

Federal and State Influence on Community Responses to Wildfire Threats: Arizona, Colorado, and New Mexico



Toddi A. Steelman, Ginger Kunkel, and Devona Bell

ABSTRACT

Federal policy has placed a priority on community-based approaches to address the wildfire risks facing communities and the environment. Federal and state governments impact considerably the resources that are available to local communities. This research identifies how federal and state agencies influence community response. Federal agencies impact communities dominantly through policy direction and the provision of financial resources. State agencies impact communities through organizational arrangements, access to funding, and programmatic decisions.

Keywords: National Fire Plan, community responses, wildfire, state forestry, community assistance

Federal policy in reaction to the wildfire disasters in 2000 and 2002 defined wildfire policy goals to reduce risk to communities and the environment through a community-based approach (USDA and USDI 2000, WGA 2001). Communities cannot act on their own, especially within the interrelated jurisdictions relevant to the wildfire problem, and federal and state governments impact significantly what is possible at the local level. While great emphasis and attention has been placed on the federal role in wildfire hazards (GAO 2000, GAO 2001, GAO 2002), overlooked in this discussion is the role of the state. State agencies often are the mediating institutions between the federal government and local communities in crafting a response to the wildfire threat. As suggested by federal policy, the current

challenge to mitigating the long-term threat of wildfire is devising stronger community responses to the wildfire problem. Consequently, it is important to understand how federal and state agencies and actions facilitate or hinder stronger community responses. This research explores how federal and state agencies provide opportunities and create obstacles for communities in Arizona, Colorado, and New Mexico that seek to respond to their wildfire threats.

The Federal Role in Wildfire Response

In the fall of 2000, President Clinton and the Secretaries of the Interior and Agriculture submitted a report on managing the impact of wildfire on communities and the environment (USDA and USDI 2000). This report, in conjunction with the Congressional appropriations and resulting plans,

strategies, and projects, has become known as the “National Fire Plan” (NFP). As part of the NFP, the fiscal year 2001 Interior and Related Agencies Appropriations Act (P.L. 106-291) directed the Secretaries of Interior and Agriculture to work with western governors to develop a coordinated 10-Year Comprehensive Strategy to the wildfire threat in the West.

Current federal policy in the form of the NFP and Western Governor’s Association 10-Year Comprehensive Strategy places a priority on community-based efforts to address the wildfire problem in the west (USDA and USDI 2000, WGA 2001). These national policies identify four common goals to mitigate the long-term threats posed by wildfire: (1) improving fire prevention and suppression; (2) rehabilitating and restoring fire-adapted ecosystems; (3) reducing hazardous fuels; and (4) promoting community assistance. As indicated by this comprehensive and integrated approach, federal policy in the NFP and Western Governor’s Association 10-Year Comprehensive Strategy signifies a shift away from a reactive role focused primarily on wildfire suppression to a more proactive role focused on long-term prevention of wildfire. With these goals in mind, communities are urged to thin forests, conduct controlled burns, restore forests, suppress fire, create defensible space around homes and commu-

nities, undertake public education about wildfire, and create markets for, and skilled work forces for removing and processing small-diameter timber and forest restoration by-products.

To facilitate community-level responses, the NFP makes funding available to state and federal agencies. Federal and state agencies have discretion in how NFP money is requested and allocated to different priority programs in their states. During the 2001–03 fiscal years, [1] Arizona secured \$252,254,888 in NFP funds, with Colorado garnering \$196,599,560 and New Mexico \$237,510,530 (NFP 2001a, b, c, d, e, f, NFP 2003a, b, c). Out of these totals, different portions have gone to Firefighting, Hazardous Fuel Treatment, Rehabilitation and Restoration, Community Assistance, and other categories. The majority of funding in each state goes to Firefighting and Hazardous Fuel Treatment, as indicated in Figure 1. Smaller portions of funding go to Rehabilitation and Restoration and Community Assistance.

