LINKING PAYMENTS FOR WATERSHED SERVICES AND WILDFIRE RISK MITIGATION: INSTITUTIONAL DESIGN AND GOVERNANCE OF THE FLAGSTAFF WATERSHED PROTECTION PROJECT (FWPP)

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ABSTRACT

Poor forest health conditions resulting from misguided land management policy have resulted in large-scale wildfires that threaten ecosystem and community wellness. Agencies are tasked with financing the exponential annual costs associated with wildfire suppression while still funding preventive forest treatment actions such as fuels reduction and restoration. In response to this problem, a growing number of communities have begun taking action locally by enacting various policy instruments aimed at securing funding or resources for forest treatment action.

Payments for Watershed Services (PWS) projects are a type of social-environmental system that seek alternative (public and/or private) funding for watershed restoration projects in order to increase or secure the provision of water resources. These systems are generally defined as a voluntary transaction where a buyer purchases an ecosystem service or action from a seller or provider, usually involving an intermediary. In most cases in the US, the buyer of these services is the public; the seller/provider is the federal government, and the intermediary is a local municipality or service utility.

The forested watersheds surrounding the City of Flagstaff, Arizona, are at very high risk of experiencing high-severity, high-intensity wildfire in the next few decades. The community has already experienced devastating wildfire impacts from the 2010 Schultz Fire, including substantial flooding in residential areas and loss of life. In response, 74% of Flagstaff residents approved a $10 million bond measure in the 2012

general election that will finance forest treatment activities in two key watersheds. A formal partnership between the USFS and the City of Flagstaff was created in order to govern the planning and implementation processes of this project, now known as the Flagstaff Watershed Protection Project, or FWPP.

As these new social-ecological systems emerge, it is important for researchers to study and document the effects of project institutional design, as well as employ evaluative criteria by which to analyze institutional performance. This research explores the gap between theory and practice, by posing two main sets of questions related to: 1) FWPP institutional design and its applications to the national forest management community, and 2) stakeholder perceptions of the following institutional performance outcomes- efficacy/effectiveness, efficiency, and accountability.

Using a case study approach that combined document analysis with key informant interviews, I determined key institutional design elements of the FWPP and how they affected project performance. The FWPP is unique in the realm of forest management because of the PWS-style bond payment coupled with the City/USFS partnership. I found that the unique institutional design of the project was a major driver of the project's success in the planning stages to date, as the bond payment and partnership led to increased timeline efficiency, public and stakeholder involvement, and the leveraging of additional resources.

I used key informant interviews (n=9) and an online survey (n=52) to examine stakeholder perspectives of overall performance outcomes within the FWPP planning process, including efficacy/effectiveness, efficiency, and accountability. Findings suggest that stakeholders agree that the project has been or will be effective, efficient, and

accountable. Perspectives varied according to partnership affiliation and level of engagement during the planning process.

The final chapter of this thesis provides a summary of the research and offers policy considerations for land managers exploring these systems. Potential PWS systems should build on the momentum of pre-existing working relationships with other local management agencies as well as making focused efforts towards educating and involving the public. PWS systems should consider developing custom baselines for performance outcomes such as effectiveness, efficiency, and accountability. Financial mechanisms should be custom to the situation, and consider the impacts of upfront and/or incremental revenue on project implementation. Thinking critically about performance outcomes during institutional design can improve monitoring and foster trust relations, and further research into this dynamic will prove beneficial to other communities considering PWS as a vehicle for addressing wildfire and watershed concerns.

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PREFACE

This thesis was written in the format of a literature review and two journal manuscripts. The first chapter describes the context of forest health and wildfire management in the southwestern US, and illuminates the concept of Payments for Watersheds Services systems and their use in forest management. Chapter two is designed to provide an institutional background and history of the Flagstaff Watershed Protection Project (FWPP). This manuscript (will be) prepared for and submitted to the *Journal of Forestry.* Chapter three gauges stakeholder perspectives of planning process outcomes, evaluating effectiveness, efficiency, and accountability. This manuscript (will be) prepared for and submitted to *Society and Natural Resources.*

CHAPTER ONE
LITERATURE REVIEW
SECTION 1: NORTHERN ARIZONA FORESTS AND FIRE

ROY MILLER

Location

Flagstaff, Arizona, is a community with a population of approximately 70,000 in North-Central Arizona, at the base of the San Francisco Peaks. It is located on the Colorado Plateau at an elevation of 7,000 feet, within the largest contiguous stand of Ponderosa pine (*Pinus ponderosa*) forest in the world (Cooper, 1960).

The San Francisco Peaks rise to an elevation of 12,400 ft., the highest point in Arizona. C. Hart Merriam originally explored the Peaks and surrounding areas northwest of Flagstaff on his expedition to Northern Arizona in the late 1800's, and was the first to document stratifications of vegetation and forest type, developing what later became known as the life zones concept- that forest type shifts in accordance with elevation and precipitation (Merriam, 1890; Phillips et al. 1989). In the case of the forests surrounding Flagstaff, juniper woodlands at lower elevations transition to open stands of ponderosa pine at approximately 7,000 ft. elevation. Above 8,500 ft., ponderosa pine transitions to mixed conifer.

The Dry Lake Hills watershed system is east of the Peaks, north of Flagstaff, and the forest vegetation is now characterized by unnaturally dense and dry stands of ponderosa pine and mixed conifer. The Lake Mary Watershed system is located south of Flagstaff, and is also crowded with dense thickets of ponderosa pine. Within this watershed is Mormon Mountain, which contains areas of wet and dry mixed conifer stands at higher elevations.

Forest and Fire Ecology

Prior to European settlement of the Southwest in the second half of the 19th Century, Ponderosa pine ecosystems were characterized by open, park-like stand structure and high species diversity in the understory, composed mainly of grasses and herbaceous flowering plants (Covington et al, 1997). Reference conditions for ponderosa pine forest structure were approximately 148 trees/ha in 1883, consisting of 65 pines, 80 oaks, and three other species. Stands were drastically more open than today, as today's stands are dominated by small, young trees, and average 1265 trees/ha (720 pines, 471 oaks, and 74 others)(Fulé et al 1997).

Mean fire interval for the Flagstaff area prior to fire suppression had a range of 3-21 years, a regime of high frequency of low-intensity surface fires that reduced density of both live and dead fuels (Heinlein et al 2005). Today, this accumulation of forest biomass contributes to the presence of infrequent, highly severe wildfire. Regular surface fire kept seed recruitment at a minimum, leading to the historic open stands present before logging, grazing, and fire exclusion (Covington and Moore, 1994; Swetnam and Baisan, 1996). The historic role of fire in ponderosa pine forests was to regulate ecosystem structure, function, and composition through high frequency, cool surface fire that removed fine fuels, coarse woody debris, small regenerating trees, and fire-intolerant species from the forest understory (Covington and Moore, 1994).

Fire regimes in mixed conifer are dependent on the tree species that dominate the forest structure. Historically, mixed-conifer was characterized by open ponderosa pine-dominated stands with scattered other species such as Douglas fir, limber pine, and White fir. Open forest structures and high understory species diversity was the norm, and the

fire return interval was similar to that of ponderosa pine ecosystems. However, due to fire exclusion in these areas, shade-tolerant conifer species (Douglas fir, limber pine, and White fir) have proliferated, changing the fire regime to resemble that of a spruce-fir forest (Heinlein et al, 2005). The current fire regime in mixed conifer ecosystems can be characterized by medium-interval, mixed-severity fire that creates a mosaic on the landscape, causing stand replacement in some areas and surface fire in others. While the dynamics of mixed-conifer fire regime are not fully understood, it is generally accepted that mixed conifer forest now incorporates fire regimes from both ponderosa and spruce/fir. The occurrence of wildfire in spruce/fir forests is infrequent (100-300 year interval), and usually results in high rates of mortality (Wadleigh and Jenkins, 1996). Fire in spruce-fire forests generally occurs after prolonged drought, causing highly combustible conditions that are well suited to stand replacing crown fire.

Climate change is impacting forest fire dynamics in an alarming way. Catastrophic, stand-replacing fires accompanied by erosion and flooding have become normative to forests that once burned frequently and at low intensities. Colder time periods historically promote cool-burning ground fires at frequent intervals, while warmer periods promote droughts and stand-replacing fires that result in debris flows and long-term erosion (Pierce et al. 2004). Droughts are becoming more severe and warm temperatures promote understory growth. Fire suppression has intensified this effect, causing exponential rises in forest stand densities which fuel stand-replacing, catastrophic mega-wildfires such as the Rodeo-Chediski and the Wallow Fire. As climate change is expected to continue this trend, fire may become the deciding factor for whether North American forests can be considered a carbon sink or source (Flannigan et al, 2000).

Hydrology of Forested Watersheds

"A forest, large or small, may render its service in many ways. It may reach its highest usefulness by standing as a safeguard as floods, winds, snow slides, moving sands, or especially against the dearth of water in the streams" (Pinchot, 1903). United States Forest Service lands provide approximately 51% of the water supply for the western United States (Brown, 2005). Healthy forested watersheds provide numerous ecosystem services essential to the proliferation of forest communities, including provisioning (food and water), regulating (climate and carbon storage), supporting (soil formation and nutrient cycling), and cultural (education and aesthetic) services (Deal, 2012). Crown fires in forested watersheds can pose significant threats to the provision of water resources, and restoration of forested watersheds is of critical importance in the southwestern U.S. and other semi-arid regions to maintain necessary ecosystem services (Agee and Skinner, 2005).

Hydrologic function of forested watersheds is being affected dramatically by climate change; forest health disturbances such as insect and pathogen outbreak, wildfire, and die-off are directly linked to water stress (Grant et al. 2013). Climate change is expected to exacerbate the trend of warm drought conditions and decreasing water supply in the Southwest, and disturbance events will increase in trend and significance (Williams et al., 2010; Allen et al. 2010). Hydrologic modeling utilizing IPCC climate change scenarios has shown that future water storage in the Colorado River Basin will be reduced by up to 40% (Christensen et al. 2004). Global population increases and water

use practices will also likely have an extremely significant impact on world water resources (Vörösmarty et al. 2000).

90% of streams in Arizona flow from forested watersheds (Sedell et al, 2000), and fuels treatment projects can help maximize the efficiency of resource delivery. Treatment effects on the water balance have demonstrated that removing trees can improve the potential for snowmelt runoff by creating conditions conducive to snowpack accumulation, reducing canopy cover and sublimation, and reducing overall tree density and evapotranspiration (Hibbert, 1965; Bosch and Hewlett 1982; Zou et. al., 2010). However, drought and other climatic conditions also have a significant effect on water balance and hydrologic function (Simonin et al. 2007). As a bottom line, the arid southwest is particularly prone to experiencing water shortages and is a position to experience worsening drought conditions over the next century.

Catastrophic Impacts of Wildfire on Communities

The last several decades have seen instances of unprecedented fire behavior and severity, as well as significant impacts on communities located within the Wildland/Urban Interface (WUI). The National Fire Plan (NFP) provides a definition, stating: "The WUI community exists where humans and their development meet or intermix with wildland fuels" (USDA and USDI, 2001). Alternatively, a common belief is that the W/UI is a geographic area where structures, primarily homes, are next to naturally occurring flammable fuels. Some people explain that W/UI is within a "dog's walk" of a structure. Others think that the W/UI starts at the point where a golf ball hit from the porch of a structure lands. Although perceptions about the W/UI are diverse,

they describe the W/UI as an area from 30 to 600 feet (9 to 91 m) around a structure or within sight of a structure (Summerfelt, 2003).

Communities in the western United States are particularly vulnerable to costs associated with damage incurred by catastrophic wildfire, as land development and ecosystem management practices have clashed. Drought stress and climate change accompanied by population growth and rural development has resulted in many western communities being located in overly crowded forest stands that are prone to severe crown fire.

Wildfire costs are on the rise. From 2000-2014, wildfire suppression costs totaled over $22 billion (NIFC 2014). In 2000, near Los Alamos, New Mexico, the Cerro Grande fire burned 42,873 acres; 18,000 people were evacuated, and 260 residences were destroyed. The Cerro Grande represents an economic shift in the traditional paradigm of wildfire economics, as it was one of first fires whose recovery costs exceeded the cost of suppression (WFLC, 2010). In Arizona in 2002, the Rodeo-Chediski fire burned an overwhelming 462,614 acres within the Fort Apache Indian Reservation, Apache-Sitgreaves and Tonto National Forests. Suppression costs of $46,500,000 accounted for 15% of the total costs, however, which total over $308 million. Over 490 structures were destroyed, and more than 30,000 residents of nearby communities were evacuated (WFLC 2010). In June 2011, the 538,049-acre Wallow Fire surpassed the Rodeo-Chediski as the largest wildfire in Arizona state history. Thirty-two residences, four commercial properties, and 36 outbuildings were destroyed.

In June 2010, the Schultz fire burned a total of 15,051 acres of Coconino National Forest bordering the City of Flagstaff. The burn was followed by the 4th wettest monsoon

season on record in Flagstaff, resulting in debris flows, severe erosion, and substantial flooding in residential areas. Immediate response alone cost $13.6 million for the fire and $12.3 million for the flood. Mitigation in 2011 and 2012 cost an additional $13.7 million, with $19 million more expected in the years to follow, resulting in a total cost estimate between $133 million and $147 million (Combrink et al, 2013). As a result of the extreme impacts that catastrophic wildfire can have on communities, it has become paramount that land and resource managers explore innovative solutions for funding forest treatment procedures that reduce the risk and impact of fire in western forests.

Reference Conditions, Forest Restoration and Fuels Treatment

The Society for Ecological Restoration defines ecological restoration as 'the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.' Reference conditions are the historic conditions of a landscape before disturbance, disruption, or degradation by anthropogenic forcing, and provide a model for ecological restoration (SER, 2004). Ecosystem restoration should result in a system that fosters public engagement, is progressive and forward thinking, is efficient, and is feasible.

Ecological restoration should result in a reduction of anthropogenic effects and harm to an ecosystem, directly or indirectly, so it is important to relate actions to goals. According to Covington and Moore (1994), "If we are serious about restoring ecosystem health and ecological integrity, then we must know what the land was like to begin with." The composition of historical ponderosa pine-dominated forests was generally more open than they are today. While some dense stands of trees may have been present, low-

intensity fires kept most forested areas open and controlled regeneration of new trees. As a result of a more open stand, more sunlight was able to reach the forest floor, increasing the presence of shade-intolerant shrubs, forbs, and grasses.

Typically, ecological restoration in ponderosa forests necessitates a combination of mechanical fuels reduction and prescribed burning. Mechanical and hand thinning operations reduce basal area and tree density, while prescribed fire reduces surface fuel loading and restores natural process to the ecosystem (Wu et al 2011). Utilized in congruence with one another, these treatments can help restore forest resilience to fire and other natural disturbances (Allen et al. 2002). Furthermore, it has been shown that "By reducing forest densities, soil water depletion may be reduced, the snowpack may be manipulated, and consequently, more winter precipitation may be made available for streamflow" (Baker 1982). Treatments should not be uniform; diversifying forest treatment options (prescribed fire, mechanical thinning) is recommended in order to achieve the most ecologically and politically appropriate prescription (Allen et al. 2002).

Since riparian ecosystems have been denigrated by land use activities such as logging and grazing, the health of these systems' processes such as overall stable stream banks, water quality, water table, biomass production, nutrient deposition, and perennial vegetation has declined. Processes that previously contributed to ecosystem functions such as adaptations to flood, whereby nutrient deposition and groundwater recharge occurs gradually over large wet meadows rather than flowing efficiently through deep channels and into a larger body of water, are often in a state of disrepair (Medina 1995). Water purification is an important function of riparian ecosystems as well, which equates to highly valuable natural capital when compared to a treatment facility.

The practice of restoration and fuel reduction actions has begun to gain traction in recent years (Stephens et al, 2012). The perceived and well-recognized necessity to restore Arizona's forests has culminated thus far in several innovative collaborative forest management actions; these include stakeholder alliances, restoration projects and unique policy initiatives. One such stakeholder alliance is the Greater Flagstaff Forest Partnership (GFFP), which was created in 1998 in response to severe wildfires caused by declining forest health conditions in and around the greater Flagstaff area. Their goals include restoration of local ecosystems, management of forest fuels in an effort to prevent catastrophic wildfire, and to research, test, develop, and demonstrate key ecological, economic, and social dynamics of restoration efforts (GFFP.org).

The Four Forest Restoration Initiative (4FRI) demonstrates the shift in forest management paradigms. This collaborative effort is made up of hundreds of stakeholders and aims to restore 2.4 million acres across four of Arizona's forests: Tonto National Forest, Kaibab National Forest, Coconino National Forest, and the Apache-Sitgreaves National Forest (4FRI.org). The project would treat 50,000 acres annually over a 20-year period, increasing prescribed burning, monitoring for treatment effectiveness, and encouraging industry participation in order to make the project cost-efficient (4FRI.org). In order to meet efficiency objectives, 4FRI will not treat areas in steep slopes or in remote or otherwise hazardous terrain. Thus, an alternative method for treating the fire-prone areas of the Dry Lake Hills and Lake Mary watersheds was necessary to accomplish forest treatment objectives. Restoration policy is still fairly novel, and increased necessity of reversing anthropogenic effects on forest trends has developed policymaking for forest initiatives at a harried pace.

SECTION 2: OVERVIEW, INSTITUTIONAL DESIGN, AND GOVERNANCE OF PAYMENT FOR WATERSHED SERVICES

Payment for Ecosystem Services (PES) and Payment for Watershed Services (PWS)

Payment for Ecosystem Services (PES) systems are voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services (Wunder 2014). More specifically, a PES system is a transaction in which a service provider or seller is responding to an offer of compensation from beneficiaries such as an NGO, private party, or local government entity. Compensation is conditional upon the specified land management practices proposed by the program, and the supply-side of the transaction is voluntary in the sense that the provider 'voluntarily' enters the contract (Porras et al, 2012:7). This definition is more fitting to non-market payment systems such as voter-approved bonds or obligatory user/ratepayer fees.

The concept of Payments for Ecosystem Services (PES) assigns ecological functions economic value, and this attribution of monetary values to environmental services has been effective in communicating the worth of these services to local policy makers (Ostrom 1990; Wunder et al. 2008). Since agency budgets for environmental projects are effectively cash-strapped, PES is quickly emerging as an effective policy tool for agencies or large corporate beneficiaries to conduct projects aimed at restoring natural capital by helping secure financial resources.

Ecosystem services are too often only recognized after they are gone (Chambers et al 2007), so preventive measures are often seeking to value a non-event, a task riddled with significant uncertainties. Businesses, governments, and the public alike are largely unaware of the true value of natural capital and it tends to be grossly undervalued (Daily

et al. 2000, Balmford et al 2002), so accurately depicting the benefits of these services is of paramount importance to land and resource managers.

Payments for Watershed Services (PWS) projects are a type of PES system that targets the enhancement of process and function for watersheds. A watershed, by nature, is a body of land that collects water, usually from precipitation, and channels it into streams, rivers, and reservoirs. Watershed services are products of ecosystem functions that provide freshwater for consumptive and non-consumptive uses, water flow regulation and filtration, water storage in soils, buffers from flood and drought, sedimentation control, storm damage control, maintenance of streambeds and wetland ecosystems, and critical wildlife habitat (Tognetti et al. 2005).

