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Evaluating Funding Mechanisms for Natural Resource Conservation

By

Elizabeth Forsburg Pardi

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University of California, Berkeley

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Professor J. Keith Gilless, Chair

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Abstract

Evaluating Funding Mechanisms for Natural Resource Conservation

by

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Doctor of Philosophy in Environmental Science, Policy, and Management

University of California, Berkeley

Professor J. Keith Gilles, Chair

The dissertation is composed of three papers. The first paper explored the history of public investment in natural resource conservation in California. First, the paper focused on the history of state trust lands and cost-share programs, and then discussed the costs and benefits of state issued bonds for natural resource protection. Finally, the paper highlighted new opportunities for funding through tax and fee mechanisms. The paper evaluated these public investment tools and discussed the future of natural resource conservation funding in California.

The second paper is based on a study conducted to understand how a sales tax affected consumers and producers in California's lumber market. Tax incidence theory was used to analyze the effect of the tax policy on prices and social welfare. The study analyzed the effect of the lumber tax using a theoretical lumber market model. A partial equilibrium model was used to examine the burden of the tax, ignoring the effects on other markets. This framework determined if the burden of the tax was primarily borne by consumers or producers. The study found that the tax burden fell on the consumers, given the inelastic nature of the lumber market.

The final paper explored examples of privatization of public land management as well as the recent trend of private investments in natural resource conservation. A case study was examined for managing state parks by private interests highlighting the funding crisis with California's state parks. The paper also investigated the increase in private investment in conservation over the last few years, focused on mitigation banks, innovative private finance, and environmental impact bonds. The goal was to provide the costs and benefits of privatization of natural resource management and conservation.

Paper I: Evolution of Public Funding Mechanisms for Forest Conservation in California

Introduction

California has 33 million acres of forestland. Federal agencies (including the Forest Service, Bureau of Land Management, and National Park Service) own and manage 19 million acres. State and local agencies, including the California Department of Forestry and Fire Protection (CAL FIRE), local open space, park and water districts, and land trusts own nearly one million acres. The remaining forestland, 40 percent, is owned by families, timber companies, and investors. Industrial timber companies own 5 million acres and nonindustrial, private landowners own 9 million acres. The majority of the nonindustrial landowners own less than 50 acres of forest land (University of California, Division of Agriculture and Natural Resources [UCANR], 2016). Only 79 landowners own between 2,500 and 10,000 acres (CAL FIRE, 2013). California's forests provide many benefits, including wildlife habitat, water supply, carbon storage, timber, and recreation causing them to be managed in different ways to meet different objectives (UCANR, 2016; Christensen et al., 2008).

California's forests face a number of threats. The subdivision of forestland is changing traditional uses from forest management, wildlife habitat, and open space, to rural development uses, and increasingly the conversion of timberland into unpermitted cannabis cultivation sites (Carah et al., 2015; Van Butsic et al., 2017). California forests are decreasingly managed with timber harvests. Due to economies of scale and the high cost of harvest permits, forest management is less economically feasible on small parcels (UCANR, 2016; Lawler et al., 2014).

Large, destructive wildfires are another threat to California's forests. Five years of record drought have led to a year-round wildfire season in California, with wildfires increasing in both size and severity. At the same time, dead trees from insects and disease have increased, a function of the drought and unhealthy forest conditions. In particular, the forests of the Sierra Nevada are overly dense with small trees and brush and at significant risk of uncharacteristic, high-intensity wildfires. These intense wildfires represent one of the greatest threats to biodiversity in California's forests and threaten lives, property, and the full range of benefits that healthy forests provide (Stephens et al., 2016; 2018).

Forests provide many values which historically have not been captured in traditional markets. These forest values include carbon sequestration, watershed services, wildlife habitat, and biodiversity. Often these values are viewed as public goods which are provided as benefits to the public (Fire and Resource Assessment Program [FRAP], 2010). Market-based frameworks and conservation investments are emerging in California for the unrecognized ecosystem services that forests provide. The frameworks include private payments, public payments or incentives and trading schemes. Public payments or incentives may utilize taxes, fees, grants, and other funding sources. Some public programs can influence market opportunities for ecosystem services by encouraging private landowners to manage for the benefit of fish and wildlife. In exchange for developing a management plan and adopting specific wildlife habitat improvements, landowners receive incentives that allow them to better realize the public benefits of their forestland (FRAP, 2010). Example programs include the California Forest Improvement Program.

The largest funding sources for projects that support environmental services come from federal, state, and local agencies. The public funding is generated from general taxes, special taxes and dedicated funds, user fees, and other sources. Over the last decade ballot initiatives have been critical to supporting ecosystem service projects and programs in California. These

initiatives include Proposition 40 (2002), Proposition 84 (2006), and Proposition 1 (2014). The funds from these initiatives are being used for watersheds planning, fish and wildlife projects, habitat restoration, habitat acquisition, improving forest health, and forest conservation (FRAP, 2010). Many policies, programs, agencies, and stakeholders are involved with making decisions over where to make investments that affect ecosystem services. Projects typically involve protecting and restoring areas that provide unique or high levels of public benefits (FRAP, 2010).

This paper will explore the long history of public investment in natural resource conservation in California. First, focusing on the history of state trust lands and cost-share programs, and then discussing the costs and benefits of state issued bonds for natural resource protection. Finally, the paper highlights new opportunities for funding through tax and fee mechanisms. The paper will evaluate these public investment tools and discuss the future of natural resource conservation funding in California.

History of State Trust Lands

Public funding for natural resources started with the formation of the United States. As newly organized states entered the Union, Congress granted states trust lands, which were meant to be managed to support essential public programs. Unlike other public lands, most state trust lands were held in trust for designated beneficiaries, principally public schools. The General Land Ordinance of 1785 and the Northwest Ordinance of 1787 established the policies that governed the disposal of the public domain to settlers and the creation of new states. Under this framework, a centrally located parcel in each surveyed township – section sixteen – would be reserved for the support of schools, and once the territory became a state, the state would receive title to these reserved parcels. The policy was later expanded to include additional reserved sections to support schools, as well as other public institutions. The original thirteen colonies plus Vermont, Kentucky, and Tennessee, contained no federal lands and received no land grants. In 1803, Ohio became the first state to receive the section township as outlined in the General Land Ordinance (Souder & Fairfax, 1996; Keiter, 2005; California State Lands Commission, 2016).

Initially, Congress gave little guidance as to whether the states should retain, lease, or sell the lands. In the 1840s, Congress began designating the states as managers when the states added specific provisions for the land to their constitutions. State trust managers were able to lease and sell these lands for a diverse range of uses in order to generate revenue for the designated beneficiaries. The proceeds were often distributed into a state's permanent fund and used for many purposes (Souder & Fairfax, 1996).

Souder and Fairfax (1996) extensively studied the history and patterns of state trust lands in the United States. They noted a pattern with state trust lands. States created before 1850 sold all or nearly all of their lands. California, which received statehood in 1850, retains only about 10 percent of its original trust lands. By 1889 the federal government began to encourage reserving forests and other public lands, and most newly created states ended up keeping and even adding to their trusts. Montana, Washington, Wyoming, Arizona, and New Mexico all manage more acres of trust lands today than were in their original land grants, partly because Congress supplemented those grants with later grants for universities and other purposes. The Morrill Act of 1862 established the land-grant college or university system by providing grants in the form of federal lands to each state. The states used the proceeds from selling those federal lands to establish public education institutions. Land-grant universities include Iowa State University, University of Wisconsin, Oregon State University, and the University of California.

Management of the trust lands also varies from state to state. In most cases, a state land office manages the trust lands and resources, transferring the revenues to the trust's permanent fund managed by another state agency. The fund from the trust resources then goes to the beneficiaries. Souder and Fairfax (1996) estimate that 80 percent of the trust acres are dedicated to primary and secondary schools, while the remainder are for colleges, counties, public buildings, prisons, hospitals, and various other schools and institutions. Trust lands in the United States include 37 million acres suitable for livestock grazing, 4 million for timber, and 3 million for crops. The states also control mineral rights, with 18 million acres leased for oil and gas, 11 million for coal, and 6 million for other minerals. Souder and Fairfax noted that major timber resources are usually held in large blocks. Most states have some sort of forest management program, but timber revenues are only significant in Washington, Oregon, Idaho, and Montana (Souder & Fairfax, 1996; Keiter, 2005).

State trust lands are publicly owned and managed, but they are not "public lands" like national parks and forests which are often managed for multiple public interests. Instead they are managed for clearly specified beneficiaries and are held in perpetuity. State trust lands historically have provided significant financial benefits from natural resources management, including oil, gas, mineral extraction, timber production, and grazing. However, Souder and Fairfax (1996) note that as extractive natural resource industries have declined, public valuation of open space, watershed protection, wildlife, and recreation has increased. This change led to questions concerning trust land management, especially the value of traditional natural resource production activities, including their worth over the long term to trust beneficiaries and their effect on conservation. Nevertheless, despite changing social, political, and environmental needs and conditions, state land management almost exclusively focus on income production (Pounds, 2011; Souder & Fairfax, 1996; Keiter, 2005). State trust land serves as the nation's first example of managing lands for a public beneficiary.

California's original trust land grant was 5.5 million acres, but currently the state land holdings only include 468,600 surface acres and 790,000 mineral acres (California State Lands Commission, 2016). California gives virtually all revenues to the state teacher's retirement program and the school land bank fund. Historically, 95 percent of all revenue have been generated by mineral resources, which include geothermal, solid minerals, and oil and gas programs. The rest of the revenue comes from surface programs, which include land exchanges and sales, alternative energy programs, grazing leases, roads, and oil and gas pipelines. In Fiscal Year 2008-09, the Legislature borrowed \$59 million from the School Land Bank Fund to help balance the state budget. This loan to the General Fund was part of the Budget Act of 2008 (Chapter 2, Statutes of 2009, Third Extraordinary Session). The loan was required to be paid back in 2016 (California State Lands Commission, 2016).

In general, state trust programs are limited in the amount of funding available, particularly in California, where the majority of state trust lands have been sold. The trust programs provide funding to public beneficiaries; however, state trust lands do not generate stable funding for conservation— either from the proceeds or through the actual management of the lands. Additionally, while managing state trust lands for recreation and wildlife does not violate trust purpose, the lands are rarely managed for these reasons because they do not generate the greatest revenue over the long run.

Private Land Incentive Programs

Beginning in the 1920s, public policy shifted from investments in state trust lands with public beneficiaries to public intervention in private land management. Public intervention in the

economy is considered when individual private actions fall short of meeting societal goals or are inconsistent with societal goals. Kluender et al. (1999) investigated the role of nonindustrial private forest (NIPF) landowner behavior and the need for public intervention. The authors reasoned that nonindustrial private forest landowner management actions, particularly reforestation behavior, was inadequate for meeting societal demands for timber over the past several decades. Numerous studies suggest that incompatible ownership objectives, forestland fragmentation, land use conversion, and lack of forest management knowledge are some of the obstacles to landowner investment in reforestation and timber management.

In 1924, the Clarke-McNary Act first promoted reforestation and forest management on private lands. Other public intervention programs followed. Two key programs of the 1930s and 1950s, were the Agricultural Conservation Program (ACP) and the Conservation Reserve Program. Their goal was to retire highly erodible farmlands from production by planting trees or by making the land permanent pasture. Funding for forestry practices under the ACP declined during the 1960s, prompting forestry interest groups to lobby Congress for a separate cost share program for forestry practices (Kluender et al., 1999). These efforts resulted in the Forestry Incentives Program. This program was initiated to stimulate forest management and reforestation efforts on nonindustrial forest lands in the face of real price appreciation and concerns about inadequate long-term timber supply. Kluender et al. (1999) suggested that the underlying assumption of these programs was that planting trees and improving forest management would eventually lead to increased timber harvest from the subsidized lands.

The California Forest Improvement Program (CFIP) was created in 1978. The primary emphasis of this program, established by the California Public Resource Code (PRC), is to improve the timber productivity of forest lands in the state; however, the program also targets the improvement of all forest resources, such as fish and wildlife habitat and soil resources, so that the overall effect of the program is to improve the total forest resource system (PRC §4791). The program provides funds to forest landowners for management plans, site preparation, tree planting, thinning, land conservation, and improvement of fish and wildlife habitat. The program's purpose is to encourage private and public investments in forestlands and resources within the state to ensure adequate future high-quality timber supplies, related employment and other economic benefits, and to protect, maintain, and enhance the forest resource for the benefit of future generations. The source of funds for CFIP historically has come from California's Forest Resource Improvement Fund which receives its funding from timber sale revenue from the state's demonstration forests. The California lumber sales tax (PRC §4629 - 4629.13) provides an additional source of revenue for CFIP. Table 1 provides the revenue generated from timber sales on state forests.

The CFIP is a cost-share program that may grant up to 75 percent of the cost of a project. To be eligible for CFIP, landowners must own at least 20 acres of forestland but not more than 5,000 acres of forestland in California. The CFIP is managed by CAL FIRE who works cooperatively with private landowners, particularly smaller nonindustrial landowners, to upgrade the management of their lands, and, therefore, improve both the productivity of the land and the degree of protection and enhancement of the forest resource. The department also engages with the forest industry and federal government to improve the management of forest lands within the state, through advisory services or other actions (PRC §4792). The program encourages the improved management of forestland and the protection of productive and stable forest resource system for public benefit.

The CFIP, and other forestry cost-share policies, are both a management tool and a direct subsidy; and therefore, tend to favor specific groups of owners. According to Romm et al. (1987), if the objective were to increase the level of publicly assisted forestry investment, the program should be augmented to expand its use beyond the small, nonindustrial forest landowner. To expand forestry investment among all nonindustrial private forestland owners, the managerial requirements of the program should be reduced to attract groups for whom these obligations are a barrier to their participation. If program requirements and the cost-share rate were reduced, Romm et al. (1987) suggest that more owners would be attracted by the reduced requirements than discouraged by the lower rate. The study also suggested that a reduced cost-share rate may not reduce program participation if additional nonmonetary and management assistance were available to participants. If the objective was to expand use of CFIP, the managerial attributes of the program might be diversified to more closely meet needs of the nonindustrial private forest landowners (Romm et al., 1987).

There are additional challenges with cost-share programs. First, cost-share programs are a government enterprise with limited capacity and limited funding. In 2016 the funding for the CFIP cost share grants was only \$3,465,000. Second, the government process for applying and the review time for the grant applications may be onerous. The landowner must send completed applications to the CAL FIRE unit where their proposed projects will occur. The CAL FIRE units review, recommend, and then send the application to Sacramento. Once in Sacramento, and only if funding is available that year, will the landowner be notified of their award (CAL FIRE, 2016).

As stated previously, the CFIP is a public subsidy program. Public subsidies are payments from governments designed so that the price is less than the marginal cost. Subsidies are supported by the argument that there is a market failure. The underlying reasoning is that the market either will not produce at the desired level or is not equipped to internalize the externalities of production. Therefore, subsidies are created in order to achieve one or more of the following: (1) to transfer wealth from taxpayers to the producers or consumers of certain goods, (2) to influence producer or consumer behavior, and (3) to keep prices of certain goods low or stable (Mehmood & Zhang, 2001).

Mehmood and Zhang (2001) acknowledge that all these three objectives have been used to justify cost-share programs for forest landowners. It has been argued that productivity of nonindustrial private forestland is low. These lands, however, are important in meeting the nation's demand for wood products given the rising demand and diminishing supply from public lands. In California, private lands provide the majority of California's timber. Nonindustrial private forestland provides 32 percent of the timber harvest (Morgan et al., 2012). A transfer of wealth to the landowners may help in maintaining the supply of timber at a healthy level. Changing behavioral patterns is also addressed by the subsidy, and the underlying arguments are that nonindustrial private forest landowners need to be encouraged to invest in long-term timber production and that these programs help minimize the externalities of timber production and maintain a socially desirable environmental quality. Finally, the rising demand may exceed supply in the future, causing real prices of wood products to increase. A subsidy, therefore, may help keep the prices of wood reasonably low and stable (Mehmood & Zhang, 2001).

There are a number of studies that try to estimate changes in landowner behavior due to cost share programs. Boyd (1984) found that landowners who would have invested on their land anyway use public funding instead. Bliss and Martin (1990) report that cost share does not change the level of management practiced by active forest managers, and Cohen (1983)

concludes that the substitution effect of public for private funding in tree planting on NIPF lands is between 30 to 50 percent (Mehmood & Zhang, 2001).

The primary stakeholder for cost-share programs, may not be the users or the landowners. The forest products industry or the public may benefit more from the program. Interest groups make these programs possible by supporting their existence with state governments and pushing for the use of public funding to sustain them. The goals of cost-share programs often promote increased lumber supply from nonindustrial timber land and protection of wildlife habitat – goals that may not be shared with the program participants (Mehmood & Zhang, 2001). For example, program administrators believe cost-share programs play an important role in promoting sustainable practices on forestlands (Kilgore et al., 2007).

In 2007 Kilgore et al. reviewed cost-share programs and participants' response to the them. Suggestions for program improvement largely centered on improved administrative design and increased program availability. "Generally, family forest owners do not consider financial incentive programs important to their forest management decisions. Many owners—even members of forestry associations—are largely unfamiliar with the programs available to them. They perceive the programs as being difficult to access, inflexible with respect to their property's characteristics and ownership objectives, unpredictable with respect to funding levels and program requirements over time, and capable of reaching only a small fraction of family forests. Financial incentive programs play only a minor role in most owners' decisions regarding forestland management and uses" (Kilgore et al., 2007, p.189).

The theory behind cost-share programs is clear. Public funding is used to reduce the costs and increase the benefits of forestland management. Cost-share programs promise to increase the timberland supply from nonindustrial timberland in response to the rise in the real prices of wood to an undesirable level. In addition, for a variety of reasons, nonindustrial forest landowners are reluctant to invest their capital in long term timber production, so incentives are needed to encourage them to undertake forest management (Steiguer, 1984). However, cost-share programs do not always deliver. Studies have shown that the programs do not have a significant effect on landowner behavior and have not increased reforestation investment. For these programs to be effective, a large public funding investment is needed (Steiguer, 1984).

Bond Funding for Forest Conservation

California consistently relies on bond funding to pay for natural resource investments. Over the last 20 years, bonds provided over \$1.2 billion in funding for which forest conservation and restoration projects were directly eligible. Bond financing is a type of long-term borrowing, through which an entity raises funds by selling financial securities called bonds to investors. These bonds are certificates which promise to repay investors their money at some future maturity date, along with periodic interest payments until that date arrives. When California sells its bonds, it normally packages together thousands of individual bonds having various maturity lengths into large bond issues worth millions of dollars. The individual bonds comprising each issue include maturities ranging from as short as one year to twenty years or more. The state markets its bonds by selling these large bond issues to bond underwriters, who subsequently break them apart and resell the individual bonds to investors (California Legislative Analyst's Office [LAO], 1987).

Bond financing does cost the state more money than if it directly pays for the costs up-front because bonds pay interest. The true costs of bond financing are determined from the debt-servicing payments stretched out over many future years, and as a result, there is an added cost for using bond financing (LAO, 1987). Whether the additional costs of bond financing are worth

incurring depends on whether they are offset by the benefits of using bonds. In other words, the Legislature or voter must assess the trade-offs that are involved between bond and non-bond financing. The benefits of using bonds can include being able to put large projects in place sooner, freeing-up current resources for other immediate high-priority needs, or avoiding large tax increases necessary to pay up-front for capital projects. If these factors are significant, the state may want to use bonds (LAO, 1987).

