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Building Social Capital in Forest Communities: Analysis of New Mexico's Collaborative Forest Restoration Program

ABSTRACT

In part because of its emphasis on building social capital, the Collaborative Forest Restoration Program (CFRP) in New Mexico represents a unique experiment in public lands management. This study uses logit probability modeling to investigate what factors determined CFRP funding, which totaled $26 million between 2001 and 2006. Results reveal program preferences for projects that encourage collaboration and improve forest health, especially in poor counties. Negative determinants of funding include measures of small-diameter material utilization, and whether a project takes place across multiple land jurisdictions. There is no evidence of bias towards funding any particular applicant type or land jurisdiction.

I. INTRODUCTION

Historically, federal forest management decisions in New Mexico have been controversial. Ownership of forest lands in New Mexico is segmented into a mosaic of different public land agencies, tribal entities, and private parties. In addition, an array of groups including environmentalists, commodity interests, tribes, and local com-

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Funding for this project was provided under Research Joint Venture Agreements (06-JV-199 and 05-JV-257) between the Rocky Mountain Research Station (RMRS), of the U.S. Department of Agriculture, Forest Service (FS), and the University of New Mexico. We thank Carl Edminster (RMRS, Flagstaff) for his research support and Sarah Masek for assistance with the GIS data. We thank Walter Dunn and Melissa Zaksek (FS, Collaborative Forest Restoration Program) for providing access to program data and records. All errors are solely the responsibility of the authors.

munities have expressed sometimes divergent views regarding forest management. Due in part to these factors, as well as changing economic and ecological conditions, federal forest management decisions have been surrounded by considerable controversy, litigation, and appeals.[1] Against this backdrop, a unique, ongoing experiment in public lands management is taking place.

Established by the U.S. Congress in 2000, the federally funded Collaborative Forest Restoration Program (CFRP) represents a significant departure from traditional federal forest management models, where decisions are made at the National Forest level within a centralized hierarchy.[2] The CFRP is a competitive grant program under which forest stakeholders from across the state apply for grants to fund projects on public lands that address the goals of the program: reducing the risk of wildfire, providing employment opportunities, building social capital in communities, and improving forest health. Consistent with its name (*Collaborative* Forest Restoration Program), a distinctive feature of the CFRP is that it emphasizes a participatory process in which groups of forest stakeholders are responsible for management decisions, project implementation, and required multi-party monitoring. Under the CFRP, different collaborative groups of stakeholders bring project proposals to the Forest Service for competitive consideration. Critically, implementation is not limited to National Forest lands but rather can take place on any combination of publicly owned lands. Recommendations on which proposals to fund are made by a Technical Advisory Panel, composed of representatives of federal and state land management agencies, independent scientists, environmental interests, commodity interests, tribal representatives, and community representatives. Therefore, from initial proposals through actual project implementation, the CFRP cedes to stakeholders considerable control over forest management.[3]

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1. Laura McCarthy, *Collaborative Forest Restoration Program Creates New Solution to Gridlock Problem*, 6 FIRE CHRONICLE: STORIES OF NAT'L FIRE PLAN 1, Feb. 2002, at 1, *available at* http://www.theforesttrust.org/firechronicle/FC6.pdf.

2. *See* Secure Rural Schools and Community Self-Determination Act of 2000, Pub. L. No. 106-393, 114 Stat. 1607 (2000).

3. In 2004, the Society of American Foresters adopted a five-year position statement advocating "the development and implementation of pilot projects designed to test alternative approaches to managing federal lands administered by the United States Department of Agriculture, Forest Service and the Bureau of Land Management." Two specific New Mexico examples are cited, (1) the CFRP and (2) the Valles Caldera National Preserve (VCNP). Soc'y of Am. Foresters, Position Statement, *Pilot Projects for Evaluating Innovative Federal Land Management Strategies* 1, *available at* http://safnet.org/policyand press/psst/ pilotprojects.cfm. In contrast to the charter forest concept as applied at the VCNP, the CFRP represents a geographically dispersed program. For review of the VCNP

By emphasizing collaboration, the CFRP can be viewed as an attempt to improve *social capital* (i.e., to create more well-developed social networks targeting forest restoration) in forest communities. The program often brings together traditionally opposing factions, requiring cooperation in the design and application of CFRP grants.[4] In this way, the program puts into practice an idea gaining momentum in natural resource management: the actions of stakeholders, here with respect to forest restoration, are influenced by the social networks connecting a community.[5] Positive environmental and economic outcomes, the thinking goes, are associated with increased levels of social capital. Together, the extensive influence afforded to stakeholders in project initiation, development, implementation, and required multi-party monitoring, as well as the focus on collaboration (i.e., developing social capital) make the CFRP unusual in its approach to forest management.

The success of this type of forest management is of identifiable interest. As evidenced by legislation recently introduced to expand the program to Arizona, the possibility exists that the design of the CFRP will be implemented in other states.[6] Affected communities in New Mexico are also watching closely and, in some selected instances, are criticizing the equity of CFRP grant distribution.[7] Further, when creating the CFRP, Congress specifically required a report on the status of the program after five years.[8] Both within and beyond New Mexico, the

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program, see Joseph Little, Robert P. Berrens & Patricia A. Champ, *Uncharted Territory – The Charter Forest Experiment on the Valles Caldera National Preserve: An Initial Economic and Policy Analysis*, 45 NAT. RESOURCES J. 33 (2005).

4. As discussed later, *social capital* is emerging as a concept of broad interest across the social sciences, and can be initially defined as "connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them." ROBERT D. PUTNAM, BOWLING ALONE: THE COLLAPSE AND REVIVAL OF AMERICAN COMMUNITY 19 (2000).

5. *See, e.g.*, G. Cornelis van Kooten et al., *Social Dilemmas and Public Range Management in Nevada*, 57 ECOLOGICAL ECON. 709 (2006); Jules Pretty & David Smith, *Social Capital in Biodiversity Conservation and Management*, 18 CONSERVATION BIOLOGY 631 (2004); HANNAH BRENKERT ET AL., USDA FOREST SERV., ROCKY MTN. RESEARCH STATION, RESEARCH NOTE RMRS-RN-25WWWW, MITIGATION OF WILDFIRE RISK BY HOMEOWNERS (2005), *available at* http://www.fs.fed.us/rm/pubs/rmrs_rn025.pdf; Mani Nepal, Alok K. Bohara & Robert P. Berrens, *Investigating the Impact of Social Networks on Household Forest Conservation Effort in Rural Nepal*, 83 LAND ECON. 174 (2007).

6. H.R. 3590, 109th Cong. (2005).

7. Kay Matthews & Mark Schiller, *Community Forest Restoration Project*, 9 LA JICARITA NEWS, July 2004, *available at* http://www.lajicarita.org/04jul.htm#CFRP; Wes Smalling, *Fairness of Forest Grants Questioned*, SANTA FE NEW MEXICAN, Mar. 16, 2003, at A1.

8. Secure Rural Schools and Community Self-Determination Act of 2000, Pub. L. No. 106-393, 114 Stat. 1607 (2000).

success of the CFRP has implications for the increasing interest in the social capital paradigm of natural resource management.[9]

Despite the general interest in this unique program and the potential for expansion outside of New Mexico, the CFRP has been the subject of little empirical study to date. It is still an open question whether the public funds disbursed under the CFRP are being allocated on the basis of the stated goals of the program. In addition, it is unknown whether each of the program objectives carries equal weight in funding considerations: what is the relative importance placed on building social capital, reducing wildfire risk, providing employment opportunities, and improving forest health? The objective of this research is to address these issues by analyzing the determinants of CFRP project funding selection. Specifically, a statistical approach common in economics and public sector program evaluation, known as *revealed-preference analysis*, is applied to CFRP funding, which totaled over $26 million between 2001 and 2006. This modeling approach allows exploration of how funded and non-funded projects differ with regard to stated program objectives, while controlling for a variety of community and project characteristics; thus, inferences can be made about program preferences for these objectives or possible alternative considerations (e.g., geographical or equity considerations).

In brief, we find that, consistent with the very title of the program, fostering collaboration and restoring forest health are significant positive determinants of funding decisions. By contrast, reducing the risk of wildfire, providing jobs, removing small-diameter trees, creating new uses or values, restoring watersheds, reestablishing historic fire regimes, and providing youth opportunities have only a small or in some cases even a negative influence on funding decisions. The evidence indicates that the CFRP has a mild preference for projects taking place in relatively poorer New Mexico counties. Among projects that treat public land within a single land jurisdiction, the CFRP has shown no sign of favoritism on the basis of the type of applicant or land ownership. However, projects that take place across multiple land jurisdictions are less likely to be funded.

A complex set of circumstances underlies the creation of the program and motivates this research. Therefore, prior to the statistical modeling of the revealed-preference analysis, discussion and review is provided of (1) contextual issues surrounding forest management in

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9. The importance of social capital in natural resource management is gaining recognition. *See, e.g.*, Jules Pretty & Hugh Ward, *Social Capital and the Environment*, 29 WORLD DEV. 209 (2001).

New Mexico, (2) implementation of the CFRP, and (3) relevant research on social capital development in natural resource management.

II. THE SETTING IN NEW MEXICO

The distinctive approach of the CFRP and its multi-layered goals (reducing wildfire risk, increasing employment, fostering social capital, and improving forest health) was shaped in part by New Mexico's geographic, socioeconomic, and political context. Understanding the program therefore requires understanding how and why the CFRP came into existence. New Mexico is a relatively poor and rural state, ranking forty-seventh among all states in personal per capita income ($22,134 in 2000) and thirty-sixth in population density (15 residents per square mile in 2000).[10] Despite pockets of urban concentration and relative affluence, poverty is chronic across much of the state, especially in rural counties, as indicated by the U.S. Department of Agriculture (USDA) Economic Research Service designation of twelve counties in New Mexico as persistent poverty counties (although not all contain significant forest lands).[11]

New Mexico is a relatively large state in size, ranking fifth in land area, and, consistent with the western region in general, much of the land is owned by the federal government (41.8 percent).[12] As the southern terminus of the Rocky Mountains, a significant amount of the state is classified as forestland (21 percent).[13] Ownership of New Mexico's forestland is spread across a number of parties. As of 2000, ownership of New Mexico forestland is distributed as follows: 49 percent USDA Forest Service, 25 percent private party, 12 percent Indian Trust, seven percent U.S. Bureau of Land Management, five percent State of New Mexico, and two percent other public ownership.[14]

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10. U.S. Census Bureau, The 2007 U.S. Statistical Abstract, at 438, 21, http://www.census.gov/compendia/statab/ (follow "Earlier Editions" hyperlink; then "2007" hyperlink) (last visited Feb. 15, 2008).

11. Rural Policy Research Institute, Demographic and Economic Profile New Mexico 8, http://www.cdktest.com/rupri/Forms/NewMexico.pdf (last visited Feb. 13, 2008). Persistent poverty, as defined by the USDA Economic Research Service, indicates that a given county has experienced poverty rates of at least 20 percent on each census from 1970 to 2000. *Id.*

12. U.S. Census Bureau, *supra* note 10, at 216.

13. RENEE A. O'BRIEN, USDA, FOREST SERV., ROCKY MTN. RESEARCH STATION, RESOURCE BULL. RMRS-RB-3, NEW MEXICO'S FORESTS, 2000, at 7 (2003).

14. *Id.*

Like much of the western United States, where critical fuel buildup of small-diameter materials has occurred over many decades of drought, fire suppression, and fire exclusion,[15] New Mexico's forests present significant risk of wildfire.[16] For example, in 2006, it is estimated that over 2,000 wildfires burned approximately 600,000 acres of New Mexico wildland.[17] Increased human presence in the wildland-urban interface (WUI) is one cause of this worsening problem: 38 percent of new home construction in the western United States is adjacent to or intermixed with WUI,[18] and 6,667 square kilometers in New Mexico are classified as WUI.[19] This increasing growth of communities in the WUI makes protecting people and property (e.g., private dwellings) a strategic priority for both suppression and mitigation efforts.[20] With annual nationwide suppression-costs commonly surpassing one billion dollars in recent years, wildfire is a significant public policy issue in the American West and elsewhere.[21] As a result, there is growing support for the idea that wildfire risk should be addressed in a more cost-effective

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15. Douglas Gantenbein, *Burning Questions*, SCI. AM., Nov. 2002, at 82.

16. These wildfires have the potential for catastrophic losses. *See* David T. Butry et al., *What Is the Price of Catastrophic Wildfires?*, 99 J. FORESTRY 9, 13 (2001).

17. Interagency Fire Center, http://www.nifc.gov/index.html. The year 2006 appears to be consistent with other years in terms of the number of fires and the acreage burned, as New Mexico accounted for over 2,000 fires and over 500,000 acres burned in 2000. ERNIE NIEMI & KRISTEN LEE, WILDFIRE AND POVERTY: AN OVERVIEW OF THE INTERACTIONS AMONG WILDFIRES, FIRE-RELATED PROGRAMS, AND POVERTY IN THE WESTERN UNITED STATES 6 (prepared by ECONorthwest for The Center for Watershed and Community Health 2001), *available at* http://www.salmonandeconomy.org/pdf//Wildfire.pdf.

18. "Wildland-urban interface" is defined as the area where "'structures and other human developments meet or intermingle with undeveloped wildland or vegetative fuels.'" U.S. Fire Admin., *Fires in the Wildland/Urban Interface*, 2 TROPICAL FIRES RESEARCH SERIES, Jan. 8, 2007, at 1, *available at* http://www.usfa.dhs.gov/downloads/pdf/tfrs/v2i16-508.pdf. *See also* USDA Forest Serv., WUI: Wildland Urban Interface, Biological Assessment and Evaluation, http://www.fs.fed.us/r3/wui/ba/ba_index.html (last visited Feb. 13, 2008).

19. V.C. Radeloff et al., *The Wildland Urban Interface in the United States*, 15 ECOLOGICAL APPLICATIONS 799, 799–805 (2005).