Protecting watersheds from catastrophic wildfire and post-fire flooding is of high importance to land managers and politicians in the Western US (WGA 2006), as fuels reduction treatments have been shown to have significant effects in reducing fire severity upon entry (Pollet and Omi, 2002). PWS systems may represent an alternative method of securing financial resources for needed public safety services, such as thinning and clearing of forest overgrowth and debris for protection against catastrophic wildfire.

In forested watersheds, the implementation of these projects can reduce capital, operational, and maintenance costs for public utilities, as well as improve water quality; water treatment costs in communities with healthy watersheds (>60% forested) are 211% less than communities whose watersheds are not as healthy (<10% forested) (Postel and Thompson, 2005; Ernst, 2004). If a forested watershed were to be affected by severe catastrophic wildfire or extensively logged, water quality would be expected to decline significantly. Subsequently, costs for treating municipal water supply would significantly

rise as a new water treatment facility was constructed, reservoirs were dredged, and new wells were drilled.

Since PWS systems are designed to provide alternative sources of economic resources that fund watershed treatment projects or activities; advantages of this model of forest treatment include heightened public and/or buyer awareness of the work being done in the watershed, collaboration between stakeholders, and relatively secure sources of project financing. PES and PWS programs incentivize natural capital enhancement, and have begun to gain traction as a beneficial institutional mechanism for financing ecosystem management activities (Gomez-Baggethun et al., 2010). PWS systems render abstract services in terms that can be better understood by those outside the scientific community by assigning ecological functions economic value. This attribution of monetary values to environmental services has been effective in communicating the worth of these services to local policy makers and the public by translating scientific research into market value (Ostrom 1990; Wunder, Engels, and Pagiola 2005).

Institutional Design and Governance of PWS Systems

Payment for Watershed Services (PWS) projects come about as a result of a need to help curtail an ecological problem affecting the yield and/or health of life-sustaining resources and processes in nearby watershed areas. Traditionally in the United States, large governmental agency landowners such as the USDA Forest Service would be chiefly responsible for planning and implementing these actions. Furthermore, they would be financially responsible for planning, implementation of treatments, and post-implementation monitoring. However, the traditional forest management paradigm is

beginning to shift, as funding for forest treatment has declined as a result of fire borrowing and the role of partnerships and collaboration has begun to significantly affect forest project management.

Successful PES systems have been shown to require local and community engagement (Vatn, 2010). However, innovative approaches to forest management are limited to the boundaries of institutional interests, which are not flexible and thus necessitate adaptation. Institutions, in this case, are defined as the "formal rules, compliance procedures, and standard operating practices that structure the relationship between individuals in various units of the polity and economy" (Hall,1986). Institutional design, then, is the establishment and organization of rules and procedures within institutions that are meant to enable and constrain behavior and action in accordance with agreed-upon values and objectives (Alexander, 2005).

Studying institutional design involves the examination of how these structures, rules, laws, norms etc., are created and formed. Well designed institutions may yield "social capital", which refers to features of organizations such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit' (Putnam 1995b). Putnam asserts that interaction, both formal and informal, establishes trust and reciprocity norms between and within communities and governments. This trust and reciprocity creates an environment where collective action is utilized to accomplish shared goals, resulting in a competent and responsive government. Local and federal agencies necessarily shape the environment in which stakeholders interact, by determining the influence that these groups will have in democratic function (Lowndes

and Wilson, 2001). When all parties have similar goals and formalize roles around accomplishing them, collective action results in strong institutions and social capital.

The overall effectiveness of a particular scheme can be determined by many factors, including the minimization of free riders, a clear definition of the ecosystem service being provided, multi-agency stakeholders acting as intermediaries between users and providers, and conditional payments delivered upon successful completion (Pirard et al, 2014). However, success is not guaranteed by meeting either or any of these factors, and there is no set framework for designing a perfect PES system. Instead, PES schemes should strive to form coherent and comprehensive policy sets to address problems related to local ecosystem management (Farley and Costanza, 2010).

The community-funded element of FWPP is a testament to new resource management paradigms, where conservation and environmental protection is valued over commodity output, long-term and future effects of conservation on community are considered, consultative and participatory decision-making is emphasized, and decision authority is decentralized (Brown and Harris, 1992; Shindler and Cramer, 1999). Successful community management of forests worldwide has been shown to require ownership, tenure security, collaborative creation and enforcement of rules and regulations, monitoring, strong leadership with capacity for local organization, expectation of benefits, common interests, and local authority (Pagdee et al. 2006). This can be somewhat paradoxical when attempting watershed-scale forest treatment objectives where large agencies are the landowners as well as the intermediaries; in this case, multiple levels of public and agency cooperation will be essential to success (Vatn, 2010).

Process Outcomes of PWS Systems

Process outcomes of PES systems can include equity, effectiveness, and efficiency (Mayrand and Paquin, 2004), as well as many others. "Effectiveness" refers to whether a project is meeting its general objectives, and whether the project is truly representative of an improvement over the no-action scenario (Engel et al, 2008). "Efficiency" can be considered the difference between the gross welfare effect of the project and the costs incurred (Pascual et al. 2010; Wunder et al. 2008). Opportunity and transaction costs include the costs of contract negotiation, procurement, scientific studies, monitoring and enforcement, and costs associated with public outreach (Jack et al. 2008). Efficient PES schemes reduce transaction costs, using untargeted payments and focusing on large landowners. Furthermore, in order to achieve higher efficiency investments should be strategically organized and coordinated across landscapes and adherent to the provision of a full bundle of ecosystem services (Turner and Daily, 2008)

Accountability is essential to legitimate governance and decision-making, and is represented by compliance, transparency, and responsiveness to stakeholders (Radovich et al. 2006). Partners should align their objectives with the goals of the project, develop a legitimate and credible decision-making process as well as protocols for communication and accounting, evaluate project performance routinely, monitor and assure integrity of public assets (such as bond money), and engage stakeholders frequently for input (Radovich et al. 2006). Partners are accountable to many parties, including legal and fiscal authorities, partner organizations, donors and indirect partners, and external stakeholders. Apart from the issue of handling money, partnerships can be held

accountable for the effectiveness of their institutional design. Inclusion of formal partners and external stakeholders supports legitimacy, and highly transparent partnerships provide accurate, timely, and useful information to stakeholders (Steets, 2004). Legitimate accountability concerns should be addressed by "…more practical experience and focused research…to determine which accountability mechanisms work best for which type of partnership and what level of accountability is needed at each stage of partnership development" (Steets, 2004).

Comparative Case-Study Analysis of Fire-Risk Mitigation Partnership PWS Systems in the Western US

The Flagstaff Watershed Protection Project (FWPP) is a fire-risk mitigation partnership project that used a $10 million municipal bond as the financial mechanism for a Payment for Watershed Services (PWS) project. FWPP was voted on and approved by 73% of voting Flagstaff residents on the November 2012 general election ballot, and plans to treat 15,300 acres over a timeline of 10-12 years.

Two similar fire-risk mitigation partnerships are currently underway in the southwestern US. The Santa Fe Municipal Watershed Investment Program plans to maintain treatments for 15,455 acres over a timeline of 20 years. The total financial cost to buyers (utility customers) is $5.1 million, to be collected incrementally from a charge incorporated into utility billing. Denver's "From Forests to Faucets: USFS and Denver Water Watershed Management Partnership" will provide funding to conduct fuels reduction and prescribed burning treatments on 38,070 acres over a timeline of 5 years.

Denver also uses a utility billing financial mechanism, and total cost to buyers will be $16.5 million, to be matched by the USFS (Table 1).

	Flagstaff	Santa Fe	Denver
Duration	10-12 years	20 years	5 years
Costs to Buyers	$10,000,000	$5,100,000	$16,500,000
Payment Method	Municipal Bond	Utility Billing	Utility Billing
Acreage Treated	15,300 acres	15,455 acres	38,070 acres
Population at-risk	67,468	69,204	1.3 million

Table 1: Background Information for 3 western PWS systems.

Table 2 includes descriptive PWS characteristics defined by Wunder, Engels, and Pagiola (2008). FWPP will implement fuels reduction treatments in order to accomplish the primary goal of community and watershed protection from catastrophic wildfire. Flagstaff voters and property tax payers are the actual buyers, but all Flagstaff residents and downstream users stand to benefit from these treatments. The USDA Forest Service is the landowner, and are selling ecosystem services rendered by the project to property owners. The City of Flagstaff initiated this project in 2012, and some key stakeholders (Sierra Club, Center for Biological Diversity, Friends of Flagstaff's Future) have been skeptical about the approach and potential treatments, neither endorsing nor opposing the proposed bond. Since the City and Forest Service will be accountable for their actions to the buyers, or property owners, public outreach and transparency is a significant concern.

Santa Fe also uses fuel reduction treatments to accomplish watershed protection goals, but will accomplish these goals through the maintenance of previous treatments. The buyers in the Santa Fe scheme are water utility customers, but all Santa Fe residents

and watershed users stand to benefit from these treatments. The USDA is again selling ecosystem services rights to customers, as part of the partnership agreement initiated by the City of Santa Fe and various interest group stakeholders. The project was initiated in 2007, and faces potential challenges such as incremental funding due to utility billing financial mechanism, and treatment considerations for wilderness areas.

Denver's PWS project has aspects similar to both Flagstaff and Santa Fe. Municipal watershed protection through fuels reduction is the primary goal and ecosystem service rendered, but unlike Santa Fe, Denver's PWS scheme will finance actual fuels reduction treatment, rather than just maintenance of treatment. The buyers in the project are Denver Water utility customers, and the financial mechanism will also use utility billing as a payment method. Denver Water initiated the project, and the beneficiaries will consist of all municipal watershed users and metropolitan-area residents. The Denver Forests to Faucets partnership was initiated in 2010, and faces challenges associated with incremental funding and a short timeline for implementation.

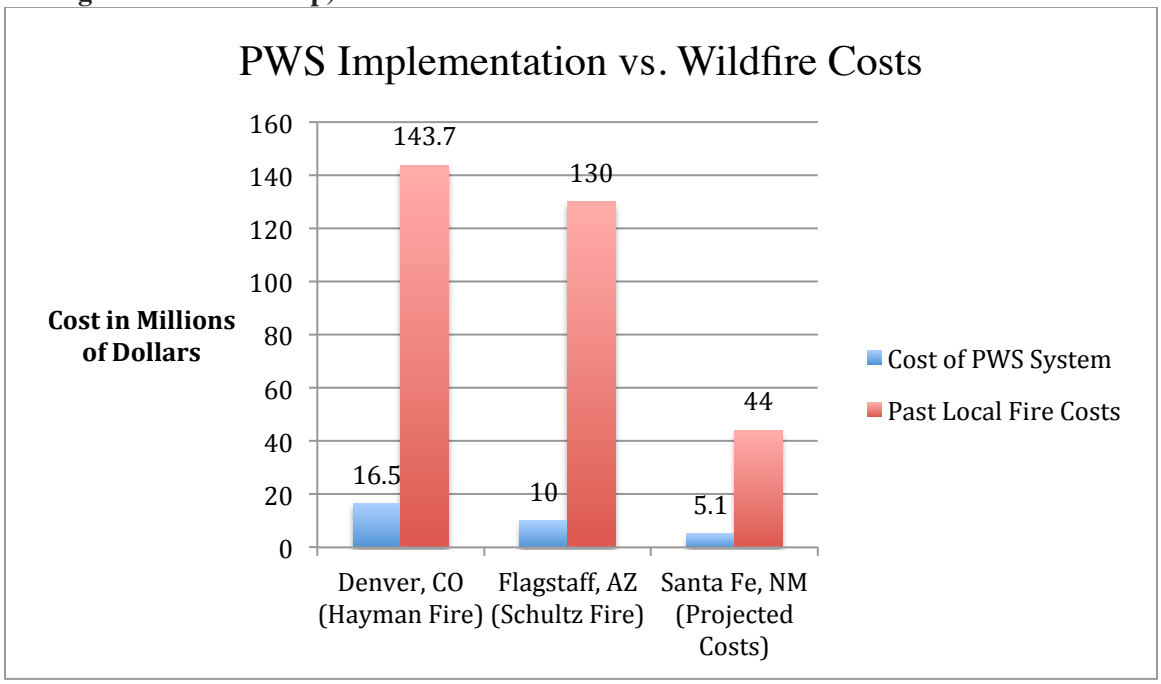
Findings regarding costs of each PWS project implementation show that there existed a strong financial motivation for cities with at risk watersheds to construct PWS projects of their own. In order to better understand the relationship between the cost of proactive PWS implementation and the cost of reactive fire mitigation strategies, the projected costs of the programs were compared to the projected/estimated costs of previous fires (Figure 1). The data used for past fire costs were collected from full cost accountings and cost projections form the different municipality management plans. This figure demonstrates the immense financial benefits of proactive PWS frameworks. This

data demonstrates an estimated $39-$127 million in avoided costs through the use of PWS systems in just three case studies.

	Targeted ES	Paid for ES	Who is buyer?	Who else benefits?	Who is seller?	Who initiated ?	Start Year	Spatial Scale	Obstacles
Flagstaff	Watershed protection from wildfire	Fuels Reduction Treatment	Voters/ Property Owners	All City Residents, Downstream Users	USDA	City of Flagstaff	2012	15,300 acres	Litigation, Public Outreach
Santa Fe	Municipal watershed protection	Treatment Upkeep	Water Utility Customers	Watershed beneficiaries, residents	USDA	City of Santa Fe, interest groups	2007	15,455 acres	Incremental Funding, Wilderness
Denver	Municipal watershed protection	Fuels Reduction Treatment	Water Utility Customers	Watershed beneficiaries, residents	USDA	Denver Water	2010	38,070 acres	Incremental Funding, Short Timeline

Table 2: Background for three ES projects. Table format adapted from Wunder, Engels and Pagiola (2008).

Figure 1: This figure displays the projected restoration costs of past fires versus the cost of implementing PWS projects in different cities. The PWS costs are estimated costs or current funding allocations (Source: FWPP Proposed Action, Santa Fe Municipal Watershed 20-year Protection Plan, U.S. Forest Service and Denver Watershed Management Partnership)



While similar in design, each project varies in the amount of acreage treated (Figure 2), and also in total cost of system (Figure 3). There was a large difference in the costs that each municipality is paying per acre- Flagstaff has the highest cost per acre treatment of $647 per acre, and Santa Fe is lowest at $333 per acre (Figure 4). This comparison in itself however does not reflect the fact that Santa Fe's cost is for the maintenance of previous treatment versus the initial treatment costs per acre of Flagstaff. Therefore a more insightful comparison can be made by looking at the cost per acre of the Flagstaff PWS system versus that of Denver's. This comparison revealed that Denver has a smaller cost per acre of $433. This $214 difference can be attributed to different variables such as steep slopes in the case of FWPP, financial mechanisms for, or varying project implementation styles or resources.

Figure 2: Total acreage proposed to be treated by each project. (Source: FWPP Proposed Action, Santa Fe Municipal Watershed 20-year Protection Plan, U.S. Forest Service and Denver Watershed Management Partnership)

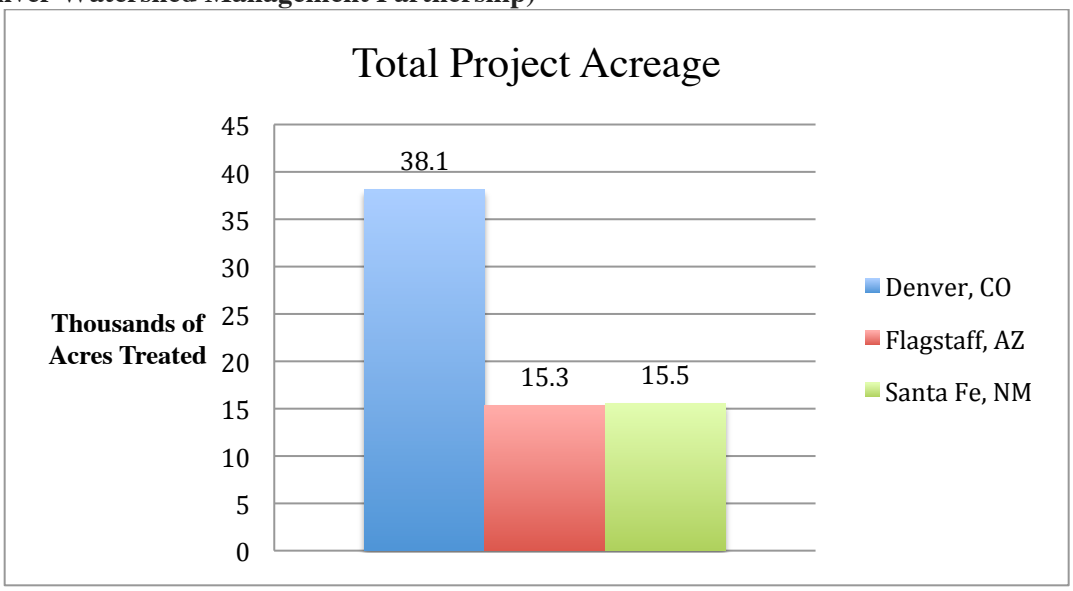


Figure 3: PWS system payment amounts in Denver, Flagstaff, and Santa Fe (Source: FWPP Proposed Action, Santa Fe Municipal Watershed 20-year Protection Plan, U.S. Forest Service and Denver Watershed Management Partnership). Note: Full cost of implementation is likely higher; these analyses consider the amount invested by the buyers and exclude additional project costs.