Local communities may procure resources through various grant opportunities, usually through the Community Assistance programs in the NFP. Community Assistance is comprised of several categories including State Fire Assistance, Volunteer and Rural Fire Assistance, Economic Action Programs, and Community and Private Land Assistance. State Fire Assistance provides technical and financial assistance to enhance firefighting capacity, carry out wildfire hazard mitigation projects, and facilitate FIREWISE workshops. Volunteer and Rural Fire Assistance provides funding for volunteer fire departments to improve communication capabilities, increase wildland fire management training, and purchase firefighting clothing and equipment. Economic Action Programs work with local communities to identify, develop, and expand economic opportunities related to traditionally underutilized wood products and expand the utilization of wood removed through hazardous fuel reduction treatments. Slash and small-diameter timber removed from hazardous stands or sites often is too small to serve traditional wood products services. Creating markets for and industries related

to small-diameter timber and other forest restoration by-products can result in sustainable incentives, longer term hazardous fuel reduction, and forest restoration. Community and Private Land Assistance promotes firefighting efficiency at all levels on federal and non-federal lands to protect communities from wildfire threats and improves landscape-level protection by expanding programs directed at homeowners. In addition to these standardized programs available through the NFP, Arizona, Colorado, and New Mexico also have available funding through the Four Corners Sustainable Forest Partnership. The Four Corners Partnership receives funding from Congress through the Economic Action Program to focus on forest restoration principles and needs, community infrastructure to use small-diameter material, and developing a regionwide network of interests and specialists working on sustainable forestry issues (FCSFP 2003). Additionally, New Mexico receives a special appropriation of nearly \$5 million per year through the Community Forest Restoration Act of 2000 (Title IV, Public Law 106-393), which established the Collaborative Forest Restoration Program (CFRP) to provide cost-share grants to stakeholders for forest restoration projects.

Community Use of NFP Funding in Arizona, Colorado, and New Mexico

Communities may acquire moneys from state and federal agencies or work in concert with them to reduce their threat of wildfire. Programs at the community level may take many forms. For instance, they may reduce hazardous fuels on private lands, engage in economic diversification through the development of new industries that use small-diameter timber, improve rural and volunteer fire departments, and/or develop public education campaigns. Funding for these projects usually comes from Community Assistance programs. Federal and state agencies exercise control over how moneys are requested for these programs in each state and how money is disbursed.

For fiscal years 2001 and 2002, Arizona procured \$7,701,900 in Community Assistance funding, while Colorado acquired \$12,780,400 and New Mexico

obtained \$20,888,023 (NFP 2001a, b, c, d, e, f, NFP 2002 a, b, c, NFP 2003a, b, c, FCSFP 2003, USDA Forest Service 2003). [2] Federal agencies control disbursement of funds over CFRP, Four Corners, Community and Private Land Assistance, Economic Action Program, and Volunteer/Rural Fire Assistance programs. State Forestry controls payment of funds through the State Fire Assistance program. In some states, like Colorado, State Forestry also controls payment of Volunteer and Rural Fire Assistance. As detailed in Table 1, State Fire Assistance makes up 53% of total Community Assistance funding in Colorado. Volunteer Fire Assistance and Economic Action Programs contribute 14% each to Colorado's total. In Arizona, State Fire Assistance also is prominent, comprising 34%, with Community and Private Land Assistance and Volunteer/Rural Fire Assistance netting 27 and 14%, respectively. New Mexico receives nearly 45% of its total share of Community Assistance funding from its special CFRP fund. State Fire Assistance and Community and Private Land Assistance provide an additional 19%, respectively.

In each state, different programs are available to fund community efforts, including cost-share programs to assist private land owners, programs to promote economic diversification, and programs to assist in wildfire prevention and suppression. For instance, New Mexico's State Fire Assistance grant program allows private landowners to defray costs to create defensible space around homes. New Mexico pays up to 75% of the total cost, while homeowners provide a 25% match in cash or in-kind. In FY 2001 and 2002, New Mexico State Forestry made available \$12,854,742 through this program (F. Rossbach, New Mexico State Forestry, April 27, 2002; E. Waterbury, Cooperative and International Forestry, April 17, 2002 and May 23, 2003; J. Selkirk, New Mexico Bureau of Land Management, May 17, 2003). Likewise, Arizona makes funding available to private landowners through its State Fire Assistance grant program. Arizona pays 50% of the cost of treatment on private land, while landowners cover the remaining half. In FY 2001 and 2002, Arizona State Land Fire Manage-