20. *See* Hayley Hesseln, *Refinancing and Restructuring Federal Fire Management*, 99 J. FORESTRY 4, 5 (2001); John Talberth et al., *Averting and Insurance Decisions in the Wildland Urban Interface: Implications of Survey and Experimental Data for Wildfire Risk Policy*, 24 CONTEMP. ECON. POL'Y 203, 204 (2006); James Brosnan, *Government Has a New Plan for Fire Season*, ALBUQUERQUE TRIB., Jan. 31, 2007, *available at* http://www.abqtrib.com/news/2007/jan/31/government-has-new-plan-fire-season/.

21. In 2000, 2002, and 2003, suppression costs were $1.362 billion, $1.661 billion, and $1.326 billion, respectively. National Interagency Fire Center, Wildland Fire Statistics, Suppression Costs for Federal Agencies (2007) (on file with Natural Resources Journal). Estimated suppression costs for 2006 may be over $2 billion. *See* Brosnan, *supra* note 20.

manner.[22] Given that significant benefits of risk reduction are accrued by communities in the WUI, it has been asserted that affected communities should take on a greater cost share in risk reduction.[23]

The National Fire Plan (NFP), administered by the U.S. Departments of the Interior and Agriculture, was created in 2000 to oversee and coordinate wildfire prevention and suppression efforts.[24] NFP wildfire spending in New Mexico is segmented into five areas: (1) firefighting, (2) rehabilitation and restoration, (3) hazardous-fuel treatment, (4) forest-health projects, and (5) community assistance programs.[25]

The CFRP is one of numerous programs that offer grants to communities for wildfire-risk reduction.[26] These grant programs vary in eligibility and purpose. The CFRP's significant scale, in addition to the diverse purposes for which its funds may be used, distinguishes it from other grant programs in the region.[27] Perhaps due to the multifaceted goals of the CFRP, the program has been alternatively classified by different sources as a hazardous fuels reduction program and a community assistance program.[28] Taxonomy aside, it is important to note that the CFRP is the most prominent community-based wildfire risk-mitigation program in the state. Of the approximately $16 million spent annually in New Mexico on wildfire risk reduction under the NFP, approximately $4 million is channeled through the CFRP.[29]

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22. USDA, OFFICE OF INSPECTOR GENERAL, W. REGION, REPORT NUMBER 08601-44-SF, AUDIT REPORT: FOREST SERVICE LARGE FIRE SUPPRESSION COSTS, at i (2006); Brosnan, *supra* note 20.

23. USDA, OFFICE OF INSPECTOR GENERAL, *supra* note 22, at ii; Hesseln, supra note 20, at 8.

24. Toddi A. Steelman et al., *Federal and State Influence on Community Responses to Wildfire Threats: Arizona, Colorado, and New Mexico*, 102 J. FORESTRY 21, 21 (2004); LAURA FALK MCCARTHY, SNAPSHOT: STATE OF THE NATIONAL FIRE PLAN 11–12 (The Forest Trust 2004), *available at* http://theforesttrust.org/images/forestprotection/Snapshot-Master.pdf.

25. USDA Forest Serv., Sw. Region, Fire and Aviation: National Fire Plan, Information by States, http://www.fs.fed.us/r3/fam/nfp/info.shtml (follow "FY 2001 Programs in New Mexico" hyperlink) (last visited Feb. 15, 2008).

26. For a description of various grants available in New Mexico, see Southwest Area Forest, Fire and Community Assistance Grants, A Brief Overview of the Grants Available in New Mexico (on file with the Natural Resources Journal). Examples of grant distributing programs include the Southwest Forests Sustainable Partnership, the Volunteer Fire Assistance Program, the Federal Excess Property Program, and the State Fire Assistance Wildland-Urban Interface Grant Program. *Id.*

27. Steelman et al., *supra* note 24, at 23.

28. *Id.*

29. From 2001 to 2006, CFRP grants have totaled $26,183,192. 2001–2006 Summaries and Contact Information: Collaborative Forest Restoration Program Projects,

New Mexico's mix of areas of chronic rural poverty, pockets of urban concentration and relative wealth along the WUI, and significant wildfire risk create a nuanced problem for policy makers. For example, the problems of wildfire risk and poverty are often intertwined.[30] From a narrow economic perspective, the total risk exposure in many rural communities may be relatively small compared to some high-income WUI communities. But wildfire has the potential to destroy both the scarce physical capital and natural resources upon which rural communities depend. This exacerbates poverty, especially for the uninsured or underinsured. While wildfire risk can be decreased significantly by reducing fuel through thinning or prescribed burns, poor communities frequently do not have the critical mass of physical and social capital to undertake risk mitigation efforts. A report by the National Fire Administration supports this connection between poverty and fire risk: "Virtually every study of socioeconomic characteristics has shown that lower levels of income are either directly or indirectly tied to an increased risk of fire."[31]

Wildfire risk mitigation in New Mexico, as with many places in the Western United States, is further complicated because forest ownership is spatially distributed in a mosaic of private, tribal, and public land (under various public agencies).[32] Many rural and WUI communities in New Mexico are located amongst forestland of varying ownership. Because forestlands, and by consequence wildfire risk, do not exactly mirror demarcations of land ownership, effective wildfire risk mitigation requires coordination across land jurisdictions. For example, the effectiveness of risk reduction treatments taking place on

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http://www.fs.fed.us/r3/spf/cfrp/2006program/pdf/2001-2006sum-contacts.pdf (last visited Feb. 13, 2008). From 2001 to 2004, CFRP spending ranged from 24 percent to 31 percent of spending classified as Hazardous Fuel Treatments and 7 percent to 12 percent of total New Mexico NFP spending. Southwestern Region, Fire & Aviation: National Fire Plan, Information by States, http://www.fs.fed.us/r3/fam/nfp/info.shtml (last visited Feb. 18, 2008). If considered as a Community Assistance program, the CFRP represents approximately 45 percent of NFP spending in New Mexico of all Community Assistance programs. *See* Steelman et al., *supra* note 24, at 23.

30. Niemi & Lee, *supra* note 17, at 29; Laura McCarthy, *Poor Communities Most Threatened by Wildfire*, 10 FIRE CHRONICLE: STORIES OF THE NAT'L FIRE PLAN, June 19, 2002.

31. U.S. FIRE ADMIN., FEMA, FA 170, SOCIOECONOMIC FACTORS AND THE INCIDENCE OF FIRE 2 (1997).

32. The checkerboard nature of forest ownership in New Mexico is most apparent visually. See maps of forest land ownership by agency for Catron County, in Catron County, Community Wildfire Protection Plan, Volume 3, Maps, *available at* http://www.catroncounty.net/cwpp/assets/CWPPFinal_Vol3_Maps.pdf, and Catron/Taos counties, respectively, http://www.emnrd.state.nm.us/EMNRD/forestry/FireMgt/documents/EnchantedCircle_CWPP_Plan_Annexes.pdf.

Forest Service lands is limited if neighboring private, state, or tribal lands go untreated, and vice versa.[33]

Another aspect of New Mexico forests relevant to the design and implementation of the CFRP is that a diverse group of stakeholders attach cultural importance to forests and have strong interests in the management of New Mexico's forested federal lands. A wide variety of state, local community, tribal, environmental, and industry interests have expressed their own distinct views over how to manage public lands. As a result, it is argued that public forest management has been hindered by lawsuits and appeals among these diverse stakeholder interests.[34]

In summary, New Mexico is a large state with significant areas of chronic rural poverty (along with pockets of urban concentration and relative affluence). Much of the terrain is forestland, with ownership of the forest spread across multiple parties, especially in the WUI. Given decades of critical fuel buildup, there is significant wildfire risk to rural communities. Finally, forest management has been accompanied by contentious relations amongst stakeholders, which might be interpreted as a relative shortage of social capital. The creation of the CFRP can be viewed as a response to these issues[35] and appears to have been born in a series of public roundtable meetings in the fall of 1998 sponsored by Senator Jeff Bingaman (D-NM). Senator Bingaman's rationale in developing the program has been described as follows:

> He wanted to do it in such a way that the forest restoration work went directly to local communities, and he also wanted to do this with the aim of reducing the level of

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33. Researchers have called for policies that can address this problem. For examples, see Steelman et al., *supra* note 24, at 24, and Thomas D. Sisk et al., *A Landscape Perspective for Forest Restoration*, 103 J. FORESTRY 319, 319–20 (2005).

34. McCarthy, *supra* note 1, at 1; Bryan Foster, *Enchanted Partnerships: In New Mexico, a Congressman's Idea Becomes a Forest Service Program That Inspires Collaboration and Protects Local Forests-Communities*, AM. FORESTS, Spring 2003, *available at* http://findarticles.com/p/articles/mi_m1016/is_1_109/ai_100876700; Mitch Friedman, *The Forest Service Is Dead; Long Live The Forest Service*, GRIST MAG., Feb. 28, 2006, *available at* http://www.grist.org/comments/soapbox/2006/02/28/friedman/.

Extensive appeals of Forest Service management decisions are not unique to New Mexico. A 2002 Forest Service report found that 48 percent of all decisions regarding mechanical treatments of hazardous fuel were appealed. *See* USDA FOREST SERV., FACTORS AFFECTING TIMELY MECHANICAL FUEL TREATMENT DECISIONS 2 (2002), *available at* http://www.fs.fed.us/emc/nepa/includes/hazardousfuelreductionreport070502.pdf#search=factorsaffectingtimelymechanicalfuel.

35. *See* McCarthy, *supra* note 1, at 1.

> conflict that has traditionally been part of the whole debate over forest restoration in New Mexico.[36]

III. THE CFRP: PROGRAM MECHANICS AND COMMUNITY REACTION

In 2000, the U.S. Congress enacted Public Law 106-393 (P.L. 106-393), commonly referred to as the Secure Rural Schools and Community Self-Determination Act.[37] As one part of this larger legislation, the Community Forest Restoration Act created the Collaborative Forest Restoration Program (CFRP), which is the focus of this analysis. The purposes of the program are described in P.L. 106-393:

> (1) to promote healthy watersheds and reduce the threat of large, high intensity wildfires, insect infestation, and disease in the forests in New Mexico;
> (2) to improve the functioning of forest ecosystems and enhance plant and wildlife biodiversity by reducing the unnaturally high number and density of small diameter trees on Federal, Tribal, State, County, and Municipal forest lands;
> (3) to improve communication and joint problem solving among individuals and groups who are interested in restoring the diversity and productivity of forested watersheds in New Mexico;
> (4) improve the use of, or add value to, small diameter trees;
> (5) to encourage sustainable communities and sustainable forests through collaborative partnerships, whose objectives are forest restoration; and
> (6) to develop, demonstrate, and evaluate ecologically sound forest restoration techniques.[38]

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36. USDA FOREST SERVICE, SW. REGION ET AL., COLLABORATIVE FOREST RESTORATION PROGRAM, 2006 ANNUAL WORKSHOP, JANUARY 24–26, 2006, at 1 (2006), available at http://www.fs.fed.us/r3/spf/cfrp/2006program/annual-workshop/report.pdf.

37. Secure Rural Schools and Community Self-Determination Act of 2000, Pub. L. No. 106-393, 114 Stat. 1607 (2000). The creation of the CFRP is only one aspect of Public Law 106-393. For a general analysis of this legislation, see Krista M. Gebert et al., *The Secure Rural Schools Act, Federal Land Payments, and Property Tax Equivalency*, 20 W.J. APPLIED FORESTRY 50 (2005).

38. Secure Rural Schools and Community Self-Determination Act of 2000, Pub. L. No. 106-393, 114 Stat. 1607, 1625–26.

Thus, in addition to the two goals emphasized in the program's name, collaboration and forest restoration, the program is charged with a number of possibly competing goals.

Because the uniqueness of the CFRP stems from the manner in which these multiple objectives are addressed, we begin by discussing the mechanics of the program. The CFRP annually awards grants to forest stakeholders to conduct projects that address the goals of the program. These grants are cost-share in nature; the federal government funds 80 percent of the total cost of the project and the grantee is responsible for the remaining 20 percent. Grantees have the option of directly funding their share of the cost or providing equivalent in-kind contributions. The Act stipulates that projects are not to exceed four years and that federal funding for each project is limited to $360,000. In summary, a project must do some, but not necessarily all, of the following: reduce the threat of wildfire, improve the use of or add value to small-diameter trees, improve forest health, include a diverse and balanced group of stakeholders, include a multi-party assessment, and create local jobs and youth opportunities.[39]

Grant eligibility is open to a broad range of forest stakeholders. In practice, applicants have included businesses, non-governmental organizations, tribes, state government, local governments, and schools. Projects may take place across any combination of publicly owned lands; projects have taken place primarily on Forest Service, state, tribal, and municipally owned land. Given that CFRP grants can be used across multiple land jurisdictions (a unique aspect of the program), the program has the distinct potential to address the coordination problem of wildfire risk spanning across political and jurisdictional boundaries.

The mechanics of the program are designed to reinforce the goal of collaboration. For example, the CFRP uses a Technical Advisory Panel (Panel) to recommend proposals to be funded. The Panel is comprised of 12 to 15 members representing various forest stakeholders. Specifically, membership on the Panel is comprised of one State Natural Resource official from the State of New Mexico; at least two representatives from federal land management agencies; at least one tribal or pueblo representative; at least two independent scientists; and equal representation from conservation interests, local communities, and commodity interests.[40] Panel members are appointed to terms of two years and are eligible for reappointment. In practice, the Panel uses a consensus-based

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39. *Id.*
40. *Id.* at 1627.

decision-making process.[41] In the first six years of the program, the Panel has reached unanimity on all funding recommendations.[42] Because the CFRP is administered by the USDA Forest Service (Region 3), funding recommendations of the Panel are subject to Forest Service approval. However, to date, all recommendations of the Panel have been accepted by the Regional Forester.