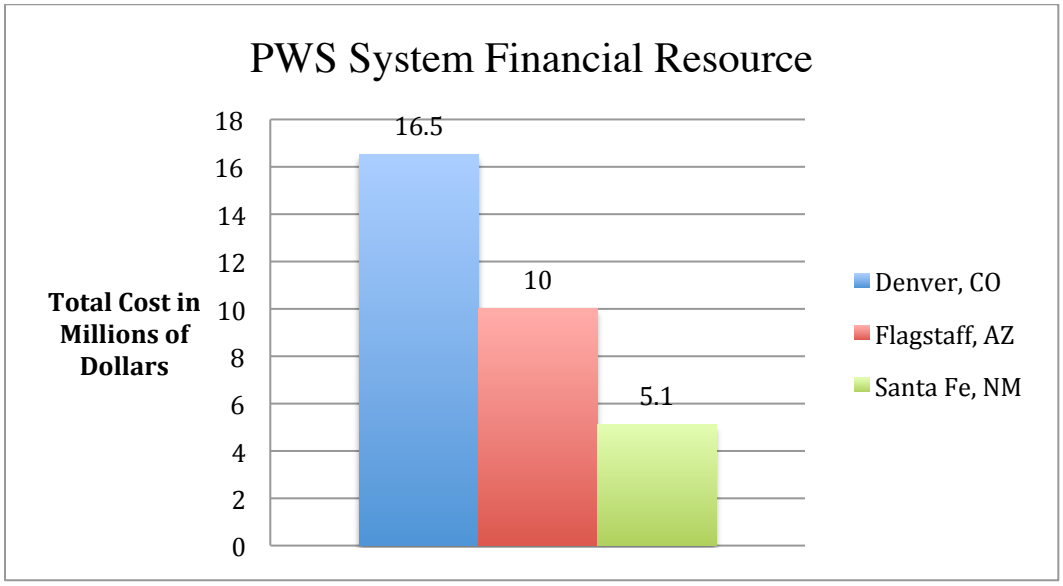
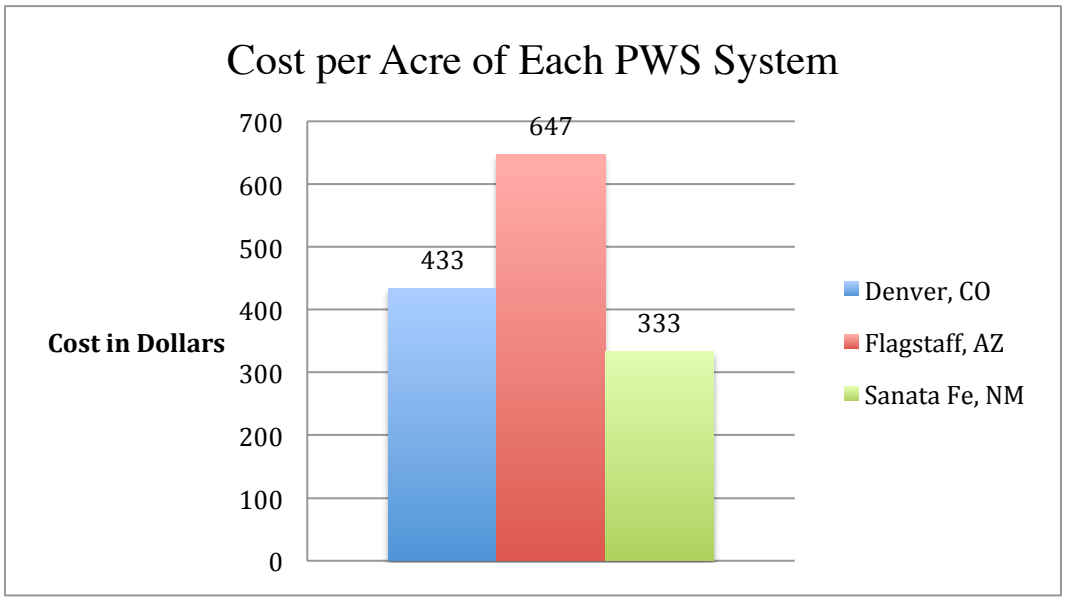
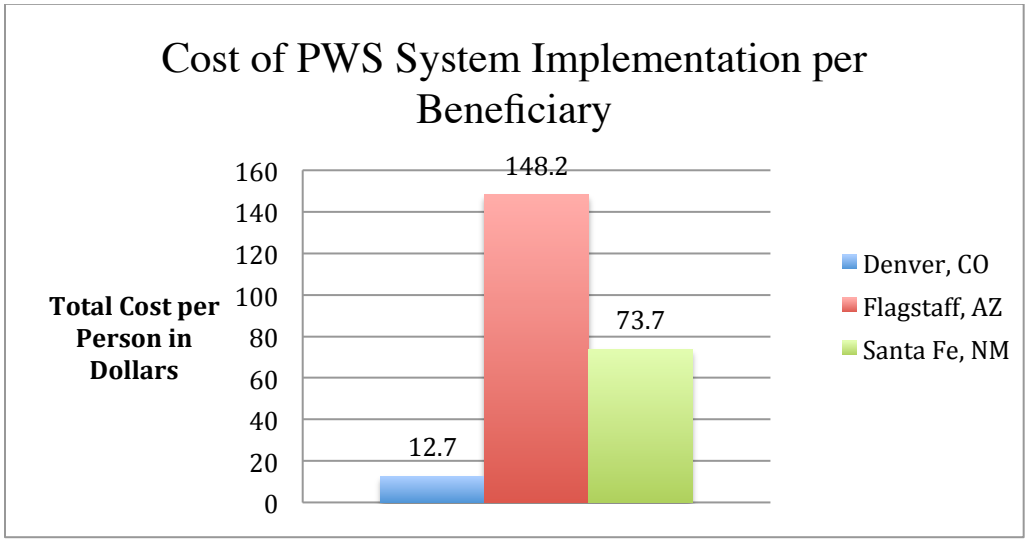


Figure 4: Projected cost per acre (dollar amount) of each PWS scheme analyzed. (Source: FWPP Proposed Action, Santa Fe Municipal Watershed 20-year Protection Plan, U.S. Forest Service and Denver Watershed Management Partnership)



Additionally, examining the sizes of the different populations at risk served to distinguish the systems further. Comparing population sizes of the municipalities against the cost of each project demonstrates that there is a difference in the amount of money that each person in paying for treatment (Figure 5). While Flagstaff is paying roughly $148 per person for their PWS system, Denver is paying the least with roughly $13 per person.

Figure 5: Depicts individual cost per buyer, allocating a dollar amount to each buyer's individual contribution to their respective PWS scheme (Source: FWPP Proposed Action, Santa Fe Municipal Watershed 20-year Protection Plan, U.S. Forest Service and Denver Watershed Management Partnership). Note: Costs are based on voter- or utility-approved funding



FWPP utilizes a unique financing method that diverges from the utility billing model of Denver and Santa Fe and provides a novel approach to PWS funding. The $10 million municipal bond offers two primary benefits. The first of these benefits is the ability to leverage the full $10 million bond upfront in the project design. By diverging from the utility billing model, the City of Flagstaff was able to leverage the entire funding power of the bond to create a partnership with the USDA Forest Service. This differs from Denver or Santa Fe's billing structure, which relies on an incremental funding model throughout the project's timeline as the primary finance source. The second benefit of employing a voter-approved bond over utility billing is the added benefit of community outreach. A municipal bond project can provide outreach and engagement capacity that utility billing can lack because it automatically becomes public agenda. Instead of going unnoticed in a water bill, a public vote over the use of a bond allowed the general public to not only become participants in the process, but also stakeholders.

As the backers of municipal bonds, the public (taxpayers) represents a stakeholder that the City of Flagstaff is accountable to for the prudent dissemination and management of project funds.

Santa Fe differs from the other models due to its PWS system design being for the maintenance of previous initial treatments conducted within the watershed. After having secured funding for initial treatment, Santa Fe took the step of implementing a PWS project to ensure that the initial investment was preserved. In this aspect it is unique that neither of the other projects outline funding of continued treatment efforts beyond the initial project timeline. The Denver PWS system design has secured the most funding for the most acreage ($16.5 million for 38,070 acres), and it has the shortest timeline of the other projects (5 years). FWPP contains an implementation timeline of 10-12 years, which may expose the Flagstaff region to the potential for a damaging fire to occur before the project is fully and successfully implemented.

CHAPTER TWO
MANUSCRIPT ONE: INSTITUTIONAL DESIGN AND GOVERNANCE OF THE FLAGSTAFF WATERSHED PROTECTION PROJECT
ROY MILLER

Abstract

Social-ecological systems such as Payment for Watershed Services projects have potential to help land managers overcome budget shortfalls for funding needed forest treatment actions and safeguard community and ecosystem well being. However, institutional design, governance structures, and performance outcomes of these systems in the United States have only recently begun to be explored by researchers- this research explores the institutional design and governance structures of the Flagstaff Watershed Protection Project (FWPP), a bond-financed fire-risk mitigation partnership initiative on USFS lands. Data was derived from document review and key informant interviews, and results indicate that the institutional design and governance structures had numerous advantages over traditional, internal models, and the project was designed to maximize the strengths of the community. The Flagstaff model or any individual PWS system should not be viewed as an exact template, but rather should be customized to fit individual attributes of communities exploring these systems in the future.

Introduction

Forest Health, Public Safety, and Budget Shortfalls

The US Forest Service manages 193 million acres of national forests and grasslands in 44 states across the National Forest System (USFS, 2007). A large amount of this acreage has been fire-excluded, overgrazed, and heavily logged, resulting in unhealthy, fire-prone landscapes (Covington et al., 1997). After a deadly sequence of

wildfires in the western US around the turn of the century, the US Forest Service enacted a highly self-defeating wildfire suppression policy after 1911, without a program to counter the inevitable accumulation of highly combustible dead and downed forest debris (Busenberg, 2004; Kauffman, 2004). Federal funding and agency implementation has since failed to properly address the results of these short-term policies, resulting in poor forest health conditions, high risk of catastrophic wildfire, and negative environmental and economic impacts on local communities. Accumulation of forest debris, unnaturally dense stands of small-diameter trees, increased homebuilding in the Wildland/Urban Interface (WUI), and compounding effects of climate change all contribute to this significant wildfire risk (Stewart et al. 2006; Westerling et al 2006). Failure to correct this problem comes at the expense of water security, forest health, community well being, and human lives. Communities in the west are beginning to realize the importance of taking matters into their own hands via alternatively financed social-ecological systems.

Forest treatments in ponderosa pine forests have proven very effective at reducing the threat and impact of catastrophic wildfire in WUI areas (Safford et al. 2009). When properly conducted, treatments can allow for greater penetration of fire retardant chemicals, and reduce the spread of spot fires ahead of the main fire (Moghaddas and Craggs, 2008), facilitate a drop from fire in the crown of trees to the forest floor, and allow improved firefighter access (Fulé et al 2002; Pollet and Omi, 2002). Furthermore, reducing forest densities will reduce soil water depletion, manipulate snowpack and consequently increase winter precipitation yields available for stream flow (Baker 1982). Forest treatment projects in municipal watersheds can potentially reduce capital,

operational, and water provision maintenance costs for communities, as well as improve water quantity and quality (Postel and Thompson, 2005; Ernst, 2004).

Unfortunately, federal land management agencies have been unable to finance these needed treatments due to federal budgetary constraints, which has resulted in a costly negative feedback loop: as wildfire suppression costs virtually set a new record each year, the practice of fire borrowing (a process of borrowing from non-fire functions of the USFS in order to fund fire suppression) undercuts preventive projects and perpetuates failed fiscal policy (Gorte, 2013).

Payments for Watershed/Ecosystem Services

Payments for Watershed Services (PWS) projects are a type of social-environmental system that seek alternative (public and/or private) funding for watershed enhancement projects in order to increase or secure the provision of water resources. PWS is nested within the larger concept of Payment for Ecosystem Services (PES), which are voluntary transactions between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services (Wunder 2014). PWS systems have numerous social and ecological benefits, but a significant function of PWS systems is that they assign ecological functions to economic values, rendering abstract natural services to terms that can be better understood by those outside the scientific community (Porras et al. 2008; Postel and Thompson, 2005). This attribution of monetary values to ecological services has been effective in communicating the worth of these services to local policy makers and the public (Ostrom 1990; Wunder, Engels, and Pagiola 2005).

PWS programs have been shown to achieve goals of watershed service valuation and conservation by providing payments to private landowners to improve land use practices and reduce poverty (Wunder, 2005; Porras et al. 2009). In most national and international PWS programs, federal agencies or private interests direct payments or investments to upstream landowners for conducting watershed enhancement activities (Stanton et al. 2010, Bennett et al. 2014). However, new systems are emerging where federal land management agencies are the recipients of payments for the provision of these services since they could not provide them without additional financial resources. These systems are potentially an important new policy tool for resolving government and market failure to account for ecosystem service losses due to failed agency land management policy, such as overgrazing and fire suppression (Wu et al. 2011). Very few case studies of institutional design for PWS systems in the United States are available in the literature (Steelman and Kunkel, 2004; Postel and Thompson, 2005; Stanton et al. 2010; Bennett et al. 2013; Bennett et al. 2014), and so there is a need to document and understand these systems, specifically in regards to institutional evolution, design characteristics, and their potential effects on local and national forest management.

As of 2013, 205 PWS systems were active worldwide, with 76 programs in development. The value of these transactions between 1973 and 2011 totals over $66 billion, with over 195 million hectares managed within the same time frame. Ninety-seven percent of PWS systems worldwide are public good payer systems, whereby a government or large NGO will pay for watershed enhancement, seen increasingly in China, who has begun taking a political interest in “eco-compensation.” When China is excluded, 31% of PWS systems worldwide are the result of a downstream beneficiary

paying an upstream land user to improve practices. There are 68 examples of active watershed investment programs in the United States, with highest concentrations located in the Pacific Northwest. These systems include bilateral and trustee mechanisms for drinking water protection, trading and offsets, and instream buybacks (Bennett et al. 2013).

Most PWS literature in the US is based around the water quality enhancement program in New York City's upper watershed that leverages municipal water fees (Postel and Thompson, 2005). This type of ratepayer-funded PWS scheme has recently shown up in risk mitigation partnerships initiated in Denver, Co and Santa Fe, NM; both projects engaged the USFS and a local water utility provider in a collaborative watershed-enhancement and fire risk mitigation effort on National Forest System lands. PWS systems can provide several different types of watershed service benefits, from water quality and/or quantity enhancement, or risk reduction from catastrophic wildfire. PWS systems that are designed to reduce wildfire risk, like those found in Denver, Santa Fe, and Flagstaff, fall under the category of "fire risk mitigation partnerships", which create a formal partnership between a drinking water utility and the USFS to address risks to water supplies and utility infrastructure associated with catastrophic wildfire (Bennett et al. 2014). The early successes of these programs may forecast the potential for appropriately designed PWS projects to resolve agency and market failure by accounting for positive benefits derived from watershed restoration and fuels reduction treatments (Kline et al. 2009).

Governance and Institutional Design

Institutions, in this case, are defined as the formal rules, compliance procedures, and standard operations that structure relationships between individuals in various components of the polity and economy (Hall and Taylor, 1996). Institutional design is the establishment and organization of rules and procedures within institutions that are meant to enable and constrain behavior and action in accordance with agreed-upon values and objectives (Alexander, 2005). Institutional analysis involves the examination of how structures, rules, laws, norms etc., are created and formed (Ostrom, 1990). Proper institutional design can help foster trust relations that are hypothesized to be a lubricant of cooperation in shared resource management, reducing transaction costs for those involved by fostering cooperative agreements (Pretty, 2003). Understanding how institutions form and perform can thus potentially be highly beneficial to evaluating future nascent PWS projects.

More inclusive approaches to governing forest treatment projects have recently become more prominent in forest management paradigms, as the representation of various stakeholder perspectives allows for more complete governance. Collaborative governance is defined as a type of governance where public and private actors work together in distinctive ways and processes of establishing rules for the provision of public goods (Ansell and Gash, 2008). Partnerships between local and federal actors are becoming increasingly common as a governance model for natural resource management on national forest lands in the US. This approach may represent a more collaborative model of governance than traditional top-down management schemes, but remains exclusive to interest groups and other stakeholders outside the governing partnership. Ultimately, governments shape the environment in which voluntary associations and

social networks exist by determining the influence those organizations, interests, and individuals will have on democratic function (Lowndes and Wilson, 2001). As resource management paradigms shift towards a more inclusive model of governance, information about how local and federal actors work together in partnerships may prove highly useful to land managers.

Flagstaff Watershed Protection Project

Over the past two decades, the forests around Flagstaff, AZ have experienced severe wildfires that have threatened community safety. Fuels treatments around the community have proven successful at mitigating the risk and effects of these wildfires, and local agencies have made fuels treatment in WUI areas a priority. In June 2010, the Schultz fire burned a total of 15,051 acres of dense stands of ponderosa pine and mixed conifer on the eastern side of the San Francisco Peaks in the Coconino National Forest, near the City of Flagstaff (Neary et al. 2011). The burn occurred in an area proposed by the USFS for the Jack Smith/Schultz timber sale, which was legally delayed by environmental groups because of controversial large-diameter tree removal. The fire was followed by the 4th wettest monsoon season on record in Flagstaff, resulting in debris flows, severe erosion, substantial flooding in residential areas (Neary et al. 2011). Fire suppression and flood mitigation alone cost $58.6 million (Combrink et al. 2013), and impacts on the community will be felt for years to come.

The Dry Lake Hills portion of the Rio de Flag watershed and the Mormon Mountain portion of the Lake Mary watershed are both at risk of high-intensity, high-severity wildfire- stand surveys within these areas indicate that 71% of the total area surveyed has a fire hazard rating of “extreme” (USFS 2014). Severe wildfire in the

Mormon Mountain/Lake Mary watershed poses a significant threat to increasing sedimentation and debris flow into Lake Mary, the City of Flagstaff's primary surface water source. A catastrophic wildfire in the Dry Lake Hills area would have numerous significant consequences: this area is highly visible from downtown Flagstaff, it is heavily trafficked by recreationists, and if it burned as severely as predicted, would likely result in extensive flooding and debris flow throughout much of Flagstaff, including the downtown area (USFS, 2012).

Growing community awareness of forest health issues and the magnitude of the impacts from the Schultz Fire both contributed to the eventual creation of a PWS program in Flagstaff. In October 2010, researchers from Northern Arizona University organized a workshop that included multiple USFS agencies from the local, regional, and national level in a discussion about PWS feasibility in the Flagstaff area. In May 2011 representatives from the City of Flagstaff and the Greater Flagstaff Forest Partnership attended a workshop that discussed the implementation of a PWS project in Santa Fe, and in March 2012, another workshop was held in Flagstaff, hosted by the City. At this workshop, the idea for a PWS program in Flagstaff was discussed, and the City Manager and other City officials made the decision to propose a bond-financed PWS project to the Flagstaff City Council, who then decided to put the project on the ballot in the November 2012 elections. On November 6, 2012, a $10 million bond (Item 405) went on the ballot as the Forest Health and Water Supply Protection Project, with the intent of providing financial resource for conducting fuels treatment on approximately 10,544 acres of Coconino National Forest. Actual bond language follows:

"To prevent flood damage to the City of Flagstaff ('City'), and to protect the City

water supply from damages which occur from large-scale and/or severe wildfire(s) in two watersheds serving the City, shall the City be authorized to sell and issue general obligation bonds in a principal amount up to $10,000,000:

- To expedite and conduct forest treatments in the Dry Lake Hills watershed north of town to reduce wildfire threat, thereby mitigating subsequent flooding to Sunnyside, downtown, the NAU campus, and neighborhoods bordering the Rio de Flag;
- To plan and conduct forest treatments in the Lake Mary watershed south of the City to reduce wildfire threat, thereby protecting the storage capacity and water quality of Lake Mary." (Ballotpedia.org, November 2012)

Approximately 3,000 acres of land owned by the State of Arizona and 140 acres of privately owned land may also receive treatment, but were not included in analysis for the FWPP Final Environmental Impact Statement (FEIS). 7,569 acres of the FWPP analysis area are within the Dry Lake Hills portion of the Rio de Flag watershed area north of Flagstaff, while 2,975 acres are in the Mormon Mountain area of the Walnut Creek-Upper Lake Mary watersheds. Bond 405 passed with an overwhelming 73.6% majority (Nielsen and Solop, 2013), becoming the first forest treatment PWS project to be voted on by the public and financed by a municipal bond.

Purpose of Study

The Flagstaff Watershed Protection Project is a unique PWS project in northern Arizona that finances fuels reduction treatments in key watersheds, and a better understanding of key dynamics and processes in the FWPP partnership may help inform

land management policy. The purpose of this case study is to describe the institutional design of the FWPP, and also to determine what effects it may have on local and national forest management. This research utilizes data generated from internal documents review as well as key informant interviews in order to answer two questions regarding institutional design of the FWPP: 1) How was the FWPP designed, and how does it function? 2) What are the impacts, if any, that the FWPP has had on local forest management?