The state uses bonds for many different purposes, ranging from financing public infrastructure like schools, prisons and parks, to assisting private-sector small businesses and homebuyers. The state's bonds generally are classified as either general obligation bonds or revenue bonds, based on the type of financial resources that are pledged to repay them. General obligation bonds have debt service payments that are guaranteed by the state's taxing authority. These bonds require voter approval and offer investors a high degree of security. The General Fund either directly pays their debt service, or is pledged to do so if other resources backing them prove to be insufficient. Traditional revenue bonds are not supported by the General Fund, rather they are paid off from a designated revenue stream-usually generated by the projects they finance - such as tolls or fees. These bonds normally do not require voter approval (LAO, 1987).

The State of California administers various programs to conserve natural resources, protect the environment, and provide recreational opportunities for the public. A majority of the funding for such programs has come from general obligation bond funds (LAO, 2001). From 1970 through 2001, voters approved about \$9.3 billion of general obligation bonds for resources-related purposes. Funds from the bonds approved in the 1970s and 1980s were typically either for park purposes (including park development and habitat conservation) or water purposes (including water quality, water supply, flood control, and safe drinking water projects). Between 1990 and 2014, six resources related bonds totaling \$20.645 billion were approved by the voters—Proposition 204 (1996), Proposition 12 (2000), Proposition 13 (2000), Proposition 40 (2002), Proposition 84 (2006), and Proposition 1 (2014). Table 2 summarizes the information.

While Proposition 12 provided funds mainly for parks and habitat conservation, Propositions 204 and 13 each provided funds for both park and habitat conservation as well as various water purposes (LAO, 2002). Proposition 40, passed in 2002, allowed the state to sell \$2.6 billion of general obligation bonds to conserve natural resources to acquire and improve state and local parks, and to preserve historical and cultural resources (LAO, 2001). Table 3 outlines Proposition 40's conservation activities and total funding.

The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, Proposition 84, authorized \$5.4 billion in general obligation bonds for safe drinking water, flood control, natural resource protection, and park improvements. A total of \$450 million was set aside for forest and wildlife conservation. These funds were spent on improving protection for wildlife habitats, improving protection of farms and ranches, and conserving forests.

In 2014, the state passed the Water Quality, Supply, and Infrastructure Improvement Act (Proposition 1), which is a \$7.545 billion general obligation bond proposal that would provide funding to address water quality, supply, and infrastructure improvement issues in California. In the 2014 Water Bond, \$1.495 billion was directed to watershed restoration and protection, and the Sierra Nevada Conservancy received \$25 million for forest restoration related activities.

It has been over 10 years since California has approved a substantive resource bond, and most of that funding has been expended. Bond financing is finite. Once the funding has been spent, the programs that rely on the money must hope another bond is passed or find additional

revenue. According to the Legislative Analyst's Office, 95 percent of Proposition 12 and 88 percent of Proposition 40 has been expended. All remaining funding of Proposition 84 has been appropriated. In response to the decline in funding, the Legislature passed Senate Bill 5, the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access for All Act of 2018 (Chapter 852, Statutes of 2017). Senate Bill 5, or Proposition 68, authorizes the sale of general obligation bonds in the amount of \$4 billion. The bond emphasizes parks and natural resource protection including, forest restoration, coast and ocean protection, climate preparedness, and water and flood protection projects. If passed by the voters, Proposition 68 will provide \$142 million for Sierra Nevada and upper watershed forest restoration, and \$20 million for the protection and restoration of coastal forests. The measure will be presented to the voters in June 2018.

Bond funding has provided a tremendous amount of money to conserve natural resources, however, there are challenges with this funding mechanism. General obligation bonds are subject to a majority vote of the public, and in some cases the Legislature, therefore they need to satisfy local political interests. For bond proposals to be successful, they need to appeal to the widest voter base. The political feasibility of passing bond measures for natural resource conservation has become unpredictable over the last few decades. Voter approval for bonds has generally decreased over the last twenty years, except for the recent water bond, which was brought to the voters during a time of economic improvement and during a historic drought. See Table 2.

The size of bond measures has varied over the years. Measures approved in elections in the 1980s averaged \$685 million. Measures approved in the 2000s have averaged \$5.15 billion. Although the latter number is inflated by a \$19.9 billion transportation bond, without this bond, the measures approved in the 2000s have averaged \$4.35 billion (Public Policy Institute of California, 2009). The State continues to be one of the largest issuers in the \$3.7 trillion United States municipal bond market. Over the last five fiscal years, the State has issued an average of \$6.5 billion of general obligation bonds annually (California State Treasurer, 2016).

Bond costs are dependent on the interest rate and inflation. Funding projects using bonds is more expensive than direct appropriations due to the interest that must be paid. This extra cost depends primarily on the interest rate and the time period over which the bonds must be repaid. Figure 1 from the Legislative Analyst's Office illustrates this example. Recent general obligation bonds sold for an interest rate of about 4.4 percent and will be paid off over a 30-year period. Figure 1 shows that under these assumptions, the total cost of a bond (in nominal dollars) will be about \$180 million for each \$100 million borrowed (\$100 million for repaying the amount borrowed and \$80 million for interest) (LAO, 2007).

The State of California has some bond debt, for which there are several reasons. First, when voters approve bonds, the volume authorized is often expected to last for a number of years. Second, there is a time lag between when bonds are authorized and funds are needed for their projects. In some cases, projects have not been started, in others, projects have not reached construction. This depends largely on factors such as how long it takes to acquire any necessary property, prepare any required environmental documents, develop project plans, and make progress on the projects themselves. A third factor reflects the fact that short-term loans are typically made to bond programs to bridge the gap between when programs need funds and when the state sells the bonds (LAO, 2007).

As the Legislative Analyst's Office states, there is no rule for how much debt is too much or how many bonds the state can afford. The debt level is dependent on policy choices about how much revenue to devote to the funding of bond projects versus other state spending priorities. In

addition, it depends on the state's ability to sell its bonds at reasonable interest rates in the financial marketplace. The debt-service ratio, the ratio of annual debt service costs to yearly revenues, is used as a general guideline to measure the state's debt burden (LAO, 2007).

California's ratio of debt service to General Fund revenues was only 6.54 percent in 2015-2016. That figure is based on \$7.7 billion of general obligation and revenue bond debt service payments versus \$117 billion of General Fund revenues (California State Treasurer, 2016). In the 2016 Debt Affordability Report, the California State Treasurer described California's debt levels as consistent with other large states in the country. Table 4 summarizes California's debt rating.

New Public Funding Mechanisms for Forest Conservation

Over the past decade, California has begun to explore new funding solutions for natural resource conservation. Policy makers are seeking mechanisms that provide stable, dedicated, and continuous funding for grant programs and natural resource agencies; that are not subject to yearly bond allocations or budget appropriations.

Fees and taxes provide stable funding for natural resource conservation, however, there are many challenges with this funding mechanism. Two California propositions and subsequent case law have narrowed the use of fees and taxes for revenue generation in the state. Fees are funds collected to pay for regulations or specific programs based on use. Taxes, on the other hand, are more general in nature and pay for public services. For example, the personal income tax goes into the state's General Fund. It is then used to fund a variety of public services and provide public benefits. Fees go directly into a special fund used to provide for specific beneficiaries. The state currently uses these types of regulatory fees to pay for most of its environmental programs.

Fees

In 2011, the Legislature passed Assembly Bill X129, which imposed an annual Fire Prevention Fee to be paid by owners of habitable structures located within the State Responsibility Areas (SRA). These are lands where the California Department of Forestry and Fire Protection (CAL FIRE) has the primary financial responsibility for prevention and suppression of fires (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a). The SRA includes state and privately-owned forest, watershed, and rangeland where the State of California has primary financial responsibility for the prevention and suppression of fires. Specific lands are excluded from SRA, even if they include forest, watershed and rangelands, if they are owned by the federal government or are within city boundaries (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a). The SRA is over 31 million acres with approximately 735,000 habitable structures within its boundaries to which CAL FIRE provides a basic level of fire prevention and protection services. Many areas also receive augmented fire protection from local agencies that provide such services. SRA is found in 56 counties of California (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a).

The money collected is deposited into the State Responsibility Area Fire Prevention Fund within the State Treasury. The law directed that, except for the costs of administration, all monies expended from the Fund are for specified fire prevention activities that benefit the owners of structures within SRA who are required to pay the fire prevention fee (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a). The fee funds a variety of fire prevention services in the SRA. Such activities include fuel reduction projects that lessen the risk of wildfire to communities and improve forest health. Other activities include defensible space inspections, helping communities create and update their Community Wildfire Protection Plans,

fire prevention education, fire hazard severity mapping, and implementation of the State and local fire plans. In Fiscal Year 2015-16, the fee funded over an estimated \$81.6 million of fire prevention programs and activities throughout the State (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a).

In 2015, California Governor Brown proclaimed a State of Emergency due to unprecedented levels of dead and dying trees in California. The United States Forest Service completed a series of aerial detection surveys estimating that, in 2014, over 29 million trees in California are dead due to pests and exacerbated by severe drought (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a). In response to this emergency, CAL FIRE directed some of the SRA fee resources to assist with the local efforts to mitigate this hazard, including SRA Fire Prevention Fund Grant recipients. The SRA fee funded 83 grant recipients who received \$9.5 million during Fiscal Year 2014-15 to help reduce wildfire risk related to the drought. Subsequently, 63 grant recipients have received \$5 million for Fiscal Year 2015-16. The funding was used to address the impacts of the tree mortality emergency. Grants are awarded to local community organizations to assist with work on forest treatment projects, education programs, and local emergency planning efforts throughout the State where there is an intensified risk of wildfires due to the drought and tree mortality (California Board of Forestry and Fire Protection, 2014; CAL FIRE, 2016a).

Tax

In 2012, the Timber Regulation and Forest Restoration Fund (TRFRF) Program was passed as a component of Assembly Bill 1492 (Committee on Budget, Chapter 289, Statutes of 2012). One of the major elements of the Program established a funding stream via a one-percent assessment on lumber and engineered wood products sold at the retail level which provided for a forest restoration grant program and stable funding for the administration of the state's timber harvest program (California Natural Resources Agency, 2017). Implementation of the TRFRF Program began in January 2013. At that time, most of the timber program staff at the responsible agencies (Department of Forestry and Fire Protection, Department of Fish and Wildlife, Department of Conservation, and State and Regional Water Boards) were shifted to program funding from TRFRF, and some initial increases in staffing were authorized for the Department of Fish and Wildlife, whose timber harvest program had been significantly reduced over a number of years. Later the TRFRF Program provided additional funding and position authority for the timber review team agencies and authorized and funded an assistant secretary position at the California Natural Resources Agency. In the 2014-15 Fiscal Year a total of \$4 million of grant funding (\$2 million/year for two years) for forest restoration projects was authorized (California Natural Resources Agency, 2017). During the same fiscal year, the revenues that flowed into the Timber Regulation and Forest Restoration Fund were \$37 million, and at the end of the year, the fund had a balance of \$26 million. Table 5 provides an overview of the fund allocations.

Cap-and-Trade

Another program established in California is not a traditional tax or fee mechanism as described above, but rather a cap-and-trade program created to reduce greenhouse gas (GHG) emissions by 2020 which also provided funding for natural resource conservation. California's cap-and-trade program has two major components: (1) the regulation and (2) auction revenue. The regulation is intended to ensure the state meets its GHG goals and provide an incentive for cost-effective emission reductions. The cap-and-trade regulation also generates auction revenue

even though generating revenue is not a primary goal of the program. Under current law, the state can only spend auction revenue on activities that facilitate GHG reductions (LAO, 2016).

Cap-and-trade is a market-based approach to reducing emissions. Market based approaches differ from other regulatory approaches, such as traditional command-and control regulations. The cap-and-trade regulation places a cap on aggregate GHG emissions from large GHG emitters, such as large industrial facilities, electricity generators and importers, and transportation fuel suppliers. Capped sources of emissions are responsible for roughly 85 percent of the state's GHG emissions. The cap declines over time, ultimately arriving at the target emission level in 2020. To implement the cap-and-trade program, the California Air Resources Board issues carbon allowances equal to the cap, and each allowance is essentially a permit to emit one ton of carbon dioxide equivalent. Entities can also trade the allowances in order to obtain enough to cover their total emissions. Some entities are forced to reduce their emissions because the number of allowances available is less than the number of emissions that would otherwise occur. Entities can also purchase offsets to cover their emissions. Offsets are GHG emission reduction projects undertaken by entities not subject to the state's cap-and-trade program, such as forestry projects that reduce GHGs (LAO, 2016).

The California Air Resources Board has conducted 13 quarterly cap-and-trade auctions since November 2012— generating roughly \$3.5 billion in state revenue. Expenditures for forest conservation programs are listed in Table 6. The \$42 million for the Department of Forestry and Fire Protection was dedicated to support urban forests and forest health restoration and reforestation projects that reduce wildfire risk and increase carbon sequestration. The expenditures are expected to enhance forest health and reduce fuel loads in the face of increasing wildfire intensity due to climate change (California State Budget 2014-15).

In 2017, the Legislature ended the SRA fee program with the extension of the cap-and-trade program. In return, a portion of the auction revenue was dedicated to the protection and restoration of the State Responsibility Area, thus ending the SRA fee. Assembly Bill 109 (Chapter 249, Statutes of 2017) dedicated \$200 million from the auction revenue to be used for state and local healthy forest and fire prevention programs.

Public Goods Charge

The final financing mechanism that has been part of the dialogue around innovative funding is the public goods charge. A public goods charge is a fee applied to a utility bill to fund public-interest programs related to that utility service. A public goods charge for electricity was passed in California in 1996 as part of the energy sector deregulation, and has been successful at funding conservation and efficiency programs for energy. State agencies and policy makers in the field of water have been interested in the possibility of a similar charge on water.

According to Griffin et al. (2010), water consumption has some negative externalities on the environment, which include decreased flows available for fish and wildlife. There are also economic externalities of water consumption. These externalities are decreased supply for future generations and increased costs of acquiring new supply. The economic and environmental externalities of using water make the case to regulate the water market to protect public values. Griffin et al. (2010) assert that water is a commodity—an input into the production of goods and services, with a price and a market value—similar to electricity.

Water can be considered a public good, with broadly shared benefits, and should be managed in a way that recognizes both the public and private aspects of the resource. Hanak et al. (2011) note that a case for a public goods charge on water uses could be made to cover the costs of improving the efficiency and reliability of California's water supply, and provide

funding for ecosystem restoration, fish protection, and the other public benefits of the state's water resources systems.

The public good surcharge on electricity and natural gas bills amounts to \$1 to \$2 per month for most California households. The funding is allocated to electricity energy efficiency programs (\$228 million per year), research and development (\$62.5 million per year) and renewable energy programs (\$65.5 million per year). The surcharge has also helped maintain a constant per-capita consumption for electricity demand. A similar public goods charge on water could provide a stable, sustainable funding mechanism to support statewide conservation and water projects (Ajami, 2012). According to Hanak et al. (2011), a public goods charge on water could function as a volumetric charge on surface and groundwater used in the state to fund water-related agencies and ecosystem programs. The source would provide stable funding and reduce the disruption, delay, and inefficiencies resulting from irregular, bond-dependent, and increasingly stressed general revenue funds.

Limitations of Taxes and Fees

In 1978 the California electorate added Proposition 13 to the California Constitution. Proposition 13 requires any increase in state taxes to "be imposed by an Act passed by not less than two thirds of all members elected to each of the two houses of the Legislature." Similarly, the Proposition requires approval by two-thirds of the electorate before the imposition of any local special tax. Fees like bonds, on the other hand, are approved by a simple majority.

The California Supreme Court addressed the distinction between taxes and fees in the Sinclair Paint case. Sinclair Paint involved a challenge to a levy used to fund a program designed to evaluate and screen for children at risk of lead poisoning and to identify sources of lead contamination responsible for that poisoning. The levy was imposed on entities that significantly contributed to environmental lead contamination. In describing the tax versus fee distinction, the court in Sinclair Paint stated that "the cases recognize that 'tax' has no fixed meaning, and that the distinction between taxes and fees is frequently 'blurred,' taking on different meanings in different contexts." The court stated that in general, taxes are imposed for revenue purposes, as opposed to in return for a specific benefit, and that taxes are typically compulsory, rather than being imposed in response to a voluntary decision to seek government privileges. The court in Sinclair Paint listed three categories into which fees may be classified: special assessments, based on the value of benefits conferred on property; development fees, exacted in return for permits or other government privileges; and regulatory fees, imposed in accordance with the state's police power. The court found that levies can be considered a legitimate fee if the revenue from the levy does not exceed the costs of the regulatory activity, it is not imposed for an unrelated revenue purpose, and it bears a reasonable relationship to the payer's burden or benefit from the regulatory activity (Steele et al., 2011).

Proposition 26, passed by the California electorate in November 2010, amended the California Constitution to provide a detailed definition of the term tax as used at both the state and local levels. It definitively placed the burden of proving that a levy is a fee and not a tax on the state or local agency (Steele et al., 2011). The Proposition expanded the definition of a tax so that more proposals would require approval by two-thirds of the Legislature or by local voters. The justification was to ensure that fees were not used for services that benefit the public broadly, rather provide services directly to the fee payer. The "levy or charge is not a tax if that the amount is no more than necessary to cover the reasonable costs of the government activity, and that the manner in which those costs are allocated to a payer bear a fair or reasonable

relationship to the payer's burdens on, or benefits received from, the governmental activity" (Steele et al., 2011; California Tax Payers Association, 2011; LAO, 2010).

Challenges have been made to both the SRA fee and to the cap-and-trade program that they are illegal taxes. There was a court case challenging whether the state could collect revenue from cap-and-trade revenues. In a lawsuit against the Air Resources Board, plaintiffs argued that the Legislature did not provide the Air Resources Board the authority to auction allowances and collect state revenue. They further argued that even if the Legislature gave the Air Resources Board the authority to collect auction revenue, such revenue constitutes an illegal tax. The plaintiffs argued that auction revenues are tax revenues and, since the legislation establishing the cap-and-trade program was not passed with a two-thirds vote, the state is collecting auction revenues illegally (LAO, 2016). The same argument was made against the SRA fee. The Legislature imposed the fire protection fee by a majority vote. The Howard Jarvis Taxpayers Association filed suit against the state, stating that the fee provided no additional or new services to property owners; therefore, it meets the Proposition 13 definition of a tax, which requires a two-thirds vote of lawmakers.

In 2017, the Legislature extended the cap-and-trade program with a two-thirds vote, thus ending the debate over the establishment of an illegal tax (Assembly Bill 398: Chapter 135, Statutes of 2017). In addition, the Legislature ended the SRA fee program with the extension of the cap-and-trade program.

Conclusion

California's forests provide many public benefits, including diverse habitats, water supply, carbon storage, biofuel, lumber, and outdoor recreation (UCANR, 2016). Market-based frameworks and conservation investments are emerging in California for the ecosystem services that forests provide. The frameworks include private payments, public payments or incentives and trading schemes. Public payments or incentives may utilize taxes, fees, grants, and other funding sources. The public investment tools should be carefully evaluated to ensure future natural resource conservation funding is available in California.

Taxes have the advantage of being directly linked to the behavior causing the market to fail. For example, activities responsible for creating greenhouse gasses can be taxed to mitigate their environmental impact. However, because of California Propositions 13 and 26, and the requirement of a two thirds majority within both houses of the state legislature, passing any new tax presents a significant political barrier. This barrier makes taxes a difficult mechanism to fund forest protection and restoration activities.