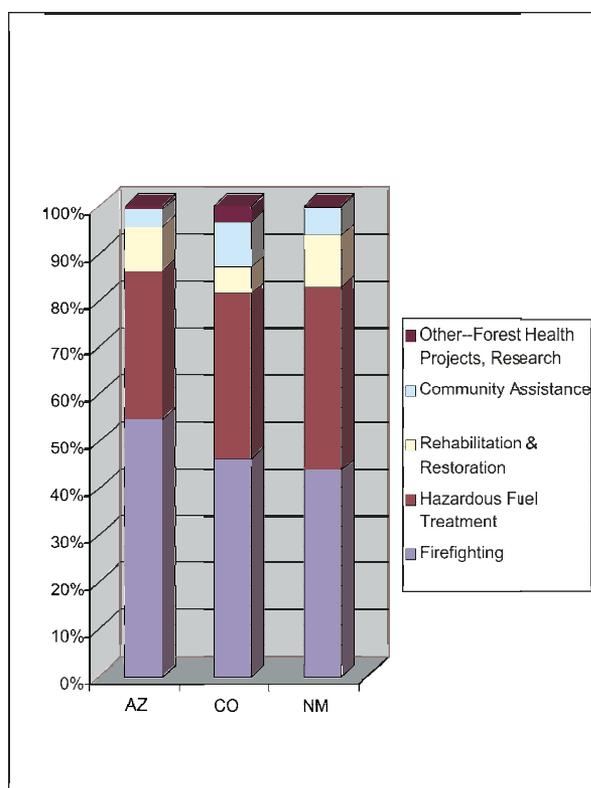


Figure 1. Percentage of total state NFP money spent on wildfire priorities.

ment Division passed \$6,121,808 to local communities through this program (E. Waterbury, Cooperative and International Forestry, April 17, 2002 and May 23, 2003). Colorado also has a 50/50 cost-share program and makes funding available to counties and communities to create defensible space and fuel breaks and dispose of slash. In FY 2001 and 2002, Colorado made available \$2,867,168 for these programs (R. Homann, Colorado State Forest Service, April 5, 2004).

Economic diversification projects are funded to create end uses for the

small diameter products and waste products that result from hazardous fuel reduction efforts. In FY 2001 and 2002, Arizona working through federal and state agencies, devoted \$1,415,900 in Economic Action and Four Corners funding to communities for these innovative economic development projects (NFP 2001a, b, c, d, e, f, NFP 2002a, b, c, FCSFP 2003, NFP 2003a, b, c). This represents 18% of Arizona's Community Assistance funding. Colorado passed on \$2,201,400 and New Mexico distributed \$11,389,023 to communities in their states for these same pur-

poses, totaling 17 and 55% of each state's Community Assistance Funding (NFP 2001a, b, c, d, e, f, NFP 2002a, b, c, FCSFP 2003, NFP 2003a, b, c, USDA Forest Service 2003).

Improving wildfire prevention and suppression also is important to communities, and funding through State Fire Assistance, Volunteer and Rural Fire Assistance programs, and Community and Private Land Assistance Programs is available to communities. In FY 2001 and 2002, Arizona, Colorado, and New Mexico made \$4,213,319, \$9,162,319, and \$5,418,319 available, respectively, for their communities (NFP 2001a, b, c, d, e, f, NFP 2002a, b, c, NFP 2003a, b, c). This represents 55, 72, and 21% of total Community Assistance funding, respectively. The above programmatic foci reveal that Arizona and New Mexico put greater funding into hazardous fuel reduction on private property than Colorado, which puts greater emphasis comparatively on improving wildfire prevention and suppression. Arizona and Colorado place equal emphasis on economic diversification, while New Mexico devotes the majority of its resources to funding through CFRP.

Communities at risk from wildfire threats respond by applying for these programs. Different patterns of response are present in each state, as revealed through analysis with Geographical Information Systems (GIS).[3] Communities at the interface of USDA Forest Service lands deemed most at risk in each state were plotted on maps and then overlaid with the funding secured

Table 1. National Fire Plan community assistance funding to Arizona, Colorado, and New Mexico in FY 2001 and 2002.

	State Fire Assistance	Volunteer Fire Assistance	Economic Action Program	Community and Private Land Fire Assistance	Rural Fire Assistance	Four Corners	Community Forest Restoration	Total
AZ	\$2,624,000 (34%)	\$1,080,000 (14%)	\$716,000 (9%)	\$2,073,000 (27%)	\$509,000 (7%)	\$699,900 (9%)	\$0	\$7,701,900
CO	\$6,831,000 (53%)	\$1,787,000 (14%)	\$1,826,000 (14%)	\$1,417,000 (11%)	\$544,000 (4%)	\$375,400 (3%)	\$0	\$12,780,400
NM	\$3,973,000 (19%)	\$946,000 (4%)	\$1,405,000 (7%)	\$4,081,000 (19%)	\$499,000 (2%)	\$629,700 (3%)	\$9,354,323 (45%)	\$20,888,023