Methods

A case-study approach was taken to evaluate key distinctive design characteristics in the FWPP project structure, which is an empirical inquiry investigating phenomena within real-life context, especially when the boundaries between phenomena and context are not clearly evident (Yin, 2003). In the case of FWPP, the phenomenon is a voter-approved forest treatment bond governed by an agency partnership, and the context is USFS forest treatment projects. Content analysis was the primary methodology utilized for documents as well as interviews. This method can be defined as a research technique that makes replicable inferences from text (Kaplan 1964). This methodology provides insight into the decisions leading up to the FWPP, emphasizing why these decisions were made, how these decisions were implemented, and the results of those decisions (Schramm, 1971).

Data for content analysis of documents was retrieved from official documents released by the partner agencies (City and USFS), as well as from the project's website, http://www.flagstaffwatershedprotection.org to analyze the formal institutional rules of

the partnership. A total of six documents were selected for analysis: FWPP Executive Summary and Implementation Plan, Memorandum of Understanding (MOU) between the City of Flagstaff and Coconino National Forest, MOU- Cooperating Agency Agreement between City and Coconino N.F., FWPP Proposed Action, Communication Plan, and Environmental Impact Statement. Information released to the public through other means (updates, media releases, and information available from http://www.flagstaffwatershedprotection.org) will also supplement analysis. Document analysis is stable, unobtrusive, exact, and can cover a broad spectrum of topics, but lacks an in-depth approach. In order to provide a more robust approach, interviews with key participants to gain insight into FWPP processes and governance dynamics will be used alongside document analysis (Yin, 2003).

Semi-structured, open-ended interviews (n=9) were conducted in spring 2014 with key participants who had an instrumental role in the FWPP design and/or planning process to understand the informal rules of institutions as well as outcomes of the planning process. Interviews are inherently flexible as a data collection method, and allow the researcher to probe, clarify, and create new questions immediately based on responses (Glaser and Strauss, 1967). The interview instrument (Appendix A) consisted of a demographics section and 28 questions relating to 1) institutional design and governance, 2) planning efficiency and partnership costs, 3) partnership accountability, and 4) public accountability. These questions were designed to gather perspectives from highly engaged members of the FWPP partnership, reflecting themes such as public outreach and involvement, accountability, collaborative efforts, challenges and obstacles, efficiency, and costs (Ostrom, 1990).

Chain referral and nominated sampling were used to select interview respondents, who were chosen as a result of their high levels of participation throughout the project. Respondents included members of the project steering committee, project management and overall administrative staff from each partner agency, and key contributors to the planning process. Participants were asked to provide expected outcomes for the project, and discuss the role of each partner in the project, and how partnership interaction helps or hinders the planning process. Several interview questions focused on challenges and obstacles that result from the partnership and bond payment, in order to gain an understanding of new problems that may arise from utilizing voter-approved payment solutions with partnership governance structures.

Qualitative data analysis was conducted by thematically coding documents and interview transcripts by hand. Coding is a process of categorizing text into relevant patterns and dimensions by utilizing a structured and inductive process that organizes text into principal themes and sub-themes with graduated level of detail (Miles and Huberman, 1994). Converging process-related patterns and structural institutional design dimensions emerged from the FWPP foundational documents and interview transcripts that allowed insight into project design and function.

Respondents (n=9) selected for elite interviews were chosen as a result of their status as project officials heavily involved in the planning and design of FWPP. This list primarily includes representatives from organizations within the FWPP partnership (City of Flagstaff, US Forest Service, and contracted NGO's such as Greater Flagstaff Forests Partnership and NAU Ecological Restoration Institute), but also included a federal wildlife agency representative from outside the partnership.

Participants held titles such as Project Manager, District Ranger, Member of Board of Directors, Director of Policy and Partnerships, Assistant to the City Manager, City Manager, Firewise Specialist, Wildland Fire Management Officer, and Senior Biologist. Five females and four males were interviewed. Experience with forest management projects varied, from four years to 36 years; average experience of respondents was approximately 15 years.

Results

Initiation of FWPP Institutional Design

The FWPP was formally initiated as a result of a feasibility workshop hosted by the City in March 2012. At this workshop, representatives from NAU Ecological Restoration Institute (ERI), NAU School of Earth Sciences and Environmental Sustainability (SESES), and Grand Canyon Trust (GCT) gave presentations that explained the threat of wildfire impacts to Flagstaff, and emphasized PWS systems as a potential solution. The decision was made to move this project forward as a bond. After review from the City Council, staff from various City departments immediately engaged other partners to refine a bond proposal. Organizations engaged by the City during initial bond formation include GFFP, ERI, Arizona State Forestry (ASF), AZ State Land Department (ASLD), Coconino County, and the U.S. Forest Service. In July 2012, City Council approved the inclusion of the $10 million bond on the November 2012 election ballot as Question #405, the "Forest Health and Watershed Protection Project", which was approved by nearly 74% of voters. The City of Flagstaff played an informational role during the bond campaign, hosting several open house-type presentation sessions and

town hall meetings to educate the public. A citizen advocacy group, *Yes on 405* formed in order to increase public awareness and campaign for the bond measure.

The USFS did not participate in the early stages of the project, becoming active only after the measure passed in November. This was likely to avoid any potential ethical conflicts inherent with asking for additional public funding for forest management. After the bond measure passed, the USFS created the Project Manager position specifically for this project, and staff from the Wildland Fire Division of the Flagstaff Fire Department were designated to assume project management responsibilities from the City side. An executive team consisting of representatives from higher level political and management backgrounds from the City, USFS, and State of Arizona was established to guide the project and facilitate coordination, updates, and briefings among agencies. A City representative is included on the interdisciplinary team (IDT), which is unique to this project at a local level. City and USFS representatives on the FWPP Communications Working group drafted an informal communication plan that outlines appropriate media and public relations protocols for information release. Participants reported that no specific measures have been established that hold the partnership accountable to the public or each other, instead relying on a shared responsibility to effectively utilize public money.

> "*We really don't have a formal process, there's no real dispute resolution process, or committee. We don't have any strict rules, its just been more of an agreement that we're going to work together and this understanding that we have to work together, or else the project falls apart and we're both held accountable by the public if that happens. So there are invisible enforcement mechanisms." – USFS employee*

Institutional Design Characteristics of the FWPP

A partnership between the City of Flagstaff (City) and the US Forest Service (USFS) is defined by a Memorandum of Understanding and multiple Cooperating Agency Agreements that structure the processes for FWPP planning and implementation. Joint planning efforts have so far resulted in the development of the FWPP Draft Environmental Impact Statement, which outlines four treatment alternatives. Except for the No Action Alternative, these alternatives outline the need and proposed use of various steep-slope logging techniques and combinations of mechanical thinning and prescribed burning techniques that are uncommon in northern Arizona. These alternatives can be "blended"; this means that the responsible official will determine which treatment action is best for a given area, effectively creating a new alternative. This is allowed as long as the impacts of these actions have been evaluated in one of the alternatives.

Roles and Responsibilities

Review of documents and interviews indicate that the City's primary formal role is to fund the initiative and oversee all bond expenditures. Additionally, they are expected to provide support and special expertise to the USFS throughout the NEPA process, as well as participate in planning, evaluation, and public outreach meetings. Planning will be funded largely by additional USFS resources leveraged by the partnership, saving bond money for implementation. The City assists with planning wherever possible, and contracts out various monitoring and public outreach responsibilities to Greater Flagstaff Forests Partnership (GFFP) and Ecological Restoration Institute (ERI). The FWPP management team sets goals and landmarks internally with consensus from team members (primarily USFS and City), and has moved forward in planning with the goal of

reducing the risk of wildfire and flooding, mitigating a potential emergency scenario for the community and securing public safety.

> *"We want to plan the project in a way where we meet our objective, which is to reduce the risk of catastrophic fire and post-fire flooding, and we also want to do it in a way that meets broader community and agency goals, in terms of minimal impacts to the environment and wildlife, and soils, and the watershed, but also to accomplish the long term goal of reducing wildfire and post-fire flooding risk." – USFS employee*

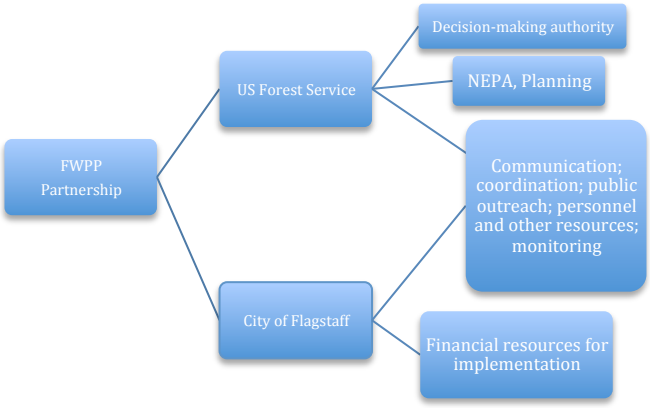
Costs and additional resources leveraged are being closely monitored by the partnership. Each agency is responsible for maintaining a record of project costs; the City fire department works with the budget and finance department to monitor bond spending and resource leveraging, and the USFS has been tracking their own administrative costs with a new budget account code devoted specifically to this project.

> "*Our finance and purchasing people in the city are heavily involved in this. So they are maintaining all the books and tracking the bond through the city budget. We do a leverage report every 6 months, and disclose how much has been spent internally. We're not counting City dollars in that leverage report. We know we started with $10 million, so it's about what else is coming from the table from all other entities. For example, Continental Country Club donated a half page out of their newsletter for FWPP. We consider that a leveraged resource. The cost of the ad space will be recorded in the next leverage report as a contribution from the public." –City employee*

Both partners share duties of timely communication and coordination within the partnership, as well as public outreach and education responsibilities (Figure 6). Partners also share monitoring duties, as well as responsibilities associated with overseeing implementation. The USFS provides the NEPA analysis and has final decision authority for treatment implementation, which cannot be delegated. Since this project uses the bond as the financial mechanism for this project and the USFS cannot accept direct public payments, the City of Flagstaff acts as the intermediary and distributor of bond funds for planning and implementation.

"*We rely heavily on the FS for the planning. We're the third party financiers. For this scale and on federal land, we need to rely on the federal government." –City employee*

Figure 6: General breakdown of formal roles within the FWPP partnership



Additional Costs of Partnership

According to all interviewees who were able to speak to the question, additional costs associated with the partnership governance structure are dwarfed by the benefits that the partnership provides. Both partners mentioned extra personnel costs due to increased public outreach efforts, and additional time needed to draft the MOU's and other agreement documents. One complexity mentioned was the transfer of bond money between the City and the USFS.

"In terms of challenges with the partnership as we go along, I think that the main thing that might just be complicating is the transfer of money. After we sign a decision, and the City decides to fund those actions with the bond money, there is a series of processes that we go through, called Supplemental Participating Agreements, or SPA. For every dollar that is transferred we have to do one of those and say exactly how much money, what its going to go for, what expectations on both sides are…because depending on the amount of money it might have to go to City Council for approval. –USFS employee

The USFS incurred additional planning-related costs not financed by the bond.

"*Even if the bond pays for cutting trees and bringing in contractors, right now we're looking at what we have to do to support those actions, for example timber marking; marking of the boundary, marking of the trees (crews and costs), and*

that, including personnel time, paint, everything, just for Dry Lake Hills, is roughly $450,000. That's just one aspect." –USFS employee

However, financial and personnel resources have been leveraged as a result of the bond payment, accounting for an additional $2.3 million (FWPP Leverage Report, 2015). This additional resource has gone towards completing necessary road improvement projects, project boundary surveying, and personnel costs attributed to the planning process of the FWPP.

"We have been able to go to our regional and Washington levels of our agency and encourage them to fund us for the planning process and for surveys and a little bit of road work and those types of things, knowing that once we get through the planning process, and surveys, and so on, that the City is going to be able to pay for a large part of the implementation. So that ($10 million bond payment) has allowed us to leverage those funds internally. Otherwise, they might not have ever given us those funds because they would say 'how will you ever be able to pay for implementation?'" –USFS employee

In terms of challenges, obstacles, and potential disadvantages, the FWPP partnership has reportedly not been irreversibly hindered or compromised throughout the planning process. Every participant agreed that the benefits of the FS/City partnership far outweighed any additional costs incurred as a result of this partnership, and participants did not report any instances of conflict.

"*Benefits of partnership outweigh these costs, not only with the bond money but with the support and involvement of the community and with the environmental groups, I think those benefits are extremely high and not to be underrated." –USFS employee*

"We've done a pretty good job where every month we update the City Manager and some of those key people about what the (treatment) alternatives are and what the (Draft Environmental Impact Statement) analysis is. If anything it's really helped us as a forest service because they bring a good outside perspective from the public." –USFS employee

Advantages of Partnership

Respondents reported multiple advantages to the USFS/City partnership throughout the planning process. Common themes included process-oriented outcomes

such as elevated efficiency, accountability, and public outreach, as well as general outcomes such as fire risk mitigation and national recognition. Respondents emphasized the fact that this project would not have ever been considered without the bond and the ensuing partnership.

> "*Funding from the bond is a unique opportunity. We probably would not be working on this area if it weren't for the bond. We have a lot of area that needs to be restored, a lot of areas where tree densities are much too high, and we can do a lot more in other areas for the same amount of money, and there are other areas that are more of a risk to communities in terms of fire entering a community, so that is really where our focus has been- areas where we can treat more acreage that would be impacting communities more directly from fire. So this is more of a secondary impact concern, really, a fire in this (FWPP) area is probably not going to burn into town but it's that post-fire effect that would really affect town." –USFS employee*

The USFS and City of Flagstaff Fire Department have been involved with planning and implementation of forest treatment projects in the Flagstaff area for decades (FWPP website, 4FRI website). Actors have productive working relationships, especially within the partnership between the City and USFS; mutual respect, understanding, and trust were mentioned during interviews as contributing to the project's success, and conflict within the project was not reported by any of the interview respondents.

> "*I wouldn't describe it as conflict, we have had a lot of discussions about priorities and approach and different considerations but from my perspective its been a really good working relationship and I wouldn't use the word conflict to characterize it." –USFS employee*

Flagstaff has been a proactive community in terms of local collaboration in forest management. Traditionally, large agency landowners such as the USDA Forest Service would be chiefly responsible for planning, financing, and implementing forest treatment actions, as well as conducting post-implementation monitoring. This type of in-house forest management allows for public comment during NEPA analysis, but typically does not work collaboratively with stakeholders, including the public, other government

agencies, or NGOs. A problem with traditional forest planning and management is that public interest groups are increasingly likely to exercise legal rights that delay or halt the implementation of land management plans through lawsuits or appeals (Selin and Chavez, 1995). This is a major consideration of the project management process, as losing bond money due to litigation would certainly result in negative public opinion of local forest management and future forest management partnerships.

> "*Normally we almost do our analysis in a box and then involve the public and our partners during key points, so this is a little different in that we have a representative of the City on the Interdisciplinary Team who is at meetings fairly regularly, but then also if there's any small decision we usually check in with the City." –USFS employee*

The FWPP has reportedly been open to recruiting all stakeholders who wish to contribute to monitoring and public outreach, but the institutional design of the project and the very nature of the partnership prevent full collaboration in the planning process. The USFS is not able to compromise when it comes to delegating final decision authority, but they reportedly made efforts to incorporate feedback from NGO stakeholders and the public alike before the formal comment period on the Draft Environmental Impact Statement (DEIS), in order to address potential issues.

> *"…We have decision authority on the national forest and we can't delegate that decision. No matter what, we have to evaluate all actions on the National Forest and decide what's acceptable and what's not." –USFS employee*

Interviewees reported that the FWPP partnership has made a substantial effort to increase public outreach and education in order to maintain transparent relationships, employing all potential resources and outlets to keep them abreast of concerns or issues, helping facilitate trust and understanding with the public.

> "*FWPP has definitely put more money into the outreach and education component, and into monitoring. A lot more than traditionally, and benefits definitely outweigh the costs." –GFFP Board Member*

> "*If you talk to the council, it (public involvement) is extremely important, because we are staff and they are the ones with their jobs on the line. They all went on record in favor of the project publicly, so they're going to be the first ones to ask questions about accountability." –City employee*

The planning timeline of this project was aggressive in comparison to traditional forest treatments. From start to finish, the FWPP planning process has moved from initiation to a Record of Decision (ROD) in 32 months (November 2012- September 2015). Respondents reported having never been a part of a project of this size and scope that moved as quickly.

> *"Normally, a project of this size with this level of analysis would take multiple years, up to 5-10 years, depending on how it is on the priority scale, and here (FWPP), we estimate to have a decision (in just under 3 years)." –USFS employee*

Timely accomplishment of planning forest treatment actions is reportedly enhanced since the FWPP was is considered a national priority project by regional and national representatives from the USFS. This means that the regional and national offices of the USFS are committed to seeing this project succeed, and are willing to provide additional resources to support this effort.

> *"One of the other advantages to having the City as a partner is that it has enabled us to make FWPP a forest priority, and dedicate a team specifically to this project to be able to meet really aggressive timelines." –USFS employee*

> "…(FWPP *representatives) talked to the undersecretary Robert Bonnie, and he had the FWPP resolution framed and sitting on his desk. He said, "I pull this out for meetings all the time to show that this is how to do it right". So he said, if you get in trouble, give me a call and we'll see what we can do." –City employee*

The FWPP has not only attained recognition from the highest levels of the agency, but has also peaked the interests of land managers facing similar forest health conditions and financial insufficiency issues. As communities begin to recognize the

potential community wellness impacts of unhealthy forests and watersheds, these collective action systems were mentioned as a possible solution.

> *"The USFS is being asked all over the West, 'what are the agreements being used? How are they being managed?' People want to do these partnerships but I think its fair to say that across the FS, there is an uneven understanding of how you can use contracts and other money transfer mechanisms efficiently. Everyone is looking at FWPP as working really well, but they are really interested in knowing the gritty details of how these agreements are put in place. Breaking institutional boundaries and transferring that knowledge in the West is an opportunity." –ERI employee*

> *"It was pretty significant that we took the framework for forest treatments and turned it upside down, in the sense that you rely on the federal government to manage federally managed land and the City of Flagstaff manages City of Flagstaff owned land, and I think it's a good illustration of how things are changing in the country. It's about cities and towns and counties taking their own destinies into their own hands. Not that we are turning our back on the FS and the federal government, we need them, we need them greatly, but it's a different type of network than we've seen in the past. The reason we wanted to convene and address this problem is because we realize that local action was essential to make the kind of impact we really needed, and put aside the traditional way of thinking about policy and governance, and who's responsible and why is it not fair. We really put that aside and focus on what are the impacts and how can we adapt and respond to those impacts? Because regardless of whose land it is, those impacts are ours." –City employee*

Discussion/Recommendations

FWPP incorporates multiple agencies and areas of expertise, which allows for different methods of procurement, enhanced monitoring, and new research opportunities in mixed conifer ecosystems. FWPP also has also been very time-efficient; the planning process has progressed at a considerable rate compared to traditional fuels treatment projects. While the planning process for most projects of this scope and size reportedly often take more than five years to complete, the FWPP was able to reach a Draft Record of Decision in only 32 months (November 2012-June 2015). Creating a Project Manager position was also beneficial, as projects of this scope and scale often need to appoint an

organized person who can accomplish goals independently as well as delegate work to others (Steelman and Kunkel, 2004).

