed coordinators to adapt their program delivery to regional strengths and priorities, coordinators also expressed greater need for a uniform national strategy. It was found that lacking such a strategy, minimal guidance was available for decisions

of the types of projects or technologies in which to invest. Coordinators also expressed that program autonomy led to less dissemination of ideas and strategies among the various regions and to uncertainty regarding the effectiveness of regional strategies.

5. Grantee perceptions of effectiveness

5.1. Project outcomes

One focus of our study was to identify project accomplishments relative to anticipated outcomes. A sample of grantees was asked a series of questions characterizing those outcomes and the challenges experienced. In terms of accomplishments, most grantees felt that their projects helped to increase biomass utilization in their area but that it was too early to judge their actions on the basis of the number of at-risk acres reduced of the wildfire threat. In most cases a relatively small number of acres had been treated but grantees felt that critical investments in utilization capacity had been made that would allow them to substantially increase the number of acres treated in future years.

In terms of the challenges to treating more acres, grantees talked about the implication of unrealistic expectations for the cost of biomass removal, revenue potential, and the technology required. They cited frequent underestimation of harvesting costs while overestimating available supply and profit potential. Costs were driven up by the need for larger than expected equipment to harvest the volume of biomass needed to amortize investments. Initially, grantees sought to minimize investments by getting-by with machinery not designed for commercial or industrial purposes, which ultimately increased unit costs and decreased productivity. For other grantees, the supply of biomass was constrained as a result of slower than expected USDA Forest Service project planning. This limited the number of businesses willing to invest in needed wood products infrastructure for fear of not being able to procure consistent volumes in the future. Many grantees had also assumed that the biomass would be free or that they would receive payment for its removal. As demand increased and as the USDA Forest Service sought to recover a greater percentage of their project planning costs, procurement costs became less predictable or more expensive than business plans warranted. Still other grantees cited unrealistic expectations about the availability of markets and the feasibility of commercial manufacturing:

Due to the economics of power production, our business wasn't able to purchase biomass at a delivered value that covered transport costs to move the biomass from the forest to the plant. Operating and maintenance expenses were significantly higher than expected and the technology just proved to be too costly to operate as a commercial unit.

Mirroring the perceptions of coordinators, several grantees expressed the need for greater technical assistance in developing proposals and help with project implementation. Improved planning would lead to more realistic expectations of costs, the time necessary to secure supply contracts, and the ability to sustainably grow their businesses to become financially self-sufficient. It would also help them to better match harvesting and manufacturing technology to available markets.

On the positive side, grantees cited a number of unexpected outcomes, many of which were related to increasing industry and community capacity. Many were impressed by the contribution of local residents to the implementation of their projects, whether it was the availability and skills of local workers to overcome technical challenges or the willingness of businesses to grow to meet increasing demand for services and products. Several grantees also expressed surprise by the level of interest their projects generated among neighboring communities, outside agencies, and even prospective investors. One grantee lamented that his ability to employ community members, particularly

young adults who might have otherwise relocated, led to an expectation among community members to grow his business:

They are very proud of their work and what they have accomplished for the community. The challenge now is that everyone wants to work for me or be a part of our project, but there's not enough to go around.

5.2. Spin-off effects

Grantees identified a number of spin-off effects from sponsored projects. Indirect job creation through business expansion was one consequence. Projects often contributed to the growth of related businesses and sectors of the local economy. For instance, NFP-EAP funds used in Utah and Arizona to expand manufacturing of log homes using small diameter trees led to increased demand for construction logs, which in turn increased the utilization of material that could be removed from local fuels reduction treatments. This increased the number of truckers needed to transport the raw logs and finished products. One grantee expressed the multiplier effect of NFP-EAP projects in this way:

By creating awareness for our new product, we've been contacted and have a purchase order for more than two million pieces annually. This will dramatically increase the utilization in our area. Increased demand...is in turn leading to a larger demand being filled by local residents thinning our forests.

Another consequence was the effect on inter-business partnerships. Program coordinators strategically invested in business clusters to encourage industry cooperation. Where there was a need for certain services like biomass harvesting, trucking or manufacturing expertise, local entrepreneurs and investors leveraged federal and state grant dollars and private finances to create business alliances. Grantees reporting using NFP-EAP funds to secure bank financing, entice prospective investors, and to establish new supply contracts, which in turn provided opportunities to expand local biomass processing. Grantees also frequently cited community empowerment and leadership as important outputs. New leaders were identified through the implementation of projects, which led to the creation of new synergies among local businesses, governments, and community partners. These synergies in turn increased the capacity to mobilize resources for technical assistance and employee training.

Tribal members acquired the knowledge to build and operate a sawmill to process small logs. This created increased capacity to bid on timber sales from the national forest and to conduct the logging operations rather than contract out the work.

Both grantees and coordinators viewed empowerment as critical to developing the long term capacity to sustain fuels reduction efforts, though not without difficulty.

Collaboration on how to deal with excessive fuels has gone much slower than originally expected. We now realize that it's much more than just using the wood, but also about social values, wildlife habitat, and a range of other issues.