CFRP grants have been used for a variety of purposes including fuel reduction, habitat restoration, capital purchases, and job training.[43] A few specific examples illustrate the variety of projects that are funded under the CFRP. One recent grant was awarded to a youth organization for the removal of small-diameter trees in Largo Canyon. Largo Canyon, located in the Carson National Forest in New Mexico, is estimated to have 26 times more trees per acre than it did 100 years ago.[44] This fuel buildup has resulted in increased wildfire risk. While the youth organization is responsible for the actual treatment of forest lands, multiple collaborators will contribute to the effort: the Forest Service will identify and mark the area for treatment, a local fire department will provide the youth organization with safety training, a New Mexico private business will purchase and haul the small-diameter material from the worksite, and students from a local school district will join in monitoring the treated acreage. As exemplified here by the wildfire risk reduction, employment opportunities, increased social capital, and youth exposure to forestry, CFRP grants in some cases provide a wide range of benefits.

Other projects have more focused objectives. The primary component of another recent grant, awarded to a New Mexico business, was the purchase of a piece of physical capital.[45] Forest restoration endeavors undertaken by citizen groups in Catron County have resulted

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41. Panel applications are open (with public notice), and the Panel is selected by the Region 3 Forester. The composition of the Panel has changed over time and can be seen at USDA Forest Service, Southwestern Region, State and Private Forestry, CFRP: Technical Advisory Committee, http://www.fs.fed.us/r3/spf/cfrp/panel.shtml (last visited Jan. 24, 2008). The Bylaws for the Technical Advisory Panel are available at http://www.fs.fed.us/r3/spf/cfrp/2005program/pdfs/2005-bylaws.pdf (last visited Jan. 24, 2008).

42. Interview with Walter Dunn, CFRP Manager, CFRP Annual Meeting (Jan. 25, 2006).

43. USDA Forest Service, Collaborative Forest Restoration Program Projects, 2001–2006 Summaries and Contact Information, http://www.fs.fed.us/r3/spf/cfrp/2006program/pdf/2001-2006sum-contacts.pdf (last visited Jan. 24, 2008).

44. This statistic, as well as the general description of this CFRP grant (14-06), was taken from the grant application materials submitted to the Technical Advisory Panel.

45. The general description of this CFRP grant (33-06) was taken from the grant application materials submitted to the Technical Advisory Panel.

in a large amount of waste wood, and the business here converts this waste wood to packaged and palletized firewood. CFRP funds were used in this case to buy a trailer to help bring the firewood to market. It is expected that the primary benefits of this CFRP grant are the increased employment opportunities and economic development resulting from small-diameter tree utilization.

A final example shows how the CFRP has brought together groups that might be commonly characterized as having adversarial relationships in the past.[46] Forest Guardians is a non-governmental organization with the mission of protecting biological diversity across the Southwest.[47] A 2006 CFRP grant was awarded to Forest Guardians to collaborate with the Forest Service in decommissioning unused roads to help re-establish natural fire regimes in the Santa Fe National Forest. Collaboration between the Forest Service and Forest Guardians represents a potentially marked departure from the tenor of past relations, as the two parties have been involved in extensive litigation over public-forest management.[48]

Thus, the CFRP differs from other forest-management programs in both its emphasis on building social capital and its focus on developing holistic methods for addressing New Mexico's linked and multifaceted challenges. Community input is used in a unique way: stakeholders are included in the management process through the decision of what types of proposals to submit to the Panel and, through their inclusion on the Panel, what types of proposals to fund. Also, the CFRP addresses the multifaceted problems of New Mexico jointly by encouraging projects that address multiple goals. At the 2006 CFRP annual workshop, Walter Dunn, the program coordinator for the CFRP, described this difference, "This highly participatory process, involving all affected stakeholders in an active way, is fairly unusual for the creation of federal statutes. The CFRP, from its inception, therefore, took a very different and largely collaborative approach to designing the program.…This makes CFRP very different from conventional forest management programs."[49]

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46. The general description of this CFRP grant (11-06) was taken from the grant application materials submitted to the Technical Advisory Panel.

47. Forest Guardians, About Forest Guardians, http://www.fguardians.org/guardians/about.asp (last visited Jan. 24, 2008).

48. *Id.*

49. USDA FOREST SERVICE, SW. REGIONET AL., *supra* note 36.

Nationally, regionally, and locally the CFRP has generated considerable interest.[50] A significant possibility exists that the CFRP or similar forest management programs will be expanded; legislation has been introduced to expand the CFRP to Arizona, doubling annual CFRP expenditures to $10 million.[51] Congress is monitoring the success of the program as well. Public Law 106-393 specifically calls for an assessment of how well the program has progressed after the first five years.[52]

New Mexicans are also interested in the administration of the CFRP. Some critics of the program have alleged that that a conflict of interest may exist when Panel members are also grant applicants.[53] Grants are not being awarded, it has also been argued, to the poorest areas of the state where help is sorely needed.[54] Countering these critics is a chorus from CFRP supporters who argue that the healthy social networks developed by the program make it a success.[55]

Critics have also questioned the effectiveness of the program, comparing the total cost of the CFRP with the on-the-ground treatments that have been accomplished.[56] This critique leads to the natural

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50. *See, e.g.*, Peter Friederici, *Peace Breaks Out in New Mexico's Forests*, 38 HIGH COUNTRY NEWS, Oct. 2, 2006, *available at* http://www.hcn.org/servlets/hcn.PrintableArticle?article_id=16654; Foster, *supra* note 34.

51. H.R. 3590, 109th Congress (2005). Legislation also has been considered to create a community forestry program in Colorado that closely follows the design of the CFRP. H.R. 1042, 108th Cong. (2003). In addition, Senate Bill 2672 was introduced in the Senate and sought to "provide opportunities for collaborative restoration projects on National Forest System and other public domain lands.…" S. 2672, 107th Cong. (2002),

52. To quote directly from the Community Forest Restoration Act of 2000:

> No later than 5 years after the first fiscal year in which funding is made available for this program, the Secretary shall submit a report to the Committee on Energy and Natural Resources of the United States Senate and the Committee on Resources of the United States House of Representatives. The report shall include an assessment on whether, and to what extent, the projects funded pursuant to this title are meeting the purposes of the Collaborative Forest Restoration Program.

Pub. L. No. 106-393 § 603, 114 Stat 1607, 1627 (2000).

53. Smalling, *supra* note 7; Matthews & Schiller, *supra* note 7. Meeting Minutes from the 2006 Technical Advisory Panel Meeting show that Panel members leave the room and do not participate in the discussion if they are affiliated with a proposal. It is our understanding that this practice may have always been used informally, but was not formally recorded in the minutes until several years into the program (i.e., it is not data that is recorded for all years of the CFRP). Jennifer Pratt Miles, Technical Advisory Panel Meeting Minutes, *available at* http://www.fs.fed.us/r3/spf/cfrp/2006program/pdf/2006-tap-mtgminutes.pdf.

54. Matthews & Schiller, *supra* note 7.

55. Friederici, *supra* note 50, at 14, 15.

56. Matthews & Schiller, *supra* note 7.

question: Are the full social benefits from the CFRP worth the cost? Answering this question is difficult. First, the program provides a potentially complex bundle of economic, ecological, and social benefits. Second, the program is only six years old and many of the benefits from CFRP grants have not yet fully taken root. Third, as will be developed in more detail in the subsequent section, it can be argued that implicit in the program is the idea that spillover effects can take place; CFRP spending may facilitate or motivate others in the community to treat surrounding lands or participate more generally in forest restoration efforts. But the presence and magnitude of such indirect or induced effects is an empirical question. While this "crowding in" has been observed elsewhere, theoretically, the opposite can also occur (as with any public funding program), where government spending "crowds out" private efforts or treatments.[57] Thus, the mechanics of how the program is implemented can matter greatly. Together, the relatively short history of the program and the murky understanding of the secondary (indirect or induced) effects of the CFRP make assessing program outputs difficult. Accordingly, we seek to gain insights from the program by analyzing the funding pattern of the CFRP.

IV. COMMUNITIES, FORESTS, AND SOCIAL CAPITAL

While the CFRP was developed in response to the specific problems characteristic of forest management in New Mexico, the program can also be viewed as part of a broader trend toward more participatory, collaborative, and community-based (decentralized) natural resource management. This trend is consistent with new Forest Service regional planning directives.[58] In addition, this participatory

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57. For a forestry example where crowding out has been observed, see Mikael Linden & Jussi Leppänen, *Effects of Public Financed Aid on Private Forest Investments: Some Evidence from Finland, 1963–2000*, 18 SCANDINAVIAN J. FOREST RES. 560 (2003). Experimental work supports the theoretical possibility of both crowding in and crowding out. *See* Robert P. Berrens et al., *Economic Experiments for Evaluating Mitigation Decisions*, *in* WILDFIRE RISK: PERCEPTIONS AND MANAGEMENT IMPLICATIONS (Wade Martin et al. eds., 2007); Heidi J. Albers et al., *Patterns of Multi-Agent Land Conservation: Crowding In/Out, Agglomeration, and Policy* (Social Sci. Res. Network), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=910983.

58. For example, the new planning directives state, "Public participation and collaboration needs to be welcomed and encouraged as a part of planning. To the extent possible, Responsible Officials need to work collaboratively with the public to help balance conflicting needs, to evaluate management under the plans, and to consider the need to adjust plans." January 2005 Regional Planning Guideline, 70 Fed. Reg. 1023, 1025 (Jan. 5, 2005) (to be codified at 36 C.F.R. pt. 219).

approach has drawn attention from a variety of disciplines, which can be used to analyze the CFRP.[59]

The CFRP can be classified as a community forestry program. Community forestry, and its many aliases, describes a forest management regime where stakeholders are included in decision making processes.[60] The amount of control afforded to locals in forest management varies significantly across different programs, ranging from as limited as informal discussion with forest managers to as extensive as government transfer of all management decisions to a local community.[61] However, connecting dissimilar community forestry programs is acceptance of the principle that there are benefits to be gained by including local community members in forest management.

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59. Decentralized natural resource management has been applied beyond forests. *See, e.g.*, R. Quentin Grafton, *Social Capital and Fisheries Governance*, 48 OCEAN & COASTAL MGMT. 753 (2005); Rob A. Cramb, *Social Capital and Soil Conservation: Evidence from the Philippines*, 49 AUSTL. J. AGRIC. & RES. ECON. 211 (2005); van Kooten et al., *supra* note 5; C. Dustin Becker et al., *Community-Based Monitoring of Fog Capture and Biodiversity at Loma Alta, Ecuador Enhance Social Capital and Institutional Cooperation*, 14 BIODIVERSITY & CONSERVATION 2695 (2005).

60. Community forestry has alternatively been called collaborative forestry, community based forestry, village forestry, and participatory forestry. Amy K. Glasmeier & Tracey Farrigan, *Understanding Community Forestry: A Qualitative Meta-Study of the Concept, the Process, and Its Potential for Poverty Alleviation in the United States Case*, 171 GEOGRAPHICAL J., 55, 57 (2005). For similar definitions of community forestry, see Thomas Brendler & Henry Carey, *Community Forestry, Defined*, 96 J. FORESTRY 21 (1998); Lane Krahl & Doug Henderson, *Uncertain Steps Toward Community Forestry: A Case Study in Northern New Mexico*, 38 NAT. RESOURCES J. 53, 55 (1998), and Richard Gauld, *Maintaining Centralized Control in Community-Based Forestry: Policy Construction in the Philippines*, 31 DEV. & CHANGE 229, 233–36 (2000).

61. In the case of the San Juan National Forest in southern Colorado, community input is reflected only in informal discussions taking place between foresters and the community on how the forest should be managed. Thomas W. Crawford & Randall K. Wilson, *Multi-Scale Analysis of Collaborative National Forest Planning Contexts in the Rural US Mountain West*, 26 POPULATION & ENV'T 397, 397–426 (2005). Greater local influence is observed in the case of community forestry programs in Nepal. Here, small groups representing the community, who are authorized to make forest management decisions, are created. While ownership of the forest remains with the Nepalese government, all management decisions are in the hands of the Community Forest User Group. K.P. Acharya, *Twenty-Four Years of Community Forestry in Nepal*, 4 INT'L FORESTRY REV. 149, 149–50 (2002). For other descriptions of community forestry programs, see, for example, Daniel Klooster & Omar Masera, *Community Forest Management in Mexico: Carbon Mitigation and Biodiversity Conservation Through Rural Development*, 10 GLOBAL ENVTL. CHANGE 259 (2000); Manjusha Gupte, *Participation in a Gendered Environment: The Case of Community Forestry in India*, 32 HUMAN ECOLOGY 365 (2004), and Richard A. Schroeder, *Community, Forestry, and Conditionality in the Gambia*, 69 AFRICA 1 (1999).

Proponents of community forestry cite numerous arguments in favor of this type of forest management. For example, it is argued that their daily exposure to the forest gives communities specialized knowledge that escapes centralized forest managers.[62] Community forestry makes use of the information advantage of local stakeholders in developing new and innovative solutions to forest restoration or protection. The prominence of the forest, from both economic and cultural perspectives, further creates a setting conducive to community forestry. Communities dependent upon the forest for economic viability recognize the importance of sustainability.[63] Amenity-rich housing developments in the WUI and amenity-based industry have developed in some cases, where both residents and tourists are drawn to communities embedded or proximate to forested or protected areas. In maintaining both lifestyles and outdoor recreation revenues, these communities have a clear interest in protecting and restoring the health of surrounding forests. Elsewhere, communities neighboring forests depend on traditional extractive activities (e.g., mining or timber production) as a source of commerce. These communities recognize the importance of the future productivity of the forest.[64] Forests are important from a social point of view in many of these communities as well, where local community members seek to maintain long-established traditions by preserving the forest.[65] This attachment, both from cultural and socio-economic perspectives, leads to the conclusion that forest conservation and the interests of surrounding communities are potentially aligned. This is not to argue that bridging diverse perspectives will not require considerable effort, and, thus, the form and implementation of any community forestry effort can matter greatly.

To summarize, this strain of research asserts that including local communities, because of a range of informational advantages and economic and cultural attachment to the forest, can help improve forest management. By including stakeholders actively in forest management, the CFRP can be seen as part of this larger trend.

A key aspect of community forestry, and more specifically the CFRP, is its potential to improve forest management by drawing on local knowledge and developing social capital among forest stakeholders. Social capital, a concept of interest across the social sciences, is broadly

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62. Crawford & Wilson, *supra* note 61, at 397–400; Glasmeier & Farrigan, *supra* note 60, at 60.