Local and federal government actors determine the influence that third-party organizations, interests, and individuals have on democratic function (Lowndes and Wilson, 2001). The FWPP brought together a large diverse group for multi-party monitoring efforts, as well as during the concept and planning phases. The traditional definition of collaboration involves the pooling of tangible resources, money, information, etc., by two or more stakeholders in an effort to solve a problem that neither party can solve alone (Gray, 1985). Although the FWPP fits this definition because it was governed by a partnership of two stakeholders that came together to address a problem that neither could address alone, it is not truly collaborative. Collaboration implies a joint decision-making approach to resolving problems, where there is shared power between the parties and each party takes collective responsibility for their actions and their outcomes (Selin and Chavez, 1995). In the FWPP, decision-making authority regarding treatment implementation on federal lands is not shared. The US Forest Service is liable for any action take on lands that they own, and thus have completed most of the planning in a figurative box.

Although the USFS officially planned and analyzed prescriptions and alternatives, they were reportedly open to considering input from the public, stakeholder group, and City throughout the process. Shared goals among a diverse and well-organized stakeholder group led to formalized roles and collective action in the FWPP, with the potential to result in strong institutions and high social capital (Putnam, 1995b). Since agency boundaries can be restrictive to accomplishing collaborative objectives,

compromise was struck by working to incorporate legitimate opinions, comments, and concerns of stakeholders from non-governmental organizations (NGOs) and the general public outside of formal comment periods. In this instance, a non-traditional project management partnership model was able to incorporate public and stakeholder input into planning objectives on an accelerated timeline, utilizing a multi-party monitoring group to evaluate outcomes. A long track record of organizational collaboration and public outreach in Flagstaff among members of the partnership has provided a foundation for local agency ability for organization and authority, as well as the capacity for institutional design, monitoring, and accountability.

Flagstaff has proven to be an excellent launching pad for PWS systems that require local involvement and approval. However, there are several potential theoretical limitations to the quality of this model that could threaten effective application in other communities. For instance, the bond-financed model is entirely dependent on the attitudes of individual voting constituencies and the implementation and administration capacities of local and federal actors. Considering the strengths of the political culture of the community will prove essential to project success. The viability of enacting a PWS model is also dependent on a community's proximity to the forested watershed and the impacts that the potential benefits of treating the watershed may or may not have. As such, it is important to customize the individual project to the characteristics of the scenario in order to ensure a well-functioning system, forming the correct institutional boundaries for the biophysical conditions, community attributes, and rules-in-use (Ostrom 2008).

The FWPP has been able to leverage over $2.3 million in additional resources, maximizing the public's investment by ensuring its use for implementation costs. While this may seem like a win-win scenario, this additional money had to be redirected from other functions. Much of it was earmarked by the USFS and directed to the project, potentially undercutting other objectives critical to the USFS mission. The FWPP may have shifted attention away from other priority fuels reduction treatments; at the local level, agency managers from the City of Flagstaff Fire Department and from the USFS Flagstaff Ranger District were redirected to the FWPP. This potentially limits their resource capacity for providing other needed forest treatments to the community.

While caveats to the model are inherent and should be asserted, the FWPP was designed effectively to maximize the strengths of the community. The project achieves several requisite factors critical to successful PWS systems, including ownership, tenure security, multiple levels of public and agency cooperation, effective enforcement of rules and regulations, monitoring, strong leadership with capacity for local organization, expectation of benefits, common interests, and local authority (Pagdee et al. 2006 ;Vatn, 2010). The findings of this research support the idea that institutional support provided by prior partnerships serves to reinforce collaboration and engagement between actors, as well as enhancing volume and activity levels of future projects (Lubell et al. 2002). Heightened public outreach and education efforts and new working relationships with stakeholders and NGO's provide experience and credibility for both agencies within the local forest management community, and can help facilitate public acceptability for ongoing maintenance costs and other forest treatment projects.

Institutional design of the FWPP is unique because of the bond payment coupled with the USFS/City planning partnership. Exploring creative institutional design opportunities may help cash-strapped land management agencies in Western communities overcome federal failure, institutional gridlock, and budgetary shortfalls that prevent successful mitigation of significant public health and safety threats that result from wildfire in forested watersheds. While the partnership structure prevents truly collaborative planning, addressing and incorporating stakeholder comment and concern throughout the entire planning process (not just formal NEPA comment periods) can have potentially significant timeline returns. Since local taxpayers primarily finance the project, it is important for the partnership to address concerns throughout the planning process in order to avoid legal delays that could potentially consume the bond and interfere with project success. The FWPP has been recognized as a top priority for the US Forest Service, and it has been called a model for community action in forest management. However, the applicability of any PWS model is contingent upon a host of variables. While the FWPP has the potential to act as a template, anyone exploring PWS options in the United States should keep in mind the importance of customizing institutional design and governance structures to the individual needs of the at-risk community.

CHAPTER THREE
MANUSCRIPT TWO: UNDERSTANDING GOVERNANCE OUTCOMES OF THE FLAGSTAFF WATERSHED PROTECTION PROJECT

ROY MILLER

Abstract

The Flagstaff Watershed Protection Project (FWPP) is a bond-financed wildfire risk mitigation partnership and Payment for Watershed Services (PWS) program in Northern Arizona; the FWPP is the only forest management project that has ever utilized a bond as the financial mechanism in conjunction with a partnership governance structure. Overall performance outcomes such as efficiency, efficacy, and accountability have not been previously explored for this type of partnership in the context of bond-financed PWS projects, and this research aims to bridge the gap. This study explored the perspectives of stakeholders involved in the FWPP using open-ended interviews of key informants (n=9), in addition to a Likert-scale type online survey disseminated to a broader group of stakeholders (n=52). We find that most stakeholders agree that project implementation will be effective, and has been efficient and accountable throughout the planning process.

Introduction

Communities in the western US are realizing the preventive potential of alternatively financed, collaboratively managed forest treatment projects as a solution to overcoming failed forest management policy (Busenberg, 2004). Currently, there are only four fire risk mitigation partnership programs in the US (Bennett et al 2014). Only one of these projects utilizes (or has ever utilized) a municipal bond as the financial mechanism, the Flagstaff Watershed Protection Project (FWPP). Flagstaff, Arizona, is a community

with a long history of wildfire threat, where local action in response to wildfire risk has been extensive and sustained. After 73% of the City's voters approved Bond 405 (later to become the FWPP), a partnership formed between the City of Flagstaff and the US Forest Service to govern planning and implementation processes.

Aggressive fire suppression, invasive agricultural practices, and old-growth logging on federal lands have resulted in tinderbox-like forests extremely prone to high-severity wildfire (Covington et al, 1997). Land management agencies such as the US Forest Service have been unable to finance restorative treatments due to budget shortfalls and prioritization of wildfire suppression action (Gorte 2013). Federal budget structures have also been slow to respond to the emerging demand for watershed treatment programs in National Forests (Steelman and Burke 2007), largely due to the failure of accurate market valuations of watershed services (Kline et al 2009).

Payment for Ecosystem Services (PES) systems are a voluntary transaction where a well-defined ecosystem service is bought by a minimum of one buyer from a minimum one provider, who must secure the provision of said ecosystem service (Wunder 2005). PES programs, which assign economic value to ecological functions, have been effective in communicating the worth of these services to local policy makers (Ostrom 1990; Wunder et al. 2008).

PES is quickly emerging as an effective policy tool for agencies or large corporate beneficiaries to conduct projects aimed at restoring natural capital. However, there is not much literature available that can help inform policy for these new systems or provide evaluation mechanisms. Further, there is even less research available that analyzes stakeholder perspectives within a single case. This article applies principles and

performance measures of Ostrom's Institutional Analysis and Development (IAD) framework to inform interview and survey questions regarding the overall institutional performance of the Flagstaff Watershed Protection Project (FWPP).

Forest Health, Water Supply and Fuels Treatment

Catastrophic, stand-replacing fires accompanied by erosion and flooding have become normative to forests that once burned frequently and at low intensities. Droughts are becoming more severe and fire suppression has caused exponential rises in forest stand densities, facilitating stand-replacing, catastrophic mega-wildfires such as the Rodeo-Chediski and the Wallow Fire. Since ninety percent of streams in Arizona flow from forested watersheds (Sedell et al. 2000), water security can be largely dependent on forest health. Fuels reduction treatments have demonstrated that in addition to reducing fire severity upon entry (Pollet and Omi, 2002), treatments can improve the potential for snowmelt runoff. Fuels treatments create conditions conducive to snowpack accumulation, reducing canopy cover and sublimation, and reducing overall tree density and evapotranspiration (Hibbert, 1965; Bosch and Hewlett 1982; Zou et. al., 2010).

Current warm drought conditions and decreasing water supplies are expected to continue in the Southwest, and water-related forest disturbance events (i.e. insect and pathogen outbreak, wildfire) are expected to increase in trend and significance (Williams et al., 2010; Allen et al. 2010). Healthy forested watersheds provide numerous ecosystem services essential to the proliferation of forest communities (Deal et al. 2012), and crown fires in forested watersheds can impact the provision of water resources. Thus, restoration

of these watersheds is of critical importance in the southwestern U.S. and other semi-arid regions to maintain necessary ecosystem services (Agee and Skinner, 2005).

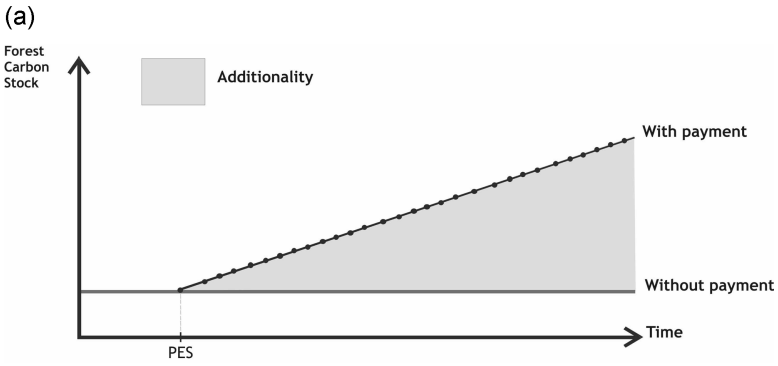
Costs of wildfires are rising dramatically- between 2000 and 2014, wildfire suppression alone cost over $22 billion (NIFC, 2014). Inadequate funding for preventive treatments such as fuels reduction and overwhelming post-fire costs to communities have all highlighted a wicked governance problem with tremendous social, ecological, and economic impacts (Gorte 2013). New social-ecological systems may represent an alternative method of securing financial resources for needed public safety and sustainability services. The presence of a healthy forested watershed can also have a significant economic impact for communities. In forested watersheds, the implementation of forest treatment projects can reduce capital, operational, and maintenance costs for public utilities, as well as improve water quality (Postel and Thompson, 2005).

PWS and Governance

Payments for Watershed Services (PWS) projects represent an approach to governance that seeks alternative (public and/or private) funding for watershed enhancement with the intent of increasing or securing water resource provision. PWS systems are voluntary transactions between service users and service providers, conditional on agreed rules of natural resource management, for generating offsite watershed services (Wunder 2014). PWS systems place economic value upon ecological functions, which translates abstract natural services into terms that can be better understood by those outside the scientific community (Porras et al. 2008; Postel and Thompson, 2005). Attributing market values to ecological services has proven effective at communicating the worth of these services to

policy makers and the public (Ostrom 1990; Wunder et al 2005). Implementation of these projects usually provides positive additionalities, which is the net positive difference that results from economic development intervention (Figure 7). Economically speaking, a buyer pays a seller to provide goods or services in exchange. In the case of forest management, payment results in fuels management actions, which have the net benefit of protecting communities and enhancing ecosystem function.

Figure 7: Wunder (2005) representation of projects with positive additionality.



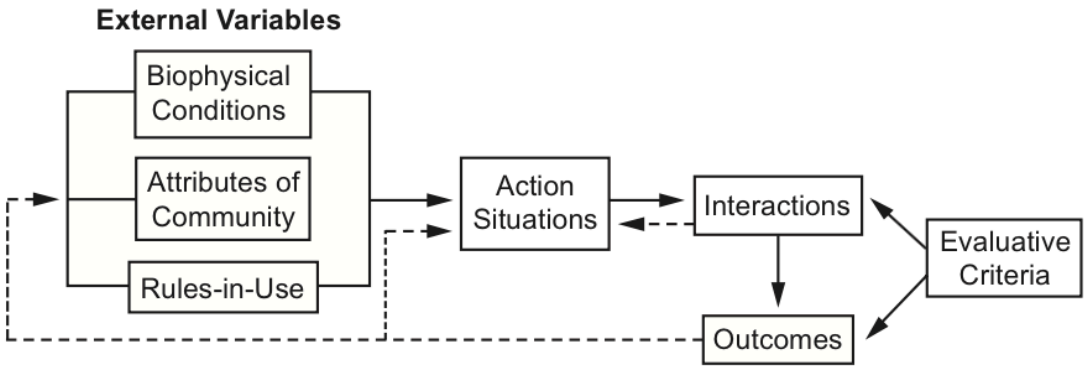
PES systems are theoretically a market solution for environmental problems, but practice has shown that effective systems usually require involvement from a local intermediary, such as municipal water utilities or the municipality itself (Steelman and Kunkel, 2004; Bennett et al. 2014). Problems inherent with trading environmental services for money include high transaction costs between users, sellers, and providers, and extremely high costs of ecosystem service provision (Vatn 2010). Opportunity and transaction costs include the costs of contract negotiation, procurement, scientific studies, monitoring and enforcement, and costs associated with public outreach (Jack et al. 2008).

In the case of many communities in the western United States, the primary landowner and provider of watershed services is the federal government; this includes the US Forest Service, Bureau of Land Management, and Bureau of Indian Affairs. This

market conditionality presents a complication, as federal government agencies are legally unable to solicit funding from non-federal institutions, in accordance with the Federal Advisory Committee Act (FACA). Furthermore, when revenues to fund forest treatments are collected from rate/taxpayers, this technically constitutes a double-payment to the federal government for correcting problems brought on by failed federal policy. Hence, accountability and transparency on the part of the intermediary is highly important in these systems, as they are the financial manager and distributor of public funds to the federal government.

As these new institutional designs for collective action and governance emerge, it is important for researchers to be able to employ evaluative criteria by which to analyze institutional performance. Elinor Ostrom's (1990) Institutional Analysis and Development (IAD) framework offers a useful means for analyzing institutional design arrangements for governance of common pool resources, distinguishing rules and evaluative criteria for generalized comparison (Figure 8).

Figure 8: Ostrom's (2011) Institutional Analysis and Design Framework.



Ostrom et al. (1994) describe the IAD framework beginning with the action situation, a social situation where individual actors interact to exchange goods and/or services, discuss strategy, solve problems, or fight. In the case of the Flagstaff Watershed

Protection Project (FWPP), Actors are simply the representative agency or corporation of the individual conducting the action. Rules are problem-solving statements that determine what actions are required, permitted, or prohibited, and describe the ensuing penalties for breaking these rules (Koontz 2004). Three types of evaluative criteria are identified within Ostrom's IAD framework: transaction costs (information, coordination, and strategic costs), overall institutional performance (efficiency, equity, accountability and adaptability), and policy impacts (Imperial 1999; Mayrand and Paquin, 2004).

Institutional Performance Outcomes

Efficacy is defined as "the ability to produce a desired or intended result" (Merriam-Webster, 2015). Efficacy is substituted for effectiveness, since effectiveness cannot be reliably measured for treatments that have not been implemented. For example, if stakeholders are unable to say whether fuels treatments have achieved their desired effect because the work has yet to be done, they might be asked to project their opinion on the most likely outcome. In the context of PWS payments, effectiveness is often measured in cost-effectiveness and environmental effectiveness. Environmental effectiveness is determined by whether a project is able to deliver a set level of environmental benefits according to physical measurements. Cost-effectiveness requires a project to achieve the same level of environmental benefits at lower costs than other possible projects and measures policies solely on the basis of how cheaply a policy achieves its goal. This is separate from cost-efficiency, which weighs costs and benefits of a particular policy (Jack et al. 2008).

Efficiency can be considered as the difference between the gross welfare effect of the project and the costs incurred (Wunder et al. 2008; Pascual et al. 2010). Efficiency can be split into two distinct categories, time-efficiency and cost-efficiency. Time-efficiency describes whether the project was handled in a timely manner, and whether the timeline allotted to the project was sufficient or excessive. Cost-efficiency "is determined by the magnitude of net benefits associated with allocation of resources" (Ostrom, 2011). Buyers and sellers (or users and providers) in PES systems must consider different aspects of efficiency when deciding to engage. A buyer's considerations are made up of costs and project effectiveness, weighed against alternative opportunities to solve the problem. Sellers must determine, among other things, how these ecosystem service provision activities will affect other land use activities in the project area (Van Noordwijk et al. 2012).

Accountability is a centerpiece of legitimate governance, and is defined by compliance, transparency, and responsiveness to stakeholders (Radovich et al. 2006). In a democratic system, officials should be accountable to citizens when manipulating, utilizing, or developing shared natural resources. Furthermore, institutional systems that aggregate project information have been shown to simultaneously actualize efficiency as well as accountability goals by promoting information redistribution to the public (Ostrom 2011). Partnership objectives should align with project goals, while developing a legitimate and credible decision-making process. Protocols for communication and accounting should be established, ensuring routine performance evaluations are conducted, as well as monitoring and integrity measures with public assets (such as bond money), and stakeholders should be engaged frequently for input (Radovich et al. 2006).

Including formal partners and external stakeholders in the decision-making process supports legitimacy and collaboration. Furthermore, highly transparent partnerships provide accurate, timely, and useful information to stakeholders (Steets, 2004).

Flagstaff Watershed Protection Project

The forests around Flagstaff, AZ have experienced multiple severe wildfires that have threatened community safety. Fuels treatments around the community have helped reduce the risk and effects of these wildfires, and fuels treatment in Wildland/Urban Interface areas has become a priority for local agencies. In June 2010, the Schultz fire engulfed 15,051 acres of dense stands of ponderosa pine and mixed conifer in the San Francisco Peaks, near the City of Flagstaff. The high-intensity, high-severity burn occurred on the Coconino National Forest, in an area proposed by the USFS for the Jack Smith/Schultz timber sale. Environmental groups legally delayed this sale because of controversial large-diameter tree removal. After the fire, Flagstaff experienced the 4th wettest monsoon season on record, resulting in debris flows, severe erosion, and residential flooding. Fire suppression and flood mitigation alone cost $58.6 million (Combrink et al. 2013). Currently, two watershed areas around Flagstaff (Dry Lake Hills and Mormon Mountain) are both at risk of high-intensity, high-severity wildfire. These areas will not be included as part of the Four Forests Restoration Initiative (4FRI), however, which is a landscape-scale initiative to restore 2.4 million acres of ponderosa pine. Severe wildfire in these areas would likely increase sedimentation and debris flow into Flagstaff's primary surface water source, and extensive flooding and debris flow throughout much of the City, including the downtown area.