through the NFP Community Assistance programs.[4] As indicated in Figure 2, Flagstaff, Eager, and Prescott have been very successful in Arizona in securing resources through the various grant-making programs mentioned above. In FY 2001 and 2002, Flagstaff acquired \$1,112,049, while Eager procured \$890,030 and Prescott garnered \$657,440 (E. Waterbury, Cooperative and International Forestry, April 17, 2002 and May 23, 2003). Communities at significant risk like Sierra Vista, Williams, and Heber Overgaard have been less successful in obtaining resources to address their problems. In Colorado, Jefferson, Larimer, Boulder, and Douglas Counties have been most successful in acquiring moneys to fund their response efforts, while the rest of Community Assistance funding is spread across numerous counties throughout Colorado, as indicated in Figure 3. Jefferson County received \$1,022,579, Larimer County collected \$462,427, and Douglas and Boulder

Counties amassed \$400,779 and \$367,667, respectively (Bell 2003). Colorado also allocates 31% of its Community Assistance funding to support statewide programs. Colorado State Forestry uses this money to pay for programs to educate homeowners about wildfire risks and fund statewide positions. Arizona and New Mexico allocate only small portions of their Community Assistance funding to statewide programs, as indicated in Figures 2 and 4. In New Mexico, Ruidoso, Manzano Mountain, and Silver City are among the communities or areas most successful in acquiring funds to mitigate their wildfire threats, as illustrated in Figure 4. Ruidoso, Manzano Mountain, and Silver City have procured \$2,274,674, \$1,418,400, and \$1,362,655, respectively (F. Rossbach, New Mexico State Forestry, April 27, 2002; E. Waterbury, Cooperative and International Forestry, April 17, 2002 and May 23, 2003; J. Selkirk, New Mexico Bureau of Land Management, May 17, 2003). Other

communities or areas at risk have been less successful in garnering resources, such as the Santa Fe Watershed, Angel Fire, and Moreno Valley.

Opportunities and Obstacles for Community Response

The GIS analysis reveals different patterns of response across the three states in this study. New Mexico has the greatest amount of funding and concentrates it among a limited number of areas. Colorado received the second largest amount of funding for communities, but these moneys are disbursed widely across many counties and a significant portion of the funding is directed to statewide programs. Arizona received the least amount of funding for communities among the states studied, but directs nearly all of it toward priority communities.

This research reveals that the dominant role for federal government is providing policy direction and financial assistance. Importantly, federal pro-