Bonds allow the state to finance large capital projects. State bonds, particularly those that pay an above market interest rate, can be an effective method to raise the large amounts of capital needed to pay for forest restoration, protection, and fire prevention. Bonds also have the advantage of only requiring a majority vote to pass. However, bond funding can be unpredictable and finite for state programs. Bonds are subject to the will of the voters and only provide a fixed level of funding. This finance mechanism may be an unreliable means to address the continuous funding need for forest restoration.

Alternative methods for financing include cost-share programs. Cost-share programs do not generate enough money, nor do they have the scale to address the needs of the state's forests. In addition, non-industrial landowners perceive the programs as slow, ineffective, inflexible, and unpredictable in terms of utilization. The lack of scale, and public buy in, makes cost-sharing programs an impractical means to address state forestland needs.

Fees may be the best long-term option for financing the costs related to improving California's forestland. The public is the ultimate beneficiary of a healthy forest system. In addition to mitigating carbon emissions, healthy forestlands offer recreational opportunities, increase biodiversity, provide clean water, and lessen the risk of private property damage from the increasing frequency and intensity of wildfires. As the public enjoys these benefits, the state may pass the associated costs through to the end user in the form of a fee.

The key to this approach is demonstrating that the public benefits from a healthy forest to a degree that a nominal fee is acceptable. A fee mechanism that improves the condition of a forested watershed would provide a sustainable and reliable source of funding for agencies tasked with responsibility over state forestland management. Funding from a fee mechanism can be budgeted so that state agencies have a clear understanding of the resources available. This would allow California's forestlands to be effectively managed in such a way that they can continue to provide public benefits for generations to come.

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Paper I: Appendix

Table 1: California State Forest Revenue in 2014 (California Board of Forestry and Fire Protection, 2014a)

Forest	Large Timber Sales	Small Timber Sales and Miscellaneous Forest Products
Jackson	\$3,683,422	\$35,098
LaTour	\$656,492	\$3,998
Mountain Home	\$0	\$68,003
Boggs Mountain	\$0	\$11,158
Soquel	\$726,764	\$9,615
Total	\$5,066,678	\$127,872

Table 2: History of Natural Resources Bonds (California on Ballotpedia, 2017)

	Proposition 204 (1996)	Proposition 12 (2000)	Proposition 13 (2000)	Proposition 40 (2002)	Proposition 84 (2006)	Proposition 1 (2014)
Funding	\$995 million	\$2.1 billion	\$1.97 billion	\$2.6 billion	\$5.4 billion	\$7.545 billion
Voter Approval	62.84%	63.20%	64.80%	56.90%	53.80%	67.13%

Table 3: Proposition 40 Funding Summary (LAO, 2001)

Proposition 40 Funding (Millions)	
Land and Water Conservation	\$ 1,275.0
State conservancies acquisition, development, and restoration projects	\$ 445.0
Wildlife habitat acquisition and restoration projects	\$ 300.0
Water quality protection and restoration activities, including, rivers, lakes, watersheds, and coastal waters	\$ 300.0
Agricultural and grazing lands preservation	\$ 75.0
Urban river parkways and streams development, restoration, and	\$ 75.0
Grants for reducing air emissions from diesel-fueled equipment operating within state and local parks	\$ 50.0
Land and water resource protection and restoration California	\$ 20.0
Urban forestry programs	\$ 10.0
Parks and Recreation	\$ 1,057.5
Urban parks and recreational facilities acquisition and development	\$ 460.0
Regional and local park acquisitions and development	\$ 372.5
State park improvements and acquisitions	\$ 225.0
Historical and Cultural Resource Preservation	\$ 267.5

Figure 1: Cost of Bond Finance (LAO, 2007)

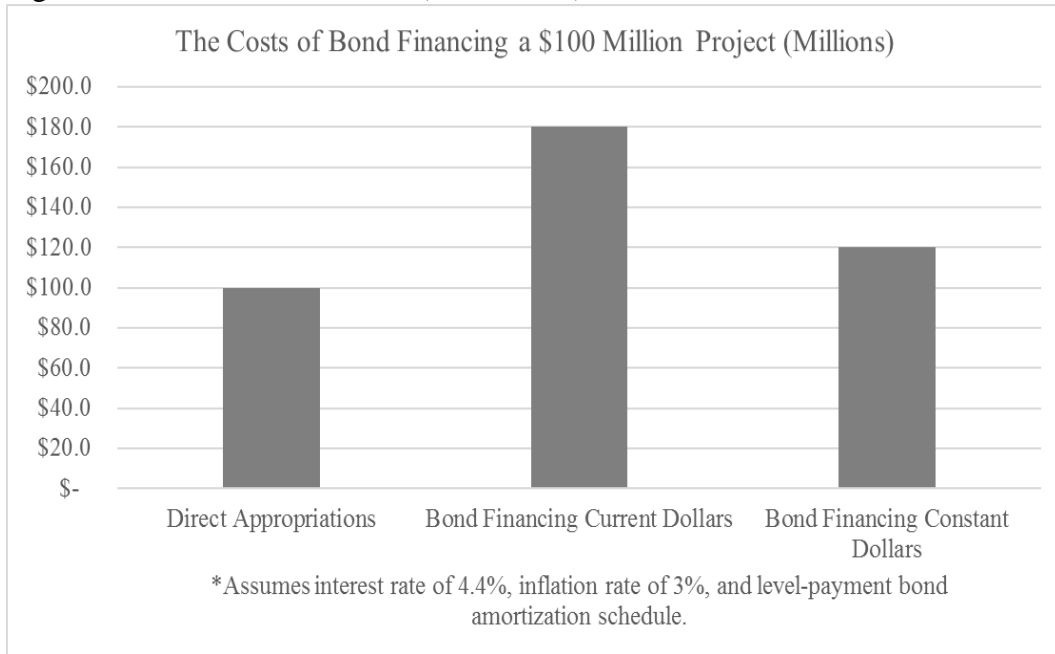


Table 4: California Debt Rating (California State Treasurer, 2016)

Rating Agency	California Debt Rating		
S&P	September 2014	July 2015	October 2016
	A	AA-	AA-
Fitch	September 2014	February 2015	October 2016
	A	A+	AA-

Table 5: Timber Regulation and Forest Restoration Fund Expenditures [Thousands] (California Natural Resources Agency, 2017)

Overview of Timber Regulation and Forest Restoration Fund (TRFRF)					
Department	FY 2011-12	FY 2012-13	FY 2013-14	FY2014-15	FY2015-16
CAL FIRE	\$95.0	\$95.0	\$101.0	\$104.0	\$114.0
Department of Fish and Wildlife	\$8.7	\$26.0	\$41.0	\$41.0	\$41.0
Water Boards	\$26.4	\$27.8	\$31.3	\$32.3	\$34.9
Department of Conservation	\$12.1	\$12.1	\$15.0	\$15.0	\$19.0
Natural Resources Agency	\$0	\$0	\$2.0	\$2.0	\$2.0
Total Program Staffing (personnel years)	142.2	160.9	190.3	191.1	211.9
Fee Administration at State Board of Equalization	\$0	\$8.7	\$4.9	\$5.6	\$14.4
Total TRFRF Expenditures	\$0	\$7,011	\$22,076	\$27,721	\$39,882

Table 6: Cap and Trade Expenditures on Forest Related Programs (California Budget, 2016-17)

Cap-and-Trade Expenditures (Millions)					
Program	2013-14	2014-15	2015-16	2016-17	2017-18
Sustainable Forests	\$ -	\$ 42	\$ -	\$ 40	\$ 200

Paper II: Analysis of California's Lumber Assessment

Introduction

In 2012 California enacted a one percent sales tax on lumber sold in the state (California Public Resources Code §4629 - 4629.13). The purpose of the tax was to generate revenue for the regulation of timber harvesting in California and to generate funding for forest restoration.

California forests have important ecological and societal values. The state has established laws and regulations controlling forest management on both private and public forestland to protect these values. The laws are designed to protect public trust resources such as water, air, and wildlife while permitting the harvest of timber from the forest (Morrison et al., 2007). The Forest Practice Act (Title 14, California Code of Regulations Chapters 4, 4.5 and 10) regulates timber harvesting on private land in California and the new lumber tax was designed to provide additional funding for the oversight of timber harvesting in California.

This study was conducted to understand how the tax affects consumers and producers in the lumber market. Tax incidence theory is used to analyze the effect of tax policy on prices and social welfare. The study analyzed the effect of the lumber tax using a theoretical lumber market model. A partial equilibrium model was used to examine the burden of the tax, ignoring the effects on other markets. This framework determines if the burden of the tax was primarily borne by consumers or producers. The study finds that the tax burden primarily falls on the consumers, given the inelastic nature of the lumber market.

California Forestland Statics

There are a few key reports on California's forests that characterize ownership and management. Key publications include the California Department of Forestry and Fire Protection's Fire and Resource Assessment Program (FRAP), the University of California's Division of Agriculture and Natural Resources 2003 report, and the U.S. Forest Service's 2006 report on "California's Forest Products Industry and Timber Harvest".

Annual statistics on California's timber production are produced by the Western Wood Products Association and the State of California's Board of Equalization. The Forest Inventory and Analysis (FIA) Program of the Forest Service also provides information to assess California's forests. The FIA reports on status and trends in forest area and location; species, size, and health of trees; total tree growth, mortality, and removals by harvest; wood production; and forestland ownership.

Background on California Forestland

California has diverse forest ecosystems. The forests include oak savannas, mixed conifer, high elevation fir, dry pine, and unique communities including pigmy forests, giant sequoias, subalpine bristlecone pine, and coast redwoods. The forests of California provide a vast array of ecological services and commodities (FRAP, 2010). The estimated area of forestland by ownership class is shown in Table 1 based on 2002–2011 Forest Inventory and Analysis data.

The Forest Service defines forestland as land where at least ten percent is covered by trees, whereas timberland (or commercial forestland) is defined as land suitable for producing timber. Most of the timberland in California (approximately 77 percent) is softwoods (Forest Inventory and Analysis [FIA], 2013). Table 2 shows the total timberland in California by ownership class and Table 3 shows the area of forestland by forest type.

California's forests are owned and managed by a number of private and public entities. The Forest Service and other federal land agencies own and manage nearly 19 million acres.

There are over 7 million acres of private timberlands in California with about one-half of this total in industrial land holdings. The largest areas of privately owned forests are in Humboldt and Mendocino Counties, but there is also a significant share of private forestry in Shasta and Siskiyou Counties (Laaksonen-Craig et al., 2003). Most of the wood supply from California timberlands now comes from private lands (FRAP, 2010).

Private non-industrial forest landowners control a quarter of the state's timberlands. The small size of these properties makes them particularly sensitive to costs and geographically dependent on local revenue opportunities. The ability for the owner to keep their lands a working forest include a number of factors: the stabilization of existing wood product infrastructure, new ecosystem service markets, and regulatory compliance cost (FRAP, 2010).

Background on California Forest Products Industry

California is one of the top lumber producing states. California forests produce mainly softwood products, such as dimensional lumber, molding and decking (FRAP, 2010). In 2012, the California timber harvest was 1.3 billion board feet (BBF), and the harvest value was \$267,417,273 million (California State Board of Equalization [BOE], 2012). Currently, most of the harvested timber volume originates in private forests. In 2012, only 8.4 percent of the volume came from public forests while 48.4 percent came from company owned timberland (Western Wood Products Association [WWPA], 2012). This represents a significant shift from the 1980s when about 40 percent of timber was harvested from public forests (Laaksonen-Craig et al., 2003).

The total timber harvest in California was highest in 1955, at over 6 BBF due to the high post-World War II demand for housing. From 1978 to 1985, the average annual timber harvest in California was about 3.4 BBF, just over half of the average from 1950 through 1960. The timber harvest continued to decline until 1982. After reaching a low point in annual average harvest in 1982, timber harvest volumes increased quickly, almost doubling by 1988. However, total volume harvested in California has steadily declined since the end of the 1980s (Laaksonen-Craig et al., 2003). Figures 1 and 2 highlight the trends of timber harvest volume and value in California.

Most of the lumber produced in California is consumed in California – approximately 63.3 percent of California's lumber market remains within the state. Softwoods make up most of the lumber species produced, with Douglas Fir at 25.7 percent and Redwood at 14.8 percent. California exports very little lumber, less than one percent, and the largest market outside of California is the western United States (WWPA, 2012).

Large quantities of lumber are brought into California from other states. California is the largest single market for western lumber (Laaksonen-Craig et al., 2003). In 2012, the state imported over 26 percent of all lumber shipments from Oregon and 12 percent from Washington (WWPA, 2012). Lumber shipments outside of the western states are difficult to assess because of inadequate statistics on how much softwood or hardwood lumber from other states is exported to California in any given year. Table 4 shows the lumber imports and exports into California.

International lumber imports consumed in California are difficult to track. Canada is the world's largest lumber exporter and a majority of its lumber is exported to the United States. Softwood lumber exports from Canada to the United States were 7.6 BBF in 2012 (Statistics Canada, 2013). The volume of Canadian lumber consumed in California is difficult to track because some of the lumber is shipped to California through other states, such as Washington and Oregon. Thus, this study calculated the lumber imported from Canada and other countries

from customs statistics at California's ports, and from a percentage of imported through ports in the Western United States.

Background on California Forest Management and Regulation of Private Forestland

There are several laws, policies and programs (regulatory and non-regulatory) that address management of forests. The overarching laws are federal and state statutes that deal with clean air, clean water and endangered species. There are other federal and state laws that deal with development of plans or permits and emphasize forest management (FRAP, 2010).

The largest forest landowner in California is the U.S. Forest Service. Additional, large federal forestland owners include the Bureau of Land Management and National Park Service. Each of the federal land management agencies in California operates under numerous federal laws, regulations and policies that require extensive planning, consideration of impacts, and application of management practices and evaluation of results (FRAP, 2010).

On non-federal forestlands in California, the basic regulatory structure is defined in the California Forest Practice Act. The purpose of the Forest Practice Act, enacted in 1973, was to establish a comprehensive regulatory system that assures the "productivity of timberlands is restored, enhanced, and maintained." The goal of maximum sustained production of high-quality timber products is achieved while considering values relating to recreation, wildlife, fisheries, economic vitality, employment, and aesthetic enjoyment (California Department of Forestry and Fire Protection [CAL FIRE], 2013).

The Forest Practice Act rules provide detailed management requirements. California's private forest landowners must have an approved Timber Harvest Plan (THP) prepared by a registered professional forester to conduct a commercial timber harvest (Nunamaker et al., 2007). The Forest Practice Act prohibits timber harvesting unless harvest operations comply with a THP prepared by the registered professional forester and approved by the Director of the California Department of Forestry and Fire Protection (CAL FIRE). Once approved, a plan is generally valid for five years, with possible one-to-two-year extensions.

In addition to CAL FIRE, THPs are reviewed by multiple state agencies, including the Department of Conservation, Department of Fish and Game, and the State Water Resources Control Board. The review process can include initial desk reviews, pre-harvest inspections, inspections during harvesting, and inspections and monitoring after harvesting is completed (CAL FIRE, 2013).

Timber Harvest Plans address all aspects of timber harvesting on a property by describing how timber stands are to be harvested and the mitigation for adverse environmental impacts associated with the harvesting activities. They address the proposed silvicultural treatments, logging method, and road construction. Using a cumulative impact assessment, the plans describe the protections for watercourses, erosion control, endangered species habitat protection, archeological and historic site protection, and adverse visual impacts.

A Timber Harvest Plan is an environmental review document, similar to an environmental impact report. It demonstrates the environmental impacts of the timber harvest and focuses on reduction and mitigation of those potential impacts. Though called a plan, a THP is a regulatory document, a permit to conduct timber harvest operations. There are exemptions to filing a THP in the case of emergencies such as wildfire or other catastrophic events, or minimal-impact small-scale timber harvesting to reduce fire hazard around a home, and removal of dead, dying, or diseased trees (Nunamaker et al., 2007).

The Forest Practice Act also allows timber harvest under a Non-Industrial Timber Management Plan (NTMP). An NTMP is a long-term timber-harvesting permit. In exchange for

more up-front planning and limitations on the types of management activities allowed, landowners get an alternative to the THP that is valid in perpetuity. To harvest timber under an approved NTMP, the landowner need only file a notice of intent to harvest (Nunamaker et al., 2007). Acres under non-industrial timber management plans are rising, but with smaller landowners increasing in participation. As of January 1, 2010, there are 711 NTMPs covering 301,598 acres (FRAP, 2010). In 2013, the California Legislature created the Working Forest Management Plan, which expands the NTMP acreage cap to 10,000 acres (California Public Resources Code § 4597).

Costs for THP preparation vary based on the scale and complexity of the plan and the environmental issues considered. A simple THP, with no streams, archeological sites, endangered species, or geological issues, will be less expensive than a complex THP covering a large area (Nunamaker et al., 2007). The average preparation cost of a timber harvest plan ranges from \$45,000 on the North Coast of California to \$25,000 in the Sierra Nevada. The costs are based on the registered professional forester's time to prepare the plan and the response to the regulatory review (Thompson & Dicus, 2005).

State expenditures to regulate timber harvesting under the Forest Practice Act total about \$13 million, mostly funded from the State of California's General Fund (Table 5). The largest cost is for THP review and enforcement, but additional expenditures include review of NTMPs and emergency plans (California Legislative Analyst's Office [LAO], 2011). Individual timber harvesting plans have been increasing in size and numbers. See Table 6 for the number of timber harvest plans and acreage current through 2013.

In 2011, the Legislative Analyst's Office recommended enactment of legislation imposing fees on timber operators to cover the state's cost of administering the Forest Practice Act. The LAO argued that the harvesting of timber on private lands has impacts on watersheds that go beyond the bounds of the timber harvesting area and affect the state's natural resources as a whole. The argument made by the LAO was that these impacts can be mitigated or avoided by use of THPs as a regulatory document. As the primary beneficiaries of timber harvesting, the timber industry should be held responsible for ecological impacts caused by timber harvesting, and thus should pay for the state's THP activities which prevent or lessen these impacts. In addition, timber harvesters benefit from the review and approval of THPs and related plans because the approval allows timber harvesters to begin revenue-generating timber harvesting (LAO, 2011).

The Legislative Analyst's Office affirmed that enacting a timber harvest regulatory fee would be consistent with the Legislature's general policy to require the costs of regulatory programs in state agencies to be reimbursed through industry fees and assessments. Examples of fee programs include the State Water Resources Control Board charging fees as a method to regulate waste discharge into water. The annual revenues from the waste discharge fees total about \$80 million. The Department of Conservation charges industry fees to cover the cost of regulating oil and gas production activities. The annual revenues from these fees total about \$27 million (LAO, 2011).

Beneficiary Pays Theory

Fees and taxes associated with the management of natural resources are tied to the theories behind the beneficiary and polluter pays principles. The beneficiary pays principle simply states that the beneficiary of a good or service should bear the cost, whereas the polluter pays principle places the financial burden onto the entity creating the environmental problem (Kemkes et al., 2010; Engel et al., 2009).

With market economy theory, people pay for goods and services they want to consume. When the private market is unable to produce certain goods, the government steps in. But the basic principle that the costs of producing goods should be shouldered by those who benefit from them remains (Faber, 2007). For example, people who expect to benefit from pollution control or conservation are expected to pay for the costs according to the benefits they expect to derive (Panayotou, 1994; Kemkes et al., 2010; Engel et al., 2009). Two cases of beneficiary pays theory serve as examples. In the first case, downstream landowners who rely on a watershed for irrigation and hydroelectricity would pay upland landowners to protect the floodplain to prevent downstream flooding and sedimentation (Panayotou, 1994). Or, in the case of climate change adaptation, the individuals who benefit from adaptation should pay the cost (Faber, 2007).