This awareness of forest health issues and the impacts from the Schultz Fire both contributed to the creation of a PWS program in Flagstaff. In 2010, Northern Arizona University researchers organized a workshop of USFS representatives from the local, regional, and national level. They were engaged in a discussion about PWS feasibility in the Flagstaff area, and results were positive. The idea for a PWS program in Flagstaff was discussed at a City workshop in 2012, and the City Manager and other department officials made the decision to propose a bond-financed PWS project to the Flagstaff City Council. On November 6, 2012, the Forest Health and Water Supply Protection Project went on the ballot as a $10 million bond (Item 405) with the intent of providing financial resource for conducting fuels treatment on approximately 10,544 acres within two priority watersheds (Dry Lake Hills and Lake Mary) in the Coconino National Forest. Bond 405 passed with an overwhelming 73.6% majority, and is the first national PWS system to be bond-financed or voted on by the public.

The Flagstaff Watershed Protection Project is one of four currently ongoing projects in the US that can be classified as a fire risk mitigation partnership program, the others include the Forest Restoration Memorandum of Understanding (Aurora, CO), From Forests to Faucets Program (Denver, CO), and the Santa Fe Watershed Management Plan (Santa Fe, NM) (Bennett et al. 2014). Studying the FWPP provides a case study of alternative governance and unique institutional design in the developing arena of Payment for Watershed Services (PWS) projects and alternatively financed natural capital restoration and enhancement projects.

Study Purpose

Since social-ecological systems are relatively new in the forest management policy lexicon, evaluation of performance can be useful for informing future projects. The IAD (Institutional Analysis and Development) framework for analyzing institutional design identifies three evaluative criteria for determining project outcomes: transaction costs, overall institutional performance, and policy impacts (Imperial 1999; Ostrom 2011). This section aims to answer the following questions: What are the FWPP stakeholders' perspectives regarding the following outcomes of governance: efficacy/effectiveness (institutional and environmental), efficiency of the planning process (time and cost), and accountability (financial and public)? How do these responses vary according to background characteristics like agency affiliation, knowledge of and participation in the FWPP, and duration of experience in forest management?

Methods

This research utilized a mixed-methods approach for data collection and analysis (Creswell 2013). The first portion of the research is composed of open-ended, semi-structured interviews with nine key participants throughout the planning process (Appendix A). The second portion is a 32-question closed-ended survey (Likert-scale type questions) that gathered perspectives from 52 project stakeholders (Appendix B). Qualitative analysis of interviews is conducted using content analysis and coding (Kaplan 1964; Miles and Huberman 1994; Westbrook 1994), and quantitative analysis of the survey is done with Statistical Package for the Social Sciences (SPSS).

Key Informant Interviews

In-depth, semi-structured interviews with highly engaged participants in FWPP planning (n=9) were conducted in order to compare project institutional design with project function. Interviews are inherently flexible as a data collection method, and allow the researcher to probe, clarify, and create new questions immediately based on responses (Glaser and Strauss, 1967). These key-informant interviews were essential for illuminating management-level approaches to problem solving, and provide deeper context for participant interaction and project dynamics. Interviews were conducted in spring 2014 and covered such topics as public outreach and involvement, accountability, collaborative efforts, challenges and obstacles, efficiency, and costs (Ostrom 1990),

Respondents were asked to contrast their experience with FWPP to traditional models of forest treatment, comment on expected outcomes for the project, and also to discuss the role of each partner in the project and how the partnership interaction helps or hinders the planning process. Several interview questions focused on challenges and obstacles that result from the partnership and bond payment, in order to gain an understanding of new problems that may arise from utilizing voter-approved payment solutions with partnership governance structures. Furthermore, respondents were asked how the public role has evolved, changed, and affected governance of the project, how decisions are made to maximize accountability to the public, and whether the partnership was able to facilitate greater public involvement.

Stakeholder Survey

An online survey (n=52) was conducted to augment the interview results, and was disseminated to individuals identified as having been included on the monitoring group emails. This survey was conducted spring 2015, and provides us with quantitative social

data across several categories from a variety of stakeholders. The first set of survey questions were designed to gather background information on each respondent and allow us to compare respondents based on background information such as level of knowledge about FWPP or the nature of their involvement in the project. The second section reports information regarding stakeholder perceptions of environmental effectiveness of the FWPP, and the third section gauges whether FWPP was effective as an institution. The survey then asks about project efficiency, use of resources and timeliness, as well as accountability outcomes and instances and effectiveness of public outreach. Fifty-two responses were collected across 32 data variables. Most questions were ordinal, using a 1-5 Likert scale with a "don't know" response. Response categories used level of agreement, level of importance, and other question-specific response labels.

Data Analysis

Qualitative data analysis was conducted by thematically coding documents and interview transcripts by hand. Coding is a process of categorizing text into relevant patterns and dimensions by utilizing a structured and inductive process that organizes text into principal themes and sub-themes with graduated level of detail (Miles and Huberman, 1994). Converging process-related patterns and structural dimensions of institutional design emerged from the FWPP foundational documents and interview transcripts that allowed insight into project design and function.

Quantitative survey data was analyzed with SPSS (Statistical Package for the Social Sciences) Version 22, a social science data statistical analysis program. This program is designed to provide descriptive and inferential statistics for survey questions. Survey questionnaires were first transcribed into a Microsoft Excel spreadsheet, and were

then imported into SPSS for statistical analysis. Data were analyzed for descriptive statistics, but also tested for significant relationships among variables using chi square tests of independence. A variable was created that separates members of the FWPP partnership from non-partners. Partners include representatives from the City of Flagstaff, USFS, Greater Flagstaff Forests Partnership (GFFP), and NAU Ecological Restoration Institute (ERI); non-partners indicate any other respondent.

A simple index was also created combining the amount of roles and the frequency of a respondent's participation in the project (project roles + engagement frequency = roles and engagement index). Neither variable were weighted, but represent the logic that those individuals who have many roles and are frequently involved are the most likely to be engaged in the process, and would have firsthand knowledge of project function. There were six options for engagement frequency, values listed from high to low:

- Several times a week
- A few times a month
- About once a month
- Once every two months
- My involvement with this project is minimal
- I have not been involved at all

Respondents could select any number of the following eight roles:

- Analysis
- Budgeting
- Coordination
- Implementation
- Monitoring
- Outreach
- Planning
- Other

A corresponding value is attributed to each response category representing engagement frequency, and added to the number of roles in the project. The highest score that a

respondent could achieve for the index was 14 points, and the lowest was 2. The index was divided into three categories: low (2-5), medium (6-10), and high (11-14).

Recruitment and Sampling

Interview respondents were selected purposively due to their status as project officials heavily involved in the planning and design of FWPP. Respondents mainly included members of the steering committee, but others were nominated as a result of their high levels of involvement as project staff. Interview respondents included two representatives from the USDA Forest Service, four representatives from the City of Flagstaff, and one representative each from the NAU Ecological Restoration Institute, Greater Flagstaff Forests Partnership, and U.S. Fish and Wildlife Service.

Survey respondents were selected by gathering email addresses from mass FWPP monitoring group emails and requesting highly engaged participants to provide email addresses of individuals involved in the planning process. This is a technique referred to as "snowball sampling." Most respondents were selected as a result of their interest in being involved with the monitoring group, from the project's beginning to present. Interview participants were then asked to provide a list of respondents who would be helpful to survey as a result of their participation in the planning process, a technique known as "nominated" or "snowball" sampling. A total of 120 online surveys were sent out, with 52 individuals actually replying to the questionnaire (response rate: 43%).

Limitations and Potential Bias

The response rate for this survey was lower than expected. This could limit the perspective of the data by creating response error, since it may primarily reflect the opinions of respondents whose feelings about the FWPP are strong enough to elicit a

response. It could also be reflective of the schedules of forest management professionals in AZ; these are often very busy individuals, involved in numerous projects and receiving hundreds of emails daily. Regardless, it does not necessarily increase the likelihood of bias within the survey, nor does it assume that nonresponse was a result of affiliation, as shown by a non-response bias check (Appendix E). In the case of this survey, low response rate was more likely caused by an external factor and not by response bias; it is quite possible that both respondents and non-respondents alike are essentially a random subset of a full survey sample.

Participant Background

1. Interview subjects

Individuals selected for elite interviews (n=9) were chosen as a result of their status as project officials heavily involved in the planning and design of FWPP. This list primarily includes representatives from organizations within the FWPP partnership (City of Flagstaff, US Forest Service, and contracted NGO's such as Greater Flagstaff Forests Partnership and NAU Ecological Restoration Institute), but also included a federal wildlife agency representative from outside the partnership. Interview participants included USFS Project Manager and District Ranger, Member of Board of Directors, Director of Policy and Partnerships, City Manager and staff, and Flagstaff Fire Department officials. Five females and four males were interviewed. Experience with forest management projects varied, from four to 36 years; average experience of respondents was approximately 15 years.

2. Survey respondents

Surveys were disseminated to potential respondents representing various organizations, including interest groups, NGO's, local and federal land management agencies, municipal water utilities, and private industry (Appendix C). Of the 52 survey respondents, 31% are USFS employees, and 48% are members of the partnership. Members of the partnership include the USFS, City of Flagstaff, and City contractors: Greater Flagstaff Forests Partnership, and Ecological Restoration Institute. Survey participants reported between 0 and 45 years of forest management experience, with a mean of 17.9 years. No relationship between years of forest management experience and partnership affiliation was noted.

Results

Data are presented in order to highlight governance outcomes such as efficiency, accountability, and effectiveness in the FWPP planning process. Analysis of institutional design characteristics is conducted by applying overall institutional performance evaluative criteria to stakeholder perspectives of the FWPP planning process. Results are substantiated with verbatim quotes from interview participants and quantitative representations gathered from survey data.

Roles and Engagement

Most respondents claimed to have between one and four roles (mean=2.76) throughout the planning process, choosing from the following options: analysis, budgeting, coordination, implementation, monitoring, outreach, planning, and other. Respondents were asked how often they were engaged in the FWPP planning process,

selecting from 'I have not been involved at all' to 'Several times per week' (Table 4). Over half (52%) were reportedly engaged 'A few times a month'. These questions were later combined into the "roles and engagement" index. Participants were also asked to report their overall level of knowledge regarding the FWPP planning process; 85% reported to be either "knowledgeable" or "very knowledgeable" about the project, and 15% reported to be "somewhat knowledgeable".

A significant difference was found in engagement levels between respondents representing the partnership and respondents not representing the partnership (χ^2 (2) = 12.71, $\rho < .002$). Those affiliated with the partnership were more likely to have more roles and engage more frequently, and vice versa. Twelve percent of partnership respondents belong to the "low" category of the roles and engagement index, compared to 55% of non-partners (Table 4).

Table 3: Partnership affiliation vs. roles and engagement index.

Does the participant belong to the partnership?	**Roles and engagement index**		
	Low	**Medium**	**High**
Partnership	12%	44%	44%
Not Partnership	55.6%	33.3%	11.1%

Evaluative Criteria and Outcomes

Efficacy/Effectiveness

Efficacy is presented in the survey as respondents' projections of future outcomes or policy impacts related to project goals. Variables discuss environment and policy impacts that treatment will have in accomplishing project goals, as well as project design and management. Overall, respondents had very positive views regarding environmental

efficacy (Figures 9, 10, and 11). The percentages of respondents who agree or strongly agree that the FWPP will help protect City water resources, reduce the risk of catastrophic fire, and reduce the risk of post-fire flooding is 96%, 100%, and 90%, respectively. The mean for each of these questions are very low, indicating that participants are very confident that the FWPP would accomplish its goals (1= Strongly Agree; 5= Strongly Disagree).

Figure 9: Level of agreement that FWPP will help protect City water resources.

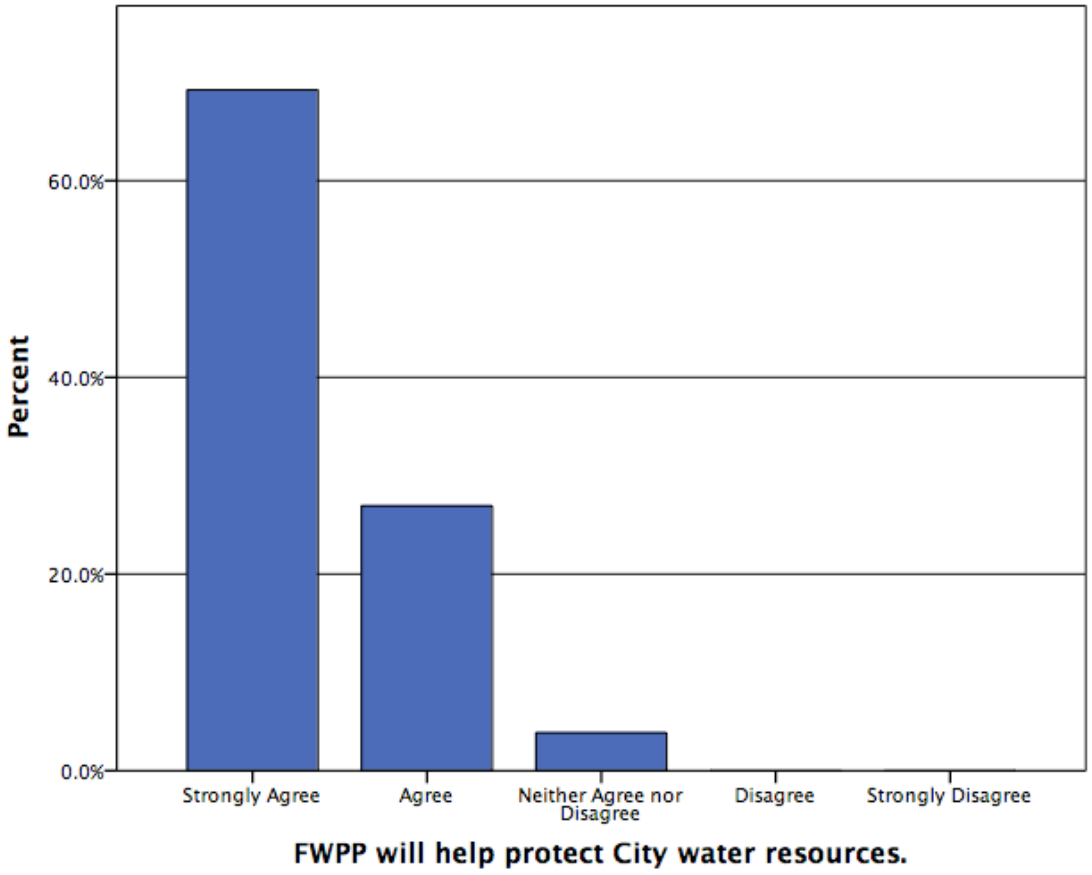


Figure 10: Level of agreement that FWPP will reduce the risk of catastrophic wildfire.

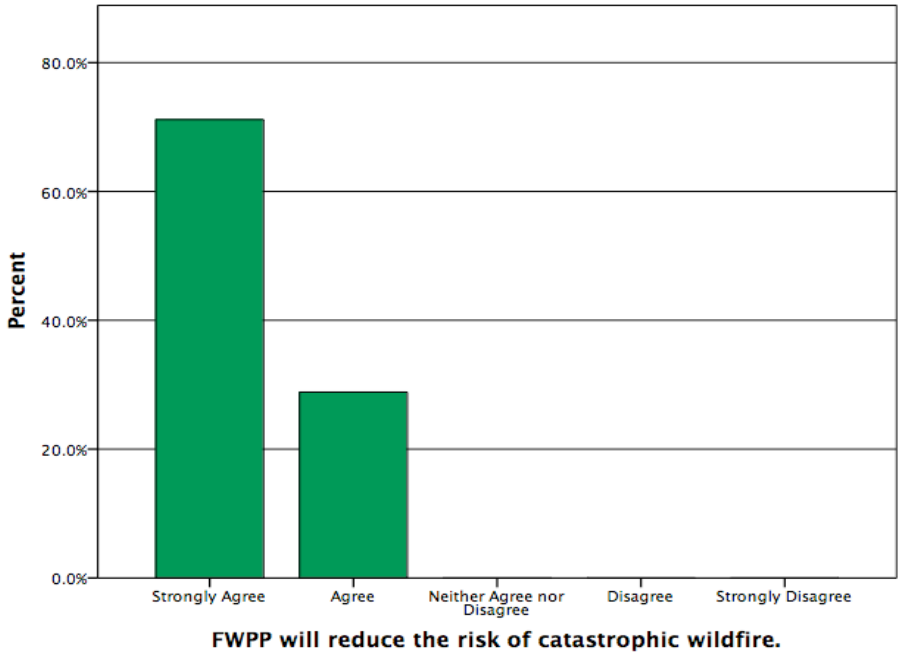
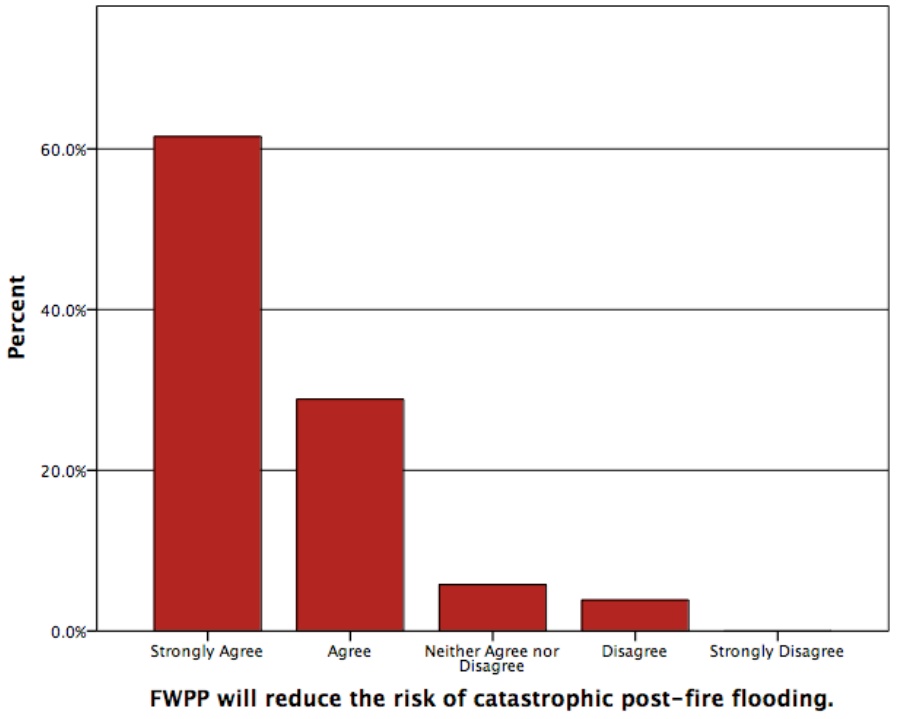


Figure 11: Level of agreement with the statement that FWPP will reduce the risk of catastrophic post-fire flooding



Interview subjects referred to the FWPP as a highly visible project that is gaining attention as a potential model for conducting treatments with limited funding. Seventy-five percent of stakeholders surveyed agree or strongly agree that the FWPP partnership has established a national model for how to accelerate forest treatment projects.

> *"It was pretty significant that we took the framework for forest treatments and turned it upside down…it's about cities and towns and counties taking their own destinies into their own hands. The reason we wanted to convene and address this problem is because we realize that local action was essential to make the kind of impact we really needed, and put aside the traditional way of thinking of policy and governance, and who's responsible and why is it not fair. We really put that aside and focus on what are the impacts and how can we adapt and respond to those impacts? Because regardless of whose land it is, those impacts are ours." –City employee*

However, long term impact of the bond payment amount was questioned, as only 4% of stakeholders surveyed strongly agree, and 37% agree, that the $10 million bond will be enough to cover FWPP implementation costs. This result is somewhat curious, lending to the significance of the efficiencies of voter-approved partnership models, but questioning the effectiveness of the payment amount.