63. Brendler & Carey, *supra* note 60, at 21; Klooster & Masera, *supra* note 61, at 262.

64. Klooster & Masera, *supra* note 61, at 262.

65. *Id.*

defined as "the norms and networks facilitating collective action for mutual benefit."[66] It has been argued that the networks and norms underlying social interaction are determinants of behavior across an array of applications.[67] The significance of social capital in natural resource management applications is increasingly being recognized[68] and is important for understanding the CFRP as well.

A primary critique of the social capital paradigm is the "conceptual vagueness" of the term.[69] What is social capital and how does it work? And importantly, how can policy incubate social capital? Focusing on social capital as applied to natural resource management, we discuss two responses from the literature.

One way in which increased social capital results in positive environmental outcomes is through information spillovers.[70] Bringing together community members to participate in environmental management creates what is referred to as *bridging* social capital.[71] Bridging social capital describes the social networks connecting people of disparate characteristics (demographic, political, cultural, etc.).[72] When relationships are cultivated through participation in environmental-management processes, the transmission of information throughout community members is made easier.[73] Through increased access to

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66. Michael Woolcock, *Social Capital and Economic Development: Toward a Theoretical Synthesis and Policy Framework*, 27 THEORY & SOC'Y 151, 155 (1998). Examples of similar definitions include Pretty & Ward, *supra* note 9, at 212 ("Four central features of social capital have been identified: (1) relations of trust; (2) reciprocity and exchanges; (3) common rules, norms, and sanctions; and (4) connectedness in networks and groups."); James S. Coleman, *Social Capital in the Creation of Human Capital*, 94 AM. J. SOCIOLOGY, at S 95, S 98 (1988) ("Social capital is defined by its function. It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors—whether persons or corporate actors—within the structure."). For a survey of the social capital literature, see Steven N. Durlauf & Marcel Fafchamps, *Social Capital* (Nat'l Bureau of Econ. Research, Working Paper Number W10485, 2004), *available at* http://ssrn.com/abstract=546282.

67. PUTNAM, *supra* note 4; Durlauf & Fafchamps, *supra* note 66.

68. Pretty & Ward, *supra* note 9, at 209; *see, e.g.*, Christopher McGrory Klyza et al., *Local Environmental Groups and the Creation of Social Capital: Evidence from Vermont*, 19 SOC'Y & NAT. RESOURCES 905 (2006); Derek Armitage, *Adaptive Capacity and Community-Based Natural Resource Management*, 35 ENVTL. MGMT. 703 (2005).

69. *See* Alejandro Portes, *Social Capital: Its Origins and Applications in Modern Sociology*, 24 ANN. REV. SOC. 1 (1998); Durlauf & Fafchamps, *supra* note 66, at 3.

70. Nepal, Bohara & Berrens, *supra* note 5; Durlauf & Fafchamps, *supra* note 66.

71. Klyza et al., *supra* note 68.

72. *Id.*

73. Pretty & Smith, *supra* note 5, at 633.

information provided by better social networks, community preferences for provision of environmental goods and services can change.[74]

Another way in which social capital leads to improved environmental outcomes is by creating a sense of community or reciprocity within an area.[75] In communities with well-developed social networks, locals are more inclined to respond to the environmental stewardship undertaken by others within their community. Particularly relevant to the CFRP is recent work identifying this reciprocity phenomenon in the context of wildfire risk mitigation behavior.[76] In-depth interviews with private landowners in Colorado provide evidence that the decision to engage in wildfire risk mitigation is directly influenced by the wildfire risk mitigation treatments on neighboring public lands.[77] That is, private landowners are more likely to mitigate wildfire risk on their own land when there is the perception that reciprocal treatments are taking place on neighboring public lands. Recent theoretical work also predicts this finding.[78] The risk of wildfire to any individual depends in part upon the amount of risk-reduction treatments undertaken on neighboring lands. Likewise, the effectiveness of risk reduction for any individual is in part determined by the actions taken on neighboring lands. Under this interdependent risk problem ("risk externalities"), one of two stable outcomes ("equilibria") is predicted: Either almost everyone will engage in mitigation or almost no one will.[79] A tipping point exists where the incentives to mitigate change are based upon the actions of surrounding property owners. From a policy perspective then, the objective is clear: public policies should induce enough of the population to mitigate so

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74. *Id.* at 631. According to Pretty and Smith,

> [r]ecent initiatives that have sought to build social capital have shown that rural people can improve their understanding of biodiversity and agroecological relationships at the same time as they develop new social rules, norms, and institutions. This process of social learning helps new ideas to spread and can lead to positive biodiversity outcomes over large areas.

Id. See also Becker et al., *supra* note 59.

75. Pretty & Ward, *supra* note 9, at 212.

76. BRENKERT ET AL., *supra* note 5.

77. *Id.*

78. Howard Kunreuther & Geoffrey Heal, *Interdependent Security*, 26 J. RISK & UNCERTAINTY 231, 231–49 (2003); Aric Shafran, *Risk Externalities and the Problem of Wildfire Risk*, (Working Paper, Oct. 2006), http://ucsu.colorado.edu/~shafrana/shafran-jobmarket.pdf.

79. Kunreuther & Heal, *supra* note 78; Paul M. Jakus, *Averting Behavior in the Presence of Public Spillovers: Household Control of Nuisance Pests*, 70 LAND ECON. 273 (1994); Shafran, *supra* note 78.

that everybody else then has the incentive to mitigate on their own.[80] The implication is that through the development of social capital, one key aspect of the CFRP is the potential to induce information spillovers and additional forest restoration and wildfire risk mitigation behaviors that take place beyond initial grant projects.[81]

However, an important finding from the social capital literature is that not all types of social capital are equally effective in inducing environmental stewardship.[82] Social capital development is most effective when there are clear ties between the benefits sought and the implementation mechanisms. Not all social capital is created equally, and activities have to be targeted to specific goals (e.g., forest stakeholders should engage in activities specifically related to forest management).[83] This finding makes the manner in which the CFRP allocates funds, through the participation of forest stakeholders, of particular significance (i.e., program implementation matters).

Assessment of the outputs associated with the CFRP remains somewhat premature in this initial phase of the program. However, interesting questions surround how the program has been implemented, such as whether the program has fully taken advantage of the opportunity to develop social capital by doing so in a targeted way.

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80. Shafran offers the following assessment:

> Policy should take advantage of the possibility for tipping to occur. There exists a tipping point such that, below the tipping point, no one has incentive to unilaterally mitigate, but once the point is reached, it becomes in the interest of other agents to follow until the preferred equilibrium is reached.

Shafran, *supra* note 78, at 11.

81. Such secondary effects may also be important for the various entrepreneurial and market-based activities (e.g., small-diameter-material utilization and product development) that the CFRP funds. Such secondary or spillover effects are commonly discussed in project proposals and final reports. In fact, incorporating indirect and induced effects is a standard procedure in formal regional modeling of economic impacts (income and employment). For a cogent introductory discussion of regional economic impact analysis in a natural resource management context, see Gregory S. Alward et al., *Regional Economic Impact Analysis for Alaskan Wildlife Resources*, *in* VALUING WILDLIFE RESOURCES IN ALASKA 61–86 (George Peterson et al. eds., 1992). For discussion of the importance of information spillovers in emerging geographic clusters of organizations and firms, see generally, Barak S. Aharonson et al., *Desperately Seeking Spillovers: Increasing Returns, Social Cohesion and the Location of New Entrants in Geographic and Technological Space* (Rotman School of Mgmt., Univ. of Toronto, 2004), *available at* http://www.rotman.utoronto.ca/strategy/working%20papers/SeekingSpillovers.pdf.

82. Nepal, Bohara & Berrens, *supra* note 5; O. Westermann et al., *Gender and Social Capital: The Importance of Gender Differences for the Maturity and Effectiveness of Natural Resource Management Groups*, 33 WORLD DEV. 1783 (2005).

83. Nepal, Bohara & Berrens, *supra* note 5.

Against this backdrop, we turn to the investigation of the determinants of CFRP funding decisions.

V. REVEALED-PREFERENCE ANALYSIS

We apply revealed-preference modeling to statistically analyze which factors were significant in CFRP funding decisions. Nobel Laureate economist Daniel McFadden is generally credited with popularizing this type of research.[84] Statistical revealed-preference modeling is commonly used to analyze the decision-making process of a government agency or program. Many government programs are provided with only a general framework or broad criteria for deciding how to allocate resources. McFadden suggests that it is possible to use the actions taken by a government program to determine the implicit choice-rules guiding the underlying decision-making process.[85] Revealed-preference analysis is a statistical tool for illuminating these implicit choice-rules.

As an initial application of such revealed-preference analysis, McFadden investigated the process used by the California Highway Division in creating highways in California in the 1960s. Using data that reflected the variation in different freeway projects, econometric evidence revealed planners' preferences for different types of projects.[86] In this spirit, numerous revealed-preference analyses have been subsequently applied to a variety of public programs.[87] Most commonly, revealed-preference studies address whether the government agency or program in question is following its stated goals or objectives.

The objectives outlined in P.L. 106-393 and the funding record from 2001 to 2006 make this type of revealed-preference analysis not

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84. *See, e.g.*, Daniel McFadden, *The Revealed Preferences of a Government Bureaucracy: Theory*, 6 BELL J. ECON. 401 (1975); Daniel McFadden, *The Revealed Preferences of a Government Bureaucracy: Empirical Evidence*, 7 BELL J. ECON. 55 (1976) [hereinafter McFadden, *Empirical Evidence*].

85. Daniel McFadden, *The Revealed Preferences of a Government Bureaucracy: Theory*, BELL J. ECON. 401, 402 (1975).

86. *Id.*

87. For examples of applications in environmental or natural resource management, see Shreekant Gupta et al., *Paying for Permanence: An Economic Analysis of EPA's Cleanup Decisions at Superfund Sites*, 27 RAND J. ECON. 563 (1996); Maureen L. Cropper et al., *The Determinants of Pesticide Regulation: A Statistical Analysis of EPA Decision Making*, 100 J. POL. ECON. 175 (1992); Robert P. Berrens et al., *Revealed Preferences of a State Bureau: Case of New Mexico's Underground Storage Tank Program*, 18 J. POL'Y ANALYSIS & MGMT. 303 (1999); and Andrew Metrick & Martin L. Weitzman, *Patterns of Behavior in Endangered Species Preservation*, 72 LAND ECON. 1 (1996).

only possible for the CFRP, but also consonant with the required directive for periodic assessment of program performance. In deciding how much to fund each proposal, the CFRP has left a footprint from which program preferences can be inferred. Irrespective of what the language of the law says should be done, how is the CFRP deciding what type of projects to fund? Further, does each of the stated goals of the program carry equal weight in funding decisions? Revealed-preference analysis is a tool that can be used to investigate these questions.

VI. DATA AND MODELING

From 2001 to 2006, the Panel considered 223 grant proposals, 219 of which have been included in the analysis here.[88] Each year, between 13 and 19 projects have been funded. In total, 89 of the 223 proposals submitted (approximately 40 percent) have received funding.[89] Table 1 depicts the raw distribution of funded projects by county.[90] Projects have taken place in roughly half of New Mexico counties. However, as shown in Table 1, those counties vary significantly in number of projects, population density, poverty, and percentage of forestland.

To start, we expect that in practice the CFRP has preferences with respect to the type of projects to fund (and at what level to fund them). These preferences could be based on the objectives of the program: fostering collaboration, reducing wildfire risk, improving forest health, and creating jobs. In addition, these preferences could be based on some other set of determinants, such as geographic location, land type, and attributes of the applicants or surrounding communities. Thus, for any given proposal, i, the program's deterministic preferences can represented by a preference function defined over a set of hypothesized determinants:

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88. The remaining four proposals were omitted because of insufficient data or removal from consideration by the applicant.

89. From 2001 to 2006, CFRP grant distribution by land jurisdiction has been as follows: Forest Service (49), Tribal (15), Multiple Jurisdiction (10), State (6), Municipal (4), Not Applicable (3), and Department of the Interior (2). Over the same period, grant distribution by applicant classification has been Business (27), Tribe (22), NGO (18), State Government (10), University/School (7), and Local Government (5). Data for these figures has been taken from CFRP grant applications.

90. The data provided in Table 1 is from multiple sources. Total CFRP spending and the number of grants taking place by county was taken directly from CFRP grant applications. For population density and the poverty rate for each county, see U.S. Census Bureau, Census 2000 Demographic Profiles: New Mexico and Counties, http://www.unm.edu/~bber/census/ sample/dpcos.htm (last visited Jan. 18, 2008). For the percentage of land in each county classified as forestland, see O'BRIEN, *supra* note 13, at 7.

$$V_i = V_i\left(X_i^{SocialCapital}, X_i^{Fire}, X_i^{ForestHealth}, X_i^{Jobs}, X_i^{CommnityCharacteristics}\right), \quad (1)$$

where $X_i^{SocialCapital}$ is a vector of one or more variables describing the degree to which a proposal develops social capital amongst stakeholders, X_i^{Fire} is a vector of one or more variables describing the degree to which a proposal reduces the risk of wildfire, $X_i^{ForestHealth}$ is a vector of one or more variables describing the degree to which a proposal improves forest health, X_i^{Jobs} is a vector of one or more variables measuring the degree to which a proposal provides jobs, and $X_i^{CommunityCharacteristics}$ is a vector of one or more variables measuring the socioeconomic characteristics of the community in which a proposal takes place.

Initially, there appear to be two potential decisions made by the Panel: (1) whether to fund a project; and (2) how much funding to award to each proposal. The open question is whether there really are two separate decisions. The descriptive statistics of the program provide some evidence that the principal decision of the panel is in deciding whether or not to fund a project (given its requested funding level), and that in practice there is primarily just one decision. Over the first six years of the program, 62 of the 89 funded projects received the full amount requested and 78 of the 89 received better than 90 percent of the amount requested. Further, the program philosophy appears to be to not split projects into pieces. For example, the meeting minutes from the 2006 Technical Advisory Panel Meeting show Panel Chairman Walter Dunn discouraging the Panel from doing "open heart surgery" on proposals by awarding partial funding.[91] The Panel appears to take this advice, only partially funding proposals in isolated cases such as when the budget begins to run short. Thus, our focus is on what projects receive funding and why.[92] Again, it is assumed that information about

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91. USDA Forest Serv., CRFP, 2006 Technical Advisory Panel Meeting, 2006 Minutes, at 90, http://www.fs.fed.us/r3/spf/cfrp/2006program/pdf/2006-tap-mtgminutes.pdf (last visited Jan. 18, 2008).