6. Discussion

A key question of this study was whether federal community assistance programs could increase biomass utilization sufficiently to expedite hazardous fuels reduction efforts in the western United States. Information was presented on project and grantee characteristics and regional funding priorities (Fig. 2). The outcomes of these investments including unanticipated and spin-offs effects were captured to characterize growth of biomass utilization capacity. Our results indicate that utilization capacity was indeed created in



Fig. 2. Project selection criteria, investments, and outcomes of federal community assistance programs.

locations where it previously did not exist or was lacking, though the magnitude of utilization varied greatly as did the degree to which it contributed to hazardous fuels reduction. Our research also reveals that stimulating biomass utilization requires parallel approaches, the mix of which will differ by region. Where challenges exist in one region for how to entice private investment, other regions focused on mechanisms to procure a consistent supply of biomass, which confirms other research (GAO, 2006; FPS, 2008).

Level of existing wood products infrastructure was also found to influence the strategies employed by program coordinators. Where minimal infrastructure existed, coordinators sought to rebuild capacity first through support of small-scale manufacturing and related harvesting and transportation needs. They invested in equipment purchases and projects to offset transportation costs with direct payments to businesses. In other regions having arguably more established infrastructure, projects tended to focus on feasibility studies, demonstrations, and supply assessments conducted by university partners or regional economic development associations. Although cited by both coordinators and grantees as a primary obstacle, investment in market research and product development was low relative to other types of projects. But the majority of NFP-EAP appropriations were more frequently used for non-utilization needs like wildfire planning and homeowner education for creating defensible spaces.

From an implementation standpoint, coordinators and grant recipients reported that the degree to which NFP-EAP projects increased fuels reduction efforts was variable but that creating synergistic business opportunities was a necessary prerequisite. For instance, it was believed that progress could be made towards fuels reduction objectives where efforts to establish long-range supply contracts could be combined with clusters of utilization activity. In some cases, utilization efforts blossomed into large-scale projects capable of treating several thousand acres annually. In other cases, private investment was slow to come, disappeared after a few years, or was entirely absent. While the potential existed, profit margins were inadequate or the products themselves and the technology used were not viable. Such projects demonstrated to would-be investors the financial and technical risks involved. They also demonstrated to program coordinators the difficulty of creating synergistic opportunities where there is a lack of existing infrastructure, technical expertise, social agreement on the scale of utilization necessary, or where investments are dependent upon uncertain markets and an inconsistent supply of biomass.

Several million dollars were invested to rebuild local expertise, facilitate collaboration, or in projects demonstrating the feasibility of particular products or harvesting processes. During the period of time data for this study were assessed, more than \$7.5 billion were appropriated through the National Fire Plan, of which only \$36 million, or less than 1%, was used to assist biomass utilization and marketing efforts. A failure to significantly expand utilization could be seen as a failure of community assistance programs or lack of necessary funding, but those investments relative to the magnitude of the problem may prove critical when coupled with agency efforts to provide long term supply contracts or with research and development

funded by the USDA and DOE. Nevertheless, the long term viability of project investments is uncertain. Coordinators expressed concern that key areas were either neglected or their investment strategies were only partially implemented before the EAP was discontinued in 2004. This was especially a concern in areas having extreme fire risks and where markets, expertise, or the supply of biomass were slow to develop. The implication is that some of the grantees interviewed have since gone out of business resulting in even fewer acres treated than prior to implementation of the NFP-EAP. Meanwhile, wildfire suppression costs are escalating at the expense of the very utilization efforts needed to reduce those costs (OIG, 2006).

As biomass utilization becomes cost effective, more areas at risk of catastrophic wildfire can be thinned of dense brush and small diameter trees. To better target limited federal resources to this end, research is needed to assess the degree to which community assistance programs and other federal investments lead to sustained fuels reduction efforts, and whether persistent economic and institutional barriers can be overcome as a result of the investment strategies employed. One of the weaknesses of the NFP-EAP and related biomass utilization and marketing programs was the inability to articulate the role of community assistance funding vis-à-vis national wildfire suppression activities. The benefits of biomass utilization are clear but program accomplishments to date have been difficult to quantify. Faced with a growing wildfire problem and reduced budgets, new federal program initiatives will need to identify where funding priorities exist and demonstrate how resources are being used to accomplish fuels reduction and related forest health objectives.

7. Conclusion

Community assistance programs have played an important role in stimulating biomass utilization; a role that has to date been largely unknown. When assessed in terms of the synergies and technical expertise created, and the investment in equipment and infrastructure, it will be important to consider the long term contribution these projects have had on reducing hazardous fuels and also for economic development. Yet, for all the focus and expectations of biomass utilization, there exists a paucity of knowledge on the effectiveness of investment strategies employed. The NFP-EAP funding and related programs and staff reported on in this study provides insight into how focused investments contributed to redevelopment of industry capacity, creating linkages to synergistic activities, and identifying factors of project feasibility. Program coordinators learned through experience the types of projects to complement regional fuels reduction efforts. Grantees experienced the challenges with biomass utilization on federal lands and the importance of managing their expectations for the volume, type, and timing of supply. They also learned of the technical expertise and levels of investment required to become financially self-sufficient. Together, these findings provide insights into strategies for building industry capacity, the degree to which federal community assistance programs may contribute to accomplishment of fuels reduction objectives, and how future agency efforts might be directed towards such.

Business enterprises were established in areas where none previously existed. It remains to be seen whether a sufficient number of projects funded through the NFP-EAP will be able to sustain themselves and how local efforts to build utilization capacity will grow where investment strategies were only partially implemented. It is clear however that the previous decades of utilization and marketing assistance provided a strong foundation from which the short-lived NFP-EAP program could emerge. Success in further reducing the risks posed by hazardous fuels will likely depend on community and business assistance in some form. The on the experiences and institutional knowledge gained from the NFP-EAP can help inform new program development.

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