Efficiency

The FWPP planning process was generally regarded to be much faster than other projects similar in scope. Speed is not necessarily the only component of efficiency, but the emphasis that has been placed on getting this project ready for implementation is widely regarded by interviewees as the reason for the rapid planning timeline.

> "*The speed of the project has been fast, faster than usual. There's nothing really magical about the way we have been working with the City that has done it, it's just been the emphasis that we have placed on it. The fact that there's a lot of political interest in it, there's a lot of community interest in it, it's become a priority for us, and so we've been able to focus our resources on it." –USFS employee*

Interview respondents also recognized time-efficiency as a highly important outcome of the planning process. Respondents consistently agreed that the reason why the partnership maintained efficiency throughout is because of an aggressive timeline and dedicated and motivated project leadership and staff. Respondents also stated repeatedly that the FWPP was considered as a priority project by partner agencies, garnering national attention as well as additional financial and personnel support.

> *"One of the other advantages to having the City as a partner is that it has enabled us to make FWPP a forest priority, and dedicate a team specifically to this project to be able to meet really aggressive timelines. Normally, a project of this size with this level of analysis would take multiple years, up to 5-10 years, depending on how it is on the priority scale, and here (FWPP), we are estimated to have a decision (in just over a year)." –USFS employee*

Seventy-two percent of respondents agree or strongly agree that the planning process for FWPP was time-efficient. Seventy-five percent of respondents agree or strongly agree that planning has been more time-efficient than traditional USFS fuels reduction treatment projects. In terms of cost-efficiencies, responses were slightly less positive; 70% of respondents agree or strongly agree that the FWPP planning process has been cost-efficient, and 62% of respondents agree or strongly agree that the FWPP has been more cost-efficient than traditionally managed projects.

Responses to efficiency questions were compared to partnership affiliation and the engagement index, and only the engagement index seemed to show a difference in stakeholder perceptions of time-efficiency (Table 4 and 5). Those more involved in the process (higher score on roles-engagement index) felt more strongly that the FWPP had been time-efficient (χ^2 (8) = 26.78, $\rho < .001$).

Table 4: Roles and engagement vs. time-efficiency.

Roles and engagement index	The FWPP planning process has been time-efficient.					
		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	Low	0%	31.3%	50%	18.8%	0%
	Medium	50%	40%	5%	0%	5%
	High	50%	42.9%	7.1%	0%	0%

Table 5: Roles and engagement vs. cost-efficiency.

Roles and engagement index	The FWPP planning process has been cost-efficient.					
		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
	Low	0%	35.7%	50%	7.1%	7.1%
	Medium	44.4%	44.4%	11.1%	0%	0%
	High	42.9%	35.7%	14.3%	7.1%	0%

Respondents noted that national and local political support for this partnership model and community investment has contributed to leveraging additional financial resources, as an estimated additional $2.3 million has been raised or reallocated to help fund the planning of the project (FWPP leverage report, June 2015).

> *"We have been able to go to our regional and Washington levels of our agency and encourage them to fund us for the planning process and for surveys and a little bit of road work and those types of things, knowing that once we get through the planning process, and surveys, and so on, that the City is going to be able to pay for a large part of the implementation. So that's allowed us to leverage those funds internally. Otherwise, they might not have ever given us those funds because they would say 'how will you ever be able to pay for implementation?'" –USFS employee*

Additional transaction costs of the partnership were reported, such as agreement documents (MOU, Communication Plan, etc.), personnel hours, and increased public outreach, but these costs were also reported to be negligible in light of the potential benefits of the partnership and the increased speed of the planning process.

Accountability

According to interview data, accountability within the partnership exists as a result of mutual responsibilities and shared commitment, as well as internal agency pressures and formal rules outlined in the MOU's. Formal requirements outlined in the MOU's loosely form an accountability structure, which is further supported by internal documents such as the Communication Plan that create informal norms that help regulate communication and engagement between partners. The City Council also plays a role in accountability, as they are the only elected, and therefore the only directly responsible public officials associated with the project.

> *"It really hasn't been an issue, but that's really all the mechanism that's in place right now, is that peer pressure if nothing else, or political pressure for each party to uphold their part of the bargain." –USFS employee*

Most respondents view the FWPP as having been financially accountable and transparent throughout the planning process. Nearly 80% of survey respondents agree or strongly agree that the FWPP partnership has been accountable with bond money spent during planning, and only 17% of respondents didn't know. Seventy-three percent of respondents agree or strongly agree that the FWPP partnership has been transparent about the use of bond money; 21% of respondents didn't know.

Respondents' evaluations of accountability levels for bond resource spending during the planning process were significantly different based on levels of engagement (χ^2 (4) = 18.21, $\rho < .001$). Only 46% in the "low" category agree or strongly agree with this statement, as opposed to 100% of the "high" category that agree or strongly agree.

The City tracks all money being spent from the bond, as well as resources leveraged as a result of the bond. The leverage report is an account of how and how much

additional resource the project has been able to leverage from outside entities. According to a 2015 biannual report released to the public, the partnership has been able to procure over $2.3 million in addition to the $10 million bond. A new job code has also been created on the FS side, whereby all employee hours and project costs can be attributed and charged to this job code.

> "*We do a leverage report every 6 months, and disclose how much has been spent internally. We're not counting city dollars in that leverage report. We know we started with $10 million, so it's about what else is coming from all other entities. For example, Continental Country Club donated a half page out of their newsletter for FWPP. We consider that a leveraged resource. The cost of the ad space will be recorded in the next leverage report as a contribution from the public." –City of Flagstaff employee*

Interviewees mentioned that the public outreach and education efforts associated with this project far exceeded any other project they had been part of. Seventy-three percent of respondents strongly agree or agree that public outreach efforts associated with the FWPP have been above and beyond those efforts found in traditional USFS forest treatment projects.

> *"Due to the significance of the project and the fact that this is voter approved money, we have really emphasized a lot of that outreach and education to the public, hosting forums, public meetings, and going above and beyond what is traditionally required or implemented in the communications. There is the EIS process, with a formal comment and objection involved with that, but we have also been soliciting informal comments and concerns from the public, and working to address those as well." –City of Flagstaff employee*

The partnership focused on soliciting input from outside stakeholders during planning, as 88% of respondents agree or strongly agree that stakeholder input was incorporated in the EIS decision-making. Seventy-nine percent of respondents agree or strongly agree that the FWPP partnership has been very collaborative in decision-making.

Eighty-four percent of respondents agree or strongly agree that implementation of FWPP will represent the best interests of City of Flagstaff residents (Figure 12).

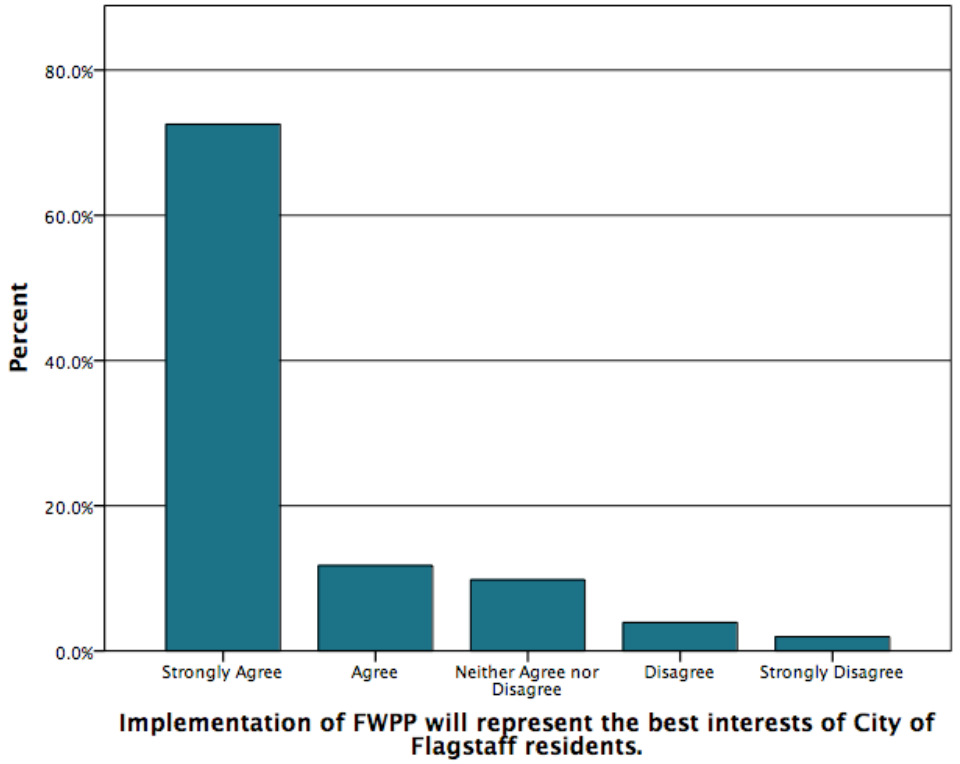


Figure 12: Respondent attitudes on whether public interest is best represented by the FWPP.

The Flagstaff City Councilmembers are the only elected representatives associated with the partnership. Since they approved the bond to be included on the 2012 election ballot, they are accountable to the public for project expenditures and outcomes. Seventy-three percent of respondents agree or strongly agree that City Council was well informed throughout the planning process, but over one-fifth of respondents did not know (Figure 13). Seventy-five percent of respondents in the "high" category of the "roles and engagement" index strongly agree that City Council was well informed, compared to just 15% of respondents in the "low" category. Fifty-eight percent of respondents agree or strongly agree that City Council participated throughout the planning process, but nearly

one-third of respondents did not know (Figure 14). The City, as intermediary, is accountable to the USFS for payment for work accomplished, and also is accountable for reporting information to the public and the City Council. The City Manager's office and various utilities such as the Fire Department and storm water division are held accountable to the Council for completing various project-related tasks. The City is responsible for creating and furnishing reports to the public and among the partnership, showing progress.

> *"If you talk to the council, {public involvement is} extremely important, because we are staff and they are the ones with their jobs on the line. They all went on record in favor of the project publicly, so they're going to be the first ones to ask questions about accountability. Council's approval of the project hasn't changed." –City of Flagstaff employee*

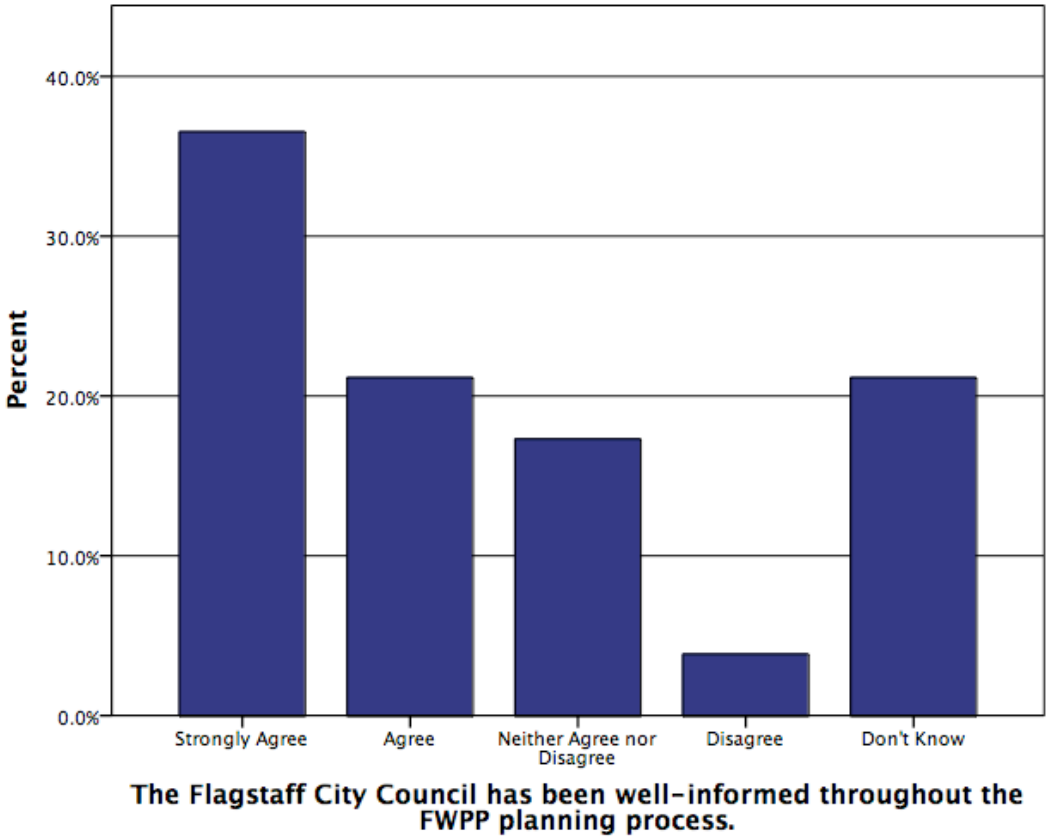


Figure 13: City Council awareness of the project.

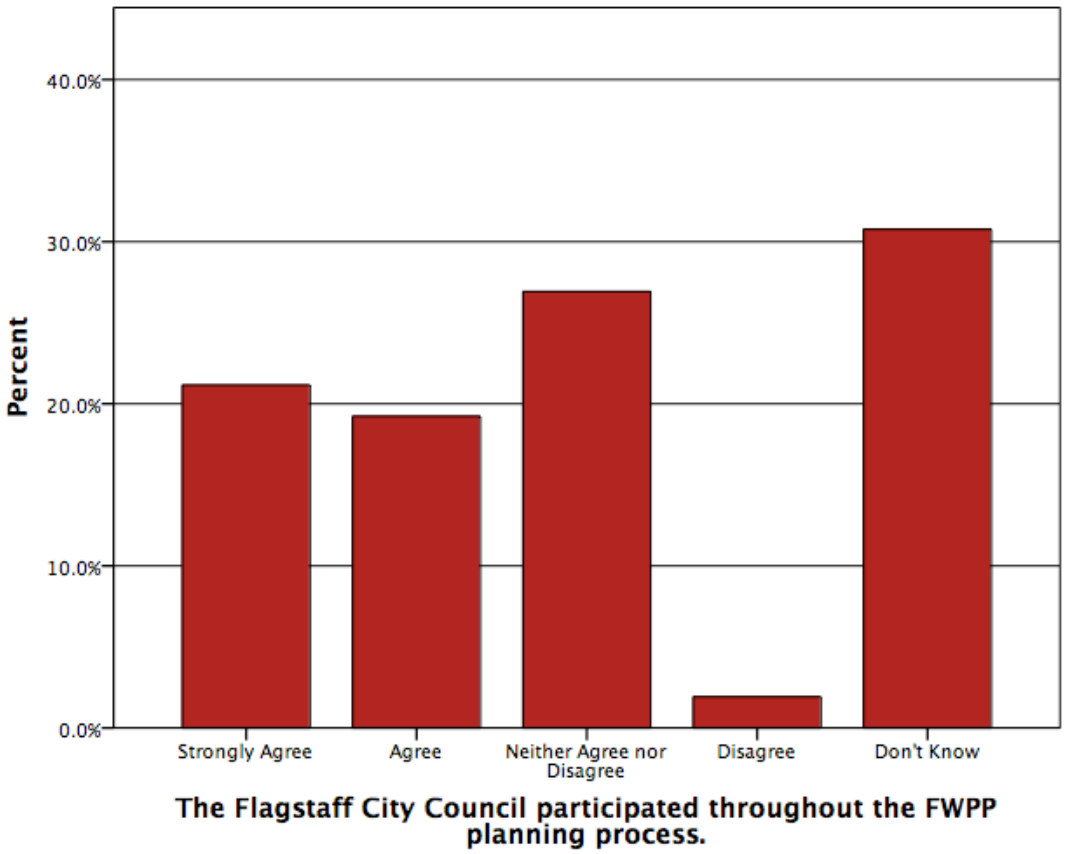


Figure 14: City Council participation throughout planning.

Discussion

Survey results indicate that stakeholders who responded showed high levels of agreement for the environmental effectiveness of fuels reduction treatments upon implementation. The support for the expected policy impacts of project implementation is in accordance with exit polling that asked why residents voted for the bond (Nielsen and Solop, 2012), and shows that the community is well aware of the additional benefits resulting from their investment. Simply, had this bond never been accepted by the Flagstaff City Council, the Dry Lake Hills area and Mormon Mountain areas would go untreated and remain at risk of high-severity, high-intensity wildfire.

One significant policy impact (Imperial, 1999) of the project was shown by most respondents' (80%) belief that the project represents a national model for accelerating fuels reduction. However, far fewer (40%) agree or strongly agree that the bond payment ($10 million) will be enough to cover the costs of implementation. Since no significant relationship to party affiliation or roles and engagement was noted for either variable, these data reflect the idea that while stakeholders believe the project can act as an effective model for at-risk communities around the nation, they are also generally concerned about the long-term effectiveness of the bond amount. However, high levels of support shown by overwhelming public approval in the general election may mean that the bond amount may have been feasibly increased.

Most respondents agree that the FWPP planning process had been time- and cost-efficient, even more so than traditional USFS "command and control" models of forest treatment project governance. Transaction costs such as developing MOU's, communication, road building, wildlife surveys, and public outreach were reported (Jack et al. 2008), but respondents claimed that these costs were offset by partnership benefits. The FWPP featured several key principles of efficient PWS systems, including untargeted payments focused on large land management entities, and organized investment in a full bundle of ecosystem services across landscapes (Turner and Daily, 2008).

Various networks and lines of accountability exist between and among FWPP stakeholders. Accountability is a system of more or less coherent rules that ask "who, to whom, and how?" Accountability is an essential part of legitimate governance and decision-making, and accountable projects have been shown to require that partners align

their objectives with the goals of the project and develop a legitimate and credible decision-making process (Chan and Pattberg, 2008). The FWPP was formed as a result of collective action between local government and community actors, and it relies on an internal decision-making process whereby outside agencies may provide input but USFS retains ultimate decision authority. The buyer (public) pays an intermediary (City) to finance forest treatments conducted on lands owned by the USFS (provider). Since additional money was leveraged by the USFS to pay for planning, there are multiple levels of accountability on the USFS side to consider. Traditional accountability structures are at play within the agency: money earmarked from the Washington Office and Regional Offices of the USFS should result in flows of information and positive outcomes from the project. The USFS, as the provider, should maintain accurate and timely reporting to the City, in order to show accountability for work funded through the bond.

As it stands, the only individual actors formally responsible to the public for the success or failure of the FWPP are the City Council. This is because councilmembers are the only elected officials in the project, and directly represent the intermediary to the voters. However, as a result of term limitations it is unlikely that councilmembers who voted to approve the project will be the same ones who may eventually be held accountable for the successes and failures of the FWPP. Thus, keeping these individuals highly informed and engaged throughout the planning process is important - if those held responsible are unaware of how the project has manifested during planning and are relying on infrequent, incomplete or inaccurate information, there is a higher likelihood that support for forest treatment partnerships like this one will wane.