92. For completeness, we explored alternative modeling techniques. Specifically, a Heckman two-step selection model was used, where the dependent variable in the selection equation is whether or not a proposal is funded, and the dependent variable in the outcome equation is the amount of funding awarded to a proposal. The estimated coefficient for the inverse Mill's ratio was not significantly different from zero, suggesting ordinary least squares (OLS) estimates of the amount of funding awarded to each proposal are not biased. Also, given the large number of proposals that were awarded either $0 or $360,000, the possibility of truncation bias in the data was considered by using two-limit

program preferences can be revealed in the decision of whether or not to fund any given proposal.

The proposal funding decision is modeled using the logit probability model.[93] The dependent variable, FUNDED, is coded as 1 when a proposal receives funding and 0 otherwise. The probability of a proposal being funded, P_i, can be modeled as:

$$P_i = \frac{1}{1 + e^{-X_i\beta}}, \quad (2)$$

where β is a vector of estimable coefficients corresponding to the vectors of explanatory variables: $X_i^{SocialCapital}$, X_i^{Fire}, $X_i^{ForestHealth}$, X_i^{Jobs}, and $X_i^{CommunityCharacteristics}$.

A variety of data sources were used in implementing the logit probability model of the proposal funding decision. First, the Panel creates an annual report describing the funding decisions of the CFRP. Included in this report is the Panel's evaluation of each proposal. As a part of their assessments of individual proposals, created prior to their final annual deliberations, the Panel lists the strengths and weaknesses of each proposal. For example, common assessments of strengths of a proposal were "This project reduces the risk of wildfire" and "There is an extensive and diverse group of collaborators and partners." We use these assessments of the Panel directly to create dummy variables [94] measuring whether a proposal addresses the stated goals of the program.[95] Census data is used to describe the county in which

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Tobit modeling on the funding amount decision. The decision of how much funding to award each proposal was also investigated using OLS. Sign and coefficient significance are similar across each modeling procedure; thus, it is argued that program preferences are essentially revealed in the binary funding decision. However, for comparison purposes, a set of two-limit Tobit models on the funding amount decision are presented in the table in the Appendix. The full set of Heckman, OLS, and two-limit Tobit modeling results are available upon request. For more information on alternative modeling techniques, see WILLIAM H. GREENE, ECONOMETRIC ANALYSIS (5th ed. 2003).

93. Given that there are not enough years to implement econometric time series modeling approaches, we start by treating all six years of proposals as part of the same initial period of program analysis (2001 to 2006), and then later relax this assumption.

94. Dummy variables are binary measurements where the variable is often coded as 1 if an observation possesses the attribute of interest and 0 otherwise. For more detailed discussion, see WILLIAM E. GRIFFITHS ET AL., LEARNING AND PRACTICING ECONOMETRICS, ch. 12 (1993).

95. There are benefits from and limitations to relying on data from the Panel reports, which are Panel consensus assessments made prior to any funding decisions and are part of the Panel records. A potential weakness of this type of data is that underlying differences in quality are not observable if projects are lumped together too generally for any given variable. Where possible, we address this by combining Panel assessments with data from other sources.

proposals take place. The physical attributes of the county in which proposals take place are measured using available geographic information system (GIS) and Forest Service data. Finally, data was collected from the grant application packages submitted to the CFRP, which describe various attributes of the applicant and the proposal.

In implementation, the vector $X_i^{SocialCapital}$ is comprised of several variables. Finding a suitable proxy for social capital is a difficulty common to all empirical studies in the literature.[96] However, because our modeling focus is the planning process of the program, more relevant than a measurement of the social capital associated with each proposal is the Panel's *assessment* of the collaboration (interpreted here as social capital development) associated with each proposal. Thus, this analysis relies on the Panel's annual assessments. PANEL-COLLABORATION is a dummy variable where 1 indicates the Panel has cited fostering collaboration as a strength of the proposal, and 0 otherwise. To augment the Panel's assessments, and add an objective component to the social capital metric, we construct the variables NUMBER-LETTERS and NUMBER-PARTNERS, measuring the number of letters of support included and number of partners listed in a proposal's application, respectively. We combine these three variables to create COLLAB-INDEX. NUMBER-LETTERS and NUMBER-PARTNERS are first divided by the maximum number of letters and partners for any proposal to scale each of the variables from 0 to 1. These three variables are weighted equally in summing to create the index COLLAB-INDEX.[97]

In implementation, the vector X_i^{Fire} is represented by an index constructed from two variables: (1) PANEL-FIRE is a dummy variable where 1 indicates the Panel specifically identifies the reduction in wildfire risk as a strength of the proposal, and 0 otherwise; and (2) AT-RISK is a dummy variable where 1 indicates the project takes place in an area subject to high risk of wildfire, and 0 otherwise. The variable FIRE-INDEX is the sum of PANEL-FIRE and AT-RISK. In addition to FIRE-INDEX, we assess whether a proposal reduces the risk of wildfire with the inclusion of log-ACRES, measuring the log of the number of acres an application proposes to treat and PERCENT-WUI, measuring the

96. Durlauf & Fafchamps, *supra* note 66.

97. Alternative specifications using the PANEL-COLLABORATION, NUMBER-LETTERS, and NUMBER-PARTNERS variables individually as measures of social capital yield similar results.

percentage of land in the county where a proposal takes place categorized as part of the wildland-urban interface (WUI).[98]

$X_i^{ForestHealth}$ is comprised of the dummy variable PANEL-FOREST-HEALTH, coded as 1 when the Panel cites maintaining forest health as a strength of the proposal, and 0 otherwise. Proposals deemed by the Panel to protect old or large trees, provide wildlife habitat, remove invasive species, or generally improve forest health are captured by this variable.[99]

X_i^{Jobs} is comprised of the dummy variable PANEL-JOBS, coded as 1 when the Panel cites the provision of jobs as a strength of the proposal, and 0 otherwise.[100]

For the vector $X_i^{CommunityCharacteristics}$ a wide variety of variables were collected and evaluated (e.g., per capita income, unemployment rate, median house value, racial characterization, and industry type in the county where a proposal takes place). Given practical concerns with avoiding statistical multicollinearity, and policy concerns over evaluating the equity aspects of the program in implementation, $X_i^{CommunityCharacteristics}$ is comprised of the variable POVERTY, which measures the percentage of residents in the county where a proposal takes place categorized as below the poverty threshold.[101]

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98. For targeted measures of wildfire risk for some New Mexico communities see ENERGY, MINERALS, & NAT. RESOURCES DEP'T, FORESTRY DIV., 2005 NEW MEXICO COMMUNITIES AT RISK ASSESSMENT PLAN (2005), *available at* http://www.emnrd.state.nm.us/FD/FireMgt/ docs05/2005NM_CAR.pdf. However, many CFRP grant proposals span across multiple communities and in doing so sometimes include multiple counties. As a consequence, we rely on the Panel's wildfire risk assessment. The presence of professional foresters and restoration specialists on the Panel and forestry specialists available at Panel deliberations add to the accuracy of this measure of wildfire risk.

99. As an alternative approach, these assessments of the Panel were treated individually and summed to create an index of the perceived provision of forest health from each proposal. Results are generally similar when this approach is used; however, because of better fit, we use the broader PANEL-FOREST-HEALTH variable in the model specifications presented here.

100. To measure the degree to which a proposal creates employment, the number of jobs expected to be created by each project could be counted. However, the wage rate, duration, and specific human capital or skill level required for different jobs created through CFRP grants varies greatly and to date are not consistently reported. All jobs from CFRP grants are not created equal. Therefore, we rely upon the Panel's "wide lens" assessment of job creation.

101. POVERTY is a constructed variable taken from Census Bureau calculations. Specifically, the Census Bureau uses income, age, and family size in determining the poverty threshold. U.S. Census Bureau, Poverty: How the Census Bureau Measures Poverty (Official Measure), http://www.census.gov/hhes/www/poverty/povdef.html#4 (last visited Jan. 25, 2008).

In addition to the above-mentioned goals of building collaborative capacity (which we interpret as a measure of social capital development), reducing the risk of wildfire, providing jobs, and improving forest health, the CFRP has other objectives. We create dummy variables to measure whether or not a proposal addresses these goals. SD-REDUCTION, NEW-USE/VALUE, YOUTH, WATERSHEDS, and HISTORIC-FIRE-REGIMES are dummy variables indicating whether or not the Panel cites the reduction of small diameter trees, the creation of new uses or values for small diameter trees, the provision of youth opportunities, watershed restoration, and restoration of historic fire regimes, respectively, as strengths of a proposal.

Many grant proposals had specific limitations or did not meet all of the eligibility requirements of the program. The Panel recognized this and cited the weaknesses of each proposal in their assessments for deliberation. Thus, the variables PRIVATE, FORM, and MATCH were created from these listed weaknesses. PRIVATE is a dummy variable coded as 1 if the Panel cites the proposed treatment of private land as a weakness of a proposal, and 0 otherwise. FORM is a dummy variable coded as 1 if the Panel cites an incorrect or incomplete application as a weakness of a proposal, and 0 otherwise. MATCH is a dummy coded as 1 if the Panel cites doubt regarding the validity of applicants matching 20 percent as a weakness of a proposal, and 0 otherwise. To test for potential order effects, the analysis includes the variable ORDER, which describes the place in the numerical order in which a proposal is discussed by the Panel.[102]

The CFRP has received applications from a wide range of applicants proposing to engage in projects across a number of land jurisdictions. As mentioned earlier, grant applicants have been businesses,

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Depending on the sign of the correlation with POVERTY, results are generally similar when other variables are used to measure community characteristics. The level of precision for community data is limited to the county level (as opposed to, say, the Census tract level) for two reasons: (1) many proposals take place across a range of communities and (2) data describing many of the proposals do not specify the community beyond the county level (e.g., if local employment or other economic information is discussed, empirical rates or facts are typically presented in the proposal at the county level, where the data is most commonly available). Where proposals take place in multiple counties, the variable POVERTY is the mean of these variables in the applicable counties.

102. A variety of additional control variables were investigated for significance in alternative modeling specifications. Examples include ownership classification of forestland in the county where a proposal takes place, population in the county where a proposal takes place, population density in the county where a proposal takes place, and population density squared in the county where a proposal takes place. These were not found to be significant determinants of the probability of funding in preliminary modeling and were dropped from further analysis.

non-governmental organizations, tribes, state government, local government, universities, and schools. Proposed treatments take place on Forest Service, tribal, state, Department of the Interior, and municipally owned lands. Significant correlation exists between variables classifying applicant type and land jurisdiction. To avoid multicollinearity problems, we construct variables to measure simultaneously the applicant type and the land jurisdiction where a proposal takes place.[103] BUSINESS-FS is a dummy variable coded as 1 if the proposal is submitted by a business and proposes to treat Forest Service land, and 0 otherwise. NGO-FS is a dummy variable coded as 1 if the proposal is submitted by an NGO and proposes to treat Forest Service land, and 0 otherwise. TRIBE-TRIBAL is a dummy variable coded as 1 if the proposal is submitted by a tribe and proposes to treat tribally owned land, and 0 otherwise. STATEGOVT-STATE is a dummy variable coded as 1 if the proposal is submitted by the state government and proposes to treat state owned land, and 0 otherwise. LOCALGOVT-MUNICIPAL is a dummy variable coded as 1 if the proposal is submitted by a local government and proposes to treat municipal land, and 0 otherwise. The residual category for the set of dummy indicator variables BUSINESS-FS, NGO-FS, TRIBE-TRIBAL, STATEGOVT-STATE, and LOCALGOVT-MUNICIPAL is comprised of various combinations of applicant type and land jurisdiction, which because of limited observations could not be included as distinct categories (e.g. businesses treating BLM land, NGOs treating tribally owned land).

Aside from these constructed variables measuring land ownership and applicant classification, we create two dummy variables measuring specific cases of land treatment characteristics. The variable NO-LAND-TREATED is a dummy variable indicating whether or not the proposal engages in identifiable, on-the-ground public land treatment (1 if not, and 0 otherwise). The variable MULTIPLE-LAND is a dummy variable that identifies whether or not a proposal takes place across multiple land jurisdictions (1 if so, 0 if not). This variable is mutually

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103. As an alternative approach, project proposals were also classified by the specific National Forest (NF) they were assigned to (Carson, Cibola, Santa Fe, Lincoln, Gila) by the CFRP program staff. Such assignments are largely location based and are potentially important not just due to geography, but also because each NF has an associated CFRP coordinator. Thus, this variable can also measure potentially unobserved effects across these NF assignments, such as the relative skill of coordinators in facilitating project proposal development and responding to Panel inquiries at annual deliberations. However, in preliminary modeling analyses, none of these NF dummy variables were found to be statistically significant determinants of the funding decision.

exclusive with the other land jurisdiction variables and includes applicants of all classifications.

There are several general hypotheses regarding the attributes of proposals and their effect on the probability of receiving funding. First, it is expected that the Panel funds projects on the basis of the primary stated goals of the program. Consequently, it is expected that the estimated coefficients for the arguments of $X_i^{SocialCapital}$, X_i^{Fire}, $X_i^{ForestHealth}$, and X_i^{Jobs} will all be positive and significantly different from zero. Specifically, the following four alternative individual hypotheses are all tested against the null hypotheses of no positive effect on funding:

H1: $\beta_{COLLAB-INDEX} > 0$
H2: $\beta_{FIRE-INDEX} > 0$
H3: $\beta_{PANEL-FOREST-HEALTH} > 0$
H4: $\beta_{PANEL-JOBS} > 0$

As noted earlier, there have been select criticisms that the CFRP may exhibit particular biases or an inequitable distribution of funding. Further, checking for social equity effects is a standard practice in revealed-preference analyses. Thus, against the null that the incidence of POVERTY in a county where a project takes place does not affect the likelihood of a project receiving funding, the following alternative hypothesis can be tested:

H5: $\beta_{POVERTY} \neq 0$

If the evidence supports H5, it would indicate that the incidence of poverty in a county where a project takes place affects the likelihood of a project receiving funding. If the sign is positive (negative), then the higher the rate of poverty in a surrounding county, the more (less) likely the project is to receive funding.