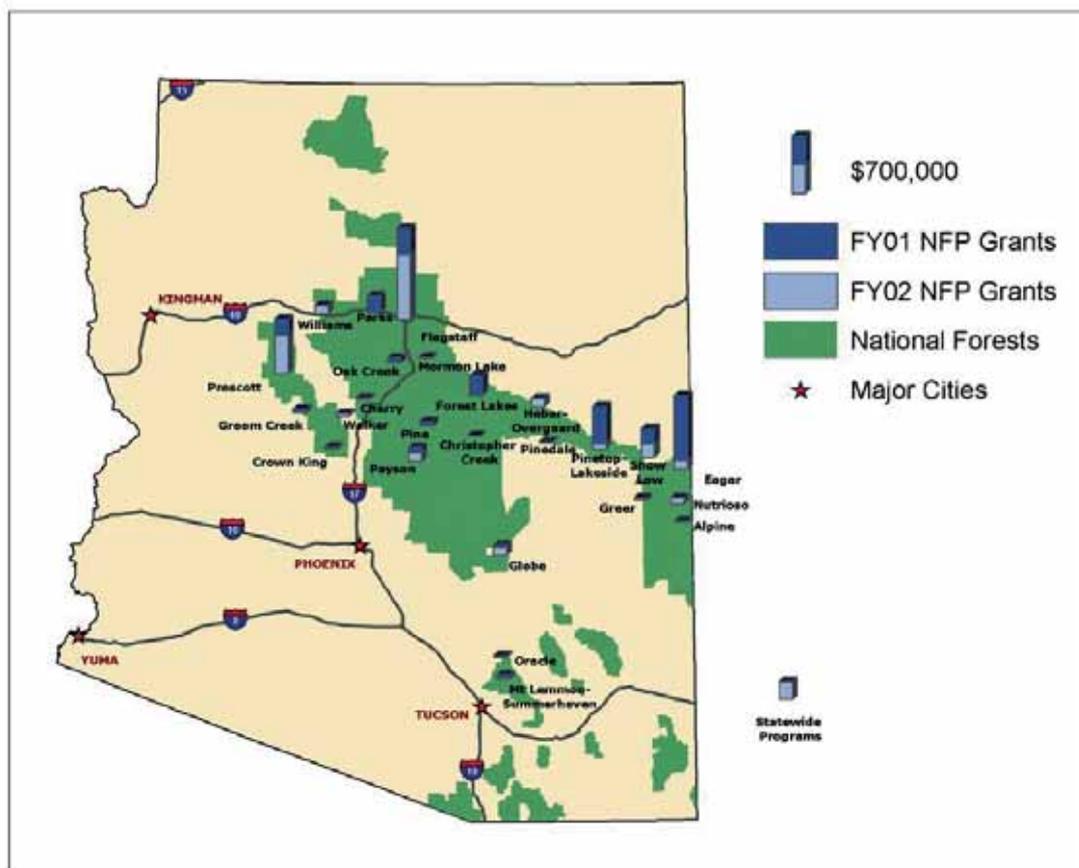


Figure 2. Levels of community response in Arizona.

grams provide resources but these are mediated through various agencies and actors at the state level. Consequently,

state organizations, agencies, and actors play an especially important role in providing obstacles to or opportunities

for communities. For instance, state statutes influence how communities take action. Colorado mandates the

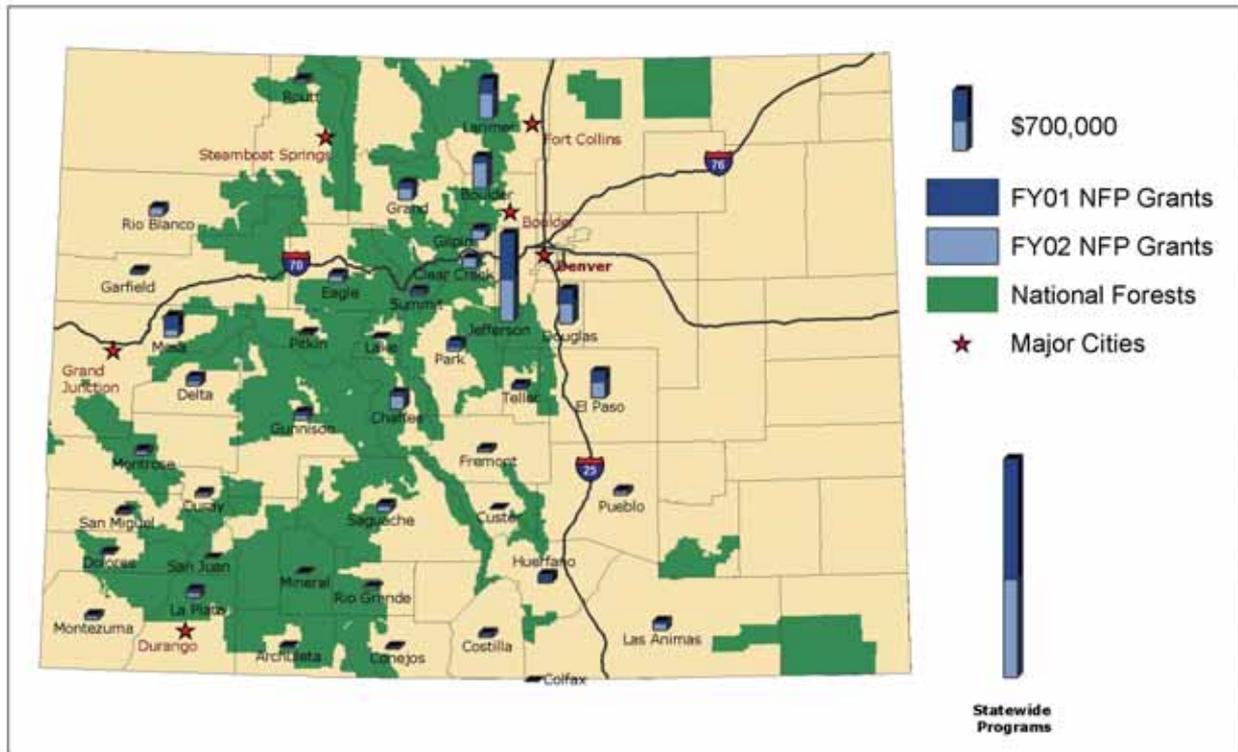


Figure 3. Levels of community response in Colorado.