It is essential to implement protocols for communication and accounting, evaluate performance routinely, monitor and assure integrity of public assets, and engage stakeholders frequently for input (Radovich et al. 2006). The most important formal measures of accountability for the FWPP include the MOU's, which structure the project and provide a breakout of roles and responsibilities, as well as the formal communication, monitoring, and reporting rules and norms created internally. Communication in the FWPP is regulated by a joint plan developed by the two agencies. The City keeps track of resources being used from the bond, and is also keeping a report of costs leveraged, and the USFS is keeping track of bond-related expenses via a new budget code, or account. Formal rules such as mandatory reporting and reviews are outlined in the FWPP MOU, and include annual revisions to the MOU and other foundational documents. A multi-party monitoring effort based on voter and stakeholder input has also been established, in order to ensure that the partnership is representing the best interests of stakeholders and is responsible for actions taken. When surveyed, most stakeholders believed that the project has been accountable and transparent so far; it is interesting to note that as a participant becomes more involved in the planning process, their belief that the partnership has been accountable increased.

Despite that the group responsible for the planning process was not a collaborative group in the traditional sense, but rather an exclusive bilateral partnership, a high level of collaborative input and action was still reported throughout planning. A significant percentage (88%) of respondents believe the project included stakeholder input in decision-making and many respondents also (79%) believe the partnership was collaborative in decision-making. A common critique of collaborative planning efforts is

that they are highly time-consuming and hinder the timeline, creating delays related to stakeholder appeasement. The hybrid model that the FWPP exemplifies seems particularly adept to overcome these challenges, maintaining an efficient timeline while addressing the needs and concerns of various stakeholders.

Three types of evaluative criteria are identified within Ostrom's IAD framework: transaction costs (information, coordination, and strategic costs), overall institutional performance (efficiency, equity, accountability and adaptability), and policy impacts (Imperial 1999; Mayrand and Paquin, 2004). The FWPP seems to align well with the ideal model of a robust social-ecological system (Ostrom 1998, 2011). Transaction costs have been low, overall performance has been high, and policy impacts stand to be positive. The FWPP has been designed effectively, it has been efficient despite incorporating collaborative processes, it has established formal and informal accountability networks, and the stakeholder group believes the project is a national model for how to accelerate forest treatments (Imperial 1999; Mayrand and Paquin, 2004). The project has thrived as a result of a sequence of meaningful and collaborative exchanges, dependent upon the idea that users and providers may observe each other's behavior as well as the impacts of each other's actions on the resource, facilitated by a history of solving problems collaboratively with high levels of trust and reciprocity (Ostrom 1998; Anderies 2004). While this new governance arrangement does have outcomes that run counter to traditional collaborative governance, it represents an innovative way to incorporate the benefits of both collaborative and traditional models of forest management.

Policy Recommendations

The FWPP is a uniquely funded and governed PWS project in Flagstaff, Arizona, initiated by local actors in order to address public safety and forest health concerns in two watershed areas that affect the community. PES and PWS systems are often discussed as a novel way to value the services we enjoy from the environment, but these systems are not without disclaimer. For instance, the financial mechanism used by the FWPP technically constitutes a double-payment to the government for doing its job, since the residents of Flagstaff are paying federal income taxes that fund the agency, as well as property taxes that fund the bond. While the residents of Flagstaff may be willing to double-pay, this may not be favorable in all communities, such as those in downstream areas, hundreds of miles removed from the forested watershed itself. Communities with a political culture that is less receptive to approving municipal bonds also may not be ideal for this model.

An upfront payment system such as a bond is recommended for its various advantages- it can provide funding to get started quickly, it can help motivate the partners to spend finite resources responsibly, and it can act as a leveraging tool for acquiring extra funds. However, an upfront payment scheme such as a bond is not always feasible, as in the case of the many unincorporated communities in forested watershed areas in the southwestern US. The FWPP stakeholder group questioned the effectiveness of the bond payment amount, which may be a warning for other communities not to ask for too much or too little. PWS systems should strive to leverage additional resources wherever possible, but should also consider a longer-term funding mechanism for financing ongoing maintenance, as an alternative or in addition to an upfront payment.

Hypothetically, an upfront mechanism could also prove susceptible to litigation by concerned interest groups. A more incremental income stream such as a ratepayer tax may prove better equipped to navigate potential financial pitfalls, and can provide funding for long-term forest treatment maintenance activities such as thinning and prescribed burning. This is provided that the community is willing to double- or triple-pay for ecosystem service provision.

PWS accountability concerns should be addressed with practical experience and focused research, in order to determine which mechanisms work best for which type of partnership, and to match the appropriate level of accountability with the stage of partnership development (Steets 2004). Future research into forest treatment projects with alternative payment systems should determine baselines for project outcomes (Hahn and Stavins, 1992) as well as develop multi-party monitoring groups for assessing these outcomes. This can allow for more comprehensive financial accountability throughout the planning process, potentially resulting in better detection of misuse of project resources, cost estimates for future and ongoing project activities, and provision of new research and subject matter experts. These general guidelines should be flexible, adaptable, and act as a foundation for projects to develop science-based custom measurements that monitor effectiveness, efficiency, accountability, and conflict (Fripp 2008; Farley and Costanza, 2010).

Increased levels of public outreach and participation reported by interview respondents are a strong step in the right direction for long-term community forest management. In order to reinforce shifting paradigms towards more collaborative forest management systems, it is imperative that the FWPP and future fire-risk mitigation

partnerships continue to expand their public outreach and education capacities. Project managers can expect significant benefits from remaining open to suggestions from the public and stakeholders, having a presence at public events, and making a concerted effort to disseminate information to the public and those ultimately held responsible for project successes or failures. When appropriately designed, PWS systems have shown the ability to achieve ambitious forest management goals. A rigid but still collaborative structure such as FWPP's can also lead to continuity in resource management, despite high rates of turnover inherent in the US Forest Service.

PWS systems represent a viable option for communities seeking alternative measures for financing fuels reduction and/or restoration actions. Continuing to expand research on governance outcomes and placing emphasis on monitoring and public outreach may contribute to public awareness and successful implementation of non-traditional policy instruments for addressing community safety alongside forest and watershed health concerns.

CHAPTER FOUR
STUDY SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter one sets the stage for PWS implementation in fire-prone watersheds. Forest health decline caused by wildfire suppression and other short-term land management policy has resulted in large-scale, catastrophic wildfires throughout the American west, threatening safety and ecosystem service provision for many communities. PWS has been recognized as a potential policy tool for securing financial resources for cash-strapped agencies seeking to implement forest treatment actions. However, not much is currently known about institutional design structures and governance of these systems in the United States. In order to address these gaps, this study took a mixed methods approach to gathering stakeholder opinions regarding institutional design and governance outcomes of the Flagstaff Watershed Protection Project (FWPP).

Chapter two provided a detailed description and history of how the FWPP was designed, and how it works. Data used in this research were derived from public documents released by the partnership, as well as through key informant interviews with key participants in FWPP. Results showed that institutional design of this PWS project is unique because a bond has never been used as the financial mechanism for a PWS or any kind of fire-risk mitigation partnership project in the US. Combining a partnership and bond has significant benefits over traditional, unilateral approaches to forest management. These benefits include increased public outreach and education, heightened timeline efficiency, increased levels of collaboration and sharing of resources between partnership agencies, a strengthening of previous working relationships, and the ability to leverage financial resources outside the bond payment.

Chapter three emphasizes overall performance outcomes that emerged during the planning process of the Flagstaff Watershed Protection Project. Key findings for the planning stage are that the unique institutional design of this project (bond payment coupled with USFS-City partnership) led to increased timeline efficiency, improved accountability and transparency, public and stakeholder involvement, and the leveraging of $2.3 million in additional resources. These beneficial policy impacts and performance outcomes provide a good example of why the FWPP is a robust social-ecological system, as evaluated through Ostrom's (2011) IAD framework.

This research suggests that PWS systems are a viable option for communities interested in community safety and ecosystem service protection benefits that wildfire protection and mitigation procedures produce. These benefits are numerous, and stand to positively affect local forest management in the future. The FWPP enjoys a sense of urgency not typical for internal projects, as pressure to show results to the public has motivated this project's timeline. The acceptance of PWS-funded fire-risk mitigation partnership projects also encourages innovative environmental and policy approaches to solving forest health issues. The FWPP is accomplishing mechanical forest treatment work on steep slopes that is groundbreaking for the southwest, and has gained national recognition from the upper offices of the Forest Service, hopefully encouraging more innovative policy approaches in the future. These types of projects create new subject matter experts, and bring in resources and expertise from various functions and agencies.

Findings suggest that communities who are investigating alternative payments and forest management governance structures should continue to consider the role of the public and remain as informative, engaged, and transparent as possible. When

appropriate, the use of a municipal bond is an effective way to secure upfront payment for PWS projects, and an agency partnership with an ear towards collaboration has proven to be an effective system of governance. Future PWS systems using municipal bonds should establish custom baselines for monitoring project outcomes, should remain open to the public for suggestion, and should also consider backup financial mechanisms in case of litigation or to finance ongoing treatment maintenance.

Payments for Watershed Services (PWS) projects have the potential to make a significant difference in the landscape of forest and watershed treatment and restoration management. Continuing to promote PWS as a potential tool for adapting to an ever-growing problem may embolden fire-threatened communities to better respond to their changing environment. It is important that these systems are being promoted and funded, but it is up to the two actors to make this work. Other communities should beware of unmet expectations when entering into a new system, since the excitement and attention heaped onto this project by the USFS and City could always serve to disappoint. Implementation will be the most important process of this project, specifically, getting it done under budget.

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APPENDIX A

DOCUMENTS ANALYZED

Document Title	Date of Publication	Source	Purpose
Flagstaff Watershed Protection Project Executive Summary and Implementation Plan	December 2012	USDA Forest Service	Summarizes the FWPP, outlines purpose and need, project overview and implementation strategies.
Memorandum of Understanding between City of Flagstaff and the Coconino National Forest	January 2013	USDA Forest Service, City of Flagstaff	Documents FS/City cooperation in establishing a joint program to conduct treatments in Dry Lake Hills and Lake Mary watersheds.
Memorandum of Understanding between City of Flagstaff and the Coconino National Forest to Grant Cooperating Agency Status	January 2013	USDA Forest Service, City of Flagstaff	Grants City Cooperating Agency Status to jointly analyze treatment methods and options during planning.
Flagstaff Watershed Protection Project Proposed Action	April 2013	USDA Forest Service	Proposes implementation strategies & alternatives.
Flagstaff Watershed Protection Project Communication Plan*	January 2013	USDA Forest Service, City of Flagstaff	Outlines proper behaviors, roles, responsibilities, and procedures for internal communication.
FWPP Draft Environmental Impact Statement	July 2014	USDA Forest Service	Document potential effects of implementation.

*The FWPP Communication Plan is not a formal document available for public record.

APPENDIX B
INTERVIEW INTRUMENT

Demographics

1. What agency or organization do you represent?
2. What is your role or position in this organization?
3. How many years have you been involved in forest treatment projects in the Southwest?

Institutional Design and Governance

1. What is your organization's role in the project, and how does this differ from traditional projects like Jack Smith/Schultz? (USFS, GFFP, City)
    a. What are your organization's goals for the FWPP planning process?
2. What are some unique key challenges or obstacles, to date, presented by the FWPP partnership? What are some *expected* unique key challenges or obstacles presented?
3. What are some unique opportunities or advantages presented by the way FWPP was designed and structured (bond, partnership, sharing of responsibilities)?
4. Has there been any conflict between parties involved in the planning process?
5. How has the financial mechanism (bond) affected how resources are used?

Planning Efficiency and Partnership Costs

1. How has the USFS/City partnership affected the speed of the FWPP planning process comparative to traditional projects?
    a. What about the partnership has slowed down or sped up planning speed the most? Have you ever been involved in a similar project that has moved as quickly?
2. How has the USFS/City partnership led to greater efficiency in planning as opposed to traditional projects like Jack Smith?
3. In your opinion, what are the main reasons that FWPP has or has not been efficient throughout the planning process?
4. Are there any disadvantages to the USFS/City partnership in planning?
5. Have overall planning costs been higher or lower as a result of the partnership? Why?
6. On a scale from 1-5, (1-lowest, 5-highest) how would you rank the efficiency of the planning process?
7. What resources (financial, personnel) has your organization leveraged or reallocated for planning FWPP? How and why were these resources reallocated? (USFS, City only)

8. Have additional costs been incurred as a result of the FWPP partnership, as opposed to traditional planning? Like what? Do benefits of the partnership outweigh these costs?

Partnership Accountability

1. How are the partners accountable to each other?
2. How have performance goals been set in the project? Who contributed to setting goals?
3. What measurements are used for monitoring effectiveness in planning?
4. Which organization is responsible for the majority of the planning duties within the partnership? How are planning responsibilities delegated?
5. How have roles and structures evolved in this project, from ballot measure to DEIS?
6. How has financial and resource integrity been established within the partnership? How has accountability with public resources been enforced?
7. How has the USFS been accountable to the City for work accomplished with the bond monies? How is this enforced?
8. How are partners held accountable to the rules and procedures agreed upon in the MOU and other FWPP documents?
9. How have documents like the Communication Plan helped facilitate accountability?

Public Accountability

1. How has the partnership been accountable to the public for actions taken in the planning process? How *should* the project be accountable to the public?
2. How has public outreach been emphasized to a greater degree in FWPP than in traditional USFS projects?
3. How has public input been solicited and incorporated into planning?
4. How important is public involvement to accountability in this project?
5. What are some of the most frequent comments, questions, and concerns about FWPP that you have received from the public?
6. Do you believe that the partnership and the planning process has been effective so far in the eyes of the general public? Why?

APPENDIX C
SURVEY INSTRUMENT

The Flagstaff Watershed Protection Project (FWPP) represents a new approach to forest management. You have been identified as knowledgeable about the FWPP and our NAU research team would like to better understand your perspectives of the project to date. The NAU Institutional Review Board (IRB) has approved the survey below. This survey is anonymous, your answers will be kept confidential, and no personal identifiers will be used in the analysis or presentation of the data collected.

We would greatly appreciate your participation in this survey. Your insights are greatly appreciated to better understand how the FWPP has proceeded. These responses will help to document and share stakeholder experiences and perceptions of the FWPP. Thank you in advance for agreeing to participate in this brief survey.

BACKGROUND

What type of agency or organization do you represent?

- US Forest Service
- Other Federal Government Agency
- City of Flagstaff
- State of Arizona
- Coconino County
- Tribal Government
- Academia
- NGO or Environmental Group
- Private Citizen
- Industry
- Other

How many years have you been involved in forest management projects?

How would you describe your level of knowledge about the Flagstaff Watershed Protection Project (FWPP)?

- Very knowledgeable
- Knowledgeable
- Somewhat knowledgeable
- Not very knowledgeable
- Not at all knowledgeable

Over the past year on average how often have you been engaged in the FWPP planning process?

- Several times a week

- A few times a month
- About once a month
- Once every two months
- My involvement with this project is minimal
- I have not been involved at all

How would you describe your role in FWPP?
(Select all that apply)

- Analysis
- Budgeting
- Coordination
- Implementation
- Monitoring
- Outreach
- Planning
- Other

ENVIRONMENTAL EFFECTIVENESS

FWPP will help protect City water resources.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

FWPP will reduce the risk of catastrophic wildfire.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

FWPP will reduce the risk of catastrophic post-fire flooding.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

Please indicate the type of forest treatment approach that the FWPP will perform during implementation, on a spectrum between ecological restoration and fuels reduction.

- 1=Ecological Restoration
- 7=Fuels Reduction

If you have any other comments regarding fuels reduction and/or ecological restoration in the FWPP project, please submit them in the space below.

INSTITUTIONAL EFFECTIVENESS

The $10 million bond will be enough to cover the costs of the treatments planned for the FWPP.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

The FWPP partnership established a national model for how to accelerate priority forest treatment projects.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Disagree

Which of the following elements have been beneficial throughout the planning process? (Select all that apply)

- Variety of Contracting Methods
- Collaborative Expertise
- Leveraging Financial Resources
- New Research Opportunities
- Multi-Party Monitoring
- Collaborative Public Outreach
- Leveraging Personnel Resources
- Other

How important are the following elements to the success of the FWPP partnership?

Variety of Contracting Methods

- Very Important
- Important
- Somewhat Important
- Not Important
- Don’t Know

Collaborative Expertise

- Very Important
- Important
- Somewhat Important

- Not Important
- Don't Know

Leveraging Financial Resources
- Very Important
- Important
- Somewhat Important
- Not Important
- Don't Know

New Research Opportunities
- Very Important
- Important
- Somewhat Important
- Not Important
- Don't Know

Multi-Party Monitoring
- Very Important
- Important
- Somewhat Important
- Not Important
- Don't Know

Collaborative Public Outreach
- Very Important
- Important
- Somewhat Important
- Not Important
- Don't Know

Leveraging Personnel Resources
- Very Important
- Important
- Somewhat Important
- Not Important
- Don't Know

EFFICIENCY OF FWPP

The FWPP planning process has been time-efficient.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree

- Strongly Agree
- Don't Know

The FWPP has been more time-efficient than traditional USFS forest treatment projects.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The FWPP planning process has been cost-efficient.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The FWPP has been more cost-efficient than traditional USFS forest treatment projects.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

ACCOUNTABILITY AND PUBLIC OUTREACH

The FWPP partnership has been accountable for bond money spent during planning.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The FWPP partnership has been financially transparent about the use of bond money.
- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The FWPP partnership included input from stakeholders in decision-making.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The Flagstaff City Council has been well informed throughout the planning process.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The Flagstaff City Council participated throughout the planning process.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

Implementation of the FWPP will represent the best interests of City of Flagstaff residents.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The public outreach efforts made by the FWPP partnership have been above and beyond the efforts associated with traditional USFS forest treatment projects.

- Strongly Agree
- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don't Know

The FWPP partnership has been very collaborative throughout the planning process.

- Strongly Agree

- Agree
- Neither Agree nor Disagree
- Disagree
- Strongly Agree
- Don’t Know

APPENDIX D
ORGANIZATIONS RECEIVING STAKEHOLDER SURVEY

-U.S. Army Corps of Engineers -Arizona State University -AZ Department of Environmental Quality -AZ Game and Fish -Sierra Club -Center for Biological Diversity	-AZ Native Plant Society -AZ State Forestry Division -U.S. Department of Agriculture -City of Flagstaff -Coconino County -International Mountain Biking Association	-Greater Flagstaff Forests Partnership -Museum of Northern Arizona -Natural Channel Design -Northern Arizona University -USDI Office of Environmental Policy and Compliance	-NAU Ecological Restoration Institute -Southwest Forest, Inc. -Salt River Project -The Nature Conservancy -Willow Bend Center -U.S. Environmental Protection Agency	-Friends of the Rio de Flag -USDA Forest Service -U.S. Fish and Wildlife Service -U.S. Geological Survey -Hopi Tribe -National Park Service -Campbell Global

***Groups receiving the stakeholder survey were recommended by interview participants, and gathered from multi-party monitoring group email listserv.

APPENDIX E
RESPONSE BIAS CHECK

Organization	Respondents	Percentage of Sample	Surveys Sent	Percentage of Sent	Difference
US Forest Service	16	31%	34	28%	2%
City of Flagstaff	5	10%	15	13%	-3%
Coconino County	4	8%	11	9%	-1%
NAU	8	15%	26	22%	-6%
AZ State Forestry	4	8%	5	4%	4%
GFFP	2	4%	4	3%	1%
Other	13	25%	25	21%	4%
Total	52		120		