It can also be expected that the Panel looks favorably upon the secondary goals of the program; thus, it is expected that the presence of the variables YOUTH, SD-REDUCTION, NEW-USE/VALUE, WATER-SHEDS, and HISTORIC-FIRE-REGIMES will increase the probability of a proposal receiving funding. Formally, against the null of no positive effect in each case, a set of individual hypotheses are tested on whether these variables affect the funding decision:

H6a: $\beta_{YOUTH} > 0$
H6b: $\beta_{SD-REDUCTION} > 0$
H6c: $\beta_{NEW-USE-VALUE} > 0$
H6d: $\beta_{WATERSHEDS} > 0$

And

H6e: $\beta_{HISTORIC-FIRE-REGIMES} > 0$.

The expected outcome on all of these secondary objectives is that they would be positively related with the probability of a proposal receiving funding.

It is expected that there is no programmatic bias in Panel decisions when choosing between proposals submitted by different classifications of applicants and land jurisdictions. Thus, against the null of no effect in each case, we test a set of alternative hypotheses that the probability of a proposal receiving funding is influenced by the applicant type and public agency that owns the land where a proposal takes place:

H7a: $\beta_{BUSINESS-FS} \neq 0$
H7b: $\beta_{NGO-FS} \neq 0$
H7c: $\beta_{TRIBE-TRIBAL} \neq 0$
H7d: $\beta_{STATEGOVT-STATE} \neq 0$

and

H7e: $\beta_{LOCALGOVT-MUNIICIPAL} \neq 0$.

While it is generally expected that funding decisions will be unaffected by applicant or jurisdictional classification, the ability of CFRP funds to be used for treatment across multiple land jurisdictions is a unique aspect of the program. We therefore expect the regression coefficient for MULTIPLE-LAND to be positive and significantly different from zero. Thus the final hypothesis, tested against the null of no positive effect, is that a project taking place on multiple land jurisdictions is a significant and positive determinant of funding:

H8: $\beta_{MULTIPLE-LAND} > 0$.

This final hypothesis tests the effect of a particularly unique feature of the program—the ability to treat land across multiple jurisdictions as part of a coordinated project.

VII. RESULTS

Logit probability modeling results are presented in Table 3. As part of the revealed-preference analysis to uncover the implicit choice-rules that may exist in the CFRP, numerous models using a wide variety of variables and constructed indices were evaluated. In order to compare explanatory power and to illustrate the possible sensitivity of results, seven model specifications are presented in Table 3, (e.g., trimmed versus extended specifications that include different sets of explanatory variables). Overall, the models fit the data well.[104] In moving from the most restricted specification (Model 1) to the most extended specification (Model 7), it can be seen that the signs and significance of comparable variables are generally quite robust. Although we present multiple combinations of explanatory variables (specifications), Model 4 is the preferred specification and our primary focus of discussion. This model successfully predicts 76.26 percent of the actual outcomes. Since this choice of preferred model is related to our conclusions on hypotheses 7a–7e (on the absence or presence of any bias towards applicant or land-jurisdiction type), it merits some statistical discussion.

Technically, Model 4 represents a significant improvement in fit relative to the more restricted specifications used in models 1, 2 and 3.[105] Model 4 is similar in specification to Model 5, which (like models 6 and 7) includes the applicant-type and land jurisdiction variables, and allows testing of specific hypotheses 7a–7e. For all three models (5, 6, and 7), the evidence supports the null hypothesis in all cases for hypotheses 7a–7e. Specifically, the estimated coefficients for the variables BUSINESS-FS, NGO-FS, TRIBE-TRIBAL, STATEGOVT-STATE, and LOCALGOVT-MUNICIPAL are not statistically different from zero. Further, when compared to Model 4, models 5, 6, and 7 show no significant

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104. In terms of the fit of the model, Maddalla R2 values range from 0.08 to 0.31, and Chi-squared values range from 18.27 to 82.00 and are in each case significant at the one percent (0.01) level. The $\chi 2$ tests for each specification show the given model to be an improvement in fit when compared to a model specification with the intercept alone. *Supra* note 96.

105. Likelihood ratio tests are used to compare the fit of the competing models in Table 3. These tests examine whether the improved fit of a model from adding additional explanatory variables adequately compensates for the reduced degrees of freedom from adding these variables.

improvement in overall fit. Thus, as an important equity result concerning the CFRP, the evidence suggests there is no bias for or against a particular applicant or land ownership type.

Having chosen a preferred model (Model 4), and drawn conclusions on hypotheses 7a–7e (no bias), we can turn to evaluating whether the multiple goals of the CFRP carry equal influence on the Panel's funding decisions.[106] In addition to evaluating the sign and statistical significance of different explanatory variables (using Model 4 in Table 3), it is also important to discuss the relative impact, or marginal effect, they have on the probability of a proposal receiving funding. Thus, Table 4 presents the marginal effects of all statistically significant variables from Model 4, by rank order of magnitude (highest to lowest).

First, results suggest that developing social capital in forest communities appears to be a key determinant in CFRP funding decisions. In all model specifications shown in Table 3, the estimated coefficient for the variable COLLAB-INDEX is positive and significant (supporting hypothesis H1). This implies that the probability of a proposal being funded is significantly increased when the assessed degree of collaboration is relatively higher.[107] Table 4 shows that for the

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106. Where directional hypotheses are presented (H1, H2, H3, H4, H6a–H6e, and H8), it is appropriate to use one-tailed tests to assess statistical significance. Thus, the estimated coefficients on the variables COLLAB-INDEX, PANEL-FOREST-HEALTH, FIRE-INDEX, PANEL-JOBS, YOUTH, SD-REDUCTION, NEW-USE/VALUE, WATERSHEDS, HISTORIC-FIRE-REGIMES, and MULTIPLE-LAND were initially evaluated using one-tailed tests. However, in Table 3 (and further in Table 5 and the Appendix) we present statistical significance using two-tailed tests for several reasons. First, some variables have no specific hypothesis (or directional hypothesis). Second, estimated coefficients for some variables with directional hypotheses show the opposite sign expected, and it is useful to show whether such effects are significantly different from zero. Third, estimated coefficients that are of the expected sign and are significant for a two-tailed test will also be significant for a one-tailed test. Finally, in only one case for one specification in Table 3 (and none later in Table 5) is an estimated coefficient (FIRE-INDEX in Model 3) insignificant when evaluated with a two-tailed test, but significant (0.10 level) when evaluated with a one-tailed test. *See* GRIFFITHS ET AL., *supra* note 94.

107. Aside from the funding decision record of the Panel, this emphasis on fostering collaboration is supported by other observations of the program. For example, all grant recipients are required by the program to attend an annual CFRP workshop. The annual workshop brings together grant applicants to discuss the workings of the program, provides a forum for grantees to discuss successes and failures of their projects, and offers grantees a chance to meet and talk with other people involved in the program. In this way, the annual meeting requirement of the CFRP is consistent with the finding that the Panel looks favorably on proposals that foster collaboration. Grant applicants are also required to engage in a multi-party assessment of their project. These multi-party assessments require the involved parties for each grant to come together and jointly decide on measurements of success for their project. Measurement varies across all projects, making comparing projects

preferred Model 4 the marginal effect of COLLAB-INDEX is 0.26, indicating that when evaluated at the variable means, a one percent increase in COLLAB-INDEX results in a 26 percent increase in the probability of a proposal being funded.

In addition to the variable COLLAB-INDEX, the estimated coefficient for the variable PANEL-FOREST-HEALTH is also positive and significant in all specifications shown in Table 3, supporting hypothesis H3. The interpretation is that the probability of a proposal being funded increases when a project is deemed to improve forest health. As shown in Table 4, the marginal effect of PANEL-FOREST-HEALTH is 0.16, indicating that the probability a proposal will be funded increases by 16 percent for a discrete change of the variable PANEL-FOREST-HEALTH from 0 to 1. The marginal effects reported in Table 4 for the remaining variables can be interpreted in the same manner. The variables COLLAB-INDEX and PANEL-FOREST-HEALTH can be interpreted as having a relatively large and significant effect on the probability of a project receiving funding.

The evidence indicates that a number of the posited explanatory variables are not significant determinants of proposal funding decisions. There is little evidence to suggest that the CFRP funds projects on the basis of reductions in the risk of wildfire, at least for the available measures used here. The estimated coefficients for the variable FIRE-INDEX, and related measures, log-ACRES and PERCENT-WUI, are generally not significantly different from zero.[108] The Panel assessment of the provision of jobs also does not appear to affect funding decisions, as evidenced by the estimated coefficient for the variable PANEL-JOBS being insignificant in all specifications. Other goals of the program, restoring watersheds or historic fire regimes, also have no statistically significant effect on funding decisions, as evidenced by regression coefficients that are not significantly different from zero.

The evidence lends some support to the assertion that the incidence of poverty in the county where a project takes place is a determinant of funding. The variable POVERTY is statistically significant in each model specification shown in Table 3, supporting hypothesis H5.

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difficult. However, the multi-party assessment requires cooperation amongst stakeholders and therefore is consistent with the program emphasis on enhancing collaboration. The Southwestern Region (Region 3) of the USDA Forest Service offers discussion of the CFRP annual workshop provided at the CFRP website. U.S. Forest Serv., Sw. Region, Collaborative Forest Restoration Program, http://www.fs.fed.us/r3/spf/cfrp/ (last visited Feb. 13, 2008).

108. The estimated coefficient on FIRE-INDEX is statistically significant (positive) at the 0.10 level (t-critical value 1.282 for a one-tailed test) in one (Model 3) of the six specifications where the variable is included in Table 3.

However, defying criticisms of the program, the estimated coefficient for POVERTY is positive; *poorer* counties are looked upon more favorably in funding decisions. The evidence refutes the argument that the CFRP is awarding funding disproportionately to wealthy counties; rather it shows the opposite case. However, as shown in Table 4, the marginal effect of POVERTY is 0.02, indicating a one percent increase in the poverty rate increases the probability of receiving funding by two percent. Therefore, while statistically significant, the effect of this poverty measure on funding decisions is small. When the evidence on POVERTY is combined with the absence of bias toward any applicant or land ownership type, it can be argued that the funding pattern is consistent with the theoretical argument that outcomes stemming from consensus-based processes, as used in the CFRP, will tend to display a focus on equity considerations.[109]

The observed effect of the variables SD-REDUCTION, NEW-USE/VALUE, and YOUTH on funding decisions is counter to expectations in each case. The estimated coefficients for the variables SD-REDUCTION, NEW-USE/VALUE, and YOUTH are negative and generally statistically significant (using two-tailed tests), the implication being that the likelihood of funding is decreased when a project addresses these stated goals of the program. Thus, the results do not support hypotheses H6a, H6b, and H6c. As shown in Table 4, the marginal effects for SD-REDUCTION, NEW-USE/VALUE, and YOUTH are -0.19, -0.19, and -0.15, respectively.

The results from the SD-REDUCTION and NEW-USE/VALUE variables are perhaps initially surprising. However, we speculate as to a plausible explanation with respect to the variable NEW-USE/VALUE. Given the huge supply of small diameter materials,[110] and what appears to be limited demand at present, there is considerable evidence that business models dependent on the use of small-diameter material are likely to have considerable difficulty becoming self-sufficient, sustainable enterprises in New Mexico forests.[111] While ostensibly it is part of

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109. *See* Matthew A. Wilson & Richard B. Howarth, *Discourse-Based Valuation of Ecosystem Services: Establishing Fair Outcomes Through Group Deliberation*, 41 ECOLOGICAL ECON. 431 (2002).

110. For example, over the last century southwestern ponderosa pine forests have been changed tremendously by fire suppression and exclusion policies. This has led to a "huge buildup of surface and ladder fuels." Sisk et al., *supra* note 33, at 319.

111. R. JAMES BARBOUR ET AL., ASSESSING THE NEED, COSTS, AND POTENTIAL BENEFITS OF PRESCRIBED FIRE AND MECHANICAL TREATMENTS TO REDUCE FIRE HAZARD IN MONTANA AND NEW MEXICO (2001), *available at* http://www.fs.fed.us/pnw/woodquality/JLMFinal _report_ dft5.PDF; Friederici, *supra* note 50.

the objectives of the CFRP to develop such opportunities, one conjecture is that the Panel deems grant proposals that are based upon small diameter utilization as being unlikely to be sustainable, and, as a result, it is less likely to fund these types of projects.

The program procedural variables have the expected influence on funding. The estimated coefficients for the variables PRIVATE and MATCH are negative and significantly different from zero (Table 3), with marginal effects of -0.32 and -0.28, respectively (Table 4). The estimated coefficient for the variable FORM is negative, but not statistically distinct from zero. Additionally, as indicated by the insignificant estimated coefficient for ORDER, the order in which a proposal is discussed does not affect the probability of funding. The composite evidence from our procedural variables is consistent with the argument that the CFRP is a well-run program and that there is no inherent preference in Panel decisions with respect to how proposals are ordered for consideration.

As indicated by the negative and significant estimated coefficient for NO-LAND-TREATED, there is evidence that the probability of receiving funding is decreased when a project does not engage in public land treatments of any kind. In fact, if a proposal does not propose to treat land, the probability of receiving funding decreases by an estimated 34 percent. Thus, although not part of our initial hypotheses of interest, the evidence indicates that the Panel has a relatively large and significant preference for projects that include an actual on-the-ground forest restoration treatment.