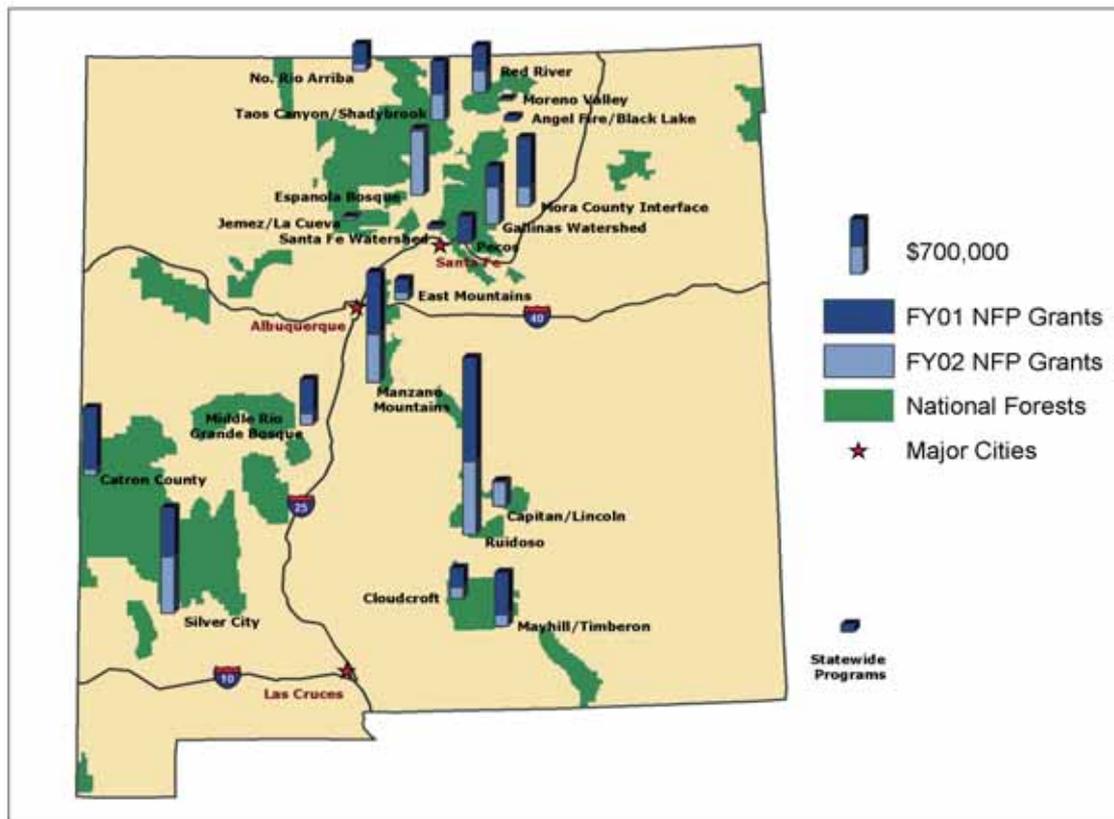


Figure 4. Levels of community response in New Mexico.

county as the primary unit of organization at the local level in response to wildfire suppression (CRS 30-11-124). The county sheriff is designated the fire warden and state forestry is to assist the sheriff and county fire department with this responsibility (CRS 30-15-513). To manage wildfires, counties must prepare county wildfire management plans. Other states, like New Mexico and Arizona, place no restrictions on the level of local organization in response to wildfire.

State Forestry in each state plays an especially active role in providing financial and technical assistance to communities. State Forestry in New Mexico and Arizona prioritized areas within their states to provide signals to communities and funding agencies alike about taking action. New Mexico State Forestry designated the "Twenty Most Vulnerable Areas" to wildfire for priority treatment and funding (New Mexico State Forestry 2003). Likewise, Arizona State Forestry identified 61 communities at highest risk and with greatest potential for loss in the state (Arizona State Land Division 2000). Colorado State Forestry has not prioritized specific areas for treatment but rather has determined that some 6,304,969 acres, 979,851 people, and 474,000 homes are under threat in a "red zone" (CSFS 2002). Consequently, in Colorado federal resources are spread thinly across 61 of the state's 63 counties, while resources are directed to and concentrated in specific high-risk communities in Arizona and New Mexico.

Control over resources also makes a difference in how communities can access the various programs that are meant to serve their purposes. For instance, Colorado State Forestry exercises disproportionate control over the pool of Community Assistance resources available to counties throughout Colorado. If State, Volunteer and Rural Fire Assistance are considered in combination, then Colorado State Forestry controls 71% of total moneys available to communities. Moreover, Colorado agencies have placed a greater priority on funding fire suppression and prevention activities than other programmatic areas. By controlling these resources, State Forestry lim-

its communities' options for funding diverse and comprehensive responses to the wildfire threats they face. Consider that Colorado receives the second highest amount of funding through Community Assistance programs, but chooses to allocate 31% of this funding to its own statewide programs. In contrast, Arizona and New Mexico have multiple funding sources controlled by different agencies. As a consequence, if a community taking action fails to attract funding from one program, it can seek out another program.