With the polluters pay principle, polluters are liable for the cost of pollution. Polluters are often thought of as the producers of goods and services; although it can be argued that consumers are the ultimate polluters since without demand the polluting products would not be produced. In practice, the pollution control costs are shared between producers and consumers according to the elasticity of demand for the polluting product in question (Panayotou, 1994). In the climate example, the emitters would pay to reduce the cost of climate impacts. The prospect of financial responsibility could serve as an incentive for reducing emissions (Faber, 2007).

Public Trust Doctrine

California's private forestland is subject to legal protections of "public trust" resources, although it is complicated in practice. The California Board of Forestry and Fire Protection (Board of Forestry) finds that, while watershed values and wildlife associated with forests are public trust resources, the trees themselves are not (Board of Forestry, 2017). On the other hand, conservationists have stated that these resources are protected for the benefit of the public (Morrison et al., 2007). The origins of the public trust doctrine are traceable to Roman law concepts of common property (California State Lands Commission, 2012). The public trust doctrine in the United States was first recognized in the constitution in what is known as the "reserve powers doctrine." The landmark passage of federal environmental laws in the 1970s had the same objective of the public trust doctrine, the government stewardship of natural resources on behalf of present and future generations. The National Environmental Policy Act of 1969 explicitly recognized a national objective to "fulfill the responsibility of each generation as a trustee of the environment for succeeding generations" (Quirke, 2016). The public trust doctrine establishes a trustee relationship of government to hold and manage wildlife, fish, and waterways for the benefit of the resources and the public. Fundamental to the concept is the notion that natural resources are deemed universally important in the lives of people, and that the public should have an opportunity to access these resources for purposes that traditionally include fishing, hunting, and travel routes (e.g., the use of rivers for navigation and commerce) (Batcheller et al., 2010; Frank, 2012).

California's public trust resources include air and water quality, wildlife, and certain environmental resources such as tidelands and wetlands. The laws that apply to natural resource management on private lands are designated to ensure that these public trust resources are not degraded. California public trust laws include the 1973 California Forest Practice Act, California Forest Practice Rules, California Endangered Species Act, Porter-Cologne Water Quality Control Act, and California Environmental Quality Act. These laws that apply to natural resource management on private lands are designed to ensure that the public trust resources are not degraded. As a result of these laws, certain management activities are either prohibited or restricted under specific circumstances. Protection of public trust resources is the principle

underlying California's forest management regulations that aim to protect water quality and the beneficial uses of water while allowing timber harvesting (Morrison et al., 2007). The California Forest Practice Act is designed to protect, enhance, and restore California's timberlands.

California Funding Mechanisms: Taxes and Fees

California state and local governments impose a variety of taxes, fees, and charges on individuals and business. Taxes, such as income, sales, and property taxes, are typically used to pay for public services such as education, prisons, health, and social services. Fees and charges, by comparison, typically pay for a service or program benefiting individuals or businesses (LAO, 2010).

There are two broad categories of fees and charges. User fees are where the user pays for the cost of a specific service or program, such as park entrance fees and garbage fees. Regulator fees pay for programs that place requirements on the activities of business or people to achieve certain public goals or help offset the public or environmental impact of certain activities (LAO, 2010).

State law has different approval requirements regarding taxes, fees, and property charges. California state and local governments usually can create or increase fees with a majority vote of the governing body (the Legislature, city council, and the county board of supervisors). In contrast, increasing tax revenues usually requires approval by two-thirds of each house of the state Legislature (LAO, 2010).

For the past few decades, there has been public disagreement regarding the difference between regulatory fees and taxes, particularly when the money is raised to pay for a program of broad public benefit. In 1991, for example, the state began imposing a regulatory fee on businesses that made products containing lead. The state uses this money to screen children at risk for lead poisoning, and identify sources of lead contamination responsible for the poisoning. The Sinclair Paint Company brought the regulatory fee to court and argued that this fee was a tax because: the program provided a broad public benefit, not a benefit to the regulated business, and the companies that pay the fee have no duties regarding the lead poisoning program other than payment of the fee (LAO, 2010).

In 1997, the California Supreme Court ruled that this charge on businesses was a regulatory fee, not a tax. The court said government may impose regulatory fees on companies that make contaminating products in order to help correct adverse health effects related to those products. Consequently, regulatory fees of this type can be created or increased by a majority vote of each house of the Legislature or a majority vote of a local governing body (LAO, 2010).

In 2012 California voters, by 53 percent to 47 percent, approved Proposition 26, a ballot initiative that reclassifies most regulatory fees on industry as "taxes" requiring a two-thirds vote in government bodies or in public referendums, rather than a simple majority (Roosevelt, 2010). The measure altered the definition of a state or local tax to include many payments currently considered to be fees or charges. Generally, the types of fees and charges that would become taxes under the measure are ones that government imposes to address health, environmental, or other societal or economic concerns. These fees pay for many services that benefit the public broadly, rather than providing services directly to the fee payer. The state currently uses these types of regulatory fees to pay for most of its environmental programs (LAO, 2010). Proposition 26 essentially defined all regulatory fees as taxes, requiring a two-thirds vote to pass in the Legislature.

2012 Lumber Tax Legislation

In 2011, the Legislative Analyst's Office explored various fee mechanisms to help offset the cost to the State for timber harvest plans. These mechanisms included a fee per plan, a fee per acre and a fee per board foot (LAO, 2011).

A fee per plan would require the application or regulated landowner to pay a fee per timber harvest plan. The fee would be paid by all landowners and easy to administer. The LAO report concluded that the fee per plan would not be equitable as all owners would pay the same regardless of workload to state agencies to review the plan. Small owners in particular could be assessed fees that make it unprofitable for them to harvest. The LAO also concluded that the policy does not consider complexity or size of plan, including necessary reviews and inspections due to variation in terrain, type of habitat, or Endangered Species Act compliance. This policy also does not consider harvesting methods and may create incentive for more aggressive harvesting of acreage to maximize profit from one plan.

A fee per acre would reflect harvest size and reduce the cost for smaller landowners. The LAO report stated that this type of fee does not take into account the complexity of plan, including necessary reviews and inspections due to variation in terrain, type of habitat, or Endangered Species Act compliance. This type of fee also does not consider harvesting methods and may create incentive for more aggressive harvesting of acreage to maximize profit from one plan.

Lastly, the LAO report reviewed a fee per board foot and asserted that a fee per board foot would reflect the harvest size in which smaller harvest operations pay less than larger ones. Fees could be collected at the same time the timber yield tax is collected by the Board of Equalization. This type of fee does not fully consider the complexity of plan, including necessary reviews and inspections due to variation in terrain, type of habitat, or Endangered Species Act compliance. However, the Board of Equalization's method to value timber does account for the location and tree species harvested.

The LAO report also made recommendations to reduce the cost to the landowner and the time required for the registered professional forester. The regulatory process could potentially be made more efficient, less costly (for both the regulated and the regulator), and shorter by gathering representatives from all involved state agencies together for initial THP review, including those issuing related permits. Additionally, reviewing THP content requirements for redundancies in the plan, and consolidating related permits into the THP would reduce costs. A single pre-harvest inspection for each THP with all involved agencies would also reduce costs (LAO, 2011).

The outcome of this report led the California State Legislature to enact Assembly Bill 1492 (Budget Committee, Chapter 289, Statutes of 2012) to pay for the oversight of timber regulations in California. Assembly Bill 1492 created a sales tax on all lumber sold in the state regardless as to where the lumber was produced. Beginning January 1, 2013, the new law required a one percent assessment on purchases of lumber products and engineered wood products for use in California, based on the selling price of the products.

The law affects retailers of lumber products or engineered wood products and purchasers, including construction contractors, who use these products in California. The Board of Forestry is responsible for determining the products that are subject to the lumber products assessment. The Board of Forestry is required to annually update their regulation.

In general, lumber products and engineered wood products subject to the assessment are building products usually used in construction in which wood is at least 10 percent of total

content. For example, the assessment is applied to all dimensions and grades of lumber, roofing, siding, plywood, particle board, fiberboard, oriented strand board, laminated veneer lumber, and inorganic-bonded and wood thermoplastic composites, including plastic lumber and decking (Board of Forestry, 2013).

Based on guidance provided by Board of Forestry the lumber products assessment does not apply to products where labor has added “significant value” to them, such as furniture, doors, windows, decorative products such as wainscoting, paneling, molding or baseboards that have added profiling, patterns, or other craftsmanship (Board of Forestry, 2013).

However, the addition of any value to a lumber product does not automatically result in a product not subject to the assessment. Many lumber products undergo additional processing before being used, but are still subject to the assessment, for example lumber that is graded and planed. In addition, engineered wood products, which are subject to the assessment, have been, by definition, processed or manufactured from raw materials (Board of Forestry, 2013).

Assembly Bill 1492 required the revenue from the assessment on lumber products sold in California to fund, among other activities, multi-agency review of permitted Forest Practice Act activities in California. Assembly Bill 1492 placed annual reporting requirements on the California Natural Resources Agency and the Environmental Protection Agency to report on specific workload, staffing, productivity and environmental impacts of Forest Practice Act activities in order to give the Legislature and stakeholders the tools to evaluate the efficiency and effectiveness of California timber programs and measure impacts of those programs on the environment (California Natural Resources Agency, 2013).

Assembly Bill 1492 also established the Timber Regulation and Forest Restoration Fund in the State Treasury, and requires that funding deposited into the fund be used for the regulatory activities of the department and other state and local agencies involved in the management of forest lands, and the costs of managing forest resource programs in the state. Additionally, the funding can be used for fire protection and suppression, and for grants to fund restoration on timberland.

Consumption Tax

One of the most common forms of taxation is the consumption tax, which is paid on individual or household consumption of goods. Consumption taxes are often levied in the form of sales taxes, taxes that are paid by consumers to vendors at the point of sale. These taxes can either be applied to a broad variety of consumptions goods or to a particular good alone. The statutory incidence of a tax is determined by who pays the tax to the government. Statutory incidence, however, ignores the fact that markets react to taxation.

The market reaction to a tax determines the economic incidence of a tax. The incidence of a tax is essentially the change in resources available to any economic agent as a result of taxation. When a tax is imposed on producers in a competitive market, producers will raise prices to offset this tax burden, and the producer’s income will not fall by the full amount of the tax. When a tax is imposed on consumers in a competitive market, the consumers will not be willing to pay as much for the taxed good, so prices will fall, offsetting to some extent the statutory tax burden on consumers. Tax incidence is identical whether the tax is levied on producers or consumers (Gruber, 2010).

The incidence of taxation on producers and consumers is ultimately determined by the elasticities of supply and demand on how responsive the quantity supplied or demanded is to price changes.

Tax Incidence Theory

Partial Equilibrium Model

The fundamental principles of tax incidence can be illustrated in a partial equilibrium model (Gruber, 2010). For the partial equilibrium analysis to be appropriate, the product in question must have a market that is small relative to the entire economy. The partial equilibrium model considers the impact of a tax on a market in isolation. A general equilibrium model can be used to consider the effects on related markets of a tax imposed on one market. In order to examine the incidence of an excise tax, the change in equilibrium that results from the imposition of the tax is characterized (Gruber, 2010).

A partial equilibrium model was used to analyze the effects of the lumber assessment on the welfare of the market participants. Since the study considered only one good (lumber), the market participants are the sellers of the good (the firms that produce and sell lumber) and the buyers of the good (the final consumers of lumber). The study measured the change in the welfare of the firms with the change in the producer surplus and the change in the welfare of the consumers with the change in the consumer surplus.

Tax Incidence Analysis

The goal of determining a tax's incidence is to assess who ultimately bears the burden of paying a tax. A market's reaction to taxation determines the economic incidence of a tax - the change in the resources available to any economic agent as a result of taxation. The economic incidence of any tax is the difference between the individual's available resources before and after the tax has been imposed (Gruber, 2010).

Tax incidence analysis considers the distribution of tax burden across economic agents, and it considers not only who pays the tax to the government but also the effects of the tax on market prices.

The incidence of taxation on producers and consumers is ultimately determined by the elasticities of supply and demand on how responsive the quantity supply or demanded is to price changes.

Following the convention in Gruber (2010), tax incidence is analyzed by measuring how imposing a tax changes the price in a market. For a tax that is paid by consumers, the total price change to consumers is:

$$\text{total price change} = \Delta P + \tau$$

Where ΔP is the change in market price and τ is the tax payment. The price change to producers is just ΔP , the reduction in price.

The definitions of elasticity of demand and supply:

$$\text{elasticity of demand} = \eta_d = \Delta Q / (\Delta P + \tau) \times (P/Q)$$

$$\text{elasticity of supply} = \eta_s = \Delta Q / \Delta P \times (P/Q)$$

The elasticity terms are set equal to each other:

$$\Delta Q / Q = \eta_d \times (\Delta P + \tau) / P = \eta_s \times \Delta P / P$$

And then the equation is solved for the change in price as a function of the tax:

$$\Delta P = [\eta_d / (\eta_s - \eta_d)] \times \tau$$

Economic Efficiency

Gruber's (2010) discussion of economic efficiency largely defines the methodology in this study. The effect of taxation on efficiency is the effect of taxes on market prices and their resulting effect on market quantities. Tax incidence studies who bore the burden of taxation through tax payments and prices changes. The social efficiency effects of taxation are determined by the effect of taxes on quantities.

The competitive equilibrium quantity maximizes social efficiency; and the reduction in quantity would cause the social efficiency to fall. Consumer surplus falls since there is reduction in quantity below the market equilibrium. Producer surplus falls since producers could make profit on the reduced quantity. The sum of this reduction in consumer and producer surplus is the deadweight loss. Deadweight loss therefore measures the inefficiency of taxation, the amount of consumer and producer surplus society loses by imposing a tax. Deadweight loss (DWL) is determined by changes in quantities when a tax is imposed, since this change captures the number of socially efficient trades that are not being made.

Following Gruber's convention again, the formula for computing deadweight loss of a tax is based on the formula for the area of a triangle: $\text{area} = (1/2) \times (\text{base}) \times (\text{height})$. The base of the deadweight loss triangle is the change in quantity induced by the tax and the height of the tax, so that:

$$DWL = -\frac{1}{2} \times \Delta Q \times \tau$$

The DWL is positive because the quantity is falling ($\Delta Q < 0$).

$$\Delta Q/Q = \eta_s \times \Delta P/P \quad \text{And} \quad \Delta P = \frac{\eta_d}{\eta_s - \eta_d} \times \tau$$

Combining and rearranging these equations yields an equation for ΔQ , the tax-induced change in quantity:

$$\Delta Q = \frac{\eta_s \eta_d}{\eta_s - \eta_d} \times \tau \times \frac{Q}{P}$$

Substituting this equation into the formula for DWL above:

$$DWL = -\frac{1\eta_s\eta_d}{2\eta_s - \eta_d} \times \tau^2 \times \frac{Q}{P}$$

Methods

Empirical Methodology

To create the partial equilibrium model, California's lumber consumption was derived from data produced by the Western Wood Products Association (WWPA) and from the United States International Trade Commission.

The WWPA reports forest product statistics including lumber production by state (in thousand board foot and estimated wholesale value). Each year the WWPA statistics include the principle market source for each state's lumber production.

The lumber consumption for California was calculated by finding the percentage of lumber produced in each state where California was part of the principal market. In 2011, for California, 62.9 percent of lumber produced in the state was sold (consumed) in California. The data is reported in Table 7.

Total consumption of lumber per year was calculated by adding the state production data to the lumber import data. Trade data was used to calculate the lumber arriving in California from all other countries. The United States International Trade Commission tracks imports for consumption into the United States at various districts of entry.

A query was designed within the Trade Commission's database to report the quantity and value of various lumber products imported into California districts. All of the countries of origin were aggregated. The districts included in the query in California were Los Angeles, San Diego, and San Francisco. In addition, Canadian lumber imports to Western United States districts were included, based upon an appropriation of California's population out of the total Western United States (74 percent). Imports for consumption are labeled with a harmonized system code that corresponds to a classification of a particular import. All lumber products subject to the assessment were queried and recorded in cubic meters and dollar values.

The total quantity and value of lumber imported into California was added to the state data. A total consumption quantity was calculated in thousand board foot for each year from 2000-2012. A total wholesale value was also calculated. The wholesale value was then used to calculate a price per thousand board foot in each year. See Table 8.

The study assumed that all lumber imported into California was consumed in California. The high expense and limited transportation from the ports would likely lead to the imported lumber remaining in the state. Thus, the lumber product quantity demand is the apparent consumption estimates.

The data timeframe was selected to provide a long-term view of California's lumber consumption prior to the enactment of the lumber assessment in 2013. Data before 2000 was not reported because of the changes in national forest policy that affected timber supply.

Using the constructed consumption and price data, a partial equilibrium model was created to determine the assessment's incidence on the lumber market. A general equation for demand and supply was derived from:

$$\text{A demand equation, } q = p^{\eta_d} \times K \text{ and a supply equation, } q = p^{\eta_s} \times L$$

Where q is the quantity of lumber in thousand board foot, p is the price of lumber per thousand board foot, η_s is the supply elasticity, η_d is the demand elasticity, and K and L are constants.

The price elasticities were not derived in this study, but obtained from the U.S. Forest Products Module (USFPM). The USFPM is a partial market equilibrium model of the United States forest sector that operates within the Global Forest Products Model to provide long-range timber market projections in relation to global economic scenarios (Ince et al., 2011). The USFPM obtains the softwood elasticities from the Global Forest Products Model and estimates the United States' demands for softwood lumber using annual consumption data and a Cobb-Douglas equation that includes as independent variables the real producer price index for each commodity group, the United States real gross domestic product and single-family housing starts (Ince et al., 2011). It was assumed that the USFPM elasticities were suitable estimates for California's softwood lumber market given the relative consumption and production patterns observed in California and the United States softwood markets. The demand elasticity (η_d) was -0.23, and the supply elasticity (η_s) was 0.794 (Ince et al., 2011). If the elasticity is less than one, the demand for lumber is inelastic.

These values were used to estimate the supply and demand functions for the lumber market. The incidence of taxation was determined by the elasticities of supply and demand on how responsive the market was to the price increase.

The effect of taxation on social efficiency was determined by examining the effect of the tax on the market price and market quantity. First, the competitive equilibrium that maximized social efficiency was determined. Next the tax was added to the model, shifting the supply curve, and creating a new market equilibrium. The change to consumer and producer surplus was calculated from the change in price from the one percent sales assessment. Deadweight loss was calculated from the model by finding the total reduction in consumer and producer surplus. The formula for computing deadweight loss based on the price elasticities was used as a reference to the equilibrium model.

Total government revenue was also computed for this model by multiplying the price and quantity to determine the revenue. One percent of the revenue accounts for the revenue collected by the state government from the lumber sales tax.

Figure 3 provides a representation of the final equilibrium using the partial equilibrium constructs. Units of outputs and initial prices, labeled as q_1 and p_1 , are produced in the absence of the tax. A tax τ is imposed on the consumers. The new equilibrium results at q^* and p^* .

Data Description

Data for the analysis performed in this study are based on a twelve-year history from 2000 to 2012, the year when the sales tax was enacted. This characterizes the decision made to enact the lumber assessment based on that year's market. The range characterizes the consumption and price information leading up to the enactment of the tax.

For simplicity, only lumber consumption was modeled in this study. The data set included a survey of all dimensions and grades of lumber sold in California that originated from the United States or internationally.