Perhaps one of the most interesting results of this analysis is how the status of a project taking place across multiple land jurisdictions significantly and negatively influences the funding decision. Again, a particularly unique feature of CFRP grants is that funds can be used on projects taking place across the mosaic of public lands. However, as shown in Table 3, when a project takes place across lands of multiple ownerships as indicated by the variable MULTIPLE-LAND, this diminishes the likelihood that a project will be funded (the evidence does not support hypothesis H8). As shown in Table 4, the marginal effect on the probability of funding is relatively large at -0.26.

One plausible explanation for why the program is not funding projects that take place across multiple land jurisdictions is that while all CFRP projects require a certain amount of coordination among public land management agencies, tribes, regulatory agencies, and other stakeholders, projects taking place across lands of multiple ownerships require an even greater amount of coordination in order to be successfully implemented. For example, endangered species, state and federal

environmental assessments and National Environmental Policy Act (NEPA) requirements may be handled differently across different agencies and jurisdictions. Thus, it is speculated that regulatory coordination problems may be a part of the explanation for why the Panel demonstrates a revealed preference *against* funding projects taking place across multiple land jurisdictions. Irrespective of the reason, to date at least, it can be argued that the CFRP has been unable to fully overcome the forest land ownership mosaic problem and thus accommodate the broadest landscape perspectives on restoration of forest health.[112] It might also be interpreted that the insignificant estimated coefficients on WATERSHEDS and HISTORIC-FIRE-REGIMES also support this conclusion.

For completeness, we also investigated the effect of dropping the assumption that all six years (2001–2006) can be viewed as part of the same initial period. While there are not enough years accumulated to implement econometric time series models, we can determine if there are year-specific effects by including a set of annual dummy variables. Using 2006 as the reference year, five dummy variables (2001YR, 2002YR, 2003YR, 2004YR, and 2005YR) are added to the same base specification as the preferred Model 4 from Table 3. These results are shown in Table 5. In addition to the estimated coefficients for the extended logit probability model, marginal effects for all statistically significant variables are presented in a separate column.

As shown from the results in Table 5, this extended model with year-specific dummy variables modestly, but statistically significantly, fits the data better.[113] Results also indicate that the estimated coefficients on two of these year-specific dummy variables (2001YR and 2002YR) are statistically significant (0.10 and 0.05 levels, respectively) and positive. Thus, relative to the reference year (2006), econometric results suggest projects were more likely to receive funding in the first two years of the program, and the marginal effects for 2001YR and 2002YR are relatively

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112. For an example of recent arguments that forest restoration, including re-introduction of natural fire regimes in southwestern Ponderosa Pine forests, is best addressed from a broad landscape-based perspective, see Sisk et al., *supra* note 33.

113. A likelihood ratio test of the model in Table 5, which includes year-specific dummy variables, shows a statistically significant (0.01 level) improvement in fit compared to Model 4 in Table 3. For brevity, we focus on the single model in Table 5. However, for completeness, we estimated a full matching set for all models in Table 3. In each comparable case to Models 1–7, they differed only in including the year-specific dummy variables. Across this set of new models, a series of likelihood ratio tests were conducted. The results from these tests indicate no statistically significant improvement in fit beyond the equivalent to Model 4 with the year-specific variables.

large (0.44 and 0.39, respectively). Not coincidently, 2001 and 2002 represent the two years in which the highest proportion of proposals submitted to the program were funded.[114] The dummy variables 2001YR and 2002YR appear to be picking up this effect. In terms of the other explanatory variables, qualitative conclusions on signs and significance (and relative magnitude of marginal effects) are shown to be generally unchanged, with several exceptions. First, the variable ORDER becomes significant at the 0.10 level, while its sign remains positive. However, in terms of impact on the probability of receiving funding, its marginal effect is very small (0.01), and thus does not appear to be an important program consideration. Second, the estimated coefficient for the variable YOUTH remains negative but is no longer significant. Thus, the conclusion that the evidence does not support hypothesis H6a remains unchanged, given the sign. Third, the indicator variable of small-diameter materials reduction (SD-REDUCTION) was a negative and significant determinant in Model 4 (Table 3). While still negative, the estimated coefficient on SD-REDUCTION is no longer significant in the extended model in Table 5. The conclusion that the evidence does not support hypothesis (H6b) remains unchanged, given the sign. Thus, while there are some changes from dropping the single-period assumption and adding year-specific dummy variables, the evidence still supports all previous conclusions on our specific hypotheses of interest.[115]

To summarize, with respect to our hypotheses of interest, the importance assigned by the CFRP in addressing the goals of the Act has some mixed results. First, consistent with the very title of the program, the evidence supports hypotheses H1 and H3. That is, fostering collaboration and restoring forest health are significant positive determinants of funding decisions. On the other hand, reducing the risk of wildfire, providing jobs, removing small-diameter trees, creating new

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114. As noted earlier, 40 percent of proposals submitted to the CFRP were funded from 2001 to 2006, ranging in different years from a low of 33 percent in 2005 to a high of 56 percent in 2002. In 2001 and 2002, the only two years above the overall average for the period, 41 percent (19 of 46) and 56 percent (15 of 27) of the proposals submitted were funded.

115. While not presented here, we further extended the specification presented in Table 5 to add the various dummy variables on applicant type and land ownership classification. Similar to our previous hypotheses H7a–H7e, we test against the null of no effect the alternative hypotheses that land applicant and land jurisdiction are determinants of project funding, however now including year-specific dummy variables. The evidence again supports the null in all cases and indicates that these classifications were not significant determinants of receiving funding.

uses or values, restoring watersheds, reestablishing historic fire regimes, and providing youth opportunities have little or in some cases a negative influence on funding decisions. Accordingly, we find no evidence to support hypotheses H2, H4, or H6. As to equity effects, the evidence indicates that the CFRP has a mild preference for projects taking place in relatively poorer New Mexico counties. This result supports hypothesis H5. Among projects that treat public land on a single land jurisdiction, the CFRP has shown no sign of favoritism on the basis of applicant or land ownership classification. The evidence supports the null hypothesis of no effect in all cases for H7a–7e. Finally, because whether a project takes place across multiple land jurisdictions is shown to be a negative determinant of funding, the evidence does not support hypothesis H8.

VIII. DISCUSSION AND CONCLUSIONS

With critical fuel buildup in many forests, the concomitant growth of the WUI, the presence of areas of chronic rural poverty, and divergent stakeholder perspectives, it seems clear that New Mexico will continue to confront both significant wildfire risk and conflict over forest management and restoration. Against this backdrop, in creating the CFRP the U.S. Congress outlined a number of objectives: (1) wildfire risk reduction, (2) forest preservation, (3) enhancement of collaborative capacity in communities, and (4) provision of local employment. In implementation though, the program has been given considerable autonomy in addressing these goals. Public Law 106-393 does not provide an explicit decision-making framework for choosing among these objectives. This article uses logit probability modeling to analyze the funding decisions made under the CFRP and econometrically infer the revealed preferences of the program.

The pattern of statistical evidence supports the argument that the development of social capital and networks is a primary goal of the CFRP. Most directly, inclusion of a strong collaborative component increases the likelihood of a proposal being funded. An emphasis has also been placed on forest health in funding decisions, and a preference is revealed for projects that include some on-the-ground treatment. From a social equity perspective, the CFRP looks favorably on proposals taking place in counties with higher percentages of residents living in poverty, and there is no evidence of program bias in terms of land jurisdiction or applicant classification. There is considerable support for the argument that the CFRP is a well-run program. From a procedural perspective, funding outcomes are consistent with the stated eligibility requirements.

Also interesting is what attributes are found to have no statistically significant impact on funding decisions. While there is some mixed evidence, reducing the risk of wildfire is generally not found to be a significant determinant. This result is found when proposals are explicitly deemed to reduce wildfire risk, as well as when proposals reduce wildfire risk by inference, in reducing the number of small diameter trees (which is a negative or insignificant determinant of funding). Restoring historical fire regimes and watersheds, stated objectives of the program, are also statistically insignificant determinants. Thus, there is mixed evidence regarding whether the Panel, and, thus, the CFRP, is pursuing *all* stated primary and secondary program objectives. Some tradeoffs may be inevitable given the composition and quality of projects the Panel receives. Nevertheless, while the strong positive effects on funding decisions of improving collaboration and forest health show adherence to the statute, this is tempered by the negative impact on funding for projects that create new uses or values for small diameter trees and the negative or insignificant impact for projects that offer youth opportunities.

There is evidence that the CFRP has shown an emphasis on developing social capital in a targeted way (building collaborative networks in forest communities). However, the limit to this argument is the finding that whether a proposed project is to take place across multiple land jurisdictions is a *negative* determinant of funding. Because of the collaboration inherent in these types of projects, CFRP grants that take place across the land ownership mosaic would appear be a very important avenue for developing the necessary social networks for community-based forest restoration. However, inferring from the modeling results, the conjecture is that coordination problems are associated with engaging in these types of multi-jurisdictional or landscape-scale projects. We argue that this may represent a significant hurdle to fully developing the bridging social capital needed in New Mexico forest communities.[116] Thus, while applauding program implementation in general, we argue that this represents a missed opportunity, and there may be a need to somehow facilitate such projects. More generally, this analysis provides a lesson for future applications in the social capital paradigm of natural resource management. Bringing together a diverse set of stakeholders and focusing on developing social capital in a targeted way is not enough. To be most

116. For a similar argument concerning New Mexico community needs for forest restoration, see Steelman et al., *supra* note 24.

effective, social capital development may require coordination not just among stakeholders but also among government agencies.

While our findings represent a first step in the analysis of the CFRP, the program warrants further study in a number of areas. First, there must be an ongoing effort to assess and practically measure the full bundle of outputs (ecological, economic, and social) that the program provides. Measuring these outputs is relatively straightforward in some cases, such as acres treated from a forest health perspective or income and employment from a regional economic modeling perspective. For the CFRP overall, programmatic assessments of these effects are warranted. However, as indicated by the results here, the development of increased collaboration among stakeholders is a primary program goal. Assessing or valuing the increased social capital associated with the CFRP is a difficult task; social scientists are only beginning to construct indices for measuring and tracking social capital. In addition, the effect of the CFRP with respect to influencing private provision of public goods (e.g., reducing interdependent wildfire risks in a community) in New Mexico forest communities is unclear. As initial reviews of final project reports and multi-party monitoring projects begin, important questions include whether specific projects conducted under the CFRP have induced positive spillover effects on private land restoration efforts and entrepreneurial behaviors in the targeted communities. The difficult public policy question is whether public funds are acting as a positive stimulus in a community (and the magnitude of such effects), or whether they are simply crowding out private actions or expenditures that might otherwise occur, and further, whether such funding is subject to diminishing returns. As the initial rounds of multi-year projects begin to be completed and project participants begin to return for possible follow-up rounds of funding, addressing such questions will become increasingly important.

Table 1. CFRP Grant Distribution by County, 2001–2006

County	CFRP Projects	Total CFRP Funding	Population Density	Percent Poverty	Percent Forestland
Sandoval	13	$3,490,660	24.2	9.0	36
Taos	12	$3,602,197	13.6	17.4	53
Grant	8	$2,685,314	7.8	15.1	36
Multiple Counties	8	$2,454,657	--	--	--
Catron	7	$1,213,132	.5	17.4	55
Lincoln	7	$1,854,291	4	10.8	20
Rio Arriba	6	$1,918,747	7	16.6	60
Santa Fe	6	$2,12,1,132	67.7	9.4	42
Sierra	4	$1,314,360	3.2	13.8	16
San Miguel	3	$828,048	6.4	19.9	31
Mora	3	$935,188	2.7	20.9	32
Cibola	2	$718,122	5.6	21.5	44
Torrance	2	$719,639	5.1	15.2	22
Valencia	2	$716,400	62	13.5	5
Colfax	2	$461,253	3.8	12.0	33
Otero	1	$118,800	9.4	15.6	20
Bernalillo	1	$360,000	477.4	10.2	17
McKinley	1	$355,844	13.7	31.9	32
NA	1	$315,398	--	--	--

Note: NA means that a project is not targeted to a specific set of locations or counties.