Policy Implications

Federal policy has placed a priority on community-based approaches to address the wildfire problem. By moving away from a strategy based primarily on fire suppression to one that integrates components of fire suppression and prevention, hazardous fuel reduction, restoration and rehabilitation of fire adapted ecosystems, and community assistance, federal policy seeks to create a more integrated and long-term solution to the wildfire problem. At the federal level, hundreds of millions of dollars have been allocated to the states to facilitate wildfire responses, but only a small portion of this money actually is available to communities. The majority of the funds go to federal land management agencies to suppress wildfire and reduce hazardous fuels on public lands that may adjoin communities under threat. While these activities are very costly, the focus on suppression and hazardous fuel reduction comes at the expense of the other goals articulated in the NFP and the Western Governor's 10-Year Strategy. Without adequate emphasis on the restoration of ecosystems and the development of capacity and incentives through community assistance, it is unclear how sustainable, long-term solutions to the wildfire problem will be feasible. In this manner, federal government creates and constrains opportunities by providing technical and financial resources in specific policy areas.

The three states addressed in this article demonstrate different opportunities and obstacles for community responses to wildfire. States influence community response through organizational arrangements, programmatic

decisions, and access to funding. For instance, Colorado has designated the county as the local unit of response, while Arizona and New Mexico give their localities greater flexibility. Arizona and New Mexico have prioritized communities for treatment to focus their effort and resources among those that face the greatest risk. While Colorado is a recognized leader in mapping and focusing project efforts on high-priority landscapes, it is unclear how these landscape-scale efforts provide incentives for prioritizing work in human-based communities. In contrast, Arizona and New Mexico use greater amounts of funding to provide an incentive to private landowners to reduce hazardous fuel to protect their communities. While each state has the same programs available to fund community-based efforts, the resources are concentrated and apportioned differently. The majority of resources in Colorado are controlled by State Forestry and come from State Fire Assistance. This means Colorado communities have a limited pool of resources elsewhere from which to draw to address their threats. In Arizona and New Mexico, programs are less concentrated, giving communities a more diverse pool from which to draw.

As a consequence of these patterns of response, Arizona and New Mexico are projected to continue to possess stronger and more viable community responses to wildfire threats than Colorado. Arizona, and New Mexico have been able to devote significant resources to targeted communities thereby developing more integrated responses that can mitigate their risks in the long-term, and these patterns are expected to persist in the future (Steelman and Kunkel, 2004). Colorado has been less successful on this front and is expected to continue to be less effective in fostering effective community responses in the future unless it changes its current focus. Federal and state agencies impact greatly how communities can respond to their wildfire risks and state agencies in particular exercise great discretion over these resources. This research begins to identify how federal and state agencies influence community response, which is the first

step to improving community response and mitigating the long-term risk of wildfire threat in the West.

Endnotes

[1] Information for FY 2001 and 2002 is final, FY 2003 is projected based on reports in the National Fire Plan (2003).

[2] Totals represent funds acquired through State Fire Assistance, Volunteer/Rural Fire Assistance, Economic Action Program, State and Private Land Assistance, Four Corners Sustainable Forest Partnership, and the Collaborative Forest Restoration Program.

[3] GIS maps were created to analyze comparative levels of community response. Maps were created by identifying communities at high risk located in the wildland-urban interface of USDA Forest Service lands. Community Assistance moneys were used as a proxy measure for level of community responsiveness to their threat.

[4] In Arizona, the State Land Division identified the 61 communities most at risk (see Arizona State Land Division 2000). In Colorado, the State Forest Service identified areas within the "red zone" (Colorado State Forest Service 2002). In New Mexico, State Forestry identified the 25 most at risk areas (see New Mexico State Forestry 2003).

Literature Cited

ARIZONA STATE LAND DIVISION. 2000. *Findings and recommendations, Governor's summit to mitigate wildfire hazards in Arizona's wildland urban interface*. 8 p.

BELL, D. 2003. *Report compiled from Colorado State Forestry archives*. June. 4 p.

COLORADO STATE FOREST SERVICE. 2002. *Interface areas of high forest fire risk in Colorado*. April. 8 p.