Import data was collected from the United States International Trade Commission (USITC), which collects United States import and export statistics. These statistics reflect government and non-government shipments of merchandise between foreign countries and the U.S. Customs Territory, U.S. Foreign Trade Zones, and the U.S. Virgin Islands.

There are two measurement styles for imports:

General Imports - This number measures the total value of merchandise shipments that arrive in the United States from foreign countries, whether such merchandise enters consumption channels immediately or is entered into bonded warehouses or U.S. Foreign Trade Zones under Customs custody.

Imports for Consumption - This number measures the total value of merchandise that physically clears Customs, or goods withdrawn from Customs bonded warehouses or U.S. Foreign Trade Zones, which immediately enter consumption channels.

Import statistics are collected and compiled in terms of about 14,000 commodity classifications in the Harmonized Tariff Schedule. The harmonized system is an international classification system standardized between countries at a basic 6-digit level. Commodity classifications in the United States are given in two publications, one for exports and one for imports. The import data was used in the model as California's international lumber consumption (United States International Trade Commission, 2012).

Domestic lumber consumption data was obtained from the Western Wood Products Association. The Statistical Yearbook of the Western Lumber Industry provides comprehensive

information about the lumber industry operating in the twelve contiguous Western states. Production data for the Yearbook are compiled from annual questionnaires sent to all operating mills in the West. Timber resource statistics are included through co-operation of the U.S. Forest Service.

The Yearbook contains the most recent state-by-state profiles of Western sawmills. The profile details timber sources, distribution channels, processing patterns and marketing areas of lumber producers throughout the region. Also included are foreign trade statistics for logs and lumber, United States housing construction information and estimates of United States softwood consumption by markets. Data was used from Yearbooks 2000 – 2012.

Results

The results of the tax incidence analysis suggest that there is little burden on producers from the lumber assessment. The tax burden on the consumers was analyzed by measuring how the lumber assessment changed the price in the market. Table 9 illustrates the burden on consumers and producers.

The effect of taxation on efficiency was measured by the effect of the assessment on the market clearing prices and quantities. The changes in market efficiency were measured by the standard formula; the results are displayed in Table 10. The results show a minor loss of economic efficiency. The formula for computing deadweight loss based on the price elasticities was used as a reference to the partial equilibrium model.

The results from the empirical study demonstrate similar findings. The partial equilibrium model seen in Figure 4 reveals the effect of taxation on the market price and market quantity. The change to consumer and producer surplus was calculated with the change in price from the one percent sales assessment. The sum of the reduction in consumer and producer surplus is the deadweight loss. These results are displayed in Table 11.

Total government revenue from the lumber assessment was calculated to be \$16,650,270 per year. The results show that the lumber assessment had little effect on producer and consumer surplus, with the greater impact to the consumer. The results validate that the market is relatively insensitive to changes in price, and the consumer bears the cost of the assessment.

Conclusion

The purpose of the study was to examine the burden of a state tax on consumer and producer welfare. The study highlights that the burden of a tax is dependent on the elasticity of supply relative to the elasticity of demand.

California's lumber products assessment was enacted to fund timber harvest regulatory programs. The one percent sales tax on lumber products in California, is levied on all lumber sold in the state regardless as to where the lumber was produced.

The California State Legislature passed this tax under a few assumptions. First, the state budget was not adequately funding the resource agencies responsible for regulating timber harvest in California. The State had been facing a number of budget shortfalls over the past decade and increasing cuts were made to the programs and staffing within the agencies that oversee the implementation of the state forest practices rules and the regulation of timber harvesting in California. In order to meet this budget shortfall, the Legislative Analyst's Office proposed several funding mechanisms to meet the needs of the decreasing budgets and increasing cost of regulation. The Legislature enacted a separate and dedicated sales tax to cover the staffing and administration costs under timber harvest regulatory programs.

The second assumption is that the Legislature enacted the new sales tax under the beneficiary pays principle. The two principles of taxation are the benefits received and the ability

to pay. According to the beneficiary pays principle, those who receive benefit from a public service should pay for it. The lumber assessment did not directly tax the lumber industry, rather the costs of the tax were passed to the public. To support this principle, it must be assumed that the public benefits from the protection of the state's natural resources thus are receiving a benefit by paying for the oversight of the timber harvesting in California. Another example is seen when hunters and fisherman pay licensing fees to the state. In this case, the beneficiaries of a state program pay for the state's cost to protect existing populations of fish and wildlife as well as programs to provide additional hunting and fishing opportunities (LAO, 2009).

Tax Versus a Fee

The lumber assessment was enacted with a two-thirds vote of the Legislature as required under California's Constitution (Section 3 of Article XIII). However, the assessment resembles a fee in that the revenue from the levy is imposed for a single regulatory activity and there is a reasonable relationship between the burden and the benefit of the tax. The levy may exceed the costs of the regulated activity, however, and the remaining funding has been allocated to related forest protection and restoration activities.

The lumber assessment raises a number of questions about how fees and taxes in California are classified. There are legal constraints that affect the Legislature's ability to raise and spend revenues from different funding sources. General Fund monies are collected broadly from taxpayers and are available by legislative appropriation for broad purposes. Relative to other fund sources, the Legislature has a great deal of flexibility regarding what programs can be funded from the General Fund. A General Fund tax increase can only be enacted with a two-thirds vote of the Legislature (LAO, 2009).

The state also collects revenues that are deposited in special funds. The state often assesses fees under the beneficiary pays or polluter pays principles. A fee may be enacted by the Legislature on a majority vote, provided there is sufficient connection between the fee payers and the programmatic activity for which the fee revenues are used (LAO, 2009).

In general, taxes are imposed for revenue purposes, as opposed to in return for a specific benefit, and that taxes are typically compulsory, rather than being imposed in response to a voluntary decision to seek government privileges (Steele et al., 2011). The lumber assessment was imposed for revenue purposes but for a specific benefit – to fund the administration of timber harvest regulation. In opposition to California's sales tax which funds general functions within state agency programs.

Proposition 26 refined the tax versus fee question in California by significantly tightening the definition of a tax and by clarifying that the burden of proof falls on the government to prove that the levy at issue is not a tax (Steele et al., 2011). A levy is considered a fee as long as the revenue from the levy does not exceed the costs of the regulatory activity and the levy is not imposed for an unrelated revenue purpose, and the levy allocated to the payer bears a fair or reasonable relationship to the payer's burdens on or benefits from the regulatory activity (Steel et al., 2011).

Tax Incidence Analysis

Tax incidence will depend on the price elasticities of supply and demand. Elasticity is a measure that economists use to quantify the responsiveness of an output to a given input and is measured by changes in price. Elasticity measures the percentage change in one, dependent variable with respect to a percentage change in another, independent variable. Thus, in a market equilibrium model, price elasticities measure either the responsiveness of consumers to changes in product prices or the responsiveness of producers to similar changes (Cubbage, 1986).

Elastic supply indicates that the proportional change in output produced is greater than the proportional change in price. Inelastic supply implies that proportional changes in output are less than proportional changes in prices. Elastic supply curves tend to be “flatter”, indicating that the quantity response is greater than the price change. Inelastic supply curves are “steeper”, indicating that quantities change little with price changes (Cubbage, 1986).

When the price elasticity of supply is higher than the price elasticity of demand, an excise tax falls mainly on consumers. Both the price elasticity of demand and the price elasticity of supply in the lumber market are inelastic, however, the price elasticity of supply is slightly higher than the price elasticity of demand, so the greater burden from the lumber assessment fell on the consumers.

Incidence analysis is used to determine how prices change, and how those changes affect different kinds of individuals. For example, consumers buy less of a taxed product, so firms produce less and buy fewer inputs – which changes the net price of each input (Fullerton & Metcalf, 2002). The partial equilibrium diagram used in this study identified both the loss of consumer surplus and the loss of producer surplus resulting from the tax.

The results from the incidence analysis does not depend on whether the tax is on the demand side or the supply side; the incidence depends only on which side of the market’s behavior is relatively elastic. The side of the market that can most easily adjust its behavior in response to a tax will bear the lowest cost of that tax. Demand is inelastic so the consumers bear much of the burden of the lumber assessment. The analysis in this study indicated there was minimal impact from the lumber assessment to society. Additionally, both demand and supply are relatively inelastic resulting in an insignificant deadweight loss. The deadweight loss is a real cost of the lumber assessment caused by the reduced consumption under the tax.

This study used the USFPM to determine the supply and demand elasticities for the lumber market. The USFPM is a partial market equilibrium model of the United States forest sector that provide long-range timber market projections. The USFPM is based on the Adams and Haynes (1980) Softwood Timber Assessment Market Model (TAMM). TAMM is an economic spatial model of North American softwood lumber, plywood, and stumpage markets designed to provide long-range projections of price, consumption and production trends. All of the supply price elasticities from the geographic regions within model were inelastic.

Several factors may cause the lack of market responsiveness. Gwartney and Stroup (1982) divide market failure into different factors: externalities, poor information, monopoly, and homogenous goods. Most of these factors also contribute to the unresponsiveness of lumber supply to prices (Cubbage, 1986). Externalities are costs or benefits that are not reflected in the market prices. With timber supply the discount rate for individuals may be greater than society’s, thus they will produce less timber than society may consider desirable. The externality arises because society may desire a longer rotation than the private forest landowner desires. Socially desirable rotations (longer rotations) may require that the private forest landowner make investments that they will never see the returns (Cubbage, 1986).

Poor information or imperfect knowledge may also be a factor contributing to the inelastic lumber supply. All parties to a transaction should have full information about the relevant terms of the exchange (e.g., price, quantity, and quality) for market outcomes to be efficient. Information requirements may not be perfect in timber markets (Murray & Prestemon, 2003). Nonindustrial private forest landowners may not be aware of the value of the goods they are producing or know little about the quantities or prices of the timber. Industrial forest

landowners may have imperfect knowledge of financial returns, either with investments and discount rates or liquidating inventories prematurely (Cubbage, 1986).

Perfect competition has long been the standard by which economists have judged the market's ability to achieve an efficient social outcome. Timber markets have certain structural characteristics that may impede perfectly competitive outcomes and imperfect competition in timber production may lead to unresponsive markets (Murray & Prestemon, 2003). Markets may have thousands of forest landowners (producers) but limited number of buyers or mills (Cubbage, 1986).

With homogenous products, one supplier's product is identical to another. Markets with little product differentiation can insulate market participants from direct price competition. Generally, lumber is separated into standard commercial grades and is a fairly homogenous commodity, compared to other consumer goods like wine. However, species differentiation, timber quality and harvest costs can vary and then product homogeneity diminishes (Murray & Prestemon, 2003). The relative homogenous lumber market may contribute to insensitivities in price.

Economic theory suggests that free markets should automatically produce an adequate amount of timber or other products assuming the underlying assumptions are met. These assumptions are not met in the case of timber. The productive activity of growing timber and the financial reward of growing timber are not closely linked, which may reduce supply elasticity for industrial and nonindustrial owners. Nonindustrial private owners fall short of perfect knowledge about timber growing and competition; imperfect competition in timber production; and homogenous products may lead to unresponsive markets. All of these factors presumably help explain the inelastic price response of lumber supply (Cubbage, 1986).

Costs and Benefits

Understanding the benefits and costs of tax requires understanding what revenues are collected, the benefits from the programs that the government undertakes, and any inefficiencies in the process of collecting the taxes.

The study estimated that the revenues collected from the one percent sales tax would exceed \$16 million dollars per year. This number was based on lumber production in 2008. The revenues will fluctuate with the lumber market; an increase in lumber consumption will result in more revenues for the government. The revenue from the lumber assessment is expected to cover the cost of timber harvest regulation in California with additional funding remaining for forest restoration programs. The improvement and protection of the state's forest resources is a benefit to society.

Inefficiencies resulted from the process of collecting the lumber assessment. A cost to lumber and building products retailers resulted with the new assessment requiring the retailers to reconfigure their computer systems to add the assessment to only the cover certain wood products. The statute allowed the first year of revenue received from the assessment to cover the cost to retailers to implement and administer the tax collect. The first year of revenue was largely not spent on the timber harvest programs but rather to correct for the cost inefficiency resulting from the new tax.

California's lumber tax is an example of passing the costs of forest practice regulation on to the consumer. These types of funding mechanism may become more contentious in the future, however, the state is likely to continue to use these types of funding mechanisms, either through fees or taxes, because the money can be reserved for specific uses. These dedicated revenue

sources could be potentially important funding mechanisms for conservation and restoration of natural resources.

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Paper II: Appendix

Table 1: Area of Forestland by Ownership (FIA, 2013)

Ownership	Acres
National Forest	15,511,124
National Park Service	1,425,942
Bureau of Land Management	1,622,162
Fish and Wildlife Service	7,638
Department of Defense or Energy	84,053
Other Federal	124,720
State	758,598
Local (county, municipal, etc.)	359,457
Other Non-Federal Lands	20,128
Undifferentiated Private	12,704,321
Total	32,618,143

Table 2: Area of Timberland by Ownership (FIA, 2013)

Ownership	Acres
National Forest	9,137,269
National Park Service	-
Bureau of Land Management	304,962
Fish and Wildlife Service	-
Department of Defense or Energy	8,442
Other Federal	-
State	106,246
Local (county, municipal, etc.)	55,149
Other Non-Federal Lands	-
Undifferentiated Private	7,378,532
Total	16,990,600

Table 3: Area of Forestland by Forest Type (FIA, 2013)

Forest Type	Acres
Pinyon/juniper	1,826,871
Douglas-fir	1,124,898
Ponderosa pine	2,254,389
Western white pine	170,697
Fir/spruce/mountain hemlock	2,019,892
lodgepole pine	1,014,343
Hemlock /Sitka spruce	46,804
Redwood	708,696
Other western softwoods	2,030,486
California mixed conifer	7,800,147
Elm/ash/cottonwood	55,104
Aspen/birch	76,276
Alder/maple	232,797
Western oak	9,456,894
Tanoak/laurel	1,989,822
Other hardwoods	602,601
Woodland hardwoods	442,526
Exotic hardwoods	4,283
Non-stocked	760,616
Total	32,618,143

Figure 1: Total Timber Harvest in California 1978 – 2012 (BOE, 2012)

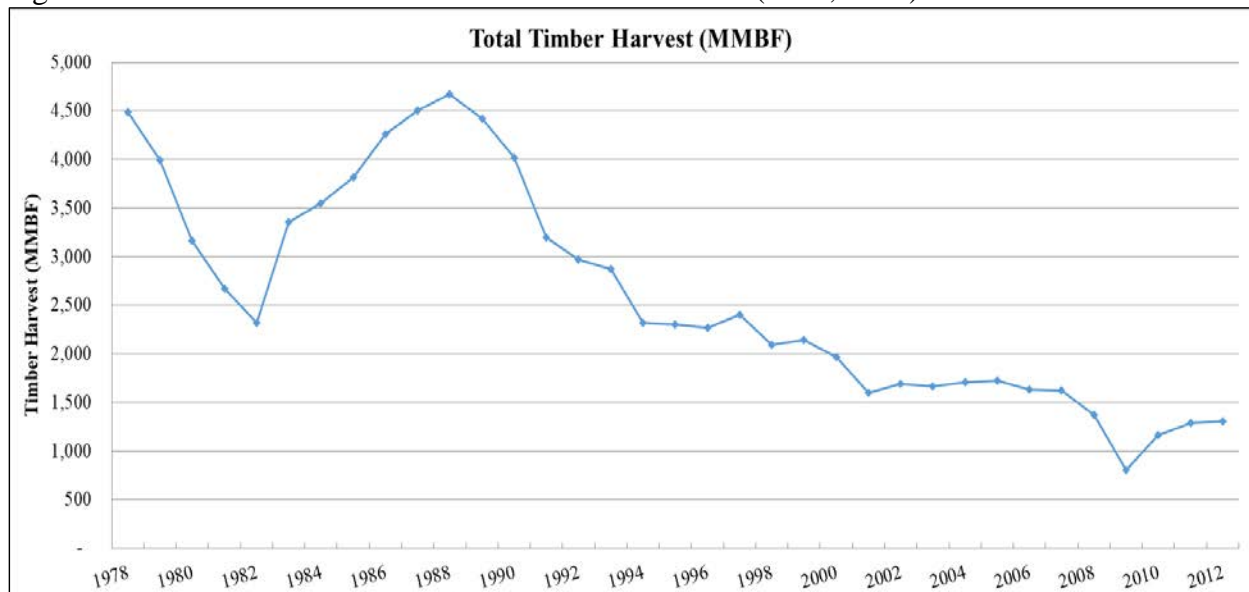


Figure 2: Total Timber Harvest Value in California 1978-2012 (BOE, 2012)

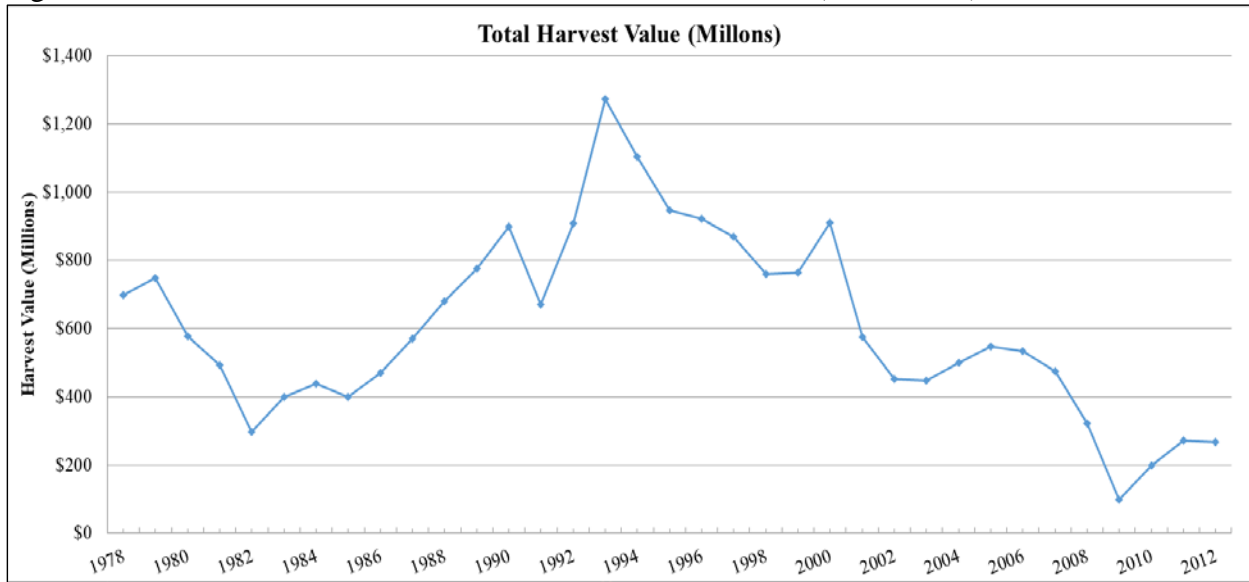


Table 4: California’s Principal Lumber Markets (WWPA, 2012)

California's Principal Markets	Percent
California	63.3
Other West (WA, OR, MT, ID, WV, NV, UT, CO, AZ, NM, AK, HI)	16.2
Midwest (ND, SD, NE, KS, MN, WI, IA, IL, IN, MI, OH, MO)	9.4
Northeast (ME, VT, NH, MA, CT, RI, NY, NJ, PA)	1.6
South Central (TX, OK)	5.7
South East (KY, WV, VA, DE, DC, MD, NC, SC, TN, MS, AL, GA, FL, LA, AR)	3.0
Export	0.9

Table 5: California Timber Harvest Regulation Funding [Thousands] (CAL FIRE, 2013)