Table 2. Variable Description and Summary Statistics for Variables used in Modeling

Variable	Description	Mean (St. Dev.)
FUNDED	1 if a proposal receives CFRP funds, 0 otherwise	0.406 (.492)
NUMBER-LETTERS	Number of letters of support included in a proposal	9.300 (5.316)
NUMBER-PARTNERS	Number of partners listed in a proposal	8.372 (5.629)
PANEL-COLLABORATION	1 if increasing collaborative capacity is cited by the Panel as a strength of the proposal, 0 otherwise	0.744 (.437)
COLLAB-INDEX	Sum of PANEL-COLLABORATION, NUMBER-LETTERS/the maximum number of letters included by any proposal, and NUMBER-PARTNERS/ the maximum of partners listed in any proposal	1.241 (0.585)
PANEL-FOREST-HEALTH	1 if improving forest heath is cited by the Panel as a strength of the proposal, 0 otherwise	0.721 (0.449)
PANEL-FIRE	1 if reducing the risk of wildfire is cited by the Panel as a strength of the proposal, 0 otherwise	0.607 (0.489)
AT-RISK	1 if a project taking place in a community subject to high risk of wildfire is cited by the Panel as a strength of the proposal, 0 otherwise	0.461 (0.500)
FIRE-INDEX	Sum of FIRE and AT-RISK	1.07 (0.914)
PANEL-JOBS	1 if the creation of jobs is cited by the Panel as a strength of the proposal, 0 otherwise	0.356 (0.480)
SD-REDUCTION	1 if removing small diameter material is cited by the Panel as a strength of the proposal, 0 otherwise	0.283 (0.452)
NEW-USE/VALUE	1 if the creation of new uses or values for small-diameter material is cited by the Panel as a strength of the proposal, 0 otherwise	0.457 (0.499)
WATERSHEDS	1 if restoring watersheds is cited by the Panel as a strength of the proposal, 0 otherwise	0.096 (0.295)
HISTORIC-FIRE-REGIMES	1 if restoring historic fire regimes is cited by the Panel as a strength of the proposal, 0 otherwise	0.233 (0.424)
YOUTH	1 if the provision of youth opportunities is cited by the Panel as a strength of the proposal, 0 otherwise	0.502 (0.501)
PRIVATE	1 if the Panel cites the proposed treatment of private lands as a weakness of the proposal, 0 otherwise	0.100 (0.301)
FORM	1 if the Panel cites an incomplete or incorrect application as a weakness of the proposal, 0 otherwise	0.370 (0.484)

MATCH	1 if the Panel cites concern for the validity of matching funds as a weakness of the proposal, 0 otherwise	0.288 (0.454)
ORDER	The order in which a proposal is discussed by the Panel	19.529 (11.466)
POVERTY	Percent of residents in the county where a proposal takes place categorized as below the poverty threshold	15.139 (4.849)
PERCENT-WUI	Percent of land in the county where a proposal takes place categorized as wildland-urban-interface	5.776 (5.212)
MULTIPLE-LAND	1 if proposal takes place across multiple land jurisdictions, 0 otherwise	0.183 (0.388)
NO-LAND-TREATED	1 if proposal does not identify a public land treatment, 0 otherwise	0.116 (0.321)
BUSINESS-FS	1 if the proposal is submitted by a business and proposes to treat Forest Service land, 0 otherwise	0.210 (0.408)
NGO-FS	1 if the proposal is submitted by a Non- Government Organization and proposes to treat Forest Service land, 0 otherwise	0.138 (0.346)
TRIBE-TRIBAL	1 if the proposal is submitted by a Tribe and proposes to treat Tribal land, 0 otherwise	0.080 (0.272)
STATEGOVT-STATE	1 if applicant is State Government and proposes to treat State land, 0 otherwise	0.031 (0.174)
LOCALGOVT-MUNICIPAL	1 if the applicant is a local government and proposes to treat municipal land, 0 otherwise	0.031 (0.174)
ACRES	Proposed number of acres treated by the project	280.054 (679.45)
REQUESTED-FUNDING	Amount of funding requested (dollars) by the project	304683.7 (96689.9)

Table 3. Logit Probability Estimates of a Project being Funded (Dependent Variable=FUNDED)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
COLLAB-	0.782	0.996	0.960	1.146	1.168	1.144	1.192
INDEX	(2.85)***	(3.05)***	(2.89)***	(3.15)***	(3.13)***	(3.03)***	(3.08)***
PANEL-	0.616	0.758	0.826	0.751	0.802	0.791	0.821
FOREST-	(1.81)*	(1.90)*	(2.05)**	(1.74)*	(1.79)*	(1.76)*	(1.82)*
HEALTH							
FIRE-INDEX	0.149	0.218	0.245	0.132	0.102	0.097	0.093
	(0.92)	(1.20)	(1.33)	(0.67)	(0.49)	(0.63)	(0.45)
PANEL-JOBS	0.335	0.245	0.231	0.303	0.231	0.250	0.234
	(1.15)	(0.72)	(0.67)	(0.82)	(0.59)	(0.63)	(0.59)
SD-	---	-0.833	-0.889	-0.911	-0.977	-0.986	-1.014
REDUCTION		(-1.96)**	(-2.06)**	(-1.98)**	(-2.06)**	(-2.07)**	(-2.10)**
NEW-	---	-0.71	-0.766	-0.842	-0.772	-0.774	-0.804
USE/VALUE		(-1.96)**	(-2.16)**	(-2.24)**	(-1.99)**	(-2.00)**	(-2.05)**
WATERSHEDS	---	-0.268	-0.312	-0.563	-0.347	-0.370	-0.362
		(-0.48)	(-0.54)	(-0.93)	(-0.52)	(-0.55)	(-0.54)
HISTORIC-	---	0.188	0.266	0.450	0.430	0.420	0.439
FIRE-REGIMES		(0.46)	(0.64)	(1.01)	(0.96)	(0.94)	(0.97)
YOUTH	---	-0.434	-0.563	-0.677	-0.640	-0.650	-0.647
		(-1.30)	(-1.63)	(-1.85)*	(-1.69)*	(-1.71)*	(-1.70)*
PRIVATE	---	-2.296	-2.285	-2.166	-2.114	-2.075	-2.117
		(-2.74)***	(-2.73)***	(-2.47)**	(-2.34)**	(-2.29)**	(-2.33)**
FORM	---	-0.567	-0.556	-0.561	-0.578	-0.565	-0.571
		(-1.63)	(-.1.58)	(-1.51)	(-1.53)	(-1.48)	(-1.49)
MATCH	---	-1.272	-1.311	-1.446	-1.562	-1.585	-1.610
		(-3.26)***	(-3.31)***	(-3.49)***	(-3.61)***	(-3.62)***	(-3.65)***
ORDER	---	0.016	0.016	0.026	0.026	0.026	0.026
		(1.11)	(1.09)	(1.55)	(1.53)	(1.55)	(1.49)
POVERTY	---	---	0.056	0.081	0.079	0.079	0.078
			(1.67)*	(2.24)**	(2.14)**	(2.13)**	(2.11)**
PERCENT-WUI	---	---	0.021	0.013	0.016	0.026	0.018
			(0.69)	(0.40)	(0.47)	(0.45)	(0.52)
MULTIPLE-	---	---	---	-1.371	-1.437	-1.430	-1.452
LAND				(-2.98)***	(-2.59)***	(-2.57)**	(-2.59)**
NO-LAND-	---	---	---	-2.329	-2.400	-2.323	-2.365
TREATED				(-3.21)***	(-3.05)***	(-2.84)***	(-2.87)***
BUSINESS-FS	---	---	---	---	0.215	0.254	0.236
					(0.41)	(0.47)	(0.44)
NGO-FS	---	---	---	---	-0.699	-0.679	-0.698
					(-1.19)	(-1.15)	(-1.18)

TRIBE-TRIBAL	---	---	---	---	0.477	0.481	0.522
					(0.70)	(0.70)	(0.76)
STATEGOVT-STATE	---	---	---	---	-0.090	-0.118	-0.290
					(-0.08)	(-0.11)	(-0.27)
MUNICIPAL-LOCAL	---	---	---	---	-0.965	-0.905	-0.954
					(-0.86)	(-0.79)	(-0.84)
log-ACRES	---	---	---	---	---	0.031	0.035
						(0.34)	(0.38)
Log-REQUESTED-FUNDING	---	---	---	---	---	---	-0.536
							(-0.64)
INTERCEPT	-2.131	-1.445	-2.356	-2.387	-2.347	-2.340	0.555
	(-4.49)***	(-2.21)**	(-2.77)***	(-2.62)***	(-2.44)**	(-2.44)**	(0.12)
N	219	219	219	219	219	219	219
LR χ^2	18.27***	53.59***	56.70***	77.03***	81.31***	81.43***	82.00***
Maddalla R^2	0.08	0.22	0.23	0.30	0.31	0.31	0.31
Log Likelihood	-138.803	-121.145	-119.590	-109.423	-107.282	-107.223	-107.018

Notes: t-statistics in parentheses, ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively (two-tailed test, t-statistic critical values are 1.65, 1.96, and 2.58, respectively. t-statistic critical values for significance at the 0.01, 0.05, and 0.10 levels, respectively, when evaluated with a one-tailed test are 1.28, 1.65, and 2.33, respectively).

Table 4. Marginal Effects for Statistically Significant Variables (Model 4)

Explanatory Variable	**Marginal Effect on the Probability of Funding**
NO-LAND-TREATED	-34%
PRIVATE	-32%
MATCH	-28%
COLLAB-INDEX	26%
MULTIPLE-LAND	-26%
SD-REDUCTION	-19%
NEW-USE/VALUE	-19%
PANEL-FOREST-HEALTH	16%
YOUTH	-15%
POVERTY	2%

Table 5. Logit Probability Model Estimates of a Project Being Funded, with Year Effects (Dependent Variable=FUNDED)

Variable	Coefficient	t-statistic	Marginal Effect (for significant variables)
COLLAB-INDEX	1.247	(3.19)***	28%
PANEL-FOREST-HEALTH	0.942	(2.02)**	19%
FIRE-INDEX	0.245	(1.12)	---
PANEL-JOBS	0.427	(1.03)	---
SD-REDUCTION	-0.305	(-0.55)	---
NEW-USE/VALUE	-0.997	(-2.43)**	---
WATERSHEDS	-0.343	(-0.53)	---
HISTORIC-FIRE-REGIMES	0.531	(1.14)	---
YOUTH	-0.413	(-1.06)	---
PRIVATE	-2.822	(-2.94)***	-36%
FORM	-0.072	(-0.16)	---
MATCH	-1.911	(-4.03)***	-35%
ORDER	0.032	(1.84)*	-1%
POVERTY	0.067	(1.73)*	1%
PERCENT-WUI	0.028	(0.80)	---
MULTIPLE-LAND	-1.727	(-3.43)***	-30%
NO-LAND-TREATED	-1.884	(-2.52)**	-30%
2001YR	1.675	(1.97)**	39%
2002YR	1.909	(2.21)**	44%
2003YR	0.190	(0.23)	--
2004YR	0.211	(0.29)	--
2005YR	-0.879	(-1.39)	--
INTERCEPT	-3.598	(-3.09)***	--
N	219	--	--
LR χ^2	92.28***	--	--
Maddalla R^2	0.34	--	--
Log Likelihood	-101.813	--	--

Notes: t-statistics in parentheses. ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively (two-tailed test, t-statistic critical values are 1.65, 1.96, and 2.58, respectively. t-statistic critical values for significance at the 0.01, 0.05 and 0.10 levels when evaluated with a one-tailed test are 1.28, 1.65, and 2.33, respectively).

APPENDIX

TOBIT ESTIMATES OF PROJECT FUNDING (DEPENDENT VARIABLE=FUNDING)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
COLLAB-INDEX	224418.30	233402.90	220228.80	239207.70	235204.70	232879.40
	(3.22)***	(3.39)***	(3.21)***	(3.56)***	(3.58)***	(3.50)***
PANEL-FOREST-	176785.40	177120.00	187416.70	154064.60	156625.50	155748.70
HEALTH	(2.10)	(2.14)	(2.24)	(1.92)	(1.96)	(1.95)
FIRE-INDEX	65533.86	65858.70	68732.99	45930.32	42226.40	41850.96
	(1.66)*	(1.76)*	(1.85)*	(1.30)	(1.20)	(1.19)
PANEL-JOBS	82748.30	69326.65	66516.76	70946.17	47154.65	48980.03
	(1.14)	(0.99)	(0.96)	(1.07)	(0.69)	(0.71)
SD-REDUCTION	---	-137994.00	-146824.80	-140685.90	-157085.00	-157387.10
		(-1.61)	(-1.70)*	(-1.71)*	(-1.90)*	(-1.90)*
NEW-	---	-193628.00	-202896.10	-203140.40	-185520.30	-185194.10
USE/VALUE		(-2.71)***	(-2.83)***	(-2.99)***	(-2.74)***	(-2.74)***
WATERSHEDS	---	-58768.01	-68403.06	-106656.70	-67410.12	-69454.21
		(-0.53)	(-0.60)	(-0.99)	(-0.60)	(-0.61)
HISTORIC-FIRE-	---	75012.91	91833.83	124860.20	119122.30	117765.60
REGIMES		(0.91)	(1.11)	(1.54)	(1.53)	(1.51)
YOUTH	---	-105942.70	-129371.30	-139212.40	-118861.50	-119766.50
		(-1.56)	-(1.85)*	(-2.10)**	(-1.81)*	(-1.82)*
PRIVATE	---	-474318.40	-473294.80	-407754.90	-371730.80	-367420.50
		(-2.79)***	(-2.77)***	(-2.45)**	(-2.29)**	(-2.25)**
FORM	---	-98196.69	-94788.13	-84519.54	-84635.86	-83557.92
		(-1.35)	(-1.30)	(-1.23)	(-1.25)	(-1.23)
MATCH	---	-280308.50	-281648.3	-272376.60	-285432.60	-286905.30
		(-3.34)***	(-3.38)***	(-3.45)***	(-3.62)***	(-3.62)***
ORDER	---	3317.25	3323.80	4853.12	4322.62	4342.50
		(1.12)	(1.13)	(1.69)*	(1.53)	(1.53)
POVERTY	---	---	10252.95	13383.87	12721.93	12715.79
			(1.48)	(2.01)**	(1.93)*	(1.93)*
PERCENT-WUI	---	---	4941.25	2941.03	3353.79	3277.16
			(0.81)	(0.51)	(0.57)	(0.56)
MULTIPLE-	---	---	---	-244692.93	-208629.00	-207534.30
LAND				(-2.84)***	(-2.09)**	(-2.08)**
NO-LAND-	---	---	---	-504501.10	-463193.20	-454487.30
TREATED				(-3.55)***	(-3.15)***	(-2.96)***
BUSINESS-FS	---	---	---	---	86136.23	89842.37
					(0.94)	(0.96)

NGO-FS	---	---	---	---	-68588.92	-67165.49
					(-0.68)	(-0.66)
TRIBE-TRIBAL	---	---	---	---	178104.50	178782.80
					(1.55)	(1.55)
STATEGOVT-STATE	---	---	---	---	-4074.08	-6847.35
					(-0.04)	(-0.04)
MUNICIPAL-LOCAL	---	---	---	---	-127498.20	-121790.90
					(-0.63)	(-0.60)
Log-ACRES	---	---	---	---	---	3023.86
						(0.19)
INTERCEPT	-601781.60	-35388.00	-516380.40	-475436.40	-481541.30	-481346.30
	(4.48)***	(-2.49)**	(-2.87)***	(-2.75)***	(-2.77)***	(-2.77)***
N	219	219	219	219	219	219
LR χ^2	26.08***	62.19***	64.88***	87.42***	93.16***	93.19***

Notes: t-statistics in parentheses, ***, **, and * indicate significance at the 0.01, 0.05, and 0.10 levels, respectively (two-tailed test, t-statistic critical values are 1.65, 1.96, and 2.58, respectively. t-statistic critical values for significance at the 0.01, 0.05, and 0.10 levels, respectively, when evaluated with a one-tailed test are 1.28, 1.65, and 2.33, respectively).