FOUR CORNERS SUSTAINABLE FOREST PARTNERSHIP. 2003. *Linking forests and communities in the southwest*. Available online at www.fourcornersforests.org/index.htm; accessed by author September 22, 2003.

GAO. 2000. *Reducing wildfire threats: Funds should be targeted to the highest risk areas*. GAO/T-RCED-00-296. Washington, DC: United States General Accounting Office. 9 p.

GAO. 2001. *The National Fire Plan: Federal agencies are not organized to effectively and efficiently implement the plan*. GAO-01-10227. Washington, DC: United States General Accounting Office. 15 p.

GAO. 2002. *Severe wildland fires: Leadership and accountability needed to reduce risks to communities and resources*. GAO-02-259. Washington, DC: United States General Accounting Office. 46 p.

NATIONAL FIRE PLAN. 2001a. *Arizona State summary from Department of Interior*. Available online at www.fireplan.gov/statebystate/Arizona1.cfm; accessed by author June 30, 2003. 3 p.

NATIONAL FIRE PLAN. 2001b. *FY 2001 programs in Arizona*. Available online at www.fireplan.gov/reports/151-158-en.pdf; accessed by author June 30, 2003. 3 p.

NATIONAL FIRE PLAN. 2001c. *Colorado State summary from Department of Interior*. Available online at www.fireplan.gov/reports/203-210-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2001d. *FY 2001 programs in Colorado*. Available online at www.fireplan.gov/reports/188-195-en.pdf; accessed by author March 28, 2003. 3 p.

NATIONAL FIRE PLAN. 2001e. *New Mexico State summary from Department of Interior*. Available online at www.fireplan.gov/statebystate/NewMexico1.cfm; accessed by author March 28, 2003. 3 p.

NATIONAL FIRE PLAN. 2001f. *FY 2001 programs in New Mexico*. Available online at www.fireplan.gov/reports/247-254-en.pdf; accessed by author March 28, 2003. 3 p.

NATIONAL FIRE PLAN. 2002a. *FY 2003 programs in Arizona*. Available online at www.fireplan.gov/reports/303-310-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2002b. *FY 2003 programs in Colorado*. Available online at www.fireplan.gov/reports/303-312-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2002c. *FY 2003 programs in New Mexico*. Available online at www.fireplan.gov/reports/329-336-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2003a. *FY 2003 programs in Arizona*. Available online at www.fireplan.gov/reports/303-310-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2003b. *FY 2003 programs in Colorado*. Available online at www.fireplan.gov/reports/303-312-en.pdf; accessed by author September 15, 2003. 3 p.

NATIONAL FIRE PLAN. 2003c. *FY 2003 programs in New Mexico*. Available online at www.fireplan.gov/reports/329-336-en.pdf; accessed by author September 15, 2003. 3 p.

Mexico. Available online at www.fireplan.gov/reports/329-336-en.pdf; accessed by author September 15, 2003. 3 p.

NEW MEXICO STATE FORESTRY. 2003. *Twenty most vulnerable wildland/urban interface communities in New Mexico*. Available online at www.emnrd.state.nm.us/forestry/20Communities/Default.htm; accessed by author September 22, 2003.

STEELMAN, T.A., and G. KUNKEL. 2004. Effective community responses to wildfire threats: Lessons from New Mexico. *Society and Natural Resources*. 17:1-21.

USDA FOREST SERVICE and DEPARTMENT OF THE INTERIOR. 2000. A report to the President in response to the wildfires of 2000. In *National Fire Plan*. Available online at www.na.fs.fed.us/nfp/overview/overview.htm; accessed by author March 4, 2002. 19 p.

USDA FOREST SERVICE. 2000. *Protecting people and sustaining resources in fire-adapted ecosystems: A cohesive strategy*. Washington DC: USDA Forest Service. 32 p.

USDA FOREST SERVICE. 2003. Collaborative Forestry Restoration Program. Available online at www.fs.fed.us/r3/spff/cfrp/; accessed by author September 22, 2003.

WESTERN GOVERNORS' ASSOCIATION. 2001. A collaborative approach for reducing wildland fire risks to communities and the environment: 10-year comprehensive strategy. In *Western Governors' Association, Key Issues in Brief*. Available online at www.westgov.org/wga/initiatives/fire/final_fire_rpt.pdf; accessed by author December 21, 2001. 24 p.

Toddi A. Steelman (toddi_steelman@ncsu.edu), is associate professor and Ginger Kunkel and Devona Bell are graduate students, North Carolina State University, Department of Forestry, Campus Box 8008, Raleigh, NC 27695-8008.