Program Title	Fiscal Year									
	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
General Fund	13,264	12,961	12,002	12,013	12,705	12,901	12,033	12,283	12,390	12,197
Cigarette and Tobacco Products Tax Fund (Resources Account)	389	389	394	396	407	422	419	360	352	358
Timber Tax Fund	28	28	30	30	31	33	34	34	33	35
Reimbursements	147	150	153	155	162	167	170	173	174	172
Forest Practice Regulatory Fund		5,000								
Total	13,828	18,528	12,579	12,594	13,305	13,523	12,656	12,850	12,949	12,762

Table 6: California Timber Harvest Plans and Acreage Through 2012 (CAL FIRE, 2012)

Number of Plans	Total Acres
121	54,738

Table 7: Lumber Consumption in California (MBF)

Year	California	Western States	International	Total Consumption
2000	2,100,526	2,513,145	3,239,507	7,853,178
2001	1,805,191	2,989,193	3,638,343	8,432,727
2002	1,762,146	3,175,780	3,851,808	8,789,734
2003	1,650,788	3,259,933	4,043,518	8,954,239
2004	1,754,505	3,729,070	4,506,487	9,990,062
2005	1,706,880	3,587,697	4,677,398	9,971,975
2006	1,582,490	3,270,528	4,117,972	8,970,990
2007	1,417,726	2,844,084	2,855,373	7,117,183
2008	1,157,760	2,066,613	1,633,622	4,857,995
2009	814,730	1,405,146	1,073,358	3,293,234
2010	838,040	1,616,838	1,178,069	3,632,947
2011	1,020,867	1,463,485	1,119,650	3,604,002
2012	1,163,454	1,741,789	1,267,270	4,172,513

Table 8: California Whole Sale Lumber Value and Price Per Thousand Board Foot (MBF)

Year	California	Western States	International	Total Value	Price (\$/MBF)
2000	\$901,644,000	\$854,252,700	\$1,259,540,070	\$3,015,436,770	\$383.98
2001	\$745,608,000	\$955,289,800	\$1,298,435,215	\$2,999,333,015	\$355.68
2002	\$745,734,300	\$1,036,598,000	\$1,272,050,196	\$3,054,382,496	\$347.49
2003	\$636,928,000	\$1,094,069,500	\$1,132,736,489	\$2,863,733,989	\$319.82
2004	\$817,499,000	\$1,557,429,000	\$1,668,804,682	\$4,043,732,682	\$404.78
2005	\$792,543,500	\$1,389,146,900	\$1,636,377,656	\$3,818,068,056	\$382.88
2006	\$724,768,200	\$1,174,995,450	\$1,539,228,276	\$3,438,991,926	\$383.35
2007	\$638,560,000	\$1,023,883,000	\$1,151,374,126	\$2,813,817,126	\$395.36
2008	\$305,721,000	\$570,074,200	\$777,078,643	\$1,652,873,843	\$340.24
2009	\$264,768,040	\$332,588,120	\$456,501,076	\$1,053,857,236	\$320.01
2010	\$316,903,512	\$477,299,792	\$551,622,282	\$1,345,825,586	\$370.45
2011	\$372,560,474	\$447,162,303	\$541,355,030	\$1,361,077,807	\$377.66
2012	\$457,902,072	\$583,714,703	\$632,443,392	\$1,674,060,167	\$401.21

Figure 3: Market Equilibrium Using the Partial Equilibrium Constructs

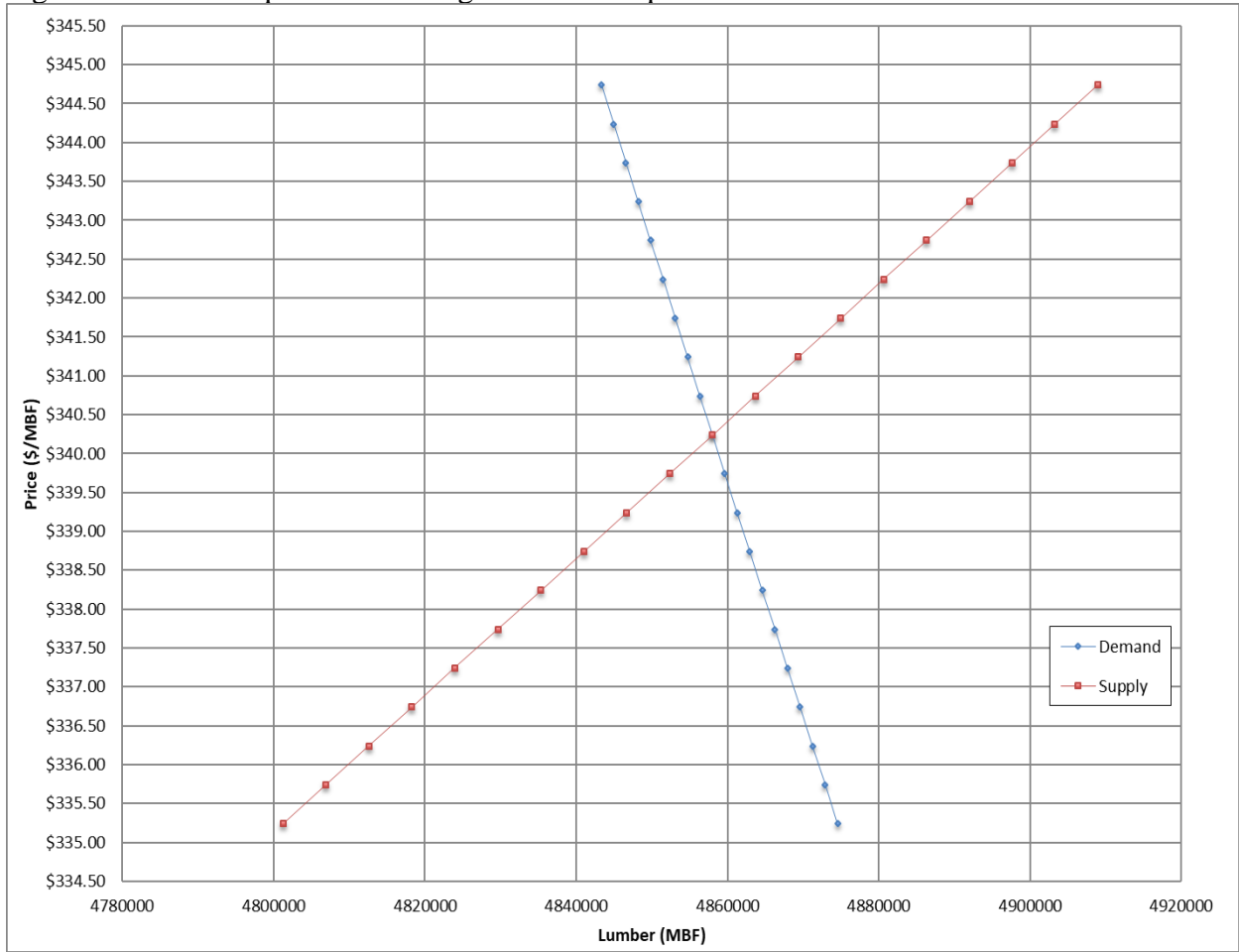


Table 9: Consumer Burden

$$\Delta P = [\eta_d / (\eta_s - \eta_d)] \times \tau$$

Consumer Burden	
Burden (ΔP)	-0.763671875

Table 10: Deadweight Loss

$$DWL = -\frac{1\eta_s\eta_d}{2\eta_s - \eta_d} \times \tau^2 \times \frac{Q}{P}$$

Deadweight Loss	
Price' (\$/mbf)	\$343.14
DWL	\$14,576.55

Figure 4: The Partial Equilibrium Model Reveals the Effect of Taxation on the Market Price and Market Quantity

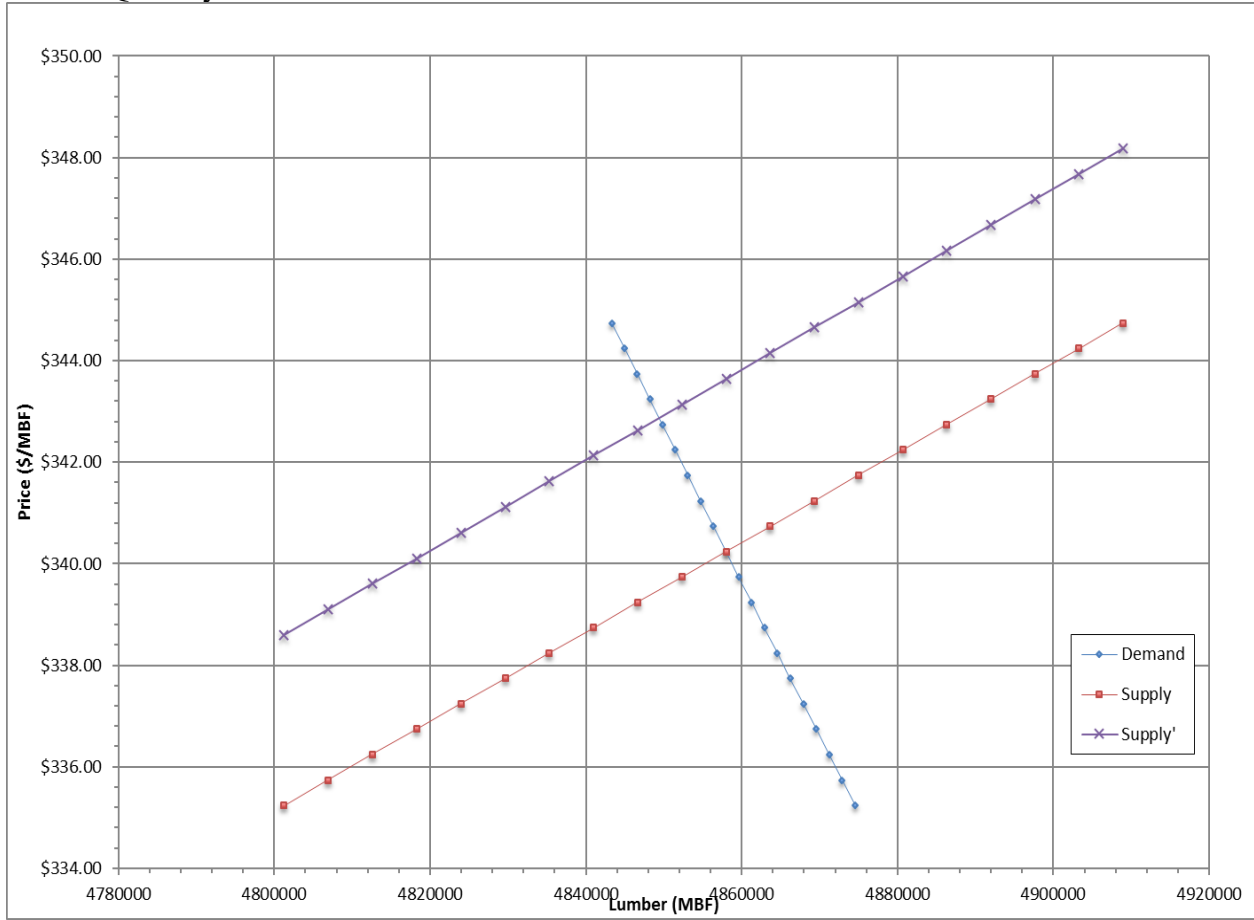


Table 11: Change in Consumer and Producer Surplus, and Deadweight Loss Results

Consumer Tax Incidence	\$14,071,744.59
Producer Tax Incidence	\$2,426,162.86
Deadweight Loss	\$14,576.55

Paper III: Recent Trends in Private Investment in Natural Resource Management

Introduction

The privatization of public resource management is occurring in the United States. Privatization is the shift away from direct government provision of goods and services (More, 2005). Proponents explain the increase in privatizing government programs by referencing economic goals, including efficiency, competition, innovation, and cost reduction (More, 2005). Recognizing the importance of political as well as economic interests of privatization is important. Since the early 1980s privatization in the United States has been a part of public policy debates (Henig, 1990). Political pressure can push toward privatization and a more market-driven approach to the management of public goods. Privatization initiatives are also political because they redistribute costs and benefits among diverse and competing groups. Privatization supporters believe public lands management by the government is inefficient and that the country would be better off if they were transferred to the private sector (More, 2006).

Public managers and decision makers face complex choices about which public services and functions should be kept in the public sector and which should be privatized. Privatization utilizes economic market models that apply the concepts of competition, performance-based contracting, service delivery, and market incentives. One critical challenge is managing the process to ensure the participation of the private sector protects public interests while still allowing businesses to earn a reasonable return on their investments (Savas, 2001).

The central argument for privatizing public land management is that privatization will increase land use productivity. According to Lehmann (1995), privatization theorists insist that institutions should be judged based on how productive they make resources. The standard used to judge productivity is the satisfaction of consumer desires: uses of resources (including both natural resources and financial resources) that do a better job of satisfying consumer desires are considered superior to other uses. Sax (1984) summarized the case for privatization: "Each person knows what is best for him or her, and, therefore, the best system is the one that permits the real preferences of individuals to be revealed and implemented. With rare exceptions, the ideal mechanism for implementing these preferences is a private marketplace where each individual expresses his or her desires through bidding. Private ownership advances this goal, and public ownership impedes it" (More, 2006, p.137).

While selling public land may be the ultimate example, privatization can range from public agencies contracting with private companies to completely privately held companies fully operating public lands. These processes include user fees, outsourcing, and public-private partnerships (More, 2006). Agencies have grown dependent on fees as a mechanism to generate revenue for public land management. Recreation or user fees have broad public support with two-thirds to three-quarters of visitors that do not mind paying the fees. However, the use of fees can limit full public access, reducing low-income users, and high prices can reduce demand and lead to declining visitation (More, 2006).

Proponents believe that privatization injects competition to promote efficiency and responsiveness to changing demand. The need for a service can be distinguished from its production. A public agency can provide funding, but may contract with private firms for actual service production. Many natural resource management agencies in the United States now contract out for maintenance service, facility operation, interpretive and educational services (More, 2005). According to Fung et al. (2006), privatization offers an opportunity to add expertise and capital from the private sector into a public project. Private companies can increase

the speed of services, bring expertise to the table, or develop innovative ways to provide a higher quality service. This may be useful when the public agency lacks the resources to effectively implement a new task. It may also be the case that the abilities of public agencies are limited by enabling legislation, mandates, or other regulations. Private entities, which are not subject to such restrictions, are often able to be more innovative, flexible, or efficient (Fung et al., 2006).

Public-private partnerships reflect market principles and can be used as a strategy for improving public management. Some of the tools employed are contracts, public-private competition, franchises, and voluntary action (Savas, 2001). Many public land management agencies have developed “friends” groups to do fundraising and promote volunteerism. However, these groups may have their own agendas, and their success in private donations or funding may lead to further budget reductions in the public sector (More, 2006). Declining budgets and increasing demands reduces the capacity of public land managers to solve problems and manage programs. And if the public sector fails to provide adequate management and public service, privatization advocates have been quick to make their case, developing arguments for increasing the market’s role in public land management (More, 2006).

Some privatized and market-based approaches are being used successfully in natural resource management. For example, state parks are considering the use of private management firms for managing concession stands, collecting fees or running recreational activities. Private groups are investing in conservation projects saving millions of acres from development or using mitigation banking to offset habitat loss. Additionally, environmental impact bonds are a new approach for scaling environmental programs by investment from the private sector. Over the last few decades, the case for the market has had a profound effect on public policy and natural resource management (More, 2005).

This paper will explore examples of privatization of public land management as well as the recent trend of private investments in natural resource conservation. First, a case study will be examined for managing state parks by private interests particularly highlighting the funding crisis with California’s state parks. Second, the paper will investigate the increase in private investment in conservation over the last few years, focusing on mitigation banks, innovative private financing, and environmental impact bonds. The goal is to provide the costs and benefits of privatization of natural resource management and conservation.

Challenges with Managing Public Resources

The 14 million acres of state park lands in the United States provide enormous value. Approximately 720 million people visit them each year, and a recent study estimated the social benefits of the recreation they provide at more than \$14 billion per year (Siikamaki, 2011). This figure is more than the \$2.3 billion it costs to operate them (National Association of State Park Directors, 2012). However, most state park systems are struggling. State parks are facing budget problems, aging infrastructure, and a growing deferred maintenance backlog. General fund revenues for state parks have been cut across the country, and state park agencies have cut costs by limiting operating hours at many parks, reducing services offered at others, and in some cases, closing parks altogether (Walls, 2013).

General fund revenues are unlikely to be sufficient in most states to fully meet current state park financial requirements, even without considering acquisition of new parks. This leaves states with tough decisions on how to manage and fund state parks. To deal with costs, Walls (2013) notes that managers are closing some parks and/or lowering costs without compromising the amenities and services that parks provide. On the revenue side, states are considering multiple revenue options—user fees, various kinds of dedicated taxes, voluntary contributions,

corporate sponsorships and other private sector involvement, and partnership arrangements—with local governments, park conservancies and foundations, and private industry (Walls, 2013). State park operating costs are covered by a combination of park-generated revenues, general fund revenues, dedicated funding sources, and some federal funding. Generally, in 2011, park-generated revenues covered 39 percent of total operating costs, general fund revenues 34 percent, and dedicated funds approximately 20 percent. However, these percentages vary widely across states (Walls, 2013).

State Park Management Costs

State parks vary widely by type, from state beaches to museums, golf courses, ski runs, historical and memorial sites, forests, lakes, and ecological reserves. In addition, many parks have their own campsites, water and waste water systems, generators or power supply, visitor information centers, and ranger stations. The operation of a state park requires many of the same services as a small city, such as electricity, water, and removing trash, and therefore have similar management costs. A state park also needs to maintain its buildings, roads, and trails and employ peace officers to ensure the safety of its visitors. Additional management costs include park rangers, resource protection (such as removal of invasive species) and providing educational services to the public (LAO, 2012).

While park management agencies are faced with declining budgets, the ideology of the private sector has been considered to develop new park management strategies. These strategies included greater reliance on business techniques, including user fees, outsourcing, and the development of public-private partnerships. These strategies move park management further from the fully public model towards the private (More, 2005).

Parks and the Public Good Theory

There are many challenges using a private model to manage a public good. Pure public goods have two defining features. One is nonrival, meaning that one person's enjoyment of a good does not diminish the ability of other people to enjoy the same good. The other is non-excludability, meaning that people cannot be prevented from enjoying the good (Kotchen, 2012).

Musgrave (1973) outlined the theory of public goods as a source of market failure. The market economy, when certain conditions are met, serves to secure an efficient use of resources in providing for private goods. At the same time, the market cannot solve the entire economic problem. The market cannot function effectively if there are externalities, such as when benefits are shared and cannot be limited to particular consumers. Market failures occur due to nonrival consumption and non-excludability.

The market failure allows for “free-riding”; individuals have little incentive to voluntarily provide for public goods when they can simply enjoy the benefits of non-rival and non-excludable public goods provided by others. Preventing under-provision of public goods is one of the primary economic rationales for government. While markets allocate private goods efficiently, governmental intervention is usually required for the efficient allocation of public goods. Thus, goods such as bridges, parks, police protection, and fire departments are usually financed with tax revenues that governments collect (Kotchen, 2012).

Open space or public parks can be an example of a public good. Under most circumstances, one person's use of the park does not reduce the park for others to enjoy, and people cannot be prevented from using the park. With parks, however, congestion among those enjoying it may cause some degree of rivalry, and all parks are not accessible to everyone (such as remote wilderness areas) (Kotchen, 2012). Parks could also be considered as a merit goods, as defined by Musgrave in 1973. Merit goods are the goods that society gives value, but are under-produced

and under-consumed. Government intervention in the market often occurs to correct for the under consumption of the good. With parks, social valuation exceeds the value attributed by private users, and the benefit should be subsidized by the government (Musgrave & Musgrave, 1973).

User Fees / User Pay Principle

Public parks could operate like public utilities, such as water, gas, or electricity, in which users pay some or all of the costs (Quinn, 2002). The user or beneficiary pays principle may be justified in this case. According to this principle, those who receive or benefit from public service should pay for it. People who use the park should pay for the park. The user pay principle was tested in 1996, when Congress authorized the Recreation Fee Demonstration Program through Public Law 104-134 for the U.S. Forest Service, National Park Service, Bureau of Land Management, and the Fish and Wildlife Service. The intent of the program was to require users of federal public land to pay for their use through fees that were then reinvested in recreation areas on federal lands and used to maintain and improve natural resources, recreation facilities, and services (U.S. Forest Service, 2003).

Using a private management model for public parks may only work in high-use places. Placing a fee on the use of a wilderness area, where impacts from human activities are minimal, would be difficult. Public oversight and management is required; however, the parks would be financially self-sustaining so non- users have no tax burden. Some also argue that fees increase efficiency by making managers more responsive to park users and their needs, while making the agencies more fiscally accountable. Fees have other effects as well. For example, they can redistribute use both across time and over areas, and their careful application may help relieve crowding and reduce damage on over-used sites. But fees are socially regressive, discouraging use among lower-income people much more than among upper-income people (More & Stevens, 2000). Fees also increase pressures for facility development (Sax, 1981; More et al., 1996) and may lead to increased commercialization. Finally, dependence on fee revenues can leave parks vulnerable to market fluctuations, such as when visitation declines (More, 2005).

State park user fees can include park entrance fees and annual passes; camping and lodging fees; fees for activities such as golfing, boating, and horseback riding; and equipment rental charges. Although user fees play a critical role in state park financing, and are appropriate for many of the services parks provide, charging a price can be inefficient. If there is no congestion and if one person's use does not take away the amount left for others to enjoy—then charging an entrance fee inefficiently limits use of the park. To the extent that parks generate revenues, effort should be made to keep those revenues within the park system. Allowing state parks to keep the revenues they earn and reinvest them in the system through an enterprise funding model provides better incentives for park management (Walls, 2013).

Outsourcing Management

Outsourcing is another management model, one that differentiates between the need for a service and its production (Crompton, 1998). The public sector provides funding, but private firms compete for production rights. This competition helps keep costs low and maintains flexibility through periodic contract review. Outsourcing adds flexibility by minimizing the need for public employees and reducing the amount of an agency's budget devoted to salaries and wages. It may, however, increase the number of people needed for contracting and oversight. Additionally, private contractors must make a profit in addition to paying labor salaries and benefits. Profit is not a requirement in the public system so that motive can raise the total provision cost. Outsourcing may offer agencies some short-term savings (More, 2005).

Outsourcing has been used in state parks for decades, primarily using concessionaire agreements to operate particular services within parks. Some have argued for a larger role; whereby private companies take on whole park operations. Contracting out park operations is neither inherently better nor worse than government provision. In general, contracting with a private firm is preferred if the contract payments together with the full costs associated with monitoring and enforcing an efficient contract are less than the internal cost of the government providing the service itself. In situations where measuring and monitoring performance is difficult and there are relationship-specific assets necessary to produce the service, contracting can be relatively costly. Although it may be straightforward to write and enforce a simple maintenance contract or contract to operate a gift shop or campground, long-run management of an entire park can be complex and involves complex tradeoffs. To use this option, states need to consider carefully whether a contract can be structured to provide the proper incentives, including penalties for not meeting specified standards, and how much it will cost the government to write, monitor, and enforce the contract (Walls, 2013).

Public-Private Partnership

One example of a public-private partnership exists where nonprofit organizations purchase land as it becomes available on the open market, preserving it until the government obtains the required appropriations and authorities for acquisition. Since these organizations must be financially self-sustaining, the upfront costs must be borne primarily by their members or from charitable contributions or from prior government acquisitions. The principal advantages of this model are its efficiency and lack of tax burden. However, it is likely that a smaller percentage of land would be preserved if this system were exclusively relied upon. More (2005) notes that there are some natural areas like this; “they tend to be small, intriguing, or spectacular places where access is easily controlled, and those not willing to pay can be excluded.” The ability to exclude is essential to privatization because profit depends on excluding anyone not willing or able to pay the price (More, 2005).

Another public-private partnership trend in the state parks systems is privatization of certain functions and services. This would include the transfer of responsibility for certain state park functions or activities from the state parks agency to a private party by contract, lease, or other formal agreement. Such practices have been employed by state park operations since 1866, but there has been an increase in their use during the past few decades. In a recent survey, park administrators cited three principle reasons for instituting some form of privatization: 1) to increase the budget, 2) to increase efficiency, and 3) to undertake a desirable project that was otherwise unfeasible (Fung et al., 2006).

Delegation to the private sector has been considered one way to address budgetary constraints and shortfalls, because it is expected to lead to greater efficiency through competition. In theory, delegation should lead to decreased cost and increased service quality by introducing competition among service providers. In the private sector, efficiency is promoted by the need to earn profits while providing a quality service at a competitive price. By contrast, public sector services typically operate as regulated monopolies, a circumstance that creates inefficiency because there is little incentive for a monopoly to respond to consumer desires. Although efficiency gains can be expected by introducing market forces into state park operations, this outcome should not be the primary motivation for moving toward privatization. Instead, the goal of privatization should be to optimize service quality and efficiency by introducing competition among the various possible service providers, including the public agency (Crompton, 1998; Fung et al., 2006).

Private philanthropy also plays a role in funding state parks. A few states have state park endowment funds, which take donations, but they are limited in number and size. Some efforts to increase voluntary contributions to state parks and the role of the nonprofit sector more generally would be worthwhile to help offset public funding shortfalls. It is unlikely that state general fund revenues for parks are going to increase in most states, and state park systems therefore need to consider all options. Relying on voluntary contributions is not without risk. For example, reliance is likely to reduce government funds and voluntary contributions to a public good suffer from the free rider problem—because everyone can enjoy the benefits without contributing themselves, people are inclined to let others contribute, resulting in a less-than-optimal amount of funding. In addition, when only a limited set of citizens contributes to the parks, it can create a disconnect between the much larger set of users and those who finance park operations (Walls, 2013).

Case Study: California State Parks

Overview

California's state park system consists of 279 state parks that total more than 1.6 million acres of property. In terms of acreage, California has the second largest state parks system in the United States, with Alaska's state park system at 3.3 million acres. Approximately 40 percent of the funding provided to the state parks is spent on maintaining park facilities. This includes costs for routine maintenance (such as removing trash and cleaning bathrooms), as well as making repairs to infrastructure. About 20 percent of funding for the parks is spent on providing public safety in the parks, primarily for park rangers. Other park expenditures are for recreation, resource protection (such as the removal of invasive species), and providing educational services to the public (California Legislative Analyst's Office, 2012). See Figure 1.

Public parks in California have long been held out as a classic public good, supported by taxpayers and available to all. For much of the park system's history, the General Fund was a primary source of revenue. In the 1980s, the General Fund provided over 80 percent of state park funding. California state parks since have gradually transitioned from a tax-supported system to a fee-supported system. Several years of state budget shortfalls over the past two decades accelerated the trend with General Fund support falling to 22 percent in the 2012-13 state budget (Little Hoover Commission, 2013). State Parks are now funded through a variety of sources, including taxes paid by Californians, camping and day use fees, bond borrowing and gasoline taxes. Three major funding streams for the department's budget are the state's General Fund, primarily from state taxpayers, the department's State Park and Recreation Fund, which includes fees paid by park users, and state bond borrowing approved by voters for environmental and conservation purposes and for capital projects (Little Hoover Commission, 2013). In 2016, California's state parks cost \$468 million per year to operate (California Legislative Analyst's Office, 2017). See Figure 2.

2012 Closures

In 2012, the State of California decided to close 70 parks – a quarter of the state's total – to address a \$22 million budget cut. This amount represented 18 percent of its General Fund allocation, and just over 5 percent of its overall operating budget. The California Department of Parks and Recreation, together with foundations, cooperating associations, friends' groups, donors and other government agencies, collected enough money to save nearly all the parks slated for closure (Little Hoover Commission, 2013).

The announcement that the Department could not sustain 70 of its parks with its existing funding and operating model signaled that the existing funding and management model was

broken. The Department could not generate enough revenue on its own to replace continual reductions in taxpayer support, thus demonstrating that the current model of a highly centralized state-run park system was not politically or structurally viable (Little Hoover Commission, 2013).

After closure announcement, Governor Brown signed two pieces of legislation to guide the Department going forward. Assembly Bill 1478 prohibited the state from closing parks during the 2012-13 and 2013-14 Fiscal Years. The bill also allocated \$10 million of the unused retained revenues to match donor commitments to specific parks and \$10 million to other parks at risk of closure. The bill outlined formulas to encourage entrepreneurial approaches in individual park districts, setting revenue targets and letting districts that exceed targets keep 50 percent of revenue they generate. Districts could use the money for improving parks and activities that generate still more revenue. A second bill signed by the Governor, Assembly Bill 1589, called for a master plan to identify funding and maintenance strategies for the state park system. The bill required the Department to develop a comprehensive action plan to boost revenues and collection of user fees throughout the park system. Cumulatively, the 2012 legislation aimed to make the Department more business-minded and entrepreneurial. The 2012 legislation also provided direction and new funding streams to urge the Department toward a new management model (Little Hoover Commission, 2013).

Little Hoover Commission Recommendations on California's State Parks

The Little Hoover Commission, formally known as the Milton Marks "Little Hoover" Commission on California State Government Organization and Economy, is an independent state oversight agency. By statute, the Commission is a bipartisan board composed of five public members appointed by the governor, four public members appointed by the Legislature, two senators and two assembly members. The Commission's purpose is to investigate state government operations and – through reports, recommendations and legislative proposals – promote efficiency, economy, and improved service. In 2013, the Commission provided recommendations on the California Department of Parks and Recreation in light of the 2012 park closure crisis (Little Hoover Commission, 2013).

The Commission's study identified a number of problem areas that undermine the success of California's state parks: 1) General Fund support has fallen for nearly 35 years; 2) self-generated revenues are unpredictable due to weather and other factors; 3) the Department lacks modern business tools to sustain a revenue-driven model; and, 4) bond borrowing has expanded the park system and added cost without providing adequate operating revenue to support its added size.

The Commission stated that the 2012 park closure crisis demonstrated that the state cannot operate all the parks it owns with its current funding structure. They concluded that some of the parks in the state's collection may not serve the system's statewide mission, or primarily serve local or regional populations. The Commission recommended that those parks that serve local needs should be realigned to local control and the remaining should represent parks of statewide significance. The Commission recommended that, once the state has determined which parks should represent the state, it must review alternative operating arrangements, and evaluate management approaches that are most appropriate for a given park, or group of parks in the same geographic area. As part of this process, it should look to models used successfully, such as Redwood National and State Parks, and the state parks operated by the East Bay Regional Park District. The Department should also look to collaborative efforts, such as the management structure set up for the Consumes River Preserve, as well as arrangements used by federal

agencies in California. The Commission encouraged innovation and that the Department should solicit proposals for resource-sharing agreements, as well as ideas for consortium-led management for groups of parks owned by different government entities.

The Commission examined the parks funding mechanisms and stated that declining taxpayer support lead to a deterioration of California's state parks public facilities. Over the past three decades, the Department experienced a dynamic seen nationally: the reduction of broad-based tax support consistent with a public good in favor of greater reliance on user fees. In the late 1970s, the General Fund covered 91 percent of expenses for the department to operate state parks. In the 2012-13 Fiscal Year, the General Fund pays 22 percent of costs to run the system. In their report, the Commission stated that state parks compete politically in the budget process against more urgent funding needs, such as health care for the poor, education and public safety.

Some states are making the case that state parks can be self-sufficient without taxpayer funding or a General Fund share of operations. The Washington Legislature ordered its state parks to use self-generated revenue starting in 2013. The Washington State Park and Recreation Commission rejected the request, stating that the proposal did not serve the mission of access and stewardship. California has not gone to this extreme, but budget cuts and the threat of park closures in 2012 signaled that it has reached the limit of how far its General Fund support can be reduced without a fundamental rethinking of how state parks should operate. As General Fund allocations declined, the California state parks have increasingly turned to generating their own revenue. Accompanying this shift, however, there has been uncertainty at future demand, which complicates budgeting and planning. The Department of Parks and Recreation often operates like a business, attracting customers who will pay entrance and parking fees. But customer numbers decline during poor weather. Boaters stay home when droughts reduce water levels at state park reservoirs, and the smoke of uncontrolled wildfires in or near parks prompt potential visitors to go elsewhere. Such variables can cause the Department's revenue to drop by as much as \$2 million in a single summer month (Little Hoover Commission, 2013).

Little Hoover Commission Recommendation on User Fees

The Commission found that user fees have offset General Fund losses in recent years, but only to a point. In some cases, higher fees have driven down attendance, which runs counter to the Department mission of broad access to its facilities. Day use fees in state parks tripled from \$5 to \$15 between 2002 and 2012, a period that saw annual visitor attendance at state parks fall as much as \$22 million. Camping fees more than doubled to \$35 in the same period. An annual pass that cost \$35 in 2002 now costs \$195. The Commission also found that the Department's attempts to impose new fees have triggered local political opposition.

The Department generates approximately \$100 million a year from state park visitors for its State Park and Recreation Fund. The Commission noted that state accounting rules, however, allow little short-term flexibility in using the money since the money must be annually appropriated by the Legislature. The Commission stated that the restriction makes it difficult for the Department to create rainy-day reserve funds or use one-time operating surpluses to invest in capital projects or equipment that could increase future revenues or lower costs. The Commission continued their analysis by stating that few businesses would expect to operate like a commercial enterprise while being hindered by the financial practices that come with being part of state government. The Department faces this conflict daily in running the state park system.

The Commission believed that the Legislature and Administration steered the Department toward a revenue-based model without providing tools to make the transition or to sustain itself.

Department and park managers lack modern accounting and business planning systems, as well as software to track costs and revenue. The fees generated by the Department are collected in the designated State Park and Recreation Fund, but cannot be managed as a business enterprise would invest or save them. The money must be appropriated by the Legislature in the following budget year, creating chronic budgeting uncertainty for the Department. The Department does not budget or track expenditures at the park level and used outdated information to develop estimated operating costs for its parks (Little Hoover Commission, 2013).

Little Hoover Commission Recommendation on Public-Private Partnership

The Commission examined the use of public-private partnerships with state parks. The Commission found that park managers are finding paths to success with an array of alternative management structures that include trusts, conservancies, and cooperative management agreements among multiple government, non-profit and private partners, all designed to protect the public interest in public assets. The common thread to these models is less centralized control and a wider network of funders, managers, trainers, volunteers and government agencies that prize efficiency, cooperation and enterprise in the service of sustainability. Open space and public lands consultants, regional park operators and key stakeholders repeatedly expressed the view that state parks need not be run by the Department. Experts interviewed by the Commission increasingly believe that state parks can be managed by other experienced land managers, while still being owned by the state, as long as proper standards remain in place, contracts are written to reflect the Department's mission and the state monitors performance.

The Commission reported that California state parks have received more than \$7 million dollars in outside funding in recent years through partnerships with corporations and the California State Parks Foundation. Private companies have helped plant trees in state parks, cleaned up state beaches, fixed fences and made direct contributions for the benefit of California state parks. The Commission believes that great potential exists for the Department to build on these contributions, especially if sponsors see fresh upward spirals of successes that help renew trust in the Department (Little Hoover Commission, 2013).

Little Hoover Commission Recommendation on Outsourcing

The Commission investigated the use of outsourcing and enterprise efforts within the State Park Systems. They discussed the theory behind these efforts stating that many focus on bringing more visitors to state parks. Increased visitation to parks invariably means consideration of additional lodges and recreational opportunities, more congestion and a heavier human imprint on wildlife habitats. The Commission stated that efforts by the Department to develop new revenue sources will inevitably fuel the tension between needed income and the desires by many parks stakeholders to keep parks as non-commercial as possible.

The Commission found that the Department of Parks and Recreation has seen growing revenues in recent years from concessions. Nearly 200 state park concessionaires, the private and non-profit enterprises that operate lodges, restaurants, stores, marinas and golf courses, grossed \$96.7 million during the 2010-11 Fiscal Year. These operations paid the department \$13.4 million – nearly 14 percent of the concessionaires' total receipts.

While concessionaires are increasingly involved in operating individual parts of the park system, the Department has been reluctant to allow private contractors to run entire parks or campgrounds as the U.S. Forest Service has for several decades. In a pilot project, the state, under Governor Pete Wilson, issued its first contract with a private for-profit concessionaire, Palo Alto-based California Land Management Services Corporation, to operate four state parks: Moss Landing State Beach, Limekiln State Park, Caswell Memorial State Park and Turlock Lake

State Recreation Area. The pilot operation, created because of the severe financial stresses on the state and the Department, faltered when Governor Gray Davis halved park fees; the private operator could not sustain the operation with the reduced revenues.

During the 2012 closure crisis, the Department invited new proposals and issued five-year contracts with private companies to operate entire state parks. The agreements are believed to be the only full-park contracts in existence within the country's state park systems. Under the agreements, both companies provided minimum security. Both also pay a percentage of their park revenues to the Department, which uses the proceeds for maintenance and repairs of those individual parks.

The Commission reported that the Department of Parks and Recreation has not enthusiastically embraced such arrangements, whether camping alternatives, corporate sponsorships or allowing private companies to operate parks. It only engaged such outside groups when forced by budget crises. Throughout California, however, private companies have been working with federal recreation agencies to provide camping and other outdoor recreation opportunities for years. Many of these agencies concluded that contracting out appropriate parks to private operators is less expensive than having government provide the service. Concessionaires provide lower-cost operations models through more extensive use of seasonal staff, though the state has long relied on seasonal workers. The private firms generate revenues from gate fees and use them to make improvements that bring more visitors to parks. Longer-term concession contracts provide longer income streams and, with them, opportunities to improve park infrastructure, expand lodging alternatives and address deferred maintenance.

As the Commission stated, within the Department, and among some groups of park users, there is considerable resistance to greater involvement by for-profit concessions. The Commission raised an appropriate question of how far the state can go without fundamentally changing the park experience. Private firms may choose only to work with the most profitable parts of a park system, putting potential taxpayer benefits in their private pockets while leaving the state to manage those without potential for revenues. Government agencies can prevent this by bundling less-visited parks with better performers when seeking management contracts. The Commission noted concerns with allowing private operators to experiment during a time of financial stress may lead to eventual large-scale entry of private management into California state parks. Concession operators make the case that the state continues to control the park environment and ambience through its contracting process.

In sum, the Commission reported that public-private partnerships can cover a broad spectrum of arrangements. The state can benefit through such arrangements as long as it knows in advance what it wants to achieve, properly identifies the risks involved and takes a sophisticated approach to developing its contracts with its partners, including hiring outside negotiating expertise when necessary (Little Hoover Commission, 2013).

Parks Forward Initiative and Public-Private Partnerships

Assembly Bill 1589 and Assembly Bill 1478 called for the formation of a multidisciplinary advisory council to conduct an independent assessment of the State Parks System and make recommendations to the California Legislature and Governor on future management, planning, and funding proposals to ensure the long-term sustainability of the state parks system. The Parks Forward Initiative was designed to fulfill these directives (Parks Forward Commission, 2016).

The goal of the Parks Forward Initiative was to develop a new vision and approach to manage, use, and sustain California's state parks. This required the creation of the Parks Forward

Commission to address a broad set of issues, including how the Department and the state parks system are organized, structured, managed, funded, and staffed, as well as the mission, number, location, and activities of individual state park units.

The Parks Forward Commission is made up of 12 independent members, selected by the California Secretary of Natural Resources. The members are from a wide array of business, finance, government, nonprofit, academic, science, and arts backgrounds. The Parks Forward Commission worked as an independent body. The Parks Forward Commission guided and reviewed relevant research, analysis, public input, and to assess the state parks system. In February 2015, the Commission adopted a plan designed to “transform the current park system into one that is financially sustainable, appropriately located, and better serves California’s growing and changing population”. The Parks Forward Commission continues to provide input and assistance to the state parks to implement the plan.

The Parks Forward Commission found in 2013, that nonprofits contributed more than \$12 million to California state parks, while nearly 40,000 volunteers donated more than 1 million hours of their time. The Parks Forward Commission recommended the Department increase the use of mission-based partnership and collaborative agreements, understanding these agreements should include ongoing Department oversight and collaboration to best achieve the mission. In addition, the Parks Forward Commission recommended that a new nonprofit organization should be created to support the Department where it lacks the resources to invest, necessary expertise, or flexibility to take on new work. The Parks Forward Commission noted that expanded collaboration with existing and future park supporters is critical to helping the Department achieve its mission and meet the needs of the state. As a key part of its transformation, the Department must look externally and embrace new models for working with partners to effectively advance its mission. The Department must function as a leader, coordinator, and partner that seeks out innovative, cost-effective means of fulfilling its duties.

The Parks Forward Commission recommended creating a nonprofit public benefit organization to provide operational, financial, and strategic support for organizations that manage or operate parks and other protected lands in California, with state parks as its priority. The Parks Forward Commission refers to this new support entity as Parks California. To be effective, Parks California must be given the ability to receive and distribute funding from governmental and non-governmental sources (Parks Forward Commission, 2016).

Costs and Benefits of State Park Privatization

No one-size-fits-all approach will work for state park systems given the diversity in their lands and facilities and the differences in size and scope. Moreover, the problems facing many states vary in degree of severity, with some states facing a crisis and others on better financial standing. User fee revenues should stay in the state park system; however, states should not rely solely on user fees. Contractual arrangements with private firms to operate parks are not likely to be the solution to state park funding challenges. States need to carefully weigh the full costs of efficient contracting with the costs of operating the parks themselves. Parks need to guard against private firms cherry-picking the most profitable and popular parks. State park systems should place some effort to increase voluntary contribution. The role of nonprofits in state parks may be worthwhile, but states need to have a careful study of the best approach (Walls, 2013).

Costs

Opposition to privatization in state parks is based on the opinion that management of public parks systems is a core function of government. Critics suggest that the privatization of state parks operations may eventually lead to more substantial privatization of public lands. A

related concern is that “over-privatization” of parks management may result in “market forces” or private interests being given disproportionate influence over policy decisions (Fung et al., 2006).

According to Fung et al. (2006), critics fear that private sector involvement may lead to increasing commercialization that compromises the primary mission of the parks system. Limited commercial operations (vending machines, general stores, gift shops, equipment rental, etc.) are often considered “visitor services” that do not detract from the parks mission. If private sector involvement leads to more elaborate endeavors (larger gift shops or restaurants, conspicuous advertising) for entirely commercial purposes, the parks mission may be threatened. Alternatively, private entities may cater to certain profitable users to the detriment of others, such as long-time or less wealthy customers. The appropriate degree and type of commercialization must be determined by park managers and the public (Fung et al., 2006). Certain positions in parks systems may require specific expertise. Critics suggest that outsourcing responsibilities may result in losses of institutional memory, control of performance quality, efficiency, and/or productivity. A related concern is that loss of control by parks officials may lead to a loss of park identity or, in extreme cases, degradation of natural resources (Fung et al., 2006).

Government restrictions may make privatization difficult or inefficient. In a detailed analysis of privatization techniques, Savas (2001) provides examples of indirect transaction costs for contract delegation, including: establishing contractual requirements, designing the bidding process, assuring the existence of a competitive market, defining and choosing the best bid, dealing effectively with affected employees, learning to work effectively with the contractor, monitoring and evaluating the performance of the contractor, and deciding whether to renew or terminate the contract upon expiration (Savas, 2001; Fung et al., 2006).

Some theorists argue that privatization will allow some people to benefit by shifting the cost to others. In recreation management, this is the main principle of the user/nonuser problem. The challenge is that nonusers should not be taxed to subsidize someone else’s recreation. The argument is that it would be more desirable to shift the burden of provision to those who obtain the benefit. While nonusers may derive some benefit from existence or option, these are likely to be small or nonexistent for all but the most well-known parks. The value of these benefits received by any individual do not compare with the benefits of actual, direct use. Moreover, when there are external costs to be borne, existence values can be negative (Stevens et al., 1994). It is true that nonusers have the right to become users, but this right is incomplete and nontransferable, while its cost is inevitable. In a market, or simulated market where the government sells the rights to defray the costs, these problems are avoided to the extent that the actual users pay for the benefit they derive, thereby reducing or eliminating the burden to nonusers (More, 2006).

Privatization may only focus on those parks capable of making a profit, while ignoring factors like ecological integrity and public access, and there are no guarantees against future development or alternative uses as the market dictates (More 2005). In other words, parks that are fully privatized may be sold if they are not making a profit, and not truly a protected area for the public.

Benefits

There are benefits for the use of the private sector to provide a service for park management. These benefits can take various forms, but the primary goal is almost always to optimize service quality and efficiency (decreasing cost) by introducing competition among the various possible service providers. Additional benefits may include: 1) the ability to separate the

provision of a service from its production; 2) the increased ability of parks administrators to focus on core agency functions; and 3) the opportunity to inject private expertise and capital into a public project (Fung et al., 2006).

Most importantly, as state parks are facing declining budgets, the private sector offers a new opportunity for investment and funding security. If structured correctly, user fees can generate enough funding to sustain individual parks and private investment opportunities could help offset declining public funding.

Private Investment in Natural Resource Management

The private sector is increasingly looking for opportunities to invest in solutions that restore natural resources. Impact investors are pursuing measurable environmental benefits alongside the desire for conventional return on capital. Mitigation banks, environmental bonds, and investment in forestland are examples.

Mitigation Banks

Wetland mitigation banks offer an example of private investment in natural resources. Wetland development is generally permitted by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act as long as the losses are offset, or mitigated, through habitat restoration somewhere else. Developers can choose either to mitigate wetland losses on-site by themselves, or to buy credits from an off-site provider or mitigation bank (Ecosystem Marketplace, 2016).

The value of a bank is defined in compensatory mitigation credits. A bank identifies the number of credits available for sale and requires the use of ecological assessment techniques to certify that those credits provide the required ecological functions. Mitigation banks are a form of third-party compensatory mitigation, in which the responsibility for mitigation implementation and success is assumed by a party other than the permittee (U.S. Environmental Protection Agency, 2016). In November 1995, multiple federal natural resource management and regulatory agencies released the “Federal Guidance on the Establishment, Use, and Operation of Mitigation Banks”. The guidance gave state agencies, local governments, and the private sector the regulatory certainty and procedural framework they needed to move forward on seeking approval to operate mitigation banks. Following its issuance, banks proliferated across the country and became a mainstream compensatory mitigation option (U.S. Environmental Protection Agency, 2016).

In 2016, the National Mitigation Banking Association stated that it expects its members to double investment in advanced mitigation projects over the next few years by more than \$300 million which will result in ecological restoration and long-term preservation over more than 200,000 acres. The Association will leverage the federal policies on advance mitigation to increase private investment in mitigation and conservation banks across the United States. Private investment in restoration and conservation has resulted in more than 1500 advance mitigation projects on more than 700,000 acres using private investment of nearly \$5 billion (The White House, 2015).

Innovative Private Finance

Innovative private finance for natural resources is a broad term that offers many examples. Generally, investments are made in projects, organizations, collaborations or managed funds, with the intention to generate measurable environmental and social impact alongside a financial return. Interest in natural resource investing has been growing in recent years, as more and more investors seek to align their portfolios with their personal values. There are a variety of investment options—from start-up social enterprises to investment grade bonds—in many

different sectors. Conservation investments are intended to drive positive impacts on natural resources and ecosystems—specifically, decreased pressure on a critical ecological resource and/or the preservation or enhancement of critical habitat—while also providing a financial return (NatureVest, 2016).

For example, Lyme Timber Company is investing \$250 million of private capital in the conservation of working forests and rural landscapes across the country. Lyme Timber's strategy relies on advance compensation mechanisms, such as conservation easements, carbon offsets and credits for restoration. New Forests plans to invest \$150 million in conservation forestry and in increasing carbon sequestration on working forest land in the United States. Its forestry investments aim to support rural livelihoods through sustainable timber management, increase carbon sequestration on working forest lands, protect wildlife habitat from fragmentation, and improve water quality outcomes (The White House, 2015).

Another example of innovative private investment is demonstrated with NatureVest, The Nature Conservancy's impact investing unit. NatureVest works to develop investable deals to source and structure investment products that support The Nature Conservancy's mission. NatureVest also engages impact investors to source impact capital in effective and scalable ways. They have an active pipeline of investments totaling over \$400 million. Projects include the Great Western Checkerboard Project, where the goal is to preserve recreational access and help conserve the ecological integrity of 165,073 acres of forests and wildlife habitat in the eastern Cascade Mountain Range of Washington and in the Blackfoot River Valley in Montana. NatureVest is helping secure financing to acquire the lands from the Plum Creek Timber Company (NatureVest, 2016).

Institutional timberland ownership is another example of innovative private finance. Over the last 30 years, private forestland in the United States has evolved from traditional family and industrial ownerships into a diverse group of ownerships that includes institutional investors and real estate investment trusts (REITs). Institutional investors typically include pension funds, endowments, foundations and insurance firms that favor diversified investment portfolios. These investors often hire forest professionals, called timberland investment management organizations (TIMOs), to purchase, manage and sell timberlands on their behalf. Timberland REITs have shares that are either publicly traded or privately held. REITs are a special tax designation for corporations that invest in real estate, such as timberland, and offer corporate income tax benefits (Zhang et al., 2012). Forisk Consulting's analysis indicates investable timberlands comprise about 11 percent of all forests in the United States (Forisk, 2016).

Environmental Impact Bonds / Pay-for-Success Models

A social impact bond is a new approach for paying for and solving social programs. The bond is a multi-stakeholder partnership in which philanthropic funders and impact investors—not governments—take on the financial risk of expanding programs with societal benefits. Nonprofits deliver the program to more people who need it, and the government pays only if the program succeeds (Callanan et al., 2012). A social impact bond structures a government contract for social services as a type of pay-for-performance contract. According to Callanan et al. (2012), there are several stakeholder groups involved in a social impact bond: constituents (the direct beneficiaries of the social services), government, nonprofit service providers, investors, intermediaries (responsible for project management), evaluation advisers (to help monitor and refine the program), and independent assessors (to determine if targets are met) (Callanan et al., 2012).

Social impact bond investors provide capital for two purposes: to pay for the services of the nonprofit and, over the lifetime of the bond, pay the intermediary, the evaluation adviser, and the independent assessor. The intermediary raises capital from investors, selects the service providers, contracts with government, works with the evaluation adviser and the independent assessor to set and measure performance targets, and partners with the evaluation adviser to monitor and analyze interim results and suggest midcourse corrections. If the program meets performance targets, the government pays the intermediary an agreed amount. The intermediary is responsible for repaying the investors their capital plus a return on investment (Callanan et al., 2012).

Social impact bonds have been gaining traction during the past several years as a way to entice private capital to help address challenging social problems. There have been eight transactions in the United States, with \$80 million invested. These financial instruments have focused on social outcomes such as improving education (Yonavjak, 2015).

An environmental impact bond is a pay-for-performance contract that addresses an environmental issue. The mechanism inherent in environmental impact bonds is similar to that of social impact bond, whereby the government pays an agreed-upon return if impact performance targets, as specified in the investment contract, are met. Environmental impact bonds represent a monetization of future costs savings, where investors are paid a return based on the amount of cost savings generated by a particular project. Monetization of future cost savings is a staple of environmental finance. For example, in the alternative energy sector, a private investment firm that provides upfront investment for energy saving technologies in an office building complex would be paid principal and a return based on the savings associated with the reduced monthly energy bill of that office complex (Nicola, 2013).

New York City has demonstrated the use of an environmental impact bond. In the early 1990s, the city paid for forest conservation in order to prevent the large costs required to supply clean water for eight million people. The watersheds for the city's drinking water were conserved through forest restoration and improved management. The program enabled the city to avoid an estimated \$4-10 billion dollars of "grey infrastructure" expenditures in exchange for approximately \$1 billion worth of watershed protection investments. The city saved money by investing in "green infrastructure" and provided funding for forest restoration. New York City's decision to invest in conservation demonstrated a win from both a financial and environmental perspective (Nicola, 2013).

In California, The Nature Conservancy, Sierra Nevada Conservancy and the U.S. Forest Service examined the cost savings from forest restoration in the Mokelumne River watershed. Their analysis showed that it made economic sense to invest in forest management to reduce the risk of destructive, high-severity wildfires. They modeled wildfire in the Mokelumne watershed both with and without implementations of fuel-treatments scenarios, and quantified the financial costs and benefits of the treatments. The total benefits of fuel treatments exceed the costs, and the benefits accrue to a wide range of land and water managers, taxpayers, and electric and water utility ratepayers. The study found that benefits due to fuel treatments total between \$126 and \$224 million, and their value was two to three times the cost (Buckley et al., 2014).

The cost-savings from forest restoration can be used in a pay-for-success model, or an environmental impact bond. The model is intended to raise capital from private investors to fund forest restoration designed to decrease burn severity and increase water availability for local utilities. Proponents suggest that investors are expected to earn market returns as real economic results, cost savings from reduction in number and severity of fires, and increased revenue for

water utilities as a result of increased water flow (Madsbjerg & Connaker, 2016). However, for the pay-for-success model to work, the intervention must result in savings that exceed the cost of the intervention. Which in this case, requires the accounting of the direct costs accrued to the government agency, and the costs are avoided only if the fire occurs. To succeed, the pay-for-success contracts require a clear articulation of problem (often a government issued request for proposal), a government champion, and dedicated funding. Additionally, the beneficiaries (government and utilities), must recognize the benefits of a healthy forest, and must be willing to pay back the investors (Koren, 2016).

Conclusion

One of the fundamental issues facing public lands, and natural resource conservation, is a lack of financial sustainability. Land has real costs associated with acquisition, maintenance, and general administration. Public funding for state parks has declined over the last decade, with more and more tax revenue allocated to other programs such as healthcare, education, and public safety. Additionally, the aging infrastructure of public lands has led to an increase in the cost of maintenance and management.

Public lands function as a public good, offering a service that is primarily funded by public money in the form of tax revenues. The lack of financial sustainability prevents the current model of funding and management to continue. This was the case in 2012 when California was faced with closing 70 state parks. New models for governing and financing public land and natural resources are needed. Private sector solutions may offer an important example for a new management model.

Parks could operate like public utilities whereby the user pays for the service. User fees can include park entrance fees, annual passes, camping and lodging fees, activity fees, and equipment fees. It can be argued that fees increase efficiency by making agencies more fiscally accountable. However, fees are socially regressive, increase pressure for facility development, and leave parks vulnerable to market fluctuation such as visitation declines.

Outsourcing management has been used for years, primarily through the use of concessionaire agreements. Contracting with a private firm to take on a management activity is preferred if the contract payments together with the full costs associated with maintaining and enforcing an efficient contract are less than the internal cost of the government providing the service itself. To use this option, states need to consider whether a contract can be structured to provide proper incentives, and how much it will cost the government to write, monitor, and enforce the contract.

Public-private partnerships help to acquire lands as they come onto the market as well as provide certain park functions and services. Public-private relationships have a long history of success and their use is increasing. Delegation of some, or all park services, has been considered a way to address budgetary constraints and shortfalls, because of the expected efficiency gains resulting from competition. The experience of the California State Parks Foundation has successfully received substantial funding through partnerships with private corporations. The Little Hoover Commission believes that there is potential for building on these contributions.

Privatization of park management whereby states contract with private firms to operate parks presents many challenges. Firms would likely cherry-pick the most popular and profitable parks, leaving states with the most expensive parks to operate. Also, there is an ideological opposition to privatization with many believing that management of parks is a core function of the government. Critics also suggest that outsourcing responsibilities results in losses of

institutional memory and public control. However, as state parks face declining budgets, the private sector does offer a new opportunity for involvement and funding security.

Institutional investors are increasingly looking for opportunities to invest in solutions that restore natural resources. Impact investors are pursuing measurable environmental benefits alongside the desire for conventional return on capital. This includes use of social or environmental impact bonds which structure a government contract for social services as a type of pay-for-performance contract. Social impact bonds have been gaining traction to entice private capital to help address challenging social problems. Clearly there is a desire on the part of companies and private investors to have a meaningful impact on the conservation of natural resources.

By engaging the private sector, the government can begin to address funding issues through a variety of innovative solutions. Public investment tools may not alone provide enough money to invest in natural resource management at an appropriate scale. With new innovative private financing, matched with traditional government funding, large-scale conservation projects can be achieved and public lands can be sustainability managed for the future.

Paper III: References

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Paper III: Appendix

Figure 1: California State Park Expenditures (California Legislative Analyst's Office, 2012)

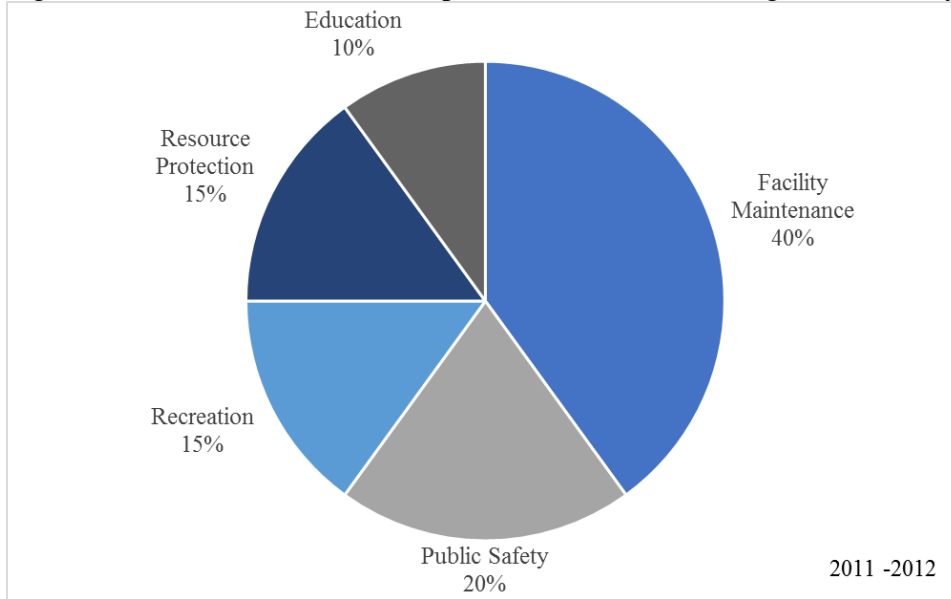


Figure 2: California State Park Funding (California Legislative Analyst's Office, 2017)

